

工服 NO. 21-02-BCC-067-01L 財團法人台灣商品檢測驗證中心



收件日期: Feb.04,2021

Receipt Date

發行日期: Feb.17,2021

Report Issue Date

校正報告 CALIBRATION REPORT

TAIWAN TESTING AND CERTIFICATION CENTER

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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 新竹市科學園區力行一路1號E-2

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: MY55330160

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

環境狀態: 環境溫度: $(23 \pm 2) ^\circ\text{C}$, 相對濕度: $(50 \pm 10) \%$

Environmental Conditions

校正日期: Feb.05,2021

Calibration Date

建議再校日期: Feb.04,2022

註: 建議再校日期為應顧客要求列入。

Recommended Recalibration Date

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

校正地點: 財團法人台灣商品檢測驗證中心校正實驗室

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

財團法人台灣商品檢測驗證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。

Taiwan Testing and Certification Center 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 Taiwan Testing and Certification Center are capable of performing services in compliance with the requirements of ISO/IEC 17025.

財團法人台灣商品檢測驗證中心

Taiwan Testing and Certification Center

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。

使用標準器及零配件 STANDARD AND ACCESSORIES USED

儀器名稱【廠牌/型號】 Nomenclature【Mfg./Model No.】	【識別號碼】 【ID. No.】	校正單位(認可編號) Cal. Source(ACRED Code)	報告號碼 Cal. Report No.	校正日期 Date Cal.	有效日期 Due Date
RF Step Attenuator 【R/S RSG】 【13050122-001】		R&S(DAKKS D-K-15195-01-01)	D-K-15195-01-01 2018-03	2018/03/08	2021/09/07
EPM Series Power Meter 【HP E4419B】 【13050609-001】		NML(TAF N0688)	U200156A	2020/11/20	2022/05/19
Swept Signal Generator 【AGILENT 83650B】 【13051703-001】		ETC(TAF 0025)	20-06-BAC-570-16L	2020/07/10	2021/07/09
Signal Generator 【R&S/SMB100A】 【13051715-001】		R&S(DAKKS D-K-15195-01-01)	532388	2019/11/26	2023/05/25
Power Sensor 【AGILENT 8482A】 【13053506-001】		KEYSIGHT(ANAB AC-1498)	1-11911589522-1	2019/11/14	2022/05/13
Power Sensor 【AGILENT 8487A】 【13053508-003】		KEYSIGHT(ANAB AC-1498)	1-12179698623-1	2020/01/15	2022/07/14
Universal Counter 【HP 53132A】 【13060804-001】		ETC(TAF 0025)	20-11-BAC-532-44L	2020/12/30	2021/06/29

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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	1.2×10^{-6}
10 MHz SPAN	1.500000 GHz	1.2×10^{-5}
20 MHz SPAN	1.500000 GHz	1.2×10^{-5}
50 MHz SPAN	1.500000 GHz	1.2×10^{-5}
100 MHz SPAN	1.500000 GHz	1.2×10^{-4}
1 GHz SPAN	1.499 GHz	1.2×10^{-3}
(a.2) 4.0 GHz Center Freq.		
1 MHz SPAN	4.000000 GHz	1.2×10^{-6}
10 MHz SPAN	4.000000 GHz	1.2×10^{-5}
20 MHz SPAN	4.000000 GHz	1.2×10^{-5}
50 MHz SPAN	4.000000 GHz	1.2×10^{-5}
100 MHz SPAN	4.000000 GHz	1.2×10^{-4}
1 GHz SPAN	3.999 GHz	1.2×10^{-3}
(a.3) 9.0 GHz Center Freq.		
1 MHz SPAN	9.000000 GHz	1.2×10^{-5}
10 MHz SPAN	9.000000 GHz	1.2×10^{-5}
20 MHz SPAN	9.000000 GHz	1.2×10^{-5}
50 MHz SPAN	9.000000 GHz	1.2×10^{-4}
100 MHz SPAN	9.000000 GHz	1.2×10^{-3}
1 GHz SPAN	8.999 GHz	1.2×10^{-6}
(a.4) 16.0 GHz Center Freq.		
1 MHz SPAN	16.000000 GHz	1.2×10^{-5}
10 MHz SPAN	16.000000 GHz	1.2×10^{-5}
20 MHz SPAN	16.000000 GHz	1.2×10^{-4}
50 MHz SPAN	16.000000 GHz	1.2×10^{-3}
100 MHz SPAN	16.000000 GHz	1.2×10^{-6}
1 GHz SPAN	15.999 GHz	1.2×10^{-5}

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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	1.2×10^{-6}
10 MHz SPAN	21.000000 GHz	1.2×10^{-5}
20 MHz SPAN	21.000000 GHz	1.2×10^{-5}
50 MHz SPAN	21.000000 GHz	1.2×10^{-5}
100 MHz SPAN	21.000000 GHz	1.2×10^{-4}
1 GHz SPAN	20.999999 GHz	1.2×10^{-3}
(a.6)29.0 GHz Center Freq.		
1 MHz SPAN	29.000000 GHz	1.2×10^{-6}
10 MHz SPAN	29.000000 GHz	1.2×10^{-5}
20 MHz SPAN	29.000000 GHz	1.2×10^{-5}
50 MHz SPAN	29.000000 GHz	1.2×10^{-5}
100 MHz SPAN	29.000000 GHz	1.2×10^{-4}
1 GHz SPAN	28.999999 GHz	1.2×10^{-3}
(a.7)35.0 GHz Center Freq.		
1 MHz SPAN	35.000000 GHz	1.2×10^{-5}
10 MHz SPAN	35.000000 GHz	1.2×10^{-5}
20 MHz SPAN	35.000000 GHz	1.2×10^{-5}
50 MHz SPAN	35.000000 GHz	1.2×10^{-4}
100 MHz SPAN	35.000000 GHz	1.2×10^{-3}
1 GHz SPAN	34.999999 GHz	1.2×10^{-6}
(b)Freq. Count Marker Accuracy:		
1.5 GHz Center Freq.	1.50000000 GHz	5.0×10^{-8}
4.0 GHz Center Freq.	4.00000000 GHz	5.0×10^{-8}
9.0 GHz Center Freq.	9.00000000 GHz	5.0×10^{-8}
16.0 GHz Center Freq.	16.00000000 GHz	5.0×10^{-8}
21.0 GHz Center Freq.	21.00000000 GHz	5.0×10^{-8}
29.0 GHz Center Freq.	29.00000000 GHz	5.0×10^{-8}
35.0 GHz Center Freq.	35.00000000 GHz	5.0×10^{-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	-103.43 dBc	0.86 dB
2621.4 MHz	-102.60 dBc	0.84 dB
2321.4 MHz	-102.47 dBc	0.90 dB
2600.0 MHz	-102.51 dBc	0.93 dB
7910.7 MHz	-102.50 dBc	0.89 dB
9821.4 MHz	-104.10 dBc	1.2 dB
(b)4 GHz Center Freq.		
4021.4 MHz	-101.56 dBc	0.90 dB
4621.4 MHz	-101.48 dBc	0.85 dB
4321.4 MHz	-101.39 dBc	0.86 dB
4600.0 MHz	-101.51 dBc	0.90 dB
8310.7 MHz	-101.63 dBc	0.85 dB
8932.1 MHz	-101.55 dBc	0.96 dB
(c)9 GHz Center Freq.		
9021.4 MHz	-100.61 dBc	0.84 dB
9621.4 MHz	-100.68 dBc	0.88 dB
9321.4 MHz	-99.50 dBc	0.94 dB
9600.0 MHz	-99.48 dBc	0.91 dB
18310.7 MHz	-99.49 dBc	0.91 dB
18932.1 MHz	-99.52 dBc	0.89 dB
(d)15 GHz Center Freq.		
15021.400 MHz	-101.93 dBc	1.1 dB
15621.400 MHz	-102.35 dBc	0.94 dB
22655.350 MHz	-102.50 dBc	0.98 dB
23276.750 MHz	-102.71 dBc	0.94 dB
7344.650 MHz	-102.39 dBc	0.88 dB
7966.050 MHz	-101.83 dBc	0.94 dB
(e)20 GHz Center Freq.		
20021.400 MHz	-101.34 dBc	1.1 dB
20621.400 MHz	-101.76 dBc	0.95 dB
15543.725 MHz	-101.66 dBc	0.94 dB
25699.075 MHz	-101.54 dBc	0.95 dB
9844.650 MHz	-101.60 dBc	0.93 dB
10466.050 MHz	-101.78 dBc	0.90 dB

