**3GPP TSG RAN WG1 #120 R1-25xxxxx**

**Athens, Greece, February 17–21, 2025**

**Source: Moderator (ZTE)**

**Title: FLS#1 on power control of PSFCH in TS 38.213**

**Agenda item: 8.1**

**Document for: Discussion and Decision**

# Introduction

In this RAN1 meeting, a CR R1-2500580 [1] is submitted on power control of PSFCH in TS 38.213.

# Discussion

As described in clause 16.3.0 in TS 38.213, for the operation of PSFCH, there are four cases as follows:

* Case 1: SL operation without shared spectrum channel access.
* Case 2: SL operation with shared spectrum channel access, when sl-TransmissionStructureForPSFCH is not provided.
* Case 3: SL operation with shared spectrum channel access, when sl-TransmissionStructureForPSFCH = ' dedicatedInterlace '.
* Case 4: SL operation with shared spectrum channel access, when sl-TransmissionStructureForPSFCH = ' commonInterlace'.

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| For operation without shared spectrum channel access, a UE is provided by *sl-PSFCH-RB-Set* a set of PRBs in a resource pool for PSFCH transmission with HARQ-ACK information in a PRB of the resource pool. A UE can be provided by *sl-RB-SetPSFCH* a set of PRBs in a resource pool for PSFCH transmission with conflict information in a PRB of the resource pool. A UE expects that different PRBs are (pre)configured for conflict information and HARQ-ACK information. For a number of sub-channels for the resource pool, provided by *sl-NumSubchannel*, and a number of PSSCH slots associated with a PSFCH slot that is less than or equal to , the UE allocates the PRBs from the PRBs to slot among the PSSCH slots associated with the PSFCH slot and sub-channel , where , , , and the allocation starts in an ascending order of and continues in an ascending order of . The UE expects that isa multiple of *.* For operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided and within RB-set , for the -th candidate PSFCH transmission occasion, , a UE determines a set of PRBs in a resource pool based on the -th indication provided by *sl-PSFCH-RB-SetList* or *sl-IUC-RB-SetList* for PSFCH transmission with HARQ-ACK information or conflict information, respectively. The UE expects that different PRBs are (pre)configured for conflict information and HARQ-ACK information. For a number of sub-channels where all PRBs of each sub-channel are located in RB-set and a number of PSSCH slots associated with a PSFCH slot that is less than or equal to , the UE allocates the PRBs from the PRBs to slot among the PSSCH slots associated with the PSFCH slot and sub-channel , where , , , and the allocation starts in an ascending order of and continues in an ascending order of . The UE expects that isa multiple of *.* For operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH =* ' dedicatedInterlace ' and within RB-set , a UE determines, based on *sl-PSFCH-RB-SetList*, all PRBs of an interlace for one PSFCH transmission with HARQ-ACK information in the resource pool. Within RB-set , the UE determines, based on *sl-IUC-RB-SetList*, all PRBs of an interlace for one PSFCH transmission with conflict information in the resource pool. For the -th candidate PSFCH transmission occasion, , the UE determines a set of interlaces that includes a number of interlaces based onthe -th indication provided by *sl-PSFCH-RB-SetList* or *sl-IUC-RB-SetList* for HARQ-ACK information or conflict information, respectively. The UE expects that different interlaces are determined for conflict information and HARQ-ACK information. The set of interlaces are indexed in an ascending order of interlace indexes. For each interlace of the set of interlaces, all PRBs in the interlace are available for PSFCH transmission*.* For a number of sub-channels in RB-set and a number of PSSCH slots that is not larger than and is associated with a slot for PSFCH transmission, the UE allocates the interlaces from the interlaces to slot and sub-channel , where , , . The allocation starts in an ascending order of and continues in an ascending order of . The UE expects that isa multiple of *.*For operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH =* ' commonInterlace' and within RB-set , a UE determines a subset of PRBs in a first interlace and, based on *sl-PSFCH-RB-SetList*, a subset of PRBs in a second interlace for a PSFCH transmission with HARQ-ACK information in a resource pool, or based on *sl-IUC-RB-SetList*, a subset of PRBs in a second interlace for a PSFCH transmission with conflict information in a resource pool. An index of the first interlace is provided by *sl-PSFCH-CommonInterlaceIndex*. The PRBs in the second interlace are provided by *sl-NumDedicatedPRBs-ForPSFCH* where, for the -th candidate PSFCH transmission occasion, , and for each interlace , the UE determines PRBs based onthe -th indication provided by *sl-PSFCH-RB-SetList* or *sl-IUC-RB-SetList* for HARQ-ACK information or conflict information, respectively. The UE expects that different subsets of PRBs are determined for conflict information and HARQ-ACK information. The UE expects that is a multiple of . For interlace , the UE determines a PRB subset with index to include PRBs , . The UE determines the PRB subsets by ordering the PRB subsets first in an ascending order of PRB subset index within an interlace and second in ascending order of interlace index, where . For a number of sub-channels in RB-set and a number of slots for PSSCH transmissions that is not larger than and is associated with a slot for PSFCH transmission, the UE allocates the PRB subsets from the PRB subsets to slot among the slots for PSSCH transmissions that are associated with the slot and sub-channel for PSFCH transmissions, where and , . The allocation starts in an ascending order of and continues in an ascending order of . The UE expects that isa multiple of *.* |

While in clause 16.2.3, for the cases which are applicable, only three cases are listed, case 2 above was missing. The related description of case 2 above can be added in clause 16.2.3 in TS 38.213.

