



TEST REPORT

Reference No..... : WTX21X1011125E
Applicant : ProtoDev Canada
Address : 304-376 Churchill Avenue North, Ottawa, K1Z 5C3 Ontario Canada
Product Name : Contactless Access
Test Model : CA-V2
Standards : FCC PART15 SUBPART B
Date of Receipt sample : Oct. 20, 2021
Date of Test..... : Oct. 20, 2021 to Oct. 28, 2021
Date of Issue : Oct. 28, 2021
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:

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

Tel.: +86-755-33663308

Fax.: +86-755-33663309

Tested by:

Reviewed By:

Approved & Authorized By:

Tom Ma / Project Engineer

Evan Cai / EMC Manager

Silin Chen / Manager



TABLE OF CONTENTS

1. GENERAL INFORMATION	3
1.1 PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT)	3
1.2 TEST STANDARDS	4
1.3 TEST METHODOLOGY	4
1.4 TEST FACILITY	4
1.5 EUT SETUP AND OPERATION MODE	5
1.6 MEASUREMENT UNCERTAINTY	5
1.7 TEST EQUIPMENT LIST AND DETAILS	6
2. SUMMARY OF TEST RESULTS	7
3. CONDUCTED EMISSIONS	8
3.1 TEST PROCEDURE	8
3.2 BASIC TEST SETUP BLOCK DIAGRAM	8
3.3 ENVIRONMENTAL CONDITIONS	8
3.4 SUMMARY OF TEST RESULTS	8
4. RADIATED EMISSION	11
4.1 TEST PROCEDURE	11
4.2 BLOCK DIAGRAM OF TEST SETUP	11
4.3 TEST RECEIVER SETUP	12
4.4 CORRECTED AMPLITUDE & MARGIN CALCULATION	12
4.5 ENVIRONMENTAL CONDITIONS	12
4.6 SUMMARY OF TEST RESULTS	12
EXHIBIT 1 - PRODUCT LABELING	21
PROPOSED FCC LABEL FORMAT	21
PROPOSED LABEL LOCATION ON EUT	21
EXHIBIT 2 - EUT PHOTOGRAPHS	22
EXHIBIT 3 - EUT INTERNAL PHOTOGRAPHS	25
EXHIBIT 4 - TEST SETUP PHOTOGRAPHS	27
EXHIBIT 5 - USERS MANUAL	29



1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: ProtoDev Canada
Address of applicant: 304-376 Churchill Avenue North, Ottawa, K1Z 5C3
Ontario Canada

Manufacturer: ProtoDev Canada
Address of manufacturer: 304-376 Churchill Avenue North, Ottawa, K1Z 5C3
Ontario Canada

General Description of EUT

Product Name:	Ontario Canada
Trade Name:	/
Model No.:	CA-V2
Adding Model(s):	/

Note: The test data is gathered from a production sample, provided by the manufacturer.

Technical Characteristics of EUT

Rated Voltage:	DC 24V
Rated Current:	25mA
Rated Power:	0.6W
Power Adapter Model:	/
Lowest Internal Frequency:	/
Highest Internal Frequency:	Above 108MHz
Classification of ITE:	Class A



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	Working Mode	/	DC 24V(With an adapter input AC120V/60Hz)
TM2	RF Mode	/	DC 24V(With an adapter input AC120V/60Hz)

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

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
Adapter	/	JZB024-240100UX	/
Laptop Computer	Lenovo	20R5-A000US	/

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	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	2021-04-12	2022-04-11
Amplifier	C&D	PAP-1G18	2002	2021-04-12	2022-04-11
Trilog Broadband Antenna	Schwarz beck	VULB9163	9163-333	2021-03-20	2023-03-19
Horn Antenna	ETS	3117	00086197	2021-03-19	2023-03-18
Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-20	2023-03-19
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
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2021-04-15	2022-04-14

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(b) Conducted Emission	Compliant
§15.109(b) Radiated Emission	Compliant

WALTEK

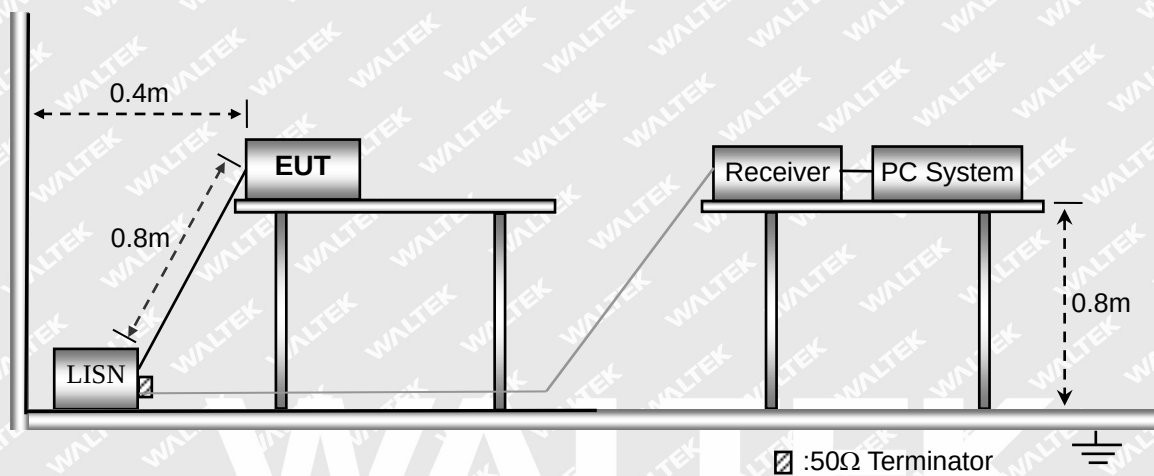


3. Conducted Emissions

3.1 Test Procedure

Test is conducted 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

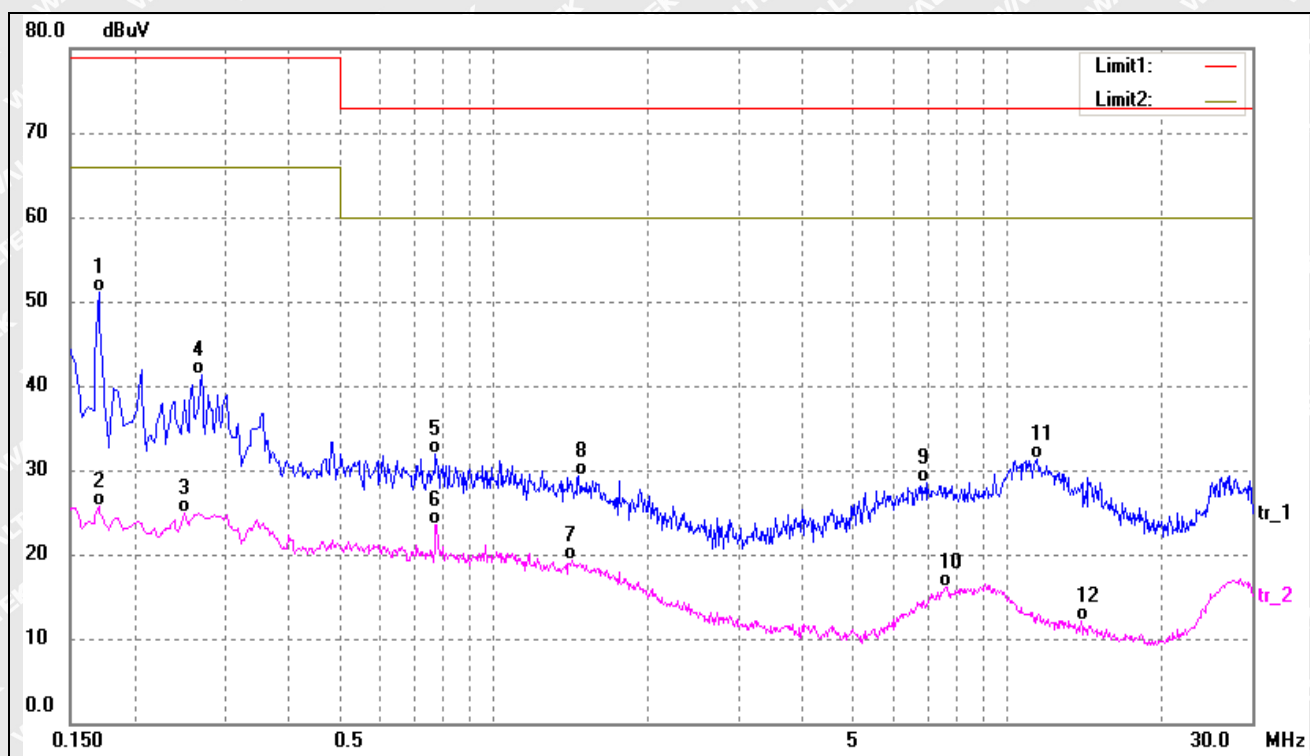
Temperature:	23.5 °C
Relative Humidity:	54 %
ATM Pressure:	997 mbar

