**3GPP TSG-RAN WG4 Meeting #116 R4-2509105**

**Bengaluru, India, 25th – 29th August, 2025**

**Agenda item:** 9.1

**Source:** Moderator (Apple)

**Title:** Topic summary for [116][138] NR\_reply\_LS\_UE\_RF

**Document for:** Information

# Introduction

This email thread is focused on the following RF topics under AI 8.

1. LS on Beam Correspondence Initial Access (R5-253653)
2. LS on maximum transmission power for STxMP (R1-2504839)
3. LS on the RAN simulation assumptions for ULBC (S4-251584)
4. LS on Harmonised Standard for NTN capable UE (R4-2509023)

# Topic #1: LS on Beam Correspondence Initial Access (R5-253653)

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2510526 | Huawei, HiSilicon | **Observation 1:** Beam lock function is important to maintain existing core requirement of PRACH spherical coverage.  **Observation 2:** RAN4 has informed RAN5 to develop the beam lock function.  **Observation 3**: The test procedure with beam lock function could fully verify the UE’s beam correspondence ability.  **Observation 4**: The test procedure without beam lock function will pass the UEs with bad beam correspondence capability.  **Observation 5**: Having both test procedures in RAN5 will cause different testing result for the same UE, which damages the value of conformance testing.  **Proposal 1: RAN4 approves the LS contents in section 2.3.**  **1. Overall Description:**  RAN4 thanks RAN5 for the LS on testing procedure and feasibility of 6.6.4 Beam Correspondence in RRC\_IDLE and RRC\_INACTIVE requirements. Please find the answers from RAN4 below:  **Question 1**: RAN5 is looking to develop test procedure with and without UE Beamlock test function, can either procedure be used to verify RAN4 core requirements?  **Answer**: RAN4 derived the core requirements based on the assumption of using beamlock test function, which is capture in TR 38.891 and the LS R4-2317764 sent to RAN5. RAN4 confirms the beam correspondence in RRC\_IDLE and RRC\_INACTIVE shall be tested with beamlock test function.  **Question 2**: Regarding the verification of spherical coverage requirement for initial access and RRC\_INACTIVE using UE Beamlock test function in the IDLE mode, will it prevent UE to not autonomously choose Uplink beams?  Will using beam lock prevent UE from autonomously choosing other beams even if UE’s behaviour is such?  **Answer**: The target of having a beamlock test function is to keep the beam unchanged during the measurement period. There is no intention of preventing UE from autonomously choosing Uplink beams. Therefore, the beamlock test function should be activated after the UE have done the Uplink beam refinement autonomously.  **Question 3**: Regarding the verification of spherical coverage requirement for initial access and RRC\_INACTIVE without using UE Beamlock test function in the IDLE mode, would this be aligned to verifying RAN4 core requirements when the requirements were defined?  **Answer**: RAN4 derived the core requirements based on the assumption of using beamlock test function. Missing of the beamlock test function is not aligned with the RAN4 requirements. If beamlock test function is not feasible, RAN4 is obliged to revisit the core requirements and introduce additional tolerance. |
| R4-2509443/4 | Apple | ***Observation 1: In TS 38.101-2, beam locked mode is not stated for verification of all the TX requirements.***  ***Proposal 1: It is proposed to state in TS38.101-2 that requirements are verified in beam locked mode for min. peak EIRP, max. EIRP, spherical coverage, and transmit OFF power.***  ***Proposal 2: To provide the following clarification to RAN5:***  **Q1**: RAN5 is looking to develop test procedure with and without UE Beamlock test function, can either procedure be used to verify RAN4 core requirements?  **Response**: RAN4 core requirements are specified under the assumption that UE beamlock function is used in testing. The reason to use beamlock function is to address the issues raised during the core requirement discussion, e.g., “when the RAR is held to trigger PRACH retransmission, UE may attempt other beams since the RAR is not received which may lead to unstable test” This is important as in the core requirement, there is no tolerance allowed.  Therefore, RAN4 is of the view that test procedure with UE beamlock function is required to properly verify the RAN4 requirements, while it is uncertain whether test procedure without UE beamlock function can properly verify the RAN4 requirements.  **Q2**: Regarding the verification of spherical coverage requirement for initial access and RRC\_INACTIVE using UE Beamlock test function in the IDLE mode, will it prevent UE to not autonomously choose Uplink beams?  Will using beam lock prevent UE from autonomously choosing other beams even if UE’s behaviour is such?  **Response**: It is RAN4 understanding that in real-field operation, UE chooses its UL beams based on DL measurements of BS TX beams, which is the reason of specifying beam correspondence requirements in RAN4 for UEs requiring no UL beam sweeping. Therefore, using beamlock function in testing does not prevent UE from choosing UL beams in the real field. Instead, beamlock function is used to ensure testing accuracy, reliability, and repeatability during tests.  **Q3**: Regarding the verification of spherical coverage requirement for initial access and RRC\_INACTIVE without using UE Beamlock test function in the IDLE mode, would this be aligned to verifying RAN4 core requirements when the requirements were defined?  **Response**: As said above, RAN4 core requirements are specified under the assumption that UE beamlock function is used in testing. Therefore, verification of spherical coverage requirement for initial access and RRC\_INACTIVE without using UE Beamlock test function in the IDLE mode is not aligned to verifying RAN4 core requirements when the requirements were defined. |
