**3GPP TSG-RAN WG4 Meeting # 100-e R4-210XXXX**

**Electronic Meeting, August 16th – 27th, 2021**

**Agenda item:** 6.1.10.5

**Source:** Moderator (Apple)

**Title:** Email discussion summary for [100-e][105] US\_n77

**Document for:** Information

# Introduction

This document summarizes the email discussions on the topic of enabling US 3.45 – 3.55GHz spectrum usage in Band n77 which has been allocated to agenda item 6.1.10.5. There are total of 8 contributions in this email thread which consists of 2 discussion papers, 2 CRs for UE and 4 CRs for BS.

Since in RAN #92-e meeting, the following RAN guidance on the support of 3.45 – 3.55GHz for US Band n77 was endorsed.

* RAN4 focuses on the necessary updates to RAN4 requirements and leave signaling work, if any, to RAN2.
* RAN2 focuses on signaling aspects, with an aim to ensure the network can properly deal with legacy n77 UEs that do not support 3.45-3.55 GHz operation in US.
* RAN tasks RAN4/2 to complete the required work in Aug. and report back to RAN#93-e.

The RAN4 requirements update may be subject to the outcome of RAN2 signaling discussions. On the other hand, the BS CRs to TS 38.104 and TS 38.141-1 had been technically endorsed in last RAN4 meeting. It will only be a formality to endorse the resubmitted draft CRs if UE draft CRs could also be endorsed.

The goal for this meeting is to complete the required work in RAN4 and report back to RAN #93-e, potentially with endorsed UE draft CRs and BS draft CRs as a package.

