**3GPP TSG RAN meeting #89-e Draft RP-201532**

**Electronic meeting, September 14 – 18, 2020**

## Status Report to TSG

**Agenda item:** 9.2.9

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **WI / SI Name** | Multi-RAT Dual-Connectivity and Carrier Aggregation enhancements (LTE, NR) | | | |
| included in this status report | Study Item:  No | Core part:  Yes | Performance part:  Yes | Testing part:  No |
| **Acronym** | LTE\_NR\_DC\_CA\_enh | | | |
| **Unique ID** | 800088 | | | |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-200791 | | | |
| **Target Completion Date**  **(indicate if changed)** | Core part:  September/2020 | | Performance part:  March/2021 | |
| **Overall Completion level** | Core part:  100% | | Performance Part:  0% | |

**Source:**

|  |  |  |
| --- | --- | --- |
| **Leading WG** | | RAN2 |
| **Rapporteur** | **Name** | Stefan Wager |
| **Company** | Ericsson |
| **Email** | stefan.wager@ericsson.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

*Additional explanations/motivations for the time budget changes in the attached Excel table*

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

## 2.1 RAN1

#### 2.1.1 Agreements

##### *Power control for dual connectivity*

###### RAN1-AH-1901 (January 2019)

* **Support of asynchronous and synchronous NR-NR Dual Connectivity**

Agreements:

* For Rel. 16 UEs and asynchronous NN-DC operation, where MCG has serving cells only in FR1 and the SCG has serving cells only in FR2, the uplink power control is performed independently across cell groups
  + This is under the assumption that for NR Rel. 16, no joint power limit across FR1 and FR2 is defined by RAN4.
* RAN1 has not identified any use case to support the case where SCG is fully in FR1 and MCG is fully in FR2 for both synchronous & asynchronous NN-DC operation. At the same time, if supported, RAN1 has not identified other RAN1 specification impact other than the power control aspect listed below and UE capability
  + If supported, power control is performed independently across the two cell groups.

Sent an LS to RAN4 (cc RAN2) capturing the above in R1-1901402.

###### RAN1#96 (Feb/Mar 2019)

* **Support of asynchronous and synchronous NR-NR Dual Connectivity**
  + No agreements, but following proposal in email discussion:

Proposals:

* For Rel. 16 NR-DC with FR1+FR1 band combinations both the semi-static power sharing and dynamic power sharing operations are supported.
  + FFS whether each power sharing operation is associated with the UE capability.
  + Email discussion till 3/15 – Kianoush (QC) – email discussion did not provide an agreement, but collected PC schemes for further discussion in the next meeting.

###### RAN1#96bis (April 2019)

* **Support of asynchronous and synchronous NR-NR Dual Connectivity**
  + No agreements. Companies are encouraged to check the alternatives listed in R1-1905839, and use them as the reference to provide further analysis. Revisit in RAN1#97

###### RAN1#97 (May 2019)

* **Support of asynchronous and synchronous NR-NR Dual Connectivity**
  + No agreements. Feature lead summary on Tdocs submitted in R1-1907891

###### RAN1-98 (August 2019)

Agreements:

* + Aim to reuse the existing CA power determination for uplink transmissions on CC(s) in a same CG.

**Agreements:** Slide 3 of R1-1909864 is agreed:

* [Offline consensus] Considering the following two alternatives for semi-static power sharing with +
  + - Alt.1: For the uplink transmission in MCG, the UE checks the semi-statically configured direction of the overlapping symbols of all serving cells of SCG, and vice versa.
      * If such overlapping with UL transmission on the SCG is possible (i.e. collides with semi-static ‘UL’ and ‘flexible’ symbols on some CCs of SCG), UE limits its actual transmission power in MCG such that ;
      * Otherwise (i.e. collides with only semi-static ‘DL’ symbols on all CCs of SCG), can be up to and can be up to .
        + Alt.1-1: and are configured by RRC signaling.
        + Alt.1-2: and are determined by RAN4 requirement.
    - Alt.2: For the uplink transmission in MCG and in SCG, UE limits its actual transmission power to be up toand to be up to

###### RAN1-98bis (October 2019)

Agreements**:**

* Adopt Alt.1-2 and Alt.2 for semi-static power sharing for NR-NR DC.
  + Alt.1-2 is only subject to configured maximum transmission power defined by RAN4
  + Configuration between Alt.1-2 and Alt.2 is supported.
  + FFS: add more clarification
  + FFS: applied for synchronous DC only or applied for both synchronous and asynchronous DC (which may be the same or different for Alt.1-2 and Alt. 2)

Agreements:

* For semi-static power sharing for NR-NR DC~~, to down-select during this week:~~
  + ~~Alt 1: no PHR is reported in a CG for the other CG~~
  + ~~Alt 2:~~ Virtual PHR for active CCs of another CG

(The above change is the updated during the meeting.)

Agreements:

For dynamic power sharing for NR-NR DC (if supported), ~~to down-select during this week:~~

* ~~Alt 1: When PHR for a CG is reported in another CG, reusing Rel-15 EN-DC framework to determine the PHR (actual/virtual) for active CCs of in the CG~~
* ~~Alt 2:~~ Virtual PHR for active CCs of another CG
* ~~Alt 3: no PHR is reported in a CG for the other CG~~
* (The above change is the updated during the meeting)

Agreements**:**

* Support dynamic power sharing
  + If there is no overlapping transmission, maximum power on CG i is determined by RAN4 spec without considering P\_CG\_i.
  + If there is overlapping transmission, maximum power on CG i is limited to P\_CG\_i.
  + Note: “look-ahead” operation is included as a UE capability below
* In case of power limitation, MCG is prioritized over SCG and reuse CA rule within each CG
* Optional UE capability to indicate the support of dynamic power sharing operation
* Separate optional UE capability to indicate the support of ’look-ahead’ operation on condition that UE indicates support of dynamic power sharing operation.

###### RAN1-99 (November 2019)

Agreements**:**

* Alt.2 of semi-static power sharing can be configured for both synchronous and asynchronous NR-DC scenarios.

**Conclusion**:

* At least from UE power sharing perspective, the cases where one or both CGs have CC[s] over FR1 and FR2 are supported in Rel.16 NR-DC

Agreements:

* Support per FR configuration of parameter *NR-DC-PC-mode* for NR-DC

Agreements:

* Alt.1-2 of semi-static power sharing can be configured for synchronous DC scenario only.
  + It is up to UE to determine whether the overlapping with UL transmission on the SCG is possible, if/when factors other than the TDD UL-DL configurations of the serving cells in the SCG (e.g., timing difference, drift) need to be taken into account.

Agreements:

Offline consensus #2 in [R1-1913407](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_99/Docs/R1-1913407.zip) is agreed.

**[Offline consensus #2]:** Make the following modification to the previous agreement:

|  |
| --- |
| * Alt.1: For the uplink transmission occasion in MCG, the UE checks the semi-statically configured direction of the overlapping symbols of all serving cells of SCG, and vice versa.   + If such overlapping for any ongoing uplink transmission(s) ~~with~~and UL transmission on the SCG is possible (i.e. collides with semi-static ‘UL’ and ‘flexible’ symbols on some CCs of SCG), UE limits its actual transmission power in MCG such that ;   + Otherwise (i.e. collides with only semi-static ‘DL’ symbols on all CCs of SCG), can be up to and can be up to .     - Alt.1-1: and are configured by RRC signaling.     - Alt.1-2: and are determined by RAN4 requirement. |

Agreements:

* Regarding whether semi-static power sharing or dynamic power sharing is explicitly configured by RRC signalling.
  + parameter *NR-DC-PC-mode* is extended to include dynamic power sharing configuration.

Agreements:

For NR-NR DC, w.r.t. handling deprioritized uplink transmission

* left for UE implementation to determine scaling down or dropping

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:
    - Alt.1: T\_offset <= T\_proc,2
    - Alt.2: T\_offset <= 2\*T\_proc,2
    - Alt.3: T\_offset reasonbly larger than Alt 1. & Alt 2 but <=4ms
    - To be addressed in the CR stage

###### RAN1-100e (February 2020 email correspondence meeting)

* RAN1 moved to maintenance mode after the 38.2xx CRs were introduced to the specifications in December 2019
* The RAN1#100e email discussions are summarized in the following Tdocs

|  |  |  |
| --- | --- | --- |
| [**R1-2001301**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100_e/Docs/R1-2001301.zip) | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-ULPC-01] | Apple |
| R1-2001302 | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-ULPC-02] | Apple |
| [**R1-2001303**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100_e/Docs/R1-2001303.zip) | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-ULPC-03] | Apple |

Issues addressed:

* For semi-static power control mode, correctly capture the power limits as follows:

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* Specify that Semi-static PC mode the UE does not expect the above equation to be violated.
* Clarification to Semi-static power sharing mode2
* Working assumption on T\_offset determination for dynamic power sharing. LS sent (in R1-2001421) requesting RAN2 to review the the working assumption

###### RAN1-100bis-e (April 2020 email correspondence meeting)

RAN1-100bis-e email discussion is summarised in R1-2003011, the following agreements were made:

|  |  |
| --- | --- |
| Issue 5-1: TP to clarify the TDD UL/DL configuration for semi-static power sharing proposed in [3] | **Conclusion**:  No specification change is needed. |
| 5-2: TP to clarify the definitions of beta\_MCG^actual(i\_1) and  beta\_MCG^actual(i\_2)  (i.e., linear values) proposed in [3] | Agreements: Agree the TP in [R1-2001688](file:///C:\Users\krantaah\OneDrive%20-%20Nokia\Documents\My%20Documents\5G%20SCG\3GPP\RAN1-100bis\Tdocs\R1-2001688.zip) to clarify the definitions of beta\_MCG^actual(i\_1) and  beta\_MCG^actual(i\_2) (i.e., linear values) |
| 5-3: TP to align RRC parameters between the endorsed MR-DC running CR of TS 38.331 and TS 38.213 proposed in [3] and [4] | Agreements: Agree the TP in [R1-2001688](file:///C:\Users\krantaah\OneDrive%20-%20Nokia\Documents\My%20Documents\5G%20SCG\3GPP\RAN1-100bis\Tdocs\R1-2001688.zip) and [R1-2001736](file:///C:\Users\krantaah\OneDrive%20-%20Nokia\Documents\My%20Documents\5G%20SCG\3GPP\RAN1-100bis\Tdocs\R1-2001736.zip) to align RRC parameters between the endorsed MR-DC running CR of TS 38.331 and TS 38.213 |
| Issue 5-5: Correction the timing of maximum transmission power determination proposed in [4] | **Conclusion**:  No specification change is needed. |

**Conclusion:**

* For PUSCH repetition Type A and PUCCH repetition, each repetition is treated separately and power can vary across repetitions.
* For PUSCH repetition Type B, each nominal repetition is treated separately and power can vary across nominal repetitions.

###### RAN1-101-e (May 2020 email correspondence meeting)

RAN1-101-e email discussion is summarised in R1-2005017, the following agreements were made:

Agreement:

* Revise the Working Assumption made in RAN1#100-e related to T\_offset determination by removing T\_(proc,CSI) from the second capability (i.e. Alt.2 in WA).
* Wait for RAN2 LS update for confirmation of the Working Assumption made in RAN1#100-e.

Agreement:

For power determination of UL transmission in SCG starting at T0, a UE may assume MCG UL transmission is present even if a higher-layer configured MCG UL transmission is not transmitted,  a dynamically scheduled MCG UL transmission is skipped according to the section 5.4.3.1.3 of TS 38.321, or an MCG UL transmission is cancelled due to either DCI format 2\_0/2\_4 received after T0-Toffset for determination for the UL transmission in MCG overlapping with the concerned SCG transmission.

Conclusion:

For SRS triggering, DCI format 2\_3 is viewed as a DCI format scheduling PUSCH transmission for dynamic power sharing operation.

Agreement:

A UE does not expect to receive a positive group TPC command in DCI format 2\_2 or DCI format 2\_3 in MCG received after T0 – T\_offset that is applied to the semi-static MCG UL transmission which overlaps with the SCG UL transmission starting at time T0. In order to determine , the UE uses DCI formats in PDCCH receptions with a last symbol that is earlier by more than T\_offset from the first symbol of the transmission occasion on the SCG starting at time T0. UE is not required to accumulate/use the non-positive group TPC command in DCI format 2\_2 or DCI format 2\_3 in MCG received after T0 – T\_offset that is applied to the semi-static MCG UL transmission which overlaps with the SCG UL transmission starting at time T0.



Agreement:

Adopt TP#1 in Section 3.1 of R1-2005017 for Clause 7.6.2 of TS 38.213

###### RAN1-102-e (August 2020 email correspondence meeting)

R1-2007351 CR on Power Control for NR-DC Moderator (Apple)

Agreement:

Confirm previous RAN1 working assumption on determination of T\_offset made in RAN1#100e together with the updates in RAN1#101-e.

Conclusion:

It is common understanding in RAN1 that max data rate (DataRate) is per FR per CG for NR-DC. No TP is needed.

Agreement:

Adopt the following values for inter-node signaling: {0.5ms, 0.75ms, 1ms, 1.5ms, 2ms, 2.5ms, 3ms}

* Send a reply LS to RAN2 to inform them of this agreement.

R1-2007261 Reply LS on UL PC for NR-DC TSG RAN WG1

##### *Enhancements to single Tx switched uplink solution for EN-DC*

###### RAN1-AH-1901 (January 2019)

Agreements:

* It is concluded that it is beneficial to specify enhancements to single Tx switched uplink solution for EN-DC over the existing single Tx switched uplink solution, e.g. via introducing a new reference HARQ configuration using NR/LTE Rel-15 or LTE eIMTA solution, etc.

###### RAN1#96 (Feb/Mar 2019)

Agreements:

For single tx switched UL in EN-DC with TDD PCell, the LTE PCell can be configured with DL-reference UL/DL config

* + For DL HARQ timing, the DL-reference UL/DL configuration is applied
    - Only LTE TDD Pattern 2, 4, 5 can be used as DL-reference
  + For UL HARQ timing is the same as without reference configuration for PCell’s UL/DL configuration other than TDD pattern 0/6,
    - FFS: whether/how to support TDD pattern 0/6 for LTE PCell
  + UE is not expected to transmit on the MCG and SCG simultaneously
  + For type 2 UE (i.e., UE without dynamic power sharing capability):
    - UE is allowed to transmit LTE PUSCH only in the UL subframes designated as UL in the DL-reference configuration
  + For type 1 UE (i.e., UE with dynamic power sharing capability):
    - The UE should not assume that LTE PUSCH is only scheduled in the UL subframes associated configured by the DL-reference configuration
    - The UE should not assume that NR PUSCH is only scheduled in the remaining UL subframes other than those configured by the DL-reference configuration
    - If there is a collision,
      * In the UL subframes designated as UL in the DL-reference configuration, UE is expected to drop NR PUSCH
      * In other UL subframes, UE behaviour to be expected to specified with details FFS
        + E.g., drop LTE PUSCH, drop NR PUSCH, etc.
      * FFS for the case of NR SRS & NR PRACH
    - Note: the impact of switching time (if non-zero) will be further studied.
    - Note: the above does not assume any restriction between gNB and eNB (e.g., tight coordination)
  + FFS: whether/how to support HARQ-offset (similar as in SUO case 1 in EN-DC with LTE FDD PCell)

###### RAN1#96bis (April 2019)

Agreements:

For DL HARQ timing corresponding to the DL-reference UL/DL configuration used in single Tx in EN-DC with TDD Pcell, the following clarifications are agreed:

* For the LTE TDD PCell: use the PDSCH ACK timeline as in Table 10.1.3.1-1 in 36.213~~)~~
* For LTE DL CA, the SCell uses the same DL-reference UL/DL configuration as the PCell
  + For the LTE FDD SCell: use the PDSCH ACK timeline defined for SCell as in case of LTE FDD-TDD CA with LTE TDD PCell (i.e. Table 10.1.3A-1 in 36.213)
  + FFS
    - For the LTE TDD SCell with different UL/DL configuration (as in SIB1) as the TDD PCell: use the PDSCH ACK timeline for SCell as in case of LTE FDD-TDD CA with LTE TDD PCell (i.e. Table 10.1.3A-1 in 36.213)
    - For the LTE TDD SCell with the same UL/DL configuration (as in SIB1) as the TDD PCell: use the same PDSCH ACK timeline as the LTE TDD PCell (i.e. Table 10.1.3.1-1 in 36.213)

Agreements:

For single UL operation in EN-DC with LTE TDD PCell, and UE is configured with DL-reference UL/DL configuration,

* Support PUCCH formats 3/4/5, PUCCH fallback operation based on implicit resource indication is not supported.
  + FFS PUCCH format and resource determination when the UE only receives DAI=1
  + FFS whether or not there are any additional issues related to SPS

###### RAN1#97 (May 2019)

* + No agreements.

###### RAN1-98 (August 2019)

Agreements:

* Regarding the FFS part (in change marks) in the agreement from RAN1 #96bis:

For DL HARQ timing corresponding to the DL-reference UL/DL configuration used in single Tx in EN-DC with TDD Pcell, the following is agreed:

* For LTE DL CA, the SCell uses the same DL-reference UL/DL configuration as the PCell (already agreed in RAN1 #96bis)
  + For the LTE TDD SCell with different UL/DL configuration (as in SIB1) as the TDD PCell: use the PDSCH ACK timeline for SCell as in case of LTE FDD-TDD CA with LTE TDD PCell (i.e. Table 10.1.3A-1 in 36.213)
  + For the LTE TDD SCell with the same UL/DL configuration (as in SIB1) as the TDD PCell: use the same PDSCH ACK timeline as the LTE TDD PCell (i.e. Table 10.1.3.1-1 in 36.213)
* Support HARQ-offset for SUO case1 in EN-DC with LTE TDD PCell
* Note: from UE perspective, it is expected that HARQ-offset value doesn’t violate the DL/UL configuration (in SIB1).
* For type 1 UE, the feature is optional. FFS for type 2 UE.

Agreements:

R15 specification on “DL HARQ timing for FDD Scell for LTE TDD-FDD CA with TDD Pcell, applied to FDD Pcell” (i.e., case1 HARQ timing in single UL), is applied to EN-DC UE capable of dual UL Tx in EN-DC with LTE FDD PCell to mitigate DL de-sensing due to Harmonics, at least including:

* UE behavior specified in 36.213 and 36.212
* FFS: all uplink subframes can be scheduled for LTE

Sent an LS to RAN2 notifying RAN2 on the above agreement in R1-1909880

Agreements:

When UE is configured with DL-reference config on the LTE PCell to support single UL in EN-DC with LTE TDD PCell, regarding the case of LTE PCell’s TDD pattern 0 & 6 (as configured in SIB1)

* Not supported in R16.

Proposal below under email approval until September 5th:

For single UL operation in EN-DC with LTE TDD PCell, and UE is configured with DL-reference UL/DL configuration, if an explicit PUCCH format 1a/1b resource is configured, option 2; otherwise, option 1

* Option 1: Support only PUCCH formats 3/4/5 when DAI=1, i.e., PUCCH fallback operation is not supported.
  + Default PUCCH resource corresponding ARI=00 is used when the UE only receives DAI=1 or SPS PDSCH.
* Option 2: Allocate an explicit PUCCH format 1a/1b resource for the fallback HARQ-ACK transmission corresponding to the PDCCH with DAI = 1 or SPS PDSCH.

Email discussion was inconclusive, to be continued in the next meeting

###### RAN1-98bis (October 2019)

Agreements:

For single UL operation in EN-DC with LTE TDD PCell, and UE is configured with DL-reference UL/DL configuration, Using only PUCCH formats 3/4/5.

* A default PUCCH format 3 resource is used when the UE only receives PDCCH with DAI=1 and/or SPS PDSCH.
  + The default one is corresponding to ARI=00
  + Note: the existing multiplexing rule for HARQ-ACK, SR, and CSI onto PUCCH format 3 remains unchanged
* No PUCCH resources are reserved for SPS PDSCH for the UE

Agreements:

If a UE is configured with Case1 HARQ timing in EN-DC, with LTE TDD Pcell and (as a working assumption) with LTE FDD PCell, UE’s PRACH resource configurations are not limited to the UL subframes given by the DL-reference config.

* For type 1 UE (i.e. with fast communication between LTE and NR modems): if the UE’s LTE PRACH transmission collides with an NR UL transmission, LTE PRACH transmission is prioritized
* For type 2 UE (i.e. without fast communication between LTE and NR modems): the UE is not required to support transmission of LTE PRACH transmission which does not coincide with the configured HARQ-ACK transmission occasions

Agreements:

* Introduce a new UE capability of supporting DL reference configuration for dual-Tx UL (e.g., to handle DL de-sensing from harmonics)
  + Agreements:
* For the single-Tx case, for FDD LTE Pcell,
  + All uplink subframes can be scheduled for LTE for type 1 UEs
    - In which case, NR transmission is dropped for when the LTE and NR transmissions collide
    - Note: there is no change of UL scheduling timing for LTE
  + Agreements:
* For the dual-Tx case, for FDD LTE Pcell,
  + All uplink subframes can be scheduled for LTE at least for type 1 UEs
    - Note: there is no change of UL scheduling timing for LTE
  + Agreements:
* Support new RRC signaling “tdm-PatternConfig-r16” to configure a UE with a DL-reference config to the MCG PCell (LTE FDD) according to Rel-16 behavior
* FFS: Introduce a new per-BC capability bit for UE to indicate that DL de-sensing from Harmonic need to be handled by configuring DL-reference config to the LTE PCell and limit LTE UL transmissions to a subset of the subframes

###### RAN1-99 (November 2019)

Agreements:

Confirm the working assumption part of the agreement from RAN1 #98bis below:

If a UE is configured with Case1 HARQ timing in EN-DC, with LTE TDD Pcell and (as a working assumption) with LTE FDD PCell, UE’s PRACH resource configurations are not limited to the UL subframes given by the DL-reference config.

