

TEST REPORT

Reference No..... : WTN21X09105139W-1
FCC ID : 2AU29AMPTILT06V2
Applicant : Turnils North America
Address : 1750 Satellite Blvd,Suite 100,Buford GA 30518
Product Name : DC Tilt Motor for Horizontal Blinds
Test Model. : AMPTILT-0.6/12
Standards : FCC Part 15.231
Date of Receipt sample : Sept. 30, 2021
Date of Test..... : Sept. 30, 2021 to Nov. 24, 2021
Date of Issue : Nov. 24, 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.

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Report version

Version No.	Date of issue	Description
Rev.00	Nov. 24, 2021	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: Turnils North America
 Address of applicant: 1750 Satellite Blvd, Suite 100, Buford GA 30518

Manufacturer: Turnils North America
 Address of manufacturer: 1750 Satellite Blvd, Suite 100, Buford GA 30518

General Description of EUT	
Product Name:	DC Tilt Motor for Horizontal Blinds
Trade Name:	/
Model No.:	AMPTILT-0.6/12
Adding Model(s):	/
Rated Voltage:	DC 12V 0.5A
Power Adaptor :	/
<i>Note: The test data is gathered from a production sample provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	433.92 MHz
Max. Field Strength:	433.92MHz: 73.2dBuV/m(3m)
Data Rate:	/
Modulation:	FSK
Antenna Type:	External Antenna
Antenna Gain:	-1dBi

1.2 Test Standards

The tests were performed according to following standards:

FCC Rules Part 15.231: Periodic operation in the band 40.66-40.70MHz and above 70MHz.

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/immunity, 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 Test Mode

The EUT was operated at continuous transmitting mode that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	Transmitting	433.92MHz

Test Conditions	
Temperature:	22~25 °C
Relative Humidity:	50~55 %.
ATM Pressure:	1019 mbar

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
DC Cable	0.37	Unshielded	Without Ferrite

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
DC Cable	1.70	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Adapter	Gangqi	GQ36-120300-AC	/
Remote Control	Dooya	DD1853T	/

1.6 Measurement Uncertainty

Measurement uncertainty		
Parameter	Conditions	Uncertainty
Occupied Bandwidth	Conducted	$\pm 1.5\%$
Conducted Spurious Emission	Conducted	$\pm 2.17\text{dB}$
Transmission Time	Conducted	$\pm 5\%$
Conducted Emissions	Conducted	9-150kHz $\pm 3.74\text{dB}$
		0.15-30MHz $\pm 3.34\text{dB}$
Transmitter Spurious 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

No.	Description	Manufacturer	Model	Serial No.	Cal Date	Due. Date
SEMT-1075	Communication Tester	Rohde & Schwarz	CMW500	148650	2021-03-27	2022-03-26
SEMT-1063	GSM Tester	Rohde & Schwarz	CMU200	114403	2021-03-27	2022-03-26
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2021-03-27	2022-03-26
SEMT-1079	Spectrum Analyzer	Agilent	N9020A	US47140102	2021-03-27	2022-03-26
SEMT-1080	Signal Generator	Agilent	83752A	3610A01453	2021-03-27	2022-03-26
SEMT-1081	Vector Signal Generator	Agilent	N5182A	MY47070202	2021-03-27	2022-03-26
SEMT-1028	Power Divider	Weinschel	1506A	PM204	2021-03-27	2022-03-26
SEMT-1082	Power Divider	RF-Lambda	RFLT4W5M18G	14110400027	2021-03-27	2022-03-26
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2021-03-27	2022-03-26
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2021-03-27	2022-03-26
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2021-04-12	2022-04-11
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2021-04-12	2022-04-11
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-19	2023-03-18
SEMT-1068	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2021-03-19	2023-03-18
SEMT-1042	Horn Antenna	ETS	3117	00086197	2021-03-19	2023-03-18
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170582	2021-04-27	2023-04-26
SEMT-1169	Pre-amplifier	Direction Systems Inc.	PAP-2640	14145-14153	2021-04-27	2022-04-26
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2021-03-27	2022-03-26
SEMT-1166	Power Limiter	Agilent	N9356B	MY45450376	2021-03-27	2022-03-26
SEMT-1076	RF Switcher	Top Precision	RCS03-A2	/	2021-03-19	2023-03-18
SEMT-C001	Cable	Zheng DI	LL142-07-07-10M(A)	/	/	/
SEMT-C002	Cable	Zheng DI	ZT40-2.92J-2.92J-6M	/	/	/
SEMT-C003	Cable	Zheng DI	ZT40-2.92J-2.92J-2.5M	/	/	/
SEMT-C004	Cable	Zheng DI	2M0RFC	/	/	/
SEMT-C005	Cable	Zheng DI	1M0RFC	/	/	/
SEMT-C006	Cable	Zheng DI	1M0RFC	/	/	/

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

FCC Rules	Description of Test Item	Result
§ 15.203	Antenna Requirement	Compliant
§15.205	Restricted Band of Operation	Compliant
§ 15.209	Radiated Spurious Emissions	Compliant
§15.231(a)	Deactivation Testing	Compliant
§15.231(b)	Radiated Emissions	Compliant
§15.231(c)	20dB Bandwidth Testing	Compliant
§ 15.207(a)	Conducted 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 External Antenna, fulfill the requirement of this section.

4. Radiated Emissions

4.1 Standard Applicable

According to §15.231(b), the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (microvolts/meter)	Field Strength of Spurious Emissions (microvolts/meter)
40.66 - 40.70	2,250	225
70 - 130	1,250	125
130 - 174	1,250 to 3,750 **	125 to 375 **
174 - 260	3,750	375
260 - 470	3,750 to 12,500 **	375 to 1,250 **
Above 470	12,500	1,250

** linear interpolations

The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

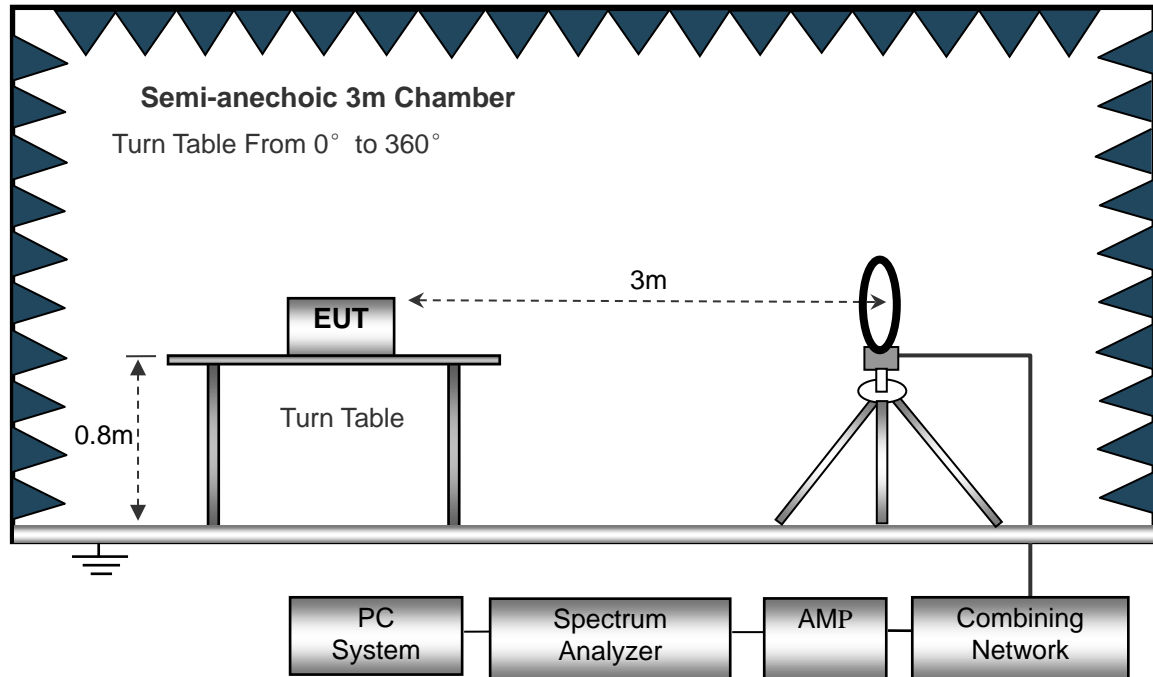
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

Compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

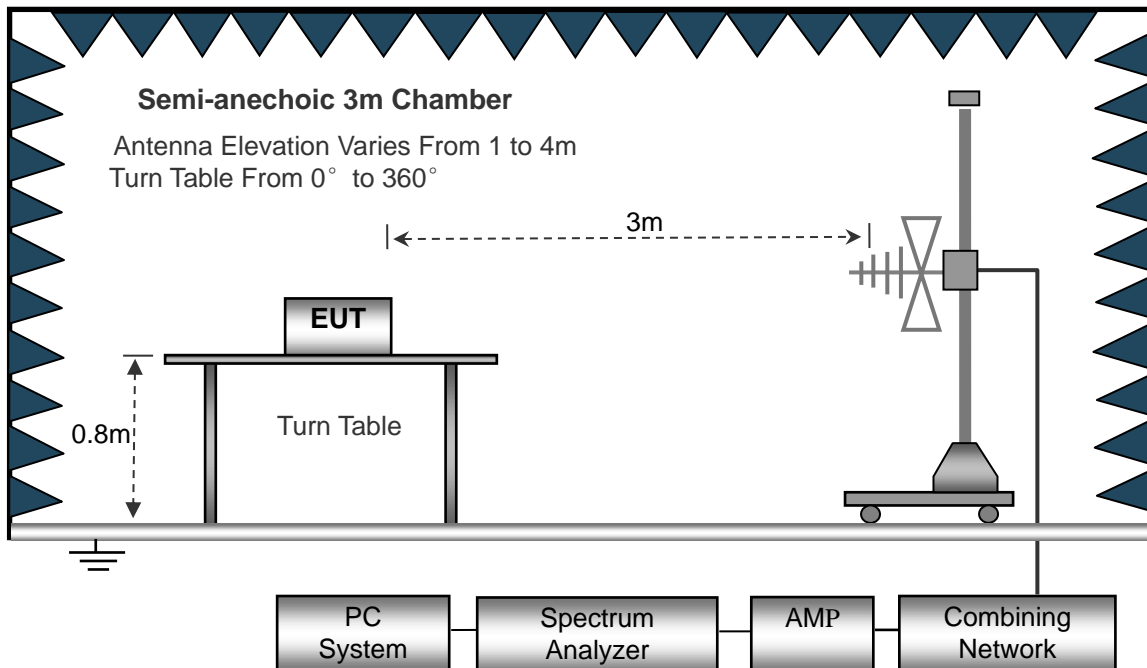
4.2 Test Procedure

The setup of EUT is according with per ANSI C63.10-2013 measurement procedure. The specification used was with the FCC Part 15.205 15.231(b) and FCC Part 15.209 Limit.

