**3GPP TSG-** **RAN WG1 Meeting #117 *R1-24xxxxx***

**Fukuoka, Japan, May 20th - May 24th, 2024**

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| *CR-Form-v12.1* |
| **[Draft] CHANGE REQUEST** |
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|  | **38.213** | **CR** |  | **rev** |  | **Current version:** | **18.2.0** |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | Correction on PSFCH Power Control to avoid exceeding Pcmax |
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| ***Source to WG:*** | Moderator (Huawei), Huawei, Hisilicon |
| ***Source to TSG:*** | R1 |
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| ***Work item code:*** | NR\_SL\_enh2-Core |  | ***Date:*** | 2024-05-xx |
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| ***Category:*** | **F** |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | 1. When *sl-TransmissionStructureForPSFCH =* 'commonInterlace', for power limited case, a UE first determines the largest value K satisfying , where is determined according to [8-1, TS 38.101-1] for transmission of all PSFCHs in , and . Then, the UE finally choose PSFCH transmission with power without exceeding the . Therefore, the finally transmitted number of PSFCH is , which might be larger than .

However, when determining the final power on each PSFCH transmission *k*, the endorsed CR R1-2403727 in RAN1#116bis only considers common PRBs among PSFCH transmissions, instead of PSFCH transmissions, which may result in total power of exceeding for simultaneous transmission among multiple RB sets.Take the example below:* Assume , and a UE determines the largest value K=1 satisfying power limit . Assume these two PSFCH transmission are located in RB set 1, and the number of common PRBs for the PSFCH transmissions is 10. Assume the UE finally choose .
* Then, in the endorsed CR R1-2403727 in RAN1#116bis, when determining the final power on each PSFCH transmission *k* in power limited cases, only 10 common PRBs among are counted. Actually, the total number of common PRBs to be transmitted are 20 PRBs among PSFCH transmissions. As a result, the total power on PSFCH transmissions may exceed .

1. When *dl-P0-PSFCH* is not provided and *sl-TransmissionStructureForPSFCH =* 'commonInterlace', the endorsed CR R1-2403727 in RAN1#116bis does not state that the number of common PRBs are calculated among PSFCH transmissions. However, the relevant parameters and in the equation for determining are not clearly defined.
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| ***Summary of change:*** | 1. When *sl-TransmissionStructureForPSFCH =* 'commonInterlace', for power limited case, when determining the final power on each PSFCH transmission *k*, the number of common PRBs is calculated among PSFCH transmissions, instead of PSFCH transmissions.
2. When *dl-P0-PSFCH* is not provided and *sl-TransmissionStructureForPSFCH =* 'commonInterlace', the number of common PRBs are calculated among PSFCH transmissions, and the relevant parameters and are clearly defined.
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| ***Consequences if not approved:*** | 1. When *sl-TransmissionStructureForPSFCH =* 'commonInterlace', for power limited case, the total power of PSFCH transmissions may exceed .
2. When *dl-P0-PSFCH* is not provided and *sl-TransmissionStructureForPSFCH =* 'commonInterlace', the specification on calculating is not clear.
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| ***Clauses affected:*** | 16.2.3 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** | **Impact Analysis:**No backward compatible issue is expected from the CR.  |
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| ***This CR's revision history:*** |  |

**16.2.3 PSFCH**

A 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,

- 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

- 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

- 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

- [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

- 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

- 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

- [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

- [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 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.