**3GPP TSG RAN WG1 Meeting #101-E R1-2004748**

**e-Meeting, May 25 – June 05, 2020**

**Source: Moderator (Intel Corporation)**

**Title: Summary of email discussions for [101-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 #101-E. Chairman has approved three email discussion threads for RAN1 #101-E. The following are the approved email discussions:

* [101-e-NR-Mob-Enh-01] Email discussion/approval of Issue #1 (UL cancellation for DAPS) and #3 (UL overlapping transmission) in R1-2003747 by 5/29; if necessary, endorse the associated TPs by 6/4 – Daewon (Intel)
* [101-e-NR-Mob-Enh-02] Email discussion/approval of Issue #5 (Power sharing mode for UL DAPS-HO) in R1-2003747 by 5/28; if necessary, endorse the associated TPs by 6/3– Daewon (Intel)
* [101-e-NR-Mob-Enh-03] Email discussion/approval of Issue #6 (PDCCH monitoring in DL DAPS-HO) in R1-2003747 by 5/28; if necessary, endorse the associated TPs by 6/2– Daewon (Intel)

This contribution summarizes the email discussion for [101-e-NR-Mob-Enh-02].

# Email Discussion [101-e-NR-Mob-Enh-02]

This discussion is regarding the power Sharing Mode for UL DAPS-HO (Issue #5 from [11]).

The main focus of the issue to finalize the specification based on agreement made in RAN1 #100bis-e:

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| **Agreement from RAN1 #100bis-e:*** 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*.
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**Issue and Proposal Summary based on [1][2][4][5][6][7]:**

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 [1]: When no power sharing is configured by the network, a UE should cancel the source cell transmission in case of UL collision in the time domain.
	+ The following is proposed TP:

## TP #1

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| 15 Dual active protocol stack based handover<---------------------------Other parts are omitted ------------------------------->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* = *Dynamic* by considering the target MCG as the MCG and the source MCG as the SCG.If - the UE is not provided with *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.<---------------------------Other parts are omitted -------------------------------> |

* Proposal [2]: When no power sharing is configured by the network, a UE should cancel the source cell transmission in case of UL collision in the time domain.
	+ The following is proposed TP:

## TP #2

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| **15 Dual active protocol stack based handover**< Unchanged parts are omitted >If the UE is not provided *UplinkPowerSharingDAPS-HO-mode*~~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. |

* Proposal [4]:
	+ Agreement and capability signaling, the TS38.213 should add a separate text when gNB does not configure UplinkPowerSharingDAPS-HO-mode configuration, which should imply UE always performs dropping of the source cell transmission during transmission overlap in time domain.
	+ Text that couples the UE capability with gNB configured mode can be cleaned up by having a generic text that states UE is not expected to be configured with power sharing mode that it does not support.
	+ The following is proposed TP:

## TP #3

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| 15   Dual active protocol stack based handover*< Unchanged parts are omitted >*If the UE ~~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 ~~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. [UE is not expected to be provided *UplinkPowerSharingDAPS-HO-mode* configuration that it did not indicate support of.]If the UE is not provided with *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 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 [5]:
	+ The following is proposed TP:

## TP #4

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| 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 *~~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 *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 *~~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.*<unchanged text 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 or -   the UE ~~does not~~ is provided *UplinkPowerSharingDAPS-HO-Mode*, 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]. |

* Proposal [6]: When the gNB disables power sharing, the behaviour should be the same as when the UE does not provide UplinkPowerSharingDAPS-HO.
	+ The following is proposed TP:

## TP #5

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| 15   Dual active protocol stack based handover*< Unchanged parts are 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 overlap the UE transmits only on the target cell  |

* Proposal in [7]:
	+ If gNB disables the power sharing between target and source cell, UE would assume the UL transmission is in TDM manner to source and target cell. If any UL transmission collision, the UE behavior is not specified.
	+ Define the UE capability for UL transmission cancellation.
	+ NR-DC based UL power control adjustment timeline can be considered by UL transmission cancellation in DPAS HO.
	+ The following is proposed TP:

## TP #6

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| 15 Dual active protocol stack based handover  If - the UE is not provided with *UplinkPowerSharingDAPS-HO-mode*, UE does not expect the UL transmission on the target cell and source cell are overlapping in time resources Or 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 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. |

* Text Proposal in [8]:

## TP #7

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| If the UE indicates support for *~~UplinkPowerSharingDAPS-HO~~* ~~=~~ *~~Semistatic-mode1~~* semi-static power sharing 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 indicates support for *~~UplinkPowerSharingDAPS-HO~~* ~~=~~ *~~Semistatic-mode2~~* semi-static power sharing 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 support for*~~UplinkPowerSharingDAPS-HO~~* ~~=~~ *~~Dynamic~~* 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 |

**Discussion Summary:**

The text proposals made in the submitted contributions can be largely categorized into 3 groups.

