

3GPP TSG RAN Rel-19 workshop  
Taipei, June 15 - 16, 2023

Source: ZTE, Sanechips

Agenda: 6

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ZTE

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# Views on Rel-19 RAN4-led topics



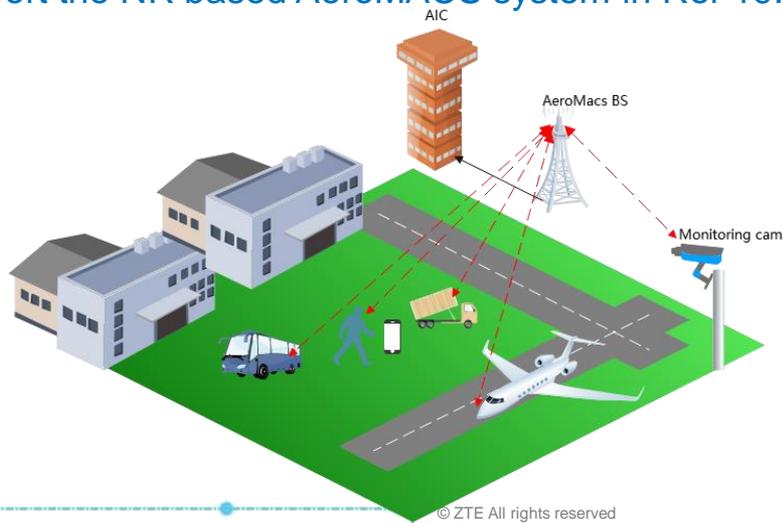
# Content

**01** Verticals

**02** Non-verticals

## NR based AeroMACS-Use case

- ❑ AeroMACS is the aeronautical mobile airport communication system (AeroMACS) which is used to provide the wireless communication system for airport to help airlines, airport authorities and airport ground service etc.
- ❑ AeroMACS is still using the WiMAX standard (IEEE 802.16) at the aeronautical C-band (5 GHz) to provide the service till now.
- ❑ Based on the latest decision from CAAC (Civil Aviation Administration of China), it's planned to provide the NR based AeroMACS system.
- ❑ **Proposal 1:** Support the NR based AeroMACS system in Rel-19.



## NR based AeroMACS- Spectrum status

- ❑ ITU-R WRC-07 decided to assign the 5091-5150MHz for the spectrum of AeroMACS system;
- ❑ ITU-R WRC-12 decided to assign the 5030~5091MHz for the spectrum of AeroMACS system;
- ❑ NAS consider the use of the 5000-5030 MHz band to extend the tuning range for the the AeroMACS.

**Proposal 2:** Specify the band 5091~5150MHz for regional deployment and 5000~5150MHz for global deployment.

## ATG evolution in Rel-19

- ❑ Potential new bands based on the operator's deployment request;
- ❑ CA based ATG system based on the deployment demand;

## NTN evolution in Rel-19

- ❑ New bands/BW for NTN which mainly depend on operator's request; (e.g. Ku-band, other low bands in FR1, 30MHz for n256 or 3MHz carrier bandwidth for FRF >1 etc )
- ❑ In-band NB-IoT in NR over SAN which is not supported yet in Rel-18;
- ❑ Multi-standard Radio SAN if necessary;
- ❑ High power for NTN UE in FR1;
- ❑ The remaining issue for NTN in Ka-band (e.g. M-ESIM or A-ESIM etc);
- ❑ Other RRM enhancement e.g. without measurement gap for satellite in Ka-band etc;

# Content

**01** Verticals

**02** Non-verticals

## BS RF/EMC related evolution in Rel-19

- ❑ Multi-band repeater or NCR in FR2 similar as Rel-18 FR2 multi-band operation;
- ❑ Multi-band (e)IAB in FR2 similar as Rel-18 FR2 multi-band operation;
- ❑ Multi-carrier SBCD BS if not completed in Rel-18;
- ❑ ATG BS EMC;
  - The current Spec in 3GPP does not cover the EMC requirements of ATG BS&UE. However by considering the use case of ATG equipment, the EMC requirement limits would be different with current spec. In order to fill the missing gap of ATG EMC requirements, we recommend to study ATG UE/BS EMC requirements in Rel-19.
    - To cover the Core&Perf EMC requirements for ATG BS;
    - To cover the Core&Perf EMC requirements for ATG UE;
    - Investigate whether the current EMC test limits is suitable for ATG equipment. If it is not suitable, then study the new limits for ATG EMC;

# Spectrum related WID in Rel-19

## ❑ Band combination Basket WIDs

- Existing R18 PC3/HPUE NR CA/DC band combinations shall continue in Rel-19.

