

Radio Test Report (BT-LE)

Report No.: RJ160905E02D-1

Test Model: B-00028

Received Date: June 21, 2018

Test Date: June 26, 2018

Issued Date: July 09, 2018

Applicant: LOGITECH FAR EAST LTD.

Address: #2 Creation Rd. 4, Science-Based Ind. Park Hsinchu Taiwan, R.O.C.

Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Hsin Chu Laboratory

Lab Address: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan R.O.C.

Test Location: E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,
Taiwan R.O.C.



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification. The report must not be used by the client to claim product certification, approval, or endorsement by TAF or any government agencies.

Table of Contents

Release Control Record	3
1 Certificate of Conformity	4
2 Summary of Test Results	5
2.1 Measurement Uncertainty	6
2.2 Modification Record	6
3 General Information	7
3.1 General Description of EUT (BT-LE)	7
3.2 Description of Test Modes	8
3.3 Test Conditions	8
3.4 Assembly	8
3.5 Antenna Specifications	9
3.5.1 Antenna Gain	9
3.5.2 Antenna Pattern	10
4 Test Results	28
4.1 Spurious Emissions for Transmitter Measurement	28
4.1.1 Limits of Spurious Emissions	28
4.1.2 Test Setup	28
4.1.3 Test Results	29
4.2 Spurious Emissions for Receiver	33
4.2.1 Limits of Spurious Emissions for Receiver	33
4.2.2 Test Setup	33
4.2.3 Test Result	34
5 Test Instruments	38
6 Photographs of the Test Configuration	39
Appendix - Information on the Testing Laboratories	40

Release Control Record

Issue No.	Description	Date Issued
RJ160905E02D-1	Original release.	July 09, 2018

1 Certificate of Conformity

Product: Headphone

Brand: Jaybird

Test Model: B-00028

Sample Status: ENGINEERING SAMPLE

Applicant: LOGITECH FAR EAST LTD.

Test Date: June 26, 2018

Standards: ARIB STD-T66 (V3.7), MIC notice 88 Appendix 43

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by :  , **Date:** July 09, 2018
Claire Kuan / Specialist

Approved by :  , **Date:** July 09, 2018
May Chen / Manager

2 Summary of Test Results

The EUT has been tested according to the following specifications:

Notice 88 Appendix 43 Reference	ARIB STD-T66 Ref.	Report Reference	Parameter	Test Results (Note)
General Provisions				
E	3.2 (6)	4.1	Spurious emissions	C
Transmitting Antenna				
--	--	3.5	Type, configuration, etc. of transmitting antenna	C
--	--	3.5	Direction pattern of transmitting antenna	C
Receiving Equipment				
G	3.3 (1)	4.2	Spurious emissions of receiver	C
--	--	3.5	Refer to all articles for transmitting antenna	C
Operating Frequency 2400 to 2483.5MHz				
--	3.7 (1)	3.4	High frequency / modulation section cannot be opened easily	C
--	3.1 (1)	3.1	Communication method	C
--	3.2 (1)a	3.1	Modulation method	C
--	3.2 (1)a	3.1	Spread spectrum method	C
Note: 1.C = Conform NC = Not Conform NT = Not Tested NA = Not Applicable 2. This report is supplementary report.				

2.1 Measurement Uncertainty

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the EUT as specified in TR 100 028-1.

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

Parameter	Uncertainty
Occupied Bandwidth	703.56 Hz
Spurious emissions	2.52 dB
Output power density	1.37 dB
Out of band radiated power	2.52 dB
Frequency Tolerance	703.56 Hz

2.2 Modification Record

There were no modifications required for compliance.

3 General Information

3.1 General Description of EUT (BT-LE)

Product	Headphone
Brand	Jaybird
Test Model	B-00028
Status of EUT	ENGINEERING SAMPLE
Nominal Voltage	DC 3.8V from battery DC 5V from USB interface
Modulation Type	GFSK
Modulation Technology	DTS
Transfer Rate	up to 1Mbps
Operating Frequency	2402MHz ~ 2480MHz
Number of Channel	40
Rated RF Output Power	9 mW
Conducted RF Output Power	8.185 mW
Radiated RF Output Power	8.269 mW
Antenna Type	Refer to section 3.5
Antenna Connector	Refer to section 3.5
Accessory Device	USB Charging Cable x 1 (unshielded, 9cm)
Cable Supplied	NA

Note:

1. This is a supplementary report of Report No.: RJ160905E02-1. The differences between them are as below information:

- ◆ USB cable just molded with charging board.
- ◆ Added one new battery as following table:

Original		
Brand Name	Model No.	Spec.
GP	NTA3266	3.8V, 60mAh
Newly		
Brand Name	Model No.	Spec.
GP	NTA3266-V3	3.8V, 53mAh

2. According to above conditions, only spurious emissions (below 1GHz) test of the new battery needs to be performed. And all data were verified to meet the requirements.
3. The EUT may have a lot of colors for marketing requirement.
4. The above EUT information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

3.2 Description of Test Modes

40 channels are provided for BT-LE mode:

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

Note:

1. The channels which were indicated in bold type of the above channel list were selected as representative test channel. Therefore only the data of the test channels were recorded in this report.

By means of test software (Blue Test3.exe V2.5) provided by manufacturer, the power levels during the tests were set according to the following codes:

Channel	Power Setting
0	Default
19	Default
39	Default

3.3 Test Conditions

Test Conditions	Voltage (Vdc)
V_{normal}	3.8
V_{max}	4.18
V_{min}	3.42

3.4 Assembly

The EUT is constructed as a Headphone. The housing consists of two parts, and the plastic enclosure was assembled with glue and covered by rubbers, separating the two parts was only possible by means of brute force.

3.5 Antenna Specifications

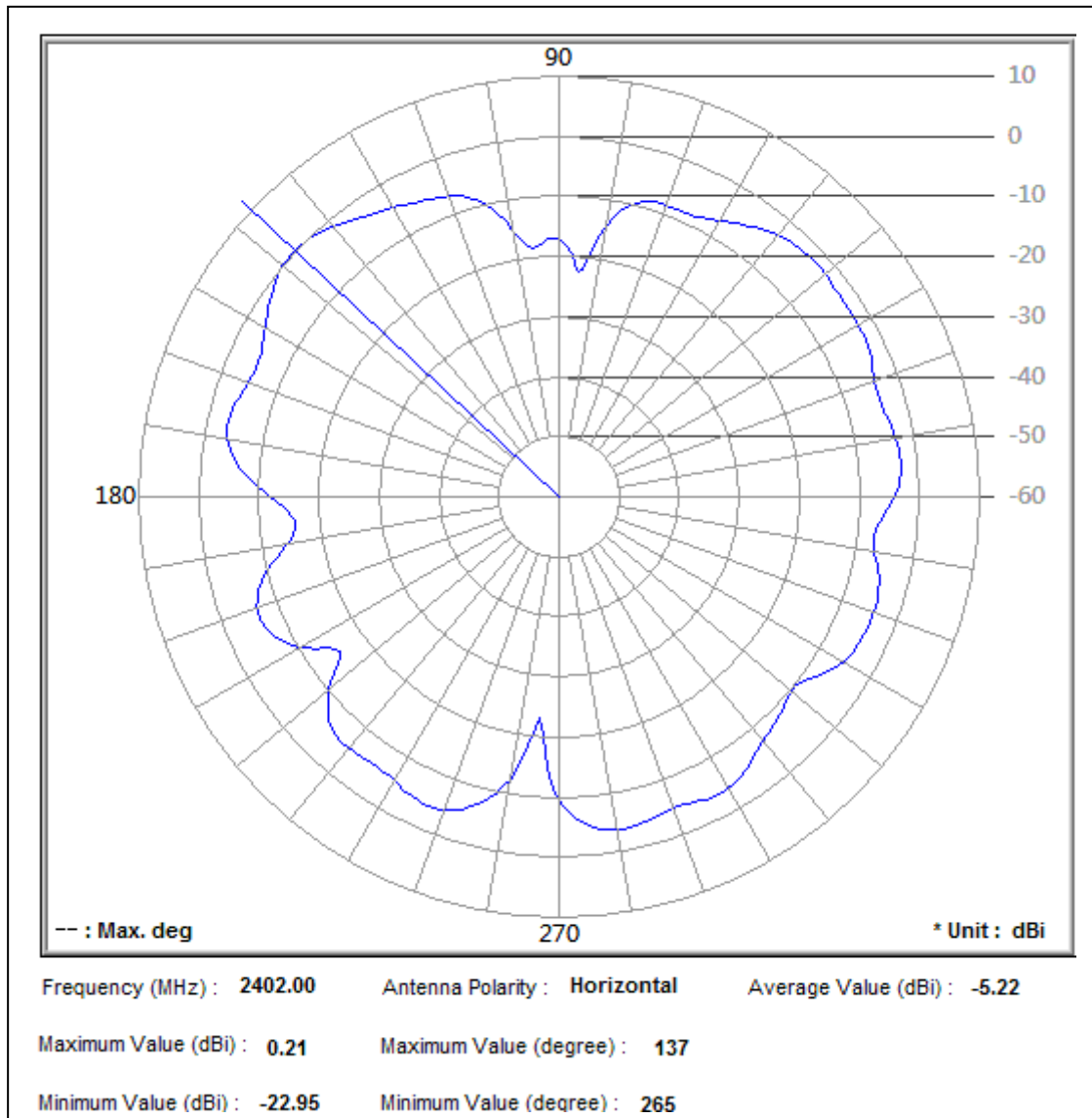
3.5.1 Antenna Gain

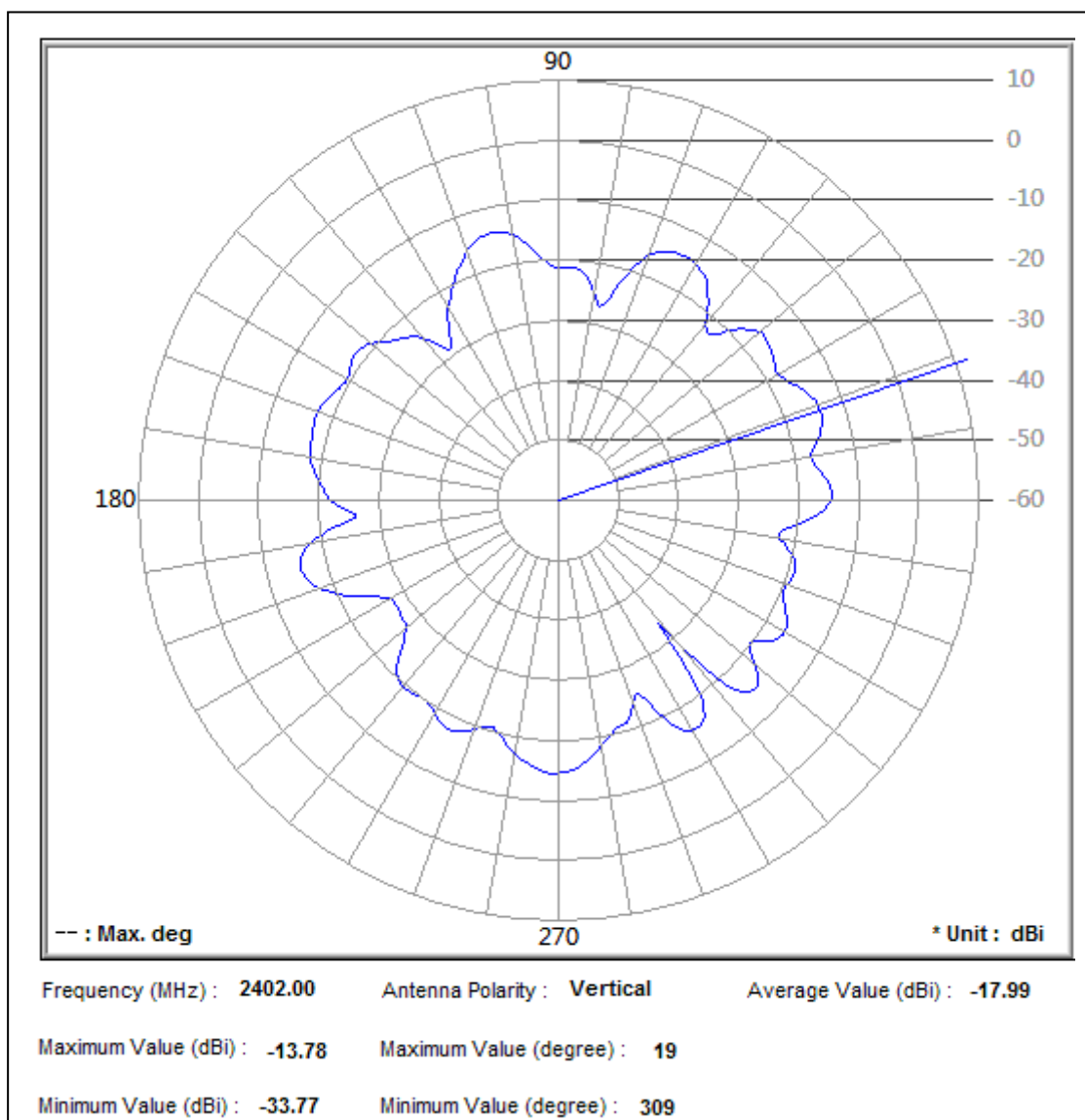
The antennas provided to the EUT, please refer to the following table:

Brand	Model	Antenna Gain (dBi)	Frequency range (GHz to GHz)	Antenna Type	Connector Type
NA	NA	0.54	2.4-2.4835	Loop Antenna	NA

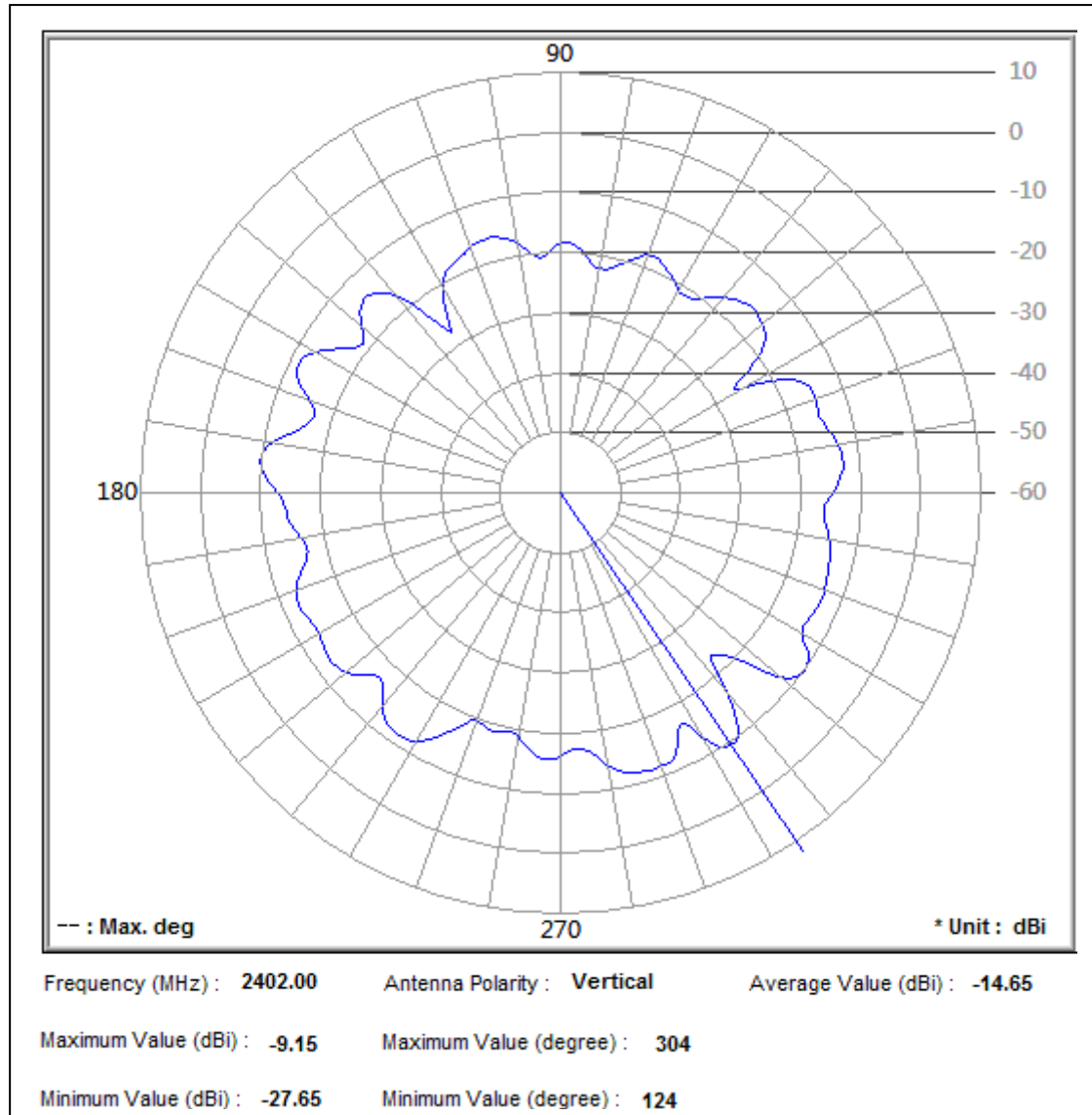
3.5.2 Antenna Pattern

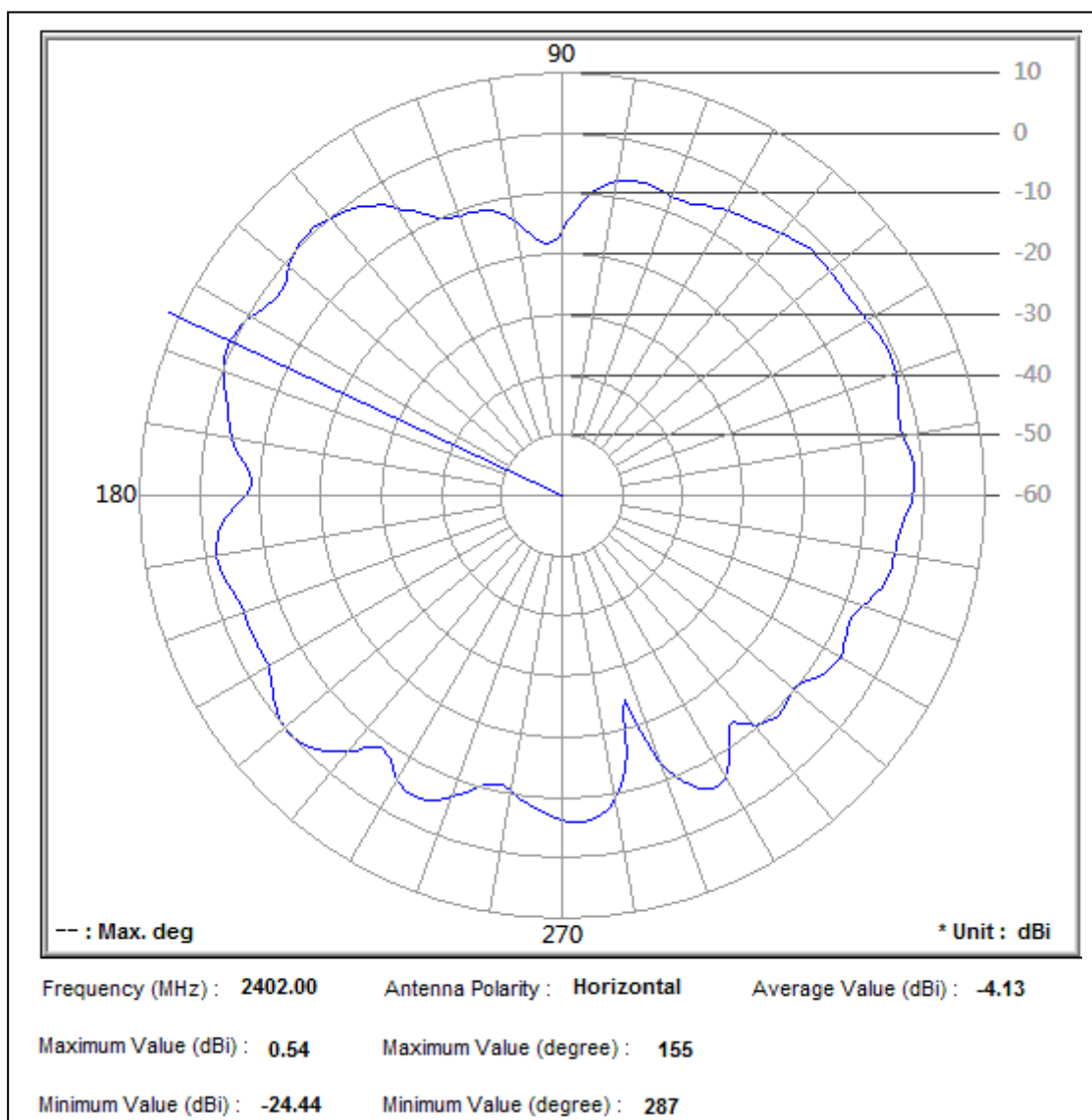
X-Y plane



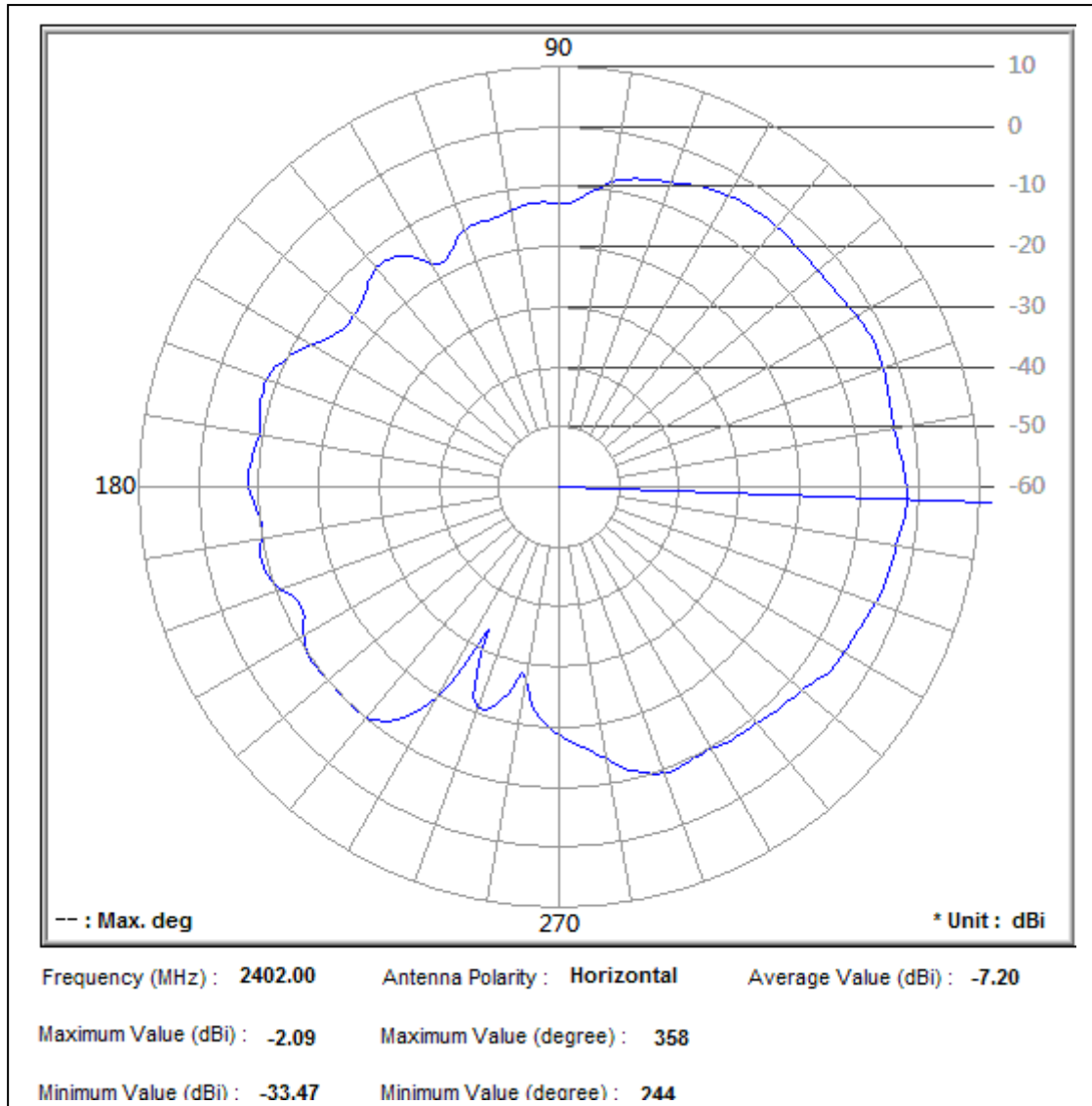


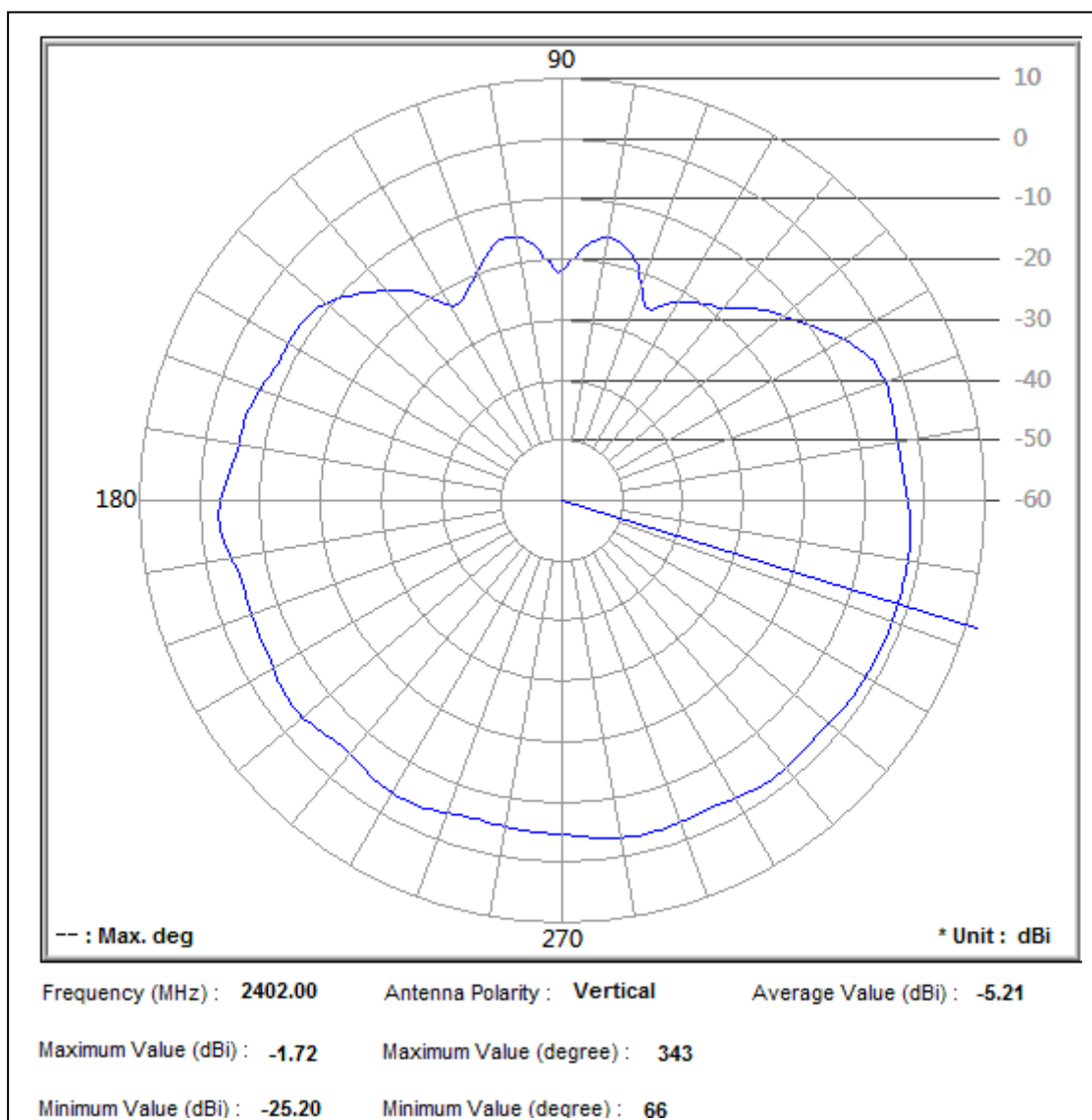
X-Z plane



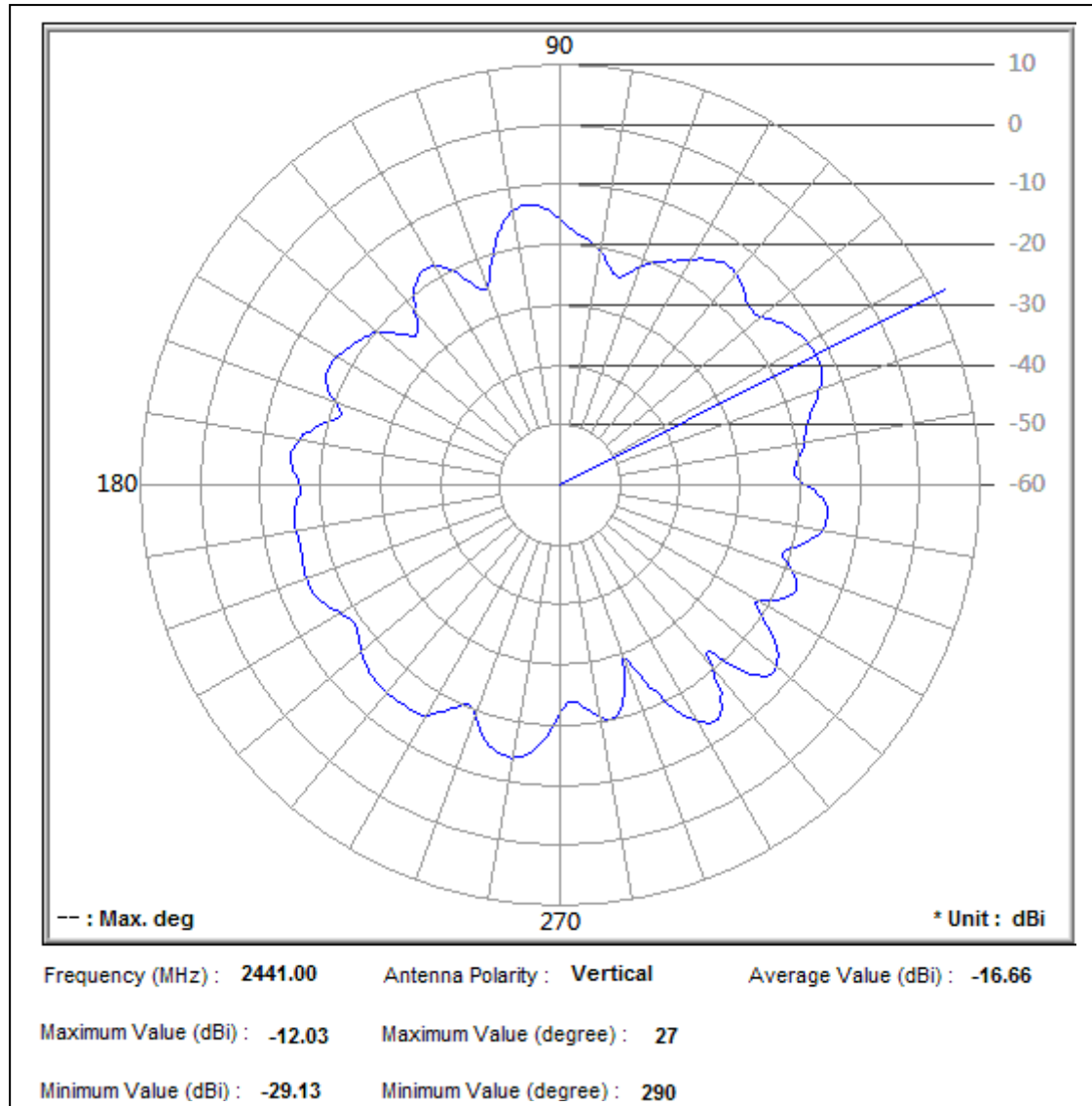


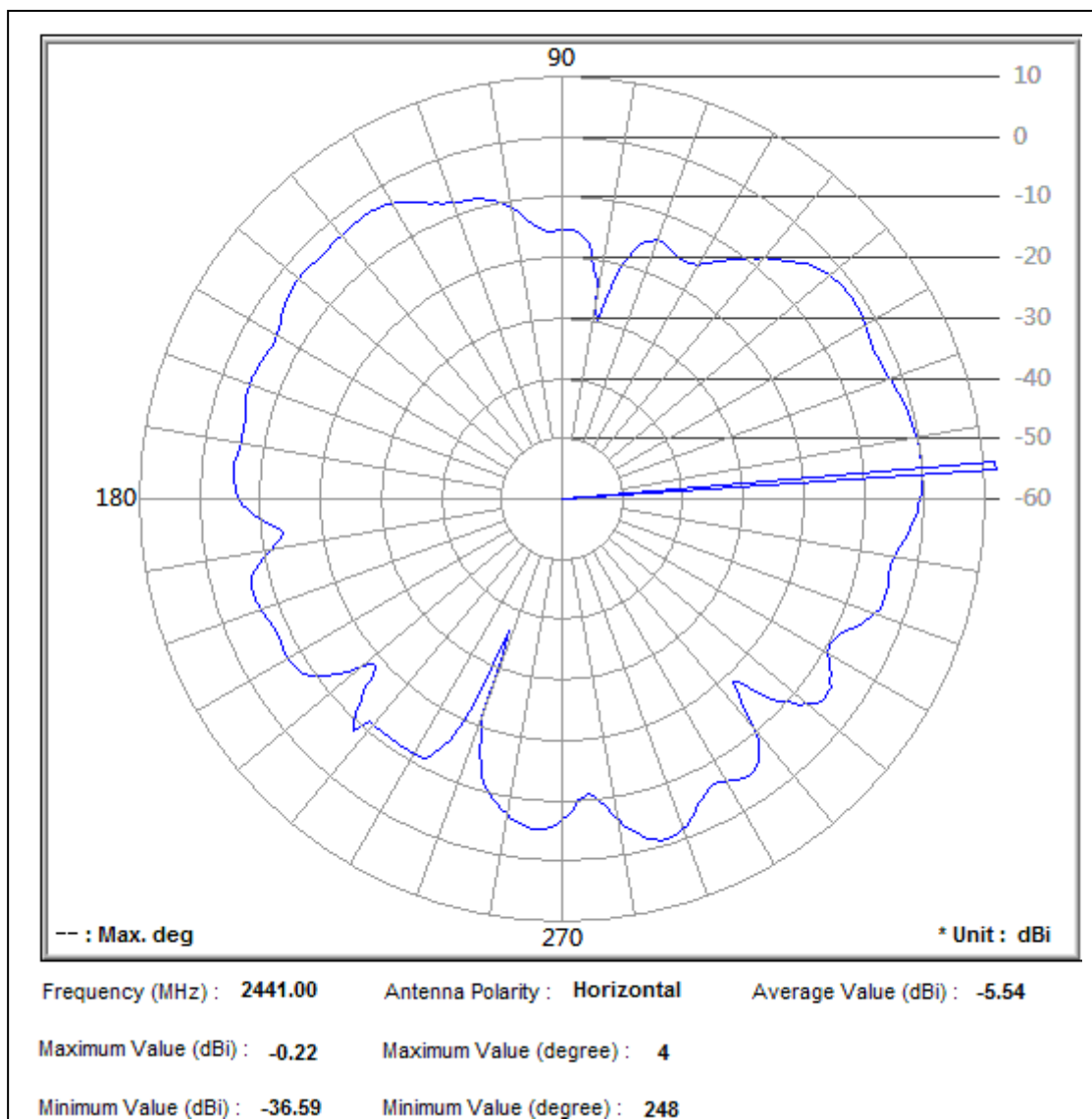
Y-Z plane



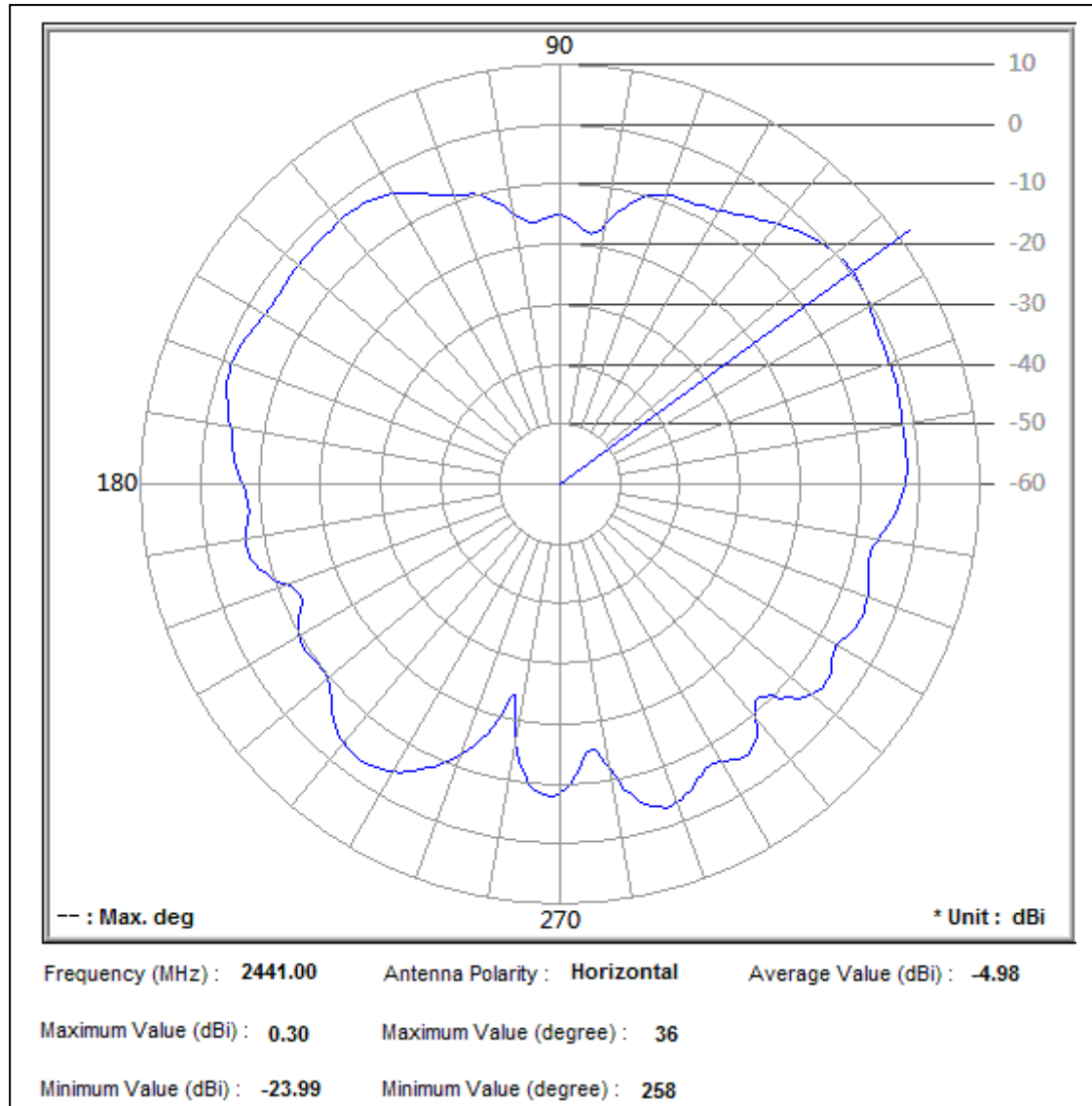


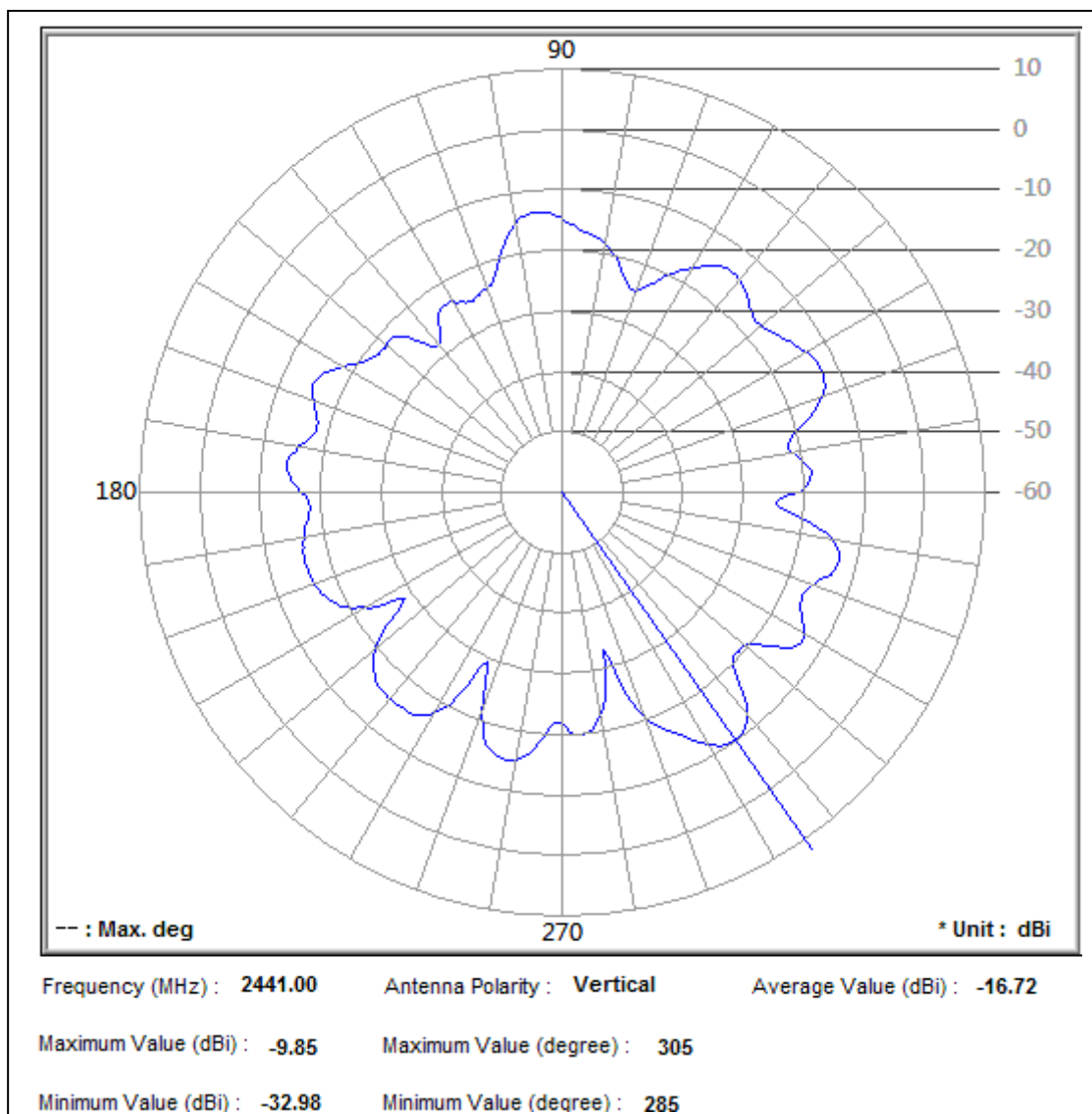
X-Y plane



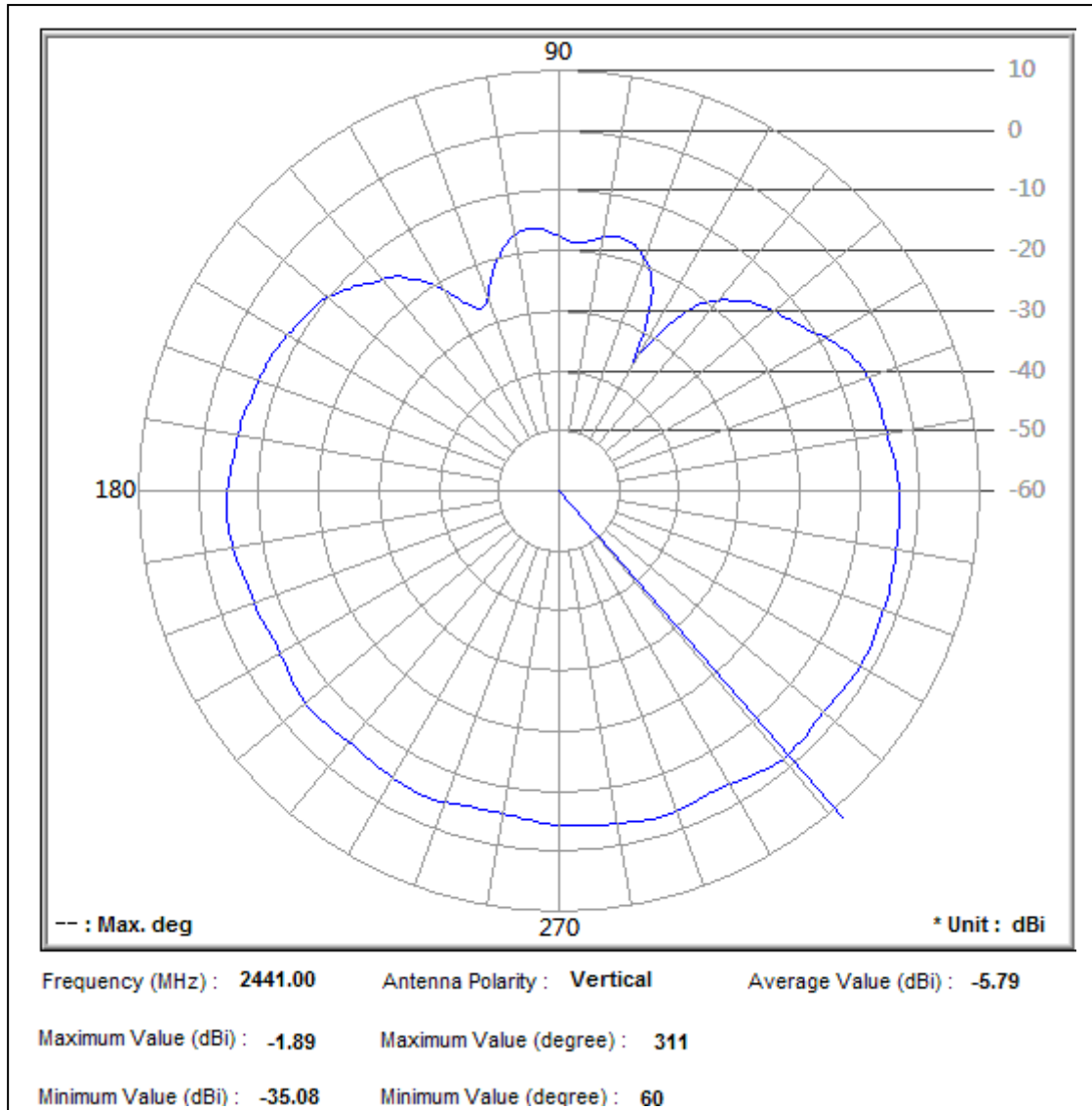


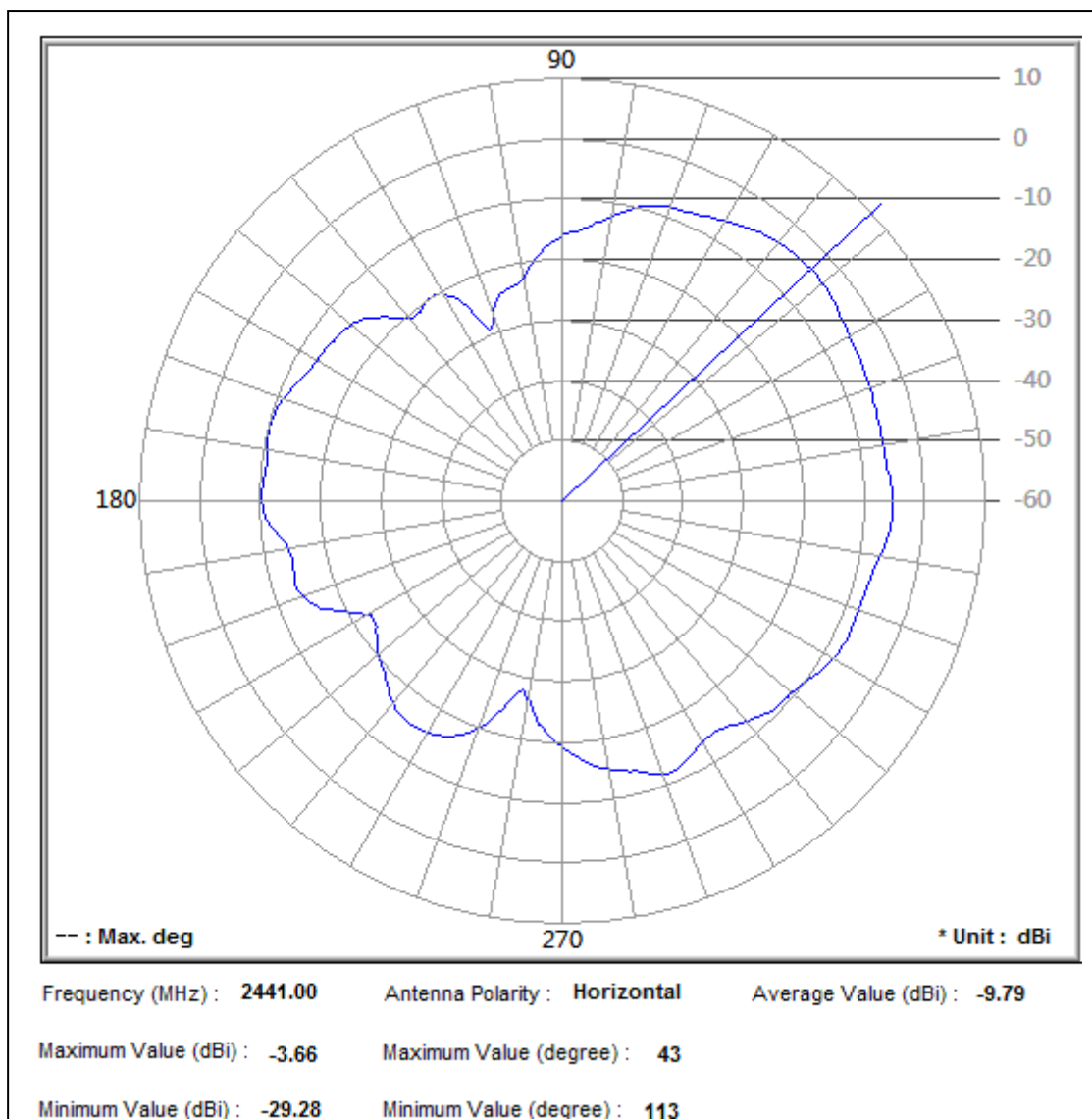
X-Z plane



