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

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

**Agenda item:** 9.18

**Source:** Moderator (CBN)

**Title:** Email discussion summary for RAN4#94e\_#31\_NR\_n28\_BW

**Document for:** Information

# Introduction

*Some important agreements in RAN4#93 are shown as below.*

* *UE part*
	+ *Agreement：Delta MPR will be introduced for band n28.*
	+ *To update spurious emission requirements for band n28 including TS 36.101, TS 38.101-1 and TS 38.101-3*
	+ *The specific Footnote for 30MHz Channel Bandwidth in Band n28 was approved.*
	+ *All of approved TPs in last meeting have been captured into R4-2000165.*
* *BS part*
	+ *BS-BS co-existence analysis was approved based on R4-1916064*
	+ *30MHz and 40MHz BS channel bandwidth for band n28 will be introduced into TS 38.104 based on R4-1916063*

*Some open issues are listed as below.*

* *UE part*
	+ *The specific value for n28 30MHz Delta MPR need to be specified.*
	+ *AMPR table for NS\_18 need to be generated based on companies’ inputs.*
	+ *REFSENS for n28 30MHz need to be specified based on RAN4’s consensus.*
* *BS part*
	+ *None*

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

* 1st round: To make consensus for each open issue including Delta MPR\MPR, AMPR and REFSENS requirements and approve the relative TPs.
* 2nd round: To agree the final big CRs including TS 38.104, TS 36.101, TS 38.101-1 and TS 38.101-3.

# Topic #1: The updated TR 38.888 v0.1.0

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000165 | CBN | Updated TR 38.888 v0.1.0 Adding wider channel bandwidths in NR band n28 based on approved TPs in last meeting. |

## Summary

*None*

## Companies views’ collection for 1st round

### Open issues

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

### TR 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.*

|  |  |
| --- | --- |
| **TR number** | **Comments collection** |
| R4-2000165 | Company A |
| Company B |
|  |

## Summary for 1st round

|  |  |
| --- | --- |
|  |  |
|  |  |

### TR

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

|  |  |
| --- | --- |
| **TR number** | **TR Status update recommendation**  |
| R4-2000165 |  *To be approved* |

|  |  |
| --- | --- |
|  |  |
|  |  |

# Topic #2: UE part for NR\_n28\_BW

*Main technical topic overview.*

*Sub-topic 2-1: MPR and delta MPR*

*Sub-topic 2-2: AMPR for NS\_18*

*Sub-topic 2-3: UE REFSENS*

*Sub-topic 2-4 Spurious emission requirements for band n28*

*Sub-topic 2-5 Big CR in TS 38.101-1 for band n28*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **Sub-topic 2-1: MPR and delta MPR****Sub-topic 2-2: AMPR for NS\_18** |
| R4-2000090 | Qualcomm Incorporated | Proposal: Define 30MHz n28 AMPR as shown in Table 2 and 3. Table 2: A-MPR regions for NS\_18

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Channel Bandwidth, MHz | Carrier Center Frequency, Fc, MHz | Regions | A-MPR | Meas.A-MPR DFT/CP |
| RBstart\*12\*SCSMHz | LCRB\*12\*SCSMHz |
| 30 | 718 | >11.7 | ≥max (0, 12\*SCS\*RBend – 1.8) | A1 |  |
| ≤11.7 | ≥6.3 | A2 | 7/8.5 |
| ≤7.92 | <6.3 | A3 | analysis |

Table 3: A-MPR for NS\_18

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation/Waveform | A1 | A2 | A3 |
| Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM  | PI/2 BPSK | [3] | [8] | [3] |
| QPSK | [3] | [8] | [3] |
| 16 QAM | [3] | [8] | [3] |
| 64 QAM | [3] | [8] | [4.5] |
| 256 QAM |  | [8] | [5.5] |
| CP-OFDM  | QPSK | [4.5] | [9.5] | [4.5] |
| 16 QAM | [4.5] | [9.5] | [4.5] |
| 64 QAM | [4.5] | [9.5] | [5.5] |
| 256QAM |  | [9.5] | [7.5] |

