**3GPP TSG-RAN WG1 #102-e R1-200xxxx**

**e-Meeting, August 17th – 28th, 2020**

**Source: Moderator (Apple Inc.)**

**Title: Summary on UL Power Control for NN-DC**

**Agenda item:** **7.2.10**

**Document for:** **Discussion and Decision**

# 1 Introduction

Based on the outcome of the e-meeting preparation phase (See section 3 in []), the following email discussion has been kicked-off:

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| [102-e-NR-MRDC-CA-PC] Email discussion/approval of the following from R1-2006752 until 8/20; if necessary, endorse remaining TPs by 8/26 – Hong (Apple)   * Issue-1: RAN2 LS reply on T\_offset determination WA * Issue-2: Granularity of inter-node signaling * Issue-3: Removal of earlier text on dynamic power sharing * Issue-4: PDCCH-ordered PRACH transmission on MCG * Issue-5: New signaling to indicate maxToffsetSCG to UE * Issue-6: Data rate handling for NR-DC * Issue-9: Clarification on the  of Different UE Capabilities * Issue-10: RRC parameter alignment |

# 2. Discussion

Table 1 summarized the identified issues in accordance to the contributions submitted and more details for each issue were provided in the following sections.

**Table 1: Issues scoping based on contributions**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Index | Description | ZTE  [1] | MTK  [2] | HW  [3] | OPPO [4] | SS  [5] | Apple [6] | E///  [7] | QCM  [8] | Nokia  [9] | Total |
| 1 | T\_offset determination WA for DPS | A close up of a sign  Description automatically generated |  | A close up of a sign  Description automatically generated |  | A close up of a sign  Description automatically generated | A close up of a sign  Description automatically generated | A close up of a sign  Description automatically generated | A close up of a sign  Description automatically generated | A close up of a sign  Description automatically generated | 7 |
| 2. | Granularity for inter-node signaling | A close up of a sign  Description automatically generated |  |  |  |  | A close up of a sign  Description automatically generated | A close up of a sign  Description automatically generated | A close up of a sign  Description automatically generated |  | 4 |
| 3 | Removal of earlier text on dynamic power sharing |  |  |  |  |  |  | A close up of a sign  Description automatically generated | A close up of a sign  Description automatically generated |  | 2 |
| 4 | Handling of PDCCH-ordered PRACH transmission on MCG |  |  |  |  |  |  |  | A close up of a sign  Description automatically generated |  | 1 |
| 5 | Introducing new signaling to indicate maxToffsetSCG to UE |  |  |  |  | A close up of a sign  Description automatically generated |  |  |  |  | 1 |
| 6 | Data rate handling for NR-DC |  |  |  |  |  |  | A close up of a sign  Description automatically generated |  |  | 1 |
| 7 | Clarification on UL cancelation on MCG |  | A close up of a sign  Description automatically generated |  |  |  |  |  |  |  | 1 |
| 8 | Scheduling offset K2 of MCG |  | A close up of a sign  Description automatically generated |  |  |  |  |  |  |  | 1 |
| 9 | Clarification on the of Different UE Capabilities |  |  |  | A close up of a sign  Description automatically generated |  |  |  |  |  | 1 |
| 10 | RRC parameter alignment |  |  |  | A close up of a sign  Description automatically generated |  |  |  |  |  | 1 |

## 2.1 Issue-1: RAN2 LS reply on T\_offset determination WA

One working assumption was made in ran1 #100-eMeeting related to T\_offset determination and corresponding UE capability signaling. According to LS [10], MN is required to process the SCG configuration to identify the T\_offset used by the UE; Otherwise, possible largest value of T\_offset has to be assumed by MN for dynamic power sharing operation.

Two LS replies were received from RAN2 [11][12] in the recent meetings with providing different information updates. In the first email [11], it stated the following on the

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| Excerpt from RAN2 reply LS [11]  “*RAN2 would like to thank RAN1 for the LS on uplink power control for NR-NR Dual-Connectivity.*  *RAN2 is still discussing the reply to RAN1 but has no consensus yet on introducing new inter-node signalling for T\_offset.*  *However, RAN2 would like to remind that it was agreed in Rel-15 that MN and SN are not required to comprehend each other’s UE configuration for MR-DC. Therefore, RAN1 making assumption that such comprehension is possible is not correct in RAN2 view.”*  Excerpt from RAN2 reply LS [12]  *“RAN2 further discussed and agreed to introduce new inter-node signaling for T\_offset exchange between node as below.*   1. *MN signals the maxToffset restriction (i.e. maxToffset) in CG-ConfigInfo to SN, and SN shall respect the restriction when deciding the SCG configuration, such that  <= maxToffset.* 2. *RAN2 understanding is that if SN cannot accept the maxToffset restriction set by MN, SN can at least reject the procedure. RAN2 companies assume that current procedures will be reused.* 3. *RAN2 understanding is that upon receiving and accepting maxToffset restriction from MN, SN can provide the actual maxToffsetSCG (e.g.) in IE requestedToffset according to the SCG configuration.* 4. *SN may request, in CG-Config, a change in the maxToffset restriction imposed by MN. The SN may request MN to increase/decrease maxToffset and It is up to the MN to decide whether to and how to respond to the SN request.*   *RAN2 further understands that RAN1 will decide whether this solution shall be used, and if so, RAN2 would need information on value range.”* |

The T\_offset values determination remains as working assumption. How to handle the working assumption, especially taking into account the RAN2 LS replies, was discussed in several contributions [1][3][5][6][7][8][9] with different proposals:

* Opt.1: Confirm the working assumption with introducing inter-node signaling for T\_offset.
* Opt.2: Introduce new inter-node signaling candidate i.e. SN should share information to MN to inform the maximum value of Toffset  or SCS information and send RAN2 for down selection between the one agreed already and the two new candidates.

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| --- | --- | --- | --- |
| Index | No. of companies | Companies | Reasoning |
| Opt.1 | 6 | ZTE[1], HW[3], SS [5], Apple [6], E///[7], QCM[8] | * inter-node signaling agreed by RAN2 ensures that T\_offset determination WA aligns with RAN2 NR-DC assumption. * Late stage of the WI. |
| Opt.2 | 1 | Nokia [9] |  |

Companies views can be provided in the following Table:

|  |  |
| --- | --- |
| **Company** | **View/Position** |
| Qualcomm | Support Option 1. |
| Nokia/NSB | We are fine with option 1. |
| Intel | OK with Option 1 |
| MTK | Fine with Option 1 |
| OPPO | Support Option 1 |
| Huawei, HiSilicon | Support Option 1 |
| ZTE | It is fine to confirm the working assumption considering the late stage of Rel-16. |
| Samsung | Option 1 is fine |
| Ericsson | Confirming the WA (i.e., Option 1) is OK assuming further re-design/additional RRC signalling (e.g. as being discussed in Issue 5) are not included. |

According to the replies, all companies prefer option.1. One company proposed to go with Option.1 on condition that there is no additional RRC signaling.

**Proposal 1: Confirm the working assumption with introducing inter-node signaling for T\_offset**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree (Y/N)** | **Comments** |
| Samsung | Y |  |
| Qualcomm | Y |  |
| ZTE | Y | Ok with the Proposal 1. But if we want to make it clearer, we suggest the following wording.  ***Proposal 1****: Confirm previous RAN1 working assumption on determination of T\_offset made in RAN1#100e together with the updates in RAN1#101bis-e.* |
| MTK | Y |  |
| Intel | Y |  |
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## 2.2 Issue-2: Granularity of inter-node signaling

In addition, RAN2 asked in [12] for information on the value range of T\_offset as copied below:

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| --- |
| *RAN2 further understands that RAN1 will decide whether this solution shall be used, and if so, RAN2 would need information on value range.* |

Different options were proposed on this regard as follows:

* Option 1: A granularity of 0.1ms with a range of **[**0.4ms, 0.5ms, …, 3.0ms].
* Option 2: A set of value {0.5ms, 0.75ms, 1ms, 1.5ms, 2ms, 2.5ms, 3ms, 4ms}
* Option 3: The range of maxToffset is 0.375ms to 3ms and the granularity of maxToffset is 0.125ms.

Companies views can be provided in the following Table:

|  |  |
| --- | --- |
| **Company** | **View/Position** |
| Qualcomm | All options work, so we are open to any of them. |
| Nokia/NSB | We don’t see significant physical issue on the granularity of T\_offset. So we suggest to share T\_offset value table to RAN2. So they can design the signaling details. |
| Intel | Option 1 or 2. Option 3 may not provide a real benefit, since the symbol length is not exactly times of 0.125ms due to the exact 0.52us CP for the first symbol in every 0.5ms |
| MTK | All options work. We slightly prefer Option 2. |
| OPPO | Open to the options |
| Huawei, HiSilicon | Similar comment as Intel, the granularity of minimum scheduling offset required by a UE for gNB scheduling is always on a basis of symbols. In order to minimize any potential spec text about symbol rounding for the signalling when it is incoporated into RAN1 spec, the granularity is supposed to be one symbol or multiple symbols with respect to a reference SCS like 15kHz. Currently, all three options don’t fulfill such requirement. |
| ZTE | Our reason for appying 0.125ms as the granularity of maxToffset is that, 0.125ms is the length of one 120KHz slot. But we are open to discuss other options. |
| Samsung | Anything is fine – option 1 to pick one as signaling overhead is no issue |
| Moderator | The T\_offset is used to limit the MCG scheduling time relative to the first symbol of potential overlapped PUSCH transmission on SCG. It is not absolutely necessary to define it in units of symbols. For example, assuming Opt.2, and 0.75 is negotiated between MN and SN using inter-node signaling, this value (i.e. 0.75ms) would have two impacts:   * The configuration (e.g. SCS, etc.) of MCG/SCG to ensure that the corresponding T\_offset calculated at UE side based on current spec i.e. T\_offset\_UE <= 0.75ms. * There is no dynamic scheduling DCI format comes after - T\_offset\_UE for potential uplink transmission starting from   Also, considering the asynchronous DC without symbol alignment as shown below, limiting symbol-level granularity seems not bringing additional benefit.  A screenshot of a cell phone  Description automatically generated |
| Ericsson | Option 2 |

Most of responses are open to either of Options. Two companies replied that using symbol granularity may provide some benefits. However, as discussed above, given the unknown SCS of MCG, using symbol granularity needs to either define reference SCS or explicitly signal it in the inter-node signal, which needs to consult with RAN2. More importantly, the benefit is questionable considering the asynchronous case as shown in the figure above as anyhow MCG/SCG maybe not symbol aligned.

Given Opt.2 is explicitly preferred by 3 companies, feature leader propose to go with it:

**Proposal 2:**

* **Adopt the following values for inter-node signaling: {0.5ms, 0.75ms, 1ms, 1.5ms, 2ms, 2.5ms, 3ms, 4ms}**
* **Reply LS to RAN2 to inform this agreement.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree (Y/N)** | **Comments** |
| Samsung | N | 4 ms was not identified as a required value by RAN1. The maximum value is 3 ms. |
| Moderator |  | I think Aris point is valid. 3ms is the maximum value based on equation in TS 38.213. So, I intend to delete the ‘4ms’. Please comment this if you see issue here. |

**Proposal 2 (Updated)**

* **Adopt the following values for inter-node signaling: {0.5ms, 0.75ms, 1ms, 1.5ms, 2ms, 2.5ms, 3ms}**
* **Reply LS to RAN2 to inform this agreement.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree (Y/N)** | **Comments** |
| Qualcomm | Y | Deleting 4ms is fine. |
| ZTE | Y |  |
| MTK | Y |  |
| Intel | Y |  |

## 2.3 Issue-3: Removal of earlier text on dynamic power sharing

Two companies [7][8] proposed to remove the following paragraph due to lack of agreement support or redundancy:

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| *- if UE transmission(s) in slot of the MCG overlap in time with UE transmission(s) in slot of the SCG and if in any portion of slot of the SCG, the UE reduces transmission power in any portion of slot of the SCG so that in all portions of slot , where and are the UE transmission powers in slot of the MCG and in slot of the SCG, respectively, that the UE determines according to Clauses 7.1 through 7.5 using and , respectively, as the maximum transmission powers on the MCG and the SCG and is the linear value of a configured maximum transmission power for NR-DC operation in FR1 as defined in [8-3, TS 38.101-3]*  *- if UE transmission(s) in slot of the MCG or in slot of the SCG do not overlap in time with any UE transmission(s) on the SCG or the MCG, respectively, the UE determines a transmission power in slot of the MCG or in slot of the SCG as described in [8-3, TS 38.101-3] and in Clauses 7.1 through 7.5 without considering or , respectively* |

Companies views can be provided in the following Table:

|  |  |
| --- | --- |
| **Company** | **View/Position** |
| Qualcomm | Support the proposal. |
| Nokia/NSB | Support |
| Intel | Agree with the proposal |
| MTK | Fine with the proposal |
| OPPO | Support the proposal |
| ZTE | Ok |
| Samsung | OK |
| Ericsson | Support |

**Proposal 3: Remove the following paragraph in TS 38.213**

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| --- |
| *- if UE transmission(s) in slot of the MCG overlap in time with UE transmission(s) in slot of the SCG and if in any portion of slot of the SCG, the UE reduces transmission power in any portion of slot of the SCG so that in all portions of slot , where and are the UE transmission powers in slot of the MCG and in slot of the SCG, respectively, that the UE determines according to Clauses 7.1 through 7.5 using and , respectively, as the maximum transmission powers on the MCG and the SCG and is the linear value of a configured maximum transmission power for NR-DC operation in FR1 as defined in [8-3, TS 38.101-3]*  *- if UE transmission(s) in slot of the MCG or in slot of the SCG do not overlap in time with any UE transmission(s) on the SCG or the MCG, respectively, the UE determines a transmission power in slot of the MCG or in slot of the SCG as described in [8-3, TS 38.101-3] and in Clauses 7.1 through 7.5 without considering or , respectively* |

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree (Y/N)** | **Comments** |
| Samsung | Y |  |
| Qualcomm | Y |  |
| ZTE | Y |  |
| MTK | Y |  |
| Intel | Y |  |
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## 2.4 Issue-4: PDCCH-ordered PRACH transmission on MCG

One fundamental design rule of dynamic power sharing is that UE does not expect to receive a DCI format on a MCG serving cell that would impact on the power of a SCG uplink transmission after the deadline. On the other hand, the following text in section 8.1 of TS 38.213 was identified:

|  |
| --- |
| 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 msec, where  - is a time duration of symbols corresponding to a PUSCH preparation time for UE processing capability 1 [6, TS 38.214] assuming corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH order and the SCS configuration of the corresponding PRACH transmission  - if the active UL BWP does not change and is defined in [10, TS 38.133] otherwise  - msec for FR1 and msec for FR2  - is a switching gap duration as defined in [6, TS 38.214]  For a PRACH transmission using 1.25 kHz or 5 kHz SCS, the UE determines assuming SCS configuration . |

One concern raised in [8] is that this context implies that UE shall be able to process dynamic power-sharing between MCG and SCG when a DCI triggered PRACH transmission on MCG serving cell takes place, even if the DCI is received after *T*offset from the start of an SCG uplink transmission that overlaps with the PRACH transmission on MCG. If the concern was justified, new TP was proposed in [8] to address it.

Companies views can be provided in the following Table:

|  |  |
| --- | --- |
| **Company** | **View/Position** |
| Qualcomm | It is important to address this issue. Suggest to adopt the TP.  Note that the proposed change is consistent with the following agreement (yellow part).  Agreements:  ·         For NR-DC dynamic power sharing, to compute the transmit power for SCG UL transmission starting at time T0,   * UE checks for PDCCH(s) received before time T0-T\_offset that trigger an overlapping MCG UL transmission, and   + If such PDCCH(s) are detected, UE sets it’s transmit power in SCG (pwr\_SCG) such that pwr\_SCG <= min{PSCG, Ptotal – MCG tx power} where ‘MCG tx power’ is the actual transmission power of MCG   + Otherwise, pwr\_SCG <= Ptotal; * UE does not expect to be scheduled by PDCCH(s) received on MCG after T0-[T\_offset] that trigger(s) MCG UL transmission(s) that overlaps with the SCG transmission.   + (working assumption) No new RRC signaling is introduced for T\_offset:   […] |
| Intel | Agree with the TP |
| MTK | Support the TP |
| OPPO | Support the TP from [8] |
| Huawei, HiSilicon | A question for clarification, whether does any the current spec require the UE with a deadliine to transmit PRACH on MCG after a PDCCH order reception? The spec text in 38.213 quoted here only requires a minimum gap for the UE rather than a deadline to complete such PDCCH order procedure. In case of the first available RA occassion overlapping SCG transmission, the UE is always free to select any later RA occassion without overlapping SCG transmission. It seems no issue with no spec change.  However, one potential issue is that the MCG PRACH is postponed too long by the UE due to consecutive SCG transmission, resulting that the gNB may have to ask the UE to re-establish the MCG, which will also release SCG. This result seems not an optimized one for gNB nor UEs. A deadline for MCG PRACH seems helpful if the UE is experiencing such case. |
| ZTE | We understand the intention of this TP. But it seems the current fomulation of this TP is not clear. There are two potential interpretations here for the current TP.  1. Network is not allowed to schedule such RACH whose first RA occasion is overlapping with the SCG UL transmission.  2. Network is allowed to schedule such RACH whose first RA occasion is overlapping with the SCG UL transmission or is before the SCG UL transmission, but the UE has to select a RA occasion that is not overlapping with the SCG UL transmission.  Maybe we should discuss the above two potential interpreations first. |
| Samsung | The proposal jeopardizes connection to the MCG. So what if there is power reduction on the SCG in some extremely rare cases if the UE needs to transmit PRACH on the MCG. There can be much bigger problems if connection to the MCG is lost.  It may be better to leave this unspecified and up to UE implementation. |
| Ericsson | Agree with comment that UE can select a later PRACH occasion but OK with the TP. |

It seems companies have different Interpretation on whether or not the PDCCH-ordered PRACH deferral is allowed. Honest speaking, my previous thought is that it is not allowed. But Ericsson seems have different understanding. 6 companies seem prefer to go with TP. 1 company prefers to leave it to be UE implementation. 1 company does not have strong preference but would like to clarify what is UE behavior of PDCCH-ordered PRACH transmission.

Given the current situation, seems allowing deferral PDCCH-order PRACH transmission is not critical factor to determine whether adopt this TP or not. Also, defining UE behavior may be better for network’s processing. Having said this, the following was proposed by feature leader:

**Proposal 4: Adopt the following TP in R1-2006787**

|  |
| --- |
| The UE does not expect to have PUSCH, PUCCH, SRS, or PRACH transmissions on the MCG that  - are scheduled/triggered by DCI formats in PDCCH receptions with a last symbol that is earlier by less than or equal to from the first symbol of the transmission occasion on the SCG, and  - overlap with the transmission occasion on the SCG  <<TP end>> |

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree (Y/N)** | **Comments** |
| Samsung | N | Optimization. Prohibits the MCG to quickly obtain PRACH from the UE. Power scaling on the SCG is not guaranteed under much more frequent and less important situations. |
| Qualcomm | Y | The TP reflects the agreement into the spec. The agreement does not distinguish whether the MCG UL transmission(s) is PRACH or not. Therefore, there should be no doubt to agree the TP.  Agreements:  ·         For NR-DC dynamic power sharing, to compute the transmit power for SCG UL transmission starting at time T0,   * UE checks for PDCCH(s) received before time T0-T\_offset that trigger an overlapping MCG UL transmission, and   + If such PDCCH(s) are detected, UE sets it’s transmit power in SCG (pwr\_SCG) such that pwr\_SCG <= min{PSCG, Ptotal – MCG tx power} where ‘MCG tx power’ is the actual transmission power of MCG   + Otherwise, pwr\_SCG <= Ptotal; * UE does not expect to be scheduled by PDCCH(s) received on MCG after T0-[T\_offset] **that trigger(s) MCG UL transmission(s)** that overlaps with the SCG transmission.   + (working assumption) No new RRC signaling is introduced for T\_offset:   […]  Keeping the current spec does not mean the handling is up to UE implementation. |
| MTK | Y | As QC mentioned, the TP seems to align with previous RAN1 agreement. |
| Intel | Y |  |
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## 2.5 Issue-5: New signaling to indicate maxToffsetSCG to UE

One more discussion point related to inter-node signaling raised in [5] is whether a new signaling is needed to provide *maxToffsetSCG* with value  to UE or alternatively inter-node signaling is invisible at the UE side without any impact.

