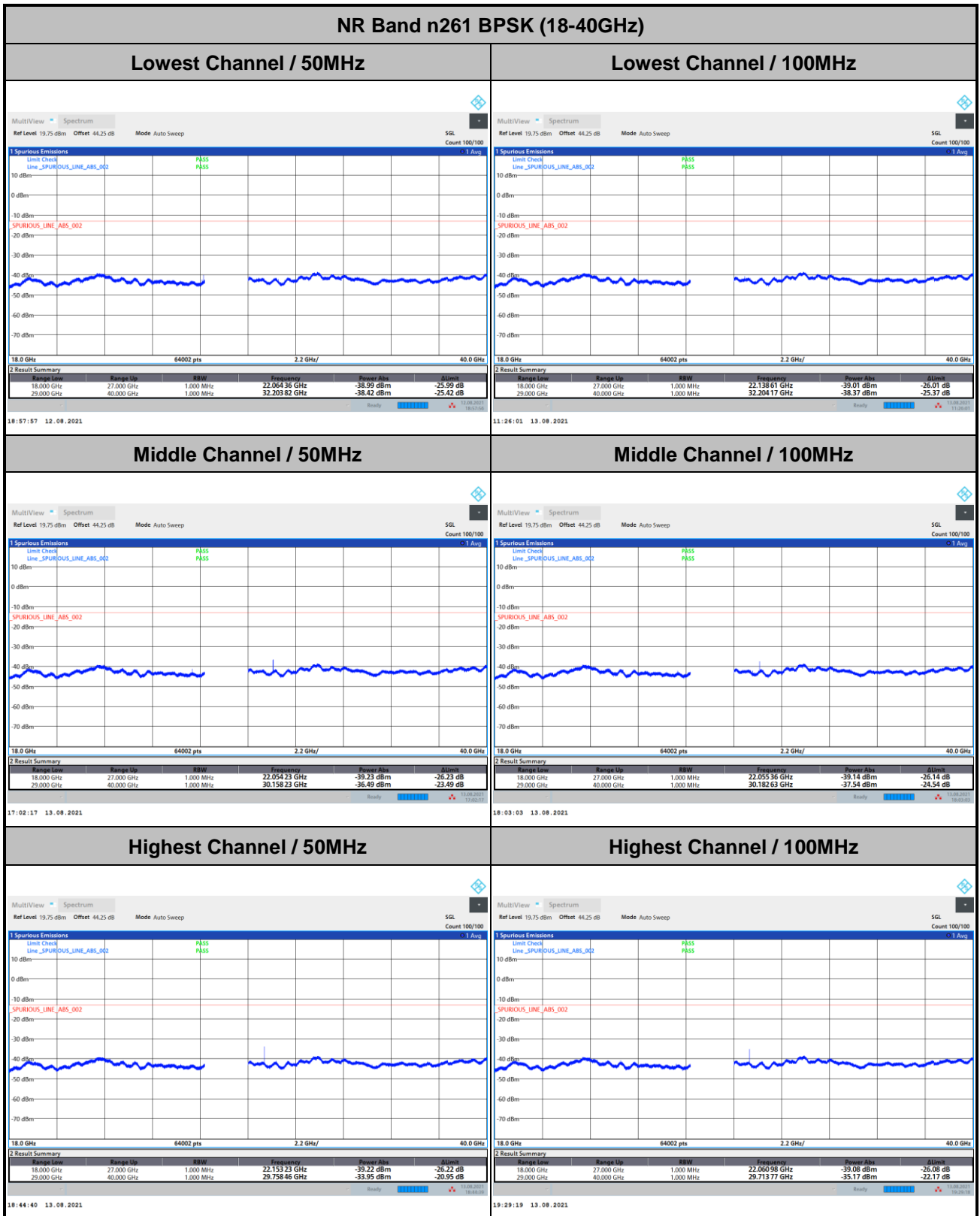




Spurious emission between 18GHz to 40GHz worst case plot is reported as following.

DFT-s-OFDM Module 1



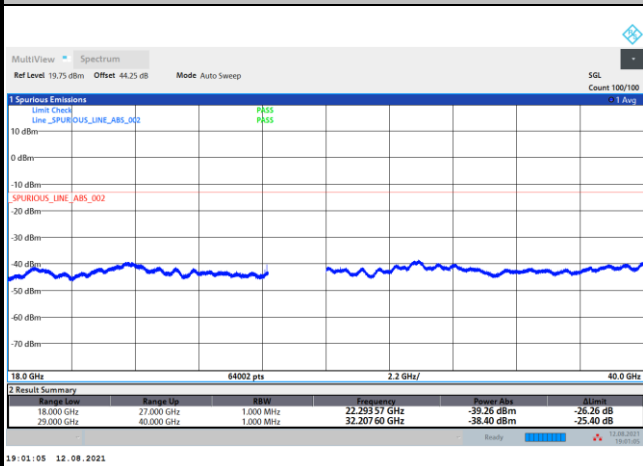
Remark: In band and out of band frequencies that has reported in previous results are omitted.



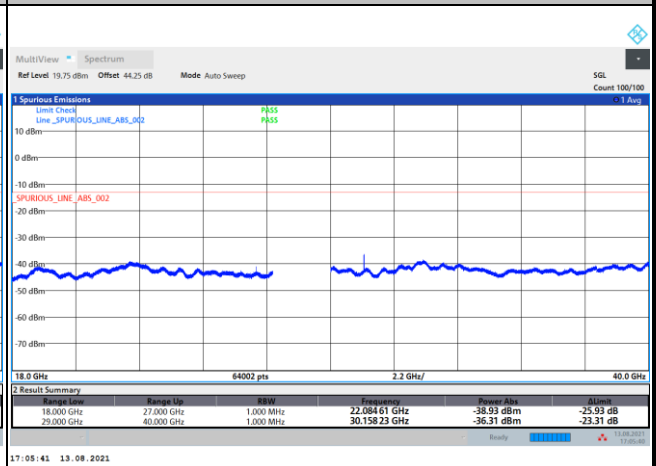
DFT-s-OFDM Module 1

NR Band n261 QPSK (18-40GHz)

