3GPP TSG RAN Meeting #93-e
Electronic Meeting, September 13 - 17, 2021

RP-212223

Views on RAN4 Rel-18: FR2 multi-beam reception

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Background

Rel-15 NR FR2 requirements

- FR2 UE requirements are based on **single RX beam/panel reception assumption** and are limited for **DL MIMO rank 2**.

Rel-16 eMIMO multi-TRP/panel transmissions

- In Rel-16 NR eMIMO WI several enhancements were introduced to enable efficient and robust DL multi-TRP/panel operation.
- Transmission schemes with simultaneous and non-simultaneous multi-beam reception from multiple TRPs/panels were introduced
- Simultaneous reception may require support of simultaneous multi-panel operation with several independent RX beams.
- **FR2 UE capability for simultaneous multi-beam reception** was introduced (*simultaneousReceptionDiffTypeD-r16*)
- **No enhanced RAN4 requirements were defined in Rel-16 & Rel-17 for FR2 UEs**

Rel-16/17 FR2 RF CA with IBM/CBM

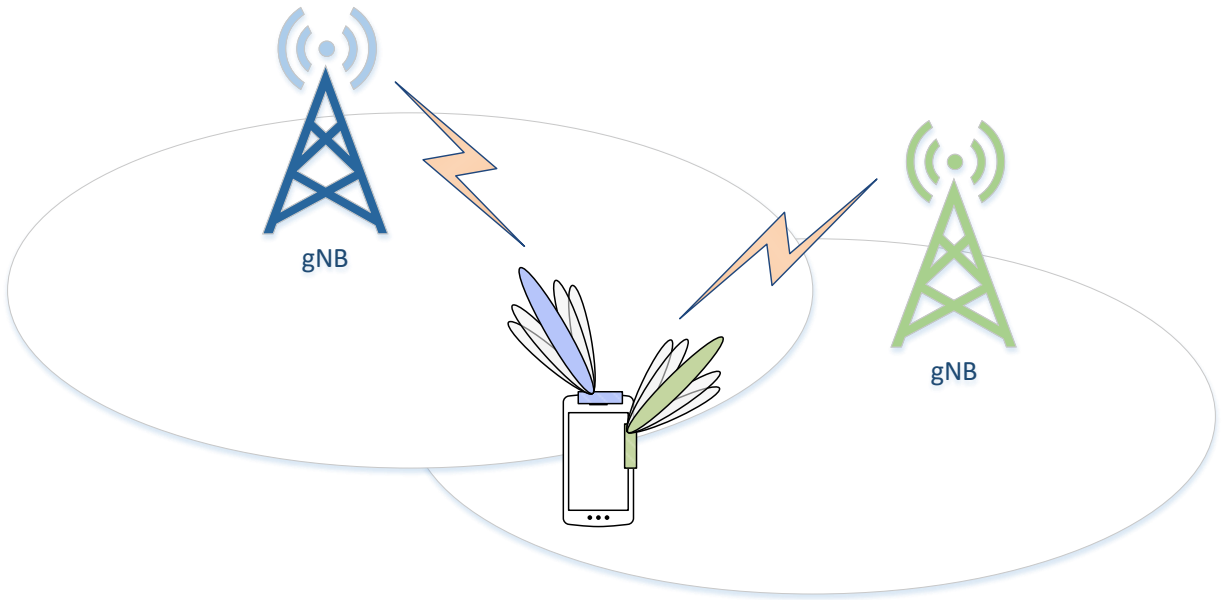
- Support of IBM (Independent Beam Management) and CBM (Common Beam Management) framework with simultaneous reception on different component carriers from the co-located and non-col-located TRPs was defined in RAN4 in Rel-16/17
- IBM concept implies simultaneous reception on different UE panels using separate beams on different component carriers and requires improved UE baseband and RF capabilities (multiple BB chains and support of multiple antenna panels)

Further improvement of FR2 single carrier operation can be achieved via enabling **support of multi-RX beam simultaneous reception** for single carrier

