[98-bis-e][320] NR_R17_SpectrumWI_Demod_NWM - Version 0.0.7
RAN4

3GPP TSG-RAN WG4 Meeting # 98-bis-e

Electronic Meeting, April 12 - 20, 2021

R4-2106142

Agenda item: 7.25.6, 7.27.4.2, 7.27.4.3

Source: Moderator (Ericsson)

Title: Email discussion summary for [98-bis-e][320] NR_R17_SpectrumWI_Demod_NWM

Document for: Information

1 Introduction

This email discussion discusses the issues on UE/BS demodulation requirements for Rel-17 spectrum WFs including NR 47GHz bands and new CBW 35/45MHz in FR1.

Candidate targets of this email discussion is listed as follows:

Table 1: Candidate of targets of email discussion.

Topics	1st round discussion	2nd round discussion
Topic #1: UE demod for 47GHz:	Discuss the applicable operating bands of FR2 UE demodulation requirements are extended up to 48200MHz.	Discuss the way forward Discuss TP/draft CR, if necessary
Topic #2: BS demod for 47GHz	Discuss the existing FR2 BS demodulation requirements are reusable for 47GHz band. Discuss the testability of BS demodulation requirements for 47GHz bands.	Discuss the way forward Discuss TP, if necessary
Topic #3: UE demod for CBW 35/45MHz	Discuss the impact to UE demodulation and CSI reporting requirements	Discuss the way forward Discuss work split and simulation assumption, if necessary

2 Topic #1: UE demodulation for 47GHz band (AI 7.27.4.2)

2.1 Companies' contribution summary

Table 2: Summary of contributions.

Tdoc	Source	Proposals / Observations
R4-2104843	Apple Inc.	**Proposal 1:** Define applicability of requirements in FR2 for 47GHz band based on outcome of demod testability discussion.
R4-2106468	Qualcomm Incorporated	**Proposal 1:** For UE Demodulation performance in FR2 up to 64QAM (MCS 18), the existing UE performance requirements in 38.101-4 can be extended up to 48.2GHz including the 47GHz band. **Proposal 2:** If the range of applicability of UE Demodulation performance in FR2 for 256QAM needs to be extended, a dedicated additional evaluation of the performances is required.
R4-2106823	Huawei, HiSilicon	**Proposal 1:** Keep current requirement for the 64QAM rank1 case and add extra 1dB for the 64QAM rank 2 case. **Proposal 2:** Do not test 256QAM at 47GHz.
R4-2106859	Ericsson	**Proposal:** Extend the applicable FR2 operating bands in TS38.101-4 Clause 7.1.1.1 from 40000 MHz to 48200 MHz.
R4-2106860	Ericsson	TP to TR38.847
R4-2106861	Ericsson	draft CR to TS38.101-4

2.2 Open issues summary and companies' view

2.2.1 Open issue

2.2.1.1 Issue 1-1: Applicability of Rel-16 FR2 UE demodulation requirements for 47GHz band

Proposal: Define the applicability of Rel-16 FR2 UE demodulation requirements for 47GHz band based on outcome of demodulation testability discussion

Recommended WF: Collect companies' inputs

Feedback Form 1: Applicability of FR2 UE demodulation requirements for 47GHz band is based on outcome of demodulation testability discussion?

Item	Company	Comments
1	Ericsson Japan K.K.	We know FR2enhTestMethods are discussing the possible maximum achievable SNR drop for 47GHz (n262) compared with 40GHz (n259), but we are not sure when SI FR2enhTestMethods concludes. Considering the TU allocation for 47GHz WI, we prefer this WI (NR47GHzband) focuses on the study whether the existing (Rel-15/16) FR2 UE demodulation requirements can be extended to 48.2GHz considering the practical phase noise (PN) model. If there are issues relating to testability that are concluded in the test enhancements SI that impact the applicability and definition of requirements, then the conclusions will need to be applied for the whole of FR2; such an activity should be done separately.
2	Huawei Tech.(UK) Co.. Ltd	[Huawei, HiSilicon] Based on our evalutions: • 0.3dB and 1dB performance degradation at 47GHz for 64QAM Rank 1 and Rank 2 respectively, it is feasible to keep the existing requirements of 64QAM Rank 1 for 47GHzm, but 1dB extra margin is perferred on top of the existing requirements for 64QAM Rank 2. • 3dB performance degradation for 256QAM Rank 1 at 47GHz, either not test 256QAM for 47GHz or enough extra margin should be added on top of the existing requirements for FR2 256QAM test.
3	Apple GmbH	Based on our proposal, we support to define the applicability of Rel-16 FR2 UE demodulation requirements for 47GHz band based on outcome of demodulation testability discussion.

