**3GPP TSG RAN WG1 Meeting #108-e R1-2202502**

**e-Meeting, February 21 – March 03, 2022**

**Source: Moderator (Intel Corporation)**

**Title: Summary #1 of email discussion on initial access aspect of NR extension up to 71 GHz**

**Agenda item: 8.2.1**

**Document for: Discussion**

# Introduction

In this contribution, moderator summarizes discussions on remaining issues related to initial access for extending NR up to 71 GHz based submitted contributions from RAN1 #108-e.

# Summary of issues

## 2.1 DBTW Application & SSB-PositionQCL signaling in SSB

* From [1] Huawei/HiSilicon:
  + Aligned with the previous RAN1 agreements, indication of ={32,64} in MIB is supported using subCarrierSpacingCommon for 120, 480 and 960 kHz SCS
  + The Note “UE is expected to be configured with =64 in licensed operations” in the agreement in RAN1#107-e is captured in 38.213 by one of the following alternatives:
    - ALT 1: “For operation without shared spectrum channel access in FR2-2, UE assumes =64 and expects that the same value for is indicated in a MIB provided by a SS/PBCH block”.
      * Adopt TP#1-1 in Section 4.1 of TS 38.213.
    - ALT 2: “For operation without shared spectrum channel access in FR2-2, UE expects subCarrierSpacingCommon = ‘scs30or120’ from a MIB provided by a SS/PBCH block.”
      * Adopt TP#1-1A in Section 4.1 of TS 38.213.
* From [2] Futurewei:
  + For the second bit to indicate select one of the following options:
    - Option 1: For FR2-2 use the MSB of the controlResourceSetZero to encode as follows:

|  |  |  |
| --- | --- | --- |
| *subCarrierSpacingCommon* | MSB of *controlResourceSetZero* |  |
| scs15or60 | 0 | 8 |
| scs15or60 | 1 | 16 |
| scs30or120 | 0 | 32 |
| scs30or120 | 1 | 64 |

* + - Option 2: For FR2-2 use as a second bit for signaling the least significant bit (LSB) of ssb-SubcarrierOffset.

|  |  |  |
| --- | --- | --- |
| *subCarrierSpacingCommon* | LSB of *ssb-SubcarrierOffset* |  |
| scs15or60 | 0 | 8 |
| scs15or60 | 1 | 16 |
| scs30or120 | 0 | 32 |
| scs30or120 | 1 | 64 |

* From [3] Interdigital
  + For SSB blocks in the frequency beyond 52.6GHz, use the index associated to the DMRS in PBCH () as a means of indication for Q parameter in addition to the license regime.
  + The DBTW only applies to operation with shared spectrum channel access.
    - The indication of should not be used in operation without shared spectrum channel access.
* From [4] vivo
  + Support to use only ‘subCarrierSpacingCommon’ to indicate the which value are {32, 64}
  + DBTW is not applied to licensed band and Adopt TP #1-2 in section 4.1 for TS 38.213.
* From [5] OPPO
  + Support 1-bit for Q indication.
  + Support indication of Q = {32, 64}.
  + TP #1-1B
  + UE should be made aware of operation in licensed band or unlicensed band after reading SIB1 via either implicit association with other indication, e.g. LBT mode indication, or explicit indication.
  + UE does not need to expect Q=64 for licensed operation
  + UE assumes there is no DBTW for operation in licensed band.
* From [6] CATT
  + For cid:image001.png@01D7C5AC.DAEE0E00only 2 values {32, 64} are supported since, only 1 bit is available
* From [7] ZTE/Sanechips
  + Revisit the previous agreements of candidate values and indication bits for and support the following methods:
    - reduce the candidate values of and only support {32, 64} for
    - use one bit to indicate : SubcarrierSpacingCommon in MIB
  + For candidate values and indication bits for , adopt TP#1-1C in TS 38.213.
  + To solve inconsistencies between RAN1’s agreements and 38.213 V17.0.0, for operation without shared spectrum channel access, RAN1 should
    - not support DBTW
    - not define
    - clarify the configuration of subCarrierSpacingCommon in the spec to avoid error case
  + For the configuration of subCarrierSpacingCommon, adopt TP#1-2 in TS 38.213 for operation without shared spectrum channel access.
* From [8] NTT Docomo
  + Adopt the following TP#1-1D (i.e., support only 1 bit in MIB indicating Q)
    - If the following is not acceptable in RAN1 in this e-meeting, support to postpone this discussion as well as the one for RB offset between SSB and CORESET#0
  + Adopt the following TP#1-2B to TS38.213 when only 1 bit of subCarrierSpacingCommon is supported for Q indication in MIB.
* From [9] Spreadtrum
  + Confirm the working assumption to use 2 bits for Q values, including SbucarrierSpacingCommon and other additional bit.
  + The reserved codepoint for Q value indication can be used to distinguish the operation in licensed operation and the operation with the short control signalling in unlicensed operation.
* From [11] Nokia/NSB
  + Limit the supported values to {32,64}.
  + Adopt TP#1-2 to Section 4.1 of TS 38.213
* From [12] Intel
  + Working assumption: Use 2 bits for : subcarrierSpacingCommon and 1 bit borrowed from indication.
  + Send an LS to RAN4 for confirming borrowing 1 bit from field of MIB.
* From [13] Ericsson
  + Agree on TP#1-2
  + For operation with shared spectrum channel access, use 1 bit to signal Q (subCarrierSpacingCommon) with the value range for Q = {32, 64}. Update RRC parameter list to reflect this and remove spare from 38.213 according to TP#1-1E (below).
* From [14] Apple
  + Using 1-bit subCarrierSpacingCommon field in MIB to indicate one from <32,64> for .
  + RAN1 to conclude that the DBTW operation is not applicable for licensed band.
  + Adopt TP#1-1F and 1-2 to add the following into clause 4.1 of TS 38.213
    - For operation without shared spectrum channel access in FR2-2, a UE is expected to configure with Q= 64, i.e., subCarrierSpacingCommon = ‘scs30or120’.
* From [15] NEC
  + DBTW should not be supported for licensed operations, i.e. DBTW is disabled in licensed operations.
  + For the value set of Q, {16, 32, 64} should be supported without other additional value.
  + For the indication of Q value and related information in MIB, the subCarrierSpacingCommon and 1 bit from pdcch-ConfigSIB1 should be used.
* From [16] Samsung
  + No need to support DBTW for licensed operation in FR2-2.
    - No specification impact.
  + Down-select one option for the indication of :
    - Option 1: Keep using 2 bits in MIB for the indication of , and send a LS to RAN4 for confirming the use of the LSB of ssb-SubcarrierOffset. Adopt TP#1-1G for TS 38.213.
    - Option 2: Use 1 bit in MIB for the indication of . Adopt TP#1-1H for TS 38.213.
    - Option 3: Don’t indicate in MIB. Adopt TP#1-1I for TS 38.213.
* From [17] Qualcomm
  + for 120/480/960 kHz SCS, consider using only 1 bit in MIB to indicate the , where:
    - ∈ {32, 64}
    - ‘subCarrierSpacingCommon’ is used to signal the 1 bit for
  + Adopt TP#1-1J
  + Adopt TP#1-2F
* From [18] Sharp
  + Use 1 MIB payload bit to partially indicate Q values of {16, 32, 64} and the full indication for Q can be complemented by SIB1. Adopt the following text proposal #1-1K.
* From [19] LG Electronics
  + Use 1 bit (i.e., SubcarrierSpacingCommon) in MIB for indicating values.
  + The value range of is {32, 64}.
  + Adopt TP#1-1L

#### TP# 1-1 for TS38.213 [1]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ===========Start of TP#1 for TS 38.213 ===========  4.1 Cell search  \*\*\* unchanged part omitted \*\*\*  For operation without shared spectrum channel access, an SS/PBCH block index is same as a candidate SS/PBCH block index.  \*\*\* unchanged part omitted \*\*\*  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  For operation without shared spectrum channel access in FR2-2, UE assumes =64 and expects that the same value for is indicated in a MIB provided by a SS/PBCH block.  Table 4.1-2: Mapping of *subCarrierSpacingCommon*  to for operation with and without shared spectrum channel access in FR2-2   |  |  | | --- | --- | | *subCarrierSpacingCommon* |  | |  |  | | scs15or60 | 32 | | scs30or120 | 64 | |  |  |   \*\*\* unchanged part omitted \*\*\*  ===========End of TP#1 for TS 38.213 =========== |

#### TP# 1-1A for TS38.213 [1]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ===========Start of TP#1A for TS 38.213 ===========  4.1 Cell search  \*\*\* unchanged part omitted \*\*\*  For operation without shared spectrum channel access, an SS/PBCH block index is same as a candidate SS/PBCH block index.  \*\*\* unchanged part omitted \*\*\*  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  For operation without shared spectrum channel access in FR2-2, a UE expects *subCarrierSpacingCommon* = ‘*scs30or120’* from a *MIB* provided by a SS/PBCH block.  Table 4.1-2: Mappingof *subCarrierSpacingCommon* to for operation with shared spectrum channel access in FR2-2   |  |  | | --- | --- | | *subCarrierSpacingCommon* |  | |  |  | | scs15or60 | 32 | | scs30or120 | 64 | |  |  |   \*\*\* unchanged part omitted \*\*\*  ===========End of TP#1A for TS 38.213 =========== |

#### TP# 1-1B for TS38.213 [1]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| <Unchanged parts are omitted>  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  **Table 4.1-2: Mapping between the combination of *subCarrierSpacingCommon* and *spare* to for operation with shared spectrum channel access in FR2-2**   |  |  |  | | --- | --- | --- | | ***subCarrierSpacingCommon*** | ***~~spare~~*** |  | | ~~scs15or60~~ | ~~0~~ | ~~16~~ | | scs15or60 | ~~1~~ | 32 | | scs30or120 | ~~0~~ | 64 | | ~~scs30or120~~ | ~~1~~ | ~~reserved~~ |   <Unchanged parts are omitted> |

#### TP# 1-1C for TS38.213 [7]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4 Synchronization procedures  4.1 Cell search  < Unchanged parts are omitted >  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  Table 4.1-2: Mapping between ~~the combination of~~ *subCarrierSpacingCommon* ~~and~~ *~~spare~~* to for operation with shared spectrum channel access in FR2-2   |  |  |  | | --- | --- | --- | | *subCarrierSpacingCommon* | *~~spare~~* |  | | ~~scs15or60~~ | ~~0~~ | ~~16~~ | | scs15or60 | ~~1~~ | 32 | | scs30or120 | ~~0~~ | 64 | | ~~scs30or120~~ | ~~1~~ | ~~reserved~~ |   < Unchanged parts are omitted > |

#### TP# 1-1D for TS38.213 [8]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4.1 Cell search  **[Unchanged Part Omitted]**  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  **Table 4.1-2: Mapping between the combination of *subCarrierSpacingCommon* and *spare* to for operation with shared spectrum channel access in FR2-2**   |  |  |  | | --- | --- | --- | |  |  |  | |  |  |  | |  |  |  | |  |  |  | |  |  |  |  |  |  | | --- | --- | | ***subCarrierSpacingCommon*** |  | | scs15or60 | 32 | | scs30or120 | 64 |   **[Unchanged part omitted]** |

#### TP# 1-1E for TS38.213 [11]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4.1 Cell search  [text omitted]  **Table 4.1-2: Mapping between the combination of *subCarrierSpacingCommon* and *spare* to for operation with shared spectrum channel access in FR2-2**   |  |  |  | | --- | --- | --- | | ***subCarrierSpacingCommon*** | ***~~spare~~*** |  | | ~~scs15or60~~ | ~~0~~ | ~~16~~ | | scs15or60 | ~~1~~ | 32 | | scs30or120 | ~~0~~ | 64 | | ~~scs30or120~~ | ~~1~~ | ~~reserved~~ | |

#### TP# 1-1E for TS38.213 [13]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| \*\*\* Unchanged part omitted \*\*\*  Table 4.1-2: Mapping between the combination of *subCarrierSpacingCommon* to for operation with shared spectrum channel access in FR2-2   |  |  |  | | --- | --- | --- | | *subCarrierSpacingCommon* | *~~spare~~* |  | | ~~scs15or60~~ | ~~0~~ | ~~16~~ | | scs15or60 | ~~1~~ | 32 | | scs30or120 | ~~0~~ | 64 | | ~~scs30or120~~ | ~~1~~ | ~~reserved~~ |   \*\*\* Unchanged part omitted \*\*\* |

#### TP# 1-1F for TS38.213 [14]

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4.1 Cell search \*\*\* Unchanged text omitted \*\*\*  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  Table 4.1-2: Mapping between the combination of *subCarrierSpacingCommon* and *spare* to for operation with shared spectrum channel access in FR2-2   |  |  |  | | --- | --- | --- | | *subCarrierSpacingCommon* |  |  | | scs15or60 |  | 32 | | scs30or120 |  | 64 |   \*\*\* Unchanged text omitted \*\*\* |

#### TP# 1-1G for TS38.213 [16]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4.1 Cell search  ====================== Unchanged Text Omitted =============================  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  Table 4.1-2: Mapping between the combination of *subCarrierSpacingCommon* and LSB of *ssb-SubcarrierOffset* *~~spare~~* to for operation with shared spectrum channel access in FR2-2   |  |  |  | | --- | --- | --- | | *subCarrierSpacingCommon* | LSB of *ssb-SubcarrierOffset ~~spare~~* |  | | scs15or60 | 0 | 16 | | scs15or60 | 1 | 32 | | scs30or120 | 0 | 64 | | scs30or120 | 1 | reserved |   ============== Unchanged Text Omitted ====================== |

#### TP# 1-1H for TS38.213 [16]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4.1 Cell search  ====================== Unchanged Text Omitted ===========================  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  Table 4.1-2: Mapping between ~~the combination of~~ *subCarrierSpacingCommon* ~~and~~ *~~spare~~* to for operation with shared spectrum channel access in FR2-2   |  |  |  | | --- | --- | --- | | *subCarrierSpacingCommon* | *spare* |  | | ~~scs15or60~~ | ~~0~~ | ~~16~~ | | scs15or60 | 1 | 32 | | scs30or120 | 0 | 64 | | ~~scs30or120~~ | ~~1~~ | ~~reserved~~ |   ====================== Unchanged Text Omitted ========================= |

