Annex A (normative): Measurement channels

A.1   General

The throughput values defined in the measurement channels specified in Annex A, are calculated and are valid per datastream (codeword). For multi-stream (more than one codeword) transmissions, the throughput referenced in the minimum requirements is the sum of throughputs of all datastreams (codewords).

The UE category entry in the definition of the reference measurement channel in Annex A is only informative and reveals the UE categories, which can support the corresponding measurement channel. Whether the measurement channel is used for testing a certain UE category or not is specified in the individual minimum requirements.

A.2   UL reference measurement channels

A.2.1   General

The measurement channels in the following subclauses are defined to derive the requirements in clause 6 (Transmitter Characteristics) and clause 7 (Receiver Characteristics). The measurement channels represent example configurations of physical channels for different data rates.

The measurement channels in the following clauses are applicable to both FDD and TDD.

The active uplink slots for TDD configurations are specified in table A.2.1-1. TDD slot patterns defined for reference sensitivity tests will be used for TDD UL RMCs.

Table A.2.1-1: TDD active uplink slots

SCS	Active Uplink slots
15 kHz	4, 9
30 kHz	8, 9, 18, 19
60 kHz	16, 17, 18, 19, 36, 37, 38, 39

Table A.2.1-2: TDD active uplink slots for PC1.5 UE with maxUplinkDutyCycle-PC1dot5-MPE-FR1-r16≤20%

SCS	Active Uplink slots
15 kHz	4
30 kHz	8, 9
60 kHz	16, 17, 18, 19

A.2.2   Reference measurement channels for FDD

A.2.2.1   DFT-s-OFDM Pi/2-BPSK

Table A.2.2.1-1: Reference Channels for DFT-s-OFDM Pi/2-BPSK

Parameter	Allocated resource blocks (L_{CRB})	DFT-s-OFDM Symbols per slot (Note 1)	Modulation	MCS Index (Note 2)	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot (Note 3)	Total number of bits per slot	Total modulated symbols per slot
Unit					Bits	Bits			Bits	
	1	11	pi/2 BPSK	0	24	16	2	1	132	132
	5	11	pi/2 BPSK	0	160	16	2	1	660	660
	9	11	pi/2 BPSK	0	288	16	2	1	1188	1188
	10	11	pi/2 BPSK	0	320	16	2	1	1320	1320
	12	11	pi/2 BPSK	0	384	16	2	1	1584	1584
	15	11	pi/2 BPSK	0	480	16	2	1	1980	1980
	18	11	pi/2 BPSK	0	576	16	2	1	2376	2376
	24	11	pi/2 BPSK	0	768	16	2	1	3168	3168
	25	11	pi/2 BPSK	0	808	16	2	1	3300	3300
	30	11	pi/2 BPSK	0	984	16	2	1	3960	3960
	32	11	pi/2 BPSK	0	1032	16	2	1	4224	4224
	36	11	pi/2 BPSK	0	1128	16	2	1	4752	4752
	45	11	pi/2 BPSK	0	1416	16	2	1	5940	5940
	50	11	pi/2 BPSK	0	1544	16	2	1	6600	6600
	60	11	pi/2 BPSK	0	1864	16	2	1	7920	7920
	64	11	pi/2 BPSK	0	2024	16	2	1	8448	8448
	75	11	pi/2 BPSK	0	2408	16	2	1	9900	9900
	80	11	pi/2 BPSK	0	2472	16	2	1	10560	10560
	81	11	pi/2 BPSK	0	2536	16	2	1	10692	10692
	90	11	pi/2 BPSK	0	2792	16	2	1	11880	11880
	100	11	pi/2 BPSK	0	3104	16	2	1	13200	13200
	108	11	pi/2 BPSK	0	3368	16	2	1	14256	14256
	120	11	pi/2 BPSK	0	3752	16	2	1	15840	15840
	128	11	pi/2 BPSK	0	3976	24	2	2	16896	16896
	135	11	pi/2 BPSK	0	4104	24	2	2	17820	17820

	160	11	pi/2 BPSK	0	4872	24	2	2	21120	21120
	162	11	pi/2 BPSK	0	5000	24	2	2	21384	21384
	180	11	pi/2 BPSK	0	5512	24	2	2	23760	23760
	216	11	pi/2 BPSK	0	6664	24	2	2	28512	28512
	243	11	pi/2 BPSK	0	7560	24	2	2	32076	32076
	270	11	pi/2 BPSK	0	8448	24	2	3	35640	35640

Table A.2.2.1-2:   **Void**

Table A.2.2.1-3:   **Void**

A.2.2   DFT-s-OFDM QPSK

NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.

NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in TS 38.214 [10].

NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

NOTE 4: The RMCs apply to all channel bandwidth where $L_{CRB} \le N_{RB.}$

Table A.2.2.2-1: Reference Channels for DFT-s-OFDM QPSK

Parameter	Allocated resource blocks ($L_{CRB)}$	DFT-s-OFDM Symbols per slot (Note 1)	Modulation	MCS Index (Note 2)	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot (Note 3)	Total number of bits per slot	Total modulated symbols per slot
Unit					Bits	Bits			Bits	
	1	11	QPSK	2	48	16	2	1	264	132
	5	11	QPSK	2	256	16	2	1	1320	660
	9	11	QPSK	2	456	16	2	1	2376	1188
	10	11	QPSK	2	504	16	2	1	2640	1320
	12	11	QPSK	2	608	16	2	1	3168	1584
	15	11	QPSK	2	768	16	2	1	3960	1980
	18	11	QPSK	2	928	16	2	1	4752	2376
	20	11	QPSK	2	1032	16	2	1	5280	2640
	24	11	QPSK	2	1192	16	2	1	6336	3168
	25	11	QPSK	2	1256	16	2	1	6600	3300
	30	11	QPSK	2	1544	16	2	1	7920	3960
	32	11	QPSK	2	1608	16	2	1	8448	4224
	36	11	QPSK	2	1800	16	2	1	9504	4752
	45	11	QPKS	2	2208	16	2	1	11880	5940
	50	11	QPSK	2	2472	16	2	1	13200	6600
	60	11	QPSK	2	3104	16	2	1	15840	7920
	64	11	QPSK	2	3240	16	2	1	16896	8448
	75	11	QPSK	2	3752	16	2	1	19800	9900

Allocated resource blocks (L_CRB)	DFT-s-OFDM Symbols per slot (Note 1)	Modulation	MCS Index (Note 2)	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot (Note 3)	Total number of bits per slot	Total modulated symbols per slot
80	11	QPSK	2	3976	24	2	2	21120	10560
81	11	QPSK	2	4040	24	2	2	21384	10692
90	11	QPSK	2	4488	24	2	2	23760	11880
100	11	QPSK	2	5000	24	2	2	26400	13200
108	11	QPSK	2	5384	24	2	2	28512	14256
120	11	QPSK	2	5896	24	2	2	31680	15840
128	11	QPSK	2	6408	24	2	2	33792	16896
135	11	QPSK	2	6664	24	2	2	35640	17820
160	11	QPSK	2	7944	24	2	3	42240	21120
162	11	QPSK	2	8064	24	2	3	42768	21384
180	11	QPSK	2	8976	24	2	3	47520	23760
216	11	QPSK	2	10752	24	2	3	57024	28512
243	11	QPSK	2	12040	24	2	4	64152	32076
270	11	QPSK	2	13320	24	2	4	71280	35640

NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.

NOTE 2: MCS Index is based on MCS table 6.1.4.1-1 defined in TS 38.214 [10]

NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

NOTE 4: The RMCs apply to all channel bandwidth where $L_{CRB} \le N_{RB}$.

Table A.2.2.2-2: Void

Table A.2.2.2-3: Void

A.2.2.3 DFT-s-OFDM 16QAM Reference DFT-s-OFDM

Table A.2.2.3-1: Channels for 16QAM

Parameter	Allocated resource blocks (L_CRB)	DFT-s-OFDM Symbols per slot (Note 1)	Modulation	MCS Index (Note 2)	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot (Note 3)	Total number of bits per slot	Total modulated symbols per slot
Unit					Bits	Bits			Bits	
	1	11	16QAM	10	176	16	2	1	528	132
	5	11	16QAM	10	888	16	2	1	2640	660
	9	11	16QAM	10	1608	16	2	1	4752	1188
	10	11	16QAM	10	1800	16	2	1	5280	1320
	12	11	16QAM	10	2088	16	2	1	6336	1584
	15	11	16QAM	10	2664	16	2	1	7920	1980
	18	11	16QAM	10	3240	16	2	1	9504	2376
	24	11	16QAM	10	4224	24	1	1	12672	3168
	25	11	16QAM	10	4352	24	1	1	13200	3300
	30	11	16QAM	10	5248	24	1	1	15840	3960
	32	11	16QAM	10	5632	24	1	1	16896	4224
	36	11	16QAM	10	6272	24	1	1	19008	4752
	45	11	16QAM	10	7808	24	1	1	23760	5940
	50	11	16QAM	10	8712	24	1	2	26400	6600
	60	11	16QAM	10	10504	24	1	2	31680	7920
	64	11	16QAM	10	11272	24	1	2	33792	8448

L_CRB	DFT-s-OFDM Symbols per slot	Modulation	MCS Index	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot	Total number of bits per slot	Total modulated symbols per slot
75	11	16QAM	10	13064	24	1	2	39600	9900
80	11	16QAM	10	14088	24	1	2	42240	10560
81	11	16QAM	10	14088	24	1	2	42768	10692
90	11	16QAM	10	15880	24	1	2	47520	11880
100	11	16QAM	10	17424	24	1	3	52800	13200
108	11	16QAM	10	18960	24	1	3	57024	14256
120	11	16QAM	10	21000	24	1	3	63360	15840
128	11	16QAM	10	22536	24	1	3	67584	16896
135	11	16QAM	10	23568	24	1	3	71280	17820
160	11	16QAM	10	28168	24	1	4	84480	21120
162	11	16QAM	10	28168	24	1	4	85536	21384
180	11	16QAM	10	31752	24	1	4	95040	23760
216	11	16QAM	10	37896	24	1	5	114048	28512
243	11	16QAM	10	43032	24	1	6	128304	32076
270	11	16QAM	10	47112	24	1	6	142560	35640

NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.

NOTE 2: MCS index is based on MCS table 6.P.4.1-1 defined in TS 38.214 [10].

NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

NOTE 4: The RMCs apply to all channel bandwidth where L_CRB ≤ N_RB.

Parameter	Allocated resource blocks (L_CRB)	DFT-s-OFDM Symbols per slot (Note 1)	Modulation	MCS Index (Note 2)	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot (Note 3)	Total number of bits per slot	Total modulated symbols per slot
Unit					Bits	Bits			Bits	
	1	11	64QAM	18	408	16	2	1	792	132
	5	11	64QAM	18	2024	16	2	1	3960	660
	9	11	64QAM	18	3624	16	2	1	7128	1188
	10	11	64QAM	18	3968	24	1	1	7920	1320
	12	11	64QAM	18	4736	24	1	1	9504	1584
	15	11	64QAM	18	6016	24	1	1	11880	1980
	18	11	64QAM	18	7168	24	1	1	14256	2376
	24	11	64QAM	18	9480	24	1	2	19008	3168
	25	11	64QAM	18	9992	24	1	2	19800	3300
	30	11	64QAM	18	12040	24	1	2	23760	3960
	32	11	64QAM	18	12808	24	1	2	25344	4224
	36	11	64QAM	18	14344	24	1	2	28512	4752
	45	11	64QAM	18	17928	24	1	3	35640	5940
	50	11	64QAM	18	19968	24	1	3	39600	6600
	60	11	64QAM	18	24072	24	1	3	47520	7920
	64	11	64QAM	18	25608	24	1	4	50688	8448

Left margin labels:
Table A.2.2.3-2:
Table A.2.2.3-3:
A.2.2.4
Table A.2.2.4-1: Channels for 64QAM

Right margin labels:
Void
Void
DFT-s-OFDM 64QAM Reference DFT-s-OFDM

L_CRB	DFT-s-OFDM Symbols per slot	Modulation	MCS Index	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot	Total number of bits per slot	Total modulated symbols per slot
75	11	64QAM	18	30216	24	1	4	59400	9900
80	11	64QAM	18	31752	24	1	4	63360	10560
81	11	64QAM	18	32264	24	1	4	64152	10692
90	11	64QAM	18	35856	24	1	5	71280	11880
108	11	64QAM	18	43032	24	1	6	85536	14256
100	11	64QAM	18	39936	24	1	5	79200	13200
120	11	64QAM	18	48168	24	1	6	95040	15840
128	11	64QAM	18	51216	24	1	7	101376	16896
135	11	64QAM	18	54296	24	1	7	106920	17820
160	11	64QAM	18	63528	24	1	8	126720	21120
162	11	64QAM	18	64552	24	1	8	128304	21384
180	11	64QAM	18	71688	24	1	9	142560	23760
216	11	64QAM	18	86040	24	1	11	171072	28512
243	11	64QAM	18	96264	24	1	12	192456	32076
270	11	64QAM	18	108552	24	1	13	213840	35640

NOTE 1:   PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.

NOTE 2:   MCS Index is based on MCS table 6.P.4.1-1 defined in TS 38.214 [10].

NOTE 3:   If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

NOTE 4:   The RMCs apply to all channel bandwidth where L_CRB ≤ N_RB.

Table A.2.2.4-2: **Void**

Table A.2.2.4-3: **Void**

A.2.2.5   DFT-s-OFDM 256QAM

Table A.2.2.5-1: Channels for 256QAM

Reference DFT-s-OFDM

Parameter	Allocated resource blocks (L_CRB)	DFT-s-OFDM Symbols per slot (Note 1)	Modulation	MCS Index (Note 2)	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot (Note 3)	Total number of bits per slot	Total modulated symbols per slot
Unit					Bits	Bits			Bits	
	1	11	256QAM	20	704	16	2	1	1056	132
	5	11	256QAM	20	3496	16	2	1	5280	660
	9	11	256QAM	20	6272	24	1	1	9504	1188
	10	11	256QAM	20	7040	24	1	1	10560	1320
	12	11	256QAM	20	8456	24	1	2	12672	1584
	15	11	256QAM	20	10504	24	1	2	15840	1980
	18	11	256QAM	20	12552	24	1	2	19008	2376
	24	11	256QAM	20	16896	24	1	3	25344	3168
	25	11	256QAM	20	17424	24	1	3	26400	3300
	30	11	256QAM	20	21000	24	1	3	31680	3960
	32	11	256QAM	20	22536	24	1	3	33792	4224
	36	11	256QAM	20	25104	24	1	3	38016	4752
	45	11	256QAM	20	31752	24	1	4	47520	5940
	50	11	256QAM	20	34816	24	1	5	52800	6600
	60	11	256QAM	20	42016	24	1	5	63360	7920
	64	11	256QAM	20	45096	24	1	6	67584	8448

	Allocated resource blocks	CP OFDM Symbols per slot	Modulation	MCS Index	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot	Total number of bits per slot	Total modulated symbols per slot
	75	11	256QAM	20	53288	24	1	7	79200	9900
	80	11	256QAM	20	56368	24	1	7	84480	10560
	81	11	256QAM	20	57376	24	1	7	85536	10692
	90	11	256QAM	20	63528	24	1	8	95040	11880
	108	11	256QAM	20	75792	24	1	9	114048	14256
	100	11	256QAM	20	69672	24	1	9	105600	13200
	120	11	256QAM	20	83976	24	1	10	126720	15840
	128	11	256QAM	20	90176	24	1	11	135168	16896
	135	11	256QAM	20	94248	24	1	12	142560	17820
	160	11	256QAM	20	112648	24	1	14	168960	21120
	162	11	256QAM	20	114776	24	1	14	171072	21384
	180	11	256QAM	20	127080	24	1	16	190080	23760
	216	11	256QAM	20	151608	24	1	18	228096	28512
	243	11	256QAM	20	172176	24	1	21	256608	32076
	270	11	256QAM	20	188576	24	1	23	285120	35640

Table A.2.2.5-2:   Void

Table A.2.2.5-3:   Void

A.2.2.6   CP-OFDM QPSK

Table A.2.2.6-1: Channels for QPSK   **Reference CP-OFDM**

Parameter	Allocated resource blocks (L$_{CRB}$)	CP OFDM Symbols per slot (Note 1)	Modulation	MCS Index (Note 2)	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot (Note 3)	Total number of bits per slot	Total modulated symbols per slot
Unit					Bits	Bits			Bits	
	1	11	QPSK	2	48	16	2	1	264	132
	5	11	QPSK	2	256	16	2	1	1320	660
	6	11	QPSK	2	304	16	2	1	1584	792
	9	11	QPSK	2	456	16	2	1	2376	1188
	10	11	QPSK	2	504	16	2	1	2640	1320
	11	11	QPSK	2	552	16	2	1	2904	1452
	12	11	QPSK	2	608	16	2	1	3168	1584
	13	11	QPSK	2	672	16	2	1	3432	1716
	15	11	QPSK	2	768	16	2	1	3960	1980
	16	11	QPSK	2	808	16	2	1	4224	2112
	18	11	QPSK	2	928	16	2	1	4752	2376
	19	11	QPSK	2	984	16	2	1	5016	2508
	24	11	QPSK	2	1192	16	2	1	6336	3168
	25	11	QPSK	2	1256	16	2	1	6600	3300
	26	11	QPSK	2	1288	16	2	1	6864	3432
	31	11	QPSK	2	1544	16	2	1	8184	4092
	33	11	QPSK	2	1672	16	2	1	8712	4356

NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.
NOTE 2: MCS Index is based on MCS table 5.1.3.1-2 defined in TS 38.214 [10].
NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
NOTE 4: The RMCs apply to all channel bandwidth where L$_{CRB}$ ≤ N$_{RB}$.

38	11	QPSK	2	1928	16	2	1	10032	5016
39	11	QPSK	2	2024	16	2	1	10296	5148
40	11	QPSK	2	2024	16	2	1	10560	5280
47	11	QPSK	2	2408	16	2	1	12408	6204
51	11	QPSK	2	2536	16	2	1	13464	6732
52	11	QPSK	2	2600	16	2	1	13728	6864
53	11	QPSK	2	2664	16	2	1	13992	6996
54	11	QPSK	2	2664	16	2	1	14256	7128
61	11	QPSK	2	3104	16	2	1	16104	8052
65	11	QPSK	2	3240	16	2	1	17160	8580
67	11	QPSK	2	3368	16	2	1	17688	8844
68	11	QPSK	2	3368	16	2	1	17952	8976
78	11	QPSK	2	3848	24	2	2	20592	10296
79	11	QPSK	2	3912	24	2	2	20856	10428
80	11	QPSK	2	3976	24	2	2	21120	10560
81	11	QPSK	2	4040	24	2	2	21384	10692
93	11	QPSK	2	4616	24	2	2	24552	12276
95	11	QPSK	2	4744	24	2	2	25080	12540
106	11	QPSK	2	5256	24	2	2	27984	13992
107	11	QPSK	2	5256	24	2	2	28248	14124
108	11	QPSK	2	5384	24	2	2	28512	14256
109	11	QPSK	2	5384	24	2	2	28776	14388
121	11	QPSK	2	6024	24	2	2	31944	15972
123	11	QPSK	2	6152	24	2	2	32472	16236
133	11	QPSK	2	6664	24	2	2	35112	17556
135	11	QPSK	2	6664	24	2	2	35640	17820
137	11	QPSK	2	6792	24	2	2	36168	18084
160	11	QPSK	2	7944	24	2	3	42240	21120
162	11	QPSK	2	8064	24	2	3	42768	21384
189	11	QPSK	2	9480	24	2	3	49896	24948
216	11	QPSK	2	10752	24	2	3	57024	28512
217	11	QPSK	2	10752	24	2	3	57288	28644
245	11	QPSK	2	12296	24	2	4	64680	32340
270	11	QPSK	2	13320	24	2	4	71280	35640
273	11	QPSK	2	13576	24	2	4	72072	36036
NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.									
NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in TS 38.214 [10].									

NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Table A.2.2.6-2: NOTE 4: The RMCs apply to all channel bandwidth where $L_{CRB} \le N_{RB}$.

Table A.2.2.6-2: ... **Void**

Table A.2.2.6-3: Void

A.2.2.7 CP-OFDM 16QAM

Table A.2.2.7-1: Reference Channels for CP-OFDM 16QAM

Parameter	Allocated resource blocks ($L_{CRB)}$	CP-OFDM Symbols per slot (Note 1)	Modulation	MCS Index (Note 2)	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot (Note 3)	Total number of bits per slot	Total modulated symbols per slot
Unit					Bits	Bits			Bits	
	1	11	16QAM	10	176	16	2	1	528	132
	5	11	16QAM	10	888	16	2	1	2640	660
	6	11	16QAM	10	1064	16	2	1	3168	792
	9	11	16QAM	10	1608	16	2	1	4752	1188
	10	11	16QAM	10	1800	16	2	1	5280	1320
	11	11	16QAM	10	1928	16	2	1	5808	1452
	12	11	16QAM	10	2088	16	2	1	6336	1584
	13	11	16QAM	10	2280	16	2	1	6864	1716
	15	11	16QAM	10	2664	16	2	1	7920	1980
	16	11	16QAM	10	2792	16	2	1	8448	2112
	18	11	16QAM	10	3240	16	2	1	9504	2376
	19	11	16QAM	10	3368	16	2	1	10032	2508
	24	11	16QAM	10	4224	24	1	1	12672	3168
	25	11	16QAM	10	4352	24	1	1	13200	3300
	26	11	16QAM	10	4480	24	1	1	13728	3432
	31	11	16QAM	10	5376	24	1	1	16368	4092
	33	11	16QAM	10	5760	24	1	1	17424	4356
	38	11	16QAM	10	6656	24	1	1	20064	5016
	39	11	16QAM	10	6784	24	1	1	20592	5148
	40	11	16QAM	10	7040	24	1	1	21120	5280

Table A.2.2.7-2: Void

Table A.2.2.7-3: Void

A.2.2.8 CP-OFDM 64QAM

Table A.2.2.8-1: Channels for 64QAM — Reference CP-OFDM

Parameter	Allocated resource blocks (L_CRB)	CP-OFDM Symbols per slot (Note 1)	Modulation	MCS Index (Note 2)	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot (Note 3)	Total number of bits per slot	Total modulated symbols per slot
	47	11	16QAM	10	8192	24	1	1	24816	6204
	51	11	16QAM	10	8968	24	1	2	26928	6732
	52	11	16QAM	10	9224	24	1	2	27456	6864
	53	11	16QAM	10	9224	24	1	2	27984	6996
	54	11	16QAM	10	9480	24	1	2	28512	7128
	61	11	16QAM	10	10760	24	1	2	32208	8052
	65	11	16QAM	10	11272	24	1	2	34320	8580
	67	11	16QAM	10	11784	24	1	2	35376	8844
	68	11	16QAM	10	11784	24	1	2	35904	8976
	78	11	16QAM	10	13576	24	1	2	41184	10296
	79	11	16QAM	10	13832	24	1	2	41712	10428
	80	11	16QAM	10	14088	24	1	2	42240	10560
	81	11	16QAM	10	14088	24	1	2	42768	10692
	93	11	16QAM	10	16392	24	1	2	49404	12276
	95	11	16QMA	10	16392	24	1	2	50160	12540
	106	11	16QAM	10	18432	24	1	3	55968	13992
	107	11	16QAM	10	18960	24	1	3	56496	14124
	108	11	16QAM	10	18960	24	1	3	57024	14256
	109	11	16QAM	10	18960	24	1	3	57552	14388
	121	11	16QAM	10	21000	24	1	3	63888	15972
Unit	123	11	16QAM	10	21504	24	1	3	64944	16236
	133	11	64QAM	19	23040	24	2	3	70224	17556
	135	11	64QAM	19	23568	24	2	3	73280	16600
	137	11	64QAM	19	24072	24	2	3	72336	18084
	160	11	64QAM	19	28968	24	1	4	87120	21780
	162	11	64QAM	19	28468	24	1	4	85536	21384
	189	11	64QAM	19	34776	24	1	4	99072	24768
	216	11	64QAM	19	37896	24	1	5	110208	28152
	217	11	64QAM	19	38096	24	1	5	111876	28804
	245	11	64QAM	19	43032	24	1	6	129360	32340
	270	11	64QAM	19	47552	24	1	6	142560	35640
	273	11	64QAM	19	48488	24	1	6	144384	36096
	25	11	64QAM	19	4992	24	1	1	10800	3300
	26	11	64QAM	19	5064	24	1	1	20592	3432
	31	11	64QAM	19	6272	24	1	2	24552	4092
	33	11	64QAM	19	13064	24	1	2	26136	4356
	38	11	64QAM	19	15112	24	1	2	30096	5016
	39	11	64QAM	19	15624	24	1	2	30888	5148

NOTE 1:   PUSCH mapping Type-A and single-symbol DM-RS configuration Type 1 with 2 additional DM-RS symbols such that DM-RS positions are set to symbols 2, 7, 11. DM-RS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.

NOTE 2:   MCS Index is based on MCS table 5.1.3.1-1 defined in TS 38.214 [10]

NOTE 3:   If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

NOTE 4:   The RMCs apply to all channel bandwidth where L_CRB ≤ N_RB

Table A.2.2.8-2: Void

Table A.2.2.8-3: Void

A.2.2.9 CP-OFDM 256QAM

Table A.2.2.9-1: Channels for 256QAM Reference CP-OFDM

Parameter	Allocated resource blocks (L_CRB)	DFT-s-OFDM Symbols per slot (Note 1)	Modulation	MCS Index (Note 2)	Payload size	Transport block CRC	LDPC Base Graph	Number of code blocks per slot (Note 3)	Total number of bits per slot	Total modulated symbols per slot
									Bits	
	47	11	64QAM	19	18960	24	1	3	37224	6204
	51	11	64QAM	19	20496	24	1	3	40392	6732
	52	11	64QAM	19	21000	24	1	3	41184	6864
	53	11	64QAM	19	21000	24	1	3	41976	6996
	61	11	64QAM	19	24567	24	1	3	48312	8052
	65	11	64QAM	19	26120	24	1	4	51480	8580
	67	11	64QAM	19	26632	24	1	4	53064	8844
	78	11	64QAM	19	31240	24	1	4	61776	10296
	79	11	64QAM	19	31752	24	1	4	62568	10428
	80	11	64QAM	19	31752	24	1	4	63360	10560
	81	11	64QAM	19	32264	24	1	4	64152	10692
	93	11	64QAM	19	36896	24	1	5	73656	12276
	95	11	64QAM	19	37896	24	1	5	75240	12540
	106	11	64QAM	19	42016	24	1	5	83952	13992
	107	11	64QAM	19	43032	24	1	6	84744	14124
Unit	28	11	256QAM	20	16432	24	1	3	27456	3432
	31	11	256QAM	20	22032	24	1	3	32736	4092
	33	11	256QAM	20	23040	24	1	3	34848	4356
	38	11	256QAM	20	26632	24	1	4	40128	5016
	39	11	256QAM	20	27656	24	1	4	41184	5148

NOTE 1: PUSCH mapping Type-A and 2-symbol DM-RS configuration Type1 with 2 additional DM-RS symbols such that DM-RS positions are set to symbols 2, 7, 11. DM-RS is [TDMed] with PUSCH data. DM-RS symbols are not counted.

NOTE 2: MCS Index is based on MCS table 5.1.3.1-1 defined in TS 38.214 [10]

NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)

NOTE 4: The RMCs apply to all channel bandwidth where $L_{CRB} \leq N_{RB}$

47	11	256QAM	20	32776	24	1	4	49632	6204
51	11	256QAM	20	35856	24	1	5	53856	6732
52	11	256QAM	20	36896	24	1	5	54912	6864
53	11	256QAM	20	36896	24	1	5	55968	6996
61	11	256QAM	20	43032	24	1	6	64416	8052
65	11	256QAM	20	46104	24	1	6	68640	8580
67	11	256QAM	20	47112	24	1	6	70752	8844
78	11	256QAM	20	55304	24	1	7	82368	10296
79	11	256QAM	20	55304	24	1	7	83424	10428
80	11	256QAM	20	56368	24	1	7	84480	10560
81	11	256QAM	20	57376	24	1	7	85536	10692
93	11	256QAM	20	65576	24	1	8	98208	12276
95	11	256QAM	20	67584	24	1	8	100320	12540
106	11	256QAM	20	73776	24	1	9	111936	13992
107	11	256QAM	20	75792	24	1	9	112992	14124
108	11	256QAM	20	75792	24	1	9	114048	14256
109	11	256QAM	20	75792	24	1	9	115104	14388
121	11	256QAM	20	86040	24	1	11	127776	15972
123	11	256QAM	20	86040	24	1	11	129888	16236
133	11	256QAM	20	94248	24	1	12	140448	17556
135	11	256QAM	20	94248	24	1	12	142560	17820
137	11	256QAM	20	96264	24	1	12	144672	18084
160	11	256QAM	20	112648	24	1	14	168960	21120
162	11	256QAM	20	114776	24	1	14	171072	21384
189	11	256QAM	20	131176	24	1	16	199584	24948
216	11	256QAM	20	151608	24	1	18	228096	28512
217	11	256QAM	20	151608	24	1	18	229152	28644
245	11	256QAM	20	172176	24	1	21	258720	32340
270	11	256QAM	20	188576	24	1	23	285120	35640
273	11	256QAM	20	192624	24	1	23	288288	36036

Table A.2.2.9-2: ... **Void**

Table A.2.2.9-3: ... **Void**

NOTE 1: PUSCH mapping Type-A and single-symbol DM-RS configuration Type-1 with 2 additional DM-RS symbols, such that the DM-RS positions are set to symbols 2, 7, 11. DMRS is [TDM'ed] with PUSCH data. DM-RS symbols are not counted.
NOTE 2: MCS Index is based on MCS table 5.1.3.1-2 defined in TS 38.214 [10].
NOTE 3: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
NOTE 4: The RMCs apply to all channel bandwidth where $L_{CRB} \leq N_{RB}$.

A.2.3 Reference measurement channels for TDD

The TDD UL RMCs are defined in clause A.2.2 with the active UL slots specified in table A.2.1-1 and TDD slot patterns as defined for reference sensitivity tests.

A.2.3.1 DFT-s-OFDM Pi/2-BPSK

Void

A.2.3.2 DFT-s-OFDM QPSK

Void

A.2.3.3 DFT-s-OFDM 16QAM

Void

A.2.3.4 DFT-s-OFDM 64QAM

Void

A.2.3.5 DFT-s-OFDM 256QAM

Void

A.2.3.6 CP-OFDM QPSK

Void

A.2.3.7 CP-OFDM 16QAM

Void

A.2.3.8 CP-OFDM 64QAM

Void

A.2.3.9 CP-OFDM 256QAM

Void

A.3 DL reference measurement channels

A.3.1 General

Unless otherwise stated, Tables A.3.2.2-1, A.3.2.2-2, A.3.2.2-3, A.3.3.2-1, A.3.3.2-2 and A.3.3.2-3 are applicable for measurements of the Receiver Characteristics (clause 7) with the exception of subclauses 7.4 (Maximum input level).

Unless otherwise stated, Tables A.3.2.3-1, A.3.2.3-2, A.3.2.3-3, A.3.3.3-1, A.3.3.3-2 and A.3.3.3-3 are applicable for subclauses 7.4 (Maximum input level) and for UE not supporting PDSCH 256QAM,

Unless otherwise stated, Tables A.3.2.4-1, A.3.2.4-2, A.3.2.4-3, A.3.3.4-1, A.3.3.4-2 and A.3.3.4-3 are applicable for subclauses 7.4 (Maximum input level) and for UE supporting PDSCH 256QAM,

Unless otherwise stated, Tables A.3.2.2-1, A.3.2.2-2, A.3.2.2-3, A.3.3.2-1, A.3.3.2-2 and A.3.3.2-3 also apply for the modulated interferer used in Clauses 7.5, 7.6 and 7.8 with test specific bandwidths.

Table A.3.1-1: Common reference channel parameters

Parameter		Unit	Value
CORESET frequency domain allocation			Full BW
CORESET time domain allocation			2 OFDM symbols at the begin of each slot
PDSCH mapping type			Type A
PDSCH start symbol index (S)			2
Number of consecutive PDSCH symbols (L)			12
PDSCH PRB bundling		PRBs	2
Dynamic PRB bundling			false
Overhead value for TBS determination			0
First DMRS position for Type A PDSCH mapping			2
DMRS type			Type 1
Number of additional DMRS			2
FDM between DMRS and PDSCH			Disable
CSI-RS for tracking	First subcarrier index in the PRB used for CSI-RS (k0)		0 for CSI-RS resource 1,2,3,4
	OFDM symbols in the PRB used for CSI-RS		l_0 = 6 for CSI-RS resource 1 and 3 l_0 = 10 for CSI-RS resource 2 and 4
	Number of CSI-RS ports		1 for CSI-RS resource 1,2,3,4
	CDM Type		'No CDM' for CSI-RS resource 1,2,3,4
	Density (ρ)		3 for CSI-RS resource 1,2,3,4
	CSI-RS periodicity	Slots	15 kHz SCS: 20 for CSI-RS resource 1,2,3,4 30 kHz SCS: 40 for CSI-RS resource 1,2,3,4 60 kHz SCS: 80 for CSI-RS resource 1,2,3,4
	CSI-RS offset	Slots	15 kHz SCS: 0 for CSI-RS resource 1 and 2 1 for CSI-RS resource 3 and 4 30 kHz SCS: 1 for CSI-RS resource 1 and 2 2 for CSI-RS resource 3 and 4 60 kHz SCS: 2 for CSI-RS resource 1 and 2 3 for CSI-RS resource 3 and 4
	Frequency Occupation		Start PRB 0 Number of PRB = BWP size
	QCL info		TCI state #0
PTRS configuration			PTRS is not configured

A.3.2   DL reference measurement channels for FDD

A.3.2.1   General

Table A.3.2.1-1: Additional reference channels parameters for FDD

Parameter	Unit	Value
Number of HARQ Processes		4
K1 value		2 for all slots

A.3.2.2 FRC for receiver requirements for QPSK

Table A.3.2.2-1: Fixed reference channel for receiver requirements (SCS 15 kHz, FDD, QPSK 1/3)

Parameter	Unit	Value							
Channel bandwidth	MHz	5	10	15	20	25	30	40	50
Subcarrier spacing	kHz	15	15	15	15	15	15	15	15
Subcarrier spacing configuration μ		0	0	0	0	0	0	0	0
Allocated resource blocks		25	52	79	106	133	160	216	270
Subcarriers per resource block		12	12	12	12	12	12	12	12
Allocated slots per Frame		8	8	8	8	8	8	8	8
MCS Index		4	4	4	4	4	4	4	4
MCS Table for TBS determination		64QAM							
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1
Information Bit Payload per Slot									
For Slots 0,1	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,3,4,5,6,7,8,9	Bits	1672	3368	5120	6912	8712	10504	14088	17424
Transport block CRC	Bits	16	16	24	24	24	24	24	24
LDPC base graph		2	2	1	1	1	1	1	1
Number of Code Blocks per Slot									
For Slots 0,1	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,3,4,5,6,7,8,9	CBs	1	1	1	1	2	2	2	3
Binary Channel Bits per Slot									
For Slots 0,1	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,3,4,5,6,7,8,9	Bits	5400	11232	17064	22896	28728	34560	46656	58320
Max. Throughput averaged over 1 frame	Mbps	1.338	2.694	4.096	5.530	6.970	8.403	11.270	13.9392
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.2.1-1.									
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).									
Note 3: SS/PBCH block is transmitted in slot #0 of each frame.									
Note 4: Slot i is slot index per frame.									

Table A.3.2.2-2: Fixed reference channel for receiver requirements (SCS 30 kHz, FDD, QPSK 1/3)

Parameter	Unit	Value											
Channel bandwidth	MHz	5	10	15	20	25	30	40	50	60	80	90	100
Subcarrier spacing configuration μ		1	1	1	1	1	1	1	1	1	1	1	1
Allocated resource blocks		11	24	38	51	65	78	106	133	162	217	245	273
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		17	17	17	17	17	17	17	17	17	17	17	17
MCS Index		4	4	4	4	4	4	4	4	4	4	4	4
MCS Table for TBS determination		64QAM											
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot													
For Slots 0,1,2	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 3,…,19	Bits	736	1608	2472	3368	4224	4992	6912	8712	10504	14088	15880	17928
Transport block CRC	Bits	16	16	16	16	24	24	24	24	24	24	24	24
LDPC base graph		2	2	2	2	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot													
For Slots 0,1,2	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 3,…,19	CBs	1	1	1	1	1	1	1	2	2	2	2	3
Binary Channel Bits per Slot													
For Slots 0,1,2	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 3,…,19	Bits	2376	5184	8208	11016	14040	16848	22896	28728	34992	46872	52920	58968
Max. Throughput averaged over 1 frame	Mbps	1.251	2.734	4.202	5.726	7.181	8.486	11.750	14.810	17.857	23.950	26.996	30.478

Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.2.1-1.
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).
Note 3: SS/PBCH block is transmitted in slot #0 of each frame.
Note 4: Slot i is slot index per frame.

Table A.3.2.2-3: Fixed reference channel for receiver requirements (SCS 60 kHz, FDD, QPSK 1/3)

Parameter	Unit	Value										
Channel bandwidth	MHz	10	15	20	25	30	40	50	60	80	90	100
Subcarrier spacing configuration μ		2	2	2	2	2	2	2	2	2	2	2
Allocated resource blocks		11	18	24	31	38	51	65	79	107	121	135
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		36	36	36	36	36	36	36	36	36	36	36
MCS Index		4	4	4	4	4	4	4	4	4	4	4
MCS Table for TBS Determination		64QAM										
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot												
For Slots 0,1,2,3	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 4,…,39	Bits	736	1192	1608	2024	2472	3368	4224	5120	6912	7808	8712
Transport block CRC	Bits	16	16	16	16	16	16	24	24	24	24	24
LDPC base graph		2	2	2	2	2	2	1	1	1	1	1
Number of Code Blocks per Slot												
For Slots 0,1,2,3	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 4,…,39	CBs	1	1	1	1	1	1	1	1	1	1	2
Binary Channel Bits per Slot												
For Slots 0,1,2,3	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 4,…,39	Bits	2376	3888	5184	6696	8208	11016	14040	17064	23112	26136	29160
Max. Throughput averaged over 1 frame	Mbps	2.650	4.291	5.789	7.286	8.899	12.125	15.206	18.432	24.883	28.109	31.363
NOTE 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.2.1-1.												
NOTE 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).												
NOTE 3: SS/PBCH block is transmitted in slot #0 of each frame.												
NOTE 4: Slot i is slot index per frame.												

A.3.2.3   FRC for maximum input level for 64QAM

Table A.3.2.3-1: Fixed reference channel for maximum input level receiver requirements (SCS 15 kHz, FDD, 64QAM)

Parameter	Unit	Value							
Channel bandwidth	MHz	5	10	15	20	25	30	40	50
Subcarrier spacing	kHz	15	15	15	15	15	15	15	15
Subcarrier spacing configuration μ		0	0	0	0	0	0	0	0
Allocated resource blocks		25	52	79	106	133	160	216	270
Subcarriers per resource block		12	12	12	12	12	12	12	12
Allocated slots per Frame		8	8	8	8	8	8	8	8
MCS Index		24	24	24	24	24	24	24	24
MCS Table for TBS determination		64QAM							
Modulation		64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1
Information Bit Payload per Slot									
For Slots 0,1	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,3,4,5,6,7,8,9	Bits	12296	25608	38936	52224	64552	77896	106576	131176
Transport block CRC	Bits	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1
Number of Code Blocks per Slot									
For Slots 0,1	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,3,4,5,6,7,8,9	CBs	2	4	5	7	8	10	13	16
Binary Channel Bits per Slot									
For Slots 0,1	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,3,4,5,6,7,8,9	Bits	16200	33696	51192	68688	86184	103680	139968	174960
Max. Throughput averaged over 1 frame	Mbps	9.837	20.486	31.149	41.779	51.642	62.317	85.261	104.941
NOTE 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.2.1-1.									
NOTE 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).									
NOTE 3: SS/PBCH block is transmitted in slot 0 of each frame									
NOTE 4: Slot i is slot index per frame									

Table A.3.2.3-2: Fixed reference channel for maximum input level receiver requirements (SCS 30 kHz, FDD, 64QAM)

Parameter	Unit	Value										
Channel bandwidth	MHz	5	10	15	20	25	30	40	50	60	80	100
Subcarrier spacing configuration μ		1	1	1	1	1	1	1	1	1	1	1
Allocated resource blocks		11	24	38	51	65	78	106	133	162	217	273
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		17	17	17	17	17	17	17	17	17	17	17
MCS Index		24	24	24	24	24	24	24	24	24	24	24
MCS Table for TBS determination		64QAM										
Modulation		64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot												
For Slots 0,1,2	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 3,…,19	Bits	5376	11784	18432	25104	31752	37896	52224	64552	79896	106576	135296
Transport block CRC	Bits	24	24	24	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot												
For Slots 0,1,2	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 3,…,19	CBs	1	2	3	3	4	5	7	8	10	13	17
Binary Channel Bits per Slot												
For Slots 0,1,2	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 3,…,19	Bits	7128	15552	24624	33048	42120	50544	68688	86184	104976	140616	176904
Max. Throughput averaged over 1 frame	Mbps	9.139	20.033	31.334	42.677	53.978	64.423	88.781	109.738	135.823	181.179	230.003
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.2.1-1												
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)												
Note 3: SS/PBCH block is transmitted in slot 0 of each frame.												
Note 4: Slot i is slot index per frame.												

Table A.3.2.3-3: Fixed Reference Channel for Maximum input level receiver requirements (SCS 60 kHz, FDD, 64QAM)

Parameter	Unit	Value									
Channel bandwidth	MHz	10	15	20	25	30	40	50	60	80	100
Subcarrier spacing configuration μ		2	2	2	2	2	2	2	2	2	2
Allocated resource blocks		11	18	24	31	38	51	65	79	107	135
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		36	36	36	36	36	36	36	36	36	36
MCS Index		24	24	24	24	24	24	24	24	24	24
MCS Table for TBS determination		64QAM									
Modulation		64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot											
For Slots 0,1,2,3	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 4,…,39	Bits	5376	8712	11784	15112	18432	25104	31752	38936	52224	65576
Transport block CRC	Bits	24	24	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot											
For Slots 0,1,2,3	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 4,…,39	CBs	1	2	2	2	3	3	4	5	7	8
Binary Channel Bits per Slot											
For Slots 0,12,3	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 4,…,39	Bits	7128	11664	15552	20088	24624	33048	42120	51192	69336	87480
Max. Throughput averaged over 1 frame	Mbps	19.354	31.363	42.422	54.403	66.355	90.374	114.307	140.170	188.006	236.074

Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.2.1-1.
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 3: SS/PBCH block is transmitted in slot #0 of each frame.
Note 4: Slot i is slot index per frame.

A.3.2.4   FRC for maximum input level for 256 QAM

Table A.3.2.4-1: Fixed reference channel for maximum input level receiver requirements (SCS 15 kHz, FDD, 256QAM)

Parameter	Unit	Value							
Channel bandwidth	MHz	5	10	15	20	25	30	40	50
Subcarrier spacing	kHz	15	15	15	15	15	15	15	15
Subcarrier spacing configuration μ		0	0	0	0	0	0	0	0
Allocated resource blocks		25	52	79	106	133	160	216	270
Subcarriers per resource block		12	12	12	12	12	12	12	12
Allocated slots per Frame		8	8	8	8	8	8	8	8
MCS Index		23	23	23	23	23	23	23	23
MCS Table for TBS determination		256QAM							
Modulation		256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM
Target Coding Rate		4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1
Information Bit Payload per Slot									
For Slots 0,1	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,3,4,5,6,7,8,9	Bits	16896	34816	53288	71688	90176	108552	143400	180376
Transport block CRC	Bits	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1
Number of Code Blocks per Slot									
For Slots 0,1	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,3,4,5,6,7,8,9	CBs	3	5	7	9	12	14	18	23
Binary Channel Bits per Slot									
For Slots 0,1	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,3,4,5,6,7,8,9	Bits	21600	44928	68256	91584	114912	138240	186624	233280
Max. Throughput averaged over 1 frame	Mbps	13.517	27.853	42.630	57.350	72.141	86.842	114.720	144.310
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.2.1-1.									
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)									
Note 3: SS/PBCH block is transmitted in slot 0 of each frame.									
Note 4: Slot i is slot index per frame.									

Table A.3.2.4-2: Fixed reference channel for maximum input level receiver requirements (SCS 30 kHz, FDD, 256QAM)

Parameter	Unit	Value										
Channel bandwidth	MHz	5	10	15	20	25	30	40	50	60	80	100
Subcarrier spacing configuration μ		1	1	1	1	1	1	1	1	1	1	1
Allocated resource blocks		11	24	38	51	65	78	106	133	162	217	273
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		17	17	17	17	17	17	17	17	17	17	17
MCS Index		23	23	23	23	23	23	23	23	23	23	23
MCS Table for TBS determination		256QAM										
Modulation		256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM
Target Coding Rate		4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot												
For Slots 0,1,2	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 3,…,19	Bits	7424	16136	25608	33816	44040	52224	71688	90176	108552	147576	184424
Transport block CRC	Bits	24	24	24	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot												
For Slots 0,1,2	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 3,…,19	CBs	1	3	4	5	6	7	9	12	14	19	23
Binary Channel Bits per Slot												
For Slots 0,1,2	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 3,…,19	Bits	9504	20736	32832	44064	56160	67392	91584	114912	139968	187488	235872
Max. Throughput averaged over 1 frame	Mbps	12.621	27.431	43.534	57.487	74.868	88.781	121.870	153.299	184.538	250.879	313.521
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.2.1-1.												
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)												
Note 3: SS/PBCH block is transmitted in slot 0 of each frame.												
Note 4: Slot i is slot index per frame.												

Table A.3.2.4-3: Fixed reference channel for maximum input level receiver requirements (SCS 60 kHz, FDD, 256QAM)

Parameter	Unit	Value									
Channel bandwidth	MHz	10	15	20	25	30	40	50	60	80	100
Subcarrier spacing configuration μ		2	2	2	2	2	2	2	2	2	2
Allocated resource blocks		11	18	24	31	38	51	65	79	107	135
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		36	36	36	36	36	36	36	36	36	36
MCS Index		23	23	23	23	23	23	23	23	23	23
MCS Table for TBS determination		256QAM									
Modulation		256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM
Target Coding Rate		4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot											
For Slots 0,1,2,3	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 4,…,39	Bits	7424	12040	16136	21000	25608	33816	44040	53288	71688	90176
Transport block CRC	Bits	24	24	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot											
For Slots 0,1,2,3	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 4,…,39	CBs	1	2	3	3	4	5	6	7	9	12
Binary Channel Bits per Slot											
For Slots 0,1,2,3	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 4,…,39	Bits	9504	15552	20736	26784	32832	44064	56160	68256	92448	116640
Max. Throughput averaged over 1 frame	Mbps	26.726	43.344	58.090	75.600	92.189	121.738	158.544	191.837	258.077	324.634
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.2.1-1.											
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)											
Note 3: SS/PBCH block is transmitted in slot #0 of each frame.											
Note 4: Slot i is slot index per frame.											

A.3.3   DL reference measurement channels for TDD

A.3.3.1   General

Table A.3.3.1-1: Additional reference channels parameters for TDD

Parameter		Value		
		SCS 15 kHz (μ=0)	SCS 30 kHz (μ=1)	SCS 60 kHz (μ=2)
TDD Slot Configuration pattern (Note 1)		DDDSU	7DS2U	$14DS_1S_24U$
Special Slot Configuration (Note 2)		10D+2G+2U	6D+4G+4U	S_1=12D+2G, S_2=6G+8U
referenceSubcarrierSpacing		15 kHz	30 kHz	60 kHz
UL-DL configuration	dl-UL-TransmissionPeriodicity	5 ms	5 ms	5 ms
	nrofDownlinkSlots	3	7	14
	nrofDownlinkSymbols	10	6	12
	nrofUplinkSlot	1	2	4
	nrofUplinkSymbols	2	4	8
Number of HARQ Processes		8	8	16
The number of slots between PDSCH and corresponding HARQ-ACK information (Note 3)		K1 = 4 if mod(i,5) = 0 K1 = 3 if mod(i,5) = 1 K1 = 2 if mod(i,5) = 2 where i is slot index per frame; i = {0,…,9}	K1 = 8 if mod(i,10) = 0 K1 = 7 if mod(i,10) = 1 K1 = 6 if mod(i,10) = 2 K1 = 5 if mod(i,10) = 3 K1 = 4 if mod(i,10) = 4 K1 = 3 if mod(i,10) = 5 K1 = 2 if mod(i,10) = 6 where i is slot index per frame; i = {0,…,19}	K1 = 13 if mod(i,20) = 2 K1 = 12 if mod(i,20) = 3 K1 = 11 if mod(i,20) = 4 K1 = 10 if mod(i,20) = 5 K1 = 9 if mod(i,20) = 6 K1 = 8 if mod(i,20) = 7 K1 = 7 if mod(i,20) = 8 K1 = 6 if mod(i,20) = 9 K1 = 6 if mod(i,20) = 10 K1 = 6 if mod(i,20) = 11 K1 = 6 if mod(i,20) = 12 K1 = 6 if mod(i,20) = 13 where i is slot index per frame; i = {0,…,39}
NOTE 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information. NOTE 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information. NOTE 3: i is the slot index per frame.				

A.3.3.2   FRC for receiver requirements for QPSK

Table A.3.3.2-1: Fixed reference channel for receiver requirements (SCS 15 kHz, TDD, QPSK 1/3)

Parameter	Unit	Value							
Channel bandwidth	MHz	5	10	15	20	25	30	40	50
Subcarrier spacing	kHz	15	15	15	15	15	15	15	15
Subcarrier spacing configuration μ		0	0	0	0	0	0	0	0
Allocated resource blocks		25	52	79	106	133	160	216	270
Subcarriers per resource block		12	12	12	12	12	12	12	12
Allocated slots per Frame		4	4	4	4	4	4	4	4
MCS Index		4	4	4	4	4	4	4	4
MCS Table for TBS determination		64QAM							
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1
Information Bit Payload per Slot									
For Slots 0,1,3,4,8,9	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,5,6,7	Bits	1672	3368	5120	6912	8712	10504	14088	17424
Transport block CRC	Bits	16	16	24	24	24	24	24	24
LDPC base graph		2	2	1	1	1	1	1	1
Number of Code Blocks per Slot									
For Slots 0,1,3,4,8,9	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,5,6,7	CBs	1	1	1	1	2	2	2	3
Binary Channel Bits per Slot									
For Slots 0,1,3,4,8,9	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,5,6,7	Bits	5400	11232	17064	22896	28728	34560	46656	58320
Max. Throughput averaged over 1 frame	Mbps	0.669	1.347	2.048	2.765	3.485	4.202	5.635	6.970
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.3.1-1.									
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)									
Note 3: SS/PBCH block is transmitted in slot 0 of each frame.									
Note 4: Slot i is slot index per frame.									

