3GPP TSG-RAN WG1 Meeting #118 R1-2xxxxxx

Maastricht, The Netherlands, August 19 – 23, 2024

Agenda Item: 8.1

Source: Moderator (Ericsson)

Title: Moderator Summary for maintenance on Two TAs for multi-DCI

Document for: Discussion & Decision

*During RAN#94e, a new WID for Rel-18 MIMO evolution for DL and UL was agreed. The highlighted Part of objective 7 is relevant for this AI:*

1. Study, and if justified, specify the following
	* Two TAs for UL multi-DCI for multi-TRP operation
	* *Power control for UL single DCI for multi-TRP operation where unified TCI framework extension in objective 2 is assumed.*

For the case of simultaneous UL transmission from multiple panels, the operation will only be limited to the objective 6 scenarios.

*The proposals submitted by Tdocs submitted to RAN1#118 are summarized in this document.*

# **1. Draft CRs**

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| # | Text Proposal | Company Position |
| 1.1 | **Proposal:** Adopt draft CR for 38.213 Clause 8.1 [1] **Reason for change:** For two TA operation, the UE can be configured with multiple RACH configurations, where different RACH configurations correspond to different cells. However, currently, the SSB-RO mapping rule including the RO validation rule is defined for serving cell only, and the SSB-RO mapping rule for neighbor cell is missing. Then how to identify the RO to transmit the PRACH ordered by PDCCH for TA measurement for neighbor cell is unclear. **Summary of change:**  Clarify that the SSB-RO mapping for neighbor cell is based on the neighbor cell SSB, which is based on the same principle as serving cell.**Consequence if not approved:** SSB-RO mapping is unclear when multiple RACH configurations are configured.**-----------------------------------------------------Start of draft CR--------------------------------------------------**8.1 Random access preamble<unrelated text omitted>SS/PBCH block indexes provided by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or in *SSB-MTC-AdditionalPCI* are mapped to valid PRACH occasions in the following order where the parameters are described in [4, TS 38.211].- First, in increasing order of preamble indexes within a single PRACH occasion- Second, in increasing order of frequency resource indexes for frequency multiplexed PRACH occasions- Third, in increasing order of time resource indexes for time multiplexed PRACH occasions within a PRACH slot- Fourth, in increasing order of indexes for PRACH slotsAn association period, starting from frame 0, for mapping SS/PBCH block indexes to PRACH occasions is the smallest integer number in the set determined by the PRACH configuration period according Table 8.1-1 such that $N\_{Tx}^{SSB}$ SS/PBCH block indexes are mapped at least once to the PRACH occasions within the association period, where a UE obtains $N\_{Tx}^{SSB}$ from the value of *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or in *SSB-MTC-AdditionalPCI*. If after an integer number of SS/PBCH block indexes to PRACH occasions mapping cycles within the association period there is a set of PRACH occasions or PRACH preambles that are not mapped to $N\_{Tx}^{SSB}$ SS/PBCH block indexes, no SS/PBCH block indexes are mapped to the set of PRACH occasions or PRACH preambles. An association pattern period includes one or more association periods and is determined so that a pattern between PRACH occasions and SS/PBCH block indexes repeats at most every 160 msec. PRACH occasions not associated with SS/PBCH block indexes after an integer number of association periods, if any, are not used for PRACH transmissions.**-----------------------------------------------------unchanged part omitted--------------------------------------------------**For paired spectrum or supplementary uplink band all PRACH occasions are valid. For unpaired spectrum, - if a UE is not provided *tdd-UL-DL-ConfigurationCommon*, a PRACH occasion for a cell in a PRACH slot is valid if it does not precede a SS/PBCH block in the PRACH slot and starts at least $N\_{gap}$ symbols after a last SS/PBCH block reception symbol, where $N\_{gap}$ is provided in Table 8.1-2 and, if *channelAccessMode* = "*semiStatic*" is provided, does not overlap with a set of consecutive symbols before the start of a next channel occupancy time where the UE does not transmit [15, TS 37.213].- the candidate SS/PBCH block index of the SS/PBCH block corresponds to the SS/PBCH block index provided by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or in *SSB-MTC-AdditionalPCI* corresponding to the cell, as described in clause 4.1- If a UE is provided *tdd-UL-DL-ConfigurationCommon*, a PRACH occasion for a cell in a PRACH slot is valid if - it is within UL symbols, or - it does not precede a SS/PBCH block in the PRACH slot and starts at least $N\_{gap}$ symbols after a last downlink symbol and at least $N\_{gap}$ symbols after a last SS/PBCH block symbol, where $N\_{gap}$ is provided in Table 8.1-2, and if *channelAccessMode* = "*semiStatic*" is provided, does not overlap with a set of consecutive symbols before the start of a next channel occupancy time where there shall not be any transmissions, as described in [15, TS 37.213]- the candidate SS/PBCH block index of the SS/PBCH block corresponds to the SS/PBCH block index provided by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or in *SSB-MTC-AdditionalPCI* corresponding to the cell, as described in clause 4.1. For preamble format B4 [4, TS 38.211], $N\_{gap}=0$. Table 8.1-2: $N\_{gap}$ values for different preamble SCS $μ$

