

**[102-e][332] NR\_SL\_enh\_Demod\_NWM - Version 0.0.5**  
**RAN4**

**R4-2207444**

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

**Electronic Meeting, 21 February – 03 March 2022**

**Agenda item:** 10.15.7

**Source:** Moderator (LG Electronics)

**Title:** Email discussion summary for [102-e][332] NR\_SL\_enh\_Demod\_NWM

**Document for:** Information

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## 1 Introduction

This email discussion is for NR SL enhancement demodulation and CSI performance in Rel-17 in Agenda 10.15.7. In this meeting, we focus the work plan and work scope for Rel-17 NR SL enhancement WI, and depending on the conclusion of the work scope discussion, the work plan would be revised in this meeting.

List of email discussion for 1<sup>st</sup> round is as follows:

- 1<sup>st</sup> round:

- Topic#1: Work plan
- Topic#2: Work scope

- 2<sup>nd</sup> round:

- Work scope
  - Test case for 256QAM demodulation
  - Test case for CSI reporting

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## 2 Topic#1: Work Plan

*This section will treat work plan for NR SL enhancement demodulation and CSI performance in Rel-17. For information, official deadline for Rel-17 demodulation part is September 2022.*

### 2.1 Companies' contributions summary

**Table 1: Companies' contributions summary**

T-doc number	Company	Proposals / Observations
R4-2204317	LG Electronics	Proposal 1: Approve the proposed work plan for Rel-17 NR sidelink demodulation to complete performance requirements in the Rel-17 timeline

## 2.2 Open issues summary

### 2.2.1 sub-topic 1-1

*Work plan is discussed in this sub-topic.*

#### **Issue 1-1: Work plan**

- Proposals:

**Table 2: Proposed work plan for NR SL enhancement demodulation**

RAN4 meeting	Work plan
RAN4#102-e	<ul style="list-style-type: none"> <li>- Discuss work scope and identify the list of performance test cases</li> </ul>
RAN4#103-e	<ul style="list-style-type: none"> <li>- Discuss and decide initial simulation assumptions based on identified test cases</li> <li>- Do work split for test cases to prepare draft CRs for upcoming meetings</li> </ul>
RAN4#104	<ul style="list-style-type: none"> <li>- Collect simulation results</li> <li>- Finalize performance requirements based on collected simulation results</li> <li>- Submit draft CRs and approve Big CR based on the draft CRs</li> <li>- Complete V2X demodulation performance requirements</li> </ul>

**Feedback Form 1: 1st round comment collection for proposed work plan**

**1 – LG Electronics Inc.**

It is general work plan for demod part, so it would be fine. After discussion of work scope, final decision could be made.

2.3 Summary for 1st round

2.3.1 Open issues

**Issue 1-1: Work plan**

- *Tentative agreements*: Final decision would be made after conclusion of work scope.
- *Candidate options*: N/A
- *Recommendation for 2nd round*: N/A

2.4 Discussion on 2nd round (if applicable)

2.5 Summary for 2nd round

Based on the discussion of work scope, the work plan is updated as follow:

**Table 3: Work plan for NR SL enhancement demodulation**

RAN4 meeting	Work plan
RAN4#102-e	<ul style="list-style-type: none"><li>- Discuss work plan and work scope of performance test cases</li></ul>
RAN4#103-e	<ul style="list-style-type: none"><li>- Discuss whether to introduce test cases for 256QAM demodulation and CSI reporting</li><li>- Discuss initial simulation assumptions if test cases are identified</li></ul>

RAN4#104	<ul style="list-style-type: none"> <li>- For identified test cases, <ul style="list-style-type: none"> <li>○ collect simulation results</li> <li>○ finalize performance requirements based on collected simulation results</li> <li>○ submit draft CRs and approve Big CR based on the draft CRs</li> </ul> </li> <li>- Complete NR SL enhancement demodulation performance requirements</li> </ul>
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### 3 Topic#2: Work Scope

