3GPP TSG RAN Meeting #92e
Electronic Meeting, June 14 - 18, 2021

RP-211197

Agenda Item: 9.7.1.2

Source: Samsung

Title: On the subcarrier spacing of SS/PBCH block for initial access in 52.6 to 71 GHz

Document for: Discussion

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Status of RAN1 Discussion

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- RAN1 intended to conclude the issue of SSB SCS till RAN1 #104b (April), but there is no consensus on the SSB SCS for initial access
- Many proposals and aspects are pending on the decision of this issue
- The following proposals were discussed in RAN1 #105 (May), but got sustained objection from companies

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)

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Motivation for Supporting 480/960 kHz SSB

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- Summary of current status on supported SCSs and their use cases

	120 kHz	240 kHz	480 kHz	960 kHz
data/control channels, and RS	**Yes**	**No**	**Yes**	**Yes**
SSB in non-initial access	**Yes**	**FFS**	**Yes**	**Yes**
SSB in initial access	**Yes**	**FFS**	**FFS**	**FFS**

- In order to provide the feasibility of implementing the system using a single numerology, RAN1 has agreed to support 480 and 960 kHz SSB for non-initial access case
- However, without the support of 480 and 960 kHz SSB for initial access case, the system still cannot be implemented with a single numerology for the standalone operation.
  - A carrier intended to implement 480/960 kHz SCS for data/control channels has to include SSB with 120 kHz SCS for initial access
  - Either TDM or FDM 120 kHz SSB with 480/960 kHz SCS data/control channels will lead to a waste of resources
  - A UE needs to switch BWP for operation with SSB in a different numerology (e.g. RRM, RLM)

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Addressing Concern on Initial Access Complexity

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- The major concern for supporting 480/960 kHz SCS for SSB in initial access is the complexity in initial cell search, which is measured by the number of synchronization raster entries per band (on-going discussion in RAN4)
- Estimated number of synchronization raster entries for bands in 52.6 to 71 GHz
  - Note: 90% channel utilization is assumed, and the exact number may change subject to RAN4 design

Number of Sync Raster Entries		SCS of SSB (kHz) for initial access						
		120	240	480	960	120+240	120+480 +960	120+240 +480+960
Type 1 Sync and Channel Raster Design (e.g. Rel-15 licensed bands)	66-71 GHz band	86	130	17	32	216	135	265
	57-71 GHz band	243	364	48	91	607	382	746
Type 2 Sync and Channel Raster Design (e.g. Rel-16 unlicensed bands)	66-71 GHz band	43	43	10	10	86	63	106
	57-71 GHz band	121	121	30	30	242	181	302

- Observation 1: Supporting 480/960 kHz SCS SSB for initial access has much smaller complexity than 240 kHz SCS
- Observation 2: Supporting 480/960 kHz SCS SSB for initial access has similar complexity as FR2 (344 entries)

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Addressing Concern on Specification Impact

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- Another concern for supporting 480/960 kHz SCS for SSB in initial access is the specification impact
- In the process of RAN1 discussion, the following aspects have been identified as approaches to minimize the RAN1 specification impact, such that RAN1 work is manageable
  - Adopt same CORESET#0/Type0-PDCCH configuration for initial access and non-initial access cases
  - 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, and other patterns are on a best effort basis
  - Only the same CORESTE#0/Type0-PDCCH SCS supported for each SSB SCS
  - Strive to reuse tables for CORESET#0 and type0-PDCCH CSS set configuration defined for FR2 in Rel-15, as much as possible

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Proposal

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- In addition to 120 kHz, support at least one of 480 and 960 kHz SCS for SS/PBCH block in initial access.

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THANK YOU

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