**3GPP TSG-RAN WG4 Meeting # 104bis-e R4-2216928**

**Electronic Meeting, October 10 – October 19, 2022**

**Agenda item:** 6.10.4

**Source:** Moderator (Intel Corporation)

**Title:** Email discussion summary for [104-bis-e][217] NR\_MG\_enh2\_part2

**Document for:** Information

# Introduction

This document is the email discussion summary for [104-bis-e][217] NR\_MG\_enh2\_part2 with the following topics covered

* Topic 1: Measurement without gaps for UEs reporting NeedForGapsInfoNR (AI 6.10.3.1)
* Topic 2: Inter-RAT measurement without gap (AI 6.10.3.2)

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

* 1st round: Collect views from companies. Make early decision on issues with clear consensus. Decide on the scope, priority, options and tentative agreement to be discussed in the 2nd round.
* 2nd round:
	+ Conclude the issues identified in the 1st round.

Contact information

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Note:

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

# Topic #1: Measurement without gaps for UEs reporting NeedForGapsInfoNR (AI 6.10.3.1)

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

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2215368**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215368.zip) | Intel Corporation | **Observation 1: When UE indicates *NeedForNCSG-NR the exact interruption requirements can be conducted.*** **Observation 2: When UE indicates “no-gap” in *NeedForGapInfoNR , it is ambiguous that whether neither NCSGs nor legacy measurement gaps are be configured by NW.*****Observation 3: How to define the interruption requirements need RAN2 further clarification on the indication of “no-gap” in *NeedForGapsNR* message (e.g. whether it is consistent with that in *“NeedForNCSG-NR****”)****.******Proposal 1: The interruption requirements when UE performing SSB measurements without gap by reporting ‘NeedForGapsInfoNR' can be defined as:***

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|  NW config UE capability | Case a: No MG  |
| Gap | No requirements |
| no-gap | Measurements out of gap,interruption allowed and interruption requirements defined in TS38.133 9.1.9[3]  |
| nogap-noncsg | Measurements out of gap,No interruption allowed |

***Proposal 2: When UE performing SSB measurement with the different “NeedForGapsInforNR” indications, the different RRM requirements of CSSF shall be defined in Rel18.******Proposal 3: Take requirements NCSG requirements as a starting point(9.3.10 in TS38.133[4]) to define the measurement reporting delay requirements for the measurement without gap as UE reporting “NeedForGapInfoNR.*** |
| [**R4-2215427**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215427.zip) | CATT | Requirement for intra-freq measurement without gap**Proposal 1: For both intra-frequency and inter-frequency measurement, reporting ‘*no-gap*’ through *NeedForGapsInfoNR* means measurement without gap and without interruption.****Proposal 2: For intra-frequency measurement, the measurement requirements and scheduling restriction for the case when UE report ‘*no-gap*’ follows the same requirements in Section 9.2.5 of TS38.133 (intra-freq w/o gap), and no other requirements are needed.**Requirement for inter-freq measurement without gap**Proposal 3: For inter-frequency measurement, the case when UE report ‘no-gap’ through NeedForGapsInfoNR should also be defined as inter-frequency measurement without gap, and requirements in Section 9.3.9 of TS38.133 (inter-freq wo/ gap) is taken as a starting point (at least for cell identification and measurement period, scheduling restriction can FFS) for further discussions.****Proposal 4: CSSF in section 9.1.5 need to be updated to include inter-frequency measurement without gap for the case when UE report ‘no-gap’ through NeedForGapsInfoNR.** |
| [**R4-2215467**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215467.zip) | Xiaomi | **Proposal 1: RAN4 to consider following scenarios where UE is capable of reporting ‘no gap’ via *NeedForGapsInfoNR*:*** **Another spare RF chain is available for UE;**
* **The target SSB to be measured is with UE’s active RF chain.**

**Proposal 2: For the interruption requirement when UE support *NeedForGaps*:****Option 1: Interruption is always expected when UE reports ‘no gap’;****Option 2: RAN4 to introduce another UE indication for ‘no gap no interruption’ besides the existing ‘no gap’.****Proposal 3: If the interruption is allowed, RAN4 to take NCSG as a starting point.****Proposal 4: The current requirements in Section 9.2.5 of TS38.133 (intra-freq w/o gap) could be reused for UE indicating ‘no-gap’ via *intraFreq-needForGap*.****Proposal 5:** **For the requirement of inter-freq measurement without gap when UE supporting NeedForGaps capability and indicating ‘no-gap’ via *interFreq-needForGap*, the requirement of Rel-16 inter-frequency without gap could be used as baseline.** |
| [**R4-2215611**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215611.zip) | Apple | **Observation 1: in existing NeedForGap procedure, when UE indicates “no-gap” on target band, UE may or may not cause interruption when measuring target band.****Proposal 1: consider the following two options on interruption design for NeedForGap*** Option 1: interruption is always allowed for “no-gap”
* Option 2: introduce additional UE capability to differentiate whether UE needs interruption

**Proposal 2: interruption length in NeedForGap (if allowed) is same as that defined in NCSG, i.e. 1ms in FR1 and 0.75ms in FR2.****Proposal 3: for measurement on band(s) with no interruption, existing requirements of intra-frequency measurement without gap and inter-frequency measurement without gap shall still apply.****Proposal 4: for measurement on band(s) with interruption, when measurement gap is not configured, UE needs to align interruption location (by align the time location when to switch on/off the RF chain and baseband resource) on all the carriers even though the SMTC length is different on different carriers.****Proposal 5: for measurement on band(s) with interruption, when measurement gap is configured:*** **If the interruption length and SMTC to be measured on all carriers from the bands on which UE indicates ‘no-gap’ can be fully covered by measurement gap, UE shall measure all the carriers within gap. No additional interruption is allowed outside measurement gap.**
* **If the SMTC to be measured on all carriers from the bands on which UE indicates ‘no-gap’ can NOT be fully covered by measurement gap, introduce network signaling to indicate whether UE shall measure the band(s) with ‘no-gap’ with or without measurement gap (similar to *interFrequencyConfig-NoGap-r16*).**
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| [**R4-2215715**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215715.zip) | CMCC | ***Observation 1: according to TS 36.133, if UE is capable of interFreqNeedForGaps or interRATNeedForGaps, the measurement is conducted without gaps and without interruption.******Observation 2: for intra-frequency measurement without gaps when UE indicates ‘no-gap’ via intraFreq-needForGap, the existinng cell identification requirements, measurement period requirements, and scheduling availability specified in TS 38.133 9.2.5 can be resued.******Proposal 1: it is proposed that interruption is not allowed when UE reporting ‘NeedForGapsInfoNR'.******Proposal 2: for intra-frequency measurement without gaps when UE indicates ‘no-gap’ via intraFreq-needForGap, existing requirements on intra-frequency measurement without gaps can be reused (e.g. 9.2.5 in TS 38.133)******Proposal 3: it is proposed to update the definition of inter-frequency SSB based measurements without measurement gaps to include the case when UE indicates ‘no-gap’ via interFreq-needForGap. The detailed update is proposed as following:***

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| TS 38.133A measurement is defined as an inter-frequency SSB based measurements without measurement gaps (either legacy measurement gap or NCSG) for UE capable of *interFrequencyMeas-NoGap* provided- the UE supports *interFrequencyMeas-Nogap-r16* [15], and- the SSB is completely contained in the active BWP of the UE.For UE supporting *ncsg-MeasGapNR-r17* and indicating *NeedForNCSG-InfoNR* for inter-frequency measurement, - An inter-frequency SSB measurement is defined as measurement without gap if- the UE indicates ‘nogap-noncsg’ via *NeedForNCSG-InfoNR* for the inter-frequency measurement, and- the SSB is not completely contained in the active BWP of the UE |

***Proposal 4: for inter-frequency SSB based measurements without measurement gaps when UE indicates ‘no-gap’ via interFreq-needForGap, it is proposed to take 9.3.10.3 as baseline to define scheduling availability。*** ***Proposal 5: for inter-frequency measurement without gaps when UE indicates ‘no-gap’ via interFreq-needForGap, it is proposed to specify cell identification (including PSS/SSS detection and time indec detection) and measurement period requirements by updating exsiting requirements (taking 9.3.4 or 9.3.10 as baseline).***  |
| [**R4-2215822**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215822.zip) | OPPO | **Proposal-1: Support option 3: Introduce additional UE capability to differentiate whether UE needs interruption.****Proposal-2: Take NCSG as a starting point to define the interruption:*** **For interruption length, reuse VIL**
* **For interruption location, use the boundary of SMTC as the starting/ending pointing**

**Proposal-3: To define requirements for measurement without gap:** * **Measurement delay requirements:**
	+ **For intra-frequency: take intra-frequency without gap in section 9.2.5 as a starting point**
	+ **For inter-frequency: take inter-frequency without gap in section 9.3.9 as a starting point**
* **Scheduling availability requirements: take NCSG as a starting point**
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| [**R4-2215967**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215967.zip) | vivo | **Proposal 1: Prefer use option 3 for issue 3-1 and the UE capabilities could be {gap, no-gap, no-gap-no-interruption}** **Proposal 2: For the interruption length, requirements defined at Rel-17 NCSG could be used as a base where interruption length is defined with the unit of number of interrupted slots of the serving cells.** **Proposal 3: CSSFoutside\_gap should be updated, similar methodology of Rel-16 inter-frequency measurement without gap WI on how to update CSSFoutside\_gap can be used as the baseline.** **Proposal 4: For the concrete RRM requirements, the framework of current specification on the inter-frequency measurement performance should be reused.** |
| [**R4-2216337**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216337.zip) | Huawei, HiSilicon | **Proposal 1: Interruption is not allowed for UE reporting ‘no-gap’ for *NeedForGapsInfoNR*.****Proposal 2: If interruption is allowed, define the interruption requirements to enable visible interruption. Take NCSG as a starting point.****Proposal 3: If interruption is allowed when UE reports ‘no-gap’, the interruption should be allowed for each of intra- and inter-frequency measurements for which UE reports ‘no-gap’.** * **The interruption will impact all the serving cells if UE does not support per-FR gap, and all the serving cells in the same FR as the measurement if UE supports per-FR gap.**

**Proposal 4: The requirements for the case when UE reports ‘no-gap’ are** * **For intra-frequency: take requirements in Section 9.2.5 of TS38.133 as starting point**
* **For inter-frequency: take requirements in Section 9.3.9 of TS38.133 as starting point, and the sample number should be 8**
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| [**R4-2216461**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216461.zip) | Ericsson | ***Observation 1: When UE reports ‘no gap’ in a band, it implies the UE uses a spare RF chain to perform the related measurements in this band without gap.******Observation 2: The total interruption ratio can be controlled by VIRP and ML in NCSG.******Observation 3: Deactivated SCell measurement requirement is defined without gap but with interruption ratio.******Proposal 1: The UE’s implementation behaviours are the same for NeedForGaps capability and NCSG capability which is to use a spare RF chain to perform the measurements.******Proposal 2: When UE reports ‘no gap’ in NeedForGaps, the additional interruption due to RF switching before and after the measurement occasions may be expected.******Proposal 3: The gap status indication in NeedForGaps should have 1-to-1 mapping with the gap status in NCSG if UE supports both NeedForGaps and NCSG capabilities.**** ***UE should report ‘no gap’ in the same band for NeedForGaps if reporting ‘no gap no interruption’ or ‘no gap no interruption’ in a band for NCSG***
* ***UE should report ‘gap’ in the same band for NeedForGaps if reporting ‘gap’ in a band for NCSG***

***Proposal 4: Different as NCSG with dedicated pattern, only define interruption length cannot control the total interruption for NeedForGaps capability.******Proposal 5: RAN4 to further discuss how to control the total interruption ratio for NeedForGaps.******Proposal 6: RAN4 cannot follow NCSG to define NeedForGaps’ measurement requirement since no pattern design for NeedForGaps.******Proposal 7: RAN4 cannot follow intra-frequency measurement without gap to define NeedForGaps’ measurement requirement since it will result in unacceptable interruption ratio in the system.******Proposal 8: The frequency layers in the band for which UE reports ‘no gap’ should be counted in CSSF outside gap.******Proposal 9: The deactivated SCell measurement requirement which has a good control in total interruption ratio can be the start point to define the NeedForGaps’ measurement requirement.******Proposal 10: RAN4 to further discuss UE’s behaviour in the following mismatch scenarios**** ***Rel-17 UE which supports NCSG in a Rel-16 NW which only supports NeedForGaps***
* ***Rel-16 UE which supports NeedForGaps in a Rel-17 NW which supports NCSG***
* ***Both UE and NW support NCSG and NeedForGaps***
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| [**R4-2216484**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216484.zip) | ZTE Corporation | **Observation 1: In Rel-16, RRM requirements for UEs supporting NeedForGaps feature are specified for intra-frequency SSB based measurements without gaps, while requirements for inter-frequency measurements without gaps are missing.** **Proposal 1: Similar as the case of intra-f measurement without gap, the condition of inter-f measurement without gap should be added into Section 9.3.1 in TS38.133.****Proposal 2: The switching from ‘gap’ to ‘no-gap’ would be accompanied by the change of UE RF BW and/or MO, so interruption can be allowed when UE reports ‘no-gap’ through NeedForGap.****Proposal 3: Regarding to the length of interruption, directly reusing the length of VIL in NCSG is fine. During Rel-17, we had discussed the requirements of NCSG wildly and deeply including the length of VIL. Proposal 4: Given that the new interruption mechanism for NeedForGap can be covered by NCSG requirements, the requirements identified in NCSG can be a baseline for this Rel-18 WI.**  |
| [**R4-2216583**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216583.zip) | Nokia, Nokia Shanghai Bell | 1. Assume for measurements without gaps target architecture without idle receiver is available.
2. Need for gaps include “gap and “no-gap”. Additional interruption might be needed even if gaps are not needed.
3. Need for NCSG gaps include “gap”, “ncsg”, “nogap-noncsg”.
4. A UE not capable of NCSG might not need gap(s) but some interruption.
5. If deriveSSBIndexFromCell-inter and deriveSSBIndexFromCell are signaled by the network, then the effective measurement duration can be reduced.
6. RAN4 to discuss if new signaling would be needed for needForGaps.
7. RAN4 to study feasible interruption times for measurement requirements without gaps.
8. A gNB supporting Rel-17 and Rel-16 interprets UEs signalling ‘no-gap’ and ‘nogap-noncsg’ as having no additional interruption.
9. A UE that requires interruption for performing measurements is not expected to signal ‘no-gap’ and ‘nogap-noncsg’ in Re-17.
10. Any change on the meaning of ‘no-gap’ and ‘nogap-noncsg’ in Rel-18 UEs would not be supported by Rel-17 gNBs.
11. Legacy behavior of existing indication in needForGaps and needForGapsNCSG shall not be changed in Rel 18 NR\_MG\_enh2.
12. If interruption is needed for a UE without gaps, it should be indicated using new indication as part of needForGaps, needForGapsNCSG or a new information element.
13. Intra-frequency measurements are typically performed without measurement gaps.
14. Intra-frequency measurements do not need retuning.
15. For intra-frequency measurement requirements use requirements in 38.133, clause 9.2.5 as a starting point.
16. RAN4 to limit scope of the requirements without gaps with additional interruption to inter-frequency scenarios.
17. For inter-frequency measurement requirements use requirements in 38.133, clause 9.3.9 as a starting point.
18. Consider smaller interruption length than VIL1+VIL2 from NCSG for a UE that requires additional interruptions for measurements without gaps.
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| [**R4-2216738**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216738.zip) | MediaTek inc. | **Observation 1: Existing Rel-16 NeedForGap requirements are not complete regarding the need for interruption and its details.****Proposal 1: RAN4 shall allow interruption for the Rel-16 NeedForGap capability when a UE indicates ‘no-gap’.****Proposal 2: RAN4 shall define requirements for the interruption length, occasions and ratio to complete Rel-16 NeedForGap requirements.****Proposal 3: RAN4 shall leverage the existing Rel-17 NCSG requirements to define the new interruption requirements for NeedForGap.****Proposal 4: RAN4 shall define the requirements for intra-frequency measurement without gap (delay of a single layer) x CSSFoutside\_gap, where the delay requirements can be reused from either Section 9.2.5 or NCSG.****Proposal 5: RAN4 shall define the requirements for inter-frequency measurement without gap (delay of a single layer) x CSSFoutside\_gap, where the delay requirements can be reused from either Section 9.3.9 or NCSG.** |
| [**R4-2216746**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216746.zip) | Qualcomm Incorporated | **Observation1:** **In current 38.133 spec, there is no requirement to report via needforGap for inter-frequency measurement.****Proposal 1. RAN4 define the requirement for inter-frequency measurement when UE report via needforgap.****Observation2: It is not clear about R16 UE behaviour from defining a new requirement. Some R16 UE may cause interruption and some UE may not cause interruption when UE report no-gap via needforGAP. It is not clear how the R16 UE meet the requirements.** **Proposal 2. The requirement shall apply only for R18 UE who report no-gap. No impact on other release UE.** **Proposal 3. For R18 UE, we can compromise to define interruption requirement when UE report no-gap. We are open to discuss having an optional UE capability to indicate the R18 UE whether interruption is needed.** |
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## Open issues summary

