**3GPP TSG-RAN WG2 Meeting#110-e R2-200xxxx**

**Electronic, 1 - 12 June 2020**

**Agenda Item:**  **6.10.2**

**Source: Huawei, HiSilicon**

**Title: Summary of [AT110-e][074][DCCA] UE capabilities (Huawei)**

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

# 1 Introduction

This document is a summary of the following offline discussion:

* [AT110-e][074][DCCA] UE capabilities (Huawei)

Scope: Treat documents under 6.10.2, determine agreeable parts and and make agreements. Implement meeting agreements in updated CRs.

 Part 1: Agreements (rapporteur sets the deadline)

 Part 2: Endorsed CRs 38306 38331 36306 36331 (For merge, good Q cover sheet etc)

 Deadline: June 11 0700 UTC

# 2 Discussion

## 2.1 Previous discussions

Following [Post109bis-e][033][DCCA] UE capabilities CRs, the following CRs were submitted:

[R2-2005251](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_110-e%5CDocs%5CR2-2005251.zip) Introduction of UE capabilities for eDCCA Huawei, HiSilicon CR Rel-16 36.306 16.0.0 1757 1 B LTE\_NR\_DC\_CA\_enh-Core R2-2003703 Late

[R2-2005252](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_110-e%5CDocs%5CR2-2005252.zip) Introduction of UE capabilities for eDCCA Huawei, HiSilicon CR Rel-16 38.306 16.0.0 0293 1 B LTE\_NR\_DC\_CA\_enh-Core R2-2003704 Late

[R2-2005253](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_110-e%5CDocs%5CR2-2005253.zip) Introduction of UE capabilities for eDCCA Huawei, HiSilicon CR Rel-16 36.331 16.0.0 4283 1 B LTE\_NR\_DC\_CA\_enh-Core R2-2003705 Late

[R2-2005254](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_110-e%5CDocs%5CR2-2005254.zip) Introduction of UE capabilities for eDCCA Huawei, HiSilicon CR Rel-16 38.331 16.0.0 1580 1 B LTE\_NR\_DC\_CA\_enh-Core R2-2003706 Late

It is believed that all comments in that discussion were taken into account.

**Q1: Do company have comments on these CRs or see any issue not indicated as FFS in these CRs?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if any)** |
| Qualcomm  | No | We think the current CRs capture different opinions quite well. |
| OPPO | No  |  |
| MediaTek | No |  |
| Nokia | No | CRs look good |
| Ericsson | No |  |
| vivo | no |  |
| ZTE | No |  |
| Futurewei | No |  |
| Samsung | No |  |
| LG | No |  |

Six aspects are FFS:

- **36.306**

- ***endc-IdleInactiveMeasurements-r16***: split in two separate capabilities, one for FR1 and one for FR2 measurements

- ***directSCellActivationResume-r16***: split in two separate capabilities, one for E-UTRA MCG SCells and one for E-UTRA SCG SCells (for NE-DC if resume with SCG is supported)

- **38.306**

- ***idleInactiveNR-MeasReport-r16***: FR1/FR2 separation, i.e. separate indications for support FR1 measurements and support of FR2 measurements (same as endc-IdleInactiveMeasurements-r16)

- ***directSCellActivation-r16***:

- split in two separate capabilities, one for NR MCG SCell activation, one for NR SCG SCell activation (in EN-DC or in NR-DC)

- FR1/FR2 separation, i.e. separate indications for direct activation of FR1 SCell and direct activation of FR2 SCell

- ***directSCellActivationResume-r16***:

- split in two separate capabilities, one for NR MCG SCell activation, one for NR SCG SCell activation (in EN-DC or in NR-DC if the UE supports resume with SCG)

- FR1/FR2 separation, i.e. separate indications for direct activation of FR1 SCell and direct activation of FR2 SCell

This discussion will poll company opinions again, but based on previous poll. there was no clear majority either way. Then, let's poll again.

**Q2: For idle/inactive NR measurements (i.e. *endc-IdleInactiveMeasurements-r16*** **and** ***idleInactiveNR-MeasReport-r16***)**, do companies prefer to distinguish FR1/FR2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if any)** |
| Qualcomm | Yes | For now, we have the following concern in early measurement in FR2. If without FR1/FR2 diff, we may be forced to take a long time for testing in the FR2, which may result in much longer time to deploy early measurement to market:1. It will burn a lot of power for IDLE/INACTIVE UE. Different from measurements for cell (re)reselection/CONNECTED, we understand early measurements is target for fast CA/DC setup, which is “best effort”. NW can first add FR1 CA/DC based on early measurement and then reconfigure to FR2 CA/DC based on CONNCTED measurement later.
2. We think FR2 measurements may not even be useful for NW because FR2 measurements are likely to change quickly and we don’t introduce any mechanism to prevent outdated reporting in Rel-16. Thus, at least for now, we are worried that FR2 early measurement will burn UE’s power and provide useless or even misleading measurements to NW.
3. In real IOT, we observe relatively slow ramp of traffic from IDLE/INACTIVE to CONNECTED. Actually, we think it is enough to use FR1 CA/DC to handle the delta traffics from beginning and then reconfigure to FR2 CA/DC later.

Please note that we don’t intend to preclude early measurements in FR2. We just need more flexible in UE implementation and IOT. |
| OPPO | Yes  | Agree with the concern from QC. |
| MediaTek | Yes | We tend to think that it would be better to have FR1/FR2 separation for most measurement capabilities. It would be useful at least for IOT purpose.  |
| Nokia | No | If UE supports FR2 it has to support measurements. We fail to see how different it would be to measure FR2 for early measurements than any other purpose. So if UE supports early measurements and FR2 it seems trivial to support early measurements for FR2 as well.  |
| Ericsson | Yes | The FR1 and FR2 differentiation is acceptable for this case. |
| vivo | Yes  | We are ok with fine granularity.  |
| ZTE | Yes |  |
| Futurewei | Yes |  |
| Samsung | Yes | FR1/FR2 separation would be reasonable since network deployment may be limited to FR1. |
| LG | Yes | It seems to be beneficial to separate FR1 and FR2 capabilities. |

**Q3: For direct SCell activation, i.e. in 36.306 *directSCellActivationResume-r16* and in 38.306 *directSCellActivation-r16* and *directSCellActivationResume-r16*, do companies prefer to distinguish MCG SCells and SCG SCells, as indicated above?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if any)** |
| Qualcomm | Yes | For 38.306 capability, we prefer the separation between MCG and SCG because we think that MCG and SCG may be handled by different modules in UE implementation. Then it means different UE implementation requirements, and different UE processing timeline between MCG and SCG.For 36.306 capability, it seems NE-DC is not a quite popular option used in field. So, we can accept no separation. But it may mean different capability signalling between 36.306 and 38.306.  |
| OPPO | ? | I am confused the question, it means that the UE can support to set the SCell activation indication for MCG SCell, but may not support to set the SCell activation indication for SCG SCell?I also wonder if ***directSCellActivationResume*** capability only used for MCG case? Because I can not see the difference for SCG when the SCell activation indication for SCG SCell is in RRCResume message or RRCReconfiguration message. |
| MediaTek | Yes | In the implementation, there will be different module to handle MCG and SCG parts. A UE supports direct NR MCG SCell activation may not finish its implementation (or testing) of NR SCG SCell activation. There are not complete the same and there is some additional effort to support one on top on the other. We however also agree that the extra effort is not huge. But to have more implementation flexibility, we prefer to separate the capability.  |
| Nokia | No | What is different for directly activating SCG and MCG cells? It seems to be exactly same so why would one separate capabilities either? |
| Ericsson | Yes | We can accept this. |
| vivo | Yes | We are ok with fine granularity. |
| ZTE | Yes with comment | If both Q3 and Q4 are agreed, then we will have 10 capability parameters just for Scell direct activation function.We understand UE vendors prefer more flexible UE capability signalling. But better to consider whether some can be merged, or be considered in further release. E.g. LTE SCG SCell (NE-DC) as indicated by Qualcomm. |
| Futurewei | No | This capability separation appears based on implementation of separate modules for MCG and SCG rather than based on capable of technical features. Direct SCell activation is a feature of DC which would be supported for both MCG and SCG. If due to different module this feature is not supported at SCG, what about other MCG/SCG common features? should be the same? It would be incomplete that for basic features a UE only supports at MCG but not supported at SCG. Too many UE capabilities will also increase the operation complexity. |
| Samsung | Yes | We are OK with this. |
| LG | Yes |  |

**Q4: For direct SCell activation, i.e. in 38.306 *directSCellActivation-r16* and *directSCellActivationResume-r16*, do companies prefer to distinguish FR1 SCells and FR2 SCells?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if any)** |
| Qualcomm | Yes | We think this separation is important for the fast deployment of direct SCell activation:1. We do see difference on UE implementations in FR1 and FR2. For example, in section 8.3.4 of 38.133, it is specified that the activation time includes RRC processing time and the time to report valid CSI:

*Ndirect* = *TRRC\_Process* + *T1* + *Tactivation\_time* + *TCSI\_Reporting*As explained in 38.133, *Tactivation\_time* and *TCSI\_Reporting* are specified in clause 8.3.2, where FR1 and FR2 requirements are different. For example, some FR2 specific requirements are list:* If there is at least one active serving cell on that FR2 band and if the RS (s) of SCell being activated is (are) QCL-TypeD with RS (s) of one active serving cell on that FR2 band, Tactivation\_time is 3 ms
* If there is no active serving cell on that FR2 band, Tactivation\_time will vary depending when TCI of PDCCH is available to UE

