

TEST REPORT

Reference No...... : WTX22X03052280W
FCC ID..... : 2AOTB-ZULWC
Applicant : Rachio Inc
Address..... : 1400 16th Street Suite 400, Denver, CO 80202
Manufacturer..... : The same as Applicant
Address..... : The same as Applicant
Product Name : Rachio 3, 12 Zone
Model No...... : 12ZULW-C
Standards : **FCC PART15 SUBPART B**
Date of Receipt sample ... : 2022-03-24
Date of Test..... : 2022-03-24 to 2022-03-29
Date of Issue : 2022-03-29
Test Report Form No. : WTX_FCC PART15B_001
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 approver.

Prepared By:

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Tested by:



Mike Shi

Approved by:



Silin Chen

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Report version

Version No.	Date of issue	Description
Rev.00	2022-03-29	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

General Description of EUT	
Product Name:	Rachio 3, 12 Zone
Trade Name:	/
Model No.:	12ZULW-C
Adding Model(s):	4ZULW-C, 6ZULW-C, 8ZULWC-PS, 16ZULWC-PS
<p><i>Note: The test data is gathered from a production sample, provided by the manufacturer. The appearance of others models listed in the report is different from main-test model 12ZULW-C, but the circuit and the electronic construction do not change, declared by the manufacturer.</i></p>	

Technical Characteristics of EUT	
Rated Voltage:	AC24V
Rated Current:	/
Rated Power:	/
Power Adapter Model:	MODEL: SX48-241000 INPUT: DC120V, 60Hz, 0.3A OUTPUT: AC24V, 1000mA
Lowest Internal Frequency:	32MHz
Highest Internal Frequency:	2462MHz
Classification of ITE:	Class B

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15 Subpart B:Unintentional Radiators.

ANSI C63.4-2014:American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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 C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

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	Normal working	EUT is connected to the AC adapter	AC120V/60Hz

EUT Cable List and Details				
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite	With / Without Chip
DC Cable	1.5	Unshielded	Without Ferrite	/

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

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

1.6 Measurement Uncertainty

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

1.7 Test Equipment List and Details

2021 Equipment Calibration List

Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
<input checked="" type="checkbox"/> Chamber A: Below 1GHz					
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2021-03-30	2022-03-29
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2021-04-12	2022-04-11
Amplifier	Agilent	8447F	3113A06717	2022-01-07	2023-01-06
Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-20	2023-03-19
Trilog Broadband Antenna	Schwarz beck	VULB9163	9163-333	2021-03-20	2023-03-19
<input type="checkbox"/> Chamber A: Above 1GHz					
Amplifier	C&D	PAP-1G18	2002	2021-04-12	2022-04-11
Horn Antenna	ETS	3117	00086197	2021-03-19	2023-03-18
<input type="checkbox"/> Chamber B: Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2021-05-06	2022-05-05
Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-635	2021-04-09	2023-04-08
Amplifier	Agilent	8447D	2944A10179	2021-04-12	2022-04-11
<input type="checkbox"/> Chamber C: Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2022-01-07	2023-01-06
Trilog Broadband Antenna	Schwarz beck	VULB 9168	1194	2021-05-28	2023-05-27
Amplifier	HP	8447F	2944A03869	2021-04-15	2022-04-14
<input checked="" type="checkbox"/> Conducted Room 1#					
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2021-04-15	2022-04-14
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2021-04-12	2022-04-11
AC LISN	Schwarz beck	NSLK8126	8126-224	2021-04-12	2022-04-11
<input type="checkbox"/> Conducted Room 2#					
EMI Test Receiver	Rohde & Schwarz	ESPI	10129	2021-04-12	2022-04-11
LISN	Rohde & Schwarz	ENV 216	100097	2021-04-12	2022-04-11

