3GPP TSG RAN meeting #102
Edinburgh, Scotland, December 11-15, 2023

RP-233207

General views on RAN4 topics for Release 19

Huawei, HiSilicon

HUAWEI

Contents

1. General consideration on RAN4 work
2. BS RF evolution and enhancements
3. Further UE RF enhancements for FR1
4. Further UE RF enhancements for FR2
5. Further OTA enhancements
6. Further RRM enhancements
7. Further demodulation enhancements
8. Cross area topics
9. Spectrum/basket WI

General consideration on RAN4 work

- **Enough TU should be reserved for RAN4 led WI/SI**
  - Observation 1: total ~13 RAN4 TU in Rel-18, ~7 TU reserved for Rel-18 RAN4 led non-spectrum WI/SI
  - Observation 2: total **21** other WGs WI/SI discussed in RAN4, **22** RAN4 non-spectrum WIs, **47** RAN4 spectrum WIs

- **Clear objective and strict control of the scope of RAN4 part in other WG led WIs**
  - Observation: discussion in some WIs has no clear objective in the WID, but spent a lot of RAN4 efforts

HUAWEI

Views on potential RAN4 non-spectrum topics

RAN4 BS RF

OTA test enhancement
- Improve the OTA test efficiency

Conformance test for expected EIRP mask
- Study the test methods for the new regulatory requirement

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

RAN4 UE RF

UE RF FR1
- RF UL enhancements
  - MPR reduction and/or power boosting with relaxed requirements
  - MPR improvement with PAPR reduction
  - Applicable ULFPTx modes reporting
- PC1.5 intra-band C/NC CA and inter-band CA
- 6Rx for handheld UE

UE RF FR2
- RF UL enhancements

RAN4 UE OTA

MIMO OTA enhancements
- Additional bands in FR1 and FR2
- Multiple TRP for FR1
- RC method as a candidate for FR2 tests

TRP/TRS enhancements
- Additional bands for FR1
- CA test for single Tx with >2CC

RAN4 RRM

EMR+ Fast SCell activation

RRM delay reduction
- FR2 unknown SCell activation based on temp RS
- L3 Measurement enhancement for FR1+FR2

Further RRM enhancement
- Interruptions at NR SRS antenna port switching
- L1/L2 mobility inter-frequency measurement enhancement

RAN4 Demod

Demodulation performance enhancement for 8Rx

Soft-IC for SU-MIMO

RAN4 Cross Areas

Non-collocated intra-band CA/EN-DC enhancements
- 4 layer enhancement
- type 3 and type 4 UE architectures

SL RAN4 enhancements
- Rel-18 leftovers
- Intra-band non-contiguous CA

ATG enhancements

HUAWEI

RAN4 BS RF

Potential Topics	Potential Objectives
OTA test enhancement	> 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]
Conformance test for expected EIRP mask	> Measurement system set-up > Test method, expected EIRP test can be built based on current TRP test with some additions. - define the tested beam directions and the beam probability factors - the measured points at upper hemisphere - manufacturer declarations > Measurement uncertainty
BS specification improvement	> Introduce new dedicated 37-series TS for RF co-location and co-existence 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

RAN4 UE RF _FR1

Potential Topics	Potential Objectives
RF UL enhancement	> Specify the UE RF requirements of MPR reduction and/or power boosting for the existing power classes by conditionally relaxing ACLR or EVM requirements: - For QPSK and 16QAM, specify the conditions and signaling to relax ACLR and the corresponding relaxed ACLR requirements - For 64QAM and 256QAM, specify the conditions and signaling to relax EVM and define the relaxed EVM requirements - NOTE: the enhancement is applicable to OFDM and DFT-s-OFDM waveform > Specify the improved MPR requirement with new PAPR reduction mechanism - The PAPR reduction mechanism is expected to be transparent to network and with less impact on existing physical layer design - MPR improvement at least for inner RB allocation region, study and specify the improved MPR for outer RB allocation regions - Targeted power class is PC3 - Candidate modulation schemes include QPSK, 16QAM > Enable semi-static and/or dynamic reporting for ULFPTx applicable modes associated with changed power (RAN1, RAN2, RAN4) - Applicable ULFPTx modes reporting could be companioned with $\Delta P_{powerclass}$ reporting, but not limited to the case that power reduction is resulting from duty cycle exceedance
PC1.5 intra-band contiguous / non-contiguous CA & inter-band CA	> Specify UE RF requirement for PC1.5 intra-band CA with 2Tx, including scenarios of - Intra-band contiguous CA w/ or w/o UL MIMO - Intra-band non-contiguous CA - Example band combinations: n77/78/79C, n77/78/79(2A) > Specify UE RF requirement for PC1.5 inter-band CA with 2Tx (PC2 TDD/FDD + PC2 TDD)

RAN4 UE RF _FR1 (cont.)