Table A.3.3.2-2: Fixed reference channel for receiver requirements (SCS 30 kHz, TDD, QPSK 1/3)

Parameter	Unit	Value										
Channel bandwidth	MHz	5	10	15	20	25	30	40	50	60	80	100
Subcarrier spacing configuration μ		1	1	1	1	1	1	1	1	1	1	1
Allocated resource blocks		11	24	38	51	65	78	106	133	162	217	273
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		11	11	11	11	11	11	11	11	11	11	11
MCS Index		4	4	4	4	4	4	4	4	4	4	4
MCS Table for TBS determination		64QAM										
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot												
For Slots 0,1,2 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,19}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,19}	Bits	736	1608	2472	3368	4224	4992	6912	8712	10504	14088	17928
Transport block CRC	Bits	16	16	16	16	24	24	24	24	24	24	24
LDPC base graph		2	2	2	2	1	1	1	1	1	1	1
Number of Code Blocks per Slot												
For Slots 0,1,2 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,19}	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,19}	CBs	1	1	1	1	1	1	1	2	2	2	3
Binary Channel Bits per Slot												
For Slots 0,1,2 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,19}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,19}	Bits	2376	5184	8208	11016	14040	16848	22896	28728	34992	46872	58968
Max. Throughput averaged over 1 frame	Mbps	0.810	2.1.769	2.719	3.705	4.646	5.491	7.603	9.583	11.554	15.497	19.721
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.3.1-1. Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit) Note 3: SS/PBCH block is transmitted in slot #0 of each frame. Note 4: Slot i is slot index per frame.												

Table A.3.3.2-3: Fixed reference channel for receiver requirements (SCS 60 kHz, TDD, QPSK 1/3)

Parameter	Unit	Value									
Channel bandwidth	MHz	10	15	20	25	30	40	50	60	80	100
Subcarrier spacing configuration μ		2	2	2	2	2	2	2	2	2	2
Allocated resource blocks		11	18	24	31	38	51	65	79	107	135
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		24	24	24	24	24	24	24	24	24	24
MCS Index		4	4	4	4	4	4	4	4	4	4
MCS Table for TBS determination		64QAM									
Modulation		QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK	QPSK
Target Coding Rate		1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3	1/3
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot											
For Slots 0,1,2,3 and Slot i, if mod(i, 20) = {14, 15, 16, 17, 18, 19} for i from {0,…,39}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 20) = {0,…,13} for i from {4,…,39}	Bits	736	1192	1608	2024	2472	3368	4224	5120	6912	8712
Transport block CRC	Bits	16	16	16	16	16	16	24	24	24	24
LDPC base graph		2	2	2	2	2	2	1	1	1	1
Number of Code Blocks per Slot											
For Slots 0,1,2,3 and Slot i, if mod(i, 20) = {14, 15, 16, 17, 18, 19} for i from {0,…,39}	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 20) = {0,…,13} for i from {4,…,39}	CBs	1	1	1	1	1	1	1	1	1	2
Binary Channel Bits per Slot											
For Slots 0,1,2,3 and Slot i, if mod(i, 20) = {14, 15, 16, 17, 18, 19} for i from {0,…,39}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 20) = {0,…,13} for i from {4,…,39}	Bits	2376	3888	5184	6696	8208	11016	14040	17064	23112	29160
Max. Throughput averaged over 1 frame	Mbps	1.766	3.2.861	3.859	4.858	5.933	8.083	10.138	12.288	16.589	20.909
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.3.1-1.											
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)											
Note 3: SS/PBCH block is transmitted in slot #0 of each frame.											
Note 4: Slot i is slot index per frame.											

A.3.3.3   FRC for maximum input level for 64QAM

Table A.3.3.3-1: Fixed reference channel for maximum input level receiver requirements (SCS 15 kHz, TDD, 64QAM)

Parameter	Unit	Value							
Channel bandwidth	MHz	5	10	15	20	25	30	40	50
Subcarrier spacing	kHz	15	15	15	15	15	15	15	15
Subcarrier spacing configuration μ		0	0	0	0	0	0	0	0
Allocated resource blocks		25	52	79	106	133	160	216	270
Subcarriers per resource block		12	12	12	12	12	12	12	12
Allocated slots per Frame		4	4	4	4	4	4	4	4
MCS Index		24	24	24	24	24	24	24	24
MCS Table for TBS determination		64QAM							
Modulation		64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1
Information Bit Payload per Slot									
For Slots 0,1,3,4,8,9	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,5,6,7	Bits	12296	25608	38936	52224	64552	77896	106576	131176
Transport block CRC	Bits	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1
Number of Code Blocks per Slot									
For Slots 0,1,3,4,8,9	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,5,6,7	CBs	2	4	5	7	8	10	13	16
Binary Channel Bits per Slot									
For Slots 0,1,3,4,8,9	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,5,6,7	Bits	16200	33696	51192	68688	86184	103680	139968	174960
Max. Throughput averaged over 1 frame	Mbps	4.918	10.243	15.574	20.890	20.890	31.158	42.630	52.470
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.3.1-1.									
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)									
Note 3: SS/PBCH block is transmitted in slot 0 of each frame.									
Note 4: Slot i is slot index per frame.									

Table A.3.3.3-2: Fixed reference channel for maximum input level receiver requirements (SCS 30 kHz, TDD, 64QAM)

Parameter	Unit	Value										
Channel bandwidth	MHz	5	10	15	20	25	30	40	50	60	80	100
Subcarrier spacing configuration μ		1	1	1	1	1	1	1	1	1	1	1
Allocated resource blocks		11	24	38	51	65	78	106	133	162	217	273
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		11	11	11	11	11	11	11	11	11	11	11
MCS Index		24	24	24	24	24	24	24	24	24	24	24
MCS Table for TBS determination		64QAM										
Modulation		64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot												
For Slots 0,1,2 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,19}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,19}	Bits	5376	11784	18432	25104	31752	37896	52224	64552	79896	106576	135296
Transport block CRC	Bits	24	24	24	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot												
For Slots 0,1,2 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,19}	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,19}	CBs	1	2	3	3	4	5	7	8	10	13	17
Binary Channel Bits per Slot												
For Slots 0,1,2 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,19}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,19}	Bits	7128	15552	24624	33048	42120	50544	68688	86184	104976	140616	176904
Max. Throughput averaged over 1 frame	Mbps	5.914	12.962	20.275	27.614	34.927	41.686	57.446	71.007	87.886	117.234	148.826

Note 1:   Additional parameters are specified in Table A.3.1-1 and Table A.3.3.1-1.
Note 2:   If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 3:   SS/PBCH block is transmitted in slot #0 of each frame.
Note 4:   Slot i is slot index per frame.

Table A.3.3.3-3: Fixed reference channel for maximum input level receiver requirements (SCS 60 kHz, TDD, 64QAM)

Parameter	Unit	Value									
Channel bandwidth	MHz	10	15	20	25	30	40	50	60	80	100
Subcarrier spacing configuration μ		2	2	2	2	2	2	2	2	2	2
Allocated resource blocks		11	18	24	31	38	51	65	79	107	135
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		24	24	24	24	24	24	24	24	24	24
MCS Index		24	24	24	24	24	24	24	24	24	24
MCS Table for TBS determination		64QAM									
Modulation		64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM	64 QAM
Target Coding Rate		3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4	3/4
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot											
For Slots 0,1,2,3 and Slot i, if mod(i, 20) = {14, 15, 16, 17, 18, 19} for i from {0,…,39}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 5) = {0,…,13} for i from {4,…,39}	Bits	5376	8712	11784	15112	18432	25104	31752	38936	52224	65576
Transport block CRC	Bits	24	24	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot											
For Slots 0,1,2,3 and Slot i, if mod(i, 20) = {14, 15, 16, 17, 18, 19} for i from {0,…,39}	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 5) = {0, …,13} for i from {4,…,39}	CBs	1	2	2	2	3	3	4	5	7	8
Binary Channel Bits per Slot											
For Slots 0,1,2,3 and Slot i, if mod(i, 20) = {14, 15, 16, 17, 18, 19} for i from {0,…,39}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 20) = {0, …,13} for i from {4,…,39}	Bits	7128	11664	15552	20088	24624	33048	42120	51192	69336	87480
Max. Throughput averaged over 1 frame	Mbps	12.902	20.909	28.282	36.269	44.237	60.250	76.205	93.446	125.338	157.382
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.3.1-1.											
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)											
Note 3: SS/PBCH block is transmitted in slot #0 of each frame.											
Note 4: Slot i is slot index per frame.											

A.3.3.4   FRC for maximum input level for 256 QAM

Table A.3.3.4-1: Fixed reference channel for maximum input level receiver requirements (SCS 15 kHz, TDD, 256QAM)

Parameter	Unit	Value							
Channel bandwidth	MHz	5	10	15	20	25	30	40	50
Subcarrier spacing	kHz	15	15	15	15	15	15	15	15
Subcarrier spacing configuration μ		0	0	0	0	0	0	0	0
Allocated resource blocks		25	52	79	106	133	160	216	270
Subcarriers per resource block		12	12	12	12	12	12	12	12
Allocated slots per Frame		4	4	4	4	4	4	4	4
MCS Index		23	23	23	23	23	23	23	23
MCS Table for TBS determination		256QAM							
Modulation		256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM
Target Coding Rate		4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1
Information Bit Payload per Slot									
For Slots 0,1,3,4,8,9	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,5,6,7	Bits	16896	34816	53288	71688	90176	108552	143400	180376
Transport block CRC	Bits	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1
Number of Code Blocks per Slot									
For Slots 0,1,3,4,8,9	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,5,6,7	CBs	3	5	7	9	12	14	18	23
Binary Channel Bits per Slot									
For Slots 0,1,3,4,8,9	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slots 2,5,6,7	Bits	21600	44928	68256	91584	114912	138240	186624	233280
Max. Throughput averaged over 1 frame	Mbps	6.758	13.926	21.315	28.675	36.070	43.421	57.360	72.150
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.3.1-1.									
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)									
Note 3: SS/PBCH block is transmitted in slot 0 of each frame.									
Note 4: Slot i is slot index per frame.									

Table A.3.3.4-2: Fixed Reference channel for maximum input level receiver requirements (SCS 30 kHz, TDD, 256QAM)

Parameter	Unit	Value										
Channel bandwidth	MHz	5	10	15	20	25	30	40	50	60	80	100
Subcarrier spacing configuration μ		1	1	1	1	1	1	1	1	1	1	1
Allocated resource blocks		11	24	38	51	65	78	106	133	162	217	273
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		11	11	11	11	11	11	11	11	11	11	11
MCS Index		23	23	23	23	23	23	23	23	23	23	23
MCS Table for TBS determination		256QAM										
Modulation		256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM
Target Coding Rate		4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot												
For Slots 01,2 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,19}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,19}	Bits	7424	16136	25608	33816	44040	52224	71688	90176	108552	147576	184424
Transport block CRC	Bits	24	24	24	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot												
For Slots 0,1,2 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,19}	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,19}	CBs	1	1	1	1	1	1	1	2	2	2	3
Binary Channel Bits per Slot												
For Slots 0,1,2 and Slot i, if mod(i, 10) = {7,8,9} for i from {0,…,19}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 10) = {0,1,2,3,4,5,6} for i from {3,…,19}	Bits	9504	20736	32832	44064	56160	67392	91584	114912	139968	187488	235872
Max. Throughput averaged over 1 frame	Mbps	8.166	17.750	28.169	37.198	48.444	57.446	78.857	99.194	119.407	162.334	202.866

Note 1:   Additional parameters are specified in Table A.3.1-1 and Table A.3.3.1-1.
Note 2:   If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)
Note 3:   SS/PBCH block is transmitted in slot #0 of each frame.
Note 4:   Slot i is slot index per frame.

Table A.3.3.4-3: Fixed reference channel for maximum input level receiver requirements (SCS 60 kHz, TDD, 256QAM)

Parameter	Unit	Value									
Channel bandwidth	MHz	10	15	20	25	30	40	50	60	80	100
Subcarrier spacing configuration μ		2	2	2	2	2	2	2	2	2	2
Allocated resource blocks		11	18	24	31	38	51	65	79	107	135
Subcarriers per resource block		12	12	12	12	12	12	12	12	12	12
Allocated slots per Frame		24	24	24	24	24	24	24	24	24	24
MCS Index		23	23	23	23	23	23	23	23	23	23
MCS Table for TBS determination		256QAM									
Modulation		256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM
Target Coding Rate		4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5	4/5
Maximum number of HARQ transmissions		1	1	1	1	1	1	1	1	1	1
Information Bit Payload per Slot											
For Slots 0,1,2,3 and Slot i, if mod(i, 20) = {14, 15, 16, 17, 18, 19} for i from {0,…,39}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 20) = {0,…,13 } for i from {4,…,39}	Bits	7424	12040	16136	21000	25608	33816	44040	53288	71688	90176
Transport block CRC	Bits	24	24	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot											
For Slots 0,1,2,3 and Slot i, if mod(i, 20) = {14, 15, 16, 17, 18, 19} for i from {0,…,39}	CBs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 5) = {0, …,13} for i from {4,…,39}	CBs	1	2	3	3	4	5	6	7	9	12
Binary Channel Bits per Slot											
For Slots 0,1,2,3 and Slot i, if mod(i, 20) = {14, 15, 16, 17, 18, 19} for i from {0,…,39}	Bits	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
For Slot i, if mod(i, 20) = {0, …,13} for i from {4,…,39}	Bits	9504	15552	20736	26784	32832	44064	56160	68256	92448	116640
Max. Throughput averaged over 1 frame	Mbps	17.818	28.896	38.726	50.400	61.459	81.158	105.696	127.891	172.051	216.422
Note 1: Additional parameters are specified in Table A.3.1-1 and Table A.3.3.1-1.											
Note 2: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit)											
Note 3: SS/PBCH block is transmitted in slot #0 of each frame.											
Note 4: Slot i is slot index per frame.											

A.4 CSI reference measurement channels

TBD

A.5 OFDMA Channel Noise Generator (OCNG)

A.5.1 OCNG Patterns for FDD

A.5.1.1 OCNG FDD pattern 1: Generic OCNG FDD Pattern for all unused REs

Table A.5.1.1-1: OP.1 FDD: Generic OCNG FDD Pattern for all unused REs

OCNG Distribution / OCNG Parameters	Control Region (Core Set)	Data Region
Resources allocated	All unused REs (Note 1)	All unused REs (Note 2)
Structure	PDCCH	PDSCH
Content	Uncorrelated pseudo random QPSK modulated data	Uncorrelated pseudo random QPSK modulated data
Transmission scheme for multiple antennas ports transmission	Single Tx port transmission	Spatial multiplexing using any precoding matrix with dimensions same as the precoding matrix for PDSCH
Subcarrier Spacing	Same as for RMC PDCCH in the active BWP	Same as for RMC PDSCH in the active BWP
Power Level	Same as for RMC PDCCH	Same as for RMC PDSCH
Note 1: All unused REs in the active CORESETS appointed by the search spaces in use. Note 2: Unused available REs refer to REs in PRBs not allocated for any physical channels, CORESETs, synchronization signals or reference signals in channel bandwidth.		

A.5.2 OCNG Patterns for TDD

A.5.2.1 OCNG TDD pattern 1: Generic OCNG TDD Pattern for all unused REs

Table A.5.2.1-1: OP.1 TDD: Generic OCNG TDD Pattern for all unused REs

OCNG Distribution / OCNG Parameters	Control Region (Core Set)	Data Region
Resources allocated	All unused REs (Note 1)	All unused REs (Note 2)
Structure	PDCCH	PDSCH
Content	Uncorrelated pseudo random QPSK modulated data	Uncorrelated pseudo random QPSK modulated data
Transmission scheme for multiple antennas ports transmission	Single Tx port transmission	Spatial multiplexing using any precoding matrix with dimensions same as the precoding matrix for PDSCH
Subcarrier Spacing	Same as for RMC PDCCH in the active BWP	Same as for RMC PDSCH in the active BWP
Power Level	Same as for RMC PDCCH	Same as for RMC PDSCH
Note 1: All unused REs in the active CORESETS appointed by the search spaces in use. Note 2: Unused available REs refer to REs in PRBs not allocated for any physical channels, CORESETs, synchronization signals or reference signals in channel bandwidth.		

A.6

A.7 V2X reference measurement channels

A.7.1 General

The algorithm for determining the payload size A is as follows; given a desired coding rate R and radio block allocation NRB

1. Calculate the RE number of 2nd stage SCI Q_SCI2^' that can be transmitted in a given sub-frame, where in order to make sure that the code-rate of 2-A is approximate to SCI 1-A, a beta offset is selected based on MCS, and vacant resource elements γ value is determined based on NRB and DMRS frequency density.

2. Transport Block Size is determined according to clause 8.1.3.2 of TS 38.214 [12] based on Table A.7.1-1.

3. Calculate Binary Channel Bits per Slot for PSSCH as below.

Binary Channel Bits per Slot = (NRB* Subcarriers per resource block*CP-OFDM symbols per slot – DMRS resource REs – PSCCH resource Res - Q_SCI2^') * Qm

Where Qm is the modulation order corresponding to MCS.

In Table A.7.1-1 Common reference channel parameters are listed the Sidelink reference measurement channels specified in annexes A.7.2 to A.7.4.

Table A.7.1-1: Common reference channel parameters

Parameter	Value	remark
Number of HARQ Processes	1	
Channel state	AWGN	
Subcarriers per resource block	12	
sl-PSSCH-DMRS-TimePatternList	2	symbol4 and symbol 10 in each slot FDMed with PSSCH within DMRS symbol Frequency density is ½
CP-OFDM symbols per slot (Note1)	12 for all slots	Excluding the first OFDM symbol in one SL slot used for AGC
PSCCH resource	10 PRBs, 3 symbols in time domain	
Slot number in 10ms	$10*2^{\mu}$	$\mu = 0,1,2$ for 15kHz, 30kHz, 60kHz
PT-RS	disable	
CSI-RS	disable	
x-overhead	0	
PSFCH period	0	
2nd stage SCI payload size	59	35bits SCI-2A + 24bits CRC
Redundancy Version	RV0	For channel coding
Alpha value for SCI-2	1	

A.7.2 FRC for V2X receiver requirements for QPSK

For V2X transmission over PC5, Table A.7.2-1, Table A.7.2-2 and Table A.7.2-3 are applicable for measurements on the Receiver Characteristics with the exception of Maximum input level.

Table A.7.2-1: Fixed reference channel for V2X receiver requirements (SCS 15 kHz, QPSK)

Parameter	Unit	Value			
Channel bandwidth	**MHz**	**10**	**20**	**30**	**40**
Subcarrier spacing	kHz	15	15	15	15
Subchannel size		10	15	10	12
Allocated resource blocks		50	105	160	216
MCS Index		4	4	4	4
MCS Table for TBS determination		64QAM			
Modulation		QPSK	QPSK	QPSK	QPSK
Transport Block Size		3624	7936	12296	16896
Transport block CRC	Bits	16	24	24	24
LDPC base graph		2	1	1	1
Number of Code Blocks per Slot		1	1	2	3
Beta offset for 2nd stage SCI		2.25	2.25	2.25	2.25
γ value when 2nd stage SCI rate match		1	1	1	1
Binary Channel Bits per Slot		12036	26556	41076	55860
Max. Throughput averaged over 100ms	Mbps	0.3624	0.7936	1.2296	1.6896
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).					
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.					

Table A.7.2-2: Fixed reference channel for V2X receiver requirements (SCS 30 kHz, QPSK)

Parameter	Unit	Value			
Channel bandwidth	**MHz**	**10**	**20**	**30**	**40**
Subcarrier spacing	kHz	30	30	30	30
Subchannel size		12	10	15	15
Allocated resource blocks		24	50	75	105
MCS Index		4	4	4	4
MCS Table for TBS determination		64QAM			
Modulation		QPSK	QPSK	QPSK	QPSK
Transport Block Size		1608	3624	5632	7936
Transport block CRC	Bits	16	16	24	24
LDPC base graph		2	2	1	1
Number of Code Blocks per Slot		1	1	1	1
Beta offset for 2nd stage SCI		2.25	2.25	2.25	2.25
γ value when 2nd stage SCI rate match		7	1	1	1
Binary Channel Bits per Slot		5160	12036	18636	26556
Max. Throughput averaged over 100ms	Mbps	0.3216	0.7248	1.1264	1.5872
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).					
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.					

Table A.7.2-3: Fixed reference channel for V2X receiver requirements (SCS 60 kHz, QPSK)

Parameter	Unit	Value			
Channel bandwidth	MHz	**10**	**20**	**30**	**40**
Subcarrier spacing	kHz	60	60	60	60
Subchannel size		10	12	12	10
Allocated resource blocks		10	24	36	50
MCS Index		4	4	4	4
MCS Table for TBS determination		64QAM			
Modulation		QPSK	QPSK	QPSK	QPSK
Transport Block Size		456	1608	2536	3624
Transport block CRC	Bits	16	16	16	16
LDPC base graph		2	2	2	2
Number of Code Blocks per Slot		1	1	1	1
Beta offset for 2nd stage SCI		2.25	2.25	2.25	2.25
γ value when 2nd stage SCI rate match		7	7	7	1
Binary Channel Bits per Slot		1464	5160	8328	12036
Max. Throughput averaged over 100ms	Mbps	0.1824	0.6432	1.0144	1.4496
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).					
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.					

A.7.3   FRC for maximum input level for 64QAM

For V2X transmission over PC5, Table A.7.3-1, Table A.7.3-2 and TableA.7.3-3 are applicable for Maximum input level when the maximum modulation order is 64QAM.

Table A.7.3-1: Fixed reference channel for V2X receiver requirements (SCS 15 kHz, 64QAM)

Parameter	Unit	Value			
Channel bandwidth	MHz	**10**	**20**	**30**	**40**
Subcarrier spacing	kHz	15	15	15	15
Subchannel size		10	15	10	12
Allocated resource blocks		50	105	160	216
MCS Index		24	24	24	24
MCS Table for TBS determination		64QAM			
Modulation		64QAM	64QAM	64QAM	64QAM
Transport Block Size		27144	60456	92200	127080
Transport block CRC	Bits	24	24	24	24
LDPC base graph		1	1	1	1
Number of Code Blocks per Slot		4	8	11	16
Beta offset for 2nd stage SCI		6.25	6.25	6.25	6.25
γ value when 2nd stage SCI rate match		1	1	1	1
Binary Channel Bits per Slot		35964	79524	123084	167436
Max. Throughput averaged over 100ms	Mbps	2.7144	6.0456	9.22	12.708
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).					
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.					

Table A.7.3-2: Fixed reference channel for V2X receiver requirements (SCS 30 kHz, 64QAM)

Parameter	Unit	Value			
Channel bandwidth	**MHz**	**10**	**20**	**30**	**40**
Subcarrier spacing	kHz	30	30	30	30
Subchannel size		12	10	15	15
Allocated resource blocks		24	50	75	105
MCS Index		24	24	24	24
MCS Table for TBS determination		64QAM			
Modulation		64QAM	64QAM	64QAM	64QAM
Transport Block Size		11528	27144	42016	60456
Transport block CRC	Bits	24	24	24	24
LDPC base graph		1	1	1	1
Number of Code Blocks per Slot		2	4	5	8
Beta offset for 2nd stage SCI		6.25	6.25	6.25	6.25
γ value when 2nd stage SCI rate match		7	1	1	1
Binary Channel Bits per Slot		15336	35964	55764	79524
Max. Throughput averaged over 100ms	Mbps	2.3056	5.4288	8.4032	12.091
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).					
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.					

TableA.7.3-3: Fixed reference channel for V2X receiver requirements (SCS 60 kHz, 64QAM)

Parameter	Unit	Value			
Channel bandwidth	**MHz**	**10**	**20**	**30**	**40**
Subcarrier spacing	kHz	60	60	60	60
Subchannel size		10	12	12	10
Allocated resource blocks		10	24	36	50
MCS Index		24	24	24	24
MCS Table for TBS determination		64QAM			
Modulation		64QAM	64QAM	64QAM	64QAM
Transport Block Size		3240	11528	18960	27144
Transport block CRC	Bits	16	24	24	24
LDPC base graph		2	1	1	1
Number of Code Blocks per Slot		1	2	3	4
Beta offset for 2nd stage SCI		6.25	6.25	6.25	6.25
γ value when 2nd stage SCI rate match		7	7	7	1
Binary Channel Bits per Slot		4248	15336	24840	35964
Max. Throughput averaged over 100ms	Mbps	1.296	4.6112	7.584	10.858
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).					
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.					

A.7.4   FRC for maximum input level for 256QAM

For V2X transmission over PC5, Table A.7.4-1, Table A.7.4-2 and Table A.7.4-3 are applicable for Maximum input level when the 256QAM is supported.

Table A.7.4-1: Fixed reference channel for V2X receiver requirements (SCS 15 kHz, 256QAM)

Parameter	Unit	Value			
Channel bandwidth	**MHz**	**10**	**20**	**30**	**40**
Subcarrier spacing	kHz	15	15	15	15
Subchannel size		10	15	10	12
Allocated resource blocks		50	105	160	216
MCS Index		23	23	23	23
MCS Table for TBS determination		256QAM			
Modulation		256QAM	256QAM	256QAM	256QAM
Transport Block Size		36896	81976	127080	172176
Transport block CRC	Bits	24	24	24	24
LDPC base graph		1	1	1	1
Number of Code Blocks per Slot		5	10	16	21
Beta offset for 2nd stage SCI		6.25	6.25	6.25	6.25
γ value when 2nd stage SCI rate match		3	3	3	3
Binary Channel Bits per Slot		48000	106080	164160	223296
Max. Throughput averaged over 100ms	Mbps	3.6896	8.1976	12.708	17.218
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).					
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.					

Table A.7.4-2: Fixed reference channel for V2X receiver requirements (SCS 30 kHz, 256QAM)

Parameter	Unit	Value			
Channel bandwidth	**MHz**	**10**	**20**	**30**	**40**
Subcarrier spacing	kHz	30	30	30	30
Subchannel size		12	10	15	15
Allocated resource blocks		24	50	75	105
MCS Index		23	23	23	23
MCS Table for TBS determination		256QAM			
Modulation		256QAM	256QAM	256QAM	256QAM
Transport Block Size		15880	36896	58384	81976
Transport block CRC	Bits	24	24	24	24
LDPC base graph		1	1	1	1
Number of Code Blocks per Slot		2	5	7	10
Beta offset for 2nd stage SCI		6.25	6.25	6.25	6.25
γ value when 2nd stage SCI rate match		3	3	3	3
Binary Channel Bits per Slot		20544	48000	74400	106080
Max. Throughput averaged over 100ms	Mbps	3.176	7.3792	11.677	16.395
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).					
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.					

Table A.7.4-3: Fixed reference channel for V2X receiver requirements (SCS 60kHz, 256QAM)

Parameter	Unit	Value			
Channel bandwidth	**MHz**	**10**	**20**	**30**	**40**
Subcarrier spacing	kHz	60	60	60	60
Subchannel size		10	12	12	10
Allocated resource blocks		10	24	36	50
MCS Index		23	23	23	23
MCS Table for TBS determination		256QAM			
Modulation		256QAM	256QAM	256QAM	256QAM
Transport Block Size		4480	15880	25608	36896
Transport block CRC	Bits	24	24	24	24
LDPC base graph		1	1	1	1
Number of Code Blocks per Slot		1	2	4	5
Beta offset for 2nd stage SCI		6.25	6.25	6.25	6.25
γ value when 2nd stage SCI rate match		3	3	3	3
Binary Channel Bits per Slot		5760	20544	33216	48000
Max. Throughput averaged over 100ms	Mbps	1.792	6.352	10.243	14.758
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit). NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.					

A.7.5 FRC for transmitter requirements

For V2X transmission over PC5, FRC specified in clause A.7.5-1, A.7.5-2, A.7.5-3 and A.7.5-4 are applicable for measurements on the Transmitter Characteristics.

Table A.7.5-1: Fixed reference channel for V2X transmitter requirements (QPSK)

Parameter	Unit	Value											
Allocated resource blocks		10	12	15	24	25	36	50	75	80	105	160	216
MCS Index		4											
MCS Table for TBS determination		64QAM											
Modulation		QPSK											
Transport Block Size		456	608	848	1608	1672	2536	3624	5632	6016	7936	12296	16896
Transport block CRC	Bits	16	16	16	16	16	16	16	24	24	24	24	24
LDPC base graph		2	2	2	2	2	2	2	1	1	1	1	1
Number of Code Blocks per Slot		1	1	1	1	1	1	1	1	1	1	2	3
Beta offset for 2nd stage SCI		2.25											
γ value when 2nd stage SCI rate match		7	7	1	7	1	7	1	1	1	1	1	1
Binary Channel Bits per Slot		1464	1992	2796	5160	5436	8328	12036	18636	19956	26556	41076	55860
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).													
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.													

Table A.7.5-2: Fixed reference channel for V2X transmitter requirements (16QAM)

Parameter	Unit	Value											
Allocated resource blocks		10	12	15	24	25	36	50	75	80	105	160	216
MCS Index		13											
MCS Table for TBS determination		64QAM											
Modulation		16QAM											
Transport Block Size		1480	1928	2664	4992	5248	7936	11528	17928	18960	25608	38936	53288
Transport block CRC	Bits	16	16	16	24	24	24	24	24	24	24	24	24
LDPC base graph		2	2	2	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot		1	1	1	1	1	1	2	3	3	4	5	7
Beta offset for 2nd stage SCI		3.5											
γ value when 2nd stage SCI rate match		0	0	6	0	6	0	0	0	0	0	0	0
Binary Channel Bits per Slot		2976	4032	5592	10368	10872	16704	24096	37296	39936	53136	82176	111744
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).													
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.													

Table A.7.5-3: Fixed reference channel for V2X transmitter requirements (64QAM)

Parameter	Unit	Value											
Allocated resource blocks		10	12	15	24	25	36	50	75	80	105	160	216
MCS Index		24											
MCS Table for TBS determination		64QAM											
Modulation		64QAM											
Transport Block Size		3240	4352	6144	11528	12296	18960	27144	42016	45096	60456	92200	127080
Transport block CRC	Bits	16	24	24	24	24	24	24	24	24	24	24	24
LDPC base graph		2	1	1	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot		1	1	1	2	2	3	4	5	6	8	11	16
Beta offset for 2nd stage SCI		6.25											
γ value when 2nd stage SCI rate match		7	7	1	7	1	7	1	1	1	1	1	1
Binary Channel Bits per Slot		4248	5832	8244	15336	16164	24840	35964	55764	59724	79524	123084	167436
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).													
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.													

Table A.7.5-4: Fixed reference channel for V2X transmitter requirements (256QAM)

Parameter	Unit	Value											
Allocated resource blocks		10	12	15	24	25	36	50	75	80	105	160	216
MCS Index		23											
MCS Table for TBS determination		256QAM											
Modulation		256QAM											
Transport Block Size		4480	6144	8712	15880	16896	25608	36896	58384	62504	81976	127080	172176
Transport block CRC	Bits	24	24	24	24	24	24	24	24	24	24	24	24
LDPC base graph		1	1	1	1	1	1	1	1	1	1	1	1
Number of Code Blocks per Slot		1	1	2	2	3	4	5	7	8	10	16	21
Beta offset for 2nd stage SCI		6.25											
γ value when 2nd stage SCI rate match		3	3	9	3	9	3	3	3	3	3	3	3
Binary Channel Bits per Slot		5760	7872	10992	20544	21552	33216	48000	74400	79680	106080	164160	223296
NOTE 1: If more than one Code Block is present, an additional CRC sequence of L = 24 Bits is attached to each Code Block (otherwise L = 0 Bit).													
NOTE 2: γ is the number of vacant resource elements in the resource block to which the last coded symbol of the 2nd-stage SCI belongs.													

Annex B (normative):
Propagation Conditions

The propagation conditions and channel models for various environments are specified. For each environment a propagation model is used to evaluate the propagation pathless due to the distance. Channel models are formed by combining delay profiles with a Doppler spectrum, with the addition of correlation properties in the case of a multi-antenna scenario.

B.0   No interference

The downlink connection between the System Simulator and the UE is without Additive White Gaussian Noise, and has no fading or multipath effects.

Annex C (normative):
Downlink physical channels

This annex specifies the downlink physical channels that are needed for setting a connection and channels that are needed during a connection.

C.0   Downlink signal levels

The downlink power settings in Table C.0-1 is used unless otherwise specified in a test case.

If the UE has more than one Rx antenna, the downlink signal is applied to each one. All UE Rx antennas shall be connected.

If the UE has one Rx antenna, the downlink signal is applied to it.

Table C.0-1: Default Downlink power levels for NR

SCS (kHz)		Unit		Channel bandwidth												
			5 MHz	10 MHz	15 MHz	20 MHz	25 MHz	30 MHz	40 MHz	50 MHz	60 MHz	70 MHz	80 MHz	90 MHz	100 MHz
15	Number of RBs		25	52	79	106	133	160	216	270	N/A	N/A	N/A	N/A	N/A
	Channel BW power	dBm	-60	-57	-55	-54	-53	-52	-51	-50	N/A	N/A	N/A	N/A	N/A
30	Number of RBs		11	24	38	51	65	78	106	133	162	189	217	245	273
	Channel BW power	dBm	-61	-57	-55	-54	-53	-52	-51	-50	-49	-48	-48	-47	-47
60	Number of RBs		N/A	11	18	24	31	38	51	65	79	93	107	121	135
	Channel BW power	dBm	N/A	-58	-56	-54	-53	-52	-51	-50	-49	-48	-48	-47	-47
	RS EPRE	dBm/ 15kH z	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85	-85
		Note 1: The channel bandwidth powers are informative, based on -85dBm/15kHz SS/PBCH SSS EPRE, then scaled according to the number of RBs and rounded to the nearest integer dBm value. Full RE allocation with no boost or deboost is assumed. Note 2: The power level is specified at each UE Rx antenna. Note 3: DL level is applied for any of the Subcarrier Spacing configuration ( ) with the same power spectrum density of -85dBm/15kHz.														

The default signal level uncertainty is +/-3dB at each test port, for any level specified. If the uncertainty value is critical for the test purpose, a tighter uncertainty is specified for the related test case in Annex F

C.1 General

The following clauses, describes the downlink Physical Channels that are transmitted during a connection i.e., when measurements are done.

C.2 Setup

Table C.2-1 describes the downlink Physical Channels that are required for connection set up.

Table C.2-1: Downlink Physical Channels required for connection set-up

Physical Channel
PBCH
SSS
PSS
PDCCH
PDSCH
PBCH DMRS
PDCCH DMRS
PDSCH DMRS
CSI-RS

As common PDSCH and PDCCH configuration parameters the parameters in Table A.3.1-1, A.3.2.1-1, C.2-2, C.2-3, and C.2-4 shall be used to bring up the connection setup for FR1 NR cell.

Table C.2-2: PDSCH and PDCCH configuration

Parameter	Unit	Value
Number of HARQ processes		8 (TDD) 4 (FDD)
Aggregation level	CCE	4

Table C.2-3: TDD UL-DL pattern for SCS 15 KHz

Parameter		Unit	UL-DL pattern
TDD Slot Configuration pattern (Note 1)			DDDSU
Special Slot Configuration (Note 2)			10D+2G+2U
UL-DL configuration (tdd-UL-DL-ConfigurationCommon)	referenceSubcarrierSpacing	kHz	15
	dl-UL-TransmissionPeriodicity	ms	5
	nrofDownlinkSlots		3
	nrofDownlinkSymbols		10
	nrofUplinkSlot		1
	nrofUplinkSymbols		2
K1 value (PDSCH-to-HARQ-timing-indicator)			[4] if mod(I,5) = 0 [3] if mod(i,5) = 1 [2] if mod(i,5) = 2 [6] if mod(i,5) = 3
Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information. Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information. Note 3: i is the slot index per frame; i = {0,…,9}			

Table C.2-4: TDD UL-DL pattern for SCS 30 KHz

Parameter		Unit	UL-DL Pattern
TDD Slot Configuration pattern (Note 1)			7DS2U
Special Slot Configuration (Note 2)			6D+4G+4U
UL-DL configuration (tdd-UL-DL-ConfigurationCommon)	referenceSubcarrierSpacing	30	kHz
	dl-UL-TransmissionPeriodicity	5	
	nrofDownlinkSlots	7	
	nrofDownlinkSymbols	6	
	nrofUplinkSlot	2	
	nrofUplinkSymbols	4	
UL-DL configuration2 (tdd-UL-DL-ConfigurationCommon2)	referenceSubcarrierSpacing	N/A	
	dl-UL-TransmissionPeriodicity	N/A	
	nrofDownlinkSlots	N/A	
	nrofDownlinkSymbols	N/A	
	nrofUplinkSlot	N/A	
	nrofUplinkSymbols	N/A	
K1 value (PDSCH-to-HARQ-timing-indicator)			8 if mod(i,10) = 0 7 if mod(i,10) = 1 6 if mod(i,10) = 2 5 if mod(i,10) = 3 5 if mod(i,10) = 4 4 if mod(i,10) = 5 3 if mod(i,10) = 6 2 if mod(i,10) = 7
Note 1: D denotes a slot with all DL symbols; S denotes a slot with a mix of DL, UL and guard symbols; U denotes a slot with all UL symbols. The field is for information. Note 2: D, G, U denote DL, guard and UL symbols, respectively. The field is for information. Note 3: i is the slot index per frame; i = {0,…,19}			

C.3 Connection

C.3.0 Measurement of Transmitter Characteristics

Unless otherwise stated, Table C.3.0-1 is applicable for measurements on the Transmitter Characteristics (clause 6).

Table C.3.0-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Parameter	Unit	Value
SSS transmit power	W	Test specific
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH to SSS	dB	0
EPRE ratio of PBCH to PBCH DMRS	dB	0
EPRE ratio of PDCCH to SSS	dB	0
EPRE ratio of PDCCH to PDCCH DMRS	dB	0
EPRE ratio of PDSCH to SSS	dB	0
EPRE ratio of PDSCH to PDSCH DMRS (Note 1)	dB	-3
EPRE ratio of CSI-RS to SSS	dB	0
EPRE ratio of PTRS to PDSCH	dB	Test specific
EPRE ratio of OCNG DMRS to SSS	dB	0
EPRE ratio of OCNG to OCNG DMRS (Note 1)	dB	0
Note 1: No boosting is applied to any of the channels except PDSCH DMRS. For PDSCH DMRS, 3 dB power boosting is applied assuming DMRS Type 1 configuration when DMRS and PDSCH are TDM'ed and only half of the DMRS REs are occupied. Note 2: Number of DMRS CDM groups without data for PDSCH DMRS configuration for OCNG is set to 1.		

C.3.1   Measurement of Receiver Characteristics

Unless otherwise stated, Table C.3.1-1 is applicable for measurements on the Receiver Characteristics (clause 7). For Adjacent channel selectivity testing, Table C.3.1-2 is applied.

Table C.3.1-1: Downlink Physical Channels transmitted during a connection (FDD and TDD)

Parameter	Unit	Value
SSS transmit power	W	Test specific
EPRE ratio of PSS to SSS	dB	0
EPRE ratio of PBCH to SSS	dB	0
EPRE ratio of PBCH to PBCH DMRS	dB	0
EPRE ratio of PDCCH to SSS	dB	0
EPRE ratio of PDCCH to PDCCH DMRS	dB	0
EPRE ratio of PDSCH to SSS	dB	0
EPRE ratio of PDSCH to PDSCH DMRS (Note 1)	dB	-3
EPRE ratio of CSI-RS to SSS	dB	0
EPRE ratio of PTRS to PDSCH	dB	Test specific
EPRE ratio of OCNG DMRS to SSS	dB	0
EPRE ratio of OCNG to OCNG DMRS (Note 1)	dB	0
Note 1: No boosting is applied to any of the channels except PDSCH DMRS. For PDSCH DMRS, 3 dB power boosting is applied assuming DMRS Type 1 configuration when DMRS and PDSCH are TDM'ed and only half of the DMRS REs are occupied. Note 2: Number of DMRS CDM groups without data for PDSCH DMRS configuration for OCNG is set to 1.		

Table C.3.1-2: PDCCH Aggregation Level for ACS testing

Parameter	Unit	Value	Comment
Aggregation level	CCE	1	CBW=10MHz when SCS=60kHz
		2	CBW=15MHz when SCS=60kHz
		4	CBW=5MHz when SCS=15kHz CBW=10,15MHz when SCS=30kHz CBW=20,25,30MHz when SCS=60kHz
		8	CBW=10,15MHz when SCS=15kHz CBW=20,25,30MHz when SCS=30kHz CBW=40,50,60,70MHz when SCS=60kHz

		16	CBW>15 MHz when SCS=15kHz CBW>30 MHz when SCS=30kHz CBW>70 MHz when SCS=60kHz

Annex D (normative):
Characteristics of the Interfering Signal

D.1 General

Some RF performance requirements for the NR UE receiver are defined with interfering signals present in addition to the wanted signal.

For NR bands with $F_{DL\_high} < 2700$ MHz and $F_{UL\_high} < 2700$ MHz, a modulated 5MHz full bandwidth NR down link signal, and in some cases an additional CW signal, are used as interfering signal.

For NR bands with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz, a modulated NR downlink signal which equals to channel bandwidth of the wanted signal for Single Carrier case and Inter-band CA case is used as interfering. For intra-band contiguous CA Bandwidth Class C case, a modulated NR downlink signal which equals to the aggregated channel bandwidth of the wanted signal is used. For intra-band contiguous CA Bandwidth Class D and E case, a modulated 50MHz NR downlink signal is used. And in some cases, an additional CW signal is used.

D.2 Interference signals

Table D.2-1 describes the modulated interferer for different channel bandwidth options for NR band lower than 2700MHz.

Table D.2-1: Description of modulated NR interferer for NR bands with $F_{DL\_high} < 2700$ MHz and $F_{UL\_high} < 2700$ MHz

	Channel bandwidth						
	5 MHz	**10MHz**	**15 MHz**	**20 MHz**	**25 MHz**	**30 MHz**	**40 MHz**
RB	NOTE1						
BW$_{Interferer}$	5 MHz						
	Channel bandwidth						
	50 MHz	**60 MHz**	**70 MHz**	**80 MHz**	**90 MHz**	**100 MHz**	
RB	NOTE1						
BW$_{Interferer}$	5 MHz						
NOTE 1: The RB configured for interfering signal is the same as maximum RB number defined in Table 5.3.2-1 for each sub-carrier spacing.							

Table D.2-2 and Table D.2-3 describe the modulated interferer for different channel bandwidth options for NR band higher than 3300MHz.

Table D.2-2: Description of modulated NR interferer for NR bands with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq 3300$ MHz

	Channel bandwidth										
	10 MHz	**15 MHz**	**20 MHz**	**30 MHz**	**40 MHz**	**50 MHz**	**60 MHz**	**70 MHz**	**80 MHz**	**90 MHz**	**100 MHz**
RB	NOTE1										
BW$_{Interferer}$	10 MHz	15 MHz	20 MHz	30 MHz	40 MHz	50 MHz	60 MHz	70 MHz	80 MHz	90 MHz	100 MHz
NOTE 1: The RB configured for interfering signal is the same as maximum RB number defined in Table 5.3.2-1 for each sub-carrier spacing.											

Table D.2-3: Description of modulated NR interferer for NR bands with $F_{DL\_low} \geq 3300$ MHz and $F_{UL\_low} \geq$ 3300 MHz for Intra-band contiguous CA

	Aggregated Channel bandwidth of Bandwidth Class C								Bandwidth Class D/E
	110 MHz	**120 MHz**	**130 MHz**	**140 MHz**	**150 MHz**	**160 MHz**	**180 MHz**	**200 MHz**	
RB(SCS=30 kHz)	**Note 1**								**133**
RB(SCS=60 kHz)	**Note 1**								**65**
BW$_{Interferer}$	110 MHz	120 MHz	130 MHz	140 MHz	150 MHz	160 MHz	180 MHz	**200 MHz**	**50MHz**
NOTE 1: The interfering signal shall be configured in the same way as the aggregated bandwidth of the wanted signal. The RB configurations for each component carrier are defined in Table 5.3.2-1 for each sub-carrier spacing.									

Annex E (normative):
Global In-Channel TX-Test

NOTE: Clauses E.2.2 to E.5.9.3 are descriptions, which assume no power ramping adjacent to the measurement period.

E.1 General

The global in-channel TX test enables the measurement of all relevant parameters that describe the in-channel quality of the output signal of the TX under test in a single measurement process.

The parameters describing the in-channel quality of a transmitter, however, are not necessarily independent. The algorithm chosen for description inside this annex places particular emphasis on the exclusion of all interdependencies among the parameters.

E.2 Signals and results

E.2.1 Basic principle

The process is based on the comparison of the actual **output signal of the TX under test**, received by an ideal receiver, with a **reference signal**, that is generated by the measuring equipment and represents an ideal error free received signal. All signals are represented as equivalent (generally complex) baseband signals.

The description below uses numbers as examples. These numbers are taken from FDD with normal CP length and 100 MHz bandwidth with 30 kHz SCS. The application of the text below, however, is not restricted to this frame structure and bandwidth.

E.2.2 Output signal of the TX under test

The output signal of the TX under test is acquired by the measuring equipment and stored for further processing. It is sampled at a sampling rate of 122.88 Mbps. In the time domain it comprises at least 10 uplink subframes. The measurement period is derived by concatenating the correct number of individual uplink slots until the correct measurement period is reached. The output signal is named $z(v)$. Each slot is modelled as a signal with the following parameters: demodulated data content, carrier frequency, amplitude and phase for each subcarrier, timing, carrier leakage.

NOTE 1: TDD

Since the uplink subframes are not continuous, *n* slots should be extracted from more than 1 continuous radio frame where

$$n = \begin{cases} 10, \text{ for 15 kHz SCS} \\ 20, \text{ for 30 kHz SCS} \\ 40, \text{ for 60 kHz SCS} \end{cases}.$$

For Error Vector Magnitude including symbols with transient periods

$$n = \begin{cases} [108] \text{ for 15 kHz SCS} \\ [216] \text{ for 30 kHz SCS} \end{cases}.$$

E.2.3 Reference signal

Two types of reference signal are defined:

The reference signal $i_1(v)$ is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: demodulated data content, nominal carrier frequency, nominal amplitude and phase for each subcarrier, nominal timing, no carrier leakage. It is represented as a sequence of samples at a sampling rate of 122.88 Msps in the time domain.

The reference signal $i_2(v)$ is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: restricted data content: nominal reference symbols, (all modulation symbols for user data symbols are set to 0V), nominal carrier frequency, nominal amplitude and phase for each applicable subcarrier, nominal timing, no carrier leakage. It is represented as a sequence of samples at a sampling rate of 122.88 Msps in the time domain.

NOTE: The PUCCH is off during the time under test.

E.2.4 Measurement results

The measurement results, achieved by the global in channel TX test are the following:

- Carrier Frequency error

- EVM (Error Vector Magnitude)

- Carrier leakage

- Unwanted emissions, falling into non allocated resource blocks.

- EVM equalizer spectrum flatness

E.2.5 Measurement points

The unwanted emission falling into non-allocated RB(s) is calculated directly after the FFT as described below. In contrast to this, the EVM for the allocated RB(s) is calculated after the IDFT for DFT-s-OFDM or after the Tx-Rx chain equalizer for CP-OFDM. The samples after the TX-RX chain equalizer are used to calculate EVM equalizer spectrum flatness. Carrier frequency error and carrier leakage is calculated in the block "RF correction".

In case the parameter 3300 or 3301 is reported from UE via *txDirectCurrentLocation* IE (as defined in TS 38.331 [6]), carrier leakage measurement in the RF correction block shall be omitted. All statements from Annex E.3 onwards shall be read assuming that no carrier leakage has been measured.
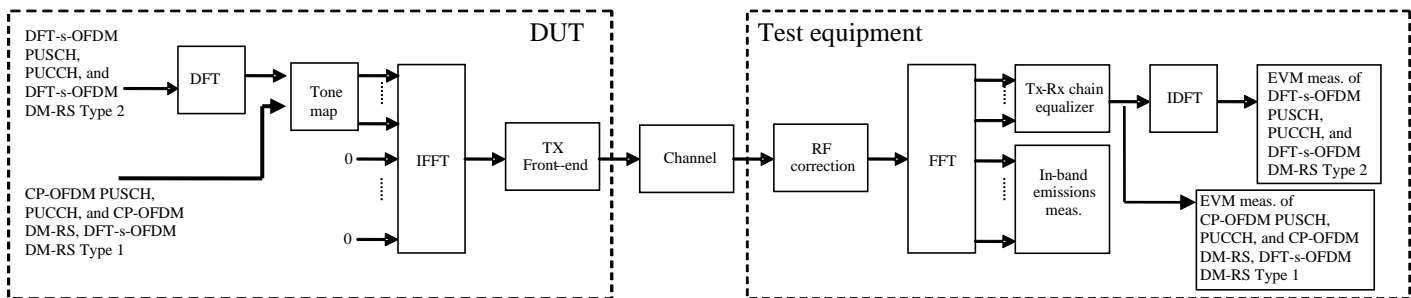
Figure E.2.5-1: EVM measurement points

E.3 Signal processing

E.3.1 Pre FFT minimization process

Before applying the pre-FFT minimization process, $z(v)$ and $i(v)$ are portioned into *n* pieces, comprising one slot each, where *n* is as defined in Annex E.2.2.

Each slot is processed separately. Sample timing, Carrier frequency and carrier leakage in $z(v)$ are jointly varied in order to minimise the difference between $z(v)$ and $i(v)$. Best fit (minimum difference) is achieved when the RMS difference value between $z(v)$ and $i(v)$ is an absolute minimum.

The carrier frequency variation and the IQ variation are the measurement results: Carrier Frequency Error and Carrier leakage.

From the acquired samples 10 carrier frequencies can be derived by averaging frequency errors for every 1, 2 or 4 slots for 15, 30 and 60 kHz SCS.

From the acquired samples *n* carrier frequencies and *n* carrier leakages can be derived.

> NOTE 1: The minimisation process, to derive carrier leakage and RF error can be supported by Post FFT operations. However the minimisation process defined in the pre FFT domain comprises all acquired samples (i.e. it does not exclude the samples in between the FFT widths and it does not exclude the bandwidth outside the transmission bandwidth configuration

> NOTE 2: The algorithm would allow deriving Carrier Frequency error and Sample Frequency error of the TX under test separately. However there are no requirements for Sample Frequency error. Hence the algorithm models the RF and the sample frequency commonly (not independently). It returns one error and does not distinguish between both.

After this process the samples $z(v)$ are called $z^0(v)$.

E.3.2   Timing of the FFT window

The FFT window length is 4096 samples per OFDM symbol. 14 FFTs (57344 samples) cover less than the acquired number of samples (61440 samples). The position in time for FFT must be determined.

In an ideal signal, the FFT may start at any instant within the cyclic prefix without causing an error. The TX filter, however, reduces the window. The EVM requirements shall be met within a window W<CP. There are three different instants for FFT:

Centre of the reduced window, called $\Delta\widetilde{c}$, $\Delta\widetilde{c}$ –W/2 and $\Delta\widetilde{c}$ +W/2.

The timing of the measured signal is determined in the pre FFT domain as follows, using $z^0(v)$ and $i_2(v)$:

1.   The measured signal is delay spread by the TX filter. Hence the distinct boarders between the OFDM symbols and between Data and CP are also spread and the timing is not obvious.