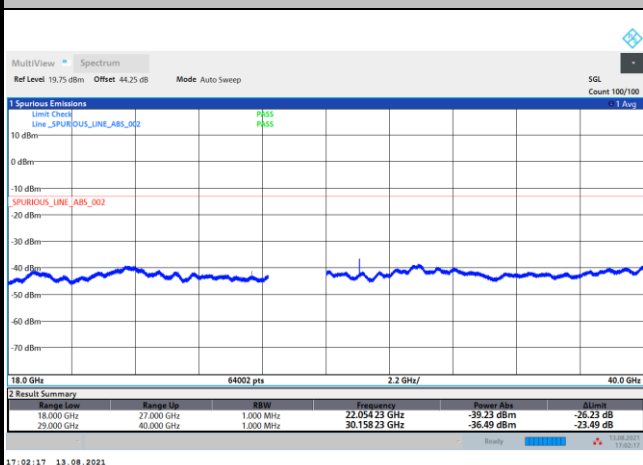
Lowest Channel / 50MHz



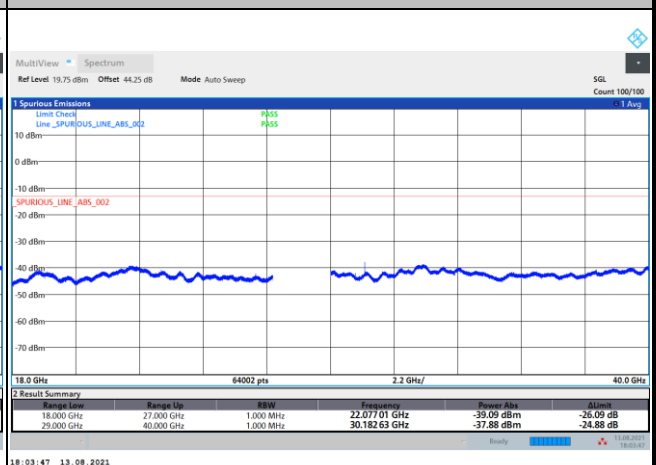
Lowest Channel / 100MHz



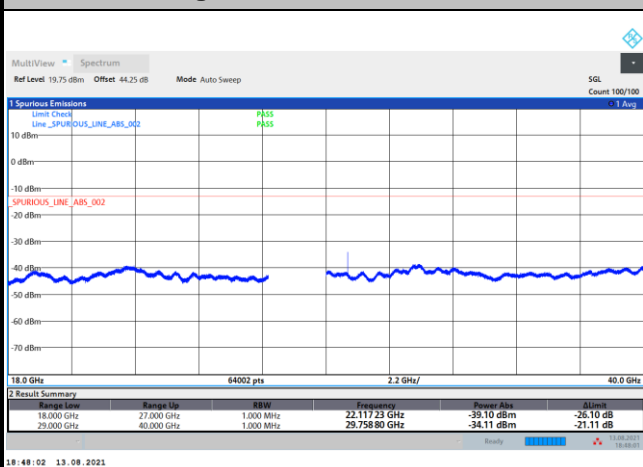
Middle Channel / 50MHz



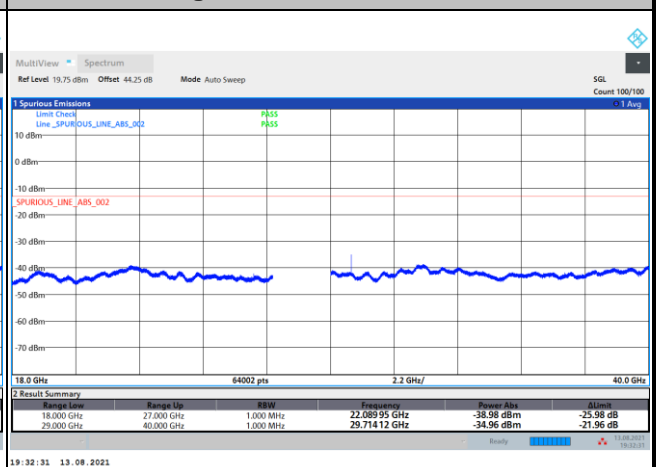
Middle Channel / 100MHz



Highest Channel / 50MHz



Highest Channel / 100MHz



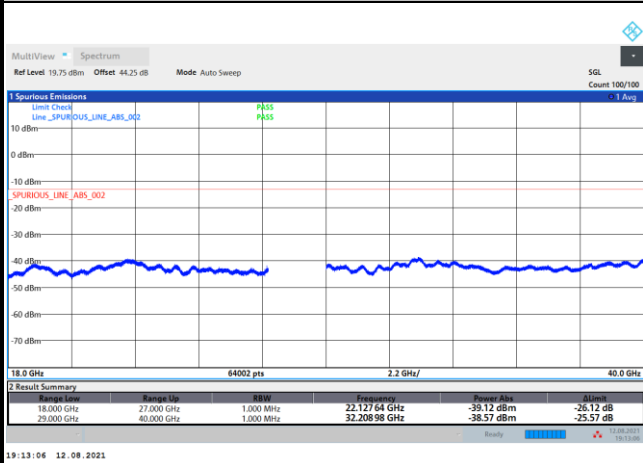
Remark: In band and out of band frequencies that has reported in previous results are omitted.



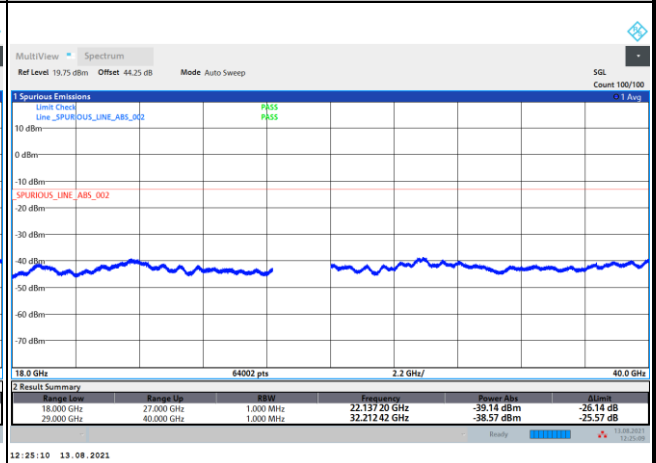
CP-OFDM Module 1

NR Band n261 QPSK (18-40GHz)

