**3GPP TSG RAN WG1 #105-e R1-2106158**

**e-Meeting, May 10th – 27th, 2021**

**Agenda item:** 7.2.11

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

**Title:** Summary on [105-e-NR-UEFeature-MRDCCA-01]

**Document for:** Discussion and Decision

1. Introduction

This contribution summarizes the following email discussion.

[105-e-NR-UEFeature-MRDCCA-01] Email discussion/approval on UE features regarding MR-DC/CA enhancement, till 5/24 (Hiroki, NTT DOCOMO)

* For FG18-1/1a/1b. following proposals are discussed in 7.2.11 if some high-level consensus is achieved based on the discussion in AI 7.2.10.
	+ Change FR1-FR2 differentiation from ‘No’ to ‘Yes’
	+ Add a note ‘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’
	+ Ask RAN2 to modify the descriptions in TS38.306 accordingly
1. Discussion on UE features for MR-DC/CA enhancement
	1. FG 18-1/1a/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. |  | Yes | N/A |  | Per BC | N/A | 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 | Yes | N/A |  | Per BC | N/A | 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 | Yes | N/A |  | Per BC | N/A | N/A | N/A | 1) {short, long} | Optional with capability signalling |

Following proposal is made in a contribution in AI 7.2.10.

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| [4] | In [1], an LS was received from RAN4 indicating that RAN4 does not introduce the parameter P-NR-FR2 in Rel-16. This parameter is related to NR-DC power control and used in RAN1 and RAN2 specs. In [2], an LS reply related to this was sent to RAN4, requesting further clarifications on how to handle power control for FR2-FR2 DC (i.e., DC where both MCG and SCG have cells with FR2 UL). 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 UE can 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.This can be achieved by enabling 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 and additionally provides forward compatibility if RAN4 continues discussion for p-NR-FR2 and p-UE-FR2 in Rel17. **Proposed modification**

| ***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 |

Our understanding is that in RAN2 it was decided in last meeting to wait for RAN1 input regarding the above capabilities. * Wait for RAN1 input on the support of power sharing for FR2+FR2 NR-DC, including changes to UE capabilities.

Since it is unclear at this point how the power limits will be specified by RAN4 for Rel17, we propose to indicate to RAN2 to modify the UE capabilities as shown above. |

Since the proposal is about updates on UE features list descriptions and 38.306 descriptions, the proposal should be discussed in AI 7.2.11 once some high-level consensus is achieved based on the discussion in corresponding maintenance agenda (AI 7.2.10).

### **FL proposal #1**

* **For FG18-1/1a/1b. following proposals are discussed in 7.2.11 if some high-level consensus is achieved based on the discussion in AI 7.2.10.**
	+ **Change FR1-FR2 differentiation from ‘No’ to ‘Yes’**
	+ **Add a note ‘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’**
	+ **Ask RAN2 to modify the descriptions in TS38.306 accordingly**

Companies are encouraged to check above FL proposal and to provide feedback if any in below. If you cannot accept the FL proposals, 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:

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| Company | Comment |
| Moderator (NTT DOCOMO) | Although originally we planned to start the discussion on this proposal after some higher level discussion in AI 7.2.10 based on RAN4 response, it seems difficult to expect that we could have neither such higher level discussion in AI 7.2.10 nor RAN4 response in this e-meeting based on the current situation.However, we should fix the capability issue raised in R1-2105790 as early as possible, since it may cause further delay of implementing Rel-16 NR-DC.So, here we can discuss whether/how to solve the issue with considering uncertainty of RAN4 response, i.e., the solution should be flexible to any potential RAN4 response. |
| Qualcomm | Support the FL proposal. |
| Nokia, NSB | Perhaps the most critical question to address before discussing these FGs in detail is to align the views on whether or not it is allowed to have FR1 and FR2 cells in the same cell group in Rel-16. In our understanding this is the main intention behind the proposed changes, and it would be good to have it clarified. Having said that we have no problem enabling such functionality, though we have some issues with the proposed FG modifications. Changing the FRx differentiation field from no to yes creates ASN.1 impacts, which we are supposed to avoid. Moreover, those changes may be unnecessary depending on the content of the RAN4 reply. In any case, our understanding is that RAN4 reply will indicate that power sharing is not supported in FR2. Hence, for the sake of progress, we propose the following modifications under some different assumptions:* Assuming it is allowed to have FR1 and FR2 cells in the same cell group in Rel-16, and RAN4 indicates power sharing is not supported in FR2, we can simply add the following note:
	+ 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.
* Assuming it is not allowed to have FR1 and FR2 cells in the same cell group in Rel-16, and RAN4 indicates power sharing is not supported in FR2, we can simply add the following note
	+ This capability is applicable for FR1 only.
 |
| Moderator (NTT DOCOMO) | Thank you very much for feedbacks!Based on the Nokia’s comment, let’s check companies’ views on whether it is allowed to have FR1 and FR2 cells in the same cell group in Rel-16.Regarding the suggested modification, it still has dependency on RAN4 reply. So, if we could not receive RAN4 reply within this e-meeting, I think we should take Ericsson’s proposal for safety.Although ASN.1 impacts at this stage should be avoided as much as possible, we would have other ASN.1 impact (as discussed for eMIMO UE features). |
| vivo | One question regarding the highlighted part following note: does it mean that the capability reporting depending on the configuraton of MCG/SCG? The configuration is not controlled by UE, but up to network.* + 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.

