**3GPP TSG- RAN4 Meeting #112R4-241x**

**Maastricht, Netherlands, 19th – 23rd August, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **4807** | **rev** | **1** | **Current version:** | **18.6.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](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:*** | CR on measurement restriction requirements for multi-Rx | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | vivo | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_FR2\_multiRX\_DL-Core | | | | |  | ***Date:*** | | | 2024-8-22 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | F |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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 can be 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)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The conditions for measurement and measurement restriction relaxation when UE is under multi-Rx is not finished yet. | | | | | | | | |
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| ***Summary of change:*** | | * Corrected measurement conditions for TRP specific BFD * Corrected measurement restriction conditions for L1-SINR measurement | | | | | | | | |
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| ***Consequences if not approved:*** | | Measurement and measurement restriction requirements for multi-Rx WI are not completed. | | | | | | | | |
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| ***Clauses affected:*** | | 8.18.3.2, 9.8.5.2 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

# <Start of Change #1>

#### 8.18.3.2 Minimum requirement

UE shall be able to evaluate whether the downlink radio link quality on the CSI-RS resource in two sets and estimated over the last TEvaluate\_BFD\_CSI-RS ms period becomes worse than the threshold Qout\_LR\_CSI-RS within TEvaluate\_BFD\_CSI-RS ms period.

The value of TEvaluate\_BFD\_CSI-RS is defined in Table 8.18.3.2-1 for FR1.

The value of TEvaluate\_BFD\_CSI-RS is defined in Table 8.18.3.2-2 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 UE supporting [*musim-GapPreference-r17]* and is configured with one or more per-UE periodic MUSIM gaps,

- P value for an BFD CSI-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(TCSI-RS, SMTC period, MGRP\_max), where MGRP max is the maximum MGRP across all configured per-UE periodic MUSIM gaps, per-UE measurement gaps and per-FR measurement gaps within the same FR as serving cell, and starting at the beginning of any configured BFD CSI-RS resource occasion:

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

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

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

- TCSI-RS is periodicity of the target CSI-RS resource for BFD.

When the configured aperiodic MUSIM gap is overlapping with configured BFD CSI-RS resource occasions, longer evaluation period would be expected.

Requirements in this clause do not apply when Noutside MG = 0 due to fully overlapping between target CSI-RS resource for BFD and MUSIM gap occasions within the window W.

Otherwise, when UE is not configured with periodic MUSIM gap(s) or not supporting MUSIM gap capability,

For FR1,

- , 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 FR2,

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

- , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is not overlapped with SMTC occasion (TCSI-RS < MGRP)

- , when the BFD-RS resource is not overlapped with measurement 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 measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod).

- , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and

- TSMTCperiod ≠ MGRP or

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

- , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is not overlapped with measurement gap and TSMTCperiod = MGRP and TCSI-RS = 0.5 × TSMTCperiod

- , when the BFD-RS resource is partially overlapped with measurement gap (TCSI-RS < MGRP) and the BFD-RS resource is partially overlapped with SMTC occasion (TCSI-RS < TSMTCperiod) and SMTC occasion is partially or fully overlapped with measurement gap.

- , when the BFD-RS resource is partially overlapped with measurement gap and the BFD-RS resource is fully overlapped with SMTC occasion (TCSI-RS = TSMTCperiod) and SMTC occasion is partially overlapped with measurement gap (TSMTCperiod < MGRP)

where,

- Psharing factor = 1, if the BFD-RS resource outside measurement 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 with 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 high layer in TS 38.331 [2] signaling 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.

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

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

For either an FR1 or FR2 serving cell, longer BFD 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 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 8.18.3.2-1 and Table 8.18.3.2-2 are defined as

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

The values of PBFD used in Table 8.18.3.2-1 and Table 8.18.3.2-2 are defined as

For each CSI-RS resource in the two sets and 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 two sets and 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 two sets and 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.

For UE not supporting [TBD - multi-rx capability], the values of PTRP in table 8.18.3.2-2 is defined as 2, if SSB/CSI-RS resources in the two sets and are overlapped, else it is 1.

For FR2-1, for UE supporting [TBD - multi-rx capability], according to the conditions described in clause 3.6.x, the value of PTRP in table 8.18.3.2-2 is defined as 1, when:

- CSI-RS resources in the two sets and are not overlapped, or

- CSI-RS resources in the two sets and are overlapped and the following conditions are met:

- Both CSI-RSs are not in any CSI-RS resource set with repetition ON

- The CSI-RS in set has same QCL source as either

- the active TCI state of a PDSCH scheduled in the same OFDM symbol or

- the QCL source based on the default QCL assumption to be applied in the same OFDM symbol according to 38.214 clause 5.1.5, and

the CSI-RS in set has same QCL source as either

- the active TCI state of a PDSCH scheduled in the same OFDM symbol or

- the QCL source based on the default QCL assumption to be applied in the same OFDM symbol according to 38.214 clause 5.1.5, and

- Resources of the active TCI states of the two PDSCHs, and or QCL sources of the default QCL assumption, or the active TCI state of PDSCH and QCL source of the default QCL assumption have been reported as a resource group in Rel-17 group-based RSRP report.

- else, the value of PTRP is 2.

