[94e-34-RAN4-R17-Spectrum] - Version 0.0.4
RAN

3GPP TSG-RAN Meeting #94-e
RP-213611

Electronic Meeting, December 6 – 17, 2021

Agenda item: 9.1.4, 9.4.4.3

Source: Moderator (RAN4 Chair)

Title: Moderator's summary of discussion [94e-34-RAN4-R17-Spectrum]

Document for: Report

1 Introduction

In this email thread we will discussion the following topics:

- New WID: 4Rx support for NR band n8 (RP-213073)
- New WID proposal for Introduction of NR TDD band in 1670-1675 MHz (RP-213525)
- New WID on Power Class 1.5 CA with xNR DL and 2NR UL bands (x= 2, 3, 4) (RP-212955)
- "Improved MSD" for CA and DC (RP-213006, RP-213146)

The following contributions will be covered.

Table 1:

TDoc	Title	Source	Type	AI
RP-213073	New WID: 4Rx support for NR band n8	CHTTL	New WID	9.1.4
RP-213525	New WID proposal for Introduction of NR TDD band in 1670-1675 MHz	Ligado Networks, Nokia	New WID	9.1.4
RP-212955	WID on Power Class 1.5 CA with xNR DL and 2NR UL bands (x= 2, 3, 4)	Ericsson	New WID	9.1.4

RP-213006	Ongoing work on improving MSD for CA and DC	Qualcomm Incorporated	Discussion	9.1.4
RP-213146	On MSD improvement for band combinations	Huawei, HiSilicon	Discussion and decision	9.4.4.3

In this document, we capture comments and conclusions for this email thread.

2 Topic #1: New WID 4Rx support for NR band n8

2.1 Companies' contribution list

Table 2:

T-doc number	Title	Sourcing company
RP-213073	New WID: 4Rx support for NR band n8	CHTTL

2.2 Initial round

2.2.1 Comments & responses

Sub-topic 1-1: Should we approve this work item in Rel-17 and any other general comment for WI?

Companies are invited to provide comments in the follow table.

Feedback Form 1: Sub-topic 1-1

1 – AT&T GNS Belgium SPRL

We would prefer if the objective could be revised as follows to remove the "at least" statement. We think that it is important to ensure that 4Rx for this low band is targeted for FWA form factor only as with the other low bands to ensure that RAN4 does not have to consider addtional device types in the timeframe available in Rel-17. The "at least" statement seems to imply that other form factors may be possible.

"Specify the 4Rx related requirement for band n8 including ~~at least~~

- ΔR_IB, 4R
  - NOTE 1: 4 Rx operation is targeted for FWA form factor.

2 – AT&T GNS Belgium SPRL

We copied this response to sub-topic 1-3 which is a more appropriate location for the comment. Other than our comment on the core objective, we have no other concerns with the WID.

3 – China Mobile Com. Corporation

We support this WID.

4 – CHTTL

To AT&T: With NOTE 1, we think it is clear that we only focus on FWA form factor for n8 4Rx in this WID. But we are also fine to remove "~~at least~~" as you suggested. Thanks!

5 – China Telecom Corporation Ltd.

We support the WID.

6 – SoftBank Corp.

We are supportive of this WI.

7 – Apple Italia S.R.L.

We recommend to be a bit more explicit in the applicability of 4 Rx operation in the WID with a view toward reusing the same wording in the specification eventually; it can be as follows: "2 Rx antenna ports shall be the baseline for this operating band except for 4 Rx FWA devices"

8 – MediaTek Inc.

We are okay with the WID.

9 – vivo Communication Technology

we are supportive of this WI

10 – Samsung Electronics Co.

We support this WI

11 – CHTTL

BTW we also support the WID obviously.

12 – Huawei Technologies France

We support this WI.

13 – ZTE Wistron Telecom AB

We are supportive of this WI.

14 – Nokia Japan

We support this WI.

15 – Ericsson LM We support this WI.
16 – China Unicom We support this WID.
17 – Intel Corporation (UK) Ltd We support this WI

Sub-topic 1-2: Any comment on the justification part

The justification part is as follows:

To provide higher throughput and better coverage, the 4Rx UE requirements had been introduced since Rel.15. However, with the consideration of the size of the antenna and the handheld UE, the 4Rx requirements was introduced for the mid/high FR1 bands in Rel.15, including NR band n1, n2, n3, n7, n34, n38, n39, n40, n41, n66, n70, n77, n78, n79.

But with the successful 5G commercialization, there has been a variety of 5G UE devices with larger size emerging for different 5G use cases, which increases the possibility on implementing 4Rx in the low band. So in Rel.16, 4Rx requirements had been further introduced for NR band n28, n30, n48, n71, including the two low bands n28 and n71. And a note had been added for these two low bands that 4Rx operation is targeted for FWA form factor.

As 4Rx had been supported in 600MHz (n71) and 700MHz band (n28), it is also quite important to support 4Rx in 900MHz band (n8) to further improve the performance in rural and suburban areas.

Since 4Rx is already supported for some low bands in the current specification. Therefore, a WI can be started to further discuss and agree on the corresponding 4Rx requirements for band n8 in the RAN4 specifications.

Companies are invited to provide comments in the follow table.

Feedback Form 2: Sub-topic 1-2

1 – Ericsson LM Justification part looks fine to us.

Sub-topic 1-3: Comments and responses on the proposed objectives

The following objectives are proposed in the WID.

Core part:

The core part includes

Specify the 4Rx related requirement for band n8 including at least $\Delta R_{IB,\ 4R}$ *NOTE 1: 4 Rx operation is targeted*

for FWA form factor. Add conformance testing in RAN5 specifications (to follow at a later stage)

Perf. part

This Perf. Part WI has to standardize the Perf. Part requirements:

- *Required changes to be added to release independence TS 38.307.*

Companies are invited to provide comments and responses in the following table.

Feedback Form 3: Sub-topic 1-3

1 – AT&T GNS Belgium SPRL

Resubmitting our post from sub-topic 1-1 here.

We would prefer if the objective could be revised as follows to remove the ”at least” statement. We think that it is important to ensure that 4Rx for this low band is targeted for FWA form factor only as with the other low bands to ensure that RAN4 does not have to consider addtional device types in the timeframe available in Rel-17. The ”at least” statement seems to imply that other form factors may be possible.

”Specify the 4Rx related requirement for band n8 including ~~at least~~

- ΔR_IB, 4R
  - NOTE 1: 4 Rx operation is targeted for FWA form factor.

2 – China Mobile Com. Corporation

We support the objecitves. For AT&T’s comments, our understanding is that the ”at least” is not for the form factor, but for ΔRIB, 4R, i.e. the requirements to specify. If my understanding is correct, we can make the ”note” about form factor as a parallel bullet instead of a subbullet.

3 – CHTTL

We share the same understanding as CMCC. We are ok to remove the ”at least” since there is no other requirement expected to be specified, and we are also fine with the CMCC’s suggestion.

4 – Apple Italia S.R.L.

We recommend to be a bit more explicit in the applicability of 4 Rx operation in the WID with a view toward reusing the same wording in the specification eventually; it can be as follows: “2 Rx antenna ports shall be the baseline for this operating band except for 4 Rx FWA devices”

5 – CHTTL

To Apple: The wording in this WID ”*NOTE 1: 4 Rx operation is targeted for FWA form factor.*” is already the same wording used in the specification. This should be clear enough.

6 – Samsung Electronics Co. we support to limit the scope to FWA and follow CMCC suggestions
7 – ZTE Wistron Telecom AB We are fine with the current objectives.
8 – Intel Corporation (UK) Ltd We are ok to limit to FWA only.

Sub-topic 1-4: Comments and responses on impacted/new specifications and target completion date & time budget

The proposed impacted specifications as well as target completion date are as follows:

Table 3:

Impacted existing TS/TR *{One line per specification. Create/delete lines as needed}*			
TS/TR No.	Description of change	Target completion plenary#	Remarks
38.101-1	*Add 4Rx related RF core requirements for NR band n8*	*TSG#95*	*Core part*
38.307	*Define 4Rx operation as release independent feature, if necessary.*	*TSG#95*	*Perf. part*

Companies are invited to provide comments and responses in the following table.

Feedback Form 4: Sub-topic 1-4

1 – Ericsson LM We are fine with the target data.

2.2.2 Summary

There is a consensus to approve the work item. There are some comments on the objective: one is to delete ”at least” and target the work at the FWA/CPE type of device only; the other is to add the applicability statement for 4Rx operation.

The revision of WID is needed in the intermediate round.

2.3 Intermediate round

2.3.1 Comments & responses

For the first comment, the consensus was reached. Then ”at least” can be deleted and a note can be added. For the second comment, it is unclear to moderator. There seem no exact such words in 38.101-1. And there is the general applicability statements in Section 7.3.1 that

In later clauses of Clause 7 where the value of REFSENS is used as a reference to set the corresponding requirement:

in all bands, the UE shall be verified against those requirements by applying the REFSENS value in Table 7.3.2-1a and in Table 7.3.2-1b with 2 Rx antenna ports tested;

for bands where the UE is required to be equipped with 4 Rx antenna ports, the UE shall additionally be verified against those requirements by applying the resulting REFSENS value derived from the requirement in Table 7.3.2-2 with 4 Rx antenna ports tested.

And with the response from CHTTL, I wonder if Apple is OK not to add the wording for the applicability in the WID.

Please check if the following revised objectives are acceptable.

