**3GPP TSG RAN Meeting #93-e RP-212566**

**Electronic Meeting, September 13 - 17, 2021**

**Agenda item:** 9.4.1.3

**Source:** RAN Vice-Chair (AT&T)

**Title:** Moderator's summary for discussion [93e-26-6GHz-NR-U]

**Document for:** Discussion

# Introduction

In this document, we will provide a summary for the email discussion on [93e-26-6GHz-NR-U] at RAN#92-e.

# Topic #1: Consideration of Aspects beyond ECC Decision (20)01

## Proposed objectives

Topic #1 will capture the outcome of the discussions related to aspects beyond ECC Decision (20)01 in the set of reference documents [1] to [6].

## Initial round

### Open issues

Issue 1.2-1: RAN needs to consider if the unlicensed operation in the frequency range 5945 MHz to 6425 MHz in Europe shall be based on available ECC Decision (20)01 or RAN4 shall consider other aspects as well.

The other aspects could consist of Radio Equipment Directive 2014/53/EU, receiver blocking requirements that will be necessary for coexistence with 6GHz IMT systems after WRC 2023, the technical requirements for the 6GHz band established through ETSI EN 303 687, and/or potential future regulations.

The following summarizes the options to consider for Issue 1.2-1.

* **Option 1: RAN4 to consider the unlicensed operation in the frequency range 5945 MHz to 6425 MHz in Europe shall be based on available ECC Decision (20)01.**
* **Option 2: RAN4 to consider other aspects in addition to ECC Decision (20)01 which could consist of Radio Equipment Directive 2014/53/EU, receiver blocking requirements that will be necessary for coexistence with 6GHz IMT systems after WRC 2023, the technical requirements for the 6GHz band established through ETSI EN 303 687, and/or potential future regulations.**
* **Option 3: Put** **WI (NR\_6GHz\_unlic\_EU) on hold pending potential future regulations for the upper 6 GHz range (6425 MHz to 7125 MHz).**

### Collection of company views

Issue 1.2-1: Indicate which option is preferred concerning aspects beyond ECC Decision (20)01 and impact to WI (NR\_6GHz\_unlic\_EU).

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| **Company** | **Comments** |
| OPPO | Option 2 is preferred |
| Huawei | All the applicable regulatory decision needs to be followed by default, including RED directive for EU. Therefore Option 2 to be considered as baseline.  For option 3: it would be good to clarify the timeline of the possible decision to put the WI on hold, so that it would be clear when to re-open technical discussion ,e.g. WRC 2023 outcomes? |
| Vodafone | Option 2. Article 3(2) of the directive states “Radio equipment shall be so constructed that it both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference”, and this must be complied with before products can be sold within the EU. If we do not define a new 6 GHz NR-U band, it is unclear how tighter requirements can be reliably specified and applied for 5945 – 6425 MHz to ensure compliance with 2014/53/EU  following the WRC23 decision. Operating with the n96 band and associated hardware within Europe would result in either unnecessary receiver blocking impacts for NR-U or a need to limit the Tx power of future licensed operation above 6425 MHz, both of which are unacceptable and not in line with the statement quoted above from 2014/53/EU. It is clear that an RF implementation targeted specifically for the 5945 – 6425 MHz range is the most effective way to ensure both licensed and unlicensed bands can coexist efficiently and avoid harmful interference. |
| BT | Option 2.  The ECC Decision is an important element of the identification of this band in Europe, however there are other elements which also need to be considered.  As previously noted, the RED requires efficient use of the radio spectrum to avoid harmful interference, and it is understood that this requires that receivers should have sufficient blocking protection. Whilst it is recognised that further clarity will be gained following the next WRC in 2023, we believe that using the band n96 receiver blocking requirements would not be appropriate in the meantime, as this would leave UEs vulnerable to interference in the future.  The figure in RP-211906 does propose a blocking mask which we believe would be appropriate, using the n96 blocking mask shifted downwards in frequency by 700 MHz, so that the UE requires the same mask at the top of the European band (i.e. above 6425 MHz) as that used at the top of the n96 band (i.e. above 7125 MHz). |
| Nokia | The three options are inter-related:  The only available quantified regulations are those of the ECC decision.  The quoted RED directive is not quantified and therefore does not help to derive any specific requirements. As implicit in BT’s response, the question is what is “sufficient”.  Consideration of 6GHz IMT systems after WRC 2023 by definition leads the conclusion towards option 3. Therefore, if it is desired to specify sufficient blocking requirements to cope fully with future 6GHz IMT systems after 2023, then option 3 is the only possible conclusion.  However, RAN4 has also agreed that “the same hardware of UE as for n96 may be reused on the frequency range 5945MHz to 6425MHz no matter whether to define a new band or define new NS for the existing n96.” This limits how much the blocking requirements may differ from those of n96. In the light of this, an alternative to option 3 could be to define the tightest blocking requirements that can be agreed to be able to be met by n96 UE hardware. The blocking mask in [4] seems to be motivated by this, and we would therefore suggest asking the question whether companies can agree to that mask, or, if not, what modification to it would be required in order to be satisfiable by n96 hardware. |
| Qualcomm | We prefer option 1. It was agreed when the work item was started to base the work on ECC Decision 20(01). In the chairmans’s minutes, it is recorded  RAN chairman clarified that 3GPP can start working on this WI based on the ECC decision already available.  WI objectives may be checked/revisited once the final EC decision becomes available (expected by March 2021)  The WI objectives were not modified based on final EC decision.  The option 2 to consider RED 2014/53/EU is not actionable since there is no requirement therein or in ETSI specification for the requested blocking. Moreover, blocking of -56 dBm and -44 dBm can be specified according to Band n96 so it is not as if no blocking is specified at all. Lastly, there was already an agreement in RAN4 that the same hardware may be used irrespective of Option 1 or Option 2. This means that the minimum requirements should NOT be specified with the assumption of filter rejection above 6425 MHz nor should it be assumed that the Rx path has higher dynamic range or linearity than that afforded by n96. Therefore, the specification of blocking for option 2 is not expected to be significantly improved compared to option 1.  As a final note, there are other non-3GPP unlicensed technologies that will be using this band. Those technologies will not be hampered by additional blocking requirements. So 3GPP is only imposing additional requirements on itself or delaying its availability of the band thereby disadvantaging itself compared to other technologies. |
| ZTE | We prefer Option 2 if regulator has imposed any restrictions, we need to fully respect that decision. based on our understandings, in-band blocking requirements and OOBB requirements for the specific frequency range or per-band are general requirements which is not purely coming from regulatory requirements. Indeed FR1 UE in-band blocking and OOBB requirements are partially originating from E-UTRA/UTRA spec, more details could be found in R4-99038 for UTRAUE RF. |
| Broadcom | We support Option 1 based the work on ECC Decision 20(01 and the final EC decision. |
| Intel | Option 1 is preferred. In our understanding Option 1 does not contradict to RED.  From our point of view Option 3 is the worst-case scenario, which would delay the adoption of NR-U 6GHz in EU for an unknown period of time. |
| Apple | Option 1 with the small clarification that it is not only the ECC Decision, but also the mandatory EC Decision that was published in June 2021. We can consider the EU RED directive, but as commented by other companies, it is not quantified in a sense that it does not provide exact blocking requirements in terms of dBm. It is also worth noting that Option 1 does provide blocking requirements, which unlike ETSI requirements for the 5GHz and 6GHz RLAN systems are more stringent and cover both lower and upper frequency ranges.  If proponents of Option 2 assume that the receiver blocking requirements should be "adequate" for the potential 6GHz IMT system after WRC 2023, then option 3 is the only possible conclusion. The matter is that we cannot predict the exact blocking requirements that EU/CEPT will end up with as a potential outcome of the WRC2023 meeting. Thus, any blocking requirements agreed now for Option 2 might be anyway inadequate. |
| Telecom Italia | Option 2 |
| Telia Company | We support Option 2 as proposed in RP-211906.  Sufficient OOBB vs. RED should be discussed and agreed as baseline. |
| Orange | We support Option 2. We are concerned that not considering sufficient protection against out of band blocking requirement will be detrimental to deployment of licensed band in the upper part of the 6 GHz band.  With this in mind we believe that a new band is necessary. |
| Telefónica | Option 2 is preferred. We need to consider further aspects in addition to ECC decision. Appropriated receiver blocking requirements compliant with 2014/53/EU need to be specified for 5945 – 6425 MHz to ensure licenced/unlicenced band coexistence |
| Skyworks | Option 1 is what granted the work to be started and option 2 does not provide any quantitative requirement for RAN4 to work with and thus from the UE prospective we do not see that it would change the agreement that a UE implementing n96 can support the European unlicensed band as is. so in our view we should stick to Option 1 or go to option 3 since there no usable information or regulation being added by option 2. Finally competing technologies are not using anything else than the EC decision and are not revisiting requirements to specifically address the >6425MHz frequency range. They only changed channelization to account for European ITS channels which is also the case for n96 |
| Ericsson | Support option 2.  Equipment compliant with the 3GPP specifications should also comply with relevant harmonized standards, that is, EN 301 908-24/25 (a transcription of relevant parts if the 3GPP specifications) and EN 303 687, to demonstrate that radio equipment both effectively uses and supports the efficient use of radio spectrum in order to avoid harmful interference according to Article 3.2 of the RED 2014/53/EU.  6 GHz NR-U devices for EU should provide sufficient receiver resilience against interference in-band and in adjacent frequency bands 6425-7125 MHz consistent with the essential requirements of RED and the efficient use of radio spectrum by way of an increased resilience of receivers. |
| Telenor | Telenor supports option 2. We share the same concern as Orange and other European operators. |

