**3GPP TSG-RAN4 Meeting #114bis *R4-2504928***

**Wuhan, China, 07 - 11, April, 2025**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  | **38.133** | **CR** | - | **rev** | **1** | **Current version:** | **19.0.0** |  |
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| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **x** | Radio Access Network |  | Core Network |  |

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| ***Title:***  | Draft CR on core requirements maintenance for R19 ATG |
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| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_ATG\_enh-Core |  | ***Date:*** | 2025-04-11 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***Release:*** | Rel-19 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | In the release-19 ATG, the core part discussed the CA enhancement in RAN4 #114 meetings. The sharing factor between L1 measurement and RRM measurement needs to be updated and the conclusion shows as follows:**Agreement:** Agree on the following Proposal 1 for the intra-frequency measurement and L1-RSRP measurement, and apply the similar principle to other related requirements. * Proposal 1:
	+ The Klayer1\_measurement and Psharing factor in CA scenario should be updated as (NOTE: take the intra-frequency measurement and L1-RSRP measurement as an example):

For UE with the antenna array,* + - Klayer1\_measurement=1,
			* if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap are not fully overlapped by intra-frequency SMTC occasions, or
			* if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap are not fully overlapped by intra-frequency SMTC occasions [configured] by same serving cell when inter-band carrier aggregation within FR1 is configured [and UE doesn’t support capability of case 4] or
			* if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols, given that SSB-ToMeasure and SS-RSSI-Measurement are configured, where SSB symbols are indicated by the union set of SSB-ToMeasure from all the configured measurement objects on the same serving carrier which can be merged. and RSSI symbols are indicated by SS-RSSI-Measurement, or
			* if all of the reference signal configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap and fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the SSB symbols and the RSSI symbols, and 1 symbol before each consecutive SSB symbols and the RSSI symbols, and 1 symbol after each consecutive SSB symbols and the RSSI symbols [configured] by same serving cell when inter-band carrier aggregation within FR1 is configured [and UE doesn’t support capability of case 4], given that SSB-ToMeasure and SS-RSSI-Measurement are configured, where SSB symbols are indicated by the union set of SSB-ToMeasure from all the configured measurement objects on the same serving carrier which can be merged. and RSSI symbols are indicated by SS-RSSI-Measurement;
		- Klayer1\_measurement=1.5, otherwise.

For ATG UE with the antenna array, * + - P value for SSB resource to be measured is defined as
			* Ntotal / Navailable with Navailable > 0
			* Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0
			* For a window W of duration max(TL1, MGRP\_max), where MGRP\_max is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any SSB resource occasion:
			* Ntotal is the total number of SSB resource occasions within the window W, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and
			* Noutside\_MG is the number of SSB resource occasions that are not overlapped with any measurement gap occasion within the window W
			* Navailable is the number of SSB resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W, or not overlapped with any measurement gap occasion nor any SMTC occasion [configured] by same serving cell within the window W when inter-band carrier aggregation within FR1 is configured [and UE doesn’t support capability of case 4].
			* TL1 is periodicity of the target SSB
			* Psharing factor = 3.
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| ***Summary of change:*** | The changes are in following part:Introduce the Rel-19 ATG CA enhancement on RLM for TS38.133 |
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| ***Consequences if not approved:*** | The requirement for Rel-19 ATG CA enhancement for UE not support common beam capability is missing. |
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| ***Clauses affected:*** | 8.1D.2.2, 8.1D.3.2, 8.5D.2.2, 8.5D.3.2, 8.5D.5.2, 8.5D.6.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ... |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

### <Start of Change 1>

#### 8.1D.2.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last TEvaluate\_out\_SSB period becomes worse than the threshold Qout\_SSB within TEvaluate\_out\_SSB evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last TEvaluate\_in\_SSB period becomes better than the threshold Qin\_SSB within TEvaluate\_in\_SSB evaluation period.

TEvaluate\_out\_SSB and TEvaluate\_in\_SSB are defined in table 8.1D.2.2-1 for FR1.

For FR1 ATG UE with one or multiple omni-directional antenna(s),

- $P=\frac{1}{1-\frac{T\_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency or inter-frequency measurements, and these measurement gaps are overlapping with some but not all occasions of the SSB; and

- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR1 ATG UE with the antenna array,

- P value for an RLM-RS resource to be measured is defined as

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRPmax), where MGRPmax is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- Ntotal is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion of same serving cell within the window W if inter-band carrier aggregation within FR1 is configured [and UE doesn’t support capability of case 4],

- otherwise, the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W.

- TL1 is periodicity of the target RLM-RS.

- Psharing factor = 3.

