**3GPP TSG RAN WG1 Meeting #110 R1-220xxxx**

**Toulouse, France, August 22-26, 2022**

**Agenda Item: 7.2.5**

**Source: Moderator (Huawei, HiSilicon)**

**Title: Summary 2 Intra-UE prioritization related to SP-CSI**

**Document for: Discussion and Decision**

# Introduction

This summary is dedicated to discuss the remaining issues on UL prioritization cases related to SP-CSI. For this meeting, this issue has been raised in [1], [2], [3], and it was also discussed during RAN1#109-e for which it is summarized in [4].

**Intra-UE prioritization related to SP-CSI (to be moderated by Thorsten- Huawei)**

**Background**

In Rel-16, for handling collision between a high priority UL channel and a low priority UL channel, the low priority UL channel will be canceled. According to the current specification some cases related to SP-CSI are missing and consequently, the UE behavior for these cases is not clear and may cause misunderstanding between gNB and UE. How to handle these remaining cases has been discussed during the last meeting and companies could achieve a good understanding about each other’s views.

The goal for the discussion in this meeting is to decide the UE behavior for the 5 remaining cases and to agree on a corresponding text proposal.

# Discussion

## Input papers to the meeting

**Initial moderator remark:**

The remaining cases 1-5 for overlapping related to SP-CSI have been discussed during last meeting.

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| --- | --- | --- | --- | --- | --- | --- |
|  | HP PUCCH with DCI | HP PUCCH with SPS AN without DCI | HP PUCCH with SR | HP PUSCH with DCI | HP CG PUSCH | HP PUSCH with SP-CSI without DCI |
| LP PUCCH with DCI | HP | Error case | HP | HP | HP | Error case |
| LP PUCCH with SPS AN without DCI | HP | HP | HP | HP | HP | HP |
| LP PUCCH with SR | HP | HP | HP | HP | HP | HP |
| LP PUCCH with CSI | HP | HP | HP | HP | HP | HP |
| LP PUSCH with DCI | HP | Error case | HP | Error case | DG | Case 2 |
| LP CG PUSCH | HP | HP | HP | DG | HP | Case 3 |
| LP PUSCH with SP-CSI without DCI | HP | HP | HP | Case 1 | Case 5 | Case 4 |

For this meeting, 2 Companies, Huawei/HiSilicon and Nokia/Nokia Shanghai Bell raise this topic in their papers and both provide a TP.

Huawei, HiSilicon discusses this issue in R1-2205781 [1] and R1-2207533 [3]. Where in the first paper the different cases are analysed and proposals are given, and in the latter paper the corresponding TP is provided. The proposals are based on the majority views that have been obtained during last meeting and are copied into the Appendix of this summary.

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| From R1-2205781 [1] (HW/HiSi)***Case 1: HP PUSCH with DCI and LP PUSCH with SP-CSI without DCI***In Rel-15, PUSCH with data cancels the entire PUSCH with SP-CSI if they overlap. For case 1, HP DG PUSCH can override LP PUSCH with SP-CSI if the timeline requirement satisfied. The timeline is the same as in Rel-15, which means the LP PUSCH is cancelled entirely and no partial cancellation is applied.***Proposal 1: For Case 1, i.e. an overlap between HP PUSCH with DCI and LP PUSCH with SP-CSI without DCI*** * ***The entire LP channel is cancelled. The time-line requirement is the same as in Rel-15 for DG PUSCH overriding LP PUSCH with SP-CSI.***

***Case 2: HP PUSCH with SP-CSI without DCI and LP PUSCH with D*C*I***Case 2 should be treated as error case, since the gNB would not schedule a LP PUSCH which anyway cannot be transmitted because of the overlapping HP PUSCH.***Proposal 2: For Case 2, i.e. an overlap between HP PUSCH with SP-CSI without DCI and LP PUSCH with DCI**** ***UE treats it as error case.***

