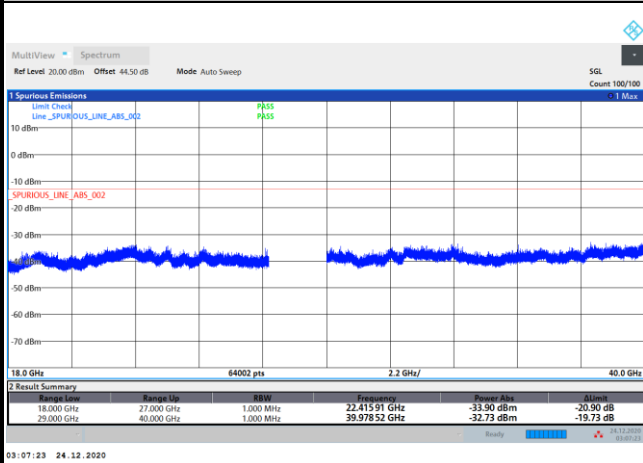




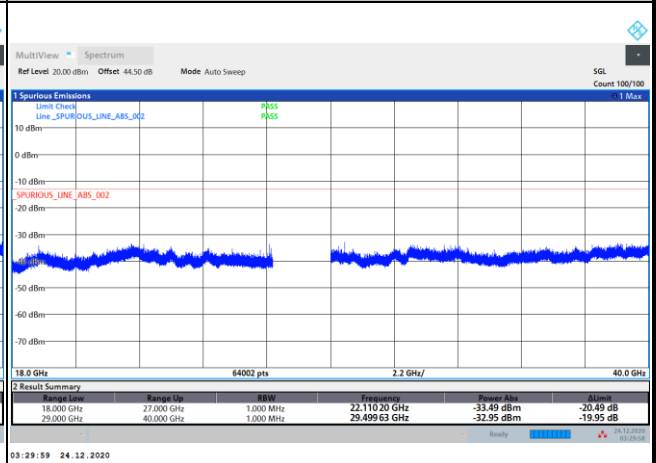
AG1 DFT-s-OFDM Module 2

NR Band n261 BPSK (18-40GHz)