### <End of Change 1>

### <Start of Change 2>

#### 8.1D.3.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last TEvaluate\_out\_CSI-RS period becomes worse than the threshold Qout\_CSI-RS within TEvaluate\_out\_CSI-RS evaluation period.

UE shall be able to evaluate whether the downlink radio link quality on the configured RLM-RS resource estimated over the last TEvaluate\_in\_CSI-RS period becomes better than the threshold Qin\_CSI-RS within TEvaluate\_in\_CSI-RS evaluation period.

- TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS are defined in table 8.1D.3.2-1 for FR1.

The requirements of TEvaluate\_out\_CSI-RS and TEvaluate\_in\_CSI-RS apply provided that the CSI-RS for RLM is not in a resource set configured with repetition ON. The requirements do not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for RLM and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR1 ATG UE with one or multiple omni-directional antenna(s),

- $P=\frac{1}{1-\frac{T\_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency or inter-frequency measurements, and these measurement gaps are overlapping with some but not all occasions of the CSI-RS; and

- P = 1, when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For FR1 ATG UE with the antenna array,

- P value for an RLM-RS resource to be measured is defined as

Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRPmax), where MGRPmax is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- Ntotal is the total number of RLM-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion of same serving cell within the window W if inter-band carrier aggregation within FR1 is configured [and UE doesn’t support capability of case 4],

- otherwise, the number of RLM-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W.

- TL1 is periodicity of the target RLM-RS

- Psharing factor = 3.

### <End of Change 2>

### <Start of Change 3>

#### 8.5D.2.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the configured SSB resource in set $\bar{q}\_{0}$ estimated over the last TEvaluate\_BFD\_SSB period becomes worse than the threshold Qout\_LR\_SSB within TEvaluate\_BFD\_SSB period.

The value of TEvaluate\_BFD\_SSB is defined in table 8.5D.2.2-1 for FR1.

For FR1 ATG UE with one or multiple omni-directional antenna(s),

- $P=\frac{1}{1-\frac{T\_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB.

- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR1 ATG UE with the antenna array,

- P value for an BFD-RS resource to be measured is defined as:

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRPmax), where MGRPmax is the maximum MGRP across all configured per-UE measurement gaps starting at the beginning of any BFD-RS resource occasion:

- Ntotal is the total number of BFD-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of BFD-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of BFD-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion of same serving cell within the window W if inter-band carrier aggregation within FR1 is configured [and UE doesn’t support capability of case 4],

- otherwise, the number of BFD-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W.

- TL1 is periodicity of the target BFD-RS

- Psharing factor = 3.

### <End of Change 3>

### <Start of Change 4>

#### 8.5D.3.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in set $\bar{q}\_{0}$ estimated over the last TEvaluate\_BFD\_CSI-RS period becomes worse than the threshold Qout\_LR\_CSI-RS within TEvaluate\_BFD\_CSI-RS period.

The value of TEvaluate\_BFD\_CSI-RS is defined in table 8.5D.3.2-1 for FR1.

The requirements of TEvaluate\_BFD\_CSI-RS apply provided that the CSI-RS for BFD is not in a resource set configured with repetition ON. The requirements shall not apply when the CSI-RS resource in the active TCI state of CORESET is the same CSI-RS resource for BFD and the TCI state information of the CSI-RS resource is not given, wherein the TCI state information means QCL Type-D to SSB for L1-RSRP or CSI-RS with repetition ON.

For FR1 ATG UE with one or multiple omni-directional antenna(s),

- $P=\frac{1}{1-\frac{T\_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS.

- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For FR1 ATG UE with the antenna array,

- P value for an BFD-RS resource to be measured is defined as:

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRPmax), where MGRPmax is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any RLM-RS resource occasion:

- Ntotal is the total number of BFD-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of BFD-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of BFD-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion of same serving cell within the window W if inter-band carrier aggregation within FR1 is configured [and UE doesn’t support capability of case 4],

- otherwise, the number of BFD-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W.

- TL1 is periodicity of the target BFD-RS.

- Psharing factor = 3.

### <End of Change 4>

### <Start of Change 5>

#### 8.5D.5.2 Minimum requirement

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured SSB resource in set $\bar{q}\_{1}$ estimated over the last TEvaluate\_CBD\_SSB period becomes better than the threshold Qin\_LR provided SSB\_RP and SSB Ês/Iot are according to annex B.2.4.1 for a corresponding band.

The UE shall monitor the configured SSB resources using the evaluation period in table 8.5D.5.2-1 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320 ms.