2.   In the Reference Signal $i_2(v)$ the timing is known.

3.   Correlation between (1.) and (2.) will result in a correlation peak. The meaning of the correlation peak is approx. the "impulse response" of the TX filter. The meaning of "impulse response" assumes that the autocorrelation of the reference signal $i_2(v)$ is a Dirac peak and that the correlation between the reference signal $i_2(v)$ and the data in the measured signal is 0. The correlation peak, (the highest, or in case of more than one, the earliest) indicates the timing in the measured signal.

From the acquired samples, *n* timings can be derived, where *n* is as defined in Annex E.2.2.

For all calculations, except EVM, the number of samples in $z^0(v)$ is reduced to 14 blocks of samples, comprising 4096 samples (FFT width) and starting with $\Delta\widetilde{c}$ in each OFDM symbol including the demodulation reference signal.

For the EVM calculation the output signal under test is reduced to 28 blocks of samples, comprising 4096 samples (FFT width) and starting with $\Delta\widetilde{c}$ –W/2 and $\Delta\widetilde{c}$ +W/2 in each OFDM symbol including the demodulation reference signal.

The number of samples, used for FFT is reduced compared to $z^0(v)$. This subset of samples is called z'(v).

The timing of the centre $\Delta\widetilde{c}$ with respect to the different CP length in a slot is as follows: (FDD, normal CP length)

$\Delta\widetilde{c}$ is on T_f=144 (=CP/2) within the CP of length 288 FFT samples (in OFDM symbols except 0 and 14 (=7 · 2^μ), where symbol 0 is the first symbol of each subframe) for 100 MHz channel bandwidth and SCS = 30 kHz.

$\Delta\widetilde{c}$ is on T_f=208 (=352-144) within the CP of length 352 FFT samples (in OFDM symbol 0 and 14 (=7 · 2^μ), where symbol 0 is the first symbol of each subframe) for 100 MHz channel bandwidth and SCS = 30 kHz.

E.3.3   Post FFT equalisation

Perform 14 FFTs on z'(v), one for each OFDM symbol in a slot using the timing $\Delta\widetilde{c}$, including the demodulation reference symbol. The result is an array of samples, 14 in the time axis t times 4096 in the frequency axis f. The samples represent the data symbols (in OFDM-symbol 0,1,3,4,5,6,8,9,10,12,13 in each slot) and demodulation reference symbols (OFDM symbol 2, 7, 11 in each slot) in the allocated RBs and inband emissions in the non-allocated RBs within the transmission BW.

Only the allocated resource blocks in the frequency domain are used for equalisation.

The nominal demodulation reference symbols and nominal data symbols are used to equalize the measured data symbols. (Location for equalization see Figure E.2.5-1)

NOTE: The nomenclature inside this note is local and not valid outside.

The nominal data symbols are created by a demodulation process. The location to gain the demodulated data symbols is "EVM" in Figure E.2.5-1. For CP-OFDM, the process described in Annex E.5 can be applied. A demodulation process as follows is recommended for DFT-s-OFDM:

1.   Equalize the measured data symbols using the reference symbols for equalisation. Result: Equalized data symbols

2.   Only for DFT-s-OFDM, iDFT transform the equalized data symbols: Result: Equalized data symbols

3.   Decide for the nearest constellation point: Result: Nominal data symbols

4.   Only for DFT-s-OFDM, DFT transform the nominal data symbols: Result: Nominal data symbols

At this stage we have an array of <u>M</u>easured data-<u>S</u>ymbols and reference-<u>S</u>ymbols (MS(f,t))

versus an array of <u>N</u>ominal data-<u>S</u>ymbols and reference <u>S</u>ymbols (NS(f,t))

(complex, the arrays comprise 11 data symbols and 3 demodulation reference symbol in the time axis and the number of allocated subcarriers in the frequency axis.)

MS(f,t) and NS(f,t) are processed with a least square (LS) estimator, to derive one equalizer coefficient per time slot and per allocated subcarrier. EC(f) is defined as

$$EC(f) = \frac{\sum_{t=0}^{13} NS(f,t)^* NS(f,t)}{\sum_{t=0}^{13} NS(f,t)^* MS(f,t)}.$$

With * denoting complex conjugation.

EC(f) are used to equalize the DFT-coded data symbols. The measured DFT-coded data and the references symbols are equalized by:

Z'(f,t) = MS(f,t) · EC(f)

With · denoting multiplication.

Z'(f,t), restricted to the data symbol (excluding t=2,7,11) is used to calculate EVM, as described in E.4.1.

EC(f) is used in E.4.4.1 to calculate EVM equalizer spectral flatness.

NOTE: The post FFT minimisation process is done over 14 symbols (11 DFT-coded data symbols and 3 reference symbols).

The samples of the non-allocated resource blocks within the transmission bandwidth configuration in the post FFT domain are called Y(f,t) (f covering the non-allocated subcarriers within the transmission bandwidth configuration, t covering the OFDM symbols during 1 slot).

E.4   Derivation of the results

E.4.1   EVM

For EVM create two sets of Z'(f,t)., according to the timing " $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2" using the equalizer coefficients from E.3.3.

Perform the iDFTs on Z'(f,t) in the case of DFT-s-OFDM waveform. The IDFT-decoding preserves the meaning of t but transforms the variable f (representing the allocated sub carriers) into another variable g, covering the same count and representing the demodulated symbols. The samples in the post IDFT domain are called iZ'(g, t). The equivalent

ideal samples are called iI(g,t). Those samples of Z'(f,t), carrying the reference symbols (=symbol 2,7,11) are not iDFT processed.

The EVM is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM = \sqrt{\frac{\sum_{t \in T} \sum_{g \in G} |iZ'(g,t) - iI(g,t)|^2}{|G| \cdot |T| \cdot P_0}} \ ,$$

where

t covers the count of demodulated symbols with the considered modulation scheme being active within the measurement period, (i.e. symbol 0,1,3,4,5,6,8,9,10,12,13 in each slot, $\rightarrow$ |T|=11)

g covers the count of demodulated symbols with the considered modulation scheme being active within the allocated bandwidth. (|G|=12* L_{CRBs} (with L_{CRBs} : number of allocated resource blocks)).

$iZ'(g,t)$ are the samples of the signal evaluated for the EVM.

$iI(g,t)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

From the acquired samples *2n* EVM values can be derived, *n* values for the timing $\Delta \tilde{c}$ –W/2 and *n* values for the timing $\Delta \tilde{c}$ +W/2 where *n* is as defined in Annex E.2.2.

E.4.2   Averaged EVM

EVM is averaged over all basic EVM measurements.

The averaging comprises *n* UL slots

$$\overline{EVM} = \sqrt{\frac{1}{n} \sum_{i=1}^{n} EVM_i^2}$$

where *n* is as defined in Annex E.2.2for PUCCH, PUSCH.

The averaging is done separately for timing $\Delta \tilde{c}$ –W/2 and $\Delta \tilde{c}$ +W/2 leading to $\overline{\text{EVM}}_l$ and $\overline{\text{EVM}}_h$

$EVM_{final} = \max(\overline{\text{EVM}}_l, \overline{\text{EVM}}_h)$ is compared against the test requirements.

E.4.3   In-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks.

Explanatory Note:

The inband emission measurement is only meaningful with allocated RB(s) next to non-allocated RB. The allocated RB(s) are necessary but not under test. The non-allocated RBs are under test. The RB allocation for this test is as follows: The allocated RB(s) are at one end of the channel BW, leaving the other end unallocated. The number of

allocated RB(s) is smaller than half of the number of RBs, available in the channel BW. This means that the vicinity of the carrier in the centre is unallocated.

There are 3 types of inband emissions:

1.   General

2.   IQ image

3.   Carrier leakage

Carrier leakage are inband emissions next to the carrier.

IQ image are inband emissions symmetrically (with respect to the carrier) on the other side of the allocated RBs.

General are applied to all unallocated RBs.

For each evaluated RB, the minimum requirement is calculated as the higher of P_{RB} - 30 dB and the power sum of all limit values (General, IQ Image or Carrier leakage) that apply.

In specific the following combinations:

-        Power (General)

-        Power (General + Carrier leakage)

-        Power (General + IQ Image)

        1 and 2 is expressed in terms of power in one non allocated RB under test, normalized to the average power of an allocated RB (unit dB).

        3 is expressed in terms of power in one non allocated RB, normalized to the power of all allocated RBs. (unit dBc).

This is the reason for two formulas *Emissions $_{relative}$*.

Create one set of Y(t,f) per slot according to the timing " $\Delta \tilde{c}$ "

For the non-allocated RBs below the in-band emissions are calculated as follows

$$
Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \dfrac{1}{|T_s|} \sum\limits_{t \in T_s} \sum\limits_{\max(f_{\min},(c_l+12\cdot\Delta_{RB}*\Delta f))}^{c_l+(12\cdot\Delta_{RB}+11)*\Delta f} |Y(t,f)|^2, \Delta_{RB} < 0 \\ \dfrac{1}{|T_s|} \sum\limits_{t \in T_s} \sum\limits_{c_h+(12\cdot\Delta_{RB}-11)*\Delta f}^{\min(f_{\max},(c_h+12\cdot\Delta_{RB}*\Delta f))} |Y(t,f)|^2, \Delta_{RB} > 0 \end{cases},
$$

where

the upper formula represents the in band emissions below the allocated frequency block and the lower one the in band emissions above the allocated frequency block.

T_s is a set of $|T_s|$ DFT-s-OFDM symbols with the considered modulation scheme being active within the measurement period,

Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB}=1$ for the first upper or $\Delta_{RB}=-1$ for the first lower adjacent RB),

$f_{\min}$ and $f_{\max}$ are the lower and upper edge of the UL transmission BW configuration,

c_l and c_h are the lower and upper edge of the allocated BW,

Δf is the SCS, and

$Y(t, f)$ is the frequency domain signal evaluated for in-band emissions as defined in the clause E.3.3

The allocated RB power per RB and the total allocated RB power are given by:

$$P_{RB} = \frac{1}{|T_s| \cdot L_{CRBs}} \sum_{t \in T_s} \sum_{c_1}^{c_1 + (12 \cdot L_{CRBs} - 1) \cdot \Delta f} |MS(t, f)|^2 [dBm/(12\Delta f)]$$

$$P_{All-RBs} = \frac{1}{|T_s|} \sum_{t \in T_s} \sum_{c_1}^{c_1 + (12 \cdot L_{CRBs} - 1)* \Delta f} |MS(t, f)|^2 [dBm]$$

The relative in-band emissions, applicable for General and IQ image, are given by:

$$Emissions_{relative}(\Delta_{RB}) = 10 \cdot \log_{10}\left(\frac{Emissions_{absolute}(\Delta_{RB})}{\frac{1}{|T_s| \cdot L_{CRBs}} \sum_{t \in T_s} \sum_{c_l}^{c_l + (12 \cdot L_{CRBs} - 1) \cdot \Delta f} |MS(t,f)|^2}\right) [dB] =$$

$$= Emissions_{absolute}(\Delta_{RB})[dBm/12\Delta f] - P_{RB}[dBm/12\Delta f]$$

where

L_{CRBs} is the number of allocated resource blocks,

and

$MS(t, f)$ is the frequency domain samples for the allocated bandwidth, as defined in the clause E.3.3.

The relative in-band emissions, applicable for carrier leakage, is given by:

$$Emissions_{relative} = 10 \cdot \log_{10}\left(\frac{Emissions_{absolute}(DCRB)}{\frac{1}{|T_s|} \sum_{t \in T_s} \sum_{c_1}^{c_1 + (12 \cdot L_{CRBs} - 1) \cdot \Delta f} |MS(t, f)|^2}\right) [dBc]$$

$$= Emissions_{absolute}(DCRB)[dBm/12\Delta f] - P_{All-RBs}[dBm]$$

where DCRB is one RB or one pair of RBs, depending whether the DC carrier is inside an RB or in-between two RBs.

Although an exclusion period may be applicable in the time domain, when evaluating EVM, the inband emissions measurement interval is defined over one complete slot in the time domain.

From the acquired samples *n* functions for general in band emissions and IQ image inband emissions can be derived, where *n* is as defined in Annex E.2.2. *n* values or *n* pairs of carrier leakage inband emissions can be derived. They are compared against different limits after the final averaging:

The in-band emissions are averaged over the *n* samples (equivalent to 10 UL subframes):

$$\overline{Emissions}_{absolute}(\Delta_{RB}) = \frac{1}{n} \sum_{i=1}^{n} Emissions_{absolute,i}(\Delta_{RB})$$

$$\overline{Emissions}_{relative}(\Delta_{RB}) = 10 * \log_{10}\left(\frac{1}{n} \sum_{i=1}^{n} 10^{Emissions_{relative,i}(\Delta_{RB})/10}\right) \quad [dB]$$

$$\overline{Emissions}_{relative} = 10 * \log_{10}\left(\frac{1}{n} \sum_{i=1}^{n} 10^{Emissions_{relative,i}/10}\right) \quad [dBc]$$

E.4.4   EVM equalizer

E.4.4.1 EVM equalizer spectrum flatness

For EVM equalizer spectrum flatness use EC(f) as defined in E.3.3. Note, EC(f) represents equalizer coefficient $f \in F$, f is the allocated subcarriers within the transmission bandwidth (($|F|$=12* L_{CRBs})

From the acquired samples *n* functions EC(f) can be derived, where *n* is as defined in Annex E.2.2.

EC(f) is broken down to 2 functions:

$$EC_1(f), f \in Range \quad 1$$

$$EC_2(f), f \in Range \quad 2$$

Where Range 1 and Range 2 are as defined for Clause 6.4.2.4 in Table 6.4.2.4.5-1 for normal condition and Table 6.4.2.4.5-2 for extreme condition and for Clause 6.4.2.5 as in Table 6.4.2.5.5-1.

The following peak to peak ripple is calculated:

$RP_1 = 20 * \log(\max(|EC_1(f)|)/\min(|EC_1(f)|))$,which denote the maximum ripple in Range 1

$RP_2 = 20 * \log(\max(|EC_2(f)|)/\min(|EC_2(f)|))$,which denote the maximum ripple in Range 2

$RP_{12} = 20 * \log(\max(|EC_1(f)|)/\min(|EC_2(f)|))$,which denote the maximum ripple between the upper side of Range 1 and lower side of Range 2

$RP_{21} = 20 * \log(\max(|EC_2(f)|)/\min(|EC_1(f)|))$,which denote the maximum ripple between the upper side of Range 2 and lower side of Range 1

E.4.4.2   EVM equalizer spectral shaping filter

The calculation of the impulse response of the spectral shaping filter is based on EC(f) as defined in E.3.3. Note that EC(f) represents complex valued equalizer coefficient with $f \in F$, where f is the allocated subcarriers within the transmission bandwidth ($|F|$=12* L_{CRBs}).

EC'(f) is the corrected version of EC(f) by shifting by T_f. T_f is as defined in Clause E.3.2.

The impulse responses are the IDFT transformed equalizer coefficients:

$$a(\tau) = IDFT\left\{\frac{1}{EC'(f)}\right\}, \text{ where } f \text{ is the frequency of the } M \text{ allocated subcarriers.}$$

The impulse response is normalized to its first value.

$$\tilde{a}(\tau) = \frac{a(\tau)}{a(0)}$$

This is equivalent to defining the 0dB as $20log_{10}\left|\tilde{a}_t(0)\right|$.

From the acquired samples, n functions $\tilde{a}(\tau)$ can be derived, where n is as defined in Annex E.2.2.

Note, that this method provides reasonable results only in the case of full allocations.

E.4.5   Frequency error and Carrier leakage

See E.3.1.

E.4.6   EVM of Demodulation reference symbols (EVM$_{DMRS}$)

For the purpose of EVM $_{DMRS}$, the steps E.2.2 to E.4.2 are repeated 6 times, constituting 6 EVM $_{DMRS}$ sub-periods. The only purpose of the repetition is to cover the longer gross measurement period of EVM $_{DMRS}$ ($6 \cdot n$ time slots) and to derive the FFT window timing per sub-period.

The bigger of the EVM results in one n TS period corresponding to the timing $\Delta\tilde{c}$ –W/2 or $\Delta\tilde{c}$ +W/2 is compared against the limit, where n is as defined in Annex E.2.2. (Clause E.4.2) This timing is re-used for EVM $_{DMRS}$ in the equivalent EVM $_{DMRS}$ sub-period.

For EVM the demodulation reference symbols are excluded, while the data symbols are used. For EVM$_{DMRS}$ the data symbols are excluded, while the demodulation references symbols are used. This is illustrated in figure E.4.6-1
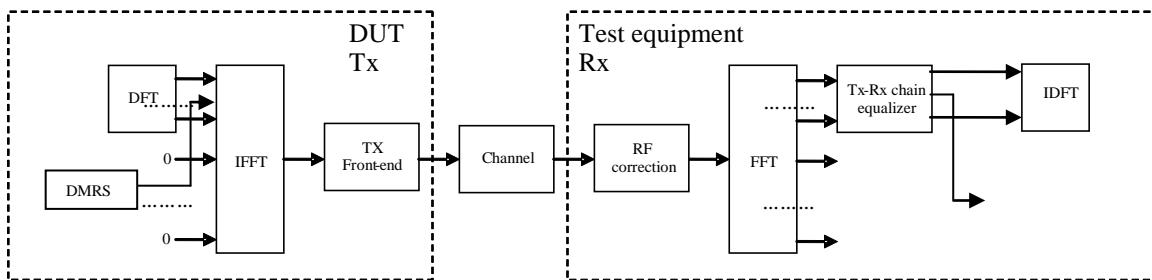
Figure E.4.6-1: EVM$_{DMRS}$ measurement points

Re-use the following formula from E.3.3:

Z'(f,t) = MS(f,t) · EC(f)

To calculate EVM$_{DMRS}$, the data symbol (t=0,1,3,4,5,6,8,9,10,12,13) in Z'(f,t) are excluded and only the reference symbols (t=2,7,11) is used.

The EVM $_{DMRS}$ is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM_{DMRS} = \sqrt{\frac{\sum\limits_{t \in T} \sum\limits_{f \in F} |Z'(f,t) - I(f,t)|^2}{|T| \cdot P_0 \cdot |F|}} ,$$

where

t covers the count of demodulation reference symbols (i.e. symbols 2,7,11 in each slot, so count=3)

f covers the count of demodulation reference symbols within the allocated bandwidth. ($|F|=12*L_{CRBs}$ (with L_{CRBs} : number of allocated resource blocks)).

$Z'(f,t)$ are the samples of the signal evaluated for the EVM $_{DMRS}$

$I(f,t)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

n such results are generated per measurement sub-period, where n is as defined in Annex E.2.2.

E.4.6.1   1st average for EVM $_{DMRS}$

EVM $_{DMRS}$ is averaged over all basic EVM $_{DMRS}$ measurements in one sub-period

The averaging comprises n UL slots

$$1stEVM_{DMRS} = \sqrt{\frac{1}{n} \sum_{i=1}^{n} (EVM_{DMRS,i})^2} ,$$

where n is as defined in Annex E.2.2.

The timing is taken from the EVM for the data. 6 of those results are achieved from the samples. In general the timing is not the same for each result.

E.4.6.2   Final average for EVM $_{DMRS}$

$$finalEVM_{DMRS} = \sqrt{\frac{1}{6} \sum_{i=1}^{6} (1stEVM_{DMRS,i})^2}$$

E.4.7   Modified signal under test

Implicit in the definition of EVM is an assumption that the receiver is able to compensate a number of transmitter impairments.

The DFT-s-OFDM modulated signals or PRACH signal under test is modified and, in the case of DFT-s-OFDM modulated signals, decoded according to:

$$Z'(t,f) = IDFT\left\{\frac{FFT\left\{z(v-\Delta\tilde{t})\cdot e^{-j2\pi\Delta\tilde{f}v}\right\}e^{j2\pi f\Delta\tilde{t}}}{\tilde{a}(t,f)\cdot e^{j\tilde{\varphi}(t,f)}}\right\}$$

where

$z(v)$ is the time domain samples of the signal under test.

The CP-OFDM modulated signals or PUSCH demodulation reference signal or PUCCH data signal under test is equalised and, in the case of CP-OFDM modulated signals decoded according to:

$$Z'(t,f) = \frac{FFT\left\{z(v-\Delta\tilde{t})\cdot e^{-j2\pi\Delta\tilde{f}v}\right\}e^{j2\pi f\Delta\tilde{t}}}{\tilde{a}(t,f)\cdot e^{j\tilde{\varphi}(t,f)}}$$

where

$z(v)$ is the time domain samples of the signal under test.

To minimize the error, the signal under test should be modified with respect to a set of parameters following the procedure explained below.

Notation:

$\Delta\tilde{t}$ is the sample timing difference between the FFT processing window in relation to nominal timing of the ideal signal.

$\Delta\tilde{f}$ is the RF frequency offset.

$\tilde{\varphi}(t,f)$ is the phase response of the TX chain.

$\tilde{a}(t,f)$ is the amplitude response of the TX chain.

In the following $\Delta\tilde{c}$ represents the middle sample of the EVM window of length W (defined in the next clauses) or the last sample of the first window half if W is even.

The EVM analyser shall

- detect the start of each slot and estimate $\Delta\tilde{t}$ and $\Delta\tilde{f}$,

- determine $\Delta\tilde{c}$ so that the EVM window of length W is centred

    - on the time interval determined by the measured cyclic prefix minus 16κ samples of the considered OFDM symbol for symbol l for subcarrier spacing configuration μ in a subframe, with l = 0 or l = 7*2^μ for normal CP, i.e. the first 16κ samples of the CP should not be taken into account for this step. In the determination of the number of excluded samples, a sampling rate of $1/T_c$ is assumed. If a different sampling rate is used, the number of excluded samples is scaled linearly.

    - on the measured cyclic prefix of the considered OFDM symbol for all other symbols for normal CP and for symbol 0 to 11 for extended CP.

    - on the measured preamble cyclic prefix for the PRACH

To determine the other parameters a sample timing offset equal to $\Delta \tilde{c}$ is corrected from the signal under test. The EVM analyser shall then

- correct the RF frequency offset $\Delta \tilde{f}$ for each time slot, and

- apply an FFT of appropriate size. The chosen FFT size shall ensure that in the case of an ideal signal under test, there is no measured inter-subcarrier interference.

The carrier leakage shall be removed from the evaluated signal before calculating the EVM and the in-band emissions; however, the removed relative carrier leakage power also has to satisfy the applicable requirement.

At this stage the allocated RBs shall be separated from the non-allocated RBs. In the case of PUCCH and PUSCH EVM, the signal on the non-allocated RB(s), $Y(t,f)$, is used to evaluate the in-band emissions.

Moreover, the following procedure applies only to the signal on the allocated RB(s).

- In the case of PUCCH and PUSCH, the UL EVM analyzer shall estimate the TX chain equalizer coefficients $\tilde{a}(t,f)$ and $\tilde{\varphi}(t,f)$ used by the ZF equalizer for all subcarriers by time averaging at each signal subcarrier of the amplitude and phase of the reference and data symbols. The time-averaging length is 1 slot. This process creates an average amplitude and phase for each signal subcarrier used by the ZF equalizer. The knowledge of data modulation symbols may be required in this step because the determination of symbols by demodulation is not reliable before signal equalization.

- In the case of PRACH, the UL EVM analyzer shall estimate the TX chain coefficients $\tilde{a}(t)$ and $\tilde{\varphi}(t)$ used for phase and amplitude correction and are selected so as to minimize the resulting EVM. The TX chain coefficients are not dependent on frequency, i.e. $\tilde{a}(t,f) = \tilde{a}(t)$ and $\tilde{\varphi}(t,f) = \tilde{\varphi}(t)$. The TX chain coefficient are chosen independently for each preamble transmission and for each $\Delta \tilde{t}$.

At this stage estimates of $\Delta \tilde{f}$, $\tilde{a}(t,f)$, $\tilde{\varphi}(t,f)$ and $\Delta \tilde{c}$ are available. $\Delta \tilde{t}$ is one of the extremities of the window W, i.e. $\Delta \tilde{t}$ can be $\Delta \tilde{c} + \alpha - \left\lfloor \dfrac{W}{2} \right\rfloor$ or $\Delta \tilde{c} + \left\lfloor \dfrac{W}{2} \right\rfloor$, where $\alpha = 0$ if W is odd and $\alpha = 1$ if W is even. The EVM analyser shall then

- calculate EVM$_l$ with $\Delta \tilde{t}$ set to $\Delta \tilde{c} + \alpha - \left\lfloor \dfrac{W}{2} \right\rfloor$,

- calculate EVM$_h$ with $\Delta \tilde{t}$ set to $\Delta \tilde{c} + \left\lfloor \dfrac{W}{2} \right\rfloor$.

For the EVM calculation on the symbols with a transient period when the UE signals a transient period capability (tp) of 2, 4 or 7usec, $\Delta \tilde{t}$ is given below.

- calculate EVM$_{l\_tp}$ with $\Delta \tilde{t}$ set to $\left\lfloor \dfrac{tp+tp_{start}}{T_c} \right\rfloor + 1$, where is $1/T_c$ the sampling rate

- calculate EVM$_{h\_tp}$ with $\Delta \tilde{t}$ set to $\left\lfloor \dfrac{CP+tp_{start}}{T_c} \right\rfloor - 1$, where $1/T_c$ is the sampling rate and the CP is the cyclic prefix of the symbol on which EVM is calculated (e.g. long CP for the first symbol of the slot) in seconds

A pictorial representation of the EVM measurement windows is given in Figure F.4-1.
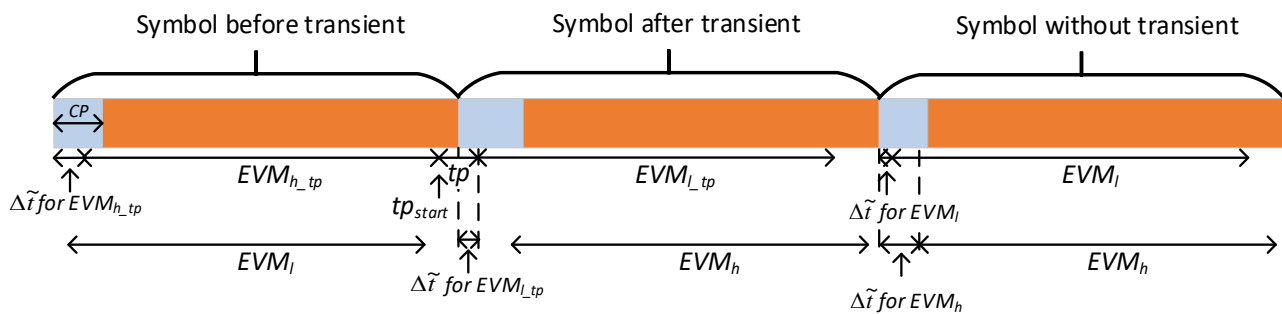
Figure E.4.7-1: EVM measurement window

E.5 EVM and inband emissions for PUCCH

For the purpose of worst case testing, the PUCCH shall be located on the edges of the Transmission Bandwidth Configuration.

The EVM for PUCCH (EVM_{PUCCH}) is averaged over n slots, where n is as defined in Annex E.2.2.

At least n TSs shall be transmitted by the UE without power change. SRS multiplexing shall be avoided during this period. The following transition periods are applicable: One OFDM symbol on each side of the slot border (instant of band edge alternation).

The description below is generic in the sense that all 5 PUCCH formats are covered. Although the number of OFDM symbols in one slot can be different from 14 (depending on the format, configuration and cyclic prefix length), the text below uses 14 without excluding the others.

E.5.1 Basic principle

The basic principle is the same as described in E.2.1

E.5.2 Output signal of the TX under test

The output signal of the TX under test is processed same as described in E.2.2

E.5.3 Reference signal

The reference signal is defined same as in E.2.3. Same as in E.2.3, $i_1(v)$ is the ideal reference for EVM_{PUCCH} and $i_2(v)$ is used to estimate the FFT window timing.

Note PUSCH is off during the PUCCH measurement period.

E.5.4 Measurement results

The measurement results are:

- EVM_{PUCCH}

- Inband emissions with the sub-results: General in-band emission, IQ image (according to: 38.101. Annex F.4, Clause starting with: "At this stage the ….")

E.5.5 Measurement points

The measurement points are illustrated in Figure E.2.5-1.

E.5.6 Pre FFT minimization process

The pre FFT minimisation process is the same as describes in clause E.3.1.

NOTE: although an exclusion period for EVM_PUCCH is applicable in E.5.9.1, the pre FFT minimisation process is done over the complete slot.

RF error, and carrier leakage are necessary for best fit of the measured signal towards the ideal signal in the pre FFT domain. However they are not used to compare them against the limits.

E.5.7 Timing of the FFT window

Timing of the FFT window is estimated with the same method as described in E.3.2.

E.5.8 Post FFT equalisation

The post FFT equalisation is described separately without reference to E.3.3:

Perform 14 FFTs on z'(v), one for each OFDM symbol in a slot using the timing $\Delta\tilde{c}$, including the demodulation reference symbol. The result is an array of samples, 14 in the time axis t times 4096 in the frequency axis f. The samples represent the OFDM symbols (data and reference symbols) in the allocated RBs and inband emissions in the non-allocated RBs within the transmission BW.

Only the allocated resource blocks in the frequency domain are used for equalisation.

The nominal reference symbols and **nominal** OFDM data symbols are used to equalize the measured data symbols.

Note: (The nomenclature inside this note is local and not valid outside)

The nominal OFDM data symbols are created by a demodulation process. A demodulation process as follows is recommended:

1. Equalize the measured OFDM data symbols using the reference symbols for equalisation. Result: Equalized OFDM data symbols

2. Decide for the nearest constellation point, however not independent for each subcarrier in the RB. 12 constellation points are decided dependent, using the applicable CAZAC sequence. Result: Nominal OFDM data symbols

At this stage we have an array of Measured data-Symbols and reference-Symbols (MS(f,t))

versus an array of Nominal data-Symbols and reference Symbols (NS(f,t))

The arrays comprise in sum 14 data and reference symbols, depending on the PUCCH format, in the time axis and the number of allocated sub-carriers in the frequency axis.

MS(f,t) and NS(f,t) are processed with a least square (LS) estimator, to derive one equalizer coefficient per time slot and per allocated subcarrier. EC(f)

$$EC(f) = \frac{\sum_{t=0}^{13} NS(f,t)^* NS(f,t)}{\sum_{t=0}^{13} MS(f,t)^* NS(f,t)}$$

With * denoting complex conjugation.

EC(f) are used to equalize the OFDM data together with the demodulation reference symbols by:

$$Z'(f,t) = MS(f,t) \cdot EC(f)$$

With · denoting multiplication.

Z'(f,t) is used to calculate EVM$_{PUCCH}$, as described in E.5.9 1

> NOTE: although an exclusion period for EVM$_{PUCCH}$ is applicable in E.5.9.1, the post FFT minimisation process is done over 14 OFDM symbols.

The samples of the non-allocated resource blocks within the transmission bandwidth configuration in the post FFT domain are called Y(f,t) (f covering the non-allocated subcarriers within the transmission bandwidth configuration, t covering the OFDM symbols during 1 slot).

E.5.9   Derivation of the results

E.5.9.1   EVM$_{PUCCH}$

For EVM$_{PUCCH}$ create two sets of Z'(f,t)., according to the timing " $\Delta \tilde{c}$ –W/2 and $\Delta \tilde{c}$ +W/2" using the equalizer coefficients from E.5.8

The EVM$_{PUCCH}$ is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s)

$$EVM_{PUCCH} = \sqrt{\frac{\sum_{t \in T} \sum_{f \in F} \left| Z'(f,t) - I(f,t) \right|^2}{|T| \cdot P_0 \cdot |F|}},$$

where

the OFDM symbols next to transition boarders (instant of PUCCH frequency hopping) are excluded:

t covers less than the count of demodulated symbols in the slot (|T|= 12)

f covers the count of subcarriers within the allocated bandwidth. (|F|=12)

$Z'(f,t)$ are the samples of the signal evaluated for the EVM$_{PUCCH}$

$I(f,t)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

From the acquired samples 2n EVM$_{PUCCH}$ value can be derived, n values for the timing $\Delta \tilde{c}$ –W/2 and n values for the timing $\Delta \tilde{c}$ +W/2, where n is as defined in Annex E.2.2.

E.5.9.2   Averaged EVM$_{PUCCH}$

EVM$_{PUCCH}$ is averaged over all basic EVM$_{PUCCH}$ measurements

The averaging comprises n UL slots

$$\overline{EVM}_{PUCCH} = \sqrt{\frac{1}{n} \sum_{i=1}^{n} \left(EVM_{PUCCH,i} \right)^2},$$

where n is as defined in Annex E.2.2.

The averaging is done separately for timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 leading to $\overline{EVM}_{PUCCH,low}$ and $\overline{EVM}_{PUCCH,high}$

$EVM_{PUCCH,final} = \max(\overline{EVM}_{PUCCH,low}, \overline{EVM}_{PUCCH,high}$ is compared against the test requirements.

E.5.9.3   In-band emissions measurement

The in-band emissions are a measure of the interference falling into the non-allocated resources blocks

Create one set of Y(t,f) per slot according to the timing " $\Delta\tilde{c}$ "

For the non-allocated RBs the in-band emissions are calculated as follows

$$Emissions_{absolute}(\Delta_{RB}) = \begin{cases} \dfrac{1}{|T_s|} \sum\limits_{t \in T_s} \sum\limits_{\max(f_{\min},(c_l+12\cdot\Delta_{RB}*\Delta f))}^{c_l+(12\cdot\Delta_{RB}+11)*\Delta f} |Y(t,f)|^2, \Delta_{RB} < 0 \\ \dfrac{1}{|T_s|} \sum\limits_{t \in T_s} \sum\limits_{c_h+(12\cdot\Delta_{RB}-11)*\Delta f}^{\min(f_{\max},(c_h+12\cdot\Delta_{RB}*\Delta f))} |Y(t,f)|^2, \Delta_{RB} > 0 \end{cases},$$

where

the upper formula represents the inband emissions below the allocated frequency block and the lower one the inband emissions above the allocated frequency block.

T_s is a set of $|T_s|$ OFDM symbols in the measurement period,

Δ_{RB} is the starting frequency offset between the allocated RB and the measured non-allocated RB (e.g. $\Delta_{RB} = 1$ for the first upper or $\Delta_{RB} = -1$ for the first lower adjacent RB),

$f_{\min}$ and $f_{\max}$ are the lower and upper edge of the UL UE channel bandwidth

c_l and c_h are the lower and upper edge of the allocated BW,

Δf is the SCS, and

$Y(t,f)$ is the frequency domain signal evaluated for in-band emissions as defined in the clause E.5.8.

The relative in-band emissions are, given by

$$Emissions_{relative}(\Delta_{RB}) = 10*\log_{10} \frac{Emissions_{absolute}(\Delta_{RB})}{\dfrac{1}{|T_s| \cdot L_{CRBs}} \sum\limits_{t \in T_s} \sum\limits_{c_1}^{c_1+(12\cdot L_{CRBs}-1)*\Delta f} |MS(t,f)|^2} [dB]$$

where

L_{CRBs} is the number of allocated RBs,

and $MS(t,f)$ is the frequency domain samples for the allocated bandwidth, as defined in the subsection E.5.8

Although an exclusion period for EVM is applicable in E.5.9.1, the inband emissions measurement interval is defined over one complete slot in the time domain.

From the acquired samples *n* functions for inband emissions can be derived, where *n* is as defined in Annex E.2.2.

The in-band emissions are averaged over the *n* samples (equivalent to 10 UL subframes) with the same PUCCH position to prevent averaging of allocated and non-allocated RBs due to PUCCH frequency hopping:

$$\overline{Emissions}_{absolute}(\Delta_{RB}) = \frac{1}{n}\sum_{i=1}^{n} Emissions_{absolute,i}(\Delta_{RB})$$

$$\overline{Emissions}_{relative}(\Delta_{RB}) = 10*\log_{10}\left(\frac{1}{n}\sum_{i=1}^{n} 10^{Emissions_{relative,i}(\Delta_{RB})/10}\right) \quad [dB]$$

Since the PUCCH allocation is always on the upper or lower band-edge, the opposite of the allocated one represents the IQ image, and the remaining inner RBs represent the general inband emissions. They are compared against different limits.

E.6   EVM for PRACH

The description below is generic in the sense that all PRACH formats are covered. The numbers, used in the text below are taken from PRACH format#0 without excluding the other formats. The sampling rate for PRACH is assumed as , 30.72 Msps in the time domain.

E.6.1   Basic principle

The basic principle is the same as described in E.2.1

E.6.2   Output signal of the TX under test

The output signal of the TX under test is processed same as described in E.2.2

The measurement period is different since 2 PRACH preambles are recorded for long preamble formats as defined in Table 6.3.3.1-1 in [8] and 10 preambles are recorded for short preamble formats as defined in Table 6.3.3.1-2 in [8].

E.6.3   Reference signal

The test description in 6.4.2.1.4.1 is based on non-contention based access:

- PRACH configuration index (responsible for Preamble format, System frame number and subframe number)

- Preamble ID

- Preamble power

signalled to the UE, defines the reference signal unambiguously, such that no demodulation process is necessary to gain the reference signal.

The reference signal i(ν) is constructed by the measuring equipment according to the relevant TX specifications, using the following parameters: the applicable Zadoff Chu sequence, nominal carrier frequency, nominal amplitude and phase for each subcarrier, nominal timing, no carrier leakage. It is represented as a sequence of samples at a sampling rate of 122.88 Msps in the time domain.

E.6.4   Measurement results

The measurement result is:

- EVMPRACH

E.6.5 Measurement points

The measurement points are illustrated in the figure below:
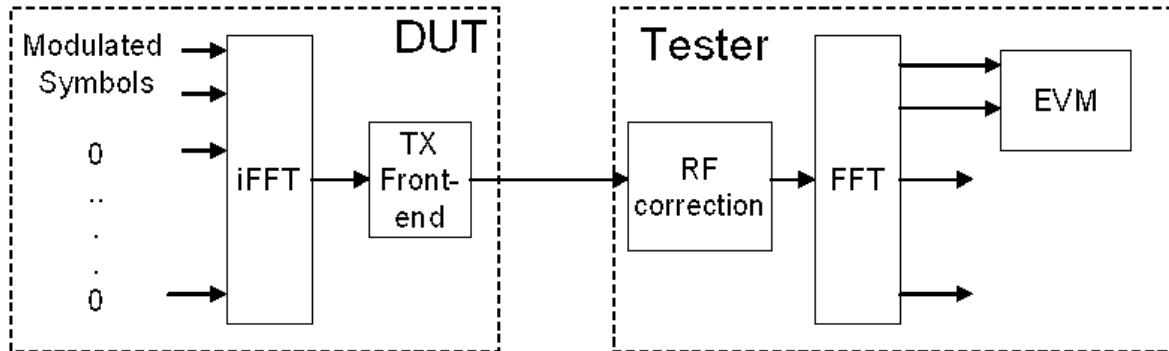
Figure E.6.5-1:Measurement points

E.6.6 Pre FFT minimization process

The pre-FFT minimization process is applied to each PRACH preamble separately. The time period for the pre- FFT minimisation process includes the complete CP and Zadoff-Chu sequence (in other words, the power transition period is per definition outside of this time period) Sample timing, Carrier frequency and carrier leakage in z(v) are jointly varied in order to minimise the difference between z(v) and i(v). Best fit (minimum difference) is achieved when the RMS difference value between z(v) and i(v) is an absolute minimum.

After this process the samples z(v) are called $z^0(v)$.

RF error, and carrier leakage are necessary for best fit of the measured signal towards the ideal signal in the pre FFT domain. However they are not used to compare them against the limits.

E.6.7 Timing of the FFT window

The FFT window length is 24576 samples for preamble format 0, however in the measurement period at least 27744 samples are taken. The position in time for FFT must be determined.

In an ideal signal, the FFT may start at any instant within the cyclic prefix without causing an error. The TX filter, however, reduces the window. The EVM requirements shall be met within a window W<CP.

The reference instant for the FFT start is the centre of the reduced window, called $\Delta \tilde{c}$,

EVM is measured at the following two instants: $\Delta \tilde{c}$ −W/2 and $\Delta \tilde{c}$ +W/2.

The timing of the measured signal $z^0(v)$ with respect to the ideal signal i(v) is determined in the pre FFT domain as follows:

Correlation between $z^0(v)$ and i(v) will result in a correlation peak. The meaning of the correlation peak is approx. the "impulse response" of the TX filter. The correlation peak, (the highest, or in case of more than one, the earliest) indicates the timing in the measured signal with respect to the ideal signal.

W is different for different preamble formats and shown in Table E.6.7-1 for $L_{RA} = 839$ and $\Delta f^{RA} \in \{1.25,5\} \, kHz$ in Table E.6.7-2 for $L_{RA} = 139$ and $\Delta f^{RA} = 15 \cdot 2^{\mu} \, kHz$ where $\mu \in \{0,1,2\}$.

Table E.6.7-1: EVM window length for PRACH formats for $L_{\text{RA}} = 839$

Preamble format	Cyclic prefix length N_{cp}	Nominal FFT size[1]	EVM window length *W* in FFT samples	Ratio of *W* to CP*
0	3168	24576	2307	72.8%
1	21024	24576	20163	95.9%
2	4688	24576	3827	81.6%
3	3168	6144	2952	93.2%
Note 1:	The use of other FFT sizes is possible as long as appropriate scaling of the window length is applied			
Note 2:	These percentages are informative			

Table E.6.7-2: EVM window length for PRACH formats for $L_{\text{RA}} = 139$

Preamble format	Cyclic prefix length N_{cp}	Nominal FFT size[1]	EVM window length *W* in FFT samples	Ratio of *W* to CP*
A1	$288 \cdot 2^{-\mu}$	$2048 \cdot 2^{-\mu}$	$144 \cdot 2^{-\mu}$	50.0%
A2	$576 \cdot 2^{-\mu}$	$2048 \cdot 2^{-\mu}$	$432 \cdot 2^{-\mu}$	75.0%
A3	$864 \cdot 2^{-\mu}$	$2048 \cdot 2^{-\mu}$	$720 \cdot 2^{-\mu}$	83.3%
B1	$216 \cdot 2^{-\mu}$	$2048 \cdot 2^{-\mu}$	$72 \cdot 2^{-\mu}$	33.3%
B2	$360 \cdot 2^{-\mu}$	$2048 \cdot 2^{-\mu}$	$216 \cdot 2^{-\mu}$	60.0%
B3	$504 \cdot 2^{-\mu}$	$2048 \cdot 2^{-\mu}$	$360 \cdot 2^{-\mu}$	71.4%
B4	$936 \cdot 2^{-\mu}$	$2048 \cdot 2^{-\mu}$	$792 \cdot 2^{-\mu}$	84.6%
C0	$1240 \cdot 2^{-\mu}$	$2048 \cdot 2^{-\mu}$	$1096 \cdot 2^{-\mu}$	88.4%
C2	$2048 \cdot 2^{-\mu}$	$2048 \cdot 2^{-\mu}$	$1904 \cdot 2^{-\mu}$	93.0%
Note 1:	The use of other FFT sizes is possible as long as appropriate scaling of the window length is applied			
Note 2:	These percentages are informative			

The number of samples, used for FFT is reduced compared to $z^0(v)$. This subset of samples is called z' (v).

EVM is based on Nominal FFT size samples per PRACH preamble and demodulated symbol.

E.6.8   Post FFT equalisation

Equalisation is not applicable for the PRACH.

E.6.9   Derivation of the results

E.6.9.1   EVM$_{\text{PRACH}}$

Perform FFT on z'(v) and i(v) using the FFT timing $\Delta \tilde{c}$ –W/2 and $\Delta \tilde{c}$ +W/2.

For format 2 and 3 the first and the repeated preamble sequence are FFT-converted separately. using the standard FFT length of 2048.

The EVM$_{\text{PRACH}}$ is the difference between the ideal waveform and the measured and equalized waveform for the allocated RB(s).

$$EVM_{PRACH} = \sqrt{\frac{\sum\limits_{t \in T} \sum\limits_{f \in F} \left| Z'(f,t) - I(f,t) \right|^2}{|T| \cdot P_0 \cdot |F|}}$$

,

where

t covers the count of demodulated symbols in the slot.

f covers the count of demodulated symbols within the allocated bandwidth.

$Z'(f,t)$ are the samples of the signal evaluated for the EVM$_{PRACH}$

$I(f,t)$ is the ideal signal reconstructed by the measurement equipment, and

P_0 is the average power of the ideal signal. For normalized modulation symbols P_0 is equal to 1.

From the acquired samples 2m EVM$_{PRACH}$ values can be derived, m values for the timing $\Delta\tilde{c}$ –W/2 and m values for the timing $\Delta\tilde{c}$ +W/2, where m is the number of recorded preambles as defined in Annex E.6.2.

E.6.9.2   Averaged EVM$_{PRACH}$

The PRACH EVM, EVM_{PRACH}, is averaged over m preamble sequence measurements.

$$\overline{EVM}_{PRACH} = \sqrt{\frac{1}{m}\sum_{i=1}^{m}\left(EVM_{PRACH,i}\right)^2}$$

,

where m is the number of recorded preambles as defined in Annex E.6.2.The averaging is done separately for timing $\Delta\tilde{c}$ –W/2 and $\Delta\tilde{c}$ +W/2 leading to $\overline{EVM}_{A\,Girl}$ and $\overline{EVM}_{A\,Girl}$

$\overline{EVM}_{PRACH}$ is compared against the test requirements.

Annex F (normative):
Measurement uncertainties and Test Tolerances

F.1   Acceptable uncertainty of Test System (normative)

The maximum acceptable uncertainty of the Test System is specified below for each test, where appropriate. The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified range, and the equipment under test to be measured with an uncertainty not exceeding the specified values. All ranges and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95 % is the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment.

For RF tests it should be noted that the uncertainties in clause F.1 apply to the Test System operating into a nominal 50 ohm load and do not include system effects due to mismatch between the DUT and the Test System.

The downlink signal uncertainties apply at each receiver antenna connector.

F.1.1   Measurement of test environments

The measurement accuracy of the UE test environments defined in TS 38.508-1 [5] subclause 4.1, Test environments shall be

- Pressure   ±5 kPa.

- Temperature   ±2 degrees.

- Relative Humidity ±5 %.

- DC Voltage   ±1,0 %.

- AC Voltage   ±1,5 %.

- Vibration   10 %.

- Vibration frequency   0,1 Hz.

The above values shall apply unless the test environment is otherwise controlled and the specification for the control of the test environment specifies the uncertainty for the parameter.

F.1.2 Measurement of transmitter

Table F.1.2-1: Maximum Test System Uncertainty for transmitter tests

Subclause	Maximum Test System Uncertainty	Derivation of Test System Uncertainty
6.2.1 UE maximum output power	f ≤ 3.0GHz ±0.7 dB, BW ≤ 40MHz ±1.4 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±1.0 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±1.3 dB, BW ≤ 20MHz ±1.5 dB, 20MHz < BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz	
6.2.2 Maximum Power Reduction (MPR)	f ≤ 3.0GHz ±0.7 dB, BW ≤ 40MHz ±1.4 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±1.0 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±1.3 dB, BW ≤ 20MHz ±1.5 dB, 20MHz < BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz	
6.2.3 UE additional maximum output power reduction	f ≤ 3.0GHz ±0.7 dB, BW ≤ 40MHz ±1.4 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±1.0 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±1.3 dB, BW ≤ 20MHz ±1.5 dB, 20MHz < BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz	
6.2.4 Configured transmitted power	f ≤ 3.0GHz ±0.7 dB, BW ≤ 40MHz ±1.4 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±1.0 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±1.3 dB, BW ≤ 20MHz ±1.5 dB, 20MHz < BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz	
6.2A.1.1 UE maximum output power for CA (2UL CA)	For Inter-band CA MAX (MU_{CC1}, MU_{CC2})	MU_{CCx} is MU of each UL CC specified in single UL case 6.2.1.
6.2A.2.1 UE maximum output power reduction for CA (2UL CA)	For Inter-band CA MAX (MU_{CC1}, MU_{CC2}) For intra-band contiguous CA Aggregated BW ≤ 100M: same as 6.2.2 for sum of powers of all CCs Aggregated BW > 100M: TBD	MU_{CCx} is MU of each UL CC specified in single UL case 6.2.2.

