**3GPP TSG RAN WG1 #119 R1-24xxxxx**

Orlando, US, November 18th – 22nd, 2024

Source: vivo

Title: Summary#1 on discussion on correction on open loop timing

 advance calculation for ATG

Agenda Item: 8.1

Document for: Discussion and Decision

# Introduction

This feature lead summary (FLS) document aims to collect and align on company views on maintenance issues on correction on support of open loop timing advance calculation for ATG, which contains a summary of the contribution and draft CR to specifications.

R1-2409708 Draft CR on correction on support of open loop timing advance calculation for ATG vivo

**1st round discussion**: please provide your feedback before **Monday 10.00 am**

# [open] Discussion

## Companies’ contributions summary

In RAN1#118bis meeting, the $N\_{TA,adj}^{UE}$ for ATG is defined and the corresponding CRs were agreed in [1][2].

Changes in [2] are copied as below:

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| **<Start of change request>** 4.2 Transmission timing adjustments **<Unchanged parts are omitted >**Using higher-layer ephemeris parameters for a serving satellite or *atg-gNB-Location* for ATG, if provided, a UE pre-compensates the two-way transmission delay on the service link based on $N\_{TA,adj}^{UE}$ that the UE determines using the serving satellite position or gNB location for ATG and its own position. To pre-compensate the two-way transmission delay between the uplink time synchronization reference point and the serving satellite, the UE determines $N\_{TA,adj}^{common} $[4, TS 38.211] based on one-way propagation delay $Delay\_{common}\left(t\right)$ that the UE determines as:$$Delay\_{common}\left(t\right)= \frac{TA\_{Common}}{2}+ \frac{TA\_{CommonDrift}}{2}×\left(t-t\_{epoch}\right)+\frac{TA\_{CommonDriftVariant}}{2}×\left(t-t\_{epoch}\right)^{2} $$where $TA\_{Common}$, $TA\_{CommonDrift}$, and $TA\_{CommonDriftVariant}$ are respectively provided by *ta-Common*, *ta-CommonDrift*, and *ta-CommonDriftVariant* and $t\_{epoch}$ is provided by *epochTime* which is the epoch time of *ta-Common*, *ta-CommonDrift*, and *ta-CommonDriftVariant* [12, TS 38.331]. $Delay\_{common}(t)$ provides a distance at time $t$ between the serving satellite and the uplink time synchronization reference point divided by the speed of light. The uplink time synchronization reference point is the point where DL and UL are frame aligned with an offset given by $N\_{TA,offset}$. **<Unchanged parts are omitted >****<End of change request>**  |

However, [3] found that the ‘service link’ is the wireless link between the NTN payload and UE, according to the definition in TS38.300 cited as below, which is not applicable to ATG.

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| --- |
| **Non-terrestrial network**: an NG-RAN consisting of gNBs, which provide non-terrestrial NR access to UEs by means of an NTN payload embarked on an airborne or space-borne NTN vehicle and an NTN Gateway.**NTN Gateway**: an earth station located at the surface of the earth, providing connectivity to the NTN payload using the feeder link. An NTN Gateway is a TNL node.**NTN payload**: a network node, embarked on board a satellite or high altitude platform station, providing connectivity functions, between the service link and the feeder link. In the current version of this specification, the NTN payload is a TNL node.**Satellite**:a space-borne vehicle orbiting the Earth embarking the NTN payload.**Service link**:wireless link between the NTN payload and UE. |

Consequently, the changes in [2] may cause confusion and does not align with the RAN2 spec. [3] suggests to remove ‘on the service link’ on top of [2] , and the draft CR is as below.

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| --- |
| 4.2 Transmission timing adjustments<<unchanged parts omitted>>Using higher-layer ephemeris parameters for a serving satellite or *atg-gNB-Location* for ATG, if provided, a UE pre-compensates the two-way transmission delay based on $N\_{TA,adj}^{UE}$ that the UE determines using the serving satellite position or gNB location for ATG and its own position. To pre-compensate the two-way transmission delay between the uplink time synchronization reference point and the serving satellite, the UE determines $N\_{TA,adj}^{common} $[4, TS 38.211] based on one-way propagation delay $Delay\_{common}\left(t\right)$ that the UE determines as:$$Delay\_{common}\left(t\right)= \frac{TA\_{Common}}{2}+ \frac{TA\_{CommonDrift}}{2}×\left(t-t\_{epoch}\right)+\frac{TA\_{CommonDriftVariant}}{2}×\left(t-t\_{epoch}\right)^{2} $$where $TA\_{Common}$, $TA\_{CommonDrift}$, and $TA\_{CommonDriftVariant}$ are respectively provided by *ta-Common*, *ta-CommonDrift*, and *ta-CommonDriftVariant* and $t\_{epoch}$ is provided by *epochTime* which is the epoch time of *ta-Common*, *ta-CommonDrift*, and *ta-CommonDriftVariant* [12, TS 38.331]. $Delay\_{common}(t)$ provides a distance at time $t$ between the serving satellite and the uplink time synchronization reference point divided by the speed of light. The uplink time synchronization reference point is the point where DL and UL are frame aligned with an offset given by $N\_{TA,offset}$.<<unchanged parts omitted>> |

## Collection of Companies’ views

According to the analysis above, companies are invited to provide their views on the following questions:

**Q1: Do you agree that the definition of the service link is not applicable to ATG?**

Companies are invited to provide their views on the questions in the following Table.

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| --- | --- | --- |
| **Company** | **(Y/N)** | **comments** |
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|  |  |  |

**Q2: if Q1 is yes, do you agree with the changes proposed in [3]? Or any other suggestion?**

Companies are invited to provide their views on the questions in the following Table.

|  |  |  |
| --- | --- | --- |
| **Company** | **(Y/N)** | **comments** |
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|  |  |  |
|  |  |  |

# Proposal for Monday online discussion

TBD

# Reference

[1] R1-2409275 Correction on the open loop timing advance calculation for ATG, Huawei, HiSilicon, Samsung, October 14th – 18th, 2024.

[2] R1-2409276 Correction on the support of open loop timing advance calculation for ATG, Huawei, HiSilicon, Samsung, October 14th – 18th, 2024.

[3] R1-2409708 Draft CR on correction on support of open loop timing advance calculation for ATG vivo