**3GPP TSG-RAN WG2 Meeting #113 electronic R2-2102439**

**Online, January 25th – February 5th 2021**

**Agenda Item: 8.9.3**

**Source: Xiaomi Communications (email discussion rapporteur)**

**Title: Summary of [041][ePowSav] TRS/CSI-RS for IDLE INACTIVE**

**Document for: Discussion and Decision**

# Introduction

This contribution provides a summary of the following email discussion:

* [AT113-e][041][ePowSav] TRS/CSI-RS for IDLE INACTIVE (Xiaomi)

Scope: Take the documents in 8.9.3 into account, except availability signalling which is postponed. Collect comments, determine agreeable points, open points and their main options and related justifications.

Intended outcome: Report, Agreements (if possible).

Deadline: Thursday Feb 4 UTC 1100 (TBD): Deadline for comments on agreements. Deadline for other aspects: EOM

Companies are invited to provide inputs and comments to questions before 2021-02-03, UTC 1100 (TBD) thus leave the rapporteur to have some time to provide draft summary with proposals.

# Contact information

|  |  |
| --- | --- |
| Company | Name and email address |
| Xiaomi | Li Yanhua; liyanhua1@xiaomi.com |
| Samsung | Anil Agiwal; anilag@samsung.com |
| Intel | Seau Sian Lim; seausian@intel.com |
| Qualcomm | Linhai He; linhaihe@qti.qualcomm.com |
| Huawei, HiSilicon | Yiru Kuang; kuangyiru@huawei.com |
| Futurewei | Yunsong Yang; yyang1@futurewei.com |
| Ericsson | Martin van der Zee, [martin.van.der.zee@ericsson.com](mailto:martin.van.der.zee@ericsson.com) |
| Apple | Sethuraman Gurumoorthy, [sethu@apple.com](mailto:sethu@apple.com) |
| MediaTek | Li-Chuan TSENG, li-chuan.tseng@mediatek.com |
| vivo | Chenli, chenli5g@vivo.com |
| OPPO | Haitao Li, lihaitao@oppo.com |
| ZTE | dong.fei@zte.com.cn |
| Sharp | Lei LIU; lei.liu@cn.sharp-world.com |
| Sony | Anders.Berggren@sony.com |
| CATT | Pierre Bertrand; pierrebertrand@catt.cn |
| Sequans | Noam Cayron ; noam.cayron@sequans.com |
| Nokia | Jussi-Pekka Koskinen, [jussi-pekka.koskinen@nokia.com](mailto:jussi-pekka.koskinen@nokia.com) |

# Discussion

## 3.1 General

The motivation of providing potential TRS/CSI-RS available in connected mode for the UE in idle/inactive is to assist time/frequency tracking and potentially help RRM measurement and paging reception indication as compared to SSB to reduce the total waking up time.

In the previous RAN1 #103, the following agreements were made and a LS [1] was sent to RAN2 on how to provide the configuration of TRS/CSI-RS occasion(s) for idle/inactive UE(s) asking RAN2 to design the signalling accordingly. For the availability of TRS/CSI-RS at the configured occasion(s), no conclusion was made on whether the availability of TRS/CSI-RS should be informed to UE or not, nor how to provide the availability of TRS/CSI-RS to UE.

|  |
| --- |
| In RAN1#103-e, RAN1 agrees the high level principle on signalling method for the configuration of TRS/CSI-RS occasion(s) for idle/inactive UE (s) in Rel-17 UE power saving enhancements. RAN1 would like to inform RAN2 the following related agreements:  **Agreements:**   * SIB signalling provides the configuration of TRS/CSI-RS occasion(s) for idle/inactive UE(s).   + Up to RAN2 to decide which SIB is to be used.   + Whether or not to additionally support other high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.) is up to RAN2   For the additional information, RAN1 would like to inform RAN2 the following related agreements made in RAN1#102-e:  **Agreements:**  The TRS/CSI-RS occasion(s) that may be for connected mode UEs can be shared to idle/inactive mode UEs.  - Note: It is understood that gNB can potentially share the occasions to idle/inactive (which would just mean it up to NW whether to share or not share).  - Note: It is understood that TRS/CSI-RS in the TRS/CSI-RS occasion(s) may or may not be transmitted.  - Note: Always-on TRS/CSI-RS transmission by gNodeB is not required  - At least TRS/CSI-RS occasion(s) corresponding to periodic TRS is supported  - FFS for other RS types  - FFS: Whether UE blind detection is required or not.  **Agreements:**  Further study whether and how to inform the availability of TRS/CSI-RS to idle/inactive mode UE (implicitly or explicitly).  - Note: Availability corresponds to the information for whether TRS/CSI-RS is actually transmitted or not.  RAN1 would like to inform RAN2 that based on agreements in RAN1#102-e and RAN1#103-e, RAN1 is still discussing the availability of the potential TRS/CSI-RS occasion(s) after the TRS/CSI-RS occasion(s) are configured by SIB. |

