**3GPP TSG RAN #109 RP-251923**

**Beijing, China, Sep 15th – 18th, 2025**

**Title: Moderator's summary for RAN4 REL-20 5G-Adv: OTA topics**

**Source: Moderator (vivo)**

# Introduction

This document summarizes the discussion of RAN4 candidate OTA topics for R20 under agenda 9.1.4.3 in RAN #109 meeting.

In RAN #108 meeting, a high-level scope of the WI was endorsed in RP-251879 as below

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| **The high-level scope for WI on UE OTA enhancement (the exact scope and WID draft will be discussed and decided in RAN#109):**   * The performance requirements of UE OTA, including TRP/TRS and MIMO OTA, for new bands   + Handheld UE is the first priority, other UE types are 2nd priority if sufficient number devices is available   + initial bands n7,n20, n79, needs operators input for other bands     - the total number of band should be limited to [5]   + prioritized UE type should be specified in the WID * Specify test method to support NTN VSAT   + Define the measurement setup, test procedure, and preliminary MU * No RAN1/2 impact is expected * Target 0.5 TU allocation |

Submitted contributions in RAN #109 for agenda 9.1.4.1 are listed as below:

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| RP-252035 | Views on Rel-20 OTA topics for 5G-A | ZTE Corporation, Sanechips |
| RP-252068 | Views on 5G-A Rel-20 OTA topics | Samsung |
| RP-252190 | Views on Rel-20 OTA topics in 5G-A | vivo |
| RP-252348 | Views on RAN4 5G-A Rel-20 OTA topics | CAICT |
| RP-252485 | Qualcomm views on OTA topics for 5GA Rel-20 | Qualcomm Incorporated |
| RP-252590 | New SID OTA Testability for VSAT | Eutelsat Group |
| RP-252591 | Motivation for New SID OTA Testability for VSAT | Eutelsat Group |
| RP-252661 | Considerations on RAN4-led Rel-20 5G-Adv OTA topics | Nokia |
| RP-252712 | Views on UE OTA works for Rel-20 5G-A | CATT |
| RP-252740 | Proposals for RAN4-led Rel-20 UE OTA topics | Huawei, HiSilicon |

# Performance requirements

## Summary of companies view

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| ***Supporting companies*** | ***Details of objectives*** |
| ZTE (2035) | Proposal 1: The UE types other than handheld UE can be treated as 2nd priority, and it should be clearly specified in the WID to keep the workload.  Proposal 2: The initial bands n7, n20 and n79 can be used as basis for introducing requirements, the other bands can rely on operator’s practical deployment demands. |
| Samsung (2068) | * Specify TRP and TRS requirements   + Specify TRP and TRS requirements for new bands for UE   + Handheld UEs with 1Tx at bands [n7, n20, and n79] are first priority     - Handheld UEs width >=56mm and <=92mm     - Maximum 3 bands are targeted for introducing requirements depending on measurement data availability   + Other UE types are 2nd priority if sufficient number of commercial devices are available * Specify MIMO OTA requirements   + Specify FR1 MIMO OTA requirements for new bands for handheld UE (2 layers or 4 layers)     - Band [n7, n20, and n79] are first priority       * Maximum 3 bands are targeted for introducing requirements depending on measurement data availability       * The requirements are specified based on Rel 17 static MPAC test method |
| vivo (2190) | * The performance requirements of UE OTA, including TRP/TRS and MIMO OTA, for new bands   + Handheld UE is the first priority   + Initial bands n20, n38, n79 for 1Tx, n41 and n78 for 2Tx non-coherent UE     - The total number of band should be limited to [5]     - For TRP TRS consider talk mode and browsing mode, for MIMO OTA focus on free space   + No new lab alignment is required   + Other UE types are 2nd priority (e.g., RedCap, XR and NTN) if sufficient number of devices is available     - FFS whether new lab alignment should be performed before measurement campaign   Note: Handheld UEs includes Size 1 (wide, width >72mm and ≤92mm) and Size 2 (narrow, width ≥56mm and ≤72mm); |
| CAICT (2348) | * Specify FR1 TRP and TRS requirements for new bands   + [n20, n38, n77] for 1Tx are first priority, [n41 and n78] for 2Tx (non-coherent UL MIMO) are second priority   + Handheld UE is the first priority. Other UE types (e.g., XR, NTN) may be considered second priority if a sufficient number of commercial devices become available. * Specify FR1 MIMO OTA requirements for new bands based on static test method (2 layers or 4 layers)   + Handheld UE is the first priority   + [n20, n38, n79] are first priority |
| Qualcomm (2485) | * Define performance requirements based on operator’s real needs   + TRP, TRS and static MIMO OTA requirements for new bands   + Target handheld UE as the first priority   + Total number of band is [4] for TRP, TRS and static MIMO OTA requirements |
| Nokia (2661) | * Endorsed UE OTA scope from RAN#108 is good and should be kept stable. RAN4 needs to put Rel-20 efforts to deriving performance requirements as test methods were defined in Rel-18/19. |
| CATT (2712) | Objectives for this performance part work item are as follows:   * Specify FR1 TRP and TRS requirements for NR bands for UE:   + Handheld UEs with 1Tx at new bands n7, n20, n79 are first priority.   + Handheld UEs with 2Tx (non-coherent UL MIMO) at n79 depending on measurement data availability are first priority   + non-RedCap XR devices are secondary priority     - Note: Suitable head phantom is required for headworn XR devices, consider the coordination with CTIA on this aspect * Specify MIMO OTA performance requirements for NR FR1 bands:   + Handheld UE (2 layers or 4 layers)     - Bands n7, n79 are first priority   + The requirements are specified based on Rel-17 static MPAC test method |
| Huawei (2740) | * Specify TRP and TRS requirements:   + Specify FR1 TRP and TRS requirements for NR bands for UE based on operators’ demand     - Handheld UEs with 1Tx at new bands n7, n20, n79   + Specify FR1 wearable TRP and TRS requirements * Specify MIMO OTA requirements:   + Specify FR1 MIMO OTA requirements for new bands for handheld UE based on operators’ demand (2 layers or 4 layers)     - Band n7, n20, n79 are first priority |

