

TEST REPORT

Reference No..... : WTX20X04019594W-1
FCC ID : 2AWGB-ERL100
Applicant : Zhejiang Zhier Information Technology Co., Ltd.
Address : Layer2, Building 4, No.2, Xiyuan Eight Road, Sandun Town, Xihu District,
Hangzhou City, Zhejiang Province
Manufacturer : Zhejiang Zhier Information Technology Co., Ltd.
Address : Layer2, Building 4, No.2, Xiyuan Eight Road, Sandun Town, Xihu District,
Hangzhou City, Zhejiang Province
Product Name : Border Manager
Test Model. : E-RL100
Additional Model(s) No. : /
Brand Name..... : /
Standards : FCC Part 15.207&15.209
Date of Receipt sample : Apr.16, 2020
Date of Test..... : Apr.28, 2020 to May.27, 2020
Date of Issue : May.28, 2020
Test Result..... : Pass

Remarks:

The results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

Prepared By:

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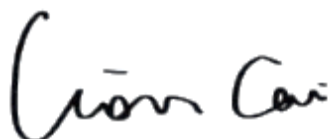
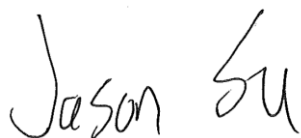
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Report version

Version No.	Date of issue	Description
Rev.00	May.28, 2020	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Zhejiang Zhier Information Technology Co., Ltd.
Address of applicant: Layer2, Building 4, No.2, Xiyuan Eight Road, Sandun Town, Xihu District, Hangzhou City, Zhejiang Province

Manufacturer: Zhejiang Zhier Information Technology Co., Ltd.
Address of manufacturer: Layer2, Building 4, No.2, Xiyuan Eight Road, Sandun Town, Xihu District, Hangzhou City, Zhejiang Province

General Description of EUT	
Product Name:	Border Manager
Trade Name:	/
Model No.:	E-RL100
Adding Model(s):	/
Rated Voltage:	Adapter DC12V; POE DC 48V
Power Adapter Model:	/
Note: The test data is gathered from a production sample, provided by the manufacturer.	

Technical Characteristics of EUT	
Frequency Range:	125kHz(Transmitting)
Antenna Type:	Integral Antenna
Radio Technology:	Acoustic Magnetic

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.207: Conducted limits.

FCC Rules Part 15.209: Radiated emission limits; general requirements.

ANSI C63.10-2013: American National Standard for Testing Unlicensed Wireless Devices.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.10-2013, The equipment under test (EUT) was configured to measure its highest possible emission level. The test modes were adapted accordingly in reference to the Operating Instructions.

1.4 Test Facility

Address of the test laboratory

Laboratory: Waltek Testing Group (Shenzhen) Co., Ltd.

Address: 1/F., Room 101, Building 1, Hongwei Industrial Park, Liuxian 2nd Road, Block 70 Bao'an District, Shenzhen, Guangdong, China

FCC – Registration No.: 125990

Waltek Testing Group (Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the FCC (Federal Communications Commission). The acceptance letter from the FCC is maintained in our files. The Designation Number is CN5010, and Test Firm Registration Number is 125990.

Industry Canada (IC) Registration No.: 11464A

The 3m Semi-anechoic chamber of Waltek Testing Group (Shenzhen) Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

1.5 EUT Setup and Operation Mode

The equipment under test (EUT) was configured to measure its highest possible emission. The test modes were adapted according to the operation manual for use, more detailed description as follows:

Test Mode List			
Test Mode	Description	Remark	Power Supply Mode
TM1	Working	Power by Adapter DC12V,125KHz Transmitting	/
TM2	Working	Power by POE DC48V, 125KHz Transmitting	/

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
RJ45	1.8	Unshielded	Without Ferrite
DC Cable	1.2	Unshielded	Without Ferrite
AC Cable	0.8	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	Lenovo	N480	/
AC/DC Adapter	JIAD	MX36Z1-1203000	/
POE Adapter	CISCO	FA015LS1-00	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Conducted Emissions	Conducted	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$
Radiated Emissions	Radiated	30-200MHz $\pm 4.52\text{dB}$
		0.2-1GHz $\pm 5.56\text{dB}$
		1-6GHz $\pm 3.84\text{dB}$
		6-18GHz $\pm 3.92\text{dB}$

1.7 Test Equipment List and Details

Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
Spectrum Analyzer	Agilent	E4407B	MY41440400	2020-04-28	2021-04-27
Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2020-04-28	2021-04-27
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2020-04-28	2021-04-27
Amplifier	Agilent	8447F	3113A06717	2020-04-28	2021-04-27
Amplifier	C&D	PAP-1G18	2002	2020-04-28	2021-04-27
Broadband Antenna	Schwarz beck	VULB9163	9163-333	2019-05-05	2021-05-04
Horn Antenna	ETS	3117	00086197	2019-05-05	2021-05-04
Loop Antenna	Schwarz beck	FMZB 1516	9773	2019-05-05	2021-05-04
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2020-04-28	2021-04-27
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2020-04-28	2021-04-27
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2020-04-28	2021-04-27
Anechoic chamber	SAEMC	FSAC318	/	2020-04-28	2021-04-27

Software List			
Description	Manufacturer	Model	Version
EMI Test Software (Radiated Emission)*	Farad	EZ-EMC	RA-03A1
EMI Test Software (Conducted Emission)*	Farad	EZ-EMC	RA-03A1

*Remark: indicates software version used in the compliance certification testing

2. SUMMARY OF TEST RESULTS

Description of Test	Result
§15.203Antenna Requirement	Compliant
§15.207 (a) Conducted Emission	Compliant
§15.209 Radiated Emission	Compliant

N/A: not applicable

3. Antenna Requirement

3.1 Standard Applicable

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

3.2 Test Result

This product has an integral antenna, fulfill the requirement of this section.

