**3GPP TSG-RAN Meeting # 90-e RP-20xxxx**

**Electronic Meeting, 7 – 11 Dec., 2020**

**Agenda item:** 9.9.14

**Source:** China Telecom (Moderator)

**Title:** Email discussion summary of [90E][45][HP\_28dBm\_flag\_2365]

**Document for:** Information

# Introduction

In RAN#90e, an email thread [90E][45][flag\_2365] was assigned to discuss the new added objective for revised WID: RP-202365: SAR schemes for High Power UE for NR inter-band Carrier Aggregation and supplemental uplink (SUL) configurations with 2 bands UL. Because the new added objective is related to 23dBm+26dBm, i.e. 28dBm CA case, we change the thread name to be [HP\_28dBm\_flag\_2365] for better tracing the discussion.

# Topic: Adding new scope in the Revised WID RP-202365

**2.1 Open issue:**

Adding new scope in the Revised WID RP-202365: SAR schemes for High Power UE for NR inter-band Carrier Aggregation and supplemental uplink (SUL) configurations with 2 bands UL

The new added scope in this WI for asking approval is listed as:

2)Specify higher maximum output power for dual PA equipped UE’s, for example, 28 dBm for a UE with 23 dBm and 26 dBm Tx chains

  Enabling higher power within existing power classes or definition of a new power class shall be considered, other options not precluded

  All associated core requirements are also to be specified

  SAR mechanisms are modified, if needed, to allow for higher transmit power

**2.2 Comments and recommended tentative agreements are listed in the below table:**

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| Company | Initial round discussion |
| Huawei | The newly added objective on higher maximum output power for dual PA equipped UE’s has been discussed in last RAN4 meeting, and some companies expressed concern during the discussion, however, there was no consensus was reached. We have concern on the SAR compliance issue and larger power not based on the reported power class may violate regulatory requirements. The objective should not be considered in the WI. |
|  | Intermediate round discussion |
| Qualcomm | We support keeping the objective in the WID.  When the proposal was presented at the last RAN4 meeting, there was significant interest from many companies including from Huawei who commented “Interesting indeed. We are also open to discuss the proposals furthermore and we expect the discussion to be undertaken in a better placeholder rather than this WI.”  Hence, most companies were open to further discussion on the technical aspects but noted that such discussion might not be within the scope of the WI.  Therefore, China Telecom has modified the WID to include this objective so that the technical details can be discussed in RAN4.  However, we do acknowledge as Huawei points out that there was not consensus and agreement in the last RAN4 meeting.  Therefore, we suggest to reword the objective as “Study feasibility of higher maximum output power … and specify if agreed”  With this modification, we believe the document can then be agreed. |
| T-Mobile USA | T-Mobile-USA has interest in this topic, and would prefer to keep it in the revised WID, with the modification proposed by Qualcomm |
| Verizon | Verizon supports keeping the objective in the WID!  Indeed, we participated in the RAN4 discussion and also included the Qualcomm proposal as an objective in our draft WI item for n77 and n78 new power devices. We have interest in this objective as the technical behind it could enable higher UE Tx power without any hardware change to the UE along with different power configurations listed in this draft WI. |
| Intel | Perhaps it is a bit late question but we were wondering what is the scope of the discussion in this email thread, as there is also similar discussion in the thread [16] and certain scope seems to be overlapped each other.  For instance, the following objective is being discussed in the thread [16] –   1. *Enhance the hardware requirements for high power devices*    1. *improve the antenna isolation for FWA devices, and*    2. *allow the PC2 UE device to deliver 28dBm power based on already present in the UE in carry 23 dBm and 26 dBm capable transmitters that can operate concurrently (R4-2016439)* |
| Nokia | It is true that this is an additional objective, but at the same time, it would be also true that this is one of the objectives that RAN4 should have discussed, but RAN4 has missed discussing by precedent and established ideas so far. Because the ultimate goal for HPUE for band combination is to allow UE to transmit more power. If there are UEs whose hardware is ready to transmit more than 26dBm(though more careful design must be needed to meet all the necessary requirements than UEs with lower power), it is natural to think about making maximum use of this ability to achieve the goal. Though normally, it is not good to unnecessarily add more objectives considering the RAN4 workload, in the end, discussing this aspect may make the total RAN4 workload less. Because this provides us an opportunity to step back and see the whole picture about HPUE for band combination. And we may be able to avoid the situation that RAN4 and RAN2 specification would be nothing but patches in the end. If other companies have the same understanding, it may be better for the objective to stay. |
| Ericsson | We support to introduce this objective and are OK with the study and specify wording.  We note though that there are a number of other proposals for additional objectives for the existing RAN4 WIs that have not been discussed so far, whereas this topic was discussed because it was flagged. |
| OPPO | As pointed out by Intel, the 28dBm also under discussion in thread [16] which seems more companies are participating. And based on the comments there, it seems no consensus on adding the 28dBm to RAN4 WIs.  The intention of removing cap on the power class is understandable, we are open on the idea and can be discussed in next RAN4 meeting but considering the impacts on requirement definition and testing actually are huge since all the RF requirements are based on the max power and power class definition. Therefore, at this moment, in our view it is premature to be added in the WID. More discussion in RAN4 is needed. |
| vivo | We think the newly proposed scope is already go beyond the original WI should cover, which is for inter-band CA/SUL and is a more general enhancement/revision.  This can also applied to UE which do not support inter-band CA/SUL, no matter a new power class defined or removal of the Powerclass as a cap.  As commented by Intel/OPPO, some related discussions were already happening in other thread and no consensus is reached for new power class, and another option to remove PowerClass as a cap would also cause far more impact for UE. It is proposed to continue discussing them in RAN4 as suggested in last RAN4 meeting before any agreement. |
| Apple | In my view the scenario for (23dBm + 26dBm) in email thread [16] is different from what is targeted in this WI irrespective whether we would call them PC2 or not. The former is for single CC where the requirements are subjected to the outcome of Tx diversity and MPR needs to be further evaluated. However, for inter-band UL CA, the MPR is very much the same as its individual CC (or sub-block). Therefore, if the SAR issue can be resolved, I see the benefit to maximize the capability of each PA to improve the coverage. Also, in general the PA efficiency is maximized at its highest output power. It would be a pity to have a 26dBm PA being used only up to 23 dBm. With that said, (26dBm + 26dBm) with total of 29dBm instantaneous power may also be considered.  With regard to power class, I have been thinking whether it is meaningful to reuse single-CC power class for inter-band UL CA. Maybe a new suite of power classes can be defined specifically for inter-band UL operation, such as PC55, PC33, PC32 (same as PC23?), and PC22. That way the output power capability for each constituent CC can be truly represented. |
| Intel | We think the scope proposed by the WID can be discussed in the email thread [16], and there is no urgency to conclude in this meeting. Considering no consensus in the thread [16] on power class, we like to discuss further in the coming RAN4 meeting. |
|  | Summary for the comments after intermediate round discussion:   * Adding the new scope for HP\_28dBm in to the WID 2365   + Supporting companies：Qualcomm, T-Mobile USA, Verizon, Nokia, Ericsson, Apple   + Objecting companies：Huawei, OPPO, vivo, Intel * The main concerns include:   + Removing the power class cap may have impact to the existing requirements correlated to power class or regulatory requirements.   + The scope is overlapped with that in the email thread [16] which has no consensus reached on this scope.   Recommended WF: Continue discussing in next RAN4 meeting. The revised WID of 2365 is recommended as noted. |
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# Final proposals