**3GPP TSG-RAN WG1 Meeting #110** **R1-xxxxxxx**

**Toulouse, France, August 22 – 26, 2022**

**Agenda Item: 8.13**

**Source: Moderator (Huawei)**

**Title: [110-Prep-AI8.13 fMR-DC/CA Enh] Prep phase summary of further MR-DC/CA Enhancement**

**Document for: Discussion and Decision**

# Introduction

According to the contribution papers under agenda item 8.13 for WI further MR-DC/CA Enhancement, all identified issues are summarized in Section 2.

# Summary of issues

According to all of companies’ contribution documents, three issues are summarized below.

* **Issue-1:** UE determination of PDCCH monitoring when SCG is deactivated for NR-DC. [1]
* **Issue-2:** CR for disabling EN-DC power split when SCG is deactivated. [2]
* **Issue-3:** CRs for fast SCell activation.[3][4][5][6]

## Issue-1: UE determination of PDCCH monitoring when SCG is deactivated for NR-DC

In [1], TP for PDCCH monitoring when SCG is deactivated for NR-DC operation is provided.

**-----------------------------**Text Proposal 3 for Section 10 in TS 38.213 h20**------------------------------------**

|  |
| --- |
| ***Reason for change:*** When a UE is configured with NR-DC but also provided with *scg-State*, there is no PDCCH monitoring in SCG. Therefore, the UE capability of PDCCH monitoring on SCG for NR-DC is not applicable in this case.  ***Summary of change:*** The UE behavior in sub-clause 10 is no applicable for a NR-DC UE if the UE is provided *scg-State*.  ***Consequences if not approved:*** UE capability of PDCCH monitoring on SCG for NR-DC is not applicable when *scg-State* is provided. |
| 10 UE procedure for receiving control information  ...  When a UE is configured for NR-DC operation and is not provided *scg-State*, the UE determines a capability to monitor a maximum number of PDCCH candidates and a maximum number of non-overlapped CCEs per slot that corresponds to downlink cells for the MCG where is provided by *pdcch-BlindDetection* for the MCG and determines a capability to monitor a maximum number of PDCCH candidates and a maximum number of non-overlapped CCEs per slot that corresponds to downlink cells for the SCG where is provided by *pdcch-BlindDetection* for the SCG. When the UE is configured for carrier aggregation operation over more than 4 cells, or for a cell group when the UE is configured for NR-DC operation and is not provided *scg-State*, the UE does not expect to monitor per slot a number of PDCCH candidates or a number of non-overlapped CCEs that is larger than the maximum number as derived from the corresponding value of .  ... |

## Issue-2: CR for disabling EN-DC power split when SCG is deactivated.

In [2], clarification on UE procedure for power control when SCG is deactivated is provided. Details of the CR are as follows:

|  |  |
| --- | --- |
| ***Reason for change:*** | RAN1#109 agreed a CR in [R1-2205683](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/R1-2205683.zip) capturing that the power control operation for NR-DC is applicable only when the SCG is activated in clause 7.6.2. by adding the following sentence in the beginning of 7.6.2:  The UE procedures described in this clause are not applicable if the UE is provided *scg-State* [12, TS 38.331].  However, what was missed was that the same is applicble also for EN-DC: When the SCG is de-activated during EN-DC operation the EN-DC power sharing described in 7.6.1 of 38.213 should be ignored. |
|  |  |
| ***Summary of change:*** | Condition the UE procedures for power control in clause 7.6.1 on the SCG being activated. |
|  |  |
| ***Consequences if not approved:*** | Incomplete support for NR-DC enhancements with EN-DC. |

\*\*\* Unchanged text is omitted \*\*\*

7.6 Dual connectivity

7.6.1 EN-DC

The UE procedures described in this clause are not applicable if the UE is provided *scg-State* [12, TS 38.331].

If a UE is configured with a MCG using E-UTRA radio access and with a SCG using NR radio access, the UE is configured a maximum power  for transmissions on the MCG by *p-MaxEUTRA* and a maximum power  for transmissions in FR1 on the SCG by *p-NR-FR1*.

The UE determines a transmission power for the MCG as described in [13, TS 36.213] using  as the maximum transmission power. The UE determines transmission power for the SCG in FR1 as described in clauses 7.1 through 7.5 using  as the maximum transmission power. The UE determines transmission power for the SCG in FR2 as described in clauses 7.1 through 7.5.

A UE does not expect to be configured for operation with shortened TTI and/or processing time [13, TS 36.213] on a cell that is included in an EN-DC configuration.

If a UE is configured with , where  is the linear value of ,  is the linear value of , and  is the linear value of a configured maximum transmission power for EN-DC operation as defined in [8-3, TS 38.101-3] for FR1, the UE determines a transmission power for the SCG as follows.

\*\*\* Unchanged text is omitted \*\*\*

## Issue-3: CRs for fast SCell activation

Four CRs from different companies for fast SCell activation are presented in this section.

### Issue-3-1: Section naming correction on the CSI-RS for Tracking for Fast SCell activation

In [3], section naming correction on the CSI-RS for Tracking for Fast SCell activation is provided. Details of the CR are as follows:

|  |  |
| --- | --- |
| ***Reason for change:*** | The A-CSI-RS for fast SCell activation was intially suggested to be a new CSI-RS type and it was named “Aperiodic CSI-RS for fast SCell activation”. Subsequentlyit was agreed that it is a special form of CSI-RS for tracking and the new subclause was placed under the TRS section 5.1.6.1.1 as 5.1.6.1.1.1, but the section heading was not updated to mention “tracking”.  At the same time a new subection under 5.2.1.5 for triggering/activation of CSI reports and CSI RS was introduced for fast SCell activation as 5.2.1.5.3 Aperiodic CSI-RS for tracking for fast SCell activation.  Subsequently the two new subclauses refer to the same RS with a different name potentially causing confusion.  5.1.6.1.1.1 Aperiodic CSI-RS for fast SCell activation  5.2.1.5.3 Aperiodic CSI-RS for tracking for fast SCell activation |
|  |  |
| ***Summary of change:*** | Aligning the 5.1.6.1.1.1 section heading to refer to CSI-RS for tracking to match the format used in 5.2.1.5.3 section heading |
|  |  |
| ***Consequences if not approved:*** | Inconsistent naming of the newly introduced CSI-RS for tracking for fast SCell activation within the same specification |

\*\*\* Unchanged text is omitted \*\*\*

##### 5.1.6.1.1.1 Aperiodic CSI-RS for tracking for fast SCell activation

A UE can be configured with aperiodic CSI-RS resources for tracking for an SCell for fast SCell activation using *NZP-CSI-RS-ResourceSet(s)* with the higher layer parameter *scellActivationRS-ConfigToAddModList*, with the QCL relation as with aperiodic CSI-RS for tracking in clause 5.1.6.1.1.

Each CSI-RS resource, defined in clause 7.4.1.5.3 of [4, TS 38.211], for fast SCell activation is configured by the higher layer parameter *NZP-CSI-RS-Resource* with the same restrictions as defined for CSI-RS for tracking in clause 5.1.6.1.1.

\*\*\* Unchanged text is omitted \*\*\*

### Issue-3-2: Corrections for efficient SCell activation

In [4], clarification on RRC parameters for efficient SCell activation is provided. Details of the CR are as follows:

|  |  |
| --- | --- |
| ***Reason for change:*** | RRC parameter alignments for further Multi-RAT Dual-Connectivity enhancements |
|  |  |
| ***Summary of change:*** | Alignments for the following RRC parameters:   * *aperiodicCSI-RS-AdditionalBandwidth* * *aperiodicTriggeringOffsetL2* * *gapBetweenBursts* * *qcl-Info* |
|  |  |
| ***Consequences if not approved:*** | Misalignments between 38.214 and 38.331 on RRC parameters of further Multi-RAT Dual-Connectivity enhancements |

##### 5.1.6.1.1 CSI-RS for tracking

<omitted text>

Each CSI-RS resource, defined in Clause 7.4.1.5.3 of [4, TS 38.211], is configured by the higher layer parameter *NZP-CSI-RS-Resource* with the following restrictions:

- the time-domain locations of the two CSI-RS resources in a slot, or of the four CSI-RS resources in two consecutive slots (which are the same across two consecutive slots), as defined by higher layer parameter *CSI-RS-resourceMapping*, is given by one of

- , , or for frequency range 1 and frequency range 2,

- , , , , ,  or  for frequency range 2.

- a single port CSI-RS resource with density  given by Table 7.4.1.5.3-1 from [4, TS 38.211] and higher layer parameter *density* configured by *CSI-RS-ResourceMapping.*

- if carrier , , and the carrier is configured in paired spectrum, the bandwidth of the CSI-RS resource, as given by the higher layer parameter *freqBand* configured by *CSI-RS-ResourceMapping*, is *X* resource blocks, where resources if the UE indicates *trs-AddBW-Set1* for the *trs-AdditionalBandwidth* capability for CSI-RS for tracking or *addBW-Set1* for the *aperiodicCSI-RS-AdditionalBandwidth* capability for aperiodic CSI-RS for fast SCell activation and if the UE indicates *trs-AddBW-Set2* for the *AdditionalBandwidth* capability for CSI-RS for tracking or *addBW-Set2* for the *aperiodicCSI-RS-AdditionalBandwidth* capability for aperiodic CSI-RS for fast SCell activation; in these cases, if the UE is configured with CSI-RS comprising X<52 resource blocks, the UE does not expect that the total number of PRBs allocated for DL transmissions but not overlapped with the PRBs carrying CSI-RS for tracking is more than 4, where all CSI-RS resource configurations shall span the same set of resource blocks; otherwise, the bandwidth of the CSI-RS resource, as given by the higher layer parameter *freqBand* configured by *CSI-RS-ResourceMapping*, is the minimum of 52 and resource blocks, or is equal to resource blocks. For operation with shared spectrum channel access, *freqBand* configured by *CSI-RS-ResourceMapping*, is the minimum of 48 and resource blocks, or is equal to resource blocks.

<omitted text>

5.1.6.1.1.1 Aperiodic CSI-RS for fast SCell activation

A UE can be configured with aperiodic CSI-RS resources for tracking for an SCell for fast SCell activation using *NZP-CSI-RS-ResourceSet(s)* with the higher layer parameter *scellActivationRS-ConfigToAddModList*, with the QCL relation, provided by higher layer parameter *qcl-Info* given by *SCellActivationRS-Config*, as with aperiodic CSI-RS for tracking in clause 5.1.6.1.1.

Each CSI-RS resource, defined in clause 7.4.1.5.3 of [4, TS 38.211], for fast SCell activation is configured by the higher layer parameter *NZP-CSI-RS-Resource* with the same restrictions as defined for CSI-RS for tracking in clause 5.1.6.1.1.

<omitted text>

##### 5.2.1.5.3 Aperiodic CSI-RS for tracking for fast SCell activation

When the UE receives an *Enhanced Scell Activation/Deactivation* MAC-CE that triggers one or two CSI-RS bursts for fast SCell activation for a (set of) deactivated SCell(s),

- if the MAC-CE indicates that the first CSI-RS burst for SCell activation is present in an SCell, then the UE may assume that the first CSI-RS burst for SCell activation is present in that SCell. The first slot of the first CSI-RS burst starts at the *m1*th SCell slot after the last SCell slot coinciding with the reference slot *n+k*, as defined in clause 4.3 of [6, TS38.213].

- if the MAC-CE indicates that the second CSI-RS burst for SCell activation is present in an SCell, then the UE may assume that the second CSI-RS burst for SCell activation is present in that SCell. The first slot of the second CSI-RS burst starts at the *m2*thSCell slot after the end of the first CSI-RS burst. The CSI-RS of the second burst shall have the same antenna port index, OFDM symbol allocations in a slot, same PRB allocation location as the CSI-RS of the first burst.

- Where the CSI-RS burst is defined as four CSI-RS resources in two consecutive slots in clause 5.1.6.1.1.1, and *m1* and *m2* are provided by the MAC-CE and higher layer configuration *aperiodicTriggeringOffsetL2* and *gapBetweenBursts*.

<omitted text>

### Issue-3-3: Draft CR on Aperiodic CSI-RS for tracking for fast SCell activation

In [5], clarification on configurations of m1 and m2 in TS 38.214 is provided. Details of the CR are as follows:

|  |  |
| --- | --- |
| ***Reason for change:*** | It is specified in 38.214 5.2.1.5.3 that the first slot of the first CSI-RS burst is *m1*th SCell slot and the second slot of the second CSI-RS burst (if any) is *m2*th SCell slot where *m1* and *m2* are provided by the MAC-CE and higher layer configuration. However, it is not clear which higher layer configurations these refer to.  At the RAN2#118-e meeting, RAN2 has agreed a new RRC parameter *aperiodicTriggeringOffsetL2-r17* in *NZP-CSI-RS-ResourceSet* as an indication of triggering offset for efficient activation of the SCell based on R2-2205505. It should be clear that *m1* is provided by *aperiodicTriggeringOffsetL2-r17* in *NZP-CSI-RS-ResourceSet* and *m2* is provided by *gapBetweenBursts* that are associated with the CSI-RS burst(s) triggered by the MAC-CE. |
|  |  |
| ***Summary of change:*** | Clarify that *m1* and *m2* are provided by aperiodicTriggeringOffsetL2 in NZP-CSI-RS-ResourceSet and gapBetweenBursts, respectively, associated with the CSI-RS burst(s) triggered by the MAC-CE |
|  |  |
| ***Consequences if not approved:*** | There are potential misunderstanding between gNB and UE on the slots that the first CSI-RS burst and/or the second CSI-RS burst start. |

5.2.1.5.3 Aperiodic CSI-RS for tracking for fast SCell activation

When the UE receives an *Enhanced Scell Activation/Deactivation* MAC-CE that triggers one or two CSI-RS bursts for fast SCell activation for a (set of) deactivated SCell(s),

- if the MAC-CE indicates that the first CSI-RS burst for SCell activation is present in an SCell, then the UE may assume that the first CSI-RS burst for SCell activation is present in that SCell. The first slot of the first CSI-RS burst starts at the *m1*th SCell slot after the last SCell slot coinciding with the reference slot *n+k*, as defined in clause 4.3 of [6, TS38.213].

- if the MAC-CE indicates that the second CSI-RS burst for SCell activation is present in an SCell, then the UE may assume that the second CSI-RS burst for SCell activation is present in that SCell. The first slot of the second CSI-RS burst starts at the *m2*thSCell slot after the end of the first CSI-RS burst. The CSI-RS of the second burst shall have the same antenna port index, OFDM symbol allocations in a slot, same PRB allocation location as the CSI-RS of the first burst.

- Where the CSI-RS burst is defined as four CSI-RS resources in two consecutive slots in clause 5.1.6.1.1.1, and *m1* and *m2* are provided by *aperiodicTriggeringOffsetL2* in *NZP-CSI-RS-ResourceSet* and *gapBetweenBursts*, respectively, associated with the CSI-RS burst(s) triggered by the MAC-CE.

In [6], clarification on configurations of m1 and m2 in TS 38.214 is provided. Details of the CR are as follows:

|  |  |
| --- | --- |
| ***Reason for change:*** | The new RRC parameter for triggering TRS via MAC CE for fast SCell activation is missing from the RAN1 specification. |
|  |  |
| ***Summary of change:*** | Clarify that m1 and m2 are provided according to aperiodicTriggeringOffsetL2 and gapBetweenBursts. |
|  |  |
| ***Consequences if not approved:*** | Unclear specification |

5.2.1.5.3 Aperiodic CSI-RS for tracking for fast SCell activation

When the UE receives an *Enhanced Scell Activation/Deactivation* MAC-CE that triggers one or two CSI-RS bursts for fast SCell activation for a (set of) deactivated SCell(s),

- if the MAC-CE indicates that the first CSI-RS burst for SCell activation is present in an SCell, then the UE may assume that the first CSI-RS burst for SCell activation is present in that SCell. The first slot of the first CSI-RS burst starts at the *m1*th SCell slot after the last SCell slot coinciding with the reference slot *n+k*, as defined in clause 4.3 of [6, TS38.213].

- if the MAC-CE indicates that the second CSI-RS burst for SCell activation is present in an SCell, then the UE may assume that the second CSI-RS burst for SCell activation is present in that SCell. The first slot of the second CSI-RS burst starts at the *m2*thSCell slot after the end of the first CSI-RS burst. The CSI-RS of the second burst shall have the same antenna port index, OFDM symbol allocations in a slot, same PRB allocation location as the CSI-RS of the first burst.

- Where the CSI-RS burst is defined as four CSI-RS resources in two consecutive slots in clause 5.1.6.1.1.1, and *m1* and *m2* are provided by the MAC-CE and higher layer configuration according to *aperiodicTriggeringOffsetL2* and *gapBetweenBursts,* respectively.

## Company comments

Companies are invited to provide comments on the issues above for discussions

|  |  |
| --- | --- |
| *Company* | *View* |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

# Conclusions

# References

1. R1-2205952 Maintenance of Rel-17 DSS ZTE
2. R1-2206430 Disabling EN-DC power split when SCG is deactivated Nokia, Nokia Shanghai Bell
3. R1-2206431 Section naming correction on the CSI-RS for Tracking for Fast SCell activation Nokia, Nokia Shanghai Bell
4. R1-2206765 Corrections for efficient SCell activation vivo
5. R1-2207208 Draft CR on Aperiodic CSI-RS for tracking for fast SCell activation Qualcomm Incorporated
6. R1-2207436 Corrections for fast SCell activation Ericsson