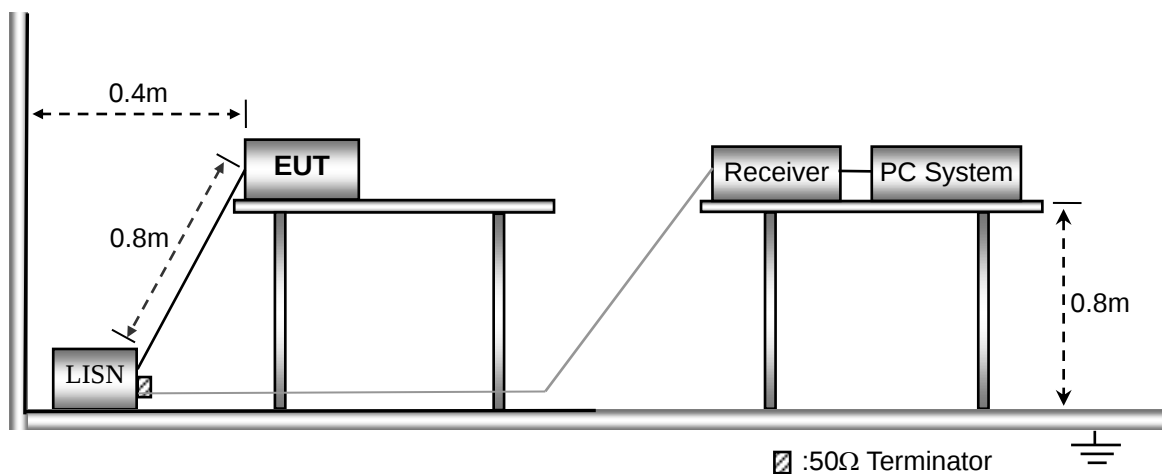
4. Conducted Emissions

4.1 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle. The spacing between the peripherals was 10 cm.