**Group 1)** Indication of no power sharing between target and source MCG

* Approach A) add new text separate from existing text that handles overlap signals for intra-band and intra-frequency cases.
	+ TP#1, TP#3, and TP#4
* Approach B) add the text to the existing text (by stating “or”) that handles overlap signals for intra-band and intra-frequency cases
	+ TP #5, and TP#6
* Approach C) change ‘UplinkPowerSharingDAPS-HO’ to ‘UplinkPowerSharingDAPS-mode’ in the existing text handles overlap signals for intra-band and intra-frequency cases (with other minor modification)
	+ TP#2, and TP#7

**Group 2)** Clean-up of existing text by removing the RRC parameter name in “if UE indications UplinkPowerSharingDAPS-HO = xxx”

* Approach A) replace the “if UE indications UplinkPowerSharingDAPS-HO = xxx” with a generic “if UE indicates supports of xxx”
	+ TP#7
* Approach B) delete the “if UE indications UplinkPowerSharingDAPS-HO = xxx” and add a generic text that states UE does not expected to be configured with modes that it does not support.
	+ TP#3

**Group 3)** correction of ‘UplinkPowerSharingDAPS-HO’ with ‘NR-DC-PC-mode’

* All mentioned in TP#3, TP#4, and TP#7
* This seems to be editorial in nature and should be straightforward.

Companies are encouraged to provide comments on the issue group 1, group 2, and group 3.

* For example, whether they prefer Approach X in Group 1 issue, Approach B in Group 2 issue, and agrees with Group 3 issue.
* If companies have another resolution for Group 1 and/or 2 issue other than what was mentioned, please provide information as well.
* If companies have concerns with certain approaches, please provide explanation.
* 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 | Group 1(approach A/B/C) | Group 2(approach A/B) | Group 3(agree/disagree) | Comments/Views |
| Huawei, HiSilicon | C | B | agree |  |
| Ericsson | B or C | A | agree | It is an error case that the UE is configured with something it does not support, and error cases are typically not described in the RAN1 specifications. |
| Intel | A(or B - TP#6 only) | A | agree | For group 1, the existing cases refer to intra-frequency and intra-band overlapping cases. gNB configuration of no power sharing would need to apply to any case (if configured). Therefore, we think changing the existing text either using approach B or C would not result in the same UE behavior.For example, in approach C, TP#2 and #7, its not clear what happens when the UE is not configured with power sharing mode (i.e. no power sharing) but configured with DAPS in inter-frequency. The description is completely missing. The same situation for TP#5.TP#6 is better in that it does not use the “overlap” definition that is defined by the existing text.For group 2, we are open whether we need to describe error cases. |
| Samsung | A or B (TP#6 only) | A  | Agree | For Group 1, we think both approach B or C do not match RAN1-99 agreement on cancellation condition.The reason we came up with TP#6 in [5] is to avoid repeating the sentence “UE transmits only on the target cell”, which will be replaced by the long paragraph in issue#1. |
| Qualcomm | Need further discussion | A | Agree | For Group 1, we would like to have further discussion on UE behavior. If the UE needs to cancel UL Tx when the gNB does not configure any UL sharing mode, the UE needs to support UL cancellation capability FG 21-2d.This is different from the scenario where UE does not indicate the UL power sharing capability where the UE may try to support one of the sharing modes to avoid UL cancellation behavior. |
| Nokia | C | A | Agree | In context of the power sharing modes, like noted in our paper, having the reference to reported UE capability is not absolutely necessary (while that is done also in Section 7.6.2) as it would be erroneous configuration. |
| Apple | Need further discussion | A | Agree | For Group 1, in our understanding, the first thing need to do is to define the UE behaviour for so called “no power sharing”, then how to capture it in the specification is just wording issue. |
| ZTE | A | A | Agree  | For Group 1, we have same understanding with Samsung. |
| MTK | A | A | Agree | For Group 1, we can agree on A generally, but we share same view as QC that it may be related to UL cancellation capability FG 21-2d.Besides, we see TP#1 as a general description and not limited to “intra-band and intra-frequency cases”. |

Tproc 2, cancel in MAC, Rel.16 cancel in physical layer

**Discussion Summary of all comments received by May 27, 11pm PDT (May 28, 6am UTC):**

Majority of the companies seem to prefer taking approach A for Group 2, and agree with issue discussed in Group 3. Moderator has remove the other aspects from TP#7 and suggests to agree to TP#8 as a conclusion for Group 2 and 3 issue.

Moderator Suggestion for Agreement:

* Agree TP #8 of R1-2004749

## TP #8

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| If the UE indicates support for *~~UplinkPowerSharingDAPS-HO~~* ~~=~~ *~~Semistatic-mode1~~* semi-static power sharing 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 indicates support for *~~UplinkPowerSharingDAPS-HO~~* ~~=~~ *~~Semistatic-mode2~~* semi-static power sharing 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 support for*~~UplinkPowerSharingDAPS-HO~~* ~~=~~ *~~Dynamic~~* 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. |

For Group 1 issue, companies seem to be somewhat split. There are more companies that prefer approach A or B (TP#6). Moderator would like to ask companies to focus on approach A or B (TP#6 based solution) for further discussion so that we can conclude.

Moderator has taken the relevant text from TP #1, #3, and #4 and merged them as TP #9.

Moderator Suggestion for Agreement:

* Agree on TP #6 or #9 of R1-2004749

## TP #9

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| 15 Dual active protocol stack based handover*<unchanged text omitted>*If - the UE does not provide *UplinkPowerSharingDAPS-HO*, or the UE is not provided with *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 overlap,the UE transmits only on the target cell. |

**Discussion Summary after May 27, 11pm PDT (May 28, 6am UTC):**

Companies are encouraged to provide comments on the following proposal. Especially, whether they have concerns with the suggested proposal. Also, if the suggestion made are acceptable, then please provide preference between TP#6 and #9.

Moderator Suggestion for Agreement:

* Agree TP #8 of R1-2004749
* Agree on TP #6 or #9 of R1-2004749

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| Company Name | Comments/Views |
| Qualcomm | We are fine with TP#8However, we’re not able to agree on either TP#6 or TP#9:* UE behavior 1 (when the gNB does not configure any UL sharing mode, the UE cancels the source transmission): This behavior is fine as long as the UE indicates the support of UL cancellation. Alternatively, we can have UE behavior that when the gNB does not configure any UL sharing mode, the UE expects that the UL transmissions to source and target do not overlap.
* UE behavior 2 (when the UE ~~does not~~ provides *UplinkPowerSharingDAPS-HO* and UE transmissions on the target cell and the source cell overlap, the UE cancels the source transmission): This is not necessarily true. It really depends on the UE RF e.g., if the UE has 2 TX chains, it can do simultaneous transmissions to source and target for this case.
 |
| Moderator (Intel) | It seems Qualcomm is suggestion a different alternative to what no power sharing mode should describe. I’ve tried to capture what I think Qualcomm was suggesting in TP#10.Companies are encouraged to provide feedback.For the 2nd issue that Qualcomm commented above, the ‘overlap’ definition already defined in specification seems to already handle the situations that Qualcomm is concerned about.It would be good for Qualcomm to provide further feedback whether the ‘overlap’ definition define is sufficient or not. If not sufficient, then what further needs to be changed in specification. |
| MediaTek | Agree on TP #8.For TP #6 or #9, we prefer TP #9. |
| Intel | Agree on TP #8Ok with TP#9. |
| Samsung | Agree with TP#8.Okay on TP#9. (please ignore our previous comments on TP#6, we mistakenly treated it the same as TP#4) |
| Huawei, HiSilicon | Agree with TP#8. Neither TP#6 nor TP#9 is agreeable to us. If UE does not provide *UplinkPowerSharingDAPS-HO*, it means UE does not support simultaneous transmission. In other words, gNB is not expected to schedule the uplink to two cells that collide. Otherwise, UE not provided the power sharing modes includes two cases: one is that UE does not support *UplinkPowerSharingDAPS-HO,* so gNB is not expected to schedule the uplink to two cells that collide; the one is that UE supports *UplinkPowerSharingDAPS-HO* but NW disables power sharing, for which UE’s behavior to transmit only on the target cell needs pre-requisite support of cancelation and gNB is not expected to schedule the uplink to two cells that collide if UE does not support UL cancelation. Therefore, based on the above understanding, neither TP#6 nor TP#9 and even nor TP#10 reflects the above.  |
| Apple | We support TP#8.For TP#6 and TP#9, if our understanding is correct, the TP#10 can be updated as,If the UE does not provide *UplinkPowerSharingDAPS-HO*, or the UE is not provided with *UplinkPowerSharingDAPS-HO-mode*, UE ~~is~~ does not expect transmissions on the target and source cell in overlapping time resources. ~~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~~ ~~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~~[Note: The above has been captured as TP#11 by Moderator] |
| ZTE | Agree with TP#8For TP #6 or #9, we prefer TP #9.In our understanding, if a UE does not provide *UplinkPowerSharingDAPS-HO*, it means the UE does not support any power sharing scheme. So, the network will not configure power sharing scheme to the UE. In other words, only keeping ‘UE is not provided with *UplinkPowerSharingDAPS-HO-mode*’ is sufficient. But, if other companies have concerns, we can accept current TP#9.  |
| Nokia | (While TP#8 is been already agreed, just to confirm that we are OK with it).TP#9 would be OK to us as well.For TP#10, it seems to propose *UplinkPowerSharingDAPS-HO* as an implicit capability for UL cancellation, i.e. if UE does not expect transmission on target and source in overlapping resources, there is no overlapping scheduling allowed. In our understanding *UplinkPowerSharingDAPS-HO* just determines whether UE can support power sharing between cells. If not and in case of overlap (in time and frequency), UE would transmit to target cell only. |
| Ericsson | We support TP#9TP#10 is out of scope of this email discussion. |

## TP #10

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| 15 Dual active protocol stack based handover*<unchanged text omitted>*If the UE does not provide *UplinkPowerSharingDAPS-HO*, or the UE is not provided with *UplinkPowerSharingDAPS-HO-mode*, UE does not expect transmissions on the target and source cell in overlapping time resources. If-   the UE ~~does not~~ provides *UplinkPowerSharingDAPS-HO,* and-   UE transmissions on the target cell and the source cell overlap,the UE transmits only on the target cell. |

## TP #11

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| 15 Dual active protocol stack based handover*<unchanged text omitted>*If the UE does not provide *UplinkPowerSharingDAPS-HO*, or the UE is not provided with *UplinkPowerSharingDAPS-HO-mode*, UE does not expect transmissions on the target and source cell in overlapping time resources. ~~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~~ ~~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~~ |

## TP #12

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| 15 Dual active protocol stack based handover*<unchanged text omitted>*If - the UE supports *[UplinkCancellationDAPS-HO], and*- the UE does not provide *UplinkPowerSharingDAPS-HO* or the UE is not provided with *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 support *[UplinkCancellationDAPS-HO], and*- the UE does not provide *UplinkPowerSharingDAPS-HO* or the UE is not provided with *UplinkPowerSharingDAPS-HO-mode*, the UE does not expect transmissions on the target and source cell in overlapping time resources.If-   the UE ~~does not~~ provides *UplinkPowerSharingDAPS-HO,* and-   UE transmissions on the target cell and the source cell overlap,the UE transmits only on the target cell. |

**Discussion Summary of all comments received by June 02, 11pm PDT (June 03, 6am UTC):**

TP#8 has been agreed by Chairman. The only issue left is the discussion on TP#6/#9/#10.

The following is summary of companies views on TP#9, #10, and #11 (proposed by Apple). Based on feedback from Huawei, moderator has formulated TP#12.

TP#6

* No company had provided preference for this. Therefore, moderator suggests to move this out of the discussion.

TP#9

* Supported by: MediaTek, Intel, Samsung, ZTE, Nokia, Ericsson
* Objected by: Qualcomm, Huawei, HiSilicon
	+ Main reasons for objection seems to be tied to whether UE is able to support UL transmission cancellation or not.

