



## Calibration certificate

ISO 17025  
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 02.5.0.0065 of 09.01.2015

Certificate number 93-17 Date when calibrated 10/17/2017 Page 1 of 2

**Item**

**calibrated**

Standard gain horn antenna M05RH

Description of measurement standard / measuring instrument / identification

**Customer**

Bureau Veritas Group Consumer Products Services Division, Taiwan  
Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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 Ukraine. 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 10/17/2017

# Calibration Certificate

Certificate number **93-17**

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 523
2. Wattmeter M 514
3. Signal generator RG4-14
4. Voltmeter V7-34
5. Frequency meter RCH3-72
6. Frequency multiplier
7. Horn antenna P6-32

Calibration conditions

Temperature 22.2 °C  
Humidity 44.2 %  
Pressure 99.7 kPa

**Calibration results are given in the Measuring report # 92-17.**

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	140 – 220 GHz	Corresponds
2	Waveguide Interface	WR-05	Corresponds
3	Gain	24.3 dBi	Corresponds (Table 1)
4	Antenna Factor	51.0 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

October 17, 2017

**MEASURING REPORT # 93-17**

October 17, 2017

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Standard gain horn antenna M05RH
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09/18/2017
Date of calibration:	From 09/18/2017 to 10/17/2017

## MEASURING CONDITIONS

Temperature: 22.2 °C	Humidity: 44.2 %	Pressure: 99.7 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

## MEASURING RESULTS

Distance between tested and generating antenna 0.5 m.

Table 1

Frequency, GHz	140	180	220
Input power, mW	4.0	2.0	2.0
Power density of electromagnetic field, W/m <sup>2</sup>	3.6	2.9	4.2
Maximum level of measured power, μW	106	56	59
Gain, dB	23.5	23.9	24.2
Antenna factor, dB/m	49.6	51.5	52.9
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. Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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 94-17 Date when calibrated 10/17/2017 Page 1 of 2

**Item**

**calibrated** Mixer M05HWD # 110215-1 + Standard gain horn antenna M05RH  
Description of measurement standard / measuring instrument / identification

**Customer**

Bureau Veritas Group Consumer Products Services Division, Taiwan  
Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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

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**Authorising  
signature**



M. Svirid/ Technical manager Date of issue 10/17/2017  
Name and position

# Calibration Certificate

Certificate number **94-17**

Page **2** of **2**

Calibration is performed by using

1. Wattmeter M 523
2. Wattmeter M 514
3. Spectrum analyzer E4407B
4. Signal generator RG4-14
5. Voltmeter V7-34
6. Frequency meter RCH3-72
7. Diplexer DPL26
8. Frequency multiplier
9. Horn antenna P6-32

Calibration conditions

Temperature 22.2 °C

Humidity 44.2 %

Pressure 99.7 kPa

**Calibration results are given in the Measuring report # 94-17.**

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	140 – 220 GHz	Corresponds
2	Waveguide Interface	WR-05	Corresponds
3	LO Input	+12 – +17 dBm	Corresponds
4	IF Frequency Range	321 – 2400 MHz	Corresponds
5	Mixer Bias	+5.75 mA	Corresponds
6	Conversion Loss	< 59 dB	Corresponds (Table 1)
7	System LO/IF Interface	SMA (f)	Corresponds

**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  
October 17, 2017

**MEASURING REPORT # 94-17**

October 17, 2017

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Mixer M05HWD # 110215-1 + standard gain horn antenna M05RH
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09/18/2017
Date of calibration:	From 09/18/2017 to 10/17/2017

## MEASURING CONDITIONS

Temperature: 22.2 °C	Humidity: 44.2 %	Pressure: 99.7 kPa
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## MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Wattmeter M 514	165
3	Spectrum analyzer E4407B	MY45110807
4	Signal generator RG4-14	4
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Diplexer DPL26	01
8	Frequency multiplier	02
9	Horn antenna P6-32	115671

## MEASURING RESULTS

IF Frequency 321.4 MHz  $\pm$  5 MHz;

Mixer Bias +5.75 mA;

LO Input Power 14.5 to 16 dBm (2.9 to 7.1 GHz).

LO Insertion Loss of Diplexer 0.7 dB.

Distance between tested and generating antenna 0.5 m.