Companies views can be provided in the following Table:

|  |  |
| --- | --- |
| **Company** | **View/Position** |
| Qualcomm | It is not clear to us why new RRC signalling is necessary. The inter-node signalling can be transparent to the UE. Proponent can clarify the intention. |
| Nokia/NSB | We don’t see a necessity |
| Intel | *maxToffsetSCG*, once exchanged by inter-node signaling, should be known to UE. Otherwise, gNB and UE will do MR-DC under different assumptions of T\_offset.  One question for clarification, assuming *maxToffsetSCG* is configured to UE as a parameter for DC operation, is it still need to derive and by other timeline values?  - and is the maximum of , , , , and based on the configurations on the MCG and the SCG, respectively, when the UE indicates a first value for the capability,  - and is the maximum of , , based on the configurations on the MCG and the SCG, respectively, when the UE indicates a second value for the capability, |
| MTK | As discussed in Issue 2, with the the limited resolution, gNB and UE would have different assumptions of T\_offset due to the quantization error. We are fine to add new signaling to indicate maxToffsetSCG to UE. As for Intel’s question, if *maxToffsetSCG* is configured to UE, to our understanding UE does not have to derive , but still has to derive . |
| OPPO | Share the same view as QC/Nokia |
| Huawei, Hisilicon | We may not fully understand the issue. So far, we don’t feel it is necessary. |
| ZTE | From our perspective, it seems the new signalling is not necessary at the UE side. We are open to introduce this new signalling if UE vendors deem it necessary. |
| Samsung | It should be clear that the UE should know T\_offset.  There are many conditions in the specifications for the UE behavior based on the value of T\_offset (“UE does not expect this and that based on T\_offset ...“).  What would be the meaning of those conditions and what would be the UE behavior if the UE is not informed T\_offset? What is the T\_offset the UE assumes? |
| Moderator | As commented in Issue 2, the negotiated T\_offset have two impacts, one is configuration of MCG/SCG and the other is when MN can transmit dynamic scheduling. It only impacts gNB behavior, instead of UE side.  Regarding granurity commented by Intel, it is true that different T\_offset (denoting as T\_offset 1, T\_offset 2) values may exist at UE and gNB side e.g. T\_offset 1 is negotiated using inter-node signaling and T\_offset 2 is computed at UE side based on the max (,) equation in TS 38.213. However, as long as T\_offset 2 <=T\_offset 1, DPS function works well and it is unnecesary to signal the value of T\_offset 1 to UE to force T\_offset 2 = T\_offset 1. That’s reason i tend to agree that it seems no need to define new RRC signaling to indicate T\_offset 1 to UEs, instead of keeping it at MN/SN side only.  Again, from UE side, there is only one T-offset i.e. T\_offset 2 in my earlier example, which is calculated based on the equation of max (,) in TS 38.213 in accordnace with MCG/SCG configuration. T\_offset 1 is simply used at MN/SN. To avoid violating the rule of DPS defined in TS 38.213, MN should ensure the T\_offset 2<=T\_offset 1 when configuring MCG. |
| Ericsson | T\_offset is defined in 38.213 and is known to the UE. So, UE behaviour is clear. Additional RRC signalling is not required. |

Companies position on this issue can be summarized in the Table below:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Description | Companies | Num. of Companies |
| Opt.1 | No need. | Qualcomm, Nokia, OPPO, Huawei, ZTE, Ericsson | 6 |
| Opt.2 | Yes. | Samsung, Intel, MTK | 3 |

**Proposal 5:** New signaling to indicate maxToffsetSCG to UE is not introduced in Rel-16.

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| --- | --- | --- |
| **Company** | **Agree (Y/N)** | **Comments** |
| Samsung |  | Nothing really to agree or disagree given the stated ‘no need’ above. |
| Qualcomm | Y |  |
| MTK | N | We still prefer to introduce this signaling due to the reason Samsung mentioned in the email thread discussion:   * DCI 2\_2/2\_3 are group common and scheduling is dynamic, it is not possible for the MCG to time the transmission of DCI 2\_2/2\_3 if the T\_negotiated value is not equal to Toffset. |
| Intel | N | Agree with the reason from Aris and it is beneficial to have this signaling |
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## 2.6 Issue-6: Data rate handling for NR-DC

In [7], one issue of data rate splitting across CGs for NR-DC was brought up for the following cases at least:

* MCG in FR1 and in FR2
* SCG in FR1 only

In this case, both MCG and SCG have the carriers in FR1. Reusing the Rel-15 determination in current specification may cause the sum data rate across cgs exceeding the UE processing capability. The proposal in [7] is that the data rate for a CG is the maximum data rate based on the band/band combination signaling and feature set information for carriers in a frequency range in one cell group from the capability signaling associated with multiple cell groups – since the SCG (and MCG) know the feature set partition that the SCG can use, the SCG can determines the data rate schedulable for a UE within SCG.

Companies views can be provided in the following Table:

