3GPP TSG-RAN WG2 Meeting #115e draftR2-2108897

Online, 16th - 27th August, 2021

**Agenda item: 8.10.2.1**

**Source: CATT**

**Title: [draft] Report of [AT115-e][106][NTN] RACH aspects (CATT)**

**Document for: Discussion and Decision**

# 1 Introduction

This document will continue to discuss companies’ views regarding the RACH aspects in 3rd round:

******[AT115-e][106][NTN] RACH aspects (CATT)**

Final scope: Continue the discussion on p1 and p2 from R2-2108897

Intended outcome: Summary of the offline discussion with e.g.:

  List of proposals for agreement (if any)

  List of proposals for further discussion

Final deadline (for companies' feedback): Thursday 2021-08-26 1000 UTC

Updated deadline (for rapporteur's summary in R2-2108901): Thursday 2021-08-26 1500 UTC

Proposals marked "for agreement" in R2-2108901 not challenged Friday 2021-08-27 0300 UTC will be declared as agreed via email by the session chair (for the rest the discussion might continue online during the CB session).

Status: Ongoing

# 2 Discussion

At RAN2#113bis-e the reporting of TA was discussed with the following agreements

1. At least for uplink scheduling adaptations, the UE may report information about the UE specific TA pre-compensation. The exact information and frequency of reports depend on RAN1 outcome. FFS on when/how to report.
* [Post113bis-e][000] “It is FFS whether the UE reports the UE specific TA pre-compensation at the RACH procedure (MSG3 or MSG5) using a MAC CE. Actual content is FFS and also depends on further RAN1 input. Configurability is FFS”

Further at RAN2#114 the following was agreed

Agreement:

1. If enabled by the network, the UE reports information about UE specific TA pre-compensation at the random access procedure (MSGA/MSG3 or MSG5) using a MAC CE. Actual content is FFS and also depends on further RAN1 input (we can revise this whole agreement if RAN1 come to a different conclusion in terms of what needs to be conveyed to the NW)

From the online discussion of RAN2 #115-e meeting, the agreement regarding UE specific TA reporting was achieved as following:

Agreements:

1. UE specific TA reporting during RACH procedure is enabled/disabled by SI (FFS for RACH in connected mode)

The agreements via email at RAN2#115-e are listed as following

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| **Agreements via email - from offline 106:**1.     The content of UE specific TA pre-compensation reported in RA procedure using MAC CE is UE specific TA (this can be revisited after receiving RAN1 response).2.     Reporting on the information about UE specific pre-compensation in connected mode is supported, FFS via RRC signalling or MAC CE3.     Event-triggers for reporting on the information about UE specific TA in connected mode is supported. FFS on the details. Confirmation by RAN1 is also needed4.     If configured, the UE shall report information of the UE specific TA pre-compensation to the target cell during the random access. FFS if a new indication in RRC reconfiguration with sync is needed or not (besides the SIB indication carried in HO command on whether TA report is enabled/disabled in the target cell).5.    Information about UE specific TA pre-compensation is not reported in RA procedures triggered due to “Request for Other SI” |

The agreements via email at RAN2#115-e are listed as following:

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| **Agreements via email - from offline 106 second round:**1.     The event-triggers for reporting information about UE specific TA are based on TA values (confirmation from RAN1 is needed)2.     A TA offset threshold can be used for event-triggered reporting, at least the offset threshold can be between current information about UE specific TA and the last successfully reported information about UE specific TA3.     The event-triggers for reporting information about UE specific TA based on time threshold is not supported in NTN.4.     No new indication in RRC reconfiguration with sync is needed to configure the UE to report information about UE specific TA in handover procedure (besides the SIB indication carried in HO command on whether TA report is enabled/disabled in the target cell). |

## 2.1 What content of information about UE specific TA in connected mode

In online discussion, some companies show the concern on the proposal 1 as below.

Proposal 1: The content of UE specific TA reported in connected mode is UE specific TA pre-compensation (13/17), FFS the UE position (3/17).

Nokia suggests keeping both options: if the UE location cannot be reported the UE sends the UE specific TA-pre-compensation value. Sony agrees, Ericsson, Intel as well.

