**3GPP TSG-RAN WG2 Meeting #119bis draft-R2-220988**

**e-Meeting, 10-19 October 2022**

**Source: Apple Inc**

**Title: [DRAFT] Summary of email discussion [AT119bis-e][013][NR17] NS Value Extension (Apple)**

**Document for: Decision**

**Agenda Item: 8.18**

# Introduction

This document provides a summary for the following email discussion.

* [AT119bis-e][013][NR18] NS Value Extension (Apple)

Scope: Treat R2-2209344, R2-2209790, R2-2209791, R2-2210395. Determine agreeable parts, Based on agreeable parts, progress TP/Draft CR, LS out if agreeable.

Intended outcome: Report, Endorsed TP/Draft CR, Approved LS out if applicable.

Deadline: In time for CB W1 Fri

Deadline (for companies' initial feedback): Wednesday 2022-10-12 2300 UTC

# Discussion

Companies providing input to this email discussion are requested to leave contact information below.

|  |  |  |
| --- | --- | --- |
| **Company** | **PoC** | **Email** |
| Huawei, HiSilicon | Tong Sha | [shatong3@hisilicon.com](mailto:shatong3@hisilicon.com) |
| Qualcomm Incorporated | Masato KITAZOE | mkitazoe@qti.qualcomm.com |
| Apple | Naveen Palle | [naveen.palle@apple.com](mailto:naveen.palle@apple.com) |
| Intel | Youn Heo | Youn.hyoung.heo@intel.com |
| Samsung | Jaehyuk JANG | [jack.jang@samsung.com](mailto:jack.jang@samsung.com) |
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| Nokia | Jarkko Koskela | [jarkko.t.koskela@nokia.com](mailto:jarkko.t.koskela@nokia.com) |
| LGE | SungHoon Jung | [Sunghoon.jung@lge.com](mailto:Sunghoon.jung@lge.com) |
| vivo | Yanxia Zhang | [Yanxia.zhang@vivo.com](mailto:Yanxia.zhang@vivo.com) |

* 1. Discussion on the RAN4 LS

**Question 1:** Do companies have any comments on the RAN4 LS [1]?

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| --- | --- |
| **Company** | **Any comments/suggestions?** |
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**Summary: No company has any specific comments on the RAN4 LS.**

**Proposal 1: Suggest the chair to note the LS.**

* 1. Discussion on proposals

Two companies provided views [2] [4] on the extension of the NS values based on the RAN4 LS [1].

Both [2] and [4] suggest using value ‘7’ in legacy IE as an indicator to the extension and that ‘7’ should not point to any actual NS value in the legacy IE.

**Question 2:** First, do companies agree with using extension IE to handle the additional values?

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| --- | --- | --- | --- |
| **Company** | **Agree** | **Do not agree (pls provide alternatives in such a case)** | **Any comments/suggestions?** |
| Huawei, HiSilicon | Agree with comments |  | We agree with using extension IE to extend the NS values. However, it should be confirmed with RAN4 whether value’7’ in legacy IE could be used to prevent legacy UE from camping on a cell with extended NS values, since the usage of NS values is defined by RAN4.  Besides, in RAN4 LS, it is stated that the NS values are intended for unlicensed operation. We suggest to clarify in the spec that the extended NS values are only for unlicensed bands, to avoid impact on licensed bands, and avoid unnecessary signalling overhead. |
| Qualcomm Incorporated | Yes |  |  |
| Apple | Yes |  |  |
| Intel | Yes |  |  |
| Samsung | Yes |  |  |
| MediaTek | Yes with comments |  | We also understand the requirement is for NR-U bands and would like to clarify that the extension IE is used for unlicensed bands only. |
| CATT | Yes |  |  |
| OPPO | Yes |  | We are fine to clarify this is only for unlicensed band. Then we also wonder whether the NS value 7 is not reserved for licensed band i.e. it can still be used by RAN4 as a valid NS value for licensed band? |
| Ericsson | Yes |  | But not sure we need to capture e.g. in 38331 that the extension is for unlicensed bands only. The actual NS values are anyway decided by RAN4. As long as there is no need for >7 NS values in a licensed band, the asn.1 extensions will not be used and hence no impact on licensed bands and signalling overhead (except from the asn.1 extension mechanism itself). |
| ZTE | Yes |  |  |
| Nokia | Yes |  | Ericsson has a point.  Regarding MTK – The limitation is in our understanding defined in RAN4 if needed/required. No need to limit in the signaling. |
| LGE | Yes |  |  |
| vivo | Yes |  |  |

**Summary: 13 companies commented on this and all companies agree to the method of extension IEs to handled the extra values. The moderator also think this is not a controversial, and rather logic way to add the signaling for the extra values.**

