

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 47-20 Date when calibrated 02.11.2020 Page 1 of 2

Item calibrated Antenna RCH010 (SAX 092)

Customer DEKRA Testing and Certification Co., Ltd
No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan

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. Conversion loss 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 02.11.2020

Calibration Certificate

Certificate number **47-20**

Page 2 of 2

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 546	Reference power meter	163	24 March 2022	1/111-174-20	RF Power
M 534	Reference power meter	161	24 March 2022	1/111-173-20	RF Power
RG4-14	Signal generator	22	12 October 2021	22-20	RF Power
G4-186	Signal generator	5	12 October 2021	21-20	RF Power
V7-34	Universal voltmeter	0067787	23 September 2021	2742-42	DC Voltage
RCH3-72	Frequency meter	931200	18 September 2021	2822-43	Frequency
P6-31A	Measuring horn antenna	35864	23 September 2021	2368-43	Gain

Calibration conditions

Temperature: 22.0 °C.
Humidity: 42.0 %.
Pressure: 100.3 kPa.

Calibration results are given in the measurement report # 47-20

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	75 – 110 GHz	Corresponds
2	Antenna Gain	21* dBi	Corresponds (Table 1)
3	Antenna Factor	49 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

November 02, 2020

MEASUREMENT REPORT # 47-20

November 02, 2020

Customer:	DEKRA Testing and Certification Co., Ltd No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan
Item calibrated:	Antenna RCH010 (SAX 092)
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09.10.2020
Date of calibration:	From 09.10.2020 to 02.11.2020

MEASUREMENT CONDITIONS

Temperature: 22.0 °C	Humidity: 42 %	Pressure: 100.3 kPa
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MEASUREMENT EQUIPMENT

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 546	Reference power meter	163	24 March 2022	1/111-174-20	RF Power
M 534	Reference power meter	161	24 March 2022	1/111-173-20	RF Power
RG4-14	Signal generator	22	12 October 2021	22-20	RF Power
G4-186	Signal generator	5	12 October 2021	21-20	RF Power
V7-34	Universal voltmeter	0067787	23 September 2021	2742-42	DC Voltage
RCH3-72	Frequency meter	931200	18 September 2021	2822-43	Frequency
P6-31A	Measuring horn antenna	35864	23 September 2021	2368-43	Gain

MEASUREMENT RESULTS

Distance between tested and generating antenna 1.0 m.

Table 1

Frequency, GHz	75	78	81	95	110
Power density of electromagnetic field, W/m ²	0.125	0.132	0.140	0.187	0.239
Maximum level of measured power, dBm	-18.2	-18.2	-18.0	-17.5	-17.5
Gain, dBi	19.8	19.9	20.1	20.8	21.0
Expanded uncertainty, dB	2.0	2.0	2.0	2.0	2.0
Antenna Factor, dB/m	47.9	48.2	48.3	49.0	50.1

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

Engineer



This measurement report issued in duplicate and sent to:

1. DEKRA Testing and Certification Co., Ltd No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan
2. Calibration Laboratory of Microwave Measuring Equipment

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

Calibration Laboratory of Microwave Measuring Equipment
of MWMLab



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Accreditation certificate No. № BY/112 5.0065 of 09.01.2015

Certificate number 49-20 Date when calibrated 02.11.2020 Page 1 of 2

Item calibrated Spectrum Analyzer Extension Module SAX 091
US53250004 (power supply # 1604)

Customer DEKRA Testing and Certification Co., Ltd
No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan

Method of calibration GOST 20271.1, MK KL 8.2-16

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/ Technical manager Date of issue 02.11.2020

Calibration Certificate

Certificate number **49-20**

Page 2 of 2

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 523	Reference power meter	162	24 March 2022	1/111-172-20	RF Power
M 534	Reference power meter	161	24 March 2022	1/111-173-20	RF Power
RG4-14	Signal generator	22	12 October 2021	22-20	RF Power
G4-161m	Signal generator	282	12 October 2021	23-20	RF Power
V7-34	Universal voltmeter	0067787	23 September 2021	2742-42	DC Voltage
RCH3-72	Frequency meter	931200	18 September 2021	2822-43	Frequency
MG3694C	Signal generator	133805	11 September 2021	2726-43	RF Power Frequency
E4407B	Spectrum analyzer	MY45110807	14 September 2021	2734-43	RF Power Frequency

Calibration conditions

Temperature: 22.0 °C.
Humidity: 42.0 %.
Pressure: 100.3 kPa.

Calibration results are given in the measurement report # 49-20

#	Parameter	Specifications required	Specifications tested and measured
1	RF Frequency Band	90 – 140 GHz	Corresponds
2	Multiplication Factor (Low / High)	12 / 6	Corresponds
3	Low Freq. LO Input Power (Typical / Damage)	10 dBm ± 3dB / 20 dBm	Corresponds
4	High Freq. LO Input Power (Typical / Damage)	0 dBm ± 3dB / 6 dBm	Corresponds
5	RF Power Limits: Compression / Damage	-10 / 0 dBm	Corresponds
6	Conversion loss RF to IF output (configuration "B")	-4.0 – -7.0* dB	Corresponds (Table 1)
7	IF Output Standard Frequency Range	16 kHz – 2.5 GHz	Corresponds

* – Expanded uncertainty of measurements 1.8 dB (IF Frequency 400 MHz).

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
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No. BY/112 5.0065

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220013, Belarus

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Technical Manager

November 02, 2020

MEASUREMENT REPORT # 49-20

November 02, 2020

Customer:	DEKRA Testing and Certification Co., Ltd No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan
Item calibrated:	Spectrum Analyzer Extension Module SAX 091 # US53250004 (power supply # 1604)
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09.10.2020
Date of calibration:	From 09.10.2020 to 02.11.2020

MEASUREMENT CONDITIONS

Temperature: 22.0 °C	Humidity: 42 %	Pressure: 100.3 kPa
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MEASUREMENT EQUIPMENT

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 523	Reference power meter	162	24 March 2022	1/111-172-20	RF Power
M 534	Reference power meter	161	24 March 2022	1/111-173-20	RF Power
RG4-14	Signal generator	22	12 October 2021	22-20	RF Power
G4-161m	Signal generator	282	12 October 2021	23-20	RF Power
V7-34	Universal voltmeter	0067787	23 September 2021	2742-42	DC Voltage
RCH3-72	Frequency meter	931200	18 September 2021	2822-43	Frequency
MG3694C	Signal generator	133805	11 September 2021	2726-43	RF Power Frequency
E4407B	Spectrum analyzer	MY45110807	14 September 2021	2734-43	RF Power Frequency

MEASUREMENT RESULTS

SSB conversion loss RF to IF port for an LO input power of 10 dBm in Standard LO Frequency operation. IF power measured from "IF Output" port with IF frequency fixed at 400 MHz.

Table 1

RF frequency, GHz	90	120	140
RF input power, dBm	-15.0	-15.0	-15.0
LO frequency, MHz	7 467	9 967	11 633
LO input power, dBm	10.0	10.0	10.0
IF frequency, MHz	400.0		
IF measured level, dBm	-10.74	-10.06	-10.45
Conversion loss, dB	-4.3	-4.9	-4.5
Expanded uncertainty, dB	1.5	1.8	1.8

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

Engineer



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Accreditation certificate No. № BY/112 5.0065 of 09.01.2015

Certificate number 50-20 Date when calibrated 02.11.2020 Page 1 of 2

Item calibrated Antenna RCH06 (SAX 091)

Customer DEKRA Testing and Certification Co., Ltd
No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451, Taiwan

Method of calibration GOST 20271.1, MK KL 8.2-16

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/ Technical manager **Date of issue 02.11.2020**

Calibration Certificate

Certificate number **50-20**

Page 2 of 2

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 523	Reference power meter	162	24 March 2022	1/111-172-20	RF Power
M 534	Reference power meter	161	24 March 2022	1/111-173-20	RF Power
RG4-14	Signal generator	22	12 October 2021	22-20	RF Power
G4-161m	Signal generator	282	12 October 2021	23-20	RF Power
V7-34	Universal voltmeter	0067787	23 September 2021	2742-42	DC Voltage
RCH3-72	Frequency meter	931200	18 September 2021	2822-43	Frequency
P6-31A	Measuring horn antenna	35864	23 September 2021	2368-43	Gain
P6-32	Measuring horn antenna	115671	23 September 2021	2369-43	Gain

Calibration conditions

Temperature: 22.0 °C.
Humidity: 42.0 %.
Pressure: 100.3 kPa.

Calibration results are given in the measurement report # 50-20

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	90 – 140 GHz	Corresponds
2	Antenna Gain	21* dBi	Corresponds (Table 1)
3	Antenna Factor	51 dB/m	Corresponds (Table 1)

* – Expanded uncertainty of measurements 2.2 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