C:\Users\z00471447\AppData\Roaming\eSpace_Desktop\UserData\z00471447\imagefiles\1C5B94B6-4D5F-4F44-941A-54E4F310CDB9.png |
| R4-2001089 | Huawei, HiSilicon | Proposal: To specify the 30MHz n28 AMPR requirements for NS\_18 as shown in table 2-1 and 2-2. Table 2 1 A-MPR regions for NS\_18

|  |  |  |  |
| --- | --- | --- | --- |
| Channel Bandwidth, MHz | Frequency range of UL transmission bandwidth configuration, MHz | Regions | A-MPR |
| RBstart\*12\*SCSMHz | LCRB\*12\*SCSMHz |
| 30 | 703~733 | > LCRB\*12\*SCS+2.52 | ≥12\*SCS\*NRB – 1.8+ RBstart\*12\*SCS | B1 |
| ≤LCRB\*12\*SCS+2.52 | ≥5.4 | B2 |
| ≤7.92 | <5.4 | B3 |

Table 2 2 A-MPR for NS\_18

|  |  |  |  |
| --- | --- | --- | --- |
| Modulation/Waveform | B1 | B2 | B3 |
| Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM  | PI/2 BPSK | [3] | [8] | [3] |
| QPSK | [3] | [8] | [3] |
| 16 QAM | [3] | [8] | [3] |
| 64 QAM | [3] | [8] | [4.5] |
| 256 QAM | [3] | [8] | [5.5] |
| CP-OFDM  | QPSK | [4] | [9.5] | [5] |
| 16 QAM | [4] | [9.5] | [5] |
| 64 QAM | [4] | [9.5] | [5.5] |
| 256QAM | [4] | [9.5] | [7.5] |

**EEC2EA4E-2DE0-48F1-8304-1A42FE02061C** |
| R4-2001088 | Huawei, HiSilicon, CBN | TP for Tx requirements1. Delta MPR

|  |  |
| --- | --- |
| Company | Huawei |
| The proposed delta MPR (dB) | 1 |

For band n28 30MHz, the allowed maximum power reduction (MPR) is defined in Table 5.1.2.1-2.**Table 5.1.2.1-2:** **The proposed delta MPR (dB)**

|  |  |  |
| --- | --- | --- |
| channel bandwidth Conditions | Power class | The allowed maximum power reduction (MPR) |
| Band n28 30MHz | Power class 3 | Table 6.2.2-1 from 38.101-1 + [1] dB |

2. AMPR for NS\_18The proposal can be referred to R4-2001089 |
| **Sub-topic 2-3: REFSENS** |
| R4-2000493 | ZTE Corporation | **Proposal: The REFSEN requirements for 30MHz in n28 are proposed highlighted as below:**REFSENS for band n28 for case 2

| **Operating Band** | **SCS kHz** | **30 MHz (dBm)** | **Duplex Mode** |
| --- | --- | --- | --- |
| n28 | 15 | -84.9 | FDD |
| 30 | -85.0 |
| 60 |  |

Where 25RB for 15kHz SCS, 10RB for 30kHz SCS are adopted in UL allocation assumption.  |
| R4-2001087 | Huawei, HiSilicon | **Discussion and TP for Rx requirements****Proposal 1: To consider the impact of Delta MPR for 30MHz n28 when RAN4 evaluate the REFSENS.****Proposal 2: REFSENS**REFSENS for band n28 for case 2

| **Operating Band** | **SCS kHz** | **30 MHz (dBm)** | **Duplex Mode** |
| --- | --- | --- | --- |
| n28 | 15 | -80.9 | FDD |
| 30 | -81.0 |
| 60 |  |

 |
| R4-2001226 | MediaTek Inc. | REFSENS for band n28 for case 1

| **Operating Band** | **SCS kHz** | **30 MHz (dBm)** | **Duplex Mode** |
| --- | --- | --- | --- |
| n28 | 15 | -88.2 | FDD |
| 30 | -88.3 |
| 60 |  |