3.4 Summary of Test Results

Please find the results below:



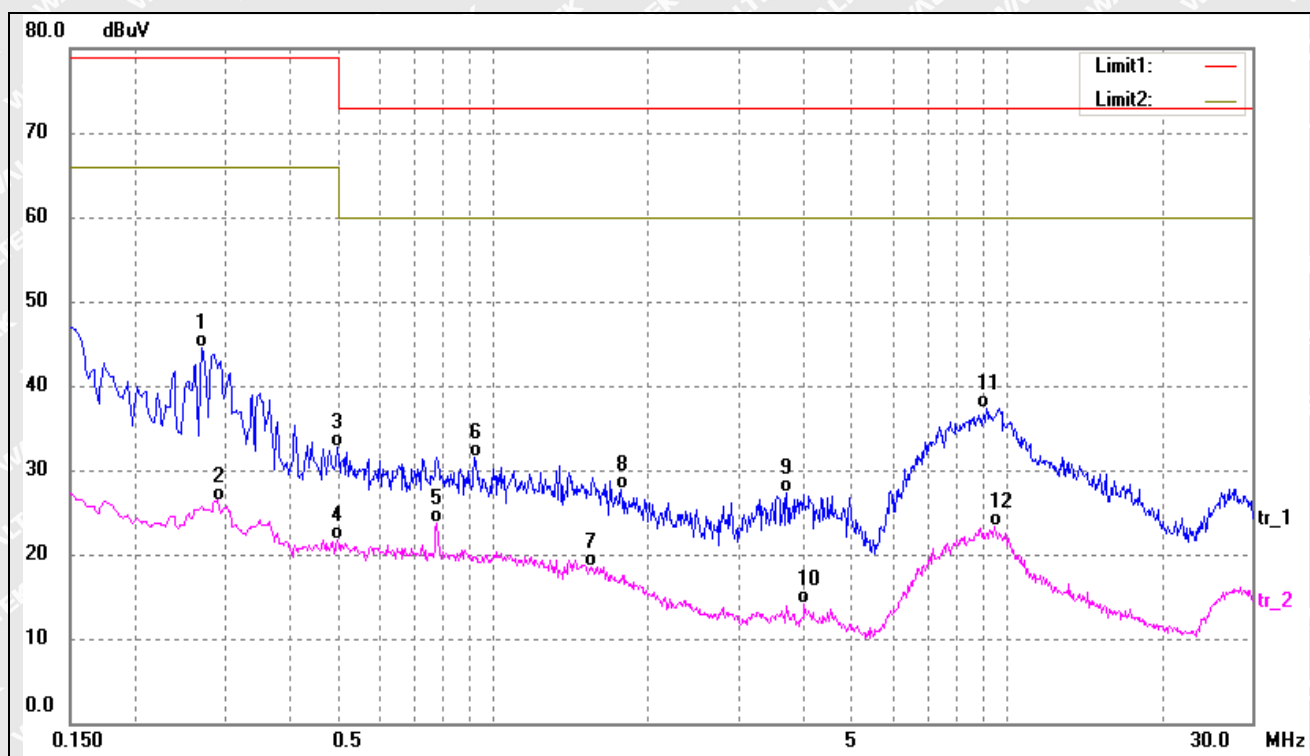
Test mode:	TM1	Polarity:	Line
------------	-----	-----------	------



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1700	40.77	10.37	51.14	79.00	-27.86	QP
2	0.1700	15.25	10.37	25.62	66.00	-40.38	AVG
3	0.2500	14.60	10.35	24.95	66.00	-41.05	AVG
4	0.2700	30.96	10.35	41.31	79.00	-37.69	QP
5	0.7740	21.46	10.42	31.88	73.00	-41.12	QP
6	0.7780	13.12	10.43	23.55	60.00	-36.45	AVG
7	1.4219	8.99	10.38	19.37	60.00	-40.63	AVG
8	1.4659	18.91	10.36	29.27	73.00	-43.73	QP
9	6.9820	18.61	9.95	28.56	73.00	-44.44	QP
10	7.5979	6.10	9.93	16.03	60.00	-43.97	AVG
11	11.4499	21.43	9.95	31.38	73.00	-41.62	QP
12	13.9179	1.92	10.09	12.01	60.00	-47.99	AVG



Test mode:	TM1	Polarity:	Neutral
------------	-----	-----------	---------



No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.2700	34.17	10.35	44.52	79.00	-34.48	QP
2	0.2900	16.06	10.34	26.40	66.00	-39.60	AVG
3	0.4980	22.49	10.26	32.75	79.00	-46.25	QP
4	0.4980	11.51	10.26	21.77	66.00	-44.23	AVG
5	0.7780	13.36	10.43	23.79	60.00	-36.21	AVG
6	0.9220	21.08	10.51	31.59	73.00	-41.41	QP
7	1.5500	8.26	10.32	18.58	60.00	-41.42	AVG
8	1.7740	17.55	10.23	27.78	73.00	-45.22	QP
9	3.7300	17.31	10.05	27.36	73.00	-45.64	QP
10	4.0420	4.00	10.04	14.04	60.00	-45.96	AVG
11	9.1540	27.50	9.89	37.39	73.00	-35.61	QP
12	9.4980	13.52	9.88	23.40	60.00	-36.60	AVG



4. RADIATED EMISSION

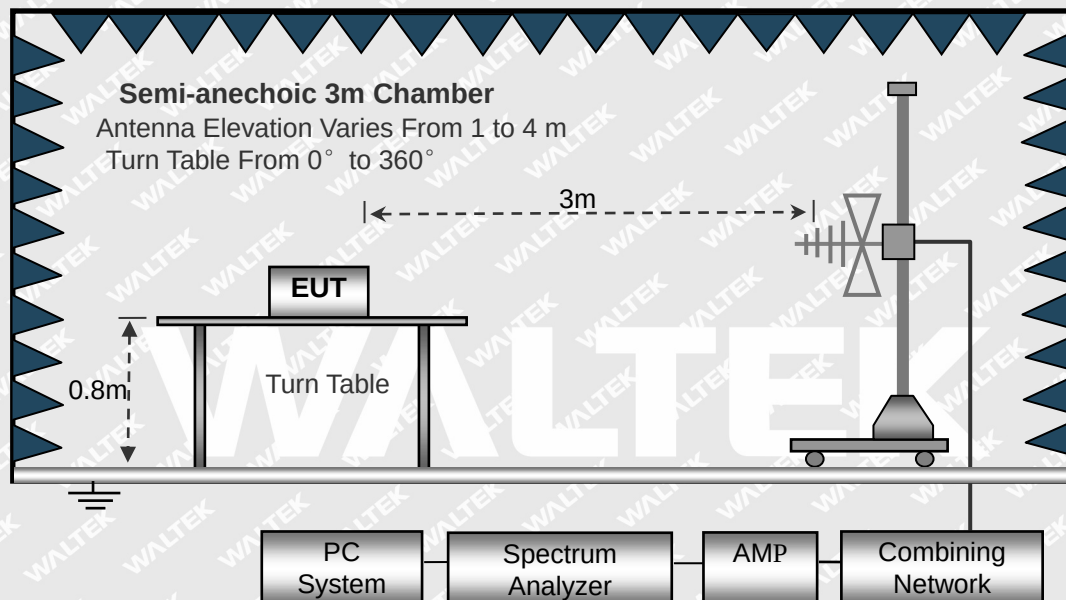
4.1 Test Procedure

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

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

Frequency :Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Trace = max hold

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:

$$\begin{aligned}\text{Corr. Ampl.} &= \text{Indicated Reading} + \text{Correct} \\ \text{Correct} &= \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}\end{aligned}$$

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 A device. The equation for margin calculation is as follows:

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

4.5 Environmental Conditions

Temperature:	22.5 °C
Relative Humidity:	54 %
ATM Pressure:	997 mbar

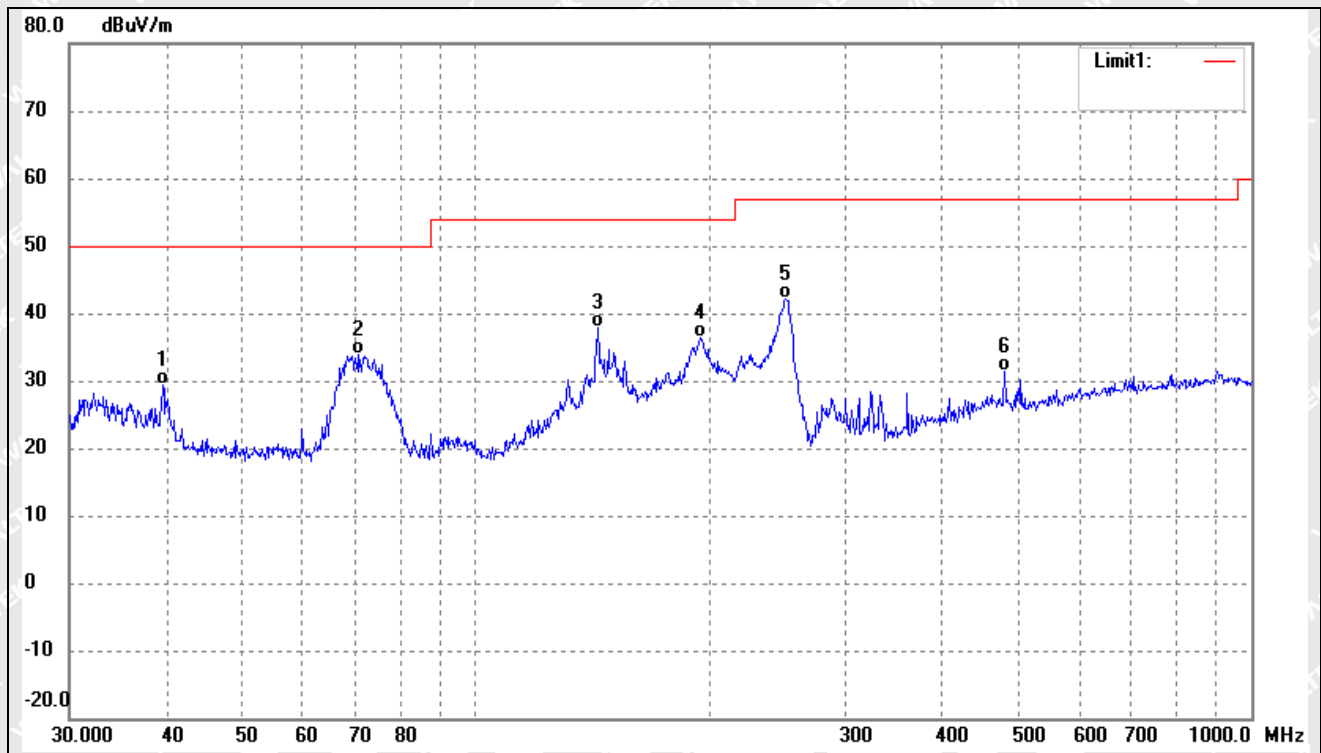
4.6 Summary of Test Results

Please find the results below:



30MHz-1GHz

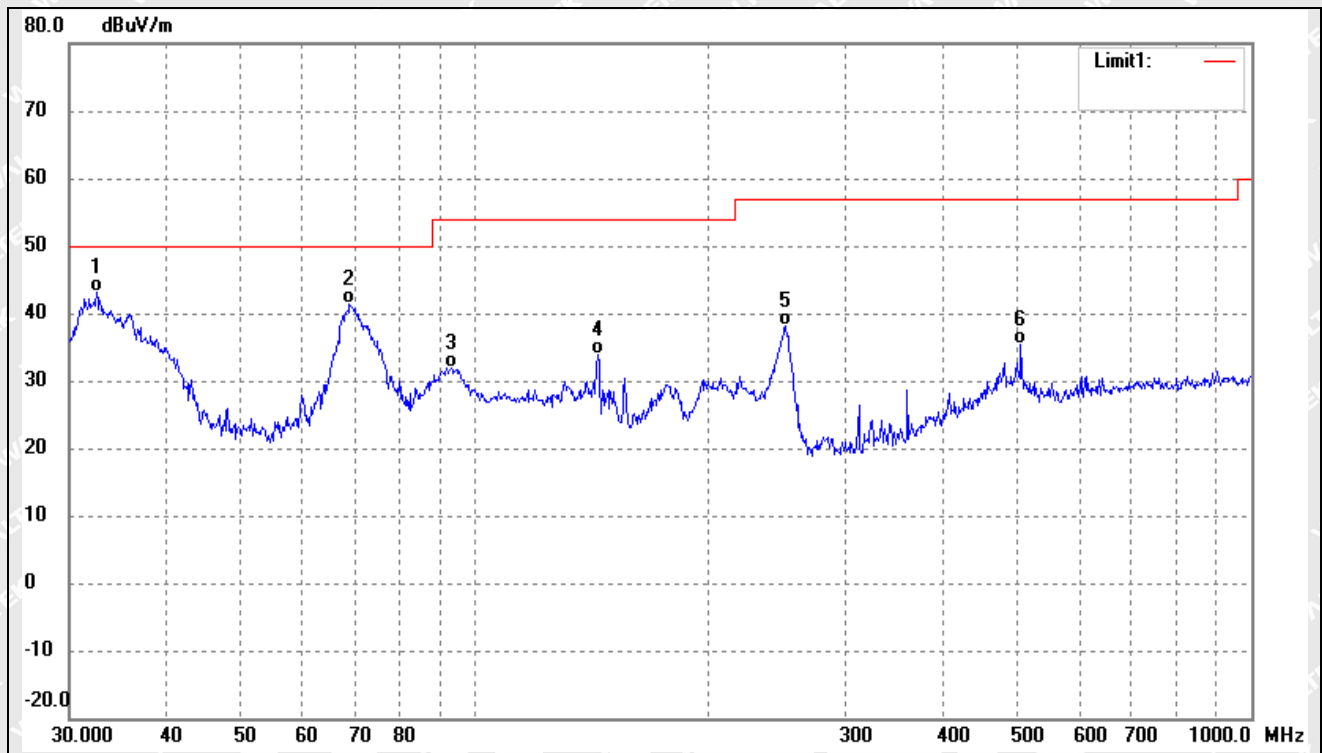
Test mode:	TM1	Polarity:	Horizontal
------------	-----	-----------	------------



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.5757	36.54	-7.11	29.43	50.00	-20.57	357	100	QP
2	70.8315	44.11	-10.22	33.89	50.00	-16.11	97	100	QP
3	143.8295	50.33	-12.40	37.93	54.00	-16.07	214	100	QP
4	195.1365	46.25	-9.87	36.38	54.00	-17.62	101	100	QP
5	251.1804	50.29	-8.28	42.01	56.90	-14.89	184	100	QP
6	480.5276	33.08	-1.79	31.29	56.90	-25.61	235	100	QP



Test mode:	TM1	Polarity:	Vertical
------------	-----	-----------	----------

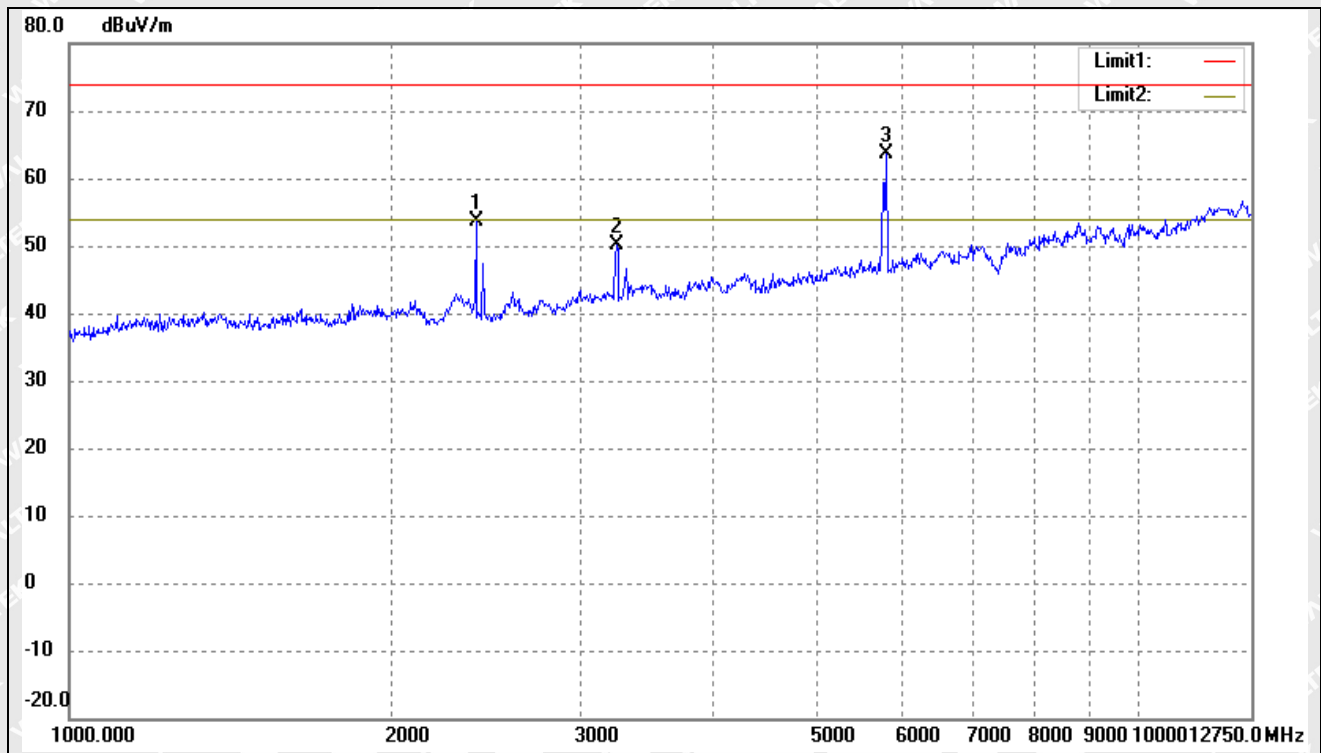


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	32.5198	52.06	-8.83	43.23	50.00	-6.77	231	100	QP
2	68.8721	51.31	-9.97	41.34	50.00	-8.66	90	100	QP
3	93.1132	41.95	-10.00	31.95	54.00	-22.05	85	100	QP
4	143.8295	46.31	-12.40	33.91	54.00	-20.09	97	100	QP
5	251.1804	46.43	-8.28	38.15	56.90	-18.75	203	100	QP
6	504.7062	36.50	-1.22	35.28	56.90	-21.62	313	100	QP



1GHz-12.75GHz

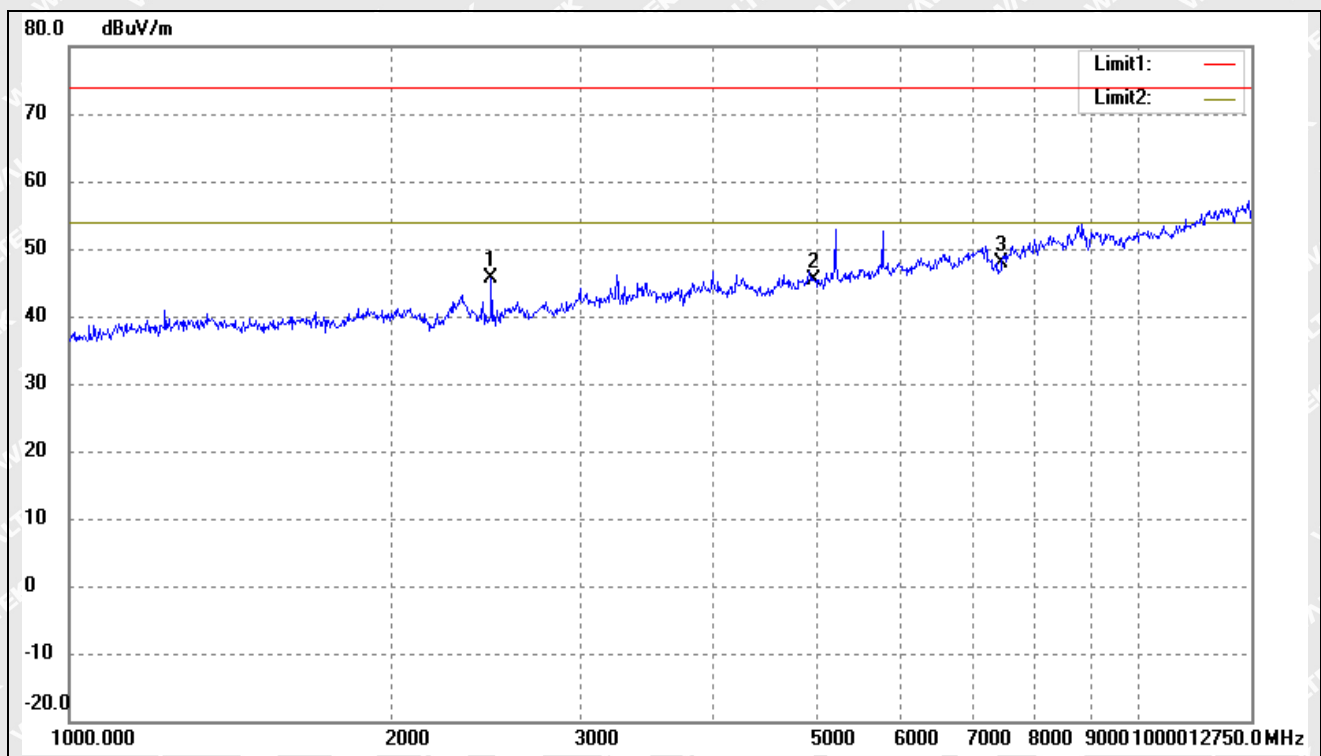
Test mode:	TM2	Polarity:	Horizontal
------------	-----	-----------	------------



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2400.466	64.25	-10.69	53.56	74.00	-20.44	85	100	peak
2	3249.760	58.79	-8.74	50.05	74.00	-23.95	230	100	peak
3	5806.408	67.69	-4.03	63.66	74.00	-10.34	70	100	peak



Test mode:	TM2	Polarity:	Vertical
------------	-----	-----------	----------

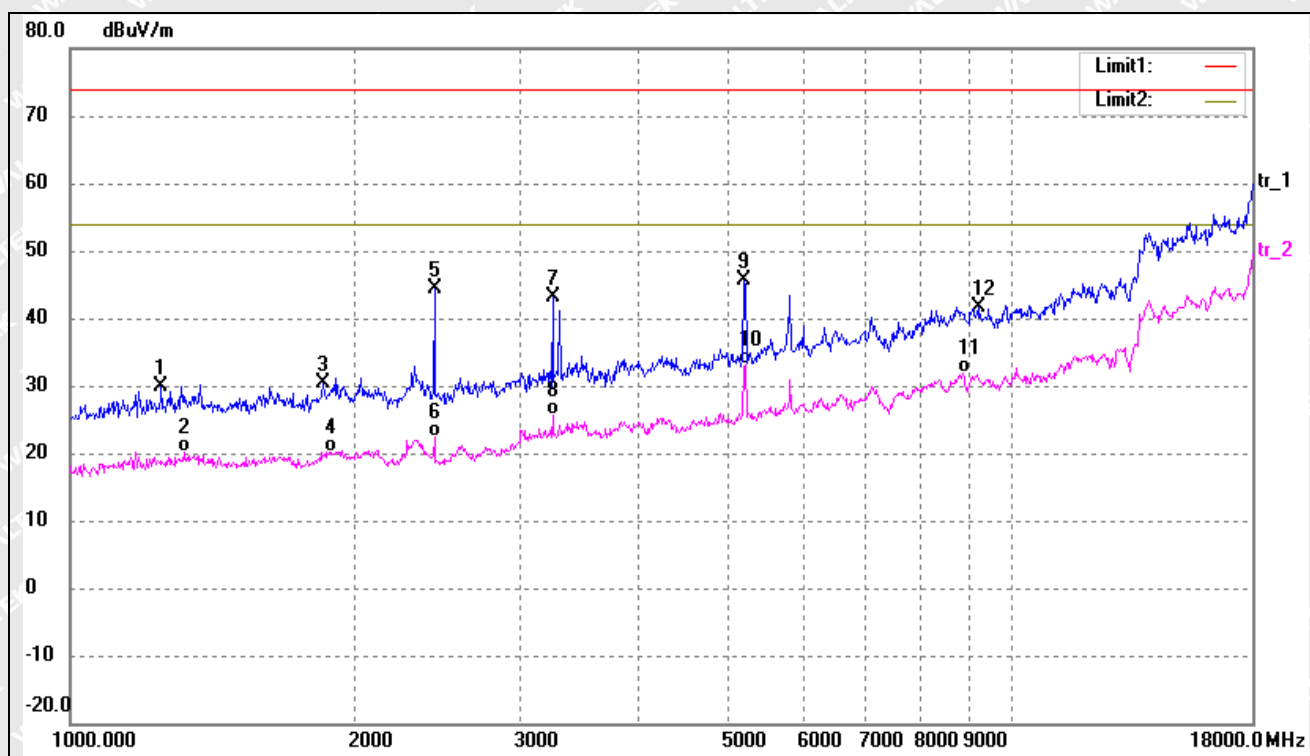


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2481.231	56.14	-10.58	45.56	74.00	-28.44	161	100	peak
2	4962.000	51.16	-5.71	45.45	74.00	-28.55	287	100	peak
3	7443.000	49.47	-1.52	47.95	74.00	-26.05	72	100	peak



1GHz-18GHz

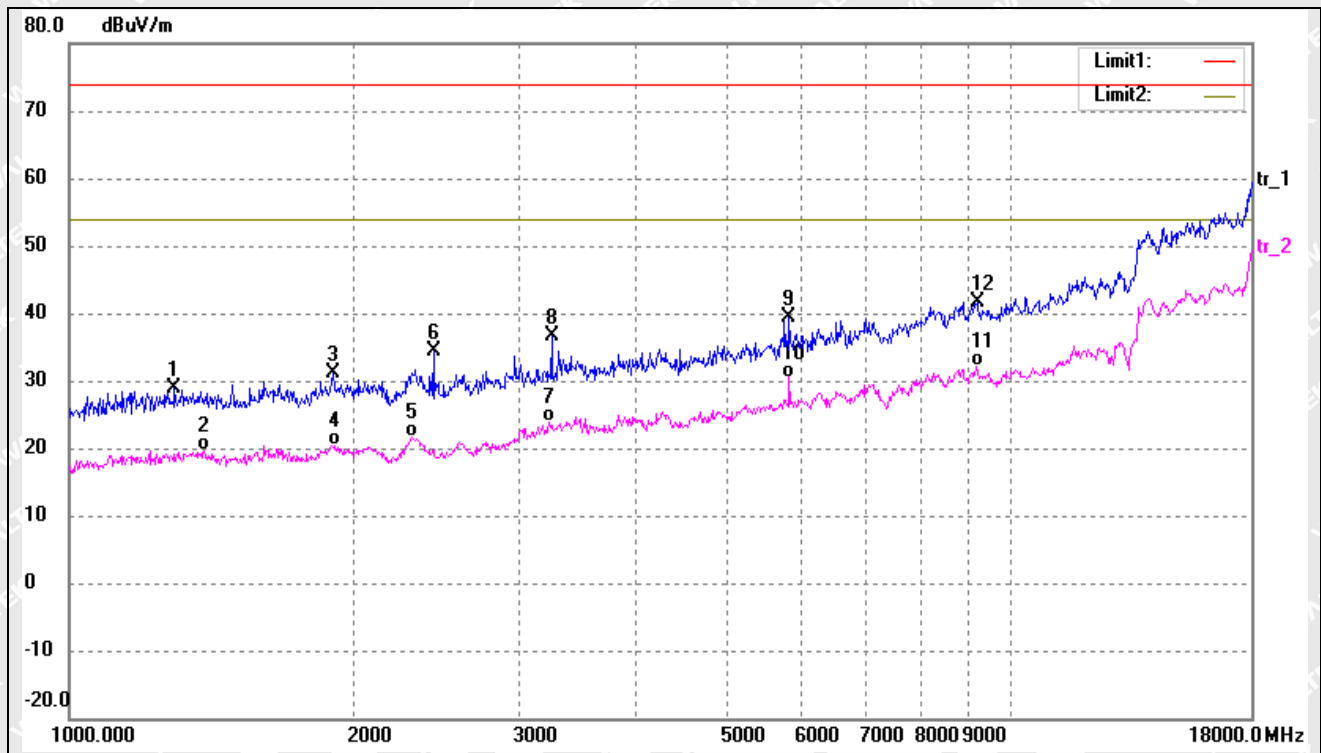
Test mode:	TM2	Polarity:	Horizontal
------------	-----	-----------	------------



No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	1249.269	43.84	-13.92	29.92	74.00	-44.08	264	100	peak
2	1319.794	33.66	-13.57	20.09	54.00	-33.91	94	100	AVG
3	1856.215	41.92	-11.65	30.27	74.00	-43.73	244	100	peak
4	1894.154	31.74	-11.54	20.20	54.00	-33.80	95	100	AVG
5	2435.701	54.95	-10.64	44.31	74.00	-29.69	168	100	peak
6	2435.701	33.12	-10.64	22.48	54.00	-31.52	110	100	AVG
7	3252.005	51.77	-8.75	43.02	74.00	-30.98	171	100	peak
8	3252.005	34.44	-8.75	25.69	54.00	-28.31	259	100	AVG
9	5194.041	50.83	-5.26	45.57	74.00	-28.43	69	100	peak
10	5209.075	38.46	-5.23	33.23	54.00	-20.77	213	100	AVG
11	8866.061	30.57	1.28	31.85	54.00	-22.15	297	100	AVG
12	9205.540	40.15	1.51	41.66	74.00	-32.34	259	100	peak



Test mode:	TM2	Polarity:	Vertical
------------	-----	-----------	----------

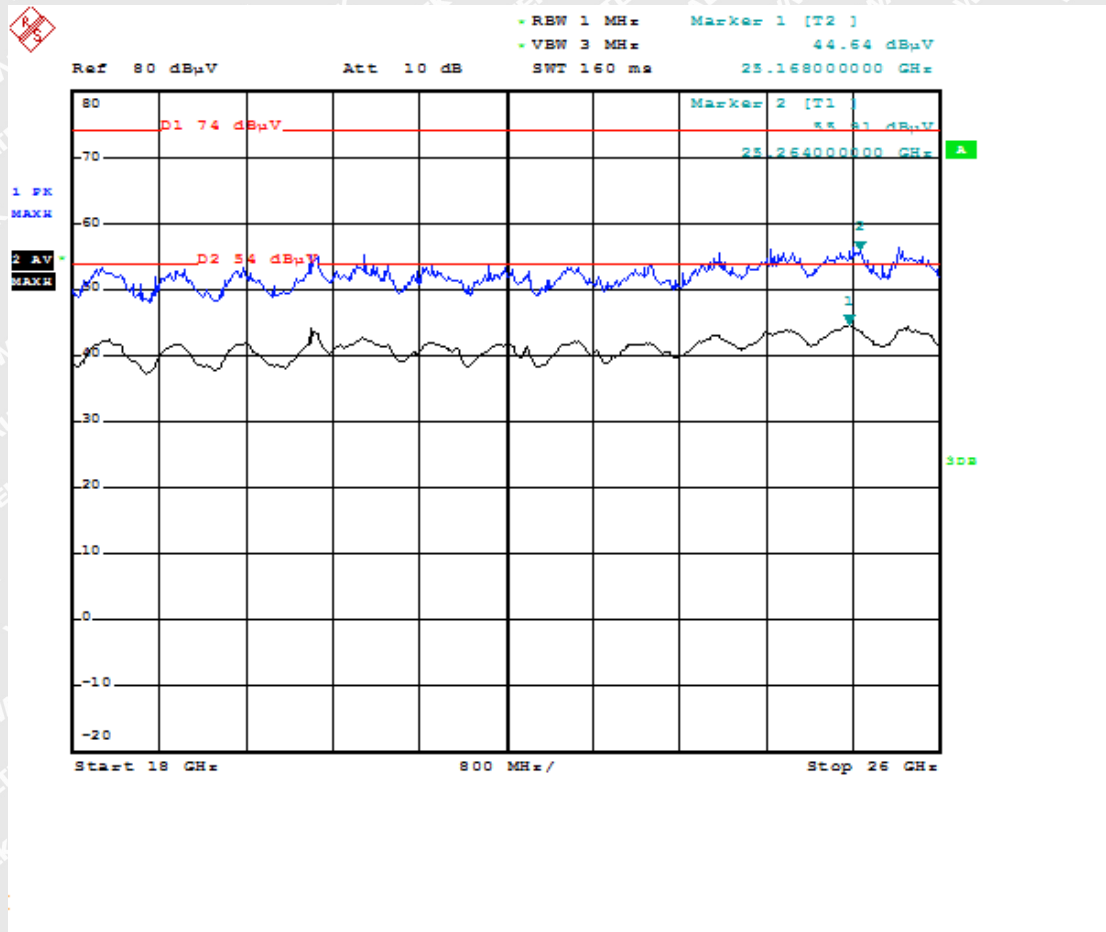


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	1293.360	42.48	-13.71	28.77	74.00	-45.23	217	100	peak
2	1390.276	32.86	-13.22	19.64	54.00	-34.36	91	100	AVG
3	1905.135	42.53	-11.51	31.02	74.00	-42.98	169	100	peak
4	1910.650	31.97	-11.49	20.48	54.00	-33.52	102	100	AVG
5	2312.219	32.36	-10.81	21.55	54.00	-32.45	268	100	AVG
6	2435.701	45.08	-10.64	34.44	74.00	-39.56	238	100	peak
7	3233.260	32.63	-8.76	23.87	54.00	-30.13	80	100	AVG
8	3252.005	45.50	-8.75	36.75	74.00	-37.25	109	100	peak
9	5813.812	43.38	-4.02	39.36	74.00	-34.64	74	100	peak
10	5813.812	34.52	-4.02	30.50	54.00	-23.50	166	100	AVG
11	9178.971	30.71	1.51	32.22	54.00	-21.78	126	100	AVG
12	9205.540	40.24	1.51	41.75	74.00	-32.25	301	100	peak

**18GHz-26GHz**

Test mode:	TM2	Polarity:	Horizontal
------------	-----	-----------	------------

Polarization:Horizontal



No.	Frequency (GHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	25.2640	55.91	74	-18.09	peak
2	25.1680	44.64	54	-9.36	AVG



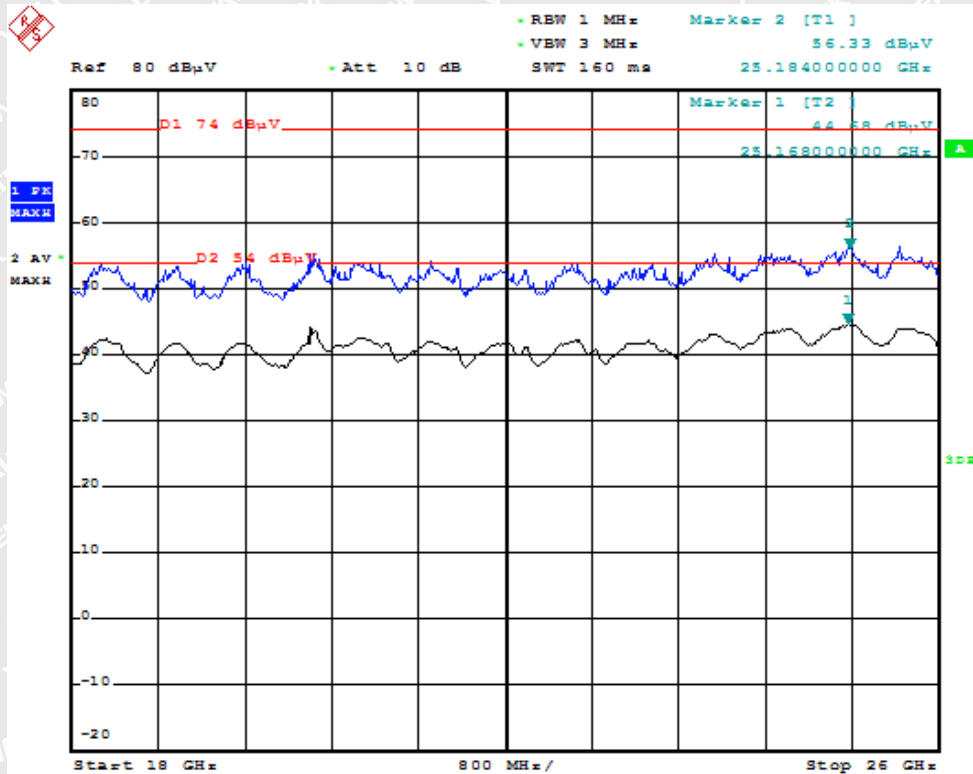
Test mode:

TM2

Polarity:

Vertical

Polarization: Vertical



No.	Frequency (GHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	25.1840	56.33	74	-17.67	peak
2	25.1680	44.68	54	-9.32	AVG



EXHIBIT 1 - PRODUCT LABELING

Proposed FCC Label Format

Product Label

Manual Label

Product Packaging Label

PRODUCT MODEL: CA-V2
Contains FCC ID: 2AC7Z-ESP32WROOM32U
FC CAN ICES-003 (B)/NMB-003(B)



Specifications: Text is Black in color and is justified. Labels are printed in indelible ink on permanent adhesive backing or silk-screened onto the EUT or shall be affixed at a conspicuous location on the EUT. Where the EUT is constructed in two or more sections connected by wires and marketed together, the above statement is required to be affixed only to the main control unit. When the EUT is so small or for such use that it is not practicable to place the statement on it, the above information shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed.

Proposed Label Location on EUT

FCC Label Location

PRODUCT MODEL: CA-V2
Contains FCC ID: 2AC7Z-ESP32WROOM32U
FC CAN ICES-003 (B)/NMB-003(B)

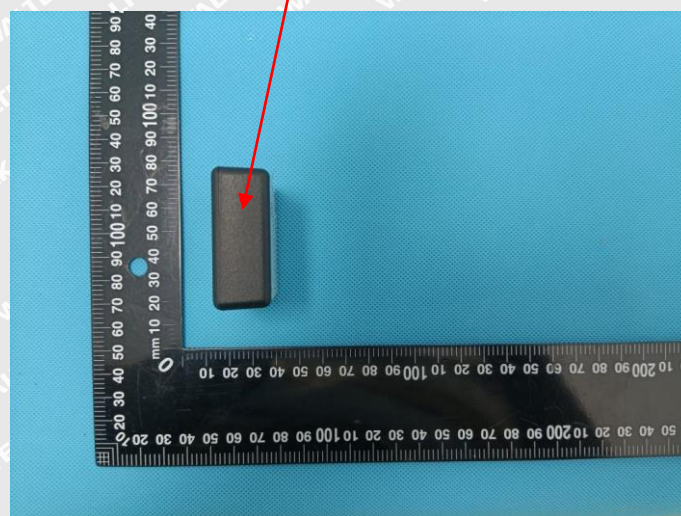
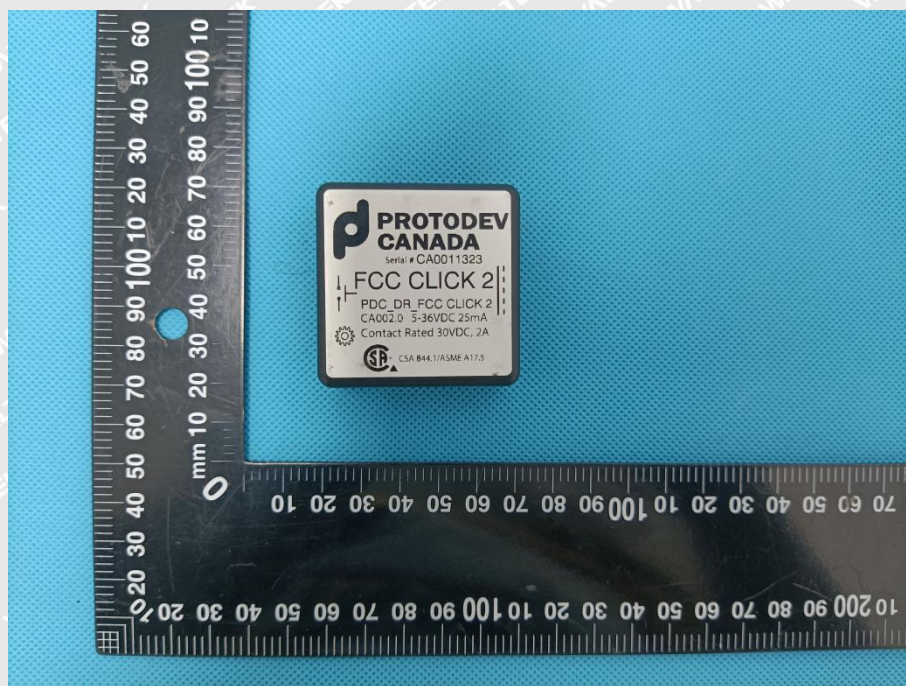


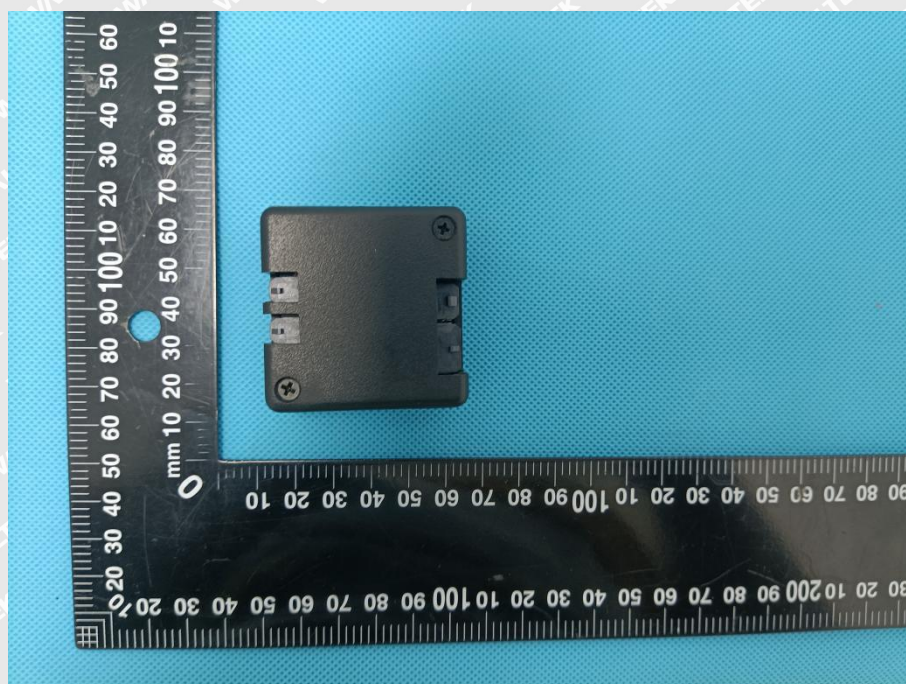


EXHIBIT 2 - EUT PHOTOGRAPHS

EUT View 1

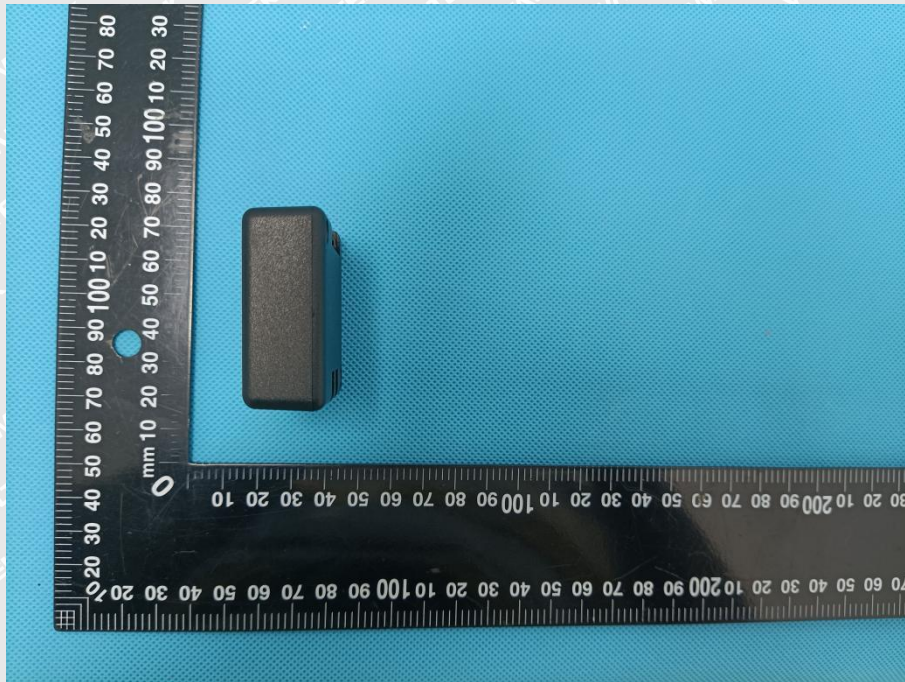


EUT View 2

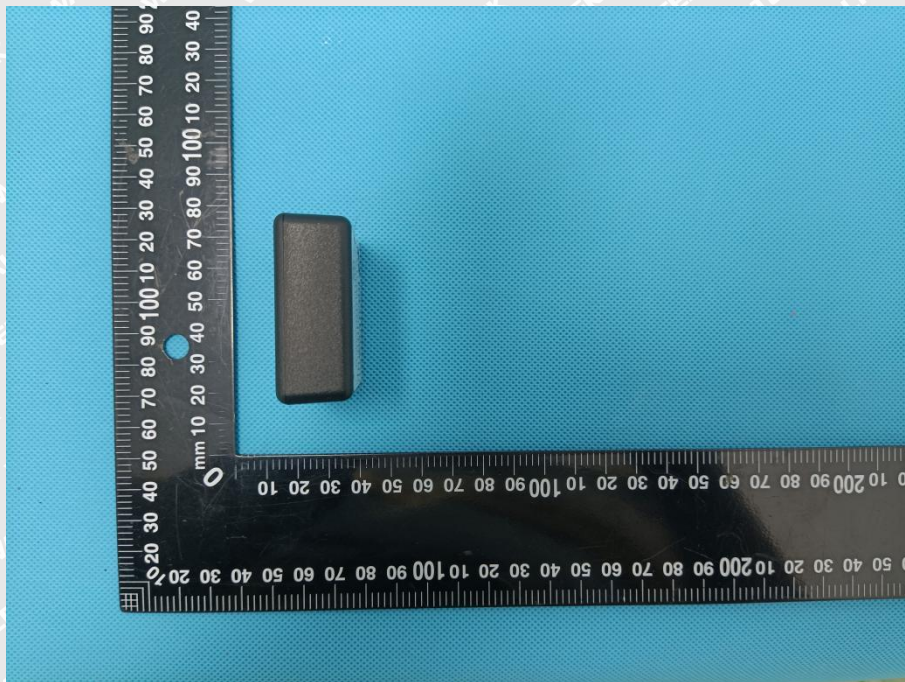




EUT View 3



EUT View 4





EUT View 5



EUT View 6



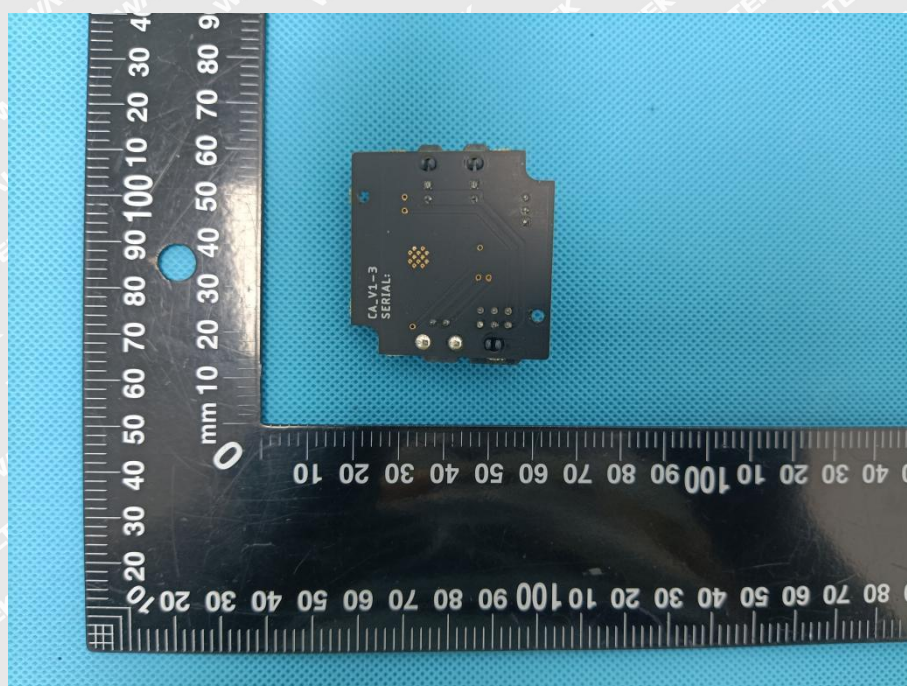


EXHIBIT 3 - EUT INTERNAL PHOTOGRAPHS

EUT Housing and Board View 1

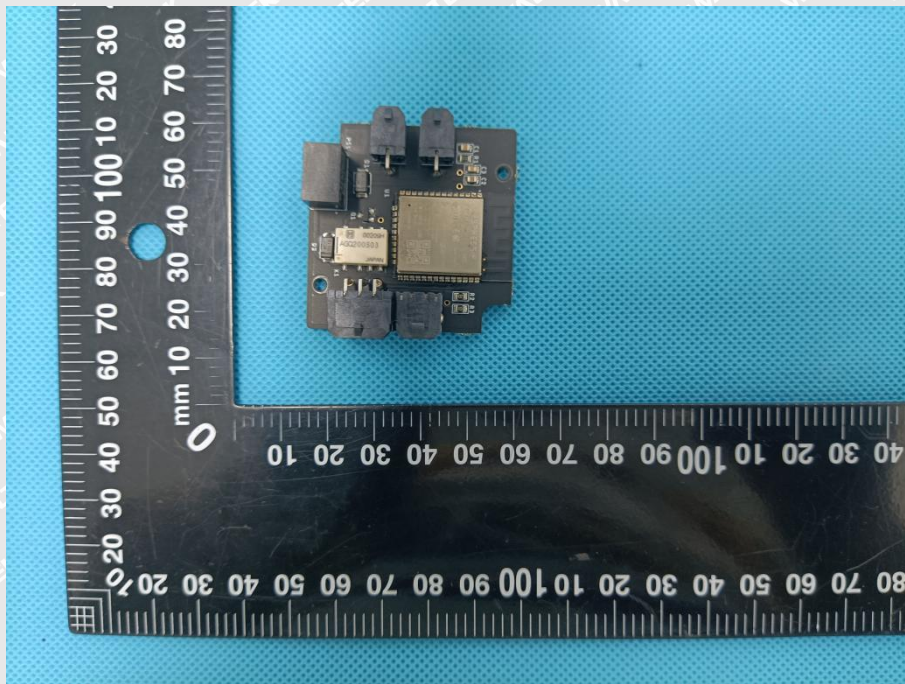


Solder Board-Component View 2





Solder Board-Component View 3



WALTEK

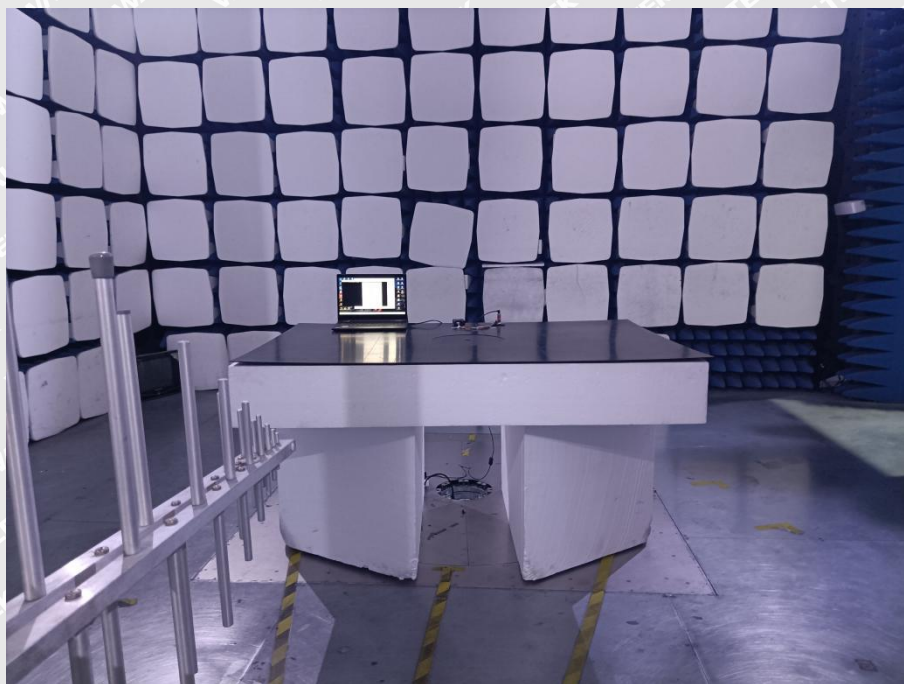


EXHIBIT 4 - TEST SETUP PHOTOGRAPHS

Conducted Emission Test Setup

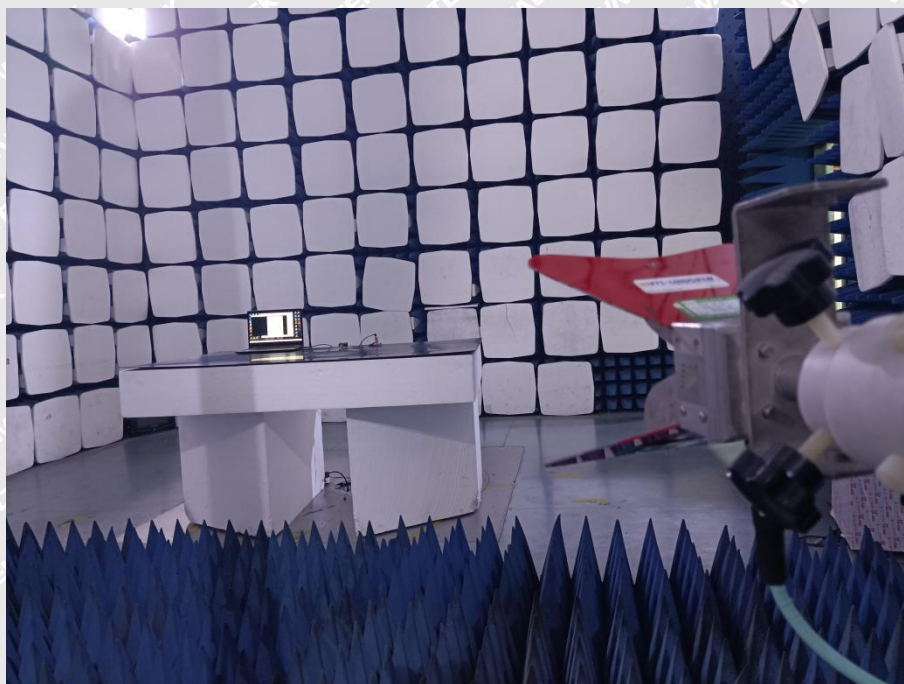


Radiation Emission Test View (Below 1GHz)





Radiation Emission Test View (Above 1GHz)



WALTEK



EXHIBIT 5 - USERS MANUAL

Information to Users

According to the FCC Part 15.19, 15.21, and 15.105 rules, for this EUT, the instructions or operation manual furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual:

FCC Caution

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

NOTE 1: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

NOTE 2: Any changes or modifications to this unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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