# Topic #1: Enabling US 3.45 – 3.55GHz in Band n77

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2112048**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112048.zip)  Type: Discussion  For: Approval | Mediatek India Technology Pvt. | **Title:** Discussion of addition of 3.45-3.55 GHz in Band n77 for the US  **Observation 1**: In RAN4#99 meeting, regarding new spectrum in US band n77, many companies considered that network needs to distinguish UE devices supporting the new frequency range.  **Observation 2**: If the decision would be that NW needs to distinguish UE supporting the new frequency range by UE capabilities, to use reserved modifiedMPR-behaviour bit would not change RAN2 framework and ease RAN2 work loading.  **Observation 3**: As summarized in RAN#92 meeting, RAN2 will focus on signaling aspects, with an aim to ensure the network can properly deal with legacy n77 UEs that do not support 3.45-3.55 GHz operation in US. In addition, to our understanding, the UEs that pass DoD band certification can use optional capability to inform NW.  **Observation 4**: RAN tasks RAN4/2 to complete the required work in Aug. and report back to RAN#93-e.  **Proposal 1**: For accelerating deployment of new frequency range in US band n77 and reporting progress to RAN#93, ping-pong efforts between RAN4 and RAN2 can be avoided with considering option in 1st bullet. Once confirmation from RAN2 that optional capability may be not needed, modification of Note 12 in 2nd bullet could be adopted.  • For UE passed the DoD band certification, the Note 12 in Table 5.2-1 could be: “In the USA this band is restricted to 3450 – 3550 MHz and 3700 – 3980 MHz and has optional capability for distinguishing devices”  • If optional capability is really not needed after RAN4 and RAN2 consensus, modification of Note 12: “In the USA this band is restricted to 3450 – 3550 MHz and 3700–3980 MHz” |
| [**R4-2112822**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112822.zip)  Type: Other  For: Approval | Ericsson | **Title:** Band n77 issues in the US  **Proposal 1:** Introduce a new band nXX to be used in the US to cover the same range and have the same RAN4 requirements (including CA band combinations) as the existing band n77, but restricted to the 3700 – 3980 MHz and the 3450 – 3550 MHz subparts. A UE that indicates support of nXX shall also indicate support of n77.  **Proposal 2:** If Proposal 1 cannot be agreed, Solution 1 (new per-UE capability bits) is recommended.  **Proposal 3:** Solution 3 (Use bit in modifiedMPR-Behaviour) is not recommended.  **Proposal 4:** Introduction of new n77 NS value to prevent non-supporting UE from camping/accessing on DoD cell shall not be pursued. |
| [**R4-2112049**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112049.zip)  Type: CR  For: Agreement  CAT F  Rel-16  TS 38.101-1 | Mediatek India Technology Pvt. | **Title:** CR for addition of 3.45-3.55 GHz in Band n77 for the US -r16  **Reason for change:**  As indicated in FCC 21-32A1, FCC will start an auction to grant new initial licenses subject to flexible use in the 3450-3550 MHz (3.45 GHz, DoD band) band by December 31, 2021. The range 3450-3550 MHz is covered by band n77. The new 3.45 GHz spectrum in US would lead to economies of scale, lower costs for deployment, and more rapid roll-out of new services. To enable the new frequency range within band n77 is beneficial for cellular ecosystem.  To ensure the network can properly deal with legacy n77 UEs that do not support 3.45-3.55 GHz operation in US, optional capability can handle the issues in initial access and handover between serving cell and target cell.  **Summary of change:**  FCC will add new frequency range 3450 - 3550MHz to US band n77. The US band n77 will be restricted to 3450 - 3550 MHz and 3700 – 3980 MHz. Based on US band n77 regulation, it is not allowed to access frequency outside of 3450 - 3550 MHz and 3700 – 3980 MHz. With the usage of optional capability, the network can properly deal with devices. |
| R4-2112050  Type: CR  For: Agreement  CAT A  Rel-17  TS 38.101-1 | Mediatek India Technology Pvt. | **Title:** CR for addition of 3.45-3.55 GHz in Band n77 for the US -r17  **Note:** This is the mirror CR of R4-2112049 |
| [**R4-2112271**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112271.zip)  Type: draftCR  For: Endorsement  CAT F  Rel-16  TS 38.104 | Nokia, Nokia Shanghai Bell | **Title:** Draft CR to TS 38.104: Addition of FCC emission limits on US 3.45-3.55 GHz band  **Reason for change:**  FCC emission limits in US 3.45-3.55 GHz band are not specified for Band n77.  **Summary of change:**  Specify the FCC emission limits in US 3.45-3.55 GHz band as additional regional spurious emissions requirements for Band n77. |
| R4-2112272  Type: draftCR  For: Endorsement  CAT A  Rel-17  TS 38.104 | Nokia, Nokia Shanghai Bell | **Title:** Draft CR to TS 38.104: Addition of FCC emission limits on US 3.45-3.55 GHz band  **Note:** This is the mirror CR of R4-2112271 |
| [**R4-2112273**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112273.zip)  Type: draftCR  For: Endorsement  CAT F  Rel-16  TS 38.141-1 | Nokia, Nokia Shanghai Bell | **Title:** Draft CR to TS 38.141-1: Addition of FCC emission limits on US 3.45-3.55 GHz band  **Reason for change:**  FCC emission limits in US 3.45-3.55 GHz band are not specified for Band n77.  **Summary of change:**  Specify the FCC emission limits in US 3.45-3.55 GHz band as additional regional spurious emissions requirements for Band n77. |
| R4-2112274  Type: draftCR  For: Endorsement  CAT A  Rel-17  TS 38.141-1 | Nokia, Nokia Shanghai Bell | **Title:** Draft CR to TS 38.141-1: Addition of FCC emission limits on US 3.45-3.55 GHz band  **Note:** This is the mirror CR of R4-2112273 |

## Open issues summary

Based on the discussions in the past two RAN4 meetings, the main open issue remained on this topic is whether a UE capability signaling is required in order for network to distinguish UEs supporting the new frequency range 3.45 – 3.55GHz or not. Per the RAN guidance in RAN #92-e meeting, the signaling aspects will be handled in RAN2, and RAN4 will focus on the necessary updates to RAN4 requirements. Therefore, the open issues to be discussed below will not cover the signaling options despite they are included in R4-2112822 which also has a replicate contribution in RAN2.