This discussion will focus on the issues from documents in 8.9.3 of RAN2#113-e, including the configuration of TRS/CSI-RS occasion(s), collecting comments on options and related issues. The availability signalling is not in the scope.

## 3.2 On providing the TRS/CSI-RS configuration by SIB

Based on company contributions, following solutions have been proposed:

One company [2] pointed out using RMSI is straightforward and can be considered for providing the TRS/CSI-RS information if size is allowed while [3][4][7][12]proposed **not** to use RMSI for providing the TRS/CSI-RS information based on the following arguments:

* The RMSI is size limited. If multiple TRS/CSI-RS resources would be configured and the configuration for each RS resource includes a number of IE parameters, optimization might be needed to reduce the signalling.
* RMSI is always broadcast and not all UEs camped on the cell support this feature, so the acquisition of this system information is not needed for these UEs.
* TRS/CSI-RS information does not need to be quickly available in the UE, the information should not be included in SIB1

If RMSI is not used, there are two paths. One company [14] proposed to use existing SIB, i.e. SIB11 while [2][4][5][7][9] [12][13]proposed to use new SIB, e.g. SIB-x for providing the TRS/CSI-RS information based on the following arguments:

* Pre-R17 UEs and R17 UEs which do not support this feature would not be impacted by, i.e. re-acquire system information is not needed if there is no information change for such UEs.
* TRS/CSI-RS configuration can be relatively large, a new SIB can accommodate more contents.

However, two companies [3][11] point out it is a bit early for RAN2 to decide whether to extend the existing SIB or introduce new SIB as it is difficult to estimate the size of TRS/CSI-RS configuration.[6] also admits the configuration may become large and infeasible to signal via SIBs but wants to defer a decision until RAN1 has concluded the content of the signalling.

Two companies [7][12] want to discuss whether SIB can be configured as area specific.[12] further points out that TRS/CSI-RS configuration has to be cell-specific, not area-specific, thus adding a merit for using new SIB not placing additional restrictions on the legacy SIB by having it be cell-specific.

Rapporteur summarized all these options and companies are invited to show your preference on the recommended solution on providing the TRS/CSI-RS configuration by SIB:

* Option 1: RMSI (if size allowed);
* Option 2: Existing SIB (SIBs other than RMSI );
* Option 3: New SIB type , e.g. SIB-x;
* Option4: Do not make the decision right now, wait for more RAN1 input;

Q1: Companies are invited to show your preference on the recommended solution on providing the TRS/CSI-RS configuration by SIB?