#### TP# 1-1I for TS38.213 [16]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4.1 Cell search  ====================== Unchanged Text Omitted ===========================  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is ~~either~~ provided by *ssb-PositionQCL* ~~or, if~~ *~~ssb-PositionQCL~~* ~~is not provided,~~~~obtained from a~~ *~~MIB~~* ~~provided by a SS/PBCH block according to Table 4.1-2~~. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  ~~Table 4.1-2: Mapping between the combination of~~ *~~subCarrierSpacingCommon~~* ~~and~~ *~~spare~~* ~~to for operation with shared spectrum channel access in FR2-2~~   |  |  |  | | --- | --- | --- | | *~~subCarrierSpacingCommon~~* | *~~spare~~* |  | | ~~scs15or60~~ | ~~0~~ | ~~16~~ | | ~~scs15or60~~ | ~~1~~ | ~~32~~ | | ~~scs30or120~~ | ~~0~~ | ~~64~~ | | ~~scs30or120~~ | ~~1~~ | ~~reserved~~ |   ==================== Unchanged Text Omitted ======================= |

#### TP# 1-1J for TS38.213 [17]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 4.1-2: Mapping between the combination of *subCarrierSpacingCommon* and *spare* to for operation ~~with shared spectrum channel access~~ in FR2-2   |  |  |  | | --- | --- | --- | | *subCarrierSpacingCommon* | *~~spare~~* |  | | ~~scs15or60~~ | ~~0~~ | ~~16~~ | | scs15or60 | ~~1~~ | 32 | | scs30or120 | ~~0~~ | 64 | | ~~scs30or120~~ | ~~1~~ | ~~reserved~~ | |

#### TP# 1-1K for TS38.213 [19]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4 Synchronization procedures  4.1 Cell search  [omitted text]  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one. If *subCarrierSpacingCommon* in the MIB indicates ‘scs15or60’, the UE assumes that for PDCCH monitoring in the Type0-PDCCH CSS set in Clause 13.  Table 4.1-2: Mapping between *subCarrierSpacingCommon* to for operation with shared spectrum channel access in FR2-2   |  |  | | --- | --- | | *subCarrierSpacingCommon* |  | | scs15or60 | 32 | | scs30or120 | 64 | |  |  | |  |  |   [omitted text] |

#### TP# 1-1L for TS38.213 [19]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  **Table 4.1-2: Mapping between the combination of *subCarrierSpacingCommon* and *spare* to for operation with shared spectrum channel access in FR2-2**   |  |  | | --- | --- | | ***subCarrierSpacingCommon*** |  | | scs15or60 | 32 | | scs30or120 | 64 | |

#### TP# 1-2 for TS38.213 [1][7][8][11][13][14][17]

|  |
| --- |
| <unchanged part omitted>  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  For operation without shared spectrum channel access in FR2-2, a UE expects *subCarrierSpacingCommon* = ‘*scs30or120’* from a MIB provided by a SS/PBCH block. |

### Summary of Discussions

There are two main issues, which are somewhat related. First is on the signaling of Q including number of bits allocated for Q. The second issues is whether Q indication is needed for licensed operation or not. From the last meeting several companies commented that these two issues are related and should be discussed together. Therefore, moderator has merge the two issues into Section 2.1.

* Signaling of Q
  + Large number of companies suggest to revise RAN1 working assumption- based on input from RAN2, such that we use only 1 bit for Q with supporting {32, 64} only.
* Indication of Q in licensed operations
  + All companies that provided TP proposed nearly identical TP to resolve the issue for Q indication in licensed operations.

Based on inputs received moderator suggest either TP#1-3 or #1-3A for further discussion.

#### TP# 1-3 for TS38.213

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4 Synchronization procedures  4.1 Cell search  < Unchanged parts are omitted >  For operation without shared spectrum channel access, an SS/PBCH block index is same as a candidate SS/PBCH block index.  < Unchanged parts are omitted >  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  For operation without shared spectrum channel access in FR2-2, a UE expects *subCarrierSpacingCommon* = ‘*scs30or120’* from a MIB provided by a SS/PBCH block.  Table 4.1-2: Mapping between ~~the combination of~~ *subCarrierSpacingCommon* ~~and~~ *~~spare~~* to for operation with shared spectrum channel access in FR2-2   |  |  |  | | --- | --- | --- | | *subCarrierSpacingCommon* | *~~spare~~* |  | | ~~scs15or60~~ | ~~0~~ | ~~16~~ | | scs15or60 | ~~1~~ | 32 | | scs30or120 | ~~0~~ | 64 | | ~~scs30or120~~ | ~~1~~ | ~~reserved~~ |   < Unchanged parts are omitted > |

#### TP# 1-3A for TS38.213

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 4 Synchronization procedures  4.1 Cell search  < Unchanged parts are omitted >  For operation without shared spectrum channel access, an SS/PBCH block index is same as a candidate SS/PBCH block index.  < Unchanged parts are omitted >  For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to . The UE assumes that within a discovery burst transmission window, a number of transmitted SS/PBCH blocks on a serving cell is not larger than and a number of transmitted SS/PBCH blocks with a same SS/PBCH block index is not larger than one.  For operation without shared spectrum channel access in FR2-2, a UE expects *subCarrierSpacingCommon* = ‘*scs30or120’* from a MIB provided by a SS/PBCH block.  Table 4.1-2: Mapping between ~~the combination of~~ *subCarrierSpacingCommon* ~~and~~ *~~spare~~* to for operation ~~with shared spectrum channel access~~ in FR2-2   |  |  |  | | --- | --- | --- | | *subCarrierSpacingCommon* | *~~spare~~* |  | | ~~scs15or60~~ | ~~0~~ | ~~16~~ | | scs15or60 | ~~1~~ | 32 | | scs30or120 | ~~0~~ | 64 | | ~~scs30or120~~ | ~~1~~ | ~~reserved~~ |   < Unchanged parts are omitted > |

### 1st Round Discussion

Please comment further on Proposal #1-1, and TP#1-3 and #1-3A. If you have any other suggestions, please comment them as well.

#### Proposal #1-1

* Use 1 bit for Q in MIB
  + SubcarrierSpacingCommon field will be used to convey value of {32, 64}
  + Note that this is revising the working assumption made in RAN1#107-e on “use 2 bits for Q, {SubcarrierSpacingCommon, spare bit in MIB}”

|  |  |
| --- | --- |
| Company | Comments |
| InterDigital | Do not support Proposal #1-1.  We propose using {8, 16, 32, 64}, where the indication can be based on combination of *SubcarrierSpacingCommon* and one additional bit. We think that the one additional bit can be one of   * MSB of *controlResourceSetZero*, * LSB of *ssb-SubcarrierOffset*, or * MSB of the DMRS index in PBCH ()   , but we are also open for other possible bits. |
| Nokia | We support Proposal #1-1.  We would prefer TP# 1-3 for further discussion, we think that Table 4.1.2 applies only in shared spectrum access. |
| Samsung | We fixed the revision marks for our TPs in 1-1G, H, and I.  We are ok with Proposal #1-1.  Although we don’t think the description for licensed operation is needed, we can be ok with TP# 1-3 with the typo fixed as follow (that highlighted “1” should not be crossed). We don’t support TP# 1-4 since there is no need to define Q for licensed operation.   |  |  |  | | --- | --- | --- | | *subCarrierSpacingCommon* | *~~spare~~* |  | | ~~scs15or60~~ | ~~0~~ | ~~16~~ | | scs15or60 | 1 | 32 | | scs30or120 | ~~0~~ | 64 | | ~~scs30or120~~ | ~~1~~ | ~~reserved~~ | |
| Qualcomm | We support proposal #1-1.  We prefer TP #1-3A but also fine with TP #1-3. |

## 2.2 SSB-PositionQCL signaling in RRC

* From [1] Huawei/HiSilicon:
  + For operations with shared spectrum, support indicating SSB-PositionQCL-Relation in SIB2, SIB3, SIB4, MeasObjectNR, and ServingCellConfigCommon with parameter values {16,32,64}.
    - SSB-PositionQCL-Relation applicable to a serving cell overwrites ={32,64} acquired from the MIB of that cell.
    - Note: Such overwriting mechanism is already supported in 38.213.
  + Include SSB-PositionQCL-Relation-r17 in the RRC parameter list as per the conclusion in RAN1 #107b-e.
* From [11] Nokia/NSB
  + Range of SSB-PositionQCL-Relation-r17 is restricted to {32,64}.
* From [13] Ericsson
  + For operation with shared spectrum channel access, use 1 bit to signal Q (subCarrierSpacingCommon) with the value range for Q = {32, 64}. Update RRC parameter list to reflect this and remove spare from 38.213 according to TP#1-1E (below).
  + Update the RRC parameter spreadsheet regarding information element SSB-PositionQCL-Relation-r16 to clarify that for operation with shared spectrum channel access in FR2-2, the value range is {32,64}. Mark the row as 'stable' and include it in the RRC parameter LS to RAN2.

|  |  |  |
| --- | --- | --- |
| Parent IE | Field name | Description |
| *SIB2* | *ssb-PositionQCL-Common-r16* | Frequency specific:  QCL relation between SSB candidate indexes common for intra-frequency neighbor cells |
| *SIB3* | *ssb-PositionQCL-r16* | Cell specific:  QCL relation between SSB candidate indexes for a specific intra-frequency neighbor cell. If provided, this overwrites the value provided by *ssb-PositionQCL-Common-r16* in *SIB2* for the indicated cell. |
| *SIB4* | *ssb-PositionQCL-Common-r16* | Frequency specific:  QCL relation between SSBs common among inter-frequency neighbor cells on a specific frequency. |
| *SIB4* | *ssb-PositionQCL-r16* | Cell specific:  QCL relation between SSB candidate indexes for a specific inter-frequency neighbor cell. If provided, this overwrites the value provided by *ssb-PositionQCL-Common-r16* in *SIB4* for the indicated cell. |
| *MeasObjectNR* | *ssb-PositionQCL-Common-r16* | Frequency specific:  QCL relation between SSB candidate indexes for all measured cells in this *MeasObjectNR* (the SSBs have the same frequency and SCS) |
| *MeasObjectNR* | *ssb-PositionQCL-r16* | Cell specific:  QCL relation between SSB candidate indexes for a specific measured cell as specified in this *MeasObjectNR*. If provided, this overwrites the value signaled by *ssb-PositionQCL-Common-r16* in this *MeasObjectNR*. |
| *ServingCellConfigCommon* | *ssb-PositionQCL-r16* | Cell specific:  QCL relation between SSB candidate indexes for the serving cell configured in this *ServingCellConfigCommon* |

### Summary of Discussions

Huawei has provided a good summary of all effected RRC for signaling of ssb-PostiionQCL

* Option 1) Update the ssb-PositionQCL to be limited to {32, 64} (assuming that will be the case for MIB)
  + Nokia/NSB, Ericsson
* Option 2) Keep the ssb-PositionQCL to be {16, 32, 64}
  + Huawei/HiSilicon

Discuss further on the following ssb-PositionQCL signaling in RRC (other than MIB)

* SIB2:: ssb-PositionQCL-Common-r16
* SIB3:: ssb-PositionQCL-r16
* SIB4:: ssb-PositionQCL-Common-r16
* SIB4:: ssb-PositionQCL-r16
* MeasObjectNR:: ssb-PositionQCL-Common-r16
* MeasObjectNR:: ssb-PositionQCL-r16
* ServingCellConfigCommon:: ssb-PositionQCL-r16

### 1st Round Discussion

Please comment further on option 1 and 2.

* Option 1) Update the ssb-PositionQCL to be limited to {32, 64} (assuming that will be the case for MIB)
  + Nokia/NSB, Ericsson
* Option 2) Keep the ssb-PositionQCL to be {16, 32, 64}
  + Huawei/HiSilicon

Based on the conclusion between option 1 and 2, moderator will formulate agreement/conclusion to suggest updates to all relevant RRC parameters (that Huawei has identified). If you have any other suggestions, please comment them as well.

|  |  |
| --- | --- |
| Company | Comments |
| InterDigital | We do not support Option 1 on limiting the values of ssb-PositionQCL and support Option 2.  For Option 2, we prefer to include the option for Q=8 to support the scenarios with higher demand for frequent monitoring and/or with lower number of SSB beams. |
| Nokia | We prefer option 1 as option 2 would require further discussion how having different range for and ssb-PositionQCL and resulted different understanding would be accounted. |
| Samsung | We support Option 2) with the understanding that the value provided by ssb-PositionQCL would override the value determined by MIB, and no other spec impact is expected. |
| Qualcomm | We prefer option 1 for the same reason as Nokia’s |

## 2.3 DBTW Length

* From [1] Huawei/HiSilicon:
  + Support default DBTW length of 5ms if discoveryBurstWindowLength is not provided in FR2-2.
    - No specification change is needed.
* From [5] OPPO
  + When the DBTW length is not configured, UE can assume the DBTW length for all supported SCSs (120/480/960 kHz) in FR2-2 is a half frame for operation in unlicensed band.
* From [7] ZTE/Sanechips
  + If the DBTW length is not configured (i.e. discoveryBurstWindowLength is not provided), UE can assume the DBTW length for all supported SCSs (120/480/960 kHz) in FR2-2 is a half frame.
    - Note: This is same as Rel-16 NR-U, and no specification change is needed.
* From [11] Nokia/NSB
  + Either confirm the DBTW length values to {1.25, 1, 0.75, 0.5, 0.25, 0.125} or, accounting the range, limit it to {1.25, 1, 0.75, 0.5, 0.25}
  + When DBTW is supported, and the DBTW length is not configured (i.e. discoveryBurstWindowLength is not provided), UE can assume the DBTW length for all supported SCSs (120/480/960 kHz) in FR2-2 is a half frame.
* From [14] Apple
  + Keep the default DBTW length to be half a frame i.e., 5ms for 480kHz and 960kHz SCS as in current specification.

### Summary of Discussions

The following is a summary of company views on DBTW lengths.

* Several companies commented that default value for DBTW should be 5 msec. (No change in specification)
* One company has suggest to confirm the DBTW lengths.

Moderator suggests checking if the following conclusion is acceptable.