## ❑ The following aspects to be included in Rel-19 WID:

- PC1.5(PC2+PC2) inter-band UL NR CA if it is not included in existing Rel-18 WID
  - Clear demands from operators for a long time.
- PC1.5 TDD intra-band UL NR CA

## ❑ The existing R18 4Rx support for NR FR1 bands (<2.6GHz) WID to be extend in Rel-19:

- In R18, 8Rx is for FWA UE, and the RF requirements for 8Rx single carrier will completed in Rel-18.
- In R18, it is feasible for handheld UE with 4Rx antennas in low frequency band (<1GHz) in terms of the RAN4 discussion, and the related requirements will be completed in Rel-18.
- In Rel-19, it can be foreseen that more bands will be requested by operators to support 8Rx, and more low frequency bands will be requested by operators to support 4Rx for handheld UE, respectively.
- In order to avoid individual WIDs, it is proposed to extend the R18 WID to include 8Rx NR FR1 bands for FWA UE and 4Rx NR FR1 bands in low frequency band (<1GHz) for handheld UE in Rel-19

## Spectrum related WID in Rel-19- WID on Further simplification of band combination

- ❑ The simplification of band combination shall continue due to more new rules/guidance would be foreseen.
- ❑ CR work to implement the new rules/guidance under the WID.
- ❑ Recommended Objectives:

Further investigate and simplify the working procedure for specifying band combination.

- Rules or guidelines collection for band combination during the timeframe of Rel-19.
  - Simplifications on BCS for band combination if feasible.
  - Further simplifications on band combinations of multiple features, e.g., NR-CA, EN-DC etc.
  - Study the possible simplifications for HPUE features.
- Efforts on possible optimization for specification structure and reduce the signaling load and test burden.
  - RAN2 and RAN 5work will be triggered by LS from RAN4.

For the simplification on V2X band combinations, the following PC5 configurations with Uu configurations should be investigated in order to minimize the specification efforts.

- Inter-band con-current V2X operating bands (TS 38.101-1&TS 38.101-13)
  - NR Uu+NR PC5 (TS 38.101-1)
  - LTE Uu+NR PC5(TS 38.101-3)
  - NR Uu+LTE PC5(TS 38.101-3)
- Intra-band con-current V2X operating bands (TS 38.101-1)

# Non-Spectrum related WID in Rel-19

## □ 6Rx for handheld UE and FWA UE

- Currently, 4Rx is for handheld UE and FWA UE, while 8Rx is only for FWA UE in Rel-18.
- Comparing to 4Rx, 6Rx can further provide higher throughput and better coverage for smartphone. Moreover, 6Rx is one of the scenarios for non-co-located intra-band NRCA/ENDC.
- Example bands: n77/n78/n79