|  |  |  |
| --- | --- | --- |
| Company | Preferred solution(s) | Comments |
| Samsung | Option 2/3 | If configuration is updated frequently, new SIB is preferred. Otherwise existing SIB other than SIB1 can be used. More inputs may be needed on how often the configuration can be updated. |
| Intel | Option 2, 3 or 4 | We have a slight preference for Option 3 as this TRS/CSI-RS configuration is not used by legacy UE. However more information is needed from RAN1 (e.g. the frequency of change if the configuration is associated with availability etc.) before a final decision can be made |
| Qualcomm | Option 2 or 3 | We share the same view as Samsung |
| Huawei, HiSilicon | Option 3 or 4 | Based on our observation, the TRS/CSI-RS configuration can be very large and introducing a new SIB can accommodate more contents, also it reduces the impact on irrelevant UE. Besides, the existing SIB is dedicated for a certain function, So Option 3 is preferred. We are also find to wait for more RAN1 input, e.g. the content of the TRS/CSI-RS configuration. |
| Futurewei | Option 3 or 4 | We also slightly prefer option 3 for now. But to make a final decision, we may need more inputs from RAN1 (i.e., option 4), regarding how large the configuration is and how often it changes. |
| Ericsson | Option 3 or 4 |  |
| Apple | Option 3 | We prefer option 3 as it does not impact any legacy behavior, and allows for future scalability of this solution for R17 and beyond. Given the fact that RAN1 in the last meeting has already left the signaling aspects of this to RAN2, we do not see what more is expected from RAN1 regarding the signaling aspect. But that said, if any further clarification needs to be elicited from RAN1 (option 4) we are fine. |
| MediaTek | Option 3 or 4 | We slightly prefer Option 3, as the TRS/CSI-RS configuration is expected to have large size. But it is fine to wait for more details from RAN1. |
| vivo | Option 3 or 4 | We are fine to option 3. In our opinion, the configuration of TRS/CSI-RS will not be changed frequently. Considering the configuration size and future extension, introducing a new SIB will be a better solutions. Besides, option 3 has little impact to legacy UEs on SI reception procedure.  We could also accept to wait for more progress from RAN1 on the configuration of TRS/CSI-RS. |
| OPPO | Option 2, 3 or 4 | Whether to use existing SIB or introduce new SIB type may depend on the change frequency for the TRS/CSI-RS configuration. We should wait for more inputs from RAN1. |
| ZTE | Option 3 or Option 4 |  |
| Sharp | Option 2, 3, or 4 | Whether Option 2 or 3 is used can be finally decided based on the inputs from RAN1 on the content of configuration and the update frequency of the configuration. |
| Sony | Option 2 or 3 | We share the same view as Samsung. Preferably option 3 as the existing SIB (other than SIB1) has already a specific purpose. |
| Xiaomi | Option3 | We prefer for a new SIB.  Option1 is not used to expose TRS/CSI-RS configuration because its size limited and other limitations as summarized above.  Option3 for a new SIB is more appropriate to accommodate this, without impacting the legacy UE. And we also want to point out TRS/CSI-RS configuration is cell-specific, not area-specific. It is undesirable to place additional restrictions on the legacy SIB by having it be cell-specific. Thus we prefer to introduce a new SIB.  But we are open to wait. |
| CATT | Option 4 | It’s a stage 3 issue. Without parameters of TRS/CSI-RS configuration s from RAN1, it is not urgent to make the decision right now.end the parameters 3 as it |
| Sequans | Option 3 or 4 | The size of information does not seem negligible, so we prefer new SIB to avoid impact on legacy UEs, but are fine with waiting with the decision |
| Nokia | Option 3 | Size of the TRS/CSI-RS configuration can be large and therefore new SIB would be preferred to avoid impacting legacy UEs that do not support this feature. |

**Summary:**

17 companies reacted to Q1 on providing the TRS/CSI-RS configuration by SIB.

14 companies (Samsung, Intel, QC, HW, Futurewei, Ericsson, Apple, MTK, VIVO, ZTE, Sony, Xiaomi, Nokia, Sequans) prefer a new SIB. Almost all the companies mentioned above are fine to wait for more RAN1 input to make a final decision.

3 companies (OPPO, Sharp, CATT) show no strong view and suggest to get more input from RAN1.

Given the almost all the companies are fine to wait for more RAN1 input, rapporteur thinks all the options are included at this stage and suggests:

1. RAN2 will further study the following options on SIB signalling providing the configuration of TRS/CSI-RS occasion(s) for idle/inactive UE(s):

**- Option 1: RMSI (if size allowed);**

**- Option 2: Existing SIB (SIBs other than RMSI);**

**- Option 3: New SIB type, e.g. SIB-x;**

## 3.3 On providing the TRS/CSI-RS configuration by other high-layer signalling methods (e.g., dedicated RRC, RRC release)

From the RAN1 LS, RAN1 has decided that SIB signalling providing the configuration of TRS/CSI-RS occasion(s) for idle/inactive UE(s) will be the baseline while RAN2 can further consider additional support of other high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.).

