Appendix - Calibration Certificate for Test Equipment

For Above 40GHz:

	Description & Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Due
01	Spectrum Analyzer Agilent	E4446A	MY48250253	Aug. 01, 2018	Jul. 31, 2019
02	Spectrum Analyzer Keysight	N9041B	US56480107	Aug. 14, 2017	Aug. 13, 2019
03	Horn Antenna (33~55GHz) OML	M22RH	110215-1	Oct. 17, 2017	Oct. 16, 2019
04	Horn Antenna (50~75GHz) OML	M15HWD	110215-1	Oct. 17, 2017	Oct. 16, 2019
05	Horn Antenna (75~110GHz) OML	M10RH	110215-1	Oct. 17, 2017	Oct. 16, 2019
06	Harmonic Mixer (110~170GHz) OML	M06RH	110215-1	Oct. 17, 2017	Oct. 16, 2019
07	Horn Antenna(110~170GHz) OML	M06HWD	110215-1	Oct. 17, 2017	Oct. 16, 2019
08	Harmonic Mixer (140~220GHz) OML	M05HWD	110215-1	Oct. 17, 2017	Oct. 16, 2019
09	Horn Antenna (140~220GHz) OML	M05RH	110215-1	Oct. 17, 2017	Oct. 16, 2019
10	Diplexer EMCI	DPL26	DPL26_01	Oct. 17, 2017	Oct. 16, 2019
11	WR15CH Conical Horn Keysight	WR15CH	WR15CH-01	Oct. 17, 2017	Oct. 16, 2019
12	WR10CH Conical Horn Keysight	WR10CH	WR10CH-01	Oct. 17, 2017	Oct. 16, 2019
13	Millimeter-Wave Signal Generator Frequency Extension Module (50~75 GHz) Keysight	E8257DV15	US54250106	Oct. 17, 2017	Oct. 16, 2019
14	Millimeter-Wave Signal Generator Frequency Extension Module (75~110 GHz) Keysight	E8257DV10	US53250009	Oct. 17, 2017	Oct. 16, 2019
15	Millimeter-Wave Signal Generator Frequency Extension Module (90~140 GHz) VDI	VDIWR8.0SGX	PSGX002	C.O.C.	C.O.C.
16	Millimeter-Wave Signal Generator Frequency Extension Module (140~220 GHz) VDI	VDIWR5.1SGX	PSGX 007	C.O.C.	C.O.C.
17	PSG analog signal generator Keysight	E8257D	MY53401987	Jun. 26, 2018	Jun. 25, 2019
18	Millimeter-Wave Signal Spectrum Analyzer Extension Modules (90~140 GHz)	VDIWR8.0SAX	PXAX002	C.O.C.	C.O.C.
19	Millimeter-Wave Signal Spectrum Analyzer Extension Modules (140~220 GHz)	VDIWR5.1SAX	PXAX 007	C.O.C.	C.O.C.
20	Power meter Keysight	E4417A	MY55276004	Oct. 17, 2017	Oct. 16, 2019
21	Waveguide Power Sensor Keysight	V8486A	MY55170003	Oct. 17, 2017	Oct. 16, 2019
22	Waveguide Power Sensor Keysight	W8486A	MY55230006	Oct. 17, 2017	Oct. 16, 2019

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財團法人台灣電子檢驗中心

校 正 報 告

CALIBRATION REPORT

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TAF Calibration Laboratory 0025

工服 NO. 18-07-BCC-436-01L ELECTRONICS TESTING CENTER, TAIWAN

申請者(Applicant): 香港商立德國際商品試驗有限公司新竹分公司

地址(Address): 新竹市科學園區力行一路1號E-2

供 校 儀 器 ITEM CALIBRATED

儀器名稱: Nomenclature	PSA Series Spectrum Analyzer	製造商: Mfg.	AGILENT
型別: Model No.	E4446A	識別號碼: ID. No.	MY48250253
校正依據: Cal. Procedure Used	詳如說明3所示	收件日期: Receipt Date	Jul.26,2018
校正資料: Cal. Info.	☑ 僅量測 Cal.Only ☐ 調整 Adjusted	校正日期: Cal. Date	Aug.01,2018
實際環境: Real Condition	溫度: 23 °C Temperature 相對濕度: 46 % Relative Humidity	建議再校日期: Recommended Recal. Date	Jul.31,2019

使用標準器及附配件 STANDARD AND ACCESSORIES

儀器名稱 Nomenclature	廠牌/型號 Mfg. / Model No.	識別號碼 ID. No.	校正日期 Date Cal.	有效日期 Due Date
RF Step Attenuator	R/S RSG	13050122-001	2018/03/08	2021/09/07
EPM Series Power Meter	HP E4419B	13050609-001	2018/03/21	2019/09/20
Swept Signal Generator	AGILENT 83650B	13051703-001	2018/07/16	2019/07/15
ESG Vector Signal Generator	AGILENT E4438C	13051705-001	2018/06/04	2019/06/03
Power Sensor	AGILENT 8487A	13053508-003	2017/09/14	2020/03/13
Universal Counter	HP 53132A	13060804-001	2018/07/10	2019/01/09

追 溯 源 CALIBRATION SOURCE

儀器名稱 Nomenclature	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
如說明5所示	----------	----------	----------	----------

ETC hereby certifies that the equipment noted herein has been compared with the above 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特此證明報告內記載之受校儀器已與上列標準做過比較校正,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。

