**3GPP TSG-RAN WG4 Meeting #94-e R4-2002504**

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

**Agenda item:** 6.7

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for RAN4#94e\_#75\_NR\_NewRAT\_RF\_BS

**Document for:** Information

# Introduction

The BS RF core spec TS 38.104 is fairly stable and there are not many contributions in this area. Contributions were submitted within the following Topics:

1. FR2 spurious emissions
2. EESS protection
3. NR BS Regional requirements
4. TR 38.817-2 updates
5. LTE-NR channel spacing
6. TS 38.104 editorial

Only Topic #2 introduces a new requirement, while all other Topics concern corrections of existing requirements and editorials.

# Topic #1: FR2 spurious emissions

Different FR2 spurious emission limits for Category A (global) and Category B (applicable mainly in Europe) have been agreed for Tx spurious emissions in previous meetings. Limits have also been agreed for Rx spurious emissions that apply globally, with no split between Category A and B.

The CRs submitted for 38.104 propose an update to FR2 Category B Tx limits.

NOTE: CR to test specification 38.141-2 is missing.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001247  R4-2001248 | ZTE Corporation | CR to 38.104: The TX spurious emission table 9.7.5.3.2.3-2 has been updated with band n257, n260, n261 requirement. |

## Open issues summary

### Sub-topic 1-1

The CR reason for change: The TX spurious emission requirement step frequency is only for band n258 now while for RX spurious emission all the FR2 bands has been finalized. The principle is for cat B spurious limit, RX and TX share the same requirement. So the table for other bands for TX spurious emission has been added based on RX table.

The issue here is to determine whether the FR2 Category B limits for Tx spurious emissions are applicable for bands n257, n260 and n261.

**Issue 1-1: Applicability of FR2 Category B Tx limits for bands n257, n260 and n261**

* Proposals
  + Option 1: Apply Category B FR2 limits also for bands n257, n260 and n261.
  + Option 2: No change.
* Recommended WF
  + Option 2 (based on existing regulation)

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Ericsson | Sub-topic 1-1: Ericsson supports Option 2. Bands should only be included for Category B when there is a region (e.g. Europe) applying Category B limits for the band. |
| Nokia | Sub topic 1-1: Step frequencies should be applicable to n257 and n258 only, Receiver spurious emissions do not refer to Tx spurious emissions, so this does not create a reason to add step frequencies to Tx side, however n257 can be in Europe so should be added. Additionally, the change should be replicated to test specification for which a new TDoc needs to be allocated. |
| Huawei | Sub topic 1-1: If n257 is used in Europe it should be added. Agree Rx is not a CAT A or B requirements so different case – all are needed |
| Ericsson | Sub topic 1-1: Band n257 and n258 are presently included in the European harmonized standard, Ericsson agrees with Nokia to include those two. Other bands can be added to the table when evidence is shown that Category B limits are applicable. |
| Samsung | Sub-topic 1-1: Support Option 2. Although n257 can be used in Europe in the future, the Category B was originally defined for n258 only. It should not be applicable to other bands before the evidence considering the existing regulation, i.e. n257, n260 and n261 |
| NEC | Sub topic 1-1: Only bands which are actually assigned as category B shall be added. Otherwise, it leads unnecessary misunderstanding. |
| Intel | Sub topic 1-1: Stay band n258 only. ETSI harmonized standard is still in the draft stage. 3GPP can add band n257 once ETSI officially releases its specifications including band n257. |
| ZTE | Thanks for the comments, we are ok to postpone the CR. |

## Summary for 1st round

### Open issues

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|  | **Status summary** |
| **Sub-topic#1-1** | **Applicability of FR2 Category B Tx limits for bands n257, n260 and n261**  Tentative agreements:  There seems to be consensus that only bands where Category B limits are applied in at least one region should be included under Category B Transmitter spurious emissions. (Noting that for Receiver spurious emissions, all bands are included in the tables since there is no difference in limits between Category A and B).  Candidate options: Based on the consensus there are still two Options:   * Option A: Add band n257 to the table, which would then list both band n257 and n258. This is based on the present Draft of the ETSI harmonised standard for NR BS (EN 301 908‑24 [v15.1.1\_0.0.5](https://docbox.etsi.org/MSG/TFES/70-Draft/TFES15-24/MSG-TFES-15-24v1511_005.docx)), where Band n257 is included in the Scope, but limited to operation in 26.5 – 27.5 GHz. NOTE: EN 301 908-24 is not yet complete and all requirements are not updated. * Option B: Keep the table as is, listing only band n258.   Recommendations for 2nd round: **Option A**, since we should aim at aligning 3GPP specifications and ETSI harmonised standards for European requirements. |

### CRs/TPs

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2001248  R4-2001247 | If Option A is agreed: Revise the CR and include Band n257 and n258 in the table.  If Option B is agreed: The CR is noted. |

## Discussion on 2nd round

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| **Company** | **Comments** |
| Ericsson | Option A is strongly recommended, since we should keep the 3GPP and ETSI specs aligned to reflect the regional application of the operating bands in the specifications. |
| Samsung | Sub topic#1-1: ETSI harmonised standard is draft version under discussion and review. It's suggested to study RAN4 specification impact after the ETSI officially releases its regulation with n257.Hence option B should be applied at current stage. |
| Nokia | As commented in the first round both n257 and n258 shall be included, support option A. |
| Intel | Option B. ETSI harmonized standard is still in the draft stage. 3GPP can add band n257 once ETSI officially releases its specifications including band n257. But vendors can take precaution on n257 on their own design |

