**3GPP TSG RAN WG1 Meeting #100bis-E R1-2002807**

**e-Meeting, April 20 – 30, 2020**

**Source: Moderator (Intel Corporation)**

**Title: Summary of email discussions for [100b-e-NR-Mob-Enh-02]**

**Agenda item: 7.2.9**

**Document for: Discussion**

# Introduction

In this contribution, we summarize the email discussion approved for discussion during RAN1 #100bis-E. Chairman has approved three email discussion threads for RAN1 #100bis-E. The following are the approved email discussions:

* [100b-e-NR-Mob-Enh-01] Email discussion/approval on UL cancellation in UL DAPS-HO by 4/24; if necessary, followed by endorsing the corresponding TP by 4/30 – Daewon (Intel)
* [100b-e-NR-Mob-Enh-02] Email discussion/approval on power sharing mode for UL DAPS-HO by 4/23; if necessary, followed by endorsing the corresponding TP by 4/29 – Daewon (Intel)
* [100b-e-NR-Mob-Enh-03] Email discussion/approval on PDCCH/PDSCH restrictions for DL DAPS-HO by 4/22; if necessary, followed by endorsing the corresponding TP by 4/28 – Daewon (Intel)

This contribution summarizes the email discussion for [100b-e-NR-Mob-Enh-02].

# Email Discussion [100b-e-NR-Mob-Enh-02]

This discussion is regarding the power Sharing Mode for UL DAPS-HO (Issue #6 from [11]).

**Issue and Proposal Summary:**

Several companies provided discussion on how to correct the power sharing mode description for UL DAPS-HO. The following are list of proposals and corresponding TPs:

* Proposal by Intel [3] The indication from the gNB to UE to have the UE to no perform any power sharing operation and always drop the source cell transmission when it overlaps with target cell could be done by not providing the *UplinkPowerSharingDAPS-HO-mode* RRC configuration. Alternative method would be explicitly introducing a ‘no-powersharing mode’ indication for *UplinkPowerSharingDAPS-HO-mode*.
	+ The following is proposed TP:

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| 15   Dual active protocol stack based handover*< Unchanged parts are omitted >*If the UE does not provide ~~indicates~~ *UplinkPowerSharingDAPS-HO* ~~=~~ *~~Semistatic-mode1~~* and is provided *UplinkPowerSharingDAPS-HO-mode* = *Semi-static-mode1*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *~~UplinkPowerSharingDAPS-HO~~NR-DC-PC-mode* = *Semi-static-mode1* by considering the target MCG as the MCG and the source MCG as the SCG. If the UE does not provide ~~indicates~~ *UplinkPowerSharingDAPS-HO* ~~= Semistatic-mode2~~and is provided *UplinkPowerSharingDAPS-HO-mode* = *Semi-static-mode2*, the UE determines a transmission power for the target MCG or for the source SCG as described in Clause 7.6.2 for *~~UplinkPowerSharingDAPS-HO~~NR-DC-PC-mode* = *Semi-static-mode2* by considering the target MCG as the MCG and the source MCG as the SCG. If the UE indicates *UplinkPowerSharingDAPS-HO* ~~= Dynamic~~and is provided *UplinkPowerSharingDAPS-HO-mode* = *Dynamic*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *~~UplinkPowerSharingDAPS-HO~~NR-DC-PC-mode* = *Dynamic* by considering the target MCG as the MCG and the source MCG as the SCG. If -   the UE is not provided with ~~does not provides~~ *UplinkPowerSharingDAPS-HO-mode,* and -   UE transmissions on the target cell and the source cell ~~overlap~~ are in overlapping time resourcesthe UE transmits only on the target cell  |

* Two alternative TP are provided by Samsung [4]. The first alternative TP is proposed if the UE feature group 21-2 description is agreed with ALT 1 formulation (described in NTT Docomo’s contribution on UE feature list summary). The second alternative TP is proposed if the UE feature group 21-2 description is agreed with ALT 2 formulation.
	+ ALT 1 formulation:

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| 15   Dual active protocol stack based handover*< Unchanged parts are omitted >*If the UE does not provide ~~indicates~~ *UplinkPowerSharingDAPS-HO* ~~=~~ *~~Semistatic-mode1~~* and is provided *UplinkPowerSharingDAPS-HO-mode* = *Semi-static-mode1*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *~~UplinkPowerSharingDAPS-HO~~NR-DC-PC-mode* = *Semi-static-mode1* by considering the target MCG as the MCG and the source MCG as the SCG. If the UE does not provide ~~indicates~~ *UplinkPowerSharingDAPS-HO* ~~= Semistatic-mode2~~and is provided *UplinkPowerSharingDAPS-HO-mode* = *Semi-static-mode2*, the UE determines a transmission power for the target MCG or for the source SCG as described in Clause 7.6.2 for *~~UplinkPowerSharingDAPS-HO~~NR-DC-PC-mode* = *Semi-static-mode2* by considering the target MCG as the MCG and the source MCG as the SCG. If the UE indicates *UplinkPowerSharingDAPS-HO* ~~= Dynamic~~and is provided *UplinkPowerSharingDAPS-HO-mode* = *Dynamic*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *~~UplinkPowerSharingDAPS-HO~~NR-DC-PC-mode* = *Dynamic* by considering the target MCG as the MCG and the source MCG as the SCG. If -   the UE is not provided with ~~does not provides~~ *UplinkPowerSharingDAPS-HO-mode,* and -   UE transmissions on the target cell and the source cell ~~overlap~~ are in overlapping time resourcesthe UE transmits only on the target cellIf -   the UE is provided *UplinkPowerSharingDAPS-HO-mode*, and -   UE transmissions on the target cell and the source cell overlapthe UE transmits only on the target cell ----omitted---- |

* + ALT 2 formulation:

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| 15 Dual active protocol stack based handover----omitted----If -   the UE does not provide *UplinkPowerSharingDAPS-HO*, or is not provided *UplinkPowerSharingDAPS-HO-Mode* and -   UE transmissions on the target cell and the source cell are in overlapping time resources the UE transmits only on the target cell.If -   the UE ~~does not~~ provides *UplinkPowerSharingDAPS-HO*, and -   UE transmissions on the target cell and the source cell overlapthe UE transmits only on the target cell UE transmissions on the target cell and the source cell overlap if they are in-   overlapping time resources if the carrier frequencies for the target MCG and the source MCG are intra-frequency and intra-band-   overlapping time resources and overlapping frequency resources if the carrier frequencies for the target MCG and the source MCG are not intra-frequency and intra-bandFor intra-frequency DAPS HO operation, the UE expects that an active DL BWP and an active UL BWP on the target cell are within an active DL BWP and an active UL BWP on the source cell, respectively.The UE determines intra-frequency as described in Clause 9.2.1 of [10, TS38.133].----omitted---- |

* Proposal by Nokia [5]: suggests to remove the *UplinkPowerSharingDAPS-HO* capability parameter description and replaces it with statement if which power control mode is used.
	+ The following is the proposed TP:

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| If the UE indicates capability for *~~UplinkPowerSharingDAPS-HO~~* ~~=~~ *Semistatic-mode1* power sharing and is provided *UplinkPowerSharingDAPS-HO-mode* = *Semi-static-mode1*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *~~UplinkPowerSharingDAPS-HO~~NR-DC-PC-mode* = *Semi-static-mode1* by considering the target MCG as the MCG and the source MCG as the SCG.If the UE indicates capability for *~~UplinkPowerSharingDAPS-HO~~* ~~=~~ *Semistatic-mode2* power sharing and is provided *UplinkPowerSharingDAPS-HO-mode* = *Semi-static-mode2*, the UE determines a transmission power for the target MCG or for the source SCG as described in Clause 7.6.2 for *~~UplinkPowerSharingDAPS-HO~~NR-DC-PC-mode* = *Semi-static-mode2* by considering the target MCG as the MCG and the source MCG as the SCG.If the UE indicates capability for*~~UplinkPowerSharingDAPS-HO~~* ~~=~~ *Dynamic* power sharing and is provided *UplinkPowerSharingDAPS-HO-mode* = *Dynamic*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *~~UplinkPowerSharingDAPS-HO~~NR-DC-PC-mode* = *Dynamic* by considering the target MCG as the MCG and the source MCG as the SCG.If - the UE is~~does~~ not provided *UplinkPowerSharingDAPS-HO-mode*, and - UE transmissions on the target cell and the source cell overlap the UE transmits only on the target cell UE transmissions on the target cell and the source cell overlap if they are in- overlapping time resources if the carrier frequencies for the target MCG and the source MCG are intra-frequency and intra-band- overlapping time resources and overlapping frequency resources if the carrier frequencies for the target MCG and the source MCG are not intra-frequency and intra-band |

* Proposal by Apple [6]: If gNB doesn’t configure the parameter UplinkPowerSharingDAPS-HO-mode, then no simultaneous UL transmission is allowed for UE with or without simultaneous transmission capability. UE drop the transmission to source cell if transmission collide in time domain resources. If gNB configures the parameter UplinkPowerSharingDAPS-HO-mode to UE with simultaneous transmission capability, if transmissions collide for intra-frequency intra-band and inter-frequency intra-band DAPS HO, then UE drops the transmission to source cell.
	+ The following the proposed TP:

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| 15 Dual active protocol stack based handover  If - the UE is not provided with *UplinkPowerSharingDAPS-HO-mode* , and- UE transmissions on the target cell and the source cell are overlapping in time resources Or if - the UE is ~~does not~~ provided with *UplinkPowerSharingDAPS-HO-mode*, and - UE transmissions on the target cell and the source cell overlap the UE transmits only on the target cell UE transmissions on the target cell and the source cell overlap if they are in- overlapping time resources if the carrier frequencies for the target MCG and the source MCG are intra-frequency and intra-band- overlapping time resources and overlapping frequency resources if the carrier frequencies for the target MCG and the source MCG are not intra-frequency and intra-bandFor intra-frequency DAPS HO operation, the UE expects that an active DL BWP and an active UL BWP on the target cell are within an active DL BWP and an active UL BWP on the source cell, respectively. |

* Proposal by Ericsson [7]: If the NW does not signal to the UE how to distribute the transmit power between source and target, i.e., if the UE is not provided with the RRC parameter UplinkPowerSharingDAPS-HO-mode, the UE drops any UL transmission to the source if it overlaps with an UL transmission to target.
	+ The following the proposed TP:

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| 15 Dual active protocol stack based handover If - the UE does not provide *UplinkPowerSharingDAPS-HO,* or is not provided *UplinkPowerSharingDAPS-HO-mode*, and - UE transmissions on the target cell and the source cell overlap the UE transmits only on the target cell. |

* Proposal by Qualcomm [8]: Change UplinkPowerSharingDAPS-HO in “… as described in Clause 7.6.2 for UplinkPowerSharingDAPS-HO …” to NR-DC-PC-mode. Furthermore, we should align the terminology for Semi-static mode i.e., changing “Semistatic-mode” to “Semi-static-mode”.
	+ Note: similar to proposal in [5]
	+ The following the proposed TP:

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| **15 Dual active protocol stack based handover**<unchanged text omitted>If the UE indicates *UplinkPowerSharingDAPS-HO* = *Semi-static-mode1* and is provided *UplinkPowerSharingDAPS-HO-mode* = *Semi-static-mode1*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *NR-DC-PC-mode* = *Semi-static-mode1* by considering the target MCG as the MCG and the source MCG as the SCG.If the UE indicates *UplinkPowerSharingDAPS-HO* = *Semi-static-mode2* and is provided *UplinkPowerSharingDAPS-HO-mode* = *Semi-static-mode2*, the UE determines a transmission power for the target MCG or for the source SCG as described in Clause 7.6.2 for *NR-DC-PC-mode* = *Semi-static-mode2* by considering the target MCG as the MCG and the source MCG as the SCG.If the UE indicates *UplinkPowerSharingDAPS-HO* = *Dynamic* and is provided *UplinkPowerSharingDAPS-HO-mode* = *Dynamic*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *NR-DC-PC-mode* = *Dynamic* by considering the target MCG as the MCG and the source MCG as the SCG.<unchanged text omitted> |

**Discussion Summary:**

Companies are encouraged to provide comments on the proposal above. Comments should include views on whether proposal by Intel [3], Samsung [4], Nokia [5], Apple [6], Ericsson [7], and/or Qualcomm [8] is/are acceptable or not. Also, if companies have a merged proposal based on proposal from above companies, please do provide them below as well.

