

**[100-e][307] NR\_47GHz\_Band\_BSRF\_NWM - Version 0.0.6**  
**RAN4**

3GPP TSG-RAN WG4 Meeting #100-e

Electronic meeting, August 16-27, 2021

R4-2115598

Agenda Item: 8.3.2, 8.3.3

Source: Moderator (Nokia)

Document for: Information

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## 1 Topic#1: BS conformance testing

BS conformance requirements are discussed under Topic#1.

### 1.1 Companies' contributions summary

**Table 1: Companies' contributions summary**

<b>T-doc number</b>	<b>Company</b>	<b>Proposals / Observations</b>
R4-2112275	Nokia, Nokia Shanghai Bell	Compromise proposal on RF signal generator uncertainty
R4-2113734	Ericsson, Nokia, T-Mobile USA, Dish Network	Proposals on the BS Rx MU
R4-2113916	Keysight Technologies UK Ltd, Rohde & Schwarz	Proposals on the BS Rx MU
R4-2113917	Keysight Technologies UK Ltd, Rohde & Schwarz	draft CR to 38.141-2
R4-2114365	Nokia, Nokia Shanghai Bell	TP to TR 38.847 (on the basis of R4-2112275)
R4-2114366	Nokia, Nokia Shanghai Bell	CR to 38.141-2 (on the basis of R4-2112275)
R42114399	Huawei	Draft CR to TR 37.941: on MU/TT derivation for 47 GHz

## 1.2 Open issues summary

**Table 2: Summary of Rx MU**

<b>Rx test</b>	<b>38.141-2: 24.25-29.5 GHz [dB]</b>	<b>38.141-2: 37- 43.5 GHz [dB]</b>	<b>R4-2113734: Ericsson, Nokia, T- Mobile USA, Dish Network [dB]</b>	<b>R4-2114365: Nokia, Nokia Shanghai Bell [dB]</b>	<b>R4-2113916: Keysight Technolo- gies UK Ltd, Rohde &amp; Schwarz [dB]</b>
Reference sen- sitivity	2.4	2.4	[2.5]	2.6	3.6
ACS	3.4	3.4	[3.5]	3.6	5.2
IBB	3.4	3.4	[3.5]	3.6	5.2
OOBB	3.6	3.6	[4.2]	3.8	4.6
Rx IM	3.9	3.9	[4.0]	4.1	5.5
In-channel selectivity	3.4	3.4	[3.5]	3.6	5.2

## 1.3 Companies views' collection for 1st round

### 1.3.1 Derivation of Rx MU

Rx MU has been discussed in the last RAN4 meetings without progress. According to the agreed WF in R4-2118608, RAN4 to agree on final Rx MU during RAN4#100-e. In order to progress and conclude this work in RAN4#100-e, it was proposed in R4-2112275 to agree on RF signal generator uncertainty first (1.03 dB is proposed as a compromise, it should be noted there are other proposals on RF signal generator uncertainty of 0.97 and 1.6 dB). The following is proposed:

- 1) agree on compromise 1.03 dB RF signal generator uncertainty
- 2) agree to not consider the 'Add estimated uncertainty contribution 0.2 from other terms' in the NR 47 GHz band
- 3) handle TR 37.941 maintenance independent from the completion of this work item so that the work item can be completed at TSG RAN#93-e as expected

### **Feedback Form 1: Comments on proposals 1, 2 and 3**

#### **1 – Keysight Technologies UK Ltd**

Keysight

- 1) As TE vender who will provide Signal Generator, and proposed number is real hardware, we need to

emphasize "Signal Generator uncertainty" number should be taken from who provide Signal Generator. And, this is from measured value from real hardware, not something to compromise.

We need to propose 1.6 for "Signal Generator uncertainty" for n262.

2), in our proposal, this additional uncertainty from other OTA term reduced to 0.1 for n262

## **2 – Nokia France**

Nokia

It is not clear why this additional uncertainty of 0.1dB is needed, as this was not considered in the discussion for BS Receiver Measurement Uncertainties in FR2 compared to the FR1 values.

## **3 – Keysight Technologies UK Ltd**

Keysight

Thank you for question.

It is to cover increase of other MU term numbers. This approach was taken because of difficulty to recalculate individual term, original assumption to come up each individual MU term number is not captured (may not exist). In our number, expecting to see mismatch term will have small increase and Quite Zone quality will also have small increase. There could also have some other terms to be increased with small number. Reason of having overall increase rather individual term is because of this difficulty.

## **4 – Keysight Technologies UK Ltd**

Keysight

To Nokia, regarding with Proposal 1) in proposal document (R4-2112275),

it proposes to agree "the allowed uncertainty of the RF signal generator" which we don't understand meaning. can you please tell us what this mean, especially meaning of "allowed"?

## **5 – Nokia France**

Nokia

Thanks for Keysight replies.

We still do not see the necessity of this additional 0.1 dB uncertainty, following the practice we used to derive FR2 MU, we should clearly state any additional uncertainty required for each contributor and calculate the final MU accordingly.

For Nokia proposal 1, the 'allowed' mean the number we are going to use to calculate the final MU. We propose to focus the discussion on proposal 1 first, as it is the main factor in the difference between the final MU in FR2 and 47GHz, similar to the case in FR1 and FR2.

## **6 – Huawei Technologies Sweden AB**

Proposals 1/2: as two TE vendors do not agree with those proposals, we are wondering if it would be possible to check also with Anritsu experts this meeting. We are working to provide more feedback for the GTW session.

Proposal 3: related CR to TR 37.941 was provided this meeting in R4-2114399 - there is no blocking point to proceed with it. R4-2114399 was shifted by the vice-chair from the Maintenance agenda, to the n262 agenda.

Regarding the following text "TR 37.941 is not included as an impacted TR in the WID [1], and thus no CR can be submitted to TR 37.941 from this work item": During last RAN meeting, Nokia did not agree to

the revised 47GHz WID (RP-211391) adding TR37.941 to the list of impacted specs. The following was captured as the summary in RP-211567:

”There is no consensus to include TR 37.941 in the objective. If the consensus is made in the next RAN4 meeting, RAN4#100e, WID can be revised in the next plenary, RAN#93e.”

Once the CR to TR37.941 is agreed during this meeting, related WID revision can be submitted to RAN#93-e.

#### **7 – Ericsson Limited**

Have TE vendors looked at the option of using external PA and filters to improve the performance?

Also, it would be good to understand what are the technology barriers that would prevent more accurate instruments in the near future. Now that we have band in this frequency range, related components should improve.

When setting new BS/UE requirements, we always consider the technology drivers, assuming such technology would mature as well. This approach should also be considered for TE, when estimating MU.

#### **8 – Nokia France**

Nokia

Thanks Huawei for comments on our proposal 3.

We are ok if CR to TS 37.941 can also be agreed in this meeting (according to the agreement in the MU values), we would not want to delay the completion of the WI because of TS 37.941 maintenance.

#### **9 – Anritsu Corporation**

Anritsu

As for 1), though we currently do not have the dedicated test equipment (VSG) for BS conformance test at that frequency range, if we refer to the MU budget table of ACS from the UE conformance test in TR38.903 (Table B.21.2-2), we are currently defining 1.45 dB even at the frequency point 40.8 GHz. (For information, this 1.45 dB was derived based on the specification of our RF converter unit for the system simulator to transmit modulation signals upto 43.5GHz.)

Given the severer frequency condition than 40.8 GHz, I feel the value proposed from Keysight (1.60 dB) for n262 is reasonable and the value 1.06 dB looks challenging.

#### **10 – Keysight Technologies UK Ltd**

Keysight

For Ericsson,

Thank you for some suggestion. Additional components in test system degrade uncertainty. For example, having PA when SG power is not enough, needs to add PA uncertainty into budget table then total test system MU increases. Our understanding is no external PA is needed.

Going higher in frequency increases inaccuracy even with CW signal source in market. and having contribution from modulation impact with larger BW increases inaccuracy.

#### **11 – Keysight Technologies UK Ltd**

Keysight

Thank you for your understanding and discussion in GTW. Now we (Keysight, R&S) can confirm OK of removal of ”additional uncertainty contribution” which is 0.1. this makes following list of values.

- EIS=[3.5]
- ACS=[5.1]
- IBB=[5.1]
- OOB=[4.5]
- RxIM=[5.4]
- InChSelect=[5.1]

if OK with moderator, we can revise our draft CR for 38.141-2.

## 12 – Dish Network

Thank you for the discussion to compromise a WF with this. We have a question for clarification for the second round. Based on the minutes (below for convenience), are we now aiming for values in brackets in the TS or in some other way that would allow us further improvements on these values when appropriate in future meetings?

We believe this type of WF would be useful and provide better options also with +45 GHz bands as discussed in the GTW. Appreciate the efforts.

Tentative Agreement (Need to be confirmed by 1st round):

For SG MU as 1.6dB, meanwhile no additional uncertainty increased for other terms.

Including the values in TS with [] and Note if needed, meanwhile to capture TR 37.941 the background and the possibility to further optimize the performance in future.

## 13 – Nokia France

{Nokia}

To Keysight, your MU values are different than what we obtained using the spreadsheet4 in TR 37.941 but changing SG value from 0.9 to 1.6 our MU values are listed below:

EIS: 3.31

ACS, IBB, ICS: 4.17

RXIMD: 4.58

OOBB: 4.37

## 14 – Huawei Technologies Sweden AB

@Dish: we intent to capture more clarifications on the discussion on SG in TR 37.941.

@Nokia, Keysight: let us also check the TR37.941 Excel spreadsheets for the MU values derivation.

## 15 – Keysight Technologies UK Ltd

Keysight

For Nokia, I'm not sure how you get EIS=3.31, I also used excel sheet in TR37.941 to get 3.5 (3.48 actually)

For Huawei, it would be very nice that if you could also re-calculate this number, it's good to have more eye to avoid calculation error.. thank you for your help.

**16 – Keysight Technologies UK Ltd**

Keysight

One more for Nokia, Even with using EIS=3.31, I can't get listed ACS, RxIM, OOB number.

if EIS=3.31, rest of number calculated is ACS=5.0, RxIM=5.3, OOB=4.4 (but again, I can't get EIS=3.31)

So, there must be something different....

**17 – Keysight Technologies UK Ltd**

Keysight

self response, for seeing calculation of Nokia. For ACS, RxIM, "TE MU for SG" used part of calculation also needs to be updated as 1.60 rather 0.9. So if I left it as 0.9 I got the same number ACS 4.2, RxIM 4.6.

However, "TE MU for SG" used for calculation of ACS, RxIM also have 1.60

(and OOB as 4.4 is the same already with EIS=3.31)

So, remaining question is EIS=3.31.... I still wonder how this is calculated...

**18 – Keysight Technologies UK Ltd**

Keysight

another one more for Nokia, to get EIS=3.31, It seems SG=1.5 (rather 1.6) was used??

can you please verify?

**19 – Nokia France**

Nokia

To Keysight, you are correct, I used 1.5 to calculate EIS MU, and didn't apply 1.6 to modulated interferer, now I got the same number as yours:

EIS: 3.48

ACS, IBB, ICS: 5.10

RXIMD: 5.43

OOBB: 4.51

**1.3.2 Other document comments collection****Feedback Form 2: Comments to R4-2113734****Feedback Form 3: Comments to R4-2113916****1 – Nokia Germany**

See comments in form 1

#### Feedback Form 4: Comments to R4-2113917

##### 1 – Nokia Germany

It was agreed some time ago Nokia will provide final CR to 38.141-2

#### Feedback Form 5: Comments to R4-2114365

#### Feedback Form 6: Comments to R4-2114366

#### Feedback Form 7: Comments to R4-2114399

##### 1 – Ericsson Limited

Do we really need this note added to all Tx tolerances for frequency in [43.5, 48.2]?

Table 11.3.7-3: why do we have this additional note in this table?

Hopefully, Rx MU values would be updated with agreements from this meeting.

##### 2 – Nokia Germany

Further updates are needed on Rx side (pending conclusion in this meeting)

##### 3 – Huawei Technologies Sweden AB

As discussed during GTW, revision is needed to update the TR with the agreements in RX MU. To answer Ericsson questions:

1. Notes: it seems that this is the best approach. Please note that the "linear approximation" approach does not apply to all requirements (and will not apply to RX), so we decided to go table-by-table.
2. Table 11.3.7-3: this is good question, as I was wondering myself how to treat this case, i.e. the MU of 2.9dB for n262 is not really "linearly approximated", as 2.7dB was used for all FR2-1 bands. The note can be updated, or removed. The same applies to Table 11.4.7-2.

## 1.4 Summary for 1st round

### 1.4.1 Rx MU derivation

Based on the GTW discussion and comments received, it is recommended to use the following maximum OTA test system uncertainty:

- EIS: [3.5] dB
- ACS, IBB, ICS: [5.1] dB
- RXIMD: [5.4] dB
- OOB: [4.5] dB

Furthermore, it is recommended to capture in the TR 38.847 that the maximum OTA test system uncertainty in

the frequency range  $43.5 \text{ GHz} < f \leq 48.2 \text{ GHz}$  is a composite of signal generator and external RF front-end with mixer. Future evaluation and improvement of uncertainty values will be performed once the signal generator internal RF supports higher frequency so external mixer is not used.

#### 1.4.2 Other documents

The following documents need to be revised:

- R4-2114365 (update uncertainty values and include information on future evaluation and improvement of uncertainty values)
- R4-2114366 (update uncertainty values)
- R4-2114399 (include Rx part)

Other documents are proposed to be noted.

### 1.5 Companies views' collection for 2nd round

#### 1.5.1 Document comments collection

##### **Feedback Form 8: Comments to revision of R4-2114365**

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##### **Feedback Form 9: Comments to revision of R4-2114366**

<p><b>1 – Keysight Technologies UK Ltd</b></p> <p>Keysight</p> <p>For those test items which TT values are updated for n262, with following description in Annex C and defined formula in Table C, requirement values also needs to be updated</p>
<p><b>2 – Nokia Germany</b></p> <p>It has been corrected in new version</p>
<p><b>3 – Keysight Technologies UK Ltd</b></p> <p>Keysight</p> <p>For Nokia about new revision. thank you for update. however, there are still more to modify.</p> <p>From Modified Annex C table,</p> <p>for Tx test,</p> <ul style="list-style-type: none"> <li>- 6.7.3 ACLR (for both Relative limit and Absolute limit)</li> <li>- 6.7.4 OBUE</li> </ul> <p>For Rx test,</p> <ul style="list-style-type: none"> <li>- 7.3 OTA sensitivity</li> </ul>



- 7.9 In Channel selectivity

These TT numbers are update for n262, therefore requirement values also needs to be updated but no in draft version of CR document for 38.141-2

#### 4 – Nokia Germany

Thank you, CR has been further updated

### Feedback Form 10: Comments to revision of R4-2114399

#### 1 – Huawei Technologies Sweden AB

For the EIS MU derivation, the following values were obtained:

- For **1.6 dB** MU for the SG:
  - o Expanded uncertainty for IAC: 3.57 dB
  - o Expanded uncertainty for CATR: 3.48 dB

It seems that only MU calculations for CATR were considered for the derivation of the final EIS MU, i.e. 3.48 dB rounded to 3.5 dB.

For the Excel spreadsheets of TR37.941, I will incorporate both IAC and CATR calculations. The same is planned for the updated CR to TR37.941.

## 1.6 Summary for 2nd round

Documents discussed in the 2nd round seem to be agreeable.

## 2 Recommendations for Tdocs

### 2.1 1st round

Existing documents:

**Table 3: 1st round Tdoc recommendation**

Tdoc number	Source	Recommendation
R4-2112275	Nokia, Nokia Shanghai Bell	Noted
R4-2113734	Ericsson, Nokia, T-Mobile USA, Dish Network	Noted
R4-2113916	Keysight Technologies UK Ltd, Rohde & Schwarz	Noted

R4-2113917	Keysight Technologies UK Ltd, Rohde & Schwarz	Noted
R4-2114365	Nokia, Nokia Shanghai Bell	Revised
R4-2114366	Nokia, Nokia Shanghai Bell	Revised
R4-2114399	Huawei	Revised

## 2.2 2nd round

Existing documents:

**Table 4:**

<b>Tdoc number</b>	<b>Source</b>	<b>Recommendation</b>
R4-2115634	Nokia, Nokia Shanghai Bell	Agreed
R4-2115635	Nokia, Nokia Shanghai Bell	Agreed
R4-2115636	Huawei	Agreed

## 3 Contact information

### **Feedback Form 11: Contact information (company, name, e-mail)**

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**5 – Dish Network**

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