**3GPP TSG RAN WG2 Meeting #116-e R2-21xxxxx**

**Electronic meeting, 1th November - 12th November 2021**

**Source: ESA**

**Title: Email discussion on LS to RTCM for GNSS integrity**

**Agenda Item: 8.11.5**

**Document for: Discussion and Decision**

1. Introduction

During the email discussion on assistance data it was mentioned the need to continue interaction with RTCM and clarify any remaining open points on GNSS integrity.

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| * **[AT116-e][611][POS] LS to RTCM (ESA)**         Scope: Discuss coordination with RTCM, taking into account the way-forward proposals in R[2-2109807](file:///E:\WORK\1%203GPP\Meeting\RAN2%20116-e\2%20During\Docs\R2-2109807.zip) and related parts of R[2-2110181](file:///E:\WORK\1%203GPP\Meeting\RAN2%20116-e\2%20During\Docs\R2-2110181.zip):   * Conclude on the intention to specify GNSS integrity signalling in Rel-17 * Determine what information we intend to share with RTCM * Draft an LS reply (TP to be endorsed later)         Intended outcome: Report in R2-2111361 and approvable LS in R2-2111362        Deadline:  Friday 2021-11-05 1000 UTC (comments), Monday 2021-11-08 1100 UTC (output available) |

This contribution puts forward several considerations for a potential LS to RTCM.

1. Context

A reply LS from RTCM has been sent to RAN2 and its summary is included in R[2-2109807](file:///E:\WORK\1%203GPP\Meeting\RAN2%20116-e\2%20During\Docs\R2-2109807.zip). In a nutshell the information received could help clarify the scope and timeline used by RTCM SC134 for its work on GNSS integrity but not how exchange of information with RAN2 could be put in place.

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| Q 1: Do RAN2 delegates agree to include the first paragraph proposed in the tentative draft LS? This is to address some questions received from RTCM SC134. | | |
| Company | Agree/Disagree | Comments if any |
| ESA | Yes |  |
| CATT | Agree with comments | We prefer to give the answers to the comments directly  Comment #1: are the presented use cases (Automotive, Rail, Industrial IoT) the only ones addressed by the Work Item?  A: Yes, we confirm that automotive, rail, and industrial IoT are the only use cases addressed in Release 17 of Positioning integrity and reliability.  Comment #2: It could be useful to know if the scope of the 3GPP Work-Item is intended to cover integrity of A-GNSS techniques (GNSS navigation message and SBAS message rebroadcasting) and SSR technologies (e.g. PPP, PPP-AR and PPP-RTK) only, or if other HA approaches and technique are part of the analysis.  A: The scope of GNSS integrity work in 3GPP now covers integrity of A-GNSS techniques (GNSS navigation message and SBAS message rebroadcasting) and SSR technologies (e.g. PPP, PPP-AR and PPP-RTK) only.  Comment #3: It is important to know how the 5G PRS and GNSS integration will be explicitly taken into account within TR 38.857 for indoor and harsh environment navigation solution.  A: For Release 17 of 3GPP it was decided to focus only on GNSS integrity therefore 5G PRS and GNSS integration is not in scope of current release. 3GPP will consider the left requirement e.g. 5G PRS in the future release. |
| ZTE | Yes | Support CATT for better reviewing |
| Nokia | Yes | We prefer CATT’s revision |
| Swift Navigation | Yes | Also prefer CATT’s revision |
| Intel | Yes, | CATT ‘s version is also ok. |
| Huawei, Hisilicon | Agree with comments | We are generally fine with the content, and the clarification made by CATT. Regarding CATT’s Comment #3, we don’t think it’s necessary to include the last sentence in the reply LS since there’s no formal agreement for now on the scope of the future release. |
| Apple | Yes, with comments | The text needs further revision. For example, “First, we confirm that automotive, rail, and industrial IoT are the only use cases addressed in Release 17 of New Radio.” reads as if these are the only use cases supported by NR (I guess the intention was to refer to positioning in NR). |
| Qualcomm | Yes, with comments | Agree with comments above that we work on Release 17 GNSS positioning (not only for New Radio but also for LTE). However, "SBAS message rebroadcasting" mentioned by CATT is not supported currently and also not part of the WID? LPP supports SBAS ranging, but not the SBAS (integrity) message rebroadcast. |
| vivo | Yes | Agree with CATT’s revision. |

