**3GPP TSG-RAN WG4 Meeting #94-e R4-2002705**

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

**Agenda item:** 9.19

**Source:** Moderator (Sprint)

**Title:** Email discussion summary for RAN4#94e\_#32\_NR\_n26

**Document for:** Information

# Introduction

This e-mail discussion is to compete the work on NR band n26 submitted under Agenda Item 9.19. To submit comments delegates are asked to enter comments in the appropriate tables below in this word doc, rename the file by adding your company name at the end (before .docx). To limit the number of e-mail attachments, delegates are requested to upload the file to the draft inbox in this e-mail discussion input folder for n26:

ftp://ftp.3gpp.org/tsg\_ran/WG4\_Radio/TSGR4\_94\_e/Inbox/Drafts/%2332\_NR\_n26/e-mail\_discussion\_input/

or

<https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Inbox/Drafts/%2332_NR_n26/e-mail_discussion_input>

Note: To upload files you must use your 3GPP userid and password to login. If you are not able to login, then you can send the file to the reflector with the proper subject for this discussion: RAN4#94e\_#32\_NR\_n26

Also, if you are able to upload your comment file, in order to let everyone know that there are new comments, please send an e-mail to the reflector with the subject RAN4#94e\_#32\_NR\_n26 to announce that your file has been uploaded.

The documents in agenda item 9.19 contain the following four main topics and sub-topics:

* Topic #1: n26 A-MPR
	+ Issue 1-1: n26 A-MPR
* Topic #2 CRs for n26

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

* 1st round: Deadline Wednesday 5pm UTC Feb. 26

2nd round: Deadline Thursday 5pm UTC Mar.5

# Topic #1: n26 A-MPR

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2000008**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000008.zip) | Apple | A-MPR Proposal for n26Proposal: Use values found in Tables 1 to 4 to define n26 A-MPR. |
| [**R4-2000092**](file:///C%3A%5CUsers%5Cne087952%5COneDrive%20-%20Sprint%5C3GPP%5CRAN4%5CTSGR4_94_eMeeting%5CDocs%5CR4-2000092.zip) | Qualcomm | n26 AMPRProposal 1: Define n26 AMPR as shown in section 2.3, 2.4, 2.5, and 2.6. |
| [**R4-2000527**](file:///C%3A%5CUsers%5Cne087952%5COneDrive%20-%20Sprint%5C3GPP%5CRAN4%5CTSGR4_94_eMeeting%5CDocs%5CR4-2000527.zip) | Nokia | n26 A-MPR simulation resultsSummary: In this contribution we have presented A-MPR simulation results for n26. All simulation results are in Annex. |
| [**R4-2002145**](file:///C%3A%5CUsers%5Cne087952%5COneDrive%20-%20Sprint%5C3GPP%5CRAN4%5CTSGR4_94_eMeeting%5CDocs%5CR4-2002145.zip) | Skyworks  | n26 PA Back-Off MeasurementsSummary: In this contribution, we present our measurement results for n26.  |
|  |  |  |

## Open issues summary

### Sub-topic 1-1 A-MPR for n26

A-MPR for n26 is the only open issue for Band n26. Several companies have provided measurement and simulation results, and now A-MPR values need to be agreed for NS\_12, NS\_13, NS\_14 and NS\_15. The proposal from Qualcomm is complete for all NS values. The proposal from Apple is partial.

**Issue 1-1: A-MPR for n26**

* Proposals
	+ Option 1: Approve Qualcomm A-MPR
	+ Option 2: Approve Qualcomm A-MPR with modifications
* Recommended WF
	+ Approve Qualcomm A-MPR with modifications as needed

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Sub topic 1-1: * + - 1. Regarding R4-2000008 for Apple: Only NS\_12 and NS\_13 results were provided.
			2. For NS\_12, Apple’s AMPR values are at most 0.5dB higher than QCOM’s values is we were to keep QCOMs regions for NS\_12. Also, no 10MHz result was provided.
			3. For NS\_13, only result for 819.5MHz was provided and if you were to only consider A1, A2, then we can compare AMPR with Qualcomm’s values.
			4. For NS\_13, Apple also provides A3, A4 that are on conflict with A1 and A2. Apple needs to clarify.
 |
| Apple | Sub topic 1-1: 1. For NS\_13 the regions A3 and A4 were added for easy comparison with regions used in previous contributions and should have been excluded from the proposal statement. Only A1 and A2 are relevant.
2. Regarding NS\_12 and 5MHz channel BW: Applying the A1 region from Qualcomm to our simulation then the AMPR values would be similar.
3. Regarding NS\_12: Simulations have been done also for 10MHz channel BW and we are fine with the combined AMPR from Qualcomm for NS\_12 5&10MHz and the values proposed.
4. Regarding NS\_13 Region A3: Simulations have been done for 5MHz with fc=821.5MHz and we are fine with the proposed AMPR values from Qualcomm.
5. Not quite sure about the exact difference between Option 2 and the Recommended WF. But we would like to propose to modify the A-MPR proposal from Qualcomm for NS\_13 slightly.

