**3GPP TSG-RAN WG4 Meeting # 116 *R4-25xxxxx***

Bengaluru, India, 25 August - 29 August, **2025**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | **DraftCR** | **rev** | **-** | **Current version:** | **19.1.0** |  |
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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:***  | DraftCR to update L1-CLI-RSSI measurement requirements |
|  |  |
| ***Source to WG:*** | CATT |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_duplex\_evo-Core |  | ***Date:*** | 2025-08-28 |
|  |  |  |  |  |
| ***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:*** | 1. To remove [ ] and align the SBFD IEs with RAN2.
2. Update the introduction part of L1-CLI-RSSI measurement requirements to explicitly describe the impacts of UE capability that whether UE can receive two DL subbands simoutanteously.
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| ***Summary of change:*** | 1. Remove [ ] and align the SBFD IEs with RAN2.
2. Update the introduction part of L1-CLI-RSSI measurement requirements to explicitly describe the impacts of UE capability that whether UE can receive two DL subbands simoutanteous.
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| ***Consequences if not approved:*** | This CR includes [ ] and the SBFD IEs are not aligned with RAN2. Besides, the impacts of UE capability that whether UE can receive two DL subbands simoutanteously on L1-CLI-RSSI measurement requirements are not clear.  |
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| ***Clauses affected:*** | 8.5.3.2,(New clause) 9.x.3.1. |
|  |  |
|  | **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:*** | N/A |
|  |  |
| ***This CR's revision history:*** | R4-2509305. |

<Start of Change 1>

8.5.3.2 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 8.5.3.2-1 or table 8.5.3.2-3 (deactivated PSCell) for FR1.

The value of TEvaluate\_BFD\_CSI-RS is defined in table 8.5.3.2-2 or table 8.5.3.2-4 (deactivated PSCell) for FR2 with N=1. 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 a UE supporting *concurrentMeasGapsPreMG-r18* and when concurrent measurement gap(s) with Pre-MG(s) are configured, or a UE supporting *concurrentMeasGapsNCSG-r18* and when concurrent measurement gap(s) with NCSG(s) are configured, or a UE supporting *concurrentMeasGap-r17* or *[musim-GapPreference-r17]* or both *concurrentMeasGap-r17* and *musim-GapPreference-r17,* and when concurrent gaps or periodic MUSIM gaps or both concurrent GAPs and periodic MUSIM gaps are configured,

- an CSI-RS resource occasion for beam failure detection is not considered to be overlapped by a gap occasion if the gap occasion is dropped according to clause 9.1.8 and 9.1.10,

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

- Ntotal / Noutside\_MG in FR1

- Psharing factor \* Ntotal / Noutside\_MG in FR2 with Navailable = 0

- Ntotal / Navailable in FR2 with Navailable> 0

- For a window W of duration max(TL1, xRP\_max), where xRP\_max is the maximum xRP across all configured per-UE measurement gaps or MUSIM gap(s) or NCSGs and per-FR measurement gaps or NCSGs, and, in case of Pre-MG, all activated per-UE measurement gaps and per-FR measurement gaps, within the same FR as serving cell, and starting at the beginning of any BFD-RS resource occasion:

- Ntotal is the total number of BFD-RS resource occasions within the window W, including those overlapped with GAP occasions, MUSIM 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 non-dropped GAP occasion nor non-dropped MUSIM gap occasion within the window W, and

- Navailable is the number of BFD-RS resource occasions that are not overlapped with any non-dropped GAP occasion nor non-dropped MUSIM gap occasion nor any SMTC occasion within the window W, and

- an CSI-RS resource occasion for beam failure detection is considered to be overlapped with the MUSIM gap if it overlaps a MUSIM gap occasion, and

 TL1 is periodicity of the target BFD-RS.

- xRP = MGRP when configured GAP is activated Pre-MG or MG, and xRP = VIRP when configured GAP is NCSG.