Table 1

Frequency, GHz	140	180	220
Input RF power, mW	0.36	0.34	0.33
Power density of electromagnetic field, W/m <sup>2</sup>	0.117	0.179	0.249
Measured Level, dBm	-69.96	-69.15	-74.46
Power received by antenna, dBm	-20.2	-20.2	-20.2
<b>Conversion Loss, dB</b>	49.8	49.0	54.3
Expanded uncertainty, dB	2.8	3.1	3.3

Engineer  M. Kasperovich

Quality Manager  A. Kostrikin

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1. Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1,  
Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.

2. Calibration Laboratory of Microwave Measuring Equipment

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## Calibration certificate

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ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 02.5.0.0065 of 09.01.2015

Certificate number 98-17 Date when calibrated 10/17/2017 Page 1 of 2

**Item**

**calibrated** Mixer M06HWD # 110215-1

Description of measurement standard / measuring instrument / identification

**Customer**

Bureau Veritas Group Consumer Products Services Division, Taiwan  
Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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

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**Authorising  
signature**



M. Svirid/ Technical manager  
Name and position

**Date of issue 10/17/2017**

# Calibration Certificate

Certificate number **98-17**

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 523
2. Spectrum analyzer E4407B
3. Signal generator G4-186
4. Frequency multiplier
5. Voltmeter V7-34
6. Frequency meter RCH3-72
7. Diplexer DPL26
8. Attenuator AP-19

Calibration conditions

Temperature 21.8 °C  
Humidity 41.4 %  
Pressure 99.1 kPa

Calibration results are given in the Measuring report # 98-17.

#	Parameter	Specifications required	Specifications tested and measured
1	System Operating Frequency	110 – 170 GHz	Corresponds
2	LO Input	+12 – +17 dBm	Corresponds
3	IF Frequency Range	321 – 2400 MHz	Corresponds
4	Mixer Bias	+3.25 mA	Corresponds
5	System Waveguide Interface	WR-06	Corresponds
6	Conversion Loss	< 52 dB	Corresponds (Table 1)
7	System LO/IF Interface	SMA (f)	Corresponds
8	Typical RF Power to Avoid Compression	-20 dBm (10 $\mu$ W)	Corresponds

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

October 17, 2017

**MEASURING REPORT # 98-17**

October 17, 2017

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Mixer M06HWD # 110215-1
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09/18/2017
Date of calibration:	From 09/18/2017 to 10/17/2017

## MEASURING CONDITIONS

Temperature: 21.8 °C	Humidity: 41.4 %	Pressure: 99.1 kPa
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## MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Spectrum analyzer E4407B	MY45110807
3	Signal generator G4-186	5
4	Frequency multiplier	01
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Diplexer DPL26	01
8	Attenuator AP-19	04

## MEASURING RESULTS

IF Frequency 321.4 MHz  $\pm$  5 MHz.

Mixer Bias +3.25 mA.

LO Input Power 14.5 to 16 dBm (2.9 to 7.1 GHz).

LO Insertion Loss of Diplexer 0.7 dB.


Table 1

Frequency, GHz	110	140	170
Input RF Power, dBm	-20.0	-20.0	-20.0
Measured Value, dBm	-65.9	-65.0	-67.8
<b>Conversion Loss, dB</b>	<b>45.9</b>	<b>45.0</b>	<b>47.8</b>
Expanded uncertainty, dB	3.4	3.4	3.5

Engineer

 M. Kasperovich

Quality Manager

 A. Kostrikin

This Measuring report issued in duplicate and sent to:

1. Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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 99-17 Date when calibrated 10/17/2017 Page 1 of 2

### Item

calibrated **Standard gain horn antenna M06RH**

Description of measurement standard / measuring instrument / identification

### Customer

Bureau Veritas Group Consumer Products Services Division, Taiwan  
Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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

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Authorising  
signature



M. Svirid/ Technical manager

Name and position

Date of issue 10/17/2017

# Calibration Certificate

Certificate number **99-17**

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 523
2. Signal generator G4-186
3. Frequency multiplier
4. Voltmeter V7-34
5. Frequency meter RCH3-72
6. Horn antenna P6-32
7. Horn antenna P6-31A

Calibration conditions

Temperature 21.8 °C  
Humidity 41.4 %  
Pressure 99.1 kPa

**Calibration results are given in the Measuring report # 99-17.**

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	110 – 170 GHz	Corresponds
2	Waveguide Interface	WR-06	Corresponds
3	Gain	24.1 dBi	Corresponds (Table 1)
4	Antenna Factor	49.1 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

October 17, 2017

**MEASURING REPORT # 99-17**

October 17, 2017

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Standard gain horn antenna M06RH
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09/18/2017
Date of calibration:	From 09/18/2017 to 10/17/2017

## MEASURING CONDITIONS

Temperature: 21.8 °C	Humidity: 41.4 %	Pressure: 99.1 kPa
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## MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Signal generator G4-186	5
3	Frequency multiplier	01
4	Voltmeter V7-34	0067787
5	Frequency meter RCH3-72	931200
6	Horn antenna P6-32	115671
7	Horn antenna P6-31A	35864


## MEASURING RESULTS

Distance between tested and generating antenna 0.50 m.

Table 1

Frequency, GHz	110	140	170
Input power, mW	5.0	5.0	5.0
Power density of electromagnetic field, W/m <sup>2</sup>	1.0	1.6	2.4
Maximum level of measured power, μW	138	141	154
<b>Gain, dB</b>	<b>23.6</b>	<b>23.8</b>	<b>24.1</b>
Antenna factor, dB/m	47.4	49.4	50.8
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. Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1,  
Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.

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## Calibration certificate

ISO 17025  
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Accreditation certificate No. № BY/112 02.5.0.0065 of 09.01.2015

Certificate number 100-17 Date when calibrated 10/17/2017 Page 1 of 2

### Item

calibrated Mixer M06HWD # 110215-1 + Standard gain horn antenna M06RH

Description of measurement standard / measuring instrument / identification

### Customer

Bureau Veritas Group Consumer Products Services Division, Taiwan  
Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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

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Authorising  
signature



M. Svirid/ Technical manager  
Name and position

Date of issue 10/17/2017

# Calibration Certificate

Certificate number **100-17**

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 523
2. Spectrum analyzer E4407B
3. Signal generator G4-186
4. Frequency multiplier
5. Voltmeter V7-34
6. Frequency meter RCH3-72
7. Diplexer DPL26
8. Horn antenna P6-32
9. Horn antenna P6-31A

Calibration conditions

Temperature 21.8 °C  
Humidity 41.4 %  
Pressure 99.1 kPa

**Calibration results are given in the Measuring report # 100-17.**

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	110 – 170 GHz	Corresponds
2	Waveguide Interface	WR-06	Corresponds
3	LO Input	+12 – +17 dBm	Corresponds
4	IF Frequency Range	321 – 2400 MHz	Corresponds
5	Mixer Bias	+3.25 mA	Corresponds
6	Conversion Loss	< 52 dB	Corresponds (Table 1)
7	System LO/IF Interface	SMA (f)	Corresponds

**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  
October 17, 2017

**MEASURING REPORT # 100-17**  
October 17, 2017

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Mixer M06HWD # 110215-1 + standard gain horn antenna M06RH
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09/18/2017
Date of calibration:	From 09/18/2017 to 10/17/2017

## MEASURING CONDITIONS

Temperature: 21.8 °C	Humidity: 41.4 %	Pressure: 99.1 kPa
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## MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Spectrum analyzer E4407B	MY45110807
3	Signal generator G4-186	5
4	Frequency multiplier	01
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Diplexer DPL26	01
8	Horn antenna P6-32	115671
9	Horn antenna P6-31A	35864

## MEASURING RESULTS

IF Frequency 321.4 MHz  $\pm$  5 MHz.

Mixer Bias +3.25 mA.

LO Input Power 14.5 to 16 dBm (2.9 to 7.1 GHz).

LO Insertion Loss of Diplexer 0.7 dB.

Distance between tested and generating antenna 0.5 m.

Table 1

Frequency, GHz	110	140	170
Input RF power, mW	0.40	0.37	0.30
Power density of electromagnetic field, W/m <sup>2</sup>	0.081	0.119	0.141
Measured Level, dB	-65.8	-64.6	-68.0
Power received by antenna, dB	-19.6	-19.8	-20.5
Conversion Loss, dB	46.2	44.8	47.75
Expanded uncertainty, dB	3.1	3.1	3.2

Engineer

M. Kasperovich

Quality Manager

A. Kostrikin

This Measuring report issued in duplicate and sent to:

1. Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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 Laboratory of Microwave Measuring Equipment  
of MWM lab



Calibration certificate

ISO 17025  
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 02.5.0.0065 of 09.01.2015

Certificate number 92-17 Date when calibrated 10/17/2017 Page 1 of 2

Item

calibrated

Mixer M05HWD # 110215-1

Description of measurement standard / measuring instrument / identification

Customer

Bureau Veritas Group Consumer Products Services Division, Taiwan  
Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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

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Authorising  
signature



M. Svirid/ Technical manager  
Name and position

Date of issue 10/17/2017

# Calibration Certificate

Certificate number **92-17**

Page **2** of **2**

Calibration is performed by using

1. Wattmeter M 523
2. Wattmeter M 514
3. Spectrum analyzer E4407B
4. Signal generator RG4-14
5. Voltmeter V7-34
6. Frequency meter RCH3-72
7. Diplexer DPL26
8. Frequency multiplier
9. Attenuator AP-19
10. Attenuator AP-18

Calibration conditions

Temperature 22.2 °C  
Humidity 44.2 %  
Pressure 99.7 kPa

**Calibration results are given in the Measuring report # 92-17.**

#	Parameter	Specifications required	Specifications tested and measured
1	System Operating Frequency	140 – 220 GHz	Corresponds
2	LO Input	+12 – +17 dBm	Corresponds
3	IF Frequency Range	321 – 2400 MHz	Corresponds
4	Mixer Bias	+5.75 mA	Corresponds
5	System Waveguide Interface	WR-05	Corresponds
6	Conversion Loss	59 dB	Corresponds (Table 1)
7	System LO/IF Interface	SMA (f)	Corresponds
8	Typical RF Power to Avoid Compression	-20 dBm (10 µW)	Corresponds

**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

**MEASURING REPORT # 92-17**

October 17, 2017

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Mixer M05HWD # 110215-1
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09/18/2017
Date of calibration:	From 09/18/2017 to 10/17/2017

## MEASURING CONDITIONS

Temperature: 22.2 °C	Humidity: 44.2 %	Pressure: 99.7 kPa
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## MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Wattmeter M 514	165
3	Spectrum analyzer E4407B	MY45110807
4	Signal generator RG4-14	4
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Diplexer DPL26	01
8	Frequency multiplier	02
9	Attenuator AP-19	04
10	Attenuator AP-18	03


## MEASURING RESULTS

IF Frequency 321.4 MHz  $\pm$  5 MHz;  
 Mixer Bias +5.75 mA;  
 LO Input Power 14.5 to 16 dBm (2.9 to 7.1 GHz).  
 LO Insertion Loss of Diplexer 0.7 dB.

Table 1

Frequency, GHz	140	180	220
Input RF Power, dBm	-20.0	-20.0	-20.0
Measured Value, dBm	-69.6	-69.2	-73.9
<b>Conversion Loss, dB</b>	<b>49.6</b>	<b>49.2</b>	<b>53.9</b>
Expanded uncertainty, dB	3.1	2.9	3.1

Engineer

 M. Kasperovich

Quality Manager

 A. Kostrikin

This Measuring report issued in duplicate and sent to:

1. Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1,  
 Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.

2. Calibration Laboratory of Microwave Measuring Equipment

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## Calibration certificate

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Accreditation certificate No. № BY/112 02.5.0.0065 of 09.01.2015

Certificate number 93-17 Date when calibrated 10/17/2017 Page 1 of 2

**Item**

**calibrated**

Standard gain horn antenna M05RH

Description of measurement standard / measuring instrument / identification

**Customer**

Bureau Veritas Group Consumer Products Services Division, Taiwan  
Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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 Ukraine. 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 10/17/2017**

# Calibration Certificate

Certificate number **93-17**

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 523
2. Wattmeter M 514
3. Signal generator RG4-14
4. Voltmeter V7-34
5. Frequency meter RCH3-72
6. Frequency multiplier
7. Horn antenna P6-32

Calibration conditions

Temperature 22.2 °C  
Humidity 44.2 %  
Pressure 99.7 kPa

**Calibration results are given in the Measuring report # 92-17.**

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	140 – 220 GHz	Corresponds
2	Waveguide Interface	WR-05	Corresponds
3	Gain	24.3 dBi	Corresponds (Table 1)
4	Antenna Factor	51.0 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  
October 17, 2017

**MEASURING REPORT # 93-17**

October 17, 2017

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Standard gain horn antenna M05RH
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09/18/2017
Date of calibration:	From 09/18/2017 to 10/17/2017

## MEASURING CONDITIONS

Temperature: 22.2 °C	Humidity: 44.2 %	Pressure: 99.7 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

## MEASURING RESULTS

Distance between tested and generating antenna 0.5 m.

