ROHDE&SCHWARZ

akkreditiert durch die / *accredited by the*

Deutsche Akkreditierungsstelle GmbH

als Kalibrierlaboratorium im / *as calibration laboratory in the*

Deutschen Kalibrierdienst

DKD

557633
D-K-15195-01-00
2020-08

Kalibrierschein
Calibration certificate

Kalibrierzeichen
Calibration mark

Gegenstand *Object*	**FS-Z60 HARMONIC MIXER 40-60GHZ**
Hersteller *Manufacturer*	**ROHDE & SCHWARZ**
Typ *Type*	**FS-Z60**
Fabrikat/Serien-Nr. *Serial number*	**100996**
Auftraggeber *Customer*	**RISE Research Institutes of Sweden AB** **Brinellgatan 4** **504 62 Borås** **SE**
Auftragsnummer *Order No.*	**4942000501 10,**
Anzahl der Seiten des Kalibrierscheines *Number of pages of the certificate*	**3 Certificate** **5 Outgoing Results**
Datum der Kalibrierung *Date of calibration*	**2020-08-21**

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.

Datum der Ausstellung
Date of issue

2020-08-24

Freigabe des Kalibrierscheins durch
Approval of the calibration certificate by

Dr. Gerhard Rösel
Leiter des Kalibrierlaboratoriums
Head of the calibration laboratory

Daniel Bevc
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 **1048.1184.35-01.00**

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
PNA Network Analyzer 67GHz	E8361A	US43140705	0044 D-K-15195-01-01 2019-12	2022-12-31
Spectrum Analyzer 20Hz...67GHz	FSU67	100059	495728 D-K-15195-01-01 2019-02	2021-02-28
Standardfrequency unit 1X1	SYSTEM2000	808	100029 D-K-15195-01-01 2020-06	2023-06-30
WR-15 Verification Kit	V11645A	3014A00219	967604-1612217-1 A2LA	2021-03-31
Bolometer 33 - 50 GHz	45772H	048	222 3560 PTB 17	2020-12-31
Bolometer 50 - 75 GHz	45774H	050	222 3782 PTB 19	2022-05-31

Remarks

The instrument was not adjusted, therefore only outgoing results are available.

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

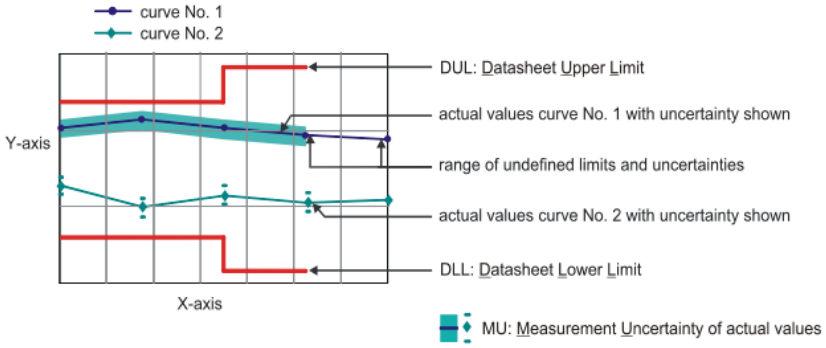
Designation:	**HARMONIC MIXER**
Type:	**FS-Z60**
Material No.:	**1048.0171.02**
Serial No.:	**100996**
Certificate No.:	**557633 D-K-15195-01-00 2020-08**
Referring to Test Documentation:	**Mixer FS-Z60 Calibration DescriptionV01.01/ 13.05.2020**

Test Department:	**3MES4**
Name:	**See certificate**
Date:	**2020-08-21**

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.
FL or FT	Factory 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



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1. FS-Z60

1.1 IF

IF-Frequency	1330 MHz

1.2 Harmonic

Number of harmonic	4

1.3 LO-Level

Mixer LO-Level	14.0 dBm

1.4 Conversion Loss

Frequency /GHz	DUL /dB	Conversion loss /dB	Expanded uncertainty of measurement /dB
40.00	20.0	10.96	2.0
40.40	20.0	11.11	2.0
40.80	20.0	11.37	2.0
41.20	20.0	11.58	2.0
41.60	20.0	11.93	2.0
42.00	20.0	12.18	2.0
42.40	20.0	12.58	2.0
42.80	20.0	12.99	2.0
43.20	20.0	12.86	2.0
43.60	20.0	13.56	2.0
44.00	20.0	13.60	2.0
44.40	20.0	13.34	2.0
44.80	20.0	13.73	2.0
45.20	20.0	13.83	2.0
45.60	20.0	14.08	2.0
46.00	20.0	14.45	2.0
46.40	20.0	14.46	2.0
46.80	20.0	14.36	2.0
47.20	20.0	14.17	2.0
47.60	20.0	14.31	2.0
48.00	20.0	14.98	2.0
48.40	20.0	15.67	2.0
48.80	20.0	15.99	2.0
49.20	20.0	14.98	2.0
49.60	20.0	13.93	2.0
50.00	20.0	13.87	2.0
50.40	20.0	14.07	2.0
50.80	20.0	13.69	2.0
51.20	20.0	13.02	2.0
51.60	20.0	12.30	2.0
52.00	20.0	11.65	2.0
52.40	20.0	10.98	2.0
52.80	20.0	10.67	2.0
53.20	20.0	10.82	2.0
53.60	20.0	11.12	2.0
54.00	20.0	11.34	2.0
54.40	20.0	11.29	2.0
54.80	20.0	11.17	2.0
55.20	20.0	11.23	2.0
55.60	20.0	11.13	2.0
56.00	20.0	11.64	2.0
56.40	20.0	11.64	2.0
56.80	20.0	11.48	2.0
57.20	20.0	11.53	2.0
57.60	20.0	11.52	2.0
58.00	20.0	11.94	2.0
58.40	20.0	12.06	2.0
58.80	20.0	12.51	2.0
59.20	20.0	12.89	2.0
59.60	20.0	12.82	2.0
60.00	20.0	12.98	2.0