校正地點: 財團法人台灣電子檢驗中心校正實驗室

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

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	1.5000000	GHz	1.4×10^{-6}
10 MHz SPAN	1.500000	GHz	1.4×10^{-5}
20 MHz SPAN	1.50000	GHz	2.1×10^{-5}
50 MHz SPAN	1.50000	GHz	2.7×10^{-5}
100 MHz SPAN	1.50000	GHz	2.5×10^{-4}
1 GHz SPAN	1.4983	GHz	1.4×10^{-3}
(a.2)4.0 GHz Center Freq.			
1 MHz SPAN	4.0000000	GHz	1.3×10^{-6}
10 MHz SPAN	4.000000	GHz	1.3×10^{-5}
20 MHz SPAN	4.00000	GHz	1.5×10^{-5}
50 MHz SPAN	4.00000	GHz	1.5×10^{-5}
100 MHz SPAN	4.00000	GHz	1.3×10^{-4}
1 GHz SPAN	3.9983	GHz	1.3×10^{-3}
(a.3)9.0 GHz Center Freq.			
1 MHz SPAN		GHz	1.3×10^{-6}
10 MHz SPAN	9.000000	GHz	1.3×10^{-5}
20 MHz SPAN	9.00000	GHz	1.3×10^{-5}
50 MHz SPAN	9.00000	GHz	1.3×10^{-5}
100 MHz SPAN	9.00000	GHz	1.3×10^{-4}
1 GHz SPAN	8.9983	GHz	1.3×10^{-3}
(a.4)16.0 GHz Center Freq.			
1 MHz SPAN	16.0000000	GHz	1.3×10^{-6}
10 MHz SPAN	16.000000	GHz	1.3×10^{-5}
20 MHz SPAN	16.00000	GHz	1.3×10^{-5}
50 MHz SPAN	16.00000	GHz	1.3×10^{-5}
100 MHz SPAN	16.00000	GHz	1.3×10^{-4}
1 GHz SPAN	15.9983	GHz	1.3×10^{-3}

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	21.0000000 GHz	1.3×10^{-6}
10 MHz SPAN	21.000000 GHz	1.3×10^{-5}
20 MHz SPAN	21.00000 GHz	1.3×10^{-5}
50 MHz SPAN	21.00000 GHz	1.3×10^{-5}
100 MHz SPAN	21.00000 GHz	1.3×10^{-4}
1 GHz SPAN	20.9983 GHz	1.3×10^{-3}
(a.6)29.0 GHz Center Freq.		
1 MHz SPAN	29.0000000 GHz	1.3×10^{-6}
10 MHz SPAN	29.000000 GHz	1.3×10^{-5}
20 MHz SPAN	29.00000 GHz	1.3×10^{-5}
50 MHz SPAN	29.00000 GHz	1.3×10^{-5}
100 MHz SPAN	29.00000 GHz	1.3×10^{-4}
1 GHz SPAN	28.9983 GHz	1.3×10^{-3}
(a.7)35.0 GHz Center Freq.		
1 MHz SPAN	35.0000000 GHz	1.3×10^{-6}
10 MHz SPAN	35.000000 GHz	1.3×10^{-5}
20 MHz SPAN	35.00000 GHz	1.3×10^{-5}
50 MHz SPAN	35.00000 GHz	1.3×10^{-5}
100 MHz SPAN	35.00000 GHz	1.3×10^{-4}
1 GHz SPAN	34.9983 GHz	1.3×10^{-3}
(b)Freq. Count Marker Accuracy:		
1.5 GHz Center Freq.	1.50000000 GHz	1.3×10^{-7}
4.0 GHz Center Freq.	4.00000000 GHz	1.3×10^{-7}
9.0 GHz Center Freq.	9.00000000 GHz	1.3×10^{-7}
16.0 GHz Center Freq.	16.0000000 GHz	1.3×10^{-7}
21.0 GHz Center Freq.	21.0000000 GHz	1.3×10^{-7}
29.0 GHz Center Freq.	29.0000000 GHz	1.3×10^{-7}
35.0 GHz Center Freq.	35.0000000 GHz	1.3×10^{-7}

Test Description	Actual Value	Expanded Uncertainty
2. Freq. Span Accuracy:		
1 kHz Span	0.00 %	1.3 %
2 kHz Span	0.00 %	1.3 %
5 kHz Span	0.00 %	1.3 %
10 kHz Span	0.00 %	1.3 %
20 kHz Span	0.00 %	1.3 %
50 kHz Span	0.00 %	1.3 %
100 kHz Span	0.00 %	1.3 %
200 kHz Span	0.00 %	1.3 %
500 kHz Span	0.00 %	1.3 %
1 MHz Span	0.00 %	1.3 %
2 MHz Span	0.00 %	1.3 %
5 MHz Span	0.00 %	6.3 %
10 MHz Span	0.00 %	6.3 %
20 MHz Span	0.00 %	6.3 %
50 MHz Span	0.00 %	6.3 %
100 MHz Span	0.00 %	6.3 %
200 MHz Span	0.00 %	6.3 %
500 MHz Span	0.00 %	6.3 %
1 GHz Span	0.00 %	6.3 %
2 GHz Span	0.00 %	6.3 %

