**3GPP TSG-RAN WG4 Meeting # 99-e R4-21XXXX**

**Electronic Meeting, 19th – 27th May, 2021**

**Agenda item:** 9.15.4

**Source:** Moderator (Qualcomm)

**Title:** Email discussion summary for [99-e][146] NR\_ext\_to\_71GHz\_Part\_2

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion (e.g. list of treated agenda items) and provide some guidelines for email discussion if necessary.*

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

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

# Topic #1: UE TX Requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109011**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109011.zip) | Sony | **Observation 1: Similar array aperture is needed to maintain the network coverage at 60 GHz as in FR2.**  **Observation 2: UE types other than handheld UE, e.g., FWA, may surpass the EIRP level of 25 dBm.** |
| [**R4-2109433**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109433.zip) | Apple | **Proposal: Consider presented regulatory parameters in further technical discussions for the 52.6-71GHz frequency range. (R4-2109433)** |
| [**R4-2109434**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109434.zip) | Apple | **Proposal: Draft LS included** |
| [**R4-2109446**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109446.zip) | Apple | **Observation 1**: The worse linearity of the PA will require a significant power back-off. We expect a power degradation between 4.5 and 5.5 dB compared to band n262.  **Observation 2:** LNAs suffer from low gain and high noise due to the transistors operating closer to their cut-off frequencies. From this extrapolation the NF degradation is between 3.5 and 4.5 dB compared to band n262.  .  **Observation 5**: UE at 60 GHz and above ranges may always operate at PCMAX in order to achieve the desired SNR at gNB receiver.  **Observation 6**: The +12dB absolute power tolerance for open loop power control would imply that UE will be operating at PCMAX.  **Observation 7**: The -12dB absolute power tolerance for open loop power control may cause UE to be out of UL coverage range and prolong the initial access process.  **Proposal 4**: For NR operation in 60GHz and above ranges, UE output power is always set at Pmax during the initial access. |
| [**R4-2109476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109476.zip) | Qualcomm Incorporated | **TX emissions Observation 1: The EN ACLR computes to -17.1 dB.**  **TX emissions Observation 2: The ACLR for NR is equal to the EN mask for n257, n258, and n261. The EN mask is tighter than the FR2 n259, n260 ACLR. RAN4 should keep the relationship between ACLR and the EN spec.**  **UE EIRP Observation 1: For a smartphone UE nominal beam peak EIRP is 21 dBm.** |
| [**R4-2109981**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109981.zip) | Ericsson | **Observation 1: none of the draft European standards for range c1-c3 specify a nominal channel raster, the nominal channel bandwidth used for RF requirements is declared.**  **Observation 2: the order of magnitude of the UE power capability is estimated at EIRP = 23 dBm in the beam peak with a conducted output power as measured at the output ports of about 19 dBm for a form factor with an 8-element dual polarized array.**  **Proposal 2: the hardware limits to be used for the RAN1 design are a conducted power of the order of 25 dBm as measured on the output ports appears feasible with an EIRP of 30 dBm for UE with larger arrays used in fixed or nomadic applications. The conducted power estimate is based on an ACLR of 15-20 dBc. For smaller arrays the power levels would be smaller.**  **Proposal 3: limit the modulation order for NR in 52.6-71 GHz to 64QAM due to EVM and the corresponding PAE.**  **Observation 4: no need to use interlaced transmissions for meeting the OBW requirements for SRD bands c1 and c3 as such, only required by output power PSD limits.**  **Observation 5: power control for UEs is part of a regulatory requirement for c3 despite the use of beam forming.** |
| [**R4-2110030**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110030.zip) | Xiaomi | **Observation 1: From UE RF requirement perspective, at least the FCC prat 15.255 should be also considered.**  **Proposal 1: 27dBm conducted requirement and 40dBm EIRP to be set as the starting point of UE RF output power**  **Observation 2: Current regulation spurious emission is more stringent comparing to UE FR2 requirement.** |
| [**R4-2110172**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110172.zip) | Intel Corporation | **Power class framework**  **Observation 1:** Majority view in the last RAN4 meeting was that the current FR2 UE RF requirements can be used as baseline for 52.6 to 71 GHz discussions. The FR2 power class approach, which captures relevant regulatory limits and aligns on a reference UE type to derive the requirements, can also be reused.  **Proposal 1:** Reuse FR2 power class framework for the 52.6 to 71 GHz frequency range. This means power classes will continue to be a package of four parameters: minimum peak EIRP, EIRP spherical coverage, maximum TRP and maximum EIRP (regulatory defined, captured in our specs for reference). Values and assumptions to be used for the four parameters are FFS.  **Maximum peak EIRP**  **Observation 2:** For fixed devices, regulatory limits for 52.6 to 71 GHz consider the device antenna gain and transmitter location (indoors vs outdoors).  **Observation 3:** For FCC, the 43 dBm max peak EIRP value used in FR2 can continue to be used for mobile devices up to 71 GHz.  **Observation 4:** Since regulatory limits for 52.6 to 71 GHz depend on the UE type considered, and antenna gain, it is useful to discuss these as part of the reference UE type description to help determine which regulatory limits to include.  **Maximum TRP**  **Observation 5:** The maximum TRP value allowed for 52.6 to 71 GHz is 27 dBm, which means 35 dBm cannot be used for power classes in this frequency range. A lower value for maximum TRP value (e.g. 23 dBm) may be captured pending the outcome of co-existence discussions.  **Maximum power spectral density**  **Observation 6:** Considering the significant antenna gain threshold, the limit for power spectral density we should consider is 23 dBm/MHz.  **General for all regulatory limits**  **Proposal 3:** RAN4 should discuss relevant regulatory limits and align on which values to capture in power classes. Table 1, Table 2 and Table 3 can be used in our discussions during this meeting.  **UE types**  **Observation 7:** For performance related requirements of 52.6 to 71 GHz, RAN4 should first agree on the reference UE type to consider in power class discussions.  **Proposal 4:** Prioritize handheld and FWA UEs in power class discussions for the 52.6 to 71 GHz frequency range.  **Budget derivations and array size**  **Observation 7:** Larger-sized antenna arrays are possible given the smaller wavelength of this frequency range. However, this needs to be further discussed once we agree on a reference UE and are better aligned on applicable regulatory limits.  **General guidelines for power class discussions**  **Proposal 5:** We recommend power class discussions in RAN4 follow the steps outlined below:   * Focus on requirements for the agreed unlicensed band: 57 to 71 GHz [2] * Agree on reference UE - prioritize handheld and FWA UEs   + Confirm applicable max peak EIRP limit (consider UE type and antenna gain)   + Confirm applicable max TRP limit (consider co-existence discussion outcome) * Capture max peak EIRP and TRP parameters in power class definition   + Updates to some FR2 values are expected   + Remaining power class parameters are minimum peak EIRP and spherical coverage * Start budget derivations   + Discuss array sizes while considering design challenges of the frequency range, and regulatory requirements   + Provide budgets for different array sizes and assess feasible values   **Draft Reply LS to RAN1 on beam switching**  **Proposal 5-1**: Agree on the draft reply LS on beam switching as the official reply from RAN4 |
| [**R4-2110604**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110604.zip) | ZTE Corporation | **Proposal 1**:to adopt the maximum EIRP/TRP and PSD in ETSI EN 303 753 for UE power class definition in unlicensed operation;  **Proposal 2**: to start with maximum TRP/EIRP in the existing TS 38.101-2 PC3 for UE power class definition in licensed operation;  **Proposal 3**: RAN4/RAN should decide the typical use case for 60GHz or at least some prioritization on 60GHz use case.  **Proposal 4**: for minimum EIRP and spherical coverage, this might needs more discussions on antenna array size and PA saturated output power and etc.  **Observation 1:** expect for handheld UE e.g. PC3, it’s expected that higher values than RAN1 assumption is feasible |
| [**R4-2110686**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110686.zip) | Nokia, Nokia Shanghai Bell | **Observation 1: Implementation losses need special attention to guarantee high EIRP output and therefore good UL link budget.**  **Proposal 1: RAN4 strives to keep UE implementation loss budget reasonably small for NR operation above 52.6 GHz to ensure good UL link budget.**  **Proposal 2: For an unlicensed NR band adopt the power limits given in Table 2 as a baseline**  **Proposal 3: Further discuss which, if any, of the existing power classes in 38.101-2 can be reused for an unlicensed NR band or a new power class is needed. As basis for power class definition, it is beneficial to discuss what are representative antenna array sizes in this frequency range.**  **Proposal 4: Postpone discussing RF output limits for a licensed band until spectrum and regulations becomes available.**  **Observation 4: Emissions due to non-linearities are typically much wider than the common 1 MHz measurement bandwidth and increasing MBW appears practical especially for wide subcarrier spacings, like 960 kHz.**  **Proposal 7: Consider specifying wider measurement bandwidth than 1 MHz at least for 960 kHz SCS in case regulatory requirements allow it.** |
| [**R4-2110828**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110828.zip) | OPPO | **Observation 1: The max peak EIRP in RAN4 is following regulation requirements and in EU it is 40dBm.**  **Observation 2: The max conduct power is not defined in RAN4 and in theory UE can achieve any power level below the upper limit of peak EIRP regulation requirement.**  **Proposal 1: Reply RAN1 that**   * **The max UE peak EIRP specified in RAN4 follows regulation requirements. And the 40dBm defined in ETSI will be used as one of the reference regulation requirement.** * **RAN4 doesn’t specify max UE conduct power in specification, and in theory UE can achieve any power level below the maximum peak EIRP regulation requirement.**   **Proposal 2: Reply LS included in paper** |
| [**R4-2110977**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110977.zip) | LG Electronics Finland | **Observation#1:** RAN1 assumption of **Maximum** EIRP of +23dBm is in line with existing PC3 requirements for handheld devices, but EIRP is too low for non-handheld devices. Therefore Maximum EIRP of +23dBm could be used as optimization point but higher EIRP levels should also be supported.  **Observation#2:** RAN1 assumption for +21dBm for **Maximum** Conducted Power seems to be sufficient for devices operating in 52.6-71GHz frequency range. |
| [**R4-2111352**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111352.zip) | Huawei, HiSilicon | Observation 1: SL scenario and corresponding UE type does not included in this WI scope.  Proposal 1: For 60GHz UE type, one methodology is to follow TS 38.101-2 definition, handheld UE and FWA UE are considered for 52.6-71GHz in the first place.  Proposal 2: New power class can be considered for UE types with form factor limitation.  Observation 2: For handheld UE, 15-18dBm peak EIRP can be considered with 8 antenna elements assumption.  Observation 3: the value larger than 21dBm TRP and 25dBm EIRP can be reached considering different UE type operating on 52.6-71GHz, it depends on the antenna array size and PA output power.  Proposal 3: Send reply LS to RAN1 to inform that RAN4 think the value larger than 21dBm TRP and 25dBm EIRP can be reached considering different UE type operating on 52.6-71GHz.  Proposal 4: Additionally, The LS could further inform that at least 30dBm peak EIRP can be reached with 32 antenna elements per polarization assumption. The EIRP can be higher if more antenna elements number is assumed.  Observation 4: For 60GHz Band, UL PTRS configuration is necessary for compensating on phase noise.  Proposal 5: The uplink PTRS configuration for 60GHz EVM requirement RMC shall be included in RAN4 spec. |

