RAN-R18-WS-eMBB-ZTE - Version 0.0.9
RAN

3GPP TSG RAN REL-18 workshop **RWS-210548**

e-Meeting, June 28th –July 2nd, 2021

Source: **ZTE**

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

Agenda Item: **4.1**

Document for: **Discussion**

1 Introduction

This document summarizes the discussion on the following ZTE contributions [1-3] submitted to the agenda item 4.1.

[1] RWS-210464, CADC and Mobility Enhancements, ZTE Corporation, Sanechips

[2] RWS-210465, Support of Reconfigurable Intelligent Surface for 5G Advanced, ZTE Corporation, Sanechips, China Unicom, NEC

[3] RWS-210466, Further enhancement of data collection for SON&MDT in NR and MR-DC, ZTE, Sanechips.

The following is the timeline of the discussion:

Round 1 Q&A:

- Questions: June 14 08:00 UTC – June 17 8:00 UTC;

- Answers: June 17 8:00 UTC – June 18 23:59 UTC

Round 2 Q&A:

- Questions: June 21 08:00 UTC – June 23 8:00 UTC;

- Answers: June 23 8:00 UTC – June 24 18:00 UTC

Before June 25 18:00 UTC, email discussion summary is to be uploaded.

2 General comments

Please provide any general comments on the contributions [1-3] in this section

Feedback Form 1: Please provide general comments on contributions in [1-3] in this section

3 Summary of Q&A and comments on contributions

3.1 CADC and mobility enhancements (RWS-210464)

FR2 is a key enabler for 5G advanced, and FR2 needs a wide variety of enhancements to improve performance and reliability and in RWS-210464, we suggest work on the following aspects:

Robustness improvements

- Support of multi-connectivity to enable multiple (e.g. up to three) connections, with the option to enable selective activation (i.e. only two connections active at a time)

o Configuration for more than two connections (e.g. cell groups) stored on UE side, and UE can activate two of them in a dynamic manner.

o The connection switch can be used for either MCG (e.g. handover) or SCG (PSCell change).

o The connection activation/deactivation/ switch can be triggered by either NW including L1/L2 command or by UE itself based on preconfigured event.

o DRB primary path switch and duplication activation/deactivation can be triggered by UE.

Interruption reduction and fast SCellactvation

- Support of make before break and RACH less HO

- Support of SRS transmission for dormant SCells

Fast failure detection and recovery

- Fast failure detection (e.g. by more frequent RLM irrespective of the DRX cycle in some cases)

- Fast recovery of Pcell through Scell and fast Pcell switch among the serving cells

Dynamic UE capability sharing

- Capability sharing based on activated cells/BWPs instead of configured cells or BWPs

3.1.1 Round-1 Discussion

3.1.1.1 Question collection (round-1)

Feedback Form 2: Please provide company comments/questions on the above aspects (see RWS-210464 for details)

1 – LG Electronics Inc.

Thank you for the proposals.

Q: Regarding dynamic UE capability sharing, are you considering to increase configured Scells/BWPs in Rel-18 for a given Rel-17 UE capability? If so, doesn't it require some other complexity such as measurement?

2 – China Telecommunications

We have similar views in terms of robustness improvement and interruption reduction, as well as fast failure detection and recovery, for the dynamic UE capability sharing, we have similar concerns as LG Electronics, it may bring other complexities for the UE.

3 – Guangdong OPPO Mobile Telecom.

Thanks for the contribution. One question for clarification:

Q: Does the "fast SCell activation" in 2nd bullet on slide #9 have the different context from "Rel-17 fast SCell activation"? or does it make the Rel-17 fast SCell activation even faster in Rel-18?

4 – Beijing Xiaomi Mobile Software

Regarding dynamic capability sharing, is there impact on UE side? Seems this could be handled by NW without UE impact?

5 – China Unicom

Thanks for this contibution.

For slides 4, if duplication activation/deactivation triggered by UE is supported in R18, is that means UE should support three or more links connecting to the gNB? What is the potential impact if duplication activation/deactivation triggered by UE is supported?

6 – MediaTek Inc.

Thanks for the quality contribution. In general, we are supportive to DC/CA enhancements and mobility enhancements, preferably as two dedicated R18 items. Below please find our specific questions/comments:

- Regarding **Robustness improvement**, is keeping data continuity when SCG blockage/failure the main target? If it is the case, can enabling fast SCG to MCG data switching also keep data continuity while existing DC framework with one SCG can be reused?
  - "multi-connectivity" may not be very precise since not all connections are activated.
- Regarding **SRS transmission for dormant SCells**, it is R16 leftover, and we also support it.

- Regarding **Fast recovery of Pcell through Scell and fast Pcell switch**, PCell is expected to be more robust than SCell. What is the expected use case and probability we need to switch PCell to a SCell?

- Regarding **Capability sharing based on activated cells/BWPs**, what is the expected delay and data interruption time for UE to adapt its capability for a CG?

7 – CATT

General comment: We think the 1st and 3rd main bullet are meaningful. For point 3/4 we could discuss a bit more on the motivations.

8 – vivo Mobile Communication Co.

Thank you for the contribuion. For robustness improvement, we also interesting this enhancement, however from UE point of view we see lots of effort about more than two TX at same time like power limitation, capability sharing etc. so we would like to limit the two TX at same time only.

For interruption reduction and fast Scell activation, we should consider the UE power consumption if SRS is allowed in dormancy state.

For fast failure detection, could you clarify what is meaning about Fast Pcell change? Lots of physical configuration should be configured by Pcell, and RACH also should be done during Pcell change now.

For dynamical UE capability sharing, how fast do you assume, per Subframe level or can be RRC configuration pattern?

9 – Intel Corporation (UK) Ltd

• For mobility interruption reduction on FR2, clarification comments: which aspects of DAPS HO in FR2 that you think is the most difficult part?
• For capability sharing : Does it cover both CA/DC case? For DC, what is the level of signalling expected over Xn for CG coordination?

10 – Apple Hungary Kft.

Thanks for the contribution. We in general agree with several aspects of the contributions. Regarding the dynamic capability sharing, is the intention to have this agonstic to the UE, or does the UE need to know/keep track of this?

11 – Lenovo (Beijing) Ltd

Thank you for the contribution.

We have the same view to support interruption reduction, fast SCell activation and fast failure recovery through SCell.

For fast PCell switch, we have the question that if there is any restriction/difficulty for role change between PCell and SCell.

For dynamic UE capability sharing based on activated cells/BWPs, is the motivation to configure more SCells/BWPs for the UE? It seems that existing NW coordination mechanism can be reused and activating multiple BWPs is up to NW implementation, is it that the spec impact is UE side?

12 – China Mobile Com. Corporation

Thanks for the contribution.

For Interruption reduction, we are also interested in the enhancement,. But for the proposed Fast SCell activation for FR2 we are not sure about the interruption gain at the cost of power consumption.

For Fast failure detection and recovery, is this meaning that the PCell and SCell could be switched dynamically? If this SCell should be pre-chosen and pre-configured?

13 – Nokia Corporation

We share your view that mobility and CA/DC enhancements are important area for Rel-18 enhancements. We also see many similar enhancements needs.

3.1.1.2 Answers (Round-1)

Feedback Form 3: Answers to Questions/comments from Round-1 for RWS-210464 (CADC and mobility enhancements)

1 – ZTE Corporation

@LG: *Thank you for the proposals. Q: Regarding dynamic UE capability sharing, are you considering to increase configured Scells/BWPs in Rel-18 for a given Rel-17 UE capability? If so, doesn't it require some other complexity such as measurement?*

ZTE feedback:

Thanks for the questions.

The main intention of the dynamic UE capability sharing is not to increase the maximum number of SCells/BWPs allowed in Rel-17, the intention is to allow that the overall capability consumed by the configured SCells/BWPs can exceed the capability supported by UE, which is mainly for the band combination and feature set combination. However, although the capability consumed by the configured SCells/BWPs can exceed the UE capability supported by UE, the NW still need to ensure the overall capability consumed by the active SCells/BWPs are allowed by the UE capability.

For the new requirement on measurement. I guess we can separate the discussion for SCells and BWPs.

For the BWPs of active serving cell (i.e. the capability consumed by the serving cell is determined by the activated BWP), we don't see any new requirement on measurement. Also considering the UE autonomous BWP switch is mainly from high-capability consumed BWP to low-capability consumed BWP (e.g. initial BWP), we think such UE autonomous BWP switch will not lead to any capability exceeding issues, at least can be controlled by NW side.

For the SCells deactivated (i.e. assume the deactivated serving cell will not consume any capability, which mainly focus on the capability for band combination and feasture set combination). We understand this may lead to some impact on RAN4 measurement requirement for SCells. To minimize the impact on UE, we were wondering whether we can further relax the measurement requirement for the deactivated SCells, at least for some kind of backup SCells (e.g. only normal SCells need to satisfy the requirement for intra-frequency measurement and some deactivated SCells may not be subject to such measurement requirements

or may be subject to some further relaxed measurement requirements etc), the details can be discussed later in the study phase.

Again, our intention is not to increase the requirement on UE capability, but to provide a more efficient way to use the UE capability with a reasonable complexity.

2 – ZTE Corporation

@ China Telecommunications: We have similar views in terms of robustness improvement and interruption reduction, as well as fast failure detection and recovery, for the dynamic UE capability sharing, we have similar concerns as LG Electronics, it may bring other complexities for the UE.

ZTE feedback:

Thanks for the support on robustness improvement, interruption reduction, as well as fast failure detection and recovery.

For the dynamic capability sharing, we understand the complexity on UE side is a very important issue and we also intend to minimize the impact on UE side. We are not intending to support the dynamic capability sharing for all kinds of capabilities, and we will mainly focus on the capability in band combination and feature set combination (e.g. the detailed capability can be discussed during the work), with which we hope the complexity on UE side can be minimized.