In the online discussion regarding LCS, the following agreement is obtained:

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| If accepted by SA3, if the gNB has user consent to obtain UE location in NTN, reporting of finer location information/full GNSS coordinates in RRC\_CONNECTED can be supported after AS security is enabled |

Whether the UE location information can be reported in connected mode is based on the reply of SA3. Thus, the rapporteur lists the discussion under two work assumptions:

* Work assumption 1: the UE location information can be reported in connected mode
* Work assumption 2: the UE location information cannot be reported in connected mode

Therefore, the rapporteur suggests discussing the following question:

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| **Question 1: Work assumption 1: the UE location information can be reported in connected mode.****Which option of information about UE specific TA in connected mode do you prefer, under the Work assumption 1?****Option 1. TA pre-compensation value (for the details of the TA value, confirmation from RAN1 is needed); Option 2. UE location information(confirmation from RAN1 is needed);**  |
| **Company** | **Option1/2** | **Comment**  |
| Nokia | Option 2 | If UE location information can be reported to NW, it is common understanding that NW can accurately determine the scheduling offset for the UE. (e.g. based on UE’s location and satellite ephemeris data, NW can estimate the UE’s UE-gNB RTT (i.e. UE-specific TA). This is same as what UE can do before UE’s initial access to decide offset for RAR timer start.). **Obviously**, reporting the location has the advantage that TA change due to satellite movement can be tracked by the gNB thus save Uu interface signalling/overhead since it is not needed to report more report of UE specific TA. So, we think it is reasonable to reuse UE’s location information to estimate UE-specific TA if it can be reported to NW anyway (e.g. for cell id mapping etc.).Furthermore, there are two concerns in the email discussion and online discussion:**# Concern 1. UE location may not be updated fast and at the right time for UL scheduling.**In our view, to fulfil the motivation of report TA information (e.g. reduce UL scheduling latency), the coarse UE location reported to NW TA estimation is sufficient. The change of UE position (for example, 2km) will have very tiny latency difference (e.g. less than 0.005ms according to R1 contribution R1-2107292).  So, the event-based UE location reporting (as agreed in RAN2 LCS discussion) is sufficient for TA estimation to facilitate UL scheduling at the right time.**# Concern 2. UE report UE location info via RRC (in UL) may not suitable since it is not as fast as MAC CE (in DL) to update K\_offset.**In our view, any changes to K\_offset would basically be to optimize for the distance between UE and satellite. The K\_offset update depends on not only UE's location but also satellite's position. This means even the UE is stationary, the K\_offset should be updated when the satellite is moving (e.g. at 7.5km per second). Compared with the satellite's movement, the K\_offset update caused by UE's movement (e.g. 3km per hour) is a very rare case. Furthermore, we think the K\_offset should not change very often even it is associated to the satellite movement over the UE (e.g. depending on unit of K\_offset and NW implementation), to save the Uu interface overhead. So, we would claim that UE reporting of coarse UE location would not cause a problem if it is provided over RRC. RRC is much faster than what is needed for K\_offset update. And added benefit from using RRC for location update is that it is kept within the ciphering and is thereby protected. |
| ZTE | Option 1 | This is for scheduling adaption where efficiency is critical, we are worried by the additional delay and specs work needed to reuse location information for scheduling adaption.If location information is agreed to be reported in connected mode, then it can only be carried in RRC message which means DU cannot decode this information. Thus this reported information will first transfer to CU, after decoding CU should first translate the location info to TA value and delivers back the information to DU, thus additional delay will be introduced, which might not be able to fulfil RAN1’s requirement. Especially considering the TA reference point may located in satellite, in which case the grant station need to decode the RRC message, translate the location info and send it back to satellite.Also this solution will require additional work in RAN3 as well, in order to support interaction between CU and DU.  |
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| **Question 2: Work assumption 2: the UE location information cannot be reported in connected mode,** **Do you agree that the information about UE specific TA in connected mode is TA pre-compensation value (for the details of the TA value, confirmation from RAN1 is needed), under the work assumption 2?** |
| **Company** | **Yes/No** | **Comment**  |
| Nokia | Yes with comment | If it is not possible to report UE location information, we agree the content of UE specific TA information should be TA pre-compensation value.However, similar to what agreed in RACH procedure, we think whether UE report the information about UE specific TA in connected mode should be NW configurable. It is FFS how to configure or enable the reporting (e.g. reuse reporting flag for RACH procedure or not).  |
| ZTE | Yes | If there are no user consent received, than UE is not requested to report location, thus we prefer to report UE TA which is not subject to user consent. |
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[Summary]

## 2.2 How to report the information about UE specific TA in connected mode

Since the content of information about UE specific TA is not decided, thus the rapporteur suggests discussing the following question based on the content of information about UE specific TA.

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| **Question 3: If the reported content of information about UE specific TA is TA pre-compensation value, do you agree using MAC CE to report TA pre-compensation value?** |
| **Company** | **Yes/No** | **Comment**  |
| Nokia | Yes | Reusing the method in RACH for simplicity.  |
| ZTE | Yes | MAC CE is more efficient. And for connected mode report, security issue needs to be confirmed by SA3.  |
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| **Question 4: If the reported content of information about UE specific TA is UE location information, which option do you prefer to use in connected mode?****Option 1. RRC signalling; Option 2. MAC CE** |
| **Company** | **Option 1/2** | **Comment**  |
| Nokia | Option 1 | See our response to Q1.If UE location should be reported, RRC is the preference since it can provide integrity protection and encryption on UE location information |
| ZTE | Option 1 |  Position information can only be carried in RRC due to security concern. |
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[Summary]

## 2.3 LS to RAN1

The following agreements at RAN2 #115-e are related with RAN1 which should be confirmed by RAN1 proposed by companies:

Agreements:

1. UE specific TA reporting during RACH procedure is enabled/disabled by SI (FFS for RACH in connected mode)

1.     The content of UE specific TA pre-compensation reported in RA procedure using MAC CE is UE specific TA (this can be revisited after receiving RAN1 response).

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| 1. Reporting on the information about UE specific pre-compensation(Typo, should be TA) in connected mode is supported, FFS via RRC signalling or MAC CE2. The event-triggers for reporting information about UE specific TA are based on TA values (confirmation from RAN1 is needed)3. A TA offset threshold can be used for event-triggered reporting, at least the offset threshold can be between current information about UE specific TA and the last successfully reported information about UE specific TA |

Thus, the rapporteur suggests discussing the following question

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| **Question 5: Do you agree that an LS should be sent to RAN1 for confirming the following agreements at RAN2 #115-e including the agreement in 3rd round?**1. UE specific TA reporting during RACH procedure is enabled/disabled by SI (FFS for RACH in connected mode)
2. The content of UE specific TA pre-compensation reported in RA procedure using MAC CE is UE specific TA (this can be revisited after receiving RAN1 response).
3. The event-triggers for reporting information about UE specific TA are based on TA values (confirmation from RAN1 is needed)
4. A TA offset threshold can be used for event-triggered reporting, at least the offset threshold can be between current information about UE specific TA and the last successfully reported information about UE specific TA
 |
| **Company** | **Yes/No** | **Comment**  |
| Nokia | No | For item 2/3/4, we think there are being discussed in RAN1 according to RAN2’s request in LS R2-2104376. RAN2 can wait for RAN1’s response first. |
| ZTE | No this meeting | RAN1 has decide to send an LS after this meeting to answer the remaining issues RAN2 asked before and include a list agreements relevant to several issues under-discussion in RAN2. We might need to revisit several issues based on on RAN1 replied LS. It is pre-mature to send LS at this stage. |
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# 3 Conclusions

Based on the views expressed in the previous sections, we propose the following:

*Proposals for easy agreements:*

*Proposals for further discussion:*

# 4 List of referenced documents

[1] [R2-2107314](file:///C%3A%5C%5CData%5C%5C3GPP%5C%5CExtracts%5C%5CR2-2107314.docx%22%20%5Co%20%22C%3AData3GPPExtractsR2-2107314.docx) Discussion on UE Specific TA Report CATT discussion

[2] R2-2108882 [offline 106] RACH aspects CATT discussion Rel-17 NR\_NTN\_solutions-Core

[3] R2-2108897 [offline 106] RACH aspects - second round CATT discussion Rel-17 NR\_NTN\_solutions-Core

# Contact information

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