Proposed Conclusion:

* Support default DBTW length of 5ms if discoveryBurstWindowLength is not provided in FR2-2.
* RAN1 concludes that as Q = 8 is not supported, DBTW length of 0.0625 msec is not supported for 480 and 960 kHz.
* No change to specification is needed

### 1st Round Discussion

Discuss further on the following conclusion.

#### Conclusion #3-1

* Support default DBTW length of 5ms if discoveryBurstWindowLength is not provided in FR2-2.
* RAN1 concludes that as Q = 8 is not supported, DBTW length of 0.0625 msec is not supported for 480 and 960 kHz.
* No change to specification is needed

|  |  |
| --- | --- |
| Company | Comments |
| InterDigital | Do not support Conclusion #3-1. Supporting Q=8 enables supporting systems with higher demand for frequent monitoring, lower latency requirements, and/or with lower number of SSB beams. |
| Nokia | Support the Conclusion #3-1 |
| Samsung | We support Conclusion #3-1 |
| Qualcomm | Fine with Conclusion #3-1 |

## 2.4 CORESET#0 Configuration

* From [1] Huawei/HiSilicon:
  + Support the following CORESET#0 RB offsets for {SSB, CORESET#0} SCS={120, 120} kHz:
    - For CORESET#0 with 24 RBs: The same as supported values in Table 13-8 of 38.213.
    - For CORESET#0 with 48 RBs: The same as supported values in Table 13-8 of 38.213 in addition to RB offset values of [0] and [28] RBs for multiplexing pattern 1.
    - For CORESET#0 with 96 RBs: RB offsets of [0] and [76] RBs for multiplexing pattern 1.
  + Support the following CORESET#0 RB offsets values for {SSB, CORESET#0} SCS={480, 480} kHz and {960, 960} kHz:
    - For CORESET#0 with 24 RBs: The same as supported values in Table 13-8 of 38.213.
    - For CORESET#0 with 48 RBs: The same as supported values in Table 13-8 of 38.213 in addition to RB offset values of [0] and [28] RBs for multiplexing pattern 1.
    - For CORESET#0 with 96 RBs: RB offsets of [0] and [76] RBs for multiplexing pattern 1.
* From [3] Interdigital
  + Support two RB offset values for MUX 3 (if supported) in CORESET#0 configuration. The two values could be (-20 if kssb=0, -21 if kssb>0) and X, where X is the number of RBs in the respective CORESET#0 and can be 24 or 48.
* From [4] vivo
  + Support Multiplexing pattern 3 for SCS 480 kHz and 960 kHz.
  + Support 96 RB for SCS 120kHz and 480 kHz and do not support 96 RB for SCS 960kHz.
  + For ‘controlResourceSetZero’ configuration for {120K, 120K} pair in FR2-2:
    - Support 2 RB offset values for multiplexing pattern 1 with 24 PRB cases: [0] and [4]
    - Support 3 RB offset values for multiplexing pattern 1 with 48 PRB cases: [0], [14], and [28]
    - Support 2 RB offset values for multiplexing pattern 1 with 96 PRB cases: [0], and [76]
    - Support following two RB offset values for multiplexing pattern 3: -20 if kssb=0, -21 if kssb>0
  + For ‘controlResourceSetZero’ configuration for {480K, 480K} pair in FR2-2:
    - Support 2 RB offset values for multiplexing pattern 1 with 24 PRB cases: [0] and [4]
    - Support 3 RB offset values for multiplexing pattern 1 with 48 PRB cases: [0], [14], and [28]
    - Support 2 RB offset values for multiplexing pattern 1 with 96 PRB cases: [0], and [76]
    - Support following two RB offset values for multiplexing pattern 3: -20 if kssb=0, -21 if kssb>0
  + For ‘controlResourceSetZero’ configuration for {960K, 960K} pair in FR2-2:
    - Support 2 RB offset values for multiplexing pattern 1 with 24 PRB cases: [0] and [4]
    - Support 3 RB offset values for multiplexing pattern 1 with 48 PRB cases: [0], [14], and [28]
    - Support following two RB offset values for multiplexing pattern 3: -20 if kssb=0, -21 if kssb>0
* From [6] CATT
  + For CORESET#0 configuration can be decided after RAN4 finalize channelization design.
  + If multiplexing pattern 3 for 480 kHz and 960 kHz is supported, the first symbols index of Type0-PDCCH monitoring occasions can be 2 for even SSB index and can be 9 for odd SSB index.
* From [8] NTT Docomo
  + Postpone the discussion on RB offset between SSB and CORESET#0 until RAN4 decides sync raster in unlicensed band.
* From [11] Nokia/NSB
  + For ‘controlResourceSetZero’ configuration for {SSB, CORESET#0/Type0-PDCCH} = {480, 480} kHz and {960, 960} kHz, support multiplex pattern 3 with 24 PRB and 2 symbol duration, and multiplexing pattern 3 with 48 PRB and 2 symbol duration.
  + For 480 kHz and 960kHz , support multiplexing pattern 1 with 96 PRB with 2-symbol duration, with four RB offsets: 0, 36, 72, 76.
  + For 120kHz, support multiplexing pattern 1 with 96 PRB with 2-symbol duration, with three RB offsets: 0, 38, 76.
  + Confirm the support of CORESET#0 with = {96} for 120kHz, 480kHz and 960kHz sub-carrier spacing.
* From [12] Intel
  + For 120 kHz
    - Multiplexing pattern 1 with 24 RBs: 0 RB offset
    - Multiplexing pattern 1 with 48 RBs: {0, 14, 28} RB offset
    - Multiplexing pattern 1 with 96 RBs: 0 RB offset
    - Multiplexing pattern 3 with 24 RB: -20 or -21 (depending on k\_ssb) RB offset
    - Multiplexing pattern 3 with 48 RB: -20 or -21 (depending on k\_ssb) RB offset
  + For 480 kHz
    - Multiplexing pattern 1 with 24 RBs: 0 RB offset
    - Multiplexing pattern 1 with 48 RBs: {0, 14, 28} RB offset
    - Multiplexing pattern 1 with 96 RBs: {0, 38} RB offset
    - Multiplexing pattern 3 with 24 RB: -20 or -21 (depending on k\_ssb) RB offset
    - Multiplexing pattern 3 with 48 RB: -20 or -21 (depending on k\_ssb) RB offset
  + For 960 kHz
    - Multiplexing pattern 1 with 24 RBs: {0, 4} RB offset
    - Multiplexing pattern 1 with 48 RBs: 0 RB offset
    - Multiplexing pattern 1 with 96 RBs: 0 RB offset
    - Multiplexing pattern 3 with 24 RB: -20 or -21 (depending on k\_ssb) RB offset
    - Multiplexing pattern 3 with 48 RB: -20 or -21 (depending on k\_ssb) RB offset
  + Additionally support 1 symbol duration 96 RB CORESET for 480 and 960 kHz for multiplexing pattern 1.
* From [13] Ericsson
  + Support the SSB-CORESET0 offset values shown in TP#6-1D (Tables 13-10A, B, and C below for 120, 480, and 960 kHz, respectively).
  + For the 57 – 66 GHz band, the SSB-CORESET0 offsets proposed in Section 5.1 for the floating channelization design are also valid for the fixed design, and no additional offset values need to be defined.
* From [16] Samsung
  + Support the same CORESET#0 configuration table for licensed and unlicensed bands.
  + For 120 kHz SCS:
    - Support one RB offset for 24 RB CORESET#0 bandwidth in Pattern 1;
    - Support two RB offsets for 48 RB CORESET#0 bandwidth in Pattern 1;
    - Support one RB offset for 96 RB CORESET#0 bandwidth in Pattern 1;
    - Support same RB offsets as Rel-15 FR 2-1 in Pattern 3;
    - Adopt TP#4-1E for TS 38.213.
  + For 480 kHz and 960 kHz SCS:
    - Support the same CORESET#0 configuration table;
    - Support multiplexing pattern 3 with same RB offsets as in Rel-15 FR2-1;
    - Support two RB offsets for 24 RB CORESET#0 bandwidth in Pattern 1;
    - Support three RB offsets for 48 RB CORESET#0 bandwidth in Pattern 1;
    - Support two RB offsets for 48 RB CORESET#0 bandwidth in Pattern 1;
    - Support 1 symbol for CORESET#0 when the bandwidth of CORESET#0 is 96;
    - Adopt TP#4-1E for TS 38.213.
* From [17] Qualcomm
  + consider adopting the following design principles (as much as possible) for CORESET0 RB offsets for both licensed and unlicensed operation for SCS = 120 kHz, 480 kHz, and 960 kHz (per # of symbols):
    - For multiplexing pattern 1:
      * 24 RBs: 2 configs aligning CORESET 0 edges with the upper and lower edges of the 20 RB SSB
      * 48 RBs: 1 config aligning the center of the CORESET 0 with the center of the 20 RB SSB
      * 96 RBs: 1 config aligning the center of the CORESET 0 with the center of the 20 RB SSB
      * 48 RBs (open for discussion): 2 configs aligning CORESET 0 edges with the upper and lower edges of the 20 RB SSB
    - For multiplexing pattern 3:
      * 24 RBs: 2 configs placing the CORESET 0 at either side of the 20 RB SSB
      * 48 RBs: 2 configs placing the CORESET 0 at either side of the 20 RB SSB

#### TP# 4-1 for TS38.213 [4]

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| <unchanged part omitted>  Table 13-10A: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {120, 120} kHz for FR2-2   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 14 | | 3 | 1 | 48 | 2 | 14 | | 4 | 3 | 24 | 2 | -20 if  -21 if | | 5 | 3 | 24 | 2 | 24 | | 6 | 3 | 48 | 2 | -20 if  -21 if | | 7 | 3 | 48 | 2 | 48 | | 8 | 1 | 48 | 1 | 0 | | 9 | 1 | 48 | 1 | 28 | | 10 | 1 | 48 | 2 | 0 | | 11 | 1 | 48 | 2 | 28 | | 12 | 1 | 96 | 1 | 0 | | 13 | 1 | 96 | 1 | 76 | | 14 | 1 | 96 | 2 | 0 | | 15 | 1 | 96 | 2 | 76 |   <unchanged part omitted>  Table 13-10B: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {480, 480} kHz and {960, 960}   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 14 | | 3 | 1 | 48 | 2 | 14 | | 4 | 1 | 48 | 1 | 0 | | 5 | 1 | 48 | 1 | 28 | | 6 | 1 | 48 | 2 | 0 | | 7 | 1 | 48 | 2 | 28 | | 8 | 3 | 24 | 2 | -20 if  -21 if | | 9 | 3 | 24 | 2 | 24 | | 10 | 3 | 48 | 2 | -20 if  -21 if | | 11 | 3 | 48 | 2 | 48 | | 12 | 1 | 96 | 2 | 0 | | 13 | 1 | 96 | 2 | 76 | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 |   <unchanged part omitted> |

#### TP# 4-1A for TS38.213 [4]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 13-10A: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {120, 120} kHz for FR2-2   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 0 | | 3 | 1 | 48 | 2 | 0 | | 4 | 1 | 48 | 1 | 14 | | 5 | 1 | 48 | 2 | 14 | | 6 | 1 | 48 | 1 | 28 | | 7 | 1 | 48 | 2 | 28 | | 8 | 1 | 96 | 1 | 0 | | 9 | 1 | 96 | 2 | 0 | | 10 | 1 | 96 | 1 | 76 | | 11 | 1 | 96 | 2 | 76 | | 12 | 3 | 24 | 2 | -20 if  -21 if | | 13 | 3 | 48 | 2 | -20 if  -21 if | | 14 |  |  |  |  | | 15 |  |  |  |  |   <unchanged part omitted>  Table 13-10B: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {480, 480} kHz for FR2-2   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 0 | | 3 | 1 | 48 | 2 | 0 | | 4 | 1 | 48 | 1 | 14 | | 5 | 1 | 48 | 2 | 14 | | 6 | 1 | 48 | 1 | 28 | | 7 | 1 | 48 | 2 | 28 | | 8 | 1 | 96 | 1 | 0 | | 9 | 1 | 96 | 2 | 0 | | 10 | 1 | 96 | 1 | 76 | | 11 | 1 | 96 | 2 | 76 | | 12 | 3 | 24 | 2 | -20 if  -21 if | | 13 | 3 | 48 | 2 | -20 if  -21 if | | 14 | 3 | 96 | 2 | -20 if  -21 if | | 15 |  |  |  |  |   <unchanged part omitted>  Table 13-10C: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {960, 960} kHz for FR2-2   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 0 | | 3 | 1 | 48 | 2 | 0 | | 4 | 1 | 48 | 1 | 14 | | 5 | 1 | 48 | 2 | 14 | | 6 | 1 | 48 | 1 | 28 | | 7 | 1 | 48 | 2 | 28 | | 8 | 3 | 24 | 2 | -20 if  -21 if | | 9 | 3 | 48 | 2 | -20 if  -21 if | | 10 |  |  |  |  | | 11 |  |  |  |  | | 12 |  |  |  |  | | 13 |  |  |  |  | | 14 |  |  |  |  | | 15 |  |  |  |  |   <unchanged part omitted> |

