3GPP TSG-RAN WG2 Meeting #116 Electronic R2-210xxxx

Online, November 1st– November 12th, 2021

**Agenda item: 6.1.4.3**

**Source: OPPO**

**Title: Summary of [AT116-e][012][NR16] UE capabilities I**

**Document for: Discussion and Decision**

# 1 Introduction

This document summarizes the following offline discussion.

* [AT116-e][012][NR16] UE capabilities I (OPPO)

Scope: Determine agreeable parts in a first phase, for agreeable parts agree on CRs. Treat [R2-2109331](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2109331.zip), [R2-2109395](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2109395.zip), [R2-2110563](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110563.zip), [R2-2110633](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110633.zip), [R2-2110023](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110023.zip), [R2-2110024](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110024.zip), [R2-2110420](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110420.zip), [R2-2110231](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110231.zip)

Intended outcome: Report, Agreed CRs if applicable

Deadline: Schedule 1

The deadline Schedule 1 for this email discussion is copied from Chair notes:

* A first round with Deadline for comments Thursday W1 Nov 4 1200 UTC to settle scope what is agreeable etc
* A Final round with Final deadline Thursday W2 Nov 11 1200 UTC. to settle details / agree CRs etc. -
* Additional check points etc if needed are defined by the Rapporteur. In case some parts of an email discussion need more time, doesn’t converge, need on-line treatment etc Rapporteur please contact chair.

This document summarizes the following contributions from Agenda Item 6.1.4.3 UE capabilities:

[1] [R2-2109331](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2109331.zip) Reply LS on Two PUCCH Capability (R1-2108657; contact: Qualcomm) RAN1 LS in Rel-16 NR\_L1enh\_URLLC-Core To:RAN2 Moved from 6.1.1

[2] [R2-2109395](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2109395.zip) Discussion on capability for DAPS OPPO discussion Rel-16 NR\_Mob\_enh-Core

[3] [R2-2110563](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110563.zip) Keeping or removing diffSCS-DAPS Ericsson discussion Rel-16 NR\_Mob\_enh-Core

[4] [R2-2110633](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110633.zip) Discussion on some issues for DAPS Huawei, HiSilicon discussion Rel-16 NR\_Mob\_enh-Core Moved from 6.1.4.1.1

[5] [R2-2110023](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110023.zip) Correction on R16 UE capability of supportedSINR-meas-r16 Apple CR Rel-16 38.331 16.6.0 2822 - F NR\_eMIMO-Core

[6] [R2-2110024](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110024.zip) Correction on R16 UE capability of supportedSINR-meas-r16 Apple CR Rel-16 38.306 16.6.0 0647 - F NR\_eMIMO-Core

[7] [R2-2110420](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110420.zip) Discussion on the handover delay due to SCell activation OPPO discussion Rel-16 LTE\_NR\_DC\_CA\_enh

[8] [R2-2110231](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110231.zip) Add the missing capabilities for SON and MDT CMCC CR Rel-16 38.822 16.1.0 0007 - B NR\_SON\_MDT-Core

# 2 Contact from companies

|  |  |  |
| --- | --- | --- |
| Company | Name | Email Address |
| Nokia |  | amaanat.ali@nokia.com |
| Qualcomm Incorporated | Masato Kitazoe | mkitazoe@qti.qualcomm.com |
| Lenovo | Hyung-Nam Choi | hchoi5@lenovo.com |
| OPPO | Qianxi Lu | Qianxi.lu@oppo.com |
| ZTE | Wenting Li | Li.wenting@zte.com.cn |
| Huawei, HiSilicon | Tong Sha | shatong3@hisilicon.com |
| Samsung | Sangbum Kim | Sb07.kim@samsung.com |
| Apple | Naveen Palle | naveen.palle@apple.com |
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| vivo | Chenli | Chenli5g@vivo.com |
| Ericsson | Zhenhua Zou | [zhenhua.zou@ericsson](mailto:zhenhua.zou@ericsson).com |

# 3 Discussion

## 3.1 Two PUCCH capablitiy

This topic is from the following contribution.

[R2-2109331](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2109331.zip) Reply LS on Two PUCCH Capability (R1-2108657; contact: Qualcomm) RAN1 LS in Rel-16 NR\_L1enh\_URLLC-Core To:RAN2

RAN1 provides their feedback to the change of twoHARQ-ACK-Codebook-type1-r16 proposed by RAN2 (R2-2106681) as follows:

| ***twoHARQ-ACK-Codebook-type1-r16***  <Unchanged text is omitted>  NOTE 1:   If the UE indicates support of this feature and is simultaneously configured with two slot-based HARQ-ACK codebooks:   * ~~whether the UE supports two PUCCH of format 0 or 2 for each HARQ-ACK codebook is subjected to the capability reported by~~ *~~twoPUCCH-F0-2-ConsecSymbols.~~* * whether the UE supports two PUCCH of format 0 or 2 in consecutive symbols in the same slot for each HARQ-ACK codebook is subjected to the capability reported by *twoPUCCH-F0-2-ConsecSymbols.* * whether the UE supports one PUCCH format 0 or 2 and one PUCCH format 1, 3 or 4 in the same ~~sub~~slot for each HARQ-ACK codebook is subjected to the capability reported by *onePUCCH-LongAndShortFormat*. * whether the UE supports two PUCCH transmissions in the same ~~sub~~slot for each HARQ-ACK codebook not covered by *twoPUCCH-F0-2-ConsecSymbols* and *onePUCCH-LongAndShortFormat* is subjected to the capability reported by *twoPUCCH-AnyOthersInSlot.* |
| --- |

