

Enhancement for Device Requirement (RAN4-led)



Areas of further enhancement for device requirement

- **Further enhancement for FR1 RF**

- Simultaneous Rx/Tx for Intra-band non-contiguous CA/DC in TDD band
 - RAN4 need to study the feasibility for the Simultaneous Rx/Tx for Intra-band non-contiguous CA/DC.
- VLP mode UE for NR-U in 6GHz if not finalized in Rel-17
 - Comply with the regulatory requirements of VLP(Very Low Power) mode in some countries.

- **Further enhancement for FR2 RF**

- Vehicular UE requirements for power class in 39GHz
- Vehicular UE requirements for inter-band DL/UL CA, e.g., 28+39GHz
- Inter-band UL CA in FR2-1 based on CBM

- **Further enhancement for RRM**

- FR2 RRM enhancement : Different RX beam sets in FR2
- **MG enhancement : concurrent gap for DC**

Note :

Gray : on-going discussion

Green : working areas with stabilized objectives (RP-212682)

Red : newly proposed objective

Further enhancement for FR1 RF

(Simultaneous Rx/Tx in FR1 RF)

- **Motivation (latest updated in RP-212879)**

- In the Rel-17, a simultaneous Rx/Tx capability is defined only for inter-band CA/DC band combinations. However, this is not applicable for intra-band CA/DC band combinations.
- Similar scenario was discussed in intra-band con-current V2X operation in TDD band in Rel-17 and related agreement was made as follows.
 - RAN4 do not allow simultaneous UL Tx and SL Rx for non-contiguous and contiguous V2X intra-band con-current operation in Rel-17.
 - SL V2X operation will consider simultaneous Rx/Tx capability after RAN4 study the feasibility of simultaneous Rx/Tx capability for intra-band CA UE of NR Uu
- Therefore, RAN4 needs to study the feasibility of the simultaneous Rx/Tx operation for intra-band CA/DC band combinations with sufficient frequency gap in TDD band. And if feasible, RAN4 needs to define the related RF core requirements.

- **Objective (latest updated in RP-212879)**

- Study the feasibility on the simultaneous Rx/Tx operation with the required frequency gap considering the reasonable desense levels for intra-band non-contiguous CA/DC UE.
- Depending on the feasibility study, define the related RF core requirements.
 - Specify the MPR and MSD requirements according to frequency gap.

Further enhancement for FR1 RF (VLP mode UE for NR-U in 6GHz)

• Motivation

- In the current specification, RAN4 only allowed the PC5(20dBm) UE in NR-U WI (NR_unlic in Rel-16, NR_6GHz_unlic_full and NR_6GHz_unlic_EU in Rel-17).
- In NR_6GHz_unlic_full WI, some companies proposed to define VLP mode UE to comply with the UK, Canada, Brazil and Korea regulatory requirements as follow.

Region	Country	Permissible operation (Note 1)	Frequency range	Maximum mean EIRP for in-band emissions	Maximum mean EIRP density for in-band emissions	Maximum mean EIRP density for out-of-band emissions
Region 1	UK	LPI	5925 – 6425MHz	24dBm	11dBm/MHz	In accordance with directive 2014/53/EC
		VLP		14dBm		
Region 2	Canada	SP	5925-6875 MHz	36dBm	23dBm/MHz	
		LPI	5925-7125 MHz	30dBm	5 dBm/MHz	
		VLP		14dBm	-8dBm/MHz	
	Brazil	LPI	5925 – 7125MHz	30dBm (AP) 24dBm (Client)	5dBm/MHz (AP) -1dBm/MHz (Client)	-27 dBm/MHz (outside operational range)
VLP	17 dBm	-5 dBm/MHz				
Region 3	South Korea	LPI	5925 – 7125MHz	24dBm	2dBm/MHz	-27 dBm/MHz (outside operational range)
		VLP	5925 – 6425MHz	14dBm	1dBm/MHz	-34 dBm/MHz (f ≤ 5925MHz, f ≥ 6445MHz)

Note1: SP(Standard Power), LPI(Low Power Indoor), VLP(Very Low Power)

• Objective

- Define VLP mode UE to comply with some countries' regulatory requirements if RAN4 cannot define the VLP in Rel-17
- Specify related RF requirements(e.g. NS, new power class, etc) to meet the out of band emission requirements from each country.