For Cases 3~5, both HP and LP channels are semi-statically configured by the gNB. All these configured UL channels are periodical. According to the discussion during the RAN1#109-e meeting, some companies are concerned that it would be too restrictive to avoid the overlapping by gNB’s configuration. Therefore, these cases can instead follow CG-CG handling, which would imply that the HP channel cancels the LP channel. Similar to R15, the cancellation should start from the first symbol of the LP channel, which means no partial cancellation will be performed for the PUSCH-PUSCH collision case.***Proposal 3: For the*** ***overlap between LP PUSCH and HP PUSCH of the following cases,*** * ***Case 3: HP PUSCH with SP-CSI without DCI and LP CG PUSCH***
* ***Case 4: HP PUSCH with SP-CSI without DCI and LP PUSCH with SP-CSI without DCI***
* ***Case 5: LP PUSCH with SP-CSI without DCI and HP CG PUSCH***
* ***UE follows CG-CG handling, that is HP channel cancels the entire LP channel.***
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| From R1-2207533 [3] (HW/HiSi)**TP for 38.213, section 9:**< Unchanged parts are omitted >If a UE would transmit the following channels, including repetitions if any, that would overlap in time- a first PUCCH of larger priority index with SR and a second PUCCH or PUSCH of smaller priority index, or - a configured grant PUSCH of larger priority index and a PUCCH of smaller priority index, or- a first PUCCH of larger priority index with HARQ-ACK information only in response to PDSCH(s) reception without corresponding PDCCH(s) and a second PUCCH of smaller priority index with HARQ-ACK information only in response to PDSCH(s) reception without corresponding PDCCH(s), or a second PUCCH of smaller priority index with SR and/or CSI, or a configured grant PUSCH with smaller priority index, or a PUSCH of smaller priority index with SP-CSI report(s) without a corresponding PDCCH, or - a PUSCH of larger priority index with SP-CSI reports(s) without a corresponding PDCCH and a PUCCH of smaller priority index with SR, or CSI, or HARQ-ACK information only in response to PDSCH(s) reception without corresponding PDCCH(s), or- a configured grant PUSCH of larger priority index and a configured PUSCH of smaller priority index on a same serving cellthe UE is expected to cancel a repetition of the PUCCH/PUSCH transmissions of smaller priority index before the first symbol overlapping with the PUCCH/PUSCH transmission of larger priority index if the repetition of the PUCCH/PUSCH transmissions of smaller priority index overlaps in time with the PUCCH/PUSCH transmissions of larger priority index.If a UE would transmit the following channels, including repetitions if any, that would overlap in time- a first PUCSCH of larger priority index with SP-CSI report(s) without a corresponding PDCCH, and a second configured grant PUSCH of smaller priority index or a PUSCH of smaller priority index with SP-CSI reports(s) without a corresponding PDCCH, or - a configured grant PUSCH of larger priority index and a PUSCH of smaller priority index with SP-CSI reports(s) without a corresponding PDCCHthe UE is expected to cancel a repetition of the PUSCH transmissions of smaller priority index from the starting symbol of the repetition if the repetition of the PUSCH transmissions of smaller priority index overlaps in time with the PUSCH transmissions of larger priority index.If a PUSCH of smaller priority index with SP-CSI reports(s) without a corresponding PDCCH overlaps in time with a PUSCH scheduled by a DCI format of larger priority index in one or more symbols on the same carrier, and if the earliest symbol of these PUSCH channels starts no earlier than N2+d2,1 symbols after the last symbol of the DCI scheduling the PUSCH where d2,1 is the maximum of the d2,1 associated with the PUSCH carrying semi-persistent CSI report and the PUSCH with data transmission, the CSI report shall not be transmitted by the UE. Otherwise, if the timeline requirement is not satisfied this is an error case.When a UE determines overlapping for PUCCH transmissions with SL HARQ-ACK reports and PUSCH of smaller priority index, including repetitions if any, after resolving the overlapping PUCCH other than PUCCH transmissions with SL HARQ-ACK reports and/or PUSCH transmissions, if the PUSCH includes no UCI, the UE resolves the overlapping for PUCCH transmissions with SL HARQ-ACK reports and PUSCH of smaller priority index as described in clauses 9.2.5 and 9.2.6.When a UE determines overlapping for PUCCH transmissions with SL HARQ-ACK reports and PUSCH of larger priority index only, including repetitions if any, after resolving the overlapping PUCCH other than PUCCH transmissions with SL HARQ-ACK reports and/or PUSCH transmissions, the UE does not transmit the PUCCH with SL HARQ-ACK reportswhere- the UE expects that the transmission of the PUSCH would not start before $T\_{proc,2}+d\_{1}$ after a last symbol of the corresponding PDCCH reception;- $T\_{proc,2} $is the PUSCH preparation time for a corresponding UE processing capability assuming $d\_{2,1}=0$ [6, TS 38.214], based on $μ$ and $N\_{2}$ as subsequently defined in this clause, and $d\_{1}$ is determined by a reported UE capability.The UE expects the PUCCH and PUSCH transmissions fulfill the conditions in clause 9 and clause 9.2.5 for UCI multiplexing replacing the reference time of "end of PDSCH" with "end of the last symbol of a last PSFCH reception occasion" as described in 16.5 and *Tproc,*1 with *Tprep*.A UE does not expect that a PUCCH carrying SL HARQ-ACK reports overlaps with PUSCH with aperiodic or semi-persistent CSI reports.A UE does not expect to be scheduled to transmit a PUCCH or a PUSCH with smaller priority index that would overlap in time with a PUCCH of larger priority index with HARQ-ACK information only in response to a PDSCH reception without a corresponding PDCCH. A UE does not expect to be scheduled to transmit a PUSCH of small priority index scheduled by a DCI format or a PUCCH of smaller priority index that would overlap in time with a PUSCH of larger priority index with SP-CSI report(s) without a corresponding PDCCH.< Unchanged parts are omitted > |

Nokia provides their views in R1-2206144 [2]. It is suggested to define all 5 cases remaining cases as error cases and a corresponding TP is provided.

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| From R1-2206144 [2] (Nokia/Nokia Shanghai Bell)In RAN1#109-e discussions on Rel-17 intra-UE multiplexing/prioritization, the scenarios where a HP/LP PUSCH overlaps with a LP/HP PUSCH with SP-CSI without a corresponding PDCCH have been discussed without reaching a consensus. This is because the handling for these scenarios is currently not defined in the specifications.**TP for 38.213, section 9:**< Unchanged parts are omitted >The UE expects the PUCCH and PUSCH transmissions fulfill the conditions in clause 9 and clause 9.2.5 for UCI multiplexing replacing the reference time of "end of PDSCH" with "end of the last symbol of a last PSFCH reception occasion" as described in 16.5 and *Tproc,*1 with *Tprep*.A UE does not expect that a PUCCH carrying SL HARQ-ACK reports overlaps with PUSCH with aperiodic or semi-persistent CSI reports.A UE does not expect to be scheduled to transmit a PUCCH or a PUSCH with smaller priority index that would overlap in time with a PUCCH of larger priority index with HARQ-ACK information only in response to a PDSCH reception without a corresponding PDCCH. A UE does not expect to be scheduled to transmit a PUCCH of smaller priority index that would overlap in time with a PUSCH of larger priority index with SP-CSI report(s) without a corresponding PDCCH.A UE does not expect to be scheduled to transmit a PUSCH of a first priority index that would overlap with a second PUSCH of a second priority index with SP-CSI report(s) without a corresponding PDCCH, where the first priority index and the second priority index are different. In the remaining of this clause, a UE multiplexes UCIs with same priority index in a PUCCH or a PUSCH before considering limitations for UE transmission as described in clause 11.1 and clause 11.1.1. A PUCCH or a PUSCH is assumed to have a same priority index as a priority index of UCIs a UE multiplexes in the PUCCH or the PUSCH.< Unchanged parts are omitted > |

## Round 1

Since different views have been provided by companies how to handle the different cases, it seems better to firstly agree on the behaviour before going to the text proposal.

Last meeting, it was pointed out by companies that defining all 5 overlapping cases as error will be complicated for the gNB implementation, since the overlap is hard to avoid some times. Especially, for two configured PUSCHs.

Companies are therefore encouraged to give their feedback on the following 3 questions:

Question 1: For Case 1 – overlap between HP PUSCH with DCI and LP PUSCH with SP-CSI without DCI, which is your preferred option?

