**3GPP TSG RAN #104**

**Shanghai, China, June 17th – 20th, 2024**

**Title: Moderator Summary for Rel-19 NES Issues**

**Source: RAN1 Chair (Samsung)**

# **1 Adaptation of PRACH in Spatial Domain**

The following is a list of proposals from company contributions:

|  |  |
| --- | --- |
| **Company** | **Proposals** |
| [RP-241056](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241056.zip)  Google | * **Proposal 1: Modify the WID for Rel-19 NES by removing the following objective on PRACH spatial domain adaptation**   + **Study adaptation of PRACH in spatial domain, e.g. non-uniform PRACH resources per SSB, and specify if found beneficial**     - * **This study is to be done in 2Q’2024 only** |
| [RP-241083](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241083.zip)  OPPO | **Proposal: do not pursue normative work for adaptation of PRACH in spatial domain, e.g., non-uniform PRACH resources per SSB.** |
| [RP-241087](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241087.zip)  LG Electronics | **Proposal #1: Excluding “Adaptation of PRACH in spatial domain” from WID (RP-240170) does NOT imply that time domain activation/deactivation of additional PRACH resources associated with a subset of SSB indices is precluded for PRACH adaptation in time domain.**  **Proposal #2: Update the objective 3 in WID (RP-240170) as follows.**   |  | | --- | | 1. Specify adaptation of common signal/channel transmissions. [RAN1/2/3/4]    * Adaptation of SSB in time domain, e.g. adapting periodicity    * Adaptation of PRACH in time domain      + Note: Activation/deactivation of a subset of additionally configured PRACH resources in time domain is not precluded    * Adaptation of paging occasions including confining the paging occasions in the time domain      + Note: there shall be no paging latency increase    * Note: there shall be no negative impact to legacy UEs, unless significant benefits are shown | |
| [RP-241132](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241132.zip)  Spreadtrum Communications |  |
| [RP-241162](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241162.zip)  Xiaomi | Don’t support spatial domain adaptation for PRACH in Rel-19 NES and modify the WID for enhancements of network energy saving for NR accordingly. The following modification is adopted: |
| [RP-241177](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241177.zip)  Nokia | **Proposal: Do not support PRACH adaptation in spatial domain in Rel-19.** |
| [RP-241180](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241180.zip)  InterDigital | **Proposal 1**: The adaptation of PRACH in spatial domain to be handled under the adaptation of PRACH in time domain  **Proposal 2**: Add the following under the sub-objective on adaptation of PRACH in time domain:   * Specify, if justified, mapping of additional PRACH resources to only a subset of SSBs |
| [RP-241209](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241209.zip)  CMCC | **Proposal 1: The decision on whether to support PRACH adaptation in spatial domain should be based on the extra NES gain of spatial domain PRACH adaptation compared to time domain PRACH adaptation, and should not only consider the NES gain of spatial domain PRACH adaptation compared to legacy static PRACH configuration.**  **Proposal 2: PRACH adaptation in spatial domain is not supported for normative work in Rel-19.** |
| [RP-241334](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241334.zip)  CATT | ***Proposal 2: Spatial domain PRACH adaptation, including additional PRACH resources to subset of SSBs as part of time domain PRACH adaptation mechanisms, is not specified in Rel-19 NES.*** |
| [RP-241507](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241507.zip)  ZTE, Sanechips | **Proposal 2: For PRACH adaptation, focus on PRACH adaptation in time domain in Rel-19 NES WI.** |

## Summary

Regarding specification of adaptation of PRACH in the spatial domain, the following is a summary of company views:

* Do not specify
  + Google, OPPO, Xiaomi, Nokia, CMCC, CATT, ZTE
* Allow time domain activation/deactivation of additional PRACH resources where a subset of SSBs are mapped to the additional PRACH resources
  + LGE, Interdigital

Clearly a WID update is needed since the study phase in RAN1 has now concluded. Based on company contributions, the moderator proposes the following two alternative WID updates for discussion:

* Alt-1: Support the following WID Update

1. Specify adaptation of common signal/channel transmissions. [RAN1/2/3/4]
   * Adaptation of SSB in time domain, e.g. adapting periodicity
   * Adaptation of PRACH in time domain
     + Note: This precludes mapping of additional PRACH resources to a subset of SSBs
   * Adaptation of paging occasions including confining the paging occasions in the time domain
     + Note: there shall be no paging latency increase
   * Note: there shall be no negative impact to legacy UEs, unless significant benefits are shown

* Alt-2: Support the following WID Update

1. Specify adaptation of common signal/channel transmissions. [RAN1/2/3/4]
   * Adaptation of SSB in time domain, e.g. adapting periodicity
   * Adaptation of PRACH in time domain
     + Note: This shall also allow mapping of additional PRACH resources to a subset of SSBs
   * Adaptation of paging occasions including confining the paging occasions in the time domain
     + Note: there shall be no paging latency increase
   * Note: there shall be no negative impact to legacy UEs, unless significant benefits are shown

## **Discussion Point 1-1**

The moderator solicits feedback on the following two questions:

Q1: What is your company 1st preference amongst Alt-1 and Alt-2?

Q2: If Alt-1 / Alt-2 is your 1st preference, can you accept Alt-2 / Alt-1 as a 2nd preference?

