



TEST REPORT

Reference No..... : WTX21X10111126E
Applicant : ProtoDev Canada
Address : 304-376 Churchill Avenue North, Ottawa, K1Z 5C3 Ontario Canada
Product Name : Contactless Access
Test Model : CA-V2
Standards : ICES-003 Issue 7
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:

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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 Adaptor 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:

ICES-003 Issue 7: Information Technology Equipment (ITE) – Limits and methods of measurement.

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 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
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

Standards	Description of Test Item	Result
ICES-003	Conducted Disturbance	Compliant
	Radiated Disturbance	Compliant

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3. Conducted Disturbance

3.1 Measurement Uncertainty

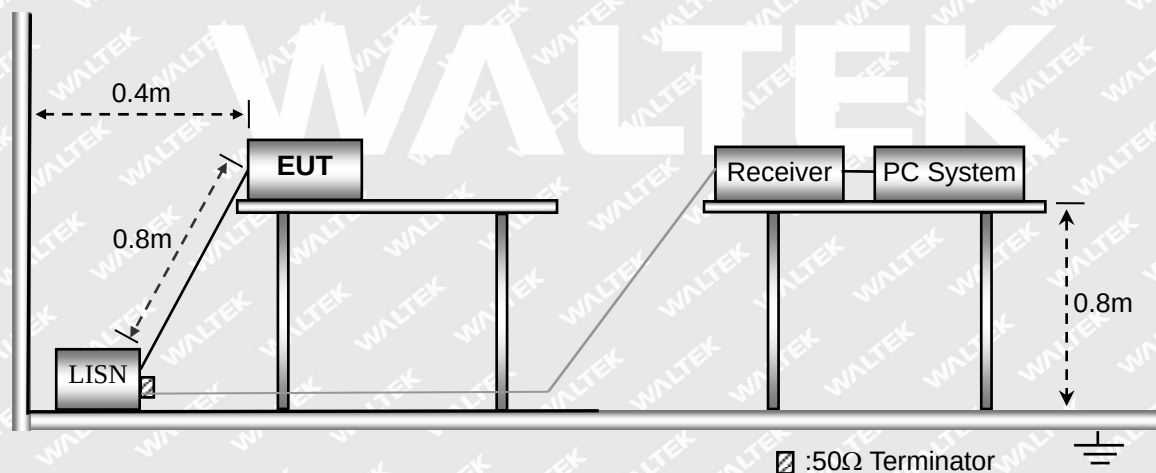
Base on NIS 81, the Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement:

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Conducted Emissions	Conducted	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$

3.2 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.

3.3 Basic Test Setup Block Diagram



3.4 Environmental Conditions

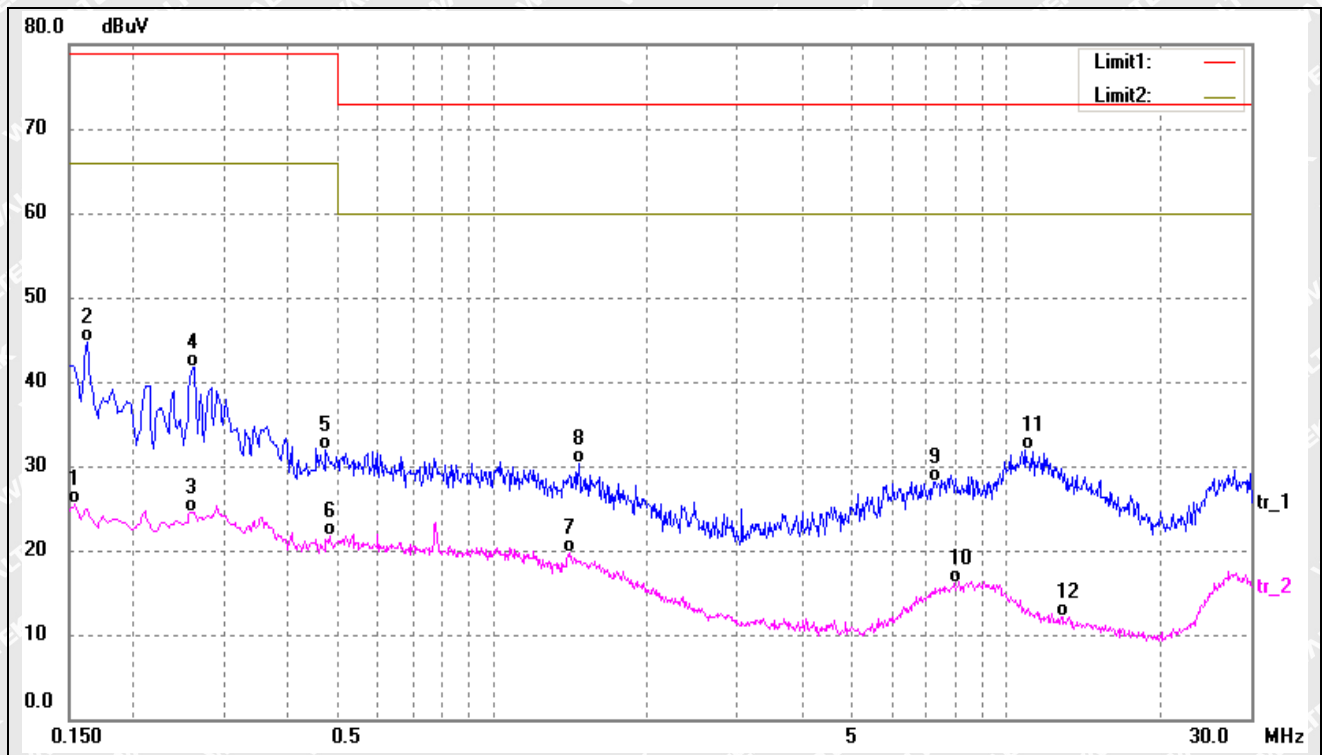
Temperature:	23.5 °C
Relative Humidity:	54 %
ATM Pressure:	997 mbar

3.5 Summary of Test Results

Please find the results below:



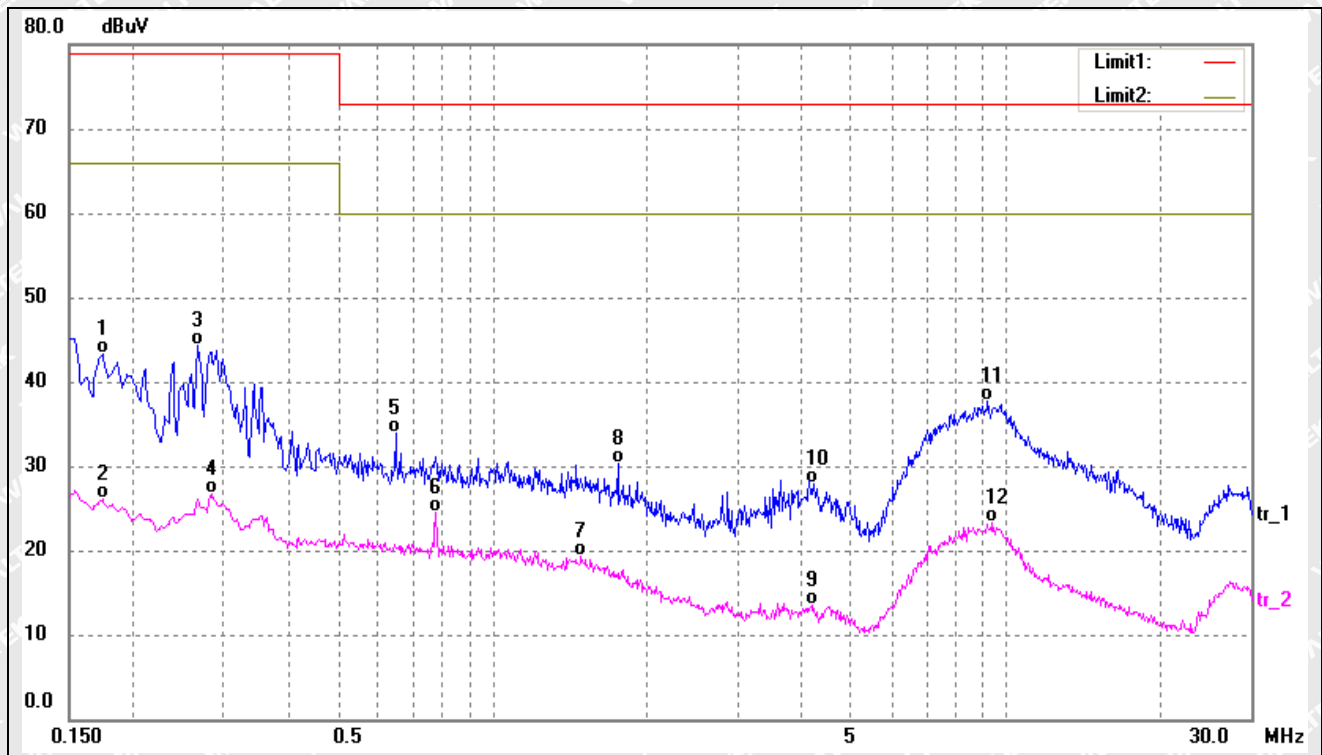
Test mode:	TM1	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB/m)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1539	15.09	10.37	25.46	66.00	-40.54	AVG
2*	0.1620	34.31	10.37	44.68	79.00	-34.32	QP
3	0.2580	14.24	10.35	24.59	66.00	-41.41	AVG
4	0.2620	31.31	10.35	41.66	79.00	-37.34	QP
5	0.4740	21.61	10.27	31.88	79.00	-47.12	QP
6	0.4820	11.34	10.27	21.61	66.00	-44.39	AVG
7	1.4180	9.39	10.38	19.77	60.00	-40.23	AVG
8	1.4780	20.02	10.36	30.38	73.00	-42.62	QP
9	7.2940	18.23	9.94	28.17	73.00	-44.83	QP
10	7.9460	6.15	9.92	16.07	60.00	-43.93	AVG
11	10.9260	21.95	9.92	31.87	73.00	-41.13	QP
12	12.8620	2.14	10.03	12.17	60.00	-47.83	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	0.1740	32.88	10.37	43.25	79.00	-35.75	QP
2	0.1740	15.66	10.37	26.03	66.00	-39.97	AVG
3*	0.2660	34.02	10.35	44.37	79.00	-34.63	QP
4	0.2819	16.32	10.34	26.66	66.00	-39.34	AVG
5	0.6500	23.50	10.35	33.85	73.00	-39.15	QP
6	0.7780	14.01	10.43	24.44	60.00	-35.56	AVG
7	1.4940	9.01	10.35	19.36	60.00	-40.64	AVG
8	1.7580	19.99	10.24	30.23	73.00	-42.77	QP
9	4.1860	3.44	10.04	13.48	60.00	-46.52	AVG
10	4.2340	17.88	10.03	27.91	73.00	-45.09	QP
11	9.2220	27.78	9.89	37.67	73.00	-35.33	QP
12	9.4460	13.38	9.88	23.26	60.00	-36.74	AVG



4. Radiated Disturbance

4.1 Measurement Uncertainty

Base on NIS 81, the Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any radiation emissions measurement:

Measurement uncertainty		
Parameter	Conditions	Uncertainty
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 $\pm 3.92\text{dB}$

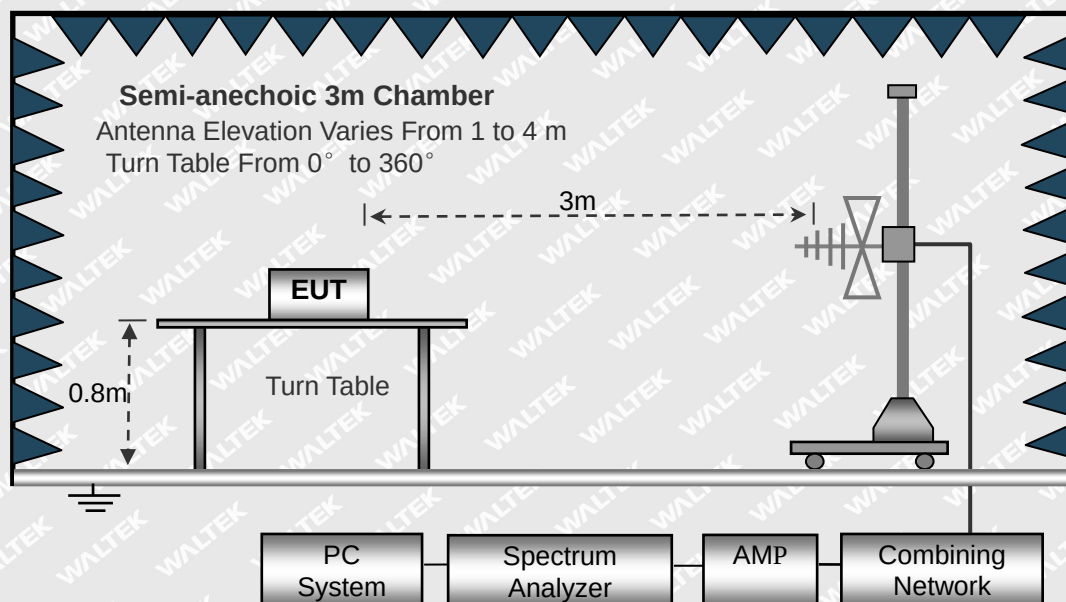
4.2 Test Procedure

The setup of EUT is according with per ANSI C63.4-2014 measurement procedure. The specification used was with the ICES-003 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.

4.3 Block Diagram of Test Setup





4.4 Test Receiver Setup

During the radiated emission test for above 1GHz, the test receiver was set with the following configurations:

For peak detector:

RBW = 1000kHz, VBW = 3000kHz, Sweep Time = Auto

For average detector:

RBW = 1000kHz, VBW = 10Hz, Sweep Time = Auto

4.5 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 -6dB means the emission is 6dB below the maximum limit for a Class B device. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{ICES-003 Limit}$$

4.6 Environmental Conditions

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

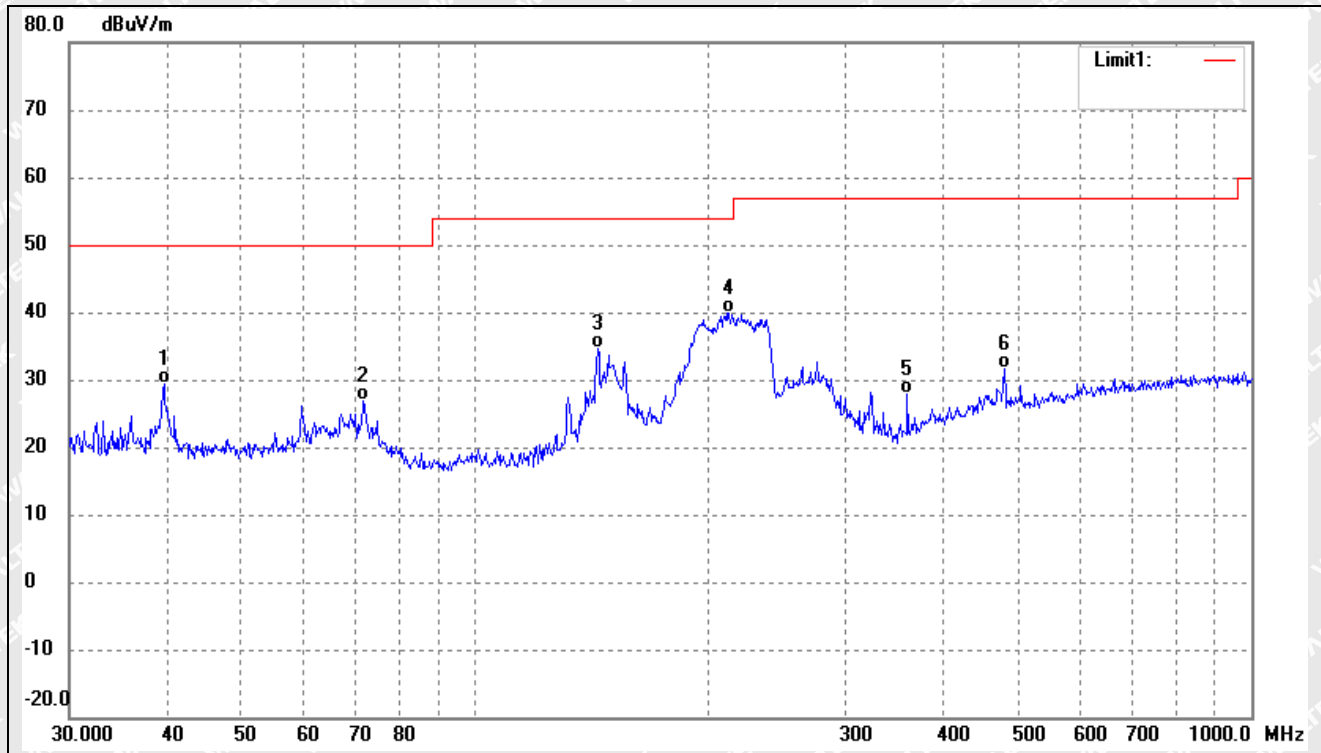
4.7 Summary of Test Results

Please find the results below:



30MHz-1GHz

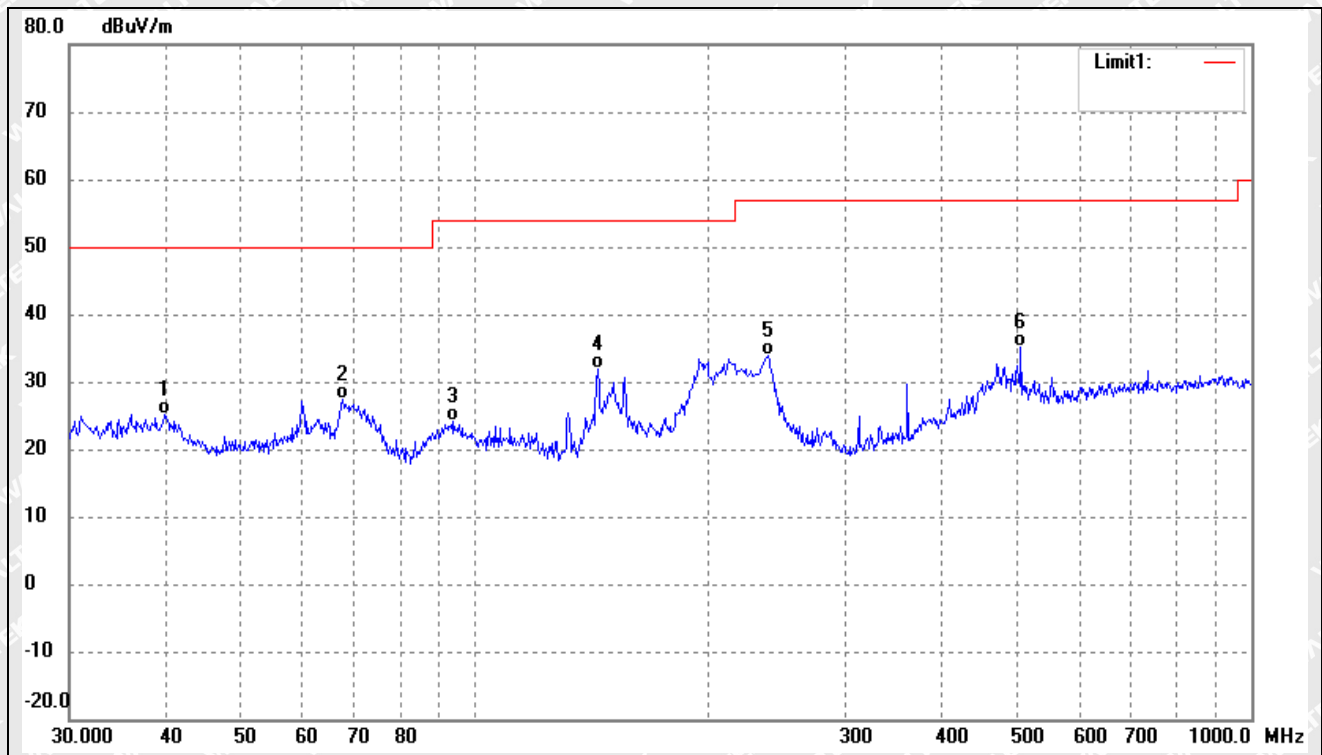
Test mode:	TM1	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.7146	36.41	-7.07	29.34	50.00	-20.66	336	100	QP
2	71.8320	37.21	-10.28	26.93	50.00	-23.07	99	100	QP
3	143.8295	47.12	-12.40	34.72	54.00	-19.28	273	100	QP
4	212.2695	49.25	-9.37	39.88	54.00	-14.12	92	100	QP
5	360.4476	32.98	-5.09	27.89	57.00	-29.11	254	100	QP
6	480.5276	33.50	-1.79	31.71	57.00	-25.29	203	100	QP



Test mode:	TM1	Polarity:	Vertical
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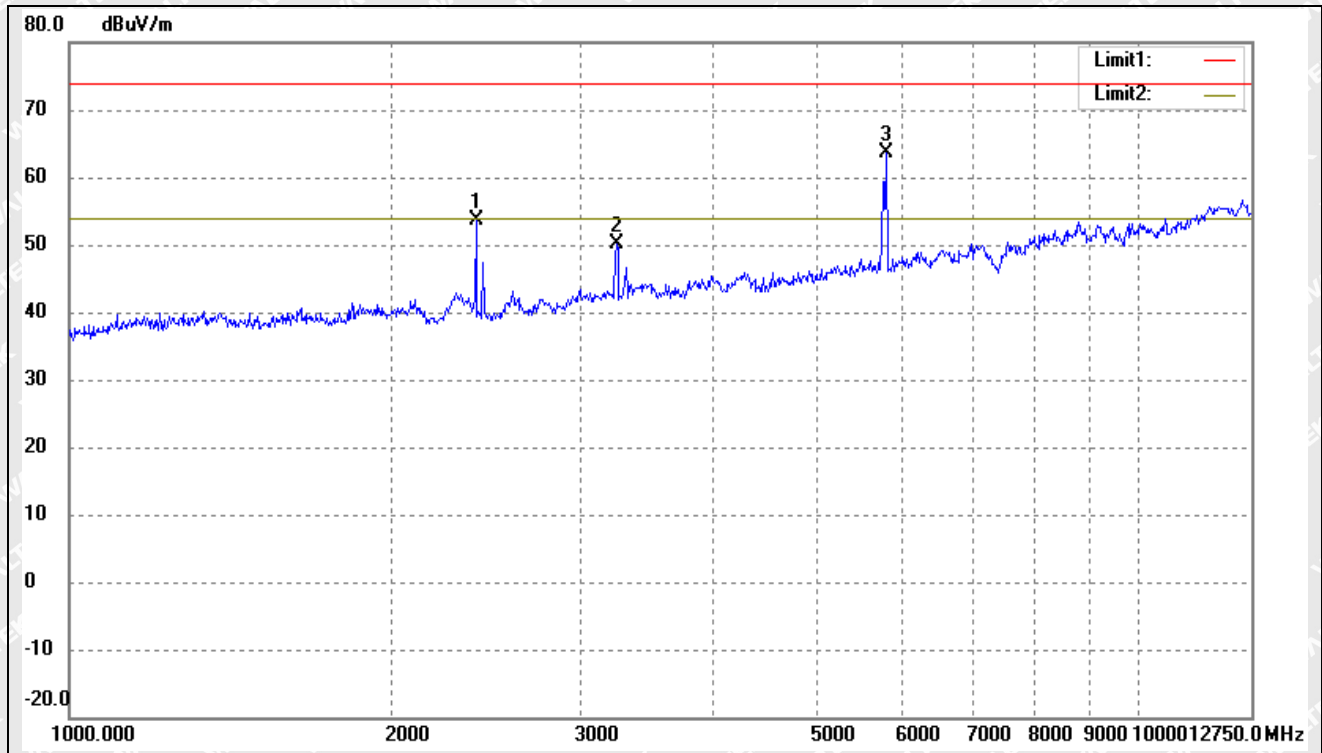


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	39.7146	32.28	-7.07	25.21	50.00	-24.79	321	100	QP
2	67.4382	37.15	-9.72	27.43	50.00	-22.57	98	100	QP
3	93.7685	33.94	-9.88	24.06	54.00	-29.94	332	100	QP
4	143.8295	44.36	-12.40	31.96	54.00	-22.04	108	100	QP
5	238.3102	42.64	-8.64	34.00	57.00	-23.00	102	100	QP
6	504.7062	36.39	-1.22	35.17	57.00	-21.83	280	100	QP



1GHz-12.75GHz

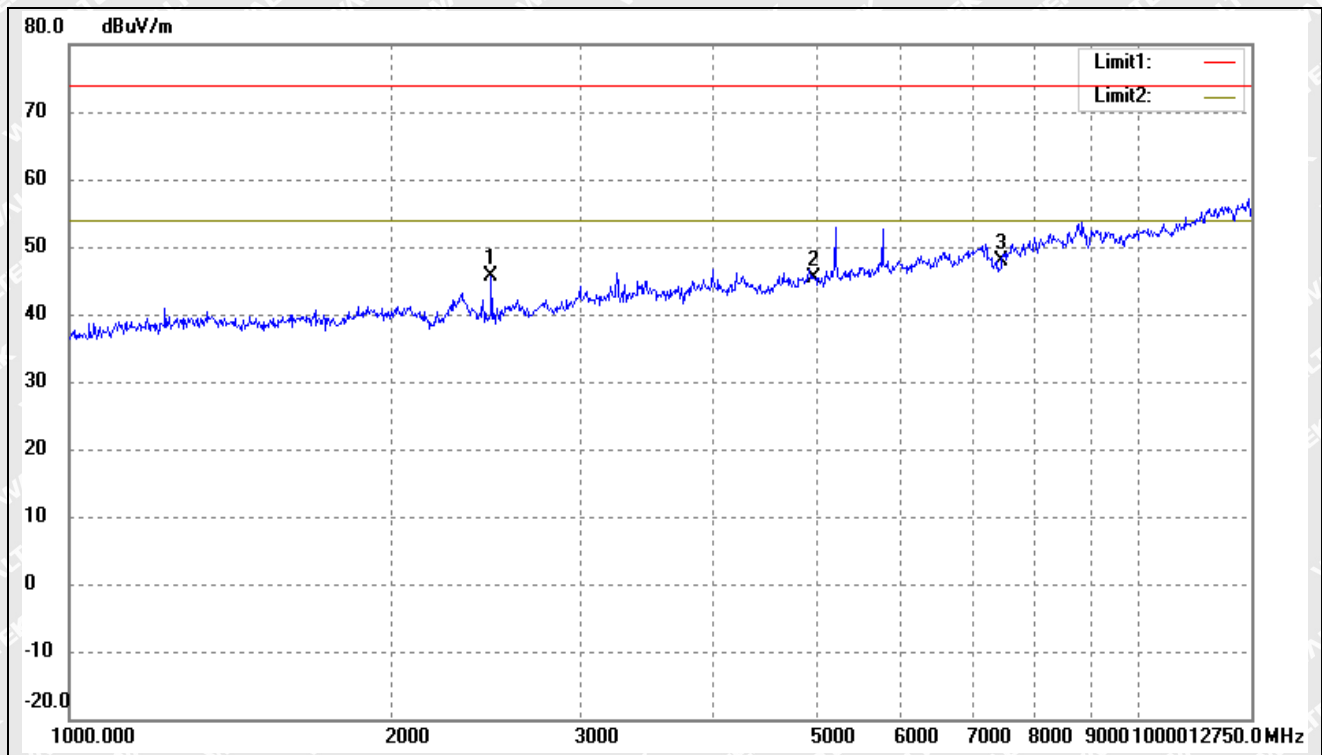
Test mode:	TM2	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2400.466	64.25	-10.69	53.56	74.00	-20.44	83	100	peak
2	3249.760	58.79	-8.74	50.05	74.00	-23.95	105	100	peak
3	5806.408	67.69	-4.03	63.66	74.00	-10.34	61	100	peak



Test mode:	TM2	Polarity:	Vertical
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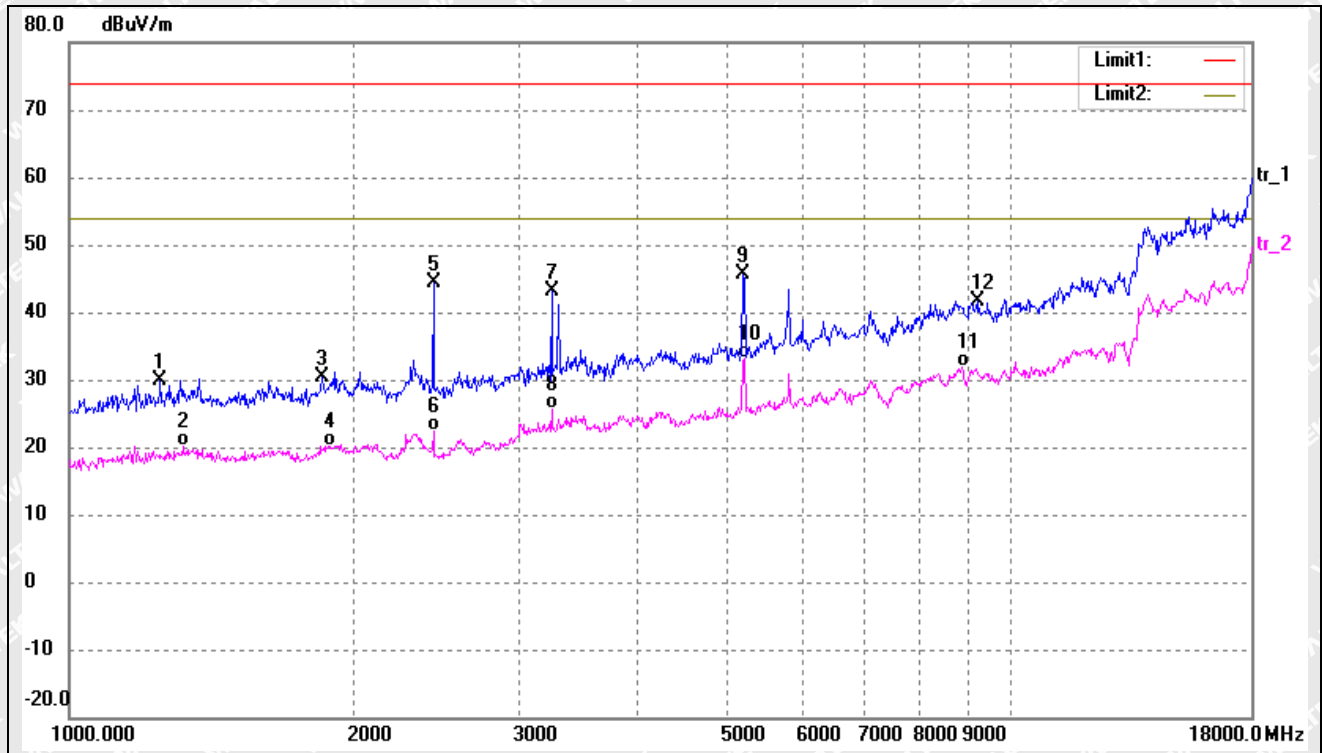


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	2481.231	56.14	-10.58	45.56	74.00	-28.44	157	100	QP
2	4962.000	51.16	-5.71	45.45	74.00	-28.55	338	100	QP
3	7443.000	49.47	-1.52	47.95	74.00	-26.05	91	100	QP



1GHz-18GHz

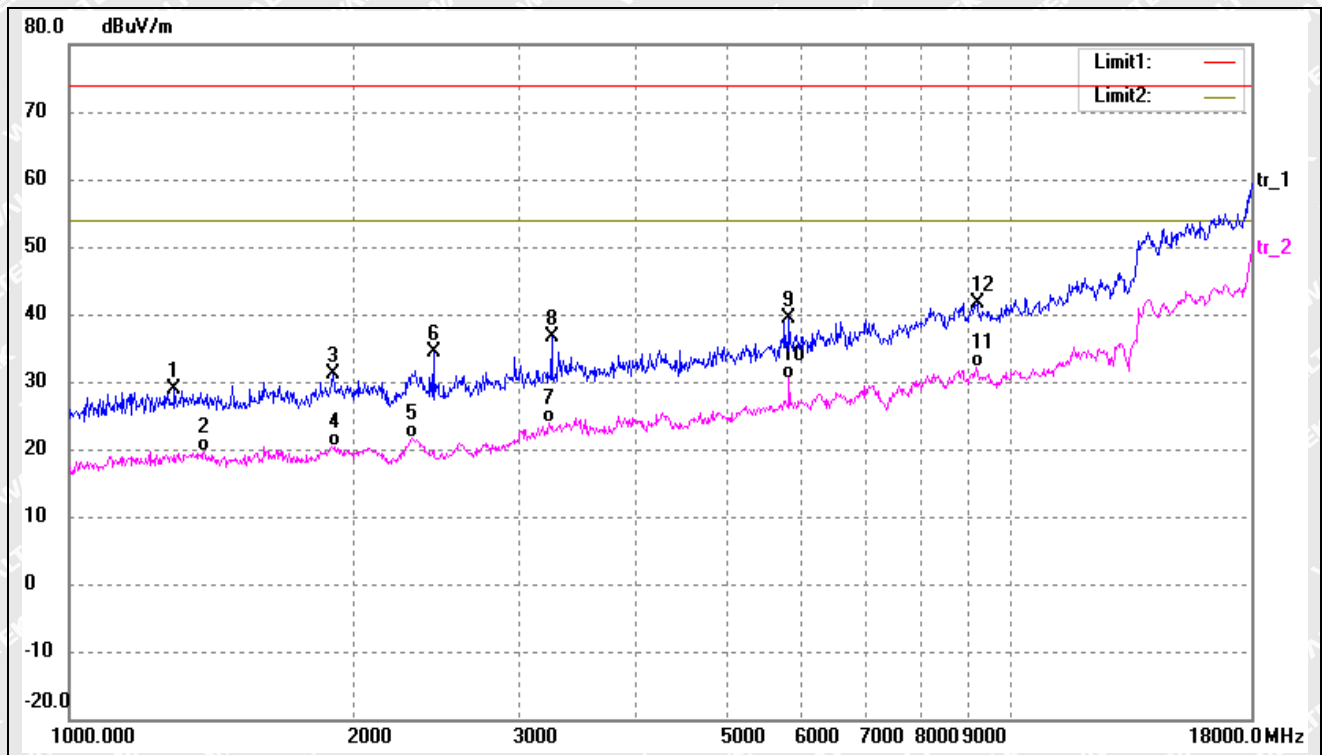
Test mode:	TM2	Polarity:	Horizontal
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No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	1249.269	43.84	-13.92	29.92	74.00	-44.08	264	100	peak
2	1319.794	33.66	-13.57	20.09	54.00	-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
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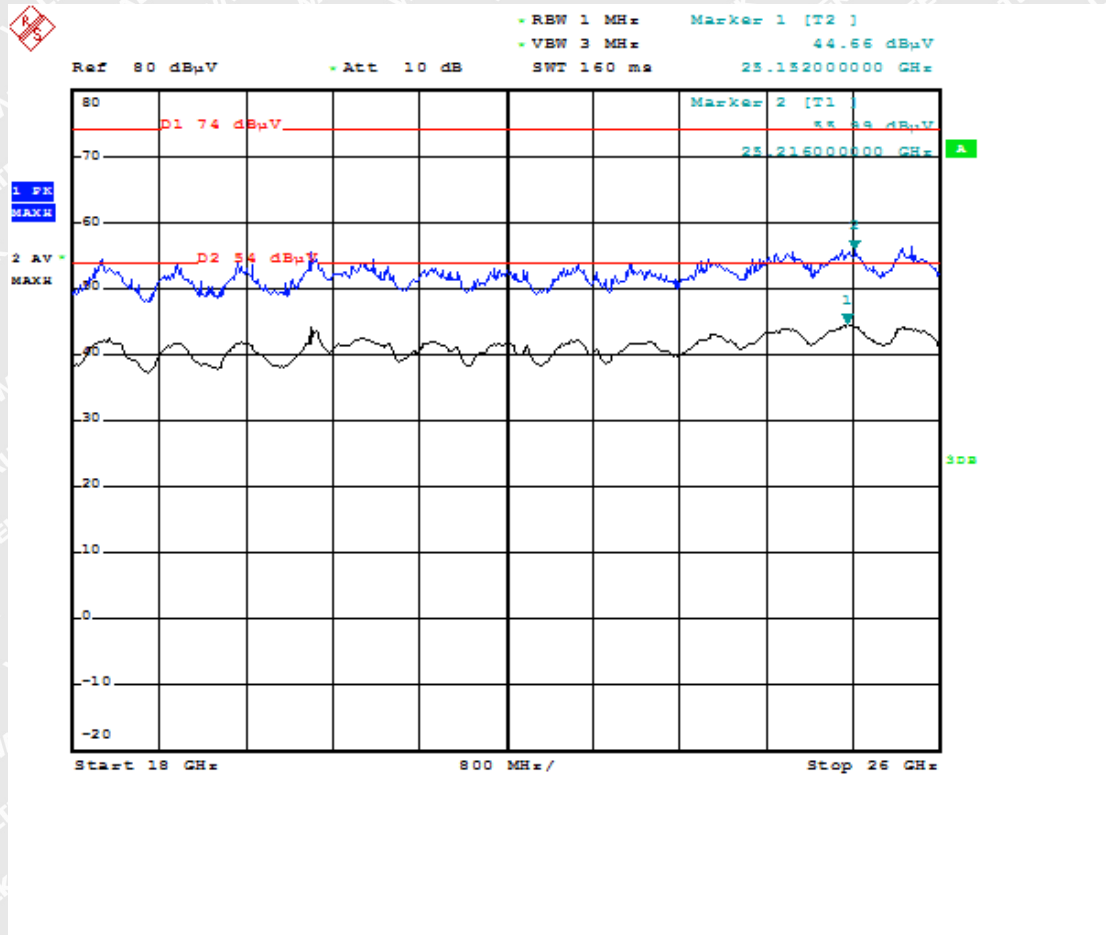


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree (°)	Height (cm)	Remark
1	1293.360	42.48	-13.71	28.77	74.00	-45.23	217	100	peak
2	1390.276	32.86	-13.22	19.64	54.00	-34.36	91	100	AVG
3	1905.135	42.53	-11.51	31.02	74.00	-42.98	169	100	peak
4	1910.650	31.97	-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
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Polarization:Horizontal

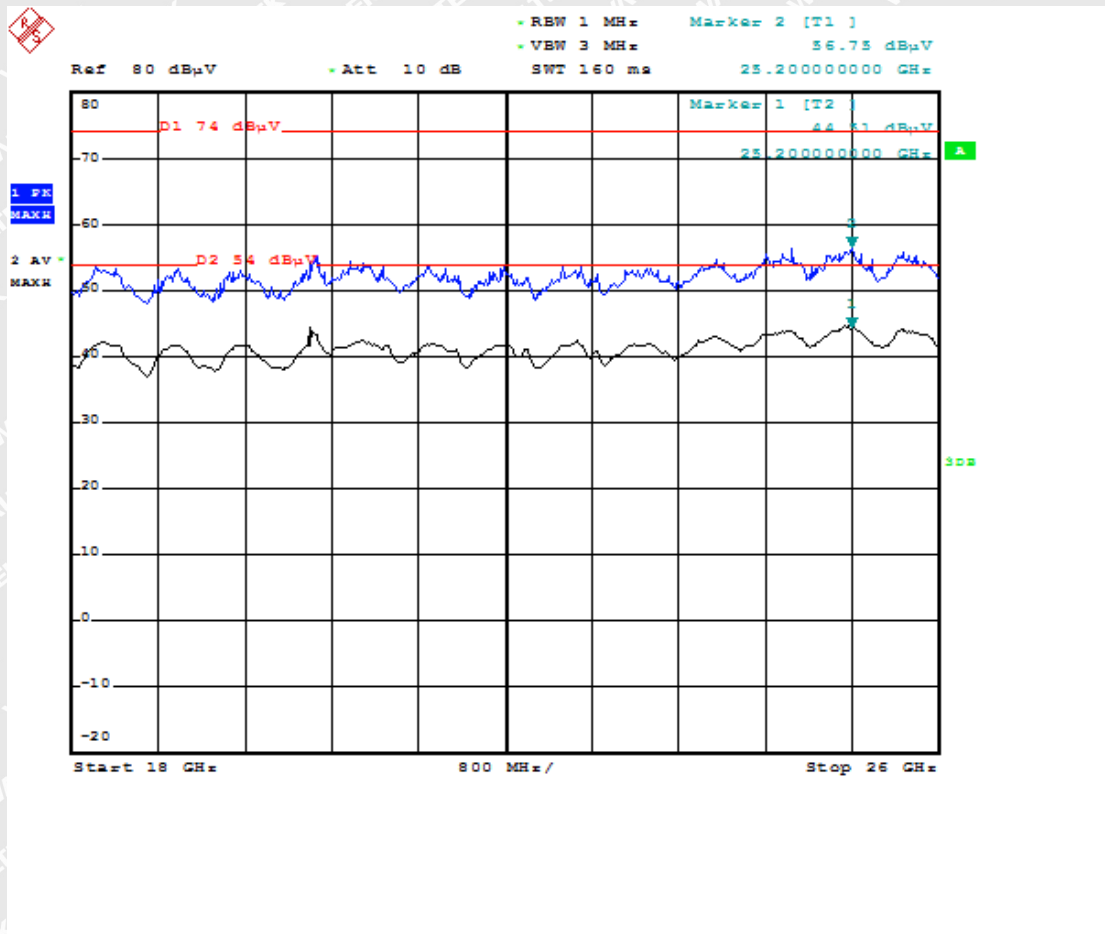


No.	Frequency (GHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	25.2160	55.89	74	-18.11	peak
2	25.1520	44.66	54	-9.34	AVG



Test mode:	TM2	Polarity:	Vertical
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Polarization: Vertical



No.	Frequency (GHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	25.2000	56.75	74	-17.25	peak
2	25.2000	44.51	54	-9.49	AVG



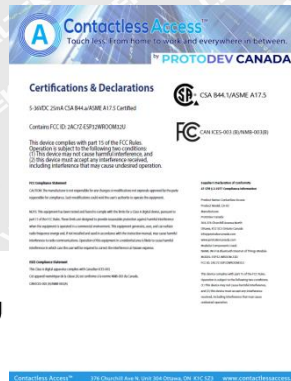
EXHIBIT 1 - PRODUCT LABELING

Proposed IC Label Format

Product Label

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

Manual Label



Product Packaging Label



Specifications: Text is Black in color and is justified. The label shall be permanently affixed to the ITE or displayed electronically and its text must be clearly legible. When the dimension of the device is too small or it is otherwise not practical to place the label on the ITE, the label shall be placed in a prominent location in the user manual supplied with the ITE. The user manual may be in an electronic format and must be readily available.

Proposed Label Location on EUT

IC Label Location

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

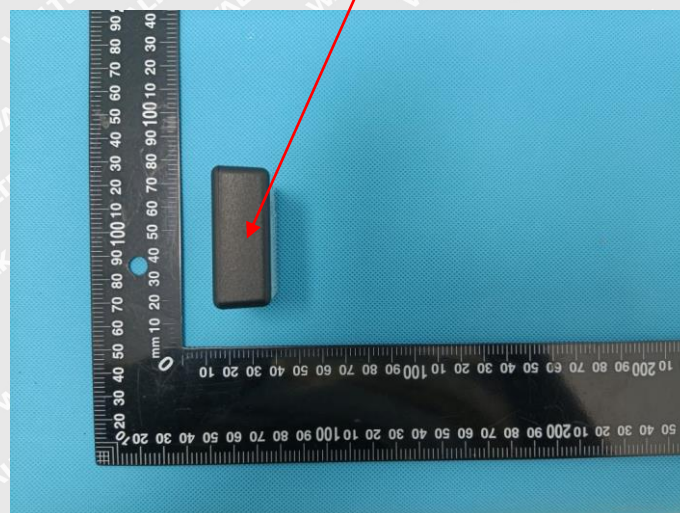
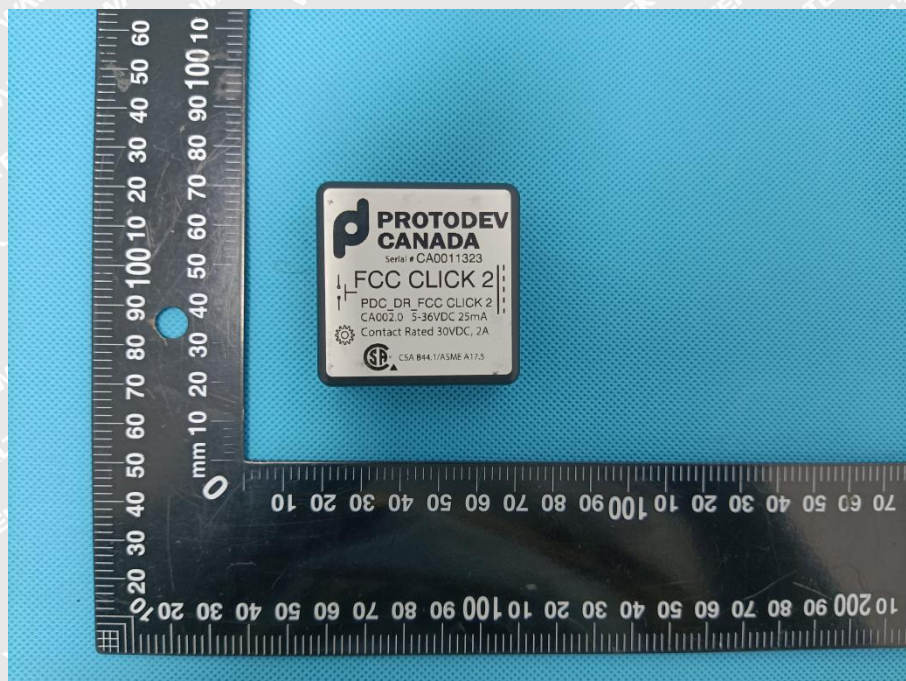




EXHIBIT 2 - EUT PHOTOGRAPHS

EUT View 1

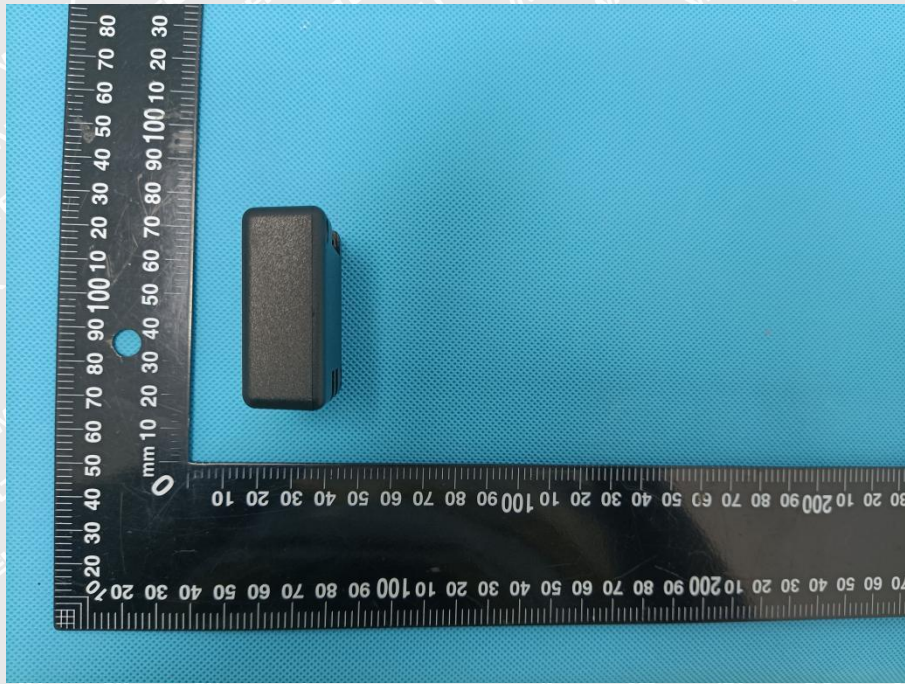


EUT View 2

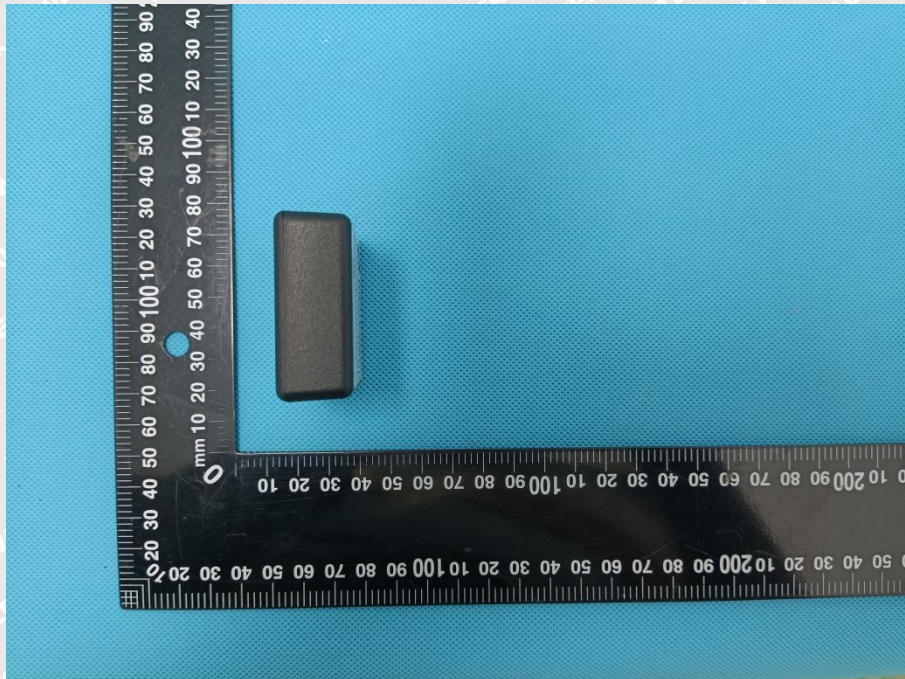




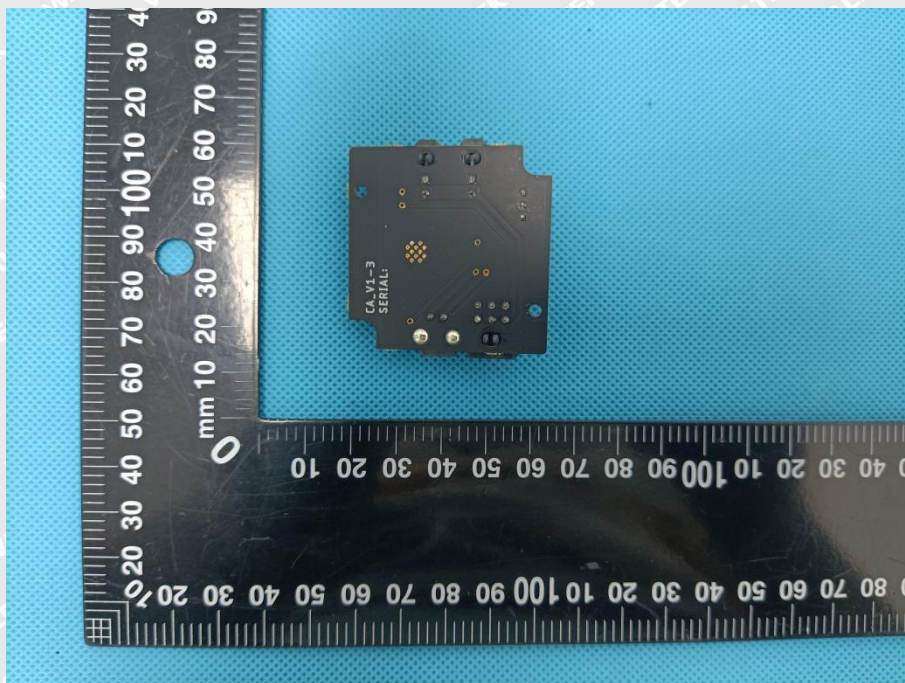
EUT View 3



EUT View 4

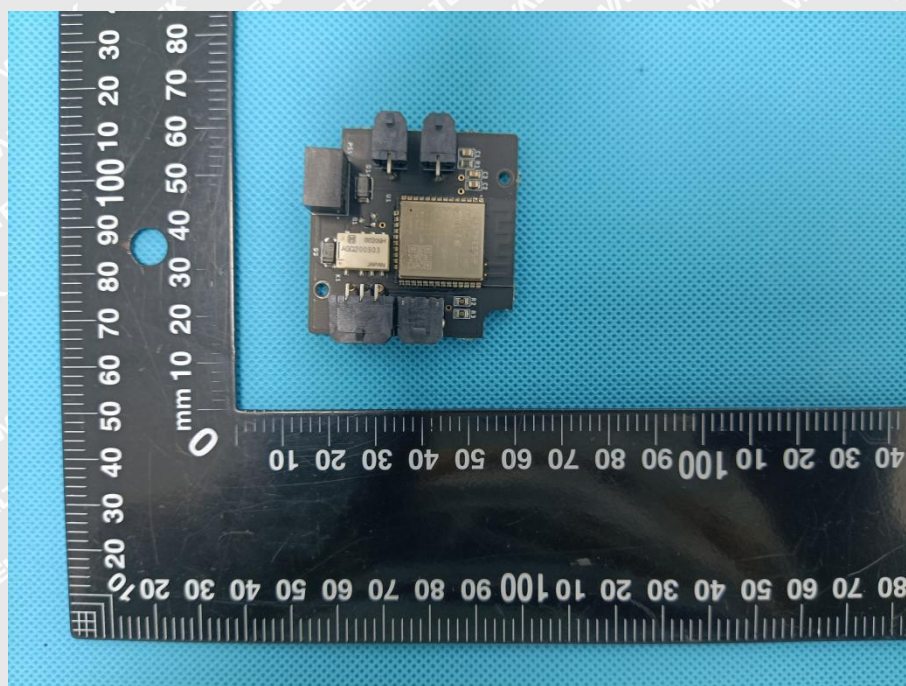


**EUT View 5****EUT View 6**

**EUT Housing and Board View 1****Solder Board-Component View 2**



Solder Board-Component View 3



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EXHIBIT 3 - TEST SETUP PHOTOGRAPHS

Conduction Emission Test View

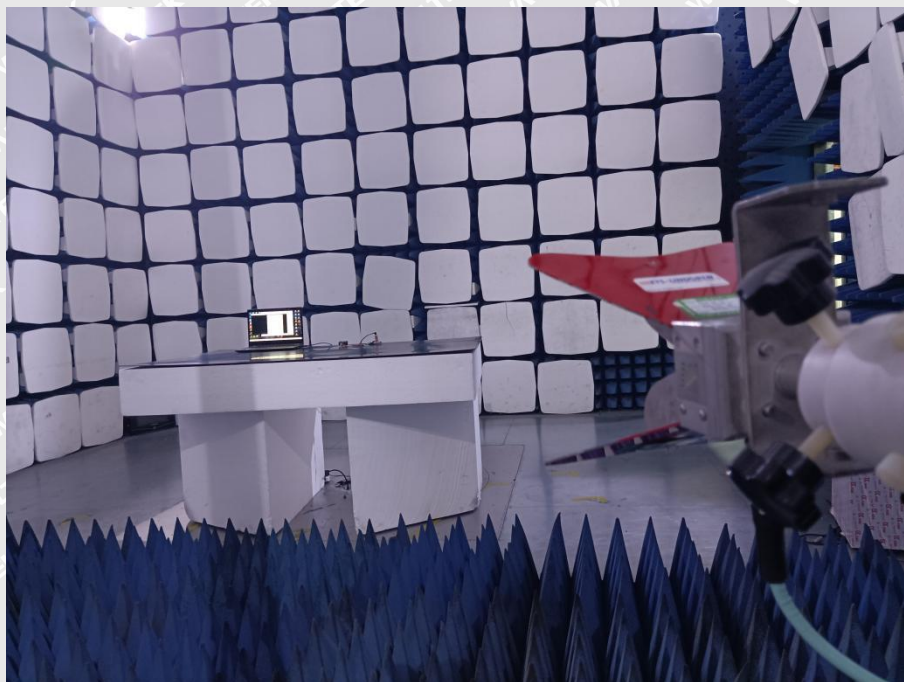


Radiation Emission Test View (Below 1GHz)





Radiation Emission Test View (Above 1GHz)



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

WALTEK