* For type 1 UE (i.e. with fast communication between LTE and NR modems): if the UE’s LTE PRACH transmission collides with an NR UL transmission, LTE PRACH transmission is prioritized
* For type 2 UE (i.e. without fast communication between LTE and NR modems): the UE is not required to support transmission of LTE PRACH transmission which does not coincide with the configured HARQ-ACK transmission occasions

Agreements:

* For the single-Tx case, for TDD LTE Pcell,
  + All uplink subframes can be scheduled for LTE for type 1 UEs
    - In which case, NR transmission is dropped for when the LTE and NR transmissions collide

Agreements:

For a UE configured with DL-reference DL/UL configuration in Rel-16 (including single Tx with LTE TDD PCell or LTE FDD PCell, and dual Tx cases):

* For type 2 UE (i.e., UE without dynamic power sharing capability), any LTE UL transmissions should take place only in UL subframes designated for HARQ-ACK feedback.
* For type 1 UE (i.e., UE with dynamic power sharing capability),
  + Confirm that any LTE UL transmissions scheduled/triggered by DCI can take place in UL subframes not designated for HARQ-ACK feedback.
  + FFS UE is not expected to transmit semi-statically configured LTE UL transmissions in the UL subframes other than those designated as UL in the DL-reference configuration if such transmission collide with NR UL transmissions.

Agreements

For the FFS part in the agreement above,

* semi-statically configured LTE UL transmissions are allowed in all UL subframes.
  + Note: In case of collision, LTE transmission is prioritized
  + Note: this configuration is subject to UE capability

Agreements:

Clarify that “tdm-PatternConfig-r16” as agreed in RAN1 #98bis is applied in both single Tx case (with LTE TDD PCell or LTE FDD PCell) and dual-Tx case.

**Conclusion**:

The value range of HARQ-offset is {0, 1, 2, 5, 6} in the DL-reference configuration for SUO of EN-DC with LTE TDD PCell, where the applicability of the values is shown below:

|  |  |  |
| --- | --- | --- |
| **Pcell Cell-specific TDD config** | **DL-Reference TDD config** | **Valid HARQ-offset value** |
| 1 | 2 | (0,1,5,6) |
| 4 | (0,5) |
| 5 | (0,1,5,6) |
| 2 | 5 | (0,5) |
| 3 | 4 | (0,1) |
| 5 | (0,1,2) |
| 4 | 5 | (0,1) |
| 5 | 5 | (0) |

* Note the above value range and the table can be derived from the previous agreement
* Note that the last row of the above table is included for completeness, which does not imply the necessity of a RRC configuration

Agreements**:**

*Clarify the notes in the following two agreements from RAN1 #98bis (only high-lighted text is updated):*

* + Agreements:
* For the single-Tx case, for FDD LTE Pcell,
  + All uplink subframes can be scheduled for LTE for type 1 UEs
    - In which case, NR transmission is dropped for when the LTE and NR transmissions collide
    - Note: there is no change of UL scheduling timing for LTE compared to R15 single-Tx with LTE FDD PCell
  + Agreements:
* For the dual-Tx case, for FDD LTE Pcell,
  + All uplink subframes can be scheduled for LTE at least for type 1 UEs
    - Note: there is no change of UL scheduling timing for LTE compared to R15 single-Tx with LTE FDD PCell

###### RAN1-100e (February 2020 email correspondence meeting)

* RAN1 moved to maintenance mode after the 38.2xx CRs were introduced to the specifications in December 2019
* The RAN1#100e email discussions are summarized in the following Tdocs

|  |  |  |
| --- | --- | --- |
| R1-2001391 | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-SingleTx-01] | Apple |
| R1-2001392 | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-SingleTx-02] | Apple |
| R1-2001393 | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-SingleTx-03] | Apple |

Issues addressed:

* No need for a new RRC configuration parameter *Semi-static-LTE-UL-in-all-subframes*
* Agreement that the Rel-16 TDM pattern definition in TS38.213 subclause 7.6.1 is under a wrong condition. However, the correction CR was not agreed and future discussions are needed
* A number of corrections on Rel-16 TDM pattern to the LTE specificaitons agreed

###### RAN1-100bis-e (April 2020 email correspondence meeting)

RAN1#100bis-e email discussion is summarized in R1-2002999, with the following agereements.

**Conclusion** (no spec impact):

* For a type 2 UE configured with P\_LTE+P\_NR <= P\_total, if the UE is configured with tdm-PatternConfig-r16 ~~or tdm-PatternConfig-r15~~, then for the band combinations for which the UE indicates using singleUL-Transmission that it does not support simultaneous  UL transmissions, the UE behavior is not specified if LTE UL transmission collide with NR UL transmission.

Agreements:

* Adopt the following TP to Section 5.1, 36.213:

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For a UE configured with EN-DC/NE-DC and serving cell frame structure type 1, if the UE is configured with *subframeAssignment-r15* for the serving cell, the UE is not expected to transmit any uplink physical channel or signal in the serving cell on subframes other than offset-UL subframes, where the offset-UL subframes are determined by applying an offset value given by *harq-Offset-r15* to the subframes denoted as uplink in the UL/DL configuration *subframeAssignment-r15*.

For a UE configured with EN-DC, if the UE does not indicate a capability for dynamic power sharing (as specified in [17]) and if the UE is configured with subframeAssignment-r16 for the serving cell, the UE is not expected to transmit any uplink physical channel or signal in the serving cell on subframes other than offset-UL subframes, where the offset-UL subframes are determined by applying an offset value given by harq-Offset-r16**, if applicable,** to the subframes denoted as uplink in the UL/DL configuration subframeAssignment-r16

* The wording “, if applicable, “ is also to be added to the corresponding paragraphs Section 6 and Section 8 of 36.213.

###### RAN1-101-e (May 2020 email correspondence meeting)

RAN1#101-e email discussion is summarized in R1-2004901 and R1-2004972 with the following agreements

Agreement:

Adopt TP 1-1 in Section 4.1 of R1-2004901 for Clauses 5.1, 6 and 8 of TS36.213

Agreement:

Adopt TP 1-2 in Section 4.1 of R1-2004901 for Clause 7.6.1 of TS38.213

Agreement:

Adopt TP 2-3 in Section 4.2 of R1-2004972 for subclause 5.1 and 8 of TS 36.213

###### RAN1-102-e (August 2020 email correspondence meeting)

No activity

##### *Efficient and low latency serving cell configuration/activation/setup*

###### RAN1-AH-1901 (January 2019)

* + No agreements.

###### RAN1#96 (Feb/Mar 2019)

* + No agreements. R1-1903812 summarizes all the proposals and collects some companies views to them

###### RAN1#96bis (April 2019)

* + LS to RAN4 in R1-1905912 on the maximum allowed SCell activation delay for Rel16 CA agreed, asking RAN4 feedback on the components of the Rel-15 activation delay.

###### RAN1#97 (May 2019)

* + No agreements.

###### RAN1-98 (August 2019)

**Conclusion:**

Study further the following two options and aim to conclude in RAN1#98bis:

* Option 1:
  + NW can send activation command MAC CE and also independently use existing signalling to trigger aperiodic/semi-persistent CSI-RS when sending the activation command
  + Request RAN4 to consider specifying additional (tighter) maximum allowed activation delay requirements for following case
    - UE receives activation command MAC CE for Scell activation and also aperiodic/semi-persistent CSI-RS for the Scell ’at the same time’ as the activation command
      * FFS: ’at the same time’, i.e., exact timing between activation command and RS trigger
      * FFS: if separate requirement based on specific RS configuration
* Option 2 - Support enhancement for triggering a specific CSI measurement/reporting configuration during MAC-CE based Scell activation
  + CSI measurement/reporting is based on Rel-15/16 RS(s)
  + FFS RS will be A-TRS, SP CSI-RS, aperiodic CSI-RS, SP TRS, etc.
  + FFS between following candidates for enhanced triggering
    - Implicit (i.e., Scell activation command reception implies specific RS is triggered like in LTE)
    - Separate MAC CE linked to activation MAC CE
    - Enhanced activation command MAC CE
    - Other candidates not precluded

Note: companies (especially those interested in option 2) should bring ‘full proposals’ covering all design aspects for the next meeting.

Agreements**:**

* From RAN1 perspective, L1 based mechanism for transitioning between ‘dormancy-like’ and ‘non dormancy-like’ behavior on activated Scells can be supported
  + ‘dormancy-like’ => sparse/no PDCCH monitoring on activated Scell while maintaining CSI measurements/reporting

Email discussion/approval of the proposal below until September 5th

* Study further following candidates for L1 based mechanism and aim to conclude at RAN1#98bis
  + Option 1
    - Introduce dedicated DCI on Pcell (or cell x) for transitioning between ‘dormancy-like’ and ‘non dormancy-like’ behavior on activated Scell(s) (or Scell(s) other than cell x)
    - For case when Scell is configured with multiple BWPs
      * Alt1: DCI indicates the BWP to be used on the Scell (FFS 1 or 2 bits per Scell)
      * Alt2: DCI indicates whether to monitor/not monitor PDCCH on current active BWP of the Scell (1 bit per Scell)
    - For case when Scell is configured with 1 BWP
      * DCI indicates whether to monitor/not monitor PDCCH on the Scell (1 bit per Scell)
    - DCI is applicable for case when UE is not configured with CIF (i.e., no cross-carrier scheduling)
      * FFS for cross-carrier scheduling case
    - DCI details
      * At least 15 DCI bits (i.e., 1 bit per Scell)
      * Monitored in UESS along with other scheduling DCI
      * No extra BDs for monitoring this DCI (so same size or size matched to one of DCI 0-0/0-1/1-0/1-1)
        + Alt 1: DCI CRC scrambled with C-RNTI but some fields reserved in one of DCI 0-0/0-1/1-0/1-1, and other fields used for triggering the dormancy behavior
        + Alt 2: DCI CRC scrambled by another RNTI (i.e., similar to SPS PDCCH release)
    - Application delay
      * <= BWP switching delay;
    - The dedicated DCI is not expected to be used for data scheduling
  + Option 2
    - Introduce new RRC signaling based on which the Bandwidth part indicator field in DCI of cell x is re-interpreted by the UE to indicate the BWP used for cell x and also cell(s) other than cell x
    - For case when UE is configured with 1 BWP on cell x or on cell(s) other than cell x
      * Rel15 behaviour is applied (i.e., no CA enhancement for this case)
    - For case when UE is configured with multiple BWPs on cell x or on cell(s) other than cell x
      * RRC signalling for case when UE is not configured with cross-carrier scheduling
        + Details FFS
      * RRC signalling for case when UE is configured with cross-carrier scheduling
        + Details FFS
    - Grouping of multiple Scells/BWPs
      * Details FFS
    - Application delay
      * <= BWP switching delay;
  + Option 3
    - Introduce new RRC signaling for per-BWP configuration of cross-carrier vs. self scheduling and use the CIF/BWP indicator fields for transitioning between ‘dormancy-like’ and ‘non dormancy-like’ behavior on activated Scells.
      * For case when UE not configured with cross-carrier scheduling/CIF
        + Rel15 behaviour is applied (i.e., no CA enhancement for this case)
      * For case when UE is configured with 1 BWP on scheduled cells other than Pcell
        + Rel15 behaviour is applied (i.e., no CA enhancement for this case)
    - Application delay
      * <= BWP switching delay;

The email discussion agreed the following

For L1 based mechanism for transitioning between ‘dormancy-like’ and ‘non dormancy-like’ behavior on activated Scells, study further the candidates including the following and aim to conclude at RAN1#98bis

o   **Option 1**

* 1. Introduce dedicated DCI on Pcell (or cell x) for transitioning between ‘dormancy-like’ and ‘non dormancy-like’ behavior on activated Scell(s) (or Scell(s) other than cell x)
  2. For case when Scell is configured with multiple BWPs

i.      Alt1: DCI indicates the BWP to be used on the Scell (FFS 1 or 2 bits per Scell)

ii.      Alt2: DCI indicates whether to monitor/not monitor PDCCH on current active BWP of the Scell (1 bit per Scell)

Note: It is also possible that the dedicated DCI is used to support both Alt. 1 and Alt. 2

* 1. For case when Scell is configured with 1 BWP

i.      Alt1: DCI indicates whether to monitor/not monitor PDCCH on the Scell (1 bit per Scell)

ii.      Alt2: DCI indicates switching between sparse PDCCH monitoring and frequent PDCCH monitoring (1bit per Scell)

* 1. DCI is applicable for case when UE is not configured with CIF (i.e., no cross-carrier scheduling)

i.      FFS for cross-carrier scheduling case

* 1. DCI details

i.      At least [15] DCI bits (i.e., 1 bit per Scell)

ii.      Monitored along with other scheduling DCI

iii.      No extra BDs for monitoring this DCI

* + - 1. Alt 1: DCI CRC scrambled with C-RNTI but some fields reserved in one of DCI 0-0/0-1/1-0/1-1, and other fields used for triggering the dormancy behavior
      2. Alt 2: DCI CRC scrambled by another RNTI (i.e., similar to SPS PDCCH release)
      3. Other alternatives not precluded (e.g. monitored in CSS with size similar to DCI 2-x)
  1. Application delay

~~i.      <= BWP switching delay;~~ BWP switching delay is starting point

ii.      FFS: if RF switching is applied for inter-band CA, and impact on application delay

* 1. The dedicated DCI is not expected to be used for data scheduling
  2. FFS: If ACK should be transmitted in response to receiving the DCI (e.g. like SPS release PDCCH)

o    **Option 2**

* 1. Introduce new RRC signaling which allows to use the existing Bandwidth part indicator field in DCI of cell x/BWP timer expiration to indicate the BWP used for cell x and also cell(s) other than cell x
  2. For case when UE is configured with 1 BWP on cell x or on cell(s) other than cell x

i.      Alt1: Rel15 behaviour is applied (i.e., no CA enhancement for this case)

Note: other alternatives not precluded

* 1. For case when UE is configured with multiple BWPs on cell x or on cell(s) other than cell x

i.      RRC signalling for case when UE is not configured with cross-carrier scheduling

* + - 1. Details FFS

ii.      RRC signalling for case when UE is configured with cross-carrier scheduling

* + - 1. Details FFS
  1. Grouping of multiple Scells/BWPs

i.      Details FFS

* 1. Application delay

~~i.      <= BWP switching delay;~~ BWP switching delay is starting point

ii.      FFS: if RF switching is applied for inter-band CA, and impact on application delay

iii.      FFS ~~details: e.g.~~ For UE indicating Type 2 capability, whether Type 1 BWP switching delay is used for some BWP switch cases (e.g. for switching between BWPs that differ only in SS configuration)

o    **Option 3**

* 1. Introduce new RRC signaling for per-BWP configuration of cross-carrier vs. self scheduling and use the CIF/BWP indicator fields for transitioning between ‘dormancy-like’ and ‘non dormancy-like’ behavior on activated Scells.

i.      For case when UE not configured with cross-carrier scheduling/CIF

* + - 1. Alt1: Rel15 behaviour is applied (i.e., no CA enhancement for this case)

Note: Other alternatives not precluded

  ii.      For case when UE is configured with 1 BWP on scheduled cells other than Pcell

* + - 1. Alt1: Rel15 behaviour is applied (i.e., no CA enhancement for this case)

Note: Other alternatives not precluded

* 1. Application delay

~~i.      <= BWP switching delay~~ BWP switching delay is starting point

ii.      FFS: if RF switching is applied for inter-band CA, and impact on application delay

o   **Option 1a**

1. Introduce new RRC signalling to create a mapping of Scell/Scell group(s) to the indication field (x-bit) in the new ~~and new dedicated~~ DCI on Pcell (or cell x) for transitioning between ‘dormancy-like’ and ‘non dormancy-like’ behavior on groups of activated Scell(s) (or groups of Scell(s) other than cell x)

i.      FFS details of RRC signaling to group the Scells

1. For case when Scell is configured with multiple BWPs

i.      Alt1: DCI indicates the BWP to be used on the group of Scell(s)

ii.      Alt2: DCI indicates whether to monitor/not monitor PDCCH on current active BWP of the group of Scell(s)

Note: It is also possible that the dedicated DCI is used to support both Alt. 1 and Alt. 2

1. For case when Scell is configured with one ~~or multiple~~ BWP~~s~~

i.      Alt1: DCI indicates whether to monitor/not monitor PDCCH on ~~current active BWP of a~~ the group of Scells ~~(1 bit per group of Scells)~~

ii.      Alt2: DCI indicates switching between sparse PDCCH monitoring and frequent PDCCH monitoring for the group of Scell(s)

1. DCI is applicable for case when UE is not configured with CIF (i.e., no cross-carrier scheduling)
2. FFS for cross-carrier scheduling case
3. DCI details FFS
4. Application delay
5. ~~<= BWP switching delay;~~ BWP switching delay is starting point
6. FFS: if RF switching is applied for inter-band CA, and impact on application delay
7. FFS between below alternatives
   1. Alt1: The new DCI is dedicated DCI and is not expected to be used for data scheduling
   2. Alt2: The new DCI is included along with scheduling DCI (i.e., enhanced field in scheduling DCI)
8. FFS: If ACK should be transmitted in response to receiving the DCI (e.g. like SPS release PDCCH)

o    **Option 3a**

1. When UE is configured with cross-carrier scheduling, use CIF/BWP indicator fields for transitioning between ‘dormancy-like’ and ‘non dormancy-like’ behavior on activated Scells
2. Use per serving cell configuration of cross-carrier vs. self scheduling as in Rel-15
3. For case when UE not configured with cross-carrier scheduling/CIF
   * + 1. Alt1: Rel15 behaviour is applied (i.e., no CA enhancement for this case)

Note: Other alternatives not precluded

1. For case when UE is configured with 1 BWP on scheduled cells other than Pcell
   * + 1. Alt1: Rel15 behaviour is applied (i.e., no CA enhancement for this case)

Note: Other alternatives not precluded

1. Application delay
2. ~~<= BWP switching delay~~ BWP switching delay is starting point
3. FFS: if RF switching is applied for inter-band CA, and impact on application delay

o    **Option 3b**

1. Configure CIF to be present in DCI format in Pcell search-space even if cross-carrier scheduling is not configured
2. Details FFS
3. Application delay
4. ~~<= BWP switching delay~~ BWP switching delay is starting point
5. FFS: if RF switching is applied for inter-band CA, and impact on application delay

Note 1: FFS: If any additional UE behavior is needed when UE is also configured for receiving PDCCH based power saving signal/channel outside active time

Note 2: “BWP” => UE specific RRC configured BWP

Note 3: ‘dormancy like behavior’ may also include CSI measurement/reporting relaxation for some cases

Note 4: It is not precluded to further combine and modify above options

###### RAN1-98bis (October 2019)

Agreements**:**

* When the UE is outside Active Time, for the L1 based mechanism for transitioning from ’dormancy-like’ to ’non-dormancy like’ behaviour on activated Scells, an explicit information field for the UE is introduced to the PDCCH WUS
  + The explicit information field is configurable within a range of 0 to X1 bits
    - X1 <<15
    - FFS whether to use BWP framework for transitioning from dormany to non-dormancy
  + FFS the case of ’non-dormancy-like’ to ’dormancy like’ transition
* When the UE is in the Active Time, for the L1 based mechanism for transitioning between ’dormancy-like’ and ’non-dormancy like’ behaviour on activated Scells, an explicit information field is newly introduced to at least DCI formats 0-1 and 1-1 for the primary cell
  + The explicit information field is configurable within a range of 0 to X2 bits
    - X2 <<15
    - FFS whether to use BWP framework for transitioning from dormany to non-dormancy or vice versa
  + FFS The DCI formats may or may not schedule data (if supported w/o data, the value of X2 can be separately discussed)
  + FFS DCI formats 0-0 and 1-0
  + FFS the impact of CIF if any

Agreements**:**

* For the L1 based Scell dormancy indication sent on primary cell within active time
  + UE is configured with at least two BWPs for an Scell
    - The explicit information field in DCI indicates switching to/from dormant BWP configured for the Scell
      * FFS definition of dormant BWP
      * FFS whether or not to the same BWP switching delay to the non-dormant to dormant transition delay
  + Note: Rel15 behavior for case when 1BWP is configured for the Scell (i.e., no dormancy indication for that Scell)

**R1-1911653**

Agreements:

* For the L1 based Scell dormancy indication sent on primary cell outside active time in WUS PDCCH
  + The explicit information field in DCI is a bitmap with up to X1 bits and 1 bit per group of configured Scells
    - Each Scell group can have one/multiple Scells and up to X1 Scell groups are configured via RRC.
      * The Scell group configuration is independent from the Scell group configuration for dormancy indication within active time (if supported)
    - X1 = [5]
      * Note: X1 is upper bound.
  + Note: Number of bits used for explicit information field in WUS PDCCH is based on configuration

Proposals:

* For the L1 based Scell dormancy indication sent on primary cell within active time select one of the below alternatives
  + Alt 1
    - The PDCCH with dormancy indication is not used for scheduling data
      * Note: At least DCI formats 0-1 and 1-1 are used for the PDCCH (as already agreed)
    - The explicit information field in DCI is a bitmap with 1 bit per configured Scell
      * Note: No additional RRC configuration of Scell grouping
    - X2=15
      * Note: X2 is upper bound
    - FFS between below options
      * New RNTI to scramble the PDCCH DCI (i.e., similar to CS-RNTI)
      * Reuse C-RNTI but reserve the FDRA field to all 1s
      * Reuse C-RNTI but add a dedicated bit to differentiate from scheduling DCI
    - FFS: HARQ-ACK handling for the dedicated DCI
  + Alt 1a
    - The PDCCH with dormancy indication is also used for scheduling data on the primary cell
    - The explicit information field in DCI is a bitmap (appended to scheduling DCI) with up to X2 bits, and 1 bit per group of configured Scells
      * Each Scell group can have one/multiple Scells and up to X2 Scell groups are configured via RRC.
    - X2 = 5
      * Note: X2 is upper bound.
    - Number of bits used for explicit information field in DCI is variable
  + Email discussion/approval till 10/25 – Ravi (Ericsson)

###### RAN1-99 (November 2019)

Agreements:

* At least for the case when PDCCH schedules data for primary cell and also indicates dormancy for Scell(s) (i.e., Case 1),
  + N (0≤N≤X2) Scell groups are configured for the UE where each Scell group can have one or multiple Scells
    - Note: The Scell group configuration is independent from the agreed Scell group configuration for dormancy indication outside active time
    - Note: X2=5 per RAN1#98bis working assumption.
  + The explicit information field for SCell dormancy indication is a bitmap of length N with each bit corresponding to one Scell group.
  + The bitmap is appended to existing fields of DCI format 0-1,1-1 (i.e., size of DCI format 0-1, 1-1 is increased by N (0≤N≤X2) bits).