6.2A.3.1 UE additional maximum output power reduction CA (2UL CA)	For Inter-band CA MAX (MU$_{CC1}$, MU$_{CC2}$)	MU$_{CCx}$ is MU of each UL CC specified in single UL case 6.2.3.
6.2A.4.1 Configured transmitted power for CA (2UL CA)	For Inter-band CA MAX (MU$_{CC1}$, MU$_{CC2}$) For intra-band contiguous CA Aggregated BW ≤ 100M: same as 6.2.2 for sum of powers of all CCs Aggregated BW > 100M: TBD	MU$_{CCx}$ is MU of each UL CC specified in single UL case 6.2.4.
6.2C.1 Configured transmitted power for SUL	Same as 6.2.4	
6.2C.3 UE maximum output power for SUL	Same as 6.2.1	
6.2C.3_1 UE maximum output power for SUL with UL MIMO	Same as 6.2.1 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.2.1 with SNR assumption reduced by 3dB compared to the single antenna case.
6.2C.4 UE maximum output power reduction for SUL	Same as 6.2.2	
6.2C.5 UE additional maximum output power reduction for SUL	Same as 6.2.3	
6.2D.1 UE maximum output power for UL MIMO	Same as 6.2.1 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.2.1 with SNR assumption reduced by 3dB compared to the single antenna case.
6.2D.2 UE maximum output power reduction for UL MIMO	Same as 6.2.2 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.2.2 with SNR assumption reduced by 3dB compared to the single antenna case.
6.2D.3 UE additional maximum output power reduction for UL MIMO	Same as 6.2.3 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.2.3 with SNR assumption reduced by 3dB compared to the single antenna case.
6.2D.4 Configured transmitted power for UL MIMO	Same as 6.2.4 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.2.4 with SNR assumption reduced by 3dB compared to the single antenna case.
6.2F.1 UE maximum output power for shared spectrum channel access	4.2GHz < f ≤ 5.925GHz ±1.3 dB, BW ≤ 20MHz ±1.5 dB, 20MHz < BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz 5.925GHz < f ≤ 7.125GHz TBD	

6.2F.3 UE additional maximum output power reduction for shared spectrum access	Same as 6.2F.1	
6.2G.1 UE maximum output power for Tx Diversity	Same as 6.2.1 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna connector in 6.2.1 with SNR assumption reduced by 3dB compared to the single antenna case.
6.2G.2 UE maximum output power reduction for Tx Diversity	Same as 6.2.2 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna connector in 6.2.2 with SNR assumption reduced by 3dB compared to the single antenna case.
6.2G.3 UE additional maximum output power reduction for Tx Diversity	Same as 6.2.3 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna connector in 6.2.3 with SNR assumption reduced by 3dB compared to the single antenna case.
6.3.1 Minimum output power	f ≤ 3.0GHz ±1.0 dB, BW ≤ 40MHz ±1.4 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±1.3 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±1.5 dB, BW ≤ 40MHz ±1.8 dB, 40MHz < BW ≤ 100MHz	
6.3.2 Transmit OFF power	f ≤ 3.0GHz ±1.5 dB, BW ≤ 40MHz ±1.7 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±1.8 dB, BW ≤ 40MHz ±1.9 dB, 40MHz < BW ≤ 80MHz ±2.2 dB, 80MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±2.0 dB, BW ≤ 20MHz ±2.1 dB, 20MHz < BW ≤ 80MHz ±2.2 dB, 80MHz < BW ≤ 100MHz	
6.3.3.2 General ON/OFF time mask	f ≤ 3.0GHz ±1.5 dB, BW ≤ 40MHz ±1.7 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±1.8 dB, BW ≤ 40MHz ±1.9 dB, 40MHz < BW ≤ 80MHz ±2.2 dB, 80MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±2.0 dB, BW ≤ 20MHz ±2.1 dB, 20MHz < BW ≤ 80MHz ±2.2 dB, 80MHz < BW ≤ 100MHz	

6.3.3.4 PRACH time mask	f ≤ 3.0GHz ±1.5 dB, BW ≤ 40MHz ±1.7 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±1.8 dB, BW ≤ 40MHz ±1.9 dB, 40MHz < BW ≤ 80MHz ±2.2 dB, 80MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±2.0 dB, BW ≤ 20MHz ±2.1 dB, 20MHz < BW ≤ 80MHz ±2.2 dB, 80MHz < BW ≤ 100MHz	
6.3.3.6 SRS time mask	f ≤ 3.0GHz ±1.5 dB, BW ≤ 40MHz ±1.7 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±1.8 dB, BW ≤ 40MHz ±1.9 dB, 40MHz < BW ≤ 80MHz ±2.2 dB, 80MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±2.0 dB, BW ≤ 20MHz ±2.1 dB, 20MHz < BW ≤ 80MHz ±2.2 dB, 80MHz < BW ≤ 100MHz	
6.3.4.2 Absolute power tolerance	f ≤ 3.0GHz ±1.0 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±1.4 dB, BW ≤ 40MHz ±1.9 dB, 40MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±2.0 dB, BW ≤ 20MHz ±2.1 dB, 20MHz < BW ≤ 40MHz ±2.2 dB, 80MHz < BW ≤ 100MHz	Test System uncertainty = SQRT (UL Meas Uncer^2 + DL Meas Uncer^2)
6.3.4.3 Relative power tolerance	±0.7 dB, BW ≤ 40MHz ±1.0 dB, 40MHz < BW ≤ 100MHz Absolute Uplink power measurement for step 2.1 same as 6.2.1. Absolute Uplink power measurement for step 1.1 same as 6.3.1.	
6.3.4.4 Aggregate power tolerance	±0.7 dB, BW ≤ 40MHz ±1.0 dB, 40MHz < f ≤ 100MHz	
6.3A.1.1 Minimum output power for CA (2UL CA)	Same as 6.3.1 for each CC	
6.3A.3.1 Transmit ON/OFF time mask for CA (2UL CA)	Same as 6.3.3.2 for each CC	
6.3A.3.1_1 Time mask for switching between two uplink carriers	Same as 6.3.3.2 for each CC	
6.3A.4.1.1 Absolute power tolerance for CA (2UL CA)	Same as 6.3.4.2 for each CC	
6.3A.4.2.1 Power Control Relative power tolerance for CA (2UL CA)	Same as 6.3.4.3 for each CC	

6.3A.4.3.1 Aggregate power tolerance for CA (2UL CA)	Same as 6.3.4.4 for each CC	
6.3D.1 Minimum output power for UL MIMO	Same as 6.3.1 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.3.1 with SNR assumption reduced by 3dB compared to the single antenna case.
6.3D.2 Transmit OFF power for UL MIMO	Same as 6.3.2 for each antenna	
6.3D.3 Transmit ON/OFF time mask for UL MIMO	ON power: Same as 6.2D.1 OFF power: Same as 6.3D.2	
6.3D.4.1 Absolute Power tolerance	Same as 6.3.4.2 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.3.4.2 with SNR assumption reduced by 3dB compared to the single antenna case.
6.3D.4.2 Relative Power tolerance	±0.9 dB, BW ≤ 40MHz ±1.4 dB, 40MHz < f ≤ 100MHz	MU is for the sum of power at each of UE antenna connector
6.3D.4.3 Aggregate Power tolerance	Same as 6.3.4.4 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.3.4.4 with SNR assumption reduced by 3dB compared to the single antenna case.
6.3F.1 Minimum output power for shared spectrum channel access	4.2GHz < f ≤ 6.0GHz ±1.5 dB, BW ≤ 40MHz ±1.8 dB, 40MHz < BW ≤ 100MHz 5.925GHz < f ≤ 7.125GHz TBD	
6.3F.2 Transmit OFF power for shared spectrum channel access	4.2GHz < f ≤ 5.925GHz ±2.0 dB, BW ≤ 20MHz ±2.1 dB, 20MHz < BW ≤ 80MHz ±2.2 dB, 80MHz < BW ≤ 100MHz 5.925GHz < f ≤ 7.125GHz TBD	
6.3F.3.2 General ON/OFF time mask for shared spectrum channel access	4.2GHz < f ≤ 5.925GHz ±2.0 dB, BW ≤ 20MHz ±2.1 dB, 20MHz < BW ≤ 80MHz ±2.2 dB, 80MHz < BW ≤ 100MHz 5.925GHz < f ≤ 7.125GHz TBD	
6.3G.1 Minimum output power for Tx Diversity	Same as 6.3.1 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.3.1 with SNR assumption reduced by 3dB compared to the single antenna case.
6.3G.2 Transmit OFF power for Tx Diversity	Same as 6.3.2 for each antenna	

6.3G.3.1 General ON/OFF time mask for Tx Diversity	ON power: Same as 6.2G.1 OFF power: Same as 6.3G.2	
6.3G.3.2 PRACH time mask for Tx Diversity	Same as 6.3.3.4 for each antenna	
6.3G.3.3 SRS time mask for Tx Diversity	Same as 6.3.3.6 for each antenna	
6.3G.4.2 Relative power tolerance for Tx Diversity	Same as 6.3.4.3 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.3.4.3 with SNR assumption reduced by 3dB compared to the single antenna case.
6.3G.4.3 Aggregate power tolerance for Tx Diversity	Same as 6.3.4.4 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.3.4.4 with SNR assumption reduced by 3dB compared to the single antenna case.
6.4.1 Frequency Error	±15 Hz, f ≤ 3.0GHz ±36 Hz, f > 3.0GHz DL Signal level: ±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz ±1.5 dB, 4.2GHz < f ≤ 6.0GHz	
6.4.2.1 Error Vector Magnitude	For up to 256QAM: f ≤ 6.0GHz, BW ≤ 100MHz 15 dBm < P_{UL} PUSCH, PUCCH, PRACH: ±1.5 % -25 dBm < P_{UL} ≤ 15 dBm PUSCH, PUCCH, PRACH: ±2.5 % -40dBm ≤ P_{UL} ≤ -25dBm PUSCH, PUCCH, PRACH: ±3.0 % Absolute Uplink power measurement same as 6.3.1. Relative Uplink power measurement same as 6.3.4.3.	
6.4.2.1a Error Vector Magnitude including symbols with transient period	Same as 6.4.2.1	

6.4.2.2 Carrier Leakage	f ≤ 3.0GHz ±0.8 dB, BW ≤ 40MHz ±1.5 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±0.8 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±1.0 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz Absolute Uplink power measurement for step 2 and step 4 same as 6.2.1. Absolute Uplink power measurement for step 6 and step 8 same as 6.3.1. Relative Uplink power measurement same as 6.3.4.3.	
6.4.2.3 In-band emissions	f ≤ 3.0GHz ±0.8 dB, BW ≤ 40MHz ±1.5 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±0.8 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±1.0 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz Absolute Uplink power measurement for steps 1.2, 1.4, 2.2, and 2.4 same as 6.2.1. Absolute Uplink power measurement for steps 1.6, 1.8, 2.6, and 2.8 same as 6.3.1. Relative Uplink power measurement same as 6.3.4.3.	
6.4.2.4 EVM equalizer spectrum flatness	±1.4 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz	
6.4.2.5 EVM equalizer spectrum flatness for Pi/2 BPSK	Same as 6.4.2.4	
6.4A.1.1 Frequency error for CA (2UL CA)	For inter-band CA: same as 6.4.1 for each CC	
6.4A.2.1.1 Error Vector Magnitude for CA (2UL CA)	For inter-band CA: same as 6.4.2.1 for each CC Absolute Uplink power measurement same as 6.3A.1.1. Relative Uplink power measurement same as 6.3.4.3.	
6.4A.2.2.1 Carrier leakage for CA (2UL CA)	For inter-band CA: same as 6.4.2.2 for each CC Uplink power measurement for step 5 and step 7 same as 6.2A.1.1. Absolute Uplink power measurement for step 9 and step 11 same as 6.3A.1.1. Relative Uplink power measurement same as 6.3.4.3.	
6.4A.2.3.1 In-band emission for CA (2UL CA)	For inter-band CA: same as 6.4.2.3 for each CC Absolute Uplink power measurement for step 5 and step 7 same as 6.2A.1.1. Absolute Uplink power measurement for step 9 and step 11 same as 6.3A.1.1. Relative Uplink power measurement same as 6.3.4.3.	
6.4C.1 Frequency error for SUL	Same as 6.4.1	

6.4C.2.1 Error Vector Magnitude for SUL	Same as 6.4.2.1	
6.4C.2.2 Carrier leakage for SUL	Same as 6.4.2.2	
6.4C.2.3 In-band emissions for SUL	Same as 6.4.2.3	
6.4C.2.4 EVM equalizer spectrum flatness for SUL	Same as 6.4.2.4	

6.4D.1 Frequency error for UL MIMO	Same as 6.4.1 for each antenna	
6.4D.2.1 Error Vector Magnitude for UL MIMO	Same as 6.4.2.1 for each antenna Absolute Uplink power measurement same as 6.3D.1. Relative Uplink power measurement same as 6.3.4.3.	
6.4D.2.2 Carrier leakage for UL MIMO	Same as 6.4.2.2 for each antenna Absolute Uplink power measurement for step 2 and step 4 same as 6.2D.1. Absolute Uplink power measurement for step 6 and step 8 same as 6.3D.1. Relative Uplink power measurement same as 6.3.4.3.	
6.4D.2.3 In-band emissions for UL MIMO	Same as 6.4.2.3 for each antenna Absolute Uplink power measurement for steps 1.2 and 1.4 same as 6.2D.1. Absolute Uplink power measurement for steps 1.6 and 1.8 same as 6.3D.1. Relative Uplink power measurement same as 6.3.4.3.	
6.4D.2.4 EVM equalizer spectrum flatness for UL MIMO	Same as 6.4.2.4 for each antenna	
6.4D.3 Time alignment error for UL MIMO	±25ns	
6.4D.4 Requirements for Coherent UL MIMO	FFS	
6.4F.1 Frequency Error for shared spectrum access	±36 Hz, f > 3.0GHz DL Signal level: ±1.5 dB, 4.2GHz < f ≤ 6.0GHz	
6.4G.1 Frequency Error for Tx Diversity	Same as 6.4.1 for each antenna	
6.4G.2.2 Carrier Leakage for Tx Diversity	Same as 6.4.2.2 for each antenna Absolute Uplink power measurement for step 2 and step 4 same as 6.2G.1. Absolute Uplink power measurement for step 6 and step 8 same as 6.3G.1. Relative Uplink power measurement same as 6.3G.4.3.	
6.4G.2.3 In-band emissions for Tx Diversity	Same as 6.4.2.3 for each antenna Absolute Uplink power measurement for steps 1.2 and 1.4 same as 6.2G.1. Absolute Uplink power measurement for steps 1.6 and 1.8 same as 6.3G.1. Relative Uplink power measurement same as 6.3G.4.3.	
6.4G.2.4 EVM equalizer spectrum flatness for Tx Diversity	±1.4 dB, BW ≤ 40MHz ±1.6 dB, 40MHz < BW ≤ 100MHz	
6.5.1 Occupied bandwidth	1.5% of channel bandwidth	
6.5.2.2 Spectrum Emission Mask	±1.5 dB, f ≤ 3.0GHz ±1.8 dB, 3.0GHz < f ≤ 4.2GHz ±2.0 dB, 4.2GHz < f ≤ 6.0GHz	
6.5.2.3 Additional spectrum emission mask	±1.5 dB, f ≤ 3.0GHz ±1.8 dB, 3.0GHz < f ≤ 4.2GHz ±2.0 dB, 4.2GHz < f ≤ 6.0GHz	
6.5.2.4.1 NR ACLR	±0.8 dB, f ≤ 4.0GHz ±1.0 dB, 4.0GHz < f ≤ 6.0GHz	

6.5.2.4.2 UTRA ACLR	±0.8 dB, f ≤ 4.0GHz ±1.0 dB, 4.0GHz < f ≤ 6.0GHz	
6.5.3.1 General spurious emissions	for results > -60 dBm: ±2.0 dB, 9kHz < f ≤ 3GHz ±2.5 dB, 3GHz < f ≤ 4GHz ±4.0 dB, 4GHz < f ≤ 19GHz ±6.0 dB, 19GHz < f ≤ 26GHz	
6.5.3.2 Spurious emission for UE co-existence	for results > -60 dBm: ±2.0 dB, 9kHz < f ≤ 3GHz ±2.5 dB, 3GHz < f ≤ 4GHz ±4.0 dB, 4GHz < f ≤ 19GHz ±6.0 dB, 19GHz < f ≤ 26GHz	
6.5.3.3 Additional spurious emissions	for results > -60 dBm: ±2.0 dB, 9kHz < f ≤ 3GHz ±2.5 dB, 3GHz < f ≤ 4GHz ±4.0 dB, 4GHz < f ≤ 19GHz ±6.0 dB, 19GHz < f ≤ 26GHz	
6.5.4 Transmit intermodulation	f ≤ 3.0GHz ±2.7 dB, BW ≤ 40MHz ±3.1 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 4.2GHz ±3.7 dB, BW ≤ 40MHz ±4.0 dB, 40MHz < BW ≤ 100MHz 4.2GHz < f ≤ 6.0GHz ±5.1 dB, BW ≤ 40MHz ±5.3 dB, 40MHz < BW ≤ 100MHz	Overall system uncertainty comprises four quantities: 1. Wanted signal setting error 2. CW Interferer level error 3. Wanted signal meas. error 4. Intermodulation product measurement error The relative level of the wanted signal and the CW interferer has 2 x effect on the intermodulation product. Items 1, 2, 3 and 4 are assumed to be uncorrelated so can be root sum squared to provide the combined effect. Test System uncertainty = SQRT [(2 x SQRT (Wanted setting_error^2 + CW_level_error^2)) ^{2} + Wanted_level_meas error^2 + Intermodulation product measurement error^2]
6.5A.1.1 Occupied bandwidth for CA (2UL CA)	For inter-band CA: same as 6.5.1 for each CC	
6.5A.2.2.1 Spectrum emission mask for CA (2UL CA)	For inter-band CA: same as 6.5.2.2 for each CC	
6.5A.2.4.1.1 NR ACLR for CA (2UL CA)	For inter-band CA: same as 6.5.2.4.1 for each CC	
6.5A.2.4.2.1 URTA ACLR for CA (2UL CA)	For inter-band CA: same as 6.5.2.4.2 for each CC	
6.5A.3.1.1 General spurious emissions for CA (2UL CA)	For inter-band CA: same as 6.5.3.1 for each CC	
6.5A.3.2.1 Spurious emission for UE co-existence for CA (2UL CA)	For inter-band CA: same as 6.5.3.2 for each CC	
6.5A.4.1 Transmit intermodulation for CA (2UL CA)	For inter-band CA: same as 6.5.4, for each CC	
6.5C.1 Occupied bandwidth for SUL	Same as 6.5.1	
6.5C.2.2 Spectrum Emission Mask for SUL	Same as 6.5.2.2	

6.5C.2.3 Additional spectrum emission mask for SUL	Same as 6.5.2.3	
6.5C.2.4.1 NR ACLR for SUL	Same 6.5.2.4.1	
6.5C.2.4.2 UTRA ACLR for SUL	Same as 6.5.2.4.2	
6.5C.3.1 General spurious emissions for SUL	Same as 6.5.3.1	
6.5C.3.2 Spurious emission for UE co-existence for SUL	Same as 6.5.3.2	
6.5C.3.3 Additional spurious emissions for SUL	Same as 6.5.3.3	
6.5C.4 Transmit intermodulation for SUL	Same as 6.5.4	
6.5D.1 Occupied bandwidth for UL MIMO	Same as 6.5.1 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.5.1 with SNR assumption reduced by 3dB compared to the single antenna case.
6.5D.2.2 Spectrum emission mask for UL MIMO	Same as 6.5.2.2 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.5.2.2 with SNR assumption reduced by 3dB compared to the single antenna case.
6.5D.2.3 Additional spectrum emission mask for UL MIMO	Same as 6.5.2.3 for each antenna	
6.5D.2.4.1 NR ACLR for UL MIMO	Same as 6.5.2.4.1 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.5.2.4.1 with SNR assumption reduced by 3dB compared to the single antenna case.
6.5D.2.4.2 UTRA ACLR for UL MIMO	Same as 6.5.2.4.2 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.5.2.4.2 with SNR assumption reduced by 3dB compared to the single antenna case.
6.5D.3.1 General spurious emissions for UL MIMO	Same as 6.5.3.1 for each antenna	
6.5D.3.2 Spurious emissions for UE co-existence for UL MIMO	Same as 6.5.3.2 for each antenna	
6.5D.3.3 Additional spurious emissions for UL MIMO	Same as 6.5.3.3 for each antenna	
6.5D.3_1.1 General spurious emissions for UL MIM(Rel-16 onward)	Same as 6.5.3.1 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.5.3.1 with SNR assumption reduced by 3dB compared to the single antenna case.

6.5D.3_1.2 Spurious emissions for UE co-existence for UL MIMO (Rel-16 onward)	Same as 6.5.3.2 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.5.3.2 with SNR assumption reduced by 3dB compared to the single antenna case.
6.5D.3_1.3 Additional spurious emissions for UL MIMO (Rel-16 onward)	Same as 6.5.3.3 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna port in 6.5.3.3 with SNR assumption reduced by 3dB compared to the single antenna case.
6.5D.4 Transmit intermodulation for UL MIMO	Same as 6.5.4 for each antenna	
6.5G.2.3.1 NR ACLR for Tx Diversity	Same as 6.5.2.4.1 for the sum of power at each of UE antenna connector	MU is for the sum of power at each of UE antenna connector, and is the same as the MU of single antenna connector in 6.5.2.4.2 with SNR assumption reduced by 3dB compared to the single antenna case.

F.1.3 Measurement of receiver

Table F.1.3-1: Maximum Test System Uncertainty for receiver tests

Subclause	Maximum Test System Uncertainty	Derivation of Test System Uncertainty
7.3.2 Reference sensitivity power level	±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz ±1.5 dB, 4.2GHz < f ≤ 6GHz	
7.3A Reference sensitivity for CA (Same MU apply to all subsections including 7.3.1, 7.3.1_1, 7.3A.2, 7.3.3, 7.3A.4, etc.)	Same as 7.3.2 for each component carrier	
7.3C.2 Reference sensitivity power level	Same as 7.3.2	
7.3D Reference sensitivity for MIMO	Same as 7.3.2	
7.4 Maximum input level	Downlink power ±0.7 dB, f ≤ 3.0GHz ±1.0 dB, 3.0GHz < f ≤ 4.2GHz ±1.5 dB, 4.2GHz < f ≤ 6GHz Uplink power measurement same as 6.2.1	
7.4A Maximum input level for CA (Same MU apply to all subsections including 7.4A.1, 7.4A.2, 7.4A.3, 7.4A.4, etc.)	Same as 7.4 for each component carrier	
7.4D Maximum input level for UL MIMO	Downlink power same as 7.4 Uplink power measurement same as 6.2D.1	The overall UL power is the linear sum of the output powers over all Tx antenna connectors
7.5 Adjacent channel selectivity	ACS value ±1.6 dB, f ≤ 3.0GHz ±2.3 dB, 3.0GHz < f ≤ 4.2GHz ±3.0 dB, 4.2GHz < f ≤ 6.0GHz Uplink power measurement same as 6.2.1	Overall ACS uncertainty comprises three quantities: 1. Wanted signal level error 2. Interferer signal level error 3. Additional impact of interferer ACLR Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The interferer ACLR effect is systematic, and is added arithmetically. Test System uncertainty = [SQRT (wanted_level_error^2 + interferer_level_error^2)] + ACLR effect.
7.5A Adjacent channel selectivity for CA (Same MU apply to all subsections including 7.5A.1, 7.5A.2, 7.5A.3, 7.5A.4, etc.)	Same as 7.5 for each component carrier	Same as 7.5 The wanted signal level uncertainty applies for each CC. Overall ACS uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect.
7.5D Adjacent channel selectivity for UL MIMO	ACS value same as 7.5 Uplink power measurement same as 6.2D.1	The overall UL power is the linear sum of the output powers over all Tx antenna connectors

7.5F.1 Adjacent channel selectivity for shared spectrum channel access	ACS value ±3.0 dB, 4.2GHz < f ≤ 5.925 GHz TBD, 5.925 GHz – 7.125 GHz Uplink power measurement same as 6.2F.1	Same as 7.5
7.6.2 Inband Blocking	Blocking ±1.6 dB, f ≤ 3.0GHz ±2.3 dB, 3.0GHz < f ≤ 4.2GHz ±3.0 dB, 4.2GHz < f ≤ 6.0GHz Uplink power measurement same as 6.2.1	Overall blocking uncertainty can have these contributions: 1. Wanted signal level error 2. Interferer signal level error 3. Interferer ACLR 4. Interferer broadband noise Items 1 and 2 are assumed to be uncorrelated so can be root sum squared to provide the ratio error of the two signals. The Interferer ACLR or Broadband noise effect is systematic, and is added arithmetically. Test System uncertainty = [SQRT (wanted_level_error^2 + interferer_level_error^2)] + ACLR effect + Broadband noise effect. In-band blocking, using modulated interferer: Broadband noise not applicable
7.6.3 Out-of-band blocking	Wanted signal, f ≤ 3.0GHz ±2.0 dB, Blocking, 1MHz < $f_{interferer}$ ≤ 3GHz ±3.9 dB, Blocking, 3GHz < $f_{interferer}$ ≤ 12.75GHz Wanted signal, 3.0GHz < f ≤ 4.2GHz ±2.2 dB, Blocking, 1MHz < $f_{interferer}$ ≤ 3GHz ±4.0 dB, Blocking, 3GHz < $f_{interferer}$ ≤ 12.75GHz Wanted signal, 4.2GHz < f ≤ 6GHz ±2.6 dB, Blocking, 1MHz < $f_{interferer}$ ≤ 3GHz ±4.2 dB, Blocking, 3GHz < $f_{interferer}$ ≤ 12.75GHz Uplink power measurement same as 6.2.1	Out of band blocking, using CW interferer: Interferer ACLR not applicable Impact of interferer Broadband noise 0.8dB Figures are combined to give Test System uncertainty, using formula given for 7.6.2
7.6.4 Narrow band blocking	Blocking ± 2.0dB, f ≤ 3.0GHz ± 2.4dB, 3.0GHz < f ≤ 4.2GHz ± 3.1dB, 4.2GHz < f ≤ 6.0GHz Uplink power measurement same as 6.2.1	Narrow band blocking, using CW interferer: Interferer ACLR not applicable Impact of interferer Broadband noise 0.8dB Figures are combined to give Test System uncertainty, using formula given for 7.6.2
7.6A.2 Inband Blocking for CA (Same MU apply to all subsections including 7.6A.2.1, 7.6A.2.2, 7.6A.2.3, 7.6A.2.4, etc.)	Same as 7.6.2 for each component carrier	Same as 7.6.2 The wanted signal level uncertainty applies for each CC. Overall blocking uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect.

7.6A.3 Out-of-band Blocking for CA (Same MU apply to all subsections including 7.6A.3.1, 7.6A.3.2, 7.6A.3.3, 7.6A.3.4, etc.)	Same as 7.6.3 for each component carrier	Same as 7.6.3 The wanted signal level uncertainty applies for each CC. Overall blocking uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect.
7.6A.4 Narrow band Blocking for CA (Same MU apply to all subsections including 7.6A.4.1, 7.6A.4.2, 7.6A.4.3, 7.6A.4.4, etc.)	Same as 7.6.4 for each component carrier	Same as 7.6.4 The wanted signal level uncertainty applies for each CC. Overall blocking uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect.
7.6C.2_1.1 Inband Blocking for SUL with 2 DL CA	Same as 7.6A.2	Same as 7.6A.2
7.6D.2 Inband blocking for UL MIMO	Blocking same as 7.6.2 Uplink power measurement same as 6.2D.1	The overall UL power is the linear sum of the output powers over all Tx antenna connectors
7.6D.3 Out-of-band blocking for UL MIMO	Wanted signal same as 7.6.3 Uplink power measurement same as 6.2D.1	The overall UL power is the linear sum of the output powers over all Tx antenna connectors
7.6D.4 Narrow-band blocking for UL MIMO	Blocking same as 7.6.4 Uplink power measurement same as 6.2D.1	The overall UL power is the linear sum of the output powers over all Tx antenna connectors
7.6F.2 In-band blocking for shared spectrum channel access	Blocking ±3.0 dB, 4.2GHz < f ≤ 5.925 GHz TBD, 5.925 GHz – 7.125 GHz Uplink power measurement same as 6.2F.1	Same as 7.6.2
7.7 Spurious response	Same as 7.6.3	Same as 7.6.3
7.7A Spurious response for CA (Same MU apply to all subsections including 7.7A.1, 7.7A.2, 7.7A.3, etc.)	Same as 7.6A.3	Same as 7.6A.3
7.7D Spurious response for UL MIMO	Same as 7.7 Uplink power measurement same as 6.2D.1	The overall UL power is the linear sum of the output powers over all Tx antenna connectors

7.8.2 Wide band Intermodulation	Intermodulation ± 2.3dB, f ≤ 3.0GHz ± 3.1dB, 3.0GHz < f ≤ 4.2GHz ± 4.3dB, 4.2GHz < f ≤ 6.0GHz Uplink power measurement same as 6.2.1	Overall intermodulation uncertainty comprises three quantities: 1. Wanted signal level error 2. CW Interferer level error 3. Modulated Interferer level error Effect of interferer ACLR has not been included as modulated interferer has larger frequency offset The effect of the closer CW signal has twice the effect. Items 1, 2 and 3 are assumed to be uncorrelated so can be root sum squared to provide the combined effect of the three signals. Test System uncertainty = SQRT [(2 x CW_level_error)^2 +(mod interferer_level_error)^2 +(wanted signal_level_error)^2]
7.8A.2 Wide band Intermodulation for CA (Same MU apply to all subsections including 7.8A.2.1, 7.8A.2.2, 7.8A.2.3, etc.)	Same as 7.8.2 for each component carrier	Same as 7.8.2 The wanted signal level uncertainty applies for each CC. Overall intermodulation uncertainty calculation includes the uncertainty for wanted level error only once, as the uncertainty of other CCs is not expected to have any significant effect.
7.8D.2 Intermodulation characteristics for UL MIMO	Intermodulation same as 7.8.2 Uplink power measurement same as 6.2D.1	The overall UL power is the linear sum of the output powers over all Tx antenna connectors
7.9 Spurious emissions	for results > -60 dBm: ±2.0 dB, 9kHz < f ≤ 3GHz ±2.5 dB, 3GHz < f ≤ 4GHz ±4.0 dB, 4GHz < f ≤ 19GHz ±6.0 dB, 19GHz < f ≤ 26GHz	
7.9A.1 Spurious emissions for CA (2DL CA)	Same as 7.9	

F.2 Interpretation of measurement results (normative)

The measurement results returned by the Test System are compared – without any modification – against the Test Requirements. The Test Requirement is defined as a threshold considered in a test to assess compliance of the device; it might be either equal ("Shared Risk" principle) or relaxed ("Never fail a good DUT" principle) compared to the corresponding core specification value by an amount defined in Annex F.3 as Test Tolerance.

The "Shared Risk" and the "Never fail a good DUT" principles are defined in Rec. ITU-R M.1545.

The actual measurement uncertainty of the Test System for the measurement of each parameter shall be included in the test report.

The recorded value for the Test System uncertainty shall be, for each measurement, equal to or lower than the appropriate figure in clause F.1 of the present document.

If the Test System for a test is known to have a measurement uncertainty greater than that specified in clause F.1, it is still permitted to use this apparatus provided that an adjustment is made value as follows:

Any additional uncertainty in the Test System over and above that specified in clause F.1 shall be used to tighten the Test Requirement, making the test harder to pass. For some tests, for example receiver tests, this may require modification of stimulus signals. This procedure will ensure that a Test System not compliant with clause F.1does not increase the chance of passing a device under test where that device would otherwise have failed the test if a Test System compliant with clause F.1 had been used.

F.3 Test Tolerance and Derivation of Test Requirements (informative)

The Test Requirements in the present document have been calculated by relaxing the Minimum Requirements of the core specification using the Test Tolerances defined in this clause. When the Test Tolerance is zero, the Test Requirement will be the same as the Minimum Requirement. When the Test Tolerance is non-zero, the Test Requirements will differ from the Minimum Requirements, and the formula used for the relaxation is given in this clause.

The Test Tolerances are derived from Test System uncertainties, regulatory requirements and criticality to system performance. As a result, the Test Tolerances may sometimes be set to zero.

The test tolerances should not be modified for any reason e.g. to take account of commonly known test system errors (such as mismatch, cable loss, etc.).

The downlink Test Tolerances apply at each receiver antenna connector.

F.3.1 Measurement of test environments

The UE test environments are set to the values defined in TS 38.508-1 subclause 4.1, without any relaxation. The applied Test Tolerance is therefore zero.

F.3.2 Measurement of transmitter

Table F.3.2-1: Derivation of Test Requirements (Transmitter tests)

Sub clause	Test Tolerance (TT)	Formula for test requirement
6.2.1 UE maximum output power	f ≤ 3.0GHz 0.7 dB, BW ≤ 40MHz 1.0 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 6.0GHz 1.0 dB, BW ≤ 100MHz	Upper limit + TT, Lower limit - TT
6.2.2 Maximum Power Reduction (MPR)	f ≤ 3.0GHz 0.7 dB, BW ≤ 40MHz 1.0 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 6.0GHz 1.0 dB, BW ≤ 100MHz	Upper limit + TT, Lower limit - TT
6.2.3 UE additional maximum output power reduction	f ≤ 3.0GHz 0.7 dB, BW ≤ 40MHz 1.0 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 6.0GHz 1.0 dB, BW ≤ 100MHz	Upper limit + TT, Lower limit - TT
6.2.4 Configured transmitted power	f ≤ 3.0GHz 0.7 dB, BW ≤ 40MHz 1.0 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 6.0GHz 1.0 dB, BW ≤ 100MHz	Upper limit + TT, Lower limit - TT
6.2A.1.1 UE maximum output power for CA (2UL CA)	For Inter-band CA MAX (TT_{CC1}, TT_{CC2})	TT_{CCx} is TT of each UL CC specified in single UL case 6.2.1.
6.2A.2.1 UE maximum output power reduction for CA (2UL CA)	For Inter-band CA MAX (TT_{CC1}, TT_{CC2}) For intra-band contiguous CA Aggregated BW ≤ 100M: same as 6.2.2 for sum of powers of all CCs Aggregated BW > 100M: TBD	TT_{CCx} is TT of each UL CC specified in single UL case 6.2.2.
6.2A.3.1 UE additional maximum output power reduction CA (2UL CA)	For Inter-band CA MAX (TT_{CC1}, TT_{CC2})	TT_{CCx} is TT of each UL CC specified in single UL case 6.2.3.
6.2A.4.1 Configured transmitted power for CA (2UL CA)	For Inter-band CA MAX (TT_{CC1}, TT_{CC2}) For intra-band contiguous CA Aggregated BW ≤ 100M: same as 6.2.4 for sum of powers of all CCs Aggregated BW > 100M: TBD	TT_{CCx} is TT of each UL CC specified in single UL case 6.2.4.
6.2C.1 Configured transmitted Configured power for SUL	Same as 6.2.4	Same as 6.2.4
6.2C.3 UE maximum output power for SUL	Same as 6.2.1	Same as 6.2.1
6.2C.3_1 UE maximum output power for SUL with UL MIMO	Same as 6.2.1 for the sum of power at each of UE antenna connector	Same as 6.2.1 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.2C.4 UE maximum output power reduction for SUL	Same as 6.2.2	Same as 6.2.2
6.2C.5 UE additional maximum output power reduction for SUL	Same as 6.2.3	Same as 6.2.3

6.2D.1 UE maximum output power for UL MIMO	Same as 6.2.1 for the sum of power at each of UE antenna connector	Same as 6.2.1 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.2D.2 UE maximum output power reduction for UL MIMO	Same as 6.2.2 for the sum of power at each of UE antenna connector	Same as 6.2.2 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.2D.3 UE additional maximum output power reduction for UL MIMO	Same as 6.2.3 for the sum of power at each of UE antenna connector	Same as 6.2.3 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.2D.4 Configured transmitted power for UL MIMO	Same as 6.2.4 for the sum of power at each of UE antenna connector	Same as 6.2.4 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.2F.1 UE maximum output power for shared spectrum channel access	3.0GHz < f ≤ 5.925GHz 1.0 dB, BW ≤ 100MHz 5.925GHz < f ≤ 7.125GHz TBD	Upper limit + TT, Lower limit - TT
6.2F.3 UE additional maximum output power reduction for shared spectrum access	Same as 6.2F.1	Same as 6.2F.
6.2G.1 UE maximum output power for Tx Diversity	Same as 6.2.1 for the sum of power at each of UE antenna connector	Same as 6.2.1 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over both Tx antenna connectors
6.2G.2 UE maximum output power reduction for Tx Diversity	Same as 6.2.2 for the sum of power at each of UE antenna connector	Same as 6.2.2 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over both Tx antenna connectors
6.2G.3 UE additional maximum output power reduction for Tx Diversity	Same as 6.2.3 for the sum of power at each of UE antenna connector	Same as 6.2.3 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over both Tx antenna connectors
6.3.1 Minimum output power	f ≤ 3.0GHz 1.0 dB, BW ≤ 40MHz 1.3 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 6.0GHz 1.3 dB, BW ≤ 100MHz	Minimum requirement + TT

6.3.2 Transmit OFF power	f ≤ 3.0GHz 1.5 dB, BW ≤ 40MHz 1.7 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 6.0GHz 1.8 dB, BW ≤ 100MHz	Minimum requirement + TT
6.3.3.2 General ON/OFF time mask	f ≤ 3.0GHz 1.5 dB, BW ≤ 40MHz 1.7 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 6.0GHz 1.8 dB, BW ≤ 100MHz	OFF Power: Minimum requirement + TT ON Power: –Same as 6.2.1
6.3.3.4 PRACH time mask	f ≤ 3.0GHz 1.5 dB, BW ≤ 40MHz 1.7 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 6.0GHz 1.8 dB, BW ≤ 100MHz	OFF Power: Minimum requirement + TT ON Power: Upper limit + TT, Lower limit - TT
6.3.3.6 SRS time mask	f ≤ 3.0GHz 1.5 dB, BW ≤ 40MHz 1.7 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 6.0GHz 1.8 dB, BW ≤ 100MHz	OFF Power: Minimum requirement + TT ON Power: Upper limit + TT, Lower limit - TT
6.3.4.2 Absolute power tolerance	UL Power ≥ 0dBm f ≤ 3.0GHz 1.0 dB, BW ≤ 40MHz 1.4 dB, 40MHz < BW ≤ 100MHz 3.0GHz < f ≤ 6.0GHz 1.4 dB, BW ≤ 100MHz	Upper limit + TT, Lower limit – TT
6.3.4.3 Relative power tolerance	0.7 dB, BW ≤ 100MHz	Upper limit + TT, Lower limit – TT
6.3.4.4 Aggregate power tolerance	0.7 dB, BW ≤ 100MHz	Upper limit + TT, Lower limit – TT
6.3A.1.1 Minimum output power for CA (2UL CA)	Same as 6.3.1	Minimum requirement + TT
6.3A.3.1 Transmit ON/OFF time mask for CA (2UL CA)	Same as 6.3.3.2	Minimum requirement + TT
6.3A.3.1_1 Time mask for switching between two uplink carriers	ON power: same as 6.2A.2.1 for inter-band CA	Same as 6.2A.2.1 for inter-band CA
6.3A.4.1.1 Absolute power tolerance for CA (2UL CA)	Same as 6.3.4.2 for each CC	Upper limit + TT, Lower limit – TT
6.3A.4.2.1 Power Control Relative power tolerance for CA (2UL CA)	Same as 6.3.4.3 for each CC	Upper limit + TT, Lower limit – TT
6.3A.4.3.1 Aggregate power tolerance for CA (2UL CA)	Same as 6.3.4.4 for each CC	Upper limit + TT, Lower limit – TT
6.3C.1 Minimum output power for SUL	Same as 6.3.1	Same as 6.3.1
6.3C.2 Transmit OFF power for SUL	Same as 6.3.2	Same as 6.3.2
6.3C.3.1 Transmit ON/OFF time mask for SUL	Same as 6.3.3.2	Same as 6.3.3.2
6.3C.3.2 General transmit ON/OFF time mask for switching between two uplink carriers	ON power: Same as 6.3.3.2	ON power: Same as 6.3.3.2

6.3C.4.1 Absolute power tolerance for SUL	Same as 6.3.4.2	Same as 6.3.4.2
6.3C.4.2 Power Control Relative power tolerance for SUL	Same as 6.3.4.3	Same as 6.3.4.3
6.3C.4.3 Aggregate power tolerance for SUL	Same as 6.3.4.4	Same as 6.3.4.4
6.3D.1 Minimum output power for UL MIMO	Same as 6.3.1 for the sum of power at each of UE antenna connector	Same as 6.3.1 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.3D.2 Transmit OFF power for UL MIMO	Same as 6.3.2 for each antenna	Same as 6.3.2 Uplink power measurement applies to each Tx antenna connector
6.3D.3 Transmit ON/OFF time mask for UL MIMO	ON power: Same as 6.2D.1 OFF power: Same as 6.3D.2	ON power: Same as 6.2D.1 OFF power: Same as 6.3D.2
6.3D.4.1 Absolute Power tolerance	Same as 6.3.4.2 for the sum of power at each of UE antenna connector	Same as 6.3.4.2 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.3D.4.2 Relative Power tolerance	Same as 6.3.4.3 for the sum of power at each of UE antenna connector	Same as 6.3.4.3 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.3D.4.3 Aggregate Power tolerance	Same as 6.3.4.4 for the sum of power at each of UE antenna connector	Same as 6.3.4.4 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.3F.1 Minimum output power	3.0GHz < f ≤ 6.0GHz 1.3 dB, BW ≤ 100MHz 5.925GHz < f ≤ 7.125GHz TBD	Minimum requirement + TT
6.3F.2 Transmit OFF power	3.0GHz < f ≤ 5.925GHz 1.8 dB, BW ≤ 100MHz 5.925GHz < f ≤ 7.125GHz TBD	Minimum requirement + TT
6.3F.3.2 General ON/OFF time mask	3.0GHz < f ≤ 5.925GHz 1.8 dB, BW ≤ 100MHz 5.925GHz < f ≤ 7.125GHz TBD	OFF Power: Minimum requirement + TT ON Power: Upper limit + TT, Lower limit - TT
6.3G.1 Minimum output power for Tx Diversity	Same as 6.3.1 for the sum of power at each of UE antenna connector	Same as 6.3.1 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors

6.3G.2 Transmit OFF power for Tx Diversity	Same as 6.3.2 for each antenna	Same as 6.3.2 Uplink power measurement applies to each Tx antenna connector
6.3G.3.1 General ON/OFF time mask for Tx Diversity	ON power: Same as 6.2G.1 OFF power: Same as 6.3G.2	ON power: Same as 6.2G.1 OFF power: Same as 6.3G.2
6.3G.3.2 PRACH time mask for Tx Diversity	Same as 6.3.3.4 for each antenna	Same as 6.3.3.4 Uplink power measurement applies to each Tx antenna connector
6.3G.3.3 SRS time mask for Tx Diversity	Same as 6.3.3.6 for each antenna	Same as 6.3.3.6 Uplink power measurement applies to each Tx antenna connector
6.3G.4.2 Relative power tolerance for Tx Diversity	Same as 6.3.4.3 for the sum of power at each of UE antenna connector	Same as 6.3.4.3 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.3G.4.3 Aggregate power tolerance for Tx Diversity	Same as 6.3.4.4 for the sum of power at each of UE antenna connector	Same as 6.3.4.4 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.4.1 Frequency Error	15 Hz	Modulated carrier frequency: Upper limit + TT, Lower limit – TT DL power: REFSENS + TT
6.4.2.1 Error Vector Magnitude	For up to 64QAM 0% For 256QAM f ≤ 6.0GHz, BW ≤ 100MHz 0.3%, 15dBm < P_{UL} 0.8%, -25dBm < P_{UL} ≤ 15dBm, 1.1%, -40dBm ≤ P_{UL} ≤ -25dBm	Minimum requirement + TT
6.4.2.1a Error Vector Magnitude including symbols with transient period	Same as 6.4.2.1	Same as 6.4.2.1
6.4.2.2 Carrier Leakage	0.8 dB, BW ≤ 100MHz	Minimum requirement + TT
6.4.2.3 In-band emissions	0.8 dB, BW ≤ 100MHz	Minimum requirement + TT
6.4.2.4 EVM equalizer spectrum flatness	1.4 dB, BW ≤ 100MHz	Minimum requirement + TT
6.4.2.5 EVM equalizer spectrum flatness for Pi/2 BPSK	Same as 6.4.2.4	Minimum requirement + TT
6.4A.1.1 Frequency error for CA (2UL CA)	For inter-band CA: same as 6.4.1 for each CC	Modulated carrier frequency: Upper limit + TT, Lower limit – TT
6.4A.2.1.1 Error Vector Magnitude for CA (2UL CA)	For up to 64QAM 0% For 256QAM For inter-band CA: same as 6.4.2.1 for each CC	Minimum requirement + TT

6.4A.2.2.1 Carrier leakage for CA (2UL CA)	For inter-band CA: same as 6.4.2.2 for each CC	Minimum requirement + TT
6.4A.2.3.1 In-band emissions for CA (2UL CA)	For inter-band CA: same as 6.4.2.3 for each CC	Minimum requirement + TT
6.4C.1 Frequency error for SUL	Same as 6.4.1	Minimum requirement + TT
6.4C.2.1 Error Vector Magnitude for SUL	Same as 6.4.2.1	Minimum requirement + TT
6.4C.2.2 Carrier leakage for SUL	Same as 6.4.2.2	Minimum requirement + TT
6.4C.2.3 In-band emissions for SUL	Same as 6.4.2.3	Minimum requirement + TT
6.4C.2.4 EVM equalizer spectrum flatness for SUL	Same as 6.4.2.4	Minimum requirement + TT
6.4D.1 Frequency error for UL MIMO	Same as 6.4.1 for each antenna	Same as 6.4.1
6.4D.2.1 Error Vector Magnitude for UL MIMO	Same as 6.4.2.1 for each antenna	Same as 6.4.2.1
6.4D.2.2 Carrier leakage for UL MIMO	Same as 6.4.2.2 for each antenna	Same as 6.4.2.2
6.4D.2.3 In-band emissions for UL MIMO	Same as 6.4.2.3 for each antenna	Same as 6.4.2.3
6.4D.2.4 EVM equalizer spectrum flatness for UL MIMO	Same as 6.4.2.4 for each antenna	Same as 6.4.2.4
6.4D.3 Time alignment error for UL MIMO	25ns	Minimum Requirement + TT
6.4D.4 Requirements for Coherent UL MIMO	FFS	FFS
6.4F.1 Frequency Error	15 Hz	Modulated carrier frequency: Upper limit + TT, Lower limit – TT DL power: REFSENS + TT
6.4G.1 Frequency Error for Tx Diversity	Same as 6.4.1 for each antenna	Same as 6.4.1
6.4G.2.2 Carrier Leakage for Tx Diversity	Same as 6.4.2.2 for each antenna	Same as 6.4.2.2
6.4G.2.3 In-band emissions for Tx Diversity	Same as 6.4.2.3 for each antenna	Same as 6.4.2.3
6.4G.2.4 EVM equalizer spectrum flatness for Tx Diversity	Same as 6.4.2.4 for each antenna	Same as 6.4.2.4
6.5.1 Occupied bandwidth	0 kHz	Minimum requirement + TT
6.5.2.2 Spectrum Emission Mask	1.5 dB, f ≤ 3.0GHz 1.8 dB, 3.0GHz < f ≤ 6.0GHz	Minimum requirement + TT
6.5.2.3 Additional spectrum emission mask	1.5 dB, f ≤ 3.0GHz 1.8 dB, 3.0GHz < f ≤ 6.0GHz	Minimum requirement + TT
6.5.2.4.1 NR ACLR	Absolute requirement 0 dB Relative requirement 0.8 dB	Absolute requirement ACLR Minimum Requirement + TT Relative requirement ACLR Minimum Requirement - TT
6.5.2.4.2 UTRA ACLR	Same as 6.5.2.4.1	Same as 6.5.2.4.1
6.5.3.1 General spurious emissions	0 dB	Minimum requirement + TT
6.5.3.2 Spurious emission for UE co-existence	0 dB	Minimum requirement + TT
6.5.3.3 Additional spurious emissions	0 dB	Minimum requirement + TT

6.5.4 Transmit intermodulation	0 dB	CW interferer Minimum Requirement - TT
6.5A.1.1 Occupied bandwidth for CA (2UL CA)	For inter-band CA: same as 6.5.1 for each CC	
6.5A.2.2.1 Spectrum emission mask for CA (2UL CA)	For inter-band CA: same as 6.5.2.2 for each CC	Minimum requirement + TT
6.5A.2.4.1.1 NR ACLR for CA (2UL CA)	For inter-band CA: same as 6.5.2.4.1 for each CC	Same as 6.5.2.4.1
6.5A.2.4.2.1 UTRA ACLR for CA (2UL CA)	For inter-band CA: same as 6.5.2.4.2 for each CC	Same as 6.5.2.4.2
6.5A.3.1.1 General spurious emissions for CA (2UL CA)	0 dB	Minimum requirement + TT
6.5A.3.2.1 Spurious emissions for UE co-existence for CA (2UL CA)	0 dB	Minimum requirement + TT
6.5A.4.1 Transmit intermodulation for CA (2UL CA)	0 dB	CW interferer Minimum Requirement - TT
6.5C.1 Occupied bandwidth for SUL	Same as 6.5.1	Same as 6.5.1
6.5C.2.2 Spectrum Emission Mask for SUL	Same as 6.5.2.2	Same as 6.5.2.2
6.5C.2.3 Additional spectrum emission mask for SUL	Same as 6.5.2.3	Same as 6.5.2.3
6.5C.2.4.1 NR ACLR for SUL	Same as 6.5.2.4.1	Same as 6.5.2.4.1
6.5C.2.4.2 UTRA ACLR for SUL	Same as 6.5.2.4.2	Same as 6.5.2.4.2
6.5C.3.1 General spurious emissions for SUL	Same as 6.5.3.1	Same as 6.5.3.1
6.5C.3.2 Spurious emission for UE co-existence for SUL	Same as 6.5.3.2	Same as 6.5.3.2
6.5C.3.3 Additional spurious emissions for SUL	Same as 6.5.3.3	Same as 6.5.3.3
6.5C.4 Transmit intermodulation for SUL	Same as 6.5.4	Same as 6.5.4
6.5D.1 Occupied bandwidth for UL MIMO	Same as 6.5.1 for the sum of power at each of UE antenna connector	Same as 6.5.1 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.5D.2.2 Spectrum emission mask for UL MIMO	Same as 6.5.2.2 for the sum of power at each of UE antenna connector	Same as 6.5.2.2 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.5D.2.3 Additional spectrum emission mask for UL MIMO	Same as 6.5.2.3 for each antenna	Same as 6.5.2.3
6.5D.2.4.1 NR ACLR for UL MIMO	Same as 6.5.2.4.1 for the sum of power at each of UE antenna connector	Same as 6.5.2.4.1 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors

6.5D.2.4.2 UTRA ACLR for UL MIMO	Same as 6.5.2.4.2 for the sum of power at each of UE antenna connector	Same as 6.5.2.4.2 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.5D.3.1 General spurious emissions for UL MIMO	Same as 6.5.3.1 for each antenna	Same as 6.5.3.1
6.5D.3.2 Spurious emissions for UE co-existence for UL MIMO	Same as 6.5.3.2 for each antenna	Same as 6.5.3.2
6.5D.3.3 Additional spurious emissions for UL MIMO	Same as 6.5.3.3 for each antenna	Same as 6.5.3.3
6.5D.3_1.1 General spurious emissions for UL MIM(Rel-16 onward)	Same as 6.5.3.1 for the sum of power at each of UE antenna connector	Same as 6.5.3.1 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.5D.3_1.2 Spurious emissions for UE co-existence for UL MIMO (Rel-16 onward)	Same as 6.5.3.2 for the sum of power at each of UE antenna connector	Same as 6.5.3.2 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.5D.3_1.3 Additional spurious emissions for UL MIMO (Rel-16 onward)	Same as 6.5.3.3 for the sum of power at each of UE antenna connector	Same as 6.5.3.3 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
6.5D.4 Transmit intermodulation for UL MIMO	Same as 6.5.4 for each antenna	Same as 6.5.4
6.5G.2.3.1 NR ACLR for Tx Diversity	Same as 6.5.2.4.1 for the sum of power at each of UE antenna connector	Same as 6.5.2.4.1 Uplink power measurement applies to overall UL power, which is the linear sum of the output powers over both Tx antenna connectors

F.3.3   Measurement of receiver

Table F.3.3-1: Derivation of Test Requirements (Receiver tests)

Sub clause	Test Tolerance (TT)	Formula for test requirement
7.3.2 Reference sensitivity power level	0.7 dB, f ≤ 3.0GHz 1.0 dB, 3.0GHz < f ≤ 6.0GHz	Reference sensitivity power level + TT T-put limit unchanged
7.3A Reference sensitivity for CA (Same TT apply to all subsections including 7.3A.1, 7.3A.1_1, 7.3A.2, 7.3A.3, 7.3A.4, etc.)	Same as 7.3.2 for each component carrier	Same as 7.3.2 for each component carrier
7.3C.2 Reference sensitivity power level	Same as 7.3.2	Same as 7.3.2
7.3D Reference sensitivity for MIMO	Same as 7.3.2	Same as 7.3.2
7.3F Reference sensitivity for shared spectrum channel access	1.0 dB, 3.0GHz < f ≤ 6.0GHz TBD, 5.925GHz < f ≤ 7.125GHz	Same as 7.3.2
7.4 Maximum input level	0.7 dB, f ≤ 3.0GHz 1.0 dB, 3.0GHz < f ≤ 6.0GHz	Maximum input level - TT
7.4A Maximum input level for CA (Same TT apply to all subsections including 7.4A.1, 7.4A.2, 7.4A.3, 7.4A.4, etc.)	Same as 7.4 for each component carrier	Same as 7.4 for each component carrier
7.4D Maximum input level for UL MIMO	Same as 7.4	Same as 7.4 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.5 Adjacent channel selectivity	0 dB	Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged
7.5A Adjacent channel selectivity for CA (Same TT apply to all subsections including 7.5A.1, 7.5A.2, 7.5A.3, 7.5A.4, etc.)	Same as 7.5 for each component carrier	Same as 7.5 for each component carrier
7.5D Adjacent channel selectivity for UL MIMO	Same as 7.5	Same as 7.5 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.5F.1 Adjacent channel selectivity for shared spectrum channel access	Same as 7.5	Same as 7.5
7.6.2 Inband Blocking	0 dB	Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged
7.6.3 Out-of-band blocking	0 dB	Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged

7.6.4 Narrow band blocking	0 dB	Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged
7.6A.2 Inband Blocking for CA (Same TT apply to all subsections including 7.6A.2.1, 7.6A.2.2, 7.6A.2.3, 7.6A.2.4, etc.)	Same as 7.6.2 for each component carrier	Same as 7.6.2 for each component carrier
7.6A.3 Out-of-band Blocking for CA (Same TT apply to all subsections including 7.6A.3.1, 7.6A.3.2, 7.6A.3.3, 7.6A.3.4, etc.)	Same as 7.6.3 for each component carrier	Same as 7.6.3 for each component carrier
7.6A.4 Narrow band Blocking for CA (Same TT apply to all subsections including 7.6A.4.1, 7.6A.4.2, 7.6A.4.3, 7.6A.4.4, etc.)	Same as 7.6.4 for each component carrier	Same as 7.6.4 for each component carrier
7.6C.2 Inband Blocking for SUL	Same as 7.6.2	Same as 7.6.2
7.6C.2_1.1 Inband Blocking for SUL with 2 DL CA	Same as 7.6A.2	Same as 7.6A.2
7.6C.3 Out-of-band blocking for SUL	Same as 7.6.3	Same as 7.6.3
7.6D.2 Inband blocking for UL MIMO	Same as 7.6.2	Same as 7.6.2 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.6D.3 Out-of-band blocking for UL MIMO	Same as 7.6.3	Same as 7.6.3 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.6D.4 Narrow-band blocking for UL MIMO	Same as 7.6.4	Same as 7.6.4 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.6F.2.1 In-band blocking for shared spectrum channel access	Same as 7.6.2	Same as 7.6.2
7.6F.3.1 Out-of-band blocking for shared spectrum channel access	Same as 7.6.3	Same as 7.6.3
7.7 Spurious response	0 dB	Wanted signal power + TT Interferer signal power unchanged T-put limit unchanged
7.7A Spurious response for CA (Same TT apply to all subsections including 7.7A.1, 7.7A.2, 7.7A.3, etc.)	Same as 7.7 for each component carrier	Same as 7.7 for each component carrier

7.7D Spurious response for UL MIMO	Same as 7.7	Same as 7.7 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.7F.1 Spurious response for shared spectrum channel access	Same as 7.7	Same as 7.7
7.8.2 Wide band Intermodulation	0 dB	Wanted signal power +TT CW Interferer signal power unchanged Modulated Interferer signal power unchanged T-put limit unchanged
7.8A.2 Wide band Intermodulation for CA (Same TT apply to all subsections including 7.8A.2.1, 7.8A.2.2, 7.8A.2.3, etc.)	Same as 7.8.2 for each component carrier	Same as 7.8.2 for each component carrier
7.8D.2 Intermodulation characteristics for UL MIMO	Same as 7.8.2	Same as 7.8.2 Uplink power measurement window applies to overall UL power, which is the linear sum of the output powers over all Tx antenna connectors
7.8F Intermodulation characteristics for shared spectrum channel access	Same as 7.8.2	Same as 7.8.2
7.9 Spurious emissions	0 dB	Minimum requirement + TT
7.9A.1 Spurious emissions for CA (2DL CA)	Same as 7.9	Same as 7.9

F.4 Uplink power window

F.4.1 Introduction

A number of Tx and Rx Test cases set the UE uplink power to be within a defined window to ensure the test is carried out in the intended conditions. This clause gives the method for calculating the uplink power window used in Tx test cases and Rx Test cases.

