**3GPP TSG-RAN WG4 Meeting # 104-e R4-22XXXXX**

**Electronic Meeting, 15– 26 August 2022**

**Agenda item:** 10.20.5

**Source:** Moderator (Apple Inc.)

**Title:** Email discussion summary for [104-e][125] NR\_unlic\_enh

**Document for:** Information

# Introduction

3GPP Rel-16 introduced unlicensed spectrum to NR and enabled the use of 5GHz and 6GHz bands. New bands and operational modes were added in Rel-17. The main work laid on introducing standard power (SP) and low power indoor (LPI) for 6GHz. The new Rel-18 work item RP-221813 aims to introduce very low power mode (VLP) and the regulatory requirements of several countries which recently finalised their specifications. Alongside the introduction of requirements to NR specification the focus should lie on harmonisation to reduce the number of different network signalling values. Further objectives are the exploration and introduction of power class 3, new channel bandwidth and the update of the NR-ARFCN for 6GHz.

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: TBA
* 2nd round: TBA

It is appreciated that the delegates for this topic put their contact information in the table below.

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
| Skyworks | Dominique Brunel | dominique.brunel@skyworksinc.com |
| Charter | Thomas Montzka | thomaswigge.montzka@charter.com |
| Qualcomm Incorporated | Gene Fong | gfong@qti.qualcomm.com |

Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Topic #1: General and work plan

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2212337 | Apple | RAN4#104:  - analyse regulatory requirements for the countries, which are in the scope of the WI, to conclude which existing NS values can be re-used and how many new NS values might be needed;  - discuss PC3 requirements for support in NR-U and find agreement;  - discuss channel raster points for n96 and n102 to include first 20MHz chunk;  - start discussion on 100MHz channel bandwidth and A-MPR evaluation;  - start working on the required A-MPR values for VLP.  - RAN4#104-bis:  - continue technical work on the requirements and NS values;  - continue work on A-MPR for PC5 and PC3;  - agree on channel raster points for n96 and n102;  - introduce running CRs for required NS values and associated A-MPR requirements.  - RAN4#105:  - agree on preliminary A-MPR values and continue work on remaining A-MPR topics;  - update running CRs for required NS values and associated A-MPR requirements.  - RAN4#106:  - finalise remaining A-MPR topics;  - agree the final CRs implemented all necessary NS values and A-MPR requirements.  Proposal: Agree the proposed work plan for this WI.  Table 2.2-1: Work split for packages   |  |  | | --- | --- | | Package | Technical contributor | | PC3 (n46 and n96) | [Charter] | | 100MHz channel | [Skyworks] | | A-MPR evaluation | See Table 2.2-2 | | Channel Raster Update for first 20MHz | Apple Inc. |   Table 2.2-2: Work split for the A-MPR simulations   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | Country | PC5 | | | PC3 | | |  | SP | LPI | VLP | SP | LPI | | **Region 1** | | | | | | | EU/CEPT |  | Y | [ Apple ] |  | [ Company ] | | **Region 2** | | | | | | | US | Y | Y |  | [ Company ] | [ Company ] | | Canada | Y | Y | [ Apple ] | [ Company ] | [ Company ] | | Brazil |  | Y | [ Apple ] |  | [ Company ] | | Peru |  | Y |  |  | [ Company ] | | Chile |  | Y |  |  | [ Company ] | | Costa Rica |  | Y |  |  | [ Company ] | | Columbia |  | Y |  |  | [ Company ] | | **Region 3** | | | | | | | South Korea |  | Y | Y |  | [ Company ] |   Proposal: Discuss work split and packages. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 1-1

One contribution was submitted proposing the work plan for this WI.

**Issue 1-1: Workplan**

* Proposals
  + Option 1: Adopt WI work plan as proposed in R4-2212337
  + Option 2: Other (please specify)
* Recommended WF
  + Agree the WI work plan as proposed in R4-2212337

### Sub-topic 1-2

In this sub-topic the work split for the different objectives is handled. The goal is to provide an outline over the various tasks for PC3, new channel bandwidth, channel raster update and A-MPR simulations. The idea is to capture interested companies planning to contribute on the topics. The tables shall not prevent companies to contribute to any topic but shall provide overview over items which are covered and those which might be lacking.

**Issue 1-2: Work split for packages**

Table 2.2-1: Work split for packages

|  |  |
| --- | --- |
| Package | Technical contributor |
| PC3 (n46 and n96) | [Charter] |
| 100MHz channel | [Skyworks] |
| A-MPR evaluation | See Table 2.2-2 |
| Channel Raster Update for first 20MHz | Apple Inc. |

Table 2.2-2: Work split for the A-MPR simulations

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Country | PC5 | | | PC3 | |
|  | SP | LPI | VLP | SP | LPI |
| **Region 1** | | | | | |
| EU/CEPT |  | Y | [ Apple ] |  | [ Company ] |
| **Region 2** | | | | | |
| US | Y | Y |  | [ Charter ] | [ Charter ] |
| Canada | Y | Y | [ Apple ] | [ Company ] | [ Company ] |
| Brazil |  | Y | [ Apple ] |  | [ Company ] |
| Peru |  | Y |  |  | [ Company ] |
| Chile |  | Y |  |  | [ Company ] |
| Costa Rica |  | Y |  |  | [ Company ] |
| Columbia |  | Y |  |  | [ Company ] |
| **Region 3** | | | | | |
| South Korea |  | Y | Y |  | [ Company ] |

* Proposals
  + Option 1: Discuss work split and name interested companies
  + Option 2: Other (please specify)
* Recommended WF
  + Discuss work split and name interested companies

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Skyworks | I guess the plan in general is agreeable, we are fine to support the 100MHz part for the existing NS. For new NS/power class maybe it should be part of the general work. We will also contribute (in part) on PC3 and PC5 MPR/A-MPR evaluations. I think the MPR aspect for PC3 is missing and needed before we step into A-MPR. This also means that the ACLR aspect for PC3 should be fixed as suggested in our paper. |
| Charter | We are fine with the work plan, but we agree with Skyworks that MPR for PC3 needs to be specified as well. |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Skyworks | We are OK with work split and as said above want to contribut to PC3 and PC5. Anyhow, it is not usual that specification is set on a single company input thus we should strive to have at least two companies as much as feasible. |
| Charter | We are fine to lead PC3 and we will participate to simulate for the US region. |
| LG Electronics | We can participate PC3-LPI for South Korea region. |

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic #1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

# Topic #2: Harmonization of regulatory requirements

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2212338 | Apple | In this discussion paper presents an overview of the 6GHz regulatory rules for the LPI and VLP modes with the intention of identifying whether they can be covered by the existing NS values or new NS values are needed.  Proposal 1a: Re-use 3GPP band n102 for the LPI operation in Morocco, UAE, Australia, UK and Hong Kong.  Proposal 1b: Re-use 3GPP band n96 for the LPI operation in Saudi Arabia.  Proposal 1c: An existing NS\_58 flag can be used to support LPI operation in Hong Kong (at least for PC5).  Proposal 1d: An existing NS\_01 flag can be used to support LPI operation in UK, Australia, Morocco, Saudi Arabia and UAE (at least for PC5).  Proposal 2a: Re-use 3GPP band n102 for the VLP operation in EU/CEPT, Morocco, Australia, UK and Hong Kong.  Proposal 2b: Re-use 3GPP band n96 for the VLP operation in Canada, Brazil, Chile, Costa Rica, South Korea.  Proposal 2c: A new NS flag to support VLP operation in EU/CEPT and Hong Kong.  Proposal 2d: A new NS flag to support VLP operation in UK, Morocco and Costa Rica.  Proposal 2e: A new NS flag to support VLP operation in Canada.  Proposal 2f: A new NS flag to support VLP operation in Brazil and Chile.  Proposal 2g: A new NS flag to support VLP operation in Australia. |
| R4-2212339 | Apple | LS on extending the maximum range for NS values  To account for local or regional regulatory requirements of some bands, RAN WG4 has a framework with so-called NS values, where a particular NS value associated with a band can signal the corresponding emission requirements. At the moment the network can signal up to 8 different NS values. However, as recently identified by RAN WG4, for some bands there might be a need to signal more than 8 different values. Based on that RAN WG4kindly asks to extend the maximum range so that up to [32] different values can be used. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1 (Harmonization for LPI)

This sub-topic is about harmonization of regulatory requirements. The goal is to group same and similar requirements to reduce amount of new network signaling values.

