3GPP TSG RAN WG1 #116 R1-2400186
Athens, Greece, February 26th – March 1st, 2024

# FL plan for Maintenance on Further NR Mobility Enhancements at RAN1#116

| | |
|---|---|
| **Document For:** | **Information** |
| **Agenda item** | **8.5** |
| **Source:** | **Moderator (Fujitsu)** |

# Summary of Q4 2023

FUJITSU

- **RAN1#114bis (October)**
  - An essential issue was found (though at least one company doesn't think so) for TCI state indication, and this issue was not resolved in RAN1#114bis
  - It was confirmed that companies have different understanding / preference on the handling of TCI states

- **RAN1#115 (November)**
  - Most of the allocated time was spent for the TCI state issue, and finally solved by agreeing Option A
  - With this agreement, RAN1 finished all important issues which may block the completion of this WI
  - However, there are minor remaining issues

The TCI state indicated in the cell switch command is associated with:
- Option A: LTM TCI state pool of the target cell, i.e. configured under LTM-Candidate-r18
- Option B: TCI state pool of the target cell, i.e. target cell's ServingCellConfig

# Running CRs

FUJITSU

## RAN1 CRs (For RAN#101)

| TS | CR | Rev | Rel | Title | Cat | Vsn | @ Mtg | TD# | Source to WG | Work Item | Clauses affected | Other Aff Specs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38.212 | 0146 | - | Rel-18 | Introduction of Rel-18 Further NR mobility enhancements | B | 17.5.0 | RAN1#114 | R1-2308711 | Huawei | NR_Mob_enh2-Core | 6.3.1.1.2, 6.3.2.1.2, 7.3.1.2.1 | TS 38.213, TS 38. 214 |
| 38.213 | 0505 | - | Rel-18 | Introduction of further mobility enhancements | B | 17.6.0 | RAN1#114 | R1-2308699 | Samsung | NR_Mob_enh2-Core | 4.2, 7.4, 7.5, 8.1, 21 (new) | |
| 38.214 | 0439 | - | Rel-18 | Introduction of specification support for mobility enhancements | B | 17.6.0 | RAN1#114 | R1-2308718 | Nokia | NR_Mob_enh2-Core | 5.2.1, 5.2.1.1, 5.2.1.2, 5.2.1.4.1, 5.2.1.4.2, | TS 38.212, TS 38.213 |

## RAN1 CRs (After RAN#102)

| TS | CR | Rev | Rel | Title | Cat | Vsn | @ Mtg | TD# | Source to WG | Work Item | Clauses affected | Other Aff Specs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 38.212 | 0166 | - | Rel-18 | Corrections on Rel-18 Further NR mobility enhancements in 38.212 | F | 18.0.0 | RAN1#115 | R1-2312740 | Huawei | NR_Mob_enh2-Core | 7.3.1.2.1 | TS 38.213, TS 38. 214 |
| 38.213 | 0573 | - | Rel-18 | Maintenance of further mobility enhancements | F | 18.0.0 | RAN1#115 | R1-2312724 | Samsung | NR_Mob_enh2-Core | 8.1, 8.2, 18 | TS/TR ... CR ...; TS/TR ... CR ... ; TS/TR ... CR ... |
| 38.214 | 0485 | - | Rel-18 | Corrections of specification support for mobility enhancements | F | 18.0.0 | RAN1#115 | R1-2312755 | Nokia | NR_Mob_enh2-Core | 5.2.1.6, 5.2.5 | |

# LS from other WGs

| | | |
|---|---|---|
| R1-2400028 | Reply LS on L1 measurements for LTM | RAN4, Ericsson |

No action needed
(CC RAN1)

| | | |
|---|---|---|
| R1-2400029 | LS on n-TimingAdvanceOffset for PDCCH order RACH | RAN4, Huawei |

Question to RAN2 and RAN1, but RAN1 is CC
RAN4 is asking why n-TimingAdvanceOffset is not included in RAN2 configuration for PDCCH-order RACH on target neighbour cell
Reply LS may be necessary

FUJITSU

# Potential issues for RAN1#116

# 1. L1 measurement

- **Agreement in RAN1#115**
  - Processing of an LTM CSI report occupies 1 CPU
- **Potential remaining issues in RAN1#116**
  - None

# 2. Measurement reporting

FUJITSU

- **Agreement in RAN1#115**
  - Conclusion: Not pursued in Rel-18: A MAC CE to activate/deactivate the SSB(s)/cell(s) configured in the L1 measurement report
  - LTM CSI report is prioritized over legacy CSI report
  - Ambiguity issue on MAC CE to activate/deactivate semi-persistent PUCCH report will be addressed by RAN2 (An LS has been sent out)

- **Potential remaining issues in RAN1#116**

Potential topic at RAN1#116

  - Priority rule within LTM CSI report in case of collision
    - The current rule in the spec refers to the RRC parameters for legacy CSI report
    - Importance: High
  - Condition to identify SpCell when SpCellInclusion is configured, e.g. which parameter should be used
    - This issue was discussed offline in RAN1#115 offline. The common understanding was to use SSB frequency rather than ARFCN. But, we had not time to agree on the TP
    - Importance: High

# 3. Beam indication

- Agreement in RAN1#115
  - Conclusion: When RACH-less LTM is performed, for beam indication of target cell based on Rel-17 unified TCI framework applied to CORESET#0 and CORESETs (other than CORESET#0) associated with CSS sets other than Type3-PDCCH CSS sets where followUnifiedTCI-state is not enabled or not provided, whether using the TCI state indicated in the Cell Switch Command is up to UE implementation.
  - Conclusion: No consensus to include simultaneousU-TCI-UpdateList under LTM-Candidate-r18 to activate and indicate TCI states for SCell(s) after cell switch command.
  - After RACH procedure until a new TCI state is indicated by the target cell, a UE follows the indicated TCI-state in the cell switch command at least for CFRA triggered by cell switch command.
  - UE may expect that:
    - For a candidate cell, the configuration of an LTM TCI state in ltm-DL-OrJointTCI-StateToAddModList-r18 and ltm-ul-TCI-ToAddModList-r18 is same as its counterpart in dl-OrJointTCI-StateList-r17 and ul-TCI-ToAddModList-r17 of the first active BWP in ServingCellConfig, at least in terms of TCI state ID, the corresponding qcl-Type1 and qcl-Type2 for the DL or joint TCI state or referenceSignal for the UL TCI state.
    - The LTM TCI state(s) in ltm-DL-OrJointTCI-StateToAddModList-r18 and ltm-ul-TCI-ToAddModList-r18 of a candidate cell is a subset of serving cell TCI state(s) in dl-OrJointTCI-StateList-r17 and ul-TCI-ToAddModList-r17 of the same cell.
  - The TCI states in the candidate Cell TCI activation/deactivation command is associated with LTM TCI state pool of the target cell, i.e. configured under LTM-Candidate-r18.
  - The TCI state indicated in the cell switch command is associated with LTM TCI state pool of the target cell, i.e. configured under LTM-Candidate-r18.

The most important achievement at RAN1#115

# 3. Beam indication (continued)

FUJITSU

- **Potential remaining issues in RAN1#116**

Potential topic at RAN1#116

  - TCI state used after cell switch when RACH based LTM is performed
    - "Follow indicated TCI state", "Follow the SSB that is QCL source of the indicated TCI state", or "SSB identified during RACH process"
    - Importance: High
  - Necessity of beam application time:
    - RAN4 will define cell switch time, but the details were not clear → RAN1 can discuss again after the clarity of RAN4 specification.
    - Importance: High (at least TBD in 38.213 needs to be solved)

not sure if RAN4 discussion is matured

  - TCI state indication for Scells after cell switch
    - No new RRC signaling can be introduced.
    - RAN1 had no discussion if any modification for the current procedure is necessary when simultaneousU-TCI-UpdateList is included in CellGroupConfig of candidate cell.
    - Importance: not clear yet

# 4. Cell switch command

- **Agreement in RAN1#115**
  - No open issues, and no discussions

- **Potential remaining issues in RAN1#116**
  - None

# 5. TCI state activation

- **Agreement in RAN1#115**
  - None

- **Potential remaining issues in RAN1#116(cnt'd)**
  - TCI state deactivation for multiple candidate cells by a single MAC CE
    - Currently, a MAC CE can (de)activate a single candidate cell. However, many companies in RAN1 want to introduce a mechanism to deactivate multiple candidate cells by a single MAC CE
    - No consensus at RAN1#115 due to the lack of time: we had no enough time to have common understanding
    - If problem is found, RAN1 needs to ask RAN2 to solve this issue
    - Importance: not clear yet

Potential topic at RAN1#116

  - UE behavour on the TRS for candidate cells before and/or after cell switch
    - RRC signaling and UE capability have been defined, but no details of the QCL configuration is captured in the spec (38.213)
      - The meaning of UE capability is still unclear. Is this applicable to "before CSC" or "before and after CSC"
    - Existing description in section 5.1.5 of 38.214 is not applicable (CandidateTCI-state is defined instead of TCI-state)
      - Description on QCL type may be needed
    - If TRS configuration is not included in the candidate cell configuration, it will lead to the mismatch with ServingCellConfig of the target cell → more discussion is needed
    - Importance: High

There might be more problem....

  - Whether to retain or deactivate TCI states for candidate cells after cell switch
    - No time to discuss online at RAN1#115 since most of the time was spent on other important issues
    - Importance: low (this could be an optimization)

# 6. TA management

FUJITSU

- **Agreement in RAN1#115**
  - Use clause 8.1 of 213 as the reference clause for the value of N used to determine the overlap scenario between the PRACH transmission to a candidate cell and an UL transmission to the serving cell.
  - n-TimingAdvanceOffset is pre-configured to UE for each candidate cell.
  - Two TPs
- **Potential remaining issues in RAN1#116**
  - Probably none

# Thank you