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

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

**Agenda item:** 10.19.6

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [104-e][124] NR\_600MHz\_APT

**Document for:** Information

# Introduction

Agenda items treated in this e-mail thread: 10.19.1, 10.19.2, 10.19.3 and 10.19.4 (no contributions against 10.19.5)

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

* 1st round: agree work plan, the TR skeleton and standard requirements that are also applicable to n71
* 2nd round: TBD

Use of running CRs with an appropriate work split (spec responsible) would be beneficial

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

Contact information

|  |  |  |
| --- | --- | --- |
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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: Work plan and TR skeleton

*The work plan and TR skeleton should be agreed at this meeting.*

*Moderator: it is proposed not to treat the contribution on HIBS coexistence (WRC-19 AI 1.4) since studies of coexistence studies with other radio services is not in the scope of 3GPP, the ITU-R WP 5D studies are not complete.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2211529](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2211529) | Spark NZ Ltd, Nokia | Title: Workplan for Introduction of APT 600 MHz band |
| [R4-2211530](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2211530) | Spark NZ | Title: Skeleton TR for APT 600MHz NR band  It is proposed that RAN4 104e meeting approves the following:   * Allocate a band number to the APT 600 MHz NR band * Allocate a TR number for the Skeleton TR * Structure of the Skeleton TR * Table of contents of the skeleton TR (attached separately) |
| [R4-2213335](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213335) | OPPO | Title: R18 Discussion on the treatment of HIBS in bands 694-960MHz  ***Observation 1: 694-960MHz might be used for HIBS in ITU-R which will bring new coexistence scenarios with the APT 600MHz NR band.***  ***Observation 2: UE requirements for HIBS are under discussion in ITU-R and could be used as reference for preliminary discussion.***  ***Observation 3: There will be an overlap of 9MHz between APT 600MHz and HIBS (694-960MHz), or an overlap of 85MHz between APT 600MHz+ band 28 and HIBS bands.***  ***Proposal 1: It is proposed to further consider the potential impact from HIBS defined in WRC AI 1.4 to this APT 600MHz WI when HIBS is introduced.*** |
| [R4-2213678](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213678) | ZTE Corporation | Title: Revised WID on APT 600 MHz NR band  For information to RAN4 |
|  |  |  |

## 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 Work plan

*Sub-topic description: the work plan of the WI*

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

**Issue 1-1: Work plan**

* Proposals
  + Option 1: Agree
  + Option 2: Revise, state what
* Recommended WF
  + TBA

### Sub-topic 1-2 TR skeleton

*Sub-topic description: the TR skeleton*

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

**Issue 1-2: TR skeleton**

* Proposals
  + Option 1: Endorse
  + Option 2: Revise, state what
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

*One of the two formats, i.e. either example 1 or 2 can be used by moderators.*

Sub topic 1-1 Work plan

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Spark NZ Ltd | We support option 1  In regards to input documents tdoc [R4-2213335](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213335) :  The APT 600 MHz band plan should not wait for HIBs. Region 3 already has a primary mobile allocation in the 470 - 890 MHz frequency band and some countries are included in the IMT footnote RR no 5.296A for 470 - 698 MHz and 610 - 698 MHz and. HIBs studies must take into account the protection of existing services. Essentially, RR no 5.296A has regulatory priority over HIBs which are just under study.  HIBs are designed to work with the mobile bands of the country that it is over. However, there is the potential for cross boarder interference issues, but this applies to all bands and not specifically to the APT 600 band. |
| Nokia | We support option 1.  It is proposed not to take speculative assumptions about HIBS into account to this work item.  We are not sure if 694-960MHz is identified to HIBS. The HIBS would be a complementary service to IMT and would not conflict with incumbent services including IMT in already identified bands.  We understand UE requirement would be aligned with IMT specifications according to Resolution 247. |
| OPPO | We are fine to follow the recommendation by the moderator.  In recent WP5D#41 meeting, as indicated in Sharing Studies Report, “Individual membership and regional telecommunication organisations are invited to make their own analysis of studies and draw their own conclusions taking into account prevailing circumstances and interference environment as well as other prevailing conditions in their countries / regions as they find appropriate and valid.”  So regional organizations are suggested to formulate the provisions by themselves.  In the meanwhile, existing user equipment (UE), which already supports a variety of frequency bands identified for IMT, could be served by both HIBS and ground-based IMT base stations.  The coexistence scenarios could be the interference from HIBS to ground component IMT in Mobile Service, which might meet additional requirement with respect to such scenario. It is what we would like to bring up to discuss for the purpose of better using both HIBS and ground based IMT in same manner. |
| Ericsson | Option 1, agree |
| Qualcomm | HIBS coexistence is out of scope of this work item. It can be brought back in for further study in the future depending on the outcome of WRC and/or intended deployment. |
| Huawei | Based on the analysis of the WID, some adjustments were proposed to further detail the core and performance parts of the workplan; link: [R4-2211529\_hw.doc](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Inbox/Drafts/%5B104-e%5D%5B124%5D%20NR_600MHz_APT/Round1/workplan/R4-2211529_hw.doc)  Additionally, work-split was proposed to be added to the list of goals for this meeting.  HIBS: Once the WRC23 decision is taken, RAN4 can revisit those co-ex studies for any potential requirements. |

Sub topic 1-2 TR skeleton

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| --- | --- |
| **Company** | **Comments** |
| Spark NZ Ltd | We support option 1 |
| Ericsson | May be section 6 should be renamed to “List of issues for support of US 600 MHz” or “List of issues for support of Band 71/n71 operation” |
| Qualcomm | While we aren’t against it, we are wondering if there is truly a need for a TR for this band. We already had a SI to study the feasibility and tradeoffs whose conclusions are already captured in a TR. It is unclear what is the value added for yet another TR for the band. |
| Huawei | To clarify this this is expected to be a RAN4 internal TR (38.8xx-series).  Section 5.3.1 missing for the co-ex with DTV?  It looks that the skeleton was reused from the TR 38.860 structure. Therefore, multiple sections may not be really needed, as they are expected to repeat what has been already captured in TR 38.860 during the SI phase. But probably ok to keep them for now.  Tables A6 and A7 to be removed from the skeleton? |

### 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.*

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| --- | --- |
|  | **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: System parameters

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

*Moderator: the moderator proposes that the band number is decided later, use the first available*

