



Module 1

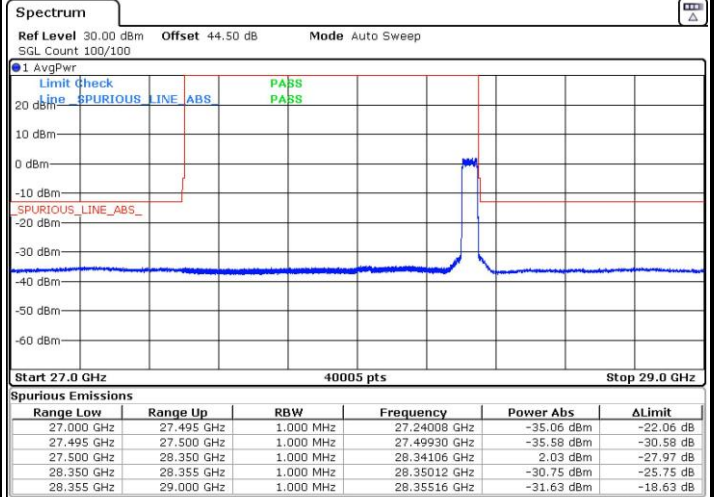
NR Band n261 / 50MHz / 64QAM

Lowest Band Edge / Full RB



Date: 23.FEB.2020 07:18:49

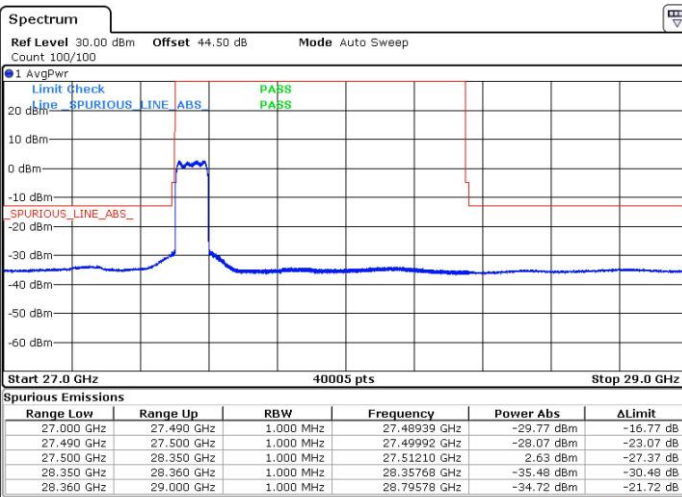
Highest Band Edge / Full RB



Date: 23.FEB.2020 07:25:20

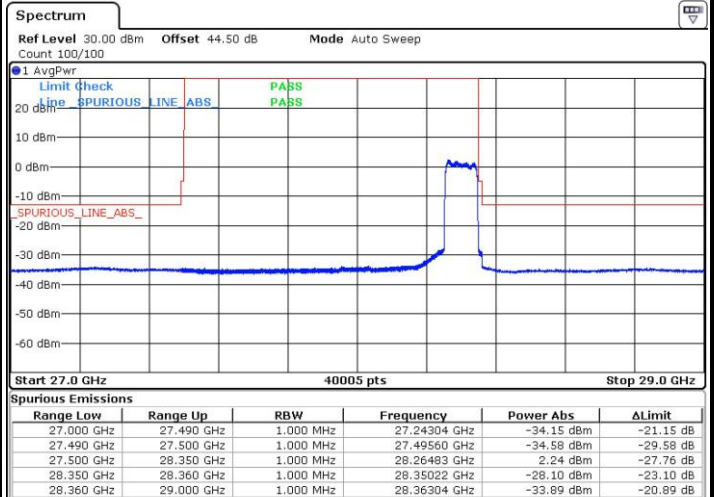
NR Band n261 / 100MHz / QPSK

Lowest Band Edge / Full RB



Date: 28.JAN.2020 13:02:32

Highest Band Edge / Full RB



Date: 28.JAN.2020 13:25:22

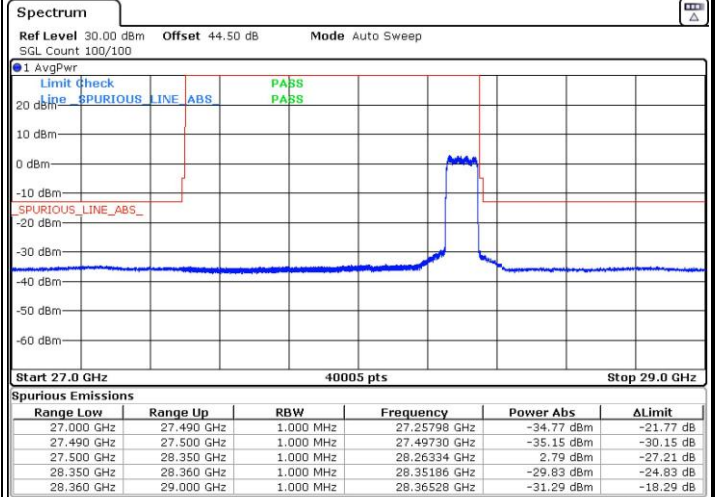
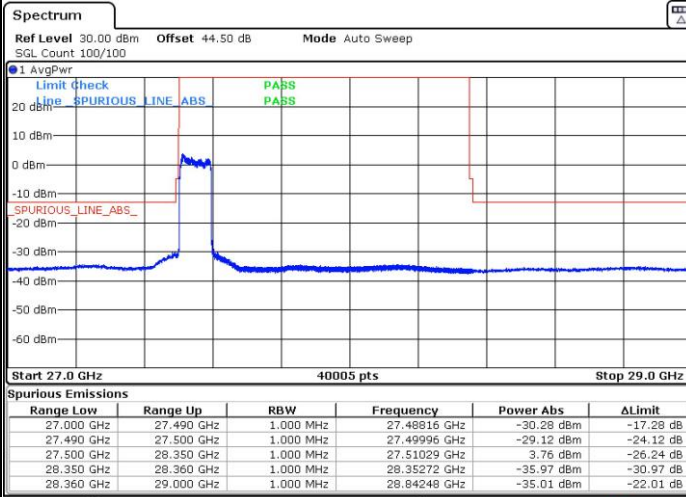


Module 1

NR Band n261 / 100MHz / 16QAM

Lowest Band Edge / Full RB

Highest Band Edge / Full RB



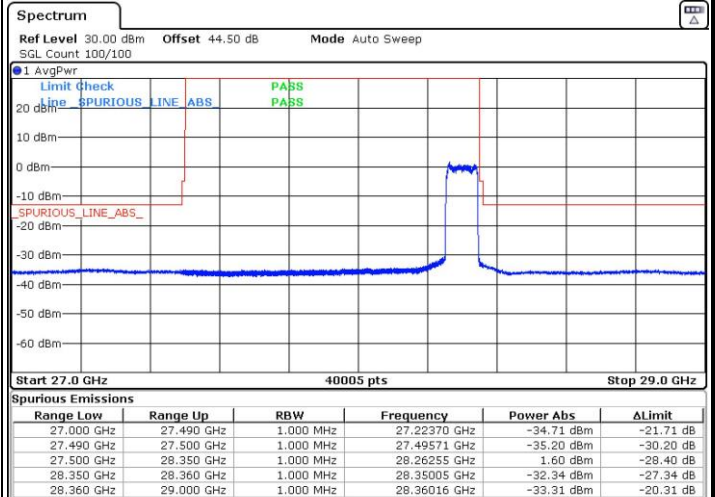
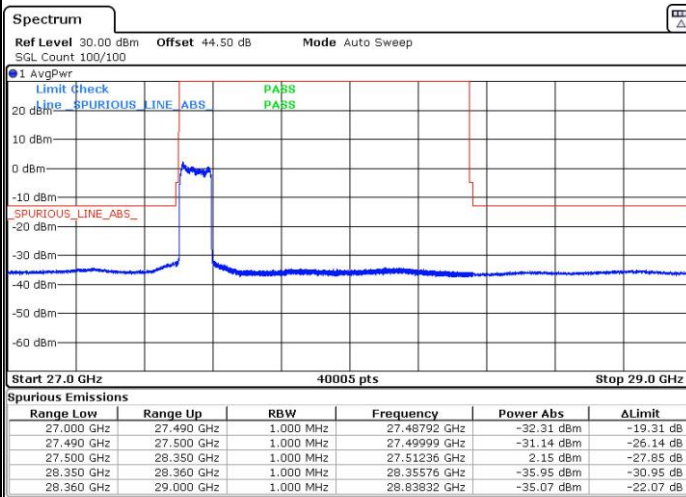
Date: 18.FEB.2020 00:07:43

Date: 18.FEB.2020 00:18:15

NR Band n261 / 100MHz / 64QAM

Lowest Band Edge / Full RB

Highest Band Edge / Full RB



Date: 18.FEB.2020 00:07:05

Date: 18.FEB.2020 00:18:58

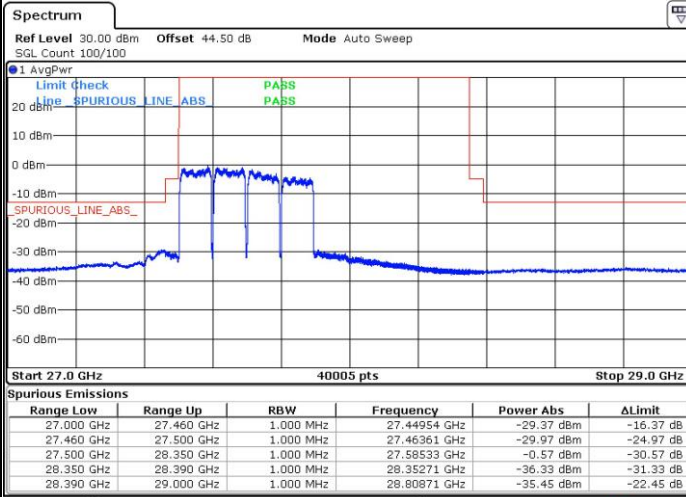


Module 1

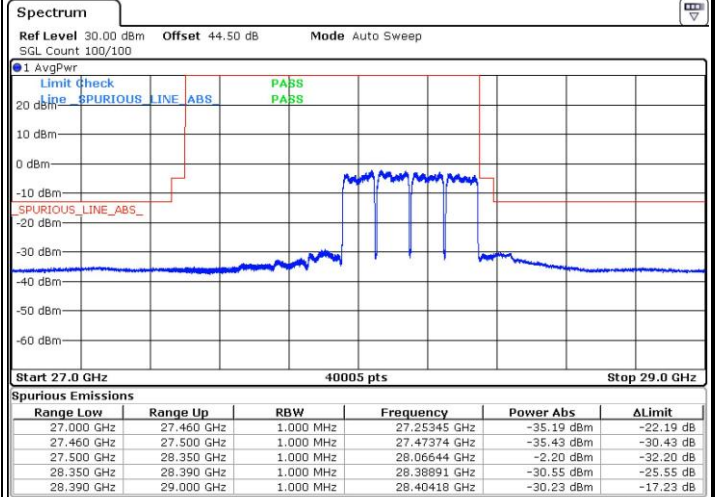
NR Band n261 / 400MHz / QPSK

Lowest Band Edge / Full RB

Highest Band Edge / Full RB



Date: 24.FEB.2020 09:54:34

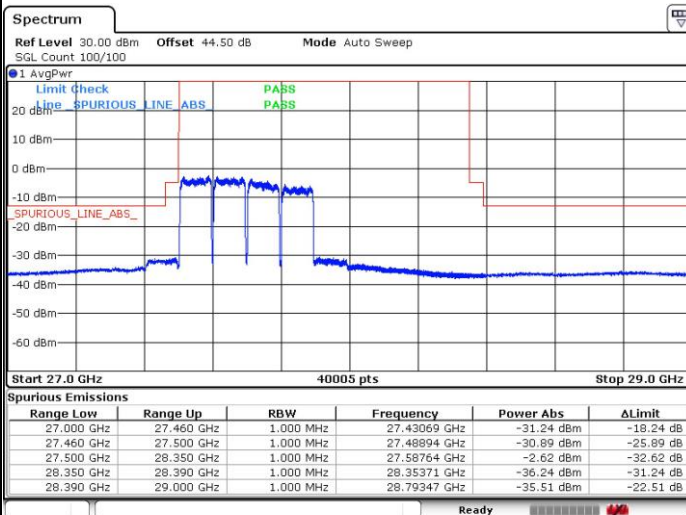


Date: 24.FEB.2020 10:08:01

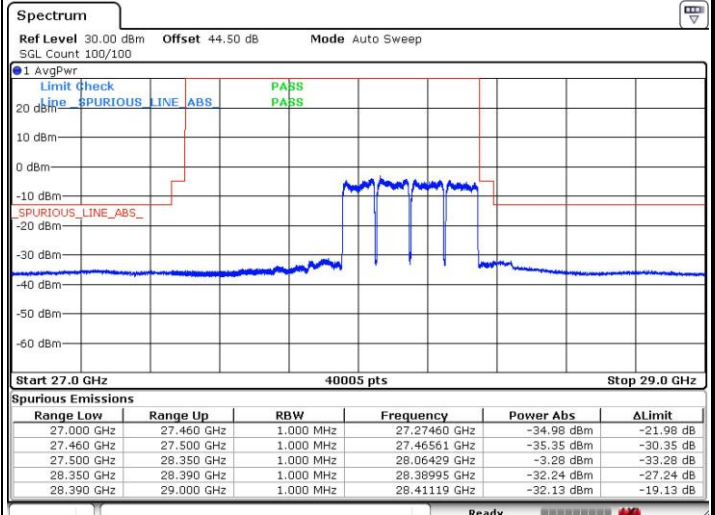
NR Band n261 / 400MHz / 16QAM

Lowest Band Edge / Full RB

Highest Band Edge / Full RB



Date: 24.FEB.2020 10:19:47



Date: 24.FEB.2020 11:11:06

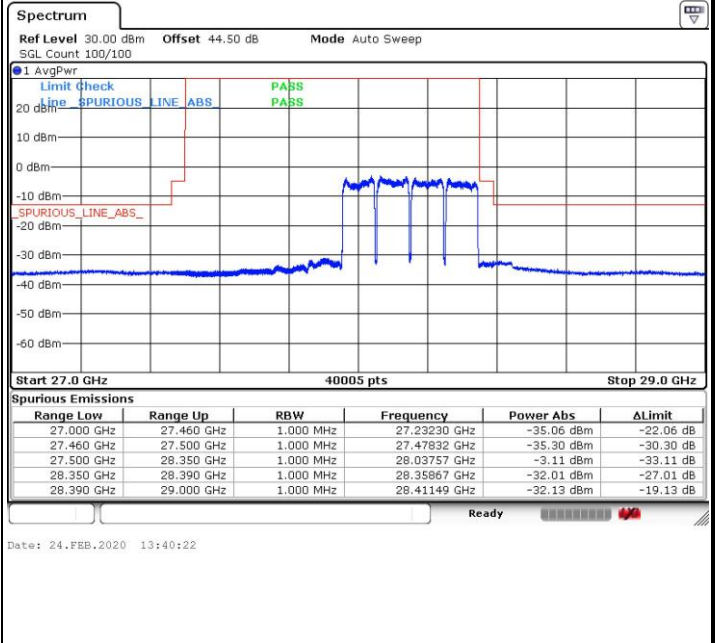
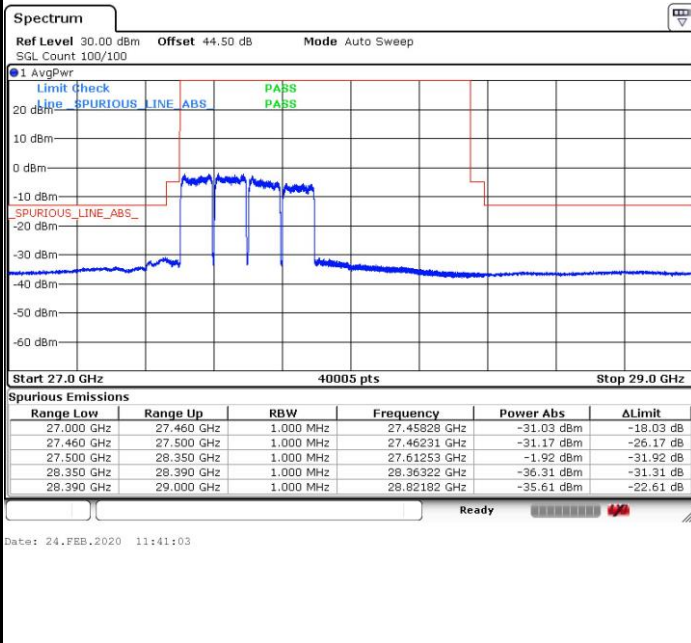