**However, three companies commented that the extension should be applicable only to unlicensed bands, while two companies think that such limitation can be defined in RAN4 if needed, and RAN2 does not need to capture such restriction.**

**One company also commented that it needs to be checked with RAN4 on ‘reserving’ existing value 7 for extension. Another company also wondered if such reserving would not be applicable to licensed bands.**

**The moderator thinks it’s better to check with RAN4 about using existing value ‘7’ as reserved (to indicate about the presence of extended NS values), and let RAN4 decide on which bands they would define the extended values (whether limit to unlicensed bands or not). Besides the text in the LS states that “atleast” for unlicensed bands, and so this does not preclude licensed bands.**

**Proposal 2: Extended NS values are signalled using extension IE and the value ‘7’ from the existing NS values can be considered as reserved (to indicate that extended NS values are signalled in the extension IE). Inform RAN4 about the signalling using ‘7’ as reserved value.**

**Proposal 3: RAN2 does not capture any restriction in the field description that the extended range is only applicable to unlicensed bands.**

[4] suggests using value range 8 to 39 with **5-bit IE**, while [2] proposes that RAN4 be provided with both options : **. 4-bit** IE enabling 8..23 extended NS range or **5-bit IE** enabling 8..39 extended NS range and get their feedback.

**Question 3:** If companies agree with Q2, what is your preference on the bitwidth for extension?

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| --- | --- | --- | --- | --- |
| **Company** | value range 8 to 39 with **5-bit IE** | value range 8 to 23 with **4-bit IE** | **Ask RAN4** | **Any other suggestions?** |
| Huawei, HiSilicon | 5-bit IE |  |  | According to RAN4 LS, up to 32 different values should be supported. |
| Qualcomm Incorporated | Yes |  |  | According to RAN4 LS. |
| Apple | Yes |  |  |  |
| Intel | Yes |  |  |  |
| Samsung | Yes |  |  |  |
| MediaTek | Yes |  |  |  |
| CATT | Yes |  |  |  |
| OPPO | Yes |  |  |  |
| Ericsson | Yes |  |  |  |
| ZTE | Yes |  |  |  |
| Nokia | Yes |  |  |  |
| LGE | Yes | Yes |  | 4 bits seems sufficient but no problem with 5 bits (5-bit option is more future proof?) |
| vivo | Yes |  |  |  |

**Summary: All 13 companies that responded, agree to using 5-bit value, which can extend the range of signal values from 8 to 39. One company commented that 4-bit is also sufficient, but ok to go with 5-bit.**

**Proposal 4: The extended range of NS values will be signalled with a 5-bit extension IE.**

In [4] there is a suggestion to limit the extension to only dedicated signalling and not in SIB1?

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| --- |
| The NS value (additionalSpectrumEmission) is conveyed to the UE   * In SIB1 (can indicate multiple NS values in a cell)   + ServingCellConfigCommonSIB -> FrequencyInfoDL/UL-SIB -> MultiFrequencyBandListNR-SIB -> NR-MultiBandInfo -> NR-NS-PmaxList -> NR-NS-PmaxValue   *NR-NS-PmaxList* information element  -- ASN1START  -- TAG-NR-NS-PMAXLIST-START  NR-NS-PmaxList ::= SEQUENCE (SIZE (1..maxNR-NS-Pmax)) OF NR-NS-PmaxValue  NR-NS-PmaxValue ::= SEQUENCE {  additionalPmax P-Max OPTIONAL, -- Need N  additionalSpectrumEmission AdditionalSpectrumEmission  }  -- TAG-NR-NS-PMAXLIST-STOP  -- ASN1STOP  We understand RAN4 do not require possibility to publish more NS values in SIB1, hence NR-NS-PmaxList need not be extended.  Since there is less size concern with extensions in dedicated signalling, the additionalSpectrumEmission-v17xy is preferably added in the frequencyInfoUL |

