Antenna Gain Measurement Report

Report No.:	RFBEDV-WTW-P23030565-5
FCC ID:	G95MGA5331
Model No.:	MGA5331
Received Date:	2023/3/16
Test Date:	2023/6/2 ~ 2023/6/6
Issued Date:	2023/7/27
Applicant:	Vantiva USA LLC
Address:	4855 Peachtree Industrial Blvd. Suite 200 Norcross, Georgia 30092
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kewi Shan Dist., Taoyuan City 33383, Taiwan
FCC Registration / Designation Number:	788550 / TW0003

Prepared by : Pettie Chen , **Date:** 2023/7/27

Pettie Chen / Senior Specialist

Approved by : Jeremy Lin , **Date:** 2023/7/27

Jeremy Lin / Project Engineer

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Release Control Record

Issue No.	Description	Date Issued
RFBEDV-WTW-P23030565-5	Original release.	2023/7/27

1 EUT Antenna System Description

1.1 Antenna Information

Antenna Type	PCB			
Connector Type	ipex(MHF)			
Frequency (MHz)	Max Gain (dBi)			
	Chain 0	Chain 1	Chain 2	Chain 3
2.4GHz	1.28	-0.72	-4.58	-2.14
5G Band 1	1.51	-0.18	0.73	-0.12
5G Band 2	1.03	1.28	2.03	0.09
5G Band 3	2.62	-0.26	2.19	2.19
5G Band 4	0.47	-0.29	2.81	0.47

1.2 Antenna Location

Please refer to report No.: BEDV-WTW-P23030565

2 2D Antenna Pattern Measurement

2.1 Test Location

2D antenna pattern measurement in Fully Anechoic Chamber

2.2 Test Measurement procedure

CISPR 16-1-6
ANSI 63.10-2013 clause 13
KDB 412172 D01 Determining ERP and EIRP v01r01

2.3 Test Setup Diagram @ Fully Anechoic Chamber

The 2D antenna pattern measurement is using the test system (refer to Figure 1). The EUT is positioned on center of turntable, for Free Space only in fully anechoic chamber. Data (Raw Value) is recorded using the spectrum analyzer at each position.

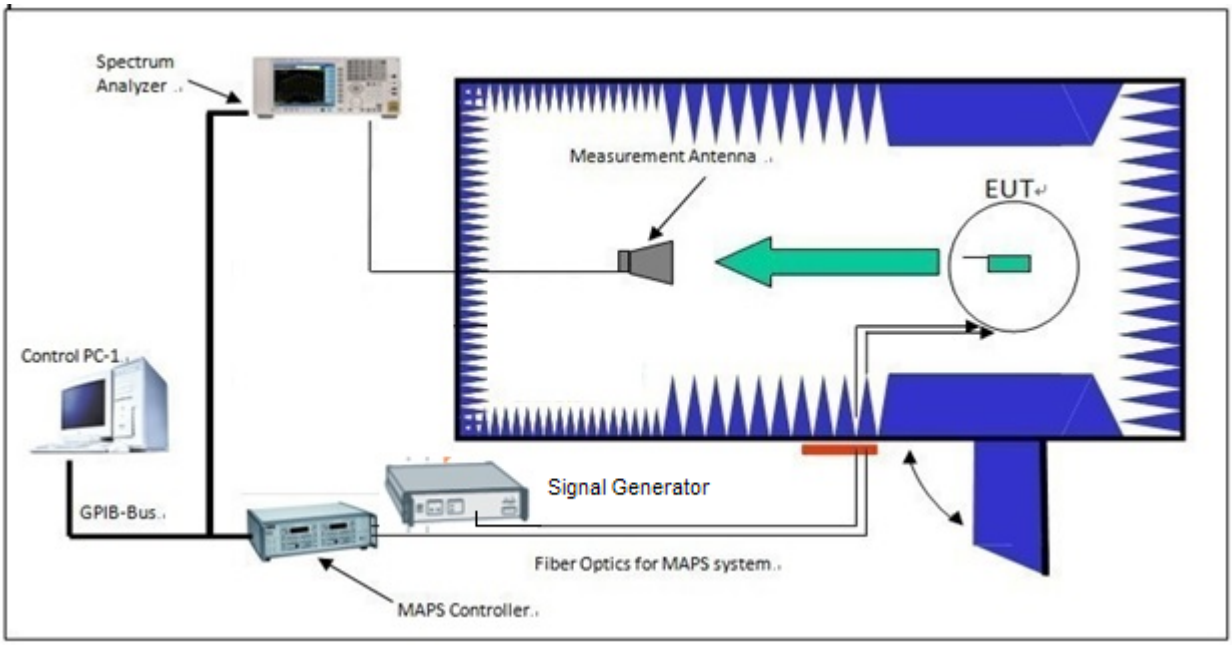


Figure 1. 2D antenna pattern test system.