Module 1

NR Band n261 / 400MHz / 64QAM

Lowest Band Edge / Full RB

Highest Band Edge / Full RB



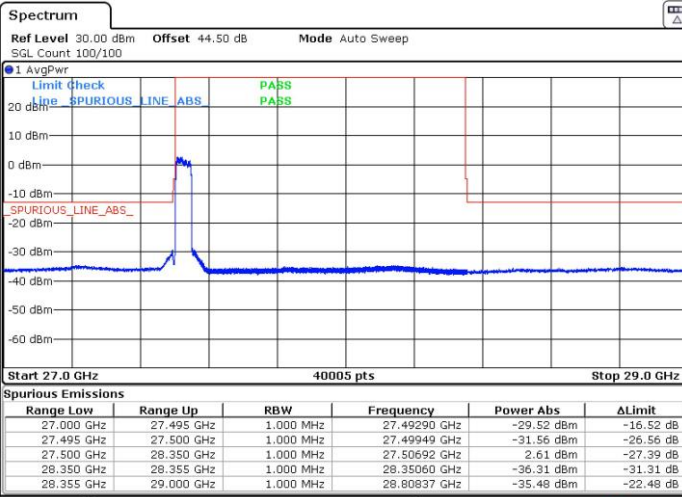




Module 2

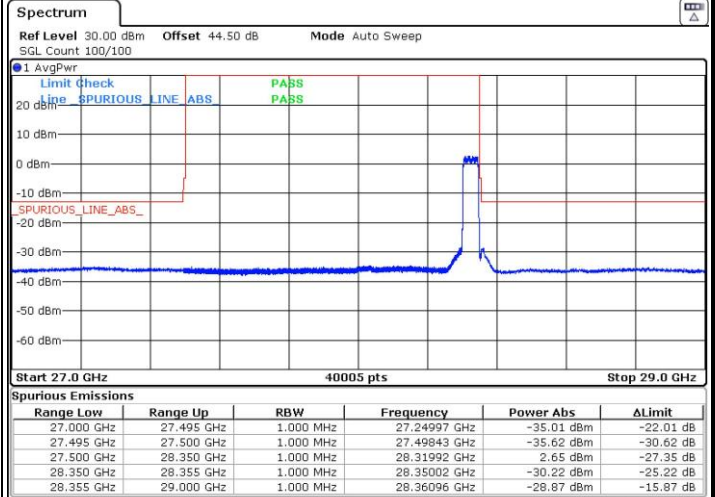
NR Band n261 / 50MHz / QPSK

Lowest Band Edge / Full RB



Date: 22.FEB.2020 15:06:02

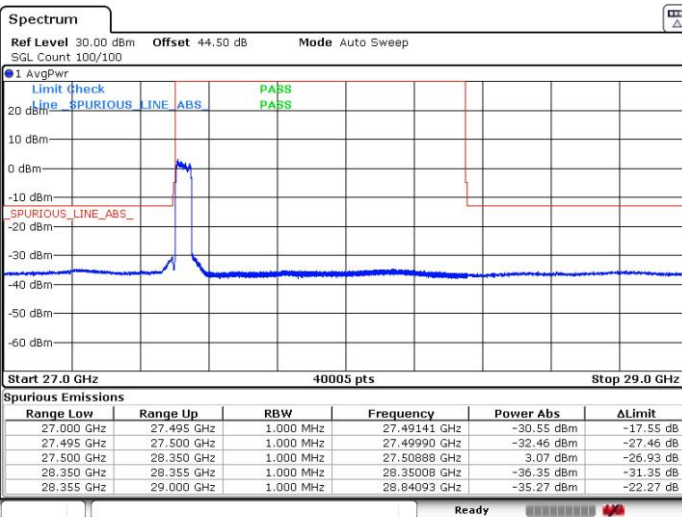
Highest Band Edge / Full RB



Date: 22.FEB.2020 14:43:25

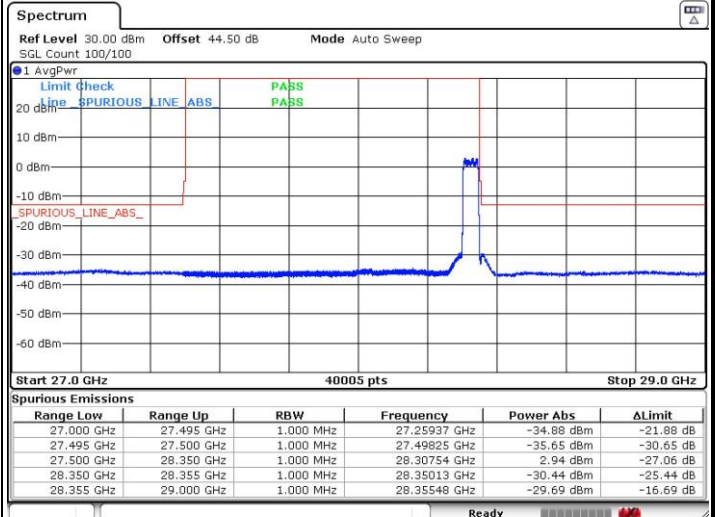
NR Band n261 / 50MHz / 16QAM

Lowest Band Edge / Full RB



Date: 22.FEB.2020 15:08:03

Highest Band Edge / Full RB



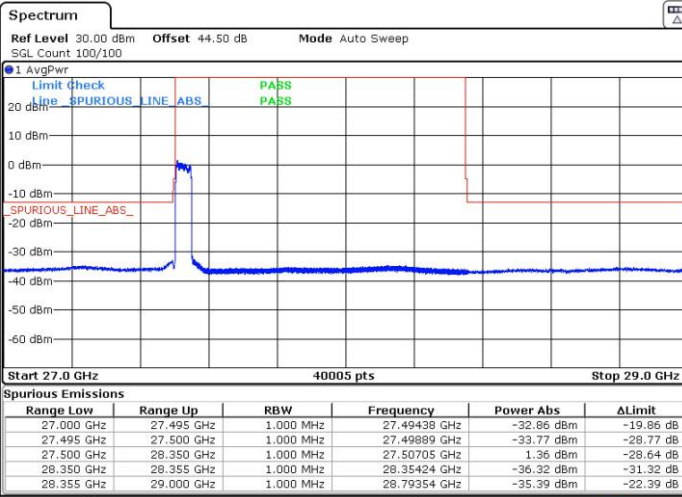
Date: 22.FEB.2020 14:45:05



Module 2

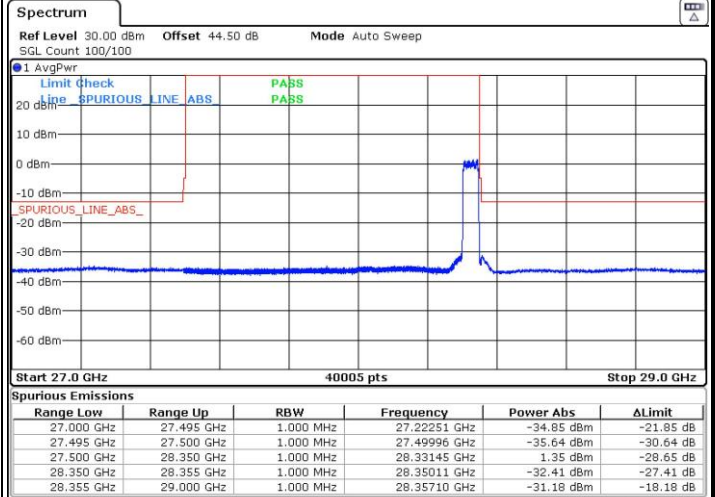
NR Band n261 / 50MHz / 64QAM

Lowest Band Edge / Full RB



Date: 22.FEB.2020 15:09:24

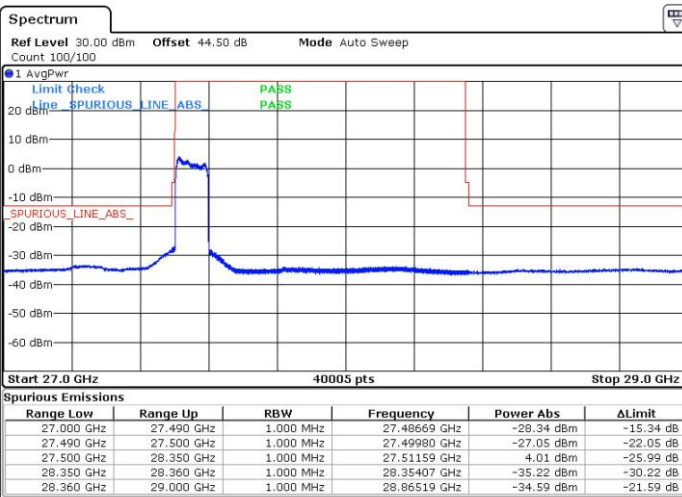
Highest Band Edge / Full RB



Date: 22.FEB.2020 14:45:47

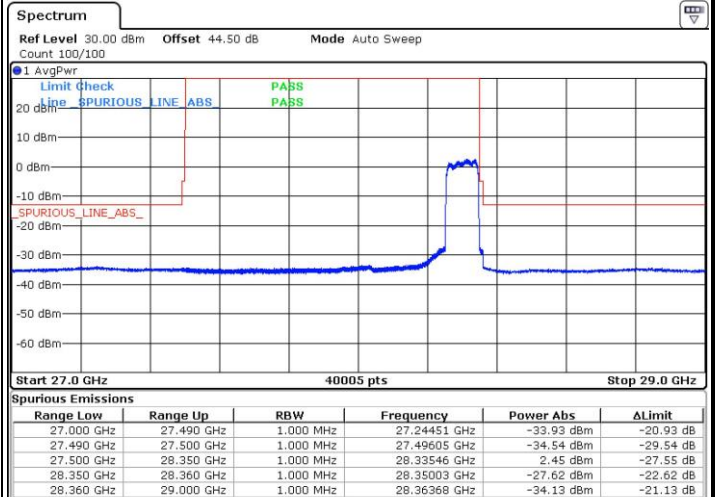
NR Band n261 / 100MHz / QPSK

Lowest Band Edge / Full RB



Date: 28.JAN.2020 17:45:35

Highest Band Edge / Full RB



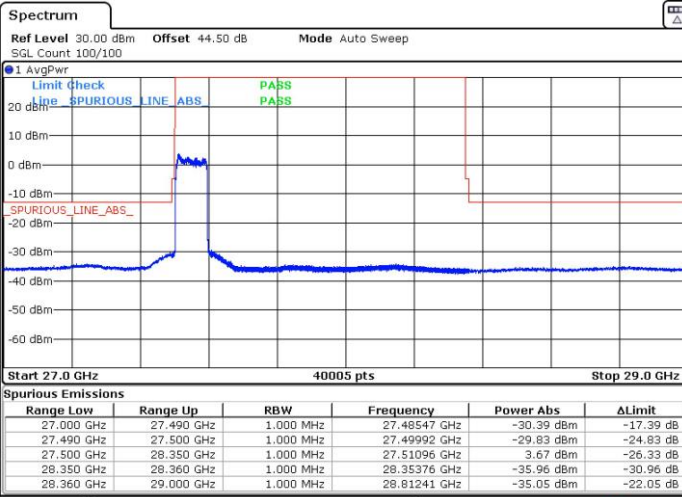
Date: 28.JAN.2020 17:58:02



Module 2

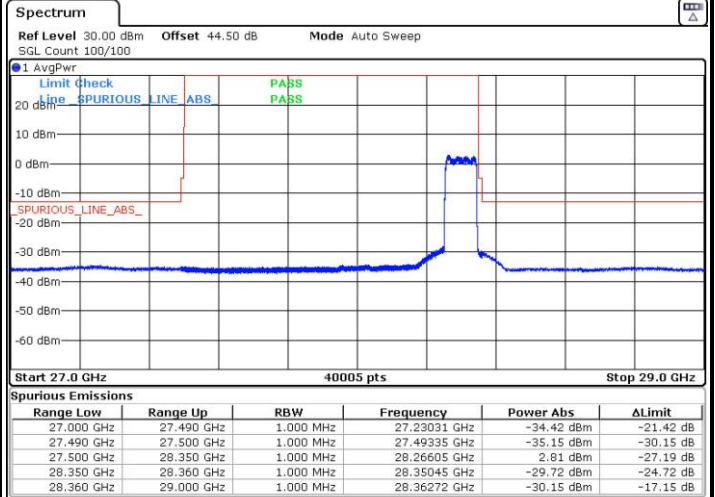
NR Band n261 / 100MHz / 16QAM

Lowest Band Edge / Full RB



Date: 17.FEB.2020 21:09:18

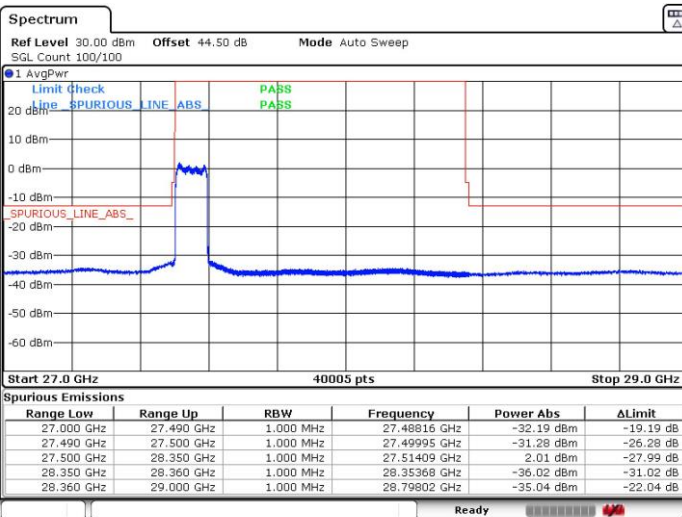
Highest Band Edge / Full RB



Date: 17.FEB.2020 21:23:41

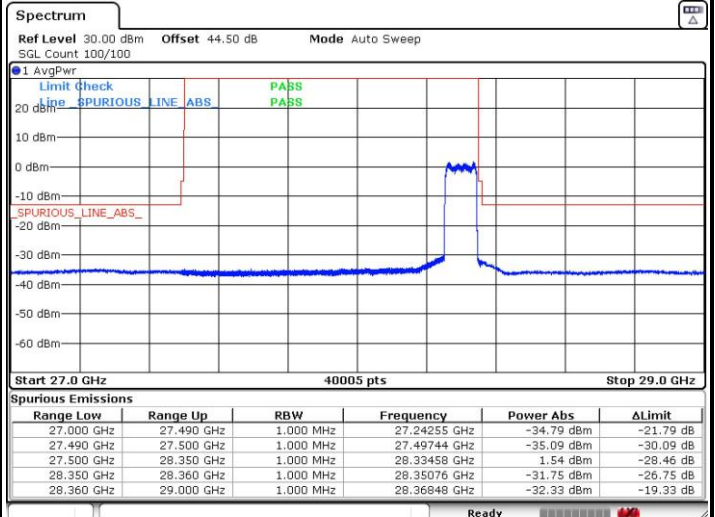
NR Band n261 / 100MHz / 64QAM

Lowest Band Edge / Full RB



Date: 17.FEB.2020 21:09:54

Highest Band Edge / Full RB



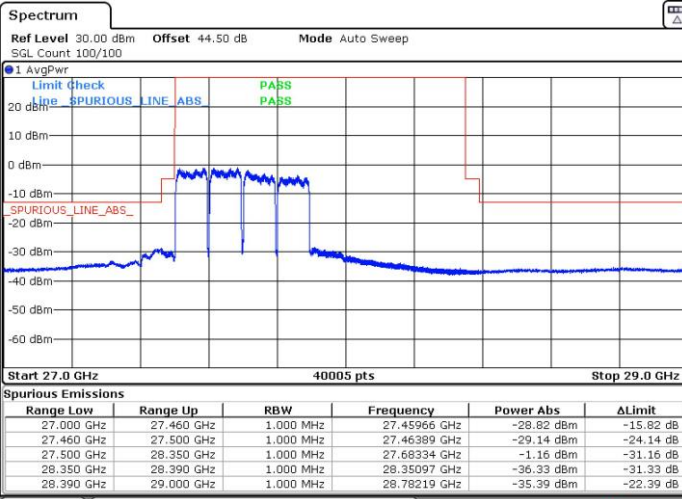
Date: 17.FEB.2020 21:24:34



Module 2

