

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

Agenda Item: 8A.4

Source: Intel Corporation

Document for: Decision



Background

Rel-15 NR FR2 requirements

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

Rel-16 NR 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 NR 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-co-located TRPs was defined in RAN4 in Rel-16/17
- IBM concept implies simultaneous reception on different UE panels/chains 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/chain simultaneous reception for a single carrier

Moderator summary for email discussion [RAN94e-R18Prep-22] (RP-212682)

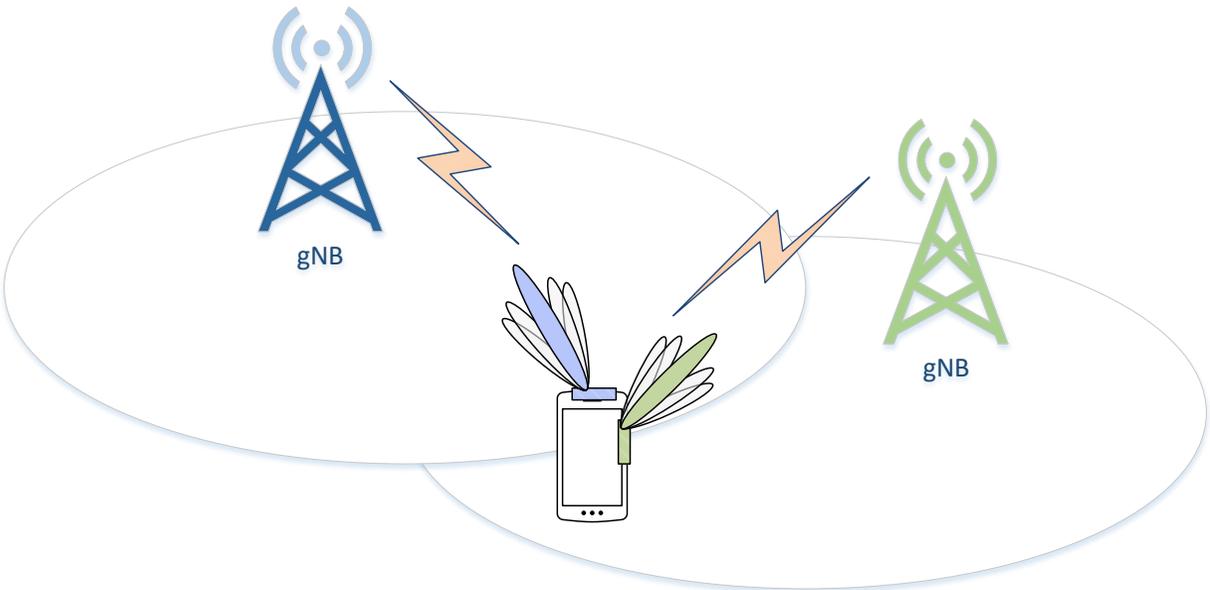
Extensive discussion on Rel-18 topics including FR2 multi-beam/chain reception took place as a part of email thread [RAN94e-R18Prep-22] and the following candidate objectives were identified [RP-212682]

- *Introduce requirements for enhanced FR2 UEs with multi-Rx chain DL reception with 4 DL MIMO layers.*
 - *Dual TCI assumption*
 - *FFS dual TCI of which release (Rel-16, Rel-17 or both) are used as baseline.*
 - *Pending on the objective of dual TCI enhancement in the package of Rel-18 MIMO items.*
 - *Enhanced RF requirements:*
 - *Identify and specify necessary RF requirements for devices with 2 panels*
 - *FFS whether to keep the current requirements of 50%-ile spherical coverage not being impacted, or improve spherical coverage requirement*
 - *Enhanced RRM requirements*
 - *FFS the detailed objectives*
 - *UE demodulation requirements:*
 - *Simultaneous and RX from different directions*
 - *4 DL MIMO layers*

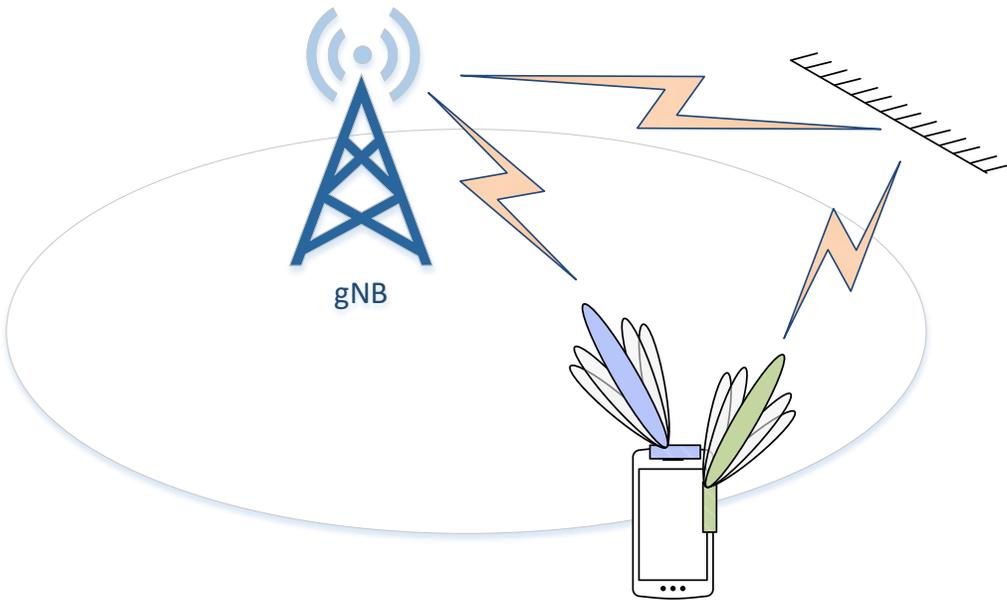
Candidate Scenarios

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

Multi-TRP TX + Multi-beam/chain RX



Single TRP + Multi-beam/chain RX



Potential Enhancements

FR2 UEs capable of multi-beam/chain simultaneous DL reception can provide multi-area performance improvements

- **Enhanced UE 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
- **Enhanced 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
- **Enhanced 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

Proposed WI Objectives (see draft WID RP-213317)

Define necessary requirements for FR2 UEs capable of multi-beam/chain simultaneous DL reception on a single component carrier

- UE RF requirements
 - Spherical coverage requirements for devices with 2 panels with improved performance
 - Other requirements
- RRM requirements
 - Enhanced RRM requirements with reduced measurement delays
 - FR2-FR2 DAPS HO requirements
- UE demodulation requirements
 - Requirements for simultaneous reception from different directions
 - Requirements for 4 DL MIMO layers

Study OTA test methodology

- Study and define FR2 OTA testing methodology for testing UEs capable of multi-beam/chain simultaneous DL reception for scenarios with signals coming from 2 different directions

Target device types

- Focus on handheld UEs supporting “simultaneousReceptionDiffTypeD-r16” UE capability
- Focus on UEs supporting simultaneous reception of at 2 beams and with support of 4 DL MIMO layers

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