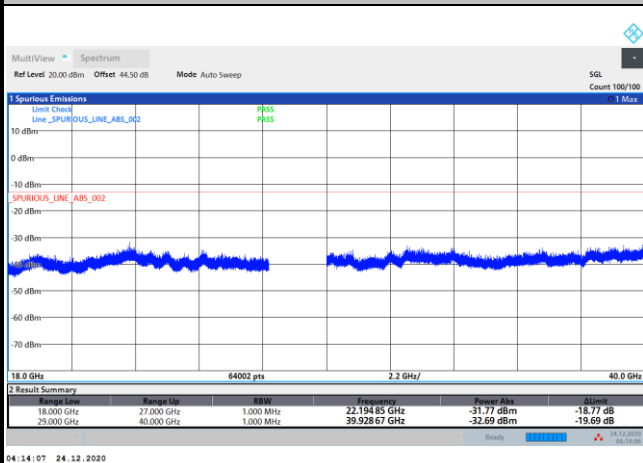
Lowest Channel / 50MHz



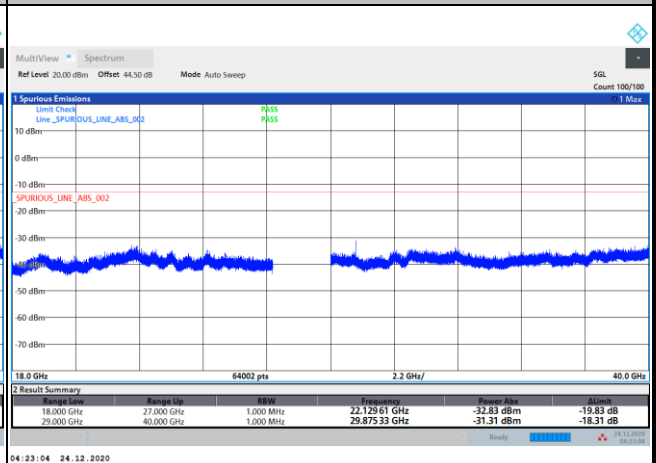
Lowest Channel / 100MHz



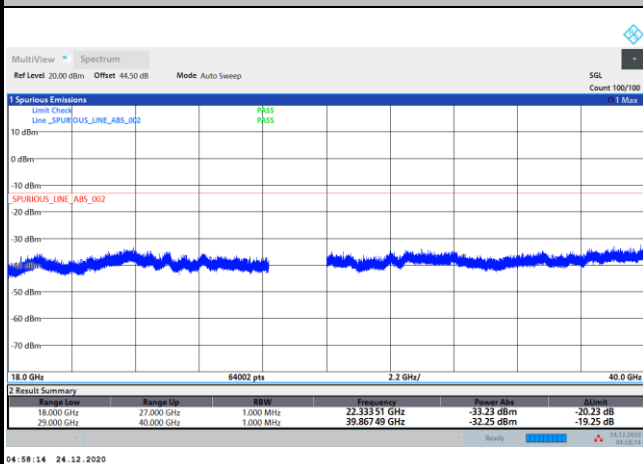
Middle Channel / 50MHz



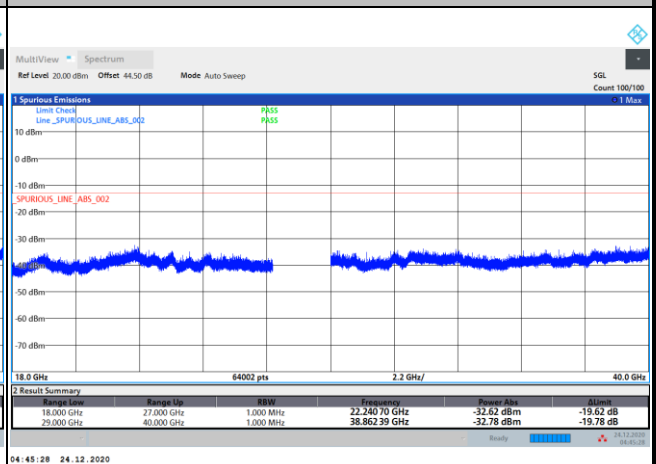
Middle Channel / 100MHz



Highest Channel / 50MHz



Highest Channel / 100MHz



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



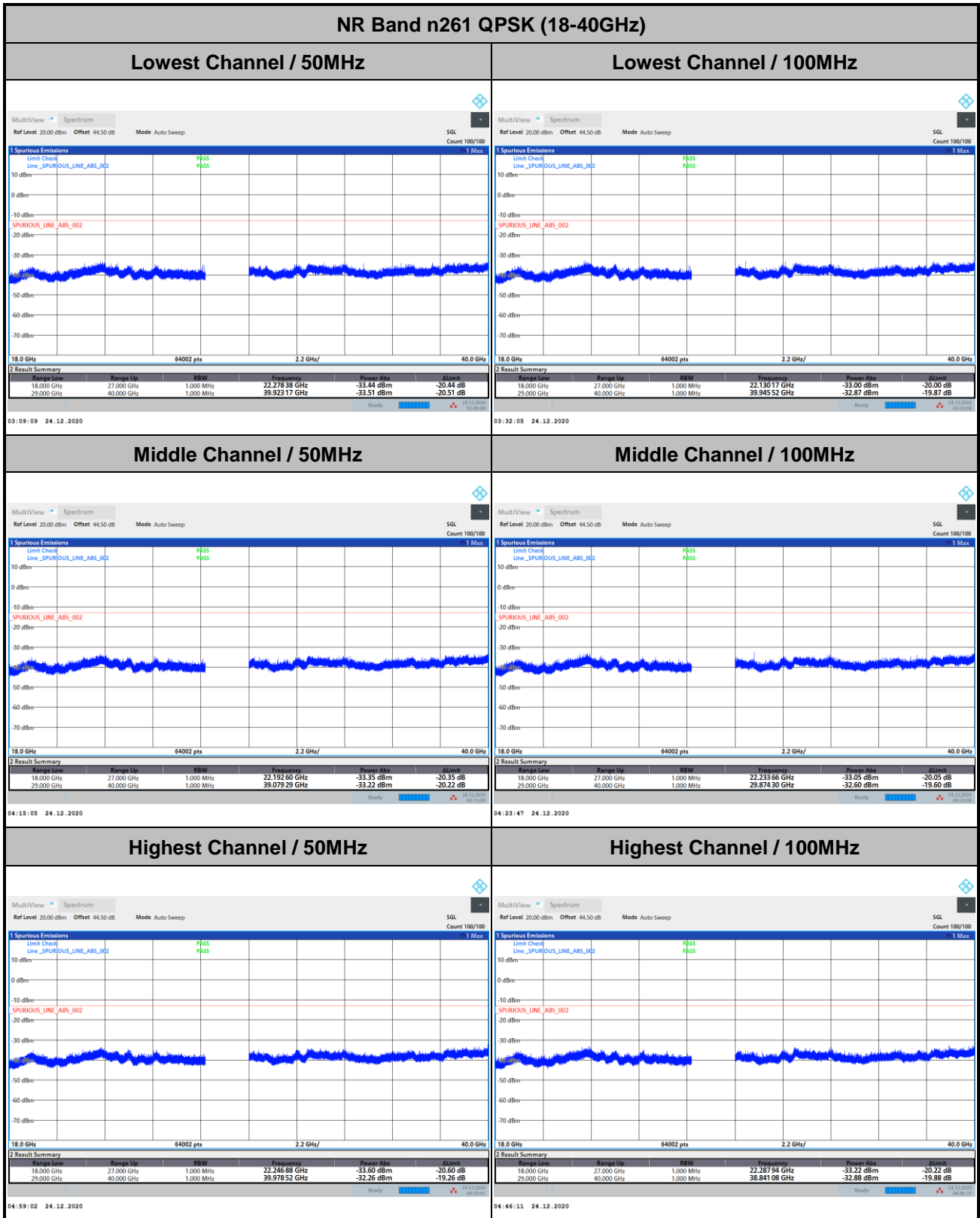
AG1 DFT-s-OFDM Module 2

NR Band n261 BPSK (18-40GHz)					
<p><b>Lowest Channel / 200MHz</b></p> <table border="1"> <thead> <tr> <th>Line Check</th> <th>Spurious Line</th> </tr> </thead> <tbody> <tr> <td>PASS</td> <td>PASS</td> </tr> </tbody> </table> <p>03:49:39 24.12.2020</p>	Line Check	Spurious Line	PASS	PASS	<p>intentionally blank</p>
Line Check	Spurious Line				
PASS	PASS				
<p><b>Middle Channel / 200MHz</b></p> <table border="1"> <thead> <tr> <th>Line Check</th> <th>Spurious Line</th> </tr> </thead> <tbody> <tr> <td>PASS</td> <td>PASS</td> </tr> </tbody> </table> <p>04:34:10 24.12.2020</p>	Line Check	Spurious Line	PASS	PASS	<p>intentionally blank</p>
Line Check	Spurious Line				
PASS	PASS				
<p><b>Highest Channel / 200MHz</b></p> <table border="1"> <thead> <tr> <th>Line Check</th> <th>Spurious Line</th> </tr> </thead> <tbody> <tr> <td>PASS</td> <td>PASS</td> </tr> </tbody> </table> <p>05:12:45 24.12.2020</p>	Line Check	Spurious Line	PASS	PASS	<p>intentionally blank</p>
Line Check	Spurious Line				
PASS	PASS				

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



AG1 DFT-s-OFDM Module 2



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



AG1 DFT-s-OFDM Module 2

NR Band n261 QPSK (18-40GHz)	
<p><b>Lowest Channel / 200MHz</b></p>	<p>intentionally blank</p>
<p><b>Middle Channel / 200MHz</b></p>	<p>intentionally blank</p>
<p><b>Highest Channel / 200MHz</b></p>	<p>intentionally blank</p>

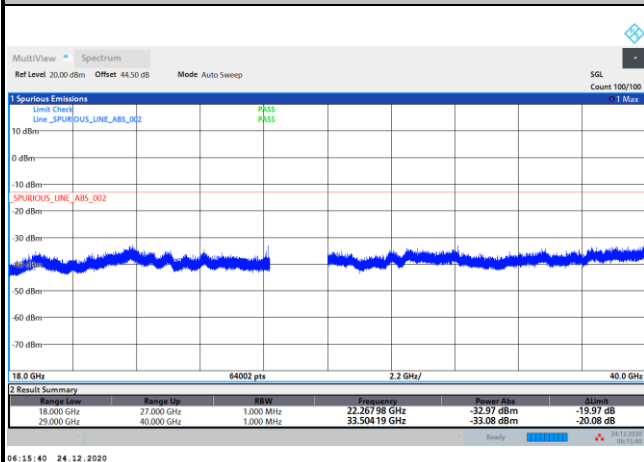
Remark: In band and out of band frequencies are omitted.



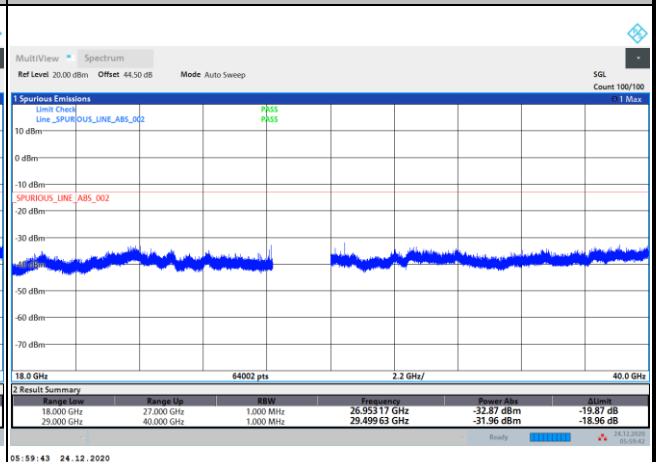
AG0+1 DFT-s-OFDM Module 2

NR Band n261 BPSK (18-40GHz)

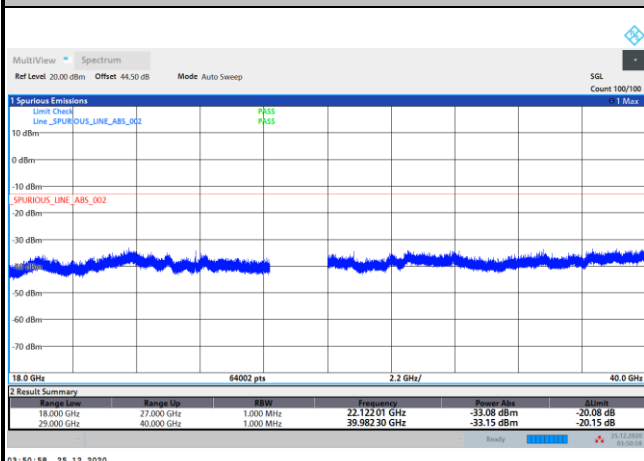
Lowest Channel / 50MHz



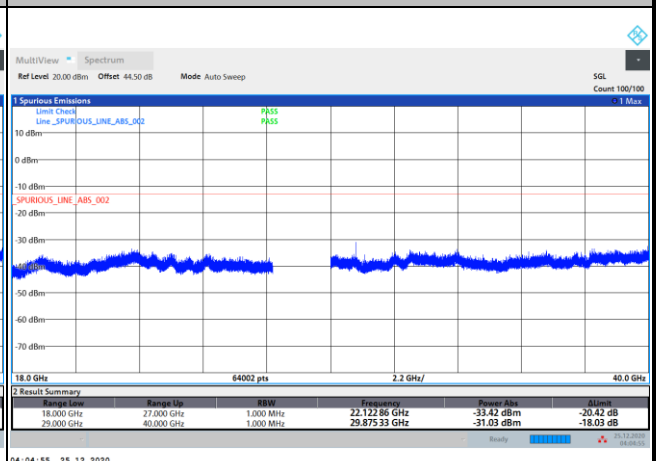
Lowest Channel / 100MHz



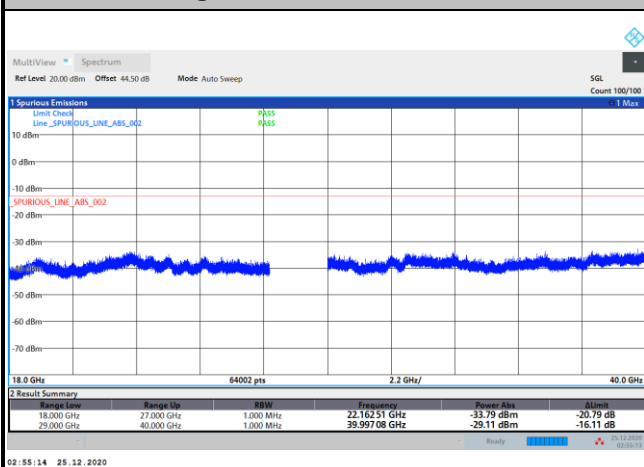
Middle Channel / 50MHz



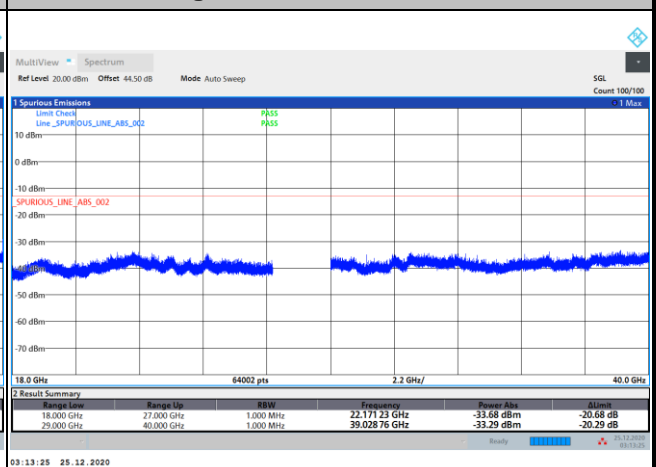
Middle Channel / 100MHz



Highest Channel / 50MHz



Highest Channel / 100MHz



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



AG0+1 DFT-s-OFDM Module 2

NR Band n261 BPSK (18-40GHz)																			
<p><b>Lowest Channel / 200MHz</b></p> <table border="1"> <thead> <tr> <th>Range Low</th> <th>Range Up</th> <th>RBW</th> <th>Frequency</th> <th>Power Abs.</th> <th>dBm</th> </tr> </thead> <tbody> <tr> <td>18,000 GHz</td> <td>27,000 GHz</td> <td>1,000 MHz</td> <td>22,244 07 GHz</td> <td>-33,61 dBm</td> <td>-20,61 dB</td> </tr> <tr> <td>29,000 GHz</td> <td>40,000 GHz</td> <td>1,000 MHz</td> <td>29,499 63 GHz</td> <td>-33,18 dBm</td> <td>-20,18 dB</td> </tr> </tbody> </table>	Range Low	Range Up	RBW	Frequency	Power Abs.	dBm	18,000 GHz	27,000 GHz	1,000 MHz	22,244 07 GHz	-33,61 dBm	-20,61 dB	29,000 GHz	40,000 GHz	1,000 MHz	29,499 63 GHz	-33,18 dBm	-20,18 dB	<p>intentionally blank</p>
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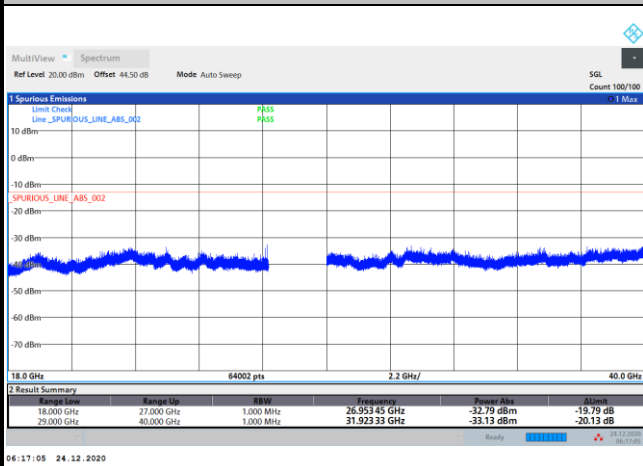
Remark: In band and out of band frequencies are omitted.



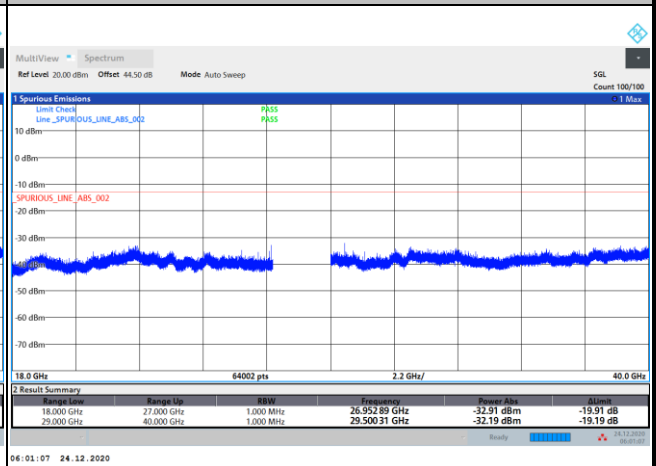
AG0+1 DFT-s-OFDM Module 2

NR Band n261 QPSK (18-40GHz)

