**3GPP TSG-RAN WG2 Meeting #130 *R2-2504916***

**St. Julian’s, Malta, 19 - 23 May, 2025**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.300** | **CR** | **0996** | **rev** | **-** | **Current version:** | **16.19.0** |  |
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| *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 | **X** | Core Network |  |

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| ***Title:*** | Correction on servingCellMO configuration for SSB-less SCell | | | | | | | | | |
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| ***Source to WG:*** | Huawei, HiSilicon, Apple, Samsung, Qualcomm Incorporated, MediaTek Inc, ZTE Corporation, Sanechips, Ericsson, Nokia | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_newRAT-Core | | | | |  | ***Date:*** | | | 2025-05-21 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **A** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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)* | |
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| ***Reason for change:*** | | According to the current spec, the UE is expected to measure the serving cell if *servingCellMO* is configured. However, for SSB-less SCell, the SSB-based measurements are not possible, and there is no associated SSB to provide timing for CSI-RS measurements.  RAN2 concluded in RAN2#130 that the network can optionally configure *servingCellMO* of SSB-less SCell. If configured, the SSB frequency of *servingCellMO* can be used to determine whether neighbour cell measurements are intra-frequency measurements or inter-frequency measurements. The exisitng criteria for determine SSB-based intra-frequency measurements are no long valid because in this case there will be no “SSB of the serving cell”.  **Impact analysis**  Impacted 5G architecture options:  NR SA, (NG)EN-DC, NE-DC, NR-DC  Impacted functionality:  RRM measurements  Inter-operability:  If the network is implemented according to the CR and the UE is not, or vice versa, there is no inter-operability issue. | | | | | | | | |
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| ***Summary of change:*** | | Update the definition of “SSB based intra-frequency measurements” so that “SSB frequency configured in the measurement object indicated by servingCellMO” is used to determine intra-frequency measurements instead of “center frequency of the SSB of the serving cell” | | | | | | | | |
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| ***Consequences if not approved:*** | | UE will determine whether neighbour cell measurements are intra-frequency measurements or inter-frequency measurements based on “SSB of the serving cell”, but there is no “SSB of the serving cell” for SSB-less SCell. | | | | | | | | |
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| ***Clauses affected:*** | | 9.2.4 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS/TR 38.331 CR 5392  TS/TR 38.306 CR 1316 | | |
| ***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

9.2.4 Measurements

In RRC\_CONNECTED, the UE measures multiple beams (at least one) of a cell and the measurements results (power values) are averaged to derive the cell quality. In doing so, the UE is configured to consider a subset of the detected beams. Filtering takes place at two different levels: at the physical layer to derive beam quality and then at RRC level to derive cell quality from multiple beams. Cell quality from beam measurements is derived in the same way for the serving cell(s) and for the non-serving cell(s). Measurement reports may contain the measurement results of the *X* best beams if the UE is configured to do so by the gNB.

The corresponding high-level measurement model is described below:

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**Figure 9.2.4-1: Measurement Model**

NOTE 1: K beams correspond to the measurements on SSB or CSI-RS resources configured for L3 mobility by gNB and detected by UE at L1.

- **A**: measurements (beam specific samples) internal to the physical layer.

- **Layer 1 filtering**: internal layer 1 filtering of the inputs measured at point A. Exact filtering is implementation dependent. How the measurements are actually executed in the physical layer by an implementation (inputs A and Layer 1 filtering) is not constrained by the standard.

- **A1**: measurements (i.e. beam specific measurements) reported by layer 1 to layer 3 after layer 1 filtering.

**- Beam Consolidation/Selection**: beam specific measurements are consolidated to derive cell quality. The behaviour of the Beam consolidation/selection is standardised and the configuration of this module is provided by RRC signalling. Reporting period at B equals one measurement period at A1.

**- B**: a measurement (i.e. cell quality) derived from beam-specific measurements reported to layer 3 after beam consolidation/selection.

- **Layer 3 filtering for cell quality**: filtering performed on the measurements provided at point B. The behaviour of the Layer 3 filters is standardised and the configuration of the layer 3 filters is provided by RRC signalling. Filtering reporting period at C equals one measurement period at B.

- **C**: a measurement after processing in the layer 3 filter. The reporting rate is identical to the reporting rate at point B. This measurement is used as input for one or more evaluation of reporting criteria.

- **Evaluation of reporting criteria**: checks whether actual measurement reporting is necessary at point D. The evaluation can be based on more than one flow of measurements at reference point C e.g. to compare between different measurements. This is illustrated by input C and C1. The UE shall evaluate the reporting criteria at least every time a new measurement result is reported at point C, C1. The reporting criteria are standardised and the configuration is provided by RRC signalling (UE measurements).

- **D**: measurement report information (message) sent on the radio interface.

- **L3 Beam filtering**: filtering performed on the measurements (i.e. beam specific measurements) provided at point A1. The behaviour of the beam filters is standardised and the configuration of the beam filters is provided by RRC signalling. Filtering reporting period at E equals one measurement period at A1.

- **E**: a measurement (i.e. beam-specific measurement) after processing in the beam filter. The reporting rate is identical to the reporting rate at point A1. This measurement is used as input for selecting the X measurements to be reported.

- **Beam Selection for beam reporting**: selects the X measurements from the measurements provided at point E. The behaviour of the beam selection is standardised and the configuration of this module is provided by RRC signalling.

