**3GPP TSG- Meeting # *R4-2108219***

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

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| ***Title:***  |  |
|  |  |
| ***Source to WG:*** |  |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** |  |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** |  |  | ***Release:*** |  |
|  | *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:*** | In RAN4#97-e, R4-2017072 added RLM test cases for MPDCCH performance improvement, where the CE Mode B early OOS test parameters of A.7.3.99 (FD-FDD), A.7.3.100 (HD-FDD), and A.7.3.101 (TDD), are based on A.7.3.82, A.7.3.84, and A.7.3.86, respectively.RAN#98-e agreed CR R4-2103500 to correct the RLM test parameters incluing A.7.3.82, A.7.3.84, and A.7.3.86, but the parameters for A.7.3.99, A.7.3.100, and A.7.3.101 were not corrected. |
|  |  |
| ***Summary of change:*** | Apply the same correction of A.7.3.82, A.7.3.84, and A.7.3.86 to A.7.3.99 (FD-FDD), A.7.3.100 (HD-FDD), and A.7.3.101, according to R4-2103500.  |
|  |  |
| ***Consequences if not approved:*** | Wrong parameters are configured.  |
|  |  |
| ***Clauses affected:*** | A.7.3.99, A.7.3.100, A.7.3.101.  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **x** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **x** |  |  Test specifications | TS 36.521-3 |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | A.7.3.99.2/A.7.3.100.2/A.7.3.101.2: When the estimated quality becomes better than the threshold… -> When the estimated quality becomes worse than the threshold… |

----------------------------------------------------- Beginning of Change ------------------------------------------------------------

### A.7.3.99 E-UTRAN FD-FDD Early Out-of-sync reporting Test for Cat-M1 UE in CEModeB for MPDCCH performance improvement

#### A.7.3.99.1 Test Purpose and Environment

The purpose of this test is to verify that the FD-FDD Cat-M1 UE properly detects an early out of sync event and makes correct reporting of it for the purpose of monitoring the downlink radio link quality of the PCell in CEModeB configured with *mpdcch-crs-connnected-config*. This test will partly verify the E-UTRAN FDD radio link monitoring requirements for Cat-M1 UE defined in clause 7.19.

The test parameters are given in Tables A.7.3.99.1-1 and A.7.3.99.1-2 below. There is one cell (cell 1), which is the active cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.3.99.1-1 shows the variation of the downlink SNR in the active cell to emulate early out-of-sync and early in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1.

In the test, the RRC parameter *numberPRB-Pairs* is set to 6 and the RRC parameter *mPDCCH-NumRepetition* is set to 128. In addition, the UE is configured with *rlm-ReportConfig*. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

Table A.7.3.99.1-1: General test parameters for E-UTRAN FD-FDD early out-of-sync testing for UE Cat-M1 in CEModeB for MPDCCH performance improvement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Active cell |  | Cell 1 | Cell 1 is on E-UTRA RF channel number 1 |
| CP length  |  | Normal |  |
| Early Out of sync transmission parameters (Note 1) | DCI format |  | 6-1B | As defined in section 5.3.3.1.12 in TS 36.212 |
| Number of OFDM symbols for legacy control channels |  | 2 | Early Out of sync threshold Q E1\_out\_CatM1 and the corresponding hypothetical MPDCCH transmission parameters are as specified in section 7.19.4 and Table 7.19.4-4 respectively.  |
| M-PDCCH aggregation level  | eCCE | 16 |
| M-PDCCH repetition level |  | 64 |
| ρA, ρB |  | -3 |
| DRX |  | OFF |  |
| Layer 3 filtering |  | Enabled | Counters:N310 = 1; N311 = 1 |
| T310 timer | ms | 1800 | T310 is enabled |
| T314 timer | ms | 0 | T314 is disabled |
| T311 timer | ms | 1000 | T311 is enabled |
| T1 | s | 2 |  |
| T2 | s | 0.8 |  |
| T3 | s | 1.8 |  |
| Note 1: MPDCCH corresponding to the early out of sync transmission parameters need not be included in the Reference Measurement Channel. |

Table A.7.3.82.1-2: Cell specific test parameters for E-UTRAN FD-FDD (cell # 1) for early out-of-sync radio link monitoring tests for Cat-M1 in CEModeB for MPDCCH performance improvement

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
| T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 |
| BWchannel | MHz | 5:10 |
| MPDCCH parameters as defined in A.3.1.3.4 |  | R.19 FDD |
| OCNG Pattern defined in A.3.2.1.1 (FDD)  |  | 5MHz: OP.22 FDD10MHz: OP.21 FDD  |
| ρA, ρB |  | -3 |
| MPDCCH\_RA | dB | 0 |
| MPDCCH\_RB | dB | 0 |
| PBCH\_RA | dB | -3 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1  | dB |
|  | dBm/15 kHz | -98 |
| SNR Note 5 | dB | -10 | -16.8 | -22.8 |
| Propagation condition |  | ETU 30Hz |
| Correlation Matrix and Antenna Configuration |  | 2x1 Low |
| Note 1: OCNG shall be used such that the resources in cell # 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.Note 3: The signal contains PDCCH for UEs other than the device under test as part of OCNG.Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.Note 5: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.3.99.1-1. |



Figure A.7.3.99.1-1: SNR variation for early out-of-sync testing

#### A.7.3.99.2 Test Requirements

The UE shall compare the downlink radio link quality of the PCell over the last Qout\_CatM1 evaluation, which is defined in 7.19.4.1, with the threshold QE1\_out\_CatM. When the estimated quality becomes worse than the threshold starting from time point B, Layer 1 of the UE shall trigger event E1 and send a report to the higher layers within Qout\_CatM1 evaluation period.

