**3GPP TSG- RAN WG4 Meeting #100 *R4-2114013***

**Electronic Meeting, August 16th – 27th 2021**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** |  | **rev** | **-** | **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 |  | Core Network |  |

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| ***Title:***  | Draft CR for Idle Mode measurements of inter-RAT CA candidate cells for early reporting (TC#3) |
|  |  |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | LTE\_NR\_DC\_CA\_enh-Perf |  | ***Date:*** | 2021-08-06 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***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 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)* |
|  |  |
| ***Reason for change:*** | Introduction of test case for Idle Mode measurements of inter-RAT CA candidate cells for early reporting. TC#3 has PCell and serving idle mode cell in NR FR1 while the target carrier is LTE. |
|  |  |
| ***Summary of change:*** | Introdcution of test case #3 for Idle Mode measurements of inter-RAT CA candidate cells for early reporting.UE in connected mode with PCell (FR1) and LTE PSCell, UE is configured with early measurement reporting with LTE PSCell carrier, Connection is released, UE is in idle mode, Change Rxlevel of LTE cell, Connection setup within T331, network requests early measurement report. s-NonIntraSearch is configured and target cell is known.Include absolute measurement accuracy test.Updated based on input in RAN4#98bis: tables for Idle mode are split and description is clarified.  |
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| ***Consequences if not approved:*** | Specification is incomplete |
|  |  |
| ***Clauses affected:*** | New section: A.x.x.x |
|  |  |
|  | **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:*** | R4-2106391, R4-2111277 |

<Start of Change>

### A.x.x.x Idle Mode measurements of inter-RAT CA candidate cells for early reporting

#### A.x.x.x.1 Test Purpose and Environment

The purpose of this test is to verify that the UE properly retains the detected cell status for the idle mode CA measurement when UE transitions from RRC Connected mode to Idle mode, when the UE has entered Idle mode. Additionally, test that the UE performs the required measurements on the serving cell and the configured inter-RAT carrier for idle mode measurement reporting. This test will partly verify the Idle mode CA measurements in clause 4.4. In the test, connected mode DRX configuration is not configured in either PCell or PSCell.

Additionally, the purpose of this test is to verify that the SS-RSRP, SS-RSRQ, RSRP and RSRQ measurement accuracy is within the specified limits. This test will verify the accuracy requirements in Sections 10.1.2B and 10.1.7B for intra-frequwncy measurements and section 10.2.4 and 10.2.5 for the inter-RAT measurements for the supported test configurations in tables A.x.x.x.x-4 and A.x.x.x.x-5.

The supported test configurations are given in Table A.x.x.x.1-1. The test parameters are given in Tables A.x.x.x.1-2, A.x.x.x.1-3, A.x.x.x.1-4 and A.x.x.x.1-5 below. In the test there are two cells, cell 1, which is the PCell in connected, and serving cell in idle mode, on radio channel 1 in FR1, and cell 2, which is the PSCell in connected, and measured LTE inter-RAT cell in idle mode, on radio channel 2 in LTE.

For the purpose of testing absolute accuracy in idle mode in this set of test cases the cells in idle mode are on different carrier frequencies (NR FR1 and LTE). The absolute accuracy of RSRP and RSRQ inter-RAT measurements are tested by using the parameters in Table A.x.x.x.x-4 and Table A.x.x.x.x-5. In all test cases, Cell 1 is the serving and Cell 2 the target cell.

The test consists of 5 successive time periods, with time duration of T1, T2, T3, T4 and T5 respectively. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1 and cell 2. During T1 cell 2, the PSCell, shall be configured.

Time duration T2 starts when UE has transmitted random access preamble on the PSCell. After T2, the UE is configured with idle mode CA measurements with the PSCell carrier as the target carrier. The connection is released [500]ms after T2 when the UE has sent random access preamble on the PSCell.

T3 starts when the connection is released. During the time periods T3 and T4 the UE is in Idle mode with the serving cell on the FR1 carrier. The UE is configured to perform inter-RAT idle mode CA/DC measurements on Cell 2 carrier. After the connection release and during T3, [1000] ms after T3 is started, the signal level of the inter-RAT carrier configured for idle mode CA/DC measurements is changed at which time T4 starts. T5 starts [65]s after T4, when the UE is paged for connection setup and UE is requested by the network to report idle mode CA/DC measurements.

Table A.x.x.x.x-1: Supported test configurations for Idle Mode measurements of inter-frequency CA candidate cells for early reporting

|  |  |
| --- | --- |
| Config | Description |
| 1 | FR1 FDD SSB SCS 15kHz BW 10MHz – LTE FDD 10MHz |
| 2 | FR1 FDD SSB SCS 15kHz BW 10MHz – LTE TDD 10MHz |
| 3 | FR1 TDD SSB SCS 30kHz BW 40MHz – LTE FDD 10MHz |
| 4 | FR1 TDD SSB SCS 30kHz BW 40MHz – LTE TDD 10MHz |
| Note 1: The UE is only required to be tested in one of the supported test configurations |

Table A.x.x.x.x.1-2: General test parameters for Idle Mode measurements of inter-frequency CA candidate cells for early reporting

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| RF Channel Number |  | 1, 2 | Two radio channels are used for this test |
| Active PCell |  | Cell 1 | PCell on RF channel number 1 in FR1 |
| PSCell |  | Cell 2 | PSCell on RF channel number 2 in LTE |
| DRX |  | OFF | For both PCell and PSCell once configured |
| PRACH configuration in Cell 2 |  | FR1 PRACH configuration 2 | PRACH configuration as specified in Clause A.3.8.3.2. |
| CSI reporting periodicity and offset configuration for Cell 2 | ms | 2 |  |
| T1 | s | [0.5] | During this time the PCell is known and PSCell is configured. |
| T2 | s | [0.5] | PSCell access. |
| T3 + T4 | s | [66] | During this time the UE is configured to perform inter-frequency measurements in idle mode on the PSCell carrier. |
| T5 | s | [0.5] | UE is paged and connection is setup. Network requests measurement report from the UE. |

Table A.x.x.x.x.1-3: Cell specific test parameters for NR cell for Idle Mode measurements of inter-frequency CA candidate cells for early reporting

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| --- | --- | --- | --- |
| Parameter | Unit | Config | Test 1 |
| Cell 1 |
| T1 | T2 | T3 | T4 | T5 |
| AoA setup |  | 1,2,3,4 | N/A |
| Assumption for UE beams Note 5R: Rough |  | 1,2,3,4 | N/A | N/A | R | R | N/A |
| Frequency Range |  | 1,2,3,4 | FR1 |
| Duplex mode |  | 1, 2 | FDD |
| 3, 4 | TDD |
| TDD Confguration1: TDDConf.1.12: TDDConf.2.1 |  | 1,2 | - |
|  | 3,4 | 1 | 1 | 2 | 2 | 1 |
| BWchannel1: 10: NRB,c = 522: 40: NRB,c = 106 | MHz | 1, 2 | 1 | 1 | - | - | 1 |
| 3, 4 | 2 | 2 | - | - | 2 |
| Initial Downlink BWP configuration |  | 1,2,3,4 | DLBWP.0.1 |
| Initial Uplink BWP configuration |  | 1,2,3,4 | ULBWP.0.1 |
| Dedicated Downlink BWP configuration1: DLBWP.1.1 |  | 1,2,3,4 | 1 | 1 | - | - | 1 |
| Dedicated Uplink BWP configuration1: ULBWP.1.1 |  | 1,2,3,4 | 1 | 1 | - | - | 1 |
| PDSCH Reference Measurement Channel1: SR.1.1 FDD2: SR.2.1 TDD | FDD | 1,2 | 1 | 1 | 1 | 1 | 1 |
| TDD | 3,4 | 2 | 2 | 2 | 2 | 2 |
| TRS configuration |  | 1,2,3,4 | - |
| TCI state |  | 1,2,3,4 | - |
| RMSI CORESET parameters | FDD | 1,2 | CR.1.1 FDD |
| TDD | 3,4 | CR.2.1 TDD |
| Dedicated CORESET parameters | FDD | 1,2 | CCR.1.1 FDD |
| TDD | 3,4 | CCR.2.1 TDD |
| OCNG PatternsNote1 |  | 1,2,3,4 | OP.1 defined in A.3.2.1 |
| SSB configuration1: SSB.1 FR12: SSB.2 FR1 |  | 1,2 | 1 |
|  | 3,4 | 2 |
| SMTC configuration |  | 1,2,3,4 | SMTC.2 |
| Correlation Matrix and Antenna config |  | 1,2,3,4 | 1x2 Low |
| EPRE ratio of PSS to SSS | dB | 1,2,3,4 | 0 | 0 | - | - | 0 |
| EPRE ratio of PBCH DMRS to SSS | 0 | 0 | - | - | 0 |
| EPRE ratio of PBCH to PBCH DMRS | 0 | 0 | - | - | 0 |
| EPRE ratio of PDCCH DMRS to SSS | 0 | 0 | - | - | 0 |
| EPRE ratio of PDCCH to PDCCH DMRS | 0 | 0 | - | - | 0 |
| EPRE ratio of PDSCH DMRS to SSS  | 0 | 0 | - | - | 0 |
| EPRE ratio of PDSCH to PDSCH  | 0 | 0 | - | - | 0 |
| EPRE ratio of OCNG DMRS to SSS | 0 | 0 | - | - | 0 |
| Noc Note2 | dBm/ 15kHz | 1,2 | [-98] | [-98] | [-98] | [-98] | [-98] |
| 3,4 |  |  |
| Noc Note2 | dBm/SCS | 1,2 | [-98] | [-98] | [-98] | [-98] | [-98] |
| 3,4 | [-95] | [-95] | [-95] | [-95] | [-95] |
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| Ês/Iot | dB | 1,2,3,4 | [5] | [5] | [5] | [5] | [5] |
| Ês/Noc | dB | 1,2,3,4 | [5] | [5] | [5] | [5] | [5] |
| SS-RSRPNote3,4 | dBm/SCS | 1,2 | [-93] | [-93] | [-93] | [-93] | [-93] |
| 3,4 | [-90] | [-90] | [-90] | [-90] | [-90] |
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| IoNote3,4 | dBm/9.36 MHz | 1,2 | [-63.85] | [-63.85] | -[-63.85] | -[-63.85] | [-63.85] |
| dBm/38.16 MHz | 3,4 | [-57.76] | [-57.76] | -[-57.76] | -[-57.76] | [-57.76] |
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| Qrxlevmin | dBm/SCS | 1 | - | - | [-140] | - |
|  | 2 | - | - | [-137] | - |
|  | 3 | - | - | [TBD] | [TBD] | - |
|  | 4 | - | - | [TBD] | [TBD] | - |
| Pcompensation | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| Qhysts | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| Qoffsets, n | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| Cell\_selection\_and\_reselection\_quality\_measurement |  | 1,2,3,4 | SS-RSRP |
| Treselection | s | 1,2,3,4 | - | 0 | - |
| SnonintrasearchP | dB | 1,2,3,4 | - | [TBD] | - |
| SnonintrasearchQ | dB | 1,2,3,4 | - | [TBD] | - |
| Threshx, high | dB | 1,2,3,4 | - | [48] | - |
| Threshserving, low | dB | 1,2,3,4 | - | [44] | - |
| Threshx, low  | dB | 1,2,3,4 | - | [50] | - |
| Propagation Condition | dB | 1,2,3,4 | - | AWGN | - |