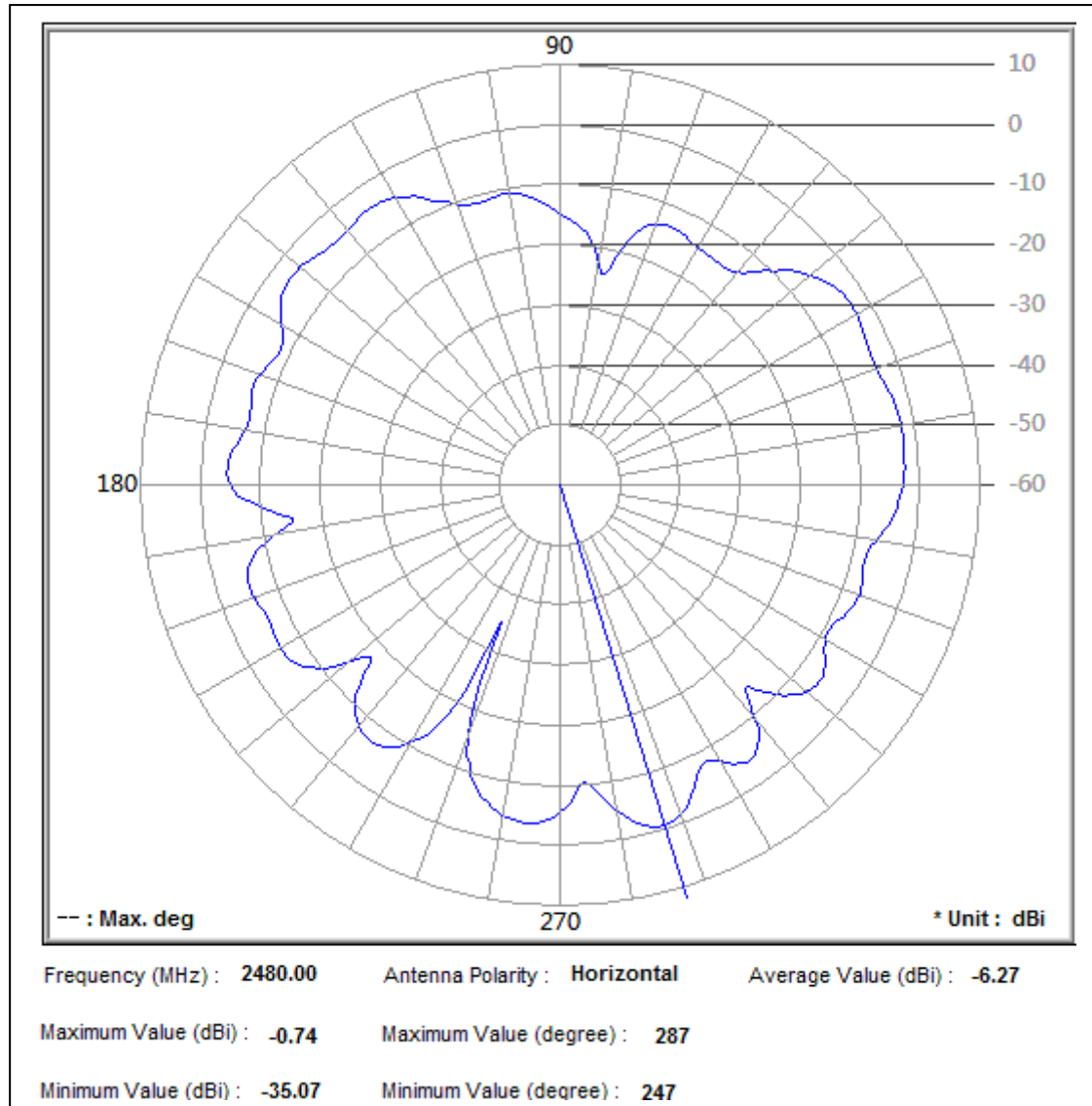


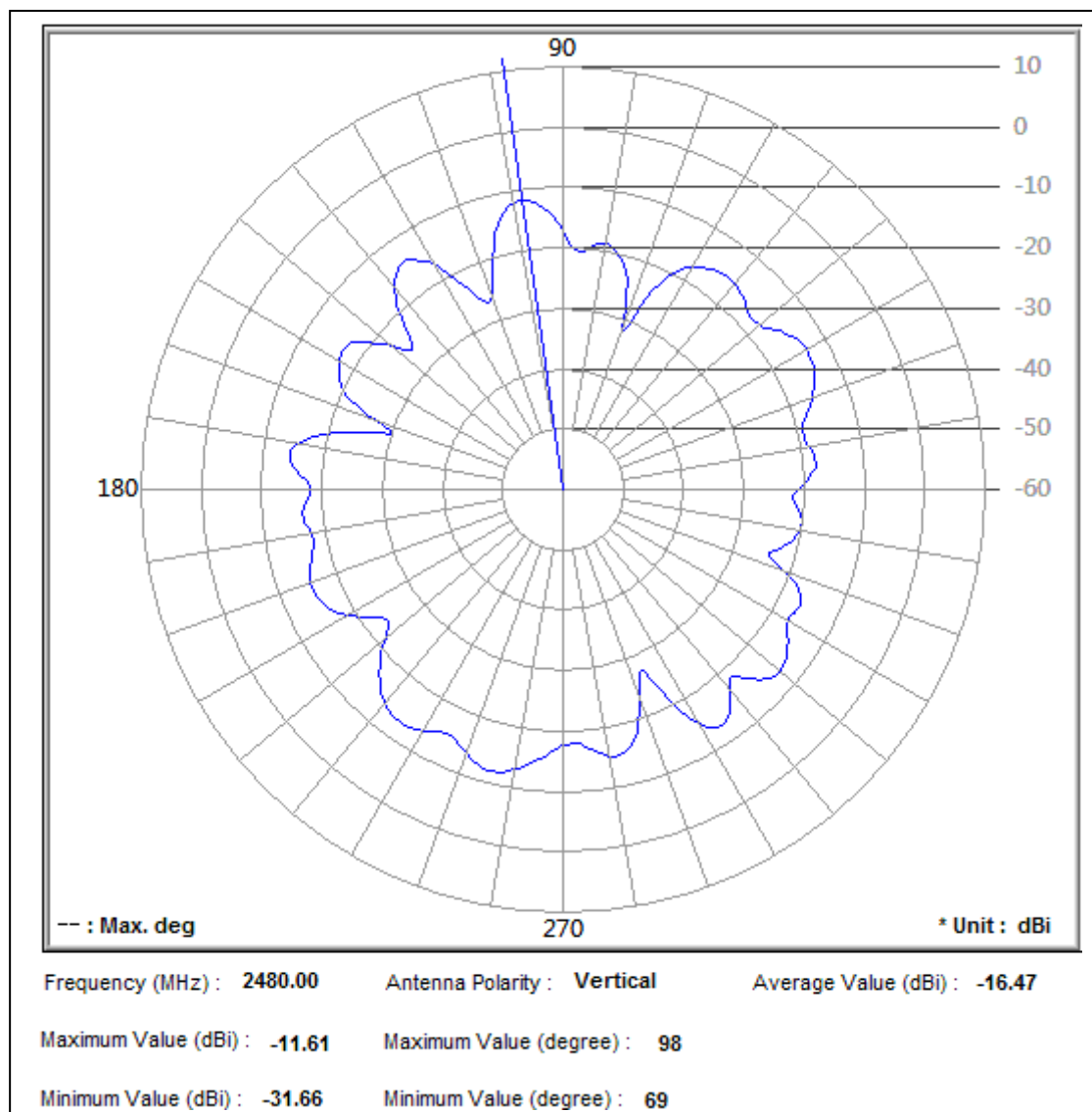
Y-Z plane



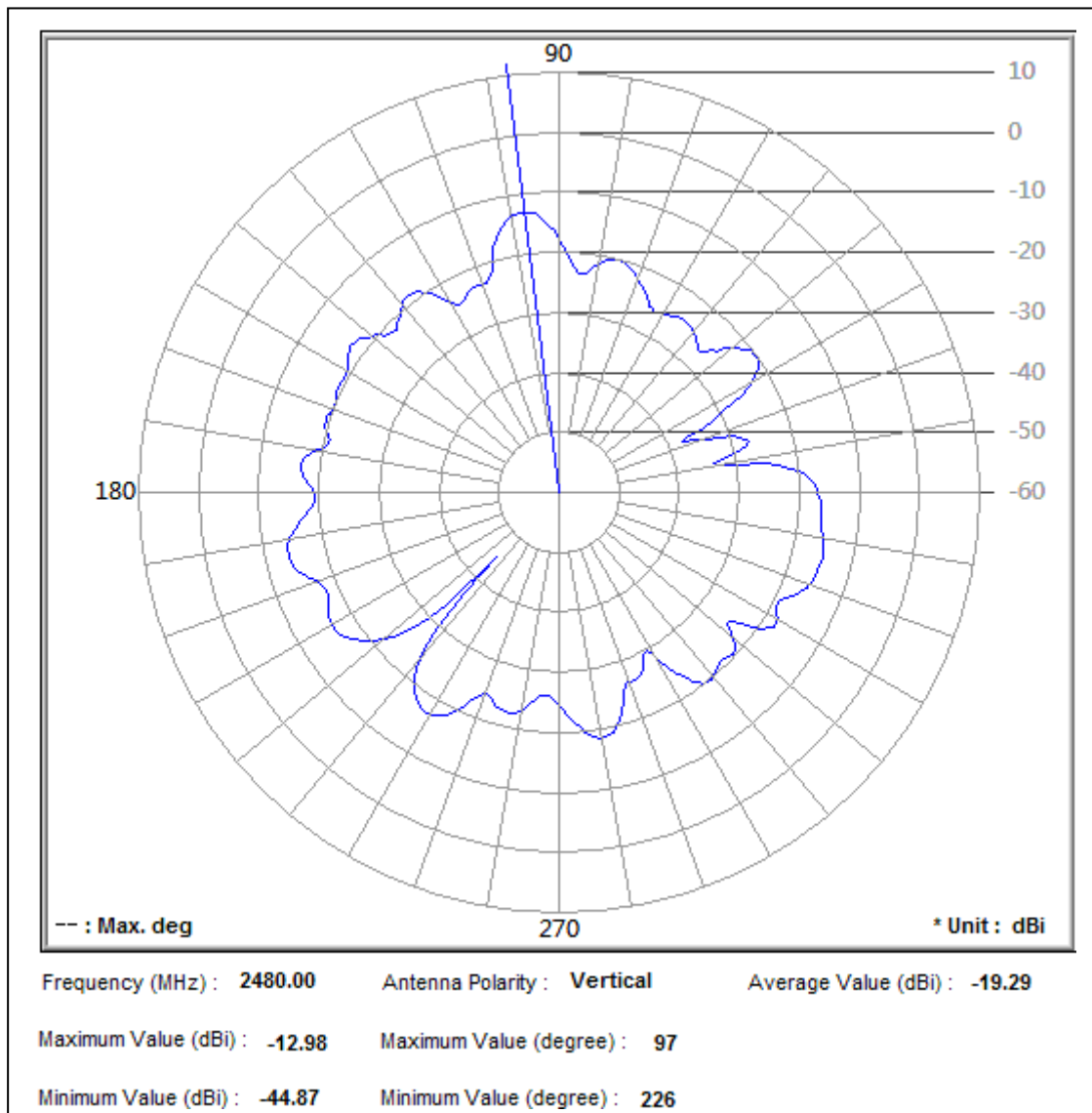


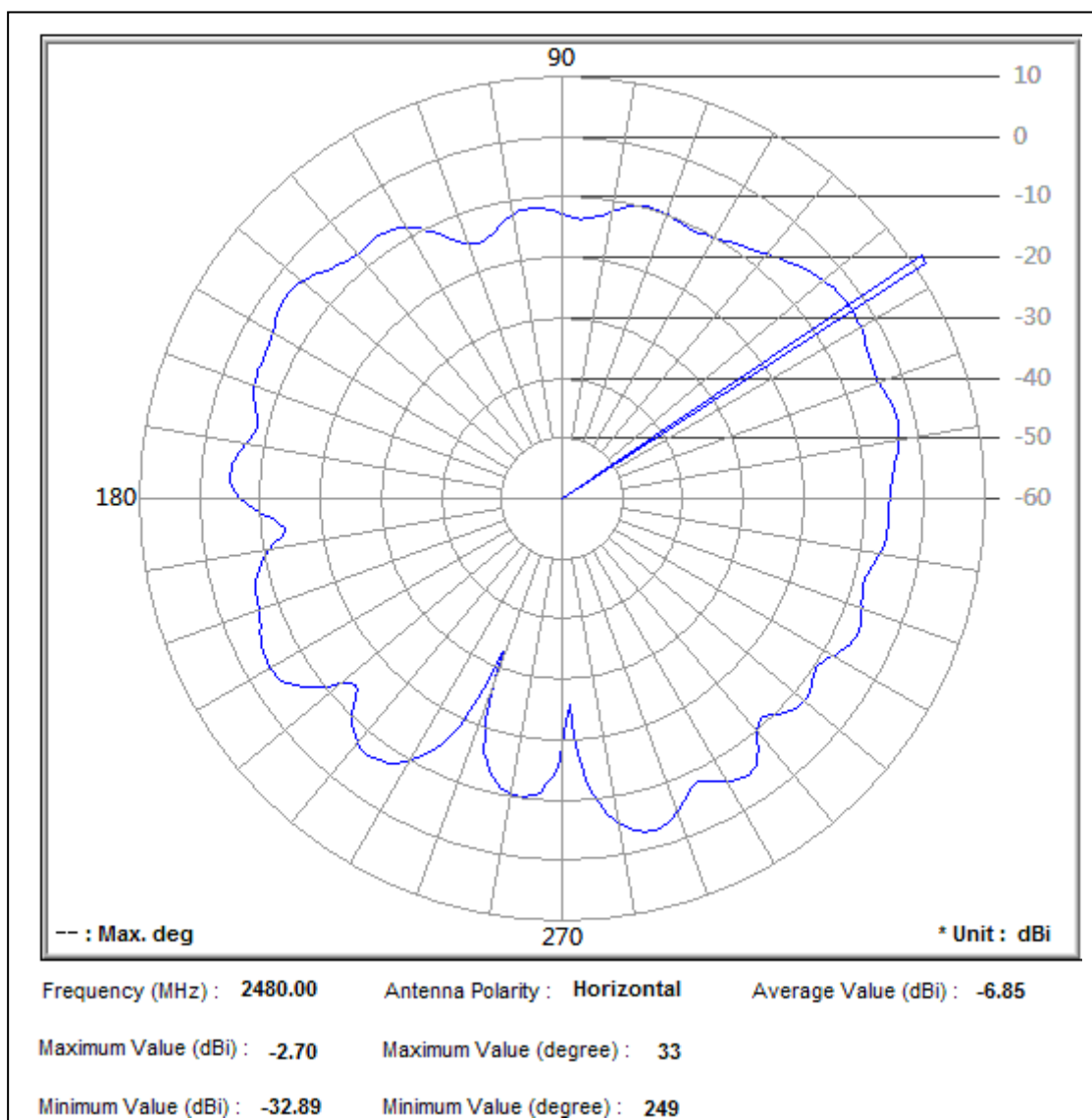
X-Y plane



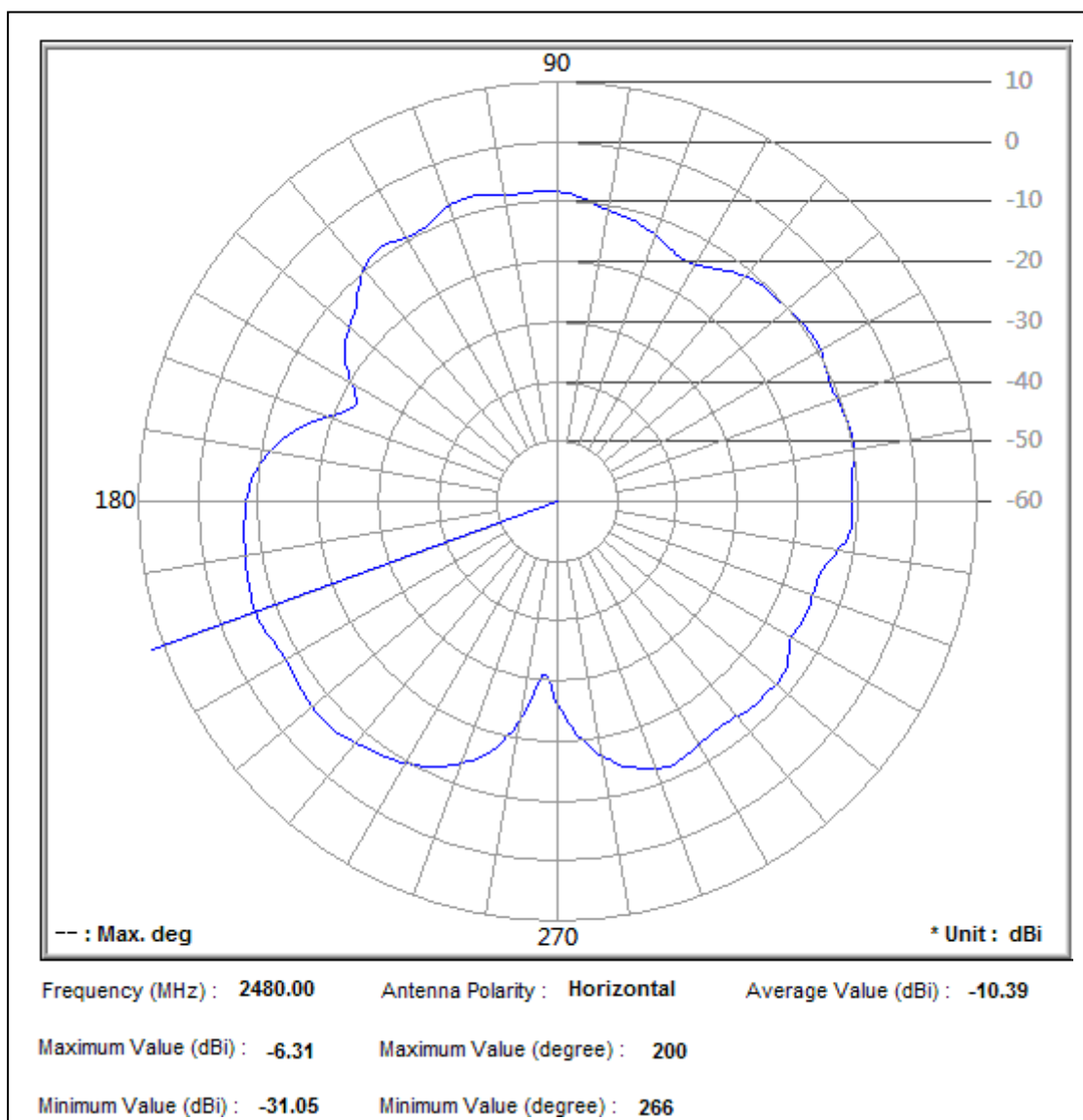


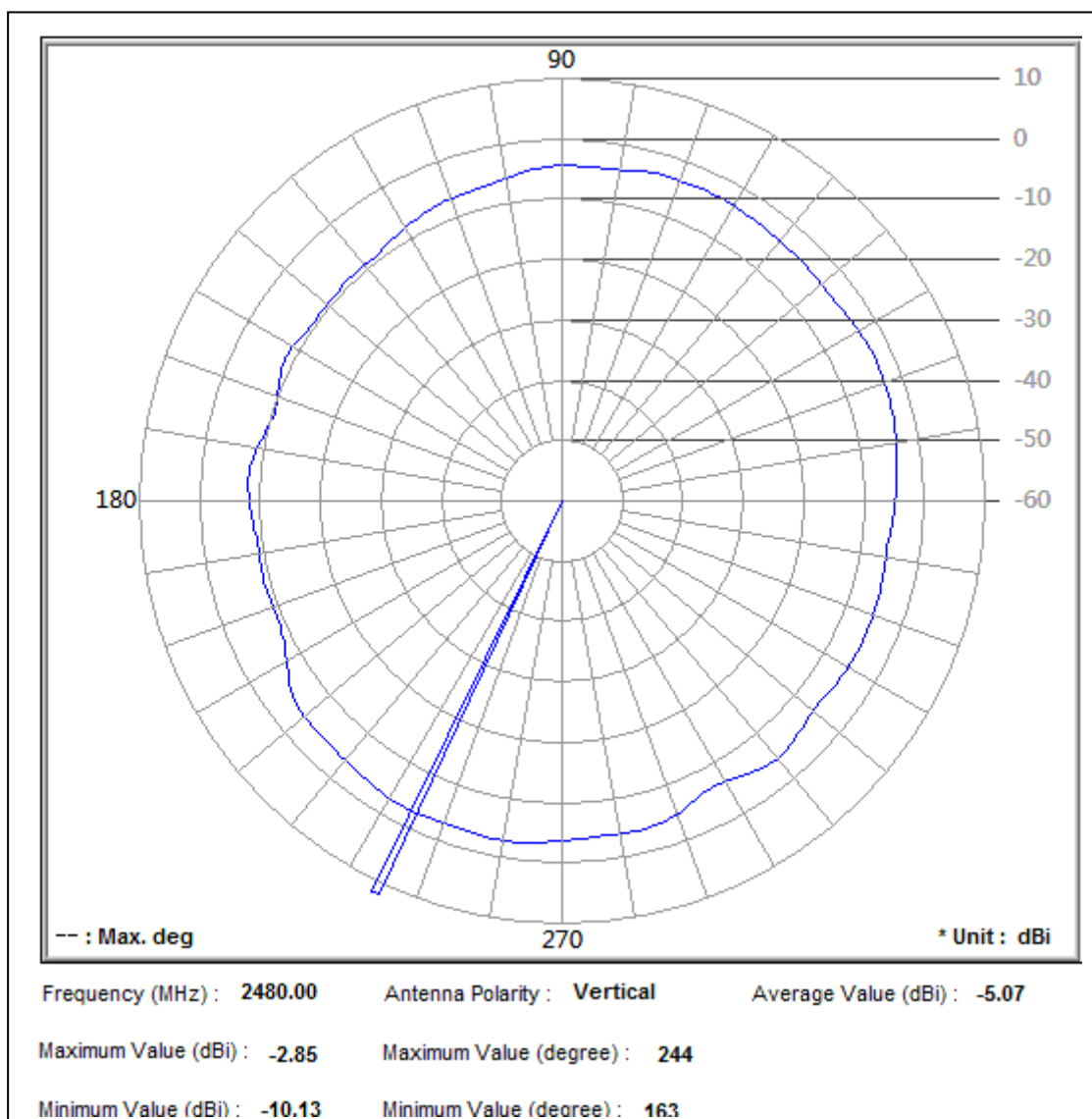
X-Z plane





Y-Z plane





4 Test Results

4.1 Spurious Emissions for Transmitter Measurement

4.1.1 Limits of Spurious Emissions

Frequencies (MHz)	Limit
Operating frequency 2400 to 2483.5MHz	
30.0MHz to 1000.0MHz	$\leq 0.25 \mu\text{W}/100\text{kHz}$
1000.0MHz to 2387MHz	$\leq 2.5 \mu\text{W}/\text{MHz}$
2387.0MHz to 2400.0MHz	$\leq 25 \mu\text{W}/\text{MHz}$