**Question 4:** Do companies agree to limit the extension to only dedicated signalling and not in SIB1?

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| --- | --- | --- | --- |
| **Company** | **Agree** | **Do not agree** | **Any comments/suggestions?** |
| Huawei, HiSiIicon |  |  | We understand in [4] the intention is not to only extend dedicated signaling, instead we understand the extension on NS values should apply to both SIB1 and dedicated signalling through AdditionalSpectrumEmission-v17xy IE.  In our view, [4] proposes to keep the size of NR-NS-PmaxList in SIB1, since there is no such requirement from RAN4. We share the same view on this point. |
| Qualcomm Incorporated |  | X | We understood the proposal in [4] is to say the “size” of NR-NS-PmaxList is not extended, which we agree to.  We have a comment on the way NR-MultiBandInfo is extended. We do not think P-max does not have to be signalled in NR-NS-PmaxList-r17. P-max in NR-NS-PmaxValue (without suffix) can be used and let the special value of additionalSpectrumEmission point to the actual value in AdditionalSpectrumEmission-v17xy. |
| Apple |  |  | [Rapporteur] If the intention is to not extend size of NR\_NS-PmaxList, we misunderstand the statemtent on adding additionalSpectrumEmission-v17xy to frequencyInfoUL (and not to frequencyInfoUL-SIB..?)  If this information is needed in frequencyInfoUL-SIB, then AdditionalSpectrumEmission-v17xy needs to be provided as a list for each of the entires of NR-NS-PmaxList.  But, the signalling details discussion depends also on whether we want to extend from R17 or R18. Maybe we agree first on this first, and then have CRs to the next meeting (if it’s R17)…? |
| Intel |  | x | We also have the same understanding that the proposal in [4] is to introduce extension of NS value in both SIB1 and dedicated signaling. Maybe, the proponent can clarify. |
| Samsung |  | x | Same as what others said, in any case, we think that the extension should apply to both SIB1 and dedicated signalling. |
| MediaTek |  |  | We understand TP from [4] also propose to have NS value in SIB1. It is unclear to us for the real intention. |
| CATT |  | x | Same as above, SIB1 extension is needed too. |
| OPPO |  |  | SIB1 extension is needed since the motivation is mainly due to diverse regulations |
| Ericsson |  | x | (Proponent of [4]).  We also understand the extension should apply to both SIB1 and dedicated signalling.  Further, we also understood RAN4 did not ask for the possibility to indicate more than 7 different NS values in a cell, so the draft ASN.1 in [4] did not extend the NR-NS-PmaxList.  Typically, we avoid extending IEs in lists in SIBs using the EAC (“…” and “double brackets”, but instead insert the extension (“parallel list”) in a parent IE or even on message level.  We will of course need to examine the draft ASN.1 later. |
| ZTE |  | x | Since the value can be signalled via both methods, it should be included in both. |
| Nokia |  |  | First let’s settle Q5 (r17 or not) |
| LGE |  | X | Same view with other companies |
| vivo |  | X | Same view with other companies |

**Summary : Among the 13 companies that responded, all except for one company agree to have this extension signalled in both broadcast and dedicated messages. One company prefers to discuss this based on whether we extend this in R17 or not.**

**The moderator thinks that we can agree to allow this signalling in both broadcast (SIB1) and UE dedicated messages, and defer the actual ASN.1 signalling discussion based on whether we want to support this from R17 or not.**

**Proposal 5: Extended NS values can be signalled in broadcast (SIB1) and UE dedicated messages.**

Finally, there is a request from RAN4 on having this extension available from Rel-17.

**Question 5:** Do companies agree on extension the IE from Rel-17?

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| --- | --- | --- | --- |
| **Company** | **Agree** | **Do not agree** | **Any comments/suggestions?** |
| Huawei, HiSilicon |  | Do not agree | We understand in RAN4 discussion this is a Rel-18 WI and therefore not sure whether there is urgency to introduce it in Rel-17. It would be good to check with RAN4 their motivation to consider Rel-17. |
| Qualcomm Incorporated | X |  | Fine to follow RAN4 guidance. |
| Apple | Yes |  |  |
| Intel |  | See comments | RAN4 asked if it is possible to introduce from Rel-17 but there is no explanation/guidance from RAN4.  Since it is from Rel-18 WI, we are not sure the need to introduce from Rel-17. More information would be helpful. |
| Samsung | x |  |  |
| MediaTek |  | Do not agree | We also don’t understand the motivation to have this in Rel-17 as it is for R18 WI. |
| CATT | x |  |  |
| OPPO |  | X | Not sure why we need it from Rel17 |
| Ericsson |  |  | No strong view. We can ask RAN4. |
| ZTE | X |  | We are fine with Rel-17. If the value 7 is to be reserved, it is better to reserve it anyway from earlier release from backwards compatibility point of view. |
| Nokia | X |  | Generally these band related aspects are release independent and we should actually do those changes from R15. As the introduction from R17 is quite easy it would be preferred as it would make RAN4 discussion easier – Then they don’t need to consider which regions/countries gets NS value from R17 value range and which regions/countries from R18 value range. For fairness for all the regions it would be easier if we could do the change in R17.  in fact we wonder why RAN4 did not consider introducing range extension from R16 where NR-U was introduced. Maybe they made just a mistake in their discussion but they intended to allow the introduction from R16 onward. Or is it understanding that no one will ever implement R16 NR-U but NR-U UE will always support R17? |
| LGE | x |  | Prefer to follow RAN4 request/guidance. |
| vivo | X |  |  |