Further, is it possible that the BC of FR1/FR2 is not supported in Rel-16, but later introduced in a release independent manner by RAN4? If it is possible, having FR1-FR2 differentiation may be future-proof? |
| Nokia, NSB | Unfortunately we are not OK with this approach. There is a very high probability that proceeding this way we would introduce an ASN.1 change for the sake of allowing a signalling that cannot be used in practice. This is not good design, and we would prefer to avoid it. It is true that we are discussing a possible ASN.1 impact on eMIMO UE features, but that would be localized in multi-TRP features. UEs and gNBs not supporting multi-TRP are not impacted by this change. Hence it should not be taken as a license to introduce further ASN.1 impacts without solid reasons behind them. If RAN4 doesn’t arrive in time for the meeting, it is fair to say RAN1 doesn’t have the information needed to update the FG yet, and this will be done in the next opportunity. Regarding vivo’s questions, the reason for the yellow highlighted part is to clarify that the power sharing applies only for those cells in FR1. Hence the UE behavior will modify according to the network configuration, but the capability just indicates what the UE can do for different configurations. Regarding the future-proofness argument, the issue is not about introducing the BCs later, the issue is regarding the support of power sharing in in FR2 in Rel-16 specifications. If that is introduced later it should not be a release-independent addition in our opinion, and hence a proper UE feature can be introduced at the same time, if needed. |
| ZTE | Our suggestion is to wait for RAN4 response first and then RAN1 can decide whether to have FR1/FR2 differentiation.After receiving RAN4’s response, if RAN1 decideds to have FR1/FR2 differentiation, there are at least the following solutions,Soluton#1. To change “FR1-FR2 DIFF” to “Yes”Soluton#2. Add new UE features specific for FR2 power sharing and declare the old one is only for FR1.Solution#1 may have NBC issue. RAN1 only needs to discuss whether to have FR1/FR2 differentiation after receiving RAN4 response. And the detailed solution on how to implement the FR1/FR2 differentiation can be up to RAN2 from our perspective.  |
| Huawei, HiSilicon | The FL proposal has big impact on ASN.1 because adding FR1-FR2 differentiation for power sharing requires a change to ASN.1 signalling structure. Therefore, we share a similar view as Nokia and prefer to avoid such change.Regarding ZTE’s solution#2, it is better not to introduce new UE capability bit until RAN4 confirmation on FR2 power sharing, otherwise, ASN.1 change to reverse such introduction is inevitable once it is not in line with RAN4 decision. Nokia’s proposal is much better, we support it. |
| Moderator (NTT DOCOMO) | Thank you very much for feedbacks!Then, how about adopting following note based on Nokia’s suggestion even if we could not receive RAN4 response within this e-meeting?* + 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.

Based on the feedbacks, it seems anyway current FGs would be only for FR1 and when it is clarified by RAN4 that the power sharing in FR2 can be supported, we would need to introduce new FGs.So, limiting the applicability of current FGs to FR1 only would be anyway necessary/appropriate if I understand companies’ views correctly.FL proposal is updated as below, and further feedbacks will be highly appreciated. |

### **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**

Companies are encouraged to check above FL proposal and to provide feedback if any in below. If you cannot accept the FL proposals, 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:

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| Company | Comment |
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1. Conclusion

TBD

Reference

[1] R1-2105790 Remaining details of Rel-16 NR UE features Ericsson

[2] R1-2105814 Remaining issues on NR Rel-16 UE features Nokia, Nokia Shanghai Bell

[3] R1-2104120 Updated RAN1 UE features list for Rel-16 NR after RAN1#104bis-e Moderators (AT&T, NTT DOCOMO, INC.)

[4] R1-2105789 Maintenance for Rel-16 MR-DCCA Ericsson