**3GPP TSG RAN WG1 #106-e R1-210xxxx**

**e-Meeting, August 16th – 27th, 2021**

**Agenda item:** 7.2.11

**Source:** Moderator (NTT DOCOMO, INC.)

**Title:** Summary on [106-e-NR-UEFeature-MRDCCA-01]

**Document for:** Discussion and Decision

1. Introduction

This contribution summarizes the following email discussion/approval at RAN1#106-e meeting.

[106-e-NR-UEFeature-MRDCCA-01] Email discussion/approval on UE features for MR-DC/CA enhancement by August 20 – Hiroki (DOCOMO)

* For FG18-1/1a/1b, add following note and ask RAN2 to modify the descriptions in TS38.306 accordingly
	+ In case MCG and/or SCG have cells in different frequency ranges, this capability is applicable for power sharing only between those MCG and SCG cells with UL in FR1
1. Discussion on UE features for MR-DC/CA enhancement
	1. UE features for NR-DC power sharing (FG18-1, 18-1a, 18-1b)

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 18. MR-DC/CA enhancement | 18-1 | Basic UL power sharing for DC | Semi-static power sharing mode1 between MCG and SCG cells of same FR for NR dual connectivity. |  | *intraFR-NR-DC-PwrSharingMode1-r16* | *CA-ParametersNRDC-v1610*  | n/a | n/a | Absence means intra-FR DC is not supported.  | Optional with capability signalling |
| 18. MR-DC/CA enhancement | 18-1a | Semi-static UL power sharing mode 2 for DC | Semi-static power sharing mode 2 between MCG and SCG cells of same FR for NR dual connectivity. | 18-1 | *intraFR-NR-DC-PwrSharingMode2-r16* | *CA-ParametersNRDC-v1610*  | n/a | n/a | Semi-static power sharing mode 2 between MCG and SCG cells of same FR is applicable only for synchronous NR dual connectivity | Optional with capability signalling |
| 18. MR-DC/CA enhancement | 18-1b | Dynamic UL power sharing for DC | Dynamic power sharing between MCG and SCG cells of same FR for NR dual connectivity.1) T\_offset | 18-1 | *intraFR-NR-DC-DynamicPwrSharing-r16,* | *CA-ParametersNRDC-v1610* | n/a | n/a | 1) {short, long} | Optional with capability signalling |

Following proposals are made in contributions.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| [2] | UE capabilities related to NR-DC power control are currently captured in 38.306 as shown below. While the RRC configuration of power sharing made can be differentiated for FR1 and FR2 (i.e., using *nrdc-PCmode-FR1* or *nrdc-PCmode-FR2*), similar differentiation of UE capability is not present in current specs.**Current capability definitions from 38.306 vg40**

| ***Definitions for parameters*** | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| ***intraFR-NR-DC-PwrSharingMode1-r16***Indicates whether the UE supports intra-FR NR DC with semi-static power sharing mode1 between MCG and SCG cells of same frequency range as defined in TS 38.213 [11]. If this field is absent, the UE does not support intra-FR NR DC.  | BC | No | No | No |
| ***intraFR-NR-DC-PwrSharingMode2-r16***Indicates whether the UE supports semi-static power sharing mode2 between MCG and SCG cells of same frequency range for synchronous intra-FR NR DC as defined in TS 38.213 [11]. The UE indicating the support of this also indicates the support of *intraFR-NR-DC-PwrSharingMode1-r16.* | BC | No | No | No |
| ***intraFR-NR-DC-DynamicPwrSharing-r16***Indicates the UE support of dynamic power sharing for intra-FR NR DC between MCG and SCG cells of same frequency range with long or short offset as specified in TS 38.213 [11]. The UE indicating the support of this also indicates the support of *intraFR-NR-DC-PwrSharingMode1-r16.* | BC | No | No | No |

