

FCC 47 CFR PART 15 SUBPART C
CERTIFICATION TEST REPORT

For

Smart home hub

MODEL No.: OTODO Hub-1-ZW-U

FCC ID: 2ARCD-HUB-1-ZW-U

Trade Mark: OTODO

REPORT NO: ES180817021W04

ISSUE DATE: September 7, 2018

Prepared for

OTODO SAS

33 Avenue du Maine, 75015 Paris, FRANCE

Prepared by

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1 TEST RESULT CERTIFICATION

Applicant : OTODO SAS
Address : 33 Avenue du Maine, 75015 Paris, FRANCE
Manufacturer : OTODO SAS
Address : 33 Avenue du Maine, 75015 Paris, FRANCE
EUT : Smart home hub
Model Name : OTODO Hub-1-ZW-U
Trademark : OTODO


Measurement Procedure Used:


APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 2, Subpart J FCC 47 CFR Part 15, Subpart C	PASS


The above equipment was tested by EMTEK(SHENZHEN) CO., LTD. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10 (2013) and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 2 and Part 15.249

The test results of this report relate only to the tested sample identified in this report

Date of Test : August 20, 2018 to September 5, 2018

Prepared by : 
Sewen Guo /Editor

Reviewer : 
Joe Xia/Editor

Approve & Authorized Signer : 
Lisa Wang/Manager



2 EUT TECHNICAL DESCRIPTION

Product:	Smart home hub
Model Name:	OTODO Hub-1-ZW-U
Modulation:	FSK
Operating Frequency Range:	902-928 MHz
Transmit Power Max	95.83 dBuV/m
Antenna Type:	Metal Pifa antenna
Antenna Gain:	-3 dBi
Power supply	<input checked="" type="checkbox"/> : DC 5V for adapter
	<input checked="" type="checkbox"/> Adapter : Model : AS013Z-0501000UU Input : 100-240V,50/60Hz,0.45A, Max Output : DC 5V,1.0A ,
Temperature Range	-10°C ~ +55°C

Note: for more details, please refer to the User's manual of the EUT.

3 SUMMARY OF TEST RESULT

FCC Part Clause	Test Parameter	Verdict	Remark
15.207	Conducted Emission	PASS	
15.209	Radiated Emission	PASS	
15.249	Radiated Spurious Emission	PASS	
15.249	Band edge test	PASS	
15.249	20dB Bandwidth	PASS	
15.203	Antenna Requirement	PASS	
NOTE1: N/A (Not Applicable)			
NOTE2: The report use radiated measurements in the restricted frequency bands. In addition, the radiated test is also performed to ensure the emissions emanating from the device cabinet also comply with the applicable limits.			

RELATED SUBMITTAL(S) / GRANT(S):

This submittal(s) (test report) is intended for FCC ID: 2ARCD-HUB-1-ZW-U filing to comply with Section 15.249 of the FCC Part 15, Subpart C Rules.

4 TEST METHODOLOGY

4.1 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to its specifications, the EUT must comply with the requirements of the following standards:
FCC 47 CFR Part 2, Subpart J
FCC 47 CFR Part 15, Subpart C

4.2 MEASUREMENT EQUIPMENT USED

4.2.1 Conducted Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LASTCAL.	DUE CAL.
Test Receiver	Rohde & Schwarz	ESCI	26115-010-0027	May 20, 2018	May 19, 2019
L.I.S.N.	Rohde & Schwarz	ENV216	101161	May 20, 2018	May 19, 2019
50ΩCoaxial Switch	Anritsu	MP59B	6100175589	May 21, 2018	May 20, 2019
Voltage Probe	Rohde & Schwarz	ESH2-Z3	100122	May 21, 2018	May 20, 2019
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100006	May 20, 2018	May 19, 2019
I.S.N	Teseq GmbH	ISN T800	30327	May 21, 2018	May 20, 2019

4.2.2 Radiated Emission Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LAST CAL.	DUE CAL.
EMI Test Receiver	Rohde & Schwarz	ESU	1302.6005.26	May 21, 2018	May 20, 2019
Pre-Amplifier	HP	8447F	2944A07999	May 20, 2018	May 19, 2019
Bilog Antenna	Schwarzbeck	VULB9163	142	May 20, 2018	May 19, 2019
Loop Antenna	ARA	PLA-1030/B	1029	May 20, 2018	May 19, 2019
Horn Antenna	Schwarzbeck	BBHA 9170	BBHA9170399	May 21, 2018	May 20, 2019
Horn Antenna	Schwarzbeck	BBHA 9120	D143	May 20, 2018	May 19, 2019
Cable	Schwarzbeck	AK9513	ACRX1	May 21, 2018	May 20, 2019
Cable	Rosenberger	N/A	FP2RX2	May 21, 2018	May 20, 2019
Cable	Schwarzbeck	AK9513	CRPX1	May 21, 2018	May 20, 2019
Cable	Schwarzbeck	AK9513	CRRX2	May 21, 2018	May 20, 2019

4.2.3 Radio Frequency Test Equipment

EQUIPMENT TYPE	MFR	MODEL NUMBER	SERIAL NUMBER	LASTCAL.	DUE CAL.
Spectrum Analyzer	Agilent	E4407B	88156318	May 21, 2018	May 20, 2019
EMI Test Receiver	Rohde & Schwarz	ESCI	101045	May 21, 2018	May 20, 2019
Signal Analyzer	Agilent	N9010A	My53470879	May 21, 2018	May 20, 2019
Power meter	Anritsu	ML2495A	0824006	May 21, 2018	May 20, 2019
Power sensor	Anritsu	MA2411B	0738172	May 21, 2018	May 20, 2019

Remark: Each piece of equipment is scheduled for calibration once a year.

4.3 DESCRIPTION OF TEST MODES

The EUT has been tested under its typical operating condition.

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

The Transmitter was operated in the normal operating mode. The TX frequency was fixed which was for the purpose of the measurements.

Test of channel included the lowest and middle and highest frequency to perform the test, then record on this report.

