

Agenda Item: 9.7.12

Source: Samsung

Title: On the scope of Rel-17 support for NR on 52.6 GHz to 71 GHz

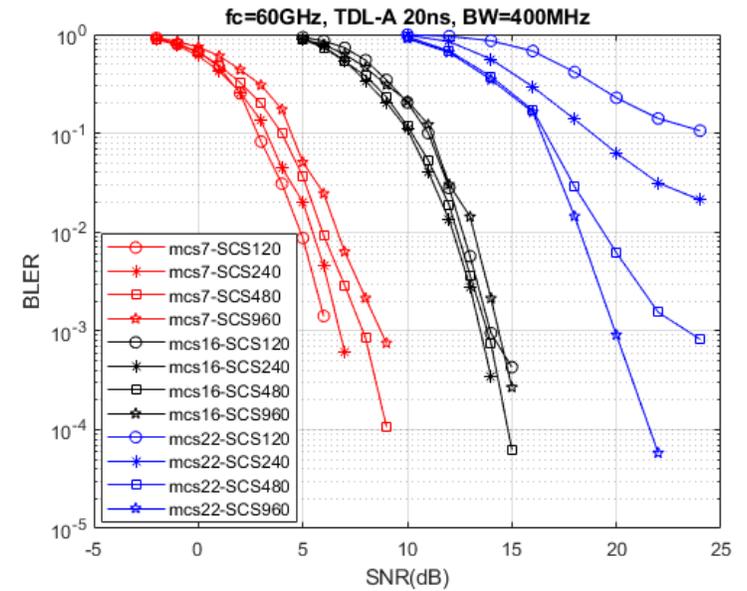
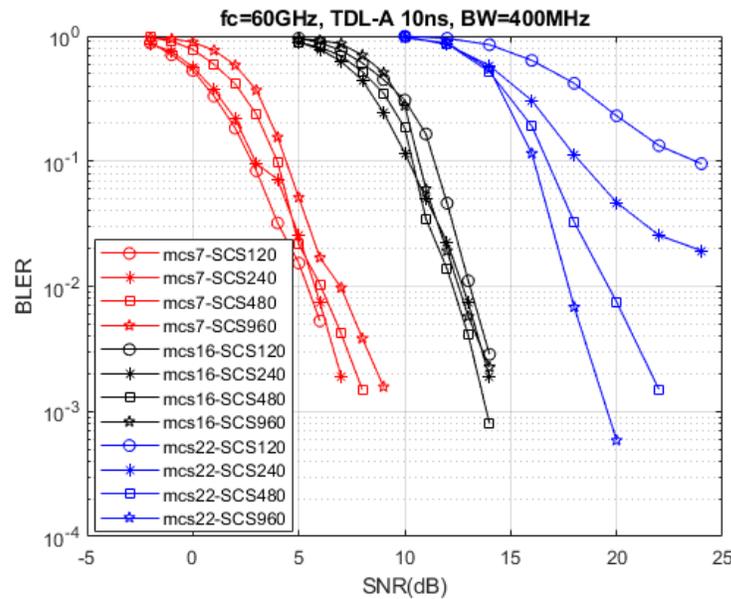
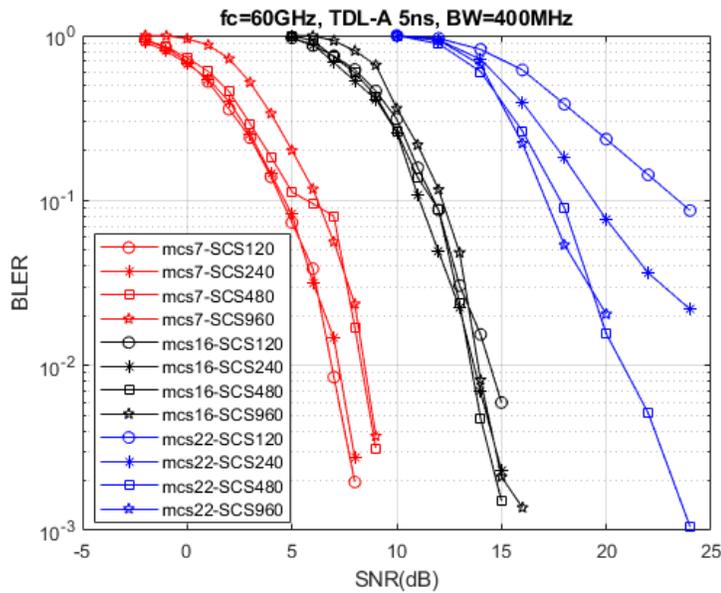
Document for: Discussion and Decision

