**3GPP TSG-RAN WG4 Meeting # 112 R4-2414279**

**Maastricht, NL, 19th ‒ 23rd August, 2024**

**Agenda item:** 8.2.6

**Source:** Moderator (Ericsson)

**Title:** Ad-hoc minutes for [112][119] FS\_NR\_IMT\_part1

**Document for:** Information

# Introduction

This document captures the minutes from the ad-hoc in IMT advanced parameters.

Topics submitted under the “general aspects” and 4GHz agenda items were not treated during the ad-hoc and have been removed from these minutes.

Some topics were not discussed during the ad-hoc (due to already being agreed in general), and are noted as such.

# Topic #3: 8GHz LS reply

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2411090 | CATT | **Observation 1: The sub-array size does not have big impacts on DL throughputs with different array configurations.**  **Observation 2: For antenna array configurations with 8 x 16 and 8 x 8, the DL throughput difference is around 10% at 30dB ACIR with a sub-array size of 3.**  **Proposal 1: Not to mention wider channel bandwidth than 100MHz in the second reply LS.**  **Proposal 2: Quote formula of RBs \* SCS without number of RBs in the reply LS for typical signal bandwidth.**  **Proposal 3: Accept ΔfOBUE as 100 MHz considering the limited time and if no other issues identified.**  **Proposal 4: Set sub-array size as 3.**  **Proposal 5: Set antenna array configuration as 8 x 8.**  **Proposal 6: Confirm the tentative agreements on UE maximum output power, i.e., 23dBm in the reply LS, and other power classes captured in TR.** |
| R4-2411141 | Apple | TP on UE parameters |
| R4-2411193 | Ericsson | Proposals for 8GHz parameters |
| R4-2411194 | Ericsson | Draft LS reply |
| R4-2411518 | Qualcomm | Observation 1: 3GPP has been studying flexible duplexing (i.e., SBFD) at the gNB in Rel-18 and Rel-19 and it is desired to document such progress in this SI TR (i.e., TR 38.922).  Proposal 1: RAN4 to agree on TDD as a baseline duplexing for 7125 – 8400 MHz frequency range and capture the following text in TR 38.922.  “*There is no defined 3GPP band for the 7125 - 8400 MHz frequency range, however, it is adjacent to existing TDD band n104 (6425 – 7125 MHz). Similar to the 4400 – 4800 MHz frequency range, SBFD can be a candidate duplexing method for this frequency range. To provide timely response to WP5D regarding the requested RF parameters, RAN4 assumed TDD as a baseline duplexing for the 7125 – 8400 MHz frequency range. The core requirements for Rel-19 SBFD work item can be tracked through the list of impacted specs captured in [SBFD\_WID].”*  Observation 2: Based on adjacent channel coexistence simulations, ACIR requirements (i.e., BS/ UE ACLR and ACS) based on 100MHz channel bandwidth can be reused for higher channel bandwidth values (e.g., 200MHz).  Proposal 2: RAN4 to reply in the LS to WP5D that 100MHz is a typical value and that higher channel bandwidths are not precluded for the 7125 – 8400 MHz frequency range. Additional information on the channel bandwidth consideration for this range should be captured in TR 38.922.  Observation 3: As signal bandwidth depends on CHBW and SCS, no need to specify a fixed signal bandwidth but rather mention its dependency on SCS and number of RBs.  Proposal 3: RAN4 to respond to WP5D on the signal bandwidth with the Quote formula of RBs \* SCS without number of RBs.  Proposal 4: RAN4 to adopt the n104 unwanted emission mask for both the AAS and non-AAS BS.  Observation 4: To determine the BS Rx sensitivity, RAN4 need to agree on the requirement type (i.e., conducted or radiated) as well as other parameters (e.g., Antenna gain, Noise Figure, implementation margin).  Proposal 5: RAN4 to mention the BS Rx sensitivity only in TR 38.922 and mentioned “to be specified” in the LS to WP5D.  Proposal 6: RAN4 to consider PC3 (i.e., 23 dBm) as a typical output power and to capture higher output powers in TR 38.922.  Observation 5: Based on adjacent channel coexistence simulations, ACIR requirements (i.e., BS/ UE ACLR and ACS) based on 23 dBm UE maximum output power can be reused for 26 dBm UE maximum output power scenarios.  Proposal 7: RAN4 to agree on 56 dBm as UE power dynamic range. |
| R4-2412068 | vivo | Proposal 1: For the signal bandwidth, similar format as 4400-4800 can be used, i.e., Signal bandwidth = NRB x SCS x 12 and the NRB and SCS is refer to the TS38.101-1.  Proposal 2: In the reply LS, only provide 23dBm as typical value for MOP. Other powers are not precluded and can be recorded in TR.  Observation 1: UE can benefit from lower ACLR to reduce the MPR and a achieve better UL performance, which is also good for the coverage.  Proposal 3: Use the co-existence outcome from TR 38.921 as the ACLR/ACS value, i.e., 26 dB ACLR/32dB ACS for UE in 7125-8400 MHz.  Observation 2: There are different reasons behind each NF value, it is hard to do the down selection.  Proposal 4: Provide a range of NF in the reply LS, e.g., 9-13 dB.  Proposal 5: The SINR operation range in 4400-4800MHz LS can be used for 7125-8400MHz.  Proposal 6: To match with 100MHz typical channel bandwidth, the REFSENS of 100MHz in n104 is used in reply LS.  Proposal 7: For the UE blocking response in 7125-8400MHz, reuse the requirement of n104. |
| R4-2412137 | Samsung | Observation 1: For 8 GHz, frequency range of 7125-8400 MHz, it was agreed that existing n104 requirements should be a baseline for future discussions.  Observation 2: Most parameters were discussed and reached agreements based on existing parameters of n104.  Observation 3: Supplementary text/note may not affect the result/process of the sharing study in WP 5D as long as the parameter has a single typical value/scheme in the LS.  Observation 4: Non-technical subjective debate can happen anytime and anywhere in ITU-R regardless of the ‘confusing’ or ‘uncertain’ information from 3GPP.  Observation 5: There is no need to limit any possibilities of larger channel bandwidth introduction in the future by ourselves as long as we have a single typical value there for ITU-R.  Proposal 1: It would be better to describe the possibilities of wider channel bandwidths both in the TR and LS.  Proposal 2: It is preferred to quote directly in MHz based on 100 MHz for n104 (Option 3) rather than other indirect options since the current spec does not support the new frequency of 8 GHz range.  Proposal 3: Other options such as 8x16x3 would also be fine for the sake of progress.  Proposal 4: 23 dBm should be adopted in the LS for the typical maximum output power of normal UE.  Proposal 5: Taking into account observations and proposals for the tricky but resolvable remaining issues above, it is better for RAN4 to send out 8 GHz parameters in this meeting. |
| R4-2412565 | MEdiatek | Proposal 1: RAN4 to consider Option 1 for the UE ACLR, which is 26dB for PC3.  Proposal 2: RAN4 to agree that capture 23 dBm as the typical maximum output power in the LS to the ITU. It was also agreed that other output powers are not precluded and should refer to the TR, capturing 20 dBm, 23 dBm, 26 dBm, and higher power classes in the TR.  Proposal 3: RAN4 to consider 13dB as the UE NF value.  Proposal 4: RAN4 to consider the sensitivity for the UE as “to be specified”.  Proposal 5: RAN4 to consider 31dBc as the UE ACS value. |
| R4-2412588 | Nokia | Proposal 1: Use band n104 unwanted emission mask and delta\_obue for AAS and non-AAS BS.  Proposal 2: Adopt 8x16 (Sub Array size 4) as BS antenna array. |