4.2 Basic Test Setup Block Diagram

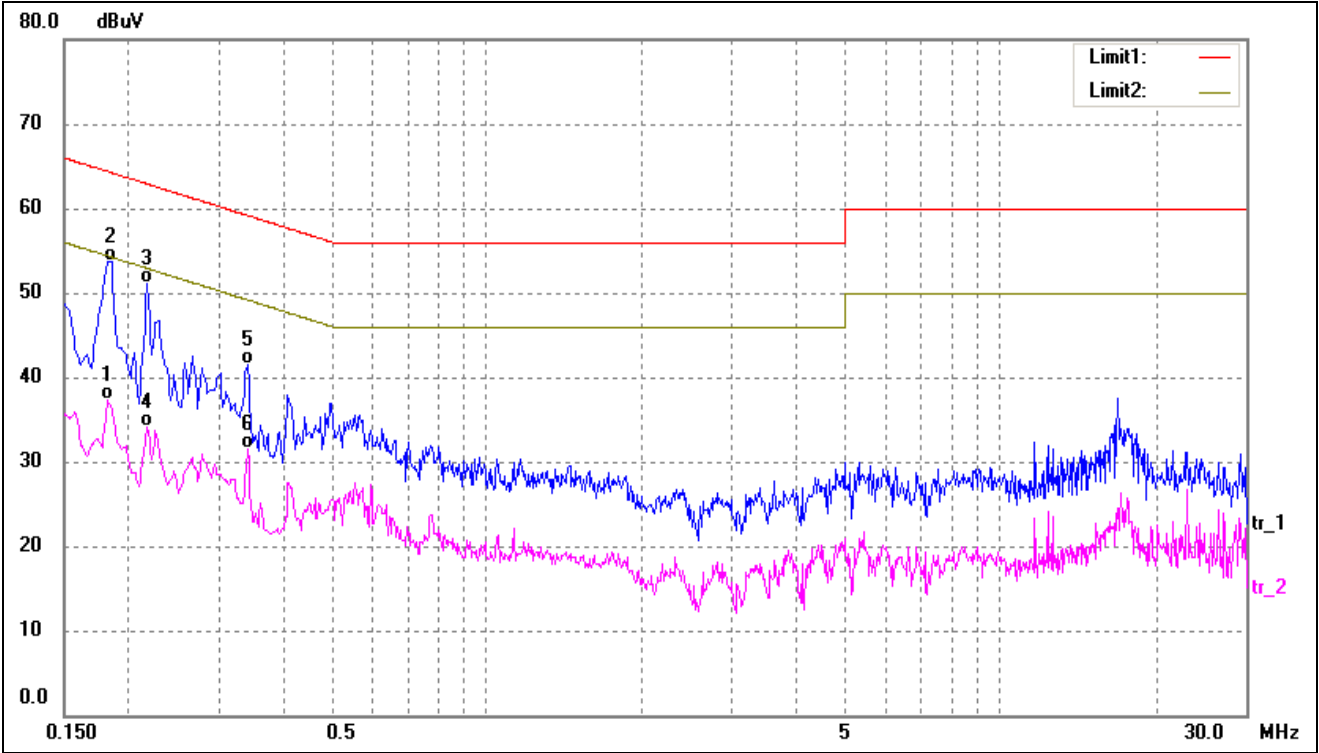


4.3 Environmental Conditions

Temperature:	26 °C
Relative Humidity:	60 %
ATM Pressure:	1011 mbar

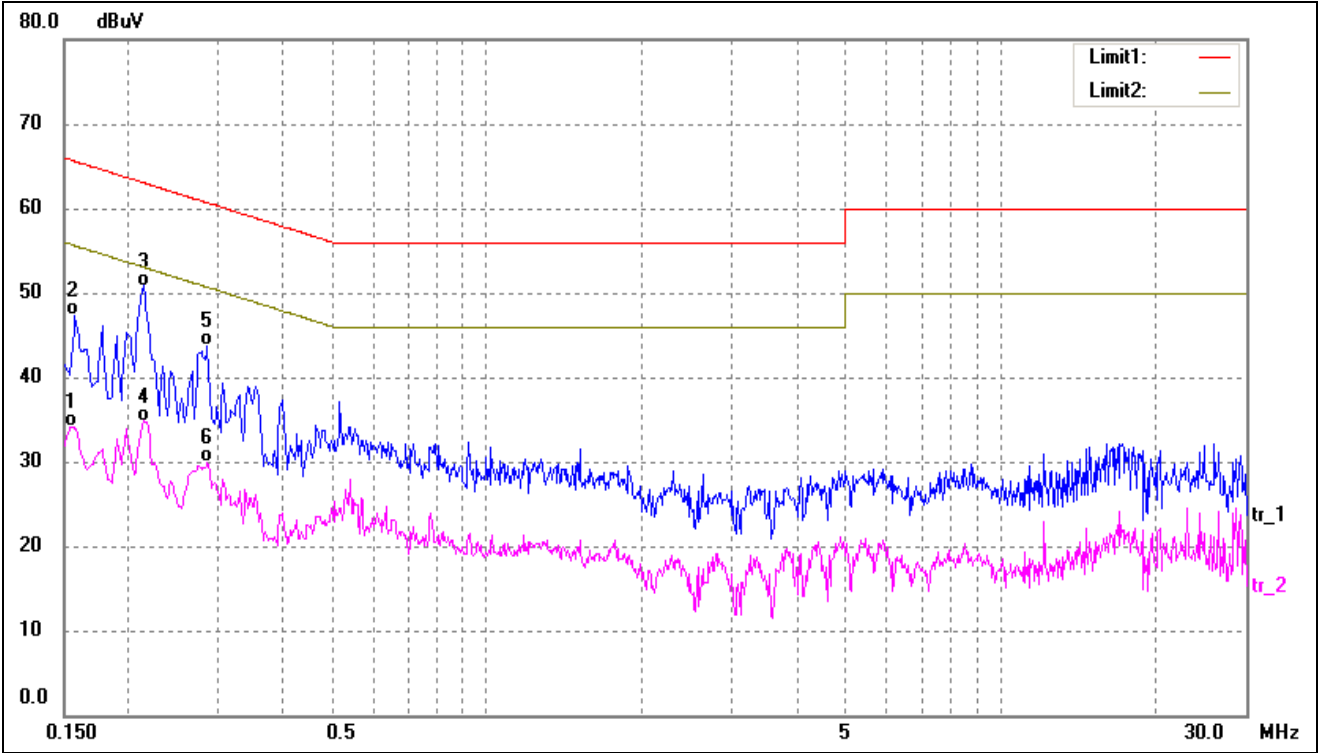
4.4 Summary of Test Results/Plots

Test mode:	TM1	Polarity:	Line
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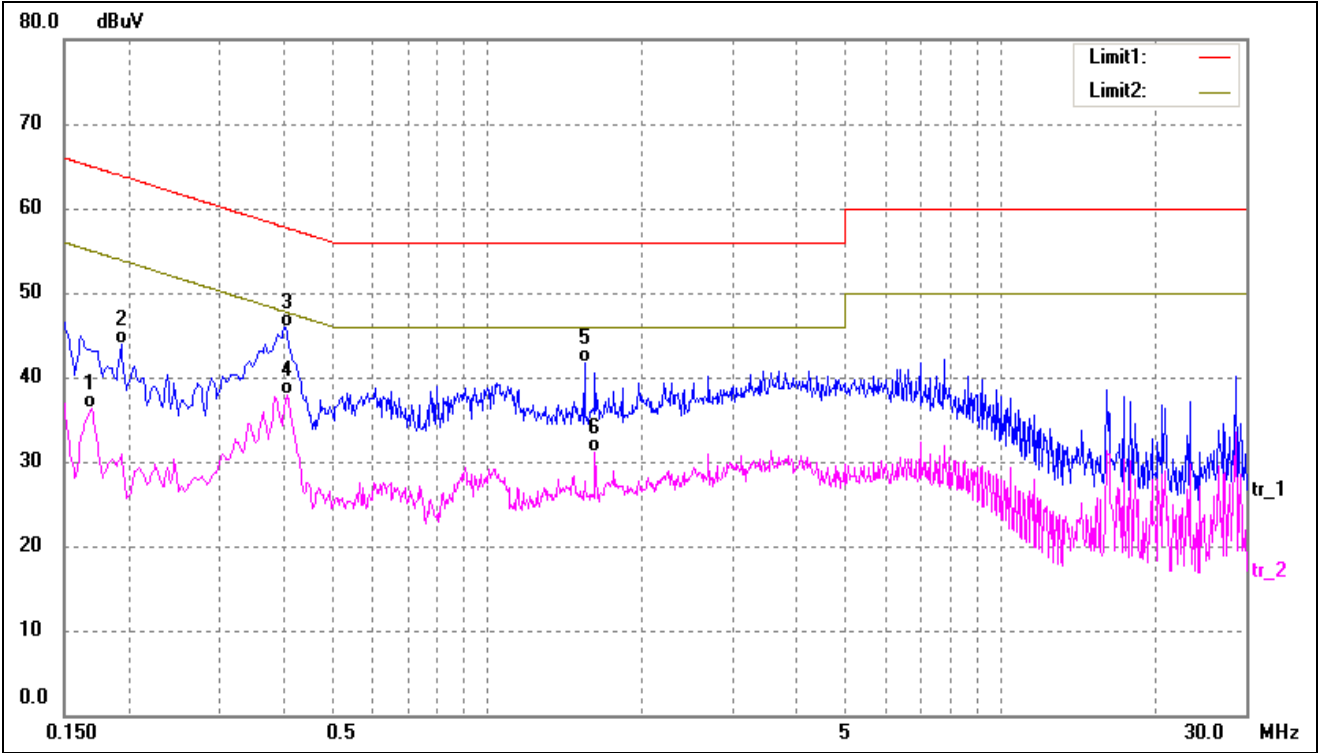
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1819	27.26	9.96	37.22	54.39	-17.17	AVG
2*	0.1860	43.84	9.96	53.80	64.21	-10.41	QP
3	0.2180	41.17	9.98	51.15	62.89	-11.74	QP
4	0.2180	24.08	9.98	34.06	52.89	-18.83	AVG
5	0.3420	31.48	10.02	41.50	59.15	-17.65	QP
6	0.3420	21.51	10.02	31.53	49.15	-17.62	AVG

