**3GPP TSG-RAN Meeting #97-e RP-22xxxx**

**Electronic Meeting, September 12 – 16, 2022**

**Agenda item:** 9.1.5, 10.1.5

**Source:** Moderator (RAN4 Chair)

**Title:** Email discussion summary for [97e-35-CompanyCR-Band-n77]

**Document for:** Information

# Introduction

In this email thread we will discussion the CRs for n77 in US and Canada.

The following contributions will be covered.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **TDoc** | **Title** | **Source** | **Type** | **AI** |
| RP-222344 | Operation in the n77 frequency range in US and Canada | Nokia, Nokia Shanghai Bell | Other | 9.12 |
| RP-222350 | Extension of operation in the n77 frequency range in US (Cat-C Rel-16) | Nokia, Nokia Shanghai Bell | CR | 9.12 |
| RP-222352 | Extension of operation in the n77 frequency range in US (Cat-A Rel-17) | Nokia, Nokia Shanghai Bell | CR | 9.12 |
| RP-222353 | Extension of operation in the n77 frequency range in Canada | Nokia, Nokia Shanghai Bell | CR | 9.12 |

In this document, we capture comments and conclusions for this email thread.

# Topic #1: n77 requirements in US and Canada

## Companies’ contributions summary

The background information is provided in RP-222344.

*Handling of NS\_55 for US and NS\_57 for Canada has been discussed for several meetings in RAN4 as well as RAN2 and requirements for non-CA case was already addressed. Although RAN4#104-e addressed CA case, CRs were not agreed. One of the reasons was RAN2 addressed both an n77 specific issue as well as a non-CA/CA NS mapping issue common to all bands and some companies preferred to wait for the RAN2 conclusion before RAN4 agrees relevant CRs.*

*On the other hand, RAN2#119-e agreed following CRs [1, 2] specific to the n77 CA issue, though the conclusion of the NS mapping issue was postponed. Hence, this contribution provides background of our companion CRs of [3, 4] which* ***address both US and Canada n77 issues without NC\_CA\_NS and CA\_NS,*** *respectively to complete the issues independently from NS mapping issue based on the agreed RAN2 CRs [1, 2].*

## Initial round

### Comments & responses for Rel-16/17 38.101-1 CRs (RP-222350/352) for n77 in US

**Sub-topic 1-1: Comments for 38.101-1 CR RP-222350 for n77 in US**

------------------------------------------ Changes ------------------------------------------------------------------------

**Table 6.2.3.1-1: Additional maximum power reduction (A-MPR)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Network signalling label** | **Requirements (clause)** | **NR Band** | **Channel bandwidth (MHz)** | **Resources blocks (*N*RB)** | **A-MPR (dB)** |
| NS\_01 |  | Table 5.2-1  (NOTE 7) | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | Table 5.3.2-1 | N/A |
| … | … | … | … | … | … |
| NS\_100 | 6.5.2.4.2 | n1, n2, n3, n5, n8, n18, n25, n26, n65, n66, n80, n81, n84, n86, n89  (NOTE 1) |  |  | Table  6.2.3.1-2 |
| NOTE 1: This NS can be signalled for NR bands that have UTRA services deployed.  NOTE 2: No A-MPR is applied for 5 MHz BWChannel where the lower channel edge is ≥ 1930 MHz,10 MHz BWChannel where the lower channel edge is ≥ 1950 MHz and 15 MHz BWChannel where the lower channel edge is ≥ 1955 MHz.  NOTE 3: Applicable when the NR carrier is within 1447.9 – 1462.9 MHz.  NOTE 4: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980 MHz.  NOTE 5: Applicable when the NR carrier is within 2545 – 2575 MHz.  NOTE 6: This NS value is applicable for cells in the range 3450 – 3550 MHz for operations in the USA. This NS value does not indicate any additional emission requirements.  NOTE 7: The NS\_01 label with the field *additionalPmax* [7] absent is default for all NR bands. | | | | | |

------------------------------------------ Changes ------------------------------------------------------------------------

------------------------------------------ Changes ------------------------------------------------------------------------

6.2A.3.1.2.0 General

Table 6.2A.3.1.2-1 specifies the additional requirements with their associated network signalling values and the allowed A-MPR and applicable CA band(s) for each CA\_NC\_NS value. The mapping of NR CA band numbers and values of the *additionalSpectrumEmission* to network signalling labels is specified in Table 6.2A.3.1.2-2.

**Table 6.2A.3.1.2-1: Additional Maximum Power Reduction (A-MPR) for intra-band non-contiguous CA**

|  |  |  |  |
| --- | --- | --- | --- |
| **CA Network Signalling value** | **Requirements (clause)** | **Uplink CA Configuration** | **A-MPR for sub-blocks in order of increasing uplink carrier frequency** |
| **A-MPR [dB]**  **(clause)** |
| CA\_NC\_NS\_01 |  | All applicaple NR CA configurations | N/A |
| CA\_NC\_NS\_04 | 6.5A.2.3.2.1  6.5A.3.3.2.1 | CA\_n41(2A) | 6.2A.3.1.2.1 |

When UEs are configured with intra-band non-contiguous CA in n77 with NS\_01 for an uplink component carrier in the range 3700-3980 MHz and NS\_55 for an uplink component carrier in the range 3450-3550 MHz in *FrequencyInfoUL-SIB*, A-MPR does not apply to the UEs regardless of which value of *additionalSpectrumEmission* in *FrequencyInfoUL* is used for the carrier in the range of 3450-3550 MHz.

------------------------------------------ Changes ------------------------------------------------------------------------

Companies are invited to provide the general comments, including comments on justification part, whether the WI is needed, how to handle the work, in the follow table.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | We recognize there is misalignment between RAN2 agreed CR’s and the lack of agreement of RAN4 CR’s. Nonetheless, we do not agree to these CR’s presented at RAN when further discussion is needed in RAN4. In our view, it would be better to wait for the discussion and common understanding in RAN4 and then propose and agree RAN4 CR’s to the RAN4 TS, rather than a company CR at RAN now. We also understand that there is no immediate urgency from the interested operators to agree to CR’s at this meeting. |
| Apple | 1. For NOTE 6 in Table 6.2.3.1-1, is it necessary to remove “spurious” and “A-MPR”? The “spurious” has been used in 6.5.5.3 clause title for NS values associated additional spurious emissions requirements. A-MPR requirements are also associated with NS values.  2. We do not have strong view on the added paragraph in 6.2A.3.1.2.0. We understand that it is meant to align with RAN2 specifications change in *additionalSpectrumEmission* in *FrequencyInfoUL* field descriptions. On the other hand, with RAN2 specifications change and NOTE 6 in Table 6.2.3.1-1, we think the expected UE behavior should be clear enough without the added paragraph. |
| T-Mobile USA | We agree with Qualcomm that this should be discussed in RAN4, not as company CRs at RAN Plenary. |
| ZTE | For the first change on NOTE 6, we are fine since it is aligned with NOTE 2 in Table 6.2.3.1-1A, where the term “additional emission requirements” is used.  For the second change, we don’t have any strong concern since it is helpful to have the specs to reflect the latest agreements. However, we understand this is an intermediate version, and the added texts will be updated and moved to Table 6.2A.3.1.2-1 according to the corresponding conclusion. |
| AT&T | We don’t agree with QC that there is no immediate urgency from interested operators to agree CR’s at this meeting. This interested operator would like to see the corresponding core requirements clearly identified in the RAN4 specification based on the RAN2 agreed CRs.  We do not see the need to update NOTE 6 although the word “spurious” could be removed but we don’t have a strong opinion on that part. NOTE 6 was agreed by RAN4 to convey that additional RF conformance tests were not required since this NS value is used for barring purposes only. As such, we prefer not to remove the text “and maximum output power reduction” from NOTE 6. Even though “N/A” is shown in the A-MPR column, the table note text adds value to make it clear to RAN5 that no additional RF conformance tests are required as in the case of NS\_06. Maybe we can modify the table note as follows.  “NOTE 6: This NS value is applicable for cells in the range 3450 – 3550 MHz for operations in the USA. This NS value does not indicate any additional spurious emission and maximum output power reduction requirements as this NS value is used for barring purposes only.”  For clause 6.2A.3.1.2.0, we support having a clear core requirement identified in the RAN4 core specification at this RAN meeting given that the RAN2 core specification has been updated to account for the UL CA configuration issue. We also agree with ZTE that it is helpful for the specs to reflect the latest agreements on n77 UL CA configuration, and that no relaxation would apply. It would also be good to have similar text added to the clause as above to make it very clear that additional RF conformance tests are not required for these cases when NS values have been used for barring purposes only. The core requirement text in this intermediate version can be updated later once the general NS mapping issue is resolved in RAN4. |