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

### Sub-topic 1-1: Interruption

[*Background:*

*The first objective for the measurements withoug gaps becasue of UE supporting NeedForGapInfoNR is:*

* + 1. Study whether the additional interruption is allowed when UE reporting ‘NeedForGapsInfoNR'. Further define the interruption length, occasion and ratio, if the interruption is allowed

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#### **Issue 1-1-1: Whether interruption is expected when UE reports ’no-gap’ in ‘NeedForGapsInfoNR'**

* Proposals
	+ Option 1: Intel, Apple, Xiaomi, Ericsson, Nokia, MTK, Qualcomm
		- Yes
	+ Option 2: CATT, CMCC, Huawei, ZTE
		- No
	+ Option 3: Intel, Xiaomi, Apple, OPPO, vivo, Qualcomm
		- Introduce additional UE capability to differentiate whether UE needs interruption
* Recommended WF
	+ Collect company views in the 1st round

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| **Company** | **Comments** |
| CMCC | Option 2. Firstly, according to TS 36.133, if UE is capable of interFreqNeedForGaps or interRATNeedForGaps, it is clearly stated that the measurement is conducted without gaps and without interruption. Same appraoch can be used for NR. Secondly, NCSG for NR is introduced in Rel-17.VIL (visible interuption length) is specified, which means interruption is allowed for NCSG. If there is additional interruption when UE reporting ‘NeedForGapsInfoNR' , there is no difference between NCSG and NeedForGaps.

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| TS 36.133, 8.1.2.1:Inter-frequency and inter-RAT measurement requirements within this clause rely on the UE being configured with one measurement gap pattern unless the UE has signaled that it is capable according to the capability interFreqNeedForGaps or interRATNeedForGaps of **conducting such measurements without gaps and without interruption**. |

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| Huawei | We support option 2 but we can compromise to option 1. We are open to option 3, but a question is whether it is a 1-bit capability, or is it reported for each target band for the current serving cell band combination.  |
| Ericsson | Option 1.We fully understand CMCC’s concern. However, we need to tradeoff between the application scope of this feature and the interruption. If we don’t allow any interruption, that means less use scenario for this feature since UE can’t use a spare RF chain to perform measurement. The outcome is UE will announce less band with ‘no gap’ and report ‘gap’ directly. If we hope UE to use ‘no gap’ to replace the ‘gap’ to minimize the interruption, it’s better to allow some interruptions to UE.We’re also open to further discuss whether to introduce an additional indication from UE to differentiate whether UE needs interruption when UE reports ‘no gap’. |
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#### **Issue 1-1-2: Requirements on the interruption length , if allowed**

[Moderator notes: According to the issue 1-1-1, the interruption requirements to be defined is for the case when UE performing measurements without gap via “no-gap or others[TBD]” in ***NeedForGapInfoNR]***

* Proposals
	+ Option 1: Apple, xiaomi, OPPO, vivo, Huawei
		- As a starting point, the interruption length can be same as these defined for NCSG,e.g.
			* When UE reporting “no-gap” in ***NeedForGapInfoNR*** the interruption length can be VIL=1ms in FR1 and VIL=0.75ms in FR2.
			* When UE reporting “others[TBD]” in ***NeedForGapInfoNR*** no interruption allowed
	+ Option 2: Nokia
		- Consider smaller interruption length than VIL1+VIL2 from NCSG for a UE that requires additional interruptions for measurements without gaps.
* Recommended WF
	+ Collect company views in the 1st round

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| **Company** | **Comments** |
| Huawei | Option 1.The second sub-bullet of option 1 depends on outcome of Issue 1-1-1. |
| Ericsson | We suggest option 1a.* As a starting point, when UE reporting “no-gap” in ***NeedForGapInfoNR,*** the interruption length can be the same as defined for NCSG for each interruption occasion.
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#### **Issue 1-1-3: Requirements on the interruption location , if allowed**

* Proposals
	+ Option 1: OPPO, MTK
		- Interruption location needs to be specified.
	+ Option 1a: OPPO,
		- For interruption location, use the boundary of SMTC as the starting/ending pointing
* Recommended WF
	+ Collect company views in the 1st round

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| **Company** | **Comments** |
| Huawei | Support option 1. Option 1a can be used as the starting point to define interruption location. |
| Ericsson | It needs further discussion.From our understanding, one option is to define a dedicated interruption location as option 1, another option is to define a total interruption ratio as deactivated SCell requirement. From our understanding, deactivated SCell requirement is very similar as this NeedForGaps. It will be measured within NCSG if NW configures NCSG, otherwise, it will be measured outside MG with interruptions. |
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#### **Issue 1-1-4: Requirements on the interruption ratio , if allowed**

* Proposals
	+ Option 1: Ericsson, MTK
		- RAN4 to further discuss how to control the total interruption ratio for NeedForGaps capability
* Recommended WF
	+ Collect company views in the 1st round

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| **Company** | **Comments** |
| Huawei | FFS. If we define location and length of interruption, do we still need to define interruption ratio? |
| Ericsson | Option 1From our understanding, defining dedicated location is one of options to control the total interruption. We can further discuss the solutions once RAN4 agrees to allow the interruption. |
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#### **Issue 1-1-5: Other aspect on whether to allow interruption**

* Proposals
	+ Proposal 1: Huawei
		- If interruption is allowed when UE reports ‘no-gap’, the interruption should be allowed for each of intra- and inter-frequency measurements for which UE reports ‘no-gap’.
			* The interruption will impact all the serving cells if UE does not support per-FR gap, and all the serving cells in the same FR as the measurement if UE supports per-FR gap.
	+ Proposal 2: ZTE
		- The switching from ‘gap’ to ‘no-gap’ would be accompanied by the change of UE RF BW and/or MO, so interruption can be allowed when UE reports ‘no-gap’ through NeedForGap
* Recommended WF
	+ Collect company views in the 1st round

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| **Company** | **Comments** |
| Huawei | Support P1 assuming option 1 is adopted for Issue 1-1-1. If option 3 for Issue 1-1-1 is adopted we can further discuss this issue.P2 is not very clear to us, does it address the interruption during reconfiguration of serving cell combination or MO (where the UE capability may switch between ‘gap’ and ‘no-gap’)? |
| Ericsson | For P1, We have the same view with Huawei.For P2, needs further clarification. Does it mean interruption is allowed when UE reports ‘no gap’? |
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### Sub-topic 1-2: Measurement reporting delay requirements

[Moderator notes: it is better to differentiate the measurement without gap into the two scenarios below when considering the measurement reportint delay requirements as for the interruption requirements:

* **Case 1:** without gap and no interruption (e.g. ’nogap’ or ’nogap-nointerruption[TBD]’ indicated in ***NeedForGapInfoNR)***
* **Case 2*:*** without gap but interruption allowed (e.g. ’nogap’ indicated in ***NeedForGapInfoNR)***

Some companies’ proposals on these issues below are based on the assumption of ’no-gap’ inidicated in NeedForGapInfoNR message. Hereby in order to simplify our discussion , the exact value (’no-gap’, ’nogap-nointerruption’ or others ) for the scenario (in which no gap will be configured and no interruption allowed) can be decoupled from the measurement delay requirements firstly.]