**Moderator’s observations**

It is Moderator observation that majority companies are comfortable with the previous guideline for performance part for TRP/TRS and MIMO OTA. Some discussion needed for which bands for both 1st priority and 2nd priority will be included in the scope. Also, which kind of devices can be included as 2nd priority has to be clearly indicated in the scope.

* Specify FR1 TRP and TRS requirements for new bands

Bands [n20, n38, n79] for 1Tx, [n41 and n78] for 2Tx non-coherent UE

* + - Maximum [5] bands are targeted for introducing requirements depending on measurement data availability
  + Handheld UE is the first priority. Other UE types [e.g., XR, NTN] may be considered second priority if a sufficient number of commercial devices become available.
    - Handheld UEs width >=56mm and <=92mm
* Specify FR1 MIMO OTA requirements for new bands based on static test method (2 layers or 4 layers)
  + Handheld UE is the first priority
  + [n20, n38, n79] are first priority
    - Maximum 3 bands are targeted for introducing requirements depending on measurement data availability

## Offline discussions

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# Test method to support NTN VSAT

## Summary of contributions

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| ***Supporting companies*** | ***Details of objectives*** |
| ZTE (2035) | * Specify test method to support NTN VSAT   + Define the measurement setup, test procedure, and preliminary MU for the VSAT device types:     - [Mobile VSAT type 4]     - [Mobile VSAT type 5]   + The test method shall be applicable for [all the existing Ka bands and Ku bands]. * No RAN1/2 impact is expected |
| Samsung (2068) | * Define the measurement setup, test procedure, and preliminary MU   + Study and define the quiet zone size based on industry needs. A preliminary assumption for quiet zone is [55 or 60] cm, larger quiet zone size is not precluded if needed.   + Develop preliminary Measurement Uncertainty (MU) * Example VSAT device types from 38.101 5 Table 9.2.1.0 1 are considered:   + [Mobile VSAT UE type 4 (mechanical steering)]   + [Mobile VSAT UE type 5 (electronic steering)] * Test method shall accommodate the following frequency ranges:   + Ka bands (i.e., existing bands n510, n511, n512)   + [Ku bands with DL from 10.7 to 12.75 GHz and UL from 13.75 14.5 GHz] |
| vivo (2190) | * The enhanced test method to cover NTN Ku and Ka bands, as well as VSAT device types   + Study how to extend the applicability of RAN4 defined OTA methodologies to support Ku/Ka testing     - FR2 OTA test methods (DFF, IFF, NFTF) extension is the first priority     - FR1 OTA test method extension is not precluded, if also applicable   + Study whether and how to support circular polarization measurements     - Linear polarization is the baseline   + Specify the required quiet zone to cover VSAT device type based on industry needs     - Mobile VSAT UE type 4 and type 5 in TS 38.101-5 is the first priority     - [60cm] QZ as a starting point   + Preliminary MU assessment for test methodologies   + Keep coordination with other SDOs on developing these test methodologies |
| CAICT (2348) | * Test methodolgy enhancement to support NTN VSAT   + Determine the VSAT device types to be supported based on NTN operators' demand.     - Mobile VSAT as starting point   + Study and define OTA test systems and methodologies     - Support testing in the Ka-band and Ku-band.     - Define a proper quite zone size to cover NTN VSAT devices   + Study the usage scenarios and specify the proper performance metric   + Develop preliminary Measurement Uncertainty (MU) (RAN5) |
| Qualcomm (2485) | * Specify test method to support NTN VSAT for Ka/Ku-band   + Define the measurement setup, test procedure, and preliminary MU   + FR2 test method specified in TR 38.810 should be used as the baseline |
| Eutelsat (2590/2591) | * Study and define RF testing methodology for FR2 non-handheld UE that can transmit simultaneously with multi-panel   + Define the measurement setup and test procedure for configured transmitted power requirements for simultaneous transmission to multiple directions     - Selecting proper AoA pairs for verification perspective   + Target PC1/PC5 devices as the 1st priority.   + Develop the related preliminary uncertainty assessments for the test methodology   + FR2 test methods for multi-Rx chain DL reception defined in TR 38.871 should be used as the baseline.   + The tests shall take the test system reuse, test system complexity and test time into account to keep the whole test costs within a reasonable level. * Investigate the applicability of current 3GPP test methods established in TR 38.810 and TR 38.871 for UE testing for the following example VSAT device types (from 38.101-5 v18.5.0 Table 9.2.1.0-1:   + Mobile VSAT UE type 4 and 5 (mechanical and electronic steering antenna) * Investigate how to support both linear and circular polarization measurements in uplink and downlink * Confirm that an L3 signalling approach to VSAT testing is to be used * Investigate the required size of the quiet zone based on industry needs. A preliminary assumption for quiet zone is 60 cm, larger volumes will be needed for some antenna types * Test methodologies are studied for the following frequency ranges:   + Ka bands (i.e., existing bands n510, n511, n512)   + Ku bands with DL from 10.7 to 12.75 GHz and UL from 13.75 – 14.5 GHz)   Study ETSI Harmonised Standard for access to radio spectrum ETSI EN 303 980 and any other applicable specifications in other regions |
| Nokia (2661) | * Endorsed UE OTA scope from RAN#108 is good and should be kept stable. RAN4 needs to put Rel-20 efforts to deriving performance requirements as test methods were defined in Rel-18/19. |
| CATT (2712) | * Study and define test methodology and radiated performance metric for NTN VSAT devices:   + Fixed VSAT devices are first priority.   + Take band n512 as example band   + Study the usage scenarios and develop test methodology for TRP/TRS requirements   + Develop preliminary Measurement Uncertainty (MU) (RAN5) * Note: No RAN1/2 impact is expected |
| Huawei (2740) | * Study and define test methodology and radiated performance metric for NTN VSAT devices   + Study the usage scenarios and develop enhanced test methodology   + Study and specify the proper performance metric * Develop the preliminary Measurement Uncertainty (MU) assessment for the test system (RAN5)   NOTE: During the course of this work item, ongoing communication with 3GPP RAN WG5, CTIA OTA Working Group, CCSA TC9, GCF, GSMA TSG-AP, ETSI MSG TFES, and PTCRB shall be maintained to ensure industry coordination on this topic. |