F.4.2 Setting the power window above a requirement

F.4.2.1 NR FR1

The method used to derive the uplink power window is defined in TS 38.521-3 [14] clause F.4.2.1.

F.4.3 Setting the power window below a requirement

F.4.3.1 NR FR1

The method used to derive the uplink power window is defined in TS 38.521-3 [14] clause F.4.3.1.

F.4.4   Setting the power window centred on a target value

F.4.4.1   NR FR1

The method used to derive the uplink power window is defined in TS 38.521-3 [14] clause F.4.4.1.

Annex G (normative):
Uplink Physical Channels

G.0   Uplink Signal Levels

Uplink signal power is a UE figure, which is configured by the Test System by means of:

    RRC messages (IE-s), such as:

        -   PUSCH-PowerControl

        -   PUCCH-PowerControl

        -   RACH-ConfigGeneric

        -   SRS-Config

    and L1/2 Power control commands (TPC).

The uplink power settings are specified in the test case.

Otherwise, the uplink power settings result from the default RRC messages described in TS 38.508 [5], and appropriate TPC-s, which are sent to the UE to transmit with an UL power level necessary for maintaining the call during the test.

G.1   General

This annex specifies the uplink physical channels that are needed for setting a connection and channels that are needed during a connection. Table G.1-1 describes the mapping of uplink physical channels and signals to physical resources

Table G.1-1: Mapping of uplink physical channels and signals to physical resources

Physical channel	Time Domain Location	Frequency Domain Location	Note
PRACH	Allowed by the parameter prach-ConfigurationIndex provided by higher layers	Allowed by the parameter msg1-FrequencyStart provided by higher layers	Mapping rule is specified in TS 38.211 [8] Section 6.3.3
DMRS	For DMRS on PUCCH format 1: Every other symbols i.e., 0, 2, 4... For DMRS on PUCCH format 2: All the PUCCH symbols For DMRS on PUCCH format 3,4: PUCCH length dependent For One symbol DMRS on PUSCH: Symbol 2,7 and 11 of each slot	DMRS on CP-OFDM PUSCH: Specified by the parameters *dmrs-Type* provided by higher layers. DMRS on DFT-OFDM PUSCH: Allowed for DMRS configuration type1 DMRS on PUCCH: PUCCH bandwidth dependent.	Mapping rule of DMRS for PUCCH is specified in TS 38.211 [8] Section 6.4.1.3 Mapping rule of DMRS for PUSCH is specified in TS 38.211 [8] Sections 6.4.1.1, 6.4.1.2
PUCCH	For PUCCH Format 0: 1 ~ 2 symbols each slot, specified by the parameters of nrofSymbols and startingSymbolIndex in PUCCH-format0 provided by the higher layer. For PUCCH Format 1: 4 ~ 14 symbols each slot, specified by the parameters of nrofSymbols and those of startingSymbolIndex of PUCCH-format1 provided by the higher layer. For PUCCH Format 2, 1 ~ 2 symbols each slot, specified by the parameters of nrofSymbols and startingSymbolIndex in PUCCH-format2 provided by the higher layer. For PUCCH Format 3: 4 ~ 14 symbols each slot, allowed by the parameters of nrofSymbols and startingSymbolIndex in PUCCH-format3, provided by the higher layer. For PUCCH Format 4: 4 ~ 14 symbols each slot, specified by the parameters of nrofSymbols and startingSymbolIndex in PUCCH-format4, provided by higher layer.	For PUCCH Format 0, 1 1 RB, the position specified by the parameters of startingPRB and intraSlotFrequencyHopping in the corresponding PUCCH-Resource provided by the higher layer. For PUCCH Format 2, 3: 1~16 RBs, specified by the parameter of nrofPRBs in PUCCH-format2 and PUCCH-format3 respectively; additionally the position specified by the parameters of startingPRB and intraSlotFrequencyHopping in the corresponding PUCCH-Resource provided by the higher layer. For PUCCH Format 4 1 RB, the position specified by the parameters of startingPRB and intraSlotFrequencyHopping in the corresponding PUCCH-Resource provided by the higher layer	Mapping rule is specified in TS 38.211 [8] Section 6.3.2 and 38.213 [9] Section 9.2
PUSCH	All remaining uplink symbols of each slot not allocated to DMRS	RBs allocated according to Reference Measurement channel in Annex A.2	Mapping rule is specified in TS 38.211 [8] Section 6.3 and 38.214 [12] Section 6.1
SRS	1, 2, or 4 symbols among the last 6 symbols in each SRS transmission slot specified by the parameters of resourceMapping, and resourceType in SRS-Config provided by the higher layer.	RBs specified by the ue-specific parameters of freqDomainPosition, freqDomainShift and freqHopping in SRS-Config provided by the higher layer.	Mapping rule is specified in TS 38.211 [8] Section 6.4.1.4.3

G.2   Set-up

Table G.2-1 describes the uplink physical channels that are required for connection set up.

Table G.2-1: Uplink Physical Channels required for connection set-up

Physical Channel
PRACH
PUCCH
PUSCH
PUCCH DMRS
PUSCH DMRS
SRS

In case of supplementary test, Table G.2-2 describes the supplementary uplink physical channels that are required for connection set-up, and unless stated otherwise, there is no other uplink physical channels configured on the NON-SUL carrier except PRACH.

Table G.2-2: Supplementary Uplink Physical Channels required for connection set-up

Physical Channel
PRACH
DMRS
PUCCH
PUSCH

G.3   Connection

The following clauses describes the uplink physical channels that are transmitted during a connection i.e., when measurements are done.

G.3.0   Measurement of Transmitter Characteristics

As specified in the test case. Otherwise:

- PUSCH + DMRS for PUSCH (and DMRS) measurements.

- PUCCH + DMRS for PUCCH (and DMRS) measurements.

- PRACH for PRACH measurements.

SRS for SRS measurements.

G.3.1   Measurement of Receiver Characteristics

As specified in the test case. Otherwise:

- PUSCH + DMRS for measurements with uplink interference configured.

- PUCCH + DMRS for measurements without uplink interference configured.

G.3.2   Measurement of Performance Requirements

As specified in the test case. Otherwise:

PUCCH + DMRS for measurements without CSI feedback, or with CSI feedback in PUCCH mode.

PUSCH + DMRS for measurements with CSI feedback in PUSCH mode.

Annex H (normative):
Statistical Testing

H.1   General

This annex specifies mapping throughput to error ratio, pass fail limits and pass fail decision rules that are needed for measuring average throughput for a duration sufficient to achieve statistical significance for testing receiver characteristics.

H.2   Statistical testing of receiver characteristics

H.2.1   General

The test of receiver characteristics is twofold.

1. A signal or a combination of signals is offered to the RX port(s) of the receiver.

2. The ability of the receiver to demodulate /decode this signal is verified by measuring the throughput.

In (2) is the statistical aspect of the test and is treated here.

The minimum requirement for all receiver tests is >95% of the maximum throughput.

All receiver tests are performed in static propagation conditions. No fading conditions are applied.

H.2.2   Mapping throughput to error ratio

a) The measured information bit throughput R is defined as the sum (in kilobits) of the information bit payloads successfully received during the test interval, divided by the duration of the test interval (in seconds).

b) In measurement practice the UE indicates successfully received information bit payload by signalling an ACK to the SS.
If payload is received, but damaged and cannot be decoded, the UE signals a NACK.

c) Only the ACK and NACK signals, not the data bits received, are accessible to the SS.
The number of bits is known in the SS from knowledge of what payload was sent.

d) For the reference measurement channel, applied for testing, the number of bits is different in different slots, however in a radio frame it is fixed during one test.

e) The time in the measurement interval is composed of successfully received slots (ACK), unsuccessfully received slots (NACK) and no reception at all (DTX-slots).

f) DTX-slots may occur regularly according the applicable reference measurement channel (regDTX).
In real live networks this is the time when other UEs are served. In TDD these are the UL and special slots.
regDTX vary from test to test but are fixed within the test.

g) Additional DTX-slots occur statistically when the UE is not responding ACK or NACK where it should. (statDTX)
This may happen when the UE was not expecting data or decided that the data were not intended for it.

The pass / fail decision is done by observing the:

- number of NACKs

- number of ACKs and

- number of statDTXs (regDTX is implicitly known to the SS)

The ratio (NACK + statDTX)/(NACK+ statDTX + ACK)is the Error Ratio (ER). Taking into account the time consumed by the ACK, NACK, and DTX-TTIs (regular and statistical), ER can be mapped unambiguously to throughput for any single reference measurement channel test.

H.2.3   Design of the test

The test is defined by the following design principles (see clause H.2.6, Theory….):

1. The early decision concept is applied.

2. A second limit is introduced: Bad DUT factor M>1

3. To decide the test pass:

   Supplier risk is applied based on the Bad DUT quality

   To decide the test fail

   Customer Risk is applied based on the specified DUT quality

The test is defined by the following parameters:

1. Limit ER = 0.05 (Throughput limit = 95%)

2. Bad DUT factor M=1.5 (selectivity)

3. Confidence level CL = 95% (for specified DUT and Bad DUT-quality)

H.2.4   Numerical definition of the pass fail limits

Table H.2.4-1: pass fail limits

ne	ns$_p$	ns$_f$	ne	ns$_p$	ns$_f$	ne	ns$_p$	ns$_f$	ne	ns$_p$	ns$_f$
0	67	NA	37	715	477	74	1290	1093	111	1847	1739
1	67	NA	38	731	493	75	1306	1110	112	1862	1756
2	95	NA	39	747	509	76	1321	1128	113	1877	1774
3	119	NA	40	763	525	77	1336	1145	114	1891	1792
4	141	NA	41	779	541	78	1351	1162	115	1906	1809
5	162	NA	42	795	557	79	1366	1179	116	1921	1827
6	183	NA	43	810	573	80	1382	1197	117	1936	1845
7	203	NA	44	826	590	81	1397	1214	118	1951	1863
8	222	NA	45	842	606	82	1412	1231	119	1966	1880
9	241	67	46	858	622	83	1427	1248	120	1981	1898
10	259	80	47	873	639	84	1442	1266	121	1995	1916
11	278	92	48	889	655	85	1457	1283	122	2010	1934
12	296	105	49	905	672	86	1472	1300	123	2025	1951
13	314	118	50	920	688	87	1487	1318	124	2040	1969
14	332	131	51	936	705	88	1503	1335	125	2055	1987
15	349	145	52	952	721	89	1518	1353	126	2069	2005
16	367	159	53	967	738	90	1533	1370	127	2084	2023
17	384	173	54	983	755	91	1548	1387	128	2099	2041
18	401	187	55	998	771	92	1563	1405	129	2114	2058
19	419	201	56	1014	788	93	1578	1422	130	2128	2076
20	436	216	57	1029	805	94	1593	1440	131	2143	2094
21	453	230	58	1045	822	95	1608	1457	132	2158	2112
22	469	245	59	1060	838	96	1623	1475	133	2173	2130
23	486	260	60	1076	855	97	1638	1492	134	2187	2148
24	503	275	61	1091	872	98	1653	1510	135	2202	2166
25	520	290	62	1107	889	99	1668	1527	136	2217	2183
26	536	305	63	1122	906	100	1683	1545	137	2232	2201
27	553	320	64	1137	923	101	1698	1562	138	2246	2219
28	569	335	65	1153	940	102	1713	1580	139	2261	2237
29	585	351	66	1168	957	103	1728	1598	140	2276	2255
30	602	366	67	1184	974	104	1742	1615	141	2291	2273
31	618	382	68	1199	991	105	1757	1633	142	2305	2291
32	634	398	69	1214	1008	106	1772	1650	143	2320	2309
33	651	413	70	1229	1025	107	1787	1668	144	2335	2327
34	667	429	71	1245	1042	108	1802	1686	145	2349	2345
35	683	445	72	1260	1059	109	1817	1703	146	2364	2363
36	699	461	73	1275	1076	110	1832	1721	*) note 2 in H.2.5		

NOTE 1: The first column is the number of errors (ne = number of NACK + statDTX)

NOTE 2: The second column is the number of samples for the pass limit (ns$_p$, ns=Number of Samples= number of NACK + statDTX + ACK)

NOTE 3: The third column is the number of samples for the fail limit (ns$_f$)

NOTE 4: The UE could be decided as early pass/fail when at least 67 samples are receieved. The ns_f is set to NA for ne less than 9.

H.2.5   Pass fail decision rules

The pass fail decision rules apply for a single measurement. A test case is passed only when all the measurements in the test case are passed.

Having observed 0 errors, pass the test at   67+   samples,   otherwise continue

Having observed 1 error,   pass the test at   95+ otherwise continue

Having observed 2 errors, pass the test at   119+ samples,   otherwise continue

Etc. etc.

Having observed 14645 errors, pass the test at 23642349+ samples, fail the test at 2345- samples, otherwise continue

Having observed 152 errors, pass the test at + samples, fail the test at 2363- samples.

Where x+ means: x or more, x- means x or less

NOTE 1: an ideal DUT passes after 67 samples. The maximum test time is 2364 samples.

NOTE 2: It is allowed to deviate from the early decision concept by postponing the decision (pass/fail or continue). Postponing the decision to or beyond the end of Table H.2.4-1 requires a pass fail decision against the test limit: pass the DUT for ER<0.0618, otherwise fail.

H.2.6   Theory to derive the pass fail limits (Informative)

Editor's note: This clause of the Annex H is for information only and it describes the background theory and information for statistical testing.

H.2.6.1 Numerical definition of the pass-fail limits

A statistical test is characterized by test time, selectivity and confidence level. The outcome of the statistical test is a decision. This decision may be correct, i.e., DUTs whose throughput is less than 95% maximum throughput being declared to fail, and DUTs whose throughput is higher or equal to 95% being declared to pass, or in-correct with opposite decision. The Confidence Level (CL) describes the probability that the decision is a correct one. The complement is the wrong decision probability (risk) D = 1-CL.

As described in H.2.2, the measurement of throughput could be mapped to ER (Error Ratio). When testing ER, transport blocks or "samples" are observed and the number of correctly and erroneously received blocks are recorded. For a "standard" test, a pre-defined number of samples are observed, and a pass/fail decision is made based on the number of observed errors being above/below a threshold. This threshold is based on the targeted throughput or BLER and the design target CL. There is always some risk of a statistical variation leading to an incorrect pass/fail decision. The greater the number of samples that are recorded, the lower is the risk of such an error. The number of samples that are observed in a standard test is dimensioned to achieve an acceptable low risk of error (i.e., an acceptable high confidence level) for DUTs that just meet the specified limit.

The standard test works well where the target ER level is relatively high and confidence level relatively low (both are chosen to be on a comparable order of magnitude). However, for relatively low ER testing the length of time required for observing sufficient samples to achieve a 95% confidence level is excessive. In many cases, the DUTs will in fact have a much lower true ER level than the target ER level, (in which case, the number of samples needed to achieve high confidence that the true ER level is lower than the limit is much smaller). On the other hand, a bad DUT which is expected to fail the requirement might have a much higher true ER level (in which case, errors occur more frequently and it can be demonstrated that the DUT is above the target ER limit with fewer samples).

To avoid long test time, an alternative test method called early pass/fail is adopted. With the early pass/fail, each time a block error is encountered, a decision is made on whether the DUT can be passed/failed with 95% CL or the test needs to continue until another error is encountered. In the case of very good DUTs, the test can also be passed, when the number of samples permissible for one error event is reached and no error event is recorded. Pass/Fail is decided based on the total number of observed samples and errors, and a statistical calculation based on an inverse binomial cumulative distribution. The calculation involves one parameter, one variable and the result:

- Parameter: d (per step decision probability).

- Variable: ne (number of observed errors).

- Result: ns (number of expected samples for pass/fail, depending on which one is calculated).

The per step decision probability risk, d, expresses the probability of making an incorrect pass/fail decision in the current step (i.e., for the current decision coordinate). d is determined by simulation such that the overall risk of making a wrong decision over all steps of each test of a large number of tests on a large number of DUTs that exactly meet the target ER limit is D=5% (and hence the CL 95%).

It should be noted that d is determined separately considering early pass and early fail testing.

For a marginal DUT (i.e., a DUT almost exactly meeting the target ER level), the unmodified early pass/early fail approach is unable to distinguish whether the DUT has just passed or just failed the BLER ($\varepsilon \to 0$), and can thus terminate with an "undecided" result. To avoid this undecided result and provide selectivity, a so-called "bad device factor" (M) is introduced into the early pass calculation. This factor biases the decision towards avoiding failing good DUT.

H.2.6.2 Simulation to derive the pass-fail limits for testing 95% throughput

As per the description in H.2.2, the 95% throughput measurement is mapped to ER=0.05, where ER is (NACK + statDTX)/(NACK+ statDTX + ACK).

The binomial distribution and its inverse are used to design the pass and fail limits. Note that this method is not unique and that other methods exist.

$$\text{fail}\left(\text{ne,d}_f\right) := \frac{\text{ne}}{\text{ns}_f} = \frac{\text{ne}}{\left(\text{ne+qnbinom}\left(\text{d}_f,\text{ne,ER}\right)\right)}$$

$$\text{pass}\left(\text{ne,cl}_p,M\right) := \frac{\text{ne}}{\text{ns}_p} = \frac{\text{ne}}{\left(\text{ne+qnbinom}\left(\text{cl}_p,\text{ne,ER}\cdot M\right)\right)}$$

Where

- fail(..) is the error ratio for the fail limit.

- pass(..) is the error ratio for the pass limit.

- ER is the specified error ratio 5%.

- ne is the number of bad results. This is the variable in both equations.

- M is the Bad DUT factor M=1.5.

- d_f is the wrong decision probability of a single (ne, ns) co-ordinate for the fail limit.
  It is found by simulation to be d_f = 0.006.

- cl_p is the confidence level of a single (ne, ns) co-ordinate for the pass limit.
  It is found by simulation to be cl_p = 0.9945.

- qnbinom(..): The inverse cumulative function of the negative binomial distribution.

The simulation works as follows:

- A large population of limit DUTs with true ER = 0.05 is decided against the pass and fail limits.

- cl_p and d_f are tuned such that CL (95 %) of the population passes and D (5 %) of the population fails.

- A population of Bad DUTs with true ER = M*0.05 is decided against the same pass and fail limits.

- cl_p and d_f are tuned such that CL (95 %) of the population fails and D (5 %) of the population passes.

- The number of DUTs decrease during the simulation, as the decided DUTs leave the population. That number decreases with an approximately exponential characteristics. After 146 bad results all DUTs of the population are decided.

NOTE: The exponential decrease of the population is an optimal design goal for the decision co-ordinates (ne, ns), which can be achieved with other formulas or methods as well.

H.2A   Statistical testing of receiver characteristics with CA

H.2A.1 General

H.2.1 applies.

H.2A.2 Mapping throughput to error ratio

H.2.2 applies for each component carrier.

H.2A.3 Design of the test

The test is defined by the following design principles (see clause H.2.6, Theory….):

1. The standard concept is applied. (not the early decision concept).

2. A second limit is introduced, defining the Bad DUT.

3. To decide the test pass:

    - Supplier risk is applied based on the Bad DUT quality.

    - To decide the test fail.

    - Customer Risk is applied based on the specified DUT quality.

The test is defined by the following parameters:

1) Limit Error Ratio = 0.05 (95% throughput is tested).

2) Bad DUT factor M=1.5 (selectivity).

3) Confidence level CL = 95% (for specified DUT and Bad DUT-quality).

H.2A.4 Pass fail decision rules

Apply 1003 samples to the DUT per CC.

Decide pass per CC in case of ≤ 62 errors, otherwise fail.

NOTE 1: The pass fail decision is done individually for each CC. The pass fail decision for one measurement is as follows: pass if all CCs or SCC only according to the test cases pass, otherwise fail. A test case is passed only when all the measurements in the test case are passed.

NOTE 2: It is allowed to apply more samples to the DUT, common for all CCs, (e.g. up to an integer number of frames). Use the ratio (62/1003) for the pass fail decision.

NOTE 3: $62/1003 = 0.0618$, the same test limit is used at the end of Table H.2.4-1

Annex I (informative): Change history

						Change history	
Date	**Meeting**	**TDoc**	**CR**	**Rev**	**Cat**	**Subject/Comment**	**New version**
2017-08	RAN5#76	R5-175705	-	-	-	Draft skeleton	0.0.1
2018-01	RAN5#1-5G-NR Adhoc	R5-180068 R5-180069 R5-180070 R5-180071 R5-180072 R5-180073 R5-180075 R5-180076 R5-180077 R5-180078 R5-180079	-	-	-	Implementation of pCRs to TS 38.521-1 V0.1.0	0.1.0
2018-01	RAN5#78	R5-181506 R5-181507 R5-181670 R5-181671 R5-181672 R5-181676 R5-181677 R5-181678 R5-181679 R5-181685 R5-181686 R5-181698 R5-181699 R5-181700	-	-	-	Implementation of pCRs to TS 38.521-1 V0.2.0	0.2.0
2018-03	RAN5#2-5G-NR Adhoc	R5-181759	-	-	-	Update TS 38.521-1 to align with new structure of TS 38.101-1 based on endorsed CR R4-1802403	0.3.0
2018-04	RAN5#2-5G-NR Adhoc	R5-81976	-	-	-	3GU mismatch	0.3.1
2018-04	RAN5#2-5G-NR Adhoc	R5-181771 R5-181833 R5-181842 R5-182000 R5-182002 R5-182003 R5-182004 R5-182005 R5-182020 R5-182021 R5-182026	-	-	-	Implementation of pCRs to TS 38.521-1 V0.4.0 Add clause 4.4 Test point analysis	0.4.0

2018-07	RAN5#79	R5-182768 R5-182973 R5-183702 R5-183703 R5-183704 R5-183705 R5-183906 R5-183936 R5-183280 R5-183923 R5-183953 R5-183954 R5-183955 R5-183956 R5-183957 R5-183958 R5-183959 R5-183960	-	-	-	Implementation of pCRs to TS 38.521-1 V0.5.0	0.5.0
2018-07	RAN5#79	R5-183960 R5-183279	-	-	-	Corrected Table numbering issues in subclause 6.5.2.4.1.4.2 Test procedure to capture R5-183960 changes into draft TS 38.521-1 v0.5.1	0.5.1
2018-07	RAN5#79	R5-182363	-	-	-	withdrawn	1.0.0
2018-08	RAN5#80	R5-185321 R5-184298 R5-185305 R5-185322 R5-185323 R5-185495 R5-185444 R5-185565 R5-185445 R5-185524 R5-184572 R5-185390 R5-184574 R5-185521 R5-185408 R5-184822 R5-185446 R5-185324 R5-185447 R5-185411 R5-185413 R5-185496 R5-185414 R5-185415 R5-185325 R5-185500 R5-185501 R5-185312 R5-185326 R5-185315 R5-185317 R5-185327 R5-185320	-	-	-	Implementation of pCRs to TS 38.521-1 V1.0.1	1.0.1
2018-09	RAN#81	-	-	-	-	raised to v15.0.0 with editorial changes only	15.0.0
2018-12	RAN#82	R5-186604	0072	-	F	5G_FR1 Text update for 7.3 Reference sensitivity	15.1.0
2018-12	RAN#82	R5-186605	0073	-	F	5R_FR1 Text Update for 6.5.3.1_General spurious emissions	15.1.0

2018-12	RAN#82	R5-186606	0074	-	F	5R FR1 Text Update for 6.5.3.2 Spurious emission for UE co-existence	15.1.0
2018-12	RAN#82	R5-186670	0078	-	F	Updating test case 6.2.3 UE additional maximum output power reduction	15.1.0
2018-12	RAN#82	R5-186671	0079	-	F	Updating test case 6.5.2.3 Additional spectrum emission mask	15.1.0
2018-12	RAN#82	R5-186680	0080	-	F	Update of test case 6.5.2.4.2, UTRA ACLR in 38.521-1	15.1.0
2018-12	RAN#82	R5-186736	0084	-	F	Update of FR1 Transmit OFF power	15.1.0
2018-12	RAN#82	R5-186774	0088	-	F	Addition of 6.3D.1 Minimum output power for UL-MIMO	15.1.0
2018-12	RAN#82	R5-186776	0089	-	F	Addition of 6.3D.2 Transmit OFF power for UL-MIMO	15.1.0
2018-12	RAN#82	R5-186781	0090	-	F	Addition of 6.3D.3 Transmit ON/OFF time mask for UL-MIMO	15.1.0
2018-12	RAN#82	R5-186901	0091	-	F	Update SEM requirements to TS 38.101-1 v15.3.0	15.1.0
2018-12	RAN#82	R5-186902	0092	-	F	Update ACS and inband blocking test cases in TS 38.521-1	15.1.0
2018-12	RAN#82	R5-187034	0107	-	F	Adding edge allocation into common uplink configuration in 6.1	15.1.0
2018-12	RAN#82	R5-187038	0109	-	F	Update test points for multiple FR1 test cases	15.1.0
2018-12	RAN#82	R5-187149	0111	-	F	Updated to Annexes for FR1 tests	15.1.0
2018-12	RAN#82	R5-187150	0112	-	F	General clauses updated for TS38.521-1	15.1.0
2018-12	RAN#82	R5-187376	0120	-	F	Update of 6.2.1 MOP	15.1.0
2018-12	RAN#82	R5-187378	0122	-	F	Update of 6.3.1 Minimum Output Power	15.1.0
2018-12	RAN#82	R5-187379	0123	-	F	Update of 6.3.3.2 General ON/OFF time mask	15.1.0
2018-12	RAN#82	R5-187380	0124	-	F	Addition of 6.2D.1 MOP for MIMO	15.1.0
2018-12	RAN#82	R5-187381	0125	-	F	Addition of 6.2D.2 MPR for MIMO	15.1.0
2018-12	RAN#82	R5-187382	0126	-	F	Addition of 6.2D.4 Configured Output Power for MIMO	15.1.0
2018-12	RAN#82	R5-187383	0127	-	F	Addition of 6.4D.1 Frequency error for MIMO	15.1.0
2018-12	RAN#82	R5-187384	0128	-	F	Addition of 6.4D.2.1 EVM for MIMO	15.1.0
2018-12	RAN#82	R5-187385	0129	-	F	Addition of 6.4D.2.2 Carrier Leakage for MIMO	15.1.0
2018-12	RAN#82	R5-187386	0130	-	F	Addition of 6.4D.2.3 In-band emissions for MIMO	15.1.0
2018-12	RAN#82	R5-187387	0131	-	F	Addition of 6.4D.2.4 EVM equalizer spectrum flatness for MIMO	15.1.0
2018-12	RAN#82	R5-187395	0132	-	F	Update of test case 6.2.3 UE A-MPR, general	15.1.0
2018-12	RAN#82	R5-187397	0133	-	F	Update of test case 6.2.3 UE A-MPR, NS_04	15.1.0
2018-12	RAN#82	R5-187399	0134	-	F	Update of test case test case 6.5.2.3 Additional spectrum emission mask, NS_04	15.1.0
2018-12	RAN#82	R5-187421	0136	-	F	Introduction of TC 6.5D.1 Occupied bandwidth for UL MIMO	15.1.0
2018-12	RAN#82	R5-187422	0137	-	F	Introduction of TC 6.5D.2.2 Spectrum Emission Mask for UL MIMO	15.1.0
2018-12	RAN#82	R5-187423	0138	-	F	Introduction of TC 6.5D.2.3 Additional Spectrum Emission Mask for UL MIMO	15.1.0
2018-12	RAN#82	R5-187424	0139	-	F	Introduction of TC 6.5D.2.4.1 NR ACLR for UL MIMO	15.1.0
2018-12	RAN#82	R5-187425	0140	-	F	Introduction of TC 6.5D.2.4.2 UTRA ACLR for UL MIMO	15.1.0
2018-12	RAN#82	R5-187429	0144	-	F	Introduction of TC 6.5D.4 Transmit intermodulation for UL MIMO	15.1.0
2018-12	RAN#82	R5-187431	0146	-	F	Introduction of TC 7.4D Maximum input level for UL-MIMO	15.1.0
2018-12	RAN#82	R5-187432	0147	-	F	Updating of 6.2C.1 Configured transmitted power for SUL	15.1.0
2018-12	RAN#82	R5-187433	0148	-	F	Introduction of TC 6.5C.1 Occupied bandwidth for SUL	15.1.0
2018-12	RAN#82	R5-187434	0149	-	F	Introduction of TC 6.5C.2.2 Spectrum Emission Mask for SUL	15.1.0
2018-12	RAN#82	R5-187435	0150	-	F	Introduction of TC 6.5C.2.3 Additional Spectrum Emission Mask for SUL	15.1.0
2018-12	RAN#82	R5-187436	0151	-	F	Introduction of TC 6.5C.2.4.1 NR ACLR for SUL	15.1.0
2018-12	RAN#82	R5-187437	0152	-	F	Introduction of TC 6.5C.2.4.2 UTRA ACLR for SUL	15.1.0
2018-12	RAN#82	R5-187438	0153	-	F	Introduction of TC 6.5C.3.2 General spurious emissions for SUL	15.1.0
2018-12	RAN#82	R5-187439	0154	-	F	Introduction of TC 6.5C.3.3 Spurious Emission for UE co-existence for SUL	15.1.0
2018-12	RAN#82	R5-187440	0155	-	F	Introduction of TC 6.5C.3.4 Additional Spurious Emission for SUL	15.1.0
2018-12	RAN#82	R5-187455	0158	-	F	Updating test case 6.3.4.2 Absolute Power Tolerance	15.1.0

2018-12	RAN#82	R5-187456	0159	-	F	Updating test case 6.3.4.4 Aggregate Power Tolerance	15.1.0
2018-12	RAN#82	R5-187560	0162	-	F	Update to Table 5.3.5-1 in TS 38.521-1	15.1.0
2018-12	RAN#82	R5-187585	0164	-	F	Update of transmit signal quality test cases in 38.521-1	15.1.0
2018-12	RAN#82	R5-187615	0167	-	F	Introduction of TC 6.5D.3.1 General spurious emissions for UL MIMO	15.1.0
2018-12	RAN#82	R5-187616	0168	-	F	Introduction of TC 6.5D.3.2 Spurious Emission for UE co-existence for UL MIMO	15.1.0
2018-12	RAN#82	R5-187617	0169	-	F	Introduction of TC 6.5D.3.3 Additional Spurious Emission for UL MIMO	15.1.0
2018-12	RAN#82	R5-187618	0170	-	F	Updating of Uplink channel for SUL in Annex G	15.1.0
2018-12	RAN#82	R5-187804	0069	1	F	Editorial Cleaning up for description of test requirement in clause 6	15.1.0
2018-12	RAN#82	R5-187805	0063	1	F	Introduction of TC 7.7D Spurious response for UL-MIMO	15.1.0
2018-12	RAN#82	R5-187807	0113	1	F	Introduction of receiver spurious emission tests for FR1 SA	15.1.0
2018-12	RAN#82	R5-187810	0114	1	F	Introduction of wideband intermodulation tests for FR1 SA	15.1.0
2018-12	RAN#82	R5-187811	0145	1	F	Introduction of TC 7.3D Reference sensitivity for UL-MIMO	15.1.0
2018-12	RAN#82	R5-187812	0085	1	F	Update of operating bands and channel arrangement to TS 38.521-1	15.1.0
2018-12	RAN#82	R5-187888	0121	1	F	Update of 6.2.4 Configured Output Power	15.1.0
2018-12	RAN#82	R5-187890	0156	1	F	Introduction of TC 6.5C.4 Transmit intermodulation for SUL	15.1.0
2018-12	RAN#82	R5-187892	0108	1	F	Removing the Editor's notes of SA messages and procedures for all FR1 test cases	15.1.0
2018-12	RAN#82	R5-187893	0083	1	F	Update of FR1 6.2.2 MPR	15.1.0
2018-12	RAN#82	R5-187894	0086	1	F	Addition of Time alignment error for UL-MIMO to TS38.521-1	15.1.0
2018-12	RAN#82	R5-187895	0115	1	F	Introduction of New FR1 test case 6.3.3.6 SRS time mask	15.1.0
2018-12	RAN#82	R5-187896	0116	1	F	5G_FR1 Text update for 6.5.3.3 Additional Spurious emission	15.1.0
2018-12	RAN#82	R5-187897	0161	1	F	Update of test case 6.3.4.3, Power Control Relative power tolerance in 38.521-1	15.1.0
2018-12	RAN#82	R5-187898	0165	1	F	Addition of EVM equalizer spectral flatness test case 6.4.2.5 to TS 38.521-1	15.1.0
2018-12	RAN#82	R5-187899	0099	1	F	Introduction of test case for Frequency error for CA	15.1.0
2018-12	RAN#82	R5-187900	0100	1	F	Introduction of test cases for Transmit modulation quality for CA	15.1.0
2018-12	RAN#82	R5-187901	0101	1	F	Introduction of test case for Spectrum emission mask for Inter-band CA	15.1.0
2018-12	RAN#82	R5-187902	0102	1	F	Introduction of test case for NR ACLR for Inter-band CA	15.1.0
2018-12	RAN#82	R5-187903	0103	1	F	Introduction of test case for UTRA ACLR for Inter-band CA	15.1.0
2018-12	RAN#82	R5-187904	0104	1	F	Introduction of test case for General spurious emissions for Inter-band CA	15.1.0
2018-12	RAN#82	R5-187905	0105	1	F	Introduction of test case for Spurious emission for UE co-existence for CA	15.1.0
2018-12	RAN#82	R5-187906	0106	1	F	Introduction of test case for Transmit intermodulation for Inter-band CA	15.1.0
2018-12	RAN#82	R5-187911	0118	1	F	Addition of notes to clarify test point selection into general section of TS 38.521-1	15.1.0
2018-12	RAN#82	R5-187914	0163	1	F	Update of Global In-channel Tx Test Annex in 38.521-1	15.1.0
2018-12	RAN#82	R5-187915	0082	1	F	Introduction of FR1 7.4 Maximum input level	15.1.0
2018-12	RAN#82	R5-188032	0075	1	F	Addition of 6.3D.4.1 Absolute Power tolerance for UL-MIMO	15.1.0
2018-12	RAN#82	R5-188033	0076	1	F	Addition of 6.3D.4.2 Relative Power Tolerance for UL-MIMO	15.1.0
2018-12	RAN#82	R5-188034	0077	1	F	Addition of 6.3D.4.3 Aggregate Power tolerance for UL-MIMO	15.1.0
2018-12	RAN#82	R5-188035	0110	1	F	Update to FR1 test case 6.3.3.4 PRACH time mask	15.1.0
2018-12	RAN#82	R5-188206	0117	1	F	Introduction of New FR1 test case 6.3.3.7 PUSCH-PUCCH and PUSCH-SRS time masks	15.1.0
2018-12	RAN#82	R5-188207	0071	1	F	5G_FR1 Text update for 7.3A Reference sensitivity for CA	15.1.0
2018-12	RAN#82	R5-188208	0067	2	F	Updates of MU in TS 38.521-1 Annex F during RAN5#81	15.1.0
2018-12	RAN#82	R5-188209	0068	2	F	Updates of TT in TS 38.521-1 Annex F during RAN5#81	15.1.0
2018-12	RAN#82	R5-188210	0097	1	F	TDD configuration for UE Tx test in FR1	15.1.0

2018-12	RAN#82	R5-188211	0119	1	F	Core alignment CR to capture TS 38.101-1 updates during RAN4#89	15.1.0
2019-03	RAN#83	R5-191034	0228	-	F	Update Clause 2 of TS 38.521-1	15.2.0
2019-03	RAN#83	R5-191035	0229	-	F	Update Clause 3.2 of TS 38.521-1	15.2.0
2019-03	RAN#83	R5-191039	0232	-	F	Correction to TC 6.4A.2.1.1 Error Vector Magnitude for CA (2UL CA)	15.2.0
2019-03	RAN#83	R5-191088	0244	-	F	Editorial cleaning up of test configuration tables in TS 38.521-1	15.2.0
2019-03	RAN#83	R5-191089	0245	-	F	Editorial correction of core alignment in TS 38.521-1	15.2.0
2019-03	RAN#83	R5-191090	0246	-	F	Updates of TT in TS38.521-1 Annex F during RAN5#NR4	15.2.0
2019-03	RAN#83	R5-191156	0247	-	F	General clauses updated for TS38.521-1	15.2.0
2019-03	RAN#83	R5-191244	0249	-	F	Editorial change in 6.5.2.1 general section	15.2.0
2019-03	RAN#83	R5-191245	0250	-	F	Update ACS and Inband Blocking test cases in TS38.521-1	15.2.0
2019-03	RAN#83	R5-191258	0251	-	F	Update to FR1 test case 6.5.4 Transmit intermodulation	15.2.0
2019-03	RAN#83	R5-191262	0252	-	F	Update of TC 7.6.3_Out-of-band blocking	15.2.0
2019-03	RAN#83	R5-191264	0253	-	F	Introduction of TC 7.6.4 Narrow-band blocking	15.2.0
2019-03	RAN#83	R5-191265	0254	-	F	Introduction of TC 7.7 Spurious response	15.2.0
2019-03	RAN#83	R5-191338	0256	-	F	Update of test case 6.3.4.3, Power Control Relative power tolerance in 38.521-1	15.2.0
2019-03	RAN#83	R5-191465	0257	-	F	Correction of FR1 6.2.2 Maximum Power Reduction (MPR)	15.2.0
2019-03	RAN#83	R5-191506	0262	-	F	Shared Risk clarification in TS 38.521-1	15.2.0
2019-03	RAN#83	R5-191526	0263	-	F	Update to FR1 test case 6.3.3.6 SRS time mask	15.2.0
2019-03	RAN#83	R5-191675	0267	-	F	Addition of MU and TT for NR FR1 UL-MIMO test cases	15.2.0
2019-03	RAN#83	R5-191815	0272	-	F	OBW test procedure update for 38.521-1	15.2.0
2019-03	RAN#83	R5-191846	0277	-	F	FR1 Text update for 6.5.3.1 General spurious emission	15.2.0
2019-03	RAN#83	R5-191848	0278	-	F	Correction of errors in Table 6.1-1 of 38.521-1	15.2.0
2019-03	RAN#83	R5-191849	0279	-	F	FR1 Text update for 7.3C Reference sensitivity power level for SUL	15.2.0
2019-03	RAN#83	R5-191852	0280	-	F	FR1 Text update for 6.5.3.2 Spurious emission for UE co-existence	15.2.0
2019-03	RAN#83	R5-191854	0281	-	F	FR1 Text update for 7.3.2 Reference sensitivity power level	15.2.0
2019-03	RAN#83	R5-192088	0317	-	F	Test mode and test loop function activation in SA Tx RF test cases in TS 38.521-1	15.2.0
2019-03	RAN#83	R5-192089	0318	-	F	Test mode and test loop function activation in SA Rx RF test cases in TS 38.521-1	15.2.0
2019-03	RAN#83	R5-192121	0320	-	F	Update of Global In-channel Tx Test Annex for FR1	15.2.0
2019-03	RAN#83	R5-192402	0266	1	F	Update of FR1 6.2.4 Configured transmitted power	15.2.0
2019-03	RAN#83	R5-192407	0294	1	F	Update of time alignment error for UL MIMO FR1 6.4D.3	15.2.0
2019-03	RAN#83	R5-192408	0295	1	F	Introduction of TC 6.4D.4	15.2.0
2019-03	RAN#83	R5-192409	0309	1	F	Update of FR1 6.2.1 MOP	15.2.0
2019-03	RAN#83	R5-192411	0310	1	F	Update of FR1 6.3.1 Minimum Output Power	15.2.0
2019-03	RAN#83	R5-192412	0311	1	F	Addition of FR1 6.3A.1 minimum output power for CA	15.2.0
2019-03	RAN#83	R5-192413	0321	1	F	Update of transmit signal quality test cases for FR1	15.2.0
2019-03	RAN#83	R5-192414	0231	1	F	Introduction of TC 7.7A.0 Minimum conformance requirements	15.2.0
2019-03	RAN#83	R5-192416	0240	1	F	Update to Wideband Intermodulation for SA FR1	15.2.0
2019-03	RAN#83	R5-192417	0241	1	F	Updates to 7.9 spurious emission for SA in FR1	15.2.0
2019-03	RAN#83	R5-192418	0259	1	F	Introduction of FR1 7.6D.3 Out-of-band blocking for UL-MIMO	15.2.0
2019-03	RAN#83	R5-192419	0260	1	F	Introduction of FR1 7.6D.4 Narrow band blocking for UL-MIMO	15.2.0
2019-03	RAN#83	R5-192420	0261	1	F	Introduction of FR1 7.8D.2 Wide band Intermodulation for UL-MIMO	15.2.0
2019-03	RAN#83	R5-192421	0276	1	F	Correction of FR1 7.4 Maximum input level	15.2.0
2019-03	RAN#83	R5-192510	0322	1	F	Asymmetric CH BWs test configuration for Reference Sensitivity	15.2.0
2019-03	RAN#83	R5-192544	0230	1	F	Correction to TC 6.4A.2.2 Carrier leakage for CA	15.2.0
2019-03	RAN#83	R5-192545	0248	1	F	Update of test case 6.5.2.4.2, UTRA ACLR in 38.521-1	15.2.0
2019-03	RAN#83	R5-192547	0273	1	F	Update of FR1 6.2D.1 MOP for MIMO	15.2.0

2019-03	RAN#83	R5-192548	0275	1	F	Update of 6.2D.4 Configured Output Power for MIMO	15.2.0
2019-03	RAN#83	R5-192549	0284	1	F	Update of FR1 test case 6.3D.1 Minimum output power for UL-MIMO	15.2.0
2019-03	RAN#83	R5-192550	0296	1	F	Update of TC 6.5D.1	15.2.0
2019-03	RAN#83	R5-192551	0297	1	F	Update of TC 6.5D.2.2	15.2.0
2019-03	RAN#83	R5-192553	0298	1	F	Introduction of TC 6.5D.2.3	15.2.0
2019-03	RAN#83	R5-192554	0299	1	F	Update of TC 6.5D.2.4.1	15.2.0
2019-03	RAN#83	R5-192555	0300	1	F	Update of TC 6.5D.2.4.2	15.2.0
2019-03	RAN#83	R5-192556	0301	1	F	Update of 6.5D.3.1	15.2.0
2019-03	RAN#83	R5-192557	0302	1	F	Update of 6.5D.3.2	15.2.0
2019-03	RAN#83	R5-192558	0303	1	F	Update of 6.5D.3.3	15.2.0
2019-03	RAN#83	R5-192559	0304	1	F	Update of 6.5D.4	15.2.0
2019-03	RAN#83	R5-192561	0313	1	F	Addition of FR1 6.3A.3 Transmit ON/OFF time mask for CA	15.2.0
2019-03	RAN#83	R5-192562	0325	1	F	Update of FR1 6.2D.2 MPR for MIMO	15.2.0
2019-03	RAN#83	R5-192563	0233	1	F	Introduction of TC 7.7A.1 Spurious response for 2DL CA	15.2.0
2019-03	RAN#83	R5-192564	0234	1	F	Introduction of TC 7.7A.2 Spurious response for 3DL CA	15.2.0
2019-03	RAN#83	R5-192565	0235	1	F	Introduction of TC 7.7A.3 Spurious response for 4DL CA	15.2.0
2019-03	RAN#83	R5-192566	0258	1	F	Introduction of FR1 7.6D.2 Inband blocking for UL-MIMO	15.2.0
2019-03	RAN#83	R5-192567	0285	1	F	Update on TC 6.4A.1.1 Frequency error for CA	15.2.0
2019-03	RAN#83	R5-192570	0286	1	F	Update on TCs in section 6.4A.2 Transmit modulation quality for CA	15.2.0
2019-03	RAN#83	R5-192576	0287	1	F	Update on TC 6.5A.2.2.1 Spectrum emission mask for CA	15.2.0
2019-03	RAN#83	R5-192577	0288	1	F	Update on TC 6.5A.2.4.1.1 NR ACLR for CA	15.2.0
2019-03	RAN#83	R5-192578	0289	1	F	Update on TC 6.5A.2.4.2.1 UTRA ACLR for CA	15.2.0
2019-03	RAN#83	R5-192579	0290	1	F	Update on TC 6.5A.3.1.1 General spurious emissions for CA	15.2.0
2019-03	RAN#83	R5-192580	0291	1	F	Update on TC 6.5A.3.2.1 Spurious emissions for UE co-existence for CA	15.2.0
2019-03	RAN#83	R5-192581	0292	1	F	Update on TC 6.5A.4.1 TX IM for CA	15.2.0
2019-03	RAN#83	R5-192583	0268	1	F	Addition of 7.5A.0 Minimum conformance requirements	15.2.0
2019-03	RAN#83	R5-192584	0269	1	F	Addition of 7.5A.1 Adjacent channel selectivity for 2DL CA	15.2.0
2019-03	RAN#83	R5-192585	0270	1	F	Addition of 7.5A.2 Adjacent channel selectivity for 3DL CA	15.2.0
2019-03	RAN#83	R5-192586	0271	1	F	Addition of 7.5A.3 Adjacent channel selectivity for 4DL CA	15.2.0
2019-03	RAN#83	R5-192587	0282	1	F	FR1 Text update for 7.3A.2 Reference sensitivity power level for CA	15.2.0
2019-03	RAN#83	R5-192588	0283	1	F	FR1 Text update for 7.3.2_1 Reference sensitivity level with 4 Rx antenna ports	15.2.0
2019-03	RAN#83	R5-192589	0305	1	F	Update of 7.3D.2	15.2.0
2019-03	RAN#83	R5-192590	0306	1	F	Update of TC 7.4D	15.2.0
2019-03	RAN#83	R5-192591	0307	1	F	Introduction of TC 7.5D	15.2.0
2019-03	RAN#83	R5-192592	0324	1	F	Update of TC 7.7D Spurious response for UL-MIMO	15.2.0
2019-03	RAN#83	R5-192593	0243	1	F	Updates of TT in TS38.521-1 Annex F during RAN5#82	15.2.0
2019-03	RAN#83	R5-192594	0265	1	F	Correction of HARQ-ACK transmission timing for DL RMC for FR1 TDD SCS=60kHz	15.2.0
2019-03	RAN#83	R5-192597	0319	1	F	Updating test case 7.3.2 Reference sensitivity power level Table 7.3.2.4.1-3	15.2.0
2019-03	RAN#83	R5-192598	0323	1	F	Update OBW, SEM and ACLR in TS 38.521-1	15.2.0
2019-03	RAN#83	R5-192682	0236	1	F	Introduction of TC 7.9A.0 Minimum conformance requirements	15.2.0
2019-03	RAN#83	R5-192683	0237	1	F	Introduction of TC 7.9A.1 Spurious emission for 2DL CA	15.2.0
2019-03	RAN#83	R5-192685	0312	2	F	Addition of FR1 6.3A.2 Transmit OFF power for CA	15.2.0
2019-03	RAN#83	R5-192693	0293	1	F	Introduction of Annex on Characteristics of the Interfering Signal FR1	15.2.0
2019-03	RAN#83	R5-192837	0326	1	F	Update of operating bands and channel arrangement to TS 38.521-1	15.2.0
2019-03	RAN#83	-	-	-	-	Editorial correction of references to TS 38.508-1 clause 4.6 tables	15.2.0
2019-06	RAN#84	R5-193535	0389	-	F	Update of test case 6.5.2.4.2, UTRA ACLR in 38.521-1	15.3.0
2019-06	RAN#84	R5-193536	0390	-	F	Update of test case 6.3.4.3, Power Control Relative power tolerance	15.3.0