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3. Image, Multiple, and Out-of-Band Response(Continued):		
(f)29 GHz Center Freq.		
28378.600 MHz	-101.27 dBc	1.2 dB
28978.600 MHz	-98.89 dBc	1.2 dB
24450.925 MHz	-100.45 dBc	1.3 dB
28700.000 MHz	-101.46 dBc	1.3 dB
16455.350 MHz	-100.30 dBc	1.3 dB
35272.325 MHz	-100.85 dBc	1.2 dB
(g)35 GHz Center Freq.		
35021.400 MHz	-97.38 dBc	1.2 dB
35621.400 MHz	-97.43 dBc	1.3 dB
33093.725 MHz	-98.39 dBc	1.3 dB
35321.400 MHz	-98.44 dBc	1.3 dB
8744.538 MHz	-97.52 dBc	1.3 dB
15544.650 MHz	-96.98 dBc	1.4 dB
4. Frequency accuracy:	10.0000002 MHz	3.5×10^{-8}
5. IF bandwidth level accuracy Check:		
100 Hz	0.00 dB	0.32 dB
300 Hz	0.00 dB	0.32 dB
1 kHz	0.00 dB	0.32 dB
3 kHz	0.01 dB	0.32 dB
10 kHz	0.00 dB(Ref.)	0.32 dB
30 kHz	0.01 dB	0.32 dB
100 kHz	0.01 dB	0.32 dB
300 kHz	0.01 dB	0.32 dB
1 MHz	0.02 dB	0.32 dB
3 MHz	0.03 dB	0.32 dB

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Test Description	Actual Value	Expanded Uncertainty
6. IF bandwidth (3 dB) Check:		
Bandwidth		
100 Hz	100.0 Hz	4.4 %
300 Hz	300.2 Hz	4.4 %
1 kHz	1.001 kHz	4.4 %
3 kHz	2.999 kHz	4.4 %
10 kHz	10.00 kHz	4.4 %
30 kHz	30.05 kHz	4.4 %
100 kHz	100.2 kHz	4.4 %
300 kHz	300.7 kHz	4.4 %
1 MHz	1.000 MHz	4.4 %
3 MHz	2.986 MHz	4.4 %
7. IF Bandwidths (3 dB)		
Shape factor Check:		
100 Hz	3.86	6.1 %
300 Hz	4.12	6.1 %
1 kHz	4.32	6.1 %
3 kHz	3.98	6.1 %
10 kHz	4.01	6.1 %
30 kHz	4.17	6.1 %
100 kHz	4.09	6.1 %
300 kHz	4.11	6.1 %
1 MHz	4.08	6.1 %
3 MHz	3.97	6.1 %

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Test Description	Actual Value	Expanded Uncertainty
8. Noise Display Check :		
9 kHz	-141.8 dBm	0.76 dB
100 kHz	-143.7 dBm	0.76 dB
999 kHz	-145.4 dBm	0.76 dB
10.99 MHz	-145.3 dBm	0.76 dB
19.99 MHz	-146.1 dBm	0.76 dB
49.99 MHz	-146.1 dBm	0.76 dB
99.99 MHz	-145.3 dBm	0.76 dB
199.9 MHz	-146.6 dBm	0.76 dB
499.9 MHz	-146.1 dBm	0.76 dB
999.9 MHz	-145.8 dBm	0.76 dB
1499 MHz	-145.1 dBm	0.88 dB
1999 MHz	-144.7 dBm	0.88 dB
2499 MHz	-144.1 dBm	0.88 dB
2999 MHz	-146.0 dBm	0.88 dB
3099 MHz	-145.2 dBm	0.88 dB
3499 MHz	-145.1 dBm	0.88 dB
3999 MHz	-144.5 dBm	0.88 dB
4499 MHz	-144.5 dBm	0.88 dB
4999 MHz	-143.9 dBm	0.88 dB
5499 MHz	-144.4 dBm	0.88 dB
5999 MHz	-143.2 dBm	0.88 dB
6499 MHz	-146.7 dBm	0.88 dB
6999 MHz	-146.2 dBm	0.88 dB
7999 MHz	-145.9 dBm	0.88 dB
8999 MHz	-146.1 dBm	0.88 dB
9999 MHz	-145.8 dBm	0.88 dB
10999 MHz	-146.3 dBm	0.88 dB
11999 MHz	-145.9 dBm	0.88 dB
12999 MHz	-145.2 dBm	0.88 dB
13999 MHz	-145.7 dBm	0.88 dB
14999 MHz	-145.5 dBm	0.88 dB
15999 MHz	-144.2 dBm	0.88 dB
16999 MHz	-143.1 dBm	0.88 dB

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Test Description	Actual Value	Expanded Uncertainty
8. Noise Display Check (@ Continued):		
17999 MHz	-143.9 dBm	0.88 dB
18999 MHz	-142.0 dBm	0.88 dB
19999 MHz	-142.0 dBm	0.88 dB
20999 MHz	-141.0 dBm	0.88 dB
21999 MHz	-142.2 dBm	0.88 dB
22999 MHz	-143.5 dBm	0.88 dB
23999 MHz	-143.9 dBm	0.88 dB
24999 MHz	-143.6 dBm	0.88 dB
25999 MHz	-143.2 dBm	0.88 dB
26999 MHz	-143.8 dBm	0.88 dB
27999 MHz	-143.5 dBm	0.88 dB
28999 MHz	-143.1 dBm	0.88 dB
29999 MHz	-142.8 dBm	0.88 dB
30999 MHz	-142.2 dBm	0.88 dB
31999 MHz	-140.7 dBm	0.88 dB
32999 MHz	-140.0 dBm	0.88 dB
33999 MHz	-139.2 dBm	0.88 dB
34999 MHz	-139.7 dBm	0.88 dB
35999 MHz	-139.0 dBm	0.88 dB
36999 MHz	-138.7 dBm	0.88 dB
37999 MHz	-137.9 dBm	0.88 dB
38999 MHz	-136.9 dBm	0.88 dB
39999 MHz	-135.9 dBm	0.88 dB

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Test Description	Actual Value	Expanded Uncertainty
9. Frequency response Check:		
RF Attenuation 10 dB		
100 kHz	-0.11 dB	0.66 dB
1 MHz	-0.12 dB	0.66 dB
10 MHz	-0.09 dB	0.66 dB
50 MHz	-0.05 dB	0.66 dB
100 MHz	-0.02 dB	0.66 dB
200 MHz	-0.03 dB	0.66 dB
300 MHz	-0.04 dB	0.66 dB
400 MHz	-0.06 dB	0.66 dB
500 MHz	-0.05 dB	0.66 dB
600 MHz	-0.04 dB	0.66 dB
700 MHz	-0.01 dB	0.66 dB
800 MHz	0.03 dB	0.66 dB
900 MHz	0.02 dB	0.66 dB
1000 MHz	0.02 dB	0.66 dB
1500 MHz	-0.08 dB	0.66 dB
2000 MHz	-0.06 dB	0.66 dB
2500 MHz	0.06 dB	0.66 dB
2990 MHz	0.05 dB	0.66 dB
3010 MHz	0.04 dB	0.70 dB
3500 MHz	0.09 dB	0.70 dB
4000 MHz	0.14 dB	0.70 dB
4500 MHz	0.15 dB	0.70 dB
5000 MHz	0.17 dB	0.70 dB
5500 MHz	0.19 dB	0.70 dB
6000 MHz	0.18 dB	0.70 dB
6500 MHz	0.15 dB	0.70 dB
6990 MHz	0.14 dB	0.70 dB
7100 MHz	0.16 dB	0.70 dB
8000 MHz	0.19 dB	0.70 dB
9000 MHz	0.18 dB	0.70 dB
10000 MHz	0.20 dB	0.70 dB
11000 MHz	-0.60 dB	0.70 dB
12000 MHz	-0.69 dB	0.70 dB
13000 MHz	-0.61 dB	0.70 dB