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| Company Name | Comments/Views |
| Huawei/HiSilicon | The basic question, to our understanding, is whether there is correlation between UE indicates the capability of simultaneous transmission and does NOT indicate any power sharing mode. Our answer is yes. If UE is about to transmit UL simultaneously, similar to NR-DC, semi-static power sharing mode 1 should a basic feature. Otherwise, “no power sharing” would be meaningless. It is different from NW making decision whether enable/disable power sharing or simultaneous transmission. For example, if UE is not provided any power sharing mode, UE can just drop transmission to source cell.  |
| Ericsson | In our understanding, two issues are discussed in parallel: the NWs ability to configure the UE to always transmit to target (and drop source if needed), and how to define the UE capability of power sharing.Again in our understanding, there seems to wide agreement that if the NW does not provide *UplinkPowerSharingDAPS-HO-mode* the UE would only transmit to target in case of collision.Regarding the issue on how to define the capability, the technical difference among the proposals seem small, and could be discussed on the UE capability threads. |
| Qualcomm | Below we provide suggested TP merging several TPs. In addition, we would like to add UE behavior for the case that the UE is provided *UplinkPowerSharingDAPS-HO-mode* different from *UplinkPowerSharingDAPS-HO* that the UE provides e.g., UE provides *UplinkPowerSharingDAPS-HO* = *Semi-static-mode1* but it is provided with *UplinkPowerSharingDAPS-HO-mode* = *Dynamic.* Althoughthis could be an error case, UE behavior should be well-specified in the spec.One question somewhat related to Samsung’s TP for Alt.2 “The UE determines intra-frequency as described in Clause 9.2.1 of [10, TS38.133].”: we have “if the carrier frequencies for the target MCG and the source MCG are intra-frequency and intra-band”. Does “intra-frequency and intra-band” mean intra-frequency case only, or mean both intra-frequency case and inter-frequency intra-band case? If it is former case, I wonder why we need to include intra-band here since intra-frequency by its own is already intra-band?**Qualcomm’s suggested TP**

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| **15 Dual active protocol stack based handover**<unchanged text omitted>If the UE indicates *UplinkPowerSharingDAPS-HO* = *Semi-static-mode1* and is provided *UplinkPowerSharingDAPS-HO-mode* = *Semi-static-mode1*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *NR-DC-PC-mode* = *Semi-static-mode1* by considering the target MCG as the MCG and the source MCG as the SCG.If the UE indicates *UplinkPowerSharingDAPS-HO* = *Semi-static-mode2* and is provided *UplinkPowerSharingDAPS-HO-mode* = *Semi-static-mode2*, the UE determines a transmission power for the target MCG or for the source SCG as described in Clause 7.6.2 for *NR-DC-PC-mode* = *Semi-static-mode2* by considering the target MCG as the MCG and the source MCG as the SCG.If the UE indicates *UplinkPowerSharingDAPS-HO* = *Dynamic* and is provided *UplinkPowerSharingDAPS-HO-mode* = *Dynamic*, the UE determines a transmission power for the target MCG or for the source MCG as described in Clause 7.6.2 for *NR-DC-PC-mode* = *Dynamic* by considering the target MCG as the MCG and the source MCG as the SCG.If - the UE does not provide *UplinkPowerSharingDAPS-HO,* or is not provided *UplinkPowerSharingDAPS-HO-mode*, or is provided *UplinkPowerSharingDAPS-HO-mode* different from *UplinkPowerSharingDAPS-HO* that the UE provides, and - UE transmissions on the target cell and the source cell are in overlapping time resourcesthe UE transmits only on the target cell.If -   the UE provides *UplinkPowerSharingDAPS-HO*, and -   UE transmissions on the target cell and the source cell overlapthe UE transmits only on the target cell <unchanged text omitted> |

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| Intel | Quick question on the proposed TP from Qualcomm (above).The last text seems to be bit strange.“If -   the UE provides *UplinkPowerSharingDAPS-HO*, and -   UE transmissions on the target cell and the source cell overlapthe UE transmits only on the target cell”This states that if the UE has indicated a capability and transmissions overlap, then it should only transmit on the target cell (regardsless of anything else). I think this may be updated similarly to what Apple suggested. |
| Samsung | We support the suggested TP from Qualcomm’s input. (above or modified version in the follow-up email).Regarding Qualcomm’s clarification about “intra-frequency and intra-band”, we think it is clear that “intra-frequency and intra-band” means intra-frequency case only. And “intra-band” can be removed in the text Qualcomm refers to. |
| ZTE | In our understanding, one of reason for UE to always drop source cell transmission in case of UL collision is that UE does not support any power sharing, i.e. nothing is reported by UE for power sharing. The other reason is that single Tx is reported as discussed in our contribution. There may be some other reasons which leads to drop source cell transmission. So we are agree that all the cases can be merged to one that the network configures UE to drop source transmission. This can be indicated by the absence of UL power sharing mode. So, we support Apples’s TP.For the description of power sharing reporting in TS38.213, we think these can be fixed after the relevant UE reporting is finished.  |
| Nokia | Like noted in our paper, the principle should be that the UE behavior should be dependent on the network configuration and not vice versa. Of course if UE does not support certain functionality, network should not configure such functionality for the UE. Hence, regardless whether UE supports given power sharing mode(s), if NW does not configure any mode in use for the UE, UE should do the cancellation. Now based on the agreements the approach in my understanding was that when there is no collision (as per overlap definition), there should always be some power sharing mechanism in use, and this can of course be clarified pending on the UE FG discussion |
| MTK | After reading through all the agreements, we find QC’s proposal most clear and match current RAN1 agreements, so **we support QC’s suggested TP**. One small suggestion is that we can do the following change:*< Unchanged parts from QC’s TP are omitted >*If -   the UE provides *UplinkPowerSharingDAPS-HO*, and -   UE transmissions on the target cell and the source cell ~~overlap~~collidethe UE transmits only on the target cell UE transmissions on the target cell and the source cell ~~overlap~~collide if they are in- overlapping time resources if the carrier frequencies for the target MCG and the source MCG are intra-frequency and intra-band- overlapping time resources and overlapping frequency resources if the carrier frequencies for the target MCG and the source MCG are not intra-frequency and intra-bandto match the wording in RAN1 #99 agreement:**Agreement:*** Confirm WA from RAN1 #98bis on UL transmission of signals/channels for DAPS HO with the following changes:
	+ Collision (in above) is defined for the following cases:
		- physical time resources for UL channel/signals partially or fully overlap for the intra-frequency intra-band scenario.
		- physical time and frequency resources for UL channel/signals partially or fully overlap in time and frequency for any other scenario.
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**Feature lead observation and summary (based on feedback received until 4/22 3pm UTC-7):**

* Companies seemed to be generally well aligned in views.
* The slight difference in views is whether the configured power sharing mode has any dependency on reported UE capability for power sharing.
* FL suggest agreeing on the common principles and iron out the exact TP.
	+ We can discuss further on how to capture the behavior for error cases, with the assumption that gNB should not configure power sharing modes that the UE does not support (or did not indicate altogether)

**Suggested Agreement:**

* gNB will have the ability to enable specific power sharing mode for DAPS including enabling no power sharing between target and source MCG (i.e. always drop source cell when overlapping).
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
	+ no power sharing between target and source MCG (i.e. always drop source cell when overlapping) can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.

The following are 2nd round of comments and input on the above summary and suggested agreement:

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| Company Name | Comments/Views |
| Samsung | We support most of summary and listed agreements above.However, we suggest to add one additional bullet under the agreements, which seems mostly aligned from companies’ views:- Additional TP modification will also be introduced to align the previous agreement and the spec regarding UE dropping behavior on time overlapping allocations when power sharing is not utilized. |
| Qualcomm | We suggest the following change to the suggested agreements:* gNB ~~will have the ability to enable~~ can configure specific power sharing mode for DAPS including enabling no power sharing between target and source MCG (i.e. always drop source cell when overlapping).
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
	+ no power sharing between target and source MCG (i.e. always drop source cell when overlapping) can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.
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| Apple | For UE without power sharing capability, we had the following agreements, so I think the discussion will be focusing on the UE with the power sharing capability.* If UE supporting DAPS HO indicates that UE is not capable of supporting simultaneous UL transmission to source and target cell, UE will drop transmission of source cell if UL transmissions of source and target cell overlap in time. Otherwise, UE transmits UL signals/channels to both source and target cell in DAPS HO.

We suggest the following change to the suggested agreements on top of Qualcomm’s comments:* For UE indicated the power sharing capability, gNB ~~will have the ability to enable~~ can configure specific power sharing mode for DAPS including enabling no power sharing between target and source MCG (i.e. always drop source cell when overlapping).
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
	+ no power sharing between target and source MCG (i.e. always drop source cell when overlapping) can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.
 |
| Huawei/HiSilicon | Power sharing capability is under discussion in parallel. For example, one possibility is that UE supports semi-static mode 1 by default but not additionally indicates a power sharing mode, so the suggested agreement works in principle. We would like to make the following suggestions to polish the suggested agreement:* gNB ~~will have the ability to enable~~ can configure a specific power sharing mode for DAPS including enabling no power sharing between target and source MCG (i.e. always drop source ~~cell when overlapping~~ UL transmission in case of collision).
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes thaSt the UE indicated support of.
	+ no power sharing between target and source MCG (i.e. always drop source ~~cell when overlapping~~ UL transmission in case of collision) ~~can be~~ is indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.

Regarding Samsung’s request to add an additional bullet to make a TP regarding UE dropping behaviour: it is our understanding that we will first settle on the FL’s suggested agreement, and then we will proceed as per the FL’s recommendation and iron out the TP based on the finalized agreement. |
| MTK | We suggest to add following modifications (**in purple**) on top of Apple and QC’s proposal:* For UE indicated the power sharing capability, gNB ~~will have the ability to enable~~ can configure specific power sharing mode for DAPS including enabling no power sharing between target and source MCG (i.e. always drop source cell when ~~overlapping~~resources overlap in time).
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.

no power sharing between target and source MCG (i.e. always drop source cell when ~~overlapping~~resources overlap in time) can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*. |
| Ericsson | We believe that the agreement text should be clarified: currently, the available power sharing modes are the ones available for NN-DC. In addition, the gNB can always choose to disable power sharing.We propose the following modification:* gNB ~~will have the ability to enable~~ can disable ~~configure specific power sharing mode for DAPS including enabling~~ ~~no power sharing~~ between target and source MCG (i.e. configure the UE to always drop source cell when overlapping).
	+ ~~no power sharing between target and source MCG (i.e. always drop source cell when overlapping) can be indicated~~ by ~~gNB~~ not configuring *UplinkPowerSharingDAPS-HO-mode*.
* gNB ~~will have the ability to enable~~ can configure specific power sharing mode for DAPS ~~including enabling no power sharing~~ between target and source MCG ~~(i.e. always drop source cell when overlapping).~~
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
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| Nokia | We share a similar view as Ericsson, i.e. basically on high level network can choose between two operation modes; UL dropping and power sharing (where power sharing mode is selected among the modes UE supports):* gNB can configure for the UE ~~will have the ability to enable~~ a specific power sharing mode for DAPS ~~including enabling no power sharing between target and source MCG (i.e. always drop source cell when overlapping).~~
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
* gNB can disable ~~will have the ability to enable~~ ~~specific power sharing mode for DAPS including enabling no~~ power sharing between target and source MCG (i.e. UE always drops source cell transmission when overlapping with target cell transmission).
	+ no power sharing between target and source MCG (i.e. always drop source cell when overlapping) can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.
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| ZTE | We support the intention of this proposal. As for the wording, we are fine with Nokia’s modification above.  |
| Qualcomm | We would like to further update on the proposal on top of proposal from NOK. Same update would be applied if we go with the other provided proposals:* gNB can configure for the UE ~~will have the ability to enable~~ a specific power sharing mode for DAPS ~~including enabling no power sharing between target and source MCG (i.e. always drop source cell when overlapping).~~
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
* gNB can disable ~~will have the ability to enable~~ ~~specific power sharing mode for DAPS including enabling no~~ power sharing between target and source MCG (i.e. UE ~~always~~ drops source cell transmission when overlapping with target cell transmission if the UE supports the cancellation of UL to source cell).
	+ no power sharing between target and source MCG (i.e. always drop source cell when overlapping) can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.
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| Huawei, HiSilicon | We are almost fine with the latest from QC except “if the UE supports the cancellation of UL to source cell”. UL cancelation is still under discussion, when the conclusion will be clear, in the TP phase, this can be fixed if needed. So far, the green part is unclear to us. For example, if the scheduling gap is long enough, all UE can cancel the uplink per the agreement when resources overlap. “if the UE supports the cancellation of UL to source cell” should be tied to a timeline. Otherwise, it does not seem meaningful.  |

**Feature lead summary (based on feedback received until 4/23 11pm UTC-7):**

* The improvement suggested by companies look promising. FL suggests to take the latest update from Qualcomm with removal of the concerning part from Huawei as basis for agreement.
* Let’s see if the suggested agreement is agreeable, if not companies are encouraged to provide further input and comments.

**Suggested Agreement:**

* gNB can configure for the UE a specific power sharing mode for DAPS
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
* gNB can disable power sharing between target and source MCG (i.e. UE drops source cell transmission when overlapping with target cell transmission).
	+ no power sharing between target and source MCG (i.e. always drop source cell when overlapping) can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.

The following are 3rd round of comments and input on the above summary and suggested agreement:

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| Company Name | Comments/Views |
| Qualcomm | Our perspective is that cancellation would require the UE to verify cancellation timeline assuming the timeline is defined. Such cancellation should be UE capability. In other word, the capability should be irrespective of whether the timeline is tight or loose. Given ongoing discussion on cancellation, we suggest the following change to move forward. We could come back to address “dropping” aspect when cancellation discussion is clearer.  **Suggested Agreement:*** gNB can configure for the UE a specific power sharing mode for DAPS
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
* gNB can disable power sharing between target and source MCG ~~(i.e. UE drops source cell transmission when overlapping with target cell transmission)~~.
	+ no power sharing between target and source MCG ~~(i.e. always drop source cell when overlapping)~~ can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.
 |
| Ericsson | FL proposal looks good to us.Question to Qualcomm: Ericsson wants to understand what it means if there is a UE that does not support cancellation for a timeline that Ericsson assumes that RAN1 will define. Let’s take a simple example, same SCS, identical configurations in source and target, in particular same K2.  The NW does its best to avoid collisions for UL transmissions. But the NW fails to coordinate the scheduling, and by accident it schedules UL transmissions in the same slot. Is it then up to the UE to which cell to transmit? Essentially determined by the order in which the PDCCHs are decoded? |
| Qualcomm(2nd comment) | Answer to Ericsson:For the error case, it would be up to the UE. Determining which cell to transmit may be based on PDCCH decoding order as you mentioned. However, we don’t see strong need to specify rules for this error case. |
| Ericsson(2nd comment) | Further comments to Qualcomm:Thank you for the explanation. As we understand it, synchronized scheduling is not a pre-requisite for DAPS, so it is not an error case in the normal sense. I am still curious why we cannot relax the timeline requirements to make it possible for all UEs to always drop. If the UE is given sufficient time, shouldn’t it always be possible to drop source if there is a collision? |
| MediaTek | Mediatek is fine with the FL proposal.As for the discussion between Qualcomm and Ericsson, Mediatek thinks it would depend on whether the UE Feature “UL transmission cancellation” is kept as in [100b-e-NR-UEFeatures-Mobility-03].Since the timeline of cancellation is becoming clear in [100b-e-NR-Mob-Enh-01], maybe we can first discuss whether to keep the UE Feature “UL transmission cancellation”. After this is resolved, the rest may be simple. |
| Qualcomm(3rd comment) | Qualcomm has general concern regarding cancellation because many aspects that are not yet clearly defined. We believe that separate interoperability testing would be required and the bit is needed to indicate that the testing was done. Timeline related is just one thing. We are investigating other aspects. For example, when a retransmission is requested to the dropped PUSCH that included a PHR report, we don’t know if we should include the earlier PHR or generate a new one? Another example is that for NDI interpretation, if the dropped Tx had a flipped NDI, next NDI is compared to dropped or not? |
| Huawei | We are ok with the suggested agreements (by FL) for progress. We can come back to the UE behavior upon the discussion on uplink cancelation is clear. |
| Apple | We are ok with the suggested agreement with removal of the dropping part. |
| Nokia | Now our interoperation of the UE capability discussion was that Monb-Enh should be able to conclude whether we need the capability or not, so Nokia thinks we should try to conclude on this. Therefore Nokia would prefer to keep the original version (FL suggestion) to close this.In respect to Qualcomm’s comment, Nokia’s concern on separating the UL cancellation is that this is not actually a ‘IOT’ flag, but a capability flag. This would result that NW would need to worry two kind of UEs that ‘support DAPS’, those that can cancel the UL and those who wont and expect perfect TDM. So Nokia understand that DAPS will require IOT, but that IOT should encompass UL cancellation in the basic element/capability rather than separate ’independent’ marker. |
| Ericsson(3rd comment) | We share Nokia’s understanding that the cancellation part should be concluded in the Mob-Enh threads, but maybe it would be in 100b-e-NR-Mob-Enh-02 – but probably not in the capability thread.We do feel that the ability to prioritize target in case of a collision is part of the basic DAPS functionality. The inability to do so would lead to that DAPS would only work for perfectly coordinated cells.Question to Qualcomm:Thanks for bringing up the additional points. Are you claiming that the specification is unclear related to these? |
| Qualcomm(4th comment) | To Ericsson: Per our understandings, those aspects are unclear in the specification yet. We may have more issues related to cancellation. To Nokia: Yes, the bit should be for the capability on whether cancellation is supported. In general, we think the cancellation capability should be introduced since many aspects related to cancellation are not yet clearly defined and such aspects can have high implication to UE implementation. |
| Intel | Question to Qualcomm:To better understand, can Qualcomm clarify what would be the UE behavior be for UEs that do not have the UL cancellation capability? Is the current specification text sufficient for UEs that do not have the UL cancellation capability? Or do you need to specify some UE behavior? |
| Qualcomm(5th Comment) | For UE not supporting UL cancellation, the consequence that is described in the following FG should be sufficient.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 21-4 | UL transmission cancellation | Indicates support of cancelling UL transmission to the source cell | UL transmission cancellation is up to UE implementation | Per BC for inter-frequency case, Per Band for intra-frequency case | Optional with capability signalling |

we should add some clarification on cancellation capability wherever dropping happens e.g., having the following update:

|  |
| --- |
| For UE indicating the support of UL transmission cancellation, If - the UE does not provide *UplinkPowerSharingDAPS-HO*, and - UE transmissions on the target cell and the source cell overlap the UE transmits only on the target cell |

For UE without supporting UL transmission cancellation, I think we can follow the consequence in the cancellation capability FG.  |
| Huawei | Our first preference is original FL proposal, because prioritizing target transmission seems more reasonable in handover operation. Regarding the capability for uplink cancelation, our views is if the time offset for UE canceling uplink is defined based on the max value all UEs support, then no need to report this capability. Otherwise, the time offset may depend on a value (e.g., delta) UE reports via UL cancelation or multiple values as component values for uplink canceling capability reporting. In such a case, if UE does not indicate this capability, UE behavior follows the despeciation regarding the time offset for uplink cancelation with delta=0, otherwise, delta will be a default value or a component value UE reports.I’m not sure if we can agree on the values for the time offset defined for cancelation in this meeting, so it may be a bit earlier to conclude the capability for uplink cancelation is needed or not for now but depends on the discussion progress in 100b-e-NR-Mob-Enh-01. |
| Nokia | So while the proposal made by Hung determines what would be the behaviour for the UE that supports cancellation, like Claes noted, precluding UE that does not support still leaves open what is the behaviour for the UE that does not support cancellation (i.e. as said the determined behaviour would not apply). E.g. if UE does not support cancellation, do we need to define the timeline for the scheduled UL transmissions still? Can they be back to back or does there need to be some guard time in between?  We currently have the timeline for PRACH vs PUSCH etc. but this would in my understanding apply only for the UEs that support cancellation.  Also as noted by Hung (in thread#01), RAN2 will not introduce any TDM pattern, so the it is not very clear to me what would be UE behaviour and what are the UE expectations from network perspective?Thus, while I can appreciate the concerns on need to define the behaviour when the UE supports the cancellation (and please note this is done to relax the UE implementation complexity), I think this is necessary as we would have UEs that support the cancellation. Splitting the DAPS capability to smaller fragments does not address the issue, but it instead will introduce new issues to consider. I would see this is issue so that if UE’s can’t support UL cancellation, it would not be necessary to support DAPS at all. I think this addresses the concerns. |
| Apple | I would like to clarify our understanding on two alternatives. It’s not clear what is the meaning of “no power sharing”, it could have two interpretations,Interpretation 1: only transmission to target cell, not transmission to source cell is allowed, the red text in Alt 1 can be removed.Interpretation 2: TMD transmission between source cell and target cell, and define dropping rule if overlapping or network scheduling avoid the collisionAlt 1 or Alt 2 is to define new UE behavior and need new agreement after RAN1#99. We want to confirm which interpretation is the common understanding, then move forward.Alt1)* gNB can disable power sharing between target and source MCG (i.e. UE drops source cell transmission when overlapping with target cell transmission).
	+ no power sharing between target and source MCG (i.e. always drop source cell when overlapping) can be indicated by gNB not configuring UplinkPowerSharingDAPS-HO-mode.
 |
| Intel | Response to Apple:Intel assumes it is interpretation 2. |
| MediaTek | We (MTK) want to share our understanding for “no power sharing” and “what is the behavior for UE that does not support cancellation”.* For “no power sharing” (gNB not configuring *UplinkPowerSharingDAPS-HO-mode*), this is only meaningful for UE that supports cancellation. The corresponding behavior would be “UE drops source cell transmission when overlapping with target cell transmission, no power sharing is performed”. This means nothing for UE that does not support cancellation.
* For “what is the behavior for UE that does not support cancellation”, UE would expect NW to schedule in a non-overlapping manner. If overlapping still happens, it would be up to UE implementation (Ex. UE may still transmit to both source and target cells).
 |

**Feature lead observation and summary (based on feedback received until 4/28 5pm UTC-7):**

* Most companies seem to be ok with the spirit of the feature lead proposal made on 4/23. Qualcomm has requested some modifications of the proposal to address the UL transmission cancellation capability.
* The following is summary of companies preferences so far
	+ ALT 1 (original FL proposal)
		- Ericsson, Nokia, Huawei
	+ ALT 2 (modified proposal by Qualcomm)
		- Qualcomm, Apple, Mediatek
* Feature lead suggest to agree to either ALT 1 or ALT 2 proposal below.

