**3GPP TSG-RAN WG4 Meeting # 104-e *R4-2214602***

 **Electronic Meeting, 15 - 26 August 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | **2488** | **rev** | **1** | **Current version:** | **17.6.0** |  |
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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:***  | CR to TS 38.133: Corrections to UE transmit timing and timing advance for satellite access  |
|  |  |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_NTN\_solutions-Core |  | ***Date:*** |  |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***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-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
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| ***Reason for change:*** | Correction to the transmit timing requirements taking into account the NTN validity timer and aligning timing advance requirements with the agreement from the previous meeting.  |
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| ***Summary of change:*** | Correcting requirements on the uplink timing between two Timing Advance commands.Adjusting the timing advance adjustment delay for TAC, which is in line with the previous agreements.This is a revision of R4-2212863. |
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| ***Consequences if not approved:*** | The specification is incomplete and ambiguous.  |
|  |  |
| ***Clauses affected:*** | 7.1C and 7.3C |
|  |  |
|  | **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>

## 7.1C UE transmit timing for Satellite Access

*Editor’s note: Applicability of frequency range, CA, DA, duplex mode, inter-RAT measurement, etc is subject to updates/changes based on the scope of the corresponding WID.*

*Editor’s note: Terminology will be further clarified and selected between, e.g. NTN and satellite access, based on further agreements.*

### 7.1C.1 Introduction

The UE shall have capability to follow the frame timing change of the reference cell in connected state. The uplink frame transmission takes place (*N*TA *+ N*TA-offset *+ N*TA,common *+ N*TA,UE-specific)*×*Tc before the reception of the first detected path (in time) of the corresponding downlink frame from the reference cell. UE initial transmit timing accuracy and gradual timing adjustment requirements are defined in the following requirements.

### 7.1C.2 Requirements

The UE initial transmission timing error shall be less than or equal to ±Te\_NTN where the timing error limit value Te\_NTN is specified in Table 7.1C.2-1. This requirement applies:

- when it is the first transmission in a DRX cycle for PUCCH, PUSCH and SRS, or it is the PRACH transmission, or it is the msgA transmission..

The UE shall meet the Te\_NTN requirement for an initial transmission provided that at least one SSB is available at the UE during the last 160 ms and the UE has a validity time running for *N*TA,commonand *N*TA,UE-specific. 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 for PRACH is defined as 0. *~~N~~*~~TA~~ ~~for other channels is not changed until next timing advance is received. If the UE has applied a Timing Advance command in clause 7.3C.2.1, in the current frame,~~ (in *T*c units) is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in clause 7.3 was applied or after the last update in or . ~~Otherwise, (~~*~~N~~*~~TA~~ *~~+ N~~*~~TA-offset~~ *~~+ N~~*~~TA,common~~ *~~+ N~~*~~TA,UE-specific~~~~)~~*~~×~~*~~T~~~~c~~ ~~(in~~ *~~T~~*~~c~~ ~~units) is the difference between UE transmission timing and the downlink timing immediately after the beginning of the downlink SFN~~

The value of *N*TA-offset depends on the duplex mode of the cell in which the uplink transmission takes place and the frequency range (FR). *N*TA-offset is defined in Table 7.1.2-2.

*Editor Notes: FFS the clarification on NTA,common and NTA,UE-specific.*

Table 7.1C.2-1: Te\_NTN Timing Error Limit

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (kHz)** | **SCS of uplink signals (kHz)** | **Te** |
| 1 | 15 | 15 | 29\*64\*Tc |
|  |  | 30 | 24\*64\*Tc |
|  |  | 60 | N/A |
|  | 30 | 15 | 24\*64\*Tc |
|  |  | 30 | 22\*64\*Tc |
|  |  | 60 | N/A |
| Note 1: Tc is the basic timing unit defined in TS 38.211 [6] |

When it is not the first transmission in a DRX cycle or there is no DRX cycle, and when it is the transmission for PUCCH, PUSCH and SRS transmission, the UE shall be capable of changing the transmission timing according to the received downlink frame of the reference cell, the updating of *N*TA,common and the updating of *N*TA,UE-specific, except when the timing advance in clause 7.3C is applied.

#### 7.1C.2.1 Gradual timing adjustment

When the transmission timing error between the UE and the reference timing exceeds ±Te\_NTN then the UE is required to adjust its timing to within ±Te\_NTN. The reference timing shall be (*N*TA *+ N*TA-offset *+ N*TA,common *+ N*TA,UE-specific)*×*Tc before the downlink timing of the reference cell. All adjustments made to the UE uplink timing shall follow these rules:

1) The maximum amount of the magnitude of the timing change, apart from a change of *N*TA,UE-specific due to satellite position update and *N*TA,common between the previous transmission and the current transmission, in one adjustment shall be Tq\_NTN.

2) The minimum aggregate adjustment rate, apart from a change of *N*TA,UE-specific due to satellite position update and *N*TA,common during the last one second, shall be Tp\_NTN per second.

3) The maximum aggregate adjustment rate, apart from a change of *N*TA,UE-specific due to satellite position update and *N*TA,common during the last 200ms, shall be Tq\_NTN per 200 ms.

Where, the maximum autonomous time adjustment step Tq\_NTN and the aggregate adjustment rate Tp\_NTN are specified in Table 7.1C.2.1-1.

Table 7.1C.2.1-1: Tq\_NTN Maximum Autonomous Time Adjustment Step and Tp\_NTN Minimum Aggregate Adjustment rate

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of uplink signals (kHz)** | **Tq\_NTN** | **Tp\_NTN** |
| 1 | 15 | [5.5]\*64\*Tc | [5.5]\*64\*Tc |
|  | 30 | [5.5]\*64\*Tc | [5.5]\*64\*Tc |
|  | 60 | N/A | N/A |
| NOTE: Tc is the basic timing unit defined in TS 38.211 [6] |

<End of Change 1>

<Start of Change 2>

## 7.3C Timing advance for satellite access

*Editor’s note: Applicability of frequency range, CA, DA, duplex mode, inter-RAT measurement, etc is subject to updates/changes based on the scope of the corresponding WID.*

*Editor’s note: Terminology will be further clarified and selected between, e.g. NTN and satellite access, based on further agreements.*

### 7.3C.1 Introduction

The timing advance is initiated by UE configured with only PCell served by SAN, upon initiating a validity timer for *N*TA,commonand *N*TA,UE-specific. The timing advance can be adjusted with MAC message that implies the adjustment of the timing advance, as defined in clause 5.2 of TS 38.321 [7].

### 7.3C.2 Requirements

#### 7.3C.2.1 Timing Advance adjustment delay

UE shall adjust the timing of its uplink transmission timing from the beginning of uplink at time slot *n*+ *k+1+2µ* for a timing advance command received in time slot *n*, and the value of *k, µ* and are defined in clause 4.2 in TS 38.213 [3]. The same requirement applies also when the UE is not able to transmit a configured uplink transmission due to the channel assessment procedure.

#### 7.3C.2.2 Timing Advance adjustment accuracy

The UE shall adjust the timing of its transmissions with a relative accuracy better than or equal to the UE Timing Advance adjustment accuracy requirement in Table 7.3C.2.2-1, to the signalled timing advance value compared to the timing of preceding uplink transmission. The timing advance command step is defined in TS 38.213 [3].

Table 7.3C.2.2-1: UE Timing Advance adjustment accuracy

|  |  |  |  |
| --- | --- | --- | --- |
| UL Sub Carrier Spacing(kHz) | 15 | 30 | 60 |
| UE Timing Advance adjustment accuracy | ±256 Tc | ±256 Tc | ±128 Tc |

*Editor’s Note: it would be further clairified with the additional conditions for TA adjustment accuracy requirement for satellite access*

<End of Change 2>