Test Mode List		
Test Mode	Description	Remark
TM1	Low Channel	903MHz
TM2	Middle Channel	915MHz
TM3	High Channel	927MHz

5 FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

Bldg 69, Majialong Industry Zone District, Nanshan District, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.10 and CISPR Publication 22.

5.2 LABORATORY ACCREDITATIONS AND LISTINGS

Site Description

EMC Lab. : Accredited by CNAS, 2016.10.24
The certificate is valid until 2022.10.28
The Laboratory has been assessed and proved to be in compliance with
CNAS-CL01:2006 (identical to ISO/IEC 17025:2005)
The Certificate Registration Number is L2291.

Accredited by TUV Rheinland Shenzhen 2016.5.19
The Laboratory has been assessed according to the requirements
ISO/IEC 17025.

Accredited by FCC, August 06, 2018
Designation Number: CN1204
Test Firm Registration Number: 882943
Accredited by A2LA, July 31, 2017
The Certificate Registration Number is 4321.01.

Accredited by Industry Canada, November 24, 2015
The Certificate Registration Number is 4480A.

Accredited by A2LA, July 31, 2017
The Certificate Number is 4321.01.

Name of Firm : EMTEK (SHENZHEN) CO., LTD.

Site Location : Bldg 69, Majialong Industry Zone, Nanshan District, Shenzhen,
Guangdong, China

6 TEST SYSTEM UNCERTAINTY

The following measurement uncertainty levels have been estimated for tests performed on the apparatus:

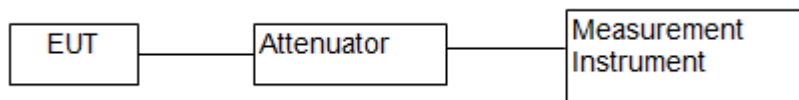
Parameter	Uncertainty
Radio Frequency	$\pm 1 \times 10^{-5}$
Maximum Peak Output Power Test	$\pm 1.0\text{dB}$
Conducted Emissions Test	$\pm 2.0\text{dB}$
Radiated Emission Test	$\pm 2.0\text{dB}$
Occupied Bandwidth Test	$\pm 1.0\text{dB}$
Band Edge Test	$\pm 3\text{dB}$
All emission, radiated	$\pm 3\text{dB}$
Antenna Port Emission	$\pm 3\text{dB}$
Temperature	$\pm 0.5^{\circ}\text{C}$
Humidity	$\pm 3\%$

Measurement Uncertainty for a level of Confidence of 95%

7 SETUP OF EQUIPMENT UNDER TEST

7.1 RADIO FREQUENCY TEST SETUP 1

The EUT wireless component's antenna port(s) of the EUT are connected to the measurement instrument per an appropriate attenuator. The EUT is controlled by PC/software to emit the specified signals for the purpose of measurements.



7.2 RADIO FREQUENCY TEST SETUP 2

The test site semi-anechoic chamber has met the requirement of NSA tolerance 4 dB according to the standards: ANSI C63.10. The test distance is 3m. The setup is according to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 and CAN/CSA-CEI/IEC CISPR 22.

Below 30MHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna (loop antenna). The Antenna should be positioned with its plane vertical at the specified distance from the EUT and rotated about its vertical axis for maximum response at each azimuth about the EUT. The center of the loop shall be 1 m above the ground. For certain applications, the loop antenna plane may also need to be positioned horizontally at the the specified distance from the EUT.

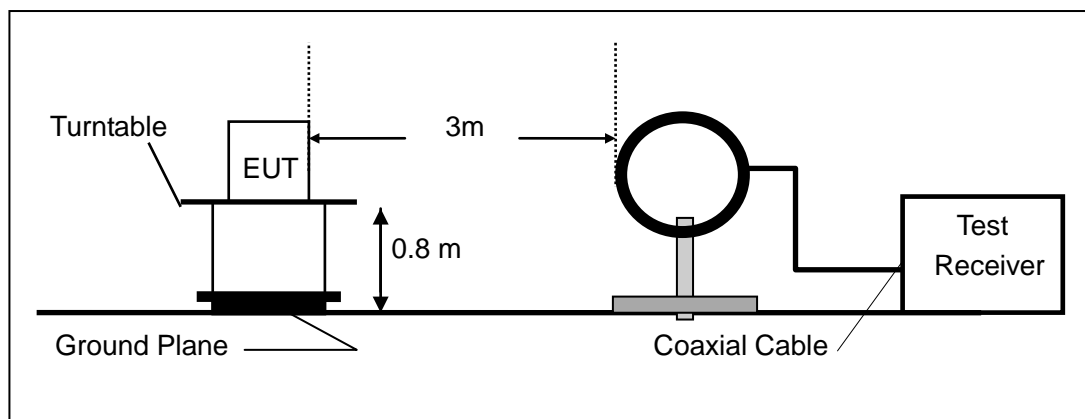
30MHz-1GHz:

The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

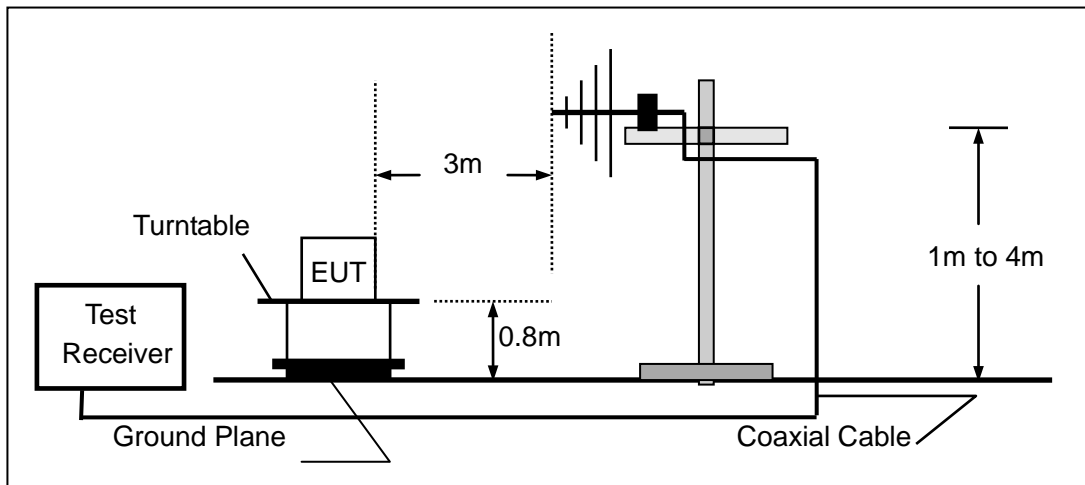
Above 1GHz:

The EUT is placed on a turntable 1.5 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarisation and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).

