**3GPP TSG RAN WG1 Meeting #104-e R1-2002008**

**e-Meeting, January 25th – February 5th, 2021**

**Title: DRAFT** LS on Agreements Pertaining to L1/L2-Centric Inter-Cell Mobility

**Response to:**

**Release:** Rel-17

**Work Item:** NR\_feMIMO-Core

**Source:** Samsung [RAN1]

**To:** RAN2

**Cc:**

**Contact Person:**

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**1. Overall Description:**

RAN1 discussed the support of L1/L2-centric inter-cell mobility.

The following agreements were made in RAN1 #102-e, #103-e, and 104-e meetings related to the support of L1/L2-centric inter-cell mobility.

* [Issue 2] For Rel.17 NR FeMIMO, on L1/L2-centric inter-cell mobility:
  1. In RAN1#103-e, finalize scope and use cases for L1/L2-centric inter-cell mobility, including:
     + Applicability in various non-CA and CA setups such as intra-band and inter-band CA
     + Use cases in comparison to Rel.15 L3-based handover (HO) taking into account potential extension of DAPS-based Rel.16 mobility enhancement to FR2-FR2 HO
     + The extent of RAN2 impact (MAC CE, RRC, user plane protocols)
     + Network architecture, e.g. NSA vs. SA, inter-RAT scenarios
  2. In RAN1#103-e, depending on the outcome of 2a), further identify additional components –along with the associated alternatives –required for supporting inter-cell mobility based on the same unified TCI framework as that for intra-cell mobility (including dynamic TCI state update signaling), including
     + Method(s) for incorporating non-serving cell information associated with TCI
     + Method(s) for DL measurements and UE reporting (e.g. L1-RSRP) associated with non-serving cell(s)
     + UE behavior for reception of signals and non-UE-specific control and data channels associated with non-serving cell(s)
     + UL-related enhancements, e.g. related to RA procedure including TA
     + Beam-level event-driven mechanism for L1/L2-centric inter-cell mobility

On Rel-17 enhancements to enable L1/L2-centric inter-cell mobility:

* The following use cases are assumed:
  + Network architecture:
    - NSA, i.e. LTE PCell and NR-PSCell
    - SA
  + Intra-band CA
    - FFS: If inter-band CA is also included
  + Intra- RAT (excluding inter-RAT)
  + Intra-frequency scenario:
    - The SSBs of non-serving cells have the same center frequency and SCS as the SSBs of the serving cell
    - An SSB of a non-serving cell is associated with a PCI different from the PCI of the serving cell
    - FFS: Support for inter-frequency scenario
  + FFS: Whether to support intra-DU only operation, or whether inter-DU is also allowed
* The following enhancement scope is assumed:
  + Facilitating measurement and reporting of non-serving RSs via incorporating non-serving cell info with some TCI(s), along with the necessary measurement and reporting scheme(s)
    - FFS: Detailed/exact method(s)
    - FFS: Whether this also implies the support of beam indication (TCI state update along with the necessary TCI state activation) for TCI(s) associated with non-serving cell RS(s)
    - FFS: Metric for the measurement and reporting, e.g. L1-RSRP or L3-RSRP or time- or spatial-domain-filtered L1-RSRP
    - FFS: Beam-level event-driven mechanism, using serving cell RS and/or non-serving cell RS
  + Facilitate serving cell to provide configurations for non-serving cell SSBs via RRC
    - FFS: details for the configurations, e.g. time/frequency location, transmission power, etc.
    - FFS: other information needed for inter-cell mobility
  + Note: In RAN1's understanding, non-serving cell SSB and non-serving cell RS can be part of the serving cell configuration
* FFS: The following enhancement scope is assumed by RAN1:
  + Whether RRC reconfiguration signaling is needed or not when a TCI associated with non-serving cell RS is indicated
    - A non-serving cell RS is an RS that is or has an SSB of a non-serving cell as direct or indirect QCL source
    - This implies no C-RNTI update when UE receives DL channel RS associated to non-serving cell RS as QCL source.
    - FFS whether TCI associated with non-serving cell can be indicated to or are applicable for all channels.
  + Whether some RRC parameters need to be updated without additional RRC signaling, e.g. some RRC parameters are pre-configured, which are associated with TCI states with neighbor cell RS as QCL source
  + Whether UE needs/can change serving cell during L1/L2-centric inter-cell mobility.
  + The above assumption to be verified by RAN2

On Rel.17 multi beam measurement/reporting enhancements for L1/L2-centric inter-cell mobility and inter-cell mTRP:

* A quality of up to K beams associated at least with non-serving cell(s) can be reported in a single CSI reporting instance
  + For each beam, the UE can report at least: (1) a Measured RS Indicator, and (2) a Beam Metric associated with the Measured RS Indicator
  + FFS: Maximum value of K
  + FFS: If K is fixed, configured, reported by UE capability, or dynamically selected
  + FFS: The type of beam metric (e.g. L1-RSRP, L3-RSRP, or hybrid L1/L3-RSRP) and related measurement behavior
  + FFS: Whether or not beam reporting associated with non-serving cell(s) can be mixed with that with serving-cell in one reporting instance

At the end of RAN1#104-e, send an LS to RAN2 with all the RAN1-related inter-cell mobility agreements done so far during Rel17.

On Rel.17 multi beam measurement/reporting enhancements for L1/L2-centric inter-cell mobility and inter-cell mTRP:

* Rel.15 L1-RSRP is used as reporting quantity for measurement and reporting of non-serving-cell(s)
  + Support SSB as a measurement RS for L1/L2-centric inter-cell mobility and inter-cell mTRP, and Rel.15 SS-RSRP calculated from SSB of non-serving cell(s)
    - FFS: Whether the measurement for SS-RSRP is limited within SMTC
    - FFS: Detailed reporting method, e.g. via including existing L1-RSRP report, UE-initiated report etc.
  + FFS: Whether or not to support CSI-RS (for e.g. mobility and/or tracking) of non-serving cell(s) as a measurement RS for L1/L2-centric inter-cell mobility and inter-cell mTRP. If the support of CSI-RS (for e.g. mobility and/or tracking) of non-serving cell(s) as a measurement RS for L1/L2-centric inter-cell mobility and inter-cell mTRP is confirmed, Rel.15 CSI-RSRP is also supported
    - Whether the support applies to CSI-RS with or without QCL source, or both
  + FFS: The number of non-serving cell(s) for measurement/reporting
  + FFS: time behavior of the reporting, i.e. periodic, semi-persistent, aperiodic, or UE-initiated
* FFS: If other reporting quantities are supported, e.g. L3-RSRP, hybrid L1/L3-RSRP
* FFS: Dynamic activation/deactivation/selection of the beam measurement on the RS(s) associated with non-serving cell(s) via MAC CE
* FFS: Timing assumption (e.g. time of arrival and time of the measurement) for measurement of non-serving cell RS measurement

… [Round-3 agreement]

**2. Actions:**

**To: RAN2**

**ACTION:** RAN1 respectfully asks RAN2 to take the above into account.

**3. Date of Next TSG-RAN WG1 Meetings:**

TSG RAN WG1 Meeting #104bis-e 12th – 20th April, 2021 E-meeting