**3GPP TSG-RAN WG4 Meeting #95-e *R4-2008644***

**Electronic Meeting, 25 May– 05 June 2020**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **36.133** | **CR** | **6895** | **rev** | **1** | **Current version:** | **16.5.0** |  |
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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:***  | RSS based RSRP measurement to IDLE mode for eMTC in enhanced coverage |
|  |  |
| ***Source to WG:*** | Ericsson |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | LTE\_eMTC5-Core |  | ***Date:*** | 2020-05-25 |
|  |  |  |  |  |
| ***Category:*** | **B** |  | ***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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | Support for RSS based RSRP measurement is introduced in release 16  |
|  |  |
| ***Summary of change:*** | Change #1: conditions for RSS based RSRP measurement in IDLE mode  |
|  |  |
| ***Consequences if not approved:*** | Not clear under what conditions the RSS measurements can be perfromed |
|  |  |
| ***Clauses affected:*** |  4.7.2.2.1, 4.7.2.2.2, 4.7.2.2.3 |
|  |  |
|  | **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:*** |  |

----------------------------------------------------- Beginning of Change 1 ------------------------------------------------------------

##### 4.7.2.2.1 Measurement and evaluation of serving cell for UE category M1 in enhanced coverage

The requirements in this subclause apply if UE is in the enhanced coverage area of the serving cell. The UE is considered to be in enhanced coverage area of serving cell according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot of the serving cell defined in Annex B.1.3 for a corresponding Band.

The UE shall measure the RSRP and RSRQ level of the serving cell and evaluate the cell selection criterion S defined in [1] for the serving cell at least every DRX cycle.

The UE is allowed to perform RSRP measurements based on RSS signals provided UE is configured with *rss-ConfigCarrierInfo* [2] and following conditions are met:

* At least two subframes containing RSS are available within the MPDCCH bandwidth for Nserv successive DRX cycles in the window of [n-5, n-1] where n is the first subframe of paging MPDCCH,
* RSS power offset (PRSS)with respect to CRS as defined in *RSS-Config* [2], where PRSS ≥ 0 dB
* RSS periodicity (TRSS) as defined in *RSS-Config* [2]

The UE shall filter the RSRP and RSRQ measurements of the serving cell using at least 4 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by, at least DRX cycle/2.

If the UE is not configured with eDRX\_IDLE cycle and has evaluated according to Table 4.7.2.2.1-1 in Nserv\_EC consecutive DRX cycles that the serving cell does not fulfil the cell selection criterion S, the UE shall initiate the measurements of all neighbour cells indicated by the serving cell, regardless of the measurement rules currently limiting UE measurement activities.

If the UE is configured with eDRX\_IDLE cycle and has evaluated according to Table 4.7.2.2.1-2 in Nserv\_EC consecutive DRX cycles within a single PTW that the serving cell does not fulfil the cell selection criterion S, the UE shall initiate the measurements of all neighbour cells indicated by the serving cell, regardless of the measurement rules currently limiting UE measurement activities.

If the UE in RRC\_IDLE has not found any new suitable cell based on searches and measurements using the intra-frequency, inter-frequency and inter-RAT information indicated in the system information during the time T, the UE shall initiate cell selection procedures for the selected PLMN as defined in [1], where T=20 s if the UE is not configured with eDRX\_IDLE cycle, and T=MAX(20 s, one eDRX\_IDLE cycle) if the UE is configured with eDRX\_IDLE cycle.

Table 4.7.2.2.1-1: Nserv\_EC

|  |  |
| --- | --- |
| DRX cycle length [s] | Nserv\_EC [number of DRX cycles] |
| 0.32 | 8 |
| 0.64 | 8 |
| 1.28 | 4 |
| 2.56 | 4 |

Table 4.7.2.2.1-2: Nserv\_ECfor UE configured with eDRX\_IDLE cycle

|  |  |  |  |
| --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Nserv [number of DRX cycles] |
| 5.12 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | 4 |
| 0.64 | ≥2.56 (2) | 4 |
| 1.28 | ≥5.12 (4) | 4 |
| 2.56 | ≥10.24(8) | 4 |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34]. |

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

------------------------------------------------------------- End of change 1 ------------------------------------------------------------

------------------------------------------------------------- Beginning of change 2 -----------------------------------------------------

##### 4.7.2.2.2 Measurements of intra-frequency cells for UE category M1 in enhanced coverage

The requirements in this subclause apply if UE is in the enhanced coverage area of the serving cell. The UE is considered to be in enhanced coverage area of serving cell according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot of the serving cell defined in Annex B.1.3 for a corresponding Band.

