[102-e][204] Maintenance_NR_eMIMO_NWM - Version 0.0.7
RAN4

3GPP TSG-RAN WG4 Meeting #102-e *R4-2207045*

e-Meeting, 21st Feb –3rd Mar 2022

Agenda item: 5.1.2.1

Source: Moderator (Samsung)

Title: Email discussion summary for [102-e][204] Maintenance_NR_eMIMO_NWM (https://nwm-trial.etsi.org/#/documents/7582) 2nd round summary final

Document for: Information

Introduction

Briefly introduce background, the scope of this email discussion (e.g. list of treated agenda items) and provide some guidelines for email discussion if necessary.

Rel-16 NR eMIMO WI (i.e., Enhancements on MIMO for NR) is a RAN1 leading WI with below major enhancement in RAN1 area, in which the following items are identified for having RAN4 RRM requirement impact, based on previous RAN4 discussion:

- Enhancements on multi-beam operation
    - DL/UL beam indication with reduced latency and overhead
    - Beam failure recovery for SCell
    - L1-SINR measurement

In RAN#96e meeting, main tasks within the RRM core work scope have completed. In the subsequent meetings, online discussion will focus on the eMIMO RRM performance requirement of the above aspects for Release-16. In RAN4#97e, agreements are reached and captured in the WF R4-2017375. In RAN4#98e, the remaining issues of Rel-16 eMIMO RRM part was discussed and the whole WI was completed then. In RAN4#99e meeting, some maintenance issues was discussed following the WF R4-2104068. In RAN4#100e, two remaining issues in WF R4-2108225 as well as some spec corrections was discussed. In RAN4#100e, WF R4-2115299 documents two outstanding issues that MRTD requirement and PL RS test case, of which the former one has been solved in RAN4#101e. And for this meeting (RAN4#102e), an outstanding issue in WF R4-2120264, i.e., PL RS test case, and other cat F CR, will be discussed.

List of candidate target of email discussion for 1st round and 2nd round

As the rapporteur company for Rel-16 MIMO enhancement WI, we would like to suggest the following candidate target of 1st and 2nd round email discussion:

- 1st round: Collect more views on all topics and to get progress as much as possible:
- 2nd round: Based on results from 1st round, reach the consensus and complete outstanding issues.

1 Topic #1: Core Requirement Maintenance

Main technical topic overview. The structure can be done based on sub-agenda basis.

1.1 Companies' contributions summary

Table 1:

T-doc number	Company	Proposals / Observations
R4-2205317	Huawei, HiSilicon	***Observation 1: When a SSB resource indicated as PL-RS is also configured for L1-RSRP measurements, UE needs to perform beam sweeping on the SSB resource for both PL-RS measurements and L1-RSRP measurements.*** ***Proposal 1: For PL-RS switching in FR2, the target PL-RS is always considered as unknown if the target PL-RS is SSB.***

1.2 Open issues summary

Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies' contributions.

1.2.1 Sub-topic 1-1

PL-RS switching

Open issues and candidate options before e-meeting:

Issue 1-1-1: SSB-based PL-RS switching in FR2

- Proposal: For PL-RS switching in FR2, the target PL-RS is always considered as unknown if the target PL-RS is SSB.

- Option 1: Support
- Option 2: Do not support

- Recommended WF
  - Based on companies' views in 1st round discussion.

Feedback Form 1:

1 – ZTE Corporation Don't think the CR is needed, especially it only suggests to add a note. Not technically essential.
2 – HiSilicon Technologies Co. Ltd We support option 1, otherwise SSB-based PL-RS switching delay requirements cannot be met in FR2. To ZTE: the current PL-RS switching delay requirements can be met only when UE does not perform Rx beam sweeping on this PL-RS. In FR2, when SSB configured as PL-RS is also used for L1-RSRP measurements, this SSB based PL-RS is considered to be known according to the known condition requirements. In FR2, Rx beam sweeping is always assumed for SSB based L1-RSRP measurements. So, UE could not meet both L1-RSRP measurements and PL-RS switching delay requirements. Hence, we suggest that SSB-based PL-RS is always considered as unknown in FR2, which allow longer switching delay for Rx beam sweeping.
3 – Apple GmbH We support option 1. Since we always include beam sweeping for SSB based measurement, we should also include that for PL-RS if its SSB based.
4 – BEIJING SAMSUNG TELECOM R&D We are not convinced by Huawei's analysis. In Huawei's paper, "Since R15, beam sweeping is always assumed for L1-RSRP measurements measured on SSB resource in FR2. Therefore, beam sweeping shall also be assumed for PL-RS measurements measured on SSB resource in FR2." But from our understanding, we think that "SSB as L1-RSRP RS" and "SSB as Pathloss RS" are totally different things. Thus the same assumption cannot be reused. Currently the known condition of PL-RS implies that if the RS is measured as L1 measurement RS before configured as PL-RS, the RS is known. Since it is known, no need to beam sweeping. Hence current known condition is logically consistent. To sum up, the logic is "PL-RS is measured before configure" -> "PL-RS is known" -> "need to beam sweep". So we do not think the proposal is valid.