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9. Frequency response Check(@ Continued):		
RF Attenuation 10 dB		
13500 MHz	-0.64 dB	0.70 dB
14000 MHz	-0.65 dB	0.70 dB
15000 MHz	-0.67 dB	0.70 dB
16000 MHz	-0.71 dB	0.70 dB
17000 MHz	-0.69 dB	0.70 dB
18000 MHz	-0.64 dB	0.70 dB
19000 MHz	-0.59 dB	0.98 dB
20000 MHz	-0.57 dB	0.98 dB
21000 MHz	-0.52 dB	0.98 dB
22000 MHz	-0.57 dB	0.98 dB
23000 MHz	-0.60 dB	0.98 dB
24000 MHz	-0.61 dB	0.98 dB
25000 MHz	-0.57 dB	0.98 dB
26000 MHz	-0.49 dB	0.98 dB
27000 MHz	-0.32 dB	1.3 dB
28000 MHz	-0.59 dB	1.3 dB
29000 MHz	-0.52 dB	1.3 dB
29900 MHz	-0.41 dB	1.3 dB
31000 MHz	-0.43 dB	1.3 dB
32000 MHz	-0.39 dB	1.3 dB
33000 MHz	-0.32 dB	1.3 dB
34000 MHz	-0.46 dB	1.3 dB
35000 MHz	-0.35 dB	1.3 dB
36000 MHz	-0.48 dB	1.3 dB
37000 MHz	-0.53 dB	1.3 dB
38000 MHz	-0.49 dB	1.3 dB
39000 MHz	-0.48 dB	1.3 dB
39999 MHz	-0.51 dB	1.3 dB
42990 MHz	-0.55 dB	1.3 dB
44000 MHz	-0.53 dB	1.3 dB
45000 MHz	-0.49 dB	1.3 dB
46000 MHz	-0.53 dB	1.3 dB
47000 MHz	-0.58 dB	1.3 dB
48000 MHz	-0.65 dB	1.3 dB
49000 MHz	-0.53 dB	1.3 dB
49999 MHz	-0.40 dB	1.3 dB

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9. Frequency response Check(@ Continued):		
RF Attenuation 20 dB		
100 kHz	0.11 dB	0.64 dB
1 MHz	0.09 dB	0.64 dB
10 MHz	0.03 dB	0.64 dB
50 MHz	-0.02 dB	0.64 dB
100 MHz	0.02 dB	0.64 dB
200 MHz	0.01 dB	0.64 dB
300 MHz	0.01 dB	0.64 dB
400 MHz	0.02 dB	0.64 dB
500 MHz	0.06 dB	0.64 dB
600 MHz	0.05 dB	0.64 dB
700 MHz	0.04 dB	0.64 dB
800 MHz	0.03 dB	0.64 dB
900 MHz	0.03 dB	0.64 dB
1000 MHz	0.02 dB	0.64 dB
1500 MHz	0.05 dB	0.64 dB
2000 MHz	0.08 dB	0.64 dB
2500 MHz	0.11 dB	0.64 dB
2990 MHz	0.15 dB	0.64 dB
RF Attenuation 40 dB		
100 kHz	0.09 dB	0.62 dB
1 MHz	0.07 dB	0.62 dB
10 MHz	0.03 dB	0.62 dB
50 MHz	-0.02 dB	0.62 dB
100 MHz	-0.05 dB	0.62 dB
200 MHz	0.00 dB	0.62 dB
300 MHz	0.01 dB	0.62 dB
400 MHz	0.02 dB	0.62 dB
500 MHz	0.05 dB	0.62 dB
600 MHz	0.04 dB	0.62 dB
700 MHz	0.04 dB	0.62 dB
800 MHz	0.03 dB	0.62 dB
900 MHz	0.03 dB	0.62 dB
1000 MHz	0.02 dB	0.62 dB
1500 MHz	0.05 dB	0.62 dB
2000 MHz	0.08 dB	0.62 dB
2500 MHz	0.11 dB	0.62 dB
2990 MHz	0.12 dB	0.64 dB

校正報告

財團法人台灣商品檢測驗證中心

工 服NO. 21-02-BCC-067-01L

CALIBRATION REPORT

TAIWAN TESTING AND
CERTIFICATION CENTER

Page 14 of 16

Test Description	Actual Value	Expanded Uncertainty
10. Display linearity Check:		
RBW 300 Hz		
10 dB	9.98 dB	0.64 dB
12 dB	7.98 dB	0.64 dB
14 dB	5.98 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.)	0.64 dB
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	-8.02 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	-18.04 dB	0.64 dB
40 dB	-19.98 dB	0.64 dB
42 dB	-21.97 dB	0.64 dB
44 dB	-23.98 dB	0.64 dB
46 dB	-25.99 dB	0.64 dB
48 dB	-28.00 dB	0.64 dB
50 dB	-29.97 dB	0.64 dB
52 dB	-31.99 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	-39.99 dB	0.64 dB
65 dB	-44.99 dB	0.64 dB
70 dB	-49.98 dB	0.64 dB
75 dB	-54.99 dB	0.64 dB
80 dB	-59.98 dB	0.64 dB
85 dB	-64.97 dB	0.64 dB
90 dB	-69.94 dB	0.64 dB
95 dB	-74.92 dB	0.64 dB
100 dB	-79.91 dB	0.64 dB

校正報告

財團法人台灣商品檢測驗證中心

工 服NO. 21-02-BCC-067-01L

CALIBRATION REPORT

TAIWAN TESTING AND
CERTIFICATION CENTER

Page 15 of 16

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	5.98 dB	0.64 dB
16 dB	3.97 dB	0.64 dB
18 dB	1.96 dB	0.64 dB
20 dB	0.00 dB(Ref.)	0.64 dB
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	-10.01 dB	0.64 dB
32 dB	-12.01 dB	0.64 dB
34 dB	-14.00 dB	0.64 dB
36 dB	-16.01 dB	0.64 dB
38 dB	-18.02 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	-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	-38.01 dB	0.64 dB
60 dB	-40.01 dB	0.64 dB
65 dB	-45.01 dB	0.64 dB
70 dB	-49.99 dB	0.64 dB
75 dB	-55.01 dB	0.64 dB
80 dB	-60.03 dB	0.64 dB

校正報告

財團法人台灣商品檢測驗證中心

工 服NO. 21-02-BCC-067-01L

CALIBRATION REPORT

TAIWAN TESTING AND
CERTIFICATION CENTER

Page 16 of 16

Test Description	Actual Value	Expanded Uncertainty
11. Attenuator accuracy Check:		
0 dB	-9.99 dB	0.34 dB
10 dB	0.00 dB(Ref.)	0.34 dB
20 dB	10.00 dB	0.34 dB
30 dB	20.01 dB	0.34 dB
40 dB	30.00 dB	0.34 dB
50 dB	40.01 dB	0.34 dB
60 dB	50.02 dB	0.34 dB
70 dB	60.03 dB	0.34 dB
12. Reference level		
switching accuracy		
Reference level Check:		
0 dBm	10.00 dB	0.36 dB
-10 dBm	0.00 dB(Ref.)	0.36 dB
-20 dBm	-10.00 dB	0.36 dB
-30 dBm	-20.00 dB	0.36 dB
-40 dBm	-30.01 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1、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。



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

Certificate of Conformance

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

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

Packing List No: 191673
Shipping Date: 05/31/19

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

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

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

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


Authorized Signature
Virginia Diodes, Inc



Virginia Diodes, Inc

Certificate of Conformance

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

From: Virginia Diodes, Inc

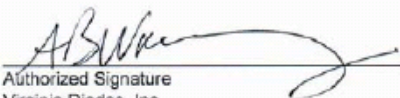
Packing List No: 191738
Shipping Date: 06/10/19

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

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

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

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


Authorized Signature
Virginia Diodes, Inc



Virginia Diodes, Inc

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

Certificate of Conformance

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

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

Packing List No: 191745
Shipping Date: 06/10/19

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

Attention: Ryan England
Phone: 707-577-5741
SO: 3922450

Quantity Shipped	Unit	Description	Order-Job Number
1	EA	VDIWR3.4SAX N9029-80047 Rev - 001 / SN: SAX 376	19195A-01
1	EA	VDI3.4SWG2-30 N9029-80033 Rev - 001 / SN: 1-19	19195A-02

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



Authorized Signature
Virginia Diodes, Inc

**Calibration Laboratory of Microwave Measuring Equipment
of MWMLab**



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 5.0065 of 09.01.2015

Certificate number 08-21 Date when calibrated 11.02.2021 Page 1 of 2

Item calibrated Signal Generator Extension Module # SGX 648 (E8257DV15)

Customer Bureau Veritas Consumer Products Services (Hong Kong) Limited,
Taoyuan Branch

Method of calibration GOST 20271.1, MK KL 05.3-2014

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Power measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

Authorising signature _____ **/ Technical manager** **Date of issue 11.02.2021**

Calibration Certificate

Certificate number **08-21**

Page 2 of 2

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 546	Reference power meter	163	24 March 2022	1/111-174-20	RF Power
M 568	Reference power meter	164	24 March 2022	1/111-175-20	RF Power
V7-34	Universal voltmeter	0067787	23 September 2021	2742-42	DC Voltage
RCH3-72	Frequency meter	931200	18 September 2021	2822-43	Frequency
MG3694C	Signal generator	133805	11 September 2021	2726-43	RF Power Frequency

Calibration conditions

Temperature: 22.2 °C.