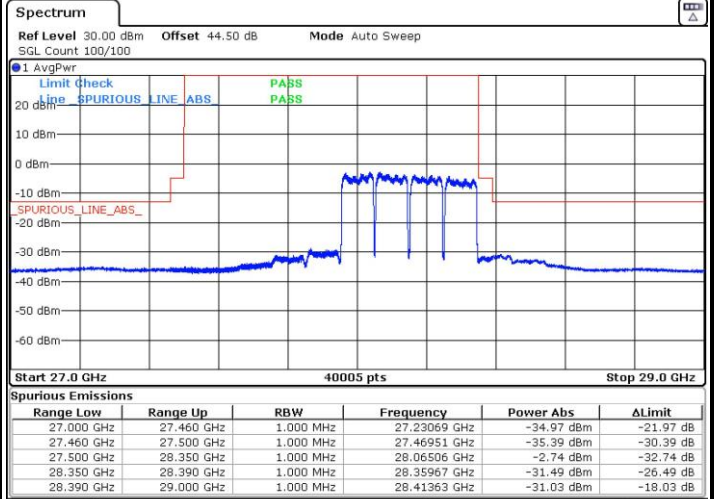
NR Band n261 / 400MHz / QPSK

Lowest Band Edge / Full RB



Date: 23.FEB.2020 02:51:27

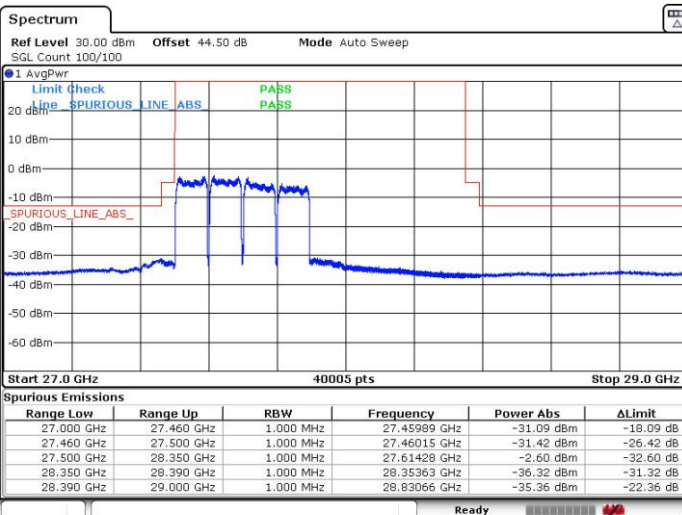
Highest Band Edge / Full RB



Date: 23.FEB.2020 03:08:47

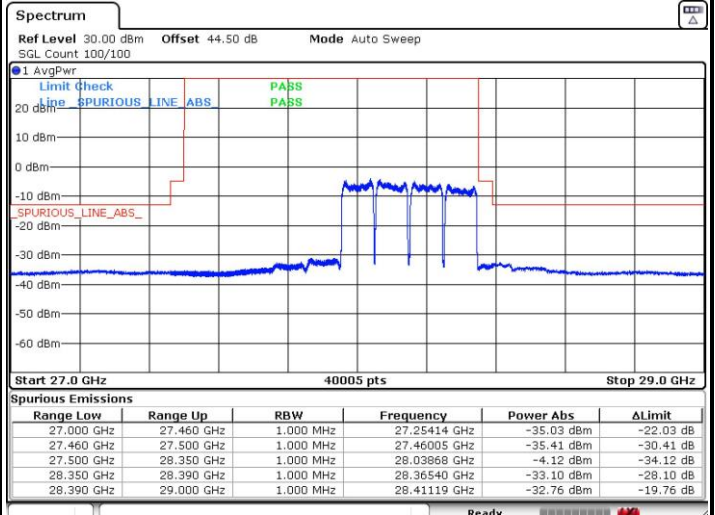
NR Band n261 / 400MHz / 16QAM

Lowest Band Edge / Full RB



Date: 23.FEB.2020 02:50:42

Highest Band Edge / Full RB



Date: 23.FEB.2020 03:08:07



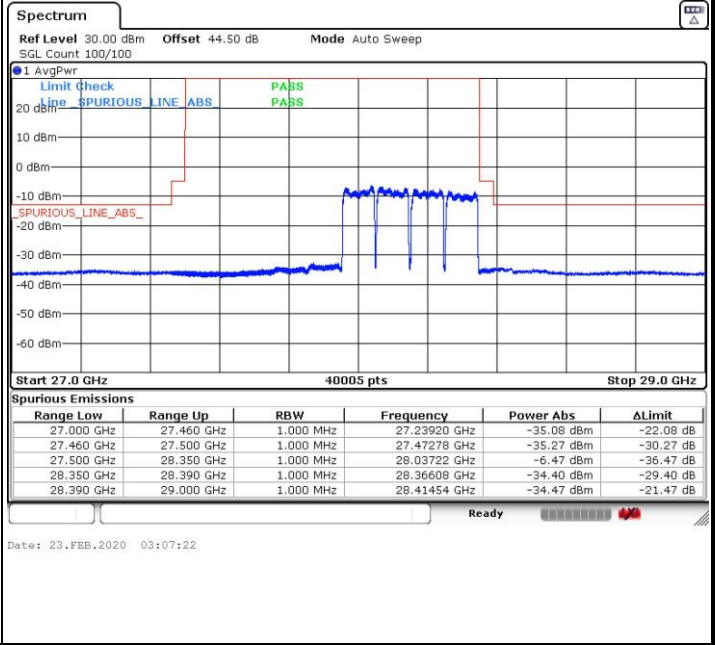
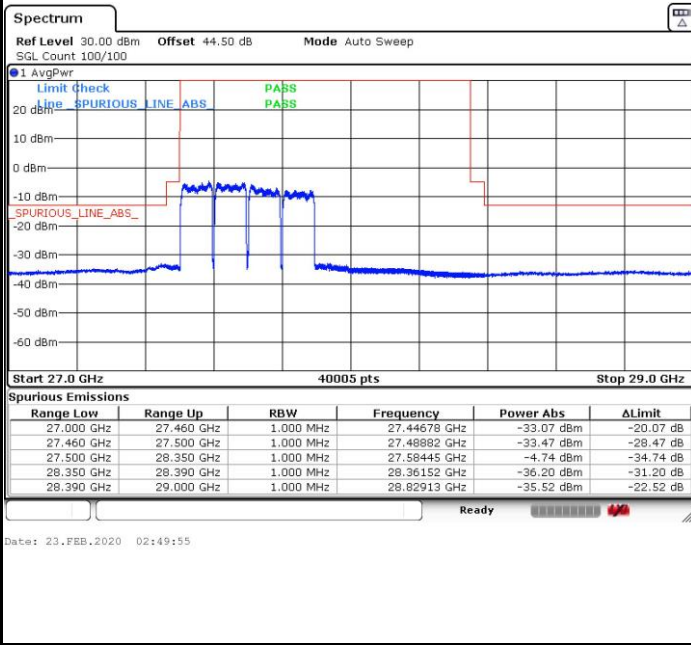


Module 2

NR Band n261 / 400MHz / 64QAM

Lowest Band Edge / Full RB

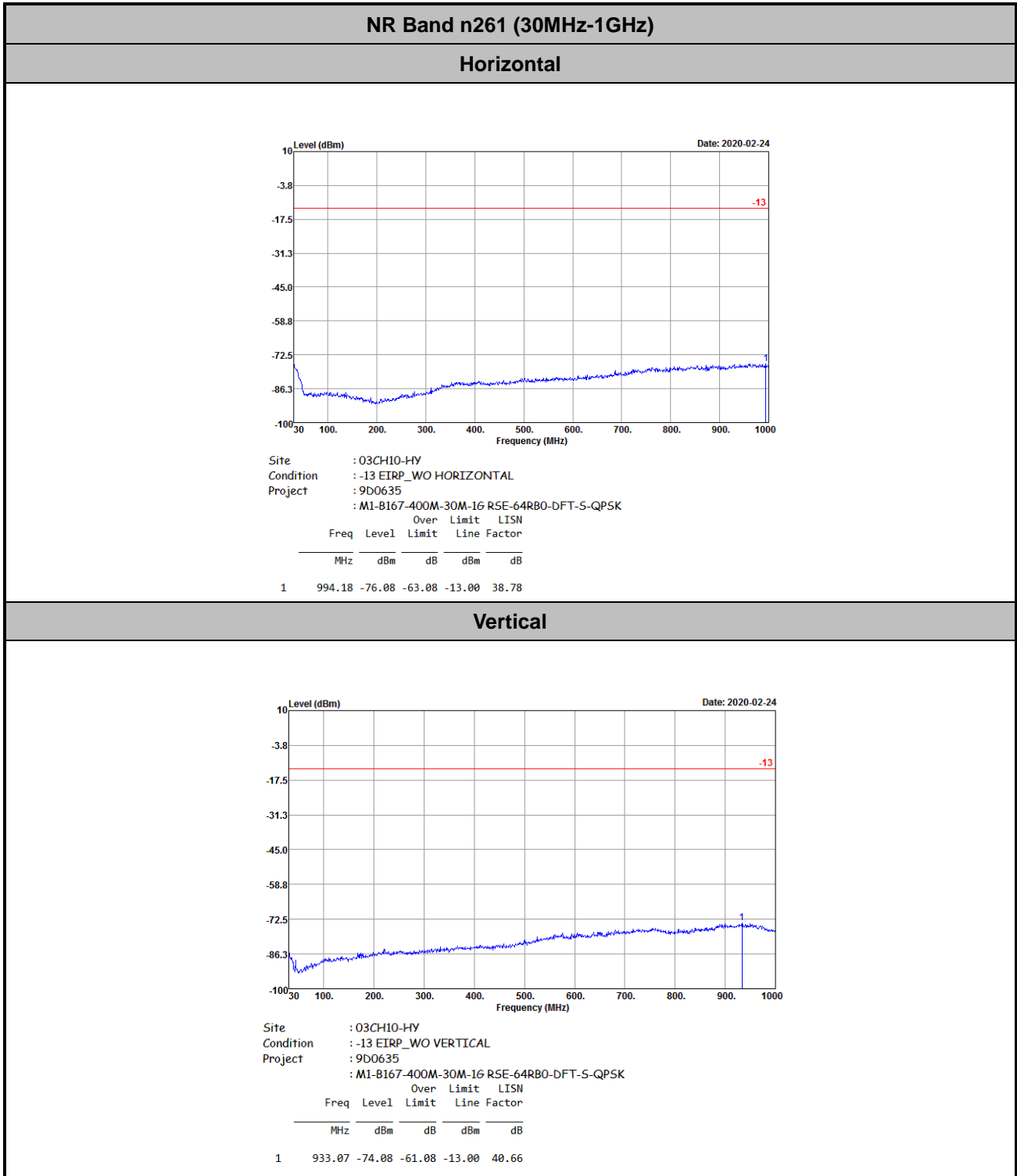
Highest Band Edge / Full RB





# Spurious Emission

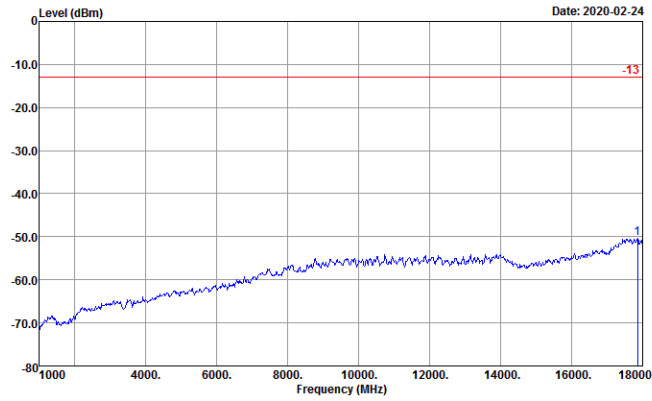
There is no significant spurious emission signal found for frequency started from 30MHz up to 18GHz. Only the noise floor is reported.





NR Band n261 (1GHz-18GHz)

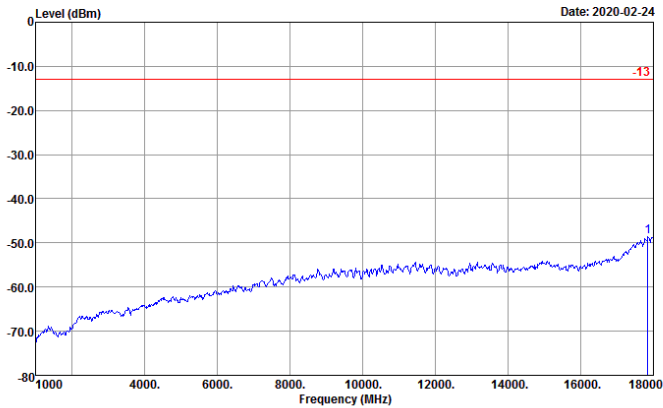
Horizontal



Site : 03CH10-HY  
 Condition : -13 EIRP\_WO HORIZONTAL  
 Project : 9D0635  
 : MI-B167-400M-1-18G RSE-64R80-DFT-S-QPSK

Over	Limit	LISN			
Freq	Level	Limit	Line	Factor	
MHz	dBm	dB	dBm	dB	
1	17864.00	-50.30	-37.30	-13.00	72.71

Vertical



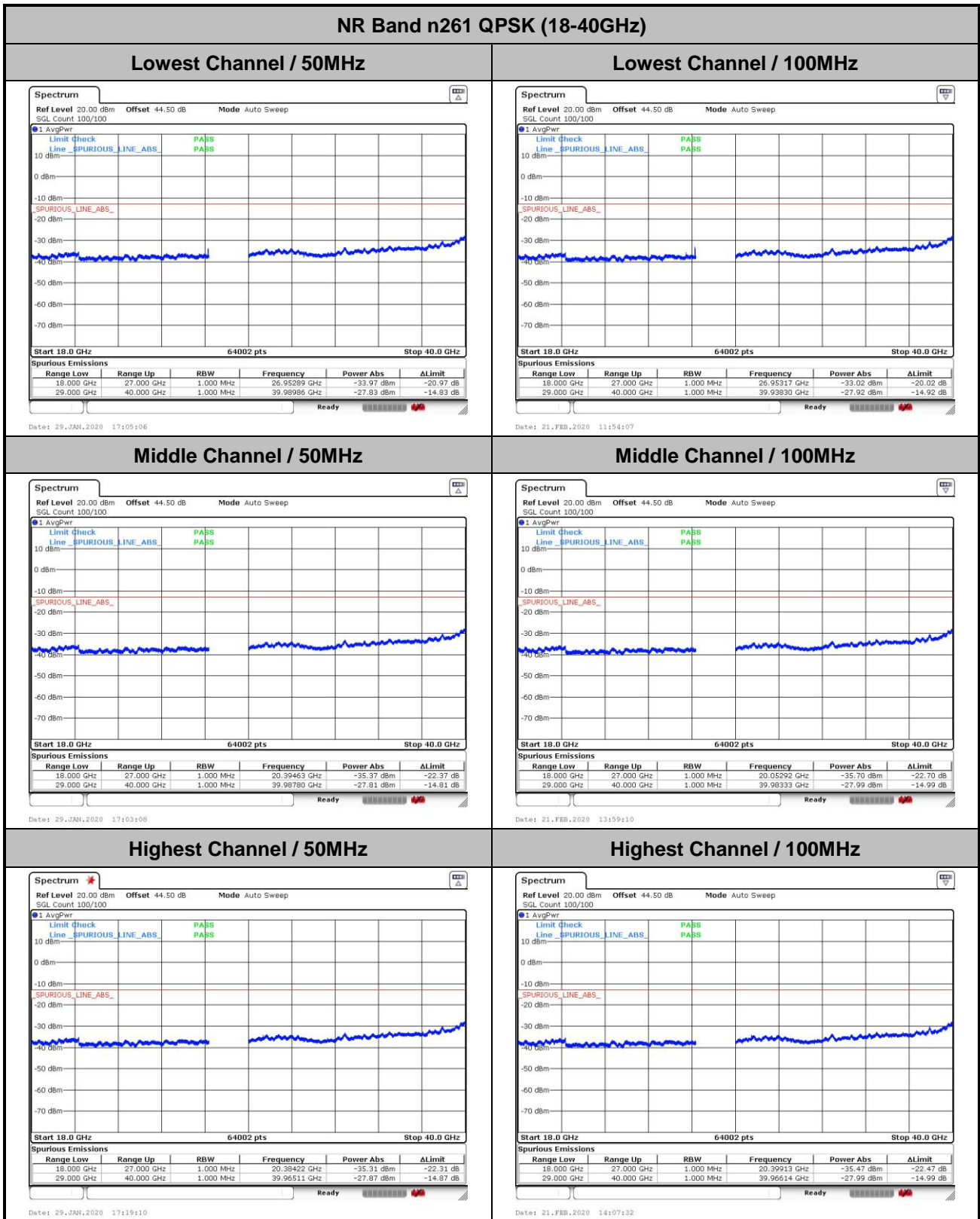
Site : 03CH10-HY  
 Condition : -13 EIRP\_WO VERTICAL  
 Project : 9D0635  
 : MI-B167-400M-1-18G RSE-64R80-DFT-S-QPSK

Over	Limit	LISN			
Freq	Level	Limit	Line	Factor	
MHz	dBm	dB	dBm	dB	
1	17847.00	-48.59	-35.59	-13.00	75.20



Spurious emission between 18GHz to 40GHz worst case plot is reported as following.

Module 0



Remark: In band and out of band frequencies are omitted.

