**3GPP TSG-RAN WG4 Meeting #94-e R4-200xxxx**

**Electronic Meeting, Feb.24th – Mar.6th 2020**

**Agenda item:** 8.12.1

**Source:** Moderator (China Telecom)

**Title:** Email discussion summary for RAN4#94e\_#17\_NR\_DL256QAM\_FR2

**Document for:** Information

# Introduction

In the last RAN4 #93 meeting, the following agreements were reached in the chairman’s meeting report.

* *Agreement:*
	+ *In 256QAM WI, BS Tx EVM will be defined as core requirements*
	+ *Whether to introduce the UE maximum input level as core requirements will be further discussed.*
	+ *In 256QAM WI, UE demod performance requirements and testability will be discussed in the performance part of this WI.*
* *Agreement:*
	+ *BS TX EVM core requiremetns for DL 256QAM FR2 is agreed as 3.5%*

Based on the above agreements and companies’ contributions submitted in this e-meeting, this email discussion will focus on the following topics

* Draft TR
* BS requirements including core and conformance requirements
* UE core requirements

# Topic #1 Draft TR

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Abstracts / Proposals / Observations** |
| [R4-2000909](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000909.zip) | China Telecom | Update TR to implement TPs approved in last meeting. |

## Open issues summary

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

### Sub-topic 1-1: Draft TR

* Recommended draft TR: R4-2000909

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [R4-2000909](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000909.zip) |  |
|  |
|  |

## Summary for 1st round

### 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.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic 1-1** | No concern on the draft TR |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2000909 | The draft TR is recommend as approved |

## Discussion on 2nd round (if applicable)

Topic #1 is concluded on 1st round, no need discuss on 2nd round.

## Summary on 2nd round (if applicable)

Topic #1 is concluded on 1st round, no need discuss on 2nd round.

# Topic #2: BS requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Abstracts / Proposals / Observations** |
| [R4-2000910](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000910.zip) | China Telecom | Abstract: This TP is intended to capture the BS core requirement for FR2 DL 256QAM |
| [R4-2001189](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001189.zip) | NTT DOCOMO, INC. | Proposal: Adopt BS TX EVM test requirements for FR2 DL 256QAM as 4.5% |
| [R4-2001426](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001426.zip) | Nokia, Nokia Shanghai Bell, China Telecom, Verizon, NTT Docomo, T-Mobile | Abstract: FR2 DL 256QAM requirements are introduced to the technical specification |
| [R4-2001427](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001427.zip) | Nokia, Nokia Shanghai Bell, China Telecom, Verizon, NTT Docomo, T-Mobile | Abstract: FR2 DL 256QAM requirements are introduced to the conformance specification |
| [R4-2001729](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001729.zip) | Ericsson | Abstract: Add minimum EVM requirement for BS type 2-O carrier |
| [R4-2002103](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2002103.zip) | Ericsson | Abstract: Add conformance requirement for BS type 2-O carrier |

## Open issues summary

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

### Sub-topic 2-1: BS EVM core requirement CR

This sub-topic will discuss the CRs/TP for BS EVM core requirement. Given we have two CRs overlapping, both the CRs are listed below. Companies can discuss on how to select or merge the CRs.

**Issue 2-1-1: BS EVM core requirement CR/TP**

* Recommended CR: R4-2001426/[R4-2001729](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001729.zip)
* Recommended TP: R4-2000910

### Sub-topic 2-2: BS conformance requirement

This sub-topic will discuss the BS conformance requirement.

The first issue 2-2-1 is BS TX EVM test requirement, for which we have seen differfent proposals from contributions.

The second issue 2-2-2 is CR for BS conformance requirement. Given we have two CRs overlapping, both the CRs are listed below. Companies can discuss on how to select or merge the CRs, if we ccould achieve agreement on the recommended WF on the first issue and no other issues were raised.

**Issue 2-2-1: BS TX EVM test requirement**

* Proposal
	+ Define BS TX EVM test requirements as 4.5% ([R4-2001189](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001189.zip), R4-2001427)
	+ Define BS TX EVM test requirements as 3.5% ([R4-2002103](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2002103.zip))
* Recommended WF/Contribution
	+ Define BS TX EVM test requirements as 4.5% ([R4-2001189](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001189.zip))

**Issue 2-2-2: BS conformance requirement CR**

* Recommended CR: R4-2001427/[R4-2002103](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2002103.zip)

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Ericsson | Issue 2-1-1: It’s ok to merge the CR for core requirement. Issue 2-2-1: There is a type-o in the CR R4-2002103 should be 4.5% since this is conformance and TT need to be taken into account. However, guidance from chairman last meeting as we also submitted a conformance CR last meeting (R4-1914570) only when performance work starts; focus on the core requirements until April. In which case, all conformance CRs should be noted as anyhow these contributions are for discussion/information.Issue 2-2-2: CRs should be noted.….Others: |
| Nokia, Nokia Shanghai Bell | Issue 2-1-1: The coversheet is not correct in R4-2001729 and therefore R4-2001427 is preferred.Issue 2-2-1: We support the WF of defining 4.5% test requirement. Otherwise the test tolerance is not correctly addressed.Issue 2-2-2: R4-2002103 has not addressed declarations, test tolerance for EVM nor included 256QAM in total power dynamic range. Therefore, our preference is to move forward with R4-2001427 |
| Huawei | Issue 2-2-1:Test requirement should be 4.5%  |
| Ericsson | Issue 2-1-1: Should coversheet in R4-2001427 have starting date of the meeting? Since the technical content is exactly the same between the 2 contributions; we ask to be added as co-source on R4-2001427 since it’s the preferred version. Issue 2-2-1/2: Only core related requirements should be handled. All others noted. |
| China Telecom | Issue 2-2-1/2: The conformance test requirement shall be discussed when core requirement is stable, from this point, we prefer to move forward with the proposals/CRs submitted in this meeting.  |
| NTT DOCOMO | Issue 2-2-1/2: We should focus on completion of core requirements and corresponding CR in this meeting. For conformance requirements, there seems to be no other issues, but we would like to follow chairman’s guidance. |

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [R4-2000910](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000910.zip) | Company A |
| Company B |
|  |
| [R4-2001426](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001426.zip) | Company A |
| Company B |
|  |
| [R4-2001427](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001427.zip) | Company A |
| Company B |
|  |
| [R4-2001729](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001729.zip) | Company A |
| Company B |
|  |
| [R4-2002103](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2002103.zip) | Company A |
| Company B |
|  |

## Summary for 1st round

### 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.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic 2-1** | Tentative agreements: No concern on the CRs’ technical content. No concern on the TPRecommendation for 2nd round: The CR R4-2001426 is recommended to be revised to capture Ericsson’s comment |
| **Sub-topic 2-2** | Tentative agreements: No technical concern on the CR R4-2001427. No technical concern on the contribution [R4-2001189](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001189.zip)1st round views collection for conformance requirement in this meeting:* + Technically endorse the BS conformance CR since no technical concern
	+ Note all the conformance requirement related contributions

Recommendation for 2nd round:* + Continue discuss on the conformance requirement in this meeting.
 |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| [R4-2000910](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000910.zip) | The TP is recommended as approved |
| [R4-2001189](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001189.zip) | The contribution is recommended as return to |
| [R4-2001426](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001426.zip) | The CR is recommended as to be revised to capture Ericsson’s comment |
| [R4-2001427](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001427.zip) | The CR is recommended as return to  |
| [R4-2001729](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001729.zip) | The CR is recommended as noted |
| [R4-2002103](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2002103.zip) | The CR is recommended as return to |

## Discussion on 2nd round (if applicable)

### Open issues summary

Open issues for Topic #2 was captured in the WF, and will be handled in Topic #3, section 3.5