**Question 1: Do companies think the changes provided by RAN1 are agreeable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Nokia | Yes |  |
| Qualcomm Incorporated | Yes | Note that we late-submitted a CR in R2-2111271. |
| ZTE(Wenting) | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes |  |
| Apple | Yes |  |
| Intel | Yes |  |
| Vivo | Yes |  |
| Ericsson | Yes |  |

## 3.2 DAPS

This topic is from the following contributions.

[R2-2109395](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2109395.zip) Discussion on capability for DAPS OPPO discussion Rel-16 NR\_Mob\_enh-Core

[R2-2110563](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110563.zip) Keeping or removing diffSCS-DAPS Ericsson discussion Rel-16 NR\_Mob\_enh-Core

[R2-2110633](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110633.zip) Discussion on some issues for DAPS Huawei, HiSilicon discussion Rel-16 NR\_Mob\_enh-Core

**DAPS capability**

Based on 38.306, DAPS specific FSC is mandatory for DAPS capability reporting. And based on the following sentence, one can understand that each carrier-pair in the DAPS-FSC shall support DAPS, without any condition on scenario (intra/inter-frequency) and UE capability for the related scenarios.

| ***featureSetCombinationDAPS-r16***  Indicates the feature set that the UE supports for DAPS handover on the NR band combination by FeatureSetCombinationId. A UE shall include this field if intra-freq or inter-freq DAPS handover is supported for this band combination. If the number of CCs within a band combination is more than two, UE shall support DAPS handover between every CC pair. A feature set including *intraFreqDAPS-r16* can only be referred to by *featureSetCombinationDAPS-r16*, not by *featureSetCombination*. A feature set without *intraFreqDAPS-r16* is only applied to inter-freq DAPS handover if it is referred to by *featureSetCombinationDAPS*. Both feature sets with and without *intraFreqDAPS-r16* can be referred to by the same *featureSetCombinationDAPS-r16*. | BC | N/A | N/A | N/A |
| --- | --- | --- | --- | --- |

For intra-frequency DAPS, according to the description as highlighted, one interpretation could be that the capability for source/target cell can be derived based on the capability reported for a **pair** of CC entries. While as also defined in TS 38.306, it seems that at least for bandwidth, another interpretation can be this capability is to be derived based on the **single** CC entry. Thus, clarification is needed.

| ***supportedBandwidthDL***  Indicates maximum DL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of intra-frequency DAPS handover for the source and target cells), which is defined in Table 5.3.5-1 in TS 38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2.  […] | FSPC | CY | N/A | N/A |
| --- | --- | --- | --- | --- |
| ***supportedBandwidthUL***  Indicates maximum UL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of intra-frequency DAPS handover for the source and target cells), which is defined in Table 5.3.5-1 in TS38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2.  […] | FSPC | CY | N/A | N/A |

As proposed in 9395 P1 below

P1: RAN2 clarify for intra-frequency DAPS HO, the source/target cell capability is to be derived based on 1) a same per-CC feature-set ID or 2) a pair of per-CC feature-set ID.

Furthermore, besides intra-frequency case, as clarified in 9395, another question seems whether the sentence above needs to be clarified to differentiate between intra-/inter-frequency support cases,

1. for intra-frequency DAPS, regardless of either a single or a pair of per-CC feature-set ID to be used, it is limited to a single band-entry
2. for inter-frequency DAPS, the pair of per-CC feature-set ID come from different band-entries

**Question 2a: How to derive the capability for source/target cell in intra-frequency DAPS handover:**

**Option1: based on a same per-CC feature-set ID**

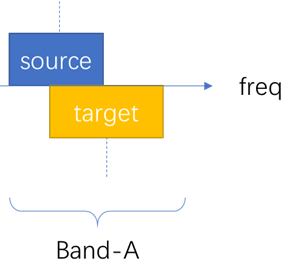
**Option2: based on a pair of per-CC feature-set ID in the same band-entry**

|  |  |  |
| --- | --- | --- |
| Company | Option1/2 | Comments |
| Nokia | Option 2 | **RAN2 Agreement:** “When intra-freq/inter-freq DAPS UE capability is indicated in a band combination comprising of a single band entry, the number of CCs in this band shall be at least two”. |
| Qualcomm Incorporated | Option 2 | Unfortunately, the RAN2 agreement is not well captured in the standard. We support clarifying it in the specifications. |
| OPPO (Qianxi) | 2 | As proponent of 9395, we propose to clarify this in the spec, e.g.,    Detailed wording can be discussed in phase-2. |
| Huawei, HiSilicon | Option2 | We think the principle to derive DAPS capability should be aligned among different features, that is based on a pair of per-CC feature set as described in *featureSetCombinationDAPS-r16*. And the principle should be applied for both intra-freq DAPS and inter-freq DAPS. |
| ZTE(Mengjie) | Option 2 |  |
| Samsung | Option 2 | Option 2 seems to be in line with the original intention. |
| Apple | Opt2 | Option 2 is the correct interpretation according to the RAN2 agreement as indicated by Nokia. |
| Intel | Option 2 |  |
| vivo | Option 2 | We think option 2 correctly capture the previous RAN2 agreement. |
| Ericsson | Option 2 | We agree with Nokia that this is the intention, however we want to note that this agreement would only have made sense if there was some coordination between the nodes. Option 2 is the agreement in RAN2 anyway, and this means that the UE has to set these two FSpCC entries to be identical. Otherwise (since coordination is missing) the source and the target node may "choose" the same entry, and if they both choose the "more advanced" entry, the UE's capabilities would be exceeded. |