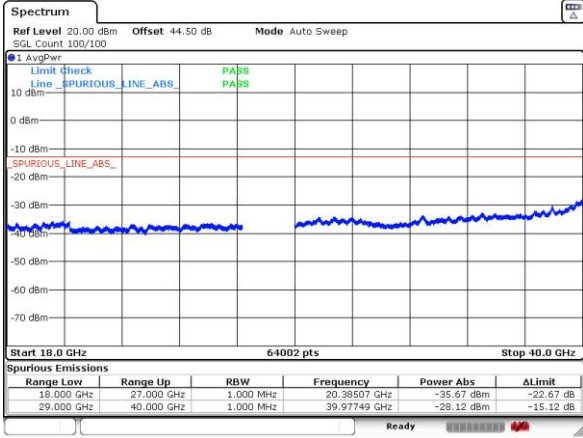




Module 0

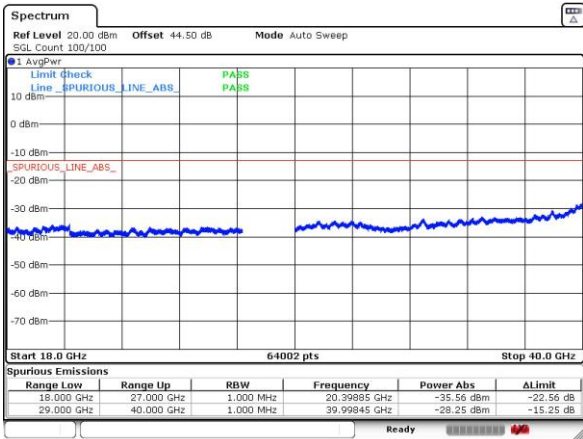
NR Band n261 QPSK (18-40GHz)

Lowest Channel / 400MHz



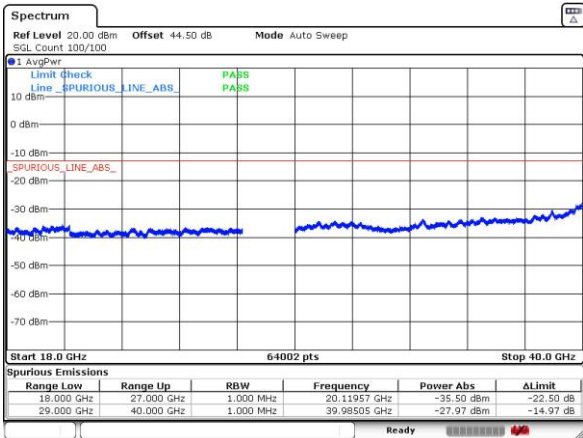
intentionally blank

Middle Channel / 400MHz



intentionally blank

Highest Channel / 400MHz



intentionally blank

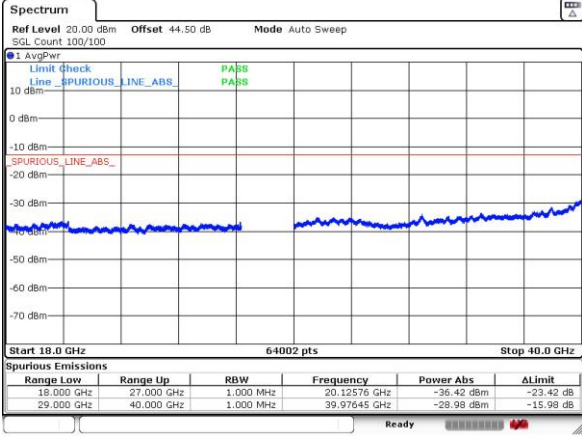
Remark: In band and out of band frequencies are omitted.



Module 1

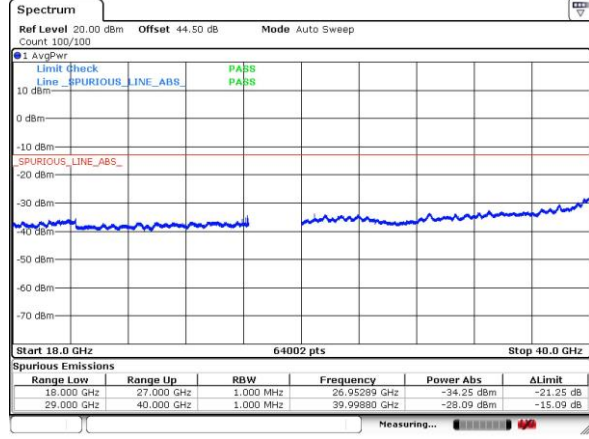
NR Band n261 QPSK (18-40GHz)

Lowest Channel / 50MHz



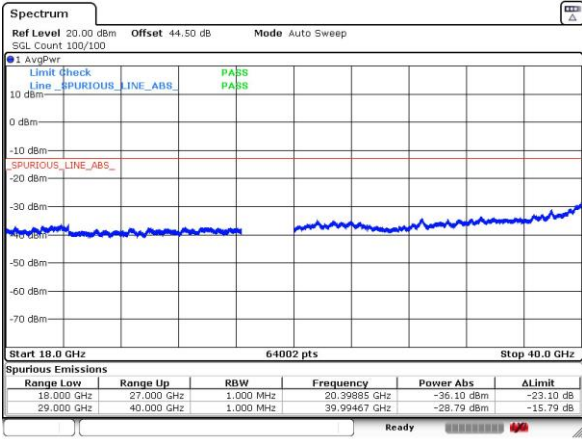
Date: 23.FEB.2020 07:20:53

Lowest Channel / 100MHz



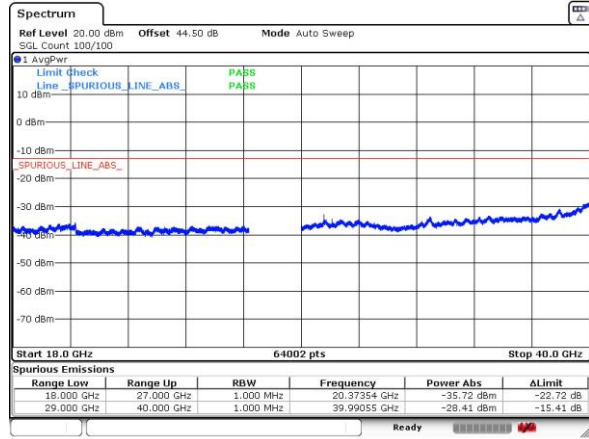
Date: 28.JAN.2020 12:52:07

Middle Channel / 50MHz



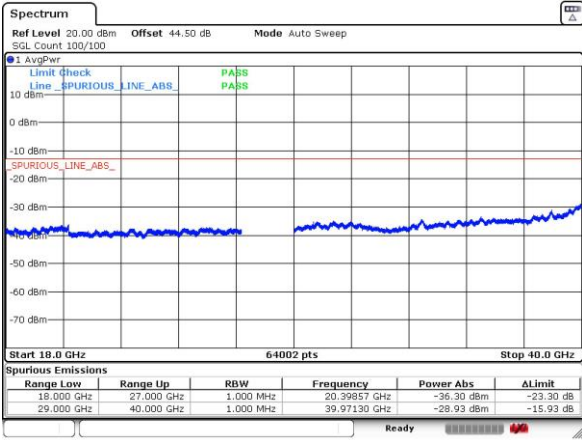
Date: 23.FEB.2020 07:07:53

Middle Channel / 100MHz



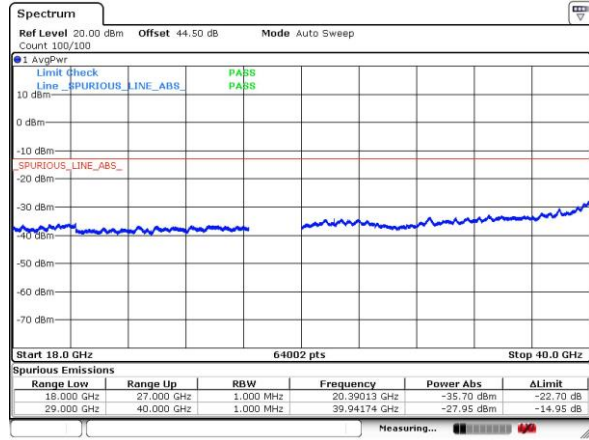
Date: 17.FEB.2020 23:51:56

Highest Channel / 50MHz



Date: 23.FEB.2020 07:27:26

Highest Channel / 100MHz



Date: 28.JAN.2020 13:23:42

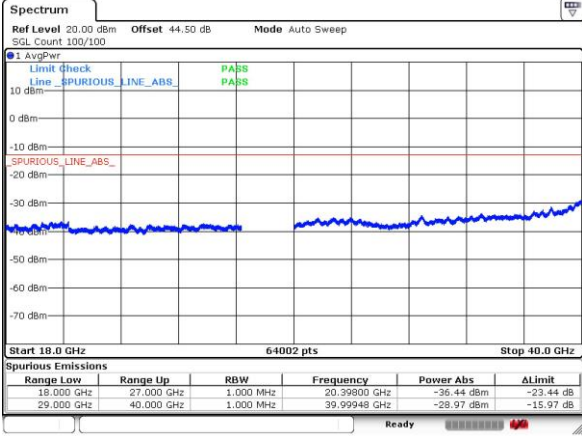
Remark: In band and out of band frequencies are omitted.



Module 1

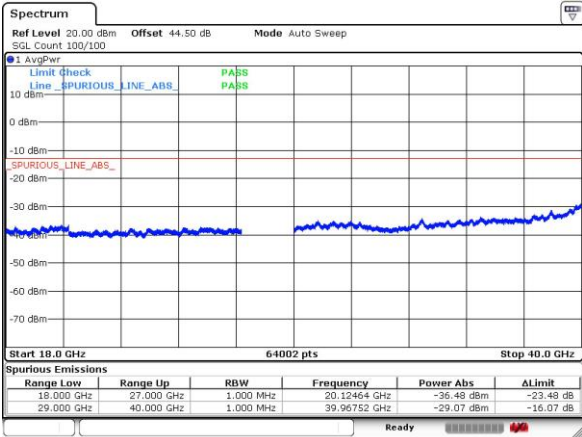
NR Band n261 QPSK (18-40GHz)

Lowest Channel / 400MHz



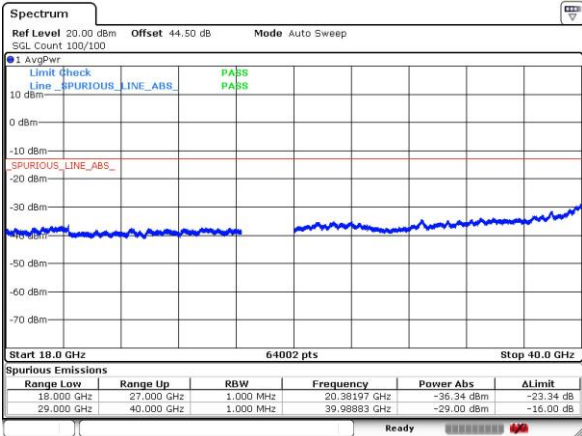
intentionally blank

Middle Channel / 400MHz



intentionally blank

Highest Channel / 400MHz



intentionally blank

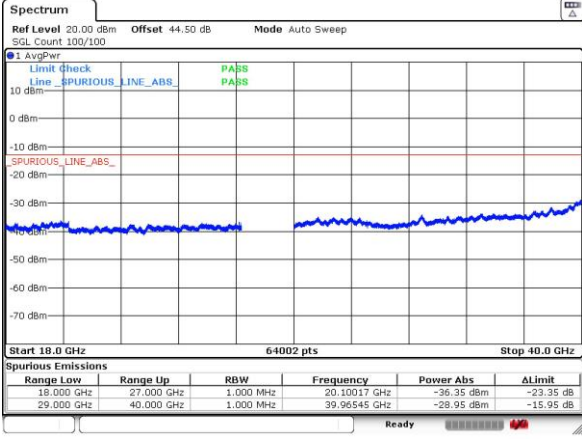
Remark: In band and out of band frequencies are omitted.



Module 2

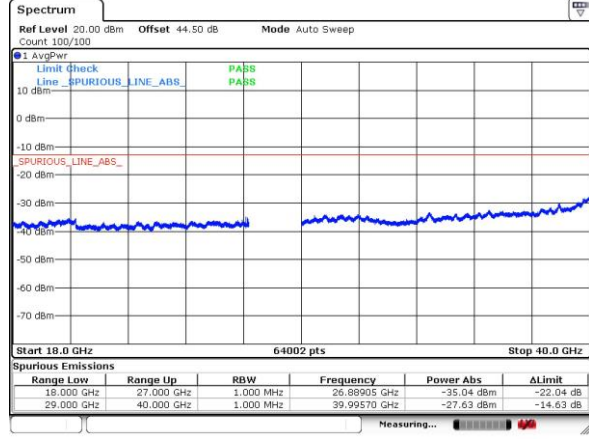
NR Band n261 QPSK (18-40GHz)

Lowest Channel / 50MHz



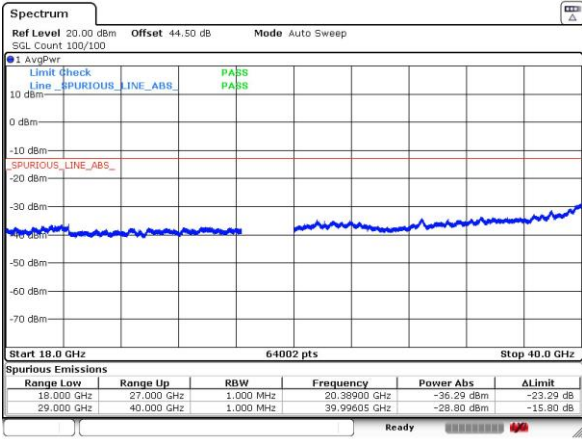
Date: 22.FEB.2020 11:57:08

Lowest Channel / 100MHz



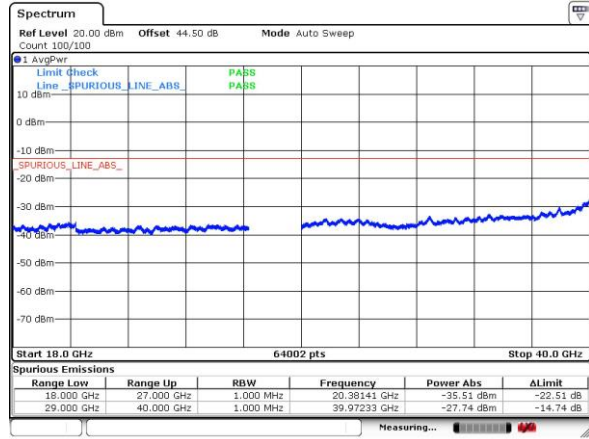
Date: 28.JAN.2020 17:43:31

Middle Channel / 50MHz



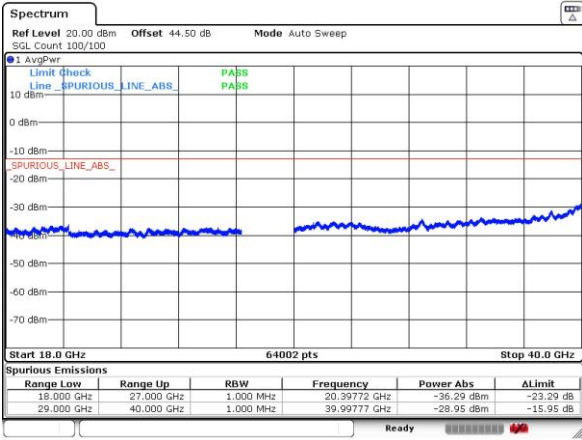
Date: 22.FEB.2020 11:48:33

Middle Channel / 100MHz



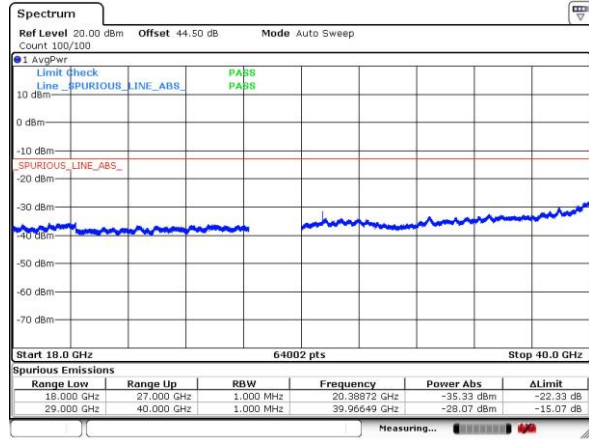
Date: 28.JAN.2020 17:52:18

Highest Channel / 50MHz



Date: 22.FEB.2020 14:50:23

Highest Channel / 100MHz



Date: 28.JAN.2020 17:55:34

Remark: In band and out of band frequencies are omitted.