Test mode:	TM1	Polarity:	Neutral
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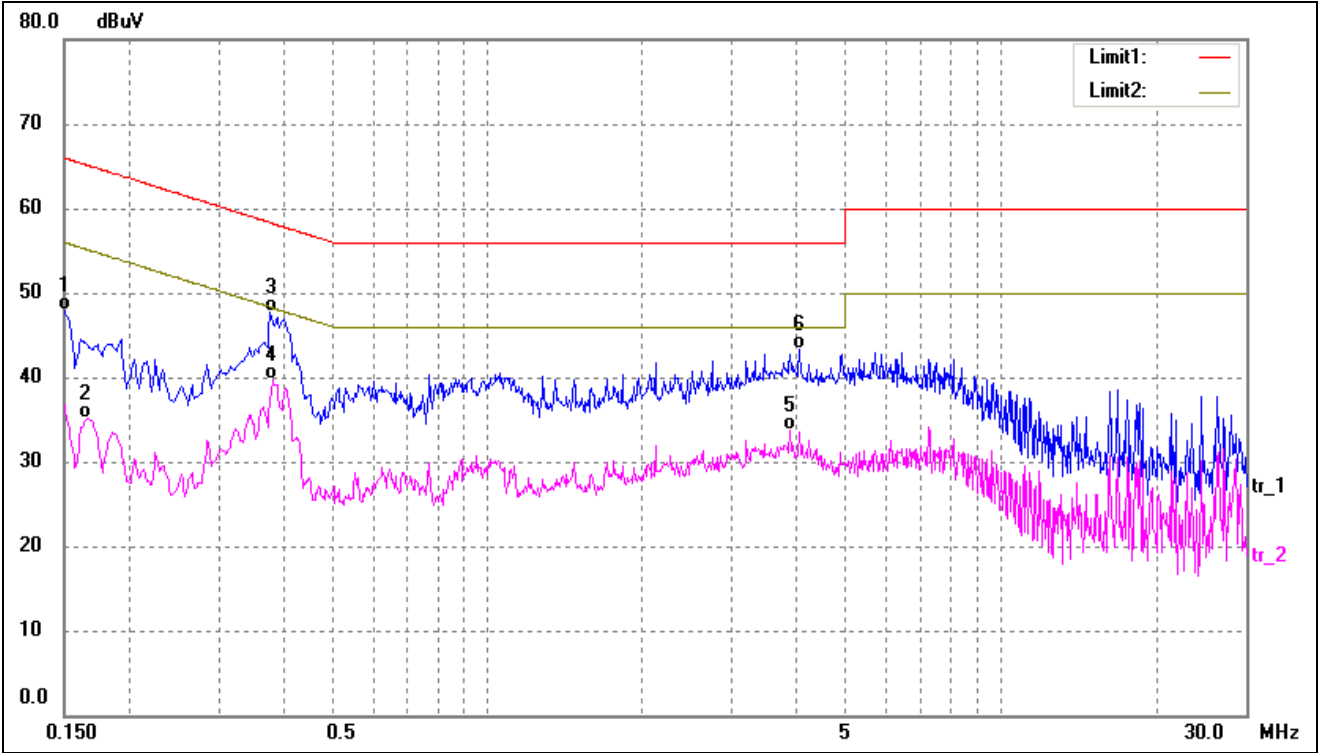
No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1539	24.09	9.95	34.04	55.78	-21.74	AVG
2	0.1580	37.38	9.95	47.33	65.56	-18.23	QP
3*	0.2140	40.82	9.98	50.80	63.04	-12.24	QP
4	0.2140	24.82	9.98	34.80	53.04	-18.24	AVG
5	0.2860	33.74	10.01	43.75	60.64	-16.89	QP
6	0.2860	19.97	10.01	29.98	50.64	-20.66	AVG

Test mode:	TM2	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1700	26.38	9.95	36.33	54.96	-18.63	AVG
2	0.1940	33.86	9.97	43.83	63.86	-20.03	QP
3	0.4060	35.83	10.01	45.84	57.73	-11.89	QP
4*	0.4100	27.91	10.01	37.92	47.65	-9.73	AVG
5	1.5500	31.31	10.37	41.68	56.00	-14.32	QP
6	1.6260	20.74	10.37	31.11	46.00	-14.89	AVG

Test mode:	TM2	Polarity:	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	38.00	9.95	47.95	65.99	-18.04	QP
2	0.1660	25.23	9.95	35.18	55.15	-19.97	AVG
3	0.3780	37.67	10.02	47.69	58.32	-10.63	QP
4*	0.3820	29.73	10.02	39.75	48.23	-8.48	AVG
5	3.8940	23.34	10.31	33.65	46.00	-12.35	AVG
6	4.0580	32.95	10.30	43.25	56.00	-12.75	QP

5. RADIATED EMISSION

5.1 Standard Applicable

According to 15.209(a), radiated emission limits; general requirements.

Frequency (MHz)	Field Strength		Field Strength Limit at 3m Measurement Dist	
	uV/m	Distance (m)	uV/m	dBuV/m
0.009 ~ 0.490	$2400/F(\text{kHz})$	300	$10000 * 2400/F(\text{kHz})$	$20\log^{(2400/F(\text{kHz}))} + 80$
0.490 ~ 1.705	$24000/F(\text{kHz})$	30	$100 * 24000/F(\text{kHz})$	$20\log^{(24000/F(\text{kHz}))} + 40$
1.705 ~ 30	30	30	$100 * 30$	$20\log^{(30)} + 40$
30 ~ 88	100	3	100	$20\log^{(100)}$
88 ~ 216	150	3	150	$20\log^{(150)}$
216 ~ 960	200	3	200	$20\log^{(200)}$
Above 960	500	3	500	$20\log^{(500)}$

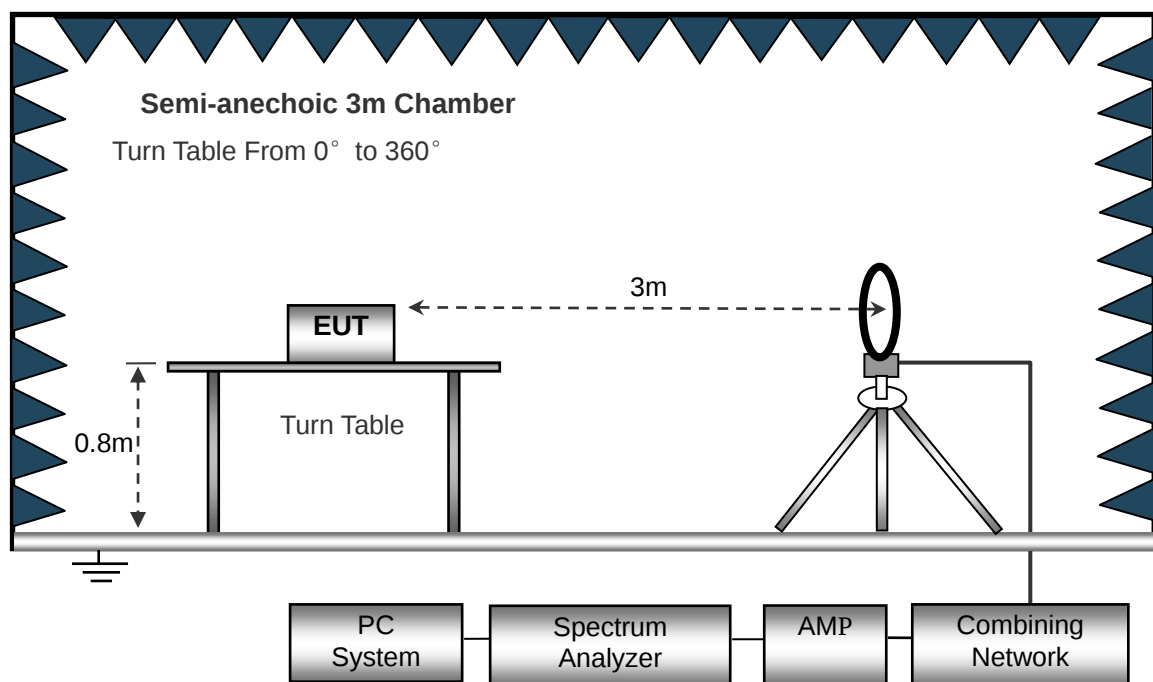
5.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.209 Limit.