**Question 2b: For the capability for source/target cell in inter-frequency DAPS handover, should it be derived from a pair of per-CC feature-set ID?**

|  |  |  |
| --- | --- | --- |
| Company | Yes/No | Comments |
| Nokia |  | **RAN2 Agreement:** “When intra-freq/inter-freq DAPS UE capability is indicated in a band combination comprising of a single band entry, the number of CCs in this band shall be at least two”. |
| Qualcomm Incoporated |  | The RAN2 agreement seems to indicate that for intra-band inter-freqency, only single band entry is included.  To sum:   * Intra-frequency: Single band entry * Intra-band inter-frequency: Single band entry * Inter-band inter-frequency: Two band entries   Again we support clarifying it in the specifications. |
| OPPO | Yes | As proponent of 9395, we propose to clarify this in the spec, e.g.,    Detailed wording can be discussed in phase-2. |
| Huawei, HiSilicon | Yes | See the comments in Q-2a. We agree with Qualcomm that for intra-frequency and intra-band inter-frequency, one single band entry should be included. |
| ZTE(Mengjie) | Yes |  |
| Samsung | Yes |  |
| Apple- |  | We think OPPO’s clarification is correct.    For QC’s summary, our different understanding is that for intra-band inter-frequency case UE can use the multiple band entries in the same bandcombination. |
| Intel | Yes | It can also be derived from a pair of per-CC feature-set ID in the same band-entry according to current spec “If the number of CCs within a band combination is more than two, UE shall support DAPS handover between every CC pair”. |
| vivo | Yes |  |
| Ericsson | Yes | Same detailed comment as for intra. |

For **inter**-frequency DAPS handover, the following case seems not clear whether supported or not, i.e.,the BW is **overlapping** between source and target cell which is shown as follows:



Questions is raised on whether this configuration is supported, and if it is supported, how to determine the capability for anchor/target cell?

P3: RAN2 clarify whether inter-frequency DAPS HO with overlapping BW between source and target cell is supported or not. If hard to confirm in RAN2, send LS to RAN1/4 to ask. If confirmed to be supported, RAN2 confirm the source/target cell capability in this case is derived based on a pair of per-CC feature-set ID for a same band entry.

**Question 3: Whether inter-frequency DAPS HO with overlapping BW between source and target cell (as shown in the figure above) is supported or not?**

**Option-1: Yes**

**Option-2: No**

**Option-3: Send LS to RAN1/4 to ask**

**Option 4: No need to discuss in RAN2, let RAN4 discuss this if needed.**

|  |  |  |
| --- | --- | --- |
| Company | Option-1/2/3 | Comments |
| Nokia | Option 1 | We do not see why this is not possible. |
| Qualcomm Incorporated | Option 2 | We do not think this scenario was considered very well. We understand the starting point was to leverage CA capability for inter-frequency DAPS, and intra-frequency scenario was a new special case. Now this scenario is somewhat inbetween and it is not clear if it should be categoried as inter-frequency or intra-frequency frorm the view point of UE RF implementation.  And we do not see this case to be a typical inter-frequency handover scenario and justifies much amount of necessary cross-WG analysis. We propose to conclude the scenario is not supported in release-16 DAPS. |
| OPPO | See comment and option-3 if RAN2 cannot converge | We tend to see the scenario is not fully clarified in all spec (e.g., at least RAN4).  If RAN2 cannot reach consensus, we suggest to send LS to RAN1/4 to notify / align. |
| Huawei, HiSilicon | Option-1 or Option-3 | In our view, the intra-band CCs with overlapping bandwidth is a possible case in inter-freq DAPS scenario, since the source and target cell may have the same frequency band with different BWs and locations as defined in 38.101. We could send LS to RAN4 to check if companies suggest to do so. |
| ZTE(Mengjie) | Option 1 or 3 | We think it’s a possible case. But it is also fine to send LS to RAN4 to check if this case can be supported or not, given that we have not discussed this in R16 DAPS. |
| Samsung | Option 3 | Since DAPS capability is based on CA capability framework, it’s unclear if the overlapped BW case is valid. Thus we may need to clarify, and we can also send a LS to RAN1/4 |
| Apple | Op2 | Same view as Qualcomm |
| Intel | Option 2 or 3 | RAN2’s understanding is DAPS UE capability is basically reused from CA, and there are no overlapped carriers in CA. In RAN4 spec 38.133, it also says “Note: For inter-frequency DAPS handover, no requirement applies if the BWP of target cell is overlapedoverlapped with the BWP of source cell in frequency domain”. But we are also ok to send a LS for confirmation. |
| vivo | Option 2 or 3 | DAPS capability is based on CA capability. This case is not a typical case for CA. At least we need to confirm with RAN4 before supporting this.  Besides, from UE point of view, we think it is not clear whether this is a valid “inter-frequency” case. |
| Ericsson | Option 4 | This was discussed earlier.  RAN2 does not need to discuss this. RAN2 specs do not define what exactly is "intra" vs. "inter" frequency. That is something which RAN4 defines. We should not attempt to duplicate this definition in RAN2 specs. If "intra" and "inter" freq definitions for DAPS needs further clarifications, companies should bring this up in RAN4. |