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

### A.7.3.100 E-UTRAN HD-FDD Early Out-of-sync reporting Test for Cat-M1 UE in CEModeB for MPDCCH performance improvement

#### A.7.3.100.1 Test Purpose and Environment

The purpose of this test is to verify that the HD-FDD Cat-M1 UE properly detects an early out of sync event and makes correct reporting of it for the purpose of monitoring the downlink radio link quality of the PCell in CEModeB configured with *mpdcch-crs-connnected-config*. This test will partly verify the E-UTRAN FDD radio link monitoring requirements for Cat-M1 UE defined in clause 7.19.

The test parameters are given in Tables A.7.3.100.1-1 and A.7.3.100.1-2 below. There is one cell (cell 1), which is the active cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.3.100.1-1 shows the variation of the downlink SNR in the active cell to emulate early out-of-sync and early in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1.

In the test, the RRC parameter *numberPRB-Pairs* is set to 6 and the RRC parameter *mPDCCH-NumRepetition* is set to 128. In addition, the UE is configured with *rlm-ReportConfig*. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

Table A.7.3.100.1-1: General test parameters for E-UTRAN HD-FDD early out-of-sync testing for UE Cat-M1 in CEModeB for MPDCCH performance improvement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Active cell |  | Cell 1 | Cell 1 is on E-UTRA RF channel number 1 |
| CP length  |  | Normal |  |
| Early Out of sync transmission parameters (Note 1) | DCI format |  | 6-1B | As defined in section 5.3.3.1.12 in TS 36.212 |
| Number of OFDM symbols for legacy control channels |  | 2 | Early Out of sync threshold Q E1\_out\_CatM1 and the corresponding hypothetical MPDCCH transmission parameters are as specified in section 7.19.4 and Table 7.19.4-4 respectively.  |
| M-PDCCH aggregation level  | eCCE | 16 |
| M-PDCCH repetition level |  | 64 |
| ρA, ρB |  | -3 |
| DRX |  | OFF |  |
| Layer 3 filtering |  | Enabled | Counters:N310 = 1; N311 = 1 |
| T310 timer | ms | 1800 | T310 is enabled |
| T314 timer | ms | 0 | T314 is disabled |
| T311 timer | ms | 1000 | T311 is enabled |
| T1 | s | 2 |  |
| T2 | s | 0.8 |  |
| T3 | s | 1.8 |  |
| Note 1: MPDCCH corresponding to the early out of sync transmission parameters need not be included in the Reference Measurement Channel. |

Table A.7.3.100.1-2: Cell specific test parameters for E-UTRAN HD-FDD (cell # 1) for early out-of-sync radio link monitoring tests for Cat-M1 in CEModeB for MPDCCH performance improvement

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
| T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 |
| BWchannel | MHz | 5:10 |
| MPDCCH parameters as defined in A.3.1.3.5 |  | R.9 HD-FDD |
| OCNG Pattern defined in A.3.2.1 (FDD)  |  | 5MHz: OP.22 FDD10MHz: OP.21 FDD  |
| ρA, ρB |  | -3 |
| MPDCCH\_RA | dB | 0 |
| MPDCCH\_RB | dB | 0 |
| PBCH\_RA | dB | -3 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1  | dB |
|  | dBm/15 kHz | -98 |
| SNR Note 5 | dB | -10 | -16.8 | -22.8 |
| Propagation condition |  | ETU 30Hz |
| Correlation Matrix and Antenna Configuration |  | 2x1 Low |
| Note 1: OCNG shall be used such that the resources in cell # 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 2: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.Note 3: The signal contains PDCCH for UEs other than the device under test as part of OCNG.Note 4: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.Note 5: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.3.100.1-1. |



Figure A.7.3.100.1-1: SNR variation for early out-of-sync testing

#### A.7.3.100.2 Test Requirements

The UE shall compare the downlink radio link quality of the PCell over the last Qout\_CatM1 evaluation, which is defined in 7.19.4.1, with the threshold QE1\_out\_CatM. When the estimated quality becomes worse than the threshold starting from time point B, Layer 1 of the UE shall trigger event E1 and send a report to the higher layers within Qout\_CatM1 evaluation period.

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

### A.7.3.101 E-UTRAN TDD Early Out-of-sync reporting Test for Cat-M1 UE in CEModeB for MPDCCH performance improvement

#### A.7.3.101.1 Test Purpose and Environment

The purpose of this test is to verify that the TDD Cat-M1 UE properly detects an early out of sync event and makes correct reporting of it for the purpose of monitoring the downlink radio link quality of the PCell in CEModeB configured with *mpdcch-crs-connnected-config*. This test will partly verify the E-UTRAN FDD radio link monitoring requirements for Cat-M1 UE defined in clause 7.19.