2483.5MHz to 2496.5MHz	$\leq 25 \mu\text{W}/\text{MHz}$
2496.5MHz to 12500.0MHz	$\leq 2.5 \mu\text{W}/\text{MHz}$

4.1.2 Test Setup



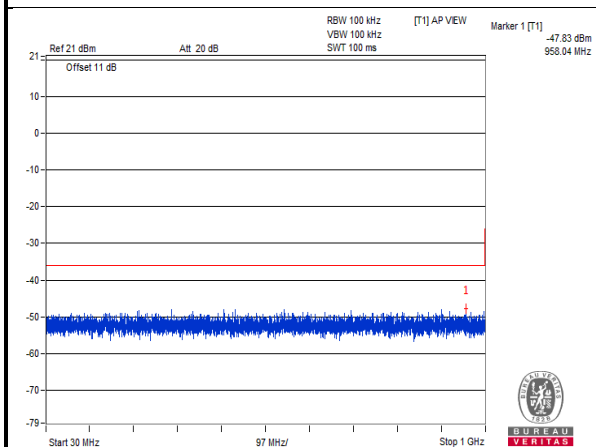
4.1.3 Test Results

Environmental Conditions		25 deg.C, 60% RH					
Test Channel		CH 0 (2402MHz)		CH 19 (2440MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Frequency (MHz)	Measured Value		
V _{normal}	30.0MHz to 1000.0MHz	958.040	0.016uW	961.800	0.018uW	0.25 uW/100kHz	PASS
V _{max}	30.0MHz to 1000.0MHz	320.510	0.02uW	911.600	0.017uW	0.25 uW/100kHz	PASS
V _{min}	30.0MHz to 1000.0MHz	624.970	0.018uW	787.080	0.019uW	0.25 uW/100kHz	PASS
Test Channel		CH 39 (2480MHz)				Limit	Result
Test Condition	Frequency Range	Frequency (MHz)		Measured Value			
V _{normal}	30.0MHz to 1000.0MHz	325.970		0.018uW		0.25 uW/100kHz	PASS
V _{max}	30.0MHz to 1000.0MHz	618.540		0.016uW		0.25 uW/100kHz	PASS
V _{min}	30.0MHz to 1000.0MHz	72.070		0.016uW		0.25 uW/100kHz	PASS

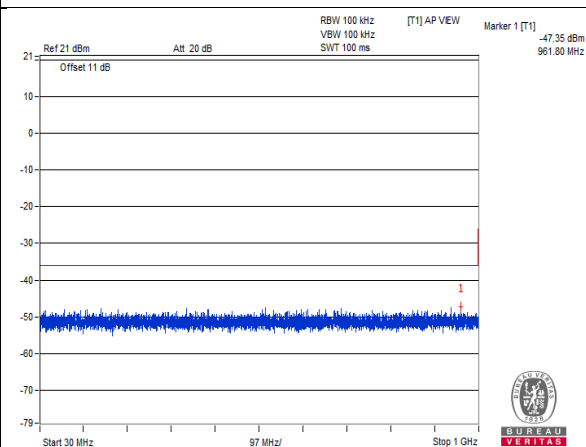
Note: 1. The worst value in each frequency range v.s. each channel has been marked by boldface.
2. The spectrum plots are attached on the following pages.

V_{normal}

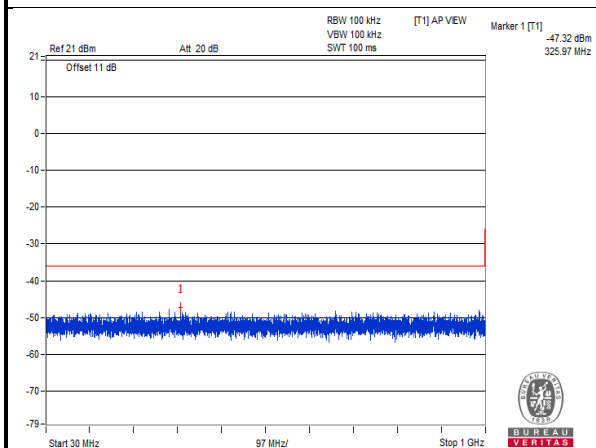
Channel 0



Channel 19



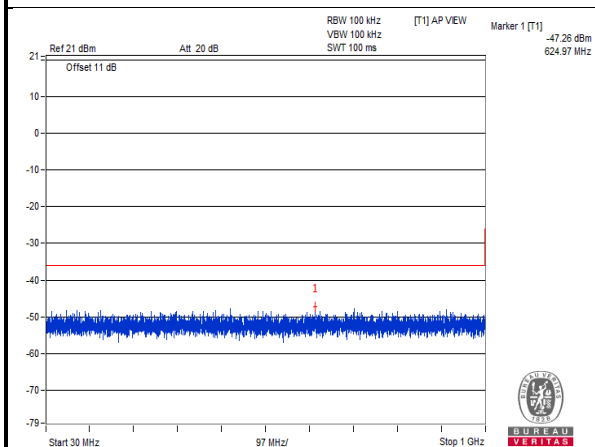
Channel 39



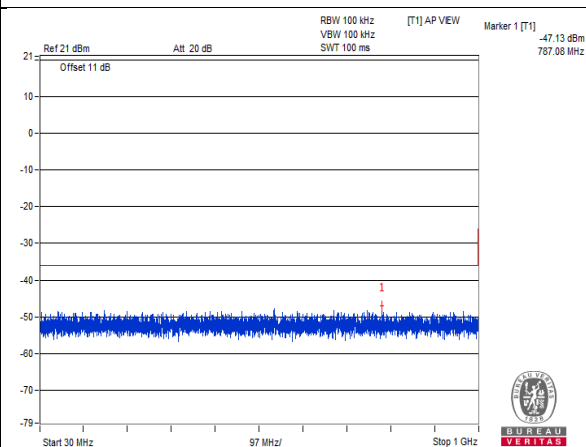


