**3GPP TSG-RAN WG4 Meeting #110bis R4-2405833**

**Changsha, China, 15th – 19th April, 2024**

**Agenda item:** 9.12.3

**Source:** Moderator (Samsung)

**Title:** Topic summary for [110bis][313] NR\_duplex\_evo

**Document for:** Information

# Introduction

In RAN#102, the work item on evolution of NR duplex operation (SBFD) has been approved [RP-234035], with WID further revised in the follow-up RAN plenary [RP-240789]. According to the objectives in WID, RAN1 is tasked to specify the mechanisms to support SBFD, including semi-static indication of time/frequency location, random access in SBFD symbols, and other transmission, reception and measurement behavior and procedures for SBFD aware UE. Furthermore, the enhancement for CLI handing, including gNB-to-gNB and UE-to-UE CLI handling, will also be specified in RAN1. Accordingly, from RAN4 perspective, it is tasked to “Specify BS RF requirements for SBFD operation at gNB [RAN4]”.

This document is provided for the moderator summary on Rel-19 work item on evolution of NR duplex operation (SBFD), in which the following highlighted agenda items are supposed to be covered specifically:

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| --- |
| * 1. Evolution of NR duplex operation: Sub-band full duplex (SBFD) [NR\_duplex\_evo]      1. General aspects (work plan) [NR\_duplex\_evo-Core]      2. BS RF requirements [NR\_duplex\_evo-Core]      3. Moderator summary and conclusions |

*Before Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

# Topic #1: Work Plan – RAN4 Core Part

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2405654 | Samsung, Huawei | Workplan for Evolution of NR Duplex Operation - RAN4 Core Part |

## Open issues summary

#### Issue 1-1-1: Work Plan – RAN4 Core Part

* Below plan is proposed for objectives of RAN4 core part:

Table 1: WI plan for Evolution of NR duplex operation (RAN4 Part)

|  |  |
| --- | --- |
| **Schedule and TU** | **Work plan** |
| April, 2024  RAN4#110bis (0.25 TU) | **RAN4 (core)**   * Start discussion on BS RF requirements for SBFD operation at gNB   + Discuss on SBFD operation impact on existing BS RF requirements   + Discuss on the necessity of introducing new requirements for SBFD operation, identified in study item |
| May, 2024  RAN4#111 (0.25 TU) | **RAN4 (core)**   * Continue discussion on BS RF requirements for SBFD operation at gNB   + Continue discussion on SBFD operation impact on existing BS RF requirements   + Continue discussion on the necessity of introducing new requirements for SBFD operation, identified in study item |
| August, 2024  RAN4#112 (1.5 + 0.5 TU) | **RAN4 (core)**   * Continue discussion on BS RF requirements for SBFD operation at gNB   + Progress achieved on SBFD operation impact on some of existing BS RF requirements   + Progress achieved on the necessity for some of new requirements for SBFD operation, identified in study item * Start discussion on RRM core requirements for CLI handling mechanism(s)   + Discuss the necessity of measurement requirement(s) for CLI handling scheme(s), including gNB-to-gNB and/or UE-to-UE scheme(s) down-selected * Start discussion on other RRM core requirements impact identified for SBFD operation |
| October,2024  RAN4#112bis (1.5 + 0.5 TU) | **RAN4 (core)**   * Continue discussion on BS RF requirements for SBFD operation at gNB   + Progress achieved on SBFD operation impact on some of existing BS RF requirements   + Progress achieved on the necessity for some of new requirements for SBFD operation, identified in study item * Continue discussion on RRM core requirements for CLI handling mechanism(s)   + Further discuss the necessity of measurement requirement(s) for CLI handling scheme(s), including gNB-to-gNB and/or UE-to-UE scheme(s) down-selected * Continue discussion on other RRM core requirements impact identified for SBFD operation |
| November, 2024  RAN4#113 (1.5 + 0.5 TU) | **RAN4 (core)**   * Continue discussion on BS RF requirements for SBFD operation at gNB   + Progress achieved on SBFD operation impact on some of existing BS RF requirements   + Agree on whether new requirements for SBFD operation identified in study item are introduced * Continue discussion on RRM core requirements for CLI handling mechanism(s)   + Progress achieved on the necessity of measurement requirement(s) for CLI handling scheme(s), including gNB-to-gNB and/or UE-to-UE scheme(s) down-selected * Continue discussion on other RRM core requirements impact identified for SBFD operation |
| February, 2025  RAN4#114 (1.5 + 0.5 TU) | **RAN4 (core)**   * Continue discussion on BS RF requirements for SBFD operation at gNB:   + Agree on SBFD operation impact on all existing BS RF requirements   + Agree on new requirements identified to be introduced for SBFD operation. * Continue discussion on RRM core requirements for CLI handling mechanism(s)   + Progress achieved on the necessity of measurement requirement(s) for CLI handling scheme(s), including gNB-to-gNB and/or UE-to-UE scheme(s) down-selected * Continue discussion on other RRM core requirements impact identified for SBFD operation |
| April, 2025  RAN4#114bis (1.5 + 0.5 TU) | **RAN4 (core)**   * Continue discussion on BS RF requirements for SBFD operation at gNB   + Draft CR(s) on existing BS RF requirements’ impact for SBFD operation are provided for discussion   + Draft CR(s) on new BS RF requirements for SBFD operation, if necessity identified, are provided for discussion * Continue discussion on RRM core requirements for CLI handling mechanism(s) and other identified impact(s)   + Draft CR(s) on measurement requirement(s) for CLI handling scheme(s), if necessity identified   + Draft CR(s) on RRM core requirements impact identified for SBFD operation |
| May, 2025  RAN4#115 (1.5 + 0.5 TU) | **RAN4 (core)**   * Finalize discussion and endorse draft CR(s) on BS RF requirements and RRM requirements for SBFD operation at gNB   **RAN4 (performance)**   * Begin discussion on   + BS RF conformance requirements to support SBFD operation at gNB   + RRM performance requirements to support SBFD operation   + SBFD-capable BS and/or SBFD-aware UE demodulation performance requirements to support SBFD operation |
| August, 2025  RAN4#116 (1.5 + 0.5 TU) | **RAN4 (core)**   * Resolve remaining issues on BS RF requirements and RRM requirements for SBFD operation at gNB, and CR updates   **RAN4 (performance)**   * Continue discussion on   + test issues identified for BS RF conformance requirements to support SBFD operation at gNB   + RRM performance requirements to support SBFD operation   + SBFD-capable BS and/or SBFD-aware UE demodulation performance requirements to support SBFD operation |
| October, 2025  RAN4#116bis (0.5 + 1 TU) | **RAN4 (performance)**   * Continue discussion and prepare draft CR(s) on   + BS RF conformance requirements to support SBFD operation at gNB   + RRM performance requirements to support SBFD operation   + SBFD-capable BS and/or SBFD-aware UE demodulation performance requirements to support SBFD operation |
| November, 2025  RAN4#117 (0.5 + 1 TU) | **RAN4 (performance)**   * Finalize discussion and endorse draft CR(s) for   + BS RF conformance requirements to support SBFD operation at gNB   + RRM performance requirements to support SBFD operation   + SBFD-capable BS and/or SBFD-aware UE demodulation performance requirements to support SBFD operation |
| January, 2026  RAN4#118 (0.5 + 1 TU) | **RAN4 (performance)**   * Resolve remaining issues and CR updates on introduced performance requirements |

