3GPP TSG-RAN WG2 Meeting #118-e R2- 220xxxx

Online, 9th May – 20th May, 2022

Source: CATT

Title: Report of [AT118-e][071][ePowSav] RRC (CATT)

Agenda Item: 6.9.1.3

Document for: Discussion and Decision

# Introduction

This contribution provides the report of the following email discussion:

* [AT118-e][071][ePowSav] RRC (CATT)

Scope: 1. For TRS/CSI-RS Address remaining issues, from tdocs under 6.9.3.3. not already addressed, Identify agreements, discussion points, etc. 2a. Allow further checking of the RRC Rapporteur resolutions in the RRC CR. 2b. Update the CR acc to meeting agreements

Intended outcome: 1. Report. 2 Agreed CR (in the end)

Deadline: CB W2 Tuesday, CR agreement expected by Post meeting discussion.

# Contact Information

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# TRS/CSR-RS remaining issues

## TRS availability when SI change

In [1], it is discussed a potential issue when the TRS/CSI-RS configuration is changed during the validity duration, as illustrated in Figures 1 and 2:



**Figure 1: TRS configuration is changed during the idle/inactive TRS validity duration configured by RRC**



**Figure 2: UE receives the validity indication duration and the TRS/CSI-RS change indication at the same**

[1] questions whether the UE still follows the legacy validity duration configured by RRC in these cases, or if another behavior should be expected. Specifically, [1] suggests two options:

* Option 1: UE still considers the updated TRS/CSI-RS as available until the validity duration time duration expires (no specification change).
* Option 2: UE considers the validity duration is ended at the boundary of the modification period during which UE receives the changed TRS/CSI-RS configuration or until the validity time duration expires, whichever is earlier.

[1] argues Option 2 could allow a clean separation of the L1 based availability indications for the old and new configurations.

**Q1. Which option do you support from Option 1 and Option 2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option1/2** | **Comment** |
| Ericsson | Option 2 | We think it needs to be clarified when L1 and L3 indicate something differently. In our understanding L3 should be leading here, e.g. the configuration might have changed or removed, in which case the L1 indication obviously is not valid anylonger. |
| Xiaomi | Option2 | I think we are meaning here is:  The TRS/CSI-RS availability is assumed to be ‘unavailable’ for all the TRS resource set group(s) upon getting the TRS/CSI-RS configuration modification.  Not only for the TRS resource set group whose configuration is changed, right? |
| Qualcomm | Option 2 | Agree with Ericsson |
| ZTE | Option 2 | From NW point of view, even though the scenario mentioned here we think it is not common since the intention of introduction of L1 indication is actually for not change the TRS Configuration during the validity period, we still think L3 signaling shall have a priority than L1 indication in case such an abnormal scenario really happen in the real deployment. |
| Sequans | Option 2 | Agree with Ericsson |
| Intel | Option 2 |  |
| Samsung | Option 2 | Once the configuration is changed, L1 indication for old configuration is not valid. New L1 indication is needed for availability indication of updated configuration. |
| LGE | Option 2 | Before UE starts SI update procedure, it may use TRS resources that was indicated before UE obtains the SIB for TRS configuration. Therefore, if an SI update procedure is performed(at the boundary of the modification period), the UE should consider the TRS as unavailable. |
| Sharp | Option 2 |  |
| Nokia | Option 2 | Agree with Ericsson |
| vivo | Option 2  (proponent) | As we have agreed, when UE acquires SIB-X with a TRS/CSI-RS configuration, it may receive the associated L1-based availability indication soon. Then if this SIB-X is changed within the previous valid duration time, UE may receive the changed TRS/CSI-RS configuration and new L1 based signaling within the valid duration time. And UE may be confused about how to deal with the new availability indication and the previous availability indication.  Besides, RAN1 has the following agreement in RAN1#107bis-e meeting:  *UE can receive L1 based signaling for TRS availability indication before the expiration/end of validity duration associated with previous L1 based signaling for TRS availability indication*   * *For each bit indicated as ‘1’ in the availability indication field of the current L1 based signaling ~~TRS availability indication~~, the UE assumes the corresponding TRS resource set(s) are available from the reference point until the end of the validity duration associated with the current L1 based signaling ~~indication~~.* * *For each bit indicated as ‘0’ in the availability indication field of the current L1 based signaling, the UE keeps the existing ~~current~~ assumption on the availability or unavailability of the corresponding TRS resource set(s).*   It can be observed that the indication of L1 based availability indication in and out of the validity duration is different. And in the above case, the new received L1 based signaling obviously should be considered as which is received out of the validity duration, which is not aligned with RAN1’s agreement.  Hence the case that TRS/CSI-RS configuration is changed within the validity time duration must be considered. And option2 is a straightforward method to resolve the issue. |
| CATT | Option 2 | Our understanding is that the L1 indication is associated with a TRS configuration (via the parameter *indBitID*), hence upon a new configuration it makes sense that the L1 indication associated with the old TRS configuration is no longer valid. |
| MediaTek | Option 2 | Agree with CATT |
| Huawei, HiSilicon | Option 2 | Agree with CATT |
| Apple | Option 2 | Agree with CATT |

