**3GPP TSG- Meeting # *xxxx***

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**Agenda item:** 8.5

**Source:** Moderator (Ericsson)

**Title:** Topic summary for [108][129] NR\_channel\_raster\_enh

**Document for:** Information

# Introduction

This document is a summary of the proposals made in the contributions submitted under AI 8.5 for the RAN4 #108 meeting.

# Topic #1: Alternatives to address WI objectives

This topic addresses the different approaches and alternatives to answer the WID objectives. Also, it initiates discussion on the the backward compatibility of positioning the SIB1 carrierBandwidth off the 100 kHz channel raster for legacy UEs.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2313503**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2313503.zip) | Google | **Proposal 1: Introduce the new channel raster with 10KHz as the step size for both UE and gNB in all FR1 bands below 3GHz that currently have 100KHz channel raster.****Proposal 2: Introduce an optional per-UE capability from Rel-18 to indicate the support of new channel raster with 10KHz as the step size for all FR1 bands below 3GHz that currently have 100 kHz channel raster.** |
| [**R4-2311067**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2311067.zip) | China Telecom | ***Observation 1:*** *No restriction on the location of UE-specific channel bandwidth.****Proposal 1：****UE capability can be introduced to support flexible location of UE-specific channel bandwidth.****Proposal 2：****UE capability can be per UE.****Proposal 3:*** *The granularity of 10MHz can be considered for SIB1 channel bandwidth.* |
| [**R4-2311220**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2311220.zip) | Apple | **Proposal 1a: Consider enhanced channel raster as 5 or 10kHz.****Proposal 1b: Enhanced channel raster is defined at least for the UE side.****Proposal 1c: Enhanced channel raster can be defined also for the network side.****Proposal 2: Enhanced channel raster is applicable at least for the FR1 bands below 3GHz.****Proposal 3a: Enhanced channel raster is optional for bands in earlier releases.****Proposal 3b: It should be discussed further whether enhanced channel raster is optional or mandatory for the bands starting from Rel-18.****Proposal 4a: Send LS to RAN WG2 asking to add a new per-band UE capability to indicate whether a UE supports enhanced channel raster for a particular band.****Proposal 4b: Send LS to RAN WG2 asking whether the per-band UE capability for the flexible channel raster can be introduced to earlier releases, and if so, which release.** |
| [**R4-2311819**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2311819.zip) | CMCC | **Proposal 1: For Ap1, specify new channel raster step size as 5KHz for both UE and gNB, and for all FR1 bands below 3GHz that currently have 100KHz channel raster.****Proposal 2: For Ap1, For NR operating bands with 100KHz channel raster, ΔFRaster is changed to** **ΔFRaster = ~~20 ×~~ ΔFGlobal in both 38.101-1 and 38.104.****Proposal 3: For Ap2, the specification updates proposed in R4-2307738 can be considered as starting point with the consideration that Rel-18 UE should mandatory support center frequency located off 100KHz.** |
| [**R4-2312020**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312020.zip) | ZTE Corporation | ***Proposal 1: Above is the expected specification’s updates of approach 2.*** |
| [**R4-2312163**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312163.zip) | Ericsson | **Observation 1: if the resource grid size (BS transmission bandwidth configuration) is odd for SCS = 15k, then only one of 15k and 30k resource grids supported by an RF channel can be centred on the 100k channel raster****Observation 2: core requirements in 38.101-1 apply with at least one of the carriers (one per numerology as advertised in SIB1) supported by the RF channel centred on the channel raster. The bandwidth (MHz) of the RF channel accommodates the channel bandwidths of the two carriers.** **Observation 3: conformance test requirements in 38.521-1 are carried out with the carrier centred on the 100k channel raster for each numerology and corresponding channel bandwidth. The BWP#0 is equal to the maximum transmission bandwidth configuration of the channel bandwidth under test, no UE-specific channel bandwidth configured.**and propose that**Proposal 1: make clear in clause 5.4.2.2 of both the BS and UE specifications that the “RF channel” is mapped to the channel raster at the centre of a carrier resource grid for at least one numerology supported by the RF channel as advertised in SIB1.