## Summary on 2nd round (if applicable)

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|  | **Status summary** |
| **Sub-topic#1-1** | **Applicability of FR2 Category B Tx limits for bands n257, n260 and n261**  There was no consensus on whether to include band n257 or not. No CR can be agreed. |

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2001248 R4-2001247 | ***CR to TS 38.104 spurious emission for FR2***  The CR in R4-2001248 to be **noted**. The CR in R4-2001247 to be **withdrawn**. |

# Topic #2: EESS protection

At WRC-19 in Sharm el-Sheikh, a new allocation was identified for terrestrial IMT in the band 24.25 to 27.5 GHz. The new IMT allocation concerns 3GPP bands n257 and n258 for NR. In addition, WRC-19 established unwanted emission limits for protection of EESS in the band 23.6 to 24 GHz.

Several proposals and a set of CRs are submitted for implementation of the EESS protection limits for NR BS in FR2.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001191 | NTT DOCOMO, INC. | Proposal 1: Introduce new additional OBUE requirements for the EESS (passive) (23.6 – 24 GHz) protection  Proposal 2: The requirement for the EESS (passive) protection applies to any BSs that support a frequency range that partially or completely overlaps with “Active service band” (i.e., 24.25 – 27.5 GHz).  Proposal 3: Define a limit of – 9dBm/200MHz in the frequency range 23.6 -24 GHz for the EESS (passive) protection, and add a note indicating a limit of -3dBm/200MHz may apply to BS brought into use prior 1st September 2027. |
| R4-2001250 | ZTE Corporation | Observation 1: The WRC-19 Resolution 750 has agreed specific requirement for 23.6--24GHz for band n 258.  Observation 2: The emission requirement within 23.6--24GHz agreed in WRC-19 is much more stringent than current 3GPP OBUE requirement.  Observation 3: ECC limit is 9dB more stringent than WRC-19 requirement.  Observation 4: For ECC decision(18)06, we can wait for ECC decision.  Proposal: To capture the WRC-19 requirement in 3GPP specification. |
| R4-2001686 | Ericsson | Observation 1: The limits of unwanted emissions agreed at WRC-19 are defined in two phases, with stricter limits applicable to IMT base stations brought into use after 1 September 2027.  Observation 2: The limits of unwanted emissions agreed at WRC-19 are defined as TRP using dBW. The corresponding limits using dBm for IMT base stations would be -3 dBm/200 MHz and -9 dBm/200 MHz (TRP) respectively for Phase 1 and 2.  Proposal 1: The limits of unwanted emissions in the range 23.6 GHz to 24 GHz should only apply for a BS where any part of the downlink transmission falls within the “Active service band” (24.25 GHz to 27.5 GHz) defined in Resolution 750 [1].  Proposal 2: Both Phase 1 and 2 limits from WRC-19 Resolution 750 [1] are implemented in NR BS specifications. The Phase 1 limits would apply for equipment brought into use until 1 September 2027, while Phase 2 limits would apply after that date. |
| R4-2001420 | Nokia, Nokia Shanghai Bell | CR to 38.817-02: Measurement uncertainty for FR2 OTA additional spurious emissions requirements is captured into TR by re-using the uncertainty for OBUE and mandatory spurious emissions. |
| R4-2001421  R4-2001422  R4-2001423  R4-2001424 | Nokia, Nokia Shanghai Bell | CRs to 38.104: OTA additional unwanted emission limit is added for FR2 capturing the WRC-19 agreement of EESS protection within 23.6 – 24 GHz.  CRs to 38.141-2: OTA additional unwanted emission limit is added for FR2 capturing the WRC-19 agreement of EESS protection within 23.6 – 24 GHz. Added requirements are measurement uncertainty, test procedure and test tolerance for FR2 additional transmitter spurious emissions. |

## Open issues summary

The open issues are divided into five subtopics, which are mostly independent:

1. Applicability for band n257
2. Applicability for band n258
3. OBUE or Spurious limit
4. Limits and phased approach
5. Test tolerance for limit

### Sub-topic 2-1

If the requirement is applicable for band n257, over what Tx frequency range should it apply? Note that only 1 GHz of band n257 overlaps with the “Active service band” in Resolution 750.

**Issue 2-1: Applicability for band n257**

* Proposals
  + Option 1: The requirement for the EESS (passive) protection applies to any BSs in band n257 (26.5 – 29.5 GHz) that support a frequency range that partially or completely overlaps with “Active service band” (i.e., 24.25 – 27.5 GHz).
  + Option 2: The requirement for the EESS (passive) protection applies to a BS where any part of the downlink transmission falls within the “Active service band” (24.25 GHz to 27.5 GHz) defined in Resolution 750 [1].

### Sub-topic 2-2

If the requirement is applicable for band n258, over what Tx frequency range should it apply? Note that band n258 fully overlaps with the “Active service band” in Resolution 750.