* Moderator Recommendation:
  + Discuss the above work plan to see it can be approved or not.
  + Per proposed in R4-2404981, it is required to “Schedule a structured timeline for the WI and allocate clear deadlines for completion of both core requirements and conformance requirements in the relevant specifications.”
* Chair: Is that possible we add a “Note” after the table to address Ericsson’s concern for coexistence study could be needed.
* Ericsson: Okay with that:
* Agreement:
  + Approve the work plan with the note as follows:
    - Note: During certain particular BS RF requirement is specified, FFS if the additional coexistence simulation to Rel-18 RAN4 co-existence study is required.

# Topic #2: General aspects of BS RF requirements

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

All Tdocs related to the following topics (including Topic#2, #3, #4 and #5) are listed here:

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2404458 | CATT | Proposal 1: Creating new sub-clauses in TS 38.104 is agreed as the method to add RF requirements of SBFD. |
| R4-2404981 | Ericsson | Proposal 1: Requirements in general need to be consistently applied and thoroughly tested in both SBFD slots and non-SBFD slots.  Proposal 2 : Further simulation is necessary to determine the expected blocker levels due to other operators’ BSs during SBFD slots and to define the SBFD RX blocking requirement during the WI phase.  Proposal 3: Capture a limited set of sub-bands, bandwidth possibilities in the same way as channel bandwidths and transmission bandwidth configurations are captured.  Proposal 4: Schedule a structured timeline for the WI and allocate clear deadlines for completion of both core requirements and conformance requirements in the relevant specifications. |
| R4-2404260 | Nokia | Observation 1: New complex test model would be needed to support joint measurement of transmitter signal quality for normal DL symbols/slots and SBFD DL symbols/slots  Observation 2: The OTA sensitivity requirement does not capture the effects from inter-sector and inter-gNB interference.  Observation 3: In channel adjacent subband leakage ratio, in-channel adjacent subband blocking and in-channel adjacent subband selectivity requirements cannot be guaranteed implicitly by the OTA sensitivity requirement, since the methods used for self-interference cancellation, might not be available for cancelling interference from other sectors and gNBs, especially when considering a multi-vendor deployment.  Observation 4: Even though RAN4 has not agreed on a reference implementation for SBFD operation, minimum requirements can still be defined to ensure proper operation considering self-interference, inter-site and inter-gNB interference.    Proposal 1: Separate transmitter signal quality measurements are preferred for normal DL symbols/slots and SBFD symbols/slots.  Proposal 2: TX IM requirements are still applicable to SBFD slots with 30dB interferer offset.  Proposal 3: Use maximum of 0.5dB for desensitization target value for self-interference.  Proposal 4: RAN4 to define in-channel adjacent sub-band leakage ratio requirements within SBFD time slots considering inter-sector interference and inter-site interference. Existing ACLR requirements could be used as baseline depending on the ratio between the bandwidths of the DL and the UL subbands.  Proposal 5: RAN4 to define in-channel adjacent sub-band selectivity, the exact requirement limits to be discussed. |
| R4-2404394 | Charter Communications, Inc | Observation 1: The study in [1] shows that adjacent-channel interference between two adjacent carriers degrades throughput performance due to SBFD operation adjacent to a second legacy TDD operator and can be worse than 30% in throughput.  Proposal 1: We propose that adjacent channel interference between two carriers should be analysed and mitigated.  Observation 2: The study in [1] shows that throughput performance degradation can be affected by both SBFD and legacy TDD, both scenarios.  Proposal 2: We propose that companies planning to provide SBFD solutions should study this issue and offer a solution that will mitigate their degradation issue.  Observation 3: When the two networks belong to a single operator, then RAN4 RRM can rely on any interface (e.g., Xn interface) between the two networks to mutually mitigate CLI.  Proposal 3: We propose that solutions identified to address adjacent channel CLI for a single operator with two adjacent carriers, if applicable to the case of adjacent channel interference between two operators, be adopted. |
| R4-2404457 | CATT | Proposal 1: LA BS RF requirements are defined in WI phase, MR BS can also be considered. FFS WA BS.  Proposal 2: The following new RF requirements are needed for SBFD BS, the requirements can be derived from the co-existence simulation.   * In-channel adjacent subband leakage power ratio * In-channel adjacent subband selectivity   Proposal 3: In-channel adjacent subband blocking requirement may be needed. Both colocation and non-colocation scenario should be analyzed or simulated for the blocking signal level.  Observation 1: For transmitter intermodulation requirement, co-location coupling loss assumption can’t use 30 dB for SBFD capable gNB.  Proposal 4: The transmitter intermodulation co-location scenario should be revisited for SBFD deployment. |
| R4-2404669 | vivo | Proposal 1: Before start of specifying BS RF requirements, it is suggested to specify operating bands for gNB SBFD.  Proposal 2. It is suggested to specify BS channel bandwidths and SBFD configurations for gNB SBFD.  Proposal 3: It is suggested to specify guardband between DL and UL subband in a BS channel bandwidth. |
| R4-2404982 | Ericsson | Observation 1 It is allowed to have different conducted power and EIRP/TRP declaration for normal DL symbols/slots and SBFD DL symbols/slots.  Observation 2 Accuracy requirement for TRP/EIRP and conducted power shall be the same for normal DL symbols/slots and SBFD DL symbols/slots.  Observation 3 Reuse the existing RE power control dynamic range requirement for SBFD BS.  Observation 4 The total dynamic range requirement is applicable for SBFD-capable BS during normal DL symbols/slots.  Observation 5 Define the output power dynamic range requirement for SBFD as the ratio of the declared rated output power with all DL sub-band RBs active for SBFD (maximum) and the same single RB power as non-SBFD (minimum).  Observation 6 Transmitter ON/OFF power doesn’t apply to SBFD slot.  Observation 7 Reuse the existing requirements for frequency error, EVM and TAE for BS in SBFD symbols/slots.  Observation 8 Measurement of average EVM for BS in normal DL symbols/slots and SBFD DL symbols/slots needs FFS.  Observation 9 The existing OBW requirement shall be applied for the whole BS channel bandwidth in SBFD symbols/slots instead of DL sub-band.  Observation 10 ACLR requirement shall be defined outside of the whole carrier instead of sub-band for SBFD DL symbols/slots and ACLR requirement is still defined as the ratio of sum of TX power within the whole carrier to the adjacent carrier.  Observation 11 For OBUE requirement, the RF bandwidth edge from which OBUE is defined is the edge of the carrier (same for both SBFD and non-SBFD symbols/slots).  Observation 12 The transmitter spurious emissions requirement is the same for both SBFD and non-SBFD slots.  Observation 13 Use the same co-existence and co-location requirements (between bands) for SBFD slots as normal TDD. Conformance to these requirements remains declaration based.  Observation 14 For SBFD-capable BS type 1-H, the existing requirement for conducted reference sensitivity level shall also be applied to BS in SBFD symbols, i.e., no sensitivity degradation is allowed.  Observation 15 For SBFD-capable BS OTA sensitivity requirement, [0.5~1.0] dB degradation value needs FFS.  Observation 16 OTA sensitivity should be defined considering in real life the receiver is further desensitized by other sources of interference including inter-site interference and inter-sector interference.  Observation 17 RAN4 requirements should be conservative enough that the SBFD BS can be expected to perform well in real deployments considering inter-site interference and inter-sector interference.  Observation 18 Due to the receiver performance is limited by receiver non-linearity, the sensitivity degradation is much greater than just the sum of the sensitivity degradation from each source alone.  Observation 19 RX dynamic range requirement is applicable for SBFD-capable BS. IoT level and wanted signal power level need further discussion in the WI phase.  Observation 20 For SBFD, the RX blocking requirement is based on signal levels from the DL of other operators BS.  Observation 21 There are no requirements enabling co-location of SBFD with another operators BS. A blocking requirement considering co-located BS could be introduced, however it would not enable co-location as the other operators BS TX emissions would still badly desensitize the SBFD receiver.  Observation 22 Co-location of SBFD BS with other operators BS in the same band is not possible.  Observation 23 The OOB blocking requirement is the same in SBFD slots as for normal TDD.  Observation 24 The receiver spurious emissions requirement is the same for both SBFD and non-SBFD slots.  Observation 25 The receiver spurious emission is only measurable with conducted testing and OTA testing with transmitter deactivated in SBFD slots.  Observation 26 Receiver in-channel selectivity requirement is focused on UL sub-band, and the wanted signal and interfering signal levels is FFS in the WI phase.  Observation 27 The same considerations on inter-site interference due to switching occur for SBFD resources when switched between TX/RX as when the whole slot is switched.  Proposal 1 Transmitter ON/OFF power should apply to normal slot.  Proposal 2 The TX IM requirement should be applied in SBFD slots, in order to demonstrate that the BS will continue to meet all regulation. However, during these tests, the RX sub-band is not expected to receive and may be deactivated during TX IM test.  Proposal 3 Study further the DL signal level from other operator BS to assume when defining the SBFD RX blocking requirement.  Proposal 4 Investigate whether an additional requirement based on a single input signal placed to cause IM with the RX sub-band provides any additional robustness, and whether such a requirement is anyhow implicitly captured by the SBFD RX blocking requirement.  Proposal 5 Apply the existing TDD switching time and off level requirement to SBFD RBs when they are switched between TX and RX.  Proposal 6 Apply the same transient period to transition between non-SBFD slots and SBFD slots as for normal full DL and UL switching.  Proposal 7 Define a requirement on TX sub-band ACLR similar to the ACLR requirement and use existing ACLR requirement as baseline.  Proposal 8 Define a requirement on RX sub-band ACS similar to the ACS requirement and use existing ACS requirement as baseline. |
