3GPP TSG-RAN WG4 Meeting #112bis R4-24170912

Hefei, China, October 14th – 18th, 2024

**Agenda item:** 6.4.4

**Source:** Intel Corporation

**Title:** WF on UE RF requirements for Rel-19 NR channel BW less than 5MHz for FR1 Phase 2

**Document for:** Approval

# Topic #1: UE RF requirements for inter-band NR CA/DC with less than 5MHz CBW

## Sub-topic 1-1 Scell SSB position restrictions (Sync raster applicability)

**Moderator**: Based on the proposals the discussion can be differentiated for the following 2 scenarios.

* Scenario #1: Band n100 with 12 PRB SSB for 3 MHz CBW and with 20 PRB SSB for 5MHz CBW (sync raster defined in TS 38.101-1 Table 5.4.3.1-3)
* Scenario #2: 12 PRB SSB with 3MHz CBW for bands other than band n100 (sync rasters defined in TS 38.101-1 Table 5.4.3.1-2)

### Issue 1-1-1: SCell SSB position restrictions for Scenario #1: Band n100 with 12 PRB SSB for 3 MHz CBW and with 20 PRB SSB for 5MHz CBW (i.e., sync raster defined in TS 38.101-1 Table 5.4.3.1-3)

* Candidate options:
	+ Option 1: Capture restrictions in TS 38.101-1
		- Option 1A (RAN4 #112 candidate option): “SCell with 12 PRB transmission bandwidth configuration within 3 MHz channel bandwidth or 20 PRB transmission bandwidth configuration within 5 MHz channel bandwidth can be configured only in band n100 with SS Block frequency position defined in Table 5.4.3.1-3.”
		- Option 1B (Nokia): “SCell with 12 PRB transmission bandwidth configuration within 3 MHz channel bandwidth or 20 PRB transmission bandwidth configuration within 5 MHz channel bandwidth can be configured only in band n100 with SS Block frequency positions defined in Table 5.4.3.1-3.”
		- Option 1C (Intel): “UE may assume that SCell with 12 PRB transmission bandwidth configuration within 3 MHz channel bandwidth or 20 PRB transmission bandwidth configuration within 5 MHz channel bandwidth can be configured only in band n100 with SS Block frequency position defined in Table 5.4.3.1-3.”
* Tentative agreement
	+ Add a note to TS 38.101-1 Table 5.4.3.1-3: SCell with 12 PRB transmission bandwidth configuration within 3 MHz channel bandwidth or 20 PRB transmission bandwidth configuration within 5 MHz channel bandwidth can be configured only in band n100 with SS Block frequency positions defined in Table 5.4.3.1-3.

### Issue 1-1-2: SCell SSB position restrictions for Scenario #2: 12 PRB SSB with 3MHz CBW for bands other than band n100 (i.e., sync rasters defined in TS 38.101-1 Table 5.4.3.1-2)

* Candidate options:
	+ Option 1 (CATT): Confirm with operators on whether other regular sync raster introduced for 3MHz channel bandwidth as specified in Table 5.4.3.1-2 is applicable for band n100. If operators confirm other regular sync raster entries as specified in Table 5.4.3.1-2, simply state in specs that the same set of sync raster entries applies to both PCell and Scell with a 3MHz or 5MHz channel bandwidth with reduced transmission bandwidth configuration, or even without any need to clarify this point.
	+ Option 2 (Huawei): Request RAN1 to clarify whether in an inter-band CA configuration with a 3MHz CBW, SSB of the Scell with 3MHz CBW can be configured off the frequency raster or not?
	+ Option 3 (QC): Require less than 5 MHz SCell to be associated with the new sync raster points for less than 5MHz, similar as PCell.
	+ Option 4: Do not specify SCell SSB position restrictions
* Tentative agreement
	+ TBA