**2.1 Round-1**

**Proposal**: Endorse CR R1-2500580 for PSFCH power control in Clause 16.2.3 in TS 38.213:

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| ***Reason for change:*** | As described in clause 16.3.0, for the operation of PSFCH, there are four cases as follows:Case 1: SL operation without shared spectrum channel access.Case 2: SL operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided.Case 3: SL operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH = ' dedicatedInterlace '.*Case 4: SL operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH = ' commonInterlace'*.While in clause 16.2.3, for the cases which are applicable, only three cases are listed, case 2 above was missing.Therefore, the related description of case 2 above should be added in clause 16.2.3 in TS 38.213. |
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| ***Summary of change:*** | Adding ‘or for operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided’. |
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| ***Consequences if not approved:*** | Power control of PSFCH is not captured completely for the operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided. |
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| ***Clauses affected:*** | 16.2.3 |

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| **<Unchanged parts are omitted>**16.2.3 PSFCHA UE with scheduled PSFCH transmissions for HARQ-ACK information and conflict information, and capable of transmitting a maximum of PSFCHs, determines a number of simultaneous PSFCH transmissions and a power for a PSFCH transmission , , on all the resource pools in PSFCH transmission occasion on active SL BWP of carrier as- if *dl-P0-PSFCH* is provided, [dBm]where- is applicable for- the PRB of the PSFCH transmission for operation without shared spectrum channel access or for operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided,- each PRB in the interlace of the PSFCH transmission for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH = '*'dedicatedInterlace'',- each PRB in the subset of PRBs in the second interlace of the PSFCH transmission for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'commonInterlace'- is a value of *dl-P0-PSFCH-r17,* if using the parameter is supported by the UE and the parameter is provided; else *dl-P0-PSFCH-r16* if provided - is a value of *dl-Alpha-PSFCH*, if provided; else, - when the active SL BWP is on a serving cell , as described in clause 7.1.1 except that- the RS resource is the one the UE uses for determining a power of a PUSCH transmission scheduled by a DCI format 0\_0 in serving cell when the UE is configured to monitor PDCCH for detection of DCI format 0\_0 in serving cell - the RS resource is the one corresponding to the SS/PBCH block the UE uses to obtain MIB when the UE is not configured to monitor PDCCH for detection of DCI format 0\_0 in serving cell - for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* ‘commonInterlace’, includes the power on PRBs in both the first and second interlaces and, for more than one PSFCH transmissions from the UE, the power on any PRB in the first interlace is not accumulated among the more than one PSFCH transmissions within a same RB set and is same as the power on the PRB in the first interlace for PSFCH transmission . - if - if , where is determined for PSFCH transmissions according to [8-1, TS 38.101-1] and- for operation without shared spectrum channel access or for operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided- and [dBm] - for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'dedicatedInterlace', where is the number of PRBs in the interlace for PSFCH transmission - and [dBm], where the power on one PRB in the interlace for PSFCH transmission is - for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'commonInterlace', where is provided by *sl-NumDedicatedPRBs-ForPSFCH*, is provided by *sl-PSFCH-PowerOffset*, and is the number of PRBs in the first interlace for all PSFCH transmissions after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0- and [dBm], where is the number of PRBs in the first interlace within the same RB set of PSFCH transmission after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0, and the power on one PRB in the first interlace for PSFCH transmission is and the power on one PRB in the subset of PRBs in the second interlace for PSFCH transmission is , where is provided by *sl-PSFCH-PowerOffset* - else- UE autonomously determines PSFCH transmissions first with ascending order of corresponding priority field values as described in clause 16.2.4.2 over the PSFCH transmissions with HARQ-ACK information, if any, and then with ascending order of priority value over the PSFCH transmissions with conflict information, if any, such that where , for , is a number of PSFCHs with priority value for PSFCH with HARQ-ACK information and , for , is a number of PSFCHs with priority value for PSFCH with conflict information and is defined as - the largest value satisfying where is determined according to [8-1, TS 38.101-1] for transmission of all PSFCHs in , if any- for operation without shared spectrum channel access or for operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided- for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'dedicatedInterlace'- for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'commonInterlace', where is the number of PRBs in the first interlace for the PSFCH transmissions after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0- zero, otherwiseand- [dBm] for operation without shared spectrum channel access or for operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided- [dBm] for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'dedicatedInterlace', where the power on one PRB in the interlace for PSFCH transmission is - [dBm] for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'commonInterlace', where is the number of PRBs in the first interlace for the PSFCH transmissions after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0, is the number of PRBs in the first interlace for PSFCH transmission(s) among the PSFCH transmissions which are within the same RB set of PSFCH transmission