Based on company contributions, following opinions have been proposed:

[5][12][14] proposed the cons of using high-layer signalling methods (e.g., dedicated RRC, RRC release) for providing the TRS/CSI-RS information based on the following arguments:

* It is a one-shot configuration. A change in TRS/CSI-RS availability and/or configuration is still needed to be conveyed via system information.
* The configuration by dedicated RRC is not valid once the UE has moved to a new cell.
* It would only apply to a UE that has already been in connected mode, i.e. UEs that initially camp on the cell cannot use it at all.

Rapporteur understands that dedicated RRC signalling method (e.g., RRC release message, etc.) does not work alone. To confirm this, a question is given as below:

Q2: Do companies agree additional high-layer signalling methods can work alone without SIB signalling providing the configuration? (if no, please provide your comments)

|  |  |  |
| --- | --- | --- |
| Company | Agree/ Disagree | Comments |
| Samsung | Disagree | TRS/CSI RS configuration is cell specific. So UE has to rely on broadcast configuration when UE moves to new cell. |
| Intel | Disagree | We are not sure how additional higher-layer signalling methods can work alone as the UE may change cell. |
| Qualcomm | Disagree | We share the same view as Samsung. |
| Huawei, HiSilicon | Disagree | Dedicated RRC signalling can only be used for connected states Ues, the configuration provided by one cell may not be valid after cell reselection. |
| Futurewei | Disagree | Agree with Samsung and Huawei. |
| Ericsson | Disagree |  |
| Apple | Disagree | There is definitely a need for a common broadcast signaling based solution for this as the impact is going to be for IDLE/INACTIVE Ues. So having only dedicated higher layer signaling solution methods will not be sufficient here. |
| MediaTek | Disagree | TRS/CSI RS configuration is cell specific. |
| Vivo | Disagree | We think high-layer signalling methods can work with SIB signalling. |
| OPPO | Disagree | TRS/CSI RS configuration is cell specific, and SIB singaling is sufficient. No need to consider additional dedicated RRC ignalling for providing the configuration of TRS/CSI-RS occasion(s) for idle/inactive Ues. |
| ZTE | Disagree | Our concern is the useless CSI/TRS transmission for specific UE when this UE is moving to another Cell, it is not resources efficient and NW will spend unnecessary power to keep sending the CSIRS/TRS. |
| Sharp | Disagree | Additional high-layer signalling methods cannot work alone. |
| Sony | Disagree | Share the same view as Huawei / HiSilicon |
| Xiaomi | Disagree | Same view as other companies. Additional higher-layer signalling methods cannot work alone because the configuration by dedicated RRC is not valid once the UE moves to another cell. |
| CATT | Disagree | Dedicated RRC signaling method is not valid when the UE moves to a new cell. |
| Sequans | Disagree | Agree with above |
| Nokia | Disagree |  |

**Summary:**

17 companies reacted to Q2 and all companies agree that additional higher-layer signalling methods cannot work alone because the configuration by dedicated RRC is not valid once the UE moves to another cell.

Rapporteur suggests to agree:

1. On signalling providing the configuration of TRS/CSI-RS occasion(s) for idle/inactive UE(s):

**- SIB signalling is assumed as baseline;**

**- Other high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.) can be additionally considered with justification, i.e., they do not work alone.**

Based on this, we will discuss whether we will provide additional support for other high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.) to provide TRS/CSI-RS configuration;

[10][11][12][14] suggested not to consider it since there is no additional gain on top of SI signaling.

* TRS/CSI-RS configuration should be shared with as many UEs as possible. Dedicated signalling is not the right approach to achieve that goal;
* Broadcasted TRS/CSI-RS configurations do not necessarily need to be accurate therefore UE-specific configuration does not add much value on top of SIB signalling;
* TRS/CSI-RS configuration is not expected to be UE-specific so, once it is available in SIB, there seems no clear use case and benefit to configure dedicated TRS/CSI resource for one idle/inactive UE;

[7] also points out the TRS/CSI-RS configuration is common information thus a UE specific TRS/CSI-RS configuration is not needed but still suggests to evaluate more.

However, [2][3][4][5][8][9][13] proposed pros of using other high-layer signalling methods (e.g., dedicated RRC, RRC release) for providing dedicated TRS/CSI-RS configuration based on the following arguments:

* A UE that moves from connected to idle/inactive mode can in principle re-use the TRS/CSI-RS that has been used during connected mode or based on an indication to re-use it [4].
* The configuration provided in RRC release message may be valid during a time duration, after that the UE follows the TRS/CSI-RS configuration in system information.
* It does not have an overhead restriction (discussed above for SIB), and may cost less signalling overhead compared with periodic broadcast signalling since the dedicated signalling is one-shot even for several specific UEs.
* NW can assist the UE transitioning from CONNECTED to IDLE/INACTIVE mode, by signalling the optimal TRS/CSI-RS occasion that this UE should use (taking into account this UE PO) via RRC signalling (e.g. RRC RELEASE).

[13]also points out if the SI signalling can carry multiple configurations to facilitate TRS/CSI-RS occasions close to the UE’s PO, there may not be a need for such dedicated RRC signalling hence suggests to wait for RAN1. Thus the rapporteur adds it as a third option.

* Option 1: Additional support for other high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.) to provide TRS/CSI-RS configuration is supported;
* Option 2: Additional support for other high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.) to provide TRS/CSI-RS configuration is **not** supported;
* Option3: Wait for RAN1 to design the TRS/CSI-RS configuration for the SIB

Companies are invited to show your preference on the recommended solution for providing the TRS/CSI-RS configuration by other high-layer signalling methods (e.g., dedicated RRC, RRC release).

Q3: Companies are invited to show your preference on the recommended solution on providing the TRS/CSI-RS configuration by other high-layer signalling methods (e.g., dedicated RRC, RRC release)?

|  |  |  |
| --- | --- | --- |
| Company | Preferred solution(s) | Comments |
| Samsung | Option 2 | Use of configuration signaled by dedicated signaling is limited. |
| Intel | Option 3 | It may be premature to make a decision on this point since it is unclear how the TRS/CSI configuration structure will be like and whether it can signal multiple configuration. |
| Qualcomm | Option 2, 3 | In general, we don’t see a need to use dedicated signaling for TRS/CSI-RS configuration. But we are fine to wait for more RAN1 input. This issue is not really a high-priority one at the moment. |
| Huawei, HiSilicon | Option3 | It is early to make the decision right now. |
| Futurewei | Option 3 | We can decide that later when RAN1’s design is more clear. |
| Ericsson | Option 3 |  |
| Apple | Option 3,1 | We would prefer to have additional dedicated signaling for TRS/CSI-RS but can wait to hear from RAN1 design on this. |
| MediaTek | Option 3 | We don’t see the need of additional signaling for TRS/CSI-RS configuration, but it’s fine to wait for more details from RAN1. |
| vivo | Option1 | Even the SI signalling can carry multiple configurations, the high-layer configuration can assist idle/inactive UE to choose the most suitable configurations.  Meanwhile, we do not quite understand Option 3. It was clearly mentioned in the LS that “Whether or not to additionally support other high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.) is up to RAN2”. Why this is related to the RAN1 design on the TRS/CSI-RS configuration for the SIB?  [Rapporteur]: Rapporteur checked the documents in 8.9.3 of RAN2#113-e and found some companies suggest to wait for more RAN1 input to make the final decision. |
| OPPO | Option 2 | See our reply to Q2. |
| ZTE | Option 2 | See above apply |
| Sharp | Option 1, 3 | We prefer to support high-layer signalling methods and we are also fine if the majority would like to wait more RAN1’s input. |
| Sony | Option 1 | TRS/CSI-RS configuration should also be able to be provided in RRC Release message, to save UE to read SI immediately after leaving RRC-Connected mode. |
| Xiaomi | Option2 | We want to keep it simple as we are not sure of the additional gain. |
| CATT | Option 2,3 | We don’t see strong motivation to introduce dedicated signaling for TRS/CSI-RS configuration. But we are fine to wait for more RAN1 input. |
| Sequans | Option 3 | We currently don’t see a need for additional dedicated information, but think it’s too early to discard this option and prefer to wait for more details |
| Nokia | Option 3 |  |

**Summary:**

17 companies reacted to Q3 on providing the TRS/CSI-RS configuration by additional other high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.).