Table 1

Frequency, GHz	140	180	220
Input power, mW	4.0	2.0	2.0
Power density of electromagnetic field, W/m <sup>2</sup>	3.6	2.9	4.2
Maximum level of measured power, $\mu$ W	106	56	59
Gain, dB	23.5	23.9	24.2
Antenna factor, dB/m	49.6	51.5	52.9
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. Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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 94-17 Date when calibrated 10/17/2017 Page 1 of 2

**Item**

**calibrated** Mixer M05HWD # 110215-1 + Standard gain horn antenna M05RH  
Description of measurement standard / measuring instrument / identification

**Customer**

Bureau Veritas Group Consumer Products Services Division, Taiwan  
Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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 Ukraine. 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 Date of issue 10/17/2017  
Name and position

# Calibration Certificate

Certificate number **94-17**

Page **2** of **2**

Calibration is performed by using

1. Wattmeter M 523
2. Wattmeter M 514
3. Spectrum analyzer E4407B
4. Signal generator RG4-14
5. Voltmeter V7-34
6. Frequency meter RCH3-72
7. Diplexer DPL26
8. Frequency multiplier
9. Horn antenna P6-32

Calibration conditions

Temperature 22.2 °C

Humidity 44.2 %

Pressure 99.7 kPa

**Calibration results are given in the Measuring report # 94-17.**

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	140 – 220 GHz	Corresponds
2	Waveguide Interface	WR-05	Corresponds
3	LO Input	+12 – +17 dBm	Corresponds
4	IF Frequency Range	321 – 2400 MHz	Corresponds
5	Mixer Bias	+5.75 mA	Corresponds
6	Conversion Loss	< 59 dB	Corresponds (Table 1)
7	System LO/IF Interface	SMA (f)	Corresponds

**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  
October 17, 2017

**MEASURING REPORT # 94-17**

October 17, 2017

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Mixer M05HWD # 110215-1 + standard gain horn antenna M05RH
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09/18/2017
Date of calibration:	From 09/18/2017 to 10/17/2017

## MEASURING CONDITIONS

Temperature: 22.2 °C	Humidity: 44.2 %	Pressure: 99.7 kPa
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## MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Wattmeter M 514	165
3	Spectrum analyzer E4407B	MY45110807
4	Signal generator RG4-14	4
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Diplexer DPL26	01
8	Frequency multiplier	02
9	Horn antenna P6-32	115671

## MEASURING RESULTS

IF Frequency 321.4 MHz  $\pm$  5 MHz;

Mixer Bias +5.75 mA;

LO Input Power 14.5 to 16 dBm (2.9 to 7.1 GHz).

LO Insertion Loss of Diplexer 0.7 dB.

Distance between tested and generating antenna 0.5 m.

Table 1

Frequency, GHz	140	180	220
Input RF power, mW	0.36	0.34	0.33
Power density of electromagnetic field, W/m <sup>2</sup>	0.117	0.179	0.249
Measured Level, dBm	-69.96	-69.15	-74.46
Power received by antenna, dBm	-20.2	-20.2	-20.2
<b>Conversion Loss, dB</b>	49.8	49.0	54.3
Expanded uncertainty, dB	2.8	3.1	3.3

Engineer \_\_\_\_\_ M. Kasperovich

Quality Manager  A. Kostrikin

This Measuring report issued in duplicate and sent to:

1. Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1,  
Lixing 1st Rd., East Dist., Hsinchu City 300, 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 92-17 Date when calibrated 10/17/2017 Page 1 of 2

**Item**

**calibrated**

Mixer M05HWD # 110215-1

Description of measurement standard / measuring instrument / identification

**Customer**

Bureau Veritas Group Consumer Products Services Division, Taiwan  
Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, 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 Ukraine. 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 10/17/2017

# Calibration Certificate

Certificate number **92-17**

Page **2** of **2**

Calibration is performed by using

1. Wattmeter M 523
2. Wattmeter M 514
3. Spectrum analyzer E4407B
4. Signal generator RG4-14
5. Voltmeter V7-34
6. Frequency meter RCH3-72
7. Diplexer DPL26
8. Frequency multiplier
9. Attenuator AP-19
10. Attenuator AP-18

Calibration conditions

Temperature 22.2 °C  
Humidity 44.2 %  
Pressure 99.7 kPa

**Calibration results are given in the Measuring report # 92-17.**

#	Parameter	Specifications required	Specifications tested and measured
1	System Operating Frequency	140 – 220 GHz	Corresponds
2	LO Input	+12 – +17 dBm	Corresponds
3	IF Frequency Range	321 – 2400 MHz	Corresponds
4	Mixer Bias	+5.75 mA	Corresponds
5	System Waveguide Interface	WR-05	Corresponds
6	Conversion Loss	59 dB	Corresponds (Table 1)
7	System LO/IF Interface	SMA (f)	Corresponds
8	Typical RF Power to Avoid Compression	-20 dBm (10 $\mu$ W)	Corresponds

**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

**MEASURING REPORT # 92-17**

October 17, 2017

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Mixer M05HWD # 110215-1
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	09/18/2017
Date of calibration:	From 09/18/2017 to 10/17/2017

## MEASURING CONDITIONS

Temperature: 22.2 °C	Humidity: 44.2 %	Pressure: 99.7 kPa
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## MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 523	162
2	Wattmeter M 514	165
3	Spectrum analyzer E4407B	MY45110807
4	Signal generator RG4-14	4
5	Voltmeter V7-34	0067787
6	Frequency meter RCH3-72	931200
7	Diplexer DPL26	01
8	Frequency multiplier	02
9	Attenuator AP-19	04
10	Attenuator AP-18	03


## MEASURING RESULTS

IF Frequency 321.4 MHz  $\pm$  5 MHz;  
 Mixer Bias +5.75 mA;  
 LO Input Power 14.5 to 16 dBm (2.9 to 7.1 GHz).  
 LO Insertion Loss of Diplexer 0.7 dB.

Table 1

Frequency, GHz	140	180	220
Input RF Power, dBm	-20.0	-20.0	-20.0
Measured Value, dBm	-69.6	-69.2	-73.9
<b>Conversion Loss, dB</b>	<b>49.6</b>	<b>49.2</b>	<b>53.9</b>
Expanded uncertainty, dB	3.1	2.9	3.1

Engineer

 M. Kasperovich

Quality Manager

 A. Kostrikin

This Measuring report issued in duplicate and sent to:

1. Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1,  
 Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.

2. Calibration Laboratory of Microwave Measuring Equipment

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





## Virginia Diodes, Inc

979 2nd St. SE  
Suite 309  
Charlottesville, VA 22902  
Phone: 434-297-3257  
Fax: 434-297-3258

### Certificate of Conformance

To: Keysight Technologies, Inc.  
SPECIAL HANDLING - Dock 2LS  
1400 FOUNTAINGROVE PARKWAY  
SANTA ROSA, CA 95403

From: Virginia Diodes, Inc  
979 2nd St. SE  
Suite 309  
Charlottesville, VA 22902

Packing List No: 191700  
Shipping Date: 06/04/19

Today's Date: 06/05/19  
PO Number: 9000855821

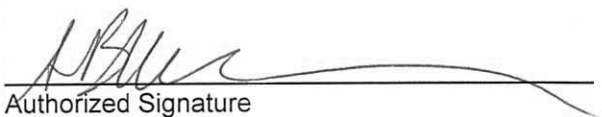
Attn: Ryan England  
Phone: 1-707-577-5741  
SO#: 3922450  
FedEx: 4296 8006 3330 / 4296 8006 3340

Quantity Shipped	Unit	Description	Order-Job Number
1	EA	VDIWR15.0SAX N9029-80057 Rev - 001; SN: SAX 381.	19194-01
1	EA	VDI15.0ATTE2-36 N9029-80059 Rev - 001; SN: 4-12.	19194-02
1	EA	VDI15.0BPFE57.2-59.4 N9029-80071 Rev - 001; SN: 7-21.	19194-03
1	EA	VDI15.0BPFE59.4-61.6 N9029-80072 Rev - 001; SN: 3-08.	19194-04
1	EA	VDI15.0BPFE61.5-63.8 N9029-80073 Rev - 001; SN: 4-14.	19194-05
1	EA	VDI15.0BPFE63.7-65.9 N9029-80074 Rev - 001; SN: 4-15.	19194-06
1	EA	WR12BPF64-71R1 N9029-80128 Rev - 001; SN: 2-11.	19194-07

