**3GPP TSG-RAN WG4 Meeting #116 R4-251xxxx**

**Bengaluru, India, August 25-29, 2025**

**Title:** WF on RRM requirements for NR\_ATG\_enh

**Agenda Item:** 7.8.1

**Source:** CMCC, ZTE Corporation

**Document for:** Approval

# <Topic 1> RRM core requirement

**Issue 1-1-1: UE Beam Type capability signaling**

* **Background: Agreement in RAN4#115**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **Consequence if the feature is not supported by the UE** | **Type** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| Rx beam Type | Indicates whether the UE supports one common Rx beam or two simultaneous separate Rx beams when UE capable of antennaArrayType-r18 on both PCC and SCC. |  | yes | N/A | If UE does not support the capability, network does not know ATG UE’s reception capability. | Per BC | No | FR1 only | N/A | This UE feature is applicable only for inter-band CA band combination(s) in Table [TBD] in TS 38.101-1. | Conditional mandatory for UEs supporting antennaArrayType-r18 on each band of the supported Band combination |

Agreement:

* Update the Note column of Rel-19 ATG UE feature ‘Rx beam Type’ to Rel-19 UE feature list

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Need for the gNB to know if the feature is supported** | **Applicable to the capability signalling exchange between UEs (V2X WI only)”.** | **Consequence if the feature is not supported by the UE** | **Type**  **(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC)** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** | **Capability interpretation for mixture of FDD/TDD and/or FR1/FR2** | **Note** | **Mandatory/Optional** |
| 48. NR\_ATG\_enh | 48-1 | Rx beam Type | Indicates whether the UE supports one common Rx beam or two simultaneous separate Rx beams when UE capable of antennaArrayType-r18 on both PCC and SCC. |  | yes | N/A | If UE does not support the capability, network does not know ATG UE’s reception capability. | Per BC | No | FR1 only | N/A | This UE feature is applicable only for inter-band CA band combination(s) in Table 5.2J.1A.2 in TS 38.101-1. | Conditional mandatory for UEs supporting antennaArrayType-r18 on each band of the supported Band combination |

**Issue 1-2-1: Sharing factor between L1 measurement and RRM measurement - effective non-overlapping duration**

Agreement:

* Remove this ‘L1-RSs fully-overlapped by intra-frequency SMTC occasions are not overlapped with any of the effective L3-RSs symbols’ case from R18.

**Issue 1-2-2: Sharing factor between L1 measurement and RRM measurement - CSI-RS based L3 measurement**

Agreement:

* For CSI-RS based intra-frequency L3 measurement

the Klayer1\_measurement shall be defined as:

* + - For UE capable of [antennaArrayType-r18] on the measured carrier
    - Klayer1\_measurement=1,

If the measured carrier is the SCC with servingcellMO configured, and the network indication [skippingSCCneighbourCellMeas] is set to [‘enable’] to UE,

Otherwise,

If inter-band carrier aggregation within FR1 is configured, and

UE not capable of antennaArrayType-r18 on the other serving carrier, or UE capable of antennaArrayType-r18 on the other serving carrier and [UE support two simultaneous separate Rx beams]

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting **on one serving cell** outside measurement gap are not fully overlapped by intra-frequency SMTC occasions or **CSI-RSs occasions** of same serving cell

Otherwise,

- if all of the reference signals configured for RLM, BFD, CBD or L1-RSRP for beam reporting outside measurement gap are not fully overlapped by intra-frequency SMTC occasions and **CSI-RSs occasions**.

* For CSI-RS based inter-frequency L3 measurement in ATG, no need to consider Klayer1\_measurement , but this shall be revised by using CAT-F CR from Rel-18

**Issue 1-2-3: Sharing factor between L1 measurement and RRM measurement - Navailable of scaling factor P**

* For RLM of PCell, the Navailable shall be defined as:
  + If inter-band carrier aggregation within FR1 is configured, and UE not capable of antennaArrayType-r18 on the other serving carrier or [UE support two simultaneous separate Rx beams]
    - the number of RLM/BFD/CBD-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion **nor CSI-RSs resource occasions** of same serving cell within the window W,
  + otherwise,
    - the number of RLM/BFD/CBD-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion **nor CSI-RSs resource occasions** within the window W.
* For BFD, CBD, L1-RSRP and L1-SINR, the Navailable in Psharingfactort shall be defined as:
  + If the measured carrier is the SCC with servingcellMO configured, and the network indication [skippingSCCneighbourCellMeas] is set to [‘enable’] to UE,
    - If inter-band carrier aggregation within FR1 is configured, and UE not capable of antennaArrayType-r18 on the other serving carrier or [UE support two simultaneous separate Rx beams]
      * the number of BFD/CBD/SSB/CSI-RS resource occasions that are not overlapped with any measurement gap **within the window W**
    - otherwise,
      * the number of BFD/CBD/SSB/CSI-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion nor CSI-RSs **resource** occasions of other serving cell within the window W
  + Otherwise,
    - If inter-band carrier aggregation within FR1 is configured, and UE not capable of antennaArrayType-r18 on the other serving carrier or [UE support two simultaneous separate Rx beams]
      * the number of BFD/CBD/SSB/CSI-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion **nor CSI-RSs resource occasions** **for L3 measurements** of same serving cell within the window W,
    - Otherwise,
      * the number of BFD/CBD/SSB/CSI-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion **nor CSI-RSs resource occasions** **for L3 measurements** within the window W.
* For BFD, CBD, L1-RSRP and L1-SINR, the Navailable in Psharingfactort shall be defined as:

·         If the measured carrier is the SCC with servingcellMO configured, and the network indication [skippingSCCneighbourCellMeas] is set to [‘enable’] to UE,

o    If inter-band carrier aggregation within FR1 is configured, and UE not capable of antennaArrayType-r18 on the other serving carrier or [UE support two simultaneous separate Rx beams]

§  the number of BFD/CBD/SSB/CSI-RS resource occasions that are not overlapped with any measurement gap **within the window W**

o    otherwise,

§  the number of BFD/CBD/SSB/CSI-RS resource occasions that are not overlapped with any measurement gap occasion nor any SMTC occasion nor CSI-RSs **resource** occasions of other serving cell within the window W

·         Otherwise,

o    If inter-band carrier aggregation within FR1 is configured, and UE not capable of antennaArrayType-r18 on the other serving carrier or [UE support two simultaneous separate Rx beams]

§  the number of BFD/CBD/SSB/**CSI-RS resource occasions** that are not overlapped with any measurement gap occasion nor any SMTC occasion **nor CSI-RSs resource occasions for L3 measurements** of same serving cell within the window W,

o    Otherwise,

§  the number of BFD/CBD/SSB/**CSI-RS resource occasions** that are not overlapped with any measurement gap occasion nor any SMTC occasion **nor CSI-RSs resource occasions for L3 measurements** within the window W.

# <Topic 2> RRM perf requirement

**Issue 2-1-1: Test applicability rule**

Agreement:

* UE is only required to be tested in one of the supported test configurations
* UE is only required to be tested in one with smallest aggregated channel bandwidth from supported band combinations which is composed of CCs ≥ the bandwidth (BWchannel) defined in each test configuration
* Test configuration for NR PCell and test configuration for NR SCell shall be chosen independently

**Issue 2-1-2: Test setups - TDD pattern for SCell**

Agreement:

* Reuse the legacy TDD pattern for SCell

**Issue 2-1-3: Test scope**

Agreement:

* Introduced test cases:
* Interruptions during measurements on deactivated NR SCC in FR1
  + test together with Event triggered reporting on SCC with deactivated SCell test under non-DRX, with measurement cycle of no smaller than 640ms
  + If it is feasible to test both neighbour cell measurement skipping and not skipping in this test case,
  + not introduce the test case for “Event triggered reporting on SCC with deactivated SCell test under non-DRX for 160 ms SCell measurement cycle”.
  + If not feasible,
  + introduce one more test case for “Event triggered reporting on SCC with deactivated SCell test under non-DRX for 160 ms SCell measurement cycle”
* Interruption requirement at SRS antenna port switching with 1 SRS symbol in a slot
* Interruption requirement at SRS antenna port switching with more than 1 SRS symbol in a slot
* SCell Activation and deactivation of known SCell in FR1 in non-DRX for 160 ms SCell measurement cycle (together with interruption requirement verification)
* SCell Activation and deactivation of known SCell in FR1 in non-DRX for 640 ms SCell measurement cycle (together with interruption requirement verification)
* SCell Activation and deactivation of unknown SCell in FR1 in non-DRX (together with interruption requirement verification)
* Direct SCell activation at SCell addition of known SCell in FR1 (together with interruption requirement verification)
* Direct SCell activation at handover with known SCell in FR1
* Fast SCell Activation of known SCell in FR1 in non-DRX for 160 ms SCell measurement cycle
* Fast SCell Activation of known SCell in FR1 in non-DRX for 640 ms SCell measurement cycle
* SCell Activation of unknown SCell with valid L3 measurement results in FR1 in non-DRX for 160 ms SCell measurement cycle
* TRS based SCell Activation of SSB-less SCell in FR1 inter-band CA in non-DRX
* Further discuss whether to only consider Periodic TRS for this test case
* Further discuss whether this test case is only applicable to case 4 UE
* Beam Failure Detection and Link Recovery Test for FR1 SCell configured with CSI-RS-based BFD and SSB-based LR in non-DRX mode for ATG