REFSENS for band n28 for case 2

| **Operating Band** | **SCS kHz** | **30 MHz (dBm)** | **Duplex Mode** |
| --- | --- | --- | --- |
| n28 | 15 | -79.9 | FDD |
| 30 | -80 |
| 60 |  |

 |
| R4-200xxxx | Qualcomm Inc. | REFSENS for band n28 for case 1

| **Operating Band** | **SCS kHz** | **30 MHz (dBm)** | **Duplex Mode** |
| --- | --- | --- | --- |
| n28 | 15 | -88.4 | FDD |
| 30 | -88.6 |
| 60 |  |

REFSENS for band n28 for case 2

| **Operating Band** | **SCS kHz** | **30 MHz (dBm)** | **Duplex Mode** |
| --- | --- | --- | --- |
| n28 | 15 | -77.8 | FDD |
| 30 | -78 |

 |
| R4-200xxxx | Murata | REFSENS for band n28 for case 2

| **Operating Band** | **SCS kHz** | **30 MHz (dBm)** | **Duplex Mode** |
| --- | --- | --- | --- |
| n28 | 15 | -77.5 | FDD |
| 30 | -77.6 |

 |
| **Sub-topic 2-4: Spurious emission requirements for band n28** |
| R4-2001170 | CATT | TP for TR 38.888: Remove Band 39 from the protected bands of DC\_1-n28 combination. Band 39 is redundant since there is no DC\_1-28 combination in China and band 39 will not be used in the region where DC\_1-28 is applicable.Updated table 5.1.2.4-3 in TR 38.888. |
| R4-2000620 | CATT, CBN, ZTE, Huawei  | CR with the following changes for TS 36.101:Updated tables 6.6.3.2-1 and 6.6.3.2A-0.Note: Adding UE-UE co-existence requirements for band n28. |
| R4-2000622 | CATT, CBN, ZTE, Huawei  | CR with the following changes for TS 38.101-3:Updated tables 6.5B.3.3.2-1 .Note: Adding UE-UE co-existence requirements for band n28. |
| R4-2000621 | CATT, CBN, ZTE, Huawei  | CR with the following changes for TS 38.101-1:Updated tables 6.5.3.2-1 and 6.5A.3.2.3-1.Note: Protected bands are added for band n28. |
| **Sub-topic 2-5: Big CR in TS 38.101-1 for band n28** |
| R4-2001086 | Huawei, HiSilicon | CR with the following changes for TS 38.101-1:Updated tables 5.3.5-1, 6.2.2-0, 6.2.3.1-1, 6.2.3.13-2, 6.2.3.13-3, 6.5.3.2-1, 6.5A.3.2.3-1, 7.3.2-1, 7.3.2-3.Note: MPR, AMPR, spurious emissions for UE co-existence and REFSENS are specified for 30MHz band n28. |

## 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 MPR and delta MPR

*Sub-topic description: to specify MPR and delta MPR for n28 30MHz*

*Open issues and candidate options before e-meeting:*

* Huawei’s Proposals
	+ 1dB delta MPR
	+ MPR for Band n28 30MHz: Table 6.2.2-1 from 38.101-1 + [1] dB

### Sub-topic 2-2 AMPR for NS\_18

*Sub-topic description: to specify AMPR for NS\_18 with 30MHz BW*

*Open issues and candidate options before e-meeting:*

* Proposals
	+ Option 1: Qualcomm’s AMPR table based on R4-2000090
	+ Option 2: Huawei’s AMPR table based on R4-2001098

*Summary:*

1. *There are some slight difference for the AMPR region allocation between Qualcomm and Huawei’s proposals.*
2. *The values of A1\B1 for CP-OFDM are 4 and 4.5 respectively. Others are same.*
3. *The second column in AMPR region is different. (frequency center vs Frequency range of UL transmission bandwidth configuration, MHz)*

### Sub-topic 2-3 UE REFSENS

*Sub-topic description: to evaluate and specify REFSENS for n28 30MHz*

*Open issues and candidate options before e-meeting:*

*Agreement: UL configuration*

Table n28 Uplink Configuration for Reference Sensitivity

| Operating band / SCS / Channel bandwidth / Duplex mode |
| --- |
| Operating Band | SCS kHz | 5MHz | 10MHz | 15MHz | 20MHz | 25 MHz | 30 MHz | 40MHz | 50MHz | 60MHz | 80MHz | 90MHz | 100 MHz | Duplex Mode |
| n28 | 15 | 25 | 251 | 251 | 251 |  | 251 |  |  |  |  |  |  | FDD |
| 30 |  | 101 | 101 | 101 |  | 101 |  |  |  |  |  |  |
| NOTE 1: UL resource blocks shall be located as close as possible to the downlink operating band but confined within the transmission bandwidth configuration for the channel bandwidth (Table 5.3.2-1). |