**ALT 1) Suggested Agreement:**

* gNB can configure for the UE a specific power sharing mode for DAPS
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
* gNB can disable power sharing between target and source MCG (i.e. UE drops source cell transmission when overlapping with target cell transmission).
	+ no power sharing between target and source MCG (i.e. always drop source cell when overlapping) can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.

**ALT 2) Suggested Agreement:**

* gNB can configure for the UE a specific power sharing mode for DAPS
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
* gNB can disable power sharing between target and source MCG ~~(i.e. UE drops source cell transmission when overlapping with target cell transmission)~~.
	+ no power sharing between target and source MCG ~~(i.e. always drop source cell when overlapping)~~ can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.

**Suggestion for focus for 4th round of discussion**

* Feature lead suggests clarifying the gap between companies regarding no power sharing mode.
* Companies are encourage to comment further on UE behavior when no power sharing mode is indicated. Feature lead has drafted suggestion based on discussion so far, which can be used basis for further discussion.

**Proposal for discussion:**

* gNB can configure for the UE a specific power sharing mode for DAPS
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
* gNB can disable power sharing between target and source MCG
	+ no power sharing between target and source MCG can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.
	+ UE behavior when no power sharing mode is indicated:
		- When source and target cell transmission overlap without sufficient time for cancellation, UE behavior is “up to UE implementation”
			* [question from FL: is this common understanding or is there something else?]
		- When source and target cell transmission overlap with sufficient time for cancellation,
			* Option 1) assuming UL cancelation capability is defined
				+ For UE that is UL cancellation capable, the UE drops source cell transmission.
				+ For UE that is UL cancellation incapable, behavior is “up to UE implementation”
				+ [question from FL: is this same as being undefined in specification?]
			* Option 2) assuming UL cancelation capability is not defined
				+ When source and target cell transmission overlap (with sufficient time offset for cancellation), the UE drops source cell transmission.
		- Note in whether or not to define sufficient time offset for cancellation is being discussed in email thread 01. For the sake of the discussion, let assume there is some notion of sufficient time for cancellation. In case RAN1 agrees this concept is not needed in specification, we can assume there is always sufficient time and ignore all cases without sufficient time.
		- Note the UE behavior defined may also need to be applicable for other power sharing modes (e.g. for intra-frequency or intra-band inter-frequency DAPS RAN1 agreed apply collision rules regardless of power sharing mode).

|  |  |
| --- | --- |
| Company Name | Comments/Views |
| Samsung | * + UE behavior when no power sharing mode is indicated:
		- When source and target cell transmission overlap without sufficient time for cancellation, UE behavior is “up to UE implementation”
			* [question from FL: is this common understanding or is there something else?] --- Question 1.
		- When source and target cell transmission overlap with sufficient time for cancellation,
			* Option 1) assuming UL cancelation capability is defined
				+ For UE that is UL cancellation capable, the UE drops source cell transmission.
				+ For UE that is UL cancellation incapable, behavior is “up to UE implementation”
				+ [question from FL: is this same as being undefined in specification?] --- Question 2.
			* Option 2) assuming UL cancelation capability is not defined
				+ When source and target cell transmission overlap (with sufficient time offset for cancellation), the UE drops source cell transmission.

For the UE behavior when no power sharing mode is indicated, below is Samsung’s answers for the question from FL list above.Question 1) Our answer is Yes or No depending on how we interpret “source and target cell transmission overlap without sufficient time for cancellation”. In our view, ‘without sufficient time’ should only be applied to the portion/duration for which source cell transmission is not cancellable based on the current baseline TP in 01 thread and handling of such portion/duration is up to implementation. In any case, we think this notion and behavior should be discussed in 01 thread.Question 2) Yes, we think “up to UE implementation” is the same as being undefined in specification.We agree most of the parts for “Proposal for discussion” except the answer Question 1 indicates. |
| MediaTek | In short, we (MTK) support Option 1.The reason we support defining UL cancelation capability is that:* Unlike the cancellation operation in DC (which is only inter-band), the cancellation of two UL signals in DAPS-HO can overlap in both time and frequency. For two ULs in the same frequency, the UE implementation of cancellation is more complex. Rather than a simple dropping triggered from baseband processing circuit, the RF circuit of UE also has to fine-tune again for this frequency due to the power variation caused by dropping. This imposes higher complexity and should be a UE capability.

For Question 1) Our answer is Yes. We have some different understanding from Samsung that there is no “portion” when we talk about cancellation. An uplink transmission is either totally cancelled or totally kept.For Question 2) Our answer is Yes. We also think “up to UE implementation” is the same as being undefined in specification. |
| Qualcomm | We’re not sure why cancellation is just simply coupled with whether the cancellation timeline is tight or relaxed. As mentioned earlier, we are concerned about cancellation in general. Timeline is just one area of concern. Per our understandings, many aspects related to cancellation are not clearly defined in the specs yet. For example, when a retransmission is requested to the dropped PUSCH that included a PHR report, the spec is not clear if the UE should include the earlier PHR or generate a new one? Another example is that for NDI interpretation, if the dropped Tx had a flipped NDI, the spec is not clear if the next NDI is compared to dropped or not? We believe these are not only issues. Resolving such undefined aspects likely requires non-trivial change to implementation. |
| Feature lead comments | If the cancellation capability functions are not just limited to whether or not UE can perform the cancellation with sufficient time offset, this means specification would need to ultimately support 4 different types of UE behaviors (see table below).

|  |  |  |
| --- | --- | --- |
|  | Sufficient time offset for cancellation | Not sufficient time offset for cancellation |
| UE capable of supporting other factors (e.g. BHR) that impact cancellation | Behavior A | Behavior B |
| UE incapable of supporting other factors (e.g. BHR) that impact cancellation | Behavior C | Behavior D |