Conclusion of TR 38.808 v0.2.0 (R1-2009849)

- ◇ As an outcome of the study, it is recommended to support 120 kHz subcarrier spacing with normal CP length, and at least one additional subcarrier spacings among 240 kHz, 480 kHz, and 960 kHz subcarrier spacing candidates. It is recommended to consider supporting at most up to three subcarrier spacings including 120 kHz. It is not recommended to consider support of only 240 kHz SCS for PDCCH/PDSCH/PUCCH/PUSCH in addition to 120 kHz. Subcarrier spacing outside 120 kHz to 960 kHz are not supported for any signals and channels. The applicability of the supported subcarrier spacing to particular signals and channels should be further discussed when specifications are developed. It is additionally recommended to limit the maximum FFT size required to 4096 and to limit the maximum of RBs per carrier to 275 RBs. The candidate supported maximum carrier bandwidth(s) for a cell should be between 400 MHz and 2160 MHz. Further investigation of the details of required changes to NR may be needed.
- ◇ As an outcome of the channel access study, it is recommended to support both channel access with LBT mechanism(s) and a channel access mechanism without LBT for gNB and UE to initiate a channel occupancy. Further investigation of the details of the channel access mechanism may be needed.

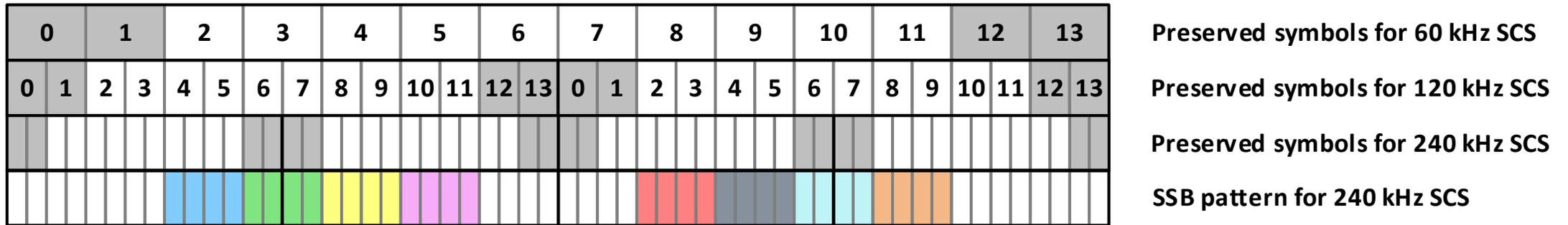
Views on the necessity of supporting 240 kHz SCS (1/2)

- ◇ It was discussed in the SI whether 240 kHz SCS is needed, with the presupposition that 120 kHz SCS is supported, and no conclusion was made by RAN1
- ◇ It is observed that the application scenarios, benefits and evaluation performance of using 120 kHz and 240 kHz SCS are very similar
 - ◆ For example, there is no significant gain in the BLER curve when using 240 kHz SCS comparing to 120 kHz SCS (R1-2008872)



Views on the necessity of supporting 240 kHz SCS (2/2)

- ◇ The only “benefit” of supporting 240 kHz SCS, mentioned in the RAN1 discussion, is to simplify the specification impact, since SSB pattern for 240 kHz SCS is already supported in Rel-15, however, this statement is not correct.
 - ◆ In NR Rel-15, the SSB pattern for 240 kHz SCS was designed to avoid collision with preserved symbols (e.g. for CORESET and HARQ) with respect to 60 kHz and 120 kHz SCS (no collision as shown in the figure)
 - ◆ However, NR Rel-15 SSB pattern for 240 kHz SCS has collision with preserved symbols with respect to 240 kHz SCS (1/4 SSBs collides with the preserved symbols as shown in the figure)
 - ◆ If supporting 240 kHz SCS for data channels, NR Rel-15 SSB pattern for 240 kHz SCS cannot be directly reused and needs to be redesigned, so specification impact for supporting 240 kHz SCS is not smaller