## 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 1-2.1 Issues related to TX output power

*Issues related to TX output power*

#### Sub-topic 1-2.1-1 Power class related topics

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

**Issue 1-2.1.1-1: UE power class framework**

* Proposals
  + Option 1: power classes will be a package of four parameters: minimum peak EIRP, EIRP spherical coverage, maximum TRP and maximum EIRP
* Recommended WF
  + agree option1

**Issue 1-2.1.1-2: TX power classes for spec**

* Proposals
  + Proposal 1: to adopt the maximum EIRP/TRP and PSD in ETSI EN 303 753 for UE power class definition in unlicensed operation;
  + Proposal 2: to start with maximum TRP/EIRP in the existing TS 38.101-2 PC3 for UE power class definition in licensed operation;
  + Proposal 3: For an unlicensed NR band adopt the power limits given in Table 2 as a baseline (R4-2110686)
  + Proposal 4: Further discuss which, if any, of the existing power classes in 38.101-2 can be reused for an unlicensed NR band or a new power class is needed. As basis for power class definition, it is beneficial to discuss what are representative antenna array sizes in this frequency range.
  + Proposal 5: Postpone discussing RF output limits for a licensed band until spectrum and regulations becomes available.
* Recommended WF
  + discuss in round 1

**Issue 1-2.1-3: Maximum UE EIRP and conducted power for LS out to RAN1**

* Proposals
  + Proposal 1: FWA may be >25 dBm EIRP
  + Proposal 2: 27/40 dBm conducted/EIRP maximum as starting point
  + Proposal 3: Reply LS from R4-2110828
  + Proposal 4: Send reply LS to RAN1 to inform that RAN4 think the value larger than 21dBm TRP and 25dBm EIRP can be reached considering different UE type operating on 52.6-71GHz.
  + Proposal 5: Additionally, The LS could further inform that at least 30dBm peak EIRP can be reached with 32 antenna elements per polarization assumption. The EIRP can be higher if more antenna elements number is assumed
  + Proposal 6: Reply LS from draft LS in R4-2109434
* Recommended WF
  + companies agree the power limits are higher than the LS in.

**Issue 1-2.1.1-4: UE types**

* Proposals
  + Option 1: Prioritize handheld and FWA
* Recommended WF
  + discuss in round 1

#### Sub-topic 1-2.1-5 Regulatory

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

**Issue 1.2.1.2-1: Regulatory output power levels**

* Proposals
  + Proposal 1: Use Table 1 for discussion of EIRP limits

**Table 1.** Summary of maximum EIRP regulatory limits [4-6]

|  |  |  |  |
| --- | --- | --- | --- |
| **Location** | **UE type** | **Max average EIRP** | **Max peak EIRP** |
| Anywhere | Mobile - FCC | 40 dBm | 43 dBm |
| Mobile - ETSI | 40 dBm |  |
| Fixed - FCC | 40 dBm | 43 dBm |
| Fixed - ETSI | 27 dBm + GAnt, for GAnt < 13 dBi  40 dBm, for 13 dBi ≤ GAnt < 30 dBi**1** |  |
| Outdoor only | Fixed - ETSI | 55 dBm, for 30 dBi ≤ GAnt |  |
| Fixed P2P - FCC | 82 dBm for GAnt > 51 dBi  82 - 2\*(51 – GAnt) for GAnt ≤ 51 dBi | 85 dBm for GAnt > 51 dBi  85 - 2\*(51 - GAnt) for GAnt ≤ 51 dBi |
| **1** For UE arrays of 8, 16, and 32 elements, the antenna gain falls in 13 dBi ≤ GAnt < 30 dBi, so the max avg EIRP limit is 40 dBm. | | | |