|  |  |
| --- | --- |
| **Company** | **View/Position** |
| Qualcomm | We consider the spec is clear, but proponent can clarify the concern. |
| Intel | OK with the proposal |
| MTK | We do not fully understand the proposal. Does it mean the current spec limit the maximum data rate achievable for FR1-FR1 DC? If so, companeis can further check whether the current spec has problem. |
| Huawei, HiSilicon | Question for clarification, the issues does not exist for the case where MCG in FR1 and SCG in FR1 only, right? If so, considering that the data rate inequation is per frequency range, why does the issue pop up after a cell in new frequency range (FR2) is added to MCG?  Additionally, the text „Within a cell group, a UE is not required to“ in TS 38.214 seems to cover what the TP is trying to do. |
| ZTE | We also think some clarification from the proponents is needed. |
| Samsung | We can discuss this further as it may include other aspects in addition to data rate. In LTE, there was no restriction per CG. |
| Ericsson | Below, we provide some further comments.  Per current spec, data rate limit (DataRate) is applied per-cell group per-CG, and is determined summing over all the carriers in the frequency range for any signaled band combination and feature set consistent with the configured servings cells.  For Rel-15 NR-CA, and NR-DC late drop (where MCG and SCG do not configure cells in same FR), “all the carriers in the frequency range“ belong to the same cell group in either of the two cases.  The issue we are highlighting is for Rel16 NR-DC where the MCG and SCG can have cells in same FR (e.g. -MCG in FR1 and in FR2, SCG in FR1 only) and how to calculate the limit (DataRate) (in the example, for the FR1 part in MCG and in SCG).  For that case, i.e. does “all the carriers in the frequency range” include all FR1 carriers indicated in the UE capability signaling for both MCG and SCG, or is it all carriers indicated in the capability signaling for the corresponding cell group? We think it should be the latter and hence the clarification is proposed. However, we are open to hearing other company views if this part is already clear from the current specification.  Regaring MTK question, the spec is not limiting the data rate FR1-FR1 DC, rather it is to clarify the value of the limit(DataRate) to be used in MCG and SCG for such case.    Regarding HW question - “within a cell group” means the data rate limit (DataRate) is applied per-FR per-CG which is OK; however intention of proposal is to clarify that limit should be different for each CG based on the corresponding capabiilty signaling. |

The following was proposed based on email discussions

**Proposal 5: It is common understanding in RAN1 that max data rate (DataRate) is per FR per CG. No TP is needed.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree (Y/N)** | **Comments** |
| Samsung | Y |  |
| Qualcomm | Y |  |
| ZTE | Y | Ok with the proposal 5. Maybe it is better to add NR-DC in the proposal somewhere, e.g.,  It is common understanding in RAN1 that max data rate (DataRate) is per FR per CG for NR-DC. No TP is needed |
| MTK | Y |  |
| Intel | Y |  |
|  |  |  |
|  |  |  |
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## 2.9 Issue-9: Clarification on the of Different UE Capabilities

In [4], OPPO proposed to clarify the of Different UE Capabilities.

There are two different UE capabilities for the value of , which are corresponding to *long* and *short*, respectively. The corresponding descriptions in TS 38.306 and TS 38.331 are copied as below

| Definitions for parameters | Per | M | FDD-TDD  DIFF | FR1-FR2  DIFF |
| --- | --- | --- | --- | --- |
| ***intraFR-NR-DC-PwrSharingMode1-r16***  Indicates whether the UE supports intra-FR NR DC with semi-static power sharing mode1 as defined in TS 38.213 [11]. If this field is absent, the UE does not support intra-FR NR DC. | BC | No | No | No |
| ***intraFR-NR-DC-PwrSharingMode2-r16***  Indicates whether the UE supports semi-static power sharing mode2 for synchronous intra-FR NR DC as defined in TS 38.213 [11]. The UE indicating the support of this also indicates the support of *intraFR-NR-DC-PwrSharingMode1-r16.* | BC | No | No | No |
| ***intraFR-NR-DC-DynamicPwrSharing-r16***  Indicates the UE support of dynamic power sharing for intra-FR NR DC with long or short offset as specified in TS 38.213 [11]. The UE indicating the support of this also indicates the support of *intraFR-NR-DC-PwrSharingMode1-r16.* | BC | No | No | No |
| ***sfn-SyncNRDC***  Indicates the UE supports NR-DC only with SFN and frame synchronization between PCell and PSCell. If not included by the UE supporting NR-DC, the UE supports NR-DC with slot-level synchronization without condition on SFN and frame synchronization. | UE | No | No | No |

CA-ParametersNRDC-v1610 ::= SEQUENCE {

-- R1 18-1: Semi-static power sharing mode1 between MCG and SCG cells of same FR for NR dual connectivity

intraFR-NR-DC-PwrSharingMode1-r16 ENUMERATED {supported} OPTIONAL,

-- R1 18-1a: Semi-static power sharing mode 2 between MCG and SCG cells of same FR for NR dual connectivity

intraFR-NR-DC-PwrSharingMode2-r16 ENUMERATED {supported} OPTIONAL,

-- R1 18-1b: Dynamic power sharing between MCG and SCG cells of same FR for NR dual connectivity

intraFR-NR-DC-DynamicPwrSharing-r16 ENUMERATED {short, long} OPTIONAL

}

In TS 38.213, these two values of are refer to the first value and the second value of the UE capability.

- ,

- and is the maximum of , , , , and based on the configurations on the MCG and the SCG, respectively, when the UE indicates a first value for the capability,

- and is the maximum of , , based on the configurations on the MCG and the SCG, respectively, when the UE indicates a second value for the capability, and

However, the first value of in TS 38.213 is larger than the second one. In contrast, the first value of UE capability in TS 38.306 and TS 38.331is short. OPPO thought that “the current descriptions in different TSs are not aligned with each other” and propose the following:

* Clarify the relationship between the values of and the candidate values of UE capability.

Companies views can be provided in the following Table:

|  |  |
| --- | --- |
| **Company** | **View/Position** |
| Qualcomm | Agree, it is good to fix the ambiguity. Our understanding is that “a first value“ and “a second value“ have been used just tentatively. |
| Nokia/NSB | Support |
| Intel | Agree with TR from OPPO |
| MTK | Support |
| OPPO | Support |
| Huawei, HiSilicon | Support |
| ZTE | OK |
| Samsung | OK |
| Ericsson | Support |

All companies prefer to fix this problem and Support the TP. Hence, the following was proposed:

**Proposal 9:** **Adopt the following TP in R1-2005981**

|  |
| --- |
| **In TS 38.213 Section 7.6**  *<omitted text>*  If a UE  - is provided *dynamic* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*, and  - indicates a capability to determine a total transmission power on the SCG at a first symbol of a transmission occasion on the SCG by determining transmissions on the MCG that  - are scheduled by DCI formats in PDCCH receptions with a last symbol that is earlier by more than from the first symbol of the transmission occasion on the SCG, or are configured by higher layers, and  - overlap with the transmission occasion on the SCG  the UE determines a maximum transmission power on the SCG at the beginning of the transmission occasion on the SCG as  - , if the UE determines transmissions on the MCG with a total power  - , if the UE does not determine any transmissions on the MCG  where  - ,  - and is the maximum of , , , , and based on the configurations on the MCG and the SCG, respectively, when the UE indicates the ~~a first~~ value of *long* for the capability,  - and is the maximum of , , based on the configurations on the MCG and the SCG, respectively, when the UE indicates the ~~a second~~ value of *short* for the capability, and  - is the total power for the transmissions on the MCG that overlap with the transmission occasion on the SCG where is determined based on transmissions configured by higher layers and on transmissions scheduled by DCI formats in PDCCH receptions with a last symbol that is at least before the first symbol of the transmission occasion on the SCG.  *<omitted text>* |

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree (Y/N)** | **Comments** |
| MTK | Y |  |
| Intel | Y |  |
|  |  |  |

## 2.10 Issue-10: RRC parameter alignment

Some editorial changes were proposed in OPPO [4] to align on RRC parameter names.

|  |
| --- |
| **In TS 38.213 Section 7.6**  *<omitted text>*   * 7.6.2 NR-DC   If a UE is configured with an MCG using NR radio access in FR1 or in FR2 and with a SCG using NR radio access in FR2 or in FR1, respectively, the UE performs transmission power control independently per cell group as described in Clauses 7.1 through 7.5.  If a UE is configured with an MCG and a SCG using NR radio access in FR1 and/or in FR2, the UE is configured a maximum power for transmissions on the MCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and a maximum power for transmissions on the SCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and with an inter-CG power sharing mode by *nrdc-PCmode-FR1-r16* for FR1 and/or by *nrdc-PCmode-FR2-r16* for FR2. The UE determines a transmission power on the MCG and a transmission power on the SCG per frequency range.  If a UE is provided *semi-static-mode1* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*,or *semi-static-mode2* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*, the UE does not expect and to be configured such that , where is the linear value of , is the linear value of , and is the linear value of a configured maximum transmission power for NR-DC operation in FR1 as defined in [8-3, TS 38.101-3].  If a UE is provided *semi-static-mode1* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*, the UE determines a transmission power for the MCG or for the SCG as described in Clauses 7.1 through 7.5 using or as the maximum transmission power, respectively.  If a UE is provided *semi-static-mode2* for *nrdc-PCmode-FR1* or for *nrdc-PCmode-FR2*  - if at least one symbol of slot of the MCG or of the SCG that is indicated as uplink or flexible to a UE by *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated*, if provided, overlaps with a symbol for any ongoing transmission overlapping with slot of the SCG or of the MCG, respectively, the UE determines a power for the transmission on the SCG or the MCG overlapping with slot as described in Clauses 7.1 through 7.5 using or , respectively, as the maximum transmission power  - otherwise, the UE determines a power for the transmission on MCG or the SCG overlapping with slot , as described in [8-3, TS 38.101-3] and in Clauses 7.1 through 7.5 without considering or , respectively  The UE expects to be provided *semi-static-mode2* for *nrdc-PCmode-FR1-r16* or for *~~nrdc-PCmode-FR1-r16~~* *nrdc-PCmode-FR2-r16* only for synchronous NR-DC operation [10, TS 38.133].  *<omitted text>* |

in addition, one more editorial change was proposed in [1] as follows:

|  |
| --- |
| **7.6.2 NR-DC**  If a UE is configured with an MCG using NR radio access in FR1 or in FR2 and with a SCG using NR radio access in FR2 or in FR1, respectively, the UE performs transmission power control independently per cell group as described in Clauses 7.1 through 7.5.  If a UE is configured with an MCG and a SCG using NR radio access in FR1 and/or in FR2, the UE is configured a maximum power C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsE9ED.tmp.jpg for transmissions on the MCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and a maximum power C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsE9FE.tmp.jpg for transmissions on the SCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and with an inter-CG power sharing mode by *nrdc-PCmode-FR1-r16* for FR1 and/or by *nrdc-PCmode-FR2-r16* for FR2. The UE determines a transmission power on the MCG and a transmission power on the SCG per frequency range.  If a UE is provided *semi-static-mode1* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*,or *semi-static-mode2* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*, the UE does not expect C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsE9FF.tmp.jpg and C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA0F.tmp.jpg to be configured such that C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA20.tmp.jpg, where C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA21.tmp.jpg is the linear value of C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA32.tmp.jpg, C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA42.tmp.jpg is the linear value of C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA43.tmp.jpg, and C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA54.tmp.jpg is the linear value of a configured maximum transmission power for NR-DC operation in FR1 or FR2 as defined in [8-3, TS 38.101-3]. |