In addition, as NW vendor, we see clear usage for such capability sharing to enable better frequency efficiency and user experience, by sharing the capability dynamically according to the radio condition in air interface. In Rel-16, the UL Tx switching has been discussed and introduced, which shows a good example for the dynamic capability sharing among different carriers. During the discussion, the issue whether other capabilities can be dynamically shared was raised as well, (e.g. MIMO capability, modulation capability, supported bandwidth per CC and even the number of CC supported in each band). So, the main intention of this proposal is to continue such discussion and try to figure out a common framework & solution for such dynamic capability sharing.

Moreover, the dynamic capability sharing is also linked to the Multi-connections with selective activation, in which the capability consumed by the configured cell group/serving cell may exceed the overall capability (i.e. from UE capability perspective, only two active connections can be supported simultaneously).

3 – ZTE Corporation

@ Guangdong OPPO Mobile Telecom: Thanks for the contribution. One question for clarification:

Q: Does the "fast SCell activation" in 2nd bullet on slide #9 have the different context from "Rel-17 fast SCell activation"? or does it make the Rel-17 fast SCell activation even faster in Rel-18?

ZTE feedback:

Thanks for the questions.

For the fast SCell activation, the main intention is to accelerate the switch delay from dormant state to normal state. Since the SRS transmission is not supported in current spec, without the SRS transmission, it is very difficult to maintain the beam tracking of UE in FR2 cells, thus a RACH procedure will be required to rebuild the beam tracking accordingly, which will delay the whole procedure and the benefit of dormant state seems gone in such case. Therefore, to avoid such delay, we propose to support SRS transmission on the dormant SCell.

4 – ZTE Corporation

@ Beijing Xiaomi Mobile Software: Regarding dynamic capability sharing, is there impact on UE side? Seems this could be handled by NW without UE impact?

ZTE feedback:

Thanks for the question.

According to the clarification made in RAN2, in current specs, the UE capability is counted based on the configured SCells/BWPs instead of active SCells/BWPs.

Also considering the feedback in the discussion, it seems such dynamic capability sharing cannot be supported by current UE, thus some impact on UE is expected.

5 – ZTE Corporation

@ China Unicom: Thanks for this contribution.

For slides 4, if duplication activation/deactivation triggered by UE is supported in R18, is that means UE should support three or more links connecting to the gNB? What is the potential impact if duplication activation/deactivation triggered by UE is supported?

ZTE feedback:

Thanks for the question.

Actually, supporting more than two active connection is not our intention.

As we mentioned in the Multi-connection with selective activation, we aim to support more than two connections stored on UE side but only two of them can be activated simultaneously. In addition, to improve the robustness of FR2, we think UE autonomous connection switch can be supported, with some pre-configured criteria from NW side. With such UE autonomous switch among connections, considering the radio condition will be different in different connection (i.e. cell group), the UE should be allowed to evaluate whether the duplication is needed or not, and perform the duplication activation/deactivation autonomously, which may also be controlled by some pre-configured criteria.

6 – ZTE Corporation

@MediaTec Inc: Thanks for the quality contribution. In general, we are supportive to DC/CA enhancements and mobility

enhancements, preferably as two dedicated R18 items. Below please find our specific questions/comments:

- Regarding Robustness improvement, is keeping data continuity when SCG blockage/failure the main target? If it is the case, can enabling fast SCG to MCG data switching also keep data continuity while existing DC framework with one SCG can be reused?

”multi-connectivity” may not be very precise since not all connections are activated

- Regarding SRS transmission for dormant SCells, it is R16 leftover, and we also support it.

- Regarding Fast recovery of Pcell through Scell and fast Pcell switch, PCell is expected to be more robust than SCell. What is the expected use case and probability we need to switch PCell to a SCell?

- Regarding Capability sharing based on activated cells/BWPs, what is the expected delay and data interruption time for UE to adapt its capability for a CG?

ZTE feedback:

Thanks for the questions and support on SRS transmission for dormant SCells.

For the robustness improvement, the intention is avoid the RRC reestablishment (also the data transmission interruption caused by such reestablishment procedure), including the reestablishment triggered by RLF and mobility failure. As we mentioned in our slides, we think the connection switch can be used for either

MCG (e.g. handover) or SCG (PSCell change), and we think the fast role change between MCG and SCG can be considered as well. For the term "multi-connectivity", the main intention is to highlight multiple cell group can be **configured**, but we are open to discuss this.

For the Fast recovery of PCell through Scell and fast PCell switch, as the widely depolyment of FR2 cells in the future, we think the FR2 cells can be used as PCell as well in some scenarios, in which case both PCell and SCell are FR2 cells, and the fast recovery through SCell seems helpful in such case.

For the interruption time for UE to adapt its capability for a CG, we think the detail should be discussed in RAN4 in the study phase. From our point of view, if we limit the dynamic capability sharing to the capabilities in band combination and feature set combination, the interruption time will be similar to the SCell activation/deactivation (for SCell level capability sharing) or BWP switching (for BWP level capability sharing).

7 – ZTE Corporation

@CATT: General comment: We think the 1st and 3rd main bullet are meaningful. For point 3/4 we could discuss a bit more on the motivations

ZTE feedback:

Thank you for the comments and for supporting the robustness improvements and fast failure detection and recovery which are indeed important.

We also think that interruption reduction and Dynamic UE capability sharing are topics that have synergies with overall work proposed here and we are happy to discuss the motivation further. Hopefully some of the answers provided above give a bit more clarity on our thinking.

8 – ZTE Corporation

@ vivo Mobile Communication Co: Thank you for the contribution.

For robustness improvement, we also interesting this enhancement, however from UE point of view we see lots of effort about more than two TX at same time like power limitation, capability sharing etc. so we would like to limit the two TX at same time only.

For interruption reduction and fast Scell activation, we should consider the UE power consumption if SRS is allowed in dormancy state.

For fast failure detection, could you clarify what is meaning about Fast Pcell change? Lots of physical configuration should be configured by Pcell, and RACH also should be done during Pcell change now.

For dynamical UE capability sharing, how fast do you assume, per Subframe level or can be RRC configuration pattern?

ZTE feedback:

Thank you for the comments.

Yes, we definitely share the view that UE complexity needs to be kept in mind with this. Hence our proposal to have MC with selective activation as a definite option to pursue. Without selective activation option, there will certainly be implications on UE complexity as you rightly point out.

Then, we agree that SRS in dormant state will have an impact on the UE power consumption. So, it is a tradeoff between latency and power consumption which is typical of such enhancements. However, we think for FR2, the benefits of allowing this may still motivate to have this feature. Further, having SRS transmission will enable using the correct cell/frequency when the traffic burst arrives and may actually reduce the overall active time as a result and may indirectly benefit the power consumption too as a result.

This is something we could consider too when discussing these aspects. Further, without the SRS transmission, to ensure the QoS requirement (e.g. packet delay budget), the NW may determine not to use the dormant state on FR2 cells, which may cause more power consumption

For the fast PCell recovery, the main intention is to avoid the RRC reestablishment caused by RLF in PCell. To avoid the RRC reestablishment procedure, the MCG fast recovery similar approach can be considered, in which the UE suspend the PCell transmission and send failure message to NW through SCell. Once the failure message is received, the NW can send RRC reconfiguration message to UE through SCell.

Besides the solution mentioned above, we can also go one step further to study the L1/L2 based and UE autonomous PCell/SCell role change, in which case some "PCell configuration" (e.g.ReconfigurationWithSync) can be configured to SCells and such "PCell configuration" will be taken into effect once the SCell becomes PCell.

For the dynamic capability sharing, the main idea is to switch the capability by serving cell activation/deactivation or BWP switching. The NW have to release the capability consumed first by deactivation the serving cell or BWP, and add back other serving cell/BWP to ensure the overall capability will not be exceeded. So, it may not be as fast as per subframe level pattern but the details can be discussed further.

9 – ZTE Corporation

@ Intel Corporation (UK) Ltd: For mobility interruption reduction on FR2, clarification comments: which aspects of DAPS HO in FR2 that you think is the most difficult part?

For capability sharing : Does it cover both CA/DC case? For DC, what is the level of signalling expected over Xn for CG coordination?

ZTE feedback:

For FR2, TDM based mechanism may be required to enable the DAPS operation with beam switching, and coordination between source gNB and target gNB is needed. In addition, even the coordination between source and target can be suppoted, the TDM manner itself will lead to negative impact on throughput, thus only limited gain can be observed compared to make before break+RACH less.

Yes, it covers both CA/DC case. For the DC case, both MN and SN can perform the UE capability sharing independently, and each node is allowed to share the UE capability within the allowed band combination/feature set combination. If more UE capability is needed, then existing semi-static inter-node capability coordination procedure can be initiated. We understand a more dynamic way may be possible in DC case to enable a real time UE capability sharing, but more signaling and complexity may be required for such operation. We are open to discuss the more dynamic way but it can be considered as second priority.

10 – ZTE Corporation

@ Apple Hungary Kft.: Thanks for the contribution. We in general agree with several aspects of the contributions. Regarding the dynamic capability sharing, is the intention to have this agonstic to the UE, or does the UE need to know/keep track of this?

ZTE feedback:

The goal is to ensure that the network is able to share the UE capabilities in a dynamic and flexibile fashion as long as the instantaneous utilization of the overall UE capability set doesn't exceed the overall UE capability. According to the clarification made in RAN2, in current specs, the UE capability is counted based on the configured SCells/BWPs instead of active SCells/BWPs.

Also considering the feedback in the discussion, it seems such dynamic capability sharing cannot be supported by current UE, thus some impact on UE is expected. However, given that the intention is not to exceed the overall UE capability, we think the impact is not that large.

11 – ZTE Corporation

@ Lenovo (Beijing) Ltd: Thank you for the contribution. We have the same view to support interruption reduction, fast SCell activation and fast failure recovery through SCell.

For fast PCell switch, we have the question that if there is any restriction/difficulty for role change between PCell and SCell.