**Issue 2-1-1: Re-use of n102**

* Proposals
  + Option 1: Re-use 3GPP band n102 for the LPI operation in Morocco, UAE, Australia, UK and Hong Kong.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 2-1-2: Re-use of band n96 for Saudi Arabia**

* Proposals
  + Option 1: Re-use 3GPP band n96 for the LPI operation in Saudi Arabia.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 2-1-3: Re-use of NS\_58 for Hong Kong**

* Proposals
  + Option 1: An existing NS\_58 flag can be used to support LPI operation in Hong Kong (at least for PC5).
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 2-1-4: Use of NS\_01**

* Proposals
  + Option 1: An existing NS\_01 flag can be used to support LPI operation in UK, Australia, Morocco, Saudi Arabia and UAE (at least for PC5).
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

### Sub-topic 2-2 (Harmonization for VLP)

This sub-topic is about harmonization of regulatory requirements. The goal is to group same and similar requirements to reduce amount of new network signaling values.

**Issue 2-2-1: Re-use of n102**

* Proposals
  + Option 1: Re-use 3GPP band n102 for the VLP operation in EU/CEPT, Morocco, Australia, UK and Hong Kong.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 2-2-2: Re-use of n96**

* Proposals
  + Option 1: Re-use 3GPP band n96 for the VLP operation in Canada, Brazil, Chile, Costa Rica, South Korea.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 2-2-3: New NS flag for EU/CEPT and Hong Kong**

* Proposals
  + Option 1: A new NS flag to support VLP operation in EU/CEPT and Hong Kong.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 2-2-4: New NS flag for UK, Morocco and Costa Rica**

* Proposals
  + Option 1: A new NS flag to support VLP operation in UK, Morocco and Costa Rica.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 2-2-5: New NS flag for Canada**

* Proposals
  + Option 1: A new NS flag to support VLP operation in Canada.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 2-2-6: New NS flag for Brazil and Chile**

* Proposals
  + Option 1: A new NS flag to support VLP operation in Brazil and Chile.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 2-2-7: New NS flag for Australia**

* Proposals
  + Option 1: A new NS flag to support VLP operation in Australia.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

### Sub-topic 2-3 (Expanding range for NS values)

With the large amount of new network signaling values the limit for the available NS values is at least hit for band n96. It is expected that more values are required in the future. The existing additionalSpectrumEmission IE is encoded as a 3-bit value thus allowing 8 different values.

**Issue 2-3: Expanding range for NS values**

* Proposals
  + Option 1: Send LS to RAN WG2 asking to extend the existing range of NS values up to 32.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

Discussions:

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1 (Harmonization for LPI)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 2-1-1: Re-use of n102  Issue 2-1-1: Re-use of band n96 for Saudi Arabia  Issue 2-1-1: Re-use of NS\_58 for Hong Kong  Issue 2-1-1: Use of NS\_01 |
| Skyworks | Issue 2-1-1: Re-use of n102 Agree  Issue 2-1-1: Re-use of band n96 for Saudi Arabia Agree  Issue 2-1-1: Re-use of NS\_58 for Hong Kong Agree  Issue 2-1-1: Use of NS\_01 if no OOB spec and in-band PSD>7dBm/MHz this is fine for PC5 as MPR will work |
| Charter | Issue 2-1-1: Re-use of n102  In order to harmonize a worldwide use to band n96 and n102, there is a need to increase the range of NS fields to accommodate each region with the specific requirements on in-band and out-of-band emissions. Hence, we would like to hold off any new introduction of new regions and new NS values before the Issue 2-3: Expanding range for NS values is approved and that RAN2 have extended support for the range.  Issue 2-1-2: Re-use of band n96 for Saudi Arabia  Same as in issue 2-1-1.  Issue 2-1-3: Re-use of NS\_58 for Hong Kong  We support re-use of existing NS values.  Issue 2-1-4: Use of NS\_01  We support re-use of existing NS values. |

Sub topic 2-2 (Harmonization for VLP)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 2-2-1: Re-use of n102  Issue 2-2-2: Re-use of n96  Issue 2-2-3: New NS flag for EU/CEPT and Hong Kong  Issue 2-2-4: New NS flag for UK, Morocco and Costa Rica  Issue 2-2-5: New NS flag for Canada  Issue 2-2-6: New NS flag for Brazil and Chile  Issue 2-2-7: New NS flag for Australia |
| Skyworks | Issue 2-2-1: Re-use of n102 agree same approach than for Korea VLP  Issue 2-2-2: Re-use of n96 agree same approach than for Korea VLP  For the one below since it’s not been studied what the limitation may be, if NS is needed only for PSD/EIRP and noy OOB could it be shared amongst different band/regulations? At least we should crosscheck later.  Issue 2-2-3: New NS flag for EU/CEPT and Hong Kong  Issue 2-2-4: New NS flag for UK, Morocco and Costa Rica  Issue 2-2-5: New NS flag for Canada  Issue 2-2-6: New NS flag for Brazil and Chile  Issue 2-2-7: New NS flag for Australia |
| Charter | Issue 2-2-1: Re-use of n102  In order to harmonize a worldwide use to band n96 and n102, there is a need to increase the range of NS fields to accommodate each region with the specific requirements on in-band and out-of-band emissions. Hence, we would like to hold off any new introduction of new regions and new NS values before the Issue 2-3: Expanding range for NS values is approved and that RAN2 have extended support for the range.  Issue 2-2-2: Re-use of n96  Same objection as in Issue 2-2-1.  Issue 2-2-3: New NS flag for EU/CEPT and Hong Kong  Same objection as in Issue 2-2-1.  Issue 2-2-4: New NS flag for UK, Morocco and Costa Rica  Same objection as in Issue 2-2-1.  Issue 2-2-5: New NS flag for Canada  Same objection as in Issue 2-2-1.  Issue 2-2-6: New NS flag for Brazil and Chile  Same objection as in Issue 2-2-1.  Issue 2-2-7: New NS flag for Australia  Same objection as in Issue 2-2-1. |
| LG Electronics | Issue 2-2-2: Re-use of n96 : fine  For following issues, option 1 is preferred with different regulation of each region.  Issue 2-2-3: New NS flag for EU/CEPT and Hong Kong  Issue 2-2-4: New NS flag for UK, Morocco and Costa Rica  Issue 2-2-5: New NS flag for Canada  Issue 2-2-6: New NS flag for Brazil and Chile  Issue 2-2-7: New NS flag for Australia |

Sub topic 2-3 (Expanding range for NS values)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 2-3: Expanding range for NS values |
| Skyworks | Issue 2-3: Expanding range for NS values this is needed in general even beyond unlicensed, ewe support |
| Charter | Issue 2-3: Expanding range for NS values  We support option 1. We would like to ask RAN2 to enable this feature from Rel-17 when n96 and n102 was introduced. It is clear from the list of new NS flag above, that countries have got their specific power limits, both total as well as maximum power density, and with different out-of-band emission requirements. Also, this list is not yet finalized, as more countries have yet to present their requirements in the different scenario. In this way, all power scenarios (SP, LPI, and VLP) in all local regions and their requirements may be introduced from the point of introduction of the two bands. Therefore, until this is completed in RAN2, we would like to hold off introduction of new regions and new NS values. |
| Qualcomm | We wonder if there’s not a better approach than continually adding new NS values. Every time a new country allows for NR-U, we potentially need a new NS value. Soon, we may have hundreds of NS values for these few bands. Most bands don’t need more than 8. And a vast majority of the countries enabling NR-U may never actually see a deployment. We suggest to have a discussion on other possible approaches before enlarging the ever-growing NS list. |
| LG Electronics | We support option 1. |

With the large amount of new network signaling values the limit for the available NS values is at least hit for band n96. It is expected that more values are required in the future. The existing additionalSpectrumEmission IE is encoded as a 3-bit value thus allowing 8 different values.

**Issue 2-3: Expanding range for NS values**

* Proposals
  + Option 1: Send LS to RAN WG2 asking to extend the existing range of NS values up to 32.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

Discussions:

Qualcomm: I have a concern. I wonder if the traditional approach is better solution. We want to step back to consider if there is a better way to do this.

Charter: if we go with Option 1, we support it. Otherwise, people to fight the limited values.

Skyworks: Agree with thinking about whether we should consider the better idea. We probably need more. One option is to use one value for different modes. For example for Korean, we can use one NS value for two modes.

LGE: our preference is option 1, because we need acquire NS value and at the same time we can discuss the better solution. On one hand we can ask for extension of values. On the other hand, we can discuss the better solution in RAN4.

Mediatek: our preference is Option 1. The five bit extension is enough. Better solution is not precluded.

Ericsson: one other option is to use different band number within the same range. There is enough available number for bands.

T-Mobile USA: we can use mobile country codes.

Agreement:

* Send LS to RAN WG2 asking to extend the existing range of NS values up to 32.
  + The extension is applicable for unlicensed band
* Further discuss the better solution to address the issue of running out the NS values.

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #3: Introduction of power class 3

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2211823 | Skyworks Solutions, Inc. | **Proposal for PC3 ACLR:**   * **Alternative 1: remove ACLR requirement for both PC5 and PC3** * **Alternative 2: same 27dB ACLR requirement for PC5 and PC3** * **Alternative 3: same 30dB ACLR requirement for PC3** * **Our preference is Alternative 1 as it does not change the PC5 specification and interference in adjacent channels is anyhow ensured by the fact that the SEM mask is relative to the in-band PSD**   **Proposal for 1Tx MPR/A-MPR evaluation:**   * **4dB post PA losses** * **1dB MPR for QPSK DFT-s-OFDM 20MHz 100RB0 waveform at 30dB ACLR** * **MPR is evaluated for the same SEM, EVM and IBE requirements than for PC5** * **MPR is evaluated at 30 and 27dB ACLR** * **Single CC MPR for 20 to 100MHz channels** |
| R4-2211586 | Charter Communications, Inc., Apple | **Proposal 1: Reuse the NS values for PC3 for SP and LPI mode in all regions.**  **Proposal 2: Reuse the signal setup from the PC5 A-MPR simulations.**  **Proposal 3: Add ACLR requirement to Power class 3 for shared spectrum channel access and set it to 30dB.**  **Proposal 4: Capture an agreement in a WF on calibration point for A-MPR simulation for PC3 in shared spectrum.**   * **PA calibration point at 20 MHz, 15 kHz, QPSK, DFT-S-OFDM, 100 RB at lower channel edge with 0.5 dB MPR, with ACLR at 30dB** * **PA calibration point at 20 MHz, 15 kHz, QPSK, DFT-S-OFDM, 100 RB at lower channel edge with 1 dB MPR, with ACLR at 30dB** * **PA calibration point at 20 MHz, 15 kHz, QPSK, DFT-S-OFDM, 100 RB at lower channel edge with 1 dB MPR, where the emission levels exactly meet the allowed emission limit of the mask.**   **Proposal 5: Reuse the PA calibration point. Verify with measurement to detect any elevated intermodulation distortion.** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 3-1 (PC3 ACLR)

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 3-1: PC3 ACLR requirement**

* Proposals
  + Option 1: Remove ACLR requirement for both PC5 and PC3
  + Option 2: Same 27dB ACLR requirement for PC5 and PC3
  + Option 3: Same 30dB ACLR requirement for PC3
  + Option 4: Other (please specify)
* Recommended WF
  + TBA

### Sub-topic 3-2 (MPR/A-MPR for 1Tx)

This section discusses the important parameters for calibration point and post PA loss

**Issue 3-2-1: Calibration**

* Proposals
  + Option 1: 0.5dB MPR for QPSK DFT-s-OFDM 20MHz 100RB0 waveform at 30dB ACLR
  + Option 2: 1dB MPR for QPSK DFT-s-OFDM 20MHz 100RB0 waveform at 30dB ACLR
  + Option 3: MPR is evaluated for the same SEM, EVM and IBE requirements than for PC5
  + Option 4: MPR is evaluated at 30 and 27dB ACLR
  + Option 5: PA calibration point at 20 MHz, 15 kHz, QPSK, DFT-S-OFDM, 100 RB at lower channel edge with 1 dB MPR, where the emission levels exactly meet the allowed emission limit of the mask.
  + Option 6: Other (please specify)
* Recommended WF
  + TBA

**Issue 3-2-2: Post PA loss**

* Proposals
  + Option 1: 4dB post PA losses
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 3-2-3: MPR evaluation**

* Proposals
  + Option 1: Focus on ingle CC MPR for 20 to 100MHz channels
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

### Sub-topic 3-3 (MPR/A-MPR for 2Tx)

This section discusses the important parameters for calibration point and post PA loss

**Issue 3-3-1: Calibration**

* Proposals
  + Option 1: 1dB MPR for QPSK DFT-s-OFDM 20MHz 100RB3 waveform at 27dB ACLR and 20MHz NR-U SEM
  + Option 2: MPR is evaluated for the same SEM, EVM and IBE requirements than for PC5
  + Option 3: MPR is evaluated at 30 and 27dB ACLR
  + Option 4: Reuse the PC5 PA calibration point for individual PAs. Verify with measurement to detect any elevated intermodulation distortion.
  + Option 5: Other (please specify)
* Recommended WF
  + TBA

**Issue 3-3-2: Post PA loss**

* Proposals
  + Option 1: 4dB post PA losses
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 3-3-3: Antenna isolation**

* Proposals
  + Option 1: 16dB antenna isolation
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 3-3-4: MPR evaluation**

* Proposals
  + Option 1: Focus on ingle CC MPR for 20 to 100MHz channels
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

### Sub-topic 3-2 (Miscellaneous Topics)

**Issue 3-4-1: Priority order**

* Proposals
  + Option 1: First n96 NS\_54 and m102 NS\_58 then possibly NS\_59

Second n46 NS 28/29/30/31 in-band PSD limited channels

Third n96 NS\_53 and NS\_60

Last NS\_61

* + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 3-4-2: PC3 and existing NS values**

* Proposals
  + Option 1: Add PC3 A-MPR to existing NS values for SP and LPI modes in all regions
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 3-4-3: Channel allocations and placement**

* Proposals
  + Option 1: Re-use channel allocations (full and partial allocations) and channel placement from PC5 for PC3 simulations
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 1-1 (PC3 ACLR)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 3-1: PC3 ACLR requirement |
| Skyworks | Issue 3-1: PC3 ACLR requirement: ACLR at 30dB will result in no power gain for PC2 2Tx implementations that are a natural extension for UE already supporting two WiFi PAs. We suggest to evaluate MPR for 27 and 30dB to be able to make an informed decision. |
| Charter | Issue 3-1: PC3 ACLR requirement  We support option 3,  or option 4 to remove ACLR requirement for only PC3.  We are fine to first evaluate both 27dB and 30dB before making a decision. |

**Issue 3-1: PC3 ACLR requirement**

* Proposals
  + Option 1: Remove ACLR requirement for both PC5 and PC3
  + Option 2: Same 27dB ACLR requirement for PC5 and PC3
  + Option 3: Same 30dB ACLR requirement for PC3
  + Option 4: Other (please specify)
* Recommended WF
  + TBA

**Discussions:**

Skyworks: if looking at the competition tech, it has no such requirement. If we use 30dB ACLR for PC3, in the case we use 2Tx (two PC5) there would be no power gain.