Test Description	Actual Value	Expanded Uncertainty
3. Image, Multiple, and Out-of-Band Response:		
(a)2 GHz Center Freq.		
2021.4 MHz	-109.12 dBc	1.9 dB
2621.4 MHz	-110.08 dBc	2.0 dB
2321.4 MHz	-110.23 dBc	2.1 dB
2600.0 MHz	-109.87 dBc	2.0 dB
7910.7 MHz	-109.45 dBc	2.1 dB
9821.4 MHz	-109.13 dBc	2.2 dB
(b)4 GHz Center Freq.		
4021.4 MHz	-106.24 dBc	1.9 dB
4621.4 MHz	-107.47 dBc	2.0 dB
4321.4 MHz	-107.51 dBc	2.0 dB
4600.0 MHz	-106.45 dBc	2.1 dB
8310.7 MHz	-107.23 dBc	2.2 dB
8932.1 MHz	-108.46 dBc	2.0 dB
(c)9 GHz Center Freq.		
9021.4 MHz	-106.24 dBc	2.1 dB
9621.4 MHz	-107.05 dBc	2.0 dB
9321.4 MHz	-106.69 dBc	2.0 dB
9600.0 MHz	-107.11 dBc	2.1 dB
18310.7 MHz	-107.23 dBc	2.1 dB
18932.1 MHz	-107.47 dBc	2.2 dB
(d)15 GHz Center Freq.		
15021.400 MHz	-106.45 dBc	2.1 dB
15621.400 MHz	-105.23 dBc	2.0 dB
22655.350 MHz	-106.11 dBc	2.1 dB
23276.750 MHz	-106.24 dBc	2.0 dB
7344.650 MHz	-105.98 dBc	2.1 dB
7966.050 MHz	-106.00 dBc	2.2 dB
(e)20 GHz Center Freq.		
20021.400 MHz	-104.37 dBc	2.0 dB
20621.400 MHz	-103.98 dBc	2.1 dB
15543.725 MHz	-102.12 dBc	2.1 dB
25699.075 MHz	-102.47 dBc	2.2 dB
9844.650 MHz	-102.65 dBc	2.3 dB
10466.050 MHz	-102.76 dBc	2.2 dB

Test Description	Actual Value	Expanded Uncertainty
3. Image, Multiple, and Out-of-Band Response: (@ Continued)		
(f)29 GHz Center Freq.		
28378.600 MHz	-102.49 dBc	2.1 dB
28978.600 MHz	-102.89 dBc	2.1 dB
24450.925 MHz	-102.11 dBc	2.0 dB
28700.000 MHz	-103.08 dBc	2.0 dB
16455.350 MHz	-103.47 dBc	2.1 dB
35272.325 MHz	-103.05 dBc	2.2 dB
(g)35 GHz Center Freq.		
35021.400 MHz	-99.87 dBc	2.2 dB
35621.400 MHz	-98.45 dBc	2.3 dB
33093.725 MHz	-97.12 dBc	2.3 dB
35321.400 MHz	-98.25 dBc	2.2 dB
8744.538 MHz	-97.66 dBc	2.1 dB
15544.650 MHz	-97.13 dBc	2.1 dB
4. Frequency accuracy:	10.000000 MHz	1.2×10^{-7}
5. IF bandwidth level accuracy Check:		
100 Hz	0.01 dB	0.26 dB
300 Hz	0.00 dB	0.26 dB
1 kHz	0.01 dB	0.26 dB
3 kHz	0.00 dB	0.26 dB
10 kHz	0.00 dB(Ref.)	----
30 kHz	0.00 dB	0.26 dB
100 kHz	0.00 dB	0.26 dB
300 kHz	0.00 dB	0.26 dB
1 MHz	0.01 dB	0.26 dB
3 MHz	0.03 dB	0.26 dB

Test Description	Actual Value	Expanded Uncertainty
6. IF bandwidth Check: (@ 3 dB)		
Bandwidth		
100 Hz	99.91 Hz	4.4 %
300 Hz	302.6 Hz	4.4 %
1 kHz	1.007 kHz	4.4 %
3 kHz	3.034 kHz	4.4 %
10 kHz	10.05 kHz	4.4 %
30 kHz	29.94 kHz	4.4 %
100 kHz	99.09 kHz	4.4 %
300 kHz	300.7 kHz	4.4 %
1 MHz	994.9 kHz	4.4 %
3 MHz	3.037 MHz	4.4 %
7. IF Bandwidths: (@3 dB)		
Shape factor Check:		
100 Hz	3.86	6.1 %
300 Hz	4.01	6.1 %
1 kHz	4.12	6.1 %
3 kHz	4.03	6.1 %
10 kHz	3.98	6.1 %
30 kHz	4.04	6.1 %
100 kHz	4.08	6.1 %
300 kHz	4.01	6.1 %
1 MHz	3.96	6.1 %
3 MHz	3.88	6.1 %

Test Description	Actual Value	Expanded Uncertainty
8. Noise Display Check :		
9 kHz	-145.9 dBm	0.80 dB
100 kHz	-148.8 dBm	0.80 dB
999 kHz	-153.2 dBm	0.80 dB
10.99 MHz	-153.5 dBm	0.80 dB
19.99 MHz	-152.9 dBm	0.80 dB
49.99 MHz	-154.7 dBm	0.80 dB
99.99 MHz	-155.3 dBm	0.80 dB
199.9 MHz	-156.2 dBm	0.80 dB
499.9 MHz	-154.7 dBm	0.80 dB
999.9 MHz	-154.5 dBm	0.80 dB
1499 MHz	-155.2 dBm	0.94 dB
1999 MHz	-156.7 dBm	0.94 dB
2499 MHz	-151.8 dBm	0.94 dB
2999 MHz	-152.0 dBm	0.94 dB
3099 MHz	-151.7 dBm	0.94 dB
3499 MHz	-151.2 dBm	0.94 dB
3999 MHz	-152.0 dBm	0.94 dB
4499 MHz	-152.8 dBm	0.94 dB
4999 MHz	-151.4 dBm	0.94 dB
5499 MHz	-151.9 dBm	0.94 dB
5999 MHz	-150.8 dBm	0.94 dB
6499 MHz	-151.1 dBm	0.94 dB
6999 MHz	-151.7 dBm	0.94 dB
7999 MHz	-151.3 dBm	0.94 dB
8999 MHz	-151.9 dBm	0.94 dB
9999 MHz	-152.0 dBm	0.94 dB
10999 MHz	-150.8 dBm	0.94 dB
11999 MHz	-150.2 dBm	0.94 dB
12999 MHz	-149.3 dBm	0.94 dB
13999 MHz	-150.0 dBm	0.94 dB
14999 MHz	-149.4 dBm	0.94 dB
15999 MHz	-149.9 dBm	0.94 dB
16999 MHz	-149.7 dBm	0.94 dB

Test Description	Actual Value	Expanded Uncertainty
8. Noise Display Check (@ Continued):		
17999 MHz	-148.4 dBm	0.94 dB
18999 MHz	-148.2 dBm	0.94 dB
19999 MHz	-148.7 dBm	0.94 dB
20999 MHz	-149.2 dBm	0.94 dB
21999 MHz	-148.9 dBm	0.94 dB
22999 MHz	-149.3 dBm	0.94 dB
23999 MHz	-148.2 dBm	0.94 dB
24999 MHz	-148.0 dBm	0.94 dB
25999 MHz	-147.5 dBm	0.94 dB
26999 MHz	-147.2 dBm	0.94 dB
27999 MHz	-147.1 dBm	0.94 dB
28999 MHz	-146.8 dBm	0.94 dB
29999 MHz	-147.0 dBm	0.94 dB
30999 MHz	-145.5 dBm	0.94 dB
31999 MHz	-144.8 dBm	0.94 dB
32999 MHz	-145.0 dBm	0.94 dB
33999 MHz	-144.1 dBm	0.94 dB
34999 MHz	-142.4 dBm	0.94 dB
35999 MHz	-140.1 dBm	0.94 dB
36999 MHz	-135.6 dBm	0.94 dB
37999 MHz	-134.7 dBm	0.94 dB
38999 MHz	-135.0 dBm	0.94 dB
39999 MHz	-134.6 dBm	0.94 dB

Test Description	Actual Value	Expanded Uncertainty
9. Frequency response Check:		
RF Attenuation 10 dB		
1 MHz	0.05 dB	0.62 dB
10 MHz	0.03 dB	0.62 dB
50 MHz	0.00 dB	0.62 dB
100 MHz	-0.12 dB	0.62 dB
200 MHz	-0.10 dB	0.62 dB
300 MHz	-0.01 dB	0.62 dB
400 MHz	-0.01 dB	0.62 dB
500 MHz	-0.02 dB	0.62 dB
600 MHz	-0.11 dB	0.62 dB
700 MHz	-0.15 dB	0.62 dB
800 MHz	-0.12 dB	0.62 dB
900 MHz	-0.14 dB	0.62 dB
1000 MHz	-0.17 dB	0.62 dB
1500 MHz	-0.15 dB	0.62 dB
2000 MHz	-0.10 dB	0.62 dB
2500 MHz	-0.09 dB	0.62 dB
2990 MHz	-0.06 dB	0.62 dB
3010 MHz	-0.10 dB	0.71 dB
3500 MHz	-0.11 dB	0.71 dB
4000 MHz	-0.15 dB	0.71 dB
4500 MHz	-0.16 dB	0.71 dB
5000 MHz	-0.12 dB	0.71 dB
5500 MHz	-0.11 dB	0.71 dB
6000 MHz	-0.13 dB	0.71 dB
6500 MHz	-0.15 dB	0.71 dB
6990 MHz	-0.12 dB	0.71 dB
7100 MHz	-0.21 dB	0.71 dB

Test Description	Actual Value	Expanded Uncertainty
9. Frequency response Check: (@ Continued)		
RF Attenuation 10 dB		
8000 MHz	-0.20 dB	0.71 dB
9000 MHz	-0.19 dB	0.71 dB
10000 MHz	-0.15 dB	0.71 dB
11000 MHz	-0.13 dB	0.71 dB
12000 MHz	-0.14 dB	0.71 dB
13000 MHz	-0.13 dB	0.71 dB
13500 MHz	-0.12 dB	0.71 dB
14000 MHz	-0.14 dB	0.71 dB
15000 MHz	-0.17 dB	0.71 dB
16000 MHz	-0.12 dB	0.71 dB
17000 MHz	-0.11 dB	0.71 dB
18000 MHz	-0.10 dB	0.71 dB
19000 MHz	-0.05 dB	0.79 dB
20000 MHz	0.24 dB	0.79 dB
21000 MHz	0.27 dB	0.79 dB
22000 MHz	0.33 dB	0.79 dB
23000 MHz	0.41 dB	0.79 dB
24000 MHz	0.39 dB	0.79 dB
25000 MHz	0.46 dB	0.79 dB
26000 MHz	0.07 dB	0.79 dB
27000 MHz	-0.31 dB	0.88 dB
28000 MHz	-0.35 dB	0.88 dB
29000 MHz	-0.38 dB	0.88 dB
29900 MHz	-0.33 dB	0.88 dB
31000 MHz	-0.29 dB	0.88 dB
32000 MHz	-0.25 dB	0.88 dB
33000 MHz	-0.23 dB	0.88 dB
34000 MHz	-0.24 dB	0.88 dB
35000 MHz	-0.21 dB	0.88 dB
36000 MHz	-0.23 dB	0.88 dB
37000 MHz	-0.27 dB	0.88 dB
38000 MHz	-0.30 dB	0.88 dB
39000 MHz	-0.29 dB	0.88 dB
39999 MHz	-0.32 dB	0.88 dB