For dynamic UE capability sharing based on activated cells/BWPs, is the motivation to configure more SCells/BWPs for the UE? It seems that existing NW coordination mechanism can be reused and activating multiple BWPs is up to NW implementation, is it that the spec impact is UE side?

ZTE feedback:

Thanks for the comments.

For fast PCell switch, the configuration for the PCell (which is typically in the reconfigurationWithSync) will need to be preconfigured to enable fast switching. So, optimization of signalling and preconfiguration will be needed to support this.

The main intention of the dynamic UE capability sharing is not to increase the maximum number of SCells/BWPs allowed in Rel-17, the intention is to allow that the overall capability consumed by the configured SCells/BWPs can exceed the capability supported by UE, which is mainly for the band combination and feature set combination. However, since the deactivated serving cell will not be counted in UE capability consumption, the configuration of more serving cells should be allowed. We also think there will be some UE impact per comments above.

12 – ZTE Corporation

@ China Mobile Com. Corporation: Thanks for the contribution.

For Interruption reduction, we are also interested in the enhancement,. But for the proposed Fast SCell activation for FR2 we are not sure about the interruption gain at the cost of power consumption.

For Fast failure detection and recovery, is this meaning that the PCell and SCell could be switched dynamically? If this SCell should be pre-chosen and pre-configured?

ZTE feedback:

Thanks for the comments!

Indeed, it is a valid observation that the interruption reduction may come with some tradeoff between UE power consumption and latency reduction. However, it is also likely that there is a overall power consumption benefit if the correct SCell/frequency may be used with low overhead and latency to enable fast data transmission (i.e. lower time to actually be in active mode as a result of choosing the correct cell). So, there is tradeoff here but the benefits especially for FR2 are far significant in our view. Further, without the SRS transmission, to ensure the QoS requirement (e.g. packet delay budget), the NW may determine not to use the dormant state on FR2 cells, which may cause more power consumption

Yes, the idea is to switch one of the SCells as a PCell with a quick and low signalling overhead based mechanism. Indeed some preconfiguration of the necessary PCell related configuration will be needed to enable this. One further, possible way is to use the approach similar to MCG fast recovery, in which the

UE will suspend the PCell transmission and send failure message to NW through SCell. Once the failure message is received, the NW can send RRC reconfiguration message to UE through SCell.

13 – ZTE Corporation

@ Nokia Corporation: We share your view that mobility and CA/DC enhancements are important area for Rel-18 enhancements. We also see many similar enhancements needs.

ZTE feedback:

Thank you for the comments, we also acknowledge that contributions from Nokia side provide similar views on a number of topics, which clearly indicate that these are aspects that may be worth pursuing in Rel-18.

3.1.2 Round-2 Discussion

3.1.2.1 Question collection (round-2)

Feedback Form 4: Round-2: Please enter further questions and comments on the CADC enhancements proposed in RWS-210464

1 – Samsung Research America

Slide 4: ”Multiple connections with selective activation”.

- Is this same as Dynamic Point Selection?
- Are the frequencies of the multiple connections the same or can they be different?
- When selecting a new connection if in a cell with a PCI different from that of the original cell, does this involve a serving cell change?
- Can the cells belong to different DUs?

2 – vivo Mobile Communication Co.

Thanks for sharing your understanding.

We think at least the channel modeling and deployment scenarios part can be studied in Rel-18.

3 – China Unicom

Thanks for your contributions.

For UE autonomous switch, which solution is considered to be supported in R18, i.e. L1/L2 triggered mobility solutions or L3 solution? From our view, both CA and DC scenarios should also be supported in R18.

4 – China Telecommunications

Thanks for the response, and we have another question that the proposed features (such as *support of multi-connectivity to enable multiple (e.g. up to three) connections*) in your slides are mainly for FR2 or can be extended to FR1 as well?

5 – Samsung Electronics Co.

We think multiple connectivity can be used for throughput enhancement. UE capability is mainly limited in uplink. Don't you consider 2 active UL CGs and more than 2 active DL CGs at a time?

6 – vivo Mobile Communication Co.

Thanks for the clarification. We understood the more about your details. We agree that CA/DC should be enhanced further in R18.

For us, Fast Failure detection is important aspects to FR2 cases. However, we also assume that we should study whether Fast MCG recovery can be reused or more enhancements are needed during WI/SI phase.

For dynamical UE capability sharing, we also see the benefit as long as the UE complexity is not very high. We also assume that RAN4 also should be involved like TX switching in R16 and R17 if we go this area.

7 – MediaTek Inc.

Thanks for the response and clarification. Below please find our further comments:

- Regarding robustness improvement, we understand if 2nd SCG is pre-configured, the SCG change delay can be shorten. On the other hand, **given that data path is already switched to MCG, longer SCG change delay will not cause data connection failure**. That is our main reason why DC with one SCG can still be robust if data path switch from SCG to MCG can be made fast enough, e.g., within 10 ms under split bearer architecture.
- Regarding **capability sharing based on activated cells/BWPs**, the switch delay will also relate to what UE processing resource to be changed, which can be part of RAN4 study on the feasibility.

3.1.2.2 Answers (Round-2)

Feedback Form 5: Answers to Questions/comments from Round-2 for RWS-210464 (CADC and mobility enhancements)

1 – ZTE Corporation

Samsung Research America:

Slide 4: "Multiple connections with selective activation".

- Is this same as Dynamic Point Selection?

- Are the frequencies of the multiple connections the same or can they be different?

- When selecting a new connection if in a cell with a PCI different from that of the original cell, does this involve a serving cell change?

- Can the cells belong to different DUs?

ZTE Answers:

Thanks for the question and please find our response as follows:

- Is this same as Dynamic Point Selection?

The main intention is not about the point selection but cell group selection.

The multiple connection here mainly refers to multiple cell groups configured by RRC layer (i.e. more than two cell groups). To minimize the impact on UE side and make the feature more promising to the market, we want to limit the simultaneously activated cell groups to two, which means, within all the cell groups configured by RRC, only two of them will be activated at a certain time.

- Are the frequencies of the multiple connections the same or can they be different?

Both inter-frequency and infra-frequency can be considered. And a common framework/solution will be designed for both cases.

- When selecting a new connection if in a cell with a PCI different from that of the original cell, does this involve a serving cell change?

Since cell group switch is expected in the "connection" switch procedure, the serving cell will be changed accordingly.

- Can the cells belong to different DUs?

Yes, we think cells belonging to different DUs can be supported.

2 – ZTE Corporation

China Unicom: Thanks for your contributions.For UE autonomous switch, which solution is considered to be supported in R18, i.e. L1/L2 triggered mobility solutions or L3 solution? From our view, both CA and DC scenarios should also be supported in R18.

ZTE Answer: Thanks for the question. We also think the UE autonomous switch can be considered in both CA and DC scenarios.

For the solution of UE autonomous switch, we think some kind of L3 criteria (e.g. similar to the trigger condition in CHO) will be configured to UE by RRC and UE will trigger the switch whenever the criteria is met.

3 – ZTE Corporation

China Telecommunications: Thanks for the response, and we have another question that the proposed features (such as support of multi-connectivity to enable multiple (e.g. up to three) connections) in your slides are mainly for FR2 or can be extended to FR1 as well?

ZTE Answer: Thanks for the question.

Our main intention is to support the configuration of multiple connectivity (e.g. multiple cell groups) but only two of them can be activated simultaneously, and we think such feature can be supported in both FR1 and FR2.

4 – ZTE Corporation

Samsung Electronics Co., Ltd: Thanks for the clarification. We understood the more about your details. We agree that CA/DC should be enhanced further in R18.

For us, Fast Failure detection is important aspects to FR2 cases. However, we also assume that we should study whether Fast MCG recovery can be reused or more enhancements are needed during WI/SI phase.

For dynamical UE capability sharing, we also see the benefit as long as the UE complexity is not very high. We also assume that RAN4 also should be involved like TX switching in R16 and R17 if we go this area.

ZTE Answer: Thanks for the support.

For the detail procedure of fast recovery, we are also fine to have further study in SI/WI phase.

For the dynamical UE capability sharing, we share the view that the complexity on UE side shall be taken into account to ensure the feature can be implemented and deployed in the market and we also think RAN4 should be involved.

5 – ZTE Corporation

vivo Mobile Communication co: Thanks for the clarification. We understood the more about your details. We agree that CA/DC should be enhanced further in R18.

For us, Fast Failure detection is important aspects to FR2 cases. However, we also assume that we should study whether Fast MCG recovery can be reused or more enhancements are needed during WI/SI phase.

For dynamical UE capability sharing, we also see the benefit as long as the UE complexity is not very high. We also assume that RAN4 also should be involved like TX switching in R16 and R17 if we go this area.

ZTE Answer: Thanks for the support.

For the detail procedure of fast recovery, we are also fine to have further study in SI/WI phase.

For the dynamical UE capability sharing, we share the view that the complexity on UE side shall be taken into account to ensure the feature can be implemented and deployed in the market and we also think RAN4 should be involved.

6 – ZTE Corporation

MediaTek Inc: Thanks for the response and clarification. Below please find our further comments:

- Regarding robustness improvement, we understand if 2nd SCG is pre-configured, the SCG change delay can be shorten. On the other hand, given that data path is already switched to MCG, longer SCG change delay will not cause data connection failure. That is our main reason why DC with one SCG can still be robust if data path switch from SCG to MCG can be made fast enough, e.g., within 10 ms under split bearer architecture.

- Regarding capability sharing based on activated cells/BWPs, the switch delay will also relate to what UE processing resource to be changed, which can be part of RAN4 study on the feasibility.

ZTE Answer:

Thanks for the clarification.

For the robustness improvement, one reason we propose the multiple connectivity is that we think two connections are not robust enough in some scenarios, especially if both MN and SN are FR2 cells, in which case the UE may lose the connection to both MN and SN due to blockage, and we hope UE based cell group switch and MN/SN role change procedure can be helpful to avoid RRC reestablishment in such case.

