



Material No 1048.0371.02 **Serial No** 101811 **Certificate** 0001A300623436
Page 3/3 **Number**

Environmental Conditions			
Ambient Temperature	(23 ± 1) °C	Relative Humidity	20%-60%

Comments on Measurement Results

The measurement results in the test report stated below have been tested for compliance with the given specifications and marked if necessary. The associated uncertainty of measurement has been taken into account, if not otherwise stated. Measurement results that are not covered by the DAkkS accreditation are marked with ' '.
 Ref.: ILAC G8:09/2019 'Guidelines on Decision Rules and Statements of Conformity'.

The expanded measurement uncertainty corresponds to the measurement results from the standard measurement uncertainty multiplied by the coverage factor $k = 2$.
 It was determined in accordance with EA-4/02 M:2013. The true value is located in the corresponding interval with a probability of 95 %.

In addition to the calibration results, the calibration certificate includes functional measurements that might have an influence on the measurement uncertainty of the calibration results. The functional measurement results are marked and are not intended to be used to support the further dissemination of metrological traceability. They are intended to verify the requirements on the measurement object according to manufacturer specifications and technical standards.

Outgoing Results

Designation: HARMONIC MIXER
Type: FS-Z90
Material No.: 1048.0371.02
Serial No.: 101811
Certificate No.: 0001A300623436
Referring to Test Documentation: 5038.8323.01-PB-02.00

Test Department: 3MM-P
Name: Johannes Negele
Date: 2021-11-16



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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- {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.
- {f} Verification of specified requirements. Technical operation that consist of the determination of one or more characteristics to a specified procedure.

- DL or DT Data Limit for symmetrical tolerance limits
- DLL Datasheet Lower Limit
- DUL Datasheet Upper Limit
- MU Symmetrical Measurement Uncertainty
- MLL or MLV Measurement Uncertainty Lower Value
- MUL or MUV Measurement Uncertainty Upper Value
- Nom. Nominal Value
- Dev. Deviation
- Act. Actual Value
- UGB Uncertainty Guard Band: Measuring uncertainty violates the data (spec.) limit.
- UGB1 A compliance statement may be possible where a confidence level of less than 95 % is acceptable.
- UGB2 A non-compliance statement may be possible where a confidence level of less than 95 % is acceptable.
- DU Datasheet Uncertainty