## TRS resource configuration conflict between Idle/Inactive and Connected

The TRS/CSI-RS configuration acquired by system information is intended to be used while the UE is in RRC\_IDLE/INACTIVE. Once the UE enters RRC\_CONNECTED, the specification has supported the mechanism since Rel-15 that the TRS/CSI-RS configuration specific to the UE can be configured by the network via dedicated signalling, in accordance with the UE capability. Since the former is cell-specific while the latter is UE-specific, they can likely be different and so [2] raises the issue that it is unclear:

1. if the UE continues to use the TRS/CSI-RS configuration acquired by system information after entering RRC\_CONNECTED and
2. if, once configured with the UE-specific TRS/CSI-RS configuration via dedicated signaling, there could still be a conflict/ambiguity between the two configurations

From RRC Rapporteur perspective, we see no possible ambiguity between both configurations because the TRS/CSI-RS configuration broadcasted in system information is specified to be for idle/inactive UEs only:

|  |  |  |
| --- | --- | --- |
| – *SIB17*  SIB17 contains configurations of TRS resources for idle/inactive UEs.  […]   | *SIB17* field descriptions | | --- | | ***trs-ResouceSetConfig***  RS configuration of TRS occasion(s) for idle/inactive UE(s), in terms of a list of N>=1 NZP TRS resource set(s). The maximum number of TRS resource sets configured by higher layer is 64. If a TRS resource is configured, the L1 based availability indication is always enabled based on that configuration. A UE which acquired SIB-X with a TRS configuration but did not yet receive an associated L1-based availability indication considers the configured TRS as unavailable. | |

So our interpretation is that connected UEs simply ignore this configuration. But it is fair to check companies’ views.

**Q2. Is there any possible conflict or ambiguity between TRS/CSI-RS configuration broadcasted in SIB17 for idle/inactive UEs and TRS/CSI-RS configuration provided via dedicated signaling for connected UEs?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Ericsson | No | In legacy, the UE in connected mode (only) uses the dedicated TRS/CSI-RS configuration (if configured). We think the UE supporting TRS/CSI-RS in Idle/Inactive should behave the same way in connected mode, i.e. the SIB configuration is not used in connected mode.  Furthermore PEI is not used in connected mode, i.e. the UE cannot keep track whether the TRS/CSI-RS configuration in SIB is valid. |
| Xiaomi | No | The spec has put it clear that SIB-17 is for idle/inactive UEs only. |
| Qualcomm | No | Agree with Ericsson and Xiaomi |
| ZTE | No | Agree with above. |
| Sequans | No | Agree with above |
| Intel | No |  |
| Samsung | No | Same view as Ericsson. |
| LGE | No | Agree with Ericsson |
| Sharp | No | Agree with above. |
| Nokia | No |  |
| vivo | No | Similar view as Ericsson. |
| CATT | No |  |
| MediaTek | No |  |
| Huawei, HiSilicon | No | Agree with Ericsson. |
| Apple | No |  |