The UE shall be able to identify new intra-frequency cells and perform RSRP and RSRQ measurements of identified intra-frequency cells without an explicit intra-frequency neighbour list containing physical layer cell identities. The UE shall not cause any interruption to the paging reception and acquisition of SI while performing measurement on serving or any neighbor cells.

The UE is allowed to perform RSRP measurements based on RSS signals provided UE is configured with *rss-ConfigCarrierInfo* [2] and following conditions are met:

* At least two subframes containing RSS are available within the MPDCCH bandwidth for the number of successive DRX cycles corresponding to Tmeasure,EUTRAN\_Intra\_NC and Tevaluate,EUTRAN\_Intra\_EC in the window of [n-5, n-1] where n is the first subframe of paging MPDCCH,
* RSS power offset (PRSS)with respect to CRS as defined in *RSS-Config* [2], where PRSS ≥ 0 dB
* RSS periodicity (TRSS) as defined in *RSS-Config* [2]

The UE shall be able to evaluate whether a newly detectable intra-frequency cell meets the reselection criteria defined in TS36.304 within Tdetect,EUTRAN\_Intra\_ECwhen that Treselection= 0. An intra-frequency cell is considered to be detectable according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot defined in Annex B.1.3 for a corresponding Band.

The UE shall measure RSRP and RSRQ at least every Tmeasure,EUTRAN\_Intra\_EC for intra-frequency cells that are identified and measured according to the measurement rules.

The UE shall filter RSRP and RSRQ measurements of each measured intra-frequency cell using at least 4 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Tmeasure,EUTRAN\_Intra\_EC/2.

The UE shall not consider an E-UTRA neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an intra-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the intra-frequency cell has met reselection criterion defined [1] within Tevaluate,E-UTRAN\_intra\_EC when Treselection = 0, provided that the cell is at least 5dB better ranked.

If Treselection timer has a non zero value and the intra-frequency cell is better ranked than the serving cell, the UE shall evaluate this intra-frequency cell for the Treselection time. If this cell remains better ranked within this duration, then the UE shall reselect that cell.

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC are specified in Table 4.7.2.2.2-1. For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC are specified in Table 4.7.2.2.2-2. Additionally, the requirements in Table 4.7.2.2.2-2 apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC when multiple PTWs are used.

Table 4.7.2.2.2-1 : Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SCH Ês/Iot of neighboring cell: Q2 [dB] | DRX cycle length [s] | Tdetect,EUTRAN\_Intra\_EC [s] (number of DRX cycles)  | Tmeasure,EUTRAN\_Intra\_EC [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_intra\_EC[s] (number of DRX cycles) |
| **-15≤ Q2 < -6** | 0.32 | 330.24 (1032) | 1.28 x N1 (4 x N1) | 10.24 x N1 (32 x N1) |
| 0.64 | 330.24 (516) | 1.28 x N1 (2 x N1) | 10.24 x N1 (16 x N1) |
| 1.28 | 524.8 (410) | 1.28 x N1 (1 x N1) | 12.8 x N1 (10 x N1) |
| 2.56 | 1039.36 (406) | 2.56 x N1 (1 x N1) | 15.36 x N1 (6 x N1) |
| **Q2≥-6** | 0.32 | 16.64 (52) | 1.28 x N1 (4 x N1) | 10.24 x N1 (32 x N1) |
| 0.64 | 23.04 (36) | 1.28 x N1 (2 x N1) | 10.24 x N1 (16 x N1) |
| 1.28 | 38.4 (30) | 1.28 x N1 (1 x N1) | 12.8 x N1 (10 x N1) |
| 2.56 | 66.56 (26) | 2.56 x N1 (1 x N1) | 15.36 x N1 (6 x N1) |
| Note 1: 5 x TRSS if RSRP is measured on RSS signals defined in *RSS-Config* [2].; otherwise N1=1. |

Table 4.7.2.2.2-2: Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate, E-UTRAN\_intra\_EC for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Tdetect,EUTRAN\_Intra\_EC [s] (number *N* of DRX cycles) for neighboring cell with SCH Es/IoT: -15≤ Q2 < -6 [dB] | Tdetect,EUTRAN\_Intra\_EC [s] (number *N* of DRX cycles) for neighboring cell with SCH Es/IoT:Q2≥-6 [dB] | Tmeasure,EUTRAN\_Intra\_EC [s] (number *N* of DRX cycles) | Tevaluate,E-UTRAN\_intra\_EC[s] (number *N* of DRX cycles) |
| 5.12 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | Note 3 (406) | Note 3 (26) | 0.32 (1) | Note 3 (6) |
| 0.64 | ≥1.28 (1) | 0.64 (1) | Note 3 (6) |
| 1.28 | ≥2.28 (1) | 1.28 (1) | Note 3 (6) |
| 2.56 | ≥2.56 (2) | 2.56 (1) | Note 3 (6) |
| NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].NOTE 3: The detection period and the evaluation period depend on the number *N* of DRX cycles and are calculated according to the formula below:. |

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

If all the relaxed monitoring criteria defined in clause 5.2.4.12 of TS 36.304 [1] are fulfilled then the UE’s intra-frequency measurement is not required to meet Tdetect,EUTRAN\_Intra\_EC, Tmeasure,EUTRAN\_Intra\_EC and Tevaluate,E-UTRAN\_intra\_EC as defined in Table 4.7.2.2.2-1 and Table 4.7.2.2.2-2.