| R4-2412710 | ZTE | Proposal 1: for carrier bandwidth and transmission bandwidth configuration, reuse NR channel bandwidth and transmission bandwidth configuration as baseline (e.g. 100MHz for 30kHz SCS as typical value) for IMT-2020, and indicate the potential lager channel bandwidth for IMT-2030 in TR.  Proposal 2: to define f\_OBUE as 100MHz and f\_OOBB requirement as 200MHz of BS type 1-H for 7125-8400MHz;  Proposal 3: regarding BS antenna array for 7125-8400MHz, propose to follow the previous reply LS R4-2103104 to WP5D on 6425-10500MHz.  Proposal 4: at least PC3 and PC2 should be supported for 7125-8400MHz; PC1.5 is also preferred.  Proposal 5: propose 56dB/59dB/62dB power dynamic range for PC3/PC2/PC1.5 respectively according to the -33dBm/100MHz minimum transmission power.  Proposal 6: reuse the same ACLR and SEM requirement for band n104 for 7125-8400MHz instead of referring to TR 38.921.  Proposal 8: reuse the same ACS requirements for band n104 for 7125-8400MHz instead of referring to TR 38.921.  Proposal 9: for IBB and OOBB requirements, not reuse the existing band requirement for band n104 and further discuss the exact requirement for it. |
| R4-2412967 | Google | Proposal 1: Considering the RF hardware technology for 6G may be more advanced than 5G NR, it would be suitable not to specify specific RB number with SCS in the reply LS without more detailed discussion. Hence, for signal bandwidth on the frequency range 7125 to 8400 MHz, it is proposed to quote formula of RBs \* SCS without specifying the number of RBs.  Proposal 2: It is preferred not to introduce HPUE but only to apply 23 dBm (PC3) and 20 dBm (PC5) to the frequency range for 7125 to 8400 MHz. Considering the last meeting tentative agreement has already captured 20 dBm (PC5) in the TR, it can be compromised that 20 dBm (PC5) is not included as the UE typical maximum output power in the reply LS. Hence, it is proposed to confirm the last meeting tentative agreement on the UE maximum out power for the frequency range 7125 to 8400 MHz. |
| R4-2413279 | Huawei | Proposal 1: It is proposed to not to mention wider channel bandwidths in the reply LS.  Proposal 2: Describe 200 MHz as a potential wider channel bandwidth in the TR  Proposal 3: Option 2 is adopted: quote formula of RBs \* SCS without number of RBs  Proposal 4: n104 unwanted emissions including ΔfOBUE definition are used for the frequency range 7125 to 8400 MHz.  Proposal 5: 26 dB ACLR for PC3 UE  Proposal 6: For the purpose of co-existence analysis, the UE maximum/typical output power for the considered frequency ranges could be 23 dBm.  Proposal 7: Follow n104 noise figure (12dB)  Proposal 8: The blocking characteristic specified in clause 7.6 of TS 38.101-1 [4] for frequency larger than 3300 MHz could be applied for the range.  Proposal 9: The antenna characteristics for IMT in 7125 to 8400 MHz is proposed in following Table 2.2-1. |
| R4-2413280 | Huawei | TP on BS parameters |
| R4-2411519 | Qualcomm | TP on UE parameters |
| R4-2411948 | Nokia | Proposal 1: In addition to 100 MHz, 200 MHz is also mentioned as a typical maximum channel bandwidth for 7125 – 8400 MHz in LS.  Proposal 2: 200-400 MHz is considered as typical maximum channel bandwidth for 14800 – 15350 MHz.  Proposal 3: Typical signal bandwidth for 100 MHz channel bandwidth is assumed 273 RB with 30 kHz SCS for 7125 – 8400 MHz. For wider channel bandwidth such as 200 MHz, 273 RB with 60 kHz SCS can be assumed as tentative agreement.  Proposal 4: It is proposed that NF=10 dB for 7125 – 8400 MHz and NF=11 dB for 14800 – 15350 MHz in the reply LS to WP5D.  Proposal 5: ACLR 30dB is proposed for PC3 and 31dB (n104) for PC2 for 7125 – 8400 MHz. It is TBD for 14800-15350 MHz.  Proposal 6: It is proposed to formally agree the tentative agreement in RAN4#111 to capture 23 dBm as typical maximum output power in the LS to ITU and refer to TR for other power classes. |