* Option A: The entire LP channel is cancelled. The time-line requirement is the same as in Rel-15 for DG PUSCH overriding LP PUSCH with SP-CSI.
* Option B: Error case

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| **Company** | **View** |
| Apple | Option A |
| ZTE | Option A. But no spec. impact. For Case 1,3,4,5, generally, the solutions could be treated as HP PUSCH cancelling LP PUSCH, no need to consider whether the PUSCH is CG PUSCH or the PUSCH is with SP-CSI without DCI. |
| CATT | We prefer Option A as we commented in the last meeting.One minor comment is that the timeline in Rel-15 is for PUSCH with SP-CSI to be overridden by PUSCH with UL-SCH. Maybe we can say the timeline requirement is the same as defined in TS 38.214 Clause 5.2.5. |
| Qualcomm | Although not exactly, but this case is similar to DG vs. DG. Hence, we prefer Option B.  |
| Spreadtrum | Option A |
| vivo | We prefer Option B |
| HW/HiSi | Option A with spec impact.  |
| FL view | @ZTE: I do agree it could be treated as HP PUSCH cancelling LP PUSCH, but in the 213, only the CG-CG case is covered (which only is valid for data). DG-DG is avoided by gNB scheduling and not captured, DG-CG is captured in 321 but it is very clear there that it is for two channels with data. Not for the case we are discussing here.@ CATT: Both the ways can work.@ Qualcomm & vivo: I think it is strange that this should be an error case, given that HP DG already has been agreed that it can override HP SP-CSI PUSCH but should now not override LP SP-CSI PUSCH. |

2022-08-22

**For Case 1** – overlap between HP PUSCH with DCI and LP PUSCH with SP-CSI without DCI, which is your preferred option?

* 5 companies prefer Option A.
	+ Option A: The entire LP channel is cancelled. The time-line requirement is the same as in Rel-15 for DG PUSCH overriding LP PUSCH with SP-CSI.
* 1 company (HW/HiSi) thinks spec impact is needed and TP is provided,
* 1 company (ZTE) thinks no spec impact, the case can be considered as HP PUSCH cancelling LP PUSCH
* CATT: Minor comment “Maybe we can say the timeline requirement is the same as defined in TS 38.214 Clause 5.2.5.”
* 2 companies (QC and vivo) prefer Option B, error case.

Based on companies’ feedback, we can have short discussion and see if my explanation is acceptable for vivo and QC. If yes, we can make the proposal below, otherwise more discussion is needed:

Proposal 1:

**For Case 1 – overlap between HP PUSCH with DCI and LP PUSCH with SP-CSI without DCI, which is your preferred option?**

* **Option A: The entire LP channel is cancelled. The time-line requirement is the same as in Rel-15 for DG PUSCH overriding LP PUSCH with SP-CSI.**
* **Note: The wording of a TP (if needed) is for further discussion**

Question 2: For Case 2 – overlap between HP PUSCH with SP-CSI without DCI and LP PUSCH with DCI, do you agree to treat this situation as an error case?

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| **Company** | **View** |
| ZTE | Can be considered as the collision between the HP PUSCH without DCI and scheduled LP PUSCH. The general case has been discussed in prior release, but the solution was left to implementation and not captured in specification. So for Case 2 here, it can also be left to implementation.  |
| CATT | As we commented in the last meeting, for this case, we are fine to define it as an error case or define the UE behaviour to prioritize HP PUSCH and drop the LP PUSCH entirely.  |
| Qualcomm | Same as above, we prefer Option B.  |
| Spreadtrum | Option B |
| vivo | Agree to treat as error case |
| HW/HiSi | Error case, Option B. |
| FL view | Case 2 should be treated as error case, since the gNB would not schedule a LP PUSCH which anyway cannot be transmitted because of the overlapping HP PUSCH. I would suggest to not to leave it to implementation.  |

**2022-08-22**

* 5 companies commented that this is an error cases during this discussion (HW/HiSi, CATT)
* 1 company (ZTE) wants to leave it to implementation,

Leaving it to implementation would cause ambiguity. Considering the long discussion and the clear majority view, I am hoping that ZTE can accept the following proposal, to define Case 2 as an error case:

Proposal 2:

***For Case 2 – overlap between HP PUSCH with SP-CSI without DCI and LP PUSCH with DCI is defined as an error case***

Question 3: For Case 3, 4, 5 – overlap between HP PUSCH with SP-CSI without DCI and LP PUSCH with DCI, which is your preferred option?