**Question 4: If the answer of Q3 is yes, how to derive the capability for source/target cell in inter-frequency handover with overlapping BW?**

**Option1: a single per-CC feature-set ID**

**Option2: a pair of per-CC feature-set ID for a same band entry**

|  |  |  |
| --- | --- | --- |
| Company | Option1/Option2 | Comments |
| Nokia | Option 2 | **RAN2 Agreement:** “When intra-freq/inter-freq DAPS UE capability is indicated in a band combination comprising of a single band entry, the number of CCs in this band shall be at least two”. |
| Huawei, HiSilicon | Option2 | See the comments in Q-2a. |
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Regrading the configuration of BW for source and target cells, 9395 propose to clarify whether legacy BCS and and frequency separation is applicable for intra-frequency DAPS handover and inter-frequency DAPS handover with overlapping BW.

P4: RAN2 clarify for intra-frequency DAPS HO, and inter-frequency DAPS HO where the BW of source and target cells are overlapping with each other (if concluded as supported by P3), the legacy reported field of frequency-separation and BCS is NOT applicable.

**Question 5a: Do companies agree that the legacy reported field of 1) frequency-separation and 2) BCS is not applicable for intra-frequency DAPS handover?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or no | Comments |
| Nokiia | No | Yes DAPS does not allow CA so that is correct understanding? |
| Qualcomm Incorporated |  | 1. Frequency separation is for intra-band non-contiguous, i.e. multiple band entries for the same band. So should not be applicable to any of DAPS scenario (see our input in Q2b. 2. Given DAPS was to leverage CA capability of the UE, our originall understanding was that BCS was applicable, but we are open for other views. |
| OPPO | Both not applicable to intra-f DAPS | 1. Frequency separation: it is related to intra-band non-contiguous case, so not related to intra-f DAPS anyway 2. BCS: it was defined for intra-/inter-band CA, i.e., applicable to inter-f DAPS but not intra-f DAPS anyway |
| Huawei, HiSilicon | See comments | We agree with the intention of the proposal that these legacy fields are defined for regular CA BC but not for DAPS. |
| ZTE(Mengjie) |  | We also agree that frequency-sepatation and BCS are defined for the legacy CA, so they are not applicable for intra-freq DAPS. |
| Samsung |  | Wait for RAN4 input on the overlapping BW |
| Apple | Agree that they are not applicable. | There are meant for CA and not to DAPS as per our understanding. |
| Intel | Yes |  |
| vivo | Agree |  |
| Ericsson | Agree | For single-carrier operation we don’t use BCS or freq-separation |

**Question 5b: If Yes to Q3, do companies agree that the legacy reported field of 1) frequency-separation and 2) BCS is not applicable for inter-frequency DAPS handover with overlapping BW?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or no | Comments |
| Intel | Not relevant (See comments) | SInce there is no overlapping inter-frequency CA, hence the overlapping BW case will not happen for inter-frequency DAPS. |
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For BW-class, due to the 331 clarification below

|  |
| --- |
| *FeatureSetDownlink* field descriptions |
| ***featureSetListPerDownlinkCC***  Indicates which features the UE supports on the individual DL carriers of the feature set (and hence of a band entry that refer to the feature set). The UE shall hence include at least as many *FeatureSetDownlinkPerCC-Id* in this list as the number of carriers it supports according to the *ca-BandwidthClassDL*, except if indicating additional functionality by reducing the number of *FeatureSetDownlinkPerCC-Id* in the feature set (see NOTE 1 in *FeatureSetCombination* IE description). The order of the elements in this list is not relevant, i.e., the network may configure any of the carriers in accordance with any of the *FeatureSetDownlinkPerCC-Id* in this list. |

It means even for class-A, there could be more than 1 per-CC FS ID. So

* If the class is higher than A (e.g., B, C..), it is not questionable that the per-CC FS IDs in the band-entry support intra and inter-frequency DAPS, at least in the shape of intra-band continuous manner, and maybe case-3 as well.
* Or if the class is A, not sure if the per-CC FS IDs in the band-entry support intra-frequency DAPS only.

So 9395 proposes to clarify

Proposal 5 RAN2 confirm if the reported BW-class for a band-entry is A, the per-CC feature-set IDs associated with this band entry only support intra-frequency DAPS HO, otherwise support inter-frequency DAPS HO as well (i.e., for BW-class B/C/…).