| Huawei | For note 6, we don’t think it is necessary to remove “spurious” and “max output power reduction” as it would not cause ambiguity with these wording, but no strong view.  For the changes under clause 6.2A.3.1.2.0, in general we are fine with the proposed wording as it is aligned with previous agreement. |
| Samsung | For note 6, share similar view as Apple and Huawei. For 2nd change, we understand there is ongoing discussion in RAN4 on how to mapping NS value from RAN2 to RAN4 with CA cases. If there is a urgent demand from operators, we can accept to approve this “intermediate” version of CR with a Note under meeting report: further update maybe required once RAN4 has draw conclusion on the generic issue of NS value mapping from RAN2 to RAN4 under CA cases. |
| MediaTek | For note 6, we think the original wordings are clear. Probably, to add “as this NS value is used for barring purposes only” can make note 6 clearest. To remove wordings of “spurious” and “max output power reduction” is unnecessary.  For the 2nd change, we share similar view as Samsung. |
| OPPO | We understand there is desire to align between RAN2 and RAN4, but we prefer to do it in RAN4 instead of RAN plenary since this need technical discussion anyway. |
| Nokia | The reason for the CR was to finish n77 issue since it’s been discussed for several meetings and a corresponding RAN2 CRs were agreed already. We understand that NS mapping discussion is on-going, but it’s unfortunate that we cannot close n77 issue since NS mapping issue itself is a common issue for all the bands and band configuration.  For NOTE 6, We are ok to keep the original wordings. We just took into account the proposal from R4-2212769. Regarding the proposal by AT&T, we think that it would be more suitable to put that behaviour into RAN2 spec and actually, it’s already in 38.331 as generic UE behaviour meaning that if a UE cannot understand an NS, the cell is considered as barred, though it depends on how others think.  To Qualcomm and others.  We understand the comments. But NS mapping issue itself is independent from n77. If we follow the direction that QC wants to follow, unless we solve the NS mapping issue, n77 issue cannot be solved. It is very unfortunate situation.  To Apple,  We also thought not changing 38.101-1 is one of the options. RAN2 spec says UE shall be able to deal with whichever value of 0 (or absent) or 1 is signalled, but it doesn’t say what the requirement(s) is. That’s why we thought it would be better to clarify it. |
| Ericsson | Nokia company CR is not technically correct on the A-MPR. The UE does no read the SI of the SCell (FrequencyInfoUL-SIB), which contains NS\_55. But the UE is configured with the NS value for SCell in dedicated signaling upon CA configuration. The "regardless of which value is signalled" is also ambiguous, only NS\_01 or NS\_55 can be signalled.  We therefore suggest to modify the wording in the Nokia CR as follows:  *“For UEs configured with intra-band non-contiguous CA in n77 and with NS\_01 indicated or configured for an uplink component carrier the range 3700-3980 MHz and NS\_55 for another uplink component carrier in the range 3450-3550 MHz, the allowed A-MPR is according to CA\_NC\_NS\_01.”*  The above updated wording will cover the case, when: NS\_01 is on one carrier and NS\_55 is on another (this exception is now covered in 38.331). The alternative with NS\_01 configured on both carriers (with a different NS in the SIB1 for one of the carriers) is already covered by existing specification. |
| Intel | Regarding Note 6 we do not have a strong opinion. In our view the original wording is OK, but also the revised wording is acceptable.  Regarding the new paragraph in 6.2A.3.1.2.0 we can accept the changes in this meeting as an intermediate step, noting the possibility that it may need some revision at next RAN4 when the more general mapping issue is resolved. For the wording, we think that Ericsson's suggested text is clearer. Specifically it seems better to refer to the already defined CA\_NC\_NS\_01 instead of introducing new text to say the same thing. |