* REFSENS for case 1

| **company** | **MTK** | **Skyworks** | **QCOM** | **Average** |
| --- | --- | --- | --- | --- |
| **Operating Band** | **SCS kHz** | **30MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** |
| n28 | 15 | -88.2 | -88.7 | -88.4 | -88.4 |
| 30 | -88.3 | -88.8 | -88.6 | -88.6 |
| 60 |  |  |  |  |

* REFSENS for case 2

| **company** | **ZTE** | **Huawei** | **MTK** | **Skyworks** | **QCOM** | **Murata** | **Average** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Operating Band** | **SCS kHz** | **30MHz (dBm)** | **30 MHz (dBm)** | **30MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** |
| n28 | 15 | -84.9 | -80.9 | -79.9 | -78.5 | -77.8 | -77.5 | -79.3 |
| 30 | -85.0 | -81.0 | -80 | -78.6 | -78.0 | -77.6 | -79.4 |
| 60 |  |  |  |  |  |  |  |

* Huawei’s proposal: To consider the impact of Delta MPR for 30MHz n28 when RAN4 evaluate the REFSENS.

### Sub-topic 2-4 Spurious emission requirements for band n28

*Sub-topic description: to specify Spurious emission requirements for band n28*

*Summary:*

1. It’s recommended that R4-2000621 can be merged into 38.101-1 big CR R4-2001086.
2. Companies are encouraged to carefully check R4-2001170 (updated TP), R4-2000620 (CR for 36.101) and R4-2000622 (CR for 38.101-3). If there is no comment, it’s recommended that these papers can be approved or agreed.

### Sub-topic 2-5 Big CR in TS 38.101-1 for band n28

*Sub-topic description: to specify UE core requirements in TS 38.101-1 for n28 30MHz*

*Summary:*

*Once RAN4 makes consensus on MPR, AMPR and REFSENS for n28 30MHz, R4-2001086 or the revision of R4-2001086 which capture RAN4’s consensus can be agreed in this meeting. Companies are encouraged to carefully check and comment it.*

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Sub topic 2-1: 1. MPR either for Band n28 30MHz or ‘Relative channel bandwidth > 3% for FDD band n28’: Table 6.2.2-1 from 38.101-1 + [1] dB.Sub topic 2-2: 1. The function limitation of A1 region is not correct for R4-2000090. It should be modified as ≥ 12\*SCS\*NRB - 1.8+ 12\*SCS\*RBstart2. For AMPR, we have a little different proposal comparing to Qualcomm’s proposal. We can merge the final table.3. The consensus can be reflected in the revision of R4-2001088Sub topic 2-3:  1. We propose to consider the impact of Delta MPR for 30MHz n28 when RAN4 evaluate the REFSENS.  2. As a compromise, we propose to use average value for case 2 REFSENS. Not to specify case 1 REFSENS in order to reduce test workload and spec complexity. Sub topic 2-4: Sub topic 2-5:  |
| Qualcomm | Sub topic 2-2: * + - 1. Regarding HW comment [*The function limitation of A1 region is not correct for R4-2000090*. *It should be modified as ≥ 12\*SCS\*NRB - 1.8+ 12\*SCS\*RBstart*].
			2. We agree that there is some error, but the equation should be max(0, RBstart\*12\*SCS-1.8) not according to HW suggestion.
			3. The slope of the boundary line is also not correct. If the slope needs to be modified, it should be LCRB/2. The line in the graph does not match the what is written in the table.
			4. B1, B2, B3 should be changed to A1, A2 and A3 for consistency.