**Summary: Among the 13 companies that responded, 3 do not want to support from R17, while one company is not sure and want to ask RAN4 for more info. 8 companies support signalling from R17. Among the 8 companies that support, 1 company actually prefers supporting the signalling from R16 itself (as NR-U was introduced in R16).**

**The moderator thinks it is better to discuss this online, as the conclusion from this would directly affect the next set of RAN2 actions: a LS reply with the relevant content, the associated ASN.1 signalling TP etc.**

* 1. Reply LS

In [3], there is a draft LS reply content. The rapporteur understands that the content would change based on the outcome of the above questions, but would like to check some views on the current text.

**Question 6:** Do companies agree on a reply LS to RAN4 based on RAN2 progress?

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| --- | --- | --- | --- |
| **Company** | **Agree** | **Do not agree** | **Any comments/suggestions?** |
| Apple | Yes |  | We should atleast inform about whether this is possible from R17 or not. |
| Intel | Yes |  | We need to ask RAN4 if we should introduce from Rel-17 although it is possible. |
| Samsung | Yes |  | Regarding the release, perhaps we can inform them it is possible, and ask them to share the background? |
| MediaTek | Yes |  | We would like to clarify the need to have this for Rel-17 with R4. RRC Signaling is of course possible to have this in Rel-17. |
| CATT | Yes |  |  |
| OPPO | Yes |  |  |
| ZTE | Yes |  |  |
| Nokia | Yes (see comment) |  | Fine to send LS if we cannot agree to introduce from R17 onward. In fact we should ask them why did they not consider introducing the extension from R16 onward as NR-U was introduced in that release! |
| LGE | Yes |  |  |
| vivo | Yes |  |  |

**Question 7:** Assuming ‘yes’ to Q6, can companies provide comments/suggestion to the current draft LS in [3]?

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| **Company** | **Any comments/suggestions?** |
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**Summary : All companies are ok to send an LS reply to RAN4, while the actual content is to be concluded, with majority of it being decided based on discussion from proposal 6.**

**Proposal 6: RAN2 to discuss whether the extension signalling is to be done from Rel-17 or Rel-18 or Rel-16. The LS reply content would be based on the outcome of this discussion.**

**A need for TP/draftCR/CR is dependant on the outcome of which release the signaling would be from. If RAN4 input is needed, then this could be deferred until the reply LS from RAN4. So the moderator thinks that we can defer the TP/draftCR/CR part to later meetings.**

**Proposal 7: Companies are invited to come up with CR/draftCR based in the next meeting(s) based on the outcome of P6.**

# Conclusion

**Proposal 1: Suggest the chair to note the LS.**

**Proposal 2: Extended NS values are signalled using extension IE and the value ‘7’ from the existing NS values can be considered as reserved (to indicate that extended NS values are signalled in the extension IE). Inform RAN4 about the signalling using ‘7’ as reserved value.**

**Proposal 3: RAN2 does not capture any restriction in the field description that the extended range is only applicable to unlicensed bands.**

**Proposal 4: The extended range of NS values will be signalled with a 5-bit extension IE.**

**Proposal 5: Extended NS values can be signalled in broadcast (SIB1) and UE dedicated messages.**

**Proposal 6: RAN2 to discuss whether the extension signalling is to be done from Rel-17 or Rel-18 or Rel-16. The LS reply content would be based on the outcome of this discussion.**

**Proposal 7: Companies are invited to come up with CR/draftCR based in the next meeting(s) based on the outcome of P6.**

# References

[1] R2-2209344 LS on extending the maximum range for NS values

[2] R2-2209790 On extending the maximum range of NS values Apple

[3] R2-2209791 [Draft] LS reply on extending the maximum range for NS values Apple

[4] R2-2210395 Increasing NS value range Ericsson

# Annex: Main body of RAN4 LS [1]

To account for local or regional regulatory requirements of some bands, RAN WG4 has a framework with so-called NS values, where a particular NS value associated with a band can signal the corresponding emission requirements. At the moment the network can signal up to 8 different NS values. However, as recently identified by RAN WG4, for some bands intended for unlicensed operation there might be a need to signal more than 8 different values.

Based on that RAN WG4 kindly asks to extend the maximum range so that up to 32 different values can be used at least for bands intended for unlicensed operation.

And, RAN WG4 also asks whether it is possible to introduce the corresponding extension starting from Rel-17.

**2. Actions:**

**To RAN WG2 group.**

**ACTION:** RAN WG4 asks RAN WG2 to extend the maximum range of NS values – if possible, starting from Rel-17 – so that up to 32 different values can be used.