3GPP TSG RAN WG4 Meeting #110

Athens, Greece, February 26th – March 1st, 2024

R4-2402445

Views on Rel-19 RAN4 cross-area and other topics

Agenda Item:	14
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Introduction

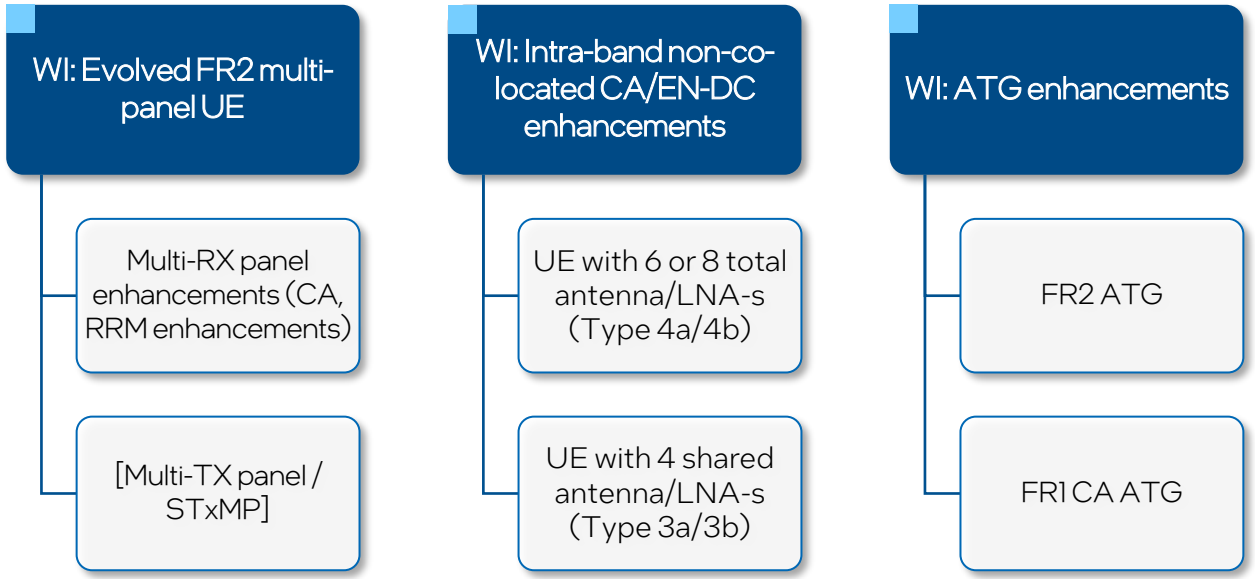
The general views on RAN4 Rel-19 SI/WI package are provided in R4-2402441

In the following slides we provided views on:

- Candidate topics identified in RAN #102 in RP-233920 and RP-233921
- Potential scope and objectives of cross-area items

The following SI/WIs are recommended to be considered for cross-area topics:

- WI: Evolved FR2 multi-panel UE
- WI: Intra-band non-co-located CA/EN-DC enhancements
- WI: ATG enhancements



Proposed scope for RAN4 Rel-19 Cross-area topics

	Prioritized objectives/scope	Comments

Evolved FR2 multi-panel UE	• Multi-RX panel enhancements (1st priority)
	  • Intra-band CA (RF/RRM requirements)
	  • RRM requirements for 1) L3 delay reduction, 2) Unified TCI state switching delay
	• STxMP requirements (2nd priority)
		A standalone WI to continue the work on RF/RRM enhancements for multi-panel simultaneous RX/TX with [1.0/1.0] RF/RD TUs per meeting.
		STxMP work can be handled with the 2nd priority (e.g., work can start in the 2nd part of R19 after meaningful progress is reached for multi-Rx part).

Intra-band non-co-located CA/EN-DC enhancements	• UEs with 6 or 8 total antenna/LNA-s (Type 4a/4b) • UEs with 4 shared antenna/LNA-s (Type 3a/3b)	Continuation of Rel-18 work to enable non-collocated operation for additional UE types. [0.5/0.5] RF/RD TUs per meeting.
ATG enhancements	• FR2 RF/RRM requirements • FR1 [intra-band] CA support	Continuation of Rel-18 work to enable ATG with focus on exploration study for FR2 use case. [0.5/0.5] RF/RD TUs per meeting.