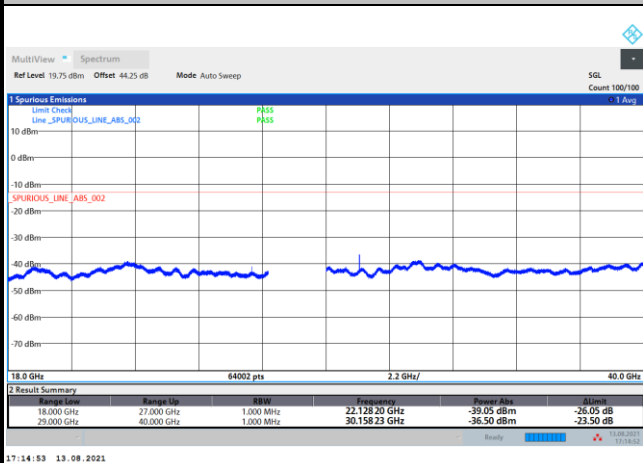
Lowest Channel / 50MHz



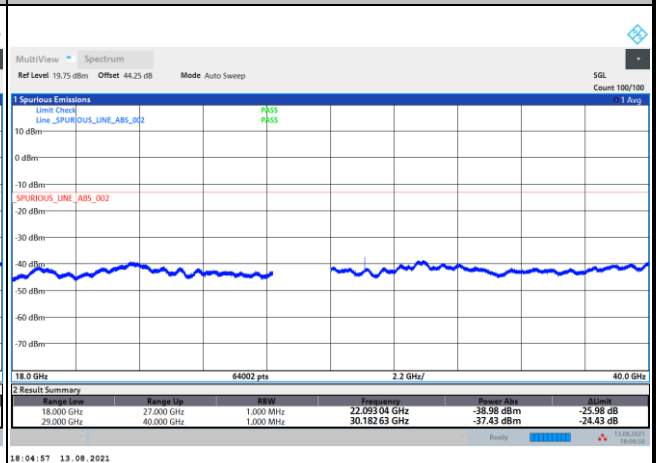
Lowest Channel / 100MHz



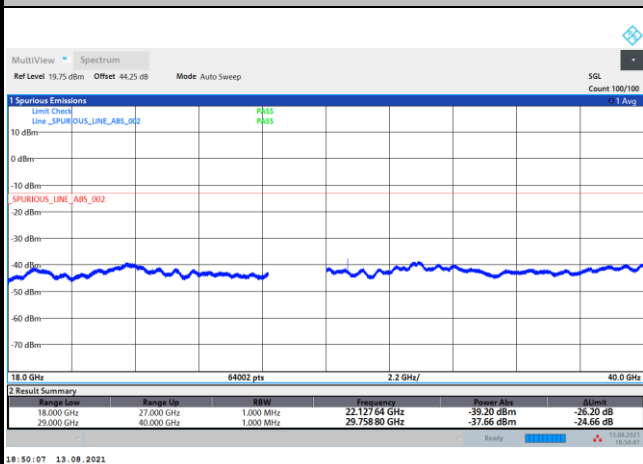
Middle Channel / 50MHz



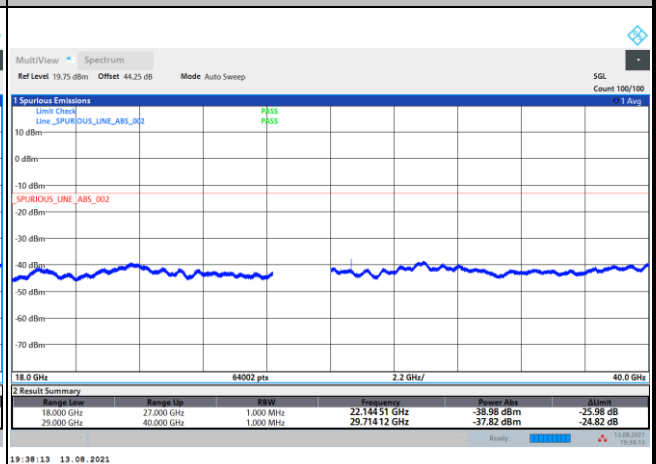
Middle Channel / 100MHz



Highest Channel / 50MHz



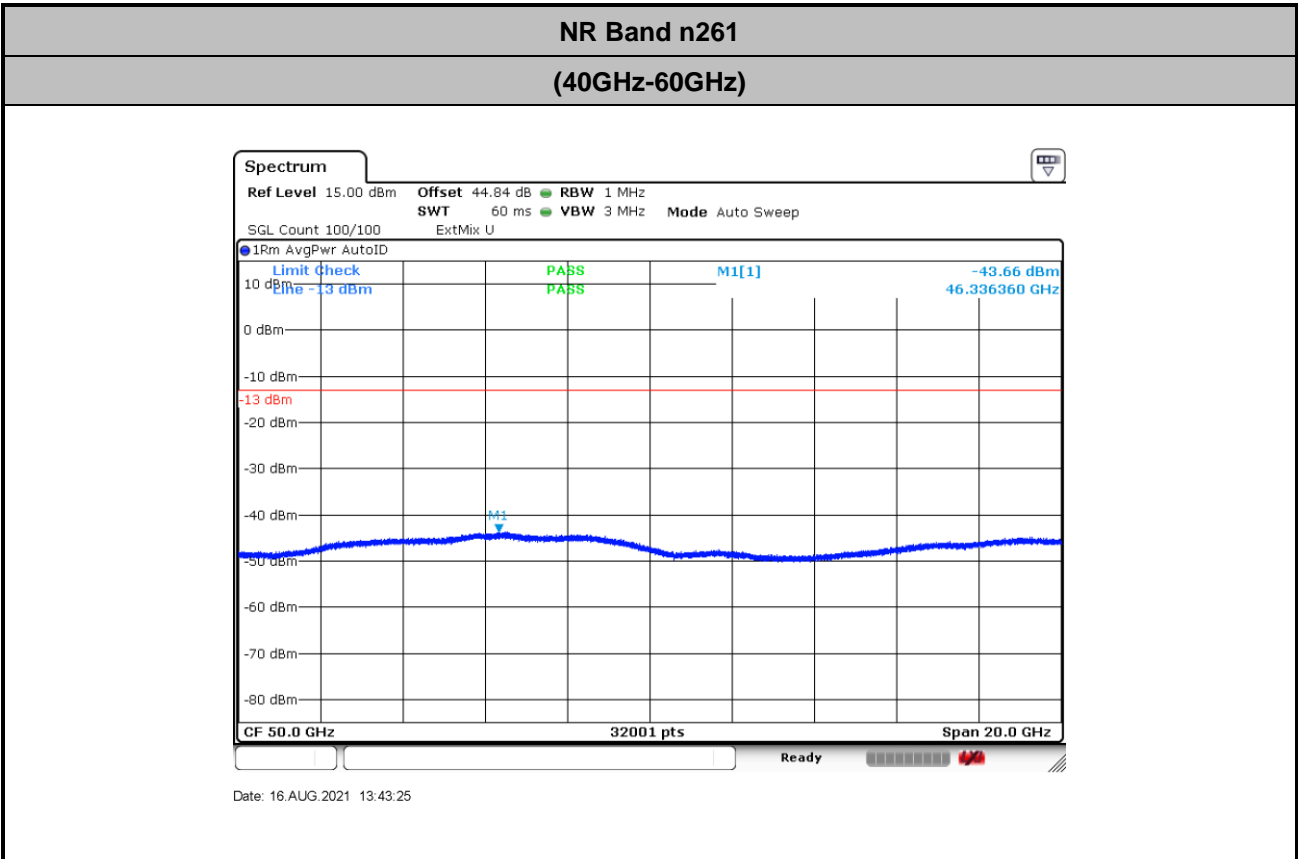
Highest Channel / 100MHz



Remark: In band and out of band frequencies that has reported in previous results are omitted.



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



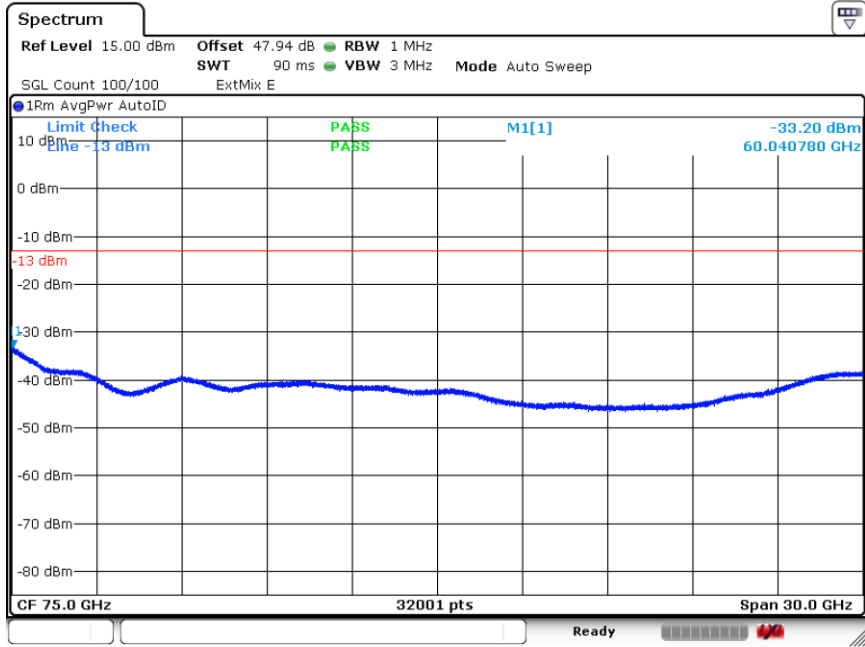
$$\text{Offset} = \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8$$

$$= 42.3 + 0.34 + 107 + 20\log(1) - 104.8 = 44.84 \text{ (dB)}$$



NR Band n261

(60GHz-90GHz)



Date: 16.AUG.2021 13:49:07

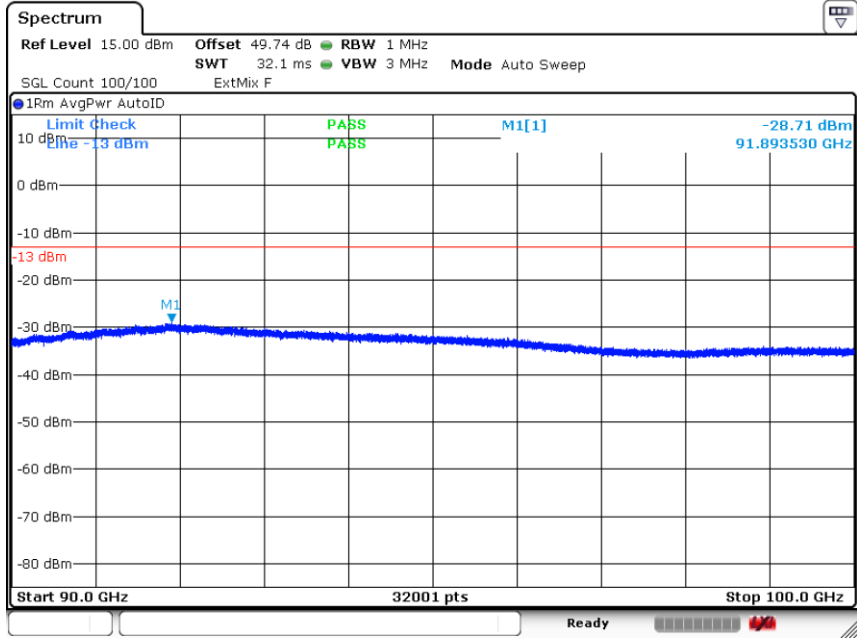
$$\text{Offset} = \text{Antenna Factor (dB/m)} + \text{Cable Loss (dB)} + 107 + 20\log(D) - 104.8$$

$$= 45.4 + 0.34 + 107 + 20\log(1) - 104.8 = 47.94 \text{ (dB)}$$



NR Band n261

(90GHz-100GHz)



Date: 16.AUG.2021 14:26:18

$$Offset = Antenna\ Factor\ (dB/m) + Cable\ Loss\ (dB) + 107 + 20\log(D) - 104.8$$

$$= 47.2 + 0.34 + 107 + 20\log(1) - 104.8 = 49.74\ (dB)$$



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	27.9248621	136.900	4.902	Pass
40	Normal Voltage	27.9248801	118.900	4.258	
30	Normal Voltage	27.9249001	98.900	3.542	
20(Ref.)	Normal Voltage	27.924999	0.000	0.000	
10	Normal Voltage	27.925034	-35.000	1.253	
0	Normal Voltage	27.9251159	-116.900	4.186	
-10	Normal Voltage	27.9251588	-159.800	5.722	
-20	Normal Voltage	27.9251718	-172.800	6.188	
-30	Normal Voltage	27.9251758	-176.800	6.331	
20	Maximum Voltage	27.924983	16.000	0.573	
20	Normal Voltage	27.924991	8.000	0.286	
20	Battery End Point	27.924978	21.000	0.752	

Note: The frequency fundamental emissions stay within the operation band.



Appendix B. R&S Mixer and Horn Antenna Calibration Reports

Calibration Method
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %
Relative Luftfeuchte

Ambient Temperature
Umgebungstemperatur

(23⁺⁷₋₃) °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® ZVA40	100103	0001-300467129	2021-06-13
Powersensor	R&S® NRP-Z55	140091	509915_D-K-15195-01-01_2019-05	2020-05-22
Powersensor	R&S® NRP-Z57	101423	508173_D-K-15195-01-01_2019-05	2020-05-07

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

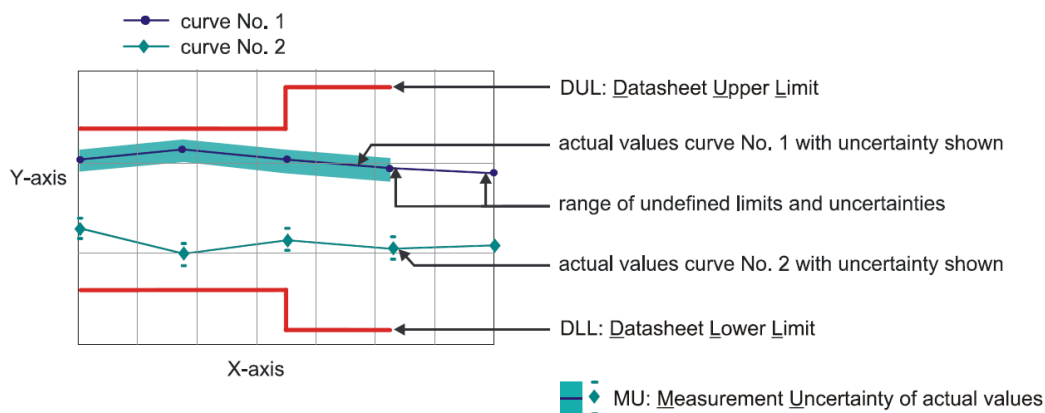
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is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