Table A.x.x.x.x.1-4: Cell specific test parameters for LTE cell for Idle Mode measurements of inter-frequency CA candidate cells for early reporting

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Config | Test 1 |
| Cell 2 |
| T1 | T2 | T3 | T4 | T5 |
| Frequency Range |  | 1,2,3,4 | LTE |
| Duplex mode |  | 1, 3 | FDD |
| 2, 4 | TDD |
| BWchannel | MHz | 1,2,3,4 | 10 | 10 | - | - | 10 |
| Measurement bandwidth |  | 1,2,3,4 | - | - | 22-27 | 22-27 | - |
| PDSCH Reference Measurement Channel1: R.1 FDD2: R.1 TDD | FDD | 1,3 | 1 | 1 | - | - | 1 |
| TDD | 2,4 | 2 | 2 | - | - | 2 |
| PDCCH/PCFICH/PHICH Reference measurement channel defined in A.3.1.2.1 and A.3.1.2.2 in 36.1331: R.6 FDD2: R.6 TDD |  | 1,3 | 1 | 1 | - | - | 1 |
| 2,4 | 2 | 2 | - | - | 2 |
| OCNG Patterns defined in A.3.2.1.1 (OP.2 FDD) and A.3.2.1.2 (OP.2 TDD) in 36.1331: OP.2 FDD2: OP.2 TDD |  | 1,3 | 1 |
| 2,4 | 2 |
| Correlation Matrix and Antenna config |  | 1,2,3,4 | 1x2 Low |
| PBCH\_RA | dB | 1,2,3,4 | N/A | N/A | 0 | 0 | N/A |
| PBCH\_RB | N/A | N/A | 0 | 0 | N/A |
| PSS\_RA | N/A | N/A | 0 | 0 | N/A |
| SSS\_RA | N/A | N/A | 0 | 0 | N/A |
| PCFICH\_RB | N/A | N/A | 0 | 0 | N/A |
| PHICH\_RA | N/A | N/A | 0 | 0 | N/A |
| PHICH\_RB | N/A | N/A | 0 | 0 | N/A |
| PDCCH\_RA | N/A | N/A | 0 | 0 | N/A |
| PDCCH\_RB | N/A | N/A | 0 | 0 | N/A |
| PDSCH\_RA | N/A | N/A | 0 | 0 | N/A |
| PDSCH\_RB | N/A | N/A | 0 | 0 | N/A |
| OCNG\_RANote 1 | N/A | N/A | 0 | 0 | N/A |
| OCNG\_RBNote 1  | N/A | N/A | 0 | 0 | N/A |
| Noc Note2 | dBm/ 15kHz | 1,2 | [-98] | [-98] | [-98] | [-98] | [-98] |
| 3,4 |  |  |
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| Ês/Iot | dB | 1,2,3,4 | [5] | [5] | [-3] | [8] | [5] |
| Ês/Noc | dB | 1,2,3,4 | [5] | [5] | [-3] | [8] | [5] |
| SS-RSRPNote3,4 | dBm/SCS | 1,2 | [-84] | [-84] | [-96] | [-85] | [-84] |
| 3,4 | [-84] | [-84] | [-93] | [-82] | [-84] |
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| IoNote3,4 | dBm/9.36 MHz | 1,2, 3, 4 | FFS | FFS | [-62.25] | [-55.37] | FFS |
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| Qrxlevmin | dBm/SCS | 1 | - | - | [-140] | - |
|  | 2 | - | - | [-137] | - |
|  | 3 | - | - | [TBD] | [TBD] | - |
|  | 4 | - | - | [TBD] | [TBD] | - |
| Pcompensation | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| Qhysts | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| Qoffsets, n | dB | 1,2,3,4 | - | - | 0 | 0 | - |
| Cell\_selection\_and\_reselection\_quality\_measurement |  | 1,2,3,4 | RSRP and RSRQ |
| Treselection | s | 1,2,3,4 | - | 0 | - |
| SnonintrasearchP | dB | 1,2,3,4 | - | [TBD] | - |
| SnonintrasearchQ | dB | 1,2,3,4 | - | [TBD] | - |
| Threshx, high | dB | 1,2,3,4 | - | [48] | - |
| Threshserving, low | dB | 1,2,3,4 | - | [44] | - |
| Threshx, low  | dB | 1,2,3,4 | - | [50] | - |
| Propagation Condition | dB | 1,2,3,4 | - | AWGN | - |