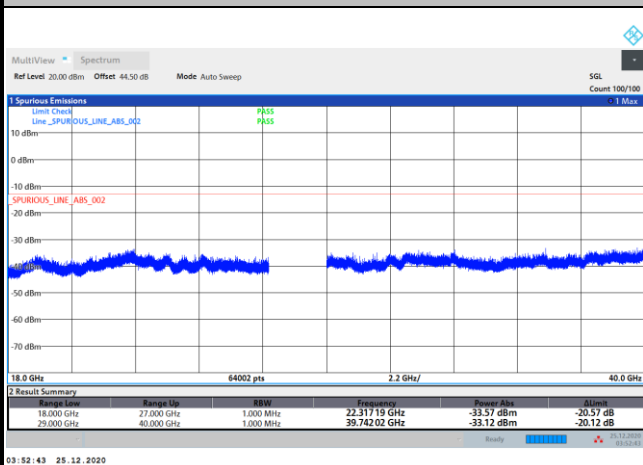
Lowest Channel / 50MHz



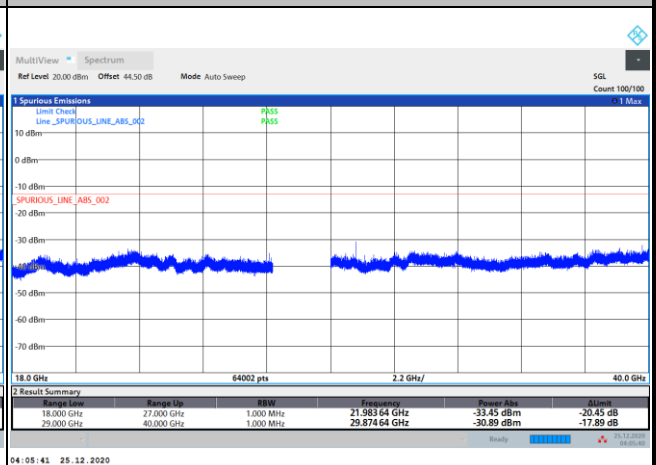
Lowest Channel / 100MHz



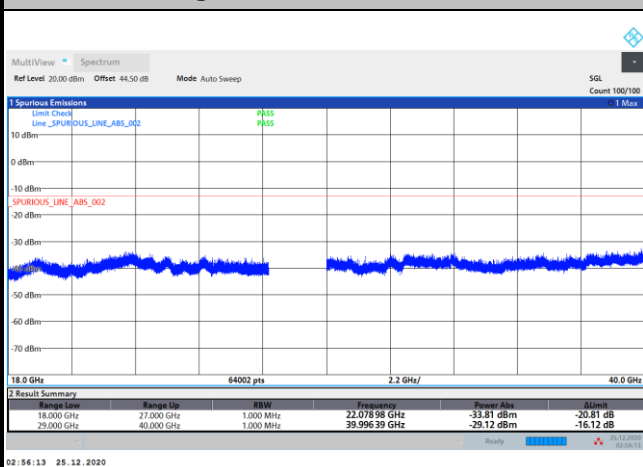
Middle Channel / 50MHz



Middle Channel / 100MHz



Highest Channel / 50MHz



Highest Channel / 100MHz



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



AG0+1 DFT-s-OFDM Module 2

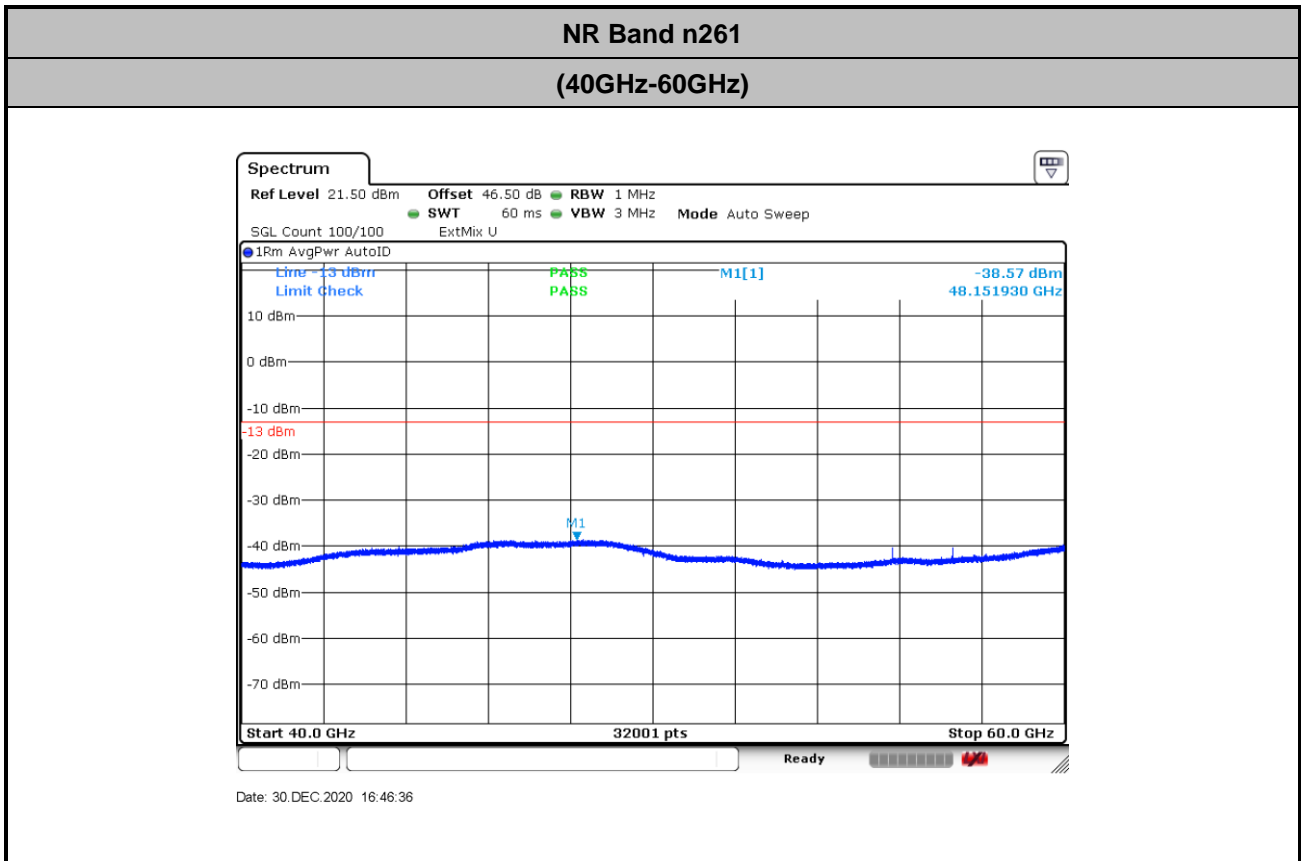
NR Band n261 QPSK (18-40GHz)													
<p><b>Lowest Channel / 200MHz</b></p> <table border="1"> <thead> <tr> <th>Line</th> <th>Limit</th> <th>Value</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>Line_SPURIOUS_LINE_ABS_002</td> <td>10 dBm</td> <td>-33.51 dBm</td> <td>PASS</td> </tr> <tr> <td>SPURIOUS_LINE_ABS_002</td> <td>20 dBm</td> <td>-19.73 dBm</td> <td>PASS</td> </tr> </tbody> </table> <p>06:31:27 24.12.2020</p>	Line	Limit	Value	Status	Line_SPURIOUS_LINE_ABS_002	10 dBm	-33.51 dBm	PASS	SPURIOUS_LINE_ABS_002	20 dBm	-19.73 dBm	PASS	<p>intentionally blank</p>
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<p><b>Highest Channel / 200MHz</b></p> <table border="1"> <thead> <tr> <th>Line</th> <th>Limit</th> <th>Value</th> <th>Status</th> </tr> </thead> <tbody> <tr> <td>Line_SPURIOUS_LINE_ABS_002</td> <td>10 dBm</td> <td>-33.49 dBm</td> <td>PASS</td> </tr> <tr> <td>SPURIOUS_LINE_ABS_002</td> <td>20 dBm</td> <td>-20.06 dBm</td> <td>PASS</td> </tr> </tbody> </table> <p>03:31:05 25.12.2020</p>	Line	Limit	Value	Status	Line_SPURIOUS_LINE_ABS_002	10 dBm	-33.49 dBm	PASS	SPURIOUS_LINE_ABS_002	20 dBm	-20.06 dBm	PASS	<p>intentionally blank</p>
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SPURIOUS_LINE_ABS_002	20 dBm	-20.06 dBm	PASS										

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.

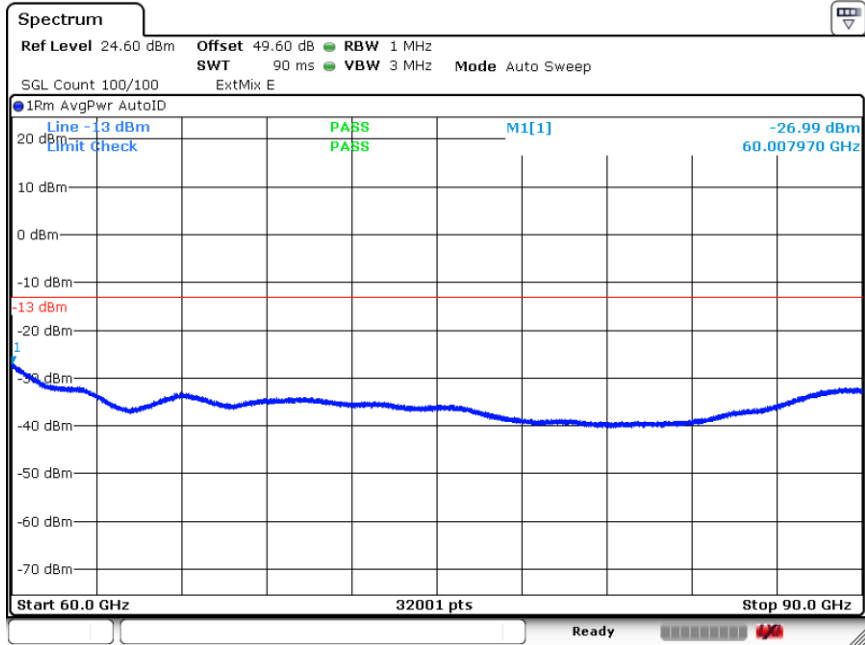


**Remark:** Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8  
 = 42.3 + 2 + 107 + 20log(1) – 104.8 = 46.5 (dB)



NR Band n261

(60GHz-90GHz)



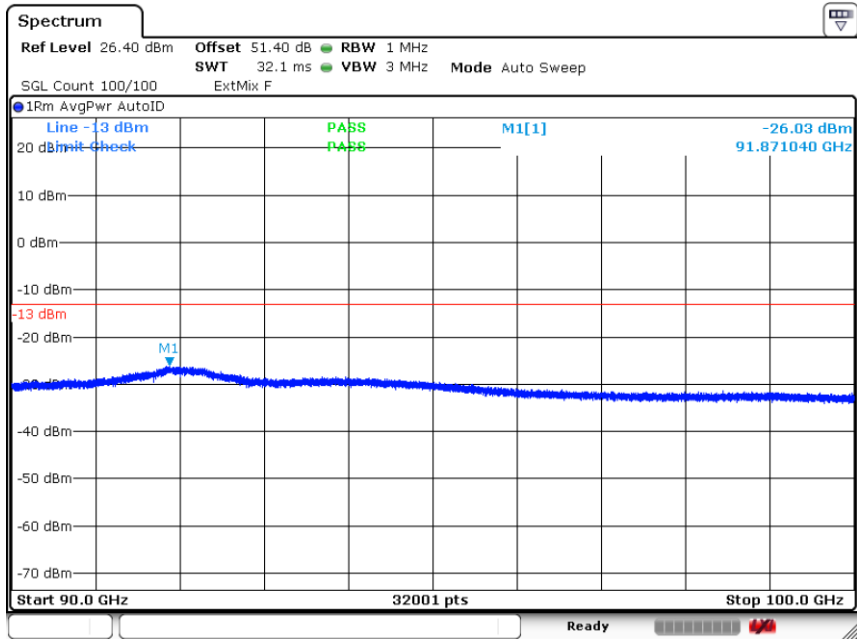
Date: 30.DEC.2020 17:12:08

**Remark:** Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8  
 = 45.4 + 2 + 107 + 20log(1) – 104.8 = 49.6 (dB)



NR Band n261

(90GHz-100GHz)



Date: 30.DEC.2020 17:30:47

**Remark:** Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8  
= 47.2 + 2 + 107 + 20log(1) – 104.8 = 51.4 (dB)



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	27.92507892	-78.420	2.808	Pass
40	Normal Voltage	27.92505544	-54.940	1.967	
30	Normal Voltage	27.92503896	-38.460	1.377	
20(Ref.)	Normal Voltage	27.9250005	0.000	0.000	
10	Normal Voltage	27.92497453	25.970	0.930	
0	Normal Voltage	27.92495005	50.450	1.807	
-10	Normal Voltage	27.92493157	68.930	2.468	
-20	Normal Voltage	27.92490859	91.910	3.291	
-30	Normal Voltage	27.92488412	116.380	4.168	
20	Maximum Voltage	27.92501149	-10.990	0.394	
20	Normal Voltage	27.925004	-3.500	0.125	
20	Battery End Point	27.92498601	14.490	0.519	

Note:

1. Normal Voltage =7.74 V. ; Battery End Point (BEP) =7.2 V. ; Maximum Voltage =8.9 V.
2. The frequency fundamental emissions stay within the operation band.