***Observations***

It is Moderator observation that majority companies are comfortable with the previous guideline for test method for NTN VAST. Some discussion needed for which NTN VSAT devices and which bands are included, .i.e.,

* Fixed VSAT or Mobile VSAT type 4 and 5
* Ka bands and Ku bands or Ka band only

Based on the agreements above if any, moderator suggest to discuss the detailed objectives in offline discussion

* The enhanced test method to cover NTN Ku and Ka bands, as well as VSAT device types
  + Study how to extend the applicability of RAN4 defined OTA methodologies to support Ku/Ka testing
    - FR2 OTA test methods (DFF, IFF, NFTF) extension is the first priority
    - FR1 OTA test method extension is not precluded, if also applicable
  + Study whether and how to support circular polarization measurements
    - Linear polarization is the baseline
  + Specify the required quiet zone to cover VSAT device type based on industry needs
    - Mobile VSAT UE type 4 and type 5 in TS 38.101-5 is the first priority
    - [60cm] QZ as a starting point
  + Preliminary MU assessment for test methodologies

Keep coordination with other SDOs on developing these test methodologies

## Offline discussions summary

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# Others

## Summary of contributions on others

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| ***Supporting companies*** | ***Details of proposals*** |
| Qualcomm (2485) | * Complete remaining test methodology for XR devices with new head phantom   + Works should start as soon as the head phantom developed by CTIA is available * FR2 OTA testing enhancement phase 4 (FR2)   + AI/ML-based beam management OTA testing methodology     - Prefer to have a dedicated objective in OTA items.       * Legacy FR2 test method/setup should be considered as the baseline.     - Could be handled under AI/ML leftovers as well depending on the group’s preference |
| Huawei (2740) | * Define test methodology for FR1 wearable devices   + Define TRP and TRS test methodology and configuration * The performance metric of 1Rx and 2Rx devices   + - Testing time reduction solutions can be considered (further measurement grid optimization is precluded)   + Study and specify the proper head phantom if needed, consider the coordination with CTIA on this aspect |

***Moderator’s Observations***

Besides the performance requirements, Huawei and QC are proposing to study the test methods for Watch (Huawei) and XR-glasses (QC). Whether to include the test methods discussions can be also discussed.

If above scope is agreed, moderator suggest to focus on the detailed objectives drafting in the offline discussions.

* Define test methodology for FR1 wearable devices and XR devices
  + Define TRP and TRS test methodology and configuration
* The performance metric of 1Rx and 2Rx devices
  + - Testing time reduction solutions can be considered (further measurement grid optimization is precluded)
  + Study and specify the proper head phantom if needed, consider the coordination with CTIA on this aspect

QC also proposed to consider AI/ML testing enhancement for FR2. If time allows, moderator suggest to discuss

* Whether to have a dedicated objective in OTA item for AI/ML test enhancement or handled under AI/ML leftover

## Offline discussions Summary

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# Conclusions