**3GPP TSG-RAN WG1 #100bis-e R1-20xxxxx**

**e-Meeting, April 20th – 30th, 2020**

**Source: Moderator (Ericsson)**

**Title: Summary of email discussion [100b-e-NR- LTE\_NR\_DC\_CA-ScellDormancy-02]**

**Agenda item:** **7.2.10.3**

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

# 1 Introduction

This document provides summary of email discussion [100b-e-NR- LTE\_NR\_DC\_CA-ScellDormancy-02] on following issues discussed during preparation phase of RAN1#100bis-eMeeting

Below are the topics (1-1/2/3/4/5) identified in [R1-2002739](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100b_e/Inbox/R1-2002739.zip) [1]

* 1-1: Processing time and HARQ timing for Case 2 dormancy indication
* 1-2: UE behavior for SCells configured with dormant BWP when DCI 2-6 is not detected
* 1-3: Handling of CIF≠0 for Case 2 dormancy indication
* 1-4: Handling of “BWP indicator field” in DCI of SCell with dormant BWP
* 1-5: DCI format 1\_1/0\_1/2\_6 with dormancy indication only in first 3 symbols of a slot

# 2. Discussion

### 2.1 Topic 1-1

Please provide your input to below questions Q1-Q3 on this topic, preferably by 04/21 (evening PST).

#### Question 1

Q1. What should be the minimum processing time requirement for time between the end of Case 2 PDCCH with SCell dormancy indication and corresponding HARQ-ACK (please provide ‘full proposal’ as much as possible)?

Companies are requested to indicate their view about the above question in the Table below.

|  |  |
| --- | --- |
| **Company Name** | **Comments (1-1, Q1)** |
| vivo | We prefer to apply the same processing time requirement as SPS release PDCCH. The desirable HARQ-ACK feedback time of Case 2 PDCCH can be decided by gNB implementation considering the BWP switching gap and the UE processing time, by indicating a proper K1 value.  |
| Panasonic | By reading some of the contributions touching this topic, it is understood the motivation to change/clarity the minimum processing time requirement is that the UE does not need to process PDSCH but only to deal with dormancy indication. Hence the minimum processing time requirement should not be longer than or even possibly smaller than current timeline as per the PDSCH processing capability. Until decoding the DCI, UE does not know in advance whether the DCI format 1\_1 indicates (1) normal PDSCH scheduling, or (2) normal PDSCH scheduling + 5 Scell dormancy indication, or (3) no PDSCH scheduling but up to 15 SCell dormancy indication. So in our opinion, if UE determines the processing timeline before detecting the DCI, no special handling is needed and just reusing legacy cross-BWP scheduling requirement covering all the three case will work fine. |
| Nokia, NSB | Our preference is to keep the numbers as captured in the current specification, but we understand that for cross-carrier scheduling, supporting CIF≠0 for a case 2 dormancy DCI, some extra delay may be required. In any case we are not willing to accept numbers higher than in below proposal derived based on cross-carrier cross-numerology scheduling framework. **Proposal 2**: *Minimum processing time requirement from the end of CASE2 PDCCH to HARQ-ACK is no larger and preferably smaller than* * If *processingType2Enabled* of *PDSCH-ServingCellConfig* is set to *enable* for the serving cell with the PDCCH providing the DCI format 1\_1
	+ *12 symbols for* $μ=0$
	+ *15 symbols for* $μ=1$
	+ *27 symbols for* $μ=2$
	+ *34 symbols for* $μ=3$
* *Otherwise,*
	+ *7 symbols for* $μ=0$
	+ *9.5 symbols for* $μ=1$
	+ *19 symbols for* $μ=2$ *(FR1 only)*
 |
| Samsung | We think the minimum processing time defined in current specification is enough. The raised issue for HARQ-ACK dropping due to overlapped with interruption time can be avoided by proper PDSCH-to-HARQ feedback timing indication by gNB. |
| Ericsson | Our preference is to reuse SPS PDCCH release processing time as captured in current specification.  |
| Qualcomm | Case 2 PDCCH triggers BWP switch over SCells between the dormant BWP and non-dormant BWP. Similar to a legacy BWP switch, once BWP switch for transitioning between dormancy and non-dormancy starts, an interruption time may occur anywhere before the BWP switch ends. Without a proper timing offset between the Case 2 PDCCH and the HARQ-ACK feedback, the HARQ-ACK feedback may collide with interruption time. To avoid the collision, the minimum processing time between Case 2 PDCCH and the corresponding HARQ-ACK should be at least the application delay required for SCells to finish the switch between the dormant BWP and non-dormant BWP.  |
| Huawei, HiSi | Agree with Samsung. |
| Intel | Agree with QC’s view. The impacts of BWP switching delay and the associated interruption delay should be considered.  |
| CATT | Agree with QC’s analysis |
| Spreadtrum | Agree with QC’s view.The delay of BWP switching defined in RAN4 should be used for the minimum processing time requirement for time between the end of Case 2 PDCCH with SCell dormancy indication and corresponding HARQ-ACK. |
| OPPO | We prefer to not introduce other timing requirement. The current spec. is sufficient. |
| MTK | Agree with QC’s view.To avoid the PCell HARQ-ACK response for case 2 dormancy indication falling inside the interruption caused by SCells BWP switch, A UE is expected to provide HARQ-ACK information in response to a DCI format 1-1 indicating SCell dormancy without scheduling PDSCH after TBWPswitchDelay + X slots from the slot containing the last symbol of a PDCCH providing the SCell dormancy without scheduling PDSCH, where TBWPswitchDelay and X are the BWP switching delay and interruption length defined in 38.133. The reason to include X is due to the following sentence in 38.133 * The **starting time** of interruption is only allowed within the BWP switching delay TBWPswitchDelay as defined in clause 8.6.2
 |
| Apple | We agree that case 2 dormancy behavior indication of the Scell effectively involves BWP switching, which is different from SPS release. There is possibility that ACK feedback falls inside the interruption time if the minimal gap is set to be same as SPS release. It would be helpful that we clarify with a LS sent to RAN4, e.g. 1) identify feasibility/potential mechanism to avoid overlapping with interruption time, or 2) whether dormancu bwp switch involves similar delauy as regular bwp switch. |

#### Question 2

Q2. Is there a need to revert the RAN1 #100-e agreement on using SPS release PDCCH framework to define HARQ-ACK feedback for Case 2 SCell dormancy indication PDCCH, as proposed in [2]?

Companies are requested to indicate their view about the above question in the Table below.

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Yes/No** | **Comments (1-1, Q2)** |
| vivo | No | We think the current framework can be kept and as commented above, the desirable HARQ-ACK feedback time of Case 2 PDCCH can be decided by gNB implementation considering the BWP switching gap and the UE processing time, by indicating a proper K1 value. |
| ZTE | No | We failed to see the motivation to revert the RAN1#100e agreement.  |
| Panasonic | No | By gNB implementation the HARQ-ACK timing can cover the BWP switching gap. There is no strong need to revert the agreement. |
| Nokia, NSB | No | If gaps/interruptions are introduced to Pcell in RAN4 due to BWP change on Scells, gNB may avoid scheduling ACK on top of gap. -> up to gNB implementation. |
| Samsung | No | No need. Instead the related paragraph can be updated as below:===================== Proposed TP =======================With reference to slots for PUCCH transmissions, if the UE detects a DCI format scheduling a PDSCH reception ending in slot  or if the UE detects a DCI format indicating a SPS PDSCH release or SCell dormancy without scheduling PDSCH reception through a PDCCH reception ending in slot , the UE provides corresponding HARQ-ACK information in a PUCCH transmission within slot , where  is a number of slots and is indicated by the PDSCH-to-HARQ\_feedback timing indicator field in the DCI format, if present, or provided by *dl-DataToUL-ACK*, or by *dl-DataToUL-ACKForDCIFormat1\_2* for DCI format 1\_2.  corresponds to the last slot of the PUCCH transmission that overlaps with the PDSCH reception or with the PDCCH reception in case of SPS PDSCH release.  |
| Ericsson | No | We don’t see need to change - any interruptions if specified by RAN4 can be handled by gNB implementation.  |
| Qualcomm | Yes | Assume the HARQ-ACK bit is generated for a virtual PDSCH according to the TDRA field in the Case 2 PDCCH. Then, the Case 2 PDCCH HARQ-ACK timeline can simply follow the PDCCH-to-PDSCH-to-HARQ-ACK timeline for a PDSCH scheduled by a legacy cross-BWP scheduling DCI. The only change for the virtual PDSCH design is to replace the legacy BWP switch delay by the application delay for the switch between the dormant BWP and non-dormant BWP for SCells. |
| Huawei, HiSi | No | Agree with Samsung |
| Intel | No | HARQ-ACK feedback for Case 2 PDCCH can follow same behavior as SPS PDSCH release |
| CATT | No | It is an implementation issue |
| Spreadtrum | No | Besides the TP provided by Samsung, we suggest to provide the following HARQ-ACK timing limits in BWP operation.38213 section 12------------------------------------------------------------------------A UE does not expect to detect a DCI format 1\_1 or a DCI format 0\_1 indicating respectively an active DL BWP or an active UL BWP change with the corresponding time domain resource assignment field providing a slot offset value for a PDSCH reception or PUSCH transmission that is smaller than a delay required by the UE for an active DL BWP change or UL BWP change [10, TS 38.133]. A UE does not expect to detect a DCI format 1\_1 indicating SCell dormancy without scheduling PDSCH reception with the corresponding PDSCH-to-HARQ\_feedback timing indicator field providing a slot offset value for a HARQ-ACK feedback transmission that is smaller than a delay required by the UE for changing from an active DL BWP to dormancy BWP [RAN4]. ------------------------------------------------------------------------ |
| OPPO | No | Using HARQ timing for SPS is already feasible. No further change to virtual PDSCH scheme. |
| MTK | Yes | Same view as QC. Using a virtual PDSCH according to the TDRA field in the Case 2 PDCCH can also solve the interruption time issue in Question 1. |

#### Question 3

Q3. Is there a need to send LS to RAN4 about this issue, as proposed in [3]?

Companies are requested to indicate their view about the above question in the Table below.

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Yes/No** | **Comments (1-1, Q3)** |
| vivo |  | Not sure an LS is critical or not, but It would be good know RAN4 status of required switching delay and interruption gap due to transition between dormancy and non-dormancy BWP.  |
| ZTE |  | We prefer not to send this LS.We expect that once RAN4 has finished their work, RAN4 would send us the LS to inform us the outcome. Currently, we are not sure about the intention/benefits of sending LS to RAN4. |
| Panasonic | No objection. | It is okay to send LS and acquire related outcome from RAN4. Anyway RAN4 may have better position to judge the SPS release HARQ-ACK timing requirement and potential impact from the BWP switching indicated by Scell dormancy indication. |
| Nokia, NSB | No | When RAN4 has something concrete on gaps/interruptions, they will send us LS. |
| Samsung | No | We don’t think LS is needed. |
| Ericsson | No | We don’t see a need to send LS to RAN4 – any interruptions if specified by RAN4 can be handled by gNB implementation. |
| Qualcomm | Yes | The minimum timing offset between Case 2 PDCCH and corresponding HARQ-ACK depends on the application delay for switch between the dormant BWP and non-dormant BWP for Scells. Besides, RAN4 is defining the application delay for SCell dormancy indication. It would be helpful to inform this issue to RAN4. Then RAN4 can consider it as a use case when they define the application delay. |
| Huawei, HiSi | No | No strong view but does not see it critically needed |
| Intel |  | It is helpful to express RAN1’s concern on defining the gaps/interruptions. Meanwhile, it is good if RAN4 can provide their views on the delay for dormancy switching |
| CATT  | No |  |
| Spreadtrum | Yes | It would be good to send the LS. |
| OPPO | No | There is no need for the LS. |
| MTK | Yes | Same as QC’s view. RAN4 is defining the application delay for SCell dormancy indication. It would be helpful to inform this issue to RAN4. |
| Apple | Yes | We think a LS to RAN4 could be helpful |

### 2.2 Topic 1-2

Please provide your input to below questions Q1-Q2 on this topic, preferably by 04/21 (evening PST).

#### Question 1

Q1. According to current specification what is the UE behavior for the following scenario?

* UE behavior regarding which BWP to use for an SCell for an ON duration, when
	+ the UE is configured with *ps-WakeUp*=true, and
	+ the UE is configured with a dormant BWP for the SCell, and
	+ the UE does not detect a DCI 2\_6 with SCell dormancy indication corresponding to the ON duration

Companies are requested to indicate their view about the above question in the Table below.

|  |  |
| --- | --- |
| **Company Name** | **Comments (1-2, Q1)** |
| vivo | The UE behavior according to the current spec is unclear, one interpretation could be that UE stay on the current BWP under the condition defined above.  |
| ZTE | The current spec only defines UE behavior of wake up or not when DCI 2\_6 is mis-detected, while it is not clear which BWP to use for SCell for the next ON duration. |
| Panasonic | Although current specification does not explicitly address this scenario, UE shall wake up in high level as per the configuration by RRC, and operate in the current BWP. |
| LG | It is natural the UE follows dormancy behavior in the most latest active time |
| Nokia, NSB | If UE wakes-up when no WUS is received, UE continues in the same active BWP as before, all clear. Transition between active and non-active time in DRX does not change active BWP. Active BWP can be changed by receiving dormancy indication, BWPI or by RRC and inactivity timer.  |
| Samsung | The UE behavior is unclear. In the above scenario, the UE will start DRX on duration timer, but does not know whether non-dormant BWP or dormant BWP is activated for the SCell configured with dormant BWP since the DCI format 2\_6 is missed. If this is not described in the specification, it would be just up to UE implementation. We prefer to resolve this issue. |
| Ericsson | According to current spec, UE continues in the same active BWP as before unless it receives an L1 indication to switch the BWP. There is no agreement that psWakeUp should control dormancy/non-dormancy transition and the current spec is already aligned with below agreement. Agreements:If a DCI format 3\_0 outside Active Time is not detected by a UE, “UE wakeup or not” is configured by the higher layer signalling to address this caseThe default is “not wake up” |
| Qualcomm | UE keeps its previous behavior (non-dormancy or dormancy) before the monitoring occasion for DCI format 2\_6 on each activated SCell.In our view, the main use case for configuring ps\_WakeUp is to define the meaning of gNB’s DTX behavior. In the case ps-WakeUp is configured to be true, this supports the mode of operation by which gNB can DTX when UE should wake-up for ON duration. It makes sense for UE to continue with the previous dormancy behavior for the SCells. If gNB intends to change the dormancy behavior for the SCells, it can always do that by signaling during active time. |
| Huawei, HiSi | UE continues its active BWP as is and follow RRC configuration and further signalling from gNB.In current spec, UE stays on the current active BWP if UE does not receive the L1/RRC signaling from gNB. We think the miss-detection of DCI format 2\_6 is not a special case considering UE may also miss the DCI format 0\_1/1\_1 that switches the active BWP. In addition, gNB can always transmit Case 1/2 PDCCH to switch SCell dormancy behavior if UE wakes up without detecting the DCI format 2\_6. |
| Intel | The UE behavior is unclear in current spec. We prefer that the most recent active BWP still applies to an activated SCell. |
| CATT | UE keeps current active BWP for each cell and follows the indication from DCI format 2\_6. If UE does not detect DCI format 2\_6, UE will keep current active BWP of SCell if the *ps-Wakeup* is set to “true”. |
| Spreadtrum | UE still continues its current active BWP.  |
| OPPO | The current spec only defines UE behavior in the spec define UE will wake up by configuration if not detected DCI 2\_6. It is not clear which BWP to use for SCell for the next ON duration without additional information. |
| MTK | Same as Samsung’s view. The UE behavior is unclear and we prefer to resolve this issue. |
| Apple | If UE does not detect WUS, UE should keep the same dormant/active BWP as before on the SCells. |

#### Question 2

Q2. For the following scenario, if the current specification is incorrect/unclear what should be the expected UE behavior?

* UE behavior regarding which BWP to use for an SCell for an ON duration, when
	+ the UE is configured with *ps-WakeUp*=true, and
	+ the UE is configured with a dormant BWP for the SCell, and
	+ the UE does not detect a DCI 2\_6 with SCell dormancy indication corresponding to the ON duration

Companies are requested to indicate their view about the above question in the Table below.

|  |  |
| --- | --- |
| **Company Name** | **Comments (1-2, Q2)** |
| vivo | When the following condition is met* + the UE is configured with *ps-WakeUp*=true, and
	+ the UE is configured with a dormant BWP for the SCell, and
	+ the UE does not detect a DCI 2\_6 with SCell dormancy indication corresponding to the ON duration

The expected UE behavior should be* If the current BWP is non-dormant BWP, UE stays on the non-dormant BWP
* If the current BWP is dormant BWP, UE switches to the non-dormant BWP provided by *first-non-dormant-BWP-ID-for-DCI-outside-active-time*

When the following condition is met* + the UE is configured with *ps-WakeUp*=false, and
	+ the UE is configured with a dormant BWP for the SCell, and
	+ the UE does not detect a DCI 2\_6 with SCell dormancy indication corresponding to the ON duration

The expected UE behavior should be* UE stays on the current BWP.
 |
| ZTE | UE switches to non-dormant BWP for all the activated SCell when the UE is configured with ps-WakeUp=true, andthe UE is configured with a dormant BWP for the SCell, andthe UE does not detect a DCI 2\_6 with SCell dormancy indication corresponding to the ON duration The reason is: If network configures “wake-up” as the default UE behavior, network cares more about the system performance. From this perspective, it makes sense to follow the same philosophy, i.e., switch to non-dormant BWP for all the activated SCells in case of miss detection of DCI 2\_6. |
| Panasonic | We think UE shall wake up in this case as this is default behavior as per RRC parameter *ps-WakeUp*=true. Also UE shall switch to the *first-non-dormant-BWP-ID-for-DCI-inside-active-time.* |
| LG | It may be better to clarify the behavior in the specifications |
| Nokia, NSB | No need for clarification |
| Samsung | We prefer to define a default UE behavior for the above scenario. The default UE behavior on dormancy should be controlled by gNB as wake-up behavior. In addition, we need to define the default UE behavior not only for the case of *ps-WakeUP*=true but also the case of *ps-WakeUP* is not provided. To minimize the performance loss due to the miss-detection, we think vivo’s proposal is reasonable.  |
| Ericsson | Spec is clear and we don’t see a need to specify new behavior. |
| Qualcomm | UE should keep its previous behavior (non-dormancy or dormancy) before the monitoring occasion for DCI format 2\_6 on each activated SCell. Any UE behavior other than this requires unnecessary additional specification work. SCell dormancy indication can also be transmitted in DCI format 0\_1/1\_1. This provides additional protection to SCell dormancy indication that WUS indication does not have. There is no need to explicitly handle the misdetection of WUS for SCell dormancy indication.  |
| Huawei, HiSi | The current specification is clear and there is no need for clarification. |
| Intel | We prefer that the most recent active BWP (no matter it is dormant BWP or non-dormant BWP) still applies to an activated SCell. |
| CATT | Specification is clear. No change is needed.  |
| Spreadtrum | We are open to make it clear in the spec:The expected UE behavior should be UE stays on the current active BWP.  |
| OPPO | We prefer to make it configurable as that for default wakeup behavior. If RRC parameter is not possible, we can consider define some default BWP, e.g. dormant BWP of that cell. |
| MTK | We prefer to clarify this behavior. VIVO’s proposal can be a starting point. |

#### TP1 Discussion

Following conclusion was made on email thread [100b-e-NR- LTE\_NR\_DC\_CA-ScellDormancy-02]

**Conclusion**

* + - ~~No consensus to add additional clarifications on UE behavior~~ For SCell(s) configured with dormant BWP, when DCI 2-6 is not detected
			* UE continues on same dormant/non-dormant BWP until an indication (L1 or RRC) to change BWP is detected or (if applicable) BWP inactivity timer expires
			* ~~Note: No TP required~~
			* Discuss further if TP is required and finalize in next phase

##### Question T1

QT1. Does the current spec already reflect the UE behavior in above conclusion?

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Yes/No** | **Comments (1-2, QT1)** |
|  |  |  |
|  |  |  |

##### Question T2

QT2. Is it OK to agree to below TP1 to reflect the UE behavior in above conclusion?

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Yes/No** | **Comments (1-2, QT2)** |
|  |  |  |
|  |  |  |

**------------------------------------------ Start of Draft TP1 of 38.213 sub-clause 10.3---------------------**

10.3 PDCCH monitoring indication and dormancy/non-dormancy behaviour for SCells

**<Unchanged parts omitted>**

The UE does not monitor PDCCH for detecting DCI format 2\_6 during Active Time [11, TS 38.321].

If a UE reports for an active DL BWP a requirement of X slots prior to the beginning of a slot where the UE would start the *drx-onDurationTimer*, the UE is not required to monitor PDCCH for detection of DCI format 2\_6 during the X slots, where X corresponds to the requirement of the SCS of the active DL BWP.

If a UE is provided search space sets to monitor PDCCH for detection of DCI format 2\_6 in the active DL BWP of the PCell or of the SpCell and the UE does not detect DCI format 2\_6

- if the UE is provided *ps-WakeupOrNot*, the UE is indicated by *ps-WakeupOrNot* whether the UE may not start or whether the UE shall start the *drx-onDurationTimer* for the next DRX cycle

- if the UE is not provided *ps-WakeupOrNot*, the UE may not start Active Time indicated by *drx-onDurationTimer* for the next DRX cycle

* if a SCell dormancy indication field is configured in DCI format 2\_6, each activated SCell in the SCell group(s) continue on its current active DL BWP when *drx-onDurationTimer starts*.

If a UE is provided search space sets to monitor PDCCH for detection of DCI format 2\_6 in the active DL BWP of the PCell or of the SpCell and the UE

- is not required to monitor PDCCH for detection of DCI format 2\_6, as described in Clauses 10, 11.1, 12, and in Clause 5.7 of [14, TS 38.321] for all corresponding PDCCH monitoring occasions outside Active Time prior to a next DRX cycle, or

- does not have any PDCCH monitoring occasions for detection of DCI format 2\_6 outside Active Time of a next DRX cycle

the UE shall start the *drx-onDurationTimer* for the next DRX cycle and if a SCell dormancy indication field is configured in DCI format 2\_6, each activated SCell in the SCell group(s) continue on its current active DL BWP.