Table A.x.x.x.x.x-5: General idle mode test parameters for Idle Mode measurements of inter-frequency CA candidate cells for early reporting

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Unit | Test configuration | Value | Comment |
| Serving cell |  | 1, 2, 3, 4 | Cell1 | The UE camps on cell 1 which is the former PCell. |
| Neighbour cell |  | 1, 2, 3, 4 | Cell2 | The UE shall perform inter-frequency measurements on cell 2 which is the former PSCell. |
| RF Channel Number |  | 1, 2, 3, 4 | 1, 2 |  |
| Time offset between cells |  | 1, 2, 3, 4 | 3 μs | Synchronous cells |
| Access Barring Information | - | 1, 2, 3,4 | Not Sent | No additional delays in random access procedure. |
| SSB configuration |  | 1, 2 | SSB.1 FR1 | Serving cell |
| 3, 4 | SSB.2 FR1 | Serving cell |
| SMTC configuration Serving cell |  | 1, 2, 3, 4 | SMTC.2 |  |
| DRX cycle length | s | 1, 2, 3, 4 | 1.28 | The value shall be used for all cells in the test. |
| PRACH configuration index |  | 1, 2, 3, 4 | 190 | The detailed configuration is specified in TS 38.211 clause 6.3.3.2 |
| rangeToBestCell |  | 1, 2, 3, 4 | Not configured |  |
| T3 | s | 1, 2, 3, 4 | [0.5] | T3 needs to be defined so that cell measurement time is taken into account. |
| T4 | s | 1, 2, 3, 4 | [65] | T4 needs to be defined so that cell measurement time is taken into account. |

#### A.x.x.x.2 Test Requirements

The UE behaviour during time durations T1, T2, T3, T4 and T5 shall be as follows:

During time durations T1 the UE shall start transmitting preamble on PSCell. During T2 the UE perform intra-frequency measurements on the PCell and the PSCell.

During the time-period T3 the connection is released, and UE enters idle mode. During the time period T3 and T4 the UE is camped in Idle mode and at T4 the signal level of cell 2 is changed. The UE shall not perform reselection. The UE shall perform Idle Mode CA measurement according to Section 4.4.

At the start of T5 the UE is paged for connection setup. During the connection setup the UE is requested to transmit early measurement report. The UE shall send early measurement report to the PCell including idle mode CA/DC measurement from cell 2.

After receiving the requested early measurement report, the test equipment verifies that the accuracy of measurement reported for serving Cell 1 and Cell 2 meets the requirements in Sections 10.1.2B and 10.1.7B and Sections 10.2.4 and 10.2.5, respectively and test ends.

The rate of correct events observed during repeated tests shall be at least 90%.

<End of Change>