Huawei: we consider the co-existence when deciding the ACLR.

Skyworks: we had some results for it.

Nokia: we have the same understanding. For NR-U, we have relative mask.

Huawei: in our understanding, when deciding ACLR, we do the co-existence study. In this case, if we would like to take 27 ACLR, we should have more analysis on this aspects

**Agreement**

* Evaluate ACLR for 27 and 30dB to be able to make an informed decision
  + Co-existence study is needed for evaluation of 27dB ACLR

Sub topic 1-2 (MPR/A-MPR for 1Tx)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 3-2-1: Calibration  Issue 3-2-2: Post PA loss  Issue 3-2-3: MPR evaluation |
| Skyworks | Issue 3-2-1: Calibration: **1dB MPR for QPSK DFT-s-OFDM 20MHz 100RB0 waveform at 30dB ACLR**  Issue 3-2-2: Post PA loss: 4dB  Issue 3-2-3: MPR evaluation: 27 and 30dB ACLR + NR-U SEM/EVM/IBE |
| Charter | Issue 3-2-1: Calibration  We support option 2. We think it should be the regular PC3 requirements, and thus the regular calibration point.  Issue 3-2-2: Post PA loss  We are fine with option 1.  Issue 3-2-3: MPR evaluation  We are fine to focus on single CC, option 1. |

Sub topic 1-3 (MPR/A-MPR for 2Tx)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 3-3-1: Calibration  Issue 3-3-2: Post PA loss  Issue 3-3-3: Antenna isolation  Issue 3-3-4: MPR evaluation |
| Skyworks | Issue 3-3-1: Calibration: 1dB MPR for QPSK DFT-s-OFDM 20MHz 100RB3 waveform at 27dB ACLR and 20MHz NR-U SEM  Issue 3-3-2: Post PA loss: 4dB  Issue 3-3-3: Antenna isolation: 16dB  Issue 3-3-4: MPR evaluation: MPR evaluation: 27 and 30dB ACLR + NR-U SEM/EVM/IBE |
| Charter | Issue 3-3-1: Calibration  We support option 1.  Our intension with option 4 was to use NR-U PC5 calibration. This is equal to option 1, if we are not mistaken.  Issue 3-3-2: Post PA loss  We are fine with option 1.  Issue 3-3-3: Antenna isolation  We are fine with option 1.  Issue 3-3-4: MPR evaluation  We are fine to focus on single CC, option 1. |

Sub topic 1-4 (Miscellaneous Topics)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 3-4-1: Priority order  Issue 3-4-2: PC3 and existing NS values  Issue 3-4-3: Channel allocations and placement |
| Skyworks | Issue 3-4-1: Priority order: Before any NS A-MPR, PC3 MPR needs to be assessed and PC5 new NS and 100MHZ in parrallel  Issue 3-4-2: PC3 and existing NS values: MPR is needed first for 1Tx and 2Tx  Issue 3-4-3: Channel allocations and placement: reuse PC5 but including specific A-MPR for channels that are only in-band PSD/EIRP limited |
| Charter | Issue 3-4-1: Priority order  We assume the time for completion of all NS values will be in March 2023. With that assumption we are OK priority order in option 1. Otherwise, we would like to increase the priority of NS\_53 to first or second as it covers quite many countries.  Issue 3-4-2: PC3 and existing NS values  We support option 1 to complete introduction of PC3 for all existing NS values.  Issue 3-4-3: Channel allocations and placement  We support option 1. |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #4: MPR/A-MPR topics