#### TP# 4-1B for TS38.213 [11]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 13-10A: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {120, 120} kHz   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 14 | | 3 | 1 | 48 | 2 | 14 | | 4 | 3 | 24 | 2 | -20 if  -21 if | | 5 | 3 | 24 | 2 | 24 | | 6 | 3 | 48 | 2 | -20 if  -21 if | | 7 | 3 | 48 | 2 | 48 | | 8 | 1 | 48 | 1 | 0 | | 9 | 1 | 48 | 2 | 0 | | 10 | 1 | 48 | 1 | 28 | | 11 | 1 | 48 | 2 | 28 | | 12 | 1 | 96 | 2 | 0 | | 13 | 1 | 96 | 2 | 38 | | 14 | 1 | 96 | 2 | 76 | | 15 | Reserved |  |  |  |   Table 13-10B: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {480, 480} kHz   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 0 | | 3 | 1 | 48 | 2 | 0 | | 4 | 1 | 48 | 1 | 14 | | 5 | 1 | 48 | 2 | 14 | | 6 | 1 | 48 | 1 | 28 | | 7 | 1 | 48 | 2 | 28 | | 8 | 3 | 24 | 2 | -20 if  -21 if | | 9 | 3 | 24 | 2 | 24 | | 10 | 3 | 48 | 2 | -20 if  -21 if | | 11 | 3 | 48 | 2 | 48 | | 12 | 1 | 96 | 2 | 0 | | 13 | 1 | 96 | 2 | 36 | | 14 | 1 | 96 | 2 | 72 | | 15 | 1 | 96 | 2 | 76 |   Table 13-10C: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {960, 960} kHz   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 0 | | 3 | 1 | 48 | 2 | 0 | | 4 | 1 | 48 | 1 | 14 | | 5 | 1 | 48 | 2 | 14 | | 6 | 1 | 48 | 1 | 28 | | 7 | 1 | 48 | 2 | 28 | | 8 | 3 | 24 | 2 | -20 if  -21 if | | 9 | 3 | 24 | 2 | 24 | | 10 | 3 | 48 | 2 | -20 if  -21 if | | 11 | 3 | 48 | 2 | 48 | | 12 | 1 | 96 | 2 | 0 | | 13 | 1 | 96 | 2 | 36 | | 14 | 1 | 96 | 2 | 72 | | 15 | 1 | 96 | 2 | 76 | |

#### TP# 4-1C for TS38.213 [12]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table 13-10A: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {120, 120} kHz for FR2-2   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 48 | 1 | 0 | | 2 | 1 | 48 | 1 | 14 | | 3 | 1 | 48 | 1 | 28 | | 4 | 1 | 48 | 2 | 0 | | 5 | 1 | 48 | 2 | 14 | | 6 | 1 | 48 | 2 | 28 | | 7 | 1 | 96 | 1 | 0 | | 8 | 1 | 96 | 2 | 0 | | 9 | 3 | 24 | 2 | -20 if k\_ssb =0  -21 if k\_ssb >0 | | 10 | 3 | 48 | 2 | -20 if k\_ssb =0  -21 if k\_ssb >0 | | 11 |  |  |  |  | | 12 |  |  |  |  | | 13 |  |  |  |  | | 14 |  |  |  |  | | 15 |  |  |  |  |   Table 13-10B: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {480, 480} kHz for FR2-2   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 48 | 1 | 0 | | 2 | 1 | 48 | 1 | 14 | | 3 | 1 | 48 | 1 | 28 | | 4 | 1 | 48 | 2 | 0 | | 5 | 1 | 48 | 2 | 14 | | 6 | 1 | 48 | 2 | 28 | | 7 | 1 | 96 | 2 | 0 | | 8 | 1 | 96 | 2 | 38 | | 9 | 3 | 24 | 2 | -20 if k\_ssb =0  -21 if k\_ssb >0 | | 10 | 3 | 48 | 2 | -20 if k\_ssb =0  -21 if k\_ssb >0 | | 11 |  |  |  |  | | 12 |  |  |  |  | | 13 |  |  |  |  | | 14 |  |  |  |  | | 15 |  |  |  |  |   Table 13-10C: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {960, 960} kHz for FR2-2   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 0 | | 3 | 1 | 48 | 2 | 0 | | 4 | 1 | 96 | 2 | 0 | | 5 | 3 | 24 | 2 | -20 if k\_ssb =0  -21 if k\_ssb >0 | | 6 | 3 | 48 | 2 | -20 if k\_ssb =0  -21 if k\_ssb >0 | | 7 |  |  |  |  | | 8 |  |  |  |  | | 9 |  |  |  |  | | 10 |  |  |  |  | | 11 |  |  |  |  | | 12 |  |  |  |  | | 13 |  |  |  |  | | 14 |  |  |  |  | | 15 |  |  |  |  | |

#### TP# 4-1D for TS38.213 [13]

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 13-10A: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {120, 120} kHz for FR2-2**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Index** | **SS/PBCH block and CORESET multiplexing pattern** | **Number of RBs** | **Number of Symbols** | **Offset (RBs)** | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 48 | 1 | 0 | | 2 | 1 | 48 | 1 | 14 | | 3 | 1 | 48 | 1 | 28 | | 4 | 1 | 48 | 2 | 0 | | 5 | 1 | 48 | 2 | 14 | | 6 | 1 | 48 | 2 | 28 | | 7 | 1 | 96 | 1 | 0 | | 8 | 1 | 96 | 2 | 0 | | 9 | 3 | 24 | 2 | -20 if  -21 if > 0 | | 10 | 3 | 24 | 2 | 24 | | 11 | 3 | 48 | 2 | -20 if  -21 if > 0 | | 12 | 3 | 48 | 2 | 48 | | 13 |  |  |  |  | | 14 |  |  |  |  | | 15 |  |  |  |  |   **Table 13-10B: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {480, 480} kHz for FR2-2**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Index** | **SS/PBCH block and CORESET multiplexing pattern** | **Number of RBs** | **Number of Symbols** | **Offset (RBs)** | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 48 | 1 | 0 | | 2 | 1 | 48 | 1 | 14 | | 3 | 1 | 48 | 1 | 28 | | 4 | 1 | 48 | 2 | 0 | | 5 | 1 | 48 | 2 | 14 | | 6 | 1 | 48 | 2 | 28 | | 7 | 1 | 96 | 2 | 0 | | 8 | 1 | 96 | 2 | 56 | | 9 | 3 | 24 | 2 | -20 if  -21 if > 0 | | 10 | 3 | 24 | 2 | 24 | | 11 | 3 | 48 | 2 | -20 if  -21 if > 0 | | 12 | 3 | 48 | 2 | 48 | | 13 |  |  |  |  | | 14 |  |  |  |  | | 15 |  |  |  |  |   **Table 13-10C: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {960, 960} kHz for FR2-2**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Index** | **SS/PBCH block and CORESET multiplexing pattern** | **Number of RBs** | **Number of Symbols** | **Offset (RBs)** | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 0 | | 3 | 1 | 48 | 2 | 0 | | 4 | 1 | 96 | 2 | 0 | | 5 | 1 | 96 | 2 | 56 | | 6 | 3 | 24 | 2 | -20 if  -21 if > 0 | | 7 | 3 | 24 | 2 | 24 | | 8 | 3 | 48 | 2 | -20 if  -21 if > 0 | | 9 | 3 | 48 | 2 | 48 | | 10 |  |  |  |  | | 11 |  |  |  |  | | 12 |  |  |  |  | | 13 |  |  |  |  | | 14 |  |  |  |  | | 15 |  |  |  |  | |

#### TP# 4-1E for TS38.213 [16]

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Table 13-10A: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {120, 120} kHz for FR2-2   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 2 | | 1 | 1 | 48 | 1 | 0 | | 2 | 1 | 48 | 1 | 28 | | 3 | 1 | 48 | 2 | 0 | | 4 | 1 | 48 | 2 | 28 | | 5 | 1 | 96 | 1 | 38 | | 6 | 1 | 96 | 2 | 38 | | 7 | 3 | 24 | 2 | -20 if ,  -21 if | | 8 | 3 | 24 | 2 | 24 | | 9 | 3 | 48 | 2 | -20 if ,  -21 if | | 10 | 3 | 48 | 2 | 48 | | 11 | Reserved | | | | | 12 | Reserved | | | | | 13 | Reserved | | | | | 14 | Reserved | | | | | 15 | Reserved | | | |   Table 13-10B: Set of resource blocks and slot symbols of CORESET for Type0-PDCCH search space set when {SS/PBCH block, PDCCH} SCS is {480, 480} kHz or {960, 960} for FR2-2   |  |  |  |  |  | | --- | --- | --- | --- | --- | | Index | SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols | Offset (RBs) | | 0 | 1 | 24 | 2 | 0 | | 1 | 1 | 24 | 2 | 4 | | 2 | 1 | 48 | 1 | 0 | | 3 | 1 | 48 | 1 | 14 | | 4 | 1 | 48 | 1 | 28 | | 5 | 1 | 48 | 2 | 0 | | 6 | 1 | 48 | 2 | 14 | | 7 | 1 | 48 | 2 | 28 | | 8 | 1 | 96 | 1 | 0 | | 9 | 1 | 96 | 1 | 76 | | 10 | 1 | 96 | 2 | 0 | | 11 | 1 | 96 | 2 | 76 | | 12 | 3 | 24 | 2 | -20 if ,  -21 if | | 13 | 3 | 24 | 2 | 24 | | 14 | 3 | 48 | 2 | -20 if ,  -21 if | | 15 | 3 | 48 | 2 | 48 |   ======================= Unchanged Text Omitted ============================= |

### Summary of Discussions

The following is a summary of company views on the CORESET#0 configuration in MIB.

* For 120 kHz
  + Finalize later once RAN4 finishes channelization: CATT, NTT Docomo
  + Multiplexing pattern 1 with 24 RBs:
    - 0 RB offset: Intel, Ericsson
    - 2 RB offset: Samsung
    - {0, 4} RB offset : Huawei/HiSilicon, vivo, Qualcomm
  + Multiplexing pattern 1 with 48 RBs:
    - 14 RB offset: Qualcomm
    - {0, 28} RB offset: Samsung
    - {0, 14, 28} RB offset: Huawei/HiliSicon, Intel, vivo, Ericsson
  + Multiplexing pattern 1 with 96 RBs:
    - 0 RB offset: Intel, Ericsson
    - {0, 76} RB offset: Huawei/HiSilicon, vivo
    - {0, 38, 76} RB offset: Nokia/NSB
    - 38 RB offset: Samsung
  + Multiplexing pattern 3 with 24 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 24} RB offset: Interdigital, Samsung, Ericsson, Qualcomm
  + Multiplexing pattern 3 with 48 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 48} RB offset: Interdigital, Samsung, Ericsson, Qualcomm
* For 480 kHz
  + Multiplexing pattern 1 with 24 RBs:
    - 0 RB offset: Intel, Ericsson
    - {0, 4} RB offset: Huawei/HiSilicon, vivo, Samsung, Qualcomm
  + Multiplexing pattern 1 with 48 RBs:
    - 14 RB offset: Qualcomm
    - {0, 14, 28} RB offset: Huawei/HiSilicon, Intel, vivo, Samsung, Ericsson
  + Multiplexing pattern 1 with 96 RBs:
    - {0, 38} RB offset: Intel
    - {0, 56} RB offset: Ericsson
    - {0, 76} RB offset: Huawei/HiSilicon, vivo, Samsung
    - {0, 36, 72, 76} RB offset: Nokia/NSB
  + Multiplexing pattern 3 with 24 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 24} RB offset: Interdigital, Ericsson, Qualcomm
  + Multiplexing pattern 3 with 48 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 48} RB offset: Interdigital, Ericsson, Qualcomm
* For 960 kHz
  + Multiplexing pattern 1 with 24 RBs:
    - {0, 4} RB offset: Huawei/HiSilicon, Intel, vivo, Samsung, Qualcomm, Ericsson
  + Multiplexing pattern 1 with 48 RBs:
    - 14 RB offset: Qualcomm
    - 0 RB offset: Intel, Ericsson
    - {0, 14, 28} RB offset: Huawei/HiSilicon, vivo, Samsung
  + Multiplexing pattern 1 with 96 RBs:
    - 0 RB offset: Intel
    - {0, 56} RB offset: Ericsson
    - {0, 76} RB offset: Huawei/HiSilicon, Samsung
  + Multiplexing pattern 3 with 24 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 24} RB offset: Interdigital, Samsung, Ericsson, Qualcomm
  + Multiplexing pattern 3 with 48 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 48} RB offset: Interdigital, Samsung, Ericsson, Qualcomm
* For the 57 – 66 GHz band, the SSB-CORESET0 offsets proposed in Section 5.1 for the floating channelization design are also valid for the fixed design, and no additional offset values need to be defined
  + Ericsson, [Intel]
* Additionally support 1 symbol duration 96 RB CORESET for 480 and 960 kHz for multiplexing pattern 1.
  + Intel

Discuss further on the RB offset values and the proposals discussed above.

### 1st Round Discussion

It looks like few companies like Intel and Ericsson has provided some quantitative analysis of required RB offsets. Moderator thinks it will be highly useful if companies can provide some quantitative analysis of which RB offsets are required to support both licensed and unlicensed operation based on RAN4 LS.

