**3GPP TSG-RAN WG2 Meeting #117-e *R2-220xxxx***

**Electronic, February 21 – March 3, 2022**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **37.340** | **CR** | **0295** | **rev** | **1** | **Current version:** | **16.8.0** |  |
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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 | **X** | Core Network |  |

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| ***Title:*** | Introduction of FR2 UL gap for Rel-17 | | | | | | | | | |
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| ***Source to WG:*** | Apple | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_RF\_FR2\_req\_enh2 | | | | |  | ***Date:*** | | | 2022-02-21 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
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| ***Reason for change:*** | | This is to introduce the FR2 UL gap feature in Rel-17.  RAN2 agreements:  1) FR2 UL gap timing reference is based on the SFN/subframe of FR2 serving cell.  2) In EN-DC, NE-DC and NR-DC without FR2-FR2 band combination, the UL gap configuration is provided by the network entity which configures FR2 bands to UE. There is no need to support MN/SN coordination on FR2 UL gap configuration.  3) NR-DC with FR2-FR2 band combination is not supported.  4) Using UAI message to indicate the need of FR2 UL gap activation/deactivation.  5) UE indicates the preferred FR2 UL gap patterns using UAI message.  6) RACH procedure is prioritized over FR2 UL gap. | | | | | | | | |
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| ***Summary of change:*** | | To capture that the network entity who configures FR2 bands to UE is the responsible one in FR2 UL gap configuration. | | | | | | | | |
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| ***Consequences if not approved:*** | | The WI is not completed. | | | | | | | | |
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| ***Clauses affected:*** | | 7.xx (new) | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 38.331 CR 2893 | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS 38.321 CR 1191 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR … CR … | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | R2-2202918 | | | | | | | | |

---------------------------------------------<Start of of 1st change>----------------------------------------

7.2 Measurements

If the measurement is configured to the UE in preparation for the Secondary Node Addition procedure described in clause 10.2, the Master node should configure the measurement to the UE.

In case of the intra-secondary node mobility described in clause 10.3, the SN should configure the measurement to the UE in coordination with the MN, if required.

The Secondary Node Change procedure described in clause 10.5 can be triggered by both the MN (only for inter-frequency secondary node change) and the SN. For secondary node changes triggered by the SN, the RRM measurement configuration is maintained by the SN which also processes the measurement reporting, without providing the measurement results to the MN.

Measurements can be configured independently by the MN and by the SN (intra-RAT measurements on serving and non-serving frequencies). The MN indicates the maximum number of frequency layers and measurement identities of intra-frequency and inter-frequency measurement that can be used in the SN to ensure that UE capabilities are not exceeded. In MR-DC, to assist MN to identify the measurement type, the SN indicates to the MN the list of SCG serving frequencies. In NR-DC, to assist SN to identify the measurement type, the MN indicates also to SN the list of MCG serving frequencies. The SN can also request the MN for new maximum values of the number of measurement identities that it can configure, and it is up to the MN whether to accommodate the SN request, based on the capability coordination principles as described in 7.3. If the SN receives from the MN a new value for the maximum number of measurement identities, is SN responsibility to ensure that its configured measurement identities to comply with the new limit.

If MN and SN both configure measurements on the same carrier frequency then the configurations need to be consistent (if the network wants to ensure these are considered as a single measurement layer). Each node (MN and SN) can configure independently a threshold for the SpCell quality. In (NG)EN-DC scenario, when the PCell quality is above the threshold configured by the MN, the UE is still required to perform inter-RAT measurements configured by the MN on the SN RAT (while it's not required to perform intra-RAT measurements); when the PSCell quality is above the threshold configured by the SN, the UE is not required to perform measurements configured by the SN. In NR-DC or NE-DC scenario, when the PCell quality is above the threshold configured by the MN, the UE is not required to perform measurements configured by the MN; when the PSCell quality is above the threshold configured by the SN, the UE is not required to perform measurements configured by the SN.

NOTE: The SN cannot renegotiate the number of frequency layers allocated by the MN in this version of the protocol.

In MR-DC, both the MN and the SN can configure CGI reporting. The MN can configure CGI reporting for intra-RAT and inter-RAT cells but the SN can only configure CGI reporting of intra-RAT cells. At any point in time, the UE can be configured with at most one CGI reporting configuration. For CGI reporting coordination, the SN sends the CGI measurement request and the embedded CGI reporting configuration to the MN. Optionally, the SN sends the unknown cell information to the MN. If there is no ongoing CGI reporting measurement on UE side, the MN forwards the SN CGI measurement configuration to UE. Otherwise the MN rejects the request by sending X2/Xn reject message. In case the SN indicates the unknown cell information, and the CGI information of the requested cell is already available in the MN, the MN can also reject the request, and sends the CGI information of the requested cell to the SN. The SN cannot configure the CGI measurement using the SRB3.