## Open issues summary

### Sub-topic 3-1 General issues

This topic considers general issues that apply to both BS and UE.

**Issue 3-1: Duplex mode**

**Previous agreement:**

Do not include SBFD in the LS, but add information in the TR. Add a reference to the TR in the LS

* Proposals
  + Option 1: Capture the following text in the TR (Qualcomm, TP R4-2411519)

**“**There is no defined 3GPP band for the 7125 - 8400 MHz frequency range up to the current release, however, it is adjacent to existing TDD band n104 (6425 – 7125 MHz). Similar to the 4400 – 4800 MHz frequency range, SBFD can be a candidate duplexing method for this frequency range. The core requirements for Rel-19 SBFD work item can be tracked through the list of impacted specs captured in [6]. To provide a timely response to WP5D regarding the requested RF parameters, RAN4 assumed TDD as a baseline duplexing for the 7125 – 8400 MHz frequency range.***.”***

This topic was not discussed during the ad-hoc

CATT: text looks OK. There is some minor change.

Agreement:

* Capture the following text in the TR (Qualcomm, TP R4-2411519)

**“**There is no defined 3GPP band for the 7125 - 8400 MHz frequency range up to the current release, however, it is adjacent to existing TDD band n104 (6425 – 7125 MHz). Similar to the 4400 – 4800 MHz frequency range, SBFD can be a candidate duplexing method for this frequency range. The core requirements for Rel-19 SBFD work item can be tracked through the list of impacted specs captured in [6]. To provide a timely response to WP5D regarding the requested RF parameters, RAN4 assumed TDD as a baseline duplexing for the 7125 – 8400 MHz frequency range.***.”***

**Issue 3-2: Typical channel bandwidth**

**Previous agreement:**

* Mention 100MHz as typical bandwidth in the LS
  + FFS whether to mention wider bandwidths may be possible in future in the LS

Describe other possibilities for bandwidth in the TR, mentioning that additional specification effort needed for >100MHz

* Proposals
  + Option 1: Do not mention bandwidth larger than 100MHz in the LS (CATT, ZTE, Huawei, Apple)
  + Option 2: Mention that larger bandwidths may be used in the future in both the TR and LS (Ericsson, Qualcomm, Samsung)
  + Option 3: Specifically mention 200MHz as the maximum channel bandwidth in the TR (Huawei)
  + Option 4: Specifically mention 200MHz as a typical example of maximum bandwidth in the LS (alongside 100MHz as typical bandwidth) (Nokia)
* Recommended WF
  + TBA

Agreement during ad-hoc:

LS indicates 100MHz as typical CBW and indicates wider channel bandwidths (documented in TR)

**Issue 3-3: Typical signal bandwidth**

**Previous discussion:**

Outcome of discussion (Not agreed):

Option 1: 273 RB, 30k SCS as 38.104

Option 2: Quote formula of RBs \* SCS without number of RBs

Option 3: Directly quote the signal bandwidth in MHz

* Proposals
  + Option 1: Quote formula of RBs \* SCS without number of RBs (CATT, Apple, Ericsson, Qualcomm, vivo, Google, Huawei)
  + Option 2: Directly quote the signal bandwidth in MHz (Samsung)
  + Option 3: Specifically state 273RB with 30kHz SCS for 100MHz CBW and 273RB with 60kHz SCS for 200MHz CBW (Nokia)
* Recommended WF
  + TBA

This topic was not discussed during the ad-hoc

Agreement: Quote formula of RBs \* SCS without number of RBs

**Issue 3-4: SINR operating range**

Previous agreement:

SINR operating range

* To be discussed further
* Proposals
  + Option 1: Same as 4GHz response (Ericsson, vivo)

This topic was not discussed during the ad-hoc

Agreement: Same as 4GHz response

### Sub-topic 3-2: BS related parameters

*This sub-topic considers BS parameters*

**Issue 3-5: BS output power**

* Proposals
  + Option 1: Refer to AAS/non-AAS in 38.104 (Ericsson, in proposed LS reply)
  + Option 2: TBA
* Recommended WF
  + Option 1

This topic was not discussed during the ad-hoc

Qualcomm: for output power, we refer to this parameter in the LS.

Nokia: Refer to the table of 38.104. In 38.104 we do not have power limit for wide area BS. We refer to LS.

**Agreement:** Refer to AAS/non-AAS in LS.

**Issue 3-6: Power dynamic range**

* Proposals
  + Option 1: 0dB (Ericsson)
  + Option 2: TBA
* Recommended WF
  + Option 1

This topic was not discussed during the ad-hoc

**Agreement:** 0dB

**Issue 3-7: Emissions mask**

**Previous agreement:**

* AAS BS:
  + Use n104 unwanted emissions mask
  + [Aim to use 100MHz for delta\_obue, conclude feasibility until RAN4#112]
* Non-AAS BS:
  + [n104 unwanted emissions mask for IMT response]
* Double check on whether there are any concerns towards sharing by RAN4#112 and in case concerns are identified, consider n96 if needed to resolve concerns
* Proposals
  + Option 1: Use n104 and 100MHz delta\_fobue (CATT, Ericsson, Nokia, ZTE, Huawei)
  + Option 2: Use n104 (Qualcomm)
  + Option 3: Add “for AAS and non-AAS” (Ericsson)
* Recommended WF
  + Clarify that Qualcomm are also OK with the delta\_f\_OBUE
  + Clarify whether to add “for AAS and non-AAS” as the applicability