For now, we think at least how to activate TCI of PDCCH is FR2 different requirement from FR1.1. It will help reduce the time to market. As we know, MCG in FR1 is more popular due to the coverage limitation of FR2; while NR-DC specified in Rel-15 is only MCG in FR1 and SCG in FR2. Thus, it is possible that we need to first focus on the case that MCG SCells in FR1 and SCG SCells in FR2. Then, the FR1/FR2 separation is helpful to reduce time to market for the feature of direct SCell activation. Note that the IOT timeline can be difficult to align between FR1-FR2 and MCG-SCG.
2. Note that FR1-FR2 CA is being specified, which will have different RAN4 requirement. Then if without FR1/ FR2 separation, we are not sure whether it is feasible to directly activate FR1 and FR2 SCells in MCG simultaneously. If not feasible, we may have to drop the whole feature.
 |
| OPPO | Yes  | It is better to have. |
| MediaTek | No strong view | But fine to separate it. If there is no majorities in this topic, we think it would be safer to separate it. |
| Nokia | No |  |
| Ericsson | Yes | The FR1 and FR2 differentiation is acceptable for this case. |
| vivo | Yes  | We are ok with fine granularity. |
| ZTE | Yes with comment | If both Q3 and Q4 are agreed, then we will have 10 capability parameters just for Scell directly activation function.We understand UE vendors prefer more flexible UE capability signalling. But better to consider whether some can be merged to avoid over specified. For instance do we really need FR1/FR2 differentiation for both RRCReconfiguration and RRCResume, will a UE supports FR1 direct SCell activation in RRCResume does not support the FR1 direct SCell activation in RRCReconfiguration? |
| Futurewei |  No | Wondering if there is anything special for SCell direct activation with respect to FR1 vs FR2. If SCell direct activation is supported in FR1, for a FR2 capable UE, is there any scenario it cannot be supported? |
| Samsung | Yes  | We are OK with this. |
| LG | Yes | It seems to be beneficial to separate FR1 and FR2. |

## 2.2 New discussions

The following document is discussing the need for additional capabilities

[R2-2005223](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_110-e%5CDocs%5CR2-2005223.zip) Introduce capabilities on Async NR-DC and cell-grouping configuration Qualcomm Incorporated

The proposals are about asynchronous NR-DC.

**Proposal 1: Like LTE, introduce UE capabilities on asynchronous NR-DC and supported cell-grouping configurations for a band combination of NR-DC, to indicate the support of Async NR-DC and power sharing between MN and SN.**

**Q5: Do companies agree with proposal 1 above?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if any)** |
| Qualcomm | Yes  | ProponentIt is actually quite strange that we already have capability of async LTE-DC, async EN-DC and even async CA, but capability of async NR-DC is missing.RAN1 has requested RAN2 to introduce an FG that indicates support of asynchronous operation in RAN1 LS (R1-2003072). Meanwhile in reply LS to RAN1 (R2-2006030), RAN2 has agreed to use LTE style cell grouping capability signalling with restriction to 5 bands.Because LTE signalling is a little complex, we can have two examples for illustration:* Example 1: a BC has 2 bands. Then only 1-bit asyncNRDC-r16 needs to report
* Example 2: a BC has 3 bands (ABC). Then UE needs to feed back both 1-bit asyncNRDC-r16 and also 3bit supportedCellGroupingAsyncNRDC-r16 (e.g. ‘001’ means the UE only supports async NR-DC of Band A in MCG and Band B/C in SCG. Other cell groupings are not supported in async way)
 |
| OPPO | Yes  | Agree with QC. |
| MediaTek |  | This is R1 lead feature for DCCA, not R2 capability. We understand that this has been discussed in e-mail discussion of “[Post109bis-e][963] UE feature list”. And the conclusion is to follow LTE approach but limited to 5 NR bands. I am not sure whether we have to discuss again here. It seems better to leave this to general R1/R4 capabilities discussion thread.  |
| Nokia | Yes | In our understanding this would conform with RAN1 request in the LSes although also fine with MTK proposal. |
| Ericsson |  | Agree with MediaTek. |
| vivo | Yes  | We are fine with LTE approach.  |
| ZTE |  | Same view as MediaTek. |
| Futurewei | Yes | Also fine to get input from RAN1. |
| Samsung | Yes | We have the same view as Qualcomm |
| LG | Yes |  |

**Proposal 2: Put the UE capabilities on asynchronous NR-DC and supported cell-grouping configurations in *CA-ParametersNRDC.***

