**3GPP TSG-RAN WG4 Meeting # 100-e Rev of R4-2114708**

**Electronic Meeting, 16th – 27th Aug. 2021**

**Agenda item:** 8.1

**Source:** Moderator (Nokia)

**Title:** Email discussion summary for [100-e][108] NR\_6GHz\_unlic\_EU

**Document for:** Information

# Introduction

During RAN#90 a WID on introduction of lower 6GHz NR unlicensed operation for Europe (RP-202592) was agreed.

The objectives of the core part work item are:

* Depending on the details of the European regulatory requirements, determine whether they are best handled by relevant updates (if any) of band n96 or whether a new band is needed.
	+ If a new band is needed, determine the band plan for unlicensed operation in the range 5945-6425 MHz
* Define or update (if needed) system parameters such as channel bandwidths and channel arrangements
* Define or update (if needed) transmitter and receiver characteristics requirements for the UE
* Define or update (if needed) transmitter and receiver characteristics requirements for the BS

The objective of the performance part work item is:

* Define or update (if needed) conformance requirements for BS testing.

According to agreed work plan (R4-2101929) the target for this meeting is:

* 3GPP RAN4#100-e (Aug. 2021)
	+ Agree or endorse TR 38.849 and revised WID if any updates;
	+ Conclude discussions related to conformance requirements for BS testing
	+ Endorse BIG CRs for impacted performance TSs;

Some targets from last meetings is still not achieved as summarized in R4-2107637. As a result, they will also be included this meeting

* 3GPP RAN4#98-e (Jan. 2021)
	+ Agree if the frequency range for unlicensed operation in Europe are best introduced to the specification by relevant updates (if any) of band n96 or whether a new band is needed.
* 3GPP RAN4#98bis-e (Jan. 2021)
	+ Core requirements for UE and BS
* 3GPP RAN4#99-e (May 2021)
* Endorse TR 38.849 for presentation at RAN;
* Conclude discussions related to core requirements for UE and BS
* Endorse BIG CRs for impacted core TSs;
* Discussions on conformance requirements for BS testing

**From above it is clear that the WI is behind agreed work plan. As a result, the WI was also discussed at RAN#92 and will again be revisited at RAN#93.**

## Rapporteur contributions

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2113692 | Nokia | draft TR 38.849 v0.4.0 – the document is reserved and proposed for email approval to capture agreements during RAN4#100-e |

# Topic #1: Band plan

The contributions and proposals/observations related to the band plan for the introduction of lower 6GHz NR unlicensed operation for Europe is discussed under this topic and the contributions and relevant proposals/observations have been included in the Table 1.1.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2113693 | Nokia | **Proposal 1:** Send LS to RAN stating which of the two options RAN4 endorses.**Proposal 2:** Respond to RAN that RAN4 endorses option 1. |
| R4-2112342 | Apple, Facebook, Hewlett Packard Enterprise, Skyworks Solutions Inc., Microsoft | **Proposal:** Leverage existing band n96 to support license-exempt usage of the 6GHz band in EU/CEPT countries. |
| R4-2113934 | ZTE Corporation | Comparison of option 1 and option 2 |
| R4-2114219 | Qualcomm Incorporated | Comparison of option 1 and option 2 |
| R4-2114231 | Huawei | Support option 2  |
| R4-2114476 | Ericsson Eurolab GmbH  | **Proposal:** Define a new band n[xx] for unlicensed operation in Europe in 5945 - 6425 MHz range. |

## Open issues summary

### Sub-topic 1-1 - Bandplan

It is needed to come to an agreement if a new band should be defined or existing n96 can be updated. As agreed at RAN4#98 (R4-2103229), RAN4#98bis (R4-2105383) and RAN4#99 (R4-2108020), unlicensed operation in the range 5945-6425 MHz can be introduced by:

**Issue 1-1:** **New band or reuse n96**

* Proposals
	+ **Option 1:** Re-using already defined band n96, for the frequency range 5945 MHz to 6425 MHz
		- FFS if additional notes and/or clarifications are needed. Regional specific requirements to be included in relevant specifications.
	+ **Option 2:** Defining a new band n[xx], for the frequency range 5945 MHz to 6425 MHz
		- On top of specific requirements provided by ECC, the new band shall reuse requirements already defined for n96, where possible.

*Note that selecting any of the options above shall not in any way interfere with regulatory activities and timelines for the 6 GHz range. (As per RAN agreement)*

Since no resolutions to which option RAN4 shall follow the question was raised to RAN discussion during RAN#92. At RAN#92 the debate was also inconclusive and RAN4 was tasked to compare option 1 (Re-using already defined band n96) and option 2 (Defining a new band n[xx]) regarding requirements and signalling at RAN4#100 meeting and to bring a comparison table back to RAN#93e.

Provided the contributions at this meeting it seems there are no clear change towards support for either option hence it might be more beneficial to focus on providing an overview of the differences between the two options. A suggestion from the moderator is to provide a joint table like the one presented in R4-2114219 for both the UE and BS aspects. This overview table(s) can then be sent to RAN#93 via LS as response to the task for RAN#4 agreed at RAN#92. Further, collecting the companies supporting either options can be relayed to RAN.

* Recommended WF
	+ Collect information in the tables below in preparation of a LS to RAN#93 to be drafted during 2nd round of RAN4#100. Whether or not to send the LS shall be further discussed in 2nd round.

## Companies views’ collection for 1st round

### Open issues

**Issue 1-1a – Companies supporting either option 1 or option 2**

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| --- | --- | --- |
| **Supporting** | **Company** | **Comments** |
| **Option 1**Re-using already defined band n96 | Skyworks | With the latest EC decision there is no ambiguity that the regulator is not looking for any specific protection of the 6GHz unlicensed spectrum nor protecting any potential future use of the spectrum above. Band n96 can be reused with clarification on valid channels and use of NS for specific emissions requirements (note that this would not be avoided with a separate band anyhow). Furthermore, there are also regulation targeting only the lower part of the 6GHz spectrum and band reuse should be targeted as it has been the case for n46 and now n96 targeting to cover 6GHz spectrum, in the same way than WiFi that do not have the concept of two 6GHz bands anyhow. Arguments about OOBE or OOBB is only related to own 3GPP requirements but not about regulation and needs to be accommodated on the UE side regardless as there is no need for a different implementation than n96. |
| Qualcomm | We have a preference to reuse Band n96. We don’t see the benefit of defining a new band, at least from the UE perspective. From the basestation perspective, if there are local regulatory requirements that need to be met in addition to those that 3GPP defines, that is anyways the case and using Band n96 doesn’t prevent that from happening. |
| Intel | Our best preference is reusing Band n96 as the latest EU regulation does not specify any protected application/band. In principle, requirements discussion in RAN4 is based on regulation and we don’t see a necessity to introduce a new band and the same band will simplify UE implementation.Our suggestion during this meeting is focus on an LS preparation to Plenary which plenary tasked RAN4 to do so, rather than spending on the discussion between option 1 or option 2. |
| Nokia | Given the current available regulations it is technically feasible to reuse n96. Reusing existing bands, if possible, is our preference.  |
| Apple | Given the current regulations and further clarifications mentioned in the mandatory EC Decision, there is no obstacle from re-using band n96. Referring to the mandatory EC Decision, “*When introducing new applications into the 5 945-6 425 MHz frequency band or into adjacent frequency bands after the entry into force of this Decision, Member States shall not adopt technical and operational conditions applicable to any new application that unduly restrict the continued use of WAS/RLAN in the 5 945-6 425 MHz frequency band in accordance with this Decision*” |
|  |  |
|  |  |
| **Option 2**Defining a new band n[xx], | ZTE | We support option 2, since option 2 could keep fully aligned with Europe band plan request, and BS RF requirement could be defined based on that appropriately, otherwise BS RF requirement for n96 cannot be treated as minimum requirements for Europe 6GHz band or provide correct guidance on how to implement the specific BS for Europe 6GHzIn addition, comparison between option 1 and option 2 should not be spec impact, it should be whether this option could fulfill the region request, or pros and cons how to meet the regional request. spec impact for both options should be manageable. |
| OPPO | Slightly prefer Option 2. This is not new, and n77/n78 is a good example to define different bands due to different region requirements. The OOBE/OOBB are valid arguments. Besides, it is true that defining NS can accommodate regional requirements but sometimes this is in the price of sacrifice other regions in UE design even all the 3GPP requirements can be met. |
| BT plc | BT plc is in favour of option 2.This will enable us to provide the reliability of service our customers demand, whereas reusing band n96 results in devices being more susceptible to receiver blocking. European consumers have come to expect reliable broadband services using 5GHz Wi-Fi, they will not accept a poor service (due to the 6GHz NR-U receiver being blocked by high power transmissions above 6425 MHz). The risk is that poor customer perception damages the market for 6GHz NR-U in Europe.The ECC decision (20)01 just covers the range 5945 ~ 6425 MHz; however, the band n96 also covers the 6425 ~ 7125 MHz range. Re-using band n96 (in Europe) will either limit the maximum allowable transmit power in the licensed band (above 6425 MHz) or cause receive a blocking in the unlicensed band (below 6425MHz). Any decision by 3GPP to re-use band n96 would in effective be pre-empting the outcome of WRC 2023 and future European regulations.We believe 3GPP should introduce a new 6 GHz NR-U band based on the current European regulations, both the Radio Equipment Directive 2014/53/EU and ECC decision (20)01; rather than assume future regulations will restrict the in-band power limit of licensed systems (above 6425MHz) to protect unlicensed systems in the adjacent band (especially unlicensed systems without any receiver selectivity). |
| Orange | We support option 2, to define a new band n[xx], in order to facilitate the specification of performance requirements adapted to the European band plan and related requirements. |
| Ericsson | Option 2 is better from the point of view of the European regulatory conformance since the frequency range indicated by a dedicated "EU" follows European regulation and operation beyond this frequency range as allowed by n96 is illegal. This is particularly important for general authorization, which cannot be guaranteed for n96 usage in Europe to prevent unauthorized operation in 6425-7125 MHz.Regarding reuse of n96 with additional NS values, the concern is that NS values may be subject to user access restriction since the equipment may not always be professionally installed like for licensed operation. There is therefore some risk that NS values are not properly implemented/signaled. This is also an issue for n46 with its support of NS values applicable for different regions and its frequency range exceeding that allowed in many EU member states (similar issue for other regions), but this should be avoided for the 6 GHz range. Receiver requirements specified to allow implementations with a 5925-7125 MHz filter while requiring sufficient blocker rejection in the 6425-7125 MHz range. |
| Deutsche Telekom | We support option 2 to ensure that specifications are adapted to European network requirements and regulation. |
|  |  |

**Issue 1-1b – Comparison of UE specification (TS 38.101-1) impact for the two options**

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| --- | --- | --- | --- |
| **Affected clause** | **Requirement** | **Option 1****Re-using already defined band n96** | **Option 2****Defining a new band n[xx],** |
| 6.2F.3 | UE additional maximum output power reduction | Ericsson: two new NS values added but only applicable for the 5945-6425 MHz range. BS and UEs using the band capable of operating outside the allowed 5945-6425 MHz, which is illegal in EU (not a 3GPP issue).  | Ericsson: two NS values supported by the band, one indicating LPI requirements and another VLP requirements. No other NS values are relevant for operations within the EU.  |
| 7.6F |  | Ericsson: the standard in-band blocking requirement applies in 5925-7125 MHz and 60 MHz outside with a blocker level up to -44 dBm. | Ericsson: Out-of-band blocking requirements in accordance with the proposal in R4-2112823 (out-of-band blocker levels capped at -30 dBm above 6425 MHz and up to 7500 MHz)  |
| APPLE (BEGIN) |
| 5.2 | Operating bands | Existing band n96 is re-used | A new band [nXX] is added |
| 5.2A.1, 5.2A.2 | Intra-band CA and inter-band CA | Band combinations with n96 will become available for the EU/CEPT region | Potential duplications of band combinations.NOTE: As there are regional bands, not all the band combinations might be duplicated. |
| 5.3.5 | UE channel bandwidth per operating band | Existing channel bandwidth will be re-used, including being standardised 100MHz. | Duplications of the n96 entries, including being standardised 100MHz. |
| 5.4.2.3 | Channel raster | Existing channel rasters are re-used, including being standardised 100MHz (with a NOTE if needed limiting the range for the EU/CEPT region) | Duplications of the n96 channel rasters, including being standardised 100MHz, that correspond to the 5945-6425MHz range |
| 5.4.3.3 | Sync raster | Existing sync rasters are re-used (with a NOTE if needed limiting the range for the EU/CEPT region) | Duplications of the n96 sync rasters corresponding to the 5945-6425MHz range |
| 5.5A.1 | Configurations for intra-band contiguous CA | Band n96 intra-band CA configurations will be re-used, including being standardised NR-U UL CA. | Duplications of n96 intra-band CA configurations, including being standardised NR-U UL CA. |
| 5.5A.3.1 | Configurations for inter-band CA (two bands) | Band n96 intra-band CA configurations will be re-used.Also for EN-DC in TS 38.101-3.  | Duplications of n96 intra-band CA configurations.Also for EN-DC in TS 38.101-3. |
| 6.2F.1 | UE maximum output power | New NS value(s) corresponding to the EU/CEPT regulations | New NS value(s) corresponding to the EU/CEPT regulations |
| 7.3F | Reference sensitivity | Band n96 requirements are re-used.Including REFSENS exceptions for band combinations in 38.101-1 and 38.101-3 | Duplication of band n96 requirements.Including REFSENS exceptions for band combinations in 38.101-1 and 38.101-3 |
| APPLE (END) |
|  |  |  |  |
| BT plc ( BEGIN ) |
|  | receiver out of band blocking performance(above 6425MHz)  | equipment is more susceptible to out of band blocking (above 6425MHz ), compared to option 2 | a new 6GHz NR-U band for Europe will improve receiver performance, compared to a band n96 receiverit gives equipment vendors the ability to improve reliability of 6GHz NR-U services; by reducing susceptibility to out of band blocking ( from interference above 6425MHz ). this will improve the customer experience of 6GHz NR-Uproposed way forward: * write specifications to allow equipment vendors to **exceed** the ‘MINIMUM’ out of band blocking performance level (if they choose), and
* define ‘MINIMUM’ out of band blocking performance level, to permit terminal devices to re-use band n96 hardware
 |
| BT plc ( END ) |
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Skyworks: Papers have shown that both ways can accommodate the spectrum with similar information to be captured and a separate band not saving any NS. Since UE implementing n96 are targeted, the specification anyhow needs to capture the EU spectrum for n96. We do not think that amount of specification work/size is a mean to discriminate between the two options.

Ericsson: the main argument for a dedicated EU band is to facilitate compliance with regulations for general authorization. Moreover, use of a dedicated EU band prevents any use outside the allowed 5945-6425 MHz.

**Issue 1-1c – Comparison of BS specification (TS 38.104) impact for the two options**

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| **Affected clause** | **Requirement** | **Option 1****Re-using band n96** | **Option 2****Defining a new band n[xx]** |
| 5.2 | Operating band |  | Add one new band  |
| 5.4.2.3 | Channel raster entries for each operating band |  | Reusing from n96 |
| 5.4.3.3  | Synchronization raster entries for each operating band |  | Reusing from n96 |
| 6.6.1 | General | HW-As 5945-6425 is not a band it will require a special note to identify it as a sub-band of n96 and have the Foube value defined for this sub-band | Redefine Fobue requirements for new bandHW – is this necessary as a new band of 480MHz is covered by table 6.6.1-1 |
| 6.6.3.2 | ACLR |  | Reusing from n96 and just add the new band number |
| 6.6.5.2  | UEM | HW-From 6.6.4.1“Unless otherwise stated, the operating band unwanted emission (OBUE) limits in FR1 are defined from ΔfOBUE below the lowest frequency of each supported downlink *operating band* up to ΔfOBUE above the highest frequency of each supported downlink *operating band*. The values of ΔfOBUE are defined in table 6.6.1‑1 for the NR *operating bands*.”As 5945-6425 MHz is not defined as an operating band this text will have to be modified to suit. The term (and the concept) “each supported operating band” will need to be modified somehow to include the concept of regional sub-band which have restricted ranges different o the operating band.There tem operating band is used >40 times in this clause – each would need to be checked and adjusted to be suitable for regional sub-bandThere is a similar issue in 6.6.5 for spurious emissions where the requirements are specified from the edge of the operating band | Reusing from n96 and just add the new band number |
| 7.2.2  | REFSENS |  | Reusing from n96 and just add the new band number |
| 7.3.2  | Dynamic range |  | Reusing from n96 and just add the new band number |
| 7.4.1.2 | ACS requirement |  | Reusing from n96 and just add the new band number |
| 7.4.2 | In-band blocking | HW-The definition of Foube will have to be clarified for the regional sub-bandFrom 7.4.2.2: “The in-band blocking requirement shall apply from FUL,low - ΔfOOB to FUL,high + ΔfOOB, excluding the downlink frequency range of the FDD *operating band*.”F\_UL\_low and F\_UL\_high are defined:FUL,low The lowest frequency of the uplink *operating band*FUL,high The highest frequency of the uplink *operating band*These definitions need to be modified to describe the regional sub-band | Reusing from n96 and just add the new band number |
| 7.5.2 | Out-of-band blocking | HW-From 7.5.2: “The out-of-band blocking requirement apply from 1 MHz to FUL,low - ΔfOOB and from FUL,high + ΔfOOB up to 12750 MHz,”Again te concept of operating band needs to be changed to account for the regional sub-band | Redefine Foobb requirements for new band |
| 7.5.3 | Co-location minimum requirements | HW-Table 7.5.3-1: “NOTE 3: The requirement does not apply when the interfering signal falls within any of the supported uplink *operating band(s)* or in ΔfOOB immediately outside any of the supported uplink *operating band(s)*.”This type of exclusion would have to be modified to take into account the regional sub-band not the operating band as the exclusions would only exist for the allocated sub-band. | Reusing from n96 and just add the new band number |
| 7.6.2 | receiver spurious emissions | HW- In 7.6.1: “For RX-only *multi-band* *connectors*, the spurious emissions requirements are subject to exclusion zones in each supported *operating band*.”The concept of the regional sub-band would need to be added to these exclusionsTable 7.6.2-1: NOTE 3: This spurious frequency range applies only for *operating bands* for which the 5th harmonic of the upper frequency edge of the UL *operating band* is reaching beyond 12.75 GHz.This should apply to the upper edge of the regional sub-band not the operating band. | Reusing from n96 and just add the new band number |
| 7.7.2 | intermodulation requirement |  | Reusing from n96 and just add the new band number |
| 7.8.2 | ICS requirement |  | Reusing from n96 and just add the new band number |
|  |  |  |  |

HW- We have tried to highlight some of the issues where requirements are defined based on the operating band and how having a regional sub-band within an operating band will change both the requirements and the way the requirements are drafted. This will involve new concepts and definitions for many of the operating band based requirements.

### CRs/TPs comments collection

*N/A*

## 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**  |
| **Issue 1-1a** | There has not been much change in companies position and according to RAN agreement the final discission is to take place at RAN#93.*Candidate options:** **Option 1:** Re-using already defined band n96, for the frequency range 5945 MHz to 6425 MHz
	+ FFS if additional notes and/or clarifications are needed. Regional specific requirements to be included in relevant specifications.
* **Option 2:** Defining a new band n[xx], for the frequency range 5945 MHz to 6425 MHz
	+ On top of specific requirements provided by ECC, the new band shall reuse requirements already defined for n96, where possible.

*Note that selecting any of the options above shall not in any way interfere with regulatory activities and timelines for the 6 GHz range. (As per RAN agreement)**Recommendations for 2nd round:*Since there is still no clear preference for neither option and the final discission is to take place at RAN#93 it is not recommended to continue this discussion and instead focus on the LS related to Issue 1-1b instead. However, companies have expressed a wish to continue also the discussion in RAN4 during 2nd round.  |
| **Issue 1-1b** | There have been multiple inputs to the wording on how the comparison between the two options shall be captured. This discussion is still ongoing.*Recommendations for 2nd round:*Continue the discussion on the wording in the LS comparison tables.  |

**GTW Agreement (August 19):**

* 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.

## Discussion on 2nd round (if applicable)

### New band or reuse n96

It is needed to decide which of the two options listed below to introduce unlicensed operation in Europe shall be taken.

* Proposals
	+ **Option 1:** Re-using already defined band n96, for the frequency range 5945 MHz to 6425 MHz
		- FFS if additional notes and/or clarifications are needed. Regional specific requirements to be included in relevant specifications.
	+ **Option 2:** Defining a new band n[xx], for the frequency range 5945 MHz to 6425 MHz
		- On top of specific requirements provided by ECC, the new band shall reuse requirements already defined for n96, where possible.

*Note that selecting any of the options above shall not in any way interfere with regulatory activities and timelines for the 6 GHz range. (As per RAN agreement)*

**Collection of comments:**

|  |  |
| --- | --- |
| **Company** | **Comments**  |
| Company A | *Comment* |
|  |  |
|  |  |

### Comparison of UE specification (TS 38.101-1) impact for the two options

Since the discussion for what shall be captured in the comparison tables is focused on only a subset of the entries those discussed are listed below with the different versions. The intention is that we agree on a version already suggested or converge to one. Instead of keeping adding layers of track-change in the LS draft this seems to be the best way of discussing alternatives. When we have a stable version it can then be copied to the LS draft.

##### Table entries wording

**Table 1 – Comparison of UE specification** **(TS 38.101-1) impact for the two options**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Affected clause** | **Requirement** | **Suggested wording version** | **Option 1****Re-using already defined band n96** | **Option 2****Defining a new band n[xx],** |
| 5.2A.1, 5.2A.2 | Intra-band CA and inter-band CA | **A1** | No changes neededBand combinations with n96 will become available for the EU/CEPT region | Specification changesPotential duplicating and re-using of band combinations.NOTE: As there are regional bands, not all the band combinations might be duplicated. |
| **A2** | New specifications neededPotential re-use of band n96 combinations.NOTE: they are no US bands available in Europe | New specifications needed  |
| **A3** |  |  |
| **A4** |  |  |
| **A5** |  |  |
| 5.5A.3.1 | Configurations for inter-band CA (two bands) | **B1** | No changes neededBand n96 intra-band CA configurations will be re-used.Also for EN-DC in TS 38.101-3.  | Specification changesDuplicating and re-using of n96 intra-band CA configurations.Also for EN-DC in TS 38.101-3. |
| **B2** | New specifications neededPotential re-use of band n96 combinations.NOTE: they are no US bands available in Europe  | New specification needed |
| **B3** |  |  |
| **B4** |  |  |
| **B5** |  |  |
| 7.6F.2 | In-band blocking characteristics | **C1** | Band n96 in-band blocking requirement applies in 5925-7125  | Out-of-band blocking requirements in in 6424-7125 MHz. The Out-of-band blocking requirement for this new band will be specified such that it is possible to reuse hardware designed for n96, per RAN4 agreement. |
| **C2** | No changes neededExisting shared access bands (n46, n96) in-band blocking requirements will apply to the 5945-6425MHz range. | Specification changeRe-use existing shared access bands (n46, n96) in-band blocking requirements for a new band in 5945-6425MHz range. NOTE: A new band [nXX] will be added to Table 7.6F.2.1-2. |
| **C3** | Specification changesThe in-band blocking requirements will need to be changed to achieve the necessary blocking above 6425 MHz | Re-use of specificationRe-use existing shared access bands (n46, n96) in-band blocking requirements for a new band in 5945-6425MHz range. NOTE: A new band [nXX] will be added to Table 7.6F.2.1-2. |
| **C4** |  |  |
| **C5** |  |  |
| 7.6F.3 | Out-of-band Blocking characteristics | **D1** | Band n96 in-band blocking requirement applies in 5925-7125  | Out-of-band blocking requirements in in 6424-7125 MHz. The Out-of-band blocking requirement for this new band will be specified such that it is possible to reuse hardware designed for n96, per RAN4 agreement. |
|  |  | **D2** | No changes neededExisting shared access bands (n46, n96) out-of-band blocking requirements will apply to the range outside 5945-6425MHz. | Specification changesRe-use existing shared access bands (n46, n96) out-of-band blocking requirements for a new band outside 5945-6425MHz.  |
|  |  | **D3** | No changes neededExisting shared access bands (n46, n96) out-of-band blocking requirements will apply to the range outside 5925-7125MHz. | Re-use of n96 specificationRe-use of band n46, n96 out-of-band blocking requirements, apply above 6425MHz.  |
|  |  | **D4** |  |  |
|  |  | **D5** |  |  |

**Collection of supported alternatives:**

|  |  |
| --- | --- |
| **Company** | **Alternative(s) that can be supported**  |
| Company A | Ax - *comment*Bx - *comment*Cx - *comment* Dx - *comment* |
|  |  |
|  |  |

##### Wording for specification impact

Further there is a discussion about if we for option 2 shall use the wording:

* Option 1: Specification changes
* Option 2: Re-use of n96 specification

The understanding of the moderator is that in principal this is the same, just a matter of wording. For both options there needs to be added/changed something in the specification by copying what is already specified for n96. This is the meaning of “*Duplicating and re-using of the n96…”* following this “header” of the cell. A suggestion could be to use either:

* Option 3: Changes needed
* Option 4: Specification impact

Note that what is agreed here would be used to align the wording in the BS section.

**Collection of supported options:**

|  |  |
| --- | --- |
| **Company** | **Options(s) that can be supported**  |
| Company A | x - *comment* |
|  |  |
|  |  |

### Comparison of BS specification (TS 38.104) impact for the two options

##### Table entries wording

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Affected clause** | **Requirement** | **Suggested wording version** | **Option 1****Re-using already defined band n96** | **Option 2****Defining a new band n[xx],** |
| 6.6.5.2  | UEM | **A1** | Specification changesAdd a note to n96 restricting it for the range 5945-6425 MHz when operated in EU. | Specification changesDuplicating and re-using from n96 and add the new band number |
| **A2** | Specification changesModify the requirement for 5945-6425 so not is not based on operating band but on restricted frequency range (and potentially a modified Foube) when operating in EU. | Specification changesDuplicating and re-using from n96 and add the new band number |
| **A3** | Potential note clarifying what is the supported frequency range (and potentially a modified Fobue) for n96 in EU. | Specification changesDuplicating and re-using from n96 and add the new band number |
| **A4** |  |  |
| **A5** |  |  |
|  |  |  |  |  |

**Collection of supported alternatives:**

|  |  |
| --- | --- |
| **Company** | **Alternative(s) that can be supported**  |
| Company A | Ax - *comment*Bx - *comment*Cx - *comment* Dx - *comment* |
|  |  |
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# Topic #2: LPI and VLP deployments

Two types of devices, LPI and VLP, are defined by ECC as described in detail in TR 37.890. These two types of devices can be deployed differently. As agreed at RAN4#98 in R4-2103229 LPI deployment shall be supported by 3GPP specification. In RAN4#99 in R4-2108020 it was agreed that VLP can be included in specification given the available regulations. However, Further discussion is needed in future meeting about the possible regulation issues.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2114375 | Apple | **Proposal 1:** We ask RAN WG4 to consider a scenario when an outdoor UE is connected to the indoor LPI base station in order to ensure that no regulatory requirements are violated in this case.**Proposal 2:** We ask RAN WG4 to consider further NW and UE controlled approaches to ensure that a UE UL transmission is compliant to the local regulations. |

## Open issues summary

It is suggested that an issue with an outdoor VLP UE connects to an indoor LPI base station exists. Solutions to this is suggested below.

**Issue 2-1: Outdoor UEs connecting to the indoor LPI base stations:**

* Proposals
	+ **Option 1:** No solution is needed to meet the regulatory requirements.
	+ **Option 2:** Consider NW and UE controlled approaches to ensure that a UE (configured with LPI) UL transmission is compliant to the local regulations when it is outdoors

## Companies views’ collection for 1st round

### Open issues

Issue 2-1

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| **Company** | **Comments** |
| Skyworks | An outdoor UE connecting to an indoor BS is a real scenario that is even considered in some regulation by allowing such transmissions for Wi-Fi if the access point beacon can be received. RAN4 shall resolve how such a UE can fall back to VLP mode from LPI mode when outdoors. In our view LPI and VLP are not necessarily different type of UEs but rather which mode the UE operates in indoor/outdoor scenarios. Such fall back mechanism should target that the UE fully benefits from UL capability according to the LPI/VLP regulation. |
| OPPO | Option 2. The problem is understood and efforts are appreciated. However, in our understanding the NW controlled approaches most likely are NW controls of UE max Tx power, this probably could be handled in RAN2 or NW scheduling since the requirements are coming from regulation not RAN4. Regarding the UE controlled approaches, it is not quite clear how UE can decide it is within room or outside room and even UE can do so there probably will no conformance test for it. Then the meaning of RAN4 requirements are lost. If RAN4 starts with this effort, we encourage companies thinks about how this will be tested finally. |
| Ericsson | Option 1. It is recognised by regulators that indoor restrictions are difficult to enforce. Therefore, coexistence studies with victim services usually account for accidental outdoor use (a percentage of aggressors is outdoors). The ECC Reports 302 and 316 consider a distribution of indoor/outdoor use, 2% outdoors and 98% indoors for the power distribution of devices used in the studies.There are no essential requirements in the draft 6 GHz harmonised standard on any mechanism for facilitating control of LPI indoor use (notwithstanding the indoor requirement in the EC Decision).  |
| Qualcomm | Option 1. Agree with the comment from Ericsson. Our understanding is that CEPT did consider accidental usage in its studies and concluded that it is not a problem. |
| Intel | Option 1. We also have the same understanding with Ericsson and Qualcomm.  |
| MediaTek  | Option 2. We can understand the problem and see the difficulty about how to find solutions. |
| Nokia | Option 1 – As stated before we believe this issue have been considered during the development of the available regulations. |

## Summary for 1st round

**GTW Agreement (August 19):**

**Agreement:** For outdoor UEs connecting to the indoor LPI base stations, no solution is needed to meet the regulatory requirements in Rel-17.

## Discussion on 2nd round (if applicable)

None, topic closed at GTW

# Topic #3: UE related

Discussions related to how the introduction of unlicensed operation in the range 5945-6425 MHz for the UE specification shall be treated.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2112823 | Ericsson | **Proposal 1:** for an EU band with the range 5945-6425 MHz, the OOBB requirements applies with a power level for Range 3 modified to -20 dBm for FInterferer > 4200 MHz except for the range FDL\_high + MAX(200 MHz,3\*CBW) < FInterferer ≤ [7500] MHz in which the said level shall be modified to -30 dBm. **Proposal 2:** for intra-band CA in an EU band with the range 5945-6425 MHz, the OOBB requirements applies with a power level for Range 3 modified to -20 dBm for FInterferer > 4200 MHz except for the range FDL\_high + MAX(200 MHz,3\*BWChannel\_CA) < FInterferer ≤ [7500] MHz in which the said level shall be modified to -30 dBm. **Proposal 3:** the remaining receiver requirements for an EU band with the range 5945-6425 MHz should be aligned with those of band n96. |
| R4-2113694 | Nokia | **Proposal 1:** Introduce channels according to the NR-ARFCN and GSCN listed in suggested the TPs **Proposal 2:** NSs corresponding to deployments defined in EN 303 687 shall be defined in 38.101-1. |
| R4-2114220 | Qualcomm Incorporated | A-MPR for NR-U VLP in 6 GHz for Europe |

## Open issues summary

### Sub-topic 3-1 – UE Out-of-band blocking

While the proposals in R4-2112823 are related to the discussions under topic 1 the question about UE out-of-band blocking can be discussed in parallel.

**Issue 3-1: Out-of-band blocking**

* Proposals
	+ **Option 1:** Out-of-band blocking for 6GHz NR-U operation in EU shall be defined according to the proposals in R4-2112823. Whether or not this requirement will be related to a new band or to a sub-set of n96 will be discussed under topic 1.
	+ **Option 2:** Out-of-band blocking for 6GHz NR-U operation in EU shall not be different than those defined for n96. Whether or not this requirement will be related to a new band or to a sub-set of n96 will be discussed under topic 1.
	+ **Option 3:** Out-of-band blocking for 6GHz NR-U operation in EU shall be further discussed.
* Recommended WF
	+ Agree that in-band blocking for 6 GHz NR-U operation shall be the same as defined for n96 and further discuss the options listed above for out-of-band blocking.

### Sub-topic 3-2 – A-MPR for VLP

MPR studies have been conducted based on the agreed assumptions at RAN4#98 in R4-2103229. Proposed values have been presented at previous and this meeting.

**Issue 3-2:** **A-MPR for VLP deployments**

* Proposals
	+ **Option 1:** Adopt the proposed values from R4-2114220
	+ **Option 2:** A-MPR values for VLP shall remain FSS
* Recommended WF
	+ Option 1 – The topic was also discussed at RAN4#99 with initial values presented. No others came back this meeting with further proposals. The values can be captured by TP to TR 38.849.

## Companies views’ collection for 1st round

### Open issues

Sub-topic 3-1 - Out-of-band blocking

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| **Company** | **Comments** |
| Ericsson | We support Option 1 that accommodates implementation of the EU band 5945-6425 MHz with a 5925-7125 MHz RF filter while requiring sufficient blocker rejection in the 6425-7125 MHz range and beyond.  |
| Qualcomm | Option 2, unless there is a regulatory requirement that demands something different. |
| Nokia | Option 3 – Our understanding is that there are not yet any regulatory requirement for this frequency range in EU. Hence, we think more discussion is needed to understand the motivation for this requirement in a shared spectrum band without regulatory mandate. |
| Apple | Option 2. Why do we need to discuss something if there are no regulatory requirements? Of course, we are open for further discussions, but Option 2 is a baseline.  |
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Sub-topic 3-2 - MPR values

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| **Company** | **Comments** |
| Skyworks | Provided that the mechanism by which a UE falls back to VLP mode when outdoor is understood and specified, the A-MPR (not MPR) values seem OK and given the small difference between Full and partial allocations, optimization for partial sub-band wideband operation may not be needed other than possibly identifying the Edge channel cases (Note 2) that could benefit from the Note 3 levels. That could be handled at a later stage. |
| Qualcomm | Option 1 |
| Nokia | We are fine to capture the proposed A-MPR values in the TR (WF). If there are to be included in the specification could dependent on Topic 2 be further discussed. |
| Apple | The mandatory EC Decision (released in June 2021) clearly states that VLP is only for peer-to-peer communication. And the draft version of EN 303 687 does not define VLP access points either. Since Rel-16 NR-U does not support peer-to-peer communication, and the sidelink over unlicensed is not possible either, we do not even need to capture VLP A-MPR values because the core functionality does not exist.  |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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|  | **Status summary**  |
| **Sub-topic#** 3-1  | It is first meeting it has been proposed to introduce out-of-band blocking as this is not currently mandated by regulations.*Candidate options:** **Option 1:** Out-of-band blocking for 6GHz NR-U operation in EU shall be defined according to the proposals in R4-2112823. Whether or not this requirement will be related to a new band or to a sub-set of n96 will be discussed under topic 1.
* **Option 2:** Out-of-band blocking for 6GHz NR-U operation in EU shall not be different than those defined for n96. Whether or not this requirement will be related to a new band or to a sub-set of n96 will be discussed under topic 1

*Recommendations for 2nd round:*It seems more discussion is needed on this before it can be decided to either include or not out-of-band blocking for 6 GHz NR-U operation |
| **Sub-topic#** 3-2  | Even though VLP MPR values have been discussed in the last meetings and we this meeting have agreement (Topic 2) that meets some of the concerns expressed it seems some additional discussion is still needed on whether or not to capture these in specification. However, the values themselves seems to be agreeable why it is proposed to capture them in the TR 38.849.*Candidate options:** **Option 1:** Adopt the proposed values from R4-2114220.
* **Option 2:** A-MPR values for VLP shall remain FSS

*Recommendations for 2nd round:*It is recommended that the values from R4-2114220 are captured in the TR 38.849. Then it can be further discussed how VLP can be introduced to the TS. |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

### Open issues

#### Sub-topic 3-1 - Out-of-band blocking

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| **Company** | **Comments** |
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#### A-MPR for VLP

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| **Company** | **Comments** |
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# Topic #4: BS related

Discussions related to how the introduction of unlicensed operation in the range 5945-6425 MHz for the BS specification shall be treated.

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2113935 | ZTE Corporation | **Proposal 1:** the legacy ΔfOBUE and ΔfOOBB requirements for licensed band should be applied for Europe unlicensed 6GHz band instead of reusing requirements for band n96; |
| R4-2113936 | ZTE Corporation | draftCR introducing 6 GHz band for EU as n100 |
| R4-2113695 | Nokia | **Proposal 1:** Introduce channels according to the NR-ARFCN and GSCN listed in TPs that are included. |

## Open issues summary

The discussion on if a new band should be defined or n96 reused is treated under Topic 1 why the discussion under this topic is focused only on other aspects.

### Sub-topic 4-1 - ΔfOBUE and ΔfOOB

As the captured in WF at RAN4#98bis in R4-2105383 if ΔfOBUE/ ΔfOOBB should follow n46 or n96 is FFS.

**Issue 4-1: ΔfOBUE and ΔfOOB**

* Proposals
	+ **Option 1:** ΔfOBUE/ ΔfOOBB should follow n46 (legacy ΔfOBUE and ΔfOOBB)
	+ **Option 2:** ΔfOBUE/ ΔfOOBB should follow n96
	+ **Option 3:** ΔfOBUE/ ΔfOOBB should be further discussed
* Recommended WF
	+ Option 3 – given only two compagnies have contributed with different opinion in previous meetings.

## Companies views’ collection for 1st round

### Open issues

Sub-topic 4-1 - ΔfOBUE and ΔfOOB

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| **Company** | **Comments** |
| ZTE | We support the option 1, otherwise 1.2GHz front-end filter design is not suitable for Europe unlicensed 6GHz; |
| Nokia | Option 3 – This is related to topic 1.  |
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### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2113936 | Nokia – It is premature to agree/endorse this CR |
| Company B |
|  |
| YYY | Company A |
| Company B |
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## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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|  | **Status summary**  |
| **Issue 4-1** | *Recommendations for 2nd round:*Same discussion as last meetings. This can not be resolved before Topic 1 (band plan) is solved. No further discussion is recommended. |

## Discussion on 2nd round (if applicable)

None – we will have to come back to this when Topic 1 (band plan) is closed.

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| R4-2114752 LS on lower 6GHz NR unlicensed operation for Europe | Nokia | To: RAN |
| TP to TR 38.849 on A-MPR for VLP | Qualcomm |  |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

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| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-2113692 | draft TR 38.849 v0.4.0 | Nokia, Nokia Shanghai Bell | To be Email approved |  |
| R4-2113693 | On system parameters for the lower 6GHz NR unlicensed operation | Nokia, Nokia Shanghai Bell | To be Noted |  |
| R4-2112342 | Band plan for lower 6GHz NR unlicensed operation in EU/CEPT | Apple, Facebook, Hewlett Packard Enterprise, Skyworks Solutions Inc., Microsoft | To be Noted |  |
| R4-2113934 | Comparison of reusing n96 and defining a new band | ZTE Corporation | To be Noted |  |
| R4-2114219 | NR-U 6 GHz band for Europe from a UE perspective | Qualcomm Incorporated | To be Noted |  |
| R4-2114231 | 6GHz unliscenced band numbering | Huawei | To be Noted |  |
| R4-2114476 | Band plan for unlicensed operation in 6GHz in Europe | Ericsson GmbH, Eurolab | To be Noted |  |
| R4-2112823 | RF requirements for a UE supporting a dedicated EU band implemented with a 5925-7125 MHz RF filter | Ericsson | To be Noted |  |
| R4-2113694 | On UE RF aspects for the lower 6GHz NR unlicensed operation | Nokia, Nokia Shanghai Bell | To be Noted |  |
| R4-2113695 | On BS RF aspects for the lower 6GHz NR unlicensed operation | Nokia, Nokia Shanghai Bell | To be Noted |  |
| R4-2113935 | Discussion on BS RF requirements for Europe unlicensed 6GHz | ZTE Corporation | To be Noted |  |
| R4-2113936 | draft CR for introduction of Europe unlicensed 6GHz. | ZTE Corporation | To be Not Pursued |  |
| R4-2114375 | On LPI and VLP modes for mixed indoor/outdoor scenarios | Apple | To be Noted |  |
| R4-2114220 | A-MPR for NR-U VLP in 6 GHz for Europe | Qualcomm Incorporated | To be Noted |  |

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** |
| R4-2114752  | LS on lower 6GHz NR unlicensed operation for Europe | Nokia |  |  |
|  | TP to TR 38.849 on A-MPR for VLP | Qualcomm |  |  |
| 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 |  |
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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

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|  |  |  |
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Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)