Email discussion summary for [RAN-R18-WS-eMBB-Rakuten] - Version 0.0.3
RAN

3GPP TSG RAN Rel-18 workshop RWS-210540

Electronic Meeting, June 28 - July 2, 2021

Agenda Item: 4.1

Source: Rakuten

Title: Email discussion summary for [RAN-R18-WS-eMBB-Rakuten]

1 Introduction

This email discussion summary covers the Q&A of the following Rakuten documents:

RWS-210199 - Uplink Enhancements

RWS-210202 - FR2 Mobility Enhancements

RWS-210246 - Inter gNB DL/UL Slot Interference Avoidance

2 Uplink Enhancements

2.1 Full Duplex/XDD

Initiate RAN1 Study item "Full Duplex/XDD" for gNB in Rel-18. Study item can include the topics like Self interference mitigation and Receiver Saturation handling.

Feedback Form 1: Comments on Full/Duplex XDD Proposal

1 – Samsung Electronics Co. Thanks for your view on duplex enhancement using XDD and subband FD and more. For the scope in Rel-18, what is highest priority in Rakuten perspective? (for example XDD and full FD at gNB and/or half and full duplex Ues, FR1 and FR2)
2 – Rakuten Mobile @Samsung Electronics: In the first phase for Rel-18 we would like to propose XDD and FUll FD at the gNB and Half duplex at UE's. We don't want to destinguish between FR1 and FR2

2.2 Multiple UEs Tx Power aggregation.

Study the potential UE aggregation mechanism, including the architecture that can be utilized to aggregate UE's Tx Power to improve the UL throughput.

Feedback Form 2: Comments on Multiple UE's Tx Power aggregation

1 – ZTE Corporation

We share similar views that UE aggregation can be used as one way to boost UL transmission power. In addition to power domain, do you intend to explore other potential benefits, e.g., spatial domain for multi-path transmission from the aggregated UEs?

2 – Qualcomm Technologies Int

Does the proposed framework allow UE aggregation only among UEs of the same user, or aggregation of UEs belonging to different users will be allowed as well?

3 – Rakuten Mobile

@ZTE : Good suggestion, We would like to support proposals from companies to explore other potential benefits.

@Qualcomm Technologies : Good questions, we believe that Multi-sim type of approach for same user can be prioritize, however we don't want to exclude the study item on UE's belonging to different users.

3.1 Enhanced Uplink CA and Power Aggregation

Study dynamic carrier selection and Tx Switching while UE configured with more than 2 Bands •Study UL dynamic power aggregation between UL CA CC's where a Tx Chain can increase power over 26dBm for a short duty cycle while UE ensures SAR compliance.

Feedback Form 3: Comments on Enhanced Uplink CA and Power Aggregation

1 – Spreadtrum Communications

For **enhanced uplink CA**, do you mean to support dynamic carrier selection together with antenna Tx switching? From our understanding, dynamic carrier selection can be studied separately from antenna Tx switching. Since carrier selection is a new topic comparing the current CA structure, we prefer to study dynamic carrier selection along first, instead of discussion it together with Tx switching.

For **uplink dynamic power aggregation**, it is a good point. A clarification for short power boosting, up to UE or also under the control of gNB? Is there any RAN1 impact?

2 – Huawei Tech.(UK) Co.. Ltd

Thank you for the contribution. We think several of the directions proposed are promising for improving the uplink capacity and coverage of the 5G networks, both for smartphones with 2Tx and for CPEs.

3 – ZTE Corporation

In general, we share that UL enhancements for better UL coverage and higher UL capacity are desirable. Enhanced UL CA and possibly also power aggregation could be the promising way to achieve this. Specifically for CA enhancements, we think support more UL carriers than DL carriers with flexible DL/UL association is one straightforward way to boost UL resources for higher capacity, as proposed in our contribution RWS-210479. Appreciated to hear your views on this point.

4 – Rakuten Mobile

@Spreadtrum Communications: We agree with your feedback, Dynamic carrier Selection and Tx Power switching can be seprated.We agree that CA Carrier Selection can be studied first. Will include in summary.

Regarding Tx power; We think it should be limited on the UE side just to ensure that SAR limit is not exceeded in case of any link or gNB malfunctioning.

@Huawei: Thank you for the comments. We are also interested in maximizing CPE's performance.

@ZTE: We will provide further comments on RWS-210479

4.RACH Coverage enhancement

•Support RACH repetitions for both FR2 and FR1

Feedback Form 4: Comments on RACH coverage enhancements

1 – Sony Europe B.V.

Clarification about "Multiple PRACH transmissions for the same beam and/or Multiple Beams"? Is it repetition for possible combining at the gNB?

2 – Spreadtrum Communications

For **UL coverage enhancement**, we also support to further study some leftover from Rel-17. Besides RACH coverage enhancement, what is your opinions towards other UL channels or solutions?

3 – ZTE Corporation

Do you think we should focus on some of the PRACH formats or all PRACH formats?

4 – Rakuten Mobile

@Sony Europe B.V Thank you for asking for the clarification, We think both same beam and Multiple beams are beneficial and yes it is possible to combine at the gNB and/or detection or PRACH via different Rx Beam. RAN1 can further discuss the use cases.

@Spreadtrum Communications : There have been several discussion /Work item on uplink coverage enhancements in Rel-16 and Rel-17. However the RACH coverage enhancement was not included.

@ZTE Corporation: Thank you for asking for the clarification, We think at this point we don't want to exclude any type of PRACH formats.

5.Support Higher Modulation (1024QAM) and Higher number of UL layer (6/8)

Feedback Form 5: Comments on Higher Modulation support Higher number of UL Layers

1 – ZTE Corporation

We share similar view that higher modulation order is one promising way for increasing UL capacity at least for fixed wireless access, e.g., CPE.

2 – Rakuten Mobile

@ZTE: Thank you for your support and comments.

3 FR2 Mobility Enhancements

3.1 L1/L2 based inter cell mobility

•The current scope of Beam based inter PCI L1/L2 based handover is being discussed within RAN1/2/3.

•RAN should continue further enhancements on L1/L2 based mobility such as inter DU L1/L2 HO, support for multiple serving cells like CA for L1/L2 Mobility.

Feedback Form 6: Comments on L1/L2 based Cell Mobility

1 – MediaTek Inc.

Q1. If L1/L2-based inter-cell mobility is introduced, where do you think the gain comes from?

2 – Nokia Corporation

We share your view that mobility enhancements are important area for Rel-18 enhancements.

Fast SN activation is discussed as a part of Rel-17 feDCCA WI. What kind of other enhancements in this area do you foreseen in Rel-18?

On faster PCell failure recovery via SCell, do you forsee enhancement for the fast mcg failure recovery feature to make it faster?

Can you clarify a bit further what kind of enhancements you are considering for MR-DC?

3 – Rakuten Mobile

@MediaTek: The biggest gain comes from reuse of RRC config for the serving cell.

@Nokia Corporation:

Fast SN activation is discussed as a part of Rel-17 feDCCA WI. What kind of other enhancements in this area do you foreseen in Rel-18?

Ans: We think PCcell recovery though SCell in FR2 is not in scope of Rel-17 feDCCA WI.

On faster PCell failure recovery via SCell, do you forsee enhancement for the fast mcg failure recovery feature to make it faster?

Ans: Our proposal is mostly for CA as MR-DC is already supported.

Can you clarify a bit further what kind of enhancements you are considering for MR-DC?

Ans: This is basically, an extension of dual connectivity with more than one SCG. More than two connections but only two of them would be activated.

3.2 Faster RLF declaration

Radio conditions change rapidly in FR2, however RLF declaration is based on DRX and hence can take few seconds to trigger.RAN1/2 should investigate method to declare Faster RLF especially for FR2

Feedback Form 7: Comments on faster RLF detection

1 – InterDigital Germany GmbH

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Can you clarify what is intended with faster RLF for FR2, and how can we tradeoff with false triggering that may occur due to temporary blocking?

2 – Rakuten Mobile

This is a good question: We understand there is a tradeoff, however we suggest RAN1 to consider the rate of Radio condition change in FR2 and RLF failure declaration. Delaying the RLF have impact on RLM performance. Operators should be given the opportunity to optimize RLF triggering.

3.3 Faster PCell failure recovery via SCell

Like fast MCG Failure recovery in Rel-16, similar faster failure recovery for PCell through SCell in FR2 should be supported.

Feedback Form 8:

1 – Nokia Corporation

We share your view that mobility enhancements are important area for Rel-18 enhancements. On faster PCell failure recovery via SCell, do you forsee enhancement for the fast mcg failure recovery feature to make it faster?

2 – Rakuten Mobile

@Nokia: Our proposal for faster recovery is mostly for CA Case, however we would interested in further enhancements for the fast MCG failure recovery.

3.4 FR2 DAPS Handover

DAPS handover is excluded for FR2, DAPS based FR2 handover should be supported.

Feedback Form 9: Comments on FR2 DAPS HO support

3.5 Enhancements of MR-DC

More than one active Leg support in Rel-18 along with study on faster SN activation.

Feedback Form 10: comments on Enhancements of MR-DC

1 – Intel Corporation (UK) Ltd

Are you considering more than 2 active legs?

2 – Nokia Corporation

We share your view that mobility enhancements are important area for Rel-18 enhancements.

Can you clarify a bit further what kind of enhancements you are considering for MR-DC?

3 – Rakuten Mobile

@Intel: Good question, basically we propose only 2 Active legs, However configured legs can be increased.

4 Inter gNB DL/UL Slot Interference Avoidance

Motivation

NR support dynamic TDD DL/UL slot configuration, however dynamic TDD configuration seems not deployed by operators in reality due to inter-cell interference.

Rel-16 focus on UE to UE CLI and related UE measurements.

Rel-16 based CLI mitigation study has not covered Inter-gNB interference specially in Heavy UL to Heavy DL case.

Due to emergence of XR/VR, Mobile gaming and other data heavy application, there have been demands to really utilize dynamic TDD configuration.

TR 38.828 states that significant performance degradation is observed due to inter-gNB interference

Proposal

RAN1 should investigate further possible solutions to decrease the impact of interference between UL and DL slots between cells when using different UL/DL configuration

Feedback Form 11: Comments on Inter gNB DL/UL Slot interference Avoidance

1 – Huawei Tech.(UK) Co.. Ltd

Thank you for the contribution. We agree with the observation that inter-BS DL/UL interference was not yet addressed and should be addressed in Rel-18.

2 – Rakuten Mobile

@Huawei: Thank you for the comments. We believe that this issue must be discussed in detail in Rel-18.

5 2nd Round of Discussion:

This email discussion summary covers the Q&A of the following Rakuten documents:

5.1 RWS-210199 - Uplink Enhancements

5.1.1 1.Full Duplex XDD

Initiate RAN1 Study item “Full Duplex/XDD” for gNB in Rel-18.

Study item can include the topics like Self interference mitigation and Receiver Saturation handling.

Feedback Form 12: FULL Duplex XDD

5.1.2 Multiple UEs Tx Power aggregation.

Study the potential UE aggregation mechanism, including the architecture that can be utilized to aggregate UE’s Tx Power to improve the UL throughput.

Feedback Form 13: Multiple UE’s Tx Power Aggregation

5.1.3 Enhanced Uplink CA and Power Aggregation

Study dynamic carrier selection and Tx Switching while UE configured with more than 2 Bands •

Study UL dynamic power aggregation between UL CA CC’s where a Tx Chain can increase power over 26dBm for a short duty cycle while UE ensures SAR compliance.

Feedback Form 14: Enhanced Uplink CA power aggregation

5.1.4 RACH Coverage enhancement

•Support RACH repetitions for both FR2 and FR1 5.Support Higher Modulation (1024QAM) and Higher number of UL layer (6/8)

Feedback Form 15: RACH Coverage enhancements

5.2 RWS-210202 - FR2 Mobility Enhancements

1.L1/L2 based inter cell mobility

•The current scope of Beam based inter PCI L1/L2 based handover is being discussed within RAN1/2/3.

•RAN should continue further enhancements on L1/L2 based mobility such as inter DU L1/L2 HO, support for multiple serving cells like CA for L1/L2 Mobility.

2.Faster RLF declaration

•Radio conditions change rapidly in FR2, however RLF declaration is based on DRX and hence can take few seconds to trigger.RAN1/2 should investigate method to declare Faster RLF especially for FR2

3.Faster PCell failure recovery via SCell

•Like fast MCG Failure recovery in Rel-16, similar faster failure recovery for PCell through SCell in FR2 should be supported.

4.FR2 DAPS Handover

•DAPS handover is excluded for FR2, DAPS based FR2 handover should be supported.

5.Enhancements of MR-DC

•More than active Leg support in Rel-18 along with study on faster SN activation.

Feedback Form 16: FR2 Mobility Enhancements

5.3 Inter gNB DL/UL Slot Interference Avoidance

RAN-1 should investigate further possible solutions to decrease the impact of interference between UL and DL slots between cells when using different UL/DL configuration.

Feedback Form 17: Inter gNB DL/UL Slot Interference Avoidance

6 Summary

6.1 Uplink Enhancements

Multiple questions were asked during 1st round of discussions which Rakuten tried to answer.

Overall no major objection raised, Rakuten would like to keep the conclusions from original Proposal.

6.2 FR2 Mobility Enhancements

Companies asked for clarification on Rakuten's proposal for FR2 Mobility; No major concern raised. Rakuten provided further clarification on each proposal.

6.3 Inter gNB DL/UL Slot Interference Avoidance

No question raised, Huawei also seems to support the proposal.