##### 4.7.2.2.3 Measurements of inter-frequency cells for UE category M1 in enhanced coverage

The requirements in this subclause apply if UE is in the enhanced coverage area of the serving cell. The UE is considered to be in enhanced coverage area of serving cell according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot of the serving cell defined in Annex B.1.3 for a corresponding Band.

The UE shall be able to identify new inter-frequency cells and perform RSRP or RSRQ measurements of identified inter-frequency cells if carrier frequency information is provided by the serving cell, even if no explicit neighbour list with physical layer cell identities is provided. The UE shall not cause any interruption to the paging reception and acquisition of SI while performing measurement on serving or any neighbor cells.

The UE is allowed to perform RSRP measurements based on RSS signals provided UE is configured with *rss-ConfigCarrierInfo* [2] and following conditions are met:

* At least two subframes containing RSS are available within the MPDCCH bandwidth for the number of successive DRX cycles corresponding to Tmeasure,EUTRAN\_Intra\_NC and Tevaluate,EUTRAN\_Inter\_EC in the window of [n-5, n-1] where n is the first subframe of paging MPDCCH,
* RSS power offset (PRSS)with respect to CRS as defined in *RSS-Config* [2], where PRSS ≥ 0 dBRSS periodicity (TRSS) as defined in *RSS-Config* [2]

If Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ then the UE shall search for inter-frequency layers of higher priority at least every Thigher\_priority\_search where Thigher\_priority\_search is described in clause 4.2.2.

If Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ then the UE shall search for and measure inter-frequency layers of higher, equal or lower priority in preparation for possible reselection. In this scenario, the minimum rate at which the UE is required to search for and measure higher priority layers shall be the same as that defined below.

The UE shall be able to evaluate whether a newly detectable inter-frequency cell meets the reselection criteria defined in TS36.304 within Tdetect,EUTRAN\_Inter\_EC, if at least carrier frequency information is provided for inter-frequency neighbour cells by the serving cells when Treselection = 0 provided that the reselection criteria is met by a margin of at least 6 dB for reselections based on ranking. An inter frequency cell is considered to be detectable according to RSRP, RSRP Ês/Iot, SCH\_RP and SCH Ês/Iot defined in Annex B.1.8 for a corresponding Band.

When higher priority cells are found by the higher priority search, they shall be measured at least every Tmeasure,E-UTRAN\_Inter\_EC . If, after detecting a cell in a higher priority search, it is determined that reselection has not occurred then the UE is not required to continuously measure the detected cell to evaluate the ongoing possibility of reselection. However, the minimum measurement filtering requirements specified later in this clause shall still be met by the UE before it makes any determination that it may stop measuring the cell. If the UE detects on a E-UTRA carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall measure RSRP or RSRQ at least every Tmeasure,EUTRAN\_Inter\_EC for identified lower or equal priority inter-frequency cells. If the UE detects on a E-UTRA carrier a cell whose physical identity is indicated as not allowed for that carrier in the measurement control system information of the serving cell, the UE is not required to perform measurements on that cell.

The UE shall filter RSRP or RSRQ measurements of each measured higher, lower and equal priority inter-frequency cell using at least 4 measurements. Within the set of measurements used for the filtering, at least two measurements shall be spaced by at least Tmeasure,EUTRAN\_Inter\_EC/2.

The UE shall not consider a E-UTRA neighbour cell in cell reselection, if it is indicated as not allowed in the measurement control system information of the serving cell.

For an inter-frequency cell that has been already detected, but that has not been reselected to, the filtering shall be such that the UE shall be capable of evaluating that the inter-frequency cell has met reselection criterion defined TS 36.304 within Tevaluate,E-UTRAN\_Inter\_EC, when Treselection = 0 provided that the reselection criteria is met by a margin of at least 6 dB for reselections based on ranking.

If Treselection timer has a non zero value and the inter-frequency cell is better ranked than the serving cell, the UE shall evaluate this inter-frequency cell for the Treselection time. If this cell remains better ranked within this duration, then the UE shall reselect that cell.