**<Unchanged parts omitted>**

**----------------------------------------- end of Draft TP1 -----------------------------------------**

### 2.3 Topic 1-3

Please provide your input to below questions Q1-Q2 on this topic, preferably by 04/21 (evening PST).

#### Question 1

Q1. According to current specification what is the UE behavior for the following scenario

* UE is configured with CIF, and detects DCI format 1-1 on primary cell with CIF≠0 and FDRA bits set according to Case 2 SCell dormancy indication.

Companies are requested to indicate their view about the above question in the Table below.

|  |  |
| --- | --- |
| **Company Name** | **Comments (1-3, Q1)** |
| vivo | Current spec does not prevent to indicate CIF≠0 for a case 2 dormancy DCI, however, it is not clear what is the use case for gNB to do so.  |
| ZTE | The current spec is clear that CIF≠0 could be configured for Case 2 SCell dormancy indication. With CIF≠0, network could use the candidates for SCell to transmit the Case2 DCI. |
| Panasonic | According to the current specification, there is no explicit exclusion of using CIF≠0 when UE performs SCell dormancy behavior as per the indication in DCI format 1\_1. |
| LG | If we clarify that CIF≠0’is not used, no further definition of the UE behavior is necessary |
| Nokia, NSB | Current spec and agreements support CIF≠0 for a case 2 dormancy DCI. Not sure what behavior needs to be defined.  |
| Samsung | The specification is clear. The UE will assume that the received DCI format 1-1 as the dormancy indication although CIF≠0. |
| Ericsson | Spec does not preclude it, i.e. UE should follow the indication in the DCI. There is no strong use case for supporting it though.  |
| Qualcomm | A major purpose to define SCell dormancy indication DCI is to allow UE to switch SCells between BWPs with DCI received on the PCell even if the UE does not support cross-carrier scheduling. There is no obvious benefit for the UE to receive a DCI for SCell dormancy indication without data scheduling and the DCI points to a cell other than the PCell because no data is scheduled. UE should not expect to receive a DCI format 1\_1 with CIF≠0 and an invalid FDRA field. |
| Huawei, HiSi | We origianlly considered no special handling is needed while now looking companies response, we’d like to understand a bit more by “With CIF≠0, network could use the candidates for SCell to transmit the Case2 DCI” and by “switch SCells between BWPs”. So network only transmits a DCI on PCell for UE to “look at” the SCell indicated by CIF, without any real different UE behavior from CIF=0. If so, there seems to be no implementation-wise concern whatever CIF value is. Otherwise some clarification is beneficial. |
| Intel | The spec doesn’t preclude Case 2 with CIF≠0. However, there is no benefit by supporting Case 2 with CIF≠0.  |
| CATT | This is an implementation error. UE should discard the DCI.  |
| Spreadtrum | Similar views, it is supported in the spec, but we can see any benefits. |
| OPPO | The spec allows this case 2 with CIF≠0. But we should not allow this due it is not following the agreements. |
| MTK | UE treats this as an error case and discards the DCI. |
| Apple | We don’t see a clear use case/motivation by setting CIF ≠0 with case 2 dormancy indication. This combination can be explicitly precluded. |

#### Question 2

Q2. Is it OK to agree to below proposal (discussed in RAN1#100-e)?

* When UE is configured with CIF, DCI format 1-1 on primary cell with CIF≠0‘is not used for Case 2 SCell dormancy indication

Companies are requested to indicate their view about the above question in the Table below.

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Yes/No** | **Comments (1-3, Q2)** |
| Vivo | Yes | UE does not expect to detect a DCI format for Case 2 SCell dormancy indication with CIF≠0, the reason could be1. There is no use case to do so
2. UE could use CIF field as a validation of the DCI
 |
| ZTE | No | We believe that allowing CIF≠0 for Case2 DCI could improve the scheduling flexibility, e.g., network could use the candidates for SCell to transmit the Case2 DCI in PCell. |
| Panasonic | No | Do not see strong need to add this. By adding this may better align between gNB and UE but also need additional DCI validation at UE side and also corresponding test cases. Unless there is some other concern, e.g. for other usage in the future CIF≠0 is reserved, otherwise no need to change the specification. |
| LG | Yes |  |
| Nokia, NSB | No\* | This would be reverting the previous agreement, and nothing is broken in the spec. \*However, if cross-carrier scheduling restriction would help chipsets to keep current HARQ-ACK timeline used for DL SPS release, we are willing to reconsider.  |
| Samsung | No | This is an optimization not a critical issue. |
| Ericsson | Yes | Although it is in the spec, there is no strong use case for supporting it and we don’t see the need to optimize this use case or add other clarifications related to it in the spec. |
| Qualcomm | Yes | There is no obvious benefit for the UE to receive a DCI format 1-1 on primary cell with CIF≠0 for Case 2 SCell dormancy indication. For Case 1 SCell dormancy indication DCI, it was already agreed that CIF≠0 is not supported. It is simple to follow the same rule. Besides, allowing CIF≠0 for Case 2 DCI causes an issue that size of the DCI format 1-1 needs to be increased by N bits where N is the number of configured SCell groups according to the RAN1 #99 agreements. There is no need to spend more efforts to fix this issue with additional agreements.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)
 |
| Huawei, HiSi |  | Some clarification from Q1 is expected |
| Intel | Yes | If Case 2 with CIF≠0 is supported, we need to further clarify the behavior related to some other field in the DCI that is not repurposed. For example, for a SCell which is indicated as non-dormant by the Case 2 DCI, if the BWP indicator in the DCI indicates a different non-dormant BWP, does it mean that UE should switch the non-dormant BWP though there is no PDSCH transmission on the new non-dormant BWP?To avoid such further effort, we prefer to avoid Case 2 with CIF≠0 since it doesn’t provide any real benefit.  |
| CATT  | Yes | There is no use case for cross carrier scheduling and SCell dormancy configured for the same SCell.  |
| Spreadtrum | Yes | We support the proposal. |
| OPPO | Yes | We should not expand the case2 DCI into SS for Scell.  |
| MTK | Yes | We support the proposal. It makes the control mechanism more clear. |
| Apple | Yes | Support |

#### TP2 Discussion

Following agreement was made on email thread [100b-e-NR- LTE\_NR\_DC\_CA-ScellDormancy-02]

Agreements:

* + When UE is configured with CIF, DCI format 1-1 on primary cell with CIF≠0‘is not used for Case 2 SCell dormancy indication
		- Discuss TP in next phase

##### Question T1

QT1. Is it OK to agree to below TP2 to reflect the UE behavior in above agreement?

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Yes/No** | **Comments (1-3, QT1)** |
|  |  |  |
|  |  |  |

**------------------------------------------ Start of Draft TP2 of 38.213 subclause 10.3-------------------------------------**

10.3 PDCCH monitoring indication and dormancy/non-dormancy behaviour for SCells

**<Unchanged parts omitted>**

If a UE is provided search space sets to monitor PDCCH for detection of DCI format 1\_1, and if

- the CRC of DCI format 1\_1 is scrambled by a C-RNTI or a MCS-C-RNTI, and if

- the UE detects a DCI format 1\_1 that does not include a carrier indicator field, or detects a DCI format 1\_1 that includes a carrier indicator field with value equal to 0, and if

- *resourceAllocation* = *resourceAllocationType0* and all bits of the frequency domain resource assignment field in DCI format 1\_1 are equal to 0, or

- *resourceAllocation* = *resourceAllocationType1* and all bits of the frequency domain resource assignment field in DCI format 1\_1 are equal to 1

- *resourceAllocation = dynamicSwitch* and all bits of the frequency domain resource assignment field in DCI format 1\_1 are equal to 0 or 1

the UE considers the DCI format 1\_1 as indicating SCell dormancy, not scheduling a PDSCH reception or indicating a SPS PDSCH release, and for transport block 1 interprets the sequence of fields of

- modulation and coding scheme

- new data indicator

- redundancy version

and of

- HARQ process number

- antenna port(s)

- DMRS sequence initialization

as providing a bitmap to each configured SCell, in an ascending order of the SCell index, where

- a '0' value for a bit of the bitmap indicates an active DL BWP, provided by *dormant-BWP*, for the UE for a corresponding activated SCell

- a '1' value for a bit of the bitmap indicates

- an active DL BWP, provided by *first-non-dormant-BWP-ID-for-DCI-inside-active-time*, for the UE for a corresponding activated SCell, if a current active DL BWP is the dormant DL BWP

- a current active DL BWP, for the UE for a corresponding activated SCell, if the current active DL BWP is not the dormant DL BWP

- the UE sets the active DL BWP to the indicated active DL BWP

**<Unchanged parts omitted>**

**----------------------------------------- end of Draft TP2 -------------------------------------------**

### 2.4 Topic 1-4

Please provide your input to below questions Q1-Q2 on this topic, preferably by 04/21 (evening PST).

#### Question 1

Q1. According to current specification what is the UE behavior for the following scenarios A and B?

* UE is configured with a dormant BWP for an Scell and
	+ A) the ‘BWP indicator field’ in PDCCH DCI format 1-1 detected for the Scell indicates a BWP ID corresponding to dormant BWP
	+ B) the ‘BWP indicator field’ in PDCCH DCI format 0-1 detected for the Scell indicates BWP ID corresponding to dormant BWP

Companies are requested to indicate their view about the above question in the Table below.

|  |  |
| --- | --- |
| **Company Name** | **Comments (1-4, Q1)** |
| vivo | The current specification seems to allow case A) and B).  |
| ZTE | As the PDSCH-Config/PDCCH-Config will not be configured for the dormant BWP, the current spec implies that ‘BWP indicator field’ in PDCCH DCI format 1-1 could not be indicated as the dormant DL BWP.If UE is under dormant DL BWP, UE cannot receive any DCI, thus there is no such case as the second bullet above described.Based on the above analysis, Case A) and Case B) are not allowed in the current specficiation. |
| Panasonic | In our understanding, UE shall perform the PDSCH reception, PUCCH transmission or PUSCH transmission in the target BWP according to the DCI and then go to dormancy behavior in the dormant BWP. UE does not need to monitor PDCCH in the dormant BWP. |
| Nokia, NSB | For A) UE would need to know how to interpret DCI format fields according to dormant BWP, but pdsch-Config in dormant BWP would not contain configurations necessary to interpret DCI fields. For B), there is no UL dormant BWP configured, as per RAN2 agreement. -> **both cases are broken in our opinion, but no need to specify stupid gNB behavior.** 😉 |
| Samsung | Scenario A) The UE behavior is unclear. First, the UE cannot identify most of DCI fields which derived from PDSCH-Config since there is no PDSCH-Config for dormant DL BWP. For example, it is not defined in the current specification, how the UE assume FDRA field size when the *resourceAllocation* is not provided to the UE. In addition, it is unclear that how the UE can decide whether the received DCI format is valid or not. According to 38.213, if a UE detects a DCI format with inconsistent information, the UE discards all the information in the DCI format. Therefore, we need to further study how the UE can handle the remaining fields other than BWP indicator. Therefore, to minimize the specification impact, we prefer not to allow switching to dormant DL BWP by using legacy DL BWP indicator field. Scenario B) This is valid only for TDD not for FDD. For TDD, a UL BWP can be linked with the dormant DL BWP. For the UL BWP, PUSCH-Config would not be provided. Therefore, similar issue observed in scenario A will be happened. Therefore, it is preferred not to allow switch to UL BWP linked with dormant DL BWP by using legacy UL BWP indicator field. |
| Ericsson | Such indication would be inconsistent with the behavior in 38.321, subclause 5.15.1. The BWP Indicator field in the DCI for the Scell cannot be used to switch the UE to the dormant BWP of the Scell. |
| Qualcomm | First, we would like to ask for clarification on what “dormant BWP” means: One interpretation is “dormant DL BWP” only for paired spectrum (FDD), and “dormant DL/UL BWP” for unpaired spectrum (TDD)? For “dormant UL BWP”, the meaning is the UL BWP that has the same *BWP-Id* as the dormant DL BWP. This is to clarify that we are not trying to revert RAN2’s agreement that that UL dormancy behaviour is not defined by dormant UL BWP.A legacy cross-BWP scheduling DCI can trigger a BWP switch and schedule a DL or UL data channel in the target BWP after the BWP switch. If a SCell is configured with dormant BWP, once UE enters the DL dormant BWP on a SCell, it will not receive any PDSCH on the active DL BWP or transmit any PUSCH on the active UL BWP. Given this, UE should not expect to receive a DCI format 1\_1 with a ‘BWP indicator field’ indicating a dormant DL BWP. At least for unpaired spectrum (TDD), UE should not expect to receive a DCI format 0\_1 with a ‘BWP indicator field’ indicating an UL BWP with the same *BWP-Id* as the dormant DL BWP; It can be further discussed whether the same can be extended to paired spectrum (FDD).  |
| Huawei, HiSi | As both BWP indicator and dormancy indication can be used for BWP switching, it seems no need to enable a UE behavior by both of them at the same time.  |
| Intel | The spec seems not explicitly exclude case A) and B). however, as commented by some companies, UE is lack of knowledge to derive the size of a DCI format if BWP indicator indicates dormant BWP due to the lack of PDSCH-Config. Case B) is even more problematic, since UL dormant BWP is not defined per RAN2 agreement, it is valid indicate dormant BWP ID in DCI format 0\_1.  |
| CATT | Dormant BWP is used for DL only. There is no concept of UL dormant BWP since there is no PDCCH monitoring for UL.  |
| Spreadtrum | A and B are allowed by the current spec. but we cannot see any use case. |
| OPPO | For DCI format 1\_1, if the BWP indicator indicates a Dormant BWP, then it should be a error case. Since the scheduling behavior is useless, it will not be able to receive data in the targeting BWP.For DCI format 0\_1, it cannot indicate a DL BWP. |
| MTK | The spec seems not explicitly exclude case A) and B). However, we prefer to exclude it to save the following spec effort. |

#### Question 2

Q1. If the current specification is incorrect/unclear for the following scenarios A and B, what should be the expected UE behavior?

* UE is configured with a dormant BWP for an SCell and
	+ A) the ‘BWP indicator field’ in PDCCH DCI format 1-1 detected for the SCell indicates a BWP ID corresponding to dormant BWP
	+ B) the ‘BWP indicator field’ in PDCCH DCI format 0-1 detected for the SCell indicates BWP ID corresponding to dormant BWP

Companies are requested to indicate their view about the above question in the Table below.

|  |  |
| --- | --- |
| **Company Name** | **Comments (1-4, Q2)** |
| vivo | UE should not expect case A) or B) to happen, i.e. defined as error case.  |
| ZTE | The current spec seems fine. |
| Panasonic | So far no substantial issue is identified to change the specification. |
| Nokia, NSB | no need to specify stupid gNB behavior |
| Samsung | Based on the observation in Q1, we can consider two alternatives as below:Alt-1) UE is not expected to be indicated BWP switch to dormant DL BWP by using legacy BWP indicator field.Alt-2) The BWP indicator field does not include the dormant DL BWP. We think Alt-2 is the best choice since it basically excludes a potential error case at all and minimize the DCI field size. For scenario A, for both TDD and FDD, the BWP indicator field can be composed of the configured DL BWPs except for the dormant DL BWP.For scenario B, for TDD, the BWP indicator field can be composed of the configured UL BWPs except for the UL BWP linked with dormant DL BWP. For FDD, any change is not needed. |
| Ericsson | gNB cannot set the BWP Id bit to dormant BWP, so it is an extra bit that is never used. Our preference is to not have a BWP indicator field in the DCI on the Scell when the Scell has only one RRC configured non-dormant BWP, i.e. not use dormant BWP in the BWP indicator field length calculation. We think this is cleanest option. Otherwise, we can keep spec as is. |
| Qualcomm | UE does not expect to handle this case. This scenario is considered as an error case. Similar clarification on the DCI format 0-1 case is helpful. |
| Huawei, HiSi | Consider it as error case and to let gNB handle it is fine. |
| Intel | UE is not expected to be indicated BWP switch to dormant DL BWP by using legacy BWP indicator field, i.e. Case A). UE doesn’t expect Case B) since there is no UL dormant-BWP.  |
| CATT  | UE does not expect to be configured with case B since UL dormant BWP does not exist. |
| Spreadtrum | They are error cases.  |
| OPPO | They should be defined as error cases. |
| MTK | UE should not expect case A) or B) to happen, i.e. defined as error case. Similar clarification on the DCI format 0-1 case is helpful. |

### 2.5 Topic 1-5

Please provide your input to below questions Q1 on this topic, preferably by 04/21 (evening PST).

#### Question 1

Q1. Is there a need to introduce a condition that UE expects to receive DCI format 0-1/1-1/2-6 with SCell dormancy indication on the primary cell only in the first 3 symbols of a slot?

Companies are requested to indicate their view about the above question in the Table below.

|  |  |  |
| --- | --- | --- |
| **Company Name** | **Yes/No** | **Comments (1-5, Q1)** |
| vivo | Yes, but except DCI format 2-6 | It is reasonable to restrict DCI 0-1/1-1 with SCell dormancy indication on the PCell only in the first 3 symbols. However, it is unnecessary to add the restriction to DCI 2-6, because the minimum gap between the last DCI 2-6 monitoring occasion and DRX onduration can naturally support the potential dormancy BWP switching. |
| ZTE | Yes | There could be different Options for this issue.Option1: If the DCI format 0-1/1-1/2-6 indicates SCell dormancy, the DCIs are expected to be within the first 3 symbols of a slot.Option2: If the DCI format 0-1/1-1/2-6 indicates SCell dormancy **change**, the DCIs are expected to be within the first 3 symbols of a slot.For Option1, regardless of whether the BWP of SCell has been changed or not, the DCIs are expected to be within the first 3 symbols of a slot as long as the DCIs are used for dormancy indication.For Option2, the DCIs are expected to be within the first 3 symbols of a slot only if the DCIs are triggering BWP change for at least one SCell. Otherwise, no such kind of restriction.Option2 is more aligned with the legacy spec description. We are open to further discuss the two options. |
| Panasonic | No | So far no strong reason is identified to do so. If concern is from BWP switching latency requirement due to SCell dormancy indication, we may need some input from RAN4. |
| Nokia, NSB | Depends | Agree with Vivo. For DCI 0-1/1-1, we are generally fine, particularly, if it helps to maintain R15 BWP switching time-line. However, so far no news from RAN4 😊 |
| Samsung | No | We don’t think the first 3-symbol restriction is not needed. It is defined for legacy BWP switching to ensure the enough time gap to preparation to transmit or received data in the new BWP. However, dormant BWP switching is just for BWP switching without any scheduling data. Therefore, we don’t think such a restriction is not needed. |
| Ericsson | No | Having such restriction increases dormancy/non-dormancy latency. From UE perspective, transition delay is the main issue which is being discussed in RAN4. Also, for DCI 2\_6, there are quite a bit of scheduling restrictions to place the search spaces before an On duration, and we prefer to avoid additional restrictions.  |
| Qualcomm | No | The condition for DCI formant 2-6 and Format 0-1/1-1 can be discussed separately. Overall, there is no need to introduce such a condition for the following reasons* With such a condition, interpretation of the PDCCH WUS changes in time. This unnecessarily increases the UE implementation complexity.
* If network decides to switch SCells between dormancy and non-dormancy, it should be able to transmits the SCell indication PDCCH at the earliest opportunity and the UE should be able to receive as long as a corresponding search space set for DCI format 0-1/1-1 is configured no matter within the first 3 symbols or not. There is no need for the network to postpone the SCell dormancy indication until the beginning of the next slot if it missed the first 3 symbols of a slot.
 |
| Huawei, HiSi |  | Agree with ViVO |
| Intel | No | We prefer to not have this limitation. Though SCell dormancy switching is based on BWP switching framework, the exact switching delay is/can be different since there is no PDSCH transmission.  |
| CATT | No | gNB should take the BWP switching delay accordingly for the transition of SCell between dormancy and non-dormancy. There is no merit in defining this restriction.  |
| Spreadtrum |  | Agree with vivo. |
| OPPO | Yes | We think the format 1\_1 and 0\_1 switching should add the 3 symbol condition. |
| MTK | Yes, but except DCI format 2-6 | Same view as VIVO. We can also accept to take a simple “Yes” as ZTE suggested Option 2. |

# 3 Conclusions

Based on the discussion on email thread [100b-e-NR- LTE\_NR\_DC\_CA-ScellDormancy-02], following conclusions and agreements were made

For Topic 1-2

**Conclusion**

* + - ~~No consensus to add additional clarifications on UE behavior~~ For SCell(s) configured with dormant BWP, when DCI 2-6 is not detected
			* UE continues on same dormant/non-dormant BWP until an indication (L1 or RRC) to change BWP is detected or (if applicable) BWP inactivity timer expires
			* ~~Note: No TP required~~
			* Discuss further if TP is required and finalize in next phase

For Topic 1-3

Agreements:

* + When UE is configured with CIF, DCI format 1-1 on primary cell with CIF≠0‘is not used for Case 2 SCell dormancy indication
		- Discuss TP in next phase

For Topic 1-5

**Conclusion**

* + - For at least DCI format 2\_6, there is no restriction that the DCI format with SCell dormancy indication is received only in the first 3 symbols of a slot
			* Note: No TP required
			* Note: If any restriction is introduced for DCI 2\_6 in UE power savings WI, whether/not it applies also for DCI format 2\_6 with SCell dormancy indication can be discussed further.
		- Discuss further whether to introduce restriction for DCI format 0\_1,1\_1

# 4 References

1. [R1-2002739](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_100b_e/Inbox/R1-2002739.zip) Summary of efficient and low latency serving cell configuration/activation/setup, Moderator (Ericsson), RAN1#100bis-e, April 2020.
2. [R1-2002560](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002560.zip) Remaining issues for SCell dormancy Qualcomm Incorporated
3. [R1-2002185](http://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_100b_e/Docs/R1-2002185.zip) Remaining issues on SCell dormancy behavior MediaTek Inc.