| R4-2405073 | Qualcomm Germany | Proposal 1: RAN4 to clearly define the scope and definition of multi-carrier operation of SBFD-capable BS in Rel-18 WI.  Proposal 2: RAN4 to discuss size of subband/guardband for indication of SBFD subband frequency location.  Observation 1: RAN4 agreed in Rel-18 SI to have the different output power requirements (conducted for FR1 and radiated for FR2-1) declaration for normal DL symbols/slots and SBFD DL symbols/slots. Accuracy requirement for TRP/EIRP and conducted power shall be the same for normal DL symbols/slots and SBFD DL symbols/slots.  Proposal 3: RAN4 to discuss how PSD scaling would be considered between normal and SBFD slots/symbols.  Observation 2: Transmit ON/OFF power requirement is not applicable within SBFD time slot. Additionally, all existing requirement for frequency error, modulation quality (EVM) and time alignment error (TAE) shall also be applied to BS in SBFD symbols/slots.  Proposal 4: RAN4 to discuss how scenarios would be defined to derive ACLR requirements for SBFD BS based on the adjacent channel coexistence analysis.  Proposal 5: RAN4 to discuss how to capture new co-location coupling loss requirements for SBFD based on the feasibility analysis captured in TR 38.858.  Proposal 6: RAN4 to consider self-interference, inter-site interference, and inter-sector interference when defining the OTA reference sensitivity.  Proposal 7: RAN4 to derive the IoT level and wanted signal power level within RAN4 adjacent channel coexistence.  Proposal 8: RAN4 to discuss which scenarios within the RAN4 adjacent channel coexistence to be defined to derive the ACS and in-band blocking requirements for SBFD BS.  Proposal 9: RAN4 to discuss how to capture the Rx intermodulation requirements in its adjacent channel coexistence work.  Proposal 10: The specific requirements of in-channel adjacent subband leakage ratio, in-channel adjacent subband Blocking, and adjacent subband selectivity will be based on RAN4 adjacent channel coexistence. |
| R4-2405310 | CMCC | Proposal 1: it’s suggested to define WA gNB requirement for SBFD.  Observation 1: the transient period for SBFD should not be larger than legacy ON-OFF transient period. Besides, the transient period between SBFD reconfiguration should not be larger than the transient period from SBFD to non-SBFD.  Proposal 2: for the typical MCL for Tx IMD, at first, we can use the range of spatial isolation from all companies’ input in TR 38.858 for SBFD self-interference analysis and then down-select to final typical value for Tx inter-modulation requirement.  Proposal 3: if larger than 30dB MCL is assumed for Tx IMD, the same degradation as legacy in-band blocking could be assumed as baseline i.e. 6dB REFSENSE degradation. and then further check the the feasibility with better SBFD receiver linearity assumption.  Proposal 4: further discuss whether the co-location ACLR/ACS or equivalent requirement is needed or not.  Observation 2: This sub-band Tx leakage falling into the same carrier can be discussed together with OTA sensitivity requirements.  Observation 3: RAN4 should at first identify the assumption of adjacent network performance for sub-band leakage requirement definition, i.e. whether inter-operator using adjacent carrier follow legacy 3GPP requirement or allow enhanced performance.  Proposal 5: both sub-band selectivity and blocking requirements should be defined.  Observation 4: Sub-band selectivity requirements when Tx interference is within the same carrier can be discussed together with OTA sensitivity requirements. If OTA sensitivity will encompass these sub-band interference, sub-band selectivity with Tx interference signal within carrier is not needed.  Observation 5: RAN4 should at first identify the assumption of adjacent network performance for sub-band selectivity requirement definition, i.e. whether inter-operator using adjacent carrier follow 3GPP requirement or allow enhanced performance. |
| R4-2405617 | Huawei, HiSilicon | Proposal 1: FFS on ACLR and OBUE that are applicable to SBFD-capable BS based on the conclusion in TR 38.858.   * For ACLR requirement, it shall be defined outside of the whole carrier instead of sub-band for SBFD DL symbols/slots and ACLR requirement is still defined as the ratio of sum of TX power within the whole carrier to the adjacent carrier. * For OBUE requirement, the RF bandwidth edge from which OBUE is defined is the edge of the carrier (same for both SBFD and non-SBFD symbols/slots).   Proposal 2: At least from OTA requirements perspective, OTA sensitivity degradation shall be discussed first as the input for related SBFD-capable BS Rx requirements determination as identified in TR 38.858.   * 1dB degradation due to self-interference is preferred.   Proposal 3: FFS on the following aspects   * For transmitter signal quality including frequency error, modulation quality (EVM) and time alignment error (TAE), further discuss the joint measurement for normal DL symbols/slots and SBFD DL symbols/slots * For transmitter intermodulation   + Check whether the transmitter intermodulation requirement is applicable in SBFD slots/symbols   + Discuss the applicable co-location coupling loss assumption and the applicable receiver degradation for the transmitter intermodulation requirement, if transmitter intermodulation requirement is applicable in SBFD slots/symbols * For dynamic range, the IoT level and wanted signal power level could be further discussed * OTA ACS * OTA In-band blocking requirement * OTA RX intermodulation * In-channel selectivity   Proposal 4: For SBFD-capable BS, define transmitter transient period between non-SBFD slot and SBFD slot.   * The transmitter transient period is within the SBFD slot. * Consider 10us as baseline.   Proposal 5: For SBFD-capable BS, further discuss whether in-channel adjacent subband leakage ratio and in-channel adjacent subband blocking and selectivity are needed to be defined. |
| R4-2405648 | ZTE Corporation | Proposal 1: for SBFD BS co-location related requirements, propose to follow the existing CLTA assumption captured in TS 38.141-2.  Proposal 2: for Tx intermodulation requirement, it’s also up to vendor’s declaration. If BS claim to comply with Tx intermodulation requirement, then ACLR, UEM ,spurious emission and Rx sensitivity degradation should be declared together.  Proposal 3: agree with 1.0dB degradation for SBFD BS REFSENS requirements;  Proposal 4: for receiver dynamic requirement, both uplink signals and BS2BS2 CLI signal should be considered for IoT levels.  Proposal 5: for the receiver intermodulation requirements, BS2BS CLI should be taken into account for power level for interference signal.  Proposal 6: for receiver intermodulation requirements, consider IMD between CW/NBB/general intermodulation interfering signal intermodulate with SBFD DL transmission with some performance degradation on SBFD receiver as shown in Figure 2.2.3-1.  Proposal 7: for the co-site inter-sector, in-channel blocking, in-channel selectivity and in-channel sub-band leakage, this could be left up to the vendor declaration without defining any specific power or freq offset of the corresponding requirement.  Proposal 8: for the inter-site scenario, propose to further discuss how to handle the BS CLI problem e.g. with RAN4 minimum RF requirement (usually worst assumptions) or with other coordination schemes defined in other WGs. |
| R4-2405655 | Samsung | Proposal 1: BS RF requirements for SBFD-capable BS shall be specified to enable all feasible BS implementations, including different kinds of solutions to address RX chain saturation and to mitigate interference .  Proposal 2: It is within RAN4 scope to study/specify the limitation or restriction on the size of subband/guardband.  Proposal 3: Same as Rel-18 study item, RAN4 shall only focus on the following multi-carrier configuration for SBFD-capable BS, i.e.,   * SBFD operates in only one BS carrier, and legacy TDD operates in other intra-band BS carrier(s) contiguous or non-contiguous to the SBFD carrier.   Proposal 4: No need further adjacent channel co-existence in Rel-19 work item.  Proposal 5: The CLI handling schemes to be supported in RAN1 shall be considered in specifying the BS RF requirements, which are agreed to be based on RAN4 adjacent channel co-existence evaluation results.  *Discussion on TX requirement impact for SBFD*  Observation 2: The discussion on TX intermodulation for SBFD-capable BS is related to the one on OTA co-location reference antenna definition in Rel-19 work item on NR BS RF requirement evolution.  Proposal 6: RAN4 further discuss the following options to derive OTA sensitivity degradation:   * Option 1: the degradation value is BS declaration based. * Option 2: a fixed value provided in the specification.   Observation 3: It is difficult for RAN4 to agree on a reference scheme for self-interference suppression and the necessary inter-gNB interference suppression by considering the different possible inter-gNB CLI mitigation schemes implemented to derive the potential new requirement in-channel adjacent subband leakage ratio.  Proposal 7: There is no necessity to introduce new requirement for in-channel adjacent subband leakage ratio.  Proposal 8: There is no necessity to introduce new requirement for in-channel adjacent subband blocking and adjacent subband selectivity. |