#### **Issue 1-2-1: Requirement for intra-freq measurement without gap when no interruption (intra-f case 1)**

* Proposals
	+ Option 1: CATT, Apple, CMCC, Xiaomi, OPPO, Huawei, Nokia, MTK
		- Reuse requirements in Section 9.2.5 of TS38.133 (intra-freq w/o gap)
	+ Option 1a: Intel, MTK
		- updated CSSFoutside\_gap is needed.
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | Option 1. As commented in Issue 1-1-1, no interruption is allowed. And the cell identification requirements, measurement period requirements, and scheduling availability, as specified in 9.2.5 can be resued. |
| Huawei  | Support option 1.On option 1a, could proponents please clarify what updates to CSSF is foreseen? |
| Ericsson | For case 1, we’re fine with option 1. |
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#### **Issue 1-2-2 Requirement for intra-freq measurement without gap when interruption allowed (intra-f case 2)**

* Proposals
	+ Option 1: Intel, Xiaomi, Apple,
		- Take requirements NCSG requirements as a starting point
	+ Option 1a: Apple
		- The other aspects can be FFS. e.g.
			* The time slot alignment among the measurement objects and interruption location
	+ Option 2: Ericsson
		- RAN4 cannot follow NCSG to define NeedForGaps’ measurement requirement since no pattern design for NeedForGaps.
		- The deactivated SCell measurement requirement can be the start point.
	+ Option 2a: Ericsson
		- The frequency layers in the band for which UE reports ‘no gap’ should be counted in CSSF outside gap
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| Huawei | We suggest to consider a new option 3.* + Option 3:
		- Take requirements in Section 9.2.5 of TS38.133 (intra-freq w/o gap) as a starting point

On option 1, we assume when UE reports ‘no-gap’ for NFG, NW will not configure MG or NCSG, so it is unclear how NCSG requirements could apply, as mentioned by the first bullet of option 2.On option 1a, we are fine to keep this issue as FFS.On option 2, we agree with the first bullet. For the second bullet, the deactivated SCell measurement requirement is based on scellMeasCycle which can be much larger than SMTC. Would such large delay be an issue for normal intra- and inter-frequency measurement?On option 2a, we are fine with it.  |
| Ericsson | Option 2, 2aOur intention is to follow deactivated SCell to define an interruption ratio and interruption length. For the total delay, we can follow the solution to measure the MO outside gaps but we’re fine to change the scellMeasCycle with other periodicity less than it. |
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#### **Issue 1-2-3: Requirement for inter-freq measurement without gap when no interruption (Inter-f case 1)**

* Proposals
	+ Option 1: CATT, Xiaomi, Apple, OPPO, vivo, Huawei, Nokia, Qualcomm
		- Take requirements in Section 9.3.9 of TS38.133 (inter-freq w/o gap) as a starting point
	+ Option 1a: CMCC
		- to update the definition of inter-frequency SSB based measurements without measurement gaps to include the case when UE indicates ‘no-gap’ via interFreq-needForGap
	+ Option 1b: Huawei
		- the sample number should be 8
	+ Option 1c: Intel, CATT, MTK
		- updated CSSFoutside\_gap is needed.
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | Support 1a.For option 1, one consideration is about the number of samples. Section 9.3.9 of TS38.133 (inter-freq w/o gap) is for the scenario that SSB is completely contained in the active BWP.The sample number in the requirements of Section 9.3.9 is 5 since AGC is not needed. For the case with inter-freq measurement without gap when UEs reporting NeedForGapsInfoNR, the SSB will be outside active BWP, AGC may be needed, we are not sure whether sample number of 5 can be reused.Option 1a is not conflict with other options. According to existing spec, the definition of inter-frequency SSB based measurements without measurement gaps only consider the case that SSB is completely contained in the active BWP of the UE and the case that UE indicates ‘nogap-noncsg’ via NeedForNCSG-InfoNR for the inter-frequency measurement. Similar like the intra-frequency case, when UE indicates ‘no-gap’ via interFreq-needForGap, it can also be considered as inter-frequency measurement without gaps. The detailed update of spec is proposed as following (the update part is highlighted in yellow):

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| TS 38.133A measurement is defined as an inter-frequency SSB based measurements without measurement gaps (either legacy measurement gap or NCSG) for UE capable of *interFrequencyMeas-NoGap* provided- the UE supports *interFrequencyMeas-Nogap-r16* [15], and- the SSB is completely contained in the active BWP of the UE.A measurement is defined as inter-frequency measurement without gaps if the UE indicates ‘no-gap’ via interFreq-needForGap for inter-frequency measurement.For UE supporting *ncsg-MeasGapNR-r17* and indicating *NeedForNCSG-InfoNR* for inter-frequency measurement, - An inter-frequency SSB measurement is defined as measurement without gap if- the UE indicates ‘nogap-noncsg’ via *NeedForNCSG-InfoNR* for the inter-frequency measurement, and- the SSB is not completely contained in the active BWP of the UE |

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| Huawei  | Support option 1, 1a and 1b.On option 1c, could proponents please clarify what updates to CSSF is foreseen? |
| Ericsson | For case 1, we’re fine with option 1. |
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#### **Issue 1-2-4: Requirement for inter-freq measurement without gap when interruption allowed(Inter-f case 2)**

* Proposals
	+ Option 1: Intel, Apple,
		- Take requirements NCSG requirements as a starting point
	+ Option 1a: Apple
		- The other aspects can be FFS. e.g.
			* Alignment among the interruption location on all carriers
	+ Option 2: Ericsson
		- RAN4 cannot follow NCSG to define NeedForGaps’ measurement requirement since no pattern design for NeedForGaps.
		- The deactivated SCell measurement requirement can be the start point.
	+ Option 2a: Ericsson
		- The frequency layers in the band for which UE reports ‘no gap’ should be counted in CSSF outside gap
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| Huawei | Same comment as for Issue 1-2-2. |
| Ericsson | Same as Issue 1-2-2. |
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### Sub-topic 1-3: UE behavior

#### **Issue 1-3-1: UE behaviors when UE supports both NeedForGap and NCSG capabilities**

* Proposals
	+ Proposal 1: Ericsson
		- The gap status indication in NeedForGaps should have 1-to-1 mapping with the gap status in NCSG if UE supports both NeedForGaps and NCSG capabilities.
			* UE should report ‘no gap’ in the same band for NeedForGaps if reporting ‘no gap no interruption’ or ‘no gap no interruption’ in a band for NCSG
			* UE should report ‘gap’ in the same band for NeedForGaps if reporting ‘gap’ in a band for NCSG
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| Huawei | We suggest to postpone this issue after we have agreement for Issue 1-1-1. |
| Ericsson | Proposal 1From our understanding, UE may support both NeedForGaps and NCSG. In this case, UE should guarantee the reporting have 1-to-1 mapping with the gap status in each band.We’re open to further discuss the detail. |
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#### **Issue 1-3-2: UE behaviors mismatch between UE and NW**

* Proposals
	+ Proposal 1: Ericsson
		- FFS: UE’s behaviour in the following mismatch scenarios
			* Rel-17 UE which supports NCSG in a Rel-16 NW which only supports NeedForGaps
			* Rel-16 UE which supports NeedForGaps in a Rel-17 NW which supports NCSG
			* Both UE and NW support NCSG and NeedForGaps
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| Huawei | Fine with P1 to further study. |
| Ericsson | Fine with P1. It may further include some Rel-18 UEs which supports NeedForGaps if we agree to differentiate the Rel-16 and Rel-18 UE for NeedForGaps. |
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### Sub-topic 1-4: Scheduling availability

#### **Issue 1-4-1: Scheduling availability**

* Proposals
	+ Option 1: CMCC, OPPO
		- take the similar requirements for NCSG (TS38.133 v17.6.0 9.3.10.3) as baseline to define scheduling availability。
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | Option 1.  |
| Huawei | Fine with option 1.  |
| Ericsson | Option 1  |