Item	Company	Comments
4	Apple GmbH	I was able to see other company comments only after submitted mine. Hence providing an update. Based on the existing test methods TR, the maximum SNR is 20dB, for up to 40GHz carrier. Since none of the requirements in FR2 exceed that, we don't see an issue with applicability of requirements on FR2. We understand that the baseband requirements are derived based on suitable PN model, carrier frequency assumption, but it seems conflicting if some of the requirements might not be testable. Question to Huawei: Extra margin will increase the SNR requirement, wouldn't that be more reason not to have those applicable to 47GHz? given the testability SNR limitation?
5	ROHDE & SCHWARZ	No strong view. However, FR2 testability for n262 is discussed as part of the testability study item. In addition RAN5 is currently actively discussing the achievable SNR for the different TCs. From what we is being discussed in RAN5, the SNR may be rather limited at these frequencies. For reference, currently RAN5 is considereing [7.3 dB] SNR underfading conditions for FR2b (up to 40 GHz). Details of the RAN5 discussion can be found in R5-211936, R5211929 and R5211950.
6	Qualcomm Technologies Int	From our point of view, the extension of the applicability of the requirements should be independent from the ongoing testability discussion, and the discussion in this thread should determine whether the existing FR2 requirements can be extended to include band n262 or not. Whether these requirement will or won't be tested depends on requirement SNR and testable SNR, but it is our view that testable SNR can be subject to improvements in the future and we don't see why we should limit the requirements applicability in view of the current testable SNR restriction.
7	Ericsson Japan K.K.	[Ericsson] We still have concern to link the ongoing FR2 testability SI to this WF, since we don't know when this SI have conclusion. As we commented in #1, the conclusions of FR2 testability SI will need to be applied for the whole of FR2 requirements. If actions are needed for the FR2 requirements, a separate activity covering all of FR2 should be initiated separately. Moreover as commented by Rohde & Schwarz in #5, RAN5 is discussing test FR2 testability and as they said the achievable SNR could be less than 10dB in the <u>fading</u> condition (in our understanding, the current RAN4 max SNR assumption of 20dB in FR2 is based on the <u>static</u> condition). In this case almost all the existing FR2 UE requirements are not testable. Since we are not sure the conclusion for both RAN4 FR2 testability SI and RAN5 FR2 testability discussion, we think this WI should independently focus on the applicability of the existing UE FR2 requirements as agreed in the last meeting.

2.2.1.2 Issue 1-2: Applicability of FR2 UE demodulation requirements except for 256QAM and 64QAM Rank 2

Proposal: Extend the applicable FR2 operating bands up to 48200MHz and keep the requirements as is.

Recommended WF: Collect companies' inputs

Feedback Form 2: Applicability of FR2 UE demodulation requirements except for 256QAM and 64QAM Rank 2

Item	Company	Comments
1	Ericsson Japan K.K.	We support the proposal. The required SNR for 64QAM rank 1 is less 12.4dB, which is also achievable.
2	Huawei Tech.(UK) Co.. Ltd	The proposal is fine for us
3	Apple GmbH	Current requirements are applicable for band n262 except for 256QAM and 64QAM Rank 2 and also test 3-1 with enhanced Type 1 receiver.
4	Intel Corporation (UK) Ltd	We support that current radiated requirements are applicable for FR2 operating bands up to 48200 MHz except 256QAM and Rank 2 64QAM. As for Rank 2 16QAM requirements with enhanced receiver we think it is better to check applicability because this test case was not agreed on the previous meeting for analysis.
5	Qualcomm Technologies Int	Support the proposal

2.2.1.3 Issue 1-3: Applicability of FR2 UE demodulation requirements for 64QAM Rank 2

Proposals:

Option 1: Extend the applicable FR2 operating bands up to 48200MHz and keep the requirements as is.

Option 2: Extend the applicable FR2 operating bands up to 48200MHz but add extra 1dB in the required SNR.

Recommended WF: Collect companies' inputs

Feedback Form 3: Applicability of FR2 UE demodulation requirements for 64QAM Rank 2

Item	Company	Comments
1	Ericsson Japan K.K.	We think the performance impacts depend on the phase noise model. But at least Qualcomm reports the existing 64QAM rank 2 requirements can be applicable for 47GHz band. We therefore think it is possible to achieve the same requirements by applying the proper compensation technique. We prefer option 1, but we may need more inputs from other companies.
2	Huawei Tech.(UK) Co.. Ltd	Based on our evaluations, prefer Option 2.
3	Apple GmbH	We are not fine with either option and propose that the tests are not applicable to band n262/ up to 48.2GHz.
4	Intel Corporation (UK) Ltd	As we see, based on submitted results there are different observations among companies due to different assumptions on phase noise model. Under different simulation assumptions we cannot conclude on requirements applicability. During the Rel-16 DL 256QAM discussion it was agreed to consider example 2 UE model from TR 38.803 for the analysis of required SNR for performance requirements. We can also reuse this model. Based on results from Huawei there is at least 1 dB degradation with this model. We also observed higher than 1 dB degradation with this model internally. So we suggest further discuss requirements applicability of minimum performance requirements but with aligned phase noise model assumption. As for different compensation techniques, it should be up to company decision.
5	Qualcomm Technologies Int	Regarding the results shared by Huawei in R4-2106823 and used here to support Option 2, we do not see how these motivate the introduction of the 1dB relaxation. According to the observation 1 contained in their paper **"There is about 0.3 and 1dB performance degradation with the phase noise at the 47GHz band for 64QAM rank 1 and 2 case respectively."**. In fact the results provided show this effect of PN on the signal for 64QAM Rank 2, but they do offer insights as to whether this degradation is specific for 47GHz or that is already accounted for in the FR2 requirement for 64 QAM Rank 2 that cover until 40GHz. It is our opinion that the metric to be observed should not be absolute impact of phase noise on 64QAM Rank 2 performance at 47 GHz, but the eventual increased degradation for this simulation performed at 47GHz compared with carrier frequencies up to 40GHz already included in the requirements. Support option 1: in our evaluation the degradation for 64QAM Rank 2 is negligible and the requirement can be extended as proposed.