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| Q 2: Do RAN2 delegates agree that we include in the LS a proposal for a 1 day online informal workshop with RTCM SC134 ? | | |
| Company | Agree/Disagree | Comments if any |
| ESA | Yes | In absence of a integrity standard from RTCM (which is expected to become available only after the end of our WI), a full day workshop could allow us to better understand the direction RTCM SC134 is going towards. Also, it can help us decide if it´s best to keep GNSS integrity in Rel17 as simple as possible and defer more complex features for Release 18 when the RTCM integrity standard is supposed to be available. Lastly, Such an event would allow us to ask questions and receive answers in real-time. |
| CATT | No | If there is no consensus reached in RTCM SC134, it is hard and difficult to expect a joint meeting can reach any agreements or achieve a good progress. Furthermore, a full day online meeting would not be effective and it would be difficult to arrange such a long time web-meeting considering the variant time difference. So liaisons are workable in this case. If RTCM SC134 could speed up their work, they can provide their outcome ASAP to 3GPP via liaisons. |
| ZTE | Maybe | Since the timeline of RTCM and RAN2 are not matched, a workshop may be useful to push the progress |
| Nokia | No | First of all, we need to clarify what is the purpose/target of this workshop?  In general we think it would be an unnecessary burden for both RTCM and 3GPP. We do not see why we need to rush and address this in Rel-17, especially considering that RAN2 is already quite overloaded and busy with many other works. There is no big issue even if we need to wait until mid-2022 when RTCM’s draft specification becomes available. |
| Swift Navigation | No | Agree with CATT and Nokia. This would be logistically challenging and it’s unclear on the purpose and outcome of such a workshop. |
| Intel |  | Same comments as CATT and Nokia. It is unclear the purpose of the workshop, and what is the expected outcome from 3GPP perspective, e.g. should we decide whether to postpone Integrity after the workshop with RTCM? In addition how to find the suitable time for both RAN2 and RTCM?  To our understanding, we should decide in RAN2 on how to handle Integrity instead of waiting further inputs from RTCM. |
| Huawei, Hisilicon | Yes | We believe an online informal workshop would be helpful for RAN2 to make solid progress on GNSS integrity. For example, in the email discussion ([Post115-e][607][POS] Integrity assistance data, a lot of technical details are involved, and it’s difficult for 3GPP RAN2 alone to make professional decisions.  Additionally, it can also provide some insights for the potential discussion on Rel-18 RAT-dependent integrity. |
| Apple | No | We don’t see how such workshop can help |
| ESA |  | Huawei summarizes very well what could be the scope of the workshop and why it may be of help to us. We don´t see how an informal talk with RTCM SC134 may hurt but we acknowledge a full day workshop is difficult to organize but maybe something a bit more reduced could be possible (or split in blocks of few hours over more days).  Note, this workshop is intended as **informal**. |
| Qualcomm |  | Same view as Nokia. |
| vivo | No | We think there will be still a lot of discussion and test on the integrity for RTCM themselves, considering that their first spec is mid-2022. So, agree with CATT, if there is no consensus reached in RTCM SC134, it is hard and difficult to expect a joint meeting can reach any agreements or achieve good progress.  Therefore, More round-trip LSs including 3GPP agreements or TPs with RTCM is better to not only make both 3GPP and RTCM digest different ideas but also avoid the inefficient discussion by just one web meeting. |

Depending whether we will have a workshop some specific questions may need to be included in the LS

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| Q 3: Do RAN2 delegates agree that we include in LS question on overbounding errors: mean + sigma vs sigma only? | | |
| Company | Agree/Disagree | Comments if any |
| ESA | Yes but only if RAN2 decides not to have a workshop with RTCM SC134 | We could understand what is the approach in RTCM. |
| CATT | Agree | We prefer to include the basic overbounding errors only. |
| ZTE | Agree |  |
| Nokia | Agree |  |
| Swift Navigation | Agree |  |
| Intel | Agree | But Should not we include all related things (agreements, potential agreements, candidate solutions, parameters) in the LS? |
| Huawei, Hisilicon | Agree | It would be helpful for RAN2 to refer to RTCM’s expertise on this question. |
| Apple | OK |  |
| ESA |  | To Intel – we can include an exhaustive list of all the agreements we make at this meeting. |
| Qualcomm | Agree |  |
| vivo | Agree |  |