2022 Equipment Calibration List

Description	Manufacturer	Model	Serial No.	Cal Date	Due Date
<input checked="" type="checkbox"/> Chamber A: Below 1GHz					
Spectrum Analyzer	Rohde & Schwarz	FSP	836079/035	2022-03-22	2023-03-21
EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2022-03-21	2023-03-20
Amplifier	Agilent	8447F	3113A06717	2022-01-07	2023-01-06
Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-20	2023-03-19
Trilog Broadband Antenna	Schwarz beck	VULB9163	9163-333	2021-03-20	2023-03-19
<input type="checkbox"/> Chamber A: Above 1GHz					
Amplifier	C&D	PAP-1G18	2002	2022-03-21	2023-03-20
Horn Antenna	ETS	3117	00086197	2021-03-19	2023-03-18
<input type="checkbox"/> Chamber B: Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2022-03-25	2023-03-24
Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-635	2021-04-09	2023-04-08
Amplifier	Agilent	8447D	2944A10179	2022-03-21	2023-03-20
<input type="checkbox"/> Chamber C: Below 1GHz					
EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2022-01-07	2023-01-06
Trilog Broadband Antenna	Schwarz beck	VULB 9168	1194	2021-05-28	2023-05-27
Amplifier	HP	8447F	2944A03869	2022-03-21	2023-03-20
<input checked="" type="checkbox"/> Conducted Room 1#					
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2022-03-25	2023-03-24
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2022-03-21	2023-03-20
AC LISN	Schwarz beck	NSLK8126	8126-224	2022-03-21	2023-03-20
<input type="checkbox"/> Conducted Room 2#					
EMI Test Receiver	Rohde & Schwarz	ESPI	10129	2022-03-21	2023-03-20
LISN	Rohde & Schwarz	ENV 216	100097	2022-03-21	2023-03-20

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
§15.107(a) Conducted Emission	Compliant
§15.109(a) Radiated Emission	Compliant

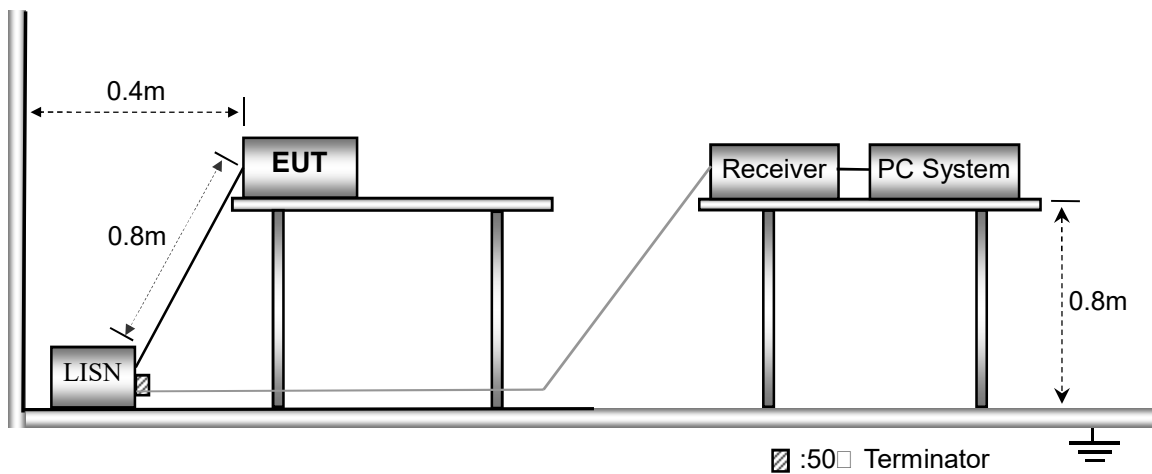
N/A: not applicable

3. Conducted Emissions

3.1 Test Procedure

Test is conducting under the description of ANSI C63.4-2014, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

