**3GPP TSG-RAN4 Meeting #98-eR4-21xxxxx**

**Online, 25 Jan. – 5 Feb., 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **38.133** | **CR** |  | **rev** | **1** | **Current version:** | **15.12.0** |  |
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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 |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | CR on CSSF for EN-DC R15 |
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| ***Source to WG:*** | Apple |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_newRAT-Core  |  | ***Date:*** | 2020-12-16 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | The CSSF design for EN-DC shall consider the MOs configured from both LTE MN and NR SN in EN-DC. |
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| ***Summary of change:*** | The CSSF requirement has been updated for EN-DC to consider the MOs configured from both LTE MN and NR SN in EN-DC. |
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| ***Consequences if not approved:*** | The CSSF design for EN-DC is not correct when the MOs configured from both LTE MN and NR SN in EN-DC. |
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| ***Clauses affected:*** | Section 9.1.5.1; 9.1.5.2 |
|  |  |
|  | **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:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

Start of Change 1

#### 9.1.5.1 Monitoring of multiple layers outside gaps

The carrier-specific scaling factor CSSFoutside\_gap,i for measurement object *i* derived in this chapter is applied to following measurement types:

- Intra-frequency measurement with no measurement gap in clause 9.2.5, when none of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.

- Intra-frequency measurement with no measurement gap in clause 9.2.5, when part of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.

- NR inter-RAT measurement configured by the E-UTRAN PCell on the NR serving carrier

- the SSB is completely contained in the active BWP of the UE, and

- none or part of the SMTC occasions of this inter-RAT measurement object are overlapped by the measurement gap;

UE is expected to conduct the measurement of this measurement object *i* only outside the measurement gaps.

If the higher layer signaling in TS 38.331 [2] of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, CSSFoutside\_gap,i and requirements derived from CSSFoutside\_gap,i are not specified.

The UE cell identification and measurement periods derived based on CSSFoutside\_gap,i in clauses 9.2.5.1, 9.2.5.2 may be extended for measurement objects of which the cell identification and measurement periods are overlapped with Tmeasure\_SFTD1 specified in clause 9.3.8 when no measurement gaps are provided.

The requirements in this clause apply provided that

- There are only SCCs in FR2, or

- The SMTC on all CCs in FR2 have the same offset, and one of following conditions is met

- If *smtc2* is configured on any FR2 CC,

- All CCs have the same configuration for *smtc1*, and

- All CCs configured with *smtc2* have the same configuration for *smtc2*

- If *smtc2* is not configured on any FR2 CC,

- The total number of different SMTC periodicities on all serving CCs does not exceed 4

Note: Longer delays for cell identification and measurement periods derived based on CSSFoutside\_gap,i in clauses 9.2.5.1, 9.2.5.2, can be expected, if the UE is configured with more than 4 different SMTC periodicities on FR2 serving carriers. The longer delay applies for the FR2 intra-frequency measurement objects with the longest SMTC periodicity/periodicities.

##### 9.1.5.1.1 EN-DC mode: carrier-specific scaling factor for SSB-based measurements performed outside gaps

For UE configured with the E-UTRA-NR dual connectivity operation, the carrier-specific scaling factor CSSFoutside\_gap,i for intra-frequency SSB-based measurements performed outside measurements gaps will be as specified in Table 9.1.5.1.1-1.

