

3GPP TSG RAN meeting #88-e

RP-201072

Electronic Meeting, June 29 - July 3, 2020

Agenda Item: 9.1.2

Source: CAICT

Title: Views on NR FR1 TRP&TRS requirements

Document for: Discussion

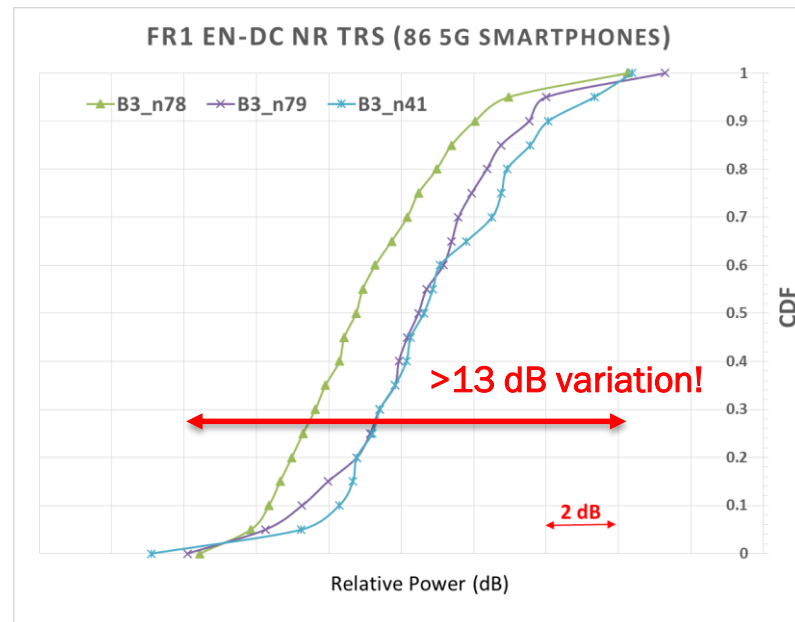
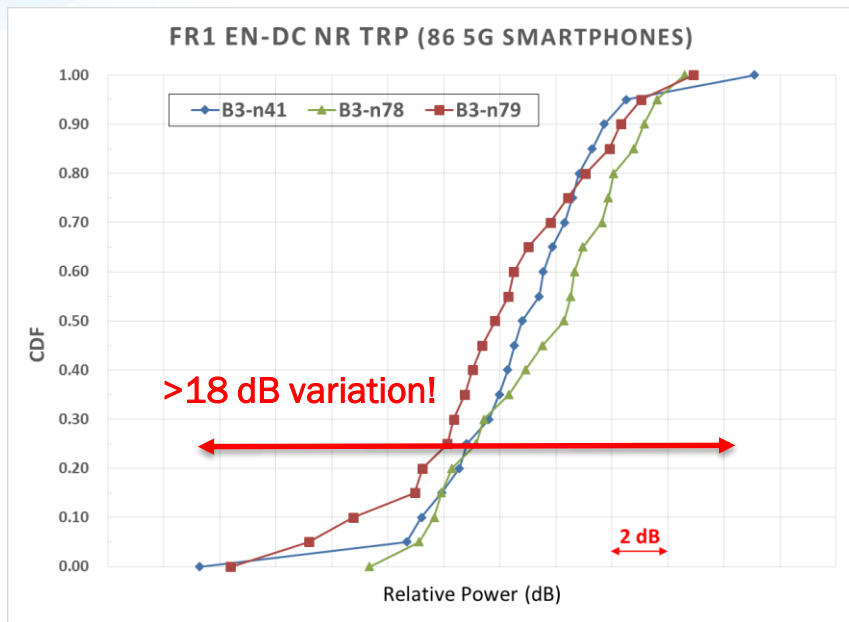


Background of TRP&TRS OTA

- Due to larger pressure on NR devices for antenna design, the OTA performance can not be guaranteed:
 - NR devices are required to support multiple frequency bands, EN-DC, CA, higher frequencies, and higher-order MIMO, resulting in huge pressure on the available space to design efficient antennas.
 - In addition, devices with thinner size and better camera performance are more popular, which further reduces the space for antenna design.
- OTA performance is the final checkpoint from certification side to ensure the performance of entire UE close to usage scenario:
 - RF transmitter and receiver requirements by conducted testing with small tolerance have been well developed in RAN4. However, the reality is all the UEs in the market may have good conducted performance without surprise, but some of the UE's actual OTA performance could be very bad.
 - The OTA performance of the entire UE and associated end-user experience shall be guaranteed on top of conducted conformance testing.
- OTA performance can take into account factors such as internal radiation interference, product structure, antenna factors, and even human body influences, which is very close to the actual product usage scenario.

Why FR1 TRP&TRS performance really matters?

FR1 TRP&TRS performance of commercial 5G UEs (86 5G smartphones)



Even under the same network scenario, different end-user may feel totally different “5G network” experience!

Status of FR1 TRP&TRS test methodologies

➤ CCSA TRP&TRS test methodologies

- Start: CCSA TC9 WG1 45th meeting, Beijing, Sep. 2018
- ✓ Both SA and EN-DC were finalized: CCSA TC9 WG1 50th meeting, Beijing, **Sep. 2019**



➤ CTIA TRP&TRS test methodologies

- Start: F2F meeting, San Diego, April 2018
- ✓ SA finalized: **November 2019**, published in CTIA OTA Test Plan v3.9
- ✓ NSA finalized: OTA CA Task Force, CATF191204_R5, 2020 3th meeting, **May 2020**



In summary:

- FR1 TRP&TRP OTA test methodologies are well developed and stable in the industry.
- The commercial Automatic-testing system have been widely used by UE vendors, OEMs, and test labs for FR1 TRP&TRS OTA, including both anechoic chamber and reverberation chamber.

Key aspects of this topic

- The reasons for traditional remarkable timescale of SISO OTA requirements are many, but two stand out:
 - Traditional OTA requirements relies on measuring actual devices will add considerable delays, and the long time also spread the performance of commercial phones, then the results will become too wide to agree requirements.
 - There was no recognized process for simulating expected TRP&TRS OTA performance including the antenna design.
- Situation changes for NR:
 - FR2 RF requirements were entirely specified and validated using radiated OTA approach.
 - Successfully specifying FR2 requirements without measuring real UEs provides much confidence to the industry to define FR1 OTA.
- Simulations based on aligned antenna assumption shall be the key approach to specify FR1 TRP&TRS requirements, without measuring actual commercial UEs. Reasonable antenna assumptions can be adopted for FR1 TRP&TRS simulations.
- Many EN-DC combinations and NR bands have been introduced for FR1, a priority list with down-selected bands shall be defined.

Way forward in 3GPP

- The FR1 OTA performance of commercial UEs shows large variation, which degrades the end-user experience.
- The test methodologies for FR1 TRP&TRS OTA have been well developed, commercial Automatic-testing system are widely used in the industry.
- Successful experience from specifying FR2 RF requirements without measuring actual devices can be adopted for FR1 OTA.
- Several kind of antenna assumptions and UE designs for the NR bands shall be defined, similar to FR2 UE RF approach.
- For EN-DC combinations and NR bands, a priority list with down-selected number of bands shall be defined.
- FR1 TRP&TRS OTA shall start within Rel-17 timeline.
- Ongoing communication with CTIA OTA Working Group and CCSA TC9 WG1 shall be maintained to ensure industry coordination on this topic.

Thank you!