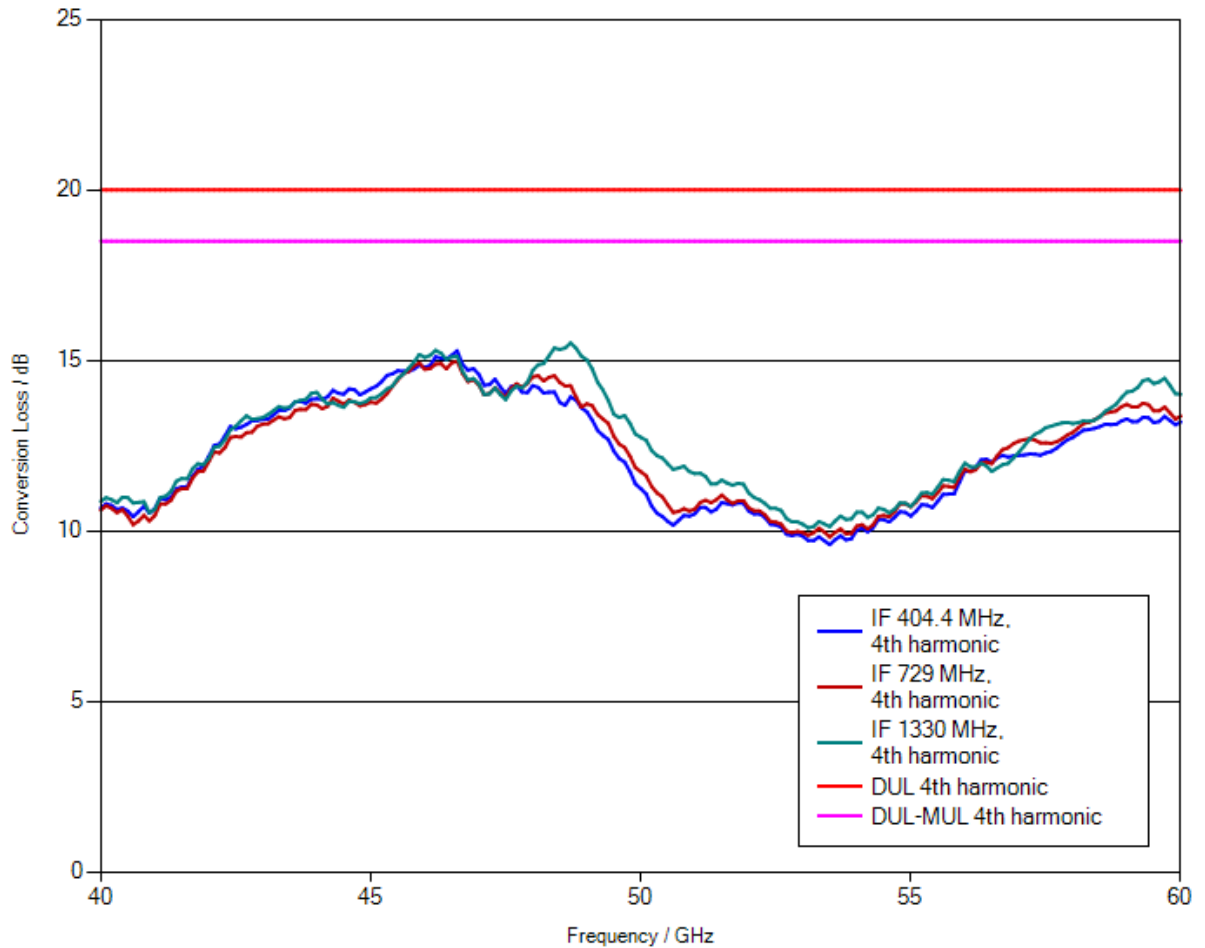
2013
7_13

Remark

1.1 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.

1.2 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 4th harmonic	4 dB	2.16 dB	PASS
IF = 729 MHz, 4th harmonic	4 dB	2.04 dB	PASS
IF = 1330 MHz, 4th harmonic	4 dB	2.19 dB	PASS

Calibration Method
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %
Relative Luftfeuchte

Ambient Temperature
Umgebungstemperatur

(23⁺⁷₋₃) °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-Z58	101063	0001-300474490	2019-08-06
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

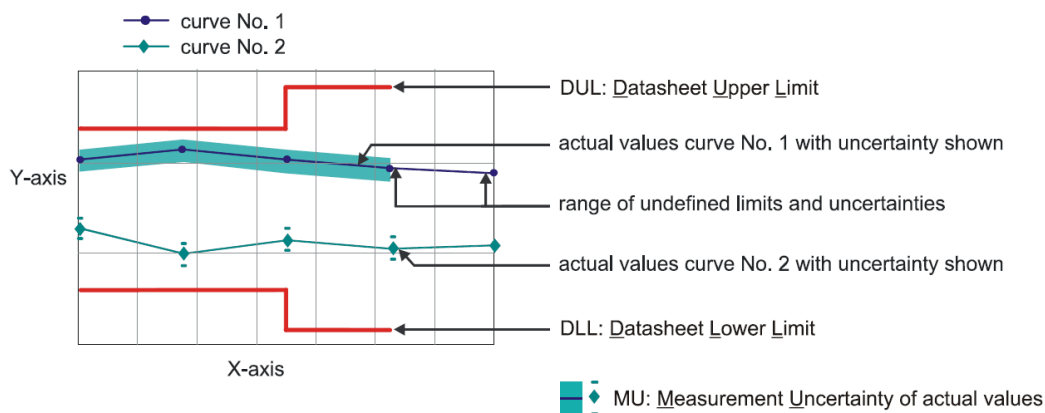
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is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

