

**[98-bis-e][137] NR_ext_to_71GHz_Part_1_NWM - Version 0.0.4
RAN4**

3GPP TSG-RAN WG4 Meeting # 98-bis-e

R4-2105474

Electronic Meeting, 12th – 20th April, 2021

Agenda item: 8.12.1, 8.12.2, 8.12.3

Source: Moderator (Intel)

Title: Email discussion summary for
[98-bis-e][137]NR_ext_to_71GHz_Part1_NWM

Document for: Information

1 Introduction

Briefly introduce background, the scope of this email discussion (e.g. list of treated agenda items) and provide some guidelines for email discussion if necessary.

List of candidate target of email discussion for 1st round and 2nd round

1st round: Collecting initial views on work plan (8.12.1), band plan and regulatory (8.12.2) and system parameters (8.12.3)

2nd round: TBA

2 Topic #1: General and work plan

Main technical topic overview. The structure can be done based on sub-agenda basis.

2.1 Companies' contributions summary

Table 1:

T-doc number	Company	Proposals / Observations
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R4-2106464	Intel	<p>Proposal #1: RAN4 to agree on the RF and RRM core parts of the workplan as presented in the above in this contribution.</p> <p>Observation #1: To specify further detail operation scenario, i.e., stand-alone, CA, or DC, it is necessary to identify whether a band is a licensed or unlicensed.</p>
R4-2106665	Nokia	<p>Proposal 1: RAN4 to progress the core requirement work considering unlicensed operation until licensed regulatory rules are available.</p> <p>Proposal 2: RAN4 shall aim to define the targeted UE form factors to help power class definition.</p> <p>Proposal 3: Unfinished UE testability aspects shall not impact setting UE core requirements and completing the NR > 52.6 GHz WI.</p>

R4-2104895	Apple	<p>Observation 1: Preliminary RF core agreements on regulatory, RF performance, and CA aspects related to NR operation in the 52.6 – 71 GHz frequency range are needed in order to define the scope of test methodology development for this frequency range.</p> <p>Observation 2: The task of defining the test methodology for the 52.6 – 71 GHz frequency range can leverage existing RAN4 experience with FR2 test methodology extension from 43.5 to 48.2 GHz as well as enhancements related to low PSD test cases, polarization mismatch, and CA aspects.</p> <p>Proposal 1: RAN4 should recommend to RAN that a study into topics related to 60 GHz testability is needed</p> <p>Proposal 2: RAN4 should recommend to RAN to include NR 52.6-71GHz UE OTA test methods objectives in the scope of Rel-17 NR FR2 Test Methods Enhancements SI (FS_FR2_enhTestMethods).</p> <p>Proposal 3: RAN4 should further recommend to RAN that the potential study scope captured in the RAN #90 discussion on OTA topics in RP-210881 is stable and sufficient to implement Proposal 2.</p>
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2.2 Open issues summary

Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies' contributions.

2.2.1 Work plan

Sub-topic description:

Open issues and candidate options before e-meeting:

Issue 1-1-1: Work plan

Proposals

Agree on R4-2106464 (Moderator)

Recommended WF

Encourage companies to share their views on the work plan.

Feedback Form 1: 1st round comment on issue 1-1-1 (work plan)

Item	Company	Comments
1	Charter Communications, Inc	We agree with moderators work plan
2	Beijing Xiaomi Mobile Software	Thanks Moderator for preparing the work plan. For the reply LS to RAN1 on beam switching, if we reply them on May meeting then RAN1 can receive them until August meeting which might not be efficient, we prefer move it to this meeting to give a try on replying the LS.
3	Charter Communications, Inc	We agree with moderators plan
4	Qualcomm Austria RFFE GmbH	We are fine with the proposed work plan

Item	Company	Comments
5	vivo Communi- cation Technol- ogy	Vivo: For the workplan, we have some comments: <ul style="list-style-type: none"> • For now, we can only agree on the work plan for RF part; for the RRM part, we should leave the decision to RRM colleagues. • In this work plan for RF part, it was only mentioned that ‘Response to RAN1 on beam switching time LS’, and how about the response to RAN1 on channel bandwidths and channelization issues? • In the workplan for RAN4#99-e, the term ‘Propose band combinations for’ is not finished.
6	LG Elec- tronics Finland	We are OK with the proposal from moderator.
7	ZTE Cor- poration	ZTE: we are also fine with the proposal from moderator
8	Ericsson GmbH, Eurolab	For the R4-2106464 to use as a basis for agreement there is only a plan to agree and send reply to RAN1 for beam switching, where is the channelization one? for the LS relating to beam switching time one approach would be split the response: timing and beam switching
9	Sony Cor- poration	We are okay with the proposal from the moderator
10	Huawei Tech- nologies Sweden AB	We shall focus on the RF part, as the RRM is supposed to be reviewed separately by RRM session (while there was no TU for RRM for this meeting). In general the workload looks good, but we have some more detailed comments to the entried for RAN4#98bis-e and expected agreements from this meeting: as for the first meeting, the expected list of agreements may be a little over-optimistic, e.g. for the conclusions on the RF requirements. Therefore, the unfinished leftovers are expected to be postponed till the following meeting (maybe this is considered as obvious). The TS 38.141 shall be corrected to TS 38.141-2 (OTA conformance testing). For May meeting, there is some incomplete text. We suggest to revise the workplan to address the above aspects.
11	Apple AB	Apple: we are OK with the proposed plan in general. RRM related plan can be subjected to further discussion in RRM session in RAN4#99e.
12	AT&T GNS Belgium SPRL	We are OK with the defined work plan and agree that further discussion on RRM aspects can be taken up by RRM session.
13	Nokia Denmark	Referring to the list of BS and UE RF requirements that will be impacted compared to Rel-16 FR2 - whether some requirements will be impacted would depend on RAN1 design and decision on supported numerologies, so it would be difficult to agree on the exact list in this meeting. However, we are okay with the proposed workplan provided this can be revisited.

Issue 1-1-2: Target UE form factor

Proposals

Option 1: RAN4 shall aim to define a targeted UE form factor to help power class definition (Nokia)

Option 2: No need to define a targeted UE form factor

Recommended WF

Share and comment on the proposal during 1st round discussion

Feedback Form 2: 1st round comments on the issue 1-1-2 (target UE form factor)

Item	Company	Comments
1	Charter Communications, Inc	We do not have a strong opinion but are leaning to Option 2: No need to define a targeted UE form factor
2	Qualcomm Austria RFFE GmbH	We need to define power classes and performance requirements based on antenna dimensions. I don't think we have to specifically define form factor but it is part of the assumptions to get to the specs.
3	Beijing Xiaomi Mobile Software	Consider the FR2 requirements, UE power calss are decided by UE type which is similar to form factors. We believe the UE type and UE power class are to be defined.
4	MediaTek Inc.	We support Option 1. For Tx/Rx performance evaluation for requirement discussion, form factor is also one of important factors. The framework was applied for current FR2 requirement discussion.
5	LG Electronics Finland	We think that definition of the form factor is important, but we are also OK with proposal from Qualcomm where form factor is indirectly indicated through antenna dimensions, which can then be defined in multiple ways, volume, area, number of radiators etc.
6	ZTE Corporation	we support option 1 to have clear UE form factor since there would be lots of application scenarios in this band.
7	Sony Corporation	We have no strong opinion, but If we aim to adopt a similar method as FR2, then UE form factor need to be defined. Otherwise, the proposal from Qualcomm also reasonable.

Item	Company	Comments
8	Huawei Technologies Sweden AB	Clearly form factor aspects will have to be considered. The "targeted" form factor can be seen as limitation of the implementations - probably we shall rather talk about (list) of prioritized form factors to consider in WI. On how to achieve this (e.g. directly define FF, or indirectly via antenna array size, etc.) is preferred to be further discussed. FR2 approach is good starting point.
9	Guangdong OPPO Mobile Telecom.	Not clear of the necessity, in FR2 the UE form factor was assumed by each power class, but not limited to one band. When define requirements the form factor anyway will be considered.
10	Apple AB	Don't see the need to limit UE form factor. The power class definitions are being discussed in Part2. Nevertheless, it is not clear why a UE form factor would matter.
11	AT&T GNS Belgium SPRL	Option 2. We can agree to use certain assumptions to derive performance requirements but actual implementations should not be limited to certain form factors.
12	Nokia Denmark	Option 1 - The objective of proposing to agree a targeted UE form factor is to narrow down the power classes in scope as well as antenna dimensions etc. This can be reworded other than the original proposal, but we do think this discussion is important.

2.2.2 Testability

Sub-topic description

Open issues and candidate options before e-meeting:

Issue 1-2-1: Unfinished UE testability

Proposals

Option 1: Unfinished UE testability aspects shall not impact setting UE core requirements and completing the NR > 52.6 GHz WI

Option 2: others

Recommended WF

Share and comment on the proposal during 1st round discussion

**Feedback Form 3: 1st round comments on the issue
1-2-1 (unfinished UE testability)**

Item	Com- pany	Comments
1	Qual- comm Austria RFEE GmbH	We should be able to continue the spec development. I expect the testability and how to handle that will continue in the next plenary.
2	Beijing Xiaomi Mobile Software	Agree with option 1.
3	vivo Commu- nication Technol- ogy	Support option 1. This is also related to issue 1-2-2, given the UE testability work will be potentially discussed in a separate testability SI, therefore the UE testability issue will not impact on completing the core requirement WI.
4	RO- HDE & SCHWARZ	It is important that during requirements definition the testability of the requirements is considered. For the current FR2 requirements several requirements were later relaxed by RAN5 to be testable. We should try and avoid this for the new set of requirements for this frequency range, otherwise it may take a long time to actually get a RAN5 specification.
5	Sony Cor- poration	we support option 1
6	Huawei Tech- nologies Sweden AB	We are not sure if there is need for such formal agreement on this, but option 1 is reasonable (especially that testability will further continue to be discussed after core requirements definition).
7	Guang- dong OPPO Mobile Telecom.	Option 1 is ok and is the approach used in Rel-15, we see no problem.