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2211532](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2211532) | Spark NZ Ltd | Title: Text Proposals for TR 38.xxx for APT 600MHz NR band  A skeleton TR 38.xxx has been provided to this meeting R4- 2211530.  This contribution proposes text proposals for various sections of the skeleton TR as per below: |
| [R4-2212068](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2212068) | Nokia, Nokia Shanghai Bell | Title: TP on System parameters for APT600  ***Proposal 1: The operating band number for APT600 is n105 or n106 depending on the decision on WI LTE\_terr\_bcast\_bands\_part2.***  ***Proposal 2: The channel raster is 100 kHz based and NR-ARFCN is 132600 – <20> – 140600 for uplink and 122400 – <20> – 130400 for downlink.***  ***Proposal 3: SSB SCS is 15 kHz with pattern A. Range of GSCN is 1535 – <1> – 1624.***  A text proposal to the TR is attached in Annex. |
| [R4-2212097](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2212097) | Skyworks Solutions Inc | Title: APT600 band CH36 rejection and REFSENS impact  **Proposal on APT600 REFSENS:**   * **REFSENS Tables 4a and 4b are adopted** * **It may be further studied if REFSENS degradation can be optimized for bandwidths >15MHz as it already accounts for 20MHz UL related de-sense.**   **Proposal:**   * **To keep the APT600 band introduction on target, the UL maximum CBW and DL maximum CBW of 20MHz and 35MHz respectively should not be increased within the WI** * **Larger UL and DL CBW may be added in the future via the R18 new CBW basket immediately after the APT 600MHz WI is finalized** |
| [R4-2212353](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2212353) | Apple | Title: On APT 600 MHz band definition for NR  ***Observation 1****: With a clever design of the new band, existing n71 devices can be re-used for the new band within the n71 frequency range*  ***Observation 2****: Re-using n71 devices for the n71 frequency range within the new band will accelerate the time to market of the installed base of UEs for the new band and much higher user numbers.*  ***Observation 3****: If the new band uses -46MHz duplex spacing for the channels within the n71 frequency range and signals n71 as MFBI, all existing n71 capable devices will be able to use the network*  ***Observation 4****: The filter rejection and the blocking performance of the transceiver need to be checked together, to find out, how good the UE can withstand the TV station signal*  ***Observation 5****: Refsens on the lowest channel of the new band and filtering against the TV station are contradicting requirements for which a good compromise needs to be found*  ***Proposal 1****: Specify a RX-TX separation of -46MHz for DL/UL frequency pairs within the frequency range 617-652MHz (DL) and 663-698MHz (UL), other separations between -51 and -86MHz are used if one or both channels are not within this frequency range.*  ***Proposal 2****: The network should use -46MHz duplex spacing and signal MBFS for n71, if the frequencies used are within the n71 frequency range to enable*  ***Proposal 3****: RAN4 to study if there is still a need for such a stringent blocking requirement as specified for n71?*  ***Proposal 4****: RAN4 to study the realistically achievable blocking levels with a real baseband, transceiver, LNA and duplexer for the n71 blocking test case in dependency on the insertion loss at the lowest RX channel* |
| [R4-2212611](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2212611) | Xiaomi | Title: Discussion on system parameters for APT 600MHz  **Proposal 1: The band number for APT 600MHz can be defined as n105 on a first-come first served basis.**  **Proposal 2: It is proposed to define 15kHz/30kHz channel raster for the new NR band n105. The applicable NR-ARFCN is calculated as Table 3.**  **Proposal 3: The applicable SS raster entries can be defined as Table 4.** |
| [R4-2213679](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213679) | ZTE Corporation | Title: Discussion on system parameter for APT600MHz  **Proposal 1**: to define the band in Table 2.1-1 for APT600MHz.  **Proposal 2**: to define the supported channel bandwidth for APT600MHz as in Table 2.2-1 and Table 2.2-2 and further discuss the applicability of NOTE 4 in Table 2.2-1 for n105.  **Proposal 3**: to further discuss the asymmetric channel bandwidth set for APT600MHz  **Proposal 4:** to use the same channel raster 100kHz as n71 and the NR-ARFCN in the Table 2.3-1 and GSCN in Table 2.3-2. |
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## Open issues summary

*Comments on the TP to the TR (R4-2211532) in the table below.*

### Sub-topic 2-1 channel and synchronization raster

*Sub-topic description:*

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

**Issue 2-1-1: Channel raster**

* Proposals
  + Option 1: 100k raster aligned with LTE
  + Option 2: 15/30k SCS raster
* Recommended WF
  + TBA

**Issue 2-1-2: GSCN raster**

* Proposals
  + Option 1: a SSB SCS is 15 kHz with pattern A. Range of GSCN is 1535 – <1> – 1624 (R4-2212068, R4-2212611 and R4-2214001)
  + Option 2: other
* Recommended WF
  + TBA

### Sub-topic 2-2 channel bandwidth

*Sub-topic description: channel bandwidth and possible support of asymmetric bandwidths*

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

**Issue 2-2-1: supported channel bandwidth**

* Proposals
  + Option 1: follow the WID (see e.g. R4-2214001)
  + Option 2: other
* Recommended WF
  + TBA

**Issue 2-2-2: asymmetric channel bandwidths**

* Proposals
  + Option 1: shall be supported like for n71 with a mandatory set
  + Option 2: asymmetric BCS shall not be mandated
  + Option 3: to be considered further (R4-2213679)
  + Option 4: not specified in this WI
* Recommended WF
  + TBA

### Sub-topic 2-3 TX/RX frequency separation

*Sub-topic description: TX/RX spacing and compatibility with n71 system parameters (e.g. use of MFBI)*

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

**Issue 2-3-1: UE TX/RX separation**

* Proposals
  + Option 1: Specify a RX-TX separation of -46MHz for DL/UL frequency pairs within the frequency range 617-652MHz (DL) and 663-698MHz (UL), other separations between -51 and -86MHz are used if one or both channels are not within this frequency range. (R4-2212353)
  + Option 2: -51 MHz (R4-2214001)
  + Option 3: other, state what
* Recommended WF
  + TBA

**Issue 2-3-2: MFBI and duplex spacing**

* Proposals
  + Option 1: The network should use -46MHz duplex spacing and signal MBFS for n71, if the frequencies used are within the n71 frequency range to enable. (R4-2212353)
  + Option 2: other, state what
* Recommended WF
  + TBA

### Sub-topic 2-4 blocking requirements, coexistence with broadcast

*Sub-topic description: discuss the need of a blocking requirement for protection from broadcast services below the band, e.g. similar to the in-band requirement for n71*

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

**Issue 2-4-1: protection from interference from broadcast**

* Proposals
  + Option 1: specify a requirement similar to that for n71
  + Option 2: as proposed in R4-2214001 (-15 dBm at 605 MHz with restrictions on range 3 interferer power)
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1 Channel and synchronization raster