**Issue 2-2: Applicability for band n258**

* Proposals
  + Option 1: The requirement for the EESS (passive) protection applies to any BSs in band n258.
* Recommended WF
  + Option 1

### Sub-topic 2-3

For band n257 and n258, the OBUE limits are defined out to ΔfOBUE = 1.5 GHz from the edges of the operating band. This means that for band n258 with its edge at 24.25 GHz, the range for the EES protection limit (23.6-24 GHz) is fully within the OBUE requirement range. For band n257 with its edge at 26.5 GHz, the range for the EES protection limit (23.6-24 GHz) is fully within the spurious requirement range.

**Issue 2-3: OBUE or Spurious limit**

* Proposals
  + Option 1: Define the limit as spurious limits and have a note stating that the frequency range may in some cases fall inside the OBUE freqeuncy range.
  + Option 2: Define the limit as OBUE limits and have a note stating that the frequency range may in some cases fall inside the spurious freqeuncy range.
  + Option 3: Define the limit twice – As OBUE for band n258 and as Spurious emissions for band n257.
* Recommended WF
  + Option 2, since OBUE applies for band n258 which has the smallest offset and largest impact. Duplication of requirements will then not be needed.

### Sub-topic 2-4

The limits of unwanted emissions agreed at WRC-19 are defined in two phases, with stricter (lower) limits applicable to IMT base stations brought into use after 1 September 2027. This “phased approach” to the limits can be implemented in different ways in the BS specifications.

**Issue 2-4: Limits and phased approach**

* Proposals
  + Option 1: Define the lower limit for protection of 23.6 -24 GHz, with a note indicating that a higher limit applies to BS brought into use prior to 1 September 2027.
  + Option 2: Define the higher limit for protection of 23.6 -24 GHz, with a note indicating that a lower limit applies to BS brought into use after to 1 September 2027.
  + Option 3: Define both the lower and the higher limits for protection of 23.6 -24 GHz on an equal basis, each with a Note. The note to the lower limit would indicate that it applies to BS brought into use after 1 September 2027. The note to the higher limit would indicate that it applies to BS brought into use on or before 1 September 2027.

### Sub-topic 2-5

The new limit for protection of EESS is (in some options) an additional spurious emissions requirement, where it is presently not documented how test tolerances are derived.

**Issue 2-5: Test tolerance for limit**

* Proposals
  + Option 1: Apply the same analysis as for mandatory spurious emissions and derive test tolerances, where TT > 0.
  + Option 2: Set test tolerances TT = 0 as for other regulatory requirements on spurious emissions.
* Recommended WF
  + Option 2, since the requirement originates in international regulation.