**Issue 1.2-1: How to modify Note 12 in Table 5.2-1 in TS 38.101-1 to include the support of 3.45 – 3.55 GHz in addition to 3.7 – 3.98 GHz in US Band n77?**

### Option 1: “In the USA this band is restricted to 3450 – 3550 MHz and 3700 – 3980 MHz and has optional capability for distinguishing devices” or “In the USA this band is restricted to 3450 – 3550 MHz and 3700 – 3980 MHz” if RAN2 and RAN4 conclude that capability signaling is not required. (R4-2112048)

* Option 2: “In the USA this band is restricted to 3450 – 3550 MHz and 3700 – 3980 MHz” irrespective of whether the capability signaling on the support of 3450 – 3550 MHz is required or not.
* Option 3: Others

**Issue 1.2-2: Is it necessary to define a new n77 NS value to prevent non-supporting UE (without FCC certification on the new frequency range) from camping/assessing on 3.45 – 3.55GHz cell?**

### Option 1: Yes

* Option 2: No
* Option 3: Leave the decision to RAN2

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | Issue 1.2-1: How to modify Note 12 in Table 5.2-1 in TS 38.101-1 to include the support of 3.45 – 3.55 GHz in addition to 3.7 – 3.98 GHz in US Band n77  Option1. And there is another proposal in paper R4-2112822 that a new band can be introduced also acceptable.  Issue 1.2-2: Is it necessary to define a new n77 NS value to prevent non-supporting UE (without FCC certification on the new frequency range) from camping/assessing on 3.45 – 3.55GHz cell  Option 3, and in our view, the NS value is designed for additional emission requirements, is there new emission requirements in this FCC certification comparing to 3GPP general requirements? |
| Qualcomm | Issue 1.2-1. Option 2. In fact, a note isn’t really needed at all. There are other bands where the entire band is not available in some countries, but there aren’t notes for those. But we can accept option 2 if companies believe a note is necessary.  Issue 1.2-2: Perhaps we don’t understand the proposal, but NS is an indication from the network to the UE. The software in the UE is either able to decode this NS or it isn’t, but the ability to decode the NS is independent of the UE’s FCC certification status. In other words, it is not as if a new version of software is loaded into the UE after FCC certification. And what would be the consequence if the network does not send the NS? Would the non-certified UE still camp? It cannot; therefore, the behavior of the UE is the same irrespective of whether the NS is sent, which means the NS might not be useful. Instead, it might be more appropriate (if needed) to have signaling from the UE to the network. That signaling would need to be based on the UE’s FCC certification status which could be set by the OEM. This would tell the network whether it should expect the UE to be able to operate on the 3450 – 3550 MHz frequency range or not. Whether this signaling is needed should be determined by RAN2. |
| Nokia | Issue 1.2-1: Option 3, include entire frequency range of n77 except for Band 48 (CBRS spectrum). Removing a note completely as proposed by Qualcomm should be also considered.  Issue 1.2-2: Option 3. While it is necessary to have UE capability, leave the decision to RAN2. |
| UScellular | Issue 1.2-1: Concur with the previous views (Nokia, Qualcomm) that a note seems to be redundant since the entire n77 spectrum range is covered, with the exclusion of the CBRS spectrum  Issue 1.2-2: Appropriate signaling to discern between UEs (previous and revised n77) seems sufficient, pending RAN2 decision. |
| Skyworks | Issue 1.2-1: It is better that the note is modified once we have a clear view from RAN2 on how to signal support of extended spectrum but we believe a note clarifying the band n48 spectrum is excluded is at minimum needed.  Issue 1.2-2: leave to RAN2 |
| ZTE | Issue 1.2-1: Option 2. As Qualcomm and other companies point out, this is not a unique situation since other countries may also cover part of n77.  Issue 1.2-2: Option 3, leave it to RAN2. |
| T-Mobile USA | Issue 1.2-1: We would also support removing the note completely as mentioned by Qualcomm, Nokia, and US Cellular. Our second choice would be Option 3 as proposed by Nokia. Our third choice would be Option 2.  Issue 1.2-2: Option 3. We don’t think NS signalling it is necessary, but can leave the decision to RAN2. |
| Apple | Issue 1.2-1: Option 2 or Option 2 together with necessary modification on signaling aspect based on the outcome of RAN2 discussions.  In general we prefer to explicitly describe the supported frequency ranges instead of only “excluding n48 range”. We understand there might be similar situation in other regions/countries but without the similar note. However, n77 is a relatively wide band. If we do not explicitly spell out the supported frequency ranges, one potential issue is that when defining the MSD test points for US band combinations, we may choose a test configuration where n77 carrier is outside of US frequency ranges and could not be verified in conformance test while there are testable configurations available but not specified.  Issue 1.2-2: Option 3  In our view, if the issue exists, it should already happen when US Band n77 was first introduced in Rel-16, meaning that some Rel-15 UEs outside of US which support the entire n77 range but without FCC certification for C band may be brought to US and potentially camp on the n77 network. It would be great if RAN4 experts in this meeting can help clarify whether this issue would happen or not, even the signaling side of decision would be left to RAN2. |