* Option A: UE follows CG-CG handling, that is HP channel cancels the entire LP channel
* Option B: Error case

|  |  |
| --- | --- |
| **Company** | **View** |
| Apple | Option A |
| ZTE | Option A. But no spec. impact as explained in Question 1. |
| CATT | For Case 3/4/5 – overlap between HP PUSCH with SP-CSI without DCI and LP PUSCH without DCI, we agree that HP PUSCH cancels the LP PUSCH entirely. |
| Qualcomm | Option B for case 4 since we do not see a use case. For URLLC, network is more likely to trigger A-CSI. For Case 3 and 5, we are open to Option A.  |
| Spreadtrum | Option A |
| vivo | Option B |
| HW/HiSi | Option A |
| FL view | For Cases 3~5, both HP and LP channels are semi-statically configured by the gNB. All these configured UL channels are periodical. According to the discussion during the RAN1#109-e meeting, some companies are concerned that it would be too restrictive to avoid the overlapping by gNB’s configuration. |

2022-08-22

**For Cases 3, 5**

* 6 companies prefer Option A: UE follows CG-CG handling, that is HP channel cancels the entire LP channel
* ZTE thinks that no spec impact is needed for the same reason as in mentioned for Case 1
* 1 company (vivo) wants error case

**For Cases 4**

* 5 companies prefer Option A: UE follows CG-CG handling, that is HP channel cancels the entire LP channel
* ZTE thinks that no spec impact is needed for the same reason as in mentioned for Case 1
* 2 company (QC, vivo) want error case

Similar to case 1, if the explanations provided by me are acceptable for vivo and QC, we can try the following proposal to firstly to follow the Cg-CG handling. And then discuss spec impact further.

Proposal 3:

***For the overlap between LP PUSCH and HP PUSCH of the following cases,***

* ***Case 3: HP PUSCH with SP-CSI without DCI and LP CG PUSCH***
* ***Case 4: HP PUSCH with SP-CSI without DCI and LP PUSCH with SP-CSI without DCI***
* ***Case 5: LP PUSCH with SP-CSI without DCI and HP CG PUSCH***
* ***UE follows CG-CG handling, that is HP channel cancels the entire LP channel.***
* ***Note: The wording of the TP (if needed) is for further discussion.***

## Round 2

During online on 2022-08-22 cases 1 and 2 have been discussed, and the following has been captured in the chairman’s notes:

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| **Possible Agreement** For Case 1 – overlap between HP PUSCH with DCI and LP PUSCH with SP-CSI without DCI, * Option A: The entire LP channel is cancelled. The time-line requirement is the same as in Rel-15 for DG PUSCH overriding LP PUSCH with SP-CSI.

Supported by Ericsson, Huawei, Nokia/NSB, Intel, DOCOMO, Panasonic, Spreadtrum, CATT, OPPO, Samsung, Apple**Possible Agreement** ***For Case 2 – overlap between HP PUSCH with SP-CSI without DCI and LP PUSCH with DCI is defined as an error case*** |

During on-line :

* For Case 1: Vivo, Qualcomm and Samsung raised concern
* For Case 2: ZTE raised concern

Some more off-line has taken place and the status is summarized below:

**For Case 1:**

* Vivo raised concerns during on-line but replied then later in email that they would be fine to accept a modified proposal for Case 1 with a clarification on the timeline (R15 time-line):
* The following proposal is acceptable for vivo:
	+ Option A: The entire LP channel is cancelled. The time-line requirement is the same as in Rel-15 defined in TS 38.214 Clause 5.2.5 for DG PUSCH overriding ~~LP~~ PUSCH with SP-CSI.
* Samsung expressed concerns wants that the UE follows the more relaxed Rel-17 time-line instead

**Moderator recommendation:** Since the Rel-17 timeline is more relaxed than the Rel-15 time-line, it should be fine for the UE implementation. And it is better to go with the Rel-17 time-line than with leaving this case undefined or having it as error case:

Does anyone have a strong concern on the updated proposal below?

Updated Proposal for Case 1:

For overlap between HP PUSCH with DCI and LP PUSCH with SP-CSI without DCI, the entire LP channel is cancelled. The time-line requirement is the same as in Rel-17 for DG PUSCH overriding LP PUSCH with SP-CSI.

