

**0.0.2**

**Variant of RAN-R18-WS-eMBB-NTT\_DOCOMO Version 0.0.1  
RAN**

3GPP TSG RAN Rel-18 workshop RWS-210537

Electronic Meeting, June 28 - July 2, 2021

Agenda Item: 4.1

Source: NTT DOCOMO, INC.

Title: Email discussion summary for [RAN-R18-WS-eMBB-NTT\_DOCOMO]

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## 1 Introduction

This email discussion summary covers the following documents:

[1] RWS-210234: Views on Rel-18 Mobility & DC/CA.

[2] RWS-210268: Views on Rel-18 MIMO.

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## 2 General Q&A (if any)

### **Feedback Form 1: Round 1 general comments/questions**

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2.1.1 Answers to general comments/questions

Void.

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## 3 Mobility & DC/CA [1]

3.1 Round 1

3.1.1 Comments/questions on Mobility & DC/CA

### **Feedback Form 2: Round 1 comments/questions on Mobility DC/CA**

<p><b>1 – MediaTek Inc.</b></p> <p>Thanks for the quality contribution. Below please find our questions/comments:</p>
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- Regarding fast SCG/PCell Change, what should we do beyond R17 scope? E.g. apply L1/L2 mobility to SCG change?
- Regarding UL enhancement for DC, can this be part of enhancement to split bearer feature, covering both DL and UL?
<b>2 – Nokia Corporation</b>  We share your view that mobility and CA/DC enhancements are important area for Rel-18 enhancements. For SCG addition/failure, the objective seems to be highly linked to ongoing Rel-17 work. Do you already have some specific further enhancements in mind?  Do you consider the latency and reliability improvement for mobility targeting mainly FR2 cases?  For Fast SCG/PCell change using L1 we see that potential gains should be studied first.
<b>3 – Nokia Corporation</b>  <b>Question:</b> Compared to existing UL bearer split, what would the "smart UL flow control" mean - i.e. what would it aim to improve?
<b>4 – Intel Corporation (UK) Ltd</b>  Regarding the smart UL flow control method at the UE side by considering the condition of each leg, should not this depend on network scheduling implementation? Or is the thinking behind the proposal that the UE decides a BSR for each node by considering the condition of each leg?

### 3.1.2 Answers on Mobility & DC/CA

Thanks everyone for your questions!

#### To MediaTek:

[Fast PCell/SCG change]

Regarding fast SCG/PCell Change, what should we do beyond R17 scope? E.g. apply L1/L2 mobility to SCG change?

**=> Our interest for now is SCG change and inter-DU scenario, as well as R17 leftovers. At the same time we think that potential gains and difference between R17 L1/L2-centric mobility should be carefully discussed.**

[UL enhancement for DC]

Regarding UL enhancement for DC, can this be part of enhancement to split bearer feature, covering both DL and UL?

**=> Firstly, we are wondering what is the scope of split bearer feature. Our original intention is since DL/UL has different coverage for NR frequency band due to limited UE uplink transmission power, as such the UL is more vulnerable to bad radio condition e.g. at the cell edge, which is our main target to**

**work on. By the way, if any issue is identified and split bearer transmit operation needs to be enhanced in DL, we are open to discuss it.**

**To Nokia:**

[SCG Addition/Failure]

For SCG addition/failure, the objective seems to be highly linked to ongoing Rel-17 work. Do you already have some specific further enhancements in mind?

**=> Yes, in our view SCG deactivation framework in R17 could be used to mitigate the impact of frequent SCG addition/failure, by e.g. UE autonomous deactivation.**

[Target for latency/reliability]

Do you consider the latency and reliability improvement for mobility targeting mainly FR2 cases?

**=> Yes, in our view FR2 is more relevant, but we're open to discuss promising scenarios also for FR1.**

[Gains of L1-based mobility]

For Fast SCG/PCell change using L1 we see that potential gains should be studied first.