Otherwise, for a UE neither supporting *concurrentMeasGap-r17* nor *concurrentMeasGapsPreMG-r18* nor *concurrentMeasGapsNCSG-r18* nor supporting *musim-GapPreference-r17* or when neither of the above configurations applies, i.e. concurrent measurement gaps, concurrent measurement gap(s) with Pre-MG(s) and concurrent measurement gap(s) with NCSG(s), and periodic MUSIM gaps,For FR1,

For FR1,

- $P=\frac{1}{1-\frac{T\_{CSI-RS}}{xRP}}$, when in the monitored cell there are 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 GAPs overlapping with any occasion of the CSI-RS.

For FR2,

- P = 1, when the BFD-RS resource is not overlapped with GAP and also not overlapped with SMTC occasion.

- $P=\frac{1}{1-\frac{T\_{CSI-RS}}{xRP}}$, when the BFD-RS resource is partially overlapped with GAP and the BFD-RS resource is not overlapped with SMTC occasion (TCSI-RS < xRP)

- $P=\frac{1}{1-\frac{T\_{CSI-RS}}{T\_{SMTCperiod}}}$, when the BFD-RS resource is not overlapped with GAP and the BFD-RS resource is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod).

- P = Psharing factor, when the BFD-RS resource is not overlapped with GAP and the BFD-RS resource is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod).

- $P=\frac{1}{1-\frac{T\_{CSI-RS}}{xRP} - \frac{T\_{CSI-RS}}{T\_{SMTCperiod}}}$, when the BFD-RS resource is partially overlapped with GAP and the BFD-RS resource is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with GAP and

- TSMTCperiod ≠ xRP or

- TSMTCperiod = xRP and TCSI-RS < 0.5 × TSMTCperiod

- $P=\frac{P\_{sharing factor}}{1-\frac{T\_{CSI-RS}}{xRP}}$, when the BFD-RS resource is partially overlapped with GAP and the BFD-RS resource is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with GAP and TSMTCperiod = xRP and TCSI-RS = 0.5 × TSMTCperiod

- $P=\frac{1}{1-\frac{T\_{CSI-RS}}{Min(xRP, T\_{SMTCperiod})}}$, when the BFD-RS resource is partially overlapped with GAP (TCSI-RS < xRP) and the BFD-RS resource is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is partially or fully overlapped with GAP.

- $P=\frac{P\_{sharing factor}}{1-\frac{T\_{CSI-RS}}{xRP}}$, when the BFD-RS resource is partially overlapped with GAP and the BFD-RS resource is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod) and SMTC occasion is partially overlapped with GAP (TSMTCperiod < xRP)

where,

- Psharing factor = 1, if the BFD-RS resource outside gap is

- not overlapped with the SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol before each consecutive SSB symbols indicated by *SSB-ToMeasure* and 1 data symbol after each consecutive SSB symbols indicated by *SSB-ToMeasure*, given that *SSB-ToMeasure* is configured, where the *SSB-ToMeasure* is the union set of *SSB-ToMeasure* from all the configured measurement objects merged on the same serving carrier, and,

- not overlapped by the RSSI symbols indicated by *ss-RSSI-Measurement* and 1 data symbol before each RSSI symbol indicated by *ss-RSSI-Measurement* and 1 data symbol after each RSSI symbol indicated by *ss-RSSI-Measurement*, given that *ss-RSSI-Measurement* is configured.

- Psharing factor = 3, otherwise.

- If the higher layer in TS 38.331 [2] signalling of *smtc2* is configured, TSMTCperiod corresponds to the value of higher layer parameter *smtc2*; Otherwise TSMTCperiod corresponds to the value of higher layer parameter *smtc1*. TSMTCperiod is the shortest SMTC period among all CCs in the same FR2 band, provided the SMTC offset of all CCs in FR2 have the same offset.