| R4-2510255/6 | vivo | **Proposal 1:** Confirm that RAN4 define the requirement of BC in initial access based on assuming the beam will not change after autonomously beam selection in IDLE mode during the test.  **Proposal 2:** Confirm that *Beamlock* should be performed after beam selection is finished and does not prevent UE to autonomously choose uplink beam. RAN4 requirement is only applied to the first selected corresponding uplink beam after beam selection.  **Proposal 3:** Confirm that RAN4 define the requirement for BC in initial access in R18 based on the assumption that beam lock function is feasible and can be used.  ***Q1: RAN5 is looking to develop test procedure with and without UE Beamlock test function, can either procedure be used to verify RAN4 core requirements?***  Answer: RAN4 define the requirements of BC in initial access based on assuming that after autonomously beam selection in IDLE mode, the uplink beam will not change during whole test procedure.  ***Q2: Regarding the verification of spherical coverage requirement for initial access and RRC\_INACTIVE using UE Beamlock test function in the IDLE mode, will it prevent UE to not autonomously choose Uplink beams?***  ***- Will using beam lock prevent UE from autonomously choosing other beams even if UE’s behaviour is such?***    Answer: Beamlock function should be performed after beam selection is finished and does not prevent UE to autonomously choose uplink beam. RAN4 requirements are only applied to the first selected corresponding uplink beam after beam selection.  ***Q3: Regarding the verification of spherical coverage requirement for initial access and RRC\_INACTIVE without using UE Beamlock test function in the IDLE mode, would this be aligned to verifying RAN4 core requirements when the requirements were defined?***  Answer: RAN4 sent LS to RAN5 check the feasibility of Beamlock Function in IDLE mode in R18 and define the requirements for BC in initial access based on the assumption that beam lock function is feasible and can be used. |
| R4-2511273 | Nokia | 1. RAN4 cannot prevent RAN5 from developing new test methods. If UE vendors believe they can meet the already defined requirements without beam lock function, it is not precluded as long as the core requirements are met. 2. Beam lock function does not prevent UE from autonomously choosing other beams in the test step 1 and step 3. But TE has to indicate/signal the UE that it should not change its beam in step 2 and step4 during measurement of that beam, this because TE need time to do measurement. Beam lock function is only an aid for the specific test case. 3. The core requirement is independent from which test method will be used to verify the spherical coverage. As long as core requirements are met, either test method can be used. |
| R4-2511345 | Qualcomm, Sony, Ericsson, Lenovo | RAN4 would like to thank RAN5 for their questions, which are clarified thusly:   1. *RAN5 is looking to develop test procedure with and without UE Beamlock test function, can either procedure be used to verify RAN4 core requirements?*   **Answer1: Yes, either procedure can be used. RAN4 confirm that core requirements do not mandate UE to implement an IABC-specific BL function for compliance with the IABC requirements.**   1. *Regarding the verification of spherical coverage requirement for initial access and RRC\_INACTIVE using UE Beamlock test function in the IDLE mode, will it prevent UE to not autonomously choose Uplink beams? Will using beam lock prevent UE from autonomously choosing other beams even if UE’s behaviour is such?*   **Answer2: Yes, BL can prevent a UE from autonomously choosing other beams if UE’s behaviour is such.**   1. *Regarding the verification of spherical coverage requirement for initial access and RRC\_INACTIVE without using UE Beamlock test function in the IDLE mode, would this be aligned to verifying RAN4 core requirements when the requirements were defined?*   **Answer3: Yes. There is no RAN4 mandate for a UE to use IABC BL for IABC core requirement compliance. From a RAN4 perspective, there is no conflict if a UE chooses to meet core requirements without a test mode. It is up to RAN5 to develop the requisite test procedures.** |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 1-1-1: Q1: RAN5 is looking to develop test procedure with and without UE Beamlock test function, can either procedure be used to verify RAN4 core requirements?**