Agreements:

Fall back DCI formats (0\_0 & 1\_0) are not used for dormancy indication

Agreements:

* When PDCCH with DCI formats 1-1 is used for indicating dormancy for SCells,
  + UE expects that the PDCCH is not used for PDSCH scheduling
    - If FDRA field in PDCCH DCI format 1-1 is set to all 1s (when type 1 RA is used for UE) or
    - If FDRA field in PDCCH DCI format 1-1 is set to all 0s (when only type 0 RA is used for UE)
  + Note: Samsung is concerned with the above agreements since Samsung believes it is a duplicate solution (compared with the one using some bits in DCI scheduling PUSCH/PDSCH)

Agreements:

* For SCell dormancy indication outside active time, confirm X1=5

Agreements:

* For the case when PDCCH with DCI format 1-1 is used for indicating dormancy for SCells, and when UE is indicated that the PDCCH is not used for PDSCH scheduling (i.e., Case 2)
  + - The explicit information field for SCell dormancy indication is a bitmap of length N1 where N1 is the number of configured Scells for the UE, and each bit in the bitmap corresponds to one configured SCell
    - The following fields are re-purposed in the PDCCH for dormancy indication– MCS (5), NDI (1), RV(2), HARQ process number(4), Antenna port(s) (at least ~~2~~ 4), DMRS sequence initialization
      * Other fields are not re-purposed
        + FFS whether or not CIF, if present, can indicate a Scell or not
  + Note: the DCI format size is same as that of Case 1 (i.e., if RRC configures N (0≤N≤X2) SCell groups, N bits are added to the DCI)

Agreements:

* When UE is outside Active Time, for the L1 based mechanism for transitioning between ‘dormancy-like’ and ‘non-dormancy like’ behaviour, the same BWP framework as inside active time is used

Agreements**:**

* At least for case of dormancy indication within active time
  + If ‘0’ is indicated by DCI field
    - If ‘UE is in non-dormant BWP, UE switches to dormant BWP
    - If ‘UE is in dormant BWP, UE continues with dormant BWP
  + If ‘1’ is indicated by DCI field
    - If ‘UE is in non-dormant BWP, UE continues with the same non-dormant BWP
    - If UE is in dormant BWP, switch to a specific non-dormant BWP explicitly configured by RRC

Agreements

For dormancy indication outside active time, for interpreting ‘0’, ‘1’ in the SCell dormancy indication field,

* reuse same approach as that of inside active time

Agreements:

* DCI format 0-1 is not used for Case 2 dormancy indication
  + **Conclusion**:
* From RAN1 perspective,
  + Application delay for transitions between dormant BWP and non-dormant BWP will be specified by RAN4.
  + Until further RAN4 input is received, current DCI based BWP switching time that is supported by the UE is assumed as the application delay.

Agreements**:**

* For Type 2 codebook, ACK is transmitted by the UE in response to detection of Case 2 PDCCH with SCell dormancy indication
* For type 1 codebook, no HARQ response is supported in response to detection of Case 2 PDCCH with SCell dormancy indication
  + Agreements:
* If the default BWP is not the dormant BWP, BWP inactivity timer is not used for transitioning from dormant BWP to another BWP

###### RAN1-100e (February 2020 email correspondence meeting)

* RAN1 moved to maintenance mode after the 38.2xx CRs were introduced to the specifications in December 2019
* The RAN1#100e email discussions are summarized in the following Tdocs

|  |  |  |
| --- | --- | --- |
| R1-2001416 | Summary of email discussion [100e-NR-LTE\_NR\_DC\_CA\_enh-ScellDormancy-01] | Ericsson |
| R1-2001417 | Summary of email discussion [100e-NR-LTE\_NR\_DC\_CA\_enh-ScellDormancy-02] | Ericsson |
| R1-2001418 | Summary of email discussion [100e-NR-LTE\_NR\_DC\_CA\_enh-ScellDormancy-03] | Ericsson |
| R1-2001419 | Text proposals from email discussion [100e-NR-LTE\_NR\_DC\_CA\_enh-ScellDormancy-01] | Ericsson |
| R1-2001420 | Text proposals from email discussion [100e-NR-LTE\_NR\_DC\_CA\_enh-ScellDormancy-02] | Ericsson |

Following issues were addressed:

* Spec updates for below issues
  + Aligning 38.213 with agreement on Scell dormancy indication when UE is in non-dormant BWP
    - TP in R1-2001419.
  + Aligning 38.213 with agreement on HARQ-ACK feedback for case 2 dormancy indication
    - TP in R1-2001419
  + Aligning 38.213 with the agreement on FDRA field for Case 2 dormancy indication (i.e., it applies if the field is set to all 1s when type 1 RA is used for UE, or is set to all 0s when only type 0 RA is used for UE)
    - TP in R1-2001419
  + When UE is configured with CIF, ‘DCI format 0-1/1-1 on primary cell with CIF≠0’ is not used for Case 1 Scell dormancy indication.
    - TP in R1-2001420
  + Case 2 dormancy indication using DCI format 1-1 is not supported for the case when DCI CRC is scrambled by CS-RNTI
    - TP in R1-2001420

###### RAN1-100bis-e (April 2020 email correspondence meeting)

RAN1#100bis-e email discussion is summarized in R1-2003012, with the following agreements.

Agreements:

* + Agree to below TP1\_rev2

--------------------------------- Start TP1rev2 for TS 38.212 sub-clause 7.3.1.2.2 ---------------------------------------

<Unchanged parts omitted>

- SCell dormancy indication – 0 bit if higher layer parameter *Scell-groups-for-dormancy-within-active-time* is not configured; otherwise 1, 2, 3, 4 or 5 bits bitmap determined according to higher layer parameter *Scell-groups-for-dormancy-within-active-time,* where each bit corresponds to one of the SCell group(s) configured by higher layers parameter *Scell-groups-for-dormancy-within-active-time,* with MSB to LSB of the bitmap corresponding to the first to last configured SCell group. The field is only present when this format is carried by PDCCH on the primary cell within DRX Active Time and the UE is configured with at least two DL BWPs for an SCell.

If all bits of frequency domain resource assignment are set to 0 for resource allocation type 0 or set to 1 for resource allocation type 1 or set to 0 or 1 for dynamic switch resource allocation type, this field is reserved and the following fields among the fields above are used for SCell dormancy indication, where each bit corresponds to one of the configured SCell(s), with MSB to LSB of the following fields concatenated in the order below corresponding to the SCell with lowest to highest SCell index

- Modulation and coding scheme of transport block 1

- New data indicator of transport block 1

- Redundancy version of transport block 1

- HARQ process number

- Antenna port(s)

~~[~~- DMRS sequence initialization~~]~~

<Unchanged parts omitted>

--------------------------------- End TP1rev2 for TS 38.212 sub-clause 7.3.1.2.2 -----------------------------

**Conclusion**: Revisit TP3 (see the summary document) in next meeting

Agreements:

* TP4 in the latest summary is endorsed.

###### RAN1-101-e (May 2020 email correspondence meeting)

RAN1#101-e email discussion is summarized in R1-2005079 with the following agreements

Agreement:

Adopt TP#1 in Section 3 of R1-2005079 for Clause 10.3 of TS38.213

Conclusion:

For an SCell configured with dormant BWP, a UE doesn’t expect the BWP indicator field in DCI 1\_1, DCI 1\_2 is set to the ID of dormant BWP

Conclusion:

From RAN1 perspective, there is no issue with linking an UL BWP with the DL dormant BWP in TDD Scell. i.e., when DL BWP is switched to dormant BWP, the expected behavior is that the UE switches to an UL BWP with BWP index which is the same as DL dormant BWP index.

R1-2005080 Draft LS on SCell Dormancy Ericsson

Final LS approved in R1-2005081

###### RAN1-102-e (August 2020 email correspondence meeting)

Agreement:

HARQ-ACK timeline of the Case 2 SCell dormancy indication DCI is defined by adding X symbols to the SPS release PDCCH HARQ-ACK timeline (i.e., X+N symbols)

* X = 4, 4, 5, 6 for capability #1 for μ =0,1,2,3
* X = 2, 2, 4 for capability #2 for μ =0,1,2

R1-2007441 CR to 38.213 on HARQ-ACK processing timeline for DCI format 1\_1 with Scell dormancy indication without scheduling PDSCH Moderator (Ericsson)

Agreement:

For DCI format 1\_1/0\_1 on primary cell with dormancy indication that indicates a BWP change between dormant and non-dormant BWPs of SCell(s), there is no additional restriction that it should be only in first 3 symbols of a slot

* If the DCI format 1\_1/0\_1 is detected after the first 3 symbols of a slot, a delay of one additional slot is given for BWP change
* Note: UE does not expect to detect DCI format 1\_1/0\_1 on primary cell with dormancy indication that indicates a BWP change between dormant and non-dormant BWPs of SCell(s) after the first 3 symbols of a slot if UE does not report any capability to support PDCCH monitoring outside the first three symbols of a slot on primary cell.

R1-2007440 CR to 38.213 on BWP triggering via SCell dormancy indication Moderator (Ericsson)

Note : For the case of detection of DCI format 1\_1/0\_1 with SCell dormancy indication after the first 3 symbols of a slot, if the delay of one additional slot for SCell BWP change is not captured in RAN4 spec, RAN1 spec will be updated to include that delay. Any other RAN1/RAN4 spec alignment e.g. based on RAN4 reply LS can also be considered in the next RAN1 meeting.

Conclusion:

For a SCell configured with dormant DL BWP for unpaired spectrum, a UE doesn’t expect the BWP indicator field in DCI 0\_1, DCI 0\_2 is set to the ID that is same as the ID of dormant DL BWP

R1-2007438 CR to 38.212 on RRC parameter alignment for SCell dormancy Moderator (Ericsson)

R1-2007439 CR to 38.213 on RRC parameter alignment for SCell dormancy Moderator (Ericsson)

##### *Cross-carrier scheduling with different numerologies on the scheduling and scheduled carriers*

###### RAN1-AH-1901 (January 2019)

* + No agreements

###### RAN1#96 (Feb/Mar 2019)

Agreements**:**

* At least for the case of lower SCS PDCCH scheduling a higher SCS PDSCH the earliest possible starting point for the PDSCH is defined by the end of the PDCCH + Δ
  + Δ>0. Detailed value(s) FFS
  + FFS other factor(s) impacting Δ
* The limit of BDs/CCEs (per slot in the scheduling CC) for the scheduled CC is determined based on the numerology of the scheduling CC.
  + Change the definition of NcellsDL,μ to “the number of configured DL-CCs whose scheduling cell is with active DL BWP having SCS configuration μ” as in Section 10.1 of 38.213

###### RAN1#96bis (April 2019)

Agreements:

* For case 1-1 scheduling (PDCCH in the beginning of the slot), when a lower SCS PDCCH schedules a higher SCS PDSCH:
  + The Δ is determined a number of symbols based on PDCCH SCS counting from the end of the last symbol of the received PDCCH symbol to the beginning of the first symbol of the corresponding received PDSCH, quantized (using the granularity of PDSCH slot duration) to the next PDSCH slot boundary

Agreements**:**

Regarding PDSCH-to-HARQ-ACK minimum allowed timing under cross-carrier scheduling with different numerologies:

* Use the Rel-15 specification without changes
  + Agreements:

Regarding PDCCH-to-PUSCH minimum allowed timing under cross-carrier scheduling with different numerologies:

* Use the Rel-15 specification without changes
  + **Conclusion**:
* The PDCCH monitoring occasion determination is based on the numerology of scheduling cell in cross-carrier scheduling with different numerologies
  + No spec change is intended
  + For the case of cross-carrier scheduling from lower SCS to higher SCS for PDSCH, companies are encouraged to provide sufficient details for the design alternative(s) for scheduling – to finalize in RAN1#97.
  + Email discussion for the remaining details for CCS till next meeting – Karri (Nokia)

###### RAN1#97 (May 2019)

Agreements**:**

* Delta-values for lower SCS PDCCH to higher SCS PDSCH case 1-1 scheduling
  + 15 kHz: 4 symbols
  + 30 kHz: 4 symbols
  + 60 kHz: 8 symbols
* Case 1-2: use the same delta as the case 1-1 scheduling
  + With the quantization step
* Case 2:
  + Use the same delta values as the case 1-1 scheduling INCLUDING the quantization step

Agreements:

* For the case of higher SCS PDCCH scheduling lower SCS PDSCH, for the scheduling timing, use the same definition as with lower SCS PDCCH scheduling higher SCS PDSCH scheduling, without quantization to the next PDSCH slot

Agreements:

* For high-SCS to low-SCS scheduling, the delta for 120 kHz SCS PDCCH: [12] symbols

Agreements:

* For the case of a lower SCS PDCCH scheduling a higher SCS PDSCH (or PUSCH), support using M DCIs in one slot for PDCCH to schedule M respective PDSCH (or PUSCH) transmissions in N slots for PDSCH (or PUSCH), where M<=N (for slot aggregation, M<N) following at least one of the following rules (potential down-selection can be done during Rel-16 UE feature discussion):
  + Alt 1a: Define max number of unicast DCIs that the UE is expected to decode in each span of PDCCH symbols
  + Alt 1b: Define an increased number of valid unicast DCIs per PDCCH monitoring occasions
  + Alt 1c: based on Rel-15 FG 3-5/3-5b
    - Further discussion whether some additional clarification is needed or not 🡪 potential clarification can be discussed under UE features

Agreements**:**

* *timeDurationForQCL* threshold is determined based on the numerology of the scheduled cells.

Agreements**:**

When PDSCH and its scheduling PDCCH are in the different CCs, if the PDCCH-to-PDSCH delay < *timeDurationForQCL* or if the TCI information is absent from the DCI, 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

**Conclusion**:

If the number of valid unicast DCIs at the same monitoring occasions is increased in the UE feature discussion, further discuss whether/how to update the HARQ-ACK codebook and PUCCH resource determination.

Agreements:

* In Rel-16, support enabling HARQ-ACK codebook type and HARQ-ACK spatial bundling configuration per PUCCH group.
  + Note: vs. per cell group in Rel-15

Agreed an LS in R1-1907953 on the RRC parameters for cross-carrier scheduling with different numerologies

###### RAN1-98 (August 2019)

* + No agreements

###### RAN1-98bis (October 2019)

Agreements**:**

At least the following two UE capabilities will be introduced

1. Scheduling cell of lower SCS and scheduled cell of higher SCS
2. Scheduling cell of higher SCS and scheduled cell of lower SCS

###### RAN1-99 (November 2019)

**Agreements**:

* The same additional beam switching timing as agreed for A-CSI under 7.2.13.4 is used for PDSCH being cross-carrier scheduled with different numerologies

Agreements:

For the time offset between PDCCH and PDSCH under cross-carrier scheduling with different numerologies:

* The timing offsets 4,4,8,[12] for SCS 15, 30, 60, 120 kHz respectively are relaxed to 4,5,10,14
* The above-mentioned numbers assume that the minimum PDCCH-to-PDSCH timing in cross-carrier scheduling with different subcarrier spacings that from RAN1 spec perspective they are assumed to have zero time offset
  + Consider if there is a need to clarify the Rel-16 feature introduction CR on this aspect
  + Agreements**:**

For QCL other than TypeD:

* Clarify that the following rule in Rel-15 is also applicable to cross-carrier scheduling with different numerologies:
  + If none of configured TCI states for the serving cell of scheduled PDSCH contains 'QCL-TypeD', the UE shall obtain the other QCL assumptions from the indicated TCI states for its scheduled PDSCH irrespective of the time offset between the reception of the DL DCI and the corresponding PDSCH.

**Conclusion**:

* Do not support cross-carrier PDCCH order in Rel-16

###### RAN1-100e (February 2020 email correspondence meeting)

* RAN1 moved to maintenance mode after the 38.2xx CRs were introduced to the specifications in December 2019
* The RAN1#100e email discussions are summarized in the following Tdocs

|  |  |  |
| --- | --- | --- |
| R1-2001352 | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-Cross-CCScheduling-01] | Nokia |
| R1-2001353 | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-Cross-CCScheduling-02] | Nokia |
| R1-2001354 | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-Cross-CCScheduling-03] | Nokia |

Following issues were addressed:

* The enhanced URLLC Rel-16 DCI format was integrated to work together with cross-carrier scheduling with different numerologies
* Default QCL assumption for cross-carrier scheduled PDSCH corrected
* Clarification on PDCCH blind decoding capabilities
* Clarification on the numerology of the additional delay parameter ’*d’*
* No conclusion on the cross-carrier SPS release HARQ-ACK Type 1 codebook

###### RAN1-100bis-e (April 2020 email correspondence meeting)

Email discussion summary in R1-2002842 with the following agreements:

The following TPs are endorsed

***TP for subclause 5.5, 38.214 for specification improvement***

* < unchanged text omitted >

This clause applies only if the PDCCH carrying the scheduling DCI is received on one carrier with one OFDM subcarrier spacing (µPDCCH), and the PDSCH scheduled to be received by the DCI is on another carrier with another OFDM subcarrier spacing (µPDSCH).

If the µPDCCH < µPDSCH, the UE is expected to receive the scheduled PDSCH, if the first symbol in the PDSCH allocation, including the DM-RS, as defined by the slot offset *K0* and the start and length indicator *SLIV* of the scheduling DCI starts no earlier than the first symbol of the slot of the PDSCH reception ~~allocated for the PDSCH~~ ~~PDSCH slot~~ starting at least *Npdsch* PDCCH symbols after the end of the PDCCH scheduling the PDSCH, not taking into account the effect of receive timing difference between the scheduling cell and the scheduled cell.

< unchanged text omitted >

***TP for subclause 5.5, 38.214***

< unchanged text omitted >

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 and the UE is configured with [*~~enabledDefaultBeamForCCS~~ enableDefaultBeamForCSS*]:

- 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 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.

< unchanged text omitted >

* ***TP for subclause 10.1, 38.213***

< unchanged text omitted >

For same cell scheduling or for cross-carrier scheduling~~where a scheduling cell and scheduled cell(s) have DL BWPs with same SCS configuration ~~, a UE does not expect a number of PDCCH candidates, and a number of corresponding non-overlapped CCEs per slot on a secondary cell to be larger than the corresponding numbers that the UE is capable of monitoring on the secondary cell per slot.

< unchanged text omitted >

**Conclusion:**

* Type-1 HARQ-ACK Codebook for cross-carrier SPS release association: The codebook is associated with the last slot (on SPS PDSCH carrier) overlapping with the PDCCH providing SPS release.
* The bit location of the SPS release in type-1 codebook is determined by the SLIV of the SPS PDSCH.
* FFS whether spec update is needed or not.

###### RAN1-101-e (May 2020 email correspondence meeting)

Email discussion summary in R1-2004641 with the following agreements:

Agreement:

* Introduce a new FG for Type2 HARQ-ACK codebook for >1 DL DCIs in same Monitoring Occasion as follows:
  + Components:
    - For HARQ-ACK type 2 codebook: Usage of the PDSCH starting time in addition to the existing MO and Cell index to order the HARQ-ACK feedback.
  + Pre-requisites: 3-1
  + FDD/TDD separation N/A
  + FR1/FR2 differentiation: N/A
  + Type: Per UE
  + Mandatory/Optional: Optional with capability signalling
  + Note: The UE capability is introduced with following assumption:
    - Specification reflects that UE behavior is modified only for UEs supporting this capability.
    - UE behavior of a UE supporting this capability is different from UE behavior of a UE not supporting this capability only for following case:
      * Type-2 HARQ-ACK codebook when HARQ-ACK feedback in a codebook corresponds to more than one DL DCI for same scheduled cell in a MO of a scheduling cell.
* FFS: check if any update is needed in the related Pseudo codeand handling of PDSCH starting time for ordering with existing functionality for multi-TRP operation

Agreement:

Adopt the following text proposal for Clause 9.1.3.1 of TS 38.213:

A value of the counter downlink assignment indicator (DAI) field in DCI formats denotes the accumulative number of {serving cell, PDCCH monitoring occasion}-pair(s) in which PDSCH reception(s) or SPS PDSCH release associated with the DCI formats is present up to the current serving cell and current PDCCH monitoring occasion, first, if the UE indicated support for [NEW FG] in increasing order of the time of the first symbol of the PDSCH for the same {serving cell, PDCCH monitoring occasion} pair, second in ascending order of serving cell index, and then in ascending order of PDCCH monitoring occasion index, where.



###### RAN1-102-e (August 2020 email correspondence meeting)

RAN1#102e email discussion handle [102-e-NR-MRDC-CA-Cross-CC-Unaligned-CA] summarized in R1-2007242 agreed to introduce the following changes to TS38.214:

* In subclause 5.1 the timeline of the dynamic grant overriding the SPS PDSCH is defined as 14 symbols, but it is not clear whether the symbols should be counted as the symbols of the PDCCH carrier or the PDSCH carrier. It was clarified that the smaller SCS of the two is always used
* In subclause 5.1.5 it is unclear which TCI state is used for a PDSCH is cross carrier scheduled by a DCI without TCI field present and the offset between the DCI and the PDSCH is equal to or greater than the threshold. This is solved by limiting the Rel-15 behavior to “same carrier scheduling”
* In RAN1#101 a new RRC parameter *enableBeamSwitchTiming-r16* was added to control the newly defined beam switching behavior in Rel-16. However, this was only clarified for the same-numerology case. For cross-numerology case this is missing and has been corrected.