### Sub-topic 1-5: Requirements applicalbilty

#### **Issue 1-5-1: General requirements applicalbilty**

* Proposals
	+ Proposal 1: Qualcomm
		- The requirement shall apply only for R18 UE who report no-gap. No impact on other release UE
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| Huawei | Fine with P1. |
| Ericsson | We need further study this issue and the following impact in issue 1-3-2. |
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| **Status summary**  |

## CRs/TPs comments collection

Moderator: No CR/TP in this AI

## Summary for 1st round

### Open issues

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

### CRs/TPs

Moderator: No CR/TP in this AI

## Discussion on 2nd round (if applicable)

The discussions in the WF are captured below

# Topic #2: inter-RAT measurement without gap(AI 6.10.3.2)

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2215369**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215369.zip) | Intel Corporation | ***Proposal 1: In Rel18, we can focus on LTE/NR SA case only when discussing inter-RAT NR/LTE measurements without gap.******Proposal 2: For inter-RAT measurement without MG, including both inter-RAT NR measurement and inter-RAT LTE measurement, the mixed numerology shall be considered.*** **Observation 1: In Rel18, RAN4 need NOT to duplicate the discussion on the scenario of inter-RAT LTE measurement without gap when UE supporting NCSG capability.*****Proposal 3: The inter-RAT EUTRAN measurement only considers the case when LTE CRS to be measured is contained in UE’s active BWP.******Proposal 4: Inter-RAT measurements without gaps shall be supported by separate basic UE capability. The other necessary UE capability to support the inter-RAT measurement wo gap can be FFS upon the different UE aspects.******Proposal 5: If CRS is completely contained in the active BWP, RAN4 can take the capability to support Rel-16 inter-frequency measurement without MG as a baseline.*** ***Proposal 6: A new requirements on the cell identification and measurement reporting for inter-RAT measurement without MG should be specified in TS38.133.*** ***Proposal 7: The updates of CSSF requirements (e.g. CSSF\_outside\_gap) is needed given the impacts from inter-RAT measurements without MG.******Proposal 8a: For the inter-RAT measurements without gap, the restrictions on the scheduling availability need to be considered.*** ***Proposal 8b: The existing scheduling availability specified for intra-frequency measurements in TS 38.133 section 9.2.5.3 can also be applied to the inter-RAT measurement without measurement gaps as a start point.*** |
| [**R4-2215428**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215428.zip) | CATT | Inter-RAT NR measurements**Proposal 1: No need to extend the capability of NeedForNCSG to inter-RAT NR measurement. UE reporting ‘FALSE’ for interRAT-NeedForGapsNR can be defined as supporting the inter-RAT NR measurement without gaps.****Proposal 2: It is confirmed that the previous issue 3-9 in the agreed WF is about which requirement framework is used as a baseline or starting point for RAN4 to develop the Inter-RAT NR measurements.** **Proposal 3: For inter-RAT NR measurements, new measurement requirements can be defined based on NR inter-frequency measurement without gap (when ‘no-gap’ reported via NeedForGapsInfoNR).**Inter-RAT LTE measurements**Proposal 4: There is no need to extend the capability of NeedForGaps to inter-RAT LTE measurement.** **Proposal 5: The case when UE reporting ‘nogap-noncsg’ for NeedForGapNCSG-InfoEUTRA is defined as supporting the inter-RAT LTE measurement without gaps for the corresponding LTE target band. Rel-17 measurement requirements will be specified for this case, so no need to define new requirements in Rel-18.****Proposal 6: For the case when LTE CRS to be measured is contained in UE’s active BWP, new measurement requirements for inter-RAT LTE measurement without gaps need to be defined and the measurement requirements for LTE inter-frequency measurement can be taken as a starting point.** |
| [**R4-2215468**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215468.zip) | Xiaomi | **Proposal 1: RAN4 to consider following scenarios where UE could perform inter-RAT LTE and inter-RAT NR measurement without MG:*** **Another spare RF chain is available for UE;**
* **The target RS to be measured is with UE’s active RF chain.**

**Proposal 2: RAN4 to define inter-RAT NR measurement without gap requirements in TS 36.133 for UE supporting NeedForGaps capability and indicating InterRAT-BandInfoNR-r16 for inter-RAT measurement.****Proposal 3: RAN4 to define inter-RAT LTE measurement without gap requirements in TS 38.133 for UE supporting NeedForGapNCSG capability and indicating NeedForGapNCSG-InfoEUTRA-r17 for inter-RAT measurement.****Proposal 4: RAN4 to extend the capability of NeedForGaps for allowing UE indicating gap information for inter-RAT LTE measurement.****Proposal 5: RAN4 to extend the capability of NeedForGapNCSG for allowing UE indicating gap information for inter-RAT NR measurement.** |
| [**R4-2215612**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215612.zip) | Apple | **Proposal 1: MR-DC scenarios are deprioritized.****Observation 1: inter-RAT LTE measurement has already been supported by *eutra-NeedForGapNCSG-reporting-r17*.****Proposal 2: no need to extend the capability of NeedForGaps to cover inter-RAT LTE measurement.****Observation 2: ‘extend the capability of NeedForNCSG to inter-RAT NR measurement’ is unclear since there is no NeedForNCSG in LTE.****Observation 3: inter-RAT NR measurement has already been supported by *interRAT-NeedForGapsNR-r16*.****Observation 4:no need to further discuss inter-RAT LTE measurement without gap, since it has already been supported in R17.** |
| [**R4-2215716**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215716.zip) | CMCC | ***Observation 1: according TS 36.331 and TS 36.133, both NeedForGap (interRAT-NeedForGapsNR) and NCSG can be used for inter-RAT NR measurement.******Observation 2: neither RRM requirements for inter-RAT NR measurement with NeedForGap nor RRM requirements for inter-RAT NR measurement with NCSG are specified.******Proposal 1: for inter-RAT NR measurement without measurement gap when UE operating in LTE SA, it is proposed to specify*** ***requirements for following two cases:**** ***NeedForGap (interRAT-NeedForGapsNR)***
* ***NCSG***

***Proposal 2: for inter-RAT LTE measurement, it is proposed to consider following two cases:**** ***Case 1: when LTE CRS to be measured is contained in UE’s active BWP***
* ***Case 2: when LTE CRS to be measured is not completely contained in UE’s active BWP, but there is spare RF chain***

***Proposal 3: for inter-RAT measurement without MG, including both inter-RAT NR measurement and inter-RAT LTE measurement, it is proposed to support mixed numerology.*** |
| [**R4-2215823**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215823.zip) | OPPO | **Proposal 1: Inter-RAT NR measurements can be applicable to EN-DC and inter-RAT LTE measurement can be applicable to NE-DC.****Proposal 2: UE capability could be discussed after the target scenarios are clear.** **Proposal 3: Consider the scenario when LTE CRS to be measured is contained in UE’s active BWP.****Proposal 4: Further discuss whether interruption is required for inter-RAT measurement without gap.****Proposal 5: The frequency layers or carrier specific sharing factor for measurement without gaps should be updated due to inter-RAT NR or LTE measurements, e.g., Nfreq or CSSFoutsidegap.** |
| [**R4-2215968**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215968.zip) | vivo | **Proposal 1: For issue 3-9, option 2 is preferred. However the IE interRAT-NeedForGapsNR could be updated to enable three status like {gap, ncsg, nogap-noncsg} to be provided.** **Proposal 2: The DSS scenario, i.e., the LTE CRS to be measured are fully contained within a UE’s active BWP, should be considered in the Inter-RAT LTE measurement. Further clarification is needed on whether the scenario where a UE have a spare RF chain used for LTE measurement should be considered in this WI or not.** |
| [**R4-2216338**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216338.zip) | Huawei, HiSilicon | **Proposal 1: De-prioritize MR-DC for inter-RAT NR (or LTE) measurements without MG.****Proposal 2: Support mix numerology scenario for inter-RAT measurement without MG.** * **Define UE capability for the scenario where LTE within active BWP of NR serving cell.**

**Proposal 3: Do not extend any existing UE capabilities for MG-less inter-RAT measurement.****Proposal 4: RAN4 to define requirements for inter-RAT NR measurement without MG based on interRAT-NeedForGapsNR.** * **FFS whether interruption is allowed when UE reports interRAT-NeedForGapsNR.**

**Proposal 5: RAN4 to define requirements for inter-RAT LTE measurement without MG for the scenario where LTE carrier is within active BWP of NR serving cell.*** **A new UE capability should be defined to indicate whether UE supports MG-less measurement in this scenario.**
 |
| [**R4-2216462**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216462.zip) | Ericsson | ***Observation 1: When RAN4 introduced the CRS-IM technology for enhancement DSS in Rel-17, additional performance degradation or network deployment restriction is expected due to inter-RAT LTE measurement within gap.******Observation 2: RAN4 had agreed to define requirement for LTE inter-RAT measurement without gap in Rel-17 NCSG.******Observation 3: RAN4 introduced searcher limitation for NR measurement, but there is no searcher limitation for LTE measurement.******Proposal 1: RAN4 to introduce a separate inter-RAT E-UTRAN measurement without gap for DSS enhancement as follow.**** ***The UE can perform inter-RAT LTE measurements without measurement gaps if the LTE cell’s target to be measured bandwidth are fully within the NR active BWP.***

***Proposal 2: RAN4 to further discuss defining inter-RAT E-UTRAN measurement without gap in which release, Rel-17 NCSG maintenance or Rel-18 inter-RAT measurement without gap.******Proposal 3: RAN4 to define inter-RAT E-UTRAN measurement without gap for NCSG in SA only, but for DSS in both SA and MR-DC.******Proposal 4:***  ***Inter-RAT measurement without gap can be performed in parallel with NR measurement without searcher limitation.******Proposal 5: When the target inter-RAT E-UTRAN frequency layers belong to an inter-band with the serving cells, no scheduling restriction is expected.******Proposal 6: When the target inter-RAT E-UTRAN frequency layers belong to an inter-band with the serving cells, scheduling restriction is expected, such as UE performing measurements in TDD bands or with different SCS.******Proposal 7: RAN4 to discuss how to apply the scheduling restriction based on LTE measurement RSs.******Proposal 8: RAN4 needs to further discuss where to perform the inter-RAT E-UTRAN measurement without gaps to reduce the performance degradation to legacy NR intra-frequency measurement without gap and L1-RSRP measurement.******Proposal 9: Both NW and UE shall have the same understanding on the measurement occasions for Inter-RAT E-UTRAN measurement without gap.******Proposal 10: RAN4 to introduce an effective measurement window for inter-RAT E-UTRAN measurement without gap. The effective measurement window can be defined based on measurement duration, measurement periodicity and offset.******Proposal 11: The scaling factor for inter-RAT E-UTRAN measurement without gap equals to the total number of frequency layers for E-UTRAN measurement without gap.******Proposal 12: RAN4 to discuss whether to introduce the inter-RAT LTE measurements without gap for DSS as release independent from Rel-17.*** |
| [**R4-2216483**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216483.zip) | ZTE Corporation | **Observation 1: During Rel-17 NCSG, the NeedForGapNCSG has been decoupled with NCSG itself.****Proposal 1: the MR-DC case can be deprioritized for both inter-RAT NR and inter-RAT LTE.****Proposal 2: Since of the mixed numerology scenario for inter-RAT is very possible and perhaps inevitable, we believe the same numerology and mixed numerology should both be supported for inter-RAT measurement without gap.****Proposal 3: Re-using the UE reports defined in NCSG for E-UTRA bands to identify inter-RAT measurement with gap or without gap.** |
| [**R4-2216739**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216739.zip) | MediaTek inc. | **Proposal 1: RAN4 can define requirements for mix numerology inter-RAT measurements without gap.****Proposal 2: RAN4 shall not extend the capability of NeedForGaps to inter-RAT LTE measurement and shall not extend the capability of NeedForNCSG to inter-RAT NR measurement.****Proposal 3: RAN4 shall define the NeedForGap requirements on top of the NeedForGapNR-r16 capability.****Proposal 4: RAN4 shall define the NeedForNCSG requirements on top of the NeedForNCSG-InfoEUTRA capability.** |
| [**R4-2216746**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216746.zip) | Qualcomm Incorporated | **Proposal 4: No other requirements are needed in Rel-18 for inter-RAT LTE measurement as RAN4 agreed to define the requirements for inter-RAT measurement without gap when UE indicates ‘nogap-noncsg’ via NeedForNCSG-InfoEUTRAN in Rel-17.** |

## Open issues summary

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

### Sub-topic 2-1: Using scenarios

*[Moderator notes:*

Up to this meeting, all proposed possible using scenarios for inter-RAT NR/LTE measurements without gap can summarized as:

1. the inter-RAT NR measurements without gap in Rel18 includes the two scenarios below.
	* **Case a-1**: UE performing the measurements without gap in NR carriers as there is vacant RF chains for UE measurements
	* **Case a-2**: NR reference signal to be measured are fully contained within UE’s LTE channel bandwidth

1. the inter-RAT LTE measurements without gap in Rel18 includes the two scenarios below.
	* **Case b-1**: UE performing the measurements without gap in LTE carriers as there is vacant RF chains for UE measurements
	* **Case b-2**: LTE CRS are fully contained within UE’s active BWP We can use these index below to aviod any confustion.

*]*

#### **Issue 2-1-1: extend to MR-DC cases**

* Proposals
	+ Option 1: [Xiaomi], OPPO
		- inter-RAT NR measurements without gap can be applicable to EN-DC and
		- inter-RAT LTE measurements without gap can be applicable to NE-DC
	+ Option 2: Intel, Apple, Huawei, ZTE
		- Deprioritize the inter-RAT measurements without gap in MR-DC
	+ Option 3: Ericsson
		- Define inter-RAT E-UTRAN measurement without gap for NCSG(case b-1) in SA only,
		- Define inter-RAT E-UTRAN measurement without gap for DSS(case b-2) in both SA and MR-DC.
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | For inter-RAT NR measurements for EN-DC for case a-2, if SSB is completely contained in the active BWP of the UE, it is similar like Rel-16 inter-frequency measurement without MG, and the requirements in 9.3.9 can be used as baseline. This scenario can be considerred. Similar consideration for inter-RAT E-UTRAN measurement without gap for case b-2. While for case a-1 and case b-1, with spare RF chain, NCSG and/or NeedForGap can be considered. But the signaling of NCSG and NeedForGap are not supported for MR-DC. More work is expected. We are open for discussion.In summary, we support to consider at least following cases:* Inter-RAT NR measurements without gap for case a-2 (NR reference signal to be measured are fully contained within UE’s LTE channel bandwidth) can be applicable to EN-DC
* inter-RAT E-UTRAN measurement without gap for case b-2 (LTE CRS are fully contained within UE’s active BWP) can be applicable to EN-DC

For case a-1 and case b-1, we prefer to consider them and are open for discussion. |
| Huawei  | Support option 2. |
| Ericsson | Option 3.We can agree with the 1st bullet for case b-1 and continue the discuss for case b-2. |
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#### **Issue 2-1-2: Numerology**

[*Moderator notes:*

in the last RAN4 meeting, the agreements below was achieved. In this meeting, we can focus on whether the mixed numberology shall be supported or not.

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| **Issue 3-7: [inter-RAT] Numerology** **< Agreement >**: * For inter-RAT measurement without MG, including both inter-RAT NR measurement and inter-RAT LTE measurement, same numerology is to be supported

**< Way forward >**: FFS mx-numerology case and potential UE capability |

]

* Proposals
	+ Option 1: Intel, CMCC, Huawei, ZTE, MTK
		- For inter-RAT measurement without MG, including both inter-RAT NR measurement and inter-RAT LTE measurement, the mixed numerology need to be supported.
			* FFS on whether the additional UE capability is needed
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | Support Option 1. Mixed numerology is a common and important sceario. For example, a cell with TDD 30KHz SCS is impacted by LTE CRS with 15KHz SCS, which is a typical deployment for CRS-IM from our point of view. It is proposed to consider mixed numerology. As for the UE capability, we are open for discussion.  |
| Huawei | Support option 1. |
| Ericsson | Support option 1. |
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#### **Issue 2-1-3: inter-RAT NR target scenarios**

* Proposals
	+ Option 1: Xiaomi, CMCC
		- **Case a-1**: Another spare RF chain is available for UE and
		- **Case a-2**: The target RS to be measured is with UE’s active RF chain

[Moderator notes: whether both of scenarios can be indicated by the same or different capability can be FFS in issue2-2-2 and 2-2-3]

* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | Support Option 1. For case a-1, with spare RF chain, there are two approaches: NCSG and “NeedForGap”, we propose to consider both. From signaling point of view, both NeedForGap (interRAT-NeedForGapsNR) and NCSG can be used for inter-RAT NR measurement. For LTE SA, from signaling point of view, “NeedForGap” is supported for inter-RAT measurement. *interRAT-NeedForGapsNR* is used to indicate need for measurement gaps when operating on the E-UTRA band and measuring on the NR band. According to existing TS 36.133, NCSG can be used for inter-RAT measurement. Since from signaling point of view, both NeedForGap (interRAT-NeedForGapsNR) and NCSG can be used for inter-RAT NR measurement, and consdiering that NeedForGap or NCSG will result in different requirements, in order to support inter-RAT NR measurement from RAN4 perspective, it is necessary to specify RRM requirements for both cases. |
| Huawei  | We suggest to focus on Case a-1. We do not see clear use case for Case a-2. It is noted that Case b-2 is valid use case because we have CRS-IM in NR side in Rel-17, but we do not have such demod enhancement in LTE side. |
| Ericsson | We have the same view as Huawei. Suggest to deprioritize the case a-2. |
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#### **Issue 2-1-4: inter-RAT LTE target scenario**

* Proposals
	+ Option 1: CMCC, Xiaomi
		- **Case b-1**: when LTE CRS to be measured is not completely contained in UE’s active BWP, but there is spare RF chain and
		- **Case b-2**: when LTE CRS to be measured is contained in UE’s active BWP
	+ Option 1a: vivo
		- **Case b-2**: when LTE CRS to be measured is contained in UE’s active BWP
		- FFS on case b-1:when LTE CRS to be measured is not completely contained in UE’s active BWP, but there is spare RF chain
	+ Option 2: Intel, Apple, CATT,OPPO, Ericsson, Huawei, Qualcomm
		- **Case b-2 ONLY**: Only when LTE CRS to be measured is contained in UE’s active BWP
			* For the inter-RAT LTE gap-less measurement when UE has the vancant RF chain, the corresponding requirements was defined in Rel17. Thus no need to consider this scenario in Rel18 scope.
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | For option 2, we agree that for the inter-RAT LTE gap-less measurement when UE has the vancant RF chain, the corresponding requirements was defined in Rel17, but the requirements are only defined for NCSG for SA operation. If MR-DC is considered (pending on Issue 2-1-1), the coresponding requirements need to be specified.Another consideration is that with spare RF chain, there are two approaches: NCSG and “NeedForGap”. If E-UTRANA interRATNeedForGaps is considered, the requirements need to be specified. |
| Huawei  | Support option 2.We understand Case b-1 is agreed to be supported in Rel-17 (Issue 1.3 in R4-2214336). |
| Ericsson | For case b-1, we suggest companies to further check how to handle it. From our understanding, many issues in case b-1 are the same as case b-2, such as scheduling restriction, measurement occasion, CSSF. It’s better not to split the discussion in two places.For case b-2, we’re fine with option 2. |

### Sub-topic 2-2: UE capabilities

[Moderator notes:

It shall be noted that the main tasks related to RAN4 (listed in the table below) are to investigate how UE to support these features and define the necessary measurement requirements. Based on the general principles, we can also organize the discussion on UE capabilities in the several sub issues below, which are coupled with the using scenarios.

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| Using scenarios (sub-topic 2-1) | Capability (sub-topic 2-2) |
| Case a-1: Inter-RAT NR wo gap because of the vacant RF chain available | FFS: issue 2-2-1 |
| Case a-2: Inter-RAT NR wo gap because the measurement reference signal can be contained within UE’s LTE bandwidth | FFS: issue 2-2-2 |
| Case b-1: Inter-RAT LTE wo gapbecause of the vacant RF chain available | FFS: issue 2-2-3 |
| Case b-2: Inter-RAT LTE wo gap because the measurement reference signal can be contained within UE’s active BWP | FFS issue 2-2-4 |

]

#### **Issue 2-2-1: On top of which UE capability to support the inter-RAT NR measurement without gap when UE has vacant RF chain avaiable (Case a-1)**

* Proposals
	+ Option 1: MTK
		- *NeedforNCSGgap-infoNR*
	+ Option 2: CATT, Xiaomi, Apple, Huawei
		- *interRAT-NeedForGapsNR-r16*
	+ Option 2a: CATT,
		- *interRAT-NeedForGapsNR-r16*, e.g., when UE report ‘*FALSE*’ through *interRAT-NeedForGapsNR-r16* can be defined as inter-RAT NR measurement without gaps
	+ Option 3: OPPO
		- FFS upon the target scenarios converged.
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | We support both Option 1 and option 2. We propose to consider both NCSG and interRAT-NeedForGapsNR-r16. From signaling point of view, both NeedForGap (interRAT-NeedForGapsNR) and NCSG can be used for inter-RAT NR measurement, and consdiering that NeedForGap or NCSG will result in different requirements, in order to support inter-RAT NR measurement from RAN4 perspective, it is necessary to specify RRM requirements for both cases. |
| Huawei  | Support option 2 and 2a.On option 1, so far NeedforNCSGgap-infoNR can only be used for intra-NR measurement.  |
| Ericsson | We have the same understanding as Huawei. |
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#### **Issue 2-2-2: On top of which UE capability to support the inter-RAT NR measurement without gap when the measurement reference signal can be contained within UE’s LTE channel bandwidth (Case a-2)**

* Proposals
	+ Option 1: MTK
		- *Same capability indication as for case a-1 (NeedforNCSGgap-infoNR)*
	+ Option 2: CATT, Xiaomi, Apple, Huawei
		- *Same capability indication as for case a-1 ( interRAT-NeedForGapsNR-r16*, e.g., when UE report ‘*FALSE*’ through *interRAT-NeedForGapsNR-r16* can be defined as inter-RAT NR measurement without gaps)
	+ Option 3: OPPO
		- FFS
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | We are not sure whether the UE capability need to be coupled with NCSG or *NeedForGap.* The scanrio (a-2) is that measurement reference signal is contained within UE’s LTE channel bandwidth, in our view, no spare RF chain is needed. |
| Huawei  | Support option 2.With option 2, we mean no separate requirement or UE capability would be defined for Case a-2. |
| Ericsson  | We have the same understanding as Huawei. |
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#### **Issue 2-2-3: On top of which UE capability to define the inter-RAT LTE measurement requirements when UE has vacant RF chain avaiable(Case b-1)**

* Proposals
	+ Option 1: Intel, Xiaomi, CATT, ZTE,
		- Reuse the existing capability. UE indicates ‘nogap-noncsg’ via *NeedForNCSG-InfoEUTRAN* for the inter-RAT LTE measurement
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | Except *NeedForNCSG,* we propose to also consider NeedForGap. We would like to hear companies’ view to support case b-1 with NeedForGap. |
| Huawei  | Support option 1. |
| Ericsson | Support option 1. |
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#### **Issue 2-2-4: On top of which UE capability to define the inter-RAT LTE measurement requirements when LTE CRS to be measured is contained in UE’s active (Case b-2)**

* Proposals
	+ Option 1: Intel, Apple
		- the capability of NeedForGaps for inter-frequency measurement wo gap in Rel16 can be taken as the baseline
	+ Option 1a: Xiaomi, MTK
		- extend the capability of NeedForGaps
	+ Option 2: Huawei, Ericsson
		- A new UE capability should be defined to indicate whether UE supports MG-less measurement in this scenario.
	+ Option 3: OPPO
		- FFS
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | Same comment as Issue 2-2-2. We are not sure whether the UE capability need to be coupled with NCSG or *NeedForGap.* The scanrio (a-2) is that measurement reference signal is contained within UE’s LTE channel bandwidth, in our view, no spare RF chain is needed. |
| Huawei  | Support option 2.In our view, Case b-2 is similar to Rel-16 inter-frequency without gap, so it is reasonable to define a separate capability for it. |
| Ericsson | Option 2.Same view as Huawei. |
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### Sub-topic 2-3: Measurement requirements

