**3GPP TSG RAN WG1 Meeting #114 R1-230xxxx**

Toulouse, France, August 21 – 25, 2023

**Agenda item: 9.17**

**Source: Nokia, Nokia Shanghai Bell**

**Title: Summary on email discussion on NR\_NTN\_enh-Core**

**Document for: Discussion and Decision**

# 1 Introduction

This thread will discuss the draft CR to 38.214 for the NR\_NTN\_enh-Core.

First checkpoint for this discussion: **September 5th, 6:00 am UTC!**

# 2 Discussion

The comments in this section are based version 0 of the draft CR.

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| Company | Comments | Editor reply/Notes |
| MediaTek | .  I copy the RAN1 agreement below. It was discussed in RAN1 whether the UE report “the actual UE Rx-Tx time difference offset”, and it was not clear what it meant this offset. RAN1 agreed on the “UE reports the actual index difference between subframe j and subframe i” to clarify to all that the actual UE Rx-Tx time difference offset is 1) not an absolute time difference in Tc; 2) an index difference between subframe index i for receiving the PRS  and subframe j for transmitting the UE Rx-Tx time difference report.  AgreementThe legacy R17 definition of UE Rx-Tx time difference is adopted for NTN with an offset that is determined based on the following: * UE reports the actual index difference between subframe j and subframe i
	+ The uplink subframe j is closest in time to the DL subframe #i received from the TP
* The DL timing drift due to Doppler over the service link associated with the UE RX-TX time difference measurement period is reported

I also copy the TS 38.215  5.1.30 UE Rx – Tx time difference for reference

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| **Definition**  | The UE Rx – Tx time difference is defined as TUE-RX – TUE-TX Where: TUE-RX is the UE received timing of downlink subframe #*i* from a Transmission Point (TP) [18], defined by the first detected path in time. TUE-TX is the UE transmit timing of uplink subframe #*j* that is closest in time to the subframe #i received from the TP. Multiple DL PRS or CSI-RS for tracking resources, as instructed by higher layers, can be used to determine the start of one subframe of the first arrival path of the TP. For frequency range 1, the reference point for TUE-RX measurement shall be the Rx antenna connector of the UE and the reference point for TUE-TX measurement shall be the Tx antenna connector of the UE. For frequency range 2, the reference point for TUE-RX measurement shall be the Rx antenna of the UE and the reference point for TUE-TX measurement shall be the Tx antenna of the UE.  |
| **Applicable for**  | RRC\_CONNECTED, RRC\_INACTIVE  |

I think the proposed CR will change the understanding in RAN1 and may lead to some confusion. The simplest way to fix this is to capture the RAN1 agreement in the CR. The UE may be configured to measure and report, via higher layer parameter [undetermined NTN related parameter] subject to UE capability, UE Rx-Tx time difference measurements on a PRS resource associated with a *dl-PRS-ID*. The UE shall report the actual ~~UE Rx-Tx time difference offset~~ index difference between subframe j and subframe i,  where the uplink subframe j is closest in time to the DL subframe i,  and the DL timing drift due to Doppler over the radio link associated with the UE RX-TX time difference measurement period as described in [7, TS 38.215]. | Made some edit in the area with a bit of streamlining the text, pls check! |
| vivo  | For following updates, we think the text “due to Doppler over the radio link associated with the UE RX-TX time difference measurement period” is not needed in 38.214.

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| The UE may be configured to measure and report, via higher layer parameter [undetermined NTN related parameter] subject to UE capability, UE Rx-Tx time difference measurements on a PRS resource associated with a *dl-PRS-ID*. The UE shall report the actual UE Rx-Tx time difference offset and the DL timing drift ~~due to Doppler over the radio link associated with the UE RX-TX time difference measurement period~~ as described in [7, TS 38.215]. |

For “min (*maxDurationDMRS-Bundling*, M)” part, in our view, in NTN, a separate parameter is needed since the capability is different considering pre-compensation may happen in NTN. In some scenarios, e.g. in ATG case, TN and NTN may co-exist in same cell as well, therefore some updates here are necessary.Is the intention to treat this in next draft after October RAN1 meeting when RRC signaling is more stable? | I initially deleted the text you mention but with the edit suggested by Mtek above, I felt letting the simple description of DL timing drift would be unclear to the reader and the existing text helps. |
| DCM | The following working assumption has been already covered in the existing text? Is this editor’s intention? We are not sure whether the last paragraph of 6.1.7 can cover this working assumption or not.

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| **Working assumption**For NTN-specific PUSCH DMRS bundling, to satisfy the phase difference limit without causing phase discontinuity, it is assumed that pre-compensation to keep phase rotation due to timing drift within the phase difference limit can be performed at UE side.* UE shall not perform TA pre-compensation update within an actual TDW if it causes phase discontinuity that may violate the phase difference limit.
	+ FFS: how to determine the actual TDW
* FFS: specification impact
* Send an LS to RAN4
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 | I have the same understanding as Sharp below, the current spec covers for the working assumptions you are mentioning here. |
| Sharp | We are fine with the editor’s CR. For DCM’s point, our understanding is that the last paragraph of 6.1.7 covers the working assumption. The requirement for the phase difference limit for NTN would be written in RAN4 specifications. | Agree! |
| Huawei, HiSilicon | For Docomo’s comments/questions, our understanding is the section 6.1.7 may need to be updated especially considering the following agreement in RAN1#114. If the UE feature is a new UE feature compared with that of TN, we need some updates in the text in section 6.1.7.

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| AgreementFor NTN-specific PUSCH DMRS bundling,* As UE capability report,
	+ UE reports the max TDW size it can support by fulfilling the phase difference limit requirement.
		- Note: phase difference limit requirement is assumed to be at gNB receiver from RAN1 perspective.
		- Details, e.g., whether FG 30-4 is used without new FG or new FG is introduced, is discussed in UE feature session.
	+ No consensus on whether to support Option 1d/1e/1f/1g.
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 | I agree how you out it: ”If the UE feature is a new UE feature compared with that of TN”. But so far we can use the existing spec. I suppose now that the CR is available, we can see in the maintenance stage how things progress and update 6.1.7 accordingly. |
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# 3 Discussion – second round

The comments in this section are based on version 1 of the draft CR available in the **Post RAN1#114 discussion.**

Second checkpoint for this discussion:  **is September 6, 9.00 am UTC!**

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| Company | Comments | Editor reply/Notes |
| Apple | For the newly added paragraph in Section 5.1.6.5, we think the wording “the DL timing drift due to Doppler over the radio link associated with the UE RX-TX time difference measurement period” may not accurately affect the RAN1 #114 agreement:*The legacy R17 definition of UE Rx-Tx time difference is adopted for NTN with an offset that is determined based on the following:* * *UE reports the actual index difference between subframe j and subframe i*
	+ *The uplink subframe j is closest in time to the DL subframe #i received from the TP*
* *The DL timing drift due to Doppler over the service link associated with the UE RX-TX time difference measurement period is reported*

In our understanding, the radio link (associated with UE RX-TX time difference measurement period) could be composed of both service link and the radio link between satellite and uplink time synchronization reference point. According to RAN1 agreement, DL time drift is only due to Doppler over the service link, rather than the Doppler over the radio link between satellite and uplink time synchronization reference point. Hence, we think it may be clarified with the following modifications: Also, based on the discussions for TS 38.215, it is preferrable to remove “actual” in the text as its impact is unclear. The UE may be configured to measure and report, via higher layer parameter [undetermined NTN related parameter] subject to UE capability, UE Rx-Tx time difference measurements on a PRS resource associated with a *dl-PRS-ID*. The UE shall report the ~~actual~~ index difference between the uplink subframe *j* and closest in time DL subframe *i*, and the DL timing drift due to Doppler over the ~~radio~~ service link associated with the UE RX-TX time difference measurement period as described in [7, TS 38.215]. |  |
| MediaTek | We have same view as Apple for service link and we are fine to remove “actual”. Note that there is a similar discussion on “actual” for draft CR to 38.215 in [Post114-38.215-NR\_NTN\_enh]. It seems moderator recommendation is to keep “actual” for now, and resolve this issue later during maintenance phase |  |
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