### Comments & responses for Rel-17 38.101-1 CR (RP-222353) for n77 in Canada

**Sub-topic 1-2: Comments for 38.101-1 CR RP-222353 for n77 in Canada**

------------------------------------------ Changes ------------------------------------------------------------------------

**Table 6.2.3.1-1: Additional maximum power reduction (A-MPR)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Network signalling label** | **Requirements (clause)** | **NR Band** | **Channel bandwidth (MHz)** | **Resources blocks (*N*RB)** | **A-MPR (dB)** |
| NS\_01 |  | Table 5.2-1  (NOTE 8) | 5, 10, 15, 20, 25, 30, 40, 50, 60, 70, 80, 90, 100 | Table 5.3.2-1 | N/A |
| … | … | … | … | … | … |
| NS\_100 | 6.5.2.4.2 | n1, n2, n3, n5, n8, n18, n25, n26, n65, n66, n80, n81, n84, n86, n89  (NOTE 1) |  |  | Table  6.2.3.1-2 |
| NOTE 1: This NS can be signalled for NR bands that have UTRA services deployed.  NOTE 2: No A-MPR is applied for 5 MHz BWChannel where the lower channel edge is ≥ 1930 MHz,10 MHz BWChannel where the lower channel edge is ≥ 1950 MHz and 15 MHz BWChannel where the lower channel edge is ≥ 1955 MHz.  NOTE 3: Applicable when the NR carrier is within 1447.9 – 1462.9 MHz.  NOTE 4: Applicable when the upper edge of the channel bandwidth frequency is greater than 1980 MHz.  NOTE 5: Applicable when the NR carrier is within 2545 – 2575 MHz.  NOTE 6: This NS value is applicable for cells in the range 3450 – 3550 MHz for operations in the USA. This NS value does not indicate any additional spurious emission and maximum output power reduction requirements.  NOTE 7: The 1Tx architecture is assumed. For power class 2 UE indicating *txDiversity-r16* [TS 38.306], the additional relaxation of [2] dB is applicable.  NOTE 8: The NS\_01 label with the field *additionalPmax* [7] absent is default for all NR bands.  NOTE 9: 5 MHz only applies to n90, not n41  NOTE 10: This NS value is applicable for cells in the range 3650-3980 MHz for operations in Canada. This NS value does not indicate any additional emission requirements. | | | | | |

------------------------------------------ Changes ------------------------------------------------------------------------

------------------------------------------ Changes ------------------------------------------------------------------------

6.2A.3.1.1 UE additional maximum output power reduction for Intra-band contiguous CA

Additional emission requirements can be signalled by the network. Each additional emission requirement is associated with a unique network signalling (NS) value indicated in RRC signalling by an NR frequency band number of the applicable operating band and an associated value in the field *additionalSpectrumEmission.* Throughout this specification, the notion of indication or signalling of an NS value refers to the corresponding indication of an NR frequency band number of the applicable operating band, the IE field *freqBandIndicatorNR* and an associated value of *additionalSpectrumEmission* in the relevant RRC information elements [7]*.* Relation between NR CA band and NR frequency band is specified in Table 5.2A.1-1.

To meet the additional requirements, additional maximum power reduction (A-MPR) is allowed for the maximum output power as specified in Table 6.2A.1.5-1. Unless stated otherwise, the total reduction to UE maximum output power is max(MPR, A-MPR) where MPR is defined in clause 6.2A.2.4. In absense of modulation and waveform types the A-MPR applies to all modulation and waveform types.

Table 6.2A.3.1.1-1 specifies the additional requirements with their associated network signalling values and the allowed A-MPR and applicable CA band(s) for each CA\_NS value. The mapping of NR CA band numbers and values of the *additionalSpectrumEmission* to network signalling labels is specified in Table 6.2.3.1.1-2.