1.3 Companies views' collection for 1st round

1.3.1 CRs/TPs comments collection

For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.

Table 2:

No.	CR/TP	Company	Comments
#1	R4-2204694	Samsung	Moderator: Correction on R16 L1-SINR spec to align with R17 version. No technical issue.
#2	R4-2204695	Samsung	Moderator: Correction on R17 L1-SINR spec to specify the clause number. No technical issue.
#3	R4-2205318	Huawei	Moderator: a company CR for Issue 1-1-1

Feedback Form 2:

1 – ZTE Corporation

R4-2205318: Don't think the CR is needed, especially it only suggests to add a note. Not technically essential.

2 – QUALCOMM JAPAN LLC.

R4-2205318: Not clear why this Note would be needed.

3 – HiSilicon Technologies Co. Ltd

To ZTE and QC:

The existing PL-RS switching delay requirements can be met only when UE does not perform Rx beam sweeping on this PL-RS. In FR2, Rx beam sweeping shall be always assumed for SSB based measurements. Hence, we suggest that SSB-based PL-RS is always considered as unknown in FR2, which allow longer switching delay for Rx beam sweeping.

4 – Apple GmbH

We agree with the changes in the CR.

5 – BEIJING SAMSUNG TELECOM R&D Same comments as Issue 1-1-1. need further feedback from proponents.

1.4 Summary for 1st round

1.4.1 Open issues

Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.

Issue 1-1-1: SSB-based PL-RS switching in FR2

Recommendations for 2nd round: *Continue discussion in the 2nd round*

1.5 Discussion on 2nd round (if applicable)

Issue 1-1-1: SSB-based PL-RS switching in FR2

- Proposal: For PL-RS switching in FR2, the target PL-RS is always considered as unknown if the target PL-RS is SSB.
    - Option 1: Support
    - Option 2: Do not support
- Recommended WF
    - Based on companies' views in 2nd round discussion.

Feedback Form 3: 2nd round Feedback to Issue 1-1-1

1 – HiSilicon Technologies Co. Ltd We support option 1. If the target PL-RS is SSB and this SSB is also used for L1-RSRP measurements, then the current PL-RS switching delay requirements can be applied. A longer PL-RS switching delay is expected.
2 – Apple GmbH We support option 1. All SSB based L1 measurements need to account for RX beam sweep and it should be the same for PL-RS. For SSB based PL-RS a longer delay is expected or we can add the delay based on Rx beam sweep factor.

Table 3:

No.	CR/TP	Company	Comments
#1	R4-2205318	Huawei	Moderator: a company CR for Issue 1-1-1

Feedback Form 4: 2nd round Feedback to CR R4-2205318

1 – BEIJING SAMSUNG TELECOM R&D

We do not prefer current changes.

Suggest revise the current Note as following:

Note: longer application time is expected if the pathloss reference signal is unknown or if in FR2 the pathloss reference signal is SSB on which UE is performing L1-RSRP measurement.

2 – ZTE Corporation

We still think that we don't need to add a note to the R16 spec at this stage when R17 is about to be completed. In our view only essential technical changes shall be made to previous versions of the spec.

3 – Nokia UK

The first sentence of the note already exists in the specification, what is

Note: longer application time is expected if the pathloss reference signal is unknown.

Can the proponent explain what does the following mean: "if in FR2 the path loss reference signal is SSB on which UE is performing L1-RSRP measurement"?

4 – Apple GmbH

We support to update the requirements when PL-RS is SSB as it should account for Rx beam sweep factor.

The 2nd note can be modified as:

Note: longer application time is expected if the pathloss reference signal is unknown or in FR2 if the target PL-RS is SSB.

5 – BEIJING SAMSUNG TELECOM R&D

To Nokia:

As Huawei proposed, if in FR2 the SSB is also used for L1-RSRP measurement, following RAN4 assumption, UE have to sweep its Rx beam for each SSB occasion. In that case, PL-RS switching could not complete according to current requirement (measuring 5 samples).

To Apple:

We prefer to keep ”SSB on which UE is also performing L1-RSRP measurement.”, or some similar wordings. This could explicitly show the reason why this note is added.

6 – Nokia UK

Thanks for the clarification from Samsung. The proposed text for the note doesn’t reflect your explanation. Thus, the wording needs to be improved.

2 Topic #2: Performance Requirement Maintenance

Main technical topic overview. The structure can be done based on sub-agenda basis.

2.1 Companies’ contributions summary

Table 4:

Tdoc Number	Company	Proposals / Observations
R4-2203573	Anritsu Corporation	***Observation 1: As factors for PHR measurement accuracy requirement, RSRP accuracy and output level uncertainty of the test equipment should be taken into consideration.*** ***Proposal 1: Utilize the existing RSRP accuracy requirement and output level uncertainty of the test equipment for the alternative of the PHR measurement accuracy requirement.*** ***Proposal 2: To secure the PHR is triggered by PL-RS switching in the test case, the threshold of PL-RS difference should be at least 5 dB, derived based on the relative SS-RSRP requirement and AWGN absolute power MU.*** ***Proposal 3: The difference of Tx power level between SSBs is set as 10 dB.***

R4-2205411	ZTE Corporation	**Observation 1:** With the suggested test method proposed in our campaign CR [6], calculated pathloss changes before and after PL RS switching to trigger PHR and no conditions of triggering PHR are meet other than calculated PL changing. **Proposal 1: Test cases for MAC-CE based pathloss RS activation delay shall be defined in TS 38.133..** **Observation 2:** L3 filtering can be disabled by setting the Filter coefficient to 0 and it's common in RRM test cases to do so. **Proposal 2: Disable L3 filtering in the test by configuring the Filter coefficient to 0.** **Proposal 3: Agree on the campaign CR [6].** **Proposal 4: Define test cases for both FR1 and FR2.**

2.2 Open issues summary

Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies' contributions.

2.2.1 Sub-topic 2-1

Define Test case for Pathloss RS Switching

Open issues and candidate options before e-meeting:

Issue 2-1-1: PHR measurement accuracy

- Proposals: Utilize the existing RSRP accuracy requirement and output level uncertainty of the test equipment for the alternative of the PHR measurement accuracy requirement.
    - Option 1: Support
    - Option 2: Do not support
- Recommended WF

- Based on the 1st round discussion.

Feedback Form 5:

1 – ZTE Corporation

Support. Suggest to check the CR R4-2205412 directly since the CR was prepared according to these proposals.

2 – QUALCOMM JAPAN LLC.

What is the overall uncertainty that would be introduced for such a test? this test will be complicated and the level of uncertainty will be so high that the test itself will be pointless. We do not think such a test is meaningful

3 – ZTE Corporation

To QC: Thanks for the comments. In our view the test is not complicated as we already give the test configurations and setup in the draft CR, and we think it is totally feasible (especially after checking and confirming with TE vendors). Why is the test not meaningful? We have a core requirement and it is very natrual to introduce corresponding test cases.

4 – HiSilicon Technologies Co. Ltd

In RAN4#100-e meeting, except RSRP accuracy related issues, there also have other issues which need to be solved.

5 – Apple GmbH

We are repeating our concerns and comments for a few meetings now. We are introducing the test case just for the purpose of introducing the test case, without a complete and sound setup. We dont have PHR accuracy requirements and they are not part of the requirement, so we can create a setup where there is no PL-RS (SSB) transmission and the test will still pass. We always have accuracy and delay requirements tested together, but in this case accuracy cannot be verified.

6 – BEIJING SAMSUNG TELECOM R&D

Let us continue discussion the test case in 2nd round as more inputs are need. But we may have to make conclusion in this meeting regarding whether the test case will be defined.

7 – ZTE Corporation

To Apple:

Don't fully understand your comments " so we can create a setup where there is no PL-RS (SSB) transmission and the test will still pass."

If you check the CR we prepared, there are SSB transmissions configured:

Prior to the start of the time duration T1,

- UE is connected to Cell 1 on radio channel 1.
- UE shall be fully synchronized to SSB #0.

During T1,

- UE is configured with a *phr-ProhibitTimer* timer value for Cell 1.
- UE is configured with a *phr-Tx-PowerFactorChange* value for Cell 1.
- The UE shall track SSB #1 so that SSB #1 as a pathloss reference signal is known to the UE.

Issue 2-1-2: The threshold of PL-RS difference

- Proposals: To secure the PHR is triggered by PL-RS switching in the test case, the threshold of PL-RS difference should be at least 5 dB (RSRP accuracy + output level uncertainty), derived based on the relative SS-RSRP requirement and AWGN absolute power MU.
  - Option 1: Support
  - Option 2: Do not support
- Recommended WF
  - Based on the 1st round discussion.

Feedback Form 6:

1 – ZTE Corporation

Support. Suggest to check the CR R4-2205412 directly since the CR was prepared according to these proposals.

Issue 2-1-3: The difference of levels of Tx power between two SSBs

- Proposals: The difference of Tx power level between SSBs is set as 10 dB.
  - Option 1: Support
  - Option 2: Do not support
- Recommended WF
  - Based on the 1st round discussion.

Feedback Form 7:

1 – ZTE Corporation

Support. Suggest to check the CR R4-2205412 directly since the CR was prepared according to these proposals.

2.3 Companies views' collection for 1st round

2.3.1 CRs/TPs comments collection

Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.

Table 5:

No.	CR/TP	Company	Note
#1	R4-2205412	ZTE Corporation, Anritsu Corporation	Moderator: dCR for Pathloss RS activation Test case.
#2	R4-2205320	Huawei	Moderator: Corrections on details in BFR and L1-SINR test cases.

Feedback Form 8:

1 – HiSilicon Technologies Co. Ltd

For R4-2205412, only the test setup should be described in clause A.6.5.x.1.1. The expected UE behavior should be captured in clause A.6.5.x.1.2, not in clause A.6.5.x.1.1. For this CR, PL-RS is configured as SSB. The wording "the target pathloss reference signal which would be SSB or NZP CSI-RS" is not proper and needs to be revised. Beside, the exact value for the expected delay should be calculated and provided in the test.

2 – Apple GmbH

We dont agree to introduce performance requirements.

3 – BEIJING SAMSUNG TELECOM R&D

Let us continue discussing the test case in 2nd round as more inputs are need, especially for TE vendors.

But we may have to make conclusion in this meeting regarding whether the test case will be defined.

4 – ZTE Corporation

To Huawei comment:

The first 2 suggestions can be captured in the revised dCR (we're still waiting for a TDoc number)

The comment "Beside, the exact value for the expected delay should be calculated and provided in the test." I think we already have that, please check "The UE shall be able to apply the target pathloss reference signal

of the serving cell on which pathloss reference signal switch occurs no later than the slot...”

2.4 Summary for 1st round

2.4.1 Open issues

Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.

Issue 2-1-1: PHR measurement accuracy

Recommendations for 2nd round: *Continue collecting views from companies in the 2nd round.*

Issue 2-1-2: The threshold of PL-RS difference

Recommendations for 2nd round:*Continue collecting views from companies in the 2nd round.*

Issue 2-1-3: The difference of levels of Tx power between two SSBs

Recommendations for 2nd round:*Continue collecting views from companies in the 2nd round.*

2.5 Discussion on 2nd round (if applicable)

Issue 2-1-1: Whether to define the test case

- Option 1: Support
- Option 2: Do not support

- Recommended WF
  - Based on the 2nd round discussion on the CR.
  - Companies please share your concerns if go with option 2.

Feedback Form 9: 2nd round Feedback to Issue 2-1-1

1 – ZTE Corporation Option 1, natural to introduce TC corresponding to Core requirements and ensure correct UE behaviors.
2 – China Mobile Com. Corporation In our view, if the technical issues are resolved, it is preferred to define the test case. Considering TE

vendor confirms that it is feasible to test it, we support Opion 1 to define the test case.

3 – Anritsu Corporation

Support option 1 and we would like to respond to some comments during the 1st round discussion.

As for the uncertainty of this test case, I partially agree that we need to take into account of the relatively large uncertainties as the test parameter to ensure that the UE sends the PHR correctly.

However, it is the condition to trigger the PHR and not the uncertainty to measure the UL power.

So we assume what we need to care as the measurement uncertainty is whether the PHR can be demodulated and also if there is any uncertainty to measure the delay so strictly.

Though the test procedures are different from other TCs, considering the similarity with the existing test cases such as beam failure detection or TCI state switching delay, we suppose that this test will have a similar measurement uncertainty and thus we assume it is testable.

