**3GPP TSG RAN WG4 Meeting #112 R4-2413016**

**Maastricht, NL, 19 Aug. 2024 – 23 Aug. 2024**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  |  | **CR** | **4886** | **rev** |  **1** | **Current version:** | **18.6.0** |  |
|  |
| *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:***  | CR on TC for A-TRS based inter-band SSB-less SCell activation delay for EN-DC |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | Netw\_Energy\_NR-Perf |  | ***Date:*** | 2024-08-09 |
|  |  |  |  |  |
| ***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 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)* |
|  |  |
| ***Reason for change:*** | EPRE is not correct in the test. |
|  |  |
| ***Summary of change:*** | EPRE is updated in the test. |
|  |  |
| ***Consequences if not approved:*** | inter-band SSB-less Scell activation is not testable |
|  |  |
| ***Clauses affected:*** | A.4.5.3.12 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS38.533 |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | R4-2413016 |

<Start of change 1>

#### A.4.5.3.12 Inter-band SSB-less Scell activation using A-TRS

##### A.4.5.3.12.1 Test Purpose and Environment

The purpose of this test is to verify the SSB less SCell activation delay is within the requirements stated in clause 8.3.2.

The supported test configurations are shown in table A.4.5.3.12.1-1 below. The test parameters are given in Tables A.4.5.3.12.1-2 and cell-specific parameters in A.4.5.3.12.1-3 below. The test consists of two successive time periods, with duration of T1 and T2, respectively. There are three carriers, E-UTRA has one cell, NR has two cells. All cells have constant signal levels throughout the test. Before the test starts the UE is connected to Cell 1 (PCell) on E-UTRA and Cell 2 (PSCell) on NR but is not aware of Cell 3 (SCell) on NR. The UE is monitoring the PCell and PSCell. The UE shall be continuously scheduled in the PCell and PSCell throughout the whole test.

At the beginning of T1 the UE receives an RRC message by which the SCell (Cell 3) becomes added. The configuration for the SCell (Cell 3) is not provided with SSB configuration (*absoluteFrequencySSB*) in the SCell *FrequencyInfoDL* nor SMTC configuration for the SCell and PSCell (Cell 2) is indicated as reference cell by higherlayer parameter [*SSB-less-Referencecell*]. Cell 3 is configured with TRS as shown in table A.4.5.3.12.1-2. The RS(s) of the Cell 3 is QCL-TypeA with TRS(s) of the Cell 3, and the TRS(s) of the Cell 3 is QCL-TypeC with SSB(s) of Cell 2.

The test equipment sends a MAC message for activation of the SCell and triggering the aperiodic CSI-RS for fast SCell activation. The point in time at which the MAC message is received at the UE antenna connector, in a slot # denoted m, defines the start of time period T2.

The UE shall be able to report valid CSI in PSCell for the activated SCell at latest in slot $m+\frac{T\_{HARQ}+T\_{activation\\_time}+T\_{CSI\\_Reporting}}{NR slot length}$, as defined in clause 8.3. The UE shall start reporting CSI in PSCell after at least one CSI-RS transmission occasion for channel measurement and reporting after slot (m+k) and shall report CQI index 0 (out-of-range) until the SCell activation has been completed. Any PSCell interruption due to activation of SCell shall occur in between slot $m+1+\frac{T\_{HARQ}}{NR slot length}$ to slot $m+1+\frac{T\_{HARQ}+3ms+Tfirst\\_ATRS}{NR slot length}+N\_{interruption}$as defined in clause 8.3. Any E-UTRA PCell interruption due to activation of SCell shall occur in between subframe $m\_{1}+1+\frac{T\_{HARQ}}{EUTRA slot length}$ to subframe $m\_{2}+1+\frac{T\_{HARQ}+3ms+Tfirst\\_ATRS}{EUTRA slot length}+N\_{interruption}$ where $m\_{1}$ and $m\_{2}$ are the index of the first and last subframe of E-UTRA PCell which overlaps with slot m.

The test equipment verifies that potential interruption is carried out in the correct time span by monitoring ACK/NACK sent in PSCell during activation and deactivation of Scell, respectively.

The test equipment verifies the activation time by counting the slots from the time when the Scell activation command is sent until a CSI report with other than CQI index 0 is received.

Table A.4.5.3.12.1-1: Inter-band SSB less SCell SCell activation in FR1 supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 2 | LTE FDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 3 | LTE FDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| 4 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, FDD duplex mode |
| 5 | LTE TDD, NR 15 kHz SSB SCS, ≥10 MHz bandwidth, TDD duplex mode |
| 6 | LTE TDD, NR 30 kHz SSB SCS, ≥40 MHz bandwidth, TDD duplex mode |
| Note 1: The UE is only required to be tested in one of the supported test configurationsNote 2: The UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration, |