* Proposals
  + Option 1: Yes (Qualcomm, Sony, Ericsson, Lenovo, Nokia?)
  + Option 2: No, or at least uncertain about test procedure without UE beamlock function (Huawei, Apple, vivo)
* Recommended WF
  + Further discussion is needed.

**Q2: Regarding the verification of spherical coverage requirement for initial access and RRC\_INACTIVE using UE Beamlock test function in the IDLE mode, will it prevent UE to not autonomously choose Uplink beams?**

* Proposals
  + Option 1: It seems all companies can agree that using beamlock function in testing does not prevent UE from choosing UL beams in the real field

**- Will using beam lock prevent UE from autonomously choosing other beams even if UE’s behaviour is such?**

* Proposals
  + Option 1: Yes (Qualcomm, Sony, Ericsson, Lenovo)
  + Option 2: No (Huawei, Apple, vivo)
* Recommended WF
  + Further discussion is needed.

**Q3: Regarding the verification of spherical coverage requirement for initial access and RRC\_INACTIVE without using UE Beamlock test function in the IDLE mode, would this be aligned to verifying RAN4 core requirements when the requirements were defined?**

* Proposals
  + Option 1: Yes (Qualcomm, Sony, Ericsson, Lenovo, Nokia?)
  + Option 2: No (Huawei, Apple, vivo)
* Recommended WF
  + Further discussion is needed.

# Topic #2: LS on maximum transmission power for STxMP (R1-2504839)

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2510273 | Vivo | RAN4 would like to thank RAN1 for the LS.  RAN4 had realized this and would like to change 38.101-2 according to RAN1’s suggestion, that is:  For the defined PCMAX,f,c,k , RAN4 would like to change the joint/UL TCI states k from (k=0,1) to (k=1,2) to align with RAN1 and RAN2. |
| R4-2511070/1 | Samsung | ***R18/19 CR in response to the LS from RAN1*** |
| R4-2511272 | Nokia | **Observation 1**: The STxMP scenario is new for both RAN1 and RAN4, for the definition of k in PCcmax, it looks like RAN1 and RAN4 had not been synchronized in advance in the past.   1. RAN4 can raise a CR to change the k definition from {0, 1} to {1, 2}, if there is no conflict in RAN4 standard based on RAN4 consensus. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions..*

### Sub-topic 2-1

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

**Issue 2-1: Reply LS**

* Recommended WF
  + There is no disagreement on the suggested change to RAN4 specification in the RAN1 LS. We can use vivo reply LS as a starting point for reply LS.
  + Samsung CRs R4-2511070/1 can be moved to thread [116][104] R18\_UERF\_maintenance\_Part2 to be discussed with other CRs on the same topic.

