

FCC RADIO TEST REPORT

FCC ID: Y8E-VM-LORA

Product : LoRa SX-1276 1W module

Trade Name : N/A

Model Name : A-00700-HBT-HP

Serial Model : N/A

Report No. : UNIA19062011FR-01

Prepared for

Vision Metering, LLC

7 Ross Cannon Street, York, SC 29745, USA

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.....: Vision Metering, LLC
Address.....: 7 Ross Cannon Street, York, SC 29745, USA
Manufacture's Name.....: Hunbil Technology (HBT) Trading Limited
Address.....: FLAT/RM B 5/F, GAYLORD COMM, BLDG 114-118
 LOCKHART RD, HONG KONG

Product description

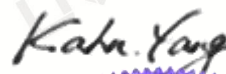
Product name.....: LoRa SX-1276 1W module
Trade Mark.....: N/A
Model and/or type reference : A-00700-HBT-HP
Standards.....: FCC Rules and Regulations Part 15 Subpart C Section 15.247
 ANSI C63.10: 2013

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.....:
Date (s) of performance of tests.....: Jun. 12 ~ 25, 2019
Date of Issue.....: Jun. 26, 2019
Test Result.....: Pass

Prepared by:



Kaha yang/Editor

Reviewer:



Sherwin Qian/Supervisor

Approved & Authorized Signer:



Liuze/Manager

Table of Contents

Page

1. TEST SUMMARY.....	5
1.1 TEST PROCEDURES AND RESULTS.....	5
1.2 TEST FACILITY.....	5
1.3 MEASUREMENT UNCERTAINTY.....	5
2. GENERAL INFORMATION.....	6
2.1 GENERAL DESCRIPTION OF EUT.....	6
2.2 Carrier Frequency of Channels.....	7
2.3 Operation of EUT during testing.....	7
2.4 DESCRIPTION OF TEST SETUP.....	7
2.5 MEASUREMENT INSTRUMENTS LIST.....	8
3. CONDUCTED EMISSIONS TEST.....	9
3.1 Conducted Power Line Emission Limit.....	9
3.2 Test Setup.....	9
3.3 Test Procedure.....	9
3.4 Test Result.....	9
4. RADIATED EMISSION TEST.....	12
4.1 Radiation Limit.....	12
4.2 Test Setup.....	12
4.3 Test Procedure.....	13
4.4 Test Result.....	13
5. BAND EDGE.....	18
5.1 Limits.....	18
5.2 Test Procedure.....	18
5.3 Test Result.....	18
6. OCCUPIED BANDWIDTH MEASUREMENT.....	20
6.1 Test Setup.....	20
6.2 Test Procedure.....	20
6.3 Measurement Equipment Used.....	20
6.4 Test Result.....	20
7. MAXIMUM PEAK OUTPUT POWER.....	22
7.1 Test Setup.....	22
7.2 Test Procedure.....	22
7.3 Limit.....	22
7.4 Test Result.....	22
8. FREQUENCY SEPARATION.....	23

Table of Contents

Page

8.1 Test Setup.....	23
8.2 Test Procedure.....	23
8.3 Limit.....	23
8.4 Test Result.....	23
9. CONDUCTED SPURIOUS & BAND EDGE EMISSION.....	25
9.1 Test Setup.....	25
9.2 Test Procedure.....	25
9.3 Limit.....	25
9.4 Test Result.....	25
10. NUMBER OF HOPPING FREQUENCY.....	30
10.1 Test Limit.....	30
10.2 Test Procedure.....	30
10.3 Test Setup.....	30
10.4 Test Result.....	30
11. TIME OF OCCUPANCY(DWELL TIME).....	31
11.1 Test Limit.....	31
11.2 Test Procedure.....	31
11.3 Test Setup.....	31
11.4 Test Result.....	31
12. ANTENNA REQUIREMENT.....	35
13. PHOTOGRAPH OF TEST.....	36

1. TEST SUMMARY

1.1 TEST PROCEDURES AND RESULTS

DESCRIPTION OF TEST	RESULT
CONDUCTED EMISSIONS TEST	COMPLIANT
RADIATED EMISSION TEST	COMPLIANT
BAND EDGE	COMPLIANT
OCCUPIED BANDWIDTH MEASUREMENT	COMPLIANT
MAXIMUM PEAK OUTPUT POWER	COMPLIANT
FREQUENCY SEPARATION	COMPLIANT
CONDUCTED BANDEGE MEASUREMENT	COMPLIANT
SPURIOUS RF CONDUCTED EMISSION	COMPLIANT
NUMBER OF HOPPING FREQUENCY	COMPLIANT
TIME OF OCCUPANCY(DWELL TIME)	COMPLIANT
ANTENNA REQUIREMENT	COMPLIANT

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 ability of our laboratory meet with "Quality Law of People's Republic of China" Clause 19. The testing quality system of our laboratory meets with ISO/IEC-17025 requirements, which is approved by CNAS. This approval result is accepted by MRA of APLAC.

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

CNAS-LAB Code: L6494

The EMC Laboratory has been assessed and in compliance with CNAS-CL01 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2017 General Requirements) for the Competence of testing Laboratories.

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 GENERAL DESCRIPTION OF EUT

Equipment	LoRa SX-1276 1W module
Trade Mark	N/A
Model Name	A-00700-HBT-HP
Serial No.	N/A
Model Difference	N/A
FCC ID	Y8E-VM-LORA
Antenna Type	IPEX Connector
Antenna Gain	1.5dBi
Frequency Range	902-928MHz
Modulation Type	FSK
Power Source	DC 3.5V On PCB from Adapter Input AC 120V/60Hz

Table for auxiliary equipment:

Equipment Description	Manufacturer	Model
Adapter	sunshine	XS-1201000SCN

2.2 Carrier Frequency of Channels

Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)	Channel	Freq. (MHz)
0	902.3	16	905.5	32	908.7	48	911.9
1	902.5	17	905.7	33	908.9	49	912.1
2	902.7	18	905.9	34	909.1	50	912.3
3	902.9	19	906.1	35	909.3	51	912.5
4	903.1	20	906.3	36	909.5	52	912.7
5	903.3	21	906.5	37	909.7	53	912.9
6	903.5	22	906.7	38	909.9	54	913.1
7	903.7	23	906.9	39	910.1	55	913.3
8	903.9	24	907.1	40	910.3	56	913.5
9	904.1	25	907.3	41	910.5	57	913.7
10	904.3	26	907.5	42	910.7	58	913.9
11	904.5	27	907.7	43	910.9	59	914.1
12	904.7	28	907.9	44	911.1	60	914.3
13	904.9	29	908.1	45	911.3	61	914.5
14	905.1	30	908.3	46	911.5	62	914.7
15	905.3	31	908.5	47	911.7	63	914.9

2.3 Operation of EUT during testing

Operating Mode

The mode is used: Transmitting mode

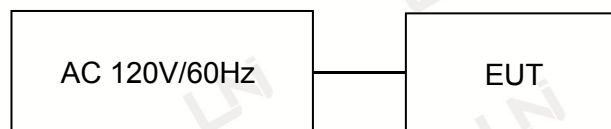
Low Channel: 902.3MHz

Middle Channel: 908.7MHz

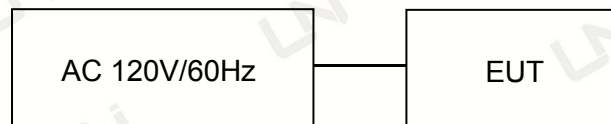
High Channel: 914.9MHz

2.4 DESCRIPTION OF TEST SETUP

Operation of EUT during Conducted testing:



Operation of EUT during Radiation testing:



2.5 MEASUREMENT INSTRUMENTS LIST

Item	Equipment	Manufacturer	Model No.	Serial No.	Calibrated until
CONDUCTED EMISSIONS TEST					
1	AMN	Schwarzbeck	NNLK8121	8121370	2019.9.9
2	AMN	ETS	3810/2	00020199	2019.9.9
3	EMI TEST RECEIVER	Rohde&Schwarz	ESCI	101210	2019.9.9
4	AAN	TESEQ	T8-Cat6	38888	2019.9.9
RADIATED EMISSION TEST					
1	Horn Antenna	Sunol	DRH-118	A101415	2019.9.29
2	BicoNILog Antenna	Sunol	JB1 Antenna	A090215	2019.9.29
3	PREAMP	HP	8449B	3008A00160	2019.9.9
4	PREAMP	HP	8447D	2944A07999	2019.9.9
5	EMI TEST RECEIVER	Rohde&Schwarz	ESR3	101891	2019.9.9
6	VECTOR Signal Generator	Rohde&Schwarz	SMU200A	101521	2019.9.28
7	Signal Generator	Agilent	E4421B	MY4335105	2019.9.28
8	MXA Signal Analyzer	Agilent	N9020A	MY50510140	2019.9.28
9	MXA Signal Analyzer	Agilent	N9020A	MY51110104	2019.9.9
10	ANT Tower&Turn table Controller	Champro	EM 1000	60764	2019.9.28
11	Anechoic Chamber	Taihe Maorui	9m*6m*6m	966A0001	2019.9.9
12	Shielding Room	Taihe Maorui	6.4m*4m*3m	643A0001	2019.9.9
13	RF Power sensor	DARE	RPR3006W	15I00041SNO88	2020.3.13
14	RF Power sensor	DARE	RPR3006W	15I00041SNO89	2020.3.13
15	RF power divider	Anritsu	K241B	992289	2019.9.28
16	Wideband radio communication tester	Rohde&Schwarz	CMW500	154987	2019.9.28
17	Biconical antenna	Schwarzbeck	VHA 9103	91032360	2019.9.8
18	Biconical antenna	Schwarzbeck	VHA 9103	91032361	2019.9.8
19	Broadband Hybrid Antennas	Schwarzbeck	VULB9163	VULB9163#958	2019.9.8
20	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-1680	2020.1.11
21	Active Receive Loop Antenna	Schwarzbeck	FMZB 1919B	00023	2019.11.02
22	Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170651	2020.3.13
23	Microwave Broadband Preamplifier	Schwarzbeck	BBV 9721	100472	2019.10.24
24	Active Loop Antenna	Com-Power	AL-130R	10160009	2020.5.10
25	Power Meter	KEYSIGHT	N1911A	MY50520168	2020.5.10
26	Frequency Meter	VICTOR	VC2000	997406086	2020.5.10
27	DC Power Source	HYELEC	HY5020E	055161818	2020.5.10
Test software					
1	E3	Audix	6.101223a	N/A	N/A

