

3GPP TSG-RAN WG4 Meeting #110
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On BS RF Topics for Rel-19

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BS RF evolution and enhancements

- OTA conformance testing enhancements
- Core requirements/Conformance test for expected EIRP mask
- BS specification improvement
- EMC specifications simplification

OTA test enhancement

- Motivation

- > Active Antenna System is widely deployed in NR. The OTA test is a must for type 1-O AAS BS. It has been found that the test time is prohibitive taking up to 3 times the time to perform the conformance testing compared to conducted conformance testing. Excessive OTA testing time has become a constraint for AAS product design, development and certification.
- > In some cases it may be that the number of test cases could be reduced without impacting the coverage of the testing. OTA TRP testing is particularly time consuming for example; the TX IMD testing comprises of 96 test cases testing output power, ACLR and out of band emissions (all TRP requirements) by contrast the output power, ACLR and out of band emissions tests have only 8 test cases in total, 6 interfere offsets are tested for each (12 for NC operation), these offsets date back to the UTRA requirements and have been carried through for each subsequent RAT however not they are generating such excessive test time so it is appropriate to see if they are all still necessary or can be reduced.

Test requirements	Type	Num of test cases	Num of TCs (TS 37.145-2)
OTA base station output power	TRP	1	ATCR7
OTA ACLR	TRP	3	ANTCR2, ANTCR8, ANTCR7
OTA out-of-band emission	TRP	4	ATCR7, ANTCR7, ATCR2a, ANTCR2
OTA transmitter spurious emission	TRP	1	ANTCR7
OTA transmitter intermodulation	TRP	36	ANTCR2, ANTCR8, ANTCR7
	TRP	48	ATCR7, ANTCR7, ATCR2a, ANTCR2
	TRP	12	ANTCR7

- > OTA blocking testing is also time consuming where the CW interfering signal is swept with a step size of 1 MHz. there could be potential methods to reduce the testing time for OTA test.

OTA test enhancement

- Objective

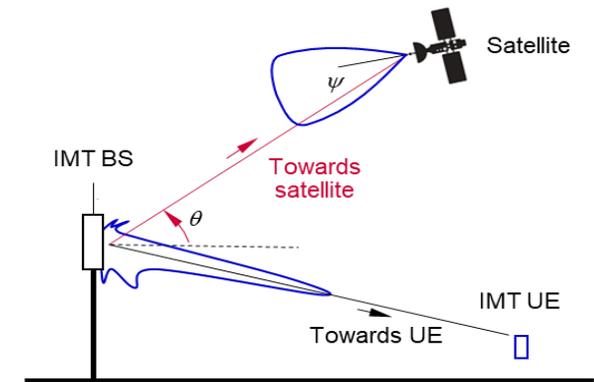
- > Study and specify the methods to reduce the testing time for TX intermodulation
 - Chose the worst case to reduce the number of test configurations
 - Chose the worst case to reduce the number of test points/offsets
 - The ACLR, OBUE, and spurious emission with the same configuration as TX intermodulation are not tested redundantly.
- > Study and specify the methods to reduce the testing time for blocking
- > [Enhancement on co-location test]

Core requirements/Conformance test for expected EIRP mask

- Motivation

- > At ITU World Radiocommunication Conference 2023 (WRC-23) held in Dubai, United Arab Emirates, 20 November to 15 December 2023, the frequency band of 6 425-7 125 MHz was identified in every ITU region as in the RR Footnotes 5.6 A 12, 5.6 B 12 and 5.6C12 with associated technical condition of limits on the expected EIRP spectral density of IMT base-stations for protecting Earth-to-space fixed satellite services (FSS) [1].
- > The expected EIRP is a new regulatory requirement and when developing the expected EIRP it is expected that 3GPP to develop the harmonized specification for compliance testing. It requests RAN4 to perform the study on the conformance test and develop a harmonized specification which would be beneficial for the industry.