# Topic #3: LS on the RAN simulation assumptions for ULBC (S4-251584)

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2509824 | Xiaomi | RAN4 would like to thank for the LS from SA in R4-2509024. RAN4 would like to provide the following response to the question.  **Question from SA4:** What are the supported power classes for UE and HPUE for NB-IoT NTN in the current release, and if any updates are expected from future releases, and in which band(s)?  **Answer from RAN4:**  From Rel-18 onwards, PC3 (23dBm) and PC5 (20 dBm) are supported for NB-IoT NTN UE on bands 256,255, 254,253 and 252.  In Rel-19, RAN4 are introducing new power classes for NB-IoT NTN UE including PC1 (31dBm) and PC2 (26dBm) on above mentioned IoT NTN operating bands.  In Rel-20, RAN4 is expected to discuss the feasibility of introducing new power classes for NB-IoT NTN operation. |
| R4-2510271 | vivo | RAN4 would like to thank SA4 for the LS.  Here is a detailed status about supported power classes for NB-Iot based Iot-NTN in current and future releases:  In Rel-18, the default power class (PC3, 23dBm) has been introduced with Iot-NTN UE RF requirements specification 36.102, and this default power class is applied to all Iot-NTN bands.  In Rel-19, power class 2 (26dBm) and power class 1 (31dBm) were agreed to be introduced. The targeted bands are band 254/255/256. The feature CR to introduce into specification is planned to be agreed in this RAN4 meeting, and the following table which referenced from draft CR can be used as a reference.  Table 6.2B.1-1: UE Power Class   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | EUTRA band | Class 1 (dBm) | Tolerance (dB) | Class 2 (dBm) | Tolerance (dB) | Class 3 (dBm) | Tolerance (dB) | Class 5 (dBm) | Tolerance (dB) | | 256 | 31 | +2/-3 | 26 | +/-2 | 23 | +/-2 | 20 | +/-2 | | 255 | 31 | +2/-3 | 26 | +/-2 | 23 | +/-2 | 20 | +/-2 | | 254 | 31 | +2/-3 | 26 | +/-2 | 23 | +/-2 | 20 | +/-2 | | 253 |  |  |  |  | 23 | +/-2 | 20 | +/-2 |   For Rel-20, a new UE power class which can transmit power higher than PC1 (e.g., up to 37dBm) will be studied and specified if deemed feasible. The feasibility and specific power would be under further study and this work has not been started yet. There are also no designated bands yet for this higher than PC1 study.  In addition, power class 1.5 (29dBm) is also included in the Rel-20 RAN4 led-package WF and highly likely to be officially agreed in next RAN plenary meeting. There is no discussion on applicable bands yet. |
| R4-2511408 | Qualcomm | RAN4 would like to thank SA WG4 for the LS. RAN4 is still working on Rel-19 and a work item NR\_IoT\_NTN\_req\_test\_enh. This work item will enable PC2 (26 dBm) and PC1 (31 dBm) for NB-IoT NTN, targeting support in bands 255 and 256.  In release 20, it is likely that support for PC2 and PC1 will extend to other operating bands, e.g. 252, 253 and 254. RAN plenary has also already approved a work item for Rel-20 (RP-251867), where one of the objectives is to study, and if feasible, specify UE transmit power higher than PC1 (e.g. up to 37 dBm) for NB-IoT NTN. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions..*

### Sub-topic 3-1: LS reply

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

* Recommended WF
  + As all three reply LSs are providing similar info as requested, we can pick one as the baseline for drafting the formal reply LS.

# Topic #4: LS on Harmonised Standard for NTN capable UE (R4-2509023)

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2511559 | Huawei, HiSilicon | **Proposal 1**: Based on requirements captured in EN 301 681 and/or ITU-R M.1480, double-check necessity of additional emission requirements to be captured in TS 38.101-5 and TS 36.102 (at least for bands 255/n255).  **Proposal 2**: RAN4 to share feedback on the “nominated bandwidth” concept, that RAN5 conformance testing requirements (and baseline RAN4 core requirements) shall not be modified during the HS drafting process.  **Proposal 3**: RAN4 to send LS reply to ETSI TC SES during this meeting, providing feedback at least on the identified Tx requirements aspects, and the nominated bandwidth concept. |

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## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions..*

### Sub-topic 4-1

*Sub-topic description:*

*Open issues and candidate options before f2f meeting:*

* Recommended WF
  + Huawei is recommended to lead the offline discussion and provide a WF/reply LS for consideration.