

## Appendix - Calibration Certificate for Test Equipment

### For Above 40GHz:

| No. | Description & Manufacturer                                                                  | Model No.          | Serial No. | Cal. Date     | Cal. Due      |
|-----|---------------------------------------------------------------------------------------------|--------------------|------------|---------------|---------------|
| 1   | Spectrum Analyzer<br>KEYSIGHT                                                               | N9030A             | MY54490561 | Jul. 31, 2019 | Jul. 30, 2020 |
| 2   | *Horn Antenna (33~55GHz)<br>OML                                                             | M22RH              | 110215-1   | Oct. 17, 2017 | Oct. 16, 2020 |
| 3   | *Horn Antenna (50~75GHz)<br>OML                                                             | M15HWD             | 110215-1   | Oct. 17, 2017 | Oct. 16, 2020 |
| 4   | *Horn Antenna (75~110GHz)<br>OML                                                            | M10RH              | 110215-1   | Oct. 17, 2017 | Oct. 16, 2020 |
| 5   | *Horn Antenna (110~170GHz)<br>OML                                                           | M06RH              | 110215-1   | Oct. 17, 2017 | Oct. 16, 2020 |
| 6   | *Horn Antenna (140~220GHz)<br>OML                                                           | M05RH              | 110215-1   | Oct. 17, 2017 | Oct. 16, 2020 |
| 7   | *Harmonic Mixer (110~170GHz)<br>OML                                                         | M06HWD             | 110215-1   | Oct. 17, 2017 | Oct. 16, 2020 |
| 8   | *Harmonic Mixer (140~220GHz)<br>OML                                                         | M05HWD             | 110215-1   | Oct. 17, 2017 | Oct. 16, 2020 |
| 9   | N9029AV15-DC9 - 50-75 GHz VDI<br>Standard Downconverter with 9VDC<br>supply<br>Keysight     | SA Extension WR15  | SAX 381    | CoC           | CoC           |
| 10  | N9029AV10-DC9 - 75-110 GHz VDI<br>Standard Downconverter with 9VDC<br>supply<br>Keysight    | SA Extension WR10  | SAX 378    | CoC           | CoC           |
| 11  | N9029AV06-DC9 - 110-170 GHz<br>VDI Standard Downconverter with<br>9VDC supply<br>Keysight   | SA Extension WR6.5 | SAX 377    | CoC           | CoC           |
| 12  | N9029AV05-DC9 - 140-220 GHz<br>VDI Standard Downconverter with<br>9VDC supply<br>Keysight   | SA Extension WR5.1 | SAX 375    | CoC           | CoC           |
| 13  | Millimeter-Wave Signal Generator<br>Frequency Extension Module<br>(50~75 GHz)<br>Keysight   | E8257DV15          | SGX 050    | CoC           | CoC           |
| 14  | Millimeter-Wave Signal Generator<br>Frequency Extension Module<br>(75~110 GHz)<br>Keysight  | E8257DV10          | SGX 051    | CoC           | CoC           |
| 15  | Millimeter-Wave Signal Generator<br>Frequency Extension Module<br>(110~170 GHz)<br>Keysight | E8257DV06-DC9      | SGX 223    | CoC           | CoC           |
| 16  | Millimeter-Wave Signal Generator<br>Frequency Extension Module<br>(140~220 GHz)             | VDIWR5.1SGX        | PSGX 007   | CoC           | CoC           |
| 17  | PSG analog signal generator<br>Keysight                                                     | E8257D             | MY53401987 | June 21, 2019 | June 20, 2020 |
| 18  | Antenna Tower & Turn Table<br>CT                                                            | NA                 | NA         | NA            | NA            |

工服 NO. 19-07-BAC-728-01L

財團法人台灣電子檢驗中心



收件日期: Jul.29,2019

Receipt Date

發行日期: Aug.02,2019

Report Issue Date

# 校正報告

## CALIBRATION REPORT

ELECTRONICS TESTING CENTER, TAIWAN

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顧客名稱 香港商立德國際商品試驗有限公司桃園分公司

Customer

顧客地址 桃園市龜山區文化里華亞二路19號

Address

### 供校儀器 ITEM CALIBRATED

儀器名稱: PXA Signal Analyzer

Nomenclature

製造商: KEYSIGHT

Manufacturer

型別: N9030A

Model No.

識別號碼: MY54490561

ID. No.

上述儀器經本實驗室校正，結果如內文。未經本實驗室書面許可，不得部份複製本報告，完整複製則不在此限。

The above instruments were calibrated by the laboratory and please refer to the content for the calibration results. This report may not be reproduced in part without the written permission of the laboratory, except for full reproduction.

校正資料: ☒ 僅量測 ☐ 調整

Calibration Information Calibration Only Adjusted

實際環境: 溫度: 23 °C 相對濕度: 47 %

Actual Environments Temperature Relative Humidity

環境管制條件: 溫度: (23 ± 2) °C ; 相對濕度: (50 ± 10) %

Environmental Conditions

校正日期: Jul.31,2019

Calibration Date

建議再校日期: Jul.30,2020

註: 建議再校日期為應客戶要求列入。

Recommended Recalibration Date

Note: The recommended recalibration date is agreed by the customer.

校正地點: 財團法人台灣電子檢驗中心校正實驗室

Laboratory Location

實驗室名稱地址: ☒ 1. 校正實驗室 33383 桃園市龜山區文明路29巷8號 TEL:+886-3-3280026

Laboratory Name and Address 2. 新竹校正實驗室 30075 新竹市科學園區園區二路47號205室 TEL:+886-3-5798806

3. 台中校正實驗室 40766 台中市西屯區福中二街8號2樓之2 TEL:+886-4-23584899

4. 台南校正實驗室 70248 台南市南區新和二路5號 TEL:+886-6-2925787#50,51

財團法人台灣電子檢驗中心特此證明報告內記載之受校儀器已與下方標準做過比較校正，用以校正之標準器可追溯至中華民國國家度量衡標準實驗室，美國標準及技術研究院，或其它國家之度量衡國家標準。本中心的校正服務均符合ISO/IEC 17025 之規定。

ETC hereby certifies that the equipment noted herein has been compared with the below listed standards. The Standards used to perform this calibration are traceable to NML/ROC,NIST/USA or other countries. The calibration services from ETC are capable of performing services in compliance with the requirements of ISO/IEC 17025.

財團法人台灣電子檢驗中心

ELECTRONICS TESTING CENTER,  
TAIWAN

實驗室主管

Laboratory Head

報告簽署人

Signature



## 使用校正依據 CALIBRATION PROCEDURE USED

1. 「頻譜(信號)分析儀校正程序書」, B00-CD-142, 5th Edition。
2. 「測試接收機/信號(頻譜)分析儀校正程序書」, B00-CD-376, 5th Edition。

## 使用標準器及附配件 STANDARD AND ACCESSORIES

| 儀器名稱【廠牌/型號】<br>Nomenclature【Mfg./Model No.】             | 【識別號碼】<br>【ID. No.】 | 校正單位(認可編號)<br>Cal. Source(ACRED Code) | 報告號碼<br>Cal. Report No. | 校正日期<br>Date Cal. | 有效日期<br>Due Date |
|---------------------------------------------------------|---------------------|---------------------------------------|-------------------------|-------------------|------------------|
| RF Step Attenuator<br>【R/S RSG】<br>【13050122-001】       |                     | R&S(DAKS D-K-15195-01-01)             | D-K-15195-01-01 2018-03 | 2018/03/08        | 2021/09/07       |
| EPM Series Power Meter<br>【HP E4419B】<br>【13050609-001】 |                     | NML(TAF N0688)                        | U180018A                | 2018/03/21        | 2019/09/20       |
| Power Sensor<br>【AGILENT 8482A】<br>【13053506-001】       |                     | KEYSIGHT(ANAB AC-1498)                | 1-9328170856-1          | 2017/10/16        | 2020/04/15       |
| Power Sensor<br>【AGILENT 8487A】<br>【13053508-003】       |                     | KEYSIGHT(ANAB AC-1498)                | 1-9230656623-1          | 2017/09/14        | 2020/03/13       |
| Universal Counter<br>【HP 53132A】<br>【13060804-001】      |                     | ETC(TAF 0025)                         | 19-06-BAC-512-04L       | 2019/07/05        | 2020/01/04       |

