**3GPP TSG RAN WG1 Meeting #103-e R1-200xxxx**

**Oct 26th – Nov 13th, 2020**

**Agenda item: 7.2.2**

**Source: Moderator (Qualcomm Incorporated)**

**Title: FL summary for initial access signals and channels for NR-U**

**Document for: Discussion and Decision**

# Introduction

This paper summarizes the CR proposals for initial access signals and channels for NR-U.

To summarize:

|  |  |  |
| --- | --- | --- |
| Issue # | Area of proposal | Contributions |
| A | FDM of ROs under multiple RB sets | [1], [5], [6] |
| B | FDM of RO/PO under multiple RB set for 2-step RACH | [1], [2], [4], [7] |
| C | Editorial bug fix for PRACH generation | [3], [4] |
| D | SSB based CSI-RS validation in DRS | [4] |

# ROs and POs

**Issue A. On FDM ROs under multiple RB sets**

In [1] and [2], it is proposed to support FDM ROs when PRACH sequence length is 139.

***Proposal from [1]: For connected mode UE, for PRACH sequence length of 139, support configuring multiple FDMed ROs in active UL BWP over multiple RB sets. The RO(s) overlapping with the UL intra cell guard should not be used. The corresponding TP#1 is provided in Appendix.***

The supporting TP is captured as TP A.1

***Proposal from [5]: adopt the above TP in TS38.213 for the RO configuration for PRACH sequence length-139.***

The supporting TP is captured as TP A.2

In [6], it is proposed to use nominal intra-cell guard band for multi-RB set RO configuration.

***Proposal from [6]: For connected mode UE, assume nominal intra-cell guard bands for RO mapping of PRACH with sequence length 1151 and 571.***

The supporting TP is captured as TP A.3

**Issue B. On multiple RB set PO configuration for 2-step RACH**

[1], [2], [4], [7], [8] discussed PO configuration for 2-step RACH.

In [1], it is further proposed to support multiple RB set PO configuration, while the associated ROs and POs are confined within the same RB set.

***Proposal from [1]: For both interlaced and non-interlaced PUSCH, the MsgA PUSCH should be confined within the same RB set as its associated RO.***

***Proposal from [1]: For non-interlaced PUSCH, the RO to PO mapping sequence should be restricted within the RB set.***

The supporting TP are TP B.1 below.

In [2], it is proposed to restrict that for 2-step RACH, both ROs and POs are constrained within a single RB set.

***Proposal from [2]: Adopt the TP#1a or TP#1b in 38.213, to capture the missed agreement in RAN1 #98b meeting***

The TPs are captured as TP B.2 and TP B.3 below.

In [4], it is proposed to support multiple RB set RO/PO configuration with per RB set RO to PO mapping

***Proposal from [4]: Support PRACH and PUSCH configuration over multiple RB sets for 2-step RACH.***

***Proposal from [4]: Support one interlaced Msg A PUSCH confined within one RB set.***

* ***The RB sets of all MsgA PUSCHs are the same RB sets of all Msg A PRACHs.***
* ***The number of FDMed POs per RB set is derived by existing parameter Nf (nrMsgA-PO-FDM).***
* ***The start interlace of 1st PO in each RB set is derived by existing parameter interlaceIndexFirstPO-MsgA-PUSCH.***

***Proposal from [4]: Adopt the following TP2 (The RB set of one Msg A PUSCH is the same as associated Msg A PRACH) or TP3 (No change of PRACH-to-PUSCH association) for TS 38.213.***

Supporting TP is captured as TP B.4 and TP B.5.

In [7], it is proposed to support 2-step RACH RO/PO configuration over multiple RB sets for connected mode UE with legacy RO/PO mapping.

***Proposal from [7]: Re-interpret the current RRC parameters to support configuring MsgA PUSCH over multiple RB sets for connected mode UEs.***

***Proposal from [7]: Legacy RO to PO mapping is reused to associate multiple RB set Msg A PRACH configuration and multiple RB set Msg A PUSCH configuration. No spec impact identified.***

The supporting TPs are captured in TP B.6.

In [8], it is proposed to interpret the freq domain resource allocation for PO and RO using nominal intra-cell guard band definition.