2.4 Test Setup Diagram for EUT

Please refer to the attached file (Test Setup Photo)

2.5 Test Instruments

Description & Manufacturer	Model No.	Serial No.	Date of Calibration	Due Date of Calibration
PXA Signal Analyzer KEYSIGHT	N9030B	MY57141948	May 19, 2023	May 18, 2024
BILOG Antenna SCHWARZBECK	VULB 9168	9168-158	Oct. 25, 2022	Oct. 24, 2023
HORN Antenna ETS	3117	00034128	Nov. 13, 2022	Nov. 12, 2023
HORN Antenna SCHWARZBECK	BBHA 9170	BBHA9170243	Nov. 13, 2022	Nov. 12, 2023
Preamplifier Agilent	8449B	3008A01963	Jul. 09, 2022	Jul. 08, 2023
Preamplifier Agilent	8447D	2944A10627	Jul. 09, 2022	Jul. 08, 2023
RF signal cable HUBER+SUHNER	SUCOFLEX 104	Cable-RF1-03 (223650/4)	Jul. 09, 2022	Jul. 08, 2023
RF signal cable WOKEN	8D-FB	Cable-RF1-01	Jul. 09, 2022	Jul. 08, 2023
RF signal cable INFINET	CA3501-3501-G.90 (3m) & CA3501-3501-F.90 (2m)	INF090 (3m)*2 & TCF427S (2m)*1	Jul. 09, 2022	Jul. 08, 2023
Software ADT	ADT_Radiated_V7.6.15.9.5	NA	NA	NA
Antenna Tower Max-Full	MFA-440H	9707	NA	NA
Turn Table ADT	NA	SN40303	NA	NA
Controller Max-Full	MF-7802	MF7802093	NA	NA
Temperature & Humidity chamber TERCHY	MHU-225AU	920842	Jun. 21, 2022	Jun. 20, 2023
Splitters/Combiners Mini-Circuits	ZN2PD-9G	NA	Jun. 09, 2022	Jun. 08, 2023
26GHz ~ 40GHz Amplifier EMC	EMC184045B	980175	Sep. 03, 2022	Sep. 02, 2023
Absorber 30 MHz ~ 40GHz	TDK / IP-045C	NA	NA	NA

TYPICAL ABSORPTION CHARACTERISTICS (VERTICAL INCIDENCE) Unit: dB

Material name	30MHz	50MHz	100MHz	500MHz	1GHz	5GHz	18GHz	40GHz
IP-045C	18	18	15	20	20	30	40	40

Note:
1. The test was performed in HwaYa RF Chamber 1.
2. The horn antenna and preamplifier (model: 8449B) are used only for the measurement of emission frequency above 1 GHz if tested.
3. The calibration interval of the all test instruments are 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

2.6 Measurement Uncertainty

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

Frequency Range	Uncertainty (±)
1 GHz ~ 18 GHz	3.294 dB

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2.7 Test Procedure

a. Connect the EUT antenna connector to the signal generator.
b. Fasten the EUT to the locator in the center of the turntable, leaving only free space.
c. Transmit a 0 dBm power level from the signal generator to the EUT antenna connector. Please refer to Figure 2 for detailed configuration.
d. Make sure the transmit signal is stable at the maximum RF power level.
e. Read the power level on the spectrum analyzer and record it in the following locations.
f. The EUT is placed on a turntable that rotates 360° in 1° steps. Measure the E and H plane patterns.
g. The turntable should be stepped from 0° to 360° with a maximum angular resolution of 1°. The 360° measurement should be compared to the 0° value to complete the pattern.
h. According to section 2.3 of KDB 412172 D01 Determining ERP and EIRP v01r01, the substitution horn antenna is substituted for EUT at the same position and signals generator export the CW signal to the substitution antenna via a TX cable. Rotated the Turn Table and moved receiving antenna to find the maximum radiation power. Adjust output power level of S.G to get a Value of spectrum reading equal to “Raw Value”. Record the power level of S.G.

$EIRP = P_{SigGen} + G_T - L_C$

where:

P_{SigGen} = power setting of the signal generator that produces the same received power reading as the DUT, in dBm.
G_T = gain of the substitute antenna, in dBd (ERP) or dBi (EIRP);
L_C = signal loss in the cable connecting the signal generator to the substitute antenna, in dB.

2.8 Test Result

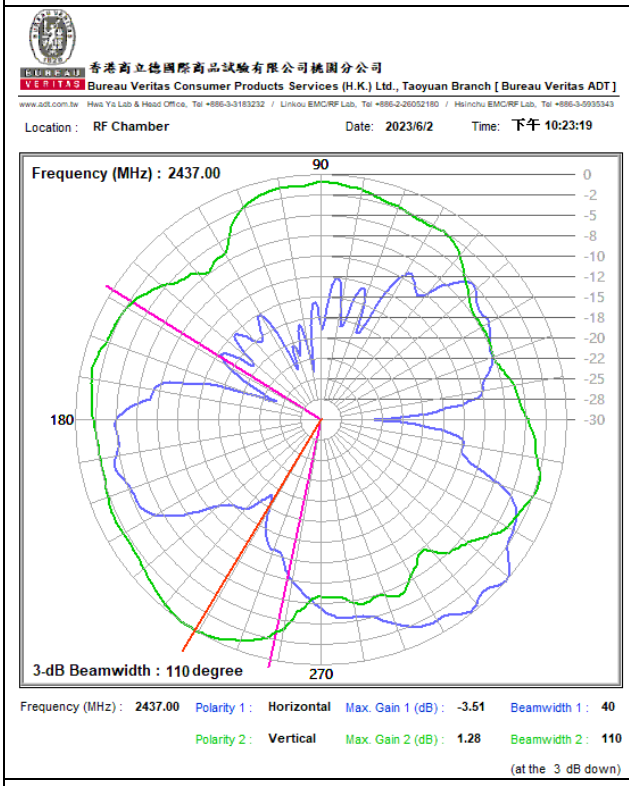
Tested By	Jeff Chen

Frequency (MHz)	Max Gain (dBi)			
	Chain 0	Chain 1	Chain 2	Chain 3
2.4GHz	1.28	-0.72	-4.58	-2.14
5G Band 1	1.51	-0.18	0.73	-0.12
5G Band 2	1.03	1.28	2.03	0.09
5G Band 3	2.62	-0.26	2.19	0.73
5G Band 4	0.47	-0.29	2.81	0.47

2.9 2D Pattern Test Plots

2437MHz: X Plane

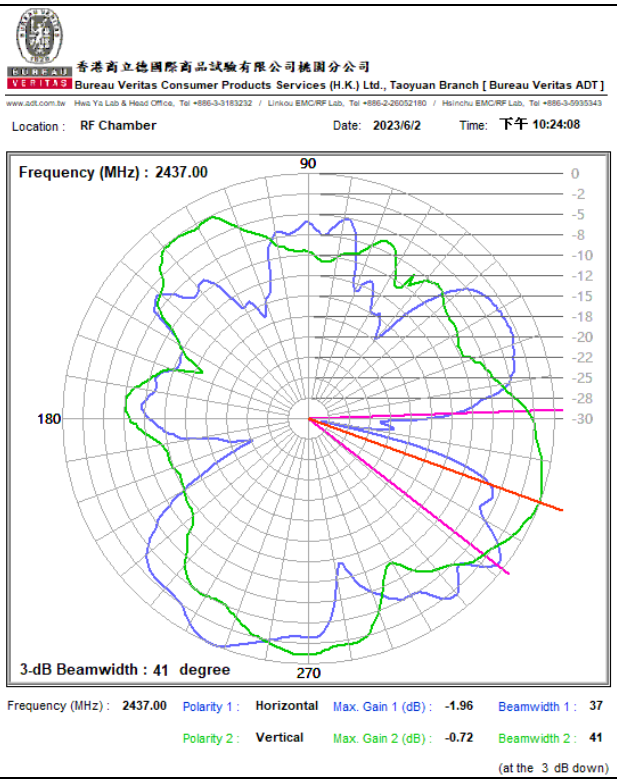
ANT 1



Frequency (MHz) :	2437.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-3.51	Beamwidth 1 :	40
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	1.28	Beamwidth 2 :	110

(at the 3 dB down)

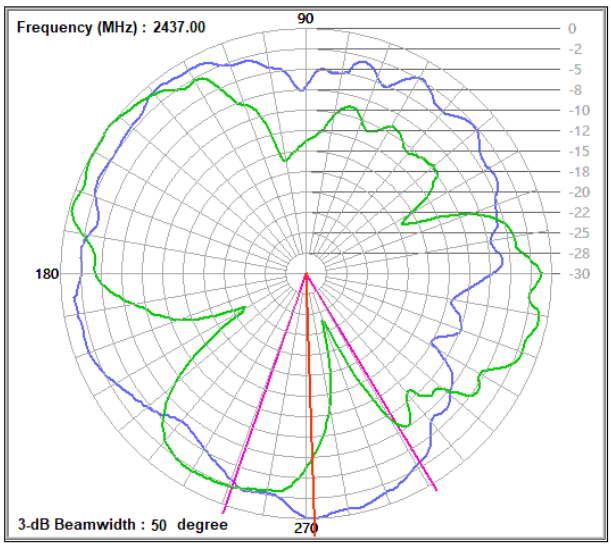
ANT 2



Frequency (MHz) :	2437.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-1.96	Beamwidth 1 :	37
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-0.72	Beamwidth 2 :	41

(at the 3 dB down)

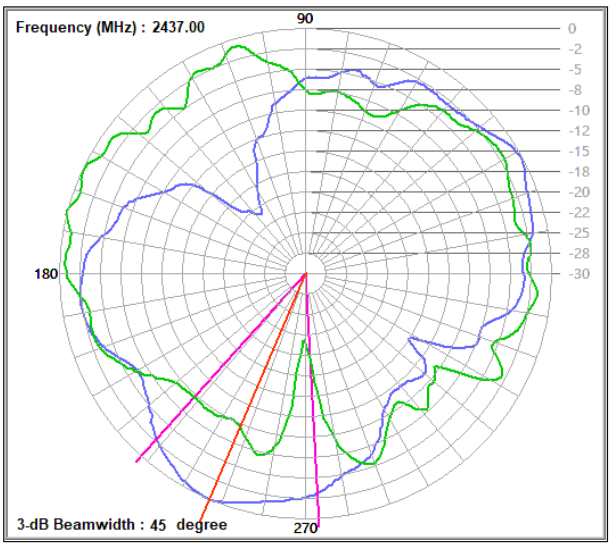
ANT 3



Frequency (MHz) :	2437.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-4.58	Beamwidth 1 :	50
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-8.67	Beamwidth 2 :	54

(at the 3 dB down)

ANT 4



Frequency (MHz) :	2437.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-2.14	Beamwidth 1 :	45
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-8.06	Beamwidth 2 :	47

(at the 3 dB down)

5180MHz: X Plane

ANT 1

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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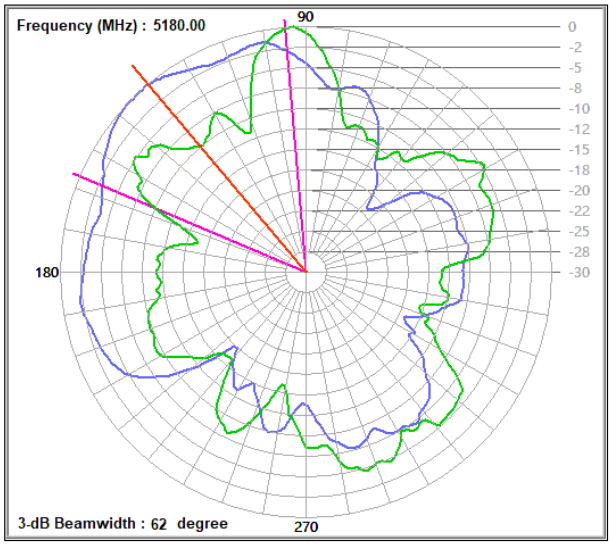

Frequency (MHz) :	5180.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	1.51	Beamwidth 1 :	62
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-8.68	Beamwidth 2 :	18

(at the 3 dB down)

ANT 2

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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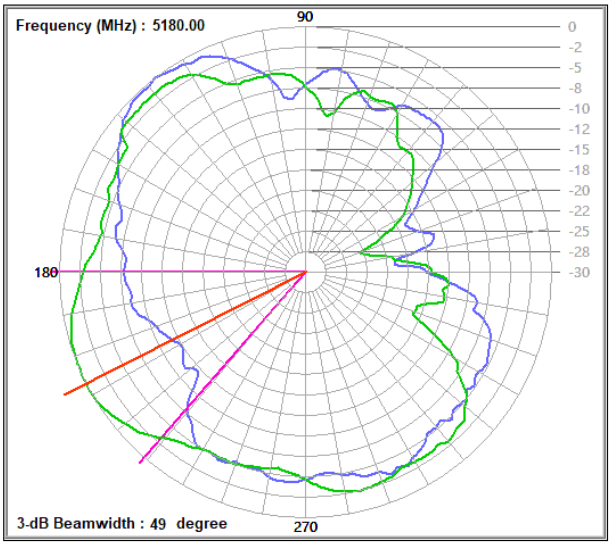

Frequency (MHz) :	5180.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-4.70	Beamwidth 1 :	40
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-0.18	Beamwidth 2 :	49

(at the 3 dB down)

ANT 3

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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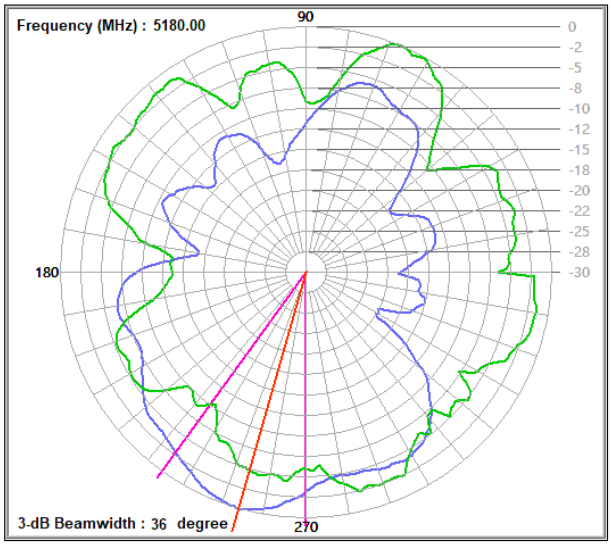

Frequency (MHz) :	5180.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	0.73	Beamwidth 1 :	36
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-11.10	Beamwidth 2 :	25

(at the 3 dB down)

ANT 4

香港商立德國際商品試驗有限公司桃園分公司
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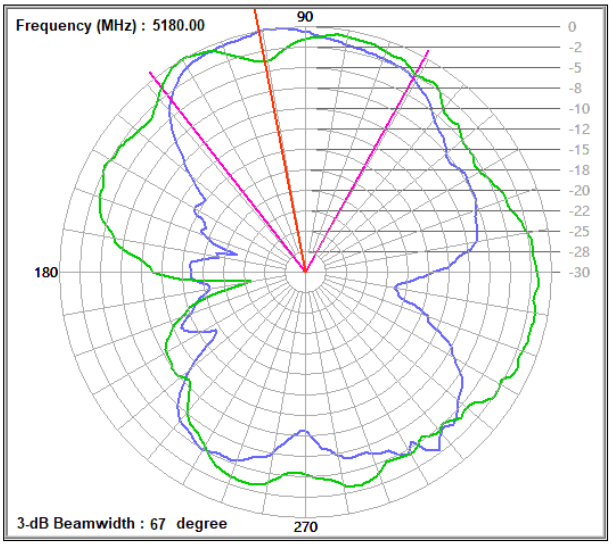

Frequency (MHz) :	5180.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-0.12	Beamwidth 1 :	67
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-1.49	Beamwidth 2 :	28

(at the 3 dB down)

5320MHz: X Plane

ANT 1

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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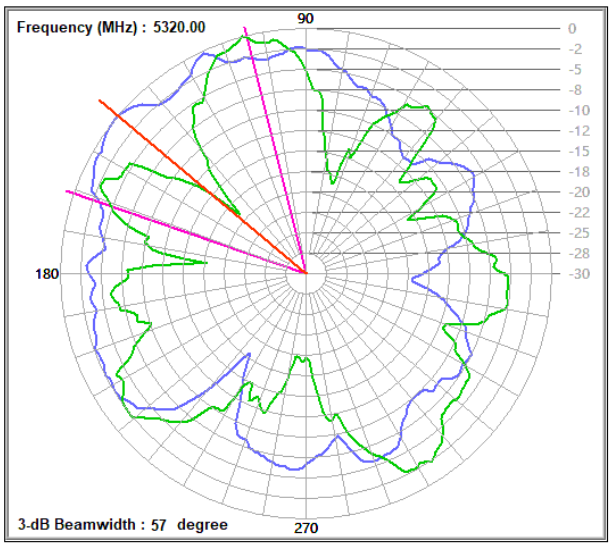

Frequency (MHz) :	5320.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	1.03	Beamwidth 1 :	57
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-6.68	Beamwidth 2 :	24

(at the 3 dB down)

ANT 2

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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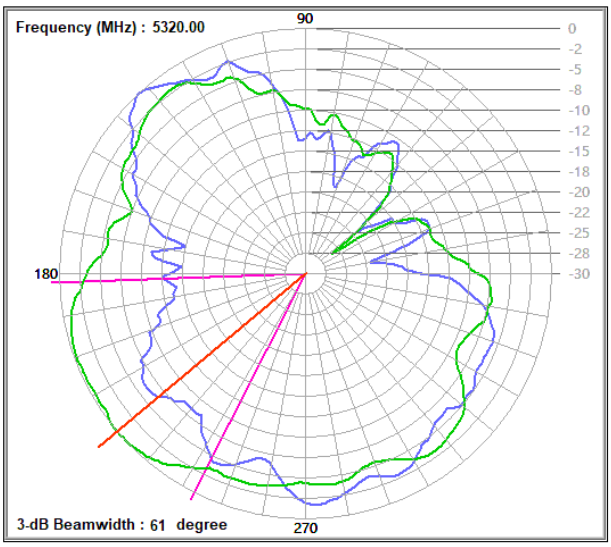

Frequency (MHz) :	5320.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-3.50	Beamwidth 1 :	22
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	1.28	Beamwidth 2 :	61

(at the 3 dB down)

ANT 3

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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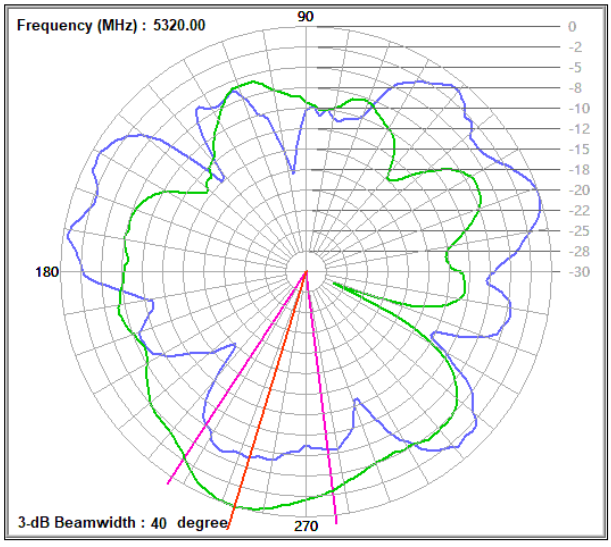

Frequency (MHz) :	5320.00	Polarity 1 :	Vertical	Max. Gain 1 (dB) :	-8.54	Beamwidth 1 :	21
		Polarity 2 :	Horizontal	Max. Gain 2 (dB) :	2.03	Beamwidth 2 :	40

(at the 3 dB down)

ANT 4

香港商立德國際商品試驗有限公司桃園分公司
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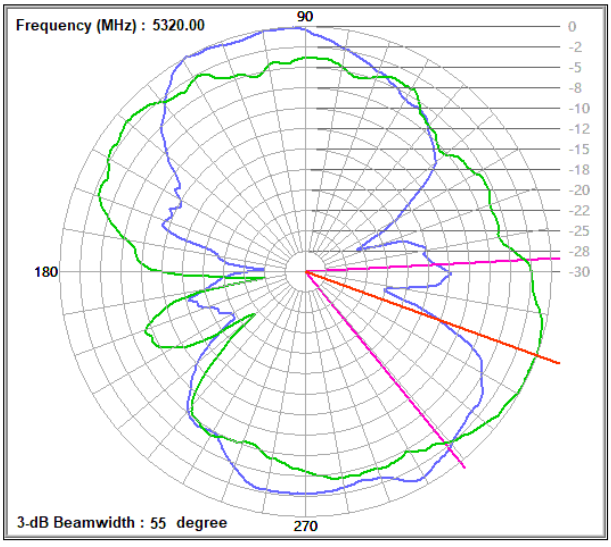

Frequency (MHz) :	5320.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-0.20	Beamwidth 1 :	54
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	0.09	Beamwidth 2 :	55

(at the 3 dB down)

5500MHz: X Plane

ANT 1

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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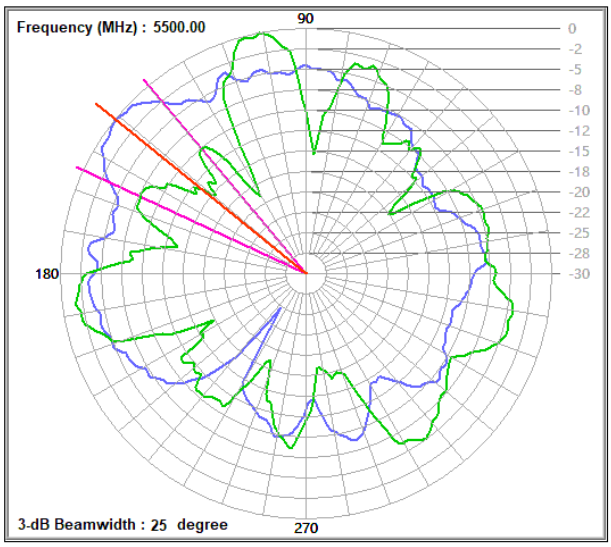

Frequency (MHz) :	5500.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	2.62	Beamwidth 1 :	25
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-5.99	Beamwidth 2 :	16

(at the 3 dB down)

ANT 2

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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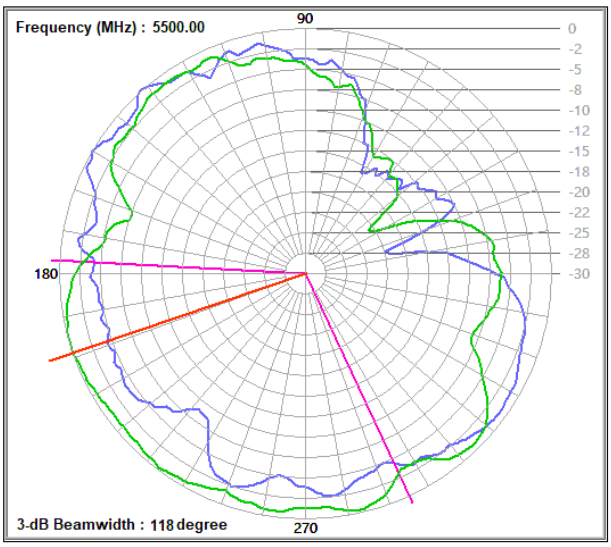

Frequency (MHz) :	5500.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-4.15	Beamwidth 1 :	46
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-0.26	Beamwidth 2 :	118

(at the 3 dB down)

ANT 3

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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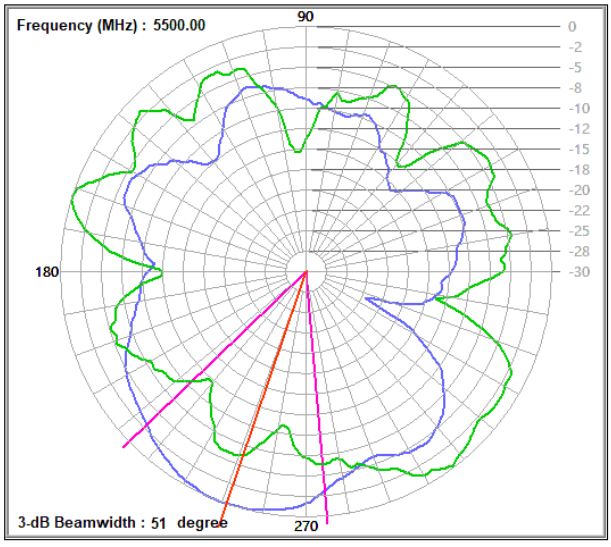

Frequency (MHz) :	5500.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	2.19	Beamwidth 1 :	51
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-9.46	Beamwidth 2 :	15

(at the 3 dB down)

ANT 4

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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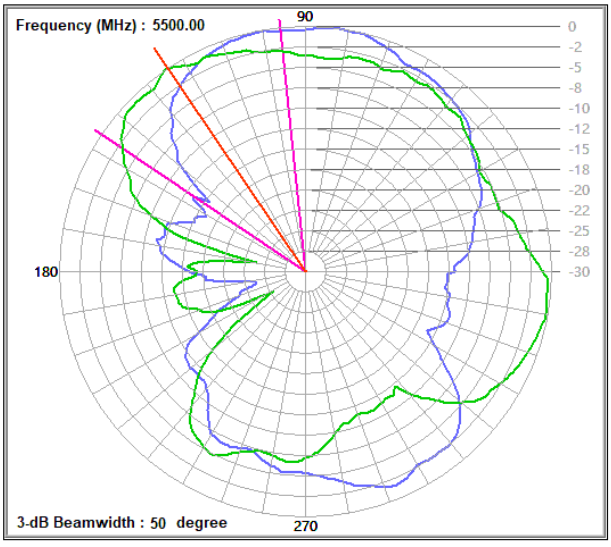

Frequency (MHz) :	5500.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-0.06	Beamwidth 1 :	82
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	0.73	Beamwidth 2 :	50

(at the 3 dB down)

5785MHz: X Plane

ANT 1

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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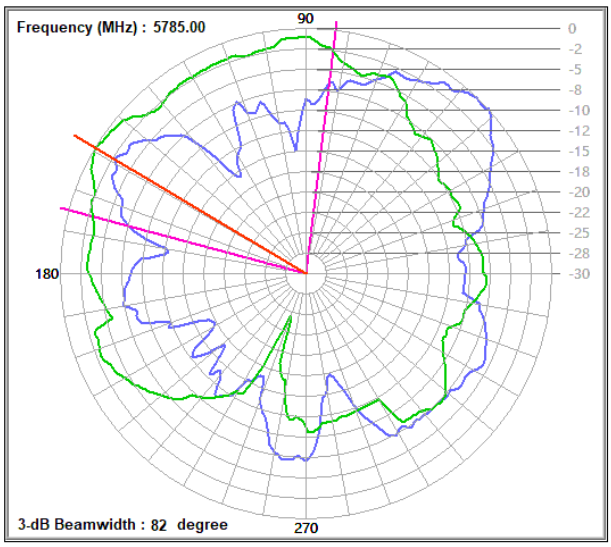

Frequency (MHz) :	5785.00	Polarity 1 :	Vertical	Max. Gain 1 (dB) :	-7.27	Beamwidth 1 :	29
		Polarity 2 :	Horizontal	Max. Gain 2 (dB) :	0.47	Beamwidth 2 :	82

(at the 3 dB down)

ANT 2

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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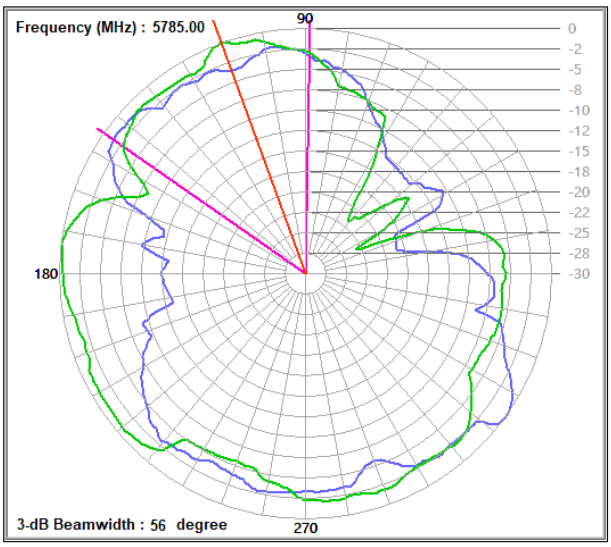

Frequency (MHz) :	5785.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	-2.40	Beamwidth 1 :	37
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-0.29	Beamwidth 2 :	56

(at the 3 dB down)

ANT 3

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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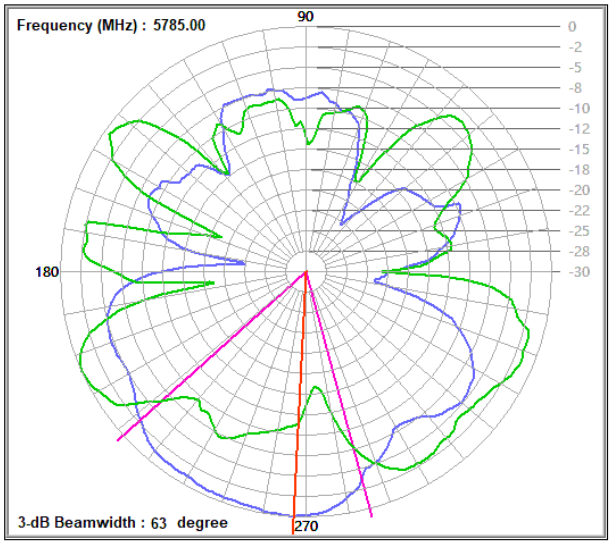

Frequency (MHz) :	5785.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	2.81	Beamwidth 1 :	63
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	-4.00	Beamwidth 2 :	22

(at the 3 dB down)

ANT 4

香港商立德國際商品試驗有限公司桃園分公司
Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch [Bureau Veritas ADT]

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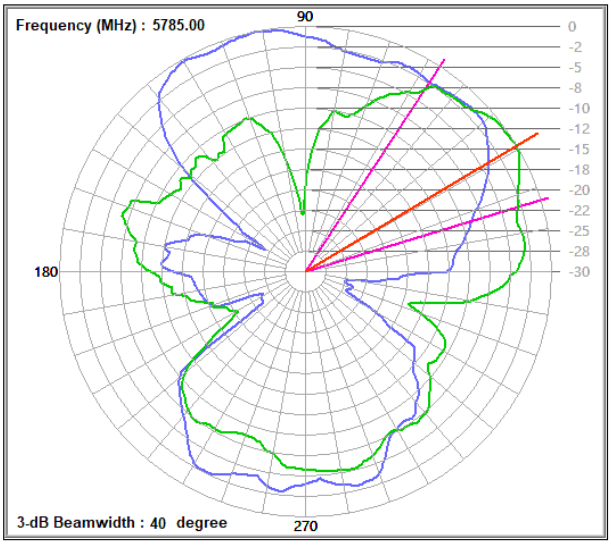

Frequency (MHz) :	5785.00	Polarity 1 :	Horizontal	Max. Gain 1 (dB) :	0.26	Beamwidth 1 :	97
		Polarity 2 :	Vertical	Max. Gain 2 (dB) :	0.47	Beamwidth 2 :	40

(at the 3 dB down)

3 Appendix - Information of the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are FCC recognized accredited test firms and accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The address and road map of all our labs can be found in our web site also.

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