### Comment collection for discussion papers

|  |  |
| --- | --- |
| **Tdoc number** | **Comments** |
| [**R4-2112048**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112048.zip) | **Title**: Discussion of addition of 3.45-3.55 GHz in Band n77 for the US |
| [**R4-2112822**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112822.zip) | **Title:** Band n77 issues in the US  Qualcomm: We do not support the proposal to define a new band. Although we are willing to consider whether signaling is needed (either overloading MPRversioning or new dedicated signaling), we don’t see the need for a new band. If additional spectrum becomes available in the future, will yet another new band be defined? We think the best way to leverage the 3.5 GHz ecosystem for US deployment and the most expeditious way to enable the spectrum is to reuse Band n77.  Verizon: RAN4 and other WGs have specified the requirements to cover the frequency range 3700 – 3980 MHz in the band n77 since Rel-16. Since then, additional band combination and different new power class items are either completed or ongoing in 3GPP.  It is too late to define a new band to cover the frequency range 3700 – 3980 MHz into a new band or define new requirement for the band at this time.  Skyworks: we do not support to define a new band. There is no justification from specific band requirement and there may be further cases of extended use of n77 in the US or different part of the world, RAN2/4 must define a mechanism by which Legacy UEs that have not been certified for an additional frequency range within a band is properly handled.  ZTE: As companies comment, this is not a unique situation for different countries and different bands. If introducing a “mirror” band in order to fulfill the change of one band for one country, then the whole list of the bands may become unnecessarily long and messy. We don’t think this is a constructive method, and we need to avoid this mirroring method.  T-Mobile USA: We don’t think a new band is needed. We also don’t understand why this situation exists only in the US. n77 is 900 MHz wide, and it is doubtful that any country has regulations for the entire 900 MHz, but we don’t put notes in the spec for other countries with partial allocations. It would be helpful to understand what is unique about the US regulations that drove RAN4 to include Note 12 to begin with.  Apple: We also prefer not to define a new band for the concerns already elaborated by companies’ comments above. |

### CRs/draftCRs/TPs comments collection

**Moderator’s Note**: draftCR R4-2112271 and draftCR R4-2112273 are resubmissions of CR R4-2107990 and CR R4-2107991 respectively which had been technically endorsed in last RAN4 meeting but postponed as the CRs need to be agreed together with UE CR as a package. It is suggested to also endorse R4-2112271 and R4-2112273 in this meeting. Yet companies are still welcome to provide comments below if found necessary.

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2112049**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112049.zip)  TS 38.101-1 | **Title:** CR for addition of 3.45-3.55 GHz in Band n77 for the US -r16 |
| T-Mobile USA: At a minimum a revision of the CR is needed because the original note 12 was deleted before the new note was added. Also, the text for Note 12 should not be bold. |
| [**R4-2112271**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112271.zip) | **Title:** Draft CR to TS 38.104: Addition of FCC emission limits on US 3.45-3.55 GHz band |
|  |
| [**R4-2112273**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_100-e/Docs/R4-2112273.zip) | **Title:** Draft CR to TS 38.141-1: Addition of FCC emission limits on US 3.45-3.55 GHz band |
|  |

## 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)

# 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

# Annex

Contact information

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email address** |
|  |  |  |

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)