- **F**: beam measurement information included in measurement report (sent) on the radio interface.

Layer 1 filtering introduces a certain level of measurement averaging. How and when the UE exactly performs the required measurements is implementation specific to the point that the output at B fulfils the performance requirements set in TS 38.133 [13]. Layer 3 filtering for cell quality and related parameters used are specified in TS 38.331 [12] and do not introduce any delay in the sample availability between B and C. Measurement at point C, C1 is the input used in the event evaluation. L3 Beam filtering and related parameters used are specified in TS 38.331 [12] and do not introduce any delay in the sample availability between A1 and E.

Measurement reports are characterized by the following:

- Measurement reports include the measurement identity of the associated measurement configuration that triggered the reporting;

- Cell and beam measurement quantities to be included in measurement reports are configured by the network;

- The number of non-serving cells to be reported can be limited through configuration by the network;

- Cells belonging to a blacklist configured by the network are not used in event evaluation and reporting, and conversely when a whitelist is configured by the network, only the cells belonging to the whitelist are used in event evaluation and reporting;

- Beam measurements to be included in measurement reports are configured by the network (beam identifier only, measurement result and beam identifier, or no beam reporting).

Intra-frequency neighbour (cell) measurements and inter-frequency neighbour (cell) measurements are defined as follows:

- SSB based intra-frequency measurement: a measurement is defined as an SSB based intra-frequency measurement provided the SSB frequency configured in the measurement object indicated by *servingCellMO* and the center frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs is also the same.

- SSB based inter-frequency measurement: a measurement is defined as an SSB based inter-frequency measurement provided the center frequency of the SSB of the serving cell and the center frequency of the SSB of the neighbour cell are different, or the subcarrier spacing of the two SSBs is different.

NOTE 2: For SSB based measurements, one measurement object corresponds to one SSB and the UE considers different SSBs as different cells.

- CSI-RS based intra-frequency measurement: a measurement is defined as a CSI-RS based intra-frequency measurement provided that:

- The subcarrier spacing of CSI-RS resources on the neighbour cell configured for measurement is the same as the SCS of CSI-RS resources on the serving cell indicated for measurement; and

- For 60kHz subcarrier spacing, the CP type of CSI-RS resources on the neighbour cell configured for measurement is the same as the CP type of CSI-RS resources on the serving cell indicated for measurement; and

- The centre frequency of CSI-RS resources on the neighbour cell configured for measurement is the same as the centre frequency of CSI-RS resource on the serving cell indicated for measurement.

- CSI-RS based inter-frequency measurement: a measurement is defined as a CSI-RS based inter-frequency measurement if it is not a CSI-RS based intra-frequency measurement.

NOTE 3: Extended CP for CSI-RS based measurement is not supported in this release.

Whether a measurement is non-gap-assisted or gap-assisted depends on the capability of the UE, the active BWP of the UE and the current operating frequency:

- For SSB based inter-frequency measurement, if the measurement gap requirement information is reported by the UE, a measurement gap configuration may be provided according to the information. Otherwise, a measurement gap configuration is always provided in the following cases:

- If the UE only supports per-UE measurement gaps;

- If the UE supports per-FR measurement gaps and any of the serving cells are in the same frequency range of the measurement object.

- For SSB based intra-frequency measurement, if the measurement gap requirement information is reported by the UE, a measurement gap configuration may be provided according to the information. Otherwise, a measurement gap configuration is always provided in the following case:

- If the serving cell is associated with SSB, other than the initial BWP, if any of the UE configured BWPs do not contain the frequency domain resources of the SSB associated to the initial DL BWP;

- If the serving cell is not associated with SSB (i.e. SSB-less SCell), if the initial BWP or any of the UE configured BWPs do not contain the SSB frequency configured in the measurement object associated with the serving cell.

- For CSI-RS based intra-frequency measurement, no measurement gap is needed;

- For CSI-RS based inter-frequency measurement, a measurement gap configuration is always provided in the following cases:

- If the UE only supports per-UE measurement gaps;

- If the UE supports per-FR measurement gaps and any of the serving cells are in the same frequency range of the measurement object.

In non-gap-assisted scenarios, the UE shall be able to carry out such measurements without measurement gaps. In gap-assisted scenarios, the UE cannot be assumed to be able to carry out such measurements without measurement gaps.

Network may request the UE to measure NR and/or E-UTRA carriers in RRC\_IDLE or RRC\_INACTIVE via system information or via dedicated measurement configuration in *RRCRelease*. If the UE was configured to perform measurements of NR and/or E-UTRA carriers while in RRC\_IDLE or in RRC\_INACTIVE, it may provide an indication of the availability of corresponding measurement results to the gNB in the *RRCSetupComplete* message. The network may request the UE to report those measurements after security activation. The request for the measurements can be sent by the network immediately after transmitting the Security Mode Command (i.e. before the reception of the Security Mode Complete from the UE).

If the UE was configured to perform measurements of NR and/or E-UTRA carriers while in RRC\_INACTIVE, the gNB can request the UE to provide corresponding measurement results in the *RRCResume* message and then the UE can include the available measurement results in the *RRCResumeComplete* message. Alternatively, the UE may provide an indication of the availability of the measurement results to the gNB in the *RRCResumeComplete* message and the gNB can then request the UE to provide these measurement results.

End of Change