**=> We agree with your view that potential gains should be discussed. Even in Release 17 companies' opinions are divided with different assumptions etc.**

[UL flow Control]

Compared to existing UL bearer split, what would the "smart UL flow control" mean - i.e. what would it aim to improve?

**=>The "smart UL flow control" intends to mean UE could transmit the UL data (e.g. PDCP data PDU) to primary leg or split secondary leg by considering the radio quality of each leg. It aims to improve the problem that UE transmits the UL data to the leg of bad radio quality, which may cause low UL throughput or a high latency.**

**To Intel:**

[UL flow Control]

Regarding the smart UL flow control method at the UE side by considering the condition of each leg, should not this depend on network scheduling implementation? Or is the thinking behind the proposal that the UE decides a BSR for each node by considering the condition of each leg?

**=>Our intention is to enhance the UL data transmission in PDCP layer that e.g. UE could transmit the UL data (e.g. PDCP data PDU) to primary leg or split secondary leg by considering the radio quality of each leg. For MAC layer, UE sends a BSR to each node by considering the condition of each leg could also be a promising candidate solution.**

## 3.2 Round 2

### 3.2.1 Comments/questions on Mobility & DC/CA

#### Feedback Form 3: Round 2 comments/questions on Mobility DC/CA

##### 1 – Fujitsu Limited

Thank you for the contribution.

We are interested in cell-edge performance and smart UL flow control. (1) Could you more elaborate on what kind of information is needed for the smart UL flow control?

(2) In NR Rel-15, uplink path switch has been agreed around RAN2#99/#100 meeting and already in the specification. Could you more elaborate on what is missing in the uplink path switch mechanism?

##### 2 – ZTE Corporation

Thanks for the contribution.

For FR2 Mobility, we also see urgent need from the market and support the enhancement on this aspect. Some similar proposals can also be found in our tdoc RWS-210464.

For the Uplink Flow Control Enhancements for DC, we understand the intention is to enable some kind of UE triggered DRB primary path switch and duplication activation/deactivation. We also see some benefits on this aspect and we have similar proposal in our tdoc RWS-210464 as well.

##### 3 – MediaTek Inc.

Thanks for the response. Regarding the smart UL enhancement, we also support the direction of leveraging more UE intelligence in UL data transmission under split bearer architecture.

For DL part, UE assistance can also help leg switching and reduce the data interruption time since UE better knows the instantaneous channel condition. In this regard, we think both UL and DL directions can be improved for the split bearer architecture.

##### 4 – DOCOMO Communications Lab.

Thanks everyone for valuable questions and comments.

###### @Fujitsu

(1) Could you more elaborate on what kind of information is needed for the smart UL flow control?

**=>For instance, the information related to radio link quality of primary and split secondary leg is needed.**

(2) In NR Rel-15, uplink path switch has been agreed around RAN2#99/#100 meeting and already in the specification. Could you more elaborate on what is missing in the uplink path switch mechanism?

**=>The existing uplink path switch mechanism is if the data volume is more than a threshold, UE can either send the data to primary leg or split secondary leg, which is highly dependent on UE implementation. The issue is if UE send data in the leg of bad radio quality, it may cause low throughput and high latency.**

###### @ZTE

For FR2 Mobility, we also see urgent need from the market and support the enhancement on this aspect. Some similar proposals can also be found in our tdoc RWS-210464.

For the Uplink Flow Control Enhancements for DC, we understand the intention is to enable some kind of

UE triggered DRB primary path switch and duplication activation/deactivation. We also see some benefits on this aspect and we have similar proposal in our tdoc RWS-210464 as well.

**=>Thanks for your comment. we are also open to discuss UE triggered duplication activation/deactivation.**

**@MediaTek**

Thanks for the response. Regarding the smart UL enhancement, we also support the direction of leveraging more UE intelligence in UL data transmission under split bearer architecture.