3.2 Basic Test Setup Block Diagram



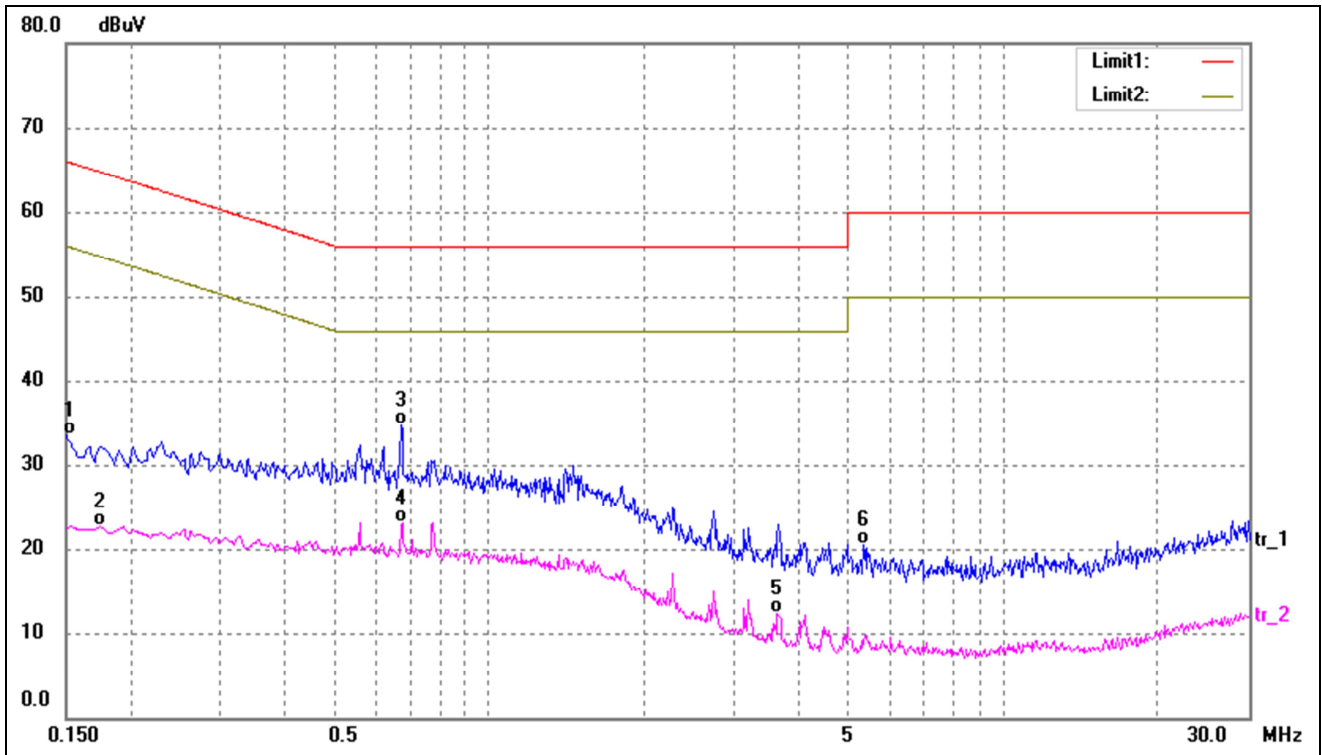
3.3 Environmental Conditions

Temperature:	23.5 °C
Relative Humidity:	54 %
ATM Pressure:	1014 mbar

3.4 Summary of Test Results

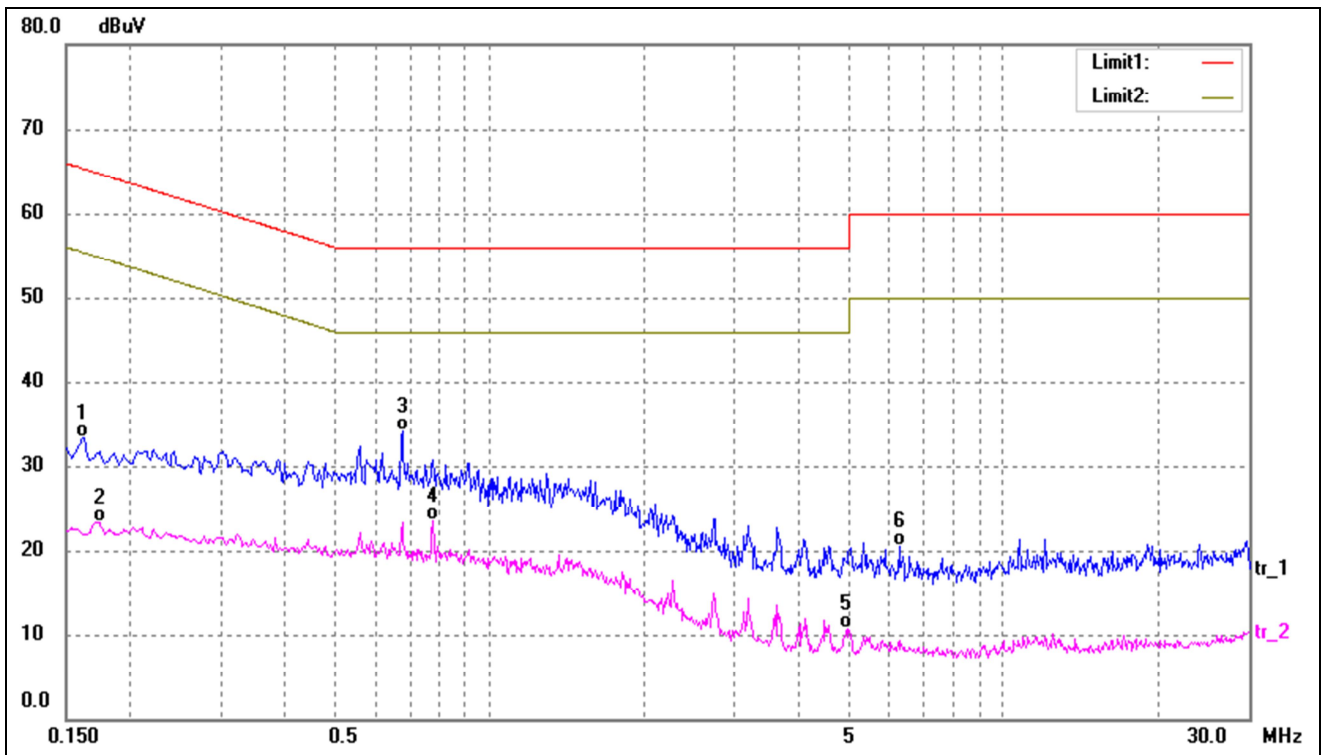
Please find the results below:

Test mode:	TM1	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1500	23.03	10.38	33.41	66.00	-32.59	QP
2	0.1740	12.33	10.37	22.70	54.77	-32.07	AVG
3*	0.6740	24.38	10.36	34.74	56.00	-21.26	QP
4	0.6780	12.83	10.37	23.20	46.00	-22.80	AVG
5	3.6340	2.29	10.06	12.35	46.00	-33.65	AVG
6	5.3580	10.49	9.99	20.48	60.00	-39.52	QP

Test mode:	TM1	Polarity:	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1620	23.00	10.37	33.37	65.36	-31.99	QP
2	0.1740	13.02	10.37	23.39	54.77	-31.38	AVG
3*	0.6780	23.66	10.37	34.03	56.00	-21.97	QP
4	0.7780	13.02	10.43	23.45	46.00	-22.55	AVG
5	4.9540	0.78	10.00	10.78	46.00	-35.22	AVG
6	6.2700	10.48	9.96	20.44	60.00	-39.56	QP

4. RADIATED EMISSION

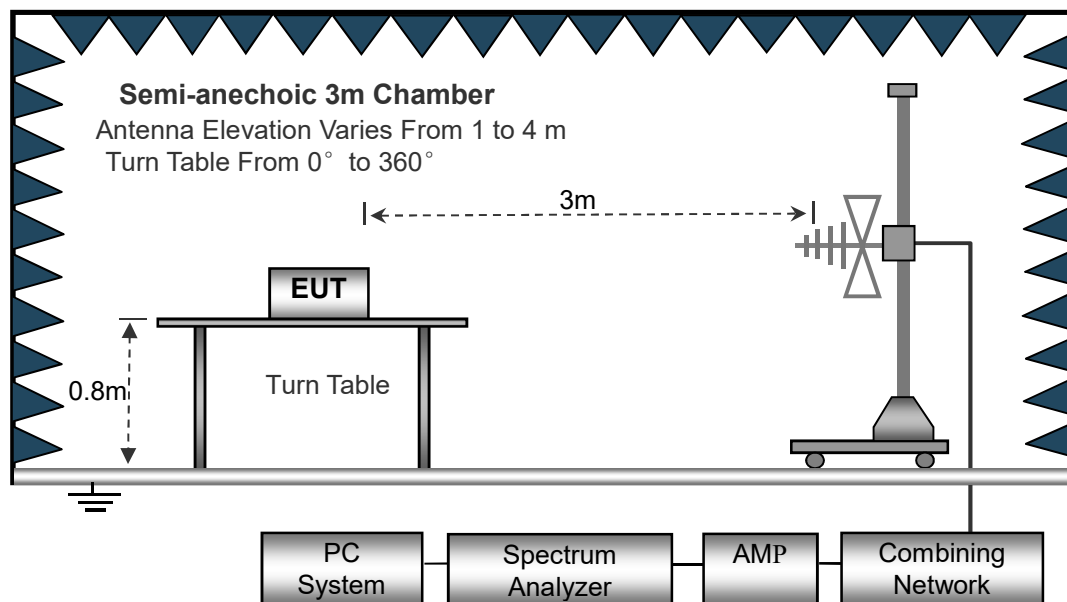
4.1 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the FCC Part 15.109 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 Block Diagram of Test Setup