3. CONDUCTED EMISSIONS TEST

3.1 Conducted Power Line Emission Limit

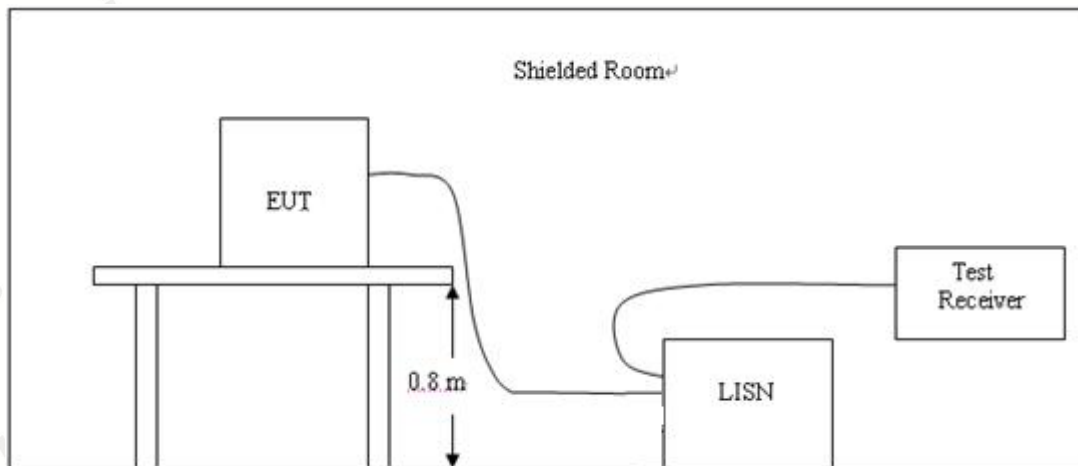
For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following

Frequency (MHz)	Maximum RF Line Voltage(dBμV)			
	CLASS A		CLASS B	
	Q.P.	Ave.	Q.P.	Ave.
0.15~0.50	79	66	66~56*	56~46*
0.50~5.00	73	60	56	46
5.00~30.0	73	60	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.

3.2 Test Setup



3.3 Test Procedure

- 1, The equipment was set up as per the test configuration to simulate typical actual usage per the user's manual. The EUT is a tabletop system, 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 150 KHz to 30MHz for emissions in each of the test modes.

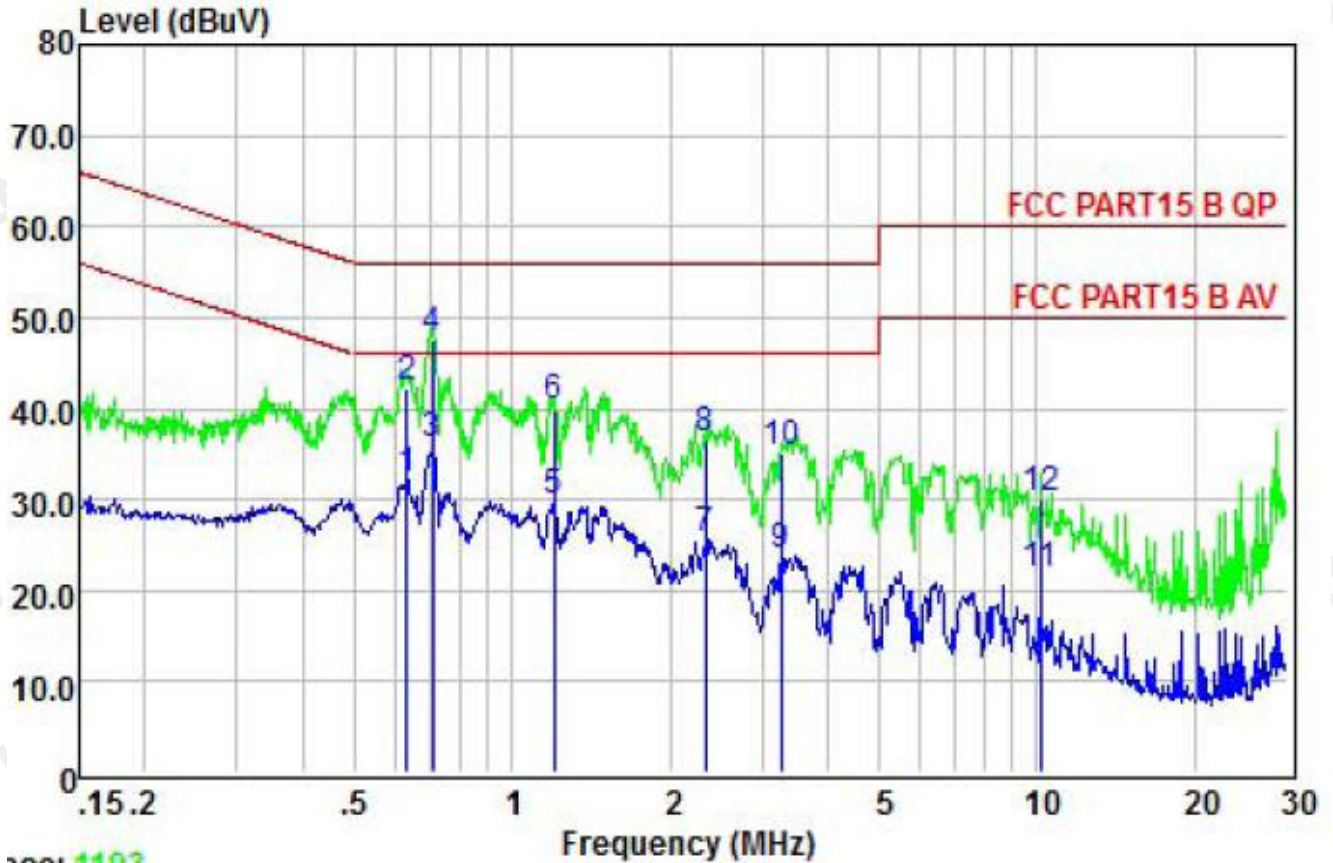
3.4 Test Result

Pass

Remark:

1. All modes were tested at AC 120V and 240V, only the worst result of AC 120V was reported.
2. All modes of Low, Middle, and High channel were tested, only the worst result of Middle Channel was reported as below:

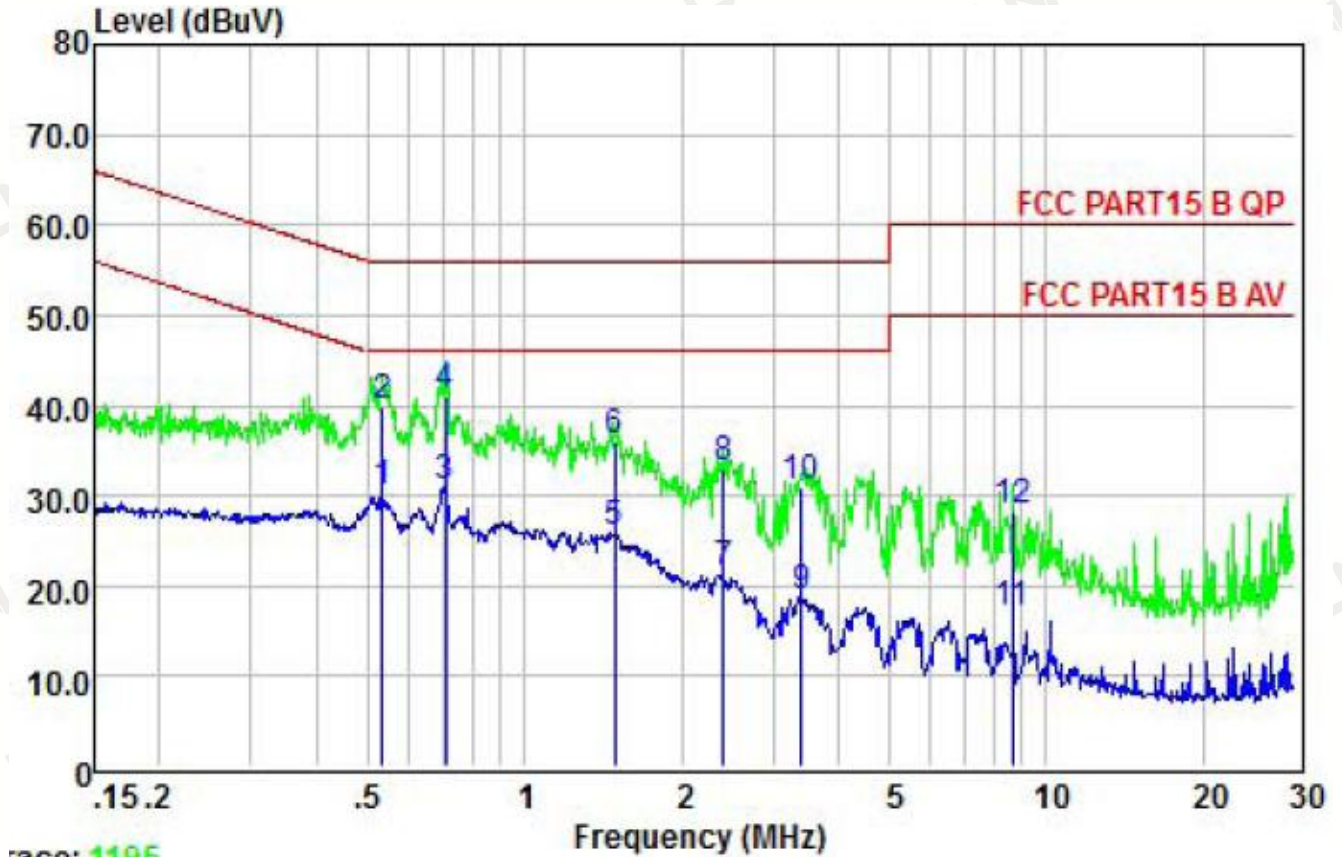
Temperature:	26°C	Relative Humidity:	48%
Test Date:	Jun. 18, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Line
Test Mode:	Transmitting mode 908.7MHz (worst mode)		