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| ZTE | Sub topic 2-1:  For band n257, the 23.6--24GHz falls in the spurious domain and the requirement is -20dBM/10MHz. As shown in zte tdoc, the limit for resolution 750 is -33dBw/200MHz(-16dBm/10MHz) before 2027 and -39dBw/200MHz(-22dBm/MHz). So for BS operating in band n257 before 2027, the EESS protection limit is covered by spurious emission limit. The only issue is BS operating in band n257 after 2027. We think additional limit should be added for this band specifying for BS brought into use after 2027.  Sub topic 2-2: Ok with the proposal  Sub topic 2-3: Ok with the WF as to choose option 2  Sub topic 2-4: Prefer option 3, which can make the situation clearer and the requirement won’t get lost in the future.  Sub topic 2-5:Ok with the WF as to choose option 2 |
| Ericsson | Sub topic 2-1: Ericsson supports Option 2, which is fully aligned with Resolution 750.  Sub topic 2-2: Ericsson supports Option 1, since band n258 fully overlaps.  Sub topic 2-3: Ericsson supports Option 2, since OBUE applies for band n258 which has the smallest offset and largest impact. Duplication of requirements will then not be needed.  Sub topic 2-4: Ericsson supports Option 1. Listing the present limit in the table and the future limit in the Note.  Sub topic 2-5: Option 2, since the requirement originates in international regulation. |
| Nokia | Sub topic 2-1: ‘Active service band’ is not only limited to n258 and therefore the requirement should apply also to any BS which supports any frequency overlapping the active service band.  Sub-topic 2-3: Slightly prefer option 1.  Sub topic 2-4: Our preference is option 3. It most closely matches the WRC-resolution.  Another thing to consider here whether we should use the term “brought into use” in 3GPP specification. 3GPP specification is first and foremost a guidance to manufacturers, and they have no control over when the base station is in the end “brought into use”. Therefore, in our contribution “brought into use” was replaced with “manufactured”.  Sub-topic 2-5. Ok to set TT = 0 as this is regulatory limit. In case the limit is specified as additional spurious emission this should not be used as a blanket approach to set TT to 0 dB for all possible additional spurious emission limits. |
| NTT DOCOMO | Sub topic 2-1: The meaning of both options seems the same. We are OK if the limit does not apply to BSs that support other than "Active service band". For example, the limit does not apply to BSs that support frequency range in 27.5 - 29.5 GHz.  Sub topic 2-3: We prefer Option 2. This limit applies for all periods, regardless of whether the transmitter is on or off. If this limit is introduced as spurious emissions requirements, both Tx and Rx spurious emissions requirements should be considered since the limit is stricter than Rx spurious emissions limits.  Sub topic 2-4: We slightly prefer Option 2, but Option 3 can be acceptable. Regarding above Nokia's comment on "manufacturing" or "brought into use", careful consideration is needed to be consistent with the original intent of the WRC-19 decision. It might be necessary to consider the case where a BS is manufactured before September 1, 2027 and brought into use after September 1, 2027. In such cases, the BS may not meet the requirements agreed in the WRC-19.  Sub topic 2-5: We prefer Option 2 since these limits are regulatory requirements. |
| Huawei | Sub topic 2-1: They seem to say the same thing but option 2 is more future proof as we won’t have to update if new bands come in that overlap  Sub topic 2-2: If option 2 is used in sub topic 2-1 then this is covered by that?  Sub topic 2-3: As both cases apply its probably safer to put in both places – option 3  Sub topic 2-4: Either is probably acceptable, but option 3 tells the whole story. The wording needs further discussion “brought into service” vs “manufactured”, when regulation changes how are old designs (made but no commissioned?) treated and what language is used? As there is a 7 year warning here maybe brought into service is applicable?  Sub topic 2-5: ok with TT=0 as regulatory limit. |
| Ericsson | Sub topic 2-1: Regarding ZTE’s comment: While it is correct that spurious limits for band n257 may be stricter than the new EESS protection limit (when integrated over 200 MHz), we should still document the new limits in the specifications. The reason is that we need to give the limits visibility, to show administrations and other external organizations that 3GPP equipment will comply. |
| Ericsson | Sub-topic 2-1: Regarding Nokia’s and DoCoMo’s comments:  Active service band is in Resolution 750 limited to 24.25-27.5 GHz, which is exactly the range of Band n258 – there the limits clearly apply. For band n257, only the range 26.5 – 27.5 GHz is within the Active service band. So the question is how the EESS limit would apply to a BS that supports band n257 (26.5 – 29.5 Gz), but which is transmitting at a frequency *higher than 27.5 GHz*, with no part of the transmission below 27.5 GHz. The transmission is then not within the active service band. The two Options mean that: - Option 1: Since the BS supports a range that overlaps with the Active service band, the EESS protection applies. - Option 2: Since the BS is not transmitting within the Active service band, the EESS protection does not apply.  Ericsson prefers Option 2, which is to align verbatim with Resolution 750. |
| Ericsson | Sub-topic 2-4: Regarding the choice of options, Ericsson could also support Option 3 as an alternative to Option 1.  Regarding Nokia and DoCoMo comments on the wording: As stated by DoCoMo, it is probably wise to copy the WRC-19 agreement verbatim, recognizing that the interpretation and wording may be different in different regions (manufacturing, placing on the market, putting into service, etc…). |
| Samsung | Sub-topic 2-1: Support Option 2, which is fully aligned with Active service band of the WRC Resolution. We don’t need administrations to over-regulate all BSs transmitting at a frequency higher than 27.5 GHz  Sub-topic 2-3: Support Option 3, which gives more clear understanding  Sub-topic 2-4: Support Option 2 and/or 3 |
| NEC | Sub topic 2-1: Support option 2.  Sub topic 2-2: Support option 1  Sub topic 2-3: Support option 3. If option 1 is adopted, we will have isolated OBUE region inside spurious region for n257. (~23.6:spurious, 23.6-24:OBUE, 24-25:spurious, 25~:OBUE, for n257). If option 2 is adopted, we will have isolated spurious region inside OBUE region for n258. It is not preferable that we will have spurious region which is nearer to the in-band region than outer OBUE region.  Sub topic 2-4: Support option 3. It best fit the notation in the WRC-19 Resolution.  Sub topic 2-5: Ok for option 2. |
| Intel | Sub-topic 2-1: Applicability for band n257  Option 2.  Sub-topic 2-2: Applicability for band n258  Support option 1  Sub-topic 2-3: OBUE or Spurious limit  Option 3, which is easier to be noticed although Option 1 and 2 are theoretically the same.  Sub-topic 2-4: Limits and phased approach  Option 3 is more clear to reader |
| Nokia, Nokia Shanghai Bell | To Ericsson comment on the two option in sub-topic 2-1: Our main preference is not to list the bands explicitly to be futureproof. Option 2 does that and is fine for us.  To Ericsson comment on wording choice: We can accept “brought into use” but, as also mentioned above, adopting this wording will create different interpretations, which we should try to limit as much as possible in 3GPP specifications. |
| ZTE | Sub-topic 2-1:  Regarding Ericsson’s comment, our concern is for band n 257, there will be two limit covering 23.6--24GHz (OBUE and spurious) if we capture the EESS protection limit in OBUE part. This can still be agreeable, in case we have an additional comment stating that the more stringent requirement will apply. |