## Summary on 2nd round (if applicable)

# Topic #3: UE core requirements

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Abstracts / Proposals / Observations** |
| [R4-2000823](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000823.zip) | Huawei, HiSilicon | Proposal: UE maximum input level is not defined for 256QAM for Rel-16 WI. |
| [R4-2000911](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000911.zip) | China Telecom | Abstract: This TP is intended to capture the UE core requirement for FR2 DL 256QAM |
| [R4-2000954](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000954.zip) | Intel Corporation | Observation #1: Rel-15 Maximum Input Level requirements are defined only for QPSK modulation and definition of only 256QAM core requirements (without 64QAM) looks rather confused.Proposal 1: Introduce FR2 Maximum Input Level core requirements for 256QAM jointly with requirements for 64QAM. |
| [R4-2001190](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001190.zip) | NTT DOCOMO, INC. | Proposal: Introduce UE maximum input level core requirements for FR2 DL 256QAM. |
| [R4-2001425](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001425.zip) | Nokia, Nokia Shanghai Bell, China Telecom, Verizon, NTT Docomo, T-Mobile | Abstract: Introduction of UE requirements related to the feature of 256QAM DL transmission in FR2, i.e. maximum input power requirement and RMC for 256QAM. |

## Open issues summary

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

### Sub-topic 3-1: UE core requirements

This sub-topic will discuss the UE core requirements.

The first issue 3-1-1 is UE maximum input level, for which we have seen differfent proposals from contributions.

The second issue are CR and TP for UE core requirements. The CR and TP submitted are listed as recommendation in case we could achieve agreeement on recommended WF on the first issue and no other issues were raised.

**Issue 3-1-1: UE maximum input level**

* Proposal
	+ Will be introduced for 256QAM in Rel-16 WI.
	+ Will not be introduced for 256QAM in Rel-16 WI
	+ Will be introduced for 256QAM jointly with requirements for 64QAM in Rel-16 WI
* Recommended WF
	+ Will be introduced for 256QAM in Rel-16 WI

**Issue 3-1-2: UE core requirements CR/TP**

* Recommended CR: R4-2001425
* Recommended TP: [R4-2000911](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000911.zip)

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia, Nokia Shanghai Bell | Issue 3-1-1: We support the proposed WF. Issue 3-1-2: We support the proposed WF. |
| Huawei | Issue 3-1-1:We think it will be confused if only introduction of 256 QAM. Hence our preference is not introduced in Rel-16. |
| Intel | Issue 3-1-1: We think that definition of only 256QAM FR2 Maximum Input Level Requirements (i.e. without 64QAM) will be rather confusing in future, because LTE and NR FR1 requirements are defined for both modulations formats. Same time, we understand that definition of FR2 core requirements for 256QAM is beneficial. Therefore, we suggest to return 64QAM requirements, which were removed earlier, and then define 256QAM requirements.Issue 3-1-2: We suggest to discuss this issue once we reach agreement on Issue 3-1-1. |
| Qualcomm | Issue 3-1-1: For consistency of the standard, we would like to see joint introduction of max. input level requirements for 64QAM and 256QAM |
| China Telecom | Issue 3-1-1/2: We think the requirements for 64QAM and 256QAM shall be discussed decoupled, which means defining 256QAM requirement has no impact to 64QAM. In order not to make the spec confusing, the requirements for 64QAM could be supplemented in the next meeting. In this meeting, we prefer to move forward with the CR/TP to draw a technical conclusion at least. |
| NTT DOCOMO | Issue 3-1-1/2: We support recommended WF since there are no feasibility issues. In addition, the requirement for 256QAM can be discussed independently of the requirement for 64QAM. |
| Apple | Issue 3-1-1: RAN5 concludes “the minimum conformance requirements in this test case are not testable due to maximum input level unachievable in IFF OTA test setup. Other test setups have not been analysed. Thus the test case will not be tested as part of UE conformance testing” in 38.521-2. Additionally, DL 256QAM in FR2 is part of objectives of Rel-17 SI on FR2 test methodology enhancement, which includes the study of 256QAM related test methodology. Before RAN5 confirms the testing feasibility and RAN4 draws conclusion out of Rel-17 SI on FR2 test methodology enhancement, we think it is premature and also not urgent for RAN4 to introduce such requirements.  |

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [R4-2000911](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000911.zip) |  |
|  |
|  |
| [R4-2001425](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001425.zip) |  |
|  |
|  |

## Summary for 1st round

### 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.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic 3-1** | Candidate options collected in first round for UE maximum input level:* + Introduced for 256QAM in Rel-16 WI
	+ Introduce for 256QAM jointly with that for 64QAM in Rel-16 WI
	+ Not introduce for 256QAM in Rel-16 WI
	+ Decide by RAN5 test feasibility and RAN4 conclusion out of Rel-17 SI on FR2 test methodology enhancement

Recommendation for 2nd round: * + Assign a WF for the discussion for both BS and UE requirements
 |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on the requirements for FR2 DL 256QAM | China Telecom |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| [R4-2000823](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000823.zip) | The contribution is recommended as noted |
| [R4-2000911](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000911.zip) | The TP is recommended as return to |
| [R4-2000954](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2000954.zip) | The contribution is recommended as noted |
| [R4-2001190](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001190.zip) | The contribution is recommended as noted |
| [R4-2001425](file:///E%3A%5C01%203GPP%20Work%5C12%20DL256QAM%5CDocs%5C94_e%5CR4-2001425.zip) | The CR is recommended as return to |

## Discussion on 2nd round (if applicable)

### Open issues summary

The Open issues for Topic #2 and Topic #3 were captured in R4-2002803 WF on the requirements for FR2 DL 256QAM. Company are encouraged to discussed the WF on the email thread: ”RAN4#94e\_#17\_NR\_DL256QAM\_FR2 – draft WF R4-2002803”

### Companies views’ collection for Open issues for 2nd round

This table will collect the formal comments for the WF on the requirements for FR2 DL 256QAM after discussion or revison on the email thread ”RAN4#94e\_#17\_NR\_DL256QAM\_FR2 – draft WF R4-2002803”, if companies would like to fill in.

|  |  |
| --- | --- |
| **Company** | **Comments** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

### CRs/TPs comments collection for 2nd round

*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.*

The contributions which were recommended as return to during the 1st round, comments will be collected in the following table for 2nd round.

|  |  |  |
| --- | --- | --- |
| **CR/TP number** | **Status after 1st round** | **Comments collection for 2nd round** |
| [R4-2001189](file:///E%3A%5C%5C01%203GPP%20Work%5C%5C12%20DL256QAM%5C%5CDocs%5C%5C94_e%5C%5CR4-2000910.zip) | return to | Company A |
| Company B |
|  |
| [R4-2002802](file:///E%3A%5C%5C01%203GPP%20Work%5C%5C12%20DL256QAM%5C%5CDocs%5C%5C94_e%5C%5CR4-2001426.zip) | return to replace of R4-2001426 |  |
|  |
|  |
| [R4-2001427](file:///E%3A%5C%5C01%203GPP%20Work%5C%5C12%20DL256QAM%5C%5CDocs%5C%5C94_e%5C%5CR4-2001427.zip) | return to |  |
|  |
|  |
| [R4-2002103](file:///E%3A%5C%5C01%203GPP%20Work%5C%5C12%20DL256QAM%5C%5CDocs%5C%5C94_e%5C%5CR4-2002103.zip) | return to  |  |
|  |
|  |
| [R4-2000911](file:///E%3A%5C%5C01%203GPP%20Work%5C%5C12%20DL256QAM%5C%5CDocs%5C%5C94_e%5C%5CR4-2000910.zip) | return to |  |
|  |
|  |
| [R4-2001425](file:///E%3A%5C%5C01%203GPP%20Work%5C%5C12%20DL256QAM%5C%5CDocs%5C%5C94_e%5C%5CR4-2001426.zip) | return to  |  |
|  |
|  |

## Summary on 2nd round (if applicable)