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工 服NO. 19-07-BAC-728-01L

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| Test Description                                           | Actual Value  | Expanded Uncertainty |
|------------------------------------------------------------|---------------|----------------------|
| 1. Freq. Readout Accuracy and Freq. Count Marker Accuracy: |               |                      |
| (a) Freq. Readout Accuracy                                 |               |                      |
| (a.1) 1.5 GHz Center Freq.                                 |               |                      |
| 1 MHz SPAN                                                 | 1.500000 GHz  | $1.2 \times 10^{-6}$ |
| 10 MHz SPAN                                                | 1.500000 GHz  | $1.2 \times 10^{-5}$ |
| 20 MHz SPAN                                                | 1.500000 GHz  | $1.2 \times 10^{-5}$ |
| 50 MHz SPAN                                                | 1.500000 GHz  | $1.2 \times 10^{-5}$ |
| 100 MHz SPAN                                               | 1.500000 GHz  | $1.2 \times 10^{-4}$ |
| 1 GHz SPAN                                                 | 1.500000 GHz  | $1.2 \times 10^{-3}$ |
| (a.2) 4.0 GHz Center Freq.                                 |               |                      |
| 1 MHz SPAN                                                 | 4.000000 GHz  | $1.2 \times 10^{-6}$ |
| 10 MHz SPAN                                                | 4.000000 GHz  | $1.2 \times 10^{-5}$ |
| 20 MHz SPAN                                                | 4.000000 GHz  | $1.2 \times 10^{-5}$ |
| 50 MHz SPAN                                                | 4.000000 GHz  | $1.2 \times 10^{-5}$ |
| 100 MHz SPAN                                               | 4.000000 GHz  | $1.2 \times 10^{-4}$ |
| 1 GHz SPAN                                                 | 3.999999 GHz  | $1.2 \times 10^{-3}$ |
| (a.3) 9.0 GHz Center Freq.                                 |               |                      |
| 1 MHz SPAN                                                 | 9.000000 GHz  | $1.2 \times 10^{-5}$ |
| 10 MHz SPAN                                                | 9.000000 GHz  | $1.2 \times 10^{-5}$ |
| 20 MHz SPAN                                                | 9.000000 GHz  | $1.2 \times 10^{-5}$ |
| 50 MHz SPAN                                                | 9.000000 GHz  | $1.2 \times 10^{-4}$ |
| 100 MHz SPAN                                               | 9.000000 GHz  | $1.2 \times 10^{-3}$ |
| 1 GHz SPAN                                                 | 8.999999 GHz  | $1.2 \times 10^{-6}$ |
| (a.4) 16.0 GHz Center Freq.                                |               |                      |
| 1 MHz SPAN                                                 | 16.000000 GHz | $1.2 \times 10^{-5}$ |
| 10 MHz SPAN                                                | 16.000000 GHz | $1.2 \times 10^{-5}$ |
| 20 MHz SPAN                                                | 16.000000 GHz | $1.2 \times 10^{-4}$ |
| 50 MHz SPAN                                                | 16.000000 GHz | $1.2 \times 10^{-3}$ |
| 100 MHz SPAN                                               | 16.000000 GHz | $1.2 \times 10^{-6}$ |
| 1 GHz SPAN                                                 | 15.999999 GHz | $1.2 \times 10^{-5}$ |

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| Test Description                                                          | Actual Value    | Expanded Uncertainty |
|---------------------------------------------------------------------------|-----------------|----------------------|
| 1. Freq. Readout Accuracy and Freq. Count Marker Accuracy: (@ Continued): |                 |                      |
| (a)Freq. Readout Accuracy                                                 |                 |                      |
| (a.5)21.0 GHz Center Freq.                                                |                 |                      |
| 1 MHz SPAN                                                                | 21.000000 GHz   | $1.2 \times 10^{-6}$ |
| 10 MHz SPAN                                                               | 21.000000 GHz   | $1.2 \times 10^{-5}$ |
| 20 MHz SPAN                                                               | 21.000000 GHz   | $1.2 \times 10^{-5}$ |
| 50 MHz SPAN                                                               | 21.000000 GHz   | $1.2 \times 10^{-5}$ |
| 100 MHz SPAN                                                              | 21.000000 GHz   | $1.2 \times 10^{-4}$ |
| 1 GHz SPAN                                                                | 20.999 GHz      | $1.2 \times 10^{-3}$ |
| (a.6)29.0 GHz Center Freq.                                                |                 |                      |
| 1 MHz SPAN                                                                | 29.000000 GHz   | $1.2 \times 10^{-5}$ |
| 10 MHz SPAN                                                               | 29.000000 GHz   | $1.2 \times 10^{-5}$ |
| 20 MHz SPAN                                                               | 29.000000 GHz   | $1.2 \times 10^{-5}$ |
| 50 MHz SPAN                                                               | 29.000000 GHz   | $1.2 \times 10^{-4}$ |
| 100 MHz SPAN                                                              | 29.000000 GHz   | $1.2 \times 10^{-3}$ |
| 1 GHz SPAN                                                                | 28.999 GHz      | $1.2 \times 10^{-6}$ |
| (a.7)35.0 GHz Center Freq.                                                |                 |                      |
| 1 MHz SPAN                                                                | 35.000000 GHz   | $1.2 \times 10^{-5}$ |
| 10 MHz SPAN                                                               | 35.000000 GHz   | $1.2 \times 10^{-5}$ |
| 20 MHz SPAN                                                               | 35.000000 GHz   | $1.2 \times 10^{-4}$ |
| 50 MHz SPAN                                                               | 35.000000 GHz   | $1.2 \times 10^{-3}$ |
| 100 MHz SPAN                                                              | 35.000000 GHz   | $1.2 \times 10^{-6}$ |
| 1 GHz SPAN                                                                | 35.000 GHz      | $1.2 \times 10^{-5}$ |
| (b)Freq. Count Marker Accuracy:                                           |                 |                      |
| 1.5 GHz Center Freq.                                                      | 1.500000000 GHz | $5.0 \times 10^{-8}$ |
| 4.0 GHz Center Freq.                                                      | 4.000000000 GHz | $5.0 \times 10^{-8}$ |
| 9.0 GHz Center Freq.                                                      | 9.000000000 GHz | $5.0 \times 10^{-8}$ |
| 16.0 GHz Center Freq.                                                     | 16.00000000 GHz | $5.0 \times 10^{-8}$ |
| 21.0 GHz Center Freq.                                                     | 21.00000000 GHz | $5.0 \times 10^{-8}$ |
| 29.0 GHz Center Freq.                                                     | 29.00000000 GHz | $5.0 \times 10^{-8}$ |
| 35.0 GHz Center Freq.                                                     | 35.00000000 GHz | $5.0 \times 10^{-8}$ |

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| Test Description        | Actual Value | Expanded Uncertainty |
|-------------------------|--------------|----------------------|
| 2. Freq. Span Accuracy: |              |                      |
| 1 kHz Span              | 0.00 %       | 0.15 %               |
| 2 kHz Span              | 0.00 %       | 0.15 %               |
| 5 kHz Span              | 0.00 %       | 0.15 %               |
| 10 kHz Span             | 0.00 %       | 0.15 %               |
| 20 kHz Span             | 0.00 %       | 0.15 %               |
| 50 kHz Span             | 0.00 %       | 0.15 %               |
| 100 kHz Span            | 0.00 %       | 0.15 %               |
| 200 kHz Span            | 0.00 %       | 0.15 %               |
| 500 kHz Span            | 0.00 %       | 0.15 %               |
| 1 MHz Span              | 0.00 %       | 0.15 %               |
| 2 MHz Span              | 0.00 %       | 0.15 %               |
| 5 MHz Span              | 0.00 %       | 0.15 %               |
| 10 MHz Span             | 0.00 %       | 0.15 %               |
| 20 MHz Span             | 0.00 %       | 0.15 %               |
| 50 MHz Span             | 0.00 %       | 0.15 %               |
| 100 MHz Span            | 0.00 %       | 0.15 %               |
| 200 MHz Span            | 0.00 %       | 0.15 %               |
| 500 MHz Span            | 0.00 %       | 0.15 %               |
| 1 GHz Span              | 0.00 %       | 0.15 %               |
| 2 GHz Span              | 0.00 %       | 0.15 %               |