	Freq	Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dB	
1	0.63	32.19	9.60	0.25	46.00	-13.81	Average
2	0.63	42.36	9.60	0.25	56.00	-13.64	QP
3	0.71	35.85	9.61	0.26	46.00	-10.15	Average
4	0.71	47.47	9.61	0.26	56.00	-8.53	QP
5	1.20	29.60	9.60	0.27	46.00	-16.40	Average
6	1.20	40.00	9.60	0.27	56.00	-16.00	QP
7	2.35	25.61	9.62	0.28	46.00	-20.39	Average
8	2.35	36.69	9.62	0.28	56.00	-19.31	QP
9	3.26	23.76	9.63	0.29	46.00	-22.24	Average
10	3.26	35.15	9.63	0.29	56.00	-20.85	QP
11	10.18	21.58	9.68	0.39	50.00	-28.42	Average
12	10.18	30.00	9.68	0.39	60.00	-30.00	QP

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

Temperature:	26°C	Relative Humidity:	48%
Test Date:	Jun. 18, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Phase:	Neutral
Test Mode:	Transmitting mode 908.7MHz (worst mode)		



	Freq	Level	LISN	Cable	Limit	Over	
	MHz	dBuV	Factor	Loss	Line	Limit	Remark
			dB	dB	dBuV	dB	
1	0.53	30.33	9.59	0.25	46.00	-15.67	Average
2	0.53	39.84	9.59	0.25	56.00	-16.16	QP
3	0.70	30.92	9.60	0.26	46.00	-15.08	Average
4	0.70	40.92	9.60	0.26	56.00	-15.08	QP
5	1.49	25.90	9.58	0.27	46.00	-20.10	Average
6	1.49	35.99	9.58	0.27	56.00	-20.01	QP
7	2.41	21.31	9.59	0.28	46.00	-24.69	Average
8	2.41	33.12	9.59	0.28	56.00	-22.88	QP
9	3.40	18.76	9.63	0.29	46.00	-27.24	Average
10	3.40	30.92	9.63	0.29	56.00	-25.08	QP
11	8.64	17.06	9.67	0.37	50.00	-32.94	Average
12	8.64	28.19	9.67	0.37	60.00	-31.81	QP

Remark: Factor = Insertion Loss + Cable Loss, Result = Reading + Factor, Margin = Result – Limit.

4. RADIATED EMISSION TEST

4.1 Radiation Limit

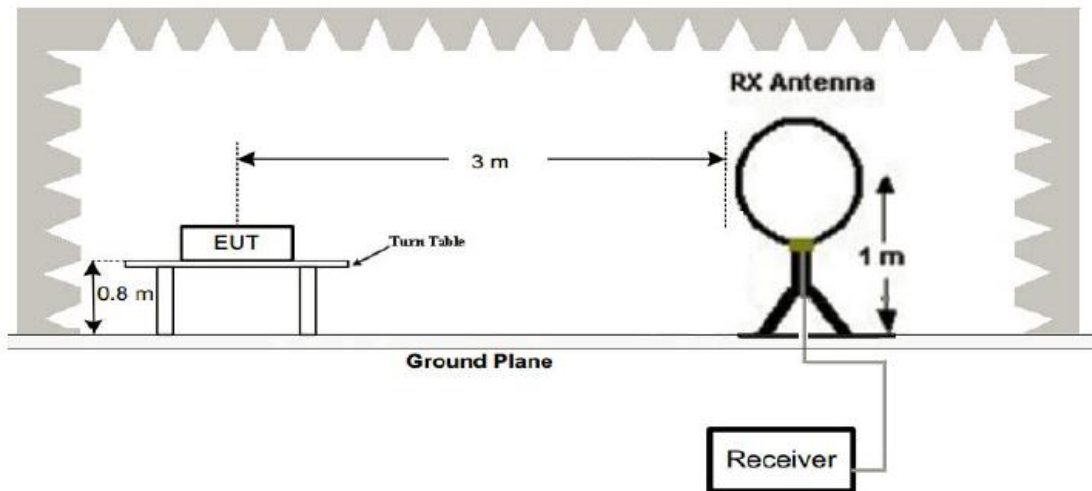
For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values:

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

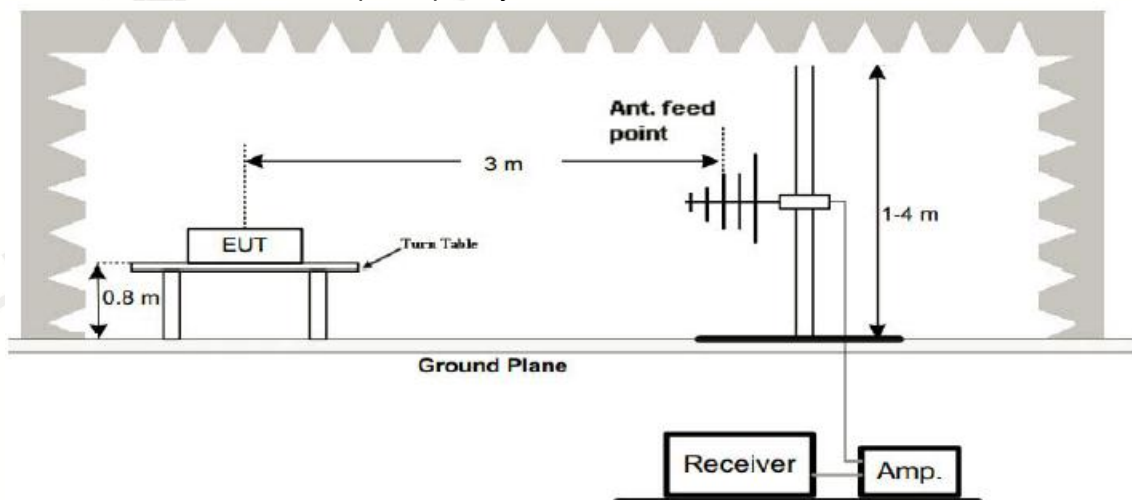
For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.

4.2 Test Setup

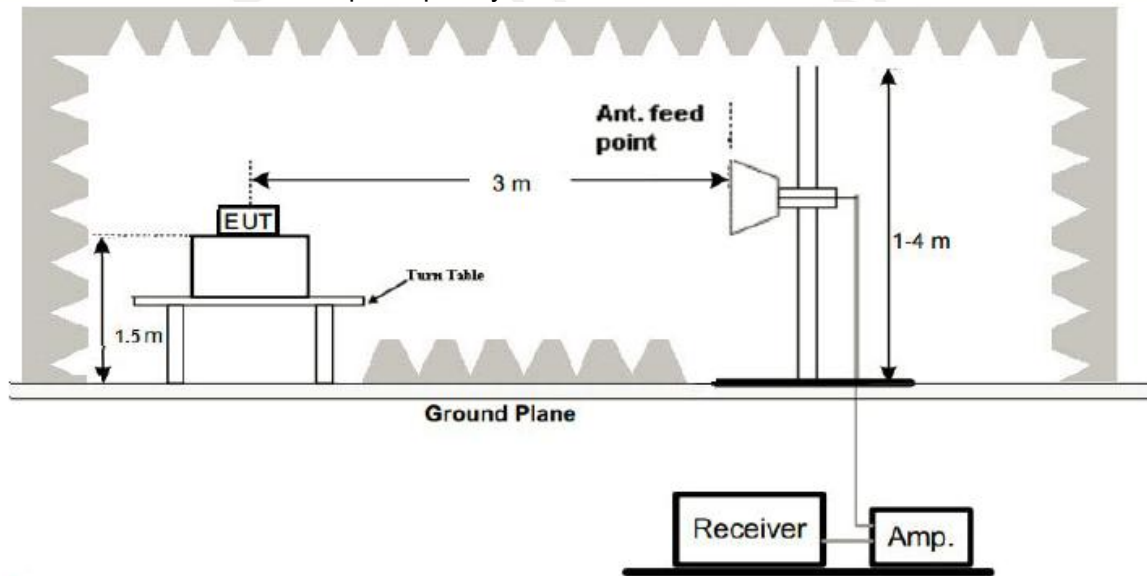
1. Radiated Emission Test-Up Frequency Below 30MHz



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



3. Radiated Emission Test-Up Frequency Above 1GHz



4.3 Test Procedure

- Below 1GHz measurement the EUT is placed on turntable which is 0.8m above ground plane. And above 1GHz measurement EUT was placed on low permittivity and low tangent turn table which is 1.5m above ground plane.
- The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
- EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
- Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
- And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
- Repeat above procedures until the measurements for all frequencies are complete.
- The test frequency range from 9KHz to 25GHz per FCC PART 15.33(a).
- The distance between test antenna and EUT as following table states:

Test Frequency range	Test Antenna Type	Test Distance
9KHz-30MHz	Active Loop Antenna	3
30MHz-1GHz	Bilog Antenna	3
1GHz-18GHz	Horn Antenna	3
18GHz-25GHz	Horn Antenna	1

Note:

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

4.4 Test Result

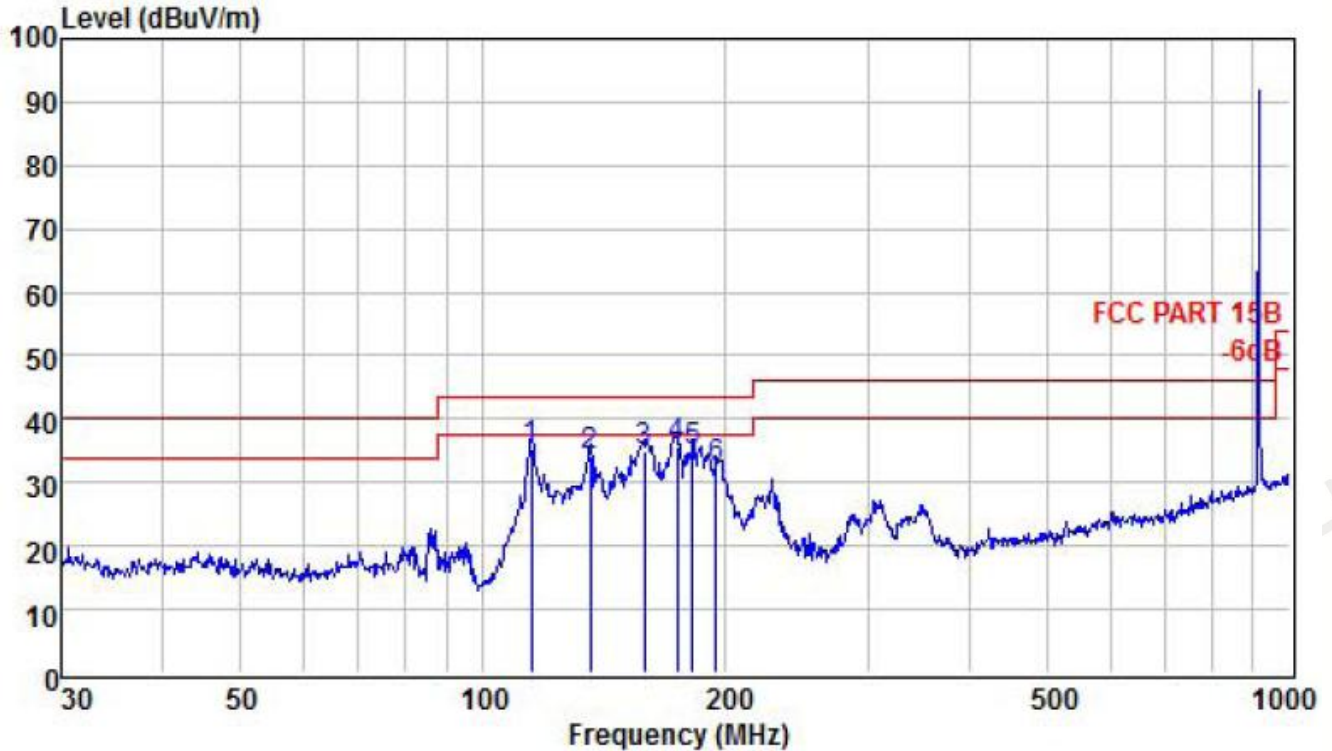
PASS

Remark:

- All modes of Low, Middle, and High channel were tested, only the worst result of Middle Channel was reported as below:
- 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.
- Radiated emission test from 9KHz to 10th harmonic of fundamental was verified, and no emission found except system noise floor in 9KHz to 30MHz and not recorded in this report.

Below 1GHz Test Results:

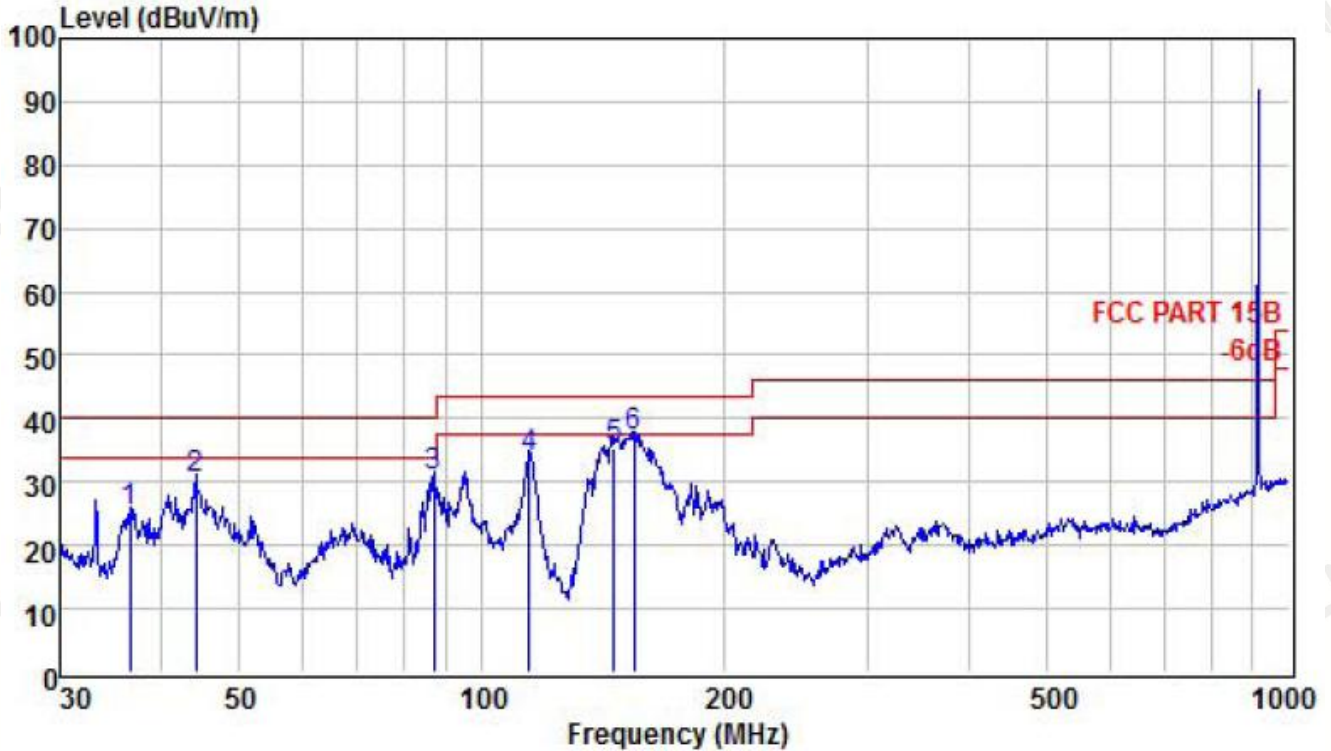
Temperature:	22°C	Relative Humidity:	48%
Test Date:	Jun. 18, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Horizontal
Test Mode:	Transmitting mode 908.7MHz (worst mode)		



	Freq	Level	Antenna Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV/m	dB/m	dB	dBuV/m	dB	
1	114.92	35.33	12.05	0.20	43.50	-8.17	QP
2	135.98	34.05	14.67	0.23	43.50	-9.45	QP
3	158.67	34.91	15.67	0.23	43.50	-8.59	QP
4	173.81	35.70	13.58	0.24	43.50	-7.80	QP
5	181.92	34.83	12.57	0.24	43.50	-8.67	QP
6	194.45	32.26	11.75	0.30	43.50	-11.24	QP

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

Temperature:	22°C	Relative Humidity:	48%
Test Date:	Jun. 18, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Vertical
Test Mode:	Transmitting mode 908.7MHz (worst mode)		



	Freq	Level	Antenna Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV/m	dB/m	dB	dBuV/m	dB	
1	36.64	25.17	13.04	0.20	40.00	-14.83	QP
2	44.28	30.32	13.27	0.13	40.00	-9.68	QP
3	87.11	30.73	11.32	0.16	40.00	-9.27	QP
4	114.51	33.81	12.02	0.20	43.50	-9.69	QP
5	145.86	35.33	15.36	0.23	43.50	-8.17	QP
6	154.28	37.04	15.57	0.23	43.50	-6.46	QP

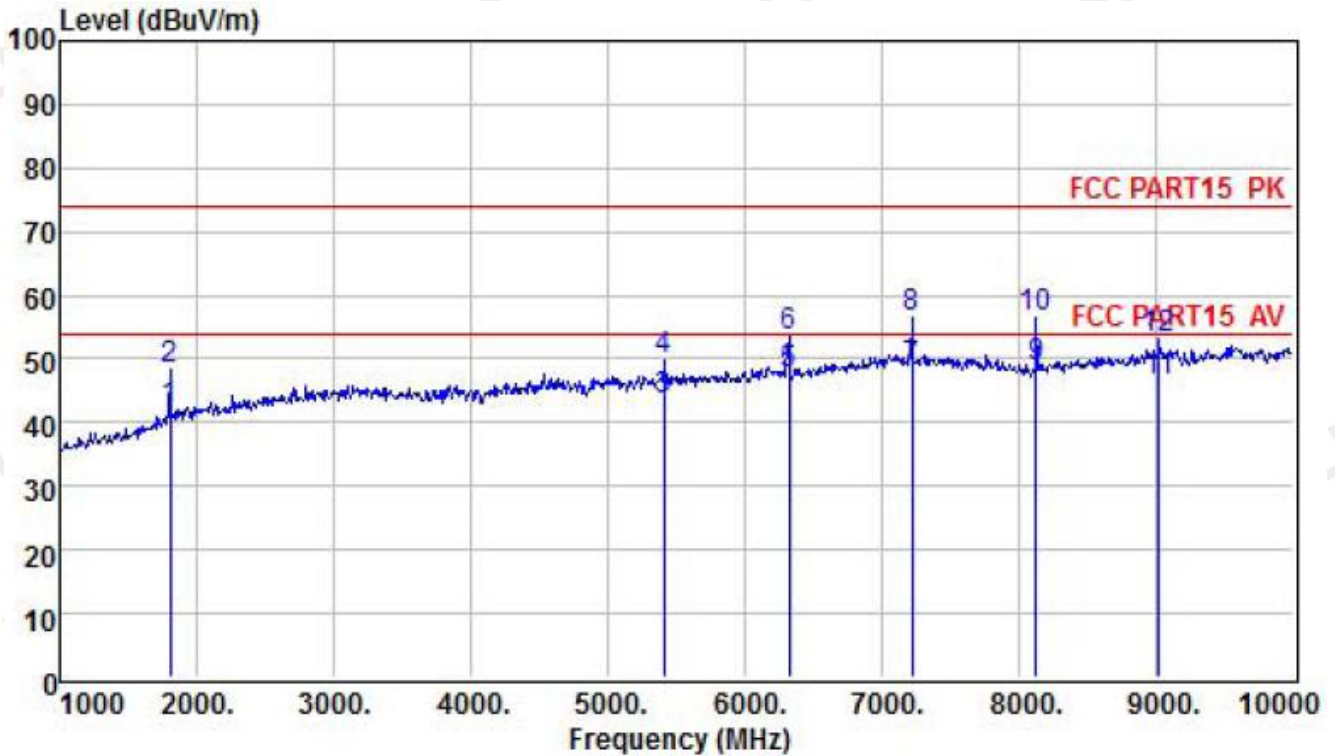
Remark: Absolute Level = Reading Level + Factor, Margin = Absolute Level – Limit
Factor = Ant. Factor + Cable Loss

Remark:

- (1) Measuring frequencies from 9 KHz to the 1 GHz, Radiated emission test from 9KHz to 30MHz was verified, and no any emission was found except system noise floor.
- (2) * denotes emission frequency which appearing within the Restricted Bands specified in provision of 15.205, then the general radiated emission limits in 15.209 apply.
- (3) The IF bandwidth of EMI Test Receiver between 30MHz to 1GHz was 120KHz, 1 MHz for measuring above 1 GHz, below 30MHz was 10KHz.

Above 1 GHz Test Results:

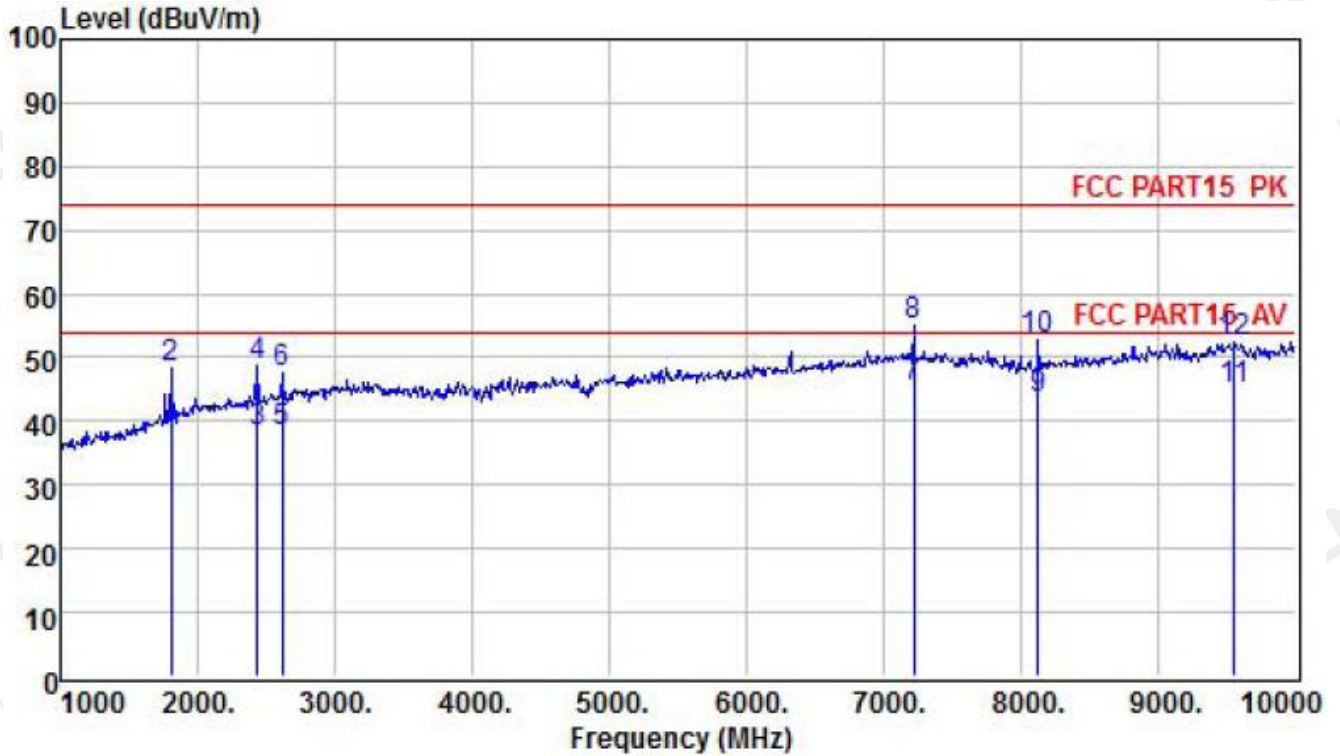
Temperature:	22℃	Relative Humidity:	48%
Test Date:	Jun. 18, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Vertical
Test Mode:	Transmitting mode 908.7MHz (worst mode)		



	Read	Antenna	Cable		Limit	Over	
Freq	Level	Factor	Loss	Level	Line	Limit	Remark
MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m	dB	
1	1802.800	38.25	27.16	2.65	41.90	54.00	-12.10 Average
2	1802.800	44.56	27.16	2.65	48.21	74.00	-25.79 Peak
3	5409.200	32.58	33.96	4.43	43.33	54.00	-10.67 Average
4	5409.200	38.97	33.96	4.43	49.72	74.00	-24.28 Peak
5	6320.000	34.69	35.64	4.98	47.55	54.00	-6.45 Average
6	6320.000	40.57	35.64	4.98	53.43	74.00	-20.57 Peak
7	7221.600	33.57	37.29	5.51	48.43	54.00	-5.57 Average
8	7221.600	41.78	37.29	5.51	56.64	74.00	-17.36 Peak
9	8123.200	34.17	36.50	6.16	48.69	54.00	-5.31 Average
10	8123.200	41.86	36.50	6.16	56.38	74.00	-17.62 Peak
11	9024.800	30.57	37.42	6.89	46.47	54.00	-7.53 Average
12	9024.800	37.19	37.42	6.89	53.09	74.00	-20.91 Peak

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

Temperature:	22℃	Relative Humidity:	48%
Test Date:	Jun. 18, 2019	Pressure:	1010hPa
Test Voltage:	AC 120V, 60Hz	Polarization:	Horizontal
Test Mode:	Transmitting mode 908.7MHz (worst mode)		



	Freq	ReadAntenna	Cable	Limit	Over	
	MHz	Level	Factor	Loss	Level	Line
	MHz	dBuV	dB/m	dB	dBuV/m	dBuV/m
1	1802.800	34.00	27.16	2.65	37.65	54.00
2	1802.800	44.60	27.16	2.65	48.25	74.00
3	2437.600	32.28	28.76	3.42	38.13	54.00
4	2437.600	42.85	28.76	3.42	48.70	74.00
5	2612.400	31.99	29.08	3.65	38.34	54.00
6	2612.400	41.18	29.08	3.65	47.53	74.00
7	7221.600	30.57	37.29	5.51	45.43	54.00
8	7221.600	39.98	37.29	5.51	54.84	74.00
9	8123.200	29.15	36.50	6.16	43.67	54.00
10	8123.200	38.18	36.50	6.16	52.70	74.00
11	9558.399	28.25	38.04	7.45	45.12	54.00
12	9558.399	35.70	38.04	7.45	52.57	74.00

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

5. BAND EDGE

5.1 Limits

FCC PART 15.247 Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

5.2 Test Procedure

The band edge compliance of RF radiated emission should be measured by following the guidance in ANSI C63.10 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization etc. Set RBW to 1MHz and VBM to 3MHz to measure the peak field strength and set RBW to 1MHz and VBW to 10kHz to measure the average radiated field strength. The conducted RF band edge was measured by using a spectrum analyzer. Set span wide enough to capture the highest in-band emission and the emission at the band edge. Set RBW to 100 KHz and VBW to 300 KHz, to measure the conducted peak band edge.

5.3 Test Result

PASS

Radiated Band Edge Test:

Horizontal:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
902	56.24	-5.81	50.43	74.00	-23.57	PK
902	53.14	-5.81	47.33	54.00	-6.67	AV
928	57.05	-5.84	51.21	74.00	-22.79	PK
928	53.25	-5.84	47.41	54.00	-6.59	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

Vertical:

Frequency	Reading Result	Factor	Emission Level	Limits	Margin	Detector Type
(MHz)	(dBμV)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	
902	56.85	-5.81	51.04	74.00	-22.96	PK
902	53.47	-5.81	47.66	54.00	-6.34	AV
928	57.12	-5.84	51.28	74.00	-22.72	PK
928	53.26	-5.84	47.42	54.00	-6.58	AV
Remark: Factor = Antenna Factor + Cable Loss – Pre-amplifier.						

6. OCCUPIED BANDWIDTH MEASUREMENT

6.1 Test Setup

Same as Radiated Emission Measurement

6.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as normal operation.
3. Spectrum Setting : RBW= 1KHz, VBW=3KHz, Sweep time = Auto.
4. The useful radiated emission from the EUT was detected by the spectrum analyser with peak detector.

6.3 Measurement Equipment Used

Same as Radiated Emission Measurement

6.4 Test Result

PASS

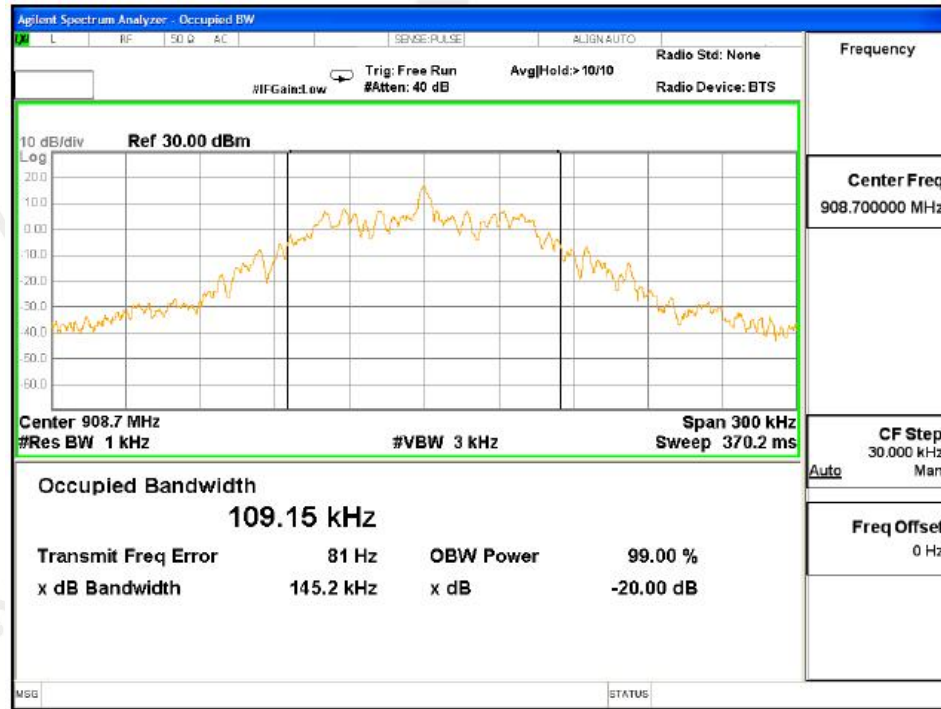
GFSK Modulation:

Frequency (MHz)	20dB Bandwidth (kHz)	Result
902.3	148.4	PASS
908.7	145.2	PASS
914.9	145.4	PASS

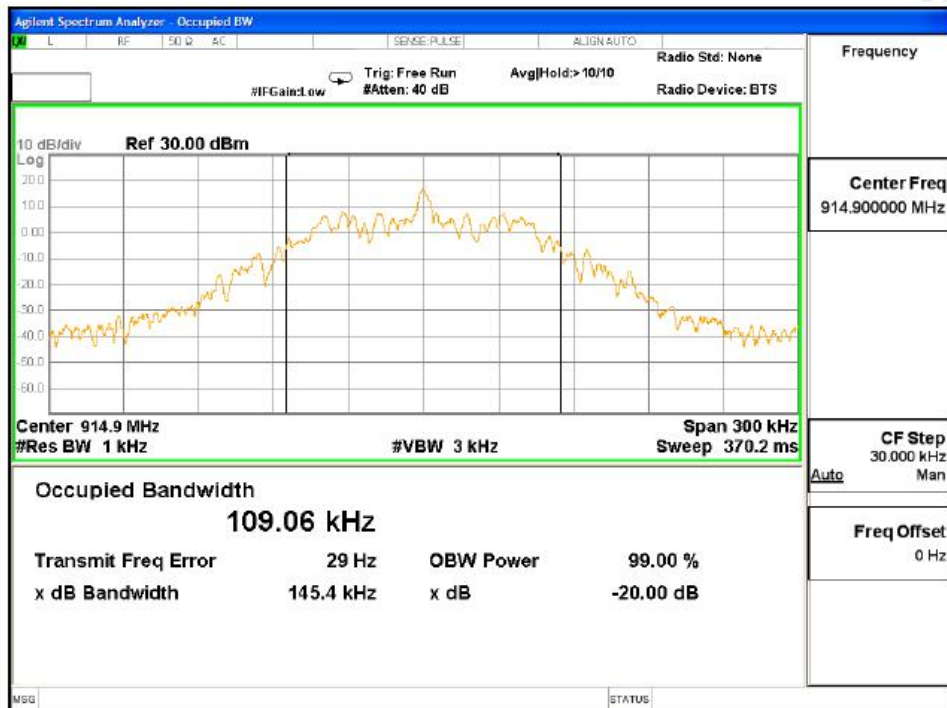
CH: 902.3MHz



CH: 908.7MHz



CH: 914.9MHz



7. MAXIMUM PEAK OUTPUT POWER

7.1 Test Setup



7.2 Test Procedure

According to ANSI C63.10:2013 Maximum peak conducted output power for HFSS devices: The maximum peak conducted output power may be measured using a broadband peak RF power meter. The power meter shall have a video bandwidth that is greater than or equal to the HFSS bandwidth and shall utilize a fast-responding diode detector. The maximum Average conducted output power may be measured using a wideband RF power meter with a thermocouple detector or equivalent. The power meter shall have a video bandwidth that is greater than or equal to the HFSS bandwidth and shall utilize a fast-responding diode detector.

7.3 Limit

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.

7.4 Test Result

PASS

Frequency	Peak Output power (dBm)	Limit (dBm)	Result
902.3	29.579	30	Pass
908.7	29.655		
914.9	29.479		

8. FREQUENCY SEPARATION

8.1 Test Setup



8.2 Test Procedure

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with RBW=30KHz and VBW=100KHz.

8.3 Limit

According to 15.247(a)(1), frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25KHz or the $2/3 \times 20\text{dB}$ bandwidth of the hopping channel, whichever is greater.

8.4 Test Result

PASS

Frequency	CH Separation (kHz)	Limit (MHz)	Result
902.3	559.0	148.4	pass
908.7	612.5	145.2	pass
914.9	581.2	145.4	pass

CH: 902.3MHz



CH: 908.7MHz



CH: 914.9MHz



9. CONDUCTED SPURIOUS & BAND EDGE EMISSION

9.1 Test Setup



9.2 Test Procedure

1. The EUT was placed on a turn table which is 0.8m above ground plane.
2. Set EUT as TX operation and connect directly to the spectrum analyzer.
3. Based on FCC Part15 C Section 15.247: RBW=100KHz, VBW=300KHz.
4. Set detected by the spectrum analyzer with peak detector.

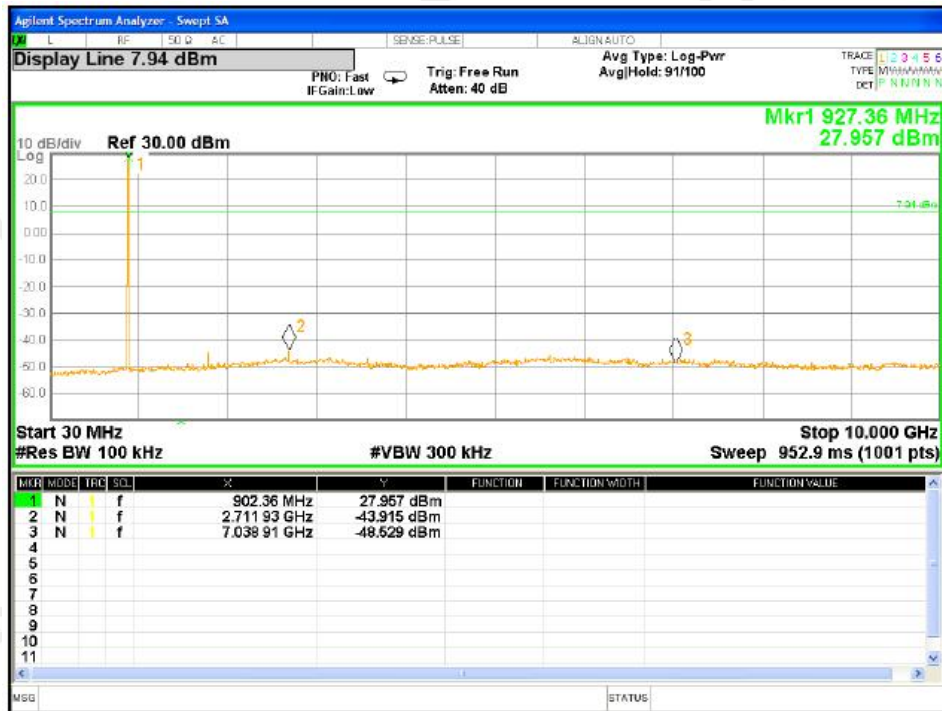
9.3 Limit

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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20dB.

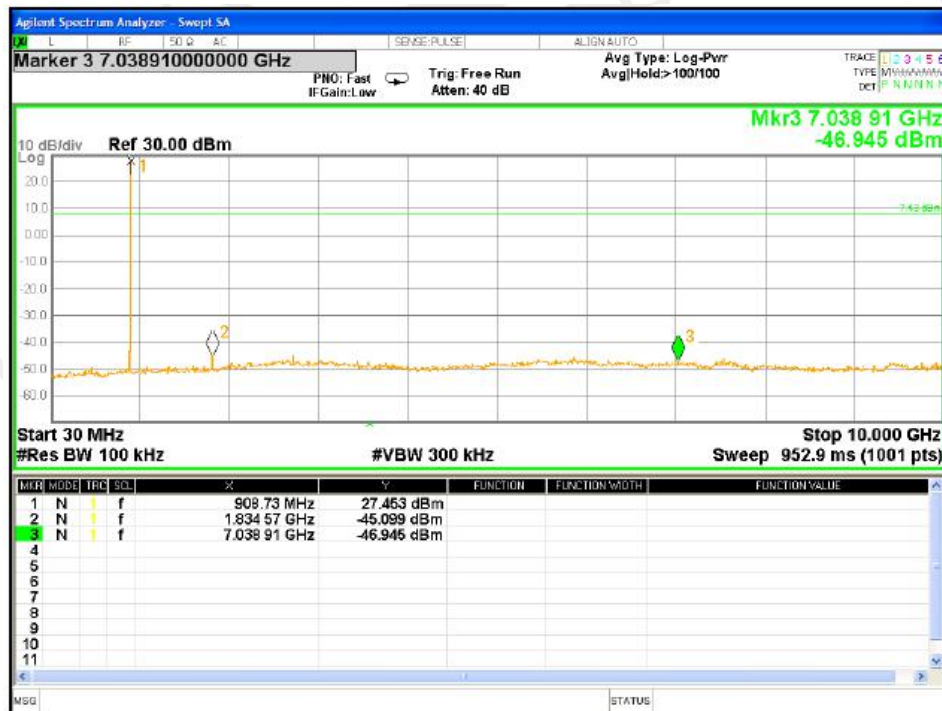
9.4 Test Result

PASS

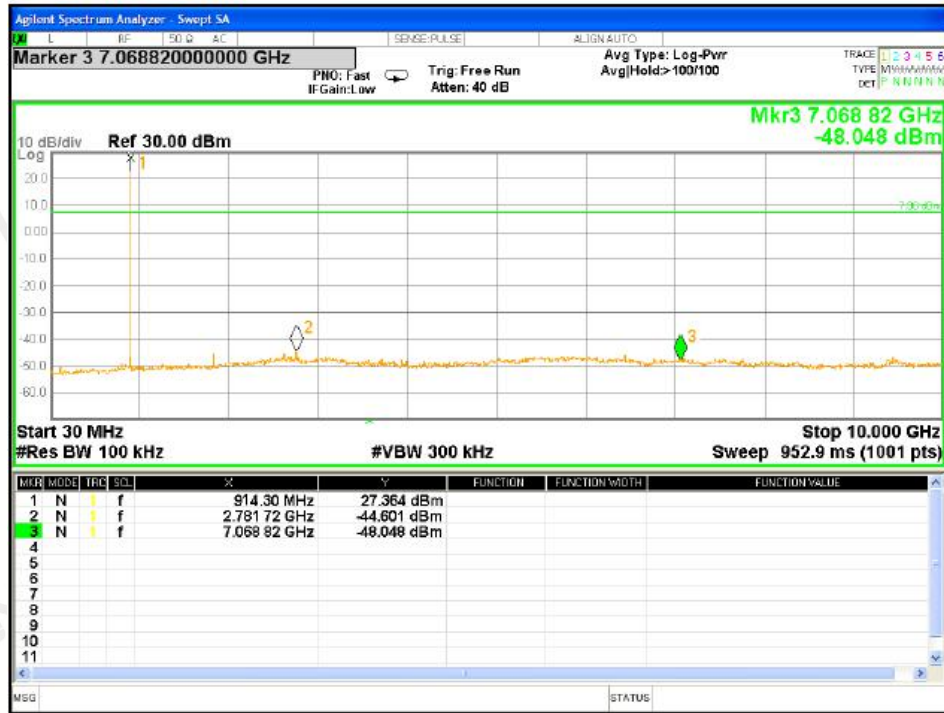
CH: 902.3MHz



CH: 908.7MHz



CH: 914.9MHz

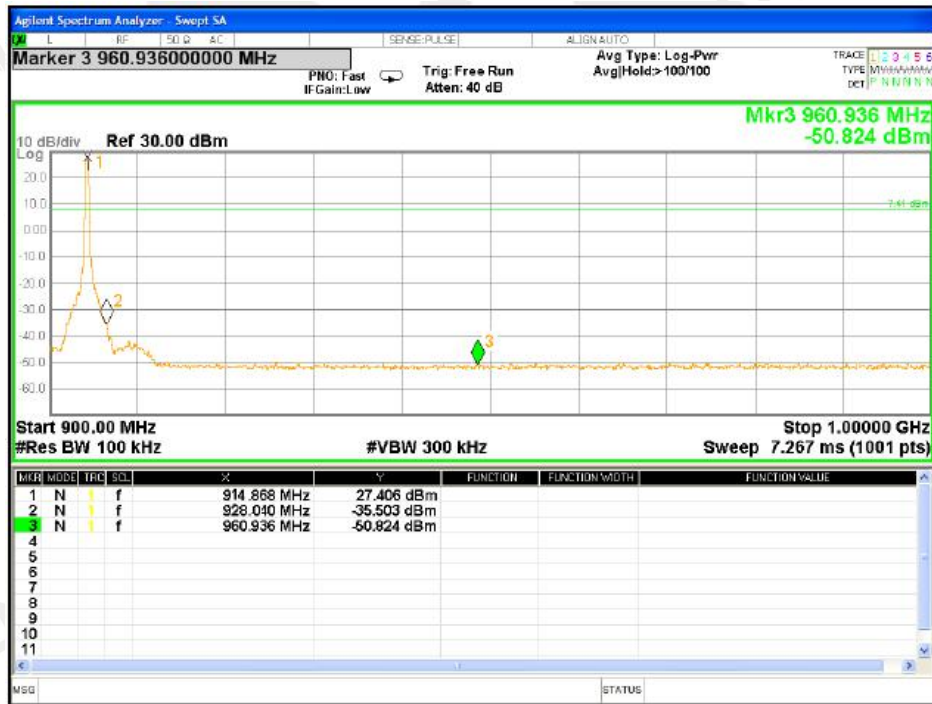


For Band edge

CH: 902.3MHz

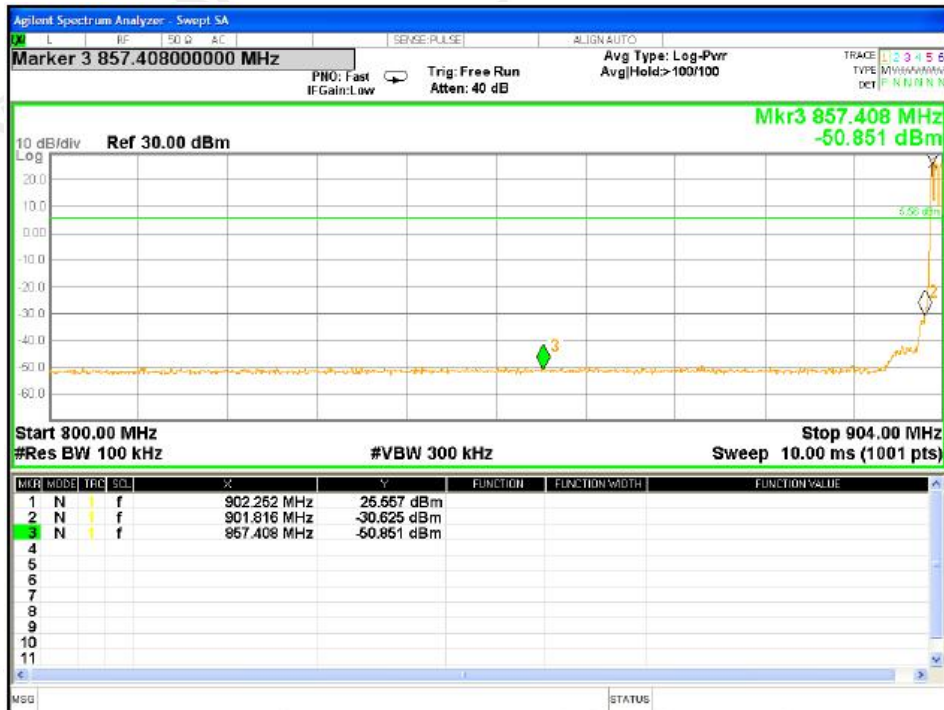


CH: 914.9MHz

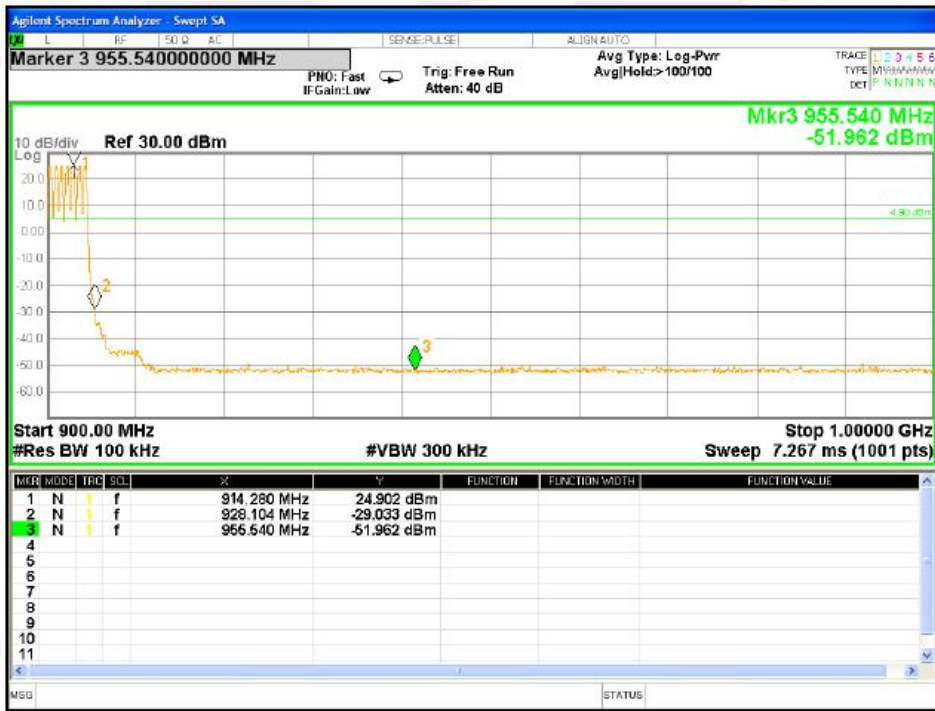


For Hopping Band edge

CH: 902.3MHz



CH: 914.9MHz



10. NUMBER OF HOPPING FREQUENCY

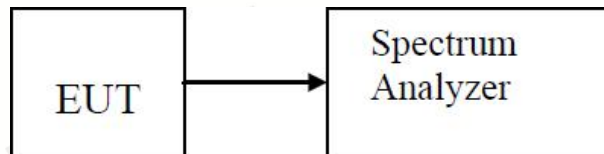
10.1 Test Limit

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.

10.2 Test Procedure

The EUT was directly connected to the spectrum analyzer and antenna output port as show in the block diagram below, Spectrum Setting : RBW= 100KHz, VBW=300KHz, Sweep time = Auto.

10.3 Test Setup



10.4 Test Result

PASS

Number of Hopping Channel 64



11. TIME OF OCCUPANCY(DWELL TIME)

11.1 Test Limit

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.