## □ 3Tx(1Tx+2Tx inter-band NR CA/DC) for handheld UE

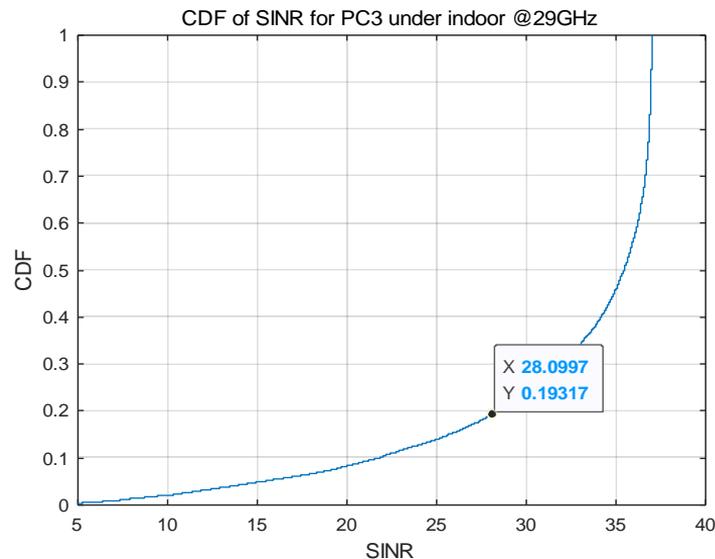
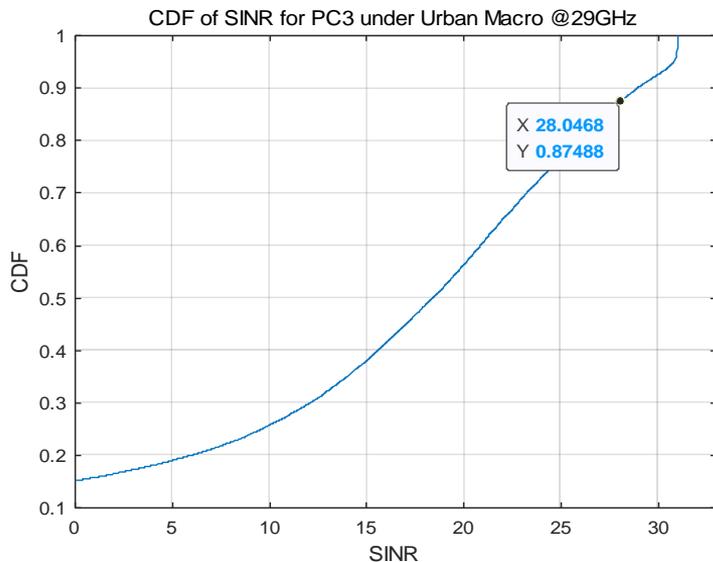
- In R18 3Tx/4Rx WI, it included one of the objectives on study the applicable 3Tx requirements for handheld UE. However, in terms of the RAN4's agreements, it was agreed that 3Tx requirements are restricted to FWA UE in R18.

## □ 3MHz+Other BW for intra-band contiguous CA to meet the market demand for irregular channel bandwidth

# Non-Spectrum related WID in Rel-19

## FR2-1 256QAM for PC3

- In Rel-18, FR2-1 256QAM for PC1/2/5 is first priority while for PC3 is second priority, and the work for RF requirements mainly focus on PC1/2/5 in Rel-18. If work for FR2-1 256QAM PC3 UE are not completed in Rel18, then it should be included in Rel-19.



PC3 is also feasible if the operating SNR is not higher than 28dB for 29GHz.

For 29GHz\_ Urban Macro: More than 10% UE can achieve above 28dB SINR for PC3.

For 29GHz\_ Indoor: More than 80% UE can achieve above 28dB SINR for PC3.

## UE RRM related evolution in Rel-19

- ❑ For R18 FR2 UE, the existing requirements for RLM and BFD is highly related with Rx beam numbers and  $T_{DRX}$ . Especially when DRX is larger than 320ms with 8 Rx beams, side condition might have already changed a lot due to UE mobility or UE rotation related behavior. It is necessary shorten the evaluation period for long DRX cycles.
  - Reducing Rx beam numbers
  - Withdraw from the long DRX cycle based on network configured measurement threshold
- ❑ The same story also applies for BFD detection delay, similar approach as mentioned for RLM enhancement could also been applied
- ❑ Proposal: to reduce RLM and BFD evaluation period for FR2 UE by reducing Rx beam numbers or withdraw from the long DRX cycle based on network configured measurement threshold or both alternatives;

## UE RRM related evolution in Rel-19

- ❑ In Rel-18, multi-panel to enhance the MIMO layer and L1 measurement was supported. In fact, the RRM measurement could be further improved for UE capable of simultaneous multi-panel reception, such as
  - Rx beam sweeping reduction
  - measurement restriction relaxation
  - group-based reporting mechanism can be further triggered
  
- ❑ Proposal: RRM measurement enhancement is expected by applying simultaneous multi-panel reception.