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| Test Description                              | Actual Value | Expanded Uncertainty |
|-----------------------------------------------|--------------|----------------------|
| 3. Image, Multiple, and Out-of-Band Response: |              |                      |
| (a)2 GHz Center Freq.                         |              |                      |
| 2021.4 MHz                                    | -98.22 dBc   | 1.7 dB               |
| 2621.4 MHz                                    | -98.46 dBc   | 0.86 dB              |
| 2321.4 MHz                                    | -98.39 dBc   | 1.0 dB               |
| 2600.0 MHz                                    | -98.67 dBc   | 0.94 dB              |
| 7910.7 MHz                                    | -98.48 dBc   | 1.0 dB               |
| 9821.4 MHz                                    | -98.63 dBc   | 1.0 dB               |
| (b)4 GHz Center Freq.                         |              |                      |
| 4021.4 MHz                                    | -94.89 dBc   | 0.9 dB               |
| 4621.4 MHz                                    | -95.38 dBc   | 1.1 dB               |
| 4321.4 MHz                                    | -95.46 dBc   | 1.1 dB               |
| 4600.0 MHz                                    | -95.50 dBc   | 1.1 dB               |
| 8310.7 MHz                                    | -95.56 dBc   | 1.1 dB               |
| 8932.1 MHz                                    | -95.57 dBc   | 1.1 dB               |
| (c)9 GHz Center Freq.                         |              |                      |
| 9021.4 MHz                                    | -95.57 dBc   | 1.1 dB               |
| 9621.4 MHz                                    | -94.60 dBc   | 1.2 dB               |
| 9321.4 MHz                                    | -94.31 dBc   | 1.2 dB               |
| 9600.0 MHz                                    | -94.06 dBc   | 0.84 dB              |
| 18310.7 MHz                                   | -94.56 dBc   | 1.1 dB               |
| 18932.1 MHz                                   | -93.73 dBc   | 0.91 dB              |
| (d)15 GHz Center Freq.                        |              |                      |
| 15021.400 MHz                                 | -94.12 dBc   | 1.1 dB               |
| 15621.400 MHz                                 | -94.53 dBc   | 1.2 dB               |
| 22655.350 MHz                                 | -94.62 dBc   | 1.1 dB               |
| 23276.750 MHz                                 | -94.31 dBc   | 1.1 dB               |
| 7344.650 MHz                                  | -94.53 dBc   | 1.1 dB               |
| 7966.050 MHz                                  | -94.63 dBc   | 1.0 dB               |
| (e)20 GHz Center Freq.                        |              |                      |
| 20021.400 MHz                                 | -92.31 dBc   | 0.94 dB              |
| 20621.400 MHz                                 | -93.69 dBc   | 1.0 dB               |
| 15543.725 MHz                                 | -93.47 dBc   | 1.1 dB               |
| 25699.075 MHz                                 | -93.67 dBc   | 1.0 dB               |
| 9844.650 MHz                                  | -93.52 dBc   | 1.1 dB               |
| 10466.050 MHz                                 | -92.50 dBc   | 1.1 dB               |

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| Test Description                                            | Actual Value   | Expanded Uncertainty |
|-------------------------------------------------------------|----------------|----------------------|
| 3. Image, Multiple, and Out-of-Band Response: (@Continued): |                |                      |
| (f)29 GHz Center Freq.                                      |                |                      |
| 28378.600 MHz                                               | -90.48 dBc     | 1.5 dB               |
| 28978.600 MHz                                               | -90.43 dBc     | 1.3 dB               |
| 24450.925 MHz                                               | -90.54 dBc     | 1.4 dB               |
| 28700.000 MHz                                               | -90.66 dBc     | 1.3 dB               |
| 16455.350 MHz                                               | -90.41 dBc     | 1.4 dB               |
| 35272.325 MHz                                               | -90.44 dBc     | 1.4 dB               |
| (g)35 GHz Center Freq.                                      |                |                      |
| 35021.400 MHz                                               | -86.97 dBc     | 1.4 dB               |
| 35621.400 MHz                                               | -87.24 dBc     | 1.3 dB               |
| 33093.725 MHz                                               | -86.39 dBc     | 1.3 dB               |
| 35321.400 MHz                                               | -86.45 dBc     | 1.3 dB               |
| 8744.538 MHz                                                | -86.60 dBc     | 1.3 dB               |
| 15544.650 MHz                                               | -86.20 dBc     | 1.2 dB               |
| 4. Frequency accuracy:                                      | 10.0000003 MHz | $3.5 \times 10^{-8}$ |
| 5. IF bandwidth level accuracy Check:                       |                |                      |
| 100 Hz                                                      | -0.02 dB       | 0.32 dB              |
| 300 Hz                                                      | -0.01 dB       | 0.32 dB              |
| 1 kHz                                                       | 0.00 dB        | 0.32 dB              |
| 3 kHz                                                       | 0.00 dB        | 0.32 dB              |
| 10 kHz                                                      | 0.00 dB(Ref.)  | ----                 |
| 30 kHz                                                      | 0.00 dB        | 0.32 dB              |
| 100 kHz                                                     | 0.00 dB        | 0.32 dB              |
| 300 kHz                                                     | 0.00 dB        | 0.32 dB              |
| 1 MHz                                                       | 0.00 dB        | 0.32 dB              |
| 3 MHz                                                       | 0.01 dB        | 0.32 dB              |

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| 6. IF bandwidth (3 dB) Check: |              |                      |
| Bandwidth                     |              |                      |
| 100 Hz                        | 100.1 Hz     | 4.4 %                |
| 300 Hz                        | 300.0 Hz     | 4.4 %                |
| 1 kHz                         | 1.000 kHz    | 4.4 %                |
| 3 kHz                         | 3.001 kHz    | 4.4 %                |
| 10 kHz                        | 10.00 kHz    | 4.4 %                |
| 30 kHz                        | 30.00 kHz    | 4.4 %                |
| 100 kHz                       | 100.1 kHz    | 4.4 %                |
| 300 kHz                       | 300.8 kHz    | 4.4 %                |
| 1 MHz                         | 1.000 MHz    | 4.4 %                |
| 3 MHz                         | 3.009 MHz    | 4.4 %                |
|                               |              |                      |
| 7. IF Bandwidths (3 dB)       |              |                      |
| Shape factor Check:           |              |                      |
| 100 Hz                        | 3.82         | 6.1 %                |
| 300 Hz                        | 3.82         | 6.1 %                |
| 1 kHz                         | 3.88         | 6.1 %                |
| 3 kHz                         | 3.82         | 6.1 %                |
| 10 kHz                        | 3.80         | 6.1 %                |
| 30 kHz                        | 3.93         | 6.1 %                |
| 100 kHz                       | 3.82         | 6.1 %                |
| 300 kHz                       | 3.81         | 6.1 %                |
| 1 MHz                         | 3.82         | 6.1 %                |
| 3 MHz                         | 3.81         | 6.1 %                |