The value of TEvaluate\_CBD\_SSB is defined in table 8.5D.5.2-1 for FR1.

where,

For FR1 ATG UE with one or multiple omni-directional antenna(s),

- $P=\frac{1}{1-\frac{T\_{SSB}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the SSB,

- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the SSB.

For FR1 ATG UE with the antenna array,

- P value for an CBD-RS resource to be measured is defined as:

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRPmax), where MGRPmax is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any CBD-RS resource occasion:

- Ntotal is the total number of CBD-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of CBD-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of CBD-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion of same serving cell within the window W if inter-band carrier aggregation within FR1 is configured [and UE doesn’t support capability of case 4],

- otherwise, the number of CBD-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W.

- TL1 is periodicity of the target CBD-RS

- Psharing factor = 3.

### <End of Change 5>

### <Start of Change 6>

#### 8.5D.6.2 Minimum requirement

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set $\bar{q}\_{1}$ estimated over the last TEvaluate\_CBD\_CSI-RS period becomes better than the threshold Qin\_LR within TEvaluate\_CBD\_CSI-RS period provided CSI-RS Ês/Iot is according to annex B.2.4.2 for a corresponding band.

The UE shall monitor the configured CSI-RS resources using the evaluation period in table 8.5D.6.2-1 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320 ms.

The value of TEvaluate\_CBD\_CSI-RS is defined in table 8.5D.6.2-1 for FR1.

For FR1 ATG UE with one or multiple omni-directional antenna(s),

- $P=\frac{1}{1-\frac{T\_{CSI-RS}}{MGRP}}$, when in the monitored cell there are measurement gaps configured for intra-frequency, inter-frequency or inter-RAT measurements, which are overlapping with some but not all occasions of the CSI-RS; and

- P = 1 when in the monitored cell there are no measurement gaps overlapping with any occasion of the CSI-RS.

For FR1 ATG UE with the antenna array,

- P value for an CBD-RS resource to be measured is defined as:

- Psharing factor \* Ntotal / Noutside\_MG with Navailable = 0

- Ntotal / Navailable with Navailable > 0

- For a window W of duration max(TL1, MGRPmax), where MGRPmax is the maximum MGRP across all configured per-UE measurement gaps, and starting at the beginning of any CBD-RS resource occasion:

- Ntotal is the total number of CBD-RS resource occasions within the window, including those overlapped with measurement gap occasions or SMTC occasions within the window W, and

- Noutside\_MG is the number of CBD-RS resource occasions that are not overlapped with any measurement gap occasion within the window W

- Navailable is

- the number of CBD-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion of same serving cell within the window W if inter-band carrier aggregation within FR1 is configured [and UE doesn’t support capability of case 4],

- otherwise, the number of CBD-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion within the window W.

- TL1 is periodicity of the target CBD-RS

- Psharing factor = 3.

### <End of Change 6>

### <Start of Change 7>

####  8.1D.7.2 Scheduling availability of UE performing radio link monitoring with a different subcarrier spacing than PDSCH/PDCCH on FR1

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

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH or CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for radio link monitoring.

When intra-band carrier aggregation in FR1 is performed, the scheduling restrictions on FR1 serving PCell applies to all serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols.

When inter-band carrier aggregation within FR1 is performed, there are no scheduling restrictions on FR1 serving cell(s) in the bands due to radio link monitoring performed on FR1 serving PCell in different bands.

### <End of Change 7>

### <Start of Change 8>

#### 8.5D.8.2 Scheduling availability of UE performing L1-RSRP measurement with a different subcarrier spacing than PDSCH/PDCCH on FR1

For UEs which support *simultaneousRxDataSSB-DiffNumerology* [14] there are no restrictions on scheduling availability due to L1-RSRP measurement based on SSB as link recovery detection resource. For UEs which do not support *simultaneousRxDataSSB-DiffNumerology* [14] the following restrictions apply due to L1-RSRP measurement based on SSB configured as link recovery detection resource.

- The UE is not expected to transmit PUCCH, PUSCH or SRS or receive PDCCH, PDSCH, TRS, CSI-RS for tracking or CSI-RS for CQI on SSB symbols to be measured for L1-RSRP.

When intra-band carrier aggregation in FR1 is performed, the scheduling restrictions on FR1 serving PCell applies to all serving cells in the same band on the symbols that fully or partially overlap with the restricted symbols.

When inter-band carrier aggregation within FR1 is performed, there are no scheduling restrictions on FR1 serving cell(s) in the bands due to radio link monitoring performed on FR1 serving PCell in different bands.

### <End of Change 8>

### <Start of Change 9>

### 8.5D.10 Requirements for Beam Failure Recovery in SCell

The requirement in clause 8.5.9 shall apply.

### <End of Change 9>