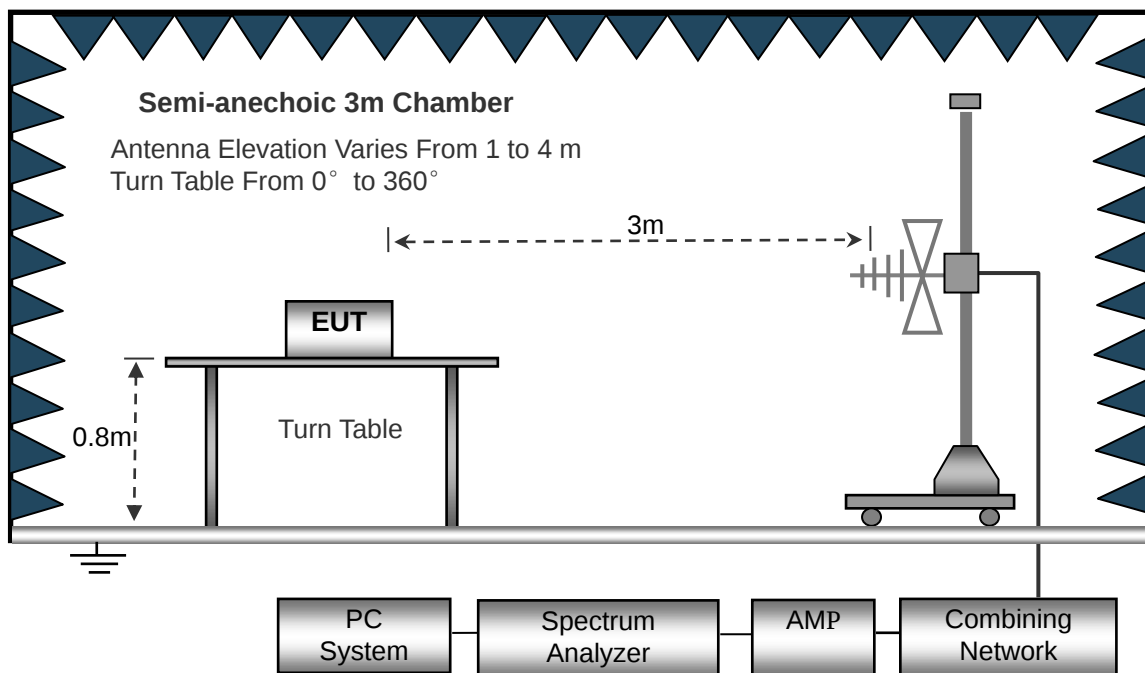
The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The test setup for emission measurement below 30MHz..



The test setup for emission measurement from 30 MHz to 1 GHz..



5.3 Test Receiver Setup

Frequency :9kHz-30MHz

RBW=10kHz,

VBW =30kHz

Sweep time= Auto

Trace = max hold

Detector function = peak

Frequency :30MHz-1GHz

RBW=120kHz,

VBW=300kHz

Sweep time= Auto

Trace = max hold

Detector function = peak, QP

5.4 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} - \text{Corr. Factor}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for a Class B device. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.209(a) Limit}$$

5.5 Environmental Conditions

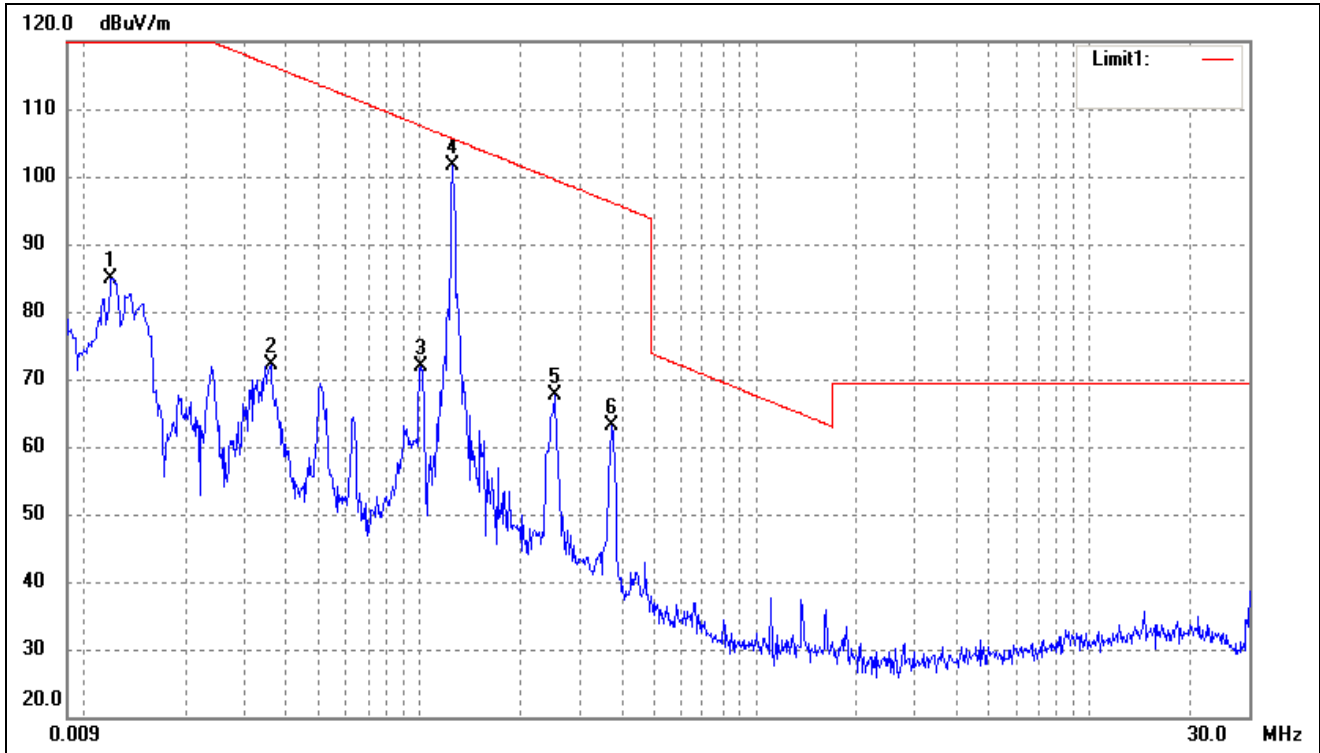
Temperature:	22 °C
Relative Humidity:	54 %
ATM Pressure:	1011 mbar

5.6 Summary of Test Results/Plots

Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.

