3GPP TSG-RAN WG2 #113 electronic R2-210xxxx

Electronic Meeting, 25th Jan – 5 Feb, 2021

Agenda Item: 6.1.2

Source: Intel Corporation

Title: [AT113-e][018][NR16] Summary of UE Cap Main (Intel)

Document for: Discussion, Decision

# 1 Introduction

This contribution summarizes the following discussion:

* [AT113-e][018][NR16] UE Cap Main (Intel)

 Scope: Treat R2-2100018, R2-2100053, R2-2101058, R2-2100060, R2-2100954, R2-2101433, R2-2100013, R2-2100452, R2-2100453, R2-2100454, R2-2101020, R2-2100008, R2-21001486, R2-2100455, R2-2100385, R2-2100386, R2-2101873, R2-2101874, R2-2101821 + Incoming LSes at meeting, if any.

 Phase 1, determine agreeable parts, Phase 2, for agreeable parts Work on CRs.

 Intended outcome: Report and Agreed CRs.

 Deadline:

 A first round with Deadline for comments Thursday Feb 28 1200 UTC to settle scope what is agreeable etc

Note that R2-2100018 and R2-2100053 are LS from RAN1 and RAN4 related to the R1 and R4 feature list which had been used in the mega CRs in the previous meeting. Hence they do not have to be treated here.

The following documents are treated in this discussion:

R2-2100385 UE capability of NR to UTRA-FDD CELL\_DCH CS handover Intel Corporation CR Rel-16 38.306 16.3.0 0485 - F SRVCC\_NR\_to\_UMTS-Core

R2-2100386 UE capability of NR to UTRA-FDD CELL\_DCH CS handover Intel Corporation CR Rel-16 38.331 16.3.1 2321 - F SRVCC\_NR\_to\_UMTS-Core

R2-2100013 Reply LS to RAN2 on beamSwitchTiming (R1-2009496; contact: vivo) RAN1 LS in Rel-16 TEI16 To:RAN2

R2-2100452 Correction on beamSwitchTiming capability vivo, Intel Corporation CR Rel-15 38.306 15.12.0 0488 - F TEI16

R2-2100453 Correction on beamSwitchTiming capability vivo, Intel Corporation CR Rel-16 38.306 16.3.0 0489 - A TEI16

R2-2100454 Correction on beamSwitchTiming-r16 capability vivo, Intel Corporation CR Rel-16 38.306 16.3.0 0490 - F TEI16

R2-2100008 LS on TPMI grouping capability (R1-2009449; contact: vivo) RAN1 LS in Rel-16 NR\_eMIMO-Core To:RAN2

R2-2100455 Correction on TPMI grouping capability vivo, Intel Corporation CR Rel-16 38.306 16.3.0 0491 - F NR\_eMIMO-Core

R2-2100060 LS on Rel-16 mandatory RRM requirements (R4-2017803; contact: CMCC) RAN4 LS in Rel-16 NR\_RRM\_enh-Core To:RAN2

R2-2100954 Capturing suppport of mandatory Rel-16 requirements Nokia, Nokia Shanghai Bell discussion Rel-16 NR\_RRM\_enh-Core

R2-2101058 Handling of other TEI features Lenovo, Motorola Mobility discussion Rel-16 TEI16

R2-2101020 Fixing issue with FGs 22-8a/b/c/d Nokia, Nokia Shanghai Bell CR Rel-16 38.306 16.3.0 0500 - F TEI16

R2-2101433 Clarification on UE capabilities with FDD/TDD differentiation Ericsson CR Rel-16 38.306 16.3.0 0509 - F NR\_newRAT-Core

R2-2101486 Correction on UE capabilities for enhanced MIMO Huawei, HiSilicon CR Rel-16 38.306 16.3.0 0513 - F NR\_eMIMO-Core

R2-2101821 Capability for dormant BWP switching of multiple SCells MediaTek Inc. discussion Rel-16

R2-2101873 CR on the Capability of PUCCH transmissions for HARQ-ACK-38331 ZTE Corporation, Sanechips,Intel CR Rel-16 38.331 16.3.0 2447 - F NR\_L1enh\_URLLC