Quantity

Shipped   Unit   DescriptionOrder-Job  
Number

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

  
Authorized Signature  
Virginia Diodes, Inc



**Virginia Diodes, Inc**  
979 2nd St. SE  
Suite 309  
Charlottesville, VA 22902  
Phone: 434-297-3257  
Fax: 434-297-3258

***Certificate of Conformance***

To: Keysight Technologies, Inc.  
SPECIAL HANDLING - Dock 2LS  
1400 FOUNTAINGROVE PARKWAY  
SANTA ROSA, CA 95403  
United States

From: Virginia Diodes, Inc  
979 2nd St. SE  
Suite 309  
Charlottesville, VA 22902

Packing List No: 191741  
Shipping Date: 06/10/19

Today's Date: 06/10/19  
PO Number: 9000855824

Attn: Ryan England  
Phone: 1-707-577-5741  
SO#: 3922450

<u>Quantity</u> <u>Shipped</u>	<u>Unit</u>	<u>Description</u>	<u>Order-Job</u> <u>Number</u>
1	EA	VDIWR10.0SAX N9029-80052 Rev - 001; SN: SAX 378.	19195D-01
1	EA	VDI10.0ATTE2-34 N9029-80027 Rev - 001; SN: 3-04.	19195D-02

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

A handwritten signature in black ink, consisting of a series of loops and a final vertical stroke, positioned above a horizontal line.

Authorized Signature  
Virginia Diodes, Inc



**Virginia Diodes, Inc**  
979 2nd St. SE  
Suite 309  
Charlottesville, VA 22902  
Phone: 434-297-3257  
Fax: 434-297-3258

***Certificate of Conformance***

To: Keysight Technologies, Inc.  
SPECIAL HANDLING - Dock 2LS  
1400 FOUNTAINGROVE PARKWAY  
SANTA ROSA, CA 95403  
United States

From: Virginia Diodes, Inc  
979 2nd St. SE  
Suite 309  
Charlottesville, VA 22902

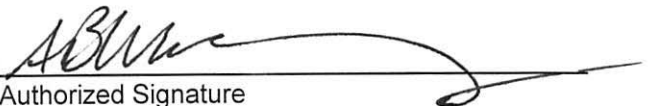
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Shipping Date: 05/31/19

Today's Date: 06/04/19  
PO Number: 9000855824

Attn: Ryan England  
Phone: 1-707-577-5741  
SO#: 3922450

<u>Quantity</u> <u>Shipped</u>	<u>Unit</u>	<u>Description</u>	<u>Order-Job</u> <u>Number</u>
1	EA	VDIWR6.5SAX N9029-80049 Rev - 001; SN: SAX 377.	19195C-01
1	EA	VDI6.5SWG2-20 N9029-80050 Rev - 001; SN: 5-34.	19195C-02

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

  
Authorized Signature  
Virginia Diodes, Inc





Virginia Diodes, Inc

**Certificate of Conformance**

To: Keysight Technologies, Inc.  
SPECIAL HANDLING - Dock 2LS  
1400 FOUNTAINGROVE PARKWAY  
SANTA ROSA, CA 95403  
United States

From: Virginia Diodes, Inc

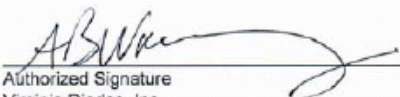
Packing List No: 191738  
Shipping Date: 06/10/19

Today's Date: 06/10/19  
PO Number: 9000855824

Attn: Ryan England  
Phone: 1-707-577-5741  
SO#: 3922450

Quantity Shipped	Unit	Description	Order-Job Number
1	EA	VDIWR5.1SAX N9029-80048 Rev - 001; SN: SAX 375.	19195B-01
1	EA	VDI5.1SWG2-20 N9029-80031 Rev - 001; SN: 4-03.	19195B-02

The VDI product(s) in this shipment meet(s) the guidelines for performance specifications established in accordance with the corresponding Purchase Order. Data presented in the User Guide, where applicable, has been obtained in accordance with VDI's Quality Management System. All instruments, used to obtain data, which require calibration have been calibrated with equipment traceable to the National Institute of Standards and Technology (NIST) and through NIST to the International System of Units (SI).

  
Authorized Signature  
Virginia Diodes, Inc