Agreement during ad-hoc:

100MHz delta\_f\_obue

Agree n104 for both AAS and non-AAS. Delta\_f\_OBUE 100MHz for AAS and as in 38.104 for non-AAS

**Issue 3-8: Noise figure**

**Previous agreement:**

* Follow 38.820, i.e., 6dB WA, 11dB MR, 14dB LA for noise figure of BS
* Follow previous agreement (included here for clarity)

This topic was not discussed during the ad-hoc

**Issue 3-9: Sensivitity**

**Previous agreement:**

* Agree on option 1. (As for n104 in 38.104)
* Capture it in the TR only.
* Proposals
  + Option 1: Capture in TR only (Qualcomm) (Captured in the previous agreement already)
* Recommended WF
  + As previous agreement

This topic was not discussed during the ad-hoc

**Issue 3-10: ACLR**

Previous agreement:

ACLR

* BS
  + Use n104
* Follow previous agreement (included here for clarity)

This topic was not discussed during the ad-hoc

**Issue 3-11: Spurious emission**

Previous agreement:

Spurious Emissions

* BS:
  + Use n104

Follow previous agreement (included here for clarity)

This topic was not discussed during the ad-hoc

**Issue 3-12: Blocking response**

Previous agreement:

Blocking response

* BS:
  + Follow n104
    - Discuss ΔfOOB
* Proposals
  + Option 1: 200MHz for delta\_f\_oobb (ZTE)

Discussion during ad-hoc:

Ericsson: We think 100MHz is feasible from the filtering side

Huawei: ZTE is based on full band filter. For this band, you may not be able to have full range. If we consider sub-band then the bandwidth is similar with n104. We can use 100MHz

Nokia: In the last WF, we did not mention to consider this parameter here. IF the only problem is the filter size it is not a big problem. With a larger sub-array size, it is less of a problem

ZTE: We cannot agree with option 1

ZTE: How is ITU-R co-existence study impacted ?

Status at ad-hoc (no conclusion):

* + 100MHz for delta\_f\_oobb (Ericsson, Huawei, Nokia)
  + 200MHz for delta\_f\_oobb (ZTE)

ZTE: we can rearrange the filter size. We do not see the feasibility issue. We can compromise to option 1.

Agreement: 100MHz for delta\_f\_oobb

**Issue 3-13: ACS**

Previous agreement:

Issue 2-12 ACS

* BS:
  + Follow n104 (42dB)

Follow previous agreement (included here for clarity)

This topic was not discussed during the ad-hoc

**Issue 3-14: BS antenna parameters**

The most significant issue to clarify for the BS parameters is the sub-array and array size. Many of the other parameters are dependent on these things.

**Previous discussion:**

|  |  | **~~Rural macro~~**  **~~(If it’s available)~~**  **~~Parameters proposed by ZTE~~** | **Suburban macro** | **Urban macro** | **Urban small cell (outdoor)/Micro cell** | **Indoor  (small cell)** |
| --- | --- | --- | --- | --- | --- | --- |
| **1** | **Base station antenna characteristics** | | | | | |
| 1.6 | Antenna array configuration (Row × Column) (Note 4) | ~~8 × 8 elements~~ | Option 1: 8 × 16 (Nokia, Ericsson, Huawei, Spark)  Option 2: 8 x 8 (ZTE, Samsung) | Option 1: 8 × 16 (Nokia, Ericsson, Huawei, Cable Labs)  Option 2: 8 x 8 (ZTE, Samsung) | 8 × 8 | 4 × 4 |
| 1.7a | Number of element rows in sub-array, *Msub* |  | Option 1: 4 (Nokia, Spark, Cable Labs, Charter)  Option 2: 3 (Ericsson, Huawei, Samsung) | Option 1: 4 (Nokia, Spark, Cable Labs, Charter)  Option 2: 3 (Ericsson, Huawei, Samsung) | N/A | N/A |