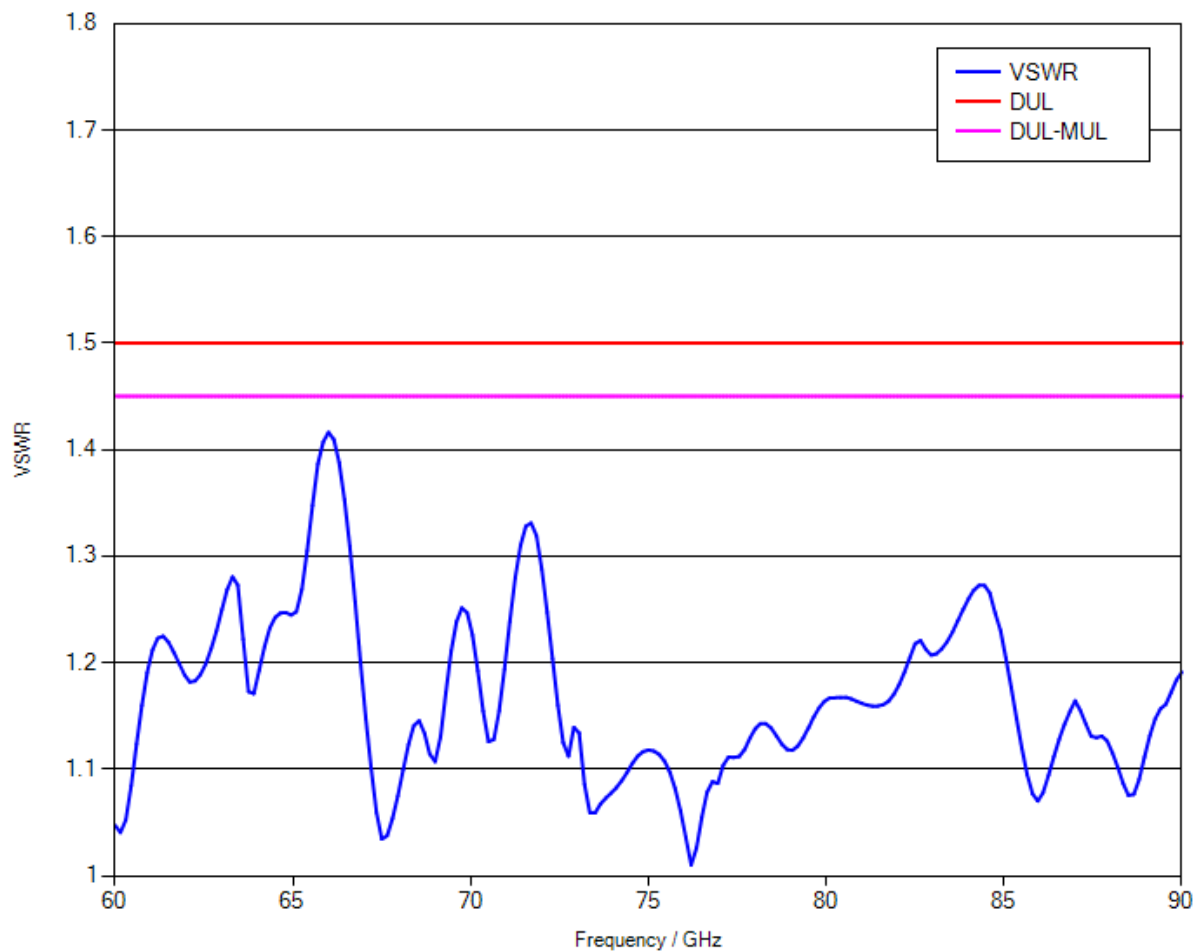
Version

2013
7_09

Remark

1.1 RF Input – VSWR

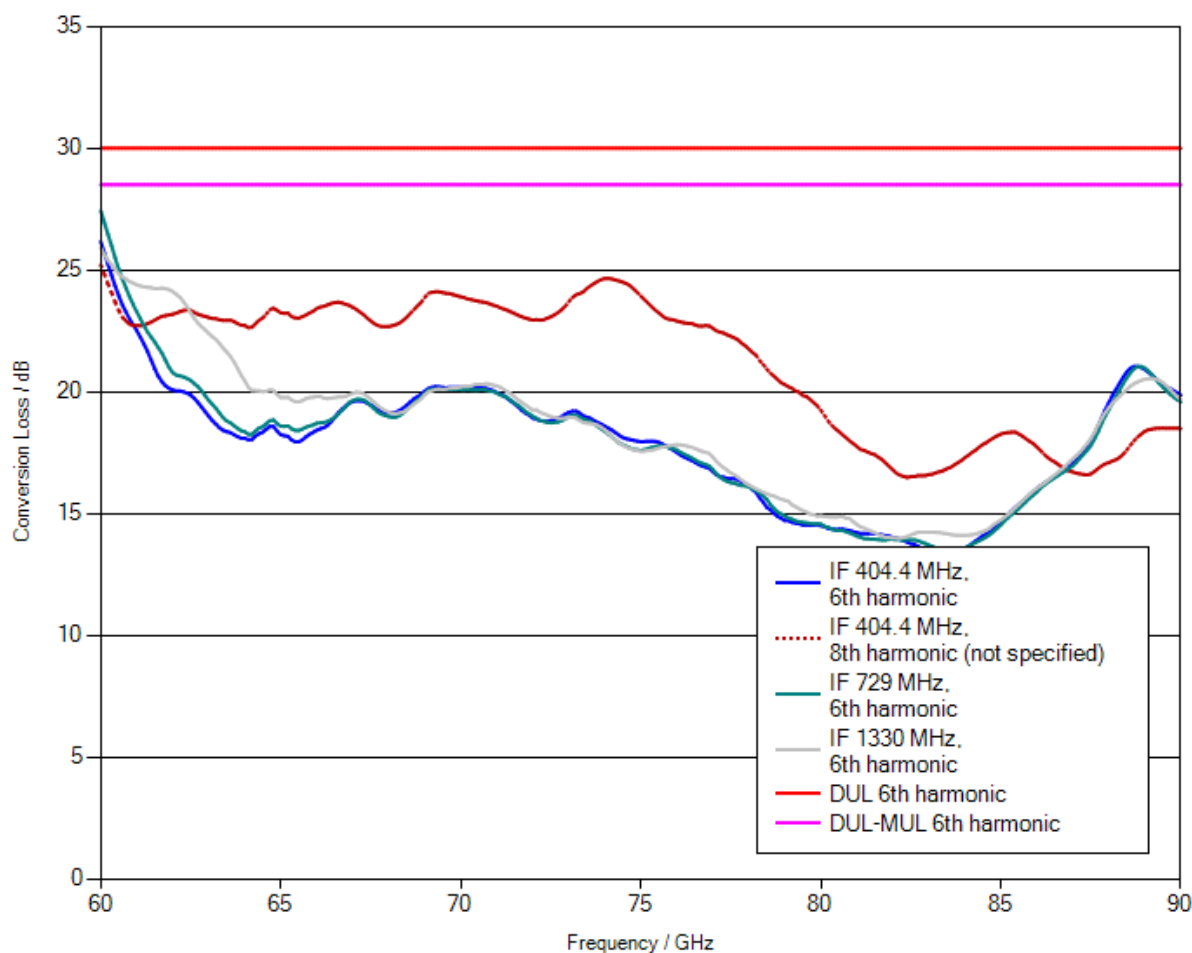
Measurement uncertainty: 0.05 (VSWR)



1.2 Conversion loss

LO level +14 dBm nominal
 Bias 0 A

Measurement uncertainty: 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	3.42 dB	PASS
IF = 404.4 MHz, 8th harmonic	not specified	2.49 dB	not specified
IF = 729 MHz, 6th harmonic	6 dB	3.85 dB	PASS
IF = 1330 MHz, 6th harmonic	6 dB	2.01 dB	PASS



Calibration Certificate

Certificate Number 24-0140-101128-02

Kalibrierschein

Zertifikatsnummer

Unit Data

Item Harmonic Mixer, 90 GHz to 140 GHz
Gegenstand

Manufacturer RPG Radiometer-Physics GmbH
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 Sporton International Inc.
Auftraggeber
No. 106 6F., Sec. 1, Hsin Tai Wu Rd., Xizhi Dist., 000000 NEW TAIPEI CITY-000000 221- TAIWAN

Order Number 8800003072
Bestellnummer

Date of Receipt 2020-10-06
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, 2020-10-26

Scope of Calibration
Umfang der Kalibrierung

Standard Calibration

Statement of Compliance (Incoming)
Konformitätsaussage (Anlieferung)

Defective.

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
4 pages Outgoing Results**

RPG Radiometer-Physics GmbH; Meckenheim

Date of Issue
Ausstellungsdatum

2020-10-27

Head of Laboratory
Laborleitung

Schulze

Person Responsible
Bearbeiter

Gottbehüt

Calibration Method
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %
Relative Luftfeuchte

Ambient Temperature
Umgebungstemperatur

(23⁺⁷₋₃) °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® ZVA40	100103	0001-300467129	2021-06-13
Powersensor	R&S® NRP-Z55	140093	509916_D-K-15195-01-01_2019-05	2021-05-22

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

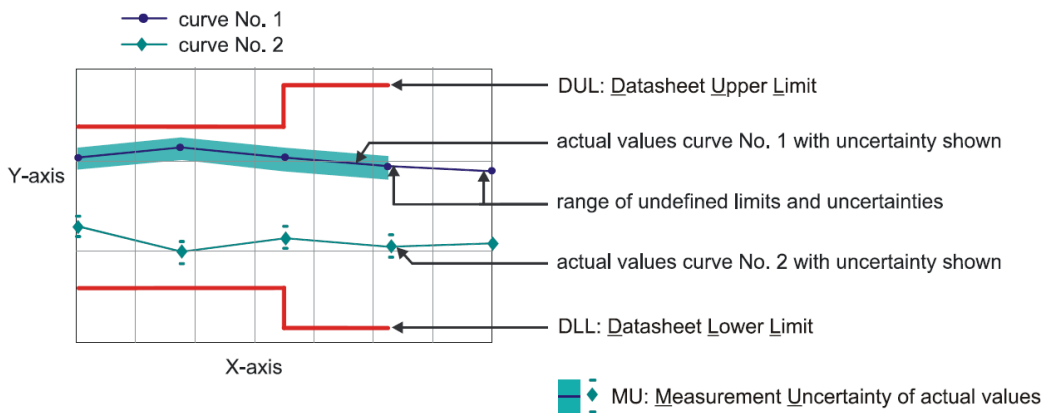
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is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