When SRB3 is not configured, reports for measurements configured by the SN are sent on SRB1. When SRB3 is configured and SCG transmission of radio bearers is not suspended, reports for measurements configured by the SN are sent on SRB3.

Measurement results related to the target SN can be provided by MN to target SN at MN initiated SN change procedure. Measurement results of target SN can be forwarded from source SN to target SN via MN at SN initiated SN change procedure. Measurement results related to the target SN can be provided by source MN to target MN at Inter-MN handover with/without SN change procedure.

Measurement results according to measurement configuration from the MN are encoded according to SN RRC when they are provided by MN to SN in *SgNB Addition Request* message / *SN Addition Request* message. During SN initiated SN change procedure, measurement results according to measurement configuration from SN are encoded according to SN RRC when they are provided by MN to SN in *SgNB Addition Request* message / *SN Addition Request* message.

Per-UE or per-FR measurement gaps can be configured, depending on UE capability to support independent FR measurement and network preference. Per-UE gap applies to both FR1 (E-UTRA, UTRA-FDD and NR) and FR2 (NR) frequencies. For per-FR gap, two independent gap patterns (i.e. FR1 gap and FR2 gap) are configured for FR1 and FR2 respectively. The UE may also be configured with a per-UE gap sharing configuration (applying to per-UE gap) or with two separate gap sharing configurations (applying to FR1 and FR2 measurement gaps respectively) [8].

A measurement gap configuration is always provided:

- In EN-DC, NGEN-DC and NE-DC, for UEs configured with E-UTRA inter-frequency measurements as described in table 9.1.2-2 in TS 38.133 [8];

- In EN-DC and NGEN-DC, for UEs configured with UTRAN and GERAN measurements as described in table 9.1.2-2 in TS 38.133 [8];

- In NR-DC, for UEs configured with E-UTRAN measurements as described in table 9.1.2-3 in TS 38.133 [8];

- In NR-DC, NE-DC, for UEs configured with UTRAN measurements as described in table 9.4.6.3-1 and 9.4.6.3-2 in TS 38.133 [8];

- In MR-DC, for UEs that support either per-UE or per-FR gaps, when the conditions to measure SSB based inter-frequency measurement or SSB based intra-frequency measurement as described in clause 9.2.4 in TS 38.300 [3] are met;

If per-UE gap is used, the MN decides the gap pattern and the related gap sharing configuration. If per-FR gap is used, in EN-DC and NGEN-DC, the MN decides the FR1 gap pattern and the related gap sharing configuration for FR1, while the SN decides the FR2 gap pattern and the related gap sharing configuration for FR2; in NE-DC and NR-DC, the MN decides both the FR1 and FR2 gap patterns and the related gap sharing configurations.

In EN-DC and NGEN-DC, the measurement gap configuration from the MN to the UE indicates if the configuration from the MN is a per-UE gap or an FR1 gap configuration. The MN also indicates the configured per-UE or FR1 measurement gap pattern and the gap purpose (per-UE or per-FR1) to the SN. Measurement gap configuration assistance information can be exchanged between the MN and the SN. For the case of per-UE gap, the SN indicates to the MN the list of SN configured frequencies in FR1 and FR2 measured by the UE. For the per-FR gap case, the SN indicates to the MN the list of SN configured frequencies in FR1 measured by the UE and the MN indicates to the SN the list of MN configured frequencies in FR2 measured by the UE.

In NE-DC, the MN indicates the configured per-UE or FR1 measurement gap pattern to the SN. The SN can provide a gap request to the MN, without indicating any list of frequencies.

In NR-DC, the MN indicates the configured per-UE, FR1 or FR2 measurement gap pattern and the gap purpose to the SN. The SN can indicate to the MN the list of SN configured frequencies in FR1 and FR2 measured by the UE.

In (NG)EN-DC and NR-DC, SMTC can be used for PSCell addition/PSCell change to assist the UE in finding the SSB in the target PSCell. In case the SMTC of the target PSCell is provided by both MN and SN it is up to UE implementation which one to use.

CLI measurements can be configured for NR cells in all MR-DC options. In EN-DC and NGEN-DC, only the SN can configure CLI measurements. In NE-DC, only the MN can configure CLI measurements. In NR-DC, both the MN and the SN can configure CLI measurements, and the MN informs the SN about the maximum number of CLI measurement resources that can be configured by the SN to ensure that the total number of CLI measurement resources does not exceed the UE capabilities.

A FR2 UL gap configuration is provided in EN-DC, NGEN-DC, NE-DC and NR-DC without FR2-FR2 band combination if UE requests FR2 UL gap for Tx power management. In EN-DC and NGEN-DC, the SN decides the FR2 UL gap pattern. In NE-DC, the MN decides the FR2 UL gap pattern. In NR-DC without FR2-FR2 band combination, the network entity which configures FR2 bands to UE decides the FR2 UL gap pattern.

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