For DL part, UE assistance can also help leg switching and reduce the data interruption time since UE better knows the instantaneous channel condition. In this regard, we think both UL and DL directions can be improved for the split bearer architecture.

**=>Thanks for your support. For DL part, we are also open to discuss the adaptive leg switching e.g. using UE assistance info.**

#### **5 – DOCOMO Communications Lab.**

I've mistakenly input above answer to this question form. Please ignore my comment above, and see answers below instead. Apologies for inconvenience.

### 3.2.2 Answers on Mobility & DC/CA

#### **Feedback Form 4: Round 2 answers on Mobility DC/CA**

#### **1 – DOCOMO Communications Lab.**

Thanks everyone for valuable questions and comments.

**@Fujitsu**

(1) Could you more elaborate on what kind of information is needed for the smart UL flow control?

**=>For instance, the information related to radio link quality of primary and split secondary leg is needed.**

(2) In NR Rel-15, uplink path switch has been agreed around RAN2#99/#100 meeting and already in the specification. Could you more elaborate on what is missing in the uplink path switch mechanism?

**=>The existing uplink path switch mechanism is if the data volume is more than a threshold, UE can either send the data to primary leg or split secondary leg, which is highly dependent on UE implementation. The issue is if UE send data in the leg of bad radio quality, it may cause low throughput and high latency.**

**@ZTE**

For FR2 Mobility, we also see urgent need from the market and support the enhancement on this aspect. Some similar proposals can also be found in our tdoc RWS-210464.

For the Uplink Flow Control Enhancements for DC, we understand the intention is to enable some kind of UE triggered DRB primary path switch and duplication activation/deactivation. We also see some benefits on this aspect and we have similar proposal in our tdoc RWS-210464 as well.

**=>Thanks for your comment. we are also open to discuss UE triggered duplication activation/deactivation.**

**@MediaTek**

Thanks for the response. Regarding the smart UL enhancement, we also support the direction of leveraging more UE intelligence in UL data transmission under split bearer architecture.

For DL part, UE assistance can also help leg switching and reduce the data interruption time since UE

better knows the instantaneous channel condition. In this regard, we think both UL and DL directions can be improved for the split bearer architecture.  
=>**Thanks for your support. For DL part, we are also open to discuss the adaptive leg switching e.g. using UE assistance info.**

## 4 MIMO [2]

### 4.1 Round 1

#### 4.1.1 Comments/questions on MIMO

#### Feedback Form 5: Round 1 comments/questions on MIMO

##### 1 – Samsung Research America

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(p7) Re UL dense deployment, we find this scenario quite interesting and has some strong potential to mitigate FR2 coverage issues! 1) How many receiver points (RPs) do you have in mind for a typical (e.g. dense urban) FR2 cell size? 2) Does the need for multiple TAs imply that a UE can transmit to multiple RPs (and the NW will subsequently perform combining across RPs)? If only one RP can receive, it seems one TA suffices. Do you agree?

-

(p7) For case A and B, are UL and DL transmissions intended to overlap on time-frequency resources?

##### 2 – vivo Communication Technology

1) On UL dense RX deployment, considering it is mainly for FR2, how does beam correspondence at UE work? In other words, during initial access how does UE select PRACH resource based on measured SSB?  
2) On transform domain precoding, what are the expected spec impacts? Does it involve new RS design, new feedback framework?

##### 3 – China Telecommunications

We also think enhancement on UL capacity is needed with the emergence of uplink centric services. For UL dense deployment in Page 7, is this structure some kind of like distributed antenna system? It seems the main antennas (on the yellow block) only transmit DL signals and the distributed antennas (on the green block) only receive UL signals as shown in the figure. Then, how can the UE know which UL beam should be used for UL transmission?

##### 4 – Beijing Xiaomi Mobile Software

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Q1: The need for TRS enh. for High-speed train can be further studied, the benefit should be evaluated first.

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Q2: If UL-only nodes are introduced, many issues should be reconsidered. The scenarios and benefits needs to be further discussed...

**5 – MediaTek Inc.**

Q1. Other than SRS-based BM, any BM-related enhancement is needed for UL dense Rx only deployment?  
Q2. UL Rx node may still has to transmit DL RS for measurement at least for UL PC control? If so, BM still can be done by DL measurement and reporting.

**6 – Qualcomm communications-France**

Regarding UL dense deployment, the use case and benefits are clear to us. In addition to the potential enhancements listed in your contribution, do you think initial access / RACH procedures also require enhancements? Or is it assumed that initial access is always toward the DL TRP (“UL dense deployment” mode will be enabled after initial access)?

**7 – HuaWei Technologies Co.**

On Page 7: For Rx only Node, does it require a dedicated/new site/location and fiber for backhauling?

**8 – Qualcomm communications-France**

Regarding transform domain CSF, what’s different compared to eType II? It seems DCM tries to distinguish ”angular” from ”spatial”?

**9 – ZTE Corporation**

Thank you so much for sharing this contribution. Regarding UL-dense network, if no PL-RS measurement in UL-only M-TRP operation, could you clarify how to guarantee the UL link adaption well? Also, we can assume that we do not need any enhancement on TA in such case, right (due to short distance among UL sites)?

**10 – Beijing Lenovo Software Ltd.**

Q1: For UL MIMO evaluation (Performance gain of > 4 rank UL MIMO), was it evaluated based on SU only UL MIMO or dynamic switching SU/MU UL MIMO for transmission?  
Q2: It is very interesting to introduce UL dense RX only deployment. Does UE need to maintain both a conventional paired UL in addition to Rx only UL? For CA, is it possible for different UL on different carriers?

**11 – Ericsson LM**

- On UL MIMO, can you elaborate on the use of ULA for 8TX UE that you used in your evaluations. Is this a reasonable antenna model for 8 TX UEs, or should RAN1 target more generic antenna models for such high end UEs?
- Why does frequency selective precoding for UL have lower priority, can you elaborate? Do you have results for subband precoding using FTP traffic? What type of UE was used, fully coherent or non-coherent?
- Does the newly proposed TRS pattern collide with LTE CRS when DSS is used?
- Why was analog beamforming used at 4GHz in your evaluations?

## 12 – Intel Corporation (UK) Ltd

What kind of UE devices can support more than 4 MIMO layers transmission and how it relates to stadium scenario mentioned in the slides as main motivation? Is it urgent enhancement considering that 4Tx is not supported in RAN4 yet?

### 4.1.2 Answers on MIMO

#### To Samsung:

(p7) Re UL dense deployment, we find this scenario quite interesting and has some strong potential to mitigate FR2 coverage issues! 1) How many receiver points (RPs) do you have in mind for a typical (e.g. dense urban) FR2 cell size?

**=> 1) We think it depends on the performance gain in FR2. In our evaluation results on p.8, we assumed 4GHz carrier frequency. In that scenario, even if with additional 2 Rx points, we observed 30% 400 % average gain. We agree the UL dense deployment is useful not only in FR1 but also in FR2.**

2) Does the need for multiple TAs imply that a UE can transmit to multiple RPs (and the NW will subsequently perform combining across RPs)? If only one RP can receive, it seems one TA suffices. Do you agree?

**=> 2) We don't imply a UE transmits UL channel to multiple RPs with different TAs. We assume UE can transmit a UL channel with a given TA. It is up to gNB implementation that one RP receives the UL channel, or multiple RPs jointly receives the UL channel. Since the path-loss between UE to Macro and UE to RP are different, we assume UE should consider different TA value for the different links.**

(p7) For case A and B, are UL and DL transmissions intended to overlap on time-frequency resources?

**=>No, we assume the same TDD configuration between Macro link and RP link (hence, no cross interference between Macro link and RP link). We can further study when the TDD configuration are different.**

#### To vivo

1) On UL dense RX deployment, considering it is mainly for FR2, how does beam correspondence at UE work? In other words, during initial access how does UE select PRACH resource based on measured SSB?