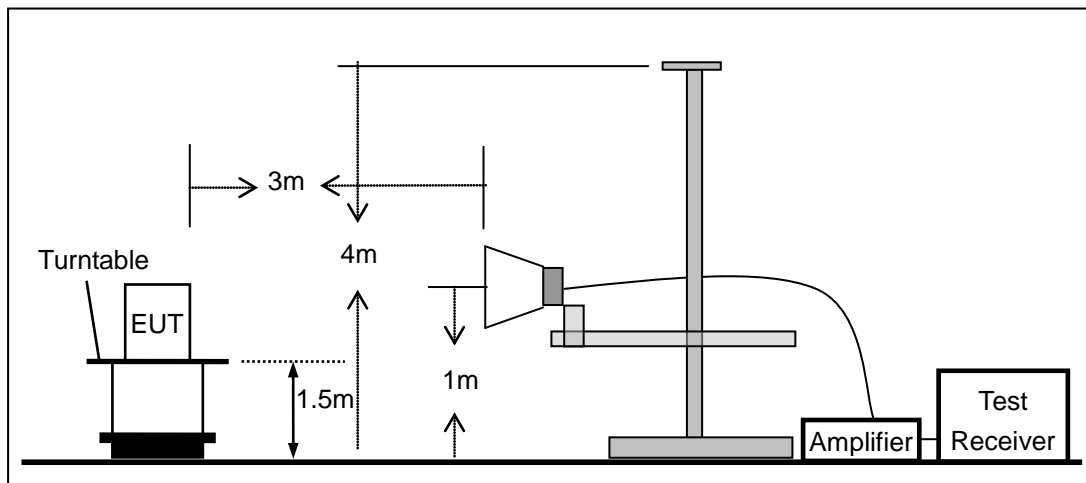
(a) Radiated Emission Test Set-Up, Frequency Below 30MHz



(b) Radiated Emission Test Set-Up, Frequency Below 1000MHz



(c) Radiated Emission Test Set-Up, Frequency above 1000MHz

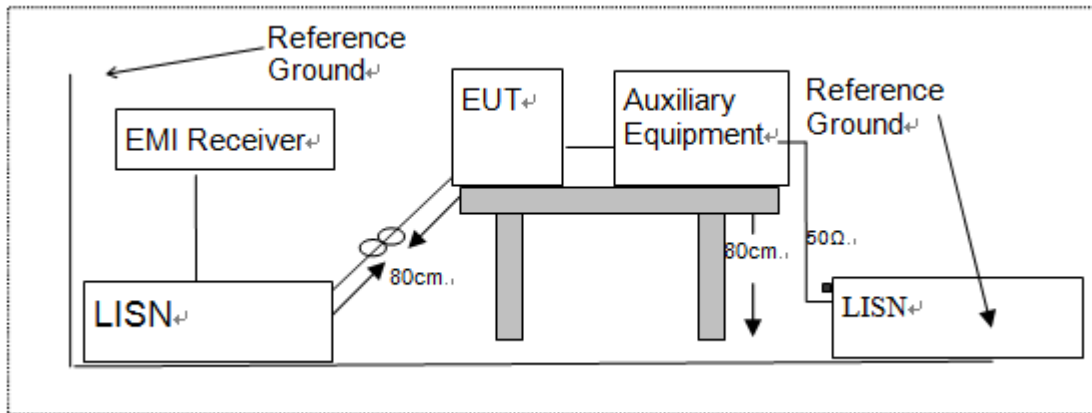


7.3 CONDUCTED EMISSION TEST SETUP

The mains cable of the EUT (maybe per AC/DC Adapter) must be connected to LISN. The LISN shall be placed 0.8 m from the boundary of EUT and bonded to a ground reference plane for LISN mounted on top of the ground reference plane. This distance is between the closest points of the LISN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8m from the LISN.

Ground connections, where required for safety purposes, shall be connected to the reference ground point of the LISN and, where not otherwise provided or specified by the manufacturer, shall be of same length as the mains cable and run parallel to the mains connection at a separation distance of not more than 0.1 m.

According to the requirements in Section 13.1.4.1 of ANSI C63.10-2013 Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30 MHz using CISPR Quasi-Peak and average detector mode.



7.4 SUPPORT EQUIPMENT

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
Adapter cable	1.0	Unshielded	Without Ferrite

Auxiliary Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
Notebook	acer	ZR1	LXTECOCO76643158 372500

Notes:

1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

8 TEST REQUIREMENTS

8.1 BANDWIDTH TEST

8.1.1 Applicable Standard

According to FCC Part 15.249

8.1.2 Conformance Limit

N/A

8.1.3 Test Configuration

Test according to clause 7.1 radio frequency test setup 1

8.1.4 Test Procedure

The EUT was operating in controlled its channel. Printed out the test result from the spectrum by hard copy function.

The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.

Set to the maximum power setting and enable the EUT transmit continuously

Set RBW \geq 1% of the 20 dB bandwidth(3KHz)

Set the video bandwidth (VBW) \geq RBW(10KHz).

Set Span= approximately 2 to 3 times the 20 dB bandwidth

Set Detector = Peak.

Set Trace mode = max hold.

Set Sweep = auto couple.

Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 20 dB relative to the maximum level measured in the fundamental emission.

Measure and record the results in the test report.