2.2.1.4 Issue 1-4: Applicability of FR2 UE demodulation requirements for 256QAM

Proposals:

Option 1: Extend the applicable FR2 operating bands up to 48200MHz and keep the requirements as is.

Option 2: Need more evaluation

Option 3: Do not test 256QAM at 47GHz.

Recommended WF: Collect companies' inputs. Moderator would like ask the proponents of Option 3 how to capture this in the spec if possible.

Feedback Form 4: Applicability of FR2 UE demodulation requirements for 256QAM

Item	Company	Comments
1	Ericsson Japan K.K.	We prefer option 1, but we are open to evaluate the 256QAM requirements further. In case it should be concluded that meeting requirements for 256QAM is not feasible in 47GHz band, then in that case the spec should make the RAN4 requirement not applicable, not just apply the RAN4 requirement but exclude RAN5 testing.
2	Huawei Tech.(UK) Co.. Ltd	For option 3, add corresponding test applicability rule like did for requirements that are only applicable for frequency bands up to 40GHz. This can be stated that the requirements for 256QAM is not applicable for frequency band above 47GHz.
3	Apple GmbH	We support option 3.
4	Intel Corporation (UK) Ltd	We prefer Option 2 with aligned phase noise model assumption among companies.
5	Qualcomm Technologies Int	Support Option 2, encouraging companies to provide 256 QAM simulation results (i.e. based on test 3-1, table 7.2.2.2.1-5, 38.101) to motivate the proposed extension of the requirements to 47GHz

2.2.2 CRs/TPs comments collection

Feedback Form 5: Comments collection (TP: R4-2106860)

Item	Company	Comments

Feedback Form 6: Comments collection (draft CR: R4-2106861)

Item	Company	Comments

2.3 Summary of 1st round

2.3.1 Issue 1-1: Applicability of Rel-16 FR2 UE demodulation requirements for 47GHz band

Candidate options:

Option 1: Define the applicability of Rel-16 FR2 UE demodulation requirements for 47GHz band based on outcome of demodulation testability discussion

Option 2: Extension of the applicability of the requirements should be independent from the ongoing testability discussion

Recommendations for 2nd round: Need more discussion.

2.3.2 Issue 1-2: Applicability of FR2 UE demodulation requirements except for 64QAM Rank 2 and 256QAM

Tentative agreements: Extend the applicable FR2 operating bands up to 48200MHz for Rel-15/16 FR2 UE demodulation requirements except for 256QAM, 64QAM rank 2, and 16QAM rank 2 with Enhanced receiver type 1

Recommendations for 2nd round: Discussed in WF.

2.3.3 Issues 1-3: Applicability of FR2 UE demodulation requirements for 64QAM Rank 2

Tentative agreements: Companies need further evaluation whether the applicable FR2 operating bands up to 48200MHz with additional extra 1dB or without additional margin for 64QAM Rank 2 test case.

Recommendations for 2nd round: Discussed in WF.

2.3.4 Issue 1-4: Applicability of FR2 UE demodulation requirements for 256QAM

Tentative agreements: Companies need further evaluation whether the following UE demodulation requirements are applicable for 47GHz band for the following test cases:

256QAM Rank 1 (TS38.101-4 Table 7.2.2.2.1-3 Test 1-4)

16QAM Rank 1 with Enhanced Receiver Type 1 (TS38.101-4 Table 7.2.2.2.1-5 Test 3-1)

Recommendations for 2nd round: Discussed in WF.

2.4 Discussion on 2nd round

2.4.1 Open issues

2.4.1.1 Issue 1-1: Applicability of Rel-16 FR2 UE demodulation requirements for 47GHz band

Option 1: Define the applicability of Rel-16 FR2 UE demodulation requirements for 47GHz band based on the outcome of ongoing testability discussion (FR2_enhTestMethods).

Option 2: Extension of the applicability of the requirements should be independent from the ongoing testability (FR2_enhTestMethods) discussion.