- When a GAP is configured only and the GAP is not NCSG,

- a BFD-RS resource or an SMTC occasion is considered to be overlapped with the GAP if it overlaps a GAP occasion, and

- xRP = MGRP

- Otherwise, when NCSG GAP only is configured,

- a BFD-RS resource or an SMTC occasion is considered to be overlapped with the GAP if

- it overlaps the VIL1 or VIL2 of NCSG, or

- it overlaps the ML of NCSG in FR2, and there exists a target carrier to be measured within NCSG that is intra-frequency carrier or inter-frequency carrier in the same band as the serving cell, or inter-frequency carrier in different band as the serving cell and UE does not support IBM between the target carrier and the serving cell,

- and

- xRP = VIRP

- If the UE is configured with Pre-MG only, a BFD-RS resource or an SMTC occasion is only considered to be overlapped by the Pre-MG if the Pre-MG is activated.

- When concurrent gaps or concurrent measurement gap(s) with Pre-MG(s) or concurrent measurement gap(s) with NCSG(s) are configured, a BFD-RS resource or an SMTC occasion is not considered to be overlapped by a GAP occasion if the GAP occasion is dropped according to clause 9.1.8, clause 9.1.12, clause 9.1.13, respectively.

NOTE: The overlap between CSI-RS for BFD and SMTC means that CSI-RS for BFD is within the SMTC window duration.

For the value of L1,

1> If the UE does not support *supportSBFD* or SBFD is not configured by the network

2> L1=0;

1> Else if the UE supports *supportSBFD* and SBFD is configured by the network

2> If DRX is not configured,

3> L1 is the number of occasions of the configured BFD-RS resource that are overlapping with the dynamic UL transmission on SBFD symbols during TEvaluate\_BFD\_CSI-RS;

2> Else if DRX is configured,

3> L1 is the number of DRX cycles in which at least one occasion of the BFD-RS resource is overlapping with the dynamic UL transmission on SBFD symbols during TEvaluate\_BFD\_CSI-RS.

If the UE supports *supportSBFD* and SBFD is configured by the network, the requirements in this clause apply provided that all occasions of the BFD-RS resource are in the same type (i.e., SBFD or non-SBFD) of symbols.

Longer evaluation period would be expected if the combination of the BFD-RS resource, SMTC occasion and GAP configurations does not meet previous conditions.

For either an FR1 or FR2 serving cell, longer evaluation period would be expected during the period Tidentify\_CGI when the UE is requested to decode an NR CGI.

When the configured aperiodic MUSIM gap is overlapping with CSI-RS resource occasion for beam failure detection, longer evaluation period would be expected.

When UE is configured with MUSIM gap(s), and if CSI-RS resource occasions for beam failure detection are fully overlapped with MUSIM gap(s), or the union of MUSIM gap(s) and GAPs, no requirement applies for CSI-RS based beam failure detection.

For either an FR1 or FR2 serving cell, longer BFD evaluation period would be expected during the period Tidentify\_CGI,E-UTRAN when the UE is requested to decode an LTE CGI.

The values of MBFD used in table 8.5.3.2-1 and table 8.5.3.2-2 are defined as

- MBFD = 10, if the CSI-RS resource(s) in set  used for BFD is transmitted with Density = 3 and over the bandwidth ≥ 24 PRBs.

Note: If UE supports *supportSBFD* and SBFD is configured by the network, the requirements in this clause apply provided that CSI-RS resource(s) in set  used for BFD is transmitted with Density = 3 and over the bandwidth ≥ 24 PRBs in at least one DL subband.

The values of PBFD used in table 8.5.3.2-1 and table 8.5.3.2-2 are defined as

 For each CSI-RS resource in the set  configured for PCell or PSCell in EN-DC or NE-DC or SA; or PCell in NR-DC

- PBFD = 1.

 For each CSI-RS resource in the set  configured for PSCell in NR-DC

- PBFD = 2 if UE is configured for beam failure detection on SCell, 1 otherwise.

