3GPP TSG RAN WG1 #104-e R1-21xxxxx

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

**Agenda item: 7.2.10**

**Source: Moderator (Nokia)**

**Title: [104-e-NR-MRDC-CA-02] Email discussion/approval on cross-carrier triggering scheduling and A-CSI RS triggering, and unaligned**

**Document for: Discussion and Decision**

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# 1 Introduction

The RAN1#104-e preparation for Rel-16 MR-DC/CA work item conclusion is captured in R1-2101792. Based on that the email thread #2 was kicked off as follows:

[104-e-NR-MRDC-CA-02] Email discussion/approval on cross-carrier triggering scheduling and A-CSI RS triggering, and unaligned CA until 10/29 – Karri (Nokia)

* XCC-1: Proposal 1 in R1-2100585
* XCC-2: Proposal 3 in R1-2100585
* XCC-3 (could be discussed with XCC-1): Proposal 2 in R1-2101443
* CA-1: Proposal (for conclusion) in R1-2101553 and Proposals 2 and 3 in R1-2100420
* CA-2: Proposals 4 and 5 in R1-2100420

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| **TDoc** | **Title** | **Source** | **X-CC** | **Unal. CA** | **Issue tags** |
| [R1-2100420](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2100420.zip) | Maintenance on MR-DC and CA enhancements | vivo |  | x | CA-1, CA-2 |
| [R1-2100585](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2100585.zip) | Remaining issues on Rel-16 carrier aggregation | MediaTek | x |  | XCC-1, XCC-2 |
| [R1-2101443](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101443.zip) | Remaining issues on SCell dormancy and cross-carrier scheduling | Qualcomm | x |  | XCC-3 |
| [R1-2101553](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101553.zip) | Maintenance for Rel-16 MR-DC and CA enhancements | Ericsson |  | x | CA-1 |

# 2 Summary of issues addressed in the Tdocs

# 2.1 Cross-carrier scheduling and A-CSI RS triggering

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| **Issue** | **TDoc** | **Issue** | **Moderator comment** |
| XCC-1 | [R1-2100585](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2100585.zip) | Proposal 1: To align the RAN1 #99 agreement for cross-carrier scheduling as mentioned above, adopt the following TP to 38.214 Section 5.1.5 where the additional beam switching timing (d) is added without connection to the default beam behavior: | Both documents address the same issue. TP in ‘0585 seems to be based on the old version of the specification and is more intrusive that the one in ‘1443 |
| XCC-3 | [R1-2101443](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101443.zip) | Proposal 2: Adopt a TP for cross-carrier beam switching time for TS 38.214 subclause 5.1.5 moving the “the UE is configured with *enableDefaultBeam-ForCCS*“ condition to a sub-bullet |
| XCC-2 | [R1-2100585](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2100585.zip) | Proposal 3: Add the following two sentences from R15 38.214 5.2.1.5.1 to the R16 newly added sections in 38.214 5.2.1.5.1a, since they are general behaviour defined for “Aperiodic CSI Reporting”/”Aperiodic CSI-RS triggering”:   * A UE is not expected to receive more than one DCI with non-zero CSI request per slot. * A UE is not expected to receive more than one aperiodic CSI report request for transmission in a given slot. | The restriction is already covered by 5.2.1.5.1a as it specifically starts with this sentence:  *When the triggering PDCCH and the triggered aperiodic CSI-RS are of different numerologies, the behavior defined in 5.2.1.5.1 for the case where the numerologies are the same applies with the following exceptions:*  And there are no exceptions made on these points. Hence they apply as is, and there is no need to replicate them in 5.2.1.5.1a |

**Moderator proposal:**

* For XCC-1/XCC-3: Agree that a change is needed, develop a TP using the proposal in R1-2101443 as the starting point.
* For XCC-2: The suggested change is not needed as the indicated text is already inherited as-is from 5.2.1.5.1 to 5.2.1.5.1a.