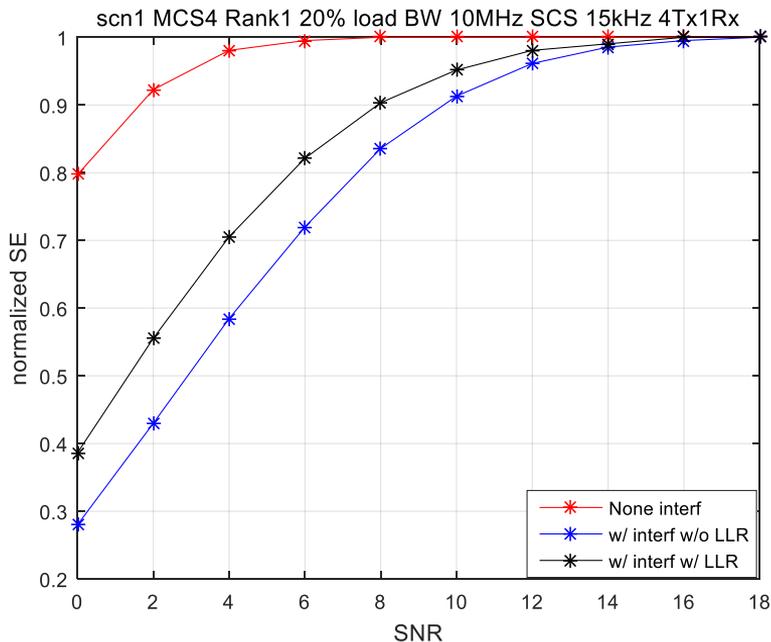
## UE RRM related evolution in Rel-19

- ❑ The SCell activation further enhancement in Rel-19 due to TU budget concerns, multiple issues were not resolved in R18.
- ❑ Candidate techniques to be considered for the further enhancements for both FR1 and FR2.
  - QCL information related enhancement;
  - Update for ending point of SCell activation;
  - TCI activation enhancement
  - etc.
  
- ❑ Proposal: Further enhance the SCell activation enhancement, focus on the potential enhancements deprioritized in Rel-18, including QCL information related enhancement, ending point of SCell activation, TCI activation enhancement, not restrict FR2, both FR1 and FR2 are involved.

## UE Demod related evolution in Rel-19

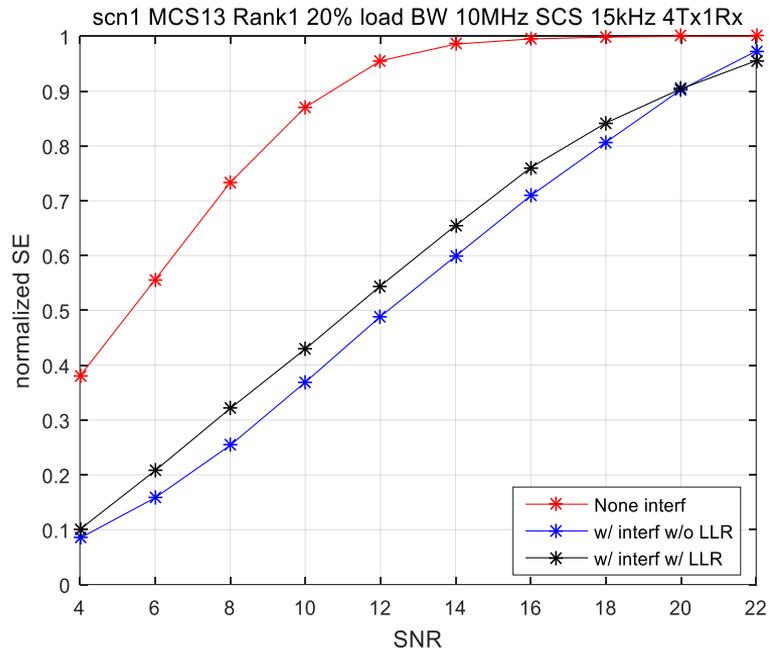
- ❑ In Rel-17, the evaluation scenarios of CRS-IM mainly focus on antenna configuration 4x2 or 4x4 which is basically targeted for normal UE.
- ❑ For Redcap UE introduced in Rel-17, its receiver numbers are reduced to 1Rx and 2Rx to reduce the cost.
- ❑ In Rel-15, RAN4 defined the performance requirement of CRS-IM for LTE Single RX Chain UEs.
- ❑ Propose: to define CRS-IM Performance Requirements for Redcap UE with single receiver in Rel-19 to ensure that Redcap UE could have the same capability to handle LTE CRS interference similar as normal NR UE.

# Simulation results-Scenario 1



» Required SNR (dB) at 70% max TP

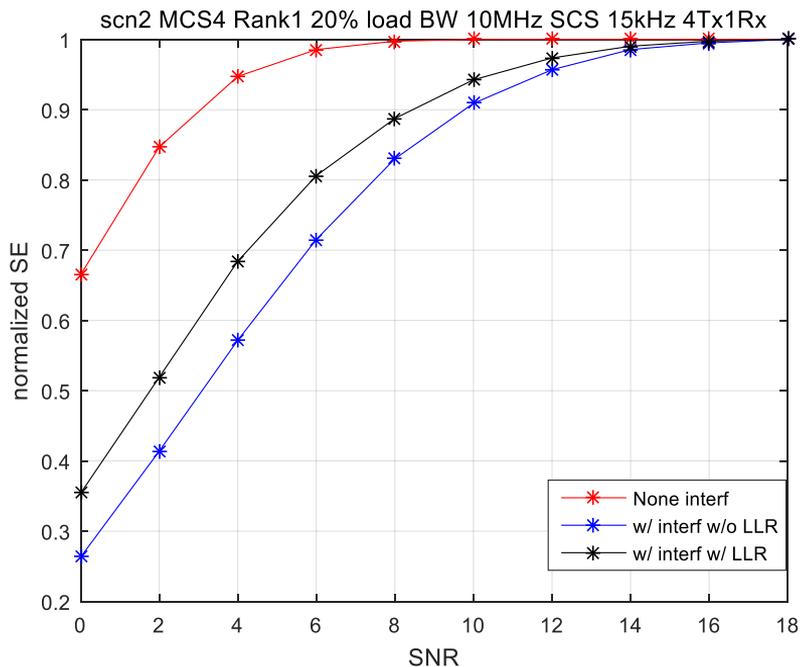
Reference (No CRS-IM)	CRS-IM LLR weighting
5.7dB	3.9dB



» Required SNR (dB) at 70% max TP

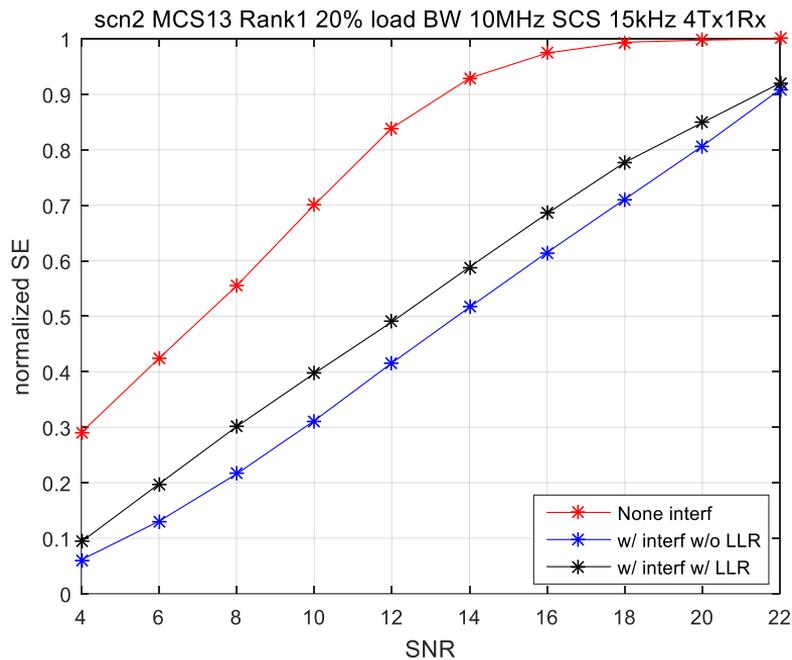
Reference (No CRS-IM)	CRS-IM LLR weighting
15.8dB	14.8dB

# Simulation results-Scenario 2



» Required SNR (dB) at 70% max TP

Reference (No CRS-IM)	CRS-IM LLR weighting
5.7dB	4.3dB



» Required SNR (dB) at 70% max TP

Reference (No CRS-IM)	CRS-IM LLR weighting
17.8dB	16.3dB

## BS Demod related evolution in Rel-19

- ❑ To investigate some advanced receiver (e.g. MMSE-IRC etc) to handle the BS CLI problems in SBFD scenario;
  - Note: it's not expected to have the impacts on the legacy BS (e.g. not supporting the SBFD operation in previous release).

# Thanks



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