Feedback Form 7: Applicability of Rel-16 FR2 UE demodulation requirements for 47GHz band

Item	Company	Comments
1	Ericsson Japan K.K.	[Ericsson] We support Option 2. This WI should focus on whether the existing FR2 requirements can be extended to include band n262 or not, with the phase noise assumption. We respect the ongoing FR2 testability SI and RAN5 testability discussion. As we commented in the 1st round, however, we are not sure when these studies complete, and the conclusions may affect to whole RAN4 FR2 UE demodulation requirements. We suggest RAN4 revisit the FR2 UE demodulation (and CSI reporting) requirements after SI testability is complete if necessary.
2	Qualcomm Technologies Int	[Qualcomm] The discussion happening on this thread will decide if the requirements are applicable to band n262 or not. The discussion on FR2 testability will conclude if they can be tested or not. In our view discussing these issues separately makes more sense in this context, so support Option 2.
3	Apple GmbH	Thanks for companies comments. We agree with Option 2. The applicability of requirements will be decided based on the baseband performance with suitable PN model.
4	Apple GmbH	We would also like to add that perhaps we should re-visit the applicability based on testability once testability SI is complete if necessary.
5	Huawei Tech.(UK) Co.. Ltd	The proposal from Apple to capture to re-visit the testability once testability SI is complete is fine for us.

2.4.2 CRs/TPs/WFs comment collection

Feedback Form 8: Comments collection for 'Way forward on UE/BS demodulation on NR 47GHz band'

Item	Company	Comments

2.5 Summary of 2nd round

All the agreements are captured in way forward R4-2106091.

3 Topic #2: BS demodulation for 47GHz band (AI 7.27.4.3)

3.1 Companies' contribution summary

Table 3: Summary of contributions

Tdoc	Source	Proposals / Observations
R4-2106781	Nokia, Nokia Shanghai Bell	**Proposal 1:** Existing demodulation minimum performance requirements are reusable for 47GHz band; the baseline assumption can remain unchallenged. **Proposal 2:** RAN4 to discuss ways to reduce the absolute power levels at the RIB required during BS demodulation testing. **Proposal 3:** RAN4 to introduce a note in the "AWGN power level at the BS input" tables of the test specification, which allows to choose the AWGN_offset between 0 and 15dB. **Proposal 4:** RAN4 to solicit input from the TE vendors and contributors that run BS demodulation performance tests on the current and/or possible future presence of a power amplifier between the signal generator and test antenna. **Proposal 5:** Assume OTA link budget as sufficient, if AWGN_offset can be chosen.

R4-2106824	Huawei, HiSilicon	**Proposal 1:** The existing BS requirements are applicable for 47GHz band.
R4-2104682	Ericsson	TP to TR38.847

3.2 Open issues summary and companies' view

3.2.1 Open issues

3.2.1.1 Issue 2-1: Applicability of existing FR2 demodulation requirements for 47GHz band

Proposal: The existing FR2 BS demodulation requirements are applicable for 47GHz band.

Recommended WF: Agree with the proposal

Feedback Form 9: Comment to the recommended WF

Item	Company	Comments
1	Ericsson Japan K.K.	Support the recommended WF.
2	Nokia	[Nokia, Nokia Shanghai Bell]: Agree with recommended WF.
3	Huawei Tech.(UK) Co.. Ltd	Agree the recommended WF.
4	Samsung Electronics Benelux BV	[Samsung]: we are ok with the proposal and recommended WF

3.2.1.2 Issue 2-2: Reduction of the absolute power levels at the RIB required during BS demodulation testing

Proposal: Add a note 'allow to choose AWGN_offset between 0dB and 15dB' in 'AWGN power level at the BS input' tables in TS38.141-2?

Recommended WF: Collect companies' inputs

Feedback Form 10: Add a note 'Allow to choose AWGN_offset between 0dB and 15dB' in the Tables 'AWGN power level at the BS input' in TS38.141-2?

Item	Company	Comments
1	Ericsson Japan K.K.	We are ok to add the note to allow to choose AWGN_offset between 0dB and 15dB in 'AWGN power level at the BS input' tables in TS38.141-2, but would propose the wording as "If needed for test purposes, the AWGN offset can be set to any value in the range 0-15dB. Changing the AWGN level does not impact the validity of the test". If we have such a note, we think it should also be applied in the conducted specifications for consistency. Then the change should be applied in 38.141-1, 38.141-2, 37.145-1, 37.145-2 and 37.141
2	Nokia	[Nokia, Nokia Shanghai Bell]: We are fine with the note wording proposed by Ericsson. For type 2-O BSs covered in 38.141-2 this freedom in testing is required. Concerning type 1-X BS, we are currently not sure which level of AWGN_offset was used to derive the AWGN power levels. It was our understanding [R4-1906369] that for FR1-O, the rule was copy pasted from LTE and we set the level 4dB lower than the wide area BS dynamic range test AWGN level. (With some exact PRB allocation adaptation for SCS != 15kHz.) As such it seems wrong, or at least diffcult, to justify the 0 to 15dB rule to be applicable for type 1-X.
3	Samsung Electronics Benelux BV	[Samsung]: we are ok with the note wording proposed by Ericsson as least for Type 2-O BS
4	Ericsson France S.A.S	Regarding the type 1-X BS, the AWGN level is 25dB greater than the LTE reference sensitivity level (for 5MHz) and 24.8dB greater than NR (probably the value from LTE was re-used ?). The issue is that once margin for a fading channel is allowed for, then with the higher SNR demodulation requirements the input power exceeds the dynamic range requirement and may also come close to or exceed the in-band blocking requirement. So it could be that the demodulation requirement dimensions the needed dynamic range in the receiver and not the RF requirements. 25dB interference is probably not a real operating scenario. So a similar issue may be considered as for 47GHz. This may be seen even more when 256QAM is introduced. Note that LTE does not have such wide bandwidths and hence AWGN level. The wording of the note may need to be different, something like "If needed for test purposes, the AWGN level may be set to up to [10] dB below the levels indicated in the table. Changing the AWGN level does not impact the validity of the test". The clarification would actually be needed for both conducted and OTA specs for FR1.

3.2.1.3 Issue 2-3: Achievable output power levels of TE

Proposal: Collect inputs from the TE vendors and contributors that run BS demodulation performance tests on the current and/or possible future presence of a power amplifier between the

signal generator and test antenna.

Recommended WF: Collect companies' inputs

Feedback Form 11: Collect inputs from the TE vendors and contributors that run BS demodulation performance tests?

Item	Company	Comments
1	Ericsson Japan K.K.	The example we provide is a worst case scenario where the BS has poor sensitivity. In this example, a PA is needed. However if the BS has (as expected) better sensitivity and the AWGN is reduced, then we agree that a PA may not be needed. The intention with the example is to demonstrate that the link budget may just about work even in the worst case scenario.
2	Nokia	[Nokia, Nokia Shanghai Bell]: It is our understanding that an external PA is usually not used, since this causes issues when trying to achieve high SNR values (due to the PA introducing too much noise, which also increases with increasing wanted signal level). But assuming that we can adjust the AWGN_offset level, the question of having a PA might no longer be relevant.

3.2.1.4 Issue 2-4: OTA link budget

Proposal: RAN4 assumes OTA link budget as sufficient, if AWGN_offset can be chosen

Recommended WF: Collect companies' inputs. Is this common understanding in RAN4?

Feedback Form 12: It is RAN4's common assumption OTA link budget is sufficient if AWGN_offset can be chosen.

Item	Company	Comments
1	Ericsson Japan K.K.	We have the same understanding OTA link budget is sufficient if AWGN_offset can be chosen.
2	Nokia	[Nokia, Nokia Shanghai Bell]: Nokia agrees with (and originated) the proposal. As per our contribution we agree with the assumption.
3	Samsung Electronics Benelux BV	[Samsung]: We are ok with the common assumption if agreed that AWGN_offset can be chosen.

3.2.2 CRs/TPs comments collection

Feedback Form 13: Comments collection (TP: R4-2104682)

Item	Company	Comments

3.3 Summary of 1st round

3.3.1 Issue 2-1: Applicability of existing FR2 demodulation requirements for 47GHz band

Tentative agreements: The existing FR2 BS demodulation requirements are applicable for 47GHz band.

Recommendations for 2nd round: No discussion is needed.

3.3.2 Issue 2-2: Reduction of the absolute power levels at the RIB required during BS demodulation testing

Tentative agreements: Add a note in the Tables 'AWGN power level at the BS input' at least for BS type 2-O in TS38.141-2.

Example of the note: *"If needed for test purposes, the AWGN offset can be set to any value in the range 0-15dB. Changing the AWGN level does not impact the validity of the test."*

FFS for 1-X BS, i.e., 38.141-1, 38.141-2, 37.145-1, 37.145-2 and 37.141.

Recommendations for 2nd round: Discuss the exact wording of the note. Also discuss whether the same note can be added to 1-X BS conformance test specifications.

3.3.3 Issue 2-3: Achievable output power levels of TE

Tentative agreements: No discussion is needed as RAN4 assumes OTA link budget as sufficient if AWGN_offset can be chosen.

Recommendations for 2nd round: No discussion is needed.

3.3.4 Issue 2-4: OTA link budget

Tentative agreements: RAN4 assumes OTA link budget as sufficient if AWGN_offset can be chosen.

Recommendations for 2nd round: No discussion is needed.

3.4 Discussion on 2nd round

3.4.1 Open issues

3.4.1.1 Issue 2-2: Reduction of the absolute power levels at the RIB required during BS demodulation testing

Discuss the note in the Tables 'AWGN power level at the BS input' at least for BS type 2-O in TS38.141-2. Example of the note is:

Option 1: If needed for test purposes, the AWGN offset can be set to any value in the range 0-15dB. Changing the AWGN level does not impact the validity of the test.

Discuss whether the same note is added for 1-X BS conformance test specification.

Feedback Form 14: Proposal of the note in the Tables 'AWGN power level at the BS input

Item	Company	Comments
1	Ericsson Japan K.K.	[Ericsson] We support the wording in option 1: If needed for test purposes, the AWGN offset can be set to any value in the range 0-15dB. Changing the AWGN level does not impact the validity of the test.
2	Nokia	[Nokia, Nokia Shanghai Bell] We agree with the technical content of the note. However the note is only applicable to FR2 AWGN levels. Currently "AWGN offset" is not a variable or concept explicitly mentioned in 38.141-2. Hence, the wording would need to be adapted to be understandable. As such we propose in the following, two possible alternative wordings; one containing more background and one less background. Both are acceptable to us. Option 2: Note x: The AWGN power level contains an AWGN offset of 15dB. If needed for test purposes, the AWGN level can be reduced by any value in the range 0dB to 15dB. Changing the AWGN level does not impact the validity of the test, as it reduces the effective base band SNR level. Option 3: Note y: If needed for test purposes, the AWGN level can be reduced by any value in the range 0dB to 15dB. Changing the AWGN level does not impact the validity of the test.
3	Samsung Electronics Benelux BV	[Samsung] we prefer option 2, which is more clear, since AWGN power level with 15dB is default value.
4	Ericsson Japan K.K.	[Ericsson] We are also fine with Option 2.
5	Huawei Tech.(UK) Co.. Ltd	Fine with Option 2

Feedback Form 15: Whether the same notes are added for 1-X BS conformance test specification (i.e., 38.141-1, 38.141-2, 37.145-1, 37.145-2 and 37.141)?

Item	Company	Comments
1	Ericsson Japan K.K.	[Ericsson] We prefer to add the same notes to 38.141-1, 38.141-2, 37.145-1, 37.145-2 and 37.141. If companies have concern to revise 1-X spec in this WI, we can propose it as maintenance or in UL 256QAM requirements in WI NR_perf_enh2_Demod. Still it would be useful if anyone has a comment whether they have a technical concern or not.
2	Nokia	[Nokia, Nokia Shanghai Bell] The BS type 1-O AWGN power levels were changed in Rel-15, following a proposal from Nokia [R4-1906369, section 2.1 proposal 7; R4-1907239] and ultimately extended to type 1-C/H, as well. To derive those values we followed the LTE method, which can be summarized as "wide are dynamic range test AWGN level - 4dB". But the method was adapted to also cover other SCSs than 15kHz. So, in more detail: "kTB noise floor of actually used BW" + "5dB NF in FR1" + "20 dB noise rise" - "4dB backoff". Hence allowing to remove up to 15dB from this figure is technically not wrong, but leads to wrong conclusions on the readers part. It should be 0-16dB (20-14=16) for FR1 AWGN levels. As mentioned by Ericsson, it is not straightforward to motivate specification changes for FR1 AWGN levels coming from the NR_*47GHz*_band WI. Maintenance or NR_*demod*_enh2 would be better places. Finally, the OTA link budget is not an issue for FR1. The absolute power levels (-73.1dBm + 20dB + 18dB = -35.1dBm) are still extreme, when compared to power controlled SNR targets of 23dB in practical deployments. However, the reduction of 16dB is not really making a dent in this equation. We make the following proposal, but are not very insistent on it. **Proposal**: Do not add a note to FR1 AWGN levels. If a note is added, it should have the range **0-16dB**.
3	Huawei Tech.(UK) Co.. Ltd	For the changes to other FR1 BS specificaiton NR FR1 BS 38.141-1/2, AAS 37.145-1/2 and MSR 37.141, especially AAS and MSR, we would like ask more time to allow the colleagues ever involved in these topics discussion to double check. we can just agree to discuss it in the maintenance.

3.4.2 CRs/TPs/WFs comment collection

See UE demodulation part.

3.5 Summary of 2nd round

All the agreements are captured in way forward R4-2106091.

4 Topic #3: UE demodulation for new CBW 35MHz/45MHz (AI 7.25.6)

4.1 Companies' contribution summary

Table 4: Summary of contributions

Tdoc number	Source	Proposals / Observations
R4-2104601	CMCC	**Proposal 1:** No need to specify single carrier test cases and CQI reporting test cases for introducing 35MHz and 45MHz bandwidth. **Proposal 2:** It is necessary to introduce 35MHz and 45MHz bandwidth configuration test cases to PDSCH FDD demodulation requirements for CA **Proposal 3:** introduce 35MHz and 45MHz to TDD tests. The Reference channel and SNR can be further studied by simulation, the simulation of TDD test cases can be done in simulation phase together with FDD test simulation. **Proposal 4:** For SDR test cases, we propose to update the number of PRBs in CORESET for PDCCH configuration as follows:
R4-2106832	Huawei, HiSilicon	**Proposal 1:** Define PDSCH CA requirements for 35MHz and 45MHz bandwidth with the following assumption. **Proposal 2:** Add support of 35MHz and 45MHz bandwidth for SDR tests.

R4-2106872	Ericsson	**Proposal 1:** Update TS38.101-4 Table 5.2-2 and Table 5.5A-4 to support the new CBW 35MHz/45MHz for the SDR tests. **Proposal 2:** RAN4 discuss whether CBW 35MHz/45MHz is added to PDSCH CA demodulation requirements. **Proposal 3:** RAN4 discuss whether CBW 35MHz/45MHz is added to CA CQI reporting requirements.

4.1.1 Open issues summary and companies' view

4.1.1.1 Open issues

4.1.1.1.1 Issue 3-1: Support of 35MHz and 45MHz bandwidth for SDR tests

Proposal: Update TS38.101-4 Table 5.2-2 and Table 5.5A-4 (the number of PRBs in CORESET for PDCCH configuration) to support the new CBW 35MHz/45MHz

Recommended WF: Agree with the proposal.

Feedback Form 16: Comments to the recommended WF

Item	Company	Comments
1	Ericsson Japan K.K.	Support the recommended WF.
2	Qualcomm Incorporated	Ok with recommended WF.
3	Huawei Tech.(UK) Co.. Ltd	Agree with the recommended WF
4	Intel Corporation (UK) Ltd	Support the recommended WF.
5	China Mobile Com. Corporation	[CMCC] Support the recommended WF

4.1.1.1.2 Issue 3-2: Introduction of PDSCH CA requirements for 35MHz and 45MHz bandwidth in FDD

Proposals:

Option 1: Define PDSCH CA requirements for 35MHz and 45MHz bandwidth in FDD. Need to collect the necessary simulation results.

Option 2: Need more discussion, because it is not mentioned in WID.

Recommended WF: Collect companies' inputs

Feedback Form 17: Define PDSCH CA requirements for 35MHz and 45MHz bandwidth in FDD?

Item	Company	Comments
1	Ericsson Japan K.K.	We are fine to add the PDSCH demodulation requirements of single component carrier with FDD 35MHz/45MHz for CA. We therefore need to collect the simulation results. We propose to discuss the simulation assumption in the 2nd round, based on R4-2104601.
2	Qualcomm Incorporated	We are ok to add these requirements but WID needs to be updated to include these requirements. Otherwise, it will be inconsistent with Plenary decisions.
3	Huawei Tech.(UK) Co.. Ltd	Prefer Option 1. But if companies have very strong view to update the WID to include this part, we can do it in next RAN plenary.
4	China Mobile Com. Corporation	We support Option1. Simulation is needed, the simulation assumption can be discussed in 2nd discussion if time allows.

4.1.1.1.3 Issue 3-3: Introduction of PDSCH CA requirements for 35MHz and 45MHz bandwidth in TDD

Proposal: Introduction of PDSCH CA requirements for 35MHz and 45MHz bandwidth in TDD

Recommended WF: It depends on the outcome of Issue 3-2. Moderator propose to postpone the discussion (e.g. 2nd round).

Feedback Form 18: Comments to the recommended WF, if any.

Item	Company	Comments
1	China Mobile Com. Corporation	We support the proposal to introduce the PDSCH CA requirements for 35MHz and 45MHz bandwidth in TDD in advance. First, 35MHz and 45MHz bandwidth may be introduced to TDD in the future; Second, the simulation of TDD test requirements can be done together with the FDD test requirements, which is convenient and time-saving compared to doing this simulation in the future.
2	Ericsson Japan K.K.	[Ericsson] We are fine to add 35MHz and/or 45MHz to PDSCH CA demodulation requirements in TDD, if the WID is updated. If not, we don't want to add it. We think RAN4 performance requirements should be based on the core specification such as TS38.101-1. To CMCC, do you plan to add 35MHz/45MHz to some TDD band(s) in WID.

4.1.1.1.4 Issue 3-4: Introduction of CA CQI requirements for 35MHz and 45MHz bandwidth

Proposals:

Option 1: No need to introduce CA CQI requirements for 35MHz and 45MHz bandwidth.

Option 2: Need discussion.

Recommended WF: Collect companies' inputs

Feedback Form 19: Define CA CQI requirements for 35MHz and 45MHz bandwidth?

Item	Company	Comments
1	Ericsson Japan K.K.	We are fine to consider 35MHz/45MHz for CA CQI test in FDD. We only need to add the subband size in TS38.101-4 Table 6.2A.3.1.1-2.
2	Qualcomm Incorporated	For consistency, we are ok to introduce these requirements. As Ericsson mentioned, we just need to update the subband size in TS38.101-4 Table 6.2A.3.1.1-2. However, these requirements should be added to WID and companies should be given a chance to verify that existing requirements hold for these CBWs as well before introducing such requirements.
3	Huawei Tech.(UK) Co.. Ltd	Like discussed in R4-2106872 from Ericsson, the sub-band size for new CBWs needs to be update to reflect new CBW.
4	China Mobile Com. Corporation	We support to introduce CA CQI requirements for 35MHz and 45MHz bandwidth in both FDD and TDD, since 35MHz and 45MHz bandwidth may be introduced to TDD in the future. We only need to update the Table 6.2A.3.1.1-2 and 6.2A.3.1.1-3 in TS 38.101-4.