**=> We assume UE should send PRACH to macro cell during initial access. However, after initial access, UE can send PUSCH/PUCCH to Rx reception points to obtain better performance based on gNB scheduling.**

2) On transform domain precoding, what are the expected spec impacts? Does it involve new RS design, new feedback framework?

**=> The expected spec impacts mainly include further enhancement based on Type II CSI. By further Type II CSI feedback enhancement, finer frequency granularity of precoding (from subband-level to RB-level or even subcarrier-level) can be realized. New RS design and new feedback framework are not mandatory, but can be further optimized for better performance, if needed. For example, CSI-RS can be enhancement for measurement. In addition, with transform domain precoding, the delay-domain values have practical physical meanings related to the propagation channels, which should vary slower**

than the frequency-compressed values in Rel-16 Type II codebook. In this case, in order to reduce feedback overhead, new feedback periodicity for different values or even new incremental feedback can be considered.

#### To China telecom

We also think enhancement on UL capacity is needed with the emergence of uplink centric services. For UL dense deployment in Page 7, is this structure some kind of like distributed antenna system? It seems the main antennas (on the yellow block) only transmit DL signals and the distributed antennas (on the green block) only receive UL signals as shown in the figure. Then, how can the UE know which UL beam should be used for UL transmission?

**=> The macro gNB (yellow block) can transmit DL signal and receive UL signal, but Rx points (green block) can only receive UL signal. Hence, UE can receive DL signal from macro gNB and UE can send UL signal to either macro gNB or Rx points. Since the beam correspondence cannot be used for UE who transmits UL signal to Rx points, we would need to use SRS based beam sweeping for UL. We can consider further enhancement of the SRS based beam sweeping to improve efficiency.**

#### To Xiaomi

Q1: The need for TRS enh. for High-speed train can be further studied, the benefit should be evaluated first.

**=> We believe the need/benefit of TRS enhancement is clear. RAN4 Rel.16 decided 870Hz as maximum Doppler shift (for 15 kHz FDD band in bi-directional SFN), by theoretical calculation. It is not possible to increase the maximum Doppler shift without RAN1 spec. enhancement. On the other hand, with Rel.17 RAN1 HST schemes, RAN4 may be able to increase the maximum Doppler shift. If not, we need the TRS enhancement. Based on our theoretical calculation, at least 3-symbol gap TRS can support 996 Hz Doppler shift (500 km/h@2.15GHz in bi-directional SFN).**

Q2: If UL-only nodes are introduced, many issues should be reconsidered. The scenarios and benefits needs to be further discussed...

**=> The scenario is for UL heavy traffic and the benefit is mainly for UL improvement will less cost and overhead (e.g. Rx points do not require power amplifier, operator does not need to care DL interference adjustment of Rx points). We think the spec. impact is not so big. Main spec. impacts include UL TPC, and potential UL BM enhancement.**

#### To MediaTek

Q1. Other than SRS-based BM, any BM-related enhancement is needed for UL dense Rx only deployment?

**=> Currently, we think no. We can consider whether/how to improve SRS based beam sweeping for UL.**

Q2. UL Rx node may still has to transmit DL RS for measurement at least for UL PC control? If so, BM still can be done by DL measurement and reporting.

**=> No, we assume UL Rx nodes does not transmits anything. DL is transmitted from macro cell only. For UL PC, we think spec. enhancement is needed. For example, gNB informs UE the path loss value, based on the measurement of UL RS reception, so that UE can calculate UL PC.**

#### To Qualcomm

Regarding UL dense deployment, the use case and benefits are clear to us. In addition to the potential enhancements listed in your contribution, do you think initial access / RACH procedures also require enhancements? Or is it assumed that initial access is always toward the DL TRP (“UL dense deployment” mode will be enabled after initial access)?

**=> We assume UE should send PRACH to macro cell during initial access, and UL dense Rx mode is enabled after initial access. Hence, currently we do not think enhancement is needed for initial access/RACH. However, we are of course open to discuss whether/how to enable the initial access / PRACH to Rx point, if needed.**

Regarding transform domain CSF, what’s different compared to eType II? It seems DCM tries to distinguish ”angular” from ”spatial”?

**=> The main difference is that, subband-level compression and precoding are considered in eType II in Rel-16, while in the transform domain CSI, RB/subcarrier-level compression (related to the delay domain in practical propagation channels) and RB/subcarrier-level precoding can be supported based on further enhancement of eType II CSI. With this finer frequency granularity, better performance can be obtained. Besides, we are not trying to distinguish “angular” from “spatial”. It is only an explanation which is trying to show that after spatial-domain compression, angular-domain values can be obtained. Similarly, after frequency-domain compression, delay-domain values can be obtained. Transform domain CSI is a further enhanced frequency-domain compression in RB/subcarrier level.**

**To Huawei**

On Page 7: For Rx only Node, does it require a dedicated/new site/location and fiber for backhauling?

**=> Yes, Rx only Node requires a dedicated location and fiber for backhauling. But, Rx points do not require power amplifier, and operator does not need to care DL interference adjustment of Rx points. So, we would be able to reduce the deployment/operational cost, compared to the usual dense UL/DL deployment.**

**To ZTE**

Thank you so much for sharing this contribution. Regarding UL-dense network, if no PL-RS measurement in UL-only M-TRP operation, could you clarify how to guarantee the UL link adaption well?

**=> For UL, pathloss can be obtained by NW based on measurement of UL SRS. And gNB can perform UL link adaption based on UL SINR measurement and UL PUSCH decoding ACK/NACK result.**

Also, we can assume that we do not need any enhancement on TA in such case, right (due to short distance among UL sites)?

**=> Yes, the same TA can be assumed for those UL RX points. Hence, it is okay to not enhance TA. But the TA to macro cell and RX points may be different. In that case, multiple TAs are needed.**

**To Lenovo**

Q1: For UL MIMO evaluation (Performance gain of > 4 rank UL MIMO), was it evaluated based on SU only UL MIMO or dynamic switching SU/MU UL MIMO for transmission?

**=> For UL MIMO evaluation of higher rank, UL SU MIMO is assumed.**

Q2: It is very interesting to introduce UL dense RX only deployment. Does UE need to maintain both a conventional paired UL in addition to Rx only UL? For CA, is it possible for different UL on different carriers?

**=> During initial access, UE maintains a UL to macro cell. But after initial access, dense RX mode can be enabled, and UE can be scheduled to transmit to any RX node or macro cell. In that case, UE does not need to maintain the UL to macro cell. So far we did not consider a CC with RX point only for CA.**

**To Ericsson**

· On UL MIMO, can you elaborate on the use of ULA for 8TX UE that you used in your evaluations. Is this a reasonable antenna model for 8 TX UEs, or should RAN1 target more generic antenna models for such high end UEs?

**=> In the simulations, for 8 Tx UE, we assume  $(M,N,P,Mg,Ng) = (1,4,2,1,1)$ , which is 1 x 4 with dual polarizations. We think it is a reasonable antenna model. If you have different views, please kindly share the antenna model in your mind.**

· Why does frequency selective precoding for UL have lower priority, can you elaborate? Do you have results for subband precoding using FTP traffic? What type of UE was used, fully coherent or non-coherent?

**=> The reason why we put “low priority” is the limited performance gain based on our SLS results. So, the freq. selective precoding is not the first priority. But, of course we are okay to introduce freq. selective precoding. We provided SLS results in full buffer. We did not conduct evaluations in FTP traffic. In our evaluations, fully coherent UE is assumed.**

· Does the newly proposed TRS pattern collide with LTE CRS when DSS is used?

**=> We are open on which symbol the new 3-symbol gap TRS will be introduced. We understand that DSS considers the following CRS patterns. We think we can find symbols for 3-symbol gap TRS on which avoid collision with CRS in DSS.**

- 1/2 ports CRS: #0, #4, #7, #11

- 4 ports CRS : #0, #1, #4, #7, #8, #11

· Why was analog beamforming used at 4GHz in your evaluations?

**=> It is because we believe analog beamforming is beneficial to extend coverage, even for 4GHz. In addition, in our simulation, we found that this assumption has little impact on the range of performance gain even though the absolute throughput is different.**

**To Intel**

What kind of UE devices can support more than 4 MIMO layers transmission and how it relates to stadium scenario mentioned in the slides as main motivation? Is it urgent enhancement considering that 4Tx is not supported in RAN4 yet?

**=> If possible, our hope is that smart phone like UE can support more than 4 layers in future, so that we can use it in e.g. stadium scenario. Although RAN4 only considers 2Tx MIMO so far, we assume RAN4 will support 4 layers later. RAN1's work is always earlier than RAN4, we believe it is good to enhance to >4 rank in some release. Since we'd like to enhance UL performance in Rel.18, we think it is good timing to support >4 rank in Rel.18.**

**After the discussion, if 3GPP decides that the smart phone like UE cannot support >4 rank, we assume more advanced UE (e.g. CPE) can support >4 rank. Even if only CPE can support it, we think still it is beneficial, for example, by using CPE as backhaul links.**

## 4.2 Round 2

### 4.2.1 Comments/questions on MIMO

#### **Feedback Form 6: Round 2 comments/questions on MIMO**

<p><b>1 – Beijing Xiaomi Mobile Software</b></p> <p>Thanks for your answers. As for Rx only node, you mentioned “pathloss can be obtained by NW based on measurement of UL SRS”, does it mean that the transmission power of UL SRS is indicated by gNB through other node? But how does gNB know the value of Tx power for UL SRS?</p>
<p><b>2 – Samsung Research America</b></p> <p>Thanks for the response.</p> <p>- (p5) Which CB did you consider for SB precoding, is it R15 UL CB, or R15 DL T1 CB?</p> <p>- (p7): For dense uplink deployments with multiple UL reception points and single DL transmission point, are you also considering DL transmissions from the UL reception points (e.g. for reference signals). If not, then is it so that in these deployments only the SRS can be used as source RS for spatial relation?</p>
<p><b>3 – Lenovo (Beijing) Ltd</b></p> <p>As a network operator, what is the most important deployment scenario and features for MIMO in R18 for DOCOMO?</p>
<p><b>4 – ZTE Corporation</b></p> <p>Thank you so much for your reply. In general, we are open to further study the potential enhancement for UL dense network.</p> <p>-</p> <p>Regarding UL power control, we still feel that some DL RS measurement may be needed, since the pure UL measurement of SRS may not be sufficient (e.g., periodicity of SRS much large than DL RS, and SRS also needs power control mechanism). In our initial thoughts, PL measurement based on multiple RSs can be considered.</p> <p>-</p> <p>Then, we are fine with non-TA enhancement.</p> <p>Regarding UL MIMO, our preference/discussion can be found in Page 7 8 of our companion contribution RWS-210479. Besides for STxMP and supporting more UL layers, multiple codeword enhancement for UL (also for no more than 4 DL layer) should be considered. Some field tests to prove the necessity of introducing multiple codewords for UL can be found in our contribution R1-2104596.</p>

### 4.2.2 Answers on MIMO

## Feedback Form 7: Round 2 answers on MIMO

### 1 – NTT DOCOMO INC.

**@Xiaomi**

Thanks for your answers. As for Rx only node, you mentioned “pathloss can be obtained by NW based on measurement of UL SRS”, does it mean that the transmission power of UL SRS is indicated by gNB through other node? But how does gNB know the value of Tx power for UL SRS?

**=>We think this is very good question. We should discuss how to get the common understanding of SRS tx power between UE and gNB, so that gNB can estimate UL pathloss. We assume the pathloss of SRS/PUSCH/PUCCH for power control calculation for different RX node is configured by gNB, based on SRS measurement. But, we should discuss how to determine tx power of “the SRS transmission”. One possible example is that when UE sends SRS to macro node (with both DL/UL functions) before entering into UL dense RX operation mode, UE calculates the power of SRS based on configured PC parameters from NW and DL PL estimated based on DL PL-RS from macro cell. In this case, NW may also calculate the tx. power of SRS based on the same formula by assuming PL value as DL power value from NW minus DL L1-RSRP reporting value. And then via tx. power of SRS minus received SRS power at different RX nodes, NW can obtain the UL pathloss from UE to different RX nodes. Hence, the tx power of UL SRS may not need to be indicated by gNB. Of course it is also a possible option and we’re open to further discuss it.**

### 2 – NTT DOCOMO INC.

**@Samsung**

Thanks for the response.

- (p5) Which CB did you consider for SB precoding, is it R15 UL CB, or R15 DL T1 CB?

**=>We used R15 UL CB in our evaluation for both SB precoding and WB precoding.**

- (p7): For dense uplink deployments with multiple UL reception points and single DL transmission point, are you also considering DL transmissions from the UL reception points (e.g. for reference signals). If not, then is it so that in these deployments only the SRS can be used as source RS for spatial relation?

**=>Our assumption is that Rx points do not transmit any data/RS. We assume only SRS can be spatial relation source RS in the scenario.**

### 3 – NTT DOCOMO INC.

**@Lenovo**

As a network operator, what is the most important deployment scenario and features for MIMO in R18 for DOCOMO?

**=> From our perspective, the most important scenario in Rel.18 is to enhance UL performance for usual (smartphone like) UEs. Proposals of 4 > rank or STxMP would impact UE complexity, so we are not sure how many smartphone like UEs can support it. On the other hand, we assume UL dense Rx deployment does not impact UE complexity compared to the two schemes, so we are most interested in this topic.**

### 4 – NTT DOCOMO INC.

**@ZTE**

Thank you so much for your reply. In general, we are open to further study the potential enhancement for UL dense network.

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Regarding UL power control, we still feel that some DL RS measurement may be needed, since the pure UL measurement of SRS may not be sufficient (e.g., periodicity of SRS much large than DL RS, and SRS also needs power control mechanism). In our initial thoughts, PL measurement based on multiple RSs can be considered.

-  
Then, we are fine with non-TA enhancement.

**=> For UL dense scenario, our most preferred scenario is that Rx points do not transmit any data/RS. In that scenario, Rx points do not require power amplifier, and operator does not need to care DL interference adjustment of Rx points. So, our assumption is that gNB estimates pathloss based on SRS measurements. But, we agree that how to determine the SRS tx power can be further discussed. If the scenario where Rx points transmitting RS only (but no data) has gain/benefit compared to conventional HetNet or scenario where Rx points transmitting nothing, we would be interested in it.**

**Also, thank you for your feedback for the TA.**

Regarding UL MIMO, our preference/discussion can be found in Page 7 8 of our companion contribution RWS-210479. Besides for STxMP and supporting more UL layers, multiple codeword enhancement for UL (also for no more than 4 DL layer) should be considered. Some field tests to prove the necessity of introducing multiple codewords for UL can be found in our contribution R1-2104596.

**=> For UL MIMO, we are also interested in your TEI proposal (2 CWs/MCSs for 2/4 layers). In STxMP, since power gap between UE-TRP#1 and UE-TRP#2 would be large, we also think 2 CWs/MCSs should be considered in STxMP scenario. Also, we assume at least 2 CWs/MCSs will be supported for more than 4 layers.**