

3GPP RAN #84  
Newport Beach, CA, U.S.A.  
June 3<sup>rd</sup> - 6<sup>th</sup>, 2019

RP-191413

Qualcomm

**Agenda Item: 3.1**

Qualcomm Incorporated

# Discussion of aperiodic CSI trigger with different numerologies



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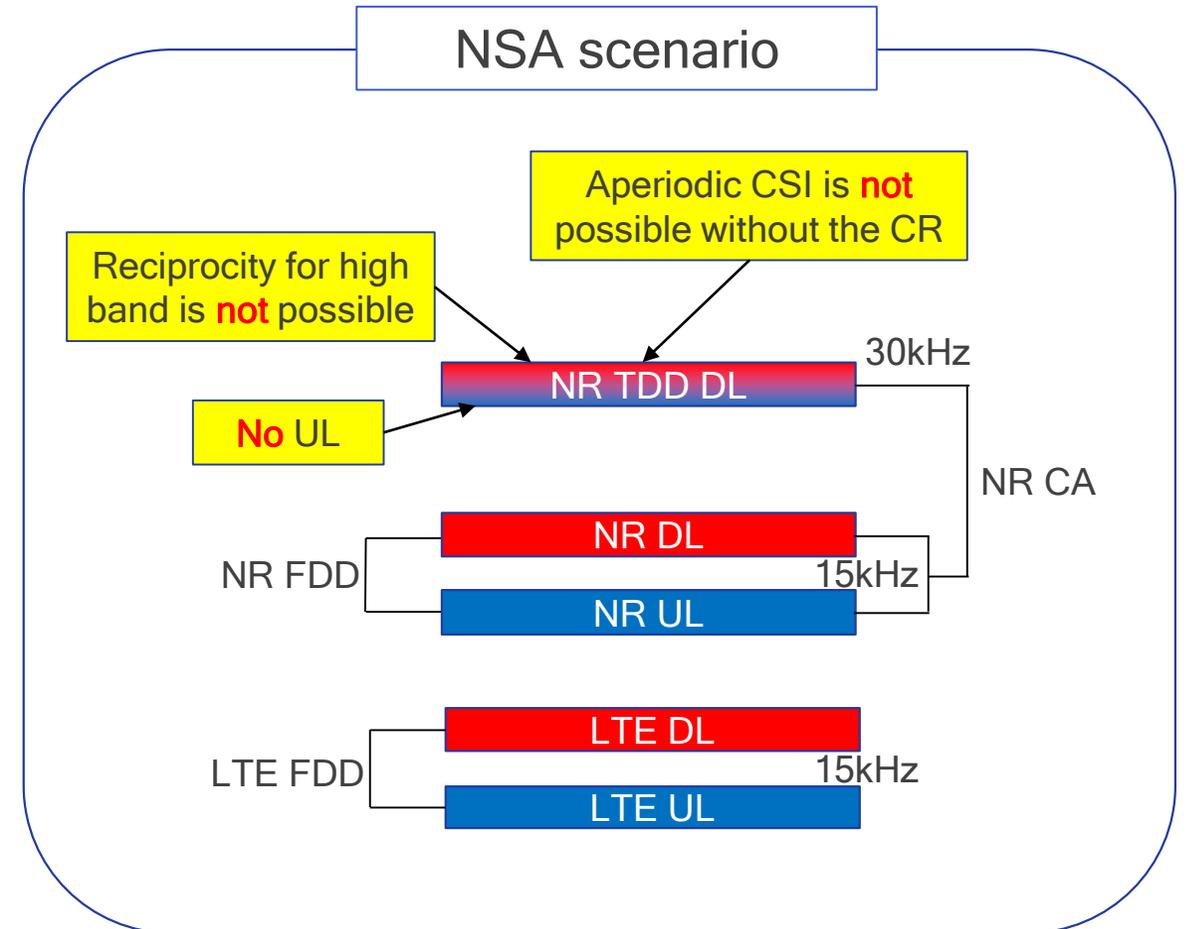
# Background

- CRs agreed as Working Agreement at RAN#83
  - RP-190632, “Correction to aperiodic CSI-RS triggering with different numerology between PDCCH and CSI-RS”
    - Ericsson, AT&T, T-Mobile USA, Sprint, Nokia, Nokia Shanghai Bell, CHTTL, Deutsche Telekom
  - RP-190633 “Capability for aperiodic CSI-RS triggering with different numerology between PDCCH and CSI-RS”
    - Ericsson, Qualcomm, AT&T, T-Mobile USA, Sprint, Nokia, Nokia Shanghai Bell, CHTTL, Deutsche Telekom
  - RP-190634 “Capability for aperiodic CSI-RS triggering with different numerology between PDCCH and CSI-RS”
    - Ericsson, Qualcomm, AT&T, T-Mobile USA, Sprint, Nokia, Nokia Shanghai Bell, CHTTL, Deutsche Telekom