**Q6: Do companies agree with proposal 2 above?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if any)** |
| Qualcomm | Yes  | In 38.306, we have *MRDC-Parameters* and *NRDC-Parameters.* However, the former one is for (NG)EN-DC and NE-DC; and the later one is per-UE. Thus, both of them are not good place. We think the most appreciate place is *CA-ParametersNRDC.* |
| OPPO | Yes  | No strong opinion. |
| MediaTek |  | Prefer to discuss this in general R1/R4 capabilities discussion. I assume that we finish R2 lead features first in DCCA WI. |
| Nokia | Yes (and No) | see detailed comment on Q7 |
| vivo |  | Agree with MTK. |
| ZTE |  | Same comment as MediaTek. |
| Futurewei |  | No strong opinion. |
| Samsung | Yes |  |

**Proposal 3: Introduce *asyncNRDC-r16* and *supportedCellGroupingAsyncNRDC-r16* to indicate the support of asynchronous NR-DC, where:**

* ***asyncNRDC-r16* is ENUMERATED {supported}, same as LTE**
* ***supportedCellGroupingAsyncNRDC-r16* reuse the mapping table of LTE with up to 4 bands from ASN.1 perspective, as illustrated in table 1.**

|  |  |  |
| --- | --- | --- |
| **Nr of Band Entries:** | 4 | 3 |
| **Length of Bit-String:** | 7 | 3 |
| **Bit String Position** | **Cell grouping option (0= first cell group, 1= second cell group)** |
| 1 | 0001 | 001 |
| 2 | 0010 | 010 |
| 3 | 0011 | 011 |
| 4 | 0100 |  |
| 5 | 0101 |  |
| 6 | 0110 |  |
| 7 | 0111 |  |

**Table 1: Illustration of mapping from bands to cell group configuration for NR-DC**

**Q7: Do companies agree with proposal 3 above?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments (if any)** |
| Qualcomm | Yes with comments | In reply LS to RAN1 (R2-2006030), RAN2 has agreed to use LTE style cell grouping capability signalling with restriction to 5 bands. Thus, the signalling needs to extend to up to 5 bands. If RAN4 to specify requirements for sync-DC and async-DC, we can make correction accordingly if their defined requirement is different |
| OPPO | Yes, but….. | Rely on RAN4 requirement. |
| MediaTek |  | Prefer to discuss this in general R1/R4 capabilities discussion. I assume that we finish R2 lead features first in DCCA WI. |
| Nokia | Yes (partly) | It seems we need to support up to 5 bands. As in release 15 we have capability “CA-ParametersNRDC” indicating “If the field is included for a band combination in the NR capability container, the field indicates support of NR-DC. ” it seems that this field description needs bit of update to reflect the point no async DC is supported based on this capability but only sync NR DC (within FRx and between FRx).  |
| vivo | Yes but | Need confirm with RAN4.  |
| ZTE |  | We understand the conclusion in RAN2 (relates to R2-2006030) is to reuse the mapping table as in LTE. Regarding the details, we also think this will be covered in the general R1/R4 capability discussion.  |
| Futurewei | Yes | Can be confirmed in R1/R4 capability discussion. |
| Samsung | Yes | Agree with Qualcomm |
| LG | Yes |  |

## 2.3 Progress on RAN2 eDCCA UE capabilities

Due to ITU submission, there cannot be any FFS or Editor's note in June 2020 Rel-16 specifications, so it is not possible to agree a CR with FFS. In case there cannot be any agreement on the above FFS, there are two possibilities:

1) all companies agree to introduce RAN2 eDCCA UE capabilities according to the (potentially small) majority view on each FFS

2) RAN2 eDCCA UE capabilities for which there is an FFS are not introduced in June 2020 specifications

3) RAN2 eDCCA UE capabilities are not introduced in June 2020 specifications

**Q8: Which of the following options are acceptable/unacceptable?**

|  |  |  |
| --- | --- | --- |
| **Company** | **(e.g. acceptable: 1, unacceptable 2/3)** | **Comments (if any)** |
| Qualcomm  | 2) but… | Our understanding on 2) is that the capabilities with FFS are not included in June 2020 spec just because of ITU submission. These FFSs should remain in Chair Notes, and will be discussed in next RAN2 meeting. Is our understanding correct? |
| OPPO | 2) | Same concern with QC? |
| MediaTek | 1) or 2) | We hope that the R2 capabilities of eDCCA could be concluded in this meeting and leave no FFS. The remaining FFS is not so critical and we just need to make a decision. If unfortunately some feature could not be concluded, we should exclude the capability of that feature and add it back in later version. |
| Nokia | 2) |  |
| Ericsson | 2) | But we have similar view as Mediatek that we could be able to conclude on the remaining FFSs.  |
| vivo | 2) |  |
| ZTE | 2) |  |
| Futurewei | 2) |  |
| Samsung | 2) |  |
| LG | 2) |  |

# 3 Conclusion

…