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| Preamble SCS | $$N\_{gap}$$ |
| 1.25 kHz or 5 kHz | 0 |
| 15 kHz or 30 kHz or 60 kHz or 120 kHz | 2 |
| 480 kHz | 8 |
| 960 kHz | 16 |

If a random access procedure is initiated by a PDCCH order, the UE, if requested by higher layers, transmits a PRACH in the selected PRACH occasion, as described in [11, TS 38.321], for which a time between the last symbol of the PDCCH order reception and the first symbol of the PRACH transmission is larger than or equal to $N\_{T,2}+∆\_{BWPSwitching}+∆\_{Delay}+T\_{switch}+T\_{SSB}+∆\_{RF/BB preparation}$ msec, where - $N\_{T,2}$ is a time duration of $N\_{2}$ symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214] assuming $μ$ corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission - $∆\_{BWPSwitching}=0$ if the active UL BWP does not change, or if a cell indicator field in the PDCCH order indicates a non-serving cell [5, TS 38.212], and $∆\_{BWPSwitching}$ is a time duration of $T\_{BWPswitchDelay}$ defined in [10, TS 38.133] otherwise - $∆\_{Delay}=0.5$ msec for FR1 and $∆\_{Delay}=0.25$ msec for FR2- $T\_{switch}$ is a switching gap duration as defined in [6, TS 38.214] - $T\_{SSB}=0$ if a cell indicator field in the PDCCH order indicates a serving cell or if cell indicator field is not present, and $T\_{SSB}$ is defined in [10, TS 38.133] otherwise- $∆\_{RF/BB preparation}=0$ if a cell indicator field in the PDCCH order indicates a serving cell or if cell indicator field is not present, and $∆\_{RF/BB preparation}$ is defined in [10, TS 38.133] otherwiseFor a PRACH transmission using 1.25 kHz or 5 kHz SCS, the UE determines $N\_{2}$ assuming SCS configuration $μ=0$.**-----------------------------------------------------End of draft CR--------------------------------------------------** | **Support**: Google, Huawei, Samsung**Not support**: |
| 1.2 | **Proposal:** Discuss either TP 1 or TP 2 for adoption in TS 38.213 Section 7.1.1 [2]**Reason for change:** Unnecessary resetting of first closed loop (l=0) configured for the first TRP instead of the resetting the second closed loop (l=1), when CFRA based PDCCH order triggers PRACH towards the second TRP.**Summary of change:**  Clarify the spec on whether to reset the first closed loop power control adjustment state (l=0) or reset the second closed loop power control adjustment state (l=1) based on whether the PRACH is toward the first TRP or the second TRP.**Consequence if not approved:** Current code results in unnecessary resetting of the wrong closed loop when PRACH is triggered towards the second TRP.============TP1 (Option 1) for 38.213 Section 7.1.1 ==============================--Unchanged part omitted------------------------- If the UE transmits a PUSCH associated with the first RS resource index $q\_{d}$, the UE applies the first $P\_{O\\_UE\\_PUSCH,b,f,c}\left(j\right)$ value, the first $α\_{b,f,c}\left(j\right)$ value, and $f\_{b,f,c}\left(i,l\right)$ for determining $P\_{PUSCH,b,f,c}(i,j,q\_{d},l)$. If the UE transmits a PUSCH associated with the second RS resource index $q\_{d}$, the UE applies the second $P\_{O\\_UE\\_PUSCH,b,f,c}\left(j\right)$ value, the second $α\_{b,f,c}\left(j\right)$ value, and $f\_{b,f,c}\left(i,l\right)$ or $f\_{b,f,c}\left(i,0\right)$ if *twoPUSCH-PC-AdjustmentStates* is provided or not provided, respectively, for determining $P\_{PUSCH,b,f,c}(i,j,q\_{d},l)$.- If the UE receives a random access response message in response to a PRACH transmission or a MsgA transmission on active UL BWP $b$ of carrier $f$ of serving cell $c$ as described in clause 8- $f\_{b,f,c}\left(0,l\right)=∆P\_{rampup,b,f,c}+δ\_{msg2,b,f,c}$, - where $l=0$ if the UE is not provided with *tag-Id2* or if the UE is not provided with *twoPUSCH-PC-AdjustmentStates*; otherwise, $l=0$ if the first TAG is indicated by the random access response message and$l=1$ if the second TAG is indicated by the random access response message, and- $δ\_{msg2,b,f,c}$ is a TPC command value indicated in a random access response grant of the random access response message corresponding to a PRACH transmission according to Type-1 random access procedure, or in a random access response grant of the random access response message corresponding to a MsgA transmission according to Type-2 random access procedure with RAR message(s) for fallbackRAR, on active UL BWP $b$ of carrier $f$ of serving cell $c$, and -  and $∆P\_{rampup\\_requested,b,f,c}$ is provided by higher layers and corresponds to the total power ramp-up requested by higher layers from the first to the last random access preamble for carrier $f$ in the serving cell $c$, $M\_{RB,b,f,c}^{PUSCH}(0)$ is the bandwidth of the PUSCH resource assignment expressed in number of resource blocks for the first PUSCH transmission on active UL BWP$ b$ of carrier $f$ of serving cell $c$, and $∆\_{TF,b,f,c}\left(0\right)$ is the power adjustment of first PUSCH transmission on active UL BWP $b$ of carrier $f$ of serving cell $c$. ===========================================================================TP2 (Option 2) for 38.213 Section 7.1.1 ==============================--Unchanged part omitted------------------------- If the UE transmits a PUSCH associated with the first RS resource index $q\_{d}$, the UE applies the first $P\_{O\\_UE\\_PUSCH,b,f,c}\left(j\right)$ value, the first $α\_{b,f,c}\left(j\right)$ value, and $f\_{b,f,c}\left(i,l\right)$ for determining $P\_{PUSCH,b,f,c}(i,j,q\_{d},l)$. If the UE transmits a PUSCH associated with the second RS resource index $q\_{d}$, the UE applies the second $P\_{O\\_UE\\_PUSCH,b,f,c}\left(j\right)$ value, the second $α\_{b,f,c}\left(j\right)$ value, and $f\_{b,f,c}\left(i,l\right)$ or $f\_{b,f,c}\left(i,0\right)$ if *twoPUSCH-PC-AdjustmentStates* is provided or not provided, respectively, for determining $P\_{PUSCH,b,f,c}(i,j,q\_{d},l)$.- If the UE receives a random access response message in response to a PRACH transmission or a MsgA transmission on active UL BWP $b$ of carrier $f$ of serving cell $c$ as described in clause 8- $f\_{b,f,c}\left(0,l\right)=∆P\_{rampup,b,f,c}+δ\_{msg2,b,f,c}$, - where $l=0$ if the UE is not provided with *tag-Id2* or if the UE is not provided with *twoPUSCH-PC-AdjustmentStates*; otherwise, if the PRACH transmission is in response to a detection of PDCCH order, - $l$ is the closed loop index of the active TCI states associated with the PCI indicated by the PRACH association indicator as described in [5, TS38.212] if the UE is provided *SSB-MTC-AdditionalPCI*,- otherwise, *l* is the closed loop index of the active TCI states associated with a same *coresetPoolIndex* as PDCCH order if the PRACH association indicator is 0, and *l* is the closed loop index of the active TCI states associated with a different *coresetPoolIndex* from the PDCCH order if the PRACH association indicator is 1, and- $δ\_{msg2,b,f,c}$ is a TPC command value indicated in a random access response grant of the random access response message corresponding to a PRACH transmission according to Type-1 random access procedure, or in a random access response grant of the random access response message corresponding to a MsgA transmission according to Type-2 random access procedure with RAR message(s) for fallbackRAR, on active UL BWP $b$ of carrier $f$ of serving cell $c$, and -  and $∆P\_{rampup\\_requested,b,f,c}$ is provided by higher layers and corresponds to the total power ramp-up requested by higher layers from the first to the last random access preamble for carrier $f$ in the serving cell $c$, $M\_{RB,b,f,c}^{PUSCH}(0)$ is the bandwidth of the PUSCH resource assignment expressed in number of resource blocks for the first PUSCH transmission on active UL BWP$ b$ of carrier $f$ of serving cell $c$, and $∆\_{TF,b,f,c}\left(0\right)$ is the power adjustment of first PUSCH transmission on active UL BWP $b$ of carrier $f$ of serving cell $c$. =============================================================== | **Support TP1**: Qualcomm, Huawei**Support TP2:** Qualcomm, **Not support**: Samsung |

Companies are asked to provide their views on the above draft CR/TPs. For companies supportive of issue 1.2, please indicate if you prefer TP1 or TP2.

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| **Company** | **Comments** |
| Huawei, Hisilicon | For issue 1.1, support the proposal.For issue 1.2, support TP2 for simplicity. |
| **Lenovo** | For issue 1.1, support the proposal.For issue 1.2, support TP2. |
| **Samsung** | Issue 1.1: Support proposalIssue 1.2: Don’t support. Not essential during maintenance.For Issue 1.2. TP1 forces a certain network mapping for TAGs and PC adjustment states.TP2 is a significant change for maintenance. This issue is not just related to 2TA, it can happen when there are two TRPs in a cell, and RACH can be sent from either TRP. This includes sDCI and mDCI scenarios, as well as scenarios when a single PC adjustment state is configured. The proposed change, just addresses one corner case. |
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# References

1. R1-2405949, Draft CR on SSB-RO mapping for two TA, Google
2. R1-2407014, Maintenance on NR MIMO Evolution for Downlink and Uplink, Qualcomm Incorporated