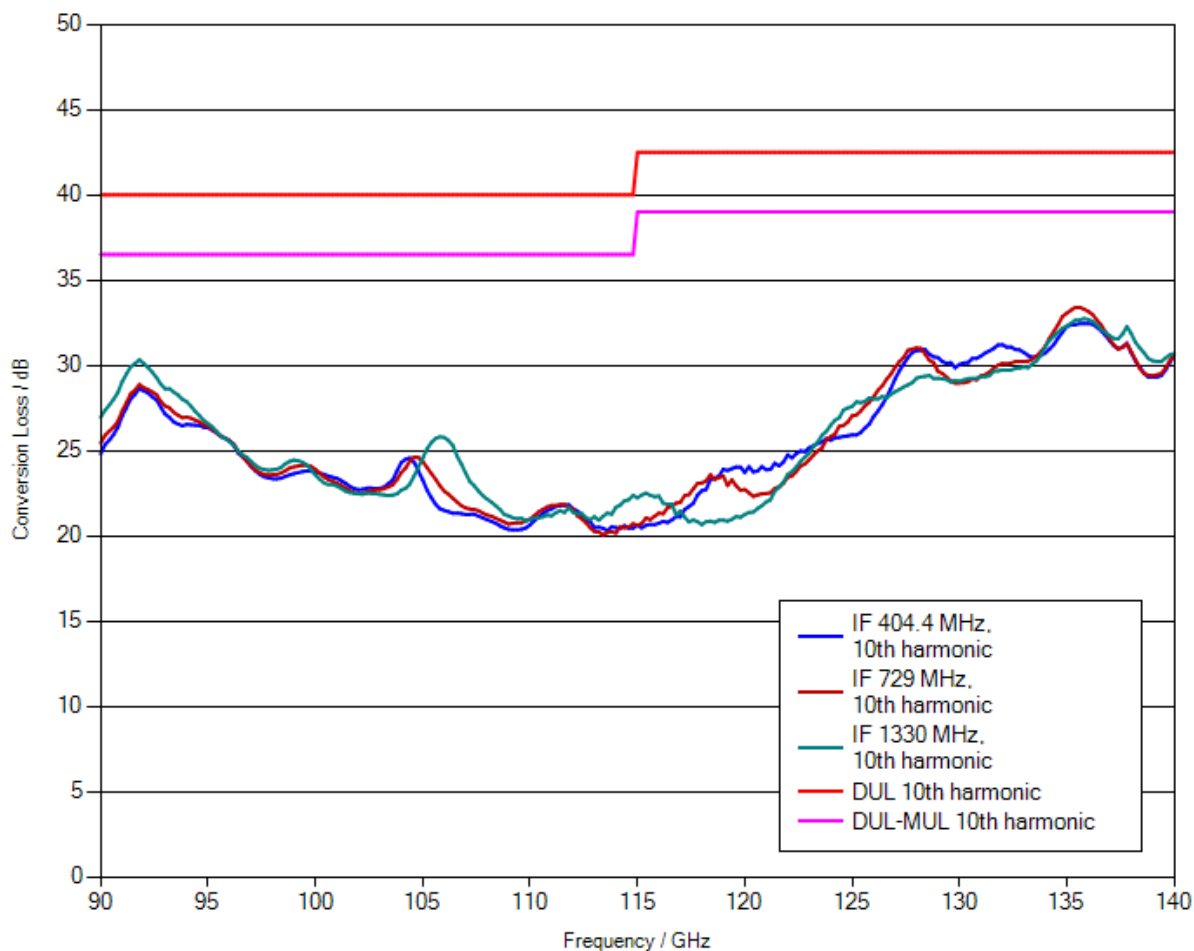
2013
7_14

Remark

1.1 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.

1.2 Frequency response within 1 GHz

	DUL	Actual (worst case)	Evaluation
IF = 404.4 MHz, 10th harmonic	6 dB	2.1 dB	PASS
IF = 729 MHz, 10th harmonic	6 dB	1.96 dB	PASS
IF = 1330 MHz, 10th harmonic	6 dB	2.13 dB	PASS



Calibration Certificate

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

Kalibrierschein

Zertifikatsnummer

Unit Data

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

Manufacturer
Hersteller **RPG**

Type
Typ **RPG FS-Z220**

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

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. Kalibriertechniken 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

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

Calibration Method
Kalibrieranweisung

RPG-PAQA-TN-2014-002

Relative Humidity 20 % - 80 %
Relative LuftfeuchteAmbient Temperature
Umgebungstemperatur(23 ⁺⁷/₋₃) °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

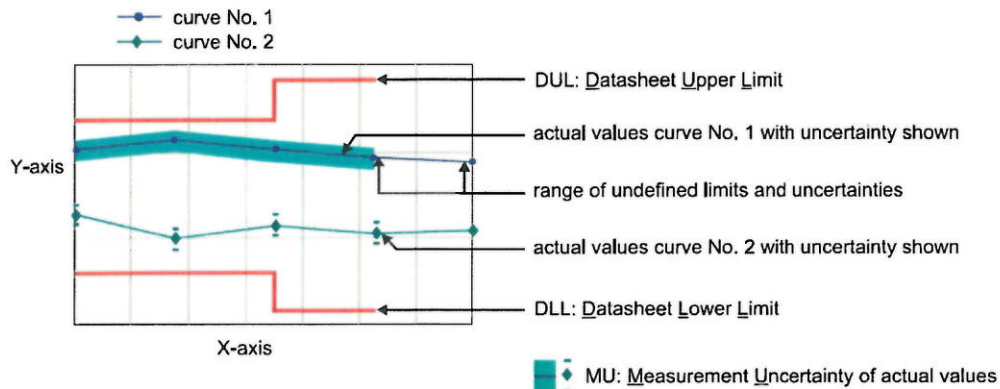
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is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

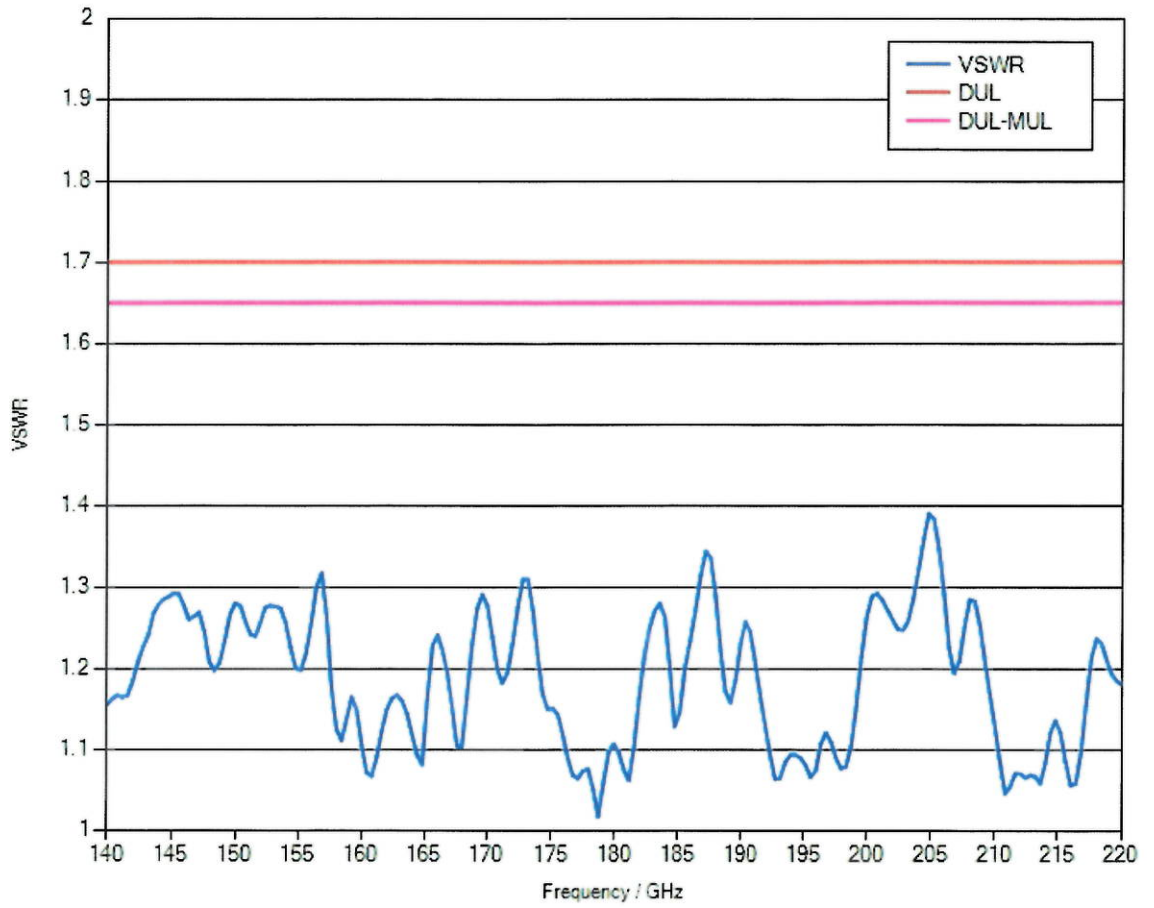
Version

2013
7_09

Remark

1.1 RF Input – VSWR

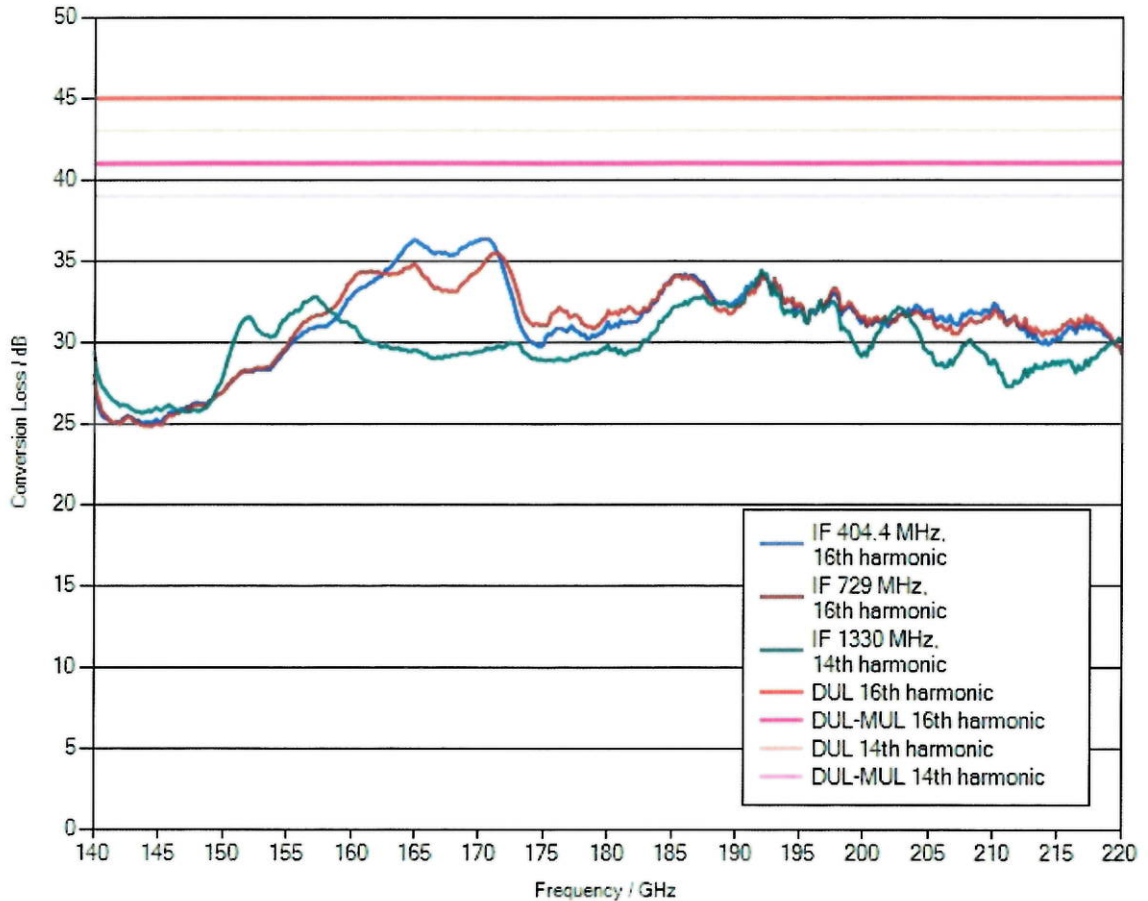
Measurement uncertainty: 0.05 (VSWR)



1.2 Conversion loss

LO level +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



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 02.5.0.0065 of 09.01.2015

Certificate number 25-18 Date when calibrated 08/17/2018 Page 1 of 2

Item calibrated

Antenna QWH-UPRR00 # 923600007

Description of measurement standard / measuring instrument / identification

Customer

Sporton International Inc.
No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District,
TaoYuan City 333, Taiwan, R.O.C.

Name of the customer, address

Method of calibration

GOST 20271.1, MK KL 8.2-16

Name of the method / identification

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

Authorising signature



M. Svirid/ Technical manager

Name and position

Date of issue 08/17/2018

Calibration Certificate

Certificate number **25-18**

Page 2 of 2

Calibration is performed by using

#	Measuring equipment	Serial number
1	Wattmeter M 568	164
2	Wattmeter M 546	163
3	Signal generator G4-186	5
4	Signal generator G4-161	3
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Horn antenna P6-133	15005

Calibration conditions

Temperature: 22.5 °C.

Humidity: 44.0 %.

Pressure: 99.9 kPa.

Calibration results are given in the Measuring report # 25-18.

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	40 – 60 GHz	Corresponds (Table 1)
2	Waveguide Interface	WR-19	Corresponds
3	Antenna Gain	24 dB	Corresponds (Table 1)
4	Antenna Factor	42 dB/m	Corresponds (Table 1)

Signature of the person who has performed calibration


M. Kasperovich/ Engineer
Name and function

**Calibration Laboratory of
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 02.5.0.0065

Address: 6, P. Brovki str., Minsk
220027, Belarus

Phone/Fax: +375 17 2938496



Technical Manager

_____ M. Svirid

August 17, 2018

MEASURING REPORT # 25-18

August 17, 2018

Customer:	Sporton International Inc. No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District, TaoYuan City 333, Taiwan, R.O.C.
Item calibrated:	Antenna QWH-UPRR00 # 923600007
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	07/20/2018
Date of calibration:	From 07/23/2018 to 08/17/2018

MEASURING CONDITIONS

Temperature: 22.5 °C	Humidity: 44 %	Pressure: 99.9 kPa
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MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 568	164
2	Wattmeter M 546	163
3	Signal generator G4-186	5
4	Signal generator G4-161	3
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Horn antenna P6-133	15005

MEASURING RESULTS

Distance between the testing and generating antennas was 2 m.

Table 1

Frequency, GHz	40	50	60
Input power, mW	10.0	10.0	10.0
Power density of electromagnetic field, W/m ²	0.049	0.067	0.072
Maximum level of measured power, μ W	36.56	37.07	31.98
Gain, dB	22.2	22.8	23.5
Antenna factor, dB/m	40.0	41.4	42.3
Expanded uncertainty, dB	2.1	2.1	2.1

Engineer



M. Kasperovich

Quality Manager



A. Kostrikin

This Measuring report issued in duplicate and sent to:

1. Sporton International INC.

Address: No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District, TaoYuan City 333, Taiwan, R.O.C.

2. Calibration Laboratory of Microwave Measuring Equipment

Duplication of Measuring report (complete or partial) must be authorized by the laboratory.



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. **№ BY/112 02.5.0.0065** of **09.01.2015**

Certificate number **28-18** Date when calibrated **08/17/2018** Page **1** of **2**

Item calibrated

Antenna QWH-EPRR00 # 784600034

Description of measurement standard / measuring instrument / identification

Customer

Sporton International Inc.

No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District,
TaoYuan City 333, Taiwan, R.O.C.

Name of the customer, address

Method of calibration

GOST 20271.1, MK KL 8.2-16

Name of the method / identification

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

Authorising signature



M. Svirid/ Technical manager
Name and position

Date of issue 08/17/2018

Calibration Certificate

Certificate number **28-18**

Page 2 of 2

Calibration is performed by using

#	Measuring equipment	Serial number
1	Wattmeter M 534	161
2	Wattmeter M 546	163
3	Signal generator G4-186	5
4	Signal generator RG4-14	22
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Horn antenna P6-134	14002
8	Horn antenna P6-31A	35864

Calibration conditions

Temperature: 22.5 °C.

Humidity: 44.0 %.

Pressure: 99.9 kPa.

Calibration results are given in the Measuring report # 28-18.

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	60 – 90 GHz	Corresponds (Table 1)
2	Waveguide Interface	WR-12	Corresponds
3	Antenna Gain	24 dB	Corresponds (Table 1)
4	Antenna Factor	45 dB/m	Corresponds (Table 1)

Signature of the person who has performed calibration



M. Kasperovich/ Engineer

Name and function

**Calibration Laboratory of
 Microwave Measuring Equipment**
 Accreditation certificate
 No. BY/112 02.5.0.0065
 Address: 6, P. Brovki str., Minsk
 220027, Belarus
 Phone/Fax: +375 17 2938496



Technical Manager

M. Svirid

August 17, 2018

MEASURING REPORT # 28-18
 August 17, 2018

Customer:	Sporton International Inc. No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District, TaoYuan City 333, Taiwan, R.O.C.
Item calibrated:	Antenna QWH-EPRR00 # 784600034
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	07/20/2018
Date of calibration:	From 07/23/2018 to 08/17/2018

MEASURING CONDITIONS

Temperature: 22.5 °C	Humidity: 44 %	Pressure: 99.9 kPa
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MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 534	161
2	Wattmeter M 546	163
3	Signal generator G4-186	5
4	Signal generator RG4-14	22
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Horn antenna P6-134	14002
8	Horn antenna P6-31A	35864

MEASURING RESULTS

Distance between the testing and generating antennas was 1.8 m at 60-75 GHz and 1.5 m at 90 GHz.

Table 1

Frequency, GHz	60	75	90
Input Power, mW	10.0	10.0	8.0
Power density of electromagnetic field, W/m ²	0.063	0.081	0.121
Maximum level of measured power, μ W	21.44	21.84	26.14
Gain, dB	22.3	23.3	23.9
Antenna Factor, dB/m	43.5	44.5	45.4
Expanded uncertainty, dB	2.1	2.1	2.1

Engineer



M. Kasperovich

Quality Manager



A. Kostrikin

This Measuring report issued in duplicate and sent to:

1. Sporton International INC.

Address: No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District, TaoYuan City 333, Taiwan, R.O.C.

2. Calibration Laboratory of Microwave Measuring Equipment

Duplication of Measuring report (complete or partial) must be authorized by the laboratory.



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 02.5.0.0065 of 09.01.2015

Certificate number 29-18 Date when calibrated 08/17/2018 Page 1 of 2

Item
calibrated

Antenna QWH-FPRR00 # 923800009

Description of measurement standard / measuring instrument / identification

Customer

Sporton International Inc.

No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District,
TaoYuan City 333, Taiwan, R.O.C.

Name of the customer, address

Method of
calibration

GOST 20271.1, MK KL 8.2-16

Name of the method / identification

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

Authorising
signature



M. Svirid/ Technical manager

Name and position

Date of issue 08/17/2018

Calibration Certificate

Certificate number **29-18**

Page 2 of 2

Calibration is performed by using

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Wattmeter M 534	161
3	Voltmeter V7-34	0067787
4	Frequency meter RCH3-72	931200
5	Signal generator RG4-14	22
6	Signal generator G4-161	282
7	Antenna P6-31A	35864
8	Antenna P6-32	115671

Calibration conditions

Temperature: 22.5 °C.