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| Q 4: Do RAN2 delegates agree to ask RTCM SC134 to invite us to attend its next meeting so we build at RAN2 level an understanding about the working process and scope of this RTCM Special Committee? | | |
| Company | Agree/Disagree | Comments if any |
| ESA | Yes |  |
| CATT |  | If LS is workable, we don’t need to attend their meeting. Hopefully we will receive the LSs about their agreements and progress in time. If the progress of RTCM can’t meet the timeline of Rel-17, RAN2 may support basic integrity of GNSS and try to align with RTCM in Rel-18. |
| ZTE | Disagree | It is not necessary since RAN2 only cares about part of research overlapped with RTCM. No need to attend their meeting. If real-time communication is needed, a workshop will be enough |
| Nokia | Disagree | Similar to our comments in Q2, we do not see why we need to rush and increase our burdens unnecessarily. |
| Swift Navigation | Disagree | We don’t see that much would be gained by RAN2 sitting in on one meeting. Furthermore, the next RTCM SC134 meeting is currently scheduled for after the next RAN2 meeting. |
| Intel |  | Same view as others. LS should be sufficient. |
| Huawei, Hisilicon | Agree |  |
| Apple | Disagree |  |
| Qualcomm |  | This may be difficult. RTCM seems now working on this for ~2 years (not only because RTCM is slow, but because the topic is complex). I don't think it will be possible to follow the current discussion in RTCM without knowing all the historic discussions which already took place in RTCM. |
| vivo | Disagree | We also don’t think much would be gained by RAN2 sitting in one meeting and RAN2 only cares about part of research overlapped with RTCM. So it isn’t more efficient.  More round-trip LSs including 3GPP agreements or TPs with RTCM are better to not only make both 3GPP and RTCM digest different ideas but also avoid the inefficient discussion by just one web meeting. |

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| Q 5: If relevant, please provide any additional items you consider needs be included in the LS | |
| Company | Additional items |
| Swift Navigation | We don’t see any discussion in this questionnaire of point (1) of the stated objectives for this email discussion, nor do we see reference to the documents/proposals called out in the email objectives:  Discuss coordination with RTCM, taking into account the way-forward proposals in R[2-2109807](file:///E:\WORK\1%203GPP\Meeting\RAN2%20116-e\2%20During\Docs\R2-2109807.zip) and related parts of R[2-2110181](file:///E:\WORK\1%203GPP\Meeting\RAN2%20116-e\2%20During\Docs\R2-2110181.zip):   * Conclude on the intention to specify GNSS integrity signalling in Rel-17 * Determine what information we intend to share with RTCM * Draft an LS reply (TP to be endorsed later)   R2-2110181 made the following proposals:  Proposal2-12a: Coordiante with RTCM on the following aspects:   * + - * - If their initial draft spec will include SSR support, and if not when can this be expected?       * - When exactly is it possible for RTCM to share their draft specifications?   Proposal2-12b: Take the following as the general guideline for working with RTCM on GNSS integrity in R17   * + - * Continue the discussion in 3GPP for the discussion in GNSS integrity       * Go with the basic support for GNSS integrity rather than seek for high target with high performance       * Send the TP as agreed in 3GPP to confirm with RTCM when it is available       * Open for CRs in R18 for alignment with RTCM as CRs to R17 GNSS positioning integrity   And R2-2109807 makes the following proposals:  Proposal 1. RAN2 shall continue working on GNSS integrity during Rel17.  Proposal 2. RAN2 to align its specs with RTCM via TEI17 once first RTCM integrity standard is available (foreseen for Q2 2022).  Proposal 3. RAN2 to send a new LS to RTCM SC134 including agreements recorded during RAN2 116.  We would like to see a discussion and alignment on these proposals. Specifically, we think the questions from Proposal2-12a should be included in the LS. We would also propose to ask RTCM SC134 to comment on the AD under consideration in [Post115-e][607] as we believe this is the most direct way to move the discussion forwards with RTCM. |
| Intel | We should decide in this meeting whether to continue/complete GNSS integrity in R17, and potentially align with RTCM via TEI. |
| Apple | Agree with Intel. If we know already that the work cannot be completed in Rel-17, we should focus on other parts of the WI. |
| ESA | We agree with Intel and Apple. We should decide in this meeting the targets for GNSS integrity in Release 17. In absence of a standard from RTCM SC134 we recommend to defer the complex integrity aspects to Release 18 or use TEI17 later on.  To Swift, thanks for pointing out several limitations in this discussion document:   * Conclude on the intention to specify GNSS integrity signalling in Rel-17 – to my understanding GNSS integrity is part of the objectives of the WI and its progress depends on individual contributions and agreement we make. Deciding otherwise would require discussion online because it would affect the objective of the WID and would require updates also in RAN. Lastly, we already had a long discussion on specific Assistance Data for integrity which still needs to be presented online since we have no new elements to take into consideration. We have no problem including a question on this topic but we think companies still intend to specify GNSS integrity signalling in Rel17 – the unknown is what exactly will be specified and this should be addressed as part of R[2-2110181](file:///E:\WORK\1%203GPP\Meeting\RAN2%20116-e\2%20During\Docs\R2-2110181.zip) * Proposal 2-12a – in our view this has already been addressed in a previous LS round. In summary, RTCM SC134 claimed to work on both OSR and SSR and the first standard is expected to be released end of Q2 2022. Nevertheless, we can ask one more time this question a bit more specific. * Proposal 2-12b – thanks for this, we thought that these points will be addressed as part of their dedicated email discussion at least for R2-211018.   We have added few extra questions based your feedback. |