** The objectives of the work item can be met without adding additional raster entries. For enhancing the channel raster**Proposal 2: do not add additional channel raster entries for the BS and UE, the network should be able to use the RRC specification for configuring the UE with locations of the UE-specific channel bandwidth within a wider cell-specific channel bandwidth. UEs capable of locating the UE-specific channel bandwidth according to RRC (with PRB granularity) are subject to capability and meet additional requirements for the UE-specific channel bandwidth.**For alternative solutions we observe that**Observation 4: should additional channel-raster entries be specified nevertheless a channel raster granularity > 10 kHz would not meet the objective of the work item.****Observation 5: changes to the channel raster implies additional raster entries for all bands to be updated in all specifications including conformance specifications. Not all entries can accommodate an SSB. The nominal carrier spacing must be modified to apply at a sub-set of channel raster entries corresponding to a 100k granularity for backwards compatibility and the nominal CA spacing must be modified for bands with a 100k raster (NBC).** **Proposal 3: regardless of the solution chosen, any restriction(s) of legacy UE implementations at initial access such as BWP location, carrier bandwidth and SIB1 decoding must be clarified to avoid UE malfunction or failed access in the field.** |
| [**R4-2312314**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312314.zip) | Huawei, HiSilicon | **Observation** 1: 10 kHz raster is the best option to consider the flexibility, compatibility of 100 KHz and limit the number of raster entries.**Observation** 2: if a new UE capability is introduced, gNB knows which UE can be configured with channel bandwidth on any 10 KHz raster, and which UE (legacy UE) can be configured on 100 KHz raster only. There is no NBC issue for new channel raster approach.**Observation** 3: If we can justify that no RF requirement is needed for the case that UE specific channel bandwidth is not on the 100 KHz channel, approach 2 can be considered.**Proposal 1**: Further discussion on the following alternatives:* + Approach 1: Specify a new channel raster
1. New channel raster step size: 10 kHz
2. The new channel raster should be specified for both UE and gNB.
3. The new channel raster should be specified for all FR1 bands below 3GHz that that currently have 100 kHz channel raster.
	* Approach 2: Do not specify new channel raster entries
4. First to discuss whether RF requirement is needed for the case that UE specific channel bandwidth is not on the 100 KHz channel. If the answer is no then approach 2 should be ok.
5. No change on the channel raster for gNB is needed.
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| [**R4-2312439**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312439.zip) | Qualcomm Incorporated | **Proposal 1: Introduce new channel raster entries with 50kHz granularity.****Proposal 2: The new channel raster entries should be specified for both UE and base station.****Proposal 3: The channel raster changes(additions of new channel raster entries) should be based on operator requests and not apply generically to all bands.****Observation 1: UE/gNB RF requirements apply based on the condition that the channel is placed on a valid channel raster entry.** **Observation 2: “Offraster” placement would violate one of the basic principles of the RAN4 requirements.****Observation 3: The RRC specifications (TS 38.331) do not “supersede” the RAN4 specifications. Not any possible RRC parameter configuration is defined/supported by the RAN4 specifications.****Observation 4: Allowing any channel placement that is enabled by the currently defined signaling will create design/testing issues and could lead to forward/backward compatibility problems in the future.** |
| [**R4-2312525**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312525.zip) | Nokia, Nokia Shanghai Bell | ***Proposal 1: RAN4#108 first discusses whether, and if so, what side conditions or limitations (e.g. w.r.t. fulfilling only the regulatory rather than 3GPP's RF performance requirements) exist for the RAN4#107 agreement on carrierBandwidth in SIB1 positioning off the 100 kHz grid for legacy UEs before discussing how to specify the future channel raster.******Proposal 2: RAN4 checks that the legacy UEs fulfil 3GPP's RF performance requirements in a single numerology case if**** + ***the carrierBandwidth in SIB1 is a maximum transmission BW configuration for the operating band (e.g. 52 RBs at 15 kHz SCS for a channel BW of 10 MHz), positioned off the 100 kHz channel raster (e.g. in band 8 centered at 940.05 MHz in the DL),***
	+ ***no UE specific channel BW is signaled,***
	+ ***the active BWP is the initial BWP and has the same BW and location off the 100 kHz channel raster as the carrierBandwidth in SIB1 (e.g., including guard bands, from 935.05 to 945.05 MHz in the DL).***

***Proposal 3: If the check of the previous proposal is successful, RAN4 explains why some legacy UEs need the UE specific channel BW signaled in connected mode to be on the 100 kHz channel raster although they need not configure their channel BW on the 100 kHz raster.******Observation 1: Even a carrier configuration where the UE's channel BW has the maximum offset of 50 kHz to the 100 kHz channel raster can fulfil the channel raster related requirement in TS 38.101-1 subclause 5.4.2.2: “The mapping must apply to at least one numerology supported by the UE.”******Proposal 4: RAN4 should check whether the channel raster related requirement in TS 38.101-1 subclause 5.4.2.2******“The mapping must apply to at least one numerology supported by the UE.”******ensures that legacy UEs' channel raster needs are met or whether the requirement should better be more specific w.r.t. which numerology should be on the channel raster.******Observation 2: For 5 MHz carriers, some locations off the 100 kHz channel raster are incompatible with the synchronization raster. Currently, TS 38.101-1 addresses this issue only for band n41, which indicates that 5 MHz carriers outside band n41 were meant to be on the 100 kHz channel raster.******Proposal 5: RAN4 should discuss whether no longer requiring to place the carrierBandwidth advertised in SIB1 on the 100 kHz channel raster requires, for consistency with the explicitly listed restrictions by the SSB in band n41, adding a note similar to note 11 in TS 38.101-1 table 5.3.5-1.******Observation 3: For a given SIB1 carrier BW and location, the requirements that anyway apply to the location of the UE specific channel BW result in much fewer allowed locations than any of the proposed new channel rasters.******Proposal 6: For new UEs supporting UE specific channel BWs off the 100 kHz channel raster: Instead of specifying any channel raster for the UE specific channel BW, just the restrictive conditions should be applied that anyway must already be fulfilled today.******Proposal 7: In a UE specific channel BW signaled to a UE not supporting the channel raster enhancement feature, at least one numerology in downlinkChannelBW-PerSCS-List and uplinkChannelBW-PerSCS-List that begins and/or ends at an edge of the UE specific channel BW shall be on the 100 kHz channel raster to prevent that the legacy UE must center its channel BW off the 100 kHz channel raster.*** |
| [**R4-2313616**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2313616.zip) | MediaTek Inc. | **Observation 1: For Case 1-2 and 1-3 where both BS and UE CBW are on 100kHz channel raster, but with odd/even or even/odd PRB numbers, it is not possible to assign such a UE specific CBW within the wider BS CBW.****Observation 2: For Case 1-1 and Case 1-4 where both BS and UE specific CBW are on 100k channel raster and have odd/odd, or even/even number of PRBs, the distance between centers of BS and UE carriers must be integer times of 5 PRBs.****Observation 3: For Case 2-2 and 2-3 where SIB1 carrier is off 100kHz channel raster, but with odd/even or even/odd PRB numbers for SIB1 and UE specific CBW, the center of SIB1 carrier should be on a 10kHz grid**.**Observation 4: For Case 2-1 and 2-4 where SIB1 carrier is off 100kHz channel raster, but with odd/odd or even/even PRB numbers for SIB1 and UE specific CBW, the center of SIB1 carrier should be on a 20kHz grid.****Proposal 1: In order to guarantee that a legacy UE can be assigned with a specific CBW within a wider BS channel, the center of SIB1 carrier should still be on a 10kHz grid if it is off 100kHz channel raster.****Proposal 2: If RAN4 agrees to introduce a new channel raster, then the step size should be 10kHz, and a new nominal channel spacing should be specified for the carriers on the new channel raster.****Proposal 3: If RAN4 agrees not to introduce a new channel raster, then Approach #2 – Alt. #3 could be a solution with a minimum spec impact.** |

## Open issues summary

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

### Sub-topic 1-1

*Sub-topic description:* Nokia proposes some preliminary discussions and clarify some topics/use cases before progressing on the channel raster enhancement.

**Issue 1-1: Preliminary discussion**

* Proposals: RAN4 should discuss the following aspects:
1. Whether, and if so, what side conditions or limitations (e.g. w.r.t. fulfilling only the regulatory rather than 3GPP's RF performance requirements) exist for the RAN4#107 agreement on carrierBandwidth in SIB1 positioning off the 100 kHz grid for legacy UEs before discussing how to specify the future channel raster. (Nokia)
2. Checks that the legacy UEs fulfil 3GPP's RF performance requirements in a single numerology case if
	1. the carrierBandwidth in SIB1 is a maximum transmission BW configuration for the operating band (e.g. 52 RBs at 15 kHz SCS for a channel BW of 10 MHz), positioned off the 100 kHz channel raster (e.g. in band 8 centered at 940.05 MHz in the DL),
	2. no UE specific channel BW is signaled,

the active BWP is the initial BWP and has the same BW and location off the 100 kHz channel raster as the carrierBandwidth in SIB1 (e.g., including guard bands, from 935.05 to 945.05 MHz in the DL). (Nokia)