- ◇ Proposal: Exclude 240 kHz SCS from the WID

Views on carrier bandwidth and channelization

- ◇ It was agreed to keep the same maximum FFT size of 4096 and maximum PRB of 275 per carrier, and both the maximum carrier bandwidth and minimum carrier bandwidth were discussed in the SI, but no conclusion
- ◇ For the maximum carrier bandwidth
 - ◆ It is beneficial to support at least one set of channelization that can be compatible to Wi-Fi 11ad/ay for fair coexistence
 - The maximum carrier bandwidth can be approximately 2 GHz to be compatible with 2.16 GHz bandwidth in Wi-Fi 11ad/ay
 - Utilizing same or similar channelization is one of the most straightforward components for guaranteeing fair coexistence, as supported in Rel-16 NR-U
 - There are no evidence or evaluation result so far justifying that there is no issue with coexistence when the channelizations between Wi-Fi and 3GPP are not compatible
- ◇ For the minimum carrier bandwidth
 - ◆ It is beneficial to support additional sets of channelization that can provide enough flexibility and efficiency for spectrum utilization
 - ◆ The minimum carrier bandwidth shall include the SSB bandwidth with respect to the default SCS for initial cell search
- ◇ Proposal:
 - ◆ Support at least one channelization to provide wide bandwidth to be compatible with Wi-Fi 11ad/ay channelization (e.g., single carrier with approximate 2 GHz BW)
 - ◆ Support additional channelizations using small bandwidth (e.g. 400 MHz) to provide flexible utilization of the frequency range

Views on impact to PHY design

- ◇ According to the recommendation from TR 38.808 v0.2.0, PHY design aspects have been categorized into the following three threads.
 - ◆ Impact to initial access, including supporting up to 64 SSB beams for both licensed and unlicensed bands and the associated initial access procedure
 - ◆ Impact to PHY signals/channels, including potential enhancement to sub-PRB/PRB based interlace, PUCCH format, PT-RS, and DM-RS, if needed
 - ◆ Impact to PHY procedures, including potential enhancement to processing timeline, multi-PDSCH/PUSCH scheduling, PDCCH monitoring, beam management, and CSI processing, if needed

- ◇ Some design aspects may overlap or partially overlap with other Rel-17 WIs, and RAN shall provide guidance on how to resolve the overlapping issue
 - ◆ Rel-17 52.6 to 71 GHz can focus on the design aspects exclusively applicable to the higher frequency range, e.g. the new numerology(ies)

- ◇ It was agreed in the SI that both channel access with and without LBT mechanism(s) are supported for carrier frequency range 52.6 to 71 GHz
 - ◆ RAN1 shall further investigate the details on the application scenario, switching condition, and indication method of each channel access mode, and make corresponding changes to the specifications if needed
 - ◆ RAN1 shall further investigate the details of the LBT mechanism, including the LBT bandwidth, MCOT, ED threshold, etc, and make corresponding changes to the specifications if needed

- ◇ Advanced channel access mechanism addressing beam based operation was also discussed in the SI
 - ◆ RAN1 shall further discuss and support the channel access mechanism using directional LBT
 - ◆ RAN1 shall further discuss and support the channel access mechanism using receiver assisted LBT
 - Focus on Class A receiver assisted LBT in Rel-17

Proposal on Key aspects to be addressed in WID

◇ Numerology and carrier bandwidth:

- ◆ Exclude 240 kHz SCS in WID
- ◆ Support at least one channelization to provide wide bandwidth to be compatible with Wi-Fi 11ad/ay channelization (e.g., single carrier with approximate 2 GHz BW)
- ◆ Support additional channelizations using small bandwidth (e.g. 400 MHz) to provide flexible utilization of the frequency range

◇ Impact to PHY design

- ◆ Impact to initial access, including supporting up to 64 SSB beams for both licensed and unlicensed bands and the associated initial access procedure
- ◆ Impact to PHY signals/channels, including potential enhancement to sub-PRB/PB based interlace, PUCCH format, PT-RS, and DM-RS, if needed
- ◆ Impact to PHY procedures, including potential enhancement to processing timeline, multi-PDSCH/PUSCH scheduling, PDCCH monitoring, beam management, and CSI processing, if needed

◇ Channel access

- ◆ Further investigate the details of channel access with and without LBT mechanism
- ◆ Support advanced channel access mechanism addressing beam based operation, including directional LBT and RX-assistant LBT

THANK YOU