## Summary for 1st round

### Open issues

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|  | **Status summary** |
| **Sub-topic#2-1** | **Applicability for band n257**  There seems to be consensus to document limits for band n257, while there are split views on how to express the frequency range for which they apply.  **Tentative agreement:**  EESS limits are documented in the specifications for band n257, event though present OBUE limits may be stricter in Phase 1.  Candidate options:  The two options are reworded below, to more clearly state the specification impact (for clarity, both n257 and n258 are included here, assuming limits are fully applicable to n258):   * Option 1: Protection limits are specified for 23.6-24 GHz, applicable for any BS supporting Band n257 or n258. * Option 2: Protection limits are specified for 23.6-24 GHz, applicable when any part of the BS transmitted carrier(s) falls within 24.25 GHz to 27.5 GHz.  NOTE: In this second option, the limtis would not apply to a Band n257 NR BS transmitting within 27.5‑29.5 GHz. |
| **Sub-topic#2-2** | **Applicability for band n258**  **Tentative agreement:**  The requirement for the EESS (passive) protection applies to any BSs in band n258. |
| **Sub-topic#2-3** | **OBUE or Spurious limit**  There is equal support for Option 2 and Option 3 in the comments received and both have good arguments. Based on this, further views on those options should be given in the 2nd round. The pros and cons given in comments are stated below.  Candidate options:   * **Option 2**: Define the limit as OBUE limits and have a note stating that the frequency range may in some cases fall inside the spurious freqeuncy range. PROS: OBUE applies for Band n258, which has the smallest offset and largest impact; CON: Will give an isolated “spurious region” inside OBUE for Band n258. * **Option 3**: Define the limit twice – As OBUE for band n258 and as Spurious emissions for band n257. PROS: The limits apply both as OBUE (n258) and spurious (n257); More clear understanding; Easier to notice. CONS: Duplication of requirement. |
| **Sub-topic#2-4** | **Limits and phased approach**  The largest support is for Option 3, i.e. to define both limits.  **Tentative agreements:**  Option 3; Define both the lower and the higher limits for protection of 23.6 -24 GHz on an equal basis, each with a Note. The note to the lower limit would indicate that it applies to BS brought into use after 1 September 2027. The note to the higher limit would indicate that it applies to BS brought into use on or before 1 September 2027. |
| **Sub-topic#2-5** | **Test tolerance for limit**  There is general support for Option 2, to set TT=0, based on the EESS protection limit being a regulatory requirement.  **Tentative agreements:** Option 2, set TT=0. |

Suggestion on WF/LS assignment:

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|  | **WF/LS t-doc Title** | **Assigned Company, WF or LS lead** |
| #1 (R4-2002466) | Way forward on EESS protection for NR BS operation in Band n257 and n258 | Ericsson |

#### Sub-topic 2-6

One open issue for feedback from proponents is whether we should target agreeing a Way Forward or a complete set of CRs from WG4#94-e.

**Sub-topic #2-6: WF or finalize CR**

* Proposals
  + Option 1: The outcome of WG4#94-e should be a WF agreement.
  + Option 2: The outcome of WG4#94-e should be an agreed set of CRs.

### CRs/TPs

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2001420 | *CR to 38.817-02: Measurement uncertainty for FR2 OTA additional spurious emissions requirements*  Since the analysis for MUtotal would still apply (even with TT=0), it should be possible to agree on the CR. **Agreeble.** |
| R4-2001421 R4-2001423  R4-2001422 R4-2001424 | *CRs to TS 38.104/38.141-2: Additional OTA transmitter spurious emissions requirements for EESS protection*  We will return to the CRs once we have decided whether to go for WF or CRs. If we agree to do CRs, the Rel-15 CRs need to be revised. |

## Discussion on 2nd round

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| **Company** | **Comments** |
| Ericsson | **Sub-topic#2-1:** Ericsson still supports Option 2, which is fully aligned with Resolution 750.  We note that the 3GPP decision may influence regulation in different region, but that we ultimately will have to align with the way the limtis are defined in regional regulation for band n257 operation.  **Sub-topic#2-3**: While we think Option 2 is the best alternative, we could also support Option 3 as a compromise to give full visibility to the limits in Resolution 750.  **Sub-topic#2-6**: If there is no consensus on Sub-topics #2-1 and #2-3 during Tuesday, we will have to go for Option 1 and postpone CRs until next meeting. |
| Samsung | Sub-topic #2-1: Option 1 lost favour with most companies already. If the WRC-19 resolution is the only source RAN4 can take so far, it should be adopted as it is using the frequency range rather than listing the bands explicitly. We are ok with Nokia’s CR, R4-2001421. If no consensus can be reached during this week, we are also fine to wait for regulators to declare intent to adopt the Resolution with the bands. |
| NTT DOCOMO | Sub-topic#2-1: We prefer Option 2 since it is consistent with WRC-19 decision.  Sub-topic#2-3: We prefer Option 2. In TS 38.104, there is a good reference. FR1 additional OBUE for protection of DTT is similar situation.  *In certain regions the following requirement may apply for protection of DTT. For BS type 1-O operating in Band n20, the level of emissions in the band 470-790 MHz, measured in an 8 MHz filter bandwidth on centre frequencies Ffilter according to table 9.7.4.2.1.1-1, shall not exceed the maximum emission TRP level shown in the table. This requirement applies in the frequency range 470-790 MHz even though part of the range falls in the spurious domain.*  Sub-topic #2-6: We are OK with Option 1.  General questions:  Does this new limit apply to only TX ON period, or both TX ON/OFF periods?  Option 2 in Issue 2-3:  Does additional OBUE apply to both TX ON and OFF periods?  Option 3 in Issue 2-3  If this new limit applies to both TX ON and OFF periods, we may need to consider both TX and RX spurious emissions requirements. |
| ZTE | Sub-topic#2-1: We prefer option 2 since it is the WRC-19 decision. If any further concern about different bands occur in the future, we can fix it at that time.  Sub-topic#2-3: We prefer option 2 as indicated in the first round.  Sub-topic#2-6: We prefer option 1 as how to capture the requirement is still under discussion.  For Docomo’s concern, we agree it will be an issue as current RX spurious emission is the same requirement as TX spurious emission. We think the requirement should also be captured in RX spurious emission part. Maybe this can also be captured in the WF? |
| Huawei | Sub-topic 2-1: As before option 2 Is our choice  Sub-topic 2-3: Option 3 is the safest approach as requirement cannot be missed, the example of the Rx emissions highlights this, if the decision affects different requirements it is clearer if the effect on each is highlighted in that requirement, not implied from another. But if option 2 is favored and is clear then we can accept.  Sub-topic 2-6: Option 1 is best so we have more time to consider the CR’s |
| Nokia | Sub-topic 2-1: Option 2 is fine to us  Sub-topic 2-3: Prefer option 3 to make requirement clear (despite there will be requirement duplication in specification) |
| NEC | Sub-topic#2-1: Option 2 is fine.  Sub-topic#2-3: We prefer option 3.  Extending OBUE region into spurious region (DTT protection case) and creating isolated OBUE region in spurious region sound different.  New limit should apply to both TX and RX periods.  We are negative to define the same limits as OBUE for TX, but as spurious for RX.  We think TX spurious/OBUE requirements could cover the limits in RX period, unless more stringent limits are applied in RX period.  Sub-topic#2-6: Option 1 is fine. |