## Appendix C. R&S Mixer Certificate



# 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.**  
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

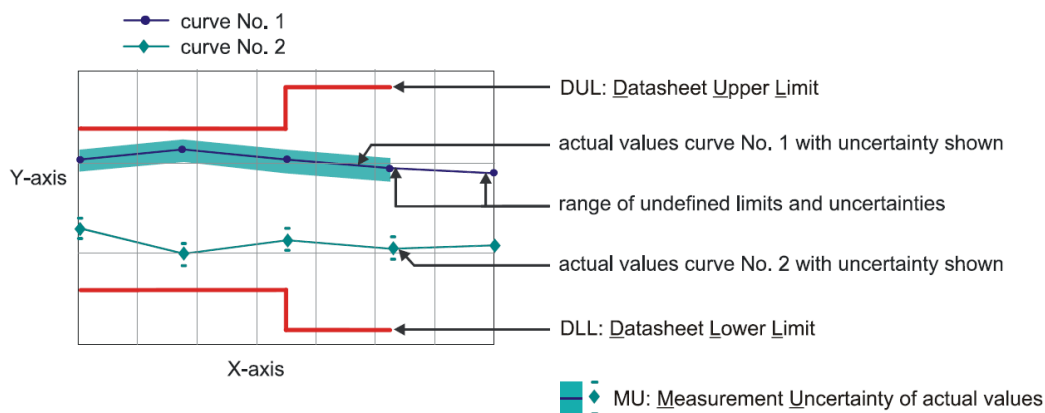
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is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

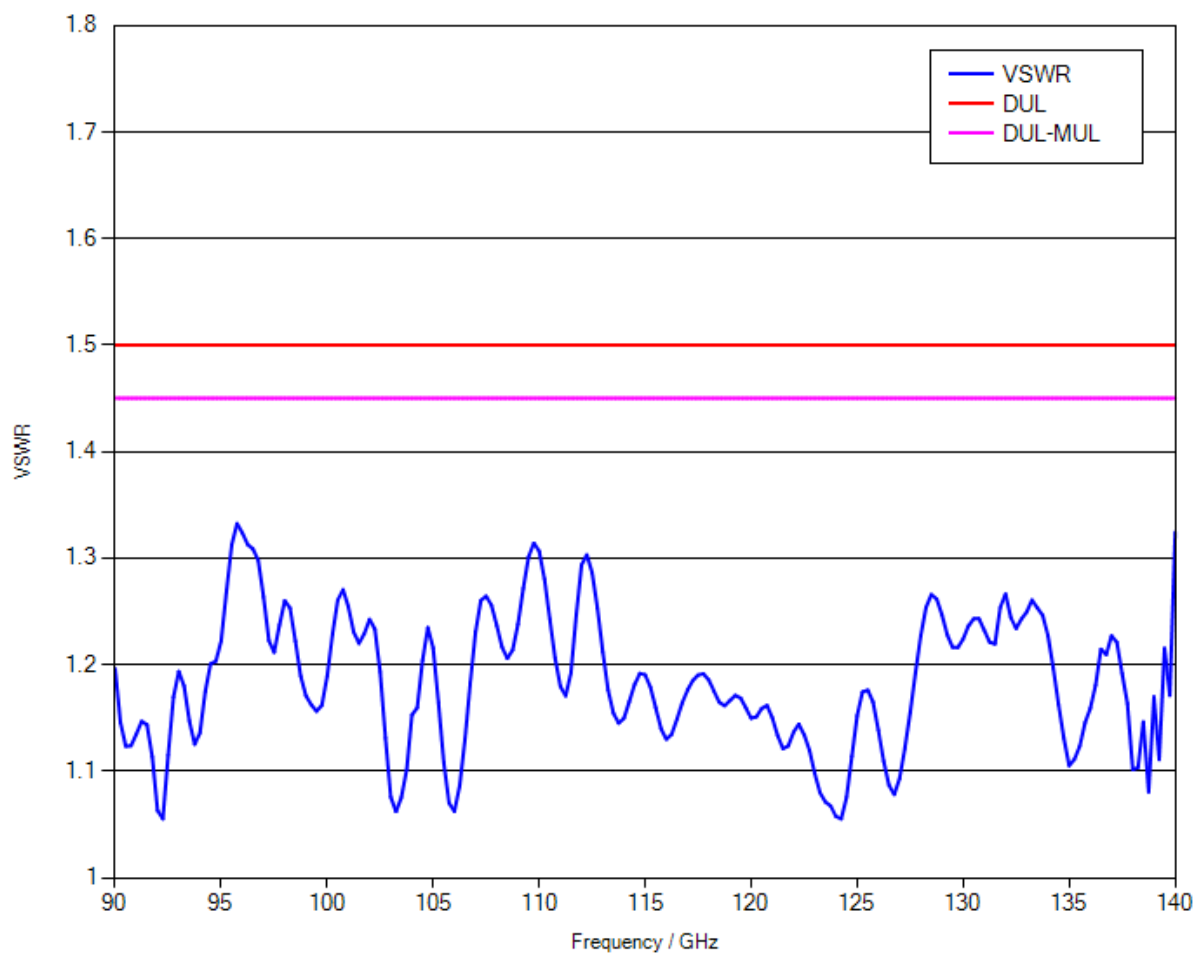
**Version**

2013  
7\_09

**Remark**

### 1.1 RF Input – VSWR

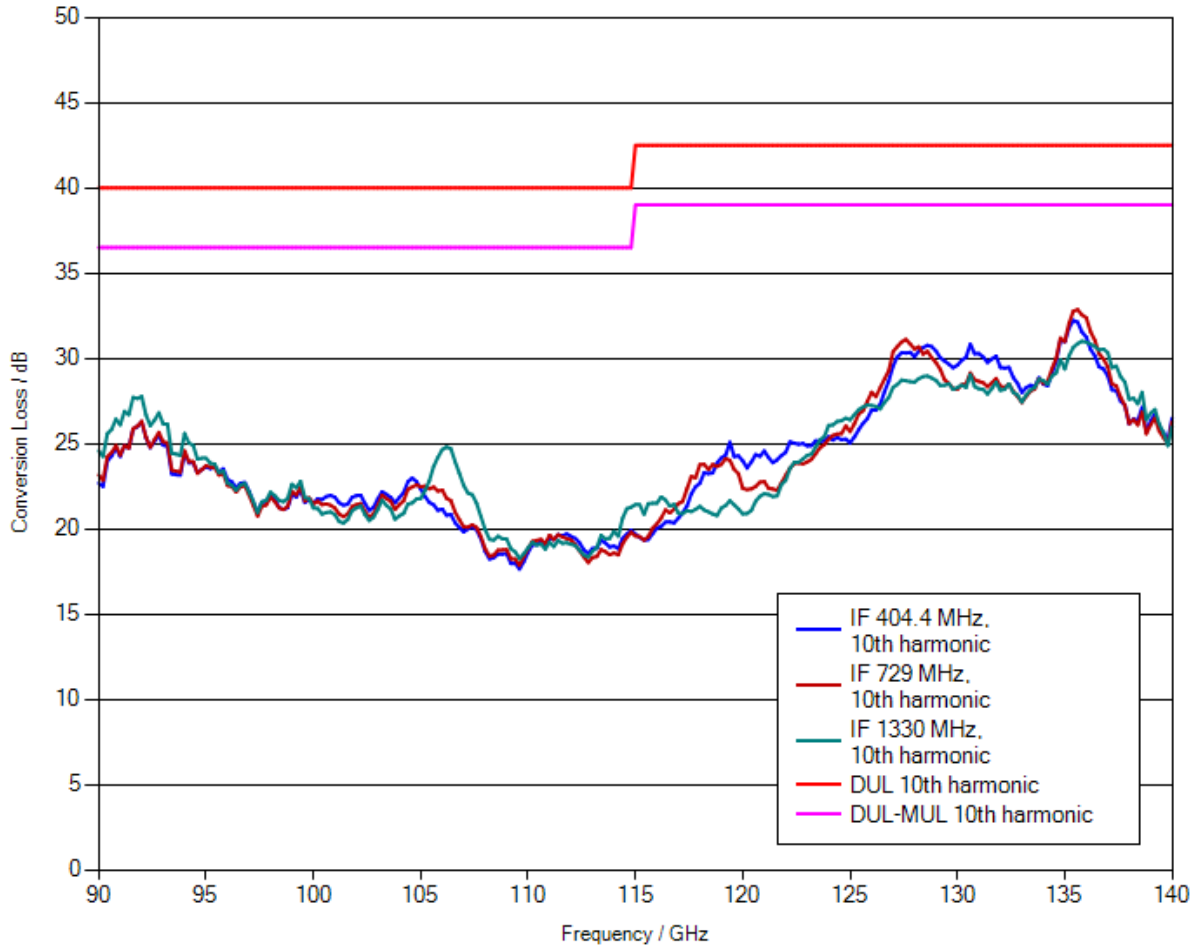
Measurement uncertainty: 0.05 (VSWR)



## 1.2 Conversion loss

LO level +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.