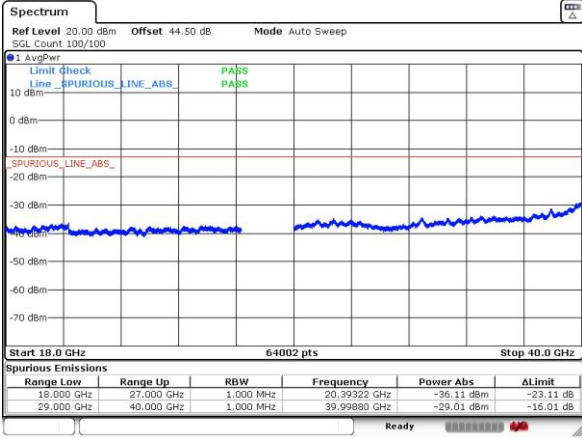




Module 2

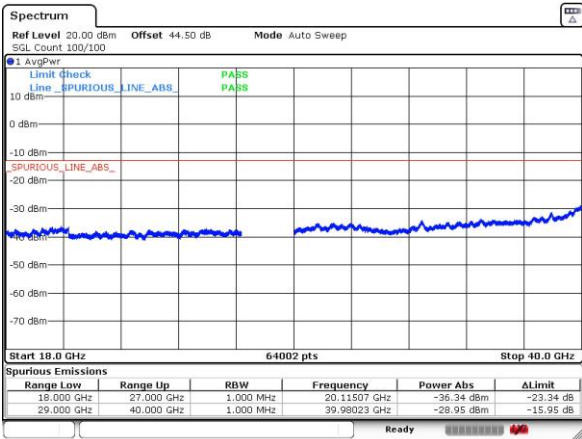
NR Band n261 QPSK (18-40GHz)

Lowest Channel / 400MHz



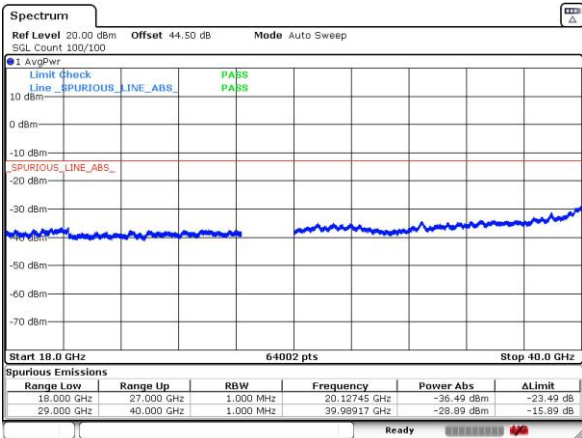
intentionally blank

Middle Channel / 400MHz



intentionally blank

Highest Channel / 400MHz

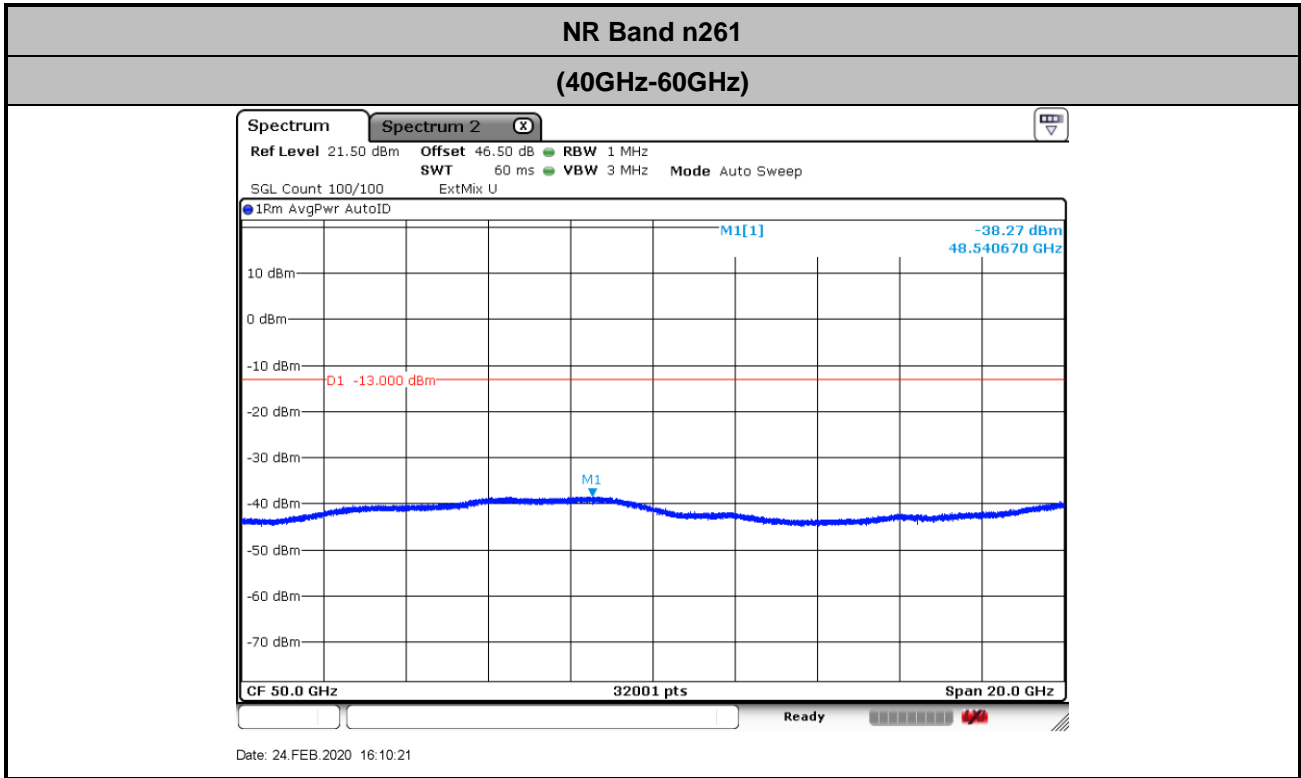


intentionally blank

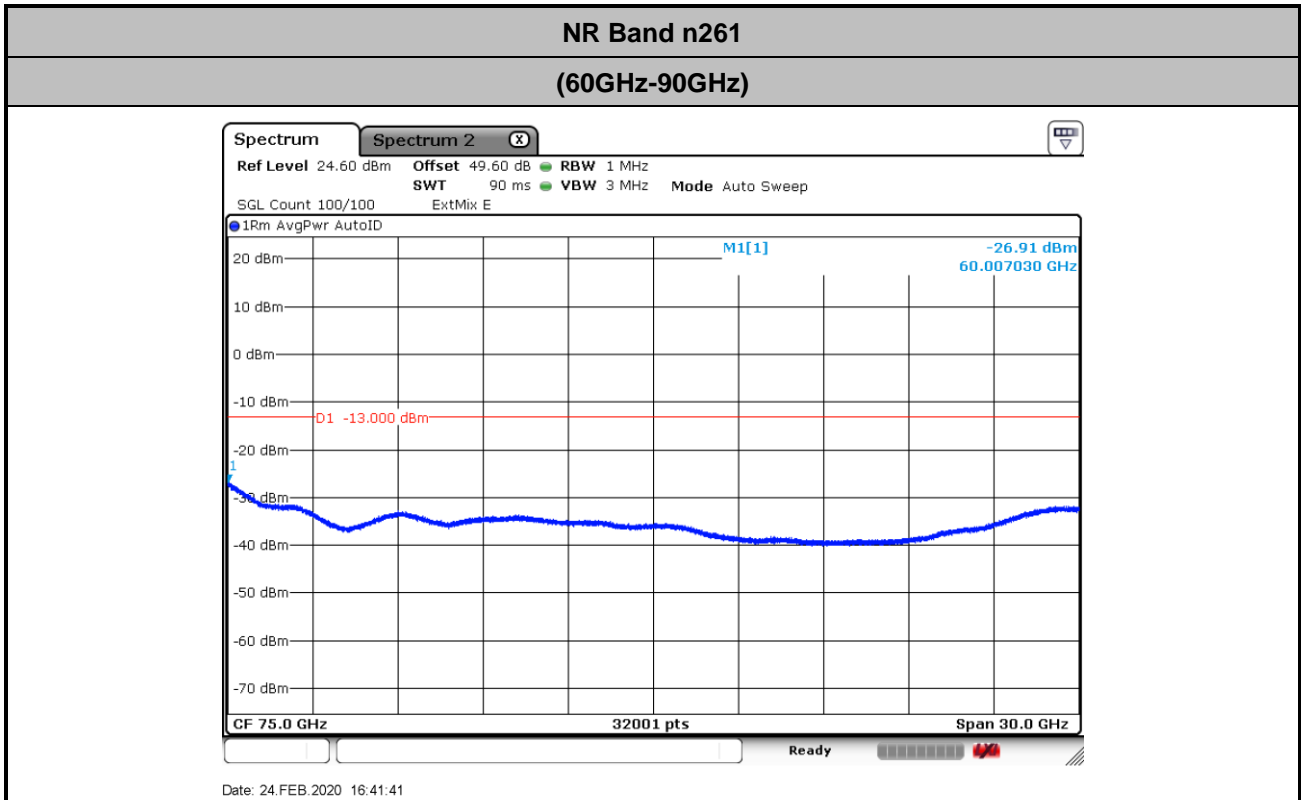
Remark: In band and out of band frequencies are omitted.



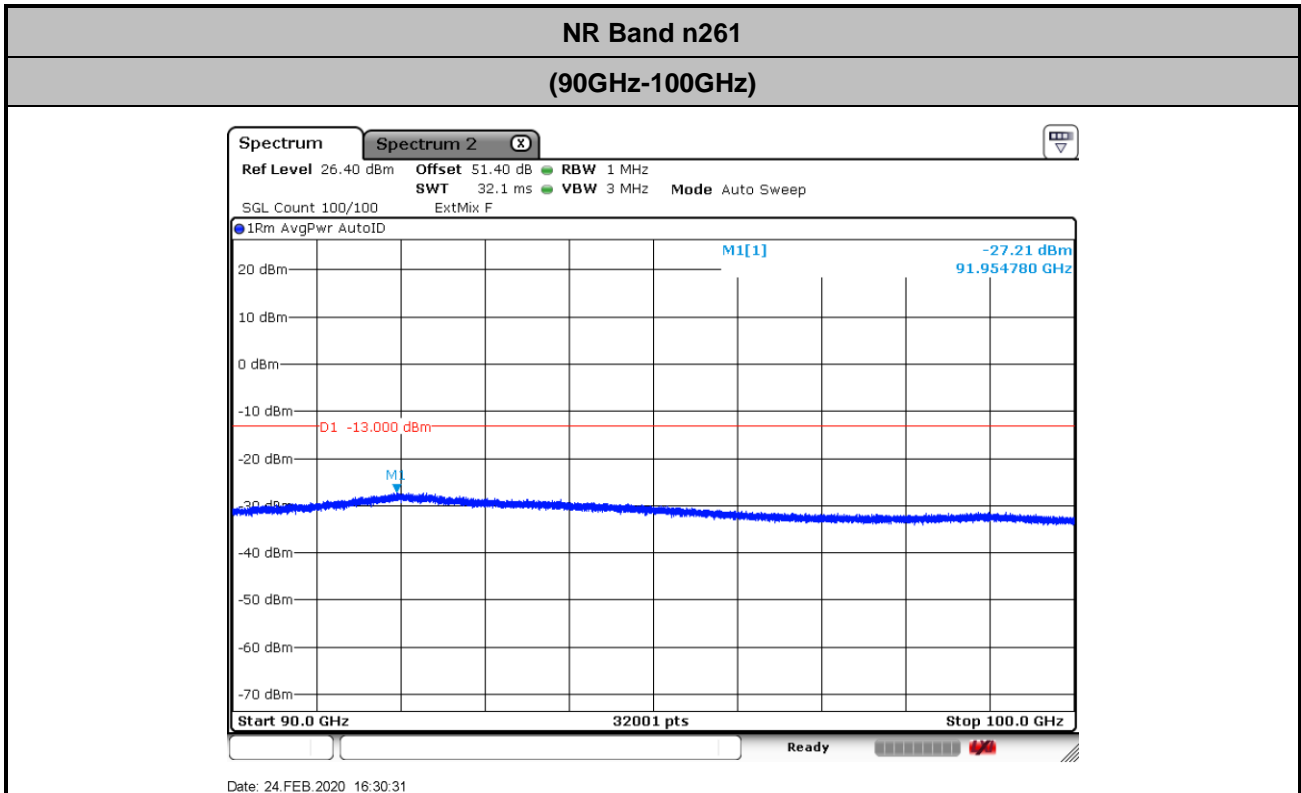
There is no significant spurious emission signal found for frequency started from 40GHz up to 100GHz. Only the noise floor is reported.



$$\begin{aligned} \text{Offset} &= \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8 \\ &= 42.1 + 2.2 + 107 + 20\log(1) - 104.8 = 46.5 \text{ (dB)} \end{aligned}$$



$$\begin{aligned} \text{Offset} &= \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8 \\ &= 47.2 + 2.2 + 107 + 20\log(1) - 104.8 = 49.6 \text{ (dB)} \end{aligned}$$



$$\begin{aligned} \text{Offset} &= \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8 \\ &= 49.0 + 2.2 + 107 + 20\log(1) - 104.8 = 51.4 \text{ (dB)} \end{aligned}$$





Frequency Stability

Test Conditions		NR Band n261 / Middle Channel			Limit
Temperature (°C)	Voltage (Volt)	CW tone			Note 2.
		Frequency (GHz)	Deviation (kHz)	Deviation (ppm)	Result
50	Normal Voltage	27.92496970	2.90	0.10	PASS
40	Normal Voltage	27.92496347	-3.33	-0.12	
30	Normal Voltage	27.92496883	2.03	0.07	
20(Ref.)	Normal Voltage	27.92496680	0.00	0.00	
10	Normal Voltage	27.92496420	-2.60	-0.09	
0	Normal Voltage	27.92496275	-4.05	-0.15	
-10	Normal Voltage	27.92496232	-4.48	-0.16	
-20	Normal Voltage	27.92496347	-3.33	-0.12	
-30	Normal Voltage	27.92496492	-1.88	-0.07	
20	Maximum Voltage	27.92496724	0.44	0.02	
20	Normal Voltage	27.92496680	0.00	0.00	
20	Battery End Point	27.92496839	1.59	0.06	

Note:

1. Normal Voltage =3.87 V. ; Battery End Point (BEP) =3.6 V. ; Maximum Voltage =4.45 V.
2. The frequency fundamental emissions stay within the operation band.



## Appendix C. R&S Mixer Certificate



# Calibration Certificate

Kalibrierschein

Certificate Number **24-0060-100986-01**

Zertifikatsnummer

## Unit Data

**Item** Harmonic Mixer, 40 GHz to 60 GHz  
Gegenstand

**Manufacturer** RPG  
Hersteller

**Type** RPG FS-Z60  
Typ

**Material Number** 1048.0171.02    **Serial Number** 100986  
Materialnummer                                  Seriennummer

**Asset Number**  
Inventarnummer

This calibration certificate documents, that the named item is tested and measured against defined specifications. Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor  $k = 2$ ). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques to the PTB/DKD or other national/international standards, which realize the physical units of measurement according to the International System of Units (SI). In all cases where no standards are available, measurements are referenced to standards of the R&S laboratories. Principles and methods of calibration correspond with EN ISO/IEC 17025. This calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid. The user is obliged to have the object recalibrated at appropriate intervals.

## Order Data

**Customer**  
Auftraggeber

**Order Number**  
Bestellnummer

**Date of Receipt**  
Eingangsdatum

Dieser Kalibrierschein dokumentiert, dass der genannte Gegenstand nach festgelegten Vorgaben geprüft und gemessen wurde. Die Messwerte lagen im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Werteintervall (Erweiterte Messunsicherheit mit  $k = 2$ ). Die Kalibrierung erfolgte mit Messmitteln und Normalen, die direkt oder indirekt durch Ableitung mittels anerkannter Kalibriertechniken rückgeführt sind auf Normale der PTB/DKD oder anderer nationaler/internationaler Standards zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Wenn keine Normale existieren, erfolgt die Rückführung auf Bezugsnormale der R&S-Laboratorien. Grundsätze und Verfahren der Kalibrierung beziehen sich auf EN ISO/IEC 17025. Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Kalibrierscheine ohne Unterschriften sind ungültig. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

## Performance

**Place and Date of Calibration**  
Ort und Datum der Kalibrierung

**Meckenheim, 2018-10-31**

**Scope of Calibration**  
Umfang der Kalibrierung

**Standard Calibration**

**Statement of Compliance (Incoming)**  
Konformitätsaussage (Anlieferung)

**New device**

**Statement of Compliance (Outgoing)**  
Konformitätsaussage (Auslieferung)

**All measured values are within the data sheet specifications.**

**Extend of Calibration Documents**  
Umfang des Kalibrierdokuments

**2 pages Calibration Certificate  
5 pages Outgoing Results**

## Radiometer Physics GmbH; Meckenheim

**Date of Issue**  
Ausstellungsdatum

**2018-11-05**

**Head of Laboratory**  
Laborleitung

Schulze

**Person Responsible**  
Bearbeiter

Heinze

**Page (Seite) 1/2**  
Vers2010-05-05/  
RPG2014-02-28

Calibration Method  
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %  
Relative Luftfeuchte

Ambient Temperature  
Umgebungstemperatur

(23<sup>+7</sup><sub>-3</sub>) °C

Working standards used (having a significant effect on the accuracy) Verwendete Gebrauchsnormale (mit signifikantem Einfluss auf die Genauigkeit)				
Item Gegenstand	Type Typ	Serial Number Seriennummer	Calibration Certificate Number Kalibrierscheinnummer	Cal. Due Kalibr. bis
Vector Network Analyzer	R&S® ZVA67	101097	20-300432406	2020-07-21
Powersensor	R&S® NRP-Z55	140093	20-300426315	2019-05-17
Powersensor	R&S® NRP-Z57	101423	20-541799	2019-04-27
Calibration Kit	WR19	U10001	24-0060-U10001-01	2019-02-01

**UGB1 A compliance statement may be possible where a confidence level of less than 95 % is acceptable.**  
Die Bestätigung der Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

**UGB2 A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.**  
Die Bestätigung der Nicht-Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

Ref.: ILAC-G8:03/2009 'Guidelines on the Reporting of Compliance with Specification'.

