3GPP TSG-RAN WG4 Meeting #113 draft R4-2419590

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

**Agenda item:** 7.11.5

**Source:** Moderator (Huawei)

**Title:** Topic summary for [113][303] NR\_BS\_RF\_Part2\_CLTA

**Document for:** Information

# Introduction

Focus of this thread is co-location test antenna (CLTA) topic of the NR\_BS\_RF\_req\_evo work item. CLTA-related objectives were extracted from the WID in RP-242010 for reference:

* Core:
  + Investigate whether the BS/IAB OTA co-location reference antenna definition need be improved for FR1, and if feasible, update the definition.
* Perf:
  + Investigate whether the existing test approach can be improved, and if feasible, improve test methods for BS/IAB OTA co-location requirements and tests for AAS-based test specifications for FR1.

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2418018 | Nokia | On OTA test enhancements  Observation 1: The power level of the spurs in these measurements are fluctuating in time.  Observation 2: More measurements are needed to ensure the usability of wideband horn antennas as CLTAs.  Observation 3: There are many factors to be taken into consideration in BS-to-BS isolation analysis.  Observation 4: Beam steering is a technology of paramount importance for AAS.  Observation 5: Beam steering has a significant effect on the isolation levels.  Proposal 1: RAN4 to focus on agreeing on the methods how to analyze BS-to-BS isolation.  Proposal 2: Frequency bands should not be limited to FR1.  Proposal 3: Beam steering need to be considered as a parameter of major importance.  Proposal 4: Frequency boundary for the TX IMD requirement removal needs to be clearly demonstrated by simulations before any agreement can be made. |
| R4-2418398 | Ericsson | Simulation of BS-to-BS isolation for edge-to-edge co-location scenario  Observation 1: Our results indicate angular regions of beam pointing directions with higher and lower coupling loss reflecting variations in the nearfield antenna pattern.  Observation 2: The total variation of coupling loss due to beamforming is more than 40 dB and the mean value is around 55 dB.  Observation 3: Here we consider a scenario where aggressor and victim are operating within the same band. But in reality, co-location requirements are defined between bands. Therefore, further analysis is required to understand the coupling loss between aggressor and victim with large frequency offset. It is expected that the coupling loss will increase with larger frequency offset.  Observation 4: In this contribution identically sized AASs have been studied. Previous studies indicate such size matching is the worst-case corresponding to minimum coupling loss. |
| R4-2419208 | ZTE Corporation, Sanechips | Further discussion on OTA test enhancement  Observation 1: if two NR AAS BS are placed with vertical separation which is quite typical for the mast installation, then the coupling loss would be larger than 50dB with10cm separation distance.  Observation 2: if two NR BS are placed with horizontal separation which is typical for roof based installation, the coupling loss is still larger than 30dBc and the coupling loss among different antenna ports are varying from 31dB to 46dBc.  Observation 3: the side by side co-location deployment should be still typical for the roof based installation  Observation 4: according to the AAU/RRU installation guidance, the minimum horizontal separation distance should be 0.6m and minimum vertical separation distance should be 0.2m which are both larger than the specified 0.1m separation distance. The co-location requirement itself in the specification is very stringent requirement compared with the practical deployment.  Observation 5: it might be very difficult to have Tx and Rx installed in the different heights of BS mast or tower according to the legacy deployment practice;  Observation 6: These two received gain for passive antenna of CLTA and AAS sub-array would be quite different. In other words, the measured spurious emission or transmitter OFF power from CLTA cannot be reused or applicable for AAS BS co-locating with AAS BS at sub-array level.  Observation 7: These two passive antenna and AAS BS pattern would be quite different, from Tx intermodulation and co-location OOBB requirement, it seems that the legacy CLTA requirement would provide more stringent conformance testing for it.  Observation 8: Based on the initial simulation results for FR1 high bands, coupling loss is expected to be larger than 50dBc regardless from array to array or array to antenna port. |
| R4-2419683 | Huawei, HiSilicon | Further discussion on CLTA aspects  Proposal 1: While CLRA antenna concept is out of scope of this work, other (than previously defined CLTA) test antennas are already allowed by legacy OTA test specifications to be used for the OTA co-location requirements testing.  Proposal 2: Before proceeding with further work on beam steering consideration for co-location scenario, number of open issues needs to be clarified first, e.g.: Investigation on the set of impacted specifications (core, test, etc.),  - Impact of supported steering range on the underlying core requirement values,  - Investigation on beam steering applicability during the test: EUT, CLTA, or both,  - Investigation on the set of impacted OTA co-location test requirements,  - Considered deployments to be modelled (horizontal antennas stacking, vertical stacking, etc.),  - Applicable frequency range.  Proposal 3: TX IMD CLTA test requirements for operating bands above 4.2 GHz to be as regional requirements (declaration based). |
| R4-2419684 | Huawei, HiSilicon | Draft CR to TS 38.141-2: TX IMD for high bands as regional requirement |
| R4-2419685 | Huawei, HiSilicon | Draft CR to TS 37.145-2: TX IMD for high bands as regional requirement |
| R4-2419686 | Huawei, HiSilicon | Draft CR to TS 38.176-2: TX IMD for high bands as regional requirement |

# Topic #1: CLTA

## Companies’ contributions summary

Numner of contributions were submitted to this meeting, to address open issues identified for CLTA in the WF in R4-2416574.

## Open issues summary

### Sub-topic 1-1: CLTA definition

Open issues and candidate options before meeting:

* Proposals
  + Proposal 1: While CLRA antenna concept is out of scope of this work, other (than previously defined CLTA) test antennas are already allowed by legacy OTA test specifications to be used for the OTA co-location requirements testing. (Huawei, R4-2419683)
* Recommended WF
  + Check online whether Proposal 1 is agreeable.
  + Moderator: While horn antennas were discussed as alternative for CLTA, there were no formal proposals formulated this, nor previous meeting.

### Sub-topic 1-2: BS-to-BS isolation analysis

Discussion on BS-to-BS isolation analyses were provided in multiple contributions: R4-2418398 (Ericsson), (R4-2418018, Nokia), R4-2419208 (ZTE).

* Proposals (non-exclusive)
  + Proposal 1: RAN4 to focus on agreeing on the methods how to analyze BS-to-BS isolation. (R4-2418018, Nokia)
  + Proposal 2: Frequency bands should not be limited to FR1 (R4-2418018, Nokia)
* Recommended WF
  + Online discussion on Proposal 1.
  + Moderator: CLTA work in this WI is limited to FR1 for now; there are no co-location requirements for FR2.

### Sub-topic 1-3: Beam stering consideration for co-location scenario

Open issues and candidate options before meeting:

* Proposals
  + Proposal 1: Beam steering need to be considered as a parameter of major importance. (R4-2418018, Nokia)
  + Proposal 2: Before proceeding with further work on beam steering consideration for co-location scenario, number of open issues needs to be clarified first: (Huawei, R4-2419683)

e.g.:

* + - Investigation on the set of impacted specifications (core, test, etc.),
    - Impact of supported steering range on the underlying core requirement values,
    - Investigation on beam steering applicability during the test: EUT, CLTA, or both,
    - Investigation on the set of impacted OTA co-location test requirements,
    - Considered deployments to be modelled (horizontal antennas stacking, vertical stacking, etc.),
    - Applicable frequency range.
* Recommended WF
  + Moderator: Last WF agreed that Evaluation of the beam steering impacts is considered as applicable to the co-location scenarios analyses. However, we need to clarify how to address Proposal 1, especially considering WID scope.
  + Online discussion on clarifications in Proposal 2.

### Sub-topic 1-4: TX IMD co-location

Related Draft CRs were submitted in R4-2419684, R4-2419685, R4-2419686 (no related work-split was arranges so far).

Open issues and candidate options before meeting:

* Proposals
  + Proposal 1: Frequency boundary for the TX IMD requirement removal needs to be clearly demonstrated by simulations before any agreement can be made. (R4-2418018, Nokia)
  + Proposal 2: TX IMD CLTA test requirements for operating bands above 4.2 GHz to be as regional requirements (declaration based). (Huawei, R4-2419683)
* Recommended WF
  + Online discussion
    - Check whether measurements provided last meeting may be used to address Proposal 1.
    - Check whether Proposal 2 would be agreeable as baseline.
  + Draft CRs suggested to be marked as Return to (focus on technical discussion first).