## Summary on 2nd round (if applicable)

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|  | **Status summary** |
| **Sub-topic#2-1** | **Applicability for band n257**  **Tentative agreement:**  There was strongest support for Option 2:  Protection limits are specified for 23.6-24 GHz, applicable when any part of the BS transmitted carrier(s) falls within 24.25 GHz to 27.5 GHz. |
| **Sub-topic#2-3** | **OBUE or Spurious limit**  **Tentative agreement:**  There was equal support for Option 2 and 3, but additional support for Option 3 being a compromise. It was therefore agreed to define the limit twice – As OBUE for band n258 and as Spurious emissions for band n257.  NOTE: Detailed wording and implementation to be worked out when the CR is drafted. |
| **Sub- topic #2-6:** | **WF or finalize CR**  **Tentative agreement:**  Since consensus on the WF was reached late, proponents supported to not finalize the CRs at this meeting. |

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2001421 R4-2001423  R4-2001422 R4-2001424 | ***CRs to TS 38.104/38.141-2: Additional OTA transmitter spurious emissions requirements for EESS protection***  The CRs in R4-2001421 and R4-2001423 to be **noted**. The CRs in R4-2001422 and R4-2001424 to be **withdrawn**. |
| WF #1 (R4-2002466) | ***Way forward on EESS protection for NR BS operation in Band n257 and n258***  The WF was developed based on the tentative agreements. **Agreeable**. |

# Topic #3: NR BS Regional requirements

In the previous meeting, OTA receiver spurious emissions requirements for BS type 2-O was modified. It was stated that additional limits may apply regionally. However, it is not listed in the regional requirements table.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001005  R4-2001006  R4-2001007  R4-2001008 | NEC | The CR Add the OTA receiver spurious emissions requirements for BS type 2-O in the regional requirements table. |

## Open issues summary

No open issues identified.

## Companies views’ collection for 1st round

### CRs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001005 R4-2001006 R4-2001007 R4-2001008 | Ericsson agrees to the CRs adding the regional requirement. |
| Huawei: Note 5 in RX emissions table states: “additional limits may apply regionally” but it’s not clear what these are or where they may be from ?  As it stands this note is in the table hence adding the requirement to the list is ok – but is the note really needed? We don’t have such a note in Tx emissions, or Tx and RX for FR1? I have a feeling the note was added to cover Europe Rx emission but now the table is compatible with those the note (and the entry in the regional requirements table in the CR) are not needed |
| Ericsson: Response to the Huawei comment; Note 5 in Table 10.7.3-1 reflects that Japanese regulation presently is slightly different but may change soon. This was the outcome of the WF agreed in R4-1913030 in Chongqing: “Add a note for Japanese regulation. After revising Japanese regulation for alignment, remove the note from the 3GPP specification”  We should then also remember to remove this regional requirement text in subclause 4.5!  Or do we not add the text to 4.5 at all, since NOTE 5 is anyway temporary…? |
|  |

## Summary for 1st round

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2001005 R4-2001007 | *CR to TS 38.104/38.141-2: Regional requirements*  There were no objections to agreeing to the CRs.  CRs are **agreeable**. |
| R4-2001006 R4-2001008 | Corresponding Category A CRs are also **agreeable**. |



# Topic #4: TR 38.817-2 updates

Several proposals introduce text in the TR for BS RF.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2000891 | Samsung | The CR proposes to add motivation for FR2 Category B spurious emission limits. |
| R4-2001249 | ZTE Corporation | The CR proposes to add a statement for out-of-band blocking when channel bandwidth is greater than 900MHz. |
| R4-2000659 | Nokia, Nokia Shanghai Bell | The CR adds statements about SCS for Rx dynamic range, plus makes editorial updates to many requirements. |
| R4-2001004 | NEC | The CR adds statements about SCS for Rx dynamic range |

## Open issues summary

### Sub-topic 4-1

**Issue 4-1: Motivation for FR2 Category B spurious emission (R4-2000891)**

* Proposals
  + Option 1: Add motivation for FR2 Category B spurious emission
* Recommended WF
  + Option 1

### Sub-topic 4-2

**Issue 4-2: Out-of-band blocking when channel bandwidth is greater than 900MHz**

* Proposals
  + Option 1: Add statement that the boundary should be discussed, if wider BW than 900 MHz is specified

