**3GPP TSG RAN WG2#118-e R2-2204489**

**e-Meeting, 9th - 20th May, 2022**

**3GPP TSG-RAN WG4 Meeting #102-e R4-2207238**

**Electronic Meeting, 21st Feb – 3rd March, 2022**

**Title:** LS on UE capability and network assistant signalling for CRS interference mitigation in scenarios with overlapping spectrum for LTE and NR

**Release:** Rel-17

**Work Item:** NR\_perf\_enh2\_Demod

**Source:** RAN WG4

**To:** RAN WG2

**Cc:**

**Contact Person:**

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**Attachments:**

**1. Overall Description:**

Within the Release 17 work item on further enhancement on NR demodulation performance (NR\_perf\_enh2\_Demod), RAN4 has discussed UE capability and network assistant signalling for CRS interference mitigation (CRS-IM) in the following two scenarios with overlapping spectrum for LTE and NR as illustrated in TR 38.833:

* Scenario 1(DSS scenario): Serving and neighbouring cells are both operating with dynamic spectrum sharing (DSS) of NR and LTE. The NR UE in the serving cell is configured with *lte-CRS-ToMatchAround*, and is suffering interference from the LTE CRS of neighbouring cells.
* Scenario 2 (non-DSS scenario): Serving cell is operating in NR, and neighbouring cells are operating in LTE. The NR UE in the serving cell is suffering interference from the LTE CRS of neighbouring cells.

As an outcome, following agreements are reached by RAN4:

* From the RAN4 perspective, the following new NR UE capabilities are agreed to be defined for CRS-IM:
* Capability #1: NR UE capable of performing CRS-IM in scenario 1 with 15 kHz SCS, UE can support Capability #1 on the CC(s) in a band only if the UE indicates support of *rateMatchingLTE-CRS* on that band.
* Capability #2: NR UE capable of performing CRS-IM in scenario 2 with 15 kHz SCS without Rel-17 new network assistant signalling on LTE channel bandwidth.
* Capability #3: NR UE capable of performing CRS-IM in scenario 2 with 15 kHz SCS with Rel-17 new network assistant signalling on LTE channel bandwidth.
* The granularity of the above capabilities is Per Feature Set per CC.
* The above capabilities are applicable for FR1 only without FDD/TDD difference.
* The above capabilities are optional for UE to report.
* Meanwhile, RAN4 is also considering the following new NR UE capabilities and will make conclusion on whether to introduce the two capabilities in the first week of RAN4 #103-e meeting:
* Capability #4: NR UE capable of performing CRS-IM in scenario 2 with 30kHz SCS without Rel-17 new network assistant signalling on LTE channel bandwidth.
* Capability #5: NR UE capable of performing CRS-IM in scenario 2 with 30kHz SCS with Rel-17 new network assistant signalling on LTE channel bandwidth.
* The granularity of the above capabilities is Per Feature Set per CC.
* The above capabilities are applicable for FR1 only without FDD/TDD difference.
* The above capabilities are optional for UE to report.
* To perform CRS-IM, RAN4 has agreed that the UE should have the following default network configuration assumptions for each neighbour LTE cell:
* For scenario 1, the CRS port number is same with that indicated in the existing IE *RateMatchPatternLTE-CRS* by the serving cell. For scenario 2, the CRS port number is 4.
* Network-based CRS interference mitigation (i.e., CRS muting) is not enabled by *crs-IntfMitigConfig* in TS 36.331 for scenario 1 and 2.
* For scenario 1, channel bandwidth and centre frequency is same with that indicated in the existing IE *RateMatchPatternLTE-CRS* by the serving cell.
* For scenario 1, MBSFN configuration is same as that indicated in the existing IE *RateMatchPatternLTE-CRS* by the serving cell. For scenario 2, MBSFN is not configured.
* With the above default network configuration assumptions, RAN4 has agreed that for UE supporting Capability #1, the UE can perform CRS-IM without Rel-17 new RRC network assistant signalling in scenario 1. For UE supporting Capability #2, the UE can perform CRS-IM without Rel-17 new RRC network assistant signalling in scenario 2 with 15 kHz SCS when *MeasObjectEUTRA IE* is configured and the configured measurement gaps overlap with neighbour LTE cell PBCH position.
* Meanwhile, new RRC based network assistant signalling is agreed to be introduced to assist CRS-IM in Rel-17, and the Rel-17 new RRC signalling are optionally to be indicated to UE supporting Capability #1 and Capability #2.
* Regarding the content of the Rel-17 new RRC network assistant signalling, for each neighbour LTE cell, RAN4 reach following agreements:
* Downlink Centre frequency
	+ For scenario 1, the downlink centre frequency can be optionally signalled to the UE, if the above default centre frequency assumption is not valid.
	+ For scenario 2, the downlink centre frequency can be optionally signalled to UE.
* Channel bandwidth
	+ For scenario 1, the channel bandwidth can be optionally signalled to the UE, if the above default channel bandwidth assumption is not valid.
	+ For scenario 2 with 15kHz SCS, the LTE channel bandwidth can be optionally signalled to UE supporting Capability #2, and should be signalled to UE supporting Capability #3 but not supporting Capability #2.
* CRS port number
	+ For scenario 1 and scenario 2, the CRS port number can be optionally signalled to the UE, if the above default CRS port number configuration assumption is not valid
* Cell ID
	+ For scenario 1 and scenario 2, the physical Cell ID can be optionally signalled to UE.
* v-Shift
	+ For scenario 1 and scenario 2, the v-Shift information can be optionally signalled to UE.
	+ If Cell ID information is informed, then v-Shift information shall not be signalled to UE.
* CRS muting
	+ For scenario 1 and scenario 2, the configuration of CRS muting can be optionally signalled to the UE if the above default CRS muting assumption is not valid.
* MBSFN configuration
	+ For scenario 1 and scenario 2, the MBSFN subframe configuration can be optionally signalled to the UE if the above default MBSFN configuration assumption is not valid.
* The above information is signalled under each serving cell with flexibility to support per UE level configuration with up to 8 interference cell information.

**2. To RAN WG2 group.**

**ACTION:** RAN4 respectfully request RAN2 to take the above information into account and design the corresponding UE capability and network assistance signalling for CRS-IM in scenarios with overlapping spectrum for LTE and NR.

**3. Date of Next TSG-RAN WG4 Meetings:**

TSG-RAN WG4 Meeting #103-e 15 May - 27 May 2022 Online

TSG-RAN WG4 Meeting #104 22 Aug - 26 Aug 2022