 For each CSI-RS resource in the set  configured for a SCell

- PBFD = Z in EN-DC or NE-DC or SA.

- PBFD = 2\* Z in NR-DC.

- Where Z is the number of band(s) on which UE is performing beam failure detection only for SCell.

**Table 8.5.3.2-1: Evaluation period TEvaluate\_BFD\_CSI-RS for FR1**

|  |  |
| --- | --- |
| **Configuration** | **TEvaluate\_BFD\_CSI-RS (ms)**  |
| no DRX | Max(50, Ceil((MBFD+L1) × P × PBFD) × Max(TCSI-RS, Tproc)) |
| DRX cycle ≤ 320 ms | Max(50, Ceil(1.5 × (MBFD+L1) × P × PBFD) × Max(TDRX, TCSI-RS, Tproc)) |
| DRX cycle > 320 ms | Ceil((MBFD+L1) × P × PBFD) × TDRX |
| NOTE 1: TCSI-RS is the periodicity of CSI-RS resource in the set . TDRX is the DRX cycle length.NOTE 2: If UE indicates *needForScaledCSIProcTimeDualDL* and the CSI-RS resource for BFD is across 2 DL subbands, Tproc = 8ms; otherwise Tproc = 0. |

**Table 8.5.3.2-2: Evaluation period TEvaluate\_BFD\_CSI-RS for FR2**

|  |  |
| --- | --- |
| **Configuration** | **TEvaluate\_BFD\_CSI-RS (ms)**  |
| no DRX | Max(50, Ceil((MBFD+L1) × P × N × PBFD) × Max(TCSI-RS, Tproc)) |
| DRX cycle ≤ 320 ms | Max(50, Ceil(1.5 × (MBFD+L1) × P × N × PBFD) × Max(TDRX, TCSI-RS, Tproc)) |
| DRX cycle > 320 ms | Ceil((MBFD+L1) × P × N × PBFD) × TDRX |
| NOTE 1: TCSI-RS is the periodicity of CSI-RS resource in the set . TDRX is the DRX cycle length.NOTE 2: If UE indicates *needForScaledCSIProcTimeDualDL* and the CSI-RS resource for BFD is across 2 DL subbands, Tproc = 8ms; otherwise Tproc = 0. |

**Table 8.5.3.2-3: Evaluation period TEvaluate\_BFD\_CSI-RS for deactivated PSCell in FR1**

|  |  |
| --- | --- |
| **Configuration** | **TEvaluate\_BFD\_CSI-RS (ms)**  |
| no DRX | Ceil(MBFD × P × PBFD) × measCyclePscell |
| DRX cycle ≤ 320 ms | Ceil(1.5 × MBFD × P × PBFD) × Max(TDRX, measCyclePscell) |
| DRX cycle > 320 ms | Ceil(MBFD × P × PBFD) × Max(TDRX, measCyclePscell) |
| NOTE: DRX cycle is the configured DRX cycle of the PSCell. measCyclePSCell is the measurement cycle length of the deactivated PSCell.  |

**Table 8.5.3.2-4: Evaluation period TEvaluate\_BFD\_CSI-RS for deactivated PSCell in FR2**

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| --- | --- |
| **Configuration** | **TEvaluate\_BFD\_CSI-RS (ms)**  |
| no DRX | Ceil(MBFD × P × N × PBFD) × measCyclePscell |
| DRX cycle ≤ 320 ms | Ceil(1.5 × MBFD × P × N × PBFD) × Max(TDRX, measCyclePscell) |
| DRX cycle > 320 ms | Ceil(MBFD × P × N × PBFD) × Max(TDRX, measCyclePscell) |
| NOTE: DRX cycle is the configured DRX cycle of the PSCell. measCyclePSCell is the measurement cycle length of the deactivated PSCell.  |

<End of Change 1>