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| 8. Noise Display Check : |              |                      |
| 9 kHz                    | -146.6 dBm   | 0.76 dB              |
| 100 kHz                  | -146.1 dBm   | 0.76 dB              |
| 999 kHz                  | -146.3 dBm   | 0.76 dB              |
| 10.99 MHz                | -148.2 dBm   | 0.76 dB              |
| 19.99 MHz                | -149.6 dBm   | 0.76 dB              |
| 49.99 MHz                | -152.8 dBm   | 0.76 dB              |
| 99.99 MHz                | -153.1 dBm   | 0.76 dB              |
| 199.9 MHz                | -153.4 dBm   | 0.76 dB              |
| 499.9 MHz                | -154.8 dBm   | 0.76 dB              |
| 999.9 MHz                | -155.4 dBm   | 0.76 dB              |
| 1499 MHz                 | -153.9 dBm   | 0.88 dB              |
| 1999 MHz                 | -152.1 dBm   | 0.88 dB              |
| 2499 MHz                 | -151.3 dBm   | 0.88 dB              |
| 2999 MHz                 | -152.2 dBm   | 0.88 dB              |
| 3099 MHz                 | -151.8 dBm   | 0.88 dB              |
| 3499 MHz                 | -151.3 dBm   | 0.88 dB              |
| 3999 MHz                 | -152.4 dBm   | 0.88 dB              |
| 4499 MHz                 | -152.3 dBm   | 0.88 dB              |
| 4999 MHz                 | -151.9 dBm   | 0.88 dB              |
| 5499 MHz                 | -151.6 dBm   | 0.88 dB              |
| 5999 MHz                 | -152.6 dBm   | 0.88 dB              |
| 6499 MHz                 | -151.9 dBm   | 0.88 dB              |
| 6999 MHz                 | -152.3 dBm   | 0.88 dB              |
| 7999 MHz                 | -151.7 dBm   | 0.88 dB              |
| 8999 MHz                 | -152.3 dBm   | 0.88 dB              |
| 9999 MHz                 | -151.8 dBm   | 0.88 dB              |
| 10999 MHz                | -152.0 dBm   | 0.88 dB              |
| 11999 MHz                | -152.5 dBm   | 0.88 dB              |
| 12999 MHz                | -152.3 dBm   | 0.88 dB              |
| 13999 MHz                | -151.9 dBm   | 0.88 dB              |
| 14999 MHz                | -152.1 dBm   | 0.88 dB              |
| 15999 MHz                | -152.7 dBm   | 0.88 dB              |
| 16999 MHz                | -152.3 dBm   | 0.88 dB              |

# 校正報告

財團法人台灣電子檢驗中心

工 服NO. 19-07-BAC-728-01L

## CALIBRATION REPORT

ELECTRONICS TESTING  
CENTER, TAIWAN

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| Test Description                         | Actual Value | Expanded Uncertainty |
|------------------------------------------|--------------|----------------------|
| 8. Noise Display Check<br>(@ Continued): |              |                      |
| 17999 MHz                                | -150.7 dBm   | 0.88 dB              |
| 18999 MHz                                | -150.3 dBm   | 0.88 dB              |
| 19999 MHz                                | -149.6 dBm   | 0.88 dB              |
| 20999 MHz                                | -149.0 dBm   | 0.88 dB              |
| 21999 MHz                                | -148.8 dBm   | 0.88 dB              |
| 22999 MHz                                | -149.3 dBm   | 0.88 dB              |
| 23999 MHz                                | -148.9 dBm   | 0.88 dB              |
| 24999 MHz                                | -149.1 dBm   | 0.88 dB              |
| 25999 MHz                                | -148.7 dBm   | 0.88 dB              |
| 26999 MHz                                | -148.9 dBm   | 0.88 dB              |
| 27999 MHz                                | -148.6 dBm   | 0.88 dB              |
| 28999 MHz                                | -147.9 dBm   | 0.88 dB              |
| 29999 MHz                                | -145.3 dBm   | 0.88 dB              |
| 30999 MHz                                | -144.3 dBm   | 0.88 dB              |
| 31999 MHz                                | -143.2 dBm   | 0.88 dB              |
| 32999 MHz                                | -144.8 dBm   | 0.88 dB              |
| 33999 MHz                                | -145.1 dBm   | 0.88 dB              |
| 34999 MHz                                | -147.4 dBm   | 0.88 dB              |
| 35999 MHz                                | -146.6 dBm   | 0.86 dB              |
| 36999 MHz                                | -145.2 dBm   | 0.86 dB              |
| 37999 MHz                                | -143.4 dBm   | 0.86 dB              |
| 38999 MHz                                | -141.6 dBm   | 0.86 dB              |
| 39999 MHz                                | -140.5 dBm   | 0.86 dB              |

# 校正報告

財團法人台灣電子檢驗中心

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| Test Description             | Actual Value | Expanded Uncertainty |
|------------------------------|--------------|----------------------|
| 9. Frequency response Check: |              |                      |
| RF Attenuation 10 dB         |              |                      |
| 1 MHz                        | 0.06 dB      | 0.64 dB              |
| 10 MHz                       | 0.03 dB      | 0.64 dB              |
| 50 MHz                       | 0.01 dB      | 0.64 dB              |
| 100 MHz                      | 0.03 dB      | 0.64 dB              |
| 200 MHz                      | 0.04 dB      | 0.64 dB              |
| 300 MHz                      | 0.04 dB      | 0.64 dB              |
| 400 MHz                      | 0.05 dB      | 0.64 dB              |
| 500 MHz                      | 0.07 dB      | 0.64 dB              |
| 600 MHz                      | 0.06 dB      | 0.64 dB              |
| 700 MHz                      | 0.04 dB      | 0.64 dB              |
| 800 MHz                      | 0.03 dB      | 0.64 dB              |
| 900 MHz                      | 0.02 dB      | 0.64 dB              |
| 1000 MHz                     | 0.03 dB      | 0.64 dB              |
| 1500 MHz                     | 0.04 dB      | 0.64 dB              |
| 2000 MHz                     | 0.05 dB      | 0.64 dB              |
| 2500 MHz                     | 0.11 dB      | 0.64 dB              |
| 2990 MHz                     | 0.16 dB      | 0.64 dB              |
| 3010 MHz                     | -0.19 dB     | 0.70 dB              |
| 3500 MHz                     | -0.17 dB     | 0.70 dB              |
| 4000 MHz                     | -0.18 dB     | 0.70 dB              |
| 4500 MHz                     | -0.17 dB     | 0.70 dB              |
| 5000 MHz                     | -0.15 dB     | 0.70 dB              |
| 5500 MHz                     | -0.14 dB     | 0.70 dB              |
| 6000 MHz                     | -0.16 dB     | 0.70 dB              |
| 6500 MHz                     | -0.17 dB     | 0.70 dB              |
| 6990 MHz                     | -0.18 dB     | 0.70 dB              |
| 7100 MHz                     | -0.17 dB     | 0.70 dB              |
| 8000 MHz                     | -0.13 dB     | 0.70 dB              |
| 9000 MHz                     | -0.16 dB     | 0.70 dB              |
| 10000 MHz                    | 0.06 dB      | 0.70 dB              |
| 11000 MHz                    | 0.05 dB      | 0.70 dB              |

# 校正報告

財團法人台灣電子檢驗中心

工 服NO. 19-07-BAC-728-01L

## CALIBRATION REPORT

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| Test Description                              | Actual Value | Expanded Uncertainty |
|-----------------------------------------------|--------------|----------------------|
| 9. Frequency response Check<br>(@ Continued): |              |                      |
| RF Attenuation 10 dB                          |              |                      |
| 12000 MHz                                     | 0.02 dB      | 0.70 dB              |
| 13000 MHz                                     | 0.03 dB      | 0.70 dB              |
| 13500 MHz                                     | 0.03 dB      | 0.70 dB              |
| 14000 MHz                                     | 0.04 dB      | 0.70 dB              |
| 15000 MHz                                     | 0.02 dB      | 0.70 dB              |
| 16000 MHz                                     | 0.06 dB      | 0.70 dB              |
| 17000 MHz                                     | 0.11 dB      | 0.70 dB              |
| 18000 MHz                                     | 0.18 dB      | 0.70 dB              |
| 19000 MHz                                     | 0.10 dB      | 0.98 dB              |
| 20000 MHz                                     | -0.09 dB     | 0.98 dB              |
| 21000 MHz                                     | -0.02 dB     | 0.98 dB              |
| 22000 MHz                                     | 0.24 dB      | 0.98 dB              |
| 23000 MHz                                     | 0.14 dB      | 0.98 dB              |
| 24000 MHz                                     | 0.09 dB      | 0.98 dB              |
| 25000 MHz                                     | 0.05 dB      | 0.98 dB              |
| 26000 MHz                                     | 0.35 dB      | 0.98 dB              |
| 27000 MHz                                     | -0.19 dB     | 1.3 dB               |
| 28000 MHz                                     | -0.11 dB     | 1.3 dB               |
| 29000 MHz                                     | -0.09 dB     | 1.3 dB               |
| 29900 MHz                                     | 0.04 dB      | 1.3 dB               |
| 31000 MHz                                     | 0.05 dB      | 1.3 dB               |
| 32000 MHz                                     | 0.03 dB      | 1.3 dB               |
| 33000 MHz                                     | 0.02 dB      | 1.3 dB               |
| 34000 MHz                                     | 0.05 dB      | 1.3 dB               |
| 35000 MHz                                     | 0.07 dB      | 1.3 dB               |
| 36000 MHz                                     | 0.09 dB      | 1.3 dB               |
| 37000 MHz                                     | 0.12 dB      | 1.3 dB               |
| 38000 MHz                                     | -0.39 dB     | 1.3 dB               |
| 39000 MHz                                     | -0.03 dB     | 1.3 dB               |
| 39999 MHz                                     | -0.08 dB     | 1.3 dB               |
| 40000 MHz                                     | -0.11 dB     | 1.3 dB               |
| 41000 MHz                                     | -0.18 dB     | 1.3 dB               |
| 42000 MHz                                     | -0.29 dB     | 1.3 dB               |
| 43000 MHz                                     | -0.35 dB     | 1.3 dB               |