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| --- | --- |
| **Company** | **View** |
| Company X | Q1:  Q2: |
| CATT | We support Alt-1, which is inline with RAN1 conclusion.  Mapping of additional PRACH resources to a subset of SSBs is clearly PRACH adaptation in spatial domain and should be precluded following RAN1 conclusion considering the limited performance gains and unrealistic use case. Therefore, we are not fine with Alt-2. |
| New H3C | We slightly prefer Alt.-1 |
| ZTE | We see no need to add the note for time domain adaption.  Remove the bullet for spatial domain adaption is sufficient for this meeting. |
| Nokia | Q1: We support Alt-1, as that properly reflects the conclusions from RAN1.  Q2: No, it would be akin to keeping the spatial adaptation despite the lack of consensus to support it in RAN1. |
| Samsung | We support remove the bullet for spatial domain adaption and also ok without note in time domain adaptation as ZTE mentioned. We want to leave it RAN1 discussion for down selection. If Alt-1 is majority, we can also ok with alt-1. |
| NTT DOCOMO | Q1: Although the wording for Alt.2 is a bit strong, we don’t prefer Alt.1 and hence our 1st preference is Alt.2 if we need to clarify it in WID. But we have similar view with ZTE/Samsung.  RAN1 made following agreement at the end of the last RAN1 meeting, and Option 4-rev1 can be “mapping of additional PRACH resources to a subset of SSBs” in our understanding. So, we do not prefer to remove it before having further study in RAN1.  ---  **Agreement**  For the adaptation mechanism for additional PRACH resources, study further the following:   * Option 1: Higher layer signalling (with potential enhancements) based PRACH resource adaptation * Option 2: L1-based adaptation to indicate whether the additional PRACH resources provided by semi-static signalling are available or not   + FFS: details   + Strive to re-use existing DCI format(s) * Option 3: Adaptation of PRACH transmission according to predefined condition(s)   + FFS: details * Option 4-rev1: L1-based adaptation to indicate whether a subset of the additional PRACH resources provided by semi-static signalling are available or not   + FFS: whether the subset of the additional PRACH resources is in RO level / SSB-to-RO mapping cycle level/PRACH association period level/PRACH association pattern period level for time-domain PRACH adaptation   + Strive to re-use existing DCI format(s) * Option 5: Enhanced cell DRX   ---  Q2: If our understanding on the above agreement is wrong, i.e., Option 4-rev1 cannot be “mapping of additional PRACH resources to a subset of SSBs”, we can accept Alt.1. Otherwise, Alt.1 is not aligned with RAN1 situation. |
| OPPO | Q1:Alt-1 will be more preferred by us.  Q2:No, but we can accept without the Note and we can have exact time domain adapation finalized in RAN1. |
| Google | Q1: Alt-1  Q2: We do not see the need to add the note |
| AT&T | We prefer Alt-1 without the additional note. Mapping of additional PRACH resources to a subset of SSBs is an example of “PRACH adaptation in the spatial domain” |
| Ericsson | Q1: Alt-1  Q2: We are open to Alt-2 |
| Xiaomi | We share same views with Samsung/ZTE. The proposed note is actually a kind of WG-level details which may be better to leave to RAN1 discussion.  On the other hand, we can also live with alt-1 if majority companies think a note is needed to downscope. |
| CMCC | We support Alt-1, and we agree with CATT that mapping of additional PRACH resources to a subset of SSBs is clearly PRACH adaptation in spatial domain and should be precluded so that RAN1 will not spend time on this issue.  Based on the following RAN1 agreement, the one source evaluation result marked as yellow below just evaluated the spatial domain PRACH adaptation with mapping of additional PRACH resources to a subset of SSBs, and it is clear the extra NES gain compared to time domain PRACH adaptation is limited (0%~8.8%), so we donot think mapping of additional PRACH resources to a subset of SSBs should be condidered any more.  **Agreement**  For the study of adaptation of PRACH in spatial domain, following network energy savings gains were reported by sources based on the evaluation framework agreed in RAN1#116bis:   * Two sources showed following NES gain for TDD, CAT1 BS power model, case C1 vs A1-1, zero load [R1-2404409, R1-2405107]   + -4% ~ -45% * Seven sources showed following NES gain for TDD, CAT1 BS power model, case C1 vs B1/A1-2, zero load [R1-2404225, R1-2404185, R1-2404334, R1-2404123, R1-2404562, R1-2405107, R1-2405163]   + 0% ~ 31%   + Note: Five sources assumed that case B1 has same PRACH resources as case A1-2. Remaining two sources evaluated only A1-2.   + Note: Three sources showed NES gains 0% ~ 10% [R1-2404225, R1-2404185, R1-2404334] * One source showed following NES gain for TDD, CAT1 BS power model, case C1 vs B1, zero load [R1-2404464]   + 1.0%~8.8%   + Note: The evaluation results provide the extra NES gain of spatial domain PRACH adaptation compared to time domain PRACH adaptation, where spatial domain and time domain PRACH adaptations are based on dynamic switching between PRACH resources according to two PRACH configuration indexes. |
| Futurewei | Our preference is not to change the WID.  As of the study of adaptation of PRACH in spatial domain, a conclusion to not specify according to the study done in RAN1 should be sufficient. Keeping the related bullet as a record of study (along with RAN1 and RAN meeting minutes) is a good practice.  For adaptation in time domain, it can be left to RAN1 for further work. |
| MediaTek | Q1: Between Alt-1 and Alt-2, Alt-1 will be more aligned with RAN1 conclusion as well as the observation that current time-domain PRACH adaptation proposals are actually different from the spatial domain proposal studied.  Q2: No note would be the better way forward, as RAN1 can specify the best solution without this note. |
| InterDigital | We are supportive for Alt-2 but will be ok just remove the spatial domain adaptation bullet without adding a note under time domain adaptation. |
| III | Q1: Alt-1 is preferred.  Q2: No note is preferred. |
| Apple | We support Alt-2. Alt-2 offers more flexible design for SSB-RO mapping and we would like to discuss further details in RAN1. |
| Huawei, HiSilicon | **Q1**: We support Alt-1, which is inline with the conclusion of the study for PRACH adaptation in spatial domain in RAN1.  **Q2**: We don't see the need to consider Alt-2. There is no consensus achieved in RAN1 to support it, and the NES gain is quite limited based on the RAN1 study. |

# **2 On Demand SIB1**

The following is a list of proposals from company contributions:

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| --- | --- |
| **Company** | **Proposals** |
| [RP-241056](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241056.zip)  Google |  |
| [RP-241083](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241083.zip)  OPPO |  |
| [RP-241087](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241087.zip)  LG Electronics |  |
| [RP-241132](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241132.zip)  Spreadtrum Communications | ***Proposal 1: Confirm to specify procedures and signaling method(s) to support on-demand SIB1 for UEs in idle/inactive mode, and do the relative revision to R19 eNES WID.*** |
| [RP-241162](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241162.zip)  Xiaomi |  |
| [RP-241177](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241177.zip)  Nokia |  |
| [RP-241180](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241180.zip)  InterDigital |  |
| [RP-241209](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241209.zip)  CMCC |  |
| [RP-241334](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241334.zip)  CATT | ***Proposal 1: Specify on-demand SIB1 for UEs in idle/inactive mode in Rel-19 NES and revise the WID accordingly.*** |
| [RP-241507](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241507.zip)  ZTE, Sanechips | **Proposal 1: Focus on Case 2, i.e. UE obtains the UL WUS configuration from Cell A, transmits UL WUS to NES Cell and receives on-demand SIB1 from NES Cell, in the study and follow-up work item phase of on-demand SIB1** **for UEs in idle/inactive mode.** |

## Summary

Two companies have suggested a WID update to specify On-Demand SIB1. However, the moderator points out that the current WID states that the checkpoint for normative work is not until RAN#105:

1. Study procedures and signaling method(s) to support on-demand SIB1 for UEs in idle/inactive mode, including: [RAN1/2/3]
   * Triggering method by uplink wake-up-signal using an existing signal/channel.
   * Wake-up-signal configuration provisioning to UE
     + Note: No modification of SSB will be discussed under this objective
   * Information exchange between gNBs at least for the configuration of wake-up signal, if necessary.
   * Checkpoint for normative work in RAN#105

## **Moderator Proposal 2-1:**

Allow discussions on On-Demand SIB1 to progress in RAN1 until the checkpoint for normative work in RAN#105. No WID update is proposed in RAN#104.

Please provide your company view on Moderator Proposal 2-1:

|  |  |
| --- | --- |
| **Company** | **View** |
| CATT | We are fine with Moderator Proposal 2-1 in general.  One minor comment is that we think the intention of the proposal is to allow further discussions in RAN WGs including RAN2 and RAN3 so we suggest the following update to the proposal. **Moderator Proposal 2-1:** Allow discussions on On-Demand SIB1 to progress in RAN1/2/3 until the checkpoint for normative work in RAN#105. No WID update is proposed in RAN#104. |
| New H3C | We are OK with this proposal |
| ZTE | Fine with the Moderator Proposal 2-1 and also agree with CATT that RAN2 and 3 should also be included in the proposal. |
| Nokia | We agree with the moderator proposal, in particular with the modification from CATT. We understand the moderator initially limited the proposal to RAN1 because the online discussion centered on RAN1 aspects, but it is better to make it clear that RAN Plenary is not preventing further discussion in other WGs. |
| Samsung | We support moderator’s proposal. |
| NTT DOCOMO | We are fine with moderator proposal 2-1 and suggestion from CATT. |
| OPPO | We are supportive for check it now. It seems we will continuous discuss on-demand SIB1 without WID updated. However, it is helpful to confirm that earlier. But, we can accept if majority want to put it in RAN#105. |
| Google | Agree with moderator’s proposal. |
| AT&T | No WID update is necessary in RAN#104. We also agree with the comments that Proposal 2-1 applies to RAN2 and RAN3 as well. |
| Ericsson | We support Moderator Proposal 2-1 with CATT’s update to clarify that discussion continue in RAN1/2/3 consistent with the WID:   1. Study procedures and signaling method(s) to support on-demand SIB1 for UEs in idle/inactive mode, including: [RAN1/2/3] |
| xiaomi | We support moderator’s proposal that no WID update is needed in RAN#104. |
| CMCC | support |
| Futurewei | We are fine with moderator’s proposal. |
| MediaTek | Support moderator proposal with CATT revision. We can decide the work scope in RAN#105. |
| InterDigital | Support |
| III | Support proposal 2-1, and fine with CATT’s view. |
| Apple | We support moderator’s proposal. |
| Huawei, HiSilicon | Fine with moderator proposal 2-1 with the revision from CATT. |