### Summary and recommendation for further discussion

In this section, the summary of comments on Topic#1 and the corresponding moderator recommendations are provided.

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|  | **Summary and recommendation** |
| **Moderator (RAN Vice-Chair, AT&T)** | **Moderator Recommendation:**  The following summarizes the company views on Issue 1.2-1.  UPDATED: 15-09-2021 to also reflect company positions in input papers.  Option 1: Nokia, Nokia Shanghai Bell, Qualcomm, Broadcom, Intel, Apple, Skyworks  Option 2: OPPO, Huawei, Vodafone, BT, ZTE, Telecom Italia, Telia, Orange, Telefónica, Ericsson, Telenor, Deutsche Telekom, Bouygues Telecom  Option 3: Nokia, Nokia Shanghai Bell, Skyworks,  For Option 1, it is generally agreed that the mandatory EC Decision 2021/1067 that was published in June 2021 would apply in addition to ECC Decision (20)01.  The company positions do not vary much from those already expressed in the input documents.  The moderator recommends continuing discussion in the intermediate round with a goal to compromise on a solution that meets the previous RAN4 agreement that “the same hardware of UE as for n96 may be reused on the frequency range 5945MHz to 6425MHz no matter whether to define a new band or define new NS for the existing n96” while minimizing risk of future compliance issues. In absence of a compromise, Option 3 may need to be considered by RAN. |

## Intermediate round

### Open issues

Issue 1.3-1: There does not seem to be a way forward on the options presented in Issue 1.2-1 as presented due to different company views. The goal for the intermediate round will be to work towards a compromise solution that meets the previous RAN4 agreement that “the same hardware of UE as for n96 may be reused on the frequency range 5945MHz to 6425MHz no matter whether to define a new band or define new NS for the existing n96” while minimizing risk of future compliance issues.

The following summarizes the options to consider for Issue 1.3-1.

* **Option 1: Based on Nokia proposal, define the tightest blocking requirements that can be agreed in order to ensure that the requirements can be met by n96 UE hardware. Companies are encouraged to consider the blocking mask in [4] as the baseline and indicate if the mask is agreeable and, if not, what modification would be required in order for n96 hardware to be compliant.**
* **Option 2: Consider the analysis in [5] related to ETSI EN 303 687 which suggests that** **NR-U devices compliant with the existing 3GPP specifications will provide blocking protection for frequencies above 6425MHz.**
* **Option 3: Other solutions to ensure that the same n96 hardware can be reused.**

### Collection of company views

Issue 1.3-1: Indicate which option is preferred and provide reasons/justification.