Given current status with p-NR-FR2 decision by RAN4, the UE capability definitions should be modified such that UEs can at least indicate support for a particular power sharing mode for FR1 only (i.e., applicable only to cells with FR1 UL in MCG and SCG) without indicating it as supported for FR2.RAN1 discussed possible updates to UE capabilities in [105-e-NR-UEFeature-MRDCCA-01] thread in RAN1#105e but the discussion could not conclude as RAN1 was waiting for RAN4 input. It was also discussed whether RAN1 could let RAN2 handle the UE capability aspect. However, in our understanding, it was decided in RAN2#113b-e meeting to wait for RAN1 input on this topic including any changes to UE capabilities and so RAN1 should provide input to RAN2. Two possible alternatives to update the UE capabilities are shown below.One option (Option 1) is to enable FR1-FR2 differentiation for these capabilities so that if UE indicates ‘yes’ for a FR, the capability is applicable for power sharing between MCG and SCG cells with UL in that FR. This separates the capability for FR1 NR-DC reporting (as also achieved by Option 1) but additionally provides more forward compatibility if RAN4 continues discussion for p-NR-FR2 and p-UE-FR2 in Rel17. **Proposed modification (Option 1)**

| ***Definitions for parameters*** | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| ***intraFR-NR-DC-PwrSharingMode1-r16***Indicates whether the UE supports intra-FR NR DC with semi-static power sharing mode1 between MCG and SCG cells of same frequency range as defined in TS 38.213 [11]. If this field is absent, the UE does not support intra-FR NR DC. If UE indicates support for a frequency range, this capability is applicable for power sharing between MCG and SCG cells with UL in that frequency range | BC | No | No | ~~No~~ Yes |
| ***intraFR-NR-DC-PwrSharingMode2-r16***Indicates whether the UE supports semi-static power sharing mode2 between MCG and SCG cells of same frequency range for synchronous intra-FR NR DC as defined in TS 38.213 [11]. The UE indicating the support of this also indicates the support of *intraFR-NR-DC-PwrSharingMode1-r16.*If UE indicates support for a frequency range, this capability is applicable for power sharing between MCG and SCG cells with UL in that frequency range | BC | No | No | ~~No~~Yes |
| ***intraFR-NR-DC-DynamicPwrSharing-r16***Indicates the UE support of dynamic power sharing for intra-FR NR DC between MCG and SCG cells of same frequency range with long or short offset as specified in TS 38.213 [11]. The UE indicating the support of this also indicates the support of *intraFR-NR-DC-PwrSharingMode1-r16.*If UE indicates support for a frequency range, this capability is applicable for power sharing between MCG and SCG cells with UL in that frequency range | BC | No | No | ~~No~~Yes |

Another option (Option 2) is to clarify in capability definitions that they are only applicable for FR1. i.e. as shown below. This is suitable if it is assumed that the capabilities are not needed for FR2 even in a future release (e.g. Rel17)**Proposed modification (Option 2)**

| ***Definitions for parameters*** | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| ***intraFR-NR-DC-PwrSharingMode1-r16***Indicates whether the UE supports intra-FR NR DC with semi-static power sharing mode1 between MCG and SCG cells of ~~same~~ frequency range 1 as defined in TS 38.213 [11]. If this field is absent, the UE does not support intra-FR NR DC.  | BC | No | No | No |
| ***intraFR-NR-DC-PwrSharingMode2-r16***Indicates whether the UE supports semi-static power sharing mode2 between MCG and SCG cells of ~~same~~ frequency range 1 for synchronous intra-FR NR DC as defined in TS 38.213 [11]. The UE indicating the support of this also indicates the support of *intraFR-NR-DC-PwrSharingMode1-r16.* | BC | No | No | No |
| ***intraFR-NR-DC-DynamicPwrSharing-r16***Indicates the UE support of dynamic power sharing for intra-FR NR DC between MCG and SCG cells of ~~same~~ frequency range 1 with long or short offset as specified in TS 38.213 [11]. The UE indicating the support of this also indicates the support of *intraFR-NR-DC-PwrSharingMode1-r16.* | BC | No | No | No |

**Conclusion**In this document, we discuss UE capability signaling impact due to the RAN4 LS [1] on p-NR-FR2. Given current status that RAN4 does not introduce the parameter P-NR-FR2 in Rel-16, an update to NR-DC UL power sharing capabilities is needed so that UEs can at least indicate support for a particular power sharing mode for FR1 only (i.e., applicable only to cells with FR1 UL in MCG and SCG) without indicating it as supported for FR2.Considering that RAN2 is waiting for RAN1 input on this issue (per RAN2 discussion in RAN2#113b-e), we propose the following* Agree on one of Option 1 or Option 2 (shown in section 2) to update the NR-DC power sharing UE capabilities by potentially also taking into account any RAN4 inputs received during RAN1#106e.
* Send LS to RAN2 requesting corresponding updates to 38.306.
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| [3] | The status of the discussion from RAN1#105-e is as follows, as captured in the email discussion summary:**Updated FL proposal #1*** **For FG18-1/1a/1b. add following note and ask RAN2 to modify the descriptions in TS38.306 accordingly**
	+ **In case MCG and/or SCG have cells in different frequency ranges, this capability is applicable for power sharing only between those MCG and SCG cells with UL in FR1**