I think there are difficulties in understanding and defining the exact UE behavior for cases with or without sufficient time offset for cancellation. It is going to even more difficult to understand the other cases.And I believe this is where the challenges lie. I believe companies want to be accommodating, but they (including myself) don’t fully understand the all other features that Qualcomm is thinking of that is tied with the UL cancellation capability. So without fully understand the consequence, it could be quite difficult to agree to it.Do you think it would be possible to spell out the other aspects for the UL cancellation capability description? Maybe this could help companies understand all the aspects that Qualcomm has concerns about.======================================Additionally, for the PHR and NDI issues, I assumed UE dropping a transmission is no different than cases when UE missed the PDCCH scheduling the PUSCH or when the PUSCH is sent but not successfully decoded by gNB. I don’t know if there is a need to spell out the associated UE behavior for deciphering DCI formats and MAC procedures to PHR. Maybe there are things that I am missing.If this needs to be specified, it would need to worked out regardless of whether cancellation capability exist, since the both behaviors (with capability and without capability) should be supported by the specification. Also the consequences for UE not supporting & support the feature needs to make sure it describes all of the changes that could happen. So how could we agree to a capability where we don’t fully understand the consequences that would happen if support or not supported.If there are issues that need to be worked out, I don’t know if we will have the time to sort out all those issue in the next 10 hours or so. If so, we may need to stop and discuss this next time. I don’t know if we can conclude to a agreement let alone a stable TP with this.Instead of finishing this meeting with nothing, what about the following? For this meeting, we will need to skip the TP altogether since we don’t have all the details finalized. |
| Huawei | When on power sharing mode is indicated, UE’s behavior either transmits only target (as agreed and specified already) or up to UE implementation (may drop source or target) as QC suggested. Up to UE implementation is not friendly to NW in general which makes UE behavior unpredictable to NW. One question for the note, when saying “applicable for other power sharing modes”, other power sharing modes I suppose mean semi-static mode 1, semi-static mode 2, and dynamic. However, the “e.g.,” in the brackets are explaining the different things., Also, why inter-frequency for inter-band was not mentioned. Can you clarify the motivation for the note? Apologies if I miss something somewhere.  |
| MediaTek | We tend to share the same understanding as Jinhuan:* (Assuming UE capability will be defined), if UE does not indicate the capability, NW should avoid to schedule the overlapped uplink.

Therefore, for the 4 different types of UE behaviors organized by Daewon:

|  |  |  |
| --- | --- | --- |
|  | Sufficient time offset for cancellation | Not sufficient time offset for cancellation |
| UE capable of supporting other factors (e.g. BHR) that impact cancellation | Behavior A | Behavior B |
| UE incapable of supporting other factors (e.g. BHR) that impact cancellation | Behavior C | Behavior D |

**Behavior A** would be: UE drops the source cell UL transmission and transmits the target cell UL transmission.**Behavior B/C/D** would all be: UE does not expect to do UL transmission on the target MCG/source MCG when a corresponding UL transmission exists on the source MCG/target MCG.This is similar to the spec in 38.213 7.6.1 EN-DC* If the UE does not indicate a capability for dynamic power sharing between E-UTRA and NR for EN-DC, the UE does not transmit in a slot on the SCG in FR1 when a corresponding subframe on the MCG is an UL subframe in the reference TDD configuration.

We are ok with FL’s Proposal for discussion, but I think the outcome of the UL transmission cancellation capability discussion would be similar here. |
| Ericsson | First of all, we agree with the moderator that for PHR and NDI, there should be no difference compared to a missed PDCCH or PUSCH. We do not see why a cancelled transmission would be different. Moreover, any potential issue should exist also when the choice of which transmission to cancel is up to the UE. We would be OK with the proposal for discussion, which would give us more time to understand the UE issues (similar to the moderator, we still do not understand why a relaxed timeline would not help), and also to fully digest the implications for the feature as such. However, in our understanding, the current specification requires that the UE in at least one case performs cancellation. |

**Feature lead observation and summary (based on feedback received until 4/30 7am UTC-7):**

* Based on discussion so far, it seems difficult to complete the stable TP before end of the meeting.
* Instead of having to restart the discussion from scratch next time, Feature lead suggest to agree on common agreeable principles so that next meeting RAN1 has something we can work with.
* Let’s see if the following suggestion is agreeable.

**Proposal for discussion:**

* gNB can configure for the UE a specific power sharing mode for DAPS
	+ It is assumed that gNB shall only enable a power sharing mode for DAPS among the power sharing modes that the UE indicated support of.
* gNB can disable power sharing between target and source MCG
	+ no power sharing between target and source MCG can be indicated by gNB not configuring *UplinkPowerSharingDAPS-HO-mode*.
	+ UE behavior when no power sharing mode is indicated:
		- Behavior FFS, exact behavior depends on the outcome of the UL transmission cancellation capability discussion

# Reference

1. R1-2001530, “Remaining issues on DAPS-HO,” Huawei, HiSilicon
2. R1-2001624, “Remaining issues on NR mobility enhancements in physical layer,” ZTE
3. R1-2002011, “Corrections to Physical layer aspects of NR mobility enhancement,” Intel Corporation
4. R1-2002148, “Remaining issues for NR Mobility Enhancement,” Samsung
5. R1-2002221, “Remaining physical layer aspects of dual active protocol stack based HO,” Nokia, Nokia Shanghai Bell
6. R1-2002344, “On remaining issues on NR mobility enhancements,” Apple
7. R1-2002490, “Correction to UL power sharing for DAPS HO,” Ericsson
8. R1-2002558, “Maintenance for NR mobility enhancements,” Qualcomm Incorporated
9. R1-2001531, “Remaining PHY aspects for CHO,” Huawei, HiSilicon
10. R1-2001625, “Discussion on FR2 mobility interruption enhancements,” ZTE
11. R1-2002010, “Issue Summary for NR Mobility Enhancements,” Moderator (Intel Corporation)