Proposal 1: it is proposed to approve the objectives as below

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Core part:

The core part includes

- Specify the 4Rx related requirement for band n8 including ~~at least~~
  - $\Delta R_{IB, 4R}$
    - ~~NOTE 1: 4 Rx operation is targeted for FWA form factor.~~
- Add conformance testing in RAN5 specifications (to follow at a later stage)
- NOTE: 4 Rx operation is targeted for FWA form factor.

Perf. Part:

This Perf. Part WI has to standardize the Perf. Part requirements:

- Required changes to be added to release independence TS 38.307.

Can we agree on the proposal 1? Is there any other change on the objectives? Please provide your comments in the table below.

Feedback Form 5:

1 – AT&T GNS Belgium SPRL

We don't understand the need to remove the sub-bullet for NOTE 1 as previously listed and place it into a separate NOTE. Since NOTE 1 is in the existing 4Rx table note, this made it clear that the n8 4Rx requirement will point to the same table note as the other low bands. This made it clear to RAN4 that the perfomance requirements would follow the same assumptions as the other low bands. We prefer the original formulation with the NOTE 1.

2 – CHTTL

We are also fine with the moderator's proposal. But how about we put it as a parallel bullet of delta R as below? (if I understand CMCC comment correctly)

Alternative proposal below:

- Specify the 4Rx related requirement for band n8 including ~~at least~~
  - ΔRIB, 4R
  - NOTE 1: 4 Rx operation is targeted for FWA form factor.
- Add conformance testing in RAN5 specifications (to follow at a later stage)

3 – China Mobile Com. Corporation

Support the objectives in proposal 1. The current NOTE is clear enough, it means this WI for 4Rx n8 is targeted for FWA form factor.

4 – Huawei Technologies France

We are fine with proposal 1. No matter where to put the note, the info is clear that the WI is for FWA UE type.

5 – Beijing Xiaomi Mobile Software

We are ok with proposal 1.

6 – Apple Italia S.R.L.

We would like to thank the companies for considering our comment and for the further clarification of the objectives in this round. The concern we have, however, is with the matter of interpreting the phrase "is targeted for." In our understanding, the WID should clearly identify the applicability of the new requirements to specific device types. Our proposed objective achieved this. Perhaps another way is to replace "is targeted for" with "is restricted to."

7 – China Telecom Corporation Ltd.

Proposal 1 looks fine, and the information is clear no matter the note is put in the main bullet or sub-bullet.

8 – Intel Corporation (UK) Ltd We are fine with moderator proposal. For the Note we don't have strong preference where to put it. We are also ok with Apple suggestion, although current wording is acceptable as well.
9 – Samsung Electronics Co. We support Moderator proposal
10 – China Unicom We are fine with moderator's proposal.
11 – Ericsson LM We are fine with moderator's proposal or updated version from CHTTL is also OK
12 – ZTE Wistron Telecom AB We support Moderator's proposal.
13 – CHTTL To apple: Again, The NOTE is "4 Rx operation is targeted for FWA form factor." is from the current specification when specifying the requirement for other low bands in Rel.16. Also we never use "is restricted to." for the other cases for FWA form factor in the current specifications. So the moderator's proposal is clear enough.

2.3.2 Summary

There are two comments on the objectives.

One is related where the NOTE should be put. In the moderator understanding, the difference between putting the NOTE in top level and under the first main bullet is that the first approach means the whole work for 4Rx on n8 is limited to FWA type device while the latter means the requirements are limited to FWA. But the moderator wonder if this issue is quite essential. The moderator is fine with either way.

Apple propose to change NOTE from "4Rx operation is targeted for FWA form factor" to " 4Rx operation is ~~targeted~~ restricted to~~for~~ FWA form factor". But the wording of 4Rx operation is targeted for FWA form factor comes from the exisiting specification. I wonder if it is neceesary to change it.

The moderator suggests the following proposals for discussion in GTW:

Proposal 1: it is proposed to approve the objectives as below

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Core part:

The core part includes

Specify the 4Rx related requirement for band n8 including ~~at least~~ $\Delta R_{IB,\,4R}$ ~~NOTE 1: 4 Rx operation is~~

~~targeted for FWA form factor.~~ Add conformance testing in RAN5 specifications (to follow at a later stage) NOTE: 4 Rx operation is targeted for FWA form factor.

Perf. Part:

This Perf. Part WI has to standardize the Perf. Part requirements:

- Required changes to be added to release independence TS 38.307.

Proposal 1a: it is proposed to approve the objectives as below

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Core part:

The core part includes

Specify the 4Rx related requirement for band n8 including ~~at least~~ $\Delta R_{IB,\,4R}$ ~~NOTE 1: 4 Rx operation is targeted for FWA form factor.~~ NOTE: 4 Rx operation is targeted for FWA form factor Add conformance testing in RAN5 specifications (to follow at a later stage).

Perf. Part:

This Perf. Part WI has to standardize the Perf. Part requirements:

- Required changes to be added to release independence TS 38.307.

2.4 Final round

3 Topic #2: New WID proposal for Introduction of NR TDD band in 1670-1675 MHz

3.1 Companies' contribution list

Table 4:

T-doc number	Title	Sourcing company
RP-213525	New WID proposal for Introduction of NR TDD band in 1670-1675 MHz	Ligado Networks, Nokia

3.2 Initial round

3.2.1 Comments & responses

Sub-topic 2-1: Should we approve this work item in Rel-17 and any other general comment for WI?

Companies are invited to provide comments in the follow table.

Feedback Form 6: Sub-topic 2-1

1 – Nokia Japan We support this WI.
2 – Apple Italia S.R.L. With only one quarter left until Rel-17 completion, we are afraid that there is not sufficient time in Rel-17 to complete this work. We recommend initiating this work item in Rel-18.

Sub-topic 2-2: Any comment on the justification part

The justification part is as follows:

Ligado Networks has contractual and regulatory authority to use the 5 MHz of spectrum associated with the FCC's nationwide license for 1670-1675 MHz as per CFR Title 47 §27.50(f) [1].

FCC has not mandated the radio propagation direction for the 1670 – 1675 MHz band (forward or reverse link) and leaves that to the operator's discretion. Acceptable access techniques include both FDD and TDD technologies, provided the relevant FCC transmitter emissions and other regulatory and requirements are met. Ligado aims to use the spectrum as 5 MHz NR TDD channel.

The NR deployment in this band will adhere to all 3GPP terrestrial out-of-band requirements for spurious emissions including those for UE, eNB, and UE-to-UE emissions as will be defined in 3GPP TS 38.101, TS 38.104, and other relevant documents. Spurious emission requirements from the addition of this new band are expected to be the same as those required from the addition of other new US bands in 3GPP.

Companies are invited to provide comments in the follow table.

Feedback Form 7: Sub-topic 2-2

Sub-topic 2-3: Comments and responses on the proposed objectives

The following objectives are proposed in the WID.

Core part:

The objective of the core part of work item is to:

Specify a new NR TDD operating band, to include BS transmit frequency range: 1670 MHz –1675 MHz, UE transmit frequency range: 1670 MHz–1675 MHz Channel bandwidth of 5 MHz with supported subcarrier spacing of 15 kHz This new NR band is expected to be release independent starting from Rel-15

Perf. part

The objective of this performance part work item is to:

Specify a new NR TDD operating Band to include the performance requirements with support of 5 (15 kHz SCS) MHz channel bandwidth

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Companies are invited to provide comments and responses in the following table.

Feedback Form 8: Sub-topic 2-3

Sub-topic 2-4: Comments and responses on impacted/new specifications and target completion date & time budget

The proposed impacted specifications as well as target completion date are as follows:

Table 5:

Impacted existing TS/TR			
TS/TR No.	Description of change	Target completion plenary#	Remarks
TS 36.104	E-UTRA; BS Radio transmission and reception	TSG RAN#95 March 2022	Core part
TS 38.101-1	NR; UE Radio transmission and reception	TSG RAN#95 March 2022	Core Part
TS 38.104	NR; BS Radio transmission and reception	TSG RAN#95 March 2022	Core Part
TS 37.104	E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception	TSG RAN#95 March 2022	Core part

TS 37.105	Active Antenna System (AAS) Base Station (BS) transmission and reception	TSG RAN#95 March 2022	Core Part
TS 36.141	E-UTRA; BS conformance testing	TSG RAN#97 Sept. 2022	Perf. Part
TS 37.141	E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing	TSG RAN#97 Sept. 2022	Perf. Part
TS 38.133	NR; Requirements for support of radio resource management	TSG RAN#97 Sept. 2022	Perf Part
TS 38.141-1	NR; Base Station (BS) conformance testing Part 1: Conducted conformance testing	TSG RAN#97 Sept. 2022	Perf. Part
TS 38.141-2	NR; Base Station (BS) conformance testing Part 2: Radiated conformance testing	TSG RAN#97 Sept. 2022	Perf. Part
TS 37.145-1	Active Antenna System (AAS) Base Station (BS) conformance testing; Part 1: conducted conformance testing	TSG RAN#97 Sept. 2022	Perf. Part
TS 37.145-2	Active Antenna System (AAS) Base Station (BS) conformance testing; Part 2: radiated conformance testing	TSG RAN#97 Sept. 2022	Perf. Part

Companies are invited to provide comments and responses in the following table.

Feedback Form 9: Sub-topic 2-4

3.2.2 Summary

One company proposed to postpone it to Rel-18 due to the limited left time in Rel-17, while one company supported it. No other company commented. Furhter discusion is needed.

3.3 Intermediate round

3.3.1 Comments & responses

There is no comment on the objectives and impacted specifications. The moderator suggests to focus on sub-topic 2-1.

Sub-topic 2-1: Should we approve this work item in Rel-17 and any other general comment for WI?

There would be two options to handle the WI.

- Option 1: Approve it as Rel-17 WI.
- Option 2: Postpone it to Rel-18.

I wonder if the company has a strong view. So to save time, the moderator would like to suggest option 1 to see if company can live with it.

Proposal 2: Approve the WI for Introduction of NR TDD band in 1670-1675 MHz in Rel-17.

Please provide your comment in the table below.

Feedback Form 10:

1 – T-Mobile USA Inc. We don't have a strong view, but 1 quarter to complete the core requirements for this new band doesn't seem realistic. This band is located 9.5 MHz from n24 but n24 has 10 MHz carriers. Have a new TDD band 9.5 MHz from an existing FDD band uplink with 10 MHz carriers seems like coexistence will need to be studied. Because of that, it seems like it would be better if this was a Rel-18 WI. Otherwise it will likely not be completed in time and the rapporteur will have to deal with exception sheets.
2 – Qualcomm Korea Previously, the proponent was advocating to use this spectrum for DL possibly combined with 1675 - 1680 MHz (RP-200783) but now is proposing TDD. The 1675 - 1680 is currently allocated for meteorological service. What would be the impact of placing a TDD channel immediately adjacent to it?
3 – Apple Italia S.R.L. We still respectfully recommend to give this work item the benefit of a complete release, as the work scope

is too difficult to conclude in the 1 quarter remaining in Rel-17. Thus, our preference is Option 2.

4 – Saankhya Labs

Support Option 1. Typically RAN has not delayed spectrum related work and there is nothing specific in this WI that requires a delay to Rel-18

5 – Ericsson LM

We have concern on the target date. 1 quarter is unrealistic for WI on band. This will also increase RAN4 work load. Realistic timeline for band WI is 3 quarters. Even it is approved as Rel-18 WI, the NR bands are release independent from R15. So release should not be used as reason to set unrealistic target completion date.

6 – Ligado Networks

We support option 1.

Ligado is the operator for both band n24 as well as this new proposed 1670-1675 MHz band. n24 operation in the UL is up to 1656.5 MHz (as noted for the band in 38.101-1) and this creates a minimum of 13.5 MHz separation from band 1670-1675 MHz which is enough distance. As an example, there is 9 MHz distance between band 14 downlink and band 13 uplinks.

Coordination rules with neighboring meteorological service are based on geographic coordination around handful of earth stations and are defined by the FCC in its order.

The completion for the perf part of Rel-17 is in Sept, ’22 and there is ample time to complete the perf. part of this WI by that time. If for whatever reason, the work cannot be completed within the Rel-17 timeframe, the WI can be moved to Rel-18. Generally, RAN has not delayed spectrum related work and there is nothing in the scope of this WI that requires a delay to Rel-18

7 – Nokia Japan

We support the option 1. A new band UE does not need A-MPR to protect n24 since n24 is UL. If there is no co-existence issue, we expect that this WI can be completed in Rel-17 with two meetings. And we think it’s possible to complete it even if there was a co-existence issue. It’s better to start this WI as soon as possible.

3.3.2 Summary

Four companeis expressed the concern on starting Rel-17 WI. Two companies supported it. There is no concensus to start the work in Rel-17.

3.4 Final round

4 Topic #3: New WID on Power Class 1.5 CA with xNR DL and 2NR UL bands (x= 2, 3, 4)

4.1 Companies’ contribution list

Table 6:

T-doc number	Title	Sourcing company
RP-212955	WID on Power Class 1.5 CA with xNR DL and 2NR UL bands (x= 2, 3, 4)	Ericsson

4.2 Initial round

4.2.1 Comments & responses

Sub-topic 3-1: Should we approve this work item in Rel-17 and any other general comment for WI?

Companies are invited to provide comments in the follow table.

Feedback Form 11: Sub-topic 3-1

1 – TELECOM ITALIA S.p.A. We support the approval of the Work Item in Rel 17. This is an urgent topic addressing market needs.
2 – Skyworks Solutions Inc. We have a issue with the description: in justification it says One of NR uplink bands is a TDD band and one is a FDD band. but the only way to reach 29dBm is to have two bands with PC2 capability (26dBm each). Since PC2 FDD bands are not yet specified (n1 and n3 are still being discussed), the only way is to have two TDD bands. Either the WI is modified to target two TDD bands at PC2 each or the WI is postponed until a PC2 FDD band is completed. For a 26dBm (TDD)+23dBm (FDD) combination the nominal power that can be reached is 27.8dBm and thus does not correspond to PC1.5 (29dBm) unless higher talerance down are agreed for PC1.5 definition. further discussion/agreements are needed to allow PC1.5 definition for a 26+23 dBm case knowing that current PC1.5 definitions for intra-band or ENDC is based on TDD only with 2x26dBm capability.
3 – Verizon UK Ltd Verizon supports this work item from Rel-17 as the major generic requirements for the PC1.5 CA are not available yet. RAN4 needs to continually develop the requirements in Rel-17 and forward them to next release timeframe for the detailed band combinations. In our view, the scope of this work need to cover the uplink band combination includes at least one TDD band. And, the uplink FDD+TDD band combinations could be in different scenarios, including - NR 23dBm (FDD) + NR 26dBm (TDD), - NR 26dBm (FDD) + NR 26dBm (TDD), and - NR 23dBm (FDD) + NR 29dBm (TDD)

Skyworks pointed out a considerable possible power class above which is under RAN4 discussion now. As RAN4 did not reach to a conclusion at time, we would like to keep the scenario in, until a final decision from RAN4.

4 – AT&T GNS Belgium SPRL

We support this proposal and have added additional requests for AT&T in a draft revision in ”Rev1 of RP-212955 WID on Power Class 1.5 CA with xNR DL and 2NR UL bands (x= 2, 3, 4) – ATT.docx” for easy viewing in the directory below. We also support the addition of ”NR 23dBm (FDD) + NR 29dBm (TDD)” as suggested by Verizon as it is important to allow for PC1.5 CA operation with single-uplink on TDD.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-34-RAN4-R17-Spectrum%5D/Initial%2

The AT&T requests are targeted for FWA applications. We used revision marking to show the changes and to add AT&T as a supporting company.

5 – Ericsson LM

We are fine with the proposed updates from AT&T and will use this version for further revisions in the next round unless there are more comments/updates to the WID.

6 – T-Mobile USA Inc.

We don’t think we can have a basket for PC1.5 with 2 B UL CA until we have a WID for PC1.5 with 2 band UL CA. We agree with Skyworks that currently the only way to achieve PC1.5 is with two PC2 transmitters. We suggest that a non-basket WI for PC1.5 UL CA for Rel-18 should be pursued instead of this Rel-17 basket.

7 – Qualcomm Korea

We also recognize some of the concerns raised above. The general requirements for PC1.5 UL CA haven’t been defined yet, so we shouldn’t approve a basket work item yet. Also, FDD PC2 isn’t completed yet either upon which this work would depend (at least for some of the identified band configurations). A release 18 work item for PC1.5 UL CA would be agreeable to us.

8 – Beijing Xiaomi Mobile Software

We agree with the view from T-Mobile USA Inc and Qualcomm, it should have a WID to address some general requirements, such as SAR issue before a bask WID. Moreover, PC2 FDD is under discussion, it is better to wait until the requirments for PC2 FDD are completed.

9 – China Telecom Corporation Ltd.

We also agree that the general requirements for PC 1.5 UL CA haven’t been defined yet, and we need to wait for the completion of WI on ”Increasing UE power high limit for CA and DC”. In addition, it is unclear to us whether 23+26dBm can be called as PC 1.5.

10 – Apple Italia S.R.L.

In general, we consider that it is beneficial for RAN4 to develop requirements for UEs which combine both UL CA and UL MIMO features. We outlined our views on this topic in our contribution RP-213182. Given that RAN4 defines PC1.5 exclusively for 2 Tx, then there are two possible interpretations of the underlying UE RF architecture: 3 Tx with PC1.5 (PC1.5 with UL MIMO on band A + band B) or 2 Tx with PC1.5 (26 dBm on band A + 26 dBm on band B). Both of these cases, in our understanding, necessitate core requirement work in Rel-18. For the 3 Tx case, we recommend considering the following objective

to be included in the non-spectrum RAN4 RF Rel-18 package ”Enhance the core requirements for UEs supporting both UL MIMO and UL CA under the assumption of a UE architecture with 3 Tx chains” and also including one band combination from the list submitted in this basket WID proposal to be used as an example band combination.

For the 2 Tx case, we have the following additional observations:

1. There is an ongoing WID on ”Increasing UE power high limit for CA and DC” which is intended to handle the UL combinations with 23dBm+26dBm and 26dBm+26dBm etc. and we may not want to specify new power classes for such UL combinations. The proposed basket WID can wait for the completion of this Rel-17 WID before adding other band combinations.

2. 23dBm+26dBm power level is in between PC2 and PC1.5. Defining it as PC2 or PC1.5 would be confusing. We also prefer not to define a new power class such as PC1.8. In our view, the combined power for inter-band UL CA is of no importance if the intention is to maximize each constituent band’s power capability.

3. The WID on PC2 for FDD band has not been completed yet. So for FDD+TDD UL combinations, the configuration cannot yet be 26dBm+26dBm.

4. For CA_n48A-n77A, it is considered as intra-band UL CA from RF perspective. There is not yet any RAN4 work on PC1.5 intra-band UL CA. This combination should be excluded from inter-band UL CA basket WID.

Once the core requirement work stabilizes in RAN4, we recommend revisiting this proposed basket WID (e.g. a checkpoint could be the September RAN plenary meeting).

11 – MediaTek Inc.