Test Results

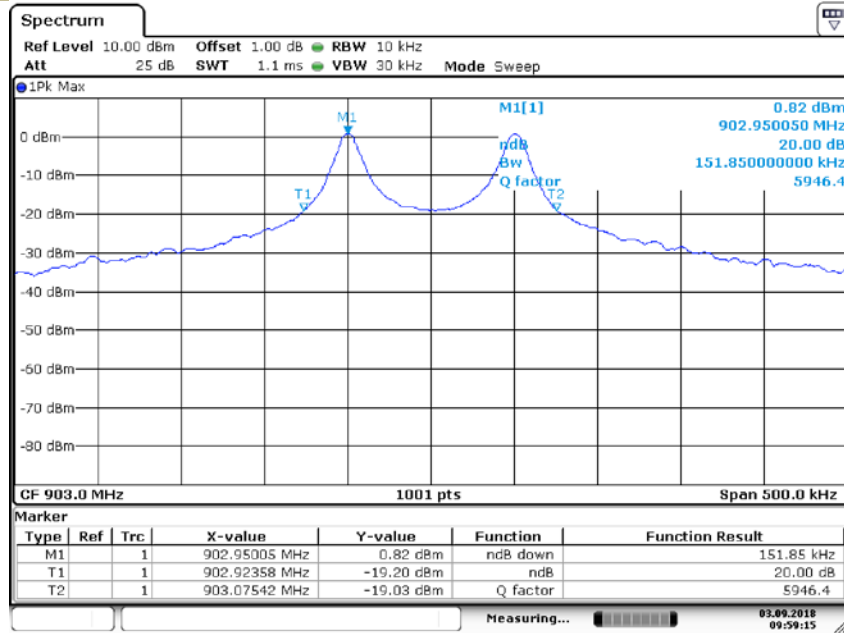
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

Operation Mode	Channel Number	Channel Frequency (MHz)	20db Measurement Bandwidth (kHz)	Limit (kHz)	Verdict
FSK	0	903	151.85	N/A	PASS
	1	915	158.34	N/A	PASS
	2	927	156.34	N/A	PASS
Note: N/A (Not Applicable)					

Test Model

Occupied Bandwidth
FSK

Channel 0: 5768.3MHz

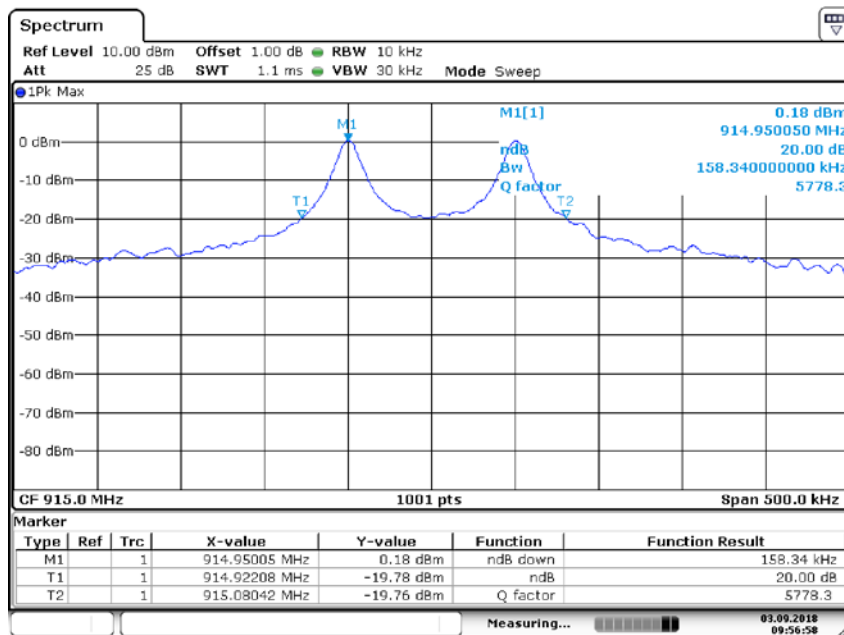


Date: 3.SEP.2018 09:59:15

Test Model

Occupied Bandwidth
FSK

Channel 0: 5802.1MHz



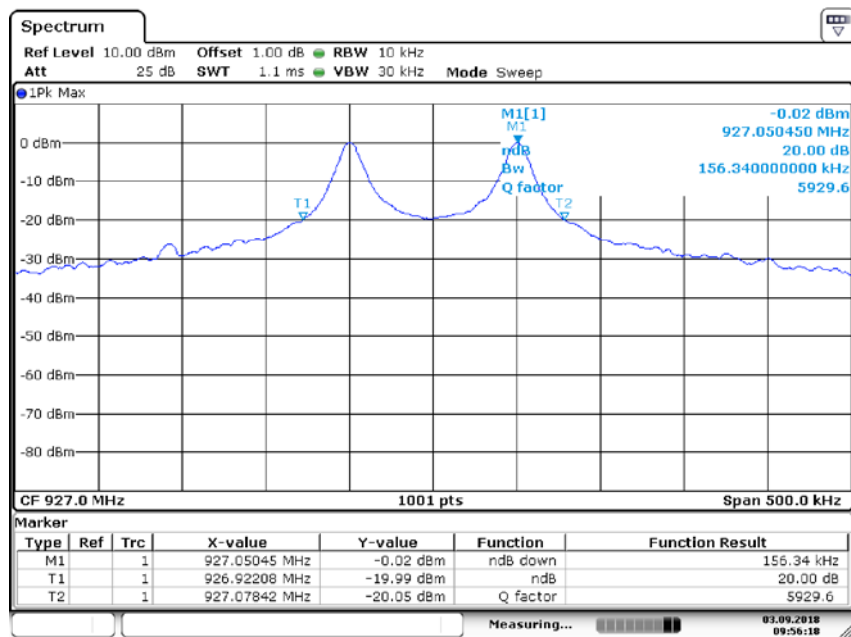
Date: 3.SEP.2018 09:56:59

Test Model

Occupied Bandwidth

FSK

Channel 2: 5830.6MHz



Date: 3.SEP.2018 09:56:18

8.2 RADIATED SPURIOUS EMISSION

8.2.1 Applicable Standard

According to FCC Part 15.249 and 15.209

8.2.2 Conformance Limit

According to FCC Part 15.249: radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