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| **Company** | **Comments** |
| Nokia | From our perspective, option 1 with the blocking mask in [4] would be an acceptable compromise, as it is intended to be satisfiable by existing n96 hardware.  (The difficulty with option 2 as written above is that it does not provide a means to quantify the blocking protection. That said, option 1 with the blocking mask in [4] would provide some additional blocking protection for frequencies above 6425MHz, and thus also fulfils option 2.) |
| Qualcomm | We have a similar view as Nokia but aren’t as confident about the proposed blocking mask in [4]. We are unsure whether the proposed mask in [4] is feasible when reusing existing n96 hardware. The presumption is that the OOB Range 2 is met without filtering for n96 but since it is OOB, it does fall within the filter’s stopband. Also, the frequency at 7125 MHz is nearly a GHz higher than 6425 MHz so the gain flatness of the front-end might not be the same and therefore provide an effective attenuation. Nonetheless, it does seem like a reasonable compromise to apply a blocking somewhere between -44 dBm (IBB level known to be met w/o filtering) and -30 dBm. This evaluation probably needs to be conducted in RAN4, but at least RAN can provide guidance that the blocking is expected to be between -44 and -30 dBm. |
| Intel | We are open to discuss how proceed with band definition under assumption that n96 hardware can be reused.  For Option 1, in case of reusing the same hardware as for n96 we expect that quite limited improvement of the mask characteristics can be achieved for UEs in the 6425-7125MHz range on top of the IBB level. We are open to discuss if an improved blocking level between -44 and -30 dBm can be considered and agree with QC that discussion should take place in RAN4. We would also like to clarify that the decision on the actual achievable level should be based on the analysis of feasibility for the existing n96 hardware rather than any other factors. |
| Skyworks | The achievable UE receiver blocking level should be based on n96 hardware and may be further evaluated in RAN4 but given that there no specific value to target, the -44dBm in-band blocking level should be the starting point. |
| Telecom Italia | None of the above. As clearly stated by European operators, the acceptable option is  **Option 2 (in section 1.2.1): RAN4 to consider other aspects in addition to ECC Decision (20)01 which could consist of Radio Equipment Directive 2014/53/EU, receiver blocking requirements that will be necessary for coexistence with 6GHz IMT systems after WRC 2023, the technical requirements for the 6GHz band established through ETSI EN 303 687, and/or potential future regulations** |
| BT | The blocking mask for the EU band proposed in [4] appears to provide an acceptable way forward, which we would be happy to support. We presume that this would require additional (or different) filtering compared to that normally used for Band n96, and we would consider any solution which provides the improved out of band blocking proposed. Therefore Option 1 would be the preferred solution on the basis that it appears to offer improved blocking protection above 6425 MHz.  We have considered the analysis in [5] (i.e. Option 2) and we note that it refers extensively to EN 303 687. It is important to note that this is a draft document, which has not yet been approved, and as has been previously stated during the discussions for this WI, we should not proceed on the basis of a draft document which may be subject to further amendment prior to publication. Indeed the observation in [5] that (draft) EN 303 687 does not include any specific blocking requirements for the upper frequencies suggests that the document is immature and may be subject to further amendment before final agreement and publication.  Finally we recognise the agreement from RAN4 that n96 hardware may be re-used for equipment operating in the European frequency band, but we don’t believe that RAN Plenary should be constrained by this, because it is for Plenary to decide what is the best solution to this issue. It is more important that we respect the ECC Decision (20)01 and EC Decision 2021/1067, which identify the upper limit of the band as 6425 MHz, and this remains the fundamental requirement for this work. |
| Vodafone | We share BT’s view that the blocking mask proposed for the EU band in [4] appears to provide an acceptable way forward. Option 1 would be our preferred solution on the basis that it provides for improved blocking protection requirements above 6245 MHz irrespective of hardware implementation. |
| Ericsson | We support Option 3: “Consider the mask in [4] above 6425 MHz a baseline since consistent with standard OOBB requirements for n96, and RAN4 is tasked to consider any other provision needed, if any, for ensuring that the same hardware of UE as for n96 may be reused on the frequency range 5945-6425 MHz”. This is also encouraged by the EC Decision.  Some explanation below:  1. One company has already commented in the first round that they can only accept the in-band requirement of -44 dBm in the entire 5925-7125 MHz no matter which band arrangement is chosen. In the absence of technical arguments for this standpoint, option 1 is therefore not attractive. The proposal in [4] is just the standard OOBB blocking mask above 6425 MHz but with the blocker level limited to -30 dBm in frequency ranges without assumed RF filter rejection. If not considered feasible by RAN, technical arguments should be presented by RAN as to why the said OOBB mask can be met for a wanted channel at the upper edge of 7125 MHz but *not* for a wanted channel at the upper edge of 6425 MHz with the understanding that an RF filter for 5925-7125 MHz assumed for the minimum requirements does not provide rejection at a 60 MHz frequency offset (3\*CHBW) above 7125 MHz.  2. *Any* blocking requirement above 5875 MHz would meet the requirement in the draft EN 303 687 for there is no blocking requirement above 5875 MHz (no requirement at all if the device also supports the 5 GHz band). The obvious outcome of the analysis of [5] as per option 2 is therefore that any standard 3GPP blocking level would suffice and the result would yet again be the in-band requirements for the range 5925-7125 MHz. The general RED directive does indeed not quantify specific blocking levels for the 6 GHz band but requires a minimum level of selectivity that must be demonstrated by measurements to make efficient use of spectrum. In view of potential new applications and existing services and in the 6425-7125 MHz range, we see no reason to relax the standard 3GPP OOBB requirements as already adopted and considered feasible for both n46 and n96 just because the draft EN 303 687 does not contain any blocking requirement, or the corresponding requirements of competing standards are more relaxed.  3. As stated by us in the initial round: equipment compliant with the 3GPP specifications should also comply with relevant harmonised standards, that is, EN 301 908-24/25 (a transcription of relevant parts of the 3GPP specifications including blocking) and EN 303 687. For 6 GHz these would only allow operation in the 5945-6425 MHz range when published, consistent with the spectrum usage conditions in the ECC Decision (20)01. |