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, 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 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

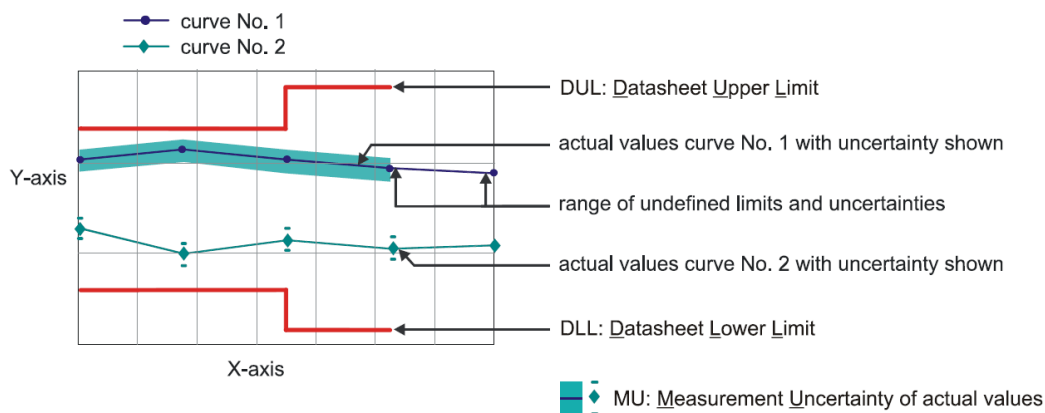
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is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

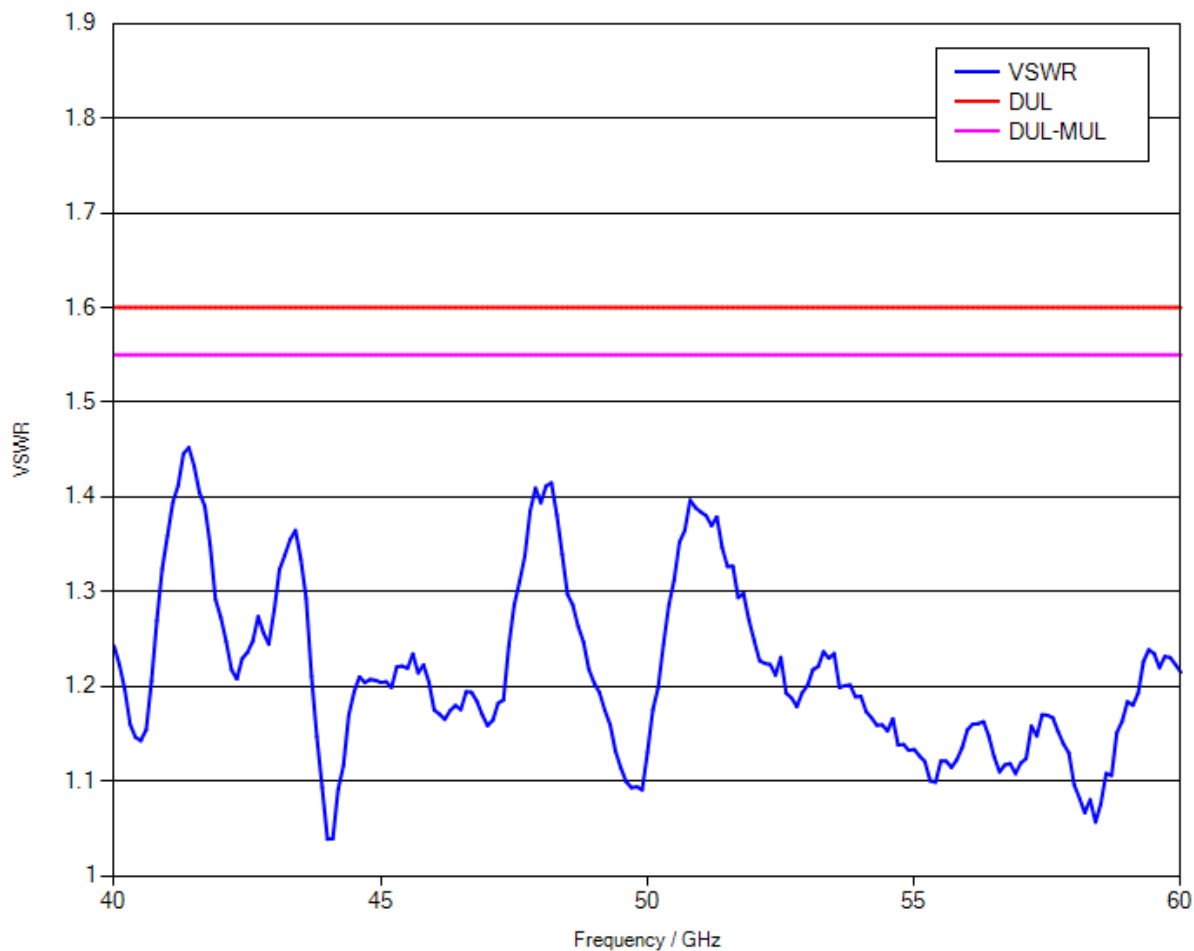
2013  
7\_09

**Remark**



### 1.1 RF Input – VSWR

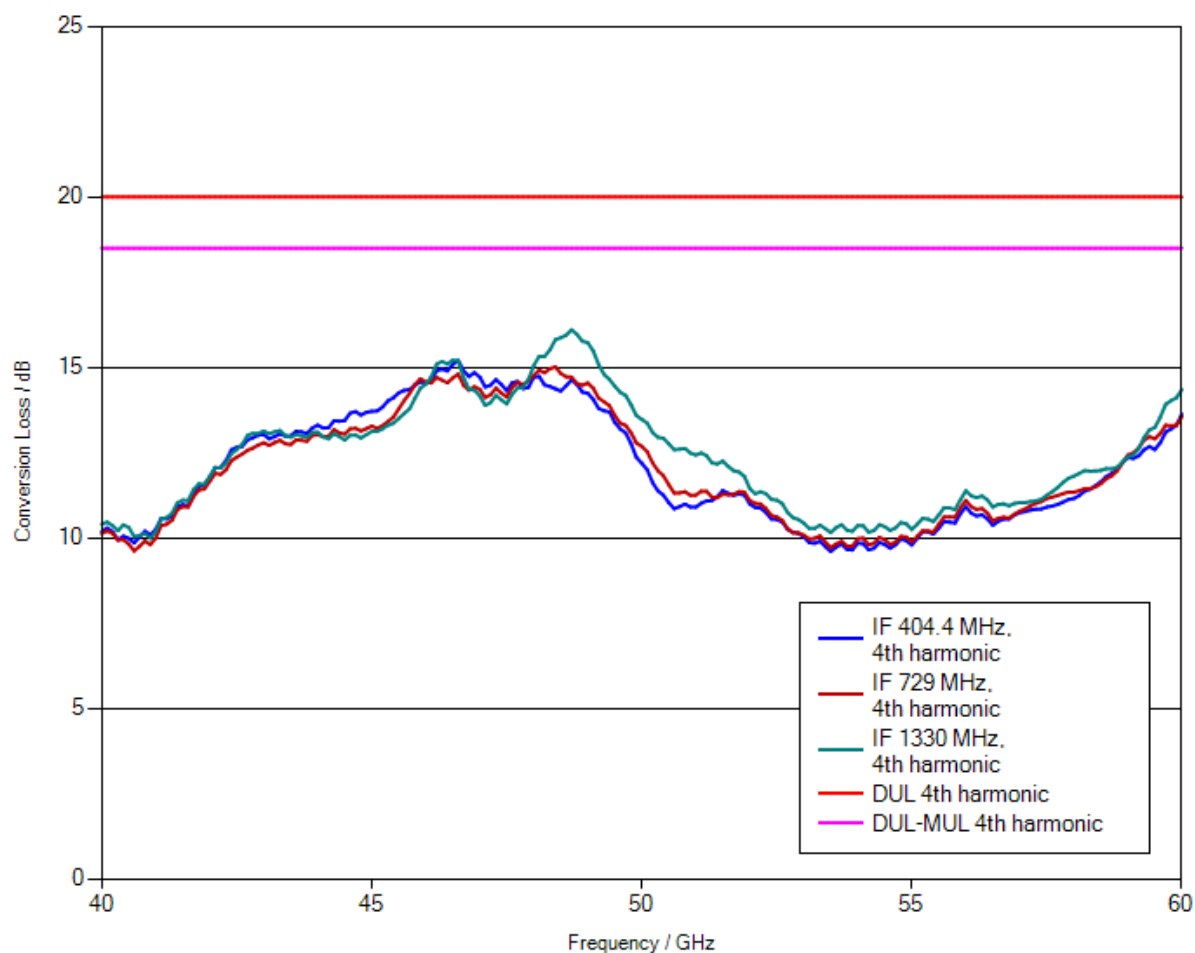
Measurement uncertainty: 0.05 (VSWR)