Humidity: 37.0 %.

Pressure: 100.2 kPa.

Calibration results are given in the measurement report # 08-21

#	Parameter	Specifications required	Specifications tested and measured
1	RF Frequency Band	50 – 75 GHz	Corresponds
2	Multiplication Factor (Low / High)	4 / 2	Corresponds
3	Low Frequency RF Input	12.5 – 18.75 GHz	Corresponds
4	Low Freq. RF Input Power (Typical / Damage)	10 dBm ± 3dB / 16 dBm	Corresponds
5	High Frequency RF Input	25 – 37.5 GHz	Corresponds
6	High Freq. RF Input Power (Typical / Damage)	0 dBm ± 3dB / 6 dBm	Corresponds (Table 1)
7	Output Power (Typical / Minimum)	20* dBm / 17 dBm	Corresponds

* – Expanded uncertainty of measurements 0.70 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Signature of the person who has performed calibration

/ Engineer

Calibration Laboratory of Microwave Measuring Equipment
of MWMLab



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. **№ BY/112 5.0065** of **09.01.2015**

Certificate number **09-21** Date when calibrated **11.02.2021** Page **1** of **2**

Item calibrated Signal Generator Extension Module # SGX 647 (E8257DV10)

Customer Bureau Veritas Consumer Products Services (Hong Kong) Limited,
Taoyuan Branch

Method of calibration GOST 20271.1, MK KL 05.3-2014

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Power measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

Authorising signature _____ / Technical manager **Date of issue 11.02.2021**

Calibration Certificate

Certificate number **09-21**

Page 2 of 2

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 546	Reference power meter	163	24 March 2022	1/111-174-20	RF Power
M 534	Reference power meter	161	24 March 2022	1/111-173-20	RF Power
V7-34	Universal voltmeter	0067787	23 September 2021	2742-42	DC Voltage
RCH3-72	Frequency meter	931200	18 September 2021	2822-43	Frequency
MG3694C	Signal generator	133805	11 September 2021	2726-43	RF Power Frequency

Calibration conditions

Temperature: 22.2 °C.

Humidity: 37.0 %.

Pressure: 100.2 kPa.

Calibration results are given in the measurement report # 09-21

#	Parameter	Specifications required	Specifications tested and measured
1	RF Frequency Band	75 – 110 GHz	Corresponds
2	Multiplication Factor (Low / High)	6 / 3	Corresponds
3	Low Frequency RF Input	12.5 – 18.33 GHz	Corresponds
4	Low Freq. RF Input Power (Typical / Damage)	10 dBm ± 3dB / 16 dBm	Corresponds
5	High Frequency RF Input	25 – 36.67 GHz	Corresponds
6	High Freq. RF Input Power (Typical / Damage)	0 dBm ± 3dB / 6 dBm	Corresponds (Table 1)
7	Output Power (Typical / Minimum)	14* dBm / 10 dBm	Corresponds

* – Expanded uncertainty of measurements 0.80 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Signature of the person who has performed calibration

/ Engineer

Calibration Laboratory of Microwave Measuring Equipment
of MWMLab



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. **№ BY/112 5.0065** of **09.01.2015**

Certificate number **10-21** Date when calibrated **11.02.2021** Page **1** of **2**

Item calibrated Signal Generator Extension Module # SGX 645 (E8257DV06)

Customer Bureau Veritas Consumer Products Services (Hong Kong) Limited,
Taoyuan Branch

Method of calibration GOST 20271.1, MK KL 05.3-2014

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Power measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

Authorising signature _____ / Technical manager **Date of issue 11.02.2021**

Calibration Certificate

Certificate number **10-21**

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

Calibration is performed by using

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

Calibration conditions

Temperature: 22.2 °C.

Humidity: 37.0 %.

Pressure: 100.2 kPa.

Calibration results are given in the measurement report # 10-21

#	Parameter	Specifications required	Specifications tested and measured
1	RF Frequency Band	110 – 170 GHz	Corresponds
2	Multiplication Factor (Low / High)	12 / 4	Corresponds
3	Low Frequency RF Input	9.17 – 14.17 GHz	Corresponds
4	Low Freq. RF Input Power (Typical / Damage)	10 dBm ± 3dB / 16 dBm	Corresponds
5	High Frequency RF Input	27.5 – 42.5 GHz	Corresponds
6	High Freq. RF Input Power (Typical / Damage)	0 dBm ± 3dB / 6 dBm	Corresponds (Table 1)
7	Output Power (Typical / Minimum)	8* dBm / 3 dBm	Corresponds

* – Expanded uncertainty of measurements 1.0 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Signature of the person who has performed calibration

/ Engineer

Calibration Laboratory of Microwave Measuring Equipment
of MWMLab



ISO 17025
ACCREDITED LABORATORY

Calibration certificate



Accreditation certificate No. **№ BY/112 5.0065** of **09.01.2015**

Certificate number **11-21** Date when calibrated **11.02.2021** Page **1** of **2**

Item calibrated Signal Generator Extension Module # SGX 644 (E8257DV05)

Customer Bureau Veritas Consumer Products Services (Hong Kong) Limited,
Taoyuan Branch

Method of calibration GOST 20271.1, MK KL 05.3-2014

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Power measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

Authorising signature _____ / Technical manager **Date of issue 11.02.2021**

Calibration Certificate

Certificate number **11-21**

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

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 523	Reference power meter	162	24 March 2022	1/111-172-20	RF Power
M 514	Reference power meter	165	24 March 2022	1/111-176-20	RF Power
V7-34	Universal voltmeter	0067787	23 September 2021	2742-42	DC Voltage
RCH3-72	Frequency meter	931200	18 September 2021	2822-43	Frequency
MG3694C	Signal generator	133805	11 September 2021	2726-43	RF Power Frequency

Calibration conditions

Temperature: 22.2 °C.

Humidity: 37.0 %.

Pressure: 100.2 kPa.

Calibration results are given in the measurement report # 11-21

#	Parameter	Specifications required	Specifications tested and measured
1	RF Frequency Band	140 – 220 GHz	Corresponds
2	Multiplication Factor (Low / High)	12 / 6	Corresponds
3	Low Frequency RF Input	11.67 – 18.33 GHz	Corresponds
4	Low Freq. RF Input Power (Typical / Damage)	10 dBm ± 3dB / 16 dBm	Corresponds
5	High Frequency RF Input	23.33 – 36.67 GHz	Corresponds
6	High Freq. RF Input Power (Typical / Damage)	0 dBm ± 3dB / 6 dBm	Corresponds (Table 1)
7	Output Power (Typical / Minimum)	4* dBm / 0 dBm	Corresponds

* – Expanded uncertainty of measurements 1.2 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Signature of the person who has performed calibration

/ Engineer

工服 NO. 21-06-BCC-133-01L 財團法人台灣商品檢測驗證中心



校正報告

CALIBRATION REPORT

收件日期: Jun.10,2021

Receipt Date

發行日期: Jun.22,2021

Report Issue Date

TAIWAN TESTING AND CERTIFICATION CENTER

Page 1 of 6

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 新竹市科學園區力行一路1號E-2

Address

供校儀器 ITEM CALIBRATED

儀器名稱: PSG Analog Signal Generator

Nomenclature

製造商: KEYSIGHT

Manufacturer

型別: E8257D

Model No.

識別號碼: MY53401987

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

環境狀態: 環境溫度: $(23 \pm 2) ^\circ\text{C}$, 相對濕度: $(50 \pm 10) \%$

Environmental Conditions

校正日期: Jun.18,2021

Calibration Date

建議再校日期: Jun.17,2022

註: 建議再校日期為應顧客要求列入。

Recommended Recalibration Date

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

校正地點: 財團法人台灣商品檢測驗證中心校正實驗室

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 42882 台中市大雅區科雅西路29號2樓217室 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

財團法人台灣商品檢測驗證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。

Taiwan Testing and Certification Center 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 Taiwan Testing and Certification Center are capable of performing services in compliance with the requirements of ISO/IEC 17025.

財團法人台灣商品檢測驗證中心

Taiwan Testing and Certification Center

報告簽署人

Signature



使用校正依據 CALIBRATION PROCEDURE USED

1. 「信號產生器校正程序書」，B00-CD-369，4th Edition。

使用標準器及附件 STANDARD AND ACCESSORIES USED

儀器名稱【廠牌/型號】 Nomenclature【Mfg./Model No.】	【識別號碼】 【ID. No.】	校正單位(認可編號) Cal. Source(ACRED Code)	報告號碼 Cal. Report No.	校正日期 Date Cal.	有效日期 Due Date
EPM Series Power Meter 【HP E4419B】 【13050609-001】		NML(TAF N0688)	U200156A	2020/11/20	2022/05/19
Avg Power Sensor 【AGILENT E9304A】 【13053522-001】		KEYSIGHT(ANAB AC-1498)	1-11911589470-1	2019/11/15	2022/05/14
Power Sensor 【R&S/NRP-Z56】 【13053525-001】		R&S(DAKKS D-K-15195-01-00)	569661/D-K-15195-01-00	2020/10/05	2024/04/04
Measuring Receiver 【R&S FSMR50】 【13054413-002】		R&S(DAKKS D-K-15195-01-00)	533788	2019/12/17	2023/06/16
Universal Counter 【HP 53132A】 【13060804-001】		ETC(TAF 0025)	20-11-BAC-532-44L	2020/12/30	2021/06/29
Frequency Counter 【AGILENT 53152A】 【13060808-001】		KEYSIGHT(ANAB AC-1498)	1-11246338304-1	2019/05/09	2022/11/08

校正報告

財團法人台灣商品檢測驗證中心

工 服NO.21-06-BCC-133-01L

CALIBRATION REPORT

TAIWAN TESTING AND
CERTIFICATION CENTER

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1. Frequency Accuracy Check:

Reading	Standard	Expanded Uncertainty
250.0000 kHz	249.99998989 kHz	8.2×10^{-10}
1.000000 MHz	0.999999595 kHz	8.1×10^{-10}
10.000000 MHz	9.999995943 MHz	8.1×10^{-10}
100.000000 MHz	99.99995946 MHz	8.1×10^{-10}
200.000000 MHz	199.9999190 MHz	8.1×10^{-10}
500.000000 MHz	499.99997974 MHz	8.1×10^{-10}
1000.000000 MHz	999.99995949 MHz	8.1×10^{-10}
2.000000000 GHz	1.9999999192 GHz	8.1×10^{-10}
5.000000000 GHz	4.999999798 GHz	8.2×10^{-10}
10.000000000 GHz	9.99999595 GHz	8.1×10^{-10}
20.000000000 GHz	19.999999192 GHz	8.1×10^{-10}
30.000000000 GHz	29.999998786 GHz	8.1×10^{-10}
40.000000000 GHz	39.999998379 GHz	8.1×10^{-10}
46.000000000 GHz	45.999998138 GHz	8.1×10^{-10}

2. Output Level And Frequency Response Accuracy Check:

Test Freq.	Setting(dBm)	Measured(dBm)	Expanded Uncertainty(dB)
250.0000 kHz	0.00	0.06	0.10
1.000000 MHz	0.00	-0.03	0.10
10.000000 MHz	0.00	-0.05	0.10
100.000000 MHz	0.00	-0.05	0.10
200.000000 MHz	0.00	-0.04	0.09
500.000000 MHz	0.00	-0.02	0.11
1.000000000 GHz	0.00	-0.05	0.09
2.000000000 GHz	0.00	0.00	0.15
3.000000000 GHz	0.00	-0.03	0.21
4.000000000 GHz	0.00	0.01	0.27
5.000000000 GHz	0.00	0.00	0.15
6.000000000 GHz	0.00	-0.03	0.11
7.000000000 GHz	0.00	-0.02	0.12
8.000000000 GHz	0.00	-0.05	0.11
9.000000000 GHz	0.00	-0.04	0.11
10.000000000 GHz	0.00	-0.05	0.11
11.000000000 GHz	0.00	-0.05	0.16
12.000000000 GHz	0.00	-0.06	0.16
13.000000000 GHz	0.00	0.01	0.16
14.000000000 GHz	0.00	-0.11	0.16
15.000000000 GHz	0.00	-0.05	0.16
16.000000000 GHz	0.00	-0.01	0.16
17.000000000 GHz	0.00	-0.03	0.16
18.000000000 GHz	0.00	-0.09	0.16

校正報告

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CALIBRATION REPORT

TAIWAN TESTING AND
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Page 4 of 6

2. Output Level And Frequency Response Accuracy Check: (Continued)

Test Freq.	Setting(dBm)	Measured(dBm)	Expanded Uncertainty(dB)
19.000000000 GHz	0.00	-0.07	0.16
20.000000000 GHz	0.00	-0.12	0.16
21.000000000 GHz	0.00	-0.06	0.18
22.000000000 GHz	0.00	-0.05	0.18
23.000000000 GHz	0.00	-0.05	0.18
24.000000000 GHz	0.00	-0.10	0.18
25.000000000 GHz	0.00	-0.13	0.18
26.000000000 GHz	0.00	-0.07	0.18
27.000000000 GHz	0.00	-0.12	0.18
28.000000000 GHz	0.00	-0.09	0.18
29.000000000 GHz	0.00	-0.14	0.18
30.000000000 GHz	0.00	-0.30	0.18
31.000000000 GHz	0.00	-0.07	0.21
32.000000000 GHz	0.00	-0.05	0.21
33.000000000 GHz	0.00	-0.19	0.21
34.000000000 GHz	0.00	0.02	0.21
35.000000000 GHz	0.00	0.04	0.21
36.000000000 GHz	0.00	-0.11	0.21
37.000000000 GHz	0.00	0.00	0.22
38.000000000 GHz	0.00	-0.01	0.22
39.000000000 GHz	0.00	-0.11	0.21
40.000000000 GHz	0.00	0.08	0.21
41.000000000 GHz	0.00	0.06	0.38
42.000000000 GHz	0.00	-0.18	0.38
43.000000000 GHz	0.00	-0.25	0.38
44.000000000 GHz	0.00	-0.17	0.38
45.000000000 GHz	0.00	-0.10	0.38
46.000000000 GHz	0.00	-0.40	0.38
47.000000000 GHz	0.00	-0.38	0.38
48.000000000 GHz	0.00	-0.14	0.38
49.000000000 GHz	0.00	-0.23	0.38
50.000000000 GHz	0.00	-0.19	0.38
100.000000 MHz	10.00	9.98	0.62
100.000000 MHz	-10.00	-10.06	0.62
100.000000 MHz	-20.00	-20.07	0.62
100.000000 MHz	-30.00	-30.11	0.62
100.000000 MHz	-40.00	-40.13	0.62
100.000000 MHz	-50.00	-50.10	0.62
100.000000 MHz	-60.00	-60.10	0.62
100.000000 MHz	-70.00	-70.11	0.62
100.000000 MHz	-80.00	-80.11	0.62
100.000000 MHz	-90.00	-90.12	0.62

校正報告

財團法人台灣商品檢測驗證中心

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CALIBRATION REPORT

TAIWAN TESTING AND
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Page 5 of 6

2. Output Level And Frequency Response Accuracy Check: (Continued)

Test Freq.	Setting(dBm)	Measured(dBm)	Expanded Uncertainty(dB)
100.000000 MHz	-100.00	-100.13	0.62
1.000000000 GHz	10.00	10.01	0.62
1.000000000 GHz	-10.00	-10.05	0.62
1.000000000 GHz	-20.00	-20.06	0.62
1.000000000 GHz	-30.00	-30.06	0.62
1.000000000 GHz	-40.00	-40.07	0.62
1.000000000 GHz	-50.00	-50.05	0.62
1.000000000 GHz	-60.00	-60.05	0.62
1.000000000 GHz	-70.00	-70.06	0.62
1.000000000 GHz	-80.00	-80.04	0.62
1.000000000 GHz	-90.00	-90.05	0.62
1.000000000 GHz	-100.00	-100.05	0.62
10.000000000 GHz	10.00	9.99	0.65
10.000000000 GHz	-10.00	-10.02	0.65
10.000000000 GHz	-20.00	-20.04	0.65
10.000000000 GHz	-30.00	-30.05	0.65
10.000000000 GHz	-40.00	-40.05	0.65
10.000000000 GHz	-50.00	-50.14	0.65
10.000000000 GHz	-60.00	-60.15	0.65
10.000000000 GHz	-70.00	-70.12	0.65
10.000000000 GHz	-80.00	-80.14	0.65
10.000000000 GHz	-90.00	-90.16	0.65
10.000000000 GHz	-100.00	-100.22	0.65
20.000000000 GHz	10.00	9.90	0.68
20.000000000 GHz	-10.00	-10.12	0.68
20.000000000 GHz	-20.00	-20.14	0.68
20.000000000 GHz	-30.00	-30.15	0.68
20.000000000 GHz	-40.00	-40.14	0.68
20.000000000 GHz	-50.00	-50.16	0.68
20.000000000 GHz	-60.00	-60.18	0.68
20.000000000 GHz	-70.00	-70.22	0.68
20.000000000 GHz	-80.00	-80.21	0.68
20.000000000 GHz	-90.00	-90.23	0.68
20.000000000 GHz	-100.00	-100.25	0.68

校正報告

財團法人台灣商品檢測驗證中心

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CALIBRATION REPORT

TAIWAN TESTING AND
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3. Harmonic Distortion Measurement Check:

Test Freq.	Harmonic(dBc)	Expanded Uncertainty(dB)
250.0000 kHz	-30.4	0.69
1.00000 MHz	-33.5	0.69
10.0000 MHz	-39.7	0.69
100.0000 MHz	-66.2	0.69
500.0000 MHz	-36.7	0.69
1.000000000 GHz	-38.3	0.69
5.000000000 GHz	-53.4	1.3
10.000000000 GHz	-66.9	1.9
20.000000000 GHz	-65.3	1.9

4. 10 MHz Ref. Out. Frequency Accuracy Check:

Reading(MHz)	Standard(MHz)	Expanded Uncertainty
10	9.9999995943	8.1×10^{-10}

說明:

- 1.項次1、4校正報告內的相對擴充不確定度評估與表示是依據「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， $k=2.0$ ，為信賴水準約95 %之涵蓋因子。
- 2.項次2、3校正報告內的擴充不確定度評估與表示是依據「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 為組合標準不確定度， $k=2.0$ ，為信賴水準約95 %之涵蓋因子。

Calibration Laboratory of Microwave Measuring Equipment
of MWMLab



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 02.5.0.0065 of 09.01.2015

Certificate number 71-19 Date when calibrated 09.12.19 Page 1 of 2

Item calibrated VDI Power Meter PM5 # 431V

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.

Method of calibration GOST 20271.1, MK KL 04.3-2014

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Conversion loss measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

Authorising
signature



/ Technical manager Date of issue 09.12.19

Calibration Certificate

Certificate number **71-19**

Page 2 of 2

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 514	Reference power meter	165	22 December 2019	21/7/2/17	RF Power
M 523	Reference power meter	162	20 December 2019	21/7/2/13	RF Power
02	Frequency multiplier	02	23 January 2020	02-19	RF Power
03	Frequency multiplier	03	23 January 2020	03-19	RF Power
RG4-14	Signal generator	22	10 July 2020	24-19	RF Power
V7-34	Universal voltmeter	0067787	27 September 2020	1994-42	DC Voltage
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
MG3694C	Signal generator	133805	21 August 2020	2066-43	RF Power Frequency

Calibration conditions

Temperature: 21.7 °C.
Humidity: 42.0 %.
Pressure: 100.2 kPa.

Calibration results are given in the measurement report # 71-19

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	110 – 330 GHz	Corresponds
2	Waveguide	WR-10	Corresponds
3	Input Loss	0.15 – 0.30 dB	Corresponds (Table 1)
4	Typical RF accuracy	5* %	Corresponds (Table 1)

Expanded uncertainty of measurements: * – 15 %.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Signature of the person who has performed calibration

/ Engineer

**Calibration Laboratory of
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 02.5.0.0065

Address: 6, P. Brovki str., Minsk
220013, Belarus

Phone/Fax: +375 17 2938496



Technical Manager

December 9, 2019

MEASUREMENT REPORT # 71-19

December 9, 2019

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	VDI Power Meter PM5 # 431V
Method of calibration:	GOST 20271.1, MK KL 04.3-2014
Number of samples:	One
Delivery date of the sample:	29.11.2019
Date of calibration:	From 29.11.2019 to 09.12.2019

MEASUREMENT CONDITIONS

Temperature: 21.7 °C	Humidity: 42 %	Pressure: 100.2 kPa
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MEASUREMENT EQUIPMENT

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 514	Reference power meter	165	22 December 2019	21/7/2/17	RF Power
M 523	Reference power meter	162	20 December 2019	21/7/2/13	RF Power
02	Frequency multiplier	02	23 January 2020	02-19	RF Power
03	Frequency multiplier	03	23 January 2020	03-19	RF Power
RG4-14	Signal generator	22	10 July 2020	24-19	RF Power
V7-34	Universal voltmeter	0067787	27 September 2020	1994-42	DC Voltage
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
MG3694C	Signal generator	133805	21 August 2020	2066-43	RF Power Frequency

MEASUREMENT RESULTS

Table 1

Frequency, GHz	110	220	330
Reference power, dBm	1.000	1.000	1.000
Measured power, dBm	0.981	0.962	0.940
Power measurement error, %	1.8	4	6
Expanded uncertainty, %	7.2	10	15

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Engineer

Quality Manager




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

Calibration Laboratory of Microwave Measuring Equipment
of MWMLab



Calibration certificate

ISO 17025
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Accreditation certificate No. № BY/112 5.0065 of 09.01.2015

Certificate number 04-20 Date when calibrated 20.01.20 Page 1 of 2

Item calibrated Conical Horn Antenna QWH-UCRR00 # 924200002

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.

Method of calibration GOST 20271.1, MK KL 8.2-16

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Conversion loss measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

Authorising
signature



/ Technical manager Date of issue 20.01.20

Calibration Certificate

Certificate number **04-20**

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

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
E4418B/ N8486AR	Power meter	US39251390/ MY52270003	19 November 2020	2978-43	RF Power
M3-75	Power meter	002189	12 March 2021	06-19	RF Power
MG3694C	Signal generator	133805	21 August 2020	2066-43	RF Power Frequency
G4-161	Signal generator	3	10 July 2020	22-19	RF Power Frequency
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-11B	Measuring horn antenna	08051	23 September 2021	2370-43	Gain
P6-133	Measuring horn antenna	15005	23 September 2021	2374-43	Gain

Calibration conditions

Temperature: 21.8 °C.

Humidity: 37.0 %.

Pressure: 100.0 kPa.

Calibration results are given in the measurement report # 04-20

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	33 – 55 GHz	Corresponds
2	Antenna Gain	21* dBi	Corresponds (Table 1)
3	Antenna Factor	43 dB/m	Corresponds (Table 1)

* – Expanded uncertainty of measurements 2.5 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Signature of the person who has performed calibration

/ Engineer

**Calibration Laboratory of
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 5.0065

Address: 6, P. Brovki str., Minsk
220013, Belarus

Phone/Fax: +375 17 2938496



Technical Manager

January 20, 2020

MEASUREMENT REPORT # 04-20

January 20, 2020

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Conical Horn Antenna QWH-UCRR00 # 924200002
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	29.11.2019
Date of calibration:	From 09.12.2019 to 20.01.2020

MEASUREMENT CONDITIONS

Temperature: 21.8 °C	Humidity: 37 %	Pressure: 100.0 kPa
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MEASUREMENT EQUIPMENT

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
E4418B/ N8486AR	Power meter	US39251390/ MY52270003	19 November 2020	2978-43	RF Power
M3-75	Power meter	002189	12 March 2021	06-19	RF Power
MG3694C	Signal generator	133805	21 August 2020	2066-43	RF Power Frequency
G4-161	Signal generator	3	10 July 2020	22-19	RF Power Frequency
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-11B	Measuring horn antenna	08051	23 September 2021	2370-43	Gain
P6-133	Measuring horn antenna	15005	23 September 2021	2374-43	Gain

MEASUREMENT RESULTS

Distance between tested and generating antenna 2 m.