Explanation of charts

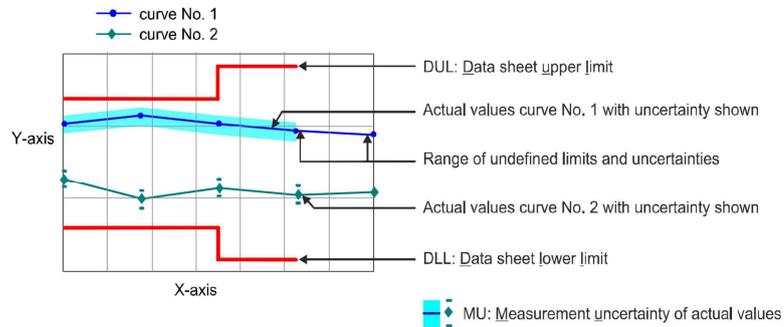


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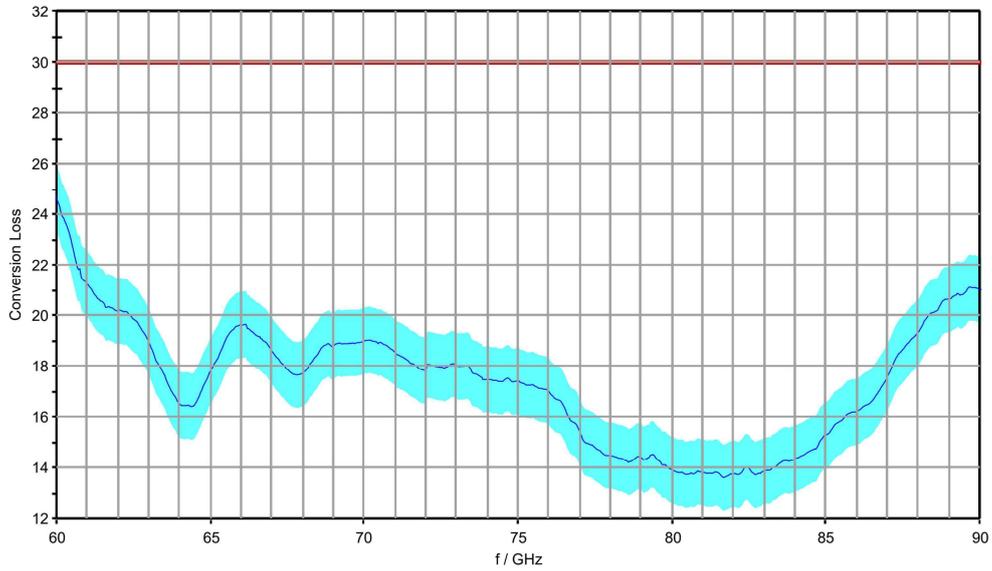
Software used for measurement	4
1. Conversion Loss (6. Harmonic)	5
1.1 Conversion Loss (IF = 404.4 MHz)	5
1.2 Conversion Loss (IF = 729 MHz)	5
1.3 Conversion Loss (IF = 1330 MHz)	6
1.4 Continuity response within 1 GHz	6

Software used for measurement			
Item	Type	Version	Remark
Suite	Setup	V12.10.02	Test Management Software G5
Test Program (7012.8706.00_)	Component	V01.05	

1. Conversion Loss (6. Harmonic)

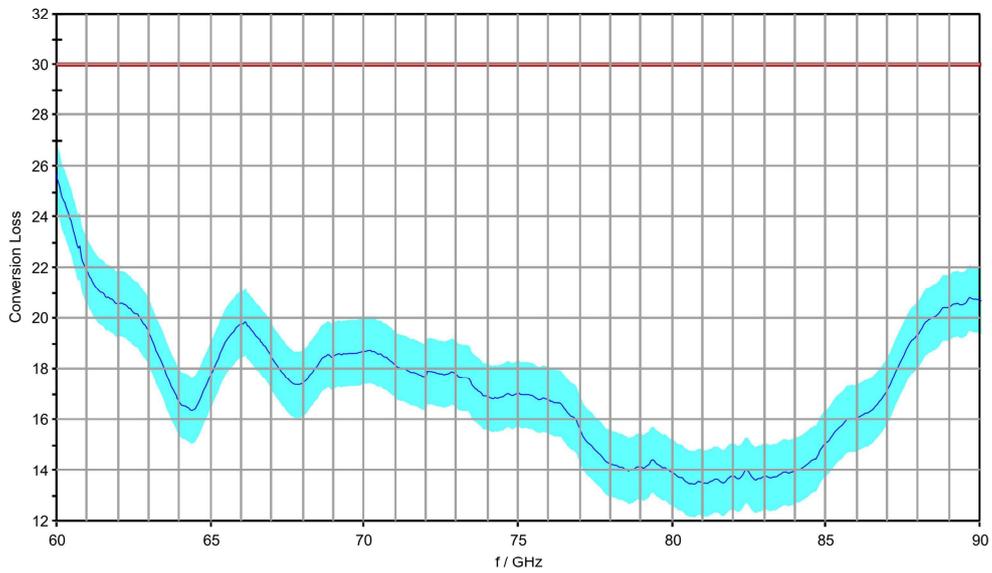
1.1 Conversion Loss (IF = 404.4 MHz)

