**3GPP TSG-RAN WG1 Meeting #113R1-23xxxxx**

**Incheon, Korea, May 22 – 26, 2023**

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| *CR-Form-v12.2* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
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|  | **38.211** | **CR** | **xxxx** | **rev** | **-** | **Current version:** | **17.4.0** |  |
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| *For* [***HE******LP***](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:*** | Introduction of NR support for dedicated spectrum less than 5MHz for FR1 | | | | | | | | | |
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| ***Source to WG:*** | Ericsson | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_LessThan\_5MHz\_FR1-Core | | | | |  | ***Date:*** | | | 2023-06-04 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***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 can be 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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | Introduction of NR support for dedicated spectrum less than 5MHz for FR1. | | | | | | | | |
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| ***Summary of change:*** | | Introduction of NR support for dedicated spectrum less than 5MHz for FR1. | | | | | | | | |
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| ***Consequences if not approved:*** | | Incomplete support for dedicated spectrum less than 5MHz for FR1. | | | | | | | | |
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| ***Clauses affected:*** | | 7.3.2.2, 7.4.3.1 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

#### 7.3.2.2 Control-resource set (CORESET)

A control-resource set consists of resource blocks in the frequency domain and symbols in the time domain.

A control-channel element consists of 6 resource-element groups (REGs) where a resource-element group equals one resource block during one OFDM symbol. Resource-element groups within a control-resource set are numbered in increasing order in a time-first manner, starting with 0 for the first OFDM symbol and the lowest-numbered resource block in the control resource set.

A UE can be configured with multiple control-resource sets. Each control-resource set is associated with one CCE-to-REG mapping only.

The CCE-to-REG mapping for a control-resource set can be interleaved or non-interleaved and is described by REG bundles:

- REG bundle  is defined as REGs  where  is the REG bundle size, , and is the number of REGs in the CORESET

- CCE  consists of REG bundles  where  is an interleaver

For non-interleaved CCE-to-REG mapping, and .

For interleaved CCE-to-REG mapping, for and for . The interleaver is defined by

where .

The UE is not expected to handle configurations resulting in the quantity not being an integer.

For a CORESET configured by the *ControlResourceSet* IE:

- is given by the higher-layer parameter *frequencyDomainResources*;

- is given by the higher-layer parameter *duration*, where is supported only if the higher-layer parameter *dmrs-TypeA-Position* equals 3;

- interleaved or non-interleaved mapping is given by the higher-layer parameter *cce-REG-MappingType*;

- equals 6 for non-interleaved mapping and is given by the higher-layer parameter *reg-BundleSize* for interleaved mapping;

- is given by the higher-layer parameter *interleaverSize*;

- is given by the higher-layer parameter *shiftIndex* if provided, otherwise ;

- for both interleaved and non-interleaved mapping, the UE may assume

- the same precoding being used within a REG bundle if the higher-layer parameter *precoderGranularity* equals *sameAsREG-bundle*;

- the same precoding being used across the all resource-element groups within the set of contiguous resource blocks in the CORESET, and that no resource elements in the CORESET overlap with an SSB or LTE cell-specific reference signals as indicated by the higher-layer parameter *lte-CRS-ToMatchAround*, *lte-CRS-PatternList1*, or *lte-CRS-PatternList2*, if the higher-layer parameter *precoderGranularity* equals *allContiguousRBs*.

For CORESET 0 configured by the *ControlResourceSetZero* IE:

- and are defined by clause 13 of [5, TS 38.213];

- the UE may assume interleaved mapping

- ;

- ;

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- the UE may assume normal cyclic prefix when CORESET 0 is configured by MIB or SIB1;

- the UE may assume the same precoding being used within a REG bundle.

For CORESET 0 on a carrier with a channel bandwidth of 3 MHz and configured by the *ControlResourceSetZero* IE:

- and are defined by Table 13-0 in clause 13 of [5, TS 38.213]

- if the CORESET is obtained by applying the description above assuming interleaved mapping with

- if the CORESET is obtained by applying the description above with interleaved with or non-interleaved mapping as defined in clause 13 of [5, TS 38.213], followed by puncturing 9 resource blocks in each OFDM symbol to obtain the 15 resource blocks forming CORESET 0.

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- the UE may assume normal cyclic prefix when CORESET 0 is configured by MIB or SIB1;

- the UE may assume the same precoding being used within a REG bundle.

#### 7.4.3.1 Time-frequency structure of an SS/PBCH block

In the time domain, an SS/PBCH block consists of 4 OFDM symbols, numbered in increasing order from 0 to 3 within the SS/PBCH block, where PSS, SSS, and PBCH with associated DM-RS are mapped to symbols as given by Table 7.4.3.1-1.

In the frequency domain, an SS/PBCH block consists of 240 contiguous subcarriers with the subcarriers numbered in increasing order from 0 to 239 within the SS/PBCH block. The quantities  and  represent the frequency and time indices, respectively, within one SS/PBCH block. The UE may assume that the complex-valued symbols corresponding to resource elements denoted as 'Set to 0' in Table 7.4.3.1-1 are set to zero. The quantity  in Table 7.4.3.1-1 is given by . The quantity  is the subcarrier offset from subcarrier 0 in common resource block to subcarrier 0 of the SS/PBCH block, where is obtained from the higher-layer parameter *offsetToPointA*.

- For operation with shared spectrum channel access in FR2-2 and for operation without shared spectrum channel access, the 4 least significant bits of  are given by the higher-layer parameter *ssb-SubcarrierOffset* and for FR1 the most significant bit of  is given by in the PBCH payload as defined in clause 7.1.1 of [4, TS 38.212].

- For operation with shared spectrum channel access in FR1, the 4 least significant bits of are given by the higher-layer parameter *ssb-SubcarrierOffset* and the most significant bit of is given by in the PBCH payload as defined in clause 7.1.1 of [4, TS 38.212]. If , ; otherwise, .

If *ssb-SubcarrierOffset* is not provided, is derived from the frequency difference between the SS/PBCH block and Point A.

The UE may assume that the complex-valued symbols corresponding to resource elements that are part of a common resource block partially or fully overlapping with an SS/PBCH block and not used for SS/PBCH transmission are set to zero in the OFDM symbols partially or fully overlapping with OFDM symbols where SS/PBCH is transmitted.

For an SS/PBCH block, the UE shall assume

- antenna port is used for transmission of PSS, SSS, PBCH and DM-RS for PBCH,

- the same cyclic prefix length and subcarrier spacing for the PSS, SSS, PBCH and DM-RS for PBCH,

- for SS/PBCH block type A,  and  with the quantities , and expressed in terms of 15 kHz subcarrier spacing, and

- for SS/PBCH block type B in FR2-1,  and  with the quantity  expressed in terms of the subcarrier spacing provided by the higher-layer parameter *subCarrierSpacingCommon* and expressed in terms of 60 kHz subcarrier spacing;

- for SS/PBCH block type B in FR2-2, and with the quantity expressed in terms of the SS/PBCH block subcarrier spacing and expressed in terms of 60 kHz subcarrier spacing;

- the centre of subcarrier 0 of resource block coincides with the centre of subcarrier 0 of a common resource block with the subcarrier spacing

- provided by the higher-layer parameter *subCarrierSpacingCommon* for operation without shared spectrum channel access in FR1 and FR2-1; and

- same as the subcarrier spacing of the SS/PBCH block for operation without shared spectrum access in FR2-2 and for operation with shared spectrum channel access.

- This common resource block overlaps with subcarrier 0 of the first resource block of the SS/PBCH block.

The UE may assume that SS/PBCH blocks transmitted with the same block index on the same center frequency location are quasi co-located with respect to Doppler spread, Doppler shift, average gain, average delay, delay spread, and, when applicable, spatial Rx parameters. The UE shall not assume quasi co-location for any other SS/PBCH block transmissions other than what is specified in [5, TS 38.213].

For cell search on a carrier with a channel bandwidth of 3 MHz, the UE is not expected to receive subcarriers 0 to 47 and 192 to 239 in any of the 4 OFDM symbols of the SS/PBCH block.

Table 7.4.3.1-1: Resources within an SS/PBCH block for PSS, SSS, PBCH, and DM-RS for PBCH.

|  |  |  |
| --- | --- | --- |
| Channel or signal | OFDM symbol number  relative to the start of an SS/PBCH block | Subcarrier number  relative to the start of an SS/PBCH block |
| PSS | 0 | 56, 57, …, 182 |
| SSS | 2 | 56, 57, …, 182 |
| Set to 0 | 0 | 0, 1, …, 55, 183, 184, …, 239 |
| 2 | 48, 49, …, 55, 183, 184, …, 191 |
| PBCH | 1, 3 | 0, 1, …, 239 |
| 2 | 0, 1, …, 47,  192, 193, …, 239 |
| DM-RS for PBCH | 1, 3 |  |
| 2 |  |