According to FCC Part 15.205, Restricted bands

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
10.495-0.505	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	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			

According to FCC Part 15.205, the level of any transmitter spurious emission in Restricted bands shall not exceed the level of the emission specified in the following table

Restricted Frequency(MHz)	Field Strength (μV/m)	Field Strength (dBμV/m)	Measurement Distance
0.009-0.490	2400/F(KHz)	20 log (uV/m)	300
0.490-1.705	2400/F(KHz)	20 log (uV/m)	30
1.705-30	30	29.5	30
30-88	100	40	3
88-216	150	43.5	3
216-960	200	46	3
Above 960	500	54	3

Remark : 1. Emission level in dBuV/m=20 log (uV/m)

2. Measurement was performed at an antenna to the closed point of EUT distance of meters.

3. Distance extrapolation factor =40log(Specific distance/ test distance)(dB);

Limit line=Specific limits(dBuV) + distance extrapolation factor.

for the frequency ranges below 30 MHz, a narrower RBW is used for these ranges but the measured value should add a RBW correction factor (RBWCF) where RBWCF [dB] =10*Ig(100 [kHz]/narrower RBW [kHz]). , the narrower RBW is 1 kHz and RBWCF is 20 dB for the frequency 9 kHz to 150 kHz, and the narrower RBW is 10 kHz and RBWCF is 10 dB for the frequency 150 kHz to 30 MHz.

Field strength of fundamental and Field strength of harmonics Limit:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902-928 MHz	50(94 dBV/m)	500(54 dBV/m)
2400-2483.5 MHz	50(94 dBV/m)	500(54 dBV/m)
5725-5875 MHz	50(94 dBV/m)	500(54 dBV/m)
24.0-24.25 GHz	250(108 dBV/m)	2500(68 dBV/m)

As shown in §15.35(b), for frequencies above 1000 MHz, the field strength limits in paragraphs (a) and (b) of this section are based on average limits. However, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any condition of modulation

For this report

Fundamental Frequency	Field Strength Of Fundamental	Field Strength of Spurious Emissions
902-928 MHz	AV:94 dBuV/m at 3m distance	AV:54 dBuV/m at 3m distance
	PK:114 dBuV/m at 3m distance	PK:74 dBuV/m at 3m distance

8.2.3 Test Configuration

Test according to clause 7.2 radio frequency test setup 2

8.2.4 Test Procedure

This test is required for any spurious emission that falls in a Restricted Band, as defined in Section 15.205. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

The EUT was placed on a turn table which is 0.8m above ground plane.

Maximum procedure was performed on the highest emissions to ensure EUT compliance.

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz(1GHz to 25GHz), 100 kHz for $f < 1$ GHz(30MHz to 1GHz)

VBW \geq RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.10-2013 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. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b). Submit this data.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a "duty cycle correction factor", derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit. Submit this data.

Repeat above procedures until all frequency measured was complete.

8.2.5 Test Results

Temperature:	24° C
Relative Humidity:	53%
ATM Pressure:	1011 mbar

■ Spurious Emission below 30MHz (9KHz to 30MHz)

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
--	--	--	--	--	--	--	--

Note: the amplitude of spurious emission that is attenuated by more than 20dB below the permissible limit has no need to be reported.

Distance extrapolation factor = $40 \log(\text{Specific distance} / \text{test distance})$ (dB);

Limit line = Specific limits(dBuV) + distance extrapolation factor

■ Field Strength of the fundamental signal

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
903	V	93.24	82.57	114	94	-20.76	-11.43
903	H	95.83	84.69	114	94	-18.17	-9.31
915	V	93.69	81.35	114	94	-20.31	-12.65
915	H	95.72	83.97	114	94	-18.28	-10.03
927	V	93.74	80.95	114	94	-20.26	-13.05
927	H	95.64	84.61	114	94	-18.36	-9.39

Note: (1) Correct Factor = Antenna Factor + Cable Loss - Amplifier Gain

(2) Emission Level = Reading Level + Probe Factor + Cable Loss

■ Out of Band Emissions

Lowest

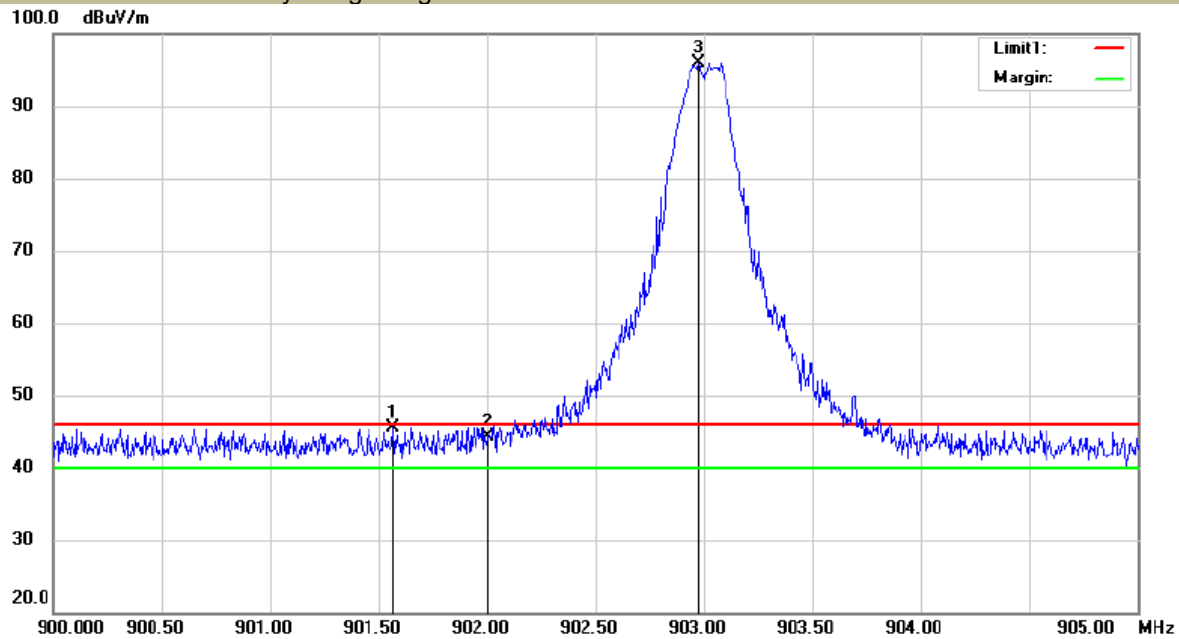
Frequency (MHz)	Polarity	PK(dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Result
901.562	H	45.55	46	-0.45	Pass
901.395	V	45.72	46	-0.28	Pass

