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Rel-19 proposal for new HPUE scenario with CA/DC

Agenda: 15

Source: Samsung, Bell Mobility, China Telecomm, China Unicom, DISH Network, KDDI Corporation,
KT Corporation, TELUS, T-Mobile USA, LG Uplus, NTT DoCoMo, Verizon

Document for : Information

Background | HPUE roadmap in previous releases

HPUE roadmap in previous releases

Higher power capability	Introduced release
PC1.5 for single TDD band	Rel-16
PC1.5 for intra-band EN-DC	Rel-16
PC2 for inter-band EN-DC	Rel-16
PC2 for single FDD band	Rel-17
PC2 for inter-band UL NR-CA	Rel-17
PC1.5 for DL CA with single UL TDD band	Rel-17
Enabling “increasing UE power high limit” feature to support 27.8dBm for NR CA and EN-DC	Rel-17
PC1.5 for 2-band inter-band UL NR-CA/EN-DC with 3Tx	Rel-18

Rel-18 HPUE related basket WIs

Operation	Power class per BC	UL Mode	PA configuration	Rel-18 basket WI	Note	
EN-DC	PC2 -2Tx	FDD(LTE)+TDD(NR)	23+26 23+23	HPUE_FR1_DC_LTE_NR_R18	Note 1: For the uplink FDD LTE + TDD NR band combinations, only 23dBm would be considered for FDD LTE band. Note 2: The basket WI focus on: the uplink is 1 LTE and 1 TDD NR Note 3: All PC2 capable EN-DC combos (with either 2Tx or 3Tx) can naturally support higher power limit feature	
		TDD(LTE)+TDD(NR)	23+23 23+26 26+23 26+26	HPUE_FR1_DC_LTE_NR_R18		
	PC2 - 3Tx	FDD(LTE)+TDD(NR)	PC3 1T+PC3 2T PC3 1T+PC2 2T	R18_3Tx_NR_CA_ENDC		Note: Only for FWA in Rel-18
		TDD(LTE)+TDD(NR)	PC3 1T+PC2 2T	R18_3Tx_NR_CA_ENDC		Note: Only for FWA in Rel-18
NR-CA inter-band DL CA	PC2 -2Tx	FDD+TDD	23+23 23+26	HPUE_FR1_DC_LTE_NR_R18	Note 1: The basket WI focus on: PC3 on FDD band, PC2 or PC3 on TDD band Note 2: All PC2 capable NR-CA combos (with either 2Tx or 3Tx) can naturally support higher power limit feature	
		TDD+ TDD	23+23 23+26 26+23 26+26	HPUE_FR1_DC_LTE_NR_R18		
	PC2/PC1.5 - Single CC UL or intra-band ULCA	TDD	PC2/PC1.5	HPUE_FR1_DC_LTE_NR_R18		
	PC2- Single CC UL	FDD	PC2	HPUE_FR1_FDD_NR_CADC_R18	Note1: PC1.5 for FDD single band (Non-CA) has not been supported yet Note2: DL modes are FDD+TDD and FDD+FDD	
	PC2-3Tx	FDD+TDD	PC3 1T+PC3 2T PC3 1T+PC2 2T	R18_3Tx_NR_CA_ENDC	Note: For FWA in Rel-18	
		TDD+TDD	PC3 1T+PC2 2T	R18_3Tx_NR_CA_ENDC	Note: For FWA in Rel-18	
PC1.5-3Tx	FDD+TDD	PC3 1T+PC1.5 2T	R18_3Tx_NR_CA_ENDC	Note: For FWA in Rel-18		
NR-CA intra-band DL CA	PC2/PC1.5 - Single CC UL or intra-band ULCA	TDD	PC2 or PC1.5 for single UL cc; PC2 for intra-band UL CA	HPUE_NR_FR1_TDD_intra_CA_R18		

Background | Discussion in RAN#102

Summary from RP-233918

- High power UE (HPUE) for CA (non-spectrum item for the combinations which need generic requirements)
 - PC1.5 UE for intra-band contiguous CA with or without UL MIMO with 2Tx
 - PC1.5 UE for two band inter-band CA with 2Tx and/or 3Tx for handheld and FWA
 - Generic framework of support increasing UE power high limit for inter-band CA HPUE (only for TN)

Further discussion on other type of HPUE CA band combinations.

Further discussion on whether to introduction of HPUE for EN-DC

Further discussion on whether to introduce PC1.5 for intra-band non-contiguous

Observations

- In previous releases, HPUE topics were spanned over several WIs e.g. FR1 UE RF, NR 3Tx-4Rx and HPUE basket WIs.
- More and more demand received from operators to extend HPUE usage with new CA/DC scenarios and new band combinations.
- HPUE gather widely support from companies especially from operators.
- It's desirable to have a dedicated WI (non spectrum) for HPUE to specify general framework and introduce new HPUE scenarios to meet business demand.

Potential new HPUE scenarios for CA/DC

Operation	Power class per BC	UL Mode	PA configuration	Note
EN-DC	PC2-2Tx	FDD(LTE)+TDD(NR)	26+26	Note: PC2 for LTE FDD band 14 is under specification in Rel18 with the assumption one single PC2 FDD PA is adopted
		FDD(LTE)+FDD(NR)	23+23 23+26	
	PC1.5-2Tx	FDD(LTE)+TDD(NR) FDD(LTE)+FDD(NR) TDD(LTE)+TDD(NR)	26+26	
	PC2/PC1.5 - 3Tx	FDD(LTE)+TDD(NR) FDD(LTE)+FDD(NR) TDD(LTE)+TDD(NR)	PC2 1Tx+ PC2 2Tx PC3 1Tx+PC2/PC1.5 2Tx PC2 1Tx+PC2/PC1.5 2Tx	
NR inter-band UL CA	PC2-2Tx	FDD+TDD	26+26	Example combos: CA_n70A-n77A, CA_n71A-n77A, CA_n26A-n77A
		FDD+FDD	23+23 23+26	Example combos: CA_n26A-n66A, CA_n26A-n70A, CA_n66A-n71A, CA_n70A-n71A, CA_n25-n66
	PC1.5-2Tx	TDD+TDD FDD+TDD FDD+FDD	26+26	Example combos: n41-n77 n25-n77,n66-n77, CA_n26A-n66A, CA_n26A-n70A, CA_n66A-n71A, CA_n70A-n71A, CA_n25-n66
		PC2-3Tx	FDD+TDD	PC2 1Tx+ PC2 2Tx
	FDD+FDD		PC3 1Tx+PC2 2Tx PC2 1Tx+PC2 2Tx	Example combo: CA_n25-n66
	PC1.5-3Tx	FDD+TDD	PC2 1Tx+ PC2 2Tx PC2 1Tx+ PC1.5 2Tx	Example combo: CA_n25-n77
		FDD+FDD	PC2 1Tx+PC2 2Tx PC2 1Tx+PC1.5 2Tx	Example combo: CA_n25-n66
		TDD+TDD	PC3 1Tx+PC1.5 2Tx PC2 1Tx+PC2 2Tx	Example combos: n41-n77
NR inter-band DL CA	PC1 - Single CC UL	FDD or TDD	4*26 8*23	Note: FWA only
NR intra-band UL CA	PC1.5 - intra-band UL CA	TDD	26+26	Example combos: n41B, n41C, n77(2A), n78(2A), n77C
	PC2- intra-band UL CA	FDD	23+23 for PC2	Example combos: n25(2A), n66(2A), n71(2A)
NR intra-band DL CA	PC2- Single CC UL	FDD	PC2 1Tx 23+23 for PC2 26+26 for PC1.5	Example combos: DL n25(2A), n66(2A), n71(2A)

Note 1: For the scenarios marked in gray color FFS whether there is operators' demand

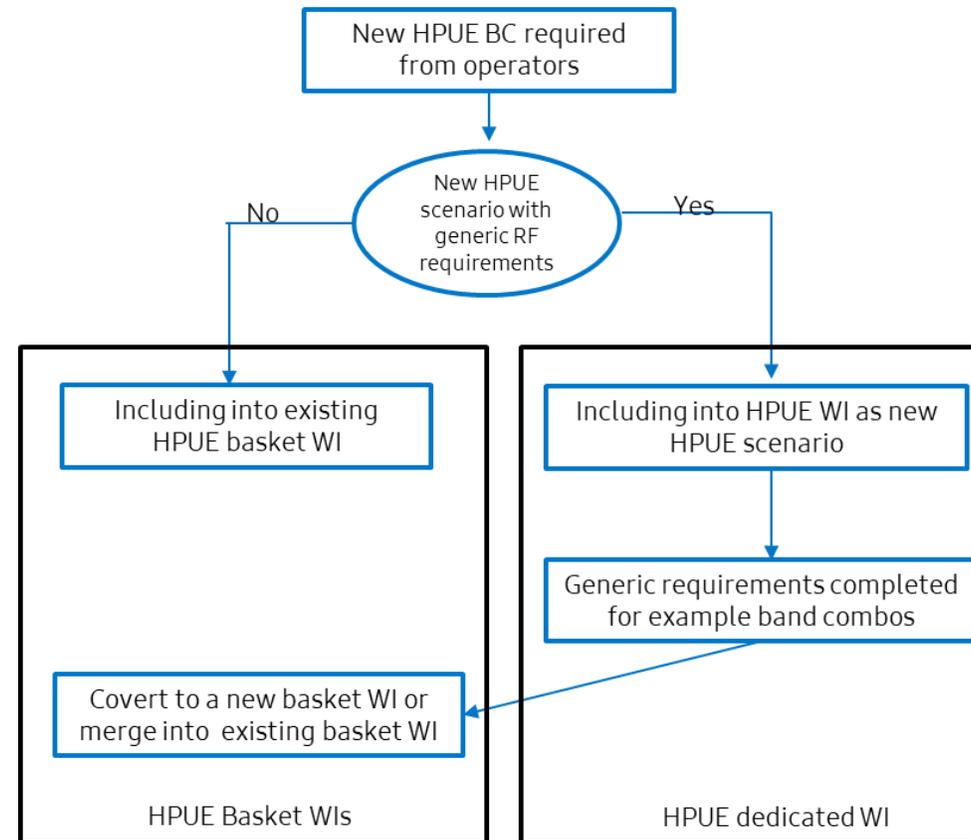
Note 2: Example band combos collected based on operators' feedback

HPUE proposals for CA/DC

Proposals

- A dedicated WI can be considered for HPUE with CA/DC
 - Establish general framework for HPUE introduction
 - Identify and specify new HPUE scenarios for UL CA/DC based on operators' demands
 - All new HPUE scenarios with new generic requirements should be specified under this dedicated WI with example band combos
 - New scenarios can be added later if there is operator's demand
 - Generic RF requirements shall be specified with example band combos under this dedicated WI
 - Once generic requirements completed on certain new HPUE scenario, corresponding HPUE scenario can be converted to a new HPUE basket WI or merged into existing basket WI

Work-flow of new HPUE BCs request



Rel-19 proposal on new HPUE scenarios for UL CA/DC

Justification

- Increasing demand to improve UE UL coverage for commercial network deployments.
- PC2 has been specified for several FDD single bands in Rel-18, hence PC2/PC1.5 for inter-band CA/DC combos including FDD band(s) with PC2 capability can be considered in Rel-19 as a evolution.
- PC1.5 for TDD-TDD inter-band CA/DC or TDD intra-band CA/DC can be considered in Rel-19 given PC1.5 for single TDD band(Non-CA) has already been specified since Rel-16.
- PC2 for FDD intra-band CA/DC can be considered in Rel-19 given PC2 for single FDD band(Non-CA) has already been specified since Rel-17.

Proposed objectives

- Identify and specify new HPUE scenarios for UL CA/DC:
 - Generate HPUE framework and specify the necessary general UE RF requirements including P_{cm}, SAR issue to support each scenario
 - HPUE scenarios and example band combos considered in this WI :
 - PC1.5 UE for intra-band contiguous CA with or without UL MIMO with 2Tx
 - PC1.5 UE for two band inter-band CA with 2Tx and/or 3Tx for handheld and FWA

Note 1: Higher power limit feature for PC3+PC1.5 and PC2+PC1.5 are considered in this WI

Note 2: All new HPUE scenarios with new generic requirements should be specified under this WI before converting to a basket WI

Note: Detailed example band combos will be provided based on the collected operators' demand as show in slide 4.