We can understand the intention. At this stage, n1 and n3 are the only bands for NR PC2 FDD Rel-17 WID scope and RAN4 colleagues are keep working on solving MSD issues. Regarding introducing other PC2 FDD bands for CA in Rel-17, we think further discussion are needed for consensus.

12 – vivo Communication Technology

We share similar views with other companies. We also prefer the completion of FDD HPUE WI, before starting FDD 26dBm related basket WID.

13 – Guangdong OPPO Mobile Telecom.

For FDD+TDD case, if use 26+26 power combination, better wait until PC2 FDD is completed for the corresponding bands, and if use two PC3 FDD to achieve PC2 FDD, then in total 3Tx should be implemented and currently 3Tx is proposed in Rel-18 for further study. Therefore, these FDD+TDD PC1.5 band combinations should be removed from Rel-17.

14 – Samsung Electronics Co.

We share the similar concerns as other vendors to have 23+29 and 23+26 scenarios in Rel-17 given the relative core requirements disucssion is not specified yet in RAN4. To fulfill the urgent request from operators, we are fine to discuss the basket WI for proposed band combinations assuming 26+26 implemenation only by using existing PC1.5 framework in Rel-17 remaining time. Other scenarios (23+29, 23+26) can be discussed in the future release once the PC1.5 framework is updated considering different implementations.

15 – Huawei Technologies France

The only way to reach PC1.5 is 2x26 for current UE implementation. To support PC1.5 TDD band + PC3 FDD band (PC2 FDD is not finished yet), it means UE can only deliver 27.8dBm output power with 1T

for each band. Also as mentioned by other companies, PC1.5 UL CA is not specified yet. It's premature to have a basket WI in Rel-17 for such kind of PC1.5 CA.

16 – LG Electronics Deutschland

When there is an issue of RF architecture and related RF core requirements foreseen, we think a careful approach is needed before starting the work in Rel-17 as spectrum WI. As commented by many vendors, there seem issues of Tx RF architectures and related technical discussion which depends on the progress on ongoing Rel-17 RF core WI like FDD PC2. So we think it would be better to study this work in Rel-18 and need to check whether there is no core RF issue related to this spectrum-related proposal.

17 – ZTE Wistron Telecom AB

(1) In general, we have similar concerns that the conditions to approve this WI are not fully satisfied yet at this moment. In particular, the requested FDD bands are not in the scope of the ongoing Rel-17 FDD HPUE WI.

(2) For the band combo CA_n48A-n77A, it is a TDD+TDD band combo, NOT an FDD + TDD. Can the proponents double check this?

18 – Nokia Japan

There are several issues to be addressed before the WI is approved. We think that we need to finish a dedicated WI for PC2 FDD for CPE purpose if the targeted device type is CPE.

- Basket or dedicated WI
  - This should not be a basket but rather dedicated WI to develop generic requirements for PC1.5(PC2 FDD + PC2 TDD).
- Power class clarification
  - 23dBm+26dBm is not a PC1.5 and the discussion is on-going under Increasing UE power high limit for CA and DC WI
- Device types are not clear if it is targeted at CPE or smartphone.
  - If the work targets at smartphone, this WI needs to wait for the completion of PC2 FDD WI if it targets at CPE, a dedicated WI for PC2 FDD for FWA would be needed.

19 – Skyworks Solutions Inc.

As an additional aspect to be considered for clarification from porponents the combination CA_n48-n77 is TDD/TDD similar to intra-band and it is unclear whether the -40dBm/MHz OOB limit associated with n48 applies to this UL CA which would then require a very large A-MPR. Also if intra-band, does it mean 23+26, 23+29, 26+26, 26+29....? and how many PAs?

Or is it PC1.5 on n77 1UL only which should be easy to cover?

It is good to see that this is for FWA implementation but it really needs clarification of the UL configurations and the WI should be 100% clear about this: table 1 has two columns both called CA configuration (is it then DL and UL?) there should be a column clarifying UL configuration and associated power class per band.

20 – China Unicom

The WID contains the scope of FDD 26dBm + TDD 26dBm, however the normative work for FDD 26dBm hasn't been completed yet, so this scope should not be included as part of the work item. We suggest to have a separate WI for FDD 26dBm + TDD 26dBm (i.e. RP-213153) in Rel-18 after the completion of WI on NR FDD PC2. The current WI may include FDD 23dBm + TDD 26dBm in which the requirements are already completed, but careful consideration on power class is needed.

Sub-topic 3-2: Any comment on the justification part

The justification part is as follows:

This Work Item will focus on power class 1.5 (PC1.5) CA band combinations with 29dBm maximum output power, in which configurations for x NR bands DL and 2 (1FDD+1TDD) NR bands UL will be defined under this WI, where

- *The downlink x is 2, 3 or 4 NR bands*
- *The uplink is 2 NR bands*
- *One of NR uplink bands is a TDD band and one is a FDD band*

Companies are invited to provide comments in the follow table.

Feedback Form 12: Sub-topic 3-2

1 – Skyworks Solutions Inc.

See our comment above on TDD+FDD case that does not support 29dBm as no PC2 FDD is complete. as for 26+23dBm case we do not see that is belongs to PC1.5 definition

2 – Verizon UK Ltd

See our comment above for the both generic requirements and the scope of scenarios of possible uplink CA.

If companies believe RAN4 needs time for completion of PC2 generic requirements, we also agree to move this work to Rel-18.

3 – AT&T GNS Belgium SPRL

We support the justification section. We also support the comment made by Verizon that if companies believe RAN4 needs more time for completion of PC2 FDD generic requirements, we can agree to move this work to Rel-18.

4 – T-Mobile USA Inc.

Until we first complete a WI for P_C1.5 for UL CA it is premature to discuss justification for a PC1.5 UL CA basket WID.

5 – Qualcomm Korea

Agree with the comment from T-Mobile. Maybe (some of) the specific band combinations identified could be included in the UL CA work item, but not as a basket.

6 – Skyworks Solutions Inc.

At least it seems to us that the 23+26dBm combinations are de facto convered by PC2 inter-band power class and allowing each band to reach its maximum power, if so do we need another power class and basket?Also we think that 1UL PC1.5 is covered in R17.

For the other cases we need to sort out the generic aspects related to power class definition, reachable max power, MSD power conditions, number of Tx, SAR aspects. May be it is worth continuing this discussion in details to have a well structured WI in R18.

Sub-topic 3-3: Comments and responses on the proposed objectives

The following objectives are proposed in the WID.

Core part:

- *PC1.5 NR CA band combinations introduced by this WI will be introduced starting with REL-17.*
- *Specify the band-combination specific RF requirements for all listed NR CA combinations for*
  - *2 different bands DL with 2 (1FDD+1TDD NR) bands UL, or*
  - *3 different bands DL with 2 (1FDD+1TDD NR) bands UL, or*
  - *4 different bands DL with 2 (1FDD +1TDD NR) bands UL.*
- *including at least*

Applicable frequencies Applicable bandwidths and bandwidth sets

- *Analyze combinations that have self-desensitization due to following reasons:*

TX Harmonic overlap of receive band TX signal overlap of receiver harmonic frequency TX frequency being in close proximity of one of the receive bands Any other identified reasons

- *For the combination where self-desensitization exists, specify at least needed*

Reference sensitivity excerptions UL RB restrictions for REFSENS test

- *Add conformance testing in RAN5 specifications (to follow at a later stage) of all Rel-17 CA combinations that fall into the category defined by the WI title.*

Note□the uplink band combination includes at least one TDD band. And, the uplink FDD+TDD band combinations could support NR 23dBm + NR 26dBm, NR 26dBm + NR 26dBm.

The configurations of power class 1.5 UE for NR CA band combinations are defined in the table 1 below:

Table 1: Power class 1.5 NR CA band combinations within FR1

Table 7:

CA configuration	**CA configuration**	**contact name, company**	**Contact email**	**other supporting companies (min. 3)**	**status (new, ongoing, completed, stopped)**
CA_n2A-n77A	CA_n2A-n77A	Zheng Zhao, Verizon	zheng.zhao@verizonwireless.com		Completed for PC3, Completed for PC2
CA_n5A-n77A	CA_n5A-n77A	Zheng Zhao, Verizon	zheng.zhao@verizonwireless.com		Completed for PC3, Completed for PC2
CA_n13A-n77A	CA_n13A-n77A	Zheng Zhao, Verizon	zheng.zhao@verizonwireless.com		Completed for PC3, Completed for PC2
CA_n48A-n77A	CA_n48A-n77A	Zheng Zhao, Verizon	zheng.zhao@verizonwireless.com		Completed for PC3, Completed for PC2
CA_n66A-n77A	CA_n66A-n77A	Zheng Zhao, Verizon	zheng.zhao@verizonwireless.com		Completed for PC3, Completed for PC2

Perf. part

Specify the necessary performance requirements such as release independence in TS 38.307.

Companies are invited to provide comments and responses in the following table.

Feedback Form 13: Sub-topic 3-3

1 – Skyworks Solutions Inc.

We are open to the specification of above combinations but we need first to clarify the cases:

for FDD+TDD we assume these are 23+26dBm cases and whether this belongs to PC1.5 as is needs further discussion.

For n48+n77 is this 26+26dBm? or 23+26dBm?

2 – AT&T GNS Belgium SPRL

We share similar comments as in Sub-topic 3-1. We have added additional requests for AT&T targeted at FWA in a draft revision using revision marking in ”Rev1 of RP-212955 WID on Power Class 1.5 CA with xNR DL and 2NR UL bands (x= 2, 3, 4) – ATT.docx” for easy viewing in the directory below. We also think that the note needs to be updated to add ”NR 23dBm (FDD) + NR 29dBm (TDD)” as suggested by Verizon as it is important to allow for PC1.5 CA operation with single-uplink on TDD.

https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_94e/Inbox/Drafts/%5B94e-34-RAN4-R17-Spectrum%5D/Initial%2

3 – T-Mobile USA Inc.

As we stated above, we can’t have a basket WID for PC1.5 UL CA until we complete a WID with PC1.5 UL CA.

4 – Verizon UK Ltd

Same as AT&T, we are also interested in FWA UPUE in three scenarios above. And, this work should not exclude the smartphones requirements in both scenarios ”NR 23dBm (FDD) + NR 26dBm (TDD)” and ”NR 26dBm (FDD) + NR 26dBm (TDD)” from others.

5 – Apple Italia S.R.L.

In general, we consider that it is beneficial for RAN4 to develop requirements for UEs which combine both UL CA and UL MIMO features. We outlined our views on this topic in our contribution RP-213182. Given that RAN4 defines PC1.5 exclusively for 2 Tx, then there are two possible interpretations of the underlying UE RF architecture: 3 Tx with PC1.5 (PC1.5 with UL MIMO on band A + band B) or 2 Tx with PC1.5 (26 dBm on band A + 26 dBm on band B). Both of these cases, in our understanding, necessitate core requirement work in Rel-18. For the 3 Tx case, we recommend considering the following objective to be included in the non-spectrum RAN4 RF Rel-18 package ”Enhance the core requirements for UEs supporting both UL MIMO and UL CA under the assumption of a UE architecture with 3 Tx chains” and also including one band combination from the list submitted in this basket WID proposal to be used as an example band combination.

For the 2 Tx case, we have the following additional observations:

1. There is an ongoing WID on ”Increasing UE power high limit for CA and DC” which is intended to handle the UL combinations with 23dBm+26dBm and 26dBm+26dBm etc. and we may not want to specify new power classes for such UL combinations. The proposed basket WID can wait for the completion of this Rel-17 WID before adding other band combinations.

2. 23dBm+26dBm power level is in between PC2 and PC1.5. Defining it as PC2 or PC1.5 would be confusing. We also prefer not to define a new power class such as PC1.8. In our view, the combined power for inter-band UL CA is of no importance if the intention is to maximize each constituent band’s power capability.

3. The WID on PC2 for FDD band has not been completed yet. So for FDD+TDD UL combinations, the configuration cannot yet be 26dBm+26dBm.

4. For CA_n48A-n77A, it is considered as intra-band UL CA from RF perspective. There is not yet any RAN4 work on PC1.5 intra-band UL CA. This combination should be excluded from inter-band UL CA basket WID.

Once the core requirement work stabilizes in RAN4, we recommend revisiting this proposed basket WID (e.g. a checkpoint could be the September RAN plenary meeting).

6 – China Unicom

As commented in 3-1, the normative work for FDD 26dBm hasn't been completed yet, so the objective of FDD 26dBm + TDD 26 dBm should be included as part of the work item. The WI for FDD 26dBm + TDD 26dBm can be started after the completion of FDD PC2 WI (as in draft WID RP-213153). And in our view, 23dBm+26dBm does not belong to Power Class 1.5, which corresponds to 29dBm UE output power.

Sub-topic 3-4: Comments and responses on impacted/new specifications and target completion date & time budget

The proposed impacted specifications as well as target completion date are as follows:

Table 8:

New specifications *{One line per specification. Create/delete lines as needed}*					
Type	TS/TR number	Title	For info at TSG#	For approval at TSG#	Remarks
Internal TR	*TR 37.xxx*	PC1.5 Rel-17 NR inter-band CA of xDL and 2UL (1FDD+1TDD) bands (x= 2, 3, 4)		*TSG#95e*	Core part

Table 9:

Impacted existing TS/TR *{One line per specification. Create/delete lines as needed}*			
TS/TR No.	Description of change	Target completion plenary#	Remarks

38.101-3	Add PC1-5 CA to User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios	RAN#95	Core part
38.307	Add PC2 CA Requirements on User Equipment (UEs) supporting a release-independent frequency band	RAN#95	Perf. part

Companies are invited to provide comments and responses in the following table.

Feedback Form 14: Sub-topic 3-4

4.2.2 Summary

3 operators supported it and showed the big interets. Many vendors and other operators expressed their views on the dependency of the proposed work on the on-going work in RAN4.

To move forward, the moderator suggests the look at each requested band combinations to clarify the dependency and discuss how to move forward in order to get everyone on the same page.

4.3 Intermediate round

4.3.1 Comments & responses

The moderator would like to provide the brief summary below according to UE architecture and targeting UL CA band combinations.

Table 10:

Num	**UE architecture and band combination type**	**Requested band combination**	**Analysis of dependency on on-going work**	**Suggested way forward**

#1	23dBm FDD + 26dBm TDD	CA_n2A-n77A, CA_n5A-n77A, CA_n13A-n77A, CA_n66A-n77A, CA_n12A-n77A, CA_n14A-n77A, CA_n30A-n77A	No dependency The approach specified by Rel-17 WI for increasing UE power high limit for CA and DC could be applied to them as general requirements.	Band combinations can be included in RP-213081, revised WID High power UE for NR inter-band Carrier Aggregation with 2 bands downlink and x bands uplink (x=1,2)
#2	23dBm TDD + 26dBm TDD	CA_n48A-n77A	No dependency	The same as above.
#3	23dBm FDD + 29dBm TDD	CA_n2A-n77A, CA_n5A-n77A, CA_n13A-n77A, CA_n66A-n77A, CA_n12A-n77A, CA_n14A-n77A, CA_n30A-n77A	To support 29dBm TDD, UE needs two 26dBm PA. Thus to support this UE architecture, UE needs support 3Tx simultaneously, which is under discussion for Rel-18 new WI proposal. Please refer to Topic #3 for 3Tx in RP-212682. And the work may also depends Rel-17 WI for increasing UE power high limit for CA and DC. But approach specified could be applied to them as general requirements.	Suggest to discuss it in Rel-18 RAN4 package
#4	23dBm TDD+ 29dBm TDD	CA_n48A-n77A	The same as above.	Suggest to discuss it in Rel-18 RAN4 package

#5	26dBm FDD + 26dBm TDD	CA_n2A-n77A, CA_n5A-n77A, CA_n13A-n77A, CA_n66A-n77A, CA_n12A-n77A, CA_n14A-n77A, CA_n30A-n77A	Depend on the on-going WI high power UE (power class 2) for one NR FDD band to finalize the general requirements for 26dBm on FDD band. Puting 26dBm FDD + 26dBm TDD may need study the SAR and whether the new general require-ment is neede or not.	Suggest to discuss it in Rel-18 RAN4 package.
#6	26dBm TDD + 26dBm TDD	CA_n48A-n77A	No dependency	It can be included in RP-213081, revised WID High power UE for NR inter-band Carrier Aggregation with 2 bands downlink and x bands uplink (x=1,2)
#7	n77A PC1.5 (26dBm+26dBm)	CA_n2A-n77A, CA_n5A-n77A, CA_n13A-n77A, CA_n48A-n77A, CA_n66A-n77A, CA_n12A-n77A, CA_n14A-n77A, CA_n30A-n77A, CA_n29A-n77A	No dependency. In the moderator view, those band combinations have already been sup-ported by the spec-ification.	What needs to do is to finalize the band combination of CA_n29A-n77A.

Companies are invited to commet on the above analysis by referring the ”num” when commenting.

Feedback Form 15:

1 – AT&T GNS Belgium SPRL

#1 and #2: For items #1 and #2, it is not clear as to why these same exact combinations would have to be added twice into the WID for High power UE for NR inter-band Carrier Aggregation with 2 bands downlink and x bands uplink (x=1,2). In addition, the existing WID only covers PC2 for the UL CA configuration. Given that the work depends on the Rel-17 WI for increasing UE power high limit for CA and DC, maybe

these combinations can be updated in a generic way once the Rel-17 WI for increasing UE power high limit for CA and DC is completed.

#7: We don't think that CA_n29A-n77A is any different from the other combinations listed for #7 since this scenario is single UL n77 with 29dBm supported with 2Tx.

2 – Verizon UK Ltd

Both # 1 and #2 should be relating to "increasing UE power high limit for CA and DC" item approved by RAN (RP-212622). If it is correct, there is no a place-holder available for these combos at this time. Furfure discussion is needed about how we can capture these combos in a generic way in Rel-17 or Rel-18.

As some ongoing Rel-17 works in RAN4, a release 18 work item for PC1.5 UL CA would be acceptable to us.

3 – T-Mobile USA Inc.

1) We believe that all of the combinations/configurations in #1, #2 and #6 are already supported for PC2 UL CA and covered in the WID in RP-213081 so there is nothing to do at this time. For UL CA power greater than power class 2, the work is ongoing in the "WI on Increasing UE power high limit for CA and DC." When that WI is complete maybe there will be a follow on basket WI.

2) For #3 and #4 and #5 we agree with the suggestion to discuss for Rel-18.

3) For #7 if the goal is n77 PC1.5 single band uplink (and not UL CA) then those combinations can be handled in the existing "High power UE (power class 2) for NR inter-band Carrier Aggregation with 2 bands downlink and 2 bands uplink" WI. In fact, DL CA_n66A-n77A with UL n77 PC1.5 has already been added to the revised WID. Even though the title says PC2, PC1.5 single band UL is included in the scope.

4 – Beijing Xiaomi Mobile Software

We support the morderator's suggestion on the need of clarification on Analysis of dependency on on-going work. However, for the above summary table we think we may need to add a column to include the clarification on UL CA power class otherwise it can not be distiguished from current UL CA PC2 since the UE archetecture 23+26 dBm, 26dBm+26dBm has already supported by UL CA power class 2.

5 – Qualcomm Korea

For #1 and #2, the 23+26 combinations could be handled by "Increasing UE power limit high CA and DC" work item in a general way. For #7, it looks like the proposal is for PC1.5 one one carrier (n77A), not UL CA. MSD would still need to be considered.

6 – Nokia Japan

Before going to the details for each of the #s, it is essential to clarify which configurations are targeted at FWA usage. Please note that PC1.5 FWA has a specific capability of *maxUplinkDutyCycle-MPE-FR1*. 23+29 for smartphone and 23+29 for FWA are different. Also, for instance, if the listed configurations in #1 are for FWA usage, we need to have some discussion even if increasing UE power high limit for CA and DC is completed since the increasing UE power high limit WI does not include FWA usage in the scope.

7 – LG Electronics Deutschland

For #1 and #2 in Table, the 23dBm+26dBm band combinations can be treated in RP-212081 basket WIs with FDD(23dBm) +TDD(26dBm) as recommended by Moderator. However, we have the same understanding that it needs to relax the Tolerance levels for PC1.5 CA UE. For #3 and #4, the 2PAs (26+26) in n77/n78/n79 + other 1PA(23dBm) in FDD band architecture would be considered. However, RAN4

did not have any consensus for the 3Tx simultaneous transmission between TDD (2PAs) band and FDD single band. Therefore, RAN4 should make a consensus that the candidate RF architecture or simultaneous 3Tx can be supported in Rel-17 or future releases. For #5, we think RAN4 should complete the existing FDD PC2 WI first in Rel-17. Then, RAN4 can add the FDD (26dBm)+TDD (26dBm) CA band combos in Rel-18. For #6, we think RAN4 can start the PC1.5 CA band combinations in Rel-17.

8 – Apple Italia S.R.L.

#1: we are fine with the moderator suggestion

#2: CA_n48A-n77A would be a non-contiguous intra-band UL CA combination, which is a feature defined in Rel-17. However, the FCC defines stringent emission requirements for band n48, which would require high A-MPR (we already see this in single band and contiguous CA cases). We would like to capture the need to define new A-MPR values for this configuration as RAN guidance to RAN4, including the guidance not to handle discussions related to this combination as part of the bulk approval process normally used for other combinations.

#3, #4, #5: we are fine with the moderator suggestion

#6: Same comment as #2

#7: In which basket work item will work on CA_n29A-n77A be organized?

9 – Samsung Electronics Co.

For #1 and #2, we share the similar view as Verizon that RP-213081 which is only target on single band PC1.5 is not the proper ”placeholder” for band combinations proposed by operators, i.e UL CA PC1.5

For #3, #4 and #5, we agree with Moderator suggestion to postpone to Rel-18 after generical requirements are finalized

For #6, in our understanding, this PC1.5 band combination can be included in a new basket WI based on generic framework of PC1.5 but not in RP-213081 since the target power class is different

For #7, we need more time to check about moderator’s observations. It seems we do not have these band combinations in RP-213081. Even it is not included in RP-213081 now, we agree with Moderator that these band combinations can be treated in RP-213081

10 – China Telecom Corporation Ltd.

For #1, #2 and #6, it seems we need to differentiate whether the allowed sum power of the two bands is 26dBm or 27.8/29dBm.

- If it is 26dBm, these combinations can be added in the revised RP-213081 Rel-17 WID on “High power UE for NR inter-band Carrier Aggregation with 2 bands downlink and x bands uplink (x=1,2)”.
- If it is 27.8/29dBm, we need to wait for the completion of WI on “Increasing UE power limit high CA and DC”.

For #7, we agree with T-Mobile’s comment that:

“*if the goal is n77 PC1.5 single band uplink (and not UL CA) then those combinations can be handled in the existing ”High power UE (power class 2) for NR inter-band Carrier Aggregation with 2 bands downlink and 2 bands uplink” WI. Even though the title says PC2, PC1.5 single band UL is included in the scope.”*

Also note that CA_n66A-n77A with n77A PC1.5 is already included in the WID RP-213081.

We have one question regarding the potential revision of WID RP-213081 suggested by moderator. Since RP-213081 is handled in thread [94e-58-flags-RP-213081-RP-213135], can we also discuss the revision of RP-213081 in this thread in this meeting? Or any additional revision of RP-213081 can be considered in the next meeting?

11 – China Unicom

We are fine with moderator's suggested way forward. Specifically, the work for FDD 26dBm + TDD 26dBm should be discussed in Rel-18 RAN4 package, which depends on the ongoing work of FDD PC2 HPUE.

12 – ZTE Wistron Telecom AB

For #3/#4/#5 we are fine with Moderator's proposals to discuss in Rel-18.

For #1 and #2, if the total power class is PC2, then it can be covered by the existing WI RP-213081.

For #6, only single UL configuration can be included in RP-213081.

13 – AT&T GNS Belgium SPRL

Concerning the comments from T-Mobile USA and others that #1 and #2 are covered in the existing WID in RP-213081, we see in the objectives for that WID that the UL CA configuration only supports PC2 as highlighted below. Therefore, the WID would not cover the case with increasing UE power high limit for CA and DC. We agree with QC that these could be handled in the Rel-17 WI for increasing UE power high limit for CA and DC in a generic way. The combinations in item #7 are covered by RP-213081.

"Specify the band-combination specific RF requirements for all listed **power class 2 NR inter-band UL CA combinations with 2 band DL / 2 band UL** Also, specify the band-combination specific RF requirements for all listed inter-band DL CA combinations with 2 band DL / 1 band UL power class 2 and/or power class 1.5 NR single band UL. The requirements that need to analyse and specify include ..."

14 – Guangdong OPPO Mobile Telecom.

Agree with moderator proposals, and the band combiantions require 3Tx architecture should be discussed in Rel-18 package.

15 – Skyworks Solutions Inc.

In our view for any UL configuration involving CA*n48-n77 whatever the power class per band we first need to understand if these are coevered by the NC UL CA framework sand whether NS*_27 applies.

Otherwise:

- 23dBmFDD+26dBmTDD or 23dBmtDD+26dBmTDD scenarios are already covered by the increased power PC2 R17 work and it is debatable if they are PC1.5 since it can only reach 27.8dBm nominaly (#1 + #2). requested combinations falling in these categoris should be covered there.
- 26dBmFDD in #5 is not complete and thus it cannot be tackled now
- #7 with 1UL PC1.5 is already covered in R17 in our view but some harmonic, harmonic mixing and cross band MSD may need revisiting.
- #3 and #4 have total power >29dBm and thus are subject to the R17 work on similar PC2 cases, once a solution is agreed for PC2 it can be easilly applied to PC1.5 for increasd power and MSD.
- #6 26dBm TDD+26dBm TDD (if no simultaneous Tx/Rx) should be a fairly easy addition but again CA_n48-n77 itself is a specific case due to potential NS-27 emissions issues. This must be clarified first.

Based on the above analysis, the moderator proposed

Proposal 3: it is proposed that

- **Add the following band combinations with 23dBm + 26dBm architecture in the revised WID High power UE for NR inter-band Carrier Aggregation with 2 bands downlink and x bands uplink (x=1,2) (RP-213081)**
  - **FDD+TDD: CA_n2A-n77A, CA_n5A-n77A, CA_n13A-n77A, CA_n66A-n77A, CA_n12A-n77A, CA_n14A-n77A, CA_n30A-n77A**
  - **TDD+TDD: CA_n48A-n77A**
- **Add the following band combinations with 26dBm + 26dBm architecture in the revised WID High power UE for NR inter-band Carrier Aggregation with 2 bands downlink and x bands uplink (x=1,2) (RP-213081)**
  - **TDD+TDD: CA_n48A-n77A**
- **Discuss the band combinations with 23dBm FDD + 29dBm TDD, 23dBm TDD+ 29dBm TDD, 26dBm FDD + 26dBm TDD in Rel-18.**

Companies are invited to comment on proposal 3.

Feedback Form 16:

1 – AT&T GNS Belgium SPRL We don't have an objection to adding the band combinations to a WID to ensure that the work is done concerning increasing UE power high limit for CA and DC for these configurations. It is not clear to us if the existing WID in RP-213081 allows for output power above PC2 for the UL CA configuration. It seems to only allow higher power for the single UL case.
2 – T-Mobile USA Inc. We agree with AT&T that the existing WID in RP-213081 only allows for PC2 for UL CA and PC1.5 or PC2 for single band UL. We think that most of the UL CA combinations listed above are already requested and/or completed for PC2 UL CA. If any of the combinations above have not already been completed for PC2 in RP-213081 then they can be added to the WID, but we cannot add UL CA for a power class above PC2 until the feature is complete for UL CA with output power greater than power class 2.
3 – Nokia Japan Regarding adding 23dBm + 26dBm to RP-213081, we don't think it is a good idea. The generic solution is under discussion in Increasing UE power high limit for CA and DC WI where CA_n1A-n78A (23dBm+26dBm) is the example band combination. We don't have intention to block the progress of the proposed band combinations but capturing the band combinations in RP-213081 does not make any progress in RAN4 but rather generates a confusion. Hence, it's better to wait for the outcome of the Increasing UE power high limit for CA and DC WI. Regarding 23dBm FDD + 29dBm TDD and 23dBm TDD+ 29dBm TDD, 26dBm FDD + 26dBm TDD in Rel-18, the former two cases can be handled considering the outcome of Increasing UE power high limit for CA and DC WI. Regarding the last 26dBm FDD + 26dBm TDD, again before we directly go to a WI for band combination, we need to finish 26 dBm FDD for FWA usage since the requirements would not be

the same as those for PC2 FDD Rel-17 targeting at smartphone.
4 – LG Electronics Deutschland We support the moderator's proposal.
5 – China Telecom Corporation Ltd. For the first two bullets, please kindly refer to our previous comments in Feedback Form 15.
6 – LG Electronics Deutschland One more comment: For the NR Band n48, RAN4 only supports PC3 UE. Therefore RAN4 needs to specify PC2 UE operation in n48 first. Furthermore, our understanding is that FCC regulatory requirements are defined not to exceed 23dBm as EIRP power levels, so RAN4 needs to study how to satisfy the regulatory requirements
7 – Skyworks Solutions Inc. for the CA_n48-n77 cases we need clarification whether NS27 applies and if so whether we need to cover inter-band PC3 and PC2 power classes with every permutations of per band power class?