Humidity: 44.0 %.

Pressure: 99.9 kPa.

Calibration results are given in the Measuring report # 29-18.

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	90 – 140 GHz	Corresponds (Table 1)
2	Waveguide Interface	WR-8	Corresponds
3	Antenna Gain	24 dB	Corresponds (Table 1)
4	Antenna Factor	48 dB/m	Corresponds (Table 1)

Signature of the person who has performed calibration


M. Kasperovich/ Engineer
Name and function

**Calibration Laboratory of
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 02.5.0.0065

Address: 6, P. Brovki str., Minsk

220027, Belarus

Phone/Fax: +375 17 2938496



Technical Manager

M. Svirid

August 17, 2018

MEASURING REPORT # 29-18

August 17, 2018

Customer:	Sporton International Inc. No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District, TaoYuan City 333, Taiwan, R.O.C.
Item calibrated:	Antenna QWH-FPRR00 # 923800009
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	07/20/2018
Date of calibration:	From 07/23/2018 to 08/17/2018

MEASURING CONDITIONS

Temperature: 22.5 °C	Humidity: 44 %	Pressure: 99.9 kPa
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MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Wattmeter M 534	161
3	Voltmeter V7-34	0067787
4	Frequency meter RCH3-72	931200
5	Signal generator RG4-14	22
6	Signal generator G4-161	282
7	Antenna P6-31A	35864
8	Antenna P6-32	115671

MEASURING RESULTS

Distance between the testing and generating antennas was 1.5 m at 90-115 GHz and 1.2 m at 140 GHz.

Table 1

Frequency, GHz	90	115	140
Input Power, mW	8.0	8.0	5.0
Power density of electromagnetic field, W/m ²	0.125	0.174	0.212
Maximum level of measured power, μW	17.99	18.87	18.79
Gain, dB	22.1	23.0	23.9
Antenna Factor, dB/m	47.2	48.4	49.3
Expanded uncertainty, dB	2.1	2.2	2.2

Engineer



M. Kasperovich

Quality Manager



A. Kostrikin

This Measuring report issued in duplicate and sent to:

1. Sporton International INC.

Address: No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District, TaoYuan City 333, Taiwan, R.O.C.

2. Calibration Laboratory of Microwave Measuring Equipment

Duplication of Measuring report (complete or partial) must be authorized by the laboratory.

Calibration certificate



Accreditation certificate No. **№ BY/112 02.5.0.0065** of **09.01.2015**

Certificate number **35-18** Date when calibrated **08/17/2018** Page **1** of **2**

Item

calibrated

Antenna QWH-GPRR00 # 923900001

Description of measurement standard / measuring instrument / identification

Customer

Sporton International Inc.

No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District,
TaoYuan City 333, Taiwan, R.O.C.

Name of the customer, address

Method of
calibration

GOST 20271.1, MK KL 8.2-16

Name of the method / identification

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

Authorising
signature



M. Svirid/ Technical manager

Name and position

Date of issue 08/17/2018

Calibration Certificate

Certificate number **35-18**

Page 2 of 2

Calibration is performed by using

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Wattmeter M 514	165
3	Signal generator RG4-14	4
4	Voltmeter V7-34	0067787
5	Frequency meter RCH3-72	931200
6	Frequency multiplier	02
7	Horn antenna P6-32	115671
8	Horn antenna 2P1	138421

Calibration conditions

Temperature: 22.5 °C.


Humidity: 44.0 %.

Pressure: 99.9 kPa.

Calibration results are given in the Measuring report # 35-18.

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	140 – 220 GHz	Corresponds (Table 1)
2	Waveguide Interface	WR-5	Corresponds
3	Antenna Gain	24 dB	Corresponds (Table 1)
4	Antenna Factor	52 dB/m	Corresponds (Table 1)

Signature of the person who has performed calibration


M. Kasperovich/ Engineer
Name and function

**Calibration Laboratory of
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 02.5.0.0065

Address: 6, P. Brovki str., Minsk
220027, Belarus

Phone/Fax: +375 17 2938496



Technical Manager

_____ M. Svirid

August 17, 2018

MEASURING REPORT # 35-18

August 17, 2018

Customer:	Sporton International Inc. No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District, TaoYuan City 333, Taiwan, R.O.C.
Item calibrated:	Antenna QWH-GPRR00 # 923900001
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	07/20/2018
Date of calibration:	From 07/23/2018 to 08/17/2018

MEASURING CONDITIONS

Temperature: 22.5 °C	Humidity: 44 %	Pressure: 99.9 kPa
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MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Wattmeter M 514	165
3	Signal generator RG4-14	4
4	Voltmeter V7-34	0067787
5	Frequency meter RCH3-72	931200
6	Frequency multiplier	02
7	Horn antenna P6-32	115671
8	Horn antenna 2P1	138421

MEASURING RESULTS

Distance between the testing and generating antennas was 1 m at 140 GHz, 0.6 m at 180 GHz and 0.3 m at 220 GHz.

Table 1

Frequency, GHz	140	180	220
Input power, mW	5.0	2.0	2.0
Power density of electromagnetic field, W/m ²	0.311	0.369	0.327
Maximum level of measured power, μW	18.15	16.71	11.42
Gain, dB	22.0	23.1	23.7
Antenna factor, dB/m	51.1	52.2	53.4
Expanded uncertainty, dB	2.2	2.3	2.5

Engineer  M. Kasperovich

Quality Manager  A. Kostrikin

This Measuring report issued in duplicate and sent to:

1. Sporton International INC.

Address: No. 52, HwaYa 1st Road, HwaYa Technology Park, Kwei-Shan District, TaoYuan City 333, Taiwan, R.O.C.

2. Calibration Laboratory of Microwave Measuring Equipment

Duplication of Measuring report (complete or partial) must be authorized by the laboratory.



Appendix C. Designation Number and Maximum Assessed

Frequency in MHz

Display Exhibits	Display Correspondence	Display Firm Name	Location	Accreditation	MRA Designation Number	Expiration Date	Contact	Contact Title	Address	P.O. Box	Mail Stop	City	State	Zip	Country	E-mail Address	Phone Number	Fax Number
		Scopes Sporton International Inc.	Guishan Dist. Taoyuan City Taiwan	National Communications Commission	APEC TEL TW1190	01/09/2022	Alex Chen	Quality Assurance Dept. Director	No.52, Huaya 1st Rd., Guishan Dist.	N/A	N/A	Taoyuan City	N/A	N/A	Taiwan	alex@sporton.com.tw	+886-3-327-3456	+886-3-327-0978
		Scopes Sporton International Inc. Hsinchu Laboratory	Zhubei City Hsinchu County 302 Taiwan (R.O.C.)	National Communications Commission	APEC TEL TW3787	01/09/2022	Alex Chen	Quality Assurance Dept. Director	No.8, Ln. 724, Bo'ai St., Zhubei City	N/A	N/A	Hsinchu County	N/A	N/A	Taiwan	alex@sporton.com.tw	+886-3-327-3456	+886-3-327-0978
		Scopes Sporton International Inc. Wensan Laboratory	Guishan Dist. Taoyuan City 333 Taiwan (R.O.C.)	National Communications Commission	APEC TEL TW3786	01/09/2022	Alex CHEN	Quality Assurance Dept. Director	No.58, Aly. 75, Ln. 564 Wenhua 3rd Rd., Guishan Dist.	N/A	N/A	Taoyuan City	N/A	N/A	Taiwan	alex@sporton.com.tw	+886-3-327-3456	+886-3-327-0978

OET Accredited Test firm scope List
Test Firm: Sporton International Inc. Wensan Laboratory

Scope	FCC Rule Parts	Maximum Assessed Frequency in Mhz	Status	Expiration Date	Recognition Date
Intentional Radiators	FCC Part 15 Subpart C	280000.00	Approved	01-09-2022	04-05-2021
U-NII without DFS Intentional Radiators	FCC Part 15, Subpart E	40000.00	Approved	01-09-2022	04-05-2021
U-NII with DFS Intentional Radiators	FCC Part 15, Subpart E	40000.00	Approved	01-09-2022	04-05-2021
UWB Intentional Radiators	FCC Part 15, Subpart F	280000.00	Approved	01-09-2022	04-05-2021
Commercial Mobile Services	Part 22 (cellular), Part 24, Part 25 (below 3 GHz), Part 27	40000.00	Approved	01-09-2022	04-05-2021
General Mobile Radio Services	Part 22 (non-cellular), Part 90 (below 3 GHz), Part 95 (below 3 GHz), Part 97 (below 3 GHz), Part 101 (below 3 GHz)	40000.00	Approved	01-09-2022	04-05-2021
Citizens Broadband Radio Services	Part 96	40000.00	Approved	01-09-2022	04-05-2021
Microwave and Millimeter Bands Radio Services	Part 25 (above 3 GHz), Part 30, Part 74, Part 90 (above 3 GHz), Part 95 (above 3 GHz), Part 97 (above 3 GHz) Part 101	280000.00	Approved	01-09-2022	04-05-2021
Hearing Aid Compatibility	Part 20	40000.00	Approved	01-09-2022	04-05-2021