TP#10 (TP drafted by Moderator based on Qualcomm feedback)

* Supported by:
* Objected by: Huawei, HiSilicon
* Out-of-scope: Ericsson

TP#11 (suggestion from Apple)

* Supported by: Apple

TP#12 (TP drafted Moderator based on Huawei, HiSilicon feedback)

* Supported by:
* Text modified to factor into account potential UL transmission cancellation capability

There seems to good support for TP#9. However, the main concerns for the TP is that the TP does not capture UL cancellation capability behaviors. Therefore, suggests the conclude on either TP#9 or TP#12 depending on the decision of UL cancellation capability.

Moderator Suggestion for Agreement:

* If UL cancellation capability (21-2d feature) is not supported in NR, agree on TP #9 of R1-2004749
* If UL cancellation capability (21-2d feature) is supported in NR, agree on TP #12 of R1-2004749

**Discussion Summary after May 27, 11pm PDT (May 28, 6am UTC):**

Moderator suggest focusing the discussion on stabilizing the TP for agreement. Instead of focusing the discussion on whether TP is agreeable or not due to UL cancellation capability, companies are encouraged to provide feedback on both TP#9 and TP#12 assuming feature 21-2d is agreed or not agreed.

Please provide comments on

* whether TP#9 is acceptable if we **assume** feature 21-2d is **not supported** in Rel-16 NR, and
* whether ~~TP#12~~ TP#14 is acceptable if we **assume** feature 21-2d is **supported** in Rel-16 NR
* If neither TP#9 or ~~TP#12~~ TP#14 ~~(or TP#13)~~ is acceptable, please provide an alternative TP.

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| Company Name | Comments/Views |
| Huawei, HiSilicon | TP#9 needs modification as follows assuming feature 21-2d is **not supported** in Rel-16 NR:If-   the UE ~~does not~~ provides *UplinkPowerSharingDAPS-HO but* the UE is 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.Because if UE provides UplinkPowerSharingDAPS-HO, it means UE is able to simultaneously transmit the two uplinks, no need to drop one. [Note from Moderator: In order to not confuse the discussion, I’ve put the changes to TP#12 as TP#13 and kept TP#12 as original drafted by Moderator] |
| Moderator (Intel) | Quick question on TP#13 (provided by Huawei).What is the UE behavior if the UE does not support ul-cancellation capability and not provided with UplinkPowerSharingDAPS-HO-mode?It seems some cases are missing from specification. Is that intentional? |
| Samsung | We accept TP#9. It reflects current agreements correctly. TP#12 is based on the proposed FG21-2d descriptions before Wednesday’s meeting. It may be acceptable with some modification reflecting the final outcome of FG21-2d. It is hard to come up with exact TP taking account with *[UplinkCancellationDAPS-HO]* before FG21-2d is stable. We cannot agree with TP#13, it departs from previous agreements.Additional comments on Huawei’s clarification to Moderator and Nokia’s question:After reviewing [101-e-NR-Mob\_enh-UEFeatures-02] thread, the changing of description from “The UE is only able to drop the transmission to the source” to “UE is not expected to simultaneously transmit PRACH/PUSCH/PUCCH/SRS to source and target cell that overlap in time domain” does not mean to change the agreed UE dropping behavior. For us, the following two statements sound similar, but they are different: (1) UE is not expected to simultaneously transmit PRACH/PUSCH/PUCCH/SRS to source and target cell that overlap in time domain.(2) UE does not expect UL transmissions to source and target overlap. (1)-> is UE behavior that UE don’t transmit simultaneously to source and target cell, which includes dropping transmission to source cell when two transmission overlapping and timeline meets.(2)-> is gNB behavior to not schedule transmissions to source and target cell overlapping in time. |
| MTK | We think both TP#9 or TP#12 can be considered as a baseline for further TP. Since it is likely RAN1 would only introduce [*UplinkCancellationDAPS-HO*] for inter-frequency HO as discussed in mob-enh-01, both TP#9 and TP#12 would need to be modified to cover the different behaviors for intra/inter frequency cases. Besides, instead of only saying “**the UE transmits only on the target cell**”, we think it is more clear to also include the cancellation timeline and transmission based cancellation under discussion in mob-enh-01 (TP#1-1~TP#1-7), for example (using TP#1-7 from Apple), change * “**the UE transmits only on the target cell**”

to* **“the UE transmits only on the target cell,** and cancels the whole transmission to source cell if the occasion of the first symbol of source cell transmission is after 𝑇offset  after a last symbol of a CORESET where the UE detects a DCI format scheduling the transmission on the target cell, where 𝑇offset is defined in Clause 7.6.2.**”**
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| Ericsson | If the capability [*UplinkCancellationDAPS-HO]* is introduced for some cases, TP#12 would seem appropriate. Since TP#12 describes the situation with and without cancellation, it would seem sufficient: 38.213 does not need to differentiate between intra and inter-frequency.  |
| Nokia | I would also have a question regarding the update proposed by Jinhuan (Huawei) to TP#9. As it now reads to me it seems to assume that UE will always provide “*UplinkPowerSharingDAPS-HO*”, while I was in the understanding that it is not always necessarily provided by UE. Is power sharing mandatory or am I misreading the proposal? |
| Huawei (2) | When UE does not indicate uplink power sharing, it means UE cannot simultaneously transmit uplink to both source and target cells. Given we have agreed that the consequence if 21-a is not supported has been captured in the UE feature that “UE is not expected to simultaneously transmit PRACH/PUSCH/PUCCH/SRS to source and target cell that overlap in time domain”. I suppose it will be captured in RAN2 spec somehow, so RAN1 spec does not need change because basically NW will not schedule two uplink overlapped. Also, if FG21-2d for uplink cancelation is introduced, but when UE does not indicate this capability, the consequence would be the same as 21-2a, so RAN1 does not need to capture it.  |
| Nokia (2) – in response to Huawei comment (2) | I agree that the wording implies that UE does not send to two cells simultaneously, i.e. no power sharing is required. However that does not imply that there could not be collision of the scheduled transmission  with two cells. Hence I think we still need to cover the case when UE does not provide “*UplinkPowerSharingDAPS-HO*” e.g. in TP#9. |
| Huawei (3) | The intention was not to revert the agreement, though the consequence seems misleading when power sharing is not supported by UE. Given now UE feature for uplink cancelation is still being discussed, the TP regardless which one is not stable yet anyway. However, it is worth pointing out at least the second “if” branch is not correct: when UE provides uplink power sharing which should impliedly say UE supports simultaneous transmission, so UE does not need to drop source when source and target overlaps in uplink.  |
| Moderator (Intel) (2)- in response to Huawei comment (3) | The second if is only triggered for “overlap” cases, where the “overlap” is defined as

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| 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 |

So I don’t think the 2nd if branch is incorrect. Do you have a different opinion? |
| Huawei (4) – in response to Moderator comment (2) | For the second if, if UE indicates support of power sharing, UE should be able to transmit to both source and target cells by sharing the power. Otherwise, it does not make sense to report support of it. In light of this, when the transmissions to both cells overlap, UE should transmit both instead of dropping unless exceeding the max transmit power. However, exceeding the max tx power should not be the case here because power sharing should ensure it is not going to happen.If-   the UE ~~does not~~ provides *UplinkPowerSharingDAPS-HO,* and-   UE transmissions on the target cell and the source cell overlap,the UE transmits only on the target cell. |
| Moderator (Intel) (3)- in response to Huawei comment (4) | It was agreed in RAN1 #99 that UE will drop the transmission for intra-frequency and intra-band cases. My understanding is that this behavior will apply even if the UE is capable of power sharing mode.Please see agreement below:

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| **Agreement:*** Confirm WA from RAN1 #98bis on UL transmission of signals/channels for DAPS HO with the following changes:
	+ Collision (in above) ~~means~~ is defined for the following cases:
		- ~~when~~ physical time resources for UL channel/signals partially or fully overlap ~~at least~~ 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.
	+ Note: Cases when UE realizes UL transmission collides after transmission to the source/target cell is ongoing can be discussed during the CR review.
* UL transmission dropping when UL transmission of signals/channels to source and target cell collide should apply to all combination of UL channel/signals (i.e. prioritize target)
* 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.
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| Ericsson | Support TP#12 |
| Additional discussion between Huawei and Intel | Regarding the 3rd if, it is not compatible with the first two ifs where UE does not indicate power sharing UE drops one or overlap will not happen, so in the 3rd if, when UE indicates power sharing, it is nature for UE to transmit both by sharing power. Otherwise, what is the power sharing used for?[Intel] I may not have understood the question correct. From my understanding the 3rd if is only applicable “if UE indicates power sharing”. In case “UE does NOT indicate power sharing”, UE will follow either 1st if or 2nd if depending on whether “UE support cancellation or not”.[Huawei] seems we are not on the same page for the issue. Yes, the 3rd if is “if UE indicates power sharing”, but the UE behavior in the current spec for this “if” is “the UE transmits only on the target cell” when “UE transmissions on the target cell and the source cell overlap”. This is not correct. The correct UE behavior should be transmitting both when “overlap” happens, but this is natural UE behavior and not sure at this moment if it needs to be captured. [Intel-2] I agree that the nominal behavior of the UE is that if the UE is scheduled with a overlapping transmission, it should transmit both.The 3rd paragraph is an exception to this nominal behavior. The “overlap” defined is only for overlapping transmission in intra-frequency and intra-band inter-frequency cases. For all other cases (inter-band inter-frequency), “overlap” is not considered to happen if it is an overlapping transmission.My understanding of the current text is “if A and B are TRUE, then perform C” whereA = the UE provides UplinkPowerSharingDAPS-HOB = UE transmissions on the target cell and the source cell overlapC = the UE transmits only on the target cell.How did you draw the conclusion that - if “the UE transmits only on the target cell”, then perform “UE transmissions on the target cell and the source cell overlap”?I need to apologize but I still do not fully understand the concern. Can you clarify further?[Huawei-2] I failed to understand why it is an exception and I also failed to understand why “overlap” is not considered to happen for other cases, the agreements in RAN1#99 defined the collision for all cases, including both intra- and inter-frequency. RAN1#99 also agreed if 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 and otherwise (the 3rd paragraph is this case because indicating power sharing means capable of simultaneous transmission to us), UE transmits UL signals/channels to both source and target cell in DAPS HO.Therefore, if A and B are TRUE, then should perform the transmission to both cells. [Intel-3] “overlap” is not considers in other cases, because that is what the specification states. The following is what is stated in specification. It clearly states UE considers “overlap” in one of the two conditioned defined. For others nothing is mentioned so they are not considered “overlap”.

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| 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 |

This is the consequence of RAN1 #99 agreement made. See highlighted text below. My understanding is that the source cell dropping needs to happen regardless of UE capability. As no UE capability condition was discussed

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| **Agreement:*** Confirm WA from RAN1 #98bis on UL transmission of signals/channels for DAPS HO with the following changes:
	+ Collision (in above) ~~means~~ is defined for the following cases:
		- ~~when~~ physical time resources for UL channel/signals partially or fully overlap ~~at least~~ 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.
	+ Note: Cases when UE realizes UL transmission collides after transmission to the source/target cell is ongoing can be discussed during the CR review.
* UL transmission dropping when UL transmission of signals/channels to source and target cell collide should apply to all combination of UL channel/signals (i.e. prioritize target)

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. |

As far as I know in RAN1 #99, we made no such agreements on whether RAN1 will define whether “UE is not capable of supporting simultaneous UL transmission” or not. Which agreement are you referring to?I still may not have fully understood the concern. But I am getting the impression what you are suggesting is trying to reverting the agreement above. Which is something that would requite further discussions. At least, it was not proposed in any of the Tdocs that were submitted for RAN1 #101-e.In addition, I don’t think the second if is indispensable because uplink cancellation and power sharing are both UE capability and the consequence is clearly stated in the UE feature list which I assume will be taken care by RAN2 to capture somewhere. [Intel] I think I understand. If the UE capability description is complete then having this text might be somewhat redundant. However, from functionality wise, there should not be an issue. Or is there is issue with the behavior defined? If the discussion is about whether or not we need the text, we can get comments from other companies as well. I thought it might be better to be complete.The alternative is to make sure we can update the capability signaling description to match the UE behavior defined by the 2nd if.[Huawei] The UE behavior complies with what are thinking. Whether or not capture it by the second “if”, it is ok for us to hear more views from others.  |
| Samsung | Our view for the ongoing discussion in this thread is roughly in-line with Intel.The behavior under third “if” is derived from the RAN1-99 agreement for cancellation behavior when “collide“ happens. We can discuss on this more later.  But unless the agreement get reversed, we prefer to go with it for now. We do found one potential flaw for TP#12 under the following conditions:* the UE is under intra-frequency DAPS HO procedure but it does not support  *[UplinkCancellationDAPS-HO]* for inter-frequency DAPS HO.
* And this UE does not provide *UplinkPowerSharingDAPS-HO* or is not provided with *UplinkPowerSharingDAPS-HO-mode*.

Following TP#12, this UE will fall into second “if” so UE don’t require to perform cancellation. But uplink cancellation is mandated for intra-frequency case, this is not right.A not-so-elegant fix for the above issue is as below:

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| 15   Dual active protocol stack based handover*<unchanged text omitted>*If -     the UE supports *[UplinkCancellationDAPS-HO]* or is under intra-frequency DAPS-HO*,* and-     the UE does not provide *UplinkPowerSharingDAPS-HO* or the UE is not provided with *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 is under inter-frequency DAPS-HO, and -     the UE does not support *[UplinkCancellationDAPS-HO], and*-     the UE does not provide *UplinkPowerSharingDAPS-HO* or the UE is not provided with *UplinkPowerSharingDAPS-HO-mode*, the UE does not expect transmissions on the target and source cell in overlapping time resources.If-   the UE ~~does not~~ provides *UplinkPowerSharingDAPS-HO,* and-   UE transmissions on the target cell and the source cell overlap,the UE transmits only on the target cell. |

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| Moderator (Intel) | I’ve made slight modifications to Samsung’s suggested TP as TP#14 (below). |
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## TP #13

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| 15 Dual active protocol stack based handover*<unchanged text omitted>*If-  the UE supports *[UplinkCancellationDAPS-HO]*, and-   the UE ~~does not~~ provides *UplinkPowerSharingDAPS-HO* and the UE is 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. |

## TP #14 (Modification of TP#12 to account for intra/inter frequency cases)

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| **15   Dual active protocol stack based handover***<unchanged text omitted>*If -     the UE supports *[UplinkCancellationDAPS-HO]* or the carrier frequencies of target MCS and source MCG are intra-frequency*,* and-     the UE does not provide *UplinkPowerSharingDAPS-HO* or the UE is not provided with *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 carrier frequencies of target MCS and source MCG are inter-frequency, and -     the UE does not support *[UplinkCancellationDAPS-HO], and*-     the UE does not provide *UplinkPowerSharingDAPS-HO* or the UE is not provided with *UplinkPowerSharingDAPS-HO-mode*, the UE does not expect transmissions on the target and source cell in overlapping time resources.If-   the UE ~~does not~~ provides *UplinkPowerSharingDAPS-HO,* and-   UE transmissions on the target cell and the source cell overlap,the UE transmits only on the target cell. |

# Conclusion of the Email Discussion [101-e-NR-Mob-Enh-02]

**Summary of email discussion outcome:**

The following were agreed.

Agreement:

* Adopt TP#8 in R1-2004748 for Clause 15 of TS 38.213.

# Reference

1. R1-2003330, “Remaining issues on NR mobility enhancements in physical layer,” ZTE
2. R1-2003506, “Remaining issues on DAPS-HO,” Huawei, HiSilicon
3. R1-2003676, “Remaining issues on Physical Layer Aspects for DAPS-HO,” MediaTek Inc.
4. R1-2003748, “Corrections to Physical layer aspects of NR mobility enhancement,” Intel Corporation
5. R1-2003890, “Remaining issues for NR Mobility Enhancement,” Samsung
6. R1-2004202, “Remaining issues on mobility enhancements,” Ericsson
7. R1-2004235, “On remaining issues on NR mobility enhancements,” Apple
8. R1-2004580, “Remaining physical layer aspects of dual active protocol stack based HO,” Nokia, Nokia Shanghai Bell
9. R1-2003331, “Discussion on FR2 mobility interruption enhancements,” ZTE
10. R1-2004148, “Remaining PHY aspects for CHO,” Huawei, HiSilicon
11. R1-2003747, “Issue Summary for NR Mobility Enhancements,” Moderator (Intel Corporation)