1. If the check of the previous proposal is successful, RAN4 explains why some legacy UEs need the UE specific channel BW signaled in connected mode to be on the 100 kHz channel raster although they need not configure their channel BW on the 100 kHz raster (Nokia)
2. check whether the channel raster related requirement in TS 38.101-1 subclause 5.4.2.2

“The mapping must apply to at least one numerology supported by the UE.”

ensures that legacy UEs' channel raster needs are met or whether the requirement should better be more specific w.r.t. which numerology should be on the channel raster. (Nokia)

1. whether no longer requiring to place the carrierBandwidth advertised in SIB1 on the 100 kHz channel raster requires, for consistency with the explicitly listed restrictions by the SSB in band n41, adding a note similar to note 11 in TS 38.101-1 table 5.3.5-1. (Nokia)
2. whether RF requirement is needed for the case that UE specific channel bandwidth is not on the 100 KHz channel (Huawei)
* Recommended WF
	+ As it’s already the 3rd meeting for this WI, considering there will be limited time allocated during the online session, the above discussions should preferably be organized offline by requestors, before AI 8.5 is discussed in the main session.

### Sub-topic 1-2

*Sub-topic description* In the last RAN4#106-bis and RAN4#107 meetings, several approaches and alternatives were discussed. Many companies have compared in last meeting, as agreed in the way forward R4-2306598. Based on the past discussion, this sub-topic is capturing the down-selection, proposing a down-selection of the different options.

Nota that, for each approach and alternative, the additional clarifications proposed in this meeting are indicated with “(updated)”

**Issue 1-2: Approaches and alternatives comparison.**

* Proposals
	+ Approach 1: Specify a new channel raster (Google, Apple, CMCC, Huawei, Qualcomm)
1. FFS what would be the new channel raster step size:

 Option 1: 5 kHz

 Option 2: 10 kHz

 Option 3: 50 kHz

1. The new channel raster should be specified for:

 both UE and gNB.

1. FFS on for which bands this new channel raster should be specified:

Option 1: Operating FR1 bands below 3 GHz that currently have 100 kHz channel raster.

 Option 2: On operators’ request

1. (updated) ΔFRaster shall be updated to ΔFRaster = ~~20 ×~~ ΔFGlobal
	* Approach 2: Do not specify new channel raster entries (ZTE, Huawei if RF requirement is not needed for the case that UE specific channel bandwidth is not on the 100 KHz channel)
		+ Alternative 1 (Ericsson, CMCC)
		1. Clarify in clause 5.4.2.2 of both the BS and UE specifications that the “RF channel” is mapped to the channel raster at the centre of a carrier grid of a serving cell for at least one numerology as advertised in SIB1.
		2. The network should be able to use the RRC specification for configuring the UE with locations of the UE-specific channel BW within a wider cell-specific bandwidth.
		3. (updated) UEs capable of locating the UE-specific channel bandwidth according to RRC (with PRB granularity) are subject to capability and meet additional requirements for the UE-specific channel bandwidth.
		+ Alternative 3: (Nokia, MediaTek)
2. For operating bands with a 100 kHz channel raster, the UE can signal a capability to support a UE specific channel BW that
	* consists of a contiguous subset of RBs from SCS-SpecificCarrier in SIB1 and
	* is a maximum transmission BW configuration
	* but need not be centered on the channel raster.
3. For UEs with the capability to support a UE specific channel BW off the 100 kHz raster in corresponding operating bands, the natural raster for the UE specific channel BW is the RB grid of the carrier bandwidth in SIB1. (For a given numerology and location of the SIB1 carrier bandwidth, its RB grid is considerably sparser than the proposed channel rasters and it includes only valid frequency locations, hence rather the RB grid of the carrier bandwidth in SIB1 should be specified as raster for the UE specific channel BW than a new channel raster.)
4. For UEs with the capability to support a UE specific channel BW off the 100 kHz raster in corresponding operating bands, it is suggested that they support SIB1 carrier bandwidths off the 100 kHz raster as well (step size given here by the global frequency raster) – at least, if a backward compatible solution for SIB1 carrier bandwidths off the 100 kHz raster is found. (Otherwise, the network would only be able to safely make use of it in new operating bands in which all UEs must have this capability, and the benefit would be very limited.)
5. Clarify in TS 38.104 that the channel raster only applies to
	* the SCS-SpecificCarrier in SIB1 and
	* the UE specific channel BW

that are signalled to UEs even if the BS transmits a wider bandwidth than signalled in SIB1.

1. (updated) In a UE specific channel BW signalled to a UE not supporting the channel raster enhancement feature, at least one numerology in downlinkChannelBW-PerSCS-List and uplinkChannelBW-PerSCS-List that begins and/or ends at an edge of the UE specific channel BW shall be on the 100 kHz channel raster to prevent that the legacy UE must center its channel BW off the 100 kHz channel raster.
* Recommended WF
	+ Based on the past discussion, agreed way forwards and the majority’s view, the recommended way forward is to select one of the following approaches and alternative:
		- Approach 1:
			* Specify a new 10 kHz channel raster.
			* The new channel raster should be specified for both UE and gNB.
			* This new channel raster should be specified for the operating FR1 bands below 3 GHz that currently have 100 kHz channel raster.
			* ΔFRaster shall be updated to ΔFRaster = ~~20 ×~~ ΔFGlobal
* Approach 2
	+ - Alternative 1
		1. Clarify in clause 5.4.2.2 of both the BS and UE specifications that the “RF channel” is mapped to the channel raster at the centre of a carrier grid of a serving cell for at least one numerology as advertised in SIB1.
		2. The network should be able to use the RRC specification for configuring the UE with locations of the UE-specific channel BW within a wider cell-specific bandwidth.
		3. (updated) UEs capable of locating the UE-specific channel bandwidth according to RRC (with PRB granularity) are subject to capability and meet additional requirements for the UE-specific channel bandwidth.
		- Alternative 3:
1. For operating bands with a 100 kHz channel raster, the UE can signal a capability to support a UE specific channel BW that
	* consists of a contiguous subset of RBs from SCS-SpecificCarrier in SIB1 and
	* is a maximum transmission BW configuration.
	* but need not be centered on the channel raster.
2. For UEs with the capability to support a UE specific channel BW off the 100 kHz raster in corresponding operating bands, the natural raster for the UE specific channel BW is the RB grid of the carrier bandwidth in SIB1. (For a given numerology and location of the SIB1 carrier bandwidth, its RB grid is considerably sparser than the proposed channel rasters and it includes only valid frequency locations, hence rather the RB grid of the carrier bandwidth in SIB1 should be specified as raster for the UE specific channel BW than a new channel raster.)
3. For UEs with the capability to support a UE specific channel BW off the 100 kHz raster in corresponding operating bands, it is suggested that they support SIB1 carrier bandwidths off the 100 kHz raster as well (step size given here by the global frequency raster) – at least, if a backward compatible solution for SIB1 carrier bandwidths off the 100 kHz raster is found. (Otherwise, the network would only be able to safely make use of it in new operating bands in which all UEs must have this capability, and the benefit would be very limited.)
4. Clarify in TS 38.104 that the channel raster only applies to
	* the SCS-SpecificCarrier in SIB1 and
	* the UE specific channel BW

that are signalled to UEs even if the BS transmits a wider bandwidth than signalled in SIB1.

1. In a UE specific channel BW signalled to a UE not supporting the channel raster enhancement feature, at least one numerology in downlinkChannelBW-PerSCS-List and uplinkChannelBW-PerSCS-List that begins and/or ends at an edge of the UE specific channel BW shall be on the 100 kHz channel raster to prevent that the legacy UE must center its channel BW off the 100 kHz channel raster.

### Sub-topic 1-3

**Issue 1-3-1: Additional clarification – initial access**

* Proposals: Regardless of the solution chosen, any restriction(s) of legacy UE implementations at initial access such as BWP location, carrier bandwidth and SIB1 decoding must be clarified to avoid UE malfunction or failed access in the field
	+ Agree
	+ Disagree
* Recommended WF
	+ TBA

**Issue 1-3-2: Additional clarification – SIB1 carrier**

* Proposals: In order to guarantee that a legacy UE can be assigned with a specific CBW within a wider BS channel, the center of SIB1 carrier should still be on a 10kHz grid if it is off 100kHz channel raster
	+ Agree
	+ Disagree
* Recommended WF
	+ TBA

### Draft CRs or proposed changes to specifications

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2312164**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312164.zip) | Ericsson | Draft CR: Clarification of the channel raster and capability for UE-specific channel bandwidth TS 38.101-1 |
| [**R4-2312165**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312165.zip) | Ericsson | Draft CR: Clarification of the channel raster – TS 38.101-2 |
| [**R4-2312166**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312166.zip) | Ericsson | Draft CR: Clarification of the channel raster – TS 38.104 |
| [**R4-2312315**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312315.zip) | Huawei, HiSilicon | Draft CR to introduce 10 kHz channel raster in Rel-18 |
| [**R4-2312020**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312020.zip) | ZTE | *k* is resource element index, and is PRB number, *NRB* represents transmission bandwidth configuration defined in chapter 5.3.1, which is given by *carrierBandwidth* indicated in downlinkConfigCommonSIB1 or uplinkConfigCommonSIB1.Proposal 1: Above is the expected specification’s updates of approach 2. |

# Topic #2: NTN aspects

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2311221**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2311221.zip) | Apple, Globalstar, Ligado Networks, Inmarsat, Hughes/Echostar | Proposal: Following the existing agreement from RAN4#106bis WF, channel raster enhancements agreed for the FR1 TN bands will be also applicable to the FR1 NTN bands. |
| [**R4-2311820**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2311820.zip) | CMCC | **Observation: Since NTN supports maximum 20MHz bandwidth, it may not face the even/odd PRB issue.****Proposal: If Approach 2 (do not specify new channel raster entries) is selected, prefer to adopt the same changes in NTN spec.****Proposal 2: The previous agreement that the carrierBandwidth advertised in SIB1 does not have to be placed on the 100KHz raster should also apply to NTN.** |
| [**R4-2313617**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2313617.zip) | MediaTek Inc. | **Proposal 1: The agreement on SIB1 positioning off the 100kHz grid for legacy UEs is also applicable for NR NTN.****Proposal 2: For NR NTN, in order to guarantee that a legacy UE can be assigned with a specific CBW within a wider BS channel, the center of SIB1 carrier should still be on a 10kHz grid if it is off 100kHz channel raster.****Proposal 3: If RAN4 agrees to introduce a new channel raster for NR NTN, then the step size should be 10kHz in order to guarantee a legacy UE is able to access a SIB1 carrier on a new channel raster entry.****Proposal 4: If RAN4 agrees not to introduce a new channel raster for NR NTN, then Approach #2 – Alt. #3 could be a solution with a minimum spec impact.** |

## Open issues summary

### Sub-topic 2-1: Channel raster enhancement and NTN

**Issue 2-1-1: NTN applicability**

* Proposals: channel raster enhancements agreed for the FR1 TN bands will be also applicable to NTN:
	+ Yes (Apple, Globalstar, Ligado Networks, Inmarsat, Hughes/Echostar, CMCC, MediaTek, Ericsson)
		- If Approach 2 (do not specify new channel raster entries) is selected, prefer to adopt the same changes in NTN spec (CMCC)
		- The previous agreement that the carrierBandwidth advertised in SIB1 does not have to be placed on the 100KHz raster should also apply to NTN. (CMCC, MediaTek)
	+ No
* Recommended WF
	+ This was already agreed in RAN4#106bis, channel raster enhancement is also applicable to NTN. Following this, the changes made to TN will also be made to NTN.

### Draft CRs or proposed changes to specifications

|  |  |  |
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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2312167**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312167.zip) | Ericsson | Draft CR: Clarification of the channel raster and capability for UE-specific channel bandwidth TS 38.101-5 |

# Topic #3: UE capability

**Note that some contributions listed in topic#2 made also some proposals related to a new UE capability. Even if those contributions are not listed below, those proposals have still been captured in this section.**