# 校正報告

財團法人台灣電子檢驗中心

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| Test Description                           | Actual Value | Expanded Uncertainty |
|--------------------------------------------|--------------|----------------------|
| 9. Frequency response Check (@ Continued): |              |                      |
| RF Attenuation 20 dB                       |              |                      |
| 1 MHz                                      | 0.07 dB      | 0.64 dB              |
| 10 MHz                                     | 0.05 dB      | 0.64 dB              |
| 50 MHz                                     | 0.03 dB      | 0.64 dB              |
| 100 MHz                                    | 0.04 dB      | 0.64 dB              |
| 200 MHz                                    | 0.06 dB      | 0.64 dB              |
| 300 MHz                                    | 0.05 dB      | 0.64 dB              |
| 400 MHz                                    | 0.06 dB      | 0.64 dB              |
| 500 MHz                                    | 0.07 dB      | 0.64 dB              |
| 600 MHz                                    | 0.08 dB      | 0.64 dB              |
| 700 MHz                                    | 0.07 dB      | 0.64 dB              |
| 800 MHz                                    | 0.06 dB      | 0.64 dB              |
| 900 MHz                                    | 0.04 dB      | 0.64 dB              |
| 1000 MHz                                   | 0.02 dB      | 0.64 dB              |
| 1500 MHz                                   | 0.09 dB      | 0.64 dB              |
| 2000 MHz                                   | 0.11 dB      | 0.64 dB              |
| 2500 MHz                                   | 0.17 dB      | 0.64 dB              |
| 2990 MHz                                   | 0.20 dB      | 0.64 dB              |
| Frequency response Check (@ Continued):    |              |                      |
| RF Attenuation 40 dB                       |              |                      |
| 1 MHz                                      | 0.09 dB      | 0.62 dB              |
| 10 MHz                                     | 0.07 dB      | 0.62 dB              |
| 50 MHz                                     | 0.06 dB      | 0.62 dB              |
| 100 MHz                                    | 0.07 dB      | 0.62 dB              |
| 200 MHz                                    | 0.06 dB      | 0.62 dB              |
| 300 MHz                                    | 0.05 dB      | 0.62 dB              |
| 400 MHz                                    | 0.04 dB      | 0.62 dB              |
| 500 MHz                                    | 0.15 dB      | 0.62 dB              |
| 600 MHz                                    | 0.11 dB      | 0.62 dB              |
| 700 MHz                                    | 0.07 dB      | 0.62 dB              |
| 800 MHz                                    | 0.08 dB      | 0.62 dB              |
| 900 MHz                                    | 0.08 dB      | 0.62 dB              |
| 1000 MHz                                   | 0.07 dB      | 0.62 dB              |
| 1500 MHz                                   | 0.09 dB      | 0.62 dB              |
| 2000 MHz                                   | 0.12 dB      | 0.62 dB              |
| 2500 MHz                                   | 0.18 dB      | 0.62 dB              |
| 2990 MHz                                   | 0.29 dB      | 0.62 dB              |

# 校正報告

財團法人台灣電子檢驗中心

工 服NO. 19-07-BAC-728-01L

## CALIBRATION REPORT

ELECTRONICS TESTING  
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| Test Description             | Actual Value  | Expanded Uncertainty |
|------------------------------|---------------|----------------------|
| 10. Display linearity Check: |               |                      |
| RBW 300 Hz                   |               |                      |
| 10 dB                        | 9.99 dB       | 0.64 dB              |
| 12 dB                        | 7.98 dB       | 0.64 dB              |
| 14 dB                        | 5.97 dB       | 0.64 dB              |
| 16 dB                        | 3.97 dB       | 0.64 dB              |
| 18 dB                        | 1.97 dB       | 0.64 dB              |
| 20 dB                        | 0.00 dB(Ref.) | -----                |
| 22 dB                        | -2.00 dB      | 0.64 dB              |
| 24 dB                        | -4.00 dB      | 0.64 dB              |
| 26 dB                        | -6.01 dB      | 0.64 dB              |
| 28 dB                        | -8.02 dB      | 0.64 dB              |
| 30 dB                        | -10.00 dB     | 0.64 dB              |
| 32 dB                        | -12.00 dB     | 0.64 dB              |
| 34 dB                        | -14.01 dB     | 0.64 dB              |
| 36 dB                        | -16.02 dB     | 0.64 dB              |
| 38 dB                        | -18.03 dB     | 0.64 dB              |
| 40 dB                        | -20.01 dB     | 0.64 dB              |
| 42 dB                        | -22.00 dB     | 0.64 dB              |
| 44 dB                        | -23.99 dB     | 0.64 dB              |
| 46 dB                        | -25.99 dB     | 0.64 dB              |
| 48 dB                        | -27.99 dB     | 0.64 dB              |
| 50 dB                        | -29.99 dB     | 0.64 dB              |
| 52 dB                        | -31.98 dB     | 0.64 dB              |
| 54 dB                        | -33.98 dB     | 0.64 dB              |
| 56 dB                        | -35.99 dB     | 0.64 dB              |
| 58 dB                        | -38.00 dB     | 0.64 dB              |
| 60 dB                        | -39.96 dB     | 0.64 dB              |
| 65 dB                        | -45.00 dB     | 0.64 dB              |
| 70 dB                        | -49.97 dB     | 0.64 dB              |
| 75 dB                        | -55.00 dB     | 0.64 dB              |
| 80 dB                        | -59.99 dB     | 0.64 dB              |
| 85 dB                        | -64.98 dB     | 0.64 dB              |
| 90 dB                        | -69.97 dB     | 0.64 dB              |
| 95 dB                        | -74.96 dB     | 0.64 dB              |
| 100 dB                       | -79.95 dB     | 0.64 dB              |