Please add company comments on the proposal above

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| **Company** | **Issue** | **Comment** |
| ZTE | **XCC-1,2,3** | OK with the moderator’s proposal. |
| Huawei | **all** | Support moderator proposal |
| NTT DOCOMO | **XCC-1/3**  **XCC-2** | We are fine with moderator proposal. |
| vivo | **XCC-1, 2, and 3** | Ok with moderator’s proposal. |
| MTK | **All** | Support moderator proposal |
| CATT | **XCC-1,2,3** | Fine with moderator’s proposal. |
| Ericsson | **all** | OK with moderator proposal |
| Qualcomm | **XCC-1,2,3** | Agreed with the Moderator proposal. |
| Intel | **XCC-1,2,3** | Agreed with the Moderator proposal. |

# 2.2 Unaligned CA

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| **Issue** | **TDoc** | **Issue** | **Moderator comment** |
| CA-1 | [R1-2101553](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2101553.zip) | Proposal (for conclusion):   * It is RAN1 understanding that, at most single non-zero offset duration (independent on SCS) can be configured among CCs of a CG in the unaligned CA configuration. | The two contributions are in disagreement on whether the limitation to a single offset should apply across all CCs, or across CCs per CG. |
| CA-1 | [R1-2100420](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2100420.zip) | Proposal 2: RAN1 should clarify that at most one non-zero CA offset across cell groups can be configured for a UE supporting capability 18-7.  Proposal 3: If more than one non-zero offsets are required, a separate UE capability from 18-7 should be introduced for such kind of Ues. |
| CA-2 | [R1-2100420](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_104-e/Docs/R1-2100420.zip) | Proposal 4: NR DC is considered synchronous with slot offset if all the cells are slot boundary aligned and the number of slot offsets between cells are not more than one.  Proposal 5: NR DC is considered asynchronous with slot offset if MCG and SCG are not slot boundary aligned and the number of slot offsets between cells are not more than one, or all the cells are slot boundary aligned with two non-zero slot offsets among cells. | Proposal 4 seems clear, but is this needed in addition to what is already said after CA-1 is resolved?  Proposal 5: this would seem redundant if there is a resolution to the CA-1. Further, it is not clear if the proponent means that the “two non-zero offsets” can be different. |

**Moderator proposal:** (taking the discussion of RAN1#103-e into consideration, see R1-2009810)

* For CA-1:
  + Agree that the CA configuration applies per CG, i.e. adopt proposal 1 of R1-2101553
  + Discuss if there is a strong need to split the capability 18-7 to differentiate between one offset over all CCs and one offset over CCs per CG
* For CA-2:
  + Agree to capture proposal 4 of R1-2100420 in the chairman’s notes.