#### **Issue 2-3-1: General principle to define the requirements**

* Proposals
	+ Proposal 1: CATT,
		- For the inter-RAT NR measurements without gap, the requirements frameworks can be based on NR inter-frequency measurement without gap
	+ Proposal 2: CATT, Xiaomi
		- For the inter-RAT LTE gap-less measurement when LTE CRS to be measured is contained in UE’s active BWP, the requirements can be based on the measurement requirements for LTE inter-frequency measurement.
	+ Proposal 3: Ericsson
		- RAN4 needs to further discuss where to perform the inter-RAT E-UTRAN measurement without gaps to reduce the performance degradation to legacy NR intra-frequency measurement without gap and L1-RSRP measurement.
		- Both NW and UE shall have the same understanding on the measurement occasions for Inter-RAT E-UTRAN measurement without gap.
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | How to define the requirements are related with scenarios. For the scenario that RS is within UE bandwith, the Rel-16 inter-f measurement without gap can be used as baseline. For the scenario that there is spare RF chain, requirements for NCSG or NeedForGap are needed. |
| Huawei  | On P1, in general fine to take NR inter-frequency without gap as baseline, but one difference is that the number of samples should be 8.On P2, in general fine to take LTE inter-frequency as baseline, and we understand it refers to LTE inter-frequency without gap.On P3, the first bullet needs more discussion. In our view, as baseline the LTE MOs to be measured without MG should be counted CSSFoutside\_MG together with other NR MOs that can be measured without MG, no matter when UE takes measurement on the LTE MOs (there is no SMTC for LTE measurement and UE can take any 5ms duration for LTE measurement). The second bullet of P3 may be meaningful when the LTE measurement causes scheduling restriction, so we are open to further study it. |
| Ericsson | P1. Same view as Huawei.P3. From our understanding, inter-RAT LTE measurement is different with NR measurement. It can be performed in any places. Furthermore, there is no searcher limitation for LTE measurement. Thus, we suggest to measure inter-RAT LTE measurement outside any SMTC with a separate scaling factor as LTE requirement. |
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#### **Issue 2-3-2: Scheduling restriction**

* Proposals
	+ Proposal 1: Intel
		- The existing scheduling availability specified for intra-frequency measurements in TS 38.133 section 9.2.5.3 can also be applied to the inter-RAT measurement without measurement gaps as a start point.
	+ Proposal 2: Ericsson
		- When the target inter-RAT E-UTRAN frequency layers belong to an inter-band with the serving cells, no scheduling restriction is expected.
		- When the target inter-RAT E-UTRAN frequency layers belong to an inter-band with the serving cells, scheduling restriction is expected, such as UE performing measurements in TDD bands or with different SCS.
		- RAN4 to discuss how to apply the scheduling restriction based on LTE measurement RSs.
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| Huawei | On P1, suggest FFS, we understand scheduling restriction for measurement with NCSG in cl. 9.3.10.3 may be more relevant for inter-RAT measurement.On P2, the first bullet may not be always true, e.g. UE may not support simultaneous Tx and Rx for the band pair of NR serving cell and LTE target carrier. The last two bullets are fine.  |
| Ericsson | We’re fine with P2 plus Hauwei’s complement for simultaneous Tx and Rx capability. |
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#### **Issue 2-3-3: Searcher limitation**

* Proposals
	+ Proposal 1: Ericsson
		- Inter-RAT measurement without gap can be performed in parallel with NR measurement without searcher limitation.
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| Huawei | We understand P1 is same as the first bullet of P3 of Issue 2-3-1. It would be good if we can merge the discussion to avoid duplication.As we commented for Issue 2-3-1: In our view, as baseline the LTE MOs to be measured without MG should be counted CSSFoutside\_MG together with other NR MOs that can be measured without MG, no matter when UE takes measurement on the LTE MOs (there is no SMTC for LTE measurement and UE can take any 5ms duration for LTE measurement). |
| Ericsson | Support P1.From our understanding, this is a general issue. For example, even if the UE performs the measurement within SMTC, it mean no searcher sharing issue between LTE MO and NO MO. Issue 2-3-1 is one of the possible results following this proposal. |
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#### **Issue 2-3-4: CCSF**

* Proposals
	+ Proposal 1: Intel, OPPO
		- The updates of CSSF requirements when these inter-RAT measurements without gap introduced (e.g. CSSF\_outside\_gap) is needed
	+ Proposal 2: Ericsson
		- The scaling factor for inter-RAT E-UTRAN measurement without gap equals to the total number of frequency layers for E-UTRAN measurement without gap.
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| Huawei | P1 is fine.We understand P2 is same as the first bullet of P3 of Issue 2-3-1. It would be good if we can merge the discussion to avoid duplication.As we commented for Issue 2-3-1: In our view, as baseline the LTE MOs to be measured without MG should be counted CSSFoutside\_MG together with other NR MOs that can be measured without MG, no matter when UE takes measurement on the LTE MOs (there is no SMTC for LTE measurement and UE can take any 5ms duration for LTE measurement). |
| Ericsson | P2.It’s better to solve some general issues such as 2-3-1 and 2-3-3 firstly. |
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#### **Issue 2-3-5: Interruption requirements for inter-RAT measurement without gap.**

* Proposals
	+ Option 1: OPPO
		- FFS
	+ Option 1a: Huawei
		- FFS on whether interruption is allowed for inter-RAT NR measurements without MG when UE reports interRAT-NeedForGapsNR.
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| Huawei | Support option 1a.Maybe conclusion from Issue 1-1-1 can be re-used for inter-RAT NR measurement, but we are open to further discussion. |
| Ericsson | FFS |
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#### **Issue 2-3-6: Effiective measurement window**

* Proposals
	+ Proposal 1: Ericsson
		- RAN4 to introduce an effective measurement window for inter-RAT E-UTRAN measurement without gap. The effective measurement window can be defined based on measurement duration, measurement periodicity and offset***.***
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| Huawei | In general we are fine with P1 but details can be FFS. We can see the point to have such effective measurement window for defining clear scheduling restriction requirements for inter-RAT LTE measurement.  |
| Ericsson | Support P1.We can discuss the detail once we have some agreements in general pricinples. |
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#### **Issue 2-3-7: Release independent requirements**

* Proposals
	+ Proposal 1: Ericsson,
		- RAN4 to discuss whether to introduce the inter-RAT LTE measurements without gap for DSS (**case b-2**) as release independent from Rel-17
* Recommended WF
	+ Collect company views in the 1st round.

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| **Company** | **Comments** |
| CMCC | We support proposal 1. CRS-IM is supported from Rel-17. From our point of view, inter-RAT LTE measurement without MG is benificail for CRS-IM, which could reduce the intreruption due to measurement for requiring parameters for CRS-IM. |
| Huawei  | We suggest to postpone the issue after we have stable requirements for Case b-2. |
| Ericsson | We support P1.We’re also fine to postpone the issue until we have a stable requirement for case b-2. |
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## CRs/TPs comments collection

Moderator: No CR/TP in this AI

## Summary for 1st round

### Open issues

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

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| **Status summary**  |
| **Issue 2-1-1:** *Status*:*Tentative agreements*: N.A*Recommendations for 2nd round*:. |

### CRs/TPs

Moderator: No CR/TP in this AI

## Discussion on 2nd round (if applicable)

The discussions in the WF are captured below

# Recommendations for Tdocs

## 1st round

**New tdocs**

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| --- | --- | --- | --- |
| **New Tdoc number** | **Title** | **Source** | **Comments** |
| TBD |  |  |  |
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**Existing tdocs**

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| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

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| **Tdoc number** | **Revised to** | **Title** | **Source** | **Recommendation**  | **Comments** |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents