**3GPP T****SG-RAN WG4 Meeting #116-bis R4-2514439**

**Prague, CZ, 13th – 17th October 2025**

**Agenda item: 7.1.1**

**Source:** Moderator (Nokia)

**Title:** Topic summary for [116bis][316] NR\_UE\_RF\_Ph5

**Document for:** Information

# Introduction

*This topic summary covers the discussion for Rel-20 NR\_UE\_RF\_Ph5, approved under WID [1]. The following agenda items covered 7.1.2, and 7.1.4, i.e., general aspects and HPUE requirements. Agenda items 7.1.3, 7.15.1, and 7.1.5.2 i.e., HPUE coexistence and addition of 6MHz channel bandwidth are covered under topic thread [329].*

*The submissions focus on discussions and initial views regarding High Power UE (HPUE) requirements, including RF enhancements, PC1.5 implementations, and multi-antenna (4Tx/2Tx) configurations for NR and FDD technologies. Multiple vendors contributed insights on refining HPUE parameters and addressing specific RF challenges in evolving network scenarios.*

# Topic #1: Workplan

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2513832 | T-Mobile USA, Ericsson | Workplan for addition of 6 MHz channel bandwidth. |
| R4-2513916 | Huawei, HiSilicon | Workplan for HPUE objectives of the WI. |
| R4-2514385 | Nokia | Workplan for both HPUE and 6MHz objective of the WID. |

## Open issues summary

### Workplan

**Issue 1-1: Workplan**

* Proposals
  + Option 1: Approve the workplan in R4-2514385
* Recommended WF
  + Refine R4-2514385 if needed and approve with T-Mobile, Ericsson, Huawei, and [Samsung] as co-source.