after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0, and the power on one PRB in the first interlace for PSFCH transmission is and the power on one PRB in the subset of PRBs in the second interlace for PSFCH transmission is , where is provided by *sl-PSFCH-PowerOffset* where is defined in [8-1, TS 38.101-1] and is determined for the PSFCH transmissions- else- the UE autonomously selects PSFCH transmissions with ascending order of corresponding priority field values as described in clause 16.2.4.2- if , where is determined for the PSFCH transmissions according to [8-1, TS 38.101-1]- [dBm] for operation without shared spectrum channel access or for operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided- and [dBm] - for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'dedicatedInterlace', where is the number of PRBs in the interlace for the PSFCH transmission - and [dBm], where the power on one PRB in the interlace for PSFCH transmission is - for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'commonInterlace', where is provided by *sl-NumDedicatedPRBs-ForPSFCH*, is provided by *sl-PSFCH-PowerOffset*, and is the number of PRBs in the first interlace for all PSFCH transmissions after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0- and [dBm], where is the number of PRBs in the first interlace for PSFCH transmission(s) among all PSFCH transmissions within the same RB set of PSFCH transmission after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0, and the power on one PRB in the first interlace for PSFCH transmission is and the power on one PRB in the subset of PRBs in the second interlace for PSFCH transmission is , where is provided by *sl-PSFCH-PowerOffset* - else- the UE autonomously selects PSFCH transmissions in ascending order of corresponding priority field values as described in clause 16.2.4.2 over the PSFCH transmissions with HARQ-ACK information, if any, and then with ascending order of priority value over the PSFCH transmissions with conflict information, if any, such that where , , is a number of PSFCHs with priority value for PSFCH with HARQ-ACK information and , is a number of PSFCHs with priority value for PSFCH with conflict information and is defined as - the largest value satisfying where is determined according to [8-1, TS 38.101-1] for transmission of all PSFCHs in , if any- for operation without shared spectrum channel access or for operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided- for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'dedicatedInterlace'- for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'commonInterlace', where is the number of PRBs in the first interlace for the PSFCH transmissions after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0- zero, otherwise and- [dBm] for operation without shared spectrum channel access or for operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided- [dBm] for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH=* 'dedicatedInterlace', where the power on one PRB in the interlace for PSFCH transmission is - [dBm] for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'commonInterlace', where is the number of PRBs in the first interlace for the PSFCH transmissions after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0, is the number of PRBs in the first interlace for PSFCH transmission(s) among the PSFCH transmissions which are within the same RB set of PSFCH transmission after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0, and the power on one PRB in the first interlace for PSFCH transmission is and the power on one PRB in the subset of PRBs in the second interlace for PSFCH transmission is , where is provided by *sl-PSFCH-PowerOffset*  where is determined for the simultaneous PSFCH transmissions according to [8-1, TS 38.101-1] - else- [dBm] for operation without shared spectrum channel access or for operation with shared spectrum channel access, when *sl-TransmissionStructureForPSFCH* is not provided- [dBm] for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'dedicatedInterlace', where the power on one PRB in the interlace for PSFCH transmission is - [dBm] for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* 'commonInterlace', where is the number of PRBs in the first interlace for the PSFCH transmissions after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0, is the number of PRBs in the first interlace for PSFCH transmission(s) among the PSFCH transmissions which are within the same RB set of PSFCH transmission after excluding PRBs for PSFCH transmissions as described in Clause 16.3.0, the power on one PRB in the first interlace for PSFCH transmission is and the power on one PRB in the subset of PRBs in the second interlace for PSFCH transmission is , where is provided by *sl-PSFCH-PowerOffset* - for operation with shared spectrum channel access and *sl-TransmissionStructureForPSFCH =* ‘commonInterlace’, includes the power on PRBs in both the first and second interlaces and, for more than one PSFCH transmissions from the UE, the power on any PRB in the first interlace is not accumulated among the more than one PSFCH transmissions within a same RB set and is same as the power on the PRB in the first interlace for PSFCH transmission .  where the UE autonomously determines PSFCH transmissions with ascending order of corresponding priority field values as described in clause 16.2.4.2 over the PSFCH transmissions with HARQ-ACK information, if any, and then with ascending order of priority value over the PSFCH transmissions with conflict information, if any, such that and where is determined for the PSFCH transmissions according to [8-1, TS 38.101-1].For resource pools configured with PSFCH resources overlapping in time, the UE either expects not to be provided with *dl-P0-PSFCH* or *dl-Alpha-PSFCH* in any of the resource pools, or expects to be provided with the same values of *dl-P0-PSFCH* and the same values of *dl-Alpha-PSFCH* for all the resource pools.**<Unchanged parts are omitted>** |

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# Conclusion

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# Reference

1. R1-2500580 Draft CR on power control of PSFCH in TS 38.213 ZTE Corporation, Sanechips