Table 1

Frequency, GHz	33	44	55
Power density of electromagnetic field, W/m ²	0.022	0.057	0.049
Maximum level of measured power, dBm	-20.0	-16.4	-17.2
Gain, dBi	18.4	20.3	21.3
Expanded uncertainty, dB	2.5	2.5	2.5
Antenna Factor, dB/m	42.2	42.8	42.9

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Engineer

Quality Manager




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

Calibration Laboratory of Microwave Measuring Equipment
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Calibration certificate

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Accreditation certificate No. № BY/112 5.0065 of 09.01.2015

Certificate number 01-20 Date when calibrated 20.01.20 Page 1 of 2

Item
calibrated Conical Horn Antenna WR15CH_001

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.

Method of
calibration GOST 20271.1, MK KL 8.2-16

*All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF.
Conversion loss measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML.
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/ Technical manager Date of issue 20.01.20

Calibration Certificate

Certificate number **01-20**

Page 2 of 2

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M3-75	Power meter	002189	12 March 2021	06-19	RF Power
G4-186	Signal generator	5	10 July 2020	23-19	RF Power Frequency
G4-161	Signal generator	3	10 July 2020	22-19	RF Power Frequency
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-134	Measuring horn antenna	14002	23 September 2021	2372-43	Gain

Calibration conditions

Temperature: 21.8 °C.
Humidity: 37.0 %.
Pressure: 100.0 kPa.

Calibration results are given in the measurement report # 01-20

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	50 – 75 GHz	Corresponds
2	Antenna Gain	21* dBi	Corresponds (Table 1)
3	Antenna Factor	46 dB/m	Corresponds (Table 1)

* – Expanded uncertainty of measurements 2.8 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Signature of the person who has performed calibration

/ Engineer

**Calibration Laboratory of
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No. BY/112 5.0065

Address: 6, P. Brovki str., Minsk
220013, Belarus

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MEASUREMENT REPORT # 01-20

January 20, 2020

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Conical Horn Antenna WR15CH_001
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	29.11.2019
Date of calibration:	From 09.12.2019 to 20.01.2020

MEASUREMENT CONDITIONS

Temperature: 21.8 °C	Humidity: 37 %	Pressure: 100.0 kPa
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MEASUREMENT EQUIPMENT

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M3-75	Power meter	002189	12 March 2021	06-19	RF Power
G4-186	Signal generator	5	10 July 2020	23-19	RF Power Frequency
G4-161	Signal generator	3	10 July 2020	22-19	RF Power Frequency
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-134	Measuring horn antenna	14002	23 September 2021	2372-43	Gain

MEASUREMENT RESULTS

Distance between tested and generating antenna 1 m.

Table 1

Frequency, GHz	50	55	65	75
Power density of electromagnetic field, W/m ²	0.15	0.18	0.23	0.26
Maximum level of measured power, dBm	-15.0	-14.7	-14.2	-14.2
Gain, dBi	18.7	19.0	20.0	20.5
Expanded uncertainty, dB	2.8	2.8	2.8	2.8
Antenna Factor, dB/m	45.6	46.1	46.5	47.2

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Engineer

Quality Manager



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

Calibration Laboratory of Microwave Measuring Equipment
of MWMLab



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 5.0065 of 09.01.2015

Certificate number 02-20 Date when calibrated 20.01.20 Page 1 of 2

Item calibrated Conical Horn Antenna WR10CH_001

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.

Method of calibration GOST 20271.1, MK KL 8.2-16

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Conversion loss measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

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/ Technical manager Date of issue 20.01.20

Calibration Certificate

Certificate number **02-20**

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

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M3-75	Power meter	002189	12 March 2021	06-19	RF Power
G4-186	Signal generator	5	10 July 2020	23-19	RF Power Frequency
RG4-14	Signal generator	22	10 July 2020	24-19	RF Power Frequency
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-31A	Measuring horn antenna	35864	23 September 2021	2368-43	Gain

Calibration conditions

Temperature: 21.8 °C.

Humidity: 37.0 %.

Pressure: 100.0 kPa.

Calibration results are given in the measurement report # 02-20

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

* – Expanded uncertainty of measurements 2.8 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Signature of the person who has performed calibration



/ Engineer

**Calibration Laboratory of
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 5.0065

Address: 6, P. Brovki str., Minsk
220013, Belarus

Phone/Fax: +375 17 2938496



MEASUREMENT REPORT # 02-20

January 20, 2020

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Conical Horn Antenna WR10CH_001
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	29.11.2019
Date of calibration:	From 09.12.2019 to 20.01.2020

MEASUREMENT CONDITIONS

Temperature: 21.8 °C	Humidity: 37 %	Pressure: 100.0 kPa
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MEASUREMENT EQUIPMENT

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M3-75	Power meter	002189	12 March 2021	06-19	RF Power
G4-186	Signal generator	5	10 July 2020	23-19	RF Power Frequency
RG4-14	Signal generator	22	10 July 2020	24-19	RF Power Frequency
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-31A	Measuring horn antenna	35864	23 September 2021	2368-43	Gain

MEASUREMENT RESULTS

Distance between tested and generating antenna 0.8 m.

Table 1

Frequency, GHz	75	92.5	110
Power density of electromagnetic field, W/m ²	0.20	0.29	0.37
Maximum level of measured power, dBm	-16.2	-15.5	-15.1
Gain, dBi	19.9	20.6	21.5
Expanded uncertainty, dB	2.8	2.8	2.8
Antenna Factor, dB/m	47.9	49.0	49.6

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Engineer

Quality Manager




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Calibration Laboratory of Microwave Measuring Equipment
of MWMLab



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 5.0065 of 09.01.2015

Certificate number 03-20 Date when calibrated 20.01.20 Page 1 of 2

Item calibrated Conical Horn Antenna WR6.5CH_001

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.

Method of calibration GOST 20271.1, MK KL 8.2-16

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Conversion loss measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

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signature



/ Technical manager Date of issue 20.01.20

Calibration Certificate

Certificate number **03-20**

Page 2 of 2

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M3-75	Power meter	002189	12 March 2021	06-19	RF Power
RG4-14	Signal generator	22	10 July 2020	24-19	RF Power Frequency
02	Frequency multiplier	02	23 January 2020	02-19	RF Power Frequency
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-31A	Measuring horn antenna	35864	23 September 2021	2368-43	Gain

Calibration conditions

Temperature: 21.8 °C.

Humidity: 37.0 %.

Pressure: 100.0 kPa.

Calibration results are given in the measurement report # 03-20

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	110 – 170 GHz	Corresponds
2	Antenna Gain	21* dBi	Corresponds (Table 1)
3	Antenna Factor	53 dB/m	Corresponds (Table 1)

* – Expanded uncertainty of measurements 3.5 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Signature of the person who has performed calibration

/ Engineer

**Calibration Laboratory of
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 5.0065

Address: 6, P. Brovki str., Minsk
220013, Belarus

Phone/Fax: +375 17 2938496



Technical Manager

January 20, 2020

MEASUREMENT REPORT # 03-20

January 20, 2020

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Conical Horn Antenna WR6.5CH_001
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	29.11.2019
Date of calibration:	From 09.12.2019 to 20.01.2020

MEASUREMENT CONDITIONS

Temperature: 21.8 °C	Humidity: 37 %	Pressure: 100.0 kPa
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MEASUREMENT EQUIPMENT

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M3-75	Power meter	002189	12 March 2021	06-19	RF Power
RG4-14	Signal generator	22	10 July 2020	24-19	RF Power Frequency
02	Frequency multiplier	02	23 January 2020	02-19	RF Power Frequency
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-31A	Measuring horn antenna	35864	23 September 2021	2368-43	Gain
P6-32	Measuring horn antenna	115671	23 September 2021	2369-43	Gain

MEASUREMENT RESULTS

Distance between tested and generating antenna 0.6 m.

