3GPP TSG-RAN WG1 Meeting #101-e R1-20xxxxx

e-Meeting, 25th May – 5th June, 2020

Agenda Item: 7.2.2.2.2

Source: Moderator (Ericsson)

Title: [101-e-NR-unlic-NRU-InitAccessProc-05] Email discussion/approval

Document for: Discussion, Decision

# 1 Introduction

This document captures discussion related to the following e-mail discussion which has been kicked-off:

[101-e-NR-unlic-NRU-InitAccessProc-05] Email discussion/approval for a potential reply LS to [R1-2003271](file:///C:\\Users\\wanshic\\OneDrive%20-%20Qualcomm\\Documents\\Standards\\3GPP%20Standards\\Meeting%20Documents\\TSGR1_101\\Docs\\R1-2003271.zip) by 5/28. To be managed under 7.2.2.2.2 – Steve (Ericsson)

# 2 Discussion

RAN4 has sent an LS to both RAN1 and RAN2 on the topic of the UE declaring beam failure due to LBT failures during active TCI state switching [1].

RAN4 provides the following background description:

During the discussion on UE requirements for active TCI state switching in NR-U, RAN4 has made the following agreements:

**RAN4#94-e:**

* *RRC-based: FFS: need for RAN2 LS if the UE declares beam failure upon exceeding L1RRC,unknown,max or L2RRC,unknown,max*

**RAN4#94:**

*Known state:*

* *RRC-based:*
  + *LRRC,known,max =[2] for TSSB≤40 ms, LRRC,known,max =[1] for TSSB>40 ms*
    - *Upon exceeding LRRC,known,max the UE may stop the active TCI state switching procedure and FFS: declare beam failure*
* *MAC-CE based:*
  + *LMAC,known,max =[2] for TSSB≤40 ms, LMAC,known,max =[1] for TSSB>40 ms*
    - *Upon exceeding LMAC,known,max the UE may stop the active TCI state switching procedure and FFS: stay in the old state*

*Unknown state:*

* *RRC-based:*
  + *L1RRC,unknown,max =[2] for TCSI-RS/SSB ≤40 ms, L1MAC,unknown,max = [1] for TCSI-RS/SSB>40 ms*
  + *L2RRC,unknown,max =[2] for TSSB ≤40 ms, L2MAC,unknown,max = [1] for TSSB>40 ms*
  + *Upon exceeding L1RRC,unknown,max or L2RRC,unknown,max the UE may abandon the active TCI state switching procedure and FFS: declare beam failure*
* *MAC-CE based switching:*
  + *L1MAC,unknown,max = [2] for TCSI-RS/SSB≤40 ms, L1MAC,unknown,max = [1] for TCSI-RS/SSB>40 ms*
  + *L2MAC,unknown,max =[2] for TSSB≤40 ms, L2MAC,unknown,max = [1] for TSSB>40 ms*
  + *Upon exceeding L1MAC,unknown,max or L2MAC,unknown,max the UE may stop the active TCI state switching procedure and FFS: stay in the old state*

*In the above, L\*,max is the maximum number of SSB occasions not available at the UE due to CCA failure for the corresponding state and switching type.*

RAN4 asks for the following feedback from RAN1 and RAN2:

In order to proceed, RAN4 would like to ask for the feedback from RAN2 and RAN1 on whether the UE shall declare beam failure due to LBT failures when configured with RRC-based active TCI state switching. Unlike with MAC-CE based active TCI state switching, the UE is not able to go back to the old TCI state either. At the same time, the UE’s TCI state in this scenario has to be unambiguously known

It is important to note that the context of this LS is only for RRC-based TCI state switching, not MAC-CE based TCI state switching. The former is used only in the special case that a single TCI state is configured, and only for PDCCH. In contrast, MAC-CE based switching is used for PDCCH when there is more than one configured TCI state (38.213 Section 10.1) and for PDSCH regardless of the number of configured TCI states (38.214 Section 5.1.5).

It is the moderator’s understanding that the scenario that RAN4 is discussing is the following:

* A single new TCI state for PDCCH is provided to the UE by RRC re-configuration
* The UE flushes its memory of the old TCI state
* Persistent LBT failure occurs at the gNB for the DL reference signal(s) (SS/PBCH block and/or CSI-RS) configured in the new TCI state

Since the UE does not remember the old TCI state and LBT failure prevents the UE from receiving the DL RSs in the new TCI state, the UE does not have a defined QCL reference (QCL source) for receiving PDCCH. As can be seen by the highlighted text above, RAN4 has an FFS on whether or not the UE should declare beam failure in this scenario after the number of RS occasions that are not available due to LBT failure exceeds a specified threshold.

At least three companies have provided input on this issue. In [2], a draft LS reply is proposed that suggests that RAN2 should decide whether or not the UE should declare beam failure. It is suggested that if RAN2 decides on supporting BF declaration, then RAN1 can capture UE behaviour in RAN1 specifications. In [3] it is proposed to postpone the decision to a later release until the design for BFD mechanism is clear. In [4] it is proposed that the UE should indeed declare beam failure when the number of RS occasions that are not available due to LBT failure exceeds the threshold. It is suggested that this existing tool in the spec is a natural fit to address the problem, and it would be undesirable to complicate the spec by introducing a new mechanism to fallback to a previously configured TCI state.

In order to formulate a reply LS to RAN4, the moderator would like to receive company feedback on the following questions:

**Q1: Do you agree or disagree that the UE should declare beam failure? If you disagree, then what should be the UE behaviour instead?**

**Q2: What feedback should RAN1 provide to RAN4?**

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| **Company** | **View/Position** |
| Ericsson | Q1: The UE should declare beam failure and initiate beam failure recovery  Q2: RAN1 should reply to RAN4 that the UE should declare beam failure, and that RAN4 should inform RAN1 when further progress is made in case any update is needed to RAN1 specifications. |
| LG Electronics | Even though it seems reasonable for UE to declare beam failure for this particular case, it is not convinced whether RAN1 could decide it without the input from RAN2, or whether any update in RAN1 specifications is necessary. It could be one way to wait for RAN2’s decission on this issue, and RAN1 may work for potential impact on RAN1 specifications after RAN2 will inform their decision. |
| Nokia, NSB | Same as LGE, we believe that RAN1 should wait for RAN2’s decision before answering to RAN4’s LS, as this topic looks like a RAN2 matter. We would therefore suggest to wait for the next meeting before replying to RAN4. |
| Samsung | Same view with LGE and Nokia. This issue is more relevant to RAN2 work, so we prefer to wait RAN2 decision before sending reply LS to RAN4. Once RAN2 decision is available, if necessary, RAN1 can discuss its impact on RAN1 specification. |
| ZTE, Sanechips | For Q1, whether UE should declare beam failure depends on the outcome of RAN2. If RAN2 supports beam failure when LBT failure number exceeds the maximum value defined by RAN4, one thing to do for RAN1 is that sending a LBT failure indicator to RAN2 when UE fails to receive DRS due to DL LBT failure at the gNB.  For Q2, we can wait RAN2 decision before sending reply LS to RAN4. |

# References

1. R1-2003271, “LS on UE declaring beam failure due to LBT failures during active TCI switching,” RAN4, RAN1#101-e, May 2020.
2. R1-2003838, “Draft reply LS on UE declaring beam failure due to LBT failures during active TCI switching,” ZTE, Sanechips, RAN1#101-e, May 2020.
3. R1-2004092, “Discussion on beam failure declaration during active TCI switching,” OPPO, RAN1#101-e, May 2020.
4. R1-2003844, “Enhancements to initial access procedures,” Ericsson, RAN1#101-e, May 2020.