# Scenarios where the CRs matter: (1) FR1 FDD-TDD CA

- **FR1 FDD - TDD CA**

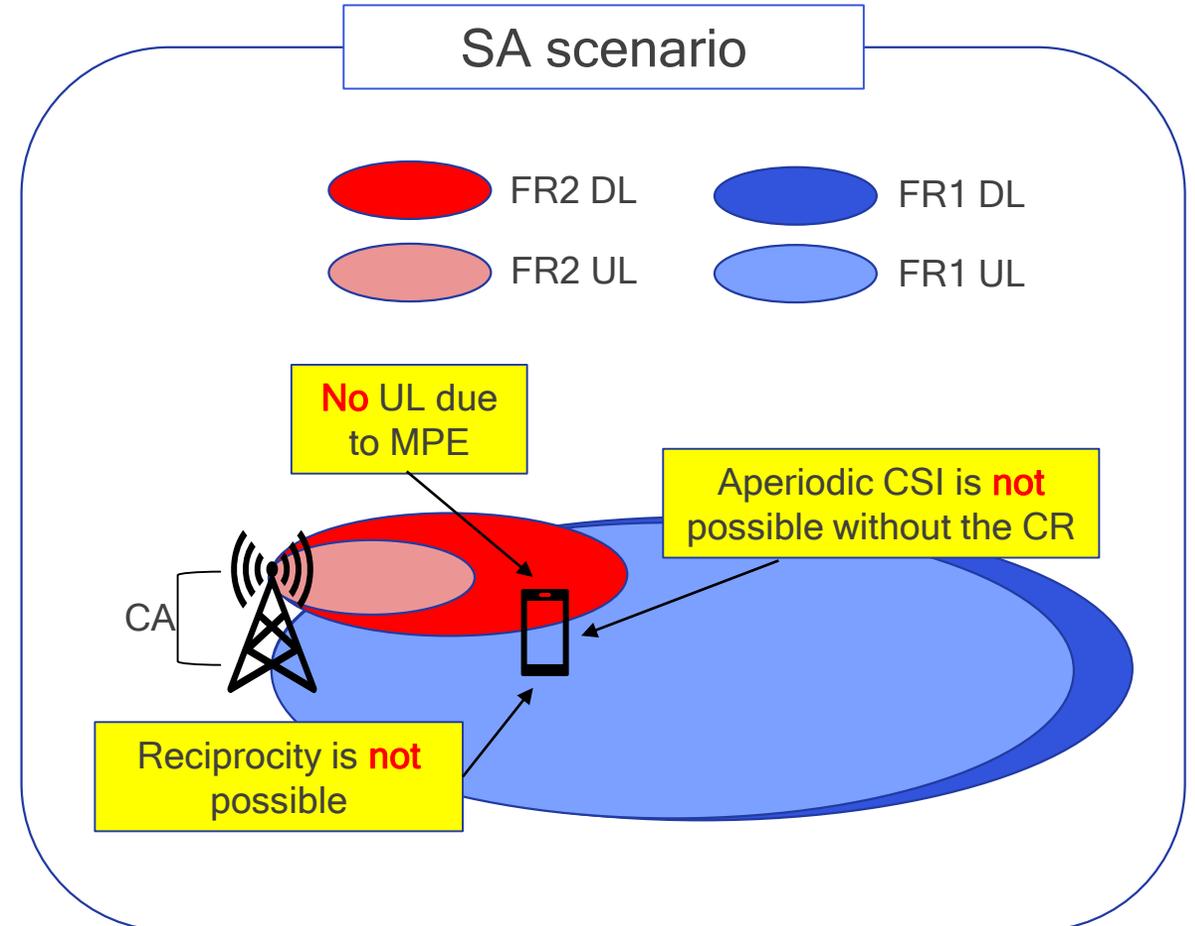
- FDD is typically with 15kHz, while TDD is typically with 30kHz
- In FR1 CA, the number of DL CCs is typically more than the number of UL CCs
  - For example, in the NSA scenario shown in the Figure, A-CSI feedback without the CR for the TDD CC would require the support of a 3<sup>rd</sup> UL CC
- When a CC doesn't have UL, reciprocity based CSI is not possible
  - Early network deployments will not support carrier-based SRS switching
- When a CC doesn't have UL, aperiodic CSI triggering without the CR for that CC is not possible when UL is in a different SCS CC



# Scenarios where the CRs matter: (2) FR1-FR2 CA

- FR1-FR2 CA

- FR1 and FR2 are always with different SCS
- Although in FR1-FR2 CA, the number of DL CCs can be the same as the number of UL CCs, often the UE is not in FR2 UL coverage
  - Typically due to MPE limitations
- When the UE is not in FR2 UL coverage, reciprocity based CSI is not possible
- When a UE is not in FR2 UL coverage, aperiodic CSI triggering without the CR for FR2 is not possible
- When a UE is not in FR2 UL coverage, aperiodic beam report triggering without the CR for FR2 is not possible



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# Impact of the lack of A-CSI-RS triggering

- Note that the lack of the CRs would have the following impact:
    - Inability to use on-demand beamformed CSI-RS for CSI feedback in both FR1 and FR2
    - Inability to use on-demand CSI-RS for beam management in FR2
    - Inability to use on-demand TRS in both FR1 and FR2
  - Some of the counter-arguments to the CRs centered around statements that operation solely with semi-persistent or periodic CSI-RS is still possible
  - However, these solutions have the following drawbacks/limitations
    - Semi-persistent CSI-RS will not be supported in early deployments
    - Periodic CSI-RS requires large overhead, especially in a beamformed system
- Even if the CR is adopted in Rel-16, as long as Rel-15 UEs are served by the system, the large overhead of beamformed periodic CSI-RS for CSI / beam management / TRS will remain

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# Conclusion

- Due to the listed drawbacks of not supporting aperiodic CSI-RS triggering with different SCS, we support confirming the RAN #83 Working Agreement.



# Thank you!

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