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2211606 | Skyworks Solutions, Inc. | In-band PSD is analysed for all types of waveforms including wideband operations cases.  **Proposal for in-band PSD limited channels: For channels that are only limited by in-band PSD in dBm/MHz and seeking to obtain the full benefit of the interlace design, optimized A-MPR values are derived based on:**   * **Allocated bandwidth in full channel or wideband operation mode** * **Identical A-MPR for CP-OFDM and DFT-s-OFDM waveforms of the same type** * **Full allocation and all interlace allocation cases** * **Use of approximated PSD values for full allocation and 0.5dB derating based on 15kHz equivalent number RB gaps per interlace is a possible simplification.** * **+0.5dB offset is added to the PSD for the middle 20MHz sub-band of 100MHz CBW** * **Table 2 above can be used as a starting point**   **Proposal on n46 NS:**   * **Pi/2 BPSK A-MPR is added to all NS by using the same A-MPR value than for QPSK**   + **It is not precluded to further optimize the value in the future** * **100MHz A-MPR is studied for OOB emission for following cases:**   + **NS\_28/30/31: Channels at 5200, 5300 and 5520MHz**   + **NS\_29: no 100MHz channels** * **Study the addition of the 5850-5880MHz range (UNII-4) for NS\_31 which is allowed indoors. Channels overlapping UNII-3 and UNII-4 are also allowed.**   + **Potentially adding the 40/60/80MHz channels aligned with the UNII-4 Wi-Fi channels**   + **Note that 100MHz channel at 5665MHz cannot be used as it overlaps with ITS channels even is UNII-4 is added for NS\_31** * **Study if 20MHz at 5700MHz for NS\_28/30/31 and at 5825MHz for NS\_31 (15MHz GB) can use MPR** * **NS\_29 A-MPR should be made equal to MPR for 64QAM DFT and 256QAM CP 40MHz channels for consistency** * **Study if inner UNII-2C and UNII-3 40/60/80MHz channels can use MPR for NS\_31** * **Check if 20MHz channel at 5745MHz should use MPR or A-MPR for NS\_31**   **Proposal on n96 NS:**   * **Pi/2 BPSK A-MPR is added to all NS by using the same A-MPR value than for QPSK**   + **It is not precluded to further optimize the value in the future** * **NS53:**   + **A-MPR is studied for 100MHz channels at 5995 and 6055MHz to meet -27dBm/MHz at frequencies < 5925 MHz**   + **Other 100MHz full allocation channels can use MPR while 100MHz partial allocation channels have an A-MPR=Max(4 , MPR)**   + **A-MPR for DFT 60MHz partial is corrected to 6.5dB** * **NS54: A-MPR is studied for 100MHz channels at 5995 and 6055MHz to meet -27dBm/MHz at frequencies < 5925 MHz** * **NS59: all 100MHz channels can use MPR** * **NS60:**   + **A-MPR for CP 256QAM 20MHz is corrected to 7dB to be consistent with MPR**   + **Current A-MPR values should only be applicable to channels at the band edges. Other channels should use the calculated in-band PSD back-off**   + **A-MPR is studied for the 100MHz channel at 5995, 6055MHz to meet -27dBm/MHz at frequencies < 5935 MHz and 7015, 7035, 7055 and 7075MHz to meet -27dBm/MHz at frequencies > 7125MHz. All other channels can use MPR** * **NS61: use two A-MPR values:**   + **Only edge channels and sub-bands <60MHz CBW have A-MPR for OOB emissions using the current table**   + **All other channels have 6dB A-MPR for 14dBm EIRP**   **Proposal on n102 NS58:**   * **A-MPR is studied for the 100MHz channel at 5995MHz to meet -22dBm/MHz at frequencies < 5935 MHz** |
| R4-2211824 | Skyworks Solutions, Inc. | In this contribution, we provide an analysis of interest of additional channels for the different 6GHz bands and their NS. When looking at in-band versus OOB limited case we make the following proposal.  **Proposal on additional channels:**   * **Additional channels should map to the current A-MPR values or to the in-band PSD limited A-MPR proposed in [2]** * **Additional channels validity should be clarified per NS.**   Based on the above we make proposal for the frequency range agreed in the WI.  **Proposal for additional channels overlapping 5925-5945MHz**   * **No additional channels for NS\_58** * **20MHz channel at 5935MHz can be added for NS\_53, 59, 60**   + **This channel would require higher A-MPR for OOB for NS\_54 and 61** * **40MHz channel at 5945MHz can be added for NS\_53, 59**   + **This channel would require higher A-MPR for OOB for NS\_54, 60 and 61** * **60MHz channel at 5955MHz can be added for NS\_53, 59**   + **This channel would require higher A-MPR for OOB for NS\_54, 60 and 61** * **80MHz channel at 5965MHz can be added for NS\_53, 59**   + **This channel would require higher A-MPR for OOB for NS\_54, 60 and 61** * **100MHz channel at 5975MHz can be added for NS\_59**   + **This channel would require higher A-MPR for OOB for all other NS**   Furthermore, we provide justification to study more additional channels outside of the current range in the WI.  **Proposal to study additional channels at the top of n96 band**   * **40MHz channel at 7105MHz for NS\_53, 59 and reuse their A-MPR** * **80MHz channel at 7085MHz for NS\_53, 59 and reuse their A-MPR**   **Proposal to study additional channels for UNII-7 in NS\_54**   * **40MHz channel at 6545MHz** * **60MHz channel at 6835MHz** * **80MHz channels at 6565 and 6825MHz** * **100MHz channels at 6575 and 6815MHz** * **Note that top 10MHz are not used and that 40 and 80MHz channels may be considered higher priority** * **All these channels can reuse MPR for A-MPR** * **If more convenient these channels can be added to all n96 NS since they can be all mapped to existing A-MPR/MPR.** |
| R4-2211821 | Skyworks Solutions, Inc. | This contribution provides a thorough analysis of the in-band PSD of all types of UL contiguous CC combinations in terms of waveform coding, types, numerology and full CC vs wideband operation and discuss both in-band and OOB limited cases for n96 ULCA A-MPR. The in-band PSD study allows to present the following proposal.  **Proposal for scheduler parameters:**   * **Same waveform type (DFT or CP) for both CCs** * **Power sharing assumes equal PSD sharing between CCs** * **Mixed allocation type (full and interlace) can be accounted for** * **Mixed numerology (15 and 30kHz) can be accounted for**   **Proposal for in band PSD limited A-MPR:**   * **Separate A-MPR are specified for in-band vs OOB limited adjacent CCs.** * **When one CC is not allocated with 20MHz sub-band, the single CC A-MPR applies** * **A-MPR values are the same for CP and DFT** * **A-MPR is based on equal PSD power split** * **A-MPR when at least one CC is allocated with interlace allocation will use the A-MPR for 1RB/interlace (worst case)** * **A-MPR for 20-100MHz aggregated BW is specified for n96B** * **A-MPR for 120-160MHz aggregated BW is specified for n96C** * **A-MPR values for Full+Full case are derived from equations using the total number of allocated 20MHz sub-bands without considering same or mixed numerology** * **A-MPR values for mixed Full+Interlace and Interlace+Interlace allocation are derived from in-band PSD at full power equations accounting for the following parameters:**   + **Number of allocated 20MHz sub-bands per CCs**   + **Same or mixed numerology**   + **Equations 1, 2a, 2b and 3 in this contribution can be used as a starting point**   + **Equations can cover up to 200MHz aggregated BW**   + **Equations can cover in-band PSD limited cases for n46, n96 and n102 and all related NS.**   With this in mind, we further propose some alternatives on how to handle n96 UL CA A-MPR in Release 17.  **Alternative proposal for CA\_n96B/C UL CA in release 17:**   * **Alternative 1: accept that no UL CA deployment is feasible in Release 17 and provide a complete and optimized A-MPR specification in Release 18** * **Alternative 2: Allow UE to take any A-MPR value in Release 17 and provide a complete and optimized A-MPR specification in Release 18** * **Alternative 3: Only enable channels that are in-band PSD limited in Release 17 with equations provided in this contribution and provide a complete and optimized A-MPR specification in Release 18**   + **Further simplifications could be used in R17 by using the worst case/allocated BW** * **Our preference is for the latest alternative with simplification when the error is less than 1dB** |
| R4-2212341 | Apple | Proposal 1: Use A-MPR values from TR 38.849 for the VLP mode in EU/CEPT and Hong Kong.  Proposal 2: Use A-MPR values from Table 2.3-1 for the VLP mode in Canada.  Proposal 3: Use A-MPR values from Table 2.4-1 for the VLP mode in Brazil.  Proposal 4: Use A-MPR values from Table 2.5-1 for the VLP mode in Australia. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 4-1 (A-MPR for VLP)

**Issue 4-1-1: VLP for EU/CEPT and Hong Kong**

* Proposals
  + Option 1: Use A-MPR values from TR 38.849 for the VLP mode in EU/CEPT and Hong Kong.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-1-2: VLP for Brazil**

* Proposals
  + Option 1: Use A-MPR values from Table 2.4-1 for the VLP mode in Brazil.
* Table 2.4-1: A-MPR values for Brazil

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-ODFM | QPSK | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11 | ≤ 6.5 | ≤ 9.5 |
| 16 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11 | ≤ 6.5 | ≤ 9.5 |
| 64 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11 | ≤ 6.5 | ≤ 9.5 |
| 256 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11 | ≤ 6.5 | ≤ 9.5 |
| CP-OFDM | QPSK | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11 | ≤ 6.5 | ≤ 9.5 |
| 16 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11 | ≤ 6.5 | ≤ 9.5 |
| 64 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11 | ≤ 6.5 | ≤ 9.5 |
| 256 QAM | ≤ 13.0 | ≤ 15.5 | ≤ 9.5 | ≤ 12.5 | ≤ 8.0 | ≤ 11 | ≤ 6.5 | ≤ 9.5 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies. | | | | | | | | | |

* + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-1-3: VLP for Australia**

* Proposals
  + Option 1: Use A-MPR values from Table 2.5-1 for the VLP mode in Australia.
* Table 2.5-1: A-MPR values for Australia

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-ODFM | QPSK | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 16 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 64 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 256 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| CP-OFDM | QPSK | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 16 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 64 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| 256 QAM | ≤ 7.0 | ≤ 9.5 | ≤ 6.0 | ≤ 6.5 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 | ≤ 6.0 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies. | | | | | | | | | |

* + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-1-4: VLP for Canada**

* Proposals
  + Option 1: Use A-MPR values from Table 2.3-1 for the VLP mode in Canada.
* Table 2.3-1: A-MPR values for Canada

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pre-coding | Modulation | Channel bandwidth (Sub-band allocation) / RB Allocation | | | | | | | |
| 20 MHz | | 40 MHz | | 60 MHz | | 80 MHz | |
| Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) | Full (dB) | Partial (dB) |
| DFT-s-ODFM | QPSK | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 |
| 16 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 |
| 64 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 |
| 256 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 |
| CP-OFDM | QPSK | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 |
| 16 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 |
| 64 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 |
| 256 QAM | ≤ 16.0 | ≤ 18.5 | ≤ 12.5 | ≤ 15.5 | ≤ 11.0 | ≤ 14.0 | ≤ 9.5 | ≤ 12.5 |
| NOTE 1: Full allocation A-MPR applies when all RB’s in a 20 MHz channel or all RB’s in all sub-bands for wideband operation are fully allocated and all sub-bands are transmitted. Partial allocation A-MPR applies when one or more RB’s in one or more sub-bands are not allocated but when all sub-bands within the channel are transmitted. When not all sub-bands within the channel are transmitted, the A-MPR associated with the channel bandwidth according to the bandwidth of the contiguously transmitted sub-bands and according to the allocation type applies. | | | | | | | | | |

* + Option 2: Other (please specify)
* Recommended WF
  + TBA

### Sub-topic 4-2 (A-MPR for inner channels)

For channels that are only limited by in-band PSD in dBm/MHz and seeking to obtain the full benefit of the interlace design the A-MPR values can be optimized.