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2311821**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2311821.zip) | CMCC | **Proposal 1: For eMBB UEs, support of configuration of off 100KHz channel raster is optional and can be release independent from Rel-15.** **Proposal 2: For RedCap UEs, support of configuration of off 100KHz channel raster is mandatory from Rel-17.** **Proposal 3: For UEs from Rel-18 onwards, support of new channel raster should be mandated.** **Proposal 4: If it is agreed to define UE capability, define per UE capability.** |
| [**R4-2312021**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312021.zip) | ZTE Corporation | ***Proposal 1: Whether one band needs to do channel raster enhancement is unclear, there is no reason to require the new capability supported by some bands, it’s better that new UE capability is applicable to per UE.******Proposal 2: To increase configuration flexibility and avoid NBC issue, this UE capability shall be optional in R17. It’s better to be mandatory from Rel-18.*** |
| [**R4-2312168**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312168.zip) | Ericsson | Draft LS to RAN2 on a capability for UE-specific channel bandwidth location |
| [**R4-2312316**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312316.zip) | Huawei, HiSilicon | **Proposal 1**: a new UE capability is needed for the UE to support new channel raster (Approach 1) or for the UE to support UE specific channel bandwidth is not on the 100 KHz raster (Approach 2).**Proposal 2**: further discuss whether all these bands with 100 kHz channel raster are required to support denser channel raster (per UE), or it will depend on the operator’s request (per band).**Proposal 3:** the new UE capability is applicable from Rel-17. |
| [**R4-2312440**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312440.zip) | Qualcomm Incorporated | **Proposal 1: The channel raster changes(additions of new channel raster entries) should be based on operator requests and not apply generically to all bands.****Proposal 2: Introduce a per-band UE capability for support of the enhanced channel raster from Rel-18.****Proposal 3: Earlier implementation of this feature should be further discussed after the actual changes are better understood.** |
| [**R4-2312526**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2312526.zip) | Nokia, Nokia Shanghai Bell | ***Proposal 1: The channel raster enhancement is a capability per UE.******Proposal 2: The channel raster enhancement is release independent from Rel-15.******Proposal 3: The channel raster enhancement should be mandated from Rel-18 and optional for Rel-15/16/17.******Proposal 4: It is proposed to ask RAN2 that the new UE capability signalling is provided for early implementation from Rel-15.*** |
| [**R4-2313618**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_108/Docs/R4-2313618.zip) | MediaTek Inc. | **Proposal 1: To help network to differentiate enhanced channel raster capable UEs from legacy UEs, a new optional UE capability should be introduced to support the feature.****Proposal 2: Introduce the optional UE capability supporting enhanced channel raster as per-UE capability if not considering other aspects e.g., IoDT.****Proposal 3: The optional UE capability can be implemented early from Rel-15 if no potential NBC issue is identified, otherwise, early implementation can be from Rel-17.** |

## Open issues summary

### Sub-topic 3-1: New UE capability

**Issue 3-1-1: UE capability**

* Proposals: Whatever new enhancements will be decided (new channel raster support, SIB1/UE-specific channel BW updates, …), shall they be supported via a new UE capability:
	+ Yes (Nokia, ZTE, Apple, MediaTek, CMCC, Ericsson, Google, China Telecom)
	+ No
* Recommended WF
	+ Yes, a new UE capability is needed to support the objectives of this WI.

**Issue 3-1-2: UE capability applicability**

* Proposals: The new UE capability should be applicable:
	+ Option1: Per band, assuming RAN4 introduces enhanced channel raster (Apple, Qualcomm)
	+ Option2: Per UE (Google, China Telecom, CMCC, Nokia, MediaTek, ZTE, Ericsson)
* Recommended WF
	+ This would depend on what information will be given with this capability (e.g. new channel raster).

**Issue 3-1-3: UE capability – Release applicability**

* Proposals: From which release the UE capability should be introduced? Some options are not exclusive.
	+ Option1: From Rel-15 (Ericsson, Nokia, CMCC, MediaTek if no NBC issue)
	+ Option2: From Rel-17 (Huawei)
	+ Option3: From Rel-18 (Qualcomm)
	+ Option4: Mandatory from Rel-18 (Nokia, CMCC, ZTE, Nokia)
	+ Option5: Optional before Rel18 (Apple, Nokia, CMCC, ZTE)
	+ Option6: For Redcap UEs, support of configuration of off 100KHz channel raster is mandatory from Rel-17 (CMCC)
* Recommended WF
	+ Optional from Rel-15 and mandatory from Rel-18.

For RedCap UEs, mandatory from Rel-17.

### Sub-topic 3-2: LS to RAN2

**Issue 3-2: LS to RAN2**

* Proposals: RAN4 shall send LS to RAN2 requesting to add the new capability
	+ Yes (Apple, Nokia, Ericsson)
	+ No
* Recommended WF
	+ Yes, a LS should be sent to RAN2 requesting for the new UE capability.

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