R2-2101874 CR on the Capability of PUCCH transmissions for HARQ-ACK-38306 ZTE Corporation, Sanechips,Intel CR Rel-16 38.306 16.3.0 0521 - F NR\_L1enh\_URLLC

Contact person(s) for each participating company:

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| --- | --- |
| Company | Contact Name, Email |
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# 2 Discussion

## 2.1 Part 1: Intended to determine agreeable parts

The proposals listed in this subsection 2.1 are extracted from CRs to facilitate the discussion and follow the numbering of the corresponding TDoc from which they were extracted (i.e. they do not represent actual proposals from this TDoc, which should be listed in subsection 2.2).

### 2.1.1 UE capability of NR to UTRA-FDD CELL\_DCH CS handover

In R2-2100385/386, the following are provided in the reasons for change and summary of change respectively:

It is noticed that the handover from NR to UTRA-FDD CELL\_DCH CS handover per UE capability has both xDD differentiation and FRx differentiation set to ‘Yes’. For such capability, the intention is to make these Rel-16 capabilities per band (instead of per UE) to resolve the issue that one combination of xDD diff and FRx diff is not possible when either XDD or FRX or both is set to ‘Yes’, as per LS to RAN1 [R2-2006367]:

*For release-16 UE capabilities for which both xDD and FRx differentiations are allowed, RAN2 intends to use “per band” capability signalling.*

1. Dummify the ***handoverUTRA-FDD-r16*** per UE capability in FRx and xDD differentiation signalling (i.e. remove the per UE ***handoverUTRA-FDD-r16*** from 38.306) in Section 4.2.9
2. Add per band capability for ***handoverUTRA-FDD-r16*** in Section 4.2.7.2 with the consistency statement ‘UE shall set the capability value consistently for all FDD-FR1 bands, all TDD-FR1 bands and all TDD-FR2 bands respectively’ to reflect that it is per UE capability even though it has been moved to per band capability

**Q1 Do companies agree to the proposed changes in the CR? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any.**

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| **Company** | **Yes/No** | **Comments** |
| Intel | Yes (Proponent) |  |
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### 2.1.2 Correction on beam Switch Timing capabilities

RAN1 sends RAN2 a LS on the UE behaviour related to the beam switch timing capabilities in R2-2100013.

In R2-2100452/453, the following are provided on the change to the Rel-15 beamSwitchTiming field description in the reason for change and the summary of change, respectively:

1. In R15, when UE reports one value among {224, 336} for beamSwitchTiming, it will be used to determine UE expectation/behavior for aperiodic CSI-RS for tracking and latency requirements for L1-RSRP reporting, while UE behaviour/assumption regarding before or after beam switch timing is unspecified for measuring AP CSI-RS for CSI acquisition (without trs-Info and without repetition) and for beam management (with repetition ‘off’).
2. RAN1 listed ‘No recommendation on the desired beam switching timing’ as ‘Consequences if the feature is not supported by the UE’ in UE feature list R1-1907862.
3. In the description of Rel-15 beamSwitchTiming capability, add the description that:

*beamSwitchTiming* of value (*sym224* or *sym336*) will be used to determine UE expectation/behavior for aperiodic CSI-RS for tracking and latency requirements for L1-RSRP reporting, while UE behaviour/assumption regarding before or after beam switch timing is unspecified for measuring AP CSI-RS for CSI acquisition (without trs-Info and without repetition) and for beam management (with repetition ‘off’).

1. Remove the decription “If this field is not included, the beam switch timing is up to 48 OFDM symbols for each supported sub-carrier spacing.”

**Q2.1 Do companies agree with the proposed changes in the CRs? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any.**

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| **Company** | **Yes/No** | **Comments** |
| Intel | Yes (Proponent) |  |
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For R2-2100454, the following are provided on the change to the Rel-16 beamSwitchTiming-r16 field description in the reason for change and the summary of change, respectively:

Regarding Rel-16 UE behavior, if the UE receives parameter *enableBeamSwitchTiming-r16*, then, the UE does the following:

* 1. **Answer A**: For CSI-RS configured with repetition “ON”, the UE applies switch time that is the same as the signalled value from the set {224, 336}
	2. **Answer B:** For CSI-RS configured with repetition “OFF”, the UE applies switch time of 48 if beamSwitchTiming-r16 is reported.
	3. **Answer C:** For CSI-RS configured without repetition and without *trs-info*, the UE applies switch time of 48 if beamSwitchTiming-r16 is reported.

