FCC TEST REPORT
FOR

Paradox Security Systems Ltd
Wireless Electronic Water Valve
Test Model: WV2M

Prepared for	:	Paradox Security Systems Ltd
Address	:	780 Industriel Blvd, Saint-Eustache, Quebec J7R 5V3, Canada
Prepared by	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
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Date of receipt of test sample	:	December 04, 2025
Number of tested samples	:	2
Sample No.	:	A251201126-1, A251201126-2
Serial number	:	Prototype
Date of Test	:	December 04, 2025 ~ December 26, 2025
Date of Report	:	December 29, 2025

FCC TEST REPORT

FCC CFR 47 PART 15 C (15.247)

Report Reference No.	:	**LCSA12045090EA**
Date of Issue.....	:	December 29, 2025
Testing Laboratory Name.....	:	**Shenzhen LCS Compliance Testing Laboratory Ltd.**
Address.....	:	101, 201 Bldg A & 301 Bldg C, Juji Industrial Park Yabianxueziwei, Shajing Street, Baoan District, Shenzhen, 518000, China
Testing Location/ Procedure.....	:	Full application of Harmonised standards ■ Partial application of Harmonised standards □ Other standard testing method □
Applicant's Name.....	:	**Paradox Security Systems Ltd**
Address.....	:	780 Industriel Blvd, Saint-Eustache, Quebec J7R 5V3, Canada
Test Specification		
Standard.....	:	FCC CFR 47 PART 15 C (15.247)
Test Report Form No.....	:	TRF-4-E-208 A/0
TRF Originator.....	:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Master TRF.....	:	Dated 2011-03

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Test Item Description.....	:	**Wireless Electronic Water Valve**
Trade Mark.....	:	PARADOX
Test Model.....	:	WV2M
Ratings.....	:	Please Refer to Page 6
Result	:	**Pass**

Compiled by:	Supervised by:	Approved by:
Li Huan/ Administrator	Kevin Huang/ RF Manager	Gavin Liang/ Manager

FCC -- TEST REPORT

Test Report No. : LCSA12045090EA	December 29, 2025 Date of issue

Test Model.....	: WV2M
EUT.....	: Wireless Electronic Water Valve
Applicant.....	**: Paradox Security Systems Ltd**
Address.....	: 780 Industriel Blvd, Saint-Eustache, Quebec J7R 5V3, Canada
Telephone.....	: /
Fax.....	: /
Manufacturer.....	**: Paradox Security Systems Ltd**
Address.....	: 780 Industriel Blvd, Saint-Eustache, Quebec J7R 5V3, Canada
Telephone.....	: /
Fax.....	: /
Factory.....	**: Paradox Security Systems Ltd**
Address.....	: 780 Industriel Blvd, Saint-Eustache, Quebec J7R 5V3, Canada
Telephone.....	: /
Fax.....	: /

Test Result	**Pass**

The test report merely corresponds to the test sample.
It is not permitted to copy extracts of these test result without the written permission of the test laboratory.

Revision History

Report Version	Issue Date	Revision Content	Revised By
000	December 29, 2025	Initial Issue	---

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1. GENERAL INFORMATION

1.1 Description of Device (EUT)

EUT	: Wireless Electronic Water Valve
Test Model	: WV2M
Ratings	: 2 x 3.6V 2100mAh ER17335 lithium batteries
Hardware Version	: /
Software Version	: V1.00.010
Frequency Range	: 902.25MHz~927.55MHz
Channel Number	: 254 channels
Channel Spacing	: 100kHz
Modulation Type	: GFSK
Antenna Description	: Internal Antenna, 2.0dBi(Max.)

Note: For a more detailed antenna description, please refer to the antenna specifications or the antenna report provided by the customer.

1.2 Support equipment List

Manufacturer	Description	Model	Serial Number	Certificate
---	---	---	---	---

1.3 External I/O Cable

I/O Port Description	Quantity	Cable
---	---	---

1.4 Description of Test Facility

NVLAP Accreditation Code is 600167-0.
FCC Designation Number is CN5024.
CAB identifier is CN0071.
CNAS Registration Number is L4595.
Test Firm Registration Number: 254912.

The 3m-Semi anechoic test site fulfils CISPR 16-1-4 according to ANSI C63.10:2013 and CISPR 16-1-4:2010 SVSWR requirement for radiated emission above 1GHz.

1.5 Statement of the Measurement Uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. To CISPR 16 – 4 “Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements” and is documented in the LCS quality system acc. To DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

1.6 Measurement Uncertainty

Test Item		Frequency Range	Uncertainty	Note
Radiation Uncertainty	:	9KHz~30MHz	±3.10dB	(1)
		30MHz~200MHz	±2.96dB	(1)
		200MHz~1000MHz	±3.10dB	(1)
		1GHz~26.5GHz	±3.80dB	(1)
		26.5GHz~40GHz	±3.90dB	(1)
Conduction Uncertainty	:	150kHz~30MHz	±1.63dB	(1)
Power disturbance	:	30MHz~300MHz	±1.60dB	(1)
Output power	:	1GHz-40GHz	±0.57dB	(1)
Occupied Channel Bandwidth	:	1GHz-40GHz	±5%	(1)
Conducted RF Spurious Emission	:	9kHz-40GHz	±1.80dB	(1)
Emissions in Restricted Bands	:	1GHz-40GHz	±2.47dB	(1)

(1). This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.7 Description of Test Modes

The EUT has been tested under operating condition.
This test was performed with EUT in X, Y, Z position and the worst case was found when EUT in X position.
All test modes were tested, only the result of the worst case was recorded in the report.
***Note: Using a temporary antenna connector for the EUT when conducted measurements are performed.

Operation Frequency each of channel					
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	902.25	9	903.05	248	926.95
2	902.35	10	903.15	249	927.05
3	902.45	...	...	250	927.15
4	902.55	127	914.85	251	927.25
5	902.65	...	...	252	927.35
6	902.75	245	926.65	253	927.45
7	902.85	246	926.75	254	927.55
8	902.95	247	926.85		

frequency, and the highest frequency of channel were selected to perform the test, and the selected channel see below:

Mode of Operations	Channel	Frequency Range (MHz)
GFSK	1	902.25
	127	914.85
	254	927.55

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2020, FCC CFR PART 15C 15.207, 15.209 and 15.247.

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The EUT was operated in the normal operating mode for Hopping Numbers and Dwell Time test and a continuous transmits mode for other tests.

According to its specifications, the EUT must comply with the requirements of the Section 15.205, 15.209, 15.247 under the FCC Rules Part 15 Subpart C.

2.3 General Test Procedures

2.3.1 Conducted Emissions(N/A)

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 6.1.1 of ANSI C63.10-2020 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using Quasi-peak and average detector modes.

2.3.2 Radiated Emissions

The EUT is placed on a turn table, which is 0.8 m above ground plane below 1GHz and 1.5 m above ground plane above 1GHz. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 6.4 of ANSI C63.10-2020

2.4. Test Sample

The application provides 2 samples to meet requirement;

Sample Number	Description
Sample 1(A251201126-1)	Engineer sample – continuous transmit
Sample 2(A251201126-2)	Normal sample – Intermittent transmit

3. SYSTEM TEST CONFIGURATION

3.1 Justification

The system was configured for testing in a continuous transmits condition.

3.2 EUT Exercise Software

The system was configured for testing in a continuous transmits condition and change test channels by software provided by application. Power setting Default.

3.3 Special Accessories

Manufacturer	Description	Model	Serial Number	Certificate
--	--	--	--	--

3.4 Block Diagram/Schematics

Please refer to the related document.

3.5 Equipment Modifications

Shenzhen LCS Compliance Testing Laboratory Ltd. has not done any modification on the EUT.

3.6 Test Setup

Please refer to the test setup photo.

4. SUMMARY OF TEST RESULTS

Applied Standard: FCC Part 15 Subpart C				
FCC Rules	Description of Test	Test Sample	Result	Remark
§15.247(a)(1)	20dB Bandwidth	Sample 1	Compliant	Appendix A.1
§15.247(b)(2)	Maximum Peak Conducted Output Power	Sample 1	Compliant	Appendix A.2
§15.247(a)(1)	Frequency Separation	Sample 1	Compliant	Appendix A.3
§15.247(a)(1)	Time Of Occupancy (Dwell Time)	Sample 1	Compliant	Appendix A.4
§15.247(a)(1)	Number Of Hopping Frequency	Sample 1	Compliant	Appendix A.5
§15.209(a)	Radiated Spurious Emissions	Sample 1 Sample 2	Compliant	Note 1
§15.247(d)	Band Edges Measurements and Conducted Spurious Emissions	Sample 1	Compliant	Appendix A.6 Appendix A.7
/	On Time and Duty Cycle	Sample 1	/	N/A
§15.205	Emissions at Restricted Band	Sample 2	Compliant	Note 1
§15.207(a)	AC Mains Conducted Emissions	N/A	N/A	N/A
§15.203	Antenna Requirements	Sample 1	Compliant	Note 1
§15.247(i)§1.1310 §15.247(i)§2.1091	RF Exposure	N/A	Compliant	Note 2

Remark:
1. Note 1 – Test results inside test report;
2. Note 2 – Test results in other test report (RF Exposure Evaluation);
3. N/A - Not Applicable!!!

5. SUMMARY OF TEST EQUIPMENT

Item	Equipment	Manufacturer	Model No.	Serial No.	Cal Date	Due Date
1	Power Meter	R&S	NRVS	100444	2025-05-22	2026-05-21
2	Power Sensor	R&S	NRP-Z81	100458	2025-05-22	2026-05-21
3	Power Sensor	R&S	U2021	10057	2025-05-22	2026-05-21
4	Test Software	MWRFtest	MTS 8310	/	N/A	N/A
5	RF Control Unit	MWRFtest	MW100-RFCB	/	2025-11-07	2026-11-06
6	MXA Signal Analyzer	Agilent	N9020A	MY53300304	2025-05-22	2026-05-21
7	DC Power Supply	Agilent	E3642A	N/A	2025-09-27	2026-09-26
8	EMI Test Software	Farad	EZ-EMC	Ver. EMC-CON 3A1.1+	N/A	N/A
9	3m Semi Anechoic Chamber	Maorui	966	/	2023-10-12	2026-10-11
10	Positioning Controller	Max-Full	MF7802BS	MF780208586	N/A	N/A
11	Active Loop Antenna	SCHWARZBECK	FMZB 1519B	00005	2024-07-13	2027-07-12
12	By-log Antenna	SCHWARZBECK	VULB9163	9163-470	2024-08-03	2027-08-02
13	Horn Antenna	SCHWARZBECK	BBHA 9120D	9120D-1925	2024-07-13	2027-07-12
14	Broadband Horn Antenna	SCHWARZBECK	BBHA 9170	791	2024-07-13	2027-07-12
15	Broadband Preamplifier	SCHWARZBECK	BBV9719	9719-025	2024-07-30	2027-07-29
16	EMI Test Receiver	R&S	ESR 7	101181	2025-05-22	2026-05-21
17	RS SPECTRUM ANALYZER	R&S	FSP40	100503	2025-05-22	2026-05-21
18	Low-frequency amplifier	SchwarzZBECK	BBV9745	00253	2025-09-27	2026-09-26
19	High-frequency amplifier	JS Denki Pte	PA0118-43	JSPA21009	2025-09-27	2026-09-26
20	6dB Attenuator	/	100W/6dB	1172040	2025-05-22	2026-05-21
21	3dB Attenuator	/	2N-3dB	/	2025-09-28	2026-09-27
22	EMI Test Receiver	R&S	ESPI	101940	2025-05-22	2026-05-21
23	Artificial Mains	R&S	ENV216	101479	2025-05-23	2026-05-22
24	10dB Attenuator	SCHWARZBECK	MTS-IMP-136	261115-001-0032	2025-05-22	2026-05-21
25	EMI Test Software	Farad	EZ-EMC	Ver. EMC-CON 3A1.1+	N/A	N/A
26	Antenna Mast	Max-Full	MFA-515BSN	1308572	N/A	N/A
27	Pulse Limiter	R&S	ESH3-Z2	102750	2025-05-23	2026-05-22

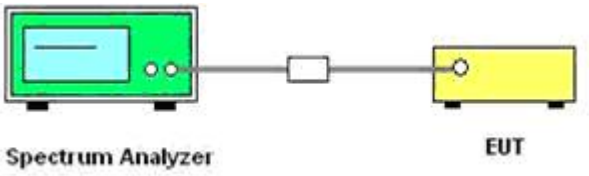
6. MEASUREMENT RESULTS

6.1. Frequency Separation and 20 dB Bandwidth

6.1.1 Limit

According to §15.247(a), Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

6.1.2 Block Diagram of Test Setu



6.1.3 Test Procedure

Frequency separation test procedure：

1). Place the EUT on the table and set it in transmitting mode.
2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.
3). Set center frequency of Spectrum Analyzer = middle of hopping channel.
4). Set the Spectrum Analyzer as RBW = 100 kHz, VBW = 300 kHz, Span = wide enough to capture the peaks of two adjacent channels, Sweep = auto.
5). Max hold, mark 2 peaks of hopping channel and record the 2 peaks frequency.

20dB bandwidth test procedure：

1). Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel.
2). RBW ≥1% of the 20 dB bandwidth, VBW ≥RBW.
3). Detector function = peak.
4). Trace = max hold.

6.1.4 Test Results

6.1.4.1 20dB Bandwidth

PASS

Please refer to Appendix A.1

Remark:

1. *Test results including cable loss;*
2. *Measured 20dB Bandwidth at difference Packet Type for each mode and recorded worst case for each mode.*

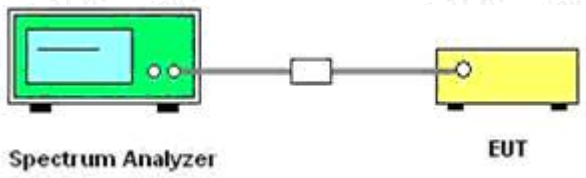
6.1.4.2 Frequency Separation

PASS

Please refer to Appendix A.3

6.2. Maximum Peak Conducted Output Power Measurement

6.2.1 Block Diagram of Test Setup



6.2.2 Limit

According to §15.247(b)(2), For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels, as permitted under paragraph (a)(1)(i) of this section.

6.2.3 Test Procedure

The transmitter output is connected to the spectrum.

6.2.4. Test Procedures

1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
2) RBW > 20 dB bandwidth of the emission being measured.
3) VBW ≥ RBW.
4) Sweep: Auto.
5) Detector function: Peak.
6) Trace: Max hold.

6.2.5 Test Results

PASS

Please refer to Appendix A.2

Remark:

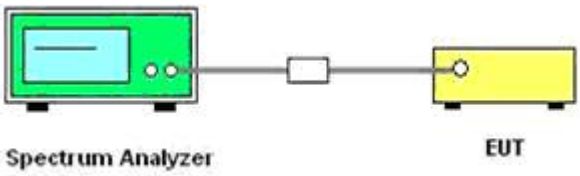
1. *Test results including cable loss;*

6.3. Time of Occupancy (Dwell Time)

6.3.1 Limit

According to §15.247(a)(1), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

6.3.2 Block Diagram of Test Setup



6.3.3 Test Procedure

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set center frequency of Spectrum Analyzer = operating frequency.

4). Set the Spectrum Analyzer as RBW=1MHz, VBW=3MHz, Span = 0Hz, Sweep = auto.

5). Repeat above procedures until all frequency measured was complete.

6.3.4 Test Results

PASS

Please refer to Appendix A.4

Remark:

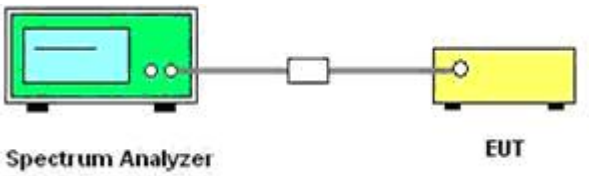
1. Test results including cable loss;

6.4. Number of Hopping Frequency

6.4.1 Limit

According to §15.247(a)(1), For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies.

6.4.2 Block Diagram of Test Setup



6.4.3 Test Procedure

1). Place the EUT on the table and set it in transmitting mode.

2). Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the Spectrum Analyzer.

3). Set Spectrum Analyzer Start=900MHz, Stop = 930MHz, Sweep = auto.

4). Set the Spectrum Analyzer as RBW=100KHz, VBW=300KHz.

5). Max hold, view and count how many channel in the band.

6.4.4 Test Results

PASS

Please refer to Appendix A.5

Remark:

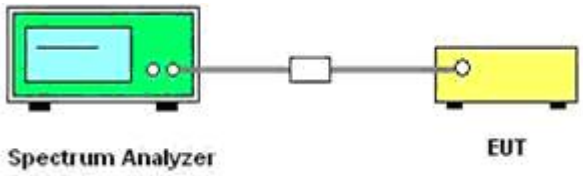
1. Test results including cable loss;

6.5. Band Edges Measurements and Conducted Spurious Emissions Test

6.5.1 Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required.

6.5.2 Block Diagram of Test Setup



6.5.3 Test Procedure

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 300 KHz.

Measurements are made over the 30 MHz to 25GHz range with the transmitter set to the lowest, middle, and highest channels

6.5.4 Test Results of Conducted Spurious Emissions

No non-compliance noted. Only record the worst test result in this report. The test data refer to the following page.

PASS

Please refer to Appendix A.6 for Band Edges Measurements.

Please refer to Appendix A.7 for Conducted Spurious Emission.

Remark:

1. Test results including cable loss;

6.6. Radiated Emissions Measurement

6.6.1. Standard Applicable

15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
\1\ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293.	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(\2\)
13.36-13.41			

\1\ Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

\2\ Above 38.6

According to §15.247 (d): 20dBc in any 100 kHz bandwidth outside the operating frequency band. In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequencies (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009~0.490	2400/F(KHz)	300
0.490~1.705	24000/F(KHz)	30
1.705~30.0	30	30
30~88	100	3
88~216	150	3
216~960	200	3
Above 960	500	3

6.6.2. Measuring Instruments and Setting

Please refer to of equipment list in this report. The following table is the setting of spectrum analyzer and receiver.

Spectrum Parameter	Setting
Attenuation	Auto
Start Frequency	1000 MHz
Stop Frequency	10th carrier harmonic
RB / VB (Emission in restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/T kHz for Average
RB / VB (Emission in non-restricted band)	1MHz / 1MHz for Peak, 1 MHz / 1/T kHz for Average

Receiver Parameter	Setting
Attenuation	Auto
Start ~ Stop Frequency	9kHz~150kHz / RB/VB 200Hz/1KHz for QP/AVG
Start ~ Stop Frequency	150kHz~30MHz / RB/VB 9kHz/30KHz for QP/AVG
Start ~ Stop Frequency	30MHz~1000MHz / RB/VB 120kHz/1MHz for QP

6.6.3. Test Procedures

1) Sequence of testing 9 kHz to 30 MHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 0.8 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions.

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna height is 1.0 meter.

--- At each turntable position the analyzer sweeps with peak detection to find the maximum of all emissions

Final measurement:

--- Identified emissions during the premeasurement the software maximizes by rotating the turntable position (0° to 360°) and by rotating the elevation axes (0° to 360°).

--- The final measurement will be done in the position (turntable and elevation) causing the highest emissions with QPK detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

2) Sequence of testing 30 MHz to 1 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a table with 0.8 m height is used, which is placed on the ground plane.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height changes from 1 to 4 meter.

--- At each turntable position, antenna polarization and height the analyzer sweeps three times in peak to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter.

--- The final measurement will be done with QP detector with an EMI receiver.

--- The final levels, frequency, measuring time, bandwidth, antenna height, antenna polarization, turntable angle, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

3) Sequence of testing 1 GHz to 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 3 meter.

--- The EUT was set into operation.

Premeasurement:

--- The turntable rotates from 0° to 315° using 45° steps.

--- The antenna is polarized vertical and horizontal.

--- The antenna height scan range is 1 meter to 4 meter.

--- At each turntable position and antenna polarization the analyzer sweeps with peak detection to find the maximum of all emissions.

Final measurement:

--- The final measurement will be performed with minimum the six highest peaks.

--- According to the maximum antenna and turntable positions of premeasurement the software maximize the peaks by changing turntable position (± 45°) and antenna movement between 1 and 4 meter. This procedure is repeated for both antenna polarizations.

--- The final measurement will be done in the position (turntable, EUT-table and antenna polarization) causing the highest emissions with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, turntable position, EUT-table position, antenna polarization, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement with marked maximum final measurements and the limit will be stored.

4) Sequence of testing above 18 GHz

Setup:

--- The equipment was set up to simulate a typical usage like described in the user manual or described by manufacturer.

--- If the EUT is a tabletop system, a rotatable table with 1.5 m height is used.

--- If the EUT is a floor standing device, it is placed on the ground plane with insulation between both.

--- Auxiliary equipment and cables were positioned to simulate normal operation conditions

--- The AC power port of the EUT (if available) is connected to a power outlet below the turntable.

--- The measurement distance is 1 meter.

--- The EUT was set into operation.

Premeasurement:

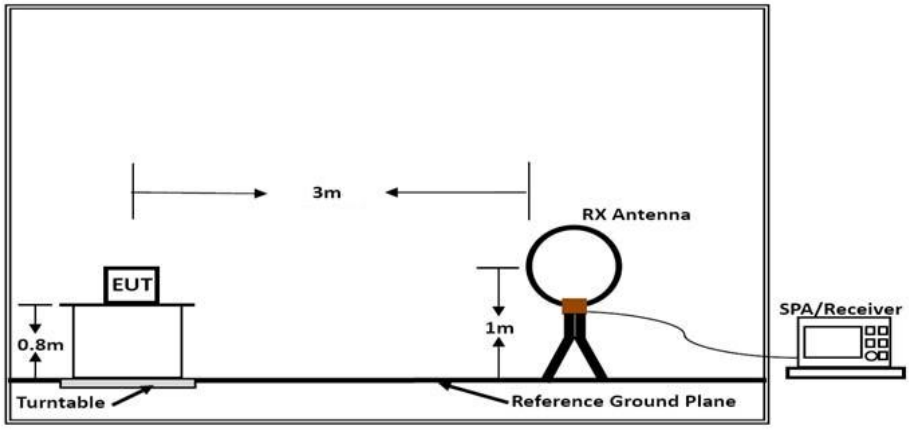
--- The antenna is moved spherical over the EUT in different polarizations of the antenna.

Final measurement:

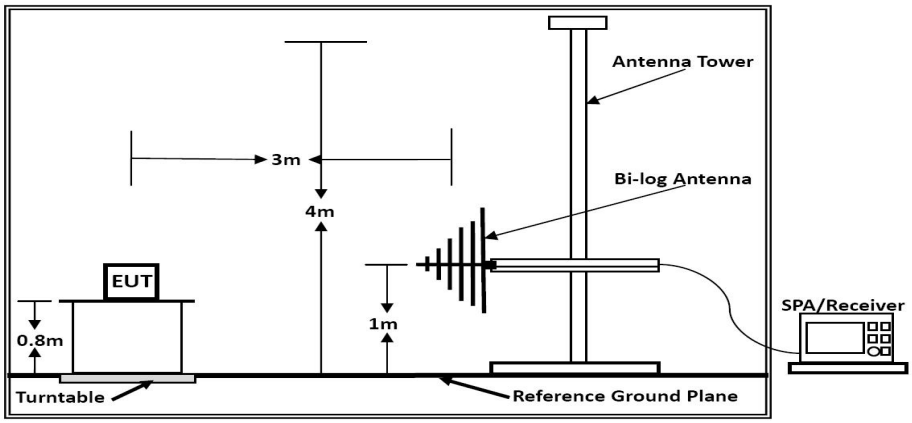
--- The final measurement will be performed at the position and antenna orientation for all detected emissions that were found during the premeasurements with Peak and Average detector.

--- The final levels, frequency, measuring time, bandwidth, correction factor, margin to the limit and limit will be recorded. Also a plot with the graph of the premeasurement and the limit will be stored.

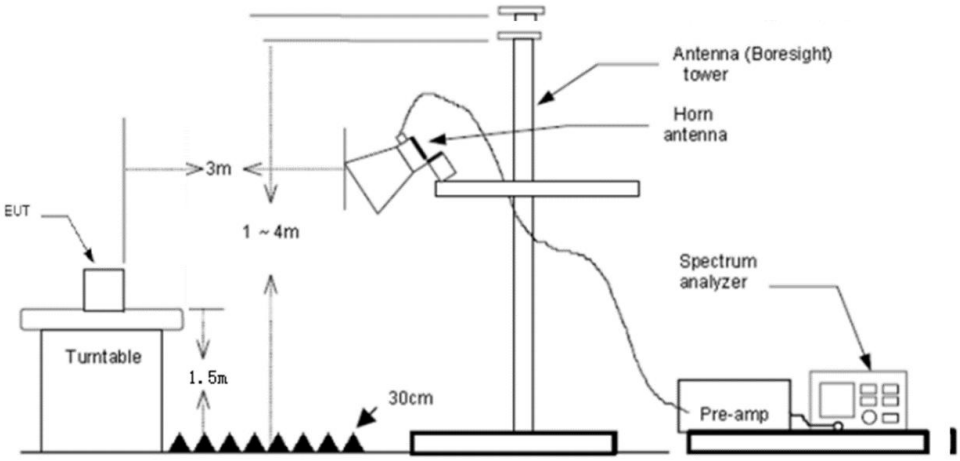
6.6.4. Test Setup Layout



Below 30MHz



Below 1GHz



Above 10 GHz shall be extrapolated to the specified distance using an extrapolation factor of 20 dB/decade form 3m to 1.5m.

6.6.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.6.6. Results of Radiated Emissions (9 KHz~30MHz)

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Billy Yu	Configurations	

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Over Limit (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

6.6.7. EUT Operation during Test

The field strength is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS (dBuV/m) = RA (dBuV) + AF (dB/m) + CL (dB) – AG (dB)

Where FS = Field Strength	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	AG = Amplifier Gain
AF = Antenna Factor	

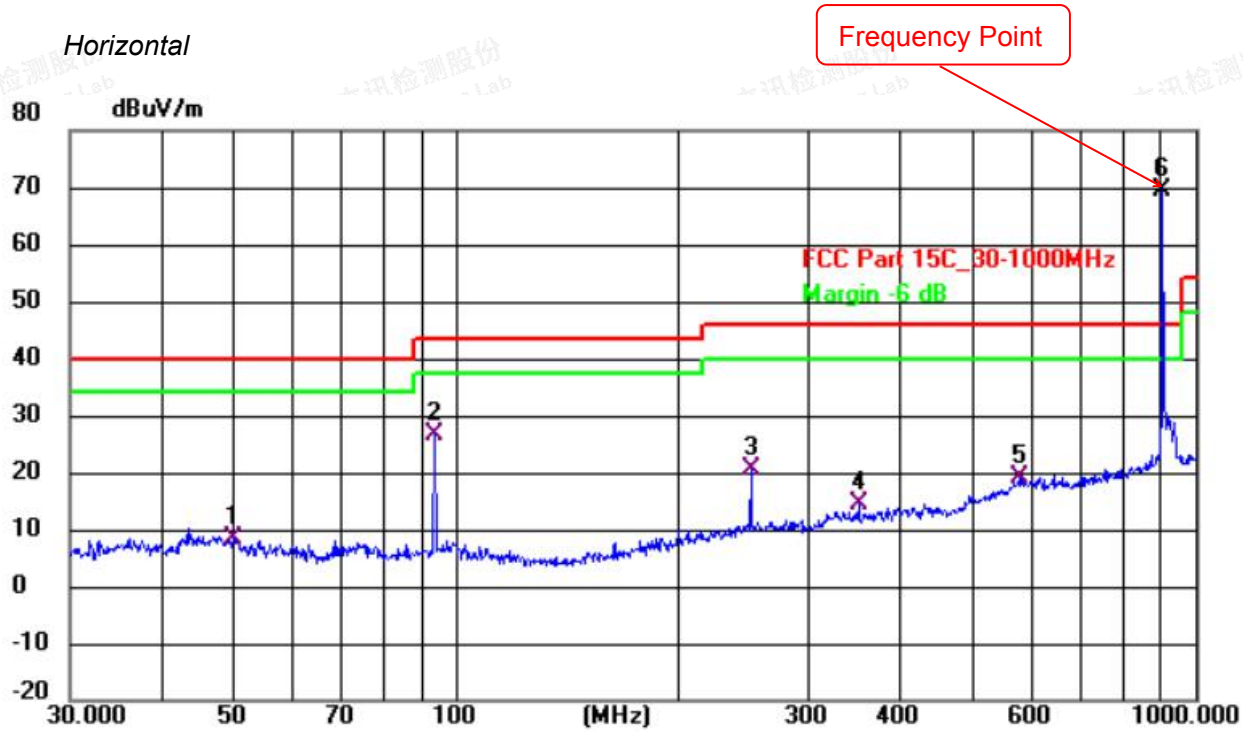
6.6.8. Results of Radiated Emissions (30 MHz~1000 MHz)

Temperature	23.8℃	Humidity	52.1%
Test Engineer	Billy Yu		

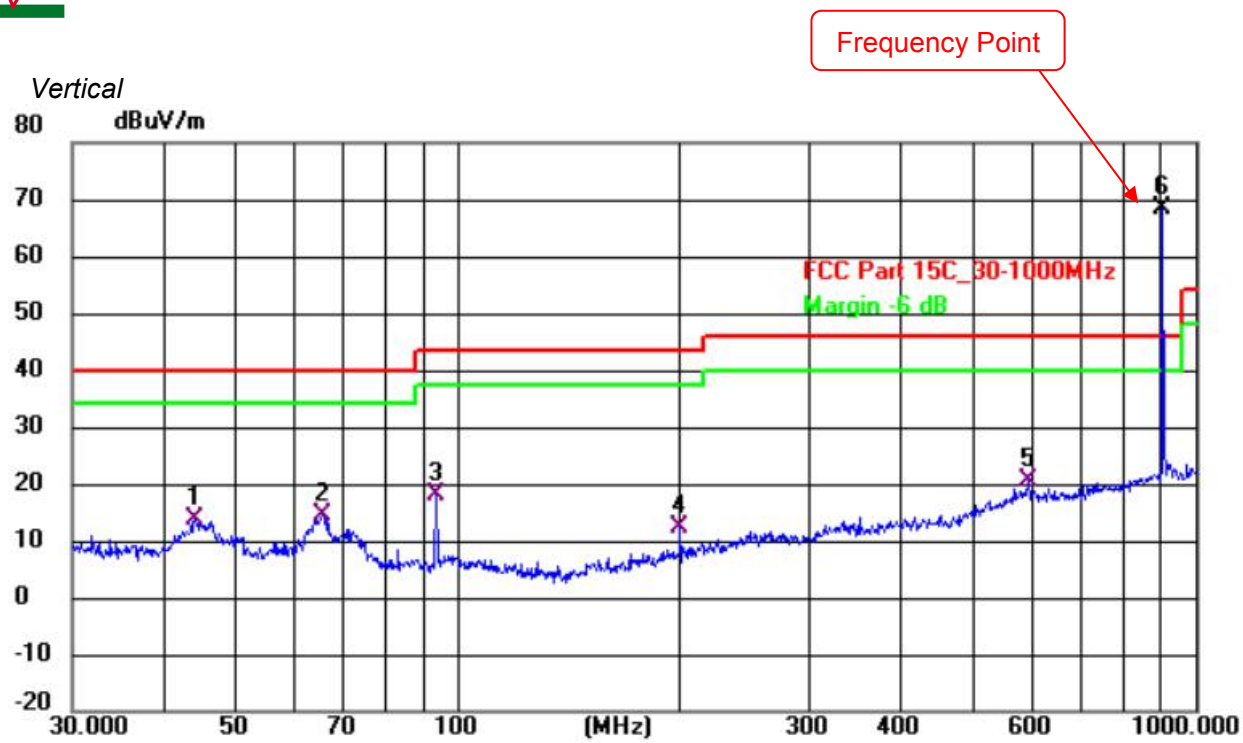
PASS.

The test data please refer to following page.

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		50.0566	25.79	-17.24	8.55	40.00	-31.45	QP	
2		93.4402	46.77	-20.19	26.58	43.50	-16.92	QP	
3		250.3012	38.36	-17.84	20.52	46.00	-25.48	QP	
4		350.4768	28.76	-14.14	14.62	46.00	-31.38	QP	
5		576.6443	29.06	-10.05	19.01	46.00	-26.99	QP	
6	*	902.2500	75.77	-6.22	69.55	46.00	23.55	peak	



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		44.1202	31.92	-18.21	13.71	40.00	-26.29	QP	
2		65.5727	35.01	-20.50	14.51	40.00	-25.49	QP	
3		93.4402	38.07	-19.97	18.10	43.50	-25.40	QP	
4		199.9856	30.83	-18.39	12.44	43.50	-31.06	QP	
5		593.0496	30.46	-9.77	20.69	46.00	-25.31	QP	
6	*	902.2500	75.14	-6.81	68.33	46.00	22.33	peak	

Note:

1). Pre-scan all modes and recorded the worst case results in this report (Low Channel).

2). Emission level (dBuV/m) = 20 log Emission level (uV/m).

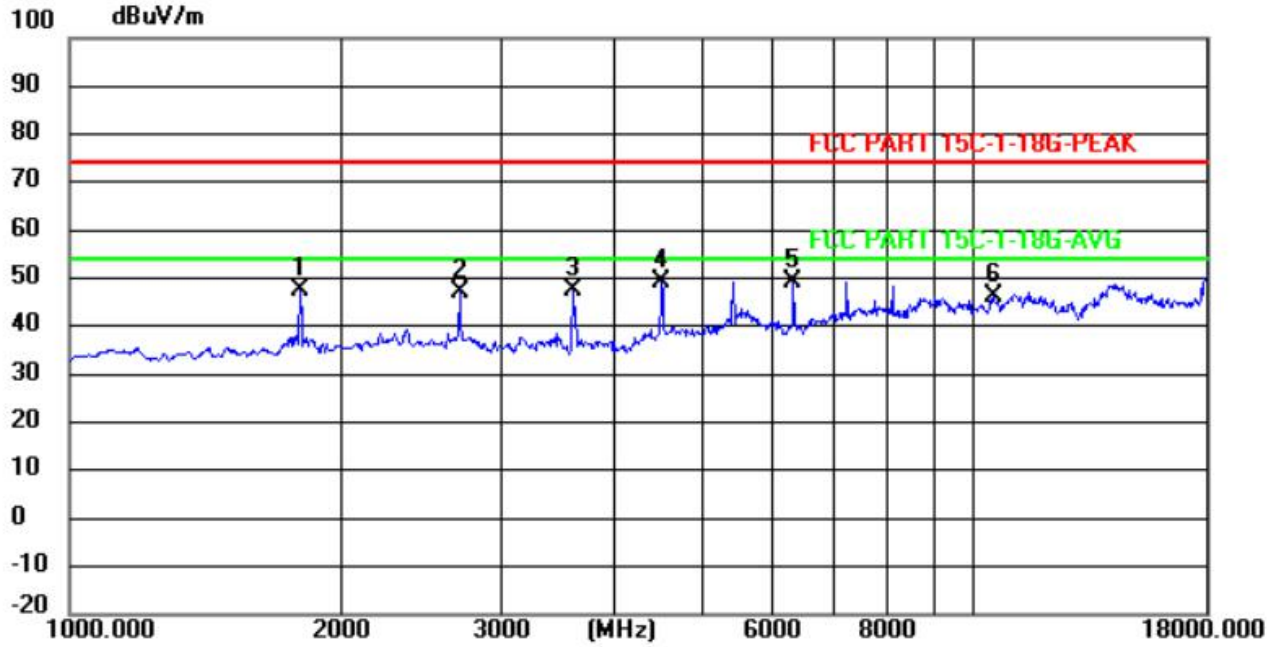
3). Level = Reading + Factor, Margin = Level–Limit, Factor = Antenna Factor + Cable Loss - Preamp Factor.

6.6.9. Results of Radiated Emissions (1 GHz~26 GHz)

Note: All the modes have been tested and recorded worst mode in the report.

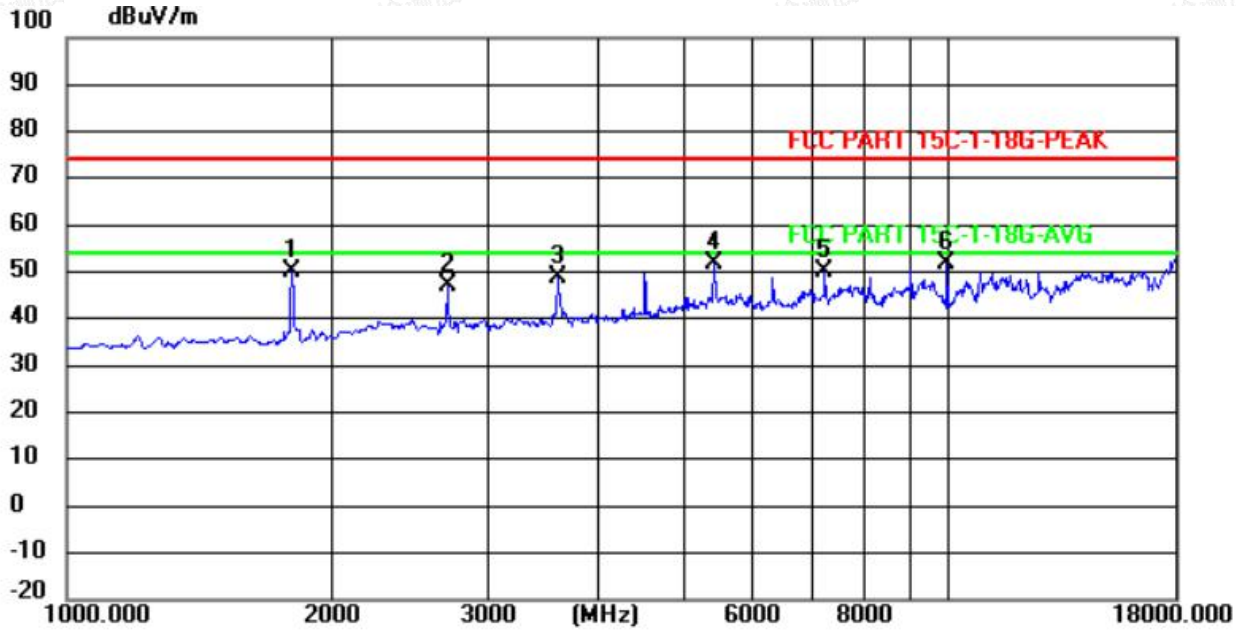
Channel 1 / 902.25MHz

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		1799.0000	59.52	-12.14	47.38	74.00	-26.62	peak	
2		2700.0000	55.60	-8.73	46.87	74.00	-27.13	peak	
3		3601.0000	54.51	-6.91	47.60	74.00	-26.40	peak	
4	*	4519.0000	53.74	-4.32	49.42	74.00	-24.58	peak	
5		6321.0000	49.94	-0.54	49.40	74.00	-24.60	peak	
6		10503.000	39.04	7.13	46.17	74.00	-27.83	peak	

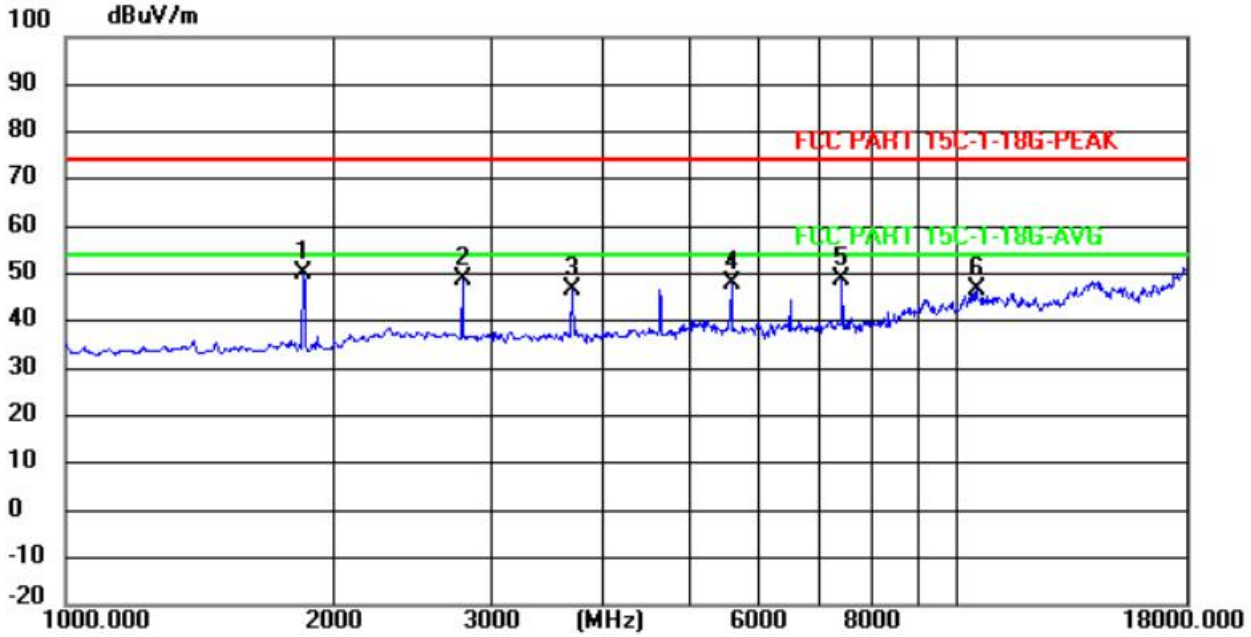
Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		1799.0000	62.15	-12.14	50.01	74.00	-23.99	peak	
2		2700.0000	55.74	-8.73	47.01	74.00	-26.99	peak	
3		3601.0000	55.72	-6.91	48.81	74.00	-25.19	peak	
4		5420.0000	54.00	-2.23	51.77	74.00	-22.23	peak	
5		7222.0000	48.14	1.90	50.04	74.00	-23.96	peak	
6	*	9925.0000	46.89	5.00	51.89	74.00	-22.11	peak	

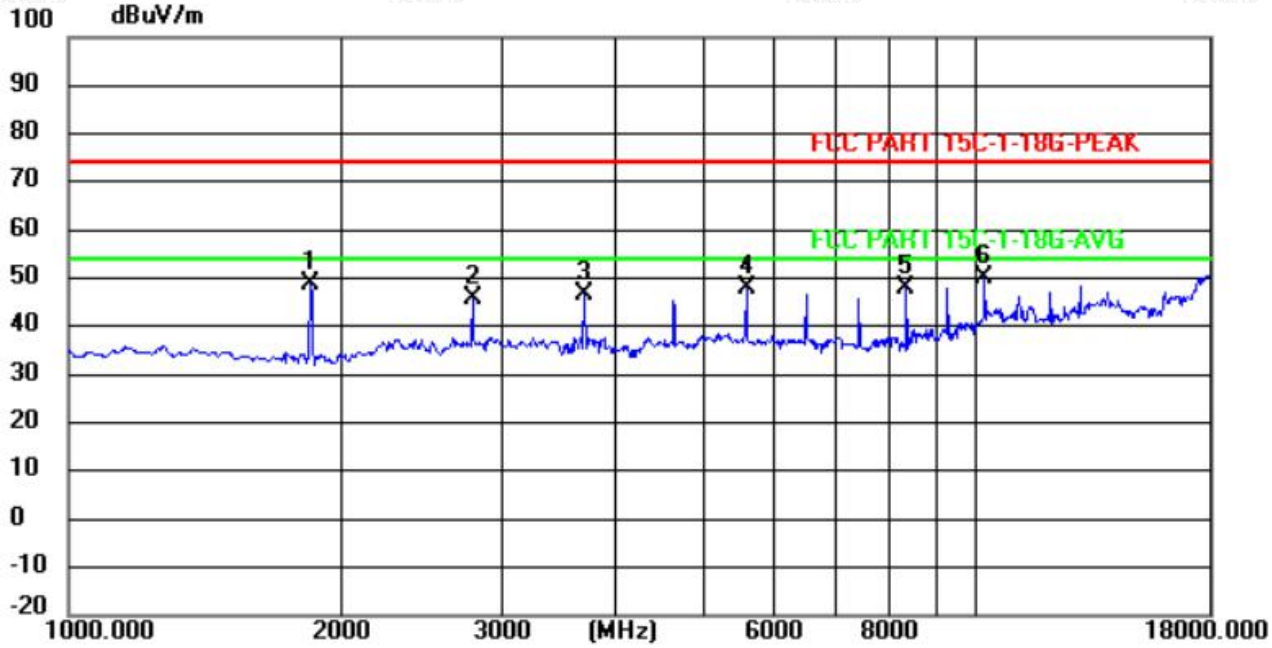
Channel 254 / 927.55MHz

Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	1850.0000	61.74	-11.53	50.21	74.00	-23.79	peak	
2		2785.0000	56.81	-8.02	48.79	74.00	-25.21	peak	
3		3703.0000	53.19	-6.45	46.74	74.00	-27.26	peak	
4		5573.0000	49.34	-1.28	48.06	74.00	-25.94	peak	
5		7426.0000	46.32	2.57	48.89	74.00	-25.11	peak	
6		10503.000	39.50	7.13	46.63	74.00	-27.37	peak	

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		1850.0000	60.21	-11.53	48.68	74.00	-25.32	peak	
2		2785.0000	53.81	-8.02	45.79	74.00	-28.21	peak	
3		3703.0000	53.21	-6.45	46.76	74.00	-27.24	peak	
4		5573.0000	49.12	-1.28	47.84	74.00	-26.16	peak	
5		8344.0000	44.84	2.95	47.79	74.00	-26.21	peak	
6	*	10197.000	44.45	5.46	49.91	74.00	-24.09	peak	

Notes:

1). Measuring frequencies from 9 KHz~10th harmonic or 26.5GHz (which is less), at least have 20dB margin found between lowest internal used/generated frequency to 30MHz.

2). Radiated emissions measured in frequency range from 9 KHz~10th harmonic or 26.5GHz (which is less) were made with an instrument using Peak detector mode.

3). Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.

4). Measured Level = Reading Level + Factor, Margin = Measured Level – Limit,

Factor = Antenna Factor + Cable Loss - Preamp Factor

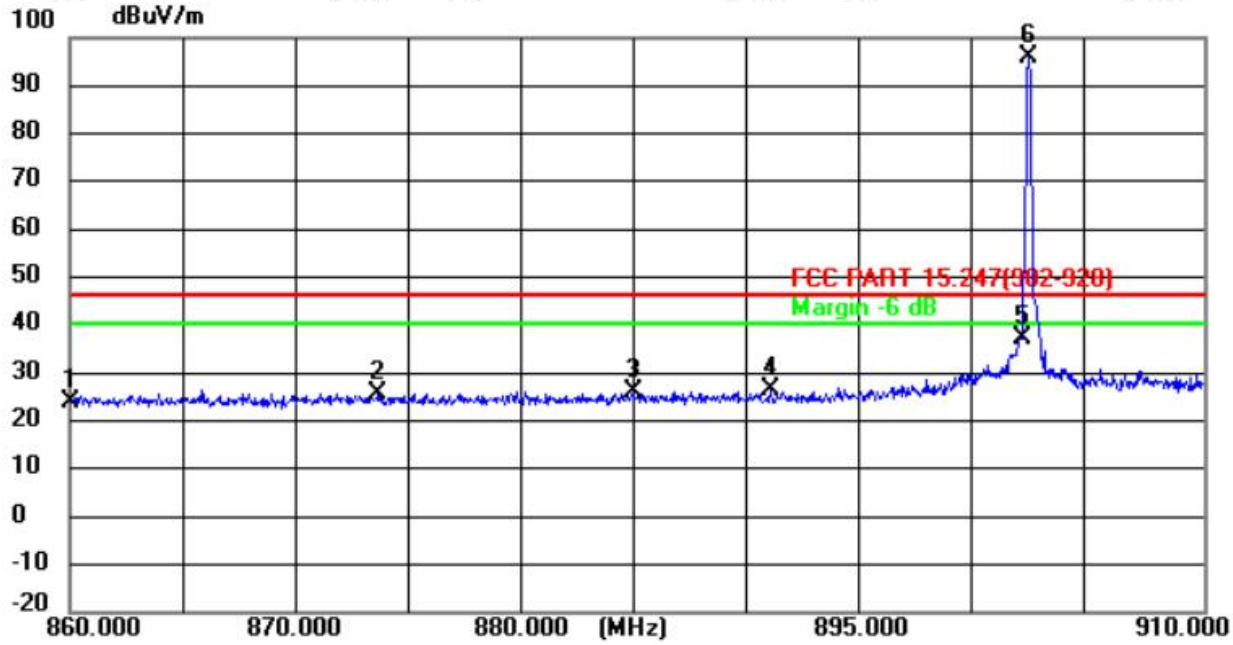
5). Pre-scan all modes and recorded the worst case results in this report(Low Channel).

6).Due to the measure PK emission level less than the AV limit value,the average doesn't need to be tested.

Restricted bands:

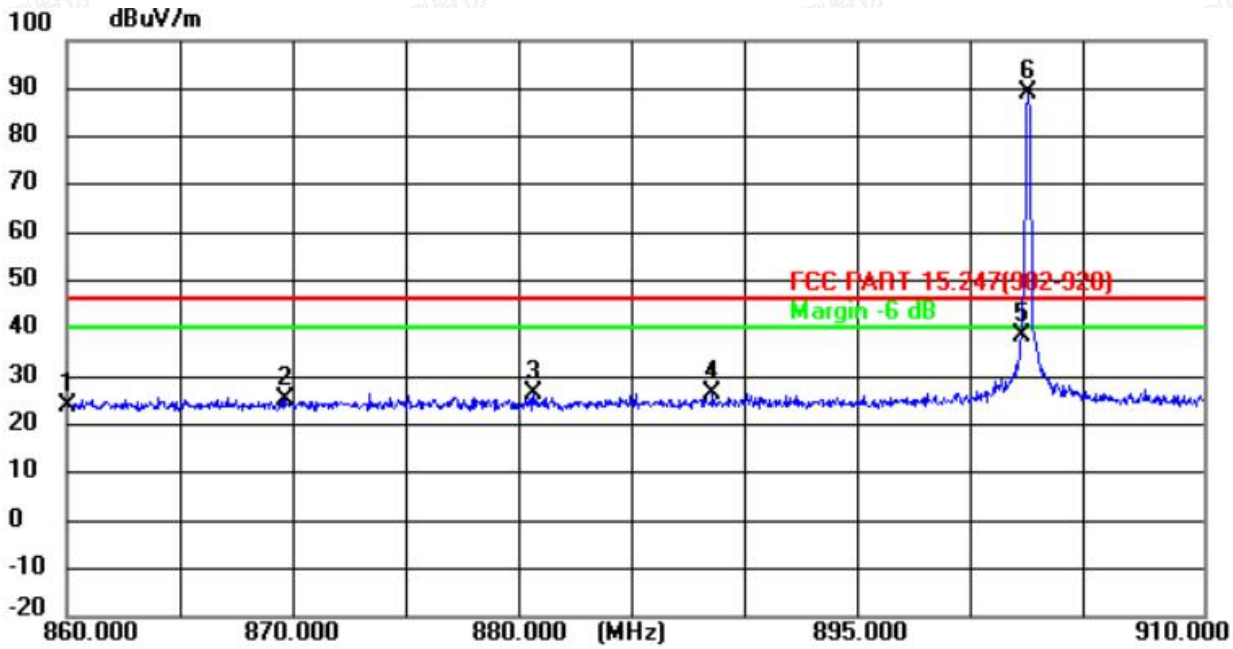
902.25MHz

Horizontal



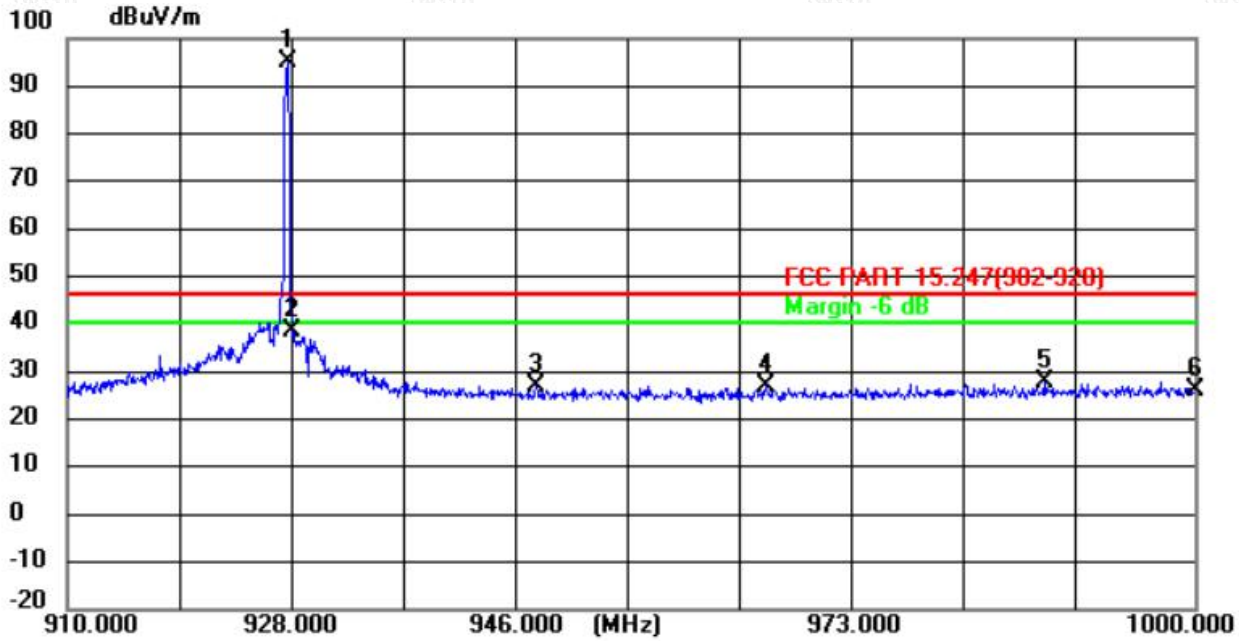
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		860.0000	30.94	-6.87	24.07	46.00	-21.93	peak	
2		873.6000	32.66	-6.89	25.77	46.00	-20.23	peak	
3		884.8500	32.55	-6.64	25.91	46.00	-20.09	peak	
4		890.9500	33.12	-6.49	26.63	46.00	-19.37	peak	
5		902.0000	43.31	-6.22	37.09	46.00	-8.91	peak	
6	*	902.2500	102.12	-6.22	95.90	46.00	49.90	peak	

Vertical



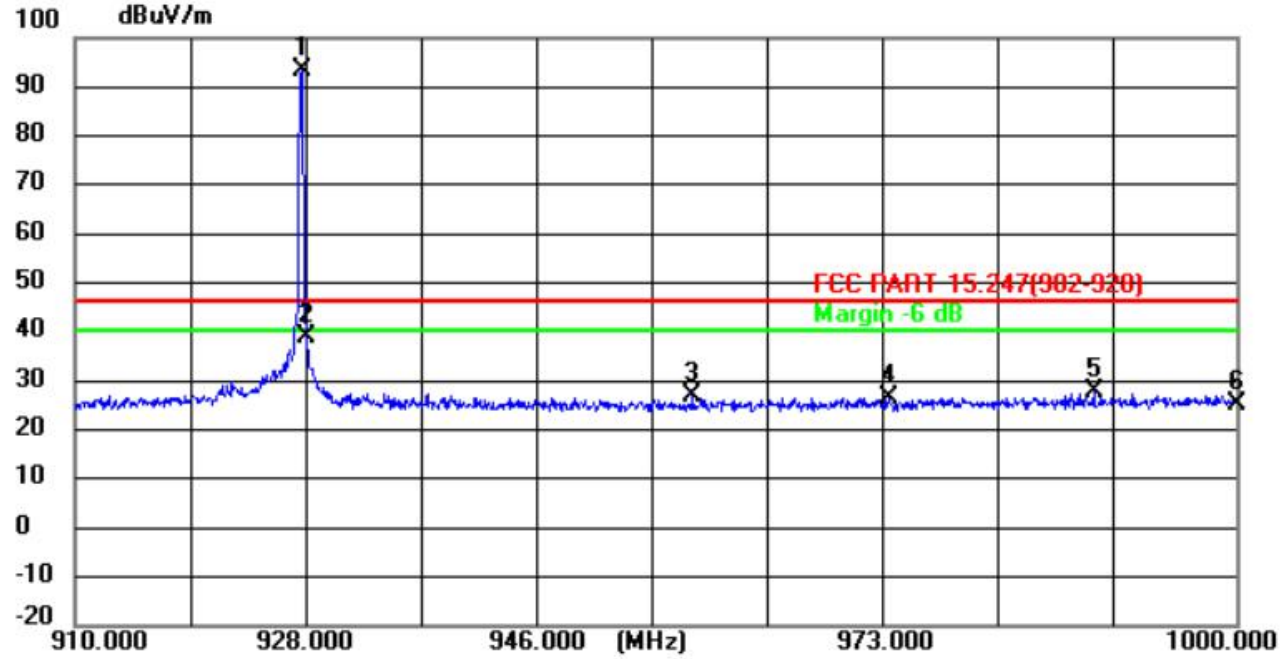
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1		860.0000	31.26	-7.51	23.75	46.00	-22.25	peak	
2		869.6500	32.74	-7.37	25.37	46.00	-20.63	peak	
3		880.5000	33.54	-7.20	26.34	46.00	-19.66	peak	
4		888.4000	33.77	-7.06	26.71	46.00	-19.29	peak	
5		902.0000	45.53	-6.82	38.71	46.00	-7.29	peak	
6	*	902.2500	95.76	-6.81	88.95	46.00	42.95	peak	

927.55MHz
Horizontal



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	927.5500	100.96	-5.84	95.12	46.00	49.12	peak	
2		928.0000	44.15	-5.83	38.32	46.00	-7.68	peak	
3		947.4400	31.98	-5.26	26.72	46.00	-19.28	peak	
4		965.8000	32.10	-5.13	26.97	46.00	-19.03	peak	
5		988.1200	32.73	-5.06	27.67	46.00	-18.33	peak	
6		1000.0000	31.29	-5.02	26.27	46.00	-19.73	peak	

Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Margin		
		MHz	dBuV	dB/m	dBuV/m	dBuV/m	dB	Detector	Comment
1	*	927.5500	99.92	-6.43	93.49	46.00	47.49	peak	
2		928.0000	45.32	-6.44	38.88	46.00	-7.12	peak	
3		957.8800	33.24	-6.45	26.79	46.00	-19.21	peak	
4		973.0900	32.60	-6.18	26.42	46.00	-19.58	peak	
5		989.0200	33.42	-5.80	27.62	46.00	-18.38	peak	
6		1000.0000	30.91	-5.52	25.39	46.00	-20.61	peak	

Notes:

1）Level（dBuv/m）=Reading+Factor;

2）Margin(dB)=Level-Limit;

3）Factor=Ant Fac-Pre Fac+Cab Loss.

6.7. AC Power Line Conducted Emissions

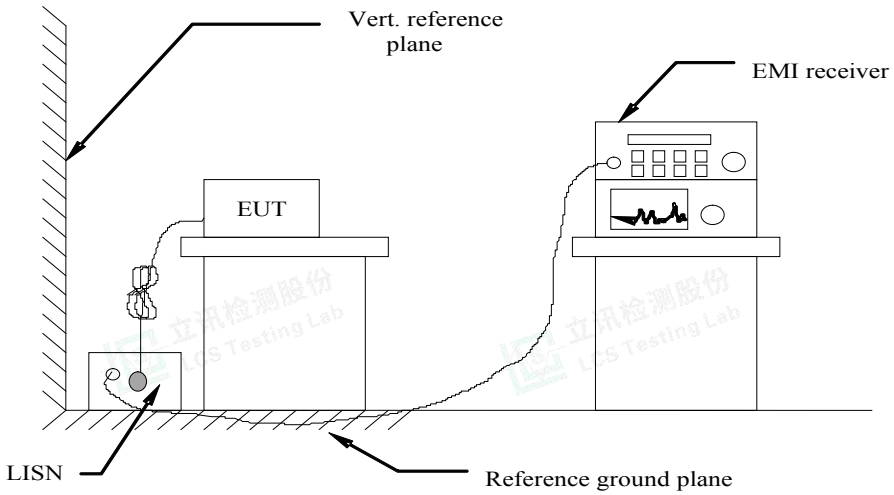
6.7.1 Standard Applicable

According to §15.207 (a): For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

* Decreasing linearly with the logarithm of the frequency

6.7.2 Block Diagram of Test Setup



6.7.3 Disturbance Calculation

The AC mains conducted disturbance is calculated by adding the 10dB Pulse Limiter and Cable Factor and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

CD (dBuV) = RA (dBuV) + PL (dB) + CL (dB)

Where CD = Conducted Disturbance	CL = Cable Attenuation Factor (Cable Loss)
RA = Reading Amplitude	PL = 10 dB Pulse Limiter Factor

6.7.4 Test Results

Not applicable.

The product is DC powered

6.8. On Time and Duty Cycle

6.8.1. Standard Applicable

None: for reporting purpose only.

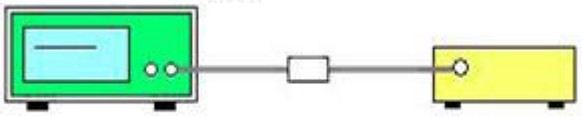
6.8.2. Measuring Instruments and Setting

Please refer to equipment list in this report. The following table is the setting of the spectrum analyzer.

6.8.3. Test Procedures

1. Set the center frequency of the spectrum analyzer to the transmitting frequency;
2. Set the span=0MHz, RBW=1.0MHz, VBW=3.0MHz, Sweep time=Auto
3. Detector = peak;
4. Trace mode = Single hold.

6.8.4. Test Setup Layout



6.8.5. EUT Operation during Test

The EUT was programmed to be in continuously transmitting mode.

6.8.6. Test result

Not Applicable

6.9. Pseudorandom Frequency Hopping Sequence

6.9.1 Standard Applicable

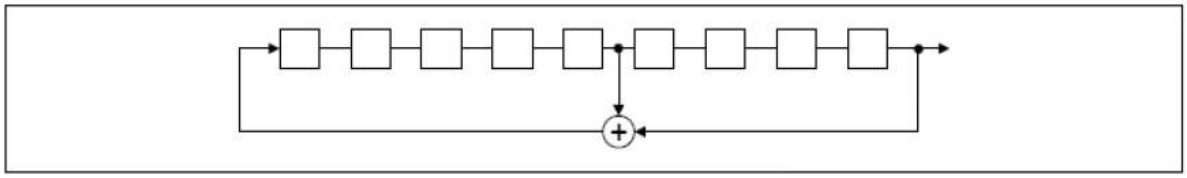
For 47 CFR Part 15C sections 15.247 (a) (1) requirement:

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

6.9.2 EUT Pseudorandom Frequency Hopping Sequence Requirement

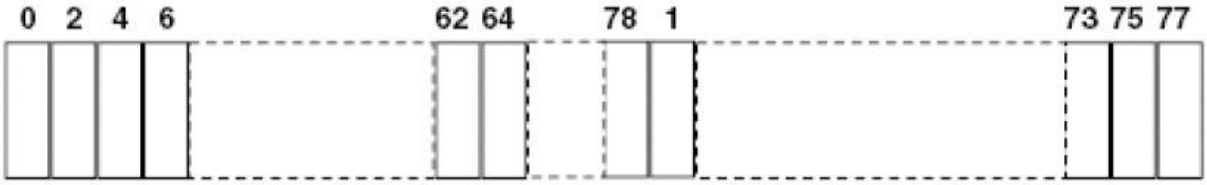
The pseudorandom frequency hopping sequence may be generated in a nice-stage shift register whose 5th first stage. The sequence begins with the first one of 9 consecutive ones, for example: the shift register is initialized with nine ones.

- Number of shift register stages:9
- Length of pseudo-random sequence:29-1=511 bits
- Longest sequence of zeros:8(non-inverted signal)



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of pseudorandom frequency hopping sequence as follows:



Each frequency used equally one the average by each transmitter.
The system receiver have input bandwidths that match the hopping channel bandwidths of their corresponding transmitter and shift frequencies in synchronization with the transmitted signals.

6.10. Antenna Requirement

6.10.1 Standard Applicable

According to antenna requirement of §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. The manufacturer may design the unit so that a broken antenna can be re-placed by the user, but the use of a standard antenna jack or electrical connector is prohibited. This requirement does not apply to carrier current devices or to devices operated under the provisions of Sections 15.211, 15.213, 15.217, 15.219, or 15.221. Further, this requirement does not apply to intentional radiators that must be professionally installed, such as perimeter protection systems and some field disturbance sensors, or to other intentional radiators which, in accordance with Section 15.31(d), must be measured at the installation site. However, the installer shall be responsible for ensuring that the proper antenna is employed so that the limits in this Part are not exceeded.

6.10.2 Antenna Connected Construction

6.10.2.1. Standard Applicable

According to § 15.203 & RSS-Gen, 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.

6.10.2.2. Antenna Connector Construction

The directional gains of antenna used for transmitting is 2.0dBi(Max), and the antenna is a Internal Antenna connect to PCB board and no consideration of replacement. Please see EUT photo for details.

6.10.2.3. Results: Compliance.

7. TEST SETUP PHOTOGRAPHS OF EUT

Please refer to separated files for Test Setup Photos of the EUT.

8. EXTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for External Photos of the EUT.

9. INTERIOR PHOTOGRAPHS OF THE EUT

Please refer to separated files for Internal Photos of the EUT.

----------THE END OF TEST REPORT----------