**3GPP TSG-RAN WG4 Meeting #100-e**

**Electronic Meeting, Aug 16 - 27, 2021**

**Agenda item:** 9.18

**Source:** Moderator (China Telecom)

**Title:** GTW session [100-e][140] NR\_cov\_enh

# Discussion

#### **Issue 1-3-1: For network commanded TA adjustment**

*Summary of round 1 feedback:*

* + Option 1: Network commanded TA adjustments should be avoided in betweenthe PUSCH/PUCCH transmissions (MTK, ZTE, E///, HW, QC, IDC, CTC compromise, OPPO, Nokia/NSB)

*Tentative agreements in round 1 summary:*

TA adjustments should be avoided in betweenthe PUSCH/PUCCH transmissions.

#### **Issue 1-3-2: For UE autonomous adjustment**

*Summary of round 1 feedback:*

* + Option 1: UE autonomous adjustment is not expected in betweenthe repetition (MTK, E///, QC, ZTE, Sony, OPPO)
  + Option 2: Up to UE implementation (ZTE, HW, Nokia/NSB)
    - HW: We cannot just avoid UE autonomous adjustment considering the user behavior and environment change. But this phase variation can be included in the phase tolerance and evaluated upon UE implementation.
    - MTK: If this were included in the tolerance, would this not result in reducing the tolerance budget for the UE due to other implementation aspects?
  + Option 3: The corresponding phase change can be pre-compensated at UE baseband processing, or estimated and compensated at BS baseband processing. (CTC, IDC)
    - CTC: the estimation/compensation at BS is based on DMRS.
    - IDC: Using the PT-RS as a mitigation measure
    - Nokia: Option 3 strongly impacts what is currently discussed in RAN1, especially on how to determine the time-domain window (discussed in sub-topic 1-5).

*Recommendations for 2nd round:*

Further discuss this issue, and consider the relationship between this issue and Issue 1-5-2/3 for the maximum duration discussion.

#### **Issue 1-5-1: For joint channel estimation, is there a maximum duration during which UE is able to maintain power consistency and phase continuity under certain tolerance level?**

*Summary of round 1 feedback:*

* + Option 1: Yes (Nokia, China Telecom, ZTE, E///, HW, QC, IDC, MTK, Sony, OPPO)

*Tentative agreements in round 1 summary:*

Agree option 1.

#### **Issue 1-5-2: If there is a maximum duration, how long is it?**

*Summary of round 1 feedback:*

* + Option 1: The maximum duration should depend on the interval where the UE does not make frequency adjustment, i.e., at least smaller than the configured SSB periodicity. (E///, Nokia/NSB, MTK)
    - HW: During connected mode, UE is not required to re-sync with SSB.
  + Option 2: Depends on JCE performance considering the phase tolerance and/or gNB frequency offset compensation accuracy during the duration even within a sync periodicity. (MTK, QC, HW, ZTE)
  + Option 3: Less than 32 slots (32 is the max number of repetitions agreed in RAN1) (CTC)

*Recommendations for 2nd round:*

Check if it is agreeable to send “option 1 + option 2” to RAN1, and further discuss the exact number in the next meeting.

#### **Issue 1-4-X: Modulation order for PUSCH/PUCCH transmissions**

*Note: This is a new issue raised in round 1.*

* Several companies (QC, MTK, E///, Sony, [Nokia]) mentioned that higher modulation orders are not likely to be used in coverage extension scenarios

*Recommendations for 2nd round:*

* Check if it is agreeable to only focus on modulation orders not higher than QPSK, i.e., focus on Pi/2 BPSK (PUCCH/PUSCH), QPSK (PUCCH/PUSCH), BPSK (PUCCH).

#### **Issue 1-1-1: Maximum length of un-scheduled gap, i.e., feasibility of 14 symbols or 1 ms for different SCSs for the un-scheduled gap**

*Summary of round 1 feedback:*

* + Option 2: 1ms for different SCS (ZTE, Nokia)
  + Option 3: 14 symbols for all SCS (HW, QC, MTK acceptable, CTC)
  + Option 4: Need further study (E///, Sony)

*Moderator’s observations:*

This is the 4th meeting to discuss this issue in RAN4, and RAN1 Rel-17 is scheduled to be completed in Dec.

If no agreement on the feasibility of 14 symbols or 1 ms in this RAN4 meeting, RAN1 will probably not include the corresponding scenarios in Rel-17.

Therefore, moderator recommends to make a decision in this meeting. Otherwise, we need to inform RAN1 that no consensus is reached on the feasibility of either 14 symbols or 1 ms.

#### **Issue 1-2-1: Non-zero gap with other uplink transmissions for the UE**

*Summary of round 1 feedback:*

* Proposals for scenario 1

*Scenario 1: if the other scheduled signals/channels during the non-zero gap have the* ***same*** *settings in antenna port, occupied PRBs and UL power than the repeated transmission signals/channels*

* + Guard period for scenario 1
    - Option 1: A guard period is needed (Sony, QC, OPPO)
      * QC: We can agree not to have the guard period for scenario 1 once we know more about the conditions for retaining the mentioned parameters, such as ensuring PUSCH/PUCCH part of repetitions and SRS has same PAPR and AVG power.
      * Sony: if RAN4 would conclude that retuning is not be needed, then the guard period can be skipped. Otherwise, the guard period would still be required.
    - Option 2: not needed (MTK, ZTE, E///, HW, Nokia)
* Proposals for scenario 2

*Scenario 2: If the other scheduled signals/channels during the non-zero gap have the* ***different*** *settings in antenna port, occupied PRBs or UL power than the repeated transmission signals/channels*

* + Option 1: A guard period is needed (Sony, QC, OPPO)
  + Option 2: Phase continuity and power consistency cannot be guaranteed (MTK, ZTE, Nokia, QC)
  + Option 3: Further investigation is needed (E///)

*Tentative agreements in round 1 summary:*

For scenario 2, no consensus is reached on the feasibility of maintaining phase continuity and power consistency across the PUSC/PUCCH transmissions.

*Recommendations for 2nd round:*

For scenario 1, further discuss whether the guard period is needed.

#### **Issue 1-6: DL slot(s) in-between repetition**

*Summary of round 1 feedback:*

* + Option 1: RAN4 further studies the scenario where DL slots between PUSCH or PUCCH repetition from UE implementation and network tolerance aspects conclude its feasibility. (Sony, E///, IDC)
  + Option 2: Do not consider further the case where there is a DL slot within a non-zero gap. (MTK, HW)
  + Option 4: Do not consider further the case where there is a DL reception (including monitoring and measurements) within a non-zero gap. (QC)

*Recommendations for 2nd round:*

* For the case of “with DL reception (including monitoring and/or measurements)”, consider the following alternatives when drafting the LS:
  + - Send a NACK (i.e., not feasible to keep phase continuity and power consistency) to RAN1, or,
    - Inform RAN1 no consensus on the feasibility, or
    - Not send any further feedback to RAN1
* For the case of “without actual DL transmission from gNB to UE and without DL monitoring”, no further discussion in round 2.
  + - Updated information from RAN1: RAN1 has endorsed the reply LS on the scenario of “without actual DL transmission from gNB to UE and without DL monitoring”. So, this bullet can be further discussed in round 2 by email.