**3GPP TSG-RAN WG4 Meeting #104-bis-eR4-2216641**

**Electronic Meeting, 10th –19th October, 2022**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.101-5** | **CR** | **0008** | **rev** | **1** | **Current version:** | **17.1.0** |  |
|  | | | | | | | | |
| *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)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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| ***Title:*** | CR on NTN frequency error requirement | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_NTN\_solutions-Core | | | | |  | ***Date:*** | | | 2022-10-10 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Unclearness on the Frequency error requirements:   1. The frequency to compare for frequency error should be UL configured frequency as FE should not be derived by comparing with a frequency containing error component. 2. How the TE will set the “ideal” pre-compensted frequency | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Changes :   1. Correct the “compared to” frequency to be UL configured frequency 2. Adding the annex for the TE to derive the expected “ideal” pre-compensated frequency | | | | | | | | |
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| ***Consequences if not approved:*** | | Unclearness exists in NTN UE specification | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 6.4A.2.3 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | |  | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.521 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | |  | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

**< change start >**

### 6.4.1 Frequency error

The NTN satellite UE basic measurement interval of modulated carrier frequency is 1 UL slot. The NTN satellite UE pre-compensates the uplink modulated carrier frequency by the estimated Doppler shift according to 3GPP TS 38.300 [9] clause 16.14.2. The mean value of basic measurements of NTN UE modulated carrier frequency shall be accurate to within ± 0.1 PPM observed over a period of 1 ms of cumulated measurement intervals ~~after compensation with ideally pre-compensated doppler frequency~~ compared with configured reference uplink carrier frequency.

[NOTE: The ideally pre-compensated reference uplink carrier frequency consists of the UL carrier frequency signalled to the UE by SAN and UL pre-compensated Doppler frequency shift. For the test case, the location of the UE is explicitly provided to the UE from the test equipment. The TE should compensate the ideally pre-compensated doppler frequency.]

Requirement will be verified for at least two cases of which one has zero Doppler conditions.

## **< unchanged text omitted >**

Annex [Z]: Frequency error compensation for pre-compensated doppler shift

For the frequency error measurement for NTN UE, TE needs to compensate the measured frequency error with ideal doppler frequency. The frequency error magnitude to be compensated for doppler shift is described in Z.1 and frequency offset measurement due to doppler frequency is described in Z.2.

[Z].1. Derive the doppler frequency for post-compensation

Assuming the satellite position is =(Sx1, Sy1,Sz1) and satellite velocity is =( (Vx1, Vy1,Vz1), and NTN UE position is =(Ux, Uy, Uz) at epoch time T1, the satellite position is =(Sx2, Sy2,Sz2) and satellite velocity is =(Vx2, Vy2,Vz2) at epoch time T2,

And

The doppler frequency at transmission time T for post-compensation could be linear extrapolation with of and , ~~the time between T1 and T2 could be set to be short so the measurement uncertainty could be reduced.~~ is the UL configured frequency.

[Z].2. Frequency error measurement due to doppler frequency after post-compensation

Measure the frequency offsetin Annex F in TS 38.101-1, then the frequency error measured after the TE post-compensation of doppler frequency:

**< change end >**