**3GPP TSG-RAN WG4 Meeting # 109** **R4-2318143**

**Chicago, US, November 13 – 17, 2023**

**Agenda item:** 8.22.4

**Source:** Moderator (CATT)

**Title:** Topic summary for [109][137] NR\_pos\_enh2\_UERF

**Document for:** Information

# Introduction

This contribution is the summary for the topic [137] NR\_pos\_enh2\_UERF in AI 8.22 and 8.22.1. R4-2320541 is moved from AI 8.22.2.5 to AI 8.2.1.

# Topic #1: Guard period for SRS aggregation

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2318315 | CATT | Proposal: The following candidate values can be provided to RAN1:  {n0us, n30us, n100us, n140us, n200us} |
| R4-2319809 | Intel Corporation | Proposal 1: The guard period values before and after each aggregated SRS transmission when an SRS resource configured within a CC without PUSCH/PUCCH are up to UE capability with possible values including {0us, 30us, 100us, 140us, 200us}.  Proposal 2: The UE capability of guard period before and after each aggregated SRS transmission when an SRS resource configured within a CC without PUSCH/PUCCH shall be defined with a per-band granularity.  Proposal 3: Introduce a capability to indicate which bands in the band combinations for CA operation are affected by the switching before/after aggregated SRS transmission. Further discuss respective interruption requirements in the RRM session. |
| R4-2320910 | Qualcomm Incorporated | Proposal: When an SRS resource configured within a CC without PUSCH/PUCCH is linked for aggregation with an SRS resource configured within an UL active BWP of a UL communication CC, feasible switching/guard period values before and after each aggregated SRS transmission are {n0us, n30us, n100us, n140us, n200us}. |
| R4-2320541 | Ericsson | Observation 1 The network can known the single RF chain capability for two SRS aggregated CC by reading the above UE CA capability and dualPA-Achitecture capability.  Observation 2 Decoupling CA capability and SRS aggregation only means the number of CC to be mapped between SRS aggregation CC and UL CA CC.  Observation 3 Multiple UL CC CA configuration is prerequisite for UE to support SRS aggregation.  Observation 4 Activation of the carrier means the activation of Scell corresponding one of CC in DL CA configuration.  Observation 5 For two UL CA configuration, either BWP switching or new defined RF retuning time could apply to SRS transmission if the BWP is different with BWP where SRS resource configured in a CC.  Proposal-1: Send a question to RAN1 on the CA configuration which is relevant to LS question together with recommend RF retuning time answer.  Proposal-2: Send RAN4 understanding on “single RF” chain in LS reply. |

## Open issues summary

**Issue 1-1: If SRS aggregation is coupled with other UE capabilities**

* Proposals
  + Proposal from Ericsson:

Network can only configure SRS aggregation if UE report below capability:

1. The intra-band contiguous CA with number of UL CC equal or greater than 2
2. dualPA-Architecture IE is absence for the same intra-band band combination mentioned above

* Recommended WF
  + Discuss in the meeting

Ericsson: we clarify the condition. It is not clear in the original LS. The most critical thing is how network interpret the single RF chain. There is no single RF chain capability. The capability is independent of CA capability. In LS we divided the scenario into single uplink and multiple uplink CA configurations.

CATT: Ericsson proposal is how to identify UE implements single RF chain. It is not required by LS. In RAN1, there is agreement SRS is decoupled with CA.

Nokia: for this feature, we have similar view as Ericsson. It is not clear.

Intel: RAN1 is discussing the feature list. Position feature is independent from CA. Wait for RAN1 decision. If UE reports the capability, network can configure it.

CATT: yesterday in RRM how to define the single RF chain is discussed. The latest knowledge is that single RF chain is not sufficient. For intra-band CA, the capability is not equal to SRS aggregation capability. This feature should be supported based on assumption of UE.

Ericsson: in our view, UE must report the intra-band capability and should not report single PA architecture. This must be clarified.

Intel: If UE declares SRS aggregation capability, then it guarantees single RF chain, which is verified by RAN4 requirements.

Intel: UE may still use single PA for SRS aggregation even if it uses dual PA for CA. We do not see the urgency to conclude.

The following bullet was discussed but there is no agreement:

* Network configures SRS aggregation based on UE capability supporting SRS aggregation
  + Assume UE needs fulfil all the requirements based on the assumption that UE has single RF chain.

**Issue 1-2: Guard period values before and after each aggregated SRS transmission**

* Proposals
  + Option 1: {0us, 30us, 100us, 140us, 200us}. (CATT, Intel, QC)
  + Option 2: Different values for different scenarios (Ericsson)
    - When network configure the UE with single UL and DL CA, below RF retuning time is agreed up to UE report:

{n0us, n30us, n100us, n140us, n200us}

* + - When network configure the UE with UL CA and DL CA and SRS aggregation CC is a subset of configured UL CA:
    - When UE default BWP /active BWP is different with BWP where SRS resource configured in a CC without PUSCH/PUCCH for SRS aggregation , the below value is agreed:

{n0us, n30us, n100us, n140us, n200us}

* + - When UE default BWP /active BWP is the same with BWP where SRS resource configured in a CC without PUSCH/PUCCH for SRS aggregation , the below value is agreed:

{n0us}

* + - RAN4 does not discuss the case where SRS aggregated CCs (more than 2 CC) are overlapping with the UL CA partially.
* Recommended WF
  + Discuss in the meeting

Huawei: in our view, RAN1 is discussing the scenario where the aggregated SRS is switched to on carrier and also verse visa. Support Option 1.

Intel: In this scenario where we need configure uplink CA as well as SRS aggregation.

Agreement:

* For the scenario, when an SRS resource configured within a CC without PUSCH/PUCCH is linked for aggregation with an SRS resource configured within an UL active BWP of a UL communication CC, a guard period is needed before and after the aggregated SRS transmissions, and the guard period values before and after each aggregated SRS transmission are
  + {0us, 30us, 100us, 140us, 200us}

**Issue 1-3: Guard period UE capability granularity**

* Proposals
  + Option 1: Per band ( Intel)
* Recommended WF
  + Discuss in the meeting

Agreement:

* The guard period UE capability is defined per band.

**Issue 1-4: New capability related to guard period**

* Proposals
  + Option 1: Introduce a capability to indicate which bands in the band combinations for CA operation are affected by the switching before/after aggregated SRS transmission. Further discuss respective interruption requirements in the RRM session. (Intel)
* Recommended WF
  + Discuss in the meeting

Chair: postpone the discussion until RRM session has conclusion and it does not impact the completion of WI.