**3GPP TSG- Meeting # *xxxxx***

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** | **1** | **Current version:** |  |  |
|  |
| *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:***  |  |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_NTN\_Ku\_bands-Core |  | ***Date:*** | 4 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***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-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19) Rel-20 (Release 20)* |
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| ***Reason for change:*** | Based on endorsed draft Big CR R4-2508456, the original text contained ambiguous or inconsistent expressions regarding the applicability of timing error requirements across different NTN deployment scenarios. Clarification are needed to avoid misinterpretation in implementation and testing. |
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| ***Summary of change:*** | The table title was revised to convert a sentence-style expression into a noun phrase for consistency with document title conventions.* Update table title of 7.1C.2-2

A clarifying condition was added to indicate that the requirement applies only when operating with 120 kHz, avoiding misinterpretation for other numerologies.* Update NOTE 3 Table 7.1C.2-3 to include “with 120 kHz SCS”
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| ***Consequences if not approved:*** | Ambiguities may lead to misinterpretation of requirement scope, causing inconsistent implementation and potential compliance issues. |
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| ***Clauses affected:*** | 7.1C |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** | **X** |  |  Test specifications | TS38.533  |
| ***(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

7.1C.1 Introduction

The UE shall have capability to follow the frame timing change of the reference cell in RRC\_CONNECTED state. The uplink frame transmission takes place $\left(N\_{TA}+N\_{TA offset}+N\_{TA,adj}^{common}+N\_{TA,adj}^{UE}\right)×T\_{c}$ 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 for FR1-NTN.

- is specified in table 7.1C.2-2 and table 7.1C.2-3 for VSAT UE in FR2-NTN.

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. The reference point for the UE initial transmit timing control requirement shall be the downlink timing of the reference cell minus $\left(N\_{TA}+N\_{TA-offset}+N\_{TA,adj}^{common}+N\_{TA,adj}^{UE}\right)×T\_{c}$.

The downlink timing is defined as the time when the first path (in time) of the corresponding downlink frame used by the UE to determine downlink timing is received from the reference cell at the UE antenna.

$N\_{TA}$ for PRACH is defined as 0. $\left(N\_{TA}+N\_{TA offset}+N\_{TA,adj}^{common}+N\_{TA,adj}^{UE}\right)×T\_{c}$ (in *T*c units) for other channels is the difference between UE transmission timing and the downlink timing immediately after when the last timing advance in clause 7.3C was applied. or after the last update in $N\_{TA,adj}^{common}$ or $N\_{TA,adj}^{UE}$.

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 for FR1-NTN.

$N\_{TA offset}$ is defined in table 7.1C.2-4 for VSAT UE in FR2-NTN.

$N\_{TA,adj}^{common}$ and $N\_{TA,adj}^{UE}$ are defined in TS 38.211 [6].

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

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (kHz)** | **SCS of uplink signals (kHz)** | **Te\_NTN** |
| FR1-NTN | 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] |

**Table 7.1C.2-2: Te\_NTN Timing Error Limit for fixed VSAT served by GSO and NGSO**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (kHz)** | **SCS of uplink signals (kHz)** | **Te\_NTN** |
| FR2-NTN | 120 | 60 | 13\*64\*Tc |
| 120 | 7.5\*64\*Tc |
| 240 | 60 | 13\*64\*Tc |
| 120 | 7.5\*64\*Tc |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6] |

**Table 7.1C.2-3: Te\_NTN Timing Error Limit for mobile VSAT served by GSO and NGSO**

|  |  |  |  |
| --- | --- | --- | --- |
| **Frequency Range** | **SCS of SSB signals (kHz)** | **SCS of uplink signals (kHz)** | **Te\_NTN** |
| FR2-NTN | 120 | 60 | 13\*64\*Tc |
| 120 | 7.5\*64\*Tc |
| 240 | 60 | 13\*64\*Tc |
| 120 | 7.5\*64\*Tc |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6]NOTE 2: Te\_NTN for 120 kHz UL SCS applies under all the following conditions:- LOS channel between UE and each GNSS satellite - The GNSS signal power level greater than or equal to the applicable value specified in Table 6.2-1 of TS 38.171- The GNSS satellite allocation is no less than the applicable value speicifed in Table 6.2-2 of TS 38.171- The velocity change within one second does not result in the position difference with respect to the projected position, based on the position and velocity obtained one second before, exceeding 10 meters.NOTE 3: The requirement for mobile VAST served by NGSO applies only to band n509 and n508 with 120 kHz SCS. The requirement applies when the interval between adjacent epoch times does not exceed 5.12 sec. |

Fixed VSAT and mobile VSAT are defined in TS 38.101-5 [43].

**Table 7.1C.2-4: The Value of** $N\_{TA offset} $**for VSAT in FR2-NTN**

|  |  |
| --- | --- |
| **Frequency range and band of cell used for uplink transmission** | $N\_{TA offset}$**(Unit: TC)** |
| FR2-NTN | 0 |
| Note 1: The UE identifies $N\_{TA offset}$ based on the information n-TimingAdvanceOffset as specified in TS 38.331 [2]. If UE is not provided with the information n-TimingAdvanceOffset, the default value of $N\_{TA offset}$ is set as 0 for FR2-NTN band. |

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 including PUSCH transmissions in Time Domain Window when *pusch-DMRS-Bundling* is enabled, 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 $N\_{TA,adj}^{common}$ and the updating of $N\_{TA,adj}^{UE}$, except when the timing advance in clause 7.3C is applied.

-------------- End of Change <1> --------------