Highest

Frequency (MHz)	Polarity	PK(dBuV/m)	Limit 3m (dBuV/m)	Margin (dB)	Result
928.425	H	45.72	46	-0.28	Pass
928.050	V	45.86	46	-0.14	Pass

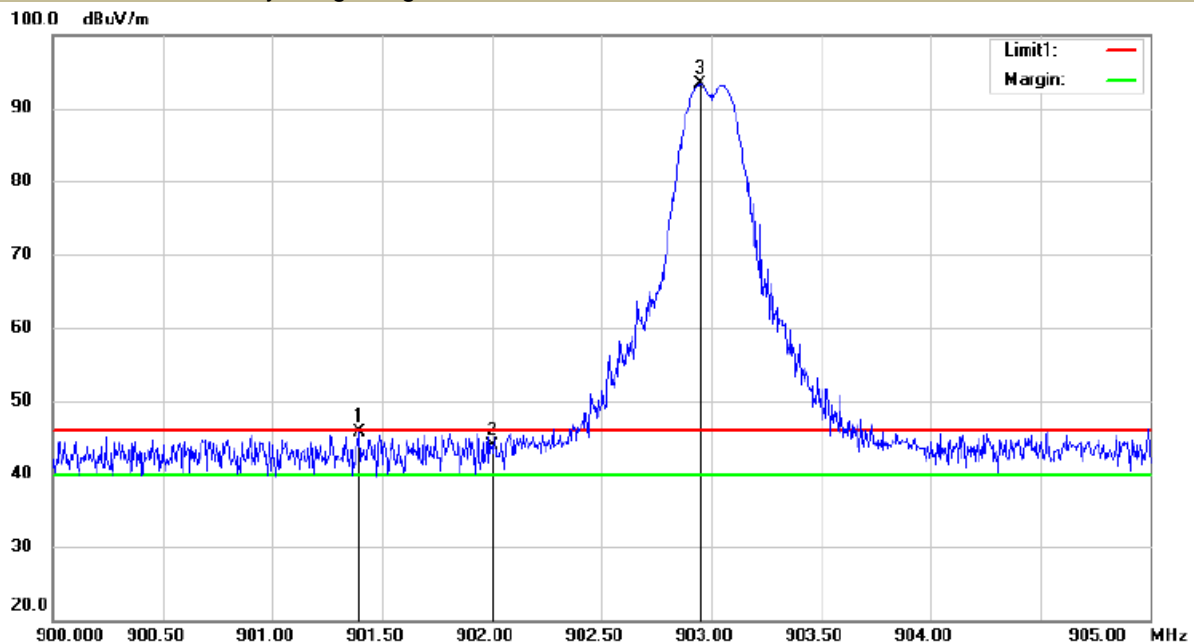
The edge emissions are below the FCC 15.209 Limits or complies with the 15.249 requirements.

Test Model	Spurious Emission Low Test By: King Kong	FSK	H
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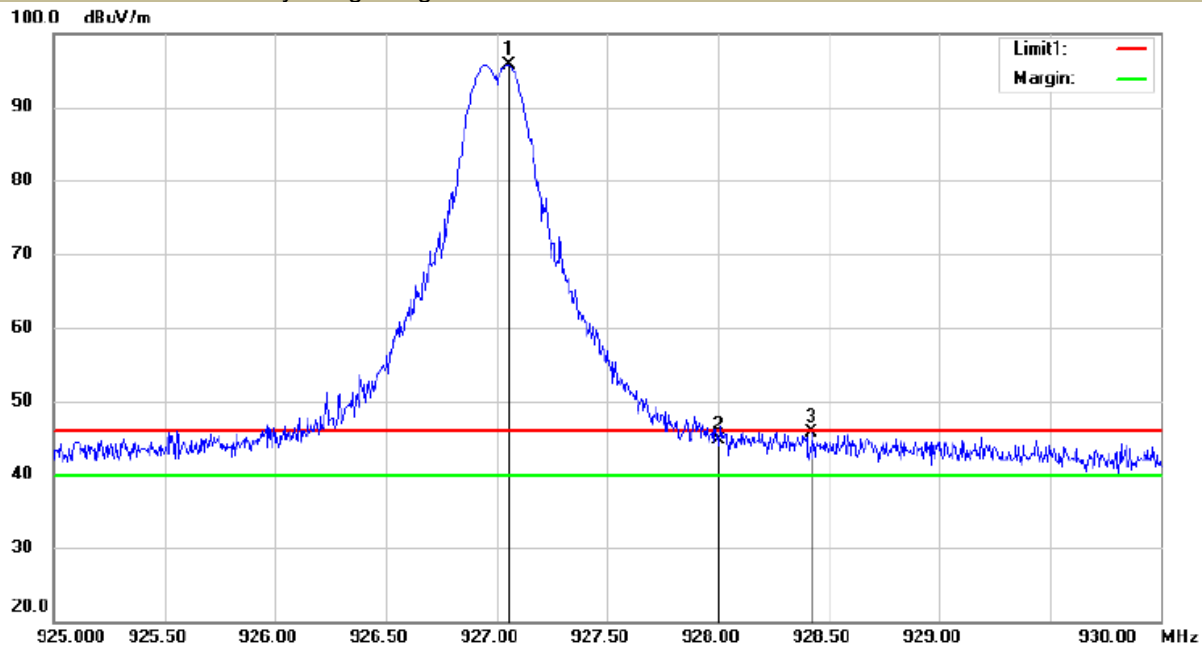
Site 3m Chamber #3 Polarization: **Horizontal** Temperature: C
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: %