Input from the following paper is considered: R4-2211606 (Skyworks)

**Issue 4-2: Dedicated A-MPR for in-band PSD limited channels**

* Proposals
  + Option 1: Introduce A-MPR for channels which are only limited by in-band PSD
  + Option 2: No dedicated A-MPR for in-band PSD limited channels
* Recommended WF
  + Discuss whether A-MPR shall be introduced for in-band PSD limited channels

### Sub-topic 4-3 (Proposals for n46)

This sub-topic is dependent on outcome of Sub topic 4-2

**Issue 4-3-1: Missing Pi/2 BPSK A-MPR for n46**

* Proposals
  + Option 1: Pi/2 BPSK A-MPR is added to all NS by using the same A-MPR value than for QPSK (R4-2211606)
  + Option 2: Other (please specify)
* Recommended WF
  + Discuss whether Pi/2 BPSK can be added by re-using QPSK A-MPR

**Issue 4-3-2: 100MHz A-MPR Study**

* Proposals
  + Option 1: Study A-MPR for 100MHz channel for NS\_28/30/31 (R4-2211606)
  + Option 2: No 100MHz channel for NS\_29
  + Option 3: Both options
* Recommended WF
  + Discuss whether 100MHz channel can be added as described by the options

**Issue 4-3-3: Addition of UNII-4 for NS\_31**

* Proposals
  + Option 1: Study the addition of the 5850-5880MHz range (UNII-4) for NS\_31 which is allowed indoors. Channels overlapping UNII-3 and UNII-4 are also allowed. Potentially adding the 40/60/80MHz channels aligned with the UNII-4 Wi-Fi channels. (R4-2211606)

* + Option 2: No change required

* + Option 3: Other (please specify)
* Recommended WF
  + Discuss whether UNII-4 can be added for NS\_31

**Issue 4-3-4: 20MHz Channel MPR/A-MPR**

* Proposals
  + Option 1: Study if 20MHz at 5700MHz for NS\_28/30/31 and at 5825MHz for NS\_31 (15MHz GB) can use MPR (R4-2211606)
  + Option 2: Check if 20MHz channel at 5745MHz should use MPR or A-MPR for NS\_31
  + Option 3: Check both options
  + Option 4: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-3-5: NS\_29 A-MPR for 64QAM and 256QAM**

* Proposals
  + Option 1: NS\_29 A-MPR should be made equal to MPR for 64QAM DFT and 256QAM CP 40MHz channels for consistency (R4-2211606)
  + Option 2: Other (please specify)
* Recommended WF
  + Discuss NS\_29 A-MPR

**Issue 4-3-6: UNII-2C and UNII-3 40/60/80MHz channels for NS\_31**

* Proposals
  + Option 1: Study if inner UNII-2C and UNII-3 40/60/80MHz channels can use MPR for NS\_31 (R4-2211606)
  + Option 2: Other (please specify)
* Recommended WF
  + Discuss whether inner UNII-2C and UNII-3 40/60/80MHz channels can use MPR for NS\_31

### Sub-topic 4-4 (Proposals for n96)

This sub-topic is dependent on outcome of Sub topic 4-2

**Issue 4-4-1: Missing Pi/2 BPSK A-MPR for n96**

* Proposals
  + Option 1: Pi/2 BPSK A-MPR is added to all NS by using the same A-MPR value than for QPSK (R4-2211606)
  + Option 2: Other (please specify)
* Recommended WF
  + Discuss whether Pi/2 BPSK can be added by re-using QPSK A-MPR

**Issue 4-4-2: NS\_53 A-MPR for 60MHz channel**

* Proposals
  + Option 1: Correct A-MPR for DFT 60MHz partial to 6.5dB (R4-2211606)
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-4-3: NS\_53 A-MPR for 100MHz channel**

* Proposals
  + Option 1: A-MPR is studied for 100MHz channels at 5995 and 6055MHz to meet -27dBm/MHz at frequencies < 5925 MHz. Other 100MHz full allocation channels can use MPR while 100MHz partial allocation channels have an A-MPR=Max(4 , MPR)
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-4-4: NS\_54 A-MPR for 100MHz channel**

* Proposals
  + Option 1: NS54: A-MPR is studied for 100MHz channels at 5995 and 6055MHz to meet -27dBm/MHz at frequencies < 5925 MHz
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-4-5: NS\_59 A-MPR for 100MHz channel**

* Proposals
  + Option 1: NS59: all 100MHz channels can use MPR
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-4-6: NS\_60 A-MPR for 256QAM**

* Proposals
  + Option 1: Correct A-MPR for CP 256QAM 20MHz to 7dB to be consistent with MPR (R4-2211606)
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-4-7: NS\_60 edge channels**

* Proposals
  + Option 1: Current A-MPR values should only be applicable to channels at the band edges. Other channels should use the calculated in-band PSD back-off (R4-2211606)
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-4-8: NS\_60 100MHz channel**

* Proposals
  + Option 1: A-MPR is studied for the 100MHz channel at 5995, 6055MHz to meet -27dBm/MHz at frequencies < 5935 MHz and 7015, 7035, 7055 and 7075MHz to meet -27dBm/MHz at frequencies > 7125MHz. All other channels can use MPR (R4-2211606)
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-4-9: NS\_61 edge channels**

* Proposals
  + Option 1: Only edge channels and sub-bands <60MHz CBW have A-MPR for OOB emissions using the current table. All other channels have 6dB A-MPR for 14dBm EIRP (R4-2211606)
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-4-10: NS\_58 100MHz channel**

* Proposals
  + Option 1: A-MPR is studied for the 100MHz channel at 5995MHz to meet -22dBm/MHz at frequencies < 5935 MHz (R4-2211606)
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

### Sub-topic 4-5 (Intra-band UL CA)

This sub-topic is for discussing the requirements of intra-band UL CA

**Issue 4-5: Scheduler parameters**

* Proposals
  + Option 1: Same waveform type (DFT or CP) for both CCs

Power sharing assumes equal PSD sharing between CCs

Mixed allocation type (full and interlace) can be accounted for

Mixed numerology (15 and 30kHz) can be accounted for

* + Option 2: Other (please specify)
* Recommended WF
  + TBA

### Sub-topic 4-6 (Intra-band UL CA with PSD limited A-MPR)

This sub-topic is for discussing the requirements of intra-band UL CA

**Issue 4-6-1: Separate A-MPR are specified for in-band vs OOB limited adjacent CCs.**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-6-2: When one CC is not allocated with 20MHz sub-band, the single CC A-MPR applies**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-6-3: A-MPR values are the same for CP and DFT**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-6-4: A-MPR is based on equal PSD power split**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-6-5: A-MPR when at least one CC is allocated with interlace allocation will use the A-MPR for 1RB/interlace (worst case)**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-6-6: A-MPR for 20-100MHz aggregated BW is specified for n96B**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-6-7: A-MPR for 120-160MHz aggregated BW is specified for n96C**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-6-8: A-MPR values for Full+Full case are derived from equations using the total number of allocated 20MHz sub-bands without considering same or mixed numerology**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 4-6-9: A-MPR values for mixed Full+Interlace and Interlace+Interlace allocation**