***Proposal from [8]: For PRACH preamble (RO) as well as Msg. A PUSCH (PO) transmissions, the UL RB set size/range is determined based on nominal intra-cell guard band configuration.***

The supporting TPs are captured as TP B.7 and B.8

**Issue C. Bug fix for RO configuration**

In [3] and [4], a bug is PRACH signal generation is identified.

***Proposal from [3]. Adopt TP#1 to correct the formula for PRACH signal generation in 38.211 Section 5.3.2 for the case of sequence lengths 571 and 1151.***

The supporting TP is captured as TP C.1.

***Proposal from [4]: Adopt the following TP4 for TS 38.211.***

The supporting TP is captured as TP C.2.

# CSI-RS validation

**Issue D. CSI-RS validation**

In [4], it is proposed to use SSB to valid CSI-RS in DRS

**Proposal from [4]: If a UE detects a SS/PBCH block, the UE assumes**

* **a CSI-RS is transmitted, if it is configured in the slot as the detected SS/PBCH block and QCLed with the detected SS/PBCH block;**
* **a CSI-RS is not transmitted, if it is configured in the slots containing candidate SS/PBCH block QCLed with the detected SS/PBCH block and QCLed with the candidate SS/PBCH block.**

The supporting TP is captured in TP D.1.

# TPs from contributions

#### ****TP A.1 from [1]****

==============TP#A.1: TS38.213 ================================

**8.1 Random access preamble**

\*\*\*Unchanged text omitted\*\*\*

For unpaired spectrum,

- if a UE is not provided *tdd-UL-DL-ConfigurationCommon*, a PRACH occasion in a PRACH slot is valid if it does not precede a SS/PBCH block in the PRACH slot and starts at least symbols after a last SS/PBCH block reception symbol, where is provided in Table 8.1-2 and, if *ChannelAccessMode-r16* = *semistatic* is provided, does not overlap with a set of consecutive symbols before the start of a next channel occupancy time where the UE does not transmit [15, TS 37.213].

- the candidate SS/PBCH block index of the SS/PBCH block corresponds to the SS/PBCH block index provided by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* , as described in Clause 4.1

- If a UE is provided *tdd-UL-DL-ConfigurationCommon*, a PRACH occasion in a PRACH slot is valid if

- it is within UL symbols, or

- it does not precede a SS/PBCH block in the PRACH slot and starts at least symbols after a last downlink symbol and at least symbols after a last SS/PBCH block symbol, where is provided in Table 8.1-2, and if *ChannelAccessMode-r16* = *semistatic* is provided, does not overlap with a set of consecutive symbols before the start of a next channel occupancy time where there shall not be any transmissions, as described in [15, TS 37.213]

- the candidate SS/PBCH block index of the SS/PBCH block corresponds to the SS/PBCH block index provided by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon*, as described in Clause 4.1.

- For operation with shared spectrum channel access, if a UE is configured with *intraCellGuardBandUL-r16* or determines the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1], a PRACH occasion with PRACH sequence length of 139 in a PRACH slot is valid if the PRACH occasion is not overlapped with the intra-cell guard band.

\*\*\*Unchanged text omitted\*\*\*

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#### ****TP A.2 from [5]****

------------------------------------------------------TP1 TS 38.213 --------------------------------------------------------

8.1 Random access preamble

**<Unchanged parts are omitted>**

For unpaired spectrum,

- if a UE is not provided *tdd-UL-DL-ConfigurationCommon*, a PRACH occasion in a PRACH slot is valid if it does not precede a SS/PBCH block in the PRACH slot and starts at least symbols after a last SS/PBCH block reception symbol, and if it does not overlap with intra-cell guard bands if configured, where is provided in Table 8.1-2 and, if *ChannelAccessMode-r16* = *semistatic* is provided, does not overlap with a set of consecutive symbols before the start of a next channel occupancy time where the UE does not transmit [15, TS 37.213].

- the candidate SS/PBCH block index of the SS/PBCH block corresponds to the SS/PBCH block index provided by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* , as described in Clause 4.1

- If a UE is provided *tdd-UL-DL-ConfigurationCommon*, a PRACH occasion in a PRACH slot is valid if

- it is within UL symbols, or

- it does not overlap with intra-cell guard bands if configured, or

- it does not precede a SS/PBCH block in the PRACH slot and starts at least symbols after a last downlink symbol and at least symbols after a last SS/PBCH block symbol, where is provided in Table 8.1-2, and if *ChannelAccessMode-r16* = *semistatic* is provided, does not overlap with a set of consecutive symbols before the start of a next channel occupancy time where there shall not be any transmissions, as described in [15, TS 37.213]

- the candidate SS/PBCH block index of the SS/PBCH block corresponds to the SS/PBCH block index provided by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon*, as described in Clause 4.1.

