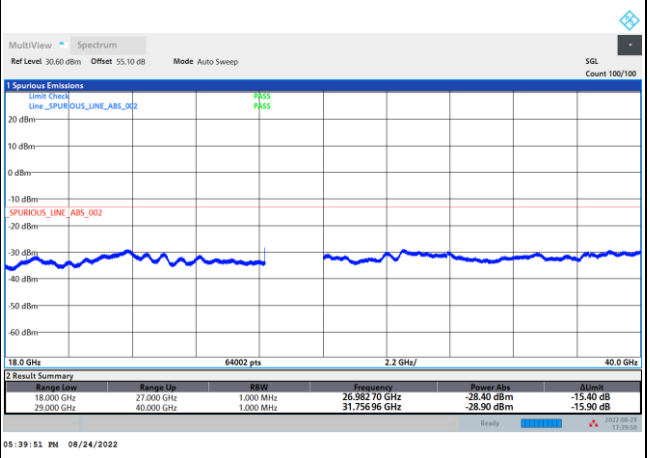
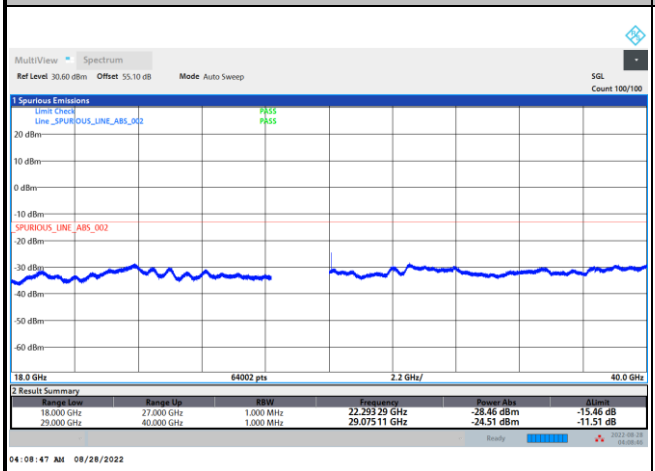
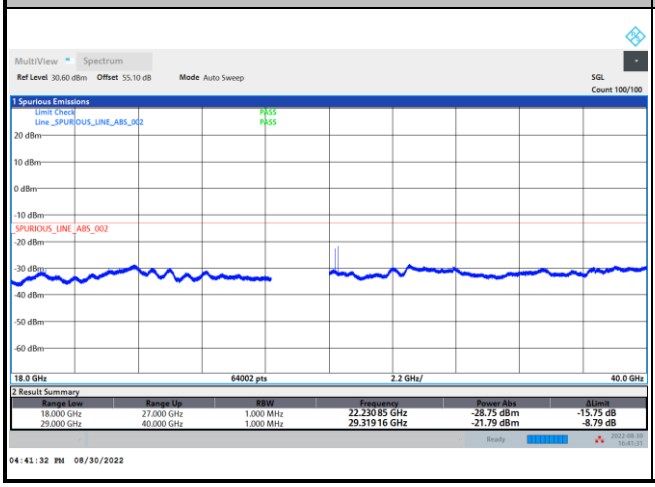
DFT-s-OFDM Module A

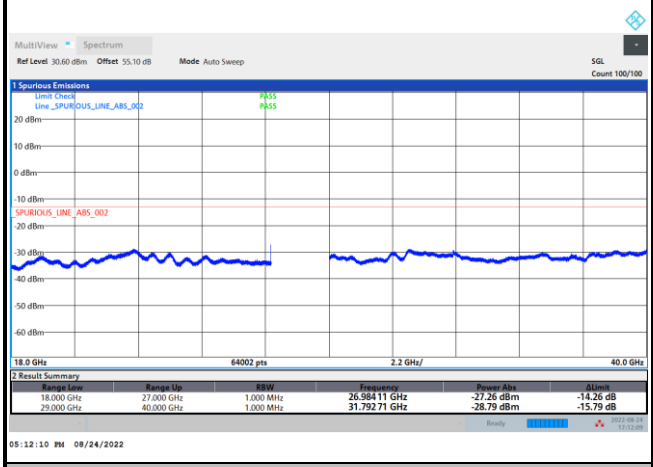
NR Band n261 QPSK (18-40GHz)	
Lowest Channel / 200MHz	
	**intentionally blank**
Middle Channel / 200MHz	
	**intentionally blank**
Highest Channel / 200MHz	
	**intentionally blank**

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

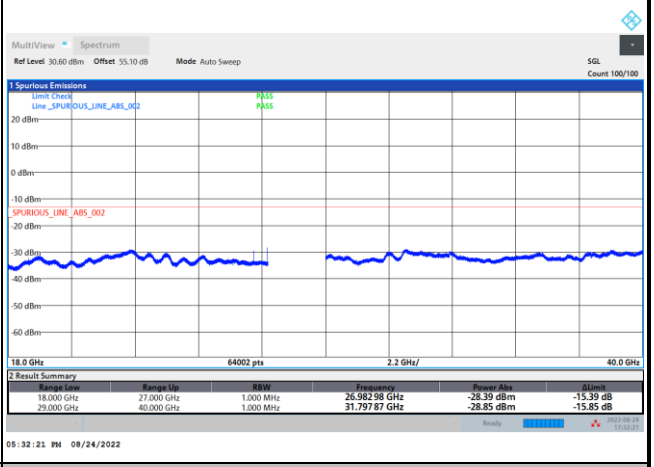
CP-OFDM Module A

NR Band n261 QPSK (18-40GHz)