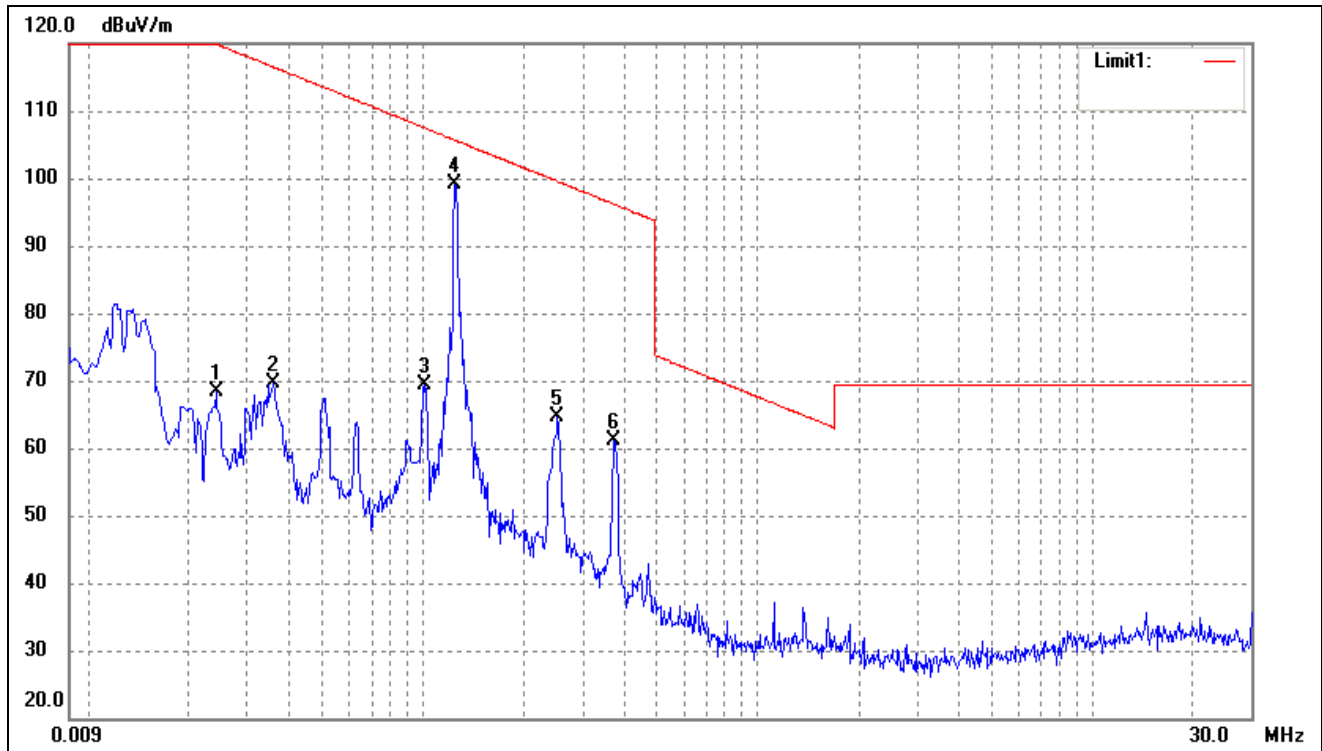
➤ Below 30MHz

Test mode:	TM1	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	0.0120	89.94	-5.18	84.76	126.00	-41.24	-	-	peak
2	0.0359	77.02	-4.80	72.22	116.49	-44.27	-	-	peak
3	0.1006	76.87	-5.05	71.82	107.54	-35.72	-	-	peak
4	0.1249	106.42	-4.85	101.57	105.67	-4.10	-	-	peak
5	0.2521	73.24	-5.72	67.52	99.57	-32.05	-	-	peak
6	0.3731	69.36	-6.13	63.23	96.17	-32.94	-	-	peak

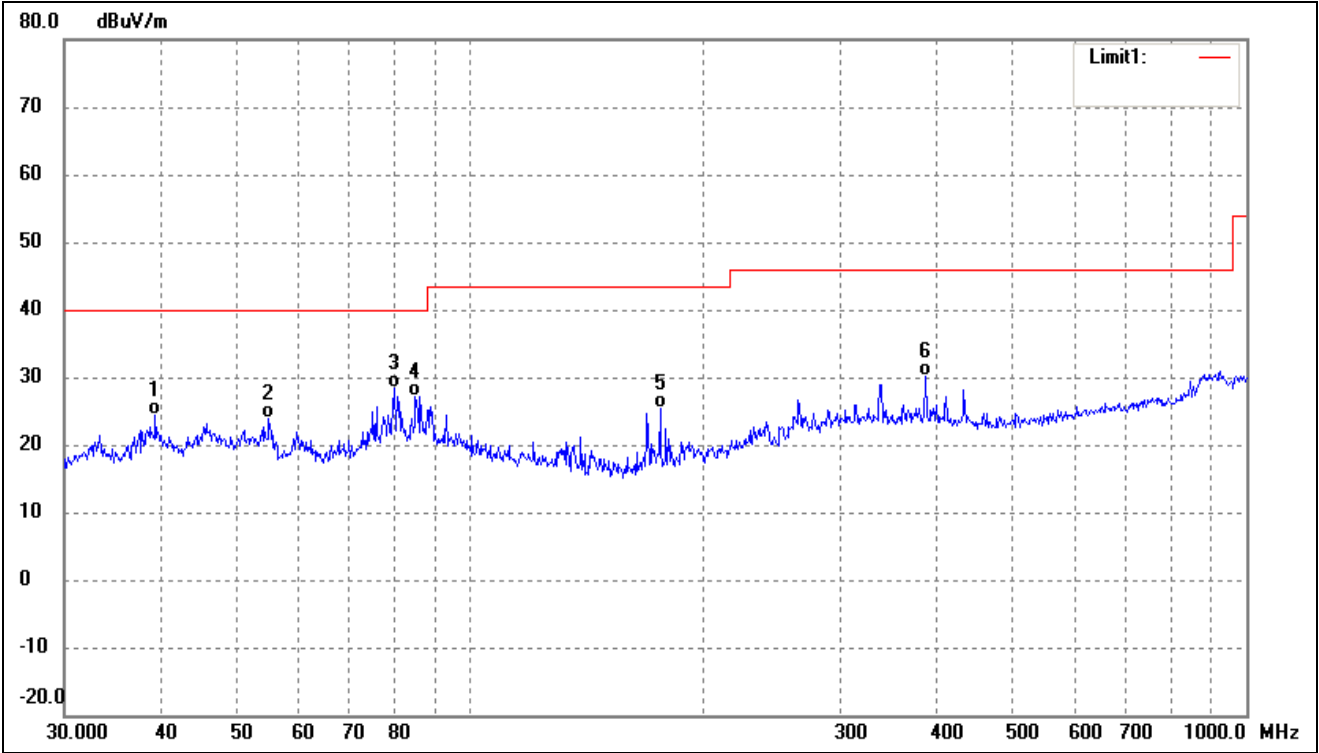
Test mode:	TM2	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	0.0240	73.80	-5.47	68.33	119.99	-51.66	-	-	peak
2	0.0359	74.52	-4.80	69.72	116.49	-46.77	-	-	peak
3	0.1005	74.37	-5.05	69.32	107.55	-38.23	-	-	peak
4	0.1247	103.92	-4.85	99.07	105.68	-6.61	-	-	peak
5	0.2519	70.24	-5.72	64.52	99.58	-35.06	-	-	peak
6	0.3730	67.36	-6.13	61.23	96.17	-34.94	-	-	peak