#### Notes

Anmerkungen

If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is actually put into operation.

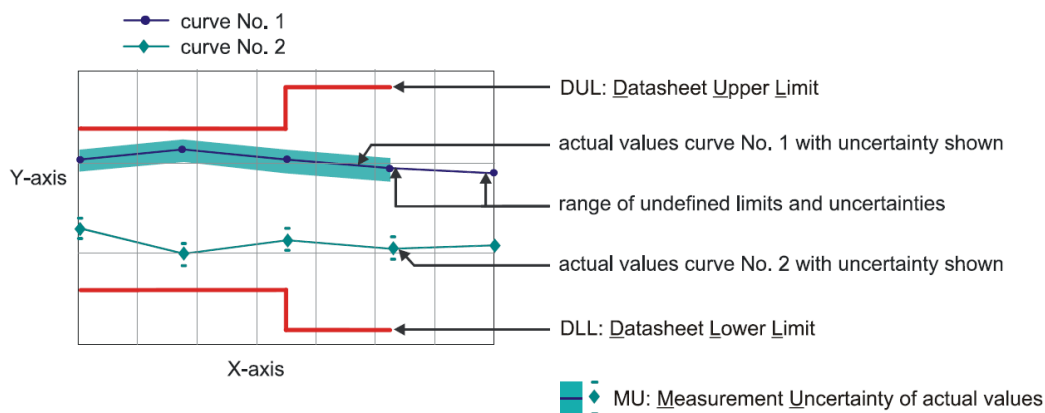


# Outgoing Results

## The following abbreviations may be used in this document

- {a) No measurement uncertainty stated because the errors always add together.  
So it is sure that a measurement result evaluated as "PASS" is pass.
- {b) The measurement uncertainty depends on the measurement result. The stated measurement uncertainty is valid for the close area around the specification. Measurement results outside the close area have a higher measurement uncertainty but are within the specification.
- {c) Functional test, therefore no measurement uncertainty is stated.
- {d) Typical value, refer to performance test.
- {e) The measurement uncertainty is taken into account when setting the measuring system.
- DL or DT Data Limit for symmetrical tolerance limits
- DLL Datasheet Lower Limit
- DUL Datasheet Upper Limit
- MU Measurement Uncertainty
- MLL or MLV Measurement Uncertainty Lower Value
- MUL or MUV Measurement Uncertainty Upper Value
- Nom. Nominal Value
- Dev. Deviation
- MErr. Measurement Error
- Act. Actual Value
- UGB Uncertainty Guard Band: Measuring uncertainty violates the data (spec.) limit.
- UGB1 Measurement results marked as UGB1 show conformity with a probability of >50 % and <95 %.
- UGB2 Measurement results marked as UGB2 show non-conformity with a probability of >50 % and <95 %.
- DU Datasheet Uncertainty

## Explanation of charts



**Software used for measurement**

**Item Type**

Measurement Studio Professional Edition  
MixerCertification

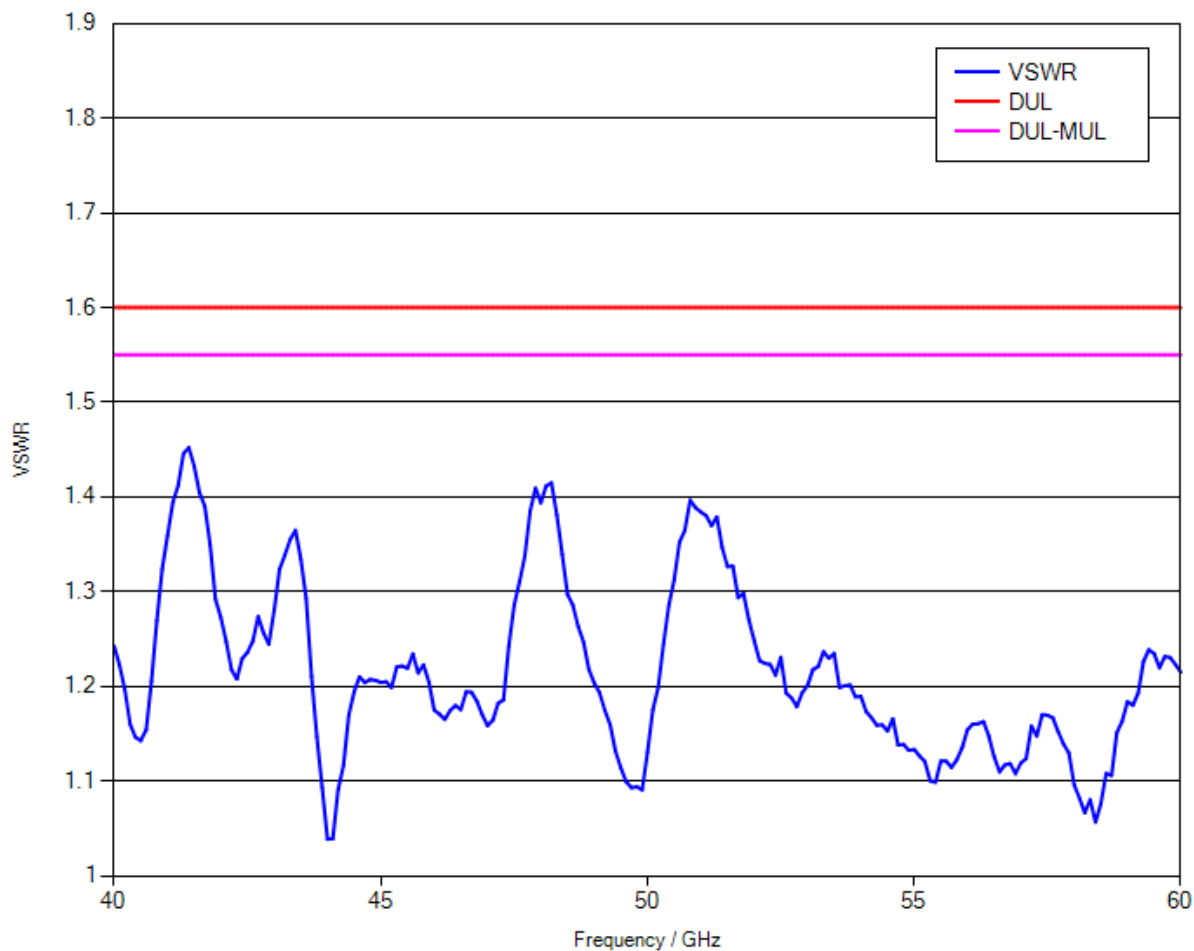
**Version**

2013  
7\_09

**Remark**

### 1.1 RF Input – VSWR

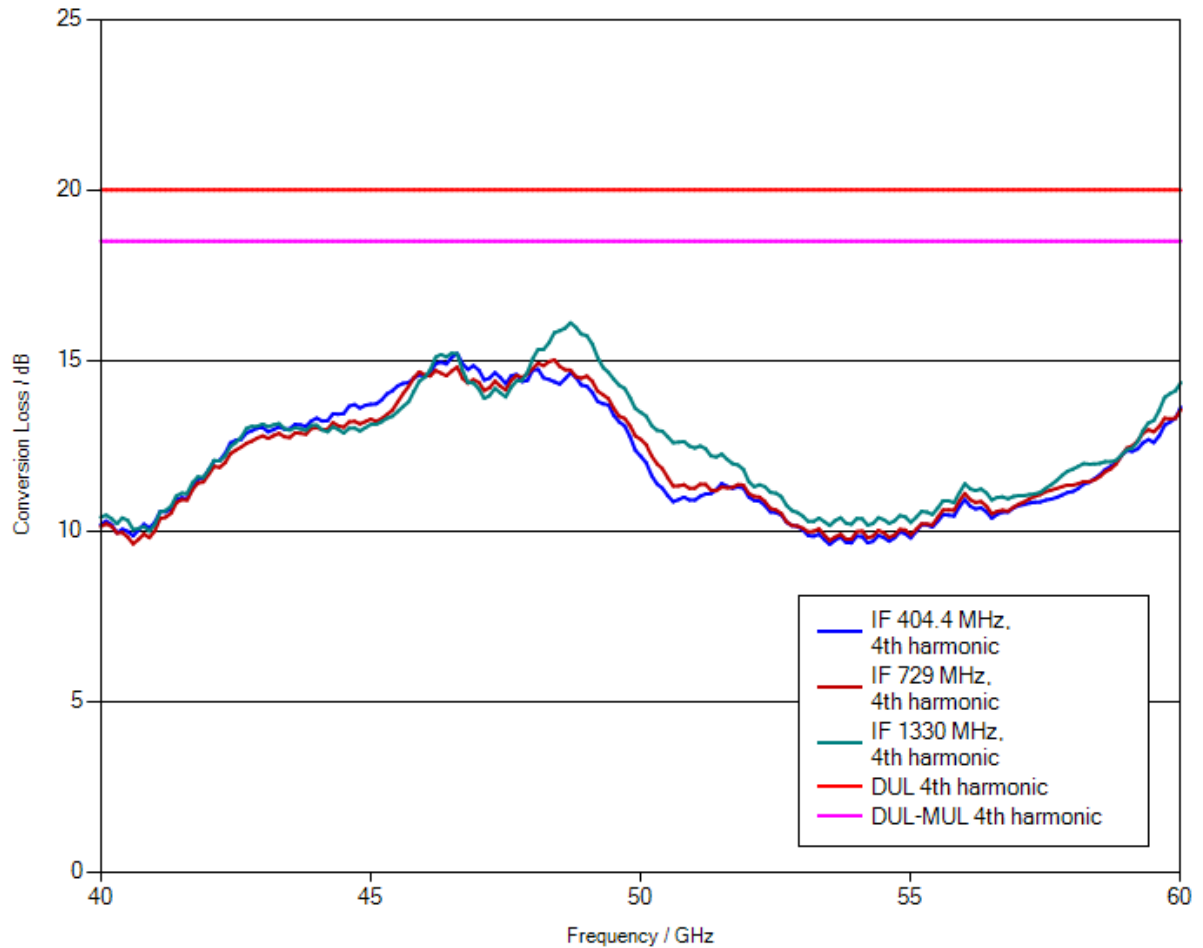
Measurement uncertainty: 0.05 (VSWR)



## 1.2 Conversion loss

LO level +13 dBm nominal  
Bias 0 A

Measurement uncertainty: 1.5 dB



**Note:** Numeric calibration data can be found attached to the PDF file of the calibration certificate. Click the “paper clip” symbol to display the file.

The file has been renamed for safety reasons.

When downloading the file onto your PC, please delete the “.file” extension and unzip the data.

### 1.3 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 4th harmonic	4 dB	2.32 dB	PASS
IF = 729 MHz, 4th harmonic	4 dB	1.99 dB	PASS
IF = 1330 MHz, 4th harmonic	4 dB	2.14 dB	PASS

# Calibration Certificate

## Kalibrierschein

Certificate Number **24-0090-101811-01**  
Zertifikatsnummer

### Unit Data

Item / Gegenstand: **Harmonic Mixer, 60 GHz to 90 GHz**  
 Manufacturer / Hersteller: **ROHDE & SCHWARZ**  
 Type / Typ: **R&S® FS-Z90**  
 Material Number / Materialnummer: **1048.0371.02**    Serial Number / Seriennummer: **101811**  
 Asset Number / Inventarnummer: \_\_\_\_\_

This calibration certificate documents, that the named item is tested and measured against defined specifications. Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor  $k = 2$ ). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques to the PTB/DKD or other national/international standards, which realize the physical units of measurement according to the International System of Units (SI). In all cases where no standards are available, measurements are referenced to standards of the R&S laboratories. Principles and methods of calibration correspond with EN ISO/IEC 17025. This calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid. The user is obliged to have the object recalibrated at appropriate intervals.

### Order Data

Customer / Auftraggeber: \_\_\_\_\_

Order Number / Bestellnummer: \_\_\_\_\_

Date of Receipt / Eingangsdatum: \_\_\_\_\_

### Performance

Place and Date of Calibration / Ort und Datum der Kalibrierung: **Meckenheim, 2018-07-16**

Scope of Calibration / Umfang der Kalibrierung: **Standard Calibration**

Statement of Compliance (Incoming) / Konformitätsaussage (Anlieferung): **New device**

Statement of Compliance (Outgoing) / Konformitätsaussage (Auslieferung): **All measured values are within the data sheet specifications.**

Extend of Calibration Documents / Umfang des Kalibrierdokuments: **2 pages Calibration Certificate  
5 pages Outgoing Results**

Dieser Kalibrierschein dokumentiert, dass der genannte Gegenstand nach festgelegten Vorgaben geprüft und gemessen wurde. Die Messwerte lagen im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Wertintervall (Erweiterte Messunsicherheit mit  $k = 2$ ). Die Kalibrierung erfolgte mit Messmitteln und Normalen, die direkt oder indirekt durch Ableitung mittels anerkannter Kalibriertechniken rückgeführt sind auf Normale der PTB/DKD oder anderer nationaler/internationaler Standards zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Wenn keine Normale existieren, erfolgt die Rückführung auf Bezugsnormale der R&S-Laboratorien. Grundsätze und Verfahren der Kalibrierung beziehen sich auf EN ISO/IEC 17025. Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Kalibrierscheine ohne Unterschriften sind ungültig. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

### Radiometer Physics GmbH; Meckenheim

Date of Issue / Ausstellungsdatum: **2018-07-19**

Head of Laboratory / Laborleitung:   
**Ceru**

Person Responsible / Bearbeiter:   
**Grossmindorf**

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Vers2010-05-05/  
RPG2014-02-28



Material Number 1048.0371.02

Serial Number 101811

Certificate Number 24-0090-101811-01

Calibration Method  
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %  
Relative LuftfeuchteAmbient Temperature  
Umgebungstemperatur(23 <sup>+7</sup><sub>-3</sub>) °CWorking standards used (having a significant effect on the accuracy)  
Verwendete Gebrauchsnormale (mit signifikantem Einfluss auf die Genauigkeit)

Item Gegenstand	Type Typ	Serial Number Seriennummer	Calibration Certificate Number Kalibrierscheinnummer	Cal. Due Kalibr. bis
Vector Network Analyzer	R&S® ZVA67	101097	20-300432406	2020-07-21
Powersensor	R&S® NRP-Z55	140093	20-300426315	2019-05-17
Powersensor	R&S® NRP-Z58	101063	20-611482	2018-07-21
Calibration kit	WR12	E10001	RPG-PAQA-TN-2014-005	2019-02-01

**UGB1** A compliance statement may be possible where a confidence level of less than 95 % is acceptable.  
Die Bestätigung der Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

**UGB2** A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.  
Die Bestätigung der Nicht-Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

Ref.: ILAC-G8:03/2009 'Guidelines on the Reporting of Compliance with Specification'.

**Notes**

Anmerkungen

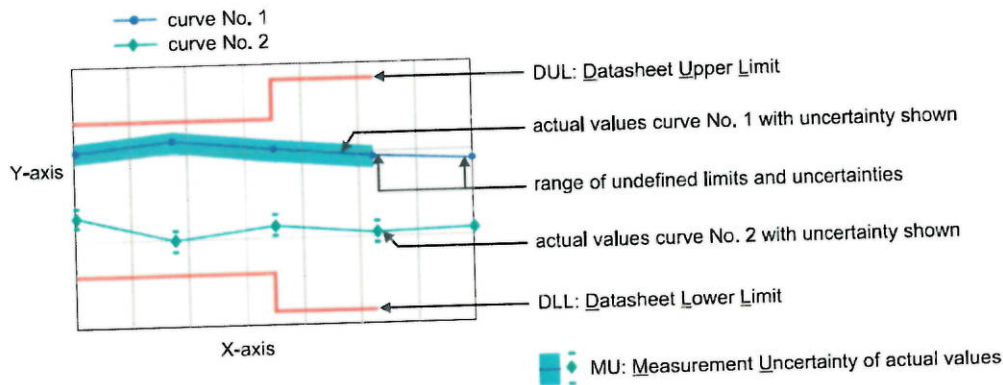
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is actually put into operation.