Please add company comments on the proposal above

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| **Company** | **Issue** | **Comment** |
| ZTE | **CA-1**  **CA-2** | We are fine with the proposal for CA-1. From our perspective, a UE feature to split the capability 18-7 to differentiate between one offset over all CCs and one offset over CCs per CG is necessary.  For CA-2, we have a different understanding. Since the synchronous and asynchronous NR-DC requirements are specified before the introduction of unaligned frame boundary, it is preferred to determine synchronous or asynchronous NR-DC before applying the slot offset in MCG and SCG. In other words, synchronous and asynchronous NR-DC is determined assuming there is no slot offset introduced by unaligned frame boundary. |
| CMCC | **CA-1**  **CA-2** | We are fine the further clarification for the application of single non-zero offset as the proposal for CA-1, but on how to split the capability 18-7, to avoid intertangling the offsets of CA and DC, we are inclined to split the capability to differentiate between single CG with one non-zero offset and multiple CGs with individual non-zero offset.  For CA-2, we share the same understanding as ZTE in general, we should not mix the offset for CA and DC, however, we are open to further clarify the slot offset and non-slot offset capability of DC on top which the unaligned CA can be configured. |
| Huawei | **CA-1** | Support moderator proposal about CA-1. |
|  | **CA-2** | As for the DC consideration, we have different understanding from the proponent of CA-2. We think unaligned CA is only about sync-DC (but of course it can also be configured in async-DC), since no slot alignment between MCG and SCG is required for async-DC, and for sync-DC, misaligned frame boundary is ok and unknown/non-indicated to UE (only slot offset within a CG can be indicated to a UE). Thus the slot alignment requirements for unaligned CA naturally meet sync-DC requirement, and is not relevant for determining whether DC is sync-ed or not. |
| NTT DOCOMO | **CA-1**  **CA-2** | We are fine with the moderator proposal for CA-1.  For CA-2, our understanding is that sync or async DC is defined based on MTTD/MRTD conditions specified in TS38.133, i.e., irrespective of slot offset within a CG, if the case which cannot meet MTTD/MRTD condition for sync NR-DC can happen for the NR-DC, it would be async NR-DC and UE needs to support asyncNRDC-r16. |
| vivo | **CA-1** | We can agree the per-CG CA offset together with a UE capability. We are open to how to define the UE capability. |
| MTK | **CA-2**  **CA-1**  **CA-2** | We think the definition of synchronous and asynchronous in the case of unaligned CA should be clarified (clearly the companies’ views here are divergent according to the comments). Proposal 4 is one trial that may be acceptable in our view. But we are open on how to clarify.  For CA-1, we share the same view with vivo, that basic feature (18-7) is one offset across CG, and additional feature is required to split the capability 18-7 to differentiate between one offset over all CCs and one offset over CCs per CG  For CA-2, we tend to agree that sync or async DC is defined based on MTTD/MRTD conditions specified in TS38.133, i.e., irrespective of slot offset within a CG. We are open to further clarification. |
| CATT | **CA-1**  **CA-2** | We agree with moderator’s proposal.  We share the same understanding as others that whether there is slot offset within a CG or not is irrelevant in determining whether DC is synchronous or asynchronous. |
| Ericsson | **CA-1**  **CA-2** | We support moderator’s proposal for CA-1  We do not support CA-2 - we do not see the need for any additional clarification for sync/async DC. |
| Qualcomm | **CA-1**  **CA-2** | We do not support the proposal from R1-2101553. Instead we support the proposal from R1-2100420.  We support the proposal from R1-2100420.  When the unaligned CA objective was added in the WID, it was clear that the solution was for both CA and for sync DC without SFN alignment. In many agreements, the agreement text says that “for unaligned CA…”  and the equivalent part “for sync DC without SFN alignment…” is missing.  We think we need to choose between two options on how to deal with the ‘missing’ set of requirements:   1. Agree that sync DC without SFN alignment is not supported in Rel-16 2. Agree that all previous decisions made for CA also apply to DC   So choose between (a) and (b).  If we choose (b) then the agreement already made is clear: There is a single non-zero offset in the band combination, therefore at most a single non-zero offset between any pair of cells, irrespective of whether they are in the same CG or in different CGs.  For this reason, we don’t agree with introducing two offsets as proposed in R1-2101553.  Note that this doesn’t preclude the possibility that there are unaligned cells within either (or within both) CGs.  We feel that this is unneeded flexibility that should be discussed further but could leave that to a 2nd stage. But we would not agree with more than a single non-zero offset across any pair of cells.  It is not our preference to introduce an additional capability for more than one offset. |
| Intel | **CA-1**  **CA-2** | We support moderator’s proposal for CA-1  We agree with others that the slot offset within a CG is not relevant for determining whether DC is synchronous or asynchronous. |

# 3 Round 2

# 3.1 Cross-carrier scheduling and A-CSI RS triggering

**From round 1:**

* For XCC-1/XCC-3: Agree that a change is needed, develop a TP using the proposal in R1-2101443 as the starting point.
* For XCC-2: The suggested change is not needed as the indicated text is already inherited as-is from 5.2.1.5.1 to 5.2.1.5.1a.

**Moderator proposal for round 2:**

* Agree the TP for XCC-1/XCC-3 according to proposal 2 in R1-2101443 (below)

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| 5.1.5 Antenna ports quasi co-location …  If the PDCCH carrying the scheduling DCI is received on one component carrier, and the PDSCH scheduled by that DCI is on another component carrier:  - The *timeDurationForQCL* is determined based on the subcarrier spacing of the scheduled PDSCH. If µPDCCH < µPDSCH an additional timing delay is added to the *timeDurationForQCL*, where *d* is defined in 5.2.1.5.1a-1, otherwise *d* is zero;  - For both the cases, when the UE is configured with *enableDefaultBeam-ForCCS,* and when the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL,* and when the DL DCI does not have the TCI field present, the UE obtains its QCL assumption for the scheduled PDSCH from the activated TCI state with the lowest ID applicable to PDSCH in the active BWP of the scheduled cell.  … |