# 校正報告

財團法人台灣電子檢驗中心

工 服NO. 19-07-BAC-728-01L

## CALIBRATION REPORT

ELECTRONICS TESTING  
CENTER, TAIWAN

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| Test Description            | Actual Value  | Expanded Uncertainty |
|-----------------------------|---------------|----------------------|
| 10. Display linearity Check |               |                      |
| RBW 300 kHz:                |               |                      |
| 10 dB                       | 9.99 dB       | 0.64 dB              |
| 12 dB                       | 7.99 dB       | 0.64 dB              |
| 14 dB                       | 5.99 dB       | 0.64 dB              |
| 16 dB                       | 3.98 dB       | 0.64 dB              |
| 18 dB                       | 1.97 dB       | 0.64 dB              |
| 20 dB                       | 0.00 dB(Ref.) | -----                |
| 22 dB                       | -2.00 dB      | 0.64 dB              |
| 24 dB                       | -4.01 dB      | 0.64 dB              |
| 26 dB                       | -6.02 dB      | 0.64 dB              |
| 28 dB                       | -8.03 dB      | 0.64 dB              |
| 30 dB                       | -10.00 dB     | 0.64 dB              |
| 32 dB                       | -12.00 dB     | 0.64 dB              |
| 34 dB                       | -14.00 dB     | 0.64 dB              |
| 36 dB                       | -16.01 dB     | 0.64 dB              |
| 38 dB                       | -18.01 dB     | 0.64 dB              |
| 40 dB                       | -20.00 dB     | 0.64 dB              |
| 42 dB                       | -21.99 dB     | 0.64 dB              |
| 44 dB                       | -23.98 dB     | 0.64 dB              |
| 46 dB                       | -25.98 dB     | 0.64 dB              |
| 48 dB                       | -27.99 dB     | 0.64 dB              |
| 50 dB                       | -30.00 dB     | 0.64 dB              |
| 52 dB                       | -32.00 dB     | 0.64 dB              |
| 54 dB                       | -33.99 dB     | 0.64 dB              |
| 56 dB                       | -35.99 dB     | 0.64 dB              |
| 58 dB                       | -38.01 dB     | 0.64 dB              |
| 60 dB                       | -39.99 dB     | 0.64 dB              |
| 65 dB                       | -45.00 dB     | 0.64 dB              |
| 70 dB                       | -49.99 dB     | 0.64 dB              |
| 75 dB                       | -54.98 dB     | 0.64 dB              |
| 80 dB                       | -59.97 dB     | 0.64 dB              |

# 校正報告

財團法人台灣電子檢驗中心

工 服NO. 19-07-BAC-728-01L

## CALIBRATION REPORT

ELECTRONICS TESTING  
CENTER, TAIWAN

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| Test Description               | Actual Value  | Expanded Uncertainty |
|--------------------------------|---------------|----------------------|
| 11. Attenuator accuracy Check: |               |                      |
| 0 dB                           | -9.98 dB      | 0.38 dB              |
| 10 dB                          | 0.00 dB(Ref.) | -----                |
| 20 dB                          | 10.00 dB      | 0.38 dB              |
| 30 dB                          | 20.00 dB      | 0.38 dB              |
| 40 dB                          | 30.01 dB      | 0.38 dB              |
| 50 dB                          | 40.00 dB      | 0.38 dB              |
| 60 dB                          | 50.03 dB      | 0.38 dB              |
| 70 dB                          | 60.06 dB      | 0.38 dB              |
| 12. Reference level            |               |                      |
| switching accuracy             |               |                      |
| Reference level Check:         |               |                      |
| 0 dBm                          | 10.00 dB      | 0.36 dB              |
| -10 dBm                        | 0.00 dB(Ref.) | -----                |
| -20 dBm                        | -10.00 dB     | 0.36 dB              |
| -30 dBm                        | -20.00 dB     | 0.36 dB              |
| -40 dBm                        | -30.00 dB     | 0.36 dB              |
| -50 dBm                        | -40.01 dB     | 0.36 dB              |
| -11 dBm                        | -1.00 dB      | 0.36 dB              |
| -12 dBm                        | -2.00 dB      | 0.36 dB              |
| -13 dBm                        | -3.00 dB      | 0.36 dB              |
| -14 dBm                        | -4.00 dB      | 0.36 dB              |
| -15 dBm                        | -5.00 dB      | 0.36 dB              |
| -16 dBm                        | -6.00 dB      | 0.36 dB              |
| -17 dBm                        | -7.00 dB      | 0.36 dB              |
| -18 dBm                        | -8.00 dB      | 0.36 dB              |
| -19 dBm                        | -9.00 dB      | 0.36 dB              |

說明:

- 1.本校正報告內的項次2、6、7相對擴充不確定度評估與評估表示係依據「ISO Guide 98-3 量測不確定度表示方式指引」，相對擴充不確定度 $U = ku_c$  其中 $u_c$ 為相對組合標準不確定度， $k = 2.0$ ，為信賴水準 95 %之涵蓋因子。  
本校正報告內的項次1、3、4、5、8、9、10、11、12擴充不確定度與評估表示係依據「ISO Guide 98-3 量測不確定度表示方式指引」，擴充不確定度  $U = ku_c$  其中 $u_c$ 為相對組合標準不確定度， $k = 2.0$ ，為信賴水準 95 %之涵蓋因子。
- 2.參考ANSI C63.2及CISPR 16-1-1相關規範。

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 96-17 Date when calibrated 10/17/2017 Page 1 of 2

Item

calibrated

Standard gain horn antenna M22RH

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. Syrid/ Technical manager

Name and position

Date of issue 10/17/2017

# Calibration Certificate

Certificate number **96-17**

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

Calibration is performed by using

1. Wattmeter M 568
2. Calibrator of power M1-11
3. Wattmeter M3-22A
4. Signal generator G4-161
5. Signal generator MG3694C
6. Voltmeter V7-34
7. Frequency meter RCH3-72
8. Frequency meter CH3-66
9. Horn antenna P6-11B
10. Horn antenna P6-80/3

Calibration conditions

Temperature 22.2 °C  
Humidity 45 %  
Pressure 99.7 kPa

Calibration results are given in the Measuring report # 96-17.

| # | Parameter           | Specifications required | Specifications tested and measured |
|---|---------------------|-------------------------|------------------------------------|
| 1 | Frequency range     | 33 – 55 GHz             | Corresponds                        |
| 2 | Waveguide Interface | WR-22                   | Corresponds                        |
| 3 | Gain                | 23.9 dBi                | Corresponds (Table 1)              |
| 4 | Antenna Factor      | 38.7 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 # 96-17**

October 17, 2017

|                                 |                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Customer:                       | Bureau Veritas Group Consumer Products Services<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>Dist., Hsinchu City 300, Taiwan, R.O.C. |
| Item calibrated:                | Standard gain horn antenna M22RH                                                                                                                      |
| Method of calibration:          | GOST 20271.1, MK KL 8.2-16                                                                                                                            |
| Number of samples:              | One                                                                                                                                                   |
| Delivery date of the<br>sample: | 09/18/2017                                                                                                                                            |
| Date of calibration:            | From 09/18/2017 to 10/17/2017                                                                                                                         |

## MEASURING CONDITIONS

|                      |                |                    |
|----------------------|----------------|--------------------|
| Temperature: 22.2 °C | Humidity: 45 % | Pressure: 99.7 kPa |
|----------------------|----------------|--------------------|

## MEASURING EQUIPMENT

| #  | Measuring equipment       | Serial number |
|----|---------------------------|---------------|
| 1  | Wattmeter M 568           | 164           |
| 2  | Calibrator of power M1-11 | 841202        |
| 3  | Wattmeter M3-22A          | 037410        |
| 4  | Signal generator G4-161   | 3             |
| 5  | Signal generator MG3694C  | 133805        |
| 6  | Voltmeter V7-34           | 0067787       |
| 7  | Frequency meter RCH3-72   | 931200        |
| 8  | Frequency meter CH3-66    | 98051         |
| 9  | Horn antenna P6-11B       | 08051         |
| 10 | Horn antenna P6-80/3      | 08112         |

## MEASURING RESULTS

Distance between tested and generating antenna 0.9 m.