For UE not configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC are specified in Table 4.7.2.2.3-1. For UE configured with eDRX\_IDLE cycle, Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC are specified in Table 4.7.2.2.3-3. Additionally, the requirements in Table 4.7.2.2.3-3 apply provided that the serving cell is configured with eDRX\_IDLE and is the same in all PTWs during any of Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC when multiple PTWs are used.

Table 4.7.2.2.3-1: Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate,E-UTRAN\_Inter\_EC

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| SCH Ês/Iot of neighboring cell: Q2 [dB] | DRX cycle length [s] | Tdetect,EUTRAN\_Inter\_EC [s] (number of DRX cycles)  | Tmeasure,EUTRAN\_Inter\_EC [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_inter\_EC[s] (number of DRX cycles) |
| **-15≤ Q2 < -6** | 0.32 | 330.24 (1032) | 1.28 x N1 (4 x N1) | 10.24 x N1 (32 x N1) |
| 0.64 | 330.24 (516) | 1.28 x N1 (2 x N1) | 10.24 x N1 (16 x N1) |
| 1.28 | 524.8 (410) | 1.28 x N1 (1 x N1) | 12.8 x N1 (10 x N1) |
| 2.56 | 1039.36 (406) | 2.56 x N1 (1 x N1) | 15.36 x N1 (6 x N1) |
| **Q2≥-6** | 0.32 | 16.64 (52) | 1.28 x N1 (4 x N1) | 10.24 x N1 (32 x N1) |
| 0.64 | 23.04 (36) | 1.28 x N1 (2 x N1) | 10.24 x N1 (16 x N1) |
| 1.28 | 38.4 (30) | 1.28 x N1 (1 x N1) | 12.8 x N1 (10 x N1) |
| 2.56 | 66.56 (26) | 2.56 x N1 (1 x N1) | 15.36 x N1 (6 x N1) |
| Note 1: 5 x TRSS if RSRP is measured on RSS signals defined in *RSS-Config* [2].; otherwise N1=1. |

Table 4.7.2.2.3-2: Void

Table 4.7.2.2.3-3: Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC for UE configured with eDRX\_IDLE cycle

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| eDRX\_IDLE cycle length [s] | DRX cycle length [s] | PTW length [s] (number of 1.28s periods) | Tdetect,EUTRAN\_Inter\_EC [s] (number of DRX cycles) for neighboring cell with SCH Es/IoT: -15≤ Q2 < -6 [dB] | Tdetect,EUTRAN\_Inter\_EC [s] (number of DRX cycles) for neighboring cell with SCH Es/IoT:Q2≥-6 [dB] | Tmeasure,EUTRAN\_Inter\_EC [s] (number of DRX cycles) | Tevaluate,E-UTRAN\_inter\_EC[s] (number of DRX cycles) |
| 5.12 ≤ eDRX\_IDLE cycle length ≤ 2621.44 | 0.32 | ≥1.28 (1) | Note 3 (406) | Note 3 (26) | 0.32 (1) | Note 3 (6) |
| 0.64 | ≥1.28 (1) | 0.64 (1) | Note 3 (6) |
| 1.28 | ≥1.28 (1) | 1.28 (1) | Note 3 (6) |
| 2.56 | ≥2.56 (2) | 2.56 (1) | Note 3 (6) |
|  | NOTE 1: The number of DRX cycles in this table is given for the DRX cycles within PTWs.NOTE 2: The eDRX\_IDLE cycle lengths are as specified in Section 10.5.5.32 of TS 24.008 [34].NOTE 3: The detection period and the evaluation period depend on the number *N* of DRX cycles and are calculated according to the formula below:. |

For higher priority cells, a UE may optionally use a shorter value forTmeasure,EUTRAN\_Inter\_EC,which shall not be less than Max(0.64 s, one DRX cycle).

For any requirement in this section, when the UE transitions between any two states when being configured with eDRX\_IDLE, being configured with eDRX\_IDLE cycle, changing eDRX\_IDLE cycle length, or changing PTW configuration, the UE shall meet the transition requirement, which is the less stringent requirement of the two requirements corresponding to the first state and the second state, during the transition time interval which is the time corresponding to the transition requirement. After the transition time interval, the UE has to meet the requirement corresponding to the second state.

If all the relaxed monitoring criteria defined in clause 5.2.4.12 of TS 36.304 [1] are fulfilled then the UE’s inter-frequency measurement is not required to meet Tdetect,EUTRAN\_Inter\_EC, Tmeasure,EUTRAN\_Inter\_EC and Tevaluate, E-UTRAN\_inter\_EC as defined in Table 4.7.2.2.3-1 and Table 4.7.2.2.3-3.

------------------------------------------------------------- End of change 2 ------------------------------------------------------------