**3GPP TSG-RAN WG2 Meeting #116 Electronic R2-211xxxx**

**Elbonia, 01 – 12 November 2021**

**Title: [DRAFT]** ReplyLS on specification impact for methods on efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths

**Response to:** -

**Release:** Release 17

**Study Item:** FS\_NR\_eff\_BW\_util

**Source:** Nokia [RAN2]

**To:** RAN4

**Cc:** RAN1

**Contact Person:**

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**Attachments:** -

**1. Overall Description:**

RAN2 would like to thank RAN4 on the LS to RAN1 and RAN2 on LS on specification impact for methods on efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths in [R1-2108700/R4-2114751](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2108700.zip)

RAN2 discussed the questions in the LS and would like to provide the following responses to the RAN4 questions:

* For the wider CBW:
  + clarify if there is any limitation for the UL carrier positions (not just BWP positions) legacy UEs support for *uplinkChannelBW-PerSCS-List* and *scs-SpecificCarrierList* in symmetric operating bands with a fixed duplex distance and asymmetric UL/DL channel bandwidth.
  + **RAN2 response:** RAN2 specifications currently assume that network only configures channel bandwidth that corresponds to the channel bandwidth values defined in TS 38.101-1 and TS 38.101-2.
  + confirm UE behaviour if it is possible to configure a carrier that is not fully contained in the NR band, i.e. the carrier can extend beyond the low edge of the band and/or the high edge of the band?
  + **RAN2 response:** RAN2 assumes network only configures channel bandwidth according to UE capabilities. UE behaviour is not specified when the channel bandwidth configuration exceeds the frequency band borders.
* For the overlapping CBWs from network perspective (one cell approach):
  + clarify whether a single SSB and CORESET (e.g. for cases where irregular BWs >10 MHz where a 4.28 MHz wide initial BWP can be in the common frequency range), can be used to configure UEs with different channel BWs on different parts of the BS channel.
  + **RAN2 response:** RAN2 specifications assume that a single cell only has a single a) cell-defining SSB (CD-SSB), b) channel bandwidth configuration in SIB1, c) CORESET#0, and d) initial BWP. Network can override the SIB1 configuration for UEs in CONNECTED but there is only one broadcast configuration.
  + clarify whether two time staggered SSBs and CORESET#0 on the same frequency (when the frequency separation is not enough to send them simultaneously at the same time and thus time staggering is needed) are supported in RAN1/2 specifications so that UEs configured with left and right channels of the next smaller regular size can track their own time staggered SSB and CORESET#0.
  + **RAN2 response:** It is possible to have staggered multiple CD-SSBs in time domain, but they will define different cells from UE perspective.
* For the overlapping CBWs from UE perspective (two cell approach / CA approach):
  + if two different Bandwidth Parts for the UE are overlapping, and both contain a subset of CSI-RS resources that are mapped to the same subset of overlapping RBs for the same UE, please clarify how does UE report CSI for the overlapped part, e.g. does UE report CSI for each cell separately, or just once for the overlapping part, or something else?
  + **RAN2 response:** RAN2 thinks it is not clear whether legacy UEs would support this kind of "overlapping CA" as this was never discussed in RAN2 before and current UE capabilities do not consider any frequency overlap in CA case.
  + clarify how PDCCH reception in overlapped CA when PCell and SCell PDCCH resources partially overlap and whether there are any impacts to cross-carrier scheduling
  + **RAN2 response:** This is not in RAN2 expertise and RAN2 leaves the question to RAN1..
* For the overlapping CBWs from UE perspective (one cell approach):
  + Is it possible to configure the UE with a dedicated *carrierBandwidth* in the *ServingCellConfig* that is wider than/partially outside the *carrierBandwidth* configured in SIB1?
  + **RAN2 response:** UE behaviour is not specified when the channel bandwidth configuration exceeds the frequency band borders. RAN2 thinks it is possible from signalling view to override the SIB1 channel bandwidth by the dedicated channel bandwidth signalling in RRC\_CONNECTED if the UE is capable of the dedicated channel bandwidth, and if network ensures the SIB1 channel bandwidth and dedicated channel bandwidth use the same PRB grid. RAN2 has no consensus whether a new capability is needed to support that the dedicated channel bandwidth is outside SIB1 channel bandwidth.
  + Clarify for equalization purposes in the DL, does the BS need to know the split between the subset of PRBs from a main RF carrier versus PRBs from an additional RF carrier are received on different channel/antenna before combining. If pre-coding assumes all PRBs experience the same channel/antenna, is signalling required so that BS pre-coding can account for the path differences of main carrier PRBs and additional carrier PRBs.
  + **RAN2 response:** This is not in RAN2 expertise and RAN2 leaves the question to RAN1.

**2. Actions:**

**To RAN4 group.**

**ACTION:** RAN2 respectfully asks RAN4 to take the RAN2 replies into account in their work.

**3. Date of Next TSG-RAN WG2 Meeting:**

3GPP RAN2#116bis-e January 17-25, 2022 Electronic Meeting

3GPP RAN2#117-e February 21 - March 03, 2022 Electronic Meeting