**Previous agreement:**

* Remove the rural macro scenario from the table.
* non-AAS can be used for Urban small cell/Micro cell scenario
* non-AAS can be used for indoor scenario
* FFS on where to capture the above two bullets
* Proposals on sub-array size
  + Option 1: Set sub-array size 3 (CATT, Ericsson, Samsung, Huawei, ZTE)
  + Option 2: Set sub-array size 4 (Nokia, ZTE, Spark)
* Recommended WF
  + TBA

Discussion during ad-hoc:

ZTE: Option 1 comes from legacy AAS BS, but for new bands we can use 4 to enhance coverge, we are OK to both

CATT: If we go for size 4, the benefit is not proportional top the cost, so we think that option 1 is preferred

Spark, If you want coverage in this band like C band then you need to increase the number of antennas 4 times.

Huawei: We also did some simulations; the two options performance is small difference in performance. 1x3 is already 4 times larger than for previous cycles. Prefer option 1.

Ericsson: We have also done simulations with 3 and 4 and do not see much difference. The coverage here is for the UL.

Nokia: Please do some study on the impact to adjacent band co-existence. We agreed to relax UL ACLR. We simulated based on more stringent ACLR of 30dB. We saw 2% degradation with 30dB. We need to ensure Satellite co-existence.

CATT: We considered co-existence and throughput. Considered ACIR at different values

Huawei: We compared throughput (coverage)

Ericsson: We looked at coverage and co-ex assuming 30dB

Spark: Increasing the number of antennas would improve the sidelobe performance and help co-existence. We have provided values of co-existence vs antenna values.

Qualcomm: Why does more aub-arrays help 3GPP to 3GPP co-existence ?

Spark: If you improve sidelobe performance in the vertical plane then you get better co-existence

Cablelabs: We need to consider the co-existence to FSS, including earth stations, maybe more challenging

Spark: we need to put our best foot forward in terms of total antenna numbers. No mask requirement with 4 sub-array size. So we put ourselves in a good position with size 4.

Ericsson: ITU-R needs to decide the mask. Larger sub-arrays makes co-existence more difficult

Intel: We should keep in mind what ITU does with the studies. To Nokia: You said it is possible to lower power to UE. Can’t we focus on total array size then ?

Status after ad-hoc (no conclusion):

* Proposals on sub-array size
  + Option 1: Set sub-array size 3 (CATT, Ericsson, Samsung, Huawei, ZTE)
  + Option 2: Set sub-array size 4 (Nokia, ZTE, Spark)
  + More offline discussion

Spark: commercial system has size 4 and even size 6. We are moving to high band. The coverage would be ensured.

Ericsson: For commercial BS, there are different sub-array size, 6 and 2. We need the specific set of parameters.

Spark: This is for IMT2030. We should think about the future.

Huawei: Option 1 may provide more co-existence with Satellites.

Qualcomm: We share the same comment. Sub-array size 3 has less impact on other system.

CATT: According to our evaluation, the reason to choose size 3. The cost increases a lot for size 3 to 4.

Spark: I do not know down-tiled sub-array to solve the problem.

Agreement:

* For IMT2030 parameter LS, set sub-array size 3.
  + The larger sub-array size is not precluded when defining the BS requirements for this frequency range in the future in RAN4, which will be captured in the TR.
* Proposals on array size (no decision at ad-hoc)
  + Option 1: Set array size 8\*8 (CATT)
  + Option 2: Array size 8\*16 for sub-urban and urban macro, 8\*8 for urban small cell/micro (Ericsson, Huawei (Huawei also possibly 4\*8), Nokia (with sub-array size 4 for sub-urban and urban macro))
  + Option 3: 8\*16 is OK (Samsung, ZTE (not clear on ZTE sub-array size))
* Recommended WF
  + (Array size and sub-array size are listed separately here, but are not really independent. Agree sub-array size first then array size).

CATT: our evaluation results, if we compare the array size, the throughput is different. The benefit is not proportional to the cost.

Ericsson: 8x16 is used to compare to what we submit to ITU for 2.5GHz. It maintains the coverage.

Agreement:

* For urban Macro, 8\*16
* For Micro, 8\*8
* Proposal on indoor
  + Option 1: For indoor small cell, consider non-AAS only (Huawei)
* Recommended WF
  + TBA

Agreement on indoor at ad-hoc: For indoor small cell, consider non-AAS only

### Sub-topic 3-2: UE related parameters

This sub-topic considers UE parameters

**Issue 3-15: UE output power**

**Tentative agreement:**

* Capture 23dBm as typical maximum output power in the LS to ITU.
  + Other output powers are not precluded and refer to TR
* Capture 20dBm, 23dBm, 26dBm, and higher power classes in TR
* Proposals
  + Option 1: Confirm the tentative agreement (CATT, Ericsson, Qualcomm, vivo, mediatek, Google ?, Nokia, Apple)
  + Option 2: 23dBm is typical power (Samsung, Huawei)
  + Option 3: Support PC2, PC1, preferable PC1.5 (ZTE) (Not quite clear whether in the TR only or also the LS?)
* Recommended WF
  + To be clarified:
    - Should the LS mention other powers possibility and refer to the TR ?
    - Or only the TR mention other powers possibility, not the LS ?

Discussion during ad-hoc

Apple: Last meeting, Samsung indicated that it is not just TX power, but other parameters. Why not have a generic statement that there is more information in the TR higher up, whilst still indicating 23dBm?

CATT: It is better to mention specific value as typical; 23dBm

Ericsson: Agree with Apple proposal

Qualcomm: We send 23dBm for 4GHz and now for 7GHz. Does this limit for 15GHz ?

Apple: We kept maximum output power previously, as in the template

Agreement during ad-hoc (exact wording for the yellow part should be checked offline):

* 23dBm indicated in LS as typical value of maximum output power
* LS contains a generic statement about referring to the TR, mentioning power
* Nothing precluded for 15GHz

**Issue 3-16: Power dynamic range**

Previous agreement:

Power dynamic range (UE)

* Use n104, as appropriate for maximum output power
* Proposals
  + Option 1: 56dB for 100MHz assuming 23dBm (Apple, Ericsson, Qualcomm, ZTE)
  + Option 2: Also 59, 62dB for PC2, PC1.5 (ZTE)
* Recommended WF
  + - The proposals are in line with the previous agreement and depend on the output power.

This topic was not discussed during the ad-hoc

Agreement: 56dB for 100MHz assuming 23dBm.

**Issue 3-17: Emissions mask**

Previous agreement:

Spectrum mask

* UE:
  + n104 as basis for emissions levels
* Follow previous agreement (included here for clarity)

This topic was not discussed during the ad-hoc

**Issue 3-18: ACLR**

Previous agreement:

ACLR

* UE
  + Option 1: 26dB, 27dB (study) for PC3
  + Option 2: 30dB (n104) for PC3, 31dB (n104) for PC2
* Proposals
  + Option 1: n104, i.e., 30dB (Ericsson, ZTE, Nokia, CATT)
  + Option 2: 26dB (previous study value) (vivo, Mediatek, Huawei, Apple, Ericsson 2nd preference, Skyworks, ZTE, Samsung, CATT)
* Recommended WF

Discussion during ad-hoc:

Ericson: The 26dB comes from the co-ex study for 6-7GHz. From the co-existence point of view, option 2 could be OK

Huawei: 26 is based on co-existence, so option 2 is safer. Later on when we define requirements, both options will still be available

Skyworks: This is close to n104, but in the end we are discussing a new range. For higher frequencies, relaxing ACLR is helpful for the UE and not hrmful for the network

ZTE: Option 2 is also OK for us

MEdiatek: ACLR can be a benefit for coverage

CATT: We agreed n104 as the baseline for other requirements previously. Both options are OK, but what does this mean mixing both ways.

Samsung: share CATT view and also Huawei; we do not limit future work. Support option 2

Nokia: We don’t follow why there should be a difference to an existing band

Skyworks: n96 is also close and has 27

Apple: We support option 2. We have 2 layouts; 26dB was obtained by simulations. N104 took 30dB so as not to change compared to FR1, even though not necessarily needed. Bear in mind that the frequency range is large. In the end, there may be different bands with different ACLRs.

Nokia: If we relax ACLR from 30, do we discuss improving MPR or A-MPR.

Nokia: Where does 27dB come from ?

Skyworks: Based on NR-U.

Nokia: How does 26dB relate to co-existence with Satellites ?