Vertical angle range \downarrow $\theta_L \leq \theta < \theta_H \downarrow$ (vertical angle θ above the horizon) \downarrow	Expected e.i.r.p. \downarrow (dBm/MHz) \downarrow (See NOTES 1, 2 and 3) \downarrow
$0^\circ \leq \theta < 5^\circ$ \downarrow	27 \downarrow
$5^\circ \leq \theta < 10^\circ$ \downarrow	23 \downarrow
$10^\circ \leq \theta < 15^\circ$ \downarrow	19 \downarrow
$15^\circ \leq \theta < 20^\circ$ \downarrow	18 \downarrow
$20^\circ \leq \theta < 30^\circ$ \downarrow	16 \downarrow
$30^\circ \leq \theta < 60^\circ$ \downarrow	15 \downarrow
$60^\circ \leq \theta \leq 90^\circ$ \downarrow	15 \downarrow



[1] WRC-23 Provisional Final Acts, https://www.itu.int/dms_pub/itu-r/opb/act/R-ACT-WRC.15-2023-PDF-E.pdf

Core requirements/Conformance test for expected EIRP mask

Objective

- Introduction of the definition and limits on expected EIRP mask in TS 38.104
- To define the conformance test in TS 38.141-2
 - > Measurement system set-up
 - > Test method
 - define the tested beam directions
 - define the measured points at upper hemisphere
 - Manufacturer declarations
 - > Measurement uncertainty

BS specification improvement - Co-location and co-existence requirements optimization for network nodes

- Motivation

- > With introduction of a new operating band, both co-location and co-ex requirements need to be updated in multiple specifications (e.g. NR BS, MSR BS, IAB). This is done in order for the new band to be protected from the legacy bands, as well as for the legacy bands to be protected from the newly introduced operating band.
- > The main issue with the existing process is it requires ~ 10 CRs for each new operating band.
- > To improve this, it is proposed to shift all existing and new co-lo and co-ex requirements to a new dedicated TS.
- > With the above, new band co-lo and co-ex would be updated in just one TS (legacy specs would refer to dedicated TS).

- Objectives

- > Introduce new dedicated 37-series TS for RF co-location and co-existence requirements, covering the following:
 1. BS, IAB, and Repeaters requirements
 2. NR, E-UTRA requirements
 3. SRAT, and MSR requirements
 4. Core and Performance parts
 5. Conducted and OTA requirements
- > Optimize handling of core TX spur requirements for the following TS: NR BS, NR Repeaters, NCR, NR IAB, MSR, AAS, E-UTRA BS
- > Optimize handling of core TX spur co-ex for the following TS: NR BS, NR Repeaters, NCR, NR IAB, BS, AAS, E-UTRA BS
- > Optimize handling of core OOB blocking co-location for the following TS: MSR BS, AAS BS, E-UTRA BS

EMC specifications simplification

- Motivation

- > EMC Core requirements are by definition RAT-agnostic, leading to significant content overlap among multiple EMC specifications.
- > We have currently 6 specifications for network nodes, 2 specifications for UE (UTRA not counted) – even a simple correction leads to many CRs for multiple specifications (workload issue).
- > It was found to be easy to merge multiple EMC specifications into a single one for all network nodes.
- > Network-side EMC specifications: EUTRA BS (36.113), MSR BS (37.113), AAS BS (37.114), NR BS (38.113), NR repeater (38.114), IAB (38.175)
- > UE side: EUTRA UE (36.124), NR UE (38.124)

- Objectives

- > Merge all network-related EMC specifications (36.113, 37.113, 37.114, 38.113, 38.114, 38.175) into a single specification, capturing single-RAT as well as MSR.
 - NOTE: specification series and spec number to be consulted with MCC.
- > Merge all UE-related EMC specifications (36.124, 38.124) into a single specification, capturing all RATs
 - NOTE: UTRA of no interest anymore, but can be also included in there is interest.
- > Afterwards, all the above legacy EMC specifications to be Withdrawn as technical content shifted to a newly merged specifications.
- > Once technical content is merged in a new specification, text optimization and alignment can be performed.