

TEST REPORT

Reference No..... : WTX22X09197704W003
FCC ID : 2ASIV-PGI302FC
Applicant : PIN GENIE, INC. DBA LOCKLY
Address..... : 676 Transfer Rd., St. Paul, MN 55114
Manufacturer : Smart Electronic Industrial (Dong Guan) Co., Ltd.
Address..... : Qing Long Road, Long Jian Tian Village, Huang Jiang Town, Dong Guan,
Guang Dong, China
Product Name : LOCKLY GUARD INGRESS
Model No..... : PGI302FC
Standards : FCC Part 15.231
Date of Receipt sample : 2022-09-30
Date of Test..... : 2022-09-30 to 2022-11-09
Date of Issue : 2022-11-09
Test Report Form No. : WTX_Part 15_231W
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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Report version

Version No.	Date of issue	Description
Rev.00	2022-11-09	Original
/	/	/

1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

General Description of EUT	
Product Name:	LOCKLY GUARD INGRESS
Trade Name:	LOCKLY
Model No.:	PGI302FC
Adding Model(s):	/
Rated Voltage:	DC 12V
Power Adaptor :	/
<i>Note: The test data is gathered from a production sample provided by the manufacturer.</i>	

Technical Characteristics of EUT	
Frequency Range:	433.97 MHz-443.97MHz
Max. Field Strength:	75.68dBuV/m(3m)
Data Rate:	/
Modulation:	FSK
Antenna Type:	Chip Antenna
Antenna Gain:	0.5dBi
<i>Note: The Antenna Gain is provided by the customer and can affect the validity of results.</i>	

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	433.97MHz
TM2	Transmitting	443.97MHz

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
/	/	/	/

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
DC Cable	1.50	Unshielded	Without Ferrite
AC Cable	1.50	Unshielded	Without Ferrite

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Computer	Lenovo	ThinkPad Edge E445	/
SWITCHING POWER SUPPLY	XUNHENG	XH1200-2000	/

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	2022-03-22	2023-03-21
SEMT-1063	GSM Tester	Rohde & Schwarz	CMU200	114403	2022-03-22	2023-03-21
SEMT-1072	Spectrum Analyzer	Agilent	E4407B	MY41440400	2022-03-25	2023-03-24
SEMT-1079	Spectrum Analyzer	Agilent	N9020A	US47140102	2022-03-22	2023-03-21
SMET-1313	Spectrum Analyzer	Agilent	N9020A	MY54320548	2022-03-22	2023-03-21
SEMT-1080	Signal Generator	Agilent	83752A	3610A01453	2022-03-22	2023-03-21
SEMT-1081	Vector Signal Generator	Agilent	N5182A	MY47070202	2022-03-22	2023-03-21
SEMT-1028	Power Divider	Weinschel	1506A	PM204	2022-03-22	2023-03-21
SEMT-1082	Power Divider	RF-Lambda	RFLT4W5M18G	14110400027	2022-03-22	2023-03-21
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	/	/	/
<input checked="" type="checkbox"/> Chamber A: Below 1GHz						
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2022-03-22	2023-03-21
SEMT-1007	EMI Test Receiver	Rohde & Schwarz	ESVB	825471/005	2022-03-22	2023-03-21
SEMT-1008	Amplifier	Agilent	8447F	3113A06717	2022-01-07	2023-01-06
SEMT-1069	Loop Antenna	Schwarz beck	FMZB 1516	9773	2021-03-20	2023-03-19
SEMT-1068	Broadband Antenna	Schwarz beck	VULB9163	9163-333	2021-03-20	2023-03-19
<input checked="" type="checkbox"/> Chamber A: Above 1GHz						
SEMT-1031	Spectrum Analyzer	Rohde & Schwarz	FSP30	836079/035	2022-03-22	2023-03-21
SEMT-1007	EMI Test	Rohde &	ESVB	825471/00	2022-03-22	2023-03-21

	Receiver	Schwarz		5		
SEMT-1043	Amplifier	C&D	PAP-1G18	2002	2022-03-22	2023-03-21
SEMT-1042	Horn Antenna	ETS	3117	00086197	2021-03-19	2023-03-18
SEMT-1121	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA917 0582	2021-04-27	2023-04-26
SEMT-1216	Pre-amplifier	Schwarzbeck	BBV 9721	9721-031	2022-03-25	2023-03-24
SEMT-1163	Spectrum Analyzer	Rohde & Schwarz	FSP40	100612	2022-03-22	2023-03-21
<input type="checkbox"/> Chamber B: Below 1GHz						
SEMT-1068	Trilog Broadband Antenna	Schwarz beck	VULB9163(B)	9163-635	2021-04-09	2023-04-08
SEMT-1067	Amplifier	Agilent	8447D	2944A101 79	2022-03-22	2023-03-21
SEMT-1066	EMI Test Receiver	Rohde & Schwarz	ESPI	101391	2022-03-22	2023-03-21
<input type="checkbox"/> Chamber C: Below 1GHz						
SEMT-1319	EMI Test Receiver	Rohde & Schwarz	ESIB 26	100401	2022-01-07	2023-01-06
SEMT-1343	Trilog Broadband Antenna	Schwarz beck	VULB 9168	1194	2021-05-28	2023-05-27
SEMT-1333	Amplifier	HP	8447F	2944A038 69	2022-03-22	2023-03-21
<input checked="" type="checkbox"/> Conducted Room 1#						
SEMT-1001	EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2022-03-21	2023-03-20
SEMT-1002	Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2022-03-25	2023-03-24
SEMT-1003	AC LISN	Schwarz beck	NSLK8126	8126-224	2022-03-22	2023-03-21
<input type="checkbox"/> Conducted Room 2#						
SEMT-1334	EMI Test Receiver	Rohde & Schwarz	ESPI	101259	2022-03-22	2023-03-21
SEMT-1336	LISN	Rohde & Schwarz	ENV 216	100097	2022-03-22	2023-03-21

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 a Chip 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.

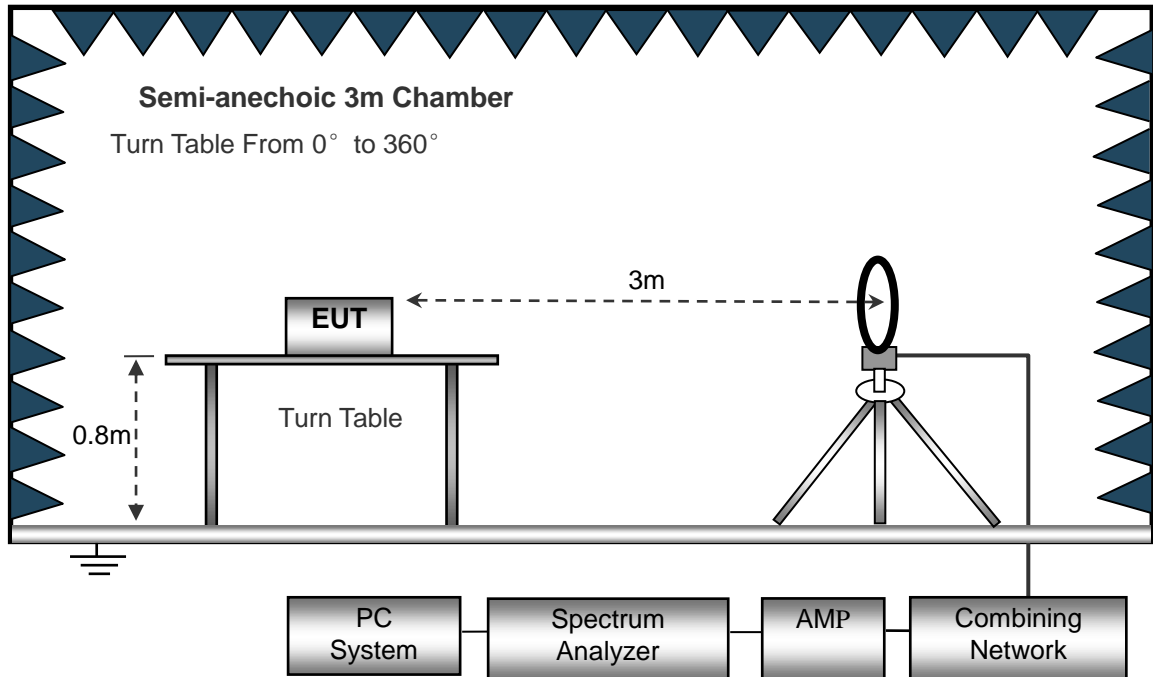
The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

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

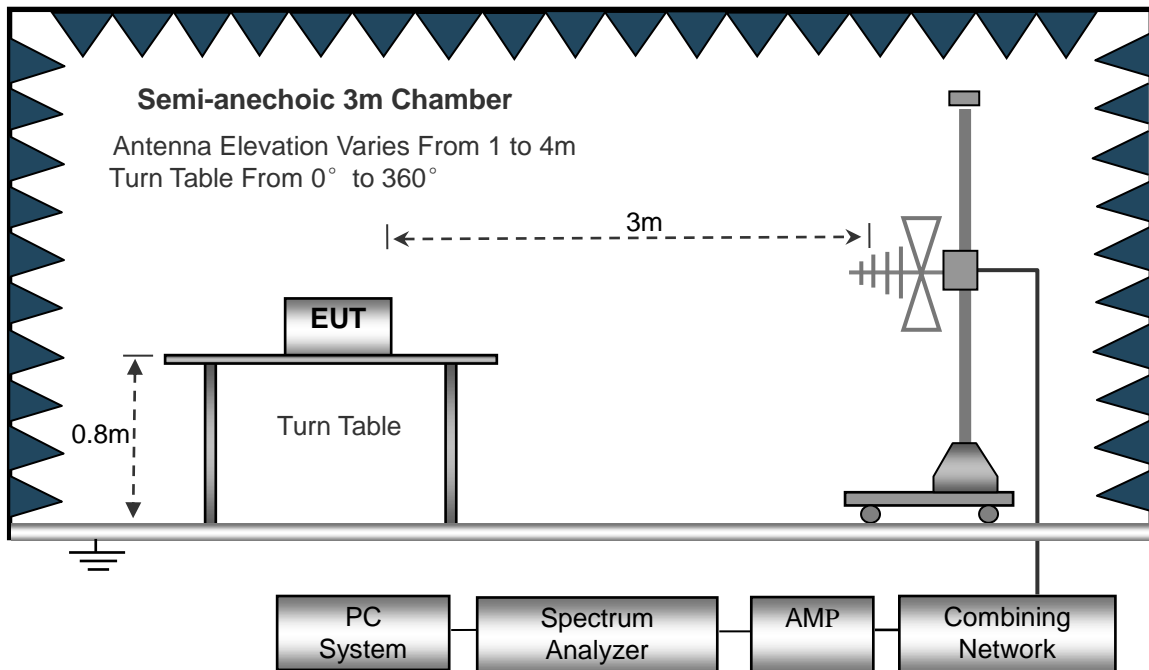
4.2 Test Procedure

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.

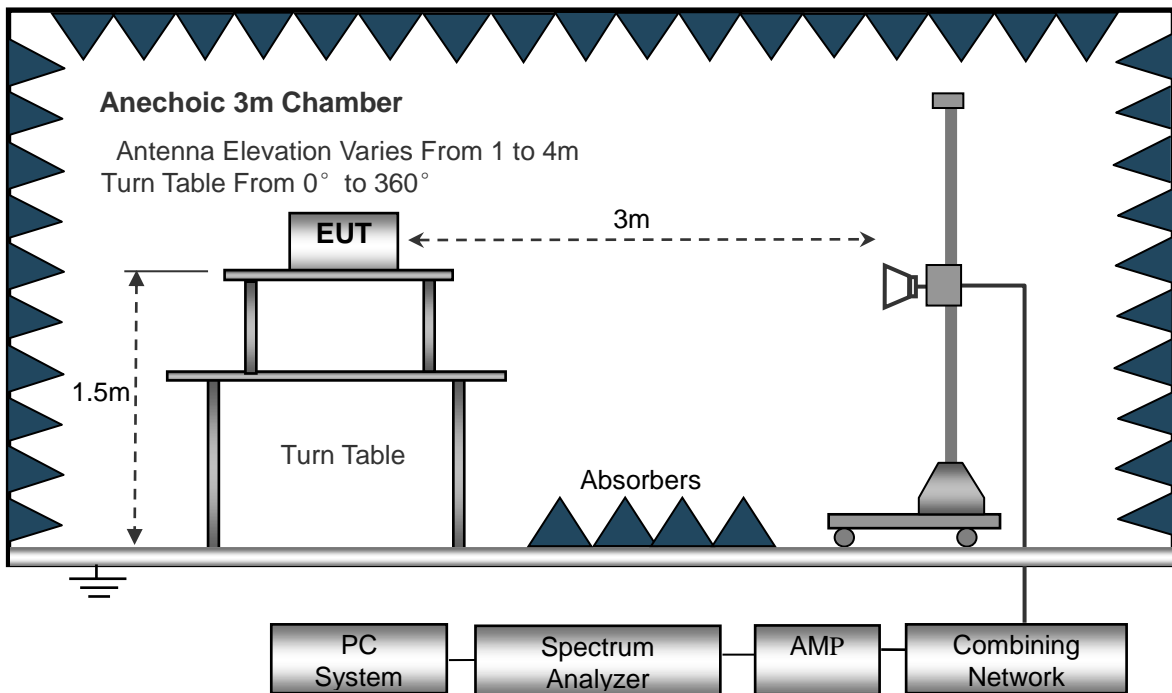
The test setup for emission measurement below 30MHz.



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:

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

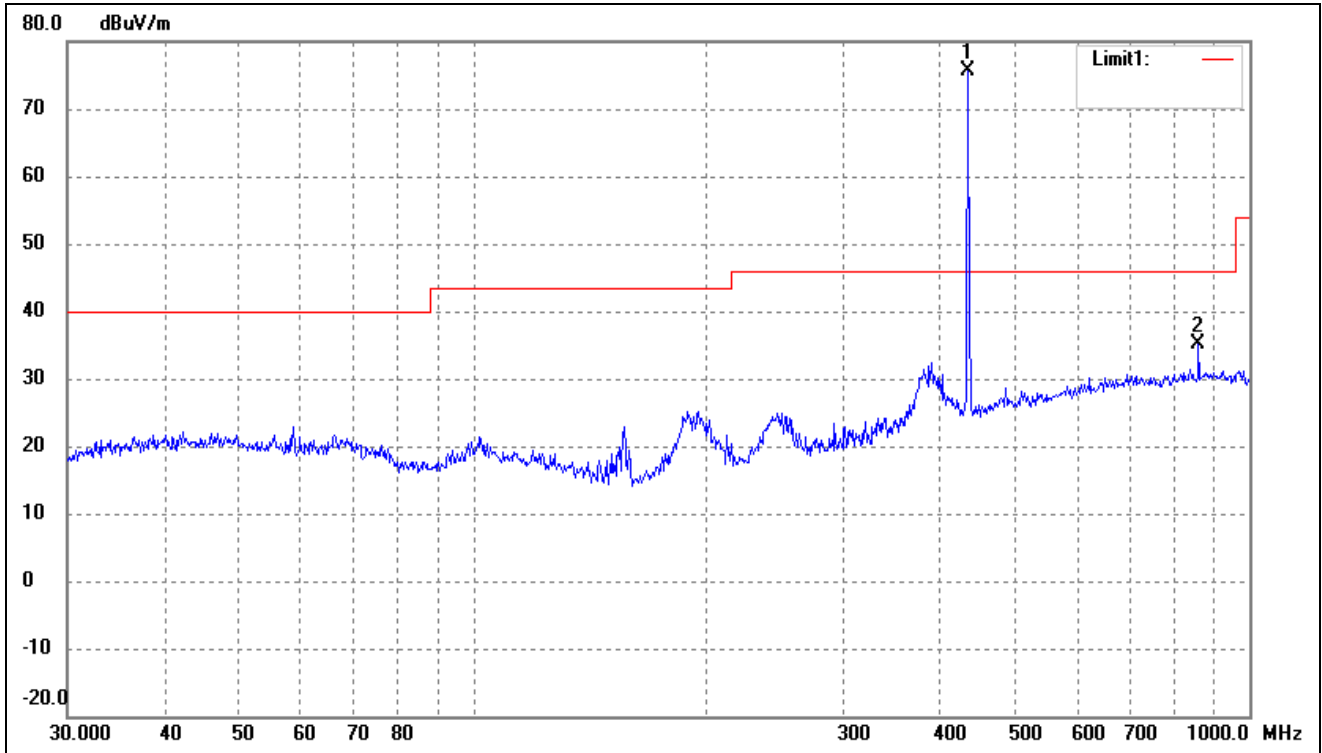
The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dB μ V means the emission is 6dB μ V below the maximum limit. The equation for margin calculation is as follows:

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

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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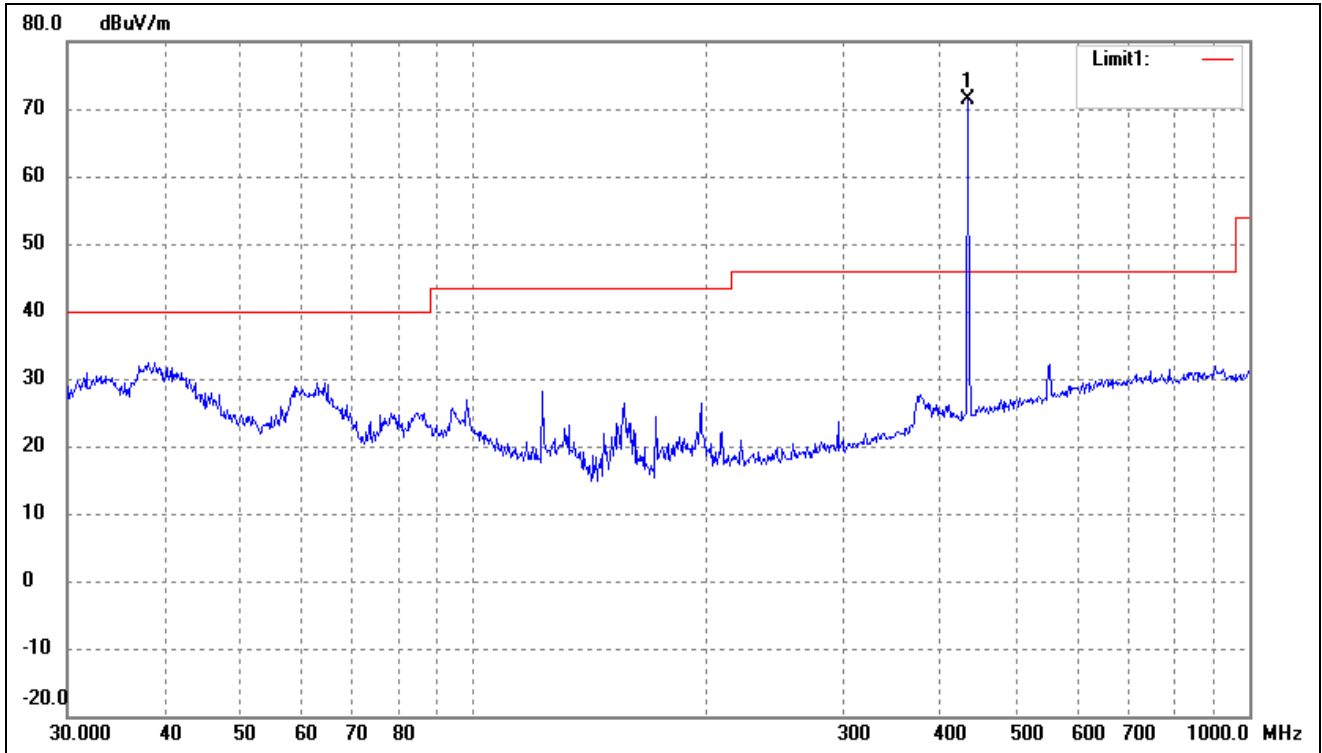


No.	Frequency (MHz)	Reading (dBuV/m)	Corr. Factor (dB)	Duty Cycle Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	434.0650	78.42	-2.74	N/A	75.68	100.83	-25.15	-	-	peak
	/	/	/	-3.74	71.94	80.83	-8.89	-	-	ave
2	860.0352	32.37	2.64	N/A	35.01	80.83	-45.82	-	-	peak
	/	/	/	-3.74	31.27	60.83	-29.56	-	-	ave

Above 1GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Corr. Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	1301.760	53.00	-12.45	40.55	74.00	-33.45	-	-	Peak
2	2247.628	54.66	-9.00	45.66	74.00	-28.34	-	-	Peak
3	4163.019	53.28	-4.97	48.31	74.00	-25.69	-	-	Peak

Test Mode	TM1	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Corr. (dB/m)	Duty Cycle Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Deg. ()	Height (cm)	Remark
1	434.0650	74.02	-2.74	N/A	71.28	100.83	-29.55	-	-	peak
/	/	/	/	-3.74	67.54	80.83	-13.29	-	-	ave

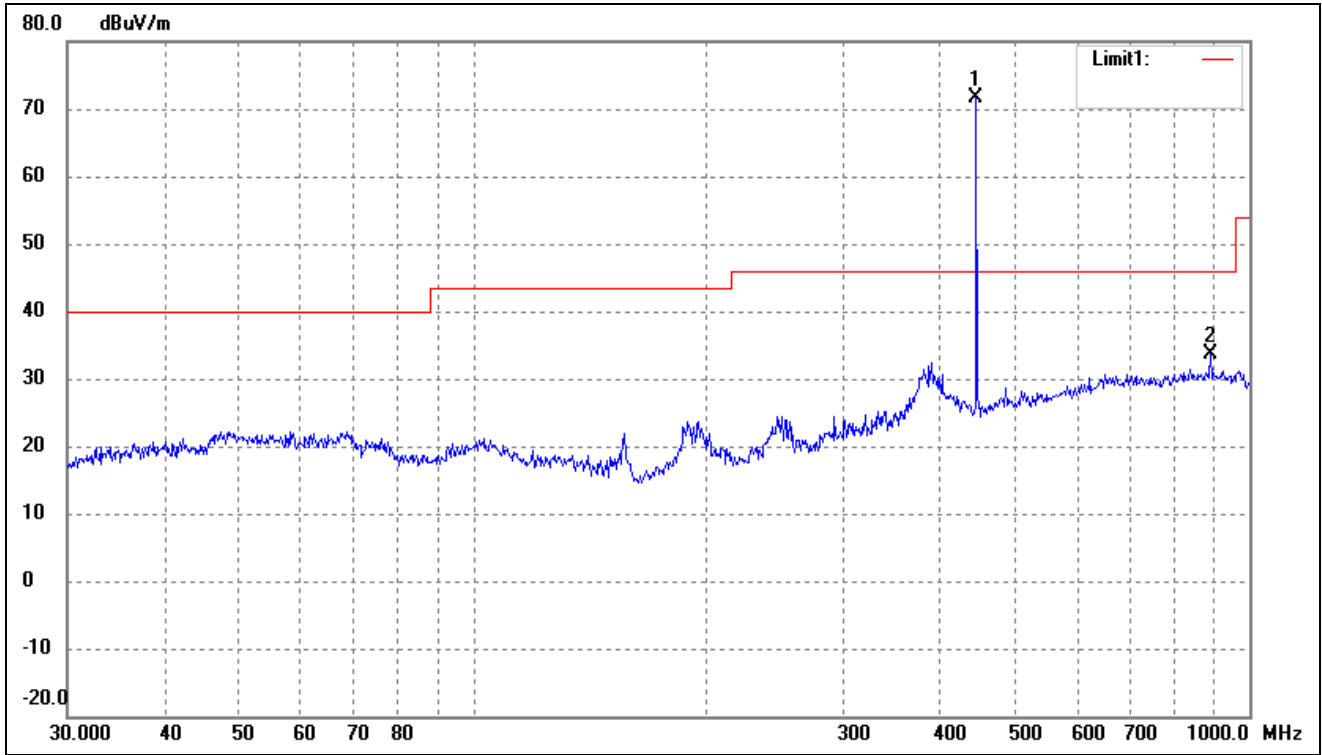
Above 1GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Corr. Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	1301.760	52.32	-12.45	39.87	74.00	-34.13	-	-	Peak
2	2367.504	54.07	-8.57	45.50	74.00	-28.50	-	-	Peak
3	3280.305	54.00	-6.46	47.54	74.00	-26.46	-	-	Peak

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.

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

Test Mode	TM2	Polarity:	Horizontal
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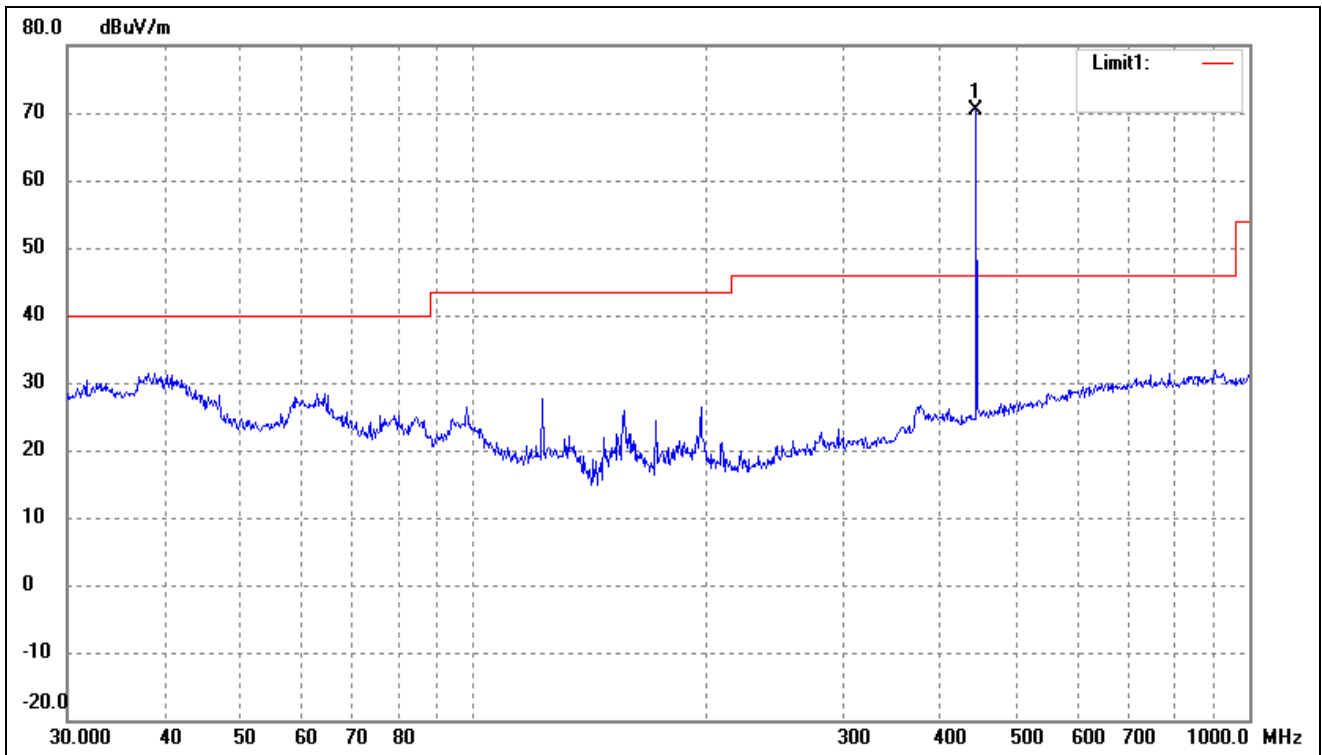


No.	Frequency (MHz)	Reading (dBuV/m)	Corr. Factor (dB)	Duty Cycle Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	444.8514	74.22	-2.48	N/A	71.74	101.15	-29.41	-	-	peak
	/	/	/	-3.74	68.00	81.15	-13.15	-	-	ave
2	890.7278	30.88	2.83	N/A	33.71	81.15	-47.44	-	-	peak
	/	/	/	-3.74	29.97	61.15	-31.18	-	-	ave

Above 1GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Corr. Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	1332.012	56.58	-12.22	44.36	74	-29.64	-	-	Peak
2	2305.422	53.93	-8.89	45.04	74	-28.96	-	-	Peak
3	4297.892	54.17	-4.45	49.72	74	-24.28	-	-	Peak

Test Mode	TM2	Polarity:	Vertical
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No.	Frequency (MHz)	Reading (dBuV/m)	Corr. Factor (dB)	Duty Cycle Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	444.8514	72.87	-2.48	N/A	70.39	101.15	-30.76	-	-	peak
	/	/	/	-3.74	66.65	81.15	-14.50	-	-	ave

Above 1GHz

No.	Frequency (MHz)	Reading (dBuV/m)	Corr. Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Deg. (°)	Height (cm)	Remark
1	1330.875	55.55	-12.13	43.42	74	-30.58	-	-	Peak
2	2352.745	54.55	-8.78	45.77	74	-28.23	-	-	Peak
3	4341.546	52.98	-4.31	48.67	74	-25.33	-	-	Peak

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.

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

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.

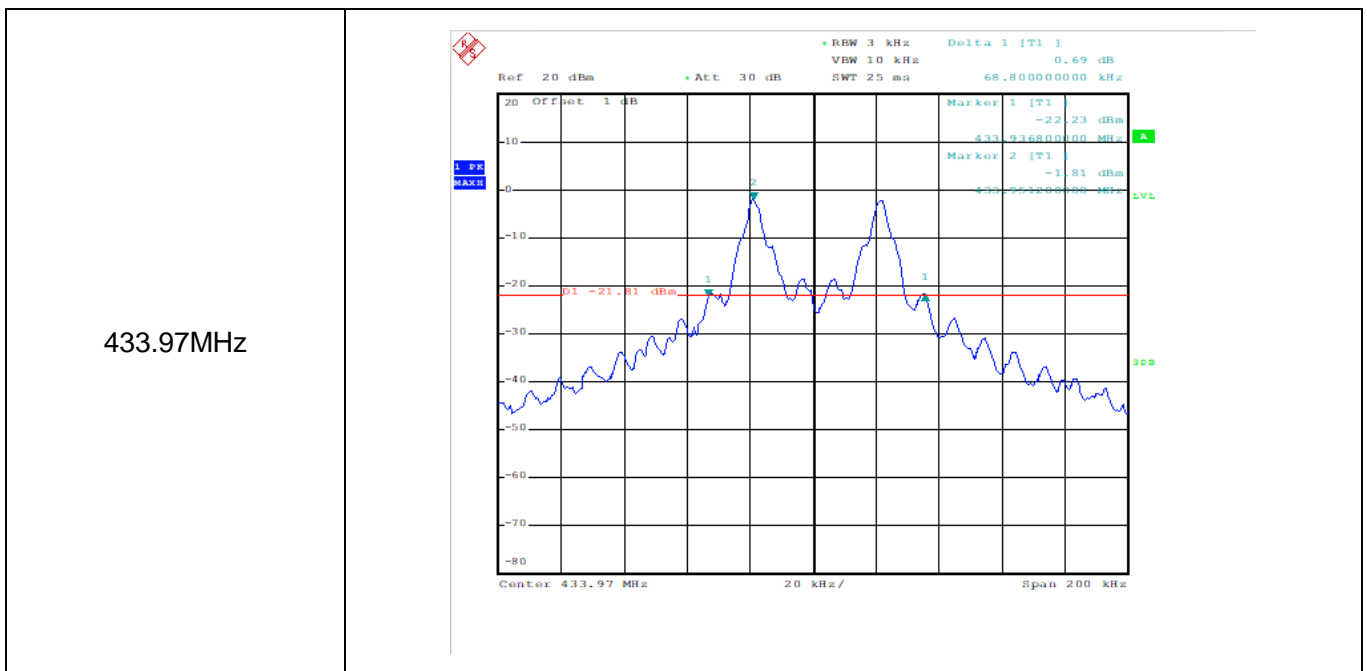
5.2 Summary of Test Results/Plots

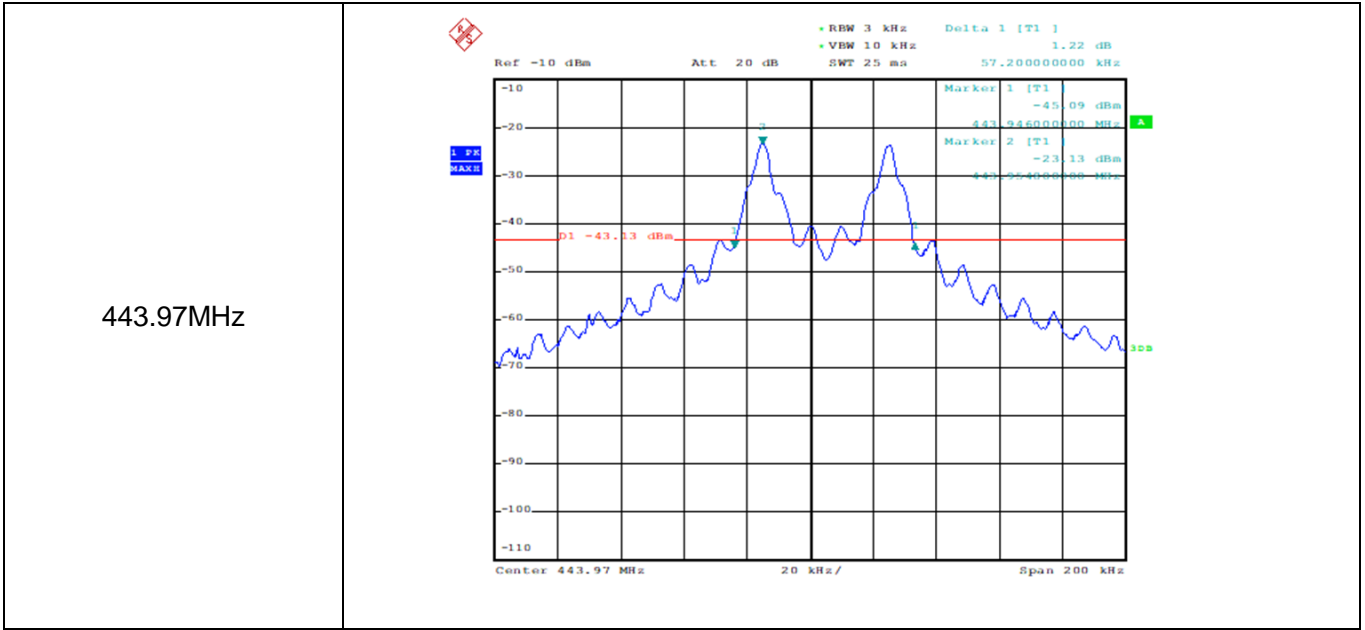
Test Frequency MHz	20dB Bandwidth kHz	Limit kHz	Result
433.97	68.80	1084.925	Pass
443.97	57.20	1108.050	Pass

Limit = Fundamental Frequency * 0.25% = 433.97MHz * 0.25% = 1084.925 kHz

Limit = Fundamental Frequency * 0.25% = 443.97MHz * 0.25% = 1108.050 kHz

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.

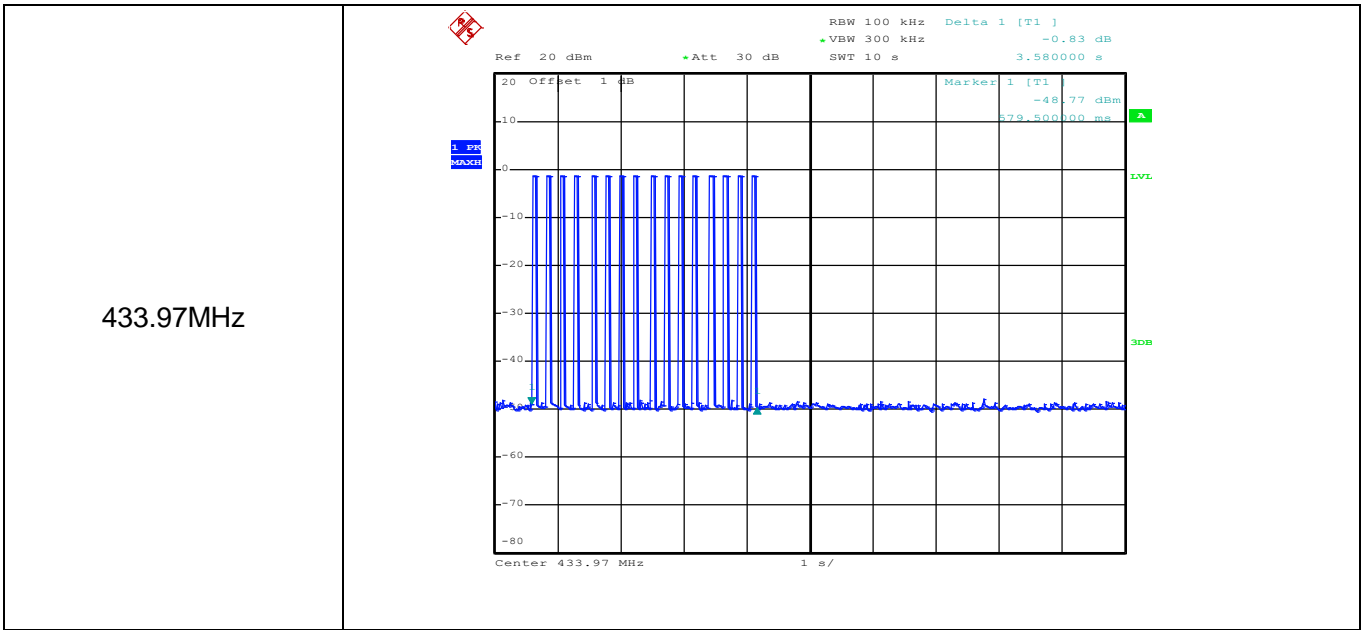
6.2 Test Procedure

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 433.97MHz, 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
Passivity	433.97	3.58	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 433.97MHz, 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.

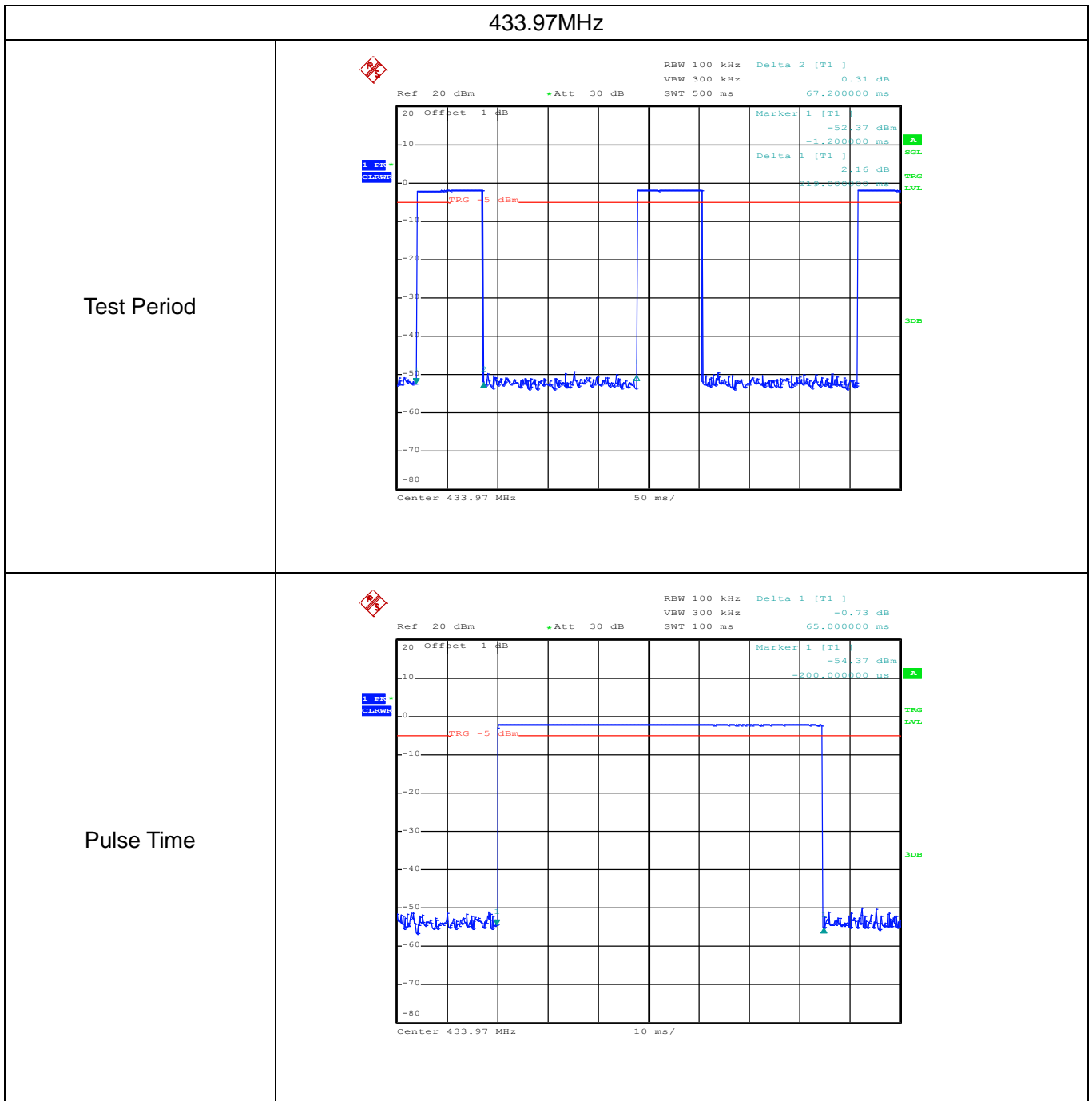
7.3 Summary of Test Results/Plots

433.97MHz:

Test Frequency	Test Period (T _p)	Total Time (T _{on})	Duty Cycle	Duty Cycle Factor
(MHz)	ms	ms	%	dB
433.97	100	65.0	65.0	-3.74

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

Please refer to the attached test plots:



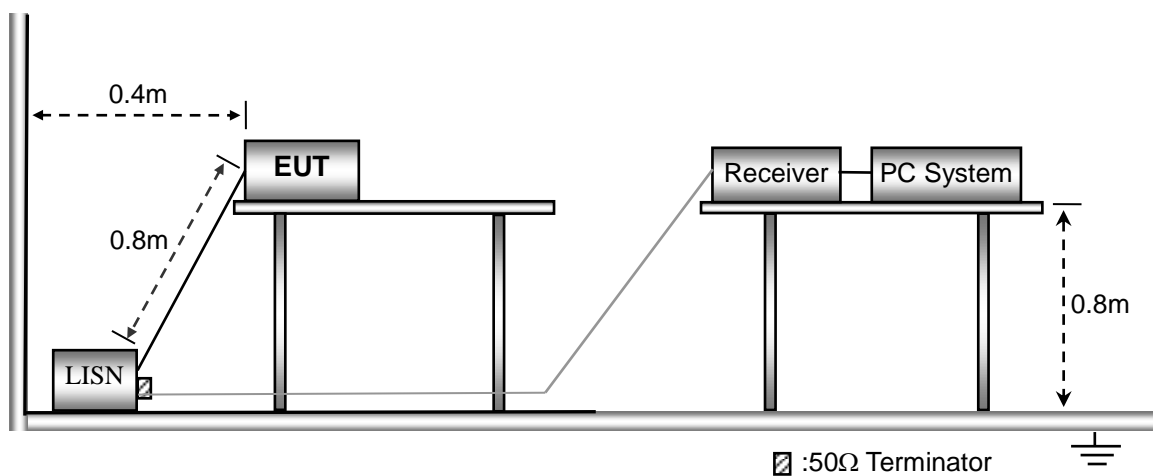
8. Conducted Emissions

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



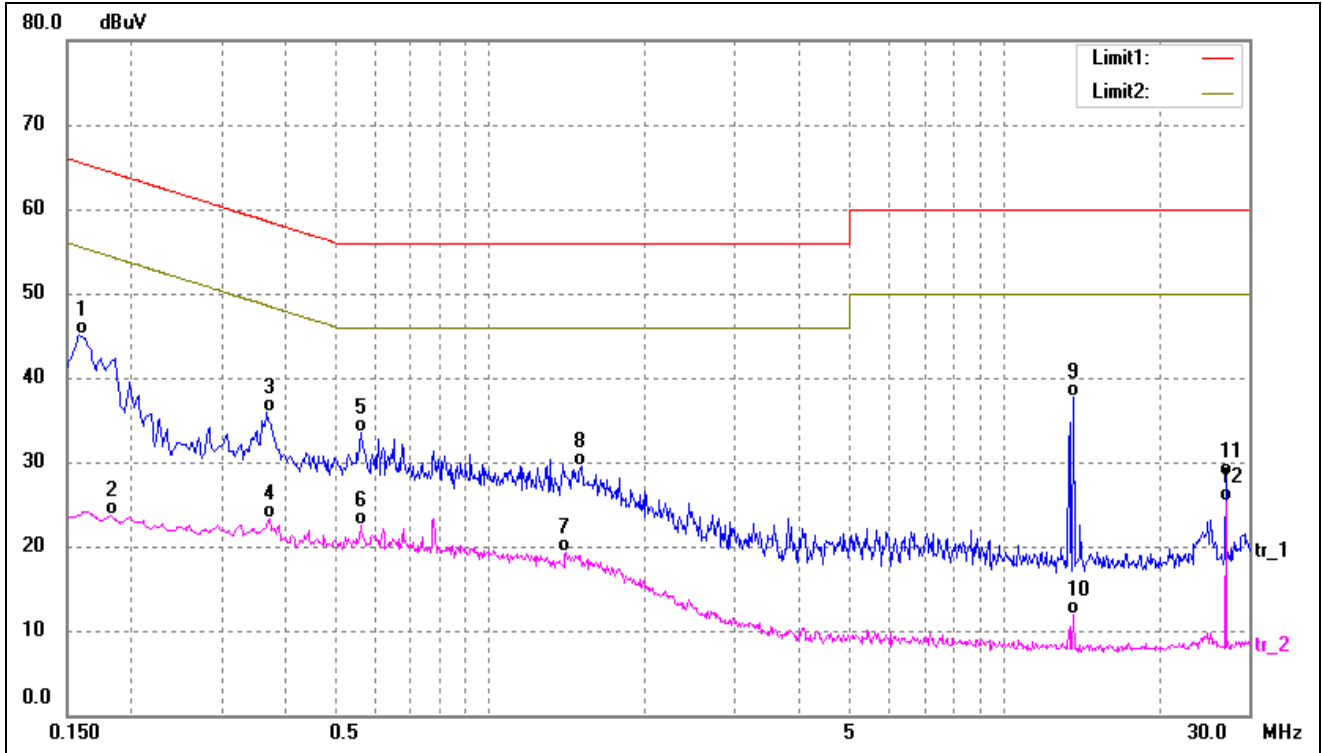
8.3 Test Receiver Setup

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

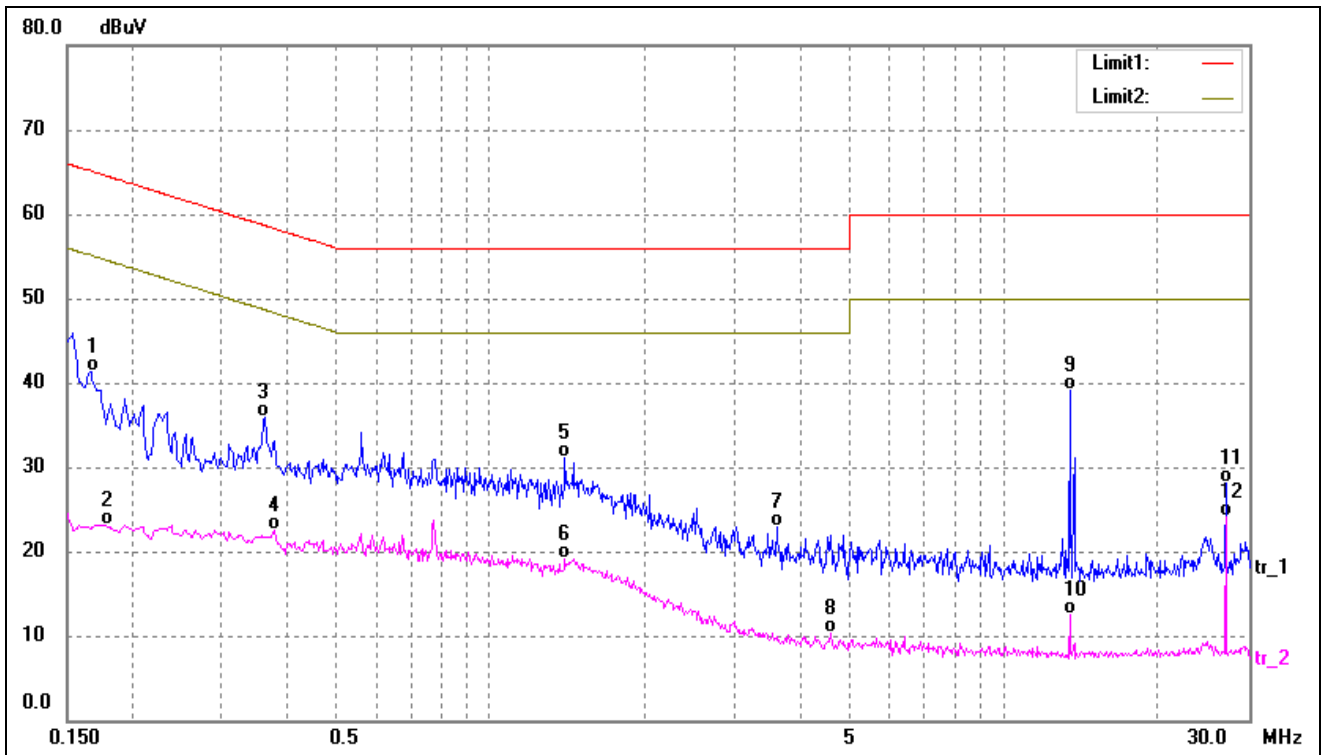
8.4 Summary of Test Results/Plots

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*	0.1580	34.78	10.31	45.09	65.56	-20.47	QP
2	0.1819	13.34	10.31	23.65	54.39	-30.74	AVG
3	0.3660	25.75	10.23	35.98	58.59	-22.61	QP
4	0.3700	13.00	10.23	23.23	48.50	-25.27	AVG
5	0.5580	23.23	10.21	33.44	56.00	-22.56	QP
6	0.5580	12.36	10.21	22.57	46.00	-23.43	AVG
7	1.4100	9.14	10.18	19.32	46.00	-26.68	AVG
8	1.5060	19.27	10.19	29.46	56.00	-26.54	QP
9	13.6580	27.52	10.27	37.79	60.00	-22.21	QP
10	13.6580	1.61	10.27	11.88	50.00	-38.12	AVG
11	27.1220	17.92	10.40	28.32	60.00	-31.68	QP
12	27.1220	14.98	10.40	25.38	50.00	-24.62	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	0.1660	30.99	10.31	41.30	65.15	-23.85	QP
2	0.1780	12.85	10.31	23.16	54.57	-31.41	AVG
3	0.3620	25.65	10.23	35.88	58.68	-22.80	QP
4	0.3780	12.18	10.23	22.41	48.32	-25.91	AVG
5	1.4020	20.95	10.18	31.13	56.00	-24.87	QP
6	1.4020	8.92	10.18	19.10	46.00	-26.90	AVG
7	3.6100	12.62	10.29	22.91	56.00	-33.09	QP
8	4.6180	-0.06	10.32	10.26	46.00	-35.74	AVG
9*	13.4620	28.80	10.27	39.07	60.00	-20.93	QP
10	13.4620	2.19	10.27	12.46	50.00	-37.54	AVG
11	27.1220	17.74	10.40	28.14	60.00	-31.86	QP
12	27.1220	13.73	10.40	24.13	50.00	-25.87	AVG

APPENDIX PHOTOGRAPHS

Please refer to "ANNEX"

**** END OF REPORT ****