For the “data path is already switched to MCG”, if MCG is on FR1, then it depends on whether the FR1 cell can provide comparable throughput and capacity as FR2 cell (this depends on the available bandwidth, coverage and capacity of FR1 cells). Therefore, if there is available FR2 SCG, we think a fast SCG switch can provide better user experience.

In addition, as the deployment of FR2 cells increases, the UE may detect multiple FR2 cells from different DUs around itself, and frequent SCG change procedure may be required to ensure the robustness. With the

multiple connectivity with selective activation, the NW can configure multiple cell groups to the UE, and a more dynamic and efficient cell group switching mechanism can be used to avoid signaling overhead and reduce the interruption time.

For the capability sharing based on activated cells/BWPs, we also think RAN4 should be involved, but we believe the delay will be much shorter compared to the RRC signaling based reconfiguration.

3.2 Support of Reconfigurable Intelligent Surface (RIS) for 5G Advanced (RWS-210465)

In RWS-210465, the motivation for the support of RIS for 5G Advanced is proposed with justification on the benefits of this techniques via both simulation and field measurement:

- Performance benefits can be achieved in both Cell specific and UE specific way from simulation and measurements from the field.

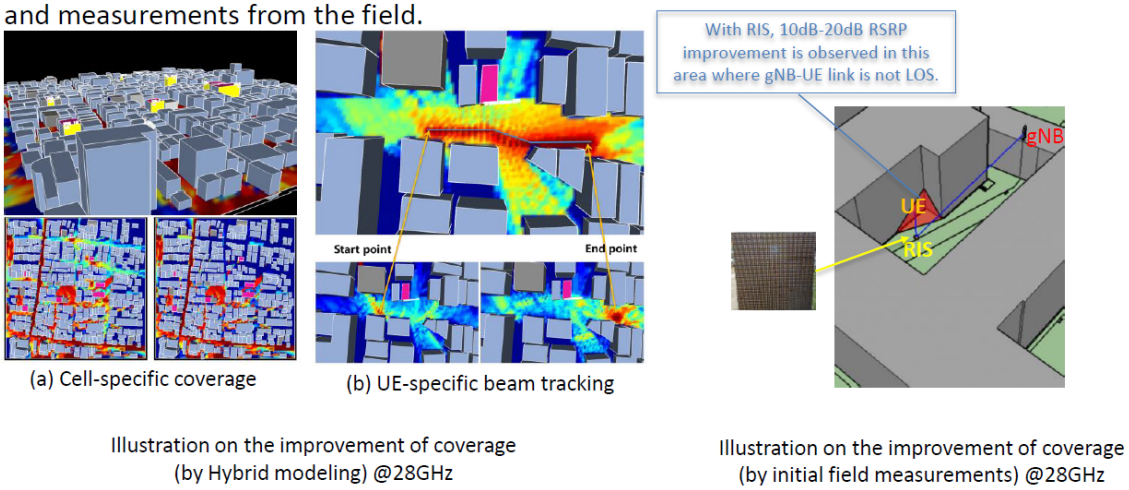

Figure 1:

For achieving the upcoming commercial deployments, we prefer to trigger the relevant study and specification work on RIS on following aspects:

Channel model

The study for channel model should focus on the following details:

- Deployment scenario identification

- RIS component modelling including Topology/Type, RF characteristics

- Channel modelling components

o Modelling methodology, e.g., statistic channel model and hybrid channel model

o Large scale modelling, e.g., pathloss

o Small scale modelling, e.g., LoS/NLoS probability, multi-path association between rays/cluster among links (e.g., gNB-RIS, RIS-UE)

o Polarization modelling

o Reciprocity aspects

Enhancement techniques

For enabling the UE-specific optimization on the performance, identifying specification impacts for the following aspects is preferred to be prioritized

- Beam management/CSI enhancement

o Training/CSI mechanism for RIS-gNB/RIS-UE (considering near/far field)

- Control interface between RIS - gNB

o Including synchronization mechanism with accuracy up to symbol level.

- RACH enhancement

o To cope with the issues related to extended coverage

- Interference coordination/mitigation

3.2.1 Round-1 Discussion

3.2.1.1 Question collection (round-1)

Feedback Form 6: Please provide company comments/questions on the above aspects (see RWS-210465 for details)

1 – CATT

This is an interesting topic, and we have following questions for clarification:

Q1: Is RIS-based transmitter in the scope? What does ”transmission-based RIS” mean on page 6?

Q2: Why ”Polarization” is highlighted for channel model in page 6? What’s the difference compared to current channel model?

Q3: It seems that channel reciprocity is assumed for the BS-RIS-UE link. Is there any evidence on this?

Q4: Is RIS transparent to UE or not?

Q5: Both TDD and FDD are considered? What’s the difference between TDD and FDD in terms of deploying RIS?

Q6: Which type of interference are to be considered for the objective of interference coodination/mitigation?

Q7: There are two options regarding decaying slope for large scale attenuation, is it something we can resolve in 3GPP? It seems more theoretical investivation is needed.

Q8: How to handle the work on RIS and work on smart repeaters(if any)? These two feature offer similar functionality.

2 – China Telecommunications

We also think RIS is a promising technique. But before we study RSI component modeling, we think the first issue is to study the component of RIS. Since industry has different understanding on RIS, some think it is totally passive, some think it is nearly passive with some switches. However, the academy‘s research on RIS includes cascade channel estimation, AI assisted beamforming and etc. To enable these functions, it needs RIS to have digital component and baseband processor. Meantime, in order to measure the channel between gNB-RIS or RIS-UE, it also needs RIS to demodulate the signals and even maybe need RIS to transmit some reference signals. Thus, we think study and identify the component of RIS is critical.

3 – Samsung Research America

We have a few questions:

1) Channel modeling: Compared to the current 5G channel model for FR2, what would be the main differences for the channel model in RIS? Also, how can we model the heterogeneous layouts illustrated in the contribution, e.g. UE transitioning from densely to sparsely populated (by buildings) areas?

2) Chanel modeling: Why is near-field modeling crucial in this case?

3) Beam management and CSI: What enhancements do you envision beyond what we may have in Rel-17?

4 – KDDI Corporation

Thank you very much for your proposals. We are also interested in RIS, as mentioned in our contribution (RWS-210300). In order to understand your proposal more concretely, let us ask you a few questions below.

<Q1>

You have suggested to study the channel model for RIS first. We think this is important, so we support studying the channel model. After that, how do you plan to use the channel model we have created? We think it would be beneficial to evaluate the performance gain of RIS based on the channel model obtained as a result of the study, but are you planning to do such evaluation?

<Q2>

What functions do you envision for the ”Interference coordination/mitigation” described in the ”technical enhancements” section? Is the impact of reflections on other operators operating in the adjacent frequency band also a subject of discussion?

5 – China Mobile Com. Corporation

1. Whether the existing beam management/CSI mechanism can be used for RIS-gNB/RIS-UE, or any special points should be considered?

2. What is the specific enhancement for interference coordination/mitigation?

6 – Sony Corporation

Thank you for your proposal. As evidenced by our contribution RWS-210306, we also have quite some interest in the topic of RIS. Here are some specific questions about your contribution. We are open to constructive discussions on RIS, in general, and the questions are aimed at better understanding your proposal:

1. In slide 2, right Fig. 2, there seem to be a double-RIS link from UE-C to RIS-2 to RIS-1 to gNB. Do you see this sort of multi-hop RIS-assisted communication within the scope of a Rel-18 SI?

2. Slide 4, in which sense differs “hybrid beamforming” from the current 3GPP channel model in TR 38.901? Do you foresee the 3GPP channel model being extended by ray launching-based channel models?

3. Slide 6, could you please elaborate on the proposal of semi-deterministic calculation of per-path and per-polarization channel coefficients instead of XPR?

4. Slide 7: Which type of "UE-specific" optimizations do you have in mind? Could you please share some details on that?

7 – Intel Corporation (UK) Ltd

1. What kind of deployment scenarios of RIS you are considering (e.g. operator deployed or user deployed)? Do you envision potentially negative impact due to deployment of RIS on other operator deployment?

2. Could you please provide further justification (or reference to other source) on (d1+d2)^2 PL model for deploymedn with RIS?

3. Do you consider RIS to be applicable to DL or UL or both?

8 – MediaTek Inc.

Do you assume RIS is appliable to legacy R15-R17 UEs as well? If not, what new UE feature is needed to communicate with RIS?

9 – vivo Mobile Communication Co.

Thanks for your contribution.

For the potential enhancement, is it possible to enable such application in a way transparent to UE?

10 – DOCOMO Communications Lab.

Thank you for contribution. We are also interested in RIS. Let me ask a couple of questions.

- Do you have any view on RIS capability from implementation/deployment/installation perspectives? For example, RIS have capability of receiving control signal or not, RIS have capability of (not reflect but) transmission e.g. to report some info to gNB, etc. I think there are many RIS types, and pros/cons are different. For example from easier installation, smaller one with lower power consumption is preferable, i.e. no TX and/or RX capability other than reflect would be one option. Such aspect is studied as well?
- From UE, RIS is transparent or seeable? If transparent, do you assume what is the existing spec, e.g. multi-TRP? RIS might be able to be treated as pseudo-TRP.
- Which aspect is motivation that you assume? e.g. coverage enh., reliability enh., data rate improvement, etc.

11 – Guangdong OPPO Mobile Telecom.

Thanks for the interesting contribution. Here are some questions from our side for clarification

Q1: Accurate channle model is a prerequisite for evaluation. Is ZTE planning to provide some field results to 3GPP to faciliate the channel modeling?

Q2: What is the typical working bandwidth for RIS? If it is too wide, how to control the inter-operator interference?

Q3: Does ZTE has some measurement result to justify the reciprocity for BS-RSI-UE link?

Q4: Theree are different types of RIS, e.g., some RIS may only shift the frequency. What are the basic functionalities of the proposed RIS unit?

Q5: What's the motivation/rationale to enhance RACH? RIS can extended the coverage. What's the additioanl enchancement needed for RACH?

12 – DOCOMO Communications Lab.

Sorry, I found typo in my last comment... Let me update as follows.

-

From UE, RIS is transparent or seeable? If transparent, do you assume what is **spec impact compared to** the existing spec, e.g. multi-TRP? RIS might be able to be treated as pseudo-TRP.

13 – China Unicom

Thank you for the proposal. As an interesting and promising technique, RIS has been studied a lot in theory, simulation and field test domain. Furthermore, more details about deployment should be clarified:

Q1: Study and evaluate the difference between hybrid channel and statistic channel model, and which one is prefer in **RIS for 5G-advanced**?

Q2: Please clarify the device status and components of RIS.

Q3: Please define the interface for control information transmission between gNB and RIS. Would you prefer to use an existing interface or define a new? Any impacts on protocols?

14 – KT Corp.

Strong interest in this topic. Currently there are only mmWave solutions available in the market without any reconfigurability. KT would like to have FR1 support of RIS

15 – Rakuten Mobile

We also have a strong interest in this topic.

Q1: We are interested in real life trials of RIS, Would ZTE be able to share the Type of RIS and use cases?

16 – Xiaomi Communications

We think RIS is a promising technique. Is RIS transparent to UEs for R18?

3.2.1.2 Answers (Round-1)

Feedback Form 7: Answers to Questions/Comments from Round-1 for the RWS-210456 (support of Reconfigurable Intelligent Surface)

1 – ZTE Corporation

@ Multiple companies (general question 1): Is RIS transparent to UE and applicable to legacy R15-R17 UEs as well?

ZTE feedback:

Yes. In general, signal transmission and reception is expected to be transparent to UE. The main activity will focus on the controlling mechanism to enable the adaptive behaviour of RIS.

To exploit full potential gain from RIS, potential enhancement on the BM/CSI report should also be considered. So the UE behaviour on measurement and reporting can be different from the existing scheme but the UE still may not need to be aware of the existence of RIS. This new UE behaviour may correspond to a new standardized UE feature.

2 – ZTE Corporation

@ Multiple companies (general question 2): Whether the existing beam management/CSI mechanism can be used for RIS-gNB/RIS-UE, or What enhancements do you envision beyond what we may have in Rel-17??

ZTE feedback:

For beam management part, at least the training behaviour for the beam between gNB-RIS should be considered. The legacy mechanism can be used for some simple implementation. But with consideration on the massive number of beam combinations, enhancement on RS measurement and feedback can be considered to improve the efficiency of training, RS overhead, measurement complexity. Near field issue may also need some standardized enhancement on BM/CSI measurement and feedback.

3 – ZTE Corporation

@ CATT: This is an interesting topic, and we have following questions for clarification:

Q1: Is RIS-based transmitter in the scope? What does ”transmission-based RIS” mean on page 6?

Q2: Why ”Polarization” is highlighted for channel model in page 6? What’s the difference compared to current channel model?

Q3: It seems that channel reciprocity is assumed for the BS-RIS-UE link. Is there any evidence on this?

Q4: Is RIS transparent to UE or not?

Q5: Both TDD and FDD are considered? What’s the difference between TDD and FDD in terms of deploying RIS?

Q6: Which type of interference are to be considered for the objective of interference coordination/mitigation?

Q7: There are two options regarding decaying slope for large scale attenuation, is it something we can resolve in 3GPP? It seems more theoretical investigation is needed.

Q8: How to handle the work on RIS and work on smart repeaters (if any)? These two feature offer similar functionality.

ZTE feedback:

Thanks for your question.

For Q1: in this paper, we only take the RIS as additional node between BS and UE, and the RIS based transmitter is not considered yet. The “transmission based RIS” in this contribution refers to transmissive RIS type that signals can penetrate the RIS to serve the UEs on the opposite side of the gNB, e.g., in O2I case. There is also another type as “reflective RIS”, where signals can be reflected by the surface. For both cases, the direction can be manipulated by controlling the corresponding components.

For Q2: In current stochastic channel model, the polarization/depolarization effect during the propagation is modelled by XPR, which is randomly generated according to the parameters. For the case with RIS,

since the response of RIS for each polarization can be different, additional step to calculate the impacts of RIS per polarization is needed.

For Q3: RIS is typically passive or nearly passive i.e. without PA and DA/AD transition. Signals can be delivered in similar way, e.g., as typical reflection. It has been studied that with such reflection, reciprocity holds with negligible loss.

For Q4: Yes, Please refer to answer for common Q1 above

For Q5: Actually RIS is capable to support both TDD and FDD without any additional efforts and difference. The required information only is to enable RIS to provide proper action for corresponding transmission regardless of TDD and FDD. There are only common issues like with no/partial channel reciprocity for FDD but this kind of issues applies to both with and without RIS.

For Q6: For interference, there may be some impacts cross cell edge since with the introduction of RIS, the coverage of cell can be extended.

For Q7: Yes, for addressing this issue, some theoretical investigation is also needed as what we have done for channel model in R15. Once the scenario and assumption is stable, it will be converged along with some measurement or simulation.

For Q8: In our view, RIS has clear advantage over smart repeater on cost, energy efficiency and deployment flexibility. Except for the channel model, similarity on some potential enhancements are expected from our side, but some RIS-specific consideration is also needed, e.g., to address the near field transmission.

4 – ZTE Corporation

@ China Telecommunications: We also think RIS is a promising technique. But before we study RSI component modeling, we think the first issue is to study the component of RIS. Since industry has different understanding on RIS, some think it is totally passive, some think it is nearly passive with some switches. However, the academy‘s research on RIS includes cascade channel estimation, AI assisted beamforming and etc. To enable these functions, it needs RIS to have digital component and baseband processor. Meantime, in order to measure the channel between gNB-RIS or RIS-UE, it also needs RIS to demodulate the signals and even maybe need RIS to transmit some reference signals. Thus, we think study and identify the component of RIS is critical.

ZTE Feedback:

Thanks for your question.

Yes, identification on the typical scenarios and RIS type including component is also mentioned in our contribution as part of objectives.

W.r.t the RIS type, we can start with the typical assumption that RIS is modelled as passive/or nearly passive node with capability to enable the adaptive transmission based on signalling from gNB. Typically, a very simple microcontroller can support this. If we only consider a simple RIS node, it may not require explicit channel measurement by RIS. The UE can perform beam management under combined channels reflecting different combination of beams.

For other more advanced components for more advanced features e.g. to enable AI at RIS, it is not a typical consideration at this point but if this is considered, it can be only up to the implementation i.e. spec-transparent.

5 – ZTE Corporation

@ Samsung Research America: We have a few questions:

1) Channel modeling: Compared to the current 5G channel model for FR2, what would be the main differences for the channel model in RIS? Also, how can we model the heterogeneous layouts illustrated in the contribution, e.g. UE transitioning from densely to sparsely populated (by buildings) areas?

2) Chanel modeling: Why is near-field modeling crucial in this case?

3) Beam management and CSI: What enhancements do you envision beyond what we may have in Rel-17?

ZTE feedback:

Thanks for your question.

1) For Q1: the main work on this part is to introduce additional step/procedure (e.g., for stochastic channel model) to introduce the impact from RIS on the gNB-RIS, RIS-UE link including the association of path in delay and angular domain with gNB-UE link.

For deterministic channel model, the propagation condition can be calculated up to the distribution of objects in the propagation environment.

2) For Q2: As one typical case, RIS can be deployed in indoor case with larger size, a UE can be close to RIS and the radio wave from the UE to the RIS will be in spherical mode instead of plane wave. For dealing with impact, we need to take care of the near field issue.

3) Please refer to answer for common Q2 above.

---

6 – ZTE Corporation

@ KDDI Corporation:

Thank you very much for your proposals. We are also interested in RIS, as mentioned in our contribution (RWS-210300). In order to understand your proposal more concretely, let us ask you a few questions below.

<Q1>You have suggested to study the channel model for RIS first. We think this is important, so we support studying the channel model. After that, how do you plan to use the channel model we have created? We think it would be beneficial to evaluate the performance gain of RIS based on the channel model obtained as a result of the study, but are you planning to do such evaluation?

<Q2>What functions do you envision for the ”Interference coordination/mitigation” described in the ”technical enhancements” section? Is the impact of reflections on other operators operating in the adjacent frequency band also a subject of discussion?

ZTE feedback:

Thanks for your question.

1) For Q1: As the basic part for RIS study, surely we need to start with the channel model. After the completion of this aspect, the RIS channel model can be used to evaluate and identify potential enhancements after introduction of RIS.

2) For Q2: The intention of “interference coordination/mitigation” is mainly to alleviate the potential inter-cell interference due to extended coverage. For operating in adjacent frequency band, since the typical RIS can be deployed without PA/AD-DA, the RF requirement for signals from gNB can be maintained, e.g., for reflective RIS. In this way, this part may not be significantly different from the cases without RIS but we are open to study this.

In general, we are open to discuss this aspect and try to achieve the common understanding based on the group’s inputs.

---

7 – ZTE Corporation

@ China Mobile Com. Corporation

1. Whether the existing beam management/CSI mechanism can be used for RIS-gNB/RIS-UE, or any special points should be considered?

2. What is the specific enhancement for interference coordination/mitigation?

ZTE feedback:

Thanks for your question.

For Q1: Please refer to answer for common Q2 above.

For Q2: interference is mainly to alleviate the potential cross-cell interference due to extended coverage. And w.r.t the potential enhancement, additional feedback or coordination on the measurement results can be considered to restrict the service region for RIS.

8 – ZTE Corporation

@ Sony Corporation: *Thank you for your proposal. As evidenced by our contribution RWS-210306, we also have quite some interest in the topic of RIS. Here are some specific questions about your contribution. We are open to constructive discussions on RIS, in general, and the questions are aimed at better understanding your proposal:*

1. In slide 2, right Fig. 2, there seem to be a double-RIS link from UE-C to RIS-2 to RIS-1 to gNB. Do you see this sort of multi-hop RIS-assisted communication within the scope of a Rel-18 SI?

2. Slide 4, in which sense differs "hybrid beamforming" from the current 3GPP channel model in TR 38.901? Do you foresee the 3GPP channel model being extended by ray launching-based channel models?

3. Slide 6, could you please elaborate on the proposal of semi-deterministic calculation of per-path and per-polarization channel coefficients instead of XPR?

4. Slide 7: Which type of "UE-specific" optimizations do you have in mind? Could you please share some details on that?

ZTE feedback:

Thanks for your question.

For Q1: Yes, the multi-hop-RIS-assisted communication can be one interesting scenario and we are open to discuss it in Rel-18. Once the channel model is complete, all scenarios can be well investigated.

For Q2: Actually in the existing TR38.901, the ray-launching based channel model is already introduced in R15 for 5G as alternative methodology in section 8. With consideration of RIS, in our view, both approaches can still be considered with different level of benefits, e.g., hybrid model will be more accurate and statistical model is easier for implementation.

For Q3: In the legacy model, XPR is used to emulate the impact of depolarization effect of propagation environment. For RIS, since this entity may have different response per polarization for each ray. Then, the semi-deterministic calculation with consideration on the direction of imping ray and location of RIS is preferred.

For Q4: It may be more accurate to describe it as adaptive controlling on RIS to serve the target UE. As one typical example, based on the training information, the gNB can optimize the beam from RIS to serve one specific UE or group of UE instead of static manipulation on the signal.

9 – ZTE Corporation

@ Intel Corporation (UK) Ltd:

1. What kind of deployment scenarios of RIS you are considering (e.g. operator deployed or user deployed)? Do you envision potentially negative impact due to deployment of RIS on other operator deployment?

2. Could you please provide further justification (or reference to other source) on (d1+d2)^2 PL model for deploymedn with RIS?

3. Do you consider RIS to be applicable to DL or UL or both?

ZTE feedback:

For Q1: In our view, RIS can be operator deployed with connectivity with gNB for initial consideration. In case of user deployed, the required specification effort and protocol can be more complicated.For the potential negative impact, one possible issue can be the interference to adjacent cells, e.g., typical inter-cell interference. And for others, there may not have specific impact since without controlling, RIS is just as normal object in the propagation environment for other operator. In general, we are open to study any kind of potential interference issues.

For Q2: According to current research by taking the RIS as passive beamformer, the product-distance based model is used in academic paper. This part surely needs to be discussed and confirmed with corresponding assumption on the RIS type and scenarios.

For Q3: Yes, since RIS is nearly passive and can be used for both links.

10 – ZTE Corporation

@ MediaTek Inc: *Do you assume RIS is applicable to legacy R15-R17 UEs as well? If not, what new UE feature is needed to communicate with RIS?*

ZTE feedback:

Thanks for your question.

Yes, please refer to answer for common Q1 above.

11 – ZTE Corporation

@ Vivo Mobile Communication Co.,: Thanks for your contribution.

For the potential enhancement, is it possible to enable such application in a way transparent to UE?

ZTE feedback:

Thanks for your question.

Yes, please refer to answer for common Q1 above.

12 – ZTE Corporation

@ DOCOMO Comm: *Thank you for contribution. We are also interested in RIS. Let me ask a couple of questions.*

Do you have any view on RIS capability from implementation/deployment/installation perspectives? For example, RIS have capability of receiving control signal or not, RIS have capability of (not reflect but) transmission e.g. to report some info to gNB, etc. I think there are many RIS types, and pros/cons are different. For example from easier installation, smaller one with lower power consumption is preferable, i.e. no TX and/or RX capability other than reflect would be one option. Such aspect is studied as well?

From UE, RIS is transparent or seeable? If transparent, do you assume what is spec impact compared to the existing spec, e.g. multi-TRP? RIS might be able to be treated as pseudo-TRP.

Which aspect is motivation that you assume? e.g. coverage enh., reliability enh., data rate improvement, etc.unications Lab:

ZTE feedback:

For Q1: Yes, I agree with that there are many RIS types with different assumption on the capability. In our views, whether to take all of them or partial solution is up to tradeoff between performance and commercial consideration, e.g., RIS with static capability may be simple but the gain will be limited since the service region is fixed. For the adaptive ones, different consideration may be studied for different types e.g. reflective and transmissive. In our view, discussion on this aspect is surely needed as mentioned in our

contribution (e.g., RIS type and component). Then, after the completion of channel model, further evaluation can be considered to identify the benefits and required enhancement. After the study, more clear guidance can be obtained. This is also one of motivation to trigger this topic in R18.

For Q2: In our view, from UE's perspective, the deployment of RIS can be potentially transparent. W.r.t the main activity will focus on the controlling mechanism to enable the adaptive behavior of RIS.

To exploit full potential gain from RIS, potential enhancement on the BM/CSI report should also be considered. The UE behavior on measurement and reporting can be different from the existing scheme but the UE still may not need to be aware of the existence of RIS. This new UE behavior may correspond to a new standardized UE feature.

W.r.t the whether the RIS can be treated as pseudo-TRP, it may be up to whether the contribution of RIS on the propagation can be well decoupled from normal environment. Otherwise, all channel component can be treated as multiple-path. Maybe we need to have clarification on whether there is a clear definition on pseudo-TRP first.

For Q3: In our view, both coverage enhancement and data rate improvement are prioritized case for RIS at initial stage. Continuous enhancement to support more usage can also be considered.

13 – ZTE Corporation

@ Guangdong OPP Mobile Telecom:

Thanks for the interesting contribution. Here are some questions from our side for clarification

Q1: Accurate channle model is a prerequisite for evaluation. Is ZTE planning to provide some field results to 3GPP to faciliate the channel modeling?

Q2: What is the typical working bandwidth for RIS? If it is too wide, how to control the inter-operator interference?

Q3: Does ZTE has some measurement result to justify the reciprocity for BS-RSI-UE link?

Q4: Theree are different types of RIS, e.g., some RIS may only shift the frequency. What are the basic functionalities of the proposed RIS unit?

Q5: What's the motivation/rationale to enhance RACH? RIS can extended the coverage. What's the additioanl enchancement needed for RACH?

ZTE feedback:

Thanks for your question.

For Q1: For the channel model part, it can be derived by following similar ways as before. Both simulation and field results can be expected to consolidate the development of modelling.

For Q2: The RIS is nearly passive entity without PA and other RF part. Then, the bandwidth can be larger enough to support all case. In this way, since the RIS is only to manipulate the signal with certain bandwidth from gNB without additional processing, the impact on the adjacent channel can be controlled. Moreover, without controlling from other operator, RIS is just as normal object in the propagation environment for other operator. Having said that, we are open to study any kind of potential interference issues.

For Q3: The reciprocity has been justified from our side. And it can be observed that such property can be maintained.

For Q4: The study on RIS type and component is also one issue within the scope and as typical way, the functionality of RIS can be considered to change the phase/amplitude of imping wave.

For Q5: In case of deployment of RIS, enhancement on configuration of RACH can be considered given that a UE may be within the extended coverage as well as the UE in the typical region.

14 – ZTE Corporation

@China Unicom: Thank you for the proposal. As an interesting and promising technique, RIS has been studied a lot in theory, simulation and field test domain. Furthermore, more details about deployment should be clarified:

Q1: Study and evaluate the difference between hybrid channel and statistic channel model, and which one is prefer in RIS for 5G-advanced?

Q2: Please clarify the device status and components of RIS.

Q3: Please define the interface for control information transmission between gNB and RIS. Would you prefer to use an existing interface or define a new? Any impacts on protocols?

ZTE feedback:

Thanks for your question.

For Q1: In our view, both methodologies shown the merit and all of them are already captured in TR38.901 (hybrid is taken as alternative). For RIS part, to enable massive evaluation, we can try to address all issues related to the statistical model firstly and then corresponding updates for hybrid can be considered with limited efforts.

For Q2: In our view, RIS can be one entity, which is deployed by operator. And the deployment of RIS can be transparent to UE.

For Q3: To enable the controlling on RIS, at least, the information to enable the synchronization between RIS and gNB in symbol level is needed. Other information as beam related indication may also be needed for RIS.

We can try to reuse the existing interface with requirement on the basic functionality in PHY level.

15 – ZTE Corporation

@ KT Corp: We also have a strong interest in this topic.

Q1: Strong interest in this topic. Currently there are only mmWave solutions available in the market without any reconfigurability. KT would like to have FR1 support of RIS

ZTE feedback: Thanks for your comment.

For this study, we are open for both FR1 and FR2.

16 – ZTE Corporation

Rakuten Mobile, Inc: We also have a strong interest in this topic.

Q1: We are interested in real life trials of RIS, Would ZTE be able to share the Type of RIS and use cases?

ZTE feedback:

Thanks for your question.

In our contribution, the initial field measurement is done by reflective RIS to justify the gain on coverage for FR2.

17 – ZTE Corporation

Xiaomi Communications: We think RIS is a promising technique. Is RIS transparent to UEs for R18?

ZTE feedback: Thanks for your question.

Yes, please refer to answer for common Q1 above

3.2.2 Round-2 Discussion

3.2.2.1 Question collection (round-2)

Feedback Form 8: Round-2: Please enter further questions and comments on the RIS enhancements proposed in RWS-210465

1 – Xiaomi Communications

Thanks for the contribution and response. Does it need a new interface between gNB and RIS? From UE perspective, can RIS be treated as a TRP? Thanks!

2 – China Telecommunications

Thanks for your replies and clarifications. We have one further question, as you mentioned, RIS can be modeled as passive/or nearly passive node at the beginning. Then for this kind of RIS, can you make some clarification on how it detects the control signaling and demodulate it? Thanks

3 – Verizon UK Ltd

A very interesting topic. We are always supportive of new ideas to extend coverage, especially for midband and mmW. This is definitely one of them. I also think it is well worth to better understand the channels between gNB-RIS and RIS-UE before we start to look for specific enhancements in e.g., beam/CSI/RACH, because if the channels are not significantly different, existing mechanisms (and maybe some new mechanisms to be introduced in Rel-18) may just do the work, which would be even better news for users like us. Thanks!

4 – Sony Corporation

Thank you very much for your answers and comments. It is clear from all the questions that RIS has gotten much interest. Here are some additional questions:

1. In your answer to general question 2, you write "beam management part, at least the training behavior for the beam between gNB-RIS should be considered. …" A clarification seems needed. In our understanding, it is the RIS-UE link that is troublesome as it is exposed to mobility and therefore needs extra attention, e.g., gNB-RIS SSB/CSI-RS transmissions might need to be repeated in the time domain to enable remote (RIS-UE) beam sweep. Could you please comment on this?

2. It is interesting to see that you also support transmissive-type RIS. Do you foresee a unified 3GPP framework for reflective- and transmissive-type RIS, or do you think that separate standardization efforts might be needed?

3. You touch upon the potential need for enhancements to RACH for, e.g., efficient initial access, which we also think can be studied in an SI. In this context, do think that there would be any advantage for a UE to be aware of initial access happening through RIS, rather than directly to the gNB? This links to the topic of UE RIS-awareness versus -transparency, raised by a few companies.

5 – China Unicom

Thank you for your reply. Channel measurement is important for adaptive beam management.

How can gNB obtain the channel measurement results from passive RIS? Whether the measurement results of two hops, i.e. btw gBN and RIS, btw RIS and UE?

6 – vivo Mobile Communication Co.

Thanks for sharing your understanding.

We think at least the channel modeling and deployment scenarios part can be studied in Rel-18.

7 – Huawei Technologies France

Thanks for the contribution.

Q1: Do you think smart repeater&IRS is only beneficial for FR2? Is that neccessary to discuss the related topic for FR1?

Q2: About the RIS large scale fading, in what case you think the decaying slop should follow (d1+d2)^2?

Q3: About the polarization, why do you think the conventional XPR model should be replaced by semi-deterministic calculation? What do you mean about semi-deterministic calculation?

8 – KDDI Corporation

Thank you very much for your answers. We would like to add one more point to the discussion. You are proposing only RIS, but some companies are proposing smart repeater. We believe that there are advantages and disadvantages to both RIS and smart repeater, and at this point we would like to consider both as candidates as a means of addressing the area coverage issues. In that case, it would be desirable to share the interface between gNB and RIS/smart repeater as much as possible, and it would be good to discuss them together if possible. Alternatively, we could discuss either RIS or smart repeater first, and then use the results for the other. We would be grateful for your comments on this point.

3.2.2.2 Answers (Round-2)

Feedback Form 9: Answers to Questions/Comments from Round-1 for the RWS-210456 (support of Reconfigurable Intelligent Surface)

1 – ZTE Corporation

Xiaomi Communications: Thanks for the contribution and response. Does it need a new interface between gNB and RIS? From UE perspective, can RIS be treated as a TRP? Thanks!

ZTE Answer: Thanks for your question.

For Q1: To enable controlling on RIS, e.g., synchronization between RIS and gNB or adaptive beamforming by RIS, an interface is needed. The detailed design including whether based on the legacy Uu interface is still open, and it will be part of SI phase in R18.

For Q2: In our view, it is preferred to have RIS transparent to UE. In general, RIS cannot be simply treated as a TRP if the previous definition of TRP is assumed e.g. in multi-TRP topics. Unlike TRP, signals cannot be generated by RIS itself.

2 – ZTE Corporation

China Telecommunications: Thanks for your replies and clarifications. We have one further question, as you mentioned, RIS can be modeled as passive/or nearly passive node at the beginning. Then for this kind of RIS, can you make some clarification on how it detects the control signaling and demodulate it? Thanks

ZTE Answer: Thanks for your question.

In general, the detection of control signalling is done by the controller at RIS side, which only require the minimum capability to process. Then, the operation of RIS will be conducted based on the control signalling. The terminology as "passive/or nearly passive" means that RIS consists of passive antenna elements (i.e. without attaching it to any active components like PA/RF chain) comparing to other techniques. It may still need some minimal power (e.g. battery powered controller) for simple control signalling processing.

3 – ZTE Corporation

Verizon UK Ltd: A very interesting topic. We are always supportive of new ideas to extend coverage, especially for midband and mmW. This is definitely one of them. I also think it is well worth to better understand the channels between gNB-RIS and RIS-UE before we start to look for specific enhancements in e.g., beam/CSI/RACH, because if the channels are not significantly different, existing mechanisms (and maybe some new mechanisms to be introduced in Rel-18) may just do the work, which would be even better news for users like us. Thanks!

ZTE Answer: Thanks for your comments.

We share similar views with you that it is worth to better understand channels with RIS by considering proper channel model under typical scenarios. Then, further justification on the needs for potential enhancements can be studied based on evaluation once a proper channel model on RIS is available. We expect some enhancements might be needed in order to exploit full potential gain from RIS.

4 – ZTE Corporation

Sony Corporation: Thank you very much for your answers and comments. It is clear from all the questions that RIS has gotten much interest. Here are some additional questions:

1. In your answer to general question 2, you write "beam management part, at least the training behavior for the beam between gNB-RIS should be considered. …" A clarification seems needed. In our understanding, it is the RIS-UE link that is troublesome as it is exposed to mobility and therefore needs extra attention, e.g., gNB-RIS SSB/CSI-RS transmissions might need to be repeated in the time domain to enable remote (RIS-UE) beam sweep. Could you please comment on this?

2. It is interesting to see that you also support transmissive-type RIS. Do you foresee a unified 3GPP framework for reflective- and transmissive-type RIS, or do you think that separate standardization efforts might be needed?

3. You touch upon the potential need for enhancements to RACH for, e.g., efficient initial access, which we also think can be studied in an SI. In this context, do think that there would be any advantage for a UE to be aware of initial access happening through RIS, rather than directly to the gNB? This links to the topic of UE RIS-awareness versus -transparency, raised by a few companies.

ZTE Answer: Thanks for your questions.

For Q1: In order to achieve the optimized performance, joint beam management for gNB-RIS and RIS-UE links are needed. We can start with some extension of the beam mangement mechanism by allowing repeated transmission over time domain of RS to cover more combinations of beams for gNB-RIS and RIS-BS channels In addition, we are open to study all potential enhancements, including reduction of RS overhead and measurement complexityin the SI.

For Q2: We also noticed that the transmissive-Type RIS is one important type, which is useful in some scenarios, e.g., O2I. W.r.t the unified framework, it will be up to the further discuss once the channel model is identified. In our view, at least the controlling part between gNB-RIS can be shared.

For Q3: In general, RIS-transparency to UE is preferred. For PRACH part, before accessing the network, it may be complicated to design the mechanism to allow the explicit awareness of RIS by UE. The need of

supporting different operation modes to differentiate scenarios with and without RIS can be studied. We can further discuss this aspect during the SI.

5 – ZTE Corporation

China Unicom: Thank you for your reply. Channel measurement is important for adaptive beam management.

How can gNB obtain the channel measurement results from passive RIS? Whether the measurement results of two hops, i.e. btw gBN and RIS, btw RIS and UE?

ZTE Answer: Thanks for your questions.

For the channel measurement, it relies on feedback from UE based on the beam management/CSI feedback framework with possible consideration on how to reduce UE complexity/RS overhead under a large number of beam combinations for gNB-RIS and RIS-UE channels. W.r.t to decoupling between two links, it can be mainly up to gNB's configuration on channel measurement under beam management framework. It can be studied whether (and how) differentiation between the measurements corresponding to two links are needed.

6 – ZTE Corporation

Vivo Mobile Communication Co: Thanks for sharing your understanding.

We think at least the channel modeling and deployment scenarios part can be studied in Rel-18.

ZTE Answers: Thanks for your comments. We share the view that at least SI phase including the channel modelling and scenarios are needed. Potential enhancements can also be studied.

7 – ZTE Corporation

Huawei Technologies France: Thanks for the contribution.

Q1: Do you think smart repeater&IRS is only beneficial for FR2? Is that neccessary to discuss the related topic for FR1?

Q2: About the RIS large scale fading, in what case you think the decaying slop should follow (d1+d2)^2?

Q3: About the polarization, why do you think the conventional XPR model should be replaced by semi-deterministic calculation? What do you mean about semi-deterministic calculation?

ZTE Answers: Thanks for your questions.

1. For Q1: We noticed that there are interests from companies on both FR1 and FR2. Since RIS can be considered to boost the coverage (e.g., cell edge or O2I) and improve the channel conditions for high throughout, in our view, we also share the view th study RIS for all bands.

2. For Q2: According to current research, by taking RIS as passive beamformer, the product-distance based model is used in academic paper. This part surely needs to be discussed and confirmed with corresponding assumption on the RIS type and scenarios.

3. In current stochastic channel model, the polarization/depolarization effect during propagation is modelled by XPR, which is randomly generated according to the parameters. For the case with RIS, since the response of RIS for each polarization can be different, additional step to calculate the impacts of RIS per polarization is needed with consideration on the parameters of each cluster.

8 – ZTE Corporation

KDDI Corporation: Thank you very much for your answers. We would like to add one more point to the discussion. You are proposing only RIS, but some companies are proposing smart repeater. We believe that there are advantages and disadvantages to both RIS and smart repeater, and at this point we would like

to consider both as candidates as a means of addressing the area coverage issues. In that case, it would be desirable to share the interface between gNB and RIS/smart repeater as much as possible, and it would be good to discuss them together if possible. Alternatively, we could discuss either RIS or smart repeater first, and then use the results for the other. We would be grateful for your comments on this point.