* + Proposal 2: Use Table 2 for discussion of max TRP
* **Table 2.** Summary of maximum TRP limits [4-6]

|  |  |
| --- | --- |
| **Emission bandwidth 1** | **Max TRP** |
| BW ≥ 100 MHz | 500 mW = 27 dBm2 |
| BW < 100 MHz | 500 mW \* (emission BW/100MHz) |
| 1 Emission BW is determined by measuring the width of the signal between two points, one below the carrier center freq. and one above the carrier center freq., that are 26 dB down relative to the max level of the modulated carrier [9]  2 Captured as max power at antenna ports in ETSI. In case of lack of suitable methods to measure maximum power level at antenna port or ports, the requirement at antenna port or ports is verified with the test metrics of Total Radiated Power (TRP), i.e. maximum TRP shall be less than or equal to 27dBm [5] | |

* + Proposal 3: Use Table 3 for discussion of PSD limits

**Table 3.** Power spectral density limit [5]

|  |  |
| --- | --- |
| Condition | Maximum EIRP0 |
| fixed outdoor installations with ≥ 30 dBi transmit antenna gain | 38 dBm/MHz |
| otherwise | 23 dBm/MHz |

* Proposal 4: Consider presented regulatory parameters in further technical discussions for the 52.6-71GHz frequency range. (R4-2109433)
* Recommended WF
  + Companies discuss during round 1 which of these proposals are agreeable.

### Sub-topic 1.2.2 Void

### Sub-topic 1.2.3 Initial access power

*Sub-topic description*

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

**Issue 1.2.3-1: Initial access power**

* Proposals
  + Option 1: Agree UE initial access power is set at Pmax
  + Option 2: This is RAN1 issue
* Recommended WF
  + discuss in round 1

### Sub-topic 1.2.4 Maximum UL modulation order

*Sub-topic description*

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

**Issue 1.2.4-1: maximum UL modulation order**

* Proposals
  + Option 1: 64 QAM
* Recommended WF
  + discuss in round 1

### Sub-topic 1.2.5 EVM

*PTRS and EVM*

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

**Issue 1.2.5-11: EVM**

* Proposals
  + Option 1: The uplink PTRS configuration for 60GHz EVM requirement RMC shall be included in RAN4 spec.
* Recommended WF
  + discuss in round 1

## Companies views’ collection for 1st round

### Open issues

*Companies provide their views on each item in each of the tables.:*

**Issue 1-2.1.1-1: UE power class framework**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 1-2.1.1-2: TX power classes for spec**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 1-2.1-3: Maximum UE EIRP and conducted power for LS out to RAN1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 1-2.1.1-4: UE types**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 1.2.1.2-1: Regulatory output power levels**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 1.2.3-1: Initial access power**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 1.2.4-1: maximum UL modulation order**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 1.2.5-11: EVM**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### 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: UE RX requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2110687**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110687.zip) | Nokia, Nokia Shanghai Bell | **Observation 1: For licensed operation in the 52.6 – 71 GHz range NR FR2 Rx requirements can be reused as baseline.**  **Observation 2: UE antenna array sizes for NR operation up to 71 GHz should be discussed.**  **Observation 3: It is possible to extract some requirements, like ACS, also from the co-existence study in 38.803.**  **Proposal 1: Postpone further discussion of UE Rx requirements for licensed operation until available spectrum becomes clear.**  **Proposal 2: Align UE Rx requirements to the ETSI EN 303 753 harmonized standard where possible for unlicensed operation in the 57 – 71 GHz range.**  **Proposal 3: Where no Rx requirements is given by the ETSI EN 303 753 harmonized standard use current FR2 NR requirements as a baseline for unlicensed operation in the 57 – 71 GHz range.**  **Proposal 4: RAN4 to further discuss relaxation, if needed, of Rx requirements as compared to current FR2 NR requirements for unlicensed operation in the 57 – 71 GHz range.** |

## 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 2.2.1 RX

*Receiver issues*

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

**Issue 2.2.1-1: RX**

* Proposals
  + Proposal 1: Postpone further discussion of UE Rx requirements for licensed operation until available spectrum becomes clear.
  + Proposal 2: Align UE Rx requirements to the ETSI EN 303 753 harmonized standard where possible for unlicensed operation in the 57 – 71 GHz range.
  + Proposal 3: Where no Rx requirements is given by the ETSI EN 303 753 harmonized standard use current FR2 NR requirements as a baseline for unlicensed operation in the 57 – 71 GHz range.
  + Proposal 4: RAN4 to further discuss relaxation, if needed, of Rx requirements as compared to current FR2 NR requirements for unlicensed operation in the 57 – 71 GHz range.
* Recommended WF
  + discuss during round 1