# Outgoing Results

The following abbreviations may be used in this document

- {a) No measurement uncertainty stated because the errors always add together. So it is sure that a measurement result evaluated as "PASS" is pass.
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- UGB2 Measurement results marked as UGB2 show non-conformity with a probability of >50 % and <95 %.
- DU Datasheet Uncertainty

## Explanation of charts



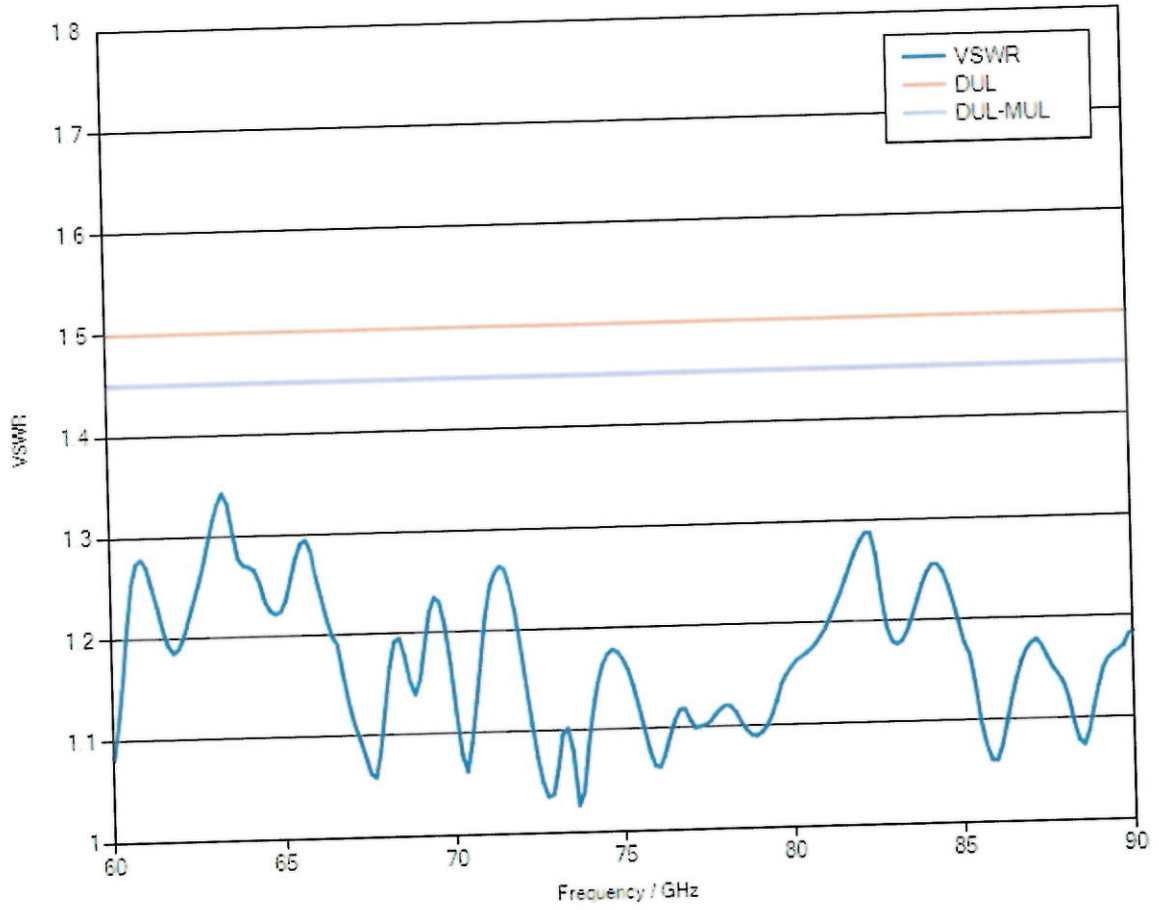
Software used for measurement  
Item Type  
Measurement Studio Professional Edition  
MixerCertification

Version  
2013  
7\_08

Remark

### 1.1 RF Input – VSWR

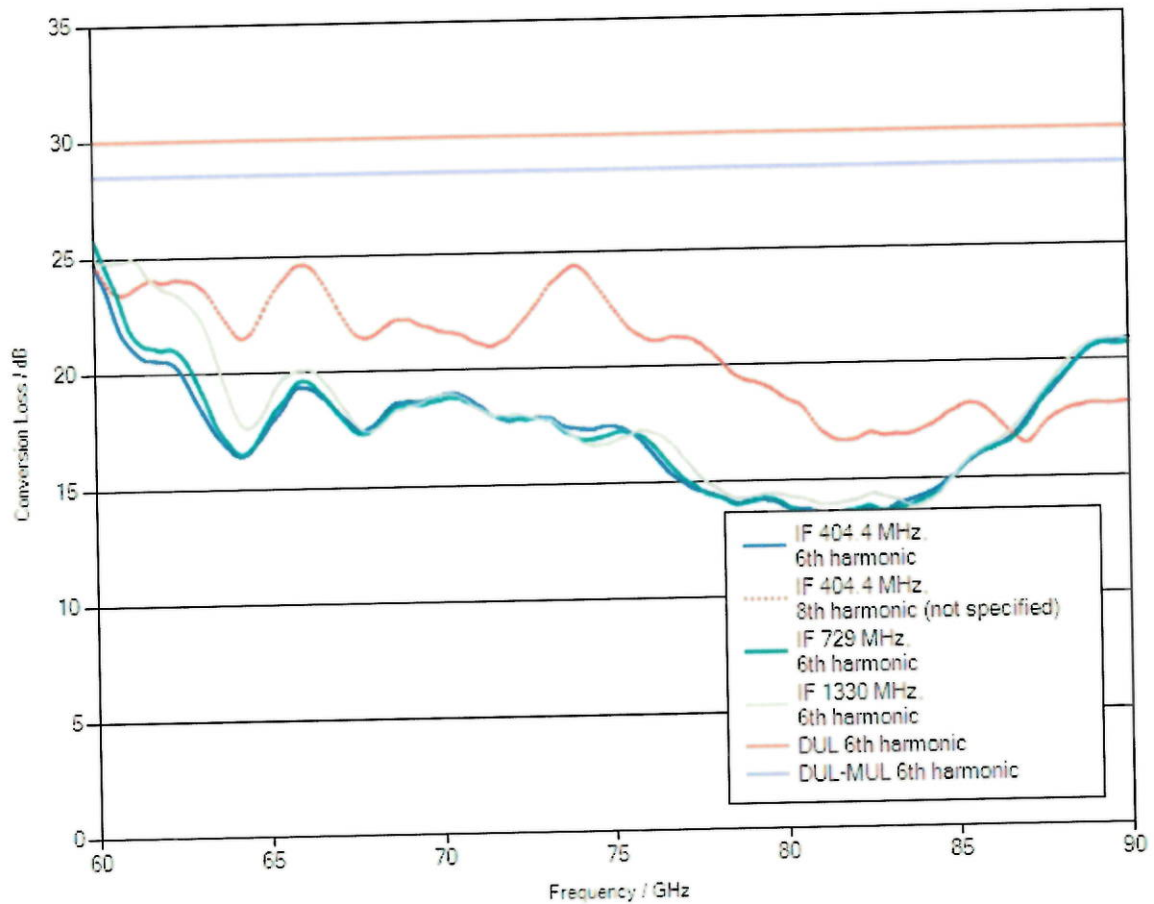
Measurement uncertainty: 0.05 (VSWR)



## 1.2 Conversion loss

LO level +14 dBm nominal  
Bias 0 A

Measurement uncertainty: 1.5 dB



Note: Numeric calibration data can be found attached to the PDF file of the calibration certificate. Click the "paper clip" symbol to display the file.

The file has been renamed for safety reasons. When downloading the file onto your PC, please delete the ".file" extension and unzip the data.

### 1.3 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 6th harmonic	6 dB	3.29 dB	PASS
IF = 404.4 MHz, 8th harmonic	not specified	2.25 dB	not specified
IF = 729 MHz, 6th harmonic	6 dB	3.47 dB	PASS
IF = 1330 MHz, 6th harmonic	6 dB	3.84 dB	PASS





# Calibration Certificate

Certificate Number **24-0140-101128-01**

Kalibrierschein

Zertifikatsnummer

## Unit Data

**Item** Harmonic Mixer, 90 GHz to 140 GHz  
Gegenstand

**Manufacturer** RPG  
Hersteller

**Type** RPG FS-Z140  
Typ

**Material Number** 3622.0708.02    **Serial Number** 101128  
Materialnummer                      Seriennummer

**Asset Number**  
Inventarnummer

This calibration certificate documents, that the named item is tested and measured against defined specifications. Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor  $k = 2$ ). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques to the PTB/DKD or other national/international standards, which realize the physical units of measurement according to the International System of Units (SI). In all cases where no standards are available, measurements are referenced to standards of the R&S laboratories. Principles and methods of calibration correspond with EN ISO/IEC 17025. This calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid. The user is obliged to have the object recalibrated at appropriate intervals.

## Order Data

**Customer**  
Auftraggeber

**Order Number**  
Bestellnummer

**Date of Receipt**  
Eingangsdatum

Dieser Kalibrierschein dokumentiert, dass der genannte Gegenstand nach festgelegten Vorgaben geprüft und gemessen wurde. Die Messwerte lagen im Regelfall mit einer Wahrscheinlichkeit von annähernd 95% im zugeordneten Werteintervall (Erweiterte Messunsicherheit mit  $k = 2$ ). Die Kalibrierung erfolgte mit Messmitteln und Normalen, die direkt oder indirekt durch Ableitung mittels anerkannter Kalibriertechniken rückgeführt sind auf Normale der PTB/DKD oder anderer nationaler/internationaler Standards zur Darstellung der physikalischen Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Wenn keine Normale existieren, erfolgt die Rückführung auf Bezugsnormale der R&S-Laboratorien. Grundsätze und Verfahren der Kalibrierung beziehen sich auf EN ISO/IEC 17025. Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Kalibrierscheine ohne Unterschriften sind ungültig. Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.

## Performance

**Place and Date of Calibration**  
Ort und Datum der Kalibrierung

**Meckenheim, 2018-09-03**

**Scope of Calibration**  
Umfang der Kalibrierung

**Standard Calibration**

**Statement of Compliance (Incoming)**  
Konformitätsaussage (Anlieferung)

**New device**

**Statement of Compliance (Outgoing)**  
Konformitätsaussage (Auslieferung)

**All measured values are within the data sheet specifications.**

**Extend of Calibration Documents**  
Umfang des Kalibrierdokuments

**2 pages Calibration Certificate  
5 pages Outgoing Results**

## Radiometer Physics GmbH; Meckenheim

**Date of Issue**  
Ausstellungsdatum

**2018-09-06**

**Head of Laboratory**  
Laborleitung

**Schulze**

**Person Responsible**  
Bearbeiter

**Dick**

**Page (Seite) 1/2**  
Vers2010-05-05/  
RPG2014-02-28

Calibration Method  
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %  
Relative Luftfeuchte

Ambient Temperature  
Umgebungstemperatur

(23<sup>+7</sup><sub>-3</sub>) °C

Working standards used (having a significant effect on the accuracy) Verwendete Gebrauchsnormale (mit signifikantem Einfluss auf die Genauigkeit)				
Item Gegenstand	Type Typ	Serial Number Seriennummer	Calibration Certificate Number Kalibrierscheinnummer	Cal. Due Kalibr. bis
Vector Network Analyzer	R&S® ZVA67	101097	20-300432406	2020-07-21
Powersensor	R&S® NRP-Z55	140093	20-300426315	2019-05-17

**UGB1 A compliance statement may be possible where a confidence level of less than 95 % is acceptable.**  
Die Bestätigung der Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

**UGB2 A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.**  
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Ref.: ILAC-G8:03/2009 'Guidelines on the Reporting of Compliance with Specification'.

#### Notes

Anmerkungen

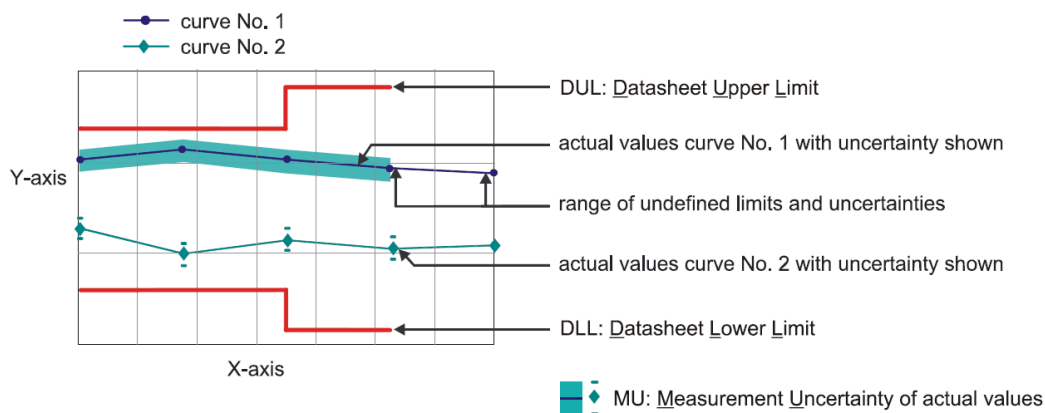
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is actually put into operation.

# Outgoing Results

## The following abbreviations may be used in this document

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- DU Datasheet Uncertainty

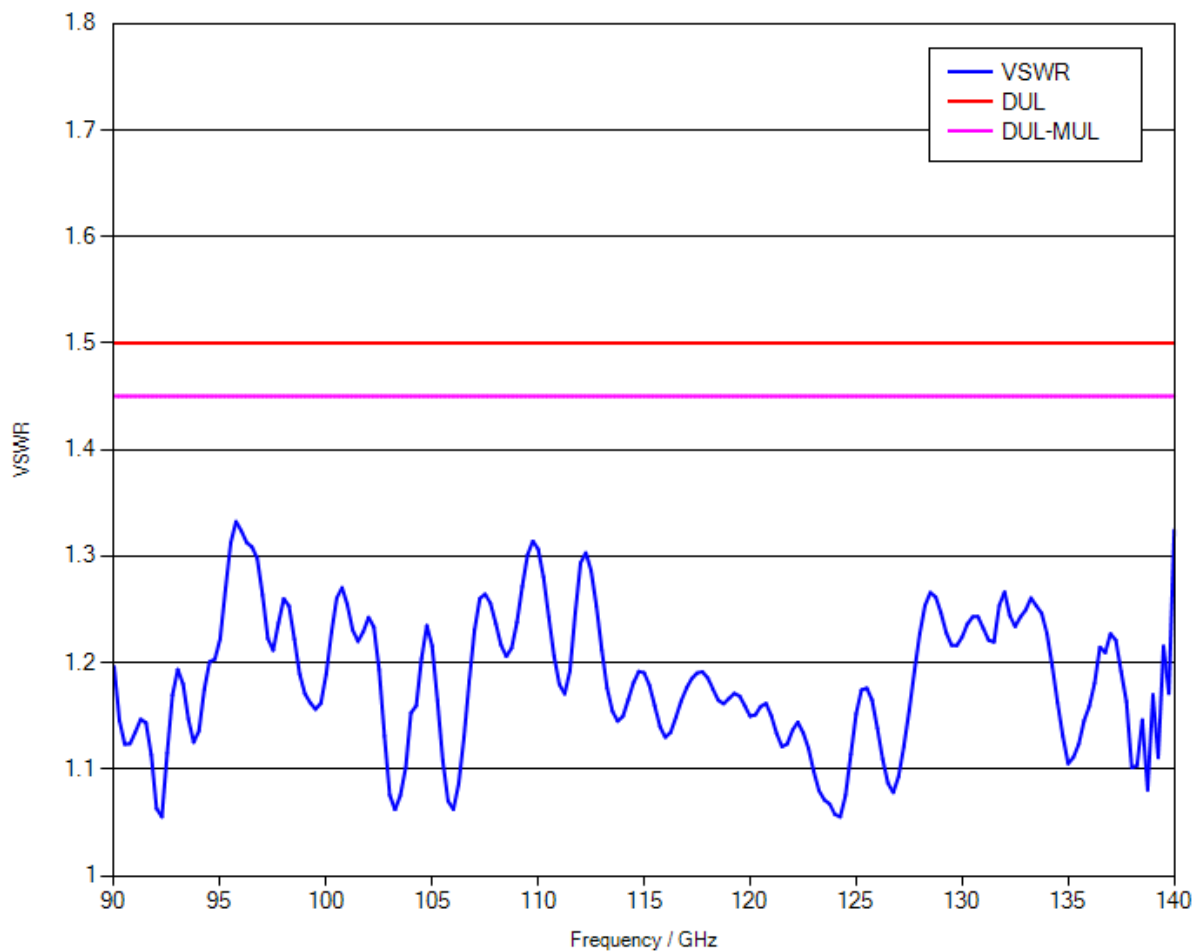
## Explanation of charts



**Software used for measurement****Item Type**Measurement Studio Professional Edition  
MixerCertification**Version**2013  
7\_09**Remark**