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| **Company** | **Comments** |
| Spark NZ Ltd | Issue 2-1-1 : We support option 1  Issue 2-1-2 : we support option 1 |
| Nokia | Issue 2-1-1: Option 1: Support 100kHz channel raster.  Issue 2-1-2: Option 1: Support three tdocs on GSCN and SSB pattern. |
| ZTE | **Issue 2-1-1: Channel raster**  Option 1: 100kHz channel raster  **Issue 2-1-2: GSCN raster**  Option 1. It is also the same values in our contribution [R4-2213679](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213679) |
| Xiaomi | Issue 2-1-1: Prefer option 2. Our thinking is that APT 600MHz is not a LTE refarming band and there is no coexistence issue between LTE and NR. A finer channel raster will enable more flexibility for carrier frequency compared with 100kHz. We also observed several companies would prefer 100kHz channel raster but we don’t see the benefit of that.  Issue 2-1-2: We support option 1. |
| Skyworks | Issue 2-1-1 : We do not have a strong view on 100kHz vs 15kHz based raster. 100Khz would just be more aligned with n71 and other low bands but not sure if this is needed |
| Ericsson | Issue 2-1-1  Option 1: 100 kHz raster should be better to align with other adjacent/overlapping bands.  Issue 2-1-2  Option 1 |
| Qualcomm | Issue 2-1-1: 100 kHz follows the previous agreements for lower frequency bands.  Issue 2-1-2: Agree with option 1. |
| Apple | Issue 2-1-1 : We support option 1, as this would also enable legacy n71 devices to use this band |
| Huawei | Issue 2-1-1: 100 kHz raster seems to have advantages from the n71 ecosystem point of view. Still, we would like to hear what would be the benefits of the 15/30kHz channel raster option, except finer granularity of carrier frequency allocation.  Issue 2-1-2: Option 1 with the same motivation as above. |
| Telstra | Issue 2-1-1: Support Option 1: 100kHz channel raster.  Issue 2-1-2: Support Option 1 |
| MeidaTek | Issue 2-1-1: Support Option 1  Issue 2-1-2: Support Option 1 |

Sub topic 2-2 Channel bandwidth

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| **Company** | **Comments** |
| Spark NZ Ltd | Issue 2-2-1 : we support option 1 an the need to follow the WID. Larger UL and DL CBW maybe considered in future via the R18 new CBW baskets upon completion of the APT600 WI.  Issue 2-2-2 : assymteric bandwidth may be supported with DL bandwidths > 20 MHz but lesser DL/UL bandwidths are symmetric. |
| Nokia | Issue 2-2-2: Option 3  UL CBW is limited to 20 MHz, so asymmetric BW would be required for DL 25, 30, 35 MHz.  For DL 5, 15, 20 MHz, asymmetric BW would not be needed. |
| ZTE | **Issue 2-2-2: asymmetric channel bandwidths**  Option 3  In terms of the objectives, the largest 20MHz channel bandwidth is for UL while 35MHz channel bandwidth is for DL, so asymmetric channel bandwidths should be defined. In our understanding it may largely depends on the operator’s demand |
| Xiaomi | Issue 2-2-1: Option 1  Issue 2-2-2: Option 3. |
| Skyworks | Issue 2-2-1: Option 1 5 to 345MHz DL with 20MHz max UL  Issue 2-2-2: support Nokia’s option 3 |
| Ericsson | Issue 2-2-1:  Option 1: up to 35MHz in DL and up to 20MHz only in UL  Issue 2-2-2:  Options 1 and 3. The set 0 (mandatory) shall also contain the n71 combinations. |
| Qualcomm | Issue 2-2-1: Option 1  Issue 2-2-2: Our understanding is asymmetric bandwidths are not a part of this WID and have not been requested by APT countries. However, we are ok to study including the asymmetric bandwidths into the specification since the uplink has been agreed to be limited to 20 MHz already. |
| Apple | Issue 2-2-1: Option 1  Issue 2-2-2: Option 3 |
| Huawei | Issue 2-2-1: Option 1. In case of interest in higher CBW for UL, those could be considered in a follow-up WI, depending on operators interest.  Issue 2-2-2: asymmetric CBW shall be somehow considered, even if it was not explicitly mentioned in the WID (as 20MHz UL limitation was motivated based on n71 studies). More discussion is needed whether the asymmetric CBW shall be considered as mandatory, or not – this may depend on the spectrum allocations in APT. |
| Telstra | Issue 2-2-1: Support Option 1 for the scope of this WID  Issue 2-2-2: Option 3. Asymmetric BW for DL BW >20 MHz |
| MediaTek | Issue 2-2-1: Option 1  Issue 2-2-2: Option 3. Support Nokia’s view |

Sub topic 2-3 TX/RX frequency separation

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| **Company** | **Comments** |
| Spark NZ Ltd | Issue 2-3-1 : The option B1 has a duplex spacing of 51 Mhz. Whilst it is desirable to have economies of scale with n71, it cannot be made mandatory so as to limit the benefits of additional bandwidth option B1 allows. The band will be shared by multiple operators and there may be a case when an operator has spectrum that partly overlaps with B1 and partly overlaps with n 71. What would such an operator do?. In another case operators may be asked to build a shared network that covers all of the spectrum range B1 allows. Here also it is logical to support the duplex spacing of 51 MHz. The 86 MHz duplex spacing is essentially creating option B1 as two bands, one with 46 MHz duplex and the other with 86 MHz duplex. This is not the intention behind B1.  With regard to a single chipset in the UE to support both bands n 71 and APT 600 MHz band, whilst this is a good idea but if it comes at the expense of limiting the benefits of option B1- then we don’t support this requirement.  Therefore, we support option 2.  Option B1 captures the intention of the AWG request to 3GPP, and the approved WID requires to develop a band plan compliant with B1.  Issue 2-3-2 : Please see our comments on issue 2-3-1 as they are also relevant here. |
| ZTE | **Issue 2-3-1: UE TX/RX separation**  Option 2. The option B1 has a duplex spacing of -51 MHz. |
| Skyworks | **Issue 2-3-1: UE TX/RX separation**  While we understand that the issue of channels overlapping n71 and the additional B1 5MHz is a concrete issue, it may still be possible to leverage UEs with n71 filters with flexibility in the duplex distance. Even with 51MHz duplex distance 30MHz of n71 could still work, and given that UL BW is max 20MHz flexible duplex is intrinsic to n71 and APT600 band. In any case n71 can support all DL channel BW since >20MHz DL, the UL is not necessarily at the duplex distance. It might be worth checking this option further. |
| Ericsson | Issue 2-3-1:  Option 2 but we are open to solutions that allow use of MFBI.  Issue 2-3-2:  Option 2 / -51 MHz as baseline, but also allowing variable duplex (at least as implied by asymmetric bandwidths). |
| Qualcomm | Issue 2-3-1: Option 2. The various band options have already been extensively discussed during the SI and there has already been agreement to specify B1. This is also consistent with the feedback received from APT. B1 has a Tx-Rx separation of -51 MHz. The specifications should firstly be written in this manner. Spectrum has already been auctioned for this band in India with the first assignment already made, not consistent with 46 MHz and with spectrum outside of the Band n71 frequency range.  Issue 2-3-2: Option 2. Although there are certain similarities, this is not Band n71. It has a different frequency range and used in a different part of the world. As commented above, spectrum has already been assigned for this band that is incompatible with n71. It is not possible to have one duplex for a portion of the band and a different duplex for a different portion of the band in the same deployment. |
| Apple | B1 denotes the frequency range and that it should be implemented as a single band, it doesn’t mean it is mandatory to use a strict 51MHz duplex spacing. In fact a more clever way to have flexible duplex spacing is no disadvantage, but it is an advantage to use the flexible duplex spacing as described in Option 1. Those operators having spectrum within the B1 extension and B71 can use that flexible duplex spacing according to their spectrum and need new UEs, while operators only having spectrum overlapping with n71 can use -46MHz and re-use the legacy devices as well as new ones. The -86MHz are only needed, if an operator only has the two 5 MHz extensions of the new band, this allocation wouldn’t even work with -51MHz duplex spacing. For other allocations covering the additional frequency range the optimum duplex spacing can be used for that spectrum. Also if in future someone wants to use the full 40 MHz, once it is specified, it is possible to use the flexible duplex spacing with -51MHz, as this would also cover the new frequency range. So the flexibility just gives more chances for usage of the new spectrum and at the same time helps to use legacy n71 devices in networks only using the n71 frequency range.  Issue 2-3-1: Option 1 for better flexibility  Issue 2-3-2: Option 1 for the possibility to re-use legacy n71 devices |
| Huawei | Issue 2-3-1: Option 2 as baseline, as per Tx-Rx separation of B1.  Issue 2-3-2: more analysis needed |
| Telstra | Issue 2-3-1: Support Option 2 (-51 MHz) in line with the request from AWG to standardize band plan option B1 |
| MediaTek | Issue 2-3-1: UE TX/RX separation  Option 2. The option B1 has a duplex spacing of -51 MHz.  Issue 2-3-2: Option 1 is doable but REFSENS of n71 shall be 0.5dB relaxed as baseline |