R1-2007243 Corrections on Cross-carrier Scheduling with Different Numerologies Moderator (Nokia)

##### *Support of aperiodic CSI-RS triggering with different numerology between CSI-RS and triggering PDCCH*

This sub-feature was introduced to the WI in September RAN#85

###### RAN1-98bis (October 2019)

Agreements**:**

* Support cross-carrier A-CSI-RS triggering when µPDCCH < µCSI-RS
* Support cross-carrier A-CSI RS triggering when µPDCCH > µCSI-RS
* For the above two cases, separate UE capabilities are introduced, and the capabilities are NOT linked with the capabilities related to the cross-carrier scheduling with different numerologies
  + Agreements:
* To support aperiodic CSI-RS triggering with different numerology between CSI-RS and triggering PDCCH

**Definition of the slot index where A-CSI RS is transmitted**

* ⎣n1×2μCSI-RS/2μPDCCH ⎦+X, where the n1 is the PDCCH carrier slot with the DCI
* Note: The case when the frame boundaries of the two carriers are not aligned may require additional compensation when determining the actual slot number

**New slot offset values**

* Extend the X(≥0) values for cross-carrier A-CSI RS triggering when the PDCCH and A-CSI RS have different SCS
  + FFS X

**Minimum A-CSI RS triggering offset for cross-carrier triggering of A-CSI RS when the PDCCH SCS and the A-CSI RS SCS are not the same**

* Minimum delay from the end of the triggering PDCCH and the start of the CSI-RS in the CSI-RS carrier’s slots is defined as *m*
  + *m* = 4, 4, 8, [12] symbols for PDCCH SCS = 15, 30, 60, 120 kHz, respectively as defined for cross-carrier scheduling of PDSCH with different PDCCH and PDSCH SCS.
  + [Working assumption] When µPDCCH < µCSI-RS the minimum delay is quantized to the beginning of the next A-CSI RS carrier slot
* FFS impact, if any, due to beam switching timing

###### RAN1-99 (November 2019)

Agreements:

When µPDCCH < µCSI-RS, X∈{0, 1, …, 31}

Agreements:

For the minimum triggerind delay with 120 kHz SCS, revert the WA and adopt 14 symbols for 120 kHz SCS

In addition, m = 4, 4, 8 are updated to 4, 5, 10

Agreements:

To confirm the WA on quantization, when µPDCCH < µCSI-RS the minimum delay is quantized to the start of the next slot

Agreements:

For cross-carrier triggering of A-CSI RS when the PDCCH SCS and the A-CSI RS SCS are not the same,

* + The same definition of the slot index where CSI-RS is transmitted is assumed for CSI-IM transmission;
  + The same minimum triggering offset as for CSI RS is defined for CSI-IM.

Agreements:

For the case when µPDCCH < µCSI-RS:

* The additional delay d for the beam switching timing delay X+d is the same for A-CSI-RS triggering with different SCS and for cross-carrier scheduling with different SCS
  + FFS: potential effects of the UE power saving WIs cross-slot scheduling may need to be considered
* The additional delay is equal to d
  + d=8, 8, 14 PDCCH symbols for 15, 30, 60 kHz SCS respectively

Agreements

For cross carrier aperiodic CSI-RS with triggering **time offset smaller the threshold,** with A-CSI RS contains QCL-typeD information:

* If there is any other DL signal in the same symbols as the CSI-RS in the scheduled cell, the UE applies the QCL assumption of the other DL signal on the aperiodic CSI-RS.
  + The definition of “other DL signal” is same as Rel-15
* Otherwise,
  + if CORESET is configured in the A CSI-RS carrier, the UE follows existing spec text. I.e., A CSI-RS follows QCL assumption of the lowest ID CORESET in the latest slot in which one or more CORESETs within the active BWP of the serving cell are monitored.
  + If CORESET is not configured in the A-CSI-RS carrier, apply the QCL assumption in the activated TCI state with the lowest ID applicable to PDSCH in the active BWP of the serving cell with the A-CSI-RS transmission

###### RAN1-100e (February 2020 email correspondence meeting)

* RAN1 moved to maintenance mode after the 38.2xx CRs were introduced to the specifications in December 2019
* The RAN1#100e email discussions are summarized in the following Tdocs

|  |  |  |
| --- | --- | --- |
| R1-2001350 | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-X-CC-A-CSI-RS-01] | Nokia |
| R1-2001351 | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-X-CC-A-CSI-RS-02] | Nokia |

Following issues were addressed:

* The the TEI16 specified on top of Rel-15 A-CSI RS triggering handling to cover also the cross-carrier A-CSI-RS triggering when the SCS of the two carriers are different.
* Clarification on the numerology of the additional delay parameter ’*d’*
* Default QCL assumption for cross-carrier triggered A-CSI-RS with different SCS corrected

###### RAN1-100bis-e (April 2020 email correspondence meeting)

Email discussion summary in [R1-2002841](file:///C:\Users\krantaah\OneDrive%20-%20Nokia\Documents\My%20Documents\5G%20SCG\3GPP\RAN1-100bis\Tdocs\R1-2002841.zip)

Agreements**:**

* Adopt the TP proposed in [R1-2001543](file:///C:\Users\krantaah\OneDrive%20-%20Nokia\Documents\My%20Documents\5G%20SCG\3GPP\RAN1-100bis\Tdocs\R1-2001543.zip) (same TP in both Huawei and Vivo doc) to TS38.214 subclause 5.2.1.5.1a
* Adopt the TP proposed in [R1-2001690](file:///C:\Users\krantaah\OneDrive%20-%20Nokia\Documents\My%20Documents\5G%20SCG\3GPP\RAN1-100bis\Tdocs\R1-2001690.zip)/Proposal 2 to TS38.214 subclause 5.2.1.5.1a
* Confirm that the text below was introduced in a wrong location and move it according to the proposal in [R1-2001737](file:///C:\Users\krantaah\OneDrive%20-%20Nokia\Documents\My%20Documents\5G%20SCG\3GPP\RAN1-100bis\Tdocs\R1-2001737.zip) from 5.2.1.5.1 to 5.2.1.5.1a of TS38.214
  + TP “including the case that the UE is not configured with [*minimumSchedulingOffset*] for any DL or UL BWP and all the associated trigger states do not have the higher layer parameter *qcl-Type* set to 'QCL-TypeD' in the corresponding TCI states”, introduced to 5.2.1.5.1 instead of the intended 5.2.1.5.1a.

###### RAN1-101-e (May 2020 email correspondence meeting)

Email discussion summary in R1-2004640 with the following agreements

Agreement:

Adopt the TPs in Sections 3.1, 3.4, 3.5 and 3.6 of R1-2004640 for Clause 5.2.1.5.1a of TS 38.214.

Agreement:

Adopt the TPs in Sections 3.2 of R1-2004640 for Clause 5.2.1.5.1 of TS 38.214

###### RAN1-102-e (August 2020 email correspondence meeting)

RAN1#102e email discussion handle [102-e-NR-MRDC-CA-Cross-CC-Unaligned-CA] summarized in R1-2007242 agreed to introduce the following changes to TS38.214:

* In subclause 5.2.1.5.1 and 5.2.1.5.1a a RRC parameter name *aperiodicTriggeringOffsetExt-r16* has been corrected to *aperiodicTriggeringOffset-r16*.

R1-2007243 Corrections on Cross-carrier Scheduling with Different Numerologies Moderator (Nokia)

##### *Support of unaligned frame boundary with slot alignment and partial SFN alignment for R16 NR inter-band CA*

This sub-feature was introduced to the WI in September RAN#85

###### RAN1-98bis (October 2019)

Agreements:

* Support explicit RRC signalling of slot offset to the UE in unaligned frame boundary with slot alignment and partial SFN alignment inter-band CA.
  + Where the slot offset for a CC is defined w.r.t. the Pcell/pScell timing, with slot granuality defined as (to down-select)
    - Alt 1: the maximum of Pcell/pScell lowest SCS among all the configured DL/UL BWPs and the CC’s lowest SCS among all the configured DL/UL BWPs
    - Alt 2:
      * If the CC is FR1, 15kHz; If the CC is FR2, 60kHz
    - Alt 3:
      * If the CC is FR1, 60kHz; If the CC is FR2, 120kHz
    - Alt4: 120kHz
    - Others?
* FFS: RAN1 Spec if any impact
* Note: Offset is always signalled if the offset is not zero for the UE indicating this capability
* Observation: One slot right-shift and one slot left-shift corresponds to different samples in the current spec description

Note: it is confirmed that the offset Range is to be limited to ±76800Ts as in the WID

**Proposals:**

In the above agreements, Alt 1 is adopted with the following details:

If SCS of PCell is smaller than [or equal to] SCS of SCell

*q* = -1

Otherwise

*q* = 1

* + - * For right shift and q = 1 or for left shift and q = -1: in the range of 2.5ms, offset is indicated e.g., by M, N and n,
* Offset equals to M\*() + nL (samples), where L is the length of the shorter slot of two type of slots of different length, M is multiple of 0.5ms, N is the number of the slots of each 0.5ms, and n is the number of slots in the fractional 0.5ms
* n is in the range of [0, N-1]
  + - * For left shift and q = 1 or for right shift and q = -1: in the range of 2.5ms, offset is indicated by M, N and n
* Offset equals to M\*() if n=0, otherwise equals to M\*() + ( +nL) (samples), where L is the length of the shorter slot of two type of slots of different length, M is multiple of 0.5ms, N is the number of the slots of each 0.5ms, and n is the number of slots in the fractional 0.5ms
* n is in the range of [0, N-1]

FFS： whether SSB SCS should also be taken into account

* + Email discussion/approval till 10/25 (including a potential RAN2 LS) – Xiaodong (CMCC)

###### RAN1-99 (November 2019)

Agreements:

Update and confirm the working assumption that Alt 1 modified as below

Alt 1: the granularity of the offset is determined by the maximum of Pcell/pScell lowest SCS among all the configured SCSs in DL/UL SCS-SpecificCarrierList and the CC’s lowest SCS among all the configured SCSs in DL/UL SCS-SpecificCarrierList

Update and confirm the working assumption as below

* + For slot offset *N*, for CA case, the beginning of slot #0 of the CC with lower SCS (or PCell/PScell for equal SCS) coincides with the beginning of slot #(*qN* mod *M*) of the CC with higher SCS (or SCell for equal SCS)
    - Where
      * *q* = -1, if lowest SCS of PCell/PScell is smaller than or equal to lowest SCS of SCell
      * *q* = 1, otherwise
  + *M* is the number of slots per frame in the CC with higher SCS
  + Note: Other simple description is not precluded as long as it is aligned with above principle.
  + Here the lowest is same as the definition in Alt 1.
* Note: For the combinations of 60kHz/60kHz and 120kHz/120kHz for Pcell/Scell with a UE-specific Pcell configuration, the above agreements may not be fully desirable. Discuss further offline whether or not to further address these cases (without any additional RRC impact). If no additional consensus reached by Friday, the above agreements stay as is

Agreements:

At most single non-zero offset duration (independent on SCS) can be configured among CCs in the unaligned CA configuration.

Agreements:

For timing determination for cross-carrier scheduling of PDSCH in 5.1.2.1 and of PUSCH in 6.1.2.1 of TS38.214

* Update the scheduled slot determination equations with slot offset *NSCS,PxSCH*, and the slot offset is only applicable for cross-carrier scheduling

Note: Error case when *NSCS,PDSCH + K0*< minimum value of UE reported *K0* capability.

Error case when *NSCS,PUSCH + K2*< minimum value of UE reported *K2* capability.

Agreements:

Adding the slot offset for cross-carrier triggering aperiodic CSI report.

Agreements:

Adding the slot offset for cross-carrier triggering aperiodic SRS.

Agreements:

For the lowest SCS combinations of other than 60kHz/60kHz and 120kHz/120kHz

* For slot offset *N*, for CA case, the beginning of slot #0 of the CC with lower SCS (or PCell/PScell for equal SCS) coincides with the beginning of slot #(*qN* mod *M*) of the CC with higher SCS (or SCell for equal SCS)
  + - Where
      * *q =* -1, if lowest SCS of PCell/PScell is smaller than or equal to lowest SCS of SCell
      * *q =* 1, otherwise
  + *M* is the number of slots per frame in the CC with higher SCS
  + Note: Other simple description is not precluded as long as it is aligned with above principle.
  + Here the lowest is same as the definition in Alt 1.

For the lowest SCS combinations of 60kHz/60kHz and 120kHz/120kHz

* For slot offset *N*, the beginning of slot #0 of the CC with lower subcarrier#0 of CRB#0 coincides with the beginning of slot #(*qN* mod *M*) of the CC with higher subcarrier#0 of CRB#0
  + - Where
      * *q* = -1, if subcarrier#0 of CRB#0 of PCell/PScell is lower than subcarrier#0 of CRB#0 of SCell
      * *q* = 1, otherwise
  + M is the number of slots per frame in the CC
  + Here the lowest is same as the definition in Alt 1.

###### RAN1-100e (February 2020 email correspondence meeting)

* RAN1 moved to maintenance mode after the 38.2xx CRs were introduced to the specifications in December 2019
* The RAN1#100e email discussions are summarized in the following Tdocs

|  |  |  |
| --- | --- | --- |
| [**R1-2001265**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100_e/Docs/R1-2001265.zip) | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-Unaligned\_CA-01] | CMCC |
| [**R1-2001266**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100_e/Docs/R1-2001266.zip) | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-Unaligned\_CA-02] | CMCC |
| [**R1-2001267**](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100_e/Docs/R1-2001267.zip) | Outcome of email thread [100e-NR-LTE\_NR\_DC\_CA\_enh-Unaligned\_CA-03] | CMCC |

Following issues were addressed:

* 38.211 and 38.214 definitions for the cross-carrier slot offsets aligned to other specs
* 38.213 and 38.214 cross-carrier timing equation approach modified so that the Rel-15 equations are kept and it is easy to see that the legacy remains unchanged

###### RAN1-100bis-e (April 2020 email correspondence meeting)

Email discussion summary in R1-2002780

Agreements:

* **Remove unintended formulae in section 9.1.2.1 of TS38.213 v16.1.0**
* **Align the parameter of** *μ* **and** *μ*offset **in the context in Section 4.5 of TS38.211 v.16.1.0**
* **Apply existing agreements for the new instance introduced by parallel CR, i.e. applying the following agreement to the part of SRS triggering [SRS-for-Positioning] in Section 6.2.1 of TS38.214 v16.1.0**

Agreements:

* **To replace all “*CA-slot-offset*” in RAN1 specification by “*ca-SlotOffset*”**
* **To replace all “*non-aligned frames*” in RAN1 specification by “*unaligned frame boundary*”**

The second agreements are to be handled by editors.

The corresponding TPs in the latest summary are also endorsed (TP#1/#2/#3) (as in [R1-2002780](file:///C:\Users\krantaah\OneDrive%20-%20Nokia\Documents\My%20Documents\5G%20SCG\3GPP\RAN1-100bis\Tdocs\R1-2002780.zip), can’t open it

###### RAN1-101-e (May 2020 email correspondence meeting)

Email discussion summary in R1-2004789

Agreement:

Adopt the TP1 in Section 2 of R1-2004789 (Cover page information in Section 1 of R1-2004789) for section 9.1.2.1 of TS38.213.

Agreement:

* Align the parameter parameter “*SCS-SpecificCarrierList*” in TS38.211 to “*scs-SpecificCarrierList*” to align with TS38.331
* Replace all “higher-layer” to “higher layer”, i.e. without the hyphen

Note: No dedicated TP for above refining revision, which will be left to editors

###### RAN1-102-e (August 2020 email correspondence meeting)

No agreements

##### *Other topics*

###### RAN1-98 (August 2019)

**Conclusion:**

* There is no consensus in RAN1 on how to clarify what synchronous in synchronous NR-DC means in Rel-15, although it is commonly understood in RAN1 that synchronous means at least slot-level synchronization

#### 2.1.2 Remaining Open issues

* None

## 2.2 RAN2

#### 2.2.1 Agreements

**RAN2#105 (Feb/Mar 2019):**

* **Early Measurement reporting:**

**Agreements:**

For IDLE/INACTIVE:

* Rel-16 early measurement configuration may contain both NR and LTE configuration, only NR configuration or only LTE configuration, to support various MR-DC and CA scenario. FFS on details. IDLE mode and INACTIVE mode details will be discussed separately
* NR early measurement configuration should include NR specific measurement parameters configurations.
* Available beam and cell level measurement results can be included in early measurement reporting if configured.
* Two email discussions to be held to progress the work on early measurement reporting:
* *[105#53][NR/eCA-DC] – Signaling (Ericsson)* 
  + - Discuss signalling for measurement reporting and identify options for:
    - When availability of measurements is indicated
    - When measurement results are provided
    - Deadline: Thursday 28/03/2019
* *[105#54][NR/eCA-DC] – Measurement configuration (Qualcomm)*
* Details of measurement configurations and measurement reporting
* Deadline: Thursday 28/03/2019

**Agreements:**

* The configured SCells (MCG and SCG) can be configured in deactivated or activated state by RRC upon addition or after a handover. Timing requirements are up to RAN4. FFS if this applies to resume.
* SCG Configuration in RRCResume message can be considered
* Sent an LS to RAN4 on RAN2 agreements and ask RAN4 to take the agreements into consideration and let us know if there are any concerns. LS endorsed in R2-1902734
* **Fast MCG link Recovery:**

**Agreements:**

* MCG failure can be indicated to the network via the SCG. FFS if via SCells.
* FFS how the failure is indicated, which SRBs, and which failure case the fast MCG failure recovery.
* We will aim to have a unified solution for the failure cases that we want to address.
* An email discussion to be held to progress the work on fast MCG recovery:
* *[105#55][NR/eCA-DC] – MCG failure (Vivo)* 
  + Summarize the different options for 1) Failure indication message, 2) SRBs to use and 3) which failure cases to address
  + Deadline: Thursday 28/03/2019

**RAN2#105bis (Apr 2019):**

* **Running CRs:**
  + The following running CRs were endorsed:
    - 37.340: R2-1905430
    - 38.300: R2-1904474
* **Early Measurement reporting:**

**Agreements:**

* For NR IDLE mode, the LTE rel-15 euCA early measurement reporting solution (i.e. via UEInformationRequest and UEInformationResponse like messages) after connection is setup will be supported.
* For both LTE and NR, sending full idle mode measurements before security activation shall not be allowed. FFS if some measurement information (detail TBD) related to idle mode measurements can be sent before security activation.
* SMC and SMC complete messages will not be modified to enable the signalling of early measurements.
* For both LTE and NR, RAN2 confirm that current specification allow that UEInformationRequest (or equivalent message to be specified in NR) can be sent by the network immediate after Security Mode Command without network having to wait for Security Mode Complete (i.e. similar to sending of Reconfiguration after SMC)
* For NR INACTIVE mode, the LTE rel-15 euCA early measurement reporting solution (i.e. via UEInformationRequest and UEInformationResponse like messages) after connection is resumed will be supported.
* Sending early measurement report is network controlled.
* For NR INACTIVE, the network can request early measurement report in RRCResume.
* For NR INACTIVE, early measurement reporting can be sent in RRCResumeComplete.

FFS Whether above two bullets should be applied to LTE RRCConnectionResume and RRCConnectionResumeComplete message.

* NR early measurements can be configured in both NR RRCRelease message and NR system information. FFS: Whether there are differences in the configuration that can be provided by RRCRelease and SI.
* Introduce some indication about the cell's early measurement support in NR system information.
* To control the duration of UE performing both IDLE and INACTIVE measurements, a single validity timer (similar to measIdleDuration in LTE euCA) is mandatory indicated only in NR RRCRelease message, i.e. not included in NR SIB.
* For both IDLE and INACTIVE early measurements, the following IEs can be optionally configured per NR frequency in both NR RRCRelease message and NR SIB:
  + A list of frequencies and optionally cells (similar to measCellList in LTE euCA) the UE is required to perform early measurements.
  + A cell quality threshold (similar to qualityThreshold in LTE euCA) the UE is required to report the measurement results only for the cells which met the configured thresholds.

FFS: A validity Area (similar to validityArea in LTE euCA) to indicate the list of cells within which UE is required to perform early measurements. If the UE reselects to a cell outside this list, the early measurements are no longer required (same as timer expiry).

If it is absent, the UE will not have area limitation of early measurements.

* For SSB based measurements:
  + For both IDLE and INACTIVE early measurements, SSB frequencies to be measured can be located out of sync raster
  + For both IDLE and INACTIVE early measurements, RSRP and RSRQ can be configured as cell and beam measurement quantity.
  + For both IDLE and INACTIVE early measurements, the configuration parameters provided per SSB frequency follow the same principles as those provided in SIB2/4 for the purposes of Idle/Inactive mobility. (Details differences can be discussed at stage 3 level)
  + As LTE euCA, cell / beam SINR is not introduced as measurement quantity in NR early measurement configuration in Rel-16.
* For SSB based beam level measurement configurations:
  + The UE is required to report the beam with the highest measurement quantity

FFS: Whether additional beams can be reported.

* + For both IDLE and INACTIVE early measurements, the UE can be configured with one of the 3 beam reporting types
    - No beam reporting;
    - Only beam identifier
    - Both beam identifier and quantity

FFS: Whether to support CSI-RS based NR early measurements

* LTE UE in IDLE mode, IDLE with suspended, and INACTIVE can be configured with NR early measurements to support fast setup of (NG)EN-DC (i.e. euCA is extended to support NR measurements). Details are FFS
* **Fast MCG link Recovery:**

**Agreements:**

* MCG fast recovery targets all MRDC architecture options
* When MCG failure occurs, UE follows SCG failure-like procedure:
  + UE does not trigger RRC connection re-establishment.
  + UE triggers an MCG failure procedure in which a failure information message is transmitted to the network via SCG.
* MCG fast recovery targets the following use cases MCG leg RLF

FFS: Other uses cases. Can consider in future whether the mechanism can be also be applied in the case of other MCG failures.

* MCG fast recovery can only be triggered after AS security has been activated and the SRB2 and at least one DRB have been setup
* MCG failure indication should include:
  + Available measurement results of MCG
  + MCG link failure cause
  + Available measurement results of SCG
  + Available measurement results of non-serving cells
* For MCG failure indication, new RRC message in introduced, e.g. MCGFailureInformation.
* SCG leg of the split SRB1 can be used for MCG fast recovery.

FFS: If configured, SRB3 can be used for MCG fast recovery. Priority is to complete the solution based on split SRB1

* New SRB is not introduced for MCG fast recovery.

**RAN2#106 (May 2019):**

* **Running CRs:**

The following running CRs were endorsed:

* + 37.340: R2-1905433
  + 36.300: R2-1905982
  + 38.300: R2-1908394
  + 36.331: R2-1905985
  + 38.331: R2-1905984
* **Early Measurement reporting:**

**Agreements:**

* RAN2 confirms that for both LTE and NR, sending cell RSRP/RSRQ of idle mode measurements before security activation shall not be allowed.
* RAN2 confirms that for both LTE and NR, sending cell PCI(s) with good quality and associated frequency of idle mode measurements before security activation shall not be allowed.
* How the UE applies filtering of beam measurements as part of early measurement reporting is left to UE implementation (Up to RAN4 to specify performance requirements for early measurement reporting)
* The UE can report more than one beam measurement. Network can configure whether it wants to receive more than just the best beam

FFS whether the network can configure max number of beams and a threshold above which beams are reported

* The early measurement configuration can be different between that in RRCRelease and in SIB. If the UE receives the early measurement configuration from RRCRelease, this overrides the early measurement configuration provided in SIB (if any).