**Question 6a Do companies agree: if the reported BW-class for a band-entry is A, the per-CC feature-set IDs associated with this band entry only used to derive intra-frequency DAPS HO capability (in case supported as reported via intraFreqDAPS-r16), but cannot be used to derive inter-frequency DAPS capability for the corresponding band entry (if supported as reported via interFreqDAPS-r16)?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or no | Comments |
| Nokia | Yes this is not precluded for both intra and inter frequency DAPS | This was discussed in [AT112-e][215][NR][MOB] Additional clarification to DAPS capabilities (Nokia) R2-2011103. As well as agreement during RAN2#112-e was that “No further modifications to specifications to allow or disallow DAPS for BW class A” |
| Qualcomm Incorporated |  | Our understanding (see Q2a) is that the UE shall include two CC entries for a single band entry. Then the need of bandwidth class A in case of intra-frequency and intra-band inter-frequency is unclear.  So only use case of bandwidth class A seems inter-band inter-frequency. |
| OPPO |  | The essential Q is whether the per-CC FS ID(s) in a BW-class A band-entry is applicable to   1. Intra-f DAPS, and 2. Intra-band inter-f DAPS   We understand it is at least NOT applicable to 2), but relies on majority view on 1) |
| ZTE(Mengjie) |  | Our understanding is that the CC in the band-entry with BW-class A can also support inter-freq DAPS with the CC in other band-entry, i.e. inter-band inter-freq. But we are open for the intra-band inter-freq case. |
| Samsung | Yes |  |
| Apple | Yes |  |
| Intel | Partially Yes | For the first sentence “only used to derive intra-frequency DAPS HO capability”, it’s not accurate. Based on current spec, it’s possible to have a two-band BC (both BW-class are A), and when UE indicates interFreqDAPS-r16, it means UE supports inter-freq DAPS between these two bands.  For the second sentence, we understand the intention is to say “it’s not possible to support a inter-freq DAPS within a band entry”. |
| vivo | Yes |  |
| Huawei, HiSilicon |  | RAN2#113-e made the following agreement:   |  | | --- | | 3 Confirm in Chairman notes that for intra-frequency DAPS, for a given band with BWC-A signalled, UE can signal more than 1 FSpCC (e.g. if 2 then one of them is for source and other for target). |   Regarding whether BWC-A could be used for intra-band inter-freq DAPS or not, in our view, the FSpCCs within one band entry with BWC-A could only be used to derive intra-freq DAPS capability.  Intra-band inter-freq DAPS capability could be derived from one band entry with a higher BW class (e.g. BWC-C), or from two band entries in a multi-band BC.  In one BWC-A band, network only configures source cell or target cell based on one FSpCC for inter-freq DAPS. To enable different feature sets, UE could indicate inter-freq DAPS capability in a multiple-band BC. |
| Ericsson |  | Agree with QC. |

For the inter-frequency DAPS **without** overlapping between source and target cells, 9397 propose to confirm the following

P7: RAN2 for inter-frequency DAPS HO cases where the BW of source and target cells are not overlapping with each other, the BW-class, frequency-separation and BCS restriction reported in the same BC-entry is applicable to both non-DAPS FSC and DAPS FSC.

**Question 6b Do companies agree that: for inter-frequency DAPS HO cases where the BW of source and target cells are NOT overlapping with each other, the 1) BW-class, 2) frequency-separation and 3) BCS restriction reported in the same BC-entry are all applicable to both non-DAPS FSC and DAPS FSC?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or no | Comments |
| Nokia | Yes | But UE is allowed to report separate FSC for DAPS also? |
| Qualcomm Incorporated | No | See our input for Q3, |
| OPPO | See comment | Response to Nokia, sure FSC for normal case and for DAPS are separate  Detailed understanding as follows   |  |  |  | | --- | --- | --- | |  | Intra-band inter-f DAPS | Inter-band inter-f DAPS | | BW class | Yes class-B/C helps to restrict the sum BW of source and target cell (besides, the outuput of Q6a is related to this Q6b) | Yes | | Frequency separation | Yes if intra-band non-contiguous is a valid case for DAPS HO (we think so) | N.A. | | BCS | Yes | Yes | |
| ZTE(Mengjie) | Yes |  |
| Samsung | Yes |  |
| Apple | Yes | It was not discussed before. But we donot see the problem to use it for both. |
| Intel | Yes |  |
| vivo | Yes |  |
| Huawei, HiSilicon | Yes | We agree that for non-overlaping inter-freq DAPS, BW class, frequency separation and BCS restriction are applicable to non-DAPS FSC and DAPS FSC as defined in current spec. |
| Ericsson | No? | This seems to need further analysis. |

**Keep of diffSCS-DAPS**

RAN4 requested in R4-2016850 to add the diffSCS-DAPS capability bits which are defined as follows:

|  |
| --- |
| *interFreqDiffSCS-DAPS-r16* indicates whether the UE supports different SCSs in source PCell and inter-frequency target PCell in DAPS handover. The UE only includes this field if different SCSs can be supported in both UL and DL. If absent, the UE does not support either UL or DL SCS being different in DAPS handover. |
| *intraFreqDiffSCS-DAPS-r16* indicates whether the UE supports different SCSs in source PCell and intra-frequency target PCell in DAPS handover. The UE only includes this field if different SCSs can be supported in both UL and DL. If absent, the UE does not support either UL or DL SCS being different in DAPS handover. |

RAN2 discussed last time whether to remove these capability bits while the decision is postponed. Some companies think they do not provide additional information considering it is already clear which SCS can be supported for UL and DL transmission of a DAPS pair. In [R2-2110563](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110563.zip), it is proposed to keep diffSCS-DAPS capabilitiy bits, i.e., interFreqDiffSCS-DAPS-r16 and intraFreqDiffSCS-DAPS-r16 unless requested by RAN4. [R2-2110633](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110633.zip) proposes to add a clarification that “In this release the UE shall not report this UE capablity”.

**Question 7: Do companies agree to keep the diffSCS-DAPS capability bits?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Nokia | Yes | Let’s not remove things now |
| Qualcomm Incorporated | Yes | At least new requirement for the UE, e.g. “shall not report” should be avoided. |
| Huawei, HiSilicon | No | Our key point is that the current ASN.1 signalling structure can let UE indicate the exact supported SCS value in each FsperCC, and UE can support DAPS with every CC pair among the indicated CCs. Based on these information, the network will anyway know SCS capability for DAPS source and target cell.  On top of that, the diffSCS-DAPS capability bits do not provide extra information, so they can be disabled. |
| ZTE(Mengjie) | No strong view | We have some sympathy with Huawei that the diffSCS-DAPS capability can be deduced from the SCS indicated in each FSpCC. But we see no harm to report this. So we are fine to follow the majority’s view. |
| Samsung | Yes |  |
| Apple | Yes |  |
| Intel | Yes |  |
| vivo | Yes |  |
| Ericsson | Yes |  |

**Question 8: If the answer of Q7 is yes, do companies agree to add the clarification sentence “In this release the UE shall not report this UE capablity” ?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Nokia | Neutral | We don’t see any need but no strong view |
| Qualcomm Incorporated | No | This is not backward compatible. If we are to disable the function of the UE caapabilitty parameter, dummifying is better solution. |
| Huawei, HiSilicon | Yes | We are also ok with Qualcomm’s approach, i.e. dummyfing the capbility bits. |
| ZTE(Mengjie) | No strong view |  |
| Samsung | No | We see no strong need for the sentence. |
| Apple | Neutral |  |
| Intel | No | As observed in R2-2110563, the diffSCS-DAPS capability bits allow different UEs to support/not support SCS-change during a DAPS handover. |
| vivo | No | No strong motivation. |
| Ericsson | No |  |

**DAPS definition on feature combination**

In current 38.331, daps-Config-r16 is defined in the RadioBearerConfig IE, and the condition DAPS is described as below:

|  |  |
| --- | --- |
| **Conditional Presence** | **Explanation** |
| *[partially omitted]* |  |
| *DAPS* | The field is optionally present, need N, in case masterCellGroup includes ReconfigurationWithSync, SCell(s) and SCG are not configured, multi-DCI/single-DCI based multi-TRP are not configured in any DL BWP, *supplementaryUplink* is not configured, ethernetHeaderCompression is not configured for the DRB, *conditionalReconfiguration* for CHO is not configured, and NR sidelink and V2X sidelink are not configured. Otherwise the field is absent. |

[R2-2110633](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110633.zip) thinks there is ambiguity in the description as highlighted. One understanding of the sentence is ‘multi-DCI multi-TRP, and single-DCI multi-TRP’, and the other understanding is ‘multi-DCI (single or multi TRP), and single-DCI multi-TRP’. As RAN2 has already agreed, DAPS can not be configured simultaneously with multi-TRP, RAN2 is ask to check whether companies share the same view that the highlighted sentence has captured the agreement well.

**Question 9: Companies is ask to confirm whether ‘multi-DCI/single-DCI based multi-TRP’ is interpreted as ‘multi-DCI multi-TRP and single-DCI multi-TRP’ ?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Nokia | Yes |  |
| Qualcomm Incorporated | Yes |  |
| Huawei, HiSilicon | Yes |  |
| ZTE(Mengjie) | Yes |  |
| Samsung | Yes |  |
| Apple | Confirm |  |
| Intel | Yes |  |
| vivo | Yes |  |
| Ericsson | No spec change needed | There is no need for changing the spec like this. It seems rather farfetched to say that this would be misinterpreted as “multi-DCI (multi-TRP or single-TRP)” and “single-DCI multi-TRP”. |

Considering multi-DCI multi-TRP is based on RRC signalling, but single-DCI multi-TRP can be controlled by MAC CE, another ambuiguity observed in [R2-2110633](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110633.zip) regards to the configuration of single-DCI based multi-TRP. Theythe wording ”multi-DCI/single-DCI based multi-TRP are not configured in any DL BWP” in TS 38.331 seems only refer to RRC configuration.

**Question 10: Do companies think there is ambiguity in ‘multi-DCI/single-DCI based multi-TRP are not configured in any DL BWP’, i.e., it only refers to RRC configuration ?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Nokia | RRC configuration | Yes if it is not configured this cannot be used. So we see this as RRC configuration. |
| Qualcomm Incorporated | No |  |
| Huawei, HiSilicon | Yes | As we discussed in R2-2110633:  mDCI+mTRP: based on network configuring UE to monitor two CORESET pool indexes (i.e. each CORESET can be assigned a separate spatial assumptions). It refers to RRC configuraiton, and we think it is clear  sDCI+mTRP: not clear about the configuration, e.g. *based on repetition (configured by RRC) or dual TCI state operation with SDM (which is activated by MAC CE)*  For sDCI+mTRP, the current specification does not mention too much, so it could refer to RRC or MAC configuration. We think it will be good to confirm what it refers to in order to avoid any misalignments between UE and networks. If majority view is that for DAPS, sDCI+mTRP only refers to RRC configuraiton (i.e. repetition configured by RRC), we can be also ok. |
| ZTE(Mengjie) | No | We have discussed how to capture the multi-TRP related configuration at RAN2#112e meeting, but it is found very difficult to clearly capture the related specific fields/MAC CE. So we captured the general term for simplicity. And the current stage-2 spec has captured the definition for multi-DCI based and single-DCI based multi-TRP, so we think it’s free to use this term in stage-3 spec. If companies think the current text is not clear, a reference to stage-2 spec can also be added. |
| Samsung | Yes |  |
| Apple | No |  |
| Intel | No | The restriction is for the feature, i.e. limit to RRC configuration. |
| vivo | No |  |
| Ericsson | No | Agree with ZTE |

**Question 11: If the answer of Q10 is yes, how to clarify it in specification?**

|  |  |
| --- | --- |
| Company | Comments |
| Nokia | We don’t see any need to clarify anything as this was pretty clear already |
| Huawei, HiSilicon | If majority view is to only refer to RRC configuration, it may be no need to clarify it in specification. Otherwise, it will be good for some clarifications in order to avoid misalignments between UE and network. |
|  |  |
|  |  |
|  |  |
|  |  |

## 3.3 eMIMO

This topic is from the following contributions.

[R2-2110023](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110023.zip) Correction on R16 UE capability of supportedSINR-meas-r16 Apple CR Rel-16 38.331 16.6.0 2822 - F NR\_eMIMO-Core

[R2-2110024](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110024.zip) Correction on R16 UE capability of supportedSINR-meas-r16 Apple CR Rel-16 38.306 16.6.0 0647 - F NR\_eMIMO-Core

Referring to contributions above, the following observations and changes are proposed:

For R16 capability of the supportedSINR-meas-r16, current RAN2 RRC spec is not aligned with the RAN1 R16 feature list and the description in TS 38.822. In RRC spec, the capability of the supportedSINR-meas-r16 is defined in ENUMERATED type while it is defined in BITMAP type in TS38.822 and RAN1 feature list. The problem of using “ ENUMERATED” to indicate the capability is that UE cannot indicate more than one case, e.g. support of both csi-RSWithoutIMR and ssbWithNZP-IMR.

Based on the reason above, it is proposed to introduce new capability parameter supportedSINR-meas-v16xy to indicate the “BITMAP” type capability, and the description of each bit is provided in TS38.306.

**Question 12: Do companies agree with the issue and if yes, are the suggested CRs agreeable?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Nokia | Yes, but | Is it correct understanding that if the UE provides the new capability it should also provide the old one with a value, which is ignored by a RAN supporting the new capability? |
| Qualcomm Incorporated | Yes | We should indeed keep the existing UE capability parameter for legacy UEs and legacy network. New UEs supporting the new capability parameter can pick what it thinks is the most relevant one to indicate in the existing UE capability parameter. |
| Lenovo | Yes but | We wonder about the value and need to keep the existing capability supportedSINR-meas-r16. There should be no legacy issues so we prefer to dummify it. Furthermore, if we keep the existing capability then the UE behaviour needs to be clearly specified how to set the existing and new capability. Furthermore wrt to the 38.331 CR, to keep the context the new supportedSINR-meas-v16xy should be introduced as NCE of ssb-csirs-SINR-measurement-r16.  Wrt to the 38.306 CR the cover page needs to be corrected:   * The current statement in “Consequences if not approved” is not correct and should be replaced by “UE cannot indicate the support of more than one L1-SINR measurement cases.” (same as in the 38.331 CR). * “Clauses affected” needs to be corrected to 4.2.7.2. |
| ZTE | Yes but | We share the similar view as Lenovo. To dummy the exiting capability, otherwise, we need to clarify how to set the existing and new capability. |
| Huawei, HiSilicon | Yes | We agree to introduce a new “BITMAP” capability to keep alignment with RAN1 feature list. |
| Samsung | Yes | It is indicated with bitmap type, in T38.822.  The new capability could be additionally added with the legacy one.  Thus, a clarification in 38.306 should be required for the case, e.g.  If the new capability is included, NW ignores the legacy capability.  Alternatively, we can consider to then dummify the legacy one. |
| Apple | Proponent | We are fine with Lenovo’s comment, i.e. to dummify the existing capability. |
| Intel | Yes |  |
| vivo | Yes with comments | We agree to introduce new capability. Regarding whether to keep or dummy the old one, we are netual. But if the old one is kept, we should define the corresponding behaviour for new UEs with new capability. |
| Ericsson | yes | Technically yes but need to consider how it is used with the old value |
| Huawei, HiSilicon |  | We agree with Qualcomm that keeping the exiting capability is better for backward compatibility. The new UEs with new capability could choose one value among the new capability to report for the legacy one, the network ignores the legacy one if new capability is reported. |

## 3.4 DCCA

This topic is from the following contributions.