2019-06	RAN#84	R5-193567	0394	-	F	Correction of 38.521-1 7.6D.2	15.3.0
2019-06	RAN#84	R5-193569	0395	-	F	Correction of 38.521-1 7.6D.3	15.3.0
2019-06	RAN#84	R5-193571	0396	-	F	Correction of 38.521-1 7.6D.4	15.3.0
2019-06	RAN#84	R5-193573	0397	-	F	Correction of 38.521-1 7.8D.2	15.3.0
2019-06	RAN#84	R5-193574	0398	-	F	Correction of 38.521-1 6.2.2	15.3.0
2019-06	RAN#84	R5-193585	0400	-	F	Update of TC 7.7A.0 Spurious response for CA	15.3.0
2019-06	RAN#84	R5-193586	0401	-	F	Correction of section number for UE diagram in Initial conditions of 38.521-1 Clause 6	15.3.0
2019-06	RAN#84	R5-193589	0404	-	F	Correction of section number for UE diagram in Initial conditions of 38.521-1 Clause 7	15.3.0
2019-06	RAN#84	R5-193593	0405	-	F	Unify Outer_1RB and Edge_1RB in Test Configuration Table of 38.521-1	15.3.0
2019-06	RAN#84	R5-193753	0413	-	F	Update of 6.3D Output power dynamics for UL-MIMO	15.3.0
2019-06	RAN#84	R5-193915	0417	-	F	Update of NR FR1 6.2.3 A-MPR NS_04	15.3.0
2019-06	RAN#84	R5-193917	0418	-	F	Update of SA FR1 RF 6.5D.2.3	15.3.0
2019-06	RAN#84	R5-193918	0419	-	F	Update of SA FR1 RF 6.5D.2.4.2	15.3.0
2019-06	RAN#84	R5-193920	0420	-	F	Update of SA FR1 RF 6.5D.3.3	15.3.0
2019-06	RAN#84	R5-193930	0421	-	F	Addition of NR FR1 6.2D.3 A-MPR for UL-MIMO	15.3.0
2019-06	RAN#84	R5-193955	0423	-	F	Update of clause 5 to TS 38.521-1	15.3.0
2019-06	RAN#84	R5-194125	0425	-	F	Update Out of band emission test cases in TS 38.521-1	15.3.0
2019-06	RAN#84	R5-194126	0426	-	F	Update ACS and Inbanblocking interferer definition in TS 38.521-1	15.3.0
2019-06	RAN#84	R5-194161	0428	-	F	Update of test case 6.2.3 UE A-MPR, NS_35	15.3.0
2019-06	RAN#84	R5-194162	0429	-	F	Update of test case 6.5.2.3; Additional spectrum emission mask	15.3.0
2019-06	RAN#84	R5-194226	0435	-	F	Correction to In-band emission test case	15.3.0
2019-06	RAN#84	R5-194228	0437	-	F	Correction to PRACH configurations	15.3.0
2019-06	RAN#84	R5-194256	0439	-	F	Correction to FR1 Reference Sensitivity	15.3.0
2019-06	RAN#84	R5-194268	0440	-	F	Update of 7.5A.0 Minimum conformance requirements	15.3.0
2019-06	RAN#84	R5-194304	0442	-	F	Correction to time domain allocation of DMRS	15.3.0
2019-06	RAN#84	R5-194305	0443	-	F	Updating 7.8.2 Wide band Intermodulation	15.3.0
2019-06	RAN#84	R5-194307	0445	-	F	Correction to ON/OFF time mask test	15.3.0
2019-06	RAN#84	R5-194308	0446	-	F	Correction to carrier leakage and in-band emission tests	15.3.0
2019-06	RAN#84	R5-194312	0447	-	F	FR1 Update for 7.3A Reference sensitivity for CA	15.3.0
2019-06	RAN#84	R5-194313	0448	-	F	FR1 Update for 7.3.2 Reference sensitivity power level	15.3.0
2019-06	RAN#84	R5-194314	0449	-	F	FR1 Update for 7.3.3 Ref sensitivity ?RIB,c	15.3.0
2019-06	RAN#84	R5-194315	0450	-	F	FR1 Update for 7.3C Reference sensitivity for SUL	15.3.0
2019-06	RAN#84	R5-194316	0451	-	F	FR1 Update for 6.5.3.2 Spurious emission for UE co-existence	15.3.0
2019-06	RAN#84	R5-194377	0454	-	F	FR1 Update for 6.5.3.3 Additional spurious emissions	15.3.0
2019-06	RAN#84	R5-194383	0455	-	F	Update of 7.5A.2 Adjacent channel selectivity for 3DL CA	15.3.0
2019-06	RAN#84	R5-194905	0414	1	F	Update of 6.3D.4.1 Absolute Power tolerance for UL-MIMO	15.3.0
2019-06	RAN#84	R5-194906	0415	1	F	Update of 6.3D.4.2 Relative Power Tolerance for UL-MIMO	15.3.0
2019-06	RAN#84	R5-194908	0465	1	F	Update of TC 6.3A.3 Transmit ON/OFF time mask for CA	15.3.0
2019-06	RAN#84	R5-194910	0463	1	F	Update of TC 6.3A.1 Minimum output power for CA FR1	15.3.0
2019-06	RAN#84	R5-194911	0434	1	F	Update of 6.2.3 for UE additional maximum output power reduction	15.3.0
2019-06	RAN#84	R5-194912	0430	1	F	Update of test case 6.2.3 UE A-MPR FR1, general part and minimum requirements	15.3.0
2019-06	RAN#84	R5-194915	0438	1	F	Correction to SRS time mask test	15.3.0
2019-06	RAN#84	R5-194916	0444	1	F	Correction to transmit signal quality test cases	15.3.0
2019-06	RAN#84	R5-194917	0461	1	F	Introduction of 6.2A.4.0.2 TIB for CA into Rel-15	15.3.0
2019-06	RAN#84	R5-194918	0468	1	F	Update of transmit signal quality test cases for FR1	15.3.0
2019-06	RAN#84	R5-194919	0407	1	F	Update of TC 7.9A.1 Spurious emissions for 2DL CA	15.3.0
2019-06	RAN#84	R5-194920	0456	1	F	Update of 7.5A.3 Adjacent channel selectivity for 4DL CA	15.3.0
2019-06	RAN#84	R5-194921	0469	1	F	Correction to FR1 Reference Sensitivity test configurations with n70	15.3.0

2019-06	RAN#84	R5-194922	0431	1	F	Update of clause 3 to TS 38.521-1	15.3.0
2019-06	RAN#84	R5-194923	0432	1	F	Update of clause 4 to TS 38.521-1	15.3.0
2019-06	RAN#84	R5-194924	0433	1	F	Update of clause 5 for operating bands and channel arrangement	15.3.0
2019-06	RAN#84	R5-194925	0452	1	F	General clause updated for FR1 spec	15.3.0
2019-06	RAN#84	R5-194926	0467	1	F	Update of Global In-channel Tx Test Annex for FR1	15.3.0
2019-06	RAN#84	R5-194957	0392	1	F	Updates of MU and TT in TS 38.521-1 Annex F during RAN5#NR5	15.3.0
2019-06	RAN#84	R5-194973	0402	1	F	Update of TC 7.9A.0 Spurious emissions for CA	15.3.0
2019-06	RAN#84	R5-194974	0403	1	F	Update of TC 7.7D Spurious response for UL-MIMO	15.3.0
2019-06	RAN#84	R5-195090	0470	1	F	Update of FR1 ON_ON time mask test cases	15.3.0
2019-06	RAN#84	R5-195092	0441	1	F	Update of 7.5A.1 Adjacent channel selectivity for 2DL CA	15.3.0
2019-06	RAN#84	R5-195140	0416	1	F	Update of 6.3D.4.3 Aggregate Power tolerance for UL-MIMO	15.3.0
2019-06	RAN#84	R5-195142	0422	1	F	Addition of TT values for NR FR1 UL-MIMO test cases	15.3.0
2019-06	RAN#84	R5-195143	0457	1	F	Introduction of Occupied bandwidth for Inter-band CA in NR SA FR1	15.3.0
2019-06	RAN#84	R5-195144	0458	1	F	Update of 6.4D.3 Time alignment error for UL-MIMO FR1	15.3.0
2019-06	RAN#84	R5-195145	0464	1	F	Update of TC 6.3A.2 Transmit OFF power for CA FR1	15.3.0
2019-06	RAN#84	R5-195198	0436	1	F	Correction to power control test cases	15.3.0
2019-06	RAN#84	R5-195403	0459	1	F	Addition of 6.2A.1.3 FR1 MOP for inter-band CA	15.3.0
2019-06	RAN#84	R5-195430	0393	1	F	Updates of MU and TT in TS 38.521-1	15.3.0
2019-06	RAN#84	R5-195431	0424	1	F	Core alignment with TS 38.101-1	15.3.0
2019-06	RAN#84	R5-193550	0391	-	F	Introduction of CA_n41A-n79A into Rel-16	16.0.0
2019-06	RAN#84	R5-195053	0462	1	F	Introduction of 6.2A.4.0.2 TIB for CA into Rel-16	16.0.0
2019-06	RAN#84	R5-195056	0399	1	F	Introduction of CA_n41 into Rel-16 TS 38.521-1	16.0.0
2019-06	RAN#84	R5-195405	0460	1	F	Introduction of 6.2A.1.3 FR1 MOP for inter-band CA into Rel-16	16.0.0
2019-09	RAN#85	R5-195732	0472	-	F	Update Clause 6.2A.4.0.2 TIB for CA	16.1.0
2019-09	RAN#85	R5-195804	0474	-	F	Update of UE A_MPR test case in 6.2.3	16.1.0
2019-09	RAN#85	R5-196191	0477	-	F	Update of Minimum conformance requirements and addition of test points in TC 6.2.2	16.1.0
2019-09	RAN#85	R5-196231	0483	-	F	Correction to 6.5.2.3 Additional spectrum emission mask	16.1.0
2019-09	RAN#85	R5-196233	0485	-	F	Correction to 6.3.4.3 Power Control Relative power tolerance	16.1.0
2019-09	RAN#85	R5-196234	0486	-	F	Correction to PUCCH format in EVM and In-band emissions test	16.1.0
2019-09	RAN#85	R5-196291	0488	-	F	Add Annex F.4 Uplink Power window explanation for SA test cases	16.1.0
2019-09	RAN#85	R5-196396	0489	-	F	Update of Minimum output power for CA FR1	16.1.0
2019-09	RAN#85	R5-196402	0492	-	F	Update of NR test case 6.2A.1-UE maximum output power for CA	16.1.0
2019-09	RAN#85	R5-196413	0498	-	F	Update of FR1 6.4D.1 Frequency error for UL MIMO	16.1.0
2019-09	RAN#85	R5-196421	0502	-	F	Update of FR1 6.4D.2.4 EVM equalizer spectrum flatness for UL MIMO	16.1.0
2019-09	RAN#85	R5-196425	0504	-	F	Update of DL RB allocation in Annex C	16.1.0
2019-09	RAN#85	R5-196481	0514	-	F	Remove references to 4Rx Reference Sensitivity test case 7.3.2_1 from Annex F	16.1.0
2019-09	RAN#85	R5-196499	0517	-	F	Updated to Annex A for RF FR1 tests	16.1.0
2019-09	RAN#85	R5-196500	0518	-	F	General clause updated for FR1 spec	16.1.0
2019-09	RAN#85	R5-196653	0521	-	F	Update TT for 6.3D.4.1	16.1.0
2019-09	RAN#85	R5-196696	0523	-	F	Update of Minimum conformance requirements and Test requirement in TC 7.4	16.1.0
2019-09	RAN#85	R5-196699	0524	-	F	Update of Minimum conformance requirements in TC 6.3.2	16.1.0
2019-09	RAN#85	R5-196711	0525	-	F	Addition of TT for 6.3D.4.2	16.1.0
2019-09	RAN#85	R5-196726	0526	-	F	Addition of TT for 6.3D.4.3	16.1.0
2019-09	RAN#85	R5-197307	0476	1	F	Update UL-MIMO to UL MIMO to align with RAN4 terminology in FR1	16.1.0
2019-09	RAN#85	R5-197308	0506	1	F	Update for 6.5.3.1 General spurious emissions	16.1.0
2019-09	RAN#85	R5-197309	0508	1	F	Update for 6.5.3.3 Additional spurious emissions	16.1.0

2019-09	RAN#85	R5-197312	0473	1	F	Update of Additional spectrum emission mask test case 6.5.2.3	16.1.0
2019-09	RAN#85	R5-197313	0480	1	F	Add TT to 6.3D.1 Minimum output power for UL-MIMO	16.1.0
2019-09	RAN#85	R5-197314	0484	1	F	Correction to PRACH configurations	16.1.0
2019-09	RAN#85	R5-197316	0494	1	F	Addition of NR test case 6.2A.3-UE additional maximum output power reduction for CA	16.1.0
2019-09	RAN#85	R5-197318	0495	1	F	Addition of NR test case 6.2A.4-Configured output power for CA	16.1.0
2019-09	RAN#85	R5-197319	0499	1	F	Update of FR1 6.4D.2.1 EVM for UL MIMO	16.1.0
2019-09	RAN#85	R5-197321	0500	1	F	Update of FR1 6.4D.2.2 Carrier leakage for UL MIMO	16.1.0
2019-09	RAN#85	R5-197324	0501	1	F	Update of FR1 6.4D.2.3 Inband emission for UL MIMO	16.1.0
2019-09	RAN#85	R5-197327	0511	1	F	Update for 7.3C.0 Minimum conformance requirements for SUL	16.1.0
2019-09	RAN#85	R5-197328	0512	1	F	Update for 7.3A.0 Minimum conformance requirements for CA	16.1.0
2019-09	RAN#85	R5-197329	0522	1	F	Update of Minimum conformance requirements and Test requirement in TCs 7.6.3 7.6.4 and 7.7	16.1.0
2019-09	RAN#85	R5-197330	0527	1	F	Update of 7.5A.0	16.1.0
2019-09	RAN#85	R5-197492	0503	1	F	Update of UL power configuration for ON/OFF and Absolute power tolerance	16.1.0
2019-09	RAN#85	R5-197514	0478	1	F	Correction of uplink power setting for SA FR1 transmitter test cases	16.1.0
2019-09	RAN#85	R5-197515	0479	1	F	Correction of uplink power setting for SA FR1 receiver test cases	16.1.0
2019-09	RAN#85	R5-197519	0493	1	F	Addition of NR test case 6.2A.2-UE maximum output power reduction for CA	16.1.0
2019-09	RAN#85	R5-197520	0497	1	F	Update of FR1 6.2D.1 MOP for UL MIMO	16.1.0
2019-09	RAN#85	R5-197521	0507	1	F	Update for 6.5.3.2 Spurious emission for UE co-existence	16.1.0
2019-09	RAN#85	R5-197522	0515	1	F	Update to Occupied bandwidth for CA in NR SA FR1	16.1.0
2019-09	RAN#85	R5-197523	0496	1	F	Addition of FR1 7.4A Maximum input level for CA	16.1.0
2019-09	RAN#85	R5-197608	0510	1	F	Update for 7.3C.2 Reference sensitivity power level for SUL	16.1.0
2019-09	RAN#85	R5-197609	0513	1	F	Update for 7.3.2 Reference sensitivity power level	16.1.0
2019-09	RAN#85	R5-197610	0471	1	F	Updates of MU and TT in TS 38.521-1	16.1.0
2019-09	RAN#85	R5-197634	0475	2	F	Update of operating bands and channel arrangement to TS38.521-1 g00	16.1.0
2019-09	RAN#85	R5-197635	0491	2	F	Update of Transmit ON/OFF time mask for CA FR1	16.1.0
2019-09	RAN#85	R5-197639	0482	2	F	Correction to power control TC 6.3.4.2 and 6.3.4.4	16.1.0
2019-09	RAN#85	R5-197640	0509	2	F	Update for 7.3A Reference sensitivity for CA	16.1.0
2019-09	RAN#85	R5-197641	0528	2	F	Addition of the connection setup in TS 38.521-1	16.1.0
2019-10	RAN#85	-	-	-	-	Deletion of R5-197560 which was added by mistake but was withdrawn and belonged to another spec	16.1.1
2019-12	RAN#86	R5-197917	0705	-	F	Addition of FR1 SUL test case 6.2C.5	16.2.0
2019-12	RAN#86	R5-197923	0711	-	F	Editorial update of test case 6.4D.2.1	16.2.0
2019-12	RAN#86	R5-198044	0714	-	F	Update of Clause 7.9A.1 Spurious emission for 2DL CA	16.2.0
2019-12	RAN#86	R5-198103	0715	-	F	Correction of Clause 7.9 Spurious emissions	16.2.0
2019-12	RAN#86	R5-198134	0716	-	F	Updating incorrect note in test procedure	16.2.0
2019-12	RAN#86	R5-198237	0723	-	F	Alignment with core specification for test case 6.3.4.3	16.2.0
2019-12	RAN#86	R5-198397	0739	-	F	Correction to Test Configuration for In-band emissions	16.2.0
2019-12	RAN#86	R5-198398	0740	-	F	Editorial correction to test configuration table in MPR test	16.2.0
2019-12	RAN#86	R5-198399	0741	-	F	Correction to the test procedure for frequency error	16.2.0
2019-12	RAN#86	R5-198401	0743	-	F	Correction to Common Uplink Configuration	16.2.0
2019-12	RAN#86	R5-198479	0747	-	F	Correction of UL RMCs	16.2.0
2019-12	RAN#86	R5-198526	0753	-	F	Update of test case 6.2.3 UE A_MPR NS_43	16.2.0
2019-12	RAN#86	R5-198546	0760	-	F	Message Contents Update for TC 6.2.4 and 6.2D.4 of TS 38.521-1	16.2.0
2019-12	RAN#86	R5-198547	0761	-	F	Addition of NR FR1 intraband non-contiguous 2CA tests to 7.4A.1 and 7.5A.1 and updating 7.5A.1 to 38.521-1 to enable testing of CA combinations involving bands n66, n70 and n71	16.2.0

2019-12	RAN#86	R5-198635	0764	-	F	Updated to Annex A for RF FR1 tests	16.2.0
2019-12	RAN#86	R5-198747	0774	-	F	Update for 7.3.3	16.2.0
2019-12	RAN#86	R5-198755	0777	-	F	Introduction of n65 to 38.521-1 Chapter 7	16.2.0
2019-12	RAN#86	R5-199085	0701	1	F	Updates of MU and TT in TS 38.521-1	16.2.0
2019-12	RAN#86	R5-199308	0724	1	F	Correction of 6.3D.3 Transmit ONOFF time mask for UL-MIMO	16.2.0
2019-12	RAN#86	R5-199309	0725	1	F	Correction of 6.3D.4.1	16.2.0
2019-12	RAN#86	R5-199310	0727	1	F	Correction of 6.3D.4.2 Relative power tolerance for UL-MIMO	16.2.0
2019-12	RAN#86	R5-199311	0731	1	F	Corrections to 6.3A.1.1 Minimum output power for CA 2UL CA FR1	16.2.0
2019-12	RAN#86	R5-199313	0702	1	F	Update of FR1 SUL test case 6.2C.1	16.2.0
2019-12	RAN#86	R5-199314	0703	1	F	Addition of FR1 SUL test case 6.2C.3	16.2.0
2019-12	RAN#86	R5-199315	0704	1	F	Addition of FR1 SUL test case 6.2C.4	16.2.0
2019-12	RAN#86	R5-199316	0706	1	F	Addition of FR1 SUL test case 6.4C.1	16.2.0
2019-12	RAN#86	R5-199317	0707	1	F	Addition of FR1 SUL test case 6.4C.2.1	16.2.0
2019-12	RAN#86	R5-199318	0708	1	F	Addition of FR1 SUL test case 6.4C.2.2	16.2.0
2019-12	RAN#86	R5-199319	0709	1	F	Addition of FR1 SUL test case 6.4C.2.3	16.2.0
2019-12	RAN#86	R5-199320	0710	1	F	Addition of FR1 SUL test case 6.4C.2.4	16.2.0
2019-12	RAN#86	R5-199321	0712	1	F	Update test points in transmit quality to replace -40dBm by minimum output power	16.2.0
2019-12	RAN#86	R5-199322	0746	1	F	Correction to UL Power Control Window in FR1	16.2.0
2019-12	RAN#86	R5-199323	0749	1	F	Corrections on A-MPR requirements in 38.521-1	16.2.0
2019-12	RAN#86	R5-199324	0750	1	F	Update of UE A_MPR Minimum Conformance requirements in 6.2.3	16.2.0
2019-12	RAN#86	R5-199325	0751	1	F	Update of test case 6.2.3 for UE A_MPR, NS_03 and NS_03U	16.2.0
2019-12	RAN#86	R5-199329	0752	1	F	Update of test case 6.2.3 UE A_MPR, NS_05 and NS_05U	16.2.0
2019-12	RAN#86	R5-199330	0754	1	F	Update of test case 6.2.3 UE A_MPR NS_43U	16.2.0
2019-12	RAN#86	R5-199331	0755	1	F	Adding of test requirements for UE A_MPR NS_100	16.2.0
2019-12	RAN#86	R5-199332	0756	1	F	Adding of test requirements for UE A_MPR NS_18	16.2.0
2019-12	RAN#86	R5-199333	0758	1	F	Update of Additional spectrum emission mask test case in 6.5.2.3	16.2.0
2019-12	RAN#86	R5-199334	0775	1	F	Update for 6.5.3.3 Additional spurious emissions	16.2.0
2019-12	RAN#86	R5-199335	0718	1	F	Correction of test applicability and minimum conformance requirements for SA FR1 7.6.4	16.2.0
2019-12	RAN#86	R5-199336	0719	1	F	Correction of minimum conformance requirements for SA FR1 7.6.3 7.7 and 7.9	16.2.0
2019-12	RAN#86	R5-199337	0717	1	F	Correction and addition of uplink power measurement MUs for SA FR1 TCs	16.2.0
2019-12	RAN#86	R5-199338	0728	1	F	Update of Operating bands and Channel arrangement to TS 38.521-1 R15	16.2.0
2019-12	RAN#86	R5-199339	0766	1	F	Update of Annex C.3.1	16.2.0
2019-12	RAN#86	R5-199412	0765	1	F	Update of clause 5 for R16 CA configurations in 38.521-1	16.2.0
2019-12	RAN#86	R5-199433	0736	1	F	Addition of reference sensitivity test for NR CA combination n29-n66	16.2.0
2019-12	RAN#86	R5-199434	0729	1	F	Update of Operating bands and Channel arrangement to TS 38.521-1 R16	16.2.0
2019-12	RAN#86	R5-199435	0767	1	F	Introduction of n29 and n65 to 38.521-1 Chapter 5 and 6.2.1	16.2.0
2019-12	RAN#86	R5-199484	0720	1	F	Correction of test procedure of SA FR1 6.5.3.1	16.2.0
2019-12	RAN#86	R5-199485	0768	1	F	Update to ACLR test case	16.2.0
2019-12	RAN#86	R5-199486	0776	1	F	Update for 6.5.3.2 Spurious emission for UE co-existence	16.2.0
2019-12	RAN#86	R5-199490	0748	1	F	update of 7.5A.2	16.2.0
2019-12	RAN#86	R5-199491	0773	1	F	Update for 7.3C.0 Minimum conformance requirements for SUL	16.2.0
2019-12	RAN#86	R5-199493	0770	1	F	Add section 4.5 Applicability and test coverage rules	16.2.0
2019-12	RAN#86	R5-199502	0721	1	F	Correction of test description for SA FR1 6.5.2.4.2	16.2.0
2019-12	RAN#86	R5-199503	0730	1	F	Addition of almost contiguous allocation test points and update of minimum conformance requirements for SA FR1 6.2.2	16.2.0

2019-12	RAN#86	R5-199556	0735	1	F	Introduction of 3CA reference sensitivity case 7.3A.2 for NR and addition of reference sensitivity test for many combinations involving bands n66, n70 and n71 to 38.521-1	16.2.0
2019-12	RAN#86	R5-199557	0762	1	F	Introduction of CA blocking case 7.6A to 38.521-1	16.2.0
2019-12	RAN#86	R5-199563	0732	1	F	Addition of 7.6A.3.1 Out-of-band blocking for CA (2DL CA) for SA FR1	16.2.0
2019-12	RAN#86	R5-199564	0733	1	F	Addition of 7.6A.4.1 Narrow band blocking for CA (2DL CA) for SA FR1	16.2.0
2019-12	RAN#86	R5-199565	0734	1	F	Addition of 7.8A.2.1 Wide band Intermodulation for CA (2DL CA) for SA FR1	16.2.0
2020-03	RAN#87	R5-200393	0789		F	Adding MU and TT for FR1 Rx CA test cases	16.3.0
2020-03	RAN#87	R5-200397	0791		F	Updating power configuration for PRACH time mask	16.3.0
2020-03	RAN#87	R5-200438	0792		F	Clarification of measurement interval of frequency error in FR1	16.3.0
2020-03	RAN#87	R5-200440	0794		F	Correction to 6.3.4.3 Power Control Relative power tolerance	16.3.0
2020-03	RAN#87	R5-200441	0795		F	Correction to SEM and ACLR test cases	16.3.0
2020-03	RAN#87	R5-200443	0797		F	Correction to UL power window description for 6.3.4.4	16.3.0
2020-03	RAN#87	R5-200461	0798		F	Update of 7.6A.3.1 Out-of-band blocking for 2DL CA	16.3.0
2020-03	RAN#87	R5-200462	0799		F	Update of 7.6A.4.1 Narrow band blocking for 2DL CA	16.3.0
2020-03	RAN#87	R5-200463	0800		F	Update of 7.8A.2.1 Wide band Intermodulation for 2DL CA	16.3.0
2020-03	RAN#87	R5-200570	0804		F	Update of NR test case 6.5.3.2-Spurious emission for UE co-existence	16.3.0
2020-03	RAN#87	R5-200640	0808		F	Update of Minimum requirements of 6.2.2 UE maximum output power reduction	16.3.0
2020-03	RAN#87	R5-200658	0810		F	Update of 6.1 common part of Tx in TS38.521-1	16.3.0
2020-03	RAN#87	R5-200659	0811		F	Core spec alignment for test case 6.3.4.3 Relative power tolerance	16.3.0
2020-03	RAN#87	R5-200664	0812		F	Correction of UL configuration for almost contiguous allocation in 6.2.2	16.3.0
2020-03	RAN#87	R5-200666	0813		F	Update measurement bandwidth references in 6.5.4	16.3.0
2020-03	RAN#87	R5-200693	0814		F	Update for 6.5.3.2 Spurious emission for UE co-existence	16.3.0
2020-03	RAN#87	R5-200700	0817		F	Removal of square brackets for DCI format for test cases in 7.6 and 7.7 of SA FR1	16.3.0
2020-03	RAN#87	R5-200721	0818		F	Addition of new Rel-16 70MHz CBW for 6.3.2 and 7.4 of SA FR1	16.3.0
2020-03	RAN#87	R5-200725	0819		F	Correction of A-SE for NS_04	16.3.0
2020-03	RAN#87	R5-200755	0823		F	Removing text from a Void clause	16.3.0
2020-03	RAN#87	R5-200757	0825		F	Correction of A_MPR test for NS_05 and NS_05U	16.3.0
2020-03	RAN#87	R5-200759	0826		F	Update of test case 6.2.3 UE A_MPR, NS_37	16.3.0
2020-03	RAN#87	R5-200761	0827		F	Update of test case 6.2.3 UE A_MPR, NS_38	16.3.0
2020-03	RAN#87	R5-200763	0828		F	Update of test case 6.2.3 UE A_MPR, NS_39	16.3.0
2020-03	RAN#87	R5-200765	0829		F	Corrections of NS_43 in 38.521-1 section 6	16.3.0
2020-03	RAN#87	R5-200767	0830		F	Corrections of NS_43U in 38.521-1 section 6	16.3.0
2020-03	RAN#87	R5-200892	0815	1	F	Update for 6.5.3.3 Additional spurious emissions	16.3.0
2020-03	RAN#87	R5-200893	0809	1	F	Core spec alignment for 7.6.3 and 7.8	16.3.0
2020-03	RAN#87	R5-200895	0787	1	F	Introduction of n95 SUL band test cases	16.3.0
2020-03	RAN#87	R5-200906	0824	1	F	Aligning A-MPR clause with TS 38.101-1 Rel-15	16.3.0
2020-03	RAN#87	R5-200907	0781	1	F	Update of TC 7.7A.1	16.3.0
2020-03	RAN#87	R5-200908	0782	1	F	Update of Clause 4 in TS 38.521-1	16.3.0
2020-03	RAN#87	R5-200909	0783	1	F	Update of clause 5 to TS 38.521-1 in R15	16.3.0
2020-03	RAN#87	R5-200922	0822	1	F	Introduction of Rel-16 spurious emissions co-existence requirements for bands n48, n65 and n95	16.3.0
2020-03	RAN#87	R5-200924	0788	1	F	Adding statistical testing condition in Annex H for CA testing	16.3.0
2020-03	RAN#87	R5-200962	0786	1	F	Corrections to TC 6.3A.3 transmit On OFF time mask for CA FR1	16.3.0
2020-03	RAN#87	R5-200971	0780	1	F	Correction of reference numbers in TS 38.521-1	16.3.0
2020-03	RAN#87	R5-200972	0793	1	F	Correction to 6.2.3 A-MPR test case	16.3.0
2020-03	RAN#87	R5-200974	0802	1	F	Update of test requirements for NR test case 6.5D.2.2 and 6.5D.2.4	16.3.0

2020-03	RAN#87	R5-200975	0803	1	F	Update of NR SUL test cases	16.3.0
2020-03	RAN#87	R5-200976	0820	1	F	Update of NR test case 6.2.4-ConfigTP	16.3.0
2020-03	RAN#87	R5-200977	0805	1	F	Update of NR test case 7.4A Maximum input level for CA	16.3.0
2020-03	RAN#87	R5-200978	0806	1	F	Update of NR test case 7.6A.2 Inband Blocking for CA	16.3.0
2020-03	RAN#87	R5-200979	0821	1	F	Cleaning up of Rx 2DL CA test cases in FR1	16.3.0
2020-03	RAN#87	R5-201054	0785	1	F	Update of R16 new bands and CBWs to TS 38.521-1 clause 5	16.3.0
2020-03	RAN#87	R5-201069	0832	1	F	Adding n65 A-MPR and Emission Requirements	16.3.0
2020-03	RAN#87	R5-201247	0790	2	F	Cleaning up of power class 2 test cases in FR1	16.3.0
2020-03	RAN#87	R5-201238	0831	1	F	Corrections of NS_18 in 38.521-1 section 6	16.3.0
2020-06	RAN#88	R5-201597	0835	-	F	Correction of 4RX Reference requirement for n77 high range in 7.3.2	16.4.0
2020-06	RAN#88	R5-201598	0836	-	F	Correction of lower limit for test ID 55 in test 6.2.3	16.4.0
2020-06	RAN#88	R5-201734	0841	-	F	Addition of NR test case 6.3C.1 Minimum output power for SUL	16.4.0
2020-06	RAN#88	R5-201735	0842	-	F	Addition of NR test case 6.3C.2 Transmit OFF power for SUL	16.4.0
2020-06	RAN#88	R5-201736	0843	-	F	Addition of NR test case 6.3C.3 Transmit ON/OFF time mask for SUL	16.4.0
2020-06	RAN#88	R5-201739	0846	-	F	Addition of NR test case 6.3C.4.3 Aggregate power tolerance for SUL	16.4.0
2020-06	RAN#88	R5-201741	0848	-	F	Update of NR test case 6.5C.3.3-Additional spurious emissions for SUL	16.4.0
2020-06	RAN#88	R5-201742	0849	-	F	Update test description of NR test case 7.6.3-Out-of-band blocking	16.4.0
2020-06	RAN#88	R5-201744	0851	-	F	Addition of NR test case 7.6C.3 Out-of-band blocking for SUL	16.4.0
2020-06	RAN#88	R5-201745	0852	-	F	Update of Annex F.3.2 and F.3.3	16.4.0
2020-06	RAN#88	R5-201749	0854	-	F	Update of NR test case 7.4A.1 Maximum input level for 2DL CA	16.4.0
2020-06	RAN#88	R5-201750	0855	-	F	Addition of NR test case 7.4A.2 Maximum input level for 3DL CA	16.4.0
2020-06	RAN#88	R5-201752	0857	-	F	Addition of NR test case 7.6A.2.2 IBB for 3DL CA	16.4.0
2020-06	RAN#88	R5-201764	0861	-	F	Adding NS_27 A_MPR and Emission Requirements for band n48	16.4.0
2020-06	RAN#88	R5-201772	0865	-	F	Adding NS_47 A_MPR and Emission Requirements for band n41	16.4.0
2020-06	RAN#88	R5-201801	0866	-	F	Update of clause 5 to TS 38.521-1 in R15	16.4.0
2020-06	RAN#88	R5-201833	0867	-	F	Update of Refsense requirements for n79	16.4.0
2020-06	RAN#88	R5-201834	0868	-	F	Correction of FR1 PUCCH EVM definition	16.4.0
2020-06	RAN#88	R5-201845	0871	-	F	Editorial correction of 6.2.1 test requirements	16.4.0
2020-06	RAN#88	R5-201847	0873	-	F	Updating 6.3.4.3 alternating sub-test	16.4.0
2020-06	RAN#88	R5-201861	0875	-	F	Addition of asymmetric BW combination set 1 of n66	16.4.0
2020-06	RAN#88	R5-201934	0877	-	F	Update of Operating bands and Channel arrangement to TS 38.521-1 for R16 CADC configurations	16.4.0
2020-06	RAN#88	R5-202034	0883	-	F	Addition of new test case 7.6A.3.2 Out-of-band blocking for CA 3DL CA R16	16.4.0
2020-06	RAN#88	R5-202035	0884	-	F	Addition of new test case 7.6A.3.3 Out-of-band blocking for CA 4DL CA R16	16.4.0
2020-06	RAN#88	R5-202036	0885	-	F	Addition of new test case 7.6A.4.2 Narrow band blocking for CA 3DL CA R16	16.4.0
2020-06	RAN#88	R5-202037	0886	-	F	Addition of new test case 7.6A.4.3 Narrow band blocking for CA 4DL CA R16	16.4.0
2020-06	RAN#88	R5-202039	0888	-	F	Addition of new test case 7.8A.2.3 Wide band Intermodulation for CA 4DL CA R16	16.4.0
2020-06	RAN#88	R5-202041	0890	-	F	Correction of test procedure and some typos in 7.6A.4.1 Narrow band blocking for CA 2DL CA R16	16.4.0
2020-06	RAN#88	R5-202042	0891	-	F	Correction of test procedure and test requirement in 7.8A.2.1 R16	16.4.0
2020-06	RAN#88	R5-202109	0893	-	F	Correction to n70 asymmetric test points in Rx tests	16.4.0

2020-06	RAN#88	R5-202217	0899	-	F	Corrections on transmitter power for CA in 38.521-1	16.4.0
2020-06	RAN#88	R5-202422	0906	-	F	Update F.1.2 with Relative Uplink power measurement uncertainty as 6.3.4.3	16.4.0
2020-06	RAN#88	R5-202430	0909	-	F	Add Reference sensitivity requirement for n48	16.4.0
2020-06	RAN#88	R5-202484	0913	-	F	Update of Reference sensitivity power level for R16 new CBW of n1	16.4.0
2020-06	RAN#88	R5-202503	0914	-	F	CR on EVM Window Centre Timing Definition in FR1	16.4.0
2020-06	RAN#88	R5-202710	0840	1	F	Update of NR test case 6.2A.3 AMPR for CA	16.4.0
2020-06	RAN#88	R5-202711	0844	1	F	Addition of NR test case 6.3C.4.1-Absolute power tolerance for SUL	16.4.0
2020-06	RAN#88	R5-202712	0845	1	F	Addition of NR test case 6.3C.4.2 Power Control Relative power tolerance for SUL	16.4.0
2020-06	RAN#88	R5-202713	0847	1	F	Update of NR test case 6.5.2.4 ACLR	16.4.0
2020-06	RAN#88	R5-202714	0864	1	F	Update of test case 6.2.3 UE A_MPR, NS_42	16.4.0
2020-06	RAN#88	R5-202715	0905	1	F	Update Uplink power control window size for SA TX TCs	16.4.0
2020-06	RAN#88	R5-202716	0910	1	F	Update for 6.5.3.1 General spurious emissions	16.4.0
2020-06	RAN#88	R5-202717	0850	1	F	Addition of NR test case 7.6C.2-Inband Blocking for SUL	16.4.0
2020-06	RAN#88	R5-202718	0902	1	F	Update of UL configuration in REFSENS	16.4.0
2020-06	RAN#88	R5-202719	0903	1	F	Diversity Characteristics requirements alignment	16.4.0
2020-06	RAN#88	R5-202765	0880	1	F	Updates to test case 6.5.2.2, Spectrum Emission Mask	16.4.0
2020-06	RAN#88	R5-202781	0859	1	F	Adding several new 2CA and 3CA combinations to 7.3A and corrections to 7.3A.1	16.4.0
2020-06	RAN#88	R5-202783	0881	1	F	Adding REFSENS requirements for 30 MHz channel bandwidth in band n41	16.4.0
2020-06	RAN#88	R5-202791	0869	1	F	Update of general clause 7.1	16.4.0
2020-06	RAN#88	R5-202807	0904	1	F	Receiver characteristics testing update to 38.521-1	16.4.0
2020-06	RAN#88	R5-202821	0862	1	F	Update of test case 6.2.3 UE A_MPR, NS_40	16.4.0
2020-06	RAN#88	R5-202822	0863	1	F	Update of test case 6.2.3 UE A_MPR, NS_41	16.4.0
2020-06	RAN#88	R5-202823	0908	1	F	Update for 6.5.3.3 Additional spurious emissions	16.4.0
2020-06	RAN#88	R5-202860	0912	1	F	Update of Spurious emission for UE co-existence for CA_n1-n78	16.4.0
2020-06	RAN#88	R5-202886	0860	1	F	Aligning A-MPR clause with TS 38.101-1 Rel-15	16.4.0
2020-06	RAN#88	R5-202887	0894	1	F	NS_05 corrections related to n65	16.4.0
2020-06	RAN#88	R5-202888	0896	1	F	Corrections on network signalling value abbreviation in 38.521-1	16.4.0
2020-06	RAN#88	R5-202889	0897	1	F	Corrections on NS signalling label for band n39 in 38.521-1	16.4.0
2020-06	RAN#88	R5-202890	0900	1	F	Correction on txDirectCurrentLocation in FR1 SA tests	16.4.0
2020-06	RAN#88	R5-202891	0911	1	F	Updated MOP UL MIMO test case to include steps for per port testing	16.4.0
2020-06	RAN#88	R5-202892	0834	1	F	Correction and clarifications of default DL physical channels power in annex C	16.4.0
2020-06	RAN#88	R5-202927	0876	1	F	Update of Operating bands and Channel arrangement to TS 38.521-1 for R16 new bands and CBWs	16.4.0
2020-06	RAN#88	R5-202928	0856	1	F	Update for NR test case 7.6A.2.1 Inband Blocking for 2DL CA	16.4.0
2020-06	RAN#88	R5-202929	0887	1	F	Addition of new test case 7.8A.2.2 Wide band Intermodulation for CA 3DL CA R16	16.4.0
2020-06	RAN#88	R5-202930	0889	1	F	Correction of CW interference setting for OOBB Inter-band 2DL CA in TC 7.6A.3.1 R16	16.4.0
2020-06	RAN#88	R5-202931	0892	1	F	Alignment of minimum conformance requirements in 7.6A.3.0 and 7.8A.2.0 with core spec R16	16.4.0
2020-06	RAN#88	R5-202940	0879	1	F	Updates to test case 6.5.2.4.1, NR ACLR	16.4.0
2020-06	RAN#88	R5-202941	0870	1	F	Skipping 2Rx testing on bands where UE support 4Rx for SA test cases	16.4.0
2020-06	RAN#88	R5-202942	0901	1	F	Re-organization of CA refsens test cases	16.4.0
2020-06	RAN#88	R5-202957	0853	1	F	Update of NR test case 6.2.2 UE maximum output power reduction	16.4.0
2020-09	RAN#89	R5-203260	0917	-	F	Adding NS_47 to Additional spurious emissions test case	16.5.0

2020-09	RAN#89	R5-203261	0918	-	F	Adding UL MIMO additional spurious emissions test for NS_47	16.5.0
2020-09	RAN#89	R5-203290	0926	-	F	Clarification of Interferer frequency selection in FR1 IBB test case 7.6.2	16.5.0
2020-09	RAN#89	R5-203291	0927	-	F	Correction of K1 to achieve PUCCH Format 3 in FDD in EVM and in-band emission	16.5.0
2020-09	RAN#89	R5-203572	0932	-	F	Corrected test config for NS_24 in additional spurious emission test 6.5.3.3	16.5.0
2020-09	RAN#89	R5-203678	0935	-	F	Adding MU and TTs for Inter-band UL CA test cases	16.5.0
2020-09	RAN#89	R5-203679	0936	-	F	Updating message content in SUL test cases	16.5.0
2020-09	RAN#89	R5-203682	0937	-	F	Updating test case 6.5A.2.4.1-NR ACLR for CA	16.5.0
2020-09	RAN#89	R5-203687	0939	-	F	Updating channel configurations for Intra-band UL contiguous CA	16.5.0
2020-09	RAN#89	R5-203688	0940	-	F	Updating intra-band CA UL and DL configurations	16.5.0
2020-09	RAN#89	R5-203689	0941	-	F	Adding MU and TTs for Intra-band UL CA test cases	16.5.0
2020-09	RAN#89	R5-203690	0942	-	F	Introduce general requirement for UL CA test cases	16.5.0
2020-09	RAN#89	R5-203691	0943	-	F	Updating NR test case 6.2A.1- MOP for CA	16.5.0
2020-09	RAN#89	R5-203696	0946	-	F	Addition of general clause 7.1A	16.5.0
2020-09	RAN#89	R5-203697	0947	-	F	Updating REFSENS minimum requirements for Intra-band non-contiguous CA	16.5.0
2020-09	RAN#89	R5-203698	0948	-	F	Update of 7.4A.2-Maximum input level for 3DL CA	16.5.0
2020-09	RAN#89	R5-203700	0950	-	F	Update of test case 7.6A.2-Inband blocking for CA	16.5.0
2020-09	RAN#89	R5-203701	0951	-	F	Update of test case 7.6A.2.2 Inband blocking for 3DL CA	16.5.0
2020-09	RAN#89	R5-203735	0956	-	F	Add intra-band contiguous CA to 6.3A.2	16.5.0
2020-09	RAN#89	R5-203748	0958	-	F	Change of RB allocation start for test case 6.3.4.3	16.5.0
2020-09	RAN#89	R5-203777	0960	-	F	Update of NR test case 6.2.1 UE MOP for n30	16.5.0
2020-09	RAN#89	R5-203778	0961	-	F	Update of NR test case 6.2.2 UE MPR for n30	16.5.0
2020-09	RAN#89	R5-203780	0962	-	F	Update of NR test case 6.2D.1 UE MOP for UL MIMO for n30	16.5.0
2020-09	RAN#89	R5-203783	0964	-	F	Update of NR test case 6.5.3.2 Spurious Emissions for UE Co-Ex for n30	16.5.0
2020-09	RAN#89	R5-203786	0965	-	F	Update of NR test case 7.3 UE Ref Sens for n30	16.5.0
2020-09	RAN#89	R5-203788	0967	-	F	Update of NR test case 7.6.3 UE OBB for n30	16.5.0
2020-09	RAN#89	R5-203789	0968	-	F	Update of NR test case 7.6.4 UE NBB for n30	16.5.0
2020-09	RAN#89	R5-203879	0972	-	F	Correction of diversity characteristics requirement in section 7.2	16.5.0
2020-09	RAN#89	R5-203880	0973	-	F	Correction of UE mean power requirements Table numbers in SEM and ACLR test cases for SA FR1	16.5.0
2020-09	RAN#89	R5-203881	0974	-	F	Adding NOTEs to the test requirement tables in 6.2D.2	16.5.0
2020-09	RAN#89	R5-203885	0978	-	F	Correction of test requirement for 6.2.1	16.5.0
2020-09	RAN#89	R5-203967	0983	-	F	Editorial correction of 6.2.4	16.5.0
2020-09	RAN#89	R5-204010	0986	-	F	Correction to target power level Pmin for SA UL MIMO TCs	16.5.0
2020-09	RAN#89	R5-204035	0987	-	F	Updating NR test case 7.6A.3 for n48	16.5.0
2020-09	RAN#89	R5-204040	0989	-	F	Update of NR test case 7.7A Spurious response for CA	16.5.0
2020-09	RAN#89	R5-204054	0990	-	F	Correction to test Configuration of flatness for Pi/2 BPSK	16.5.0
2020-09	RAN#89	R5-204103	0991	-	F	Correction of QPSK UL RMC	16.5.0
2020-09	RAN#89	R5-204195	0996	-	F	Update 6.5.3.2 Spurious emission for UE co-existence	16.5.0
2020-09	RAN#89	R5-204202	0997	-	F	Update for 7.3A.0 Minimum conformance requirements for CA	16.5.0
2020-09	RAN#89	R5-204263	1001	-	F	Update of CSI-RS definition for DL RMCs in TS 38.521-1	16.5.0
2020-09	RAN#89	R5-204711	0933	1	F	Updating 6.2A.3-AMPR for CA for NS_43 and NS_01,NS_43U and NS_01	16.5.0
2020-09	RAN#89	R5-204760	0934	1	F	Cleaning up of Tx inter-band CA test cases	16.5.0
2020-09	RAN#89	R5-204761	1000	1	F	Editorial correction to FR1 co-existence requirements	16.5.0
2020-09	RAN#89	R5-204762	0923	1	F	Update of clause5 into TS 38.521-1 R15	16.5.0
2020-09	RAN#89	R5-204807	0993	1	F	Update of UE co-existence for CA_n1-n78	16.5.0
2020-09	RAN#89	R5-204808	0925	1	F	Update of R16 CADC combos in TS 38.521-1	16.5.0
2020-09	RAN#89	R5-204823	0916	1	F	Correction of test frequencies for NS_47	16.5.0

2020-09	RAN#89	R5-204824	0919	1	F	Adding band n48 to maximum output power and maximum output power reduction tests	16.5.0
2020-09	RAN#89	R5-204825	0984	1	F	Addition of 25MHz for NR band n1	16.5.0
2020-09	RAN#89	R5-204826	0985	1	F	Addition of AMPR NS_48 for NR band n1	16.5.0
2020-09	RAN#89	R5-204827	0992	1	F	Addition of n1 R16 new CBW into 38.521-1 Refsense test	16.5.0
2020-09	RAN#89	R5-204828	0924	1	F	Update of R16 new bands and CBWs in 38.521-1	16.5.0
2020-09	RAN#89	R5-204832	0952	1	F	Introduce of new TC 6.3A.4.1	16.5.0
2020-09	RAN#89	R5-204833	0953	1	F	Introduce of new TC 6.3A.4.2	16.5.0
2020-09	RAN#89	R5-204834	0954	1	F	Introduce of new TC 6.3A.4.3	16.5.0
2020-09	RAN#89	R5-204835	0955	1	F	Add intra-band contiguous CA to 6.3A.1	16.5.0
2020-09	RAN#89	R5-204836	0957	1	F	Add intra-band contiguous CA to 6.3A.3	16.5.0
2020-09	RAN#89	R5-204837	0949	1	F	Adding band n48 for Blocking characteristics testing	16.5.0
2020-09	RAN#89	R5-204839	0995	1	F	Updated to FR1 general clauses for NRSL eV2X	16.5.0
2020-09	RAN#89	R5-204854	0959	1	F	Correct UE output power configuration to some UL MIMO cases	16.5.0
2020-09	RAN#89	R5-204855	0969	1	F	Removal of editor's note about missing of Rel-15 In-gap OOB blocking requirement in RAN4 spec	16.5.0
2020-09	RAN#89	R5-204897	0929	1	F	Update to 7.5A.2 ACS for 3DL CA	16.5.0
2020-09	RAN#89	R5-204898	0988	1	F	Update of NR test case 7.5A Adjacent Channel selectivity for CA	16.5.0
2020-09	RAN#89	R5-204905	0975	1	F	Correction of 6.2D.1 and Test applicability of 6.5.2.4.2	16.5.0
2020-09	RAN#89	R5-204906	0976	1	F	Correction of test requirement for 6.2.4	16.5.0
2020-09	RAN#89	R5-204907	0977	1	F	Addition of test procedure and test requirement for PC2 fallback to PC3 for network signalling value NS_04	16.5.0
2020-09	RAN#89	R5-204908	0979	1	F	Adding additional tolerance to test requirement of 6.2.1, 6.2.2, 6.2.3 and 6.2.4	16.5.0
2020-09	RAN#89	R5-204909	0980	1	F	Update of 6.2.3 for minimum conformance requirements for A-MPR	16.5.0
2020-09	RAN#89	R5-204910	0970	1	F	Alignment of requirements in 7.6.3 and 7.6A.3 with the core spec	16.5.0
2020-09	RAN#89	R5-204911	0971	1	F	Removal of SDL bands from single carrier Rx TCs 7.6.2, 7.6.3 and 7.6.4	16.5.0
2020-09	RAN#89	R5-204912	0981	1	F	Update of SA Rx test cases for 4Rx UEs	16.5.0
2020-09	RAN#89	R5-204913	0998	1	F	Update Uplink power control window size for SA RX TCs	16.5.0
2020-09	RAN#89	R5-204960	0928	1	F	Addition of test cases for n28 with CBW of 30MHz	16.5.0
2020-09	RAN#89	R5-204961	0922	1	F	n26 Rx requirements in 38.521-1	16.5.0
2020-09	RAN#89	R5-204962	0966	1	F	Update of NR test case 7.6.2 UE IBB for n30	16.5.0
2020-09	RAN#89	R5-204974	0945	1	F	Updating of NR test case 6.2A.4-Configured output power for CA	16.5.0
2020-09	RAN#89	R5-204980	0930	2	F	Corrections and additions to 7.3A	16.5.0
2020-09	RAN#89	R5-204981	0931	2	F	Completing 3CA Rx cases 7.5A.2 and 7.7A.2	16.5.0
2020-09	RAN#89	R5-204984	0944	1	F	Update of NR test case 6.2A.2-MPR for CA	16.5.0
2020-09	RAN#89	RP-201670	1002	-	F	Adding FR1 PDCCH Aggregation Level in Annex C.3	16.5.0
2020-12	RAN#90	R5-205252	1005	-	F	Adding NR Band n53 to UE maximum output power and MPR test cases	16.6.0
2020-12	RAN#90	R5-205254	1007	-	F	Adding NR Band n53 into Spurious emission for UE co-existence	16.6.0
2020-12	RAN#90	R5-205299	1011	-	F	Update of clause 5 in TS 38.521-1 R15	16.6.0
2020-12	RAN#90	R5-205490	1014	-	F	Update of Reference sensitivity power level for R16 new CBW of n3	16.6.0
2020-12	RAN#90	R5-205493	1015	-	F	Correction of diversity characteristics requirement in section 7.2	16.6.0
2020-12	RAN#90	R5-205494	1016	-	F	Correction of minimum conformance requirements and test requirement for narrow band blocking for Intra-band contiguous CA	16.6.0
2020-12	RAN#90	R5-205495	1017	-	F	Correction of Allocated slots per Frame for DL reference measurement channels	16.6.0
2020-12	RAN#90	R5-205535	1018	-	F	Correcting RB start for test case 6.3C.4.2	16.6.0
2020-12	RAN#90	R5-205537	1019	-	F	Update of NR test case 6.2.1 UE MOP for n14	16.6.0