FFS: Whether some other measurement related configuration in SI (e.g. smtc) outside of the early measurement configuration can still be used.

* A single early measurement configuration is provided in SI for idle and inactive

FFS: Whether the early measurement configuration can be kept when the UE receives the Release (to Inactive to Idle) in response to Resume Request.

* L3 filtering is not applied to early measurement reporting
* The UE performs the idle measurement for the frequencies in configured frequency list only when the UE support CA or MR-DC between the frequency and the serving frequency.
* FFS Whether the network can provide information on support of CA/DC between frequencies to assist the UE to determine which frequencies to provide measurement for.
* If UE reselects to a cell that does not support early measurements (as indicated by absence of an indicator in SI), the validity timer keeps running, but the UE is not required to performs measurements while camped on that cell (same as LTE euCA)
* Three email discussions to be held to progress the work on early measurement reporting:
* *[106#35][NR/DCCA] Validity area (Vivo)* 
  + - Whether it is needed or not
    - What is the content of the validity area
    - If configured, how does it affect UE idle measurement performing behaviour
      * What happens if the UE reselects to a cell that is not part of the validity area (for any of the configured frequencies/cells) while measIdleDuration is running
      * What happens if the UE reselects back to a cell that is part of the validity area while measIdleDuration is running
    - Intended outcome: Report to next meeting
    - Deadline: Thursday 2019-08-08
* *[106#36][NR/DCCA] Measurement and reporting configuration (Qualcomm)*
  + - What SIB(s) are used for idle mode meas configuration
    - If CSI-RS configuration is needed or not
    - Whether the network can configure max number of beams and a threshold above which beams are reported
    - Whether some other measurement related configuration in SI (e.g. smtc) outside of the early measurement configuration can still be used.
    - Whether the network can provide information on support of CA/DC between frequencies to assist the UE to determine which frequencies to provide measurement for.
    - How to prevent outdated measurement reporting
    - Any other scenarios where the UE removes/releases idle measurement configurations and/or results
    - *Intended outcome:* Report to next meeting
    - *Deadline:* Thursday 2019-08-08
* *[106#37][NR/DCCA] UE behaviour regarding idle measurement configurations and measurement results (Ericsson)* 
  + - during state transitions, inter-RAT cell re-selection, etc, while measIdleDuration is running
    - 2 step resume/release
    - Inter-RAT cell re-selection
    - RRC rejection
    - autonomous transition to IDLE mode (e.g. reception of CN paging while in INACTIVE)
    - successful transition to CONNECTED mode
    - transition to IDLE/INACTIVE mode
    - when measIdleDuration expires or stops
    - clarifications regarding when the UE starts/stops/suspends/resumes idle measurements
    - *Intended outcome:* Report to next meeting
    - *Deadline:* Thursday 2019-08-08
* **Efficient and low latency configuration signaling:**

**Agreements:**

* SCell dormant state like LTE euCA will not be introduced in NR.
* ‘dormancy’ behaviour will be studied as a solution for fast return to SCell utilisation for data transfer. The 'dormancy' behaviour implies that the UE stops monitoring PDCCH but continues other activities such as CSI measurements, AGC and beam management. RAN1/4 input required on feasibility and benefit.
* Temporary RS resources at SCell activation will be studied as a solution for fast SCell activation. RAN1/4 input required on feasibility and benefit.
* Sent an LS to RAN1/4 to request input for the dormancy behaviour and the denser RS approach (R2-1908483)
* An email discussion to be held to progress the work on SCG and MCG SCell configuration:
  + *[106#38][NR/DCCA] SCG and MCG SCell Configuration with RRC Resume (Ericsson)*
    - Progress the discussion of maintaining SCG and MCG SCell Configuration in RRC Resume and providing an SCG and MCG SCell configuration in RRC Resume for both LTE and NR. The discussion should aim to understand potential benefits.
    - *Intended outcome:* Report to next meeting
    - *Deadline:* Thursday 2019-08-08
* **Fast MCG link Recovery:**

**Agreements:**

* Fast MCG recovery is not supported in case (intra and inter-RAT) handover failure
* Fast MCG recovery is not supported in case of integrity check failure
* Fast MCG recovery is not supported in case of RRC connection reconfiguration failure
* FFS Whether a guard timer is needed for the MCG failure indication message
* Once the MCG failure indication is triggered, the UE shall:
  + transmit the MCG failure indication;
  + suspend MCG transmission for all SRBs and DRBs;
  + reset MCG-MAC;
  + maintain the current measurement configurations from both the MN and the SN, and continue measurements based on configuration from the MN and the SN if possible.

FFS whether switch the primaryPath to SCG is needed

* If SCG failure is detected while MCG is suspended then initiate RRC re-establishment procedure
* Upon receiving the MCG failure indication, the MN sends reconfiguration with sync or RRC Release to the UE via SRB1.
* Upon reception of reconfig with sync the UE resumes MCG transmission if suspended

**RAN2#107 (August 2019):**

* **Running CRs:**

The following running CRs were endorsed:

* + 37.340: R2-1909192
  + 36.300: R2-1910240
  + 38.300: R2-1910241
  + 36.331: R2-1911764
  + 38.331: R2-1911763

Email discussions to be held to update the running CRs:

* *[107#14][NR/DCCA] Stage 2 running CR (Ericsson/Vivo)*
  + Intended outcome: Endorsed running CR
  + Deadline: Thursday 2019-09-12
* *[107#33][NR/DCCA] Stage 38.331 running CR (Ericsson)*
  + Intended outcome: Running CR submitted to next meeting
  + Deadline: Thursday 2019-10-03
* *[107#34][NR/DCCA] Stage 36.331 running CR (Ericsson)*
  + Intended outcome: Running CR submitted to next meeting
  + Deadline: Thursday 2019-10-03
* **Early Measurement reporting:**

**Agreements:**

* For per-frequency SSB measurement configuration reuse the IE structure that is currently used in SIBs for cell reselection purposes.
* The legacy SSB measurement configurations in NR SIB2/4 and LTE SIB24 are reused for NR early measurements performed in frequencies which are candidates of cell selection/reselection, i.e. not introduce new measurement configurations in NR/LTE SIB for these SSBs.
* Same as LTE euCA, NR frequency list (not the SSB measurement configuration) can be different between RRC release and SIB. The frequency list, if provided, in RRC release message overrides the one provided in SIB.
* For per frequency SSB measurement configuration for purpose of only early measurements, it can be included in both RRC release message and SIB. If provided in RRC release message, it overrides the one provided in SIB in the cell where the RRC Release message is received.

FFS How UE manages the situation when an SSB measurement configuration for a given frequency is provided in SIB of the current cell and was also provided RRC Release (in an earlier cell).

* As in LTE euCA, the indication whether to report RSRP, RSRQ or both can be indicated in both RRC release message and SIB. If provided in RRC release, it overrides the one in SIB.
* Similar to LTE euCA, the indication of beam reporting type (i.e. whether to, not report beam results, report only the beam index, or report both beam index and results) can be indicated in both RRC release message and SIB. If provided in RRC release, it overrides the one in SIB.
* NR early measurement configuration is included in a new NR SIB.
* NR early measurement configuration is included in LTE SIB5 (i.e. the SIB including LTE early measurement configurations)
* It is not necessary to specify CSI-RS based early measurements for the case of SCell with SSB in Rel-16.
* It is not necessary to specify CSI-RS based early measurements for the case of SCell without SSB in Rel-16.
* In NR early measurement configuration, the UE can be configured with maximum number for beam reporting and only beams above configured threshold for cell quality derivation are required to be reported (as NR CONNECTED measurements).
* Do not support the network provide information on network’s support of CA/DC between frequencies to assist the UE to determine which frequencies to provide NR early measurement in Rel-16.
* Do not support a mechanism to prevent outdated early measurement reporting in Rel-16.
* Upon the reception of the RRCSetup message in response to RRCSetupRequest or RRCResumeRequest (while T331 is running), the UE stops T331, and deletes the dedicated idle mode measurement configuration, if any.
* Upon the reception of the RRCReject message in response to RRCSetupRequest or RRCResumeRequest (while T331 is running), the UE keeps performing the idle mode measurements.
* During a 2-step resume (i.e. RRCRelease in response to RRCResumeRequest), the network can release or reconfigure the idle mode measurements.

FFS whether this is delta or complete replace

* Upon the expiry of T331 while in IDLE or INACTIVE mode, the UE deletes the dedicated idle mode measurement configuration, if any.
* The UE deletes the early measurement results after it has successfully reported them to the network (i.e. in UEInformationResponse or RRCResumeComplete).
* An email discussion to be held to progress the remaining work on early measurements:
  + *[107#35][NR] Remaining aspects of early measurement configuration (Vivo)*

-To at least address the FFS points and the validity area

-*Intended outcome*: Report to next meeting

-*Deadline:* Thursday 2019-10-03

* **Efficient and low latency configuration signaling:**

**Agreements:**

* The LTE RRCConnectionResume message (Inactive to Connected) can contain the MCG SCell configuration and the associated UE behaviour in handling the SCell configuration is the same as in the Rel-15 RRC connection reconfiguration procedure.
* In NR and LTE Rel-16, the UE maintains the MCG SCell configuration upon the initiation of the resume procedure.
* The RRC(Connection)Resume message contains an indication to restore/resume the MCG SCells (noting that behaviour in legacy eNBs that don't support this feature needs to be considered).
* The (LTE and NR) RRC(Connection)Resume (Inactive to Connected) message can contain the SCG configuration and the associated UE behaviour in handling the SCG configuration is the same as in the Rel-15 RRC (connection) reconfiguration procedure.
* In NR and LTE Rel-16, the UE maintains the SCG configuration upon the initiation of the resume procedure.
* The RRC(Connection)Resume message contains an indication to restore/resume the SCG (noting that behaviour in legacy e/gNBs that don't support this feature needs to be considered).
* An email discussion to be held to progress the work on SCell/SCG Resume:
  + *[107#32][NR/DCCA] MCG SCell/SCG resume (Interdigital)*

• Possible enhancements to blind resume of MCG SCell and/or SCG (e.g. conditional restore of stored configuration on resume)

• SCell activation at resume

• Resume at SN

• Suspended SCG (while in Connected mode)

- The rapporteur can also add other items (keeping the total number limited)

*Intended outcome*: Report to next meeting

*Deadline*: Thursday 2019-10-03

* **Fast MCG recovery:**

**Agreements:**

* Upon sending a MCG failure indication, UE starts a timer.
* Upon resumption of MCG, UE stops the timer.
* Upon expiry of the timer, UE initiates RRC connection re-establishment procedure.
* Network can configure the timer value (no infinite value)
* If a UE is configured with split SRB1 with PDCP duplication, there is no need to switch the primaryPath upon detection of MCG failure since MCG failure indication will be transmitted via SCG RLC bearer of split SRB1.
* If PDCP duplication is not activated, upon detection of MCG failure the primaryPath for split SRB1 is implicitly reconfigured to the SCG. The UE expects the network to explicitly reconfigure the primaryPath back to MCG in the MCG recovery or in a Re-establishment
* SRB3, if configured, can be used for MCG fast recovery.
* For MCG fast recovery via SRB3, MCG Failure Information message in UL (same message as for SRB1 case) is encapsulated by the UE into an SN RRC message.
* For MCG fast recovery via SRB3, the MN response message in DL (either a reconfiguration with sync or release message) is encapsulated by the SN in an SN RRC message.

FFS Transmission of the complete message

* An email discussion to be held to progress the work on MCG Fast recovery:
  + *[107#31][NR/DCCA] MCG fast recovery (Ericsson)*

• Other recovery mechanisms:

o (PCell) Recovery via SCell

o Other means?

• Issue of outstanding SRB1 PDCP packets upon MCG fast recovery

• Any other issues related to NW control, configurations, etc.

- The rapporteur can also add other items (keeping the total number limited)

*Intended outcome*: Report to next meeting

*Deadline*: Thursday 2019-10-03

**RAN2#107bis (October 2019):**

* **Running CRs:**
  + 37.340: R2-1912268
  + 36.300: R2-1912540
  + 38.300: R2-1912541
  + 36.331: R2-1914189
  + 38.331: R2-1914188
* **Early Measurement reporting:**

**Agreements:**

* There is a validity area, and the action when the UE exits the validity area is that the UE stops all early measurements.
* Validity area is configured by means of dedicated RRC signaling
* Validity area can be configured by means of: Lists of PCIs; Lists of CellIdentity;
* When UE reselects to a cell that is not part of the validity area (for any of the configured frequencies/cells) while measIdleDuration is running, UE should stop measurement. UE stops the timer. WA that the UE also clears the entire early measurement configuration.
* If network uses broadcast signaling for the list of early measurements, it will provide all parameters by broadcast signaling with the only exception that dedicated signalling is used for the timer
* If network uses dedicated signaling for the list of early measurements, the following signalling options are allowed for each of the frequencies:
  + SSB measurement configuration (incl SMTC) and all other parameters are provided by dedicated signaling
  + SSB measurement configuration (incl SMTC) is broadcast and all other parameters are provided by dedicated signaling
* No UE requirements will be specified for what UE shall do upon reselection to a cell broadcasting for some frequency an SSB measurement configuration that differs from the values received in the RRC release message i.e. UE may stop early performing measurements for concerned frequency
* **Efficient and low latency configuration/signaling:**

**Agreements:**

* Based on RAN1/RAN4 reply LS, introduce ‘dormancy’ behaviour for NR SCell, i.e. the UE stops monitoring PDCCH on SCell but continue performing CSI measurements, AGC and beam management, if configured.
* RAN2 confirms that UE “dormancy” operation is part of SCell activated state (i.e. not as part of SCell deactivated state)
* Direct SCell activation (setting the SCell state to activated or deactivated) in resume message is supported, if R4 can confirm that there are no blocking issues from their point of view
* When the UE resumes to a cell included in the stored SCG, particular functionality for swapping of MCG and SCG configurations is not considered for Rel16
* New conditions/triggers for resuming directly to the SN are not considered in Rel16.
* R2 assumes the following (can be slightly modified due to progress on Scell dormancy):
  + The UE supports network-controlled suspension of the SCG in RRC\_CONNECTED.
  + UE behaviour for a suspended SCG is FFS
  + The UE supports at most one SCG configuration, suspended or not suspended, in Rel16.
  + In RRC\_CONNECTED upon addition of the SCG, the SCG can be either suspended or not suspended by configuration.
* LS sent to RAN4 regarding SCell state on resume is approved in R2-1914217
* Common Cell Configuration for Signalling Reduction will not be considered in Rel-16 in WI CADC enh.
* Agreed to have 2 email discussions to progress the work on efficient and low latency configuration/signalling:
  + *[108#55][NR/DCCA] MCG SCell and SCG Configuration with RRC Resume (ZTE)*
    - Scope: Identify and progress if possible any remaining issues (Main OI: How to handle the case if Resumed cells/scg or cells/scg to resume is in fact not present, smaller OI: gNB indicate what to resume/release to the UE).
    - Intended outcome: Report for the next meeting
    - Deadline: 2020-01-30
  + *[108#56][NR/DCCA] SCell dormancy open issues(OPPO)*
    - Intended outcome: Report for next meeting, paving the way for fruitful discussions.
    - Deadline: 2020-01-30
* **Fast MCG recovery:**

**Agreements:**

* Fast PCell recovery via SCell is not introduced in Rel-16.
* We add no functionality for optimized RRC re-establishment to SN RAT in Rel-16
* No further mechanisms are introduced to resolve outstanding UL/DL RRC deadlock messages situation upon the triggering of MCG failure recovery
* For MCG fast recovery via SRB3, the MCGFailureInformation message in UL is encapsulated in the ULInformationTransferMRDC message
* A new RRC message, i.e., DLInformationTransferMRDC, is introduced in order to allow the SN to encapsulate (for SRB3) the MN response (i.e., RRCReconfiguration or RRCRelease message) to be send to the UE
* The RRC procedure on these encapsulated messages are the same as if they had been received by SRB1
* When receiving a MN RRCRelease message encapsulated within an SN RRC message via SRB3, the UE does not send any complete message
* Split SRB1 is always used for the transmission of the MCGFailureInformation message. SRB3 is used only if split SRB1 is not configured
* MCG failure recovery can be configured by the network.

**RAN2#108 (Nov 2019):**

* **Running CRs:**
  + 37.340: R2-1914936
  + 36.300: R2-1915279
  + 38.300: R2-1915280
  + 36.331: R2-1915281
  + 38.331: R2-1915282
* Email discussions to be held to progress the stage 2/3 running CRs:
  + [108#13][DCCA] Stage 2 running CRs 36.300, 38.300 (Ericsson)

Scope: Final check on the stage 2 CRs

Intended outcome: Endorsed CRs

Deadline: 2019-12-13

* + [108#14][DCCA] Stage 2 running CRs 37.340 (vivo)

Scope: Final check on the stage 2 CR

Intended outcome: Endorsed CR

Deadline: 2019-12-13

* + [108#33][DCCA] RRC running CRs 36.331, 38.331 (Ericsson)

Scope: agreeable Draft CRs for next meeting, capturing agreements

Intended outcome: Agreeable Draft CR

Deadline: 2020-01-23

* **NR DC:**

**Agreements:**

* Agreed to have an email discussion to progress this work:
  + *[108#15][DCCA] Power control for NR DC (Vivo)*

Intended outcome: Endorsed TP, input to the running CR

Deadline: 2012-12-13

* **Early Measurement reporting:**

**Agreements:**

* Upon entering RRC CONNECTED mode, the UE stops validity timer T331 (if running) and deletes the dedicated idle mode measurement configuration (if configured).
* After moving to another RAT due to inter-RAT cell reselection, the UE stops validity timer T331 (if running) and deletes the dedicated idle mode measurement configuration (if configured)
* While transition from NR INACTIVE mode to NR IDLE mode, the UE keeps the validity timer T331 (if running) and the dedicated idle mode measurement configuration (if configured), i.e. just continue.
* While transition from LTE INACTIVE mode to LTE IDLE mode, the UE keeps the validity timer T331 (if running) and the dedicated idle mode measurement configuration (if configured), i.e. just continue.
* When UE reselects to a cell that is not part of the validity area, the UE stops the validity timer and also clears the entire early measurement configuration.
* For the early measurements during a 2-step resume:
  + if RRCConnectionRelease does not include idle/inactive measurement configuration, the UE keeps the configuration and T331 continues running (i.e. no action);
  + if RRCConnectionRelease includes idle/inactive measurement configuration, the new configuration completely replaces the old configuration (incl timer which would be started).
  + if RRCConnectionRelease includes an release indication, the UE releases the old configuration, stops timer.
* The validity area is defined as a carrier list (which could be different from the carriers to be measured during RRC\_IDLE/INACTIVE) with optional PCI list per carrier.
* The early measurement results are sorted by RSRP unless only RSRQ is configured as reporting quantity.
* The validity area cannot include IRAT cells
* If, for a frequency for which SSB config was provided by broadcast @ initial configuration, reselected cell does not broadcast SSB config the UE is not required to measure concerned frequency while camping on concerned cell (but should re-attempt following another re-selection)
* Measurement for Cell reselection (304) and early measurements are independent.
* In case UE cannot find suitable cell to camp or in anycell selection does not trigger stopping T331 or deleting early measurement configuration (no need to capture in the TS).
* The NR Rel-16 early measurement reporting solution is introduced in LTE
  + The network can request (in RRCConnectionResume) the UE to send early measurements
  + The UE can include early measurements in RRCConnectionResumeComplete.
* If a UE is released by an eNB which only configures bcast LTE early measurements and then reselects to an eNB which broadcasts both LTE and NR idle/inactive measurement configurations, the UE shall apply these NR configurations
* A new indication is introduced in SIB2 to indicate that the UE can perform NR early measurements while camped on the cell.
* At least one indication is introduced in RRCConnectionResume to indicate that the UE shall include the LTE and/or NR early measurements in RRCConnectionResumeComplete.
* **Efficient and low latency configuration/signaling:**

**Agreements:**

* We use BWP model as agreed/assumed in R1.
* Upon entering dormancy, the UE clears/suspends any uplink grants (type 1 and type2) associated with the SCell.
* In dormancy SCell, the UE doesn’t perform RACH.
* In dormancy SCell, aperiodic CSI/SRS via self-carrier scheduling is not allowed.
* As dormant state in LTE euCA, SCell dormancy is not applicable to the PUCCH SCell.
* WA: If in dormancy SCell, aperiodic CSI via cross-carrier scheduling is not allowed, FFS for SRS
* Send LS to R1 cc R4 informing of agreements, stating that this is not finished and e.g. SRS transmissions on the dormancy SCell is still FFS (no action) [R2-1916587]
* SCG suspension will not be pursued in Rel-16
* **Fast MCG recovery:**

**Agreements:**

* The guard timer for fast MCG link recovery should be configured via dedicated signalling, it is configured by the MN.
* The configuration of guard timer implicitly indicates that the feature of fast MCG link recovery is enabled by the network, and that the UE shall initiate the procedure.
* **Cross-Carrier scheduling with different numerologies:**

**Agreements:**

* It was agreed to use the baseline CR R2-1916583 to capture stage 3 of CCS with different numerologies.
* **Other aspects:**