Potential Topics	Potential Objectives
6Rx for handheld UE	> Investigate and enable 6Rx on higher frequency bands targeting at support of smartphone (RAN4) > Investigate the feasibility whether 6Rx can be extended to the smartphone, and decide which UE type (smartphone and/or FWA/CPE) will be considered - Feasibility study includes performance gain and form factor > Consider NR TDD bands higher than 1.8GHz and example bands are n41, n77 and n78 (other bands to be introduced in the release independent way later) > Specify the requirements to support 6Rx subject to the conclusion of feasibility study - Specify the UE RF requirements to support 6Rx - Specify RLM test cases with 6Rx - Specify UE demodulation performance and CSI requirements to support 6Rx - Support at least up to 4 MIMO layers, FFS for layer larger than 4

RAN4 UE RF_FR2

Potential Topics	Potential Objectives
RF UL enhancement	> Specify the UE RF requirements of MPR reduction with conditionally relaxed EVM requirement > Study and specify improved MPR for intra-band CA

HUAWEI

RAN4 UE OTA_MIMO OTA

Potential Topics	Potential Objectives
Additional bands in FR1 and FR2 for MIMO OTA test	> Based on operators' requests, agree on the bands to be covered in FR1 and FR2 > Use existing test procedures to define performance for additional bands in FR1 and FR2 through measurement campaign > RC (Reverberation Chamber) method as a candidate for FR2 tests
Multiple TRP test scenarios for FR1 MIMO OTA	> Develop scenarios and associated channel conditions for multiple TRP tests for FR1 MIMO OTA. > Ensure that test equipment can support multiple TRP tests > Develop test procedures and performance requirement through measurement campaign

HUAWEI

RAN4 UE OTA_TRP & TRS

Potential Topics	Potential Objectives
Additional bands for FR1	> Consider bands outside those defined in R18 WID (RP-223112). > Also complete the performance requirements for bands not finished, if any, in Release 18 work item
CA TRP and TRS beyond 2CC for single Tx	> Develop test procedures for 2CC UL CA. > Define performance requirements for 2CC UL and DL CA > Develop test procedures and associated performance requirements for UL and DL CA beyond 2CC
Complete test procedures and performance metrics for 2Tx	> Develop test procedures and associated performance requirements for 2Tx scenarios.

RAN4 RRM

Potential Topics	Potential Objectives
EMR+ Fast SCell activation	> Fast SCell activation with EMR reports upon UE enters connected mode > Introduce corresponding signaling if needed
RRM delay reduction: FR2 unknown SCell activation based on Temporary RS	> FR2 SCell activation delay further reduction base on Temporary RS and L3 measurement triggered by SCell activation command. > Introduce corresponding signaling if needed
RRM delay reduction: L3 Measurement enhancement for FR1+FR2	> Enhance CSSF (carrier-specific scaling factor) for L3 measurement outside gap in the above case
Further RRM enhancement: Interruptions at NR SRS antenna port switching	> Interruption requirements at NR SRS antenna port switching when SRS starting in any symbol of a slot > Finer granularity of interruption requirements at NR SRS antenna port switching (i.e. symbol level interruption length for more applicable scenarios)
Further RRM enhancement: L1/L2 mobility inter-frequency measurement enhancement	> L1/L2 inter-frequency measurement with NCSG (Network Controlled Small Gap) - In FR1, SSB based L1-RSRP measurement can be performed simultaneously with L3-RSRP measurement; - In FR2, SSB based L1-RSRP measurement is to be shared with L3 measurement with one NCSG, Or define a dedicated NCSG for L1-RSRP measurement

RAN4 Demod

Potential Topics	Potential Objectives
Performance enhancements for 8Rx capable UE	> Define PDSCH performance requirements with MMSE-IRC receiver for suppressing inter-cell interference for 8Rx with MIMO layer not less than 4 for FR1 > Define PDSCH performance requirements with MMSE-IRC receiver for suppressing intra-cell inter-user interference for 8Rx for FR1 > Define the enhanced demodulation performance requirements with MIMO layers not less than 4 layers for 8Rx capable UE
Soft-IC for SU-MIMO	> Specify performance requirements for the advanced receiver with soft IC to cancel the inter-stream interference for single-cell multi-layer scenario - Evaluate the performance gain of the advanced receiver with soft IC compared to existing NR receiver(s) - Specify PDSCH requirements for the advanced receiver with soft IC

RAN4 cross area topics

Potential Topics	Potential Objectives
Non-collocated intra-band CA/EN-DC enhancement	> Specify the following aspects for UE architecture type 4 with max 4-layer MIMO for NR CA and EN-DC: - Maximum tolerable power imbalance between carriers in DL - Maximum arrival time difference between CCs in DL - Specify the UE capability for UE architecture type 4 (similar to *intraBandNR-CA-non-collocated-r18*) - Extend the *nonCollocatedTypeNR-CA-r18* NW IE or define a new one to include type 4 indication > Study and specify the above mentioned aspects for UE architecture type 3, if companies opinions converge on it (second priority) > Specify non-collocated contiguous 2CC and non-contiguous 3CC for intra-band NR-CA (Type 2/3/4) and inter-band EN-DC (second priority)
SL RAN4 enhancements	> Rel-18 leftovers > Intra-band non-contiguous CA
ATG enhancements	> CA to enhance throughput and capacity for ATG UE, including intra-band CA and inter-band CA - Investigate if the existing CA band combinations can be reused for ATG or to specify new ATG-specific CA band combinations. - Investigate if Delta Tib and Rib are applicable to ATG UE - Specify the Tx requirements for ATG UE, e.g. maximum output power requirements, configured output power - Specify the Rx requirements for ATG UE, e.g. REFSENS requirements

Spectrum/basket WI

- Spectrum/Band combination basket WIs should be further considered after approval of non-spectrum WI/SIs after March 2024

- Clear boundary on the general requirements between non-spectrum and spectrum WI proposals
  - > General requirements are supposed to be specified under non-spectrum WIs
  - > Exception could be considered for spectrum WI only for limited exemplary bands/combinations
    - No more band/band combinations could be added later for spectrum WI including general requirements
  - > Basket WIs are strictly limited to band/band combination specific requirements

HUAWEI