**<Unchanged parts are omitted>**

--------------------------------------------------------- END -----------------------------------------------------------

#### ****TB A.3 from [6]****

--------- beginning of text proposal for TS 38.212

5.3.2 OFDM baseband signal generation for PRACH

The time-continuous signal  on antenna port for PRACH is defined by

where  and

-  is given by clause 6.3.3;

-  is the subcarrier spacing of the initial uplink bandwidth part during initial access. Otherwise,  is the subcarrier spacing of the active uplink bandwidth part;

- is the largest value among the subcarrier spacing configurations by the higher-layer parameter *scs-SpecificCarrierList*;

-  is the lowest numbered resource block of the initial uplink bandwidth part and is derived by the higher-layer parameter *initialUplinkBWP* during initial access. Otherwise,  is the lowest numbered resource block of the active uplink bandwidth part and is derived by the higher-layer parameter *BWP-Uplink*;

- is the frequency offset of the lowest PRACH transmission occasion in frequency domain with respect to physical resource block 0 of the active uplink bandwidth part. The quantity is given by the higher-layer parameter *frequencyStartMsgA-PUSCH* if configured and a type-2 random-access procedure is initiated as described in clause 8.1 of [5, TS 38.213], otherwise by *msg1-FrequencyStart* as described in clause 8.1 of [5 TS 38.213];

-  is the PRACH transmission occasion index in frequency domain for a given PRACH transmission occasion in one time instance as given by clause 6.3.3.2;

-  is the number of resource blocks occupied and is given by the parameter allocation expressed in number of RBs for PUSCH in Table 6.3.3.2-1.

- is the start CRB index of UL RB set defined as in Clause 7 for the case when the UE is not configured with *intraCellGuardBandUL-r16*. [6, TS 38.214]

- is the index of the RB set which contains the lowest PRACH transmission occasion in frequency domain indicated by . The UE expects that is configured such that each PRACH transmission occasion is fully contained within an RB set.

-------- Unchanged contents are omitted

--------- end of text proposal--------------------

#### ****TB B.1 from [1]****

========================Start of TP for TS38.213===============================

**8.1A PUSCH for Type-2 random access procedure**

\*\*\*Unchanged text omitted\*\*\*

A UE determines a first interlace or first RB for a first PUSCH occasion in an active UL BWP respectively from *interlaceIndexFirstPO-MsgA-PUSCH* or from *frequencyStartMsgA-PUSCH* that provides an offset, in number of RBs in the active UL BWP, from a first RB of the active UL BWP. A PUSCH occasion includes a number of interlaces or a number of RBs provided by *nrofInterlacesPerMsgA-PO* or by *nrofPRBs-perMsgA-PO*, respectively. Consecutive PUSCH occasions in the frequency domain of an UL BWP are separated by a number of RBs provided by *guardBandMsgA-PUSCH*. A number of PUSCH occasions in the frequency domain of an UL BWP is provided by *nrMsgA-PO-FDM*. If a UE is configured with *intraCellGuardBandUL-r16* or determines the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1], the PUSCH occasion in an active UL BWP is confined in the RB set same as its associated PRACH occasion.

\*\*\*Unchanged text omitted\*\*\*

Each consecutive number of preamble indexes from valid PRACH occasions in a PRACH slot and in a RB set if configured

- first, in increasing order of preamble indexes within a single PRACH occasion

- second, in increasing order of frequency resource indexes for frequency multiplexed PRACH occasions

- third, in increasing order of time resource indexes for time multiplexed PRACH occasions within a PRACH slot

are mapped to a valid PUSCH occasion and the associated DMRS resource in the same RB set if configured

- first, in increasing order of frequency resource indexes for frequency multiplexed PUSCH occasions

- second, in increasing order of DMRS resource indexes within a PUSCH occasion, where a DMRS resource index is determined first in an ascending order of a DMRS port index and second in an ascending order of a DMRS sequence index [4, TS 38.211]

- third, in increasing order of time resource indexes for time multiplexed PUSCH occasions within a PUSCH slot

- fourth, in increasing order of indexes for PUSCH slots

where , is a total number of valid PRACH occasions in a RB set if configured per association pattern period multiplied by the number of preambles per valid PRACH occasion provided by *msgA-PUSCH-PreambleGroup*, and is a total number of valid PUSCH occasions in the same RB set if configured per PUSCH configuration per association pattern period multiplied by the number of DMRS resource indexes per valid PUSCH occasion provided by *msgA-DMRS-Configuration*.