Views on RAN #102 candidate topics

Views on RAN #102 candidate topics

Summary (RAN#102)	Intel views

FR2 multi-RX/STxMP
RF:
• RF scope needs to be significantly reduced, such as inter-band CA.
RRM:
• Multi-RX: Focus on the following two objectives for multi-RX:
  • Study and if identified, specify enhanced FR2-1 L3 RRM measurement requirements and L3 procedure delay requirement
  • Unified TCI state switching delay
  • Note: Should avoid overlapping with the general FR2 delay reduction discussed in the RRM/Demod offline session.
  • Note: Whether to consider intra-band CA for RRM would depend on the RF scoping outcome.
• STxMP:
  • Unified TCI switching
	High priority
	✓ Continuation of Rel-18 is required to provide a complete set of functionality for FR2 FWA/CPE types of devices
	✓ The WI scope may need to be limited to fit the overall RAN4 TU constraints and a prioritization of identified objectives is recommended.
	✓ Multi-Rx:
	  • Focus on intra-band CA with common beam management (CBM).
	  • Focus on the identified RRM objectives 1) L3 delay reduction; 2) Unified TCI state switching delay
	  • Additional Demodulation objectives are recommended with Joint processing of simultaneous mTRP signals.
	✓ STxMP work can be handled with the 2nd priority (e.g, work can start in the 2nd part of R19 after meaningful progress is reached for multi-Rx part)

Intra-band non-collocated CA/DC • Type 3 requirements assuming MRTD<CP and power imbalance < X dB • Type 4 requirements assuming MRTD>CP	**Medium priority** ✓ Rel-19 project is required to complete the work started in Rel-18 timeframe and is aligned with requests from a number of operators. ✓ The work on Type 4a/4b (FWA) can be prioritized in case of workload constraints.

Views on RAN #102 candidate topics

Summary (RAN#102)	Intel views
ATG • Evaluate and specify the necessary RF and RRM requirements for FR2 ATG. • Evaluate and specify the necessary RF and RRM requirements for intra-band and [inter-band] CA for ATG.	**Medium priority.** Further operators' inputs on scenarios prioritization is required. Potentially both FR1 and exploration FR2 work can fit the limited TU budget as FR1 work scope is expected to have a relatively limited impact on the specification. Exploration work for FR2 ATG use case can be beneficial to extend mmWave deployment opportunities.
Sidelink • Non-contiguous CA in ITS band (band 47) • [PC3 for SL-U].	Limited work scope can be considered to address the remaining SL opens (e.g., non-contiguous CA in band n47)
NTN enhancements • NTN performance requirements/testing for NGSO • In-band/guard band NTN IoT coexistence with NR NTN • UE channel bandwidth less than 5 MHz for NR NTN FR1 bands	A prioritized subset can be considered to be a part of "NTN RAN4 item" along with NTN HPUE enhancements. Further prioritization of objectives is recommended based on NTN ecosystem inputs.
NR Channel BW less than 5 MHz • Requirements for CA and DC, e.g. for n100 + n101	The motivation for additional CA/DC scenarios for NR < 5MHz CBW is unclear and needs to be further clarified.