4.3 Test Receiver Setup

Frequency :9kHz-30MHz	Frequency :30MHz-1GHz	Frequency :Above 1GHz
RBW=10KHz,	RBW=120KHz,	RBW=1MHz,
VBW =30KHz	VBW=300KHz	VBW=3MHz(Peak), 10Hz(AV)
Sweep time= Auto	Sweep time= Auto	Sweep time= Auto
Trace = max hold	Trace = max hold	Trace = max hold
Detector function = peak	Detector function = peak, QP	Detector function = peak, AV

4.4 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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Correct}$$

$$\text{Correct} = \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

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:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15.109(a) Limit}$$

4.5 Environmental Conditions

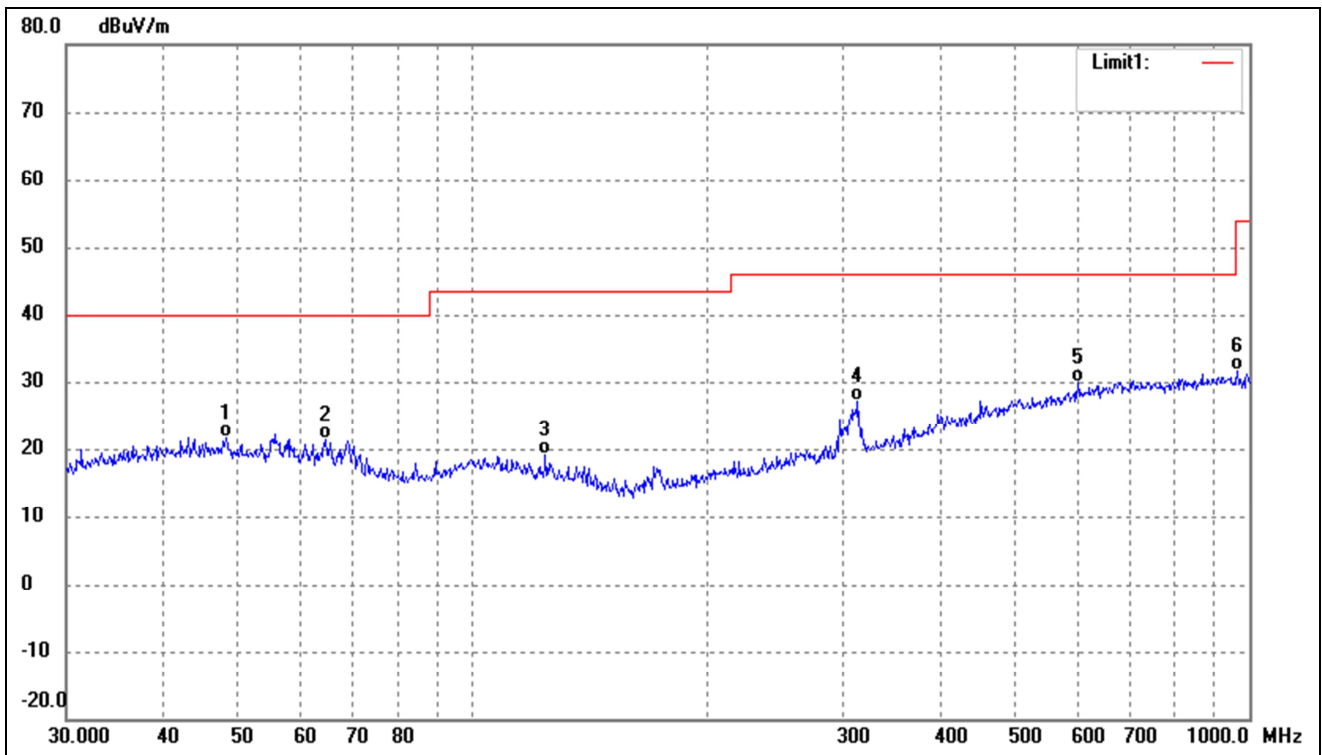
Temperature:	22.5 °C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

4.6 Summary of Test Results

Please find the results below:

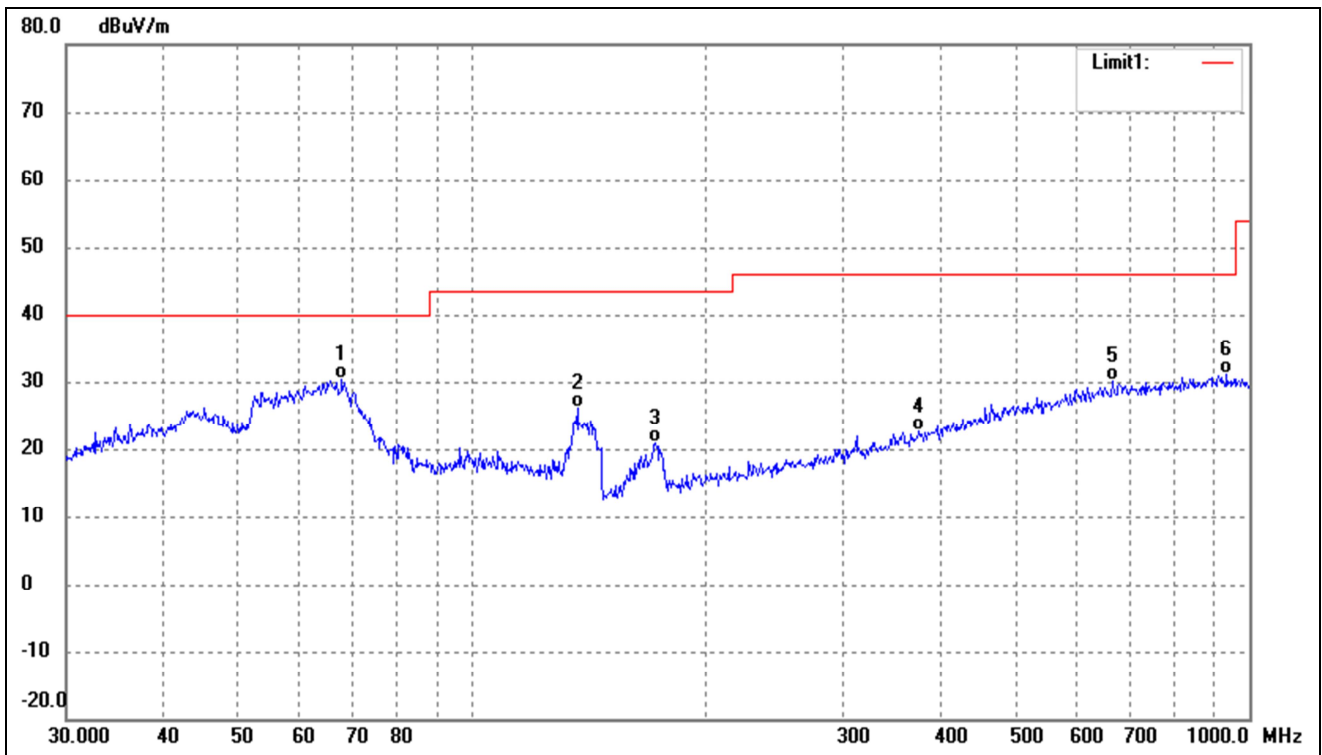
Below 1GHz

Test mode:	TM1	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	48.1626	28.68	-6.97	21.71	40.00	-18.29	-	-	QP
2	64.6594	30.63	-9.24	21.39	40.00	-18.61	-	-	QP
3	124.1330	29.37	-10.36	19.01	43.50	-24.49	-	-	QP
4	313.2760	33.68	-6.54	27.14	46.00	-18.86	-	-	QP
5	601.4265	29.41	0.39	29.80	46.00	-16.20	-	-	QP
6	965.5421	29.05	2.52	31.57	54.00	-22.43	-	-	QP

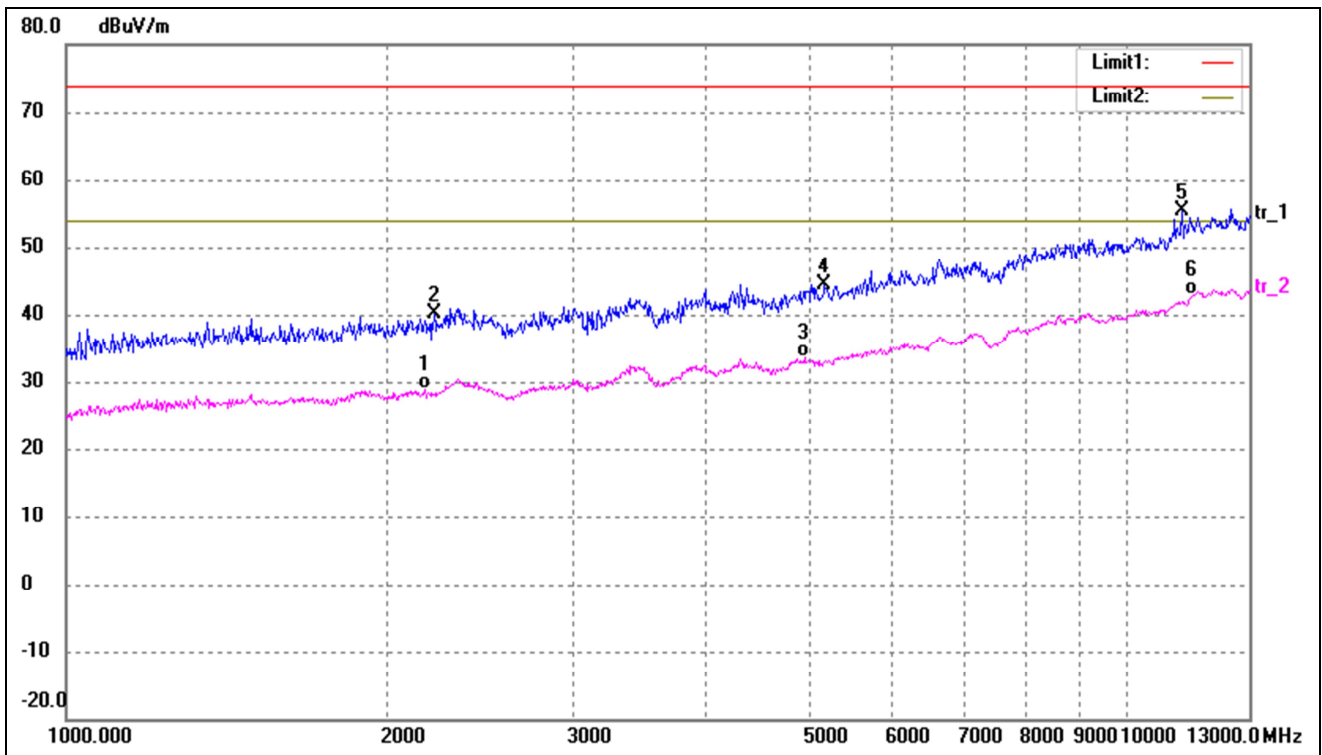
Test mode:	TM1	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	67.9129	40.26	-9.81	30.45	40.00	-9.55	-	-	QP
2	136.4598	37.99	-11.97	26.02	43.50	-17.48	-	-	QP
3	171.9946	32.45	-11.63	20.82	43.50	-22.68	-	-	QP
4	375.9385	27.22	-4.61	22.61	46.00	-23.39	-	-	QP
5	665.8035	28.97	1.08	30.05	46.00	-15.95	-	-	QP
6	935.5463	28.41	2.62	31.03	46.00	-14.97	-	-	QP

Above 1GHz

Test mode:	TM1	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	2175.328	39.84	-11.00	28.84	54.00	-25.16	-	-	AVG
2	2220.426	51.00	-10.93	40.07	74.00	-33.93	-	-	peak
3	4955.650	39.30	-5.73	33.57	54.00	-20.43	-	-	AVG
4	5176.517	49.69	-5.29	44.40	74.00	-29.60	-	-	peak
5	11231.780	51.10	4.18	55.28	74.00	-18.72	-	-	peak
6	11494.076	38.01	4.98	42.99	54.00	-11.01	-	-	AVG