Sub topic 2-3: Sorry for late contribution. We have submitted the contribution in the draft inbox. We feel the image and TX signal causes high distortion for case 2 REFSENS. The high efficiency PA biasing increases the effect of the distortion even with the appropriate correction factors. We have updated Sub-topic 2-3 with Qualcomm’s addition. |
| Skyworks | Sub topic 2-3: We believe delta-MPR can not be used to derive REFSENS since an MPR is an allowance for UE, so REFSENS should assume UE transmitting at full Tx power,We are fine with taking the average values of each company’s REFSENS for 30MHz case 1 and case 2. However, we are asking for clarification on the assumptions used in R4-2000493 since the reported Tx noise level for case 2 is close to previously reported measured data from MTK [R4-1914190, R4-2001226] and Skyworks [R4-1916062] R4#93, but proposed REFSENS is lower. |
| Huawei | Sub topic 2-2: To Qualcomm* + - 1. We agree to use the Max() function. Maybe the *12\*SCS\*NRB* is missing in the function. We can use this one ≥Max(0, 12\*SCS\*NRB – 1.8+ RBstart\*12\*SCS).
			2. We can follow your suggestion to set the slope of the boundary line as LCRB/2.
			3. Considering Ericsson’s comments, we can use A3, A4, A5 in order to distinguish the original A1and A2. Please see my modification below.

Table 6.2.3.13-0: Band n28 30MHz A-MPR regions for NS\_18

|  |  |  |  |
| --- | --- | --- | --- |
| Channel Bandwidth, MHz | Frequency range of UL transmission bandwidth configuration, MHz | Regions | A-MPR |
| RBstart\*12\*SCSMHz | LCRB\*12\*SCSMHz |
| 30 | 703~733 | >(LCRB\*12\*SCS)/2+5.22 | ≥Max(0, 12\*SCS\*NRB – 1.8 – RBstart\*12\*SCS) | A3 |
| ≤(LCRB\*12\*SCS)/2+5.22 | ≥5.4 | A4 |
| ≤7.92 | <5.4 | A5 |

Table 6.2.3.13-1: A-MPR for NS\_18

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | A1(dB) | A2(dB) | A3(dB) | A3(dB) | A5(dB) |
| Omitted, please see the spec | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM  | PI/2 BPSK | [3] | [8] | [3] |
| QPSK | [3] | [8] | [3] |
| 16 QAM | [3] | [8] | [3] |
| 64 QAM | [3] | [8] | [4.5] |
| 256 QAM | [3] | [8] | [5.5] |
| CP-OFDM  | QPSK | [4.5] | [9.5] | [5] |
| 16 QAM | [4.5] | [9.5] | [5] |
| 64 QAM | [4.5] | [9.5] | [5.5] |
| 256QAM | [4.5] | [9.5] | [7.5] |

Sub topic 2-3: To Skyworks, Thanks for your clarification. We can follow your suggestion not to consider the delta-MPR when we evaluate the REFSENS. Yes, we can take the average values of each company’s REFSENS for 30MHz case 1 and case 2. |
| Murata | Sub topic 2-3: 1. Sorry for late contribution. We have submitted the contribution about REFSENS for case 2 in the draft inbox.
2. We have updated Sub-topic 2-3 with Murata’s addition in 2.1 Companies’ contributions summary and 2.2.3 Sub-topic 2-3 UE REFSENS.
3. In our contribution, we propose that REFSENS of 30MHz CBW should be relaxed again when 40MHz CBW is standardized. It is challenging to achieve the same characteristics as dual DPX approach.
 |
| Skyworks | To Huawei: Thank you for the clarification. We are ok with introducing [1dB] delta-MPR in brackets for Rel’16, and dimension REFSENS without deltaMPR. |
|  |  |