## 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

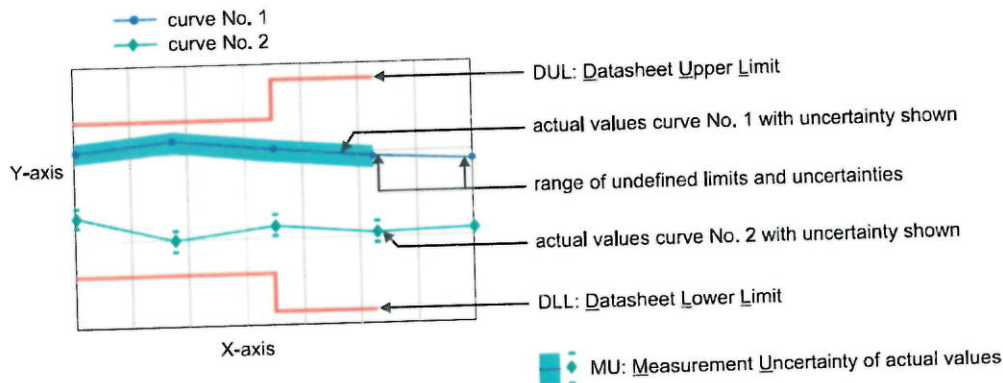
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is 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.
{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.
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{d}	Typical value, refer to performance test.
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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



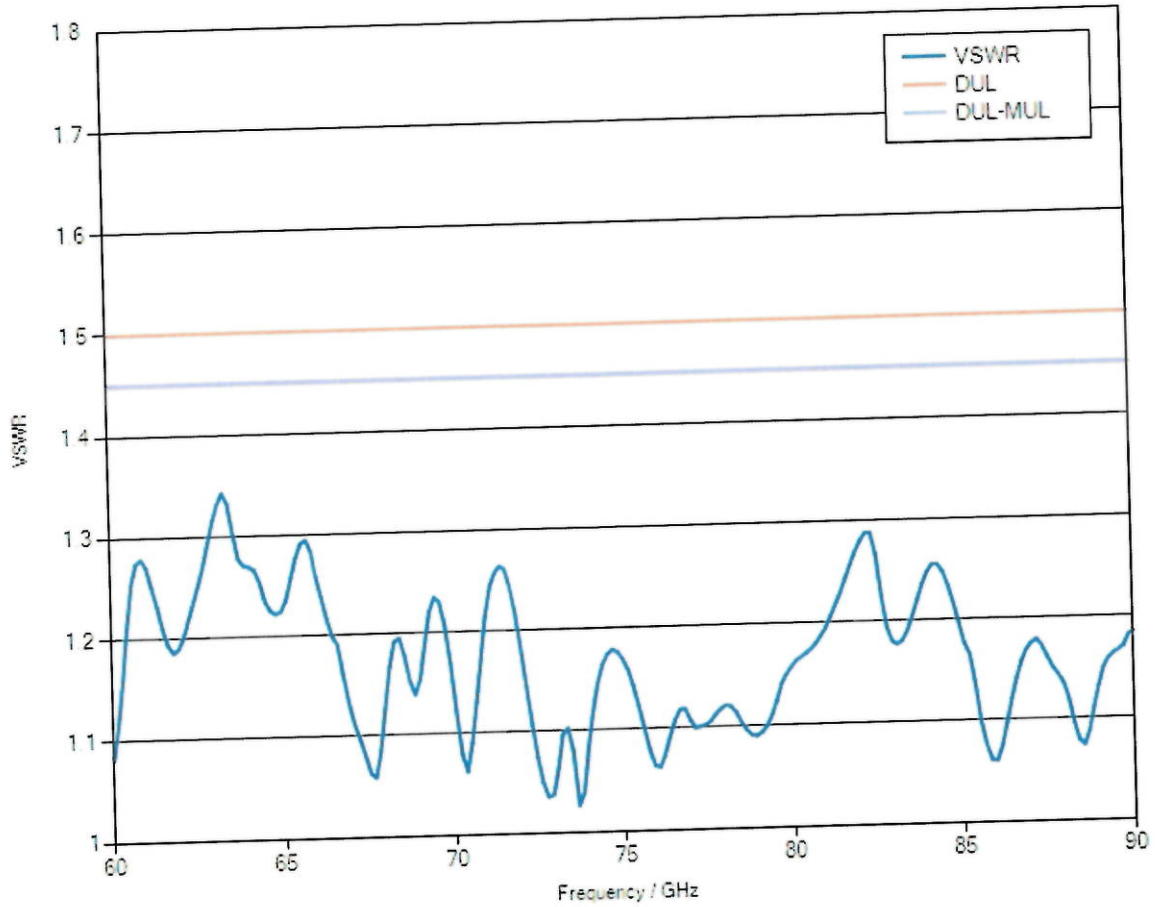
Software used for measurement  
Item Type  
Measurement Studio Professional Edition  
MixerCertification

Version  
2013  
7\_08

Remark

### 1.1 RF Input – VSWR

Measurement uncertainty: 0.05 (VSWR)