Agreement:

* ITU-R reply is 26dB ACLR
* This does not preclude considering 30dB when making actual requirements, and further discussing relation of 26/30dB to MPR/A-MPR (to be documented in TR)

**Issue 3-19: Spurious emission**

Previous agreement:

Spurious Emissions

* UE:
  + Use n104
* Follow previous agreement (included here for clarity)

This topic was not discussed during the ad-hoc

**Issue 3-20: Noise figure**

Previous agreement:

Noise Figure

* UE
  + Option 1: Follow n104 noise figure (12dB)
  + Option 2: Be consistent with information sent previously IMT-2020 28GHz, e.g. 10dB
  + Option 3: Be consistent with Previous LS to ITU-R on 6, 10GHz, NF was 9-13dB
* Proposals
  + Option 1: Follow n104, 12dB (Ericsson, Huawei, Apple, CATT)
  + Option 2: Reply with a range, 9-13dB (vivo, Apple as potential compromise since the previous response also contained the range, Mediatek)
  + Option 3: 13dB (mediatek)
  + Option 4: 10dB (Nokia)

Discussion during ad-hoc:

Mediatek: We think that the NF should be between 12-13. Prefer option 2.

Vivo: We see that there are different values considering n104, co-existence studies etc. So we refer to the TR with an explanation for the range.

Qualcomm: WP5D just need a value for the simulator; we might confuse them

CATT: If we reply with a range, ITU will pick up the worst, 13dB.

Mediatek: We could do 12-13.

Intel: How can we justify 13dB when we have lower for 15GHz ? 11dB for simulation assumptions ?

Apple: The final agreement may end up different

Intel: For mm wave, we said 10dB. Now we have 13dB.

Skyworks: For fR1, everything about 4.5 is more than 10dB.

Agreement: Reply with noise figure 13dB

**Issue 3-21: Sensitivity**

Previous agreement:

Sensitivity

* To be discussed further
* Proposals:
  + Option 1: State “To be specified”, refer to n104 in TR (Ericsson, Apple)
  + Option 2: n104 sensitivity in LS (vivo)
  + Option 3: State “to be specified” in LS (mediatek, Apple)
  + Option 4: Do not mention any value (Huawei)
* Recommended WF
  + Check whether we can write “to be specified” in the LS
  + Check whether to add a reference to n104 sensitivity in the TR and in the LS

Discussion during ad-hoc:

Skyworks: Do we quote 2RX or 4RX ?

Apple: It is assumed RX chains are not counted. ITU will not use sensitivity

Qualcomm: Sensitivity is not critical

Agreement

* + We can write “to be specified” in the LS
  + Add a reference to n104 sensitivity in the TR

**Issue 3-22: Blocking and spurious response**

Previous agreement: No previous agreement (FFS)

* Proposals
  + Option 1: Ericsson: Follow 38.101-1 for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (Tables 7.6.2-2 and 7.6.2-4, 7.6.3-2 and 7.6.3-4 and 7.7-2) (Ericsson, vivo, Huawei)
  + Option 2: Do not use n104, discuss further (ZTE)
  + Option 3: We can consider Option 1 as a tentative baseline, but the actual blocking requirements will depend on the band plan and the RF filter assumptions if a common filter covering larger blocks is assumed

Discussion during ad-hoc:

ZTE: When we defined requirements for n104, we wanted to enable re-use of HW with n96, so we had different blocking. For 7GHz we do not need to share hardware

Apple: There may be HW sharing with n104, so the blocking requirements may be different. In the end, depending on the band plan, the end requirements may be different.

Agreement:

* For LS response: Follow 38.101-1 for NR bands with FDL\_low ≥ 3300 MHz and FUL\_low ≥ 3300 MHz (Tables 7.6.2-2 and 7.6.2-4, 7.6.3-2 and 7.6.3-4 and 7.7-2)
  + Check the actual list and number of tables is correct
* In the TR, capture that depending on the band plan and possibly Hardware re-use or not, the actual requirement may differ

**Issue 3-23: ACS**

Previous agreement:

Issue 2-12 ACS

* UE:
  + Follow n104 or follow previous studies
* Proposals
  + Option 1: As n104, 33dB (Ericsson, ZTE)
  + Option 2: 32dB (previous study TR) (vivo)
  + Option 3: 31dB (mediatek, Apple)

Agreement during ad-hoc: 32dB (previous study TR)