**Agreements:**

* ***Async CA/DC:***
  + Under async CA, clarify that the UE uses SFN of primary cell (i.e. PCell or PSCell) within the same cell group for the calculation of HARQ Process ID in SPS/CG, i.e. no change of rel-15 legacy UE behaviour.
  + Under async CA, clarify that the UE uses SFN of primary cell (i.e. PCell or PSCell) within the same cell group for calculation of downlink/uplink assignment occurrences of SPS/CG, i.e. no change of rel-15 legacy UE behaviour.
  + Under async CA, clarify that the UE uses SFN of primary cell (i.e. PCell or PSCell) within the same cell group for DRX on-duration determination, i.e. no change of rel-15 legacy UE behaviour.
  + R2 assumes that SFN from PCell is used for SI reception, thus no impact to SI reception
  + R2 assumes that SFN from PCell is used for Rel-15 DRX, thus no impact to Rel-15 DRX.
  + R2 assumes that SFN from PCell is used for UP operation (CG, DRX etc), thus no impact to UP.
  + Agreed to have an email discussion to progress the work on the RRC signaling aspects
* *[108#57][DCCA] async CA (QC)*
  + - Scope: RRC signalling design for slot offset, taking into account R1 Nov outcome.
    - Intended outcome: agreeable TP for RRC
    - Deadline: 2020-01-30
* ***UE capabilities:***
  + Agreed to have an email discussion to progress the work on UE capabilities for the CA/DC WI:
* *[108#48][DCCA] DCCA R2 feature list (Huawei)*
  + - Scope: Identify features and dependencies (incl also e.g. TDD-FDD FRx applicability), and structure (per band per BC when applicable), for LTE and NR,
    - Intended outcome: Agreeable Input to R2 feature list(s), Agreeable TPs 38.331 38.306
    - Deadline: 2020-01-30

**RAN2#109-e (Feb/Mar 2020):**

* **WI CRs:**
  + 37.340: R2-2002395
  + 36.300: R2-2002371
  + 38.300: R2-2002372
  + 36.331: R2-2002391
  + 38.331: R2-2002392
  + 38.321: R2-2002382
* **NR DC:**

**Agreements:**

* + For NR-DC power control, need an IE to indicate the semi-static TDD pattern of MCG to SN when semi-static power control Alt 1-2 is set by MN (may already be present)
  + Send an LS to check and ask for this to RAN3 (vivo). LS endorsed in R2-2001759
  + Send the LS to RAN4 to inform two new parameters introduced in RAN2 for NR-DC power control. LS endorsed in in R2-2000294.
  + For NR-DC power control, the NR-DC-PC-mode configured by MN is indicated to SN
* **Early Measurement reporting:**

**Agreements:**

* + The UE starts to perform early measurements only when it is configured with measIdleDuration in RRC(Connection)Release (i.e. early measurement cannot be started only based on SIB signalling).
  + RAN2 confirms that the different ways of configuring early measurements are:
    - All configuration received in dedicated signalling (i.e. RRC(Connection)Release; or
    - All configuration received in broadcast (except for the measIdleDuration); or
    - The dedicated signalling contains measIdleDuration and the list of the EUTRA/NR carriers:
      * For E-UTRA carriers, the measurement configuration is contained via the dedicated signaling
      * For each of the NR carriers, the SSB configuration can be configured either via dedicated signalling or via SIB.
  + RAN2 to confirm that the NR/EUTRA carrier list can not be split into SIB and dedicated signalling (i.e. either both in SIB or both in dedicated).
  + The measIdleDuration range in LTE euCA to be adopted in NR (i.e. ENUMERATED {sec10, sec30, sec60, sec120, sec180, sec240, sec300, spare})
  + As in LTE euCA, the RSRQ-Range-r13 IE (i.e. -30..46) will be used for specifying the thresholds for early measurement reporting of E-UTRA carriers in NR.
  + The SCS IE to be on the top level of the MeasIdleCarrierNR (i.e. not within the ssb-MeasConfig IE).
  + Capture the “available” aspect in procedure text.
  + Clarification to be added in 36.331 that the UE will be configured with only one validity area (either the rel-15 or rel-16 version).
  + In LTE/NR rel-16, the UE performs measurement on a carrier only if it is capable of CA or DC between the concerned carrier and the serving carrier.
  + No special handling will be specified for the case of 2-step resume without context fetch (i.e. can be handled via network implementation).
  + RNA update is not triggered due to going out of the validity area.
  + For early measurements while camping in LTE, the UE is required to measure E-UTRA if idleModeMeasurements-r15 is included. The UE is required to measure NR carriers, if idleModeMeasurements-r16 is included IEs, in SIB2 respectively.
  + In NR rel-16, the idleModeMeasurements can be used to specify whether the UE is required to perform early measurements on EUTRA, NR or both carriers. FFS if one IE (i.e. ENUMERATED {eutra, nr, both} or separate IEs (i.e. one for EUTRA, one for NR) is to be used.
  + The frequencyBandList to be on the top level of MeasIdleCarrierNR. FFS regarding nrofSS-BlocksToAverage-r16 and absThreshSS-BlocksConsolidation-r16 IEs.
  + No additional information elements regarding dedicated SSB configuration validity will be specified.
  + In rel-16, SFTD measurements cannot be configured as part of early measurement configuration.
  + No special handling of early measurement results during inter-RAT cell reselection will be specified.
  + The early measurement configuration will not be enhanced to support per (serving)-frequency early measurement target frequency list.
  + A NOTE to be added in 36/38.331 that UE is not required to perform early measurements on a given frequency if it finds mismatch between dedicated and SIB SSB configuration.
  + For early measurement configuration and reporting, ASN.1 signalling to allow the configuration of
    - up to 8 E-UTRA and 8 NR carries to be measured
    - up to 8 E-UTRA and 8 NR carriers to be reported
    - up to 32 beams to be included in the NR results
    - LS to be sent to RAN4 (Ericsson), with the purpose of:
      * informing RAN2 decision
      * asking for input:
        + clarification on the UE requirement aspects of early measurement performance and reporting
      * LS endorsed in R2-2002376
* **Efficient and low latency configuration/signaling (Fast SCell Activation):**

**Agreements:**

* + The network will explicitly configure the dormant BWP associated with one BWP id by RRC in downlinkBWP-ToAddModList and explicitly indicate the dormant BWP in ServingCellConfig (similar to first active downlink BWP and default downlink BWP).
  + Legacy SCell A/D MAC CE can be used to transit a SCell from activated state to deactivated state, no matter whether the SCell is in dormant BWP or not.
  + Legacy SCell A/D MAC CE can be used to transit a SCell from deactivated state to activated state, the BWP with firstActiveDownlinkBWP-Id is activated like legacy
  + No impact on the behaviour of sCellDeactivationTimer due to dormancy behaviour.
  + bwp-InactivityTimer should stop if running when UE enters dormant BWP.
  + Timer-based transition between non-dormancy and dormancy is NOT supported (i.e. no new timer or timer behaivour is introduced).
  + Rel-15 legacy behaviour of TA maintenance will be applied for dormancy Scell (i.e. no spec impact)
  + L1 based mechanism agreed in RAN1 can only apply to activated state cell. The UE should ignore the dormancy indication in DCI for deactivated SCell.
  + Network will configure the BWP id via RRC to be activated BWP upon transition from dormancy behavior to non-dormancy behavior (does not reuse the firstActiveDownlinkBWP-Id in RRC).
  + UE will not monitor the PDCCH for the SCell when enter dormant BWP for the SCell.
  + The pdcch-Config IE, pdcch-ConfigCommon and sps-Config IE are not configured for the dormant BWP. And CSI-RS configuration can be configured for the dormant BWP.
  + To support beam management in dormancy SCell:
  + - The tci-StatesToAddModList in pdsch-Config IE can be configured for the dormant BWP.
  + - BFR is supported and radioLinkMonitoringConfig IE and BeamFailureRecoverySCellConfig can be configured for dormant BWP for beam failure detection purpose.
  + - An LS to be sent to RAN1 to check any issues.
  + performing periodic or semi-persistent CSI measurements on dormancy SCell with the corresponding report transmitted on other cell (i.e., sPCell or non-dormancy SCell) is supported”.
  + At most 2 set of SCell group configuration are supported in RRC signalling, i.e. Scell-groups-for-dormancy-outside-active-time and Scell-groups-for-dormancy-within-active-time as defined in RAN1.
  + In one SCell group configuration set, SCell can be configured only in one dormancy SCell group and the only the SCell configured with dormant BWP can be configured in the dormancy SCell group.
  + SRS transmission (including aperiodic SRS, semi-periodic SRS and periodic SRS) is not supported in case the DL BWP is switched to dormant BWP. This point will be included in the RAN1 LS to allow issues checking.
  + The UE should stop all the UL behavior in case the DL BWP is switched to dormant BWP, i.e. stop any UL transmission, suspend any configured uplink grant Type 1, clear any configured uplink grant of configured grant Type 2 in the dormancy SCell. This point will be included in the RAN1 LS to allow issues checking.
  + No UL dormant BWP is defined, and the UL behaviour is specified in TS38.321 in case the DL BWP is switched to dormant BWP.
  + No limitation for relationship between first active BWP and dormant BWP for BWP configuration, i.e. no spec impact.
  + Include in LS to R1 question what is the scenario for and whether the UE will receive two indications as a consequence of <Two separate first active non-dormant BWPs will be configured in RRC for the cases within active time and outside active time respectively when leaving dormant BWP>
  + *FFS: the implicit BFD-RS configuration for dormant BWP is supported or not*.
  + Aperiodic CSI reporting (no matter it is triggered via self-carrier scheduling or cross-carrier scheduling, no matter it is transmitted on dormant SCell or on other non-dormant SCell) is not supported.
  + The pdcch-ConfigCommon IE, sps-Config IE are not configured for dormant BWP and CSI-RS configuration can be configured for dormant BWP
  + To support beam management in dormancy SCell:
    - The tci-StatesToAddModList in pdsch-Config IE can be configured for the dormant BWP.
    - if PDSCH-Config is configured in dormant BWP, the UE only applies the TCI state, and doesn’t apply other configurations.
    - pdsch-ConfigCommon IE are not configured for dormant BWP;
  + The BFR is supported for the dormant BWP and BFR procedure follow the R16 eMIMO agreements. Both radioLinkMonitoringConfig IE and BeamFailureRecoverySCellConfig can be configured for dormant BWP for beam failure detection purpose.
  + To support SCell group configuration in RRC:
    - At most 2 sets of Scell group configuration are supported in RRC signalling, i.e. Scell-groups-for-dormancy-outside-active-time and Scell-groups-for-dormancy-within-active-time as defined in RAN1.
    - One Scell could be configured only in one Scell group of the outside active time Scell Groups. One Scell could be configured only in one Scell group of the inside active time Scell Groups
    - Only Scell configured with dormant BWP can be configured in the dormancy Scell group.
  + LS to RAN endorsed in R2-2002381
* **Efficient and low latency configuration/signaling (MCG SCell and SCG Configuration with RRC Resume)**

**Agreements:**

* + If “SecondaryCellGroup” is included in RRC(Connection)Resume without “restoreSCG”, UE shall release the stored SCG configuration and apply SCG configuration in “SecondaryCellGroup”.
  + confirm that we Support SCG delta configuration in RRCResume message (by including restoreSCG and secondaryCellGroup).
  + For restoreSCG upon RRC resume, Network shall always include secondaryCellGroup (with at least reconfigurationWithSync) together with restoreSCG.
* **Fast MCG recovery:**

**Agreements:**

* + The values for T316 are: ms50, ms100, ms200, ms300, ms400, ms500, m600, ms1000, ms1500, ms2000
  + RAN2 to confirm that in case of MCG failure during the execution of PSCell change or addition, the UE shall trigger RRC re-establishment procedure (as currently implemented in the RRC Running CR).
  + FFS if The MR-DC scenarios illustrated in Table B-1 of TS 37.340 are supported for the fast MCG recovery procedure (i.e., the intention is to not support additional cases than the one illustrated in Table B-1 of TS 37.340).
  + RAN2 to confirm that, in case of SRB3, the MCGFailureInformation and the response to it are sent encapsulated within the ULInformationTransferMRDC and the DLInformationTransferMRDC.
  + RAN2 confirms that the option can be adopted to handle the pending SCG RLC failure report upon the triggering of MCG fast recovery is left to UE implementation.
  + RAN2 to confirm that, upon triggering RRC re-establishment due to the T316 expiry, the UE shall set the reestablishmentCause to otherFailure.
  + RAN2 assumes to not specify any network behaviour regarding the setting of the timer T316 in relation to the value of the inactivity timer.
  + It is confirmed that the UE expects the network to explicitly reconfigure the primaryPath back to MCG after sending the MCGFailureInformation. If some clarification (i.e., a note) is needed this is discussed in the RRC running CR.
* [Post109e][DCCA] Fast MCG recovery (Ericsson)

Scope: Referring to R2-2002226, a) SN change during the fast MCG recovery in an email discussion to the next meeting, b) the supported MR-DC handover scenarios for the fast MCG recovery.

Intended outcome: Report, pave the way for agreements

Deadline: Next Meeting

* **Other aspects:**

**Agreements:**

* ***Async CA/DC:***
* In all MR-DC with async CA involving FR2 carrier(s), NW always explicitly indicate which serving cell as FR2 gap timing via RRC.
* In (NG)EN-DC and NR SA with async CA involving FR2 carrier(s), NW indicates which FR2 serving cell as FR2 gap timing reference via a newly introduced RRC IE refFR2ServCellAsyncCA. Same as NR rel-15, SpCell in FR1 can’t be used as FR2 gap timing reference.
* Introduce separate field descriptions on tdm-PatternConfig-r15 and tdm-PatternConfig-r16 with clarifications on their different use cases and UE behaviours:
* tdm-PatternConfig-r15: it is used when power control or IMD issues require single UL transmission in EN-DC with LTE FDD PCell
* tdm-PatternConfig-r16: it is used when power control or IMD issues require single UL transmission in EN-DC with LTE FDD/TDD PCell, and when DL de-sensing issue from harmonic require dual UL transmission in EN-DC with LTE FDD PCell.
* In NE-DC and NR-DC with async CA involving FR2 carrier(s), NW indicates which FR2 serving cell as FR2 gap timing reference via the new RRC IE refFR2ServCellAsyncCA when IE refServCellIndicator is set to mcg-FR2.
* Revert the RAN2#108 agreements on CG/SPS in Async CA as:
* Under async CA, the UE uses SFN of concerned serving cell for the calculation of HARQ Process ID in SPS/CG (no change of rel-15 legacy UE behaviour).
* Under async CA, the UE uses SFN of concerned serving cell for the calculation of downlink/uplink assignment occurrences of SPS/CG (no change of rel-15 legacy UE behaviour).
* Capture the clarifications on DRX, CG and SPS in Async CA in TS 38.321
* CRs in R2-2000122/R2-2002231 (for 38.331), and R2-2002325 (for 36.331) endorsed
* ***UE capabilities:***
* Offline discussion, resulting in agreed TPs R2-2001190(38.331), R2-2001191(36.331), and CRs R2-2001192(38.306), R2-2002335(36.306)

**RAN2#109bis-e (April 2020):**

* **WI CRs:**
  + 36.331: R2-2003881
  + 38.331: R2-2003882
* **NR DC:**

**Agreements:**

* + Reply LS to RAN1 on NR-DC power control is approved in R2-2004196.
  + Email discussion until next meeting regarding NR-DC
    - Post109bis-e][DCCA] Uplink power control for NR-NR Dual-Connectivity (Apple)
    - Scope : introduction of/modification of inter-node signalling to support what is decribed in R2-2002517
    - Outcome : Report
    - Deadline : Next meeting
* **Early Measurement reporting:**

**Agreements:**

* + RAN2 to confirm that the intention is that NR sleeping cells are not considered for early measurements (i.e. SMTC2-LP not included in NR ssb-MeasConfig).
  + RAN2 to confirm that the 8 carriers per cell limitation for reporting early measurements does not include the PCell (i.e. 8 neighbor cells can be included for the serving cell carrier and no changes are required regarding the qualityThreshold field description.
  + The NOTE regarding UE behavior on SSB configuration differences between dedicated and broadcasted signaling to be kept (not sufficient support to change).
  + The new rel-16 IE (in 36.331) to enable the reporting of up to 8 EUTRA carriers in early measurement results, will be used to include only the additional 5 carriers that can be reported in rel-16 (as captured in [5])
  + When the UE is configured to measure more frequencies than it is configured to report, it is left up to UE implementation on which frequencies to include in the early measurement report.
  + The cell quality and beam quality derivation procedures for connected mode will be reused also for early measurements (with appropriate changes to clarify that layer3 filtering is not applied for the case of early measurements). The proposals in R2-2003395/R2-2003718 to be used as baseline
  + (For 36.331) to enable the network to configure only NR carriers for early measurements, without the need to include E-UTRA carriers, the definition of the NR carrier list can be included in a separate IE outside the measIdleConfigSIB-r15.
  + (For 36.331/38.331) to explicitly capture in the procedure text that the UE will not consider the early measurement carrier list(s) in SIB if it has received any of the carrier lists (i.e. E-UTRA, NR, or both) in RRC(Connection)Release.
  + Two IEs: idleModeMeasurementsNR and idleModeMeasurementsEUTRA to be used in NR SIB1 to indicate whether the UE performs EUTRA and NR early measurements
  + The cell quality derivation parameters (NR: nrofSS-BlocksToAverage-r16 and absThreshSS-BlocksConsolidation-r16; LTE: maxRS-IndexCellQual and threshRS-Index) will be kept under the ssb-MeasConfig.
  + A maximum of 8 cells per carrier can be reported for early measurements in LTE/NR rel-16.
  + In LTE, a need code of “Need OR” to be used for the following IEs inside ssb-MeasConfig of MeasIdleCarrierListNR: measTimingConfig-r15, maxRS-IndexCellQual-r15, threshRS-Index-r15 and ssb-ToMeasure-r15.
  + To use a new rel-16 IE (in 36.331) to enable the reporting of up to 8 EUTRA carriers in early measurement results
* **Efficient and low latency configuration/signaling (Fast SCell Activation):**

**Agreements:**

* + RAN2 confirm that, for TDD, the first non-dormant UL BWP is the UL BWP with the same ID as the first non-dormant DL BWP (no change to today, wrt BWP switching).
  + RAN2 confirm that UE do not switch UL BWP (for FDD) as a result of transition from dormancy to non-dormancy or vice versa (no change to today, wrt BWP switching).
  + The activated SCell on which the active BWP is dormant BWP should not be included in PHR report. FFS whether we need addition/modification to PHR trigger.
  + For dormant BWP configuration :
    - Dormant BWP configuration should be based on condition that UE is configured with at least two BWPs for an SCell.
    - Dormant BWP configuration can be configured in SCell addition and SCell modification procedure.
* **Efficient and low latency configuration/signaling (MCG SCell and SCG Configuration with RRC Resume)**

**Agreements:**

* + Confirm the use of the new rel-16 IE SCellToAddModList IE (included in latest 36.331 DCCA CR) for SCell addition/modification in RRCConnectionResume.
  + The sPCellCommonConfig for the PSCell is saved as part of the UE AS Inactive AS context.
  + Send LS to RAN3, informing on RAN2’s agreement (LG)
    - The sPCellConfigCommon for the PSCell is saved as part of the UE AS Inactive AS context.
    - LS approved in R2-2004242
  + Update the previous RAN2 agreement as below:
    - For restoreSCG upon RRC resume, Network shall always include secondaryCellGroup (with at least reconfigurationWithSync of NR SCG, or mobilityControlInfoSCG of LTE SCG) together with restoreSCG.
  + RAN2 confirm not to introduce mechanism for checking the validity of stored PSCell in Rel-16.
  + Under the assumption that encryption for this message is possible now and no other functional changes are needed, LTE RRCConnectionResume message can be used to restore NR SCG in case of EN-DC (Note ngEN-DC with 5GCN was already agreed/assumed).
* **Fast MCG recovery:**

**Agreements:**

* + During fast MCG recovery, it is up to network implementation to guarantee that the RRC-related messages are delivered to the UE by the SN before the release of its control plane resources.
  + RAN2 assumes it is feasible to support inter-RAT HO during fast MCG recovery.
  + Send an LS to RAN3 to ask to implement the necessary signaling to support inter-RAT HO during fast MCG recovery.
  + Apart from inter-RAT HO, all handover scenarios according to Table B-1 of TS 37.340 that have a DC option in the column “from” are supported in fast MCG recovery.
  + Inter-RAT handover via SRB3 is supported upon MCG failure recovery, including the following scenarios: Case 1: (NG)EN-DC to NR; Case 4: NR-DC to LTE/EPC; Case 5: NR-DC to LTE/5GC; Case 6: EN-DC to GERAN/UTRAN; Case 8: NR-DC to UTRAN-FDD (i.e. SRVCC from 5G to 3G)
  + UE can include UTRAN-FDD measurement results in MCG Failure Information message.
  + When SCG RLC failure is detected, in case SRB3 is not configured, and MCG transmission is suspended, the UE shall trigger the failure information procedure and transmit the FailureInformation message via the SCG leg of split SRB1.
  + The related ASN.1 field (and configuration) of the timer T316 is moved from the RLF-TimersAndConstants IE to the RRCReconfiguration message.
* **Capabilities and Other aspects:**

**Agreements:**

* + Remove FFS1 in endc-IdleInactiveMeasurements-r16, i.e. a LTE UE that supports endc-IdleInactiveMeasurements-r16 is not required to support ca-IdleInactiveMeasurements-r16.
  + Remove FFS2 in endc-IdleInactiveMeasurements-r16, i.e. in LTE, endc-IdleInactiveMeasurements-r16 applies to LTE IDLE, INACTIVE, and RRC connection suspension states.
  + In NR, UE capability for MCG RLF recovery via SCG does not distinguish between NR and E-UTRA SCG.
  + LTE UE that supports idleInactiveValidityAreaList-r16 is not required to support ca-IdleModeValidityArea-r15 (i.e. remove the FFS).
  + We will have 2 separate NR capabilities, ca-idle-inactive-MeasReport-r16 and nedc-idle-inactive-MeasReport-r1, to distinguish LTE and NR measurements (naming TBD)
  + Split resumeWithSCells -r16 in two separate LTE capabilities:
    - a) not deleting stored MCG SCell configuration when initiating the resume procedure"
    - b) (re-)configuration of MCG SCells in the RRCConnectionResume message",
  + Condition: if Ue support a the UE also must support b
  + Add p-maxEUTRA, p-maxUE-FR1, and tdm-patternConfig in the RRCConnectionResume message. We allow the network to release these configurations when the UE is resumed without SCG. TBD if need codes is “Need OR” etc
  + Field descriptions of harq-ACK-SpatialBundlingPUCCH, harq-ACK-SpatialBundlingPUSCH, harq-ACK-SpatialBundlingPUCCH-secondaryPUCCHgroup, and harq-ACK-SpatialBundlingPUSCH-secondaryPUCCHgroup to be updated as shown above to clarify the spatial bundling for the primary and secondary PUCCH can be disabled/enabled independently.