Companies views can be provided in the following Table:

|  |  |
| --- | --- |
| **Company** | **View/Position** |
| Qualcomm | OK with the changes. |
| Nokia/NSB | Support |
| Intel | OK with the TP |
| MTK | Fine with the TP |
| OPPO | Support |
| ZTE | Support |
| Samsung | OK |
| Ericsson | OK with TP |

**Proposal 10: Adopt the following TP in R1-2005981 and R1-2005420**

|  |
| --- |
| **In TS 38.213 Section 7.6**  *<omitted text>*   * 7.6.2 NR-DC   If a UE is configured with an MCG using NR radio access in FR1 or in FR2 and with a SCG using NR radio access in FR2 or in FR1, respectively, the UE performs transmission power control independently per cell group as described in Clauses 7.1 through 7.5.  If a UE is configured with an MCG and a SCG using NR radio access in FR1 and/or in FR2, the UE is configured a maximum power for transmissions on the MCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and a maximum power for transmissions on the SCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and with an inter-CG power sharing mode by *nrdc-PCmode-FR1-r16* for FR1 and/or by *nrdc-PCmode-FR2-r16* for FR2. The UE determines a transmission power on the MCG and a transmission power on the SCG per frequency range.  If a UE is provided *semi-static-mode1* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*,or *semi-static-mode2* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*, the UE does not expect and to be configured such that , where is the linear value of , is the linear value of , and is the linear value of a configured maximum transmission power for NR-DC operation in FR1 as defined in [8-3, TS 38.101-3].  If a UE is provided *semi-static-mode1* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*, the UE determines a transmission power for the MCG or for the SCG as described in Clauses 7.1 through 7.5 using or as the maximum transmission power, respectively.  If a UE is provided *semi-static-mode2* for *nrdc-PCmode-FR1* or for *nrdc-PCmode-FR2*  - if at least one symbol of slot of the MCG or of the SCG that is indicated as uplink or flexible to a UE by *tdd-UL-DL-ConfigurationCommon* and *tdd*-*UL-DL-ConfigurationDedicated*, if provided, overlaps with a symbol for any ongoing transmission overlapping with slot of the SCG or of the MCG, respectively, the UE determines a power for the transmission on the SCG or the MCG overlapping with slot as described in Clauses 7.1 through 7.5 using or , respectively, as the maximum transmission power  - otherwise, the UE determines a power for the transmission on MCG or the SCG overlapping with slot , as described in [8-3, TS 38.101-3] and in Clauses 7.1 through 7.5 without considering or , respectively  The UE expects to be provided *semi-static-mode2* for *nrdc-PCmode-FR1-r16* or for *~~nrdc-PCmode-FR1-r16~~* *nrdc-PCmode-FR2-r16* only for synchronous NR-DC operation [10, TS 38.133].  *<omitted text>* |

|  |
| --- |
| **7.6.2 NR-DC**  If a UE is configured with an MCG using NR radio access in FR1 or in FR2 and with a SCG using NR radio access in FR2 or in FR1, respectively, the UE performs transmission power control independently per cell group as described in Clauses 7.1 through 7.5.  If a UE is configured with an MCG and a SCG using NR radio access in FR1 and/or in FR2, the UE is configured a maximum power C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsE9ED.tmp.jpg for transmissions on the MCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and a maximum power C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsE9FE.tmp.jpg for transmissions on the SCG by *p-NR-FR1* and/or by *p-NR-FR2-r16* and with an inter-CG power sharing mode by *nrdc-PCmode-FR1-r16* for FR1 and/or by *nrdc-PCmode-FR2-r16* for FR2. The UE determines a transmission power on the MCG and a transmission power on the SCG per frequency range.  If a UE is provided *semi-static-mode1* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*,or *semi-static-mode2* for *nrdc-PCmode-FR1-r16* or for *nrdc-PCmode-FR2-r16*, the UE does not expect C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsE9FF.tmp.jpg and C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA0F.tmp.jpg to be configured such that C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA20.tmp.jpg, where C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA21.tmp.jpg is the linear value of C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA32.tmp.jpg, C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA42.tmp.jpg is the linear value of C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA43.tmp.jpg, and C:\Users\10240317\AppData\Local\Temp\ksohtml\wpsEA54.tmp.jpg is the linear value of a configured maximum transmission power for NR-DC operation in FR1 or FR2 as defined in [8-3, TS 38.101-3]. |

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree (Y/N)** | **Comments** |
| Samsung | Y |  |
| Qualcomm | Y |  |
| ZTE | Y |  |
| MTK | Y |  |
| Intel | Y |  |
|  |  |  |
|  |  |  |
|  |  |  |

# 3 Conclusion

To be completed

# References

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3. [R1-2005805](file:///C:\Users\wanshic\OneDrive%20-%20Qualcomm\Documents\Standards\3GPP%20Standards\Meeting%20Documents\TSGR1_102\Docs\R1-2005805.zip) UL power control for NR-NR dual connectivity Huawei, HiSilicon
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10. R1-2001421, LS on uplink power control for NR-NR Dual-Connectivity, RAN1, RAN1#100-e
11. R1-2003262, LS reply on uplink power control for NR-NR Dual-Connectivity, RAN2, RAN1#101-e
12. R1-2004922 LS Reply to RAN1 on UL PC for NR-DC RAN2, Apple, RAN2 #110-e
13. R1-2006999 Outcome of preparation discussion on UL Power Control for NN-DC