**3GPP TSG-RAN WG4 Meeting # 109 R4-23xxxxx**

**Chicago, US, November 13 – 17, 2023**

**Agenda item:** 8.19.4

**Source:** Moderator (CMCC)

**Title:** Topic summary for [109][307] FS\_NR\_duplex\_evo\_Part3

**Document for:** Information

# Introduction

This thread focuses on adjacent channel co-existence evaluation for Rel-18 NR Duplex evolution SI and corresponds to agenda 8.19.2.1. This is the last meeting to close this SI.

# Topic #1: Simulation conclusion and assumptions

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **[R4-2319183](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319183.zip)** | Samsung | Draft TP to TR 38.858 Section 11.3  Detailed updated clause are listed as below:  11.3.3, 11.3.5 |
| **[R4-2319184](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319184.zip)** | Samsung | Draft TP to TR 38.858 Section 11.2 |
| **[R4-2319395](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319395.zip)** | Ericsson | TP to TR 38.858: Additions and corrections relevant for adjacent channel co-existence evaluation results in clause 11  Based on analysis of simulation results the following updates to conclusion are presented for approval:  **Proposal 1:** For Scenario 1/Case 3, update the conclusion for UL to capture that throughput degradation is observed at cell edge and at average.  **Proposal 2:** Change the conclusion for Case 2 to capture: The throughput degradation is due to the inter-BS ACI introduced by SBFD, which increases as grid shift (BS-to-BS distance) decreases in scenarios 1, 2 and 5. In scenario 4 (UMa-to-UMi scenario), the degradation increases and then decreases due to the relative distance and elevation angle between UMa and UMi base stations. This is a result of the grid shift reduction and consequent changes in antenna discrimination.  Summary of changes:   1. In subclause 11.1, the editor’s note is removed, references to tables corrected and minor editorial corrections. 2. In subclause 11.3, the editor’s note is replaced with introduction to section. 3. In subclause 11.3.1, table heading is added. 4. In subclause 11.3.2, table heading is added. 5. In subclause 11.3.3, table headings are added. 6. In subclause 11.3.4, table headings are added. 7. In subclause 11.3.1 to subclause 11.3.4, reference to considered scenario is added. 8. In subclause 11.3.2, align Scenario 4/Case 2 UL conclusion with other Scenario conclusions, as described in section 2.2. 9. In subclause 11.3.1 to subclause 11.3.4, harmonization of terminology (BS, antenna configuration, grid-shift, etc.) 10. In subclause 11.3.3, align Scenario 1/Case 3 with simulation results in Excel-sheet, as described in section 2.1. |
| **[R4-2319400](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319400.zip)** | Ericsson | TP to TR 38.858: Addition of missing information relevant for interference power scaling in Annex E  **Proposal 1:** Add description of RAN4 power scaling concept in Annex E.2.3.  **Proposal 2:** Add misalignment between RAN1 and RAN4 in Annex E.4  The TP also update following sections.  E.1, E.2.1, E.2.3, E.3.1, E.4.2, E.4.3, E.4.4 |
| **[R4-2319780](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319780.zip)** | Qualcomm Germany | TP to TR 38.858: Section 11.2 |
| **[R4-2319807](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319807.zip)** | Qualcomm Germany | TP to TR 38.858 Annex E  Detailed updated clause are listed as below:  E.1, E.2.1, E.2.2, E.2.3, E.3.2 |
| **[R4-2320055](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320055.zip)** | Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd. | TP to TR 38.858 Section E: Adjacent channel co-existence evaluation results  Detailed updated clause are listed as below:  E.1, E.2.1, E.2.2, E.2.3, E.2.4, E.3.1, E.3.5 |
| **[R4-2320056](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320056.zip)** | Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd. | TP to TR 38.858 Section 11: Adjacent channel co-existence evaluation results  we propose a TP for Section 11 on TR 38.858, with the following changes:   * Add a clarification for the criteria used to derive the co-existence conclusions. * Add a clarification Table 11.3.2-1 for the effect of grid shift in the UMa-to-UMi scenario. * Removing a sentence in Table 11.3.4-1 that indicates that the UE-to-UE distance decreases with the grid shift. This is not correct, since the grid shift only affects the BS-to-BS distance. * Editorial changes:   + Align terminology between gNB and BS.   + Improve section readability.   + Correction of typos.   Detailed updated clause are listed as below:  11.1, 11.3 |
| **[R4-2320057](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320057.zip)** | Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd. | Observation 1: The submitted results for Scenario 1, Case 3, and baseline ACIR show UL throughout degradation at the cell center above the 5% criteria for any of the considered combinations of SBFD BS antenna configuration, SBFD BS Tx power, grid shift and adopted blocking model.  Observation 2: The conclusions currently captured in the endorsed draft TR 38.858 for Scenario 1, Case 3, state that: “SBFD UL throughput degradation is observed only for cell edge throughput and [no degradation is observed for average throughput]”.  Proposal 1: The coexistence conclusions for Scenario 1, Case 3 should indicate that UL throughput degradation is observed at both cell-edge and cell-center.  TP in annex on clause 11.3.3 |
| **[R4-2320253](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320253.zip)** | CableLabs, Charter Communications, Nokia, Nokia Shanghai Bell, Spark NZ Ltd. | **Observation 1: For Urban hotspot -> Urban hotspot deployments for FR1: DL throughput degradation is observed at the cell edge due to inter-UE CLI. There is no observed DL throughput degradation with enhanced ACIR by 8 dB.**  **Observation 2: Throughput degradation reduces as the ACIR enhancement increases, which could change the conclusion of SBFD coexistence simulations. For example, in scenario 2 case 1 with gNB antenna config 2, 49 dBm Tx power, 100% grid shift, and no noise figure enhancement, the cell edge (at the 5th percentile) throughput degradation is 17% (median value based on results from four companies) with the baseline ACIR, it is reduced to 13% with 2 dB ACIR enhancement, 8% with 4 dB ACIR enhancement, 3% with 6 dB ACIR enhancement, and no throughput degradation with 8 dB ACIR enhancement.**  **Observation 3: The theoretical maximum ACIR enhancement in FR1 is 4.8 dB for case 1, 6.2 dB for case 2, 1.2 dB for case 3, and 1.8 dB for case 4. The theoretical maximum ACIR enhancement in FR2-1 is 2.5 dB for case 1, 1.5 dB for case 2, 5.5 dB for case 3, and 3.5 dB for case 4.**  **Proposal 1: The ACIR enhancement limitations listed in Observation 3 need to be described in TR 38.858 clause 11 to avoid misleading.**  **Proposal 2: RAN4 needs to discuss how to consider SBFD adjacent-channel coexistence results with ACIR enhancement exceeding the limits.**   * **Option 1: The SBFD adjacent channel coexistence simulation results with unrealistically enhanced ACIR of up to 8 dB in the EXCEL spreadsheet could be presented AS IS. The WORD document generated by the moderator’s Python code should be updated with ACIR enhancement up to the limits.** * **Option 2: The SBFD adjacent channel coexistence simulation results with unrealistically enhanced ACIR of up to 8 dB in both the EXCEL spreadsheet and the WORD document generated by the moderator’s Python code could be presented AS IS because RAN4 #109 is the last meeting.**   All TPs on annex 11 are listed as in annex. Detailed updated clause are listed as below:  11.2 and 11.3.5 |