### Sub-topic 4-3

**Issue 4-3: SCS for Rx dynamic range (R4-2000659, R4-2001004)**

* Proposals
  + Option 1: Add text defining the SCS according to R4-2000659
  + Option 2: Add text defining the SCS according to R4-2001004

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 4-1: For Samsung’s paper, we have modification of FR2 TX spurious emission in our CR R4-2001247 and R4-2001248 which have defined more bands than only band n258. So maybe this can be captured also in the TR. |
| Ericsson | Sub topic 4-1: Ericsson agrees to add the background for FR2 Category B spurious emissions, but the text will need some revision.  Sub topic 4-2: Ericsson does not agree to the text proposed in Option 1. We do not need to document in the TR what “should be discussed”. When new BW are added in the future, the TR and TS can be updated accordingly.  Sub-topic 4-3: Ericsson prefers Option 1 with some modifications: The SCS doesn’t really depend on the FRCs as the FRCs depend on the considered SCS. Probably more correct to write: “SCS is the considered subcarrier spacing for that wanted signal”. |
| Nokia | Sub topic 4-1: Text in section 9.7.5.3 is a bit unclear if they mean a new band number with cat B is introduced or is adding cat B to existing bands also in scope.  Sub topic 4-2: Better put 900 MHz into the main paragraph to avoid conflict statements; redundant space before ‘If’’. It should be clarified that 900 MHz refers to operating band bandwidth and not to channel bandwidth.  Sub topic 4-3: R4-2001004 can be combined with R4-2000659 which makes editorial updates to many requirements. Ok with Ericsson wording: “SCS is the considered subcarrier spacing for that wanted signal”. |
| Huawei | Sub topic 4-1: The bands for which this applies was discussed in earlier sub topic, as this is TR then maybe best to avoid specific numbers and just put the “rules” by which bands are included i.e. CAT B limits are adopted somewhere for the band..  Sub topic 4-2: Ok but “should “ is not really correct work for TR “may” is better  Sub topic 4-3: Both CR’s contain multiple corrections so both may be needed. For the SCS text the Nokia ne uses a proper reference (although it’s a specific reference and the referenced document is not versioned!!). It might be possible to just use a general reference and not mention the sub-clause in this case. |
| Samsung | Sub topic 4-1: fine to have revision to address companies’ comment. |
| NEC | Sub topic 4-1: Ok to add motivation for FR2 cat-B spurious emission, but text needs modifications.  Sub topic 4-2: No need to add statement. It is clear that the boundary should be discussed if wider BW than currently defined. If the statement is added, we may want to have a statement for FR2 BW. We may also want to have a statement for ΔfOOB, etc.  Sub topic 4-3: Both R4-2000659 and R4-2001004 need modifications. They shall be merged. |
| ZTE | Sub topic 4-2:  Thanks for all the comments.  For Ericsson and NEC: The sentence is simply copy paste from TX in-band and out-of band boundary(subclause 5.10). We think this should also apply for RX in-band and out-of-bnad boundary and needs to be captured in the TR.  For Nokia: How to capture that can be further discussed. |

## Summary for 1st round

### Open issues

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| --- | --- |
|  | **Status summary** |
| **Sub-topic#4-1** | **Motivation for FR2 Category B spurious emission (R4-2000891)**  There seems to be consensus to add the text, but some revisions are needed  Tentative agreements: Introduce text in a revised CR, with comments reflected:   * Include the bands agreed under Issue #2 (ZTE, HUawei) or simply state all bands where Category B limtis are applicable (Huawei) * Improve clarity of text (Nokia comment)   **Recommendations for 2nd round:** Revise CR as above. |
| **Sub-topic#4-2** | **Out-of-band blocking when channel bandwidth is greater than 900MHz (R4-2001249)**  There are opinions to not add any text at all, while others would agree to include a modified version.  **Recommendations for 2nd round:** Continue discussing CR content. |
| **Sub-topic#4-3** | **SCS for Rx dynamic range (R4-2000659, R4-2001004)**  There were views that both CRs has merit, but revisions are needed.  **Recommendations for 2nd round:** Merge the two CRs, using R4-2000659 as baseline. |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2000891 | *CR for background on Category B unwanted emission requirement for BS type 2-O*  CR to be **revised (R4-2002467)** based on Sub-topic 4-1 discussions. |
| R4-2001249 | *CR to TS 38.817-02 out-of-band blocking boundary*  Continue discussing the CR in round two. **Return to.** |
| R4-2000659 | *CR to TR 38.817-02: Clarifications and corrections on receiver dynamic range and other requirements*  To be **revised (R4-2002468)** (Merge with R4-2001004) |
| R4-2001004 | *CR to TR 38.817-02: Clarification on receiver dynamic range requirement*  To be **noted** (Merge with R4-2000659) |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub-topic#4-2: As currently the case that channel bandwidth greater than 900MHz is not clear for RX out-of-band boundary, we think this CR is quite necessary to express this. Otherwise people can not find any investigation from the TR. |
| Huawei | Sub-topic 4-2: The CR for the TR and uses “should” this is not correct language for a TR. In general anything not currently covered (larger bands, different frequencies, new regulation, etc…..) may be discussed, it’s the nature of the work. So we are not sure if this is necessary – but if the language is corrected then it’s ok. |
| Nokia | Sub-topic#4.2: If the necessity of the CR is agreed, then CR should be revised according to comments (including ours in 1st round). |

## Summary on 2nd round (if applicable)

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#4-1** | **Motivation for FR2 Category B spurious emission (R4-2000891)**  The CR in R4-2000891 was revised based on 1st and 2nd round discussions. |
| **Sub-topic#4-2** | **Out-of-band blocking when channel bandwidth is greater than 900MHz (R4-2001249)**  There were conflicting opinions on how to revise the CR in R4-2001249 and no agreement was made. The CR can be noted. |
| **Sub-topic#4-3** | **SCS for Rx dynamic range (R4-2000659, R4-2001004)**  There were views that both CRs has merit, but revisions are needed.  **Recommendations for 2nd round:** Merge the two CRs, using R4-2000659 as baseline. |

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2002467 | ***CR for background on Category B unwanted emission requirement for BS type 2-O***  Revised based on 1st and 2nd round discussions. **Agreeable**. |
| R4-2001249 | ***CR to TS 38.817-02 out-of-band blocking boundary***  No agreement, the CR to be **noted**. |
| R4-2002468 | ***CR to TR 38.817-02: Clarifications and corrections on receiver dynamic range and other requirements***  Was merged from R4-2000659 and R4-2001004. **Agreeable**. |

# Topic #5: LTE-NR Channel spacing

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001241  R4-2001242  R4-2001243  R4-2001244 | ZTE Corporation | CR to 37.104 makes the following observations and proposals:   * The channel spacing of current TS 37.104 for EN-DC scenario is not aligned with the agreed CR of R4-1915485. This is corrected. * CR (R4-1915485) is not captured correctly to the spec. |

## Open issues summary

### Sub-topic 5-1

The CR lists as reasons for change that the channel spacing of current TS 37.104 for EN-DC scenario is not aligned with the agreed CR of R4-1915485 (for 38.104).

**Issue 5-1: Channel spacing of current TS 37.104 for EN-DC scenario**

* Proposals
  + Option 1: Delete the 30kHz channel raster and change to 30 kHz channel raster granularity.
* Recommended WF
  + Option 1

### Sub-topic 5-2

The CR lists as reasons for change that this CR (R4-1915485) is not captured correctly to the spec Sub-topic description. There is no proposal for a correction and the CR referenced is for another specification.

**Issue 5-2: R4-1915485 not captured correctly**

* Proposals
  + ???
* Recommended WF
  + If there is no proposed change, this “reason for change” should be deleted from the cover page.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub topic 5-2: We are ok with the recommended WF to update the cover page. |
| Ericsson | Sub topic 5-1: Ericsson agrees with option 1, to align the text as proposed.  Sub topic 5-2: An explanation from the proponent would be needed The final CR created in round 2 will need to be revised. |
| Nokia | Sub-topic 5-1: Proposed additional changes/comments:  1. “The spacing between carriers” -> “The spacing between E-UTRA and NR carriers”  2. Since this specification Clause is not restricted to CA or DC, it is not clear why EN-DC is included in the text proposal? |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#5-1** | There were comments on the text that are not yet resolved:   1. “The spacing between carriers” -> “The spacing between E-UTRA and NR carriers” 2. Since this specification Clause is not restricted to CA or DC, it is not clear why EN-DC is included in the text proposal?   **Recommendations for 2nd round:** Resolve comments. |
| **Sub-topic#5-2** | Tentative agreements: The reasons for change concerning “Correction CR” to be removed from cover page.  **Recommendations for 2nd round:** Revise CR. |

### CRs/TPs

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2001241 R4-2001243 R4-2001242 R4-2001244 | Resolve comments on the text.  **Revise CRs (R4-2002469, R4-2002470)**. |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **Company** | **Comments** |
| ZTE | Sub-topic 5-2: The two draft revised CRs has been uploaded to the thread inbox based on comments received in the first round. |
| Nokia | Sub-topic 5-1: We are fine with revised documents |

## Summary on 2nd round (if applicable)

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| --- | --- |
|  | **Status summary** |
| **Sub-topic#5-1** | The comments were resolved and the CRs revised. |
| **Sub-topic#5-2** | Solved by revising the cover page. |

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2002469 R4-2002470 R4-2001242 R4-2001244 | All CRs are **agreeable**. |

# Topic #6: TS 38.104 Editorial

A few CRs were submitted with editorial corrections.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2001245  R4-2001246 | ZTE Corporation | CRs makes several editorial corrections. |
| R4-2000660  R4-2000661 | Nokia, Nokia Shanghai Bell | CRs makes several editorial corrections. |

## Open issues summary

No open issues identified.

## Companies views’ collection for 1st round

### CRs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2001246 | Ericsson: The editorial corrections are OK. |
|  |
|  |
| R4-2000660 | Ericsson: The editorial corrections are OK. |
|  |
|  |

## Summary for 1st round

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2001246 R4-2001245 | **Agreeable** |
| R4-2000660 R4-2000661 | **Agreeable** |

## Discussion on 2nd round (if applicable)

It was discovered that the titles of R4-2000660 and R4-2000661 had incorrect titles and need to be **revised**.

## Summary on 2nd round (if applicable)

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2002527 R4-2002528 | Revisions of R4-2000660 and R4-2000661. **Agreeable**. |