IF = 404.4 MHz, 6. Harmonic



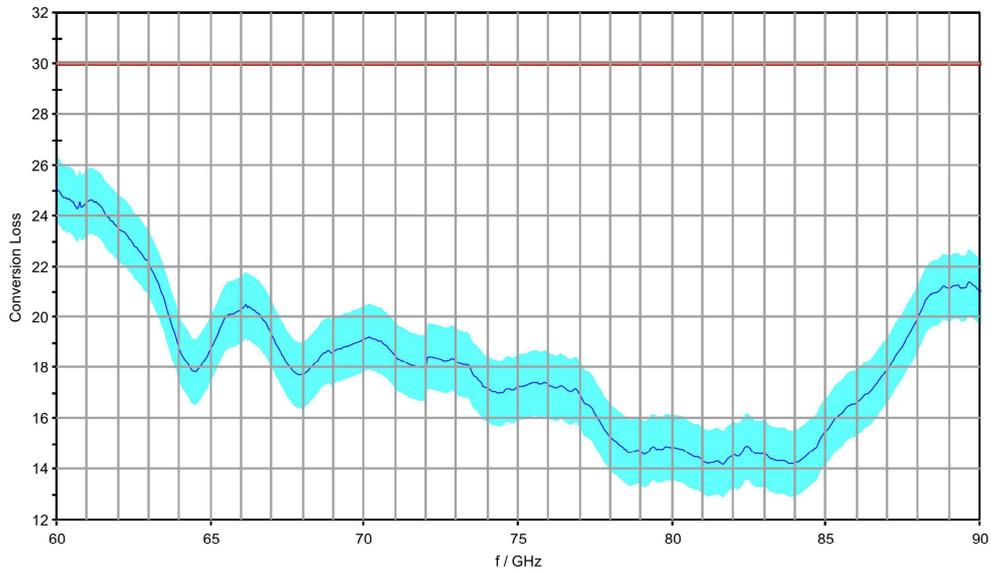
1.2 Conversion Loss (IF = 729 MHz)

IF = 729 MHz, 6. Harmonic



1.3 Conversion Loss (IF = 1330 MHz)

IF = 1330 MHz, 6. Harmonic



1.4 Continuity response within 1 GHz

Continuity response within any 1 GHz Band, 6. Harmonic

	DUL /dB	Continuity /dB
max. at IF = 404.4 MHz:	6.0	3.46
max. at IF = 729 MHz:	6.0	3.80
max. at IF = 1330 MHz:	6.0	3.42

Incoming Results

Designation: HARMONIC MIXER
Type: FS-Z90
Material No.: 1048.0371.02
Serial No.: 101811
Certificate No.: 0001A300623436
Referring to Test Documentation: 5038.8323.01-PB-02.00

Test Department: 3MM-P
Name: Michael Haupt
Date: 2021-11-16



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Explanation of charts

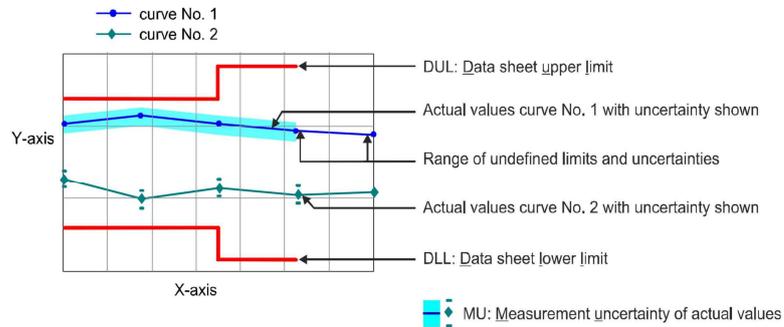


Table of contents

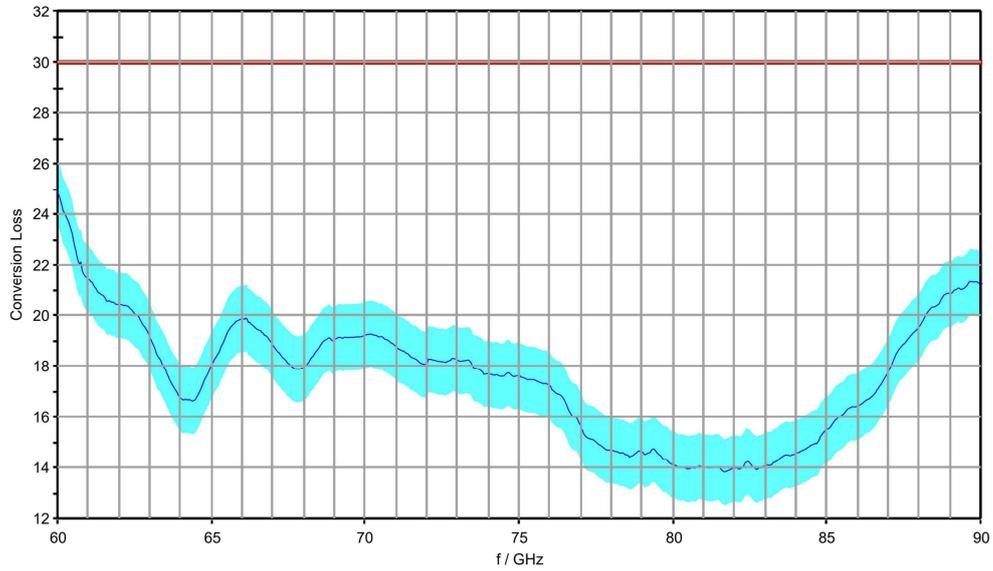
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1.4 Continuity response within 1 GHz	6