## Companies views’ collection for 1st round

### Open issues

**Issue 2.2.1-1: RX**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### 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: Time-related issues

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109446**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109446.zip) | Apple | **Observation 3**: In terms of RF hardware control timelines, leveraging of FR2 based implementations implies reusing FR2 requirements on switching between DL and UL as well as Tx/Rx beam switching delays.  **Observation 4**: When defining transient requirements, such as Tx-Rx transition time and other transient periods, RAN4 should be aware of the device type and traffic pattern assumptions.  **Proposal 1**: For NR operation in the 52.6 – 71 GHz range, the Rx-Tx and Tx-Rx transition time shall reuse the FR2 value of 13792 Tc.  **Proposal 2**: For NR operation in the 52.6 – 71 GHz range, the Tx and Rx beam switch delay shall reuse the FR2 assumption.  **Proposal 3**: RAN4 should inform RAN1 that as a baseline the FR2 assumptions on Tx beam switching time, Rx beam switching time, Rx-Tx transition time, and Tx-Rx transition time shall be reused for NR operating in the 52.6 – 71 GHz frequency range. RAN4 should further ask RAN1 whether from the physical layer design perspective it is feasible to support an optionally shorter Rx-Tx/Tx-Rx transition time. |
| [**R4-2109474**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109474.zip) | Qualcomm Incorporated | **Proposal 1: 60 GHz UE requires 7.015 µsec for TX/RX beam switching**  **Proposal 2: 60 GHz UE requires 200 nsec for beam switching**  **Proposal 3: For 60 GHz The minimum duration between any two UE beam switches is 4.5 µsec**  **Proposal 4: The UE portion of LS to RAN1 is included below** |
| [**R4-2109874**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109874.zip) | Ericsson | **Proposal: For electronics operating at 52 to 71 GHz, the maximum beam switching time of 50 ns can be assumed.**  **Proposal: At the end of this contribution a draft LS reply is attached.** |
| [**R4-2109981**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109981.zip) | Ericsson | **Proposal 5: TX ON-ON transients should be distinguished from TX ON-OFF transients for operations in 52.6-71 GHz similar to the transient period capability for FR1.** |
| [**R4-2110172**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110172.zip) | Intel Corporation | **Transient Period and DL-UL switching time**  **Observation 3-1:** In Rel-15, FR2 5 uS transient period was defined for all three transient periods, i.e., ON-to-OFF, OFF-to-ON, and ON-to-ON.  **Observation 3-2:** DL/UL switching time determines cell coverage.  **Observation 3-3:** ON/OFF transient period is the main factor of UL/DL switching time, i.e., UL/DL switching time = ON/OFF transient period + extra time for the rest of configuration.  **Observation 3-4:** ON/OFF transient period needs to be defined first, to determine UL/DL switching time.  **Observation 3-5:** ON/ON transient period directly connected to system throughput performance.  **Observation 3-6:** In FR2, a blanked symbol was introduced for a consecutive power change which is comparable with one OFDM symbol duration with 120 kHz SCS and throughput degradation was limited as 5 uS transient period was comparable with ~7 uS OFDM symbol duration.  **Observation 3-7:** In 60 GHz, with the existing FR2 transient period, i.e., 5 uS, multiple blanked symbols have to be introduced with 480/960 kHz SCS in 60 GHz which severely degrades system throughput performance.  **Observation 3-8:** In FR2, 1 symbol guard period was assumed.  **Observation 3-9:** In 60 GHz, multiple symbols are required for guard period for higher SCS with the same FR2 ON/OFF transient period, which makes additional overhead to the system.  **Observation 3-10:** ON/OFF transient period has impact on the DL/UL switching time and determines the cell coverage distance as well as DL/UL switching overhead.  **Observation 3-11:** 1uS ON-OFF and OFF-ON switching time are feasible from implementation perspective.  **Observation 3-12:**   * Single slot scheduling case:   + The existing 5 uS transient period cannot provide reliable performance for 16QAM MCS 16 with 480 kHz and 960 kHz SCS (note that ∞ means that there is scenario with certain TP cannot reach 1 % BLER).   + 3uS transient period shows 13.6 dB performance loss compared to the ideal transient period (0 uS) for the MCS 16 with 960 kHz SCS   + 2us transient period provides up to 3.5 dB performance loss for MCS 16 with 960 kHz SCS   + 1us transient period allows < 2 dB performance loss for all considered scenarios * Multiple PUSCH/PUCCH slot transmissions   + Comparing the same evaluation condition with the multiple PUSCH/PUCCH slot transmission, the performance get improved with larger number of bundling. For example, for 3 uS transient period for MCS 16 with 960 kHz SCS the performance is 13.6 dB (without bundling) 🡪 11.3 dB (with 2 slot bundling) 🡪 9.2 dB (with 4 slot bundling) 🡪 7.6 dB (with 8 slot bundling).   + While there could be 6 dB throughput improvement with multiple-slot transmission, we would like to point out that the evaluation is based on optimistic assumption, i.e., there is no transient period between the multiple slots illustrated in figure 4, which may or may not hold true based on the final design. Furthermore, the 7.6 dB loss from the 3 uS transient period with MCS 16 with 960 kHz SCS is still quite large compared to the ideal transient period (0 uS TP).   **Observation 3-13**: 16 QAM is not possible with FR2 5 uS transient period in 60 GHz and at least 3 uS transient period is required to support 16 QAM in 60 GHz.  **Observation 3-14**: 64 QAM seems not to be feasible with a single slot scheduling even with 1 uS transient period.  **Observation 3-15**: 1 uS transient period (both ON/OFF and ON/ON) is feasible and 3 uS DL/UL switching time is feasible.  **Proposal 3-1**: RAN4 agrees on [1 – 3] uS transient period for both ON/OFF and ON/ON transient period for 52.6 – 71 GHz range.  **Proposal 3-2**: RAN4 agrees on either [3 – 5] uS for switching time for both DL-to-UL and UL-to-DL.  **UE Tx beam switching and Rx beam switching times**  **Proposal 4-1**: 50 nS is UE switching Tx beam and Rx beam times  **Draft Reply LS to RAN1 on beam switching**  **Proposal 5-1**: Agree on the draft reply LS on beam switching as the official reply from RAN4 |
| [**R4-2110410**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110410.zip) | Ericsson | **Proposal 1:** Separate UE transients for transmit TDD ON/OFF and OFF/ON and for continuous ON-power transmissions.  **Observation 1:** The reduced TGUARD could be traded off with a higher UL/DL switch frequency (lower latency), compared to FR2 or more data (less overhead), again compared to FR2.  **Observation 2:** The shorter cell radius of 52.6 to 71 GHz will limit overhead, since guard period is lower for smaller cells.  **Observation 3:** Existing BS and UE transients and agreed Cell Phase Synchronization requirements TGUARD = 3 µs, TBS = 3 µs and TUE = 5 µs, results in low overhead, 1.4 % and 1.8 %, for reasonable cell ranges of 140 meters up to 500 meters and the same switch point periodicity (in absolute time) as for SCS = 120 kHz. If the switch point periodicity increases, then overhead increases, but given the amount of spectrum available in 52.6 to 72 GHz range, this is less critical.  **Observation 4:** If both low latency and low overhead, are needed, at the same time then we consider first UE transients down to existing FR2 BS transients of 3 µs, as the first action, lower both UE and BS transients below 3 µs as second priority action.  **Observation 5:** If the transient periods are long in relation to a symbol, then this will incur a loss of symbols, but we can control the loss with the switch point periodicity.  **Proposal 2:** Keep the FR2 UE TDD ON/OFF and OFF/ON transients (13792 Tc (=7.015 µsec)) for extension to 71 GHz WI**.** |
| [**R4-2110605**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110605.zip) | ZTE | **Observation 1: switching delay for Tx and Rx beams should be the same.**  Observation 2: if the output power for 60GHz is on the same level of that for the existing FR2 and same PA manufacturing material (e.g. GaAs, Si), then similar ramping up time and ramping down time could be expected for 60GHz.  **Proposal 1: from gNB perspective, the feasible beam switching delay for 60GHz should be around 20ns with considerations of manufacturing’s variation**s.  **Proposal 2: for cell synchronization error for 60GHz WID, 3us should be reused.**  **Observation 2: to reduce the GP overhead for 480kHz and 960kHz of 60GHz, alternatives could be either extend the TDD periodicity or reduce ON-OFF transition time from BS and UE side.** |
| [**R4-2110686**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110686.zip) | Nokia, Nokia Shanghai Bell | **Proposal 8: RAN4 to reply to RAN1 aligned with study item conclusions that gNB beam switching can take place in less than 59 ns (i.e. 50ns).**  **Observation 5: UE beam switching times from FR2 can be re-used**  **Proposal 9: Re-use UE transient time from current FR2.** |
| [**R4-2111379**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111379.zip) | Huawei, HiSilicon | **Proposal 1: U/D and D/U switching time for 60GHz stay with 7us as current FR2 Band.**  **Observation 1: for in-panel case, 5us is required for T/Rx beam switching and on-on power change. For cross panel case, RAN4 may need further discussion on current FR2 Band, and also FFS for new 60GHz Band.**  **Proposal 2: For in panel case, minimum duration between beam switches is 5us on 60GHz Band. For cross panel case, FFS.**  **Proposal 3: For in-panel case UE beam switching time which is purely for beam direction change can be defined with following 2 options:**  **Option 1: UE beam switching time(beam direction change) is assumed as the CP length for 960kHz: 75ns.**  **Option 2: 100ns.**  **For cross panel case, FFS.**  **Proposal 4: For BS beam switching time, further study on the beam switching time after BS side has more input on transmission power requirement.** |