Table A.4.5.3.12.1-2: General test parameters for Inter-band SSB less SCell SCell activation in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1,2,3 | One E-UTRAN radio channel (1) and two NR radio channel (2,3) are used for this test |
| Active PCell |  | Cell 1 | Primary cell on E-UTRAN RF channel number 1.As specified in clause A.3.7.2.1 |
| Active PSCell |  | Cell 2 | Primary secondary cell on NR RF channel number 2. |
| Configured deactivated SCell |  | Cell 3 | Configured deactivated secondary cell on NR RF channel number 3 |
| CP length |  | Normal |  |
| DRX |  | OFF | Continuous monitoring of primary cell |
| Cell-individual offset for cells on E-UTRA RF channel number | dB | 0 | Individual offset for cells on primary component carrier. |
| Cell-individual offset for cells on NR channel number | dB | 0 | Individual offset for cells on secondary component carrier. |
| Cell3 timing offset to cell2 | μs | Length of CP of Cell 3 |  |
| Time alignment error between cell3 and cell2 | μs | ≤ 3 | The value of time alignment error depends upon the type of carrier aggregation. |
| T1 | s | 7 | During this time the PSCell shall be known and the SCell configured and detected. |
| T2 | s | 1 | During this time the UE shall activate the SCell. |
| A3-offset | dB | -15 |  |
| THARQ | ms | k1 NR slot length | k1 is a number of slots indicated by the PDSCH-to-HARQ\_feedback timing indicator field in a corresponding DCI format or provided by *dl-DataToUL-ACK* if the PDSCH-to-HARQ feedback timing field is not present in the DCI format, the value is defined in 38.213 [3] |
| TCSI\_Reporting | ms | 15 | the delay (in ms) including uncertainty in acquiring the first available downlink CSI reference resource, UE processing time for CSI reporting (clause 5.2.2.5 in TS 38.214) and uncertainty in acquiring the first available CSI reporting resources as specified in TS 38.331 [2] |
| k | slot |  | As specified in clause 4.3 of TS 38.213 [3] |

Table A.4.5.3.12-3: Cell specific test parameters for Inter-band SSB less SCell activation in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Cell 2 | Cell 3 |
|  |  | T1 | T2 | T1 | T2 |
| SSB ARFCN |  | freq1 | Not applicable |
| Duplex mode | Config 1,4 |  | FDD |
|  | Config 2,3,5,6 |  | TDD |
| TDD configuration | Config 1,4 |  | Not Applicable |
|  | Config 2,5 |  | TDDConf.1.1 |
|  | Config 3,6 |  | TDDConf.2.1 |
| Reference Channel |  |  | N/A | Cell 2 |
| BWchannel | Config 1,4 | MHz | Note 7 |
|  | Config 2,5 |  | Note 7 |
|  | Config 3,6 |  | Note 7 |
| BWoccupied | Config 1,4 | RB | 52 Note 5 |
| Config 2,5 | 52 Note 5 |
| Config 3,6 | 106 Note 6 |
| DL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.0.1 |
| DL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | DLBWP.1.1 |
| UL initial BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.0.1 |
| UL dedicated BWP configuration | Config 1, 2, 3, 4, 5, 6 |  | ULBWP.1.1 |
| TCI state  |  |  | TCI.State.0 | TCI.State.0 Note 8 |
| Aperiodic CSI-RS for SCell activation | Config 1,4 |  | N/A | TRS.1.3 FDD |
| Config 2,5 | N/A | TRS.1.3 TDD |
| Config 3,6 | N/A | TRS.1.4 TDD |
| gapBetweenBursts |  | Slot | N/A |
| DRX Cycle | ms | Not Applicable |
| PDSCH Reference  | Config 1,4 |  | SR.1.1 FDD | SR.1.1 FDD |
| measurement channel | Config 2,5 |  | SR.1.1 TDD | SR.1.1 TDD |
|  | Config 3,6 |  | SR.2.1 TDD | SR.2.1 TDD |
| RMSI CORESET  | Config 1,4 |  | CR.1.1 FDD | CR.1.1 FDD |
| Reference Channel | Config 2,5 |  | CR.1.1 TDD | CR.1.1 TDD |
|  | Config 3,6 |  | CR.2.1 TDD | CR.2.1 TDD |
| RMC CORESET  | Config 1,4 |  | CCR.1.1 FDD | CCR.1.1 FDD |
| Reference Channel | Config 2,5 |  | CCR.1.1 TDD | CCR.1.1 TDD |
|  | Config 3,6 |  | CCR.2.1 TDD | CCR.2.1 TDD |
| TRS configuration | Config 1,4 |  | TRS.1.1 FDD | TRS.1.1 FDD |
|  | Config 2,5 |  | TRS.1.1 TDD | TRS.1.1 TDD |
|  | Config 3,6 |  | TRS.1.2 TDD | TRS.1.2 TDD |
| OCNG Patterns | Config 1,2,4,5 |  | OP.1 Note 5 |
| Config 3,6 |  | OP.1 Note 6 |
| SMTC configuration |  | SMTC.1 | Not Applicable |
| SSB configuration | Config 1,2,4,5 |  | SSB.1 FR1 | Not Applicable |
|  | Config 3,6 |  | SSB.2 FR1 | Not Applicable |
| CSI-RS configuration for CSI reporting | Config 1,4 |  | CSI-RS.1.1 FDD |
| Config 2,5 |  | CSI-RS.1.1 TDD |
| Config 3,6 |  | CSI-RS.2.1 TDD |
| PDSCH/PDCCH  | Config 1,2,4,5 | kHz | 15 |
| subcarrier spacing | Config 3,6 |  | 30 |
| reportConfigType | Config 1-6 |  | periodic |
| reportQuantity | Config 1-6 |  | cri-RI-PMI-CQI |
| CSI reporting periodicity | Config 1,2,4,5 | slot | 5 | N/A |
| CSI reporting offset | Config 3,6 | slot | 10 | N/A |
| Config 1,2,4,5 | 2 | N/A |
| Config 3,6 | 4 | N/A |
| EPRE ratio of PSS to SSS |  | 0 | 0 |
| EPRE ratio of PBCH DMRS to SSS |  |  |
| EPRE ratio of PBCH to PBCH DMRS |  |  |
| EPRE ratio of PDCCH DMRS to SSS |  |  |
| EPRE ratio of PDCCH to PDCCH DMRS | dB |  |
| EPRE ratio of PDSCH DMRS to SSS  |  |  |
| EPRE ratio of PDSCH to PDSCH  |  |  |
| EPRE ratio of OCNG DMRS to SSS(Note 1) |  |  |
| EPRE ratio of OCNG to OCNG DMRS (Note 1) |  |  |
| Note2 | Config 1,2,4,5 | dBm/SCS | -104 |
|  | Config 3,6 |  | -101 |
|  | dB | 10 | 22  |
|  | dB | 10 | 22 |
| SS-RSRPNote3 | Config 1,2,4,5 | dBm/SCS | -87 | NA |
|  | Config 3,6 |  | -84 | NA |
| SCH\_RP Note 3 | dBm/15 kHz | -87 | Note 3 |
| Propagation condition | - | AWGN |
| IoNote3 | Config 1,2,4,5 | dBm/9.36MHz | -58.96 | Note 3 |
| Config 3,6 | dBm/38.16MHz | -52.87 | Note 3 |
| Note 1: OCNG shall be used such that both cells are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: Interference from other cells and noise sources not specified in the test is assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled within BWoccupied.Note 3: SS-RSRP, Io and SCH\_RP levels have been derived from other parameters for information purposes. They are not settable parameters themselves.Note 4: The uplink resources for CSI reporting are assigned to the UE prior to the start of time period T2.]Note 5: All UL/DL transmission shall be confined within BWoccupied (i.e. 10 MHz, 52 RBs) from FC,low, and Io is independent of the BWchannel configured.Note 6: All UL/DL transmission shall be confined within BWoccupied (i.e. 40 MHz, 106 RBs) from FC,low, and Io is independent of the BWchannel configured.Note 7: NRB,c. is derived from Table 5.3.2-1 in TS38.101-1[2] with configured BWchannel.Note 8: The SSB in referenceSignal in the TCI state is configured as the SSB in Cell 1. |

*Editor’s Notes : FFS whether consider ΔEPRENote 9*

##### A.4.5.3.12.2 Test Requirements

During T2 the UE shall send the first CSI report for SCell in the first available uplink resource after slot (m+k). UE is allowed to postpone CSI report to next available uplink resource if an available uplink resource is subject to interruption. Whether CSI report in slot (m+k) was interrupted is checked by monitoring ACK/NACK sent in PCell in slot (m+k).

During T2 the UE shall start sending CSI reports for SCell with non-zero CQI index at latest in a slot $m+\frac{T\_{HARQ}+T\_{activtion\\_time}+T\_{CSI\\_Reporting}}{NR slot length}$, Tactivation\_time = TFirstATRS + 5ms, as defined in clause 8.3.

During T2 interruption of PSCell during SCell activation shall not happen outside the slot $m+1+\frac{T\_{HARQ}}{NR slot length}$ to $m+1+\frac{T\_{HARQ}+3ms+T\_{X}}{NR slot length}+N\_{interruption}$, and interruption of E-UTRA PCell during SCell activation shall not happen outside the subframe $m\_{1}+1+\frac{T\_{HARQ}}{EUTRA slot length}$ to subframe$ m\_{2}+1+\frac{T\_{HARQ}+3ms+T\_{X}}{EUTRA slot length}+N\_{interruption}$, as defined in clause 8.3.

The interruption of PSCell shall not be more than the values specified for EN-DC in Clause 8.2.1.2.19.

All of the above test requirements shall be fulfilled in order for the observed SCell activation delay and SCell deactivation delay to be counted as correct. The rate of correct observed SCell activation delay during repeated tests shall be at least 90%.

NOTE: During T2 if there are no uplink resources for reporting the valid CSI in a slot $m+\frac{T\_{HARQ}+T\_{activtion\\_time}+T\_{CSI\\_Reporting}}{NR slot length}$ as defined in clause 8.3 then the UE shall use the next available uplink resource for reporting the corresponding valid CSI.

<End of change 1>