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1: BS RF Specification structure for SBFD requirements

#### Issue 2-1-1: BS RF Specification structure for SBFD requirements

* Options of how to introduce BS RF new requirements for SBFD-capable BS:
  + Option 1 (CATT): Creating new sub-clauses in TS 38.104 (similar as UE feature in TS38.101)
  + Option 2: Embedding the corresponding new RF requirements for SBFD in the corresponding section of TS 38.104
* Moderator Recommendation:
  + Discussion on this issue firstly by collecting pros and cons of both options.

### Sub-topic 2-2: SBFD-capable BS classes

#### Issue 2-2-1: BS classes to support SBFD operation

* Options:
  + Option 1 (CATT): LA BS RF requirements are defined in WI phase, MR BS can also be considered. FFS WA BS.
  + Option 2 (CMCC): BS classes to support SBFD is declaration based, and it is suggested to define WA gNB requirement for SBFD
* Moderator Recommendation:
  + Discussion on this proposal firstly in this meeting.

### Sub-topic 2-3: SBFD Requirement applicability

#### Issue 2-3-1: Applicability of SBFD and non-SBFD requirements

* General rule for the applicability of SBFD and non-SBFD requirements:
  + Option 1 (Ericsson): Requirements in general need to be consistently applied and thoroughly tested in both SBFD slots and non-SBFD slots.
* Moderator Recommendation:
  + Discussion on this general applicability rule firstly and to see if there is some requirement for which the requirement can be verified in either SBFD or non-SBFD slots.

#### Issue 2-3-2: Applicability of SBFD requirements to different feasible BS implementations

* The applicability of SBFD requirements to different feasible BS implementations:
  + Option 1 (Samsung): BS RF requirements for SBFD-capable BS shall be specified to enable all feasible BS implementations, including different kinds of solutions to address RX chain saturation and to mitigate interference.
* Moderator Recommendation:
  + Discussion on this option firstly in this meeting.