4/17 companies (Samsung, OPPO, ZTE, Xiaomi) see no additional gain on top of SI signalling thus suggest not support it. 3/17 companies (Sony, Sharp, Vivo) show interest on this.

However, 10/17 (Intel, QC, Huawei, Futurewei, Ericsson, Apple, MTK, CATT, Sequans, Nokia ) suggest to wait for more RAN1 input to make the final decision. Given that half of the companies want to wait for more RAN1 input, rapporteur suggests:

1. RAN2 will further study on high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.) on providing the configuration of TRS/CSI-RS occasion(s) for idle/inactive UE(s):

## 3.4 On providing the TRS/CSI-RS configuration by other solutions (e.g. pre-configuration, paging message, etc.)

[5] pointed that pre-configuration is a possible means, and it is feasible to use paging to transmit information to idle/inactive-mode UEs. These approaches, however, may not be optimal considering signalling flexibility. Since just one company mentioned this, rapporteur suggests not to consider this.

Q4: Do companies agree that providing TRS/CSI-RS configuration via other solutions (e.g. pre-configuration, paging message, etc.) will not be considered? (if no, please provide your comments)?

|  |  |  |
| --- | --- | --- |
| Company | Agree/ Disagree | Comments |
| Samsung | Agree |  |
| Intel | FFS | Even though these other methods seem a bit far-fetched, we prefer to keep it open for the time being. |
| Qualcomm | Agree |  |
| Huawei, HiSilicon | Agree | The benefits of providing TRS/CSI-RS configuration via other solutions are not clear, better to keep simple. |
| Futurewei | Agree |  |
| Ericsson | Agree | There should not be any impact nor restriction on the connected mode TRS/CSI-RS configuration. |
| Apple | FFS | Agree with Intel, though these options are far-fetched at this point of discussion, we can keep it open for now and based on WI progress we can exclude them at a later stage. |
| MediaTek | Agree | The purpose of providing TRS/CSI-RS configuration to idle-mode Ues is to help power saving; we do not really configure UE to do something. So let’s keep it simple. |
| Vivo | FFS | We are not sure the specific benefit of these methods for now, but we can keep it open and maybe other suitable method and justification can be acceptable later. |
| OPPO | Agree |  |
| ZTE | FFS |  |
| Sharp | FFS |  |
| Sony | FFS | Same view as Intel or we can keep it open with lower priority |
| Xiaomi | Agree | We want to keep it simple as we are not sure of the additional gain. |
| CATT | Agree |  |
| Sequans | FFS | Agree with Intel. We can agree to lowering the priority of this discussion. |
| Nokia | Agree |  |

**Summary:**

17 companies reacted to Q4 on providing the TRS/CSI-RS configuration by other solutions (e.g. pre-configuration, paging message, etc.)

10/17 companies (Samsung, QC, Huawei, Futurewei, Ericsson, MTK, OPPO, Xiaomi, CATT,Nokia) see no need to consider this and to keep it simple while 7/17 companies (Intel, Apple, Vivo, ZTE, Sony, Sharp, Sequans) want to keep it open.

Rapporteur checked with RAN1 colleagues and learnt that some companies suggested to predefine or fix a part of TRS/CSI-RS parameters in specification to reducing the signalling in RAN1. Since RAN1 is discuss this, rapporteur suggests to keep it open.

1. RAN2 will further study on providing the TRS/CSI-RS configuration by other solutions (e.g. pre-configuration, paging message, etc.)

## 3.5 Change of TRS/CSI-RS configuration in idle/inactive mode by SIB

From the LS [1], the TRS/CSI-RS cannot be assumed to be always on. It is up to gNB implementation whether or not to transmit a TRS/CSI-RS. It is likely the network may provide a configuration of the RS to the UEs even though there is no TRS/CSI-RS actually available or transmitted. As the change of availability on TRS/CSI-RS is still in RAN1’s scope, RAN2 needs to consider how to convey the change of TRS/CSI-RS configuration.