In the description of Rel-16 beamSwitchTiming capability, add the description that:

For CSI-RS configured with repetition “OFF”, the UE applies beam switch time of sym48 if *beamSwitchTiming-r16* is reported. For CSI-RS configured without repetition and without *trs-info*, the UE applies beam switch time of sym48 if *beamSwitchTiming-r16* is reported.

**Q2.2 Do companies agree with the proposed changes in the CR? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any.**

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| **Company** | **Yes/No** | **Comments** |
| Intel | Yes (Proponent) | One typo, it should be ‘In the description of Rel-16‘ rather than Rel-15 in the summary of change in the cover page. |
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### 2.1.3 TPMI grouping capability

RAN1 sends RAN2 a LS on adding the TPMI grouping index definition to TS38.306 in R2-2100008.

In R2-2100455, the following are provided in the summary of change:

:

In the description of Rel-16 capability *ul-FullPwrMode2-TPMIGroup*:

1. Add the description that 2bits bitmap with {TPMI=0} and {TPMI=1} and the TPMI index is as specified in Table 6.3.1.5-1 of TS 38.211 [6] for mode 2 in case of non-coherent with 2 ports.
2. Add the definition table of G0~G6 according to RAN1 conclusion.

**Q3 Do companies agree with the proposed changes in the CR? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any.**

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| **Company** | **Yes/No** | **Comments** |
| Intel | Yes (Proponent) |  |
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### 2.1.4 Rel-16 mandatory RRM requirements

RAN4 sends RAN2 a LS informing RAN2 that RAN4 specified RRM requirements that are mandatory to be supported for Rel-16 UEs in R2-2100060.

In R2-2100954, it discusses how the network is aware of the Rel-16 mandatory capability support and has the following observation and proposal:

:

**Observation 2:** Network is always aware of UE access stratum release via UE capabilities.

**Proposal 2:** Indicate to RAN4 that network can determine UE support of the mandatory Rel-16 requirements from the AS release indicator in UE capabilities (i.e. *accessStratumRelease*).

From rapporteur point of view, even though the RRM requirements are mandatory for Rel-16, there is still a need to have IOT bit for these features so that UE has opportunity to be tested with a network that takes the RRM requirements into account.

**Q4.1 Do companies think that there is a need to introduce IOT/capability bits for the mandatory Rel-16 RRM requirement or AS release indicator is sufficient for the mandatory Rel-16 RRM requirements?**

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| **Company** | **IOT bits needed or AS release indicator is sufficient** | **Comments** |
| BT | No | A mandatory without signalling capabiltiy doesn’t require capabilty bits and the introduction for them cannot be accepted by BT.AS release indicator is enough and all the mandatory without signalling parameters must be supported by the UE for the reported release. |
| Intel | IOT bits needed | Agree with the rapporteur’s view |
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R2-2100954 is also proposed that TS38.306 document the following Rel-16 RAN4 mandatory capabilities:

- RRM requirements of multiple SCell activation,

- UE requirements for UE-specific channel bandwidth change

- UE requirements for UL spatial relation switch.

**Observation 1:** RAN4 has defined three mandatory UE requirements that do not have capability signalling for Rel-16

**Proposal 1:** RAN2 to document the RAN4 mandatory capabilities in [TS38.306](https://www.3gpp.org/DynaReport/38306.htm) and indicate this to RAN4.

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**Proposal 2:** Indicate to RAN4 that network can determine UE support of the mandatory Rel-16 requirements from the AS release indicator in UE capabilities (i.e. *accessStratumRelease*).

As mentioned in R2-2100954, RAN2 did not capture all Rel-15 mandatory capabilities in since that would have caused a lot of "basic" requirements to be written into RAN2 specifications.