### 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** |
| R4-2001088TP for Tx requirements | [ZTE]: It is proposed to uses ‘Relative channel bandwidth > 3% for FDD band n28’ for channel bandwidth Conditions, rather than ‘Band n28 30MHz’. |
| [Huawei]: To ZTE, I’m open to use ‘Relative channel bandwidth > 3% for FDD band n28’ for channel bandwidth Conditions. |
|  |
| R4-2001087TP for Rx requirements | [ZTE]: More information shall be captured in the TP body, such as the values from the other companies, backgrounds, etc.. |
| [Huawei]: To ZTE, it’s OK to capture more information in the TP body. The most important thing is to reach a consensus to specify the case 2 REFSENS.  |
| [Skyworks]: * + - 1. Although we support the concept of Delta-MPR to deal with 30MHz BW for n28, we believe the proposed [1]dB value needs to be further studied via either simulations or measurements.
			2. About using Delta-MPR for REFSENS: Delta-MPR is an allowance for the UE, not a compulsory requirement. Some UEs will not apply Delta-MPR, so REFSENS dimensioning should assume UE transmitting at full output power.
 |
| [Huawei]: To Skyworks, we provide the simulation to evaluate the Delta-MPR in the last meeting. And before this meeting, we make some measurements and we think one dB Delta-MPR is enough. |
| [CBN]: To Skyworks, considering this WI is very crucial for CBN’s ongoing deployment of 5G network with 30MHz CBW on n28, and it is scheduled to be finalized for Rel-16 in this upcoming RAN plenary in March, we would request that accept Huawei’s 1 dB Delta-MPR simulation result with square bracket. Thank you. |
| [Skyworks]: To CBN: we are ok with the proposed delta-MPR value in bracket for Rel-16. We wanted to point out that deltaMPR should not be used to dimension REFSENS. See our reply to Huawei’s response on this topic. |
| R4-2001170Updated TP to remove band 39 for DC\_1\_n28 | Ericsson: This CR is not in the scope of this WI (adding channel BW to n28) and should be submitted in DC agenda items or TEI. |
| [Huawei]: To Ericsson, I think this is an updated TP to address apple’s comments in the reflector. |
|  |
| R4-2000620CR for 36.101 | [CATT]: An offline comments from Softbank was received that Protection of n78 and n79 from CA\_8-39, n78 and n79 should be moved to the next line (Band 22, 41...) which has Note 2 (Harmonic exception). A revision number is needed. |
| Ericsson: when adding new channel BW in a band, CRs to BS and UE shall be complete (big CR) and submitted at the same time/same meeting. This CR can’t be agreed as is. |
| [CATT]: For 36.101, all the changes needed for 36.101 are captured. If this meeting needs to close the WI, the CR should be agreed after revision. |
| R4-2000622CR for 38.101-3 | Ericsson: This CR is not in the scope of this WI, TS 38.101-3 is even not listed in the impacted TSs in the WI.  |
| [Huawei]: To Ericsson, based on RP-192656, this WI has an impact on TS 38.101-3. |
| [CATT]: To Ericsson, the WID has been updated in RAN#86 to include 38.101-3 as affected specifications. This CR can be agreed. |
| R4-2000621CR for 38.101-1 (only spurious emission requirements) | [Huawei]: 1. It’s recommended that R4-2000621 can be merged into 38.101-1 big CR R4-2001086. |
| Ericsson: same remarks than for R4-2000620, we should only have big CR, and all big CRs submitted in same meeting for approval. Of course, it’s ok to work with partial draft CR in the meantime, but not CR. |
| [CATT]: We are fine to merge into the big CR by Huawei. But still it can be technically endorsed. |
| R4-2001086big CR for 38.101-1 | [ZTE]: It is proposed to uses ‘Relative channel bandwidth > 3% for FDD band n28’ in second row in Table 6.2.2-0, rather than ‘Band n28 30MHz’. In addition, is it need to add asymmetric channel bandwidths for band n28 (clause 5.3.6) in the CR? |
| [Huawei]: To ZTE, I’m open to specify the asymmetric channel bandwidths. It depends on operators’ demand. |
| Ericsson:1. We don’t need table 6.2.2-0. This could be addressed just adding a note in existing table 6.2.2-1.
2. To keep consisten with other sections, better put table 6.2.3.13-2 before table 6.2.3.13-1 and change table’s number with “-0”.
3. Table 6.2.3.13-3 shall be merged with table6.2.3.13-1
 |
| [Huawei]: To Ericsson, we can consider your suggestion when we revise the big CR. |
| [Skyworks]:same comments than for R4-2001087, REFSENS values can not be derived assuming all UEs will use Delta-MPR since MPR is an allowance, not a compulsory requirement. |
| [Nokia]: If table 6.2.2-0 is kept then it needs to be general not specific to band 28 and 30 MHz BW. This delta MPR should be specified in relation to Relative channel bandwidth.In beginning of section 6.2.2 you have added and deleted same text, secretary do not know how to implement. |
| R4-2000493On UE REFSEN for 30MHz in band n28 | [Skyworks]: Question for clarification:Although the reported measured Tx noise level falling in Rx band for case 2 is close to the values we reported in Reno #93, the proposed REFSENS level is lower. What assumptions have been used to derive REFSENS = -84.9 dBm at SCS15kHz?  |
|  [ZTE]. To Skyworks, actually we have some ideal assumptions. In our assumption, 55dB Tx/Rx duplexer isolation, 3dB FE loss, and the Tx noise of -25dBm as the total noise (just following my test colleague’s suggestion) to derive the REFSEN. I also notice that our values looks a little bits weird comparing the other’s results. But i think in reality, the REFSEN can be further optimized due to some methods in the implementation. |
| [Skyworks]: to ZTE, thank you for the clarification. To our understanding, RAN 4 agreement is 50dB Tx/Rx duplexer isolation. Our REFSENS proposal assumes 50dB isolation.  |