*This section will discuss the work scope of demodulation and CSI performance.*

#### 3.1 Companies' contributions summary

**Table 4: Companies' contributions summary**

T-doc number	Company	Proposals / Observations
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R4-2204317	LG Electronics	<p>Proposal 2: RAN4 to decide whether to define a separate test case for SL DRX configuration</p> <ul style="list-style-type: none"> <li>- Option 1: Define one test case with SL DRX configuration based on existed single link PSSCH demodulation test, and reuse the performance requirement for the single link PSSCH test.</li> <li>- Option 2: Do not define a separate test case for SL DRX configuration</li> </ul> <p>Proposal 3: Introduce CSI reporting performance requirements which are the mandatory feature for UEs to support NR sidelink.</p> <p>Proposal 4: Introduce demodulation performance test cases for 256QAM and rank 2</p> <p>Proposal 5: RAN4 to decide whether to define the following demodulation performance requirements:</p> <ul style="list-style-type: none"> <li>- 5-1: Demodulation performance for con-current operation</li> <li>- 5-2: Demodulation performance based on gNB based sync source</li> </ul>
R4-2205801	Huawei,HiSilicon	<p>Proposal 1: Not define demodulation and CSI requirements for Rel-17 sidelink.</p>

### 3.2 Open issues summary

*Companies are encouraged to provide views on which test cases should be defined or not.*

#### 3.2.1 Sub-topic 2-1: Demodulation and CSI performance test - new feature in Rel-17

*This sub-topic is for discussion on demodulation and CSI performance which are introduced in Rel-17 NR SL enhancement.*

#### **Issue 2-1: Test case for demodulation and CSI performance in Rel-17**

- Proposals
  - Option 1: Define one test case with SL DRX configuration based on existed single link PSSCH demodulation test, and reuse the performance requirement for the single link PSSCH test.
  - Option 2: Do not define demodulation and CSI requirements for Rel-17 SL
- Recommended WF
  - Need further discussion

**Feedback Form 2: 1st round comment collection for test case for demodulation and CSI performance in Rel-17**

<p><b>1 – Qualcomm Incorporated</b></p> <p>We support option 2. DRx doesn't affect demod performance, and we don't see obvious motivation to include CSI requirement from R17 perspective.</p>
<p><b>2 – LG Electronics Inc.</b></p> <p>It is true that SL DRX doesn't affect the demod performance. But we can simply check demod performance with SL DRX configuration using existing one of single link PSSCH test cases. it would be no additional work and just define test case with the same requirement with the single link PSSCH test.</p> <p>For CSI in Rel-17, no work would be expected.</p>
<p><b>3 – HiSilicon Technologies Co. Ltd</b></p> <p>We support option 2. Same views with Qualcomm</p>
<p><b>4 – Intel Corporation SAS</b></p> <p>Support Option 2. We don't see the strong need to verify the SL performance with DRX</p>

3.2.2 Sub-topic 2-2: Demodulation and CSI performance test - leftover issues in Rel-16

*This sub-topic is for discussion on demodulation and CSI performances which are leftover in Rel-16 based on agreed WFs (R4-2012758, R4-2103819, and R4-2103990).*

**Issue 2-2: Test case for 256QAM demodulation**

- Proposals
  - Option 1: Introduce demodulation performance test case for 256QAM
  - Option 2: Do not introduce demodulation performance test case for 256QAM
- Recommended WF
  - Need further discussion

**Feedback Form 3: 1st round comment collection for test case  
for 256QAM demodulation**

**1 – Qualcomm Incorporated**

We are open to discuss option 1 if we use identical test configuration as R16 PSSCH requirement and MCS 20 (lowest MCS for 256QAM), which has already been discussed in R16 and is a simple extension from R16 requirement.

Since R17 specification enables more use cases, adding 256QAM requirement might be reasonable.

**2 – LG Electronics Inc.**

We support option 1. As commented by Qualcomm, test configurations have already discussed in Rel-16, and using applicability rule, the 64QAM test could be replaced by the 256QAM if UE supports 256QAM.

**3 – HiSilicon Technologies Co. Ltd**

Option 2. 256QAM is optional in Rel-16 and we don't see the motivation to introduce it in Rel-17

**4 – Intel Corporation SAS**

Option 1 is fine for us to increase the SL test coverage.

**Issue 2-3: Test case for rank 2 demodulation**

- Proposals

- Option 1: Introduce demodulation performance test case for rank 2
- Option 2: Do not introduce demodulation performance test case for rank 2

- Recommended WF

- Need further discussion

**Feedback Form 4: 1st round comment collection for test case  
for rank 2 demodulation**

**1 – Qualcomm Incorporated**

Option 2.

**2 – LG Electronics Inc.**

We prefer option 1. Supporting rank 2 is new feature to improve the performance in NR SL. Even this is optional feature, the test case should be introduced for UE to support this feature.

**3 – HiSilicon Technologies Co. Ltd**

Option 2. Supporting option 2 is optional feature and was introduced in Rel-16. We don't see a motivation to verify it in Rel-17

**4 – Intel Corporation SAS**

Both options are fine for us. As for Option 1, probably we first need to double check whether it is really widely used for SL operation. Rank 2 is usually used to increase the data rate, which probably is not the main target for SL operation.

**Issue 2-4: Test case for con-current operation scenario (WAN+SL)**

- Proposals
  - o Option 1: Introduce demodulation performance test case for con-current operation scenario
  - o Option 2: Do not introduce demodulation performance test case for con-current operation scenario
- Recommended WF
  - o Need further discussion

**Feedback Form 5: 1st round comment collection for test case for con-current operation scenario**

<p><b>1 – Qualcomm Incorporated</b></p> <p>Option 2</p>
<p><b>2 – LG Electronics Inc.</b></p> <p>prefer option 2.</p>
<p><b>3 – HiSilicon Technologies Co. Ltd</b></p> <p>Option 2</p>
<p><b>4 – Intel Corporation SAS</b></p> <p>Both options are fine for us. In LTE the SDR requirements were defined to verify the correct operation in such scenario. Taking into account low interest from other companies, Option 2 is fine for us.</p>

**Issue 2-5: Test case for gNB based sync source**

- Proposals
  - o Option 1: Introduce demodulation performance test case for gNB based sync source
  - o Option 2: Do not introduce demodulation performance test case for gNB based sync source
- Recommended WF
  - o Need further discussion

**Feedback Form 6: 1st round comment collection for test case  
for gNB based sync source**

<b>1 – Qualcomm Incorporated</b> Option 2
<b>2 – LG Electronics Inc.</b> prefer option 2.
<b>3 – HiSilicon Technologies Co. Ltd</b> Option 2.
<b>4 – Intel Corporation SAS</b>  This scenario was proposed by us for Rel-16 requirements to ensure correct SL operation for scenarios with higher Time and Frequency offsets in comparison to GNSS based sync source. In case all interested companies assume that current requirements can guaranty the proper SL performance for scenario with gNB based sync source, we are fine to go with Option 2.

**Issue 2-6: Test case for CSI reporting**

- Proposals
  - Option 1: Introduce CSI reporting performance test cases which are the mandatory feature for UEs to support NR sidelink
  - Option 2: Do not introduce CSI reporting performance test cases
- Recommended WF
  - Need further discussion

**Feedback Form 7: 1st round comment collection for test case  
for CSI reporting**

<b>1 – Qualcomm Incorporated</b> Option 2
<b>2 – LG Electronics Inc.</b>  We support option 1. CSI reporting is mandatory feature if UE support NR sidelink. So, the test cases for CSI reporting should be defined.
<b>3 – HiSilicon Technologies Co. Ltd</b> Option 2

#### **4 – Intel Corporation SAS**

Prefer Option 2, but we are open to further discuss the scenarios and test design to understand whether it is really beneficial to verify such feature.

@LGE: In case it is mandatory and very important feature, we are wonder why it was deprioritized in Rel-16.

### 3.3 Summary for 1st round

#### 3.3.1 Open issues

#### 3.3.2 Sub-topic 2-1: Demodulation and CSI performance test - new feature in Rel-17

##### **Issue 2-1: Test case for demodulation and CSI performance in Rel-17**

- ***Tentative agreements:*** Do not define test cases for demodulation and CSI performance based on new feature introduced in Rel-17. (based on majority views)
- ***Candidate options:*** N/A
- ***Recommendation for 2nd round:*** N/A

#### 3.3.3 Sub-topic 2-2: Demodulation and CSI performance test - leftover issues in Rel-16

##### **Issue 2-2: Test case for 256QAM demodulation**

- ***Tentative agreements:*** Three companies support option 1, and one company support option 2. Majority views are option 1, but further check is needed.
- ***Candidate options:***
  - Option 1: Introduce demodulation performance test case for 256QAM
  - Option 2: Do not introduce demodulation performance test case for 256QAM
- ***Recommendation for 2nd round:***Please companies confirm if option 1 is agreeable. (This is leftover issue from Rel-16 based on agreed WF R4-2103990.)

##### **Issue 2-3: Test case for rank 2 demodulation**

- ***Tentative agreements:*** Do not define test case for rank 2 demodulation. (based on majority views)
- ***Candidate options:*** N/A
- ***Recommendation for 2nd round:***N/A

##### **Issue 2-4: Test case for con-current operation scenario (WAN+SL)**

- **Tentative agreements:** Do not define test case for con-current operation scenario.
- **Candidate options:** N/A
- **Recommendation for 2nd round:**N/A

**Issue 2-5: Test case for gNB based sync source**

- **Tentative agreements:** Do not define test case for gNB based sync source
- **Candidate options:** N/A
- **Recommendation for 2nd round:**N/A

**Issue 2-6: Test case for CSI reporting**

- **Tentative agreements:** Two companies support option 2, one company suggest further discussion, and one company support option 1. So, further discussion is needed.
- **Candidate options:**
  - Option 1: Introduce CSI reporting performance test cases which are the mandatory feature for UEs to support NR sidelink
  - Option 2: Do not introduce CSI reporting performance test cases
- **Recommendation for 2nd round:**Please provide reasons for supporting each option in terms of test scenario, test design, etc. (This is leftover issue from Rel-16 based on agreed WF R4-2012758.)

3.4 Discussion on 2nd round (if applicable)

3.4.1 Demodulation and CSI performance test - leftover issues in Rel-16

**Issue 2-2: Test case for 256QAM demodulation**

- Proposals:
  - Option 1: Introduce demodulation performance test case for 256QAM
  - Option 2: Do not introduce demodulation performance test case for 256QAM
- Recommended WF:
  - Introduce demodulation performance test case for 256QAM

**Feedback Form 8: 2nd round comment collection for test case for 256QAM demodulation**

**1 – Qualcomm Incorporated**

As we commented in the previous round, we can accept option 1 if the configuration is identical to low speed PSSCH test in R16 except MCS set to 20 (lowest 256QAM).

**2 – HiSilicon Technologies Co. Ltd**

Option 2. 256QAM is optional for sidelink UE and the SNR is quite high which may be hard to achieved. We don't see the motivation to introduce one Rel-16 optional feature in Rel-17

**3 – LG Electronics Inc.**

We have the same view with QC. it is useful for advanced V2X services, especially unicast scenario where high SNR could be observed. This issue was triggered in Rel-16, and RAN4 agreed to discuss and define corresponding requirements in Rel-17 timeframe.

**Issue 2-6: Test case for CSI reporting**

- Proposals:

- Option 1: Introduce CSI reporting performance test cases which are the mandatory feature for UEs to support NR sidelink
- Option 2: Do not introduce CSI reporting performance test cases

- Recommended WF:

- Need further discussion. Please provide reasons for supporting each option in terms of test scenario, test design, etc.

**Feedback Form 9: 2nd round comment collection for test case for CSI reporting****1 – Qualcomm Incorporated**

Option 2, CSI reporting test is not as straightforward as 256QAM test, which is a simple extension of R16 test. We don't agree to take such a large work load to define a test in R17 for R16 scope.

**2 – HiSilicon Technologies Co. Ltd**

Option 2. Same views with Qualcomm

**3 – LG Electronics Inc.**

As mentioned in 1st round, CSI reporting is the mandatory feature for V2X. In our understanding, RAN4 had agreed to focus on demodulation works in Rel-16, so CSI reporting test was postponed/deprioritized. Maybe we need some discussion for test design considering aperiodic CSI and feedback delay, and only CQI test could be introduced.

## 3.5 Summary for 2nd round

### Issue 2-2: Test case for 256QAM demodulation

- **Tentative agreements:** Whether to introduce the demodulation performance test case for 256QAM will be discussed in the next meeting.

### Issue 2-6: Test case for CSI reporting

- **Tentative agreements:** Whether to introduce CSI reporting performance test case will be discussed in the next meeting.

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## 4 Recommendations for Tdocs

### 4.1 1st round

#### New tdocs

**Table 5: New tdocs**

Title	Source	Comments
WF on SL enhancement demodulation	LG Electronics	All agreements will be captured in this WF.

#### Existing tdocs

**Table 6: Existing tdoc**

Tdoc number	Title	Source	Recommendation	Comments
R4-2204317	Work plan and scope for NR sidelink enhancement demodulation performance	LG Electronics	Noted	
R4-2205801	Discussions on Rel-17 sidelink UE requirements	Huawei,HiSilicon	Noted	

4.2 2nd round

**Table 7: Recommendation of 2nd round tdoc**

Tdoc number	Title	Source	Recommendation	Comments
<b>R4-2207224</b>	WF on SL enhancement demodulation	LG Electronics	Agreeable	

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**5 Annex**

Please add your contact information in the feedback form below as following:

- **Company, Name, Email address**

**Feedback Form 10: Contact Information**

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