* Proposals
  + Option 1: A-MPR values for mixed Full+Interlace and Interlace+Interlace allocation are derived from in-band PSD at full power equations accounting for the following parameters:
    - Number of allocated 20MHz sub-bands per CCs
    - Same or mixed numerology
    - Equations 1, 2a, 2b and 3 in this contribution can be used as a starting point
    - Equations can cover up to 200MHz aggregated BW
    - Equations can cover in-band PSD limited cases for n46, n96 and n102 and all related NS.
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

### Sub-topic 4-7 (UL CA A-MPR for n96 in Release 17)

This sub-topic is for discussing alternatives on how to handle n96 UL CA A-MPR in Release 17

**Issue 4-7: (UL CA A-MPR for n96 in Release 17)**

* Proposals
  + Option 1: Accept that no UL CA deployment is feasible in Release 17 and provide a complete and optimized A-MPR specification in Release 18
  + Option 2: Allow UE to take any A-MPR value in Release 17 and provide a complete and optimized A-MPR specification in Release 18
  + Option 3: Only enable channels that are in-band PSD limited in Release 17 with equations provided in this contribution and provide a complete and optimized A-MPR specification in Release 18. Further simplifications could be used in R17 by using the worst case/allocated BW
  + Option 4: Other (please specify)
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 4-1 (A-MPR for VLP)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 4-1-1: VLP for EU/CEPT and Hong Kong  Issue 4-1-2: VLP for Brazil  Issue 4-1-3: VLP for Australia  Issue 4-1-4: VLP for Canada |
| Skyworks | I guess this is PC5 only  Issue 4-1-1: VLP for EU/CEPT and Hong Kong: agree proposed A-MPR for OOB limited cases but add A-MPR 6dB for EIRP limited channels, and treat cases with -1dBm/MHz, it is unclear if the proposed values are in-band or OOB limited.  Issue 4-1-2: VLP for Brazil: Adopt proposed values since they are in-band PSD limited  Issue 4-1-3: VLP for Australia: Adopt proposed values since they are in-band PSD or EIRP limited  Issue 4-1-4: VLP for Canada: Adopt proposed values since they are in-band PSD limited |

Sub topic 4-2 (A-MPR for inner channels)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 4-2: Dedicated A-MPR for in-band PSD limited channels |
| Skyworks | Issue 4-2: Dedicated A-MPR for in-band PSD limited channels: since there are multiple cases where a large number of channels are in-band PSd limited it is worth having a better granularity there. |

Sub topic 4-3 (Proposals for n46, dependent on Issue 4-2)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 4-3-1: Missing Pi/2 BPSK A-MPR for n46  Issue 4-3-2: 100MHz A-MPR Study  Issue 4-3-3: Addition of UNII-4 for NS\_31  Issue 4-3-4: 20MHz Channel MPR/A-MPR  Issue 4-3-5: NS\_29 A-MPR for 64QAM and 256QAM  Issue 4-3-6: UNII-2C and UNII-3 40/60/80MHz channels for NS\_31 |
| Skyworks | Just note that the 100MHz / Pi/2 BPSK and corrections inputs can still be taken into account independently from Issue 4-2 |
| Charter | Issue 4-3-1: Missing Pi/2 BPSK A-MPR for n46  We are fine with option 1 to add the missing values.  Issue 4-3-2: 100MHz A-MPR Study  We are fine with option 1.  Issue 4-3-4: 20MHz Channel MPR/A-MPR  We are OK with option 1. |

Sub topic 4-4 (Proposals for n96, dependent on Issue 4-2)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 4-4-1: Missing Pi/2 BPSK A-MPR for n96  Issue 4-4-2: NS\_53 A-MPR for 60MHz channel  Issue 4-4-3: NS\_53 A-MPR for 100MHz channel  Issue 4-4-4: NS\_54 A-MPR for 100MHz channel  Issue 4-4-5: NS\_59 A-MPR for 100MHz channel  Issue 4-4-6: NS\_60 A-MPR for 256QAM  Issue 4-4-7: NS\_60 edge channels  Issue 4-4-8: NS\_60 100MHz channel  Issue 4-4-9: NS\_61 edge channels  Issue 4-4-10: NS\_58 100MHz channel |
| Skyworks | Just note that the 100MHz / Pi/2 BPSK and corrections inputs can still be taken into account independently from Issue 4-2 |
| Charter | Issue 4-4-1: Missing Pi/2 BPSK A-MPR for n96  We are fine with option 1.  Issue 4-4-2: NS\_53 A-MPR for 60MHz channel  We support the change in option 1.  Issue 4-4-3: NS\_53 A-MPR for 100MHz channel  We support option 1 to study of the edge channels for A-MPR  Issue 4-4-4: NS\_54 A-MPR for 100MHz channel  We support option 1 to study of the edge channels for A-MPR |
| LG Electronics | Issue 4-4-1: Missing Pi/2 BPSK A-MPR for n96  : Fine with option 1.  Issue 4-4-9: NS\_61 edge channels  : For clarification, what are edge channels? |

Sub topic 4-5 (Intra-band UL CA)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 4-5: Scheduler parameters |
| Skyworks | Note that it is essential for all ULCA cases that we have a limited set of parameters to vary and thus at least have an agreement of a limited set for studies, Hopefully based on what makes sense from scheduler point of view |

Sub topic 4-6 (Intra-band UL CA with PSD limited A-MPR)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 4-6-1: Separate A-MPR are specified for in-band vs OOB limited adjacent CCs.  Issue 4-6-2: When one CC is not allocated with 20MHz sub-band, the single CC A-MPR applies  Issue 4-6-3: A-MPR values are the same for CP and DFT  Issue 4-6-4: A-MPR is based on equal PSD power split  Issue 4-6-5: A-MPR when at least one CC is allocated with interlace allocation will use the A-MPR for 1RB/interlace (worst case)  Issue 4-6-6: A-MPR for 20-100MHz aggregated BW is specified for n96B  Issue 4-6-7: A-MPR for 120-160MHz aggregated BW is specified for n96C  Issue 4-6-8: A-MPR values for Full+Full case are derived from equations using the total number of allocated 20MHz sub-bands without considering same or mixed numerology  Issue 4-6-9: A-MPR values for mixed Full+Interlace and Interlace+Interlace allocation |
| Charter | Issue 4-6-2: When one CC is not allocated with 20MHz sub-band, the single CC A-MPR applies  Yes, Option 1.  Issue 4-6-3: A-MPR values are the same for CP and DFT  Option 1.  Issue 4-6-4: A-MPR is based on equal PSD power split  Option 1.  Issue 4-6-6: A-MPR for 20-100MHz aggregated BW is specified for n96B  We support option 1.  Issue 4-6-7: A-MPR for 120-160MHz aggregated BW is specified for n96C  We support option 1.  Issue 4-6-8: A-MPR values for Full+Full case are derived from equations using the total number of allocated 20MHz sub-bands without considering same or mixed numerology  Option 1.  Issue 4-6-9: A-MPR values for mixed Full+Interlace and Interlace+Interlace allocation  Option 1. |

Sub topic 4-7 (UL CA A-MPR for n96 in Release 17)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 4-7: (UL CA A-MPR for n96 in Release 17) |
| Skyworks | It is important that we have a decision on how to manage n96B/C UL I release 17 |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #5: Channel raster

