**3GPP TSG RAN Plenary Meeting #88e draftRP-20xxxx**

**29th of June - 03rd of July, 2020**

**Agenda item: 9.1.1 & 9.4.9 &10.1.1**

**Source: China Unicom (Moderator)**

**Title:** **Intermediate Summary for Email discussion on R16\_R17\_PC2**

**Document for: Discussion**

# Introduction

This document is a summary of the following email discussion,

*Goal: Determine a way forward for the different PC2-related proposals*

*Input contributions covered: 723,728, 1004, 1034, 996, 1220, 995*

*Moderator: Gen Cao*

**Deadline**: 11:59h UTC 30th June

**Note**: if an objective does not receive any comments till the deadline, this objective is assumed agreeable to include in the WID.

# Discussion

**Section 1: FDD+TDD EN-DC PC2 HPUE**

RP-200995 WI\_Exception\_ENDC\_UE\_PC2\_FDD\_TDD (China Unicom)

Proposal: Extend the WI completion date to September 2020.

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| --- | --- |
| Company | Comment |
| vivo | Support. |
| Apple | According to TS38.101-1, P-MPR is the allowed max output power reduction for “ensuring compliance with applicable electromagnetic energy absorption requirements and addressing unwanted emissions / self desense requirements in case of simultaneous transmissions on multiple RAT(s) for scenarios not in scope of 3GPP RAN specifications” Thus, P-MPR based techniques for the UE to comply with SAR regulation should be listed as alternative options for the corresponding open issues. |
| CHTTL | Support |
| Xiaomi | Support |

**Moderator summary: Agree to extend the WI to September 2020.**

RP-200996 Discussion On PC2 EN-DC FDD+TDD HPUE (China Unicom)

Proposal: Propose to finalize the WI as soon as possible. If agreements or compromises on whether or not to include blind scheme could not be made. Then follow majority view to set the duty cycle based scheme as solution to keep align with SI conclusion, and further treat blind scheme at later stage.

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| Company | Comment |
| vivo | Support this proposal. As the main outcome of previous SI, the duty cycle based scheme was also supported by a clear majority of companies consistently. |
| AT&T | As mentioned during the second round of discussion at RAN4 #95-e, the blind scheme should be used as baseline as all UEs are capable of supporting. Any duty-cycle reporting for UEs should be considered as an option on top of the blind scheme. We propose to make the decision based on further technical discussions in RAN4 #96-e as the division in viewpoints does not seem to be easy to solve by majority view. |
| Apple | According to TS38.101-1, P-MPR is the allowed max output power reduction for “ensuring compliance with applicable electromagnetic energy absorption requirements and addressing unwanted emissions / self desense requirements in case of simultaneous transmissions on multiple RAT(s) for scenarios not in scope of 3GPP RAN specifications” Thus, P-MPR based techniques for the UE to comply with SAR regulation should be listed as alternative options for the corresponding open issues.  An additional comment: the proposal does not clearly identify which option in the listed open issues shall be selected based on majority view if progress is not achieved. |
| China Unicom | In our discussion paper, the following options received majority support.  Open issue 1:Issues on “blind” scheme (scheme of reducing LTE FDD power)  Majority view: Not to include “blind” scheme at current stage. (Samsung, Xiaomi, Qualcomm, ZTE, CHTTL, Huawei, OPPO, CU, vivo)  Open issue 2: Choosing ”default value” or “blind scheme” when capability parameters are absent  Majority view: Using default value of maxNRDuty for two cases of LTE and NR power combination (Samsung, Xiaomi, Qualcomm, ZTE, [Huawei], CU, vivo)  Open issue 3: Choosing “PC fallback” or “blind scheme” when the UL EN-DC scheduling exceeds the UE capability  Majority view: UE should fallback to PC3 (Samsung, Xiaomi, Qualcomm, ZTE, [CHTTL], Huawei, OPPO, CU, vivo) |
| CHTTL | Support |
| Xiaomi | Support |