4.1.1.2 CRs/TPs comment collection

No CRs/TPs in this agenda

4.1.2 Summary of 1st round

4.1.2.1 Issue 3-1: Support of 35MHz and 45MHz bandwidth for SDR tests

Tentative agreements: Update TS38.101-4 Table 5.2-2 and Table 5.5A-4 (the number of PRBs in CORESET for PDCCH configuration) to support the new CBW 35MHz/45MHz for SDR tests.

Recommendations for 2nd round: No discussion is needed.

4.1.2.2 Issue 3-2: Introduction of PDSCH CA requirements for 35MHz and 45MHz bandwidth in FDD

Tentative agreements: Define PDSCH CA requirements for 35MHz and 45MHz bandwidth in FDD.

Suggest to update the WID.

Recommendations for 2nd round: No discussion is needed.

4.1.2.3 Issue 3-3: Introduction of PDSCH CA requirements (and CA CQI reporting tests) for 35MHz and 45MHz bandwidth in TDD

Candidate options:

Option 1: introduce the PDSCH CA requirements for 35MHz/45MHz bandwidth in TDD in advance.

Option 2: Not introduce the PDSCH CA requirements for 35MHz/45MHz bandwidth in TDD before TS38.101-1 defines the supporting bands.

Recommendations for 2nd round: Need further discussion

4.1.2.4 Issue 3-4: Introduction of CA CQI requirements for 35MHz and 45MHz bandwidth

Tentative agreements: Define CA CQI requirements for 35MHz and 45MHz bandwidth for FDD.

Add the subband size in TS38.101-4 Table 6.2A.3.1.1-2.

Suggest to update the WID.

Recommendations for 2nd round: No discussion is needed.

4.2 Discussion on 2nd round

4.2.1 Open issues

4.2.1.1 Issue 3-3 Introduction of PDSCH CA requirements and CA CQI reporting tests for 35MHz and 45MHz bandwidth in TDD

Option 1: Introduce the PDSCH CA requirements for 35MHz/45MHz bandwidth in TDD in advance.

Option 2: Not introduce the PDSCH CA requirements for 35MHz/45MHz bandwidth in TDD before TS38.101-1 defines the supporting bands.

Feedback Form 20: Introduce PDSCH CA requirements and CA CQI reporting tests for 35MHz/45MHz bandwidth in TDD?

Item	Company	Comments
1	Ericsson Japan K.K.	[Ericsson] As we commented in the 1st round, RAN4 demodulation performance requirements should be based on the UE RF core requirements. If it is planned to update the WID to add 35MHz/45MHz to some FR1 TDD bands in the next plenary, we are fine to add 35/45MHz to TDD PDSCH CA demodulation and CA CQI reporting requirements. If not, we don't want to add it.
2	Qualcomm Incorporated	[Qualcomm] We prefer Option 2. We should first have some bands supporting these bandwidths before defining the requirements. Otherwise, we are not following the proper procedure of defining requirements. We can't define requirements for something that doesn't exist yet.
3	China Mobile Com. Corporation	[CMCC] We can compromise, Option2 is OK for us

4.2.2 CRs/TPs/WFs comment correction

Feedback Form 21: Comment collection for Way forward on UE demodulation and CQI reporting for channel bandwidths 35MHz and 45MHz for NR FR1

Item	Company	Comments
1	Qualcomm Incorporated	[Qualcomm] For CA CQI requirements, can you please add a sentence saying "Companies to verify if existing requirements hold for CBWs of 35MHz and 45MHZ for FR1 FDD". Most likely, it should be ok but we would like to verify these requirements before adding them to the spec.

4.3 Summary of 2nd round

All the agreements are captured in way forward R4-2106090.

5 Recommendations for Tdocs

For the Recommendation column, include one of the following

CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued

Other documents: Agreeable, Revised, Noted

5.1 1st round

Table 5: New Tdocs

Title	Source	Agenda	Comments
Way forward on UE/BS demodulation on NR 47GHz band	Ericsson	7.27.4.2, 7.27.4.3	Capture the agreements and open issues in Topics #1 and #2.
Way forward on UE demodulation and CQI reporting for channel bandwidths 35MHz and 45MHz for NR FR1	Ericsson	7.25.6	Capture the agreements and open issues in Topic #3.

Table 6: Existing Tdocs

Tdoc number	Title	Source	Recommendation	Comments
R4-2106860	pCR to 38.847: UE performance requirements	Ericsson	**Postponed**	Need further study
R4-2106861	draftCR to TS 38.101-4: n262 demodulation requirements	Ericsson	**Postponed**	Need further study
R4-2104682	pCR to TR 38.847: BS demodulation requirements	Ericsson	**Agreeable**	No comments captured in the 1st round

5.2 2nd round

Table 7: Recommendation for Tdocs in 2nd round

Tdoc number	Title	Source	Recommendation	Comments
R4-2106091	Way forward on UE/BS demodulation on NR 47GHz band	Ericsson	**Agreeable**	
R4-2106090	Way forward on UE demodulation and CQI reporting for channel bandwidths 35MHz and 45MHz for NR FR1	Ericsson	**Agreeable**	