Table 1

|                                                          |       |       |       |
|----------------------------------------------------------|-------|-------|-------|
| Frequency, GHz                                           | 33    | 44    | 55    |
| Input Power, mW                                          | 10.0  | 10.0  | 10.0  |
| Power density of electromagnetic field, W/m <sup>2</sup> | 0.117 | 0.199 | 0.291 |
| Maximum level of measured power, μW                      | 139   | 186   | 180   |
| Gain, dB                                                 | 22.6  | 24.0  | 24.2  |
| Antenna Factor, dB/m                                     | 38.0  | 39.1  | 40.8  |
| Expanded uncertainty, dB                                 | 2.5   | 2.6   | 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 97-17 Date when calibrated 10/17/2017 Page 1 of 2

### Item

calibrated **Mixer M22HWD # 110215-1 + Standard gain horn antenna M22RH**

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 **97-17**

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Calibration is performed by using

1. Wattmeter M 568
2. Calibrator of power M1-11
3. Wattmeter M3-22A
4. Signal generator G4-161
5. Signal generator MG3694C
6. Voltmeter V7-34
7. Frequency meter RCH3-72
8. Frequency meter CH3-66
9. Horn antenna P6-11B
10. Horn antenna P6-80/3
11. Spectrum analyzer E4407B
12. Diplexer DPL26

Calibration conditions

Temperature 22.2 °C

Humidity 45 %

Pressure 99.7 kPa

**Calibration results are given in the Measuring report # 97-17.**

| # | Parameter              | Specifications required | Specifications tested and measured |
|---|------------------------|-------------------------|------------------------------------|
| 1 | Frequency range        | 33 – 55 GHz             | Corresponds                        |
| 2 | Waveguide Interface    | WR-22                   | Corresponds                        |
| 3 | LO Input               | +12 – +17 dBm           | Corresponds                        |
| 4 | IF Frequency Range     | 321 – 2400 MHz          | Corresponds                        |
| 5 | Mixer Bias             | +1.86 mA                | Corresponds                        |
| 6 | Conversion Loss        | < 35 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 # 97-17**

October 17, 2017

|                                 |                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Customer:                       | Bureau Veritas Group Consumer Products Services<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>Dist., Hsinchu City 300, Taiwan, R.O.C. |
| Item calibrated:                | Mixer M22HWD # 110215-1 + standard gain horn<br>antenna M22RH                                                                                         |
| Method of calibration:          | GOST 20271.1, MK KL 8.2-16                                                                                                                            |
| Number of samples:              | One                                                                                                                                                   |
| Delivery date of the<br>sample: | 09/18/2017                                                                                                                                            |
| Date of calibration:            | From 09/18/2017 to 10/17/2017                                                                                                                         |

## MEASURING CONDITIONS

|                      |                |                    |
|----------------------|----------------|--------------------|
| Temperature: 22.2 °C | Humidity: 45 % | Pressure: 99.7 kPa |
|----------------------|----------------|--------------------|

## MEASURING EQUIPMENT

| #  | Measuring equipment       | Serial number |
|----|---------------------------|---------------|
| 1  | Wattmeter M 568           | 164           |
| 2  | Calibrator of power M1-11 | 841202        |
| 3  | Wattmeter M3-22A          | 037410        |
| 4  | Signal generator G4-161   | 3             |
| 5  | Signal generator MG3694C  | 133805        |
| 6  | Voltmeter V7-34           | 0067787       |
| 7  | Frequency meter RCH3-72   | 931200        |
| 8  | Frequency meter CH3-66    | 98051         |
| 9  | Horn antenna P6-11B       | 08051         |
| 10 | Horn antenna P6-80/3      | 08112         |
| 11 | Spectrum analyzer E4407B  | MY45110807    |
| 12 | Diplexer DPL26            | 01            |

## MEASURING RESULTS

IF Frequency 321.4 MHz  $\pm$  5 MHz;  
 Mixer Bias +1.86 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 0.9 m.

Table 1

| Frequency, GHz                                           | 33     | 44     | 55     |
|----------------------------------------------------------|--------|--------|--------|
| Input RF power, mW                                       | 0.71   | 0.51   | 0.57   |
| Power density of electromagnetic field, W/m <sup>2</sup> | 0.0091 | 0.0068 | 0.0055 |
| Measured level, dBm                                      | -54.9  | -53.6  | -53.5  |
| Power received by antenna, dBm                           | -20.1  | -20.2  | -19.9  |
| Conversion Loss, dB                                      | 34.8   | 33.4   | 33.6   |
| Expanded uncertainty, dB                                 | 3.0    | 2.9    | 2.8    |

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 101-17 Date when calibrated 10/17/2017 Page 1 of 2

**Item**

**calibrated** Mixer M15HWD # 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

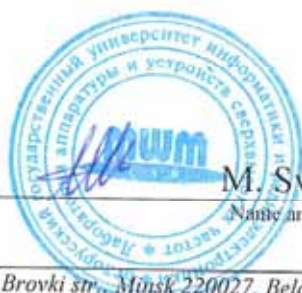
**Method of  
calibration**

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 **101-17**

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 568
2. Wattmeter M 546
3. Spectrum analyzer E4407B
4. Signal generator G4-186
5. Signal generator G4-161
6. Voltmeter V7-34
7. Frequency meter RCH3-72
8. Frequency meter CH3-66
9. Diplexer DPL26

Calibration conditions

Temperature 22.9 °C  
Humidity 44.5 %  
Pressure 98.4 kPa

Calibration results are given in the Measuring report # 101-17.

| # | Parameter                             | Specifications required | Specifications tested and measured |
|---|---------------------------------------|-------------------------|------------------------------------|
| 1 | System Operating Frequency            | 50 – 75 GHz             | Corresponds                        |
| 2 | LO Input                              | +12 – +17 dBm           | Corresponds                        |
| 3 | IF Frequency Range                    | 321 – 2400 MHz          | Corresponds                        |
| 4 | Mixer Bias                            | +4.05 mA                | Corresponds                        |
| 5 | System Waveguide Interface            | WR-15                   | Corresponds                        |
| 6 | Conversion Loss                       | < 37 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 # 101-17**

October 17, 2017

|                                 |                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Customer:                       | Bureau Veritas Group Consumer Products Services<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>Dist., Hsinchu City 300, Taiwan, R.O.C. |
| Item calibrated:                | Mixer M15HWD # 110215-1                                                                                                                               |
| Method of calibration:          | GOST 20271.1, MK KL 8.2-16                                                                                                                            |
| Number of samples:              | One                                                                                                                                                   |
| Delivery date of the<br>sample: | 09/18/2017                                                                                                                                            |
| Date of calibration:            | From 09/18/2017 to 10/17/2017                                                                                                                         |

## MEASURING CONDITIONS

|                      |                  |                    |
|----------------------|------------------|--------------------|
| Temperature: 22.9 °C | Humidity: 44.5 % | Pressure: 98.4 kPa |
|----------------------|------------------|--------------------|

## MEASURING EQUIPMENT

| # | Measuring equipment      | Serial number |
|---|--------------------------|---------------|
| 1 | Wattmeter M 568          | 164           |
| 2 | Wattmeter M 546          | 163           |
| 3 | Spectrum analyzer E4407B | MY45110807    |
| 4 | Signal generator G4-186  | 5             |
| 5 | Signal generator G4-161  | 3             |
| 6 | Voltmeter V7-34          | 0067787       |
| 7 | Frequency meter RCH3-72  | 931200        |
| 8 | Frequency meter CH3-66   | 98051         |
| 9 | Diplexer DPL26           | 01            |

## MEASURING RESULTS

IF Frequency 321.4 MHz  $\pm$  5 MHz;

Mixer Bias +4.05 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             | 50          | 55          | 65          | 75          |
|----------------------------|-------------|-------------|-------------|-------------|
| Input RF Power, dBm        | -20.0       | -20.0       | -20.0       | -20.0       |
| Measured Value, dBm        | -51.2       | -52.6       | -55.0       | -57.4       |
| <b>Conversion Loss, dB</b> | <b>31.2</b> | <b>32.6</b> | <b>35.0</b> | <b>37.4</b> |
| Expanded uncertainty, dB   | 2.0         | 2.1         | 2.2         | 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 102-17 Date when calibrated 10/17/2017 Page 1 of 2

**Item**

**calibrated**

**Standard gain horn antenna M15RH**

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 **102-17**

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 568
2. Wattmeter M 546
3. Signal generator G4-186
4. Signal generator G4-161
5. Voltmeter V7-34
6. Frequency meter RCH3-72
7. Horn antenna P6-134

Calibration conditions

Temperature 22.9 °C

Humidity 44.5 %

Pressure 98.4 kPa

Calibration results are given in the Measuring report # 102-17.

| # | Parameter           | Specifications required | Specifications tested and measured |
|---|---------------------|-------------------------|------------------------------------|
| 1 | Frequency range     | 50 – 75 GHz             | Corresponds                        |
| 2 | Waveguide Interface | WR-15                   | Corresponds                        |
| 3 | Gain                | 24.0 dBi                | Corresponds (Table 1)              |
| 4 | Antenna Factor      | 44.1 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 # 102-17**