## 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 3.2.1 Beam switching

*Sub-topic description: Beam switching. Companies*

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

**Issue 3.2.1-1: RX -TX and TX -RX beam switching**

* Proposals
  + Option 1: For NR operation in the 52.6 – 71 GHz range, the Rx-Tx and Tx-Rx transition time shall reuse the FR2 value of 13792 Tc. (7.015 usec)
  + Option 2: RAN4 agrees on either [3 – 5] uS for switching time for both DL-to-UL and UL-to-DL.
* Recommended WF
  + discuss in Round 1

*Sub-topic description:*

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

**Issue 3.2.1-2: Minimum duration between beam switches**

* Proposals
  + Option 1: For in panel case, minimum duration between beam switches is 5us on 60GHz Band. For cross panel case, FFS.
  + Option 2: For 60 GHz The minimum duration between any two UE beam switches is 4.5 µsec
* Recommended WF
  + discuss in Round 1

**Issue 3.2.1-3: UE Beam switch time (beam direction switch only)**

* Proposals
  + Option 1: For NR operation in the 52.6 – 71 GHz range, the Tx and Rx beam switch delay shall reuse the FR2 assumption.(200 nsec)
  + Option 2: 50 nS is UE switching Tx beam and Rx beam times
  + Option 3: Within Panel: UE beam switching time(beam direction change) is assumed as the CP length for 960kHz: 75ns.
  + Option 4: Within Panel: 100ns.
  + Option 5: around 20 nsec with consideration for mfg variations
* Recommended WF
  + discuss in Round 1

**Issue 3.2.1-4: UE Inter-panel Beam switch time (beam direction switch only)**

* Proposals
  + Option 1: Same as within-panel
  + Option 2: FFS
* Recommended WF
  + discuss in Round 1

**Issue 3.2.1-5: GNB Beam switch time (beam direction switch only)**

* Proposals
  + Option 1: Within panel: RAN4 to reply to RAN1 aligned with study item conclusions that gNB beam switching can take place in less than 59 ns (i.e. 50ns).
  + Option 2: For BS beam switching time, further study on the beam switching time after BS side has more input on transmission power requirement.
* Recommended WF
  + discuss in Round 1

**Issue 3.2.1-6: LS to RAN1 on beam switching**

* Proposals
  + Option 1: RAN4 should inform RAN1 that as a baseline the FR2 assumptions on Tx beam switching time, Rx beam switching time, Rx-Tx transition time, and Tx-Rx transition time shall be reused for NR operating in the 52.6 – 71 GHz frequency range. RAN4 should further ask RAN1 whether from the physical layer design perspective it is feasible to support an optionally shorter Rx-Tx/Tx-Rx transition time.
  + Option 2: Agree on the draft reply LS on beam switching as the official reply from RAN4 (10172)
  + Option 3: Agree on draft LS from 9474
  + Option 4: Agree on LS from 9874
* Recommended WF
  + Return to LS discussion once parameters are agreed

### Sub-topic 3.2.2 Transient times

*Sub-topic description:*

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

**Issue 3.2.2-1: TX ON-ON and TX ON-OFF transient period**

* Proposals
  + Option 1: RAN4 agrees on [1 – 3] uS transient period for both ON/OFF and ON/ON transient period for 52.6 – 71 GHz range.
  + Option 2: Re-use UE transient time from current FR2.
* Recommended WF
  + discuss during round 1

**Issue 3.2.2-2: TX ON-ON and TX ON-OFF transient periods different**

* Proposals
  + Option 1: TX ON-ON transients should be distinguished from TX ON-OFF transients for operations in 52.6-71 GHz similar to the transient period capability for FR1.
* Recommended WF
  + discuss during round 1

**Issue 3.2.2-3: DL-UL and UL-DL switching**

* Proposals
  + Option 1: RAN4 agrees on either [3 – 5] uS for switching time for both DL-to-UL and UL-to-DL.
* Recommended WF
  + discuss during round 1

### Sub-topic 3.2.3 Cell synchronization error

*Sub-topic description:*

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

**Issue 3.2.3-1: Cell synchronization error**

* Proposals
  + Option 1: for cell synchronization error for 60GHz WID, 3us should be reused.
* Recommended WF
  + discuss during round 1

## Companies views’ collection for 1st round

### Open issues

**Issue 3.2.1-1: RX -TX and TX -RX beam switching**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 3.2.1-2: Minimum duration between beam switches**

|  |  |
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| **Company** | **Comments** |
| XXX |  |

**Issue 3.2.1-3: UE Beam switch time (beam direction switch only)**

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| **Company** | **Comments** |
| XXX |  |

**Issue 3.2.1-4: UE Inter-panel Beam switch time (beam direction switch only)**

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| **Company** | **Comments** |
| XXX |  |

**Issue 3.2.1-5: GNB Beam switch time (beam direction switch only)**

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| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 3.2.1-6: LS to RAN1 on beam switching**