## Open issues summary

* + 1. Sub-topic 1-1 Conclusion for scenario 1/case 3

Previous meeting agreement is listed as below for information

Case 3 considers SBFD as a victim while NR TDD is operating DL in the adjacent channel for both FR1 and FR2-1. The following can be summarized:

Impact on SBFD DL:

|  |  |  |
| --- | --- | --- |
| Deployment Scenario  (Aggressor -> Victim) | Frequency range | Co-existence conclusion |
| Urban Macro -> Urban Macro | FR1 and FR2-1 | No observed throughput degradation on the SBFD DL for both average throughput and cell edge throughput for different gNB Tx powers, ranging (46dBm to 53 dBm for FR1 and 30 dBm for FR2-1), Grid shifts (5% to 100%), and different SBFD antenna configuration. |
| Urban Hotspot -> Urban Hotspot (N/A for FR2-1) |
| Indoor -> Indoor |
| Urban Micro/Dense -> Urban Micro/Dense |

Impact on SBFD UL:

|  |  |  |
| --- | --- | --- |
| Deployment Scenario  (Aggressor -> Victim) | Frequency range | Co-existence conclusion |
| Urban Macro -> Urban Macro | FR1 | Under baseline assumptions, observed SBFD UL throughput degradation is observed only for cell edge throughput and [no degradation is observed for average throughput]. With higher gNB Tx power and lower grid shifts, the degradation is increased for cell edge throughput and [average throughput]. |
| FR2-1 | Under baseline assumptions, no degradation on the SBFD UL is observed for both cell edge throughput and average throughput. Throughput loss is observed with higher gNB Tx power and lower grid shifts. |
| Urban Hotspot -> Urban Hotspot | FR1 | Under baseline assumptions, observed throughput degradation is observed at cell edge throughput and average throughput. With higher gNB Tx power and lower grid shifts, the degradation is increased. |
| Indoor -> Indoor | FR1 and FR2-1 | No SBFD UL throughput degradation for both average throughput and cell edge throughput is observed. |
| Urban Micro/Dense -> Urban Micro/Dense | FR1 | Under FR1 Urban micro 38dBm Tx power assumption, no degradation on the SBFD UL is observed for both cell edge throughput and average throughput. Throughput loss is observed with higher gNB Tx power (46dBm) and lower grid shifts. |
| FR2-1 | Under baseline assumptions, SBFD UL throughput degradation is observed only for cell edge throughput and [no degradation is observed for average throughput]. |

Detailed simulation results until last meeting are in R4-2316989.

Moderator note: all followings issues are to discuss the content that listed into square bracket in last meeting.

**Issue 1-1-1: conclusion for scenario 1/case 3 FR1, impact on SBFD UL:**

* Proposals
  + Option 1: (Ericsson, Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd.)
    - * For SBFD UL, observed throughput degradation is observed at cell edge throughput and average throughput. With higher BS Tx power and lower grid- shifts, the degradation is increased.
      * SBFD UL throughput degradation is observed at cell edge throughput and average throughput. With higher gNB Tx power and lower grid shifts, the degradation is increased for cell edge throughput and average throughput.
  + Option 2: (Samsung)
    - * Under baseline assumptions, observed SBFD UL throughput degradation is observed only for cell edge throughput and no degradation is observed for average throughput. With higher gNB Tx power and lower grid shifts, the degradation is increased for cell edge throughput and average throughput.
* Recommended WF
  + FFS for average throughput with baseline assumption.
  + With higher gNB Tx power and lower grid shifts, the degradation is increased for cell edge throughput and average throughput., i.e. delete the square bracket on top of last meeting agreements.

**Issue 1-1-2: conclusion for scenario 1/case 3 FR2-1, impact on SBFD UL:**

* Proposals
  + Option 1: (Ericsson. Samsung)
    - * no degradation is observed for average throughput.
* Recommended WF
  + Option 1, i.e delete the square bracket on top of last meeting agreements.
    1. Sub-topic 1-2 Conclusion for scenario 4/case 2

Previous meeting agreement is listed as below for information

Case 2 considers legacy TDD in UL slot as a victim while SBFD is operating in the UL slot in the adjacent channel for both FR1 and FR2-1. The following can be summarized:

|  |  |  |
| --- | --- | --- |
| Deployment Scenario  (Aggressor -> Victim) | Frequency range | Co-existence conclusion |
| Urban Macro -> Urban Macro | FR1 | The TDD UL has significant throughput degradation for different SBFD gNB antenna configuration and different gNB Tx powers.   * The cell edge throughput degradation is worse than the average throughput degradation. * The throughput degradation is due to the inter-gNB ACI introduced by SBFD, which increases as grid shift (gNB-to-gNB distance) decreases except in the UMa-to-UMi scenario. * The throughput degradation increases with SBFD gNB Tx power. * SBFD gNB antenna configuration slightly impacts the throughput degradation. |
| Urban Hotspot -> Urban Hotspot |
| Urban Macro ->Urban Micro |
| Urban Micro/Dense -> Urban Micro/Dense |
| Indoor -> Indoor | FR1 & FR2-1 | No TDD UL throughput degradation is observed. |
| Urban Macro -> Urban Macro | FR2-1 | TDD UL throughput degradation is observed at cell edge, no strong degradation is observed for the average throughput. |
| Urban Dense -> Urban Dense |