Please add company comments on the TP above

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| **Company** | **Comment** |
| Nokia, NSB | OK with the TP |
| ZTE | The RRC parameter name is not correct here.  Besides, we prefer to move “when the UE is configured with *enableDefaultBeam-ForCCS*” to be beginning of the paragraph because the existing “when…, and when …..” needs to be together with the current “For both the cases”. Otherwise, there are three “when..” behind “for both the cases”, it may be ambiguous which are the two cases.  Thus, the following is proposed.  ------------------------  If the PDCCH carrying the scheduling DCI is received on one component carrier, and the PDSCH scheduled by that DCI is on another component carrier:  - The *timeDurationForQCL* is determined based on the subcarrier spacing of the scheduled PDSCH. If µPDCCH < µPDSCH an additional timing delay is added to the *timeDurationForQCL*, where *d* is defined in 5.2.1.5.1a-1, otherwise *d* is zero;  - When the higher layer parameter *enableDefaultBeamForCCS-r16* is set as 'enabled' for the UE, for both the cases, when the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL,* and when the DL DCI does not have the TCI field present, the UE obtains its QCL assumption for the scheduled PDSCH from the activated TCI state with the lowest ID applicable to PDSCH in the active BWP of the scheduled cell. |
| vivo | OK with the original TP with a correct RRC name. The further revision from ZTE is not needed. |
| Qualcomm | It is good to correct the RRC naming error.  It might not be preferrable to add “*enableDefaultBeamForCCS-r16* is set as 'enabled'” because a main purpose of the spec text is Rel-15 network does not configure “*enableDefaultBeamForCCS-r16*” and then default beam is not supported. Technically ZTE’s change is doing the same because ‘enabled’ is the only valid value option, but without ‘enabled’ the purpose of the design is clearer. |
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# 3.2 Unaligned CA

**From round 1:**

* For CA-1: There is no consensus that the one offset for the CA configuration means that there can be one non-zero offset in MCG and another non-zero offset in SCG. Several companies believe that this would require a new capability. The necessity for the new capability is unclear and one
* For CA-2: The unaligned CA introduction has no relation to the question of synch or asynch.

**Moderator proposal for round 2:**

* For CA-1:
  + The current FG18-7 is understood as: at most one non-zero CA offset **across all CCs in all cell groups** can be configured for a UE
    - Introduce this clarification to the UE feature list (and subsequently to TS38.306)
  + Do not request a new FG for a new UE capability for two different non-zero CA offsets with DC, one per cell group.
* For CA-2:
  + The decisions made for unaligned CA apply also in the presence of sync DC without SFN alignment. No further agreements are necessary.

Please add company comments on the TP above

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| **Company** | **Comment** |
| Nokia, NSB | CA-1: OK with the proposal. When looking at it together with CA2, the 1st bullet is implied, and no compelling case has been made to introduce a second UE capability to allow two offsets, when an agreement for a maximum of one offset has been made  CA-2: OK with the proposal |
| ZTE  CMCC | For CA-2, we would like to add a note to say “no specification is needed”.  CA-1: based on existing specification, we fail to see how the capability can be interpreted as “at most one non-zero CA offset **across all CCs in all cell groups**”, and we have the otherwise understanding. Based on the agreement “Agreement:  At most single non-zero offset duration (independent on SCS) can be configured among CCs in the unaligned CA configuration.”  Although CG is not mentioned in the agreement, it states clearly it applies in the unaligned CA configuration, which is configured in individual CG other than in across CGs.  Moreover, from the specification completeness point of view, we should support the extendibility even there are no compelling cases, instead of precluding the possibility. We support different capability instead of round 2 proposal. |
| vivo | OK with both proposals CA-1 and CA-2. |
|  |  |
| Qualcomm | We agree with the proposal for both CA-1 and CA-2.  For CA-1, suggest removing the two ‘CA’ as follows to avoid ambiguity.  As mentioned in our previous round feedback, another option is:   1. Agree that sync DC without SFN alignment is not supported in Rel-16  * For CA-1:   + The current FG18-7 is understood as: at most one non-zero ~~CA~~ offset **across all CCs in all cell groups** can be configured for a UE     - Introduce this clarification to the UE feature list (and subsequently to TS38.306)   + Do not request a new FG for a new UE capability for two different non-zero ~~CA~~ offsets with DC, one per cell group. |
|  |  |