Though most companies seemed to be fine with the proposal above, a decision could not be reached in the meeting because RAN1 was waiting for a RAN4 LS that was on the imminence of being agreed. Unfortunately, RAN4 failed to send the LS in the end, though it is clear from the related RAN4 discussions that the pending issues are not directly impacting RAN1. In our understanding, this proposal above is very well aligned with the current understanding from RAN4, which is reflected in an earlier LS [1]. In [1] it is clear that RAN4 does not intend to introduce power sharing mechanisms for FR2 in Rel-16, and hence it is not reasonable for RAN1 to redefine the FGs such that UE could indicate power sharing support in FR2. This would cause ASN.1 impacts for a feature that cannot be supported in Rel-16 in any case. Hence, we propose the following:**Proposal: Confirm updated FL proposal#1 above, i.e.** * **For FG18-1/1a/1b. add following note and ask RAN2 to modify the descriptions in TS38.306 accordingly**
	+ **In case MCG and/or SCG have cells in different frequency ranges, this capability is applicable for power sharing only between those MCG and SCG cells with UL in FR1**
 |

At the RAN1#105-e meeting, this issue was discussed and RAN1 concluded to wait for RAN4 response [4]. Although RAN1/2 have not received RAN4 LS response on this issue yet, during the preparation phase email discussion, following comments are provided and it seems companies are ok to discuss this issue.

|  |  |
| --- | --- |
| ZTE | We are ok to discuss this issue. |
| Nokia, NSB | We are ok to discuss the issue |
| OPPO | Support to discuss it.  |
| Ericsson | OK to discuss this issue. |

Based on the above, following proposal can be discussed in RAN1#106-e meeting.

**FL proposal #1**

* **For FG18-1/1a/1b, add following note and ask RAN2 to modify the descriptions in TS38.306 accordingly**
	+ **In case MCG and/or SCG have cells in different frequency ranges, this capability is applicable for power sharing only between those MCG and SCG cells with UL in FR1**

Companies are encouraged to check above FL proposal and to provide feedback if any in below. If you cannot accept the FL proposal, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposal:

|  |  |
| --- | --- |
| Company | Comment |
| CATT | We are OK with FL proposal #1 |
| Intel | We are in principle OK with FL proposal #1Further, it would be better to explicitly clarify that intra-FR power sharing is not supported in FR2. Otherwise, the absence of capability signaling may mean the absent feature is mandatory.  |
| Nokia, NSB | We support FL proposal. We are OK with Intel clarification as well.  |
| ZTE | We are ok with the FL proposal#1. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!As suggested by Intel, we can update the note to clarify that intra-FR power sharing is not supported in FR2 in Rel-16.**Updated FL proposal #1*** **For FG18-1/1a/1b, add following note and ask RAN2 to modify the descriptions in TS38.306 accordingly**
	+ **In case MCG and/or SCG have cells in different frequency ranges, this capability is applicable for power sharing only between those MCG and SCG cells with UL in FR1, and the intra-FR power sharing in FR2 is not supported in Rel-16.**
 |

**Updated FL proposal #1**

* **For FG18-1/1a/1b, add following note and ask RAN2 to modify the descriptions in TS38.306 accordingly**
	+ **In case MCG and/or SCG have cells in different frequency ranges, this capability is applicable for power sharing only between those MCG and SCG cells with UL in FR1, and the intra-FR power sharing in FR2 is not supported in Rel-16.**

Companies are encouraged to check above FL proposal and to provide feedback if any in below. If you cannot accept the FL proposal, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposal:

|  |  |
| --- | --- |
| Company | Comment |
| Qualcomm | We are OK with the FL proposal #1 but not OK with the Updated FL proposal #1. The exact meaning of “intra-FR power-sharing” is unclear and intra-FR NR-DC power-control for FR2 is pending RAN4’s feedback. |
| Nokia, NSB | Qualcomm does have a point here, because this is not RAN1’s decision to make. Perhaps the best way would be to keep the original proposal 1 and add a note to the minutes saying that eventual support of intra-FR power sharing in FR2 is up to RAN4. Our understanding is that in case RAN4 decides that this is supported it will then trigger a discussion on capability signalling for it, especially considering it is such a late decision. And such capability would be independent of FG18-1/1a/1b, as this would be a separate feature altogether.  |
| Ericsson | We prefer original FL proposal #1. Regarding “and the intra-FR power sharing in FR2 is not supported in Rel-16**.**”, our view also is this should be handled after receiving RAN4 LS reply. If needed, a note may be added in the text of the LS to address point raised by Intel but we do not see strong need for it as the FR2 power sharing handling is expected to be clarified after conclusion of RAN4 discussion. |
| Moderator (NTT DOCOMO) | Thank you very much for the feedbacks!Based on the feedbacks from Qualcomm, Nokia and Ericsson, the proposal is further updated as below.The added note is just for RAN1 minutes, not to be captured in RAN1 UE features list and TS38.306 at this moment. If it is not necessary even for RAN1 minutes, we can delete it.**Updated FL proposal #1*** **For FG18-1/1a/1b, add following note and ask RAN2 to modify the descriptions in TS38.306 accordingly**
	+ **In case MCG and/or SCG have cells in different frequency ranges, this capability is applicable for power sharing only between those MCG and SCG cells with UL in FR1~~, and the intra-FR power sharing in FR2 is not supported in Rel-16~~.**
* **Note: eventual support of intra-FR power sharing in FR2 is up to RAN4**
 |

### **Updated FL proposal #1**

* **For FG18-1/1a/1b, add following note and ask RAN2 to modify the descriptions in TS38.306 accordingly**
	+ **In case MCG and/or SCG have cells in different frequency ranges, this capability is applicable for power sharing only between those MCG and SCG cells with UL in FR1.**
* **Note: eventual support of intra-FR power sharing in FR2 is up to RAN4**

Companies are encouraged to check above FL proposal and to provide feedback if any in below. If you cannot accept the FL proposal, please put your company name after “Cannot accept the proposals” below and please provide your alternative proposal (in your comment) which could be acceptable to all in your consideration.

 Cannot accept the proposal:

|  |  |
| --- | --- |
| Company | Comment |
| Intel | We are a bit confused by the note. In RAN4 LS to RAN2/1 in R1-2102303, it is explicitly informed that both p-UE-FR2 and P-NR-FR2 are not introduced in Rel-16. Our question is that, without p-UE-FR2 and P-NR-FR2, if there a way to support semi-static or dynamic power sharing between CGs for FR2 (as FG 18-1/1a/1b)?From the other aspect, even if RAN4 find a new way to handle power control for FR2, which is different from semi-static or dynamic power sharing, it will not impact our current discussion on FG 18-1/1a/1b. |
| Huawei, HiSilicon | We share similar concern with Intel that no support of intra-FR2 power sharing should be confirmed along with any change to the UE capability. Otherwise, the proposed change makes the feature of intra-FR2 power sharing be mandatory to a UE capable of NR-DC, or additional ASN.1 change is required now or in the future. Since the motivation of the proposal is to make ASN.1 stable as early as possible, a complete solution is needed. We feel the confirmation on on support of intra-FR2 power sharing for NR-DC is necessary. |
|  |  |

Reference

[1] R1-2106502 Discussion on positioning UE features Huawei, HiSilicon

[2] R1-2107997 Update to NR-DC Power sharing UE capabilities Ericsson

[3] R1-2108196 On Rel-16 UE Features Nokia, Nokia Shanghai Bell

[4] R1-2106158 Summary on [105-e-NR-UEFeature-MRDCCA-01] Moderator (NTT DOCOMO, INC.)

[5] R1-2108147 Removal of power sharing for FR2-FR2 dual connectivity from Rel-16 Nokia, Nokia Shanghai Bell

[6] 3GPP TR38.822 v16.0.0

[7] 3GPP TS38.306 v16.5.0