[R2-2110420](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110420.zip) Discussion on the handover delay due to SCell activation OPPO discussion Rel-16 LTE\_NR\_DC\_CA\_enh

In this contribution, it is observed that handover delay would be increased due to the SCell activation indication in RRCReconfiguration message including reconfigurationWithSync:

* Compared RRC reconfiguration, the RRC processing delay is increased by 6ms for RRC reconfiguration with SCell addition/release indication.
* Delays at physical layers will also increase since it needs to make it ready for CSI report transmission and other actions of activated SCell.

UE shall always perform SCell activation at handover if it is indicated since no capability field is defined for this case in TS 38.306. Note that there is capbality defined to indicate whether to support SCell activation in RRC resume procedure. Therefore, it is propose to introduce a UE capability, which is used to indicate whether SCell activation during handover is supported by UE.

**Question 13: Do companies agree to introduce a new capability parameter to indicate whether SCell activation during handover is supported by UE?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Nokia | No | NOT OK, this should be just the network’s problem not a UE capability. It is always under network control to do or not do something and network may always choose not to do something. |
| Qualcomm Incorporated |  | We did not understand the connection between the problem statement and the proposed solution in the document. How does the introduction of new UE capability reduce the handover delay? |
| Huawei, HiSilicon | No | In the current spec, the capability *directMCG-SCellActivation-r16* is used to indicate whether UE supports direct MCG SCell activation upon SCell addition and upon reconfiguration with sync. That would be a NBC change to introduce a new capability separately for SCell activation during handover scenario. |
| ZTE | No | We may not fully understand the following statement from this paper, why SCell activation must be performed before RACH in target Pcell?  *“if SCell activation indication is received in RRCReconfiguration message including reconfigurationWithSync, the SCell shall be activated before the completion of handover. ”*  And as QC also commented, why a new UE capability can be helpful (if problem truly exists)? |
| Samsung | No | Unclear if it’s a real problem |
| Apple | No | Similar view as Qualcomm. |
| Intel | No | We have concern that it may lead to NBC change. |
| vivo | No | We think this issue is not the motivation for new UE capability. |
| Ericsson | No | Not needed. The handover (reconfiguration with sync) case is already covered by existing capabilities (separate for FR1/FR2):  ***directMCG-SCellActivation-r16***  Indicates whether the UE supports direct NR MCG SCell activation, as specified in TS 38.321 [8], upon SCell addition, upon reconfiguration with sync of the MCG, as specified in TS 38.331 [9].  ***directSCG-SCellActivation-r16***  Indicates whether the UE supports direct NR SCG SCell activation, as specified in TS 38.321 [8], upon SCell addition and upon reconfiguration with sync of the SCG, both performed via an *RRCReconfiguration* message received via SRB3 or contained in an *RRC(Connection)Reconfiguration* message received via SRB1, as specified in TS 38.331 [9] and TS 36.331 [17]. |

## 3.5 MDT

This topic is from the following contribution.

[R2-2110231](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110231.zip) Add the missing capabilities for SON and MDT CMCC CR Rel-16 38.822 16.1.0 0007 - B NR\_SON\_MDT-Core

In RAN2#108 meeting, the following agreements on UE capability were agreed:

*Agreements:*

*Location related capability:*

*locationReport is mandatory supported without UE capability, i.e. if location information is available, UE shall include location information while performing MDT.*

*SON related capability:*

*CEF reporting and RLF reporting are mandatory supported without UE capability, same as LTE.*

From the agreement, it is clear that RAN2 agree that locationReport, CEF reporting and RLF reporting are mandatory supported without UE capability signalling. However, these capabilities are missing in TR 38.822 and it is proposed in [R2-2110231](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_116-e\Docs\R2-2110231.zip) to fix it.

**Question 14: Do companies agree to add the following mandatory capabilities for NR SON and MDT feature in TS 38.822?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Nokia | Yes |  |
| Qualcomm Incorporated | Yes |  |
| Lenovo | Yes but | * Cover page: in “Other specs affected” the “N” box for “Other core specifications” needs to be ticked and the references to 38.304 and 38.331 CRs need to be removed; WI code should be “NR\_SON\_MDT-Core”; Release should be “Rel-16”; CR category should be “F”, Impact analysis should be added by saying there are no interoperability issues. * In the table all entries “No” in the columns “Need of FDD/TDD diff” and “Need of FR1/FR2 diff” should be replaced by “N/A”. * The description of “Location reporting” should be corrected to “If location information is available, it is mandatory for UE to include location information for SON and MDT related reporting.” |
| ZTE(Zhihong) | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes |  |
| Intel | Yes |  |
| vivo | Yes |  |
| Ericsson |  | We are fine with the changes proposed in the CR but wonder if we should do regular maintenance of TS 38.822 spec. |

# 4 Conclusion

TBD.