**3GPP TSG-RAN4 Meeting #95-e *R4-2008646***

**Electronic Meeting, 25 May – 5 June, 2020**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **36.133** | **CR** | 6889 | **rev** | **1** | **Current version:** | **16.5.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
|  | | | | | | | | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | | | | | |
| ***Title:*** | CR to add additional timing requirements for PUR | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, HiSilicon | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | LTE\_eMTC5-Core | | | | |  | ***Date:*** | | | 2020-05-11 |
|  |  | | | |  | |  | | |  |
| ***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 can be 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:*** | | The Tx timing requirement for PUR was added in R4-1910559 to section 7.1. However, the Tx timing requirement for Cat-M1 and M2 UEs are defined in section 7.24. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Add the Tx timing requirement for PUR in section 7.24. It should be noted that the PUR requirement in 7.1 is still needed for non-BL UE. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No Tx timing requirement for PUR for Cat-M1 and M2 UEs. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 7.24 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

<Start of Change 1>

### 7.1.2 Requirements

The UE initial transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in Table 7.1.2-1. This requirement applies when it is the first transmission in a DRX, eDRX\_CONN cycle for PUCCH, SPUCCH, PUSCH of subframe, slot or subslot duration and SRS, or it is the first transmission after RACH-less handover, or it is the PRACH transmission. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the reference cell. *N*TA\_Ref for PRACH is defined as 0.  (in *Ts* units) for other channels is the difference between UE transmission timing and the Downlink timing immediately after when the last timing advance in clause 7.3 was applied. *N*TA\_Ref for other channels is not changed until next timing advance is received.

Table 7.1.2-1: Te Timing Error Limit

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Te\_ |
| 1.4 | 24\*TS |
| ≥3 | 12\*TS |
| Note: TS is the basic timing unit defined in TS 36.211 | |

When it is not the first transmission in a DRX or eDRX\_CONN cycle or there is no DRX or no eDRX\_CONN cycle, and when it is the transmission for PUCCH, SPUCCH, PUSCH of subframe, slot or subslot duration and SRS transmission or it is not the first transmission after RACH-less handover, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell except when the timing advance in clause 7.3 is applied.

When in a TAG the transmission timing error between the UE and the reference timing exceeds ±Te, or in a sTAG the UE changes the downlink SCell for deriving the UE transmit timing for cells in the sTAG configured with one or two uplinks, the UE is required to adjust its timing to within ±Te in that TAG, as long as,

- the UE is configured with a pTAG and one or two sTAG, the transmission timing difference between TAGs does not exceed the maximum transmission timing difference (i.e., 32.47us) after such adjustment, or

- the UE is configured with synchronous dual connectivity, the transmission timing difference between pTAG and psTAG does not exceed the maximum transmission timing difference (i.e., 35.21us) after such adjustment.

If the transmission timing difference after such adjustment is bigger than the maximum transmission timing difference UE may stop adjustment in this TAG. For a UE configured with more than one serving cell and with *ShortTTI -r15* or with *ShortProcessingTime=TRUE*, UE may stop the transmit timing adjustment if the conditions specified in the subclause B.7.1 cannot be fulfilled after such adjustment. The reference timing shall be  before the downlink timing of the reference cell. All adjustments made to the UE uplink timing under the above mentioned scenarios shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be Tq seconds.

2) The minimum aggregate adjustment rate shall be 7\*TS per second.

3) The maximum aggregate adjustment rate shall be Tq per 200ms.

If the UE is not configured with *highSpeedEnhMeasFlag2-r16* then the maximum autonomous time adjustment step Tq is specified in Table 7.1.2-2.

If the UE is configured with *highSpeedEnhMeasFlag2-r16* then the maximum autonomous time adjustment step Tq is specified in Table 7.1.2-3. The requirements in Table 7.1.2-3 shall apply provided that the UE is configured with only PCell.

Table 7.1.2-2: Tq Maximum Autonomous Time Adjustment Step when the UE is not configured with *highSpeedEnhMeasFlag2-r16*

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Tq\_ |
| 1.4 | 17.5\*TS |
| 3 | 9.5\*TS |
| 5 | 5.5\*TS |
| ≥10 | 3.5\*TS |
| Note: TS is the basic timing unit defined in TS 36.211 | |

Table 7.1.2-3: Tq Maximum Autonomous Time Adjustment Step when the UE is configured with *highSpeedEnhMeasFlag2-r16*

|  |  |
| --- | --- |
| Downlink Bandwidth (MHz) | Tq\_ |
| 1.4 | 17.5\*TS |
| 3 | 9.5\*TS |
| ≥ 5 | 5.5\*TS |
| Note: TS is the basic timing unit defined in TS 36.211 | |

<End of Change 1>

<Start of Change 2>

## 7.24 UE transmit timing for Category M1

### 7.24.1 Introduction

The Category M1 UE shall have the capability to follow the frame timing change of the connected eNode B. The uplink frame transmission takes place  before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell.

The UE shall use the serving cell as the reference cell for deriving the UE transmit timing. UE initial transmit timing accuracy, maximum amount of timing change in one adjustment, minimum and maximum adjustment rate are defined in the following requirements.

### 7.24.2 Requirements

The UE initial transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in Table 7.24.2-1. This requirement applies when it is the first transmission in a DRX cycle, eDRX\_CONN cycle, or the first transmission in a repetition period (R>1) for PUCCH, PUSCH, and SRS, or the first transmission after an uplink transmission gap in a repetition period (R>1) for PUCCH or PUSCH, or it is the PRACH transmission, or it is the transmission on PUR. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the serving cell minus . The downlink timing is defined as the time when the first detected path (in time) of the corresponding downlink frame is received from the serving cell. *N*TA\_Ref for PRACH is defined as 0.  (in *Ts* units) for other channels is the difference between UE transmission timing and the Downlink timing immediately after when the last timing advance in clause 7.3 was applied. *N*TA\_Ref for other channels is not changed until the next timing advance is received.

Table 7.24.2-1: Te Timing Error Limit

|  |  |
| --- | --- |
| CE Mode | Te\_ |
| A | 24\*TS |
| B | 48\*Ts |
| NOTE 1: TS is the basic timing unit defined in TS 36.211.  NOTE 2: This requirement applies regardless of the downlink carrier bandwidth. | |

When it is not the first transmission in a DRX or eDRX\_CONN cycle or there is no DRX or no eDRX\_CONN cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall, when no repetitions are configured on the uplink or the repetition period is R=1, be capable of changing the transmission timing according to the received downlink frame of the serving cell except when the timing advance in clause 7.3 is applied such that the UE transmission timing error shall be less than or equal to ±Te where the timing error limit value Te is specified in Table 7.24.2-1.

When no repetition period is configured, or the configured repetition period is R=1, all adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change in one adjustment shall be Tq seconds.

2) The minimum aggregate adjustment rate shall be 7\*TS per second.

3) The maximum aggregate adjustment rate shall be Tq per 200ms.

where the maximum autonomous time adjustment step Tq is specified in Table 7.24.2-2.

Table 7.24.2-2: Tq Maximum Autonomous Time Adjustment Step

|  |  |
| --- | --- |
| CE Mode | Tq\_ |
| A | 17.5\*TS |
| B | 17.5\*Ts |
| NOTE 1: TS is the basic timing unit defined in TS 36.211.  NOTE 2: This requirement applies regardless of the downlink carrier bandwidth. | |

When a repetition period is configured on the uplink for which R>1, the UE shall not adjust the uplink transmission timing autonomously during an ongoing repetition period other than at initial transmission as defined above.

<End of Change 2>