3GPP TSG RAN WG1 #109-e R1-220XXXX

e-Meeting, May 9th – 20th, 2022

Source: CMCC

Title: Summary on email discussion of TR skeleton for Rel-18 SI on evolution of NR duplex operation

Agenda item: 9.3

Document for: Discussion & Decision

# 1 Introduction

This document captures the RAN1#109-e email discussion [109-e-R18-Duplex-01] for the TR skeleton for the study item “Study on evolution of NR duplex operation” with SID in RP-220633. Companies are invited to enter their comments on the TR skeleton below.

# 2 Draft TR skeleton

A draft TR skeleton has been provided by the rapporteur in R1-2205187 (it can also be found in the draft folder ‘Inbox/drafts/9.3/draftSkeleton’) and presented in an online (GTW) session in RAN1#109e. The structure of the draft TR skeleton is inspired by TR 36.828.

# 3 Discussion

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| **Company** | **Comments** |
| QC | **Comment #1**: The description of section 6.1 should be updated to include the feasibility aspects of SBFD to reflect the SID description.

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| 6.1 SBFD feasibility and schemesEditor’s note: This section captures the general aspects of SBFD feasibility and schemes except the inter-gNB and inter-UE CLI handling schemes, which are captured in a separate section. |

**Comment #2**: Similar to the structure of section 6 of SBFD, Section 8 should have one more item on “Dynamic TDD schemes and feasibility”. This is needed to make sure we are aligned to the SID. Other schemes for dynamic TDD such as subband half-duplex (SBHD) as discussed in our tdoc R1-2205032 could be captured in that section.

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| The detailed objectives are as follows:* Identify applicable and relevant deployment scenarios (RAN1).
* Develop evaluation methodology for duplex enhancement (RAN1).
* Study the subband non-overlapping full duplex and potential enhancements on dynamic/flexible TDD (RAN1, RAN4).
* Identify possible schemes and evaluate their feasibility and performances (RAN1).
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**Comment #3**For section 7 and section 9, we think that FR1 and FR2 evaluation methodology and performance analysis should be captured independently in two different sections. **Comment #4**For section 6.2 and 8.1 on cross-link interference, it should be clarified how to handle the common and SBFD specific enhancement or dynamic-TDD specific enhancements.**Comment #5**It is preferred to have separate and dedicated section for new channel models of BS-BS channel model and UE-UE. And additional section capturing the model of the different components of self-interference and inter-SB modelling. These models are new to RAN1/RAN4 and should be captured in separate sections. **Comment #6**As commented online, there could be link-budget analysis and link-level analysis in addition to SLS. Based on the outcome of RAN1 discussion, these evaluation methods should be added in addition to the SLS. |
| Ericsson | **Comment #1**In our view, both link and system level evaluations are needed in this study item for SBFD, where link level evaluations are needed to properly study self-interference suppression. For dynamic TDD, we think system level evaluations are sufficient. Based on this, RAN1 should agree on a set of evaluation assumptions for both link and system level. These can be captured in the TR as two separate tables (see, for example, TR 38.808 for the 60 GHz WI). Accordingly, we suggest that Section 7.1 should contain two sub-sections as follows:7.1 Evaluation Methodologies7.1.1 Link Level *Note: includes a table of link-level evaluation assumptions*7.1.2 System Level*Note: includes a table of system-level evaluation assumptions***Comment #2**Regarding Qualcomm's Comment #5, we agree that the BS-BS and UE-UE channel models are important, and these can be captured in a table with all other evaluation as we suggest above.**Comment #3**We believe the structure of Section 7.2 – 7.x+2 needs adjustment. One of the more important aspects of the SI is to evaluate the performance impact on a legacy network, and this is done through a two-operator evaluation where Operator A deploys SBFD, and Operator B is legacy (static-TDD). This is stated in the SID quite clearly:* Study the performance of the identified schemes as well as the impact on legacy operation assuming their co-existence in co-channel and adjacent channels (RAN1).

This is in contrast to the RAN4 objective which is about studying feasibility and impact on RF requirements:* Study the feasibility of and impact on RF requirements considering adjacent-channel co-existence with the legacy operation (RAN4).

Hence, since RAN1 shall evaluate performance in both co-channel (single-operator) and adjacent channel (two-operator) scenarios, we think the structure of the evaluation results in the TR should reflect this objective accurately. Our suggestion is as follows, where different scenarios can be defined under each sub-section.7.2 Single-Operator Evaluation Results*Editor's Note: This section captures performance evaluation results for single-operator (co-channel) scenarios.*7.2.1 Scenario 17.2.2 Scenario 2…7.3 Two-Operator Evaluation Results *Editor's Note: This section captures performance evaluation results for two-operator (adjacent channel) coexistence scenarios, i.e., SBFD operator + legacy (static TDD) operator.*7.3.1 Scenario 17.3.2 Scenario 2…**Comment #4**We also agree with Qualcomm’s comment 3 regarding having separate sub-sections for FR1 and FR2 evaluations.  |
| OPPO | **Comment #1**: Another way to fulfill the SID task of “Identify possible schemes and evaluate their feasibility and performances (RAN1)” is to put feasibility evaluation in section 7, with separate sub-sections. If the feasibility study is put in section 6, * The feasibility study should be applicable to individual SBFD scheme, rather than the general SBFD principle. So Qualcomm’s suggestion could be improved to “SBFD schemes and corresponding feasibilities”
* The group should discuss whether such feasibility study should include not only SBFD schemes in section 6.1, but also interference handling schemes in section 6.2. Our understanding is to include both.

**Comment #2**: We share the view with Qualcomm that the “scheme and feasibility” apply to dynamic TDD section as well. **Comment #3:** Regarding to how to capture in TR the common schemes that handles both CLI in full duplex and CLI in dynamic TDD (i.e., Qualcomm’s comment #4), we are less worried for now, and think this is a kind of editorial issue that can be solved by either cross-reference or simple duplication. However, we are more curious on how to handle the RAN1 discussion for such common part (if any) -- keep the discussions parallel in two agenda? or even a more basic question: should the RAN1 discussion pursue to have any common handling between the CLI in full duplex and the CLI in dynamic TDD? We understand this may go beyond the skeleton itself but somehow related.**Comment #4**: We think it is a bit too early to discuss now where to put what kind of channel model or where to put LLS results. At current stage it is good enough to say the note under sections 7 and 9 as: *Editor’s note: This section captures the evaluation metrics, description of evaluation methodologies, etc, respectively for SLS and LLS, if any agreed.* **Comment #5:**  By reading the following SID assignment, * Study the performance of the identified schemes as well as the impact on legacy operation assuming their co-existence in co-channel and adjacent channels (RAN1).

we had a feel that the co-existence study should not be based on potentially separate scenarios, such as scenario x+1 or x+2. Instead, the fair comparison between w/ legacy operation and w/o legacy operation is better to be based on the same deployment scenario (with different ratios of R18/legacy UE populations). In addition, we think it is a bit too early to exclude the evaluation setup that co-channel co-existence and adjacent-channel coexistence occur together. Therefore, we prefer to see a skeleton like following, and with scenarios {x+1, x+2} being removed: *7.x Scenario y: SBFD scenario y**Editor’s note: This section captures the evaluation assumptions and performance evaluation results for SBFD scenario y, including the evaluation cases that take into account the impact on legacy operation assuming their co-existence in co-channel and adjacent channels.* |
| Spreadtrum | **Comment #1**: For the new added section 10 ***Feasibility of and impact on RF requirements***, editor’s note only mentioned RAN4 work and input. If coexistence issue can be discussed in this section, RAN1 work should be included as well, as it is in the scope of SID below: * *Study the performance of the identified schemes as well as the impact on legacy operation assuming their co-existence in co-channel and adjacent channels (RAN1).*
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| Huawei, HiSilicon | **Comment #1:** On section 7.1 and 9.1, in addition to system-level evaluation, we think both link budget analysis and link-level evaluation should be included. As discussed in our contribution R1-2203156, to evaluate the feasibility and performance of SBFD and dynamic TDD (in response to Ericsson’s comment #1), it is critical to study the CLI handling schemes, which are highly related to the performance of RX receiver, co-site self-interference cancellation, etc. It is difficult to evaluate these aspects in system level simulations due to the difficulty in modelling of realistic channel estimation (potentially impacted by CLI) and interference suppression algorithms. In addition, the link budget analysis on interference (section 2.4 in R1-2203156) is a very useful tool to study the feasibility and performance of SBFD and dynamic TDD. These results can provide some good insights on the potential blocking issues by comparing with the current RAN4 requirement as well as how much interference suppression and/or cancellation is required for each scenario. These are important for concluding the feasibility of SBFD and dynamic TDD. 7.1.1 Link budget analysis*Note: This section includes the simulation assumptions for link budget analysis*7.1.2 Link Level evaluations*Note: This section includes the simulation assumptions for link-level evaluations*7.1.2 System Level evaluations*Note: This section includes the simulation assumptions for system-level evaluations*…9.1.1 Link budget analysis*Note: This section includes the simulation assumptions for link budget analysis*9.1.2 Link Level evaluations*Note: This section includes the simulation assumptions for link-level evaluations*9.1.2 System Level evaluations*Note: This section includes the simulation assumptions for system-level evaluations***Comment #2:**On QC’s comment 1 to include the feasibility aspects of SBFD for section 6.1, we have a different view. The feasibility of SBFD not only depends on the general aspects of SBFD, it is also highly dependent on Section 6.2, i.e. whether the CLI can be properly handled. Hence, one possible way to conclude on the feasibility in separate sub-section under section 7 and section 9.**Comment #3:** On section 6.2, we are wondering whether intra-gNB CLI (self-interference) should also be included. |
| TCL | For section 6.1 we share similar views with Qualcomm and OPOO to include “Feasibility” in section 6.1, in order to align section 6.1 with the objectives mentioned in the SID. For “Inter-gNB and Inter-UE CLI handling” in section 6 and section 8, we are ok with the moderator skeleton, as the solutions of inter-gNB and inter UE CLI handling in SBFD may be different from CLI handling solutions in dynamic TDD. |
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# References

1. RP-213591, New SI: Study on evolution of NR duplex operation, CMCC
2. RP-220633, Revised SID: Study on evolution of NR duplex operation, CMCC