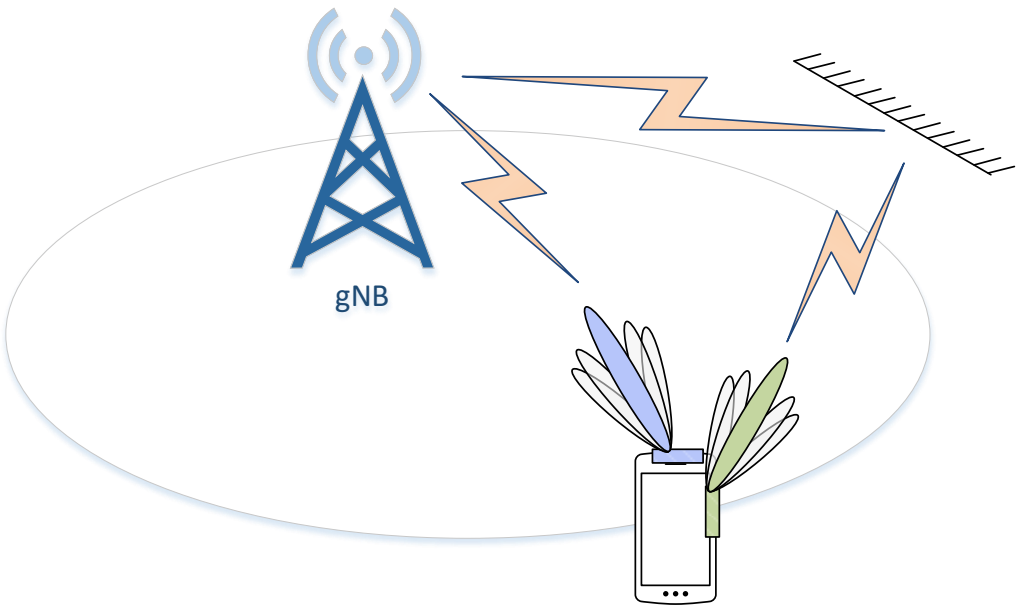
Scenarios

Enhanced FR2 UEs with a support of simultaneous reception using multiple RX beams can extract full benefits both Single-TRP and Multi-TRP FR2 scenarios

Multi-TRP TX + Multi-beam RX



Single TRP + Multi-beam RX



Potential Enhancements

Demodulation performance

- **4 DL MIMO layers**: Support of multi-beam simultaneous reception can increase FR2 peak throughput via support of 4 DL MIMO layers
- **Multi-TRP reception**: Support of multi-beam simultaneous reception can be helpful to ensure robust UE connectivity to the network and enable efficient multi-TRP operation

RRM performance

- **Fast RRM measurements**: RX beam search is a bottleneck factor for FR2 RRM requirements. RRM performance improvements can be achieved for UEs supporting 2 separate panels with simultaneous processing via reduction of the RX beam search time
- **FR2 DAPS HO**: Support of simultaneous multi-beam reception can also enable DAPS HO operation, which is currently not defined for FR2

RF performance

- **Improved spherical coverage**: Rel-15 spherical coverage requirements are defined for the case of single panel UEs and further improvement of EIS spherical coverage is possible for multi-panel UEs

Candidate RAN4 Objectives

Define requirements for UEs capable of multi-beam simultaneous reception

- Define enhanced RRM requirements
  - RRM measurement delay reduction
  - FR2-FR2 DAPS HO
- Define enhanced RF requirements
  - Spherical coverage requirements for devices with 2 panels with improved performance
- Define UE demodulation requirements
  - UE performance requirements to support multi-beam reception for Single/Multi DCI based Multi-TRP schemes under FR2 scenarios
  - Note: requirements for multi-beam single panel non-simultaneous RX can be considered as well

Study OTA test methodology

- Study FR2 OTA testing methodology for UE Demodulation testing for scenarios with signals coming from 2 different directions

Target device types

- Focus on handheld UEs.
- *Note 1: Consider UEs with multi-panel and single-panel implementations*
- *Note 2: FR2 HST scenarios can benefit from the support of CPE devices with simultaneous multi-beam/panel reception under bi-directional multi-RRH/TRP deployment scenarios*

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