October 17, 2017

|                                 |                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Customer:                       | Bureau Veritas Group Consumer Products Services<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>Dist., Hsinchu City 300, Taiwan, R.O.C. |
| Item calibrated:                | Standard gain horn antenna M15RH                                                                                                                      |
| Method of calibration:          | GOST 20271.1, MK KL 8.2-16                                                                                                                            |
| Number of samples:              | One                                                                                                                                                   |
| Delivery date of the<br>sample: | 09/18/2017                                                                                                                                            |
| Date of calibration:            | From 09/18/2017 to 10/17/2017                                                                                                                         |

## MEASURING CONDITIONS

|                      |                  |                    |
|----------------------|------------------|--------------------|
| Temperature: 22.9 °C | Humidity: 44.5 % | Pressure: 98.4 kPa |
|----------------------|------------------|--------------------|

## MEASURING EQUIPMENT

| # | Measuring equipment     | Serial number |
|---|-------------------------|---------------|
| 1 | Wattmeter M 568         | 164           |
| 2 | Wattmeter M 546         | 163           |
| 3 | Signal generator G4-186 | 5             |
| 4 | Signal generator G4-161 | 3             |
| 5 | Voltmeter V7-34         | 0067787       |
| 6 | Frequency meter RCH3-72 | 931200        |
| 7 | Horn antenna P6-134     | 14002         |

## MEASURING RESULTS

Distance between tested and generating antenna 0.6 m.

Table 1

| Frequency, GHz                                           | 50    | 55    | 65    | 75    |
|----------------------------------------------------------|-------|-------|-------|-------|
| Input Power, mW                                          | 10.0  | 10.0  | 10.0  | 10.0  |
| Power density of electromagnetic field, W/m <sup>2</sup> | 0.430 | 0.503 | 0.627 | 0.800 |
| Maximum level of measured power, $\mu$ W                 | 0.283 | 0.288 | 0.269 | 0.263 |
| <b>Gain, dB</b>                                          | 23.6  | 23.7  | 24.0  | 24.1  |
| Antenna factor, dB/m                                     | 40.6  | 41.2  | 42.5  | 43.6  |
| Expanded uncertainty, dB                                 | 2.1   | 2.2   | 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 103-17 Date when calibrated 10/17/2017 Page 1 of 2

### Item

calibrated Mixer M15HWD # 110215-1 + Standard gain horn antenna M15RH

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. Syrid/ Technical manager

Name and position

Date of issue 10/17/2017

# Calibration Certificate

Certificate number **103-17**

Page 2 of 2

Calibration is performed by using

1. Wattmeter M 568
2. Wattmeter M 546
3. Signal generator G4-186
4. Signal generator G4-161
5. Voltmeter V7-34
6. Frequency meter RCH3-72
7. Horn antenna P6-134
8. Spectrum analyzer E4407B
9. Diplexer DPL26

Calibration conditions

Temperature 22.9 °C

Humidity 44.5 %

Pressure 98.4 kPa

**Calibration results are given in the Measuring report # 103-17.**

| # | Parameter              | Specifications required | Specifications tested and measured |
|---|------------------------|-------------------------|------------------------------------|
| 1 | Frequency range        | 50 – 75 GHz             | Corresponds                        |
| 2 | Waveguide Interface    | WR-15                   | Corresponds                        |
| 3 | LO Input               | +12 – +17 dBm           | Corresponds                        |
| 4 | IF Frequency Range     | 321 – 2400 MHz          | Corresponds                        |
| 5 | Mixer Bias             | +4.05 mA                | Corresponds                        |
| 6 | Conversion Loss        | < 37 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 # 103-17**

October 17, 2017

|                                 |                                                                                                                                                       |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| Customer:                       | Bureau Veritas Group Consumer Products Services<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>Dist., Hsinchu City 300, Taiwan, R.O.C. |
| Item calibrated:                | Mixer M15HWD # 110215-1 + standard gain horn<br>antenna M15RH                                                                                         |
| Method of calibration:          | GOST 20271.1, MK KL 8.2-16                                                                                                                            |
| Number of samples:              | One                                                                                                                                                   |
| Delivery date of the<br>sample: | 09/18/2017                                                                                                                                            |
| Date of calibration:            | From 09/18/2017 to 10/17/2017                                                                                                                         |

## MEASURING CONDITIONS

|                      |                  |                    |
|----------------------|------------------|--------------------|
| Temperature: 22.9 °C | Humidity: 44.5 % | Pressure: 98.4 kPa |
|----------------------|------------------|--------------------|

## MEASURING EQUIPMENT

| # | Measuring equipment      | Serial number |
|---|--------------------------|---------------|
| 1 | Wattmeter M 568          | 164           |
| 2 | Wattmeter M 546          | 163           |
| 3 | Signal generator G4-186  | 5             |
| 4 | Signal generator G4-161  | 3             |
| 5 | Voltmeter V7-34          | 0067787       |
| 6 | Frequency meter RCH3-72  | 931200        |
| 7 | Horn antenna P6-134      | 14002         |
| 8 | Spectrum analyzer E4407B | MY45110807    |
| 9 | Diplexer DPL26           | 01            |

## MEASURING RESULTS

IF Frequency 321.4 MHz  $\pm$  5 MHz;

Mixer Bias +4.05 mA;

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

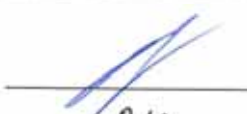
LO Insertion Loss of Diplexer 0.7 dB.

Distance between tested and generating antenna 0.6 m.

Table 1

| Frequency, GHz                                           | 50    | 55    | 65    | 75    |
|----------------------------------------------------------|-------|-------|-------|-------|
| Input RF power, mW                                       | 0.36  | 0.36  | 0.38  | 0.36  |
| Power density of electromagnetic field, W/m <sup>2</sup> | 0.014 | 0.018 | 0.024 | 0.029 |
| Measured Level, dBm                                      | -51.7 | -52.4 | -55.1 | -57.4 |
| Power received by antenna, dBm                           | -20.2 | -19.8 | -19.9 | -20.2 |
| <b>Conversion Loss, dB</b>                               | 31.5  | 32.6  | 35.2  | 37.2  |
| Expanded uncertainty, dB                                 | 2.8   | 2.9   | 2.8   | 2.8   |

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 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<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>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<br>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       |
| <b>Conversion Loss, dB</b> | <b>43.3</b> | <b>41.0</b> | <b>42.8</b> |
| 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

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

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**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<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>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<br>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       |
| <b>Conversion Loss, dB</b> | <b>43.3</b> | <b>41.0</b> | <b>42.8</b> |
| 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

ISO 17025  
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

*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 **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<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>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<br>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 <sup>2</sup> | 0.499 | 0.747 | 0.940 |
| Maximum level of measured power, $\mu$ W                 | 144   | 147   | 140   |
| <b>Gain, dB</b>                                          | 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

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 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

*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 **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<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>Dist., Hsinchu City 300, Taiwan, R.O.C. |
| Item calibrated:                | Mixer M10HWD # 110215-1 + standard gain horn<br>antenna M10RH                                                                                         |
| Method of calibration:          | GOST 20271.1, MK KL 8.2-16                                                                                                                            |
| Number of samples:              | One                                                                                                                                                   |
| Delivery date of the<br>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).

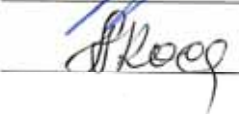
LO Insertion Loss of Diplexer 0.7 dB.

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 <sup>2</sup> | 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.

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 $\mu$ 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<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>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<br>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       |
| <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

*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<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>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<br>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 <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.

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

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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<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>Dist., Hsinchu City 300, Taiwan, R.O.C. |
| Item calibrated:                | Mixer M06HWD # 110215-1 + standard gain horn<br>antenna M06RH                                                                                         |
| Method of calibration:          | GOST 20271.1, MK KL 8.2-16                                                                                                                            |
| Number of samples:              | One                                                                                                                                                   |
| Delivery date of the<br>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 <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

*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**

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Technical Manager



M. Svirid

**MEASURING REPORT # 92-17**

October 17, 2017

|                                 |                                                                                                                                                       |
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| Customer:                       | Bureau Veritas Group Consumer Products Services<br>Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East<br>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<br>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       |
| <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

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