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| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 3.2.2-1: TX ON-ON and TX ON-OFF transient period**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 3.2.2-2: TX ON-ON and TX ON-OFF transient periods different**

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| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 3.2.2-3: DL-UL and UL-DL switching**

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| --- | --- |
| **Company** | **Comments** |
| XXX |  |

**Issue 3.2.3-1: Cell synchronization error**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### 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: Coexistence requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2110687**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110687.zip) | Nokia, Nokia Shanghai Bell | **Observation 3: It is possible to extract some requirements, like ACS, also from the co-existence study in 38.803.** |
| [**R4-2108786**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2108786.zip) | Qualcomm CDMA Technologies | **Proposal 1: Consider scenarios indoor-A (for multi-operator) and indoor-C (for single operator) from TR 38.808 as RAN4 co-exist simulation scenario for 52.6-71 GHz.**  **Proposal 2: Consider one of the three scenarios listed in TS 38.808 for dense urban deployment as RAN4 co-exist simulation scenario for 52.6-71 GHz.**  **Proposal 3: Consider the carrier frequency and channel bandwidth parameters listed in TR 38.808 as a starting point for RAN4 co-exist simulation scenario for 52.6-71 GHz.**  **Proposal 4: Consider the BS antenna radiation pattern parameters assumed in TR 38.808 as RAN4 co-exist simulation scenario for 52.6-71 GHz.**  **Proposal 5: Consider the noise figure assumptions in TR 38.808 as RAN4 co-exist simulation scenario for 52.6-71 GHz.**  **Proposal 6: Consider the non-LBT to derive more stringent requirements for 52.6-71 GHz.** |
| [**R4-2109015**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109015.zip) | CATT | **Proposal: Discuss and agree the simulation assumption for the ACIR requirement.** |
| [**R4-2109383**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109383.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1) There is no need to simulate both 400MHz and 2GHz channel bandwidths, only 400MHz should be simulated.**  **Proposal 2) There is no need to simulate Scenario Indoor-A as the requirements should be decided by the more stringent case, only Scenario Indoor-C should be simulated.** |
| [**R4-2109476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109476.zip) | Qualcomm Incorporated | **UE EIRP Proposal 1: Use 21 dBm UE EIRP with a 2x8 antenna array for coexistence studies.** |
| [**R4-2109981**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109981.zip) | Ericsson | **Proposal 1: consider a UE ACLR range of 15-20 dB feasible for the 52.6-71 GHz frequency range.**  **Proposal 2: the hardware limits to be used for the RAN1 design are a conducted power of the order of 25 dBm as measured on the output ports appears feasible with an EIRP of 30 dBm for UE with larger arrays used in fixed or nomadic applications. The conducted power estimate is based on an ACLR of 15-20 dBc. For smaller arrays the power levels would be smaller.**  **Observation 3: in practice it is the OBW and EVM requirements that determine the achievable UE output power, the ACLR is not dimensioning.** |
| [**R4-2110172**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110172.zip) | Intel Corporation | **Proposal 2-1: Agree on 17 dBc UE ACLR for all supported channel bandwidths in 60 GHz** |
| [**R4-2110686**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2110686.zip) | Nokia, Nokia Shanghai Bell | **Observation 2: Co-existence study for this frequency range has already been documented in TR 38.803**  **Proposal 5: Extract the ACLR and ACS requirements from TR 38.803 for licensed operation** |

## 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 4.2.1

*Sub-topic description:*

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

**Issue 4.2.1-1: Coexistence simulation**

* Proposals
  + Option 1: Discuss and align coexistence simulation parameters
  + Option 2: Rely on system coexistence simulation results from 38.803
* Recommended WF
  + discuss during round 1

**Issue 4.2.1-2: ACLR and ACS**

* Proposals
  + Option 1: Extract the ACLR and ACS requirements from TR 38.803 for licensed operation
  + Option 2: Agree on 17 dBc UE ACLR for all supported channel bandwidths in 60 GHz
  + Option 3: consider a UE ACLR range of 15-20 dB feasible for the 52.6-71 GHz frequency range.
  + Option 4: decide on ACLR/ACS requirements based on coexistence study results
* Recommended WF
  + discuss during round 1

## Companies views’ collection for 1st round

### Open issues

**Issue 4.2.1-1: Coexistence simulation**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |
| CATT | Option 1. According to our preliminary simulation, when BS EIRP is larger and the beam is narrower, the ACIR requirement could be relaxer than the results from 38.803. In order to have more simulation results in next meeting, we think it’s important for companies to align the simulation assumptions in this meeting. Comparing with our proposal and Qualcomm’s proposal, the only difference is BS max Tx power. For the indoor scenario, we’re ok only indoor-C is simulated. For the CBW, we see 100MHz CBW is stringent than 2GHz, so 100MHz should also be considered. So we suggest to have a WF on co-existence simulation parameters to align each other. |

**Issue 4.2.1-2: ACLR and ACS**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |
| CATT | Option 4. |

### 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**

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

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |
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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** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
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. Do not include hyper-links in the documents