Companies are asked to provide further comments (including preferences, or whether they can accept specific options) on the following summary (e.g. provide further information or quantitative analysis about reasons behind the RB offset)

* For 120 kHz
  + Finalize later once RAN4 finishes channelization: CATT, NTT Docomo
  + Multiplexing pattern 1 with 24 RBs:
    - 0 RB offset: Intel, Ericsson
    - 2 RB offset: Samsung
    - {0, 4} RB offset : Huawei/HiSilicon, vivo, Qualcomm, Nokia, Samsung
  + Multiplexing pattern 1 with 48 RBs:
    - 14 RB offset: Qualcomm
    - {0, 28} RB offset: Samsung
    - {0, 14, 28} RB offset: Huawei/HiliSicon, Intel, vivo, Ericsson, Nokia, Samsung
  + Multiplexing pattern 1 with 96 RBs:
    - 0 RB offset: Intel, Ericsson
    - {0, 76} RB offset: Huawei/HiSilicon, vivo, Samsung
    - {0, 38, 76} RB offset: Nokia/NSB, Samsung
    - 38 RB offset: Samsung
  + Multiplexing pattern 3 with 24 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 24} RB offset: Interdigital, Samsung, Ericsson, Qualcomm
  + Multiplexing pattern 3 with 48 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 48} RB offset: Interdigital, Samsung, Ericsson, Qualcomm
* For 480 kHz
  + Multiplexing pattern 1 with 24 RBs:
    - 0 RB offset: Intel, Ericsson
    - {0, 4} RB offset: Huawei/HiSilicon, vivo, Samsung, Qualcomm, Nokia
  + Multiplexing pattern 1 with 48 RBs:
    - 14 RB offset: Qualcomm
    - {0, 14, 28} RB offset: Huawei/HiSilicon, Intel, vivo, Samsung, Ericsson, Nokia
  + Multiplexing pattern 1 with 96 RBs:
    - {0, 38} RB offset: Intel
    - {0, 56} RB offset: Ericsson
    - {0, 76} RB offset: Huawei/HiSilicon, vivo, Samsung
    - [{0, 36, 72, 76}] RB offset: Nokia/NSB
  + Multiplexing pattern 3 with 24 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 24} RB offset: Interdigital, Ericsson, Qualcomm, Samsung
  + Multiplexing pattern 3 with 48 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 48} RB offset: Interdigital, Ericsson, Qualcomm, Samsung
* For 960 kHz
  + Multiplexing pattern 1 with 24 RBs:
    - {0, 4} RB offset: Huawei/HiSilicon, Intel, vivo, Samsung, Qualcomm, Ericsson, Nokia
  + Multiplexing pattern 1 with 48 RBs:
    - 14 RB offset: Qualcomm
    - 0 RB offset: Intel, Ericsson
    - {0, 14, 28} RB offset: Huawei/HiSilicon, vivo, Samsung, Nokia
  + Multiplexing pattern 1 with 96 RBs:
    - 0 RB offset: Intel
    - {0, 56} RB offset: Ericsson
    - {0, 76} RB offset: Huawei/HiSilicon, Samsung
    - {0, 36, 72, 76} RB offset: Nokia/NSB
  + Multiplexing pattern 3 with 24 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 24} RB offset: Interdigital, Samsung, Ericsson, Qualcomm
  + Multiplexing pattern 3 with 48 RB:
    - -20 or -21 (depending on k\_ssb) RB offset: Intel, vivo
    - {-20 or -21 (depending on k\_ssb) or 48} RB offset: Interdigital, Samsung, Ericsson, Qualcomm

|  |  |
| --- | --- |
| Company | Comments |
| InterDigital | If multiplexing pattern 3 is supported in CORESET#0 configuration, we prefer to use the currently existing RB offset configuration in Rel. 16.  Therefore, we support two RB offset values for MUX 3. The two values could be (-20 if kssb=0, -21 based on kssb) and X, where X is the number of RBs in the respective CORESET#0 (can be 24 or 48 RBs).  In this way, the CORESET#0 could be multiplexed along with SSB in frequency domain, wherein the CORESET#0 RBs could have the option to be positioned preceding or following the respective SSB RBs. |
| Nokia | Update to the above summary our proposed ranges, if missing. For multiplexing pattern 3 case we did not have specific/dedicated proposal in our paper but in the formulated tables {-20/-21, 24} and {-20/-21, 48} were assumed, for 24RB and 48RB CORESET sizes, respectively.  We used fixed RF channel placement (given in Appendix A of our contribution in R1-2201662) to identify the possible channel locations i.e.   * + Distance between center of the channels being integer multiple of 960 kHz   + Guard bands of different RF channels are not overlapping   + For 100MHz channel bandwidth the channel raster step is minimized   + For 400MHz, 800MHz, 1600MHz and 2GHz channel bandwidths the channel raster locations are aligned to enable smooth CA operation and minimize the gap between channels   Based on these locations we evaluated the needed SS-raster positions and RB offsets for ‘fixed SS-raster’. For ‘floating SS-raster’ valid ARFCN was assumed for channel placement, and RB offsets were identified.  For multiplexing pattern 1 and CORESET size of 24RB and 48RB, it would seem that regardless of partially different assumptions, common offsets can be found. With multiplexing pattern 3, the offsets should be hopefully common.  Further discussion and alignment seems to be needed for 96RB case. |
| Samsung | We also provided the analysis on the minimum number of frequency offset required for each possible sync raster intervals discussed in RAN4, according to same principle used for Rel-15. The particular choices on the offset values, according to the minimum number of offsets, can be multiple, and we can be flexible on that point. We suggest to go with a conservative design as long as the total number of rows in the CORESET#0 configuration table doesn’t exceed 16. |

## 2.5 NR Carrier RSSI measurement

* From [16] Samsung
  + For 480 and 960 kHz:
    - Support the following 4 configurations for NR carrier RSSI measurement:
    - Configuration #0: {0, 1};
    - Configuration #1: {0, 1, …, 5};
    - Configuration #2: {0, 1, …, 8};
    - Configuration #3: {0, 1, …, 12};
  + Adopt TP#5-1 for TS 38.215.

#### TP# 5-1 for TS38.215 [16]

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 5.1.3 SS reference signal received quality (SS-RSRQ)  ======================== Unchanged Text Omitted ===========================  Table 5.1.3-1: NR Carrier RSSI measurement symbols   |  |  | | --- | --- | | **OFDM signal indication *endSymbol*** | **Symbol indexes** | | | 0 | {0,1} | | 1 | For 480 kHz and 960 kHz {0,1,2,..,10,12}; otherwise {0,1,2,..,10,11} | | 2 | {0,1,2,…, 5} | | 3 | For 480 kHz and 960 kHz {0,1,2,..,8}; otherwise {0,1,2,…, 7} |   ========================= Unchanged Text Omitted ============================== |

### Summary of Discussions

Updates to NR RSSI has been discussed in the last two meetings. However, the proposal was not agreeable and RAN1 was not able to conclude previously. Given the ample time to discuss and agree to the proposal, moderator suggests unless there is new compelling evidence or information, we skip the discussion and close the issue for Rel-17.

Moderator asks the proponent companies to provide inputs to concerns raised from the previous meetings that stopped RAN1 to agree on the proposal.

### 1st Round Discussion

Moderator asks the proponent companies to provide inputs to concerns raised from the previous meetings that stopped RAN1 to agree on the proposal. Companies are asked to provide further comments on the proposal.

|  |  |
| --- | --- |
| Company | Comments |
| Samsung | As commented in the last meeting, we are ok with compromising to the following TP. Whether this change is essential or optimization is indeed subject, and we believe this change is beneficial and without any technical drawback. We would encourage more companies to reconsider this issue and reach a consensus.  ===================== Unchanged Text Omitted ===========================  Table 5.1.3-1: NR Carrier RSSI measurement symbols   |  |  | | --- | --- | | **OFDM signal indication *endSymbol*** | **Symbol indexes** | | | 0 | {0,1} | | 1 | For 480 kHz and 960 kHz {0,1,2,..,10,12}; otherwise {0,1,2,..,10,11} | | 2 | {0,1,2,…, 5} | | 3 | {0,1,2,…, 7} |   ==================== Unchanged Text Omitted ============================== |
|  |  |

## 2.6 PRACH

* From [19] LG Electronics,
  + Update the Table 6.3.3.2-1 in TS 38.211 as in TP#6-1

#### TP# 6-1 for TS38.211 [19]

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table 6.3.3.2-1: Supported combinations of and , and the corresponding value of .**   |  |  |  |  |  | | --- | --- | --- | --- | --- | |  | **for PRACH** | **for PUSCH** | **, allocation expressed in number of RBs for PUSCH** |  | | 839 | 1.25 | 15 | 6 | 7 | | 839 | 1.25 | 30 | 3 | 1 | | 839 | 1.25 | 60 | 2 | 133 | | 839 | 5 | 15 | 24 | 12 | | 839 | 5 | 30 | 12 | 10 | | 839 | 5 | 60 | 6 | 7 | | 139 | 15 | 15 | 12 | 2 | | 139 | 15 | 30 | 6 | 2 | | 139 | 15 | 60 | 3 | 2 | | 139 | 30 | 15 | 24 | 2 | | 139 | 30 | 30 | 12 | 2 | | 139 | 30 | 60 | 6 | 2 | | 139 | 60 | 60 | 12 | 2 | | 139 | 60 | 120 | 6 | 2 | | 139 | 120 | 60 | 24 | 2 | | 139 | 120 | 120 | 12 | 2 | | 139 | 120 | 480 | 3 | 1 | | 139 | 120 | 960 | 2 | 23 | | 139 | 480 | 120 | ~~48~~47 | 1~~2~~ | | 139 | 480 | 480 | 12 | 2 | | 139 | 480 | 960 | 6 | 2 | | 139 | 960 | 120 | 94~~96~~ | ~~2~~1 | | 139 | 960 | 480 | 24 | 2 | | 139 | 960 | 960 | 12 | 2 | | 571 | 30 | 15 | 96 | 2 | | 571 | 30 | 30 | 48 | 2 | | 571 | 30 | 60 | 24 | 2 | | 571 | 120 | 120 | 48 | 2 | | 571 | 120 | 480 | 12 | 1 | | 571 | 120 | 960 | 7 | 47 | | 571 | 480 | 120 | 191~~192~~ | 1~~2~~ | | 571 | 480 | 480 | 48 | 2 | | 571 | 480 | 960 | 24 | 2 | | 1151 | 15 | 15 | 96 | 1 | | 1151 | 15 | 30 | 48 | 1 | | 1151 | 15 | 60 | 24 | 1 | | 1151 | 120 | 120 | 97 | 6 | | 1151 | 120 | 480 | 25 | 23 | | 1151 | 120 | 960 | 13 | 45 | |

### Summary of Discussions

Updates to NR PRACH table has been discussed in the last meetings. However, the proposal was not agreeable and RAN1 was not able to conclude previously. Given that this is issue being revisited, moderator suggests unless there is new compelling evidence or information, we skip the discussion and close the issue for Rel-17.

Moderator asks the proponent companies to provide inputs to concerns raised from the previous meetings that stopped RAN1 to agree on the proposal.

### 1st Round Discussion

Moderator asks the proponent companies to provide inputs to concerns raised from the previous meetings that stopped RAN1 to agree on the proposal. Companies are asked to provide further comments on the proposal.

|  |  |
| --- | --- |
| Company | Comments |
|  |  |
|  |  |

## 2.7 Editorial Aspects

* From [2] Futurewei:
  + Change the Draft 38.213 h00 text “For operation without shared spectrum channel access, in FR1 and FR2, and for operation with shared spectrum channel access in FR2-2” to “For operation without shared spectrum channel access, in FR1 and FR2, and for operation in FR2-2”
* From [7] ZTE/Sanechips
  + For PRACH slot index for 480 and 960 kHz, adopt TP#7-2 in TS 38.211.
* From [10] Panasonic
  + Adopt TP#7-3, #7-4

#### TP# 7-1 for TS38.213 [10]

|  |
| --- |
| 4.1 Cell search ============= Unchanged Text Omitted =============  - For operation without shared spectrum channel access, in FR1 and FR2, and for operation ~~with shared spectrum channel access~~ in FR2-2  - For operation with shared spectrum channel access in FR1, for and 15 kHz SCS of SS/PBCH blocks and for and 30 kHz SCS of SS/PBCH blocks  ============= Unchanged Text Omitted ===================== |

#### TP# 7-2 for TS38.211 [7]

|  |
| --- |
| **5.3.2 OFDM baseband signal generation for PRACH**  < Unchanged parts are omitted >  where  -  is given by the parameter "starting symbol" in Tables 6.3.3.2-2 to 6.3.3.2-4;  -  is the PRACH transmission occasion within the PRACH slot, numbered in increasing order from 0 to  within a RACH slot where  is given Tables 6.3.3.2-2 to 6.3.3.2-4 for and fixed to 1 for ;  -  is given by Tables 6.3.3.2-2 to 6.3.3.2-4;  -  is given by  - if kHz, then  - if kHz and either of "Number of PRACH slots within a subframe" in Tables 6.3.3.2-2 to 6.3.3.2-3 or "Number of PRACH slots within a 60 kHz slot" in Table 6.3.3.2-4 is equal to 1, then , otherwise  *{indent backwards here}*- if kHz and *{next paragraph here}*  - the "Number of PRACH slots within a 60 kHz slot" in Table 6.3.3.2-4 is equal to 1, then for kHz and for kHz  *{indent forwards here}*- the "Number of PRACH slots within a 60 kHz slot" in Table 6.3.3.2-4 is equal to 2, then for kHz and for kHz.  < Unchanged parts are omitted > |

#### TP# 7-3 for TS38.211 [10]

|  |
| --- |
| 7.4.3.1 Time-frequency structure of an SS/PBCH block ============= Unchanged Text Omitted =============  - For operation without shared spectrum channel access, and for operation with shared spectrum channel access in FR2-2, 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, , and if *ssb-SubcarrierOffset* is not provided, is derived from the frequency difference between the SS/PBCH block and Point A.  ============= Unchanged Text Omitted ===================== |

#### TP# 7-4 for TS38.213 [10]

|  |
| --- |
| 13 UE procedure for monitoring Type0-PDCCH CSS sets  ============= Unchanged Text Omitted =============  For operation without shared spectrum channel access, and for operation with shared spectrum channel access in FR2-2, a UE assumes that the offset in Tables 13-1 through 13-10C is defined with respect to the SCS of the CORESET for Type0-PDCCH CSS set from the smallest RB index of the CORESET for Type0-PDCCH CSS set to the smallest RB index of the common RB overlapping with the first RB of the corresponding SS/PBCH block. The SCS of the CORESET for Type0-PDCCH CSS set is provided by *subCarrierSpacingCommon* for FR1 and FR2-1 and same as the SCS of the corresponding SS/PBCH block for FR2-2. In Tables 13-7, 13-8, and 13-10 is defined in [4, TS 38.211].  ============= Unchanged Text Omitted ===================== |

### Summary of Discussions

The suggested updates in TP#7-1, 7-2, 7-3, and 7-4 all seem reasonable editorial changes that fixed ambiguity and adds clarity to specification. Moderator asks companies to review the TP and comment if they are acceptable.

### 1st Round Discussion

Moderator asks companies to check on TP#7-1, #7-2, #7-3, and #7-4 and provide comments on them.

|  |  |
| --- | --- |
| Company | Comments |
| InterDigtial | We support moderator’s assessment and find the TP#7-1, 7-2, 7-3, and 7-4 acceptable. |
| Nokia | TP#7-1: OK  TP#7-2: OK  TP#7-3/4: OK |
| Samsung | Editor has fixed the wording related to TP#7-1 in the draft CR after RAN1#107bis, so we believe this TP is not needed anymore.  OK with TP#7-2.  TP#7-3/4, we don’t think the change is essentially needed (especially when two editors are using the same wording in different spec), but we are ok if all companies want the change. |
| Qualcomm | Fine with TP# 7-1, 7-2, 7-3, and 7-4 |

## 2.8 Other Aspects

* From [5] OPPO:
  + Support indication of short control signalling transmission related parameters.
  + RAN4’s conclusions on fixed channelization for unlicensed band should be taken into account and revisit the following questions:
    - Whether RB set should be reconsidered to match with channelization
    - Whether CORESET should be configured within each channelization
    - Whether PUCCH and PRACH should be transmitted within channelization
    - Whether LBT bandwidth should be aligned with channelization (related to agenda item 8.2.6)
* From [9] Spreadtrum
  + Supporting initial cell selection with 480kHz SSB should be an optional UE capability separately from supporting other processing with 480/960kHz SCS.
  + The candidate SSB positions for 120kHz SCS follows the current spec.
  + The SSB-based TRS/CSI-RS validation can be supported.