**Issue 1-2: conclusion for scenario 4/case 2:**

* Proposals
  + Option 1: update statement of grid shift impact on throughput degradation for scenario 4, i.e. throughput degradation increase and then decrease as grid shift increase (Ericsson in R4-2319395, Nokia in R4-2320056)
    - Change the conclusion for Case 2 to capture: The throughput degradation is due to the inter-BS ACI introduced by SBFD, which increases as grid shift (BS-to-BS distance) decreases in scenarios 1, 2 and 5. In scenario 4 (UMa-to-UMi scenario), the degradation increases and then decreases due to the relative distance and elevation angle between UMa and UMi base stations. This is a result of the grid shift reduction and consequent changes in antenna discrimination. (Ericsson in R4-2319395)
    - The throughput degradation is due to the inter-BS ACI introduced by SBFD, which increases as grid shift (BS-to-BS distance) decreases in Scenarios 1, 2 and 5. In Scenario 4 (UMa-to-UMi), the throughput degradation increases and then decreases as the grid shift reduces. This is due to the relative distance and elevation angle between UMa and UMi base stations. (Nokia)
* Recommended WF
  + Option 1 and further refine the wording.
    1. Sub-topic 1-3 ACIR enhancement

**Issue 1-3-1: ACIR enhancement related description in final TR:**

* Proposals
  + Option 1: The ACIR enhancement limitations listed as below need to be described in TR 38.858 clause 11 to avoid misleading. (CableLabs, Charter Communications, Nokia, Nokia Shanghai Bell, Spark NZ Ltd.)
    - The theoretical maximum ACIR enhancement in FR1 is 4.8 dB for case 1, 6.2 dB for case 2, 1.2 dB for case 3, and 1.8 dB for case 4. The theoretical maximum ACIR enhancement in FR2-1 is 2.5 dB for case 1, 1.5 dB for case 2, 5.5 dB for case 3, and 3.5 dB for case 4.
  + Option 2: no detailed value of ACIR enhancement (Samsung in TP 2319184)
    - “Where the relative ACIR was derived by assuming SBFD-capable gNB and SBFD-aware UEs are using same ACLR and ACS as legacy TDD gNB and UEs. Moreover, it is worth noting that by the nature of ACIR composition as defined in Annex E, the ACIR enhancement can be limited due to the limitation of legacy ACLR/ACS of the network operating on adjacent-channel.”
* Recommended WF
  + TBD

**Issue 1-3-2: whether/how to consider SBFD adjacent-channel coexistence results with ACIR enhancement exceeding the limits:**

* Proposals
  + Option 1: RAN4 needs to discuss how to consider SBFD adjacent-channel coexistence results with ACIR enhancement exceeding the limits. (CableLabs, Charter Communications, Nokia, Nokia Shanghai Bell, Spark NZ Ltd.)
    - Option 2-1: The SBFD adjacent channel coexistence simulation results with unrealistically enhanced ACIR of up to 8 dB in the EXCEL spreadsheet could be presented AS IS. The WORD document generated by the moderator’s Python code should be updated with ACIR enhancement up to the limits.
    - Option 2-2: The SBFD adjacent channel coexistence simulation results with unrealistically enhanced ACIR of up to 8 dB in both the EXCEL spreadsheet and the WORD document generated by the moderator’s Python code could be presented AS IS because RAN4 #109 is the last meeting.
  + Option 2: TBA
* Recommended WF
  + TBD
    1. Sub-topic 1-4 power scaling related statement in final TR

**Issue 1-4: power scaling related statement in final TR**

* Proposals
  + Option 1: Add description of RAN4 power scaling concept in Annex E.2.3. (Ericsson, Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd.)
  + Option 2: Add misalignment between RAN1 and RAN4 in Annex E.4. (Ericsson, Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd.)

Moderator note: Above options are not mutually exclusive. Further discuss one by one.