#### Issue 2-3-3: Operating bands for SBFD operation

* Operating bands for SBFD operation:
  + Option 1 (vivo): Specify operating bands for SBFD operation.
  + Option 2: In general, no band-specific requirement for SBFD operation.
* Moderator Recommendation:
  + Discussion on this issue firstly in this meeting.
* Ad-hoc:
  + ZTE: only limited to TDD bands.
  + QC: clarify further on option-1.
  + vivo: We want to discuss which TDD band(s) can be used for SBFD. From regulation perspective, some of TDD bands are studied and we are not quite sure all of them can be used for SBFD. Maybe a note or a new column for different bands which can be used for SBFD.
  + Samsung: For study item, we don’t restrict the discussion on a specific band.
  + ZTE: another approach: SBFD can be used for FR1/FR2-1 TDD bands.
  + Charter: some bands we want to preclude from SBFD operation.
  + Vivo: if some bands have CBW less than 100MHz, it is smaller than the assumption used in study item.
  + ZTE: it is just assumption used in study item.
  + Huawei: SBFD is just one feature, which should not be defined for a specific band.
  + CATT: no band-specific requirement is needed for SBFD.

### Sub-topic 2-4: SBFD frequency-domain configuration

#### Issue 2-4-1: SBFD frequency-domain configuration in RAN4 specification

* [Moderator] As requested in WID, to support SBFD operation at gNB side within a TDD carrier, the mechanism for semi-static indication of frequency location of SBFD subbands to UE in RRC\_CONNECTED mode shall be specified. Based on last RAN1 meeting, it is agreed that:

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| --- |
| **Agreement**  The subband frequency-domain resources are same across different SBFD symbols within a TDD carrier. Frequency location of cell specific UL subband, and DL subband(s) if explicitly indicated, are indicated with reference to CRB grid.   * RB-level granularity is supported for semi-static indication of SBFD subband frequency location.   + Subject to RAN4 guidance on the size of subband/guardband, if any   + FFS reference starting RB and reference SCS |

* Proposals related to SBFD frequency-domain configuration in RAN4 specification:
  + Proposal 1 (Samsung/Qualcomm/Ericsson/vivo): It is within RAN4 scope to study/specify the limitation or restriction on the size of subband/guardband.
* Moderator Recommendation:
  + The proposal 1 can be agreed, and it can be suggested to FFS the size of subband/guardband in the following RAN4 meetings.
* Ad-hoc:
  + CATT: only limited scenarios are studied? Maybe some typical configurations are needed in the specification.
  + ZTE: Agree with P1. The problem is how to define the size of guardband which is needed, which could be different sizes needed.
  + CMCC: Agree with P1 and same concern as ZTE.
  + vivo: In the study phase, 5RBs are used for study, which could be the starting point for WI phase.
  + QC: we need to consider that in work item phase, which is RAN4 scope.
  + Huawei: Whether it is needed to be specified? We doubt that.
* Agreement:
  + It is within RAN4 scope to study/specify the limitation or restriction on the size of subband/guardband, by taking account different feasible BS/UE implementations.
    - FFS how RAN4 specification captures the subband configurations
    - FFS the necessity of standardize the guardband;
      * If needed, FFS the sizes of guardband in RAN4 shall be decided.

### Sub-topic 2-5: SBFD operation in BS configured with multi-carriers

#### Issue 2-5-1: SBFD operation in BS configured with multi-carriers

* Proposals related to multi-carrier operation:
  + Proposal 1 (Samsung): Same as Rel-18 study item, RAN4 shall only focus on the following multi-carrier configuration for SBFD-capable BS, i.e.,
    - SBFD operates in only one BS carrier, and legacy TDD operates in other intra-band BS carrier(s) contiguous or non-contiguous to the SBFD carrier.
  + Proposal 2 (Qualcomm): RAN4 to clearly define the scope and definition of multi-carrier operation of SBFD-capable BS in Rel-18 WI.
* Moderator Recommendation:
  + ~~P1 and P2 are contradicting,~~ FFS the implication on RAN4 scope if the assumption is still followed as Rel-18 study item.
* Ad-hoc:
* Agreement:
  + Rel-19 requirement shall consider both (1) single carrier operation for SBFD (2) SBFD operates in only one BS carrier, and legacy TDD operates in other intra-band BS carrier(s) contiguous or non-contiguous to the SBFD carrier.

### Sub-topic 2-6: SBFD co-location requirement and reference antenna

#### Issue 2-6-1: Co-location requirement and reference antenna

* Proposal:
  + Proposal 1 (CMCC): for the typical MCL for Tx IMD, at first, we can use the range of spatial isolation from all companies’ input in TR 38.858 for SBFD self-interference analysis and then down-select to final typical value.
  + Proposal 2 (ZTE): for SBFD BS co-location related requirements, propose to follow the existing CLTA assumption captured in TS 38.141-2.
  + Proposal 3 (Qualcomm): RAN4 to discuss how to capture new co-location coupling loss requirements for SBFD based on the feasibility analysis captured in TR 38.858.
* Relationship with BS RF enh. WI on refence antenna discussion:
  + Observation 1 (Samsung): The discussion on TX intermodulation for SBFD-capable BS is related to the one on OTA co-location reference antenna definition in Rel-19 work item on NR BS RF requirement evolution.
* Moderator Recommendation:
  + Discussion on how to treat this with BS RF enh.WI on OTA co-location reference antenna definition firstly.
  + Proposals on further study coupling loss are to be discussed next.
* Ad-hoc:
  + Ericsson: BS RF enh. WI on OTA co-location reference antenna definition will be concluded in the end of Rel-19. Prefer to separate the discussion for SBFD. For OTA co-location reference antenna definition change, it is only for high frequency.
  + ZTE: Prefer to have separate discussion as BS RF enh. WI on OTA co-location reference antenna definition.
  + Nokia: The discussion in BS RF enh. WI may lead to very different reference antenna, so separate discussion is needed.
  + CMCC: For SBFD operation, based on our analysis, a large coupling loss is expected.
  + CATT: Decouple the general discussion on OTA co-location reference antenna definition in BS RF enh. WI from SBFD requirement for TX IMD.
  + Huawei: Prefer to study this in parallel. Similar as CATT.
  + Ericsson: Discussion on OTA co-location reference antenna definition in BS RF enh. WI is the general discussion for all co-location requirement. If the new definition is given, in the end, it shall be applied to SBFD requirement. For four co-location requirement, two are declaration based, and the real problem is TX IMD.
* Way forward:
  + Continue the discussion on TX IMD requirement for SBFD, based on the existing assumption for co-location reference antenna.
    - The assumption of co-location reference antenna could be revised based on the outcome from BS RF enh. WI.