**RAN2#110-e (June 2020):**

* **WI CRs:**
  + 37.340: R2-2006338
  + 36.331: R2-2006349
  + 38.331: R2-2006350
  + 38.321: R2-2006080
* **NR DC:**

**Agreements:**

* + 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 T\_(proc,SCG)^max <= maxToffset.
  + 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.
  + RAN2 understanding is that upon receving and accepting maxToffset restriction from MN, SN can provide the actual maxToffsetSCG (e.g.T\_(proc,SCG)^max) in IE requestedToffset according to the SCG configuration.
  + 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.
  + LS to RAN1 on UL PC for NR-DC approved in R2-2006028
* **Early Measurement reporting:**

**Agreements:**

* + We don’t explicitly introduce support for EM for NR-U in R16, i.e. we don’t ask R4 to work on this.
  + Confirm the UE behaviour in the case that LTE SIB1 broadcasts several PLMNs:
  + If T331 is running and there is no carrier list in dedicated signalling, the UE is required to measure all NR carriers in SIB25 (because RAN4 agreed requirement is 8 NR carriers), even if carrier #X in SIB25 cannot be used if the UE has selected PLMN #Y in SIB1 (and indicates PLMN1 when it initiates connection establishment).
    - [Post110-e][080][DCCA] Early Measureemnts and Network Sharing (Huawei)

Scope: Clarify How Early Measureemnts work with Network Sharing. Determine the need for Corrections (if any).

Intended outcome: Report

Deadline: Long

* **Efficient and low latency configuration/signaling (Fast SCell Activation):**

**Agreements:**

* + to support implicit BFD-RS for dormant BWP,
    - no search space is configured in PDCCH-Config of dormant BWP but can apply tci-StatesPDCCH-ToAddList included in ControlResourceSet.
    - pdcch-ConfigCommon is not configured on dormant BWP.
  + New PHR trigger is supported due to BWP switching from dormancy to non-dormancy and the corresponding text is included in MAC CR.
    - Can also consider how to avoid redundant and frequent PHR reporting.
  + RAN2 to confirm that, for TDD, DL BWP transition from non-dormancy to dormancy also requires UL BWP switching to the same BWP-Id as the one configured for the dormant BWP.
  + Confirm that dormant SCell don’t support SRS or A-CSI.
  + Confirm that we stick with current design with two first non-dormant BWPs
  + We support the implicit configuration of the beam failure detection RS for dormant BWP, details for offline discussion.
  + We introduce limitation that default BWP can not be same as dormant BWP
  + Reply LS to RAN4 on Scell dormancy requirement scope approved in R2-2006318
* **Capabilities and Other aspects:**

**Agreements:**

* + R2 intended that Search thresholds (s-NonIntraSearchP and s-NonIntraSearchQ) do not apply to EMR measurements performed on carriers configured for EMR measurements.
    - Reply LS sent to RAN4 in R2-2006287.
  + For idle/inactive NR measurements (i.e. endc-IdleInactiveMeasurements-r16 and idleInactiveNR-MeasReport-r16), distinguish FR1/FR2.
  + For direct SCell activation, i.e. in 36.306 directSCellActivationResume-r16 and in 38.306 directSCellActivation-r16 and directSCellActivationResume-r16, define separate capabilities for MCG SCells and SCG SCells (of the same RAT).
  + For direct SCell activation, i.e. in 38.306 directSCellActivation-r16 and directSCellActivationResume-r16, distinguish FR1 SCells and FR2 SCells.

**RAN2#111-e (August 2020):**

* **Efficient and low latency configuration/signaling (Fast SCell Activation):**

**Agreements:**

* + Reactivation of SCell is supported for any BWP. In case of reactivation of dormant BWP regular dormant operation continues (e.g. no UL activity, CSI reporting) and PHR is not sent. CR to 38.321 agreed in R2-2008180.
* **Capabilities and Other aspects:**

**Agreements:**

* + For sync NR-DC:
    - 38.306 CR to capture “The UE shall not report this UE capability from this release” in field description of sfn-SyncNRDC
    - Confirm that Rel-16 UE shall support Rel-15 grouping (i.e. MCG fully in FR1 and SCG fully in FR2), for backward compatibility with Rel-15 network. No new signaling is required to be introduced.
  + For async NR-DC:
    - Introduce 1-bit indication on whether Rel-16 UE supports asynchronous operation and its supported cell grouping for a given band combination,
    - Absence of cell grouping signaling means the UE only support Rel-15 cell grouping (i.e. MCG fully in FR1 and SCG fully in FR2)
    - Cell grouping is supported, FFS: signaling detail of cell grouping (LTE cell grouping capability can be considered). MCG and SCG can be differentiated in cell grouping signalling (provided that we can finally agree on a signalling solution) FFS how to signal
  + Assume to send LS, at least for information.
  + RAN2 intends to introduce a Rel-16 UE capability for sync-DC (can be 1 bit, cell grouping or else) in a future meeting. Absence of such UE capability parameter means the UE supports release-15 cell grouping only (i.e. FR1 MCG + FR2 SCG).
    - **[Post111-e][021][NR16] UE cap NR-DC (Qualcomm)**

Scope: CRs to implement: A) 1-bit async NR-DC UE capability. B) the change that “The UE shall not report this UE capability from this release” in field description of sfn-SyncNRDC”. C) the requirement that “The Rel-16 UE shall support Rel-15 cell grouping (i.e. MCG fully in FR1 and SCG fully in FR2)”. D) LS to RAN1/4: with questions that would help RAN2 to conclude on open issues, i.e. cell grouping signalling for sync DC. Informing RAN2 agreements reached so far.

Wanted outcome: approved LS, agreed CRs

Deadline: Short

#### 2.2.2 Remaining Open issues

* + None

## 2.3 RAN3

#### 2.3.1 Agreements

**RAN3#103 (Feb/Mar 2019)**

There were only high-level discussions and no agreements yet.

**RAN3#103bis (Apr 2019)**

No TUs allocated.

**RAN3#104 (May 2019):**

No TUs allocated.

**RAN3#105 (August 2019):**

No TUs allocated.

**RAN3#105bis (October 2019)**

* **Support of efficient Cell Setup**
* Discussions on the RAN2 agreements and how to design the network aspects in terms of X2 and Xn signalling.
* There were also discussions whether all possible scenarios (with MN change and/or SN change).
* First detailed discussions on stage 3.
* For reference see [3-1]
* **Support of Fast MCG recovery:**
* Basic agreement to include respective X2 and Xn signalling in the RRC TRANSFER message to carry the MN RRC messages MCGFailureInformation (addressed to MN) and RRC Reconfiguration or RRC Release (addressed to UE).

**RAN3#106 (November 2019):**

* **Support of efficient Cell Setup**
* CR for 37.340 was endorsed [3-2] excluding MN change and SN change scenarios due to ongoing discussions in RAN2.
* CR for 38.423 agreed in [3-3] and CR for 36.423 agreed in [3-4], containing new codepoints of the Lower Layer presence status change IE to allow “suspend lower layers” and “resume lower layer”, in addition to Rel-15 codepoints that (only) allow to release and re-establish lower layer resources. Remaining functionality from Rel-15 was maintained (keeping SDAP entities (in NG-RAN only), PDCP entities, Xn-U/X2-U bearer resources, NG-U/S1-U bearer resources and UE context information shall be kept).
* CR for 38.473 agreed in [3-5]. Impact to F1AP was not discussed explicitly at RAN3#105bis. It was however decided that more discussions on the UE context content which has to be maintained during lower layer suspension in the DU in order to specify minimum requirements upon receiving the *Lower Layer Presence Status Change* IE.
* The CR for F1AP [3-6] made it necessary to also provide stage 2 in TS 38.401. A CR was agreed in [3-5] and includes an example message flow for RRC\_INACTIVE.
* **Support of Fast MCG recovery:**
* Continuation of stage 2/3 work based on agreements from RAN3#105bis
* CR for 37.340 was endorsed [3-7] introducing 2 example message flows, one for EN-DC and one for MR-DC with 5GC.
* CR for 38.423 agreed in [3-8] and CR for 36.423 agreed in [3-9], containing new IEs for inter-node RRC messages within the RRC TRANSFER message, allowing to relay RRC messages sent received over SRB3 via X2/Xn-C. In addition, it included the possibility to allow the MN knowing whether this option was actually configured in the UE by the SN.
* **RAN3#108 (June 2020):**
* RAN3 agreed changes to the F1AP to include storage of sPCellConfigCommon in UE context, based on input in an LS from RAN2. CR in R3-204338.
* **RAN3#109 (August 2020):**
* RAN3 agreed corrections to the X2/Xn SN Addition/Modification procedures for the Fast MCG recovery via SRB3. CRs agreed in R3-205622/5623.

#### 2.3.2 Remaining Open issues

* None

## 2.4 RAN4

#### 2.4.1 Agreements

**RAN4#90 (Feb/Mar 2019)**

No TUs allocated.

**RAN4#90bis (Apr 2019)**

No TUs allocated.

**RAN4#91 (May 2019):**

No TUs allocated.

**RAN4#92 (August 2019):**

A WF was agreed in R4-1909997.

* **Early Measurement reporting:**

**Agreements:**

* RAN4 defines measurement requirements for UE early measurement in IDLE and INACTIVE
* RAN4 defines UE requirements for NR Inter-RAT for early measurements
* RAN4 defines UE requirements for LTE Inter-RAT for early measurements
* The supported measurement quantities for early measurements are RSRP and RSRQ
* RAN4 defines measurement accuracy for early measurement reporting
* RAN4 defines measurement period for measurements for early reporting
* RAN4 captures requirements for early reporting based on SIB configuration
* In NR, supporting IDLE/INACTIVE mode CA measurement should not extend the measurement capability defined in Rel-15
* Discuss the definition and restriction on carriers for early measurement reporting.
* Discuss if the LTE way of using search thresholds for limiting the UE measurements for idle mode measurements for reporting.
* Analyze the necessary changes and proposed requirements
* **Efficient and low latency serving cell configuration/activation/setup**

**Agreements:**

Direct NR SCell activation:

* RAN4 defines delay requirements for directly activated configured SCell.
* RAN4 defines interruption requirements for directly activated configured SCell.
* At least as a starting point, time lines for direct NR SCell activation can be based on adapted time lines of corresponding E-UTRA requirements, where one adaptation is that additional time for CSI measurement and reporting is added.
* Provide input to RAN4#92bis on whether interruption window is to be adapted in NR requirements.
* Provide input to RAN4#92bis on values for parameters in the direct NR SCell activation time line.
* Provide analysis on necessary changes and proposed requirements

SCell activation delay:

* Two reply LSs were agreed as response to LSs received from RAN1 and RAN2:
  + On maximum allowed SCell activation delay for Rel16 CA (R4-1909995)
  + On NR fast SCell activation (R4-1910574)

**RAN4#92-bis (October 2019):**

A WF was agreed in R4-1912717.

* **Early Measurement reporting:**

**Agreements**:

* Requirements for early measurement reporting will be the same in Inactive mode and Idle mode using same principle as currently defined Inactive measurement requirements.
* For Idle measurements for early Measurement reporting companies are encouraged to provide input and views on following:
  + For NR,
    - Should RAN4 use the concept of UE idle mode measurement capability (total number of carrier) for defining requirements for early measurement reporting?
    - Should RAN4 adopt the concept of overlapping and non-overlapping carriers for defining requirements for early measurement reporting?
  + For NR, the number of carriers the UE should be able to report early measurements:
    - NR inter-frequency carriers
  + Use of measurement thresholds to decide when measurements for early reporting should be performed by the UE.
  + Impact on mobility measurement performance from measurements for early reporting.
* For Idle measurements for introducing Inter-RAT early measurements in 36.133 companies are encouraged to provide input and views on following:
  + For LTE,
    - Principle of introducing NR inter-RAT measurements for early reporting in LTE.
    - Number of NR carriers supported for early measurement reporting.
    - Detected cell status upon transitioning from connected to:
      * Idle mode, or
      * inactive mode
* For Idle measurements for UE behaviour, companies are encouraged to provide input and views on following, based on RAN2 outcome:
  + For NR,
    - At cell change, while the T331 timer is running, what is UE behaviour regarding measurements configured for EMR when:
      * One cell change occur
      * More than one cell change occur
    - At cell change, what is the UE behaviour related to reporting of EMR
      * RAN4 needs to define UE behaviour and the applicable requirements for EMR when a cell change occurs while the timer T331 is running
        + Option1: UE always stops
        + Option 2: UE always continues
        + Option 3: UE is either stops/restarts or continues the early measurement, e.g., based on the T331 timer and the time point of the cell change relative to the timer, measurement type (inter-frequency, inter-RAT, or intra-frequency), and/or the type of the change or no change in the cell/carrier relation caused by the cell change

For example, the UE could restart the measurement if the carrier relation or measurement type changes, say from overlapping carriers to non-overlapping carriers or from intra-frequency to inter-frequency, while the UE could continue if the carrier relation or measurement type do not change

* + - * + If the stops the early measurements, will they be reported?

FFS: The stopped early measurement based on old samples (before the cell change) may still be reported to the network, at least when the remaining time to the expiry of the T331 timer is short or not sufficient for the new measurement (after the cell change)

* + - * + If the UE continued, which requirement applies?

The early measurement, which was continued over a time period with one or more cell changes and was performed on a carrier which was a non-overlapping carrier with the serving carrier before and/or after the cell change, shall meet the requirement corresponding to that for the non-overlapping carrier

FFS for other scenarios

* + The concept of unknown cells considering early measurement reporting.
    - The UE shall not report or indicate the availability of measurements for EMR for unknown cells
    - If a cell measured for EMR purpose gets unknown while the T331 timer is running, the UE has to perform the cell identification prior to measuring that cell
  + Impact on early measurements after T331 stops and before reporting EMR
    - Observation: A UE may continue the measurements at least on the overlapping carriers (e.g., for mobility purpose) even after T3331 stops and report them for EMR purpose
    - If the UE continues a measurement after T331, e.g. on the overlapping carrier, RAN4 specifies applicable requirements if such measurements can be reported for EMR

**RAN4#93 (November 2019):**

* **Direct SCell activation in RRC resume message (RAN2 LS):**

A response LS to RAN2 was approved in R4-1915844, where RAN4 replies that it is RAN4 consensus that there is no blocking issue for allowing direct SCell activation in RRC resume before the UE sends early measurement results.

* **Direct SCell activation:**

The time lines and activation delays for direct SCell activation upon handover and upon SCell addition were agreed. The following issues are left for further studies:

* FFS for the direct activation requirements for multiple SCells.
* FFS during which time period of the activation delay interruption is allowed.
* **Dormancy behaviour:**

RAN4 agreed to await further progress in RAN1 before continuing work on requirements relating to dormancy behaviour.

* **Early Measurement reporting:**

A WF on early measurements was agreed in R4-1915842 with the following agreements.

**Tentative agreement**:

* An overlapping carrier is a carrier which the UE is actively measuring for mobility and EMR.
* An non-overlapping carrier is a carrier which the UE is actively measuring for EMR only.

**Working assumption** on EMR carriers:

* RAN4 EMR requirements for NR carriers while camped on NR only apply if EMR carriers are in CA combination supported by UE
* RAN4 EMR requirements for NR carriers while camped on LTE only apply if UE supports EN-DC and NR EMR carriers are in the ENDC band combination supported by UE

**Agreements** on NR measurements for UE camping on NR cell):

* Number of carriers to measure for EMR considering the use of overlapping and non-overlapping carriers:
  + Option 1: Re-use the LTE euCA requirements for number of carriers to be reported for early measurements (Qualcomm)
    - Limit the number of overlapping and number of non-overlapping carriers (i.e. LTE EMR approach)
  + Option 2: Specify the total number of carriers (MediaTek)
    - Limit the number of overlapping + non-overlapping carriers (i.e. total number of carriers for EMR)
  + Option 3: No limit on carriers that can be configured for EMR (as long as it does not exceed UE measurement capability) (Nokia, Huawei)
  + Option 4: Limit the number of non-overlapping carriers only (New, option 3 + limit on number of non-overlapping carriers)
* FFS: UE behavior when the above limits are exceeded
* Measurements for EMR and mobility:
  + Possible options:
    - S-measure threshold is assumed not applicable to carriers for EMR.
      * Overlapping EMR carriers are measured continuously.
      * Non-EMR carriers are measured according to s-Measure threshold.
    - Hence, beyond s-Measure threshold UE measures both EMR and non-EMR carriers.
    - To reduce overall measurement latency:
      * EMR carriers are measured when Serving cell RxLev is good
      * EMR carriers are not required to be measured or can be down selected when Serving cell RxLev is not good
      * Non-EMR carriers obey s-Measure threshold
  + RAN4 to discuss whether to apply threshold on serving cell condition for EMR:
    - Example:
      * EMR carriers will measured when Rxlev>threshold
      * EMR carriers are not required to be measured   
        or can be down selected when Rxlev<threshold
* Early measurement and cell change, discuss following aspects :
  + Possible Agreement: Follow RAN2 agreements which are (for information)
    - Dedicated:
      * UE performs measurements for EMR using the RRCRelease configured MOs independently from PCell changes while T331 is running.
    - SIB Configured:
      * UE performs EMR measurements according to serving cell SIB configuration while T331 is running.
    - FFS whether the above also applies when the carrier changes from overlapping to non-overlapping or from non-overlapping to overlapping after the cell change
  + Discuss if any additional rules are necessary from RAN4 side
* Early measurement and cell change, discuss following aspects:
  + At cell change, what is the UE behaviour related to reporting of EMR:
    - Option 1: leave it to UE implementation
    - Option 2: RAN4 defines specific rules
  + RAN4 to discuss introduction of the concept of unknown cells considering early measurement reporting
    - Option 1: Introduce known/unknown cells for EMR
    - Option 2: Do not introduce known/unknown cells for EMR
  + Impact on early measurements after T331 stops and before reporting EMR
    - FFS if RAN4 specifies applicable requirements for the early measurements performed and used for EMR after the expiry of the T331 timer (at least for overlapping carriers)
    - FFS if the UE shall be capable of reporting the results of the early measurements at least up to T0 after the expiry of T331
* On detected cell and cell detection:
  + The existing requirements under *ca-IdleModeMeasurements* as baseline,
  + FFS whether to defines requirements for the detected cell status for the idle mode CA measurement when UE transitions from RRC Connected mode to Idle mode and after UE has entered Idle mode in 36.133 section 4.9.2.1
* Possible options:
  + Option 1: Apply the same principles for NR inter-frequency cells.
  + Option 2: Do not apply the same principles for NR inter-frequency cells.