* Recommended WF
  + TBD

1. Topic #2: TPs

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **[R4-2318924](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318924.zip)** | CMCC | TP for TR 38.858 to update annex E.  Detailed updated clause are listed as below:  E.1, E.2.1 |
| **[R4-2319183](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319183.zip)** | Samsung | Draft TP to TR 38.858 Section 11.3  Detailed updated clause are listed as below:  11.3.3, 11.3.5 |
| **[R4-2319184](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319184.zip)** | Samsung | Draft TP to TR 38.858 Section 11.2 |
| **[R4-2319395](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319395.zip)** | Ericsson | TP to TR 38.858: Additions and corrections relevant for adjacent channel co-existence evaluation results in clause 11  Based on analysis of simulation results the following updates to conclusion are presented for approval:  **Proposal 1:** For Scenario 1/Case 3, update the conclusion for UL to capture that throughput degradation is observed at cell edge and at average.  **Proposal 2:** Change the conclusion for Case 2 to capture: The throughput degradation is due to the inter-BS ACI introduced by SBFD, which increases as grid shift (BS-to-BS distance) decreases in scenarios 1, 2 and 5. In scenario 4 (UMa-to-UMi scenario), the degradation increases and then decreases due to the relative distance and elevation angle between UMa and UMi base stations. This is a result of the grid shift reduction and consequent changes in antenna discrimination.  Summary of changes:   1. In subclause 11.1, the editor’s note is removed, references to tables corrected and minor editorial corrections. 2. In subclause 11.3, the editor’s note is replaced with introduction to section. 3. In subclause 11.3.1, table heading is added. 4. In subclause 11.3.2, table heading is added. 5. In subclause 11.3.3, table headings are added. 6. In subclause 11.3.4, table headings are added. 7. In subclause 11.3.1 to subclause 11.3.4, reference to considered scenario is added. 8. In subclause 11.3.2, align Scenario 4/Case 2 UL conclusion with other Scenario conclusions, as described in section 2.2. 9. In subclause 11.3.1 to subclause 11.3.4, harmonization of terminology (BS, antenna configuration, grid-shift, etc.) 10. In subclause 11.3.3, align Scenario 1/Case 3 with simulation results in Excel-sheet, as described in section 2.1. |
| **[R4-2319400](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319400.zip)** | Ericsson | TP to TR 38.858: Addition of missing information relevant for interference power scaling in Annex E  **Proposal 1:** Add description of RAN4 power scaling concept in Annex E.2.3.  **Proposal 2:** Add misalignment between RAN1 and RAN4 in Annex E.4  The TP also update following sections.  E.1, E.2.1, E.2.3, E.3.1, E.4.2, E.4.3, E.4.4 |
| **[R4-2319780](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319780.zip)** | Qualcomm Germany | TP to TR 38.858: Section 11.2 |
| **[R4-2319807](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319807.zip)** | Qualcomm Germany | TP to TR 38.858 Annex E  Detailed updated clause are listed as below:  E.1, E.2.1, E.2.2, E.2.3, E.3.2 |
| **[R4-2320055](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320055.zip)** | Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd. | TP to TR 38.858 Section E: Adjacent channel co-existence evaluation results  Detailed updated clause are listed as below:  E.1, E.2.1, E.2.2, E.2.3, E.2.4, E.3.1, E.3.5 |
| **[R4-2320056](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320056.zip)** | Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd. | TP to TR 38.858 Section 11: Adjacent channel co-existence evaluation results  we propose a TP for Section 11 on TR 38.858, with the following changes:   * Add a clarification for the criteria used to derive the co-existence conclusions. * Add a clarification Table 11.3.2-1 for the effect of grid shift in the UMa-to-UMi scenario. * Removing a sentence in Table 11.3.4-1 that indicates that the UE-to-UE distance decreases with the grid shift. This is not correct, since the grid shift only affects the BS-to-BS distance. * Editorial changes:   + Align terminology between gNB and BS.   + Improve section readability.   + Correction of typos.   Detailed updated clause are listed as below:  11.1, 11.3 |