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| --- | --- |
|  | Company |
| Concern |  |

**For Case 2:**

ZTE wants to leave case 2 to UE implementation. The rest of the companies accepts to define case 2 as an error case.

**@ZTE: Can you accept majority view to define case 2 as an error case**

Does anyone have a strong concern about the following possible agreement?

**Possible Agreement**

***For Case 2 – overlap between HP PUSCH with SP-CSI without DCI and LP PUSCH with DCI is defined as an error case***

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| --- | --- |
|  | Company |
| Concern |  |

**For case 3, 4, 5**

**It is proposed that the UE follows CG-CG handling, that is HP channel cancels the entire LP channel**

***Case 3: HP PUSCH with SP-CSI without DCI and LP CG PUSCH***

***Case 4: HP PUSCH with SP-CSI without DCI and LP PUSCH with SP-CSI without DCI***

***Case 5: LP PUSCH with SP-CSI without DCI and HP CG PUSCH***

Please note, that it earlier has been discussed to define these as error cases. But at that time it was not agreeable, since both channels are configured, and it was found too complicated that the gNB should avoid the overlap in all situations.

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|  | Case 4 | Case 4 | Case 5 |
| Support |  |  |  |
| Concern |  |  |  |

Comments:

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| Company | Comment |
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Companies have replied in email to the above cases: The situation is the following (copied from email)

So for case 1: We are stuck between the following options:

* Move discussion to Rel-17 (to address Sa’s concern). But then what to do with this case in Rel-16. Shall it be an error case? Considering the large support for Option A, I don’t want to go this way without giving companies more time to think.
* Re-use Rel-15 time-line. This seems sufficient for all companies except Samsung that want a more relaxed time-line

So for case 2: : We have the following options

* Error case
* Some other option, without spec impact.
	+ E.g ZTE: The LP PUSCH should not be scheduled, which depends on clever gNB implementation and no spec. impact?
	+ The issue that I see with the proposal from ZTE is that if we do not do the clarification in TS 28.214 section 5.2.5 in which it is defined that PUSCH with data overrides PUSCH with SP-CSI, then without spec impact, the UE would have to be designed to cancel PUSCH SP-CSI regardless the PHY priorities of the two PUSCHs. Therefore, it should be ensured that this case never happens.

For cases 3,4,5, the status is

* The majority view is still to follow CG-CG
* Qualcomm had one concern on Case 4, two SP-CSIs of different priorities are overlapping.
	+ I think that this could even be easier than CG-CG, since no PDUs are involved and everything is handled in PHY. So it should be feasible for Case 4, that the LP SP-CSI is cancelled.
* Defining all cases as error cases, is complicated for the gNB implementation, because all cases are configured periodic transmission and an overlap is very complicated for the gNB to avoid.

More time is needed for companies to check.

# Outcome

TBD.

# References

[1] [R1-2205781](file:///C%3A%5CUsers%5Cyounsun%5CDocuments%5C3GPP%20documents%5CRAN1%20tdocs%5CTSGR1_110%5CDocs%5CR1-2205781.zip), “Remaining issues on UL prioritization cases related to SP-CSI”, Huawei, HiSilicon

[2] [R1-2206144](file:///C%3A%5CUsers%5Cyounsun%5CDocuments%5C3GPP%20documents%5CRAN1%20tdocs%5CTSGR1_110%5CDocs%5CR1-2206144.zip), “[Draft CR] Clarification on intra-UE prioritization for PUSCH with SP-CSI”, Nokia, Nokia Shanghai Bell

[3] [R1-2207533](file:///C%3A%5CUsers%5Cyounsun%5CDocuments%5C3GPP%20documents%5CRAN1%20tdocs%5CTSGR1_110%5CDocs%5CR1-2207533.zip), “Correction on UL prioritization cases related to SP-CSI”, Huawei, HiSilicon

[4] [R1-2205440](file:///D%3A%5Cold_drive_E%5Cwork%5C%E5%85%88%E8%BF%9B%E7%AE%97%E6%B3%95%E7%A0%94%E7%A9%B6%E7%BB%84%5C%E6%A0%87%E5%87%86%5C03%20%E6%8F%90%E6%A1%88%5CRAN1%5CDocs%5CR1-2205440.zip), “Summary of [109-e-R16-URLLC-07] Issue#8: Remaining issues on UL prioritization cases related to SP-CSI, Moderator (Huawei), RAN1 #109-e

# Appendix – Companies’ views from RAN1#109-e on the 5 cases and how to capture them in the specification

|  |  |
| --- | --- |
| Case 1 | HP PUSCH with DCI and LP PUSCH with SP-CSI without DCI |
| Already supported in Rel-16 | Currently missing in Rel-16 | Comments |
| Company | Yes/No | Behaviour | Yes/No | How to define behaviour |
| HW/HiSi | No | n.a. | Yes | Error case |  |
| vivo | No | n.a. | Yes | Error case |  |
| Intel | No | n/a | Not “missing”, juts not spelled out | Error case |  |
| DOCOMO | No | n.a. | Yes | Error case |  |
| CATT | No | n.a. | Yes | HP cancel LP with Rel-15 timeline requirement | See below |
| Samsung | No | n.a. | Yes | Error case | See below |
| Qualcomm | No | n.a. | Yes | HP cancels LP with the same timeline as in R15 DGCG collision handling  |  |

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| Case 2 | HP PUSCH with SP-CSI without DCI and LP PUSCH with DCI |
| Already supported in Rel-16 | Currently missing in Rel-16 | Comments |
| Company | Yes/No | Behaviour | Yes/No | How to define behaviour |
| HW/HiSi | No | n.a. | Yes | Error case |  |
| vivo | No | n.a. | Yes | Error case | See below |
| Intel | No | n/a | Not “missing”, just not spelled out | Error case |  |
| DOCOMO | No | n.a. | Yes | Error case |  |
| CATT | No | n.a. | Yes | Same as Case 1 or error case | See below |
| Samsung | No | n.a. | Yes | Error case  | See below |
| Qualcomm | No | n.a. | Yes | Error event |  |

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| Case 3 | HP PUSCH with SP-CSI without DCI and LP CG PUSCH |
| Already supported in Rel-16 | Currently missing in Rel-16 | Comments |
| Company | Yes/No | Behaviour | Yes/No | How to define behaviour |
| HW/HiSi | No | n.a. | Yes | Error case |  |
| vivo | No | n.a. | Yes | Fine to support |  |
| Intel | No | n/a | Not “missing” but not spelled out explicitly | Follow CG-CG handling. |  |
| DOCOMO | No | n.a. | Yes | Follow CG-CG handling. |  |
| CATT | No | n.a. | Yes | HP cancel LP |  |
| Samsung | YES | Transmit HP |  |  |  |
| Qualcomm | No | n.a. | Yes | The same as CGCG collision handling  |  |

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| --- | --- |
| Case 4 | HP PUSCH with SP-CSI without DCI and LP PUSCH with SP-CSI without DCI |
| Already supported in Rel-16 | Currently missing in Rel-16 | Comments |
| Company | Yes/No | Behaviour | Yes/No | How to define behaviour |
| HW/HiSi | No | n.a. | Yes | Error case |  |
| vivo | No | n.a. | Yes | Fine to support |  |
| Intel | No | n/a | Not “missing” but not spelled out explicitly | Follow CG-CG handling. |  |
| DOCOMO | No | n.a. | Yes | Follow CG-CG handling. |  |
| CATT | No | n.a. | Yes | HP cancel LP |  |
| Samsung | YES | Transmit HP |  |  |  |
| Qualcomm | No | n.a.  | Yes | The same as CGCG collision handling |  |

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| Case 5 | LP PUSCH with SP-CSI without DCI and HP CG PUSCH |
| Already supported in Rel-16 | Currently missing in Rel-16 | Comments |
| Company | Yes/No | Behaviour | Yes/No | How to define behaviour |
| HW/HiSi | No | n.a. | Yes | Error case |  |
| vivo | No | n.a. | Yes | Fine to support |  |
| Intel | No | n/a | Not “missing” but not spelled out explicitly | Follow CG-CG handling. |  |
| DOCOMO | No | n.a. | Yes | Follow CG-CG handling. |  |
| CATT | No | n.a. | Yes | HP cancel LP |  |
| Samsung | YES | Transmit HP |  |  |  |
| Qualcomm | No | n.a. | Yes | Follow CGCG handling  |  |