### 1.1 RF Input – VSWR

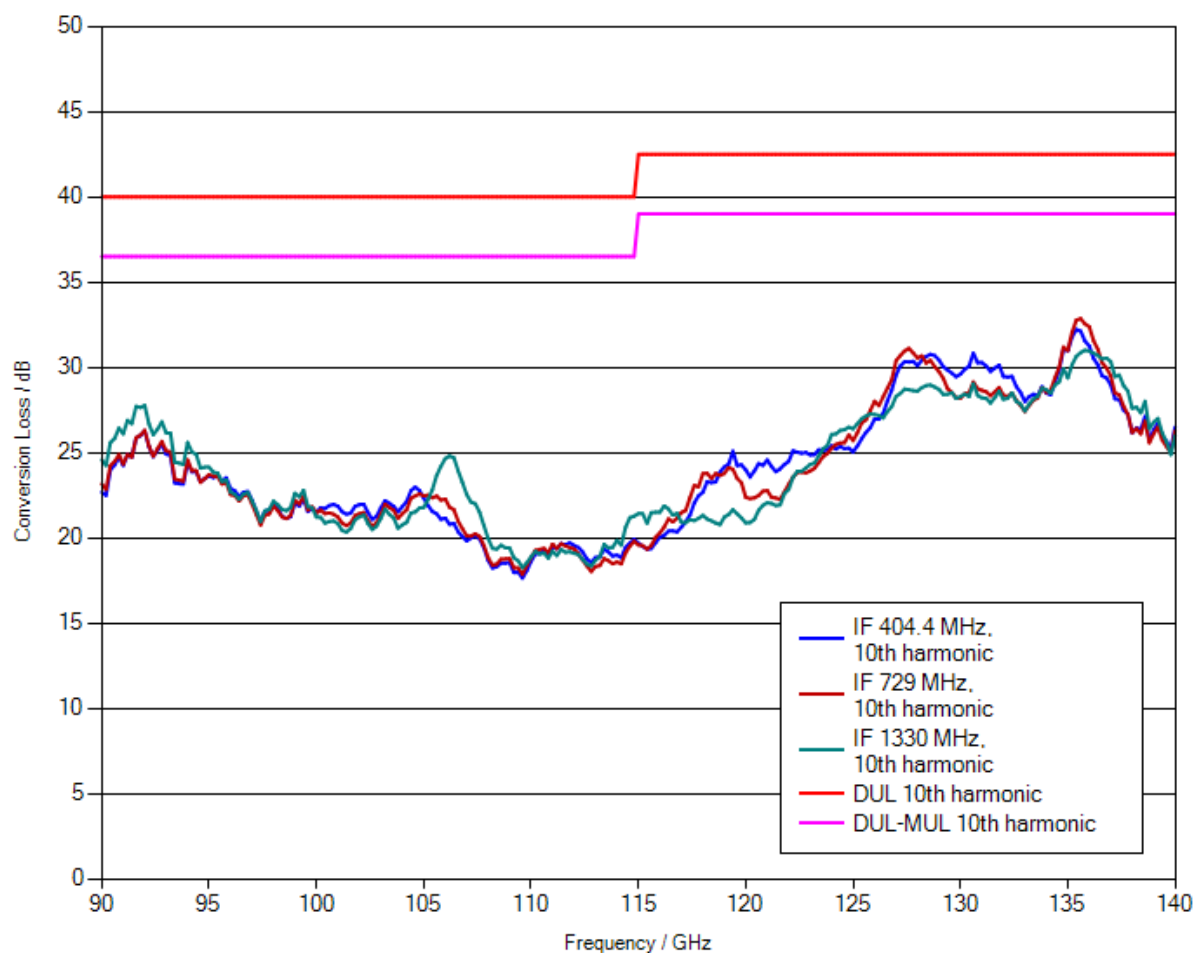
Measurement uncertainty: 0.05 (VSWR)



## 1.2 Conversion loss

LO level +14 dBm nominal  
Bias 0 A

Measurement uncertainty: 3.5 dB



**Note:** Numeric calibration data can be found attached to the PDF file of the calibration certificate. Click the “paper clip” symbol to display the file.

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### 1.3 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 10th harmonic	6 dB	2.8 dB	PASS
IF = 729 MHz, 10th harmonic	6 dB	2.75 dB	PASS
IF = 1330 MHz, 10th harmonic	6 dB	2.62 dB	PASS





# Calibration Certificate

**Certificate Number 24-0220-101014-01**

Kalibrierschein

Zertifikatsnummer

## Unit Data

**Item** Harmonic Mixer, 140 GHz to 220 GHz  
Gegenstand

**Manufacturer** RPG  
Hersteller

**Type** RPG FS-Z220  
Typ

**Material Number** 3593.3250.02    **Serial Number** 101014  
Materialnummer    Seriennummer

**Asset Number**  
Inventarnummer

This calibration certificate documents, that the named item is tested and measured against defined specifications. Measurement results are located usually in the corresponding interval with a probability of approx. 95% (coverage factor  $k = 2$ ). Calibration is performed with test equipment and standards directly or indirectly traceable by means of approved calibration techniques to the PTB/DKD or other national/international standards, which realize the physical units of measurement according to the International System of Units (SI). In all cases where no standards are available, measurements are referenced to standards of the R&S laboratories. Principles and methods of calibration correspond with EN ISO/IEC 17025. This calibration certificate may not be reproduced other than in full. Calibration certificates without signatures are not valid. The user is obliged to have the object recalibrated at appropriate intervals.

## Order Data

**Customer**  
Auftraggeber

**Order Number**  
Bestellnummer

**Date of Receipt**  
Eingangsdatum

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## Performance

**Place and Date of Calibration**  
Ort und Datum der Kalibrierung

**Meckenheim, 2018-08-27**

**Scope of Calibration**  
Umfang der Kalibrierung

**Standard Calibration**

**Statement of Compliance (Incoming)**  
Konformitätsaussage (Anlieferung)

**New device**

**Statement of Compliance (Outgoing)**  
Konformitätsaussage (Auslieferung)

**All measured values are within the data sheet specifications.**

**Extend of Calibration Documents**  
Umfang des Kalibrierdokuments

**2 pages Calibration Certificate  
5 pages Outgoing Results**

## Radiometer Physics GmbH; Meckenheim

**Date of Issue**  
Ausstellungsdatum

**2018-08-28**

**Head of Laboratory**  
Laborleitung

Schulze

**Person Responsible**  
Bearbeiter

Heinze

**Page (Seite) 1/2**  
Vers2010-05-05/  
RPG2014-02-28

Calibration Method  
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %  
Relative Luftfeuchte

Ambient Temperature  
Umgebungstemperatur

(23<sup>+7</sup><sub>-3</sub>) °C

Working standards used (having a significant effect on the accuracy) Verwendete Gebrauchsnormale (mit signifikantem Einfluss auf die Genauigkeit)				
Item Gegenstand	Type Typ	Serial Number Seriennummer	Calibration Certificate Number Kalibrierscheinnummer	Cal. Due Kalibr. bis
Vector Network Analyzer	R&S® ZVA67	101097	20-300432406	2020-07-21
Powersensor	R&S® NRP-Z55	140093	20-300426315	2019-05-17

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**UGB2 A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.**  
Die Bestätigung der Nicht-Konformität ist möglich, sofern ein Grad des Vertrauens von weniger als 95 % akzeptabel ist.

Ref.: ILAC-G8:03/2009 'Guidelines on the Reporting of Compliance with Specification'.

#### Notes

Anmerkungen

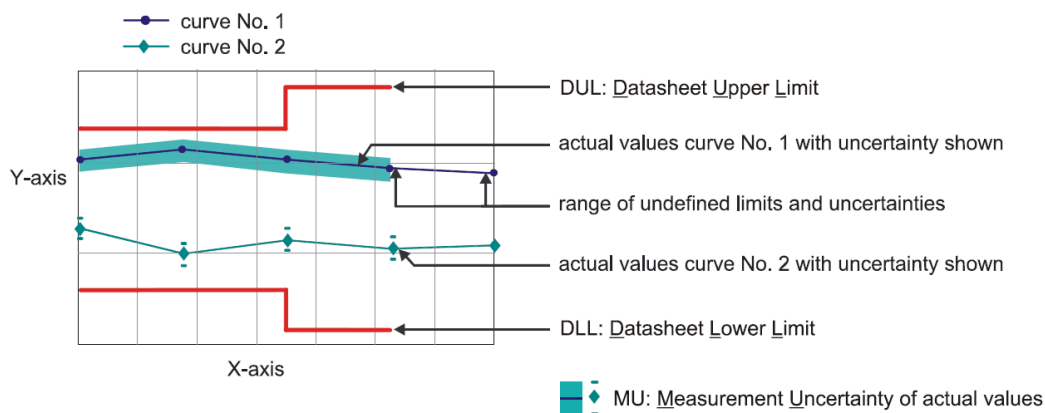
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## Explanation of charts



**Software used for measurement**

**Item Type**

Measurement Studio Professional Edition  
MixerCertification

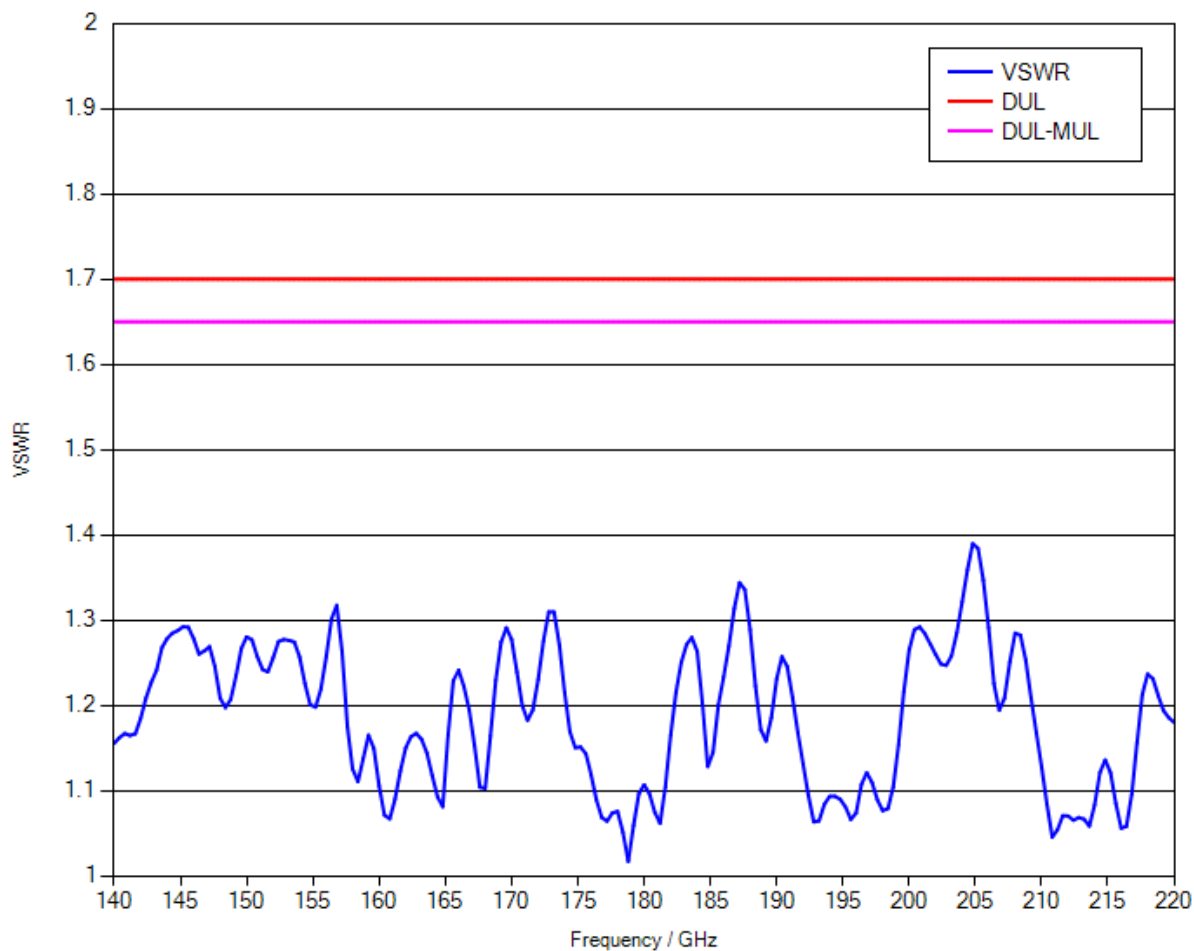
**Version**

2013  
7\_09

**Remark**

### 1.1 RF Input – VSWR

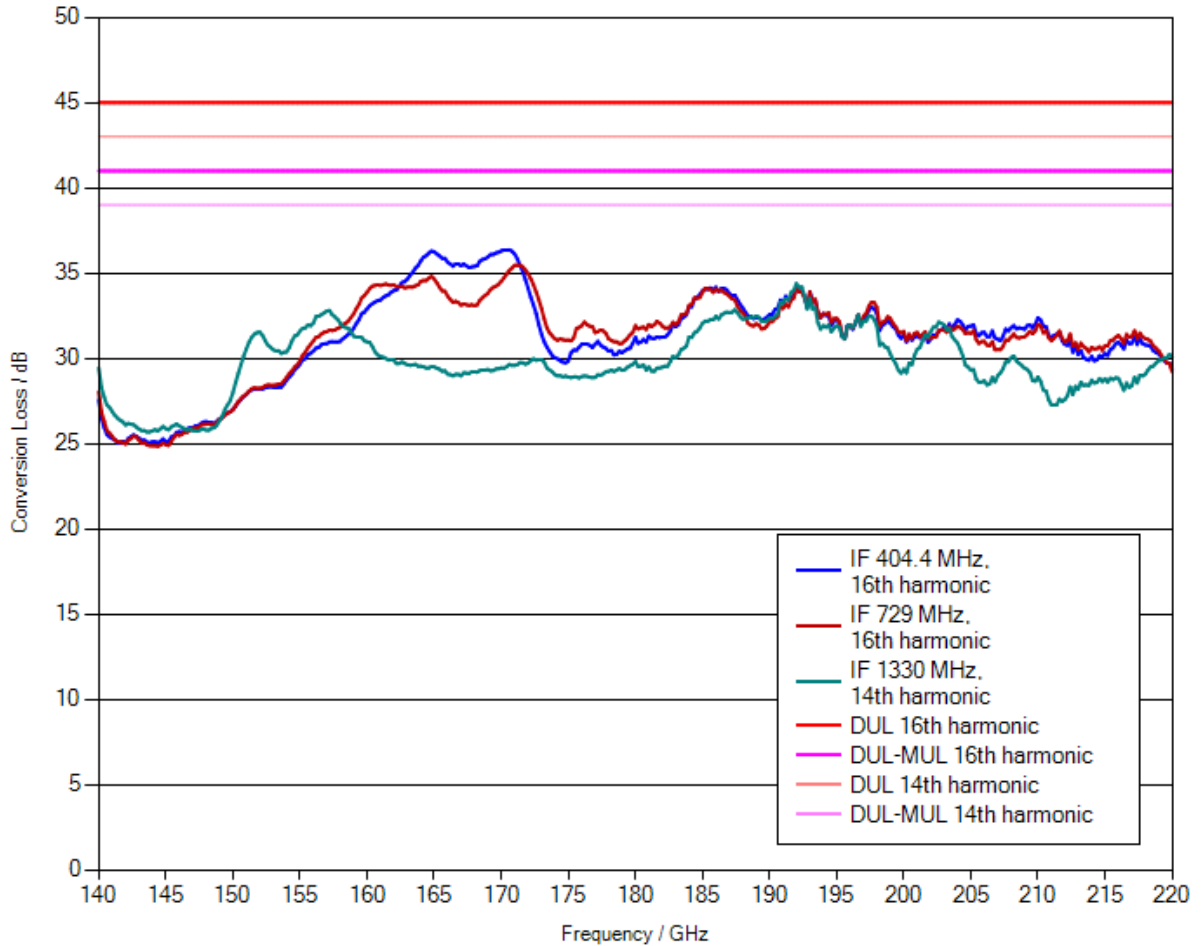
Measurement uncertainty: 0.05 (VSWR)



## 1.2 Conversion loss

LO level +13 dBm nominal  
 Bias 0 A

Measurement uncertainty: 4 dB



**Note:** Numeric calibration data can be found attached to the PDF file of the calibration certificate. Click the “paper clip” symbol to display the file.

The file has been renamed for safety reasons. When downloading the file onto your PC, please delete the “.file” extension and unzip the data.



### 1.3 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 16th harmonic	6 dB	2.71 dB	PASS
IF = 729 MHz, 16th harmonic	6 dB	2.61 dB	PASS
IF = 1330 MHz, 14th harmonic	6 dB	2.61 dB	PASS