# **3 SSB Adaptation in Time Domain**

The following is a list of proposals from company contributions:

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| --- | --- |
| **Company** | **Proposals** |
| [RP-241056](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241056.zip)  Google |  |
| [RP-241083](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241083.zip)  OPPO |  |
| [RP-241087](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241087.zip)  LG Electronics |  |
| [RP-241132](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241132.zip)  Spreadtrum Communications | ***Proposal 2: For R19 eNES WID, a note can be added: For SSB adaptation in time domain, it does not exclude that some cells only allow R19 eNES-capable UEs to camp on or access.*** |
| [RP-241162](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241162.zip)  Xiaomi |  |
| [RP-241177](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241177.zip)  Nokia |  |
| [RP-241180](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241180.zip)  InterDigital |  |
| [RP-241209](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241209.zip)  CMCC |  |
| [RP-241334](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241334.zip)  CATT |  |
| [RP-241507](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_104/Docs/RP-241507.zip)  ZTE, Sanechips |  |

## Summary

One company has proposed a WID update to the following objective with the rationale that some NES techniques can be deployed in “greenfield”, hence backward compatibility does not need to be considered:

1. Specify adaptation of common signal/channel transmissions. [RAN1/2/3/4]
   * Adaptation of SSB in time domain, e.g. adapting periodicity
     + Note: Thisdoes not exclude that some cells only allow R19 eNES-capable UEs to camp on or access.
   * Adaptation of PRACH in time domain
   * Study adaptation of PRACH in spatial domain, e.g. non-uniform PRACH resources per SSB, and specify if found beneficial
     + This study is to be done in 2Q’2024 only
   * Adaptation of paging occasions including confining the paging occasions in the time domain
     + Note: there shall be no paging latency increase
   * Note: there shall be no negative impact to legacy UEs, unless significant benefits are shown

## **Discussion Point 3-1**

Please provide your company view on whether or not the above WID update as proposed in RP-241132 is needed.

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| --- | --- |
| **Company** | **View** |
| CATT | We do not see the need of the above WID update. |
| New H3C | We fail to see the requirement of updating WID |
| ZTE | No need for the above WID update. |
| Nokia | We do not see a need for updating the WID here. These aspects were thoroughly discussed during RAN#102 and the current WID description is already taking them into account. |
| Samsung | Not needed |
| NTT DOCOMO | Although we have such understanding as a proposed note, it seems not essential to update WID. |
| OPPO | We feel this update is not necessary. The detailed restriction up to RAN1. |
| Google | We failed to see the necessity for the update |
| AT&T | We prefer not to update the WID as proposed in RP-241132 |
| Ericsson | We do not support the WID update proposed in RP-241132 |
| Xiaomi | We do not support the WID update proposed in RP-241132. What the note proposes is part of WG-level discussion and has been discussed as one potential solution to avoid impacts for legacy UE. |
| CMCC | support |
| Futurewei | No need for such an update. |
| MediaTek | We think the note may not help RAN1 discussion and thus not deemed necessary to include |
| InterDigital | No need to have such an update. |
| III | No need to update the WID |
| Apple | We prefer not to include the note and to discuss the details in RAN1. |
| Huawei, HiSilicon | Technically the note is correct, since greenfield is possible. However, it seems not necessary to add such kind of note under this objective. |

# **4 Conclusions**

TBD