# Topic #2: HPUE requirements

*PC1 4Tx for following TDD bands n41, n77/n78, n79, and n104 and PC1.5 2Tx for following FDD bands n1 and n25.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2513925 | ZTE Corporation, Sanechips | Proposal 1: Define 4Tx CPE/FWA UE with 4x26dBm PA configuration as PC1 UE with 31dB maximum output power and +2/-3dB tolerance.  Proposal 2: If necessary, RAN4 FFS how to deal with the potential 1dB more output power.  **Observation 1: 32dBm output power is in the range of PC1 31dBm maximum output power with +2/-3dB tolerance.**  **Observation 2: UE is not allowed to always transmit with maximum output power because of power backoff and network configuration. 4Tx with 4x26dBm PA configuration will cause more serious reverse IMD compared to legacy UE, which may further limit UE’s output power.**  **Observation 3: A new power class with 32dBm maximum output power will impact current RAN2 specification.**  **Observation 4: 4Tx PC1 NTN HPUE has been introduced in Rel-19.** |
| R4-2513849 | Apple | **Observation 1:** *Antenna isolation is a fundamental aspect for MPR and A-MPR and needs to be analyzed and agreed before discussion on MPR and A-MPR can take place.*  Proposal 1: RAN4 should start the discussion on PC1.5 for FDD bands by analyzing antenna isolation for low and mid bands to make a conclusion at RAN4#117.  Observation 2: For band n1, due to the wide duplex gap, the TX noise at the RX input is extremely low (well below the thermal noise). The RSD from PC3 to PC1.5 with 2Tx is negligible.  Proposal 2: Adopt the RSD requirements for n1 from PC3 to PC1.5 with 2Tx as shown in Table 2.2.1-1.   | *Operating Band* | ***3***  *MHz (dB)* | *5*  *MHz (dB)* | *10*  *MHz (dB)* | *15*  *MHz (dB)* | *20*  *MHz (dB)* | *25*  *MHz (dB)* | *30 MHz (dB)* | *35 MHz (dB)* | *40*  *MHz (dB)* | *45 MHz (dB)* | *50*  *MHz (dB)* | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *n1* |  | *0* | *0* | *0* | *0* | *0* | *0* | *-* | *0* | *0* | *0* |   *Table 2.2.1-1 Reference Sensitivity Degradation from PC3 to PC2 for FDD bands for UE supporting Tx Diversity*  Proposal 3: Adopt the RSD requirements for n25 from PC3 to PC1.5 with 2Tx as shown in the Table below.   | *Operating Band* | ***3***  *MHz (dB)* | *5*  *MHz (dB)* | *10*  *MHz (dB)* | *15*  *MHz (dB)* | *20*  *MHz (dB)* | *25*  *MHz (dB)* | *30 MHz (dB)* | *35 MHz (dB)* | *40*  *MHz (dB)* | *45 MHz (dB)* | *50*  *MHz (dB)* | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | *n25* |  | *3.6* | *3.6* | *3.7* | *3.7* | *3.9* | *8.7* | *8.9* | *9.4* | *9.8* |  |   ***Table 2.2.1-2*** *Reference Sensitivity Degradation from PC3 to PC2 for FDD bands for UE supporting Tx Diversity* |
| R4-2513174 | CATT | Proposal 1: the nominal output power for 4Tx TDD bands with 4x26dBm PA should be 32dBm. In addition, since the exemplary bands n41, n77 and n78 can supported PC1 31dBm in the latest specification, it may cause some NBC issue or ambiguity if RAN4 just simply reuse the existing ‘PC1’ indication.  Proposal 2: 2dB upper tolerance is proposed for 32dBm nominal output power.  Proposal 3: As 32dBm+2dB tolerance with 4x26dBm PA can achieve 34dBm output power, RAN4 can request RAN2 to extend the range of P-Max without any NBC issue.  Proposal 4: RAN4 can discuss whether the general Tx RF requirements for TDD bands with 2Tx PC1.5 can be reused for FDD bands, at least including MOP+tolerance, ACLR, MPR requirements.  Proposal 5: RAN4 can need to discuss the AMPR and RSD requirements for band n1 and n25.  For AMPR, the following NS label should be considered for band n1 and n25. NS\_03/NS\_03U/NS\_05/NS\_05U/NS\_48/NS\_49/NS\_100.  For RSD, RAN4 need to discuss the Reference Sensitivity Degradation from PC3 to PC1.5 for FDD bands n1 and n25 for UE supporting Tx Diversity |
| R4-2514073 | Nokia | Proposal 1: Define new power class 1Bis for 32 dBm.  Proposal 2: Discuss and aim to agree co-existance simulation assumptions in RAN4#117 for 32 dBm 4Tx FWA use case  **Observation 1: PC1.5 with 2Tx for TDD feature is already specified and those emission requirements can be extended into FDD operation.**  **Observation 2: PC1.5 with 2Tx for TDD MPR maybe be extendedable for FDD operation.**  **Observation 3: A-MPR study is need for PC1.5 with 2Tx for FDD example bands n1, n25.**  Observation 4: self-desentization (MSD) needs to be studies for example bands n1 and n25. |
| R4-2514500 | Ericsson | Observation l: Since the support for 4 Tx for UL MIMO and Tx Diversity has been introduced for PC1.5 in Rel-18, the following clauses in TS 38.101-1 will not require any further update by introducing PC1 with 4 x 26 dBm PA configuration: UE additional maximum output power reduction for UL MIMO, minimum output power for UL MIMO, transmit ON/OFF time mask for UL MIMO, power control for UL MIMO, Error Vector Magnitude, carrier leakage, in-band emissions, EVM equalizer spectrum flatness for UL MIMO, occupied bandwidth for UL MIMO, out of band emission for UL MIMO, spurious emission for UL MIMO, transmit intermodulation for UL MIMO, reference sensitivity for UL MIMO, reference sensitivity for Tx Diversity, maximum input level for UL MIMO, adjacent channel selectivity for UL MIMO, blocking characteristics for UL MIMO, spurious response for UL MIMO, intermodulation characteristics for UL MIMO, EVM measurement for multiple Tx and out of band emission for Tx Diversity.  Observation 2: ‘Mode-full power’ can be introduced for PC2 under 4 x 26 dBm PA configuration assumption. It should be discussed whether it can be introduced in this WI.  Proposal 1: The MPR requirements for PC1 with 4 Tx should be specified for both “10 dB antenna isolation” and “20 dB or above antenna isolation” cases since CPE devices can have a small form factor, while FWA devices typically have a large form factor. The same requirements can be used for both UL MIMO and TxD.  Proposal 2: For the PCMAX,c tolerance in closed-loop spatial multiplexing scheme for 4Tx, an additional row should be added to Table 6.2D.4-2 covering the 29 dBm < PCMAX,c ≤ 32 dBm range with the corresponding TLOW(PCMAX\_L,c) and THIGH(PCMAX\_H,c) requirements.  Proposal 3: It should be confirmed whether both ULFPTx ‘Mode-1’ and ‘Mode-2’ are feasible for both single layer and two layers for PC1(bis) with 4 x 26 dBm PAs. In the case that one of the subcases is not feasible, it should be discussed how to capture it in the specifications.  Proposal 4: ‘Mode-full power’ is not feasible for PC1(bis) with 4 x 26 dBm PAs configuration.  Proposal 5: Discuss whether to introduce a new power class, e.g. PC1bis with the maximum output power of 32 dBm, or a power boosting capability of 1 dB for PC1. Allowing 1 dB higher tolerance of the maximum output power shall be avoided.  Proposal 6: For PC1.5 with 2Tx for FDD bands for handheld and FWA UE, the identified specification impact is on the MPR requirements, where new requirements should be derived for both 10 dB (for smaller form factors such as handheld) and 20 dB or above antenna isolation assumption (for large FWA form factor). A potential impact is also on the Reference Sensitivity Degradation from PC3 to PC1.5 for FDD bands for UE supporting Tx Diversity, which should be further studied |
| R4-2514418 | Huawei, HiSilicon | ***4Tx FWA with 32dBm MOP***  ***Observation 1: For 4x26dBm with up to 32dBm MOP, new general requirements for MOP, ACLR and MPR will be needed.***  Proposal 1: RAN4 to check if it’s feasible to reuse the existing PC1 power class definition with 1dB relaxation of the upper bound tolerance. Any NBC issue should be avoided.  Proposal 2: To define a new power class for 32dBm MOP should also be considered, since the underlying PA assumption as well as the requirements of MOP, ACLR and MPR will be different from the existing requirements for PC1 (31dBm).  Proposal 3: Pending on the conclusion of the ACLR requirement, simulations and/or measurements are needed to evaluate the MPR and A-MPR requirements. Only n41 needs to consider A-MPR requirement.  Proposal 4: The Rel-18 4Tx framework is used as the basis for the 4x26dBm PA configuration targeting a 32dBm MOP, including ULFPTx modes, UL-MIMO coherence and power fallback implementation.  Proposal 5: Follow Rel-18 agreement that supporting 4Tx is release independent from Rel-18.  Proposal 6: The general requirements for 4x26dBm shall be band-agnostic, applicable for both TDD and FDD bands, unless otherwise specified in band-specific requirements.  ***2Tx PC 1.5 for FDD***  ***Observation 2: Compared to TDD bands, achieving 2Tx PC1.5 in FDD bands—where each transmitter reaches 26 dBm—poses significant challenges in terms of UE thermal management and duplexer power handling capability.***  Proposal 7: RAN4 to confirm if it’s feasible to reuse existing TDD 2Tx PC1.5 MPR requirements for FDD bands.  Proposal 8: Once MPR requirements are concluded, continue to study A-MPR for the example bands (n1 and n25).  Proposal 9: RSD for the example bands (n1 and n25) can be evaluated in parallel to the Tx requirements.  Proposal 10: Check whether release independence for FDD 2Tx PC1.5 could be the same as that for TDD bands. |
| R4-2514486 | NTT Docomo | **Observation 1: RAN4 should consider the differences in UE implementation assumptions and the regularity of existing power classes increasing in 3dB.**  Proposal 1: RAN4 can introduce new power class with 4Tx for TDD bands for CPE/FWA. |
| R4-2513990 | OPPO | Observation 1: In the past, RAN4 spent whole release to enhance Tx power with 0.5dB, there is no reason to give up 1dB in Rel-20.  Observation 2: PC1 was defined for public safety UE with 1Tx 31dBm which is not same as current multi-Tx FWA whose Tx power can exceed PC1.  Proposal 1: For 4x26dBm and 2x29dBm FWA, introduce a new power class, e.g., PC1bis, with 32dBm for it.  Observation 3: Current ACLR for PC1 is for public safety which is much higher than PC1.5 and may not be applicable to other UE types like handheld UE and FWA.  Proposal 2: If PC1 is used as the power class for 4x26dBm and 2x29dBm, the ACLR needs to be re-evaluated. |
| R4-2513991 | OPPO | **Observation 1: PC1.5 with 2Tx for TDD band has been introduced in Rel-16.**  **Observation 2: PC1.5 with 2Tx for NTN FDD bands HPUE had been discussed in Rel-19 and some requirements had been agreed to reuse TN TDD PC1.5 with 2Tx.**  Proposal 1: For PC1.5 with 2Tx for NTN FDD bands HPUE, consider reuse following Tx requirements has been defined for PC1.5 with 2Tx for TDD bands:  • Nominal MOP and +2/-3 tolerance  • 31dBc ACLR  • MPR with 2Tx in Table 6.2D.2-3 of TS 38.101-1  Proposal 2: Define AMPR for example bands n1 and n25 based on their NS values request, separately.  Proposal 3: RSD for PC1.5 with 2Tx FDD bands need study based on the feasible duplexers for handheld and FWA separately |
| R4-2514355 | Qualcomm | **Observation 1: Support for 2x2 UL MIMO and Tx Diversity is in WI scope of PC 1.5 with 2 Tx for FDD bands.**  Proposal 1: Maximum output power (MOP) to support 2x2 UL MIMO and Tx Diversity shall be 29 dBm (i.e 2x26 dBm) for both handheld and FWA UE in FDD bands n1 and n25.  Proposal 2: Analyze the applicability of existing MPR table for PC 1.5 with 2 Tx for a FDD handheld UE.  Proposal 3: Analyze the applicability of existing MPR table for PC1.5 with 2 Tx for a FDD FWA UE.  Proposal 4: Evaluate A-MPRs for all the applicable NS labels for bands n1 and n25 for PC1.5 with 2 Tx for FDD handheld and FWA UEs.  **Observation 2: For a PC2 UE with Tx Diversity additional relaxation is provided in Note 7 of Table 6.2.3.1-1.**  Proposal 5: Evaluate whether further relaxation in A-MPR for PC1.5 with 2 Tx FDD architecture is required for a UE indicating Tx Diversity.  Proposal 6: Update the modified MPR behavior table L.1-1 for bands n1 and n25 to support PC1.5 with 2 Tx for FDD handheld and FWA UEs.  **Observation 3: UTRA ACLR requirement is applicable for NS labels NS\_03U, NS\_05U and NS\_100.**  Proposal 7: Evaluate whether new UTRA ACLR is required for PC1.5 with 2 Tx when NS labels NS\_03U, NS\_05U and NS\_100 are signalled. |
| R4-2514420 | Qualcomm | Proposal 1: The starting point for the UE RF requirements for the 4Tx PC1 UE is the set of UE RF requirements for 4Tx PC1.5  Proposal 2: Antenna to antenna isolation is assumed to 20 dB for the 4Tx PC1 FWA UE |
| R4-2514249 | Samsung | * **4Tx for CPE/FWA for TDD band**   Proposal 1: Reuse PC1 with MOP tolerance as +3/-3 dB.  **Observation 1: PC1 is specified for n14 for public safety scenario only, but not for other bands.**  Proposal 2: Leverage the existing capability 4Tx-TxD(i.e., txDiversity4Tx-r18) to indicate for the new PC1 with modified power class tolerance. Spec modification as following, take n41 as example.   |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | | n41 | 316,x | +2/-3 | 295 | +2/-33 | 26 | +2/-33 | 23 | ±23 | | NOTE 6: Generally, PC1 UE is not targeted for smartphone form factor.  NOTE 7: The UE power class 1 requirements for Band n14 are applicable for public safety scenario only.  NOTE X: Tolerance is modified to +3/-3 dB if UE indicates *txDiversity4Tx-r18*. | | | | | | | | |   Proposal 3: Adopt 20dB antenna isolation to perform MPR/A-MPR evaluation.   * **2Tx PC1.5 for FWA/handheld for FDD band**   Proposal 4: For PC1.5 with 2Tx, all existing general requirements defined based on TDD are applicable for FDD.  Proposal 5: RAN4 to define A-MPR for n1 and n25 for PC1.5.  -N1: NS\_05/05U, NS\_48, NS\_49  -N25: NS\_03/03U  Proposal 6: RAN4 to define Reference Sensitivity degradation for PC1.5 FDD bands for UE indicating TxD. |
| R4-2513781 | Skyworks | **Proposal on 4x26dBm PA power class:**   * **Assuming ≥20dB antenna isolation and 34dB ACLR target, 31dBm PC1 can be reused and ACLR specified at 37dB for <2.5GHz and 34dB for >2.5GHz. No need to create a new power class** * **32dBm can only be reached if coexistence simulations >2.5GHz show that 31dB ACLR is sufficient, and antenna isolation is ≥20dB.**    + **Even so, creating a new power class is for 1dB improvement for a limited set of allocation seems unnecessary and alternatively, considering PC1 boosting for inner DFT-s-OFDM QPSK seems less complex.** * **A-MPR for NS\_04 and NS\_47 should be evaluated for Band n41**   **Proposal on 2Tx PC1.5 for FDD definition:**   * **31dB ACLR and 10dB antenna isolation used for 2Tx PC1.5 TDD bands can be reused for FDD bands which UL is >1.7GHz** * **FFS if 31dB ACLR and 10dB antenna isolation used for 2Tx PC1.5 TDD bands can be reused for FDD bands which UL is <1.7GHz** * **NS\_05, NS\_05U, NS\_48 and NS\_49 PC1.5 A-MPR should be evaluated for Band n1** * **NS\_03 and NS\_03U PC1.5 A-MPR should be evaluated for Band n25** * **Like for PC2 we can assume that NS\_100 is not required for n1 and n25 HPUE.**   **Proposal on 2Tx PC1.5 FDD RSD:**   * **Only 2Tx RSD is specified for PC1.5: it should be clarified that only 2Tx PC1.5 will apply to FDD bands in the band power class table.** * **RSD simplification is investigated in a similar way than for MSD simplification based on:**   + **Fixed interference level increase**   + **Fixed Main to diversity imbalance (FFS if 6dB used for MSD simplification is adequate or higher value is needed.**   + **And directly derived from PC3 1Tx REFSENS or PC2 2Tx RSD.** * **Given the large duplex distance, RSD should be minimal for Band n1 but important for Band n25 that has significant de-sense for CBW>25MHz (both from REFSENS and PC2 2Tx RSD).** |
| R4-2514212 | Spreadtrum, UNISOC | ***Proposal 1: New power class (e.g., PC1bis) can be introduced to define the MOP of 32dBm.***  ***Proposal 2: PCMAX,c tolerance in closed-loop spatial multiplexing scheme for 4Tx of 32dBm can be modified to Table 1.***  **Table 1: PCMAX,*c* tolerance in closed-loop spatial multiplexing scheme for 4Tx**   |  |  |  | | --- | --- | --- | | PCMAX,*c*(dBm) | Tolerance TLOW(PCMAX\_L,*c*) (dB) | Tolerance THIGH(PCMAX\_H,*c*) (dB) | | 24.5 ≤ PCMAX,*c* ≤ **32** | 3.0 | 2.0 | | 23.5 ≤ PCMAX,*c* < 24.5 | 5.0 | 2.0 | | 22.5 ≤ PCMAX,*c* < 23.5 | 5.0 | 3.0 | | 21.5 ≤ PCMAX,*c* < 22.5 | 5.0 | 4.0 | | 18 ≤ PCMAX,*c* < 21.5 | 5.0 | | | 13 ≤ PCMAX,*c* < 18 | 6.0 | | | -40 ≤ PCMAX,*c* < 13 | 7.0 | | |
| R4-2513567 | Vivo | **Proposal 1: It is suggested to reuse PC1 with or without general power boosting scheme to achieve up to 32 dBm in Rel-20.**  **Observation 1: Currently, in TS 38.101-1, the MPR requirements are based on one PC1 PA linearity, which are not suitable for 4Tx 32dBm case.**  **Proposal 2: It is suggested to re-evaluate MPR for PC1 with 4Tx for FWA UE.**  **Observation 2. Leveraging the substantial experience gained from specifying 4Tx MIMO&TxD for PC1.5 in Rel-18, the standardization effort required to define 4Tx MIMO&TxD for PC1 in Rel-20 is expected to be limited.**  **Proposal 3: Requirements for PC1.5 with 2Tx for TDD bands can be used as a starting point for PC1.5 with 2Tx for FDD bands for handheld and FWA UE.** |
| R4-2513927 | ZTE | **Observations:**  **Observation 1. Reusing legacy PC1 ans introducing a new power class will cause different workload in RAN4. The RF requirements discussion would largely depend on which power class is adopted.**  **Proposals for 4x26dBm HPUE**  **Proposal 1: The requirements of Frequency error, Transmit OFF power, Transmit ON/OFF time mask, Transmit modulation quality, Transmit intermodulation keep unchanged for 4x26dBm PA configurations, regardless of which power class is adopted.**  **Proposal 2: There are no changes for Rx requirements for 4x26dBm PA configurations, regardless of which power class is adopted.**  **Proposal 3: For the requirements depends on sum of power from all UE transmit antenna connectors, e.g. MPR/A-MPR, OOB emission requirements, it should be postponed until RAN4 decides the power class.**  **Proposal 4: The requirements for TxD can be derived from UL MIMO requirements.**  **Proposal 5: To achieve 31dBm or 32dBm maximum output, only ULFPTx mode-1 is considered.**  **Proposals for PC1.5 FDD HPUE**  **Proposal 6: The MPR requirements of PC1.5 2Tx requirements for TDD bands can be applied to FDD bands for PC1.5 UE with 2Tx.**  **Proposal 7: A-MPR needs to be discussed for PC1.5 2Tx for FDD bands.**  **Proposal 8: It is proposed that RSD=0 dB from PC3 to PC1.5** **for PC1.5 2Tx FDD band n1.**  **Proposal 9: It is proposed to study a general approach to defined the RSD requirements from PC3 to PC1.5 for all PC1.5 2Tx FDD bands.** |

## Open issues summary

### 4Tx total output power

*Sub-topic description: With 4 26 dBm output power PAs, the total output power can be 32 dBm. Current PC1 output power is 31 dBm with +2/-3 tolerance.*

**Issue 2-1-1: Maximum output power**

* Proposals
  + Option 1: 31 dBm +2/-3 tolerance *(ZTE, Skyworks)*
  + Option 2: 32 dBm +2/-3 tolerance *(CATT, Nokia, Huawei, NTT Docomo, OPPO, Vivo)*
  + Option 3: 31 dBm +3/-3 tolerance *(Samsung)*
  + Option 4: Wait for ACLR number before deciding if 32dBm is feasible (Skyworks)
* Recommended WF
  + TBA

**Issue 2-1-2: Power class**

* Proposals
  + Option 1: Use PC1 *(ZTE, Samsung, Skyworks, Vivo)*
  + Option 2: PC1 with 1dB power boosting (Ericsson*, Skyworks, Vivo*)
  + Option 3: PC1Bis (Nokia, Ericsson, Huawei, NTT Docomo, *OPPO, Spreadtrum*)
* Recommended WF
  + TBA

### 4Tx MPR/A-MPR simulation assumptions

*Sub-topic description: MPR and A-MPR assumptions need to be agreed before stating the simulation work.*

**Issue 2-2-1: Antenna isolation**

*Moderator comment: Currently for PC1.5, MPR is defined with two different isolation assumptions, 10dB and 20dB.*

* Proposals
  + Option 1: Adopt 10 dB for CPE, and 20db for FWA and CPE (Ericsson).
  + Option 2: Adopt 20db for both FWA/CPE (Samsung, Qualcomm, Skyworks)
* Recommended WF
  + TBA

**Issue 2-2-2: NS to be simulated**

*Moderator comment: NS\_04, NS\_47, NS\_55, and NS\_57 are all applicable NSs for the exemplary bands. NS\_55 and NS\_57 do not indicate any additional spurious emission and maximum output reduction requirements.*

* Proposals
  + Option 1: NS\_04 and NS\_47 (Huawei, Skyworks)
* Recommended WF
  + Agree to simulate NS\_04 and NS\_47 for n41. No additional NSs are required.

### 4Tx ULFPTx

**Issue 2-3-1: Mode-1 and Mode-2 feasibility**

* Proposals
  + Option 1:Mode-1 and Mode-2 are feasible for both single layer and two layers (Ericsson)
  + Option 2: Only Mode-1 is feasible for both single and two layers *(ZTE)*
* Recommended WF
  + TBA

### 4Tx WID applicability

*Sub-topic description: WID does not say anything regarding PC2 or FDD bands* support 4Tx for CPE/FWA UE with 4x26dBm PA configurations. The exemplary bands for this objective are TDD. However, there seems to be some interest in this topic so we can discuss this to get some initial comments.

**Issue 2-4-1: Mode-full power feasibility for PC2**

* Proposals
  + Option 1: Mode-full power is feasible for PC2 (Ericsson)
* Recommended WF
  + TBD

**Issue 2-4-2: 4Tx PC1/PC1bis requirements to be band agnostic**

* Proposals
  + Option 1: FDD and TDD bands are supported (Huawei)
* Recommended WF
  + TBD

### 2Tx leveraging TDD requirements

*Sub-topic description: PC1.5 is already specified for TDD bands and for this objective the exemplary bands are FDD bands n1 and n25.*

**Issue 2-5-1: Reusing MOP for 2Tx PC1.5 from TDD bands**

* Proposals
  + Option 1: Yes (Nokia, OPPO, Qualcomm, Vivo)
* Recommended WF
  + Yes

**Issue 2-5-2: Reusing MPR for 2Tx PC1.5 from TDD bands**

*Moderator comment: There are two MPR tables for PC1.5 with 2Tx, assuming different isolation and form factor. One of those tables (*6.2D.2-2*) still has values in square brackets in version 19.3.0 of TS 38.101-1*

* Proposals
  + Option 1: No (Huawei)
  + Option 2: Yes (Nokia, OPPO, Vivo, ZTE)
* Recommended WF
  + TBA

### 2Tx MPR/A-MPR simulation assumptions

*Sub-topic description: MPR and A-MPR assumptions need to be agreed before stating the simulation work.*

**Issue 2-6-1: Antenna isolation assumption**

* Proposals
  + Option 1: **10 dB for handheld and 20 dB or above for FWA** (Ericsson, Qualcomm)
  + Option 2: 20 dB or higher for FWA (OPPO)
  + Option 3: 10dB for FDD bands with UL >1.7GHz i.e., n1, and n25, irrespective of the form factor (Skyworks)
* Recommended WF
  + TBA.

**Issue 2-6-2: ACLR assumption**

* Proposals
  + Option 1: **31 dB for FDD bands with UL >1.7 GHz (n1, n25)** (Skyworks)
  + Option 2: 31 dB for all FDD bands
* Recommended WF
  + TBA.

**Issue 2-6-3: NS to be considered**

*Moderator comment: For n1, following NS are valid: NS\_100, NS\_05, NS\_05U, NS\_48, NS\_49. For n25, following NS are valid: NS\_100, NS\_03, NS\_03U. NS\_03U, NS\_05U*

|  |  |  |
| --- | --- | --- |
| ***NS*** | ***Band*** | ***UTRA protection (Note1of*** **Table 6.2.3.1-1*)*** |
| *NS\_03* | *n25* | *no* |
| *NS\_03U* | *n25* | *Yes* |
| *NS\_05* | *n1* | *no* |
| *NS\_05U* | *n1* | *Yes* |
| *NS\_48* | *n1* | *no* |
| *NS\_49* | *n1* | *no* |
| *NS100* | *n1, n25* | *yes* |

* Proposals
  + Option 1: NS\_03/NS\_03U/NS\_05/NS\_05U/NS\_48/NS\_49/NS\_100 (CATT, OPPO, Qualcomm)
  + Option 2: NS\_03/NS\_03U/NS\_05/NS\_05U/NS\_48/NS\_49 (Samsung, Skyworks)
* Recommended WF
  + TBA.

**Issue 2-6-4: UTRA ACLR for NS\_03U, NS\_05U, and NS\_100**

*Moderator comment: Depends on the agreement of issue 2-6-3. If NS\_100 is needed, then UTRA ACLR requirement needs to be discussed. Currently it is defined for PC2 and PC3.*

Table 6.5.2.4.2-1: UTRA ACLR requirement

|  |  |  |
| --- | --- | --- |
|  | Power class 2 | Power class 3 |
| UTRAACLR1 | 33 dB | 33 dB |
| UTRAACLR2 | 36 dB | 36 dB |

* Proposals
  + Option1: New value is needed (Qualcomm)
  + Option2: Can reuse PC2 values
* Recommended WF
  + TBA.

### 2Tx Reference sensitivity degradation from PC3 to PC1.5

**Issue 2-6-1: PC1.5 2 Tx RSD for n1**

* Proposals
  + Option 1: 0dB for all channel bandwidth (Apple, Skyworks, ZTE)
* Recommended WF
  + Agree to have 0 dB RSD for n1.

**Issue 2-2-2-2: PC1.5 2 Tx RSD for n25**

* Proposals
  + Option 1: (Apple)

| *Operating Band* | ***3***  *MHz (dB)* | *5*  *MHz (dB)* | *10*  *MHz (dB)* | *15*  *MHz (dB)* | *20*  *MHz (dB)* | *25*  *MHz (dB)* | *30 MHz (dB)* | *35 MHz (dB)* | *40*  *MHz (dB)* | *45 MHz (dB)* | *50*  *MHz (dB)* |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *n25* |  | *3.6* | *3.6* | *3.7* | *3.7* | *3.9* | *8.7* | *8.9* | *9.4* | *9.8* |  |

* + Option 2: (ZTE)

| **Operating Band** | **3**  **MHz (dB)** | **5**  **MHz (dB)** | **10**  **MHz (dB)** | **15**  **MHz (dB)** | **20**  **MHz (dB)** | **25**  **MHz (dB)** | **30 MHz (dB)** | **35 MHz (dB)** | **40**  **MHz (dB)** | **45 MHz (dB)** | **50**  **MHz (dB)** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| n1 |  | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 |
| n25 |  | 1.5 | 1.5 | 1.6 | 1.6 | 1.7 | 6.0 | 6.2 | 6.7 | 7.1 |  |

* Recommended WF
  + Discuss the methodology first and then the numbers.

References

1. RP-252942, New WID: UE RF enhancements for NR FR1, Phase 5, vivo, RAN meeting #109, Sep 2025.