Table 1

Frequency, GHz	110	140	170
Power density of electromagnetic field, W/m ²	0.70	0.67	1.0
Maximum level of measured power, dBm	-14.8	-15.6	-14.7
Gain, dBi	19.0	20.5	21.3
Expanded uncertainty, dB	2.8	3.0	3.5
Antenna Factor, dB/m	52.0	52.7	53.5

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Engineer

Quality Manager




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of MWMLab



Calibration certificate

ISO 17025
ACCREDITED LABORATORY



Accreditation certificate No. № BY/112 02.5.0.0065 of 09.01.2015

Certificate number 73-19 Date when calibrated 09.12.19 Page 1 of 2

Item calibrated Conical Horn Antenna WR5.1CH_001

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.

Method of calibration GOST 20271.1, MK KL 8.2-16

All measurements are traceable to the SI units which are realized by national measurement standards of NMI and state standards of RF. Conversion loss measurements above 178 GHz are to confirm operation functionality and traceable only to MWMLab standards and OML. This certificate shall not be reproduced, except in full. Any publication extracts from the calibration certificate requires written permission of the issuing calibration laboratory of microwave measuring equipment.

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/ Technical manager Date of issue 09.12.19

Calibration Certificate

Certificate number **73-19**

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

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 514	Reference power meter	165	22 December 2019	21/7/2/17	RF Power
M 523	Reference power meter	162	20 December 2019	21/7/2/13	RF Power
RG4-14	Signal generator	22	10 July 2020	24-19	RF Power Frequency
02	Frequency multiplier	02	23 January 2020	02-19	RF Power
V7-34	Universal voltmeter	0067787	27 September 2020	1994-42	DC Voltage
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-32	Measuring horn antenna	115671	18 May 2020	405-43	Gain

Calibration conditions

Temperature: 21.7 °C.

Humidity: 42.0 %.

Pressure: 100.2 kPa.

Calibration results are given in the measurement report # 73-19

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	140 – 220 GHz	Corresponds
2	Antenna Gain	21* dBi	Corresponds (Table 1)
3	Antenna Factor	54 dB/m	Corresponds (Table 1)

* – Expanded uncertainty of measurements 3.0 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Signature of the person who has performed calibration



/ Engineer

**Calibration Laboratory of
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 02.5.0.0065

Address: 6, P. Brovki str., Minsk

220013, Belarus

Phone/Fax: +375 17 2938496



Technical Manager

December 9, 2019

MEASUREMENT REPORT # 73-19

December 9, 2019

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Conical Horn Antenna WR5.1CH_001
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	29.11.2019
Date of calibration:	From 29.11.2019 to 09.12.2019

MEASUREMENT CONDITIONS

Temperature: 21.7 °C	Humidity: 42 %	Pressure: 100.2 kPa
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MEASUREMENT EQUIPMENT

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 514	Reference power meter	165	22 December 2019	21/7/2/17	RF Power
M 523	Reference power meter	162	20 December 2019	21/7/2/13	RF Power
RG4-14	Signal generator	22	10 July 2020	24-19	RF Power Frequency
02	Frequency multiplier	02	23 January 2020	02-19	RF Power
V7-34	Universal voltmeter	0067787	27 September 2020	1994-42	DC Voltage
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-32	Measuring horn antenna	115671	23 September 2021	2369-43	Gain

MEASUREMENT RESULTS

Distance between tested and generating antenna 0.50 m.

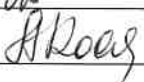
Table 1

Frequency, GHz	140	180	220
Power density of electromagnetic field, W/m ²	0.969	0.145	0.114
Maximum level of measured power, dBm	-16.12	-24.51	-26.55
Gain, dBi	18.4	20.4	21.2
Expanded uncertainty, dB	2.2	2.4	3.0
Antenna Factor, dB/m	54.8	54.3	55.9

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Engineer

Quality Manager

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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 75-19 Date when calibrated 09.12.19 Page 1 of 2

Item calibrated Diagonal Horn Antenna WR3.4DH_001

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.

Method of calibration GOST 20271.1, MK KL 8.2-16

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signature



/ Technical manager Date of issue 09.12.19

Calibration Certificate

Certificate number **75-19**

Page 2 of 2

Calibration is performed by using

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 514	Reference power meter	165	22 December 2019	21/7/2/17	RF Power
RG4-14	Signal generator	22	10 July 2020	24-19	RF Power Frequency
02	Frequency multiplier	02	23 January 2020	02-19	RF Power
03	Frequency multiplier	03	23 January 2020	03-19	RF Power
V7-34	Universal voltmeter	0067787	27 September 2020	1994-42	DC Voltage
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-137	Measuring horn antenna	15001	18 May 2020	406-43	Gain

Calibration conditions

Temperature: 21.7 °C.

Humidity: 42.0 %.

Pressure: 100.2 kPa.

Calibration results are given in the measurement report # 75-19

#	Parameter	Specifications required	Specifications tested and measured
1	Frequency range	220 – 330 GHz	Corresponds
2	Antenna Gain	21* dBi	Corresponds (Table 1)
3	Antenna Factor	55 dB/m	Corresponds (Table 1)

* – Expanded uncertainty of measurements 3.5 dB.

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of k=2 for a normal distribution.

Signature of the person who has performed calibration



/ Engineer

**Calibration Laboratory of
Microwave Measuring Equipment**

Accreditation certificate

No. BY/112 02.5.0.0065

Address: 6, P. Brovki str., Minsk
220013, Belarus

Phone/Fax: +375 17 2938496



MEASUREMENT REPORT # 75-19

December 9, 2019

Customer:	Bureau Veritas Group Consumer Products Services Division, Taiwan Branch E-2, No.1, Lixing 1st Rd., East Dist., Hsinchu City 300, Taiwan, R.O.C.
Item calibrated:	Diagonal Horn Antenna WR3.4DH_001
Method of calibration:	GOST 20271.1, MK KL 8.2-16
Number of samples:	One
Delivery date of the sample:	29.11.2019
Date of calibration:	From 29.11.2019 to 09.12.2019

MEASUREMENT CONDITIONS

Temperature: 21.7 °C	Humidity: 42 %	Pressure: 100.2 kPa
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MEASUREMENT EQUIPMENT

Model	Model Description	Equipment ID	Cal Due Date	Certificate Number	Trace Value
M 514	Reference power meter	165	22 December 2019	21/7/2/17	RF Power
RG4-14	Signal generator	22	10 July 2020	24-19	RF Power Frequency
02	Frequency multiplier	02	23 January 2020	02-19	RF Power
03	Frequency multiplier	03	23 January 2020	03-19	RF Power
V7-34	Universal voltmeter	0067787	27 September 2020	1994-42	DC Voltage
RCH3-72	Frequency meter	931200	13 September 2020	2261-43	Frequency
P6-137	Measuring horn antenna	15001	23 September 2021	2373-43	Gain

MEASUREMENT RESULTS

Distance between tested and generating antenna 0.50 m.

Table 1

Frequency, GHz	220	275	330
Power density of electromagnetic field, W/m ²	0.331	0.395	0.446
Maximum level of measured power, dBm	-21.36	-21.10	-21.34
Gain, dBi	21.7	23.1	23.9
Expanded uncertainty, dB	3.0	3.5	3.5
Antenna Factor, dB/m	55.3	55.8	56.6

The uncertainty evaluation has been performed in accordance with ISO/IEC Guide 98-3:2008 (GUM). The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k such that the coverage probability corresponds to approximately 95 %. This probability corresponds to a coverage factor of $k=2$ for a normal distribution.

Engineer

Quality Manager



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2. Calibration Laboratory of Microwave Measuring Equipment

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



Virginia Diodes, Inc

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

Certificate of Conformance

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

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

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

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

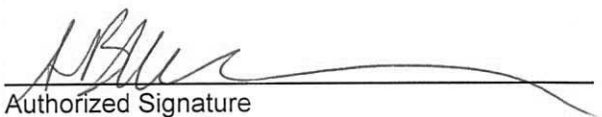
Attn: Ryan England
Phone: 1-707-577-5741
SO#: 3922450
FedEx: 4296 8006 3330 / 4296 8006 3340

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

Quantity

Shipped Unit DescriptionOrder-Job
Number

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


Authorized Signature
Virginia Diodes, Inc



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

Certificate of Conformance

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

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

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

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

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

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

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A handwritten signature in black ink, consisting of a series of loops and flourishes, is written over a horizontal line.

Authorized Signature
Virginia Diodes, Inc