Test Description	Actual Value	Expanded Uncertainty
9. Frequency response Check: (@ Continued)		
RF Attenuation 20 dB		
1 MHz	0.07 dB	0.62 dB
10 MHz	0.04 dB	0.62 dB
50 MHz	0.05 dB	0.62 dB
100 MHz	-0.07 dB	0.62 dB
200 MHz	-0.05 dB	0.62 dB
300 MHz	0.00 dB	0.62 dB
400 MHz	0.02 dB	0.62 dB
500 MHz	0.00 dB	0.62 dB
600 MHz	-0.09 dB	0.62 dB
700 MHz	-0.10 dB	0.62 dB
800 MHz	-0.08 dB	0.62 dB
900 MHz	-0.09 dB	0.62 dB
1000 MHz	-0.11 dB	0.62 dB
1500 MHz	-0.09 dB	0.62 dB
2000 MHz	-0.05 dB	0.62 dB
2500 MHz	-0.03 dB	0.62 dB
2990 MHz	-0.01 dB	0.62 dB
Frequency response Check: (@ Continued)		
RF Attenuation 40 dB		
1 MHz	0.07 dB	0.62 dB
10 MHz	0.04 dB	0.62 dB
50 MHz	0.00 dB	0.62 dB
100 MHz	-0.09 dB	0.62 dB
200 MHz	-0.05 dB	0.62 dB
300 MHz	-0.03 dB	0.62 dB
400 MHz	0.00 dB	0.62 dB
500 MHz	-0.05 dB	0.62 dB
600 MHz	-0.09 dB	0.62 dB
700 MHz	-0.07 dB	0.62 dB
800 MHz	-0.08 dB	0.62 dB
900 MHz	-0.09 dB	0.62 dB
1000 MHz	-0.08 dB	0.62 dB
1500 MHz	-0.05 dB	0.62 dB
2000 MHz	-0.02 dB	0.62 dB
2500 MHz	-0.03 dB	0.62 dB
2990 MHz	-0.02 dB	0.62 dB

Test Description	Actual Value	Expanded Uncertainty
10. Display linearity Check:		
RBW 300 Hz		
10 dB	10.00 dB	0.62 dB
12 dB	8.00 dB	0.62 dB
14 dB	5.99 dB	0.62 dB
16 dB	3.98 dB	0.62 dB
18 dB	1.98 dB	0.62 dB
20 dB	0.00 dB(Ref.)	-----
22 dB	-2.00 dB	0.62 dB
24 dB	-4.00 dB	0.62 dB
26 dB	-6.00 dB	0.62 dB
28 dB	-8.00 dB	0.62 dB
30 dB	-10.00 dB	0.62 dB
32 dB	-12.00 dB	0.62 dB
34 dB	-14.00 dB	0.62 dB
36 dB	-16.01 dB	0.62 dB
38 dB	-18.02 dB	0.62 dB
40 dB	-20.00 dB	0.62 dB
42 dB	-22.00 dB	0.66 dB
44 dB	-24.00 dB	0.66 dB
46 dB	-26.00 dB	0.66 dB
48 dB	-28.01 dB	0.66 dB
50 dB	-29.99 dB	0.66 dB
52 dB	-31.99 dB	0.66 dB
54 dB	-34.00 dB	0.66 dB
56 dB	-36.00 dB	0.66 dB
58 dB	-38.01 dB	0.66 dB
60 dB	-39.99 dB	0.66 dB
65 dB	-45.00 dB	0.66 dB
70 dB	-50.00 dB	0.66 dB
75 dB	-55.00 dB	0.66 dB
80 dB	-59.99 dB	0.66 dB
85 dB	-65.00 dB	0.66 dB
90 dB	-70.01 dB	0.66 dB
95 dB	-75.03 dB	0.66 dB
100 dB	-80.07 dB	0.66 dB

Test Description	Actual Value	Expanded Uncertainty
10. Display linearity Check		
RBW 300 kHz:		
10 dB	9.99 dB	0.62 dB
12 dB	7.99 dB	0.62 dB
14 dB	5.99 dB	0.62 dB
16 dB	3.98 dB	0.62 dB
18 dB	1.97 dB	0.62 dB
20 dB	0.00 dB(Ref.)	-----
22 dB	-2.00 dB	0.62 dB
24 dB	-4.00 dB	0.62 dB
26 dB	-6.01 dB	0.62 dB
28 dB	-8.01 dB	0.62 dB
30 dB	-10.01 dB	0.62 dB
32 dB	-12.00 dB	0.62 dB
34 dB	-14.01 dB	0.62 dB
36 dB	-16.02 dB	0.62 dB
38 dB	-18.02 dB	0.62 dB
40 dB	-20.00 dB	0.62 dB
42 dB	-21.99 dB	0.66 dB
44 dB	-23.99 dB	0.66 dB
46 dB	-25.99 dB	0.66 dB
48 dB	-28.00 dB	0.66 dB
50 dB	-29.99 dB	0.66 dB
52 dB	-31.98 dB	0.66 dB
54 dB	-33.99 dB	0.66 dB
56 dB	-35.99 dB	0.66 dB
58 dB	-38.00 dB	0.66 dB
60 dB	-39.99 dB	0.66 dB
65 dB	-44.99 dB	0.66 dB
70 dB	-50.00 dB	0.66 dB
75 dB	-55.01 dB	0.66 dB
80 dB	-60.02 dB	0.66 dB

Test Description	Actual Value	Expanded Uncertainty
11. Attenuator accuracy Check:		
0 dB	-10.04 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	29.98 dB	0.38 dB
50 dB	40.01 dB	0.38 dB
60 dB	50.00 dB	0.38 dB
70 dB	60.03 dB	0.38 dB
12. Reference level		
switching accuracy		
Reference level Check:		
0 dBm	10.00 dB	0.34 dB
-10 dBm	0.00 dB(Ref.)	-----
-20 dBm	-10.00 dB	0.34 dB
-30 dBm	-20.00 dB	0.34 dB
-40 dBm	-30.00 dB	0.34 dB
-50 dBm	-40.00 dB	0.34 dB
-11 dBm	-1.00 dB	0.34 dB
-12 dBm	-2.00 dB	0.34 dB
-13 dBm	-3.00 dB	0.34 dB
-14 dBm	-4.00 dB	0.34 dB
-15 dBm	-5.00 dB	0.34 dB
-16 dBm	-6.00 dB	0.34 dB
-17 dBm	-7.00 dB	0.34 dB
-18 dBm	-8.00 dB	0.34 dB
-19 dBm	-9.00 dB	0.34 dB

校正報告

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.環境管制條件: 溫度: (23 ± 2) ℃； 相對濕度: (50± 10) %。

3.「頻譜分析儀校正程序書」，B00-CD-142，5th Edition。

「測試接收機/頻譜分析儀校正程序書」，B00-CD-376，4th Edition。

並參考ANSI C63.2:2014及CISPR 16-1-1:2015相關規範。

4.報告內之建議再校日期為應申請者要求列入。

5.使用追溯源及附配件:

儀 器 名 稱	校正單位	報 告 號 碼	校正日期	有效日期
Power Sensor	KEYSIGHT(ANAB AC-1498)	1-9230656623-1	2017/9/14	2020/3/13
Power Sensor	KEYSIGHT(ANAB AC-1498)	1-9328170856-1	2017/10/16	2020/4/15
RF Step Attenuator	R&S(DAkkS D-K-15195-01-01)	D-K-15195-01-01 2018-03	2018/3/8	2021/9/7
Rubidium Atomic Frequency Standard	CHT(TAF N0815)	FTC-2018-04-16	2018/4/30	2019/10/29
EPM Series Power Meter	NML(TAF N0688)	U180018A	2018/3/21	2019/9/20

Keysight Technologies
1400 Fountaingrove Parkway
Santa Rosa, California 95403-1738
USA

5962-0476

Certificate of Calibration

Certificate No: 988804-1620896-1

Manufacturer: Keysight Technologies
Description: Spectrum Analyzer
Model No: N9041B
Serial No: US56480107
Options Installed With Specifications: 5CX EA3 EP0 EXM H1G LFE LNP MPB NF2 NUL P50 PFR

Date of Calibration: 14-AUG-2017
Temperature: (23 ± 5) °C
Humidity: (1 to 70)% RH
Procedure: EPSG1030476

This certifies that the equipment has been calibrated using applicable Keysight Technologies procedures in compliance with a quality management system registered to ISO 9001:2015.

As Received: Factory tested. No incoming data available.

As Shipped Conditions: At the completion of the calibration, measured values were IN SPECIFICATION at the points tested.

Remarks or special requirements:

Notes:
1) This calibration report shall not be reproduced, except in full.

Traceability Information: Measurements are traceable to the International System of Units (SI) via national metrology institutes (www.keysight.com/find/NMI) that are signatories to the CIPM Mutual Recognition Arrangement.

Print Date: 18-AUG-2017

Keysight Technologies

	DD	MM	YY	BY
Cal	14	08	17	SC
Due				

Stephanie Cornell
Operations Manager

cert form rev i

KEYSIGHT TECHNOLOGIES

Keysight Technologies
1400 Fountaingrove Parkway
Santa Rosa, California 95403-1738
USA

