**3GPP TSG- Meeting # *R4-2510087***

**, , August - , 2025**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** | **-** | **Current version:** |  |  |
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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 CSI-RS based CBD evaluation period requirements with SBFD |
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| ***Source to WG:*** | China Telecom |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_duplex\_evo-Core |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *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:*** | Based on CR work split in WF R4-2504904, the requirements on CSI-RS based CBD evaluation period needs to be updated for impact of SBFD operation. |
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| ***Summary of change:*** | Introduce updated CSI-RS based CBD evaluation period requirements due to the impact of SBFD operation. |
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| ***Consequences if not approved:*** | The CSI-RS based CBD evaluation period requirements with SBFD are missing. |
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| ***Clauses affected:*** | 8.5.6.2 |
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|  | **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 ...  |
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| ***Other comments:*** | This draftCR is based on endorsed Big draftCR R4-2508459 from RAN4#115. |
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| ***This CR's revision history:*** |  |

Start of Change 1

#### 8.5.6.2 Minimum requirement

Upon request the UE shall be able to evaluate whether the L1-RSRP measured on the configured CSI-RS resource in set 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 8.5.6.2-1 and 8.5.6.2-2 corresponding to the non-DRX mode, if the configured DRX cycle ≤ 320 ms.

The value of TEvaluate\_CBD\_CSI-RS is defined in table 8.5.6.2-1 for FR1.

The value of TEvaluate\_CBD\_CSI-RS is defined in table 8.5.6.2-2 for FR2 with scaling factor N, where

- N = 2, 4 or 6 for serving cell in FR2-1 if the UE supports *fastBeamSweepingMultiRx-r18* according to the conditions in clause 3.6.19

- N=8 for other cases in FR2-1, and

- N=12 for FR2-2.

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 CSI-RS resource for candidate beam detection that are overlapping with dynamic UL transmission on SBFD symbols during TEvaluate\_CBD\_CSI-RS;

2> If DRX is configured,

3> L1 is the number of DRX cycles in which at least one occasion of the CSI-RS resource for candidate beam detection is overlapping with dynamic UL transmission on SBFD symbols during TEvaluate\_CBD\_CSI-RS.

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

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 candidate beam 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 CBD-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 periodic 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 CBD-RS resource occasion:

- Ntotal is the total number of CBD-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 CBD-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 CBD-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 candidate beam detection is considered to be overlapped with the MUSIM gap if it overlaps a MUSIM gap occasion, and

- TL1 is periodicity of the target CBD-RS, and

- 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), concurrent measurement gap(s) with NCSG(s), and periodic MUSIM gaps,

For FR1,

- , 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; and

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

For FR2,

- P = 1, when candidate beam detection RS is not overlapped with GAP and also not overlapped with SMTC occasion.

- when candidate beam detection RS is partially overlapped with GAP and candidate beam detection RS is not overlapped with SMTC occasion (TCSI-RS < xRP)

- , when candidate beam detection RS is not overlapped with GAP and candidate beam detection RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod).

- P =Psharing factor, when candidate beam detection RS is not overlapped with GAP and candidate beam detection RS is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod).

- ,, when candidate beam detection RS is partially overlapped with GAP and candidate beam detection RS 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

- , when candidate beam detection RS is partially overlapped with GAP and candidate beam detection RS 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

- , when candidate beam detection RS is partially overlapped with GAP and candidate beam detection RS is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is partially or fully overlapped with GAP

- ,, when candidate beam detection RS is partially overlapped with GAP and candidate beam detection RS 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 CBD-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 present, TSMTCperiod follows *smtc2*; Otherwise TSMTCperiod follows *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 CBD-RS resource or an SMTC occasion is considered to be overlapped with the GAP if it overlaps the GAP occasion, and

- xRP = MGRP

- Otherwise, when NCSG GAP only is configured,

- a CBD-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, an CBD-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 CBD-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 CBD and SMTC means that CSI-RS for CBD is within the SMTC window duration.

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

Longer evaluation period would be expected if the CSI-RS is on the same OFDM symbols with RLM, BFD, BM-RS, or other CBD-RS, according to the measurement restrictions defined in clause 8.5.6.3.

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

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

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.

For either an FR1 or FR2 serving cell, longer CBD 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 MCBD used in table 8.5.6.2-1 and table 8.5.6.2-2 are defined as

- MCBD = 3, if the CSI-RS resource configured in the set is transmitted with Density = 3 and over the bandwidth ≥ 24 PRBs.

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

The values of PCBD used in table 8.5.6.2-1 and table 8.5.6.2-2 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

- PCBD = 1.

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

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

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

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

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

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

- PCBD is the number of band(s) on which UE is performing candidate beam detection only for SCell.

Table 8.5.6.2-1: Evaluation period TEvaluate\_CBD\_CSI-RS for FR1

|  |  |
| --- | --- |
| **Configuration** | **TEvaluateC\_CBD\_CSI-RS (ms)**  |
| non-DRX, DRX cycle ≤ 320 ms | Max(25, Ceil((MCBD+L1) × P × PCBD) × max(TCSI-RS, Tproc)) |
| DRX cycle > 320 ms | Ceil((MCBD+L1) × P × PCBD) × 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 CBD is across 2 DL subbands, Tproc = 8ms; otherwise Tproc = 0. |

Table 8.5.6.2-2: Evaluation period TEvaluate\_CBD\_CSI-RS for FR2

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| **Configuration** | **TEvaluate\_CBD\_CSI-RS (ms)**  |
| non-DRX, DRX cycle ≤ 320 ms | Max(25, Ceil((MCBD+L1) × P × N × PCBD) × max(TCSI-RS, Tproc)) |
| DRX cycle > 320 ms | Ceil((MCBD+L1) × P × N × PCBD) × 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 CBD is across 2 DL subbands, Tproc = 8ms; otherwise Tproc = 0. |

End of Change 1