[2][7][9][11][14] understand that at least the configuration of TRS/CSI-RS would not be frequently changed. It seems the change of TRS/CSI-RS configuration in SIB could follow legacy SI change procedure and signalling due to TRS/CSI-RS configuration is expected to be low. However, a concern comes from companies. [2][5] proposed that the current SI modification procedure results in irrelevant Ues (e.g., legacy Ues or Ues not supporting/using the TRS/CSI-RS mechanism) perform unnecessary SI update and wasting power especially when the change of TRS/CSI-RS information is frequent. Thus, further optimization, e.g., by paging short message or PEI will be considered which indicates only to the Ues supporting idle/inactive TRS/CSI-RS to acquire the updated SI in the next modification period.

[5] also points that the network should be able to modify the TRS/CSI-RS configuration at any time while [7] holds a different opinion. To capture this, rapporteur classifies the potential enhancement for fast SI update mechanism i.e. ETWS like notification into the further optimization option.

* Option 1: The legacy SI change procedure is sufficient for the change of TRS/CSI-RS configuration in SIB, i.e. further optimization will not be considered;
* Option 2: Further optimization can be considered, e.g., by paging short message , PEI or fast SI update mechanism;

Companies are invited to show your preference on the recommended solution on changing of TRS/CSI-RS configuration in idle/inactive mode by SIB.

Q5: Companies are invited to show your preference on the recommended solution on changing of the TRS/CSI-RS configuration by SIB?

|  |  |  |
| --- | --- | --- |
| Company | Preferred solution(s) | Comments |
| Samsung | Option 2 | Separate notification can be considered in short message or PEI |
| Intel | Option 2 | This should be considered to avoid unnecessary waking legacy UE, particularly if the availability is linked with the configuration. |
| Qualcomm | Option 2 |  |
| Huawei, HiSilicon | Option 2 | We would like to first clarify that we understand the TRS/CSI-RS may be changed at any time (may not fit the SI modification period) but may not be frequently. Based on this understanding, the change of TRS/CSI-RS configuration needs to be studied, e.g. how the NW informs the UE timely, as the UE behaviour may be different if TRS/CSI-RS configuration is changed. |
| Futurewei | Option 2 |  |
| Ericsson | Option 1 |  |
| Apple | Option 1 / Option 2 | We feel that legacy SI modification procedure is good enough to address this use case. But we are open to any optimization via option 2 as well. |
| MediaTek | Option 2 | TRS/CSI-RS configuration should not change frequently, so legacy procedure may be enough. But at this moment we’d like to keep further optimization possible (‘can be considered’). |
| Vivo | Option 1 / Option 2 | We think the legacy SI change procedure can always useful here. But it may have some impact on legacy Ues. Considering the configuration of TRS/CSI-RS is not changed frequently, this little impact could be acceptable.  If there is no additional availability mechanism, the SI change for TRS/CSI-RS will be more frequent. In this case, option 2 could be preferred. |
| OPPO | Option1 | Given that RAN1 has agreed to inform availability on TRS/CSI-RS to idle/inactive Ues, in our understanding, the TRS/CSI-RS configuration would not be changed frequently, so the legacy SI change procedure is sufficient. |
| ZTE | Option 1 |  |
| Sharp | Option 2 | We slightly prefer Option 2 considering impacts on legacy Ues. |
| Sony | Option 2 | We need to explore the possibility of a UE receiving multiple TRS/CSI-RS configurations and possibility to activate/change from one to another. |
| Xiaomi | Option 1 | We understand we need to separate the provisioning of availability of TRS/CSI-RS to the UE from the TRS/CSI-RS configuration for use. Since The TRS/CSI-RS configuration is not assumed to change often, the legacy SI change procedure is sufficient. |
| CATT | Option 1 | The configuration of TRS/CSI-RS would not be frequently changed. We think legacy SI change procedure is sufficient for the change of TRS/CSI-RS configuration in SIB. |
| Sequans | Option 2 |  |
| Nokia | Option 1&2 | Legacy SI change procedure can be naturally used, but further optimizations can be considered on top. |

**Summary:**

17 companies reacted to Q5 on changing of the TRS/CSI-RS configuration by SIB.

5/14 companies (Ericsson, OPPO, ZTE, Xiaomi, CATT) suggest the legacy SI change procedure is sufficient.