**Table 6.2A.3.1.1-1: Additional maximum power reduction (A-MPR)**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Network signalling label** | **Requirements (clause)** | **NR CA Band** | **Aggregated channel bandwidth (MHz)** | **Resources blocks (*N*RB)** | **A-MPR (dB)** |
| CA\_NS\_01 |  | Table 5.2A.1-1 | All applicaple NR CA bands | All applicaple NR CA configurations | N/A |
| CA\_NS\_04 | 6.5A.2.3.1.1  6.5A.3.3.1.1 | CA\_n41 | Table 5.5A.1-1 | 6.2A.3.1.1.1 | 6.2A.3.1.1.1 |
| CA\_NS\_27 | 6.5A.2.3.1.2  6.5A.3.3.1.2 | CA\_n48 | Table 5.5A.1-1 | 6.2A.3.1.1.2 | 6.2A.3.1.1.2 |
| CA\_NS\_46 | 6.5A.3.3.1.3 | CA\_n7 | Table 5.5A.1-1 | 6.2A.3.1.1.3 | 6.2A.3.1.1.3 |
|  | | | | | |

[The CA\_NS\_01 label with the field *additionalPmax* [7] absent is default for all NR bands.]

When UEs are configured with intra-band contiguous CA in n77 with NS\_01 for an uplink component carrier in the range 3450-3650 MHz and NS\_57 for an uplink component carrier in the range 3650-3980 MHz in *FrequencyInfoUL-SIB*, A-MPR does not apply to the UEs regardless of which value of *additionalSpectrumEmission* in *FrequencyInfoUL* is used for the carrier in the range of 3650-3980 MHz

------------------------------------------ Changes ------------------------------------------------------------------------

Companies are invited to provide the general comments, including comments on justification part, whether the WI is needed, how to handle the work, in the follow table.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | We recognize there is misalignment between RAN2 agreed CR’s and the lack of agreement of RAN4 CR’s. Nonetheless, we do not agree to these CR’s presented at RAN when further discussion is needed in RAN4. In our view, it would be better to wait for the discussion and common understanding in RAN4 and then propose and agree RAN4 CR’s to the RAN4 TS, rather than a company CR at RAN now. We also understand that there is no immediate urgency from the interested operators to agree to CR’s at this meeting. |
| Apple | 1. For NOTE 10 in Table 6.2.3.1-1, is it necessary to remove “spurious” and “A-MPR”? The “spurious” has been used in 6.5.5.3 clause title for NS values associated additional spurious emissions requirements. A-MPR requirements are also associated with NS values.  2. We do not have strong view on the added paragraph in 6.2A.3.1.1. We understand that it is meant to align with RAN2 specifications change in *additionalSpectrumEmission* in *FrequencyInfoUL* field descriptions. On the other hand, with RAN2 specifications change and NOTE 10 in Table 6.2.3.1-1, we think the expected UE behavior should be clear enough without the added paragraph.  3. If the added paragraph is indeed needed, we think it also needs to be added in clause 6.2A.3.1.2.0 for intra-band non-contiguous UL CA as UL CA in Canada Band n77 may not always be contiguous. |
| T-Mobile USA | We agree with Qualcomm that this should be discussed in RAN4, not as company CRs at RAN Plenary. One question we have is why the new text is only being added for contiguous CA and not non-contiguous UL CA? The header levels are incorrect for the sub-clauses in 6.2A.3, and they should also be fixed. |
| ZTE | Similar comments as in previous CR. |
| AT&T | Similar comments as with the n77 USA CR. Any final agreed text should be aligned. We also agree with Apple that the intra-band non-contiguous UL CA case should also be accounted for from a core requirement perspective but perhaps the Canadian operator(s) could comment if the intent is to always use intra-band contiguous UL CA. |
| Huawei | Similar comments in 1.2.1. |
| Samsung | Similar comments in 1.2.1. |
| MediaTek | Similar comments as in previous CR. |
| OPPO | Similar comments in 1.2.1. |
| Nokia | To Apple and AT&T, thank you for the comment on the case intra band non-contiguous UL CA for n77 in Canada. We agree that n77(2A) is used in Canada, NS\_57 and accompanied texts are needed to be written in NC\_CA as well. |
| Ericsson | Same comments as in 1.2.1. |

### Summary

**Sub-topic 1-1: Comments for 38.101-1 CR RP-222350 for n77 in US**

12 companies made comments. Among them 3 companies would like to discuss the technique details in RAN4 meeting rather than in RAN. The other companies could accept the CR but had comments on the changes in the CRs.