From the online discussion (Rapporteur’s feeling), most companies do not think it should impact RAN2 specifications. However, it is still good to double check that this is the case.

**Q4.2 If AS release indicator is sufficient for network to determine UE support of the mandatory Rel-16 RRM requirements, do companies think that there is a need to capture the following mandatory Rel-16 RRM requirement in TS38.306?**

| Definitions for feature |
| --- |
| **RRM requirements of multiple SCell activation** It is mandatory for UE to support the requirements for multiple SCell activation as specified in subclause 8.3.7 of TS 38.133 [5].  |
| **UE requirements for UE-specific channel bandwidth change** It is mandatory for UE to support the requirements for UE-specific channel bandwidth change as specified in clause 8.13 of TS 38.133 [5]. |
| **UE requirements for UL spatial relation switch**It is mandatory for UE to support the delay requirements for UL spatial relation switch as specified in subclause 8.12 of TS 38.133 [5]. |

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| **Company** | **Yes/No** | **Comments** |
| BT | Yes | In a situation where a parameter is optional for Rel-15 UEs but mandatory for Rel-16, it is simpler to capture them in a single document. TS 38.306 seems to be the most appropriate one considering 38.822 was a draft an discontinued time ago. |
| Intel | No | We have not done this for Rel-15 and hence we should not do it for Rel-16. Otherwise, there is inconsistency. |
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R2-2100954 also proposed to copy RAN5 in cc in the reply LS back to RAN4 so that RAN5 is made aware of these mandatory RRM requirements so that they can update their test coverage accordingly.

**Observation 3:** RAN5 needs to be aware of the mandatory Rel-16 capabilities and how the support for them can be inferred based on UE capabilities.

**Proposal 3:** Include RAN5 in the LS to ensure they are aware of the RAN2 (and RAN4) decisions on Rel-16 mandatory capabilities.

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**Proposal 2:** Indicate to RAN4 that network can determine UE support of the mandatory Rel-16 requirements from the AS release indicator in UE capabilities (i.e. *accessStratumRelease*).

**Q4.3 Do companies think that there is a need to inform RAN5 in the RAN2 reply LS to RAN4 so that RAN5 is made aware of these mandatory RRM reqiorements so that they can update their test coverage accordingly?**

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| **Company** | **Yes/No** | **Comments** |
| BT | Yes | RAN5 needs to be aware of these mandatory RRM requirements considering this was mention in RAN4 LS “*It is common understanding that Rel-15 NR UEs may not meet the respective requirements and network needs to know whether the UE can meet the new Rel-16 requirement to adjust the scheduling behavior*” |
| Intel | No | RAN5 can base it on RAN4 spec to update their test coverage |
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### 2.1.5 Handling of other TEI features

R2-2101058 has the following proposals

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**Proposal 1:** RAN2 is asked to add the feature eCall over IMS as optional feature w/o capability signaling in the RAN2 feature list and TS 38.306 as well.

**Proposal 2:** RAN2 is asked to add the feature “UAC-AC1-SelectAssistInfo-r16 in SIB1” in the RAN2 feature list and TS 38.306 as well, and to decide whether the feature should be conditionally mandatory or optional w/o capability signaling for the UE.

**Q5.1 Do companies agree with Proposal 1 above?**

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| **Company** | **Yes/No** | **Comments** |
| Intel | Yes | No strong view. OK to go with majority view. |
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For Proposal 2, RAN2 has to decide on whether it should be a conditionally mandatory for a UE that is configured for delay tolerant service or it should be an optional without capability signalling since the legacy R15 field uac-AccessCategory1-SelectionAssistanceInfo needs to be present anyway in case of per-PLMN signaling, and many networks may not have any problems with the limited flexibility in configuring uac-AccessCategory1-SelectionAssistanceInfo.

**Q5.2 Do companies think that “UAC-AC1-SelectAssistInfo-r16 in SIB1” should be defined as conditionally mandatory for a UE that is configured for delay tolerant service or simply as optional without capability signaling?**

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| **Company** | **Conditionally mandatory without capability signalling/ Optional without capability signalling** | **Comments** |
| Intel | Optional without capability signalling | No strong view. OK to go with majority |
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During the online discussion, Qualcomm would also want to check whether the following in the RAN2 feature list should be optional with or without capability signalling:

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| 24-16 | Introduction of PRACH prioritization parameters for MPS and MCS in RACH-ConfigCommon |

The review comments from companies and resolution from the rapporteur are provided for information below from the RAN2 feature list review:

Agree, adding it as ‘Mandatory without capability signalling’ since it is not specified in Section 5 and 6 of 38.306 and the 38.321 text seems to mandate the UE implementation

[Huawei] In the cover sheet of agreed CR R2-2002102, it describes “The feature is optional…”, so we understand it is “Optional without capability signalling” and needs to be added in 38.306.

{Rapp} The full sentence is ‘The feature is optional and can be enabled on a per gNB basis.’. So the optionaility is from the gNB. The 38.321 text below seems to mandate the UE implementation (in view that network can configure it from SIB for idle/inactive mode):

2> else if *ra-PrioritizationForAccessIdentityTwoStep* is configured for the selected carrier

2> else if *ra-PrioritizationForAccessIdentity* is configured for the selected carrier; and

**Q5.3 “PRACH prioritization parameters for MPS and MCS in RACH-ConfigCommon” can be one of the following:**

**Option 1: Mandatory without capability signalling**

**Option 2: Optional without capability signalling**

**Option 3: Optional with capability signalling**

**Option 4: Others??**

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| **Company** | **Option?** | **Comments** |
| Intel | Option 1 | According to 38.321 text, it seems to mandate the UE implementation (in view that network can configure it from SIB for idle/inactive mode):2> else if *ra-PrioritizationForAccessIdentityTwoStep* is configured for the selected carrier2> else if *ra-PrioritizationForAccessIdentity* is configured for the selected carrier; andHowever we are also fine to go with the majority view. |
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### 2.1.6 Fixing issue with FGs 22-8a/b/c/d

In R2-2101020, the following are provided in the reason for change and the summary of change, respectively:

RAN1#103-e introduced further UE features in R1-2009585, including FG 22-8 “for SRS for CB PUSCH and antenna switching on FR1 with symbol level offset for aperiodic SRS transmission”. The introduction of this FG required introduction of four related FGs as well in order to avoid NBC issues appearing. A correction is required on those newly introduced FGs in order to ensure they indicate the functionality as intended.

Update the relevant capabilities in section 4.2.7.7 removing the dependencies from 3-2, 3-5, 3-5a and 3-5b. Also relevant updates from the feature excel are also updated to the capabilities due to removal of the dependency.

**Q6 Do companies agree with the proposed changes in the CR? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any.**

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| **Company** | **Yes/No** | **Comments** |
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### 2.1.7 Clarification on UE capabilities with FDD/TDD differentiation

In R2-2101433, the following are provided in the reason for change and the summary of change, respectively:

The clarification of the FR1/FR2 differentiation for the following feautres are missing:

* drx-Adaptation-r16
* aggregationFactorSPS-DL-r16
* twoTCI-Act-servingCellInCC-List-r16
* cli-RSSI-Meas-r16
* cli-SRS-RSRP-Meas-r16
* handoverUTRA-FDD-r16
* interFrequencyMeas-NoGap-r16
* simultaneousRxDataSSB-DiffNumerology-Inter-r16

Some of those features are clarified within their corresponding field description (as previously done for similar cases in Rel-15), while others are clarified in Annex A.2 (as previously done for similar cases in Rel-15).

In clause 4.2.7.10 the following capabilities are clarified:

* cli-RSSI-Meas-r16 - To clarify that this feature corresponds to the FR of the cells to be measured;
* cli-SRS-RSRP-Meas-r16 - To clarify that this feature corresponds to the FR of the cells to be measured;

 In clause 4.2.9 the following capabilities are clarified:

* interFrequencyMeas-NoGap-r16 - To clarify that this feature corresponds to the FR of the cells to be measured;
* simultaneousRxDataSSB-DiffNumerology-Inter-r16 - To clarify that this feature corresponds to the FR of the cells where the SSB and PDCCH/PDSCH are received.