Table 9.1.5.1.1-1: CSSFoutside\_gap,i scaling factor for EN-DC mode

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| --- | --- | --- | --- | --- | --- |
| Scenario | *CSSF*outside\_gap,i for FR1 PSCC | *CSSF*outside\_gap,i for FR1 SCC | *CSSF*outside\_gap,i for FR2 PSCC | *CSSF*outside\_gap,i for FR2 SCC where neighbour cell measurement is required Note 2 | *CSSF*outside\_gap,i for FR2 SCC where neighbour cell measurement is not required |
| **EN-DC with FR1 only CA**  | NEUTRAN\_config\_PSCC + NNR\_config\_PSCC note 6 | NEUTRAN\_NR\_config\_SCC note7 | N/A | N/A | N/A |
| **EN-DC with****FR2 only intra band CA**  | N/A | N/A | NEUTRAN\_config\_PSCC + NNR\_config\_PSCC note 6 | N/A | NEUTRAN\_NR\_config\_SCC note7 |
| **EN-DC with****FR1 +FR2 CA (FR1 PSCell) Note 1** | NEUTRAN\_config\_PSCC + NNR\_config\_PSCC note 6 | 2×( NEUTRAN\_NR\_config\_SCC- (NEUTRAN\_config\_SCC + NNR\_config\_SCC)) note7, note8 | N/A | K\*(NEUTRAN\_config\_SCC + NNR\_config\_SCC)Note 5, Note 8 | 2×( NEUTRAN\_NR\_config\_SCC- (NEUTRAN\_config\_SCC + NNR\_config\_SCC)) note7, note8 |
| **EN-DC with****FR1 +FR2 CA (FR2 PSCell) Note 1** | N/A | NEUTRAN\_NR\_config\_SCC note7 | NEUTRAN\_config\_PSCC + NNR\_config\_PSCC note 6 | N/A | NEUTRAN\_NR\_config\_SCC note7 |
| Note 1: Only one NR FR1 operating band and one NR FR2 operating band are included for FR1+FR2 inter-band EN-DC.Note 2: Selection of FR2 SCC where neighbour cell measurement is required follows clause 9.2.3.2.Note 3: VoidNote 4: VoidNote 5: K=1 if only one SCell is configured, K=2 otherwise.Note 6: If E-UTRAN MN configures MO on PSCC, NEUTRAN\_config\_PSCC =1, otherwise NEUTRAN\_config\_PSCC =0. If NR SN configures MO on PSCC, NNR\_config\_PSCC =1, otherwise NNR\_Config\_PSCC =0. If MOs configured by NR SN and E-UTRAN MN are on PSCC and meet MO merging conditions in clause 9.1.3.2, NEUTRAN\_config\_PSCC + NNR\_config\_PSCC =1.Note 7: NEUTRAN\_NR\_config\_SCC = ) where,  If E-UTRAN MN configures MO on SCC i, NEUTRAN\_config\_SCC,i =1, otherwise, NEUTRAN\_config\_SCC,i =0. If NR SN configures MO on SCC i, NNR\_config\_SCC,i =1, otherwise, NNR\_config\_SCC,i =0. If both E-UTRAN MN and NR SN configures MOs on SCC i and those two MOs meet MO merging conditions in clause 9.1.3.2, NEUTRAN\_config\_SCC,i +NNR\_config\_SCC,i = 1.Note 8: If E-UTRAN MN configures MO on FR2 SCC where neighbour cell measurement is required, NEUTRAN\_config\_SCC =1, otherwise, NEUTRAN\_config\_SCC =0. If NR SN configures MO on FR2 SCC where neighbour cell measurement is required, NNR\_config\_SCC =1, otherwise, NNR\_config\_SCC =0. If MOs configured by NR SN and E-UTRAN MN are on same SCC where neighbour cell measurement is required and meet MO merging conditions in clause 9.1.3.2, NEUTRAN\_config\_SCC + NNR\_config\_SCC =1. |

End of Change 1

Start of Change 2

#### 9.1.5.2 Monitoring of multiple layers within gaps

The carrier-specific scaling factor CSSFwithin\_gap,i for measurement object *i* derived in this chapter is applied to following measurement types:

- Intra-frequency measurement object with no measurement gap in clause 9.2.5, when all of the SMTC occasions of this intra-frequency measurement object are overlapped by the measurement gap.

- Intra-frequency measurement object with measurement gap in clause 9.2.6.

- Inter-frequency measurement object in clause 9.3.

- E-UTRA Inter-RAT measurement object in clauses 9.4.2 and 9.4.3.

- E-UTRA Inter-RAT RSTD and E-CID measurements in clauses 9.4.4 and 9.4.5.

- NR Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.4) on NR serving carrier

- the SSB is completely contained in the active BWP of the UE, or

- all of the SMTC occasions of this inter-RAT measurement object are overlapped by the measurement gap;

- NR Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.4) on NR non-serving carrier.

- E-UTRAN Inter-frequency measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.3) and by the E-UTRAN PSCell (TS 36.133 [15] clause 8.19.3).

- E-UTRAN Inter-frequency RSTD measurement configured by the E-UTRAN PCell (TS 36.133 [15] clause 8.17.15).

- UTRA Inter-RAT measurement object configured by the E-UTRAN PCell (TS 36.133 [15] clauses 8.17.5 to 8.17.12).

- GSM Inter-RAT measurements configured by the E-UTRAN PCell (TS 36.133 [15] clauses 8.17.13 and 8.17.14).

UE is expected to conduct the measurement of this measurement object *i* only within the measurement gaps.

If the higher layer signaling in TS 38.331 [2] of *smtc2* is present and *smtc1* is fully overlapping with measurement gaps and *smtc2* is partially overlapping with measurement gaps, CSSFwithin\_gap,i and requirements derived from CSSFoutside\_gap,i are not specified.

##### 9.1.5.2.1 EN-DC mode: carrier-specific scaling factor for SSB-based measurements performed within gaps

The scaling value CSSFwithin\_gap,i below has been derived without considering GSM inter-RAT carriers.

When one or more measurement objects are monitored within measurement gaps, the carrier specific scaling factor for a target measurement object with index *i* is designated as CSSFwithin\_gap,i and is derived as described in this clause.

If measurement object *i* refers to an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured, CSSFwithin\_gap,i=1. Otherwise, the CSSFwithin\_gap,i for other measurement objects (including RSTD measurement with periodicity Tprs=160ms) participate in the gap competition are derived as below.

For each measurement gap *j* not used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 160ms period, count the total number of intrafrequency measurement objects and interfrequency/interRAT measurement objects which are candidates to be measured within the gap *j*.

- An NR measurement object is a candidate to be measured in a gap if its SMTC duration is fully covered by the MGL excluding RF switching time. For intra-frequency NR carriers, if the higher layer in TS 38.331 [2] signaling of *smtc2* is configured, the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc2*; otherwise the assumed periodicity of SMTC occasions corresponds to the value of higher layer parameter *smtc1*

- An inter-RAT UTRA measurement object configured by E-UTRA PCell [15] is a candidate to be measured in all measurement gaps.

- An inter-frequency E-UTRA measurement object configured by E-UTRA PCell [15] is a candidate to be measured in all measurement gaps.

- For UEs which support and are configured with per FR gaps, the counting is done on a per FR basis, and for UEs which are configured with per UE gaps the counting is done on a per UE basis.

- Mintra,i,j: Number of intra-frequency measurement objects which are candidates to be measured in gap *j* where the measurement object *i* is also a candidate. Otherwise Mintra,i,j equals 0.

- Minter,i,j : Number of NR inter-frequency measurement objects or NR inter-RAT measurement objects configured by E-UTRA PCell, EUTRA inter-frequency measurement objects configured by E-UTRA PCell, UTRA inter-RAT measurement objects configured by E-UTRA PCell which are candidates to be measured in gap *j* where the measurement object *i* is also a candidate. Otherwise Minter,i,j equals 0.

- Mtot,i,j = Mintra,i,j + Minter,i,j : Total number of intra-frequency, inter-frequency and inter-RAT measurement objects which are candidates to be measured in gap *j* where the measurement object *i* is also a candidate. If MO configured by NR SN and inter-RAT MO configured by LTE MN on the same frequency that are measured within MG meets MO merging conditions in clause 9.1.3.2, they shall be counted as one merged MO in Mtot,i,j. Otherwise Mtot,i,j equals 0.

For each measurement gap *j* used for an RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 160ms period, Mintra,i,j = Minter,i,j = Mtot,i,j =0.

 The carrier specific scaling factor CSSFwithin\_gap,i is given by:

 If *measGapSharingScheme* is equal sharing, CSSFwithin\_gap,i= max(ceil(Ri×Mtot,i,j)), where *j*=0…(160/MGRP)-1

 If *measGapSharingScheme* is not equal sharing and

- measurement object *i* is an intra-frequency measurement object, CSSFwithin\_gap,i is the maximum among

- ceil(Ri×Kintra×Mintra,i,j) in gaps where Minter,i,j≠0, where *j*=0…(160/MGRP)-1

- ceil(Ri×Mintra,i,j) in gaps where Minter,i,j=0, where *j*=0…(160/MGRP)-1

- measurement object *i* is an inter-frequency or inter-RAT measurement object, CSSFwithin\_gap,i is the maximum among

- ceil(Ri×Kinter×Minter,i,j) in gaps where Mintra,i,j ≠0, where *j*=0…(160/MGRP)-1

- ceil(Ri×Minter,i,j)in gaps where Mintra,i,j=0, where *j*=0…(160/MGRP)-1

 Where Ri is the maximal ratio of the number of measurement gap where measurement object *i* is a candidate to be measured over the number of measurement gap where measurement object *i* is a candidate and not used for RSTD measurement with periodicity Tprs>160ms or with periodicity Tprs=160ms but *prs-MutingInfo-r9* is configured within an arbitrary 1280ms period.

Note: longer delays for cell identification and measurement periods derived based on CSSFwithin\_gap,i can be expected, if the UE is configured with inter-RAT MO on NR serving CC by E-UTRAN PCell in EN-DC mode.

End of Change 2