WI: Evolved NR FR2 UE Simultaneous Multi-Panel Operation

Evolved FR2 UE Simultaneous Multi-Panel Operation

Simultaneous Multi-panel RX

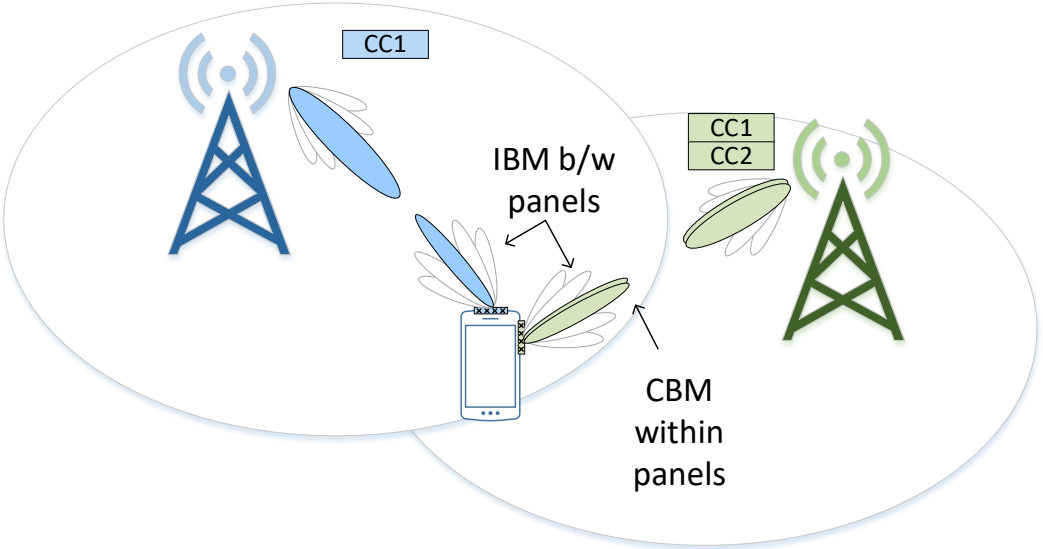
Motivation

- Support of FR2 simultaneous multi-Rx chain requirements is being introduced in Rel-18 NR_FR2_multiRX_DL WI. The Rel-18 requirements are limited to a single carrier scenario, and multiple potential enhancements were de-prioritized.
- Further evolution of Multi-Rx operation requirements is required to extract full benefits of advanced UE implementations with the focus on FWA/CPE use cases

Candidate objectives/scope

- **DL CA multi-panel simultaneous RX**: Focus on intra-band CA and common beam management (CBM) within each panel. Introduce corresponding RF/RRM/Demod requirements and test methods.
- **Enhanced RRM requirements**: Rel-18 leftovers incl. L3 enhancements, inter-cell mTRP TCI state switch.
- **Enhanced demodulation requirements**: Joint processing of simultaneous mTRP signals.

Multi-RX CA operation framework



Evolved FR2 UE Simultaneous Multi-Panel Operation

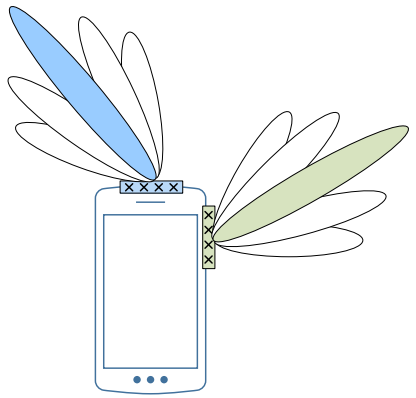
Simultaneous Multi-panel TX

Motivation

- Simultaneous FR2 multi-panel transmission (STxMP) feature can improve FR2 UL performance including data rate and connection robustness
- Support of STxMP is introduced in Rel-18 FeMIMO WI. However, it is expected that a limited set of RAN4 requirements is planned to be introduced in Rel-18 (Pcmax).
- Rel-18 scope does not include RF and FR2 Test Methods for STxMP. Extensive RAN4 studies work are needed to introduce the baseline requirements.

Candidate objectives/scope

- Focus on leftovers from Rel-18 work
- UE requirements to support single carrier STxMP operation including at least RF and RRM
- Limit to 2 Tx panels case, handheld and FWA/CPE UEs and single carrier STxMP operation.
- **SRS multi-panel simultaneous Tx**
- **RF requirements:** At least consider EIRP and new requirement concept based on spherical coverage
- **RRM requirements:** UL TCI state switch requirements, UL beam management procedures (e.g., beam selection)
- **OTA test methods** to enable STxMP testing



Other Cross-area Topics

Other Areas

The work on selected Rel-18 areas and use cases is recommended to continue to introduce a more complete set of functionality, but a relatively small work scope and load is anticipated

ATG enhancements

Candidate objectives/scope

- Evaluate and specify the necessary RF and RRM requirements for FR2 ATG.
- Evaluate and specify the necessary RF and RRM requirements for intra-band and [inter-band] CA for ATG.

Intra-band non-collated CA/EN-DC

Candidate objectives/scope

- Support of non-collocated scenarios for FR1 intra-band non-contiguous NR CA and inter-band EN-DC (with overlapped DL spectrum)
  - Support for UEs with 6 or 8 total antenna/LNA-s (Type 4a/4b)
  - Support for UEs with 4 shared antenna/LNA-s between carriers (Type 3a/3b)
  - Investigate and specify the tolerable power imbalance and required arrival time differences between carriers
  - Specify MRTD and MTTD requirements in non-collocated deployment

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