Item	Company	Comments
8	Apple AB	<p>When we look back at the introduction of the mmWave frequency range to 3GPP specifications, we had a core work item to introduce requirements and a testability study item in parallel to handle the complex interplay of test methodology feasibility and core requirement development. As a general rule, such an arrangement allowed the core discussion to focus on setting UE core requirements and the testability discussion to focus on test feasibility. However, we also had examples of the impact of test limitations on core requirements (e.g. the nominal temperature condition applicability of spherical coverage requirements, DL signal strength limitations on max input level, single AoA assumption for blocking scenarios, limitation of demodulating a UL polarization, and all of the low UL power test cases). We have resolved each limitation differently, but the effort was performed jointly between the work item and the study item.</p> <p>In the case of the NR > 52.6 GHz WI, we do not currently have a parallel effort to study test methodology. If we did, then Option 1 is a reasonable proposal. However, given the current lack of agreement on including 60 GHz testability scope into the FR2 test methodology enhancement study item, it is difficult for us to agree with Option 1.</p> <p>The proposed WF can be</p> <p>It is difficult to conclude how UE testability aspects will impact setting UE core requirements now. Until RAN #92 RAN4 should strive to make progress on UE RF core requirements as much as we can. RAN will have a discussion about 60 GHz testability again. After that we can further discuss how to handle this issue.</p>
9	Nokia Denmark	Option 1 - Core req. development shall continue regardless of parallel discussion on testability.

Issue 1-2-2: Testability

Proposals

Option 1: To include NR 52.6 – 71 GHz UE OTA test methods objectives in the scope of Rel-17 NR FR2 Test Methods Enhancements SI (FS_FR2_enhTestMethods)

Option 2: others

Recommended WF

Share and comment on the proposal during 1st round discussion

**Feedback Form 4: 1st round comments on the issue
1-2-2 (Testability)**

Item	Com-pany	Comments
1	Beijing Xiaomi Mobile Software	This issue has been discussed in RAN#91-e and we believe it is RAN level discussion.
2	MediaTek Inc.	We support Option-2. Although we don't have strong view on this specific proposal, it shall belong RAN plenary discussion scope.
3	vivo Commu- nication Technol- ogy	Support Option1. This topic has been discussed in March RAN plenary meet- ing, further study the testability issue of the test system with extended capabil- ity up to 71GHz in the existing FR2 test methods enhancement SI is an efficient approach, clear recommendation from RAN4 to RAN plenary on how to treat 60GHz UE testability issue is needed.
4	RO- HDE & SCHWARZ	We already shared our view during the plenary and support Option 1. Having the testability discussion in parallell with the requirement definition is impor- tant to ensure the requirements are actually testable.
5	Sony Cor- poration	It is also our understanding that this needs to be discussed in a RANP
6	Qual- comm Austria RFFE GmbH	Agree with others this is RAN plenary discussion
7	Huawei Tech- nologies Sweden AB	This is RAN level discussion. We suggest not to double it in RAN4.
8	Guang- dong OPPO Mobile Telecom.	No strong view, in last RAN meeting there are proposals to set up one specific FR2 OTA SI to include all the testing related issues in each WI. We are open to further discuss where this is to be handled for 52.6-71GHz.
9	Apple AB	Support option 1 as proposed in R4-2104895. We believe that a RAN4 recom- mendation to RAN Plenary can help to smoothly establish this study scope.
10	AT&T GNS Belgium SPRL	If RAN4 intends to provide a recommendation to RAN, we would prefer option 1 to ensure that testability aspects for the new range are discussed in a timely manner.
11	Nokia Denmark	In principal we are fine to include a 60GHz band to the OTA test methods. However, further discussion should take place.

2.3 Summary of 1st round

Issue 1-1-1 (work plan)

It seems the proposed work plan can be agreeable in general. The following is suggested for approval in 2nd round discussion

- We only agree on RF work plan in this meeting. RRM work plan will be discussed in the May meeting.
- Revise RF work plan to send two reply LS (beam switching and channel BW) to RAN1 in this meeting.
- Fixing typos

Issue 1-1-2 (Target UE form-factor)

The following is the status:

- Option 1: RAN4 shall aim to define a target UE form factor to help power class definition (Nokia, MTK, ZTE, [LGE], [Sony])
- Option 2 : Power class definition will include this and no need to define (Qualcomm, Xiaomi, OPPO, Apple, AT&T, [LGE], [Sony])

The moderator think form factor would be important for power class definition. However, separate discussion would make another layer of discussions and eventually this will be also considered as parameters of power class definition. Therefore, the moderator suggest to agree on option 2 as the following modification:

Modified Option 2: Power class definition shall consider target UE form factor aspect.

During the 2nd round discussion, interested companies are encouraged to share their view on the modified option 2 suggested by the moderator.

Issue 1-2-1 (Unfinished UE testability)

Majority view is supporting option 1 (Unfinished UE testability aspects shall not impact setting UE core requirements and completing the NR > 52.6 GHz WI)

Moderator suggest to agree on the option 1.

Issue 1-2-2 (Testability)

There are approximately half and half to support the option 1 (include UE OTA in Rel-17 WI) and option 2 (plenary discussion). While this has been discussed in the plenary, the moderator understands this is RAN4 responsibility. Can the proponent of the option 2 provide further justification?

2.4 Discussion on 2nd round (if applicable)

Issue 1-1-2 (Target UE form-factor)

Feedback Form 5: 2nd round comment on the Issue 1-1-2 (Target UE form-factor)

Item	Company	Comments
1	MediaTek Inc.	We are fine on "Power class definition shall consider target UE form factor aspect.". We think each power class shall be specified based on the assumption of UE type, and then, both note and UE assumption table shall be added in corresponding TS.
2	MediaTek Inc.	We are fine with "Agree on Power class definition shall consider target UE form factor aspect.". We further think each power class shall be specified based on the assumption of UE type, and then, both note and UE assumption table shall be added in corresponding TS.
3	Beijing Xiaomi Mobile Software	We are fine with Moderator's modified option 2.
4	Qualcomm Austria RFFE GmbH	we are ok with Modified Option 2: Power class definition shall consider target UE form factor aspect.
5	Apple AB	Companies can provide their inputs on the form factor during power class discussion.
6	Sony Corporation	We are fine with the modified option 2
7	Huawei Technologies Sweden AB	The approach in 38.101-2 should be taken as the baseline. In other words, there seems to be no need to define the target UE form factor for this WI. During the discussion on the power class, companies can provide clarifications on the assumed form factor.
8	AT&T GNS Belgium SPRL	We would prefer the following for the modified option 2 by removing the word "target". "Power class definition shall consider UE form factor aspect."
9	Charter Communications, Inc	We agree with moderators modified option 2 and Mediatek's further comments and clarification
10	LG Electronics Finland	We support modified Option 2: Power class definition shall consider target UE form factor aspect.
11	Nokia Denmark	We are fine with the modified Option 2 " <i>Power class definition shall consider target UE form factor aspect.</i> "

Item	Company	Comments
12	Intel Deutschland GmbH	If the intention is to have a UE form factor in mind when deriving power class requirements as we did in FR2, then we agree to consider the UE form factor during power class <i>discussions</i>

Issue 1-2-2 (Testability)

Feedback Form 6: 2nd round comment on the Issue 1-2-2 (Testability)

Item	Company	Comments
1	Beijing Xiaomi Mobile Software	We are fine with option 1.
2	Qualcomm Austria RFFE GmbH	It seems this is asking for RAN4 sourcing a modified WID proposal to be brought to plenary? We can't agree to that. Individual companies can bring such proposals as in normal working for RANP. QCOM brought a testability proposal last RANP but that did not go. Further discussion in RANP is needed to figure out the way to solve the issue.
3	Apple AB	We still believe option 1 can address the testability issue in a more systematic way.
4	Huawei Technologies Sweden AB	Option 1 seems ok. Companies are encouraged to double-check on the related RANP discussions - we shall not have inter-dependency among different WID's. If this issue is still controversial, it is better to leave it to RANP.
5	AT&T GNS Belgium SPRL	Option 1 provides a way forward that allows the testability aspects to be considered during the Rel-17 timeframe. This is necessary in order to provide RAN5 with sufficient definition of test methods to support the definition of the conformance test requirements. We agree that this is a RAN Plenary decision but we recommend that RAN4 provide a recommendation to RAN Plenary to minimize discussion/debate at RAN Plenary.
6	Nokia Denmark	We are fine to return to this discussion at RAN if this is preferred. However, we remain of the opinion that 60GHz band OTA test methods should be studied further.
7	Intel Deutschland GmbH	Having a parallel discussion on testability aspects is important and helpful, so we support Option 1. Plenary discussion is needed, but we think adding this objective to the FR2 test methods enhancements item makes sense.

3 Topic #2: Band plan and regulatory requirements

Main technical topic overview. The structure can be done based on sub-agenda basis.

3.1 Companies' contributions summary

Table 2:

T-doc number	Company	Proposals / Observations
R4-2104534	vivo	<p>Proposal 1: It is proposed to define multiple unlicensed bands for 52.6GHz 71GHz for different regions.</p> <p>Proposal 2: At least define these two unlicensed bands for NR-U 60GHz: Band nX: 57 71 GHz Band nY: 57 66 GHz</p> <p>Proposal 3: Include the ITS spectrum (63 64GHz) in the band definition for NR-U band 60GHz.</p> <p>Observation 1: Only unlicensed spectrum usage for 57 GHz 71 GHz is identified through various regions/countries.</p> <p>Observation 2: Only defining one band cannot cover all the unlicensed usage throughout various regions/countries.</p> <p>Observation 3: Band number definition for frequency range 52.6 71 GHz depends on the frequency range designation.</p>
CATT	R4-2104802	<p>Proposal 1: Define separate bands for licensed and unlicensed spectrum.</p> <p>Proposal 2: Define licensed bands for 66-71 GHz and unlicensed bands for 57.24-70.2 GHz.</p>
Apple	R4-2104885	<p>Proposal: Introduce a single (unlicensed) band covering the frequency range of 57-71GHz.</p>

Intel	R4-2106465	<p>Proposal #1: RAN4 agrees on one of options above for unlicensed bands as baseline for future discussion.</p> <p>Proposal #2: RAN4 continues to discuss on licensed regulatory status and band definition.</p> <p>Observation #1: IEEE 802.11ad/ay channelization is not fully utilizing the available unlicensed spectrum based on the latest spectrum regulations.</p> <p>Observation #2: It is important to identify licensed band as future RF discussions require this information, i.e., raster design, channel bandwidths, maximum output power, spectrum emission mask, and spurious emission, etc.</p>
ZTE	R4-2106587	<p>Proposal 1: 52.6-54.25GHz and 54.25-55.78GHz should be excluded from band definition for 52.6-71GHz.</p> <p>Proposal 2: for 66-71GHz, the licensed band should be defined at least.</p>
Ericsson	R4-2107076	<p>Proposal 1: Specify 57 – 71 GHz band for unlicensed usage</p> <p>Proposal 2: Specify 66 – 71 GHz band for licensed usage</p>
Nokia	R4-2107189	<p>Proposal 1: Define a band (57 – 71 GHz) for unlicensed operation in countries where regulations are available.</p> <p>Proposal 2: For an unlicensed 60 GHz band (57 – 71 GHz) adopt requirements from the ETSI EN 303 753 harmonized standard where applicable.</p> <p>Proposal 3: Postpone discussing a band definition for licensed band until spectrum availability becomes clear enough.</p>

Xiaomi	R4-2106300	<p>Observation 1: Normally a new frequency band should be decided first and a sample frequency to be selected for further analysis.</p> <p>Observation 2: The RF requirements need to consider the SCS and channel bandwidth which have been left from SI phase for NR extend to 71GHz.</p> <p>Proposal: Two bands can be defined as one licensed band and one un-licensed band to define corresponding requirements.</p>
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3.2 Open issues summary

Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies' contributions.

3.2.1 Band plan

Sub-topic description: Based on companies' inputs, separate band (e.g., licensed and unlicensed) definitions seem to be acceptable.

Open issues and candidate options before e-meeting:

Issue 2-1-1: Band plan

Proposals

Option 1: Separate band definitions for licensed and unlicensed operations

Recommended WF

Companies to comment or share their views during 1st round

**Feedback Form 7: 1st round comments on the issue
2-1-1 (Band plan)**

Item	Com-pany	Comments
1	Charter Communications, Inc	We prefer Option 1: Separate band definitions for licensed and unlicensed operations
2	Charter Communications, Inc	The main reason for our preference is that if we ended up aligning NR-Unlic in 60 GHz with ad/ay with regards to channelization, multi carrier bonding configurations, etc... then it might be better to define bands separately
3	Beijing Xiaomi Mobile Software	We prefer option 1 as similar to current 6GHz licensed and un-licensed bands which are defined separately.
4	CATT	We support option 1 to separate the licensed and unlicensed bands definition.
5	Beijing Xiaomi Mobile Software	Agree with Option 1.
6	China Mobile Com. Corporation	Support option1 to define different bands for licensed and unlicensed
7	vivo Communication Technology	Vivo: Generally, we agree with Option 1. However, for now, there is only unlicensed usage for the frequency range from 52.6G 71GHz, according to the regulatory update in the last RAN meeting. We can consider the unlicensed band definitions first, and then consider licensed band definition until the regulatory is clear.
8	MediaTek Inc.	Generally Option 1 is fine, in the sense that we can only progress with unlicensed operation currently. But similar comment as vivo, we should address how to specify licensed operation once the regulatory definition is more clear.
9	LG Electronics Finland	We prefer option 1.
10	Ericsson GmbH, Eurolab	We support Option 1.
11	ZTE Corporation	we support to define the licensed band for 60GHz
12	Sony Corporation	Option 1
13	Huawei Technologies Sweden AB	Option 1. Potential aim for alignment is seen to cause more problems than benefits.

Item	Company	Comments
14	Samsung R&D Institute UK	Agree with the option1 to differentiate licensed and unlicensed operation.
15	Guang-dong OPPO Mobile Telecom.	Ok with option 1 considering the requirements might be different for license and unlicense, and the spectrum usage and status is also not same for different regions.
16	Apple AB	We are Ok with the general principle that there can be different definitions for licensed and unlicensed bands. Nevertheless, introduction of e.g. licensed bands should be done only when the corresponding regulatory decisions are made.
17	AT&T GNS Belgium SPRL	We support option 1.
18	Nokia Denmark	Option 1 - Separate band definitions for licensed and unlicensed operations, similar to other bands defined for NR-U operation.

Issue 2-1-2: Licensed band proposal

Proposals

Option 1: 66 – 71 GHz (CATT, ZTE, Ericsson)

Option 2: Postpone the decision until regulatory becomes clear

Recommended WF

Companies to comment or share their views during 1st round

Feedback Form 8: 1st round comments on the issue 2-1-2 (Licensed band proposal)

Item	Company	Comments
1	Charter Communications, Inc	We do not have a strong opinion but we believe Option 2: Postpone the decision until regulatory becomes clear is the right approach
2	Qualcomm Austria RFFE GmbH	We welcome the inclusion of licensed bands but not until regulatory bodies define the band and rules for use by NR

Item	Company	Comments
3	CATT	Support option 1.
4	China Mobile Com. Corporation	Support option 1
5	vivo Communication Technology	We support Option 2. For now, the regulatory for licensed usage is not clear.
6	MediaTek Inc.	If the regulations are unclear, then equally unclear how we can specify a licensed band, so option 2 seems most reasonable.
7	LG Electronics Finland	We think that we should use similar approach as with 6GHz i.e. new bands can be added when rules are clear and need is indicated. We do not object definition of licensed band(s) already at this point in time if conditions above are met.
8	Ericsson GmbH, Eurolab	We support Option 1.
9	Huawei Technologies Sweden AB	Option 2, especially that this is the first meeting of the WI and we see no gains in trying to rush it.
10	Huawei Technologies Sweden AB	Correction of the comment: Option 1. As this is the first meeting of the WI and we see no gains in trying to rush it.
11	Samsung R&D Institute UK	We agree that licensed operation should be considered and comply with regulation. Hence it seems premature to make decision on specific band definition yet.
12	Guangdong OPPO Mobile Telecom.	This is similar as the situation of 6GHz where license and unlicense are related, in our view Option2 is more reasonable but it should be clear that this 52.6-71GHz will also be applied to license and once the regulation becomes more clear then the normative work can start.
13	Apple AB	Support Option 2. To our understanding, none of the Administrations has decided yet to designate this frequency range, 66-71GHz, to the licensed operation. Once the corresponding decision is made, we can consider adding that band.
14	AT&T GNS Belgium SPRL	Option 2. We should follow usual RAN4 approach to define operating bands as the regulatory rules become clearer.

Item	Company	Comments
15	Nokia Denmark	Option 2 - We encourage the definition of a licensed band but currently our understanding is that there are no clearly regulatory defined candidates.

Issue 2-1-3: Unlicensed band proposal

Proposals

Option 1: 57 – 71 GHz (vivo, Apple, Ericsson, Nokia)

Option 2: 57 – 66 GHz (vivo)

Option 3: 57.24 - 70.2 GHz (CATT)

Recommended WF

Companies to comment or share their views during 1st round

Feedback Form 9: 1st round comments on the issue 2-1-2 (Unlicensed band)

Item	Company	Comments
1	Charter Communications, Inc	We agree with option 1, 57 – 71 GHz (vivo, Apple, ZTE, Ericsson, Nokia)
2	Qualcomm Austria RFFE GmbH	Option 1 57-71
3	CATT	We would like to understand if the channelization is defined to be aligned with 802.11 ad, how to understand and use the extra spectrum for option 1.
4	China Mobile Com. Corporation	The difference between option1 and option 3 is whether the channelization is aligned between 802.11ad. In our view, there is no need to align the channelization, so we are OK with option1
5	vivo Communication Technology	According to current licensing situation, only defining one band cannot cover all the unlicensed usage throughout various regions/countries. So, we suggest to define multiple unlicensed bands for 52.6GHz 71GHz for different regions, as O1 and O2.

Item	Company	Comments
6	MediaTek Inc.	Option 1, 57-71GHz band at least as an initial design target, along with the target that the same UE can operate in regions where only a subset of the range is allocated to unlicensed operation.
7	Beijing Xiaomi Mobile Software	We slightly prefer option 1 as this is currently defined from 802.11. However, we believe this won't prevent us defining any further bands might be overlaped or subset of current option 1 ferquency range if necessary.
8	LG Electronics Finland	We support option 1 i.e. 57-71GHz
9	Ericsson GmbH, Eurolab	Option 1.
10	Guangdong OPPO Mobile Telecom.	Option 1
11	Apple AB	Support Option 1. There are several countries/regions, in which the full range of 57-71GHz is allocated for unlicensed operation, and thus we can consider a single band covering the whole range. If a particular country/region has a sub-range allocated to unlicensed, it still can be supported by the "master" band.
12	AT&T GNS Belgium SPRL	Option 1
13	Nokia Denmark	Option 1

Issue 2-1-4: ITS band proposal

Proposals

Option 1: 63 – 64 GHz for EU (vivo)

Option 2: others

Recommended WF

Companies to comment or share their views during 1st round

**Feedback Form 10: 1st round comments on the issue
2-1-3 (ITS band)**

Item	Com-pany	Comments
1	Beijing Xiaomi Mobile Software	A clarification question is if the ITS band is defined, should it be considered also in the Rel-17 Sidelink enhancement WID?
2	vivo Commu- nication Technol- ogy	In the objective on band plan for B52.6G, it is stated that the band definition should exclude the ITS spectrum in this frequency range. Our intention is to clarify how to handle the ITS spectrum when defining the band for B52.6G. The proper way to address this issue is ‘Whether to exclude the ITS spectrum 63 64G in the band definition for NR-U band 60GHz’.
3	MediaTek Inc.	We understand that wideband data transmission systems are allowed in that range as well in Europe, so no need to exclude.
4	LG Elec- tronics Finland	To our understanding side-link is not part of the WI.
5	Ericsson GmbH, Eurolab	It should be noted with the amendment of the ECC Decision, EC-C/DEC/(09)01, and following deliberations in CEPT Report 70 in the 2018-2019 timeframe, the frequency range for ITS has been moved from the 63-64 GHz band to the 63.72-65.88 GHz band which under this ECC Decision are also covered by the EC Decision for short range devices (2006/771/EC and its amendments) with identical usage parameters to coexist with the SRD on a non-interference non-protection basis . No need to consider the ITS for our arrangement.
6	Huawei Tech- nologies Sweden AB	We would like to have more time during the second round to check related ECC decisions.
7	Guang- dong OPPO Mobile Telecom.	For clarification, this ITS band is for EU, how about other regions? If other region is not for ITS, then it should be included.
8	Apple AB	Support Option 2. Firstly, EU/CEPT has updated EU ITS band definition, latest revisions of which was done in 2019. Our technical understanding is that it uses same unlicensed mode as the whole range of 57-71GHz allocated by EU/CEPT for the license-exempt operation. In fact, in the latest revision from 2019 the ITS “band” range was changed a bit so that it aligns with one of the WIFI channels. From that perspective we do not see a need to introduce explicitly a 3GPP band for this range.
9	Nokia Denmark	Option 2 - There should be no need to define this band at current stage.

Issue 2-1-5: Baseline regulatory requirement

Proposals

Option 1: ETSI EN 303 753 harmonized standard (Nokia)

Option 2: others

Recommended WF

Companies to comment or share their views during 1st round

Feedback Form 11: 1st round comments on issue 2-1-4 (Baseline regulatory)

Item	Company	Comments
1	Charter Communications, Inc	If ETSI EN 303 753 harmonized standard meets the US regulatory rules, we are ok with option 1. Further investigation and clarification will be warranted before agreeing with option 1
2	Qualcomm Austria RFFE GmbH	We should be aware of the EN requirement in this band and consider as we develop requirements. The proposal "baseline regulatory requirement" we don't agree with that.
3	Beijing Xiaomi Mobile Software	We agree for un-licensed band (if defined), the ETSI EN 303 753 can be a baseline.
4	MediaTek Inc.	The EN 303 753 seems to be still very much in draft form with no detailed requirements defined, so a bit unclear what is proposed. In general, 3GPP should ensure that the device types and corresponding UE requirements for unlicensed operation are compatible with relevant regulatory requirements.
5	MediaTek Inc.	Correction to previous comment: The EN still has a number of requirements undefined. There seem to be a few requirements defined.
6	LG Electronics Finland	We are OK with option 1.
7	Ericsson GmbH, Eurolab	The 303 753 for c2 is only in draft form. For unlicensed operation in Europe (under the relevant EC Decision), the UE should meet the requirements of the harmonized standard. Do not agree with EN 303 753 as Baseline regulatory requirement.

Item	Company	Comments
8	Huawei Technologies Sweden AB	This proposal seems to be confusing as it is worded in very general way. When referring to the ETSI standard, one shall remember that it may assume certain EU regulatory aspects, which may not be valid for other regions. In general, we do not see any need for such agreement.
9	Guangdong OPPO Mobile Telecom.	In our view, it can be considered as reference or starting point, but we are not sure the meaning of "baseline". Every regulatory should be taken into account.
10	Apple AB	ETSI standard should be definitely taken into account, but we also need to account for other local regulatory restrictions, if any.
11	AT&T GNS Belgium SPRL	We agree with QC comment that we need to consider the EN requirement when developing the core requirements but don't need to consider it as the "baseline regulatory requirement".
12	Nokia Denmark	Option 1 - we should use ETSI EN 303 753 harmonized standard as "baseline" in the meaning that the separate requirements can still be discussed.

3.3 Summary of 1st round

Issue 2-1-1 (Band plan)

It is agreeable to have separate band definition for licensed and unlicensed operations.

Issue 2-1-2 (Licensed band definition)

Agreement of GTW on Apr. 14

- Agree to define a band [66-71] GHz, based on which the system parameters discussion can proceed with an aim to harmonize for both licensed and unlicensed bands

~~The work on this band will start when regulations become clear~~ (further clarification was made in GTW on Apr. 15; see below)

Agreement of GTW on Apr. 14

- The work except system parameters on this band will start when regulations become clear.

Issue 2-1-3 (Unlicensed band definition)

- Agree on the option 1: Define 57 GHz - 71 GHz as unlicensed band

Issue 2-1-4 (ITS band definition)

The latest approved WID (RP-202925) stated as follow:

"Specify new band(s) for the frequency range from 52.6GHz-71GHz. The band(s) definition should include UL/DL operation and excludes ITS spectrum in this frequency range."

Perhaps RAN4 needs to further discuss whether band definition exclude ITS spectrum which is currently defined over 63 - 64 GHz. Also given unlicensed band has been agreed for 57 - 71 GHz, should actual unlicensed band be 57 GHz - 63 GHz and 64 GHz - 71 GHz?

The moderator suggest to further discuss during the 2nd round discussion.

Issue 2-1-5 (Baseline regulatory requirement)

Agreement of GTW on Apr. 14

- RAN4 to consider EU harmonized standards as starting point, not precluding other available regulatory requirements

3.4 Discussion on 2nd round (if applicable)

Issue 2-1-4 (ITS band definition)

Feedback Form 12: 2nd round comment on the Issue 2-1-4 (ITS band definition)

Item	Company	Comments
1	MediaTek Inc.	Please see MediaTek comment to the 1st round on this topic.
2	MediaTek Inc.	ok maybe our 1st round comment was not 100% clear. We understand that there is no exclusion of wideband transmission systems (such as a 60GHz NR system) in the 63-64GHz range in Europe, i.e. usage is not exclusive to ITS.
3	vivo Communication Technology	For unlicensed band, we think it is not necessary to exclude the ITS spectrum. In NR-U 5GHz band definition, we have a similar situation: the band definition for NR-U band n46 is 5150-5925MHz, however, the ITS spectrum around 5GHz is n47 (frequency range from 5855 5925 MHz). The 5.9GHz ITS spectrum is totally included in NR-U band definition of n46. Furthermore, channel raster overlapped with ITS bands is added for NR-U. For licensed band definition for 60GHz, we are not sure whether to exclude the ITS band.
4	Apple AB	EU regulations do not assume that 63-64GHz shall be excluded from the unlicensed band operation. There is a document that just allows usage of slightly different parameters for that range (e.g. no LBT is allowed), but it does not mean that normal unlicensed services are prohibited.
5	Huawei Technologies Sweden AB	We suggest to postpone this decision to allow companies check the related regulatory situation. For now, we are not sure if we can use NR-U operation in 6GHz range as a reference for this ITS topic in 63-64GHz.

Item	Company	Comments
6	Charter Communications, Inc	We agree with Vivo's comments above
7	LG Electronics Finland	We do not see the need to exclude the ITS spectrum from unlicensed band in Europe. Side-link operation itself is not part of this WI.
8	Nokia Denmark	There should be no need to exclude the ITS spectrum for a unlicensed band. The band should be defined as a single range from 57 GHz - 71 GHz

4 Topic #3: System Parameters

Main technical topic overview. The structure can be done based on sub-agenda basis.

4.1 Companies' contributions summary

Table 3:

T-doc number	Company	Proposals / Observations
R4-2104536	vivo	<p>Proposal 1: Both NR based channel arrangement and NR-U based channel arrangement should be considered for the frequency range 52.6GHz 71GHz.</p> <p>Proposal 2: ΔF_{Raster} 120kHz, 480kHz and 960kHz should be included for the channel raster for the frequency range from 52.6GHz to 71GHz, further restrictions on channel numbers can be added as a note.</p> <p>Observation 1: The number of sync raster entries for NR-U based channel arrangement is smaller than NR based channel arrangement.</p>
R4-2104594	CMCC	<p>Proposal 1: <i>RAN4 should wait for RAN1 conclusion on SSB SCS in order to start the work, e.g. sync raster design.</i></p> <p>Proposal 2: <i>Consider the following minimum and maximum bandwidths for 52.6-71GHz.</i></p>

R4-2104804	CATT	<p>For maximum CBW and RB number,</p> <p>Proposal 1: 264 RB is defined as the maximum RB number for 400 MHz/120 kHz and 1600 MHz/480 kHz.</p> <p>Observation 1: When spectrum utilization is studied, the feasibility should also take Fs into account to study the filter performance and complexity.</p> <p>Observation 2: 275 RB maximum size in RAN1 is not valid when CBW RB number is much larger than 275.</p> <p>Observation 3: Without Tc change, the following three configurations can support larger TBW than 802.11 ad and they're feasible from implementation point of view. 960 KHz SCS/166 RB with 1912.32 MHz TBW 480 KHz SCS/332 RB with 1912.32 MHz TBW 480 KHz CA: 1600 MHz + 400 MHz</p> <p>Observation 4: 960 KHz SCS/166 RB and 480 KHz SCS/332 RB single carrier can support 2 GHz CBW from implementation point of view.</p> <p>Observation 5: If Tc is not changed, the solution of 480 KHz SCS and CA to support similar TBW as 802.11 ad brings more benefit than single carrier solutions.</p> <p>Observation 6: The solution of 960 KHz SCS/4096 FFT size to support 1830.5 MHz TBW is not valuable from implementation point of view.</p> <p>Proposal 2: RAN4 agrees not to change Tc and send LS to RAN1 about the possible implementations.</p> <p>Proposal 3: 2 GHz is agreed as the maximum CBW for both licensed and unlicensed spectrum.</p> <p>Proposal 4: 480 KHz SCS single carrier 1600 MHz and CA: 1600 MHz + 400 MHz are allowed to be used in unlicensed spectrum.</p>
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R4-2104821	Apple	<p>Proposal 1: <i>The following max./min. CBW are proposed:</i></p> <p>Proposal 2: <i>it is proposed that UE support of the following max. CBW for each SCS is optional:</i> 120kHz: 400MHz 480kHz: 1600MHz 960kHz: 2000MHz and/or 2160MHz</p> <p>Proposal 3: <i>it is proposed to use Table 1 as a starting point for further SU discussion.</i></p> <p>Channel raster</p> <p>In the unlicensed spectrum, considering 802.11ad/ay channelization of 2160MHz, it is proposed to specify NR channel raster in such a way that for any CBW, there is no NR channel that overlaps with two 802.11 ad/ay channels, i.e. the straddling case as shown in the figure below, in order to ensure the good channel usage of 802.11ad/ay. Moreover, a minimum set of raster points can be specified in order to align with 802.11ad/ay channelization of 2160MHz as much as possible.</p> <p>Also, for NR deployment only in unlicensed spectrum, similar efforts can be made to avoid as much as possible that one NR channel does not overlap with two other NR channels in frequency. This requires a careful consideration of both CBW selection and raster design. Since for this band, the minimum SCS is 120kHz. Therefore, instead of specifying F_{Raster} of both 60kHz and 120kHz in existing FR2 bands, we can consider F_{Raster} of 120kHz only for this new band as the minimum SCS is 120kHz, whose support is mandatory</p> <p>For licensed spectrum, denser raster points can be specified than for unlicensed spectrum to allow more flexibility in channel</p>
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R4-2106305	LGE	<p>Proposal 1: Maximum channel bandwidth for 960kHz SCS</p> <p>Proposal 2: Minimum channel bandwidth for 120kHz and 960kHz SCS</p>
R4-2106588	ZTE	<p>Proposal 1: for 120kHz SCS, propose the minimum channel bandwidth as 50MHz.</p> <p>Proposal 2: for 960kHz SCS, propose the minimum CBW supported as 400MHz and maximum CBW supported as 2000MHz.</p> <p>Proposal 3: 120kHz channel raster should be applied for licensed operation of 52.6-71GHz.</p> <p>Proposal 4: postpone the sync raster discussion until mini BW and SSB SCS has been defined.</p>

R4-2106691	Ericsson	<p>Observation 1: The 57 – 71 GHz band consists of large blocks of contiguous spectrum. Supporting a small channel bandwidth (e.g., 50 MHz) is not motivated, since small blocks of fragmented spectrum do not exist in this band.</p> <p>Observation 2: Maximum channel bandwidth for 960 kHz SCS should not be larger than 2.16 GHz due to overlapping channels</p> <p>Observation 3: Unlike FR2 the 52.6 – 71 GHz frequency range has less fragmented spectrum allocations giving the possibility to consider a “fixed” raster design.</p> <p>Observation 4: Channel spacing can be arranged by spacing 3 set of subcarriers (e.g. 833, 834, 833 for 100 Mhz / 120 kHz) repeated over a continuous span of the frequency range or simpler put .</p> <p>Observation 5: The advantage of a fixed channel raster only a single raster sync point (GSCN) per minimum channel bandwidth is needed to be defined and a reduction of search points compared to supporting fixed and floating rasters.</p> <p>Observation 6: Large array sizes, bandwidths and higher SCS compared to Rel-15 FR2 numerologies which has impact on overall feasible spectrum utilization values.</p> <p>Proposal 1: RAN4 to agree only “fixed” channelization design support</p>
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R4-2107190	Nokia	<p>Proposal 1: Support channelization according to 2.16 GHz CBW, which is preferred from coexistence point of view.</p> <p>Proposal 2: Support sub-channelization for 2.16 GHz channels to facilitate smooth coexistence for narrowband operation.</p> <p>Proposal 3: Define Max. and Min. CBW per SCS as given in Table 3.</p> <p>Proposal 4: Support CA within a 2.16 GHz channel, and between 2.16 GHz channels</p> <p>Proposal 5: Consider $n \times 400$ MHz, $n = [2, 3, 4, 5]$ as the supported channel BW options for CA operation within a 2.16 GHz channel</p> <p>Proposal 6: Send reply LS to RAN1 as provided in the annex of this contribution</p>
R4-2104535	vivo	

4.2 Open issues summary

Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies' contributions.

4.2.1 Numerologies and CBW

Sub-topic description:

Open issues and candidate options before e-meeting:

Issue 3-1-1: minimum channel BW

Proposals

120 kHz SCS

- Option 1-1: 100 MHz

- Option 1-2: 200 MHz

- Option 1-3: 400 MHz

240 kHz SCS

- Option 2-1: 200 MHz

- Option 2-2: 400 MHz

960 kHz SCS

- Option 3-1: 400 MHz

- Option 3-2: 2000 MHz

- Option 3-3: 2160 MHz

Recommended WF

Encourage companies to share their views during 1st round

Feedback Form 13: 1st round comments on issue 3-1-1 (Min CBW)

Item	Company	Comments
1	Charter Communications, Inc	Our preference is - Option 3-1: 400 MHz
2	Charter Communications, Inc	Our preference is min channel bandwidth of 400 MHz for 960 khz scs
3	Qualcomm Austria RFFE GmbH	For 960 SCS 400 MHz minimum is needed. For 120 SCS 100 for coverage and spectral useage. For 480 SCS (not listed) 200 or 400 MHz are ok with us.
4	CATT	Prefer 1-1, 2-1 and 3-1.
5	China Mobile Com. Corporation	We prefer 200MHz for 120KHz, 200MHz for 480KHz and 400MHz fo 960KHz.

Item	Company	Comments
6	vivo Communication Technology	For 120kHz SCS, we support Option 1-3; For 240kHz SCS, we support Option 2-2; For 960kHz SCS, we support Option 3-1; In summary, we propose 400MHz as the minimum channel bandwidths for all SCSes.
7	MediaTek Inc.	For 120kHz SCS, 100MHz seems fine (option 1-1). Would like to understand further the motivation from other companies to propose such low bandwidths for 480kHz/960kHz SCS, given that it adds multiple design options.
8	Beijing Xiaomi Mobile Software	Our preference are as following: for 240kHz, we think current the candidate SCS should be 480kHz/960kHz. 120kHz-100MHz; 960kHz-400MHz
9	LG Electronics Finland	Our preference is 100, 200 and 400MHz for 120k, 480k and 960k SCS respectively.
10	ZTE Corporation	prefer 100MHz for 120kHz and 200MHz for 240kHz and 400MHz for 960kHz
11	Ericsson GmbH, Eurolab	Support Option 1-1 due to ensure coverage aspects are considered if the channel bandwidth is too large for minimum than coverage is compromised. Support Option 2-2 Given that the maximum channel bandwidth for 120 kHz has been agreed as 400 MHz (as in Rel-15), it is redundant to introduce a minimum channel bandwidth less than 400 MHz for 480 kHz SCS Support Option 3-3 According to the discussion during the study item phase, the rationale for introducing 960 kHz SCS was that without it, it would not be possible to achieve the same channel bandwidth as 802.11ay, and thus not be competitive. For this reason, it makes little sense to be satisfied with anything less than 2160 MHz for the maximum bandwidth
12	Huawei Technologies Sweden AB	120 kHz SCS: Option 1-2: 200 MHz 240 kHz SCS: Option 2-1: 200 MHz 480 kHz SCS: 200 MHz 960 kHz SCS: Option 3-1: 400 MHz
13	Samsung R&D Institute UK	For 960kHz SCS Option 3-1: 400MHz is preferred
14	Apple AB	for 120kHz SCS, it is still worthwhile to look at the licensed spectrum block sizes before completely excluding 50MHz. Otherwise, 100MHz is reasonable. For 480kHz SCS, we can agree on 200MHz. For 960kHz SCS, in RAN1 discussion, both 400MHz and 800MHz are the options and should be considered.

Item	Company	Comments
15	Guangdong OPPO Mobile Telecom.	120khz- 100M 480khz- 200M 960khz- 400M
16	Nokia Denmark	For all SCSs our preference is a minimum channel bandwidth of 400MHz

Issue 3-1-2: maximum channel BW

Proposals

- 120 kHz SCS: 400 MHz
- 480 kHz SCS: 1600 MHz
- 960 kHz SCS:

Option 3-1: 2000 MHz

Option 3-2: 2160 MHz

Recommended WF

Share and comment on the proposal during 1st round discussion

Feedback Form 14: 1st round comments on issue 3-1-2 (Max CBW)

Item	Company	Comments
1	Charter Commu- nications, Inc	Our preference is Option 3-2: 2160 MHz
2	Charter Commu- nications, Inc	Our preference is to have max channel bandwidth of 2160 MHz. This will make this technology competitive with other technologies in the band
3	Qual- comm Austria RFFE GmbH	For 920 SCS we have a preference for 2000 MHz, but 2160 would be ok.

Item	Company	Comments
4	CATT	960 KHz support 2000 MHz, and that CBW can support larger TBW than 802.11 ad and also can support to align with licensed spectrum CBW definition.
5	China Mobile Com. Corporation	We are wondering why 3.2GHz is not an option for 960KHz. For 120KHz and 480KHz, the maximum bandwidths are the BW that can be achieved by 4096FFT and 275RB.
6	vivo Communication Technology	The maximum channel bandwidth for 120kHz and 480kHz are clear. For 960kHz, we support Option 3-1. However, we are willing to compromise for Option 3-2, or both 2000M and 2160M are respectively considered for licensed and unlicensed operation, as other companies proposed.
7	MediaTek Inc.	No strong view between 3-1 and 3-2. However, we would like the same maximum bandwidth to be selected for licensed and unlicensed in general.
8	Beijing Xiaomi Mobile Software	We agree with the proposed Max CBW for 120kHz and 480kHz SCS. For 960kHz SCS, we can accept 2160MHz.
9	MediaTek Inc.	We also think that we should consider further whether to make some maximum channel bandwidths optional for the UE.
10	LG Electronics Finland	We think that for un-licensed use 2160MHz, that aligns with channel BW of the co-existing system, is best way forward. 2000MHz can offer higher SU for licensed parts of the frequency range.
11	ZTE Corporation	for 960kHz of licensed band, 2000MHz should be okay
12	Ericsson GmbH, Eurolab	There is no need to discuss again the maximum channel bandwidths for other SCS other than 960 kHz. Support Option 3-2 this is beneficial from the perspective of minimizing the number of permutations of channel bandwidth/SCS from a requirements and conformance perspective. There is also no benefit to defining 2000 MHz as maximum channel bandwidth if the intention of 960 kHz is to be competitive with IEEE as this would reduce unnecessarily the SU by 160 MHz.
13	Sony Corporation	We support Option 3-2: 2160 MHz for 960 kHz
14	Huawei Technologies Sweden AB	Option 3-1: 2000 MHz; for both licensed and un-licensed usage.
15	Samsung R&D Institute UK	For 960kHz SCS, Option 3-1: 2000MHz preferred

Item	Company	Comments
16	Apple AB	For 480kHz SCS, 1600MHz can be considered as optional (following the same logic that 400MHz is optional for 120kHz SCS). For 960kHz SCS, If the same max. CBW is specify for both licensed and unlicensed operation, 2000MHz is preferred. However, if different max. CBW is specified for licensed and unlicensed operation, 2160MHz has better alignment with 802.11ad/ay. Consequently, 2000MHz can be the one for licensed operation and 2160MHz can the one for unlicensed operations. When 2160MHz is selected as the maximum CBW, 2000MHz should be considered as one intermediate smaller value. The rationale of having 2000MHz is because it will provide better spectrum utilisation for some countries/regions.
17	Nokia Denmark	Option 3-2: 2160MHz for 960kHz SCS
18	Guangdong OPPO Mobile Telecom.	For 960khz, 2160MHz is preferred.

Issue 3-1-3: Carrier aggregation support

Proposals

Option 1: enable CA to support wider CBW, i.e., 1600 MHz + 400 MHz

Option 2: No need to support CA

Recommended WF

Share and comment on the proposal during 1st round discussion

Feedback Form 15: 1st round comments on issue 3-1-3 (CA support)

Item	Company	Comments
1	Charter Communications, Inc	We refer Option 1: enable CA to support wider CBW, i.e., 1600 MHz + 400 MHz
2	Charter Communications, Inc	We support option 1

Item	Company	Comments
3	Qualcomm Austria RFFE GmbH	We need to enable CA support. CA support of nx400 MHz with different CA bandwidth classes makes sense.
4	CATT	Support CA for both licensed and unlicensed spectrum.
5	China Mobile Com. Corporation	Support option1
6	vivo Communication Technology	We think CA is beneficial for supporting channel bandwidths larger than 2000MHz; for channel bandwidths equal or less than 2000M, a single carrier would be sufficient and no CA needed.
7	Beijing Xiaomi Mobile Software	We support Option 1.
8	MediaTek Inc.	We think the usage of CA needs to be discussed further, so would prefer some more analysis, before we make a general agreement.
9	LG Electronics Finland	We support CA with nx400 MHz that is in line with earlier way forward decision.
10	Sony Corporation	we support Option 1
11	Huawei Technologies Sweden AB	Agree with MediaTek: the CA was supposed to be discussed during the WI, and we see the need to have more analysis before jumping to such general agreements. There are relations to multiple open topics: e.g. to the band definitions (intra vs. inter-band CA). There are relations to the FR terminology (FR2 only CA or FR1+FR2, etc.). CA shall be supported, but Option 1 is worded in a way that just a single CC combination would be allowed. Continue the discussion for next meeting.
12	Samsung R&D Institute UK	Agree to enable CA in general. But details such as CA bandwidth class should be studied further.
13	Nokia Denmark	Option 1 - CA shall be supported. CA is necessary to support sub-channelization within wider channels, e.g. n*400 MHz, and CA support shall not be limited to extend total beyond maximum channel bandwidth of e.g. 2160 MHz.
14	Intel	Support option 1. However, further discussion is required to conclude CA support, i.e., how many CCs will be supported. Too many bandwidth combinations are not desirable.

Issue 3-1-4: Spectrum Utilization

Proposal: R4-2104821 (Apple)

Moderator comment: To prepare the reply LS to RAN1, please share your view with focus on the max CBW for each SCS, i.e., 400 MHz with 120 kHz, 1600 MHz with 480 kHz, and 2000/2160 MHz with 960 kHz.

SCS (kHz)	[50MHz]	100MHz	200MHz	400MHz	[800MHz]	[1600MHz]	[2000MHz]	[2160MHz]
120	[32]	[66]	[132]	[264]				
480			[32]	[66]	[132]	[264]		
960				[32]	[66]	[132]	[165]	[178]

Figure 1: Spectrum utilization proposal from R4-2104821

Feedback Form 16: 1st round comments on the issue 3-1-4 (SU)

Item	Company	Comments
1	CATT	We don't have 2000 MHz and 2160 MHz CBW agreement yet, the RB number should be discussed when there's a conclusion. We proposed 166 RB for 2000 MHz. It can be discussed further. 264 RB is the same as what we proposed.
2	vivo Communication Technology	<i>We are OK to use this table as a starting point for further SU discussion.</i>
3	MediaTek Inc.	This table seems to use the approach from current FR2. However, more analysis is required on whether that approach can be applied here.
4	LG Electronics Finland	This can be used as a starting point for discussion, but we need to remember that for 960k SCS 170RBs is maximum that can be supported unless Tc is re-defined in RAN1. At the moment we do not support this. The maximum sampling rate of the NR system is currently limited to 1966.08MHz due to 480kHz being used as deltaFmax in 38.211. In case that this definition is not revised by RAN1 this will limit the number of RBs that can be supported with 960kHz SCS to 170. 170RBs results into transmission that uses 2040 sub-carriers and occupies mathematically 1958.4MHz. On the other hand, if deltaFmax value of is revised to a higher value (for example 960kHz), then significantly wider transmissions can also be supported, but this is also possible with existing deltaFmax by using carrier aggregation .

Item	Company	Comments
5	Ericsson GmbH, Eurolab	RAN4 should consider SU of 85% and evaluate latest technology challenges this frequency range brings rather than to assume that FR2 SU can also be applied. With larger CBW and possible lower PSD restrictions compared to FR2 it is first important for RAN4 to study impacts e.g. EVM requirements at edge PRB may be hindered due to lower PSD and large CBW if high SU is used.
6	Qualcomm Austria RFFE GmbH	More work is needed. The table is based on 95% SU. It is unclear whether this is a good starting point for implementation.
7	Huawei Technologies Sweden AB	More study needed for the second round, at least. There is obvious dependency on the other open issues on min/max channel BW. It shall be clarified what is the bare minimum set of information that RAN1 needs to receive during this meeting (LS mentions min CHBW and channelization).
8	Apple AB	we think the current RAN4 spectrum utilization values, with a maximum of 95%, can be a good starting point. the final conclusion will need to be made together with RF requirements including MOP, ACLR/OOBE, and ACS/blocking, etc.

4.2.2 Channelization

Sub-topic description

Open issues and candidate options before e-meeting:

Issue 3-2-1: Harmonize licensed and unlicensed channelization

Moderator comment: Whether RAN4 needs to discuss licensed and unlicensed channelization together or separately.

Option 1: Discuss together

Option 2: Discuss separately

Feedback Form 17: 1st round comments on the issue 3-2-1 (Harmonize licensed and unlicensed channelization)

Item	Company	Comments
1	Charter Communications, Inc	As we mentioned earlier if for unlicensed co-existence and better use of the spectrum important then we should align with ad/ay. If there are issues with this channelization in licensed band then this should be discussed separately; otherwise discussion together might be useful

Item	Company	Comments
2	CATT	Band plan can be separated. But for channelization, sync raster, CBW, our understanding is that aligning unlicensed design with licensed design may bring benefit.
3	China Mobile Com. Corporation	We prefer to discuss licensed and unlicensed channelization together. If some critical differences are identified and necessary, then separate discussion may be needed.
4	vivo Communication Technology	In our understanding, the key point is not we decide to discuss them together or separately. The real problem is whether to define the same channelization or different channelizations for licensed and unlicensed operation.
5	Beijing Xiaomi Mobile Software	As when we define the channelization of NR-U 6GHz, the channel bandwidth, specific raster points are defined specifically. We believe similar approach will apply for above 52.6 unlicensed band. Hence, different channelization will occur for licensed and un-licensed bands within this frequency range.
6	MediaTek Inc.	We would like to harmonize the channelization design where possible, at least not completely independent designs. So we need to consider reusability for potential future licensed allocations when we design for unlicensed.
7	Ericsson GmbH, Eurolab	Support Option 1: There is currently no motivation why there should be different channelization between unlic and lic. Additionally there is no reason to align with unlic channelization as no LBT is needed for this range.
8	Qualcomm Austria RFFE GmbH	We need to define licensed band first. Once we have a licensed band we can determine if unlic channelization the same as licensed makes sense. The same channelization could possibly result in a simpler implementation.
9	Huawei Technologies Sweden AB	Those shall be discussed together, but whether to decide them to be the same is another issue. Same channelization and common/similar implementation is a potential outcome, not the assumption for this task.
10	Apple AB	Since different aspects to be considered for licensed and unlicensed operations (e.g. alignment with 802.11ad/ay should be considered for unlicensed case only), it makes more sense to discuss them separately. Based on the conclusion, it can be further decided if a unified channelization can be specified.
11	Intel	Considering regulatory status, it might be difficult to consider together from the beginning and we think the harmonization would be the outcome of the discussion as Huawei commented.
12	Guangdong OPPO Mobile Telecom.	Align the channelization might be good, but if not possible then can be separated, since in anyway in the same region it is less likely to be deployed both.

Issue 3-2-2: Channelization for licensed band

Proposals

Option 1: Align with IEEE 802.11ad/ay channels (fixed channelization like in NR-U)

Option 2: Do not consider IEEE channels (floating raster like in NR system)

Recommended WF

Share and comment on the proposal during 1st round discussion

Feedback Form 18: 1st round comments on issue 3-2-1 (channelization for licensed band)

Item	Company	Comments
1	Charter Communications, Inc	Our preference is Option 1: Align with IEEE 802.11ad/ay channels (fixed channelization like in NR-U)
2	Charter Communications, Inc	Sorry for our previous comment, for licensed band, we do not have a strong opinion
3	Charter Communications, Inc	We suggest listing the pro's and con's to make the appropriate decision
4	Qualcomm Austria RFTE GmbH	The discussion for channelization should follow once a licensed band is identified and we agree to pursue it. At this point the regulatory has not defined a licensed band.
5	CATT	Support option 2.
6	China Mobile Com. Corporation	We prefer option 2. There is no need to align the licensed band channelization with IEEE channels
7	vivo Communication Technology	We suggest to figure this issue after we have a clear picture on the regulatory decisions and band plan for licensed usage.
8	Beijing Xiaomi Mobile Software	We support option 2 which is also illustrated in issue 3-2-1.

Item	Company	Comments
9	MediaTek Inc.	There seems to be one option missing, which is do a fixed raster but without aligning to IEEE channels. In general, fixed raster and harmonization of channelization designs between licensed and unlicensed would be a good design target, but we cannot finalize it for licensed without regulations.
10	ZTE Corporation	option 2 is preferred.
11	Ericsson GmbH, Eurolab	see comments from Issue 3-2-1
12	Huawei Technologies Sweden AB	Option 2 is preferred.
13	Apple AB	We should firstly decide if the same channelization will be used for both licensed and unlicensed operations. If yes, option 1 makes more sense. Otherwise, there is no need to align with 802.11ad/ay. Also, we do not need to discuss licensed band now because we do not even know which frequency range Administrations will allocate and which block sizes they will consider.
14	Nokia Denmark	This discussion should be postponed until a clearly regulatory defined candidate for a licensed band have been defined.
15	Intel	We would prefer to wait until all regulatory becomes clear. Otherwise, we support option 2.
16	Guangdong OPPO Mobile Telecom.	Option 2.

Issue 3-2-3: Channelization for unlicensed band

Proposals

Option 1: Align with IEEE 802.11ad/ay channels (fixed channelization like in NR-U)

Option 1A: Support sub-channelization for 2.16 GHz channels to facilitate smooth coexistence for narrowband operation.

Option 2: Do not consider IEEE channels (floating raster like in NR system)

Recommended WF

Share and comment on the proposal during 1st round discussion

Feedback Form 19: 1st round comments on issue 3-2-2 (channelization for unlicensed band)

Item	Com-pany	Comments
1	Charter Communications, Inc	Our preference is Option 1: Align with IEEE 802.11ad/ay channels (fixed channelization like in NR-U)
2	Charter Communications, Inc	We prefer option 1
3	Qualcomm Austria RFFE GmbH	Option 1. We should have 'fixed channelization like NR-U'. It also makes sense to align these channels and subchannels so they fit inside the 802.11 ad/ay channels.
4	CATT	Option 1A seems more reasonable.
5	China Mobile Com. Corporation	For option 1A, does it mean that only 2.16GHz bandwidth are defined for unlicensed band
6	vivo Communication Technology	This issue can wait for the conclusion on the band plan and supported channel bandwidths for B52.6G. If we intend to define different channelization with IEEE channels, why do we require them to be aligned?
7	Beijing Xiaomi Mobile Software	We prefer option 1A which has been applied for previous NR-U bands.
8	LG Electronics Finland	Should align with 2.16 GHz channels as starting point, but also make it possible to support narrower-band operations.
9	MediaTek Inc.	We prefer fixed channelization (as in previous comment for licensed), but no view on whether it should align to IEEE. At least it is unclear for smaller channels, given that they don't align anyway - probably needs more study.
10	Sony Corporation	Option 1
11	Ericsson GmbH, Eurolab	see comments from Issue 3-2-1
12	Huawei Technologies Sweden AB	More time to analyze this is requested. Fixed channelization (like in NR-U) seems to be good starting point. Option 1A shall be considered only when the max CHBW is decided.

Item	Company	Comments
13	Nokia Denmark	Option 1 - Similar to other NR-U bands we should strive for alignment between technologies deployed in the same spectrum.
14	Apple AB	For unlicensed band channelization, we should strive to align with 802.11ad/ay channels. Also, it should be avoided that one NR channel partially overlapped with two 802.11ad/ay channels.
15	Intel	We support option 1 or 1A would be ok for us.
16	Guang-dong OPPO Mobile Telecom.	Option 1 or 1A

4.3 Summary of 1st round

Issue 3-1-1 (Minimum channel BW)

Agreement of GTW on Apr. 14

- 120kHz: Option 1, 480kHz: Option 2, 960kHz: Option 1,
- The above agreement is subject to further review of licensed spectrum block sizes.

Above options are based on RAN1 LS, i.e., 100 MHz for 120 kHz, 400 MHz for 480 kHz, and 400 MHz for 960 kHz

Issue 3-1-2 (Maximum channel BW)

WF from GTW on Apr. 14

- To further consider the following options:
- 2000MHz for both licensed and unlicensed operations
- 2160MHz as the max. bandwidth, also 2000MHz will be specified as a channel bandwidth, both licensed and unlicensed operations
- 2160MHz for unlicensed operation and 2000MHz for licensed operation
- Make a decision for unlicensed operation and FFS for licensed operation

Issue 3-1-3 (Carrier aggregation support)

Majority view is supporting option 1 (enabling CA support) but there were a few comments that this still requires further study and analysis, i.e., how many CCs are allowed, CA bandwidth class, etc.

Moderator suggest to have more discuss on the further study and analysis aspect during the 2nd round discussion.

Issue 3-1-4 (Spectrum Utilization)

This seems to require further discussion at least once maximum channel BWs are agreed.

Moderator suggest to postpone the discussion until the issue 3-1-2 is agreed.

Agreement in GTW on Apr. 15

Agree on option 3 (Need more study)

Issue 3-2-1 (Harmonize licensed and unlicensed channelization)

Moderator understands based on the companies input that harmonization between licensed and unlicensed channelization would be nice to have to simplify implementation. However, given the spectrum situation, it seems to difficult to have joint discussion between two. In the issues 3-2-2 (licensed band channelization) and 3-2-3 (unlicensed band channelization), there are the different preference clearly between two channelization,

Moderator suggest to have further discussion during the 2nd round discussion. Especially, moderator encourages interested companies to check LBT requirement for licensed and unlicensed bands.

Issue 3-2-2 (Channelization for licensed band)

Majority view is option 2 (Do not consider IEEE channels (floating raster like in NR system)). Given the spectrum situation for licensed operation, however, it is unclear whether it would be meaningful discussion without clear regulatory guidance.

During GTW session on Apr. 15, the following clarification were made for the options:

- Option 1: Do not use the NR-U approach, i.e. considering IEEE channels with fixed channelization
- Option 2: Do not consider IEEE channels, use floating raster like in NR system
- Option 3: Do not consider IEEE channels, use a fixed raster

Moderator suggest to have further discussion during the 2nd round, and suggests the proponent of the option 3 to provide further detail how fixed raster could be harmonized with unclear spectrum situation as well as LBT/no-LBT requirement.

Issue 3-2-3 (Channelization for unlicensed band)

The following summarizes the companies input

- Option 1: Align with IEEE 802.11ad/ay channels, i.e., fixed channelization like in NR-U (Charter, Qualcomm, Sony, Ericsson)
- Option 1A: Support sub-channelization for 2.16 GHz channels to facilitate smooth coexistence for narrowband operation (Nokia, CATT, Xiaomi, LGE)

- Option 2: Do not consider IEEE channels, i.e., floating raster like in NR system
- Option 3: More time to study (MTK, Huawei)

Moderator understands the Option 1A seems include the Option 1 where the Option 1A also include other smaller CBW < 2.16 GHz. Moderator’s impression of supporting the Option 1 also considering the case where smaller CBWs can be supported within an IEEE 11ad/ay channel.

Moderator suggest to agree on the Option 1A. In case of any comment, please share your views during 2nd round discussion.

4.4 Discussion on 2nd round (if applicable)

Issue 3-1-2 (Maximum channel BW)

Feedback Form 20: 2nd round comment on the Issue 3-1-2 (Maximum channel BW)

Item	Company	Comments
1	MediaTek Inc.	It seems best to come back on this once there has been further analysis on the feasible spectrum utilization for such bandwidths.
2	vivo Communication Technology	<p>Option 1 is our first choice. 2160 MHz is beneficial for the alignment with ad./ay. channel. However, in our understanding, with 2000 MHz channel bandwidth, we can also achieve the alignment, at least in an approximate way. So, we think 2000MHz for both licensed and unlicensed operation is OK.</p> <p>We can also accept Option 3. If companies insist the exact alignment with ad./ay. channel for unlicensed operation.</p> <p>We do not accept Option 2. Supporting both these two channel bandwidths for both licensed and unlicensed are not necessary.</p>
3	Beijing Xiaomi Mobile Software	For max CBW, we think it can be discussed together with the channelization of licensed and un-licensed bands. For example, if the channelization of licensed and un-licensed bands are the same as proposed by some company, then how can they have different max CBW? We still believe "2160MHz as the max. bandwidth, also 2000MHz will be specified as a channel bandwidth, both licensed and unlicensed operations" can solve most of compan'es concern.
4	Apple AB	we prefer to the option that "2160MHz for unlicensed operation and 2000MHz for licensed operation".

Item	Company	Comments
5	Charter Communications, Inc	We believe maximum channel bandwidth should be 2.16 GHz for both unlicensed and licensed bands. The challenge will be that if we adopt a rigid channelization design such that all channels are confined to be within 2.16 GHz channels defined by Wi-Fi then potentially you could have a large spectrum wastage. We would make a potential proposal to address this in the channelization discussion
6	CATT	Support 2GHz for both licensed and unlicensed bands. 2GHz for unlicensed bands has no problem to co-exist or compete with 802.11ad. The transmission BW can be 80 MHz larger than the TBW of 802.11ad. There's no OCB problem, and the co-exist can be solved by channelization design. There're other benefits. First is that aligning with licensed band can allow the implementation to share a common design. Second is that 2 GHz is also a carrier aggregation BW for smaller BW, we're discussing CA support then the larger BW is equal to the CA of smaller BW which is the same as what was done for NR. The last is that the baseband sampling rate can be kept to Tc which is already 4 times of what's used by the current FR2 baseband sampling rate. On the other hand, we don't see the benefit for 2.16 GHz. There can be two ways to use this BW. First method is that the maximum RB number is the same as 2 GHz, then BB sampling rate can be kept as Tc, actually the design for 2GHz is reused but only see the spec defines a larger BW. The other method can be increasing the baseband sampling rate to two times of Tc then support more RB. We didn't analyze that case, but according to the proposals in this meeting, only 13 more RB is supported by 2.16 GHz compared with 2 GHz. Doubling baseband sampling rate not only brings much more BB implementation pleasure for baseband, and also to the BB-RF interface data rate. With so much sacrifice to support only 13 more RB really is not a good solution.
7	Sony Corporation	We prefer the option "2160MHz as the max. bandwidth, also 2000MHz will be specified as a channel bandwidth, both licensed and unlicensed operations". We think 2160 MHz should be introduced to achieve the better co-existence, and it is not necessary to have two maximum channel bandwidth. 2000 MHz channel BW can still be specified anyway in this case. However, as a compromise, we can also accept the option "2160MHz for unlicensed operation and 2000MHz for licensed operation" if that would be the majority view.
8	Huawei Technologies Sweden AB	we support option 1. We are not convinced by the argument to align with 802.11ad,/ay for now. As there is related LS to RAN1 mentioning that both 2000MHz and 2160MHz are under discussion for max channel bandwidth in RAN4, we seen no rush to decide it this meeting. The proposal to further discuss this topic together with the channelization of licensed and un-licensed bands seems reasonable.
9	LG Electronics Finland	We prefer 2160MHz for unlicensed operation and 2000MHz for licensed operation. We are OK with 2160MHz as max BW, but think that 2000MHz may make more sense for licensed part and should therefore be included as one of the supported bandwidths.

Item	Company	Comments
10	Nokia Denmark	Our preference is option 2 (2160MHz as the max. bandwidth, also 2000MHz will be specified as a channel bandwidth, both licensed and unlicensed operations) as this covers both options. However, can accept option 3 (2160MHz for unlicensed operation and 2000MHz for licensed operation) as compromise.

Issue 3-1-3 (Carrier aggregation support)

Feedback Form 21: 2nd round comment on the Issue 3-1-3 (Carrier aggregation support)

Item	Company	Comments
1	vivo Communication Technology	We agree CA needs further study. In our understanding, we don't need CA to support channel bandwidth less than or equal to 2000MHz, which single carrier can cover. CA is need for supporting channel bandwidth larger than 2000MHz.
2	Qualcomm Austria RFFE GmbH	We think it would be good to come back to this in the May meeting. Even though the time is way to short between meetings maybe this will give companies some time to propose some CA classes. Definitely we need to enable CA.
3	Qualcomm Austria RFFE GmbH	Additional note we absolutely need CA for bandwidths <2000 MHz. There are many types of devices in the WID and many of the will not support the 2000 MHz type wide bandwidth.
4	Qualcomm Austria RFFE GmbH	I wish this thing allowed edits. Let me modify the above. We either need CA or we need a sufficient number of smaller bandwidths supported. That is discussion for next meeting.
5	Apple AB	It would be indeed beneficial to clarify which combinations we prioritise. We did the same exercise for NR-U to limit the scope to the reasonable limit.
6	Charter Communications, Inc	We support carrier aggregation. If we want NR-U in 60 GHz to be competitive with Wi-Fi, we should allow up to 4 CC's and max aggregation of 8.64 GHz as ad/ay does.
7	CATT	Agree CA should be supported. The CA case could be small CBW can be aggregated to large CBW, such as $5 * 400MHz$ can be $2000MHz$. And $n * 2000MHz$ can also be discussed. Agree that single carrier should be in high priority if there's no problem for CA from system parameter point of view.
8	Sony Corporation	We agree that CA should be supported.

Item	Company	Comments
9	Huawei Technologies Sweden AB	We need more analyses and discussion on this to define what are the prioritized scenarios. If we want to be competitive with wigig, the support of CA is needed. Agree with some above comments, that CA for channel BWs smaller than 2000MHz is expected to be also useful for spectrum utilization purposes, and to consider devices with various capabilities.
10	LG Electronics Finland	We support earlier way forward to "build" CA with 400MHz blocks up to MaxBW,, but also wider bandwidths are needed, like NxMaxBW. Would be good to agree priorities and pick the most important combinations in May meeting.
11	Nokia Denmark	We do think CA should be supported, including also CA supporting total bandwidth less than 2000/2160 MHz, but are fine to allow further checking until next meeting

Issue 3-2-1 (Harmonize licensed and unlicensed channelization)

Feedback Form 22: 2nd round comment on the Issue 3-2-1 (Harmonize licensed and unlicensed channelization)

Item	Company	Comments
1	MediaTek Inc.	We still believe that harmonization would be preferable as a baseline design target. Not sure how the LBT question is relevant here except for 2.16GHz channel sizes (which we still have not agreed whether to specify yet).
2	Ericsson LM	<ul style="list-style-type: none"> • None of the European standards for frequency ranges c1-c3 does not specifies a channel raster (the nominal channel bandwidth is declared) • Adopting a "fixed" channelization design restricts the potential channel positions to a subset of the possible ARFCNs. It is sufficient to define at least a single sync raster point (GSCN) for each channel centre frequency. • Choosing a "fixed" channel design reduces UE SSB search complexity. • Choosing a "fixed" channel design does not require alignment of IEEE; even though harmonization (same raster for licensed and unlicensed) can be possible

Item	Company	Comments
3	vivo Communication Technology	We think it is not likely to have a consensus on Issue 3-2-1 in this meeting. We only have one comment, what is this LBT requirement has to do with whether to harmonize licensed and unlicensed channelization? In early GTW session, some company expressed the meaning that ‘if LBT is mandated, then need to consider the alignment with IEEE channel; if no LBT, then do not need to consider the alignment with IEEE channel.’ Is this the common understanding?
4	Beijing Xiaomi Mobile Software	1, We don’t see the LBT requirement is directly linked to the fixed channelization. 2, Even though regulations doesn’t specify the channel raster(actually they never do that if we check Wifi ETSI 300 328 and ETSI 301 893, no channel raster is defined in those specific regulation specs), the alignment with IEEE channel is for co-existence issue and should be considered for un-licensed bands. 3, For licensed band, the NR like channelization can apply. Hence we believe different channelization is needed for licensed and unlicensed bands.
5	Ericsson LM	Correction: None of the European standards for frequency ranges c1-c3 specify a channel raster (the nominal channel bandwidth is declared)
6	Apple AB	we see the benefit to harmonize sync raster design to reduce the number of hypothesis during the initial access, e.g. the sync raster of unlicensed operation can be the subset of licensed one for the spectrum which can be both unlicensed and licensed. However, that does not mean licensed and unlicensed ones should have identical sync raster definition.
7	Apple AB	We also agree with other companies’ comments that co-existence issue with 802.11 should be considered during the unlicensed band channelization discussion
8	Charter Communications, Inc	The channelization and raster should satisfy at least three conditions: 1) the US unlicensed band of 14 GHz should be fully utilized for 120kHz, 480kHz, 960 kHz SCS without wasting spectrum 2) If required, NR can be assigned 2.16 GHz channels that are aligned with 11ad at 960kHz SCS 3) If the channel bandwidth is smaller than 2.16 GHz (e.g., using 480 kHz SCS), then we should be able to define a corresponding NR channel that does not overlap with more than 1 802.11ad channel.
9	CATT	We can design licensed and unlicensed channelization first and at the same time to see if it’s beneficial to harmonize them. Just arguing this in high level may not be easy to reach a conclusion.

Item	Company	Comments
10	Huawei Technologies Sweden AB	It is unlikely to have conclusion on this during this meeting. The harmonization shall be seen as nice-to-have conclusion based on discussions in licensed, and separate unlicensed discussion. Harmonization shall not be the pre-assumptions for the discussion.
11	LG Electronics Finland	We propose to come back to this in May meeting.
12	Nokia Denmark	We see a benefit of a single raster where a subset can be used for NR-U. The overall raster should be optimised considering the spectrum available. However, at the least the NR-U subset raster points should be aligned to other technologies deployed in same spectrum. The alignment does not have to be exact but close enough to enable alignment with reasonable accuracy dependent on manufacturer choice. These design principles should ensure an overall efficient design and at the same time alleviate concerns on alignment with IEEE some companies have.

Issue 3-2-2 (Channelization for licensed band)

Feedback Form 23: 2nd round comment on the Issue 3-2-2 (Channelization for licensed band)

Item	Company	Comments
1	MediaTek Inc.	None of Options 1, 2, 3. Would propose a fixed raster, harmonized where possible with what we agree for unlicensed. But probably the details of this are not urgent to define now.
2	Ericsson LM	See Ericsson comments from Issue 3-2-1
3	vivo Communication Technology	We can come back for this issue the next meeting.
4	Beijing Xiaomi Mobile Software	We think option 2 can be a starting point.
5	Apple AB	FR2 liked channelization can be extended to 60GHz range.
6	Charter Communications, Inc	We agree with Mediatek's proposal
7	CATT	The two options can be discussed further to see the pros and cons in next meeting.

Item	Company	Comments
8	Huawei Technologies Sweden AB	Option 2 as starting point, but it seems to be pre-mature to decide this meeting. More analysis needed.
9	Nokia Denmark	See 3-2-1

Issue 3-2-3 (Channelization for unlicensed band)

Feedback Form 24: 2nd round comments on the Issue 3-2-3 (Channelization for unlicensed band)

Item	Company	Comments
1	MediaTek Inc.	Our 1st round comment was actually that a fixed raster seems best but alignment with IEEE should be FFS. Note also that the meaning of "sub-channelization" is still unclear as the smaller channel bandwidths are not a factor of 2.16GHz. So we don't agree that Option 1A includes Option 1, and don't agree at this stage with Option 1 either. Maybe we could all agree that for unlicensed we target a fixed channelization, and whether or not to align with IEEE channels is FFS.
2	Ericsson LM	See Ericsson comments from Issue 3-2-1
3	vivo Communication Technology	We tend to leave this issue open. We don't have consensus whether to introduce 2.16GHz for 60GHz. What if we agree for only introduce 2000MHz for both licensed and unlicensed bands?
4	Beijing Xiaomi Mobile Software	See our comments in issue 3-2-1.
5	Apple AB	Similar comments as 3-2-1 that two issues should be considered. One is to harmonize with licensed band channelization. The other is co-existence with 802.11 ad/ay, which includes our previous proposal to define 2.16GHz as the maximum CBW for unlicensed band.
6	Charter Communications, Inc	We should have a fixed raster design and analyze ieee channel alignment against the lowest spectrum wastage as possible
7	CATT	We should first have common understanding what's the regulation status. Some company said no LBT is needed. Some company said LBT is mandatory.

Item	Company	Comments
8	Huawei Technologies Sweden AB	Prefer to have more time to analyze it, including also the sub-channelization. Suggest to postpone the decision till May meeting.
9	Nokia Denmark	See 3-2-1
10	Intel	ETSI BRAN EN 302 567 clause 4.2.5 requires LBT as mandatory for 60 GHz, i.e., "LBT is mandatory to facilitate spectrum sharing", while FCC does not require LBT for 60 GHz (FCC 47CFR 15.255 or TR 38.805)

5 Recommendation for Tdocs

5.1 1st round

New tdocs

Table 4:

Title	Source	Comments
NR on 52.6 - 71 GHz work plan	Intel	A revised work plan
WF on [137] NR_ext_to_71GHz_Part1	Intel	Aim to capture the agreement during GTW and NWM discussions
<i>reply LS to RAN1 on max/min CBW and channelization for NR operation in 52.6 - 71 GHz</i>	<i>Intel</i>	<i>Aim to reply on RAN1 LS</i>

Existing tdocs

Table 5:

Tdoc number	Title	Source	Recommendation	Comments
R4-2105410	WF on [137] NR_ext_to_71GHz_Part1	Intel	Agreeable	

R4-2105411	Reply LS on channel bandwidth for frequency extended to 71 GHz	Intel	Agreeable	
R4-2105412	NR on 52.6 - 71 GHz work plan	Intel	Agreeable	

Notes:

Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.

For the Recommendation column please include one of the following:

CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued

Other documents: Agreeable, Revised, Noted

For new LS documents, please include information on To/Cc WGs in the comments column

Do not include hyper-links in the documents

5.2 2nd round