### Summary and recommendation for further discussion

In this section, the summary of comments on Topic#1 and the corresponding moderator recommendations are provided.

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|  | **Summary and recommendation** |
| **Moderator (RAN Vice-Chair, AT&T)** | **Moderator Recommendation:**  The majority of the companies see Option 1 as acceptable or as a starting point for further discussions in RAN4 concerning the achievable UE receiver blocking level based on the analysis of feasibility for the existing n96 hardware.  The moderator recommends that RAN consider providing RAN4 with guidance concerning further discussion on UE receiver blocking level with the following list of options. The list of options and way forward will be updated based on the outcome of the Wednesday GTW for any final round discussions.   * **Option 1: Task RAN4 with the evaluation of an achievable UE receiver blocking level based on existing n96 hardware. The blocking level is expected to be somewhere between ‑44 dBm (IBB level known to be met w/o filtering) and -30 dBm.** * **Option 2: Consider the mask in [4] above 6425 MHz a baseline since consistent with standard OOBB requirements for n96, and RAN4 is tasked to consider any other provision needed, if any, for ensuring that the same hardware of UE as for n96 may be reused on the frequency range 5945-6425 MHz.** * **Option 3: Others.**   **Wednesday GTW Outcome:** During the discussion, Option 1 was modified to target as close as possible to -30dBm. Based on the outcome of the GTW session, no further discussion is required on this topic in the final round. There will be further discussion on topic #2 based on this decision. The following option was endorsed.   * **Option 1: Task RAN4 with the evaluation of an achievable UE receiver blocking level based on existing n96 hardware. The blocking level is targeted to be as close as possible to -30 dBm.** |

## Final round

### Open issues

N/A

### Collection of company views

N/A

### Summary and recommendation for further discussion

N/A

## Final comments

The following option was endorsed.

* **Option 1: Task RAN4 with the evaluation of an achievable UE receiver blocking level based on existing n96 hardware. The blocking level is targeted to be as close as possible to -30 dBm.**

# Topic #2: Band Definition for Lower 6GHz NR Unlicensed Operation for Europe

## Proposed objectives

Topic #2 will capture the outcome of the discussions related to band definition for lower 6GHz NR unlicensed operation for Europe in the set of reference documents [1] to [4] and [6].

## Initial round

### Open issues

Issue 2.2-1: RAN needs to decide which options RAN4 shall follow to introduce unlicensed operation in the frequency range 5945 MHz to 6425 MHz in Europe.

The following summarizes the options to consider for Issue 2.2-1.

* **Option 1: Re-using already defined band n96, for the frequency range 5945 MHz to 6425 MHz.**
* **Option 2: Defining a new band n[xx], for the frequency range 5945 MHz to 6425 MHz.**
* **Option 3: Proceed with both option 1 and option 2 by specifying a new band for lower 6GHz NR unlicensed operation for Europe and amending the n96 specification with the NS values relevant for operation in Europe.**

### Collection of company views

Issue 2.2-1: Indicate which option is preferred to introduce unlicensed operation in the frequency range 5945 MHz to 6425 MHz in Europe.