### Sub-topic 2-7: System-level Simulation

#### Issue 2-7-1: Simulation for RX in-band blocking requirement

* There is one proposal from Ericsson to trigger the discussion on simulation for RX blocking requirement level:
  + Proposal 1 (Ericsson): Further simulation is necessary to determine the expected blocker levels due to other operators’ BSs during SBFD slots and to define the SBFD RX blocking requirement during the WI phase.
* Moderator Recommendation:
  + Discussion on this proposal in details, in the following aspects, e.g.:
    - What kinds of simulation required? System level or others.
    - Scenarios and other parameters?
    - Procedure to determine the level of in-band blocking?
    - How the co-channel CLI schemes to be considered in this evaluation?
    - Others.

#### Issue 2-7-2: Simulation for adjacent channel co-existence study

* [Moderator] In Rel-18 study item, Extensive evaluation has been conducted for adjacent channel co-existence study in Rel-18 RAN4 study, in which the coexistence simulations were performed under a total of 8 deployment scenarios, and in each deployment scenario a total of 4 cases were performed by obtaining the performance metrics, i.e, throughput loss at the cell edge and cell average:

Table 11.1-1 (from TR 38.858): Adjacent channel co-existence scenarios

| Scenario | FR | Aggressor | Victim |
| --- | --- | --- | --- |
| 1 | FR1 | Urban Macro | Urban Macro |
| 2 | FR1 | Urban Hotspot | Urban Hotspot |
| 3 | FR1 | Indoor | Indoor |
| 4 | FR1 | Urban Macro | Micro |
| 5 | FR1 | Micro | Micro |
| 6 | FR2-1 | Urban Macro | Urban Macro |
| 71 | FR2-1 | Urban Hotspot | Urban Hotspot |
| 8 | FR2-1 | Urban Dense | Urban Dense |
| 9 | FR2-1 | Indoor | Indoor |
| Note 1: This scenario has been down-selected. | | | |

Table 11.1-2 (from TR 38.858): Adjacent channel co-existence cases

| Case | Aggressor | Victim | Slot allocation  Aggressor Victim |
| --- | --- | --- | --- |
| 1 | SBFD | TDD DL |  |
| 2 | SBFD | TDD UL |  |
| 3 | TDD DL | SBFD |  |
| 4 | TDD UL | SBFD |  |
| Note: Case 3 and Case 4 are down-selected for Scenario 4. | | | |

* Proposals related to the necessity of further evaluation:
  + Proposal 1 (Samsung): No need further adjacent channel co-existence in Rel-19 work item.
  + Proposal 2 (Charter): We propose that adjacent channel interference between two carriers should be analysed and mitigated. (Moderator: not quite sure proponent’s intention is to have more co-existence study or not)
* Moderator Recommendation:
  + Discussion on the above proposals firstly in this meeting.
  + If further evaluation is needed, pls. clarify in which scenario/case additional evaluation is needed and why it is needed.

### Sub-topic 2-8: CLI handling for co-channel/adjacent channel interference

#### Issue 2-8-1: CLI handling for co-channel/adjacent channel interference

* [Moderator] Based on the revised WID, the CLI handling schemes to be introduced are discussed in RAN1.
* Proposals:
  + Proposal 1 (Charter): We propose that companies planning to provide SBFD solutions should study this issue and offer a solution that will mitigate their degradation issue.
  + Proposal 2 (Charter): We propose that solutions identified to address adjacent channel CLI for a single operator with two adjacent carriers, if applicable to the case of adjacent channel interference between two operators, be adopted.
  + Proposal 3 (Samsung): The CLI handling schemes to be supported in RAN1 shall be considered in specifying the BS RF requirements, which are agreed to be based on RAN4 adjacent channel co-existence evaluation results.
* Moderator Recommendation:
  + Specifying CLI handling scheme(s) is clearly not within RAN4 scope:

|  |
| --- |
| * Specify enhancements for CLI handling [RAN1, RAN2, RAN3]:   + Support gNB-to-gNB CLI handling scheme(s) (the detailed schemes are to be down-selected from those in TR38.858 by RAN1#117)   + Support UE-to-UE CLI handling scheme(s) (the detailed schemes are to be down-selected from those in TR38.858 by RAN1#117)   + Note: Without dedicated optimization for dynamic/flexible TDD. |

* + If CLI handling scheme(s) is specified in other groups, RAN4 can discuss BS RF requirement by considering the newly introduced CLI handling scheme(s).

### Sub-topic 2-9: Summary of Rel-18 study on the impact of BS RF requirement for SBFD-capable BS

#### Issue 2-9-1: Summary of Rel-18 study on the impact of BS RF requirement for SBFD-capable BS

* [Moderator] Summary of Rel-18 study on the impact of BS RF requirement for SBFD-capable BS is provided in R4-2405655, and here it can be used the baseline for view collection to make sure the group is aligned on the expected work in normative phase.
* Proposal:
* Table-1. Summary of Rel-18 study on the impact of BS RF requirement for SBFD-capable BS

|  |  |  |  |
| --- | --- | --- | --- |
| **Req. Category** | **Requirement** | **R18 Study Outcome** | **Action Expected in R19 for SBFD-capable BS** |
| **BS TX requirement** (already defined in TS 38.104 for legacy BS) | Base Station output power and radiated transmit power | (1) Declaration of TX power: Different declaration is allowed for SBFD symbol/slots. (2) Accuracy of TX power: Same requirement applies to SBFD symbol/slots. | Requirement changes expected |
| Output power dynamics | (1) RE power control dynamic range: Same requirement for SBFD BS (2) Total dynamic range: the new way agreed to calculate total dynamic range requirement for SBFD symbols/slots | Requirement changes expected |
| Transmit ON/OFF power | transmit ON/OFF power requirement is not applicable within SBFD time slot | No requirement changes expected |
| Transmitted signal quality | (1) Frequency error, modulation quality (EVM) and time alignment error (TAE): existing requirements shall be applied in SBFD symbols/slots (2) FFS joint measurement for normal DL and SBFD symbols/slots | FFS joint measurement for normal DL and SBFD symbols/slots |
| Unwanted emissions | (1) OBW: the existing OBW requirement shall be applied for the whole BS channel bandwidth in SBFD symbols/slots instead of DL sub-band (2) ACLR: Clarification of definition (3) OBUE: Clarification of definition (4) TX spurious emission: existing requirements apply (5) inter-band co-location and co-existence: still declaration based and existing requirements apply | Requirement changes expected |
| Transmitter intermodulation | FFS whether the transmitter intermodulation requirement is applicable in SBFD slots/symbols FFS applicable coupling loss assumption and receiver degradation | FFS requirement applicability to SBFD slots/symbols and detailed requirements if applied |
| **BS RX requirement** (already defined in TS 38.104 for legacy BS) | Reference sensitivity level and OTA sensitivity | Conducted: existing requirement applies OTA: New requirement for RX in uplink subband with degradation allowed | FFS OTA sensitivity degradation value and other side conditions |
| Dynamic range | Dynamic range: existing requirements apply IoT level and wanted signal level: FFS | FFS IoT level and wanted signal level |
| In-band selectivity and blocking | ACS: ACS value and interference level is determined by RAN4 co-existence study In-band blocking: In-band blocking requirement and the interference level is determined by RAN4 co-existence study | FFS ACS and in-band blocking requirement based on RAN4 co-existence study |
| Out-of-band blocking | Existing OOBB requirement applies except OTA sensitivity degradation | Requirement changes expected on requirement side condition |
| Receiver spurious emissions | No new requirement needed | No requirement changes expected |
| Receiver intermodulation | RX intermodulation requirement and the interference levels shall be determined by RAN4 co-existence study | FFS RX intermodulation requirement and the interference based on RAN4 co-existence study |
| In-channel selectivity | FFS the wanted signal and interfering signal levels | FFS the wanted signal and interfering signal levels |
| **Potentially new requirements for SBFD operation** (Not defined in TS 38.104 for legacy BS) | Transmitter transient period | A transition period between non-SBFD slot and SBFD slot and corresponding requirement is needed | FFS detailed new requirement for transition period |
| In-channel adjacent subband leakage ratio | No conclusion on the necessity of this requirement | FFS the necessity of In-channel adjacent subband leakage ratio requirement |
| In-channel adjacent subband blocking and adjacent subband selectivity | No conclusion on the necessity of this requirement | FFS the necessity of In-channel adjacent subband blocking and adjacent subband selectivity |