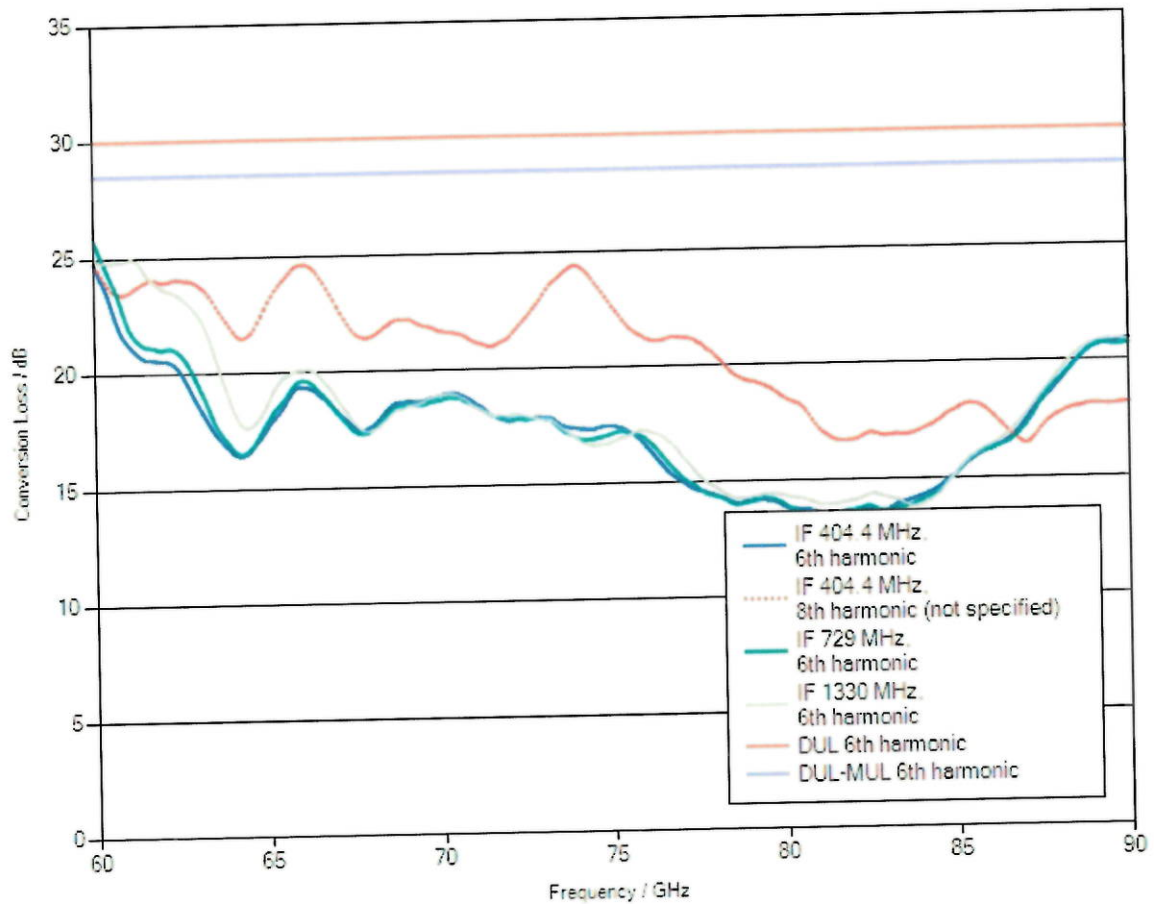




## 1.2 Conversion loss

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 24-0220-101014-01**

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

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, 2018-08-27**

**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

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

#### Notes

Anmerkungen

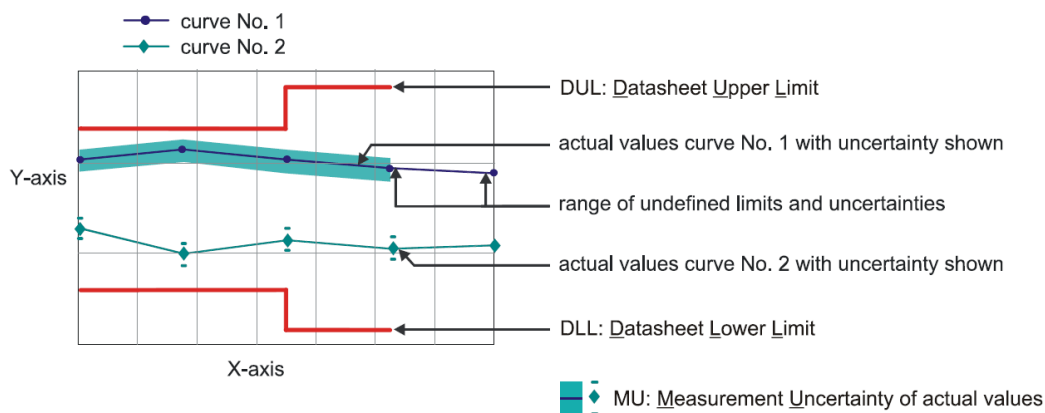
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- UGB2 Measurement results marked as UGB2 show non-conformity with a probability of >50 % and <95 %.
- DU Datasheet Uncertainty

## Explanation of charts



**Software used for measurement**

**Item Type**

Measurement Studio Professional Edition  
MixerCertification

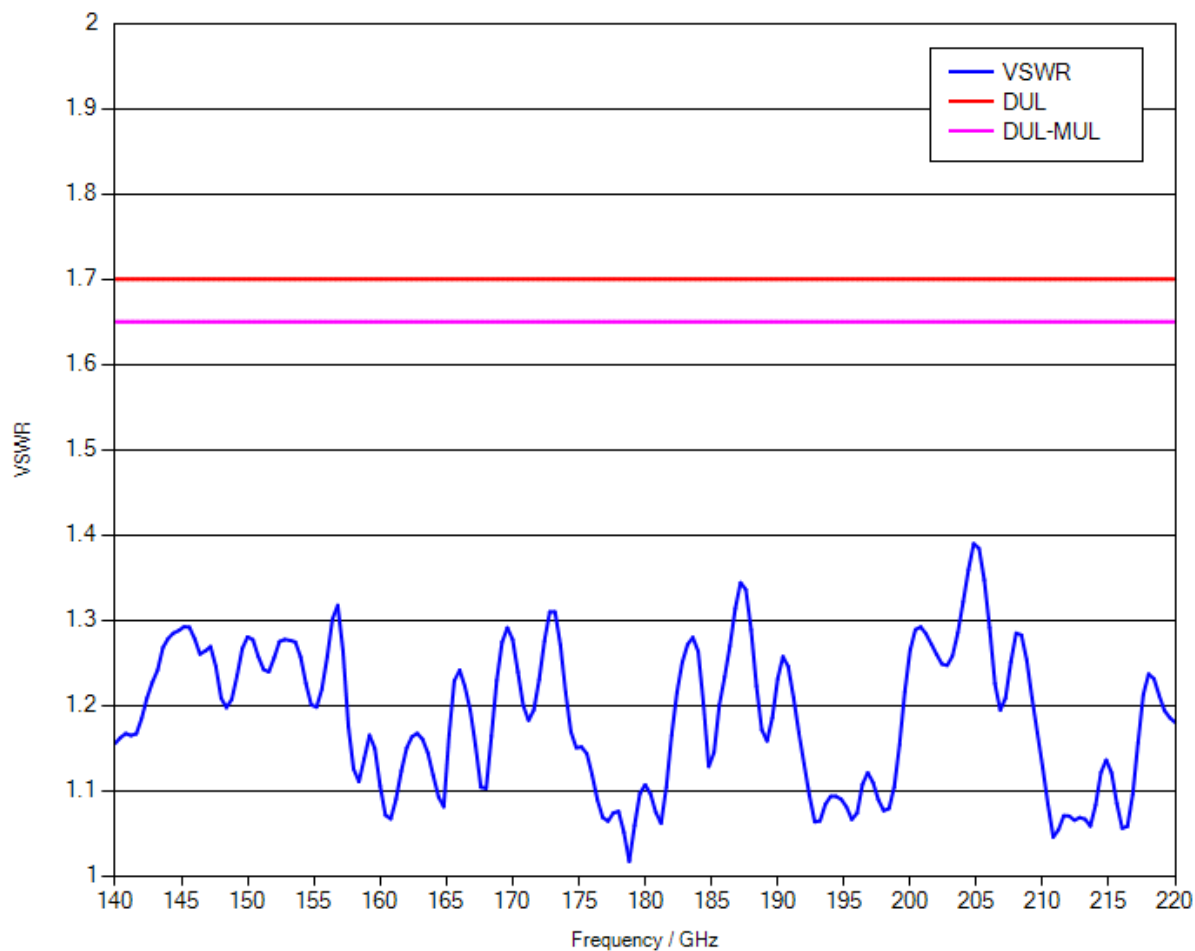
**Version**

2013  
7\_09

**Remark**

### 1.1 RF Input – VSWR

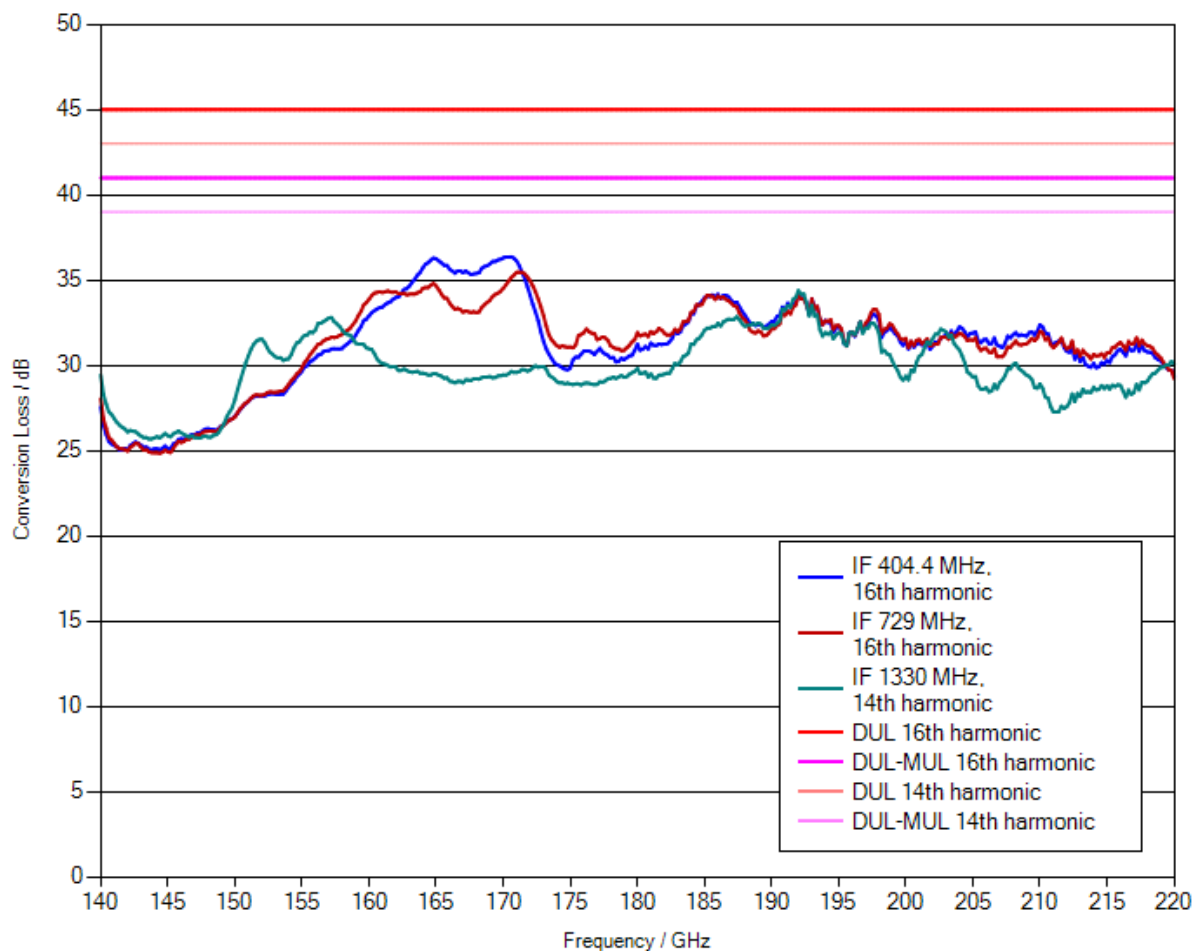
Measurement uncertainty: 0.05 (VSWR)



## 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.

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### 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