In Annex A.2 the following capabilities are added:

* drx-Adaptation-r16 - Classification is "PCell";
* aggregationFactorSPS-DL-r16 - Classification is "All serving cells";
* twoTCI-Act-servingCellInCC-List-r16 - Classification is "All serving cells";
* handoverUTRA-FDD-r16 - Classification is "PCell";

**Q7 Do companies agree with the proposed changes in the CR? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any.**

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| **Company** | **Yes/No** | **Comments** |
| Intel | Yes |  |
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### 2.1.8 Correction on UE capabilities for enhanced MIMO

In R2-2101486, there are 2 changes to the CR. The second change related to the TPMI index definition for non-coherent with 2 ports is already discussed in Section 2.1.3 and is aligned to the changes in R2-2100455. So for R2-2101486, only the first change needs to be discussed as provided in the reason for changes and summary of change, respectively:

1. According to the latest UE features list for Rel-16 designed by RAN1 (R1-2009585), the feature group of out-of-order operation for DL (FG16-2a-2) has two components:

 1)  Support out-of-order operation for PDCCH to PDSCH

 2)  Support out-of-order operation for PDSCH to HARQ-ACK.

The above two components have been captured by TS 38.331. However, in the current TS 38.306, only component 1 is captured and component 2 is missed. To make TS 38.306 consistent with both TS 38.331 and the UE FG design by RAN1, we propose to add the description on *supportPDSCH-ToHARQ-ACK-r16* to *outOfOrderOperationDL-r16* in TS 38.306.

1. Add the description on *supportPDSCH-ToHARQ-ACK-r16* to the field description of *outOfOrderOperationDL-r16*.

**Q8 Do companies agree with the proposed changes in the CR? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any.**

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| **Company** | **Yes/No** | **Comments** |
| Intel | Yes |  |
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### 2.1.9 Capability for dormant BWP switching of multiple SCells

In R2-2101821, it is stated that RAN4 has concluded to introduce a new capability for dormant BWP switching of multiple SCells that is separate from corresponding capability for active BWP switching (*bwp-SwitchingMultiCCs-r16*). However, RAN4 is still discussing the exact value of this new capability.

From rapporteur point of view, RAN2 should wait for RAN4 to conclude on the exact value for the new capability before introducing it. RAN2 can wait for the updated R4 feature list to include this.

**Q9 Do companies agree with adding the new capability for dormant BWP switching of multiple SCells or wait for updated R4 feature list?**

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| **Company** | **Yes/No** | **Comments** |
| Intel |  | Wait for RAN4 to provide the updated R4 feature list via a LS. |
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### 2.1.10 Capability of PUCCH transmissions for HARQ-ACK

In R2-2101873.1873, the following are provided in the reason for change and summary of change:

:

The component 6 of RAN1 feature 11-4/4a as below were not included in the current ASN.1

**11-4/4a component 6:**

Supported maximum number of actual PUCCH transmissions for HARQ-ACK within a slot

Candidate values for the component 6 of FG11-4/4a is: For NCP, {4, 5, 6, 7} for 2-symbol\*7 sub-slot configuration; For ECP, the candidate value is {4, 5, 6} for 2-symbol\*6 sub-slot configuration.

(1)Dummy the legacy capabilities: twoHARQ-ACK-Codebook-type1-r16/

twoHARQ-ACK-Codebook-type2-r16

(2)Add new field twoHARQ-ACK-Codebook-type1-r16/

twoHARQ-ACK-Codebook-type2-r16 to indicate the maximum number of actual PUCCH transmissions for HARQ-ACK within a slot

**Q10 Do companies agree with the proposed changes in the CR? For companies agreeing to the proposed changes, please also comment on the contents of the CR, if any.**

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| **Company** | **Yes/No** | **Comments** |
| Intel | Yes (Proponent) |  |
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## 2.2 Part 2: Intended to progress discussion on agreeable parts

- To be updated after discussion on part 1 -

# 3 Conclusion

- To be updated after discussion on part 1 -