* Moderator Recommendation:
  + The table can be used the baseline for view collection to make sure the group is aligned on the expected work in normative phase.
  + After discussion, the revised table can be captured in Way Forward.

# Topic #3: TX requirements in details

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

Skipped since all Tdocs are summarized in Topic#2 already.

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 3-1: BS output power

#### Issue 3-1-1: PSD scaling for normal and SBFD slots/symbols

* Proposals:
  + Proposal 1 (Qualcomm): RAN4 to discuss how PSD scaling would be considered between normal and SBFD slots/symbols.
* Moderator Recommendation:
  + Discussion on the PSD scaling first proposal here.

### Sub-topic 3-2: TX intermodulation

#### Issue 3-2-1: TX intermodulation requirement

* Proposals:
  + Proposal 1 (CATT): The transmitter intermodulation co-location scenario should be revisited for SBFD deployment (Co-location coupling loss assumption can’t use 30 dB for SBFD capable gNB).
  + Proposal 2 (CMCC): if larger than 30dB MCL is assumed for Tx IMD, the same degradation as legacy in-band blocking could be assumed as baseline i.e. 6dB REFSENSE degradation. and then further check the feasibility with better SBFD receiver linearity assumption.
  + Proposal 3 (ZTE): for Tx intermodulation requirement, it’s also up to vendor’s declaration. If BS claim to comply with Tx intermodulation requirement, then ACLR, UEM, spurious emission and Rx sensitivity degradation should be declared together.
  + Proposal 4 (Nokia): TX IM requirements are still applicable to SBFD slots with 30dB interferer offset.
  + Proposal 5 (Ericsson): The TX IM requirement should be applied in SBFD slots, in order to demonstrate that the BS will continue to meet all regulation. However, during these tests, the RX sub-band is not expected to receive and may be deactivated during TX IM test.
* Moderator Recommendation:
  + Discussion on inter-modulation on the following aspects:
    - The coupling loss used in the location reference antenna: discussed in Sub-topic 2-8;
    - Under certain coupling loss, what is expected for the RX sub-band: degradation or no reception is expected.
    - Requirement is vendor-declaration based or not.

### Sub-topic 3-3: Unwanted emissions

#### Issue 3-3-1: The necessity of Co-location ACLR requirement

* Proposals:
  + Proposal 1 (CMCC): Further discuss whether the co-location ACLR or equivalent requirement is needed or not.
* Moderator Recommendation:
  + Discuss the proposal firstly, which is intended to separate the ACLR requirement into co-located requirement (which could be tightened from regular ACLR requirement).

#### Issue 3-3-2: Regular ACLR requirement

* Proposals:
  + Proposal 1 (Qualcomm): RAN4 to discuss how scenarios would be defined to derive ACLR requirements for SBFD BS based on the adjacent channel coexistence analysis
* Moderator Recommendation:
  + Discussion on the proposal firstly.

### Sub-topic 3-4: Transmitter signal quality

#### Issue 3-4-1: Joint measurement for normal DL symbols/slots and SBFD symbols/slots

* Proposals:
  + Observation 1 (Nokia): New complex test model would be needed to support joint measurement of transmitter signal quality for normal DL symbols/slots and SBFD DL symbols/slots.
  + Proposal 1 (Nokia): Separate transmitter signal quality measurements are preferred for normal DL symbols/slots and SBFD symbols/slots.
* Moderator Recommendation:
  + Discussion on the proposal(s) firstly:
    - Question to the group: The measurement will only impact core RF requirement or not?

# Topic #4: RX requirements in details

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

Skipped since all Tdocs are summarized in Topic#2 already.

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 4-1: OTA sensitivity

#### Issue 4-1-1: OTA sensitivity degradation

* Options:
  + Option 1: the degradation value is BS declaration based.
  + Option 2: a fixed value for degradation provided in the specification.
    - Option 2a: 1.0dB degradation
    - Option 2b: Use maximum of 0.5dB for desensitization target value for the OTA sensitivity requirement due to self-interference.
* Assumption for the interference considered in the OTA sensitivity degradation:
  + Alt. 1: RAN4 to consider self-interference, inter-site interference, and inter-sector interference when defining the OTA reference sensitivity.
  + Alt. 2: Only self-interference considered
  + Alt. 3: Others
* Moderator Recommendation:
  + Discussion on the Options/Alts firstly.

### Sub-topic 4-2: ACS

#### Issue 4-2-1: Co-location ACS requirement

* Proposals:
  + Proposal 1 (CMCC): Further discuss whether the co-location ACS or equivalent requirement is needed or not.
* Moderator Recommendation:
  + Discussion on the proposal together with Issue 3-3-1 for co-location ACS.

### Sub-topic 4-3: Dynamic range

#### Issue 4-3-1: Dynamic range requirement

* Proposals:
  + Proposal 1 (ZTE): For receiver dynamic requirement, both uplink signals and BS2BS2 CLI signal should be considered for IoT levels.
  + Proposal 2 (Qualcomm): RAN4 to derive the IoT level and wanted signal power level within RAN4 adjacent channel coexistence.
* Moderator Recommendation:
  + P1 and P2 are not contradicting, and discussion on both proposals firstly.