Software used for measurement			
Item	Type	Version	Remark
Suite	Setup	V12.10.02	Test Management Software G5
Test Program (7012.8706.00_)	Component	V01.05	

1. Conversion Loss (6. Harmonic)

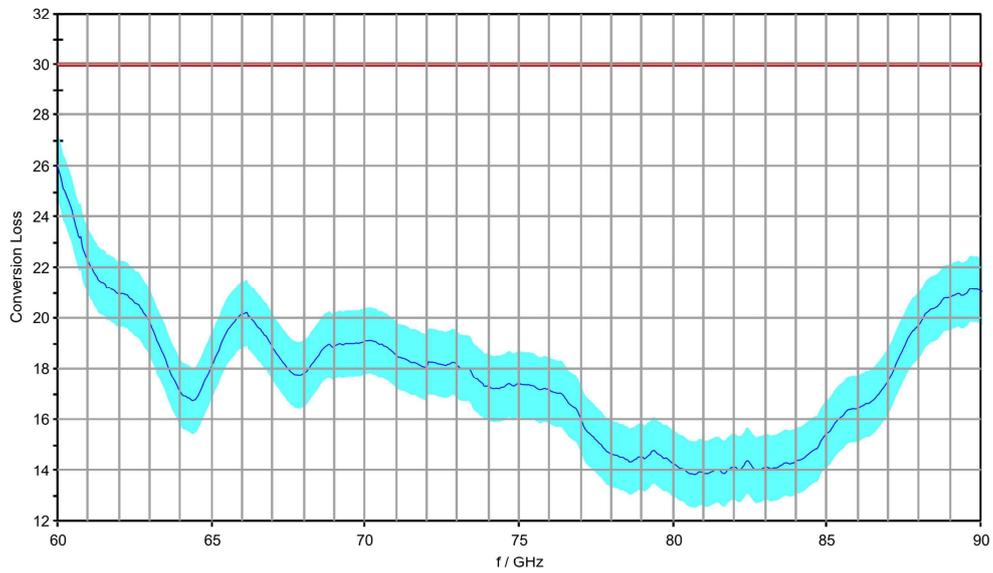
1.1 Conversion Loss (IF = 404.4 MHz)