**Agreements** on (inter-RAT) NR measurements for UE camping on LTE cell:

* Different UE capabilities:
  1. Option 1: UE supporting *ca-IdleModeMeasurements* also support measurement of NR inter-RAT for early reporting.
  2. Option2: UE not supporting *ca-IdleModeMeasurements* support measurement of NR inter-RAT for early reporting.
  3. Other options are not precluded
  4. For all options: it is assumed that the UE under discussion is a UE capable of EN-DC, while a UE capable of existing *ca-IdleModeMeasurements* might not support EN-DC.
* Possible options: proceed the work in RAN4 defining requirements for all cases.
* Number of carriers:
  + Possible options:
    - Option 1: For a UE supporting EMR of NR inter-RAT carriers in addition to ca-IdleModeMeasurements existing number of LTE carriers as defined under ca-IdleModeMeasurements are kept unchanged
      * For a UE supporting EMR of NR inter-RAT carriers in addition to ca-IdleModeMeasurements shall support NR inter-RAT measurements on a number of NR carriers in addition to existing inter-frequency carriers as defined under ca-IdleModeMeasurements.
    - Option 2: For a UE supporting EMR of NR inter-RAT carriers in addition to ca-IdleModeMeasurements the UE support a number of EMR carriers which may be LTE or NR (total number of euCA EMR carriers remain unchanged)
    - Option 3: For a UE supporting EMR of NR inter-RAT carriers but not supporting ca-IdleModeMeasurements shall support measurements on a number of NR carriers.
    - Other options are not precluded
* Number of NR inter-RAT carriers:
  + FFS
* Detected cell state:
  + The existing requirements under *ca-IdleModeMeasurements* as baseline,
  + FFS whether to define requirements for the detected cell status for the idle mode CA measurement when UE transitions from RRC Connected mode to Idle mode and after UE has entered Idle mode in 36.133 section 4.9.2.1
* Possible options:
  + Option 1: Apply the same principles for NR inter-RAT cells.
  + Option 2: Do not apply the same principles for NR inter-RAT cells.
* **RAN4#94-e (February-March 2020):**
* *Direct SCell activation in RRC resume message*
  + Activation delay requirements were agreed and captured in 38.133 clause 8.3.6.
* *Direct SCell activation*
  + Interruption window for Direct SCell activation was discussed but related CR was postponed to next meeting.
* *Dormancy behavior*
  + Agreements:
    - RAN4 to define UE requirements for:
      * BWP switch delay from dormancy to non-dormancy
      * BWP switch delay from non-dormancy to dormancy
    - RAN4 to define UE dormancy switch delay requirements for:
      * DCI based switch
      * Timer based switch
    - RAN4 defines UE dormancy switch delay requirements for:
      * Scheduled DCI dormancy switch indication
      * Non-scheduled dormancy switch indication
      * WUS indicated dormancy switch indication
    - RAN4 initially defines dormancy switch delay requirements for one SCell after which RAN4 will define dormancy switch delay requirements when multiple SCells change between dormancy and non-dormancy
* *Early Measurement Reporting*
  + Agreements NR Early Measurement Reporting requirements:
    - RAN4 use ‘actively measured’ in the definition of overlapping and non-overlapping carriers is agreeable conditioned that RAN4 also defines the conditions for ‘actively measured’.
      * RAN4 will define the conditions for ‘actively measured’ carrier.
    - RAN4 follow RAN2 and captures that the UE performs the idle measurement for the frequencies in configured frequency list only when the UE support CA or MR-DC between the frequency and the serving frequency.
    - The total number of carriers that the UE must measure, for mobility and for EMR (overlapping and non-overlapping), should not exceed UE’s NR idle mode mobility measurement capability (section 4.2.2.1 in 38.133).
    - UE requirements related to number of overlapping and non-overlapping carriers for EMR in NR SA idle mode, use following in order to enable further discussions in RAN4 while leaving all numbers FFS:
      * The total number carriers the UE at least shall be able to measure for EMR, N ≤ 14;
        + N = A + B;
        + The number of overlapping carriers, A = [0;x];
        + The number of non-overlapping carriers, B = [0;y]
      * A, B, x and y are all FFS.
      * There may be additional restrictions on number of LTE carriers to be measured in NR idle.
    - RAN4 agree to option 1 and defines requirements for the detected cell status for the EMR measurement when UE transitions from RRC Connected mode to Idle or Inactive mode and after UE has entered Idle or Inactive mode
      * Note: further clarification as to the conditions needs to be discussed
  + Agreements NR inter-RAT Early Measurement Reporting requirements:
    - UE requirements scenarios:
      * RAN4 to continue the discussion related to UE requirements for supporting NR Inter-RAT measurements for EMR. Later RAN4 can, if needed, return to the capability discussion.
      * RAN4 defines the LTE NR Inter-RAT measurements requirements for EMR regardless of the capability, which will be discussed separately
    - Number of LTE EMR carriers to support:
      * At least agree that the total number of carriers for EMR and mobility should not exceed the corresponding Rel-15 capability
      * RAN4 discussion to continue to decide the actual number.
    - Number of NR inter-RAT carriers:
      * At least agree that the total number of carriers for EMR and mobility should not exceed the corresponding Rel-15 capability.
      * RAN4 discussion to continue to decide the actual number.
    - Cell detected status at transitioning from connected mode
      * Adopt the LTE concept:
        + An NR inter-RAT cell which is a detected cell in Connected mode prior to connection release, shall remain detected after UE has entered Idle/Inactive mode
      * Open: conditions when the detected cell status remain detected during transitioning from connected to idle or inactive mode.
* **RAN4#94-e-bis (April 2020):**
  + *inter band NR-DC FR1 UE RF requirements* 
    - Pcmax is specified for both MCG and SCG.
    - The total NR-DC power is specified for all NR-DC-PC-modes, including the applicable maximum configured power per CG in accordance with 38.213 for each NR-DC PC mode. Power class 3 is assumed on both CG and that the total NR-DC power complies with Power class 3.
    - Test cases are specified for the total measured NR-DC power (PUMAX) and the measured CG power (both depend on NR-DC PC mode).
  + *Direct SCell activation*
    - Corrections to the activation timelines were agreed.
  + *Dormancy behaviour*
    - RAN4 develops generic requirements using Rel-15 BWP switching delay requirements as baseline
      * RAN4 will further study under which conditions w.r.t. parameter changes and system configurations a faster switching than in the baseline can be achieved
    - For switching between non-dormancy and dormancy during active time, switching delay is the same for
      * dormancy indication via DCI 0-1 and DCI 1-1, respectively
      * dormancy indication via DCI 1-1 with indication per SCell group and indication per SCell, respectively
    - Existing Rel-15 BWP change interruption requirements, except for zero interruption, serve as baseline for interruptions on PCell and other SCells due to switching of single SCell from dormancy to non-dormancy
      * RAN4 is to further study whether triggering outside or inside active time, certain BWP parameter changes, and UE capabilities call for other than baseline interruption requirements
    - Measurement requirements for non-dormancy SCell serve as baseline for measurement requirements for dormancy SCell
      * RAN4 will further study whether relaxations in RRM and/or CSI measurement requirements shall be allowed for dormancy SCell
    - The UE is allowed to cause interruptions to communication with other serving cells due to measurements on dormancy SCell
      * RAN4 will further study what requirements shall apply to the interruptions caused due to measurements during dormancy
* *Early Measurement Reporting*
  + Agreements NR inter-frequency and LTE inter-RAT Early Measurement Reporting requirements (R4-2005847):
    - Actively measured condition
      * At least following conditions apply for an actively measured EMR carrier:
        + T331 timer is running.
        + Serving cell is in the validity area.
        + Serving cell support EMR
    - Definition of overlapping and non-overlapping (sub-topic 1-2)
      * An overlapping carrier is a carrier which the UE is actively measuring for EMR and mobility.
      * A non-overlapping carrier is a carrier which the UE is actively measuring for EMR.
      * Note: overlapping and overlapping carrier relates to a carrier configured for EMR.
    - Define measurement requirements for NR inter-frequency and LTE inter-RAT EMR carriers
      * NR inter-frequency EMR measurement requirements on an overlapping NR EMR carrier follow existing NR inter-frequency measurements.
      * LTE inter-RAT EMR measurement requirements on an overlapping LTE EMR carrier follow existing LTE inter-RAT measurements.
    - Defining the number of EMR carriers
      * if N>14:
        + Option 1: no RAN4 requirements defined (UE implementation)
      * Agreement: Total number of carriers that the UE needs to measure for cell reselection and EMR (overlapping or not overlapping), including NR and LTE carriers, cannot exceed Rel-15 UE capability (as defined in 38.133, section 4.2.2.1)
    - Conditions when UE is required to perform measurements for EMR
      * RAN4 at least defines UE EMR requirements for EMR carriers while T331 timer is active
      * RAN4 not to define different or additional UE behaviour than what RAN2 has defined related to EMR measurement at cell change
    - Define cell detected status based on LTE baseline and on:
      * The detected cell is on the overlapping or non-overlapping carrier (as indicated by dedicated RRC signalling or SIB), and
      * A T331 is provided during connection release, and
      * The carrier frequency of the detected cell and the serving cell are among the supported band combination of the UE
  + Agreements NR inter-RAT Early Measurement Reporting requirements (R4-2005847):
    - On measurement requirements for LTE inter-RAT EMR carriers:
      * RAN4 use existing cell detection, measurement period and accuracy of cell re-selection for NR inter-RAT measurements for EMR measurements for overlapping carriers
    - Number of LTE EMR carriers:
      * The number of LTE EMR inter-frequency carriers remain unchanged compared to Rel-15
    - Cell detected status:
      * Agreement: Define cell detected status based on LTE baseline and on:
      * The detected cell is on the overlapping or non-overlapping carrier (as indicated by dedicated RRC signalling or SIB), and
      * A T331 is provided during connection release, and
      * The carrier frequency of the detected cell and the serving cell are among the supported band combination of the UE
        + Note: last line was already agreed in RAN4#94e meeting.
* **RAN4#95-e (May-June 2020):**
  + *Direct SCell activation*
    - Interruption window placement for Direct SCell activation was agreed.
  + *Dormancy behaviour*
    - Switching delay non-dormancy to dormancy, general case w.r.t. parameter change, triggering inside active time
      * For general case w.r.t. parameter change and conditioned on that DCI is received within the first 3 OFDM symbols, switching between non-dormancy and dormancy follows the Rel-15 BWP switching time in Table 8.6.2-1.
      * For DCI-based triggering with DCI received in any of the first X OFDM symbols of a slot, and for timer-based triggering, the switching delay for transition from non-dormancy to dormancy is given by Table 8.6.2-1.
      * For DCI-based triggering with DCI received after the first X OFDM symbols of a slot, if applicable, the switching delay for transition from non-dormancy to dormancy is given by Table 8.6.2-1 plus Z additional slot(s).
      * For value of X:
        + Option 1a: X = 3 symbols
        + Option 1b: X = 7 symbols
      * For value of Z:
        + Option 2a: Z = 1 slot in numerology for the spCell in which the triggering DCI was received
        + Option 2b: Z = 1 slot in the numerology for the SCell for which the transition is triggered
      * In case SCS differs between spCell and SCell, the switching delay, except for Z slot(s), associated with the smaller SCS applies.
    - Switching delay dormancy to non-dormancy, general case w.r.t. parameter change, triggering inside active time
      * The dormancy switching delay for switching between dormancy and non-dormancy is same as for switching between non-dormancy and dormancy
    - Measurement requirements for CSI and RRM measurements during dormancy
      * UE measurement requirements are same for dormant as for non-dormant SCell.
* *Early Measurement Reporting*
  + Agreed CR to TS 38.133 (R4-2009264)
  + Agreements NR inter-frequency and LTE inter-RAT Early Measurement Reporting requirements (R4-2009263):
    - Total number of NR inter-frequency EMR carriers ≤7 carriers
    - Total number of LTE inter-RAT EMR carriers ≤7 carriers
    - UE requirements concerning number of EMR carriers:
      * RAN4 confirm, that same principle assumptions which currently applies concerning UE measurement capability would also apply to UE measurement capability of carriers configured for EMR.
      * RAN4 to specify a total number of EMR carriers the UE shall be able to measure
      * There is no need to distinguish overlapping and non-overlapping EMR carriers when considering the total number of EMR carriers
      * RAN4 will discuss and define a number of non-overlapping NR inter-frequency and/or LTE inter-RAT EMR carriers the UE at least need to be able to measure.
        + The total number of EMR carriers the UE at least shall be able to measure ≤13 carriers
      * Considering the total number of overlapping EMR carriers the UE at least shall be able to measure:
        + The UE shall at least be able to measure:

Overlapping LTE inter-RAT EMR carriers ≤7 LTE carriers

Overlapping NR inter-frequency EMR carriers ≤7 NR carriers

Number of non-overlapping LTE inter-RAT carriers ≤ [1, 2] carrier(s)

* + - UE requirements related to EMR and beam-level measurement capability:
      * Companies propose to introduce this as a UE capability. Hence, assuming capability is introduced moderator suggest that RAN4 will define beam level measurements for EMR requirements for UE supporting such capability
      * For a UE supporting beam level EMR RAN4 will introduce beam level measurement requirements for EMR under the assumption that UE will be allowed additional time for such measurement. Numbers are FFS.
      * For a UE not supporting beam level measurement for EMR capability shall support cell level measurement for EMR
      * Note: UE requirements related to EMR and beam-level measurement capability is a UE capability
    - Detected cell conditions details:
      * RAN4 include into the cell detected state condition upon transition to idle/inactive mode that the detected cell status is only applicable on SSB level, i.e. for one cell, UE can consider the SSBs detected in connected mode as also detected when entering into idle mode
      * Adopt option 1 and add a condition similar to the condition used in LTE: ‘In the absence or expiration of T331, it is up to UE implementation to apply the requirements on the detected cell status in this subclause’.
    - UE measurement requirements for EMR when T331 has expired:
      * RAN4 will not define UE measurement requirements for EMR when T331 has expired
    - UE requirements related to EMR measurements at cell change:
      * RAN4 will not define requirements at cell change
  + Agreements NR inter-RAT Early Measurement Reporting requirements (R4-2009263):
    - Capturing the UE capability:
      * Capture the UE capability in the requirements. Wording can be discussed further
    - Number of NR Inter-RAT EMR carriers to measure:
      * The number of NR Inter-RAT EMR carriers to measure (total) is 8
      * Define a separate limit on number of non-overlapping carriers for inter-RAT NR EMR
    - Cell detected status when entering idle mode:
      * Follow agreement for NR inter-frequency as discussed in Sub-topic 1-6 as closely as possible
    - Beam level measurements for NR Inter-RAT EMR (2-6):
      * Define UE measurement capability to support beam-level measurements for EMR on inter-RAT NR carriers
      * Beam level measurements for NR Inter-RAT EMR follow agreements for UE requirements related to inter-frequency beam level EMR reporting
      * Beam level measurements for NR Inter-RAT EMR follow agreements for UE requirements related to inter-frequency beam level EMR reporting
      * Note: UE requirements related to EMR and beam-level measurement capability is a UE capability
* **RAN4#96-e (August 2020):**
  + *Early measurement reporting*
    - *WF (R4-2012301, Nokia)*
      * *Agreements on NR measurements in 38.133:*
        + *Issue 1-2-2-1: Number of non-overlapping EMR carriers:*

*The number of non-overlapping inter-frequency EMR carriers is ≤7*

* + - * + *Issue 1-2-2-2: Number of non-overlapping EMR carrier when the total number limit is exceeded:*

*RAN4 will not define requirements for number of non-overlapping EMR carrier when the total number limit is exceeded*

* + - * + *Issue 1-2-3-1: NR inter-frequency beam-level measurement capability:*

*RAN4 agree following related to NR inter-frequency beam-level measurement capability:*

*FR1: 7 SSBs with different SSB index and/or PCI per inter-frequency layer*

*FR2: 10 SSBs with different SSB index and/or PCI per inter-frequency layer*

* + - * + *Note: number of carriers for scaling requirements can be further considered and discussed.*
        + *Issue 1-2-5-1: For overlapping EMR carriers:*

*For overlapping EMR carriers, the UE measurement accuracy requirements for carriers configured for EMR:*

*RAN4 to define relaxed NR measurement requirements for overlapping carrier compared to existing NR inter-frequency requirements in terms of SNR and accuracy*

*LTE inter-RAT measurement requirements for overlapping carrier follows existing LTE inter-frequency requirements for CA Idle mode measurements for overlapping carrier*

* + - * *Agreements on NR measurements in 36.133:*
        + *Sub-topic#2-1: s-NonIntraSearch thresholds and EMR carriers:*

*s-NonIntraSearch thresholds and NR inter-RAT EMR carriers follow agreements for NR measurements for EMR.*

* + - * + *Sub-topic#2-2: Capturing the UE capability:*

*Capture the UE capability according to the proposed applicability text in 36.133 (R4-2010569) with necessary name correction.*

* + - * + *Sub-topic#2-3: Number of NR Inter-RAT EMR carriers to measure:*

*UE should be able to measure up to 8 overlapping and non-overlapping inter-RAT NR EMR carriers in total:*

*Overlapping NR inter-RAT carriers: ≤8*

*Non-overlapping NR inter-RAT carriers: ≤2*

* + - *R4-2012248 (CR to introduce EMR in 36.133, Huawei)*
    - *R4-2012112 (LS response on measurement capability for EMR, Ericsson)*
    - *R4-2012297 (LS on EMR measurement requirements in NR, Ericsson)*
  + *Direct SCell activation (R4-2012213):*
    - Delay requirements for direct activation of multiple SCells are based on those for MAC CE based activation of multiple SCells, with adaptation for RRC-based instead of MAC-based triggering.
      * The applicable scenarios are same as for MAC CE based multiple SCell activation.
      * Delay requirements for Direct SCell activation of multiple SCells shall fulfill:
        + For SCell addition and RRC resume: Ndirect\_multiple\_scells = TRRC\_Process + T1 + Tactivation\_time\_multiple\_scells + TCSI\_Reporting - 3ms, where Tactivation\_time\_multiple\_scells is defined in clause 8.3.7
        + For Handover: Ndirect\_multiple\_scells = TRRC\_process + Tinterrupt + T2 + T3 + Tactivation\_time\_multiple\_scells + TCSI\_Reporting - 3ms, where Tactivation\_time\_multiple\_scells is defined in clause 8.3.7
      * TFirstSSB\_MAX\_multiple\_scells used in Tactivation\_time\_multiple\_scells is clarified with respect to start time of the activation process in direct activation (accounting for difference between MAC and RRC-based triggering)
    - Definition of interruption windows for Direct Scell activation of Multiple Downlink Scells at SCell addition, RRC Resume, and Handover shall be based on the corresponding interruption windows for single Scell, with the following case added:
      * TFirstSSB\_MAX\_multiple\_scells, for any scenario where Tactivation\_time\_multiple\_cells includes TFirstSSB\_MAX\_multiple\_scells
    - Direct Scell Activation of Multiple Downlink Scells at Scell addition, RRC Resume, and Handover shall be supported for [2] Scells.
  + *SCell dormancy (R4-2012278):*
    - Remove Timer-based triggering from requirement scope and only define requirements for DCI-based triggering
    - Only introduce generic dormancy switching delay requirements. The further need for optimizations w.r.t. parameter change can be discussed in the future release, if needed.
    - Allow additional [1] slot delay for SCell dormancy switching to compensate for cross carrier scheduling. In case SCS differs between spCell and SCell, the smaller SCS applies for the delay requirement.
    - Capture the delay requirement for triggering after first 3 OFDM symbols in a DCI format-agnostic manner. In case RAN1 introduces restrictions for DCI formats 0\_1 and/or 1\_1, RAN4 will update the RRM specification accordingly. For delay requirement, additional Z=1 slot (spCell numerology) delay is applied for DCI received after first X=3 symbols in a slot.
    - Define interruption requirements for transition into/out of dormancy in a single SCell during active time as follows:
      * Interruption length as for BWP switching between non-dormant BWPs applies
      * The starting time of interruption is only allowed within the BWP switching delay for transition between dormancy and non-dormancy
      * If UE is not capable of per-FR gap, UE is allowed to cause interruption of up to X slots to other active serving cells.
      * If UE is capable of per-FR gap, UE is allowed to cause interruption of up to X slots to other active serving cells in the same frequency range
      * If UE is capable of per-FR gap, and the BWP switching involves a SCS change, the UE is additionally allowed to cause interruptions of up to X slots to other active serving cells in any frequency range.
      * Interruptions are allowed regardless of which parameters change between dormancy and non-dormancy
    - Define delay and interruption requirements for transition into/out of dormancy in a single SCell outside active time (DCI 2\_6) as follows:
      * The same set of switch delay requirements shall be applied as for triggering inside active time;
      * The same set of interruption requirements shall be applied as for triggering inside active time.
      * If RAN1 defines something that makes Dormant BWP switching time/interruption outside DRX active time to always be absorbed into WUS gap, RAN4 will revise the specification text accordingly.
    - Define interruption requirements for CSI-RS and SSB-based measurements on dormant SCell as follows:
      * The total rate of ACK/NACK feedback loss on any non-dormant serving cell resulting from CQI measurements and RRM measurements on dormant SCells, shall not exceed [0.5]%.
    - Define delay requirements for switching of multiple SCells into/out of dormancy as follows:
      * delay requirements for switching of multiple SCells into/out of dormancy shall be based on corresponding delay requirements for switching of multiple SCells between non-dormant BWPs, i.e., TMultipleBWPswitchDelay or TMultipleBWPswitchDelay+Z for simultaneous BWP switching case.
      * Incremental processing time per CC value D is reused from BWP switching on multiple CCs
      * Companies can as part of maintenance further look in to whether to introduce a separate capability with respect to incremental value D for SCell dormancy switching.
    - Define interruption requirements for switching of multiple SCells into/out of dormancy as follows:
      * Interruption requirements for switching of multiple Scells between dormancy and non-dormancy are based on corresponding interruption requirements for switching of multiple SCells between non-dormant BWPs, i.e., the interruption as defined for single CC dormancy switch is allowed for each dormancy switch.
      * Interruption is allowed regardless of which parameters change between dormancy and non-dormancy
      * The further need for optimizations can be discussed in the future release, if needed

#### 2.4.2 Remaining Open issues

Core part:

* RRM requirements for early Measurement reporting

Performance part:

* RRM test cases for early Measurement reporting
* RRM test cases for activation/deactivation of multiple SCells
* RRM test cases for SCell dormancy switching delay/interruption requirements

## 2.5 RAN5

#### 2.5.1 Agreements

#### 2.5.2 Remaining Open issues

#### 2.5.3 Remaining Open issues with cross-WG dependencies

## 2.6 RAN6

#### 2.6.1 Agreements

#### 2.6.2 Remaining Open issues

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

## 3.1 SAx/CTs

#### 3.1.1 Agreements with cross-TSG impacts

#### 3.1.2 Remaining Open issues with cross-TSG impacts

## 4. References

[3-1] R3-196154 "Summary of offline discussion for RRC Resume", report on offline discussions during RAN3#105bis

[3-2] R3-197599 "Resuming SCG in RRC Resume", draft CR 37.340 Rel-16, endorsed at RAN3#106

[3-3] R3-197600 "Resuming SCG in RRC Resume", CR0259r2 38.423 Rel-16, agreed at RAN3#106

[3-4] R3-197779 "Resuming SCG in RRC Resume", CR1391r4 36.423 Rel-16, agreed at RAN3#106

[3-5] R3-197778 "CR for TS 38.473 on supporting SN Resume during the RRCResume procedure", CR0514r2 38.473 Rel-16, agreed at RAN3#106

[3-6] R3-197743 "Support of SN Resume during the RRCResume procedure", CR0112 38.401 Rel-16, agreed at RAN3#106.

[3-7] R3-197780 "Support for MCG RLF information delivery over SRB3", draft CR 37.340 Rel-16, endorsed at RAN3#106

[3-8] R3-197781 "Fast MCG link recovery via SRB3", CR1416r2 36.423 Rel-16, agreed at RAN3#106

[3-9] R3-197782 "Fast MCG link Recovery with SRB3", CR02852 38.423 Rel-16, agreed at RAN3#106

14.11.2019 minor adaptations for RAN #86

18.08.2019 minor adaptations for RAN #85

12.05.2019 minor adaptations for RAN #84

27.02.2019 minor adaptations for RAN #83

21.11.2018 completion levels with colours added (for RAN #82)

v04.81 31.07.2018 simplification of template and addition of cross-TSG aspects (for RAN #81)

v04.80 21.05.2018 minor adaptations for RAN #80

v04.79 26.02.2018 minor adaptations for RAN #79

v04.78 18.11.2017 minor adaptations for RAN #78

v04.77 06.08.2017 minor adaptations for RAN #77

v04.76 15.05.2017 minor adaptations for RAN #76

v04.75 31.01.2017 minor adaptations for RAN #75

v04.74 28.10.2016 minor adaptations for RAN #74

v04.73 01.09.2016 adaptations for RAN #73 (time units in extra Excel table, RAN6 reporting included)

v04.72 26.05.2016 adaptations for RAN #72 (introduction of NR & GERAN TUs)

v04.71 10.02.2016 minor adaptations for RAN #71

v04.70 30.10.2015 minor adaptations for RAN #70

v04.69 12.08.2015 minor adaptations for RAN #69

v04.68 21.05.2015 minor adaptations for RAN #68

v04.67 01.02.2015 minor adaptations for RAN #67

v04.66 16.11.2014 minor adaptations for RAN #66

v04.65 16.08.2014 minor adaptations for RAN #65

v04.64 22.05.2014 minor adaptations for RAN #64

v04.63 24.01.2014 restructuring for RAN #63 to cover Core & Perf. in one doc file

v03.62 11.11.2013 section 1.2.3 adapted for RAN #62

v03 11.08.2013 section 1.2.3 added on time budget

v02 07.05.2010 history added, some spelling corrections

v01 13.11.2009 First version of the template