4.3.2 Summary

Based on companies' comments, the moderator propose

Modified Proposal 3: it is proposed that

- **Postpone the discussion on the following band combinations with 23dBm + 26dBm architecture untill the completion of Rel-17 WI for increasing UE power high limit for CA and DC**
  - **FDD+TDD: CA_n2A-n77A, CA_n5A-n77A, CA_n13A-n77A, CA_n66A-n77A, CA_n12A-n77A, CA_n14A-n77A, CA_n30A-n77A**
  - **TDD+TDD: CA_n48A-n77A**
- **Postpone the discussion on the following band combinations with 26dBm + 26dBm architecture untill the completion of Rel-17 WI for increasing UE power high limit for CA and DC**
  - **TDD+TDD: CA_n48A-n77A**
- **Discuss the band combinations with 23dBm FDD + 29dBm TDD, 23dBm TDD+ 29dBm TDD, 26dBm FDD + 26dBm TDD in Rel-18.**
- **Further discussion is needed on whether the requirements are needed for the following band combinations with n77A PC1.5 uplink (single uplink on one band) and if needed how to capture them**
  - **CA_n2A-n77A, CA_n5A-n77A, CA_n13A-n77A, CA_n48A-n77A, CA_n66A-n77A, CA_n12A-n77A, CA_n14A-n77A, CA_n30A-n77A, CA_n29A-n77A**

4.4 Final round

5 Topic #4: Improved MSD

5.1 Companies' contribution list

Table 11:

T-doc number	Title	Sourcing company
RP-213006	Ongoing work on improving MSD for CA and DC	Qualcomm Incorporated
RP-213146	On MSD improvement for band combinations	Huawei, HiSilicon

5.2 Initial round

5.2.1 Comments & responses

Background information:

In RAN#93-e the issue was extensively discussed in Topic#4 of [93e-08-RAN4-R17-Spectrum]. The conclusion is as follows.

- *Low MSD discussion will continue in RAN4.*

Afterwards in RAN4#101-e, the issue was discussed but no agreement was reached. RP-213146 provided the summary of RAN4 status. For Rel-18 the same proposed working area was under discussion, which was captured in RP-212682.

Sub-topic 4-1: How to treat "low MSD topic

- **Option 1 (**RP-213006**): if possible after prioritizing Rel-17 closure, it would be beneficial to allow continued discussion of this topic in the remainder of Rel-17 timeline and extending into Rel-18.**
- **Option 2** (Proposal #3 in RP-213146)**: Stop the discussion on MSD improvement in R17, and continue the study in a dedicated SI in R18.**

Companies are invited to provide the comments on the above proposal.

Feedback Form 17: Sub-topic 4-1

1 – AT&T GNS Belgium SPRL

We support Option 1. It is important given the significant operator support for this effort to ensure that RAN4 has an agenda item available to make progress on the MSD improvement topic.

2 – Ericsson LM

We are also fine with Option 1.

3 – Verizon UK Ltd

We are also support Option 1. This topic has been discussed in RAN4 long time back and expect RAN4 to continually progress the requirements effectively.

4 – China Mobile Com. Corporation

In general, we support the MSD improvement study. However, in Q1 2022, RAN4 should really focus on the Rel-17 completion. We are not sure allowing the discussion by email will facilate the discussion very well in next quarter. So we prefer proposal 2, to have a dedicated SI in Rel-18 and apporve it in March. In last RAN pleanry, it was endorsed that Rel-18 RAN4 work will start in Q3. We can further decide whether to allow the MSD discussion in Q2 depending on the Rel-17 progress in RAN4.

5 – Qualcomm Korea

We support the comments from AT&T, Ericsson, and Verizon for option 1. However, we also recognize the concern from CMCC that continued email may not be so productive in the next quarter if companies are not motivated to progress the work. We suggest that if the discussion can be more focused (perhaps according to the suggested objectives in RP-213006), there is a better chance to make progress.

6 – Apple Italia S.R.L.

We appreciate the list of open issues related to the MSD improvement topic provided in RP-213006. We think one more important consideration is the use of UE assistance information to help the network scheduler to make more efficient resource allocation decision for the UE in the presence of MSD. This proposal was submitted to RAN4 #101 in R4-2117986, and we would like to see it included in the scope of further work on this topic. We also hold the same understanding as RP-213146 in terms of the general principle of handling this item as part of the Rel-18 RAN4-led work package.

In terms of these options, we prefer Option 2, which is aligned with the Rel-18 RAN4-led package approval process.

7 – Beijing Xiaomi Mobile Software

We support the view from CMCC, in order to better orgnize the discussion, a SI/WI in R18 is prefered, if possible, may be it can be as earlier start topic from Q2 in R18.

8 – Guangdong OPPO Mobile Telecom.

Prefer Option 2 and can be considered in RAN4 Rel-18 package discussion in next RAN plenary meeting.

9 – Samsung Electronics Co.

we support CMCC proposal to adapt option 2 and focus on completion of REl-17 items in next quarter

10 – vivo Communication Technology

Several options for further study have been well summarized by T-mobile in R4-2119375. The directions for next-step's convergence are very diverged, we think a Rel-18 SI is a proper way to go. In addition, currently it seems no further progress could be made in RAN4 given there is no corresponding project to well organize the discussions. So we prefer option 2.

11 – LG Electronics Deutschland

We prefer Option 2 but the early start of Rel-18 from Q2 2022 for this issue can be considered pending the RAN decision.

12 – Huawei Technologies France

We prefer option 2. Only two meetings are left for RAN4 to complete all remaining Rel-17 WIs. It's not useful to occupy RAN4 additional efforts to have further discussion for such topic without specific TU in any WI/SI. We understand the companies interest to further improve the MSD, but we also need to recognize that the main focus of RAN4 for the moment is for other important issues to be completed on schedule. A SI in Rel-18 is a better choice.

13 – ZTE Wistron Telecom AB

We are fine with Option 1 to continue the discussion in the Rel-17 timeline.

14 – Nokia Japan

Generally, option 1 is more efficient than option 2 since the option 2 stops the discussion for 9 months. But, given that progress in RAN4 has not been seen, if we continue the discussion in Rel-17, at least we need more specific agenda items are necessary. Regarding procedure perspective, if Rel-17 SI is established in this meeting, the gap until Q3 can be shorten by the extension of the SI in March.

15 – TELECOM ITALIA S.p.A.

We support option 1 and in particular the proposal from Nokia seems a good way forward to focus the activity.

A 9-months gap is not acceptable to us

16 – Intel Corporation (UK) Ltd

We are supportive of RAN4 work on MSD improvements. Given a critical stage of Rel-17 work completion in Q1'2022 we prefer to go with Option 2 and continue discussion in Rel-18 timeframe. We are open to CMCC suggestion to consider earlier start of work on this topic in Q2 subject to Rel-17 progress and RAN4 WI package approval.

17 – Skyworks Solutions Inc.

Given the different views on the objectives from different companies, we do not expect much progress in RAN4 in the coming meetings. we believe it is better to spend time developping a R18 set of objectives including network assistance aspects to really solve the issue in all aspects and for any mix of UEs. May be some time can still be used in R17 to narrow down the options in view of a R18 SI/WI.

Sub-topic 4-2: Comments on objectives in Section 2.1 of RP-213006

Companies are invited to provide the comments in the table below.

Feedback Form 18: Sub-topic 4-2

1 – AT&T GNS Belgium SPRL We think that this is a good starting point for discussion. We hope that by having the agenda time available per Option 1 in sub-topic 4-1, RAN4 can further optimize the set of objectives as each of the questions are answered. We think that the last objective could indicate that the work is applicable to inter-band CA and DC for PC3 and higher CA/DC power classes as opposed to limiting to PC2 and PC3.
2 – Verizon UK Ltd The further discussion in RAN4 is needed, and the optimization of MSD improvement should be involved in both UE and gNB. Also, the MSD improvement should be applicable to both PC2 and PC3 inter-band CA and DC work, mainly for PC2.
3 – Apple Italia S.R.L. We think one more important consideration is the use of UE assistance information to help the network scheduler to make more efficient resource allocation decision for the UE in the presence of MSD. This proposal was submitted to RAN4 #101 in R4-2117986, and we would like to see it included in the scope of further work on this topic.
4 – Huawei Technologies France Specific objectives can be further discussed in Rel-18 scope.
5 – ZTE Wistron Telecom AB These questions are beneficial when considering potential objectives. The second question can be further elaborated to something like: ”The achievable network performance gains against the proportion of advanced end devices and the improved MSD”. One possible way is to define an SI in Rel-17 to study this before going to investigate and specify specific improved MSD values, which can be left to a Rel-18 WI.
6 – Nokia Japan We should make clear that how the discussion is proceeded with. There questions were posed and discussed in RAN4, but no conclusion. For instance, if the capability should be optional or not. The proponent of this topic has been saying that it’s ok to be optional while companies negative to this topic has been saying that it’s too early to discuss capability aspects etc....At least high level guidance together with specific agenda is beneficial if we continue the discussion in Rel-17.
7 – TELECOM ITALIA S.p.A. it is important to identify some objectives to focus the discussion in Rel 17 remaining time and have normative work in Rel 18

Sub-topic 4-3: Comments on the observations and proposal #1 2 of RP-213146

Companies are invited to provide the comments in the table below.