However, 12/17 companies (Samsung, Intel, QC, Huawei, Futurewei, Apple, MTK, Vivo, Sharp, Sony, Sequans, Nokia) want to consider further optimizations to SI change procedure. And 2 companies mentioned the configuration may potentially be linked with the availability

Based on the majority views, rapporteur suggests to keep it open.

1. RAN2 will further study on changing of the TRS/CSI-RS configuration by SIB and further optimization to SI change procedure are not excluded, e.g., by paging short message, PEI or fast SI update mechanism.

## 3.6 Other

Q6: Any other relevant issue to discuss?

|  |  |
| --- | --- |
| Company | Issue description |
|  |  |
|  |  |
|  |  |

# Conclusions

Based on companies’ inputs to this email discussion, the following proposals are listed for agreement:

For easy agreement:

1. **On signalling providing the configuration of TRS/CSI-RS occasion(s) for idle/inactive UE(s):**

**- SIB signalling is assumed as baseline;**

**- Other high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.) can be additionally considered with justification, i.e., they do not work alone.**

For further study:

**On providing the configuration of TRS/CSI-RS:**

1. **RAN2 will further study the following options on SIB signalling providing the configuration of TRS/CSI-RS occasion(s) for idle/inactive UE(s):**

**- Option 1: RMSI (if size allowed);**

**- Option 2: Existing SIB (SIBs other than RMSI);**

**- Option 3: New SIB type, e.g. SIB-x;**

1. RAN2 will further study additional high-layer signalling methods (e.g., dedicated RRC, RRC release message, etc.) on providing the configuration of TRS/CSI-RS occasion(s) for idle/inactive UE(s):
2. RAN2 will further study on other solutions (e.g. pre-configuration, paging message, etc.) on providing the TRS/CSI-RS configuration of TRS/CSI-RS occasion(s) for idle/inactive UE(s);

**On changing the configuration of TRS/CSI-RS:**

1. RAN2 will further study on changing of the TRS/CSI-RS configuration (by SIB) and further optimizations to SI change procedure are not excluded, e.g., by paging short message, PEI or fast SI update mechanism.

# References

1. [R2-2100030](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2100030.zip) LS on signalling method for TRS/CSI-RS occasion(s) for idle/inactive UE(s)
2. [R2-2100458](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2100458.zip) RAN2 impacts on TRS/CSI-RS in idle inactive mode vivo discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core
3. [R2-2100816](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2100816.zip) TRS/CSI-RS for idle and inactive mode UE SHARP Corporation discussion
4. [R2-2100912](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2100912.zip) Discussion on TRS/CSI-RS configuration of idle/inactive-mode UEs Sony discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core
5. [R2-2101275](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2101275.zip) On potential TRS/CSI-RS for idle/inactive mode UE Huawei, HiSilicon discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core
6. [R2-2101310](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2101310.zip) Potential TRS/CSI-RS occasion(s) Nokia, Nokia Shanghai Bell discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core
7. [R2-2101739](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2101739.zip) TRS/CSI-RS exposure Ericsson discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core R2-2009956
8. [R2-2101888](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2101888.zip) Considerations on TRS CSI-RS occasion(s) for idle inactive UE(s) CMCC discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core
9. [R2-2100853](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2100853.zip) NR UE Power Save TRS/CSI-RS Signaling for IDLE/INACTIVE UEs Apple discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core
10. [R2-2100154](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2100154.zip) Discussion on signaling aspects of TRS/CSI-RS occasion(s) for idle/inactive Ues OPPO discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core
11. [R2-2100299](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2100299.zip) Considerations on configuration of TRS/CSI-RS CATT discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core
12. [R2-2100345](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2100345.zip) Discussion on TRS CSI-RS for RRC-IDLE and RRC-INACTIVE State UE Xiaomi Communications discussion
13. [R2-2101302](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2101302.zip) TRS/CSI-RS configuration and availability for idle/inactive-mode UE Intel Corporation discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core
14. [R2-2100313](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_113-e/Docs/R2-2100313.zip) Power saving enhancements for paging reception Qualcomm Incorporated discussion Rel-17 NR\_UE\_pow\_sav\_enh-Core