As for the indication that PHR accuracy requirement does not exist, we are fine to define the associated requirement as ZTE already replied at the previous meeting. But as we show the comparison in our discussion paper (R4-2203573), both PHR report and PUSCH contain very similar equation factors, we suppose the existing RSRP accuracy requirement can compensate for the lack of the PHR accuracy requirement.

And it is appreciated if companies could indicate issues specifically which still exist to achieve the test.

4 – Apple GmbH

Our main concern is on the lack of PHR accuracy requirement. Since we dont have PHR accuracy, we have a large SNR change to ensure L1-RSRP change triggering a PHR. Do we verify any L1-RRP report based on SSB change?

Also, based on the current SNR levels, the SNR of SSB1 after PL-RS switch is very low, we don't guarantee L1-RSRP measurement accuracy at such low SNR.

If testcase for FR2 is considered, the PL-RS switch requirements when PL-RS is SSB is discussed in **Issue 1-1-1: SSB-based PL-RS switching in FR2** so the test should also consider that if any change is introduced.

5 – BEIJING SAMSUNG TELECOM R&D

To Apple:

In our understanding, in FR2, if the PL-RS SSB is also configured as RS for L1-RSRP measurement, then the longer delay is expected.

But in the test case, the PL-RS is known and only configured for measuring PL-RS, so the current requirement still works and it has no impact.

Table 6:

No.	CR/TP	Company	Note
#1	R4-2205412	ZTE Corporation	Moderator: dCR for Pathloss RS activation Test case.

Feedback Form 10: 2nd round Feedback to the CR R4-2205412

1 – ZTE Corporation We have shared a revision accomodating companies suggestions. It is shared in ftp.
2 – Apple GmbH Since we dont have PHR accuracy requirements, should we at least introduce L1-RSRP accuracy requirement as part of the test? Also, based on the current SNR levels, the SNR of SSB1 after PL-RS switch is very low, we don't guarantee L1-RSRP measurement accuracy at such low SNR.
3 – Apple GmbH We think L1-RSRP reports should be enabled to SSB0 and SSB1 at least to ensure known state. According to known condition, it should have sent L1-RSRP report before MAC CE. So they can both be configured at the beginning of the test.
4 – BEIJING SAMSUNG TELECOM R&D Based on our comments in previous meeting, in the test case, some test procedures need to be added. For example: During the time T1, UE needs to report a PHR report. This is because for triggering PHR report in T2 (for determining the difference), the pathloss will be compared with the pathloss of the last time PHR Report. During the time T2, Uplink grant is needed right after the RS switching signaling for the PHR reporting. PHR will be reported after UL grant is received by UE.

3 Recommendations for Tdocs

3.1 1st round

New tdocs

Table 7:

Title	Source	Comments
WF on eMIMO RRM Maintenance	Samsung	Capture agreements and WF during the meeting

Existing tdocs

Table 8:

Tdoc number	Title	Source	Recommendation	Comments
R4-2204694	Draft CR to TS38.133 Corrections on L1-SINR requirement (Rel-16)	Samsung	Agreeable	
R4-2204695	Draft CR to TS38.133 Corrections on L1-SINR requirement (Rel-17)	Samsung	Agreeable	
R4-2205318	DraftCR on maintaining PL-RS switching delay requirements R16	Huawei	Return to	Continue discussion in 2nd round
R4-2205412	[dCR] Test cases for applicable timing for PL RS activated by MAC-CE	ZTE	Return to	More views are needed from companies in 2nd round.
R4-2205320	DraftCR on correction to L1-SINR and SCell BFR tests R16	Huawei	Agreeable	

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   a) CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   b) Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

3.2 2nd round

Table 9:

Tdoc number	Title	Source	Recommendation	Comments
R4-2207089	DraftCR on maintaining PL-RS switching delay requirements R16	Huawei	Can be endorsed	No further tech concern so it can be endorsed.
R4-2207086	[dCR] Test cases for applicable timing for PL RS activated by MAC-CE	ZTE Corporation, Anritsu Corporation	Agreeable after revised	Sourcing companies asked a new Tdoc number to revise the R4-2207086. Then it is agreeable.
R4-2206820	WF on eMIMO RRM Maintenance	Samsung	Agreeable after revised	Since ZTE's CR is changed, then the WF may need some revision on FFS items. Then it is agreeable.

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   a) CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   b) Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents