

FCC RADIO TEST REPORT

FCC ID:2AP9S-GW-RFC3

Product: RF Controller

Trade Name: N/A

Model Name: GW-RFC3

Serial Model: N/A

Report No.: UNIA21111715ER-61

Prepared for

Gateway Plastic Hardware & Lighting Co., Ltd
Jingfu Road, Xincheng Industrial Area, Hengli Town, DONGGUAN
Guangdong, China

Prepared by

Shenzhen United Testing Technology Co., Ltd.
2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang
Community, Xixiang Str, Bao'an District, Shenzhen, China

TEST RESULT CERTIFICATION

Applicant's name : **Gateway Plastic Hardware & Lighting Co., Ltd**

Address : Jingfu Road, Xincheng Industrial Area, Hengli Town,
DONGGUAN Guangdong, China

Manufacture's Name : **GATEWAY LIGHTING (VIETNAM) COMPANY LIMITED**

Address : Gia Le Industrial Zone, Dong Xuan Commune, DONG
HUNG DISTRICT Thai Binh Province

Product description

Product name..... : **RF Controller**

Trade Mark : **N/A**

Model and/or type reference : **GW-RFC3**

Standards..... : FCC Part 15 Subpart C 15.231
ANSI C63.10: 2013

This device described above has been tested by Shenzhen United Testing Technology Co., Ltd., and the test results show that the equipment under test (EUT) is in compliance with the FCC requirements. And it is applicable only to the tested sample identified in the report.

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Date of Test..... : November 23, 2021

Date (s) of performance of tests..... : November 10, 2021-November 23, 2021


Date of Issue..... : November 23, 2021

Test Result..... : Pass

kahn.yang


Prepared by:

Kahn yang/Editor



Reviewer:

Sky dong/Supervisor



Approved & Authorized Signer:

Liuze/Manager

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1 TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

FCC and IC Requirements		
FCC Part 15.207	Conducted Emission	N/A
FCC Part 15.231(b)	Radiated Emission	Compliant
FCC Part 15.231(c)	20dB Bandwidth	Compliant
FCC Part 15.231(a)	Release Time Measurement	Compliant
FCC Part 15.203	Antenna Requirement	Compliant
The product is a Manually transmitter.		

1.2 TEST FACILITY

Test Firm : Shenzhen United Testing Technology Co., Ltd.

Address : 2F, Annex Bldg, Jiahuangyuan Tech Park, #365 Baotian 1 Rd, Tiegang Community, Xixiang Str, Bao'an District, Shenzhen, China

The testing quality system of our laboratory meets with ISO/IEC-17025 requirements. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

Designation Number: CN1227

Test Firm Registration Number: 674885

The 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.

1.3 MEASUREMENT UNCERTAINTY

Measurement Uncertainty

Conducted Emission Expanded Uncertainty = 2.23dB, k=2

Radiated emission expanded uncertainty(9kHz-30MHz) = 3.08dB, k=2

Radiated emission expanded uncertainty(30MHz-1000MHz) = 4.42dB, k=2

Radiated emission expanded uncertainty(Above 1GHz) = 4.06dB, k=2

2 GENERAL INFORMATION

2.1 ENVIRONMENTAL CONDITIONS

During the measurement the environmental conditions were within the listed ranges:

Temperature	Normal Temperature:	25°C
Voltage	Normal Voltage	3.0V
Other	Relative Humidity	54 %
	Air Pressure	100.34 kPa

2.2 GENERAL DESCRIPTION OF EUT

Equipment	RF Controller
Trade Mark	N/A
Model Name	GW-RFC3
Serial No.	N/A
Model Difference	N/A
FCC ID	2AP9S-GW-RFC3
Antenna Type	PCB Antenna
Antenna Gain	0dbi
Frequency Range	433.92MHz
Number of Channels	1
Modulation Type	OOK
PowerSource	DC 3V (battery)
Adapter Model	N/A

2.3 CARRIER FREQUENCY OF CHANNELS

Channel	Frequency(MHz)
1	433.92

2.4 OPERATION OF EUT DURING TESTING

To investigate the maximum EMI emission characteristics generates from EUT, the test system was pre-scanning tested base on the consideration of following EUT operation mode or test configuration mode which possible have effect on EMI emission level. Each of these EUT operation mode(s) or test configuration mode(s) mentioned above was evaluated respectively.

Operating Mode

The mode is used: Transmitting mode

2.5 DESCRIPTION OF TEST SETUP

During test, Keep EUT is in continuous transmission mode, Both open button and close button have test, The two keys were tested to assess and only record the worst case in thereport.

Note: New battery is used during all test.



3.1 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
Conduction Emissions Measurement					
1	Conducted Emission Test Software	EZ-EMC	Ver.CCS-3A1-CE	N/A	N/A
2	AMN	Schwarzbeck	NNLK8121	8121370	2022.09.22
3	AAN	TESEQ	T8-Cat6	38888	2022.09.22
4	Pulse Limiter	CYBRTEK	EM5010	E115010056	2022.05.17
5	EMI Test Receiver	Rohde&Schwarz	ESCI	101210	2022.09.22
Radiated Emissions Measurement					
1	Radiated Emission Test Software	EZ-EMC	Ver.CCS-03A1	N/A	N/A
2	Horn Antenna	Sunol	DRH-118	A101415	2022.09.27
3	Broadband Hybrid Antenna	Sunol	JB1	A090215	2022.03.01
4	PREAMP	HP	8449B	3008A00160	2022.09.22
5	PREAMP	HP	8447D	2944A07999	2022.05.17
6	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2022.09.22
7	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2022.09.22
8	Signal Generator	Agilent	E4421B	MY4335105	2022.09.22
9	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2022.09.22
10	MXA Signal Analyzer	Keysight	N9020A	MY51110104	2022.09.22
11	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2022.05.17
12	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2022.05.17
13	RF power divider	Anritsu	K241B	992289	2022.09.22
14	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2022.09.22
15	Active Loop Antenna	Com-Power	AL-130R	10160009	2022.07.25
16	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2022.09.22
17	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2022.05.23
18	Horn Antenna	A-INFOMW	LB-180400-KF	J211060660	2022.09.27
19	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2022.09.22
20	Signal Generator	Agilent	N5183A	MY47420153	2022.09.22
21	Spectrum Analyzer	Rohde&Schwarz	FSP 40	100501	2022.09.22
22	Power Meter	KEYSIGHT	N1911A	MY50520168	2022.09.22
23	Frequency Meter	VICTOR	VC2000	997406086	2022.09.22
24	DC Power Source	HYELEC	HY5020E	055161818	2022.09.22

3 TEST CONDITIONS AND RESULTS

3.2 CONDUCTED EMISSIONS TEST

Limit

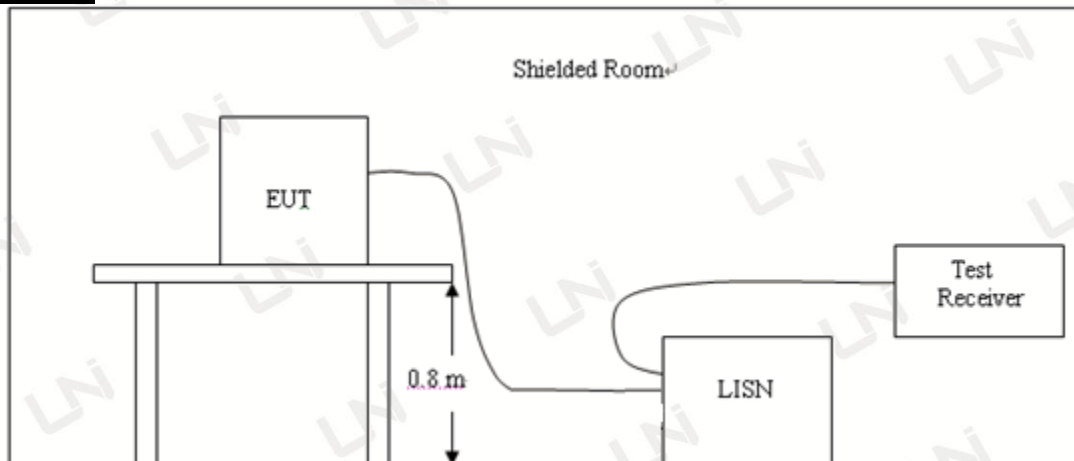
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency range (MHz)	Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreasing linearly with the logarithm of the frequency

For intentional device, according to §15.207(a) Line Conducted Emission Limit is same as above table.

Test Setup



Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. A wooden table with a height of 0.8 meters is used and is placed on the ground plane as per ANSI C63.10.
- 2, Support equipment, if needed, was placed as per ANSI C63.10.
- 3, All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10.
- 4, If a EUT received DC power from the USB Port of Notebook PC, the PC's adapter received AC120V/60Hz power through a Line Impedance Stabilization Network (LISN) which supplied power source and was grounded to the ground plane.
- 5, All support equipments received AC power from a second LISN, if any.
- 6, The EUT test program was started. Emissions were measured on each current carrying line of the EUT using a spectrum Analyzer / Receiver connected to the LISN powering the EUT. The LISN has two monitoring points: Line 1 (Hot Side) and Line 2 (Neutral Side). Two scans were taken: one with Line 1 connected to Analyzer / Receiver and Line 2 connected to a 50 ohm load; the second scan had Line 1 connected to a 50 ohm load and Line 2 connected to the Analyzer / Receiver.
- 7, Analyzer / Receiver scanned from 150KHz to 30MHz for emissions in each of the test modes.

Test Result

Note: EUT is only powered by battery, So it is not applicable for this test.

3.3 RADIATED EMISSION TEST

Radiation Limit

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

Frequency (MHz)	Distance (Meters)	Radiated (dBμV/m)	Radiated (μV/m)
30-88	3	40	100
88-216	3	43.5	150
216-960	3	46	200
Above 960	3	54	500

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

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

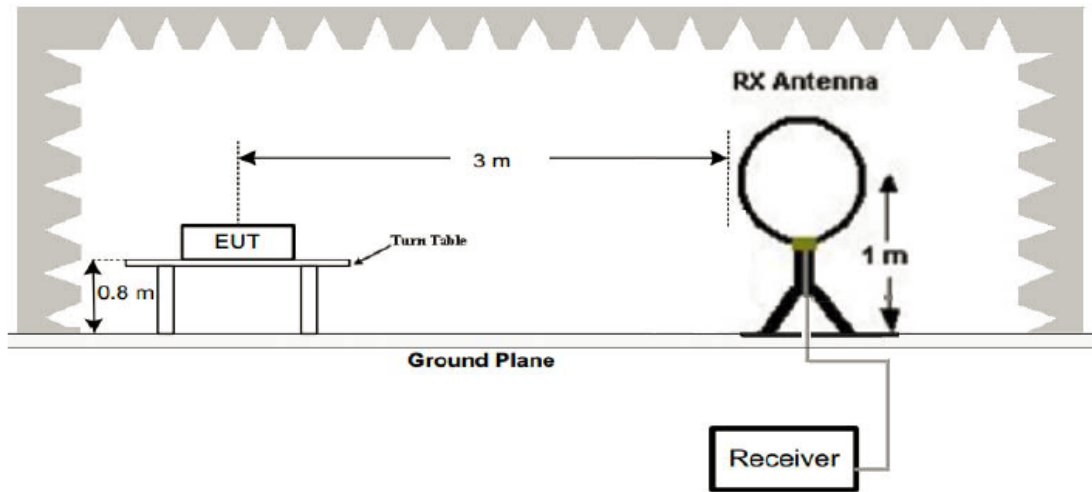
FrequencyRange of Fundamental [MHz]	Field Strength of Fundamental Emission [Average] [μV/m]	Field Strength of Spurious Emission [Average] [μV/m]
40.66-40.70	2250	225
70-130	1250	125
130-174	1250-3750	125-375
174-260	3750	375
260-470	3750-12500	375-1250
Above 470	12500	1250

Where F is the frequency in MHz, the formulas for calculating the maximumpermitted fundamental fieldstrengths are as follows: for the band 130-174 MHz, $\mu\text{V/m}$ at 3 meters= $56.82(F) - 6136$; forthe band 260-470 MHz, $\mu\text{V/m}$ at 3 meters= $41.67(F)-7083$. The maximum permitted unwantedemission level is 20 dB below the maximum permitted fundamental level.

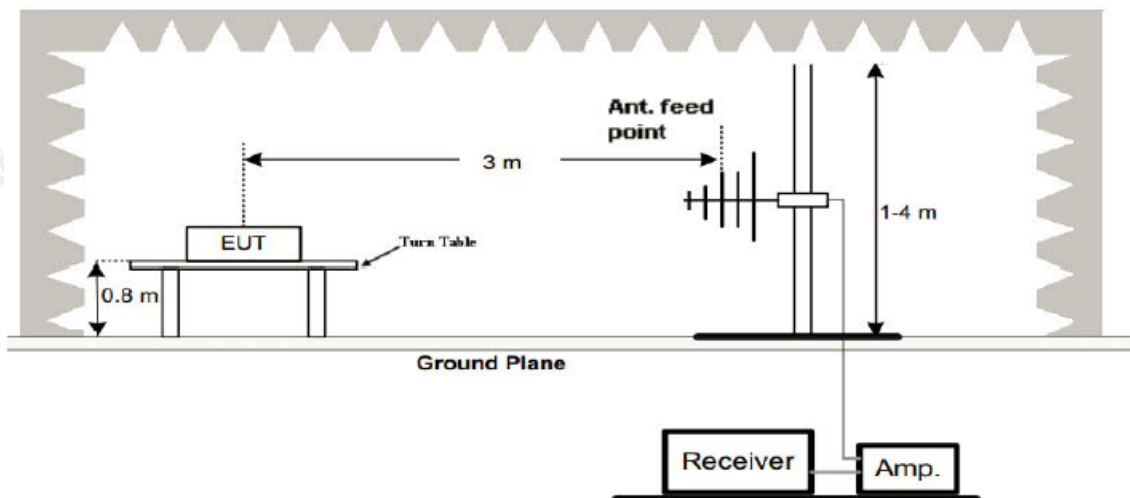
Test Setup

The equipment is installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

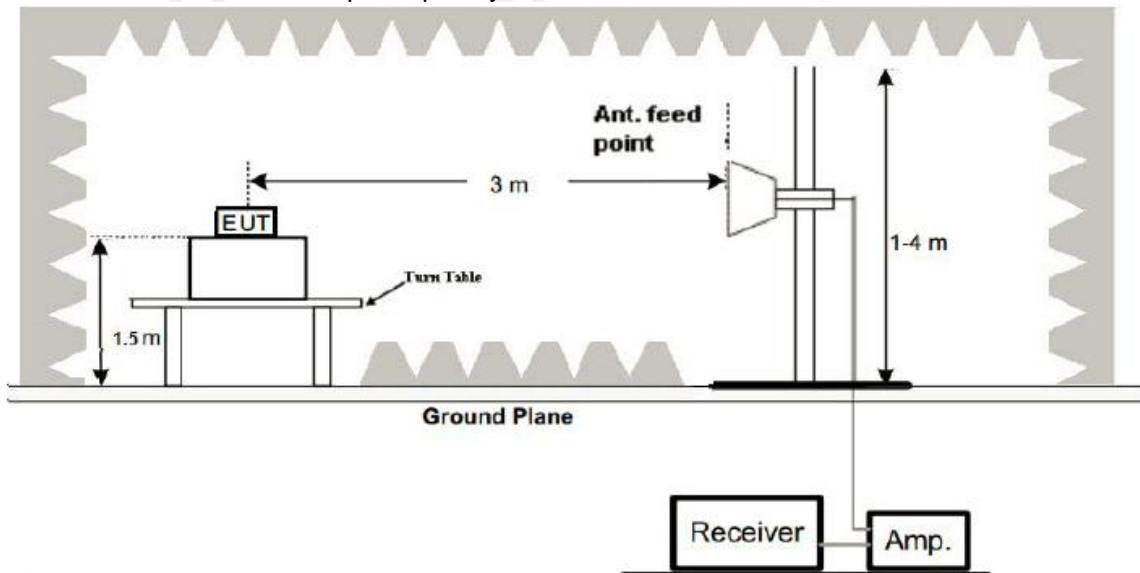
1. Radiated Emission Test-Up Frequency Below 30MHz



2. Radiated Emission Test-Up Frequency 30MHz~1GHz



3. Radiated Emission Test-Up Frequency Above 1GHz



Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground (Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground (Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

The bandwidth of test receiver is set at 120 kHz in 30-1000MHz, and 1MHz in 1000 MHz.

Note:

For battery operated equipment, the equipment tests shall be performed using a new battery.

Test Result

---PASS---

Remark:

1. All the test modes completed for test. The worst case of Radiated Emission is Middle channel, the test data of this mode was reported.
2. By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "Z axis" position was the worst, and test data recorded in this report.
3. The frequency range from 9kHz to 6000 MHz is checked.
4. Below 30MHz, the emissions are lower than 20dB below the allowable limit. Therefore, 9kHz-30MHz data were not recorded.

EUT:		Generator Remote Controller								
Model No.:		GW-RFC3				Power Supply:		DC 3V		
Test Mode:		TX				Test Engineer:		Kahn		
Frequency (MHz)	Reading	Factor	Average	Result(dBμV/m)		Limit(dBμV/m)		Margin(dB)		Polarization
	(dBμV/m)	Corr.	Factor							
	PEAK	(dB)	(dB)	AV	PEAK	AV	PEAK	AV	PEAK	
434.0649	54.50	17.65	-6.29	65.87	72.15	80.83	100.83	-14.96	-28.68	Horizontal
868.1301	29.72	23.67	-6.29	47.1	53.39	60.83	80.83	-13.73	-27.44	
1301.243	56.52	-2.00	-6.29	48.23	54.52	60.83	80.83	-12.60	-26.31	
2603.165	46.66	3.72	-6.29	44.09	50.38	60.83	80.83	-16.74	-30.45	
3035.153	49.68	5.53	-6.29	48.92	55.21	60.83	80.83	-11.91	-25.62	
3470.264	48.18	5.97	-6.29	47.86	54.15	60.83	80.83	-12.97	-26.68	
3905.057	48.82	6.89	-6.29	49.42	55.71	60.83	80.83	-11.41	-25.12	
4340.000	46.85	7.27	-6.29	47.83	54.12	60.83	80.83	-13.00	-26.71	
434.0649	57.42	17.65	-6.29	68.78	75.07	80.83	100.83	-12.05	-25.76	Vertical
868.1301	31.06	23.66	-6.29	48.43	54.72	60.83	80.83	-12.40	-26.11	

1301.021	50.65	-2.00	-6.29	42.36	48.65	60.83	80.83	-18.47	-32.18	Vertical
1735.000	49.87	-0.39	-6.29	43.19	49.48	60.83	80.83	-17.64	-31.35	
2603.112	46.84	3.71	-6.29	44.26	50.55	60.83	80.83	-16.57	-30.28	
3471.006	47.16	5.97	-6.29	46.84	53.13	60.83	80.83	-13.99	-27.70	
3905.000	47.68	6.89	-6.29	48.28	54.57	60.83	80.83	-12.55	-26.26	
4340.000	47.01	7.27	-6.29	47.99	54.28	60.83	80.83	-12.84	-26.55	

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

$$\text{Where Corrected Factor} = \text{Antenna Factor} + \text{Cable Loss} + \text{High Pass Filter Loss} - \text{Amplifier Gain}$$

3. FCC Limit for Average Measurement = $41.67(433.92) - 7083 = 10998.4464 \mu\text{V/m} = 80.83 \text{ dB}\mu\text{V/m}$

4. The spectral diagrams in appendix I display the measurement of peak values.

5. Average value= PK value + Average Factor (duty factor)

6. If the peak-detected amplitude can be shown to comply with the average limit, then it is not necessary to perform a separate average measurement.

7. The EUT is tested radiation emission in three axes(X,Y,Z). The worst emissions are reported in three axes.

8. Pulse Desensitization Correction Factor

$$\text{Pulse Width (PW)} = 0.520 \text{ ms}$$

$$2/\text{PW} = 2/0.52 = 3.846 \text{ kHz}$$

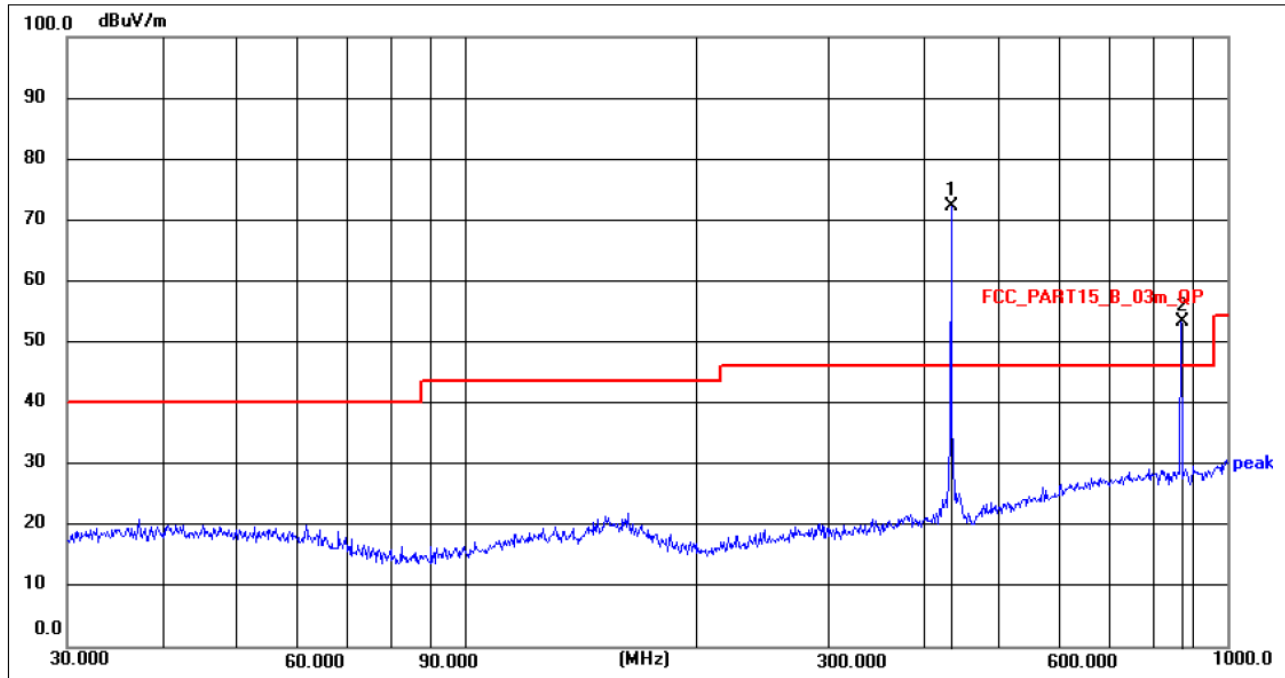
$$\text{RBW (100kHz)} > 2/\text{PW}$$

Therefore PDCF is not needed.



Below 1GHz Test Results:

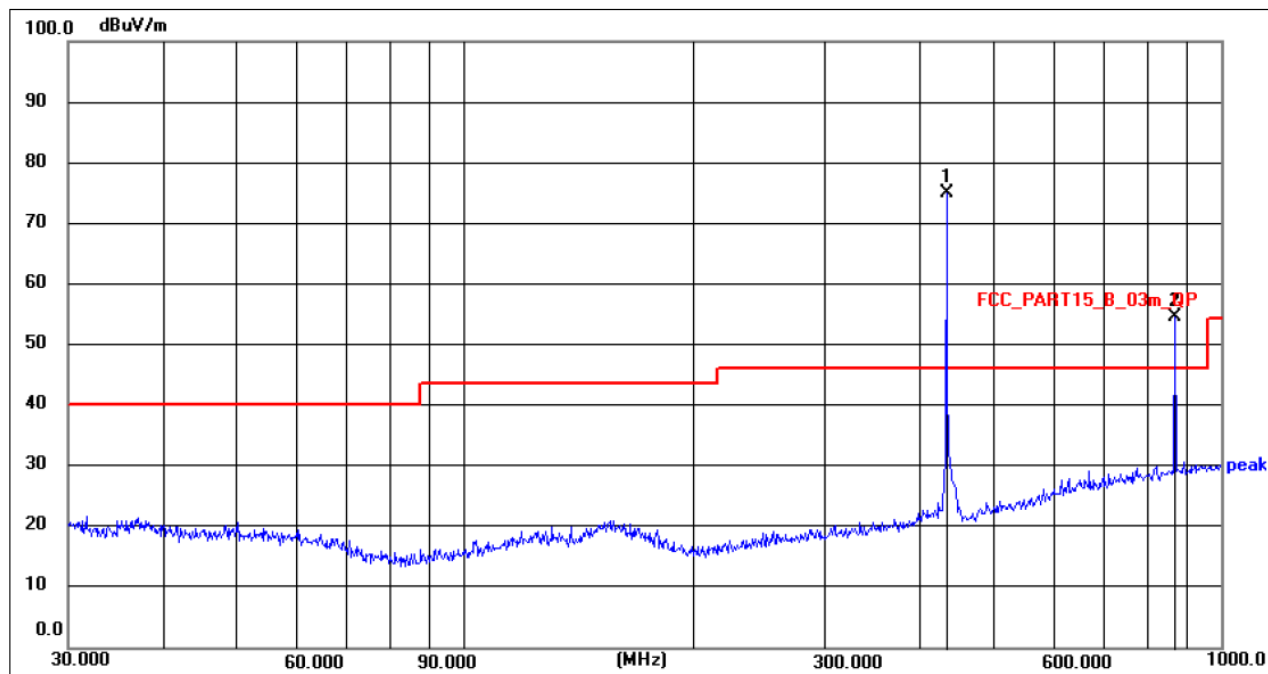
Temperature:	25°C	Relative Humidity:	54%
Test Date:	November 12,2021	Pressure:	1034hPa
Test Voltage:	DC 3V	Polarization:	Horizontal
Test Mode:	TX		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Remark
1 *	434.0649	54.50	17.65	72.15	100.83	-28.68	153	254	peak
2	868.1301	29.72	23.67	53.39	80.83	-27.44	129	166	peak

Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit
Factor=Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	25°C	Relative Humidity:	54%
Test Date:	November 12,2021	Pressure:	1034hPa
Test Voltage:	DC 3V	Polarization:	Vertical
Test Mode:	TX		

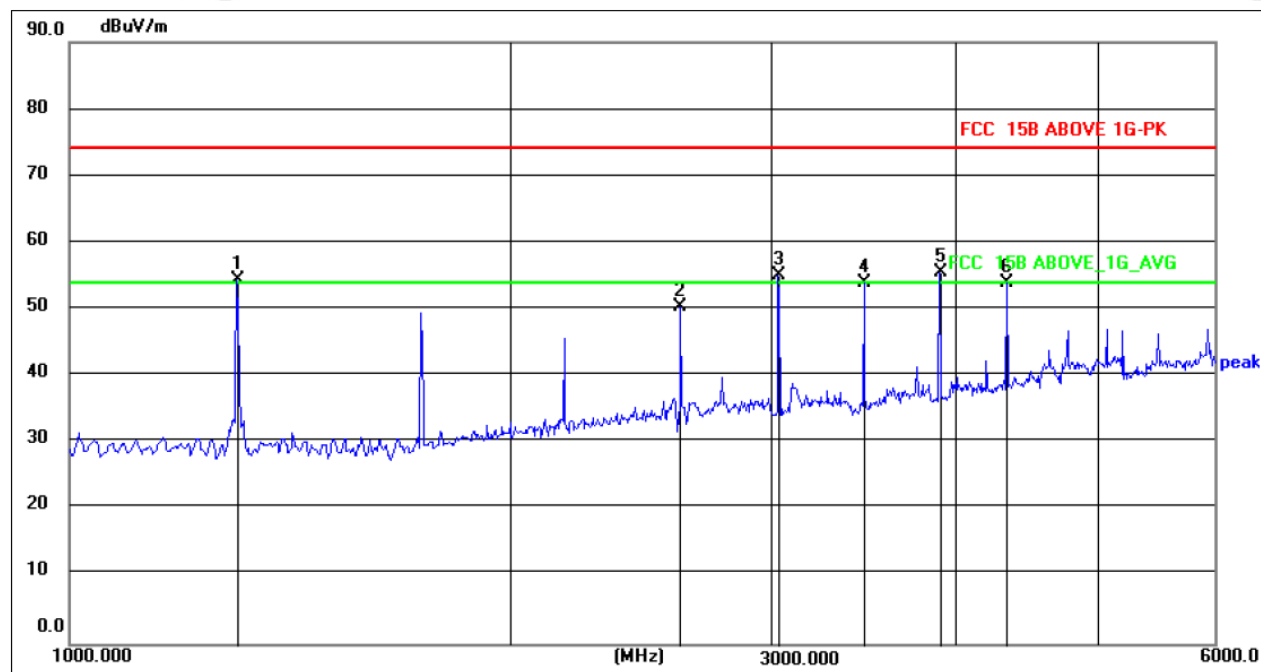


No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Remark
1 *	434.0649	57.42	17.65	75.07	100.83	-25.76	129	116	peak
2	868.1301	31.06	23.66	54.72	80.83	-26.11	151	35	peak

Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit
 Factor=Ant. Factor + Cable Loss – Pre-amplifier

Above 1GHz Test Results:

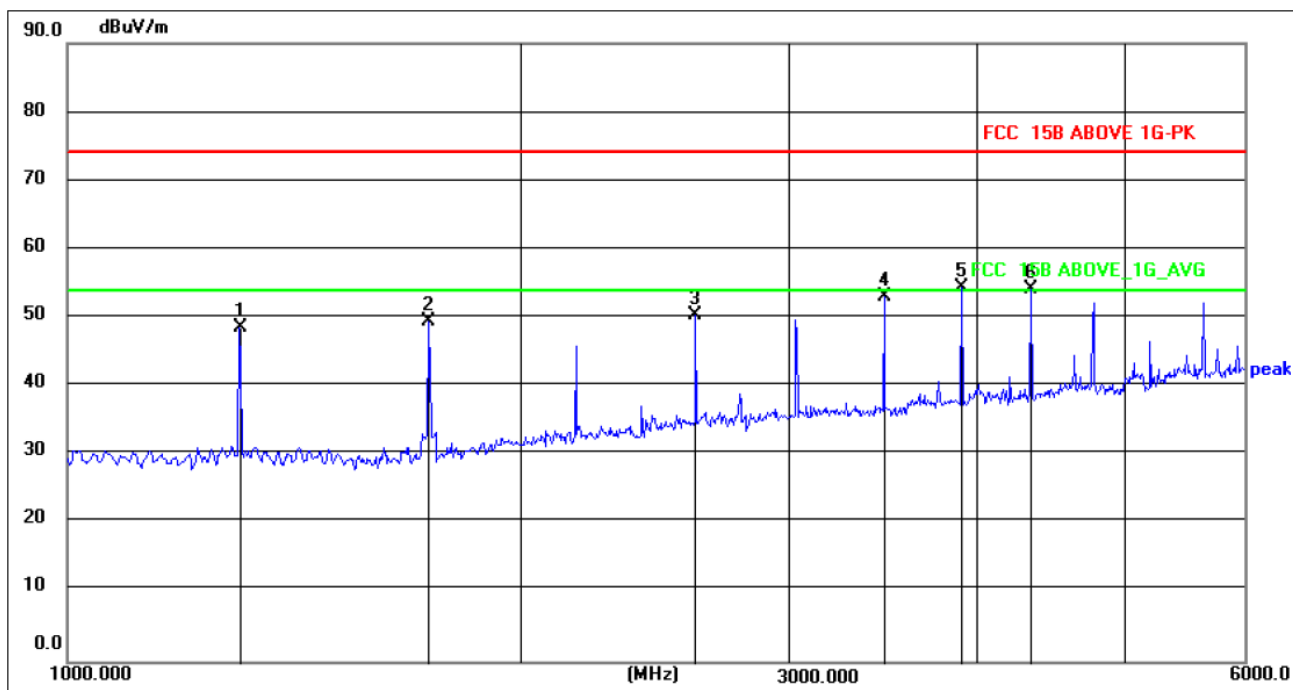
Temperature:	25°C	Relative Humidity:	54%
Test Date:	November 12,2021	Pressure:	1034hPa
Test Voltage:	DC 3V	Polarization:	Horizontal
Test Mode:	TX		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Det.	Height (cm)	Azimuth (deg)	Remark
1	1301.243	56.52	-2.00	54.52	80.83	-26.31	peak	142	35	
2	2603.165	46.66	3.72	50.38	80.83	-30.45	peak	132	321	
3	3035.153	49.68	5.53	55.21	80.83	-25.62	peak	127	352	
4	3470.264	48.18	5.97	54.15	80.83	-26.68	peak	106	304	
5 *	3905.057	48.82	6.89	55.71	80.83	-25.12	peak	119	215	
6	4340.000	46.85	7.27	54.12	80.83	-26.71	peak	138	228	

Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit
Factor=Ant. Factor + Cable Loss – Pre-amplifier

Temperature:	25°C	Relative Humidity:	54%
Test Date:	November 12,2021	Pressure:	1034hPa
Test Voltage:	DC 3V	Polarization:	Vertical
Test Mode:	TX		



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Height (cm)	Azimuth (deg)	Remark
1	1301.021	50.65	-2.00	48.65	80.83	-32.18	105	213	peak
2	1735.000	49.87	-0.39	49.48	80.83	-31.35	116	108	peak
3	2603.112	46.84	3.71	50.55	80.83	-30.28	128	139	peak
4	3471.006	47.16	5.97	53.13	80.83	-27.70	131	211	peak
5 *	3905.000	47.68	6.89	54.57	80.83	-26.26	144	69	peak
6	4340.000	47.01	7.27	54.28	80.83	-26.55	133	312	peak

Remark: Absolute Level= Reading Level+ Factor, Margin= Absolute Level – Limit
Factor=Ant. Factor + Cable Loss – Pre-amplifier

3.4 -20dBOCCUPIED BANDWIDTH

Limit

According to 47 CFR 15.231(c) The bandwidth of emission shall be no wider than 0.25% of the center frequency. Therefore, the bandwidth of the emission limit is $433.92 \text{ MHz} \times 0.25\% = 1084.5 \text{ kHz}$. Bandwidth is determined at the two points 20 dB down from the top of modulated carrier.

Test Procedure

- 1.Set SPA Center Frequency = Fundamental frequency, RBW = 10 kHz, VBW = 30 kHz, Span = 1MHz.
2. Set SPA Max hold, Mark peak, -20 dB.

Test Configuration

The equipment are installed on the bandwidth of emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.



Test Result

---PASS---

Channel Frequency	Measurement		
	20dB bandwidth(kHz)	Limit (kHz)	Result
433.92MHz	58	$0.25\% \times 433.92 \times 1000 = 1084.8$	Pass

The spectral following:



3.5 Release time measurement

LIMIT

According to FCC §15.231(a)(1), a manually operated transmitter shall employ a switch that will auto-matically deactivate the transmitter within not more than 5 seconds of being released.

TEST PROCEDURE

1. Set SPA Center Frequency = Fundamental frequency, RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz.
2. Set EUT as normal operation and press Transmitter button.
3. Set SPA View. Delta Mark time.

Test Configuration

The equipment are installed on Release Time Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

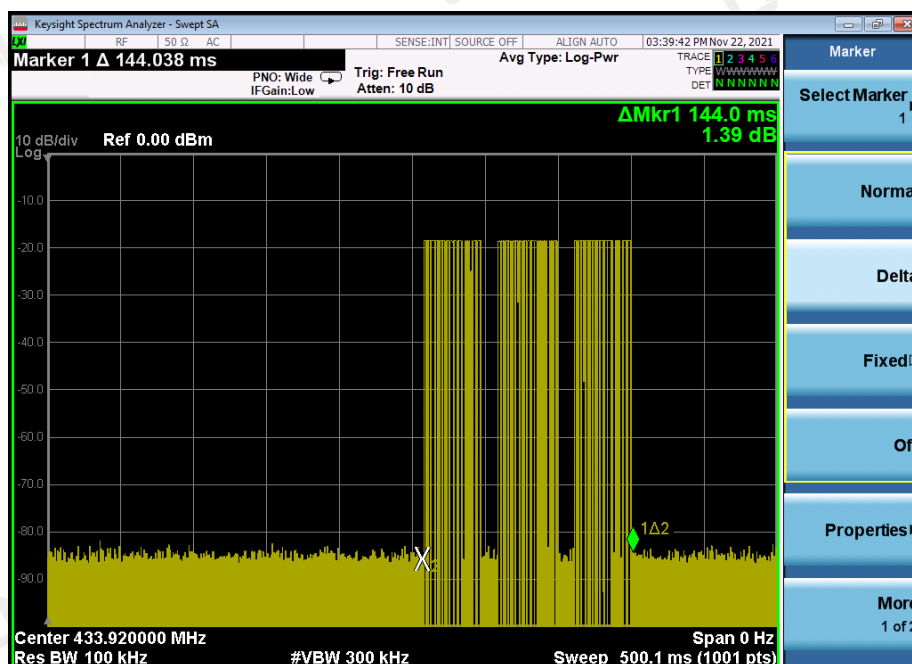


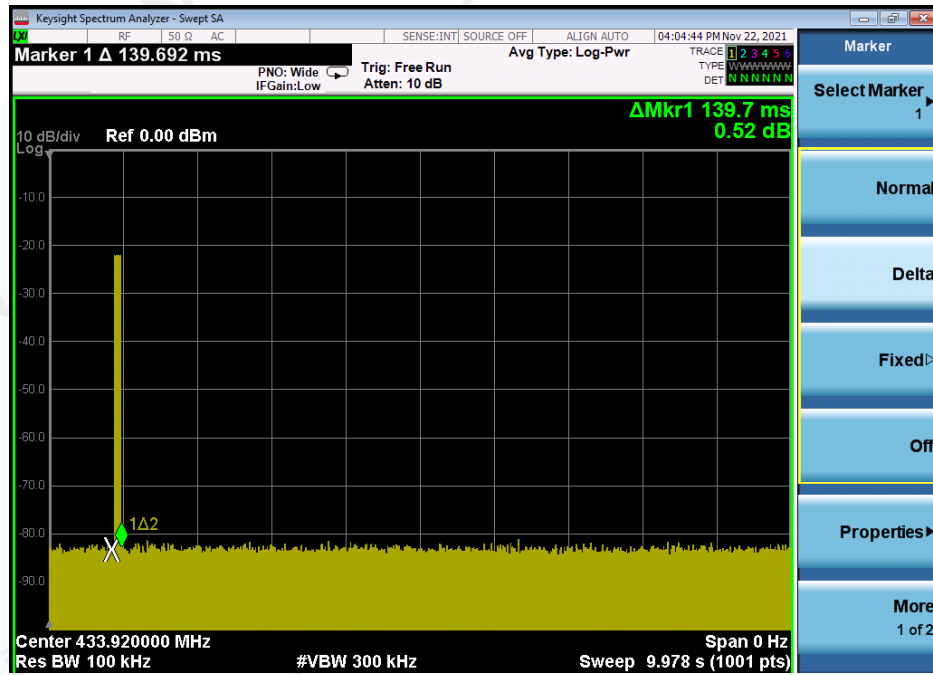
TEST RESULTS

---PASS---

Frequency (MHz)	One transmission time (S)	Limit(S)	Result
433.92	0.144	5	Pass

the duration of a transmission Time = 144.0ms=0.144s





3.6 Average factor measurement

LIMIT

According to ANSI C63.10-2013.

ANSI C63.10-2013 Section 7.5 Unless otherwise specified, when the radiated emission limits are expressed in terms of the average value of the emission, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 s (100 ms). In cases where the pulse train exceeds 0.1 s, the measured field strength shall be determined during a 0.1 s interval.⁶⁴ The following procedure is an example of how the average value may be determined. The average field strength may be found by measuring the peak pulse amplitude (in log equivalent units) and determining the duty cycle correction factor (in dB) associated with the pulse modulation as shown in Equation (10):

Average factor in dB = 20 log (duty cycle)

TEST PROCEDURE

1. Set SPA Center Frequency = Fundamental frequency, RBW = 100 kHz, VBW = 300 kHz, Span = 0 Hz.
2. Set EUT as normal operation and press Transmitter button.
3. Set SPA View. Delta Mark time.
4. The time period over which the duty cycle is measured is 100 milliseconds, or the repetition cycle, whichever is a shorter time frame. The worst case (highest percentage on) duty cycle is used for the calculation

Test Configuration

The equipment are installed on Release Time Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.



TEST RESULTS

---PASS---

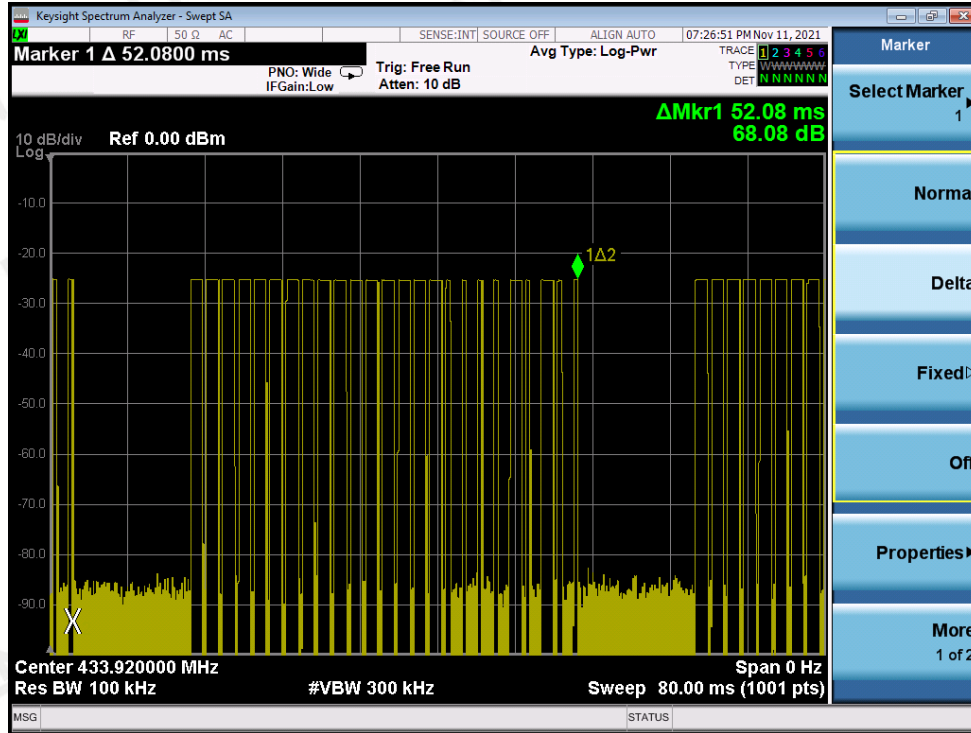
The duty cycle is simply the on time divided by the period:

Effective period of the cycle = $(1.2 \times 18) + (0.52 \times 7) \text{ms} = 25.24 \text{ms}$

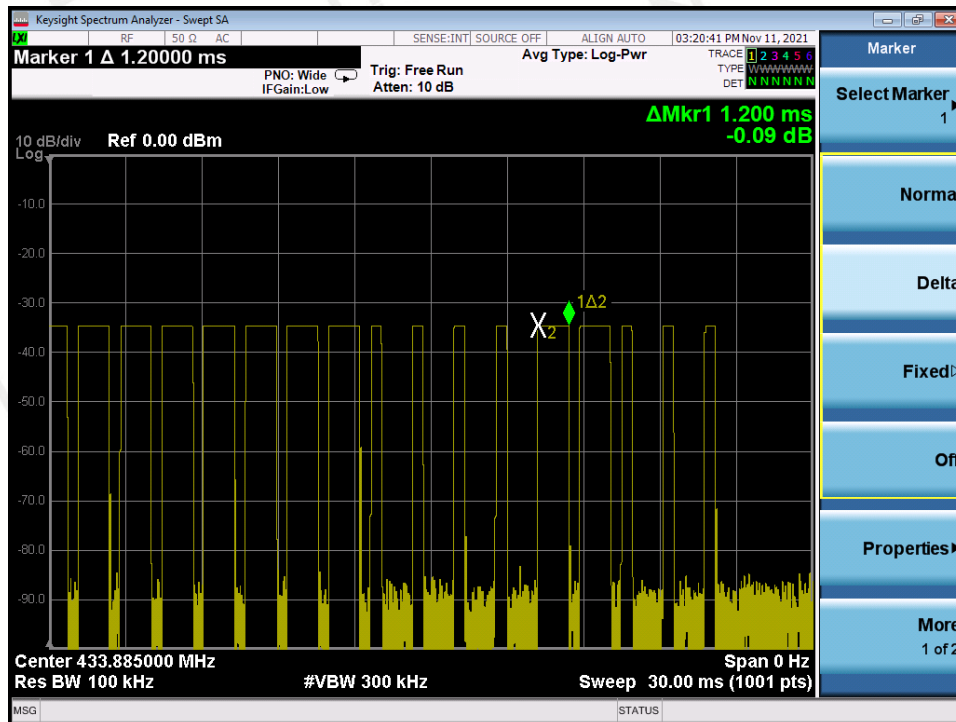
DC = $25.24 \text{ms} / 52.08 \text{ms} = 0.485$

Therefore, the average factor is found by $20 \log 0.485 = -6.29 \text{dB}$

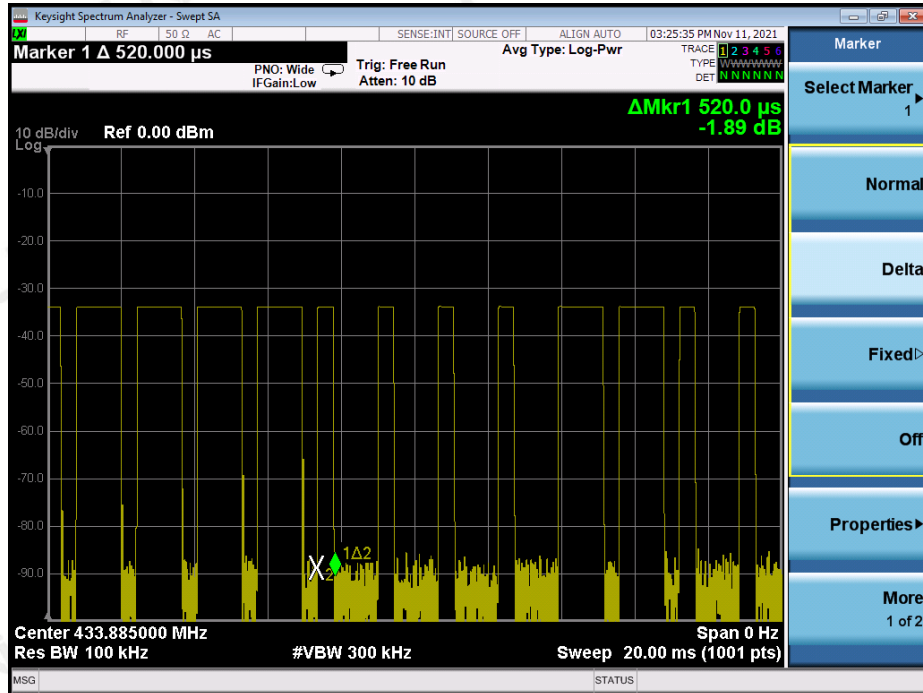
The spectral following.



The graph shows the duration of 'on' signal. From marker 1 to marker 2, duration is 1.2ms.



The graph shows the duration of 'on' signal. From marker 1 to marker 2, duration is 0.52ms.



3.7 ANTENNA REQUIREMENT

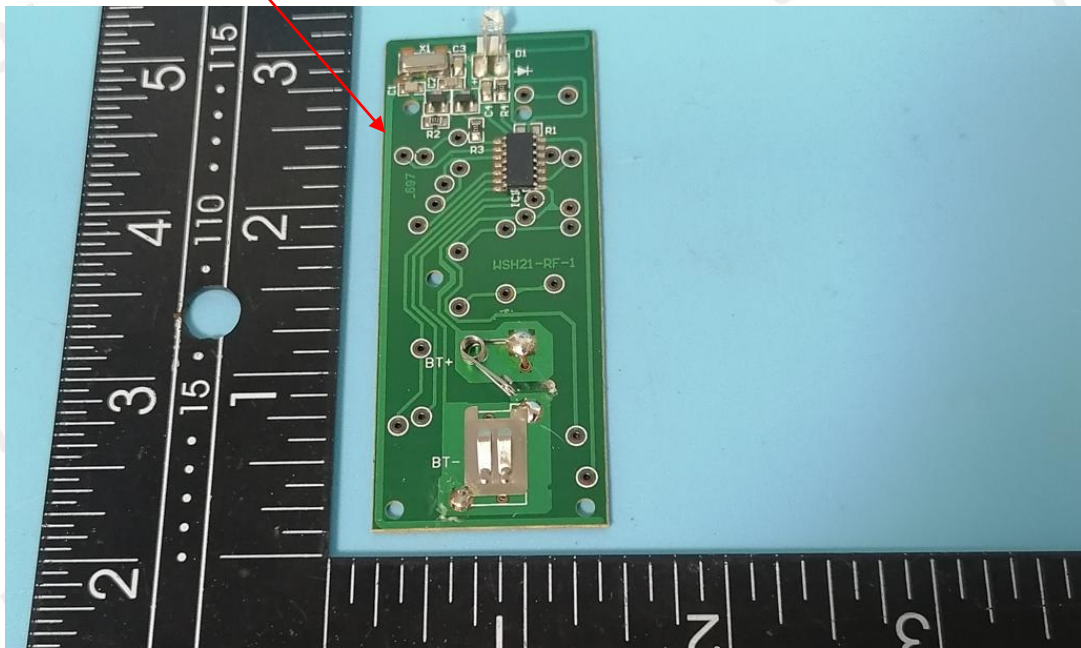
Standard Applicable:

For intentional device, according to FCC 47 CFR Section 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.

Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Antenna gain of EUT is 0dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.

ANTENNA



PHOTOGRAPH OF TEST
Radiated Emission

Below 1GHz



Above 1GHz



*****End of Report*****