2020-12	RAN#90	R5-205550	1023	-	F	Update of NR test case 7.3 UE Ref Sens for n14	16.6.0
2020-12	RAN#90	R5-205551	1024	-	F	Update of NR test case 7.6.2 UE IBB for n14	16.6.0
2020-12	RAN#90	R5-205552	1025	-	F	Update of NR test case 7.6.3 UE OBB for n14	16.6.0
2020-12	RAN#90	R5-205553	1026	-	F	Update of NR test case 7.6.4 UE NBB for n14	16.6.0
2020-12	RAN#90	R5-205557	1028	-	F	Updating abbreviation list	16.6.0
2020-12	RAN#90	R5-205569	1031	-	F	Adding 30 MHz channel bandwidth to test requirements for UL MIMO Spurious	16.6.0
2020-12	RAN#90	R5-205574	1032	-	F	Co-existence Table corrections related to n65	16.6.0
2020-12	RAN#90	R5-205700	1043	-	F	Addition of V2X reference measurement channels	16.6.0
2020-12	RAN#90	R5-205731	1045	-	F	Introduce General requirement for CA configurations	16.6.0
2020-12	RAN#90	R5-205732	1046	-	F	Adding RB allocation for channel BW 70MHz	16.6.0
2020-12	RAN#90	R5-205733	1047	-	F	Updating test configuration tables for intra-band UL CA test cases	16.6.0
2020-12	RAN#90	R5-205734	1048	-	F	Updating NR test case MOP for MIMO for several NR bands	16.6.0
2020-12	RAN#90	R5-205735	1049	-	F	Updating NR test case MPR for MIMO for several NR bands	16.6.0
2020-12	RAN#90	R5-205736	1050	-	F	Updating minimum requirement for OBW for inter-band CA	16.6.0
2020-12	RAN#90	R5-205737	1051	-	F	Update OBW testing for intra-band UL CA	16.6.0
2020-12	RAN#90	R5-205743	1055	-	F	Updating NR test case 7.4A.2-Maximum input level for 3 DL CA	16.6.0
2020-12	RAN#90	R5-205745	1056	-	F	Updating NR test case 7.5A.2- Adjacent channel selectivity for 3DL CA	16.6.0
2020-12	RAN#90	R5-205746	1057	-	F	Updating NR test case 7.6A.2.2- In-band Blocking for 3DL CA	16.6.0
2020-12	RAN#90	R5-205748	1058	-	F	Updating Narrow band blocking for CA for band n48	16.6.0
2020-12	RAN#90	R5-205790	1061	-	F	Removing the highest SCS from test configuration for Tx spurious emissions for UL MIMO	16.6.0
2020-12	RAN#90	R5-205791	1062	-	F	Update of MPR for PC3 half Pi BPSK DMRS in 6.2.2	16.6.0
2020-12	RAN#90	R5-205796	1066	-	F	Update of MOP for UL MIMO with ULFPTx in 6.2D.1	16.6.0
2020-12	RAN#90	R5-205799	1068	-	F	Addition of new test case 6.5D.3_1.2 UE co-existence spurious emissions for Rel-16 UL MIMO	16.6.0
2020-12	RAN#90	R5-205800	1069	-	F	Addition of new test case 6.5D.3_1.3 additional spurious emissions for Rel-16 UL MIMO	16.6.0
2020-12	RAN#90	R5-205852	1070	-	F	Correction of RAR timing for PRACH TC 6.3.3.4 and EVM TC 6.4.2.1	16.6.0
2020-12	RAN#90	R5-205872	1073	-	F	Editorial correction to minimum requirements of REFSENS for CA	16.6.0
2020-12	RAN#90	R5-205879	1075	-	F	Update of Rx test cases to add 40MHz for NR band n38	16.6.0
2020-12	RAN#90	R5-205882	1076	-	F	Update of A-MPR for NS_18	16.6.0
2020-12	RAN#90	R5-206022	1082	-	F	Update of 6.3.1 for UE minimum output power test	16.6.0
2020-12	RAN#90	R5-206088	1088	-	F	Correction to ASEM for NS_27	16.6.0
2020-12	RAN#90	R5-206160	1102	-	F	Correction of Test Message Table 6.3.3.4.4.3-2 in section 6.3.3.4	16.6.0
2020-12	RAN#90	R5-206638	1071	1	F	Handling of delta Tib for UE supporting multiple band combinations	16.6.0
2020-12	RAN#90	R5-206639	1077	1	F	Update of A-MPR for NS_46	16.6.0
2020-12	RAN#90	R5-206640	1090	1	F	Update for 6.5.3.2 Spurious emission for UE co-existence	16.6.0
2020-12	RAN#90	R5-206641	1092	1	F	Correction for 6.3.3.6 SRS time mask	16.6.0
2020-12	RAN#90	R5-206642	1098	1	F	Correction to spurious co-existence requirements for n28 and n83	16.6.0
2020-12	RAN#90	R5-206643	1044	1	F	CR to update DMRS position in UL RMC for FR1	16.6.0
2020-12	RAN#90	R5-206718	1037	1	F	Addition of UL CA combinations to maximum output power for Inter-band CA	16.6.0
2020-12	RAN#90	R5-206719	1035	1	F	Update of 7.5A.3 Adjacent channel selectivity for 4DL CA	16.6.0
2020-12	RAN#90	R5-206740	1006	1	F	Adding NR Band n53 to UE additional maximum output power reduction test cases	16.6.0
2020-12	RAN#90	R5-206741	1008	1	F	Adding NS_45 to Additional spurious emissions test case for NR Band n53	16.6.0
2020-12	RAN#90	R5-206742	1020	1	F	Update of NR test case 6.2.2 UE MPR for n14	16.6.0
2020-12	RAN#90	R5-206743	1021	1	F	Update of NR test case 6.2.3 UE A-MPR for n14	16.6.0

2020-12	RAN#90	R5-206744	1022	1	F	Update of NR test case 6.5.3.2 Spurious Emissions for UE Co-Ex for n14	16.6.0
2020-12	RAN#90	R5-206745	1029	1	F	Adding A-MPR test for band n30 with NS_21	16.6.0
2020-12	RAN#90	R5-206746	1030	1	F	Adding additional Spectrum emission test for band n30 with NS_21	16.6.0
2020-12	RAN#90	R5-206747	1041	1	F	Update of NR test case 6.5.2.3 Additional Spectrum Emission Mask for n30	16.6.0
2020-12	RAN#90	R5-206748	1074	1	F	Update of Tx test cases to add 40MHz for NR band n38	16.6.0
2020-12	RAN#90	R5-206749	1080	1	F	Correction of 6.3.2 for UE transmit OFF power test	16.6.0
2020-12	RAN#90	R5-206750	1096	1	F	Adding n26 Tx requirements	16.6.0
2020-12	RAN#90	R5-206751	1009	1	F	Adding NR Band n53 Receiver requirements	16.6.0
2020-12	RAN#90	R5-206761	1010	1	F	Update of Test case 6.3A.4.1	16.6.0
2020-12	RAN#90	R5-206762	1034	1	F	Update of Test case 6.3A.4.3	16.6.0
2020-12	RAN#90	R5-206763	1059	1	F	Updating NR test case 7.8A.2.2-Wide band Intermodulation for 3DL CA	16.6.0
2020-12	RAN#90	R5-206764	1078	1	F	Addition of 6.2E.1.1 V2X MOP for non-concurrent	16.6.0
2020-12	RAN#90	R5-206765	1079	1	F	Addition of 7.3E.2 V2X REFSENS for non-concurrent	16.6.0
2020-12	RAN#90	R5-206766	1063	1	F	Update of SEM for PC3 half Pi BPSK DMRS in 6.5.2.2	16.6.0
2020-12	RAN#90	R5-206767	1064	1	F	Update of NR ACLR for PC3 half Pi BPSK DMRS in 6.5.2.4.1	16.6.0
2020-12	RAN#90	R5-206768	1067	1	F	Addition of new test case 6.5D.3_1.1 general spurious emissions for Rel-16 UL MIMO	16.6.0
2020-12	RAN#90	R5-206863	1060	1	F	Update of signalling configuration for almost contiguous allocation across clause 6	16.6.0
2020-12	RAN#90	R5-206864	1053	1	F	Updating NR test case REFSENS for 2DL CA	16.6.0
2020-12	RAN#90	R5-206879	1036	1	F	Addition of 2UL CA exception to reference sensitivity test case	16.6.0
2020-12	RAN#90	R5-206880	1039	1	F	Update of Refsense test case for CA_n1A-n78A into 38.521-1	16.6.0
2020-12	RAN#90	R5-206881	1040	1	F	Update of Refsense test case for CA_n1A-n77A into 38.521-1	16.6.0
2020-12	RAN#90	R5-206882	1042	1	F	Update of R16 CADC configurations into 38.521-1 clause 5	16.6.0
2020-12	RAN#90	R5-206888	1089	1	F	Update for 6.5D.3.3 Additional spurious emissions for UL MIMO	16.6.0
2020-12	RAN#90	R5-206889	1094	1	F	Update for 6.5.3.3 Additional spurious emission	16.6.0
2020-12	RAN#90	R5-206890	1012	1	F	Update of R16 new band and CBWs into TS 38.521-1 clause 5	16.6.0
2020-12	RAN#90	R5-206891	1033	1	F	Update of Test case 6.3A.4.2	16.6.0
2020-12	RAN#90	R5-206892	1054	1	F	Updating NR test case REFSENS for 3DL CA	16.6.0
2020-12	RAN#90	R5-206894	1027	1	F	Addition of test case 6.5D.1_1, Occupied bandwidth for UL MIMO (Rel-16 onward)	16.6.0
2020-12	RAN#90	R5-206901	1093	1	F	Update for 6.5A.3.2 Spurious emission for UE co-existence	16.6.0
2020-12	RAN#90	R5-206912	1091	1	F	Update for 6.5A.3.1 General spurious emissions for CA	16.6.0
2021-03	RAN#91	R5-210169	1106	-	F	Addition of TC 7.3A.0.3.2.4 RIB,c for four bands	16.7.0
2021-03	RAN#91	R5-210170	1107	-	F	Update of TC 7.7A.3	16.7.0
2021-03	RAN#91	R5-210290	1108	-	F	Clarification of uplink power measurement uncertainty in test case 6.3.4.3	16.7.0
2021-03	RAN#91	R5-210291	1109	-	F	Message exceptions definition in test case 6.2.2	16.7.0
2021-03	RAN#91	R5-210384	1114	-	F	Add TT to power control for UL CA	16.7.0
2021-03	RAN#91	R5-210385	1115	-	F	Update MU/TT on power control for UL CA	16.7.0
2021-03	RAN#91	R5-210419	1116	-	F	Addition of new test case 6.4E.2.2.1 Error Vector Magnitude for V2X for non-concurrent operation	16.7.0
2021-03	RAN#91	R5-210423	1118	-	F	Addition of 6.5E.2.2.1D	16.7.0
2021-03	RAN#91	R5-210424	1119	-	F	Addition of 6.5E.2.3.1	16.7.0
2021-03	RAN#91	R5-210425	1120	-	F	Addition of 6.5E.2.3.1D	16.7.0
2021-03	RAN#91	R5-210426	1121	-	F	Addition of 6.5E.2.4.1	16.7.0
2021-03	RAN#91	R5-210427	1122	-	F	Addition of 6.5E.2.4.1D	16.7.0
2021-03	RAN#91	R5-210428	1123	-	F	Addition of 6.5E.3.2.1	16.7.0
2021-03	RAN#91	R5-210429	1124	-	F	Addition of 6.5E.3.2.1D	16.7.0

2021-03	RAN#91	R5-210485	1125	-	F	Correction of test purpose for 6.3.2 and 6.3D.2	16.7.0
2021-03	RAN#91	R5-210487	1127	-	F	Editorial correction for error in Table 7.6.4.4.1-1	16.7.0
2021-03	RAN#91	R5-210539	1129	-	F	Introduction 4CA Reference Sensitivity test 7.3A.3	16.7.0
2021-03	RAN#91	R5-210540	1130	-	F	Introduction 4CA Maximum Input Level test 7.4A.3	16.7.0
2021-03	RAN#91	R5-210541	1131	-	F	Introduction 4CA In-Band Blocking test 7.6A.2.3	16.7.0
2021-03	RAN#91	R5-210723	1133	-	F	Omitting of FR1 Rx cases with UL-MIMO on TDD bands	16.7.0
2021-03	RAN#91	R5-210782	1136	-	F	Update of A-MPR minimum requirements for Rel-16 DMRS	16.7.0
2021-03	RAN#91	R5-210787	1139	-	F	Adding additional TP for half Pi BPSK DMRS to SEM test case for SUL	16.7.0
2021-03	RAN#91	R5-210788	1140	-	F	Adding additional TP for half Pi BPSK DMRS to NR ACLR test case for SUL	16.7.0
2021-03	RAN#91	R5-210793	1142	-	F	Update of the test configuration for carrier leakage for SUL	16.7.0
2021-03	RAN#91	R5-210899	1146	-	F	Removal of the highest SCS from test configuration for Tx spurious emissions for CA	16.7.0
2021-03	RAN#91	R5-210902	1147	-	F	Updating test case 7.3A.1_1 for 4Rx test requirements	16.7.0
2021-03	RAN#91	R5-210903	1148	-	F	Editorial correction to clause 7.3.1	16.7.0
2021-03	RAN#91	R5-210906	1150	-	F	Updating A-SEM for MIMO testing for NS_04	16.7.0
2021-03	RAN#91	R5-210908	1152	-	F	Updating test applicability of test case 6.5D.2.4.2-UTRA ACLR for UL MIMO	16.7.0
2021-03	RAN#91	R5-210911	1154	-	F	Correction to test configuration table Test IDs for test case 6.5D.3.3	16.7.0
2021-03	RAN#91	R5-210912	1155	-	F	Correction to test case 6.2.3 AMPR for NS_24	16.7.0
2021-03	RAN#91	R5-210918	1160	-	F	Updating MOP and MPR for MIMO testing for several NR bands	16.7.0
2021-03	RAN#91	R5-210919	1161	-	F	Updating 6.5A.3.1.0 for intra-band CA	16.7.0
2021-03	RAN#91	R5-210920	1162	-	F	Updating test requirement of CA test cases for CA configurations including n90	16.7.0
2021-03	RAN#91	R5-210922	1164	-	F	Updating test case 7.6A.4 for band n48	16.7.0
2021-03	RAN#91	R5-210991	1174	-	F	Update for 7.3.2 Reference sensitivity power level	16.7.0
2021-03	RAN#91	R5-210995	1175	-	F	Update for 6.5.3.2 Spurious emission for UE co-existence_R15	16.7.0
2021-03	RAN#91	R5-210996	1176	-	F	Addition of test case 6.5D.2_1.4.2, UTRA ACLR for UL MIMO (Rel-16 onward)	16.7.0
2021-03	RAN#91	R5-211008	1178	-	F	Update of CA_n1A-n78C into 3DL CA Refsense TC 7.3A.2	16.7.0
2021-03	RAN#91	R5-211026	1180	-	F	Update of CA_n1A-n78C into 3DL CA maximum input level TC 7.4A.2	16.7.0
2021-03	RAN#91	R5-211037	1181	-	F	Addition of minimum requirement for intra-band UL CA in the test case 6.4A.2	16.7.0
2021-03	RAN#91	R5-211040	1182	-	F	Addition of 70M into 38.521-1 TC6.3A.1	16.7.0
2021-03	RAN#91	R5-211041	1183	-	F	Addition of 70M into 38.521-1 TC6.3D	16.7.0
2021-03	RAN#91	R5-211048	1185	-	F	Correction to test tolerance for FR1 blocking tests	16.7.0
2021-03	RAN#91	R5-211092	1186	-	F	Test ID separation to powerBoostPiBPSK 1 and 0 in Table 6.5.2.2.4.1-1	16.7.0
2021-03	RAN#91	R5-211109	1187	-	F	Corrections to subclauses in 38.521-1 with appropriate subclause level and heading styles	16.7.0
2021-03	RAN#91	R5-211113	1188	-	F	Corrections to reference figures for transmission bandwidth in FR1	16.7.0
2021-03	RAN#91	R5-211133	1189	-	F	Addition of ULFPTx in MPR test case	16.7.0
2021-03	RAN#91	R5-211176	1191	-	F	Reference to measurement BW corrected in 6.5D.4 TX intermodulation test case	16.7.0
2021-03	RAN#91	R5-211274	1195	-	F	Updating 6.5A.3.2 for CA_n1A-n79A	16.7.0
2021-03	RAN#91	R5-211613	1184	1	F	Spurious emissions for UE co-existence update to core specs	16.7.0
2021-03	RAN#91	R5-211657	1192	1	F	PC1 and PC3 Updates for Band n14	16.7.0
2021-03	RAN#91	R5-211676	1110	1	F	Clarifications for ON/OFF time mask for UL MIMO test case	16.7.0
2021-03	RAN#91	R5-211677	1126	1	F	Correction of test frequencies for NR band n28 30MHz test channel bandwidth of CA SUL and UL MIMO test cases in section 6	16.7.0
2021-03	RAN#91	R5-211678	1151	1	F	Updating AMPR for MIMO test case for NS_35	16.7.0

2021-03	RAN#91	R5-211679	1153	1	F	Correction to RB allocation start for test case 6.3D.4.2	16.7.0
2021-03	RAN#91	R5-211680	1128	1	F	Correction of test frequencies for NR band n28 30MHz test channel bandwidth of CA SUL and UL MIMO test cases in section 7	16.7.0
2021-03	RAN#91	R5-211681	1149	1	F	Updating test case 7.3C.2-Reference sensitivity power level for SUL	16.7.0
2021-03	RAN#91	R5-211682	1143	1	F	Update of clause 5 to R15 TS 38.521-1	16.7.0
2021-03	RAN#91	R5-211764	1113	1	F	Update of 7.5A.3 Adjacent channel selectivity for 4DL CA	16.7.0
2021-03	RAN#91	R5-211765	1144	1	F	Update of R16 CADC configurations into TS38.521-1 clause 5	16.7.0
2021-03	RAN#91	R5-211786	1134	1	F	Correction of test points for NS_48	16.7.0
2021-03	RAN#91	R5-211787	1135	1	F	Addition of A-MPR test for NS_49	16.7.0
2021-03	RAN#91	R5-211788	1177	1	F	Update for 6.5.3.2 Spurious emission for UE co-existence_R16	16.7.0
2021-03	RAN#91	R5-211804	1172	1	F	Updating Editors Note in 6.2A.2 and 6.2A.4 for intra-band UL CA	16.7.0
2021-03	RAN#91	R5-211805	1159	1	F	Updating general requirements for intra-band non-contiguous CA	16.7.0
2021-03	RAN#91	R5-211806	1117	1	F	Addition of 6.5E.2.2.1	16.7.0
2021-03	RAN#91	R5-211807	1137	1	F	Adding test point for Rel-16 DMRS in EVM equalizer spectrum flatness test case	16.7.0
2021-03	RAN#91	R5-211808	1141	1	F	Addition of new test case 6.4C.2.5 EVM equalizer spectrum flatness for half Pi BPSK DMRS for SUL	16.7.0
2021-03	RAN#91	R5-211911	1165	1	F	Adding NR test case-Time mask for Uplink carriers switching	16.7.0
2021-03	RAN#91	R5-211912	1166	1	F	Adding MU and TT for Uplink carriers switching testing	16.7.0
2021-03	RAN#91	R5-211915	1138	1	F	Adding additional TP for half Pi BPSK DMRS to MPR test case for SUL	16.7.0
2021-03	RAN#91	R5-210804	1145	-	F	Update of R17 CADC configurations into TS38.521-1 clause 5	17.0.0
2021-03	RAN#91	R5-210932	1169	-	F	Updating Additional spurious emissions testing for SUL band n83 and n84	17.0.0
2021-03	RAN#91	R5-210933	1170	-	F	Updating clause 6.2C.2 for Rel-17 SUL combinations	17.0.0
2021-03	RAN#91	R5-210934	1171	-	F	Updating REFSENS for SUL for new R17 configurations	17.0.0
2021-03	RAN#91	R5-211174	1190	-	F	Addition of R17 new CBWs into 38.521-1 clause 5	17.0.0
2021-03	RAN#91	R5-211837	1167	1	F	Updating MPR testing for SUL band n83	17.0.0
2021-03	RAN#91	R5-211838	1168	1	F	Updating AMPR testing for SUL band n83 and n84	17.0.0
2021-06	RAN#92	R5-212029	1198	-	F	Updating clause 6.2C.2 for Rel-17 SUL combinations	17.1.0
2021-06	RAN#92	R5-212168	1201	-	F	Removal of technical content in 38.521-1 v16.7.0 and substitution with pointer to the next Release	17.1.0
2021-06	RAN#92	R5-212340	1216	-	F	Typos in references of clause 6.5.3.2	17.1.0
2021-06	RAN#92	R5-212619	1218	-	F	Correction to A-MPR test ID for NS_24 in TC6.2.3	17.1.0
2021-06	RAN#92	R5-212668	1220	-	F	Correction of A-MPR test requirements for NS_04 band n41	17.1.0
2021-06	RAN#92	R5-212671	1222	-	F	Addition of A-MPR test requirements for NS_03 band n70	17.1.0
2021-06	RAN#92	R5-212682	1227	-	F	Update of 70M CBW into TC 6.3D.3	17.1.0
2021-06	RAN#92	R5-212704	1228	-	F	Update of 70M CBW into TC 6.3.3.2	17.1.0
2021-06	RAN#92	R5-212739	1229	-	F	Update of V2X in Section 5	17.1.0
2021-06	RAN#92	R5-212740	1230	-	F	Update to FR1 test case title in clause 6	17.1.0
2021-06	RAN#92	R5-212741	1231	-	F	Update to FR1 test case title in clause 7	17.1.0
2021-06	RAN#92	R5-212839	1235	-	F	Update of clause 3 for symbols and abbreviations	17.1.0
2021-06	RAN#92	R5-212856	1240	-	F	Correction of the test step number in the test requirement section	17.1.0
2021-06	RAN#92	R5-212914	1241	-	F	Editorial correction of 6.2.1	17.1.0
2021-06	RAN#92	R5-212926	1243	-	F	Addition of 6.1E General section	17.1.0
2021-06	RAN#92	R5-212927	1244	-	F	Addition of 6.2E.2.1 V2X MPR non-concurrent	17.1.0
2021-06	RAN#92	R5-212928	1245	-	F	Addition of 6.3E.1.1 V2X minimum output power non-concurrent	17.1.0
2021-06	RAN#92	R5-212969	1246	-	F	Updating AMPR for SUL test case for n84	17.1.0
2021-06	RAN#92	R5-212970	1247	-	F	Updating UTRA ACLR for SUL testing for n84	17.1.0
2021-06	RAN#92	R5-212971	1248	-	F	Updating test case 7.6C.2 Inband Blocking for SUL	17.1.0

2021-06	RAN#92	R5-212972	1249	-	F	Updating test case 7.6C.3 Out-of-band blocking for SUL	17.1.0
2021-06	RAN#92	R5-212974	1251	-	F	Updating H.2.2 for NR SA FR1 testing	17.1.0
2021-06	RAN#92	R5-212979	1252	-	F	Correction to RB allocations for test case 6.2.3 A-MPR for NS_46	17.1.0
2021-06	RAN#92	R5-212980	1253	-	F	Updating test case general spurious emission for CA_n28A-n41A	17.1.0
2021-06	RAN#92	R5-212981	1254	-	F	Updating Spurious emission for UE co-existence for CA_n28A-n41A	17.1.0
2021-06	RAN#92	R5-212983	1255	-	F	Updating Transmitter power for CA requirements for CA_n28A-n41A	17.1.0
2021-06	RAN#92	R5-212988	1257	-	F	Updating 6.2D.3 A-MPR for UL MIMO for band n1	17.1.0
2021-06	RAN#92	R5-212989	1258	-	F	Updating UTRA ACLR for MIMO testing for NR band n1	17.1.0
2021-06	RAN#92	R5-212992	1260	-	F	Updating 6.2C.2 for new R17 SUL configurations	17.1.0
2021-06	RAN#92	R5-212993	1261	-	F	Updating test case 6.2A.1 MOP for CA for R17 configuration CA_n28A-n79A	17.1.0
2021-06	RAN#92	R5-212994	1262	-	F	Correction to wrong RB allocations in NR test case 6.5C.3.3	17.1.0
2021-06	RAN#92	R5-212998	1265	-	F	Updating test case 7.3C.2 REFSENS for SUL for new R17 SUL configurations	17.1.0
2021-06	RAN#92	R5-212999	1266	-	F	Updating REFSENS for SUL 3CC testing for new R17 SUL configurations	17.1.0
2021-06	RAN#92	R5-213000	1267	-	F	Updating 7.6C.3 Out-of-band blocking for SUL_n79A-n83A	17.1.0
2021-06	RAN#92	R5-213015	1270	-	F	Updating test description to enable DFT-s-OFDM modulation across clause 6	17.1.0
2021-06	RAN#92	R5-213016	1271	-	F	Updating message contents to enable DFT-s-OFDM modulation in 7.3 refsens	17.1.0
2021-06	RAN#92	R5-213058	1275	-	F	Update of test configuration for UTRA ACLR for Rel-16 UL MIMO	17.1.0
2021-06	RAN#92	R5-213100	1278	-	F	Updating 6.5D.3_1.3 Additional spurious emissions for UL MIMO Rel-16 onward for NR band n1	17.1.0
2021-06	RAN#92	R5-213101	1279	-	F	Correction to Reference sensitivity test requirements in DL CA	17.1.0
2021-06	RAN#92	R5-213102	1280	-	F	Corrections to band n70 reference sensitivity testing	17.1.0
2021-06	RAN#92	R5-213160	1285	-	F	Correction to Message Contents Condition for NR ACLR	17.1.0
2021-06	RAN#92	R5-213882	1202	1	F	Change Editors note in 6.2D.2	17.1.0
2021-06	RAN#92	R5-213883	1208	1	F	Update p-Max of PCC to 6.2A.1.1	17.1.0
2021-06	RAN#92	R5-213884	1209	1	F	Update p-Max of PCC to 6.2A.2.1	17.1.0
2021-06	RAN#92	R5-213885	1210	1	F	Update p-Max of PCC to 6.5A.1.1	17.1.0
2021-06	RAN#92	R5-213886	1211	1	F	Update p-Max of PCC to out of band emission for CA	17.1.0
2021-06	RAN#92	R5-213887	1212	1	F	Update p-Max of PCC to spurious emission for CA	17.1.0
2021-06	RAN#92	R5-213888	1213	1	F	Correct message content to 6.2A.4.1	17.1.0
2021-06	RAN#92	R5-213889	1214	1	F	Cleanup for TS 38.521-1spurious emission for UE co-existence table (non CA)	17.1.0
2021-06	RAN#92	R5-213890	1215	1	F	Cleanup for TS 38.521-1 spurious emission for UE co-existence table (CA Bands)	17.1.0
2021-06	RAN#92	R5-213891	1221	1	F	Correction of A-MPR and A-SEM test requirements for NS_06 band n12	17.1.0
2021-06	RAN#92	R5-213892	1242	1	F	Addition of A-MPR NS_10 test	17.1.0
2021-06	RAN#92	R5-213893	1250	1	F	Updating NR SA test frequency selection for NR band n28	17.1.0
2021-06	RAN#92	R5-213894	1224	1	F	Update of R15 38.521-1 clause 5	17.1.0
2021-06	RAN#92	R5-213970	1256	1	F	Updating test case REFSENS for CA for CA_n28A-n41A	17.1.0
2021-06	RAN#92	R5-213971	1272	1	F	Corrections to NR Rx CA cases	17.1.0
2021-06	RAN#92	R5-213972	1284	1	F	Update of CA_n1A-n78C into 3DL CA TCs in 38.521-1	17.1.0
2021-06	RAN#92	R5-213978	1232	1	F	Correction of 6.5.1 for test of channel occupied bandwidth	17.1.0
2021-06	RAN#92	R5-213979	1233	1	F	Correction of 6.5.2.2 for test of spectrum emission mask	17.1.0
2021-06	RAN#92	R5-213980	1234	1	F	Correction of 6.5.2.4 for test of adjacent channel leakage ratio	17.1.0
2021-06	RAN#92	R5-213981	1282	1	F	Update of 70M CBW into TC 6.3.3.4 PRACH time mask	17.1.0
2021-06	RAN#92	R5-213982	1283	1	F	Update of 70M CBW into 38.521-1 TC 6.3A.4.1	17.1.0

2021-06	RAN#92	R5-213983	1223	1	F	Update of R16 new CBW configurations into TS38.521-1 clause 5	17.1.0
2021-06	RAN#92	R5-213995	1239	1	F	Update of minimum conformance requirements for Occupied bandwidth for CA in TC 6.5A.1	17.1.0
2021-06	RAN#92	R5-213998	1203	1	F	Update of 6.5E.2.2.1	17.1.0
2021-06	RAN#92	R5-213999	1204	1	F	Update of 6.5E.2.3.1	17.1.0
2021-06	RAN#92	R5-214000	1205	1	F	Update of 6.5E.2.4.1	17.1.0
2021-06	RAN#92	R5-214001	1206	1	F	Update of 6.5E.3.2.1	17.1.0
2021-06	RAN#92	R5-214002	1207	1	F	Addition of 6.5E.3.3.1	17.1.0
2021-06	RAN#92	R5-214003	1236	1	F	Addition of new test case 6.4E.2.2.1D Error Vector Magnitude for V2X for non-concurrent operation SL-MIMO	17.1.0
2021-06	RAN#92	R5-214004	1237	1	F	Addition of new test case 6.4E.2.4.1 In band emissions for V2X for non-concurrent operation	17.1.0
2021-06	RAN#92	R5-214005	1238	1	F	Addition of new test case 6.4E.2.4.1D In band emissions for V2X for non-concurrent operation SL-MIMO	17.1.0
2021-06	RAN#92	R5-214007	1274	1	F	Test case 6.2D.4 updated for ULFPTx	17.1.0
2021-06	RAN#92	R5-214021	1199	1	F	Updating clause 7.3C for Rel-17 SUL combinations	17.1.0
2021-06	RAN#92	R5-214022	1263	1	F	Updating REFSENS for CA test case for CA_n28A-n79A	17.1.0
2021-06	RAN#92	R5-214023	1268	1	F	Adding new test case 7.6C.2_1 Inband Blocking for SUL and DL CA	17.1.0
2021-06	RAN#92	R5-214024	1269	1	F	Adding new test case 7.6C.3_1 Out-of-band blocking for SUL and DL CA	17.1.0
2021-06	RAN#92	R5-214025	1226	1	F	Update of R17 CADC configurations into TS38.521-1 clause 5	17.1.0
2021-06	RAN#92	R5-214110	1225	1	F	Update of R16 new CADC configurations into TS38.521-1 clause 5	17.1.0
2021-09	RAN#93	R5-214221	1288	-	F	Updating clause 6.2C.2 for Rel-17 SUL combinations in TS 38.521-1	17.2.0
2021-09	RAN#93	R5-214224	1289	-	F	Update clause 7 for R17 CA and SUL RX characteristics in TS 38.521-1	17.2.0
2021-09	RAN#93	R5-214476	1294	-	F	Addition of Configured Tx Power Minimum Conformance Requirements for n41 Power Class 1.5	17.2.0
2021-09	RAN#93	R5-214477	1295	-	F	Addition of MOP for UL MIMO Minimum Conformance Requirements for n41 Power Class 1.5	17.2.0
2021-09	RAN#93	R5-214479	1297	-	F	Update of NR ACLR Test Requirement for n41 Power Class 1.5	17.2.0
2021-09	RAN#93	R5-214598	1305	-	F	Addition of reference section for TDD DL reference measurement channels in 7.1	17.2.0
2021-09	RAN#93	R5-214599	1306	-	F	Correction of test SCS in the test configuration table	17.2.0
2021-09	RAN#93	R5-214600	1307	-	F	Correction of Test Frequencies in the test configuration table	17.2.0
2021-09	RAN#93	R5-214601	1308	-	F	Correction of Test Frequencies for NR band n28 and30MHz test channel bandwidth in the test configuration table	17.2.0
2021-09	RAN#93	R5-214603	1310	-	F	Unify the Terminology of normal condition in the test configuration tables	17.2.0
2021-09	RAN#93	R5-214604	1311	-	F	Correction of subclause titles with appropriate styles	17.2.0
2021-09	RAN#93	R5-215043	1313	-	F	Correcting test frequencies in test case 6.2D.4	17.2.0
2021-09	RAN#93	R5-215073	1316	-	F	Addition of 6.2E.1.1D MOP for non-concurrent with SL-MIMO	17.2.0
2021-09	RAN#93	R5-215074	1317	-	F	Addition of 6.2E.2.1D MPR for non-concurrent with SL-MIMO	17.2.0
2021-09	RAN#93	R5-215075	1318	-	F	Addition of 6.3E.1.1D Minimum output power for non-concurrent with SL-MIMO	17.2.0
2021-09	RAN#93	R5-215080	1319	-	F	Addition of NR ACLR for intra-band CA	17.2.0
2021-09	RAN#93	R5-215165	1321	-	F	Correction of test frequencies for A-MPR NS_47	17.2.0
2021-09	RAN#93	R5-215185	1323	-	F	Update of 6.2D.2 MPR for UL MIMO with supporting ULFPTx	17.2.0
2021-09	RAN#93	R5-215214	1331	-	F	Corrections on power tolerance for intra-band contiguous CA	17.2.0
2021-09	RAN#93	R5-215282	1334	-	F	Introduction of CA_n71(2A) to Rx cases	17.2.0
2021-09	RAN#93	R5-215284	1335	-	F	Updating message contents for SUL test cases	17.2.0
2021-09	RAN#93	R5-215285	1336	-	F	Removal of SUL band in NR single-carrier test cases	17.2.0
2021-09	RAN#93	R5-215286	1337	-	F	Editorial correction to test case 6.2A.1 and 6.2A.2	17.2.0

2021-09	RAN#93	R5-215287	1338	-	F	Correction to test procedure of test case 6.5.2.3 Additional SEM	17.2.0
2021-09	RAN#93	R5-215297	1339	-	F	Updating the test requirement of NR test case MPR for MIMO	17.2.0
2021-09	RAN#93	R5-215298	1340	-	F	Updating NR test case 6.2A.1 MOP for intra-band non-contiguous UL CA	17.2.0
2021-09	RAN#93	R5-215305	1344	-	F	Updating test case 6.5A.1.1 occupied bandwidth for intra-band CA	17.2.0
2021-09	RAN#93	R5-215307	1345	-	F	Updating test case 6.3A.2 Transmit OFF power for intra-band non-contiguous UL CA	17.2.0
2021-09	RAN#93	R5-215311	1346	-	F	Updating MOP testing for SUL band n97	17.2.0
2021-09	RAN#93	R5-215312	1347	-	F	Updating MPR testing for SUL band n97	17.2.0
2021-09	RAN#93	R5-215332	1350	-	F	Update of requirement for spurious emission test case in 6.5A.3.2.1	17.2.0
2021-09	RAN#93	R5-215334	1352	-	F	Correction of A-MPR test configuration for NS_27 in 6.2.3	17.2.0
2021-09	RAN#93	R5-215335	1353	-	F	Correction of A-SPR test configuration for NS_17 in 6.5.3.3	17.2.0
2021-09	RAN#93	R5-215373	1354	-	F	Update Test applicability to FR1 TC 6.3C.2	17.2.0
2021-09	RAN#93	R5-215406	1359	-	F	Update of CBW 70MHz into TC 6.3.4.2 absolute power tolerance	17.2.0
2021-09	RAN#93	R5-215438	1360	-	F	Update of CBW 70MHz into TC 6.3.4.3 relative power tolerance	17.2.0
2021-09	RAN#93	R5-215439	1361	-	F	Update of CBW 70MHz into TC 6.3A.3.1	17.2.0
2021-09	RAN#93	R5-215463	1366	-	F	Correct the abbreviations for network signalling value in 38.521-1	17.2.0
2021-09	RAN#93	R5-215472	1368	-	F	Correction of test configuration in test case 6.5.2.2.2	17.2.0
2021-09	RAN#93	R5-215513	1372	-	F	Update of CBW 70MHz into TC 6.3A.3.1_1	17.2.0
2021-09	RAN#93	R5-215562	1374	-	F	Introduction of Reference sensitivity for NR-U	17.2.0
2021-09	RAN#93	R5-215564	1376	-	F	Introduction of Spectrum emission mask for NR-U	17.2.0
2021-09	RAN#93	R5-215573	1378	-	F	Update for 6.5.4 Transmit intermodulation	17.2.0
2021-09	RAN#93	R5-215845	1315	1	F	Correction of UTRA ACLR for inter-band CA	17.2.0
2021-09	RAN#93	R5-215846	1320	1	F	Adding A-MPR NS_06 test case for band 14 power class 1	17.2.0
2021-09	RAN#93	R5-215847	1312	1	F	Update of FR1 UL RMCs	17.2.0
2021-09	RAN#93	R5-215929	1356	1	F	Update of R16 new CBW configurations into TS38.521-1 clause 5	17.2.0
2021-09	RAN#93	R5-215962	1325	1	B	Introduction of MOP, MPR and configured Tx power test cases for n24 and n99	17.2.0
2021-09	RAN#93	R5-215963	1327	1	B	Introduction of n24 and n99 to spurious emissions and addition spurious emission test cases	17.2.0
2021-09	RAN#93	R5-215964	1348	1	F	Updating Spurious emissions for UE co-existence test cases for R17 requirements	17.2.0
2021-09	RAN#93	R5-215965	1328	1	B	Introduction of n24 to receiver sensitivity test cases	17.2.0
2021-09	RAN#93	R5-215966	1329	1	B	Introduction of n24 - blocking test cases	17.2.0
2021-09	RAN#93	R5-215967	1358	1	F	Update of R17 new band and CBWs into TS38.521-1 clause 5	17.2.0
2021-09	RAN#93	R5-215983	1292	1	F	Introduction of NR-U MOP test case	17.2.0
2021-09	RAN#93	R5-215984	1293	1	F	Introduction of NR-U in general clauses	17.2.0
2021-09	RAN#93	R5-215985	1375	1	F	Introduction of general spurious emission for NR-U	17.2.0
2021-09	RAN#93	R5-215986	1298	1	F	Update of Tx test cases for PC2 CA_n3A-n41A with UL CA_n3A-n41A	17.2.0
2021-09	RAN#93	R5-215987	1299	1	F	Update of Tx test cases for PC2 CA_n28A-n79A with UL CA_n28A-n79A	17.2.0
2021-09	RAN#93	R5-215988	1300	1	F	Update of Tx test cases for PC2 CA_n28A-n41A with UL CA_n28A-n41A	17.2.0
2021-09	RAN#93	R5-215989	1301	1	F	Update of Tx test cases for PC2 CA_n40A-n41A with UL CA_n40A-n41A	17.2.0
2021-09	RAN#93	R5-215990	1302	1	F	Update of Tx test cases for PC2 CA_n3A-n41A with UL PC2 n41A	17.2.0
2021-09	RAN#93	R5-215991	1303	1	F	Update of Tx test cases for PC2 CA_n28A-n79A with UL PC2 n79A	17.2.0

2021-09	RAN#93	R5-215992	1304	1	F	Update of Tx test cases for PC2 CA_n28A-n41A with UL PC2 n41A	17.2.0
2021-09	RAN#93	R5-215999	1296	1	F	Addition of MOP for UL MIMO Test Requirements for n41 Power Class 1.5	17.2.0
2021-09	RAN#93	R5-216000	1369	1	F	Adding Power Class 1.5 for LTE Band 41and NR Band n41 MOP	17.2.0
2021-09	RAN#93	R5-216001	1370	1	F	Adding Power Class 1.5 for LTE Band 41and NR Band n41 MPR	17.2.0
2021-09	RAN#93	R5-216002	1371	1	F	Adding Power Class 1.5 for LTE Band 41and NR Band n41 A-MPR	17.2.0
2021-09	RAN#93	R5-216029	1290	1	F	Update of NR FR1 General ON-OFF time mask test case	17.2.0
2021-09	RAN#93	R5-216030	1291	1	F	Update of NR FR1 SRS time mask test case	17.2.0
2021-09	RAN#93	R5-216031	1330	1	F	Cleanup for spurious emission for UE co-existence table	17.2.0
2021-09	RAN#93	R5-216032	1332	1	F	Update intra-band CA to 6.2A.2.1	17.2.0
2021-09	RAN#93	R5-216033	1373	1	F	Update to the coherent UL-MIMO test case	17.2.0
2021-09	RAN#93	R5-216034	1377	1	F	Correction to test applicability for different NS value	17.2.0
2021-09	RAN#93	R5-216035	1351	1	F	Correction to test configuration in 7.3A.1	17.2.0
2021-09	RAN#93	R5-216065	1341	1	F	Updating test case 6.3A.4.1 Absolute power tolerance for intra-band non-contiguous UL CA	17.2.0
2021-09	RAN#93	R5-216066	1342	1	F	Updating test case 6.3A.4.2 Relative power tolerance for intra-band non-contiguous UL CA	17.2.0
2021-09	RAN#93	R5-216067	1343	1	F	Updating test case 6.3A.4.3 Aggregate power tolerance for intra-band non-contiguous UL CA	17.2.0
2021-09	RAN#93	R5-216080	1357	1	F	Update of R17 CADC configurations into TS38.521-1 clause 5	17.2.0
2021-09	RAN#93	R5-216084	1333	1	F	Update p-Max of PCC of intra-band CA to 6.5A.1.1	17.2.0
2021-09	RAN#93	R5-216085	1364	1	F	Correction of 6.2.3 for UE additional maximum output power reduction	17.2.0
2021-09	RAN#93	R5-216086	1365	1	F	Correction of 6.2.1 for UE capability IE for maximum output power	17.2.0
2021-09	RAN#93	R5-216107	1363	1	F	Update of 6.2A.1 for UE maximum output power for CA	17.2.0
2021-09	RAN#93	R5-216110	1362	1	F	Update of 6.3.3.6 for SRS time mask test for BW 70MHz	17.2.0
2021-09	RAN#93	R5-216114	1326	1	B	Introduction of A-MPR test cases for n24 and n99	17.2.0
2021-09	RAN#93	R5-216141	1322	1	F	Correction to IE and UE capability for low PAPR DMRS across Tx cases	17.2.0
2021-12	RAN#94	R5-216512	1391	-	F	Updates on FR1 On-Off time mask for UL MIMO test 6.3D.3 upon RAN4 clarifications	17.3.0
2021-12	RAN#94	R5-216514	1392	-	F	Editorial corrections for NS_47 in A-MPR FR1 test 6.2.3	17.3.0
2021-12	RAN#94	R5-216515	1393	-	F	Corrections for NS_27 in A-MPR FR1 test 6.2.3	17.3.0
2021-12	RAN#94	R5-216533	1399	-	F	Addition of asymmetric channel bandwidths for n24	17.3.0
2021-12	RAN#94	R5-217111	1410	-	F	Clarifications for inter-band testing in 7.4.A.1 2DL CA MIL test	17.3.0
2021-12	RAN#94	R5-217112	1411	-	F	Clarifications for inter-band testing in 7.5.A.1 2DL CA ACS test	17.3.0
2021-12	RAN#94	R5-217199	1412	-	F	Update for 6.3.3.1 Transmit ON/OFF time mask general	17.3.0
2021-12	RAN#94	R5-217200	1413	-	F	Update for 6.3.3.6 SRS time mask	17.3.0
2021-12	RAN#94	R5-217202	1415	-	F	Addition of Annex E.4.7 Modified signal under test	17.3.0
2021-12	RAN#94	R5-217215	1416	-	F	Correction to IE and UE capability for low PAPR DMRS	17.3.0
2021-12	RAN#94	R5-217216	1417	-	F	Removal of low PAPR test points from 6.2.3 A-MPR	17.3.0
2021-12	RAN#94	R5-217234	1418	-	F	Introduction of ACLR for NR-U	17.3.0
2021-12	RAN#94	R5-217235	1419	-	F	Introduction of 7.3F.3 for NR-U	17.3.0
2021-12	RAN#94	R5-217261	1421	-	F	Addition of CA_n26A-66A, CA_n26A-70A, CA_n48A-66A, CA_n48A-70A and CA_n48A-n71A to the UL CA Maximum output power and Tx Spurious emissions	17.3.0
2021-12	RAN#94	R5-217262	1422	-	F	Addition of Reference Sensitivity test for CA combinations CA_n26A-66A, CA_n26A-70A, CA_n48A-66A and CA_n48A-70A	17.3.0

2021-12	RAN#94	R5-217263	1423	-	F	Addition of intra-band non-contiguous + intra-band non-contiguous to 4CA Reference sensitivity, Maximum input level and blocking cases	17.3.0
2021-12	RAN#94	R5-217427	1431	-	F	Correction to test configuration of NS_49 in 6.2.3	17.3.0
2021-12	RAN#94	R5-217476	1437	-	F	Cleaning up General sections of NR SA test cases	17.3.0
2021-12	RAN#94	R5-217479	1440	-	F	Correction to PDCCH DCI format for test case 6.4A.2.3.1	17.3.0
2021-12	RAN#94	R5-217482	1443	-	F	Update to test case Transmit ON/OFF time mask for SUL	17.3.0
2021-12	RAN#94	R5-217485	1446	-	F	Updating title of clause 6.4D	17.3.0
2021-12	RAN#94	R5-217487	1448	-	F	Adding intra-band contiguous CA non-contiguous RB allocations in 6.1A	17.3.0
2021-12	RAN#94	R5-217492	1453	-	F	Updating 6.3A.4.3 Aggregate power tolerance for intra-band CA	17.3.0
2021-12	RAN#94	R5-217552	1455	-	F	Addition of n3 CBW 50MHz into TC 7.3.2 Reference sensitivity power level	17.3.0
2021-12	RAN#94	R5-217553	1456	-	F	Editorial cleanup of message exceptions in PRACH time mask	17.3.0
2021-12	RAN#94	R5-217608	1463	-	F	Update to 5G V2X RMCs	17.3.0
2021-12	RAN#94	R5-217609	1464	-	F	Correction to 5G V2X RF tests	17.3.0
2021-12	RAN#94	R5-217631	1466	-	F	Update of R16 new band and CBWs into TS38.521-1 clause 5	17.3.0
2021-12	RAN#94	R5-217660	1469	-	F	Update of R17 new band and CBWs into TS38.521-1 clause 5	17.3.0
2021-12	RAN#94	R5-217665	1471	-	F	Update of CBW 70MHz into TC 6.3D.4.2	17.3.0
2021-12	RAN#94	R5-217686	1477	-	F	Update of R16 CADC configurations into TS38.521-1 clause 5	17.3.0
2021-12	RAN#94	R5-217746	1478	-	F	Update 7.5A.3 Adjacent channel selectivity for 4DL CA within RF1	17.3.0
2021-12	RAN#94	R5-218223	1379	1	F	Update of 6.3.3.4 PRACH time mask	17.3.0
2021-12	RAN#94	R5-218224	1408	1	F	Corrections for CA MPR table reference	17.3.0
2021-12	RAN#94	R5-218225	1420	1	F	6.5.3 Spurious emissions-Editorial correction	17.3.0
2021-12	RAN#94	R5-218226	1433	1	F	Correction to the number of HARQ process for PUCCH format 3 with FDD condition	17.3.0
2021-12	RAN#94	R5-218227	1438	1	F	Updating SRS time mask test case	17.3.0
2021-12	RAN#94	R5-218228	1439	1	F	Correction to PDCCH DCI format for test case 6.4.2.3	17.3.0
2021-12	RAN#94	R5-218229	1441	1	F	Correction to NR test case 6.4A.1.1 - Frequency error for CA	17.3.0
2021-12	RAN#94	R5-218230	1442	1	F	Update to NR FR1 ON-OFF time mask for CA (2UL CA)	17.3.0
2021-12	RAN#94	R5-218232	1475	1	F	Update of NR FR1 TC 6.3A.3 Transmit ON/OFF time mask for CA	17.3.0
2021-12	RAN#94	R5-218233	1432	1	F	Correction to the periodicity of CSI-RS for tracking	17.3.0
2021-12	RAN#94	R5-218280	1470	1	F	Update of CBW 70MHz into TC 6.3D.4.1	17.3.0
2021-12	RAN#94	R5-218281	1473	1	F	Update of CBW 70MHz into 6.5A of 38.521-1	17.3.0
2021-12	RAN#94	R5-218282	1474	1	F	Update of CBW 70MHz into 6.5C of 38.521-1	17.3.0
2021-12	RAN#94	R5-218292	1450	1	F	Updating 6.2A.4 Configured output power for intra-band UL CA	17.3.0
2021-12	RAN#94	R5-218300	1401	1	F	Update to test case 6.4E.2.4.1 In-band emissions for V2X / non-concurrent operation	17.3.0
2021-12	RAN#94	R5-218301	1402	1	F	Update to test case 6.4E.2.4.1D In-band emissions for V2X / non-concurrent operation / SL-MIMO	17.3.0
2021-12	RAN#94	R5-218302	1403	1	F	Addition of new test case 6.4E.2.4.2 In-band emissions for V2X / con-current operation	17.3.0
2021-12	RAN#94	R5-218303	1404	1	F	Addition of new test case 6.4E.2.5.1 EVM equalizer spectrum flatness for V2X / non-concurrent operation	17.3.0
2021-12	RAN#94	R5-218304	1405	1	F	Addition of new test case 6.4E.2.5.1D EVM equalizer spectrum flatness for V2X / non-concurrent operation / SL-MIMO	17.3.0
2021-12	RAN#94	R5-218305	1406	1	F	Addition of new test case 6.4E.2.5.2 EVM equalizer spectrum flatness for V2X / con-current operation	17.3.0
2021-12	RAN#94	R5-218362	1397	1	F	Updates to A-MPR test case for n24 and n99	17.3.0