Table 8.18.2-1: Evaluation period TEvaluate\_BFD\_CSI-RS for FR1

|  |  |
| --- | --- |
| Configuration | TEvaluate\_BFD\_CSI-RS (ms) |
| no DRX | Max(50, Ceil(MBFD × P × PBFD) × TCSI-RS) |
| DRX cycle ≤ 320ms | Max(50, Ceil(1.5 × MBFD × P × PBFD) × Max(TDRX, TCSI-RS)) |
| DRX cycle > 320ms | Ceil(MBFD × P × PBFD) × TDRX |
| Note: TCSI-RS is the periodicity of CSI-RS resource in the two sets and . TDRX is the DRX cycle length. | |

**Table 8.18.3.2-2: Evaluation period TEvaluate\_BFD\_CSI-RS for FR2**

|  |  |
| --- | --- |
| Configuration | TEvaluate\_BFD\_CSI-RS (ms) |
| no DRX | Max(50, Ceil(MBFD × P × N × PBFD\*PTRP) × TCSI-RS) |
| DRX cycle ≤ 320ms | Max(50, Ceil(1.5 × MBFD × P × N × PBFD\*PTRP) × Max(TDRX, TCSI-RS)) |
| DRX cycle > 320ms | Ceil(MBFD × P × N × PBFD\*PTRP) × TDRX |
| Note: TCSI-RS is the periodicity of CSI-RS resource in the two sets and . TDRX is the DRX cycle length. | |

# <End of Change #1>

# <End of Change #2>

#### 9.8.5.2 Measurement restriction if CSI-RS configured for L1-SINR measurement

For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP or outside the active BWP for UE supporting [FG53-1], provided that the SSB is within the configured UE-specific CBW, and has same SCS than CSI-RS configured for L1-SINR measurement, the UE shall be able to perform CSI-RS measurement without restrictions.

For FR1, when the SSB for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement is within the active BWP or outside the active BWP for UE supporting [FG53-1], provided that the SSB is within the configured UE-specific CBW, and has different SCS than CSI-RS configured for L1-SINR me

- If the UE supports *simultaneousRxDataSSB-DiffNumerology*, UE shall be able to perform CSI-RS measurement without restrictions.

- If the UE does not support *simultaneousRxDataSSB-DiffNumerology*, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR1, when the CSI-RS configured for L1-SINR measurement is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement, UE shall be able to measure the CSI-RS for L1-SINR measurement without any restriction.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as SSB for RLM, BFD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, or in the same symbol as SSB for CBD measurement on the same CC or different CCs in the same band when beam failure is detected, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band,

- In the following cases, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and the other CSI-RS. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

- The CSI-RS for L1-SINR measurement or the other CSI-RS in a resource set configured with repetition ON, or

- The CSI-RS or the other CSI-RS is configured as dedicated IMR for L1-SINR computation with SSB as CMR, or

- The other CSI-RS is configured in q1 and beam failure is detected, or

- The two CSI-RS-es are not QCL-ed w.r.t. QCL-TypeD, or the QCL information is not known to UE,

- Otherwise, UE shall be able to measure the CSI-RS configured for L1-SINR measurement without any restriction.

For UE incapable of [*capability of measurement with RTD>CP*] and for UE capable of [*capability of measurement with RTD>CP*],

- For both FR1 and FR2, when the CSI-RS configured for L1-SINR measurement fully or partially overlaps with the OFDM symbol as SSB from candidate LTM neighbor cell for intra-frequency L1-RSRP measurement or inter-frequency L1-RSRP measurement without gap, UE is not required to receive CSI-RS for L1-SINR measurement in the PRBs that overlap with an SSB.

- For FR1, when the CSI-RS configured for L1-SINR measurement fully or partially overlaps with the OFDM symbol as SSB from candidate LTM neighbor cell for intra-frequency L1-RSRP measurement or inter-frequency L1-RSRP measurement without gap, if CSI-RS and SSB have different SCS and UE does not support simultaneousRxDataSSB-DiffNumerology, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

- For FR2, when the CSI-RS configured for L1-SINR measurement on one CC fully or partially overlaps with the OFDM symbol as SSB from candidate LTM neighbor cell for intra-frequency L1-RSRP measurement or inter-frequency L1-RSRP measurement without gap in the same band, UE is required to measure one of but not both CSI-RS for L1-SINR measurement and SSB. Longer measurement period for CSI-RS based L1-SINR measurement is expected, and no requirements are defined.

For FR2, when the UE is indicated with two TCI states for simultaneous PDSCH reception, when the CSI-RS configured for L1-SINR measurement on one CC is in the same OFDM symbol as another CSI-RS for RLM, BFD, CBD, L1-RSRP or L1-SINR measurement on the same CC or different CCs in the same band, UE shall be able to measure the CSI-RS configured for L1-SINR measurement without any restriction under the following conditions:

- Both CSI-RSs are not in any CSI-RS resource set with repetition ON,

- One CSI-RS has same QCL source as either,

- the active TCI state of a PDSCH scheduled in the same OFDM symbol or

- the QCL source based on the default QCL assumption to be applied in the same OFDM symbol according to 38.214 clause 5.1.5, and

the other CSI-RS has same QCL source as either

- the active TCI state of a PDSCH scheduled in the same OFDM symbol or

- the QCL source based on the default QCL assumption to be applied in the same OFDM symbol according to 38.214 clause 5.1.5.

- Resources of the active TCI states of the two PDSCHs, and or QCL sources of the default QCL assumption, or the active TCI state of PDSCH and QCL source of the default QCL assumption have been reported as a resource group in Rel-17 group-based RSRP report.

# <End of Change #2>