### Summary of Discussions

Similar to last meeting, moderator suggest that short control signaling and LBT aspects to be discussed in channel access agenda. Also any discussion whether specific features should be optional or mandatory should be discussed in the UE feature discussion (unless it is proposal to introduce a new capability).

Companies to provide additional comments for other missing issues not covered by the moderator summary.

### 1st Round Discussion

Companies to provide additional comments for other missing issues not covered by the moderator summary.

|  |  |
| --- | --- |
| Company | Comments |
|  |  |
|  |  |

# Reference

1. R1-2200952, “Remaining issue of initial access signals and channels for 52-71GHz spectrum,” Huawei, HiSilicon
2. R1-2200987, “On the remaining issues in initial access for Beyond 52.6GHz,” FUTUREWEI
3. R1-2201032, “Remaining issues for initial access operation in 52.6-71GHz,” InterDigital, Inc.
4. R1-2201085, “Remaining issues on initial access aspects for NR operation from 52.6GHz to 71GHz,” vivo
5. R1-2201265, “Discussion on remaining issue for initial access aspects,” OPPO
6. R1-2201351, “Remaining issues on Initial access aspects for up to 71GHz operation,” CATT
7. R1-2201388, “Remaining issues on the initial access aspects for 52.6 to 71GHz,” ZTE, Sanechips
8. R1-2201470, “Remaining issues on initial access aspects for NR in FR2-2,” NTT DOCOMO, INC.
9. R1-2201541, “Discussion on initial access aspects for NR for 60GHz,” Spreadtrum Communications
10. R1-2201596, “Maintenance on initial access aspects for NR from 52.6 GHz to 71 GHz,” Panasonic Corporation
11. R1-2201662, “Initial access aspects,” Nokia, Nokia Shanghai Bell
12. R1-2201688, “Discussion on initial access aspects for extending NR up to 71 GHz,” Intel Corporation
13. R1-2201734, “Initial Access Aspects,” Ericsson
14. R1-2201764, “On remaining issues for initial access,” Apple
15. R1-2201901, “Remaining issues on initial access aspects supporting NR from 52.6 to 71 GHz,” NEC
16. R1-2202004, “Maintenance on initial access aspects for NR from 52.6 GHz to 71 GHz,” Samsung
17. R1-2202129, “Initial access aspects for NR in 52.6 to 71GHz band,” Qualcomm Incorporated
18. R1-2202189, “Initial access aspects,” Sharp
19. R1-2202335, “Initial access aspects to support NR above 52.6 GHz,” LG Electronics

# List of RAN1 Agreements on initial access

## RAN1 #104-e

**R1-2102073** [Draft] LS on beam switching gap for 60 GHz band Intel Corporation

Final LS endorsed in R1-2102202

Agreement:

Send an LS to RAN4 to get input on gap required for gNBs and UEs for beam switching and for UL/DL and DL/UL switching.

Agreement:

Whether or not to support 240 kHz, 480kHz and 960kHz SCS for SSB and the conditions under which SSB for 240 kHz, 480 kHz and 960 kHz may be supported will be decided no later than RAN1#104bis-e.

Agreement:

For an unlicensed band that requires LBT, further study whether/how to support discovery burst (DB) and discovery burst transmission window (DBTW) at least for 120 kHz SSB SCS

* If DB supported
  + FFS: What signals/channels are included in DB other than SS/PBCH block
* If DBTW is supported
  + Support mechanism to indicate or inform that DBTW is enabled/disabled for both IDLE and CONNECTED mode UEs
    - FFS: how to support UEs performing initial access that do not have any prior information on DBTW.
  + PBCH payload size is no greater than that for FR2
  + Duration of DBTW is no greater than 5 ms
  + Number of PBCH DMRS sequences is the same as for FR2
* The following points are additionally FFS:
  + How to indicate candidate SSB indices and QCL relation without exceeding limit on PBCH payload size
  + Details of the mechanism for enabling/disabling DBTW considering LBT exempt operation and overlapping licensed/unlicensed bands
  + Whether or not to support DBTW for SSB SCS(s) other than 120 kHz if other SSB SCS(s) are supported

Agreement:

For CORESET#0 and Type0-PDCCH search space configured in MIB:

* Support {SS/PBCH Block, CORESET#0 for Type0-PDCCH} SCS equal to {120, 120} kHz
  + Support at least SSB and CORESET#0 multiplexing patterns, number of RBs for CORESET#0, number of symbols (duration of CORESET#0) that are supported in Rel-15/16 for {SS/PBCH Block, CORESET#0 for Type0-PDCCH} SCS = {120, 120} kHz.
    - FFS: Supporting additional values
  + FFS: Supported values for SSB to CORESET#0 offset RBs
* If 480kHz SSB SCS that configures CORESET#0 and Type0-PDCCH CSS in MIB is agreed to be supported,
  + Support {SS/PBCH Block, CORESET#0 for Type0-PDCCH} SCS equal to {480, 480} kHz
* If 960 kHz SSB SCS that configures CORESET#0 and Type0-PDCCH CSS in MIB is agreed to be supported,
  + Support {SS/PBCH Block, CORESET#0 for Type0-PDCCH} SCS equal to {960, 960} kHz
* If 240 kHz SSB SCS is agreed to be supported,
  + Support {SS/PBCH Block, CORESET#0 for Type0-PDCCH} SCS equal to {240, 120} kHz
* FFS: any other combinations between one of SSB SCS (120, 240, 480, 960) and one of CORESET#0 SCS (120, 480, 960)
  + FFS: initial timing resolution based on low SCS (120 kHz) and its impact on the performance of higher SCS (480/960 kHz)

Agreement:

For 480 kHz and 960 kHz SSB SCS (if agreed)

* Study further on reserving symbol gap between SSB positions with different SSB index (and possibly between SSB position and other signal/channels)
  + FFS: whether symbol gap is needed for only 960 kHz or both 480 and 960 kHz.
* Study further on reserving gap for UL/DL switching within the pattern accounting possibility for reserving UL transmission occasions in the SSB pattern
* Study should account for inputs from RAN4

Agreement:

* For initial access and non-initial access use cases, support 120kHz PRACH SCS with sequence length L=571, 1151 (in addition to L=139) for PRACH Formats A1~A3, B1~B4, C0, and C2.
* For non-initial access use cases,
  + if 480kHz and/or 960 kHz SSB SCS is agreed to be supported, support 480 and/or 960 kHz PRACH SCS with sequence length L=139 for PRACH Formats A1~A3, B1~B4, C0, and C2, respectively.
    - FFS: support of sequence length L = 571, 1151
* FFS: Support of 480 and/or 960 kHz PRACH SCS for initial access use cases, if 480 and/or 960 kHz SSB SCS is agreed to be supported for initial access

Agreement:

If 480 and/or 960 kHz PRACH SCS is supported, RAN1 should study whether or not the current RA-RNTI calculation and PRACH identification in RAR correctly provides unique identification of PRACH.

## RAN1 #104-bis-e

Agreement:

For the case where SSB location and SCS are explicitly provided to the UE (non-initial access) and SSB does not configure Type-0 PDCCH, support 480 kHz and 960 kHz numerologies for the SSB

* Note: Strive to minimize specification impact due to the new SCS for SSB

Agreement:

* For operation with shared spectrum channel access of NR 52.6 – 71 GHz, support discovery burst (DB) and define the DB same as in Rel-16 37.213 Section 4.0
* FFS: Support discovery burst transmission window (DBTW) at least for SSB with 120 kHz SCS with the following requirements
  + PBCH payload size is no greater than that for FR2
  + Duration of DBTW is no greater than 5 ms
  + Number of PBCH DMRS sequences is the same as for FR2
  + FFS: applicability of DBTW design for 120kHz to SSB with 480kHz and 960kHz SCS
  + Support mechanism to indicate or inform that DBTW is enabled/disabled for both IDLE and CONNECTED mode UEs
    - FFS: how to support UEs performing initial access that do not have any prior information on DBTW.
    - FFS: details of the mechanism for enabling/disabling DBTW considering LBT exempt operation and overlapping licensed/unlicensed bands
    - FFS: details of how to inform UEs of the configuration of DBTW

Agreement:

For SSB with 120kHz SCS for NR 52.6 GHz to 71 GHz,

* 120 kHz SCS: the first symbols of the candidate SS/PBCH blocks have indexes {4, 8,16, 20} + 28×n, where index 0 corresponds to the first symbol of the first slot in a half-frame.
* For carrier frequencies within 52.6 GHz to 71GHz, support at least 𝑛 = 0, 1, 2, 3, 5, 6, 7, 8, 10, 11, 12, 13, 15, 16, 17, 18.
  + Other values of *n* (if any) are FFS, and support of additional n values are subject to support of DBTW for 120kHz SSB

Agreement:

* PRACH configuration for 480/960 kHz SCS (if agreed)
  + The minimum PRACH configuration period is 10 ms (as in FR2)
  + For RO configuration for PRACH with 480/960kHz SCS,
    - FFS: details of how to configure the 480/960 kHz PRACH ROs using [60 or 120 kHz] reference slot considering at least:
      * location of 480/960 kHz PRACH slot per reference slot
      * location of duration containing 480/960khz PRACH slot pattern within 10ms
      * potential impact to RA-RNTI calculation

## RAN1 #105-e

Agreement:

For 480kHz/960kHz SSB, select one of the following alternatives:

* ALT 1) First symbols of the candidate SSB have index {X, Y} + 14\*n, where index 0 corresponds to the first symbol of the first slot in a half-frame
  + value of X and Y are identical for 480kHz and 960kHz
    - FFS: exact value of X and Y
* ALT 2) First symbols of the candidate SSB have index {4, 8, 16,20} + 28\*n, where index 0 corresponds to the first symbol of the first slot in a half-frame
* Values of n for 480kHz and 960kHz for ALT 1 and 2
  + FFS: whether number of values for ‘n’ depend on LBT operation (i.e. LBT vs no-LBT)
  + FFS: exact values of ‘n’ for each SCS
  + Values of ‘n’ for one mode of operation shall be strictly a subset of values for another mode of operation, if two mode of operation exist for number of candidate SSBs
  + FFS: whether values of ‘n’ shall not be all consecutive integer values (i.e. non-candidate SSB slots are positioned every few candidate SSB slots)

Proposal:

In addition to 120kHz, support **480** kHz SSB for initial access with support of CORESET0/Type0-PDCCH configuration in the MIB with following constraints.

* Limited sync raster entry numbers
  + It is assumed that RAN4 supports a channelization design which results in the total number of synchronization raster entries considering both licensed and unlicensed operation in a 52.6 – 71 GHz band no larger than 665 (Note: the total number of synchronization raster entries in FR2 for band n259 + n261 is 602). If the assumption cannot be satisfied, it’s up to RAN4 to decide its applicability to bands in 52.6 – 71 GHz.
* only 480kHz CORESTE#0/Type0-PDCCH SCS supported for 480 kHz SSB SCS.
* SSB time domain candidate resource pattern (within a slot or pair of slots) for 480 and 960kHz SSB are identical
* Prioritize support SSB-CORESET0 multiplexing pattern 1. Other patterns discussed on a best effort basis.
* Note: Strive to minimize specification impact by reusing tables for CORESET#0 and type0-PDCCH CSS set configuration defined for FR2 in Rel-15, as much as possible

Formal objection sustained by: Huawei, MediaTek (would like to discuss at next meeting)

Proposal:

In addition to 120kHz, support **both** **480 and 960** kHz SSB for initial access with support of CORESET0/Type0-PDCCH configuration in the MIB with following constraints.

* Limited sync raster entry numbers
  + It is assumed that RAN4 supports a channelization design which results in the total number of synchronization raster entries considering both licensed and unlicensed operation in a 52.6 – 71 GHz band no larger than 665 (Note: the total number of synchronization raster entries in FR2 for band n259 + n261 is 602). If the assumption cannot be satisfied, it’s up to RAN4 to decide its applicability to bands in 52.6 – 71 GHz.
* only 1 CORESTE#0/Type0-PDCCH SCS supported for each SSB SCS i.e., (480,480) and (960,960).
* SSB time domain candidate resource pattern (within a slot or pair of slots) for 480 and 960kHz SSB are identical
* Prioritize support SSB-CORESET0 multiplexing pattern 1. Other patterns discussed on a best effort basis.
* Note: Strive to minimize specification impact by reusing tables for CORESET#0 and type0-PDCCH CSS set configuration defined for FR2 in Rel-15, as much as possible

Formal objection sustained by: Huawei, MediaTek (object to 960 kHz)

Proposal:

To support ANR and PCI confusion detection for 480/960kHz SCS based SSB, support CORESET#0/Type0-PDCCH configuration in MIB of 480 and 960kHz SSB

* FFS: additional method(s) to enable support to obtain neighbor cell PCI and SIB1 contents related to CGI reporting
* Only 1 CORESTE#0/Type0-PDCCH SCS supported for each SSB SCS, i.e., (480,480) and (960,960).
* Prioritize support SSB-CORESET0 multiplexing pattern 1. Other patterns discussed on a best effort basis.
* Note: Strive to minimize specification impact by reusing tables for CORESET#0 and type0-PDCCH CSS set configuration defined for FR2 in Rel-15, as much as possible
* Note: From UE perspective, ANR detection for 480/960kHz SCS based SSB is not supported if the UE does not support 480/960 SCS for SSB.
* Note: for ANR, when reading the MIB, the cell containing the SSB is known to the UE, as defined in 38.133 specification.

Formal objection sustained by: Huawei

Agreement:

For the case agreed in RAN1 #104bis-e where 480/960 kHz SSB location and SCS are explicitly provided to the UE (non-initial access)

* Support configuring CORESET#0/Type0-PDCCH for the purpose of ANR/PCI confusion detection by down selecting from the following two alternatives
  + Alt 1) Using dedicated signaling
  + Alt 2) Using configuration in MIB
    - Note: for ANR, when reading the MIB, the cell containing the SSB is known to the UE, as defined in 38.133 specification.

Agreement:

For 480kHz and 960kHz PRACH,

* Down-select among option 1 and 2
  + Option 1) The reference slot duration corresponds to 60 kHz SCS. A PRACH slot index, , corresponds to one of the starting 480/960 kHz PRACH slots within the reference slot.
    - FFS: supported values of the starting PRACH slot index within reference slot and whether or not the ROs for a given PRACH configuration can span more than one PRACH slot if gaps between consecutive ROs are supported for LBT and/or beam switching purposes
  + Option 2) Each 120kHz RO corresponds to 4 and 8 candidate RO positions for 480kHz and 960kHz PRACH, respectively. Information about the number and locations of 480/960kHz candidate RO(s) are configured or pre-selected within each 120kHz RO. The reference 120kHz RO is determined by the current PRACH configuration method in Rel-15/16 specification.
* Following alternatives are considered on PRACH density
  + ALT 1) At least the same density (i.e. number of PRACH slots per reference slot) as for 120kHz PRACH in FR2 is supported
    - FFS: support for higher PRACH slot density (number of PRACH slots per reference slot)
  + ALT 2) at least the same RO density (i.e. number of RO per reference slot) as for 120kHz PRACH in FR2 is supported
    - FFS: support for higher RO density
  + An “example” illustration of PRACH slots for 480/960kHz is shown below:



* FFS: whether and how to account for LBT in RO configuration (if needed)
* FFS: whether and how to account for beam switching gap in RO configuration (if needed)

Agreement:

FFS: Support DBTW at least for 120kHz

* FFS whether DBTW will be applicable for 480/960 kHz SSB SCS
  + If DBTW is supported for 480/960kHz SSB:
    - For the case agreed in RAN1 #104bis-e where 480/960 kHz SSB location and SCS are explicitly provided to the UE (non-initial access), indication of DBTW configuration (e.g. enable/disable of DBTW,  , and DBTW length) are supported by dedicated signaling.
* For 120kHz SSB, support mechanism to distinguish at least the following scenarios:
  + Case 1) (Unlicensed with LBT off) + DBTW disabled
  + Case 2) (Unlicensed with LBT on) + DBTW enabled
  + Case 3) (Unlicensed with LBT on) + DBTW disabled
  + Case 4) (Licensed) + DBTW disabled
  + FFS: Whether/how LBT on/off is indicated in MIB
    - If not indicated in MIB, then FFS whether/how the UE determines different sizes of DCI 1\_0 with CRC scrambled by SI-RNTI
  + FFS: whether any case(s) can be combined for DBTW signaling design and how to handle implications to DCI 1\_0 size ambiguity if is not distinguished in signaling
  + FFS: whether all above cases need an explicit indication
  + FFS: Whether a single indication can be used for combination of more than one cases
* For 120 kHz SSB, enable/disable of DBTW is indicated by one or more of the following methods:
  + Option 1) signaling in MIB
    - Option 1-1) disabling DBTW is jointly coded with
    - Option 1-2) indicated by other bit fields in MIB
    - FFS: among options 1-1 and 1-2
  + Option 2) distinct GSCN used by the SSB
  + Option 3) By comparing the value of  in MIB and DBTW length after UE reads SIB1 or by comparing the value of  in MIB and default DBTW length of 5 ms before UE reads SIB1.
  + FFS: whether to support option 1, 2, 3, or any combination of the options.
  + Note: enable/disable signaling of DBTW by MIB or GSCN does not preclude other signaling methods

Agreement:

If DBTW is supported,

* Working assumption: MIB signaling to support
  + Alt A) indication of at least for 120kHz SSB
    - In this case, the total number of values of to not exceed 4
  + Alt B) Explicit indication of SSB index and/or SSB candidate location
    - FFS on the details of signaling
  + FFS betweenAlt A, or B, or supporting both
* Supported DBTW lengths
  + Alt 1) 0.5, 1, 2, 3, 4, 5 msec
    - Note: same as Rel-16 FR1 NR-U
  + Alt 2) maximum 5 msec
    - FFS other values
  + FFS between Alt 1 and 2
* Number of candidate positions when DBTW is enabled
  + For 120kHz SSB
    - FFS between 64 or 80
  + If DBTW is additionally supported for 480/960kHz SSB
    - FFS between 64 or 128

## RAN1 #106-e

Conclusion:

RAN1 will continue discussions to develop solutions for supporting DBTW

Agreement:

* For 480 and 960kHz PRACH:
  + The reference slot duration corresponds to 60 kHz SCS. A PRACH slot index, , corresponds to one of the starting 480/960 kHz PRACH slots within the reference slot.



Agreement:

* For 480kHz and 960kHz sub-carrier spacing, first symbols of the candidate SSB have index {2, X} + 14\*n, where index 0 corresponds to the first symbol of the first slot in a half-frame.



* Alt 1: X = 8
* Alt 2: X = 9

Agreement:

For 480kHz and 960kHz sub-carrier spacing, first symbols of the candidate SSB have index {2, 9} + 14\*n, where index 0 corresponds to the first symbol of the first slot in a half-frame.

Working assumption:

For 120kHz SSB, the number of candidates SSBs in a half frame is 64.

Agreement:

For DBTW with 120kHz SCS (if supported), support DBTW lengths {0.5, 1, 2, 3, 4, 5} msec

* Note: this should be the same as Rel-16 NR-U DBTW lengths.

Agreement:

For ‘controlResourceSetZero’ configuration for {SSB, CORESET#0/Type0-PDCCH} = {480, 480} kHz and {960, 960} kHz,

* Support the following set of parameters.

|  |  |  |
| --- | --- | --- |
| SS/PBCH block and CORESET multiplexing pattern | Number of RBs | Number of Symbols |
| 1 | 24 | 2 |
| 1 | 48 | 1 |
| 1 | 48 | 2 |

* + Note: the number of entries corresponding the same {mux pattern, number of RB, number of symbol} tuple (listed above) will depend on required RB offsets that needs to be supported based on channel and sync raster design.
* FFS: addition other set of parameters

Agreement:

Do not support PRACH length L=571, 1151 for 960kHz PRACH and at least L =1151 for 480kHz PRACH.

Agreement:

For 480 and 960kHz PRACH:

* At least the same RO density in time domain (i.e. number of specified RO per reference slot according the PRACH configuration index) as for 120kHz PRACH in FR2 is supported
  + FFS: Support gap between consecutive ROs in time domain and the details to derive the gap

Agreement:

For 480 and 960kHz PRACH,

* When a PRACH slot can contain all time domain PRACH occasions corresponding to a PRACH Config. Index in Table 6.3.3.2-4 of 38.211 including gap(s) between consecutive PRACH occasions (if supported) to account for LBT and/or beam switching,
  + and when number of PRACH slots in a reference slot is 1,
    - for 480kHz and for 960kHz PRACH
  + and when the number of PRACH slots in a reference slot is 2,
    - for 480kHz and for 960kHz PRACH
* FFS: values, when a PRACH slot cannot contain all time domain PRACH occasions~~,~~ corresponding to a PRACH Config. Index in Table 6.3.3.2-4 of 38.211 including gap(s) between consecutive PRACH occasions (if supported) to account for LBT and/or beam switching.
* FFS: whether to allow for additional values if the maximum that can be configured for the number of FD RO’s is less than 8 (due to BW limitation)

## RAN1 #106-bis-e

Working assumption:

Support DBTW for 120 kHz.

* FFS: Support for 480 kHz and 960 kHz

Conclusion:

Do not support gap between consecutive ROs for 480kHz and 960kHz

Agreement:

Same DCI size for DCI 1\_0 in CSS regardless of channel access mode (i.e., LBT on/off).

* Existing DCI size alignment in TS38.212 applies to DCI 1\_0 and 0\_0 in CSS.

Agreement:

* Indication of licensed and unlicensed operation is not explicitly indicated in MIB or PBCH payload.
  + FFS: Whether or not to indicate licensed regime by different synchronization raster entries.
* Indication of use of LBT or no-LBT is not explicitly indicated in MIB or PBCH payload.

Agreement:

No other values of n other than agreed previously is supported for 120kHz SCS, where parameter ‘n’ is the set of values to determine the first symbols of the candidate SSB blocks for 120kHz SCS in agreement from RAN1 #104-bis-e.

Working assumption:

* For {SSB, CORESET#0/Type0-PDCCH} = {120, 120} kHz, support multiplexing pattern 1 with 96 PRB CORESET#0, and {1, 2} symbol durations
* Note: the working assumption can be confirmed once RAN1 agrees on the number of needed SSB-CORESET0 offsets for 24 and 48 RB CORESET0 based on RAN4 channelization design

Agreement:

Additionally, support PRACH length L=571 for 480kHz

Agreement:

Support 120 kHz and 480 kHz subcarrier spacing for initial UL BWP for PCell.

Working assumption:

For SCS that DBTW is supported, the following fields are used to indicate parameters related to operation of DBTW

* If only 1 bit is needed: subCarrierSpacingCommon
* If 2 bits is needed: subCarrierSpacingCommon, and 1 bit from pdcch-ConfigSIB1 (pending CORESET0 or search space design would allows for this bit), else, use the spare-bit (not the Msg Extension bit)
  + The design of CORESET0 and search space shall be done without any consideration to this proposal
  + If 2 bits are needed for both 120kHz and 480/960kHz cases, then use the same bit field combination (i.e. use pdcch-ConfigSIB1 bit for 120/480/960 kHz or spare-bit for 120/480.960 kHz)
  + Note: If pdcch-ConfigSIB1 bit is used, the use of controlResourceSetZero (searchSpaceZero) for 120 kHz and   searchSpaceZero (controlResourceSetZero) for 480/960 kHz is not precluded
* FFS: if 3 bits are required
* Note: the working assumption can be confirmed after RAN1 agrees on the number of needed SSB-CORESET0 offsets based on RAN4 channelization design

Agreement:

For 120kHz SCS, for  values:

* If 2 bits are available in MIB for , at least support {16, 32, 64}
* If 1 bit is available in MIB for , support {32, 64}
  + FFS: methods to indicate more  values without increasing used number of bits, e.g., {16, 32, 64}
* Note: value  < 64 indicates DBTW enabled/supported and operation with shared spectrum.
* Note: For operation without shared spectrum channel access, a UE expects to be configured with  = 64. Use of =64 in shared spectrum is not precluded.
* FFS: 1 bit or 2 bits used for 

Agreement:

Supported value of n for 480/960kHz SSB slot pattern:

* ALT A) non-contiguous, N slot gap (slots that do not contain SSB) every M slots that contain SSB
  + same pattern will apply to 480kHz and 960kHz (i.e same N and M for 480 and 960 kHz)
  + N = 2, M = 8
  + FFS: starting position of n
* ALT B) non-contiguous, N slot gap (slots that do not contain SSB) every M slots that contain SSB
  + scaled version pattern will apply between 480 and 960 kHz (i.e. N and M for 480kHz, 2N and 2M for 960 kHz)
  + N = 2, M = 8
  + FFS: starting position of n
* ALT C) slots that do not contain SSB correspond to the slots that do not contain SSB in 120 kHz Case D.
  + Note: ALT 4 means that only slots 32-39 for 480 kHz SSB pattern are reserved for UL and 960 kHz SSB pattern is contiguous.

Agreement:

For ‘searchSpaceZero’ configuration for {SSB, CORESET#0/Type0-PDCCH} = {480, 480} kHz and {960, 960} kHz, use the following table for multiplexing pattern 1:

* FFS: The value of X (> 0)
* FFS: whether or not to use different X value depending on whether DBTW is ON/OFF
* FFS: whether or not to use same or different X value for 480 and 960 kHz
* FFS: whether Y = , or Y=, or whether to remove entries with Y

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Index** |  | **Number of search space sets per slot** |  | **First symbol index** |
| 0 | 0 | 1 | 1 | 0 |
| 1 | 0 | 2 | 1/2 | {0, if  is even}, {7, if  is odd} |
| 2 | X | 1 | 1 | 0 |
| 3 | X | 2 | 1/2 | {0, if  is even}, {7, if  is odd} |
| 4 | 5 | 1 | 1 | 0 |
| 5 | 5 | 2 | 1/2 | {0, if  is even}, {7, if  is odd} |
| 6 | 0 | 2 | 1/2 | {0, if  is even}, {Y, if  is odd} |
| 7 | X | 2 | 1/2 | {0, if  is even}, {Y, if  is odd} |
| 8 | 5 | 2 | 1/2 | {0, if  is even}, {Y, if  is odd} |
| 9 | 5 + X | 1 | 1 | 0 |
| 10 | 5 + X | 2 | 1/2 | {0, if  is even}, {7, if  is odd} |
| 11 | 5 + X | 2 | 1/2 | {0, if  is even}, {Y, if  is odd} |
| 12 | 0 | 1 | 2 | 0 |
| 13 | 5 | 1 | 2 | 0 |
| 14 | Reserved | | | |
| 15 | Reserved | | | |

## RAN1 #107-e

**Agreement**

* Support DBTW with 480 and 960 kHz SCS.
* For licensed and unlicensed operation, support 64 candidate SSB positions in a half frame
* Working assumption: Use 2 bits for Q:
  + SubcarrierSpacingCommon
  + spare bit in MIB
* Send LS to RAN2 for confirming the use of the spare bit in MIB
  + The use of 2 bits for Q can be revisited if RAN2 tells RAN1 that the spare bit cannot be used

R1-2112614 [Draft] LS on initial access for 60 GHz Intel Corporation

Final LS endorsed in R1-2112805.

**Agreement**

Confirm the following working assumptions:

* (From #106-bis-e) Support DBTW for 120 kHz.
* (From #106-e) For 120kHz SSB, the number of candidates SSBs in a half frame is 64.

**Agreement**

For SCS that support DBTW, UE derives the QCL relation between candidate SSBs by the value of , where is the candidate SSB index.

**Conclusion**

* The bit-width of ssb-PositionsInBurst in SIB1 and ServingCellConfigCommon is kept the same as in Rel-15 (i.e., 16-bits in SIB1 and 64-bits in ServingCellConfigCommon).

**Agreement**

If multiplexing pattern 3 for 480 and 960 kHz is supported, the TDRA allocation table C is updated as follows:

* Row index 6 (previously reserved) is set to
  + Dmrs-TypeA-Position: 2,3
  + PDSCH mapping type: Type B
  + K0 : 0
  + S = 11
  + L = 2

**Agreement**

Finalizing PRACH slot index for 480 and 960 kHz (removal of bracket of previous agreement)

* when number of PRACH slots in a reference slot is 1,
  + for 480kHz and for 960kHz PRACH
* when the number of PRACH slots in a reference slot is 2,
  + for 480kHz and for 960kHz PRACH

**Agreement**

Update the Table 8.1-2 in TS38.213 to indicate the Ngap (gap between valid RO and SS/PBCH) for 480 kHz and 960 kHz SCS as follows:

* for 480 kHz
* for 960 kHz;

**Agreement**

For single cell operation or for operation with carrier aggregation in a same frequency band, a UE does not transmit PRACH and PUSCH/PUCCH/SRS in a same slot or when a gap between the first or last symbol of a PRACH transmission in a first slot is separated by less than 𝑁 symbols from the last or first symbol, respectively, of a PUSCH/PUCCH/SRS transmission in a second slot where 𝑁=16 for 𝜇=5, 𝑁=32 for 𝜇=6, and 𝜇 is the SCS configuration for the active UL BWP. For a PUSCH transmission with repetition Type B, this applies to each actual repetition for PUSCH transmission [6, TS 38.214].

**Conclusion:**

as part of gap between last symbol of PDCCH order reception and first symbol of the PRACH transmission for FR2-2 uses the same value as FR2-1 (i.e. single value for FR2).

**Agreement**

* For 480 kHz, slot index, n, that contain SSB are:
  + n = {0,1,2,3,4,5,6,7, 8,9,10,11,12,13,14,15, 16,17,18,19,20,21,22,23, 24,25,26,27,28,29,30,31}
* For 960 kHz, slot index, n, that contain SSB are:
  + n = {0,1,2,3,4,5,6,7, 8,9,10,11,12,13,14,15, 16,17,18,19,20,21,22,23, 24,25,26,27,28,29,30,31}

**Agreement**

For ‘searchSpaceZero’ configuration for {SSB, CORESET#0/Type0-PDCCH} = {120, 120} kHz,

* use Table 13-12 in TS38.213 for multiplexing pattern 1,
* use Table 13-15 in TS38.213 for multiplexing pattern 3.

**Agreement**

For ‘searchSpaceZero’ configuration for {SSB, CORESET#0/Type0-PDCCH} = {480, 480} kHz and {960, 960} kHz, parameter X from previous RAN1 agreement is set to:

* X = 1.25 for 480 kHz
* X = 0.625 for 960 kHz

**Conclusion:**

For FR2-2, support the same mechanism as in Rel-16 for extended RAR window for both 4-step and 2-step RACH.

**Agreement**

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 and for , and is the SCS configuration for the active UL BWP.

**Agreement**

For 480 and 960 kHz, supported DBTW lengths are:

* {1.25, 1, 0.75, 0.5, 0.25, 0.125, X} ms, where X = 0.0625 if Q=8 is supported and X is removed if Q=8 is not supported.

**Agreement**

SSB-PositionQCL-Relation IE to indicate QCL relationship between SSB positions for FR2-2 are same set of values supported for in MIB.

**Agreement**

For operation with shared spectrum access, for SS/PBCH block and CORESET#0 multiplexing pattern 3, a UE monitors PDCCH in the Type0-PDCCH CSS set over slots that include Type0-PDCCH monitoring occasions associated with SS/PBCH blocks that are quasi co-located with the SS/PBCH block that provides a CORESET for Type0-PDCCH CSS set.

**Agreement**

For ‘searchSpaceZero’ configuration for {SSB, CORESET#0/Type0-PDCCH} = {480, 480} kHz and {960, 960} kHz, parameter Y from previous RAN1 agreement is Y = .

**Agreement**

* For 480kHz and 960kHz PRACH, reuse the RA-RNTI and MSGB-RNTI formula as FR2 and express the slot indexes t\_id based on 120kHz SCS:
  + RA-RNTI =1+s\_id+14×t\_id+14×80×f\_id +14×80×8×ul\_carrier\_id
  + MSGB-RNTI = 1 + s\_id + 14 × t\_id + 14 × 80 × f\_id + 14 × 80 × 8 × ul\_carrier\_id + 14 × 80 × 8 × 2
    - where the subcarrier spacing to determine t\_id is based on the value of µ specified in clause 5.3.2 in TS 38.211 [8] for µ = {0, 1, 2, 3}
    - for µ = {5, 6}, t\_id is the index of the 120 kHz slot in a system frame that contains the PRACH occasion (0 ≤ t\_id < 80).
  + Note: As per previous RAN1 agreement, there is only one 480 or 960 kHz PRACH slot in a 120kHz slot, such that RA-RNTI and MSGB-RNTI does not result in ID collision.
* Send LS to RAN2 on the updates on RA-RNTI and MSGB-RNTI.

R1-2112734 [Draft] LS on RA-RNTI and MSGB-RNTI for 480 and 960 kHz Intel Corporation

Final LS endorsed in R1-2112832 (with removal of “first” in text referring to the captured agreement)

**Agreement**

* Same values using the same set of signaling bits are supported for 120, 480, and 960 kHz.
* Supported values of : {16, 32, 64}
  + Note:
    - For operation with shared spectrum channel access, any supported value of can be indicated and value < 64 indicates DBTW enabled
    - UE is expected to be configured with =64 in licensed operations
    - For operation with and without shared spectrum channel access, =64 indicates that the SS/PBCH block index and the candidate SS/PBCH block index have a one-to-one mapping relationship.

**Working assumption**

For ‘controlResourceSetZero’ configuration for {SSB, CORESET#0/Type0-PDCCH} = {480, 480} kHz and {960, 960} kHz,

* After supporting entries for multiplexing pattern 1 for the agreed pairs of (, ) ={(24, 2), (48, 1), (48,2)} (with required RB offsets), if additional entries are left, support multiplex pattern 3 with 24 PRB and 2 symbol duration, and multiplexing pattern 3 with 48 PRB and 2 symbol duration.

**Working assumption**

For ‘controlResourceSetZero’ configuration for {SSB, CORESET#0/Type0-PDCCH} = {480, 480} kHz and {960, 960} kHz,

* After supporting entries for multiplexing pattern 1 for the agreed pairs of (, ) ={(24, 2), (48, 1), (48,2)} (with required RB offsets) and multiplex pattern 3 with 24 and 48 PRB and 2 symbol duration (with required RB offsets), if additional entries are left, support multiplexing pattern 1 with 96 PRB and 2 symbol duration
  + Note: the working assumption can be confirmed once RAN1 agrees on the number of needed SSB-CORESET0 offsets for 24 and 48 RB CORESET0 based on RAN4 channelization design.

**Agreement**

* If is indicated, the same interpretation of ssb-PositionsInBurst in SIB1 or ServingCellConfigCommon as in Rel-16 is supported, i.e.:
  + A bit set to 1 at position indicates SS/PBCH block index k-1
  + The UE assumes that a bit at position k > is set to 0
    - For ssb-PositionsInBurst in SIB1, the UE assumes that a bit at *groupPresence* corresponding to a SS/PBCH block index ≥ is set to 0
  + Note: for ssb-PositionsInBurst in SIB1, position k corresponds to the SS/PBCH block index indicated by a bit in inOneGroup and a bit in groupPresence
* In operation with shared spectrum in 60 GHz, for ssb-PositionsInBurst in ServingCellConfigCommonSIB,
  + for MSB k, k≥1, of inOneGroup and MSB m, m≥1, of groupPresense of ssb-PositionsInBurst:
    - if MSB k of inOneGroup and MSB m of groupPresense are set to 1, the UE assumes that SSB(s) within DBTW with ‘candidate SSB index(es)’ corresponding to ‘SSB index’ equal to k-1+(m-1)×8 may be transmitted;
    - if MSB k of inOneGroup or MSB m of groupPresense is set to 0, the UE assumes that SSB(s) within DBTW with ‘candidate SSB index(es)’ corresponding to ‘SSB index’ equal to k-1+(m-1)×8 is not transmitted;
* In operation with shared spectrum in 60 GHz, for ssb-PositionsInBurst in ServingCellConfigCommon,
  + ssb-PositionsInBurst bits correspond to supported ‘SSB indices’,
    - and UE assumes that SSB(s) within DBTW with ‘candidate SSB index(es)’ corresponding to indicated bit(s) may be transmitted;
    - and UE assumes that SSB(s) within DBTW with ‘candidate SSB index(es)’ corresponding to not indicated bit(s) are not transmitted
* Note to spec editor: The above three bullets maintain the same behavior as Rel-16 NR-U

**Agreement**

Update the Table 6.3.3.2-1 in TS 38.211 as follows:

* Table 6.3.3.2-1: Supported combinations of and , and the corresponding value of .

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | for PRACH | for PUSCH | , allocation expressed in number of RBs for PUSCH |  |
| ... | ... | ... | ... | ... |
| 139 | 120 | 120 | 12 | 2 |
| 139 | 120 | 480 | 3 | 1 |
| 139 | 120 | 960 | 2 | 23 |
| 139 | 480 | 120 | 48 | 2 |
| 139 | 480 | 480 | 12 | 2 |
| 139 | 480 | 960 | 6 | 2 |
| 139 | 960 | 120 | 96 | 2 |
| 139 | 960 | 480 | 24 | 2 |
| 139 | 960 | 960 | 12 | 2 |
| 571 | 120 | 120 | 48 | 2 |
| 571 | 120 | 480 | 12 | 1 |
| 571 | 120 | 960 | 7 | 47 |
| 571 | 480 | 120 | 192 | 2 |
| 571 | 480 | 480 | 48 | 2 |
| 571 | 480 | 960 | 24 | 2 |
| 1151 | 120 | 120 | 97 | 6 |
| 1151 | 120 | 480 | 25 | 23 |
| 1151 | 120 | 960 | 13 | 45 |

## RAN1 #107-bis-e

**Conclusion:**

RRC parameters list to capture changes identified below:

* Add the following note to the comment section of discoveryBurstWindowLength-r17 row in RRC parameter list
  + “Note: This parameter is to be included in both SIB1 and the common serving cell configuration parameters”.
* Support adding “SSB-PositionQCL-Relation-r17” to RRC parameter list as both UE-specific and cell-specific parameter.
* Inform RAN2 (by adding notes to RRC parameter list) that the either the value range of the information element SSB-PositionQCL-Relation-r16 needs to be extended, or a new Rel-17 IE need to be defined to allow configuration of Q = 16, 32, or 64 in SIB2, SIB3, SIB4, MeasObjectNR, and ServingCellConfigCommon for RRM measurements when operating with shared spectrum channel access in FR2-2.

The TP below for TS38.213v17.0.0 is endorsed as a working assumption

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| =========== Unchanged Text Omitted ===========  Table 13-15A: PDCCH monitoring occasions for Type0-PDCCH CSS set - SS/PBCH block and CORESET multiplexing pattern 3 and {SS/PBCH block, PDCCH} SCS {480, 480} kHz or {960, 960} kHz   |  |  |  | | --- | --- | --- | | Index | PDCCH monitoring occasions (SFN and slot number) | First symbol index  ( = 0, 1, …, 31) | | 0 |  | 2, 9 in  , |   ============ Unchanged Text Omitted ============ |

The TP below for TS38.211v17.0.0 is endorsed

|  |
| --- |
| \*\*\* Unchanged text omitted \*\*\*  5.3.2 OFDM baseband signal generation for PRACH  The time-continuous signal  on antenna port for PRACH is defined by  \*\*\* Unchanged text omitted \*\*\* |

The TP below for TS38.214v17.0.0 is endorsed

|  |
| --- |
| \*\*\* Unchanged text omitted \*\*\*  7       UE procedures for transmitting and receiving on a carrier with intra-cell guard bands  For operation with shared spectrum channel access in FR1, when the UE is configured with any of *IntraCellGuardBandsPerSCS* for UL carrier and for DL carrier with SCS configuration , the UE is provided with intra-cell guard bands on a carrier with , each defined by start CRB and size in number of CRBs, and, provided by higher layer parameters *startCRB* and *nrofCRBs*, respectively, where. The subscript *x* is set to DL and UL for the downlink and uplink, respectively. Where there is no risk of confusion, the subscript *x* can be dropped. The intra-cell guard bands separateRB sets, each defined by start and end CRB,and, respectively. The UE does not expect that *nrofCRBs* is configured with non-zero value smaller than the applicable intra-cell guard bands as specified in [8, TS 38.101-1] corresponding to and carrier size. The UE determines the start and end CRB indices for as  \*\*\* Unchanged text omitted \*\*\* |

**R1-2200689** Summary #1 of email discussion on initial access aspect of NR extension up to 71 GHz Moderator (Intel Corporation)

TP# 8-1a for TS38.213 in section 3 of R1-2200689 is endorsed.

**Conclusion**

RRC parameters list to capture changes identified below

* New parameter, ra-ResponseWindow-r17, under sub-feature group SSB and RACH
  + Value range {sl240, sl320, sl640, sl960, sl1280, sl1920, sl2560}
  + Based on previous conclusion:
    - For FR2-2, support the same mechanism as in Rel-16 for extended RAR window for both 4-step and 2-step RACH.
* New parameter, msgB-ResponseWindow-r17, under sub-feature group SSB and RACH
  + Value range { sl240, sl640, sl960, sl1280, sl1920, sl2560}
  + Based on previous conclusion:
    - For FR2-2, support the same mechanism as in Rel-16 for extended RAR window for both 4-step and 2-step RACH.
* Existing parameter, msgA-PRACH-RootSequenceIndex-r16, under sub-feature group SSB and RACH
  + Description:
    - May not need to change the IE, but need to add in the note on the limitation to be used with SCS. Field description requires updating to capture that L = 1151 is not supported for SCS 480 and 960 kHz and L = 571 is not supported for 960 kHz.
  + Value range:
    - CHOICE { l571 INTEGER {0..569}, l1151 INTEGER {0..1149}}
  + Cell-specific