R2-2109807 and parts of R2-2110181 include several proposals regarding the coordination with RTCM SC134. Those proposals that are similar between the two papers have been collated.

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| Q 6: Do you agree to include in the LS to RTCM the following questions:   * If their initial draft spec will include SSR support, and if not when can this be expected?   - When exactly is it possible for RTCM to share their draft specifications? | | |
| Company | Agree/Disagree | Comments if any |
| ESA | Yes | The scope and timeline adopted by RTCM SC134 has been shared with us in R2-2109392 LS to 3GPP RAN2. Nevertheless, we can ask these questions on more time and focus this time on SSR. |
| Nokia | Yes | We think these questions are reasonable. |
| Qualcomm | Yes | I think it is not only a question of *when* RTCM can share a draft, but also *if* they can share a draft? |
| Swift Navigation | Yes | We think these are important points to clarify as the LS received is not completely clear on SSR status. Swift is also a member of RTCM SC134, and although we cannot speak on their behalf, we make the following informal observations:   * SSR integrity work in SC134 has so far been limited to individual company submissions and has not yet been extensively discussed * SSR is not currently incorporated into the working drafts * SC134 does not have clear authority to specify integrity for SSR as that would require an underlying SSR spec which would be the responsibility of SC104 * SC104 is resuming work on SSR but this is still in the very early stages and there is no timeline for completion of this work * SC104 has been deliberating on SSR since 2007   Therefore, we think it is important to ask RTCM to provide a specific view on SSR status. In addition, we note that RTCM working documents are typically kept private whereas 3GPP documents are public so prompting the specific discussion on information sharing logistics would be beneficial. |
| vivo | Yes |  |
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| Q 7: Do you agree to include only basic support for GNSS integrity in Release 17 and defer complex work to Release 18 and adopt TEI17? | | |
| Company | Agree/Disagree | Comments if any |
| ESA | Yes, with comments | There are enough specific proposals captured in Integrity Assistance Data email discussion ( R[2-2110181](file:///E:\WORK\1%203GPP\Meeting\RAN2%20116-e\2%20During\Docs\R2-2110181.zip)) so for the time being, until those proposals are being discussed, we think there is no need to change anything. We think the time should be spent discussing the various options put forward by different parties. In ESA´s view, the availability of RTCM SC134 standards or preliminary specifications is a key decision factor when it comes to signalling complex GNSS integrity features in Rel17. We would be supportive of postponing the complex features to Release 18. |
| Nokia | Yes | For Rel-17 we have agreed to have procedures of transferring integrity requirements and integrity results reporting, so essentially NR already can provide a fundamental framework for 3GPP to support positioning integrity to a certain extent. Even without additional assistance data that is specifically tailored for GNSS integrity, the integrity result could still be derived using some existing assistance information. Although this may not be perfect for some use cases, from standardization perspective we think this is more important to align with RTCM when they are ready. So, we prefer to wait and address this in future releases. |
| Qualcomm | Yes | Same view as Nokia. |
| Swift Navigation | No, with comments | We agree with the general approach to continue to working towards the WI objectives in Rel17 and then making any corrections to align with RTCM once a spec is available through TEI17.  We are concerned about categorizing the work that is necessary to continue as “basic” vs “complex”. R2-2110181 indicates there is agreement that existing Rel16 IEs are not sufficient to derive the integrity results nor to meet the objectives of this WI, so we believe it is important to acknowledge that there is still need for RAN2 to specify new AD to support integrity. We can defer some more advanced topics but we must be prepared to discuss and develop this new AD in order to meet the WI objectives. It is unclear that TUs will be allocated in Rel18 to complete this work. |
| vivo | Yes | We think RTCM’s spec is more reliable and valuable. But there will be still a lot of discussion and test on the integrity for RTCM themselves, considering that their first spec is mid-2022. Besides, there is limited time remaining in R17. So we can defer complex work to Release 18 and adopt TEI17. |
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In R[2-2109807](file:///E:\WORK\1%203GPP\Meeting\RAN2%20116-e\2%20During\Docs\R2-2109807.zip) and related parts of R[2-2110181](file:///E:\WORK\1%203GPP\Meeting\RAN2%20116-e\2%20During\Docs\R2-2110181.zip) we have several proposals that suggest RAN2 could act in two ways when it comes to its relation to RTCM SC134:

* Option 1: RAN2 waits for RTCM SC134 to release its first GNSS standard;
* Option 2: RAN2 attaches to a new LS to RTCM SC134 an exhaustive list of agreements, candidate solutions for integrity, and candidate assistance data.

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| Q 8: Which option do you prefer? | | |
| Company | Option | Comments if any |
| ESA | Option 2 for now | This could help us gather more feedback but there is the risk that this sought –after feedback might not be arriving to us in time for current release: coming RTCM SC134 meeting is scheduled for 1-2/02/2022 which is very close to our deadline. Nevertheless, RTCM reply could be used later on, in Release 18. |
| Nokia | Option 1 + Option 2 | We can wait, but it does not harm if we can also inform RTCM what we have in the reply LS. |
| Qualcomm | Option 1 | I think our current list of agreements do not cover the real issue: Which information/assistance data are needed (or at least useful) in order to determine the integrity of a location estimate. All agreements we made are quite 3GPP specific, and not really about integrity message content. |
| Swift Navigation | Option 2 | Agree with ESA. We believe the most efficient way to get specific input from RTCM is to ask them to comment on our current agreements, proposals and candidate AD. As ESA notes, RTCM will only meet one more time before this WI concludes and therefore we anticipate we will only be able to gather limited input from RTCM in time. This is why we emphasise the need for RAN2 to move forwards with the AD development. We do not see a reason to wait on RTCM as we already have proposals under discussion and are not yet blocked. |
| vivo | Option 1 + Option 2 | We think we can inform agreements, some questions related to important issues, etc before the end of R17 and get some feedback for at least the basic progress we have made. |
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1. GNSS Integrity – tentative draft LS to RTCM

Title: LS on GNSS integrity assistance data

Release: Release 17

Work Item: NR\_pos\_enh

Source: RAN2

To: RTCM SC134

Cc: RTCM

**Contact Person:**

Name: Florin Grec

Tel. Number: xxxxxx

E-mail Address: florin-catalin.grec@esa.int

**Send any reply LS to: 3GPP Liaisons Coordinator, mailto:3GPPLiaison@etsi.org**

Attachments: TBC (pending companies agreement)

**1. Overall Description:**

3GPP RAN2 thanks RTCM for its liaison note sent on 3rd of September in reply to R2-2106596. First, we confirm that automotive, rail, and industrial IoT are the only use cases addressed in Release 17 of New Radio. Second, the scope of GNSS integrity work in 3GPP does not preclude any GNSS method at this moment and it is based on contributions. Lastly, for Release 17 of New Radio it was decided to focus only on GNSS integrity therefore 5G PRS and GNSS integration is not in scope of current release.

Through its LS RTCM clarified the scope and timeline adopted by SC134 for its first release of an integrity standard. At the moment, the work on GNSS integrity in RAN2 is expected to last until Q1 2022 and this is before RTCM target release date for the integrity standard. This time misalignments represents a challenge to our common goal of aligning views, at least for the near future and several points needs further clarifications.

RAN2 would like to learn from RTCM (Radio Technical Commission for Maritime Services):

* **Question 1 to X: Pending on agreements**

**Actions:**

**To RTCM SC134.**

**ACTION:** RAN2 respectfully asks RTCM SC134 to provide feedback on the above questions.

**3. Date of Next RAN2 Meetings:**

RAN2#116-bis-e 17th – 25th January 2022 Electronic meeting

RAN2#117-e 21st February – 3rd March 2022 Electronic meeting