2021-12	RAN#94	R5-218363	1398	1	F	Updates to additional spurious emission test case for n24 and n99	17.3.0
2021-12	RAN#94	R5-218365	1467	1	F	Update of R17 CADC configurations into TS38.521-1 clause 5	17.3.0
2021-12	RAN#94	R5-218373	1425	1	F	Update of MOP test cases for PC2 CA_n3A-n78A with UL CA_n3A-n78A	17.3.0
2021-12	RAN#94	R5-218379	1380	1	F	Update of PC1.5 n41 MOP test requirement	17.3.0
2021-12	RAN#94	R5-218380	1381	1	F	Adding Power Class 1.5 for NR Band n79 MOP	17.3.0
2021-12	RAN#94	R5-218381	1382	1	F	Introduction of PC1.5 n79 MOP for UL MIMO	17.3.0
2021-12	RAN#94	R5-218382	1383	1	F	Introduction of PC1.5 n79 MPR	17.3.0
2021-12	RAN#94	R5-218383	1384	1	F	Introduction of PC2 n34 MOP	17.3.0
2021-12	RAN#94	R5-218384	1385	1	F	Introduction of PC2 n34 MOP for UL MIMO	17.3.0
2021-12	RAN#94	R5-218385	1386	1	F	Introduction of PC2 n34 MPR	17.3.0
2021-12	RAN#94	R5-218386	1387	1	F	Introduction of PC2 n39 MOP	17.3.0
2021-12	RAN#94	R5-218387	1388	1	F	Introduction of PC2 n39 MOP for UL MIMO	17.3.0
2021-12	RAN#94	R5-218388	1389	1	F	Introduction of PC2 n39 MPR	17.3.0
2021-12	RAN#94	R5-218389	1390	1	F	Introduction of PC2 n39 A-MPR for NS_50	17.3.0
2021-12	RAN#94	R5-218411	1468	1	F	Introduction of NR-U A-MPR test case	17.3.0
2021-12	RAN#94	R5-218416	1409	1	F	Clarifications on additional UE co-ex requirements for 2 Band UL CA	17.3.0
2021-12	RAN#94	R5-218417	1429	1	F	Update of 6.2.2 for UE maximum output power reduction	17.3.0
2021-12	RAN#94	R5-218418	1430	1	F	Update of 6.2.3.3.28 for alignment of NS_56 with RAN4 specification	17.3.0
2021-12	RAN#94	R5-218419	1444	1	F	Update to test case Transmit ON/OFF time mask for UL MIMO	17.3.0
2021-12	RAN#94	R5-218420	1445	1	F	Updating test applicability to FR1 test cases	17.3.0
2021-12	RAN#94	R5-218421	1465	1	F	Update of A-MPR NS_04 for band n41	17.3.0
2021-12	RAN#94	R5-218422	1476	1	F	38.521-1_Corrections of test cases having impact on ETSI EN 301 908 25	17.3.0
2021-12	RAN#94	R5-218423	1435	1	F	Updating 7.3A.2 Reference sensitivity for CA_n1A-n78A-n79A	17.3.0
2021-12	RAN#94	R5-218456	1434	1	F	Addition of UE co-existence requirements for band n40 to TS 38.521-1	17.3.0
2021-12	RAN#94	R5-218457	1449	1	F	Updating 6.2A.2 MPR for CA test case for intra-band UL CA	17.3.0
2021-12	RAN#94	R5-218458	1451	1	F	Updating 6.3A.4.1 Absolute power tolerance for intra-band CA	17.3.0
2021-12	RAN#94	R5-218459	1454	1	F	Updating 6.5A.1.1 Occupied bandwidth for CA	17.3.0
2021-12	RAN#94	R5-218471	1462	1	F	Addition of CA_n1A-n3A into TC 7.3A Reference sensitivity for CA	17.3.0
2021-12	RAN#94	R5-218476	1424	1	F	Update of MOP test cases for PC2 CA_n1A-n78A with UL CA_n1A-n78A	17.3.0
2021-12	RAN#94	R5-218477	1394	1	F	PC1.5 MPR n77 n78	17.3.0
2021-12	RAN#94	R5-218478	1395	1	F	PC1.5 MOP n77 n78	17.3.0
2021-12	RAN#94	R5-218481	1414	1	F	Introduction of new test case 6.4.2.1a	17.3.0
2022-03	RAN#95	R5-220071	1481	-	F	Addition of Test description and Test requirement for 6.3A.2.1 Transmit OFF power for 2UL CA	17.4.0
2022-03	RAN#95	R5-220072	1482	-	F	Correction of Table number in step 4 of 6.3A.4.2.1.4.1	17.4.0
2022-03	RAN#95	R5-220073	1483	-	F	Correction of Test SCS in Table 6.2D.2.4.1-1	17.4.0
2022-03	RAN#95	R5-220074	1484	-	F	Addition of missing clause titles for 6.5B, 6.5D.2_1.4 and 6.5D.2_1.4.1	17.4.0
2022-03	RAN#95	R5-220075	1485	-	F	Correction of clause title styles	17.4.0
2022-03	RAN#95	R5-220076	1486	-	F	Correction of Test SCS in Table 7.3C.2.4.1-1	17.4.0
2022-03	RAN#95	R5-220077	1487	-	F	Correction of style in Table 7.4D.4.1-1	17.4.0
2022-03	RAN#95	R5-220078	1488	-	F	Correction of Test frequency in Table 7.6C.3_1.1.4.1-1	17.4.0
2022-03	RAN#95	R5-220080	1489	-	F	Adding additional tolerance to test requirement of Transmitter power test cases	17.4.0
2022-03	RAN#95	R5-220081	1490	-	F	Removal of Editor note about PC1 requirements in Rel-15 and Rel-16	17.4.0
2022-03	RAN#95	R5-220082	1491	-	F	Correction of table numbers in 7.6C.2_1.1 and 7.6C.3_1.1	17.4.0

2022-03	RAN#95	R5-220084	1493	-	F	Introduction of new V2X test cases in 7.6E	17.4.0
2022-03	RAN#95	R5-220086	1495	-	F	Introduction of new V2X test cases in 7.8E	17.4.0
2022-03	RAN#95	R5-220138	1497	-	F	Update test requirements of PC2 n34 MOP for UL MIMO	17.4.0
2022-03	RAN#95	R5-220139	1498	-	F	Update test requirements of PC2 n39 MOP for UL MIMO	17.4.0
2022-03	RAN#95	R5-220249	1510	-	F	Corrected REFSENS reference in SUL Frequency error test	17.4.0
2022-03	RAN#95	R5-220250	1511	-	F	Correction of test requirements in spurious test 7.7D	17.4.0
2022-03	RAN#95	R5-220251	1512	-	F	DL RMC correction for TDD SCS 60kHz	17.4.0
2022-03	RAN#95	R5-220252	1513	-	F	Editorial correction to minimum requirements in test 6.2D.2	17.4.0
2022-03	RAN#95	R5-220253	1514	-	F	General corrections in FR1 6.3A.3.1 ONOFF time mask CA	17.4.0
2022-03	RAN#95	R5-220254	1515	-	F	Frequency correction for NS_27 in A-MPR test	17.4.0
2022-03	RAN#95	R5-220255	1516	-	F	n71 IBNC - UL allocation correction for testing REFSENS without exceptions	17.4.0
2022-03	RAN#95	R5-220273	1518	-	F	Clarifications on 5G NR connectivity options for RF FR1	17.4.0
2022-03	RAN#95	R5-220280	1520	-	F	Update CA configurations for CA_n41A-n79A BCS1	17.4.0
2022-03	RAN#95	R5-220349	1522	-	F	Adding NR bands for UL MIMO in FR1	17.4.0
2022-03	RAN#95	R5-220362	1527	-	F	Introduction of CA_n7A-n78A reference sensitivity test requirements	17.4.0
2022-03	RAN#95	R5-220537	1531	-	F	Correction on test procedure and initial condition for power tolerance test cases	17.4.0
2022-03	RAN#95	R5-220639	1532	-	F	Editorial, correction of clause numbering in test case 6.5D.2.4.1	17.4.0
2022-03	RAN#95	R5-220752	1536	-	F	Updating on additional UE co-ex requirements for 2 Band UL CA	17.4.0
2022-03	RAN#95	R5-220753	1537	-	F	Updating on n74 co-existence for TS 38.521-1	17.4.0
2022-03	RAN#95	R5-220870	1547	-	F	Updating MOP and Configured Tx Power TCs for CA_n24A-n41A	17.4.0
2022-03	RAN#95	R5-220871	1548	-	F	Updating MOP and Configured Tx Power TCs for CA_n24A-n48A	17.4.0
2022-03	RAN#95	R5-220872	1549	-	F	Updating MOP and Configured Tx Power TCs for CA_n24A-n77A	17.4.0
2022-03	RAN#95	R5-220873	1550	-	F	Updating reference sensitivity test requirement for CA combination of n24 and n41	17.4.0
2022-03	RAN#95	R5-220874	1551	-	F	Updating Delta_RIB_c and reference sensitivity test requirement for CA combination of n24 and n48	17.4.0
2022-03	RAN#95	R5-220893	1558	-	F	Correction to test procedure of SRS time mask	17.4.0
2022-03	RAN#95	R5-220899	1560	-	F	Correction to test requirement of NS_27 in 6.2.3	17.4.0
2022-03	RAN#95	R5-220900	1561	-	F	Correction to test requirement of NS_47 in 6.2.3	17.4.0
2022-03	RAN#95	R5-220905	1563	-	F	Correction to test CBW for Non-SUL carrier in 6.4C.2.2	17.4.0
2022-03	RAN#95	R5-220906	1564	-	F	Correction to test requirement of 6.5C.3.2	17.4.0
2022-03	RAN#95	R5-220914	1566	-	F	Correction to RMC for PUCCH format 1 test cases	17.4.0
2022-03	RAN#95	R5-220915	1567	-	F	Correction to connection diagram and test configuration for Tx SUL test cases	17.4.0
2022-03	RAN#95	R5-220919	1568	-	F	Correction to transmission slot in SRS time mask test case	17.4.0
2022-03	RAN#95	R5-221046	1570	-	F	Addition of 6.5.2.3 on new CBW to A-SEM for NS_04	17.4.0
2022-03	RAN#95	R5-221051	1571	-	F	Correction of 6.2A.1 for UE maximum output power for CA	17.4.0
2022-03	RAN#95	R5-221052	1572	-	F	Correction of 6.2A.2 on UE MPR for CA	17.4.0
2022-03	RAN#95	R5-221106	1573	-	F	Correcting test applicabilities for MIMO test cases	17.4.0
2022-03	RAN#95	R5-221107	1574	-	F	Correcting to NR test case 6.2A.1 MOP for CA	17.4.0
2022-03	RAN#95	R5-221109	1576	-	F	Updating test case 6.2.3 AMPR for NS_03 and NS_03U	17.4.0
2022-03	RAN#95	R5-221113	1577	-	F	Updating General Spurious testing for CA_n41A-n79A	17.4.0
2022-03	RAN#95	R5-221114	1578	-	F	Updating A-MPR for CA testing for CA_n41A-n79A	17.4.0
2022-03	RAN#95	R5-221116	1579	-	F	Updating minimum requirements for test case 6.2.3 AMPR	17.4.0
2022-03	RAN#95	R5-221117	1580	-	F	Updating test case Additional spurious emissions for NS_46	17.4.0
2022-03	RAN#95	R5-221119	1582	-	F	Updating UTRA ACLR for UL MIMO Rel-16 onward for NS_100	17.4.0
2022-03	RAN#95	R5-221120	1583	-	F	Updating Additional spurious emissions for UL MIMO Rel-16 onward for several bands	17.4.0
2022-03	RAN#95	R5-221121	1584	-	F	Updating 6.1A for intra-band contiguous CA Outer1 RB allocation	17.4.0

2022-03	RAN#95	R5-221122	1585	-	F	Updating test case 6.2A.2 MPR for intra-band non-contiguous CA	17.4.0
2022-03	RAN#95	R5-221128	1588	-	F	Updating FR1 Spectrum emission mask for intra-band CA test case	17.4.0
2022-03	RAN#95	R5-221130	1589	-	F	Updating Relative power control tolerance testing for intra-band CA	17.4.0
2022-03	RAN#95	R5-221198	1591	-	F	Addition of CBW 70MHz into TC 6.5D	17.4.0
2022-03	RAN#95	R5-221200	1592	-	F	Addition of CBW 70MHz into Rx TCs	17.4.0
2022-03	RAN#95	R5-221209	1593	-	F	Updating MPR minimum requirement for NR band n97	17.4.0
2022-03	RAN#95	R5-221244	1596	-	F	Addition of CA_n1A-n3A into TC 6.2A	17.4.0
2022-03	RAN#95	R5-221266	1604	-	F	Correction of in-band emissions test cases	17.4.0
2022-03	RAN#95	R5-221267	1605	-	F	Correction of SRS time mask test case	17.4.0
2022-03	RAN#95	R5-221322	1606	-	F	Update for 6.5C.3.3 Additional spurious emissions for SUL	17.4.0
2022-03	RAN#95	R5-221339	1610	-	F	A-MPR updates for n77	17.4.0
2022-03	RAN#95	R5-221361	1613	-	F	Editorial update within channel raster section	17.4.0
2022-03	RAN#95	R5-221675	1480	1	F	Correction of test applicability of A-MPR	17.4.0
2022-03	RAN#95	R5-221676	1528	1	F	Alignment of test points of ACLR with MPR	17.4.0
2022-03	RAN#95	R5-221677	1539	1	F	Corrections of Tx TCs having impact on ETSI EN 301 908-25	17.4.0
2022-03	RAN#95	R5-221678	1557	1	F	Correction to note of general spurious emissions	17.4.0
2022-03	RAN#95	R5-221679	1559	1	F	Correction to test requirement of 6.2.4	17.4.0
2022-03	RAN#95	R5-221680	1562	1	F	Correction to measurement timing for inter-band CA with FDD and TDD	17.4.0
2022-03	RAN#95	R5-221681	1565	1	F	Editorial correction to SUL test cases	17.4.0
2022-03	RAN#95	R5-221682	1607	1	F	Editorial correction to clause 6.5.3.2 and 6.5.3.3	17.4.0
2022-03	RAN#95	R5-221683	1541	1	F	Update to statistical testing	17.4.0
2022-03	RAN#95	R5-221684	1603	1	F	Correction to FR1 UL RMCs	17.4.0
2022-03	RAN#95	R5-221758	1509	1	F	Update Spurious emissions for UE co-existence for CA_n3A-n41A	17.4.0
2022-03	RAN#95	R5-221759	1517	1	F	Update Spurious emissions for UE co-existence for CA_n41A-n79A	17.4.0
2022-03	RAN#95	R5-221760	1508	1	F	Update Reference sensitivity test case for CA_n3A-n41A	17.4.0
2022-03	RAN#95	R5-221761	1526	1	F	Introduction of CA_n5A-n78A reference sensitivity test requirements	17.4.0
2022-03	RAN#95	R5-221762	1538	1	F	Introduction of CA_n5A-n7A and CA_n7A_n78A maximum output power test requirements	17.4.0
2022-03	RAN#95	R5-221763	1611	1	F	MSD test configurations modification for US inter-band CA combinations with n77	17.4.0
2022-03	RAN#95	R5-221764	1507	1	F	Update operating bands and CA configurations for CA_n3A-n41A	17.4.0
2022-03	RAN#95	R5-221765	1553	1	F	General updates of clause 5 for R16 CADC configurations	17.4.0
2022-03	RAN#95	R5-221788	1597	1	F	New channel bandwidth for n25. UL-MIMO.	17.4.0
2022-03	RAN#95	R5-221789	1602	1	F	Addition of CBHWs 25 MHz, 30 MHz, 40 MHz for n25	17.4.0
2022-03	RAN#95	R5-221790	1598	1	F	New channel bandwidth for n25. refsens and UL-MIMO	17.4.0
2022-03	RAN#95	R5-221791	1540	1	F	General updates of clause 5 for R16 new CBW configurations	17.4.0
2022-03	RAN#95	R5-221794	1581	1	F	Updating test case AMPR for MIMO	17.4.0
2022-03	RAN#95	R5-221795	1586	1	F	Updating Absolute power tolerance for intra-band non-contiguous CA	17.4.0
2022-03	RAN#95	R5-221796	1587	1	F	Updating FR1 ACLR for intra-band CA test case	17.4.0
2022-03	RAN#95	R5-221817	1492	1	F	Introduction of new V2X test cases in 6.3E.2	17.4.0
2022-03	RAN#95	R5-221818	1542	1	F	Update to NR V2X test cases with non-concurrent operation	17.4.0
2022-03	RAN#95	R5-221819	1543	1	F	Addition of 6.2E.2.2 MPR for concurrent operation	17.4.0
2022-03	RAN#95	R5-221820	1494	1	F	Introduction of new V2X test cases in 7.7E	17.4.0
2022-03	RAN#95	R5-221870	1601	1	F	Update of R17 new CBW 45M into refsense TC	17.4.0
2022-03	RAN#95	R5-221877	1519	1	F	Update of R17 NR inter-band CA Tx requirements within FR1	17.4.0
2022-03	RAN#95	R5-221878	1521	1	F	Update of R17 NR inter-band CA Rx requirements within FR1	17.4.0

2022-03	RAN#95	R5-221879	1552	1	F	Updating Delta_RIB_c and reference sensitivity test requirement for CA combination of n24 and n77	17.4.0
2022-03	RAN#95	R5-221880	1569	1	F	Addition of several CA combinations to Reference Sensitivity test case	17.4.0
2022-03	RAN#95	R5-221881	1554	1	F	General updates of clause 5 for R17 CADC configurations	17.4.0
2022-03	RAN#95	R5-221882	1590	1	F	Updating clause 5.2C for R17 SUL configurations	17.4.0
2022-03	RAN#95	R5-221894	1599	1	F	Introduction of NR-U OFF power test case	17.4.0
2022-03	RAN#95	R5-221895	1600	1	F	Introduction of NR-U General ON/OFF time mask test case	17.4.0
2022-03	RAN#95	R5-221896	1529	1	F	Update of MOP test cases for PC2 CA_n1A-n78A with UL CA_n1A-n78A	17.4.0
2022-03	RAN#95	R5-221897	1530	1	F	Update of MOP test cases for PC2 CA_n3A-n78A with UL CA_n3A-n78A	17.4.0
2022-03	RAN#95	R5-221898	1534	1	F	Update superscripts of power class for inter-band CA	17.4.0
2022-03	RAN#95	R5-221899	1535	1	F	Update MOP for 2 bands DL and 1 band UL CA	17.4.0
2022-03	RAN#95	R5-221900	1594	1	F	Update MOP for Intra-band contiguous CA	17.4.0
2022-03	RAN#95	R5-221901	1595	1	F	Update MOP for Intra-band non-contiguous CA	17.4.0
2022-03	RAN#95	R5-221902	1505	1	F	Update UL CA configurations for PC2 and PC1.5 CA_n41C	17.4.0
2022-03	RAN#95	R5-221903	1506	1	F	Update configuration for PC2 CA_n3A-n41A	17.4.0
2022-03	RAN#95	R5-221904	1502	1	F	Update NR ACLR test case for PC1.5	17.4.0
2022-03	RAN#95	R5-221905	1496	1	F	Update TC Frequency Error for DSS	17.4.0
2022-03	RAN#95	R5-221906	1499	1	F	Update TC Frequency Error for UL MIMO for DSS	17.4.0
2022-03	RAN#95	R5-221907	1500	1	F	Update TC Frequency Error for CA for DSS	17.4.0
2022-03	RAN#95	R5-221912	1609	1	F	Update for 6.4.2.1a EVM including symbols with transient period	17.4.0
2022-03	RAN#95	R5-221930	1575	1	F	Updating message contents for REFSENS for 2DL CA exceptions testing	17.4.0
2022-06	RAN#96	R5-222174	1616	-	F	Correction to n46 ARFCN	17.5.0
2022-06	RAN#96	R5-222200	1617	-	F	Removing the empty space in the table number of Table 7.3.2.3-1a and correct the style of table title of Table 7.3.2.3-1b	17.5.0
2022-06	RAN#96	R5-222201	1618	-	F	Correction of test metric of out of band emission for UL MIMO	17.5.0
2022-06	RAN#96	R5-222202	1619	-	F	Correction of Test Environment in Table 6.5A.2.2.1.4.1-2	17.5.0
2022-06	RAN#96	R5-222203	1620	-	F	Correction of test applicability of 6.4.2.5	17.5.0
2022-06	RAN#96	R5-222204	1621	-	F	Moving test requirement of 6.3E.1.1D to the correct section and correction of style of some table notes	17.5.0
2022-06	RAN#96	R5-222205	1622	-	F	Correction of clause style in 6.2E.2.2	17.5.0
2022-06	RAN#96	R5-222206	1623	-	F	Removing FFS for the test configuration table in 6.2E.1.1.4.1	17.5.0
2022-06	RAN#96	R5-222241	1629	-	F	Update Spurious emissions for UE co-existence for CA_n41C	17.5.0
2022-06	RAN#96	R5-222310	1631	-	F	Introduction of Transmitter power for NR-DC	17.5.0
2022-06	RAN#96	R5-222311	1632	-	F	Introduction of UE maximum output power reduction for NR-DC	17.5.0
2022-06	RAN#96	R5-222312	1633	-	F	Introduction of UE additional maximum output power reduction for NR-DC	17.5.0
2022-06	RAN#96	R5-222313	1634	-	F	Introduction of Configured output power for inter-band NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-222327	1648	-	F	Editorial correction for references to Table 5.5A.3-1	17.5.0
2022-06	RAN#96	R5-222331	1649	-	F	FR1 - 6.5A.3.2 - Spurious for co-existence - correction for CA_n41-n79	17.5.0
2022-06	RAN#96	R5-222334	1652	-	F	Reference correction in test case 6.5C.4	17.5.0
2022-06	RAN#96	R5-222335	1653	-	F	Correction of min value for A-MPR - FR1 - NS_44 - Test ID 17	17.5.0
2022-06	RAN#96	R5-222336	1654	-	F	Replace n79C by n77C in test case 6.2A.2.1	17.5.0
2022-06	RAN#96	R5-222337	1655	-	F	Editorial correction in Test IDs in FR1 test case 7.5A.2	17.5.0
2022-06	RAN#96	R5-222338	1656	-	F	Corrections for n50 and n79 in FR1 test case 7.3.2	17.5.0
2022-06	RAN#96	R5-222339	1657	-	F	Editorial corrections for FR1 in annex F.1.2	17.5.0
2022-06	RAN#96	R5-222351	1659	-	F	Update of reference sense test case 7.3.2 for n48 and CWBs 30 and 70 MHz	17.5.0

2022-06	RAN#96	R5-222352	1660	-	F	Update of reference sense test case 7.3.2 for n2 and CWBs 25 30 and 40 MHz	17.5.0
2022-06	RAN#96	R5-222353	1661	-	F	Update of reference sense test case 7.3.2 for n5 and CWB 25 MHz	17.5.0
2022-06	RAN#96	R5-222354	1662	-	F	Introducing CBW 70 MHz for Default Downlink Power levels in Annex C	17.5.0
2022-06	RAN#96	R5-222355	1663	-	F	Introducing CBW 30 MHz for Characteristics of the Interfering Signalling in Annex D	17.5.0
2022-06	RAN#96	R5-222356	1664	-	F	Introducing CBW 70 MHz for Characteristics of the Interfering Signalling in Annex D	17.5.0
2022-06	RAN#96	R5-222448	1667	-	F	Editorial correction of REFSENS test case 7.3.2	17.5.0
2022-06	RAN#96	R5-222450	1669	-	F	Correction of REFSENS test case for n66 and CBW 25 and 30 MHz	17.5.0
2022-06	RAN#96	R5-222481	1671	-	F	Correction to EVM measurement point for DFTs-OFDM DM-RS Type 2	17.5.0
2022-06	RAN#96	R5-222540	1674	-	F	Correction of REFSENS test case for n66 and CBW 40 MHz	17.5.0
2022-06	RAN#96	R5-222571	1676	-	F	Addition of reference sensitivity test for several CA combinations	17.5.0
2022-06	RAN#96	R5-222655	1678	-	F	Addition of UE co-existence requirements for band n18 to TS 38.521-1	17.5.0
2022-06	RAN#96	R5-222664	1682	-	F	General updates of clause 5 for R17 new CBW configurations	17.5.0
2022-06	RAN#96	R5-222683	1693	-	F	Update of R17 CADC configurations into refsense TC	17.5.0
2022-06	RAN#96	R5-222738	1696	-	F	Update 7.3F.2 Ref sensitivity power level	17.5.0
2022-06	RAN#96	R5-222739	1697	-	F	Introduction of 7.6F.2 IBB for NR_U	17.5.0
2022-06	RAN#96	R5-222745	1700	-	F	Update 6.5.3.2 Spurious emissions for UE co-existence	17.5.0
2022-06	RAN#96	R5-222746	1701	-	F	Introduction of ACS for NR_U	17.5.0
2022-06	RAN#96	R5-222808	1703	-	F	Correction of A-MPR regions for NS_46	17.5.0
2022-06	RAN#96	R5-222857	1706	-	F	Updates of clause 5 for R15 bands and CBW configurations	17.5.0
2022-06	RAN#96	R5-222873	1707	-	F	Aligning test case Occupied bandwidth for UL MIMO with the latest work plan version	17.5.0
2022-06	RAN#96	R5-222930	1719	-	F	Update of the definition of uplink RB allocation for power class 1.5 UE	17.5.0
2022-06	RAN#96	R5-222939	1720	-	F	Aligning test case 6.5D.2.4.1 NR ACLR for UL MIMO with the latest work plan version	17.5.0
2022-06	RAN#96	R5-222955	1722	-	F	Aligning test case 6.5D.2.4.2 UTRA ACLR for UL MIMO with the latest work plan version	17.5.0
2022-06	RAN#96	R5-222975	1723	-	F	Addition of CA_n1A-n8A into MOP TC	17.5.0
2022-06	RAN#96	R5-222993	1724	-	F	Corrections of DCI format for Tx TCs having impact on ETSI EN 301 908-25	17.5.0
2022-06	RAN#96	R5-222997	1725	-	F	Removal of brackets for DCI for Rx test cases	17.5.0
2022-06	RAN#96	R5-223018	1727	-	F	Update of Annex F for UL MIMO test cases	17.5.0
2022-06	RAN#96	R5-223022	1728	-	F	Addition of CA_n1A-n8A into Refsens TC	17.5.0
2022-06	RAN#96	R5-223124	1731	-	F	Updating minimum requirement for 7.6A.3 OOB for CA testing	17.5.0
2022-06	RAN#96	R5-223130	1734	-	F	Updating almost contiguous RB allocation for 45MHz CBW	17.5.0
2022-06	RAN#96	R5-223133	1736	-	F	Updating Additional spurious emissions for NS_48 for 45MHz CBW	17.5.0
2022-06	RAN#96	R5-223134	1737	-	F	Updating test case 6.3.1 Minimum output power for CBW 45MHz	17.5.0
2022-06	RAN#96	R5-223135	1738	-	F	Updating transmit ON_OFF time mask test case for 45MHz CBW	17.5.0
2022-06	RAN#96	R5-223136	1739	-	F	Updating test case 7.4 Maximum input level for new Rel-17 CBWs	17.5.0
2022-06	RAN#96	R5-223137	1740	-	F	Updating 6.3D.1 Minimum output power for UL MIMO for 45MHz CBW	17.5.0
2022-06	RAN#96	R5-223138	1741	-	F	Updating transmit ON_OFF time mask for MIMO test case for 45MHz CBW	17.5.0

2022-06	RAN#96	R5-223159	1746	-	F	Update TC 6.5.3.3 Additional spurious emissions for PC2 n39	17.5.0
2022-06	RAN#96	R5-223198	1748	-	F	Addition of redcap requirement into sub-clause 7.1 and 7.2	17.5.0
2022-06	RAN#96	R5-223655	1753	1	F	Introduction of test specifications for additional Rel-16 CA combos to Clause 6	17.5.0
2022-06	RAN#96	R5-223656	1650	1	F	Test procedure correction in FR1 CA test case 7.6A.4.3	17.5.0
2022-06	RAN#96	R5-223657	1721	1	F	General updates of clause 5 for R16 CADC configurations	17.5.0
2022-06	RAN#96	R5-223693	1750	1	F	Update test configuration table for NS_27 of A-MPR	17.5.0
2022-06	RAN#96	R5-223694	1694	1	F	Update of CBW 70MHz into refsens TC	17.5.0
2022-06	RAN#96	R5-223695	1692	1	F	General updates of clause 5 for R16 new CBW configurations	17.5.0
2022-06	RAN#96	R5-223697	1666	1	F	Corrections in message exceptions and test points for FR1 test case 6.3A.4.1.1	17.5.0
2022-06	RAN#96	R5-223698	1702	1	F	Update 6.5.3.2 Spur-emiss R16_17 for UE co-exist	17.5.0
2022-06	RAN#96	R5-223699	1732	1	F	Correction to NS_27 in test case AMPR for MIMO	17.5.0
2022-06	RAN#96	R5-223700	1651	1	F	Test procedure correction in FR1 CA test case 7.6A.4.2	17.5.0
2022-06	RAN#96	R5-223705	1726	1	F	Addition of spectrum emission mask testing for UL MIMO with ULFPTx	17.5.0
2022-06	RAN#96	R5-223729	1733	1	F	Updating RB allocation for CBW 45MHz	17.5.0
2022-06	RAN#96	R5-223730	1735	1	F	Updating AMPR test case for NS_48 for CBW 45MHz	17.5.0
2022-06	RAN#96	R5-223731	1658	1	F	Update of reference sense test case 7.3.2 for n41 and CWB 70 MHz	17.5.0
2022-06	RAN#96	R5-223734	1679	1	F	Updating General Spurious Emissions TC for CA_n24-n41	17.5.0
2022-06	RAN#96	R5-223735	1680	1	F	Updating General Spurious Emissions TCs for CA_n24-n48	17.5.0
2022-06	RAN#96	R5-223736	1681	1	F	Updating General Spurious Emissions TCs for CA_n24-n77	17.5.0
2022-06	RAN#96	R5-223737	1683	1	F	Updating Spurious emission for UE co-existence TC for CA_n24-n41	17.5.0
2022-06	RAN#96	R5-223738	1684	1	F	Updating Spurious emission for UE co-existence TC for CA_n24-n48	17.5.0
2022-06	RAN#96	R5-223739	1685	1	F	Updating Spurious emission for UE co-existence TC for CA_n24-n77	17.5.0
2022-06	RAN#96	R5-223740	1686	1	F	Updating AMPR TC for Rel-17 CA_n24-n41	17.5.0
2022-06	RAN#96	R5-223741	1687	1	F	Updating AMPR TC for Rel-17 CA_n24-n48	17.5.0
2022-06	RAN#96	R5-223742	1689	1	F	Updating AMPR TC for Rel-17 CA_n24-n77	17.5.0
2022-06	RAN#96	R5-223743	1690	1	F	General updates of clause 5 for R17 CADC configurations	17.5.0
2022-06	RAN#96	R5-223754	1695	1	F	Add MU and TT for 7.5F.1 and 7.6F.2	17.5.0
2022-06	RAN#96	R5-223756	1635	1	F	Introduction of Output power dynamics and Minimum output power for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223757	1636	1	F	Introduction of Transmit OFF power for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223758	1637	1	F	Introduction of Transmit ON/OFF time mask for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223759	1638	1	F	Introduction of Transmit signal quality and Frequency error for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223760	1639	1	F	Introduction of Error Vector Magnitude for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223761	1640	1	F	Introduction of Carrier leakage for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223762	1641	1	F	Introduction of In-band emissions for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223763	1642	1	F	Introduction of Output RF spectrum emissions and Occupied bandwidth for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223764	1643	1	F	Introduction of Out of band emission Spectrum emission mask for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223765	1644	1	F	Introduction of Adjacent channel leakage ratio for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223766	1645	1	F	Introduction of Spurious emission for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223767	1646	1	F	Introduction of Transmit intermodulation for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223768	1647	1	F	Introduction of NR-DC references to transmitter test requirements	17.5.0
2022-06	RAN#96	R5-223769	1630	1	F	Introduction of configuration DC_n48A-n70A for NR-DC in FR1	17.5.0
2022-06	RAN#96	R5-223770	1665	1	F	UL MIMO MOP requirements for PC1.5 in n77 and n78	17.5.0

2022-06	RAN#96	R5-223773	1625	1	F	Removal of PC1.5 from TC 6.2.1 MOP	17.5.0
2022-06	RAN#96	R5-223774	1626	1	F	Removal of PC1.5 from TC 6.2.2 MPR	17.5.0
2022-06	RAN#96	R5-223775	1627	1	F	Removal of PC1.5 from TC 6.2.3 A-MPR	17.5.0
2022-06	RAN#96	R5-223776	1628	1	F	Removal of PC1.5 from TC 6.5.2.4.1 ACLR	17.5.0
2022-06	RAN#96	R5-223777	1713	1	F	Addition of new test case 6.2G.1 maximum output power for Tx Diversity	17.5.0
2022-06	RAN#96	R5-223778	1714	1	F	Addition of new test case 6.2G.2 maximum output power reduction for Tx Diversity	17.5.0
2022-06	RAN#96	R5-223779	1715	1	F	Addition of new test case 6.2G.3 additional maximum output power reduction for Tx Diversity	17.5.0
2022-06	RAN#96	R5-223780	1716	1	F	Addition of new test case 6.5G.2.3 Adjacent channel leakage ratio for Tx Diversity	17.5.0
2022-06	RAN#96	R5-223781	1729	1	F	Introduce SRS IL for UE with NR TxD	17.5.0
2022-06	RAN#96	R5-223782	1718	1	F	Addition of Annex F for Tx Diversity test cases	17.5.0
2022-06	RAN#96	R5-223785	1709	1	F	Addition of Redcap MOP 6.2I.1	17.5.0
2022-06	RAN#96	R5-223786	1710	1	F	Addition of Redcap MPR 6.2I.2	17.5.0
2022-06	RAN#96	R5-223787	1711	1	F	Addition of Redcap AMPR 6.2I.3	17.5.0
2022-06	RAN#96	R5-223788	1712	1	F	Addition of Redcap configured output power 6.2I.4	17.5.0
2022-06	RAN#96	R5-223789	1704	1	F	Addition of Reference sensitivity TC for RedCap	17.5.0
2022-06	RAN#96	R5-223790	1705	1	F	Addition of redcap general requirement into clause 3-5	17.5.0
2022-06	RAN#96	R5-223804	1624	1	F	Moving additional tolerance in 6.2A.3.1.5 and 6.2D.3.5 to end of the section	17.5.0
2022-06	RAN#96	R5-223805	1670	1	F	Correction to time mask test cases	17.5.0
2022-06	RAN#96	R5-223806	1672	1	F	Correction to RB allocation and test requirement in 6.2.3	17.5.0
2022-06	RAN#96	R5-223807	1673	1	F	Correction to DCI format in 6.4.2.1	17.5.0
2022-06	RAN#96	R5-223809	1708	1	F	Update to MPR test requirements to remove ambiguity of T_LC	17.5.0
2022-06	RAN#96	R5-223810	1743	1	F	Correction to Test Channel Bandwidths for FR1 CA	17.5.0
2022-06	RAN#96	R5-223811	1744	1	F	Editorial correction to test requirement of Aggregate power tolerance for UL MIMO	17.5.0
2022-06	RAN#96	R5-223812	1752	1	F	Update 6.2.3 for additional maximum power reduction	17.5.0
2022-06	RAN#96	R5-223813	1675	1	F	Clarification of BCS in test configuration of CA test cases	17.5.0
2022-06	RAN#96	R5-223872	1698	1	F	Update 6.4.2.1a EVM including symbols with transient period	17.5.0
2022-06	RAN#96	R5-223873	1755	1	F	Update for 6.3.3.1 General clause of Tx ON-OFF time mask	17.5.0
2022-06	RAN#96	R5-223875	1699	2	F	Update AMPR for NS_04	17.5.0
2022-09	RAN#97	R5-224167	1757	-	F	Addition of NR-DC into symbols clause 3.2	17.6.0
2022-09	RAN#97	R5-224169	1758	-	F	Introduction of General spurious emissions requirements for CA_n48A-n70A	17.6.0
2022-09	RAN#97	R5-224170	1759	-	F	Introduction of Spurious emissions band UE co-existence Test configurations for CA_n48A-n70A	17.6.0
2022-09	RAN#97	R5-224171	1760	-	F	Introduction of Reference sensitivity for inter-band NR-DC in FR1	17.6.0
2022-09	RAN#97	R5-224172	1761	-	F	Introduction of Maximum input level for inter-band NR-DC in FR1	17.6.0
2022-09	RAN#97	R5-224173	1762	-	F	Introduction of Adjacent channel selectivity for inter-band NR-DC in FR1	17.6.0
2022-09	RAN#97	R5-224174	1763	-	F	Introduction of Blocking characteristics for inter-band NR-DC in FR1	17.6.0
2022-09	RAN#97	R5-224175	1764	-	F	Introduction of Spurious response for inter-band NR-DC in FR1	17.6.0
2022-09	RAN#97	R5-224176	1765	-	F	Introduction of Intermodulation characteristics for inter-band NR-DC in FR1	17.6.0
2022-09	RAN#97	R5-224177	1766	-	F	Introduction of Spurious emissions for inter-band NR-DC in FR1	17.6.0
2022-09	RAN#97	R5-224205	1767	-	F	Addition of 30 MHz ChBW to NS_27 for testing of A-MPR	17.6.0
2022-09	RAN#97	R5-224206	1768	-	F	Addition of 30 MHz ChBW for testing of NS_27 additional spectrum emission mask and spurious emissions	17.6.0
2022-09	RAN#97	R5-224222	1771	-	F	Update of A-SE for n39	17.6.0
2022-09	RAN#97	R5-224231	1772	-	F	Update Reference sensitivity exceptions for CA_n3A-n41A	17.6.0

2022-09	RAN#97	R5-224241	1776	-	F	Correction of additional tolerance to test requirement in 6.2F.1.5 and 6.2F.3.5	17.6.0
2022-09	RAN#97	R5-224242	1777	-	F	Adding additional tolerance to test requirement of TxD Transmitter power test cases	17.6.0
2022-09	RAN#97	R5-224243	1778	-	F	Correction of additional test points for asymmetric channel bandwidths in Rx test cases	17.6.0
2022-09	RAN#97	R5-224244	1779	-	F	Correction of Table 7.3F.2.4.1-1	17.6.0
2022-09	RAN#97	R5-224245	1780	-	F	Removing of n91, n92, n93 and n94 from 7.3I.2	17.6.0
2022-09	RAN#97	R5-224246	1781	-	F	Removing of n91, n92, n93 and n94 from 7.6.2	17.6.0
2022-09	RAN#97	R5-224274	1786	-	F	Update of MOP test case for UL CA_n1A-n78A	17.6.0
2022-09	RAN#97	R5-224289	1792	-	F	Updates of clause 5 for R15 bands and CBW configurations	17.6.0
2022-09	RAN#97	R5-224291	1793	-	F	7.3A.1_1 - Test requirements corrections	17.6.0
2022-09	RAN#97	R5-224292	1794	-	F	NS_15 minimum requirements missing in test case 6.5.3.3	17.6.0
2022-09	RAN#97	R5-224293	1795	-	F	Requirement correction for ON power in test 6.3D.3	17.6.0
2022-09	RAN#97	R5-224300	1802	-	F	7.3.2 - Test requirements corrections	17.6.0
2022-09	RAN#97	R5-224301	1803	-	F	General clean up in 38.521-1 annex F	17.6.0
2022-09	RAN#97	R5-224617	1808	-	F	Addition of test requirement for CA_n77C in 7.3A.1	17.6.0
2022-09	RAN#97	R5-224628	1811	-	F	Correction to interference values in Rx test cases	17.6.0
2022-09	RAN#97	R5-224765	1812	-	F	Update to 6.2D.3 to add AMPR NS_04 for ULFPTx	17.6.0
2022-09	RAN#97	R5-224767	1814	-	F	Update to 6.5D.2.3 to add A-SEM NS_04 for ULFPTx	17.6.0
2022-09	RAN#97	R5-224779	1815	-	F	Addition of 6.3G.1 Minimum output power for Tx Diversity	17.6.0
2022-09	RAN#97	R5-224780	1816	-	F	Addition of 6.3G.2 Transmit OFF power for Tx Diversity	17.6.0
2022-09	RAN#97	R5-224781	1817	-	F	Addition of 6.3G.3.1 General ON/OFF time mask for Tx Diversity	17.6.0
2022-09	RAN#97	R5-224782	1818	-	F	Addition of 6.3G.3.2 PRACH time mask for Tx Diversity	17.6.0
2022-09	RAN#97	R5-224783	1819	-	F	Addition of 6.3G.3.3 SRS time mask for Tx Diversity	17.6.0
2022-09	RAN#97	R5-224784	1820	-	F	Addition of 6.3G.4.2 Relative power tolerance for Tx Diversity	17.6.0
2022-09	RAN#97	R5-224785	1821	-	F	Addition of 6.3G.4.3 Aggregate power tolerance for Tx Diversity	17.6.0
2022-09	RAN#97	R5-224790	1826	-	F	Update of Annex F to add 6.3G and 6.4G new test cases	17.6.0
2022-09	RAN#97	R5-224811	1827	-	F	Addition of 6.3F.1 Minimum output power for NR-U	17.6.0
2022-09	RAN#97	R5-224812	1828	-	F	Addition of 6.4F.1 Frequency error for NR-U	17.6.0
2022-09	RAN#97	R5-224830	1832	-	F	Update configuration table of 6.5D.2.3 to refer to AMPR	17.6.0
2022-09	RAN#97	R5-224831	1833	-	F	Update to SEM for CA	17.6.0
2022-09	RAN#97	R5-224832	1834	-	F	Update to SEM for SUL	17.6.0
2022-09	RAN#97	R5-224834	1835	-	F	Update to MOP for CA to add CA_41C PC2	17.6.0
2022-09	RAN#97	R5-224835	1836	-	F	Update to MPR for CA to add CA_41C PC2	17.6.0
2022-09	RAN#97	R5-224837	1837	-	F	Update to configured output power for CA to add CA_41C PC2	17.6.0
2022-09	RAN#97	R5-224838	1838	-	F	Update to SEM for CA to add CA_41C PC2	17.6.0
2022-09	RAN#97	R5-224843	1840	-	F	Update to MOP to add PC2 TxD requirements for band n1 and n3	17.6.0
2022-09	RAN#97	R5-224857	1843	-	F	Addition of n3 CBW 35MHz, 45MHz into refsens	17.6.0
2022-09	RAN#97	R5-224874	1847	-	F	Updating A-MPR Test Case for CA_n24-n41	17.6.0
2022-09	RAN#97	R5-224875	1848	-	F	Updating A-MPR Test Case for CA_n24-n48	17.6.0
2022-09	RAN#97	R5-224876	1849	-	F	Updating A-MPR Test Case for CA_n24-n77	17.6.0
2022-09	RAN#97	R5-224885	1850	-	F	Correction of 6.5.3.3 for NS_14	17.6.0
2022-09	RAN#97	R5-224899	1852	-	F	Update IBB for NR-U	17.6.0
2022-09	RAN#97	R5-224900	1853	-	F	Adding OOB blocking for NR-U	17.6.0
2022-09	RAN#97	R5-224902	1854	-	F	Introduction of Spurious response for NR_U	17.6.0
2022-09	RAN#97	R5-224904	1855	-	F	Addition of Wide band Intermodulation for NR_U	17.6.0
2022-09	RAN#97	R5-224905	1856	-	F	Update TT for NR_U test cases	17.6.0
2022-09	RAN#97	R5-224935	1859	-	F	Corrections on requirements of A-MPR for NS_05 and NS_05U	17.6.0
2022-09	RAN#97	R5-224941	1860	-	F	Update of reference sensitivity power level for 3DL CA	17.6.0
2022-09	RAN#97	R5-224982	1863	-	F	Update of MOP TC to add PC2 requirements for band n1 and n3	17.6.0
2022-09	RAN#97	R5-225003	1865	-	F	Editorial correction to UTRA ACLR test cases	17.6.0

2022-09	RAN#97	R5-225011	1866	-	F	Add new test case 6.5G.3.1	17.6.0
2022-09	RAN#97	R5-225033	1869	-	F	Update to test coverage rules in FR1 SA RF tests	17.6.0
2022-09	RAN#97	R5-225058	1873	-	F	Addition of 4Rx for FDD band n8 into TC 7.3.2	17.6.0
2022-09	RAN#97	R5-225063	1874	-	F	Update MOP PC2 testing for CA_n41A-n79A	17.6.0
2022-09	RAN#97	R5-225064	1875	-	F	Updating test configurations for SUL test cases	17.6.0
2022-09	RAN#97	R5-225068	1877	-	F	Correction to AMPR test requirement for NS_04	17.6.0
2022-09	RAN#97	R5-225069	1878	-	F	Updating structure of clause 6.3C.3 Transmit ON/OFF time mask for SUL	17.6.0
2022-09	RAN#97	R5-225070	1879	-	F	Updating TT in Annex F for R15 time mask test cases	17.6.0
2022-09	RAN#97	R5-225071	1880	-	F	Updating test case 6.3.3.2 General ON/OFF time mask	17.6.0
2022-09	RAN#97	R5-225072	1881	-	F	Updating AMPR for NS_47 PC2 almost contiguous RB allocation testing	17.6.0
2022-09	RAN#97	R5-225078	1884	-	F	Updating MU and TT in Annex F for several time mask test cases	17.6.0
2022-09	RAN#97	R5-225079	1885	-	F	Updating Occupied bandwidth for 45MHz CBW	17.6.0
2022-09	RAN#97	R5-225080	1886	-	F	Updating Occupied bandwidth for UL MIMO for 45MHz CBW	17.6.0
2022-09	RAN#97	R5-225081	1887	-	F	Updating SRS time mask test case for 45MHz CBW	17.6.0
2022-09	RAN#97	R5-225082	1888	-	F	Updating Spectrum Emission Mask for 45MHz CBW	17.6.0
2022-09	RAN#97	R5-225083	1889	-	F	Updating Absolute power tolerance for 45MHz CBW	17.6.0
2022-09	RAN#97	R5-225084	1890	-	F	Updating Absolute power tolerance for UL MIMO for 45MHz CBW	17.6.0
2022-09	RAN#97	R5-225085	1891	-	F	Updating Relative power tolerance for 45MHz CBW	17.6.0
2022-09	RAN#97	R5-225086	1892	-	F	Updating Relative power tolerance for UL MIMO for 45MHz CBW	17.6.0
2022-09	RAN#97	R5-225089	1895	-	F	Adding new test case MOP for SUL with UL MIMO	17.6.0
2022-09	RAN#97	R5-225091	1896	-	F	Adding MU and TT for new SUL and UL MIMO test case	17.6.0
2022-09	RAN#97	R5-225113	1897	-	F	Correction for CA_n41A-n79A	17.6.0
2022-09	RAN#97	R5-225114	1898	-	F	Editorial correction of common uplink configuration	17.6.0
2022-09	RAN#97	R5-225168	1900	-	F	Updating ACLR for 45MHz CBW	17.6.0
2022-09	RAN#97	R5-225169	1901	-	F	Updating Maximum input level for UL MIMO for 45MHz CBW	17.6.0
2022-09	RAN#97	R5-225683	1858	1	F	Update of Refsens TC for RedCap UE in 7.3I	17.6.0
2022-09	RAN#97	R5-225687	1769	1	F	Update test procedure of MOP for TxD	17.6.0
2022-09	RAN#97	R5-225689	1770	1	F	Update test procedure of MOP	17.6.0
2022-09	RAN#97	R5-225702	1805	1	F	Updating Spurious emission for UE co-existence TC for CA_n2-n77, CA_n5-n77, CA_n66-n77	17.6.0
2022-09	RAN#97	R5-225703	1806	1	F	Update Rx Requirements for additional Rel-16 CA combos	17.6.0
2022-09	RAN#97	R5-225704	1902	1	F	General updates of clause 5 for R16 CADC configurations	17.6.0
2022-09	RAN#97	R5-225718	1756	1	F	Correction to UL Configuration for Band n14 REFSENS	17.6.0
2022-09	RAN#97	R5-225720	1851	1	F	Update 6.5.3 Spur-emiss R16_17	17.6.0
2022-09	RAN#97	R5-225721	1882	1	F	Adding ON/OFF time mask for Tx Uplink switching testing for SUL	17.6.0
2022-09	RAN#97	R5-225722	1883	1	F	Updating test case 6.3A.3.1_1 Time mask for switching between two uplink carriers	17.6.0
2022-09	RAN#97	R5-225723	1810	1	F	Correction to CA configuration in 7.4A.2	17.6.0
2022-09	RAN#97	R5-225728	1844	1	F	Addition of n8 CBW 35MHz into refsens	17.6.0
2022-09	RAN#97	R5-225729	1791	1	F	General updates of clause 5 for R17 new CBW configurations	17.6.0
2022-09	RAN#97	R5-225733	1845	1	F	Addition of TX spurious emissions test points for seven UL CA combinations	17.6.0
2022-09	RAN#97	R5-225734	1846	1	F	Addition many 4CA NR combinations to reference sensitivity test	17.6.0
2022-09	RAN#97	R5-225735	1868	1	F	General updates of clause 5 for R17 CADC configurations	17.6.0
2022-09	RAN#97	R5-225750	1829	1	F	Add PC2 test configuration and requirement table for n1 A-MPR	17.6.0
2022-09	RAN#97	R5-225751	1785	1	F	Introduction of REFSENS test requirements for PC2 UL CA_n1A-n78A	17.6.0
2022-09	RAN#97	R5-225753	1788	1	F	TxD MPR test requirements for PC 1.5 FWA UEs	17.6.0
2022-09	RAN#97	R5-225754	1790	1	F	UL MIMO MPR Tests for PC1.5 UEs	17.6.0
2022-09	RAN#97	R5-225756	1789	1	F	TxD A-MPR test requirements for NS_04	17.6.0

2022-09	RAN#97	R5-225757	1822	1	F	Addition of 6.4G.1 Frequency error for Tx Diversity	17.6.0
2022-09	RAN#97	R5-225758	1823	1	F	Addition of 6.4G.2.2 Carrier leakage for Tx Diversity	17.6.0
2022-09	RAN#97	R5-225759	1824	1	F	Addition of 6.4G.2.3 In-band emissions for Tx Diversity	17.6.0
2022-09	RAN#97	R5-225760	1825	1	F	Addition of 6.4G.2.4 EVM equalizer spectrum flatness for Tx Diversity	17.6.0
2022-09	RAN#97	R5-225761	1862	1	F	Add new test case 6.5G.1	17.6.0
2022-09	RAN#97	R5-225762	1867	1	F	Add new test case 6.5G.4	17.6.0
2022-09	RAN#97	R5-225763	1871	1	F	Updates to receiver requirements for TxD scenarios	17.6.0
2022-09	RAN#97	R5-225768	1864	1	F	Update of PC2 UE requirements for band n1 and n3 into TC 7.3.2	17.6.0
2022-09	RAN#97	R5-225784	1775	1	F	Correction of additional tolerance to test requirement of R15 Transmitter power test cases	17.6.0
2022-09	RAN#97	R5-225785	1782	1	F	Editorial correction to TC 6.5.3.3	17.6.0
2022-09	RAN#97	R5-225786	1787	1	F	Corrections to A-MPR test requirements for NS_04	17.6.0
2022-09	RAN#97	R5-225787	1796	1	F	Test procedure and requirement correction in OBW test 6.5D.1	17.6.0
2022-09	RAN#97	R5-225788	1831	1	F	Update to 6.2D.3 to align NS_04 test configuration with 6.2.3	17.6.0
2022-09	RAN#97	R5-225789	1876	1	F	Updating Additional emission test cases for NS_xxU	17.6.0
2022-09	RAN#97	R5-225790	1899	1	F	Correction of UL MIMO A-MPR test case	17.6.0
2022-09	RAN#97	R5-225791	1773	1	F	Addition of Operating bands in Table 5.2-1	17.6.0
2022-09	RAN#97	R5-225869	1809	1	F	Correction to EVM measurement point for DFTs-OFDM DM-RS Type 2	17.6.0
2022-10	RAN#97	R5-225687	1769	1	F	re-implementation of R5-225687 which was only partly according to latest spec	17.6.1