11.2 Test Procedure

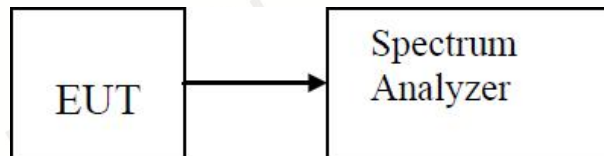
The transmitter output was connected to the spectrum analyzer through an attenuator.

Set center frequency of spectrum analyzer=operating frequency with RBW=1MHz and VBW=3MHz, Span=0Hz.

Sweep Time is 20 second.

Set the center frequency on any frequency would be measure and set the frequency span to zero span.

11.3 Test Setup

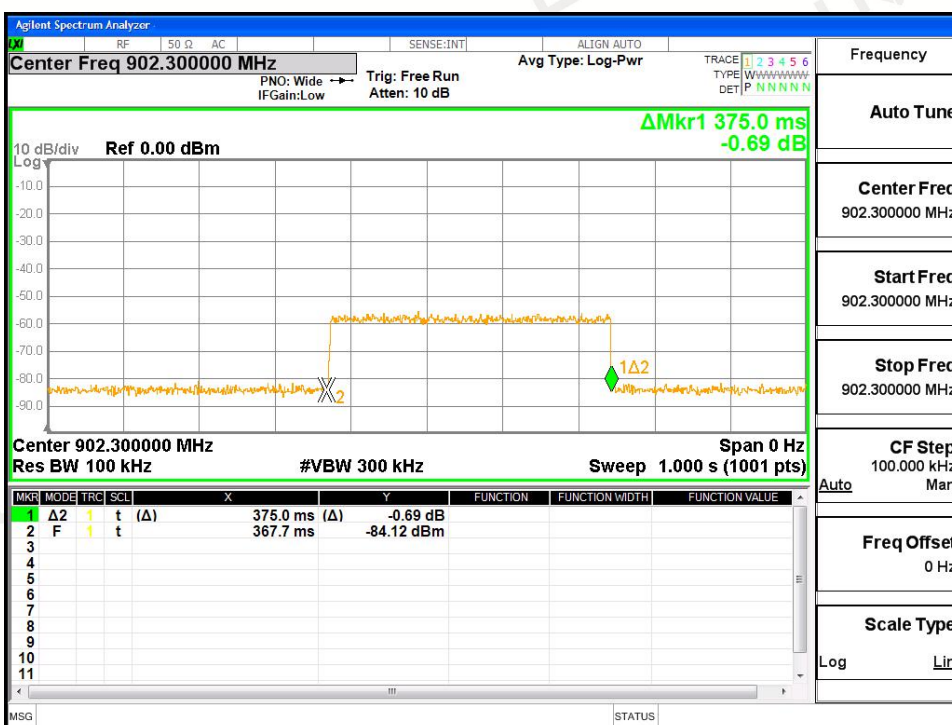


11.4 Test Result

PASS

Frequency	Dwell Time(ms)	Limit(ms)	Result
902.3	375.0	400	Pass
908.7	372.9	400	Pass
914.9	372.9	400	Pass

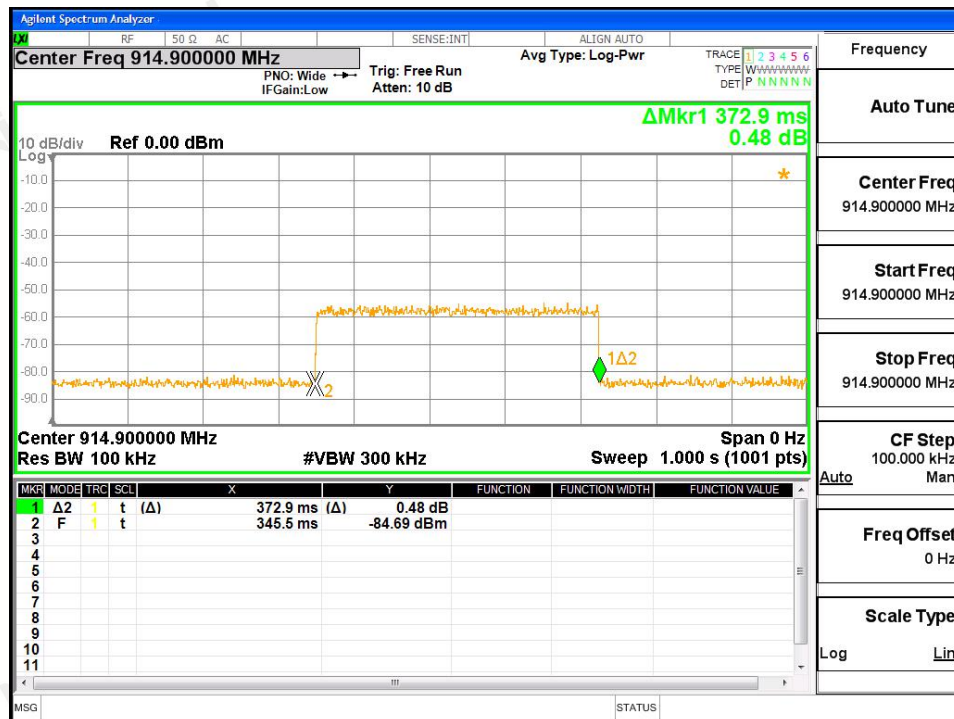
CH: 902.3MHz



CH: 908.7MHz



CH: 914.9MHz



12. ANTENNA REQUIREMENT

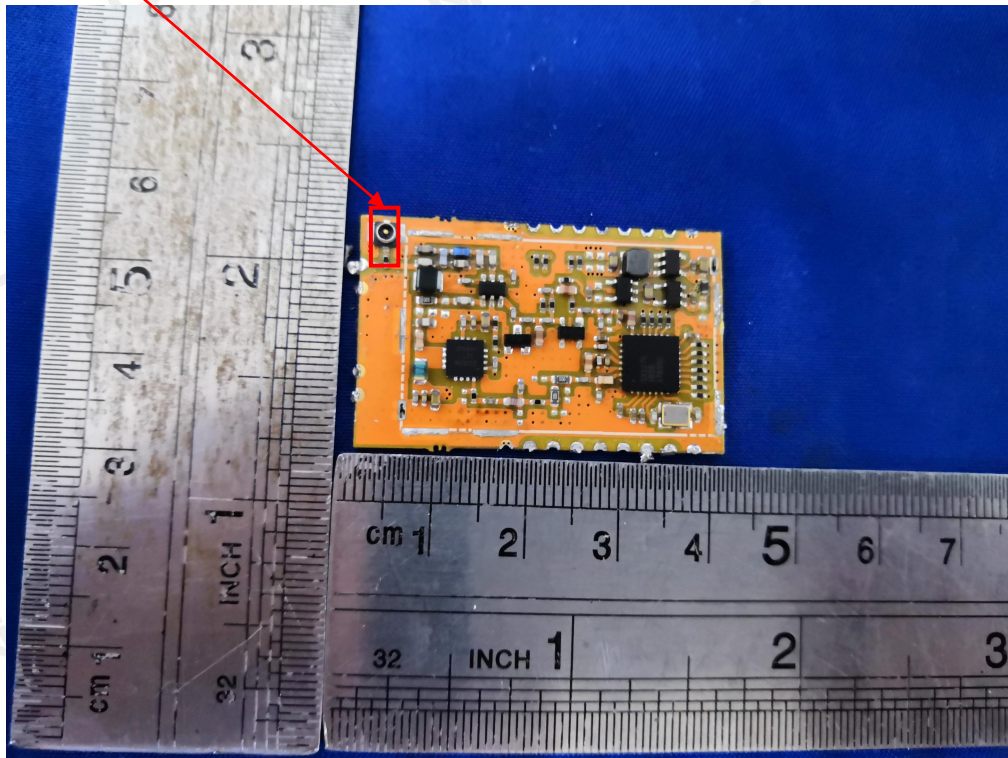
Standard Applicable:

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 Connected Construction

The antenna used in this product is an External antenna, The directional gains of antenna used for transmitting is 1.5dBi.

BT ANTENNA:



13. PHOTOGRAPH OF TEST

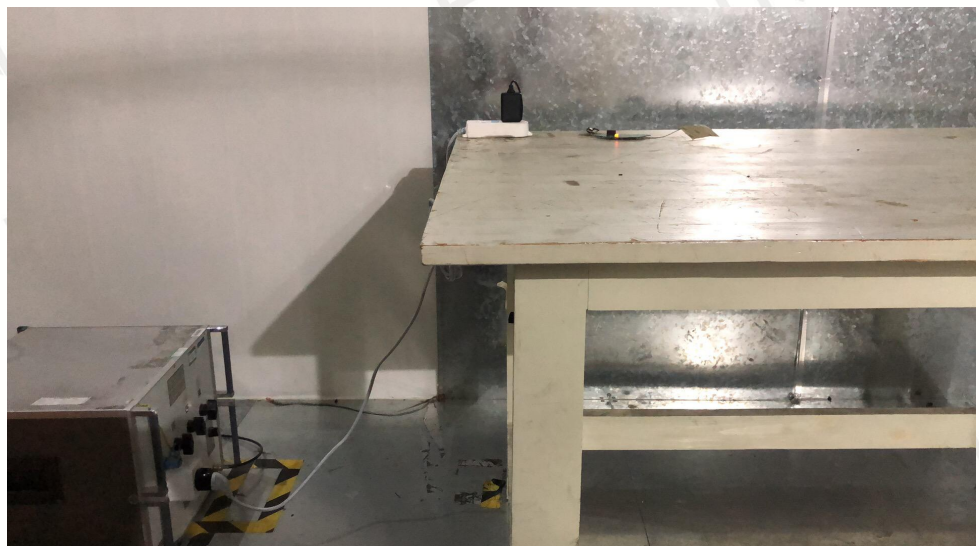
**Radiated Emission
(Below 1G)**



**Radiated Emission
(Above 1G)**



Conducted Emission



End of Report