## Sub-topic 1-2 UE Capability signalling

RAN4 #112 agreements are provided below:

|  |
| --- |
| * Options for further discussion
	+ Option 1: Request RAN2 to introduce UE capability signaling to enable less than 5MHz CBW operation for CA/DC
		- The following Rel-18 capabilities for NR less than 5MHz CBW operation need to be extended or new capabilities defined to enable CA/DC operation scenario with one or more component carriers with less than 5MHz CBW
			* [support12PRB-CORESET0-r18]
			* [support3MHz-ChannelBW-Asymmetric-r18]
			* [support3MHz-ChannelBW-Symmetric-r18]
			* [support5MHz-ChannelBW-20PRB-CORESET0-r18]
			* [support12PRB-CORESET0-GSCN-41637-r18]
		- UE capability signalling granularity is FFS
		- The respective UE capabilities shall be early-implementable from Rel-18
		- The details including whether to update existing Rel-18 capabilities or introduce new Rel-19 capabilities are up to RAN2
	+ Option 2: Do not introduce new UE capability signaling to enable less than 5MHz CBW operation for CA/DC
		- RAN4 to define BCSs for band combination CA\_n100A-n101A or combinations with other band where 3 MHz is supported as usual where 3MHz / 5MHz channel bandwidths are listed for each band. BCS5 with supportedMinBandwidthUL-r17 set to 5 MHz can be used to indicate that a UE supports CA channel BWs other than 3 MHz for a given band.
		- RAN2 specs need to remove “This feature is only applicable to single-carrier operation from Rel-19. RAN2 to confirm no NBC issues.
		- No new RAN2 UE capability signaling is required.”
	+ Other options are not precluded
 |

### Issue 1-2-1: UE capability signalling

* Candidate options
	+ Option 1 (ZTE, Nokia): UE capability signalling details, including whether to update existing Rel-18 capabilities or introduce new Rel-19 capabilities, should be decided in RAN2
	+ Option 2 (CATT, E///, Intel): Do not introduce new UE capability signaling to enable less than 5MHz CBW operation for CA/DC. Reuse existing UE capabilities for NR < 5MHz. Request RAN2 to remove the single-carrier constraints for existing UE capabilities for NR < 5MHz features subject to RAN2 confirmation that there are no NBC issues.
		- Option 2A (CATT): Remove single-carrier constraints for Rel-18 UE capabilities for NR < 5MHz features in Rel-19 specs
		- Option 2B (Intel): Remove single-carrier constraints for Rel-18 UE capabilities for NR < 5MHz features in Rel-18 specs
* Tentative agreement
	+ Existing UE capabilities signalling framework is re-used to indicate UE support for NR < 5MHz operation for CA/DC band combinations
	+ UE is expected to support NR < 5MHz operation for CA/DC band combinations on one or more CCs subject that it indicates
		- One or more of corresponding UE capabilities for NR < 5MHz defined in Rel-18
			* [support12PRB-CORESET0-r18]
			* [support3MHz-ChannelBW-Asymmetric-r18]
			* [support3MHz-ChannelBW-Symmetric-r18]
			* [support5MHz-ChannelBW-20PRB-CORESET0-r18]
			* [support12PRB-CORESET0-GSCN-41637-r18]
		- [BCS for band combination, which includes the support of NR < 5MHz CBW for one or more CCs]
	+ Recommend RAN2 to update the UE capability signalling
		- Remove the single carrier constraints for existing UE capabilities for Rel-18 NR < 5MHz capabilities subject to RAN2 confirmation that there are no NBC issues.
		- [Extend BCS signalling framework to support indication of 3 MHz minimum bandwidth]
		- Whether to update existing Rel-18 capabilities or make the change in Rel-19 is up to RAN2

### Issue 1-2-2: BCS capability signalling impacts

* Candidate options
	+ Option 1 (E///): 3 MHz channel BW should be added to the list of possible value for the FeatureSetUplinkPerCC parameter supportedMinBandwidthUL-r17 for BCS5
* Tentative agreement
	+ TBA

### Issue 1-2-3: UE capability signalling granularity, if new signalling is introduced

* Candidate options
	+ Option 1 (ZTE): New capabilities shall be defined with per band combination granularity
	+ Option 2: Reuse UE capability signalling granularity from corresponding Rel-18 features
* Tentative agreement
	+ TBA

### Issue 1-2-4 Applicable release and early implementation aspects

* Candidate options
	+ Option 1: Support of NR < 5MHz features for CA/DC shall be early-implementable from Rel-18
	+ Option 2: Support of NR < 5MHz features for CA/DC shall be introduced from Rel-19
* Tentative agreement
	+ TBA