### Sub-topic 4-4: In-band selectivity and blocking

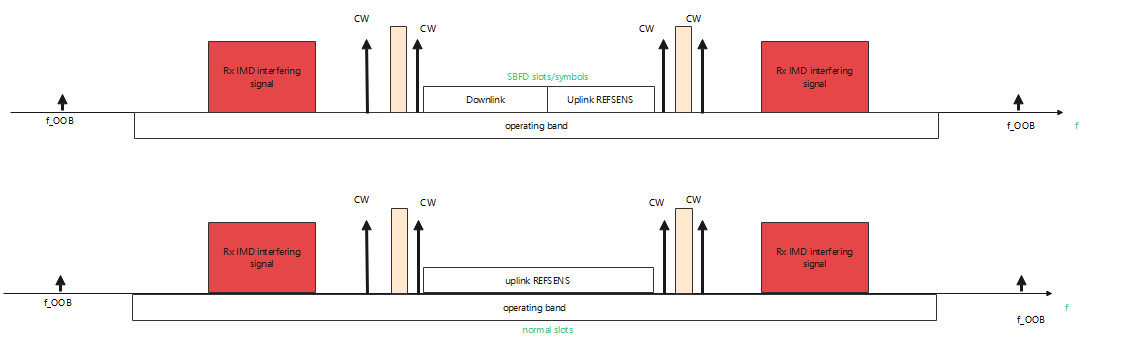
#### Issue 4-4-1: In-band selectivity and blocking

* Proposals:
  + Proposal 1 (Qualcomm/Ericsson): RAN4 to discuss which scenarios within the RAN4 adjacent channel coexistence to be defined to derive the ACS and in-band blocking requirements for SBFD BS.
* Moderator Recommendation:
  + Discussion on the proposal firstly.

### Sub-topic 4-5: Receiver intermodulation

#### Issue 4-5-1: Receiver intermodulation requirement

* Proposals:
  + Proposal 1 (Ericsson): Investigate whether an additional requirement based on a single input signal placed to cause IM with the RX sub-band provides any additional robustness, and whether such a requirement is anyhow implicitly captured by the SBFD RX blocking requirement.
  + Proposal 2 (Qualcomm): RAN4 to discuss how to capture the Rx intermodulation requirements in its adjacent channel coexistence work.
  + Proposal 3 (ZTE): For the receiver intermodulation requirements, BS2BS CLI should be taken into account for power level for interference signal.
  + Proposal 4 (ZTE): For receiver intermodulation requirements, consider IMD between CW/NBB/general intermodulation interfering signal intermodulate with SBFD DL transmission with some performance degradation on SBFD receiver as shown in Figure 2.2.3-1.

Figure 2.2.3-1: Example of Rx intermodulation requirement for SBFD BS

* Moderator Recommendation:
  + Discussion on Proposal 1 firstly, to see it can be accepted or not.

# Topic #5: Potentially new requirements in details

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

Skipped since all Tdocs are summarized in Topic#2 already.

*The moderator can suggest a limited number of papers which could be presented.*

## Open issues summary

*Before f2f meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 5-1: In-channel adjacent subband requirements

#### Issue 5-1-1: Necessity of In-channel adjacent subband leakage ratio/selectivity requirements

* Proposals:
  + Proposal 1 (CMCC): In-channel adjacent subband leakage ratio/selectivity can be discussed together with OTA sensitivity requirements.
  + Proposal 2 (Samsung): no necessity to introduce new requirement for in-channel adjacent subband leakage ratio/selectivity.
  + Proposal 3 (ZTE): For co-site inter-sector scenario, this could be left up to the vendor declaration without defining any specific power or freq offset of the corresponding requirement.
  + Proposal 4 (ZTE): For the inter-site scenario, propose to further discuss how to handle the BS CLI problem e.g. with RAN4 minimum RF requirement (usually worst assumptions) or with other coordination schemes defined in other WGs.
  + Proposal 5 (Nokia/Ericsson): RAN4 to define in-channel adjacent sub-band leakage ratio requirements within SBFD time slots considering co-site inter-sector interference and inter-site interference. And RAN4 to define in-channel adjacent sub-band selectivity requirement.
* Moderator Recommendation:
  + Discussion on the proposal(s) firstly by considering:
    - How to propose a minimum requirement to consider different interference cancelation implementations and CLI handing schemes?
    - In-channel adjacent subband leakage ratio/selectivity can be guaranteed by OTA sensitivity or not?
    - ZTE’s proposal on separate the scenarios into co-site inter-sector and inter-site

#### Issue 5-1-2: The way to derive requirements for in-channel adjacent subband leakage ratio/selectivity

* Proposals:
  + Proposal 1 (CATT/Qualcomm): The following new RF requirements are needed for SBFD BS, the requirements can be derived from the co-existence simulation.
    - In-channel adjacent subband leakage power ratio
    - In-channel adjacent subband selectivity
  + Observation 1 (CMCC): RAN4 should at first identify the assumption of adjacent network performance for sub-band leakage/selectivity requirement definition, i.e. whether inter-operator using adjacent carrier follow legacy 3GPP requirement or allow enhanced performance.
  + Proposal 2 (Nokia/Ericsson): Use existing ACLR and ACS as baseline.
* Moderator Recommendation:
  + Discussion on these proposals firstly.

#### Issue 5-1-3: In-channel adjacent subband blocking requirement

* Proposals:
  + Proposal 1 (CATT): In-channel adjacent subband blocking requirement may be needed. Both colocation and non-colocation scenario should be analyzed or simulated for the blocking signal level.
  + Proposal 2 (Samsung): There is no necessity to introduce new requirement for in-channel adjacent subband blocking and adjacent subband selectivity.
  + Proposal 3 (ZTE): for the co-site inter-sector, this could be left up to the vendor declaration without defining any specific power or freq offset of the corresponding requirement.
  + Proposal 4 (ZTE): for the inter-site scenario, propose to further discuss how to handle the BS CLI problem e.g. with RAN4 minimum RF requirement (usually worst assumptions) or with other coordination schemes defined in other WGs.
  + Proposal 5 (Qualcomm): The specific requirement of in-channel adjacent subband Blocking will be based on RAN4 adjacent channel coexistence.
* Moderator Recommendation:
  + Discussion on the proposal(s) firstly by considering:
    - How to propose a minimum requirement to consider different interference cancelation implementations and CLI handing schemes?
    - ZTE’s proposal on separating the scenarios into co-site inter-sector and inter-site
    - The scenario discussed for collocation and non-colocation

### Sub-topic 5-2: Transient period

#### Issue 5-2-1: Requirement for transient period

* Proposals:
  + Observation 1 (CMCC): the transient period for SBFD should not be larger than legacy ON-OFF transient period. Besides, the transient period between SBFD reconfiguration should not be larger than the transient period from SBFD to non-SBFD.
  + Proposal 1 (Huawei): transmitter transient period between non-SBFD slot and SBFD slot:
    - The transmitter transient period is within the SBFD slot.
    - Consider 10us as baseline.
  + Proposal 2 (Ericsson): Apply the existing TDD switching time and off level requirement to SBFD RBs when they are switched between TX and RX.
  + Proposal 3 (Ericsson): Apply the same transient period to transition between non-SBFD slots and SBFD slots as for normal full DL and UL switching.
* Moderator Recommendation:
  + Discussion on the proposal(s) firstly, by considering the following bullets can be agreed or not:
    - The length of transient period between non-SBFD slots and SBFD slots is the same as TDD TX/RX switching
    - The transmitter transient period is within the SBFD slot