Sub topic 2-4 blocking requirements, coexistence with broadcast

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| --- | --- |
| **Company** | **Comments** |
| Spark NZ Ltd | Issue 2-4-1 : The TV standard in APT countries is DVBT-2 and not ATSC as possibly in the US. Furthermore, the TV channel spacings are 6/7/8 MHz. The channel numbers are not the same amongst themselves and also with the US- see Fig 1 of R4-2214001 Channel 36 in 6 MHz countries has a guard band of 4 MHz for option B1.Statistical simulations using DVBT-2 parameters ( see ITU R BT 2383- typical freq sharing characteristics for DTT broadcasting systems in the 470- 862 MHz band) for the APT region using 200 KW EIRP DTT transmitter and a 20 dB UE filter rejection show that the 97% interference power as -44 dBm ( case 2 in band blocking). More details of the simulations are given in R4-2211532. The filter rejection of 20 dB is assumed to be the lowest as better filter rejections were also shown to the AWG correspondence group that carried out the co existence studies. The parameters used to determine the guardband requirements for Television broadcast are based on the general case in use in apt countries and not values that are an exception such as 1MW EIRP.  We support option 2. |
| Skyworks | The reuse of APT duplexer for n71 is key so a UE declaring n71 support but implemented with a APT600 filter must still support the n71 blocking level and will see the higher power DTT interference in the US. So regardless on how blocking is defined for APT600 the n71 blocking and US DTT interference must be supported by the APT600 duplexer design which is why we propose to allows a REFSENS degradation compared to n71 REFSENS for channels overlapping with the first 5MHz. |
| Ericsson | Issue 2-4-1:  Option 1. We can also consider a modification of the existing blocker level for B71/n71 (broadcast protection) if that is needed for allowing implementation of UEs supporting both APT600 and 71/n71 while still offering protection from DTV interferers.. |
| Qualcomm | Option 2. The APT600 band is specified for APT countries (for example, UE coexistence will not include US countries) while Band n71 is primarily intended for US. In the US, the broadcast TV towers can transmit as high as 1 MW; hence, the B71/n71 blocker values were derived based on this. On the other hand, it is our understanding that TV broadcast in APT countries is limited to 200 kW. Moreover, because of the spectrum arrangement for the APT600 band, the guardband is smaller for APT600 than it is for Band n71. Therefore, the requirements for APT600 band should be based on the expected conditions present where the band is expected to be deployed. Please see R4-2214000 where I describe in detail the derivation and justification of blocking requirements for APT600. |
| Apple | Issue 2-4-1: None of the options. There is no need for such a stringent TV blocking requirement as for n71, since according to the APT study the TV stations have much lower output power than those in the US. So when using the duplexer for the APT band and n71, the blocking for n71 will be the much more stringent case. |
| Huawei | More study needed. |
| Telstra | Issue 2-4-1: Support Option 2 for reasons cited by Spark NZ, Qualcomm |
| MediaTek | Issue 2-4-1: We tend to agree on option 1 but the requirements need further study |

### CRs/TPs comments collection

*Comments on the TP to the TR in this clause..*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [R4-2211532](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2211532)  Text Proposals for TR 38.xxx for APT 600MHz NR band | Spark NZ : we support the TPs as in R4-2211532 |
| Skyworks: the TR is very confusing on the DTT interference: Table 5.3.2-1 talks about interference with 8MHz CH38 and 6MHz CH37 that are both overlapping with B1 so it can’t work. And the simulations are with other channels and assuming 20dB attenuation that is not available from all filters technologies.  The TR should clarify exactly which DTT channels should be considered for B1 and remove B2. My understanding is the following for B1 worst case DTT interference to UE:  6 MHz Channel Raster/Spacing: 596-602 MHz (CH 36) at 4MHz offset and simulation do show a degradation  8 MHz Channel Raster/Spacing: 598-606 MHz (CH 37) at 6MHz offset  7 MHz Channel Raster/Spacing: 596-603 MHz (CH 38) at 9MHz offset  And the conclusion 1) in chapter 5 is conditioned to throughput loss and 20dB rejection from the Rx filter of the full band duplexer. The TR should not be a copy of APT input but what we need in 3GPP to account for and then agree on filter/blocking assumptions. |
| Huawei: TR shall capture the outcomes of RAN4 discussions.  Capturing conclusions (from APT studies) at this stage does not seem to be the right approach. If needed, the APT inputs can be referred to, and further reused in RAN4 as input to the requirements derivation.  Section 8 is not needed. |
| 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: UE RF requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2212069](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2212069) | Nokia, Nokia Shanghai Bell | Title: UE RF requirement for APT600  ***Proposal 1: A single UE RF architecture that supports both B1 and band n71 shall be assumed.***  ***Observation 1: Max power tolerance for PC3 should be +2/-2.5 dB. One for PC3 UL MIMO should be +2/+3 dB.***  ***Observation 2: No network signalling value (other than NS\_01) is identified yet for APT region.***  ***Observation 3: For the coexistence of APT600 band, at least the following APT region bands 1, 3, 5, 7, 8, 20, 26, 28, 38, 39, 40, 41, 42, 50, 51, 65, 74, n77, n78 should be added in UE coexistence table.***  ***Observation 4: In-band, out-of-band and narrow band blocking should be specified for APT600 aligned with band n71.*** |
| [R4-2212097](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2212097) | Skyworks Solutions Inc | Title: APT600 band CH36 rejection and REFSENS impact  **Proposal on APT600 REFSENS:**   * **REFSENS Tables 4a and 4b are adopted** * **It may be further studied if REFSENS degradation can be optimized for bandwidths >15MHz as it already accounts for 20MHz UL related de-sense.**   [Tables 4a and 4b pasted below]  **Proposal:**   * **To keep the APT600 band introduction on target, the UL maximum CBW and DL maximum CBW of 20MHz and 35MHz respectively should not be increased within the WI** * **Larger UL and DL CBW may be added in the future via the R18 new CBW basket immediately after the APT 600MHz WI is finalized** |
| [R4-2212612](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2212612) | Xiaomi | Title: Discussion on UE RF requirements for APT 600MHz  This contribution provides an overview of UE RF requirement impact for APT 600MHz in Table 1. |
| [R4-2212714](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2212714) | ZTE Corporation | Title: Discussion on APT 600MHz UE RF requirement  **Maximum output power**  ***Proposal 1. The maximum output power for the new added FDD band is proposed in Table 4.***  [Table below]  **MPR**  ***Proposal 2. Current MPR can be reused for the new added FDD band [n105].***  ***REFSEN***  ***Proposal 3. Some evaluations would be needed to define the sensitivity requirements for the new added FDD band***  In addition, the summary of the corrections on TS38.101-1 are given in table 5. |
| [R4-2214000](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2214000) | Qualcomm Incorporated | Title: UE RF requirements for the APT 600 MHz band  The UE RF requirements for the APT 600 MHz band have been introduced in this contribution including frequency arrangement, channel bandwidths, raster, output power, spurious emissions, reference sensitivity, and blocking. The reference sensitivity analysis has been provided as well as the justification for the blocking requirement. A draft CR can be found in [8].  *See draft CR in R4-2214001 below* |
|  |  |  |

## 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 MOP for PC3

*Sub-topic description: tolerance and other restrictions for the supported power class.*

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

**Issue 3-1-1: Maximum output power (PC3), tolerance**

* Proposals
  + Option 1: +2/-2
  + Option 2: +2/-2.5
  + Option 3: +2/-3
  + Option 4: other
* Recommended WF
  + TBA

**Issue 3-1-2: MOP band-edge relaxation**

* Proposals
  + Option 1: 1.5 dB as per the current NOTE 3
  + Option 2: no relaxation
  + Option 3: other, state what
* Recommended WF
  + TBA

### Sub-topic 3-2 Reference sensitivity

*Sub-topic description*

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

**Issue 3-2: Reference sensitivity**

* Proposals
  + Option 1: as proposed in R4-2212097

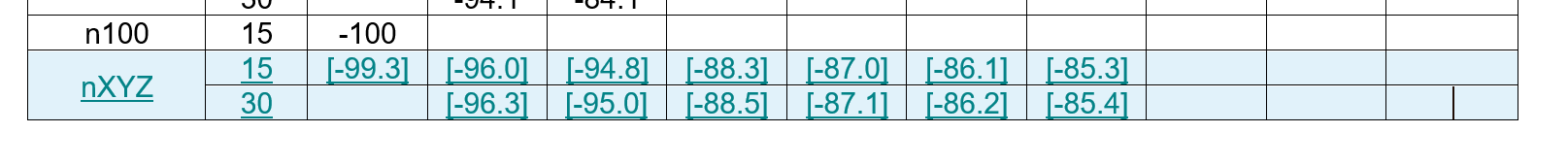
**Table 4a: REFSENS level for APT600 band**

| **Operating band / SCS / Channel bandwidth** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Operating Band** | **SCS kHz** | **5**  **MHz (dBm)** | **10**  **MHz (dBm)** | **15**  **MHz (dBm)** | **20**  **MHz (dBm)** | **25**  **MHz (dBm)** | **30 MHz (dBm)** | **35 MHz (dBm)** |
| **APT600**  **(n10X?)** | **15** | **-97.2X** | **-94.0Y** | **-91.6Y** | **-86.0Y** | **-84.1Y** | **-82.5Y** | **-80.7Y** |
| **30** |  | **-94.3Y** | **-91.9Y** | **-87.4Y** | **-84.2Y** | **-82.6Y** | **-80.8Y** |
| **Note X: 5MHz channels overlapping the 612-617MHz range are allowed [1]dB REFSENS degradation**  **Note Y: >5MHz channels overlapping the 612-617MHz range are allowed [0.5]dB REFSENS degradation** | | | | | | | | | |

**Table 4b: UL configuration for REFSENS**

| **Operating band / SCS (kHz) / Channel bandwidth (MHz) / Duplex mode** | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Operating Band** | **SCS** | **5** | **10** | **15** | **20** | **25** | **30** | **35** | **Duplex Mode** |
| **APT600** | **15** | **25** | **251** | **201** | **201** | **Note 5** | **Note 5** | **Note 5** | **FDD** |
| **(n10X?)** | **30** |  | **121** | **101** | **101** | **Note 5** | **Note 5** | **Note 5** |  |
| **Note 1: UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.3.2-1).**  **Note 5: For this DL channel bandwidth, the UL configuration of the highest UL channel bandwidth specified in Table 5.3.6-1 and the default Tx-Rx frequency separation specified in Table 5.4.4-1 shall be used.** | | | | | | | | | |

* + Option 2: as proposed in R4-2214001





* + Option 3: other
* Recommended WF
  + TBA

### Sub-topic 3-3 standard selectivity and blocking requirements (other than protection from broadcast)

*Sub-topic description: standard blocking requirements (ACS, narrowband, in-band and out-of-band blocking). The blocking requirement for protection from broadcast interferers is handles in Topic #2.*

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

**Issue 3-3: standard selectivity and blocking requirements**

* Proposals
  + Option 1: same as for n71 and other bands
  + Option 2: other, state what
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 3-1 MOP for PC3

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Spark NZ | We support either of options 2 or 3. |
| Nokia | Issue 3-1-1: Option 2: +2/-2.5  Issue 3-1-2: Option 2: no relaxation |
| ZTE | **Issue 3-1-1: Maximum output power (PC3), tolerance**  Our initial proposal is [+/-2]dB. Given that this was already discussed in the SI and in the TR, where the insertion loss is approaching 3 dB for single full band duplexer implementation but still meets the Band 71 filter specification. So Option 2 is fine to us. It seems option 3 is for the band supporting UL-MIMO?  **Issue 3-1-2: MOP band-edge relaxation**  Option 1: 1.5 dB as per the current NOTE 3  The relative duplex gap for both n71 and new added band are the same (i.e. 1.67% which is smaller than 1.75%). Considering single duplexer implementation for the new added band, so like other FDD band, the MOP band-edge relaxation should be considered. |
| Xiaomi | Issue 3-1-1: Option 2: +2/-2.5  Issue 3-1-2: Option 1: 1.5 dB as per the current NOTE 3 |
| Skyworks | Issue 3-1-1: Option 2: +2/-2.5 even for n71 the switch losses are traded for more loss in a full duplexer (more BW and smaller gap) compared to dual duplexer. This is even further the case with 5MHz more BW  Issue 3-1-2: Option 1: 1.5 dB as per the current NOTE 3 especially again that a n71 UE using the APT600 duplexer will need rejection of the Tx filter at n29 frequencies which will induce higher losses at the top 5MHz of the APT600 UL |
| Ericsson | Issue 3-1-1:  Option 2, aligned with n71 and n28 |
| Qualcomm | Issue 3-1-1: Option 2, +2/-2.5  Issue 3-1-2: Option 2. Note 3 is not currently applied to n71 either, although that’s not the reason we don’t think it’s needed here. |
| MediaTek | Issue 3-1-1: Option 2: +2/-2.5  Issue 3-1-2: Option 1 |

Sub topic 3-2 Reference sensitivity

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Spark NZ | We support option 2. The UL/DL separation for the APT 600 band is slightly larger ie 51 MHz. we expect this will reduce the self TX/Rx interference and result in better Rx sensitivity. More advanced duplexers will also improve this further. |
| Nokia | Option 2 looks a good starting point for further discussion. |
| Xiaomi | Option 1. The REFSENS for band n71 can be considered as a starting point. |
| Skyworks | Option 1: the claim that APT600 has less issue with UL noise is not valid for the 5/10/15MHz which follows the 3dB/octave progression. So this n71 baseline for 5/10/15MHz has not reason to change, if anything the larger BW would call for more losses. But in our proposal we maintain n71 REFSENS and we are only further asking a relaxation in the first 5MHz such that the US DTT protection is met (with high power interferer). As suggested in our proposal we are open to reassess (improve) REFSENS for channels >15MHz. we do not see the reason to reassess REFSENS again as n71 5/10/15MHz baseline is solid from contributions of many companies/filter technologies and we are ready to absorb the impact of reduced %gap and increased BW if the first 5MHz get an allowance. |
| Ericsson | Option 2  The contribution R4-2212097 seemingly accounts for more coexistence scenarios and filter implementations than R4-2214000 – if this is a correct observation, we can consider a compromise between the two proposals. We note that APT600 is a band for coverage scenarios, minimum requirements should be specified accordingly. |
| Murata | With the assumed larger duplex offset and full band duplexer consideration, only the 5th order component comes into play and is less severe than the original n71 REFSENS 20MUL/35MDL, so option 2 is reasonable. |
| Qualcomm | Option 2. The APT600 is actually easier for refsens than n71 due to the wider Tx-Rx. The only aspect that is more difficult is the insertion loss of the filter which has already been accounted for in our analysis. |
| Apple | Option 1: We should re-use the n71 Refsens.  It doesn’t make sense to have a 2dB tighter Refsens than n71 although the duplexer is more difficult due to the larger bandwidth and the resulting higher insertion loss, especially at the band edges. 5MHz more duplex spacing will not result in a notably improved Refsens. We already calculate with much improved duplexers enabling the single duplexer approach, since n71 was defined for a dual duplexer configuration. Speculating on even better duplexer performance in the future is not something that can be taken into account for devices defined and built now. |
| MedaiTek | Option 3: We suggest 0.5dB relaxation with option 1 for CBW<=20MHz based on study in TR38.860 that there may be 0.5B more insertion on the filter implementation. We are fine with others in option 1   | **Operating band / SCS / Channel bandwidth** | | | | | | | | | | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Operating Band** | **SCS kHz** | **5**  **MHz (dBm)** | **10**  **MHz (dBm)** | **15**  **MHz (dBm)** | **20**  **MHz (dBm)** | **25**  **MHz (dBm)** | **30 MHz (dBm)** | **35 MHz (dBm)** | | **APT600**  **(n10X?)** | **15** | **-96.7X** | **-93.5Y** | **-91.1Y** | **-85.5Y** | **-84.1Y** | **-82.5Y** | **-80.7Y** | | **30** |  | **-93.8Y** | **-91.4Y** | **-86.9Y** | **-84.2Y** | **-82.6Y** | **-80.8Y** | | **Note X: 5MHz channels overlapping the 612-617MHz range are allowed [1]dB REFSENS degradation**  **Note Y: >5MHz channels overlapping the 612-617MHz range are allowed [0.5]dB REFSENS degradation** | | | | | | | | | | |

Sub topic 3-3 standard selectivity and blocking requirements (other than protection from broadcast)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Spark NZ | We expect duplexer design will improve when more advanced filer technologies are adopted. A marginal insertion loss increases relative to n71 of say 0.5 dB may be assumed. |
| Skyworks | The n71 blocking requirement will be dictating the filter design (with high power interference) whatever we do for APT600. It is no true that the spec has to reflect the use of more advanced technologies (3GPP specs are technology agnostic) and the APT600 needs to be achievable by current technologies just accounting for improved design which is already demanding for the increased BW and the OOB rejection for both the DL and UL filters. We do not see the need to repeat the n71 case 3 specific blocking requirement if it is clear that UE supporting n71 with an APT600 filter will declare n71 anyhow, if copied to APT600 it will require adjustment in level or offset. |
| Ericsson | Option 1 |
| Qualcomm | Standard selectivity and blocking should be ok. The interesting part is the DTV blocking. |
| Apple | Option 1, except that n71 blocking case 3 with -15dBm interferer is not needed. |
| MediaTek | Option 1 except that n71 blocking case 3, it needs more discussion |

### 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 #4: BS RF requirements

*BS RF requirements for APT 600 MHz, most can be aligned with those of n71.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2213582](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213582) | Nokia, Nokia Shanghai Bell | Title: BS requirements for APT 600 MHz NR band  It is proposed to agree on proposed changes in this document, draft CR to 38.104 will be provided in the coming meetings.  See below *Before e-Meeting, moderators* |
| [R4-2213680](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213680) | ZTE Corporation | Title: Discussion on BS RF requirements for APT600MHz  Proposal 1: to use the proposals in table for APT600MHz BS RF requirements. |
|  |  |  |

## 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 unwanted emissions and colocation requirements

*Sub-topic description: unwanted emissions requirement and colocation, alignment with n71*

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

**Issue 4-1: unwanted emissions requirement and colocation**

* Proposals
  + Option 1: agree requirements below as proposed in R4-2213582

6.6.4.2.1 *Basic limits* for Wide Area BS (Category A)

For BS operating in Bands n5, n8, n12, n13, n14, n18, n26, n28, n29, n71, n85, APT 600 MHz, *basic limits* are specified in table 6.6.4.2.1‑1.

6.6.4.2.2.1 Category B requirements (Option 1)

For BS operating in Bands n5, n8, n12, n20, n26, n28, n29, n67, n71, n85, APT 600 MHz, the *basic limits* are specified in table 6.6.4.2.2.1-1:

6.6.5.2.3 Additional spurious emissions requirements

| System type for NR to co-exist with | Frequency range for co-existence requirement | *Basic limits* | *Measurement bandwidth* | Note |
| --- | --- | --- | --- | --- |
| E-UTRA Band 71 or  NR Band n71 | 617 – 652 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n71 or APT 600 MHz |
| 663 – 698 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band n71 or APT 600 MHz, since it is already covered by the requirement in clause 6.6.5.2.2. |
| APT 600 MHz | 612 – 652 MHz | -52 dBm | 1 MHz | This requirement does not apply to BS operating in band n71 or APT 600 MHz. |
| 663 – 703 MHz | -49 dBm | 1 MHz | This requirement does not apply to BS operating in band APT 600 MHz, since it is already covered by the requirement in clause 6.6.5.2.2. |

6.6.5.2.4 Co-location with other base stations

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Type of co-located BS | Frequency range for | *Basic limits* | | | Measurement | Note |
|  | co-location requirement | WA BS | MR BS | LA BS | bandwidth |  |
| APT 600 MHz | 663 – 703 MHz | -96 dBm | -91 dBm | -88 dBm | 100 kHz |  |

* + Option 2: other, state aspects not agreeable in Option 1
* Recommended WF
  + TBA

### Sub-topic 4-2 other RF requirements and alignment with n71

*Sub-topic description: requirements other than those covered in sub-topic 4-1.*

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

**Issue 4-2: other RF requirements**

* Proposals
  + Option 1: agree requirements as proposed in R4-2213680 (Table 1 below)

**Table 1. Summary of related RF requirement**

|  |  |
| --- | --- |
| **Tx part** | |
| Base station output power | All of these requirements are defined as band or channel bandwidth agnostic except for output power dynamics, therefore it’s not expected to have any impacts with the introduction of APT600MHz. |
| Output power dynamics |
| Transmit ON/OFF power |
| Transmitted signal quality |
| OBW |
| Tx intermodulation |
| ACLR | To follow the requirement of band n71 |
| Operating band unwanted emissions | For OBUE requirement, to follow OBUE requirements of band n71.  For Fobue requirement, to follow the existing requirement in TS 38.104 |
| Transmitter spurious emissions | To add the additional spurious emissions requirements for APT600MHz  To add the co-location with other base station for APT600MHz |
| **Rx part** | |
| REFSENS | No requirement impacts and just to follow the requirements of band n71 |
| Dynamic range requirement | No requirement impacts and to follow the requirements of n71 |
| ACS, | No requirement impacts and to follow the requirements of n71 |
| Blocking requirement | No requirement impacts and to follow the requirements of n71s |
| OOBB | No requirement impacts and to follow the requirements of n71 |
| RX IMD | No requirement impacts and to follow the requirements of n71s |
| Rx spurious emission | No requirement impacts and to follow the requirements of n71 |
| ICS | No requirement impacts and to follow the requirements of n71 |

* + Option 2: other, state aspects not agreeable in Option 1
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

Sub topic 4-1 unwanted emissions and colocation requirements

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Option 1 |
| ZTE | Option 1. |
| Ericsson | Option 1 but one question for clarification: why should we specify cat B option 1 OBUE? Is that for China? |
| Huawei | Option 1 as baseline, subject to the above clarification on cat B1. |
| Nokia | Cat B was added because it was included in a joint contribution on APT600 in APT/AWG (AWG-29/INP-36(Rev.1)). We are open for further discussion, feedback from MNOs is welcome. |

Sub topic 4-2 other RF requirements and alignment with n71

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Is there any impact to output power dynamics according to this proposal? BS requirements are in general band agnostic so it is not clear why n71 specific requirement is listed for ACLR, Rx, etc.? |
| ZTE | Option 1.  Our intention is to compare the requirements of new band with the band n71, and to see which requiremetns would be impacted. For lots of BS RF requirements sucn as ACLR, Rx etc, they are defined as band agnostic way so there are no impacts.  For output power dynamic requirements, it includes RE power control dynamic range and Total power dynamic range, where for the former one, it is related to the modulation schemes, and for the letter one, it is related to the supported channel bandwidths, and it was already includes the requirements for the channel bandwidth supported by the APT600MHz band. So no impacts to output power dynimic. |
| Ericsson | Option 1 |
| Huawei | Ok as baseline, but further verify for the next meeting. As we define APT band (not global), there may be need to indicate on the potential Regional requirements. |

### 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: Draft CRs

*Moderator: it is proposed not to treat additional CRs proposed in the revised WID (subject to RAN decision). Moreover, a running CR for each spec (one company responsible) should be used.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Impacted existing TS/TR** *{One line per specification. Create/delete lines as needed}* | | | |
| TS/TR No. | Description of change | Target completion plenary# | Remarks |
| 38.101-1 | NR; UE Radio transmission and reception | RAN#98 | Core part |
| 38.133 | NR; Requirements for support of radio resource management | RAN#98 | Core part |
| 38.104 | NR; BS Radio transmission and reception | RAN#98 | Core part |
| 38.141-1 | NR; Base Station (BS) conformance testing Part 1: Conducted conformance testing | RAN#99 | Perf. Part |
| 38.141-2 | NR; Base Station (BS) conformance testing Part 2:  Radiated conformance testing | RAN#99 | Perf. Part |
| 36.104 | E-UTRA; BS Radio transmission and reception | RAN#98 | Core part |
| 36.141 | E-UTRA; BS conformance testing | RAN#99 | Perf. Part |
| 37.104 | E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception | RAN#98 | Core part |
| 37.141 | E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing | RAN#99 | Perf. Part |
| 37.105 | Active Antenna System (AAS) Base Station (BS) transmission and reception | RAN#98 | Core part |
| 37.145-1 | Active Antenna System (AAS) Base Station (BS) conformance testing; Part 1: conducted conformance testing | RAN#99 | Perf. Part |
| 37.145-2 | Active Antenna System (AAS) Base Station (BS) conformance testing; Part 2: radiated conformance testing | RAN#99 | Perf. Part |

*Proposed to be added (subject to RAN approval), see R4-2213678.*

|  |  |  |  |
| --- | --- | --- | --- |
| 38.174 | NR; Integrated access and backhaul radio transmission and reception | RAN#98 | Core part |
| 38.176-1 | NR; Integrated Access and Backhaul (IAB) conformance testing; Part 1: Conducted conformance testing | RAN#99 | Perf. Part |
| 38.176-2 | NR; Integrated Access and Backhaul (IAB) conformance testing; Part 2: Radiated conformance testing | RAN#99 | Perf. Part |
| 38.106 | NR repeater radio transmission and reception | RAN#98 | Core part |
| 38.115-1 | NR; Repeater conformance testing - Part 1: Conducted conformance testing | RAN#99 | Perf. Part |
| [38.115-2](https://www.3gpp.org/DynaReport/38115-2.htm) | NR; Repeater conformance testing - Part 2: Radiated conformance testing | RAN#99 | Perf. Part |

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2213681](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213681) | ZTE Corporation | 38.104 draft CR Rel-18 CR  draft CR to TS38.104 the introduction of APT600MHz |
| [R4-2213682](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213682) | ZTE Corporation | 38.174 draft CR Rel-18  draft CR to TS38.174 the introduction of APT600MHz  *This specification is not part of the WID* |
| [R4-2213683](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213683) | ZTE Corporation | 38.761-1 draft CR Rel-18  Draft CR to TS38.176-1 the introduction of APT600MHz  *This specification is not part of the WID* |
| [R4-2213684](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213684) | ZTE Corporation | 38.761-2 draft CR Rel-18  Draft CR to TS38.176-2 the introduction of APT600MHz  *This specification is not part of the WID* |
| [R4-2213685](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213685) | ZTE Corporation | 38.106 draft CR Rel-18  Draft CR to TS38.106 the introduction of APT600MHz  *This specification is not part of the WID* |
| [R4-2214001](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2214001) | Qualcomm Incorporated | 38.101-1 draft CR Rel-18  Introduction of APT 600 MHz band |

## 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

*Sub-topic description:*

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

**Issue 2-1: TBA**

* Proposals
  + Option 1: TBA
  + Option 2: TBA
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

*Comments on the drqft CRs in the table below.*

### 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** |
| [R4-2213681](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2213681)  Draft CR 38.104  38.104 draft CR Rel-18 CR (ZTE) | Huawei: formally speaking, in order to follow the meeting arrangement we shall not treat any CRs this meeting (related system parameter discussion just stared, no decisions). Furthermore, work-split was supposed to be arranged first.  Suggest to collect comments, but no endorsement this meeting. |
| Company B |
|  |
| [R4-2214001](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_104-e/Docs/R4-2214001)  Draft CR 38.101-1  Introduction of APT 600 MHz band | Nokia:  Should UL MIMO be supported in Table 5.2D-1 and Table 6.2D.1-1?  Should asymmetric BW be supported in Table 5.3.6-1?  Do we really need region 1, 2 and Japanese bands in Table 6.5.3.2-1 for UE co-existence? (i.e., band 2, 4, 11, 18, 19, 21, 25, 31, 32, 34, 43, 66, 67, 68, 69, 72, 75 and 76?  Should RedCAP 2 Rx Refsens be supported in Table 7.3I.2-2 and Table 7.3I.2-5? |
| Skyworks: we are not in agreement with everything in this CR and we suggest we align first on the system aspects. The UE blocking REFSENS…need more discussions. |
| Qualcomm: To Nokia, for UL MIMO, it was not included in the WID so I didn’t include it in the CR. There is a separate basket for UL MIMO if it is requested. For coexistence, I included the same bands is Band 28/n28 since the justification in the WID suggests this band as a complement to Band 28/n28. I don’t know if RedCap is included by default, if it needs to be in the WID, if there is a basket, etc. Happy to further discuss Skyworks concerns and revise if needed. |
| Huawei: same formal comment as to 3681. |

## 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 |  |
| R4-2211529 |  | Workplan for Introduction of APT 600 MHz band | Spark NZ Ltd, Nokia |  |  |
| R4-2211530 |  | Skeleton TR for APT 600MHz NR band | Spark NZ |  |  |
| R4-2211532 |  | Text Proposals for TR 38.xxx for APT 600MHz NR band | Spark NZ Ltd |  |  |
| R4-2212068 |  | TP on System parameters for APT600 | Nokia, Nokia Shanghai Bell |  |  |
| R4-2212069 |  | UE RF requirement for APT600 | Nokia, Nokia Shanghai Bell |  |  |
| R4-2212097 |  | APT600 band CH36 rejection and REFSENS impact | Skyworks solutions Inc |  |  |
| R4-2212353 |  | On APT 600 MHz band definition for NR | Apple |  |  |
| R4-2212611 |  | Discussion on system parameters for APT 600MHz | Xiaomi |  |  |
| R4-2212612 |  | Discussion on UE RF requirements for APT 600MHz | Xiaomi |  |  |
| R4-2212714 |  | Discussion on APT 600MHz UE RF requirement | ZTE Corporation |  |  |
| R4-2213335 |  | R18 Discussion on the treatment of HIBS in bands 694-960MHz | OPPO |  |  |
| R4-2213678 |  | Revised WID on APT 600 MHz NR band | ZTE Corporation |  |  |
| R4-2213679 |  | Discussion on system parameter for APT600MHz | ZTE Corporation |  |  |
| R4-2213680 |  | Discussion on BS RF requirements for APT600MHz | ZTE Corporation |  |  |
| R4-2213681 |  | draft CR to TS38.104 the introduction of APT600MHz | ZTE Corporation |  |  |
| R4-2213682 |  | draft CR to TS38.174 the introduction of APT600MHz | ZTE Corporation |  |  |
| R4-2213683 |  | Draft CR to TS38.176-1 the introduction of APT600MHz | ZTE Corporation |  |  |
| R4-2213684 |  | Draft CR to TS38.176-2 the introduction of APT600MHz | ZTE Corporation |  |  |
| R4-2213685 |  | Draft CR to TS38.106 the introduction of APT600MHz | ZTE Corporation |  |  |
| R4-2214000 |  | UE RF requirements for the APT 600 MHz band | Qualcomm Incorporated |  |  |
| R4-2214001 |  | Introduction of APT 600 MHz band | Qualcomm Incorporated |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

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 |  |
|  |  |  |  |  |  |

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