Further enhancement for FR2 RF (Vehicular UE requirement in FR2-1)

- **Motivation**

- Background (RP-212682)
 - RF enhancement in FR2-1 for 39GHz band (RAN4)
 - Vehicular UE requirements for power class in 39GHz
 - Vehicular UE requirements for inter-band DL/UL CA, e.g., 28+39GHz
- During RAN#94e-Pre, above bullet was in working areas with stabilized objectives.
- Added NR band number for more clarification
 - n260 for 39GHz
 - n260+n261 for 28+39GHz

- **Objective**

- Specify RF requirement for Vehicular UE(PC2) in FR2-1 on 39GHz
 - Consider n260 as starting point
- Specify RF requirement for Vehicular UE(PC2) inter-band DL/UL CA in FR2-1
 - Consider n260+n261 based on IBM as starting point

Further enhancement for FR2 RF (Inter-band UL CA in FR2-1 based on CBM)

- **Motivation**

- Background (RP-212682)

- Inter-band and intra-band DL/UL CA/DC RF enhancement in FR2-1 depending on operators' requests (RAN4)
 - Define RF requirement(s) for support of inter-band UL CA in FR2-1 based on CBM
 - » Take the capability alignment between UL and DL CA into account, e.g., only consider the case where DL CBW is available

- During RAN#94e-Pre, above bullet was in working areas with stabilized objectives.

- Added NR band combination for more clarification

- Band combinations of Rel-17 FR2-1 inter-band DL CA as starting point.

- **Objective**

- Specify RF requirements for FR2-1 inter-band UL CA based on CBM

- Consider band combinations of Rel-17 FR2-1 inter-band DL CA as starting point.

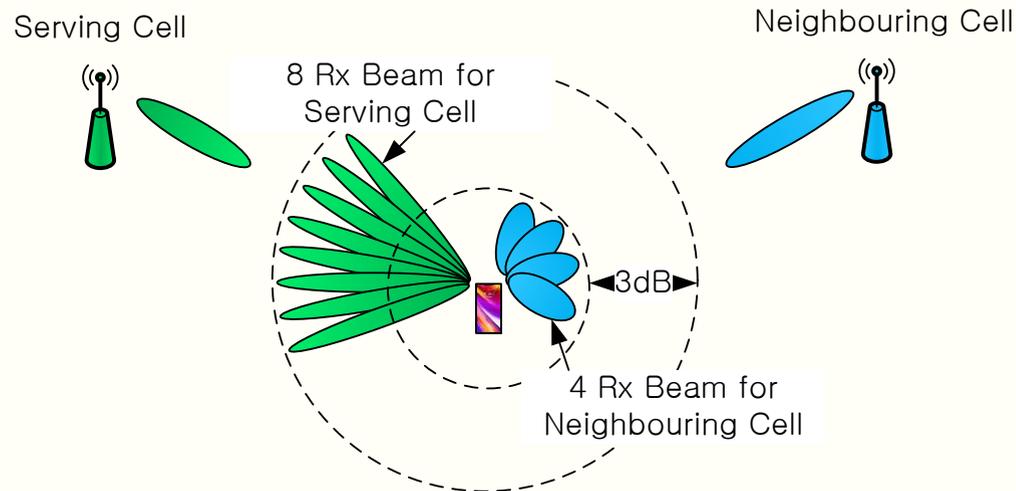
- Specify RRM requirements for FR2-1 inter-band UL CA based on CBM

Further enhancement for RRM

(FR2 RRM Enhancement: Different RX beam sets in FR2)

- **Motivation**

- For a UE capable of FR2 NR
 - Different sets of RX beams can be used in measurements based on different measurement objects(MOs)
 - The measured RSRP of a neighboring cell can be different from serving cell even though the received signal levels are same for the different sets
 - a set of fine RX beams for the serving cell
 - a set of rough RX beams for neighbors
 - It is problematic for mobility management and as a result, RLF can occur abnormally.



- **Objective**

- Phase 1: Study mobility for different sets of RX beams between different MOs in FR2
- Phase 2: Agree a method how the different set of UE Rx beams is captured into specification. Specify RRM requirements related to different sets of RX beams

Further enhancement for RRM

(MG enhancement : concurrent gap for DC)

- **Motivation**

- In Rel-17, maximum 2 MGs are supported for UE not supporting per-FR gap and for UE supporting per-FR gap.
- In Rel-17, Rel-16 configuration mechanism under DC mode was reused. It is not efficient in aspect of measurement period due to MG sharing between PCell and PSCell in DC mode.
 - In EN-DC,
 - per-UE gap and FR1 gap are configured by MN,
 - FR2 gap is configured by SN.
 - In NE-DC and NR-DC,
 - per-UE gap, FR1 gap and FR2 gap are configured by MN

- **Objective**

- Phase 1: Study feasibility of a separated concurrent MG configuration for PCell and PSCell in DC mode
- Phase 2: Specify RRM requirements related to the separated concurrent MGs in DC mode, if feasible.