ZTE Answer: Thanks for your question. We also noticed that there is interest on the other topic (i.e., smart repeater). In our view, RIS can be considered for both coverage enhancement for cell edge or throughput improvement with lower cost and high energy efficiency.
W.r.t the standardization efforts, study phase on RIS and smart repeater is needed to identify the potential enhancements. It is preferred if common aspects can be identified for some of these solutions, but additional specific consideration for each solution is also foreseen to maximise the benefit. Moreover, as commented by many companies, firstly, the discussion on channel modeling for RIS should be triggered in order to proceed with the further steps for evaluation.

3.3 Further enhancement of data collection for SON&MDT in NR and MR-DC in Rel-18 (RWS-210466)

In RWS-210466, we suggest a WI for further enhancement of data collection for SON&MDT in NR and MR-DC in Rel-18, the potential aspects for enhancement include:

NR multicast and broadcast services

In Rel-16 & Rel-17, NR MDT aiming at scenarios of coverage and QoS verification were considered. It is also noted that in in Rel-12, an enhancement of logged MDT for MBSFN has been conducted and specified. Given the fact that NR multicast and broadcast services is going to be specified in Rel-17, it is beneficial to consider how to support NR multicast and broadcast services into NR MDT.

MDT for NPN

In Rel-16 & Rel-17, NG-RAN node is not aware of CAG ID during the initial access and during mobility. After the user is authorized to access a PNI-NPN network by the core network, the RAN network cannot know the CAG information that the user is currently accessing, thus the operator is unable to calculate the user load of different CAG networks and optimize the network capacity according to different NPN network loads. It is beneficial to have a mechanism for MDT to record the accessing CAG information.

Left-over issues in Rel-16 or Rel-17 of NR SON /MDT

Due to the lack of time, several issues raised for NR SON/MDT in Rel-16 or in Rel-17 were decided to be postponed to next release. these left-over issues are listed below:

- SON Enhancements for CPC subject to the progress of R17 CPC enhancements and SON enhancements for CHO.

- For CHO/DAPS, SON related Data forwarding enhancements on HO to wrong cell.

- Enhancements for RACH Report retrieval from DU to CU.

3.3.1 Round-1 Discussion

3.3.1.1 Question collection (round-1)

Feedback Form 10: Please provide company comments/questions on the above aspects (see RWS-210466 for details)

1 – CATT

Thank you for the contribution. We also think further enhancement of data collection for SON/MDT with more features considerred should be discussed in Rel-18.Just one question on MDT for MBS: Could you please clarify what should be supported for MDT on multicast?

2 – InterDigital Germany GmbH

for new R17 features that should be discussed in SON in R18 you mention only a few (example MBS) do you feel that others aren't necessary or are just lower priority (example NTN)?

3 – Lenovo Information Technology

Thanks for the contributions.

We share your view on SON/MDT enhancements for MBS, NPN, CPAC. Besides that, we believe more cases should be covered, such as: SON for IAB topology and routing, and SON for NTN mobility. Do you think whether they should be supported or what's you highest priority.

4 – China Mobile International Ltd

We also think SON/MDT enhancement in Rel-18 should be continued and our paper could be found in RWS-210336. the scope could include SONMDT enhancement for MRO and for some new features, e.g., MBS, IAB, NTN, etc.

3.3.1.2 Answers (Round-1)

Feedback Form 11: Answers to Questions/Comments from Round-1 for the RWS-210466 (Further enhancement of data collection for SONMDT in NR and MR-DC in Rel-18)

1 – ZTE Corporation

@ CATT: Thank you for the contribution. We also think further enhancement of data collection for SON/MDT with more features considerred should be discussed in Rel-18.Just one question on MDT for MBS: Could you please clarify what should be supported for MDT on multicast?

ZTE feedback:

Thanks for your question.

In LTE, MDT extended for MBMS in Rel-12. In order to provide the same performance of NR to LTE, we suggest to support further enhancement of MDT on MBS.

One important objective of NR MBS is to support service continuity between between multicast (PTM) and unicast (PTP). Then logged MDT can be leveraged to collect information to improve continuity performance.

2 – ZTE Corporation

@InterDigital Germany GmbH: for new R17 features that should be discussed in SON in R18 you mention only a few (example MBS) do you feel that others aren't necessary or are just lower priority

(example NTN)?

ZTE feedback:

Thanks for the question.

We understand that SON/MDT is more meaningful to the information collection and optimization of the functions used on a large scale. For example, mobility enhancement in the Rel-10 .SON/MDT in the Rel-18 can continue its evolution, but we should be cautious about selecting the new functions introduced by Rel-16 and Rel-17. This is why we only select the MBS and NPN in this meeting. For MBS, it is because MDT for MBMS has already been supported in LTE Rel-12, in order to keep same performance of NR and LTE, we prefer to select MBS as the candidate.

Regarding NTN, It is our understanding the enhancement of NTN to SON/MDT may be concentrated in the functions related to Load Management and Energy Saving. Other SON/MDT functions, such as MRO and RACH Optimization, may not be considered. We are neutrality to the support of this function in R18.

For IAB, our view is some SON related enhancement is necessary in R18, but we prefer discuss it in IAB WI. Please see our proposal in RWS-210475.

We mainly focus on the mobile IAB scenario (deployed on the vehicle). In this scenario we need SON enhancement so that the mobile IAB node can update and maintain NCRT in a timely manner when moving. For example, during the moving process, the mobile IAB can only be switched to a specific IAB donor. When the vehicle arrives at the station, the updated NCR needs to be obtained in a timely manner to support the UE switch between IAB node and macro node.

3 – ZTE Corporation

@ Lenovo Information Technology: Thanks for the contributions.

We share your view on SON/MDT enhancements for MBS, NPN, CPAC. Besides that, we believe more cases should be covered, such as: SON for IAB topology and routing, and SON for NTN mobility. Do you think whether they should be supported or what's you highest priority.

ZTE feedback:

Thanks for the question.

We share similar views on basic features of R18 SON/MDT. While for other features, we are neutral to support, please see our view on NTN response to InterDigital.

While for IAB, our view is some SON related enhancement is necessary in R18, but we prefer discuss it in IAB WI. Please see our proposal in RWS-210475. Please see our response to InterDigital.

4 – ZTE Corporation

China Mobile International Ltd: We also think SON/MDT enhancement in Rel-18 should be continued and our paper could be found in RWS-210336. the scope could include SONMDT enhancement for MRO and for some new features, e.g., MBS, IAB, NTN, etc.

ZTE feedback:

Thanks for the question.

We share similar views on the basic features as CMCC.

3.3.2 Round-2 Discussion

3.3.2.1 Question collection (round-2)

Feedback Form 12: Round-2: Please enter further questions and comments on the SON/MDT enhancements in RWS-210466

4 Conclusion

In this offline discussion, the following ZTE contributions on eMBB enhancements for Rel-18 have been discussed:

- CADC enhancements for eMBB (RWS-210464)

- Support of Reconfigurable Intelligent Surface (RIS) (RWS-210465)

- Further enhancements for data collection for SON&MDT in NR and MR-DC (RWS-210466)

CADC enhancements in Rel-18:

As part of the CADC enhancements, improvements for the following broad areas have been proposed (RWS-210464):

- Robustness improvements

- Interruption reduction and fast SCell activation

- Fast failure detection and recovery

- Dynamic UE capability sharing

Discussion on these enhancements took place in 2 rounds of Q&A sessions with active participation from companies including network vendors, UE/chipset vendors and operators.

During the discussion, a number of companies expressed support for general enhancements to improve robustness and interruption reduction as well as failure detection and recovery. Dynamic capability sharing was also discussed and companies mentioned that the UE complexity should be minimised for this (which seems feasible).

Overall, there seems to be a good support for the general CADC enhancements in Rel-18 and a clear market need seems to exist especially to support more efficient utilisation of new spectrum (specifically, FR2).

Support of Reconfigurable Intelligent Surface (RIS):

To support better coverage and improve the throughput for 5G networks, study on RIS is proposed and details of the scope were discussed (RWS-210465) as below:

- Study on Channel modelling and deployment scenario identification

- Identification of enhancement techniques

Discussion on these aspects also took place in 2 rounds with active participation (i.e., 18 companies) from

network vendors, UE/chipset vendors and operators.

A number of companies (including operators) pointed out that RIS is a promising technique and needs further attention in Rel-18 with following highlights:

Study phase on RIS is needed with discussion on channel modelling firstly in order to proceed further step for evaluation

Some synergies between RIS and smart repeater on the enhancements can be foreseen and study phase on both seems beneficial.

RIS could be transparent to the UE and this can enable improvements without much UE complexity.

In general, RIS seems to be an attractive area for study in Rel-18 especially motivated by the need for improved performance in both FR1 and FR2 and seems to address operator needs in these bands.

Further enhancements for data collection for SON&MDT in NR and MR-DC:

In RWS-210466, work on the following broad areas for enhanced data collection for SON and MDT in NR and MR-DC is proposed:

- NR multicast and broad cast services

- MDT for NPN

- Left-over issues in Rel-16 or Rel-17 for NR SON/MDT

Discussion on the above aspects took place with one round of comments and questions from a number of companies including one operator.

In general companies seem to agree that work on SON/MDT in Rel-18 is needed and pointed out that features such as MBS, NPN, NTN and IAB should be considered within this work.

5 References

[1] RWS-210464, CADC and Mobility Enhancements, ZTE Corporation, Sanechips

[2] RWS-210465, Support of Reconfigurable Intelligent Surface for 5G Advanced, ZTE Corporation, Sanechips, China Unicom, NEC

[3] RWS-210466, Further enhancement of data collection for SON&MDT in NR and MR-DC, ZTE, Sanechips.