The test parameters are given in Tables A.7.3.101.1-1 and A.7.3.101.1-2 below. There is one cell (cell 1), which is the active cell, in the test. The test consists of three successive time periods, with time duration of T1, T2 and T3 respectively. Figure A.7.3.101.1-1 shows the variation of the downlink SNR in the active cell to emulate early out-of-sync and early in-sync states. Prior to the start of the time duration T1, the UE shall be fully synchronized to cell 1.

In the test, the RRC parameter *numberPRB-Pairs* is set to 6 and the RRC parameter *mPDCCH-NumRepetition* is set to 128. In addition, the UE is configured with *rlm-ReportConfig*. UE shall successfully complete the RRC reconfiguration accordingly prior to the start of time duration T1.

Table A.7.3.101.1-1: General test parameters for E-UTRAN TDD early out-of-sync testing for UE Cat-M1 in CEModeB for MPDCCH performance improvement

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | Unit | Value | Comment |
| Active cell |  | Cell 1 | Cell 1 is on E-UTRA RF channel number 1 |
| CP length  |  | Normal |  |
| Early Out of sync transmission parameters (Note 1) | DCI format |  | 6-1B | As defined in section 5.3.3.1.12 in TS 36.212 |
| Number of OFDM symbols for legacy control channels |  | 2 | Early Out of sync threshold Q E1\_out\_CatM1 and the corresponding hypothetical MPDCCH transmission parameters are as specified in section 7.19.4 and Table 7.19.4-4 respectively.  |
| M-PDCCH aggregation level  | eCCE | 16 |
| M-PDCCH repetition level |  | 64 |
| ρA, ρB |  | -3 |
| DRX |  | OFF |  |
| Layer 3 filtering |  | Enabled | Counters:N310 = 1; N311 = 1 |
| T310 timer | ms | 1800 | T310 is enabled |
| T314 timer | ms | 0 | T314 is disabled |
| T311 timer | ms | 1000 | T311 is enabled |
| T1 | s | 2 |  |
| T2 | s | 0.8 |  |
| T3 | s | 1.8 |  |
| Note 1: MPDCCH corresponding to the early out of sync transmission parameters need not be included in the Reference Measurement Channel. |

Table A.7.3.101.1-2: Cell specific test parameters for E-UTRAN TDD (cell # 1) for early out-of-sync radio link monitoring tests for Cat-M1 in CEModeB for MPDCCH performance improvement

|  |  |  |
| --- | --- | --- |
| Parameter | Unit | Test 1 |
| T1 | T2 | T3 |
| E-UTRA RF Channel Number |  | 1 |
| BWchannel | MHz | 5:10 |
| Special subframe configuration Note 1 |  | 6 |
| Uplink-downlink configuration Note 1 |  | 1 |
| MPDCCH parameters as defined in A.3.1.3.6 |  | R.17 TDD |
| OCNG Pattern defined in A.3.2.2 (TDD)  |  | 5MHz: OP.10 TDD10MHz: OP.11 TDD  |
| ρA, ρB |  | -3 |
| MPDCCH\_RA | dB | 0 |
| MPDCCH\_RB | dB | 0 |
| PBCH\_RA | dB | -3 |
| PBCH\_RB | dB |
| PSS\_RA | dB |
| SSS\_RA | dB |
| OCNG\_RANote 1 | dB |
| OCNG\_RBNote 1  | dB |
|  | dBm/15 kHz | -98 |
| SNR Note 5 | dB | -10 | -16.8 | -22.8 |
| Propagation condition |  | ETU 30Hz |
| Correlation Matrix and Antenna Configuration |  | 2x1 Low |
| Note 1: For special subframe and uplink-downlink configurations see Tables 4.2-1 and 4.2-2 in TS 36.211.Note 2: OCNG shall be used such that the resources in cell # 1 are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.Note 3: The timers and layer 3 filtering related parameters are configured prior to the start of time period T1.Note 4: The signal contains PDCCH for UEs other than the device under test as part of OCNG.Note 5: SNR levels correspond to the signal to noise ratio over the cell-specific reference signal REs.Note 6: The SNR in time periods T1, T2 and T3 is denoted as SNR1, SNR2 and SNR3 respectively in figure A.7.3.101.1-1.Note 7: Aggregation level and repetition levels specified in A.7.3.101.1-1 are used for this test. |



Figure A.7.3.101.1-1: SNR variation for early out-of-sync testing

#### A.7.3.101.2 Test Requirements

The UE shall compare the downlink radio link quality of the PCell over the last Qout\_CatM1 evaluation, which is defined in 7.19.4.1, with the threshold QE1\_out\_CatM. When the estimated quality becomes worse than the threshold starting from time point B, Layer 1 of the UE shall trigger event E1 and send a report to the higher layers within Qout\_CatM1 evaluation period.

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

------------------------------------------------------------- End of change ------------------------------------------------------------