V_{min}

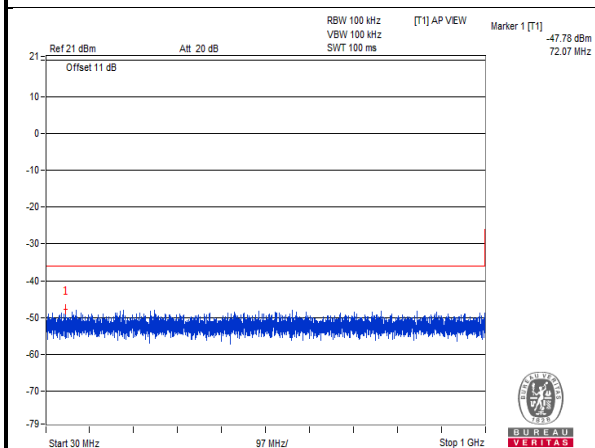
Channel 0



Channel 19



Channel 39



4.2 Spurious Emissions for Receiver

4.2.1 Limits of Spurious Emissions for Receiver

Frequencies (MHz)	Limit
Below 1GHz	$\leq 4\text{nW}$ (-54dBm)
Above 1GHz	$\leq 20\text{nW}$ (-47dBm)

4.2.2 Test Setup



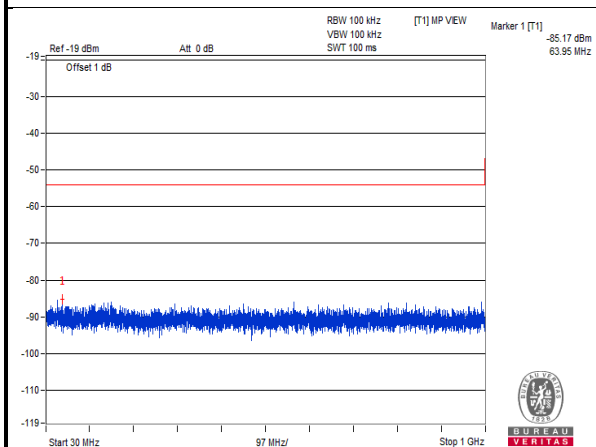
4.2.3 Test Result

Environmental Conditions		25 deg.C, 60% RH					
Test Channel		CH 0 (2402MHz)		CH 19 (2440MHz)		Limit	Result
Test Condition	Frequency Range	Frequency (MHz)	Measured Value	Frequency (MHz)	Measured Value		
V _{normal}	Below 1GHz	63.950	0.003041nW	63.950	0.002495nW	4nW/100kHz	PASS