Basically, there would be two options to move forward. Based on most companies’ views, the moderator would like to propose

* **Proposal 1-1**: for 38.101-1 CR RP-222350 for n77 in US
  + Option 1:
    - For Change #1 for section 6.2.3, keep original NOTE 6 unchanged and add clarification for NS values
      * NOTE 6: This NS value is applicable for cells in the range 3450 – 3550 MHz for operations in the USA. This NS value does not indicate any additional spurious emission and maximum output power reduction requirements as this NS value is used for barring purposes only.
    - For Change #2 for section 6.2A.3.1.2, add clarification for NS values on top of current changes
      * When UEs are configured with intra-band non-contiguous CA in n77 with NS\_01 for an uplink component carrier in the range 3700-3980 MHz and NS\_55 for an uplink component carrier in the range 3450-3550 MHz in FrequencyInfoUL-SIB, A-MPR does not apply to the UEs regardless of which value of additionalSpectrumEmission in FrequencyInfoUL is used for the carrier in the range of 3450-3550 MHz. The additional RF conformance tests are not required for these cases when NS values have been used for barring purposes only.
      * Further update is needed for Change #2 in future WG meetings.
  + Option 2:
    - For Change #1 for section 6.2.3, keep original NOTE 6 unchanged and add clarification for NS values
      * NOTE 6: This NS value is applicable for cells in the range 3450 – 3550 MHz for operations in the USA. This NS value does not indicate any additional spurious emission and maximum output power reduction requirements as this NS value is used for barring purposes only.
    - For Change #2 for section 6.2A.3.1.2, replace the Change # 2 by the following alternative
      * For UEs configured with intra-band non-contiguous CA in n77 and with NS\_01 indicated or configured for an uplink component carrier the range 3700-3980 MHz and NS\_55 for another uplink component carrier in the range 3450-3550 MHz, the allowed A-MPR is according to CA\_NC\_NS\_01.

**Sub-topic 1-2: Comments for 38.101-1 CR RP-222353 for n77 in Canada**

Companies’ views are similar to sub-topic 1-1.

In addition, Apple commented *if the added paragraph is indeed needed, we think it also needs to be added in clause 6.2A.3.1.2.0 for intra-band non-contiguous UL CA as UL CA in Canada Band n77 may not always be contiguous*. T-Mobile USA and AT&T had similar comments. According to response from proponent, the similar change should also be done for NC CA.

* **Proposal 1-2**: for 38.101-1 CR RP-222353 for n77 in Canada
  + The similar wording agreed for sub-topic 1-1 can be reused
  + The similar changes in Section 6.2A.3.1.1 should also be made for NC CA.

## Intermediate round

### Comments & responses

**Sub-topic 1-1: Comments for 38.101-1 CR RP-222350 for n77 in US**

In the intermediate round, please comment on **Proposal 1-1**. The moderator wonder if companies still have strong view to go back to WG meeting to address this issue.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |
|  |  |
|  |  |
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**Sub-topic 1-2: Comments for 38.101-1 CR RP-222353 for n77 in Canada**

In the intermediate round, please comment on **Proposal 1-2**.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |
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### Summary

Moderator summarizes discussion status for this round, list all the identified open issues and tentative agreements or candidate options and suggestion for next round.

## Final round

### Comments & responses

*Based on the status of the final round, recommendations will be provided.*

Companies are invited to provide comments and responses in the following table.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |
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|  |  |
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### Summary

Moderator summarizes discussion status and provide the recommendation.

# Summary of Recommendations