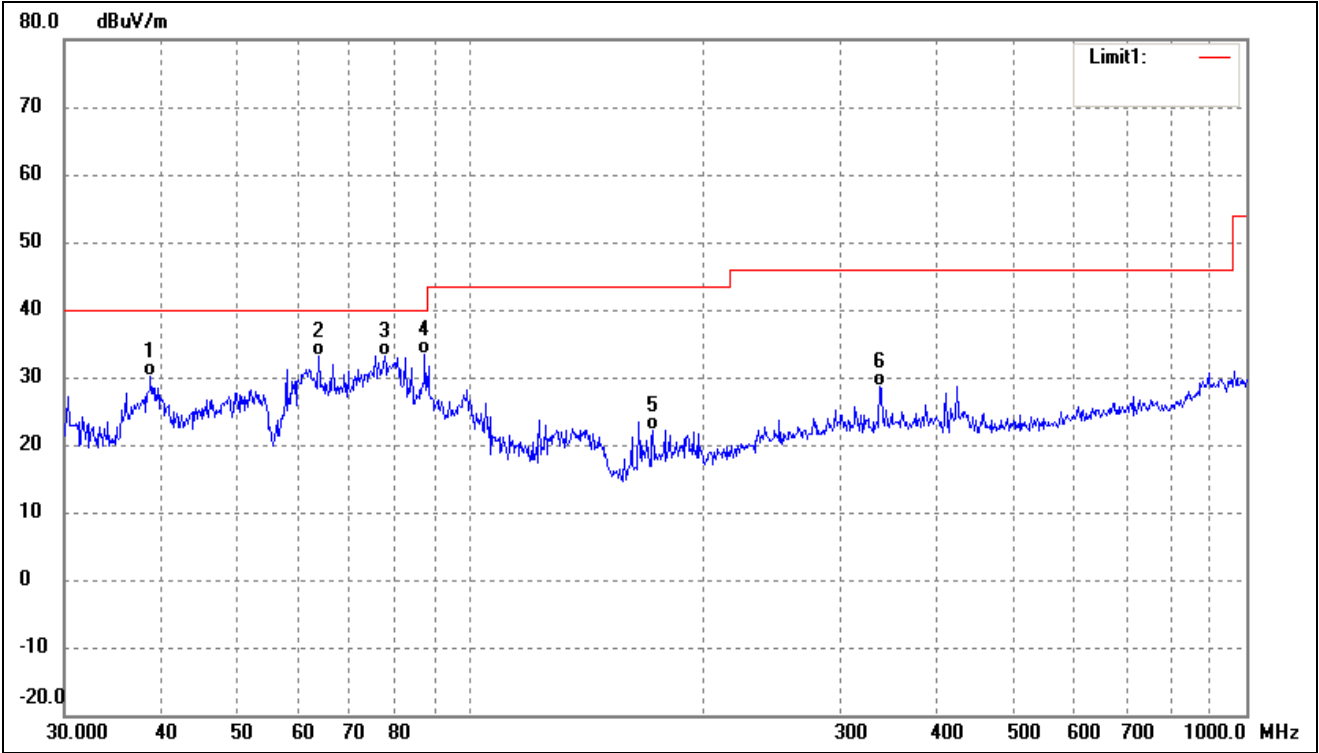
➤ 30MHz-1GHz

Test mode:	TM1	Polarity:	Horizontal
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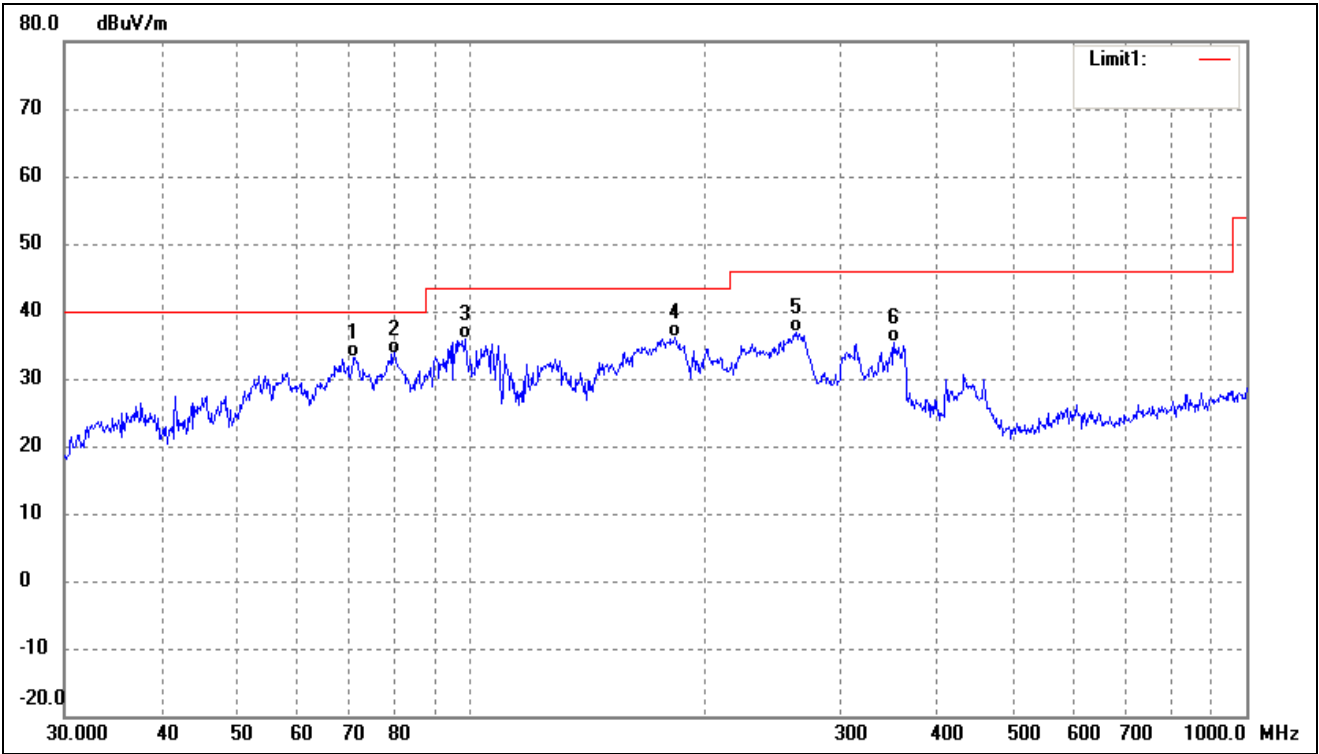
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	()	(cm)	
1	39.2991	38.91	-14.42	24.49	40.00	-15.51	-	-	QP
2	55.0274	38.87	-15.08	23.79	40.00	-16.21	-	-	QP
3	79.8003	47.44	-19.07	28.37	40.00	-11.63	-	-	QP
4	84.9995	45.27	-18.17	27.10	40.00	-12.90	-	-	QP
5	175.6516	40.69	-15.20	25.49	43.50	-18.01	-	-	QP
6	386.6338	37.96	-7.92	30.04	46.00	-15.96	-	-	QP