## Adding an “infinite” value to the field *validityDuration*

[3] observes that the current configurability of the TRS/CSI-RS validity duration poorly serves the use case where the TRS/CSI-RS configuration is steady and does not change: “*However there is additional overhead and complexity without good motivation, in both UE and gNB, to indicate TRS/CSI-RS availability explicitly via L1 signalling for the use case when the TRS/CSI-RS configuration does not change*”. “*The finite values defined for the validityDuration IE range also do not allow to a correct configuration for the use case where the TRS/CSI-RS configuration is valid as long as it is scheduled*”. To better address this usecase, proposes to support the “infinite” value for the field *validityDuration*.

**Q3. Do you support adding the “infinite” value to the field *validityDuration*?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| Ericsson | Yes (proponent) | The use case where the TRS/CSI-RS configuration does not change, needs to be supported as well. |
| Xiaomi | - | Have sympathy on this.  Better to discuss in RAN1 since RAN1 decides the value range. |
| Qualcomm | No | SIBs have a validity timer of 3 hours. We don’t see any use cases to make exception for TRS/CSI-RS configuration. |
| ZTE | No | Qualcomm’s explain is valid to us. |
| Sequans | Yes | It seems like a good solution to minimize needless signalling.  SIB validity time can be used instead of infinity, but that is semantics which can be solved in the field description. Anyway some additional description will be needed, e.g., not mandating any L1 indication. We are also fine to consult RAN1. |
| Intel | No | Agree with Xiaomi that this needs to be discussed in RAN1 since it is on the validity duration of the L1 availability indication. |
| Samsung | No |  |
| LGE | No | In our understanding, it seems to have some impact on RAN1 as well, as it is different from the assumptions made so far in RAN1. In RAN1, Always-on TRS transmission by the network is not considered, and SIB-based signaling is not agreed. |
| Sharp | No | Agree to discuss it in RAN1. |
| Nokia | Yes | We support having “infinite” value in the field *validityDuration*. We don’t see any reason why it could not be introduced. |
| vivo | Yes | If the TRS/CSI-RS configuration doesn’t change, it may be efficient. |
| CATT | Yes | We have some sympathy on this. It provides the flexibility to configure a steady TRS configuration for idle/inactive UEs. Specifically:  On one hand we acknowledge that if we go with above Option 2 behaviour of Q1, and considering the SIB17 (and hence the TRS config therein) expires every 3 hours, then the associated TRS/CSI-RS configuration will also become unavailable and so will the related L1 based availability indication. So the value “infinite” somehow never happens.  On the other hand, the maximum value for the *validityTimer* is 512 x default paging cycle. Assuming a typical default paging cycle of 64 radio frames (= 640ms) then the maximum value for the *validity timer* is 512 x 640ms = 512 x 0.64s ~ 5min30s so we are still far from the above 3 hours. And the network is still required to send a new L1-based validity indication every 5m30s.  So we still see a benefit in supporting the infinite value because, even if the “infinite” will never happen in practice, it still bounds the upper limit of the *validityTimer* to the SIB expiration delay of 3 hours. |
| MediaTek | Yes | This makes sense when TRS/CSI-RS configuration doesn’t change, at least with a modification period (if Option 2 in Q1 is agreed). We may also check with RAN1. |
| Huawei, HiSilicon | No | We think the current value range is large enough, so there is no need to enhance it further. |
| Apple | No | Agree with QC and Xiaomi. |

# Conclusion

TBD

# Reference

1. R2-2204809 Discussion on TRS availability when SI change, vivo
2. R2-2204908 TRS/CSI-RS configuration in RRC\_CONNECTED, DENSO
3. R2-2206046 TRS and CSI-RS exposure, Ericsson