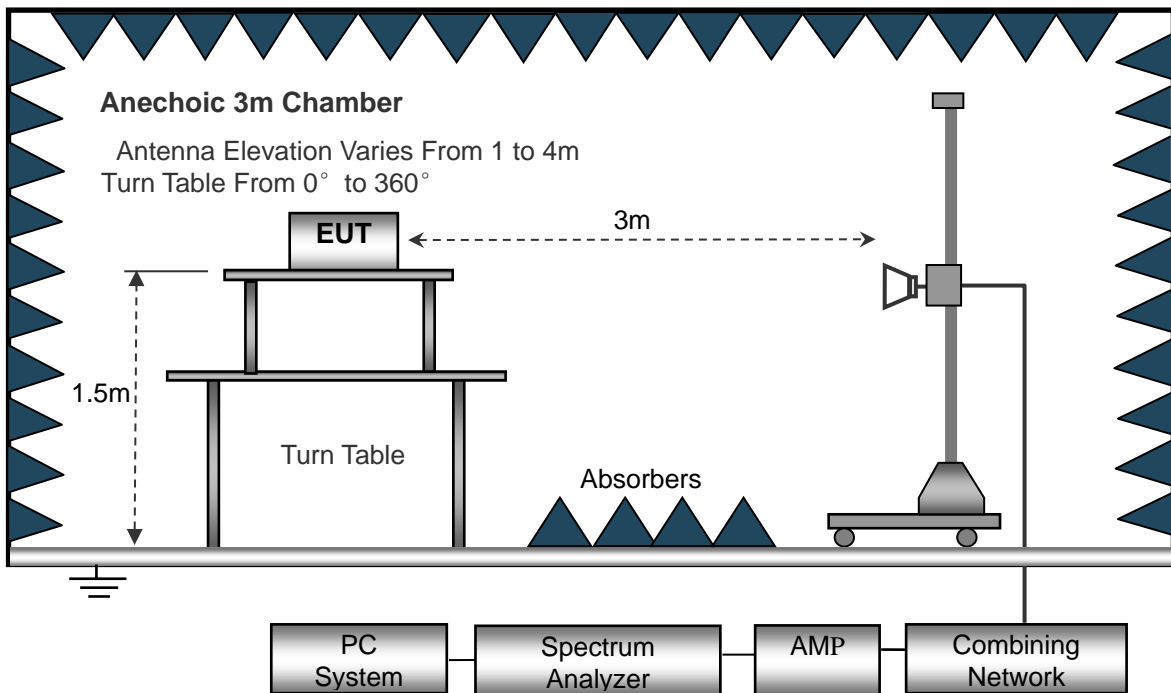
The test setup for emission measurement below 30MHz.



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



The test setup for emission measurement above 1GHz.



4.3 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:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Loss} + \text{Cab. Loss} - \text{Ampl. Gain}$$

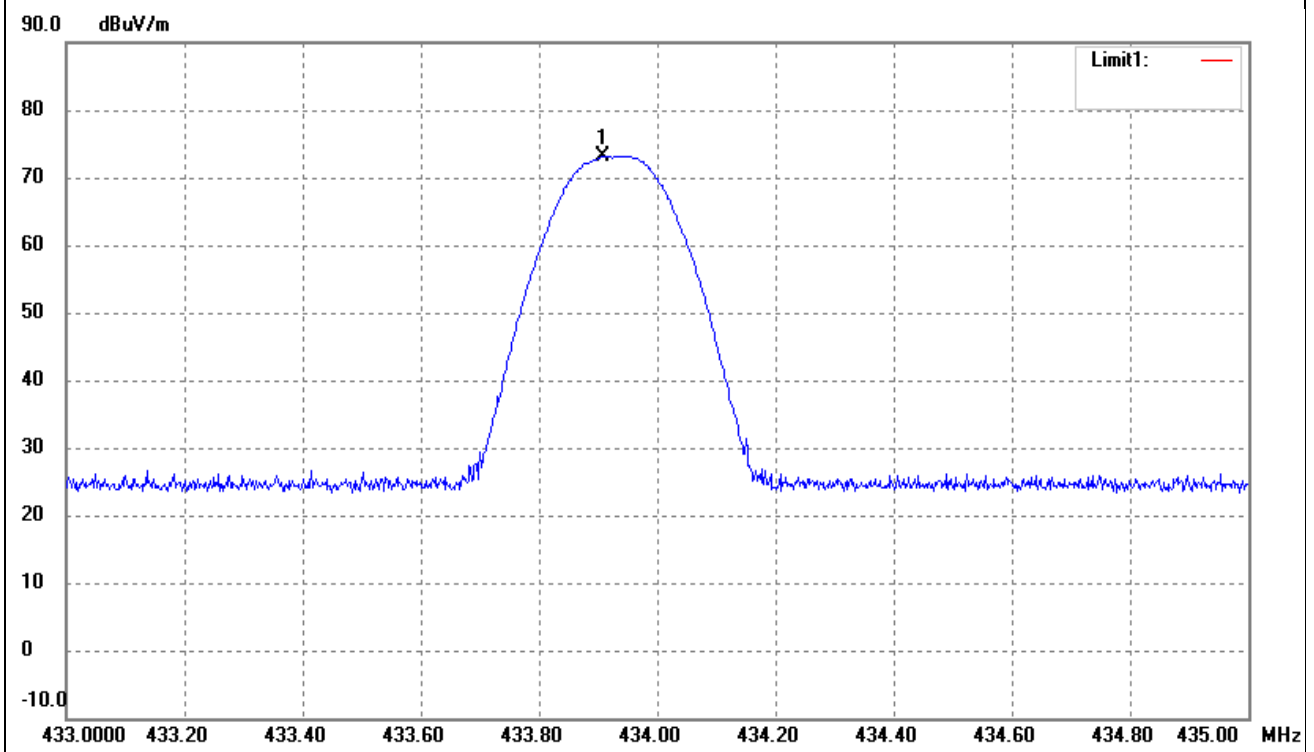
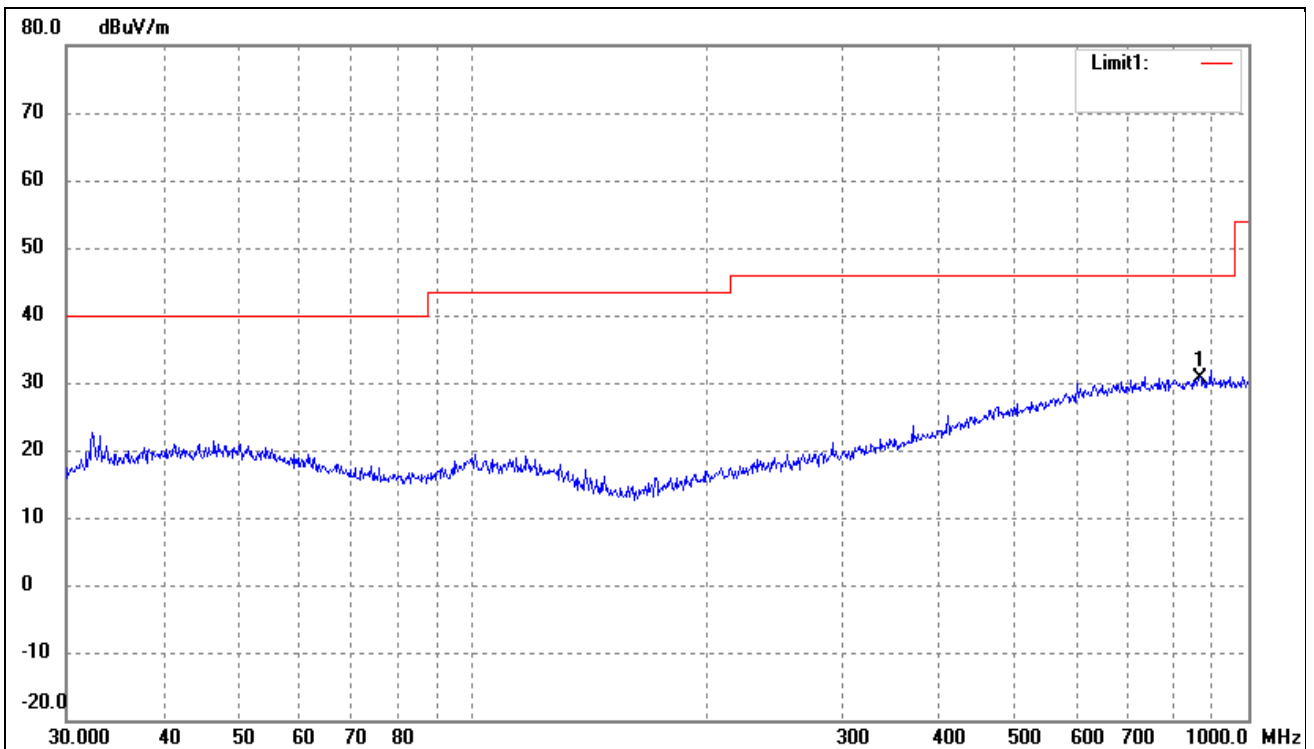
The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15C Limit}$$

4.4 Summary of Test Results/Plots

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

Test Mode	TM1	Polarity:	Horizontal
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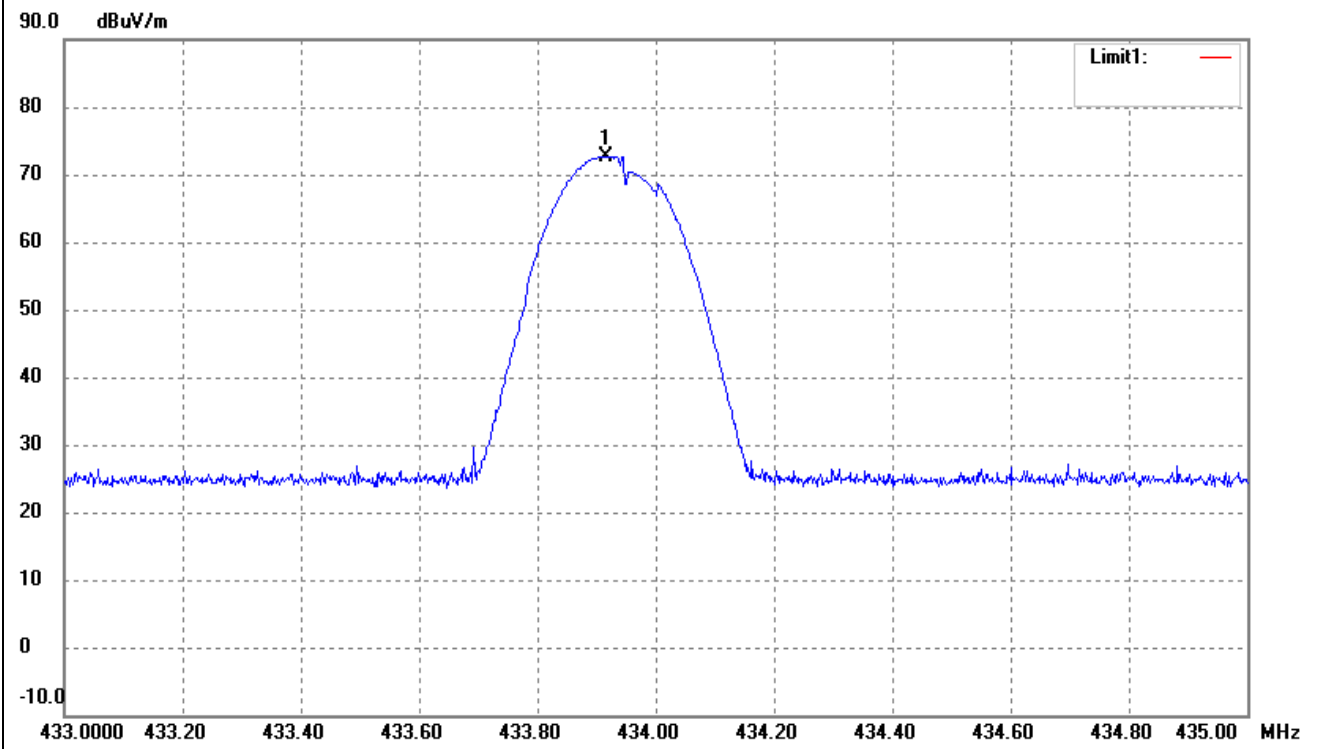
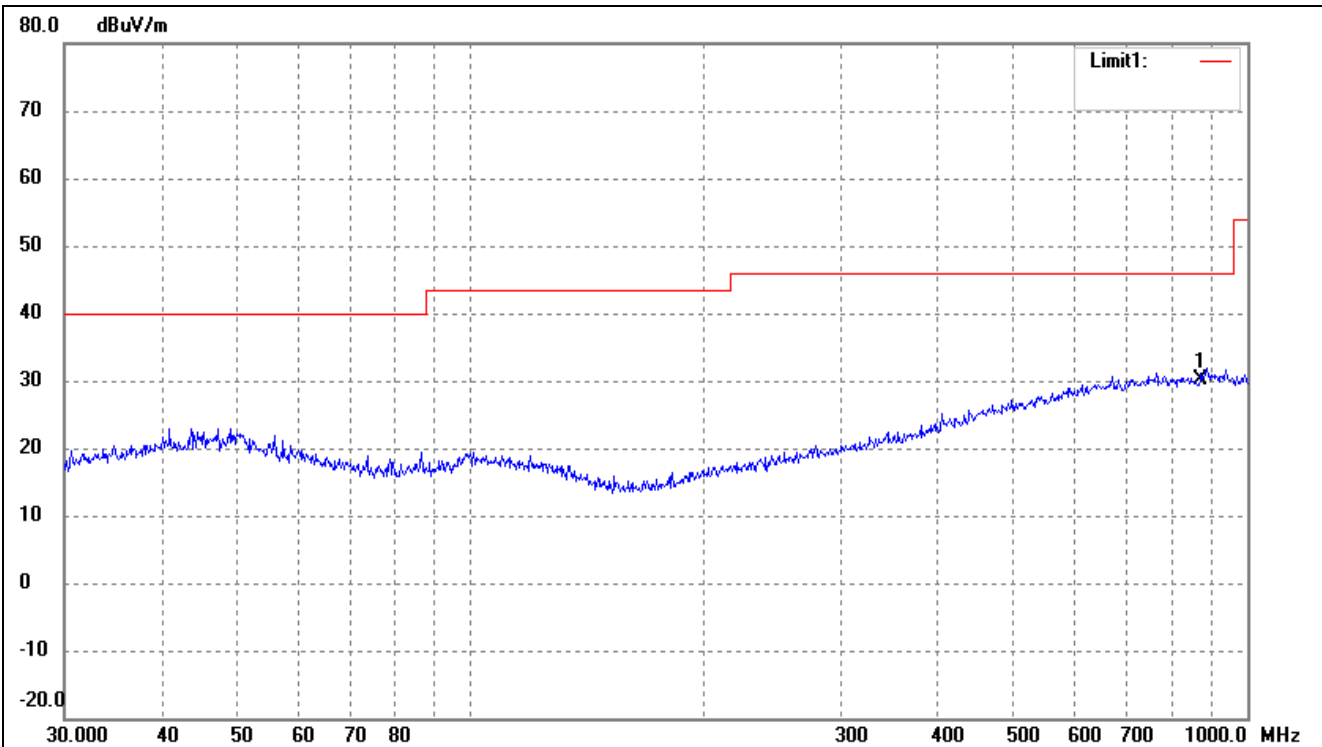


No.	Frequency (MHz)	Reading (dBuV/m)	Correct dB/m	Dutycycle Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Degree ()	Height (cm)	Remark
1	433.908	76.19	-2.99	N/A	73.20	100.83	-27.63	102	116	peak
	433.908	/	/	-21.94	51.26	80.83	-29.57	102	116	Ave
2	867.84	28.06	2.51	N/A	30.57	80.83	-50.26	319	124	peak
	867.84	/	/	-21.94	8.63	60.83	-52.20	319	124	Ave

Above 1GHz

No.	Frequency MHz	Reading dBuV/m	Corr. Factor (dB)	Dutycycle Factor (dB)	Result dBuV/m	Limit dBuV/m	Margin dB	Deg. (°)	Height (cm)	Remark
1	1301.76	54.03	-13.66	N/A	40.37	74.00	-33.63	95	150	Peak
	1301.76	/	/	-21.94	18.43	54.00	-35.57	95	150	Ave
2	1767.877	59.19	-11.90	N/A	47.29	81.00	-33.71	287	162	Peak
	1767.877	/	/	-21.94	25.35	61.00	-35.65	287	162	Ave
3	1919.761	61.43	-11.47	N/A	49.96	81.00	-31.04	294	148	Peak
	1919.761	/	/	-21.94	28.02	61.00	-32.98	294	148	Ave

Test Mode	TM1	Polarity:	Vertical
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No.	Frequency	Reading	Corr.	Dutycycle	Result	Limit	Margin	Deg.	Height	Remark
	MHz	dBuV/m	Factor(dB)	Factor(dB)	dBuV/m	dBuV/m	(dB)	(°)	(cm)	
1	433.916	75.57	-2.99	N/A	72.58	100.83	-28.25	149	103	peak
	433.916	/	/	-21.94	50.64	80.83	-30.19	149	103	Ave
2	867.84	27.68	2.51	N/A	30.19	80.83	-50.64	323	98	peak
	867.84	/	/	-21.94	8.25	60.83	-52.58	323	98	Ave

Above 1GHz

No.	Frequency	Reading	Corr.	Dutycycle	Result	Limit	Margin	Deg.	Height	Remark
	MHz	dBuV/m	Factor(dB)	Factor(dB)	dBuV/m	dBuV/m	dB	(°)	(cm)	
1	1493.846	57.99	-12.69	N/A	45.30	74.00	-28.70	84	132	Peak
	1493.846	/	/	-21.94	23.36	54.00	-30.64	84	132	Ave
2	1767.877	60.56	-11.90	N/A	48.66	81.00	-32.34	287	166	Peak
	1767.877	/	/	-21.94	26.72	61.00	-34.28	287	166	Ave
3	1937.036	58.40	-11.42	N/A	46.98	81.00	-34.02	286	149	Peak
	1937.036	/	/	-21.94	25.04	61.00	-35.96	286	149	Ave

Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, other than listed in the table above are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

5. 20dB Bandwidth

5.1 Standard Applicable

According to FCC Part 15.231(c), the bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70MHz and below 900MHz. Bandwidth is determined at the points 20dB down from the modulated carrier.

5.1 Test Procedure

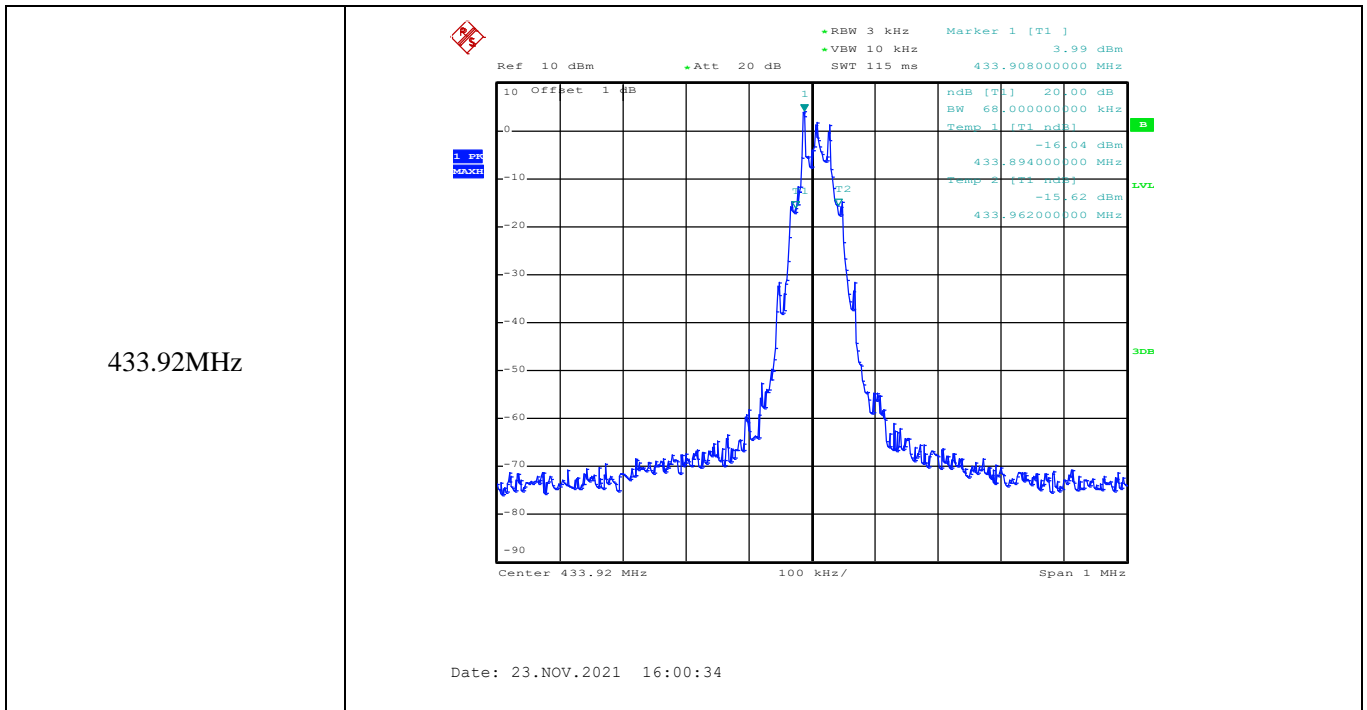
With the EUT’s antenna attached, the EUT’s 20dB Bandwidth power was received by the test antenna, which was connected to the spectrum analyzer with the START, and STOP frequencies set to the EUT’s operation band.

5.2 Summary of Test Results/Plots

Test Frequency MHz	20dB Bandwidth kHz	Limit kHz	Result
433.92	68	1084.8	Pass

Limit = Fundamental Frequency X 0.25% = 433.92MHz X 0.25% = 1084kHz

Please refer to the attached plots.



6. Transmission Time

6.1 Standard Applicable

According to FCC Part 15.231(a), the transmitter shall be complied the following requirements:

- 1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.
- (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation.
- (3) Periodic transmissions at regular predetermined intervals are not permitted. However, polling or supervision transmissions, including data, to determine system integrity of transmitters used in security or safety applications are allowed if the total duration of transmissions does not exceed more than two seconds per hour for each transmitter. There is no limit on the number of individual transmissions, provided the total transmission time does not exceed two seconds per hour.

6.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

6.3 Summary of Test Results/Plots

Transmission Type	Test Frequency(MHz)	Transmission Time(s)	Limit(s)	Result
Manually	433.92	0.32	5	Pass

Please refer to the attached plots.

7. Duty Cycle

7.1 Standard Applicable

According to FCC Part 15.231 (b)(2) and 15.35 (c), for pulse operation transmitter, the averaging pulsed emissions are calculated by peak value of measured emission plus duty cycle factor.

7.2 Test Procedure

With the EUT's antenna attached, the EUT's output signal was received by the test antenna, which was connected to the spectrum analyzer. Set the center frequency to 433.92MHz, than set the spectrum analyzer to Zero Span for the release time reading. During the testing, the switch was released then the EUT automatically deactivated.

7.3 Summary of Test Results/Plots

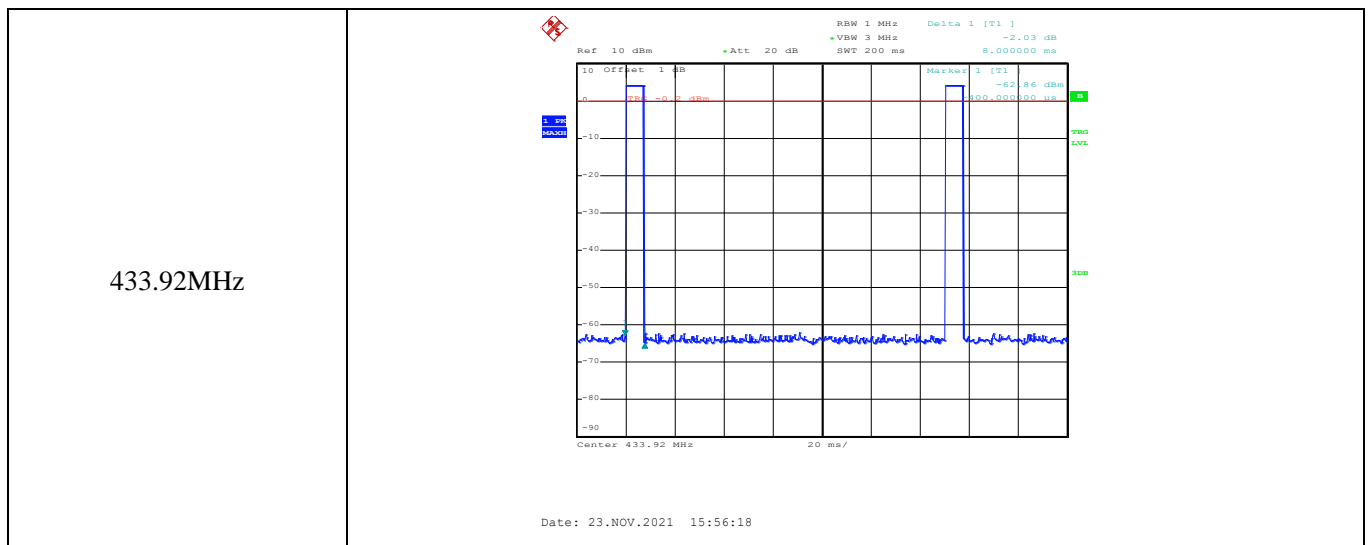
433.93MHz:

Width of Pulse (ms)	Quantity of Pulse	Total Time (T _{on}) (ms)
8.00	1	8.00

Test Period (T _p) ms	Total Time (T _{on}) ms	Duty Cycle %	Duty Cycle Factor dB
100	8.00	8.00	-21.94

Remark: Duty Cycle Factor=20*log(Duty Cycle)

Please refer to the attached test plots:



8. Conducted Emissions

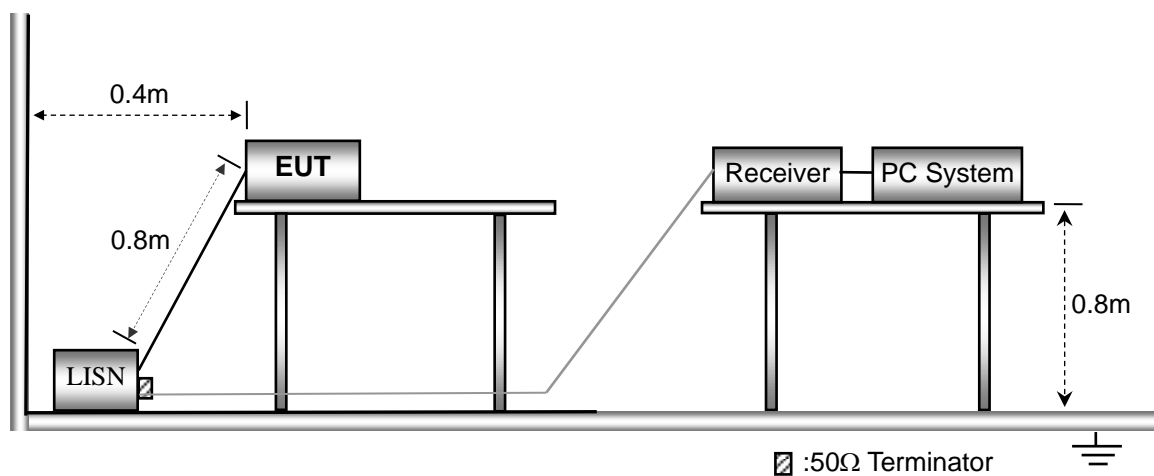
8.1 Test Procedure

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 40cm long in the middle.

The spacing between the peripherals was 10cm.

8.2 Basic Test Setup Block Diagram



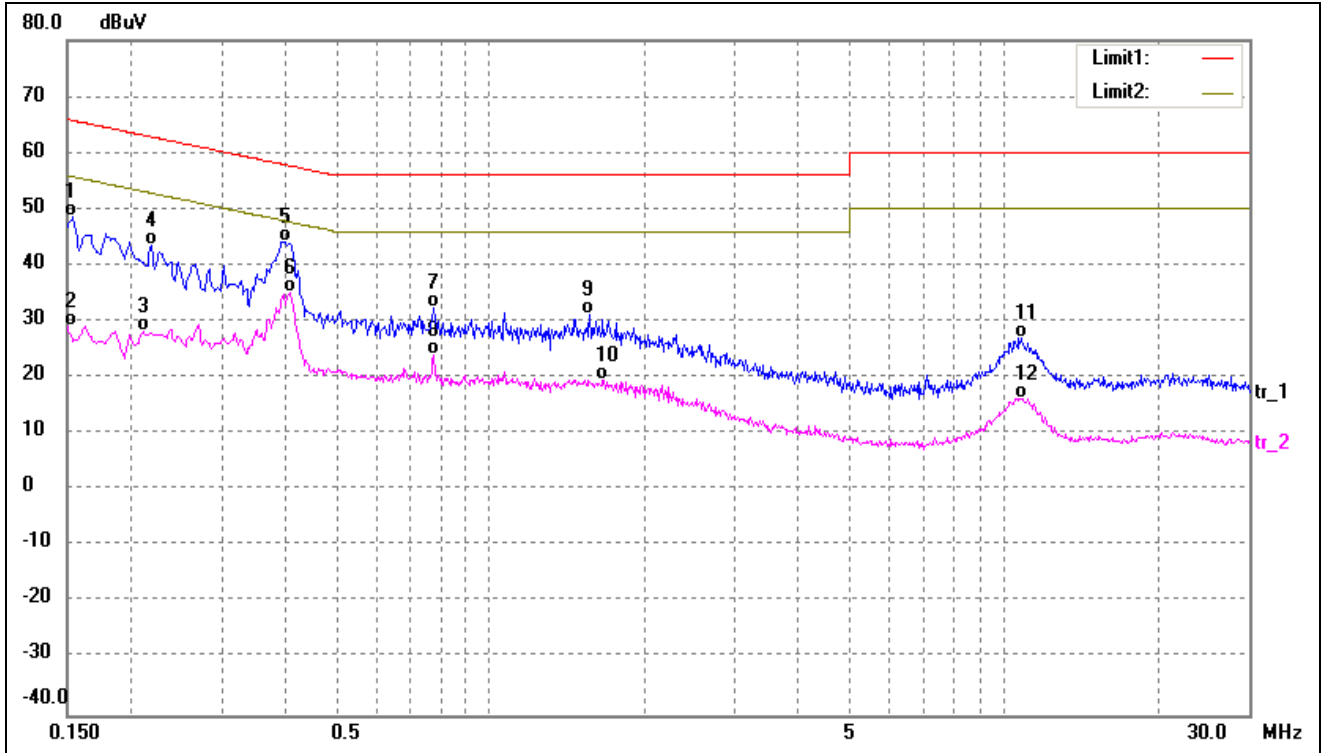
8.3 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

Start Frequency	150kHz
Stop Frequency	30MHz
Sweep Speed	Auto
IF Bandwidth.....	10kHz
Quasi-Peak Adapter Bandwidth	9kHz
Quasi-Peak Adapter Mode	Normal

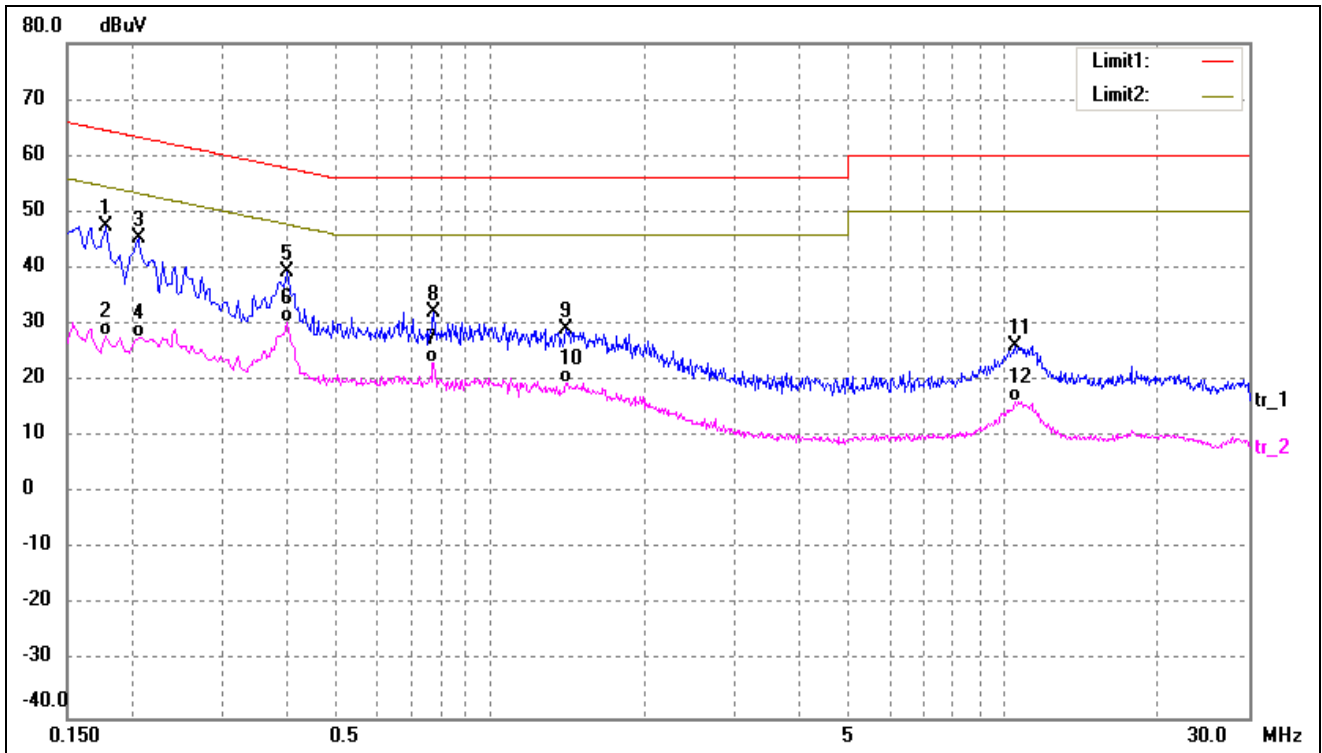
8.4 Summary of Test Results/Plots

Test Mode	TM1(AC120V 60Hz)	Polarity:	Neutral
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1539	38.34	10.37	48.71	65.78	-17.07	QP
2	0.1539	18.69	10.37	29.06	55.78	-26.72	AVG
3	0.2100	17.88	10.37	28.25	53.20	-24.95	AVG
4	0.2180	33.05	10.36	43.41	62.89	-19.48	QP
5	0.3980	33.88	10.29	44.17	57.89	-13.72	QP
6*	0.4060	24.97	10.29	35.26	47.73	-12.47	AVG
7	0.7780	21.95	10.43	32.38	56.00	-23.62	QP
8	0.7780	13.74	10.43	24.17	46.00	-21.83	AVG
9	1.5660	20.83	10.31	31.14	56.00	-24.86	QP
10	1.6660	9.30	10.27	19.57	46.00	-26.43	AVG
11	10.8260	17.03	9.92	26.95	60.00	-33.05	QP
12	10.8580	6.40	9.92	16.32	50.00	-33.68	AVG

Test Mode	TM1(AC120V 60Hz)	Polarity:	Line
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No.	Frequency (MHz)	Reading (dBuV)	Correct (dB)	Result (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1*	0.1780	36.96	10.37	47.33	64.57	-17.24	peak
2	0.1780	17.69	10.37	28.06	54.57	-26.51	AVG
3	0.2060	34.88	10.37	45.25	63.36	-18.11	peak
4	0.2060	17.40	10.37	27.77	53.36	-25.59	AVG
5	0.4020	28.98	10.29	39.27	57.81	-18.54	peak
6	0.4020	20.04	10.29	30.33	47.81	-17.48	AVG
7	0.7740	12.82	10.42	23.24	46.00	-22.76	AVG
8	0.7780	21.59	10.43	32.02	56.00	-23.98	peak
9	1.4100	18.69	10.39	29.08	56.00	-26.92	peak
10	1.4140	9.08	10.38	19.46	46.00	-26.54	AVG
11	10.5180	16.25	9.90	26.15	60.00	-33.85	peak
12	10.5180	6.43	9.90	16.33	50.00	-33.67	AVG

APPENDIX PHOTOGRAPHS

Please refer to “ANNEX”

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