Our proposal is to use the values from Qualcomm but use the values from our side (using region A1 and A2 only) where A-MPR is higher. This would increase some values by 0.5dB except for 256QAM which would be 1.5dB. |
| Nokia: | Sub topic 1-1: Qualcomm proposal can be used a basis. Some modifications would be necessary. Discussion should continue in a form of A-MPR tables as the written format used in this summary is difficult to follow. |
| Qualcomm | If we consider Apple’s comments, then the following changes could be proposed:NS\_12

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation/Waveform | A1\_QCOM | A1\_APPLE | A1 |
| Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM PI/2 BPSK | ≤ [5] | ≤ [5] | ≤ [5] |
| DFT-s-OFDM QPSK | ≤ [5] | ≤ [5] | ≤ [5] |
| DFT-s-OFDM 16 QAM | ≤ [5] | ≤ [5.5] | ≤ [5.5] |
| DFT-s-OFDM 64 QAM | ≤ [5] | ≤ [5.5] | ≤ [5.5] |
| DFT-s-OFDM 256 QAM | ≤ [6] | ≤ [6] | ≤ [6] |
| CP-OFDM QPSK | ≤ [6.5] | ≤ [7] | ≤ [7] |
| CP-OFDM 16 QAM | ≤ [6.5] | ≤ [7] | ≤ [7] |
| CP-OFDM 64 QAM | ≤ [6.5] | ≤ [7] | ≤ [7] |
| CP-OFDM 256 QAM | ≤ [8] | ≤ [8] | ≤ [8] |

NS\_13 -QCOM

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation/Waveform | A1 | A2 | A3 |
| Outer/Inner | Outer/Inner | Outer |
| DFT-s-OFDM PI/2 BPSK | ≤ [3] | ≤ [4.5] | ≤ [3] |
| DFT-s-OFDM QPSK | ≤ [3] | ≤ [4.5] | ≤ [3] |
| DFT-s-OFDM 16 QAM | ≤ [3.5] | ≤ [4.5] | ≤ [3] |
| DFT-s-OFDM 64 QAM | ≤ [4.5] | ≤ [4.5] | ≤ [3] |
| DFT-s-OFDM 256 QAM | ≤ [6] | ≤ [4.5] |  |
| CP-OFDM QPSK | ≤ [5] | ≤ [6.5] | ≤ [4.5] |
| CP-OFDM 16 QAM | ≤ [5] | ≤ [6.5] | ≤ [4.5] |
| CP-OFDM 64 QAM | ≤ [6] | ≤ [6.5] | ≤ [4.5] |
| CP-OFDM 256 QAM | ≤ [8] | ≤ [6.5] |  |

NS\_13 -APPLE

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation/Waveform | A1 | A2 |  |
| Outer/Inner | Outer/Inner |  |
| DFT-s-OFDM PI/2 BPSK | ≤ [3.5] | ≤ [4.5] |  |
| DFT-s-OFDM QPSK | ≤ [3.5] | ≤ [4.5] |  |
| DFT-s-OFDM 16 QAM | ≤ [3.5] | ≤ [5] |  |
| DFT-s-OFDM 64 QAM | ≤ [3.5] | ≤ [5] |  |
| DFT-s-OFDM 256 QAM | ≤ [4.5] | ≤ [6] |  |
| CP-OFDM QPSK | ≤ [4.5] | ≤ [6.5] |  |
| CP-OFDM 16 QAM | ≤ [4.5] | ≤ [6.5] |  |
| CP-OFDM 64 QAM | ≤ [4.5] | ≤ [6.5] |  |
| CP-OFDM 256 QAM | ≤ [7] | ≤ [8] |  |

NS\_13

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation/Waveform | A1 | A2 | A3 |
| Outer/Inner | Outer/Inner | Outer |
| DFT-s-OFDM PI/2 BPSK | ≤ [3.5] | ≤ [4.5] | ≤ [3] |
| DFT-s-OFDM QPSK | ≤ [3.5] | ≤ [4.5] | ≤ [3] |
| DFT-s-OFDM 16 QAM | ≤ [3.5] | ≤ [5] | ≤ [3] |
| DFT-s-OFDM 64 QAM | ≤ [4.5] | ≤ [5] | ≤ [3] |
| DFT-s-OFDM 256 QAM | ≤ [6] | ≤ [4.5] |  |
| CP-OFDM QPSK | ≤ [5] | ≤ [6.5] | ≤ [4.5] |
| CP-OFDM 16 QAM | ≤ [5] | ≤ [6.5] | ≤ [4.5] |
| CP-OFDM 64 QAM | ≤ [6] | ≤ [6.5] | ≤ [4.5] |
| CP-OFDM 256 QAM | ≤ [8] | ≤ [6.5] |  |

 |

### 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** |
| XXX | Company A |
| Company B |
|  |
| YYY | 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#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### 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**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: CRs for n26

As this WI is due to close in Q1 2020, CRs have been provided for each of the impacted specifications.

## Companies’ contributions summary

|  |  |  |  |
| --- | --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** | **TS** |
| **[R4-2000332](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000332.zip)** | Nokia, Sprint | Introduction of n26 | 36.104 |
| [**R4-2000333**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000333.zip) | Nokia, Sprint | Introduction of n26 | 36.141 |
| [**R4-2000334**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000334.zip) | Nokia, Sprint | Introduction of n26 | 37.104 |
| [**R4-2000335**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000335.zip) | Nokia, Sprint | Introduction of n26 | 37.141 |
| [**R4-2000336**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000336.zip) | Nokia, Sprint | Introduction of n26 | 37.105 |
| [**R4-2000337**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000337.zip) | Nokia, Sprint | Introduction of n26 | 37.145-1 |
| [**R4-2000338**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000338.zip) | Nokia, Sprint | Introduction of n26 | 37.145-2 |
| [**R4-2000339**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000339.zip) | Nokia, Sprint | Introduction of n26 | 38.104 |
| [**R4-2000340**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000340.zip) | Nokia, Sprint | Introduction of n26 | 38.141-1 |
| [**R4-2000341**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000341.zip) | Nokia, Sprint | Introduction of n26 | 38.141-2 |
| [**Draft\_R4-2000432**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Inbox/Drafts/%2332_NR_n26/Draft_R4-2000432_CR_38101-1-g20_n26.zip) | Sprint Corporation | CR for 38.101-1: Introduction of n26Official CR to be uploaded once A-MPR is agreed | 38.101-1 |
| [**R4-2000506**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000506.zip) | Dish Network | n26 introduction to 38.133 | 38.133 |
|  |  |  |  |

## Open issues summary

Once A-MPR (Topic #1) is agreed, there should be no open issues for this WI. The CR for 38.101-1 is waiting for agreement on A-MPR. A Draft can be found in the meeting inbox.

### Sub-topic 2-1 n26 CRs

## Companies views’ collection for 1st round

### Open issues

N/A

### 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** |
| 36.104[**R4-2000332**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000332.zip) | Company A Please erase this and enter comments here. |
| Company B |
|  |
| 36.141[**R4-2000333**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000333.zip) | Company A |
| Company B |
|  |
| 37.104[**R4-2000334**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000334.zip) | Company A |
|  |
|  |
| 37.141[**R4-2000335**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000335.zip) | Company A |
|  |
|  |
| 37.105[**R4-2000336**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000336.zip) | Company A |
|  |
|  |
| 37.145-1[**R4-2000337**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000337.zip) | Company A |
|  |
|  |
| 37.145-2[**R4-2000338**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000338.zip) | Company A |
|  |
|  |
| 38[**R4-2000339**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000339.zip).104 | Company A |
|  |
|  |
| 38.141-1[**R4-2000340**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000340.zip) | Company A |
|  |
|  |
| 38.141-2[**R4-2000341**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000341.zip) | Company A |
|  |
|  |
| 38.101-1[**Draft\_R4-2000432**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Inbox/Drafts/%2332_NR_n26/Draft_R4-2000432_CR_38101-1-g20_n26.zip) |  MCC: there is a spelling error on cover page summary of change field, requirments -> requirements. 3GPP specifications are composed of clauses, not sections. |
|  |
|  |
| 38.133[**R4-2000506**](http://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_94_e/Docs/R4-2000506.zip) | Company A |
|  |
|  |

## 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** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |