



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate
No.

№ BY/112 02.5.0.0065

of

09.01.2015

Certificate number 89-17 Date when calibrated 10/17/2017 Page 1 of 2

Item

calibrated

Mixer M10HWD # 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 **89-17**

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 534
2. Wattmeter M 546
3. Spectrum analyzer E4407B
4. Signal generator RG4-14
5. Signal generator G4-186
6. Voltmeter V7-34
7. Frequency meter RCH3-72
8. Diplexer DPL26

Calibration conditions

Temperature 22.2 °C

Humidity 48.1 %

Pressure 98.8 kPa

Calibration results are given in the Measuring report # 89-17

| # | Parameter | Specifications required | Specifications tested and measured |
|---|---------------------------------------|-------------------------|------------------------------------|
| 1 | System Operating Frequency | 75 – 110 GHz | Corresponds |
| 2 | LO Input | +12 – +17 dBm | Corresponds |
| 3 | IF Frequency Range | 321 – 2400 MHz | Corresponds |
| 4 | Mixer Bias | +5.57 mA | Corresponds |
| 5 | System Waveguide Interface | WR-10 | Corresponds |
| 6 | Conversion Loss | <46 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

October 17, 2017

MEASURING REPORT # 89-17

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 M10HWD # 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: 48.1 % | Pressure: 98.8 kPa |
|----------------------|------------------|--------------------|

MEASURING EQUIPMENT

| # | Measuring equipment | Serial number |
|---|--------------------------|---------------|
| 1 | Wattmeter M 534 | 161 |
| 2 | Wattmeter M 546 | 163 |
| 3 | Spectrum analyzer E4407B | MY45110807 |
| 4 | Signal generator RG4-14 | 22 |
| 5 | Signal generator G4-186 | 5 |
| 6 | Voltmeter V7-34 | 0067787 |
| 7 | Frequency meter RCH3-72 | 931200 |
| 8 | Diplexer DPL26 | 01 |

MEASURING RESULTS

IF Frequency 321.4 MHz \pm 5 MHz;

Mixer Bias +5.57 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 | 75 | 92.5 | 110 |
|----------------------------|-------------|-------------|-------------|
| Input RF Power, dBm | -20.00 | -20.00 | -20.00 |
| Measured Value, dBm | -63.3 | -61.0 | -62.8 |
| Conversion Loss, dB | 43.3 | 41.0 | 42.8 |
| Expanded uncertainty, dB | 3.0 | 2.8 | 2.9 |

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

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ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 02.5.0.0065 of 09.01.2015

Certificate number 90-17 Date when calibrated 10/17/2017 Page 1 of 2

Item

calibrated Standard gain horn antenna M10RH

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 90-17

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 534
2. Wattmeter M 546
3. Horn antenna P6-31A
4. Signal generator G4-186
5. Signal generator RG4-14
6. Voltmeter V7-34
7. Frequency meter RCH3-72

Calibration conditions

Temperature 22.2 °C

Humidity 48.1 %

Pressure 98.8 kPa

Calibration results are given in the Measuring report # 90-17

| # | Parameter | Specifications required | Specifications tested and measured |
|---|---------------------|-------------------------|------------------------------------|
| 1 | Frequency range | 75 – 110 GHz | Corresponds |
| 2 | Waveguide Interface | WR-10 | Corresponds |
| 3 | Gain | 24.2 dBi | Corresponds (Table 1) |
| 4 | Antenna Factor | 45.4 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 # 90-17

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 M10RH |
| 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: 48.1 % | Pressure: 98.8 kPa |
|----------------------|------------------|--------------------|

MEASURING EQUIPMENT

| # | Measuring equipment | Serial number |
|---|-------------------------|---------------|
| 1 | Wattmeter M 534 | 161 |
| 2 | Wattmeter M 546 | 163 |
| 3 | Signal generator G4-186 | 5 |
| 4 | Signal generator RG4-14 | 22 |
| 5 | Voltmeter V7-34 | 0067787 |
| 6 | Frequency meter RCH3-72 | 931200 |
| 7 | Horn antenna P6-31A | 35864 |

MEASURING RESULTS

Distance between tested and generating antenna 0.5 m.

Table 1

| | | | |
|--|-------|-------|-------|
| Frequency, GHz | 75 | 92.5 | 110 |
| Input power, mW | 5.0 | 5.0 | 5.0 |
| Power density of electromagnetic field, W/m ² | 0.499 | 0.747 | 0.940 |
| Maximum level of measured power, μW | 144 | 147 | 140 |
| Gain, dB | 23.6 | 23.7 | 24.0 |
| Antenna factor, dB/m | 44.2 | 45.9 | 47.1 |
| Expanded uncertainty, dB | 1.8 | 1.9 | 1.9 |

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.

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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 91-17 Date when calibrated 10/17/2017 Page 1 of 2

Item

calibrated

Mixer M10HWD # 110215-1 + standard gain horn antenna M10RH

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 **91-17**

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 534
2. Wattmeter M 546
3. Horn antenna P6-31A
4. Signal generator RG4-14
5. Signal generator G4-186
6. Voltmeter V7-34
7. Frequency meter RCH3-72
8. Spectrum analyzer E4407B
9. Diplexer DPL26

Calibration conditions

Temperature 22.2 °C

Humidity 48.1 %

Pressure 98.8 kPa

Calibration results are given in the Measuring report # 91-17.

| # | Parameter | Specifications required | Specifications tested and measured |
|---|------------------------|-------------------------|------------------------------------|
| 1 | Frequency range | 75 – 110 GHz | Corresponds |
| 2 | Waveguide Interface | WR-10 | Corresponds |
| 3 | LO Input | +12 – +17 dBm | Corresponds |
| 4 | IF Frequency Range | 321 – 2400 MHz | Corresponds |
| 5 | Mixer Bias | +5.57 mA | Corresponds |
| 6 | Conversion Loss | < 46 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 # 91-17

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 M10HWD # 110215-1 + standard gain horn antenna M10RH |
| 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: 48.1 % | Pressure: 98.8 kPa |
|----------------------|------------------|--------------------|

MEASURING EQUIPMENT

| # | Measuring equipment | Serial number |
|---|--------------------------|---------------|
| 1 | Wattmeter M 534 | 161 |
| 2 | Wattmeter M 546 | 163 |
| 3 | Horn antenna P6-31A | 35864 |
| 4 | Signal generator RG4-14 | 22 |
| 5 | Signal generator G4-186 | 5 |
| 6 | Voltmeter V7-34 | 0067787 |
| 7 | Frequency meter RCH3-72 | 931200 |
| 8 | Spectrum analyzer E4407B | MY45110807 |
| 9 | Diplexer DPL26 | 01 |

MEASURING RESULTS

IF Frequency 321.4 MHz \pm 5 MHz;

Mixer Bias +5.57 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 | 75 | 92.5 | 110 |
| Input RF power, mW | 0.34 | 0.35 | 0.37 |
| Power density of electromagnetic field, W/m ² | 0.167 | 0.209 | 0.386 |
| Measured Level, dBm | -63.4 | -61.0 | -62.8 |
| Power received by antenna, dBm | -20.0 | -19.8 | -19.9 |
| Conversion Loss, dB | 43.4 | 41.2 | 42.9 |
| Expanded uncertainty, dB | 3.2 | 3.1 | 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.

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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 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 μ 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 |
|----------------------|------------------|--------------------|

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 |
| Conversion Loss, dB | 45.9 | 45.0 | 47.8 |
| 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

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 **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 |
|----------------------|------------------|--------------------|

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 ² | 1.0 | 1.6 | 2.4 |
| Maximum level of measured power, μW | 138 | 141 | 154 |
| Gain, dB | 23.6 | 23.8 | 24.1 |
| 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.

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 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

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 **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 |
|----------------------|------------------|--------------------|

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 ² | 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 certificate

ISO 17025
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

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 **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 μ 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 |
|----------------------|------------------|--------------------|

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 |
| Conversion Loss, dB | 45.9 | 45.0 | 47.8 |
| 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

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 **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 |
|----------------------|------------------|--------------------|

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 ² | 1.0 | 1.6 | 2.4 |
| Maximum level of measured power, μW | 138 | 141 | 154 |
| Gain, dB | 23.6 | 23.8 | 24.1 |
| 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.

2. Calibration Laboratory of Microwave Measuring Equipment

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Calibration certificate

ISO 17025
ACCREDITED LABORATORY



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

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 **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 |
|----------------------|------------------|--------------------|

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 ² | 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

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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 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

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 μ 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 # 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 |
|----------------------|------------------|--------------------|

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 |
| Conversion Loss, dB | 49.6 | 49.2 | 53.9 |
| 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

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 |
|----------------------|------------------|--------------------|

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 ² | 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

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 **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 |
|----------------------|------------------|--------------------|

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 ² | 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 |
| Conversion Loss, dB | 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 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

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 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 |
|----------------------|------------------|--------------------|

MEASURING EQUIPMENT

| # | Measuring equipment | Serial number |
|----|--------------------------|---------------|
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| 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 |
| Conversion Loss, dB | 49.6 | 49.2 | 53.9 |
| Expanded uncertainty, dB | 3.1 | 2.9 | 3.1 |

Engineer

 M. Kasperovich

Quality Manager

 A. Kostrikin

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