A PUSCH occasion is valid if it does not overlap in time and frequency with any PRACH occasion associated with either a Type-1 random access procedure or a Type-2 random access procedure. Additionally, for unpaired spectrum and for SS/PBCH blocks with indexes provided by *ssb-PositionsInBurst* in *SIB1* or by *ServingCellConfigCommon*

- if a UE is not provided *tdd-UL-DL-ConfigurationCommon*, a PUSCH occasion is valid if the PUSCH occasion

- does not precede a SS/PBCH block in the PUSCH slot, and

- starts at least symbols after a last SS/PBCH block symbol, where is provided in Table 8.1-2

- if a UE is provided *tdd-UL-DL-ConfigurationCommon*, a PUSCH occasion is valid if the PUSCH occasion

- is within UL symbols, or

- does not precede a SS/PBCH block in the PUSCH slot, and

- starts at least symbols after a last downlink symbol and at least symbols after a last SS/PBCH block symbol, where is provided in Table 8.1-2 and, if *ChannelAccessMode-r16* = *semistatic* is provided, does not overlap with a set of consecutive symbols before the start of a next channel occupancy time where the UE does not transmit [15, TS 37.213].

- For operation with shared spectrum channel access, if a UE is configured with *intraCellGuardBandUL-r16* or determines the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1], a PUSCH occasion in a PUSCH slot is valid if the PUSCH occasion is not overlapped with the intra-cell guard band.

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#### ****TB B.2 form [2]****

**Reasons for change**

To capture the agreement in the specification

**Summary of changes**

All msgA PUSCH occasions are confined within a single RB set

**Specs/Sections impacted**

TS 38.213, Section 8.1A

**Consequences if not approved:**

MsgA PUSCH may across multiple RB sets

======================== Start of TPB.2 for TS 38.213 ===============================

8.1A PUSCH for Type-2 random access procedure

\*\*\* Unchanged text omitted \*\*\*

A UE determines a first interlace or first RB for a first PUSCH occasion in an active UL BWP respectively from *interlaceIndexFirstPO-MsgA-PUSCH* or from *frequencyStartMsgA-PUSCH* that provides an offset, in number of RBs in the active UL BWP, from a first RB of the active UL BWP. A PUSCH occasion includes a number of interlaces or a number of RBs provided by *nrofInterlacesPerMsgA-PO* or by *nrofPRBs-perMsgA-PO*, respectively. Consecutive PUSCH occasions in the frequency domain of an UL BWP are separated by a number of RBs provided by *guardBandMsgA-PUSCH*. A number of PUSCH occasions in the frequency domain of an UL BWP is provided by *nrofMsgA-PO-FDM*. For operation with shared spectrum channel access, all PUSCH occasions are confined within a single RB set.

\*\*\* Unchanged text omitted \*\*\*

======================== End of TPB.2 ===============================

#### TP B.3 from [2]

**Reasons for change**

To capture the agreement in the specification

**Summary of changes**

All msgA PUSCH occasions and the associated msgA RACH occasions are confined within a single RB set

**Specs/Sections impacted**

TS 38.213, Section 8.1A

**Consequences if not approved:**

MsgA PUSCH may across multiple RB sets

======================== Start of TS 38.213 ===============================

8.1A PUSCH for Type-2 random access procedure

\*\*\* Unchanged text omitted \*\*\*

A UE determines a first interlace or first RB for a first PUSCH occasion in an active UL BWP respectively from *interlaceIndexFirstPO-MsgA-PUSCH* or from *frequencyStartMsgA-PUSCH* that provides an offset, in number of RBs in the active UL BWP, from a first RB of the active UL BWP. A PUSCH occasion includes a number of interlaces or a number of RBs provided by *nrofInterlacesPerMsgA-PO* or by *nrofPRBs-perMsgA-PO*, respectively. Consecutive PUSCH occasions in the frequency domain of an UL BWP are separated by a number of RBs provided by *guardBandMsgA-PUSCH*. A number of PUSCH occasions in the frequency domain of an UL BWP is provided by *nrofMsgA-PO-FDM*. For operation with shared spectrum channel access, all PUSCH occasions and the associated RACH occasions are confined within a single RB set.

\*\*\* Unchanged text omitted \*\*\*

======================== End of TP B.3 ===============================

#### TP B.4 from [4]

=========================== Start of TPB.4 for TS 38.213 ===================================

8.1A PUSCH for Type-2 random access procedure

============================= Unchanged Texts Omitted =================================

A UE determines time resources and frequency resources for PUSCH occasions in an active UL BWP from *msgA-PUSCH-Config* for the active UL BWP. If the active UL BWP is not the initial UL BWP and *msgA-PUSCH-Config* is not provided for the active UL BWP, the UE uses the *msgA-PUSCH-Config* provided for the initial UL BWP. If a UE is configured with *interlaceIndexFirstPO-MsgA-PUSCH*, the RB set for a MsgA PUSCH occasion is the RB set of the associated Msg A PRACH occasion.

A UE determines a first interlace for a first PUSCH occasion in a RB set or first RB for a first PUSCH occasion in an active UL BWP respectively from *interlaceIndexFirstPO-MsgA-PUSCH* or from *frequencyStartMsgA-PUSCH* that provides an offset, in number of RBs in the active UL BWP, from a first RB of the active UL BWP. A PUSCH occasion includes a number of interlaces within the RB set or a number of RBs provided by *nrofInterlacesPerMsgA-PO* or by *nrofPRBs-perMsgA-PO*, respectively. Consecutive PUSCH occasions in the frequency domain of a RB set or of an UL BWP are separated by a number of RBs provided by *guardBandMsgA-PUSCH*. A number of PUSCH occasions in the frequency domain of a RB set or of an UL BWP is provided by *nrMsgA-PO-FDM*.

============================= Unchanged Texts Omitted =================================

Each consecutive number of preamble indexes from valid PRACH occasions in a PRACH slot

- first, in increasing order of preamble indexes within a single PRACH occasion

- second, in increasing order of frequency resource indexes for frequency multiplexed PRACH occasions

- third, in increasing order of time resource indexes for time multiplexed PRACH occasions within a PRACH slot

are mapped to a valid PUSCH occasion and the associated DMRS resource

- first, in increasing order of frequency resource indexes for frequency multiplexed PUSCH occasions

- second, in increasing order of DMRS resource indexes within a PUSCH occasion, where a DMRS resource index is determined first in an ascending order of a DMRS port index and second in an ascending order of a DMRS sequence index [4, TS 38.211]

- third, in increasing order of time resource indexes for time multiplexed PUSCH occasions within a PUSCH slot

- fourth, in increasing order of indexes for PUSCH slots

where , is a total number of valid PRACH occasions per association pattern period multiplied by the number of preambles per valid PRACH occasion provided by *msgA-PUSCH-PreambleGroup*, and is a total number of valid PUSCH occasions per PUSCH configuration per association pattern period multiplied by the number of DMRS resource indexes per valid PUSCH occasion provided by *msgA-DMRS-Configuration*. If a UE is configured with *interlaceIndexFirstPO-MsgA-PUSCH*, the PRACH to PUSCH association is performed per RB set.

======================== End of TP B.4 for TS 38.213 ==================================

#### TP B.5 from [4]

========================== Start of TP B.5 for TS 38.213 ===================================

8.1A PUSCH for Type-2 random access procedure

============================ Unchanged Texts Omitted =================================

A UE determines time resources and frequency resources for PUSCH occasions in an active UL BWP from *msgA-PUSCH-Config* for the active UL BWP. If the active UL BWP is not the initial UL BWP and *msgA-PUSCH-Config* is not provided for the active UL BWP, the UE uses the *msgA-PUSCH-Config* provided for the initial UL BWP. If a UE is configured with *interlaceIndexFirstPO-MsgA-PUSCH*, the RB set(s) for MsgA PUSCH is the RB set(s) for Msg A PRACH. A PUSCH occasion is confined within one RB set.

A UE determines a first interlace for a first PUSCH occasion in a RB set or first RB for a first PUSCH occasion in an active UL BWP respectively from *interlaceIndexFirstPO-MsgA-PUSCH* or from *frequencyStartMsgA-PUSCH* that provides an offset, in number of RBs in the active UL BWP, from a first RB of the active UL BWP. A PUSCH occasion includes a number of interlaces within the RB set or a number of RBs provided by *nrofInterlacesPerMsgA-PO* or by *nrofPRBs-perMsgA-PO*, respectively. Consecutive PUSCH occasions in the frequency domain of a RB set or of an UL BWP are separated by a number of RBs provided by *guardBandMsgA-PUSCH*. A number of PUSCH occasions in the frequency domain of a RB set or of an UL BWP is provided by *nrMsgA-PO-FDM*.

============================ Unchanged Texts Omitted =================================

=========================== End of TP B.5 for TS 38.213 ==================================

#### TP B.6 from [7]

==========TP to TS 38.213 8.1A=================================

8.1A PUSCH for Type-2 random access procedure

For a Type-2 random access procedure, a UE transmits a PUSCH, when applicable, after transmitting a PRACH. The UE encodes a transport block provided for the PUSCH transmission using redundancy version number 0. The PUSCH transmission is after the PRACH transmission by at least symbols where for or , for or , and is the SCS configuration for the active UL BWP.

A UE does not transmit a PUSCH in a PUSCH occasion if the PUSCH occasion associated with a DMRS resource is not mapped to a preamble of valid PRACH occasions or if the associated PRACH preamble is not transmitted as described in Clause 7.5 or Clause 11.1. A UE can transmit a PRACH preamble in a valid PRACH occasion if the PRACH preamble is not mapped to a valid PUSCH occasion.

A mapping between one or multiple PRACH preambles and a PUSCH occasion associated with a DMRS resource is per PUSCH configuration.

A UE determines time resources and frequency resources for PUSCH occasions in an active UL BWP from *msgA-PUSCH-Config* for the active UL BWP. If the active UL BWP is not the initial UL BWP and *msgA-PUSCH-Config* is not provided for the active UL BWP, the UE uses the *msgA-PUSCH-Config* provided for the initial UL BWP.

If a UE is not provided with *useInterlacePUCCH-PUSCH*, the UE determines a first RB for a first PUSCH occasion in an active UL BWP respectively from *frequencyStartMsgA-PUSCH* that provides an offset, in number of RBs in the active UL BWP, from a first RB of the active UL BWP. A PUSCH occasion includes a number of RBs provided by *nrofPRBs-perMsgA-PO*. A number of PUSCH occasions in the frequency domain of an UL BWP is provided by *nrofMsgA-PO-FDM*.

1. For operation without shared spectrum channel access, consecutive PUSCH occasions in the frequency domain of an UL BWP are separated by a number of RBs provided by *guardBandMsgA-PUSCH*.
2. For operation with shared spectrum channel access, assume the first PUSCH occasion is located in the RB set . is the RB offset from the first RB of the first PUSCH occasion and the lowest RB of RB set . Within each RB set, consecutive PUSCH occasions in the frequency domain are separated by a number of RBs provided by *guardBandMsgA-PUSCH*. If the current RB set does not have enough RBs to fit in all the remaining PUSCH occasions, placing remaining PUSCH occasions starting from RB of the next RB set, still all PUSCH occasions are identified.

If a UE is provided with *useInterlacePUCCH-PUSCH*, RB set is the RB set contains the first PRACH occasion used for Type-2 random access procedure. Within an RB set, PUSCH occasions start with interlace provided by *interlaceIndexFirstPO-MsgA-PUSCH* and each PUSCH occasion contains a number of interlaces provided by *nrofInterlacesPerMsgA-PO*. A number of PUSCH occasions in the frequency domain of an UL BWP is provided by *nrofMsgA-PO-FDM*. If the current RB set does not have enough interlaces for all remaining PUSCH occasions, the next RB set is used starting from interlace provided by *interlaceIndexFirstPO-MsgA-PUSCH*.

------------Unchanged part omitted---------------------

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#### TP B.7 from [8]

============= TP B.7 for 38.211==========================

5.3.2 OFDM baseband signal generation for PRACH

[…]

The time-continuous signal  on antenna port for PRACH is defined by

where  and

-  is given by clause 6.3.3;

-  is the subcarrier spacing of the initial uplink bandwidth part during initial access. Otherwise,  is the subcarrier spacing of the active uplink bandwidth part;

- is the largest value among the subcarrier spacing configurations by the higher-layer parameter *scs-SpecificCarrierList*;

-  is the lowest numbered resource block of the initial uplink bandwidth part and is derived by the higher-layer parameter *initialUplinkBWP* during initial access. Otherwise,  is the lowest numbered resource block of the active uplink bandwidth part and is derived by the higher-layer parameter *BWP-Uplink*;

- is the frequency offset of the lowest PRACH transmission occasion in frequency domain with respect to physical resource block 0 of the active uplink bandwidth part. The quantity is given by the higher-layer parameter *msgA-RO-FrequencyStart* if configured and a type-2 random-access procedure is initiated as described in clause 8.1 of [5, TS 38.213], otherwise by *msg1-FrequencyStart* as described in clause 8.1 of [5 TS 38.213];

-  is the PRACH transmission occasion index in frequency domain for a given PRACH transmission occasion in one time instance as given by clause 6.3.3.2;

-  is the number of resource blocks occupied and is given by the parameter allocation expressed in number of RBs for PUSCH in Table 6.3.3.2-1.

- is the start CRB index of uplink RB set . The UE assumes that the uplink RB set is defined as when the UE is not provided *intraCellGuardBandUL-r16.* [6, TS 38.214]

- is the index of the RB set which contains the lowest PRACH transmission occasion in frequency domain indicated by . The UE may assume that is configured such that each PRACH transmission occasion is fully contained within an RB set.

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#### TP B.8 from [8]

===================TP B.8 for 38.213===========================

8.1A PUSCH for Type-2 random access procedure

[…]

A UE determines time resources and frequency resources for PUSCH occasions in an active UL BWP from *msgA-PUSCH-Config* for the active UL BWP. If the active UL BWP is not the initial UL BWP and *msgA-PUSCH-Config* is not provided for the active UL BWP, the UE uses the *msgA-PUSCH-Config* provided for the initial UL BWP.

A UE determines a first interlace or first RB for a first PUSCH occasion in an active UL BWP respectively from *interlaceIndexFirstPO-MsgA-PUSCH* or from *frequencyStartMsgA-PUSCH* that provides an offset, in number of RBs in the active UL BWP, from a first RB of the active UL BWP. A PUSCH occasion includes a number of interlaces or a number of RBs provided by *nrofInterlacesPerMsgA-PO* or by *nrofPRBs-perMsgA-PO*, respectively. Consecutive PUSCH occasions in the frequency domain of an UL BWP are separated by a number of RBs provided by *guardBandMsgA-PUSCH*. A number of PUSCH occasions in the frequency domain of an UL BWP is provided by *nrofMsgA-PO-FDM*. If a UE is provided with *useInterlacePUCCH-PUSCH* by *BWP-UplinkCommon* or *BWP-UplinkDedicated,* the UE assumes that the RB set is defined as when the UE is not provided *intraCellGuardBandUL-r16* [6, TS 38.214].

If a UE does not have dedicated RRC configuration, or has an initial UL BWP as an active UL BWP, or is not provided *startSymbolAndLengthMsgA-PO*, *msgA-PUSCH-timeDomainAllocation* provides a SLIV and a PUSCH mapping type for a PUSCH transmission by indicating

- one of the first *maxNrofUL-Allocations* values from *PUSCH-TimeDomainResourceAllocationList*, if *PUSCH-TimeDomainResourceAllocationList* is provided in *PUSCH-ConfigCommon*

- one of the entries from table 6.1.2.1.1-2 or table 6.1.2.1.1-3 in [6, TS 38.214], if *PUSCH-TimeDomainResourceAllocationList* is not provided in *PUSCH-ConfigCommon*

else, the UE is provided a SLIV by *startSymbolAndLengthMsgA-PO*, and a PUSCH mapping type by *mappingTypeMsgA-PUSCH* for a PUSCH transmission.

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#### TP C.1 from [3]

Reason for changes

Error in equation for PRACH signal generation for the case of PRACH sequence lengths 571/1151.

Summary of changes

* Addition of the variable (number of subcarriers per RB) to the equation for PRACH signal generation
* Clarification to resolve differences in notation between 38.211 and 38.214.

Specs/Sections impacted

38.211 Section 5.3.2

Consequences if not approved

PRACH signal generation will be incorrect if sequence length 571 or 1151 is configured.

--------------------------------------- Text Proposal for 38.211, Section 5.3.2 ---------------------------------------

\*\*\* Unchanged text omitted \*\*\*

5.3.2 OFDM baseband signal generation for PRACH

The time-continuous signal  on antenna port for PRACH is defined by

where  and

-  is given by clause 6.3.3;

-  is the subcarrier spacing of the initial uplink bandwidth part during initial access. Otherwise,  is the subcarrier spacing of the active uplink bandwidth part;

- is the largest value among the subcarrier spacing configurations by the higher-layer parameter *scs-SpecificCarrierList*;

-  is the lowest numbered resource block of the initial uplink bandwidth part and is derived by the higher-layer parameter *initialUplinkBWP* during initial access. Otherwise,  is the lowest numbered resource block of the active uplink bandwidth part and is derived by the higher-layer parameter *BWP-Uplink*;

- is the frequency offset of the lowest PRACH transmission occasion in frequency domain with respect to physical resource block 0 of the active uplink bandwidth part. The quantity is given by the higher-layer parameter *msgA-RO-FrequencyStart* if configured and a type-2 random-access procedure is initiated as described in clause 8.1 of [5, TS 38.213], otherwise by *msg1-FrequencyStart* as described in clause 8.1 of [5 TS 38.213];

-  is the PRACH transmission occasion index in frequency domain for a given PRACH transmission occasion in one time instance as given by clause 6.3.3.2;

-  is the number of resource blocks occupied and is given by the parameter allocation expressed in number of RBs for PUSCH in Table 6.3.3.2-1.

- is the start CRB index of uplink RB set corresponding to the quantity in [6, TS 38.214]

- is the index of the RB set which contains the lowest PRACH transmission occasion in frequency domain indicated by . The UE may assume that is configured such that each PRACH transmission occasion is fully contained within an RB set.

-  and  are given by clause 6.3.3

\*\*\* Unchanged text omitted \*\*\*

-------------------------------------------------------- End Text Proposal -----------------------------------------------------------

#### TP C.2 from [4]

========================== Start of TP for TS 38.211 ===================================

5.3.2 OFDM baseband signal generation for PRACH

The time-continuous signal  on antenna port for PRACH is defined by

============================= End of TP for TS 38.211 ==================================

#### TP D.1 from [4]

========================== Start of TP for TS 38.213 ===================================

For operation with shared spectrum channel access, and for a set of symbols of a slot configured by higher layer parameters to receive CSI-RS, if the UE receives a SS/PBCH block within the slot, wherein the CSI-RS is configured to be QCLed with the received SS/PBCH block, the UE receives the CSI-RS.

For operation with shared spectrum channel access, and for a set of symbols of a slot configured by higher layer parameters to receive CSI-RS, if the UE detects a first SS/PBCH block in a discovery burst transmission window, and the set of symbols of the slot for receiving CSI-RS are within the same slot as the symbols for a second SS/PBCH block, wherein the second SS/PBCH block is within the same discovery burst transmission window as the first SS/PBCH block and QCLed with the first SS/PBCH block, then the UE cancels the reception of CSI-RS.

========================== End of TP for TS 38.213 ==================================

# Reference

[1]. R1-2007606, Maintenance on initial access signals and channels, Huawei, HiSilicon

[2]. R1-2007959, Text proposals on the initial access for NR-U, ZTE, Sanechips

[3]. R1-2007978, Initial Access Signals and Channels, Ericsson

[4]. R1-2008125, Remaining issues on Initial access signals and channels, Samsung

[5]. R1-2008246, Discussion on the remaining issues of initial access signal/channel, OPPO

[6]. R1-2008385, Remaining issues on initial access and UL signals/channels for NR-U, Sharp

[7]. R1-2008600, PO configuration for 2-step RACH over multiple RB sets, Qualcomm Incorporated

[8]. R1-2008042, Remaining issues of random access for NR-U, LG Electronics