Feedback Form 19: Sub-topic 4-3

1 – AT&T GNS Belgium SPRL

We don't see how the observations solve and/or mitigate the MSD issue since the existing MSD requirements apply for the entire victim band based on the selection of one test point. Presently, there is no performance definition outside of the MSD test points defined. RAN4 has been trying to address this issue for sometime with no conclusion. In addition, the CA/DC configurations should be useful for the consumer across the cell. Otherwise, a significant portion of the user base will not see the performance improvements from CA/DC if their primary location is outside of the cell area where MSD impact is lower.

We are OK with proposal 1 as written since this study should involve UE and BS vendors. Concerning proposal 2, there needs to be a little more flexibility to consider devices that are already capable of meeting a lower MSD where the cost analysis on the UE side would be moot. Certainly, we would have to consider the percentage of UEs that were capable of meeting the lower MSD in order to determine the overall benefit. This comment is related to the capability reporting suggested in the objectives from RP-213006.

2 – Verizon UK Ltd

For proposal 1, see our comments above the a joint effort between UE and network, and we agree more further discussions are needed to RAN4.

The proposal 2 is similar to the 4th objective in PR-213006. The analysis requirements and decision are needed for how much MSD improvement is feasible.

3 – ZTE Wistron Telecom AB

For Proposal 1, similar to the elaborated question in our previous comments, and it can be carried out in Rel-17, maybe a dedicated SI would be helpful to capture the potential study outcomes,

For Proposal 2, it can be carried out via a Rel-18 WI.

4 – Nokia Japan

Regarding the proposal 1, we don't see the necessity of capturing a join effort between UE and network. Normally, a UE capability exists for network to be aware of UE's ability and the network makes maximum use of it during any time of need.

Concerning the proposal 2, we generally understand the motivation of the proposal itself. We, however, don't agree with doing that study for this particular topic since the expected UE's performance difference between low MSD UE and not low MSD UE can be around 30 dB based on some contributions. Even now, RAN4 requirements' granularity is even finer.

5.2.2 Summary

The companies' views on how to move forward are still split. According to the moderator counting, 8 companies supported continuing RAN4 discussion, while 9 companies proposed to focus on finalization of Rel-17 in following quarters and discuss the objectives in Rel-18.

Regarding the proposals in the two papers, the companies' comments were received but it is difficult for the moderator to identify the potential agreements.

5.3 Intermediate round

5.3.1 Comments & responses

The group has discussed this topic for a long time. It is clear that some fundamental issue was not addressed and even if RAN4 spent the effort in the next quarter there would be no agreement. Considering the tight timeline in Rel-17, the moderator suggests to focus on finalization of other important Rel-17 on-going WIs and not to continue discussing this topic in RAN4 meetings in Q1 and Q2 2022.

According to comments, some kind of middle ground is to discuss the potential objectives for Rel-18. To meet the goal to identify the objectives, the moderator suggests to continue discussing the potential objectives based on the contributions in RP-213006 and RP-213146 in the rest days of this meeting and in the Febuary email discussion for RAN4 Rel-18. Then it might address the argument of ”9-month gap”.

Proposal 4: it is proposed

- **Stop discussion on “low MSD” in RAN4 meetings in Q1 and Q2 2022.**
- **Continue discuss the potential objectives for Rel-18 in February pre-RAN email discussion.**

Companies are invited to comment on proposal 4.

Feedback Form 20:

1 – AT&T GNS Belgium SPRL Concerning Proposal 4, we support discussing the potential objectives for Rel-18 in the February pre-RAN email discussion. However, it could still be valuable to collect RAN4 input concerning those potential objectives based on RP-213006 in January RAN4 meeting even if the discussion is limited to one round to allow for more fruitful pre-RAN email discussion for the RAN4 Rel-18 items. Although not our preference, we would be OK with a dedicated SI in Rel-18 with RAN approval in March as a compromise if MSD discussion would be allowed in Q2. Shutting down this topic completely for 9 months is not acceptable and as such we don’t fully support the first bullet in Proposal 4 as written.
2 – T-Mobile USA Inc. We agree with AT&T that it would be useful to discuss the WID or SID objectives in the January meeting.
3 – China Mobile Com. Corporation To address some of the concerns about time gap, maybe we can first agree to stop discussion in Q1 for the sake of Rel-17 completion. But for Q2, we do not make decision at this moment. The decision will depend on the discussion in February pre-RAN discussion. **Proposal 4: it is proposed** **Stop discussion on “low MSD” in RAN4 meetings in Q1 ~~and Q2~~ 2022.** **Continue discuss the potential objectives for Rel-18 in February pre-RAN email discussion.**
4 – Huawei Technologies France We are fine with the proposal by moderator. The potential objectives can be discussed in February pre-RAN R18 email discussion.

5 – vivo Communication Technology

We are OK with the proposals from moderator.

6 – Qualcomm Korea

Further discussion to narrow down objectives as proposed by the moderator is a worthwhile approach. However, the discussion may benefit from RAN4 input, rather than relying solely on pre-RAN email discussion. In that sense, it may be beneficial to have RAN4 discussion in Q1 as commented by AT&T.

7 – Beijing Xiaomi Mobile Software

We are OK with the proposals from moderator. CMCC suggestion that whether the SI/WI can be earlier start from Q2 can be discussed in the next RAN plenary is also acceptable for us.

8 – LG Electronics Deutschland

We support the moderator's proposal. And it is also fine to start Rel-18 discussion from 2Q 2022.

9 – Samsung Electronics Co.

We support Moderator proposal

10 – Verizon UK Ltd

RAN4 should continue the related discussion of the WID or SID objectives in Q1 and narrow down objectives as proposed.

11 – Nokia Japan

We support proposal from AT&T as we have proposed that it's better to focus on establishing a good objective since RAN#92e.

12 – Apple Italia S.R.L.

We support the Moderator's proposal 4.

13 – Intel Corporation (UK) Ltd

We are fine with moderator's proposal.

14 – VODAFONE Group Plc

We support the proposal from AT&T.

15 – ZTE Wistron Telecom AB

We are fine with Moderator's proposal. It is a pragmatic way forward.

16 – Guangdong OPPO Mobile Telecom.

Ok with proposal

17 – Skyworks Solutions Inc.

We are supportive of moderator proposal and focus on defining proper objectives for R18. Depending on the progress and approval in March we may revisit when to start the effort.

Companies are invited to continue commenting on the potential objectives based on the contributions RP-213006 and RP-213146.

Objectives in RP-213006

1. Should the requirements be specified as minimum requirements applicable to all devices? Or should the requirements be defined as supplemental capability-based requirements applicable only to those devices signaling the capability?
2. From a network perspective, how will improvement in MSD benefit system performance if only a subset of devices are capable?
3. From a network perspective, how much MSD improvement is sought?
4. From a UE perspective, how much MSD improvement is feasible as a minimum requirement? How much MSD improvement is feasible as an optional capability-based requirement?
5. Applicable to PC2 and PC3, inter-band CA and DC in FR1.

Proposals in RP-213146

- Observation #1: The MSD problem is most severe for UEs at the cell edge when max Tx power is needed. The UEs away from the cell edge may not suffer from the MSD problem due to the decrease of Tx power.
- Observation #2: The gNB scheduler can adaptively allocate the DL/UL resources, and avoid scheduling the aggressor UL(s) and the victim DL(s) simultaneously for a given UE. The average throughput for the cell edge UEs may not be affected.
- Observation #3: For many band combinations, the MSD problem can be avoided or mitigated by network planning.
- Proposal #1: A joint effort between UE and network should be considered to tackle the MSD problem. The potential gain for the cell performance should be studied.
- Proposal #2: RAN4 to justify the potential gain of MSD improvement. And cost and benefit analysis should be conducted for any potential solution, be it UE-based or network-based.

Please provide your suggested objectives.

Feedback Form 21:

1 – AT&T GNS Belgium SPRL

As noted above, we think that it would be valuable to collect RAN4 input concerning those potential objectives in the January RAN4 meeting even if the discussion is limited to one round to allow for more fruitful pre-RAN email discussion for the RAN4 Rel-18 items. As mentioned in the initial round, we think that having some agenda time available would help RAN4 further optimize the set of objectives as each of the

questions are answered from RP-213006.
2 – T-Mobile USA Inc. We agree with AT&T that it would be useful to discuss the objectives in the January RAN4 meeting.
3 – Qualcomm Korea Agree with the comments from AT&T and T-Mobile.
4 – Verizon UK Ltd RAN4 should continue the related discussion of the WID or SID objectives in Q1.
5 – Nokia Japan Our view on the WID is written in RP-213242.

5.3.2 Summary

Companies' views are still diverge. The moderator would like to suggest the orginial proposal.

Proposal 4: it is proposed

- **Stop discussion on "low MSD" in RAN4 meetings in Q1 and Q2 2022.**
- **Continue discuss the potential objectives for Rel-18 in February pre-RAN email discussion.**

5.4 Final round

6 Summary of Recommendations