## 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:** + 1dB delta MPR
	+ MPR for Band n28 30MHz: Table 6.2.2-1 from 38.101-1 + [1] dB

*Candidate options:**Recommendations for 2nd round: The tentative agreement can be captured into the revision of* R4-2001088 (TP) and *revision of* R4-2001086 (big CR to TS 38.101-1) |
| **Sub-topic 2-2** | *Tentative agreements:*Table 6.2.3.13-0: Band n28 30MHz A-MPR regions for NS\_18

|  |  |  |  |
| --- | --- | --- | --- |
| Channel Bandwidth, MHz | Frequency range of UL transmission bandwidth configuration, MHz | Regions | A-MPR |
| RBstart\*12\*SCSMHz | LCRB\*12\*SCSMHz |
| 30 | 703~733 | >(LCRB\*12\*SCS)/2+5.22 | ≥Max(0, 12\*SCS\*NRB – 1.8 – RBstart\*12\*SCS) | A3 |
| ≤(LCRB\*12\*SCS)/2+5.22 | ≥5.4 | A4 |
| ≤7.92 | <5.4 | A5 |

Table 6.2.3.13-1: A-MPR for NS\_18

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Modulation/Waveform | A1(dB) | A2(dB) | A3(dB) | A4 (dB) | A5(dB) |
| Omitted, please see the spec | Outer/Inner | Outer/Inner | Outer/Inner |
| DFT-s-OFDM  | PI/2 BPSK | [3] | [8] | [3] |
| QPSK | [3] | [8] | [3] |
| 16 QAM | [3] | [8] | [3] |
| 64 QAM | [3] | [8] | [4.5] |
| 256 QAM | [3] | [8] | [5.5] |
| CP-OFDM  | QPSK | [4.5] | [9.5] | [5] |
| 16 QAM | [4.5] | [9.5] | [5] |
| 64 QAM | [4.5] | [9.5] | [5.5] |
| 256QAM | [4.5] | [9.5] | [7.5] |

*Candidate options:**Recommendations for 2nd round: The tentative agreement can be captured into the revision of* R4-2001088 (TP) and *revision of* R4-2001086 (big CR to TS 38.101-1) |
| **Sub-topic 2-3** | *Tentative agreements:** REFSENS for case 2

| **company** | **ZTE** | **Huawei** | **MTK** | **Skyworks** | **QCOM** | **Murata** | **Average** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Operating Band** | **SCS kHz** | **30MHz (dBm)** | **30 MHz (dBm)** | **30MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** |
| n28 | 15 | -84.9 | -80.9 | -79.9 | -78.5 | -77.8 | -77.5 | -79.3 |
| 30 | -85.0 | -81.0 | -80 | -78.6 | -78.0 | -77.6 | -79.4 |
| 60 |  |  |  |  |  |  |  |

To specify average value for case 2 as UE REFSENS*Candidate options:**Qualcomm:** + - 1. *I cannot agree on the averaging method.*
			2. *Huawei agree MTK’s results as worst case, the delta-MPR effect should be excluded.*
			3. *Can ZTE include analysis result based on Worst case assumption, since we cannot average worst case and typical data.*
			4. *Proposed averaged REFSENS is below, which aligns with Skyworks measured values.*

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **ZTE (Include W.C)** | **Huawei** | **MTK** | **Skyworks** | **QCOM** | **Murata** | **Average** |
| **30MHz (dBm)** | **30 MHz (dBm)** | **30MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** | **30 MHz (dBm)** |
| -84.9 | -79.9 | -79.9 | -78.5 | -77.8 | -77.5 | -78.7 |
| -85 | -80 | -80 | -78.6 | -78 | -77.6 | -78.8 |

*ZTE: As per Skyworks, 50dB Tx/Rx duplexer isolation shall be used. For sake of the progress and align the worse case of assumption with other companies, here we will update the results.* 50dB Tx/Rx duplexer isolation. Our REFSENS proposal assumes 50dB isolation.*Recommendations for 2nd round: The tentative agreement can be captured into the revision of* R4-2001087 (TP) and *revision of* R4-2001086 (big CR to TS 38.101-1) |
| **Sub-topic 2-4** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round: Based on current agreement, it’s recommended to implement corresponding CRs.*  |
| **Sub-topic 2-5** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round: Based on current agreement and tentative agreement above, it’s recommended to implement big CR to TS 38.101-1.* |

*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**  |
| R4-2001088TP for Tx requirements | *To be revised* |
| R4-2001087TP for Rx requirements | *To be revised* |
| R4-2001170Updated TP to remove band 39 for DC\_1\_n28 | *To be approved* |
| R4-2000620CR for 36.101 | *To be revised* |
| R4-2000622CR for 38.101-3 | *To be agreed together with other* *official CRs.* |
| R4-2000621CR for 38.101-1 (only spurious emission requirements) | *To be merged into the revision of R4-2001086* *( CATT ask “to* be technically endorsed”. It depends on Chairman’s decision.*)* |
| R4-2001086big CR for 38.101-1 | *To be revised* |

## Discussion on 2nd round (if applicable)

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2002849CR for 38.101-1: introduce UE RF requirements for adding wider channel bandwidth in band n28 |  |
|  |
|  |
| R4-2002847TP on UE RF REFSENS for adding wider channel bandwidth in band n28 |  |
|  |
|  |
|  |
|  |
|  |
| R4-2002846TP on UE Tx RF requirements for adding wider channel bandwidth in band n28 |  |
|  |
|  |
| R4-2002848Introducing new channel bandwidth for band n28 |  |
|  |

## 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 #3: BS part for NR\_n28\_BW

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

*Sub-topic 3-1 CR to TS 38.104 for adding 30MHz and 40MHz BS channel bandwidth in band n28*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000623 | CATT, CBN, ZTE, Huawei | To introduce 30MHz and 40MHz BS channel bandwidth for band n28 |

## Summary

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

Summary:

Based on RAN4’s agreement, it’s recommended that this CR can be agreed. Companies are encouraged to carefully check it.

## Companies views’ collection for 1st round

|  |  |
| --- | --- |
|  |  |
|  |  |

### 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** |
| R4-2000623 | Ericsson: No issue with this CR but it could only be agreed if CR to TS 38.101-1 is also agreed at same time. |
| Company B |
|  |

## Summary for 1st round

|  |  |
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| --- | --- | --- |
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|  |  |  |

### 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**  |
| R4-2000623 | *To be agreed together with other official CRs.* |

## 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”* |

# Tdoc check list

## Tdoc for 1st round

|  |  |
| --- | --- |
| **TR/CR/TP number** | **TR/CRs/TPs Status update recommendation**  |
| R4-2000165 |  *To be approved* |
| R4-2001088 | *To be revised* |
| R4-2001087 | *To be revised* |
| R4-2001170 | *To be approved* |
| R4-2000620 | *To be revised* |
| R4-2000622 | *To be agreed together with other official CRs.* |
| R4-2000621 | *To be merged into the revision of R4-2001086* *( CATT ask “to* be technically endorsed”. It depends on Chairman’s decision.*)* |
| R4-2001086 | *To be revised* |
| R4-2000623 | *To be agreed together with other official CRs.* |