**Moderator summary: Companies agree to close the WI as soon as possible. There is no agreement for baseline solution in RAN4. Moderator propose RAN#88-e to make decision on the completion time for this WI without extra extension.**

PR-201220 ENDC\_UE\_PC2\_FDD\_TDD (Verizon, Qualcomm)

Proposal 1: Consider the Rel-15 UE-based (P-MPR) control as baseline for Rel-16 and ensure the PC2 HPUE in the FDD+TDD EN-DC implementation

Proposal 2: Make this feature as a case of Rel-15 via release independence specification, 38.307 in order the Rel-15 devices started to advertise PC2

Proposal 3: RAN4 should further investigate other possible option(s) in Rel-17

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| Company | Comment |
| T-mobile USA | P1: We do not believe that P-MPR is needed for a UE based approach. We support the “blind” approach but could accept a UE-Based approach (such as we proposed in R4-2006654) if it Pcmax\_low was based on PC3 MPR, but we could not accept an approach based on P-MPR since P-MPR is unbounded. P2: We support release independence to Rel-15, but not P-MPR.  P3: We would support exploring other options in Rel-17. |
| Intel | P1: We understand this (P-MPR) is a part of existing UE implementation and a special case of option 1 in the open issue-1 in RP-20996. We suggest to focus on the available options which RAN4 has spent for many meetings. |
| vivo | P1: It is quite unfortunate that this solution was raised, basically means everything we had done for Rel-16 SI and WI was cleared. Considering the fact that we do have some conclusion in SI phase and a clear majority in WI stage. |
| Ericsson | P1: In our understanding, the so-called “blind” scheme is a very simple use of Rel-15 EN-DC power control that can be supported with Rel-15 signalling and conformance testing. Duty cycle reporting can be added as an add-on. The P-MPR approach has two disadvantages; firstly it makes it unpredictable for the network what power the UE will be able to deliver for TDD and secondly it leads to a need for FDD-TDD scheduling co-ordination. Furthermore, there is no conformance testing designed for the P-MPR approach. Considering that the so-called “blind” approach can re-use existing conformance testing, it is not clear whether adoption of the P-MPR approach will lead to a shorter standardization time. We have uploaded a contribution for information in RP-201269 that clarifies our view in more detail. Thus we support extension of the WI until September to further clarify and agree CRs in RAN4. |
| AT&T | P1: We continue to support the blind scheme as based as opposed to UE-based (P-MPR) control as baseline. Using P-MPR control as baseline seems to be outside of the scope for P-MPR usage as defined in the RAN4 specification. P-MPR is also optional and a per-UE proprietary solution.  P2:The baseline decision made at RAN4 #96-e for Rel-16 shall form the basis for any release independence for Rel-15.  P3: As mentioned in our comments on RP-200996, we propose to make the decision for Rel-16 (and release independence for Rel-15) based on further technical discussions in RAN4 #96-e as opposed to making a decision at RAN #88-e. We also support investigating other options in Rel-17. |
| Huawei | P1: For clarification, whether the proposal is for the case that when dutycycle capability is absent? If that is the case, we think that this proposal as a compromise can be considered in order to close the WI on time. For a UE not reporting the dutycycle capability, it doesn’t mean that the average power over a period of duration shall not exceed 23dBm if the UE can meet the SAR requirement. In that sense, a better way is to leave to UE implementation rather than the so called “blind” scheme. |
| Apple | P1: we agree with Proposal 1  P2: if this WI develops a scheme in addition to the P-MPR based approach, then this scheme cannot be release independent and shall be a Rel-16 feature (with corresponding capability signaling).  P3: we are fine to transfer unfinished scope of this WI to Rel-17 if open issues remain |
| CHTTL | P1: We think if we agree to close the Rel.16 WI with this proposal, we should also jointly consider some wayforward or guidance on how to move forward on Rel.17. Other options might be impacted if we take the UE-based (P-MPR) approach as the baseline. |
| Xiaomi | P1: We agree with intel and vivo’s view, and think the dutycycle approach is more general for high power UE case. |
| Nokia | P1: Proposal 1 is acceptable compromise for us although not ideal. It is also ok for us to extend the WID until September. |
| Vodafone | P1: We quite like the blind scheme as a simple alternative. If it does not require any ignaling changes then we would support to discuss it further. Discussing it after Q3 may be a reasonable approach. |
| China Unicom | P1: The WI should be completed base on conclusion of SI. P-MPR based solution was not discussed during the SI phase, so it is not appropriate to use P-MPR to finalize the WI. We prefer duty-cycle based solution as baseline. |

**Moderator summary: Some companies propose to discuss the new addition of the Rel-15 UE-based approach (P-MPR) as the baseline solution. There is no agreement on this proposal. Majority companies suggest to focus on the available solutions in RAN4 discussion.**

**Section 2: New WI proposals**

**RP-200728**

Title: **New WI proposal: Power Class 2 UE for NR inter-band CA and SUL configurations with 2 bands UL**

Agenda Item: 9.1.1

For: Approval

Source: China Telecom

1. WI Objectives  
Companies are encouraged to provide their view on the objectives. If you can agree the current objectives, please comment yes. If you are not comfortable with the current objectives or have some proposal for modification, please provide a comment.

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| --- | --- | --- |
| Company Name | Yes/No | Comments |
| Qualcomm | No | Since it is expected that the same schemes to facilitate SAR compliance will be leveraged from the ongoing work item on FDD-TDD PC2 EN-DC, it would be better to wait for the conclusion of that work item before starting this. There are no SUL combinations listed. If there is no interest in SUL then it should not be included. If there is interest, then at least one combination should be included. Also, the work related to FDD-TDD PC2 EN-DC does not consider SUL so the same schemes may not apply or may need to be revised in the case of SUL. |
| MTK | No | We are not sure if the conclusion of EN-DC can be directly re-used here. In EN-DC, the E-UTRAN RAT is always prioritized. But here for NR inter-band CA and SUL, whether there is a prioritization rule is unclear to us.  · For CA, operation scenario is not clear. FDD+TDD and TDD+TDD shall be discussed separately. · There’s power ambiguity on SUL scenario. SUL does not transmit with NUL simultaneously. It would be good to first have some study phase clarify the scenarios. |
| Intel | No | •Based on WID, the SUL PC is always PC2 and we are interested to know the motivation to include SUL PC in the WID. •NUL and SUL cannot be transmitted simultaneously. |
| Ericsson | Yes | EN-DC solutions can and should be used as reference, but clearly it is not copy/paste and the solutions for these cases need to be specified in their own right. So we do not see the need to wait until EN-DC is fully complete. Since this is a basket WI, we think it should be captured in the WI that solutions need to be designed for SUL if SUL combinations are proposed. All schemes should consider SAR compliance. |
| CMCC | Yes | We agree that EN-DC solution cannot be copy/paste for UL CA. So there is no need to wait until EN-DC is complet.  For SUL SAR issue in the WID, our understanding is that it trys to address the existing SAR issue from Rel-15, i.e. SUL band combination consist of 1 PC2 NUL band and PC3 SUL band.  So the SAR solution is general for all SUL band combinations consists of PC2 NUL and PC3 SUL. That is why no SUL combinations listed in the WID in our understanding.Different from UL CA HPUE, there is no need to specify any specific RF requirement. |
| Huawei | Yes | The SAR solution as well as capability ignaling could be different from that the EN-DC HPUE, thus we don’t need to align everything with EN-DC and wait for the completion of the EN-DC WI.  Since it is a basket WI, the specific combination can be provided later in the WI stage based on inputs from companies. RAN4 also had other basket Wis without combination proposed when the basket WI was approved. |
| China Telecom | Yes | To Qualcomm and Ericsson: For SUL combination list, we think the table list for SUL is redundant. Because no RF requirements such as MSD etc. are identified to be specified for SUL combination due to non-simultaneously transmission, and the SAR scheme will be generally applied for all the SUL combos. If RF requirements are proposed for some of SUL combination by companies, we could add the specific combination in the table list in future. Regarding whether reusing EN-DC PC2, we share the same views with Ericsson, and also think the EN-DC PC2 solution is just an reference, and do not consider to reuse that. We can remove the sentence saying referring to the scheme for EN-DC in the objectives of the WID.  To MTK: Regarding the motivation of this WID, we intend to capture all the PC2 work for NR SA. That is why we have UL CA PC2 and NUL PC3+SUL PC2, and the UL CA PC2 include FDD+TDD and TDD+TDD. The scenarios for FDD+TDD and TDD+TDD are same. But we agree to discuss them separately. We could add a bullet to clarify that UL CA PC2 include FDD+TDD and TDD+TDD, and the cases for FDD+TDD and TDD+TDD will be discussed separately.  To MTK and Intel, I guess you have the same comment on the SUL part. For SUL PC2, because NUL and SUL cannot transmitted simultaneously, there is no issue for NUL PC3+SUL PC3, and only NUL PC3+SUL PC2 need to be considered due to SAR limit. |
| Apple | No | The WID assumes PA architectures that are not full-rated (e.g. 23+23 or 23+26 dBm); RAN4 needs to resolve the signaling aspects for this “PC2.5” as a core requirement before agreeing this WID, since Ues which support these PA architectures are likely to have different requirements, such as MPR, compared to PC2 Ues with full-rated PA architectures (e.g. 26+26 dBm) |

**Moderator summary: Companies agree that this WI does not need to wait until EN-DC HPUE WI complete. Moderator propose to provide SUL combinations list in the WI objective, and clarify the motivation to include SUL PC and discuss the technical issues mentioned above.**

2. Time units

Please provide your view on the Tus.

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| --- | --- | --- |
| Company Name | Total Tus for this WI | Comments |
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**RP-201004**

Title: **New basket WID: High power UE (power class 2) for one NR FDD band**

Agenda Item: 9.1.1

For: Approval

Source: China Unicom

1. WI Objectives  
Companies are encouraged to provide their view on the objectives. If you can agree the current objectives, please comment yes. If you are not comfortable with the current objectives or have some proposal for modification, please provide a comment.

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| --- | --- | --- |
| Company Name | Yes/No | Comments |
| Qualcomm | No | PC2 has not been evaluated for FDD bands before so there are a number of technical issues to be studied. It is expected that SAR and thermal issues will need careful study as well as interference (both to self-desense and cross device coexistence). The justification in the work item points to CPE in industrial use cases, but there is no such limitation of applicability in the objectives. While TDD PC2 was justified due to the link budget implication of TDD, it is not well understood the justification for FDD especially for CPE where higher gain antennas are a more common solution than increasing the conducted Tx power. |
| T-mobile USA | Maybe | It would be nice to see a motivation paper, which should accompany a new WID. For the handheld case we are not sure that PC2 will improve the coverage for an FDD band if say a 50% duty cycle is needed to meet SAR requirements. Cell coverage is usually defined as a certain throughput at the cell edge. If PC2 is achieved by limiting the FDD transmit duty cycle, then what you gain in higher power you lose in transmit time, so you need twice as many RBs so the PSD will be the same and the coverage is essentially the same. |
| MTK | No | Similar view as Qualcomm. PC2 for FDD band is a new topic. Same solution for SAR on TDD band may not be applicable here. Also It could be challenging for duplexer and receiver in-device coexistence control which are FDD specific.  It would be good to at least have some study phase to check the feasibility first. |
| vivo | No | We also share similar views with Qualcomm and MTK, that the scenario and applicability is also not that clear, and there are some FDD-specific issues never really studied before. A SI may be more appropriate in this case. |
| Ericsson |  | Indeed SAR should be clarified; also whether there is any need for co-existence studies depending on the bands. |
| Huawei | Yes | We support the idea to have a FDD HPUE WI. The main issue like other HPUE WI is still the appropriate SAR solution, which should be studied in the WI. |
| Nokia |  | It is not clear from the WID yet what bands are targeted. |
| Apple | No | Since there is operator interest only for PC2 in n1, we prefer to recast this WI from a basket to a targeted PC2 WI for band n1 |
| CHTTL | Yes | We are supportive to have some study. |
| China Unicom | Yes | In terms of SAR issue, we propose to have two separate schemes for SAR compliance (e.g. one for handheld devices, one for CPEs).  For handheld devices, the main motivation is to improve the performance for cell edge users to have higher data throughput as compared to PC2 FDD UEs. |

2. Time units

Please provide your view on the Tus.

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| Company Name | Total Tus for this WI | Comments |
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**Moderator summary: Some companies suggest to have a study phase for PC2 in FDD bands. Moderator propose to discuss on the scope of the WI which includes a study phase first and clarify the scenarios and motivation.**

**RP-201034**

Title: **New Basket WID on High power UE (power class 2) for EN-DC**

Agenda Item: 9.1.1

For: Approval

Source: China Unicom

1. WI Objectives  
Companies are encouraged to provide their view on the objectives. If you can agree the current objectives, please comment yes. If you are not comfortable with the current objectives or have some proposal for modification, please provide a comment.

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| --- | --- | --- |
| Company Name | Yes/No | Comments |
| Qualcomm | No | It would be good to list the proposed EN-DC band combinations to include in this basket. |
| T-mobile | No | Band combinations are needed for the basket. FDD\_+ TDD PC2 combinations should not be included in a basket until the FDD+TDD EN-DC PC2 work is complete, so only TDD+TDD inter-band combinations would be appropriate at this time. |
| Intel | No | •WID should include power class declaration in each CG in EN-DC, and explicitly exclude UL-MIMO in the scope, i.e., HPUE requirements are limited to 1PA and 2PA architectures. •We would like to make it clear of deployment scenario whether it is synchronous or asynchronous operation. •Simultaneous Rx-Tx aspect needs to be evaluated |
| CMCC | Yes | We already provide request on FDD+TDD EN-DC HPUE in previous RAN4 meeting, e.g. B3+n41. |
| Huawei | Yes | The basket WI is a package to treat all similar band combinations, once the targets are clear, the specific band combinations can be added based on companies requests. Also we see requests from operator. |
| Nokia |  | It would be good to list the targeted band combinations. |
| Apple | No | This WID mixes PA architecture assumptions which are needed to support the listed band combinations  In the case of EN-DC 41/n79, both bands have single-carrier PC2 requirements defined, and EN-DC requirements for full-rated PA architectures can also be defined.  In the case of EN-DC 39/n41 and 39/n79, single-carrier requirements for PC2 in Band 39 are not defined, and the work on these requirements depends upon the conclusion of the "PC2.5" discussion related to mixed full-rated and not full-rated PA architectures. We prefer to handle this discussion separately.  In summary, a work item to define PC2 requirements for EN-DC 41/n79 does not depend on core requirement open issues and can be initiated this meeting. PC2 requirements for EN-DC 39/n41 and 39/n79 still have a dependency upon the "PC2.5" discussion. |
| CHTTL | Yes | We are supportive. |
| China Unicom | Yes | Our interested band combinations include B1\_n78A, B8\_n78A.  Other operators could also input their interested band combinations. |

2. Time units

Please provide your view on the TUs.

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| Company Name | Total TUs for this WI | Comments |
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**Moderator summary: Moderator propose to modify the objective part and provide the band combinations list for information in this basket. Further clarifications on the requirements for synchronous/asynchronous and other technical details mentioned above are needed.**

**RP-200723**

Title: **New SID on high-power UE operation for fixed-wireless/vehicle-mounted use cases in Band 12 and in Band 5**

Agenda Item: 10.1.1

For: Approval

Source: U.S. Cellular

1. WI Objectives  
Companies are encouraged to provide their view on the objectives. If you can agree the current objectives, please comment yes. If you are not comfortable with the current objectives or have some proposal for modification, please provide a comment.

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| Company Name | Yes/No | Comments |
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2. Time units

Please provide your view on the TUs.

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| Company Name | Total TUs for this WI | Comments |
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**Moderator summary: This SI is newly added, company views are provided in second round discussion.**

# Conclusions