IF = 404.4 MHz, 6. Harmonic



1.2 Conversion Loss (IF = 729 MHz)

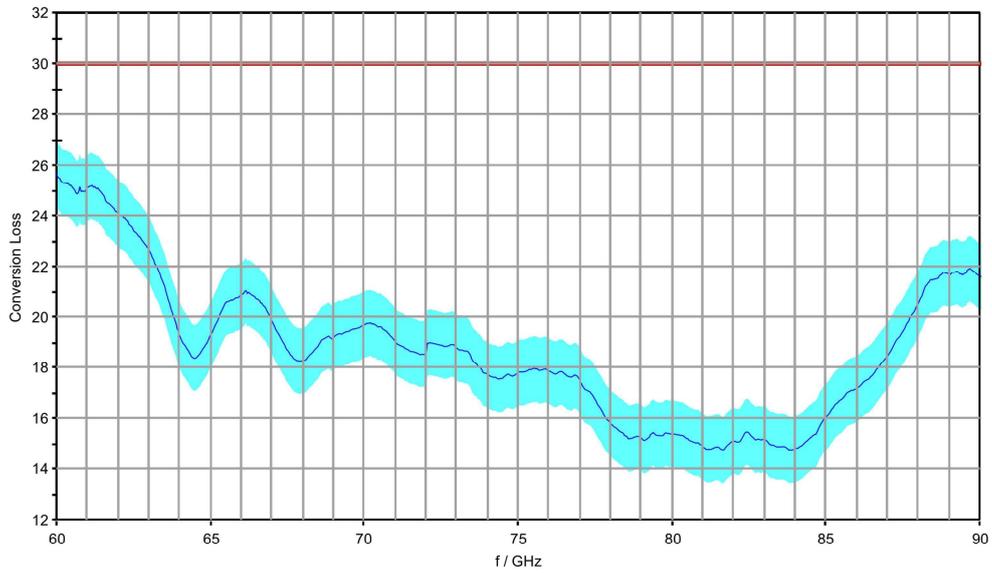
IF = 729 MHz, 6. Harmonic



Incoming Results

1.3 Conversion Loss (IF = 1330 MHz)

IF = 1330 MHz, 6. Harmonic



1.4 Continuity response within 1 GHz

Continuity response within any 1 GHz Band, 6. Harmonic

	DUL /dB	Continuity /dB
max. at IF = 404.4 MHz:	6.0	3.45
max. at IF = 729 MHz:	6.0	3.81
max. at IF = 1330 MHz:	6.0	3.41



Calibration Certificate

Kalibrierschein

Certificate Number **24-0140-101128-02**

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

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⁺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

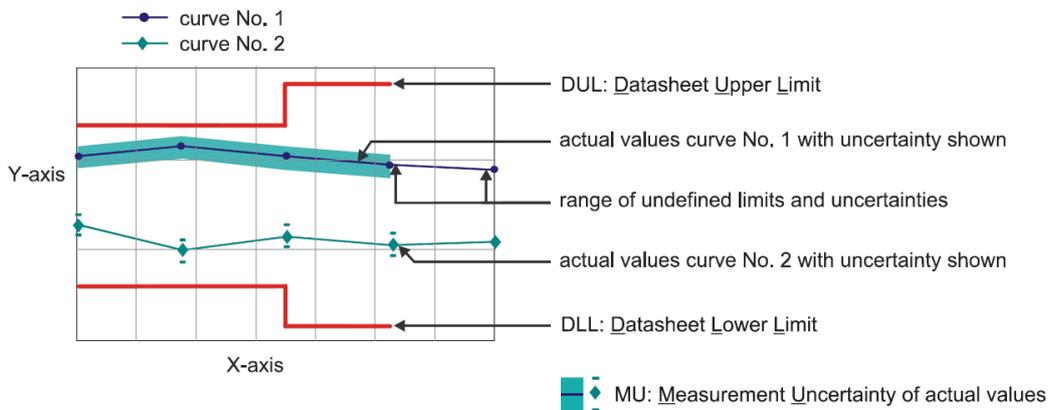
If the new product is stored under the climate conditions as specified in the data sheet upon delivery, the product's accuracy is not significantly affected within 12 month after its calibration in our factory. In this case, the recommended calibration interval starts on the date when the product is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