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2211824 | Skyworks Solutions, Inc. | In this contribution, we provide an analysis of interest of additional channels for the different 6GHz bands and their NS. When looking at in-band versus OOB limited case we make the following proposal.  **Proposal on additional channels:**   * **Additional channels should map to the current A-MPR values or to the in-band PSD limited A-MPR proposed in [2]** * **The validity of additional channels should be clarified per NS.**   Based on the above we make proposal for the frequency range agreed in the WI.  **Proposal for additional channels overlapping 5925-5945MHz:**   * **No additional channels for NS\_58** * **20MHz channel at 5935MHz can be added for NS\_53, 59, 60**   + **This channel would require a higher A-MPR for OOB for NS\_54 and 61** * **40MHz channel at 5945MHz can be added for NS\_53, 59**   + **This channel would require a higher A-MPR for OOB for NS\_54, 60 and 61** * **60MHz channel at 5955MHz can be added for NS\_53, 59**   + **This channel would require a higher A-MPR for OOB for NS\_54, 60 and 61** * **80MHz channel at 5965MHz can be added for NS\_53, 59**   + **This channel would require a higher A-MPR for OOB for NS\_54, 60 and 61** * **100MHz channel at 5975MHz can be added for NS\_59**   + **This channel would require a higher A-MPR for OOB for all other NS**   Furthermore, we provide justification to study more additional channels outside of the current range in the WI.  **Proposal to study additional channels at the top of n96 band:**   * **40MHz channel at 7105MHz for NS\_53 and NS\_59 and reuse the A-MPR** * **80MHz channel at 7085MHz for NS\_53 and NS\_59 and reuse the A-MPR**   **Proposal to study additional channels for UNII-7 in NS\_54**   * **40MHz channel at 6545MHz** * **60MHz channel at 6835MHz** * **80MHz channels at 6565 and 6825MHz** * **100MHz channels at 6575 and 6815MHz** * **Note that the top 10MHz of the range are not used and that the 40 and 80MHz channels may be considered a higher priority** * **All of these channels can reuse MPR for A-MPR** * **If it is more convenient, these channels can be added to all n96 NS, since they can be all mapped to an existing A-MPR/MPR** |
| R4-2212340 | Apple | Proposal 1a: As a baseline, enable first 20MHz for band n96 and n102 only for NR-U DL channels.  Proposal 1b: First 20MHz can be considered for NR-U UL channels later (depending on the progress of the technical work).  Proposal 2: To be discussed further whether this enhancement applies only to Rel-18 UEs or earlier releases. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 5-1 (Channel at band edge)

3GPP bands n96 and n102 both start at 5925MHz. However, no channel raster points were defined that would allow utilizing first 20MHz chunk of spectrum, i.e. 5925-5945MHz. This sub-topic discusses the introduction of additional channel raster points enabling true edge channel support for the named bands.

**Issue 5-1-1: New channels at band edge**

* Proposals
  + Option 1: Additional channels should map to the current A-MPR values or to the in-band PSD limited A-MPR as proposed in R4-2211606. Additional channels validity should be clarified per NS.
  + Option 2: Channel at band edge which have larger A-MPR than current edge channels shall be downlink only
  + Option 3: As a baseline, enable first 20MHz for band n96 and n102 only for NR-U DL channels.

First 20MHz can be considered for NR-U UL channels later (depending on the progress of the technical work).

* + Option 4: Do not define the additional channel raster points
  + Option 5: Other (please specify)
* Recommended WF
  + TBA

Discussions:

LGE: it depends on the country region. The starting point can be different depending on country. In Korea, 20MHz is not available. Option 4 works.

Skyworks: similar to LGE. There are bands where these additional channel are not feasible or it will require higher MPR than the existing. If we introduces the new channel bandwidth, they need be optional for some bands. One way is to enable additional channels as optional using the existing NS values.

Charter: we have same view. Pending on the region, the higher A-MPR is needed. We support option 4.

Apple: we prefer not to define. Option 2 and 4 would be way forward.

Qualcomm: same comment. We can assume DL only and base station can meet the emission requirement.

Skyworks: we agree that if we use DL only the BS can decide whether to implement the channel or not depending on local regulation. For country there is no out-of-band requirements, what should we do? Are we open to see the UL?

Qualcomm: either option 4. We just do DL only and sacrifis the UL.

Skyworks: there are cases. Only sub-band is used. The channel space is not always ideal and there is no out-of-band requirements.

**Agreement:**

* Down-select to Option 2 and Option 4.

**Issue 5-1-2: Applicable release for channels at band edge**

* Proposals
  + Option 1: This enhancement applies only to Rel-18 UEs
  + Option 2: This enhancement applies to earlier releases
  + Option 3: Other (please specify)
* Recommended WF
  + Discuss whether the enhancement shall be applicable to Rel-18 onwards or earlier releases

### Sub-topic 5-2 (Additional channels for NS\_53/58/59/60)

*This sub-topic captures the proposals for additional channels overlapping 5925-5945MHz*

**Issue 5-2-1: No additional channels for NS\_58**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 5-2-2: 20MHz channel at 5935MHz can be added for NS\_53/59/60**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 5-2-3: 40MHz channel at 5945MHz can be added for NS\_53/59**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 5-2-4: 60MHz channel at 5955MHz can be added for NS\_53/59**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 5-2-5: 80MHz channel at 5965MHz can be added for NS\_53/59**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 5-2-6: 100MHz channel at 5975MHz can be added for NS\_59**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

### Sub-topic 5-3 (n96 upper channel study)

Proposal to study additional channels at the top of n96

**Issue 5-3: n96 upper channel study**

* Proposals
  + Option 1: 40MHz channel at 7105MHz for NS\_53 and NS\_59 and reuse the A-MPR
  + Option 2: 80MHz channel at 7085MHz for NS\_53 and NS\_59 and reuse the A-MPR
  + Option 3: Study both options
* Recommended WF
  + TBA

### Sub-topic 5-4 (UNII-7 channel study for NS\_54)

Proposal to study additional channels for UNII-7 in NS\_54

**Issue 5-4-1: 40MHz channel at 6545MHz**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 5-4-2: 60MHz channel at 6835MHz**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 5-4-3: 80MHz channels at 6565 and 6825MHz**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

**Issue 5-4-4: 100MHz channels at 6575 and 6815MHz**

* Proposals
  + Option 1: Yes
  + Option 2: Other (please specify)
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 5-1 (Channel at band edge)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 5-1-1: New channels at band edge  Issue 5-1-2: Applicable release for channels at band edge |
| Skyworks | It is important that added channels do not impose more A-MPR work or can use existing A-MPR. One key aspect is whether we can make those additional channel support based on NS. |
| Charter | This will probably add more A-MPR work, because these channels probably need more A-MPR backoff. We object to add these channels right now. |

Sub topic 5-2 (Additional channels for NS\_53, 58, 59, 60)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 5-2-1: No additional channels for NS\_58  Issue 5-2-2: 20MHz channel at 5935MHz can be added for NS\_53/59/60  Issue 5-2-3: 40MHz channel at 5945MHz can be added for NS\_53/59  Issue 5-2-4: 60MHz channel at 5955MHz can be added for NS\_53/59  Issue 5-2-5: 80MHz channel at 5965MHz can be added for NS\_53/59  Issue 5-2-6: 100MHz channel at 5975MHz can be added for NS\_59 |
|  |  |

Sub topic 5-3 (n96 upper channel study)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 5-3: n96 upper channel study |
|  |  |

Sub topic 5-4 (UNII-7 channel study for NS\_54)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | THIS IS A TEMPLATE, PLEASE DO NOT CHANGE IT, ADD A NEW ROW BELOW  Issue 5-4-1: 40MHz channel at 6545MHz  Issue 5-4-2: 60MHz channel at 6835MHz  Issue 5-4-3: 80MHz channels at 6565 and 6825MHz  Issue 5-4-4: 100MHz channels at 6575 and 6815MHz |
|  |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |  |
| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
|  | WF on … | YYY |  |
|  | LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |  |

**Existing tdocs**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-22xxxxx |  | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-22xxxxx |  | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-22xxxxx |  | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |  |

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