# 6.4 Timing

# 6.4.1 UE transmit timing

# 6.4.1.0 Minimum conformance requirements

# 6.4.1.0.1 Minimum conformance requirements for UE transmit timing accuracy

The UE initial transmission timing error shall be less than or equal to  $\pm T_e$  where the timing error limit value  $T_e$  is specified in Table 6.4.1.0.1-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS or it is the PRACH transmission.

The UE shall meet the Te requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus  $(N_{TA} + N_{TA \text{ offset}}) \times T_c$ . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell.  $N_{TA}$  for PRACH is defined as 0.

 $(N_{\text{TA}} + N_{\text{TA offset}}) \times T_{\text{c}}$  (in  $T_c$  units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in clause 7.3 was applied.  $N_{\text{TA}}$  for other channels is not changed until next timing advance is received. The value of  $N_{\text{TA offset}}$  depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR).  $N_{\text{TA offset}}$  is defined in Table 6.4.1.0.1-2.

Frequency Range	SCS of SSB signals (KHz)	SCS of uplink signals s(KHz)	Te
		15	12*64*Tc
	15	30	10*64*Tc
1		60	10*64*Tc
I	30	15	8*64*Tc
		30	8*64*Tc
		60	7*64*Tc
	120 240	60	3.5*64*Tc
2		120	3.5*64*Tc
2		60	3*64*T <sub>c</sub>
		120	3*64*Tc
Note 1: T <sub>c</sub> is the basic timing unit defined in TS 38.211 [6]			

Table 6.4.1.0.1-1: Te Timing Error Limit

# Table 6.4.1.0.1-2: The Value of N<sub>TA offset</sub>

Freque	ncy range and band of cell used for uplink transmission	N <sub>TA offset</sub> (Unit: Tc)		
FR1 FDD band without LTE-NR coexistence case or		25600 (Note 1)		
FR1 TDD	band without LTE-NR coexistence case			
FR1 FDD	band with LTE-NR coexistence case	0 (Note 1)		
FR1 TDD	band with LTE-NR coexistence case	39936 (Note 1)		
FR2		13792		
Note 1:	te 1: The UE identifies $N_{\text{TA offset}}$ based on the information n-			
	TimingAdvanceOffset according to [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N_{\text{TA offset}}$ is set as			
25600 for FR1 band. In case of multiple UL carriers in the same TAG, UE expects that the same value of n-TimingAdvanceOffset is provided for all the UL carriers according to section 4.2 in [3] and the value 39936 of $N_{\text{TA offset}}$ can also be provided for a FDD serving cell.				

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in clause 7.3 is applied.

When the transmission timing error between the UE and the reference timing exceeds  $\pm T_e$ , the UE is required to adjust its timing to within  $\pm T_e$ . The reference timing shall be  $(N_{TA} + N_{TA \text{ offset}}) \times T_c$  before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

- 1) The maximum amount of the magnitude of the timing change in one adjustment shall be T<sub>q</sub>.
- 2) The minimum aggregate adjustment rate shall be  $T_p$  per second.
- 3) The maximum aggregate adjustment rate shall be  $T_q$  per [200]ms.
- where the maximum autonomous time adjustment step  $T_q$  and the aggregate adjustment rate  $T_p$  are specified in Table 6.4.1.0.1-3.

# Table 6.4.1.0.1-3: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (KHz)	Tq	Τp	
	15	5.5*64*Tc	5.5*64*Tc	
1	30	5.5*64*Tc	5.5*64*Tc	
	60	5.5*64*Tc	5.5*64*Tc	
2	60	2.5*64*Tc	2.5*64*Tc	
Z	120	2.5*64*Tc	2.5*64*Tc	
NOTE 1: $T_c$ is the basic timing unit defined in TS 38.211 [6]				

The normative reference for this requirement is TS.38.133 [6] clause 7.1.2.

# 6.4.1.1 NR SA FR1 UE transmit timing accuracy

# 6.4.1.1.1 Test purpose

The purpose of this test is to verify that the UE can follow frame timing change of the connected gNodeb and that the UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are within the specified limits. This test will verify the requirements in TS 38.133 [6] clause 7.1.2.

6.4.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

#### 6.4.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.4.1.0.1.

The normative reference for this requirement is TS.38.133 [6] clause A.6.4.1.1

6.4.1.1.4 Test Description

#### 6.4.1.1.4.1 Initial Conditions

Initial conditions are a set of test configurations the UE needs to be tested in and the steps for the SS to take with the UE to reach the correct measurement state.

The initial test configurations consist of environmental conditions, test frequencies, test channel bandwidths and subcarrier spacing based on NR operating bands specified in Table 5.3.5-1 of 38.521-1 [17].

This test can be run in one of the configurations defined in Table 6.4.1.1.4.1-1.

# Table 6.4.1.1.4.1-1: Supported test configurations for FR1 PCell

Configuration	Description		
6.4.1.1-1	NR FDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz		

6.4.1.1-2	NR TDD, SSB SCS 15 kHz, data SCS 15 kHz, BW 10 MHz			
6.4.1.1-3	NR TDD, SSB SCS 30 kHz, data SCS 30 kHz, BW 40 MHz			
Note: The UE is only required to be tested in one of the supported test				
confi	configurations in FR1 depending on UE capability.			

Configure the test equipment and the DUT according to the parameters in Table 6.4.1.1.4.1-2

Table 6.4.1.1.4.1-2: Initial conditions for NR SA FR1 transmit timing accuracy

Parameter	Value		eter Value Comment		Comment
Test environment		NC	As specified in TS 38.508-1 [14] clause 4.1.		
Test frequencies	As s	pecified in Annex E.1.2, Table E.	4-1 and TS 38.508-1 [14] clause 4.3.1.		
Channel bandwidth	As specified by the test configuration selected from Table 6.4.1.1.4.1-1				
Propagation conditions	AWGN		As specified in Annex C.2.2.		
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.		
Diagram	DUT Part	A.3.2.3.4			
Exceptions to connection diagram	Without LTE link				

- 1. Message contents are defined in clause 6 6.4.1.1.4.3.
- 2. A single NR cell is used. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1. The general test parameters are given in Table 6.4.1.1.5-1 below.

#### 6.4.1.1.4.2 Test procedure

The test consists of a single NR cell (PCell). The downlink timing of the NR Cell is changed and the changes in UE transmit timing are observed. The transmit timing is verified by the UE transmitting SRS used as a measurement reference facilitating the SS timing estimation.

The test sequence shall be carried out in RRC\_CONNECTED for every test case.

Following will be the test sequence for this test

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* according to TS 38.508-1 [6] clause 4.5.
- 2. Set up NR Cell according to parameters given in Table 6.4.1.1.4.1-1.
- 3. The SS shall transmit an RRCReconfiguration message configuring the UE with the message content defined in clause 6.4.1.1.4.3.
- 4. The UE shall transmit RRCReconfigurationComplete message.
- 5. After connection set up with the cell and during 2 seconds before DL timing adjustment, the test equipment shall monitor all SRS transmissions and verify that, for each received SRS, the timing of the NR cell is within ( $N_{TA} + N_{TA_{offset}}$ )  $\times T_c \pm T_e$  of the first detected path of DL SSB.
  - a. The  $N_{TA}$  offset value (in  $T_c$  units) is 25600 for FR1
- 6. The test system shall adjust the timing of the DL path by values given in Table 6.4.1.1.4.2-1. For Test 2, the DL timing change shall be applied within the first half of the DRX cycle upon expiration of the preceding DRX ON duration.

SCS of SSB signals (KHz)	Adjustment Value	
	Test1	Test2
15	+64*64Tc	+32*64Tc
30	+32*64Tc	+16*64Tc

#### Table 6.4.1.1.4.2-1: Adjustment Value for DL Timing

- 7. The test system shall verify that the adjustment step size and the adjustment rate shall be according to requirements specified in Table 6.4.1.1.5-5. This will only be done for Test1. The test system samples the UE Transmit Timing once per SRS transmission (as per configured SRS periodicity). To check Rule 1, the SS shall check that the maximum time adjustment step size  $T_{g}$  between one SRS transmission to next consecutive SRS transmission of a valid UL slot is within Rule 1 as specified in clause 6.4.1.0.1 and Table 6.4.1.0.1-3. To check that the minimum adjustment rate is within Rule 2 as specified in clause 6.4.1.0.1 and Table 6.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 1 + offset seconds sliding window (offset in ms to the next consecutive SRS transmission), with step size p (where p is the periodicity of SRS), as long as the resulting slot is a valid UL slot. To check that the maximum adjustment rate is within Rule 3 as specified in clause 6.4.1.0.1 and Table 6.4.1.0.1-3, the SS shall measure the change in SRS transmission timing over a 200ms - offset sliding window of previous SRS transmission, with step size p (where p is the periodicity of SRS), as long as the resulting slot is a valid UL slot. The three rules apply until the UE transmit timing offset is within the limits specified in 6.4.1.0.1 and Table 6.4.1.0.1-3 with respect to the first detected path (in time) of the corresponding downlink frame of Cell 1. The test system will wait till evaluation interval of T seconds is met to ensure UE transmit timing is stable at the end of the step, where T=.DL\_timing\_change[Ts]/5.5Ts and DL\_timing\_change is specified in Table 6.4.1.1.4.2-1.
- 8. After the UE transmit timing is within the limits specified in step 7, and during 2 seconds, the test system shall monitor all SRS transmissions and verify that, for each received SRS, the UE transmit timing offset stays within  $(N_{TA} + N_{TA\_offset}) \times T_c \pm T_e$  of the first detected path of DL SSB. For Test 2 the UE transmit timing offset shall be verified for the first transmission in the DRX cycle immediately after DL timing adjustment.

# 6.4.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

#### Table 6.4.1.1.4.3-0: Common Exception messages

Default Message Contents		
Common contents of system information blocks exceptions		
Default RRC messages and information elements contents exceptions	Table H.3.9-1	

Derivation Path: TS 38.508-1 [14], Table 4.6.3-182			
Information Element	Value/remark	Comment	Condition
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE			
(SIZE(0maxNrofSRS-ResourceSets)) OF			
SEQUENCE {			
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE			
(SIZE(1maxNrofSRS-Resources)) OF SEQUENCE {			
SRS-Resource[1] SEQUENCE {		entry 1	
freqHopping SEQUENCE {			
c-SRS	14		SCS15
	25		SCS30
}			
groupOrSequenceHopping	neither		
resourceType CHOICE {			
periodic SEQUENCE {			
periodicityAndOffset-p CHOICE {			
sl1	0		Test 1
sl320	3		Test 2 and
			SCS15
sl640	5		Test 2 and
			SCS30
}			
}			
}			
}			
}			
}			

# Table 6.4.1.1.4.3-1: SRS-Config : Additional test requirement for UE transmit timing accuracy for NR SA FR1 UE

# Table 6.4.1.1.4.3-2: DRX-Config : Additional test requirement for UE transmit timing accuracy Test 2 for NR SA FR1

Derivation Path: TS 38.508-1 [14], Table 4.6.3-56	6		
Information Element	Value/remark	Comment	Condition
DRX-Config ::= CHOICE {			
drx-InactivityTimer	ms1		
drx-RetransmissionTimerDL	sl1		
drx-RetransmissionTimerUL	sl1		
drx-LongCycleStartOffset CHOICE {			
ms320	0		
}			
}			

# 6.4.1.1.5 Test Requirements

# Table 6.4.1.1.5-1: Cell Specific Test Parameters for UL Transmit Timing test

Parameter	Unit	Config	Test1	Test2
SSB ARFCN		1,2,3	Freq1	Freq1
NR Channel Number		1,2,3	2	2
		1	Not Applicable TDDConf.1.1 TDDConf.2.1	
TDD configuration		2		
		3		

		1	10: NRI	в,с = 52
BW <sub>channel</sub>	MHz	2	10: N <sub>RI</sub>	в,с = 52
		3		<sub>s,c</sub> = 106
Initial BWP Configuration		1,2,3	DLBWP.0.1 ULBWP.0.1	
Dedicated BWP Configuration		1,2,3	DLBWP.1.1 ULBWP.1.1	
DRx Cycle	ms	1,2,3	N/A	DRX.8 <sup>Note5</sup>
		1	SR.1.	1 FDD
PDSCH Reference measurement channel		2	SR.1.	1 TDD
		3		1 TDD
RMSI CORESET		1	CR.1.	1 FDD
Reference Channel		2	CR.1.	1 TDD
		3	CR.2.	1 TDD
Dedicated CORESET		1		.1 FDD
Reference Channel		2		.1 TDD
OCNG Patterns		<u>3</u> 1,2,3		. <u>1 TDD</u> P.1
		1,2		1 FR1
SSB configuration		3	SSB.2	
		1	SMT	ГС.1
SMTC		3		FC.2
		1	TRS.1	.1 FDD
TRS configuration		2	TRS.1	.1 TDD
<u>j</u>		3	TRS.1	.2 TDD
EPRE ratio of PSS to SSS EPRE ratio of PBCH DMRS to SSS EPRE ratio of PBCH to PBCH DMRS EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS EPRE ratio of PDSCH DMRS to SSS EPRE ratio of PDSCH to PDSCH EPRE ratio of OCNG DMRS to SSS(Note 1) EPRE ratio of OCNG to OCNG DMRS (Note 1)	dB	1,2,3	0	0
N <sub>oc</sub> Note2	dBm/15 kHz	1,2,3	-98	-98
N <sub>oc</sub> Note2	dBm/SCS	1,2	-98	-98
	ubiii/303	3	-95	-95
$\hat{\mathrm{E}}_{\mathrm{s}}/\mathrm{I}_{\mathrm{ot}}$		1,2,3	3.3	3.3
$\hat{E}_{_s}/N_{_{oc}}$		1,2,3	3.3	3.3
SS-RSRP <sup>Note3</sup>	dBm/SCS	1,2	-95	-95
	dBm/SCS	3	-92	-92
IO <sup>Note3</sup>	dBm/9.36MHz	1,2	-65.08	-65.08
	dBm/38.1MHz	3	-61.99	-61.99
Propagation condition		1,2,3	AW	
SRS Config		1	SRSConf.1 <sup>Note6</sup>	SRSConf.3Note
transmitted pow Note 2: Interference fror	er spectral density n other cells and r	is achieved for a noise sources not	SRSConf.1 <sup>Note6</sup> allocated and a cons all OFDM symbols. specified in the tes modelled as AWG	st is assumed to

Note 3:	SS-RSRP and lo levels have been derived from other parameters for information
	purposes. They are not settable parameters themselves.
Note 4:	SS-RSRP minimum requirements are specified assuming independent interference
	and noise at each receiver antenna port.
Note 5:	DRx related parameters are given in Table 6.4.1.1.5-3 or Table A.51
Note 6:	SRS configs are given in Table 6.4.1.1.5-2

# Table 6.4.1.1.5-2: SRS Configuration for Timing Accuracy Test

	Field	SRSConf.1	SRSConf.2	SRSConf.3	Comments
SRS-	srs-ResourceSetId	0	0	0	
ResourceSet	srs-ResourceIdList	0	0	0	
	resourceType	Periodic	Periodic	Periodic	
	Usage	Codebook	Codebook	Codebook	
	SRS-ResourceSetId	0	0	0	
SRS-Resource	nrofSRS-Ports	Port1	Port1	Port1	
	transmissionComb	n2	n2	n2	
	combOffset-n2	0	0	0	
	cyclicShift-n2	0	0	0	
	resourceMapping startPosition	0	0	0	
	resourceMapping nrofSymbols	n1	n1	n1	
	resourceMapping repetitionFactor	n1	n1	n1	
	freqDomainPosition	0	0	0	
	freqDomainShift	0	0	0	
	freqHopping c-SRS	14 for test configuration 1,2 25 for test configuration 3	25	14	Matches N <sub>RB,c</sub>
	freqHopping b-SRS	0	0	0	
	freqHopping b-hop	0	0	0	
	groupOrSequenceHopping	Neither	Neither	Neither	
	resourceType	Periodic	Periodic	Periodic	
	periodicityAndOffset-p	sl1	sl640,5	sl320,3	Offset to align with DRx periodicity
	sequenceld	0	0	0	Any 10 bit number

# Table 6.4.1.1.5-3: DRX-Configuration for UL Timing Tests

Field	Test 2 Value			
drx-onDurationTimer	6 ms			
drx-InactivityTimer	1 ms			
drx-RetransmissionTimerDL	1 slot			
drx-RetransmissionTimerUL	1 slot			
longDRX-CycleStartOffset	320 ms			
shortDRX	disable			
TimeAlignmentTimer	Infinity			
Note: The DRX cycle and time alignment timer parameters are specified in clause 6.3.2 in TS 38.331 [13]				

# Table 6.4.1.1.5-4: Te Timing Error Limit

Frequency Range	SCS of SSB signals (KHz)	SCS of uplink signals (KHz)	Te
	1 15	15	13.75*64*T <sub>c</sub>
1		30	11.75*64*T <sub>c</sub>
1		60	11.75*64*T <sub>c</sub>
	30	15	9.75*64*Tc

			30	9.75*64*Tc		
			60	8.75*64*Tc		
Note 1: T <sub>c</sub> is the basic timing unit defined in TS 38.211 [6]						

# Table 6.4.1.1.5-5: $T_q$ Maximum Autonomous Time Adjustment Step and $T_p$ Minimum Aggregate Adjustment rate

Frequency Range	SCS of uplink signals (KHz)	Τq	Tp	Maximum Adjustement Rate
	15	6.0*64*Tc	1.9*64*Tc	6.6*64*Tc
1	30	6.0*64*Tc	1.9*64*Tc	6.6*64*Tc
	60	6.0*64*T <sub>c</sub>	1.9*64*T <sub>c</sub>	6.6*64*T <sub>c</sub>
NOTE 1: T <sub>c</sub> is the ba				

- 6.4.2 UE timer accuracy
- 6.4.3 Timing advance
- 6.4.3.0 Minimum conformance requirement

# 6.4.3.0.1 Minimum conformance requirement for timing advance adjustment

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 6.4.3.1.3-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS38.213 [8].

# Table 6.4.3.1.3-1: UE Timing Advance adjustment accuracy

Sub Carrier Spacing, SCS kHz	15	30	60	120
UE Timing Advance adjustment accuracy	±256 T <sub>c</sub>	±256 T <sub>c</sub>	±128 T <sub>c</sub>	±32 Tc

# 6.4.3.1 NR SA FR1 timing advance adjustment accuracy

# 6.4.3.1.1 Test purpose

The purpose of the test is to verify UE timing advance adjustment delay and accuracy requirement defined in clause 7.3 of TS 38.133 [6].

# 6.4.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

6.4.3.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.4.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.4.3.1.

6.4.3.1.4 Test description

# 6.4.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.4.3.1.4.1-1.

Config	Description				
1	NR 15 kHz SSB SCS, 10MHz bandwidth, FDD duplex mode				
2	NR 15 kHz SSB SCS, 10MHz bandwidth, TDD duplex mode				
3 NR 30 kHz SSB SCS, 40MHz bandwidth, TDD duplex mode					
Note: The UE is only require	Note: The UE is only required to be tested in one of the supported test configurations				

#### Table 6.4.3.1.4.1-1: NR SA FR1 timing advance adjustment accuracy supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.4.3.1.4.1-2

#### Table 6.4.3.1.4.1-2: Initial conditions for NR SA FR1 timing advance adjustment accuracy

Parameter	Value		Comment
Test environment		NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As	specified in Annex E.1.2, Table E.4	4-1 and TS 38.508-1 [14] clause 4.3.1.
Channel bandwidth		As specified by the test configuration	on selected from Table 6.4.3.1.4.1-1
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
Diagram	DUT Part	A.3.2.3.4	
Exceptions to connection diagram		Without LTE Link	

# Table 6.4.3.1.4.1-3: General test parameters for timing advance

Parameter	Unit	Value	Comment
RF channel number		1	
Initial DL BWP		DLBWP.0.1	As specified in Table A.8.1-1
Dedicated DL BWP		DLBWP.1.1	As specified in Table A.8.1-2
Initial UL BWP		ULBWP.0.1	As specified in Table A.8.2-1
Dedicated UL BWP		ULBWP.1.1	As specified in Table A.8.2-2
Timing Advance Command ( <i>T</i> <sub>A</sub> ) value during T1		31	<i>N</i> <sub>TA_new</sub> = <i>N</i> <sub>TA_old</sub> for the purpose of establishing a reference value from which the timing advance adjustment accuracy can be measured during T2
Timing Advance Command ( <i>T<sub>A</sub></i> ) value during T2		39	For SCS = 15kHz : $N_{TA\_new} = N_{TA\_old} + 8192*T_c$ (based on equation in TS38.213 section 4.2) For SCS = 30kHz : $N_{TA\_new} = N_{TA\_old} + 4096*T_c$ (based on equation in TS38.213 section 4.2)
T1	S	5	
T2	S	5	

- 1. Message contents are defined in clause 6.4.3.1.4.3.
- 2. Single Cell is used, which is NR FR1 PCell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.
- 3. The test parameters are given in Table 6.4.3.1.4.1-3 above.
- 4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.
- 5. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [10] clause 4.5.

#### 6.4.3.1.4.2 Test Procedure

The test consists of single cell. The test consists of two successive time periods, with time durations of T1 and T2 respectively. In each time period, timing advance commands are sent to the UE and Sounding Reference Signals (SRS), as specified in table 6.4.3.1.5-1 and table 6.4.3.1.4.1-3, are sent from the UE and received by the test equipment. By

measuring the reception of the SRS, the transmit timing, and hence the timing advance adjustment accuracy, can be measured. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.

- 1. Set the parameters according to values in Tables 6.4.3.1.4.1-3.
- 2. SS shall transmit an RRCReconfiguration message.
- 3. The UE shall transmit RRCReconfigurationComplete message.
- 4. During time period T1, the test equipment shall send one message with a Timing Advance Command MAC Control Element, as specified in Clause 6.1.3.4 in TS 38.321. The Timing Advance Command value shall be set to 31, which according to Clause 4.2 in TS 38.213 results in zero adjustment of the Timing Advance. In this way, a reference value for the timing advance used by the UE is established.
- 5. During time period T2, the test equipment shall send a sequence of messages with Timing Advance Command MAC Control Elements, with Timing Advance Command value 39 as specified in table 6.4.3.1.4.1-3. This value shall result in changes of the timing advance used by the UE, and the accuracy of the change shall then be measured, using the SRS sent from the UE.
- 6. As specified in Clause 7.3.2.1 of TS 38.133 [6], the UE adjusts its uplink timing at slot n+k+1 for a timing advance command received in slot n. This delay must be taken into account when measuring the timing advance adjustment accuracy, via the SRS sent from the UE.
- 7. The UE Time Alignment Timer, described in Clause 5.2 in TS 38.321, shall be configured so that it does not expire in the duration of the test.
- 8. The result from the SRS and adjustment of the timing advance in step 7) is used to measure that the UE adjusts the timing of its transmission with a relative accuracy better than or equal to value specified in Table 6.4.3.1.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission.
- 9. If the UE adjust the timing of its transmission within a relative accuracy greater than or equal to value specified in Table 6.4.3.1.3-1 to the signalled timing advance value compared to the timing of preceding uplink transmission then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
- 10. The SS shall transmit RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
- 11. After the RRC connection release, the SS transmits in Cell a Paging message (including PagingRecord with ue-Identity) for the UE and ensures the UE is in State RRC\_CONNECTED according to TS 38.508-1 [14] clause 4.5.4 or if the paging fails, switch off and on the UE and ensure the UE is in RRC\_CONNECTED according to TS 38.508-1 [14] clause 4.5.4.
- 12. Repeat step 2-11 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

# 6.4.3.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 7.3, with the following exceptions:

#### Table 6.4.3.1.4.3-0: Common Exception messages

Default Message Contents				
Common contents of system information blocks exceptions				
Default RRC messages and information elements contents exceptions	Table H.3.9-1			

Derivation Path: TS 38.508-1, Table 4.6.3-182							
Information Element	Value/remark	Comment	Condition				
SRS-Config ::= SEQUENCE {							
srs-ResourceSetToAddModList SEQUENCE	1 entry						
(SIZE(0maxNrofSRS-ResourceSets)) OF							
SEQUENCE {							
SRS-ResourceSet[1] SEQUENCE {		entry 1					
resourceType CHOICE {							
periodic SEQUENCE {							
}							
}							
}							
}							
srs-ResourceToAddModList SEQUENCE	1 entry						
(SIZE(1maxNrofSRS-Resources)) OF SEQUENCE {							
SRS-Resource[1] SEQUENCE {		entry 1					
freqHopping SEQUENCE {							
c-SRS	12	Config 1,2					
	24	Config 3					
}							
groupOrSequenceHopping	neither						
resourceType CHOICE {							
periodic SEQUENCE {	periodic						
periodicityAndOffset-p CHOICE {							
sl5	2	Once every 5 Slots	SCS15				
sl5	4	Once every 5	SCS30				
		Slots					
}							
}							
}							
}							
<u>}</u>							
}							

# Table 6.4.3.1.4.3-1: srs-Config setup

# 6.4.3.1.5 Test Requirement

The UE shall apply the signalled Timing Advance value to the transmission timing at the designated activation time i.e. k slots after the reception of the timing advance command, where:

k = 5 for Config 1, 2, and 3

The Timing Advance adjustment accuracy shall be within the limits specified in Table 6.4.3.1.5-3.

The rate of correct Timing Advance adjustments observed during repeated tests shall be at least 90%.

Table 6.4.3.1.5-1 and Table 6.4.3.1.5-2 define the primary level settings.

# Table 6.4.3.1.5-1: Cell specific test parameters for timing advance

Paramotor	Unit	Test1	
Farameter		T1	T2

		Config 1		FDD
Duple	ex mode	Config 2,3	1	TDD
		Config 1		Not Applicable
TDD configuration		Config 2		TDDConf.1.1
		Config 3		TDDConf.2.1
		Config 1		10: N <sub>RB,c</sub> = 52
BW	channel	Config 2	MHz	$10: N_{RB,c} = 52$
BW	channel	Config 3	111112	$40: N_{RB,c} = 32$
		Config 1		10: N <sub>RB,c</sub> = 52
	PBW			
DVV	PDW	Config 2	MHz	$10: N_{RB,c} = 52$
		Config 3		$40: N_{\text{RB,c}} = 106$
	DRx Cy		ms	Not Applicable
PDSCH	Reference	Config 1		SR.1.1 FDD
	nent channel	Config 2		SR.1.1 TDD
		Config 3		SR2.1 TDD
RMSI (	ORESET	Config 1		CR.1.1 FDD
	ce Channel	Config 2		CR.1.1 TDD
Kelelen		Config 3		CR2.1 TDD
Dodiantes	CORESET	Config 1		CCR.1.1 FDD
		Config 2		CCR.1.1 TDD
Keieren	ce Channel	Config 3		CCR.2.1 TDD
		Config 1		TRS.1.1 FDD
TRS Co	nfiguration	Config 2		TRS.1.1 TDD
	garadon	Config 3		TRS.1.2 TDD
	OCNG Pa			OCNG pattern 1
		Config 1,2		SMTC.1 FR1
SMTC co	onfiguration	Config 3		SMTC.2 FR1
DDSCL	I/PDCCH	Config 1,2		15 kHz
		Config 3	kHz	30 kHz
	er spacing			
	I/PUSCH	Config 1,2	kHz	15 kHz
	er spacing	Config 3		30 kHz
	PRE ratio of P			
		DMRS to SSS		
		to PBCH DMRS		
		H DMRS to SSS		
		to PDCCH DMRS	dB	0
		H DMRS to SSS	üD	0
		CH to PDSCH		
EPRE ration	o of OCNG DN	/IRS to SSS(Note 1)		
EPRE ratio	o of OCNG to	OCNG DMRS (Note		
	1)			
	λ/ No	te2	dBm/15kH	
	$N_{_{oc}}$ No		z	-98
N Note?	C	Config 1,2		-98
$N_{_{oc}}$ Note2		Config 3	dBm/SCS	-95
	$\hat{\mathbf{E}}_{s}/\mathbf{I}_{s}$		dB	3
	$\hat{E}_s/N$	ос	dB	3
Lo <sup>Note3</sup>		Config 1,2	dBm/ 9.36MHz	-67.57
-		Config 3	dBm/ 38.16MHz	-62.58
	Propagation	condition	-	AWGN
Note 1:			cells are fully	allocated and a constant total transmitted power spectral
		ieved for all OFDM sy		
				t specified in the test is assumed to be constant over
				/GN of appropriate power for $N_{ac}$ to be fulfilled.
Note 3:	lo levels have parameters th		her parameters	s for information purposes. They are not settable

Fie	əld	Value	Comment
c-SRS	Config 1,2		
0-383	Config 3	24	Frequency honning is dischlod
b-S	RS	0	Frequency hopping is disabled
b-ł	пор	0	
freqDoma	inPosition	0	Frequency domain position of SRS
freqDon	nainShift	0	
groupOrSequ	enceHopping	neither	No group or sequence hopping
SRS-PeriodicityAndOffset		sl5@2 for SCS 15kHz sl5@4 for SCS 30kHz	Once every 5 slots
pathlossReferenceRS		ssb-Index=0	SSB #0 is used for SRS path loss estimation
US	age	Codebook	Codebook based UL transmission
startP	osition	0	resourceMapping setting. SRS on last
nrofSy	nrofSymbols		symbol of slot, and 1symbols for SRS
repetitionFactor		n1	without repetition.
combOffset-n2		0	transmission Comb patting
cyclicS	cyclicShift-n2		transmissionComb setting
	nrofSRS-Ports		Number of antenna ports used for SRS transmission
Note: For further inf	ormation see clause 6	6.3.2 in TS 38.331.	

# Table 6.4.3.1.5-2: Sounding Reference Symbol Configuration for timing advance

Table 6.4.3.1.5-3: UE Timing Advance adjustment accuracy

Sub Carrier Spacing, SCS kHz	15	30	60
UE Timing Advance adjustment accuracy	±344 T <sub>c</sub>	±344 T <sub>c</sub>	±216 Tc

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

# 6.5 Signaling characteristics

# 6.5.1 Radio link monitoring

# 6.5.1.00 General

The UE shall monitor the downlink link quality based on the reference signal in the configured RLM-RS resource(s) in order to detect the downlink radio link quality of the PCell and PCell as specified in [3]. The configured RLM-RS resources can be all SSBs, or all CSI-RSs, or a mix of SSBs and CSI-RSs. UE is not required to perform RLM outside the active DL BWP.

On each RLM-RS resource, the UE shall estimate the downlink radio link quality and compare it to the thresholds  $Q_{out}$  and  $Q_{in}$  for the purpose of monitoring downlink radio link quality of the cell.

The threshold  $Q_{out}$  is defined as the level at which the downlink radio link cannot be reliably received and shall correspond to the out-of-sync block error rate (BLER<sub>out</sub>) as defined in Table 6.5.1-1.

The threshold  $Q_{in}$  is defined as the level at which the downlink radio link quality can be significantly more reliably received than at  $Q_{out}$  and shall correspond to the in-sync block error rate (BLER<sub>in</sub>) as defined in Table 6.5.1-1.

The out-of-sync block error rate (BLER<sub>out</sub>) and in-sync block error rate (BLER<sub>in</sub>) are determined from the network configuration via parameter *rlmInSyncOutOfSyncThreshold* signalled by higher layers. When UE is not configured with *RLM-IS-OOS-thresholdConfig* from the network, UE determines out-of-sync and in-sync block error rates from Configuration #0 in Table 6.5.1-1 as default. All requirements here are applicable for BLER Configuration #0 in Table 6.5.1-1.

## Table 6.5.1-1: Out-of-sync and in-sync block error rates

Configuration	BLERout	BLERin
0	10%	2%

UE shall be able to monitor up to  $X_{RLM-RS}$  RLM-RS resources of the same or different types in each corresponding carrier frequency range, where  $X_{RLM-RS}$  is specified in Table 6.5.1-2, and meet the requirements as specified in this section.

# Table 6.5.1-2: Maximum number of RLM-RS resources XRLM-RS

Maximum number of RLM-RS resources, X <sub>RLM-RS</sub>	Carrier frequency range of PCell/Pcell
2	FR1, ≤ 3 GHz
4	FR1, > 3 GHz
8	FR2

If different SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB shall be TDMed. If same SCS is used for CSI-RS based RLM-RS and SSB, then CSI-RS based RLM-RS and SSB can be FDMed or TDMed.

Any uplink signal transmitted by the UE is used for detecting the In-/Out-of-Sync state of the UE. In terms of measurement, the uplink signal is verified on the basis of the UE output power:

For intra-band contiguous carrier aggregation, transmit OFF power is measured as the mean power per component carrier.

For UE with multiple transmit antennas, transmit OFF power is measured as the mean power at each transmit connector.

- UE output power higher than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [4]) means uplink signal
- UE output power equal to or less than Transmit OFF power -50 dBm (as defined in TS 38.101-3 [4]) means no uplink signal.

# 6.5.1.0 Minimum conformance requirements

# 6.5.1.0.1 Minimum conformance requirements for out-of-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{Evaluate\_out\_SSB}$  [ms] period becomes worse than the threshold  $Q_{out\_SSB}$  within  $T_{Evaluate\_out\_SSB}$  [ms] evaluation period. The requirements in this section apply for each SSB based RLM-RS resource configured for PSCell, provided that the SSB configured for RLM is transmitted within UE active DL BWP during the entire evaluation period defined in Table 6.5.1.0.1-1.

T<sub>Evaluate\_out\_SSB</sub> is defined in Table 6.5.1.0.1-1 for FR1.

Configuration	T <sub>Evaluate_out_SSB</sub> (ms)	
no DRX	max(200,ceil(10*P)*T <sub>SSB</sub> )	
DRX cycle≤320	max(200,ceil(15*P)*max(T <sub>DRX</sub> ,T <sub>SSB</sub> ))	
DRX cycle>320	20 ceil(10*P)*T <sub>DRX</sub>	
NOTE: T <sub>SSB</sub> is the periodicity of SSB configured for RLM.		

# Table 6.5.1.0.1-1: Evaluation period T<sub>Evaluate\_out</sub> for FR1

For FR1,

- P=1/(1 T<sub>SSB</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [13] signaling of *smtc2* is present,  $T_{SMTCperiod}$  follows *smtc2*; otherwise  $T_{SMTCperiod}$  follows *smtc1*.

Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

When the downlink radio link quality on all the configured RLM-RS resources is worse than Q<sub>out</sub>, Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [13].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least  $T_{Indication\_interval}$ .

If DRX is used, when the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When

- the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration,

or

- the UE transitions between DRX and no DRX or DRX cycle periodicity changes,

for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When DRX is not used  $T_{Indication\_interval}$  is max(10ms,  $T_{RLM-RS,M}$ ), where  $T_{RLM,M}$  is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to  $T_{SSB}$  specified in section 8.1.2 if the RLM-RS resource is SSB.

When DRX is used, TIndication\_interval is max(10ms, 1.5\*DRX\_cycle\_length, 1.5\*TRLM-RS,M) if DRX cycle\_length is less than or equal to 320ms, and TIndication\_interval is DRX\_cycle\_length if DRX cycle\_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [13], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [13].

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

For UE which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on SSB symbols to be measured for radio link monitoring.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2, 8.1.4, 8.1.5, 8.1.6 and 8.1.7.

## 6.5.1.0.2 Minimum conformance requirements for in-sync SSB-based RLM

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{Evaluate\_in\_SSB}$  [ms] period becomes better than the threshold  $Q_{in\_SSB}$  within  $T_{Evaluate\_in\_SSB}$  [ms] evaluation period.

T<sub>Evaluate\_out\_SSB</sub> and T<sub>Evaluate\_in\_SSB</sub> are defined in Table 6.5.1.0.2-1 for FR1.

For FR1,

- P=1/(1 T<sub>SSB</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, T<sub>SMTCperiod</sub> follows *smtc2*; Otherwise T<sub>SMTCperiod</sub> follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration.Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of  $M_{out}$  and  $M_{in}$  used in Table 6.5.1.2.3-1 are defined as:

-  $M_{out} = 20$  and  $M_{in} = 10$ , if the CSI-RS resource configured for RLM is transmitted with Density =3.

Configuration	T <sub>Evaluate_out</sub> (ms)	T <sub>Evaluate_in</sub> (ms)
no DRX	max(200, ceil(M <sub>out</sub> ×P)×T <sub>CSI-RS</sub> )	max(100, ceil(M <sub>in</sub> ×P) × T <sub>CSI-RS</sub> )
DRX ≤ 320ms	max(200, ceil(1.5×Mout×P)×	max(100, ceil(1.5×Min×P)× max(T <sub>DRX</sub> , T <sub>CSI-</sub>
	max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))	RS))
DRX > 320ms	ceil(M <sub>out</sub> ×P) × T <sub>DRX</sub>	ceil(M <sub>in</sub> ×P) × T <sub>DRX</sub>
NOTE: T <sub>CSI-RS</sub> is the periodicity of CSI-RS resource configured for RLM. T <sub>DRX</sub> is the DRX cycle length.		

Table 6.5.1.0.2-1: Evaluation period T<sub>Evaluate\_out</sub> and T<sub>Evaluate\_in</sub> for FR1

If the high layer in TS 38.331 [2] signaling of *smtc2* is present, T<sub>SMTCperiod</sub> follows *smtc2*; Otherwise T<sub>SMTCperiod</sub> follows *smtc1*.

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than Q<sub>in</sub>, Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

The in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [3]. Two successive indications from Layer 1 shall be separated by at least  $T_{Indication\_interval}$ .

When DRX is not used  $T_{Indication\_interval}$  is max(10ms,  $T_{RLM-RS,M}$ ), where  $T_{RLM,M}$  is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to  $T_{SSB}$  specified in section 8.1.2 of TS 38.133 [6] if the RLM-RS resource is SSB, or  $T_{CSI-RS}$  specified later in this if the RLM-RS resource is CSI-RS.

When DRX is used, TIndication\_interval is max(10ms, 1.5\*DRX\_cycle\_length, 1.5\*TRLM-RS,M) if DRX cycle\_length is less than or equal to 320ms, and TIndication\_interval is DRX\_cycle\_length if DRX cycle\_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

When the UE transitions between DRX and no DRX or when DRX cycle periodicity changes, for each RLM-RS resource, for a duration of time equal to the evaluation period corresponding to the second mode after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation period corresponding to the first mode and the second mode. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second mode for each RLM-RS resource. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

When the UE transitions from a first configuration of RLM-RS resources to a second configuration of RLM-RS resources that is different from the first configuration, for each RLM-RS resource present in the second configuration,

for a duration of time equal to the evaluation period corresponding to the second configuration after the transition occurs, the UE shall use an evaluation period that is no less than the minimum of evaluation periods corresponding to the first configuration and the second configuration. Subsequent to this duration, the UE shall use an evaluation period corresponding to the second configuration for each RLM-RS resource present in the second configuration. This requirement shall be applied to both out-of-sync evaluation and in-sync evaluation of the monitored cell.

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [13].

There are no scheduling restrictions due to radio link monitoring performed with a same subcarrier spacing as PDSCH/PDCCH on FR1.

For UE which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to radio link monitoring based on SSB as RLM-RS. For UE which do not support *simultaneousRxDataSSB-DiffNumerology* [11] the following restrictions apply due to radio link monitoring based on SSB as RLM-RS.

- The UE is not expected to transmit PUCCH/PUSCH or receive PDCCH/PDSCH on SSB symbols to be measured for radio link monitoring.

The normative reference for this requirement is TS 38.133 [6] clauses 8.1.2, 8.1.4, 8.1.5, 8.1.6, 8.1.7 and A.7.5.1.

# 6.5.1.0.3 Minimum conformance requirements for out-of-sync and in-sync CSI-RS based RLM

[TS 38.133 clause 8.1.3.2]

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{Evaluate\_out\_CSI-RS}$  [ms] period becomes worse than the threshold  $Q_{out\_CSI-RS}$  within  $T_{Evaluate\_out\_CSI-RS}$  [ms] evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last  $T_{Evaluate_in_CSI-RS}$  [ms] period becomes better than the threshold  $Q_{in_CSI-RS}$  within  $T_{Evaluate_in_CSI-RS}$  [ms] evaluation period.

- T<sub>Evaluate\_out\_CSI-RS</sub> and T<sub>Evaluate\_in\_CSI-RS</sub> are defined in Table 8.1.3.2-1 for FR1.

For FR1,

- P=1/(1 T<sub>CSI-RS</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

If the high layer in TS 38.331 [2] signaling of *smtc2* is present,  $T_{SMTCperiod}$  follows *smtc2*; Otherwise  $T_{SMTCperiod}$  follows *smtc1*.

Note: The overlap between CSI-RS RLM and SMTC means that CSI-RS based RLM is within the SMTC window duration. Longer evaluation period would be expected if the combination of RLM-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of  $M_{out}$  and  $M_{in}$  used in Table 8.1.3.2-1 are defined as:

-  $M_{out} = 20$  and  $M_{in} = 10$ , if the CSI-RS resource configured for RLM is transmitted with Density =3.

	-		
Configuration	T <sub>Evaluate_out</sub> (ms)	T <sub>Evaluate_in</sub> (ms)	
no DRX	max(200, ceil(Mout×P)×TCSI-RS)	max(100, ceil(Min×P) × T <sub>CSI-RS</sub> )	
DRX ≤ 320ms	max(200, ceil(1.5×Mout×P)×	max(100, ceil(1.5×Min×P)× max(TDRX, TCSI-	
	max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))	RS))	
DRX > 320ms	ceil(M <sub>out</sub> ×P) × T <sub>DRX</sub>	ceil(Min×P) × T <sub>DRX</sub>	
NOTE: T <sub>CSI-RS</sub> is the periodicity of CSI-RS resource configured for RLM. T <sub>DRX</sub> is the DRX cycle length.			

# Table 6.5.1.0.3-1: Evaluation period T<sub>Evaluate\_out</sub> and T<sub>Evaluate\_in</sub> for FR1

[TS 38.133 clause 8.1.6]

When the downlink radio link quality on all the configured RLM-RS resources is worse than  $Q_{out}$ , Layer 1 of the UE shall send an out-of-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the out-of-sync indications as specified in TS 38.331 [2].

When the downlink radio link quality on at least one of the configured RLM-RS resources is better than  $Q_{in}$ , Layer 1 of the UE shall send an in-sync indication for the cell to the higher layers. A Layer 3 filter shall be applied to the in-sync indications as specified in TS 38.331 [2].

The out-of-sync and in-sync evaluations for the configured RLM-RS resources shall be performed as specified in clause 5 in TS 38.213 [3]. Two successive indications from Layer 1 shall be separated by at least  $T_{Indication\_interval}$ .

When DRX is not used  $T_{Indication\_interval}$  is max(10ms,  $T_{RLM-RS,M}$ ), where  $T_{RLM,M}$  is the shortest periodicity of all configured RLM-RS resources for the monitored cell, which corresponds to  $T_{SSB}$  specified in section 8.1.2 if the RLM-RS resource is SSB, or  $T_{CSI-RS}$  specified in section 8.1.3 if the RLM-RS resource is CSI-RS.

In case DRX is used,  $T_{Indication\_interval}$  is max(10ms, 1.5\*DRX\_cycle\_length, 1.5\*T<sub>RLM-RS,M</sub>) if DRX cycle\_length is less than or equal to 320ms, and  $T_{Indication\_interval}$  is DRX\_cycle\_length if DRX cycle\_length is greater than 320ms. Upon start of T310 timer as specified in TS 38.331 [2], the UE shall monitor the configured RLM-RS resources for recovery using the evaluation period and Layer 1 indication interval corresponding to the no DRX mode until the expiry or stop of T310 timer.

[TS 38.133 clause 8.1.5]

The transmitter power of the UE in the monitored cell shall be turned off within 40ms after expiry of T310 timer as specified in TS 38.331 [2].

The normative reference for this requirement is TS 38.133 [6] clause 8.1.3.2, 8.1.6 and 8.1.5.

# 6.5.1.1 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

# 6.5.1.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PCell configured with SSB-based RLM RS in non-DRX mode. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] section 8.1.2.

# 6.5.1.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards.

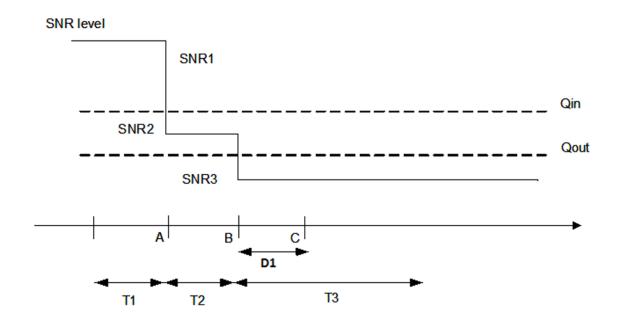
# 6.5.1.1.3 Minimum conformance requirement

The minimum conformance requirements are specified in clause 6.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.1.

# 6.5.1.1.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.1.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. The UE is configured to perform inter-frequency measurements using Gap Pattern ID #0 (40ms) in test 1.





# 6.5.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.1.4.1-1.

Table 6.5.1.1.4.1-1: NA SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-
based RLM RS in non-DRX mode supported test configurations

Configuration	Description	
6.5.1.1-1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz	
6.5.1.1-2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz	
6.5.1.1-3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz	
Note: The UE is only required to pass in one of the supported test configurations in FR1.		

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.1.4.1-2.

# Table 6.5.1.1.4.1-2: Initial conditions for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment
Test environment		NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies			4-1 and TS 38.508-1 [14] clause 4.3.1.
Channel bandwidth	As specified by the test configuration selected from		on selected from Table 6.5.1.1.4.1-1
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
Diagram	DUT Part A.3.2.3.4		
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part		

#### Table 6.5.1.1.4.1-3: Void

- 1. Message contents are defined in clause 6.5.1.1.4.3.
- 2. Single Cell is used, which is NR FR1 Pcell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.
- 3. The test parameters are given in Table 6.5.1.1.4.1-4 below.
- 4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

# Table 6.5.1.1.4.1-4: General test parameters for FR1 out-of-sync testing in non-DRX mode

Parameter		Unit	Value		
				Test 1	
Active PCell RF Channel Number				Cell 1	
				1	
Duplex mode		Config 1		FDD	
		Config 2, 3		TDD	
BW <sub>channel</sub>		Config 1	MHz	10: N <sub>RB,c</sub> = 52	
		Config 2		10: N <sub>RB,c</sub> = 52	
		Config 3		40: N <sub>RB,c</sub> = 106	
DL initial BWP co		Config 1, 2, 3		DLBWP.0.1	
DL dedicated BW configuration	Р	Config 1, 2, 3		DLBWP.1.1	
UL initial BWP co	ofiguration	Config 1, 2, 3		ULBWP.0.1	
UL dedicated BW	P	Config 1, 2, 3			
configuration	1	00mg 1, 2, 0		ULBWP.1.1	
TDD Configuration	n	Config 1		Not Applicable	
		Config 2		TDDConf.1.1	
		Config 3		TDDConf.2.1	
RMSI CORESET	Reference	Config 1		CR.1.1 FDD	
Channel		Config 2		CR.1.1 TDD	
		Config 3		CR.2.1 TDD	
Dedicated CORES		Config 1		CCR.1.3 FDD	
Reference Chann	el	Config 2		CCR.1.3 TDD	
		Config 3		CCR.2.2 TDD	
SSB Configuration	า	Config 1		SSB.1 FR1	
		Config 2		SSB.1 FR1	
		Config 3		SSB.2 FR1	
SMTC Configurati	ion	Config 1, 2		SMTC.1	
		Config 3		SMTC.1	
PDSCH/PDCCH s	subcarrier	Config 1, 2		15 KHz	
spacing		Config 3		30 KHz	
PRACH Configura	ation	Config 1, 2		Table A.7.1-1, PRACH.1 FR1	
		Config 3		Table A.7.1-1, PRACH.1 FR1	
SSB index assign	ed as RLM R	S		0	
OCNG parameter				OP.1	
CP length				Normal	
Correlation Matrix	and Antenna	Configuration		2x2 Low	
Out of sync	DCI format		1	1-0	
transmission		Control OFDM symbols		2	
parameters	Aggregation level		CCE	8	
	Ratio of hypothetical PDCCH RE		dB	4	
	energy to average SSS RE energy				
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy		dB	4	
	DMRS precoder granularity			REG bundle size	

REG bundle	size		6	
DRX			OFF	
Gap pattern ID			gp0	
Layer 3 filtering			Enabled	
T310 timer		ms	0	
T311 timer		ms	1000	
N310			1	
N311			1	
CSI-RS configuration for CSI	Config 1, 4		CSI-RS.1.1 FDD	
reporting	Config 2, 5		CSI-RS.1.1 TDD	
	Config 3, 6		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD	
	Config 2, 5		TRS.1.1 TDD	
	Config 3, 6		TRS.1.2 TDD	
T1		S	0.2	
T2		S	0.48	
Т3		S	0.48	
D1		S	0.44	
Note 1: All configurations are Note 2: UE-specific PDCCH	assigned to the UE pri s not transmitted after	or to the start of time p T1 starts.	eriod T1.	

# 6.5.1.1.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 6.5.1.1.4.1-4.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.
- 2. The SS shall transmit an RRCReconfiguration message configuring the UE for inter-frequency measurements.
- 3. The UE shall transmit RRCReconfigurationComplete message.
- 4. Set the parameters according to T1 in Table 6.5.1.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
- 5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.1.5-1. T2 starts.
- 6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.1.5-1. T3 starts.
- 7. If the SS:

a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 1]) during the period from time point A to time point B

and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

- 8. Otherwise the number of failed tests is increased by one.
- 9. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.1.5-1.
- 10. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.
- 11. Repeat steps 4-10 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.1.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short\_DCI" and with the following exceptions:

# Table 6.5.1.1.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in non-DRX mode test requirement

Default Message Contents				
Common contents of system information blocks exceptions				
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-1 Table H.3.1-6 with conditions gapUE and RLM Table H.3.5-4 Table H.3.5-9			

# Table 6.5.1.1.4.3-1: Void

#### Table 6.5.1.1.4.3-2: RLF-TimersAndConstants

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150					
Information Element	Value/remark	Comment	Condition		
RLF-TimersAndConstants ::= SEQUENCE {					
t310	ms0				
n310	n1				
t311	ms1000				
n311	n1				
}					

# Table 6.5.1.1.4.3-3: Void

# Table 6.5.1.1.4.3-4 SIB1

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28					
Information Element	Value/remark	Comment	Condition		
SIB1 ::= SEQUENCE {					
cellSelectionInfo SEQUENCE {					
q-RxLevMin	-53	-106 is actual value in dBm (-53 * 2 dBm)	dBm/15kHz		
	-51	-102 is actual value in dBm (-51 * 2 dBm)	dBm/30kHz		
}					
}					

#### 6.5.1.1.5 Test Requirement

Table 6.5.1.1.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

# Table 6.5.1.1.5-1: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in non-DRX mode

Parameter		Unit		Test 1	
			T1	T2	Т3
EPRE ratio of PDCCH D	MRS to SSS	dB	4		
EPRE ratio of PDCCH to	D PDCCH DMRS	dB		0	
EPRE ratio of PBCH DM	IRS to SSS	dB			
EPRE ratio of PBCH to I	PBCH DMRS	dB			
EPRE ratio of PSS to SS	SS	dB			
EPRE ratio of PDSCH D	MRS to SSS	dB		0	
EPRE ratio of PDSCH to	PDSCH DMRS	dB			
EPRE ratio of OCNG DM	MRS to SSS	dB			
EPRE ratio of OCNG to	OCNG DMRS	dB			
SNR on RLM-RS	Config 1	dB	1.9	-6.1	-15.9
	Config 2		1.9	-6.1	-15.9
	Config 3		1.9	-6.1	-15.9
λ/	Config 1	dBm/	-98		
$N_{oc}$	Config 2	15kH	-98		
	Config 3	Z	-98		
$N_{oc}$	Config 1	dBm/	-98		
IV <sub>OC</sub>	Config 2	SCS	-98		
	Config 3		-95		
Propagation condition			TDL-C 300ns 100Hz		
				ed and a constant total t	ransmitted power
	ity is achieved for all				
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.					
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.					
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in Figure 6.5.1.1.4-1.					
Note 5: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas					

connected under test, the SNR during T3 from D.4.1.1, is -18dB-TT = -18.9dB (including test tolerances).

# Table 6.5.1.1.5-2: Measurement gap configuration for out-of-sync tests in non-DRX mode

Field	Test 1	
Field	Value	
gapOffset	0	
Note Ensure that RLM RS is partially overlapped with measurement gap		

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

# 6.5.1.2 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSBbased RLM RS in non-DRX mode

# 6.5.1.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync for the purpose of monitoring downlink radio link quality of the PCell, when DRX is not used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.2.

# 6.5.1.2.2 Test applicability

This test applies to all types of NR UEs supporting Release 15 and forwared

# 6.5.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.2.

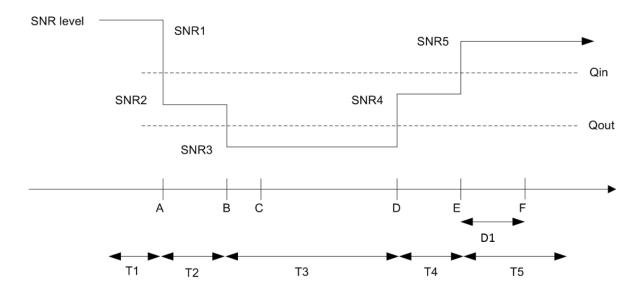
1131

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.2.

#### 6.5.1.2.4 Test Description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms.





6.5.1.2.4 Test Requirements

6.5.1.2.4.1 Initial Conditions

This test shall be tested using any of the test configurations in Table 6.5.1.2.4.1-1.

Configuration	Description	
6.5.1.2-1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz	
6.5.1.2-2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz	
6.5.1.2-3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz	
Note: The UE is only required to pass in one of the supported test configurations in FR1		

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.2.4.1-2.

# Table 6.5.1.2.4.1-2: Initial conditions for SA FR1 radio link monitoring in-sync test for PSCell configured with SSB-based RLM RS in non-DRX mode

Parameter	Value		Comment	
Test environment		NC	As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies	As	specified in Annex E.1.1, Table E.	2-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified by the test configuration selected from Table 6.5.1.2.4.1-1			
Propagation conditions		AWGN	As specified in Annex C.2.2.	
Connection	TE Part A.3.1.7.1		As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		

Exceptions to connection	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and	
diagram	A.3.1.7.4 for TE Part	

# Table 6.5.1.2.4.1-3: Void

- 1. Message contents are defined in clause 6.5.1.2.4.3.
- 2. The power levels and settings for Cell 1 are set according to Annex A.6, Table A.6.1.1-1. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2
- 3. The general test parameters are given in Table 6.5.1.2.4.1-4 below.
- 4. Downlink signals for NR cell are initially set up according to Annex C.1.

Table 6.5.1.2.4.1-4: General test parameters for FR1 in-sync testing in non-DRX mode

P	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
BW <sub>channel</sub>	Config 1	MHz	10: N <sub>RB,c</sub> = 52
	Config 2		10: N <sub>RB,c</sub> = 52
	Config 3		40: N <sub>RB,c</sub> = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
0	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.1 FDD
Reference Channel	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 KHz
subcarrier spacing	Config 3		30 KHz
PRACH Configuration	Config 1, 2		Table A.7.1-1, PRACH.1 FR1
SSB index assigned as	Config 3		Table A.7.1-1, PRACH.1 FR1 0
OCNG parameters	RLIVI R3		0 OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
	Antenna Conngulation		
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4

	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX			OFF
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
for CSI reporting	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1, 4		TRS.1.1 FDD
	Config 2, 5		TRS.1.1 TDD
	Config 3, 6	Τ Γ	TRS.1.2 TDD
T1		S	0.2
T2		S	0.2
Т3		S	0.24
T4		S	0.2
T5		S	0.88
D1		S	0.84
	ations are assigned to the UE prior PDCCH is not transmitted after 1		of time period T1.

#### 6.5.1.2.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.2.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states.. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 6.5.1.2.4-1.4.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.
- 2. Set the parameters according to T1 in Table 6.5.1.2.5-1 for subtest 1 and 2. Propagation conditions are set according to Annex C.2.3. T1 starts.
- 3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.2.5-1. T2 starts.
- 4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.2.5-1. T3 starts.
- 5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.2.5-1. T4 starts.
- 6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.2.5-1. T5 starts.
- 7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the subframe according the configured CQI reporting mode (PUCCH 1-0) during the period from time point A to time point F (D1 after the start of time duration T5) the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

- 8. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.
- 9. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.2.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short\_DCI" and with the following exceptions:

# Table 6.5.1.2.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in non-DRX mode test requirement

Default Message Contents			
Common contents of system information blocks exceptions			
Default RRC messages and information elements contents exceptions	Table H.3.5-4 Table H.3.5-9		

# Table 6.5.1.2.4.3-1: Void

# Table 6.5.1.2.4.3-2: RLF-TimersAndConstants

Information Element	Value/remark	Comment	Condition
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms1000		
n310	n1		
t311	ms1000		
n311	n1		
}			

# Table 6.5.1.2.4.3-3: Void

# 6.5.1.2.5 Test Requirement

The requirements in this section apply for each SSB based RLM-RS resource configured for the PCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in section 6.5.1.2.3.

Table 6.5.1.2.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95%.

DRX mode								
	Para	imeter	Unit			Test 1		
				T1	T2	T3	T4	T5
EPRE rat	io of PDCO	CH DMRS to SSS	dB			0		
EPRE rat	io of PDC	CH to PDCCH DMRS	dB			0		
EPRE rat	io of PBCH	I DMRS to SSS	dB					
EPRE rat	EPRE ratio of PBCH to PBCH DMRS							
EPRE rat	io of PSS t	to SSS	dB					
EPRE rat	io of PDSC	CH DMRS to SSS	dB			0		
		CH to PDSCH DMRS	dB					
EPRE rat	io of OCN	G DMRS to SSS	dB					
EPRE rat	io of OCN	G to OCNG DMRS	dB					
SNR on F	RLM-RS	Config 1	dB	1.8	-6.2	- 15. 8	-5.3	1.8
		Config 2	-	1.8	-6.2	- 15. 8	-5.3	1.8
		Config 3		1.8	-6.2	- 15. 8	-5.3	1.8
M		Config 1	dBm/	-98				
$N_{oc}$		Config 2	15	-98				
		Config 3	kHz			-98		
$N_{oc}$		Config 1	dBm/			-98		
1 oc		Config 2	SCS			-98		
		Config 3				-95		
	ion condition						100Hz	
Note 1:								
	Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.					t as		
Note 3:								
Note 4:								
	SNR2, SNR3, SNR4 and SNR5 respectively in Figure 6.5.1.2.4-1.							
Note 5:	under tes during T3	values are specified for st. For a UE wiht 4RX a 3 and T4 from D.4.1.1 nd -8.8dB(including tes	ntennas o are -18.0	connec )-TT an	ted und	der test	t, the S	NR

#### Table 6.5.1.2.5-1: Cell specific test parameters for FR1 for in-sync radio link monitoring tests in non-DRX mode

# 6.5.1.3 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSBbased RLM RS in DRX mode

# 6.5.1.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink radio link quality of the PCell configured with SSB-based RLM RS when DRX is used. This test will partly verify the NR cell radio link monitoring requirements in TS 38.133 [6] section 8.1.2.

# 6.5.1.3.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

# 6.5.1.3.3 Minimum conformance requirement

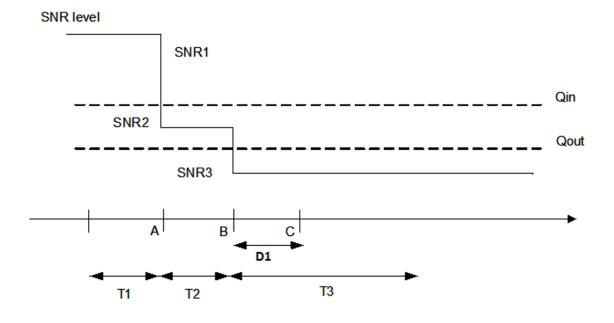
The minimum conformance requirements are specified in clause 6.5.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.3.

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# 6.5.1.3.4 Test description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.3.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.





#### 6.5.1.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.3.4.1-1.

# Table 6.5.1.3.4.1-1: NA SA FR1 radio link monitoring out-of-sync test for PCell configured with SSBbased RLM RS in DRX mode supported test configurations

Configuration	Description
6.5.1.3-1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
6.5.1.3-2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz
6.5.1.3-3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz
Note: The UE FR1.	is only required to pass in one of the supported test configurations in

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.3.4.1-2.

# Table 6.5.1.3.4.1-2: Initial conditions for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode

Parameter Value		Value	Comment
Test environment		NC	As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As	specified in Annex E.1.2, Table E.4	4-1 and TS 38.508-1 [14] clause 4.3.1.
Channel bandwidth		As specified by the test configuration	on selected from Table 6.5.1.3.4.1-1
Propagation conditions			As specified in Annex C.2.2.
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
Diagram	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	bands u	pable UEs without any 2 Rx RF se A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part	

# Table 6.5.1.3.4.1-3: Void

- 1. Message contents are defined in clause 6.5.1.3.4.3.
- 2. Single Cell is used, which is NR FR1 PCell. The connection setup is done according to the settings in Annex C.1.2 and C.1.3.
- 3. The test parameters are given in Table 6.5.1.3.4.1-4 below.
- 4. Downlink signals for NR cell are initially set up according to Annex C.1.2 and C.1.3.

#### Table 6.5.1.3.4.1-4: General test parameters for FR1 out-of-sync testing in DRX mode

Parameter		Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
BW <sub>channel</sub>	Config 1	MHz	10: N <sub>RB,c</sub> = 52
	Config 2		10: N <sub>RB,c</sub> = 52
	Config 3		40: N <sub>RB,c</sub> = 106
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
TDD Configuration	Config 1		Not Applicable
Ū	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.3 FDD
Reference Channel	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD
SSB Configuration	Config 1		SSB.1 FR1
-	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
	Config 1, 2		15 KHz

PDSCH/PDCCH subcarrier spacing	Config 3		30 KHz
PRACH Configuration	Config 1, 2		Table A.7.1-1, PRACH.1 FR1
	Config 3		Table A.7.1-1, PRACH.1 FR1
SSB index assigned as	RLM RS		0
OCNG parameters	_		OP.1
CP length			Normal
Correlation Matrix and A	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
ransmission parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
-	REG bundle size		6
ORX Configuration			DRX.3
Gap pattern ID			N.A.
ayer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
Г1		S	0.2
Г2		S	0.68
ГЗ		S	0.68
D1		S	0.64
Note 1: All configurat Note 2: UE-specific F	tions are assigned to the UE PDCCH is not transmitted after	prior to the s er T1 starts.	tart of time period T1.

# 6.5.1.3.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 6.5.1.3.4.1-4.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.
- 2. Set the parameters according to T1 in Table 6.5.1.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
- 3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.3.5-1. T2 starts.
- 4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.3.5-1. T3 starts.
- 5. If the SS:a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause

6.3.1.5 in each subframe configured for CQI transmission (according to configured CQI periodicity on PUCCH [format 1]) during the period from time point A to time point B

and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires, the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

- 6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.3.5-1.
- 7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [10] clause 4.5.
- 8. Repeat steps 2-8 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.3.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short\_DCI" and with the following exceptions:

# Table 6.5.1.3.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with SSB-based RLM RS in DRX mode test requirement

Default Message Contents				
Common contents of system information				
blocks exceptions				
Default RRC messages and information	Table H.3.5-4			
elements contents exceptions	Table H.3.5-9			
·	Table H.3.7-1 with condition DRX.3			

# Table 6.5.1.3.4.3-1: Void

# Table 6.5.1.3.4.3-2: RLF-TimersAndConstant

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	Value/remark	Comment	Condition
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
n311	n1		
t311	ms1000		
}			

#### Table 6.5.1.3.4.3-3: Void

#### Table 6.5.1.3.4.3-4 SIB1

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28					
Information Element	Value/remark	Comment	Condition		
SIB1 ::= SEQUENCE {					
cellSelectionInfoSEQUENCE {					
q-RxLevMin	-53	-106 is actual value in dBm (-53 * 2 dBm)	dBm/15kHz		
	-51	-102 is actual value in dBm (-51 * 2 dBm)	dBm/30kHz		

	}		
}			

6.5.1.3.5 Test Requirement

Table 6.5.1.3.5-1 defines the cell specific primary level settings.

The UE behavior in each test during time durations T1, T2 and T3 shall be as follows:

During the period from time point A to time point B the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The UE shall stop transmitting uplink signal no later than time point C (D1 second after the start of the time duration T3).

The rate of correct events observed during repeated tests shall be at least 90%.

# Table 6.5.1.3.5-1: Cell specific test parameters for FR1 (Cell 1) for out-of-sync radio link monitoring tests in DRX mode

Parameter			Unit	Test 1		
				T1	T2	T3
EPRE ratio of PDCCH DMRS to SSS			dB	4		
EPRE ratio of PDCCH to PDCCH DMRS			dB	0		
EPRE ratio of PBCH DMRS to SSS			dB			
EPRE ratio of PBCH to PBCH DMRS			dB			
EPRE ratio of PSS to SSS			dB			
EPRE ratio of PDSCH DMRS to SSS			dB	0		
EPRE ratio of PDSCH to PDSCH DMRS			dB			
EPRE ratio of OCNG DMRS to SSS			dB			
EPRE ratio of OCNG to OCNG DMRS			dB			
SNR on RI	LM-RS	Config 1	dB	1.8	-6.2	-15.8
		Config 2		1.8	-6.2	-15.8
		Config 3		1.8	-6.2	-15.8
N <sub>oc</sub> Config 1 Config 2 Config 3		Config 1	dBm/15	-98		
			kHz	-98		
				-98		
N <sub>oc</sub> Config 1 Config 2 Config 3		0	dBm/S	-98		
			CS	-98		
			-95			
Propagation condition				TDL-C 300ns 100Hz		
	OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total					
	transmitted power spectral density is achieved for all OFDM symbols.					
Note 2: The signal contains PDCCH for UEs other than the device under test as part of OCNG.						
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.						
Note 4: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively i						espectively in
	Figure 6.5.1.3.4-1.					
	4RX antennas connected under test, the SNR during T3 from D.4.1.1, is -18dB-TT = -18.9dB					
	(including test tolerances)					

For the test to pass, the total number of successful tests shall be more than 90% of the cases with a confidence level of 95%.

# 6.5.1.4 NR SA FR1 radio link monitoring in-sync test for PCell configured with SSBbased RLM RS in DRX mode

# 6.5.1.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects in sync for the purpose of monitoring downlink radio link quality of the Pcell when DRX is used. This test will partly verify the FR1 radio link monitoring requirements in clause 8.1.2.

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## 6.5.1.4.2 Test applicability

This test applies to all types of NR UE Release 15 and forward supporting 5GS NR SA FR1 and long DRX cycle.

6.5.1.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.4.

# 6.5.1.4.4 Test Description

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CSI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.Editor note: whether to revise power level to be gradually changed

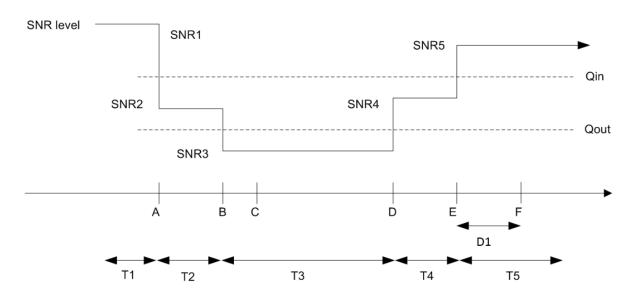


Figure 6.5.1.4.4-1 - SNR variation for in-sync testing

#### 6.5.1.4.4.1 Initial Conditions

This test shall be tested using any of the test configurations in Table 6.5.1.4.4.1-1.

Configuration	Description			
6.5.1.4-1	FDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz			
6.5.1.4-2	TDD, SSB SCS 15 KHz, data SCS 15KHz, BW 10MHz			
6.5.1.4-3	TDD, SSB SCS 30 KHz, data SCS 30KHz, BW 40MHz			
Note: The UE is only required to pass in one of the supported test configurations in FR1.				

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.4.4.1-2.

# Table 6.5.1.4.4.1-2: Initial conditions for SA FR1 radio link monitoring in-sync test for NR PCell configured with SSB-based RLM RS in DRX mode

Parameter	Value		Comment	
Test environment		NC	As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies			4-1 and TS 38.508-1 [14] clause 4.3.1.	
Channel bandwidth		As specified by the test configuration selected from Table 6.5.1.4.4.1-1		
Propagation conditions	AWGN		As specified in Annex C.2.2.	
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part			

#### Table 6.5.1.4.4.1-3: Void

- 1. Message contents are defined in clause 6.5.1.4.4.3.
- 2. There is one cell (Cell 1), which is the active NR cell, in the test. The power levels and settings are set according to Annex A.6, Table A.6.1.1-1. The connection setup is done according to the settings in Annex C.1.3, and the downlink signal levels as per Annex C.1.2.
- 3. The general test parameters are given in Table 6.5.1.4.4.1-4 below.
- 4. Downlink signals for NR cell are initially set up according to Annex C.1.

Table 6.5.1.4.4.1-4: General test parameters for FR1 in-sync testing in DRX mode

Pa	rameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
	Config 2, 3		TDD
BWchannel	Config 1	MHz	10: $N_{RB,c} = 52$
	Config 2	-	$10: N_{RB,c} = 52$
DL initial BWP configurati	Config 3		<u>40: N<sub>RB,c</sub> = 106</u> DLBWP.0.1
DL Initial BWP configuration	ion Config 1, 2, 3 Config 1, 2, 3		
configuration	Conng 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	ion Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP	Config 1, 2, 3		ULBWP.1.1
configuration			
TDD Configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
RMSI CORESET Referen	U		CR.1.1 FDD
Channel	Config 2		CR.1.1 TDD CR.2.1 TDD
Dedicated CORESET	Config 3		
Reference Channel	Config 1 Config 2		CCR.1.1 FDD CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
COD Conngaration	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
0	Config 3		SMTC.1
PDSCH/PDCCH subcarri			15 KHz
spacing	Config 3		30 KHz
PRACH Configuration	Config 1, 2		Table A.7.1-1, PRACH.1 FR1
C C	Config 3		Table A.7.1-1, PRACH.1 FR1
SSB index assigned as R			0
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and Ar	ntenna Configuration		2x2 Low
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average SSS RE energy	dB	0
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
Out of sync	DCI format		1-0
transmission parameters	Number of Control OFDM symbols		2
1	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH	dB	4
	RE energy to average SSS		
	RE energy		
	Ratio of hypothetical PDCCH DMRS energy to average SSS RE energy	dB	4

	REG bundle size		6
DRX Configuration			DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration for	Config 1		CSI-RS.1.1 FDD
CSI reporting	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
CSI-RS for tracking	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
T1		S	0.2
T2		S	0.2
Т3		S	0.64
T4		S	0.2
T5		S	0.88
D1		S	0.84
	s are assigned to the UE p CCH is not transmitted afte		e period T1.

#### 6.5.1.4.4.2 Test Procedure

There is one cell (Cell 1), which is the active NR cell, in the test. The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.4.4-1 shows the variation of the downlink SNR in the active cell to emulate out-of-sync and in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to PCell. The UE shall be configured for periodic CQI reporting in PUCCH [format 1] with a reporting periodicity as mentioned in the above table 6.5.1.4.4-1.4.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.
- 2. Set the parameters according to T1 in Table 6.5.1.4.5-1 for subtest 1 and 2. Propagation conditions are set according to Annex C.2.3. T1 starts.
- 3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.4.5-1. T2 starts.
- 4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.4.5-1. T3 starts.
- 5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.4.5-1. T4 starts.
- 6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.4.5-1. T5 starts.
- 7. If the SS detects uplink power equal to or higher than the minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the subframe according the configured CQI reporting mode (PUCCH 1-0) during the period from time point A to time point F (D1 second after the start of time duration T5) the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

- 8. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5.
- 9. Repeat steps 2-7 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.4.4.3 Message Contents

Message contents are according to TS 38.508-1 [14] clause 4.6.1 and 7.3.1 with condition "Short\_DCI" and with the following exceptions:

# Table 6.5.1.4.4.3-0: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with SSB-based RLM RS in DRX mode test requirement

Default Message Contents		
Common contents of system information		
blocks exceptions		
Default RRC messages and information	Table H.3.5-4	
elements contents exceptions	Table H.3.5-9	
	Table H.3.7-1 with condition DRX.3	

### Table 6.5.1.4.4.3-1: Void

### Table 6.5.1.4.4.3-2: RLF-TimersAndConstant

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150					
Information Element	Value/remark	Comment	Condition		
RLF-TimersAndConstants ::= SEQUENCE {					
t310	ms2000				
n310	n1				
n311	n1				
t311-v1530	ms1000				
}					

### Table 6.5.1.4.4.3-3: Void

## 6.5.1.4.5 Test Requirement

The requirements in this section apply for each SSB based RLM-RS resource configured for the PCell, provided that the SSB configured for RLM are actually transmitted within UE active DL BWP during the entire evaluation period specified in section 6.5.1.4.3.

Table 6.5.1.4.5-1 defines the cell specific primary level settings.

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (D1 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence interval of 95%.

P	Unit			Test 1			
		T1	T2	T3	T4	T5	
EPRE ratio of PD	CCH DMRS to SSS	dB	0				
EPRE ratio of PD	CCH to PDCCH DMRS	dB			0		
EPRE ratio of PB	CH DMRS to SSS	dB					
EPRE ratio of PB	CH to PBCH DMRS	dB					
EPRE ratio of PSS	S to SSS	dB					
EPRE ratio of PD	SCH DMRS to SSS	dB			0		
EPRE ratio of PD	SCH to PDSCH DMRS	dB					
EPRE ratio of OC	NG DMRS to SSS	dB					
EPRE ratio of OC	NG to OCNG DMRS	dB			-	-	
SNR on RLM-RS	Config 1	dB	1.8	-6.2	-15.8	-5.3	1.8
	Config 2		1.8	-6.2	-15.8	-5.3	1.8
	Config 3		1.8	-6.2	-15.8	-5.3	1.8
$N_{oc}$	Config 1	dBm/15	-98				
<sup>1</sup> v <sub>oc</sub>	Config 2	kHz			-98		
	Config 3				-98		
$N_{oc}$	Config 1	dBm/S			-98		
I V OC	Config 2	CS			-98		
Config 3			-95				
Propagation cond					-C 300ns 10		
	shall be used such that the					constant to	otal
	itted power spectral density						
	nal contains PDCCH for U					of OCNG.	
Note 3: SNR levels correspond to the signal to noise ratio over the SSS REs.							
	Note 4: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and						
	espectively in Figure 6.5.1						
	IR values are specified for						
4RX antennas connected under test, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -							
8.0-11,	which are -18.8dB and -8.	8dB(includi	ing test tole	erances).			

# Table 6.5.1.4.5-1: Cell specific test parameters for FR1 for in-sync radio link monitoring tests in DRX mode

# 6.5.1.5 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

#### 6.5.1.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS Out-of-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 6.5.1.5.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS based RLM.

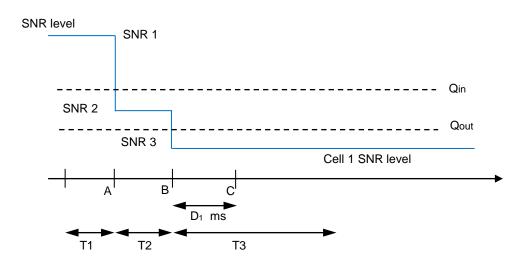
#### 6.5.1.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.5.

#### 6.5.1.5.4 Test description

The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.5.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.





#### 6.5.1.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.5.4.1-1.

# Table 6.5.1.5.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX

Configuration	Description	
6.5.1.5-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth	
6.5.1.5-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth	
6.5.1.5-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth	
Note: The UE is only	required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.5.4.1-2.

#### Table 6.5.1.5.4.1-2: Initial conditions for NR SA radio link monitoring NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified	in Annex E, Table E.4-1 and TS 38	.508-1 [14] clause 4.3.1.
Channel	As specified	by the test configuration selected fr	rom Table 6.5.1.5.4.1-1.
bandwidth			
Propagation	AWGN		As specified in Annex C.2.2
conditions			
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
Diagram	DUT Part	A.3.2.3.4	
Exceptions to	For 4Rx capable UEs without any 2 Rx RF		
connection	bands use A.3.2.5.2 for DUT part and		
diagram	A.3.1.7.4 for	TE Part	

- 1. The general test parameter settings are set up according to Table 6.5.1.5.4.1-3. The measurement gap configuration is according to Table 6.5.1.5.4.1-4.
- 2. Message contents are defined in clause 6.5.1.5.4.3.
- 3. There are one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.5.5-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

 Table 6.5.1.5.4.1-3: General test parameters for NR SA FR1 radio link monitoring out-of-sync test for

 PCell configured with CSI-RS-based RLM RS in non-DRX

	Parameter	Unit	Value
A stille DC all			Test 1
Active PCell			Cell 1
RF Channel Number	Config 1		1 FDD
Duplex mode	Config 1 Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable
TDD Conliguration			
	Config 2 Config 3		TDDConf.1.1 TDDConf.2.1
DL initial BWP			DLBWP.0.1
configuration	Config 1, 2, 3		
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
RMSI CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.3 FDD
Reference Channel	Config 2		CCR.1.3 TDD
	Config 3		CCR.2.2 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
-	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 kHz
subcarrier spacing	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for P	DCCH/PDSCH		TCI.State.2
OCNG parameters			OP.1
CP length			Normal
	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control OFDM symbols		2
parameters	Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	8 4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity REG bundle size		REG bundle size 6
DRX			OFF
Gap pattern ID			gp0
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
2	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		S	0.2
T2		S	0.48
12	1	•	0110

D1		S	0.44
Note 1:	Note 1: UE-specific PDCCH is not transmitted after T1 starts.		

# Table 6.5.1.5.4.1-4: Measurement gap configuration for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX

Field	Test 1	
Field	Value	
gapOffset	0	

#### 6.5.1.5.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
- 2. The SS shall transmit an RRCReconfiguration message configuring the UE for inter-frequency measurements.
- 3. The UE shall transmit RRCReconfigurationComplete message.
- 4. Set the parameters of Cell 1 according to T1 in Table 6.5.1.5.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
- 5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.5.5-1. T2 starts.
- 6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.5.5-1. T3 starts.
- 7. If the SS:
  - a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

- 8. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.5.5-1.
- 9. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
- 10. Repeat steps 4-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with condition "Short\_DCI" and with the following exceptions:

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# Table 6.5.1.5.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

	Default Message Contents		
Common contents of system information blocks exceptions			
Default RRC messages and information elements contents exceptions	Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range) Table H.3.1-4 with A3-offset = 0 Table H.3.1-6 with conditions gapUE and RLM Table H.3.5-4 Table H.3.5-9 with Condition CSI-RS RLM		

### Table 6.5.1.5.4.3-2 SIB1

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	Value/remark	Comment	Condition
SIB1 ::= SEQUENCE {			
cellSelectionInfoSEQUENCE {			
q-RxLevMin	-46	-92 is actual value in dBm (-46 * 2 dBm)	dBm/15kHz or dBm/30kHz
}			
}			

### Table 6.5.1.5.4.3-2: RLF-TimersAndConstants

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	Value/remark	Comment	Condition
RLF-TimersAndConstants ::= SEQUENCE {			
t310	ms0		
n310	n1		
t311	ms1000		
n311	n1		
}			

### 6.5.1.5.5 Test requirement

Tables 6.5.1.5.4.1-3 and 6.5.1.5.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode.

# Table 6.5.1.5.5-1: Cell specific test parameters for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

	Parameter	Unit	Test 1			
			T1	T2	T3	
	tio of PDCCH DMRS to	dB	4			
SSS		* ==				
	tio of PDCCH to PDCCH	dB				
DMRS						
SSS	tio of PBCH DMRS to	dB				
	tio of PBCH to PBCH	dB	-			
DMRS		ub				
	tio of PBCH to PBCH	dB				
DMRS				0		
	tio of PDSCH DMRS to	dB		0		
SSS						
	io of PDSCH to PDSCH	dB				
DMRS		ID				
SSS	tio of OCNG DMRS to	dB				
	tio of OCNG to OCNG	dB				
DMRS		uр				
SNR on	Config 1	dB	1.8	-6.2	-15.8	
RLM-RS	Config 2		1.8	-6.2	-15.8	
	Config 3		1.8	-6.2	-15.8	
N	Config 1	dBm/15KHz		-98		
N <sub>oc</sub>	Config 2		-98			
	Config 3		-98			
	ion condition			TDL-C 300ns 100Hz		
Note 1:	OCNG shall be used suc			ated and a constant t	otal transmitted	
	power spectral density is					
Note 2:	The uplink resources for					
Note 3:	NZP CSI-RS resource se	et configuration for CS	SI reporting are assigr	ied to the UE prior to	the start of time	
	period T1.					
Note 4: Note 5:	Measurement gap config					
Note 5: Note 6:						
Note 7:						
Note 8: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in fig			elv in figure			
6.5.1.5.4-1.						
Note 9:	The SNR values are spe	cified for testing a UE	E which supports 2RX	on at least one band.	For testing of a UE	
	which supports 4RX on a					
	test tolerances).		<u> </u>	•	` <b>`</b>	

The UE behaviour during time durations T1, T2 and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 no later than time point C ( $D_1$  ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

# 6.5.1.6 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

#### 6.5.1.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when no DRX is used. This test will partly verify the FR1 PCell CSI-RS in-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

### 6.5.1.6.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting CSI-RS based RLM.

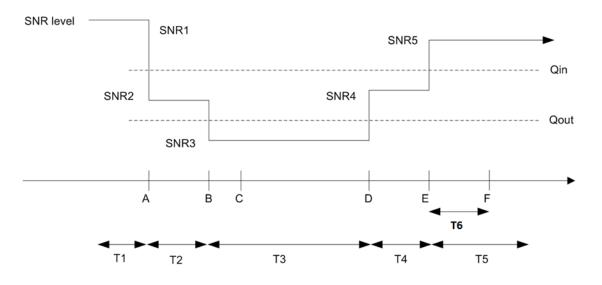
### 6.5.1.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.6.

### 6.5.1.6.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.6.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the Pcell to emulate out-of-sync and in-sync states.





#### 6.5.1.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.1.6.4.1-1.

# Table 6.5.1.6.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Configuration	Description	
6.5.1.6-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth	
6.5.1.6-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth	
6.5.1.6-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth	
Note: The UE is only required to pass in one of the supported test configurations in FR1		

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.6.4.1-2.

# Table 6.5.1.6.4.1-2: Initial conditions for for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Parameter		Value	Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified	in Annex E, Table E.4-1 and TS 38	.508-1 [14] clause 4.3.1.
Channel	As specified	by the test configuration selected fr	om Table 6.5.1.6.4.1-1.
bandwidth			
Propagation	AWGN		As specified in Annex C.2.2
conditions			
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
Diagram	DUT Part	A.3.2.3.4	
Exceptions to	For 4Rx capable UEs without any 2 Rx RF		
connection	bands use A.3.2.5.2 for DUT part and		
diagram	A.3.1.7.4 for	TE Part	

- 1. The general test parameter settings are set up according to Table 6.5.1.6.4.1-3.
- 2. Message contents are defined in clause 6.5.1.6.4.3.
- 3. There is one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.6.5-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

 Table 6.5.1.6.4.1-3: General test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1		FDD
TDD Configuration	Config 2, 3		TDD
TDD Configuration	Config 1		Not Applicable TDDConf.1.1
	Config 2 Config 3		TDDConf.1.1 TDDConf.2.1
DL initial BWP	Config 1, 2, 3		DLBWP.0.1
configuration			
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
RMSI CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.1 FDD
Reference Channel	Config 2		CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 kHz
subcarrier spacing	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for P	DCCH/PDSCH		TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and	Antenna Configuration		2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control OFDM symbols		2
parameters	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission	DCI format		1-0
parameters	Number of Control OFDM symbols		2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE	dB	0
	energy Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6

DRX			OFF
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	1000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
	Config 2		CSI-RS.1.1 TDD
	Config 3		CSI-RS.2.1 TDD
T1		S	0.2
T2		S	0.2
T3		S	0.44
T4		S	0.2
T5		S	0.88
D1		S	0.84
Note 1: UE-specific	PDCCH is not transmitted after T1	starts.	

#### 6.5.1.6.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is not enabled.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
- 2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.6.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
- 3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.6.5-1. T2 starts.
- 4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.6.5-1. T3 starts.
- 5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.6.5-1. T4 starts.
- 6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.6.5-1. T5 starts.
- 7. If the SS detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

- 8. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
- 9. After T5 expires, repeat steps 2-7 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

# Table 6.5.1.6.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Default Message Contents				
Common contents of system information				
blocks exceptions				
Default RRC messages and information Table H.3.5-4				
elements contents exceptions	Table H.3.5-9 with Condition CSI-RS RLM			

### 6.5.1.6.5 Test requirement

Tables 6.5.1.6.4.1-3 and 6.5.1.6.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in non-DRX mode.

# Table 6.5.1.6.5-1: Cell specific test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in non-DRX mode

Parameter		Unit			Test 1			
			T1	T2	T3	T4	T5	
EPRE ratio of PDCCH DMRS to		dB			0			
SSS								
	tio of PD	CCH to PDCCH	dB					
DMRS				-				
	tio of PB	CH DMRS to	dB					
SSS				-				
	tio of PB	CH to PBCH	dB					
DMRS			5	-				
	tio of PB	CH to PBCH	dB					
DMRS		SCH DMRS to	dB	-		0		
SSS			uБ					
		SCH to PDSCH	dB	1				
DMRS		30110 FD3011	uВ					
	tio of OC	NG DMRS to	dB					
SSS			dD					
	tio of OC	NG to OCNG	dB					
DMRS								
SNR on	0	Config 1	dB	1.8	-6.2	-15.8	-5.3	1.8
RLM-RS		Config 2		1.8	-6.2	-15.8	-5.3	1.8
	C	Config 3		1.8	-6.2	-15.8	-5.3	1.8
λī		Config 1	dBm/15kHz			-98	I	
N <sub>oc</sub>		Config 2				-98		
	C	Config 3				-98		
Propagat	ion cond	lition			TDI	L-C 300ns 10	0Hz	
Note 1:	OCNG	shall be used suc	ch that the resources	in Cell 1 are	fully allocated	d and a const	ant total trans	smitted
			achieved for all OFE					
Note 2:			CSI reporting are as					
Note 3:			et configuration for C	SI reporting a	are assigned	to the UE pric	or to the start	of time
Note 4	period			- 46 - 115				
Note 4: Note 5:			guration is assigned to					<b>F</b> 4
Note 6: The signal contains PDCCH for UEs other than Note 7: SNR levels correspond to the signal to noise ra						0.		
Note 8: The SNR in time periods T1, T2, T3, T4 and					NR2 SNR3	SNR4 and SN	NR5	
respectively in figure 6.5.1.6.4-1.						1112, O1110, 1		
Note 9:			cified for testing a UE	E which supp	orts 2RX on a	at least one b	and. For testi	ing of a UE
			all bands, the SNR du					
			including test tolerand					

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

# 6.5.1.7 NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

### 6.5.1.7.1 Test purpose

The purpose of this test is to verify that the UE properly detects the out of sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS Outof-sync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

#### 6.5.1.7.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM and long DRX cycle.

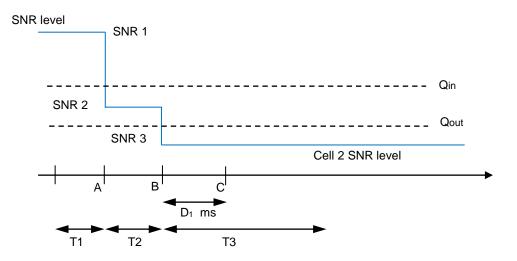
### 6.5.1.7.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.7.

### 6.5.1.7.4 Test description

The test consists three successive time periods, with time duration of T1, T2 and T3 respectively. Figure 6.5.1.7.4-1 shows the three different time durations and the corresponding variation of the downlink SNR in the active cell to emulate out-of-sync states.



### Figure 6.5.1.7.4-1: SNR variation for out-of-sync testing

### 6.5.1.7.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.5.1.7.4.1-1.

# Table 6.5.1.7.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Configuration	Description		
6.5.1.7-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth		
6.5.1.7-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth		
6.5.1.7-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth		
Note: The UE is only required to pass in one of the supported test configurations in FR1			

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.7.4.1-2.

# Table 6.5.1.7.4.1-2: Initial conditions for NR SA radio link monitoring for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Parameter	Value		Comment	
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies	As specified	in Annex E, Table E.4-1 and TS 38	.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified	As specified by the test configuration selected from Table 6.5.1.7.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2	
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		
Exceptions to connection diagram	For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.7.4 for TE Part			

- 1. The general test parameter settings are set up according to Table 6.5.1.7.4.1-3.
- 2. Message contents are defined in clause 6.5.1.7.4.3.
- 3. There is one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table 6.5.1.7.5-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

 Table 6.5.1.7.4.1-3: General test parameters for NR SA FR1 radio link monitoring out-of-sync test for

 PCell configured with CSI-RS-based RLM RS in DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1	_	FDD
	Config 2, 3		TDD
TDD Configuration	Config 1	_	Not Applicable
	Config 2	_	TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
RMSI CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.3 FDD
Reference Channel	Config 2	1	CCR.1.3 TDD
	Config 3	1	CCR.2.2 TDD
SSB Configuration	Config 1		SSB.1 FR1
COD Conngalation	Config 2	-	SSB.1 FR1
	Config 3	-	SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
Sin te comgutation	Config 3	-	SMTC.1
PDSCH/PDCCH			15 kHz
	Config 1, 2		
subcarrier spacing	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for P	DCCH/PDSCH		TCI.State.2
OCNG parameters			OP.1
CP length			Normal
Correlation Matrix and			2x2 Low
Out of sync	DCI format		1-0
transmission	Number of Control OFDM symbols		2
parameters	Aggregation level Ratio of hypothetical PDCCH RE energy to average CSI-RS RE	dB	8 4
	energy Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
DRX	•	1	DRX.3
Gap pattern ID			N.A.
Layer 3 filtering			Enabled
T310 timer		ms	0
T311 timer		ms	1000
N310		1	1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
for CSI reporting	Config 2	1	CSI-RS.1.1 TDD
	Config 3	1	CSI-RS.2.1 TDD
T1		S	0.2
T2			1.28
T3		S	
10		S	1.28

D1		S	1.24
Note 1:	UE-specific PDCCH is not transmitted after T1 start	s.	

#### 6.5.1.7.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5. Establish SRB2 and DRB in the RRC Reconfiguration message.
- 2. Set the parameters of Cell 1 according to T1 in Table 6.5.1.7.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
- 3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.7.5-1. T2 starts.
- 4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.7.5-1. T3 starts.
- 5. If the SS:
  - a) detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the slots configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect any uplink power higher than OFF power defined in TS 38.521-1 [17] clause 6.3.2.5 from time point C (D1 after the start of T3) until T3 expires,

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

- 6. When T3 expires the SS shall change the SNR value to T1 as specified in Table 6.5.1.7.5-1.
- 7. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
- 8. Repeat steps 2-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.1.7.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

# Table 6.5.1.7.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring out-of-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Default Message Contents		
Common contents of system information		
blocks exceptions		
Default RRC messages and information	Table H.3.1-9	
elements contents exceptions	Table H.3.5-4	
	Table H.3.5-9 with Condition CSI-RS RLM	
	Table H.3.7-1 with condition DRX.3	

#### Table 6.5.1.7.4.3-2 SIB1

Derivation Path: TS 38.508-1 [14], Table 4.6.1-28			
Information Element	Value/remark	Comment	Condition
SIB1 ::= SEQUENCE {			
cellSelectionInfoSEQUENCE {			
q-RxLevMin	-46	-92 is actual value in dBm (-46 * 2 dBm)	dBm/15kHz or dBm/30kHz
}			
}			

# Table 6.5.1.7.4.3-3: RLF-TimersAndConstant

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150				
Information Element Value/remark Comment Condition				
RLF-TimersAndConstants ::= SEQUENCE {				
t310	ms0			
}				

### 6.5.1.7.5 Test requirement

Tables 6.5.1.7.4.1-3 and 6.5.1.7.5-1 define the primary level settings including test tolerances for Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode.

### Table 6.5.1.7.5-1: Cell specific test parameters for FR1 for NR SA FR1 radio link monitoring out-ofsync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Parameter		Unit		Test 1	
			T1	T2	Т3
EPRE ratio of PDCCH DMRS to		dB		4	
SSS					
EPRE ratio of PDCCH to PDCCH		dB			
DMRS					
SSS	tio of PBCH DMRS to	dB			
	tio of PBCH to PBCH	dB			
DMRS		uв			
EPRE rat	tio of PBCH to PBCH	dB			
DMRS				0	
	tio of PDSCH DMRS to	dB		0	
SSS					
	io of PDSCH to PDSCH	dB			
DMRS	tio of OCNG DMRS to				
SSS	IO OF OUNG DIVIRS TO	dB			
	tio of OCNG to OCNG	dB			
DMRS		uв			
SNR on	Config 1	dB	1.8	-6.2	-15.8
RLM-RS	Config 2		1.8	-6.2	-15.8
	Config 3		1.8	-6.2	-15.8
M	Config 1	dBm/15kHz		-98	
N <sub>oc</sub>	Config 2		-98		
	Config 3			-98	
Propagat	ion condition			TDL-C 300ns 100Hz	
Note 1:			in Cell 1 are fully allocated and a constant total transmitted		
	power spectral density is				
Note 2:	The uplink resources for				
Note 3:	NZP CSI-RS resource s	et configuration for C	SI reporting are assigr	ned to the UE prior to	the start of time
Note 4	period T1.		. de s l l⊏ e eise de de s se	land of the one wind <b>T</b> A	
Note 4:	Measurement gap config				
Note 5: The timers and layer 3 filterin Note 6: The signal contains PDCCH					e penda 11.
Note 6.	SNR levels correspond				
Note 7: Note 8:	The SNR in time periods				elv in figure
14010-0.	A.6.5.1.7.1-1.				
Note 9:	The SNR values are spe	ecified for testing a UE	E which supports 2RX	on at least one band.	For testing of a UE
	which supports 4RX on				
	test tolerances).		-		

The UE behaviour in each test during time durations T1, T2 and T3 shall be as follows:

During time durations T1, T2 and T3, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on PCell.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 (PCell) at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

The UE shall stop transmitting uplink signal in Cell 1 (PCell) no later than time point C ( $D_1$  ms after the start of the time duration T3) on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

# 6.5.1.8 NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

### 6.5.1.8.1 Test purpose

The purpose of this test is to verify that the UE properly detects the in sync for the purpose of monitoring downlink CSI-RS based radio link quality of the PCell when DRX is used. This test will partly verify the FR1 PCell CSI-RS insync radio link monitoring requirements in TS 38.133 [6] clause 8.1.

#### 6.5.1.8.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM and long DRX cycle.

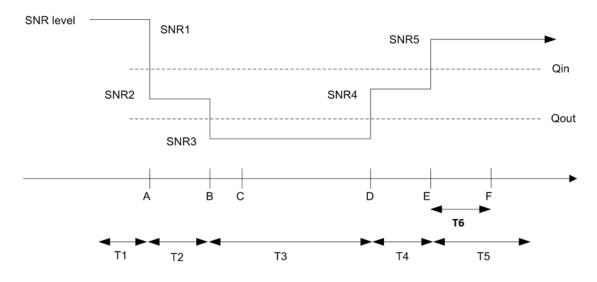
### 6.5.1.8.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.1.0.3.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.1.8.

### 6.5.1.8.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.1.8.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate in-sync states.





#### 6.5.1.8.4.1 Initial conditions

This test shall be run in one of the configurations defined in Table 6.5.1.8.4.1-1.

# Table 6.5.1.8.4.1-1: Supported test configurations for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Configuration	Description
6.5.1.8-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.8-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.1.8-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only required to pass in one of the supported test configurations in FR1	

Configure the test equipment and the DUT according to the parameters in Table 6.5.1.8.4.1-2.

# Table 6.5.1.8.4.1-2: Initial conditions for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Parameter		Value	Comment	
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies	As specified	in Annex E, Table E.4-1 and TS 38	3.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified	ed by the test configuration selected from Table 6.5.1.8.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2	
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4	1	
Exceptions to connection diagram		able UEs without any 2 Rx RF 3.2.5.2 for DUT part and TE Part		

- 1. The general test parameter settings are set up according to Table 6.5.1.8.4.1-3. The measurement gap configuration for subtest 2 is according to Table 6.5.1.8.4.1-4.
- 2. Message contents are defined in clause 6.5.1.8.4.3.
- 3. There are one cell in the test, where Cell 1 is the NR PCell on the NR carrier. Cell 1 is the cell used for connection setup with the power level set according to Table A.6.1.1-1 for this test. Cell 1 is configured according to Annex C.1.2 and C.1.3.

# Table 6.5.1.8.4.1-3: General test parameters for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

	Parameter	Unit	Value
			Test 1
Active PCell			Cell 1
RF Channel Number			1
Duplex mode	Config 1	_	FDD
700 0 0	Config 2, 3		TDD
TDD Configuration	Config 1	_	Not Applicable
	Config 2	_	TDDConf.1.1
	Config 3		TDDConf.2.1
DL initial BWP configuration	Config 1, 2, 3		DLBWP.0.1
DL dedicated BWP configuration	Config 1, 2, 3		DLBWP.1.1
UL initial BWP configuration	Config 1, 2, 3		ULBWP.0.1
UL dedicated BWP configuration	Config 1, 2, 3		ULBWP.1.1
RMSI CORESET	Config 1		CR.1.1 FDD
Reference Channel	Config 2		CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET	Config 1	1	CCR.1.1 FDD
Reference Channel	Config 2	1	CCR.1.1 TDD
	Config 3		CCR.2.1 TDD
SSB Configuration	Config 1		SSB.1 FR1
	Config 2	_	SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration	Config 1, 2		SMTC.1
	Config 3		SMTC.1
PDSCH/PDCCH	Config 1, 2		15 kHz
subcarrier spacing	Config 3		30 kHz
TRS configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
CSI-RS for RLM	Config 1		Resource #4 in TRS.1.1 FDD
	Config 2		Resource #4 in TRS.1.1 TDD
TOL (	Config 3		Resource #4 in TRS.1.2 TDD
TCI configuration for P	DCCH/PDSCH		TCI.State.2
OCNG parameters			OP.1
CP length Correlation Matrix and	Antenna Configuration		Normal 2x2 Low
	-		
Out of sync	DCI format		1-0
transmission	Number of Control OFDM symbols		2
parameters	Aggregation level	CCE	8
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy	dB	4
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	4
	DMRS precoder granularity		REG bundle size
	REG bundle size		6
In sync transmission	DCI format	1	1-0
parameters	Number of Control OFDM symbols	1	2
	Aggregation level	CCE	4
	Ratio of hypothetical PDCCH RE energy to average CSI-RS RE	dB	0
	energy Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0
	DMRS precoder granularity		REG bundle size
	REG bundle size		6

DRX			DRX.3
Gap pattern ID			gp0
Layer 3 filtering			Enabled
T310 timer		ms	2000
T311 timer		ms	1000
N310			1
N311			1
CSI-RS configuration	Config 1		CSI-RS.1.1 FDD
for CSI reporting	Config 2		CSI-RS.1.1 TDD
_	Config 3		CSI-RS.2.1 TDD
T1		S	0.2
T2		S	0.2
Т3		S	1.24
Τ4			0.2
T5			1.88
Т6		S	1.84
Note 1: UE-specific	PDCCH is not transmitted after T1	starts.	

#### Table 6.5.1.8.4.1-4: Measurement gap configuration for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

	Field	Test 1
	Field	Value
	gapOffset	0
Note 1:	Void	

### 6.5.1.8.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5ms. In the test, DRX configuration is enabled in PCell and DRX inactivity timer has already been expired, i.e. UE tries to decode PDCCH and to send periodic CQI during the period when On-duration timer is running. Time alignment timers shall be set to "infinity" so that UL timing alignment is maintained during the test. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms).

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
- 2. The SS shall transmit an RRCReconfiguration message configuring the UE for inter-frequency measurements.
- 3. The UE shall transmit RRCReconfigurationComplete message.
- 4. Set the parameters of Cell 1 according to T1 in Table 6.5.1.8.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.
- 5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.1.8.5-1. T2 starts.
- 6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.1.8.5-1. T3 starts.
- 7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.1.8.5-1. T4 starts.
- 8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.1.8.5-1. T5 starts.
- 9. If the SS detects uplink power equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in the On-duration part of every DRX cycle in the configured slots for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point F (T6 after the start of time duration T5) the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. If the UE has not re-established the connection in at least 1s, the UE is switched off and then on. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 4-10 for both subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

# 6.5.1.8.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and 7.3.1 with the following exceptions:

# Table 6.5.1.8.4.3-1: Common Exception messages for NR SA FR1 radio link monitoring in-sync test for PCell configured with CSI-RS-based RLM RS in DRX mode

Default Message Contents			
Common contents of system information blocks exceptions			
Default RRC messages and information elements contents exceptions	Table H.3.1-1         Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED,         GAP_NEEDED         Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range)         Table H.3.1-4 with A3-offset = 0         Table H.3.5-4         Table H.3.5-9 with Condition CSI-RS RLM         Table H.3.7-1 with condition DRX.3 and Gap		

# Table 6.5.1.8.4.3-2: RLF-TimersAndConstant

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150					
Information Element Value/remark Comment Condition					
RLF-TimersAndConstants ::= SEQUENCE {					
t310	ms2000				
}					

### 6.5.1.8.5 Test requirement

Tables 6.5.1.8.4.1-3 and 6.5.1.8.5-1 define the primary level settings including test tolerances for Radio Link Monitoring In-sync Test for FR1 PCell configured with CSI-RS-based RLM in DRX mode.

Table 6.5.1.8.5-1: Cell specific test parameters for NR SA FR1 radio link monitoring in-sync test for

#### PCell configured with CSI-RS-based RLM RS in DRX mode Unit Parameter Test 1 **T1** T2 **T4** T5 Т3 EPRE ratio of PDCCH DMRS to dB 4 SSS EPRE ratio of PDCCH to PDCCH dB DMRS EPRE ratio of PBCH DMRS to dB

SSS		dB					
EPRE ratio of PBCH to PBCH		dB					
DMRS							
	io of PBCH to PBCH	dB					
DMRS			-		0		
	io of PDSCH DMRS to	dB	°				
SSS EDBE rot	io of PDSCH to PDSCH	dB	-				
DMRS		uв					
-	io of OCNG DMRS to	dB	-				
SSS		45					
	io of OCNG to OCNG	dB					
DMRS							
SNR on	Config 1	dB	1.8	-6.2	-15.8	-5.3	1.8
RLM-RS	Config 2		1.8	-6.2	-15.8	-5.3	1.8
	Config 3		1.8	-6.2	-15.8	-5.3	1.8
N <sub>oc</sub>	Config 1	dBm/15kHz			-98		
1 oc	Config 2				-98		
Config 3			-98				
Propagation condition			TDL-C 300ns 100Hz				
Note 1: OCNG shall be used such that the resources in Cell 1 are fully allocated and a constant total transmitted			mitted				
power spectral density is achieved for all OFDM symbols.							
	Note 2: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T1.						
Note 3:	3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the start of time period T1.						
Note 4:							
Note 5:	The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.						
Note 6:	The signal contains PDCCH for UEs other than the device under test as part of OCNG.						
Note 7:	SNR levels correspond to the signal to noise ratio over the SSS REs.						
Note 8:	The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2, SNR3, SNR4 and SNR5						
	respectively in figure 6.5.1.8.4-1.						
Note 9:							
	which supports 4RX on all bands, the SNR during T3 and T4 from D.4.1.1 are -18.0-TT and -8.0-TT, which				TT, which		
	are -18.8dB and -8.8dB(including test tolerances)						

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the period from time point A to time point F (T6 second after the start of time duration T5) the UE shall transmit uplink signal at least in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting on the PCell.

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

# 6.5.2 Interruption

- 6.5.2.0 Minimum conformance requirements
- 6.5.2.0.1 Minimum conformance requirements for interruptions during measurements on deactivated NR SCC

Interruptions on PCell due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [13] is 640 ms or longer.

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- If the PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on PCell immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 6.5.2.0.1-1
- If the PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than X slots before  $T_{SMTC\_duration}$  and no later than X slots after  $T_{SMTC\_duration}$ , provided the cell specific reference signals from the active serving cells and the deactivated SCell are available in the same slot, where X and  $T_{SMTC\_duration}$  are given by Table 6.5.2.0.1-2. The interruption shall not exceed requirements in Table 6.5.2.0.1-2.

Interruptions on active SCells due to measurements when an SCell is deactivated are allowed with up to 0.5% probability of missed ACK/NACK when the configured *measCycleSCell* [13] is 640 ms or longer.

- If the activated SCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on an activated SCell immediately before and immediately after an SMTC. Each interruption shall not exceed requirement in Table 6.5.2.0.1-1
- If the activated SCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on the activated SCell no earlier than X slots before  $T_{SMTC\_duration}$  and no later than X slots after  $T_{SMTC\_duration}$ , provided the cell specific reference signals from the active serving cells and the deactivated SCell are available in the same slot, where X and  $T_{SMTC\_duration}$  are given by Table 6.5.2.0.1-2. The interruption shall not exceed requirements in Table 6.5.2.0.1-2.

Table 6.5.2.0.1-1: Interruption duration for SCell activation/deactivation for inter-band CA

μ	NR Slot length (ms) of victim cell	Interruption length (slot)		
0	1		1	
1	0.5		1	
2	0.25	Both aggressor cell and victim cell are on FR2	2	
	0.25	Either aggressor cell or victim cell is on FR1	3	
3	0.125	Aggressor cell is on FR2	4	
	0.125	Aggressor cell is on FR1	5	

NR Slot	Interruption length (slots)	
1	1 + T <sub>SMTC_duration</sub> * $N_{slot}^{subframe,\mu}$	
0.5	1 + T <sub>SMTC_duration</sub> * $N_{slot}^{subframe,\mu}$	
0.25	2 + T <sub>SMTC_duration</sub> * $N_{\text{slot}}^{\text{subframe},\mu}$	
0.125	4 + T <sub>SMTC_duration</sub> * $N_{slot}^{subframe,\mu}$	
<ol> <li>TSMTC_duration measured in subframes is         <ul> <li>the longest SMTC duration among all above active serving cells and the SCell being activated when one SCell is activated. If SSB configuration (<i>absoluteFrequencySSB</i>) but no SMTC configuration is provided for the SCell being activated, the SSB transmission periodicity is assumed to be 5ms and TSMTC duration for the SCell being activated is [x]ms. If no SSB configuration (<i>absoluteFrequencySSB</i>) nor SMTC configuration is provided for the SCell being activated is [x]ms. If no SSB configuration (<i>absoluteFrequencySSB</i>) nor SMTC configuration is provided for the SCell being activated is [s 0ms;</li> <li>the longest SMTC duration among all active serving cells in the same band when one SCell is</li> </ul> </li> </ol>		
$N_{\rm slot}^{\rm subframe,\mu}$ is as defined in TS 38.211 [7].		
	Iength (ms)         1         0.5         0.25         0.125         TSMTC_duration meases         - the longest SMT         serving cells and to one SCell is activated (absoluteFrequent is provided for the transmission period TSMTC duration for the no SSB configuration SMTC configuration activated, TSMTC duration for the is 0ms;         - the longest SMT serving cells in the deactivated.	

The normative reference for this requirement is TS 38.133 [6] clause 8.2.2.2.

# 6.5.2.1 NR SA FR1 interruptions during measurements on deactivated NR SCC

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

#### 6.5.2.1.1 Test purpose

To verify UE's ability to complete NR PCell interruptions during the measurement on the deactivated NR SCC within the missed ACK/NACK rate in standalone NR requirements.

#### 6.5.2.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 2DL CA.

6.5.2.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.2.1.

6.5.2.1.4 Test description

#### 6.5.2.1.4.1 Initial conditions

Test 6.5.2.1 can be run in one of the configurations defined in this clause. Supported test configurations for NR PCell are shown in Table 6.5.2.1.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.2.1.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

### Table 6.5.2.1.4.1-1: Supported test configurations for NR PCell

Config	Description		
6.5.2.1-1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode		
6.5.2.1-2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode		
6.5.2.1-3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode		
Note 1: The UE is only required to be tested in one of the supported test configurations			
Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BW <sub>channel</sub> ) defined in each test configuration,			

Configscell	Description		
1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode		
2	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode		
3	NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode		
Note 1: The UE is only required to be tested in one of the supported test configurations			
Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BW <sub>channel</sub> ) defined in each test configuration,			

Configure the test equipment and the DUT according to the parameters in Table 6.5.2.1.4.1-2.

# Table 6.5.2.1.4.1-2: Initial conditions for NR SA FR1 interruptions during measurements on deactivated NR SCC

Parameter		Value	Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified	d in Annex E, table E.4-1 and TS 38.	508-1 [14] clause 4.3.1 and 4.4.2.
Channel bandwidth	As specified by the test configuration selected from Table 6.5.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.
Connection	TE Part	A.3.1.8.1	As specified in TS 38.508-1 [14] Annex A.
Diagram	DUT Part	A.3.2.3.4	
Exceptions to connection diagram	N/A		

- 1. The general test parameter settings are set up according to Table 6.5.2.1.4.1-3
- 2. Message contents are defined in clause 6.5.2.1.4.3.
- 3. There are two NR carriers and two cells specified in the test. Cell 1 is the PCell on one NR carrier, Cell 2 is the SCell on the other NR carrier. Cell 1 and Cell 2 shall be configured according to Annex C.1.1 and C.1.2.

# Table 6.5.2.1.4.1-3: General test parameters for NR SA FR1 interruptions during measurements on deactivated NR SCC

Parameter	Unit	Value	Comment
RF Channel Number		1, 2	Two NR RF channels
Active PCell		Cell1	PCell on NR RF channel number 1.
Configured deactivated SCell		Cell2	Deactivated SCell on NR RF channel number 2.
CP length		Normal	Applicable to Cell1 and Cell 2
DRX		OFF	
Measurement gap pattern Id		OFF	
SCell measurement cycle (measCycleSCell)	ms	640	
T1	S	10	

### 6.5.2.1.4.2 Test procedure

The test consists of two cells: Cell1 and Cell2. Cell1 is PCell and Cell2 is deactivated SCell. The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *measCycleSCell* or *allowInterruptions* for the deactivated NR SCells is received at the UE antenna connector. Cell1 shall be configured as PCell and Cell2 shall be configured as SCell.. During T1, PCell is continuously scheduled in DL.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
- 2. The SS shall transmit an RRCReconfiguration message including measCycleSCell or allowInterruptions for the deactivated NR SCell.
- 3. The UE shall transmit RRCReconfigurationComplete message.
- 4. Set the parameters according to Table 6.5.2.1.5-1. Propagation conditions are set according to Annex C.2.1. T1 starts.
- SS schedules on PCell continuously and UE shall start sending ACK/NACK reports. The SS shall monitor ACK/NACK/DTX on PCell.
- 6. If more than 99.5% of uplink transmissions are received by SS then count a success for the event "ACK/NACK". Otherwise count a fail for the event "ACK/NACK".

- 7. If no longer than X consecutive DTX is observed by the SS, then count a success for the event "DTX". Otherwise count a fail for the event "DTX". Where
  - For test configuration 6.5.2.1-1 and 6.5.2.1-4,
    - $X = interruption \ length + k_1 \ if \ k_1 \le interruption \ length$
    - $X = interruption length if k_1 > interruption length$

Note: UE expects that the SS won't use  $k_1 = 3$  for test configuration 4.5.2.3-1 and 4.5.2.3-4.

- For test configuration 6.5.2.1-2, 6.5.2.1-3 and 6.5.2.1-5,
  - X = interruption length.
- interruption length is given in table 6.5.2.1.5-2 for inter-band case and in 6.5.2.1.5-3 for intra-band case.
- 8. After the RRC connection release, the SS:
  - transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC\_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED TS 38.508-1 [14] clause 4.5),

or

Commor

- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On according to TS 38.508-1 [14] clause 4.5.
- 9. Repeat step 2-8 until a test verdict has been achieved.

Each of the events "ACK/NACK" and "DTX" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

6.5.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

Default Message Contents				
n contents of system information blocks				
ons				
RRC messages and information elements	Table H.3.1-2 with Condition Deactivated			
s exceptions	Table H.3.1-4 with A3-offset = 15			
mennen entente eventiene fer Test	Table U.2.1.2 with Condition Departivated			

#### Table 6.5.2.1.4.3-1: Common Exception messages

exceptions	
Default RRC messages and information elements	Table H.3.1-2 with Condition Deactivated SCell;
contents exceptions	Table H.3.1-4 with A3-offset = 15
Specific message contents exceptions for Test	Table H.3.1-3 with Condition Deactivated SCell
Configuration 6.5.2.1-1, 6.5.2.1-2, 6.5.2.1-3 and 6.5.2.1-	and SSB.1 FR1
4	Table 7.3.1-3 in TS 38.508-1 [14] with condition
	SMTC.1
Specific message contents exceptions for Test	Table H.3.1-3 with Condition Deactivated SCell
Configuration 6.5.2.1-5	and SSB.2 FR1
	Table 7.3.1-3 in TS 38.508-1 [14] with condition
	SMTC.1

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition MEAS				
Information Element	Value/remark	Comment	Condition	
ServingCellConfig ::= SEQUENCE {				
servingCellMO	2	MeasObjectId for SCell in Table		
		H.3.1-2		
}				

#### Table 6.5.2.1.4.3-2: ServingCellConfig (Cell 2)

#### 6.5.2.1.5 Test requirement

Table 6.5.2.1.5-1 and Table 6.5.2.1.5-1A defines the primary level settings including test tolerances for NR SA FR1 interruptions during measurements on deactivated NR SCC.

## Table 6.5.2.1.5-1: NR cell specific test parameters for NR PCell for NR SA FR1 interruptions during measurements on deactivated NR SCC

Paramete	er	Unit	Cell1
Frequency Range			FR1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
TDD configuration	Config 1		Not Applicable
3	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
BWchannel			Note 9
BWoccupied	Config 1,2	RB	52 Note 7
	Config 3		106 Note 8
Initial DL BWP Configurat	U		DLBWP.0.1
Dedicated DL BWP Confi			DLBWP.1.1
Initial UL BWP Configurat			ULBWP.0.1
Dedicated UL BWP Confi			ULBWP.1.1
PDSCH Reference	Config 1		SR.1.1 FDD
measurement channel	Config 2		SR.1.2 TDD
	Config 3		SR.2.1 TDD
CSI-RS for tracking	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
RMSI CORESET	Config 1		CR.1.1 FDD
parameters	Config 2		CR.1.1 TDD
Parametere	Config 3		CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.1 FDD
parameters	Config 2		CCR.1.1 TDD
F	Config 3		CCR.2.1 TDD
OCNG Patterns	Config 1,2		OP.1 <sup>Note 7</sup>
	Config 3		OP.1 Note 8
SMTC Configuration			SMTC.1
SSB Configuration	Config 1,2		SSB.1 FR1
ga	Config 3		SSB.2 FR1
Correlation Matrix and An			1x2 Low
Configuration			
EPRE ratio of PSS to SS	8		
EPRE ratio of PBCH DMF	RS to SSS		
EPRE ratio of PBCH to P	BCH DMRS		
EPRE ratio of PDCCH DN			
EPRE ratio of PDCCH to		dB	0
EPRE ratio of PDSCH DM			
EPRE ratio of PDSCH to			
EPRE ratio of OCNG DM	RS to SSS Note 1		
EPRE ratio of OCNG to C	CNG DMRS Note 1		
Noc <sup>Note 2</sup>		dBm/15 kHz	-104
SS-RSRP Note 3		dBm/15 kHz	-87
Ês/I <sub>ot</sub>		dB	17
Ês/Noc		dB	17

Noc <sup>Note 2</sup>		Config 1,2	dBm/SCS	-104
		Config 3		-101
Io <sup>Note3</sup>		Config 1,2	dBm/9.36MHz	-58.96
		Config 3	dBm/38.16MHz	-52.86
Time offs	set to Cell1 Note 5	· • • • •	μS	-
Propaga	tion Condition		•	AWGN
Note 1:		ed such that bot	th cells are fully allo	cated and a constant total
	transmitted power	spectral density	is achieved for all C	DFDM symbols.
Note 2:				ecified in the test is assumed
	to be constant over	er subcarriers an	d time and shall be	modeled as AWGN of
	appropriate power	r for Noc to be ful	filled within BWoccupi	ed.
Note 3:	SS-RSRP and lo	levels have beer	n derived from other	parameters for information
purposes. They are not settable parameters themselvess.			ess.	
Note 4:	Void			
Note 5:	Note 5: Receive time difference between slot boundaries of signals received from the two			•
	cells at the UE antenna connector including time alignment error between the two			ment error between the two
	cells.			
Note 6:	e 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked			
	with ULBWP.0.2 defined in clause 12 of TS 38.213 [3].			
Note 7:	All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 10 MHz, 52 RBs)			
	from F <sub>C,low</sub> , and Io is independent of the BW <sub>channel</sub> configured.			
Note 8:				upied (i.e. 40 MHz, 106 RBs)
	from Fc,low, and Io is independent of the BW <sub>channel</sub> configured.			•
Note 9:	N <sub>RB,c</sub> . is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BW <sub>channel</sub> .			

## Table 6.5.2.1.5-1A: NR cell specific test parameters for NR SCell for NR SA FR1 interruptions during measurements on deactivated NR SCC

Parameter		Unit	Cell2
Frequency Range			FR1
Duplex mode	Configscell 1		FDD
	ConfigsCell 2,3		TDD
TDD configuration	Configscell 1		Not Applicable
<u> </u>	ConfigsCell 2		TDDConf.1.1
	Configscell 3		TDDConf.2.1
BWchannel	•		Note 9
BWoccupied	ConfigsCell 1,2	RB	52 Note 7
	Configscell 3		106 Note 8
Initial DL BWP Configurati	ų.		DLBWP.0.1
Dedicated DL BWP Config	juration		DLBWP.1.1
Initial UL BWP Configurati	on		N/A
Dedicated UL BWP Config	juration		N/A
PDSCH Reference	Configscell 1		SR.1.1 FDD
measurement channel	Configscell 2		SR.1.2 TDD
	Config <sub>SCell</sub> 3		SR.2.1 TDD
CSI-RS for tracking	Config <sub>SCell</sub> 1		TRS.1.1 FDD
	Config <sub>SCell</sub> 2		TRS.1.1 TDD
	Config <sub>SCell</sub> 3		TRS.1.2 TDD
RMSI CORESET	Config <sub>SCell</sub> 1		CR.1.1 FDD
parameters	ConfigsCell 2		CR.1.1 TDD
	ConfigsCell 3		CR.2.1 TDD
Dedicated CORESET	ConfigsCell 1		CCR.1.1 FDD
parameters	ConfigsCell 2		CCR.1.1 TDD
	ConfigsCell 3		CCR.2.1 TDD
OCNG Patterns	ConfigsCell 1,2		OP.1 Note 7
	Configscell 3		OP.1 Note 8
SMTC Configuration			SMTC.4
SSB Configuration	ConfigsCell 1,2		SSB.5 FR1
-	Configscell 3		SSB.6 FR1
Correlation Matrix and Antenna			1x2 Low
	Configuration		
EPRE ratio of PSS to SSS		1	
EPRE ratio of PBCH DMR		dB	0
EPRE ratio of PBCH to PE			Ŭ
EPRE ratio of PDCCH DM	RS to SSS		

EPRE ratio of PDCCH to PDCCH DMRS				
EPRE ratio of PDSCH DMRS to SSS				
EPRE ratio of PDSCH to PDSCH				
EPRE rat	io of OCNG DMR	S to SSS Note 1		
EPRE rat	io of OCNG to OC	CNG DMRS Note 1		
Noc <sup>Note 2</sup>			dBm/15 kHz	-104
SS-RSRF	Note 3		dBm/15 kHz	-87
Ês/Iot			dB	17
Ês/Noc			dB	17
Noc <sup>Note 2</sup>		Config <sub>SCell</sub> 1,2	dBm/SCS	-104
		Configscell 3		-101
lo <sup>Note3</sup>		Config <sub>SCell</sub> 1,2	dBm/9.36MHz	-58.96
		Configscell 3	dBm/38.16MHz	-52.86
Time offs	et to Cell1 Note 5		μS	3
Propagat	ion Condition			AWGN
Note 1:	OCNG shall be	used such that both	cells are fully alloca	ted and a constant total
			s achieved for all OF	
Note 2:				cified in the test is assumed to
				eled as AWGN of appropriate
		be fulfilled within B		
Note 3:				arameters for information
		are not settable par	ameters themselves	SS.
Note 4:	Void			
Note 5:				hals received from the two
cells at the UE antenna connector in			icluding time alignm	ent error between the two
cells. Note 6: For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked			DWD DI DWD 0.2 is linked	
				DVVF. DLDVVF.U.Z IS IIIIKED
with ULBWP.0.2 defined in clause 12 of TS 38.213 [3]. Note 7: All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 10 MHz, 52 RBs) fro			$(i \in 10 \text{ MHz} 52 \text{ RBs})$ from	
F <sub>C,low</sub> , and Io is independent of the B				
Note 8: All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 40 MHz, 106 RBs) from F <sub>C,low</sub> , and Io is independent of the BW <sub>channel</sub> configured.				
Note 9: $N_{RB,c.}$ is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BW <sub>channel</sub> .				

The UE shall be continuously scheduled on PCell during the entire length of T1. During the time duration T1 the UE shall transmit at least 99.5% of ACK/NACK on PCell.

If the NR PCell is not in the same band as the deactivated SCell, the UE is only allowed to cause interruptions on NR PCell immediately before and immediately after an SMTC. Each interruption on NR PCell shall not exceed the value defined in Table 6.5.2.1.5-2.

If the NR PCell is in the same band as the deactivated SCell, the UE is only allowed to cause an interruption on PCell no earlier than 1 slot before an SMTC and no later than 1 slot after the SMTC. the interruption on NR PCell shall not exceed the value defined in Table 6.5.2.1.5-3.

#### Table 6.5.2.1.5-2: Interruption duration if the PCell is not in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	1
1	0.5	1

Table 6.5.2.1.5-3: Interruption duration if the PCell is in the same band as the deactivated SCell

μ	NR Slot length (ms)	Interruption length
0	1	2 + SMTC duration
1	0.5	2 + SMTC duration

The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.3 SCell activation and deactivation delay

## 6.5.3.0 Minimum conformance requirements

6.5.3.0.1 Minimum conformance requirements for SCell activation and deactivation delay

Same as in clause 4.5.3.0.1.

# 6.5.3.1 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 160ms SCell measurement cycle

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

#### 6.5.3.1.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements in TS 38.133 [6] clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

6.5.3.1.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

6.5.3.1.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.1.

6.5.3.1.4 Test description

#### 6.5.3.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for NR PCell are shown in Table 6.5.3.1.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.3.1.4.1-1A. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

#### Table 6.5.3.1.4.1-1: supported test configurations for NR PCell

Config		Description
6.5.3.1-1		NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
6.5.3.1-2		NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
6.5.3.1-3		NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 2: 1	The U Suppo	E is only required to be tested in one of the supported test configurations. E is only required to be tested in one with smallest aggregated channel bandwidth from rted band combinations which is composed of CCs $\geq$ the bandwidth (BW <sub>channel</sub> ) defined in est configuration.

Conf	igscell	Description
1		NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
3		NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1:	The UE is	s only required to be tested in one of the supported test configurations
Note 2:		s only required to be tested in one with smallest aggregated channel bandwidth from supported nbinations which is composed of CCs ≥ the bandwidth (BW <sub>channel</sub> ) defined in each test tion,

Configure the test equipment and the DUT according to the parameters in Table 6.5.3.1.4.1-2 and Table 6.5.3.1.4.1-3.

Parameter	Value		Comment
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.
Test frequencies	As specified	in Annex E, Table E.4-1 and TS 3	8.508-1 [14] clause 4.3.1.
Channel	As specified	by the test configuration selected	rom Table 6.5.3.1.5-1
bandwidth			
Propagation	AWGN		As specified in Annex C.2.2.
conditions			
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.
Diagram	DUT Part	A.3.2.3.1	
Exceptions to connection	- Without LTE link		
diagram	- For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and		
alagian	A.3.1.8.4 for		

#### Table 6.5.3.1.4.1-2: Initial conditions for known FR1 SCell activation case

## Table 6.5.3.1.4.1-3: General test parameters for known FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
RF Channel Number		1,2	Two NR radio channel (1, 2) are used for this test
Active PCell		Cell 1	Primary cell on NR RF channel number 1.
Configured deactivated SCell		Cell 2	Configured deactivated secondary cell on NR RF channel number 2
CP length		Normal	
DRX		OFF	Continuous monitoring of primary cell
Cell-individual offset for cells on NR channel number	dB	0	Individual offset for cells on primary component carrier.
SCell measurement cycle (measCycleSCell)	ms	160	
Cell2 timing offset to cell1	μS	0	
Time alignment error between cell2 and cell1	μS	≤ Time alignment error as specified in TS 38.104 [13] clause 6.5.3.1.	The value of time alignment error depends upon the type of carrier aggregation.
T1	s	7	During this time the PCell shall be known and the SCell configured and detected.
T2	s	1	During this time the UE shall activate the SCell.
Т3	S	1	During this time the UE shall deactivate the SCell.
Tharq	ms	Config 1: 2 Config 2: 3 Config 3: 2.5	k <sub>1</sub> ×NR slot length k <sub>1</sub> is a number of slots and is indicated by the PDSCH-to-HARQ-timing-indicator field in the DCI format, if present, or provided by <i>dl-DataToUL-ACK</i> , the value of k should be the minimum value defined in TS 38.213 [8] that will meet the timing constraints of this test case.
Tcsl_Reporting	ms	15	the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [13].

- 1. Message contents are defined in clause 6.5.3.1.4.3.
- 2. There are two NR carriers, each with one cell. Cell 1 is NR FR1 PCell and Cell 2 is the deactivated SCell. Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

#### 6.5.3.1.4.2 Test procedure

The test consists of three successive time periods, with duration of T1, T2 and T3, respectively. Before the test starts the UE is connected to Cell 1, but is not aware of Cell2. The UE is only monitoring the PCC. The UE shall be continuously scheduled in the PCell throughout the whole test.

The point in time at which the MAC message is received at the UE antenna connector, in slot # denoted n, defines the start of time period T2. The UE shall be able to report valid CSI in PCell for the activated SCell at latest in slot n +  $\frac{T_{\text{HARQ}+T_{activation\_time}+T_{\text{CSI\_Reporting}}}{NR \text{ slot length}}$ , as defined in TS 38.133 [6] clause 8.3. The UE shall start reporting CSI in PCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $n + \frac{T_{\text{HARQ}+3ms}}{NR \text{ slot length}}$  and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PCell interruption due to activation of SCell shall occur in the slot  $n + 1 + \frac{T_{\text{HARQ}}}{NR \text{ slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}+3ms+TX}}{NR \text{ slot length}} + N_{\text{interruption}}$ , as defined in TS 38.133 [6] clause 8.3.

Time period T3 starts when a MAC message for deactivation of SCell, sent from the test equipment to the UE in a slot # denoted m, is received at the UE antenna connector. The UE shall carry out deactivation of the SCell in a slot m +  $\frac{T_{HARQ}+3ms}{NR \ slot \ length}$ , as defined in TS 38.133 [6] clause 8.3, and The starting point of any PCell interruption due to the deactivation shall occur in the slot m +  $1 + \frac{T_{HARQ}}{NR \ slot \ length}$  to m +  $1 + \frac{T_{HARQ}+3ms}{NR \ slot \ length}$ , as defined in TS 38.133 [6] clause 8.3.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
- 2. Set the parameters according to T1 in Tables 6.5.3.1.4.1-3 and 6.5.3.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2..
- 3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1 and provide measurement configurations.
- 3a. The UE sends a MeasurementReport message.
- 4. The SS shall configure transmission of PDSCH with a maximum number of 1 HARQ transmission.
- 5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n and T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.
- 6. After at least one CSI-RS transmission occasion for channel measurement, the UE shall start sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell according to the following criteria:
  - If the first CSI report for SCell is received by the SS no later than slot  $n + 1 + \frac{T_{HARQ} + 3ms + T_{CSI\_Reporting}}{NR \ slot \ length}$ ,
    - or slot  $n + 1 + \frac{T_{HARQ} + 3ms + T_{CSI\_Reporting} + T_X}{NR \ slot \ length} + N_{interruption} + 1$  if the slot  $n + 1 + \frac{T_{HARQ} + 3ms + T_{CSI\_Reporting}}{NR \ slot \ length}$  was subject to interruption,
  - and CSI report with non-zero CQI index is received by the SS earlier than or equal to slot  $n + \frac{T_{HARQ} + T_{activation\_time} + T_{CSI\_Reporting}}{NR slot length}$ ,
    - or the next available uplink resource if there are no uplink resources for reporting the valid CSI in a slot n +  $\frac{T_{\text{HARQ}+T_{\text{activation_time}+T_{\text{CSI_Reporting}}}}{NR \text{ slot length}}$
  - and DTX is not observed by the SS outside the slot  $n + 1 + \frac{T_{HARQ}}{NR \text{ slot length}}$  to  $n + 1 + \frac{T_{HARQ} + 3ms + T_X}{NR \text{ slot length}} + N_{interruption} + \frac{T_{HARQ}}{NR \text{ slot length}}$  up to the end of T2
  - Then the number of successes for the event "Activation" is increased by one. Otherwise, count a fail for the event "Activation" and go to step 9.

- 7. When T2 expires, the SS deactivate SCC by sending the deactivation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted m and T3 starts in slot m. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 8, otherwise go to step 9.
- 8. The UE shall stop sending CSI reports for SCell and the SS shall monitor CSI reports for SCell sent from the UE and ACK/NACK sent in PCell during SCell deactivation.
  - If the last CSI report is received by the SS earlier than or equal to slot  $m + \frac{T_{HARQ}+3ms}{NR \ slot \ length}$

and DTX is not observed by the SS outside the slot  $m + 1 + \frac{T_{HARQ}}{NR \ slot \ length}$  to  $m + 1 + \frac{T_{HARQ} + 3ms}{NR \ slot \ length} + \frac{T_{HARQ} + 3ms}{NR \ slot \ length}$  $N_{interruption} + \frac{T_{HARQ}}{NR \ slot \ length}$  up to the end of T3,

- Then the number of successes for the event "Deactivation" is increased by one. Otherwise, count a fail for the event "Deactivation".
- 9. When T3 expires, or Activation in step 5 was not acknowledged, or a fail was counted for the event "Activation" in step 6, or Deactivation in step 7 was not acknowledged, the SS shall transmit a RRCRelease message to release the RRC connection which includes the release of the established radio bearers as well as all radio resources.
- 10. Set Cell 2 physical cell identity = ((current cell 2 physical cell identity + 1) mod 1008) for next iteration of the test procedure loop.
- 11. After the RRC connection release, the SS:

- transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5),

- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode On according to TS 38.508-1 [14] clause 4.5.

12. Repeat steps 2-11 until a test verdict has been achieved.

Each of the events "Activation" and "Deactivation" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1 in Annex G.2 is achieved. Different events may require different times for a verdict. If all events pass, the test passes. If one event fails, the test fails.

#### 6.5.3.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

#### Table 6.5.3.1.4.3-1: Common Exception messages

	Default Message Contents
Common contents of system information blocks exceptions	
Default RRC messages and information elements contents exceptions	Table H.3.1-7 with Condition Deactivated SCell;

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Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR_MEAS and SCell_add			
Information Element	Value/remark	Comment	Condition
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
<pre>rrcReconfiguration ::= SEQUENCE {</pre>			
measConfig	MeasConfig	Table 6.5.3.1.4.3- 2A	
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig-SCell	Table 6.5.3.1.4.3- 5	
}			
}			
}			
}			

## Table 6.5.3.1.4.3-2: RRCReconfiguration: SCell addition

## Table 6.5.3.1.4.3-2A: MeasConfig (Table 6.5.3.1.4.3-2)

Derivation path: Table H.3.1-2 with condition Deactivated	SCell		
Information Element	Value/Remark	Comment	Condition
measConfig ::= SEQUENCE {			
measObjectToAddModList SEQUENCE (SIZE (1maxNrofMeasId)) OF SEQUENCE {	2 entries		
measObject[2] CHOICE {			
measObjectNR	MeasObjectNR for SCell	entry 2 Table 6.5.3.1.4.3- 3	
}			
}			
reportConfigToAddModList SEQUENCE (SIZE (1maxReportConfigId)) OF ReportConfigToAddMod {	1 entry		
ReportConfigToAddMod[1] SEQUENCE {		entry 1	
reportConfigId	ReportConfigId		
reportConfig CHOICE {			
reportConfigNR	ReportConfigNR	Table 6.5.3.1.4.3- 4	
}			
}			
}			
}			

## Table 6.5.3.1.4.3-3: MeasObjectNR for SCell

Value/remark	Comment	Condition
SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1		
sf160		
_	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1

### Table 6.5.3.1.4.3-4: ReportConfigNR

Derivation Path: Table H.3.1-4			
Information Element	Value/remark	Comment	Condition
ReportConfigNR::= SEQUENCE {			
reportType CHOICE {			
eventTriggered SEQUENCE {			
eventId CHOICE {			
eventA3 SEQUENCE {			
a3-Offset CHOICE {			
rsrp	-30	To ensure reporting can always be triggered	
}			
}			
}			
}			
}			
}			

## Table 6.5.3.1.4.3-5: CellGroupConfig-SCell (Table 6.5.3.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 wit	th condition MEAS and SCell_a	dd	
Information Element	Value/remark	Comment	Condition
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
servCellIndex	Not present	PCell always uses	
		servCellIndex=0	
reconfigurationWithSync	Not present		
rlf-TimersAndConstants	Not present		
rlmInSyncOutOfSyncThreshold	Not present		
spCellConfigDedicated	ServingCellConfig-SpCell	Table 6.5.3.1.4.3-	
		6	
}			
sCellToAddModList SEQUENCE (SIZE	1 entry		
(1maxNrofSCells)) OF SCellConfig {			
SCellConfig[1] SEQUENCE {		entry 1	
sCellConfigDedicated	ServingCellConfig-SCell	Table 6.5.3.1.4.3-	
		7	
smtc	SSB-MTC specified in TS		
	38.508-1 [14] Table		
	7.3.1-3 with condition		
	SMTC.1		
}			
}			
}			

## Table 6.5.3.1.4.3-6: ServingCellConfig-SpCell (Table 6.5.3.1.4.3-5)

Information Element	Value/remark	Comment	Condition
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
servingCellMO	1		
}			

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 w	ith condition No_UL		
Information Element	Value/remark	Comment	Condition
ServingCellConfig ::= SEQUENCE {			
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6		
servingCellMO	2		
}			

### Table 6.5.3.1.4.3-7: ServingCellConfig-SCell (Table 6.5.3.1.4.3-5)

## 6.5.3.1.5 Test requirement

Table 6.5.3.1.5-1 and Table 6.5.3.1.5-2 defines the primary level settings including test tolerances for all tests.

# Table 6.5.3.1.5-1: Cell specific test parameters for NR PCell for known FR1 SCell activation case,160ms SCell measurement cycle

Parameter		Unit	Cell 1
		•	T1 T2 T3
Duplex mode	Config 1	4 –	FDD
	Config 2,3		TDD
	Config 1		Not applicable
TDD configuration	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
BWchannel		MHz	Note 7
BW <sub>occupied</sub>	Config 1,2	RB	52 Note 5
	Config 3		106 Note 6
Initial BWP configuration			DLBWP.0.2
TCI state			TCI.State.0
	Config 1		TRS.1.1 FDD
TRS Configuration	Config 2		TRS.1.1 TDD
	Config 3		TRS.1.2 TDD
PDSCH Reference	Config 1		SR.1.1 FDD
measurement channel	Config 2		SR.1.1 TDD
measurement channel	Config 3		SR.2.1 TDD
	Config 1		CCR.1.1 FDD
Dedicated CORESET	Config 2	1 [	CCR.1.1 TDD
parameters	Config 3	1	CCR.2.1 TDD
	Config 1		CR.1.1 FDD
RMSI CORESET	Config 2		CR.1.1 TDD
parameters	Config 3		CR.2.1 TDD
OCNG Patterns	Config 1,2		OP.1 <sup>Note 5</sup>
	Config 3,	-	OP.1 Note 6
	Config 1,2		SSB.1 FR1
SSB Configuration	Config 3	-	SSB.2 FR1
	Config 1		CSI-RS.1.1 FDD
CSI-RS configuration for	Config 2		CSI-RS.1.1 TDD
CSI reporting Note 8	Config 3		CSI-RS.2.1 TDD
			SMTC.1
SMTC configuration			
reportConfigType			periodic
reportQuantity			cri-RI-PMI-CQI
	Config 1,2	slot	5
CSI reporting periodicity	Config 3		10
	Config 1,2	slot	3
CSI reporting offset	Config 3		5
EPRE ratio of PSS to SSS			-
EPRE ratio of PBCH DMR	S to SSS	1	
EPRE ratio of PBCH to PB		1	
EPRE ratio of PDCCH DM		1	
EPRE ratio of PDCCH to P		dB	0
EPRE ratio of PDSCH DMRS to SSS			ő
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMR		4	
EPRE ratio of OCNG block		4	
		<u>├</u>	104
N <sub>oc</sub> <sup>Note2</sup>	Config 1,2	dBm/SCS	-104
	Config 3		-101
Ês/lot		dB	17
$\widehat{E}_{s}/N_{oc}$		dB	17
SS-RSRP <sup>Note3</sup>	Config 1,2	dBm/SCS	-87
Config 3			-84
SCH_RP Note 3		dBm/15 kHz	-87
	Config 1,2	dBm/	58.06
Io Note3		9.36MHz	-58.96
	Config 3	dBm/	-52.87
		38.16MHz	
Propagation condition		1 1	AWGN

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within BW <sub>occupied</sub> .
Note 3:	SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5:	All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 10 MHz, 52 RBs) from F <sub>C.low</sub> , and Io is independent of the BW <sub>channel</sub> configured.
Note 6:	All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 40 MHz, 106 RBs) from Fc,low, and Io is independent of the BW <sub>channel</sub> configured.
Note 7:	NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BW <sub>channel</sub> .
Note 8:	On top of the reference configurations, CSI-RS offset should be set to meet the CSI reference resource timing definition in TS 38.214 cl. 5.2.2.5.

# Table 6.5.3.1.5-2: Cell specific test parameters for NR SCell for known FR1 SCell activation case,160ms SCell measurement cycle

			Cell 2
Parameter		Unit	T1 T2 T3
Dural autoria da	Config <sub>SCell</sub> 1		FDD
Duplex mode	ConfigsCell 2,3		TDD
	ConfigsCell 1		Not applicable
TDD configuration	ConfigsCell 2		TDDConf.1.1
	Config <sub>SCell</sub> 3		TDDConf.2.1
BWchannel		MHz	Note 7
BWoccupied	Config <sub>SCell</sub> 1,2	RB	52 Note 5
	ConfigsCell 3		106 Note 6
Initial BWP configuration TCI state	1		DLBWP.0.2 TCI.State.0
TOTSIALE	Config <sub>SCell</sub> 1		TRS.1.1 FDD
TRS Configuration	Configscell 2	-	TRS.1.1 TDD
INS Configuration	ConfigsCell 3	-	TRS.1.2 TDD
	Configscell 1		N/A
PDSCH Reference	Config <sub>SCell</sub> 2		N/A
measurement channel	ConfigsCell 3		N/A
	Configscell 1		N/A
Dedicated CORESET	ConfigsCell 2		N/A
parameters	ConfigsCell 3		N/A
RMSI CORESET	ConfigsCell 1		N/A
parameters	ConfigsCell 2	_	N/A
•	ConfigsCell 3		N/A
OCNG Patterns	ConfigsCell 1,2	-	OP.1 <sup>Note 5</sup>
	Configscell 3,		OP.1 Note 6
SSB Configuration	ConfigsCell 1,2	-	SSB.1 FR1
	Config <sub>SCell</sub> 3		SSB.2 FR1
CSI-RS configuration	Config <sub>SCell</sub> 1		CSI-RS.1.1 FDD CSI-RS.1.1 TDD
for CSI reporting Note 8	Config <sub>SCell</sub> 2 Config <sub>SCell</sub> 3		CSI-RS.2.1 TDD
SMTC configuration	Configscell 5		SMTC.1
reportConfigType			N/A
reportQuantity			N/A
CSI reporting	ConfigsCell 1,2	slot	N/A N/A
periodicity	Config <sub>SCell</sub> 3	0.01	
CSI reporting offset	Config <sub>SCell</sub> 1,2	slot	N/A
	ConfigsCell 3	5101	N/A
EPRE ratio of PSS to SS			
EPRE ratio of PBCH DM			
EPRE ratio of PBCH to I			
EPRE ratio of PDCCH D			0
EPRE ratio of PDCCH to		dB	0
EPRE ratio of PDSCH D EPRE ratio of PDSCH to			
EPRE ratio of OCNG DM			
EPRE ratio of OCNG to	OCNG DMRS Note 1	-	
	Configscell 1,2		-104
N <sub>oc</sub> <sup>Note2</sup>	Configscell 3	dBm/SCS	-101
Ê <sub>s</sub> /I <sub>ot</sub>		dB	17
Ê <sub>s</sub> /N <sub>oc</sub>	1	dB	17
SS-RSRP <sup>Note3</sup>	ConfigsCell 1,2	dBm/SCS	-87
Configscell 3			-84
SCH_RP Note 3	Config. 10	dBm/15 kHz	-87
L Noto3	Configscell 1,2	dBm/ 9.36MHz	-58.96
lo <sup>Note3</sup>	Config <sub>SCell</sub> 3	dBm/	-52.87
Dreperation		38.16MHz	
Propagation condition		-	AWGN

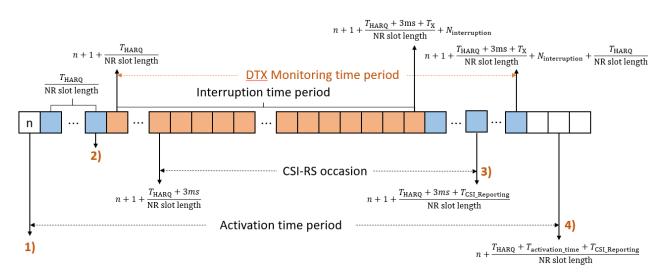
Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled within BW <sub>occupied</sub> .
Note 3:	SS-RSRP and SCH_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.
Note 5:	All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 10 MHz, 52 RBs) from Fc,low, and Io is independent of the BW <sub>channel</sub> configured.
Note 6:	All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 40 MHz, 106 RBs) from Fc <sub>low</sub> , and lo is independent of the BW <sub>channel</sub> configured.
Note 7:	NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BW channel.
Note 8:	

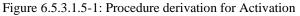
During T2 the UE shall send the first CSI report for SCell no later than the first available uplink resource after at least one CSI-RS transmission occasion for channel measurement and reporting after slot  $n + 1 + \frac{T_{HARQ} + 3ms}{NR \ slot \ length}$  UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot  $n + 1 + \frac{T_{HARQ} + 3ms + T_{CSI} \ Reporting}{NR \ slot \ length}$  was interrupted or not is checked by monitoring ACK/NACK sent in PCell in slot  $n + 1 + \frac{T_{HARQ} + 3ms + T_{CSI} \ Reporting}{NR \ slot \ length}$ .

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot  $n + \frac{T_{HARQ} + T_{activtion\_time} + T_{CSI\_Reporting}}{NR \ slot \ length}$ ,  $T_{activation\_time} = T_{FirstSSB} + 5ms$ , as defined in TS 38.133 [6] section 8.3.

During T2 interruption of PCell/PSCell during SCell activation shall not happen outside the slot  $n + 1 + \frac{T_{\text{HARQ}}}{\text{NR slot length}}$  to  $n + 1 + \frac{T_{\text{HARQ}+3\text{ms}+T_X}}{\text{NR slot length}} + N_{\text{interruption}}$ , as defined in TS 38.133 [6] section 8.3.

Figures 6.5.3.1.5-1 shows the derivation of the Test procedure requirement for DTX during T2, based on the core requirements for interruption.





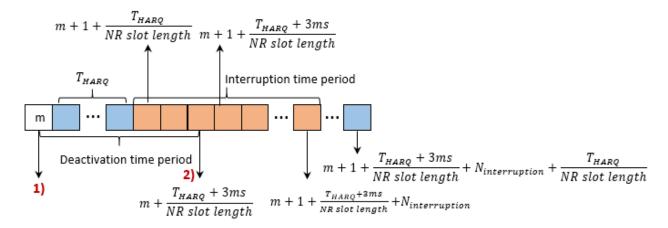
- 1) Activation command for SCell
- 2) ACK for MAC-CE for SCell1 activation
- 3) First CSI report timing (could be invalid CQI)
- 4) First non-zero CSI report transmission

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During T3 the UE shall stop sending CSI reports for SCell at latest in a slot  $m + \frac{T_{HARQ}+3ms}{NR \ slot \ length}$ , as defined in TS 38.133 [6] section 8.3.

During T3 interruption of PCell during SCell deactivation shall not happen outside the slot  $m + 1 + \frac{T_{HARQ}}{NR \ slot \ length}$  to  $m + 1 + \frac{T_{HARQ} + 3ms}{NR \ slot \ length}$ , as defined in TS 38.133 [6] section 8.3.

Figures 6.5.3.1.5-2 shows the derivation of the Test procedure requirement for NR PSCell DTX during T3, based on the core requirements for interruption.





- 1) Deactivation command for SCell
- 2) Latest slot stop sending CSI reports for SCell

The interruption on any activated serving cell shall not be more than the values specified for SA in TS 38.133 [6] clause 8.2.2.2.2.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay and SCell deactivation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot  $n + \frac{T_{HARQ}+T_{activtion\_time}+T_{CSI\_Reporting}}{NR \ slot \ length}$  as defined in TS 38.133 [6] section 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

### 6.5.3.2 NR SA FR1 SCell activation and deactivation of known SCell in non-DRX for 640ms SCell measurement cycle

#### 6.5.3.2.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements in TS 38.133 [6] clause 8.3, when the SCell in FR1 is known by the UE at the time of activation.

#### 6.5.3.2.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

#### 6.5.3.2.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.2.

#### 6.5.3.2.4 Test description

#### 6.5.3.2.4.1 Initial conditions

Same initial conditions as described in section 6.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 6.5.3.2.4.1-2 will replace the values of corresponding parameters in Tables 6.5.3.1.4.1-3.

#### Table 6.5.3.2.4.1-1: Void

## Table 6.5.3.2.4.1-2: General test parameters for known FR1 SCell activation case, 640ms SCell measurement cycle

Ī	Parameter	Unit	Value	Comment
	SCell measurement cycle (measCycleSCell)	ms	640	

#### 6.5.3.2.4.2 Test procedure

Same test procedure as described in section 6.5.3.1.4.2.

#### 6.5.3.2.4.3 Message contents

Same message contents as described in section 6.5.3.1.4.3 with following exception:

- Table 6.5.3.1.4.3-3 is replaced by Table 6.5.3.2.4.3-1.

#### Table 6.5.3.2.4.3-1: MeasObjectNR for SCell

Derivation Path: Table H.3.1-3 with condition Deactivated SCell and Synchronous cells				
Information Element	Value/remark	Comment	Condition	
MeasObjectNR::= SEQUENCE {				
smtc1	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1			

#### 6.5.3.2.5 Test requirement

Same test requirement as described in section 6.5.3.1.5, except  $T_{activation\_time}$  will be replaced with the value  $T_{FirstSSB\_MAX} + T_{rs} + 5ms$ .

#### 6.5.3.3 NR SA FR1 SCell activation and deactivation of unknown SCell in non-DRX

6.5.3.3.1 Test purpose

This test is to verify that the SCell activation and deactivation times are within the requirements stated in TS 38.133 [6] clause 8.3, when the SCell in FR1 is unknown by the UE at the time of activation.

6.5.3.3.2 Test applicability

This test applies to all types of NR UE from Release 15 onwards and supporting 2DL CA.

#### 6.5.3.3.3 Minimum conformance requirements

The minimum conformance requirements are defined in clause 6.5.3.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.3.3.

### 6.5.3.3.4 Test description

#### 6.5.3.3.4.1 Initial conditions

Same initial conditions as described in section 6.5.3.1.4.1 with following exception:

- The listed parameter values in Tables 6.5.3.3.4.1-2 will replace the values of corresponding parameters in Tables 6.5.3.1.4.1-3.

#### Table 6.5.3.3.4.1-1: Void

## Table 6.5.3.3.4.1-2: General test parameters for unknown FR1 SCell activation case, 160ms SCell measurement cycle

Parameter	Unit	Value	Comment
T1	ms	100	During this time the PSCell shall be known and the SCell configured, but not detected.

#### 6.5.3.3.4.2 Test procedure

Same test procedure as described in section 6.5.3.1.4.2, except step3 and step 5 are replaced by following steps:

- 3. T1 starts. Immediately after, the SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1. The SCell (Cell 2) shall be powered OFF till T2 starts.
- 5. The SS activates SCC by sending the activation MAC-CE (Refer TS 38.321 [12], clauses 5.9, 6.1.3.10) in a slot # denoted n, power ON the SCell (Cell2), T2 starts in slot n. If the SS receives ACK for MAC-CE sent by the UE, the test proceeds to step 6, otherwise go to step 9.

and,

- step 3a is removed.

#### 6.5.3.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

#### Table 6.5.3.3.4.3-1: RRCReconfiguration in step 3: SCell addition

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition SCell_add					
Information Element	Value/remark	Comment	Condition		
RRCReconfiguration ::= SEQUENCE {					
criticalExtensions CHOICE {					
rrcReconfiguration ::= SEQUENCE {					
nonCriticalExtension SEQUENCE {					
masterCellGroup	CellGroupConfig	Table 6.5.3.3.4.3-			
		2			
}					
}					
}					
}					

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19 with condition SCell_add					
Information Element	Value/remark	Comment	Condition		
CellGroupConfig ::= SEQUENCE {					
spCellConfig SEQUENCE {					
spCellConfigDedicated	ServingCellConfig-SpCell	Table 6.5.3.3.4.3- 3			
}					
sCellToAddModList SEQUENCE (SIZE (1maxNrofSCells)) OF SCellConfig {	1 entry				
SCellConfig[1] SEQUENCE {		entry 1			
sCellConfigDedicated	ServingCellConfig-SCell	Table 6.5.3.3.4.3- 4			
smtc	SSB-MTC specified in TS 38.508-1 [14] Table 7.3.1-3 with condition SMTC.1				
}					
}					
}					

#### Table 6.5.3.3.4.3-2: CellGroupConfig (Table 6.5.3.3.4.3-1)

### Table 6.5.3.3.4.3-3: ServingCellConfig-SpCell (Table 6.5.3.3.4.3-2)

erivation Path: TS 38.508-1 [14], Table 4.6.3-167				
Information Element	Value/remark	Comment	Condition	
ServingCellConfig ::= SEQUENCE {				
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6			
}				

#### Table 6.5.3.3.4.3-4: ServingCellConfig-SCell (Table 6.5.3.3.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167 with condition No_UL					
Information Element	Value/remark	Comment	Condition		
ServingCellConfig ::= SEQUENCE {					
csi-MeasConfig	CSI-MeasConfig for RRM specified in TS 38.508-1 [14] Table 7.3.1-6				
}					

#### 6.5.3.3.5 Test requirement

Same test requirement as described in section 6.5.3.1.5, except  $T_{activation\_time}$  will be replaced with the value  $T_{FirstSSB\_MAX} + T_{SMTC\_MAX} + 2*T_{rs} + 5ms$ 

## 6.5.4 UE UL carrier RRC reconfiguration delay

### 6.5.4.0 Minimum conformance requirements

### 6.5.4.0.1 Minimum conformance requirements for UL carrier RRC reconfiguration delay

[TS 38.133, clause 8.4.2]

When the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within  $T_{UL\_carrier\_config}$  from the end of the last slot containing the RRC command.

 $T_{UL\_carrier\_config}$  equals the maximum RRC procedure delay defined in clause x.y in TS 38.331 [2] plus the interruption time specified in TS 38.133 [6] section 8.2.1.2.6.

[TS 38.133, clause 8.4.3]

1200

When the UE receives a RRC message implying NR UL or Supplementary UL carrier deconfiguration RRC signalling, the UE shall stop UL signalling on the deconfigured UL carrier within  $T_{UL\_carrier\_deconfig}$  from the end of the last slot containing the RRC command.

T<sub>UL\_carrier\_deconfig</sub> equals the maximum RRC procedure delay defined in clause x.y in TS 38.331 [2].

The normative reference for this requirement is TS 38.133 [6] clause 8.4.

### 6.5.4.1 NR SA FR1 UE UL carrier RRC reconfiguration delay

6.5.4.1.1 Test purpose

To verify that when the UE receives a RRC message implying NR UL or Supplementary UL carrier configuration, the UE shall be ready to start transmission on the newly configured carrier within the time limits specified in TS 38.133 [6] section 8.4.2 and 8.4.3 for configuring and deconfiguring, respectively.

#### 6.5.4.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting SUL.

#### 6.5.4.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.4.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.4.1.

6.5.4.1.4.1 Initial conditions

The Test shall be tested using any of the test configuration in Table 6.5.4.1.4.1-1.

Configuration	PSCell (Cell 1)	SCell (Cell 2)		
6.5.4.1-1	15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode		
6.5.4.1-2	15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode		
6.5.4.1-3	15 kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode	DL and UL: 30kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, ≥40MHz bandwidth, SUL duplex mode		
6.5.4.1-4	15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode		
6.5.4.1-5	15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode		
6.5.4.1-6	15 kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, ≥40MHz bandwidth, SUL duplex mode		
6.5.4.1-7	30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, FDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode		
6.5.4.1-8	30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode	DL and UL: 15kHz SSB SCS, ≥10MHz bandwidth, TDD duplex mode; SUL: 15kHz SCS, ≥10MHz bandwidth, SUL duplex mode		
6.5.4.1-9	30 kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode	DL and UL: 30kHz SSB SCS, ≥40MHz bandwidth, TDD duplex mode; SUL: 30kHz SCS, ≥40MHz bandwidth, SUL duplex mode		
<ul> <li>Note 1: The UE is only required to be tested in one of the supported test configurations.</li> <li>Note 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BW<sub>channel</sub>) defined in each test configuration.</li> </ul>				

Configure the test requirement and the DUT according to the parameters in Table 6.5.4.1.4.1-2.

#### Table 6.5.4.1.4.1-2: Initial conditions for NR SA FR1 UE UL carrier RRC reconfiguration delay

Parameter	Value		Comment	
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies	frequencies As specified in Annex E, Table E.4-1 and TS 38.508-1 [14] clause 4.3			
Channel	As specified	As specified by the test configuration selected from Table 6.5.4.1.4.1-1.		
bandwidth				
Propagation	AWGN		As specified in Annex C.2.1.	
conditions				
Connection	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		
Exceptions to	N/A			
connection				
diagram				

1. The general test parameter settings are set up according to Table 6.5.4.1.4.1-3.

2. Message contents are defined in clause 6.5.4.1.4.3.

3. There are two NR FR1 carriers and two cells in the test. Cell 1 is PCell on the primary component carrier, Cell 2 is SCell on the secondary component carrier. Cell 1 is the cell used for connection setup with the power levels set according to Table A.6.5.4.1.5-1 for this test. Cell 2 is configured according to Annex C.1.1 and C.1.2.

Parameter	Unit	Test	Value	Comment
	Unit	configuration		
RF Channel		Config 1,2,3, 4,	1, 2	Two radio channels are used for these two
Number		5, 6, 7, 8, 9		tests.
Active cell		Config 1,2,3, 4,	Cell 1: FR1 PCell	FR1 PCell on RF channel number 1
		5, 6, 7, 8, 9	Cell 2: FR1 SCell	FR1 SCell on RF channel number 2
CP length		Config 1,2,3, 4,	Normal	
-		5, 6, 7, 8, 9		
DRX		Config 1,2,3, 4,	OFF	
		5, 6, 7, 8, 9		
Measurement gap		Config 1,2,3, 4,	OFF	
pattern Id		5, 6, 7, 8, 9		
Filter coefficient		Config 1,2,3, 4,	0	L3 filtering is not used
		5, 6, 7, 8, 9		
T1		Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		
T2	6	Config 1,2,3, 4,	5	
	S	5, 6, 7, 8, 9		
Т3	3		5	
	S	5, 6, 7, 8, 9		

Table 6.5.4.1.4.1-3: General test parameters for NR standalone UE UL carrier RRC reconfiguration
Delay on Pcell

#### 6.5.4.1.4.2 Test procedure

There are two cells: FR1 PCell (cell 1) and FR1 SCell (cell 2). Both NR uplink and supplementary uplink are broadcast by *ServingCellConfigCommonSIB*. In test 1, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, NR uplink of cell 2 is configured to UE. At the start of T2, a supplementary uplink of cell 2 is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the supplementary uplink is released through *RRCReconfiguration*.

In test 2, the test consists of three time periods, with duration of T1, T2 and T3 respectively. During time duration T1, supplementary uplink on cell 2 is configured to UE. At the start of T2, a NR uplink is configured to UE through *RRCReconfiguration*, then UE shall start transmission both on the NR uplink and supplementary uplink. At the start of T3, the NR uplink is released through *RRCReconfiguration*.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
- 2. Setup PCell (Cell 1) according to parameters given in Table 6.5.4.1.5-1. Propagation conditions are set according to Annex C clause C.2.2.
- 3. For SCell (Cell 2), both NR uplink and supplementary uplink are broadcast by ServingCellConfigCommonSIB.
- 4. For Test 1: NR uplink of SCell is configured to UE during T1
  - 4.1 During time duration T1, NR uplink of SCell is configured to UE. Setup SCell (Cell 2) according to parameters given in Table 6.5.4.1.5-2
  - 4.2 At the start of T2, a supplementary uplink of SCell (Cell 2) is configured to UE through RRCReconfiguration, then UE shall start transmission on both the NR uplink and supplementary uplink on SCell (Cell 2) within 20ms. If UE transmits data on both the NR uplink and supplementary uplink on SCell (Cell 2) within 20ms from the start of T2, then count a success for the event "reconfiguration" otherwise count a failure for event "reconfiguration"
  - 4.3 At the start of T3, the supplementary uplink is released through RRCReconfiguration, then UE shall transmit data only on the NR uplink carrier on SCell (Cell 2) within 20ms. If UE stop transmitting data on supplementary uplink carrier on SCell (Cell 2) within 20ms from the start of T3, then count a success for the event "deconfiguration" otherwise count a failure for event "deconfiguration".

- 5. For Test 2: Supplementary uplink of SCell is configured to UE during T1
  - 5.1 During time duration T1, Supplementary uplink of SCell is configured to UE. Setup SCell (Cell 2) according to parameters given in Table 6.5.4.1.5-2
  - 5.2 At the start of T2, a NR uplink of SCell (Cell 2) is configured to UE through RRCReconfiguration, then UE shall start transmission on both the NR uplink and supplementary uplink on SCell (Cell 2) within 20ms. If UE transmits data on both the NR uplink and supplementary uplink on SCell (Cell 2) within 20ms from the start of T2, then count a success for the event "reconfiguration" otherwise count a failure for event "reconfiguration"
  - 5.3 At the start of T3, the NR uplink is released through RRCReconfiguration, then UE shall transmit data only on the Supplementary uplink carrier on SCell (Cell 2) within 20ms. If UE stop transmitting data on NR uplink carrier on SCell (Cell 2) within 20ms from the start of T3, then count a success for the event "deconfiguration" otherwise count a failure for event "deconfiguration".
- 6. Repeat steps 1-5 until a test verdict has been achieved.

Each of the events "reconfiguration" and "deconfiguration" is evaluated independently for the statistic, resulting in an event verdict: pass or fail. Each event is evaluated only until the confidence level according to Table G.2.3-1in Annex G.2 is achieved. Different events may require different times for a verdict.

If all events pass, the test passes. If one event fails, the test fails.

#### 6.5.4.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 with the following exceptions:

 Table 6.5.4.1.4.3-1: Common Exception messages

Default Message Contents					
Common contents of system information					
blocks exceptions					
Default RRC messages and information	Table H.3.8-1				
elements contents exceptions	Table H.3.8-2				

#### 6.5.4.1.5 Test requirement

Table 6.5.4.1.5.1-1 and 6.5.4.1.5-2 define the primary level settings including test tolerances for UE UL carrier RRC reconfiguration delay test.

reconfiguration Delay on PCell (Cell 1)									
Parameter	Unit	Test	Test Test 1			Test 2			
		Configuration	T1	T2	Т3	T1	T2	T3	
Channel number		Conf 1, 2, 3, 4,		1			1		
		5, 6, 7, 8, 9							
		Conf 1, 2, 3		N/A			N/A		
TDD configuration		Conf 4, 5, 6		TDD Conf.1	.1	-	TDD Conf.1.	1	
		Conf 7, 8, 9		TDD Conf.2	.1	TDD Conf.2.1			
		Conf 1, 2, 3	Note 6				Note 6		
BW <sub>channel</sub>	MHz	Conf 4, 5, 6	Note 6			Note 6			
		Conf 7, 8, 9		Note 6		Note 6			
		Conf 1, 2, 3		52 Note 4			52 Note 4		
BWoccupied	RB	Conf 4, 5, 6		52 Note 4			52 Note 4		
		Conf 7, 8, 9	106 Note 5				106 Note 5		
PDSCH reference		Conf 1, 2, 3		SR.1.1 FDI	)		SR.1.1 FDD	)	
measurement		Conf 4, 5, 6	SR.1.1 TDD SR.1.1 TD				SR.1.1 TDD	)	
channel as defined in A.3.1.1	Conf 7, 8, 9 SR 2.1 TDD				SR 2.1 TDE	)			
		Conf 1, 2, 3		CR.1.1 FDI	)		CR.1.1 FDD	)	
		Conf 4, 5, 6		CR.1.1 TDI	)		CR.1.1 TDE	)	

## Table 6.5.4.1.5-1: NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on PCell (Cell 1)

	1	,				r		
RMSI CORESET		Conf 7, 8, 9						
reference					<b>`</b>		00 04 700	
measurement				CR.2.1 TDI	נ		CR.2.1 TDD	
channel as defined in A.3.1.2								
RMC CORESET		Conf 1, 2, 3	(	CCR.1.1 FD	D		CCR.1.1 FDI	۰ ۲
reference		Conf 4, 5, 6		CCR.1.1 TD			CCR.1.1 TDI	
measurement		Conf 7, 8, 9		JON.1.1 1D				<i>,</i>
channel as defined		00117,0,9	(	CCR.2.1 TD	D		CCR.2.1 TDI	C
in A.3.1.3					-			_
OCNG Pattern Note 1		Conf 1, 2, 3, 4,		OP.1			OP.1	
OCING Pallemnes		5, 6, 7, 8, 9		OP.1			UP.1	
		Conf 1, 2, 3, 4,		SSB.1 FR1			SSB.1 FR1	
SSB configuration		5, 6						
		Conf 7, 8, 9		SSB.2 FR1			SSB.2 FR1	
SMTC configuration		Conf 1, 2, 3, 4,		SMTC.1			SMTC.1	
		5, 6, 7, 8, 9	-		<b>D</b>			
		Conf 1		TRS.1.1 FD			TRS.1.1 FDI	
		Conf 2 Conf 3		TRS.1.1 FD TRS.1.1 FD			TRS.1.1 FDI TRS.1.1 FDI	
		Conf 3 Conf 4		TRS.1.1 FD			TRS.1.1 FDI	
CSI-RS for tracking		Conf 5		TRS.1.1 TD			TRS.1.1 TDI	
		Conf 6		TRS.1.1 TD			TRS.1.1 TDI	
		Conf 7		TRS.1.2 TD			TRS.1.2 TDI	
		Conf 8		TRS.1.2 TD			TRS.1.2 TDI	
		Conf 9		TRS.1.2 TD			TRS.1.2 TDI	
DL initial BWP	1	Conf 1, 2, 3, 4,						
configuration		5, 6, 7, 8, 9		DLBWP.0.	I		DLBWP.0.1	
DL dedicated BWP		Conf 1, 2, 3, 4,		DLBWP.1.	1		DLBWP.1.1	
configuration		5, 6, 7, 8, 9			I	DLBVVP.1.1		
UL dedicated BWP		Conf 1, 2, 3, 4,		ULBWP.1.	1	ULBWP.1.1		
configuration		5, 6, 7, 8, 9		5-5111.1.	•		5-5111.1	
EPRE ratio of PSS								
to SSS	-							
EPRE ratio of								
PBCH_DMRS to SSS								
EPRE ratio of PBCH	4							
to PBCH_DMRS								
EPRE ratio of	1							
PDCCH_DMRS to								
SSS								
EPRE ratio of	1							
PDCCH to		Conf 1 2 2 4						
PDCCH_DMRS	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		0			0	
EPRE ratio of		5, 0, 7, 0, 9						
PDSCH_DMRS to								
SSS								
EPRE ratio of								
PDSCH to								
PDSCH_DMRS	-							
EPRE ratio of								
OCNG DMRS to SSS								
EPRE ratio of	1							
OCNG to OCNG								
DMRS								
	dBm /	Conf 1, 2, 3, 4,		-102			-102	
Nets 2	15kHz	5, 6, 7, 8, 9						
$N_{oc}$ Note 2	dBm/	Conf		-102			-102	
	SCS	1,2,3,4,5,6						
		Conf 7,8,9		-99			-99	
$\hat{E}_s/N_{oc}$	dB	Conf 1, 2, 3, 4,	16	16	16	16	16	16
		5, 6, 7, 8, 9		1		1	1	
	ł		4.0	4.0	4.0	4.0	4.0	10
$\hat{\mathbf{E}}_{a}/\mathbf{I}_{at}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16

SS-RSRP Note 3	dBm/	Conf 1,2,3,4,5,6	-86	-86	-86	-86	-86	-86
	SCS	Conf 7,8,9	-83	-83	-83	-83	-83	-83
	dBm/	Conf	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9
	9.36	1,2,3,4,5,6						
Io Note 3	MHz							
10	dBm/	Conf 7,8,9	-51.8	-51.8	-51.8	-51.8	-51.8	-51.8
	38.16							
	MHz							
Propagation		Conf 1, 2, 3, 4,		AWGN			AWGN	
Condition		5, 6, 7, 8, 9						
Antenna		Conf 1, 2, 3, 4,	1 x 2 1 x 2					
configuration		5, 6, 7, 8, 9						
NOTE 1: OCNG sha					and a const	iant total tra	nsmitted po	wer
		hieved for all OFD			lin the test	ia accumed	to be const	ant over
NOTE 2: Interference subcarriers		and shall be mode						
BW <sub>occupied</sub> .						00		
NOTE 3: $\hat{E}_{_{s}}/I_{_{ot}}$ , Io	, and SS-F	SRP levels have	been deriv	ed from oth	ner paramet	ters for infor	mation purp	oses.
		parameters them						
NOTE 4: All UL/DL t	ransmissio	on shall be confine	d within B	Woccupied (i.e	e. 10 MHz,	52 RBs) fror	m Fc,low, and	lo is
		W <sub>channel</sub> configured						
NOTE 5: All UL/DL t				Woccupied (i.e	e. 40 MHz,	106 RBs) fro	om F <sub>C,low</sub> , an	d lo is
		W <sub>channel</sub> configured						
NOTE 6: N <sub>RB,c</sub> . is de	NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BW <sub>channel</sub> .							

# Table 6.5.4.1.5-2 : NR Cell specific test parameters for NR standalone UE UL carrier RRC reconfiguration Delay on SCell (Cell 2)

Parameter	Unit	Test Test 1 Test 2		Test 1				
		Configuration	T1	T2	Т3	T1	T2	Т3

TDD configuration	ł	Conf 1, 2, 3, 4,		2			2	
TDD configuration	<u> </u>	5, 6, 7, 8, 9 Conf 1, 4, 7		N/A			N/A	
		Conf 2, 5, 8		TDDConf.1	1		TDDConf.1.1	
. 55 conniguration		Conf 3, 6, 9		TDDConf.2			TDDConf.2.1	
				Note 6	. I			
	N 41 I	Conf 1, 4, 7					Note 6	
BWchannel	MHz	Conf 2, 5, 8		Note 6			Note 6	
		Conf 3, 6, 9		Note 6			Note 6	
		Conf 1, 4, 7		52 Note 4			52 Note 4	
BW <sub>occupied</sub>	RB	Conf 2, 5, 8		52 Note 4			52 Note 4	
		Conf 3, 6, 9		106 Note 5			106 Note 5	
		Conf 1, 4, 7	G-	G-FR1-	G-FR1-		G-FR1-	
			FR1-	A3-10	A3-10 in	N/A	A3-10 in	N/A
			A3-10	in [28]	[28]		[28]	
			in [28]				[]	
		Conf 2, 5, 8	G-	G-FR1-	G-FR1-		G-FR1-	
PUSCH parameters			FR1-	A3-10	A3-10 in	N/A	A3-10 in	N/A
for NR UL carrier			A3-10	in [28]	[28]		[28]	
			in [28]				[20]	
		Conf 3, 6, 9	G-	G-FR1-	G-FR1-		G-FR1-	
	l		FR1-	A3-14	A3-14 in	N/A	A3-14 in	N/A
	l		A3-14	in [28]	[28]	19/7	[28]	
	ļ		in [28]				[20]	
		Conf 1, 4, 7	Table	Table	Table			
			8.3.3.1	8.3.3.1.	8.3.3.1.2	N/A	N/A	N/A
			.2-1 in	2-1 in	-1 in [28]	IN/A	IN/A	IN/A
			[28]	[28]				
		Conf 2, 5, 8	Table	Table	Table			
PUCCH parameters			8.3.3.1	8.3.3.1.	8.3.3.1.2	N/A	NI/A	NI/A
For NR UL carrier			.2-1 in	2-1 in	-1 in [28]	IN/A	N/A	N/A
			[28]	[28]				
		Conf 3, 6, 9	Table	Table	Table			
			8.3.3.1	8.3.3.1.	8.3.3.1.2	N1/A	N1/A	NI/A
			.2-2 in	2-2 in	-2 in [28]	N/A	N/A	N/A
			[28]	[28]				
		Conf 1, 4, 7		G-FR1-		G-FR1-	G-FR1-	G-FR1-
		, ,	N/A	A3-10	N/A	A3-10 in	A3-10 in	A3-10 in
				in [28]		[28]	[28]	[28]
PUSCH parameters		Conf 2, 5, 8		G-FR1-		G-FR1-	G-FR1-	G-FR1-
for supplementary		,-,-	N/A	A3-10	N/A	A3-10 in	A3-10 in	A3-10 in
UL				in [28]		[28]	[28]	[28]
-		Conf 3, 6, 9		G-FR1-		G-FR1-	G-FR1-	G-FR1-
			N/A	A3-14	N/A	A3-14 in	A3-14 in	A3-14 in
				in [28]		[28]	[28]	[28]
		Conf 1, 4, 7		[]		Table	Table	Table
			N/A	N/A	N/A	8.3.3.1.2	8.3.3.1.2	8.3.3.1.2
						-1 in [28]	-1 in [28]	-1 in [28
		Conf 2, 5, 8					Table	
PUCCH parameters	l					Table	8.3.3.1.2	Table
for supplementary			N/A	N/A	N/A	8.3.3.1.2	-1 in	8.3.3.1.2
						-1 in [28]	[28]	-1 in [28
UL		Conf 3, 6, 9				Table	Table	Table
	ļ	U0011 3. D. M		N/A	N/A	8.3.3.1.2	8.3.3.1.2	8.3.3.1.2
		Coni 3, 6, 9	N/A	IN/A				
		Coni 3, 6, 9	N/A	IN/A	-	-2 in [28]	-2 in [28]	-2 in [28
UL						-2 in [28]	2 in [28] SR.1.1 FDD	
UL PDSCH reference		Conf 1, 4, 7		SR.1.1 FD	D		SR.1.1 FDD	
UL PDSCH reference measurement		Conf 1, 4, 7 Conf 2, 5, 8		SR.1.1 FD SR.1.1 TD	D D		SR.1.1 FDD SR.1.1 TDD	
UL PDSCH reference measurement channel as defined		Conf 1, 4, 7		SR.1.1 FD	D D		SR.1.1 FDD	
UL PDSCH reference measurement channel as defined in A.3.1.1		Conf 1, 4, 7 Conf 2, 5, 8 Conf 3, 6, 9		<u>SR.1.1 FD</u> <u>SR.1.1 TD</u> SR 2.1 TD	D D D		<u>SR.1.1 FDD</u> <u>SR.1.1 TDD</u> SR 2.1 TDD	)
UL PDSCH reference measurement channel as defined in A.3.1.1 RMSI CORESET		Conf 1, 4, 7 Conf 2, 5, 8 Conf 3, 6, 9 Conf 1, 4, 7		SR.1.1 FD SR.1.1 TD SR 2.1 TD CR.1.1 FD	D D D D		SR.1.1 FDD SR.1.1 TDD SR 2.1 TDD CR.1.1 FDD	) 
UL PDSCH reference measurement channel as defined in A.3.1.1 RMSI CORESET reference		Conf 1, 4, 7 Conf 2, 5, 8 Conf 3, 6, 9 Conf 1, 4, 7 Conf 2, 5, 8		<u>SR.1.1 FD</u> <u>SR.1.1 TD</u> SR 2.1 TD	D D D D		<u>SR.1.1 FDD</u> <u>SR.1.1 TDD</u> SR 2.1 TDD	
UL PDSCH reference measurement channel as defined in A.3.1.1 RMSI CORESET reference measurement		Conf 1, 4, 7 Conf 2, 5, 8 Conf 3, 6, 9 Conf 1, 4, 7		SR.1.1 FD SR.1.1 TD SR 2.1 TD CR.1.1 FD CR.1.1 TD	D D D D D		SR.1.1 FDD SR.1.1 TDD SR 2.1 TDD CR.1.1 FDD CR.1.1 TDD	) ) ) )
UL PDSCH reference measurement channel as defined in A.3.1.1 RMSI CORESET reference measurement channel as defined		Conf 1, 4, 7 Conf 2, 5, 8 Conf 3, 6, 9 Conf 1, 4, 7 Conf 2, 5, 8		SR.1.1 FD SR.1.1 TD SR 2.1 TD CR.1.1 FD	D D D D D		SR.1.1 FDD SR.1.1 TDD SR 2.1 TDD CR.1.1 FDD	) ) ) )
UL PDSCH reference measurement channel as defined in A.3.1.1 RMSI CORESET reference measurement		Conf 1, 4, 7 Conf 2, 5, 8 Conf 3, 6, 9 Conf 1, 4, 7 Conf 2, 5, 8		SR.1.1 FD SR.1.1 TD SR 2.1 TD CR.1.1 FD CR.1.1 TD	D D D D D D		SR.1.1 FDD SR.1.1 TDD SR 2.1 TDD CR.1.1 FDD CR.1.1 TDD	

RMC CORESET		Conf 3, 6, 9						
reference measurement channel as defined in A.3.1.3			CCR.2.1 TDD			(	CCR.2.1 TD	D
		Conf 1, 2, 4, 5,		OP.1 Note 4	Ļ		OP.1 Note 4	
OCNG Pattern Note 1		7, 8 Conf 3, 6, 9		OP.1 Note 5	5		OP.1 Note 5	
		Conf 1, 2, 4, 5,		SSB.1 FR			SSB.1 FR1	
SSB configuration		7,8 Conf 3, 6, 9		SSB.2 FR			SSB.2 FR1	
		Conf 1, 2, 3, 4,			I			
SMTC configuration		5, 6, 7, 8, 9		SMTC.1	-		SMTC.1	
		Conf 1		<u> </u>			TRS.1.1 FDI	
		Conf 2 Conf 3		FRS.1.2 TD			<u> </u>	
		Conf 4		TRS.1.1 FD			TRS.1.1 FDI	
CSI-RS for tracking		Conf 5		FRS.1.1 TE			TRS.1.1 TDI	
		Conf 6		<u>FRS.1.2 TD</u>			<u> FRS.1.2 TDI</u>	
		Conf 7 Conf 8		<u>FRS.1.1 FD</u> FRS.1.1 TD			<u> </u>	
		Conf 9		TRS.1.2 TD			TRS.1.2 TDI	
DL initial BWP		Conf 1, 2, 3, 4,		DLBWP.0.			DLBWP.0.1	
configuration		5, 6, 7, 8, 9		DEDWI .0.	1		DEDWI .0.1	
DL dedicated BWP configuration		Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		DLBWP.1.	1		DLBWP.1.1	
UL dedicated BWP		Conf 1, 2, 3, 4,		ULBWP.1.	1	ULBWP.1.1		
configuration		5, 6, 7, 8, 9		ULDWF.I.	1		ULDWF.I.I	
EPRE ratio of PSS to SSS								
EPRE ratio of								
PBCH_DMRS to								
SSS	-							
EPRE ratio of PBCH								
to PBCH_DMRS EPRE ratio of								
PDCCH_DMRS to SSS								
EPRE ratio of								
PDCCH to		Conf 1, 2, 3, 4,						
PDCCH_DMRS	dB	5, 6, 7, 8, 9		0			0	
EPRE ratio of PDSCH_DMRS to								
SSS EPRE ratio of	1							
PDSCH to								
PDSCH_DMRS								
EPRE ratio of								
OCNG DMRS to SSS								
EPRE ratio of	1							
OCNG to OCNG								
DMRS								
	dBm / 15kHz	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9		-102			-102	
$N_{oc\ Note\ 2}$		Conf 1, 2, 4, 5,				400		
00 11010 2	dBm/ SCS	7,8	-102			-102		
<u>^</u> /		Conf 3, 6, 9 Conf 1, 2, 3, 4,		-99			-99	
$\hat{E}_s/N_{oc}$	dB	5, 6, 7, 8, 9	16	16	16	16	16	16
$\hat{E}_{_{s}}/I_{_{ot}}$ Note 3	dB	Conf 1, 2, 3, 4, 5, 6, 7, 8, 9	16	16	16	16	16	16
SS-RSRP Note 3	dBm/	Conf 1, 2, 4, 5, 7,8	-86	-86	-86	-86	-86	-86
	SCS	Conf 3, 6, 9	-83	-83	-83	-83	-83	-83

	dBm/	Conf 1, 2, 4, 5,						
	9.36	7,8	-57.9	-57.9	-57.9	-57.9	-57.9	-57.9
In Note 3	MHz							
10	dBm/	Conf 3, 6, 9						
	38.16		-51.8	-51.8	-51.8	-51.8	-51.8	-51.8
	MHz							
Propagation		Conf 1, 2, 3, 4,		AWGN			AWGN	
Condition		5, 6, 7, 8, 9		/			/mon	
Antenna		Conf 1, 2, 3, 4,		1 x 2			1 x 2	
	configuration 5, 6, 7, 8, 9							
NOTE 1: OCNG shall					nd a consta	int total tran	smitted pow	er
spectral der	nsity is ac	hieved for all OFD	M symbols	3.				
NOTE 2: Interference	from othe	r cells and noise s	ources no	t specified i	n the test is	assumed to	o be constar	nt over
subcarriers	and time	and shall be mode	elled as AV	VGN of app	propriate po	wer for $N_{oc}$	to be fulfille	d within
BW <sub>occupied</sub> .								
NOTE 3: $\hat{E}_{_{ m s}}/I_{_{ m ot}}$ , Io, a	and SS-RS	SRP levels have b	een derive	d from othe	er paramete	ers for inform	nation purpo	ses. They
are not sett	able parai	meters themselves	S.					
NOTE 4: All UL/DL tr	ansmissio	on shall be confine	d within B	W <sub>occupied</sub> (i.e	e. 10 MHz,	52 RBs) fror	m F <sub>C,low</sub> , and	lo is
independen	independent of the BW <sub>channel</sub> configured.							
NOTE 5: All UL/DL tr	ansmissio	on shall be confine	d within B	W <sub>occupied</sub> (i.e	e. 40 MHz,	106 RBs) fro	om F <sub>C,low</sub> , an	d lo is
independen	t of the B	Wchannel configured	ł.					
NOTE 6: NRB,c. is der	ived from	Table 5.3.2-1 in T	S38.101-1	[2] with co	nfigured BV	Vchannel.		

In test 1 the UE shall be ready to start transmission on the supplementary uplink carrier on SCell within 20 ms from the start of T2.

In test 1 the UE shall stop the transmission on the supplementary uplink carrier on SCell within 20 ms from the start of T3.

In test 2 the UE shall be ready to start transmission on the NR uplink carrier on SCell within 20 ms from the start of T2.

In test 2 the UE shall stop the transmission on the NR uplink carrier on SCell within 20 ms from the start of T3.

All of the above test requirements shall be fulfilled in order for the observed UE UL carrier configuration delay and UE UL carrier release delay to be counted as correct. The rate of correct observed UE UL carrier configuration delay and UE UL carrier release delay during repeated tests shall be at least 90%.

### 6.5.5 Link recovery procedures

#### 6.5.5.0 Minimum conformance requirements

6.5.5.0.1 Minimum conformance requirements for SSB-based BFD and link recovery procedures

Same as in the clause 4.5.5.0.1.

6.5.5.0.3 Scheduling availability of UE during beam failure detection and candidate beam detection

Same as in the clause 4.5.5.0.3.

#### 6.5.5.0.4 Requirements for Beam Failure Recovery in SCell

Same as in the clause 4.5.5.0.4.

## 6.5.5.0.2 Minimum conformance requirements for CSI-RS-based BFD and link recovery procedures

UE shall be able to evaluate whether the downlink radio link quality on the configured CSI-RS resource in set  $\overline{q}_0$  estimated over the last T<sub>Evaluate\_BFD\_CSI-RS</sub> [ms] period becomes worse than the threshold Q<sub>out\_LR\_CSI-RS</sub> within T<sub>Evaluate\_BFD\_CSI-RS</sub> [ms] period.

The value of  $T_{Evaluate\_BFD\_CSI-RS}$  is defined in Table 8.5.3.2-1 for FR1.

For FR1,

- P=1/(1 T<sub>CSI-RS</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

Longer evaluation period would be expected if the combination of BFD-RS, SMTC occasion and measurement gap configurations does not meet pervious conditions.

The values of M<sub>BFD</sub> used in Table 6.5.5.0.2-1 is defined as

-  $M_{BFD} = 10$ , if the CSI-RS resource configured for BFD is transmitted with Density = 3.

Configuration		T <sub>Evaluate_BFD_CSI-RS</sub> (ms)			
no DRX		max([50], [M <sub>BFD</sub> *P] * T <sub>CSI-RS</sub> )			
DRX cycle ≤ 320ms		max([50], [1.5×M <sub>BFD</sub> *P]*max(T <sub>DRX</sub> , T <sub>CSI-RS</sub> ))			
DRX cycle > 320ms		[Mbfd*P] * Tdrx			
Note: 7	Γ <sub>CSI-RS</sub> is the ∣	periodicity of CSI-RS resource in the set $ \overline{q}_{0}^{}$ . ${\sf T}_{\sf DRX}^{}$ is the			
DRX cycle length.					

Table 6.5.5.0.2-1: Evaluation period T<sub>Evaluate\_BFD\_CSI-RS</sub> for FR1

When the radio link quality on all the configured RS resources in set  $\bar{q}_0$  is worse than  $Q_{out\_LR}$ , Layer 1 of the UE shall send a beam failure instance indication to the higher layers. A Layer 3 filter may be applied to the beam failure instance indications as specified in TS 38.331 [13].

The beam failure instance evaluation for the configured RS resources in set  $\bar{q}_0$  shall be performed as specified in section 6 in TS 38.213 [8]. Two successive indications from Layer 1 shall be separated by at least T<sub>Indication\_interval\_BFD</sub>.

When DRX is not used,  $T_{Indication_interval\_BFD}$  is max(2ms,  $T_{BFD-RS,M}$ ), where  $T_{BFD-RS,M}$  is the shortest periodicity of all configured RS resources in set  $\bar{q}_0$  for the accessed cell, corresponding to either the shortest periodicity of the SSB in the set  $\bar{q}_0$  or CSI-RS resource in the set  $\bar{q}_0$ .

When DRX is used,  $T_{Indication\_interval\_BFD}$  is max(1.5\*DRX\_cycle\_length, 1.5\*T<sub>BFD-RS,M</sub>) if DRX cycle\_length is less than or equal to 320ms, and  $T_{Indication\_interval}$  is DRX\_cycle\_length if DRX cycle\_length is greater than 320ms.

UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set  $\bar{q}_1$  estimated over the last  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  [ms] period becomes better than the threshold  $Q_{\text{in\_LR}}$  within  $T_{\text{Evaluate\_CBD\_CSI-RS}}$  [ms] period provided CSI-RS  $\hat{E}_{s}$ /Iot is according to Annex Table B.2.4.2 for a corresponding band.

The value of  $T_{Evaluate\_CBD\_CSI-RS}$  is defined in Table 6.5.5.0.2-2 for FR1.

For FR1,

- P=1/(1 T<sub>CSI-RS</sub>/MGRP), when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and
- P=1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

In both FR1 and FR2, if different SCS is used for SSB and CSI-RS, and the UE does not support *simultaneousRxDataSSB-DiffNumerology*, it is assumed that the CSI-RS configured for candidate beam detection and each SSB shall be TDMed transmitted.

The values of  $M_{CBD}$  used in Table 6.5.5.0.2-2 is defined as

- M<sub>CBD</sub> = 3, if the CSI-RS resource configured in the set  $\overline{q}_1$  is transmitted with Density = 3.

Configuration		T <sub>Evaluate_CBD_CSI-RS</sub> (ms)			
non-DRX		max([25], ceil(M <sub>CBD</sub> *P) * T <sub>CSI-RS</sub> )			
DRX cycle ≤ 320ms		ceil(Mcвd *P*N) * max(Tdrx, Tcsi-rs)			
DRX cycle > 320ms		ceil(M <sub>CBD</sub> *P) *T <sub>DRX</sub>			
Note:	T <sub>CSI-RS</sub> is the	periodicity of CSI-RS resource in the set $\overline{q}_{ m l}$ . T <sub>DRX</sub> is the			
DRX cycle length.					

Table 6.5.5.0.2-2: Evaluation period T<sub>Evaluate\_CBD\_CSI-RS</sub> for FR1

The normative reference for this requirement is TS 38.133 [6] clause 8.5.3.2, 8.5.4 and 8.5.6.2.

#### 6.5.5.1 NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX

#### 6.5.5.1.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 6.5.5.1.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1 and link recovery.

#### 6.5.5.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.1.

#### 6.5.5.1.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.1.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 6.5.5.1.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set q1 of the candidate beam used for link recovery

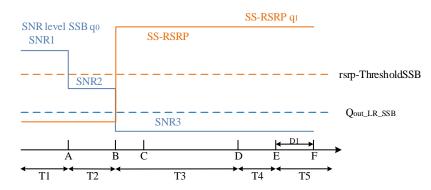


Figure 6.5.5.1.4-1: SNR and L1-RSRP variation for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

6.5.5.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.1.4.1-1.

#### Table 6.5.5.1.4.1-1: Supported test configurations for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

Configuration	Description
6.5.5.1-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.1-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth
6.5.5.1-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth
Note: The UE is only	required to pass in one of the supported test configurations in FR1

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.1.4.1-2.

## Table 6.5.5.1.4.1-2: Initial conditions for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

Parameter	Value		Comment	
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies	As specified in Annex E, table E.4-1 and TS 38.508-1 [14] clause 4.3.1 and 4.4.2.			
Channel bandwidth	As specified by the test configuration selected from Table 6.5.5.1.4.1-1.			
Propagation conditions	AWGN		As specified in Annex C.2.2.	
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2 Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part			

- 1. The general test parameter settings are set up according to Table 6.5.5.1.4.1-3.
- 2. Message contents are defined in clause 6.5.5.1.4.3.
- 3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

# Table 6.5.5.1.4.1-3: General test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

Duplex mode         Config 1 Config 2, 3 TDD         FDD           BWChannel         Config 1 Config 2         MHz         TDD           BWChannel         Config 1 Config 2         MHz         10: NRB,c = 52           Config 1 Config 3         Config 1         MHz         10: NRB,c = 52           DL initial BWP         Config 1, 2, Config 1, 2, Configuration         DLBWP.0.1           DL dedicated BWP         Config 1, 2, Config 2         DLBWP.0.1           Configuration         3         UL BWP.0.1           DL dedicated BWP         Config 1, 2, Config 2         ULBWP.0.1           Config 2         Config 1, 2, Config 3         ULBWP.1.1           Config 1         Not Applicable         Config 1           Config 2         Config 1         TDDConf.1.1           Config 3         CR.1.1 FDD         Config 1           Config 3         CR.1.1 FDD         Config 2           Config 1         CR.1.1 FDD         Config 3           SSB Configuration         Config 1         SSB.3 FR1           Config 3         SSB.4 FR1         Config 3           SSB Configuration         Config 1, 2         SMTC.1           Config 3         SO KHz         PRACH.2 FR1           Config 3         SO KH	Parameter		Unit	Value	Comment
RF Channel Number         1           Duplex mode         Config 1         FDD           Duplex mode         Config 1         MHz         10: NRB,c = 52           BWchannel         Config 1         MHz         10: NRB,c = 52           DL initial BWP         Config 1, 2, config 1, 2, configuration         DLBWP.0.1           DL dedicated BWP         Config 1, 2, configuration         DLBWP.0.1           DL dedicated BWP         Config 1, 2, configuration         UL BWP.0.1           DL dedicated BWP         Config 1, 2, configuration         ULBWP.0.1           Config 2         TDDConf.1.1         Config 1           Config 3         Config 1         Not Applicable           Config 4         Config 2         TDDConf.1.1           Config 3         CR.1.1 FDD         CR.1.1 TDD           Config 4         Config 3         SSB 3.FR1           Config 3         SSB 4.FR1         SSB 4.FR1           SSB Configuration         Config 1.2         SMTC.1           Config 3         SSB 4.FR1         SSB 4.FR1           SSB Configuration         Config 1.2         SMTC.1           Config 3         SSB 4.FR1         SSB 4.FR1           Config 3         SMTC.1         Config 3				Test 1	
RF Channel Number         1           Duplex mode         Config 1         FDD           Duplex mode         Config 1         MHz         10: NRB,c = 52           BWchannel         Config 1         MHz         10: NRB,c = 52           DL initial BWP         Config 1, 2, config 1, 2, configuration         DLBWP.0.1           DL dedicated BWP         Config 1, 2, configuration         DLBWP.0.1           DL dedicated BWP         Config 1, 2, configuration         UL BWP.0.1           DL dedicated BWP         Config 1, 2, configuration         ULBWP.0.1           Config 2         TDDConf.1.1         Config 1           Config 3         Config 1         Not Applicable           Config 4         Config 2         TDDConf.1.1           Config 3         CR.1.1 FDD         CR.1.1 TDD           Config 4         Config 3         SSB 3.FR1           Config 3         SSB 4.FR1         SSB 4.FR1           SSB Configuration         Config 1.2         SMTC.1           Config 3         SSB 4.FR1         SSB 4.FR1           SSB Configuration         Config 1.2         SMTC.1           Config 3         SSB 4.FR1         SSB 4.FR1           Config 3         SMTC.1         Config 3	Active PSCell			Cell 1	
BWChannel         Config 2, 3         TDD           BWChannel         Config 1         MHz         10: NRB,c = 52           Config 3         40: NRB,c = 106           DL initial BWP         Config 1, 2, 2         DLBWP.0.1           Sonfiguration         3         DL UL initial BWP         Config 1, 2, 2           UL dedicated BWP         Config 1, 2, 2         ULBWP.0.1           Sonfiguration         3         UL dedicated BWP           Config 1, 2, 2         ULBWP.0.1           Sonfiguration         3         TDDConf.1.1           Config 2         TDDConf.1.1           Config 3         CR.1.1 FDD           Channel         Config 1         SSB 3 FR1           Config 3         CR.1.1 FDD           SSB Configuration         Config 1, 2         SSB.3 FR1           Config 3         SSB.4 FR1         SSB 3 FR1           Config 1, 2         SMTC.1         Config 3           SSB Index assigned as BFD RS (q_0)         0         SSB Index assigned as CBD RS (q_1)           OCNG parameters         OP.1         PRACH.2 FR1           Control OFDM         Soutrol OFDM         2           SSB Index assigned as CBD RS (q_1)         1         0           OCN reg 2 </td <td>RF Channel Number</td> <td></td> <td></td> <td></td> <td></td>	RF Channel Number				
BWchannel         Config 1         MHz         10: NRB,c = 52           Config 2         Config 3         40: NRB,c = 106           DL initial BWP         Config 1, 2, 2         DLBWP.0.1           configuration         3         DLBWP.0.1           DL dedicated BWP         Config 1, 2, 2         ULBWP.0.1           configuration         3         ULBWP.0.1           DL dedicated BWP         Config 1, 2, 2         ULBWP.0.1           configuration         3         ULBWP.0.1           TDD Configuration         Config 1, 2, 2         ULBWP.0.1           configuration         3         TDDConf.1.1           CORESET Reference         Config 1         Not Applicable           Config 2         CSB3.3 FR1         Config 2           Config 3         CR.1.1 FDD         Config 3           SSB Configuration         Config 1, 2         SSB.3 FR1           Config 3         SSB 4 FR1         SSB 3 FR1           SMTC Configuration         Config 1, 2         SMTC.1           Config 3         SMTC.1         Config 3           PSCH/PDCCH         Config 1, 2         SMTC.1           Config 3         SMTC.1         Config 3           SSB Index assigned as BFD RS (q_0)	Duplex mode	Config 1		FDD	
Config 2         10: NRB,c = 52           Config 3         40: NRB,c = 106           DL initial BWP         Config 1, 2, 3         DLBWP.0.1           Sonfiguration         3         DLBWP.0.1           UL dedicated BWP         Config 1, 2, 4         ULBWP.0.1           Configuration         3         UL dedicated BWP           Configuration         Config 1, 2, 4         ULBWP.0.1           UL dedicated BWP         Config 1, 2, 5         ULBWP.1.1           Configuration         Config 1         Not Applicable           Config 2         TDDConf.1.1         Config 2           Config 3         CR.1.1 TDD         Config 2           Config 1         CSB 3.5 FR1         Config 3           Config 1         SSB 3.5 FR1         Config 3           Config 1, 2         SSB 4.5 FR1         Config 3           SSB Configuration         Config 1, 2         SMTC.1           Config 3         SSB 4.5 FR1         Config 3           SSB Index assigned as BPD RS (q)         0         SSS 58           Corlig 3         30 KHz         PRACH.2 FR1           Corlig 4         PRACH.2 FR1         Config 3           SSB Index assigned as BPD RS (q)         0         0	•	Config 2, 3		TDD	
Config 3         Unitial BWP           configuration         3           DL dedicated BWP         Config 1, 2, 2           configuration         3           DL dedicated BWP         Config 1, 2, 2           configuration         3           DL dedicated BWP         Config 1, 2, 2           configuration         3           DL dedicated BWP         Config 1, 2, 2           ull initial BWP         Config 1, 2, 2           ull dedicated BWP         Config 1, 2, 2           ull dedicated BWP         Config 1, 2, 2           configuration         Config 2           TDD Configuration         Config 2           Config 3         CR.1.1 TDD           Config 1         SSB 3 FR1           Config 2         SSB 3 FR1           Config 3         SSB 4 FR1           SMTC Config 1, 2         SMTC.1           Config 3         SMTC.1           Config 4         PRACH.2 FR1           SSB Index assigned as CB RS (q)         0	BWchannel	Config 1	MHz	10: NRB,c = 52	
Config 3         40: NRB, c = 106           DL initial BWP configuration         Config 1, 2, 3         DLBWP.0.1           DL dedicated BWP configuration         Config 1, 2, 3         DLBWP.0.1           UL initial BWP configuration         Config 1, 2, 3         ULBWP.0.1           UL dedicated BWP configuration         Config 1, 2, 3         ULBWP.0.1           DD dedicated BWP configuration         Config 1, 2, 3         ULBWP.1.1           Config 1         Config 2         TDDConf.1.1           Config 2         Config 1         CR.1.1 FDD           CORESET Reference Channel         Config 1         SSB.3 FR1           Config 2         SSB.3 FR1         Config 3           Config 3         SSB 4 FR1         Config 3           SSB Configuration         Config 1, 2         SMTC.1           Config 3         SSB 4 FR1         Config 3           SSB Index assigned as BP RS (q)         0         SSB           SSB Index assigned as BP RS (q)         0         0           Control OFDM sarameters         OP.1         0           Control OFDM sarameters         OP.1         0           Control OFDM sarameters         OP.1         0           Control OFDM sarameters         OP.1         0 <t< td=""><td></td><td>Config 2</td><td></td><td>10: NRB,c = 52</td><td></td></t<>		Config 2		10: NRB,c = 52	
DL     initial BWP     Config 1, 2, 3     DLBWP.0.1       configuration     3     UBBWP.0.1       DL     decicated BWP     Config 1, 2, 3     UBBWP.0.1       configuration     3     UL     UL       configuration     3     UL       configuration     3     UL       configuration     3     UL       configuration     3     UL       configuration     Config 1     Not Applicable       config 2     Config 1     Config 2       config 1     Config 2     CR.1 f DD       Config 2     CR.1 f DD     Config 1       Config 3     CR.2.1 f DD     Config 2       SSB Configuration     Config 1     SSB.3 FR1       Config 2     Config 3     SMTC.1       Config 3     Config 1     SSB.3 FR1       Config 3     SMTC.1     Config 3       PDSCH/PDCCH     Config 1, 2     SMTC.1       config 3     Config 3     SMTC.1       PDSCH/PDCCH     Config 1, 2     SMTC.1       config 3     PRACH 2 FR1     Config 3       Config 3     PRACH.2 FR1     Config 3       Config 4     Normal     Config 4       Config 5     PCH 2     CR1       Config 6     DC 1				$40^{\circ}$ NRB c = 106	
configuration         3         Description           DL dedicated BWP         Config 1, 2, 3         DLBWP.1.1           Configuration         3         UL initial BWP         Config 1, 2, 3           UL initial BWP         Config 1, 2, 3         ULBWP.0.1           configuration         3         UL BWP.1.1           configuration         3         TDD Config.1         Not Applicable           Config 2         TDDConf.1.1         TDDConf.2.1           CORESET Reference         Config 2         CR.1.1 FDD           Channel         Config 1         SSB.3 FR1           Config 3         CR.2.1 TDD           SSB Configuration         Config 1, 2         SSB.3 FR1           Config 1         SSB.3 FR1         Config 3           Config 3         SMTC.1         PRACH Config 1, 2           SSB Configuration         Config 1, 2         SMTC.1           PDSCH/PDCCH         Config 1, 2         SMTC.1           SSB Index assigned as BFD RS (q_0)         0         0           SSB Index assigned as CBD RS (q_1)         1         0           Config 3         OP.1         CONG parameters         OP.1           CP length         Normal         2         Config 3 <tr< td=""><td></td><td>J. J. J</td><td></td><td></td><td></td></tr<>		J. J			
DL decicated BWP     Config 1, 2, 3     DLBWP.1.1       configuration     3     ULUBWP.0.1       configuration     3     ULUBWP.0.1       configuration     3     Not Applicable       Config 1     Config 1, 2, 3     ULBWP.1.1       configuration     3     Not Applicable       TDD Configuration     Config 1     Not Applicable       CORESET Reference     Config 1     CR.1.1 FDD       Channel     Config 2     CR.1.1 FDD       Config 3     CR.2.1 TDD     Config 2       Config 4     Config 1     SSB.3 FR1       Config 5     Config 1, 2     SSB.3 FR1       Config 1     SSB.3 FR1     Config 3       Config 1     SSB.3 FR1     Config 3       SMTC Configuration     Config 1, 2     SMTC.1       PDSCH/PDCCH     Config 1, 2     SMTC.1       SUbcarrier spacing     Config 1, 2     Onfig 3       PRACH Configuration     Config 1, 2     Onfig 3       SSB Index assigned as BFD RS (q_0)     0     SSSB Mex assigned as CBD RS (q_1)       OCNG parameters     OP.1     1       OCRG parameters     OP.1     Control OFDM       Symbols     Symbols     S       Aggregation level     CCE     8       Ratio of     dB<		-		DLBWP.0.1	
UL initial BWP     Config 1, 2, 3     ULBWP.0.1       configuration     3     ULBWP.0.1       configuration     3     ULBWP.1.1       configuration     Config 1, 2, 1     ULBWP.1.1       configuration     Config 1     Not Applicable       TDD Configuration     Config 1     TDDConf.1.1       Config 2     CR.1.1 FDD       Channel     Config 1     CR.1.1 FDD       Config 1     Config 2     CR.1.1 TDD       SSB Configuration     Config 1     SSB.3 FR1       Config 2     SSB.3 FR1     Config 3       SMTC Configuration     Config 1, 2     SMTC.1       Config 3     SMTC.1     Config 3       PDSCH/PDCCH     Config 1, 2     SMTC.1       Config 3     GMTC.1     Config 3       SSB Index assigned as CBD RS (q_0)     0       SSB Index assigned as CBD RS (q_1)     1       OCNE parameters     OP.1       CP length     Control OFDM       Control OFDM     2       Symbols     Control OFDM       average CSI-RS     Rei orf       Ret orf     2       Control OFDM     CONTRIA       Aggregation level     CCE       Aggregation level     CCE       Aggregeation level     CE       <	DL dedicated BWP	Config 1, 2,		DLBWP.1.1	
configuration     3     UL declacted BWP     Config 1, 2, 3       UL declacted BWP     Config 1, 2, 3     ULBWP.1.1       configuration     3     TDDConfiguration       TDD Configuration     Config 2     TDDConf.1.1       CORESET Reference     Config 2     CR.1.1 FDD       Channel     Config 3     CR.2.1 TDD       SSB Configuration     Config 1     SSB.3 FR1       Config 3     SSB.4 FR1     SSB.3 FR1       Config 3     SSB.4 FR1     Config 3       SMTC Configuration     Config 1, 2     SMTC.1       PDSCH/PDCCH     Config 1, 2     SMTC.1       Subcarrier spacing     Config 3     30 KHz       PRACH Configuration     Config 1, 2     PRACH.2 FR1       Corfig 3     PRACH.2 FR1     Config 3       SSB Index assigned as BFD RS (q_0)     0     0       SSB Index assigned as CBD RS (q_1)     1     0       Corfiguration     Config 3     PRACH.2 FR1       Corfiguration     Config 4     1-0       Config 7     PRACH.2 FR1     Configuration       Corfig 3     PRACH.2 FR1     Configuration       Corfig 4     Normal     Corfiguration       CORfig 7     PRACH.2 FR1     Configuration       Config 7     Control OFDM     2 <td></td> <td></td> <td></td> <td></td> <td></td>					
UL dedicated BWP     Config 1, 2, 3     ULBWP.1.1       configuration     3     TDD Config 1       TDD Configuration     Config 1     Not Applicable       CONFIG 2     TDDConf.1.1     TDDConf.2.1       CORESET Reference     Config 2     CR.1.1 FDD       Channel     Config 2     CR.1.1 TDD       SSB Configuration     Config 1     SSB.3 FR1       Config 2     SSB.3 FR1     Config 3       SMTC Configuration     Config 1, 2     SSB.4 FR1       Config 3     SMTC.1     Config 3       SMTC Configuration     Config 1, 2     15 KHz       Subcarrier spacing     Config 1, 2     15 KHz       SSB Index assigned as BFD RS (qo)     0     0       SSB Index assigned as CBD RS (qr)     1     0       OCNG parameters     OP.1     Config 1       Crelength     Normal     2x2 Low       Control OFDM     Symbols     2       Aggregation level     CCE     8       Ratio of     dB     0       hy				ULBWP.0.1	
TDD Configuration       Config 1 Config 2       Not Applicable         Config 3       TDDConf.1.1       TDDConf.2.1         CORESET Reference Channel       Config 1       CR.1.1 FDD         Config 2       CR.1.1 TDD         SSB Configuration       Config 1       SSB.3 FR1         Config 1       CSB.3 FR1       Config 2         Config 3       SSB.3 FR1       Config 3         SMTC Configuration       Config 1, 2       SMTC.1         PDSCH/PDCCH       Config 1, 2       SMTC.1         subcarrier spacing       Config 1, 2       SMTC.1         PRACH Configuration       Config 1, 2       PRACH.2 FR1         Config 3       SB Index assigned as BFD RS (q_0)       0         SSB Index assigned as BFD RS (q_0)       0       0         SSB Index assigned as CBD RS (q_1)       1       0         Correlation Matrix and Antenna       2x2 Low       2         Configuration       DCI format       1-0         Beam failure       DCI format       1-0         detection       Number of       2         Configuration       Control OFDM       2         average CSI-RS       Ret energy       4B         Aggregation level       CEE       8 </td <td>UL dedicated BWP</td> <td></td> <td></td> <td>ULBWP.1.1</td> <td></td>	UL dedicated BWP			ULBWP.1.1	
Config 2 Config 3TDDConf.1.1CORESET Reference ChannelConfig 2 Config 2CR.1.1 FDDChannelConfig 2 Config 3CR.2.1 TDDSSB ConfigurationConfig 1 Config 1 Config 3SSB.3 FR1SMTC ConfigurationConfig 1, 2 Config 3SMTC.1SMTC ConfigurationConfig 1, 2 Config 3SMTC.1PDSCH/PDCCH subcarrier spacingConfig 1, 2 Config 3SMTC.1PRACH ConfigurationConfig 1, 2 Config 3PRACH.2 FR1SSB Index assigned as BFD RS (q_0)00SSB Index assigned as CBD RS (q_1)1OCNG parameters Conrelation Matrix and Antenna Correlation Matrix and Antenna symbols0P.1 2 CONTControl OFDM sparametersDCI format Aggregation level1-0Aggregation level average CSI-RS RE energy to average CSI-RS RE energyGB CO CFFDRX Gap pattern IDOFF	configuration	-			
Config 3         TDDConf.2.1           CORESET Reference Channel         Config 1         CR.1.1 FDD           Config 3         CR.2.1 TDD           SSB Configuration         Config 1         SSB.3 FR1           Config 3         SSB.4 FR1           SMTC Configuration         Config 1, 2           Subcarrier spacing         Config 1, 2           SSB Index assigned as BFD RS (q_0)         0           SSB Index assigned as CBD RS (q_1)         1           OCNE parameters         OP.1           COrrelation Matrix and Antenna         2x2 Low           Control OFDM symbols         2           Aggregation level         CCE           Aggregation level         CE           Aggregation level         CE           Aggregation level	I DD Configuration				
CORESET Reference Channel       Config 1 Config 2 Config 3       CR.1.1 FDD         SSB Configuration       Config 1 Config 2 Config 3       CR.1.1 TDD         SSB Configuration       Config 1 Config 2 Config 3       SSB.3 FR1         SMTC Configuration       Config 1, 2 Config 3       SSB.4 FR1         SMTC Configuration       Config 1, 2 Config 3       SMTC.1         PDSCH/PDCCH       Config 1, 2 Config 3       SMTC.1         PRACH Configuration       Config 1, 2 Config 3       PRACH.2 FR1         SSB Index assigned as BFD RS (q_0)       0         SSB Index assigned as CBD RS (q_1)       1         OCNC parameters       OP.1         Correlation Matrix and Antenna       2x2 Low         Config Orthore of transmission parameters       DCI format         Aggregation level       CCE         Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy       Matrix of dB         Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy       REG bundle size         Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy       GB         Ret energy to average CSI-RS RE energy       GB         Ret energy to average CSI-RS RE energy       GB         RE G bundle size       6         DMRS precoder granularity       GB					
Channel       Config 2 Config 3       CR.1.1 TDD         SSB Configuration       Config 1 Config 2       SSB.3 FR1         SMTC Configuration       Config 1, 2 Config 3       SMTC.1         SMTC Configuration       Config 1, 2 Config 3       SMTC.1         PDSCH/PDCCH       Config 1, 2 Config 3       SMTC.1         SUbcarrier spacing       Config 1, 2 Config 3       PRACH.2 FR1         SSB Index assigned as BFD RS (q_0)       0         SSB Index assigned as CBD RS (q_1)       1         OCNE parameters       OP.1         Cortengtion       Control OFDM symbols         Control OFDM parameters       DCI format         Control OFDM parameters       2         Control OFDM parameters       2         Matio of hypothetical PDCCH RE energy to average CSI-RS RE energy       dB         Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy       dB         Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy       REG bundle size         Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy       REG bundle size         Ratio of hypothetical PDCCH DMRS       6         PDCH DMRS energy to average CSI-RS       6         RE ondle size       6	00050575 /				
Config 3         CR.2.1 TDD           SSB Configuration         Config 1         SSB.3 FR1           Config 3         SSB.3 FR1         SSB.3 FR1           SMTC Configuration         Config 1, 2         SMTC.1           PDSCH/PDCCH         Config 1, 2         SMTC.1           subcarrier spacing         Config 1, 2         SMTC.1           PRACH Configuration         Config 1, 2         PRACH.2 FR1           Config 3         SSB Index assigned as BFD RS (q_0)         0           SSB Index assigned as CBD RS (q_0)         0         SSB Index assigned as CBD RS (q_1)           OCNG parameters         OP.1         OP.1           Control OFDM         Symbols         2x2 Low           Control OFDM         Symbols         2           Parameters         OP.1         2           Control OFDM         Symbols         2           Aggregation level         CCE         8           Aggregation level         CCE         8           Ratio of         dB         0           hypothetical         PDCCH DMRS         PDCCH DMRS           energy to         average CSI-RS         RE energy           DMRS precoder         REG bundle size           Readition					
SSB Configuration       Config 1 Config 2 Config 3       SSB.3 FR1         SMTC Configuration       Config 1, 2 Config 3       SMTC.1         PDSCH/PDCCH       Config 1, 2 Config 3       SMTC.1         subcarrier spacing       Config 1, 2 Config 3       SMTC.1         PRACH Configuration       Config 1, 2 Config 3       PRACH.2 FR1         SSB Index assigned as BFD RS (q_0)       0         SSB Index assigned as CBD RS (q_1)       1         OCNG parameters       OP.1         CP length       Normal         Control OFDM symbols       2         Parameters       OP.1         Control OFDM symbols       2         Aggregation level       CCE         Aggregation level       CCE         Aggregation level       CCE         Aggregation level       CCE         Ratio of hypothetical PDCCH DMRS energy       dB       0         PDCCH DMRS energy       0         Ratio of hypothetical PDCCH DMRS energy       REG bundle size         PDCH DMRS energy       6         DMRS precoder granularity       6         DRX       OFF	Channel				
Config 2 Config 3         SSB.3 FR1           SMTC Configuration         Config 1, 2         SMTC.1           Config 3         SMTC.1         SMTC.1           PDSCH/PDCCH subcarrier spacing         Config 1, 2         15 KHz           PRACH Configuration         Config 1, 2         9000000000000000000000000000000000000					
Config 3SSB.4 FR1SMTC ConfigurationConfig 1, 2 Config 3SMTC.1PDSCH/PDCCH subcarrier spacingConfig 1, 2 Config 315 KHzPRACH ConfigurationConfig 1, 2 Config 3PRACH.2 FR1Config 3PRACH.2 FR1SSB Index assigned as BFD RS (q_0)0SSB Index assigned as CBD RS (q_1)1OCNG parametersOP.1Config 1, 2OP.1Config 3OP.1Config 4NormalCorrelation Matrix and Antenna2x2 LowConfig 72Control OFDM symbols2Aggregation levelCCEAggregation levelCCEAggregation levelCCERatio of hypothetical PDCCH DMRS energy to average CSI-RS RE energydBRatio of hypothetical PDCCH DMRS energy to average CSI-RS RE energyGREG bundle size6DRX Gap pattern IDOFF	SSB Configuration	¥			
SMTC Configuration       Config 1, 2 Config 3       SMTC.1         PDSCH/PDCCH subcarrier spacing       Config 1, 2 Config 3       15 KHz         PRACH Configuration       Config 1, 2 Config 3       9RACH.2 FR1         PRACH configuration       Config 3       PRACH.2 FR1         SSB Index assigned as BFD RS (q_0)       0       0         SSB Index assigned as CBD RS (q_1)       1       0         OCNG parameters       OP.1       0         Correlation Matrix and Antenna       2x2 Low       0         Configuration       DCI format       1-0         Beam failure detection parameters       DCI format       1-0         Mumber of control OFDM symbols       2       0         Aggregation level       CCE       8         Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy       dB       0         Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy       REG bundle size       6         DMRS precoder granularity       REG bundle size       6       0         DMRS precoder granularity       6       0       0					
Config 3SMTC.1PDSCH/PDCCH subcarrier spacingConfig 1, 215 KHzSubcarrier spacingConfig 1, 2PRACH.2 FR1PRACH ConfigurationConfig 3PRACH.2 FR1SSB Index assigned as BFD RS (q_0)0SSB Index assigned as CBD RS (q_1)1OCNG parametersOP.1Correlation Matrix and Antenna2x2 LowConfigurationDCI format1-0Beam failure detection parametersDCI formatAggregation levelCCEAggregation levelCCERatio of hypothetical PDCCH RE energy to average CSI-RS RE energydBOCKH DMRS energy to average CSI-RS RE energy0DMRS precoder granularityREG bundle size for the sizeDRX Gap pattern IDOFF		Config 3		SSB.4 FR1	
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PDSCH/PDCCH subcarrier spacing       Config 1, 2 Config 3       15 KHz         PRACH Configuration       Config 1, 2 Config 3       PRACH.2 FR1         SSB Index assigned as BFD RS (q_0)       0         SSB Index assigned as CBD RS (q_1)       1         OCNG parameters       OP.1         CP length       Normal         Config 1, 2       Normal         CP length       Normal         Config 1, 2       OP.1         Correlation Matrix and Antenna       2x2 Low         Control OFDM       Symbols         symbols       Symbols         Aggregation level       CCE         Aggregation level       CCE         Aggregation level       CCE         Ratio of       dB         hypothetical       PDCCH RE         energy to       average CSI-RS         RE energy       Ratio of         DMRS precoder       REG bundle size         Gap pattern ID       GPO	Ū				
subcarrier spacing     Config 3     30 KHz       PRACH Configuration     Config 1, 2 Config 3     PRACH.2 FR1       SSB Index assigned as BFD RS (q_0)     0       SSB Index assigned as CBD RS (q_1)     1       OCNG parameters     OP.1       CP length     Normal       Control OFDM symbols     2x2 Low       Control OFDM symbols     2       Aggregation level     CCE       Ratio of hypothetical PDCCH RE energy to average CSI-RS RE energy     dB       Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy     dB       Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy     Ag 0       Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy     REG bundle size       DMRS precoder granularity     REG bundle size       DRX     OFF	PDSCH/PDCCH				
PRACH Configuration       Config 1, 2       PRACH.2 FR1         Config 3       PRACH.2 FR1         SSB Index assigned as BFD RS (q_0)       0         SSB Index assigned as CBD RS (q_1)       1         OCNG parameters       OP.1         CP length       Normal         Correlation Matrix and Antenna       2x2 Low         Control OFDM       2         parameters       Control OFDM         parameters       Symbols         Aggregation level       CCE         Aggregation level       CCE         Aggregation level       CCE         PDCCH RE       energy to         average CSI-RS       RE energy         Ratio of       dB       0         hypothetical       PDCCH DMRS         PDCCH DMRS       energy to         average CSI-RS       RE energy         Ratio of       dB       0         hypothetical       PDCCH DMRS         PDCCH DMRS       energy to         average CSI-RS       RE energy         DMRS precoder       REG bundle size         granularity       REG bundle size         Gap pattern ID       GPO	subcarrier spacing	-			
Config 3PRACH.2 FR1SSB Index assigned as BFD RS (q_0)0SSB Index assigned as CBD RS (q1)1OCNG parametersOP.1CP lengthNormalCorrelation Matrix and Antenna2x2 LowConfigurationDCI formatBeam failureDCI formatdetectionNumber ofcontrol OFDM2symbolsAggregation levelAggregation levelCCERatio ofdBhypotheticalPDCCH REenergy toaverage CSI-RSRE energyRatio ofhypotheticalPDCCH DMRSenergy toaverage CSI-RSRE energyDRXCRXOPRXOPRCRXOPROPROPROPROPROPROPROPROPROPCH DMRSenergy toaverage CSI-RSRE energyDMRS precodergranularityREG bundle sizeGap pattern IDOPF	PRACH Configuration	•			
SSB Index assigned as BFD RS (q_0)       0         SSB Index assigned as CBD RS (q_1)       1         OCNG parameters       OP.1         CP length       Normal         Correlation Matrix and Antenna       2x2 Low         Configuration       DCI format       1-0         Beam failure       DCI format       1-0         detection       Number of       2         transmission       Control OFDM       2         parameters       Symbols	r na torr coningulation	-	-		
SSB Index assigned as CBD RS (q1)       1         OCNG parameters       OP.1         CP length       Normal         Correlation Matrix and Antenna       2x2 Low         Configuration       2x2 Low         Beam failure detection       DCI format       1-0         Mumber of       2         control OFDM       2         symbols       2         Aggregation level       CCE       8         Ratio of       dB       0         hypothetical       PDCCH RE       0         PDCCH RE       energy to       average CSI-RS         RE energy       Ratio of       dB       0         hypothetical       PDCCH DMRS       0         PDCCH DMRS       energy to       average CSI-RS         RE energy       DMRS precoder       REG bundle size         DMRS precoder       REG bundle size       6         DRX       OFF       0       0	SSB Index assigned	•		-	
OCNG parameters       OP.1         CP length       Normal         Correlation Matrix and Antenna       2x2 Low         Configuration       DCI format       1-0         Beam failure       DCI format       2         detection       Number of       2         transmission       Control OFDM       2         parameters       Symbols       0         Aggregation level       CCE       8         Ratio of       dB       0         hypothetical       PDCCH RE       0         PDCCH RE       energy to       average CSI-RS         RE energy       Ratio of       dB       0         hypothetical       PDCCH DMRS       0         PDCCH DMRS       energy to       average CSI-RS         RE energy       DMRS precoder       REG bundle size         DMRS precoder       REG bundle size       6         DRX       OFF       0       0	SSB Index assigned a	$as D D RS (q_0)$			
CP length       Normal         Correlation Matrix and Antenna       2x2 Low         Configuration       DCI format       1-0         Beam failure       DCI format       1-0         detection       Number of       2         transmission       Control OFDM       2         parameters       Aggregation level       CCE       8         Aggregation level       CCE       8         Ratio of       dB       0         hypothetical       PDCCH RE       energy to         average CSI-RS       RE energy       Ratio of         Ratio of       dB       0         hypothetical       PDCCH DMRS       energy to         average CSI-RS       RE energy       Average CSI-RS         RE energy       DMRS precoder       REG bundle size         DMRS precoder       REG bundle size       6         DRX       OFF       Gap pattern ID       gp0					
Correlation Matrix and Antenna       2x2 Low         Configuration       DCI format       1-0         Beam failure detection transmission parameters       DCI format       2         Aggregation level       CCE       8         Aggregation level       CCE       8         Ratio of       dB       0         hypothetical       PDCCH RE       1         PDCCH RE       energy to       average CSI-RS         RE energy       Ratio of       dB       0         Nypothetical       PDCCH RE       1       1         PDCCH RE       energy to       1       1         energy to       average CSI-RS       1       1         Retio of       dB       0       1       1         PDCCH DMRS       energy to       1       1       1         average CSI-RS       RE energy       1       1       1       1         DMRS precoder       REG bundle size       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1       1					
Configuration       DCI format       1-0         Beam failure detection       Number of       2         transmission parameters       Control OFDM       2         Aggregation level       CCE       8         Aggregation level       CCE       8         Ratio of       dB       0         hypothetical       PDCCH RE       4         PDCCH RE       4       4         energy to       average CSI-RS       4         Ratio of       dB       0         hypothetical       PDCCH DMRS       4         PDCCH DMRS       energy to       4         average CSI-RS       8       4         Ratio of       dB       0         hypothetical       PDCCH DMRS       4         PDCCH DMRS       energy to       4         average CSI-RS       8       4         RE energy       5       6         DMRS precoder       REG bundle size       6         DRX       OFF       5         Gap pattern ID       gp0       5		1.4.7			
Beam failure       DCI format       1-0         detection       Number of       2         transmission       Control OFDM       2         parameters       Aggregation level       CCE       8         Aggregation level       CCE       8         Ratio of       dB       0         hypothetical       PDCCH RE       0         PDCCH RE       energy to       average CSI-RS         RE energy       Ratio of       dB       0         Ratio of       dB       0         hypothetical       PDCCH RE       0         energy to       average CSI-RS       8         RE energy       Ratio of       dB       0         hypothetical       PDCCH DMRS       0       1         PDCCH DMRS       energy to       average CSI-RS       8         RE energy       DMRS precoder       REG bundle size       6         DRX       OFF       6       0		d Antenna		2x2 Low	
detection transmission parameters       Number of Control OFDM symbols       2         Aggregation level       CCE       8         Aggregation level       CCE       8         Ratio of       dB       0         hypothetical PDCCH RE energy to average CSI-RS RE energy       0         Ratio of       dB       0         Number of symbols       dB       0         PDCCH RE energy to average CSI-RS RE energy       0         Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy       dB       0         DMRS precoder granularity       REG bundle size 6       6         DRX       OFF       0	Beam failure	DCI format		1-0	
transmission       Control OFDM       symbols	detection				
Aggregation level       CCE       8         Ratio of       dB       0         hypothetical       PDCCH RE       0         PDCCH RE       energy to       average CSI-RS         RE energy       Ratio of       dB       0         Ratio of       dB       0       0         hypothetical       PDCCH DMRS       0       0         PDCCH DMRS       energy to       0       0         Average CSI-RS       RE energy       0       0         PDCCH DMRS       energy to       0       0         Average CSI-RS       RE energy       0       0         DMRS precoder       REG bundle size       6         DRX       OFF       0       0         Gap pattern ID       gp0       0       0	transmission	Control OFDM		_	
Ratio of       dB       0         hypothetical       PDCCH RE       0         PDCCH RE       energy to       0         average CSI-RS       RE energy       0         Ratio of       dB       0         hypothetical       PDCCH DMRS       0         PDCCH DMRS       energy to       0         average CSI-RS       RE energy       0         DCCH DMRS       0       0         PDCCH DMRS       0       0         energy to       0       0         average CSI-RS       0       0         RE energy       0       0         DMRS precoder       REG bundle size         granularity       6       0         DRX       0FF       0         Gap pattern ID       gp0       0	parameters		CCE	8	
hypothetical PDCCH RE energy to average CSI-RS RE energy       Image: CSI-RS RE energy         Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy       dB       0         PDCCH DMRS energy to average CSI-RS RE energy       Image: CSI-RS RE energy       Image: CSI-RS RE energy         DMRS precoder granularity       REG bundle size 6       Image: CSI-RS RE energy         DMRS precoder granularity       REG bundle size       Image: CSI-RS RE energy         DRX       Image: CSI-RS RE energy       Image: CSI-RS RE energy       Image: CSI-RS RE energy         REG bundle size       Image: CSI-RS RE energy       Image: CSI-RS RE energy       Image: CSI-RS RE energy         Image: CSI-RS       Image: CSI-RS RE energy       Image: CSI-RS RE energy       Image: CSI-RS RE energy         Image: CSI-RS       Image:					
PDCCH RE       energy to         average CSI-RS       average CSI-RS         Ratio of       dB       0         hypothetical       PDCCH DMRS         energy to       average CSI-RS         RE energy       average CSI-RS         RE energy       average CSI-RS         RE energy       B         DMRS precoder       REG bundle size         granularity       6         DRX       OFF         Gap pattern ID       gp0			uр	0	
energy to average CSI-RS RE energy       average CSI-RS RE energy         Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy       dB       0         DMRS precoder granularity       REG bundle size 6       6         DRX       OFF       Gap pattern ID					
average CSI-RS       average CSI-RS         Ratio of       dB       0         hypothetical       PDCCH DMRS         energy to       average CSI-RS         average CSI-RS       RE energy         DMRS precoder       REG bundle size         granularity       6         DRX       OFF         Gap pattern ID       gp0					
Ratio of       dB       0         hypothetical       PDCCH DMRS       4         PDCCH DMRS       energy to       4         average CSI-RS       8       4         RE energy       1       1         DMRS precoder       REG bundle size       6         granularity       6       1         DRX       0FF       3         Gap pattern ID       1       1		average CSI-RS			
hypothetical PDCCH DMRS energy to average CSI-RS RE energy       PDCCH DMRS energy to average CSI-RS RE energy         DMRS precoder granularity       REG bundle size         REG bundle size       6         DRX       OFF         Gap pattern ID       gp0					
PDCCH DMRS       energy to         average CSI-RS       average CSI-RS         RE energy       DMRS precoder         granularity       REG bundle size         REG bundle size       6         DRX       OFF         Gap pattern ID       gp0			dB	0	
average CSI-RS RE energy     REG bundle size       DMRS precoder granularity     REG bundle size       REG bundle size     6       DRX     OFF       Gap pattern ID     gp0		PDCCH DMRS			
average CSI-RS RE energy     REG bundle size       DMRS precoder granularity     REG bundle size       REG bundle size     6       DRX     OFF       Gap pattern ID     gp0					
DMRS precoder granularity     REG bundle size       REG bundle size     6       DRX     OFF       Gap pattern ID     gp0		average CSI-RS			
granularity     granularity       REG bundle size     6       DRX     OFF       Gap pattern ID     gp0				REG bundle size	
DRX OFF Gap pattern ID gp0		granularity			
Gap pattern ID gp0		REG bundle size			
	gapOffset			0 0	

rlmInSyncOutOfSyncThreshold			absent	When the field is absent, the UE applies the value 0.
rsrp-ThresholdSSB	Config 1, 2	dBm/ SCS kHz	-98	Threshold used for Q <sub>in_LR_SSB</sub>
	Config 3	dBm/ SCS kHz	-95	Threshold used for Q <sub>in_LR_SSB</sub>
powerControlOffsetSS			db0	Used for deriving rsrp- ThresholdCSI -RS
beamFailureInstanceMaxCount			n1	see clause 5.17 of TS 38.321 [12 ]
beamFailureDetectionTimer			pbfd4	see clause 5.17 of TS 38.321 [12 ]
CSI-RS	Config 1		CSI-RS.1.1 FDD	-
configuration for	Config 2		CSI-RS.1.1 TDD	
CSI reporting	Config 3		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1		TRS.1.1 FDD	
, s	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
SSB Index assigned			0, 1	
T310 Timer		ms	1000	
N310			2	
Τ1		S	0.2	During this time the UE shall be fully synchronized to cell 1
T2		S	0.37	
T3		S	0.24	
T4		S	0	
T5		S	0.17	
D1		S	0.13	
			prior to the start of t	ime period T1.
Note 2: UE-specifi	c PDCCH is not tran	smitted at	fter T1 starts.	

#### 6.5.5.1.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled. The UE is configured to perform inter-frequency measurements using GP ID #0 (40ms) in test 1

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. The SS sends an RRCReconfiguration message to the UE to configure inter-frequency measurement.

3. The UE sends an *RRCReconfigurationComplete* message.

4. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.1.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

- 5. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.1.5-1. T2 starts.
- 6. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.1.5-1. T3 starts.
- 7. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.1.5-1. T4 starts.

- 8. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.1.5-1. T5 starts.
- 9. If the SS:
  - a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1
     [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q<sub>1</sub>before time point B

and

c) detects preamble on a beam associated with the candidate beam set  $q_1$  before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

10. Switch the UE off and on. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

11. Repeat steps 4-10 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.5.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

#### Table 6.5.5.1.4.3-1: Common Exception messages for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

Default Message Contents				
Common contents of system information blocks exceptions				
Default RRC messages and information elements contents exceptions	Table H.3.1-6 with Condition BFD Table H.3.1-1 Table H.3.1-2 with Condition INTER-FREQ, L3 FILTERING NEEDED, GAP_NEEDED Table H.3.1-3 with Condition INTER-FREQ MO (where ssbFrequency is set to the ARFCN value of carrier center of High range) Table H.3.1-4 with A3-offset = 0			
	Table H.3.1-8 with Condition SSB BFD			
	Table H.3.1-10 with Condition SSB			
	Table H.3.1-10A Table H.3.5-4 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1			

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	Value/remark	Comment	Condition
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	1000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

## Table 6.5.5.1.4.3-2: PDCCH Search Space for BFR

## Table 6.5.5.1.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	Value/remark	Comment	Condition
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

## Table 6.5.5.1.4.3-4: Void

## Table 6.5.5.1.4.3-5: PDCCH-Config

Derivation Path: TS 38.501-1 [14], Table 4.6.3-95			
Information Element	Value/remark	Comment	Condition
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList	2 entries		
SEQUENCE(SIZE (13)) OF ControlResourceSet {			
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE	2 entries		
(110)) OF SearchSpace {			
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

Derivation Path: TS 38.501-1 [14], Table 7.3.1-15			
Information Element	Value/remark	Comment	Condition
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

## Table 6.5.5.1.4.3-6: ControlResourceSet for BFR

## 6.5.5.1.5 Test requirement

Tables 6.5.5.1.4.1-3 and 6.5.5.1.5-1 define the primary level settings including test tolerances for NR SA FR1 SSBbased beam failure detection and link recovery in DRX.

### Table 6.5.5.1.5-1: NR Cell specific test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in non-DRX mode

	Parameter Unit					Test 1		
				T1	T2	Т3	T4	T5
EPRE ratio of PDCCH DMRS to SSS		dB		•		•	•	
EPRE rat	EPRE ratio of PDCCH to PDCCH DMRS		dB					
EPRE rat	EPRE ratio of PBCH DMRS to SSS		dB					
EPRE rat	tio of PBCH to PB	CH DMRS	dB					
EPRE rat	tio of PSS to SSS		dB			0		
EPRE rat	tio of PDSCH DMF	RS to SSS	dB					
	tio of PDSCH to P		dB					
	tio of OCNG DMR		dB					
	tio of OCNG to OC		dB					
SNR_SS	B of set q₀	Config 1		5.8	-2.2	-12.8	-12.8	-12.8
		Config 2	dB	5.8	-2.2	-12.8	-12.8	-12.8
		Config 3		5.8	-2.2	-12.8	-12.8	-12.8
		Config 1		-10.2	-10.2	10.2	10.2	10.2
SNR_SS	B of set q1	Config 2	dB	-10.2	-10.2	10.2	10.2	10.2
		Config 3		-10.2	-10.2	10.2	10.2	10.2
		Config 1	dBm/S	-108.2	-108.2	-87.8	-87.8	-87.8
SSB_RP	SSB_RP of set q <sub>1</sub>	Config 2	CS kHz	-108.2	-108.2	-87.8	-87.8	-87.8
		Config 3		-105.2	-105.2	-84.8	-84.8	-84.8
N <sub>oc</sub>		Config 1	dBm/15			-98		
- ' <i>OC</i>		Config 2	kHz	-98				
		Config 3				-98		
	ion condition	<u> </u>				C 300ns 10		
Note 1: Note 2:	transmitted powe	used such that the er spectral density irces for CSI repo	/ is achieve	d for all OF	DM symbo	ls.		
Note 3:	NZP CSI-RS res	ource set configu	ration for C	SI reporting	g are assigi	ned to the l	JE prior to t	
Note 4:		ap configuration is						
Note 5:	The timers and I T1.	ayer 3 filtering rel	ated param	eters are c	onfigured p	rior to the s	start of time	period
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.								
Note 7: SNR levels correspond to the signal to noise ratio over the SSS REs.								
Note 8:	respectively in fig							
respectively in figure 6.5.5.1.4-1. Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1 is -15dB-TT = -15.8dB (including test tolerances).				R for RS in				

### Table 6.5.5.1.5-2: Void

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = 130 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.5.2 NR SA FR1 SSB-based beam failure detection and link recovery in DRX

#### 6.5.5.2.1 Test purpose

The purpose of this test is to verify that the UE properly detects SSB-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . The purpose is to test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the SSB based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 6.5.5.2.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, link recovery and long DRX cycle.

#### 6.5.5.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.2.

#### 6.5.5.2.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.2.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active cell to emulate SSB based beam failure. Figure 6.5.5.2.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery.

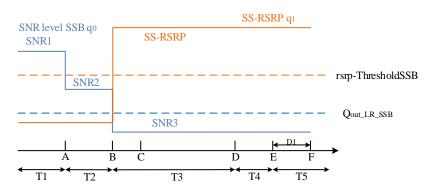


Figure 6.5.5.2.4-1: SNR and L1-RSRP variation for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

## 6.5.5.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.2.4.1-1.

## Table 6.5.5.2.4.1-1: Supported test configurations for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

Configuration	Description	
6.5.5.2-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth	
6.5.5.2-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth	
6.5.5.2-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth	
Note: The UE is only required to pass in one of the supported test configurations in FR1		

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.2.4.1-2.

## Table 6.5.5.2.4.1-2: Initial conditions for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

Parameter		Value	Comment	
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies	As specified	l in Annex E, table E.4-1 and TS 38.	508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified	ied by the test configuration selected from Table 6.5.5.2.4.1-1.		
Propagation conditions	AWGN	GN As specified in Annex C.2.2.		
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		
Exceptions to connection diagram		apable UEs without any 2 Rx RF A.3.2.5.2 for DUT part and		

1. The general test parameter settings are set up according to Table 6.5.5.2.4.1-3.

2. Message contents are defined in clause 6.5.5.2.4.3.

3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

## Table 6.5.5.2.4.1-3: General test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

Daran		Unit	Value	Commont
Parameter		Unit	Value Test 1	Comment
			10311	
Active PSCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1		FDD	
	Config 2, 3	N 41 I	TDD	
BWchannel	Config 1	MHz	10: NRB,c = 52	
	Config 2		10: NRB,c = 52	
		-		
	Config 3		40: NRB,c = 106	
DL initial BWP	Config 1, 2,		DLBWP.0.1	
configuration	3		DLBWP.1.1	
DL dedicated BWP configuration	Config 1, 2, 3		DLBVVP.1.1	
UL initial BWP	Config 1, 2,		ULBWP.0.1	
configuration	3		OLDWI .0.1	
UL dedicated BWP	Config 1, 2,		ULBWP.1.1	
configuration	3			
TDD Configuration	Config 1		Not Applicable	
	Config 2	_	TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET Reference	<u> </u>		CR.1.1 FDD	
Channel	Config 2		CR.1.1 TDD	
	Config 3		CR.2.1 TDD	
SSB Configuration	Config 1		SSB.3 FR1	
	Config 2		SSB.3 FR1	
	Config 3		SSB.4 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
Ū	Config 3		SMTC.1	
PDSCH/PDCCH	Config 1, 2		15 KHz	
subcarrier spacing	Config 3	-	30 KHz	
PRACH Configuration	-		PRACH.2 FR1	
1 IV CIT Comgaration	Config 3		PRACH.2 FR1	
	-		-	
SSB Index assigned			0	
SSB Index assigned			OP.1	
OCNG parameters				
CP length	d Antonno		Normal	
Correlation Matrix an Configuration	u Antenna		2x2 Low	
Beam failure	DCI format		1-0	
detection	Number of		2	
transmission	Control OFDM		2	
parameters	symbols			
	Aggregation level	CCE	8	
	Ratio of	dB	0	
	hypothetical		-	
	PDCCH RE			
	energy to			
	average CSI-RS			
	RE energy			
	Ratio of	dB	0	
	hypothetical			
	PDCCH DMRS			
	energy to			
	average CSI-RS			
	RE energy DMRS precoder		REG bundle size	
	granularity			
	REG bundle size		6	
DRX			DRX.7	see clause
				A.3.3.7 of TS
				38.133 [6]

Gap pattern ID			N.A.	
rlmInSyncOutOfSync	Threshold		absent	When the field
, , ,				is absent, the
				UE applies
				the value 0.
rsrp-ThresholdSSB	Config 1, 2	dBm/	-98	Threshold
	-	SCS		used for
		kHz		$Q_{in\_LR\_SSB}$
	Config 3	dBm/	-95	Threshold
		SCS		used for
		kHz		$Q_{in\_LR\_SSB}$
powerControlOffsetS	S		db0	Used for
				deriving rsrp-
				ThresholdCSI
				-RS
beamFailureInstance	MaxCount		n1	see
				clause 5.17 of
				TS 38.321 [12
beamFailureDetection	nTimer		pbfd4	see
DeamrailureDelection			pbiu4	clause 5.17 of
				TS 38.321 [12
				10 00.021 [12
CSI-RS	Config 1		CSI-RS.1.1 FDD	•
configuration for	Config 2		CSI-RS.1.1 TDD	
CSI reporting	Config 3		CSI-RS.2.1 TDD	
CSI-RS for tracking	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
SSB Index assigned	as RLM RS		0, 1	
T310 Timer		ms	1000	
N310			2	
T1		S	1	During this
				time the UE
				shall be fully
				synchronized
				to cell 1
T2		S	5.17	
T3		S	3.24	
T4		S	0	
T5		S	1.97	
D1		S	1.93	
			prior to the start of t	ime period T1.
Note 2: UE-specifi	c PDCCH is not trans	smitted at	ter T1 starts.	

#### 6.5.5.2.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.2.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

- 3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.2.5-1. T2 starts.
- 4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.2.5-1. T3 starts.
- 5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.2.5-1. T4 starts.
- 6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.2.5-1. T5 starts.
- 7. If the SS:

a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1
 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B

and

c) detects preamble on a beam associated with the candidate beam set q1 before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. Switch the UE off and on. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

#### 6.5.5.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 4.6 and clause 7.3 with the following exceptions:

## Table 6.5.5.2.4.3-1: Common Exception messages for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

Default Message Contents				
Common contents of system information blocks exceptions				
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition SSB BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.5-4 Table H.3.7-1 with Condition DRX.7 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1			

#### Table 6.5.5.2.4.3-2: PDCCH Search Space for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162				
Information Element	Value/remark	Comment	Condition	
SearchSpace ::= SEQUENCE {				
searchSpaceId	4	BFR		
controlResourceSetId	2	BFR		
monitoringSlotPeriodicityAndOffset CHOICE {				
sl1	NULL			
}				
monitoringSymbolsWithinSlot	1000000000000	Symbol 0		
nrofCandidates SEQUENCE {				
aggregationLevel1	n0			
aggregationLevel2	n0			
aggregationLevel4	n0			
aggregationLevel8	n1	AL8		
aggregationLevel16	n0			
}				
searchSpaceType CHOICE {				
ue-Specific SEQUENCE {			USS	
dci-Formats	formats0-0-And-1-0	DCI Format 1_0		
}				
}				
}				

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## Table 6.5.5.2.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	Value/remark	Comment	Condition
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

## Table 6.5.5.2.4.3-4: Void

## Table 6.5.5.2.4.3-5: PDCCH-Config

Derivation Path: TS 38.501-1 [14], Table 4.6.3-95			
Information Element	Value/remark	Comment	Condition
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList	2 entries		
SEQUENCE(SIZE (13)) OF ControlResourceSet {			
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE	2 entries		
(110)) OF SearchSpace {			
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

## Table 6.5.5.2.4.3-6: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14], Table 7.3.1-15	5		
Information Element	Value/remark	Comment	Condition
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

#### 6.5.5.2.5 Test requirement

Tables 6.5.5.2.4.1-3 and 6.5.5.2.5-1 define the primary level settings including test tolerances for NR SA FR1 SSB-based beam failure detection and link recovery in DRX.

## Table 6.5.5.2.5-1: NR Cell specific test parameters for NR SA FR1 SSB-based beam failure detection and link recovery in DRX

Parameter	Unit	Test 1				
		T1	T2	T3	T4	T5

io of PDCCH DMI	RS to SSS	dB					
io of PDCCH to P	DCCH DMRS	dB					
io of PBCH DMRS	S to SSS	dB					
EPRE ratio of PBCH to PBCH DMRS		dB					
io of PSS to SSS		dB			0		
		dB					
io of PDSCH to P	DSCH DMRS	dB					
		dB					
io of OCNG to OC	CNG DMRS	dB					
B of set q₀	Config 1		5.8	-2.2	-12.8	-12.8	-12.8
		dB		-2.2		-12.8	-12.8
				-2.2	-12.8	-12.8	-12.8
				-10.2	10.2		10.2
B of set q1		dB					10.2
							10.2
	Config 1	dDm /C			-87.8	-87.8	-87.8
SSB_RP of set q1	Config 2		-108.2	-108.2	-87.8	-87.8	-87.8
	Config 3		-105.2	-105.2	-84.8	-84.8	-84.8
	Config 1	dBm/15			-98		
	Config 2	kHz			-98		
	Config 3				-98		
ion condition				TDL-	C 300ns 10	00Hz	
						constant t	otal
		ration for C	SI reporting	g are assigi	ned to the l	JE prior to t	the start
	1.						
		- 41					
The timers and I	ayer 3 filtering rel	ated param	eters are c	onfigurea p	rior to the s	start of time	period
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.							
SNR levels corre	espond to the sigr	al to noise	ratio over t	he SSS RE	S.		
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3							
		a LIE with 2	RX antenn	as connect	ed under te	est For all	F with
					·9 ·0, · •, •		,
	io of PDCCH to P io of PBCH DMRS io of PBCH to PB io of PSS to SSS io of PDSCH DMI io of PDSCH DMI io of OCNG DMR io of OCNG to OC B of set q0 B of set q1 B of set q1 B of set q1 CONG shall be to transmitted pow The uplink resound NZP CSI-RS reso of time period To Void. The timers and I T1. The signal conta SNR levels correct The SNR in time respectively in fi The SNR values 4RX antennas c	io of PSS to SSS io of PDSCH DMRS to SSS io of PDSCH to PDSCH DMRS io of OCNG DMRS to SSS io of OCNG to OCNG DMRS B of set q0 Config 2 Config 3 Config 1 B of set q1 Config 2 Config 3 Config 2 Config 3 Config 1 Config 2 Config 3 Config 1 Config 2 Config 3 Config 1 Config 2 Config 3 Config 1 Config 2 Config 3 Config 1 Config 2 Config 3 Config 3 Config 3 Config 1 Config 2 Config 3 Config 3 Config 1 Config 2 Config 3 Config 3 Config 3 Config 1 Config 2 Config 3 Config 1 Config 2 Config 3 Config 3 Config 3 Config 3 Config 3 Config 3 Config 3 Config 3 Config 3 Config 1 Config 2 Config 3 Config 4 Config 4 Config 5 Config 5 Config 5 Config 7 Config 7	io of PDCCH to PDCCH DMRS         dB           io of PBCH to PBCH DMRS         dB           io of PSS to SSS         dB           io of PDSCH DMRS to SSS         dB           io of PDSCH DMRS to SSS         dB           io of PDSCH DMRS to SSS         dB           io of OCNG DMRS to SSS         dB           io of OCNG DMRS to SSS         dB           io of OCNG to OCNG DMRS         dB           io of OCNG to OCNG DMRS         dB           io of Set q0         Config 1           Config 2         dB           Config 3         Config 2           dB         Config 1           dBm/S         CS kHz           Config 1         dBm/S           config 2         dB           config 1         dBm/S           config 2         kHz           Config 3         CS kHz           of set q1         Config 2           config 2         kHz           config 3         CS kHz           config 3         CS kHz           config 3         Config 3           of set q1         Config 1           dBm/S         CS kHz           config 3         CS kHz <t< td=""><td>io of PDCCH to PDCCH DMRS       dB         io of PBCH to PBCH DMRS       dB         io of PBCH to PBCH DMRS       dB         io of PDSCH DMRS to SSS       dB         io of PDSCH to PDSCH DMRS       dB         io of OCNG DMRS to SSS       dB         io of OCNG to OCNG DMRS       dB         B of set q0       Config 1         Config 2       dB         Config 1       5.8         Config 2       dB         B of set q1       Config 2         Config 1       -10.2         Config 1       -10.2         Config 2       dB         Config 3       -10.2         of set q1       Config 2       -108.2         Config 3       -10.2         of set q1       Config 2       -108.2         Config 3       -105.2       -108.2         Config 3       -105.2       -108.2         Config 3       CS kHz       -105.2         Config 3       Config 3       -105.2         Config 3       Config 3</td><td>io of PDCCH to PDCCH DMRS       dB         io of PBCH to PBCH DMRS       dB         io of PSS to SSS       dB         io of PDSCH DMRS to SSS       dB         io of PDSCH to PDSCH DMRS       dB         io of OCNG DMRS to SSS       dB         io of OCNG to OCNG DMRS       dB         io of OCNG to OCNG DMRS       dB         io of OCNG to OCNG DMRS       dB         B of set q0       Config 1         Config 2       dB         Config 3       -10.2         Config 1       -10.2         Config 2       dB         Config 3       -108.2         Config 1       -108.2         Config 2       CS kHz         Config 3       -105.2         Config 1       dBm/S         Config 2       CS kHz         Config 3       -105.2         Config 4       -105.2     &lt;</td><td>io of PDCCH to PDCCH DMRS dB io of PBCH DMRS to SSS dB io of PSS to SSS dB io of PDSCH DMRS to SSS dB io of PDSCH DMRS to SSS dB io of OCNG DMRS to SSS dB io of OCNG to OCNG DMRS dB B of set q0 Config 1 6.5.8 -2.2 -12.8 Config 2 dB 5.8 -2.2 -12.8 Config 1 -10.2 10.2 10.2 Config 1 -10.2 -10.2 10.2 Config 2 dB -10.2 -10.2 10.2 Config 3 -10.2 -10.2 -10.2 -10.2 Config 3 -10.2 -10.2 -10.2 -84.8 Config 1 dBm/15 -98 Config 2 KHz -98 Config 3 -98</td><td>io of PDCCH to PDCCH DMRS       dB         io of PBCH to PBCH DMRS       dB         io of PBCH to PBCH DMRS       dB         io of PSS to SSS       dB         io of PDSCH DMRS to SSS       dB         io of OCNG to CONG DMRS       dB         B of set q₀       Config 1         Config 2       dB         Config 1       -10.2         Config 2       dB         Config 3       -10.2         -10.2       10.2         B of set q1       Config 1         Config 2       CS kHz         Config 3       -10.2         -10.2       -10.2         0 set q1       Config 2         Config 1       dBm/5         -10.2       -10.2         Config 1       -10.2         -10.2       -10.2         -10.2       -10.2         Config 2       CS kHz         Config 3       -10.2         -00       -98         Config 2       kHz         &lt;</td></t<>	io of PDCCH to PDCCH DMRS       dB         io of PBCH to PBCH DMRS       dB         io of PBCH to PBCH DMRS       dB         io of PDSCH DMRS to SSS       dB         io of PDSCH to PDSCH DMRS       dB         io of OCNG DMRS to SSS       dB         io of OCNG to OCNG DMRS       dB         B of set q0       Config 1         Config 2       dB         Config 1       5.8         Config 2       dB         B of set q1       Config 2         Config 1       -10.2         Config 1       -10.2         Config 2       dB         Config 3       -10.2         of set q1       Config 2       -108.2         Config 3       -10.2         of set q1       Config 2       -108.2         Config 3       -105.2       -108.2         Config 3       -105.2       -108.2         Config 3       CS kHz       -105.2         Config 3       Config 3       -105.2         Config 3       Config 3	io of PDCCH to PDCCH DMRS       dB         io of PBCH to PBCH DMRS       dB         io of PSS to SSS       dB         io of PDSCH DMRS to SSS       dB         io of PDSCH to PDSCH DMRS       dB         io of OCNG DMRS to SSS       dB         io of OCNG to OCNG DMRS       dB         io of OCNG to OCNG DMRS       dB         io of OCNG to OCNG DMRS       dB         B of set q0       Config 1         Config 2       dB         Config 3       -10.2         Config 1       -10.2         Config 2       dB         Config 3       -108.2         Config 1       -108.2         Config 2       CS kHz         Config 3       -105.2         Config 1       dBm/S         Config 2       CS kHz         Config 3       -105.2         Config 4       -105.2     <	io of PDCCH to PDCCH DMRS dB io of PBCH DMRS to SSS dB io of PSS to SSS dB io of PDSCH DMRS to SSS dB io of PDSCH DMRS to SSS dB io of OCNG DMRS to SSS dB io of OCNG to OCNG DMRS dB B of set q0 Config 1 6.5.8 -2.2 -12.8 Config 2 dB 5.8 -2.2 -12.8 Config 1 -10.2 10.2 10.2 Config 1 -10.2 -10.2 10.2 Config 2 dB -10.2 -10.2 10.2 Config 3 -10.2 -10.2 -10.2 -10.2 Config 3 -10.2 -10.2 -10.2 -84.8 Config 1 dBm/15 -98 Config 2 KHz -98 Config 3 -98	io of PDCCH to PDCCH DMRS       dB         io of PBCH to PBCH DMRS       dB         io of PBCH to PBCH DMRS       dB         io of PSS to SSS       dB         io of PDSCH DMRS to SSS       dB         io of OCNG to CONG DMRS       dB         B of set q₀       Config 1         Config 2       dB         Config 1       -10.2         Config 2       dB         Config 3       -10.2         -10.2       10.2         B of set q1       Config 1         Config 2       CS kHz         Config 3       -10.2         -10.2       -10.2         0 set q1       Config 2         Config 1       dBm/5         -10.2       -10.2         Config 1       -10.2         -10.2       -10.2         -10.2       -10.2         Config 2       CS kHz         Config 3       -10.2         -00       -98         Config 2       kHz         <

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.5.3 NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

### 6.5.5.3.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link

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recovery, when no DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 6.5.5.3.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM and link recovery.

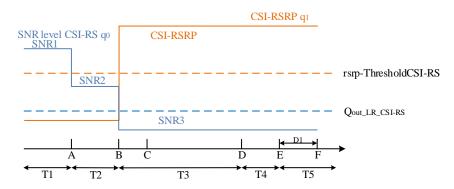
#### 6.5.5.3.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.3.

#### 6.5.5.3.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.3.4-1 shows the five different time durations and the corresponding variation of the downlink SNR of the CSI-RS in set q0 in the active cell to emulate CSI-RS based beam failure and the variation of the downlink L1-RSRP of the CSI-RS in set q1 of the candidate beam used for link recovery.



## Figure 6.5.5.3.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

#### 6.5.5.3.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.3.4.1-1.

## Table 6.5.5.3.4.1-1: Supported test configurations for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Configuration	Description		
6.5.5.3-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth		
6.5.5.3-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth		
6.5.5.3-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth		
Note: The UE is only required to pass in one of the supported test configurations in FR1			

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.3.4.1-2.

## Table 6.5.5.3.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Parameter		Value	Comment	
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies	As specified	in Annex E, table E.4-1 and TS 38.	.508-1 [14] clause 4.3.1 and 4.4.2.	
Channel bandwidth	As specified	by the test configuration selected from Table 6.5.5.3.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2.	
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		
Exceptions to connection diagram		pable UEs without any 2Rx RF		

- 1. The general test parameter settings are set up according to Table 6.5.5.3.4.1-3.
- 2. Message contents are defined in clause 6.5.5.3.4.3.
- 3. There is one NR carrier and one NR cell specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

# Table 6.5.5.3.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Parame	ter	Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Number			1	
Duplex mode	Config 1	_	FDD	
TDD Configuration	Config 2, 3		TDD	
TDD Configuration	Config 1 Config 2	_	Not Applicable TDDConf.1.1	
	Config 3	_	TDDConf.2.1	
CORESET Reference	Config 1		CR.1.1 FDD	
Channel	Config 2	-	CR.1.1 TDD	-
	Config 3	-	CR.2.1 TDD	-
SSB Configuration	Config 1		SSB.3 FR1	
3	Config 2		SSB.3 FR1	
	Config 3		SSB.4 FR1	
SMTC Configuration	Config 1, 2		SMTC.1	
-	Config 3		SMTC.1	
PDSCH/PDCCH	Config 1, 2		15 KHz	
subcarrier spacing	Config 3	-	30 KHz	
PRACH Configuration	Config 1, 2		PRACH.4 FR1	
a la le l'é é é l'ingélétien	Config 3	_	PRACH.4 FR1	-
csi-RS-Index assigned as b	-		0	
RS in set q₀				
OCNG parameters			OP.1	
CP length	0		Normal	
Correlation Matrix and Ante	-		2x2 Low	
Beam failure detection	DCI format		1-0	
transmission parameters	Number of Control OFDM symbols		2	
	Aggregation level	CCE	8	
	Ratio of	dB	0	
	hypothetical			
	PDCCH RE energy			
	to average CSI-RS			
	RE energy Ratio of	dB	0	
	hypothetical	uБ	0	
	PDCCH DMRS			
	energy to average			
	CSI-RS RE energy			
	DMRS precoder		REG bundle size	
	granularity			
	REG bundle size		6	
DRX			OFF	
Gap pattern ID			N.A.	
csi-RS-Index assigned as o	andidate beam		1	N
detection RS in set q <sub>1</sub>	hald		abaar t	\//box 4b x 4' - 1 -1 ' -
rlmInSyncOutOfSyncThres	ΠΟΙΟ		absent	When the field is
				absent, the UE applies the value 0.
rsrp-ThresholdSSB	Config 1, 2	dBm/SCS kHz	-98	Threshold used for
	50mg 1, 2		30	Qin_LR_SSB
	Config 3	dBm/SCS kHz	-95	Threshold used for
	Ŭ.			$Q_{in\_LR\_SSB}$
powerControlOffsetSS			db0	Used for deriving rsrp- ThresholdCSI-RS
beamFailureInstanceMaxCount			n1	see TS 38.321 [12], section 5.17
beamFailureDetectionTimer			pbfd4	see TS 38.321 [12],
CSI-RS configuration for	Config 1		CSI-RS.1.2 FDD	section 5.17
q <sub>0</sub> and q <sub>1</sub>	Config 2	-	CSI-RS.1.2 FDD CSI-RS.1.2 TDD	4
	Config 3	-	CSI-RS.2.2 TDD	4
	Config 1	+	CSI-RS.1.1 FDD	
		I		1

CSI-RS configuration for	Config 2		CSI-RS.1.1 TDD	
CSI reporting	Config 3		CSI-RS.2.1 TDD	7
TRS configuration	Config 1		TRS.1.1 FDD	
	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned	Config 1		CSI-RS.1.2 FDD	
as RLM RS	Config 2		CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		S	0.2	During this time the UE shall be fully synchronized to cell 1
T2		S	0.18	
Т3		S	0.14	
T4		S	0	
T5		S	0.08	
D1		S	0.04	
Note 1: UE-specific PD0	CCH is not transmitte	ed after T1 starts.		

## 6.5.5.3.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.3.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

- 3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.3.5-1. T2 starts.
- 4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.3.5-1. T3 starts.
- 5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.3.5-1. T4 starts.
- 6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.3.5-1. T5 starts.
- 7. If the SS:
  - a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1
     [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B

and

c) detects preamble on a beam associated with the candidate beam set  $q_1$  before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. Switch the UE off and on. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

## 6.5.5.3.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

## Table 6.5.5.3.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Default Message Contents				
Common contents of system information blocks exceptions				
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition CSI-RS Table H.3.1-10A Table H.3.1-11 with Condition CSI-RS Table H.3.5-4 Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1			

## Table 6.5.5.3.4.3-2: PDCCH Search Space for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	Value/remark	Comment	Condition
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	1000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

## Table 6.5.5.3.4.3-3: RLF-TimersAndConstants

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	Value/remark	Comment	Condition
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

## Table 6.5.5.3.4.3-4: Void

#### Table 6.5.5.3.4.3-5: NZP-CSI-RS-Resource

#### Derivation Path: TS 38.508-1 [14]. Table 4.6.3-85

Information Element	Value/remark	Comment	Condition
NZP-CSI-RS-Resource ::= SEQUENCE {			
powerControlOffsetSS	db0		
}			

Derivation Path: TS 38.501-1 [14], Table 4.6.3-95				
Information Element	Value/remark	Comment	Condition	
PDCCH-Config ::= SEQUENCE {				
controlResourceSetToAddModList	2 entries			
SEQUENCE(SIZE (13)) OF ControlResourceSet {				
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR		
}				
controlResourceSetToReleaseList	Not present			
searchSpacesToAddModList SEQUENCE(SIZE	2 entries			
(110)) OF SearchSpace {				
SearchSpace[2]	SearchSpace	entry 2, BFR		
}				
searchSpacesToReleaseList	Not present			
downlinkPreemption	Not present			
tpc-PUSCH	Not present			
tpc-PUCCH	Not present			
tpc-SRS	Not present			
}				

## Table 6.5.5.3.4.3-6: PDCCH-Config

## Table 6.5.5.3.4.3-7: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14], Table 7.3.1-15			
Information Element	Value/remark	Comment	Condition
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

## 6.5.5.3.5 Test requirement

Tables 6.5.5.3.4.1-3 and 6.5.5.3.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX.

## Table 6.5.5.3.5-1: NR Cell specific test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in non-DRX

Paramet	er	Unit	Test 1				
			T1	T2	Т3	T4	Т5
EPRE ratio of PDCCH D	MRS to SSS	dB					
EPRE ratio of PDCCH to	PDCCH DMRS	dB					
EPRE ratio of PBCH DM	RS to SSS	dB					
EPRE ratio of PBCH to F	BCH DMRS	dB					
EPRE ratio of PSS to SS	S	dB			0		
EPRE ratio of PDSCH D	MRS to SSS	dB					
EPRE ratio of PDSCH to	PDSCH DMRS	dB					
EPRE ratio of OCNG DM	IRS to SSS	dB					
EPRE ratio of OCNG to (	DCNG DMRS	dB					
SNR_CSI-RS of set q <sub>0</sub>	Config 1		5.8	-2.2	-12.8	-12.8	-12.8
	Config 2	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 3		5.8	-2.2	-12.8	-12.8	-12.8
	Config 1		-10.2	-10.2	10.2	10.2	10.2
SNR_CSI-RS of set q1	Config 2	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 3		-10.2	-10.2	10.2	10.2	10.2
CSI-RS_RP of set q1	Config 1		-108.2	-108.2	-87.8	-87.8	-87.8

	Config 2	dBm/S	-108.2	-108.2	-87.8	-87.8	-87.8
	Config 3	CS kHz	-105.2	-105.2	-84.8	-84.8	-84.8
M	Config 1	dBm/15		•	-98		
N <sub>oc</sub>	Config 2	kHz			-98		
	Config 3				-98		
Propagat	tion condition			TDL-	C 300ns 10	00Hz	
Note 1:	OCNG shall be used such that the	e resources	in Cell 1 a	re fully alloo	cated and a	constant t	otal
	transmitted power spectral density	is achieve	ed for all OF	DM symbo	ls.		
Note 2:	The uplink resources for CSI repo	rting are as	signed to t	he UE prior	to the star	t of time pe	riod T1.
Note 3:	NZP CSI-RS resource set configu	ration for C	SI reporting	g are assigi	ned to the l	JE prior to	the start
	of time period T1.						
Note 4:	Void						
Note 5:	The timers and layer 3 filtering relation	ated param	eters are c	onfigured p	rior to the s	start of time	period
	T1.						
Note 6:	The signal contains PDCCH for U	Es other the	an the devi	ce under te	st as part c	of OCNG.	
Note 7:	SNR levels correspond to the sign	al to noise	ratio over t	he REs car	rying CSI-F	RS.	
Note 8:	te 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3						
	respectively in figure 6.5.5.3.4-1.						
Note 9:							
	4RX antennas connected under te			set q0 durii	ng T3, T4, a	and T5 fron	n D.4.1.1,
	is -15dB-TT = -15.8dB (including t	est tolerand	ces).				

The UE behaviour in each test during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = 40 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.5.4 NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

#### 6.5.5.4.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct CSI-RS-based link recovery based on beam candidate set  $q_1$ . To test the downlink monitoring for beam failure detection within the UEs active DL BWP, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the CSI-RS based beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 6.5.5.4.2 Test applicability

This test applies to all types of NR UE release 15 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, link recovery and long DRX cycle.

#### 6.5.5.4.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.4.

#### 6.5.5.4.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.4.4-1 shows the five different time durations and the corresponding variation of the downlink SNR in the active

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cell to emulate CSI-RS based beam failure. Figure 6.5.5.4.4-1 additionally shows the variation of the downlink L1-RSRP of the CSI-RS in set  $q_1$  of the candidate beam used for link recovery.

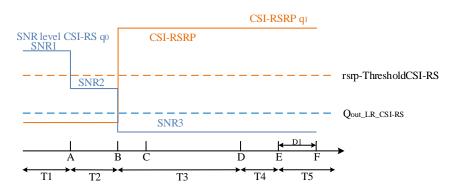


Figure 6.5.5.4.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

#### 6.5.5.4.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.4.4.1-1.

Table 6.5.5.4.4.1-1: Supported test configurations for NR SA FR1 CSI-RS-based beam failure
detection and link recovery in DRX

Configuration	Description		
6.5.5.4-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth		
6.5.5.4-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth		
6.5.5.4-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth		
Note: The UE is only required to pass in one of the supported test configurations in FR1			

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.4.4.1-2.

## Table 6.5.5.4.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Value	Comment		
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.		
Test frequencies	As specified	in Annex E, table E.4-1 and TS 38.	508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified	by the test configuration selected from Table 6.5.5.4.4.1-1.			
Propagation conditions	AWGN	As specified in Annex C.2.2.			
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.		
Diagram	DUT Part	A.3.2.3.4			
Exceptions to connection diagram		pable UEs without any 2Rx RF			

- 1. The general test parameter settings are set up according to Table 6.5.5.4.4.1-3.
- 2. Message contents are defined in clause 6.5.5.4.4.3.
- 3. There is one NR carrier and one NR cells specified in the test. Cell 1 is the NR cell used for connection setup with the power level set according to Annex C.1.2 and C.1.3 for this test.

# Table 6.5.5.4.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit	Value Test 1	Comment
Active PCell			Cell 1	
RF Channel Numb	per		1	
Duplex mode	Config 1		FDD	
I	Config 2, 3		TDD	
TDD	Config 1		Not Applicable	
Configuration	Config 2		TDDConf.1.1	
C C	Config 3		TDDConf.2.1	
CORESET	Config 1		CR.1.1 FDD	
Reference	Config 2		CR.1.1 TDD	
Channel	Config 3		CR.2.1 TDD	
SSB	Config 1		SSB.3 FR1	
Configuration	Config 2		SSB.3 FR1	
J	Config 3		SSB.4 FR1	
SMTC	Config 1, 2		SMTC.1	
Configuration	Config 3		SMTC.1	
PDSCH/PDCCH	Config 1, 2		15 KHz	
subcarrier	-			
spacing	Config 3		30 KHz	
PRACH	Config 1, 2		PRACH.4 FR1	
Configuration	Config 3		PRACH.4 FR1	
csi-RS-Index assig	gned as beam failure		0	
OCNG parameters			OP.1	
CP length	5		Normal	
Correlation Matrix	and Antenna		2x2 Low	
Configuration	and Antenna		ZXZ LOW	
Beam failure	DCI format		1-0	
detection	Number of Control		2	
transmission	OFDM symbols		2	
parameters	Aggregation level	CCE	8	
parameters	Ratio of hypothetical	dB	0	
	PDCCH RE energy to average CSI-RS RE energy	uв	0	
	Ratio of hypothetical PDCCH DMRS energy to average CSI-RS RE energy	dB	0	
	DMRS precoder		REG bundle size	
	granularity REG bundle size		6	+
DRX	REG buildle size		DRX.7	
		-	N.A.	
Gap pattern ID	gned as candidate beam		<u>N.A.</u> 1	
detection RS in se	t a		I	
rlmInSyncOutOfSy			absent	When the field is absent, the UE applies the value 0.
rsrp-	Config 1, 2	dBm/S	-98	Threshold used for
ThresholdSSB		CS kHz	50	Qin_LR_SSB
mesholdoob	Config 3	dBm/S CS kHz	-95	Threshold used for Qin_LR_SSB
powerControlOffse	etSS	00 1112	db0	Used for deriving rsrp-ThresholdCSI- RS
beamFailureInstar	nceMaxCount		n1	see TS 38.321 [12], section 5.17
beamFailureDetec	tionTimer		pbfd4	see TS 38.321 [12], section 5.17
CSI-RS	Config 1		CSI-RS.1.2 FDD	
configuration for	Config 2	]	CSI-RS.1.2 TDD	]
configuration for				
q <sub>0</sub> and q <sub>1</sub>	Config 3		CSI-RS.2.2 TDD	

CSI-RS	Config 2		CSI-RS.1.1 TDD	
configuration for	Config 3		CSI-RS.2.1 TDD	
CSI reporting				
TRS	Config 1		TRS.1.1 FDD	
configuration	Config 2		TRS.1.1 TDD	
	Config 3		TRS.1.2 TDD	
CSI-RS-Index	Config 1		CSI-RS.1.2 FDD	
assigned as	Config 2		CSI-RS.1.2 TDD	
RLM RS	Config 3		CSI-RS.2.2 TDD	
T310 Timer		ms	1000	
N310			2	
T1		S	1	During this time the
				UE shall be fully
				synchronized to cell
				1
T2		S	8.37	
Т3		s	6.44	
T4		S	0	
T5		S	1.97	
D1		S	1.93	
Note 1: UE-spe	cific PDCCH is not transm	itted after 7	1 starts.	

## 6.5.5.4.4.2 Test procedure

Prior to the start of the time duration T1, the UE shall be fully synchronized to NR Cell 1. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is enabled.

1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

2. Set the parameters of NR Cell 1 according to T1 in Table 6.5.5.4.5-1. Propagation conditions are set according to Annex C.2.3. T1 starts.

- 3. When T1 expires the SS shall change the SNR value to T2 as specified in Table 6.5.5.4.5-1. T2 starts.
- 4. When T2 expires the SS shall change the SNR value to T3 as specified in Table 6.5.5.4.5-1. T3 starts.
- 5. When T3 expires the SS shall change the SNR value to T4 as specified in Table 6.5.5.4.5-1. T4 starts.
- 6. When T4 expires the SS shall change the SNR value to T5 as specified in Table 6.5.5.4.5-1. T5 starts.
- 7. If the SS:
  - a) detects uplink power on NR carrier equal to or higher than minimum output power defined in TS 38.521-1
     [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on a beam associated with the candidate beam set q1before time point B

and

c) detects preamble on a beam associated with the candidate beam set  $q_1$  before time point F (D1 after the start of T5),

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. Switch the UE off and on. Ensure the UE is in RRC\_CONNECTED with generic procedure parameters Connectivity NR, Connected without release On and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.

9. Repeat steps 2-8 for all subtests until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

## 6.5.5.4.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

## Table 6.5.5.4.4.3-1: Common Exception messages for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

	Default Message Contents				
Common contents of system information					
blocks exceptions					
Default RRC messages and information	Table H.3.1-8 with Condition CSI-RS BFD				
elements contents exceptions	Table H.3.1-10 with Condition CSI-RS				
	Table H.3.1-10A				
	Table H.3.1-11 with Condition CSI-RS				
	Table H.3.5-4				
	Table H.3.7-1 with Condition DRX.7Table 7.3.1-3 in TS 38.508-1 [14]				
	with condition SMTC.1				

## Table 6.5.5.4.4.3-2: PDCCH Search Space for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	Value/remark	Comment	Condition
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	1000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

## Table 6.5.5.4.4.3-3: RLF-TimersAndConstants

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	Value/remark	Comment	Condition
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

## Table 6.5.5.4.4.3-4: Void

### Table 6.5.5.3.4.3-5: NZP-CSI-RS-Resource

Derivation Path: TS 38.508-1 [14], Table 4.6.3-85			
Information Element	Value/remark	Comment	Condition
NZP-CSI-RS-Resource ::= SEQUENCE {			
powerControlOffsetSS	db0		
}			

Table	6.5.5.4.4.3-6: PDCCH-Config	
-------	-----------------------------	--

Derivation Path: TS 38.501-1 [14], Table 4.6.3-95				
Information Element	Value/remark	Comment	Condition	
PDCCH-Config ::= SEQUENCE {				
controlResourceSetToAddModList	2 entries			
SEQUENCE(SIZE (13)) OF ControlResourceSet {				
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR		
}				
controlResourceSetToReleaseList	Not present			
searchSpacesToAddModList SEQUENCE(SIZE	2 entries			
(110)) OF SearchSpace {				
SearchSpace[2]	SearchSpace	entry 2, BFR		
}				
searchSpacesToReleaseList	Not present			
downlinkPreemption	Not present			
tpc-PUSCH	Not present			
tpc-PUCCH	Not present			
tpc-SRS	Not present			
}				

## Table 6.5.5.4.4.3-7: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14], Table 7.3.1-15			
Information Element	Value/remark	Comment	Condition
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

## 6.5.5.4.5 Test requirement

Tables 6.5.5.4.4.1-3 and 6.5.5.4.5-1 define the primary level settings including test tolerances for NR SA FR1 CSI-RSbased beam failure detection and link recovery in DRX.

## Table 6.5.5.4.5-1: NR Cell specific test parameters for NR SA FR1 CSI-RS-based beam failure detection and link recovery in DRX

Parameter		Unit			Test 1		
			T1	T2	Т3	T4	T5
EPRE ratio of PDCCH DMF	RS to SSS	dB		•		•	
EPRE ratio of PDCCH to PI	DCCH DMRS	dB					
EPRE ratio of PBCH DMRS	to SSS	dB					
EPRE ratio of PBCH to PBC	CH DMRS	dB					
EPRE ratio of PSS to SSS		dB			0		
EPRE ratio of PDSCH DMR	S to SSS	dB					
EPRE ratio of PDSCH to PI	DSCH DMRS	dB					
EPRE ratio of OCNG DMRS	S to SSS	dB					
EPRE ratio of OCNG to OC	NG DMRS	dB					
SNR_CSI-RS of set q <sub>0</sub>	Config 1		5.8	-2.2	-12.8	-12.8	-12.8
	Config 2	dB	5.8	-2.2	-12.8	-12.8	-12.8
	Config 3		5.8	-2.2	-12.8	-12.8	-12.8
	Config 1		-10.2	-10.2	10.2	10.2	10.2
SNR_CSI-RS of set q1	Config 2	dB	-10.2	-10.2	10.2	10.2	10.2
	Config 3		-10.2	-10.2	10.2	10.2	10.2
CSI-RS_RP of set q1	Config 1		-108.2	-108.2	-87.8	-87.8	-87.8

		Config 2	dBm/S	-108.2	-108.2	-87.8	-87.8	-87.8
		Config 3	CS kHz	-105.2	-105.2	-84.8	-84.8	-84.8
M		Config 1	dBm/15		•	-98	•	
N <sub>oc</sub>		Config 2	kHz			-98		
		Config 3				-98		
Propagat	tion condition				TDL-	C 300ns 10	00Hz	
Note 1:	OCNG shall be us	ed such that the	e resources	in Cell 1 a	re fully alloo	cated and a	constant t	otal
	transmitted power							
Note 2:	The uplink resource	ces for CSI repo	rting are as	signed to t	he UE prior	to the star	t of time pe	riod T1.
Note 3: NZP CSI-RS resource set configuration for CSI reporting are assigned to the UE prior to the st				the start				
	of time period T1.							
Note 4:	Void							
Note 5:	The timers and lay	er 3 filtering rela	ated param	eters are c	onfigured p	rior to the s	start of time	period
	T1.							
Note 6:	The signal contain	is PDCCH for U	Es other the	an the devi	ce under te	st as part c	of OCNG.	
Note 7:	e 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.							
Note 8:	Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3							
	respectively in figure 6.5.5.4.4-1.							
Note 9:								
	4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1,					n D.4.1.1,		
	is -15dB-TT = -15.	.8dB (including t	is -15dB-TT = -15.8dB (including test tolerances).					

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = 1930 ms after the start of T5, the UE shall transmit preamble on a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble on a beam associated with the candidate beam set  $q_1$  earlier than time point B.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# 6.5.5.5 NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

#### 6.5.5.5.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . To test the downlink monitoring for beam failure detection within the UEs active DL BWP without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when no DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 6.5.5.5.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, SSB link recovery and SCell beam failure recovery.

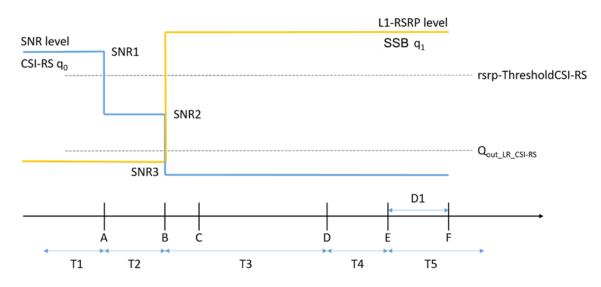
#### 6.5.5.5.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2 and 6.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.5.

#### 6.5.5.5.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.5.4-1 shows the SNR of the CSI-RS in set  $q_0$  in the active SCell to emulate beam failure. Figure 6.5.5.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery.



### Figure 6.5.5.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

6.5.5.5.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.4.1-1.

Configuration	Description	
6.5.5.5-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth	
6.5.5.5-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth	
6.5.5.5-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth	
Note: The UE is only required to pass in one of the supported test configurations in FR1		

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.4.1-2.

## Table 6.5.5.5.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

Parameter		Value	Comment			
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.			
Test frequencies	As specified	in Annex E, table E.4-1 and TS 38.	.508-1 [14] clause 4.3.1 and 4.4.2.			
Channel bandwidth	As specified	As specified by the test configuration selected from Table 6.5.5.5.4.1-1.				
Propagation conditions	AWGN		As specified in Annex C.2.2.			
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.			
Diagram	DUT Part	A.3.2.3.4				
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part					

1. The general test parameter settings are set up according to Table 6.5.5.4.1-3.

- 2. Message contents are defined in clause 6.5.5.4.3.
- 3. There is one NR carrier and two NR cells specified in the test. Cell 1 is the NR cell (PCell) used for connection setup and Cell 2 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test.

## Table 6.5.5.5.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

Parameter		Unit	Value	Comment
			Test 1	
A (; DO !!			0 11 4	
	Active PCell RF Channel Number for PCell		Cell 1	
	ber for PCell		1	
Active SCell			Cell 2	
RF Channel Num			2	
Duplex mode	Config 1		FDD	
<u></u>	Config 2, 3		TDD	
BW channel	Config 1		10: NRB,c = 52	
	Config 2	MHz	10: NRB,c = 52	
	Config 3		40: NRB,c = 106	
TDD	Config 1		Not Applicable	
Configuration	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET	Config 1		CR.1.1 FDD	A.1.2
Reference	Config 2		CR.1.1 TDD	
Channel	Config 3		CR.2.1 TDD	
SSB	Config 1		SSB.1 FR1	A.3
Configuration	Config 2		SSB.1 FR1	
	Config 3		SSB.2 FR1	
SMTC	Config 1, 2		SMTC.1	A.4
Configuration	Config 3		SMTC.1	
PDSCH/PDCCH	Config 1, 2	kHz	15	
subcarrier spacing	Config 3		30	
PRACH	Config 1, 2		PRACH.2 FR1	Table A.7.1-1
Configuration	Config 3		PRACH.2 FR1	Table A.7.1-1
	gned as beam failure		0	
detection RS in se	et q <sub>0</sub> in activated SCell			
OCNG parameter	S		OP.1	A.2.1
CP length			Normal	
Correlation Matrix Configuration	and Antenna		2x2 Low	
Beam failure	DCI format		1-0	
detection transmission	Number of Control OFDM symbols		2	
parameters	Aggregation level	CCE	8	
	Ratio of	dB	0	
	hypothetical PDCCH RE energy to average CSI-RS	-		
	RE energy			
	Ratio of hypothetical PDCCH DMRS energy to average	dB	0	
	CSI-RS RE energy DMRS precoder		REG bundle size	
	granularity REG bundle size		6	
	IVEG DULIDIE SIZE		0	

DRX		1 1	OFF	
Gap pattern ID			 N.A.	
schedulingRequestID-E			absent	When the field is
schedulingrequestid-b			absent	absent, the random
				access procedure
				will be triggered for
				SCell BFR
SSB Index assigned as	CBD RS (a1) in		0	00011 01 11
activated SCell	022110(41)		C C	
rlmInSyncOutOfSyncTh	reshold		absent	When the field is
				absent, the UE
				applies the value 0.
				(TS 38.133 [6]
				Table 8.1.1-1).
	onfig 1, 2	dBm/SCS	-98	Threshold used for
	onfig 3	kHz	-95	Qin_LR_SSB
powerControlOffsetSS			db0	Used for deriving
				rsrp-ThresholdCSI-
				RS
beamFailureInstanceMa	IxCount		n1	see clause 5.17 of
				TS 38.321 [12]
beamFailureDetectionT	mer		pbfd4	see clause 5.17 of
		_		TS 38.321 [12]
CSI-RS configuration fo	ÿ		CSI-RS.1.2 FDD	A.1.4
q <sub>0</sub> in activated SCell	Config 2	-	CSI-RS.1.2 TDD	
	Config 3		CSI-RS.2.2 TDD	
CSI-RS configuration fo			CSI-RS.1.1 FDD	A.1.4
CSI reporting	Config 2		CSI-RS.1.1 TDD	_
TDC configuration	Config 3		CSI-RS.2.1 TDD	
TRS configuration	Config 1		TRS.1.1 FDD TRS.1.1 TDD	
	Config 2			
	Config 3		TRS.1.2 TDD	
CSI-RS-Index assigned RLM RS in PCell	Ų		CSI-RS.1.2 FDD	A.1.4
KLIVI KO IN POEII	Config 2		CSI-RS.1.2 TDD	_
T310 Timer	Config 3		CSI-RS.2.2 TDD	
		ms	1000	
N310 T1		s	2 0.2	During this time the
		5	0.2	UE shall be fully
				synchronized to cell
T2		S	0.18	•
T3		S	0.14	
T4		S	0	
T5		S	0.17	
D1		s	0.13	
	DCCH is not tra			1

#### 6.5.5.5.4.2 Test procedure

Same test procedure as described in section 6.5.5.3.4.2, except following exception and steps 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

- 7. If the SS:
  - a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on the PCell before time point B

and

c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

And

d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameter *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

6.5.5.5.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

## Table 6.5.5.4.3-1: Common Exception messages for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

Default Message Contents				
Common contents of system information				
blocks exceptions				
Default RRC messages and information	Table H.3.1-8 with Condition CSI-RS BFD			
elements contents exceptions	Table H.3.1-10 with Condition SSB			
	Table H.3.1-10A			
	Table H.3.5-4			
	Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1			

#### Table 6.5.5.5.4.3-2: PDCCH Search Space for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162							
Information Element	Value/remark	Comment	Condition				
SearchSpace ::= SEQUENCE {							
searchSpaceId	4	BFR					
controlResourceSetId	2	BFR					
monitoringSlotPeriodicityAndOffset CHOICE {							
sl1	NULL						
}							
monitoringSymbolsWithinSlot	1000000000000	Symbol 0					
nrofCandidates SEQUENCE {							
aggregationLevel1	n0						
aggregationLevel2	n0						
aggregationLevel4	n0						
aggregationLevel8	n1	AL8					
aggregationLevel16	n0						
}							
searchSpaceType CHOICE {							
ue-Specific SEQUENCE {			USS				
dci-Formats	formats0-0-And-1-0	DCI Format 1_0					
}							
}							
}							

1245

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	Value/remark	Comment	Condition
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

## Table 6.5.5.5.4.3-4: PDCCH-Config

Derivation Path: TS 38.501-1 [14], Table 4.6.3-95			
Information Element	Value/remark	Comment	Condition
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList	2 entries		
SEQUENCE(SIZE (13)) OF ControlResourceSet {			
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE	2 entries		
(110)) OF SearchSpace {			
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		
}			

## Table 6.5.5.5.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14], Table 7.3.1-15	5			
Information Element	Value/remark	Comment	Condition	
ControlResourceSet ::= SEQUENCE {				
controlResourceSetId	2			
duration	2			
cce-REG-MappingType CHOICE {				
interleaved ::= SEQUENCE {				
reg-BundleSize	n6			
interleaverSize	n2			
shiftIndex	0			
}				
tci-StatesPDCCH-ToAddList	Not present			
}				

## 6.5.5.5.5 Test requirement

Tables 6.5.5.5.4.1-3 and 6.5.5.5-1 define the primary level settings including test tolerances for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX.

## Table 6.5.5.5-1: NR Cell specific test parameters for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in non-DRX

Parameter	Unit	Cell1			Fest 1 Cell2	2	
		T1 to T5	T1	T2	T3	T4	T5

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EPRE rat SSS	io of PDCCH	DMRS to	dB						
	io of PDCCH	to PDCCH	dB						
EPRE rat SSS	io of PBCH DI	MRS to	dB						
EPRE rat	io of PBCH to	PBCH	dB						
EPRE rat	io of PSS to S	SSS	dB	0			0		
EPRE rat SSS	io of PDSCH	DMRS to	dB						
EPRE rat DMRS	io of PDSCH 1	to PDSCH	dB						
EPRE rat SSS	io of OCNG D	MRS to	dB						
EPRE rat	io of OCNG to	OCNG	dB						
SNR CS	I-RS of set	Config 1	dB	5	5.8	-2.2	-12.8	-12.8	-12.8
		Config 2		5	5.8	-2.2	-12.8	-12.8	-12.8
<b>4</b> 0		Config 3		5	5.8	-2.2	-12.8	-12.8	-12.8
		Config 1	dB	-10	-10.2	-10.2	10.2	10.2	10.2
SNR_SS	SNR_SSB of set q <sub>1</sub>	Config 2		-10	-10.2	-10.2	10.2	10.2	10.2
		Config 3		-10	-10.2	-10.2	10.2	10.2	10.2
	SSB_RP of set q <sub>1</sub>		dBm/	-108	-108.2	-108.2	-87.8	-87.8	-87.8
SSB_RP			SCS kHz	-108	-108.2	-108.2	-87.8	-87.8	-87.8
		Config 3		-105	-105.2	-105.2	-84.8	-84.8	-84.8
		Config 1	dBm/	-98			-98		
$N_{oc}$		Config 2	15kHz	-98			-98		
		Config 3		-98			-98		
Propagat	ion condition			TDL-C		TDL·	-C 300ns 10	00Hz	
				300ns					
Note 4		h		100Hz					
Note 1:	OCNG shall transmitted p						a and a col	nstant total	
Note 2:	The uplink re						he start of	time period	Т1
Note 3:	NZP CSI-RS								
1000 0.	time period 1		. oomgala		oporting al	e acorgrieu			
Note 4:	Void								
Note 5:		nd layer 3 fil	tering relate	ed parameter	rs are confi	gured prior	to the start	of time pe	riod T1.
Note 5: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1. Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.									
Note 7: SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.									
Note 8: The SNR in time periods T1, T2, T3, T4 and T5 is denoted as SNR1, SNR2 and SNR3 respectively in									
Note 9:	figure 6.5.5.5.4-1. Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX antennas connected under test, the SNR for RS in set q0 during T3, T4, and T5 from D.4.1.1, is -								
15dB-TT = -15.8dB (including test tolerances).									

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

# 6.5.5.6 NR SA FR1 Scell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

## 6.5.5.6.1 Test purpose

The purpose of this test is to verify that the UE properly detects CSI-RS-based beam failure in the set  $q_0$  configured for a serving cell and that the UE performs correct SSB-based link recovery based on beam candidate set  $q_1$ . To test the downlink monitoring for beam failure detection within the UEs active DL BWP without *schedulingRequestID-BFR-SCell-r16* configuration, during the evaluation period, and link recovery, when DRX is used. This test will partly verify the beam failure detection and link recovery for an FR1 serving cell requirements in TS 38.133 [6] clause 8.5.

#### 6.5.5.6.2 Test applicability

This test applies to all types of NR UE release 16 and forward supporting 5GS NR SA FR1, CSI-RS based RLM, SSB link recovery and SCell beam failure recovery.

#### 6.5.5.6.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.5.0.2 and 6.5.5.0.4.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.5.6.

### 6.5.5.6.4 Test description

The test consists of five successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Figure 6.5.5.6.4-1 shows the SNR of the CSI-RS in set  $q_0$  in the active SCell to emulate beam failure. Figure 6.5.5.6.4-1 additionally shows the variation of the downlink L1-RSRP of the SSB in set  $q_1$  of the candidate beam used for link recovery.

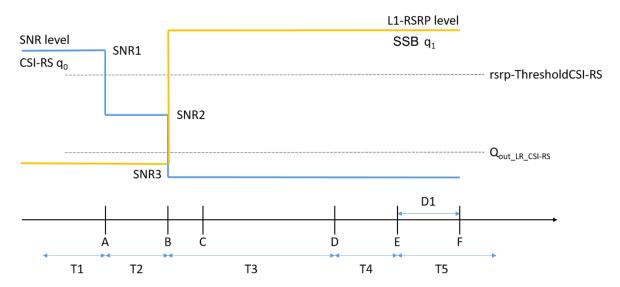


Figure 6.5.5.6.4-1: SNR and L1-RSRP variation for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery for SCell in DRX

### 6.5.5.6.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.5.6.4.1-1.

Table 6.5.5.6.4.1-1: Supported test configurations for FR1 PCell and SCell

Configuration	Description				
6.5.5.6-1	FDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth				
6.5.5.6-2	TDD duplex mode, 15 kHz SSB SCS, 10MHz bandwidth				
6.5.5.6-3	TDD duplex mode, 30 kHz SSB SCS, 40MHz bandwidth				
Note: The UE is only required to pass in one of the supported test configurations in FR1					

Configure the test equipment and the DUT according to the parameters in Table 6.5.5.6.4.1-2.

## Table 6.5.5.6.4.1-2: Initial conditions for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery for SCell in DRX

Parameter		Value	Comment		
Test environment	environment NC As specified in TS 38.508-1 [14] clau		As specified in TS 38.508-1 [14] clause 4.1.		
Test frequencies	As specified	in Annex E, table E.4-1 and TS 38.	508-1 [14] clause 4.3.1 and 4.4.2.		
Channel bandwidth	As specified	ed by the test configuration selected from Table 6.5.5.6.4.1-1.			
Propagation conditions	AWGN		As specified in Annex C.2.2.		
Connection	TE Part	A.3.1.7.1	As specified in TS 38.508-1 [14] Annex A.		
Diagram	DUT Part	A.3.2.3.4	1		
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE Part				

- 1. The general test parameter settings are set up according to Table 6.5.5.6.4.1-3.
- 2. Message contents are defined in clause 6.5.5.6.4.3.
- 3. There is one NR carrier and two NR cells specified in the test. Cell 1 is the NR cell (PCell) used for connection setup and Cell 2 is the NR cell (SCell) with the power level set according to Annex C.1.2 and C.1.3 for this test.

## Table 6.5.5.6.4.1-3: General test parameters for NR SA FR1 CSI-RS-based beam failure detection and SSB-based link recovery for SCell in DRX

Pa	arameter	Unit	Value	Comment
			Test 1	
Active PCell			Cell 1	
RF Channel Nur	nber for PCell		1	
Active SCell			Cell 2	
RF Channel Nur	nber for SCell		2	
Duplex mode	Config 1		FDD	
	Config 2, 3		TDD	
BWchannel	Config 1	MHz	10: NRB,c = 52	
	Config 2		10: NRB,c = 52	
	Config 3		40: NRB,c = 106	
TDD	Config 1		Not Applicable	
Configuration	Config 2		TDDConf.1.1	
	Config 3		TDDConf.2.1	
CORESET	Config 1		CR.1.1 FDD	A.1.2
Reference	Config 2		CR.1.1 TDD	
Channel	Config 3		CR.2.1 TDD	
SSB	Config 1		SSB.1 FR1	A.3
Configuration	Config 2		SSB.1 FR1	
	Config 3		SSB.2 FR1	

	1				
SMTC	Config 1			SMTC.1	A.4
Configuration	Config 3			SMTC.1	
PDSCH/PDCCH	Config 1	, 2	kHz	15	
subcarrier	Config 3	}		30	
spacing	0 ( )				<b>.</b>
PRACH	Config 1			PRACH.2 FR1	Table A.7.1-1
Configuration	Config 3	5		PRACH.2 FR1	Table A.7.1-1
csi-RS-Index assi	gned as b	eam failure		0	
detection RS in se					
OCNG parameter				OP.1	A.2.1
CP length				Normal	
Correlation Matrix	and Ante	nna		2x2 Low	
Configuration					
Beam failure	DCI form	nat		1-0	
detection	Number	of Control		2	
transmission	OFDM s	symbols			
parameters	Aggrega	ation level	CCE	8	
	Ratio of		dB	0	
	hypothe				
		RE energy			
		ge CSI-RS			
	RE ener	Зу			
	Ratio of		dB	0	
	hypothe				
	PDCCH				
		o average			
		RE energy			
		orecoder		REG bundle size	
	granular	ndle size		0	
	REG DU	nule size		6	
DRX Gap pattern ID				DRX.7 N.A.	A.5
schedulingReque				absent	When the field is
schedulingReque	SUD-DEK-	SCell-110		absent	absent, the random
					access procedure
					will be triggered for
					SCell BFR
SSB Index assign	ed as CB	D RS (a1) in		0	
activated SCell				<b>C</b>	
rlmInSyncOutOfS	vncThrest	nold		absent	When the field is
-,	,				absent, the UE
					applies the value 0.
					(TS 38.133 [6]
					Table 8.1.1-1).
rsrp-ThresholdBF	R Confi	g 1, 2	dBm/SCS	-98	Threshold used for
	Confi	g 3		-95	$Q_{in\_LR\_SSB}$
powerControlOffs	etSS			db0	Used for deriving
					rsrp-ThresholdCSI-
					RS
beamFailureInsta	nceMaxC	ount		n1	see clause 5.17 of
					TS 38.321 [12]
beamFailureDeteo	beamFailureDetectionTimer			pbfd4	see clause 5.17 of
		1 -			TS 38.321 [12]
CSI-RS configura		Config 1		CSI-RS.1.2 FDD	A.1.4
q <sub>0</sub> in activated SC	ell	Config 2		CSI-RS.1.2 TDD	4
		Config 3		CSI-RS.2.2 TDD	
CSI-RS configura	tion for	Config 1		CSI-RS.1.1 FDD	A.1.4
CSI reporting		Config 2		CSI-RS.1.1 TDD	4
		Config 3		CSI-RS.2.1 TDD	
TRS configuration	1	Config 1		TRS.1.1 FDD	
		Config 2		TRS.1.1 TDD	
		Config 3		TRS.1.2 TDD	

CSI-RS-Index assigned as	Config 1		CSI-RS.1.2 FDD	A.1.4	
RLM RS in PCell	Config 2		CSI-RS.1.2 TDD		
	Config 3		CSI-RS.2.2 TDD		
T310 Timer		ms	1000		
N310			2		
Τ1		S	1	During this time the UE shall be fully synchronized to cell 1	
T2		S	8.37		
Т3		S	6.44		
T4		S	0		
T5		S	1.97		
D1		S	1.93		
Note 1: UE-specific PDCCH is not transmitted after T1 starts.					

#### 6.5.5.6.4.2 Test procedure

Same test procedure as described in section 6.5.5.3.4.2, except following exception and step 7 and 8:

Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. The UE shall be configured for periodic CSI reporting with a reporting periodicity of 5 ms. In the test, DRX configuration is not enabled.

- 7. If the SS:
  - a) detects uplink power on the PCell equal to or higher than minimum output power defined in TS 38.521-1 [17] clause 6.3.1.5 in each slot configured for CSI transmission (according CSI reporting on PUCCH) during the period from time point A to time point B

and

b) does not detect preamble on the PCell before time point B

and

c) detects preamble on the preconfigured PRACH resource before time point F (D1 after the start of T5).

And

d) SS transmits a RAR to UE after receiving the preamble transmitted by the UE. SS detects the MAC-CE on the PCell transmitted by the UE providing the index for the activated SCell, and the index for the SSB provided by higher layer.

the number of successful tests is increased by one.

Otherwise the number of failed tests is increased by one.

8. If the iteration or random access procedure for BFD fails, the SS shall first attempt to release and add the FR1 SCell, by ensuring the UE is in state RRC\_CONNECTED with generic procedure parameters *Connectivity* NR, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [6] clause 4.5. If that also fails, then the UE is switched OFF/ON to proceed with the next iteration.

#### 6.5.5.6.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

## Table 6.5.5.6.4.3-1: Common Exception messages for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

Default Message Contents			
Common contents of system information blocks exceptions			
Default RRC messages and information elements contents exceptions	Table H.3.1-8 with Condition CSI-RS BFD Table H.3.1-10 with Condition SSB Table H.3.1-10A Table H.3.5-4 Table H.3.7-1 with Condition 'DRX.7' Table 7.3.1-3 in TS 38.508-1 [14] with condition SMTC.1		

## Table 6.5.5.6.4.3-2: PDCCH Search Space for BFR

Derivation Path: TS 38.508-1 [14], Table 4.6.3-162			
Information Element	Value/remark	Comment	Condition
SearchSpace ::= SEQUENCE {			
searchSpaceId	4	BFR	
controlResourceSetId	2	BFR	
monitoringSlotPeriodicityAndOffset CHOICE {			
sl1	NULL		
}			
monitoringSymbolsWithinSlot	1000000000000	Symbol 0	
nrofCandidates SEQUENCE {			
aggregationLevel1	n0		
aggregationLevel2	n0		
aggregationLevel4	n0		
aggregationLevel8	n1	AL8	
aggregationLevel16	n0		
}			
searchSpaceType CHOICE {			
ue-Specific SEQUENCE {			USS
dci-Formats	formats0-0-And-1-0	DCI Format 1_0	
}			
}			
}			

## Table 6.5.5.6.4.3-3: *RLF-TimersAndConstants*

Derivation Path: TS 38.508-1 [14], Table 4.6.3-150			
Information Element	Value/remark	Comment	Condition
RLF-TimersAndConstants ::= SEQUENCE {			
n310	n2		
}			

Information Element	Value/remark	Comment	Condition
PDCCH-Config ::= SEQUENCE {			
controlResourceSetToAddModList	2 entries		
SEQUENCE(SIZE (13)) OF ControlResourceSet {			
ControlResourceSet[2]	ControlResourceSet	entry 2, BFR	
}			
controlResourceSetToReleaseList	Not present		
searchSpacesToAddModList SEQUENCE(SIZE	2 entries		
(110)) OF SearchSpace {			
SearchSpace[2]	SearchSpace	entry 2, BFR	
}			
searchSpacesToReleaseList	Not present		
downlinkPreemption	Not present		
tpc-PUSCH	Not present		
tpc-PUCCH	Not present		
tpc-SRS	Not present		

## Table 6.5.5.6.4.3-4: PDCCH-Config

## Table 6.5.5.6.4.3-5: ControlResourceSet for BFR

Derivation Path: TS 38.501-1 [14], Table 7.3.1-15			
Information Element	Value/remark	Comment	Condition
ControlResourceSet ::= SEQUENCE {			
controlResourceSetId	2		
duration	2		
cce-REG-MappingType CHOICE {			
interleaved ::= SEQUENCE {			
reg-BundleSize	n6		
interleaverSize	n2		
shiftIndex	0		
}			
tci-StatesPDCCH-ToAddList	Not present		
}			

## 6.5.5.6.5 Test requirement

Tables 6.5.5.6.4.1-3 and 6.5.5.6.5-1 define the primary level settings including test tolerances for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX.

# Table 6.5.5.6.5-1: NR Cell specific test parameters for NR SA FR1 SCell CSI-RS-based beam failure detection and SSB-based link recovery in DRX

Parameter	Unit	Cell 1	Test 1 Cell2				
		T1 to T5	T1	T2	T3	T4	T5

EPRE rati	atio of PDCCH DMRS to		dB						
EPRE ratio of PDCCH to PDCCH DMRS		dB							
EPRE ratio of PBCH DMRS to		dB							
SSS FPRF rati	io of PBCH	to PBCH	dB						
DMRS			uD						
EPRE rati	io of PSS to	SSS	dB	0			0		
EPRE rati	io of PDSCH	I DMRS to	dB						
EPRE rati	io of PDSCH	to PDSCH	dB						
EPRE rati	io of OCNG	DMRS to	dB						
	io of OCNG	to OCNG	dB						
	-RS of set	Config 1	dB	5	5.8	-2.2	-12.8	-12.8	-12.8
_		Config 2	dB	5	5.8	-2.2	-12.8	-12.8	-12.8
$\mathbf{q}_0$		Config 3	dB	5	5.8	-2.2	-12.8	-12.8	-12.8
		Config 1	dB	-10	-10.2	-10.2	10.2	10.2	10.2
SNR_SSE	B of set q₁	Config 2	dB	-10	-10.2	-10.2	10.2	10.2	10.2
		Config 3	dB	-10	-10.2	-10.2	10.2	10.2	10.2
		Config 1	dBm/	-110	-108.2	-108.2	-87.8	-87.8	-87.8
SSB_RP	of set q₁	Config 2	SCS kHz	-110	-108.2	-108.2	-87.8	-87.8	-87.8
		Config 3		-107	-105.2	-105.2	-84.8	-84.8	-84.8
		Config 1	dBm/15	-98			-98		
$N_{oc}$		Config 2	kHz	-98			-98		
00		Config 3		-98			-98		
Propagati	on conditior	1		TDL-C		TDL·	C 300ns 1	00Hz	
				300ns					
				100Hz					
Note 1:		II be used suc				y allocated	and a cons	stant total tr	ansmitted
		ctral density is							
Note 2:		resources for							
Note 3:		RS resource se	t configuration	on for CSI rep	porting are	assigned to	the UE pri	or to the st	art of
Note 4:	time period T1.								
Note 5:									
Note 6: The signal contains PDCCH for UEs other than the device under test as part of OCNG.									
Note 7:	SNR levels correspond to the signal to noise ratio over the REs carrying CSI-RS.								
Note 8:									
	figure 6.5.5.6.4-1.								
Note 9: The SNR values are specified for a UE with 2RX antennas connected under test. For a UE with 4RX					n 4RX				
		connected und							
		dB (including to							
		、 · · · · · · · · · · · · · · · · · · ·		,					

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During the time duration T1 and T2, the UE shall transmit uplink signal at least in all subframes configured for CSI transmission on Cell 1.

During the period from time point A to time point B the UE shall transmit uplink signal in Cell 1 in all uplink slots configured for CSI transmission according to the configured periodic CSI reporting for Cell 1.

During T3 the UE shall detect beam failure and initiate link recovery. During T4 and T5 the UE measures and evaluate beam candidate from beam candidate set  $q_1$ .

No later than time point F occurring no later than D1 = 120+10 ms after the start of T5, the UE shall transmit preamble for UL-SCH resource application, followed by MAC-CE on the assigned uplink resources containing a beam associated with the candidate beam set  $q_1$ . The UE shall not transmit preamble earlier than time point B.

During T5, the System Simulator shall transmit a Random Access Response to UE after the System Simulator receives the preamble from UE. The UE shall transmit the msg.3 containing candidate beam set q1 for SCell BFR if UE receives the Random Access Response.

Test is concluded once the test equipment has received the initial preamble transmission from the UE. The rate of correct events observed during repeated tests shall be at least 90%.

## 6.5.6 Active BWP switch delay

## 6.5.6.1 DCI-based and time-based active BWP switch

- 6.5.6.1.0 Minimum conformance requirements
- 6.5.6.1.0.1 Minimum conformance requirements for DCI-based and time-based active BWP switch

For DCI-based BWP switch, after the UE receives BWP switching request at DL slot n on a serving cell, UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of  $T_{BWPswitchDelay}$  which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals until the first DL or UL slot occurs right after a time duration of  $T_{BWPswitchDelay}$  which starts from the beginning of DL slot n except DCI triggering BWP switch on the cell where DCI-based BWP switch occurs. The UE is not required to follow the requirements defined in this clause when performing a DCI-based BWP switch between the BWPs in disjoint channel bandwidths or in partially overlapping channel bandwidths.

For timer-based BWP switch, the UE shall start BWP switch at DL slot n, where slot n is the first slot of a DL subframe (FR1) or DL half-subframe (FR2) immediately after a BWP-inactivity timer *bwp-InactivityTimer* [13] expires on a serving cell, and the UE shall be able to receive PDSCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch on the first DL or UL slot occurs right after a time duration of  $T_{BWPswitchDelay}$  which starts from the beginning of DL slot n.

The UE is not required to transmit UL signals or receive DL signals during time duration  $T_{BWPswitchDelay}$  after *bwp-InactivityTimer* [13] expires on the cell where timer-based BWP switch occurs.

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in Table 6.5.6.1.0.1-1.

	NR Slot	BWP switch delay T <sub>BWPswitchDelay</sub> (slots)				
μ	length (ms)	Type 1 <sup>Note 1</sup>	Type 2 <sup>Note 1</sup>			
0	1	1	3			
1	0.5	2	5			
2	0.25	3	9			
3	0.125	6	18			
Note 1: Depends on UE capability.						
Note 2: If the BWP switch involves changing of SCS, the BWP switch delay is determined by the smaller SCS between the SCS before BWP switch and the SCS after BWP switch.						

### Table 6.5.6.1.0.1-1: BWP switch delay

Provided the UE does not have the required TCI-state information to receive PDCCH and PDSCH in the new BWP, the UE shall use old TCI-states before the BWP switch until a new MAC CE updating the required TCI-state information for PDCCH and PDSCH is received after the BWP switch.

If UE has the information on the required TCI-state information to receive PDCCH and PDSCH in the new BWP,

- UE shall be able to receive PDCCH and PDSCH with old TCI-states before the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

- UE shall be able to receive PDCCH and PDSCH with new TCI-states after the delay as specified in TS 38.133 [6] Clause 8.10 in the new BWP.

If the BWP switch is triggered within DRX active time, and one of the two BWPs in a BWP switching is a dormant BWP [TS 38.321, 12], UE shall be able to complete active BWP switching within

- T<sub>BWPswitchDelay</sub>, provided that the BWP switching request is received in any of the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs, or
- T<sub>BWPswitchDelay</sub> + 1, provided that the BWP switching request is received after the first 3 OFDM symbols of a slot corresponding to the serving cell where BWP switching occurs

When either of the DCI-based, timer-based or RRC-based downlink BWP switch and/or uplink BWP switch occur on multiple CCs simultaneously or over partially overlapping period, the interruption requirements described in this section apply for each BWP switch.

When UE receives a DCI indicating UE to switch its active BWP involving changes in any of the parameters listed in Table 6.5.6.1.0.1-3, the UE is allowed to cause interruption of up to X slot to other active serving cells if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 6.5.6.1.0.1-3 and the UE is capable of per-FR gap the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 6.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay T<sub>BWPswitchDelay</sub> as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

When a BWP timer *bwp-InactivityTimer* defined in TS 38.331 [13] expires, UE is allowed to cause interruption of up to X slot to other active serving cells due to switching its active BWP involving changes in any of the parameters listed in Table 6.5.6.1.0.1-3 if the UE is not capable of per-FR gap, or if the BWP switching involves SCS changing. When the BWP switch imposes changes in any of the parameters listed in Table 6.5.6.1.0.1-3 and the UE is capable of per-FR gap, the UE is allowed to cause interruption of up to X slot to other active serving cells in the same frequency range wherein the UE is performing BWP switching. X is defined in Table 6.5.6.1.0.1-2. The starting time of interruption is only allowed within the BWP switching delay  $T_{BWPswitchDelay}$  as defined in TS 38.133 [6] clause 8.6.2. Interruptions are not allowed during BWP switch involving any other parameter change.

μ	NR Slot length (ms)	interruption length X (slots)
0	1	1
1	0.5	1
2	0.25	3
3	0.125	5
Note1:	void	

Table 6.5.6.1.0.1-2: Interruption length X

Parameters	Comment
locationAndBandwidth	
nrofSRS-Ports	From TS 38.331 [13]
maxMIMO-Layers-r16	

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.2 and 8.2.1.2.7

## 6.5.6.1.1 NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX

Editor's Note: TT analysis for test configuration with SpCC SCS = 15kHz + SCC SCS = 30kHz or SpCC SCS = 30kHz + SCC SCS = 15kHz are still missing.

#### 6.5.6.1.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6, and interruption requirement on other active serving cell defined in TS 38.133 [6] clause 8.2.2.2.5.

#### 6.5.6.1.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2 and 2DL CA.

#### 6.5.6.1.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.1.1.

#### 6.5.6.1.1.4 Test description

#### 6.5.6.1.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in this clause. The supported test configurations for PCell are shown in Table 6.5.6.1.1.4.1-1. Supported test configurations for NR SCell are shown in Table 6.5.6.1.1.4.1-1A below. Test configuration for NR PCell and test configuration for NR SCell are chosen independently.

# Table 6.5.6.1.1.4.1-1: Supported test configurations for NR PCell for NR SA FR1-FR1 DCI-based DL active BWP switch with SCell in non-DRX

Config Description				
6.5.6.1.1-1	NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode			
6.5.6.1.1-2 NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode				
6.5.6.1.1-3 NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode				
Note 1: The UE is	s only required to be tested in one of the supported test configurations			
	ote 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported			
band combinations which is composed of CCs ≥ the bandwidth (BW <sub>channel</sub> ) defined in each test configuration,				

# Table 6.5.6.1.1.4.1-1A: Supported test configurations for NR SCell for NR SA FR1-FR1 DCI-based DL active BWP switch with SCell in non-DRX

Con	igscell	Description
1		NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode
2		NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode
3		NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode
Note 1:		s only required to be tested in one of the supported test configurations
Note 2:	2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BW <sub>channel</sub> ) defined in each test	
	configura	tion,

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.1.1.4.1-2.

## Table 6.5.6.1.1.4.1-2: Initial conditions for NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX

Parameter		Value	Comment			
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.			
Test frequencies	As specified	in Annex E, Table E.4-1 and TS 38	3.508-1 [14] clause 4.3.1.			
Channel bandwidth	As specified	As specified by the test configuration selected from Table 6.5.6.1.1.4.1-1.				
Propagation conditions	AWGN		As specified in Annex C.2.2			
Connection	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.			
Diagram	DUT Part	A.3.2.3.4				
Exceptions to connection diagram		pable UEs without any 2Rx RF				

- 1. The general test parameter settings are set up according to Table 6.5.6.1.1.4.1-3.
- 2. Message contents are defined in clause 6.5.6.1.1.4.3.
- 3. The test scenario comprises of one NR PCell (Cell 1) and one NR SCell (Cell 2). Cell 1 and Cell 2 are configured according to Annex C.1.2 and C.1.3.

Parameter	Unit	Value	Comment
NR RF Channel Number		1, 2	Two NR radio channels are used for this test
Active PCell		Cell 1	PCell on RF channel number 1.
Active SCell		Cell 2	SCell on RF channel number 2.
CP length		Normal	
DRX		OFF	For both PCell and SCell
bwp-InactivityTimer	ms	200	
Cell-individual offset for cells on RF channel number 1	dB	0	Individual offset for cells on PCC.
Cell-individual offset for cells on RF channel number 2	dB	0	Individual offset for cells on SCC.
Cell2 timing offset to cell1	μs	3	Time alignment error as specified in TS 38.104 [28] clause 6.5.3.1.
T1	S	0.2	
T2	S	0.2	
Т3	S	0.2	

Table 6.5.6.1.1.4.1-3: General test parameters for DL BWP switch in SA

#### 6.5.6.1.1.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on SCell (Cell 2) to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 2 and the time duration of T2.

PDCCHs indicating new transmissions shall be sent continuously on PCell (Cell 1) to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 (PCell) on radio channel 1 (PCC), and Cell 2 (SCell) on radio channel 2 (SCC).
- UE is configured with 2 different UE-specific downlink bandwidth parts for SCell, BWP-1 and BWP-2, in Cell 2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is configured with 1 UE-specific downlink bandwidth parts the same as initial BWP for PCell, BWP-0 in Cell 1 before starting the test.

- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1 in SCell.
- UE is indicated in *firstActiveDownlinkBWP*-Id that the active DL BWP is BWP-0 in PCell.
- UE is configured with a *bwp-InactivityTimer* timer value for SCell.

All cells have constant signal levels throughout the test.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
- 2. The SS shall configure SCell (Cell 2) on the SCC as per TS 38.508-1 [14] clause 7.5.1. Set the parameters according to Tables 6.5.6.1.1.4.1-3 and 6.5.6.1.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
- 3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP* of Cell 2. This message also configures 2 different UE-specific bandwidth parts for Cell 2, BWP-1 and BWP-2 and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 6.5.6.1.1.4.3-2.
- 4. The SS shall send a DCI format 1\_1 command for SCell DL BWP switch.
- 5. The UE shall receive the DCI format 1\_1 command in SCell's slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:
  - a) If the UE starts to report valid ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot (*i*+T<sub>BWPswitchDelay</sub>+k<sub>1</sub>)

and

b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (*i*+T<sub>BWPswitchDelay</sub>+ Interruption length + k<sub>1</sub>)

and

- c) If the number of consecutive missing ACK/NACK for PCell is no more than 1
- Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.
- 6. If the UE sends valid ACK/NACK for the SCell on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on SCell.
- 7. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on SCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part BWP-1:
  - a) If the UE starts to report valid ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot (*j*+T<sub>BWPswitchDelay</sub>+k<sub>1</sub>)

and

 b) If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot (*j*+T<sub>BWPswitchDelay</sub>+ Interruption length + k<sub>1</sub>)

and

c) If the number of consecutive missing ACK/NACK for PCell is no more than 1.

- Then, the number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.
- 8. Repeat steps 4-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in SCell by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

The SS verifies that potential interruption to PCell is carried out in the correct time span by monitoring ACK/NACK sent in PCell during BWP switch of SCell, respectively.

Interruption length is defined in TS 38.133 [6] Table 8.2.2.2.5-1-1.

If all subtests pass, the test passes. If one subtest fails, the test fails.

6.5.6.1.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

# Table 6.5.6.1.1.4.3-1: Common Exception messages for NR SA FR1-FR1 DCI-based DL active BWP switch in non-DRX

	Default Message Contents
Common contents of system information	
blocks exceptions	

## Table 6.5.6.1.1.4.3-1A: RRCReconfiguration (Step 3)

Derivation Path: TS 38.508-1 [14], Table 4.8.1-1B			
Information Element	Value/remark	Comment	Condition
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table	
		6.5.6.1.1.4.3-1B	
}			
}			
}			
}			

## Table 6.5.6.1.1.4.3-1B: CellGroupConfig (Table 6.5.6.1.1.4.3-1A)

Derivation Path: TS 38.508-1 [14], Table 4.8.1-2	with condition SCell_add		
Information Element	Value/remark	Comment	Condition
CellGroupConfig ::= SEQUENCE {			
sCellToAddModList SEQUENCE (SIZE	1 entry		
(1maxNrofSCells)) OF SCellConfig {			
SCellConfig[1] SEQUENCE {		entry 1	
sCellConfigDedicated	ServingCellConfig	Table	
		6.5.6.1.1.4.3-2	
}			
}			
}			

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	Value/remark	Comment	Condition
ServingCellConfig ::= SEQUENCE {			
initialDownlinkBWP SEQUENCE {			
pdcch-Config CHOICE {			
release	NULL		
}			
pdsch-Config CHOICE {			
release	NULL		
}			
radioLinkMonitoringConfig CHOICE {			
release	NULL		
}			
downlinkBWP-ToAddModList SEQUENCE (SIZE	2 entries		
(1maxNrofBWPs)) OF SEQUENCE {			
BWP-Downlink[1]	BWP-Downlink with	entry 1	
	condition BWP1	Table	
		6.5.6.1.1.4.3-3	
BWP-Downlink[2]	BWP-Downlink with	entry 2	
	condition BWP2	Table	
		6.5.6.1.1.4.3-3	
firstActiveDownlinkBWP-Id	1	According to BWP-1	
bwp-InactivityTimer	ms200		
defaultDownlinkBWP-Id	1	According to	
		BWP-1	
}			

## Table 6.5.6.1.1.4.3-2: ServingCellConfig (Table 6.5.6.1.1.4.3-1B)

## Table 6.5.6.1.1.4.3-3: BWP-Downlink (Table 6.5.6.1.1.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9		_	
Information Element	Value/remark	Comment	Condition
BWP-Downlink ::= SEQUENCE {			
bwp-ld	1	BWP-1	BWP1
-	2	BWP-2	BWP2
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1		BWP1
	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3		BWP2
}			
}			

Table 6.5.6.1.1.4.3-4: Void

## Table 6.5.6.1.1.4.3-5: Void

Derivation Path: TS 38.508-1 [14], Table 4.6.3-103			
Information Element	Value/remark	Comment	Condition
PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation {	4 entries		
PDSCH-TimeDomainResourceAllocation[1] SEQUENCE {		entry 1	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
PDSCH-TimeDomainResourceAllocation[2]     SEQUENCE {		entry 2	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	72	S=2, L=6	
PDSCH-TimeDomainResourceAllocation[3]     SEQUENCE {		entry 3	
k0	TBWPswitchDelay	Defined in Table 6.5.6.1.0.1-1	The DCI indicating BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
PDSCH-TimeDomainResourceAllocation[4]     SEQUENCE {		entry 4	
kO	1		First DCI right after DCI-based BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
}			

## Table 6.5.6.1.1.4.3-6: PDSCH-TimeDomainResourceAllocationList

## Table 6.5.6.1.1.4.3-7: Void

6.5.6.1.1.5 Test requirements

Tables 6.5.6.1.1.4.1-3 and 6.5.6.1.1.5-1 and 6.5.6.1.1.5-2 define the primary level settings including test tolerances.

## Table 6.5.6.1.1.5-1: NR Cell specific test parameters for NR PCell for DL BWP switch in SA

Parameter Unit Cell 1
-----------------------

Frequency Range			FR1
Duplex mode	Config 1		FDD
Duplox mode	Config 2,3		TDD
TDD configuration	Config 1		Not Applicable
1 DD conligaration	Config 2		TDDConf.1.1
	Config 3		TDDConf.1.2
BW <sub>channel</sub>	Coning 5		
			Note 7 52 Note 5
BWoccupied	Config 1,2	RB	
	Config 3		106 Note 6
Active BWP ID			0
Initial DL BWP Configura	ation		DLBWP.0.2 <sup>Note4</sup>
Initial UL BWP Configura	ation		ULBWP.0.2 <sup>Note4</sup>
Active DL BWP-0 Configuration			DLBWP.0.2 <sup>Note4</sup>
Active DL BWP-1 Config	uration		N.A.
Active DL BWP-2 Config			N.A.
Active UL BWP-0 Config			ULBWP.0.2 <sup>Note4</sup>
Active UL BWP-1 Config			N.A.
Active UL BWP-2 Configuration			N.A.
		+ +	
PDSCH Reference	Config 1	┥ ┝	SR.1.1 FDD
measurement channel	Config 2	4	SR.1.1 TDD
	Config 3	↓	SR.2.1 TDD
RMSI CORESET	Config 1	╡	CR.1.1 FDD
parameters	Config 2	1 L	CR.1.1 TDD
	Config 3		CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.1.2 FDD
parameters	Config 2		CCR.1.2 TDD
	Config 3		CCR.2.4 TDD
TRS Configuration	Config 1		TRS.1.1 FDD
	Config 2		TRS.1.1 TDD
	Config 3	1 1	TRS.1.2 TDD
OCNG Patterns	Config 1,2		OP.1 Note 5
	Config 3		OP.1 Note 6
SSB Configuration	Config 1,2		SSB.1 FR1
g	Config 3	1 F	SSB.2 FR1
SMTC Configuration	e eg e		SMTC.1
Correlation Matrix and Antenna			1x2 Low
Configuration			
EPRE ratio of PSS to SS	s	dB	0
EPRE ratio of PBCH DMRS to SSS			Ũ
EPRE ratio of PBCH to PBCH DMRS		-	
		-	
EPRE ratio of PDCCH DMRS to SSS EPRE ratio of PDCCH to PDCCH DMRS		-	
		-	
EPRE ratio of PDSCH DMRS to SSS		-	
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DN	1KS to SSS(Note		
1)	0010 51/52	4	
EPRE ratio of OCNG to	OCNG DMRS		
(Note 1) N <sub>oc</sub> <sup>Note 2</sup>	<b>A #</b> • •		
N <sub>oc</sub> <sup>Note 2</sup>	Config 1,2	dBm/SCS	-104
	Config 3		-101
Noc <sup>Note 2</sup>	1	dBm/15KHz	-104
SS-RSRP Note 3	Config 1,2	dBm/SCS	-87
	Config 3		-84
Ês/lot		dB	17
Ês/Noc		dB	17
Io <sup>Note3</sup>		dBm/	-58.96
	Config 1,2	9.36MHz	
	Config 3	dBm/	-52.86
	Coning 5	38.16MHz	

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant
	total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is
	assumed to be constant over subcarriers and time and shall be modelled as
	AWGN of appropriate power for Noc to be fulfilled within BWoccupied.
Note 3	SS-RSRP and Io levels have been derived from other parameters for
	information purposes. They are not settable parameters themselves.
Note 4:	For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is
	linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is
	linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].
Note 5:	All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 10 MHz, 52
	RBs) from F <sub>C,low</sub> , and Io is independent of the BW <sub>channel</sub> configured.
Note 6:	All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 40 MHz, 106
	RBs) from F <sub>C,low</sub> , and Io is independent of the BW <sub>channel</sub> configured.
Note 7:	$N_{RB,c}$ . is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BW <sub>channel</sub> .

## Table 6.5.6.1.1.5-2: NR Cell specific test parameters for NR SCell for DL BWP switch in SA

Parameter Unit Cell2			
	Parameter	Unit	Cell2

Frequency Range			FR1
Duplex mode	ConfigsCell 1		FDD
Duplex mode	Config <sub>SCell</sub> 2,3		TDD
TDD configuration	ConfigsCell 1		Not Applicable
1DD configuration	ConfigsCell 2		TDDConf.1.1
			TDDConf.1.2
DW	Configscell 3		
BW <sub>channel</sub>			Note 7 52 Note 5
BWoccupied	Config <sub>SCell</sub> 1,2	RB	
	Configscell 3		106 Note 6
Active BWP ID			1, 2
Initial DL BWP Configurati			DLBWP.0.2 <sup>Note4</sup>
Initial UL BWP Configurati			N.A.
Active DL BWP-0 Configuration			N.A.
Active DL BWP-1 Configu	ration		DLBWP.1.1 <sup>Note4</sup>
Active DL BWP-2 Configu	ration		DLBWP.1.3 <sup>Note4</sup>
Active UL BWP-0 Configu	ration		N.A.
Active UL BWP-1 Configuration			N.A.
Active UL BWP-2 Configuration			N.A.
PDSCH Reference	Configscell 1		SR.1.1 FDD
measurement channel	Config <sub>SCell</sub> 2	1 F	SR.1.1 TDD
	ConfigsCell 3	· · · · · · · · · · · · · · · · · · ·	SR.2.1 TDD
RMSI CORESET	ConfigsCell 1		CR.1.1 FDD
parameters	ConfigsCell 2	{ }	CR.1.1 TDD
parameters			CR.2.1 TDD
Dedicated CODESET	Configscell 3		
Dedicated CORESET	Config <sub>SCell</sub> 1		CCR.1.2 FDD
parameters	ConfigsCell 2		CCR.1.2 TDD
<b>TDO O</b> (1 )	Configscell 3		CCR.2.4 TDD
TRS Configuration	ConfigsCell 1		TRS.1.1 FDD
	ConfigsCell 2		TRS.1.1 TDD
	Config <sub>SCell</sub> 3		TRS.1.2 TDD
OCNG Patterns	ConfigsCell 1,2		OP.1 Note 5
	Configscell 3		OP.1 Note 6
SSB Configuration	Configscell 1,2		SSB.1 FR1
	ConfigsCell 3		SSB.2 FR1
SMTC Configuration			SMTC.1
Correlation Matrix and Antenna			1x2 Low
Configuration			
EPRE ratio of PSS to SSS		dB	0
EPRE ratio of PBCH DMRS to SSS			
EPRE ratio of PBCH to PBCH DMRS			
EPRE ratio of PDCCH DM	IRS to SSS		
EPRE ratio of PDCCH to PDCCH DMRS			
EPRE ratio of PDSCH DMRS to SSS			
EPRE ratio of PDSCH to PDSCH			
EPRE ratio of OCNG DMF		1	
EPRE ratio of OCNG to OCNG DMRS Note 1		1	
N <sub>oc</sub> <sup>Note 2</sup>	Config <sub>SCell</sub> 1,2	dBm/SCS	-104
	Config <sub>SCell</sub> 3	1	-101
Noc <sup>Note 2</sup>		dBm/15KHz	-104
SS-RSRP Note 3	Configscell 1,2	dBm/SCS	-87
	Configscell 3		-84
Ês/lot		dB	17
Ês/Noc		dB	17
Io <sup>Note3</sup>		dBm/	-58.96
10	Configscell 1,2	9.36MHz	-30.30
	300 mg 300 m 1,2	0.0010112	
		dBm/	-52.86
	Config <sub>SCell</sub> 3	38.16MHz	02.00
Propagation Condition	1		AWGN
		1	,

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant
	total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is
	assumed to be constant over subcarriers and time and shall be modelled as
	AWGN of appropriate power for Noc to be fulfilled within BWoccupied.
Note 3	SS-RSRP and lo levels have been derived from other parameters for
	information purposes. They are not settable parameters themselves.
Note 4:	For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is
	linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is
	linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [3].
Note 5:	All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 10 MHz, 52
	RBs) from Fc,low, and Io is independent of the BWchannel configured.
Note 6:	All UL/DL transmission shall be confined within BW <sub>occupied</sub> (i.e. 40 MHz, 106
	RBs) from Fc,low, and Io is independent of the BWchannel configured.
Note 7:	N <sub>RB,c</sub> . is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BW <sub>channel</sub> .

During T1, the UE shall start to send the ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot  $(i+T_{BWPswitchDelay}+k_1)$ .

During T3, the UE shall start to send the ACK/NACK for SCell on PCell from the first UL slot that occurs after the beginning of DL slot  $(j+T_{BWPswitchDelay}+k_1)$ .

Where, k<sub>1</sub> is the timing between DL data receiving and acknowledgement as specified in [9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration T<sub>BWPswitchDelay</sub> defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

During T1 and T3, the start time of PCell interruption during SCell active BWP switch shall not happen outside the BWP switch delay.

The interruption of PCell shall not be longer than the interruption duration specified for active BWP switch in TS 38.133 [6] clause 8.2.2.2.5.

All of the above test requirements shall be fulfilled in order for the observed SCell active BWP switch interruption to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after the beginning of DL slot (i+ T<sub>BWPswitchDelay</sub>+k<sub>1</sub>), (j+ T<sub>BWPswitchDelay</sub>+k<sub>1</sub>), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.

#### 6.5.6.1.2 NR SA FR1 DCI-based DL active BWP switch in non-DRX

6.5.6.1.2.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement defined in TS 38.133 [6] clause 8.6.

### 6.5.6.1.2.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting BWP adaptation of at least 2 BWPs, DCI and timer-based active BWP switching delay Type1 or Type2.

#### 6.5.6.1.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.1.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.1.2.

## 6.5.6.1.2.4 Test description

### 6.5.6.1.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.6.1.2.4.1-1.

# Table 6.5.6.1.2.4.1-1: Supported test configurations for NR SA FR1 DCI-based DL active BWP switch in non-DRX

Config	Description
6.5.6.1.2-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.5.6.1.2-2 NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode	
6.5.6.1.2-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is only required to be tested in one of the supported test configurations	
Note 2: A UE which fulfils the requirements in test case A.6.5.6.1.1 can skip the test cases in A.6.5.6.1.2	

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.1.2.4.1-2.

### Table 6.5.6.1.2.4.1-2: Initial conditions for NR SA FR1 DCI-based DL active BWP switch in non-DRX

Parameter	Value		Comment	
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies	As specified	in Annex E, Table E.4-1 and TS 38	3.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified	As specified by the test configuration selected from Table 6.5.6.1.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2	
Connection	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.			

- 1. The general test parameter settings are set up according to Table 6.5.6.1.2.4.1-3.
- 2. Message contents are defined in clause 6.5.6.1.2.4.3.
- 3. The test scenario comprises of one NR PCell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

### Table 6.5.6.1.2.4.1-3: General test parameters for DL BWP switch in SA

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	Cell1 on RF channel number 1.
CP length		Normal	
DRX		OFF	
bwp-InactivityTimer	ms	200	
T1	S	0.2	
T2	S	0.2	
Т3	S	0.2	

### 6.5.6.1.2.4.2 Test procedure

The test consists of 3 successive time periods, with durations of T1, T2, and T3, respectively.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE would have ACK/NACK sending except for the time duration when BWP is switching on Cell 1 and the time duration of T2.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.

- UE is configured with 2 different UE-specific downlink bandwidth parts, BWP-1 and BWP-2 before starting the test. BWP-1 and BWP-2 always include bandwidth of the initial DL BWP and SSB.
- UE is indicated in *firstActiveDownlinkBWP-Id* that the active DL BWP is BWP-1.
- UE is configured with a *bwp-InactivityTimer* timer value for PCell.

The Cell 1 has constant signal levels throughout the test.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
- 2. Set the parameters according to Tables 6.5.6.1.2.4.1-3 and 6.5.6.1.2.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
- 3. The SS shall transmit an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures 2 different UE-specific bandwidth parts, BWP-1 and BWP-2 and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to Table 6.5.6.1.2.4.3-2.
- 4. The SS shall send a DCI format 1\_1 command for Cell 1 DL BWP switch.
- 5. The UE shall receive the DCI format 1\_1 command in slot # denoted i, then T1 starts and the UE switch its bandwidth part from BWP-1 to BWP-2:

If the UE starts to report valid ACK/NACK for Cell 1 from the first UL slot that occurs after the beginning of DL slot ( $i+T_{BWPswitchDelay}+k_1$ ). The number of successful subtests is increased by one. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

- 6. If the UE sends valid ACK/NACK for the Cell 1 on BWP-2, T2 starts. During T2, the SS shall not transmit DCI format for PDSCH reception on Cell 1.
- 7. T3 starts from the first slot #j of the DL subframe immediately after the slot wherein *bwp-InactivityTimer* timer expires and the SS restarts to send DCI format for PDSCH reception on PCell. Then, the UE shall switch its bandwidth part from BWP-2 back to the default bandwidth part, BWP-1:

If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $(j+T_{BWPswitchDelay}+k_1)$ . The number of successful subtests is increased by one and go to step 8 after T3 expires. Otherwise, count a fail for the test, switch off/on the UE and go to step 1.

8. Repeat steps 4-7 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time by counting the slots from the time when the BWP switch command is received or *bwp-InactivityTimer* timer expires till an ACK/NACK is received.

If all subtests pass, the test passes. If one subtest fails, the test fails.

6.5.6.1.2.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

## Table 6.5.6.1.2.4.3-1: Common Exception messages for NR SA FR1 DCI-based DL active BWP switch in non-DRX

	Default Message Contents
Common contents of system information	
blocks exceptions	

Table 6.5.6.1.2.4.3-1A: Void

### Table 6.5.6.1.2.4.3-1B: Void

Derivation Path: TS 38.508-1 [14], Table 4.8.1-1B			
Information Element	Value/remark	Comment	Condition
RRCReconfiguration ::= SEQUENCE {			
criticalExtensions CHOICE {			
rrcReconfiguration SEQUENCE {			
nonCriticalExtension SEQUENCE {			
masterCellGroup	CellGroupConfig	Table	
		6.5.6.1.2.4.3-1D	
}			
}			
}			
}			

## Table 6.5.6.1.2.4.3-1C: RRCReconfiguration (Step 3)

# Table 6.5.6.1.2.4.3-1D: CellGroupConfig (Table 6.5.6.1.2.4.3-1C)

Derivation Path: TS 38.508-1 [14], Table 4.8.1-2	2		
Information Element	Value/remark	Comment	Condition
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table	
		6.5.6.1.2.4.3-2	
}			
}			

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	Value/remark	Comment	Condition
ServingCellConfig ::= SEQUENCE {			
initialDownlinkBWP SEQUENCE {			
pdcch-Config CHOICE {			
release	NULL		
}			
pdsch-Config CHOICE {			
release	NULL		
}			
radioLinkMonitoringConfig CHOICE {			
release	NULL		
}			
downlinkBWP-ToAddModList SEQUENCE (SIZE	2 entries		
(1maxNrofBWPs)) OF SEQUENCE {	2 010103		
BWP-Downlink[1]	BWP-Downlink with	entry 1	1
	condition BWP1	Table	
		6.5.6.1.2.4.3-3	
BWP-Downlink[2]	BWP-Downlink with	entry 2	
	condition BWP2	Table	
		6.5.6.1.2.4.3-3	
1		0.0.0.1.2.4.3-3	
firstActiveDownlinkBWP-Id	1	According to	
IIISIACIIVEDOWIIIIIIKDVVF-IU		BWP-1	
bwp-InactivityTimer	ms200	DWI-1	
defaultDownlinkBWP-Id	1	According to	
		BWP-1	
uplinkConfig SEQUENCE {		DWF-1	
initialUplinkBWP SEQUENCE {			
pucch-Config CHOICE {			
release	NULL		
}			
pusch-Config CHOICE {			
release	NULL		_
}			_
srs-Config CHOICE {			
release	NULL		
uplinkBWP-ToAddModList SEQUENCE (SIZE			
(1maxNrofBWPs)) OF SEQUENCE {			
BWP-Uplink[1]	BWP-Uplink with	entry 1	
	condition BWP1	Table	
		6.5.6.1.2.4.3-4	
BWP-Uplink[2]	BWP-Uplink with	entry 2	
	condition BWP2	Table	
		6.5.6.1.2.4.3-4	
firstActiveUplinkBWP-Id	1	According to	
		BWP-1	
}			
}			
}			

# Table 6.5.6.1.2.4.3-2: ServingCellConfig (Table 6.5.6.1.2.4.3-1D)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9	I		
Information Element	Value/remark	Comment	Condition
BWP-Downlink ::= SEQUENCE {			
bwp-ld	1	BWP-1	BWP1
	2	BWP-2	BWP2
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1		BWP1
	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3		BWP2
}			
}			

# Table 6.5.6.1.2.4.3-3: BWP-Downlink (Table 6.5.6.1.2.4.3-2)

## Table 6.5.6.1.2.4.3-4: BWP-Uplink (Table 6.5.6.1.2.4.3-2)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-1	3		
Information Element	Value/remark	Comment	Condition
BWP-Uplink ::= SEQUENCE {			
bwp-ld	1	BWP-1	BWP1
	2	BWP-2	BWP2
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1	BWP-1	BWP1
	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3	BWP-2	BWP2
}			
}			

Table 6.5.6.1.2.4.3-5: Void

Derivation Path: TS 38.508-1 [14], Table 4.6.3-103			
Information Element	Value/remark	Comment	Condition
PDSCH-TimeDomainResourceAllocationList ::= SEQUENCE(SIZE(1maxNrofDL-Allocations)) OF PDSCH-TimeDomainResourceAllocation {	4 entries		
PDSCH-TimeDomainResourceAllocation[1] SEQUENCE {		entry 1	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
PDSCH-TimeDomainResourceAllocation[2]     SEQUENCE {		entry 2	
k0	Not present		
mappingType	typeA		
startSymbolAndLength	72	S=2, L=6	
PDSCH-TimeDomainResourceAllocation[3] SEQUENCE {		entry 3	
k0	TBWPswitchDelay	Defined in Table 6.5.6.1.0.1-1	The DCI indicating BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
PDSCH-TimeDomainResourceAllocation[4]     SEQUENCE {		entry 4	
kO	1		First DCI right after DCI-based BWP switch
mappingType	typeA		
startSymbolAndLength	53	Start symbol(S)=2, Length(L)=12	
}			
}			

## Table 6.5.6.1.2.4.3-6: PDSCH-TimeDomainResourceAllocationList

## 6.5.6.1.2.5 Test requirements

Tables 6.5.6.1.2.4.1-3 and 6.5.6.1.2.5-1 define the primary level settings including test tolerances.

Table 6.5.6.1.2.5-1: NR Cell specific test parameters for DL BWP switch in SA

	Parameter		Cell 1
Frequency Range			FR1
Duplex mode	Config 1		FDD
	Config 2,3		TDD
TDD configuration	Config 1		Not Applicable
	Config 2		TDDConf.1.1
	Config 3		TDDConf.2.1
BWchannel	Config 1		10 MHz: N <sub>RB,c</sub> = 52
	Config 2		10 MHz: N <sub>RB,c</sub> = 52
	Config 3		40 MHz: N <sub>RB,c</sub> = 106
Active BWP ID			1, 2
Initial DL BWP	0		DLBWP.0.2 Note 4
Configuration	Config 1,2,3		
Active DL BWP-1	Operation 4.0.0		DLBWP.1.1 Note 4
Configuration	Config 1,2,3		
Active DL BWP-2	0 ( 100		DLBWP.1.3 Note 4
Configuration	Config 1,2,3		
Initial UL BWP	0 1 1 0 0		ULBWP.0.2 Note 4
Configuration	Config 1,2,3		
Active UL BWP-1			ULBWP.1.1 Note 4
Configuration	Config 1,2,3		
Active UL BWP-2	Config 1		N/A
Configuration	Config 2,3		ULBWP.1.3 Note 4
PDSCH Reference	Config 1	+	SR.1.1 FDD
measurement channel		_	SR.1.1 TDD
		_	
RMSI CORESET	Config 3		SR.2.1 TDD
	Config 1	_	CR.1.1 FDD
parameters	Config 2	_	CR.1.1 TDD
Dedicated CORESET	Config 3		CR.2.1 TDD
	Config 1	_	CCR.1.2 FDD
parameters	Config 2	_	CCR.1.2 TDD
	Config 3		CCR.2.4 TDD
OCNG Patterns			OP.1
SSB Configuration	Config 1,2		SSB.1 FR1
	Config 3		SSB.2 FR1
SMTC Configuration			SMTC.1
Correlation Matrix and	Antenna		1x2 Low
Configuration	0		
TRS Configuration	Config 1,4		TRS.1.1 FDD
	Config 2,5		TRS.1.1 TDD
	Config 3,6	-10	TRS.1.2 TDD
EPRE ratio of PSS to S		dB	0
EPRE ratio of PBCH D		_	
EPRE ratio of PBCH to		_	
EPRE ratio of PDCCH			
EPRE ratio of PDCCH			
EPRE ratio of PDSCH		_	
EPRE ratio of PDSCH			
EPRE ratio of OCNG	DMRS to SSS(Note		
1)		4	
EPRE ratio of OCNG t	0 OCNG DMRS		
(Note 1) Noc <sup>Note 2</sup>	0		404
Noc <sup>11010</sup>	Config 1,2	dBm/SCS	-104
Note 0	Config 3		-101
N <sub>oc</sub> <sup>Note 2</sup>		dBm/15kH	-104
00 000-N/( 0	<b>A</b> # 1 -	Z	
SS-RSRP Note 3	Config 1,2	dBm/SCS	-87
Config 3			-84
Ês/lot		dB	17
Ê <sub>s</sub> /N <sub>oc</sub>		dB	17
Io <sup>Note3</sup>	Config 1,2	dBm/	-58.96
	Connig 1,2	9.36MHz	
	Config 3	dBm/	-52.86
-	_	38.16MHz	
Propagation Condition			AWGN

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is
	assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for Noc to be fulfilled.
Note 3:	SS-RSRP and to levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	For unpaired spectrum, a DL BWP is linked with an UL BWP. DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of TS 38.213 [8].

During T1, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $(i+T_{BWPswitchDelay}+k_1)$ .

During T3, the UE shall start to send the ACK/NACK for PCell from the first UL slot that occurs right after the beginning of DL slot  $(j+T_{BWPswitchDelay}+k_1)$ .

Where, k<sub>1</sub> is the timing between DL data receiving and acknowledgement as specified in 38.214[9].

Depending on UE capability *bwp-SwitchingDelay* [13], UE shall finish BWP switch within the time duration  $T_{BWPswitchDelay}$  defined in TS 38.133 [6] Table 8.6.2-1.

All of the above test requirements shall be fulfilled in order for the observed PCell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

- NOTE: During T1, T3 if there are no uplink resources for reporting the ACK/NACK in the first UL slot that occurs after beginning of DL slot (i+ T<sub>BWPswitchDelay</sub>+k<sub>1</sub>), (j+ T<sub>BWPswitchDelay</sub>+k<sub>1</sub>), then the UE shall use the next available uplink resource for reporting the corresponding ACK/NACK.
- 6.5.6.2 RRC-based active BWP switch
- 6.5.6.2.0 Minimum conformance requirements
- 6.5.6.2.0.1 Minimum conformance requirements for RRC-based active BWP switch

For RRC-based BWP switch, after the UE receives RRC reconfiguration involving active BWP switching or parameter change of its active BWP, UE shall be able to receive PDSCH/PDCCH (for DL active BWP switch) or transmit PUSCH (for UL active BWP switch) on the new BWP on the serving cell on which BWP switch occurs on the first DL or UL slot right after a time duration of  $\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}}{NR Slot length}$  slots which begins from the beginning of DL slot

n, where

DL slot n is the last slot containing the RRC command, and

 $T_{RRCprocessingDelay}$  is the length of the RRC procedure delay in ms as defined in clause 12 in TS 38.331 [13], and

 $T_{BWPswitchDelayRRC} = 6ms$  is the time used by the UE to perform BWP switch.

The UE is not required to transmit UL signals or receive DL signals during the time defined by  $T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}$  on the cell where RRC-based BWP switch occurs.

The normative reference for this requirement is TS 38.133 [6] clauses 8.6.3.

## 6.5.6.2.1 NR SA FR1 RRC-based DL active BWP switch in non-DRX

#### 6.5.6.2.1.1 Test purpose

The purpose of this test is to verify the DL BWP switch delay requirement for RRC-based BWP switch defined in TS 38.133 [6] clause 8.6.

#### 6.5.6.2.1.2 Test applicability

This test applies to all types of NR UE release 15 onwards supporting BWP adaptation of at least 2 BWPs.

#### 6.5.6.2.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.6.2.0.1.

The normative reference for this requirement is TS 38.133 [6] clause A.6.5.6.2.1.

6.5.6.2.1.4 Lest description	6.5.6.2.1.4	Test description
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6.5.6.2.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.6.2.1.4.1-1.

# Table 6.5.6.2.1.4.1-1: Supported test configurations for NR SA FR1 RRC-based DL active BWP switch in non-DRX

Config	Description
6.5.6.2.1-1	NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
6.5.6.2.1-2	NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode
6.5.6.2.1-3	NR 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
Note 1: The UE is onl	y required to be tested in one of the supported test configurations

Configure the test equipment and the DUT according to the parameters in Table 6.5.6.2.1.4.1-2.

Parameter		Value	Comment	
Test environment	NC	As specified in TS 38.508-1 [14] claus		
Test frequencies	As specified	in Annex E, Table E.4-1 and TS 38	.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified	fied by the test configuration selected from Table 6.5.6.2.1.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2	
Connection	TE Part	A.3.1.8.2	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		
Exceptions to connection diagram	- Without LTE link - For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.			

1. The general test parameter settings are set up according to Table 6.5.6.2.1.4.1-3.

2. Message contents are defined in clause 6.5.6.2.1.4.3.

3. The test scenario comprises of one NR Cell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

Parameter	Unit	Value	Comment
NR RF Channel Number		1	One NR radio channel is used for this test
Active Cell		Cell 1	PCell on RF channel number 1.
CP length		Normal	
DRX		OFF	
T1	S	0.2	

## 6.5.6.2.1.4.2 Test procedure

The test consists of 1 time period, with duration of T1.

PDCCHs indicating new transmissions shall be sent continuously on Cell 1 to ensure that the UE will have ACK/NACK sending.

Before the test starts,

- UE is connected to Cell 1 on radio channel 1.

- UE has bandwidth part BWP-1 in its RRC-configuration for Cell 1.
- UE is indicated in firstActiveDownlinkBWP-Id that the active DL BWP is BWP-1 of initial condition in Cell 1.

Cell 1 has constant signal level throughout the test.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
- 2. Set the parameters according to Tables 6.5.6.2.1.4.1-3 and 6.5.6.2.1.5-1. Propagation conditions are set according to Annex C clauses C.2.2.
- 3. The SS shall send an *RRCReconfiguration* message releasing the dedicated configuration of the *initialDownlinkBWP* and the *initialUplinkBWP*. This message also configures another UE-specific bandwidth part, BWP-1 and indicates BWP-1 as the active DL BWP using *firstActiveDownlinkBWP-Id*, according to the initial condition of Active BWP-1 in Table 6.5.6.2.1.5-1.
- 4. The UE shall transmit an *RRCReconfigurationComplete* message.
- 5. The SS shall send an *RRCReconfiguration* message with updated bandwidth part configuration for DL BWP switch, change the BWP according to the final condition of Active BWP-1 in Table 6.5.6.2.1.5-1. T1 starts.
- 6. The UE shall receive the *RRCReconfiguration* in PCell's slot # denoted i and reconfigure its bandwidth part with the updated bandwidth part configuration.
- 7 If the UE starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot  $i + \frac{T_{RRCprocessingDelay} + T_{BWPswitchDelayRRC}}{NR Slot length} + k1$  then the number of successful tests is increased by one. Otherwise, the number of failure tests is increased by one.
- 8. After the SS receives the ACK/NACK in step 7) or when T1 expires, the SS shall transmit *RRCRelease* message to release the RRC connection.
- 9. After the RRC connection release, the SS:

-transmits in NR Cell 1 a Paging message for the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5 (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5),

or

- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.

10. Repeat steps 2-9 until the confidence level according to Tables G.2.3-1 in Annex G clause G.2 is achieved.

The SS verifies the DL BWP switch time in PCell by counting the slots from the time when the RRC Reconfiguration message including updated BWP configuration is sent till a valid ACK/NACK is received.

#### 6.5.6.2.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

#### Table 6.5.6.2.1.4.3-1: Common Exception messages for NR SA FR1 RRC-based DL active BWP switch in non-DRX

Default Message Contents		
Common contents of system information		
blocks exceptions		

Table 6.5.6.2.1.4.3-1A: Void

#### Table 6.5.6.2.1.4.3-1B: Void

Derivation Path: TS 38.508-1 [14], Table 4.6.1-13 with condition NR				
Information Element	Value/remark	Comment	Condition	
RRCReconfiguration ::= SEQUENCE {				
criticalExtensions CHOICE {				
rrcReconfiguration SEQUENCE {				
radioBearerConfig	Not present			
nonCriticalExtension SEQUENCE {				
masterCellGroup	CellGroupConfig	Table 6.5.6.2.1.4.3-1D		
dedicatedNAS-MessageList	Not present			
}				
}				
}				
}				

# Table 6.5.6.2.1.4.3-1C: RRCReconfiguration (1, Step 3, Step 5)

# Table 6.5.6.2.1.4.3-1D: CellGroupConfig (Table 6.5.6.2.1.4.3-1C)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-19			
Information Element	Value/remark	Comment	Condition
CellGroupConfig ::= SEQUENCE {			
spCellConfig SEQUENCE {			
spCellConfigDedicated	ServingCellConfig	Table	
		6.5.6.2.1.4.3-1E	
}			
}			

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	Value/remark	Comment	Condition
ServingCellConfig ::= SEQUENCE {			
initialDownlinkBWP SEQUENCE {			
pdcch-Config CHOICE {			
release	NULL		
}			
pdsch-Config CHOICE {			
release	NULL		
}			
radioLinkMonitoringConfig CHOICE {			
release	NULL		
}			
downlinkBWP-ToAddModList SEQUENCE (SIZE	1 entry		
(1maxNrofBWPs)) OF BWP-Downlink {			
BWP-Downlink[1] SEQUENCE {	BWP-Downlink	entry 1	
		Table	
		6.5.6.2.1.4.3-1F	
}			
firstActiveDownlinkBWP-Id	1	BWP-1	
defaultDownlinkBWP-Id	1	BWP-1	
uplinkConfig SEQUENCE {			
initialUplinkBWP SEQUENCE {			
pucch-Config CHOICE {			
release	NULL		
}			
pusch-Config CHOICE {			
release	NULL		
}			
srs-Config CHOICE {			
release	NULL		
}			
uplinkBWP-ToAddModList SEQUENCE (SIZE	1 entry		
(1maxNrofBWPs)) OF BWP-Uplink {			
BWP-Uplink[1]	BWP-Uplink	entry 1	
		Table	
		6.5.6.2.1.4.3-1G	
}			
firstActiveUplinkBWP-Id	1	BWP-1	
}			
}			

Table 6 5 6 2 1 4 3-1E	ServingCellConfig (Table 6.5.6.2.1.4.3-1D)
1 abie 0.J.0.2.1.4.J-1 L.	ServingCenconing (Table 0.5.0.2.1.4.5-1D)

# Table 6.5.6.2.1.4.3-1F: BWP-Downlink (Table 6.5.6.2.1.4.3-1E)

Derivation Path: TS 38.508-1 [14], Table 4.6.3-9	)		
Information Element	Value/remark	Comment	Condition
BWP-Downlink ::= SEQUENCE {			
bwp-ld	1		
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.3		Step 3
	RIV defined in TS 38.214 [9] that corresponds to DLBWP.1.1		Step 5
}			
}			

Derivation Path: TS 38.508-1 [14], Table 4.6.3-13			
Information Element	Value/remark	Comment	Condition
BWP-Uplink ::= SEQUENCE {			
bwp-ld	1		
bwp-Common SEQUENCE {			
genericParameters	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.3		Step 3
	RIV defined in TS 38.214 [9] that corresponds to ULBWP.1.1		Step 5
}			
}			

# Table 6.5.6.2.1.4.3-1G: BWP-Uplink (Table 6.5.6.2.1.4.3-1E)

## Table 6.5.6.2.1.4.3-2: Void

6.5.6.2.1.5 Test requirements

Tables 6.5.6.2.1.4.1-3 and 6.5.6.2.1.5-1 define the primary level settings including test tolerances.

Table 6.5.6.2.1.5-1: NR Cell specific test parameters for DL BWP switch

	Paramet	er	Unit	Cell 1
Frequency I				FR1
Duplex mod		Config 1		FDD
		Config 2,3		TDD
TDD configu	uration	Config 1		Not Applicable
C C		Config 2		TDDConf.1.1
		Config 3	] [	TDDConf.2.1
BW <sub>channel</sub>		Config 1		10 MHz: N <sub>RB,c</sub> = 52
		Config 2		10 MHz: N <sub>RB,c</sub> = 52
		Config 3		40 MHz: N <sub>RB,c</sub> = 106
Active BWP	ID			1
Initial DL BV	VP	0		DLBWP.0.2
Configuratio	n	Config 1,2,3		
Initial UL BV	VP	0 5 4 0 0		ULBWP.0.2
Configuratio	n	Config 1,2,3		
Initial	Active DL			DLBWP.1.3
Condition	BWP-1	0		
	Configurat	Config 1,2,3		
	ion			
	Active UL			ULBWP.1.3
	BWP-1	0		
	Configurat	Config 1,2,3		
	ion			
Final	Active DL		1	DLBWP.1.1
Condition	BWP-1	Config 1.0.0		
	Configurat	Config 1,2,3		
	ion			
	Active UL			ULBWP.1.1
	BWP-1	Config 1.0.0		
	Configurat	Config 1,2,3		
	ion			
PDSCH Ref	ference	Config 1		SR.1.1 FDD
measureme	nt channel	Config 2	] [	SR.1.1 TDD
		Config 3		SR.2.1 TDD
RMSI CORE	ESET	Config 1		CR.1.1 FDD
parameters		Config 2		CR.1.1 TDD
-		Config 3		CR.2.1 TDD
Dedicated C	ORESET	Config 1		CCR.1.1 FDD
parameters		Config 2		CCR.1.1 TDD
-		Config 3		CCR.2.3 TDD
OCNG Patte	erns			OP.1
SSB Config	uration	Config 1,2		SSB.1 FR1
Ũ		Config 3		SSB.2 FR1
SMTC Conf	iguration			SMTC.1
TRS Config		Config 1		TRS.1.1 FDD
5		Config 2		TRS.1.1 TDD
		Config 3		TRS.1.2 TDD
Antenna Co	nfiguration	· • •		1x2 Low
Propagation				AWGN
	of PSS to SS	S	dB	0
	of PBCH DM		1	
	of PBCH to F		1	
	of PDCCH D		1	
EPRE ratio of PDCCH to PDCCH DMRS		]		
EPRE ratio of PDSCH DMRS to SSS		1		
EPRE ratio of PDSCH to PDSCH		1		
EPRE ratio of OCNG DMRS to SSS <sup>(Note 1)</sup>		1		
EPRE ratio of OCNG to OCNG DMRS <sup>(Note</sup>				
Noc <sup>Note 2</sup>	I	Config 1,2	dBm/SCS	-104
INOC	ŀ	Config 3		-104 -101
SS-RSRP No	ote 3	Config 1,2	dBm/SCS	-101 -87
00-NOKF ***	ŀ	Config 3		-84
Ês/Iot		Coning S	dB	-84 17
Ês/Noc			dB	17

Io <sup>Note3</sup>		Config 1,2	dBm/ 9.36MHz	-58.96
		Config 3	dBm/ 38.16MHz	-52.86
Note 1:				y allocated and a constant
				ed for all OFDM symbols.
Note 2:				not specified in the test is
				e and shall be modelled
		ppropriate power fo		
Note 3:	Note 3: SS-RSRP and Io levels have been derived from other parameters for			other parameters for
	information purposes. They are not settable parameters themselves.			meters themselves.
Note 4:				
	DLBWP.0.2 is linked with ULBWP.0.2; DLBWP.1.1 is linked with			
	ULBWP.1.1; DLBWP.1.3 is linked with ULBWP.1.3 defined in clause 12 of			
	TS 38.213 [8].			

During T1, the UE shall be ready for the reception of uplink grant for Cell from the first DL slot that occurs right after the beginning of slot i +  $\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}}{NR Slot length}$  and starts to report valid ACK/NACK for PCell from the first UL slot that occurs after the beginning of DL slot i +  $\frac{T_{RRCprocessingDelay}+T_{BWPswitchDelayRRC}}{NR Slot length}$  + k1.

Where, *k1* is the timing between DL data receiving and acknowledgement as specified in [12].

All of the above test requirements shall be fulfilled in order for the observed Cell active BWP switch delay to be counted as correct.

The rate of correct events observed during repeated tests shall be at least 90%.

# 6.5.7 DL interruptions at switching between two uplink carriers

## 6.5.7.0 Minimum conformance requirements

The DL interruption requirements at dynamic switching between two uplink carriers specified in this clause are applicable for an uplink band pair of an inter-band UL CA configuration when the capability *uplinkTxSwitchingPeriod* is present, and is only applicable for uplink switching mechanism specified in clause 6.1.6 of TS 38.214 [9], where NR uplink carrier 1 is capable of one transmit antenna connector and NR uplink carrier 2 is capable of two transmit antenna connectors, and the two uplink carriers are in different bands with different carrier frequencies.

When dynamic switching between two uplink carriers is conducted, UE is allowed to cause DL interruption of X OFDM symbols in NR downlink carrier(s) as indicated by *uplinkTxSwitching-DL-Interruption* [13]. The DL interruption starts from the first OFDM symbol which fully or partially overlaps with the UL switching period located in either NR carrier 1 or carrier 2 as indicated in RRC signalling [13]. The DL interruption lengths of X are defined in Table 6.5.7.0-1.

No DL interruption is allowed in the NR downlink carrier(s) which is not indicated by *uplinkTxSwitching-DL-Interruption*. No DL interruption is allowed for some inter-band UL CA configurations as specified in clause 5.2A.2 of TS 38.101-1 [2].

# Table 6.5.7.0-1: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers

μ	NR Slot length (ms)	Uplink Tx switching period <sup>Note1</sup>				
		35us 140us 210us				
0	1	2	3	4		
1	0.5	3 6 7				
2	0.25	4 10 14				
Note 1: Uplink Tx switching period depends on UE capability uplinkTxSwitchingPeriod						

The normative reference for this requirement is TS 38.133 [6] clauses 8.2.2.2.10.

## 6.5.7.1 NR SA FR1 DL Interruptions at switching between two uplink carriers in FDD-TDD CA

6.5.7.1.1 Test purpose

The purpose of this test is to verify the DL interruption requirements during UE dynamic switching between two uplink carriers.

6.5.7.1.2 Test applicability

This test applies to all types of NR UE release 16 onwards, configured with uplinkTxSwitchingPeriod.

6.5.7.1.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7.0.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.2.2.10 and A.6.5.7.1

6.5.7.1.4 Test description

6.5.7.1.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7.1.4.1-1.

#### Table 6.5.7.1.4.1-1: Supported test configurations

Config	Description
6.5.7.1-1	NR Cell 1: 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode
	NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 6.5.7.1.4.1-2.

# Table 6.5.7.1.4.1-2: Initial conditions for DL interruptions at switching between two uplink carriers in FDD-TDD CA

Parameter	Value		Comment	
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies	As specified	in Annex E, Table E.4-1 and TS 38	.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified	by the test configuration selected from Table 6.5.7.1.4.1-1.		
Propagation conditions	AWGN	As specified in Annex C.2.2		
Connection	TE Part	A.3.1.8.2a	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		
Exceptions to connection diagram	<ul> <li>For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.</li> <li>Without LTE link</li> <li>Without Faders</li> </ul>			

- 1. The general test parameter settings are set up according to Table 6.5.7.1.4.1-3.
- 2. Message contents are defined in clause 6.5.7.1.4.3.
- 3. The test scenario comprises of two NR Cells. (Cell 1 and Cell 2). Cell 1 is configured according to Annex C.1.2 and C.1.3.

Parameter	Unit	Test	Value	Comment
		configuration		
RF Channel		Config 1	1, 2	Two radio channels are used for this test.
Number				
Active cell		Config 1	Cell 1: FR1 PCell	FR1 PCell on RF channel number 1
		-	Cell 2: FR1 SCell	FR1 SCell on RF channel number 2
CP length		Config 1	Normal	
DRX		Config 1	OFF	
Measurement		Config 1	OFF	
gap pattern Id		-		
Filter coefficient		Config 1	0	L3 filtering is not used
CSI-RS		Config 1	Cell 1: CSI-RS.1.5	
configuration for		-	FDD	
L1-RSRP			Cell 2: CSI-RS.2.5	
reporting			TDD	
T1	s	Config 1	5	

# Table 6.5.7.1.4.1-3: General test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA

### 6.5.7.1.4.2 Test procedure

The test consists of two active NR cells: Cell1( PCell) and Cell2(SCell). The test consists of one time period, with duration of T1. Prior to the start of the time duration T1, the UE shall be connected to Cell1 and Cell2 and the RRC message including *uplinkTxSwitching* is received at the UE antenna connector.

UE is configured to transmit SRS on both PCell and SCell on the last 2 symbols of special slot. DL interruption is expected to take place prior to the SRS symbols.

- 1. Ensure the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* and Test Mode *On* according to TS 38.508-1 [14] clause 4.5.
- 2. Configure PCell (Cell1) and SCell(Cell2) according to Table 6.5.7.1.5-1. Propagation conditions are set according to Annex C clause C.2.2.
- 3. The SS shall transmit an RRCReconfiguration message to configure PCell (Cell1) and SCelll(Cell2) as per TS 38.508-1 [7] clause 7 with the message content exceptions defined in clause 6.5.7.1.4.3. *UplinkTxSwitching* is configured to the UE.
- 4. The UE shall transmit *RRCReconfigurationComplete* message.
- 5. Set the parameters according to T1 in Tables 6.5.7.1.5-1. T1 starts.
- 6. SS schedules UL transmission on PCell continuously on the DL slots of SCell.
- 7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB on following symbol on the special slot on PCell and SCell:

### PCell (Cell1)

- symbol#12 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
- otherwise,
  - symbol #8 if UE capability uplinkTxSwitchingPeriod is 210us or
  - symbol #9 if UE capability uplinkTxSwitchingPeriod is 140us or
- symbol #10 if UE capability uplinkTxSwitchingPeriod is 35us.

#### SCell(Cell2)

- symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
- otherwise,

- symbol #4 if UE capability uplinkTxSwitchingPeriod is 210us or
- symbol #5 if UE capability uplinkTxSwitchingPeriod is 140us or
- symbol #8 if UE capability uplinkTxSwitchingPeriod is 35us.
- 8. After SS transmits the DCI trigger, the UE shall send L1-RSRP report containing valid L1-RSRP report for CSI-RS#0 and CSI-RS#1 at slot 5 from the reception of DCI trigger, if so increase the number of passed iterations by one otherwise increase the number of failed iterations by one and switch off the UE.
- 9. SS transmits in Cell 1 a Paging message (including PagingRecord with UE-Identity) for the UE and ensures the UE is in state RRC\_CONNECTED TS 38.508-1 [14] clause 4.5. (if the paging fails, switches off and on the UE and ensures the UE is in state RRC\_CONNECTED TS 38.508-1 [14] clause 4.5),

or

- switches off and on the UE and ensures the UE is in state RRC\_CONNECTED with generic procedure parameters Connectivity *NR*, Connected without release *On* according to TS 38.508-1 [14] clause 4.5.
- 10. Repeat step 3-9 until a test verdict has been achieved.

6.5.7.1.4.3 Message contents

Message contents are according to TS 38.508-1 [14] clause 7.3 with the following exceptions:

# Table 6.5.7.1.4.3-1: Common Exception messages for DL interruptions at switching between two uplink carriers in FDD-TDD CA

	Default Message Contents
Common contents of system information	
blocks exceptions	

## Table 6.5.7.1.4.3-2: ServingCellConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-167			
Information Element	Value/remark	Comment	Condition
ServingCellConfig ::= SEQUENCE {			
uplinkConfig SEQUENCE {			
uplinkTxSwitching-r16 SEQUENCE {			
uplinkTxSwitchingPeriodLocation-r16	TRUE		
uplinkTxSwitchingCarrier-r16	carrier1	TE configures one	
	carrier2	of the two uplink carriers involved in dynamic UL TX switching as carrier1 and the other as carrier2	
}			
}			
}			

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Information Element	Value/remark	Comment	Condition
CellGroupConfig ::= SEQUENCE {			
uplinkTxSwitchingOption-r16	switchedUL		UE reports 'switchedUL or 'both' for capability IE uplinkTxSwi ching- OptionSupp ort-r16
	dualUL		UE reports 'dualUL' for capability IE uplinkTxSw. ching- OptionSupp ort-r16

## Table 6.5.7.1.4.3-3: CellGroupConfig

## 6.5.7.1.4.3-4: TDD-UL-DL-ConfigCommon

Information Element	Value/remark	Comment	Condition
TDD-UL-DL-ConfigCommon ::= SEQUENCE {			
pattern1 SEQUENCE {			
nrofDownlinkSymbols	11		
nrofUplinkSymbols	2		
}			
}			

Derivation Path: TS 38.508-1 [14], Table 4.6.3-182			
Information Element	Value/remark	Comment	Condition
SRS-Config ::= SEQUENCE {			
srs-ResourceSetToAddModList SEQUENCE			
(SIZE(0maxNrofSRS-ResourceSets)) OF			
SEQUENCE {			
SRS-ResourceSet[1] SEQUENCE {		entry 1	
resourceType CHOICE {			
periodic SEQUENCE {			
}			
}			
}			
}			
srs-ResourceToAddModList SEQUENCE			
(SIZE(1maxNrofSRS-Resources)) OF SEQUENCE {			
SRS-Resource[1] SEQUENCE {		entry 1	
nrofSRS-Ports	ports2		
resourceMapping SEQUENCE {			
startPosition	0		
nrofSymbols	n2		
}			
freqHopping SEQUENCE {			
c-SRS	0		
}			
groupOrSequenceHopping	neither		
resourceType CHOICE {			
periodic SEQUENCE {			
periodicityAndOffset-p CHOICE {			
sl8	3		
}			
}			
}			
}			
}			
}			

## 6.5.7.1.4.3-5: SRS-Config

## Table 6.5.7.1.4.3-6: CSI-MeasConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-38			
Information Element	Value/remark	Comment	Condition
CSI-MeasConfig::= SEQUENCE {			
nzp-CSI-RS-ResourceToAddModList SEQUENCE			
(SIZE (1maxNrofNZP-CSI-RS-Resources)) OF NZP-			
CSI-RS-Resource {			
NZP-CSI-RS-Resource[1] SEQUENCE {		entry 1	
nzp-CSI-RS-ResourceId	0		
resourceMapping SEQUENCE {			
frequencyDomainAllocation CHOICE { other	000001		
- Olinei	000001		
nrofPorts			
firstOFDMSymbolInTimeDomain	p1 12		UE does not
			report uplinkTxSwit ching-DL-
			Interruption- r16
	8		UE capability
			uplinkTxSwit chingPeriod is 210us
	9		UE
			capability uplinkTxSwit chingPeriod is 140us
	10		UE capability
			uplinkTxSwit chingPeriod is 35us
firstOFDMSymbolInTimeDomain2	Not present		
cdm-Type	noCDM		
density CHOICE {			
three			
}			
freqBand SEQUENCE {	-		
startingRB	0		
nrofRBs	106		
}			
}			
powerControlOffset powerControlOffsetSS	0 db6		UE
	dbo		configured with CSI-RS power boosting of 6dB
scramblingID	0		
periodicityAndOffset	Not Present		
qcl-InfoPeriodicCSI-RS	Not Present		
}			
NZP-CSI-RS-Resource[2] SEQUENCE {		entry 2	
nzp-CSI-RS-Resourceld	1		
resourceMapping SEQUENCE {			
frequencyDomainAllocation CHOICE {			
other	000001	1	
}			
nrofPorts	p1		

firstOFDMSymbolInTimeDomain	10		UE does not
			report
			uplinkTxSwit
			ching-DL-
			Interruption-
			r16
	4		UE
			capability
			uplinkTxSwit
			chingPeriod
			is 210us
	5		UE
			capability
			uplinkTxSwit
			chingPeriod
			is 140us
	8		UE
	3		capability
			uplinkTxSwit
			chingPeriod
			is 35us
firstOFDMSymbolInTimeDomain2	Not present		13 0003
cdm-Type	noCDM		}
	TIOCDIVI		
density CHOICE {			
three			
}			
freqBand SEQUENCE {			
startingRB	0		
nrofRBs	52		
}			
}			
powerControlOffset	0		
powerControlOffsetSS	db6		UE
			configured
			0
			with CSI-RS
			with CSI-RS
			power
			power boosting of
scramblingID	0		power
scramblingID periodicityAndOffset	0 Not Present		power boosting of
periodicityAndOffset	Not Present		power boosting of
periodicityAndOffset qcI-InfoPeriodicCSI-RS	-		power boosting of
periodicityAndOffset	Not Present		power boosting of
periodicityAndOffset qcI-InfoPeriodicCSI-RS } }	Not Present Not Present		power boosting of
periodicityAndOffset qcI-InfoPeriodicCSI-RS } } nzp-CSI-RS-ResourceSetToAddModList	Not Present		power boosting of
periodicityAndOffset qcI-InfoPeriodicCSI-RS } nzp-CSI-RS-ResourceSetToAddModList SEQUENCE (SIZE (1maxNrofNZP-CSI-RS-	Not Present Not Present		power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {	Not Present Not Present 1 entry		power boosting of
periodicityAndOffset qcI-InfoPeriodicCSI-RS } nzp-CSI-RS-ResourceSetToAddModList SEQUENCE (SIZE (1maxNrofNZP-CSI-RS-	Not Present         Not Present         1 entry         NZP-CSI-RS-	entry 1	power boosting of
periodicityAndOffset qcl-InfoPeriodicCSI-RS } nzp-CSI-RS-ResourceSetToAddModList SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {	Not Present Not Present 1 entry	entry 1 6.5.7.1.4.3-7	power boosting of
periodicityAndOffset qcl-InfoPeriodicCSI-RS } nzp-CSI-RS-ResourceSetToAddModList SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId { NZP-CSI-RS-ResourceSet[1] }	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet		power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         arzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE	Not Present         Not Present         1 entry         NZP-CSI-RS-		power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ResourceConfigurations)) OF	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet		power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ResourceConfigurations)) OF CSI-ResourceConfig {	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet	6.5.7.1.4.3-7	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ResourceConfigurations)) OF	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet	6.5.7.1.4.3-7	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ResourceConfigurations)) OF CSI-ResourceConfig {	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet	6.5.7.1.4.3-7	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ResourceConfigurations)) OF CSI-ResourceConfig {	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet	6.5.7.1.4.3-7	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ResourceConfigurations)) OF CSI-ResourceConfig {         CSI-ResourceConfig[1]         }	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet	6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3-	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ResourceConfigurations)) OF CSI-ResourceConfig {         CSI-ResourceConfig[1]         }	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet	6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3-	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE         (SIZE (1maxNrofCSI-ResourceConfigurations)) OF         CSI-ResourceConfig {         CSI-ResourceConfig[1]         }         csi-ReportConfigToAddModList SEQUENCE (SIZE	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1 <t< td=""><td>6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3-</td><td>power boosting of</td></t<>	6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3-	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE         (SIZE (1maxNrofCSI-ResourceConfigurations)) OF         CSI-ResourceConfig {         CSI-ResourceConfig[1]         }         csi-ReportConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ReportConfigurations)) OF CSI-         (1maxNrofCSI-ReportConfigurations)) OF CSI-	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1 <t< td=""><td>6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3-</td><td>power boosting of</td></t<>	6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3-	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE         (SIZE (1maxNrofCSI-ResourceConfigurations)) OF         CSI-ResourceConfig {         CSI-ResourceConfig[1]         }         csi-ReportConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ReportConfigurations)) OF CSI-ReportConfigUrations)) OF CSI-ReportConfig {	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1	6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3- 8	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE         (SIZE (1maxNrofCSI-ResourceConfigurations)) OF         CSI-ResourceConfig {         CSI-ResourceConfig[1]         }         csi-ReportConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ReportConfigurations)) OF CSI-         (1maxNrofCSI-ReportConfigurations)) OF CSI-	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1 <t< td=""><td>6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3- 8 entry 1</td><td>power boosting of</td></t<>	6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3- 8 entry 1	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE         (SIZE (1maxNrofCSI-ResourceConfigurations)) OF         CSI-ResourceConfig {         CSI-ResourceConfig[1]         }         csi-ReportConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ReportConfigurations)) OF CSI-ReportConfigUrations)) OF CSI-ReportConfig {	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1	6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3- 8 entry 1 Table 6.5.7.1.4.3-	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE         (SIZE (1maxNrofCSI-ResourceConfigurations)) OF         CSI-ResourceConfig {         CSI-ResourceConfig[1]         }         csi-ReportConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ReportConfigurations)) OF CSI-ReportConfigUrations)) OF CSI-ReportConfig {	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1	6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3- 8 entry 1	power boosting of
periodicityAndOffset         qcl-InfoPeriodicCSI-RS         }         nzp-CSI-RS-ResourceSetToAddModList         SEQUENCE (SIZE (1maxNrofNZP-CSI-RS- ResourceSets)) OF NZP-CSI-RS-ResourceSetId {         NZP-CSI-RS-ResourceSet[1]         }         csi-ResourceConfigToAddModList SEQUENCE         (SIZE (1maxNrofCSI-ResourceConfigurations)) OF         CSI-ResourceConfig {         CSI-ResourceConfig[1]         }         csi-ReportConfigToAddModList SEQUENCE (SIZE (1maxNrofCSI-ReportConfigurations)) OF CSI-ReportConfigUrations)) OF CSI-ReportConfigUrations)	Not Present         Not Present         1 entry         NZP-CSI-RS- ResourceSet         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1         1	6.5.7.1.4.3-7 entry 1 Table 6.5.7.1.4.3- 8 entry 1 Table 6.5.7.1.4.3-	power boosting of

Derivation Path: TS 38.508-1 [14], Table 4.6.3-87			
Information Element	Value/remark	Comment	Condition
NZP-CSI-RS-ResourceSet ::= SEQUENCE {			
nzp-CSI-ResourceSetId	0	For CSI-RS#0	
	1	For CSI-RS#1	
nzp-CSI-RS-Resources SEQUENCE (SIZE (1maxNrofNZP-CSI-RS-ResourcesPerSet)) OF NZP-CSI-RS-Resourceld {	1 entry		
NZP-CSI-RS-ResourceId[1]	0	entry 1	
repetition	off		
aperiodicTriggeringOffset	6		
trs-Info	Not present		
}			

### Table 6.5.7.1.4.3-7: NZP-CSI-RS-ResourceSet

### Table 6.5.7.1.4.3-8: CSI-ResourceConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-41			
Information Element	Value/remark	Comment	Condition
CSI-ResourceConfig ::= SEQUENCE {			
csi-ResourceConfigId	0	For CSI-RS#0	
	1	For CSI-RS#1	
csi-RS-ResourceSetList CHOICE {			
nzp-CSI-RS-SSB SEQUENCE {			
nzp-CSI-RS-ResourceSetList SEQUENCE (SIZE			
(1maxNrofNZP-CSI-RS-ResourceSetsPerConfig))			
OF NZP-CSI-RS-ResourceSetId {			
NZP-CSI-RS-ResourceSetId [1]	0		
}			
csi-SSB-ResourceSetList	Not present		
}			
}			
bwp-ld	0		
resourceType	aperiodic		
}			

Derivation Path: TS 38.508-1 [14], Table 4.6.3-39			
Information Element	Value/remark	Comment	Condition
CSI-ReportConfig ::= SEQUENCE {			
reportConfigId	0		
carrier	ServCellIndex		
resourcesForChannelMeasurement	0		
csi-IM-ResourcesForInterference	Not present		
nzp-CSI-RS-ResourcesForInterference	Not present		
reportConfigType CHOICE {			
Aperiodic SEQUENCE {			
reportSlotOffsetList SEQUENCE (SIZE			
(1maxNrofUL-Allocations)) OF INTEGER {			
INTEGER	5		
INTEGER	5		
}			
}			
}			
reportQuantity CHOICE {			
cri-RSRP	NULL		
}			
reportFreqConfiguration	Not present		
timeRestrictionForChannelMeasurements	Not present		
timeRestrictionForInterferenceMeasurements	Not present		
codebookConfig	Not present		
dummy	Not present		
groupBasedBeamReporting	Not present		
cqi-Table	Not present		
subbandSize	Not present		
non-PMI-PortIndication	Not present		
semiPersistentOnPUSCH-v1530	Not present		
semiPersistentOnPUSCH-v1610	Not present		
aperiodic-v1610 SEQUENCE {			
reportSlotOffsetListDCI-0-2-r16	Not present		
reportSlotOffsetListDCI-0-1-r16 SEQUENCE (SIZE			
(1maxNrofUL-Allocations-r16)) OF INTEGER {			
INTEGER	5		
INTEGER	5		
}			
}			
reportQuantity-r16	Not present		
codebookConfig-r16	Not present		
}			

### Table 6.5.7.1.4.3-9: CSI-ReportConfig

#### 6.5.7.1.5 Test requirements

Table 6.5.7.1.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink carriers in FDD-TDD CA.

 Table 6.5.7.1.5-1: Cell specific test parameters for DL interruptions at switching between two uplink carriers in FDD-TDD CA

Parame	ter	Unit	Cell1	Cell2
Frequency Range			FR1	FR1
Duplex mode	Config 1		FDD	TDD
TDD configuration	Config 1		N/A	TDDConf.2.1 except that: S='11DL:1GP:2UL'; nrofDownlinkSymbols:11 nrofUplinkSymbols: 2
BW <sub>channel</sub>	Config 1		10 MHz: N <sub>RB,c</sub> = 52	40 MHz: N <sub>RB,c</sub> = 106
Initial BWP Configuration	Config 1		DLBWP.0.1	DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1	DLBWP.1.1
UL dedicated BWP configuration	Config 1		ULBWP.1.1	ULBWP.1.1
SRS configuration	Config 1		SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0resourceMappingnrofSymbols: n2	SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols: n2
PDSCH Reference measurement channel	Config 1		SR.1.1 FDD	SR.2.1 TDD
RMSI CORESET parameters	Config 1		CR.1.1 FDD	CR.2.1 TDD
Dedicated CORESET parameters	Config 1		CCR.1.1 FDD	CCR.2.1 TDD
OCNG Patterns			OP.1	OP.1
SMTC Configuration			SMTC.1	SMTC.1
SSB Configuration	Config 1		SSB.1 FR1	SSB.2 FR1
Correlation Matrix and A Configuration			1x2 Low	2x2 Low
EPRE ratio of PSS to SS EPRE ratio of PBCH DM EPRE ratio of PBCH to P EPRE ratio of PDCCH D EPRE ratio of PDCCH to EPRE ratio of PDSCH D EPRE ratio of PDSCH to EPRE ratio of OCNG DM	RS to SSS PBCH DMRS MRS to SSS PDCCH DMRS MRS to SSS PDSCH	dB	0	0
1) EPRE ratio of OCNG to ( (Note 1)	OCNG DMRS	-		
N <sub>oc</sub> <sup>Note 2</sup>		dBm/15 kHz	-105.1	-105.1
SS-RSRP Note 3		dBm/ SSB SCS	-88.1	85.1
CSI-RS RSRP Note6		dBm/SCS	-82.1	79.1
Ês/lot		dB	17	17
Ês/Noc		dB	17	17
Noc <sup>Note 2</sup>	Config 1	dBm/SCS	105.1	-102.1
Io <sup>Note3</sup> on symbols without CSI-RS	Config 1	dBm/9.36 MHz	60.06	-
		dBm/ 38.16MHz	-	-53. 96
Io <sup>Note6</sup> on symbols with CSI-RS	Config 1	dBm/9.36 MHz	-57.68	-
		dBm/ 38.16MHz	-	-51.58
Time offset to Cell1 Note 5		μS	-	0
Propagation Condition			AWGN	AWGN

Note 1:	OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.
Note 2:	Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for $N_{oc}$ to be fulfilled.
Note 3:	SS-RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.
Note 4:	Void
Note 5:	Receive time difference between slot boundaries of signals received from the two cells at the UE antenna connector including time alignment error between the two cells.
Note 6:	CSI-RS RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7.1.5-2

## Table 6.5.7.1.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers

μ	NR Slot length (ms)	Uplink Tx switching period Note1			
	_	35us 140us 210us			
0	1	2	3	4	
1	0.5	3	6	7	
2	0.25	4 10 14			
Note 1:	Uplink Tx switching period depends on UE capability uplinkTxSwitchingPeriod				

The UE shall send L1-RSRP report at slot 5 from the reception of DCI trigger. The L1-RSRP report shall include the results of CSI-RS#0. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7.1.5-4.

#### Table 6.5.7.1.5-3: L1-RSRP absolute accuracy requirements for the reported values of CSI-RS#0

Normal Conditions	T1
Lowest reported value (CSI-RS#0)	64
Highest reported value (CSI-RS#0)	84

#### Table 6.5.7.1.5-4: L1-RSRP absolute accuracy requirements for the reported values of CSI-RS#1

Normal Conditions	T1
Lowest reported value (CSI-RS#0)	67
Highest reported value (CSI-RS#0)	87

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.

#### 6.5.7.2 NR SA FR1 DL Interruptions at switching between two uplink carriers in TDD-TDD CA

6.5.7.2.1 Test purpose

The purpose of this test is to verify the DL interruption requirements during UE dynamic switching between two uplink carriers.

6.5.7.2.2 Test applicability

This test applies to all types of NR UE release 16 onwards, configured with uplinkTxSwitchingPeriod.

#### 6.5.7.2.3 Minimum conformance requirements

The minimum conformance requirements are specified in clause 6.5.7.0.

The normative reference for this requirement is TS 38.133 [6] clause 8.2.2.2.10 and A.6.5.7.2

#### 6.5.7.2.4 Test description

#### 6.5.7.2.4.1 Initial conditions

This test shall be tested using any of the test configurations in Table 6.5.7.2.4.1-1.

#### Table 6.5.7.2.4.1-1: Supported test configurations

Config	Description
6.5.7.2-1	NR Cell 1: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode
	NR Cell 2: 30 kHz SSB SCS, 40 MHz bandwidth, TDD duplex mode

Configure the test equipment and the DUT according to the parameters in Table 6.5.7.2.4.1-2.

## Table 6.5.7.2.4.1-2: Initial conditions for DL interruptions at switching between two uplink carriers in TDD-TDD CA

Parameter	Value		Comment	
Test environment	NC		As specified in TS 38.508-1 [14] clause 4.1.	
Test frequencies	As specified	in Annex E, Table E.4-1 and TS 38	.508-1 [14] clause 4.3.1.	
Channel bandwidth	As specified	by the test configuration selected from Table 6.5.7.2.4.1-1.		
Propagation conditions	AWGN		As specified in Annex C.2.2	
Connection	TE Part	A.3.1.8.2a	As specified in TS 38.508-1 [14] Annex A.	
Diagram	DUT Part	A.3.2.3.4		
Exceptions to connection diagram	<ul> <li>For 4Rx capable UEs without any 2Rx RF bands use A.3.2.5.2 for DUT part and A.3.1.8.4 for TE part.</li> <li>Without LTE link</li> <li>Without Faders</li> </ul>			

- 1. The general test parameter settings are set up according to Table 6.5.7.2.4.1-3.
- 2. Message contents are defined in clause 6.5.7.2.4.3.
- 3. The test scenario comprises of one NR Cell (Cell 1). Cell 1 is configured according to Annex C.1.2 and C.1.3.

## Table 6.5.7.2.4.1-3: General test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA

Parameter	Unit	Test configuration	Value	Comment
RF Channel Number		Config 1	1, 2	Two radio channels are used for this test.
Active cell		Config 1	Cell 1: FR1 PCell Cell 2: FR1 SCell	FR1 PCell on RF channel number 1 FR1 SCell on RF channel number 2
CP length		Config 1	Normal	
DRX		Config 1	OFF	
Measurement gap pattern Id		Config 1	OFF	
Filter coefficient		Config 1	0	L3 filtering is not used
CSI-RS configuration for L1-RSRP reporting		Config 1	Cell 1: CSI-RS.2.5 TDD Cell 2: CSI-RS.2.5 TDD	
T1	S	Config 1	5	

#### 6.5.7.2.4.2 Test procedure

Same as in 6.5.7.1.4.2 with the following exception in step 7.

7. SS triggers aperiodic CSI-RS for L1-RSRP reporting with power boosting 6dB on following symbol on the special slot on PCell and SCell:

- symbol#10 if UE does not report uplinkTxSwitching-DL-Interruption-r16;
- otherwise,
  - symbol #4 if UE capability uplinkTxSwitchingPeriod is 210us or
  - symbol #5 if UE capability uplinkTxSwitchingPeriod is 140us or
  - symbol #8 if UE capability uplinkTxSwitchingPeriod is 35us.

#### 6.5.7.2.4.3 Message contents

Same as in 6.5.7.1.4.2 with the following exception:

## Table 6.5.7.2.4.3-6: CSI-MeasConfig

Derivation Path: TS 38.508-1 [14], Table 4.6.3-38			
Information Element	Value/remark	Comment	Condition
CSI-MeasConfig::= SEQUENCE {			
nzp-CSI-RS-ResourceToAddModList SEQUENCE			
(SIZE (1maxNrofNZP-CSI-RS-Resources)) OF NZP-			
CSI-RS-Resource { NZP-CSI-RS-Resource[1] SEQUENCE {		ontry 1	
nzp-CSI-RS-ResourceId	0	entry 1	
resourceMapping SEQUENCE {	0		
frequencyDomainAllocation CHOICE {			
other	000001		
}			
nrofPorts	p1		
firstOFDMSymbolInTimeDomain	10		UE does not report uplinkTxSwit ching-DL- Interruption- r16
	4		UE capability uplinkTxSwit chingPeriod is 210us
	5		UE capability uplinkTxSwit chingPeriod is 140us
	8		UE capability uplinkTxSwit chingPeriod is 35us
firstOFDMSymbolInTimeDomain2	Not present		
cdm-Type	noCDM		
density CHOICE {			
three			
freqBand SEQUENCE {	0		
startingRB nrofRBs	0 106		
}			+
}			1
powerControlOffset	0		1
powerControlOffsetSS	db6		
scramblingID	0		
periodicityAndOffset	Not Present		
qcl-InfoPeriodicCSI-RS	Not Present		
}			
}			
NZP-CSI-RS-Resource[2] SEQUENCE {		entry 2	
nzp-CSI-RS-ResourceId	1		
resourceMapping SEQUENCE {			
frequencyDomainAllocation CHOICE {	000001		
other	000001		
nrofPorts	p1		
firstOFDMSymbolInTimeDomain	10		UE does not report uplinkTxSwit ching-DL- Interruption- r16

UE capability uplinkTxSwit chingPeriod is 210us UE capability uplinkTxSwit chingPeriod is 140us UE

capability uplinkTxSwit chingPeriod is 35us

Release 17	1300	JUFF 13 30.333 VI	
	4		
	5		
	Ŭ		
	8		
firstOFDMSymbolInTimeDomain2	Not present		
cdm-Type	noCDM		
density CHOICE {			
three			
freeDend SEQUENCE (			
freqBand SEQUENCE { startingRB	0		
nrofRBs	52		
}	52		
}			
powerControlOffset	0		
powerControlOffsetSS	db6		
scramblingID	0		
periodicityAndOffset	Not Present		
qcl-InfoPeriodicCSI-RS	Not Present		
}			
}	1		
nzp-CSI-RS-ResourceSetToAddModList SEQUENCE (SIZE (1maxNrofNZP-CSI-RS-	1 entry		
ResourceSets)) OF NZP-CSI-RS-ResourceSetId {			
NZP-CSI-RS-ResourceSet[1]	NZP-CSI-RS-	entry 1	
	ResourceSet	6.5.7.1.4.3-7	
}			
csi-ResourceConfigToAddModList SEQUENCE	1 entry		
(SIZE (1maxNrofCSI-ResourceConfigurations)) OF			
CSI-ResourceConfig {		a na fun : A	
CSI-ResourceConfig[1]		entry 1 Table 6.5.7.1.4.3-	
		8	
	+	~	

### 6.5.7.2.5 Test requirements

csi-ReportConfigToAddModList SEQUENCE (SIZE

(1..maxNrofCSI-ReportConfigurations)) OF CSI-

ReportConfig { CSI-ReportConfig[1]

Table 6.5.7.1.5-1 defines the primary level settings including test tolerances for DL interruptions at switching between two uplink carriers in FDD-TDD CA.

1 entry

CSI-ReportConfig

entry 1

9

Table 6.5.7.1.4.3-

# Table 6.5.7.2.5-1:Cell specific test parameters for DL interruptions at switching between two uplink carriers in TDD-TDD CA

Parame	ter	Unit	Cell1	Cell2
Frequency Range			FR1	FR1
Duplex mode	Config 1		TDD	TDD
TDD configuration	Config 1		TDDConf.2.1 except that S='11DL:1GP:2UL';	TDDConf.2.2
			nrofDownlinkSymbols:11	
	Config 1		nrofUplinkSymbols: 2	40 MH- 100
BW <sub>channel</sub> Initial BWP	Config 1		40 MHz: $N_{RB,c} = 106$	40 MHz: $N_{RB,c} = 106$
Configuration	Config 1		DLBWP.0.1	DLBWP.0.1
DL dedicated BWP configuration	Config 1		DLBWP.1.1	DLBWP.1.1
UL dedicated BWP configuration	Config 1		ULBWP.1.1	ULBWP.1.1
SRS configuration	Config 1		SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: 0 resourceMappingnrofSymbols:	SRS configuration in Table 4.4.1.1.5-2 is applied except that: resourceMappingstartPosition: ( resourceMappingnrofSymbols:
			n2	n2
PDSCH Reference measurement channel	Config 1		SR.2.1 TDD	SR.2.1 TDD
RMSI CORESET parameters	Config 1		CR.2.1 TDD	CR.2.1 TDD
Dedicated CORESET	Config 1		CCR.2.1 TDD	CCR.2.1 TDD
parameters			OP.1	OP.1
OCNG Patterns SMTC Configuration			SMTC.1	SMTC.1
SSB Configuration	Config 1		SSB.2 FR1	SSB.2 FR1
Correlation Matrix and A			1x2 Low	2x2 Low
	ntenna		TX2 LOW	ZXZ LOW
Configuration EPRE ratio of PSS to SS	20			0
		dB	0	0
EPRE ratio of PBCH DM		-		
EPRE ratio of PBCH to PBCH DMRS		-		
EPRE ratio of PDCCH D		-		
EPRE ratio of PDCCH to		-		
EPRE ratio of PDSCH D		_		
EPRE ratio of PDSCH to				
EPRE ratio of OCNG DM	IRS to SSS(Note			
1) EPRE ratio of OCNG to (	OCNG DMRS	-		
(Note 1)				
Noc <sup>Note 2</sup>		dBm/15 kHz	-105.1	-105.1
SS-RSRP Note 3		dBm/ SSB SCS	-85.1	-85.1
CSI-RS RSRP Note6		dBm/SCS	-79.1	-79.1
Ês/I <sub>ot</sub>		dB	17	17
Ês/Noc		dB	17	17
Noc <sup>Note 2</sup>	Config 1	dBm/SCS	-102.1	-102.1
Io <sup>Note3</sup> on symbols without CSI-RS	Config 1	dBm/ 38.16MHz	-53.96	-53.96
lo <sup>Note6</sup> on symbols with	Config 1	dBm/	-51.58	-51.58
CSI-RS Time offset to Cell1 Note 5	<u> </u>	38.16MHz μs	-	0
Propagation Condition		μο	AWGN	AWGN
Note 1: OCNG shall b	e used such that bo Ill OFDM symbols.	th cells are full	y allocated and a constant total tran	
Note 2: Interference fr and time and	om other cells and r shall be modelled as	s AWGN of app	not specified in the test is assumed to propriate power for $N_{oc}$ to be fulfilled	
parameters th		a aerived from	other parameters for information pu	rposes. They are not settable
	difference between a alignment error bet		s of signals received from the two ce	Ils at the UE antenna connector
			rom other parameters for informatio	n purposes. They are not settab

Note 6: CSI-RS RSRP and lo levels have been derived from other parameters for information purposes. They are not settable parameters themselves.

UE shall send L1-RSRP report while meeting the accuracy requirements defined in TS 38.133 clause 10.1.19.2.

The DL interruption lengths of X are defined in Table 6.5.7.2.5-2

## Table 6.5.7.2.5-2: DL interruption length on NR carrier(s) in the unit of OFDM symbols (X) for switching between two uplink carriers

μ	NR Slot length (ms)	Uplink Tx switching period Note1			
	-	35us	140us	210us	
0	1	2	3	4	
1	0.5	3	6	7	
2	0.25	4	10	14	
Note 1:	te 1: Uplink Tx switching period depends on UE capability uplinkTxSwitchingPeriod				

The UE shall send L1-RSRP report at slot 5 from the reception of DCI trigger. The L1-RSRP report shall include the results of CSI-RS#0 and CSI-RS#1. Each L1-RSRP measurement report shall meet the corresponding absolute accuracy requirements in Table 6.5.7.1.5-4.

## Table 6.5.7.2.5-3: L1-RSRP absolute accuracy requirements for the reported values of CSI-RS#0 and CSI-RS#1

Normal Conditions	T1
Lowest reported value (CSI-RS#0)	67
Highest reported value (CSI-RS#0)	87

The rate of correct events observed during repeated tests shall be at least 90% with a confidence level of 95%.