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| **Company** | **Comments** |
| OPPO | Option 2 is preferred |
| Huawei | Option 2.  Regarding option 3: Option 3 was proposed during last RAN4 discussion due to lack of progress on option 1 vs 2. Considering further inputs during this RAN meeting, the option 3 is discouraged. |
| Vodafone | Option 2. |
| BT | Option 2 |
| Nokia | 1. This decision must be made by RAN plenary. It cannot be pushed back to RAN4 again, as RAN4 has repeatedly been unable to make this decision as it is not purely technical. 2. If option 2 is adopted, RAN plenary must also instruct RAN4 as to the blocking requirements to be specified, as explained in our response in section 1.2.2, since RAN4 is not able to specify option 2 without such instruction. 3. Option 1 would also be acceptable to us. 4. Option 3 is totally unacceptable. Even its own proponents state in [3] that it “is not our preference either. It is an inelegant solution, creates additional work, and leads to ambiguous standards only because RAN4 is not capable of making a decision. It does not reflect positively on RAN4.” Moreover, it is illogical: if option 1 is not acceptable, it cannot become acceptable simply by additionally specifying option 2. Similarly, if option 2 is not acceptable, it cannot become acceptable simply by additionally specifying option 1. 5. Another option, as discussed in our response in section 1.2.2, would be to put the work item on hold until sufficient regulatory detail is available to make it possible to reach consensus on the blocking requirements. |
| Qualcomm | 1. We prefer option 1. Option 2 could be considered if the specified UE blocking requirements over the range 6425 MHz and above are the same as the blocking requirements for Band n96 over that same range, but our preference is still option 1. |
| ZTE | We still support the option 2 to have new band, if we go with option 1, this will just put the potential risk and deployment restriction to regional regulators at the end, this is no good way forward for WID.  Meanwhile we think the legacy device for Europe unlicensed 6GHz should also not impact the upper 6GHz in Europe for harmonized coexistence.  If companies are not fine with option 3, then it’s also fine for us to drop it from the table. |
| Broadcom | We support Option 1. |
| Intel | Option 1 is preferred.  For Options 2 and 3 it would be good to clarify if the intention of proponents is to overturn RAN4 agreement that “*The same hardware of UE as for n96 may be reused on the frequency range 5945MHz to 6425MHz no matter whether to define a new band or define new NS for the existing n96*” or that Option 2 will be defined under assumption that same hardware can be reused? |
| Apple | We support Option 1. If it is difficult to achieve the agreement now, then we can consider putting the WI on hold and wait till more regulatory related decisions become available.  Option 3 is not totally unacceptable. As explained by Nokia, it is just illogical: if option 1 is not acceptable, it cannot become acceptable simply by additionally specifying option 2. Similarly, if option 2 is not acceptable, it cannot become acceptable simply by additionally specifying option 1. |
| Telecom Italia | Option 2  Option 3 is a non-sense |
| Telia Company | We support Option 2 as proposed in RP-211906.  Sufficient OOBB vs. RED should be discussed and agreed as baseline. |
| Orange | Option 2 |
| Telefonica | We support option 2 |
| Skyworks | RAN4 has already expressed the view that both options are feasible and whatever the way, new NS are needed to support the European unlicensed spectrum and the agreement that “*The same hardware of UE as for n96 may be reused on the frequency range 5945MHz to 6425MHz no matter whether to define a new band or define new NS for the existing n96*” shall be respected. And again this is how competing technologies are doing. We also think that some issues that are brought up only pertains to the guarantee that NRU BS will not try to operate >6425MHz which is the same issue than in n46 where BS shall not operate in UNII4 in Europe where it can be the case in the US. Also we do not see how a UE that supports the entire 6GHz spectrum cannot be supported when roaming in Europe for an unlicensed spectrum. |
| Ericsson | Support option 2.  Option 2 does not permit operation outside the allowed 5945-6425 MHz frequency range in the EU and would be endowed with at most two NS values (for LPI and VLP) both relevant for operations according to the EC Decision.  Option 2 can be specified with tighter blocking requirements for the range 6425-7125 MHz as compared to Option 1 since this range is not in-band for Option 2.  The above supported using the same hardware as for Option 1, allowing “the internal market to benefit from a spectrum resource also available worldwide, thus generating large economies of scale for equipment manufacturers” as spelled out in the EC Decision. |
| MediaTek | There is agreement in RAN4 that the same hardware may be used irrespective of Option 1 or Option 2, we think the agreement is a good solution for further discussion and should not be precluded. |

### Summary and recommendation for further discussion

In this section, the summary of comments on Topic#2 and the corresponding recommendations are provided.

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|  | **Summary and recommendation** |
| **Moderator (RAN Vice-Chair, AT&T)** | **Moderator Recommendation:**  The following summarizes the company views on Issue 2.2-1. Companies shown in brackets are meant to indicate that the support of the option is predicated on additional constraints.  UPDATED: 15-09-2021 to also reflect company positions in input papers.  Option 1: Nokia, Qualcomm, Broadcom, Intel, Apple, Skyworks, MediaTek  Option 2: OPPO, Huawei, Vodafone, BT, [Nokia], [Qualcomm], ZTE, Telecom Italia, Telia, Orange, Telefónica, , Ericsson, MediaTek, Deutsche Telekom, Telenor, Bouygues Telecom  Option 3: ZTE, Sanechips  The company positions do not vary much from those already expressed in the input documents although some companies have indicated support for an alternative option predicated on additional constraints. Option 3 can be dropped from any further discussions. Option 2 seems feasible to some companies that prefer Option 1 if the same n96 hardware can be reused.  The moderator recommends to postpone any further discussion on the decision concerning whether to re-use the existing n96 band or defining a new band until further discussion on Issue 1.3-1 is held concerning the possible compromise on a solution that meets the previous RAN4 agreement that “the same hardware of UE as for n96 may be reused on the frequency range 5945MHz to 6425MHz no matter whether to define a new band or define new NS for the existing n96” while minimizing risk of future compliance issues. |

## Intermediate round

### Open issues

Postpone any further discussion on the decision concerning whether to re-use the existing n96 band or defining a new band until further discussion on Issue 1.3-1 is held concerning the possible compromise on a solution that meets the previous RAN4 agreement that “the same hardware of UE as for n96 may be reused on the frequency range 5945MHz to 6425MHz no matter whether to define a new band or define new NS for the existing n96” while minimizing risk of future compliance issues. Further discussion on this topic may be needed in the final round based on the outcome of Issue 1.3-1.

### Collection of company views

N/A.

### Summary and recommendation for further discussion

As there was no intermediate round discussion on this topic, the way forward on this topic for the final round discussion will be determined after the Wednesday GTW session.

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|  | **Summary and recommendation** |
| **Moderator (RAN Vice-Chair, AT&T)** | **Moderator Recommendation:**  Wednesday GTW Outcome: Based on the outcome of the GTW discussion and the selection of Option 1 for topic #1, there appears to be the need to define a new band as opposed to re-using NR band n96 since alternate UE receiver blocking requirements are being considered.  The moderator recommends that RAN provides guidance that RAN4 should define a new band to support the definition of alternate UE receiver blocking requirements. |

## Final round

### Open issues

Issue 2.4-1: The moderator recommends that RAN provides guidance that RAN4 should define a new band to support the definition of alternate UE receiver blocking requirements.

The following moderator way forward to consider for Issue 2.4-1 is as follows.

* **RAN4 is asked to define a new band n[xx] for lower 6GHz NR unlicensed operation for Europe (5945 MHz to 6425 MHz) in order to support the definition of alternate UE receiver blocking requirements.**

### Collection of company views

Issue 2.4-1: Can we endorse the moderator WF?

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| **Company** | **Comments** |
| Charter Communications Inc. | We agree with moderator’s suggestion but we will like to understand the implications in the recommendations from RAN4 to use a common architecture as n96 if this architecture does not meet the tighter receiver requirements. We will strongly object in RAN4 to any spec changes in n96 to reflect tighter requirements driven by other Regions. |
| Ericsson | The moderator way forward is ok.  But we suggest to capture this WF and also the “modified Option 1” endorsed at the GTW session (on 15th Sept), in the same document. This is to avoid any confusion regarding agreements on blocking. |
| Nokia | We agree that the definition of a new band for lower 6GHz NR unlicensed operation for Europe (5945 MHz to 6425 MHz) underlies the agreed way forward in section 1.5 above. Note that defining this new band is dependent on completion of the task agreed in section 1.5.  Ericsson’s suggestion on capturing this WF is helpful. |
| Qualcomm | Ok with the proposal (and happy to see compromise and progress, finally). We also agree with Nokia’s comment that the new band is dependent on agreement of UE blocking. |
| Skyworks | We are OK to create a new band under the understanding that it can be supported by UEs implementing n96. A similar note than n78 vs n77 will be useful. |
| Vodafone | We support the moderator WF. |
| Orange | Orange supports the introduction of the new band for Europe. |
| Intel | Given the agreement in Topic #1, we think original initial round Option 1 or Option 2 could both work and it depends more on how we introduce blocking requirements. Our first preference is Option 1 (i.e., reuse n96).  Same time, we can accept moderator proposal as a compromise. |
| BT | We agree with and support the moderator's proposal to define a new band for lower 6 GHz NR-U operation in Europe. |
| Apple | It is not clear how to jump from the endorsed way forward formulated during the GTW session on Wednesday to the conclusion that a new band is needed. Maybe a new band indeed will be defined, but the first step is to have a clear picture on what the blocking requirements are.  As a side remark, if a new band is defined then will it be only for the EU/CEPT countries or e.g. Region 1 countries? For instance, UK defines the corresponding frequency range as 5925-6425MHz, not 5945-6425MHz. And the same situation is for several other Region 1 countries. If a new band is defined as 5945-6425MHz and is specifically for EU/CEPT, but not other Region 1 countries, then will we support them with band n96?? It seems that we are rushing again with decisions without having checked the full picture. |

### Summary and recommendation for further discussion

In this section, the summary of comments on Topic#2 and the corresponding moderator recommendations are provided.

|  |  |
| --- | --- |
|  | **Summary and recommendation** |
| **Moderator (RAN Vice-Chair, AT&T)** | **Moderator Recommendation:**  Based on the company comments, the proposed moderator way forward for Issue 2.4-1 seems agreeable with the understanding that defining this new band is dependent on completion of the task agreed for Option 1 in section 1.5. One company expressed concern that we are rushing with decisions without understanding the full picture.  The moderator recommends that RAN endorse the following moderator way forward for “Topic #2: Band Definition for Lower 6GHz NR Unlicensed Operation for Europe” as follows.   * **RAN4 is asked to define a new band n[xx] for lower 6GHz NR unlicensed operation for Europe (5945 MHz to 6425 MHz) in order to support the definition of alternate UE receiver blocking requirements.**   + **Definition of this new band is dependent on completion of the task agreed in RP‑212589.** |

## Final comments

See section 3.

# Final Conclusions

**Moderator Recommendations:**

The moderator recommendations for the discussion [93e-26-6GHz-NR-U] can be found below.

1) For “Topic #1: Consideration of Aspects beyond ECC Decision (20)01”, the following option was endorsed in RP‑212589 [7].

* **Option 1: Task RAN4 with the evaluation of an achievable UE receiver blocking level based on existing n96 hardware. The blocking level is targeted to be as close as possible to -30 dBm.**

2) The moderator recommends that RAN endorse the following moderator way forward for “Topic #2: Band Definition for Lower 6GHz NR Unlicensed Operation for Europe” as follows.

* **RAN4 is asked to define a new band n[xx] for lower 6GHz NR unlicensed operation for Europe (5945 MHz to 6425 MHz) in order to support the definition of alternate UE receiver blocking requirements.**
  + **Definition of this new band is dependent on completion of the task agreed in RP‑212589.**

3) The Tdocs in [1] through [6] can be Noted.

# References

[1] RP-211823: On Introduction of lower 6GHz NR unlicensed operation for Europe; Nokia, Nokia Shanghai Bell

[2] RP-211906: Requirements for 6GHz NR-U band plan in Europe; BT plc, Telecom Italia, Telefonica, Vodafone, Deutsche Telekom, Orange, Telia Company, Telenor, Bouygues Telecom

[3] RP-212050: On progress for WI on introduction of lower 6GHz NR unlicensed operation for Europe; Qualcomm Incorporated

[4] RP-212125: On the introduction of lower 6GHz NR unlicensed operation for Europe; Ericsson

[5] RP-212300: Summary of the regulatory requirements for in- and out-of-band blocking in the 6GHz EU/CEPT band; Apple Inc.

[6] RP-212409: Discussion on band plan for Europe unlicensed 6GHz; ZTE, Sanechips

[7] RP-212589: Agreement regarding discussion [93e-26-6GHz-NR-U] Topic #1: Consideration of Aspects beyond ECC Decision (20)01; RAN vice-chair (AT&T)