5962-0476

Certificate of Calibration

Certificate No: 988804-1620896-1

Calibration Equipment Used

Date Used: Date equipment used in this calibration

Model Number	Model Description	Trace Number	Date Used	Cal Due Date
EPM-442A	Power Meter	53981	13-AUG-2017	31-MAY-2018
E4419A	Power Meter	20351	13-AUG-2017	31-OCT-2017
8481D	Power Sensor	23534	13-AUG-2017	10-MAR-2018
8485A	Power Sensor	25321	13-AUG-2017	24-JAN-2019
5065-4616	50 MHz / 0 dBm Power Reference	83799	13-AUG-2017	03-FEB-2018
E8257D	RF Signal Generator	889322	13-AUG-2017	10-MAR-2019
8485A	Power Sensor	84380	13-AUG-2017	23-JAN-2018
E8257D	RF Signal Generator	595364	13-AUG-2017	25-AUG-2018
5065-4618	50 MHz / -30 dBm Power Reference	85517	13-AUG-2017	02-FEB-2018
8481D	Power Sensor	21934	13-AUG-2017	09-MAY-2018
5065-4617	50 MHz / -25 dBm Power Reference	21856	13-AUG-2017	17-JUL-2018
E8257D	RF Signal Generator	969023	14-AUG-2017	30-APR-2018
5065-4617	50 MHz / -25 dBm Power Reference	84544	14-AUG-2017	31-JAN-2018
53131A	Universal Counter	24515	14-AUG-2017	31-MAY-2018
5065-4616	50 MHz / 0 dBm Power Reference	958564	13-AUG-2017	12-JAN-2018
E8257D	RF Signal Generator	984558	13-AUG-2017	09-NOV-2018
E4413A	E-Series Power Sensor	446186	13-AUG-2017	23-MAR-2018
E4413A	E-Series Power Sensor	446192	13-AUG-2017	06-OCT-2017
E4419B	EPM Series Power Meter	401670	13-AUG-2017	30-APR-2019
5065-4617	50 MHz / -25 dBm Power Reference	21432	13-AUG-2017	11-MAY-2018
E8257D	RF Signal Generator	805712	14-AUG-2017	18-FEB-2018
3458A	Multimeter	810262	14-AUG-2017	31-DEC-2017
5065-4617	50 MHz / -25 dBm Power Reference	83869	14-AUG-2017	01-FEB-2018
33120A	Function Generator	21475	14-AUG-2017	30-JUN-2018
53132A	Frequency Counter	20053	14-AUG-2017	31-JUL-2018
N1914A	EPM Series Power Meter	984226	03-AUG-2017	09-MAR-2018
5065-4616	50 MHz / 0 dBm Power Reference	424325	03-AUG-2017	28-FEB-2018
N5245AS	PNA-X Network Analyzer With Custom Solutions	965679	03-AUG-2017	31-MAR-2018
N4693A	2.4mm Electronic Calibration Kit	977167	03-AUG-2017	14-MAR-2018
N8488A	10 MHz to 67 GHz Thermocouple Power Sensors	969433	03-AUG-2017	19-MAR-2018
8496G	Programmable Step Attenuator	681416	13-AUG-2017	23-MAR-2018
8494G	Programmable Step Attenuator	681415	13-AUG-2017	23-MAR-2018
34401A	Multimeter	440958	13-AUG-2017	30-SEP-2017
EPM-442A	Power Meter	20209	13-AUG-2017	31-DEC-2018
5065-4617	50 MHz / -25 dBm Power Reference	84447	13-AUG-2017	22-MAR-2018
EPM-442A	Power Meter	53994	13-AUG-2017	31-MAR-2019
E4433B	Signal Generator	23357	13-AUG-2017	31-MAR-2019
8481D	Power Sensor	14239	13-AUG-2017	14-APR-2018
8482A	Power Sensor	12674	13-AUG-2017	25-JUL-2018
8648D	Signal Generator	20081	13-AUG-2017	08-AUG-2018
53132A	Frequency Counter	421431	11-AUG-2017	28-FEB-2018
E8257D	RF Signal Generator	959219	11-AUG-2017	31-MAY-2019
5065-4617	50 MHz / -25 dBm Power Reference	21860	11-AUG-2017	11-MAY-2018
8485A	Power Sensor	20455	13-AUG-2017	17-MAR-2019
8485A	Power Sensor	20489	13-AUG-2017	13-FEB-2019
N8487A	50 MHz to 50 GHz Thermocouple Power Sensors	974789	13-AUG-2017	04-DEC-2017

KEYSIGHT TECHNOLOGIES

Keysight Technologies
1400 Fountaingrove Parkway
Santa Rosa, California 95403-1738
USA

5962-0476

Certificate of Calibration

Certificate No: 988804-1620896-1

Calibration Equipment Used

Date Used: Date equipment used in this calibration

Model Number	Model Description	Trace Number	Date Used	Cal Due Date
N8487A	50 MHz to 50 GHz Thermocouple Power Sensors	975275	13-AUG-2017	11-FEB-2019
E8257D	RF Signal Generator	972887	13-AUG-2017	31-DEC-2018
EPM-442A	Power Meter	259648	13-AUG-2017	31-JUL-2018
E4419B	EPM Series Power Meter	411670	13-AUG-2017	31-AUG-2018
E8257D	RF Signal Generator	970283	13-AUG-2017	31-MAY-2019
5065-4616	50 MHz / 0 dBm Power Reference	87022	13-AUG-2017	10-MAY-2018
E4417A	Peak Power Meter	972406	13-AUG-2017	14-NOV-2017
N4693A	2.4mm Electronic Calibration Kit	965682	13-AUG-2017	21-APR-2018
N5245AS	PNA-X Network Analyzer With Custom Solutions	980925	13-AUG-2017	28-FEB-2018
5065-4616	50 MHz / 0 dBm Power Reference	421626	13-AUG-2017	15-JUN-2018
N8488A	10 MHz to 67 GHz Thermocouple Power Sensors	975721	13-AUG-2017	07-JUL-2018
E8257D	RF Signal Generator	977931	14-AUG-2017	21-JAN-2018
5065-4617	50 MHz / -25 dBm Power Reference	85922	14-AUG-2017	07-OCT-2017
8487A	Power Sensor	21769	14-AUG-2017	11-OCT-2017
5065-4616	50 MHz / 0 dBm Power Reference	84832	14-AUG-2017	23-MAR-2018
E4419B	EPM Series Power Meter	417535	14-AUG-2017	31-AUG-2018
E8267D	RF Signal Generator	429323	14-AUG-2017	31-AUG-2018
8487A	Power Sensor	85181	14-AUG-2017	04-OCT-2017
E8257D	RF Signal Generator	878612	13-AUG-2017	31-DEC-2017
5065-4616	50 MHz / 0 dBm Power Reference	83932	13-AUG-2017	10-MAY-2018
E4413A	E-Series Power Sensor	446183	13-AUG-2017	23-JUN-2018
ECP-E26A	Sensor, CW Power	960966	13-AUG-2017	23-MAR-2018
E4419B	EPM Series Power Meter	260036	13-AUG-2017	30-APR-2019
5065-4620	50 MHz / -25 dBm Power Reference	84454	13-AUG-2017	17-MAY-2018
E4437B	Signal Generator	388745	13-AUG-2017	31-MAR-2018
8485A	Power Sensor	14432	13-AUG-2017	10-JAN-2019
8485A	Power Sensor	21458	13-AUG-2017	22-MAY-2019
E4437B	Signal Generator	23055	13-AUG-2017	06-SEP-2018
5065-4616	50 MHz / 0 dBm Power Reference	84619	13-AUG-2017	09-MAY-2018
EPM-442A	Power Meter	20824	13-AUG-2017	31-MAY-2019
8485A	Power Sensor	84377	13-AUG-2017	01-JUN-2018
E4419B	EPM Series Power Meter	21962	13-AUG-2017	31-JUL-2018
5065-4616	50 MHz / 0 dBm Power Reference	419807	13-AUG-2017	09-MAY-2018

Calibration Laboratory of Microwave Measuring Equipment
of MWM lab

ISO 17025
ACCREDITED LABORATORY

Calibration certificate

Accreditation certificate No. **№ BY/112 02.5.0.0065** **of** **09.01.2015**

Certificate number **95-17** **Date when calibrated** 10/17/2017 **Page** 1 **of** 2

Item calibrated **Mixer M22HWD # 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

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

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

Calibration Certificate

Certificate number **95-17**

Calibration is performed by using

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

Calibration conditions

Temperature 22.2 °C
Humidity 45 %
Pressure 99.7 kPa

Calibration results are given in the Measuring report # 95-17.

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

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

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 # 95-17

October 17, 2017

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

MEASURING CONDITIONS

Temperature: 22.2 °C	Humidity: 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	Spectrum analyzer E4407B	MY45110807
5	Signal generator G4-161	3
6	Signal generator MG3694C	133805
7	Voltmeter V7-34	0067787
8	Frequency meter RCH3-72	931200
9	Frequency meter CH3-66	98051
10	Diplexer DPL26	01

MEASURING RESULTS

IF Frequency 321.4 MHz ± 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.

Table 1

Frequency, GHz	33	44	55
Input RF Power, dBm	-20.0	-20.0	-20.0
Measured Value, dBm	-54.9	-53.5	-53.5
Conversion Loss, dB	**34.9**	**33.5**	**33.5**
Expanded uncertainty, dB	2.1	2.1	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.C.C.
2. Calibration Laboratory of Microwave Measuring Equipment

Calibration Laboratory of Microwave Measuring Equipment
of MWM lab

ISO 17025
ACCREDITED LABORATORY

Calibration certificate

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

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

Calibration Certificate

Certificate number **96-17**

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

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

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

MEASURING CONDITIONS

Temperature: 22.2 °C	Humidity: 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^2	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

Calibration Laboratory of Microwave Measuring Equipment
of MWM lab

ISO 17025
ACCREDITED LABORATORY

Calibration certificate

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

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

MWM Lab. BSUIR, 6, P.Brovki str., Minsk, 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

Calibration Certificate

Certificate number **97-17**

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

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

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

MEASURING CONDITIONS

Temperature: 22.2 °C	Humidity: 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 ± 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^2	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

Calibration Laboratory of Microwave Measuring Equipment
of MWM lab

ISO 17025
ACCREDITED LABORATORY

Calibration certificate

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 **Date of issue** **10/17/2017**
Name and position

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

Calibration Certificate

Certificate number **101-17**

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 μW)	Corresponds

Signature of the person who has performed calibration

M. Kasperovich/ Engineer

Name and function

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

Calibration Laboratory of
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Technical Manager

M. Svirid

October 17, 2017

MEASURING REPORT # 101-17

October 17, 2017

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

MEASURING CONDITIONS

Temperature: 22.9 °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 ± 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
Conversion Loss, dB	**31.2**	**32.6**	**35.0**	**37.4**
Expanded uncertainty, dB	2.0	2.1	2.2	2.5

Engineer _____ M. Kasperovich

Quality Manager _____ A. Kostrikin

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ISO 17025
ACCREDITED LABORATORY

Calibration certificate

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

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

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

Calibration Certificate

Certificate number **102-17**

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

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

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Technical Manager

_____ M. Svirid

October 17, 2017

MEASURING REPORT # 102-17

October 17, 2017

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

MEASURING CONDITIONS

Temperature: 22.9 °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^2	0.430	0.503	0.627	0.800
Maximum level of measured power, μW	0.283	0.288	0.269	0.263
Gain, dB	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

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ACCREDITED LABORATORY

Calibration certificate

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

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

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

Calibration Certificate

Certificate number **103-17**

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

MWM Lab. BSUIR, 6, P.Brovki str., Minsk 220027, Belarus *Phone/Fax: +375 17 293-84-96/E-mail: info@mwmlab.com*

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Technical Manager

M. Svirid

October 17, 2017

MEASURING REPORT # 103-17

October 17, 2017

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

MEASURING CONDITIONS

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

MEASURING EQUIPMENT

#	Measuring equipment	Serial number
1	Wattmeter M 568	164
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3	Signal generator G4-186	5
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IF Frequency 321.4 MHz ± 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^2	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
Conversion Loss, dB	31.5	32.6	35.2	37.2
Expanded uncertainty, dB	2.8	2.9	2.8	2.8

Engineer _____ M. Kasperovich

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