V _{max}	Below 1GHz	168.580	0.00309nW	78.860	0.003388nW	4nW/100kHz	PASS
V _{min}	Below 1GHz	84.920	0.00399nW	250.550	0.002667nW	4nW/100kHz	PASS
Test Channel		CH 39 (2480MHz)				Limit	Result
Test Condition	Frequency Range	Frequency (MHz) Measured Value		Measured Value			
V _{normal}	Below 1GHz	63.950		0.003221nW		4nW/100kHz	PASS
V _{max}	Below 1GHz	339.430		0.002938nW		4nW/100kHz	PASS
V _{min}	Below 1GHz	640.130		0.002831nW		4nW/100kHz	PASS

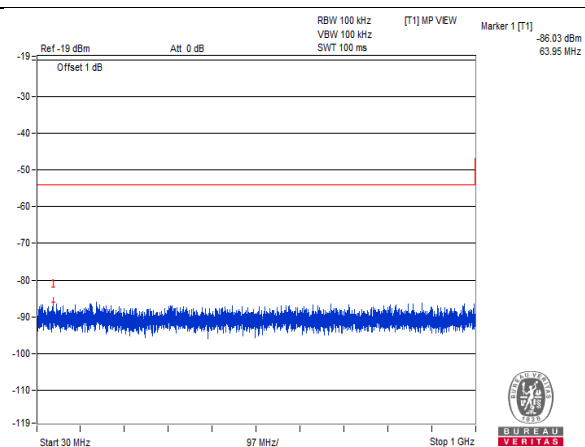
Note: 1. The worst value in each frequency range v.s. each channel has been marked by boldface.
2. The spectrum plots are attached on the following pages.

V_{normal}

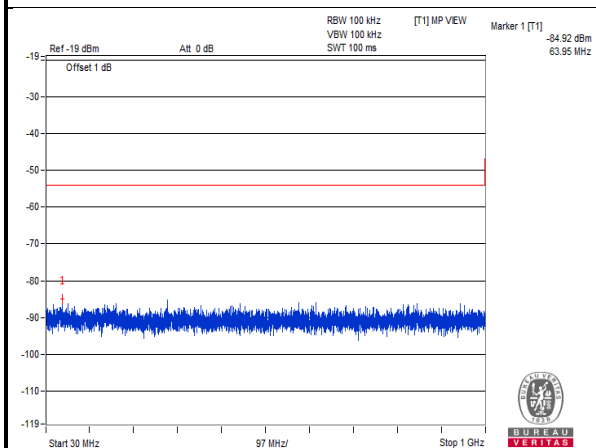
Channel 0

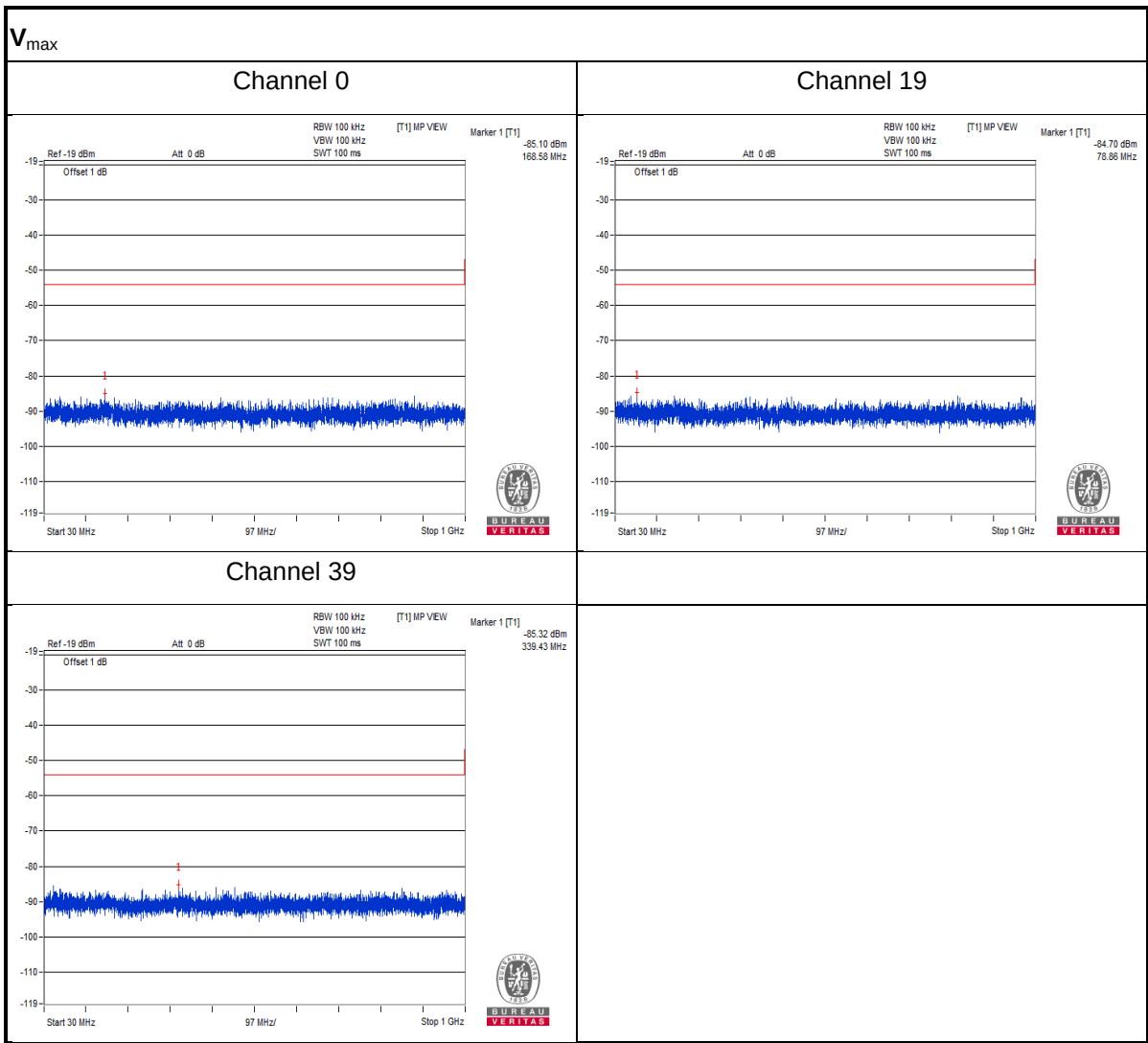


Channel 19



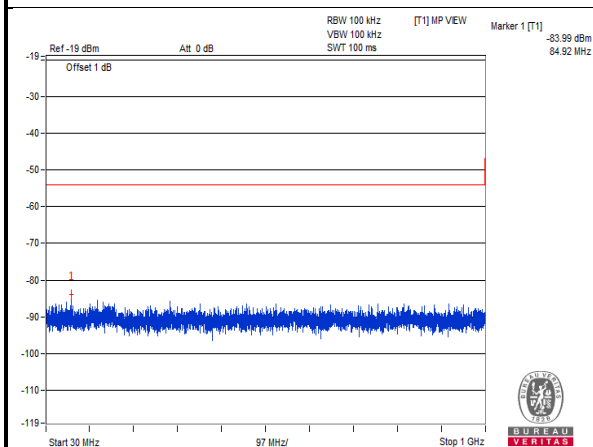
Channel 39



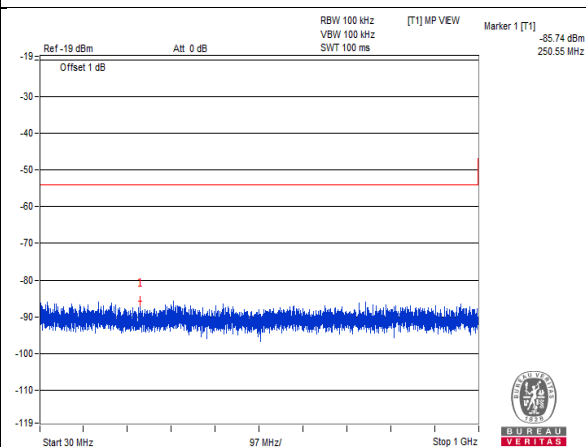


V_{min}

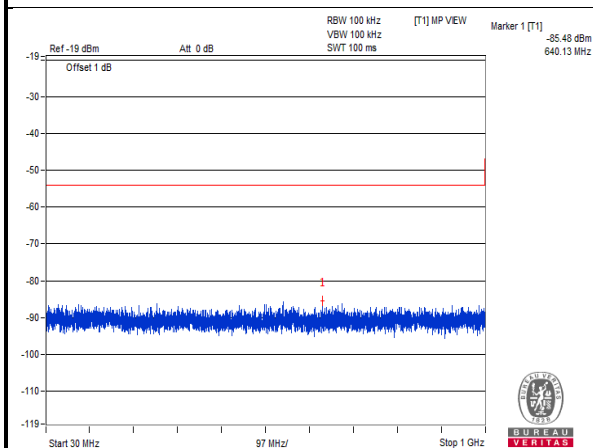
Channel 0



Channel 19



Channel 39

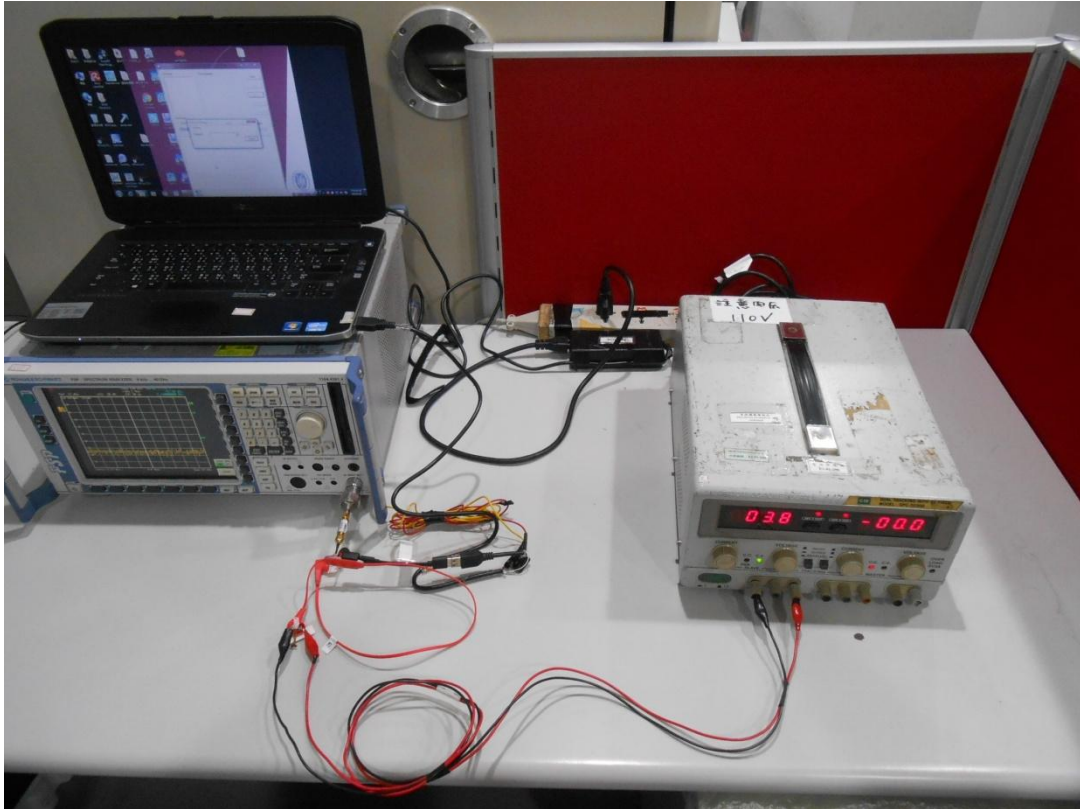


5 Test Instruments

Description & Manufacturer	Model no.	Serial No.	Calibrated Date	Calibrated Until	Calibration Authority
Spectrum Analyzer R&S	FSV40	100964	June 20, 2018	June 19, 2019	ETC
ESG Vector signal generator Agilent	E4438C	MY47271330 506 602 UNJ	Oct. 11, 2017	Oct. 10, 2018	ETC
Detector Narda	4503A	0306	NA	NA	NA
Power Meter Anritsu	ML2495A	1014008	May 09, 2018	May 08, 2019	ETC
Power Sensor Anritsu	MA2411B	0917122	May 09, 2018	May 08, 2019	ETC
Digital Oscilloscope R&S	RTO1012	300053	June 28, 2017	June 27, 2018	ETC
DC Power Supply Topward	6603D	795558	NA	NA	NA
AC Power Source Extech Electronics	6205	1440452	NA	NA	NA
True RMS Clamp Meter FLUKE	325	31130711WS	May 22, 2018	May 21, 2019	ETC

NOTE: 1. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.
2. Tested Date: June 26, 2018

6 Photographs of the Test Configuration



Appendix - Information on 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 accredited and approved according to ISO/IEC 17025.

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

Linko EMC/RF Lab

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF/Telecom Lab

Tel: 886-3-6668565

Fax: 886-3-6668323

Hwa Ya EMC/RF/Safety Lab

Tel: 886-3-3183232

Fax: 886-3-3270892

Email: service.adt@tw.bureauveritas.com

Web Site: www.bureauveritas-adt.com

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

--- END ---