Test mode:	TM1	Polarity:	Vertical
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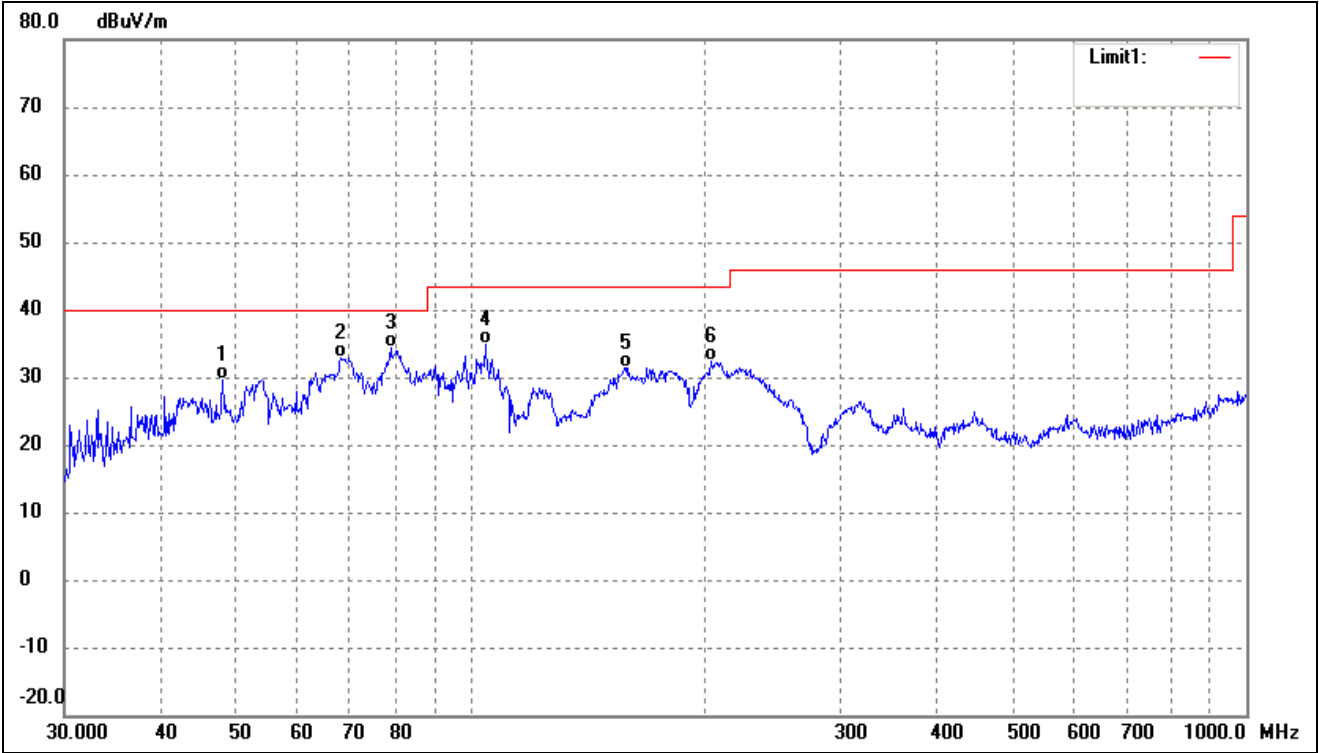
No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	38.7518	44.69	-14.64	30.05	40.00	-9.95	-	-	QP
2	63.7588	48.98	-15.89	33.09	40.00	-6.91	-	-	QP
3	77.5928	51.84	-18.72	33.12	40.00	-6.88	-	-	QP
4	87.4177	50.85	-17.55	33.30	40.00	-6.70	-	-	QP
5	171.9946	37.74	-15.51	22.23	43.50	-21.27	-	-	QP
6	337.2155	36.72	-8.04	28.68	46.00	-17.32	-	-	QP

Test mode:	TM2	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	70.8315	48.39	-15.19	33.20	40.00	-6.80	-	-	QP
2	79.8002	49.20	-15.45	33.75	40.00	-6.25	-	-	QP
3	98.4865	49.48	-13.53	35.95	43.50	-7.55	-	-	QP
4	183.8439	50.38	-14.14	36.24	43.50	-7.26	-	-	QP
5	262.8955	47.66	-10.77	36.89	46.00	-9.11	-	-	QP
6	351.7078	43.36	-8.01	35.35	46.00	-10.65	-	-	QP

Test mode:	TM2	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	47.9938	40.85	-11.13	29.72	40.00	-10.28	-	-	QP
2	68.1513	47.67	-14.78	32.89	40.00	-7.11	-	-	QP
3	78.9651	49.73	-15.40	34.33	40.00	-5.67	-	-	QP
4	104.5361	47.99	-13.10	34.89	43.50	-8.61	-	-	QP
5	158.6675	46.99	-15.53	31.46	43.50	-12.04	-	-	QP
6	204.2375	45.09	-12.64	32.45	43.50	-11.05	-	-	QP

Remark: ‘-’ Means’ the test Degree and Height are not recorded by the test software and only show the worst case in the test report.

***** END OF REPORT *****