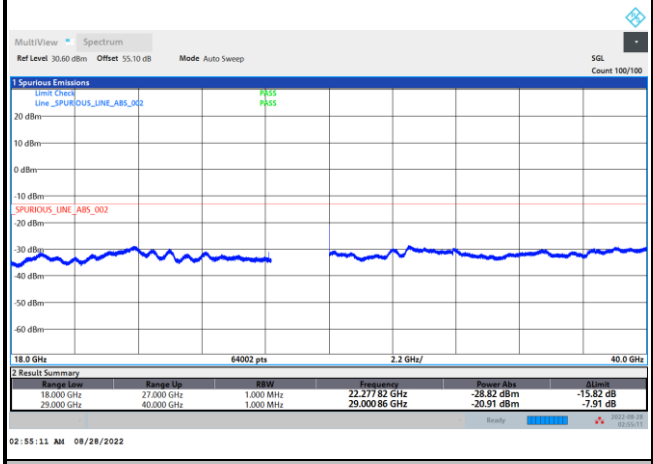
Lowest Channel / 50MHz



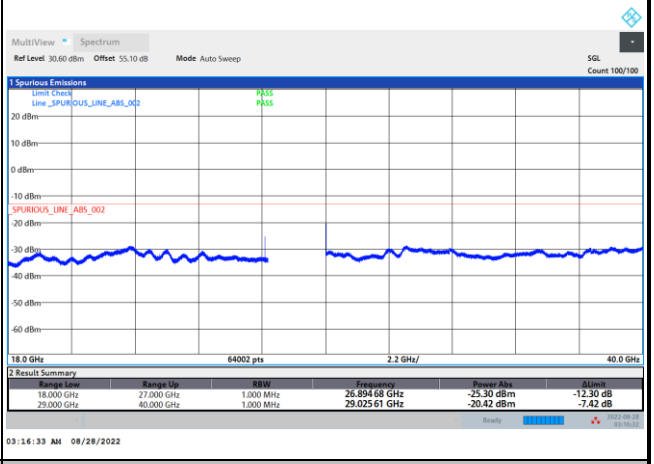
Lowest Channel / 100MHz



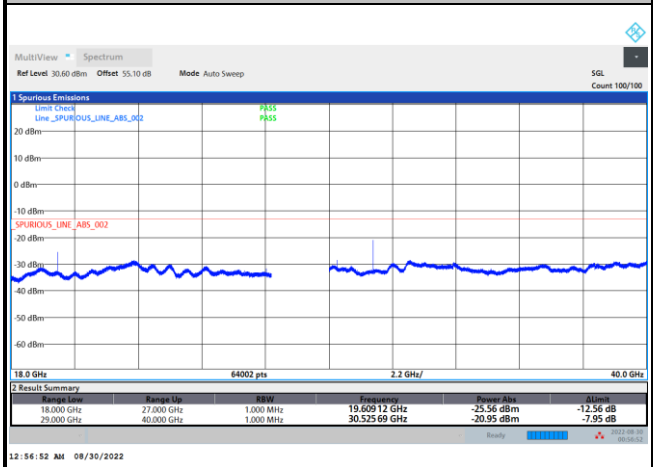
Middle Channel / 50MHz



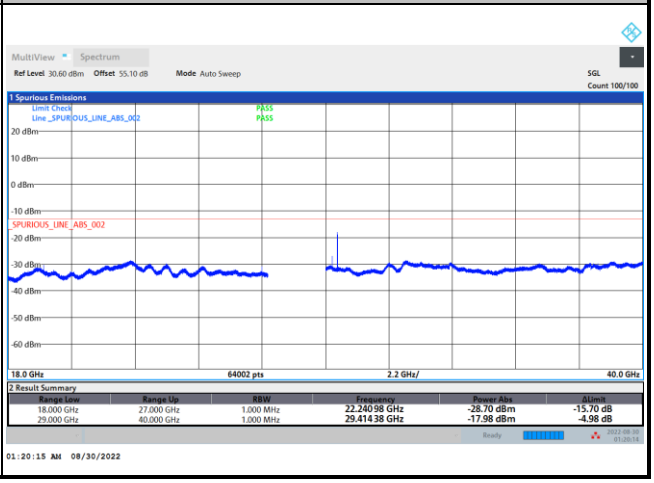
Middle Channel / 100MHz



Highest Channel / 50MHz

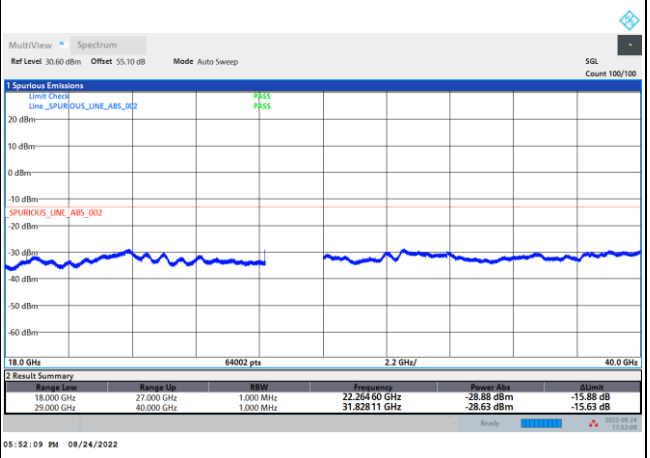
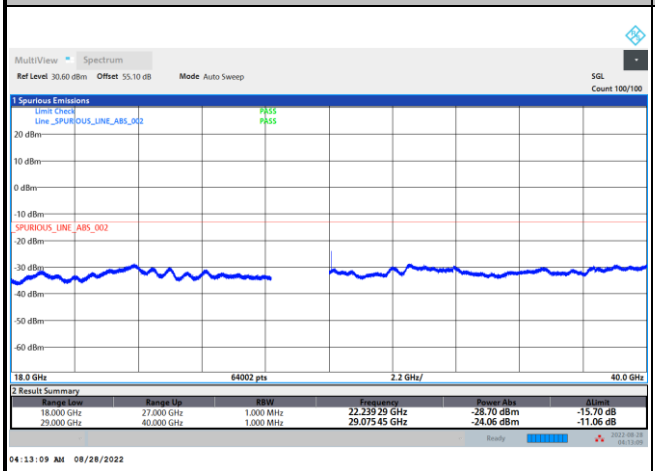
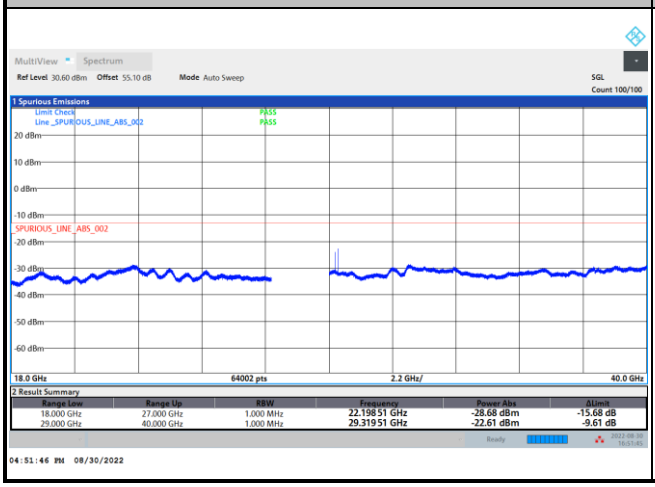


Highest Channel / 100MHz



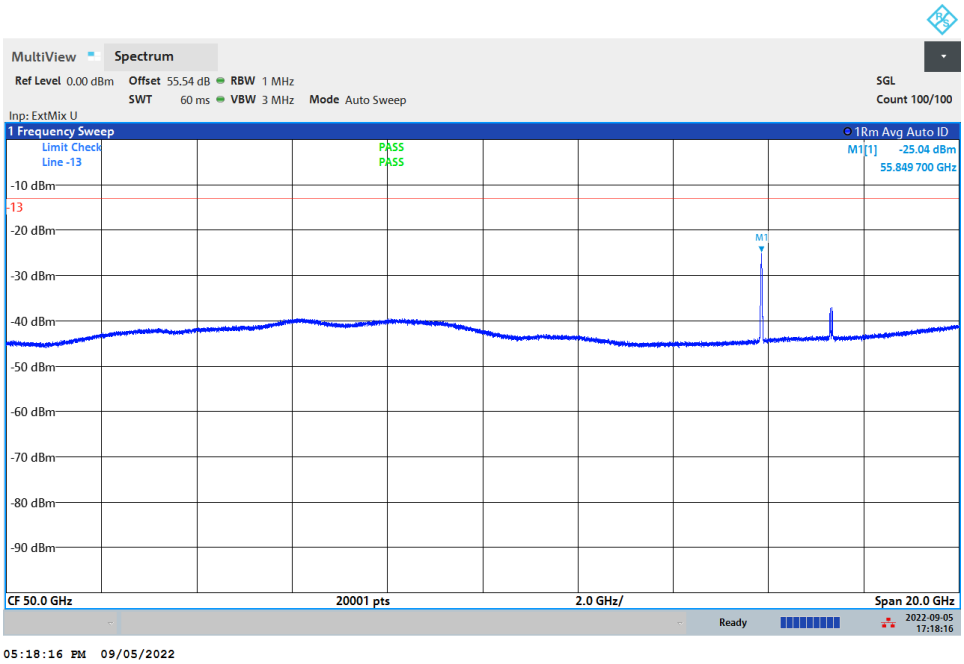
Remark: In band and out of band frequencies are omitted.

CP-OFDM Module A

NR Band n261 QPSK (18-40GHz)	
Lowest Channel / 200MHz	
	**intentionally blank**
Middle Channel / 200MHz	
	**intentionally blank**
Highest Channel / 200MHz	
	

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

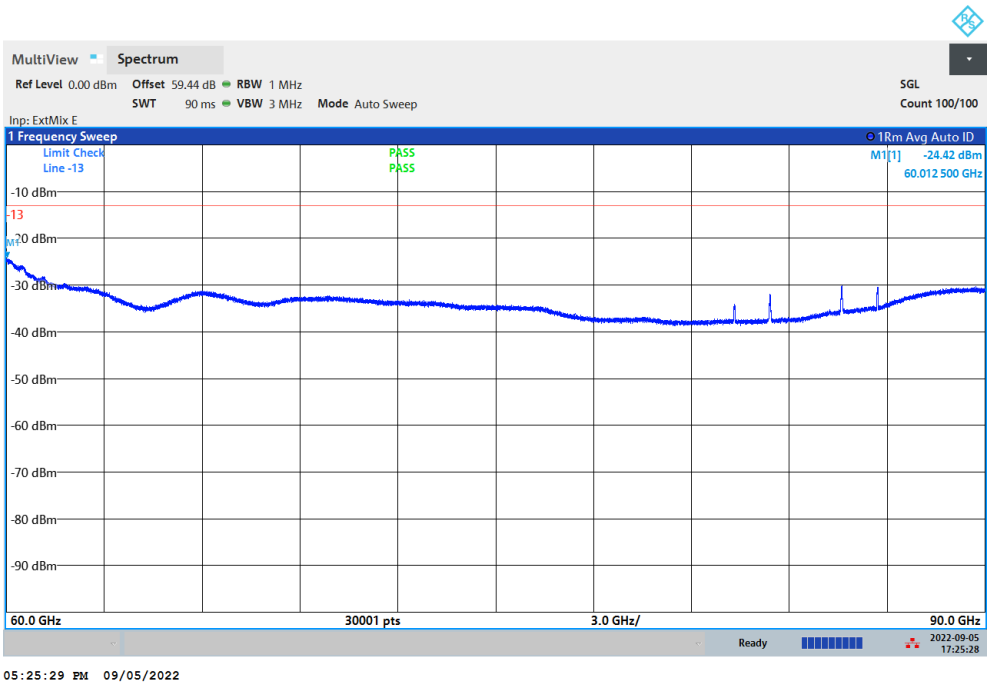
NR Band n261
(40GHz-60GHz)



Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8 + *Duty Factor*

= 43 + 0.43 + 107 + 20log(1) – 104.8 + 9.91 = 55.54 (dB)

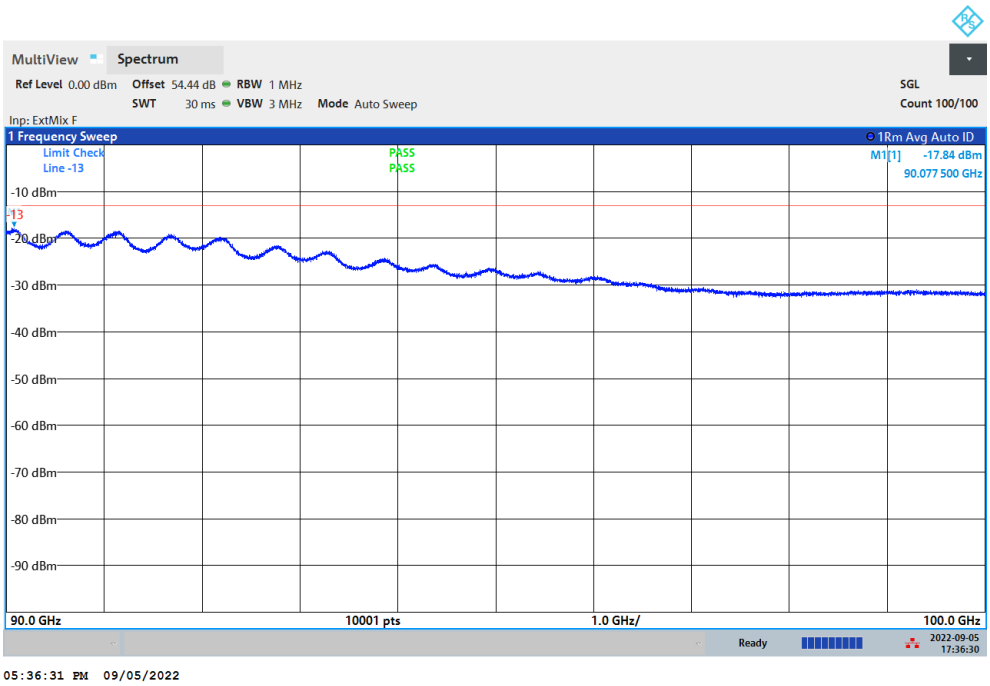
NR Band n261
(60GHz-90GHz)



Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8 + *Duty Factor*

= 46.9 + 0.43 + 107 + 20log(1) – 104.8 + 9.91 = 59.44 (dB)

NR Band n261
(90GHz-100GHz)



Offset = Antenna Factor (dB/m) + Cable Loss (dB) + 107 + 20log (D) – 104.8 + *Duty Factor*

= 47.92 + 0.43 + 107 + 20log(0.5) – 104.8 + 9.91 = 54.44 (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	27.9260345	-0.500	0.018	Pass
40	Normal Voltage	27.9260345	-0.500	0.018	
30	Normal Voltage	27.9260345	-0.500	0.018	
20(Ref.)	Normal Voltage	27.926034	0.000	0.000	
10	Normal Voltage	27.9260345	-0.500	0.018	
0	Normal Voltage	27.9260345	-0.500	0.018	
-10	Normal Voltage	27.9260345	-0.500	0.018	
-20	Normal Voltage	27.926035	-1.000	0.036	
-30	Normal Voltage	27.926035	-1.000	0.036	
20	Maximum Voltage	27.926034	0.000	0.000	
20	Normal Voltage	27.926034	0.000	0.000	
20	Battery End Point	27.9260345	-0.500	0.018	

Note:

1. Normal Voltage =3.85 V.；Battery End Point (BEP) =3.60 V.；Maximum Voltage =4.45 V.
2. The frequency fundamental emissions stay within the operation band.

———THE END———

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

ROHDE&SCHWARZ

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD

Kalibrierzeichen *Calibration mark*	593876
	D-K-15195-01-00
	2021-04

Kalibrierschein
Calibration certificate

Gegenstand *Object*	**FS-Z60 HARMONIC MIXER 40-60GHZ**
Hersteller *Manufacturer*	**ROHDE & SCHWARZ**
Typ *Type*	**FS-Z60**
Fabrikat/Serien-Nr. *Serial number*	**100986**
Auftraggeber *Customer*	**Sporton International Inc.** **6F., Sec. 1, Hsin Tai Wu Rd., No. 106** **221 New Taipei City** **TW**
Auftragsnummer *Order No.*	**311002157**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**3 Certificate** **5 Outgoing Results** **5 Incoming Results**
Datum der Kalibrierung *Date of calibration*	**2021-04-09**

Dieser Kalibrierschein dokumentiert die Rückführung auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI).
Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European co-operation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
This calibration certificate documents the traceability to national standards, which realize the units of measurement according to the International System of Units (SI).
The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.
The user is obliged to have the object recalibrated at appropriate intervals.

Dieser Kalibrierschein darf nur vollständig und unverändert weiterverbreitet werden. Auszüge oder Änderungen bedürfen der Genehmigung des ausstellenden Kalibrierlaboratoriums. Kalibrierscheine sind bei Nennung des für die Freigabe Verantwortlichen in Klarschrift auch ohne Unterschrift gültig.
This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates with the full name of the approval responsible person are valid without signature.

Datum der Ausstellung *Date of issue*	Freigabe des Kalibrierscheins durch *Approval of the calibration certificate by*	
2021-04-09	Dr. Gerhard Rösel Leiter des Kalibrierlaboratoriums *Head of the calibration laboratory*	Johannes Negele Bearbeiter *Person in charge*

Place of Calibration

87700 Memmingen, Rohde-und-Schwarz-Str. 1

Calibration Procedure

The measuring object is an RF harmonic mixer, which converts an RF signal at one frequency into a signal at another frequency (here: IF). The conversion loss was measured using a vector network analyzer. The RF output power as well as the IF input power of the corresponding ports of the VNA were traced back to a power sensor. The conversion loss is defined as the ratio of the power at the IF frequency to the power at the RF frequency with a given LO power. (IF: Intermediate frequency; LO: Local Oscillator)

The traceability is represented in the table Working Standards used.

Calibration Method **See first page of Outgoing Results**

Statement of Compliance

Incoming: All measured values are within the data sheet specifications.

Outgoing: All measured values are within the data sheet specifications.

Working Standards used

Item	Type	Serial Number	Calibration Certificate Number	Cal. Due
Therm.Power Sensor DC-40GHz	NRP-Z55	130179	585760 D-K-15195-01-00 2021-01	2023-01-31
Thermal Power Sensor	NRP67T	100977	515392 D-K-15195-01-01 2019-07	2022-07-31
Vect. Netw. Analyzer 4PORT	ZVA67	101175	0023 D-K-15195-01-00 2021-03	2022-03-31

Measurement Uncertainty

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 %.

Environmental Conditions

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

Ancillary Functional Measurements

In addition to the calibration results, the calibration certficate 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.

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. Measurement results that are not covered by the DAkkS accreditation are marked with [1].

Ref.: ILAC G8:09/2019 'Guidelines on Decision Rules and Statements of Conformity'.

Outgoing Results

Designation:	**HARMONIC MIXER**
Type:	**FS-Z60**
Material No.:	**1048.0171.02**
Serial No.:	**100986**
Certificate No.:	**593876 D-K-15195-01-00 2021-04**
Referring to Test Documentation:	**5038.8581.01-PB-02.00**

Test Department:	**3MME3**
Name:	**Johannes Negele**
Date:	**2021-04-09**

Table of contents

Software used for measurement **3**

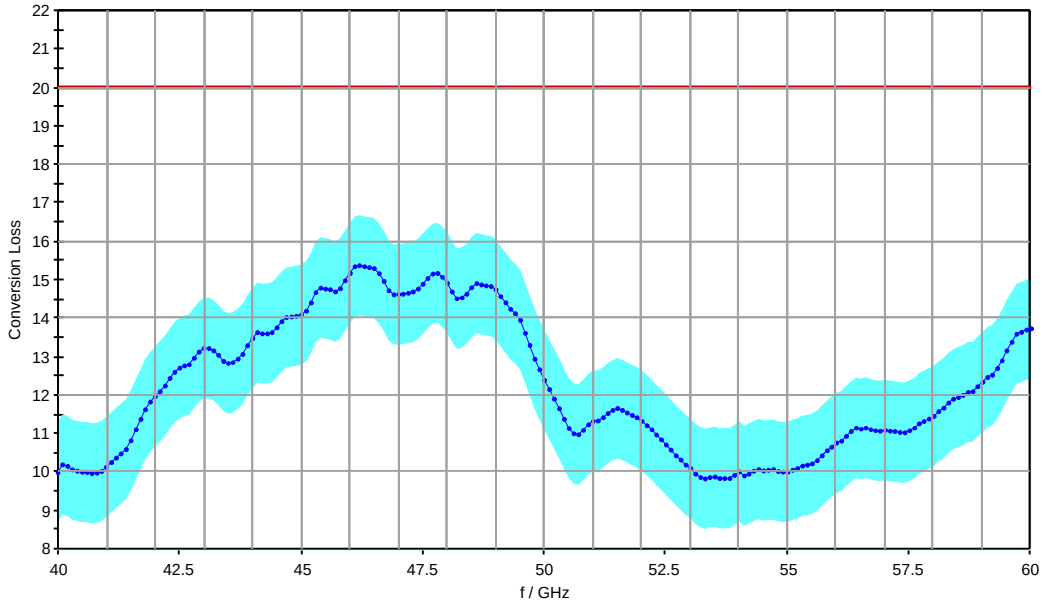
1. Conversion Loss (4. Harmonic) **4**
1.1 Conversion Loss (IF = 404.4 MHz) 4
1.2 Conversion Loss (IF = 729 MHz) 4
1.3 Conversion Loss (IF = 1330 MHz) 5
1.4 Continuity response within 1 GHz 5

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 (4. Harmonic)

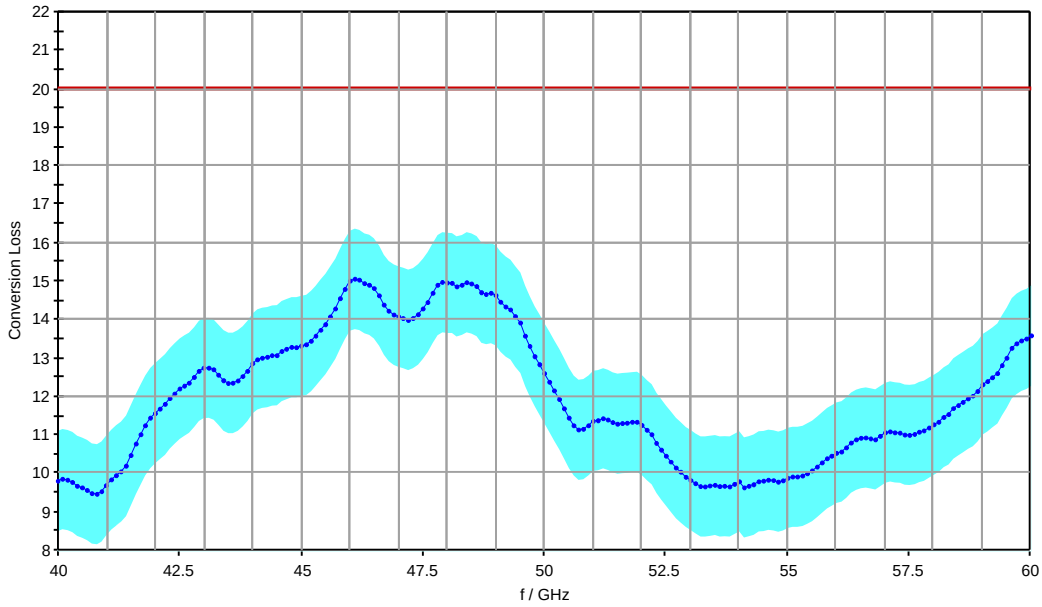
1.1 Conversion Loss (IF = 404.4 MHz)

IF = 404.4 MHz, 4. Harmonic



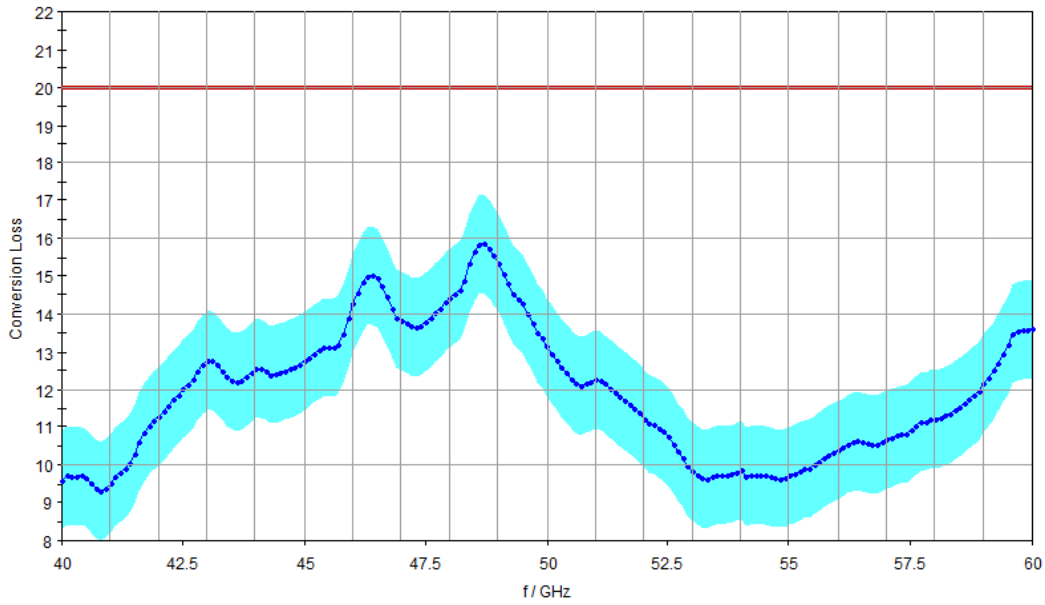
1.2 Conversion Loss (IF = 729 MHz)

IF = 729 MHz, 4. Harmonic



1.3 Conversion Loss (IF = 1330 MHz)

IF = 1330 MHz, 4. Harmonic



1.4 Continuity response within 1 GHz

Continuity response within any 1 GHz Band, 4. Harmonic

	DUL /dB	Continuity /dB
max. at IF = 404.4 MHz:	6.0	2.80
max. at IF = 729 MHz:	6.0	2.47
max. at IF = 1330 MHz:	6.0	2.22

Incoming Results

Designation:	**HARMONIC MIXER**
Type:	**FS-Z60**
Material No.:	**1048.0171.02**
Serial No.:	**100986**
Certificate No.:	**593876 D-K-15195-01-00 2021-04**
Referring to Test Documentation:	**5038.8581.01-PB-02.00**

Test Department:	**3MME3**
Name:	**Johannes Negele**
Date:	**2021-04-09**

Incoming Results

Table of contents

Software used for measurement **3**

1. Conversion Loss (4. Harmonic) **4**
1.1 Conversion Loss (IF = 404.4 MHz) 4
1.2 Conversion Loss (IF = 729 MHz) 4
1.3 Conversion Loss (IF = 1330 MHz) 5
1.4 Continuity response within 1 GHz 5

Incoming Results

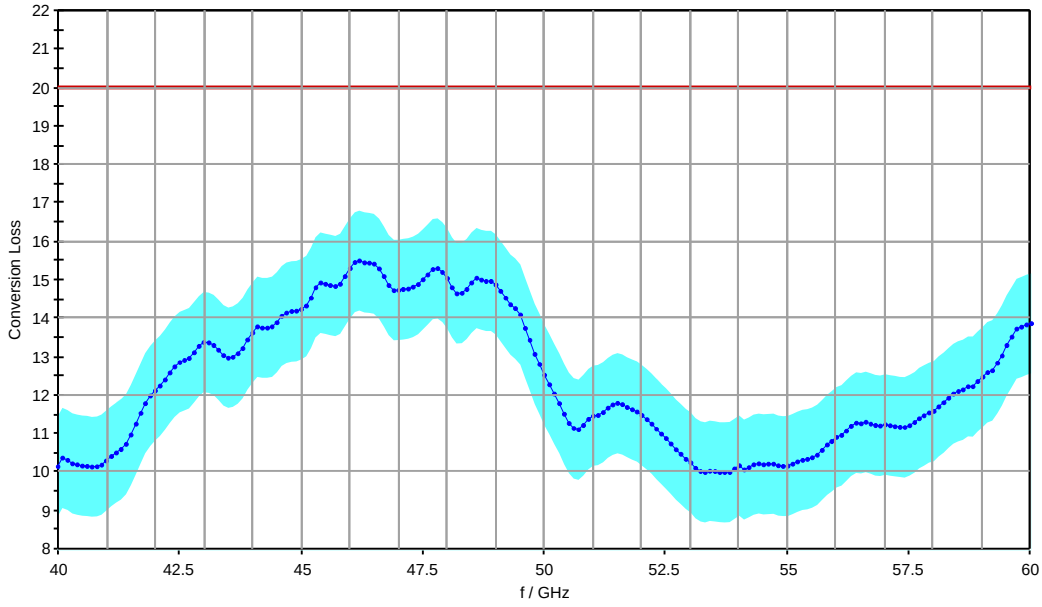
Software used for measurement			
Item	**Type**	**Version**	**Remark**
Suite	Setup	V12.10.02	Test Management Software G5
Test Program (7012.8706.00_)	Component	V01.05	

Incoming Results

1. Conversion Loss (4. Harmonic)

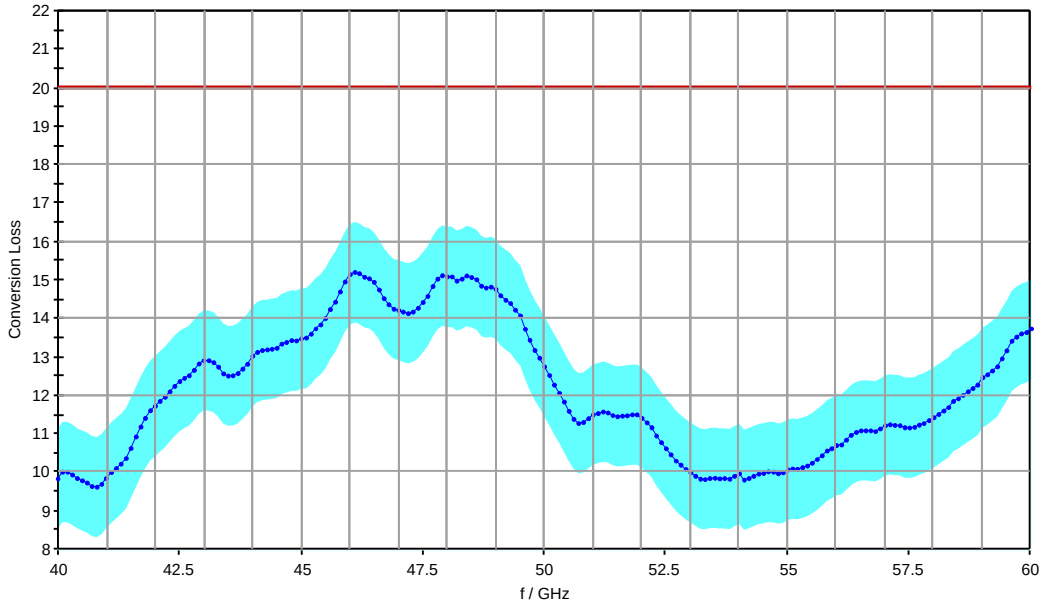
1.1 Conversion Loss (IF = 404.4 MHz)

IF = 404.4 MHz, 4. Harmonic



1.2 Conversion Loss (IF = 729 MHz)

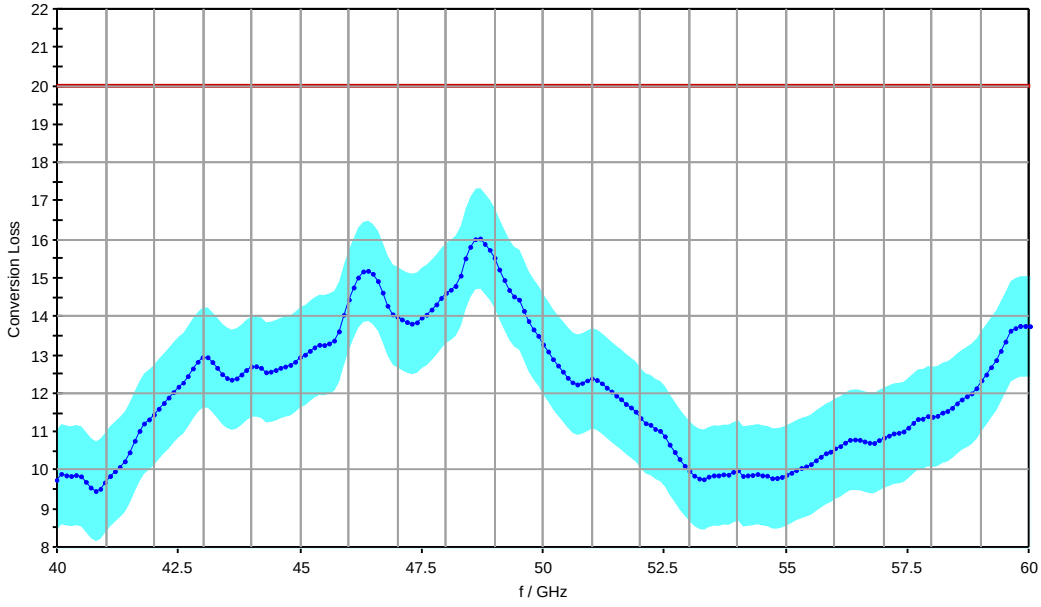
IF = 729 MHz, 4. Harmonic



Incoming Results

1.3 Conversion Loss (IF = 1330 MHz)

IF = 1330 MHz, 4. Harmonic



1.4 Continuity response within 1 GHz

Continuity response within any 1 GHz Band, 4. Harmonic

	DUL /dB	Continuity /dB
max. at IF = 404.4 MHz:	6.0	2.81
max. at IF = 729 MHz:	6.0	2.48
max. at IF = 1330 MHz:	6.0	2.24

Incoming Results

ROHDE&SCHWARZ

CALIBRATION CERTIFICATE

Kalibrierschein

Certificate Number
Zertifikatsnummer

0001A300623436

DAkkS Deutsche Akkreditierungsstelle D-K-15195-01-00

General Data

Item Gegenstand	FS-Z90 HARMONIC MIXER 60-90GHZ		
Manufacturer Hersteller	ROHDE & SCHWARZ		
Type Typ	FS-Z90		
Material Number Materialnummer	1048.0371.02	**Serial Number** Seriennummer	101811
Order Number Bestellnummer	8800012961 10, 516816.0	**Asset Number** Inventarnummer	
Customer Auftraggeber	Sporton International Inc. 6F., Sec. 1, Hsin Tai Wu Rd., No. 106 221 New Taipei City TW		

Performance

Place and Date of Calibration Ort und Datum der Kalibrierung	87700 Memmingen, Rohde-und-Schwarz-Str. 1 2021-11-16
Statement of Compliance (Incoming) Konformitätsaussage (Anlieferung)	All measured values are within the data sheet specifications.
Statement of Compliance (Outgoing) Konformitätsaussage (Auslieferung)	All measured values are within the data sheet specifications.
Customers due Interval Kalibrierintervall des Kunden	
Extent of Calibration Document Umfang des Kalibrierdokuments	3 Certificate 6 Outgoing Results 6 Incoming Results

Date of Issue Ausstellungsdatum	**Approval of the certificate by** Freigabe des Kalibrierscheins durch	
2021-11-16	Dr. Gerhard Rösel	Johannes Negele
	Laboratory management Labormanagement	**Person responsible** Bearbeiter

Calibration Mark
Kalibrierzeichen

300623436
D-K-15195-01-00
2021-11

Member of Deutscher Kalibrierdienst
Mitglied im Deutschen Kalibrierdienst

DKD

This calibration certificate documents the metrological traceability to national standards, which realize the units of measurement according to the International System of Units (SI). The DAkkS is signatory to the multilateral agreements of the European co-operation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates. The user is obliged to have the object recalibrated at appropriate intervals. This calibration certificate may not be reproduced other than in full except with the permission of the issuing laboratory. Calibration certificates with the full name of the approval responsible person are valid without signature.

Dieser Kalibrierschein dokumentiert die metrologische Rückführbarkeit auf nationale Normale zur Darstellung der Einheiten in Übereinstimmung mit dem Internationalen Einheitensystem (SI). Die DAkkS ist Unterzeichner der multilateralen Übereinkommen der European cooperation for Accreditation (EA) und der International Laboratory Accreditation Cooperation (ILAC) zur gegenseitigen Anerkennung der Kalibrierscheine.
Für die Einhaltung einer angemessenen Frist zur Wiederholung der Kalibrierung ist der Benutzer verantwortlich.
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ROHDE&SCHWARZ

Material No	1048.0371.02	**Serial No**	101811	**Certificate Number**	**0001A300623436**
Page	2/3				

Calibration Procedure
The measuring object is an RF harmonic mixer, which converts an RF signal at one frequency into a signal at another frequency (here: IF). The conversion loss was measured using a vector network analyzer. The RF output power as well as the IF input power of the corresponding ports of the VNA were traced back to a power sensor. The conversion loss is defined as the ratio of the power at the IF frequency to the power at the RF frequency with a given LO power. (IF: Intermediate frequency; LO: Local Oscillator) The traceability is represented in the table Working Standards used.

Working Standards used

Item	Type	Serial Number	Calibration Certificate Number	Cal. Due
Therm.Power Sensor DC-44GHz	NRP-Z55	140170	0023 D-K-15195-01-00 2020-12	2022-02-28
Thermal Waveguide Power Sensor	NRP90TWG	910001	0001A300621305	2022-10-31
Vector Network Analyzer 4 Port	ZVA67	101175	0023 D-K-15195-01-00 2021-03	2022-03-31

Remarks

ROHDE&SCHWARZ

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

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 [1].
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**