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

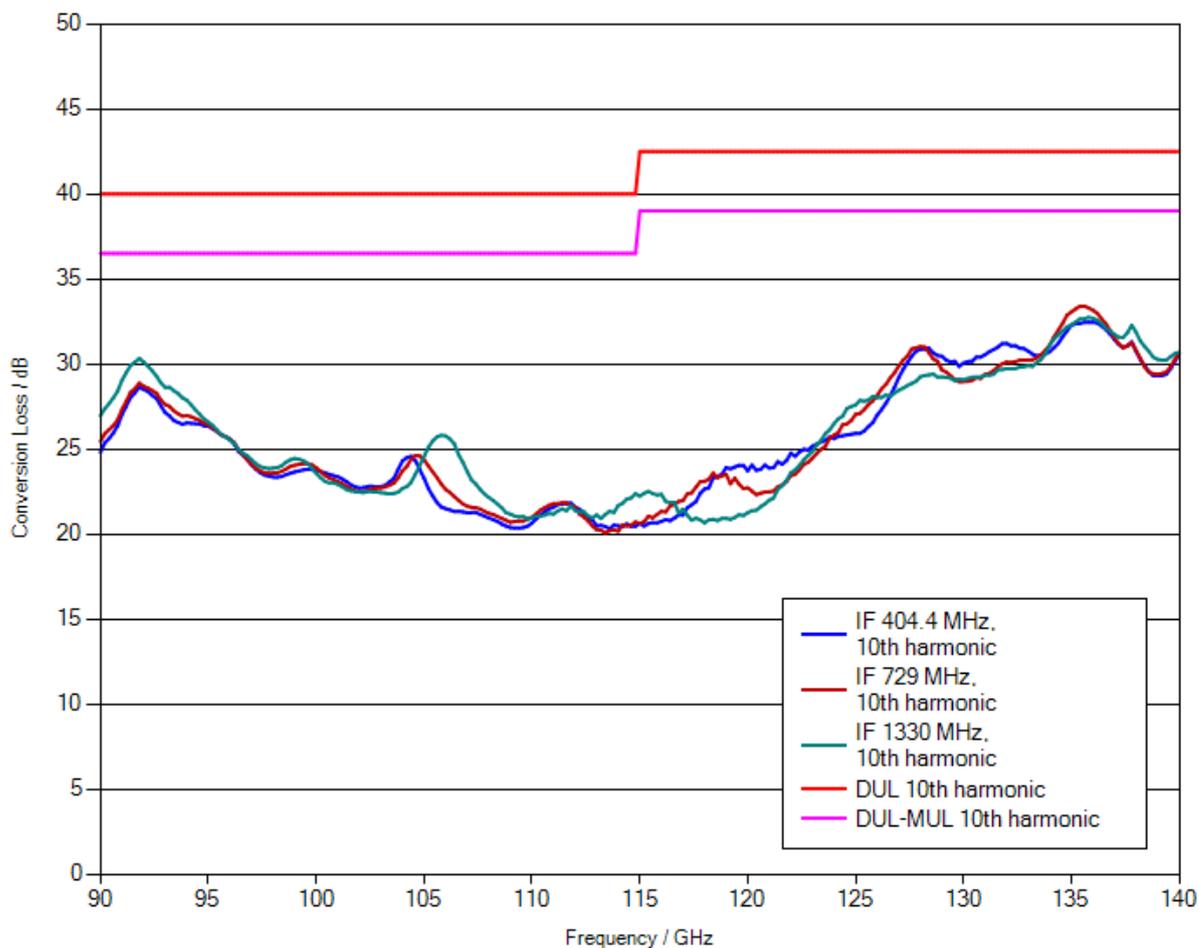


Software used for measurement**Item Type**Measurement Studio Professional Edition
MixerCertification**Version**2013
7_14**Remark**

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 Laboratory of Microwave Measuring Equipment
of MWMLab



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 5.0065 of 09.01.2015

Certificate number 36-21 Date when calibrated 06.07.2021 Page 1 of 2

Item calibrated Antenna QWH-UPRR00 # 1410300003

Customer Sporton International Inc.

Method of calibration GOST 20271.1, MK KL 8.2-16

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Gain measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. 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



/ Technical manager Date of issue 06.07.2021

Calibration Certificate

Certificate number **36-21**

Page 2 of 2

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M1-11	Calibrator of power with wattmeter M3-22A	841202/ 037410	08 December 2021	3882-43	RF Power
M 568	Reference power meter	164	24 March 2022	1/111-175-20	RF Power
G4-161	Signal generator	3	12 October 2021	20-20	RF Power
MG3694C	Signal generator	133805	11 September 2021	2726-43	RF Power Frequency
V7-34	Universal voltmeter	0067787	23 September 2021	2742-42	DC Voltage
RCH3-72	Frequency meter	931200	18 September 2021	2822-43	Frequency
P6-133	Horn antenna	15005	23 September 2021	2374-43	Gain
P6-11B	Measuring horn antenna	08051	23 September 2021	2370-43	Gain

Calibration conditions

Temperature: 23.8 °C.

Humidity: 43.2 %.

Pressure: 100.1 kPa.

Calibration results are given in the measurement report # 36-21

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	40 – 60 GHz	Corresponds
2	Antenna Gain	22.5* dBi	Corresponds (Table 1)
3	Antenna Factor	42 dB/m	Corresponds (Table 1)

* – Expanded uncertainty of measurements 2.0 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Signature of the person who has performed calibration


/ Engineer

**Calibration Laboratory of
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 5.0065

Address: 6, P. Brovki str., Minsk
220013, Belarus

Phone/Fax: +375 17 2938496



Technical Manager

July 6, 2021

MEASUREMENT REPORT # 36-21

July 6, 2021

Customer:	Sporton International Inc.
Item calibrated:	Antenna QWH-UPRR00 # 1410300003
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	21.06.2021
Date of calibration:	From 21.06.2021 to 06.07.2021