| **[R4-2320057](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320057.zip)** | Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd. | Observation 1: The submitted results for Scenario 1, Case 3, and baseline ACIR show UL throughout degradation at the cell center above the 5% criteria for any of the considered combinations of SBFD BS antenna configuration, SBFD BS Tx power, grid shift and adopted blocking model.  Observation 2: The conclusions currently captured in the endorsed draft TR 38.858 for Scenario 1, Case 3, state that: “SBFD UL throughput degradation is observed only for cell edge throughput and [no degradation is observed for average throughput]”.  Proposal 1: The coexistence conclusions for Scenario 1, Case 3 should indicate that UL throughput degradation is observed at both cell-edge and cell-center.  TP in annex on clause 11.3.3 |
| **[R4-2320253](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320253.zip)** | CableLabs, Charter Communications, Nokia, Nokia Shanghai Bell, Spark NZ Ltd. | **Observation 1: For Urban hotspot -> Urban hotspot deployments for FR1: DL throughput degradation is observed at the cell edge due to inter-UE CLI. There is no observed DL throughput degradation with enhanced ACIR by 8 dB.**  **Observation 2: Throughput degradation reduces as the ACIR enhancement increases, which could change the conclusion of SBFD coexistence simulations. For example, in scenario 2 case 1 with gNB antenna config 2, 49 dBm Tx power, 100% grid shift, and no noise figure enhancement, the cell edge (at the 5th percentile) throughput degradation is 17% (median value based on results from four companies) with the baseline ACIR, it is reduced to 13% with 2 dB ACIR enhancement, 8% with 4 dB ACIR enhancement, 3% with 6 dB ACIR enhancement, and no throughput degradation with 8 dB ACIR enhancement.**  **Observation 3: The theoretical maximum ACIR enhancement in FR1 is 4.8 dB for case 1, 6.2 dB for case 2, 1.2 dB for case 3, and 1.8 dB for case 4. The theoretical maximum ACIR enhancement in FR2-1 is 2.5 dB for case 1, 1.5 dB for case 2, 5.5 dB for case 3, and 3.5 dB for case 4.**  **Proposal 1: The ACIR enhancement limitations listed in Observation 3 need to be described in TR 38.858 clause 11 to avoid misleading.**  **Proposal 2: RAN4 needs to discuss how to consider SBFD adjacent-channel coexistence results with ACIR enhancement exceeding the limits.**   * **Option 1: The SBFD adjacent channel coexistence simulation results with unrealistically enhanced ACIR of up to 8 dB in the EXCEL spreadsheet could be presented AS IS. The WORD document generated by the moderator’s Python code should be updated with ACIR enhancement up to the limits.** * **Option 2: The SBFD adjacent channel coexistence simulation results with unrealistically enhanced ACIR of up to 8 dB in both the EXCEL spreadsheet and the WORD document generated by the moderator’s Python code could be presented AS IS because RAN4 #109 is the last meeting.**   All TPs on annex 11 are listed as in annex. Detailed updated clause are listed as below:  11.2 and 11.3.5 |
| **[R4-2320448](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320448.zip)** | Qualcomm Germany | TP to TR 38.858: Section 11.2  This TP is the same as R4-2319780 |
| **[R4-2320640](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320640.zip)** | Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd. | This TP is the same as R4-2320055 |
| **[R4-2320641](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320641.zip)** | Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd. | This TP is the same as R4-2320056 |
| **[R4-2320642](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320642.zip)** | Nokia, Nokia Shanghai Bell, Charter Communications, Spark NZ Ltd. | This TP is the same as R4-2320057 |

## Open issues summary

### Sub-topic 2-1 TPs

Following list TPs for each clause. Merge is required.

|  |  |  |  |
| --- | --- | --- | --- |
| **Clause number** | | **Tdoc number** | **note** |
| 11 Adjacent channel co-existence evaluation results | 11.1 Introduction | **[R4-2319395](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319395.zip) (Ericsson)**  **[R4-2320056](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320056.zip) (Nokia)** |  |
| 11.2 Summary of all simulation results | **[R4-2319184](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319184.zip) (Samsung)**  **[R4-2319780](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319780.zip) (Qualcomm)**  **[R4-2320253](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320253.zip) (CableLabs)** | Based on conclusion of topic 1-3 |
| 11.3 Conclusion | **[R4-2319395](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319395.zip) (Ericsson)**  **[R4-2320056](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320056.zip) (Nokia)** |  |
| 11.3.1 Case 1: aggressor SBFD DU victim NR TDD DL | **[R4-2319395](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319395.zip) (Ericsson)**  **[R4-2320056](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320056.zip) (Nokia)** |  |
| 11.3.2 Case 2: aggressor SBFD DU victim NR TDD UL | **[R4-2319395](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319395.zip) (Ericsson)**  **[R4-2320056](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320056.zip) (Nokia)** | Capture conclusion of topic 1-2 |
| 11.3.3 Case 3: aggressor NR TDD DL victim SBFD DU | **[R4-2319183](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319183.zip) (Samsung)**  **[R4-2319395](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319395.zip) (Ericsson)**  **[R4-2320056](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320056.zip) (Nokia)**  **[R4-2320057](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320057.zip) (Nokia)** | Capture conclusion of topic 1-1 |
| 11.3.4 Case 4: aggressor NR TDD UL victim SBFD DU | **[R4-2319395](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319395.zip) (Ericsson)**  **[R4-2320056](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320056.zip) (Nokia)** |  |
| 11.3.5 General remarks on coexistence findings | **[R4-2319183](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319183.zip) (Samsung)**  **[R4-2320253](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320253.zip) (CableLabs)** |  |
| Annex E Adjacent channel co-existence evaluation | E.1 RAN4 co-existence simulation scenarios | **[R4-2319400](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319400.zip) (Ericsson)**  **[R4-2318924](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318924.zip) (CMCC)**  **[R4-2319807](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319807.zip) (Qualcomm)**  **[R4-2320055](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320055.zip) (Nokia)** |  |
| E.2 RAN4 co-existence simulation assumptions | **[R4-2318924](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2318924.zip) (CMCC)**  **[R4-2319400](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319400.zip) (Ericsson)**  **[R4-2319807](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319807.zip) (Qualcomm)**  **[R4-2320055](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320055.zip) (Nokia)** | Capture conclusion of topic 1-4 |
| E.3 RAN4 co-existence simulation methodology | **[R4-2319400](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319400.zip) (Ericsson)**  **[R4-2319807](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319807.zip) (Qualcomm)**  **[R4-2320055](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320055.zip) (Nokia)** |  |
| E.4 Differences in simulation assumptions of RAN1 and RAN4 | **[R4-2319400](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319400.zip) (Ericsson)** | Capture conclusion of topic 1-4 |

Following TPs are Repetitive.

[R4-2320448](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320448.zip) is same as R4-2319780

[R4-2320640](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320640.zip) is same as R4-2320055

[R4-2320641](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320641.zip) is same as R4-2320056

[R4-2320642](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2320642.zip) is same as R4-2320057

1. Topic #3: updated simulation data

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **[R4-2319396](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319396.zip)** | Ericsson | Additional simulation results (Scenario 3 and 9) related to SBFD adjacent channel coexistence evaluation  **Observation 1**: For Scenario 3/Case 1, where users are uniformly distributed in the indoor area, the DL signal is strong and resilient to UE-to-UE CLI, so that degradation is not observed.  **Observation 2**: For Scenario 3/Case 2, the DL of SBFD does not cause disruptive BS-to-BS interference against the UL of TDD. Degradation is not observed since the UL is strong to be resilient to BS-to-BS interference, and the dominant source of interference is that internal to the same TDD operator and happening on the same link and channel.  **Observation 3**: For Scenario 3/Case 3, the DL of TDD does not cause disruptive interference against the UL of SBFD or the DL of SBFD. Degradation is not observed since the UL and DL of SBFD are strong to be resilient to interference from the other operator. The interference from the other operator is not the dominating source of interference.  **Observation 4**: For Scenario 3/Case 4, where users are uniformly distributed in the indoor area, the DL signal is strong and resilient to UE-to-UE CLI, so that degradation is not observed. The dominant source of interference is not the one coming from the other operator.  **Observation 5**: For Scenario 9/Case 1, where users are uniformly distributed in the indoor area, the DL signal is strong and resilient to UE-to-UE CLI, so that degradation is not observed. The dominant source of interference is the same operator and same link interference, rather than the one coming from the other operator.  **Observation 6**: For Scenario 9/Case 2, the DL of SBFD does not cause disruptive BS-to-BS interference against the UL of TDD. Degradation is not observed since the UL is strong to be resilient to BS-to-BS interference, and the dominant source of interference is that internal to the same TDD operator and happening on the same link and channel.  **Observation 7**: For Scenario 9/Case 3, the DL of TDD does not cause disruptive interference against the UL of SBFD or the DL of SBFD. Degradation is not observed since the UL and DL of SBFD are strong to be resilient to interference from the other operator. The interference from the other operator is not the dominating source of interference.  **Observation 8**: For Scenario 3/Case 4, where users are uniformly distributed in the indoor area, the DL signal is strong and resilient to UE-to-UE CLI, so that degradation is not observed. The dominant source of interference is not the one coming from the other operator. |
| **[R4-2319399](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_109/Docs/R4-2319399.zip)** | Ericsson | SBFD coexistence simulation results (Scenario 3 and 9) in Excel-format |

## Open issues summary

### Sub-topic 3-1 simulation results

Ericsson add their simulation results for FR1 and FR2-1 indoor scenarios which is aligned with last meeting co-existence results, moderator merge them with last meeting simulation results and update the summary as linked as below.