Test Model	Spurious Emission Low Test By: King Kong	FSK	V
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Site 3m Chamber #3 Polarization: **Vertical** Temperature: C
Limit: (RE)FCC PART 15 CLASS B Power: AC 120V/60Hz Humidity: %

Test Model	Spurious Emission High Test By: King Kong	FSK	H
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Site 3m Chamber #3

Polarization: *Horizontal*

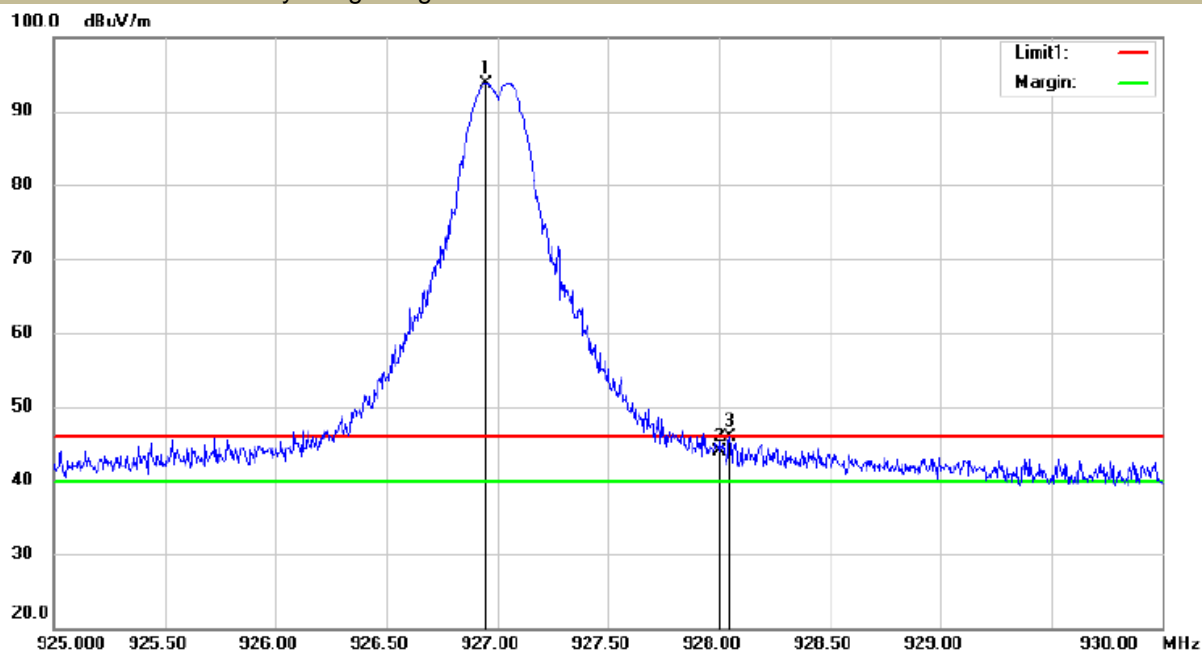
Temperature: C

Limit: (RE)FCC PART 15 CLASS B

Power: AC 120V/60Hz

Humidity: %

Test Model	Spurious Emission High Test By: King Kong	FSK	V
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Site 3m Chamber #3

Polarization: *Vertical*

Temperature: C

Limit: (RE)FCC PART 15 CLASS B

Power: AC 120V/60Hz

Humidity: %

■ Spurious Emission Above 1GHz (1GHz to 25GHz)

Test mode: FSK Frequency: Channel 0: 903MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
1806.00	V	63.93	49.90	74	54	-10.07	-4.10
2709.00	V	55.74	45.93	74	54	-18.26	-8.07
3612.00	V	54.59	44.91	74	54	-19.41	-9.09
4515.00	V	52.51	42.39	74	54	-21.49	-11.61
1806.00	H	64.59	50.20	74	54	-9.41	-3.80
2709.00	H	58.68	46.16	74	54	-15.32	-7.84
3612.00	H	55.70	45.07	74	54	-18.30	-8.93
4515.00	H	53.10	41.74	74	54	-20.90	-12.26

Test mode: FSK Frequency: Channel 1: 915MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
2730.36	V	64.97	48.68	74	54	-9.03	-5.32
3576.01	V	55.41	47.12	74	54	-18.59	-6.88
11604.20	V	56.69	44.21	74	54	-17.31	-9.79
17406.30	V	50.64	42.28	74	54	-23.36	-11.72
2730.36	H	64.62	49.19	74	54	-9.38	-4.81
3576.01	H	56.30	46.16	74	54	-17.70	-7.84
11604.20	H	53.04	45.55	74	54	-20.96	-8.45
17406.30	H	52.74	40.71	74	54	-21.26	-13.29

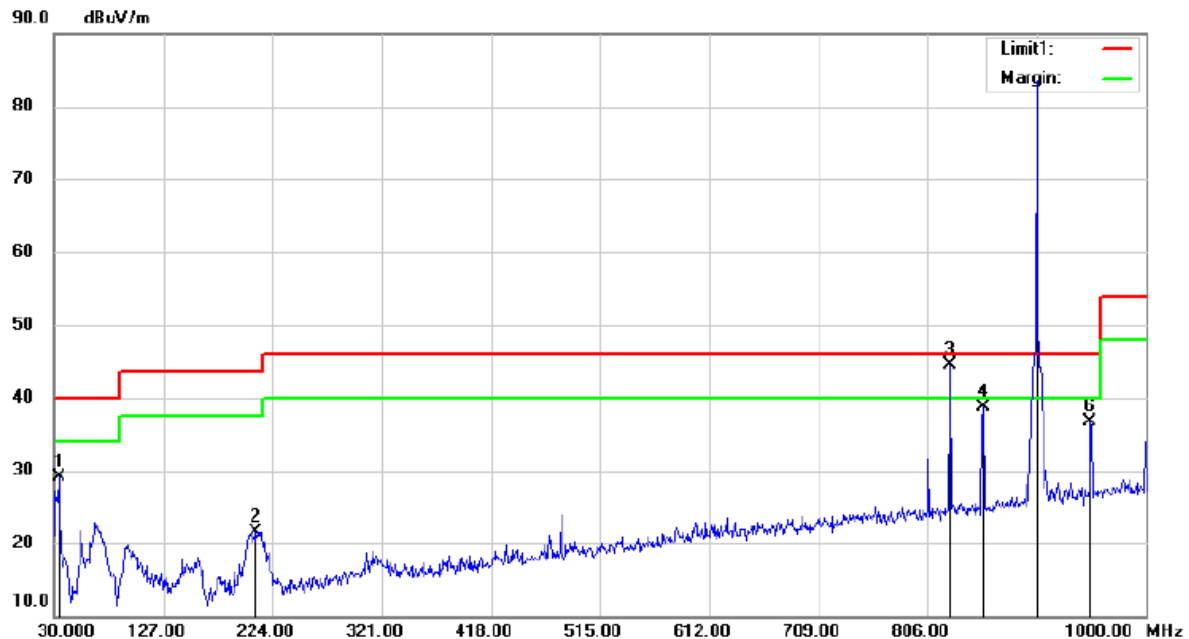
Test mode: FSK Frequency: Channel 2: 927MHz

Freq. (MHz)	Ant.Pol. H/V	Emission Level(dBuV/m)		Limit 3m(dBuV/m)		Over(dB)	
		PK	AV	PK	AV	PK	AV
2727.60	V	65.12	48.34	74	54	-8.88	-5.66
3900.10	V	55.66	45.27	74	54	-18.34	-8.73
11661.20	V	54.89	44.76	74	54	-19.11	-9.24
17491.80	V	51.34	40.90	74	54	-22.66	-13.10
2727.60	H	62.69	48.50	74	54	-11.31	-5.50
3900.10	H	55.83	46.92	74	54	-18.17	-7.08
11661.20	H	56.44	44.20	74	54	-17.56	-9.80
17491.80	H	52.59	42.41	74	54	-21.41	-11.59

- Note:**
- (1) All Readings are Peak Value (VBW=3MHz) and Peak Value (VBW=10Hz).
 - (2) Emission Level= Reading Level+Correct Factor +Cable Loss.
 - (3) Correct Factor= Ant_F + Cab_L - Preamp
 - (4) 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.

■ Spurious Emission below 1GHz (30MHz to 1GHz)

All modes have been tested, and the worst result recorded was report as below:



Site: 3m Chamber #3

Polarization: **Vertical**

Temperature: C

Limit: (RE)FCC PART 15 CLASS B

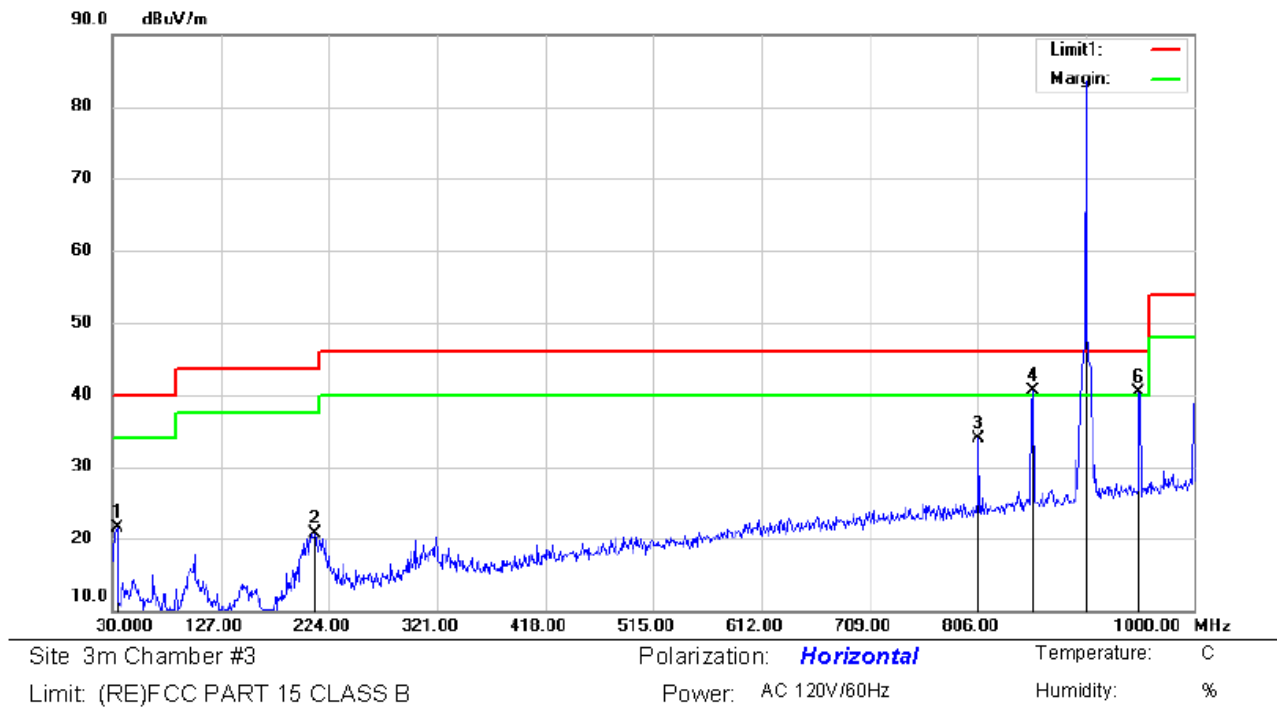
Power: AC 120V/60Hz

Humidity: %

Mode: 903

Note:

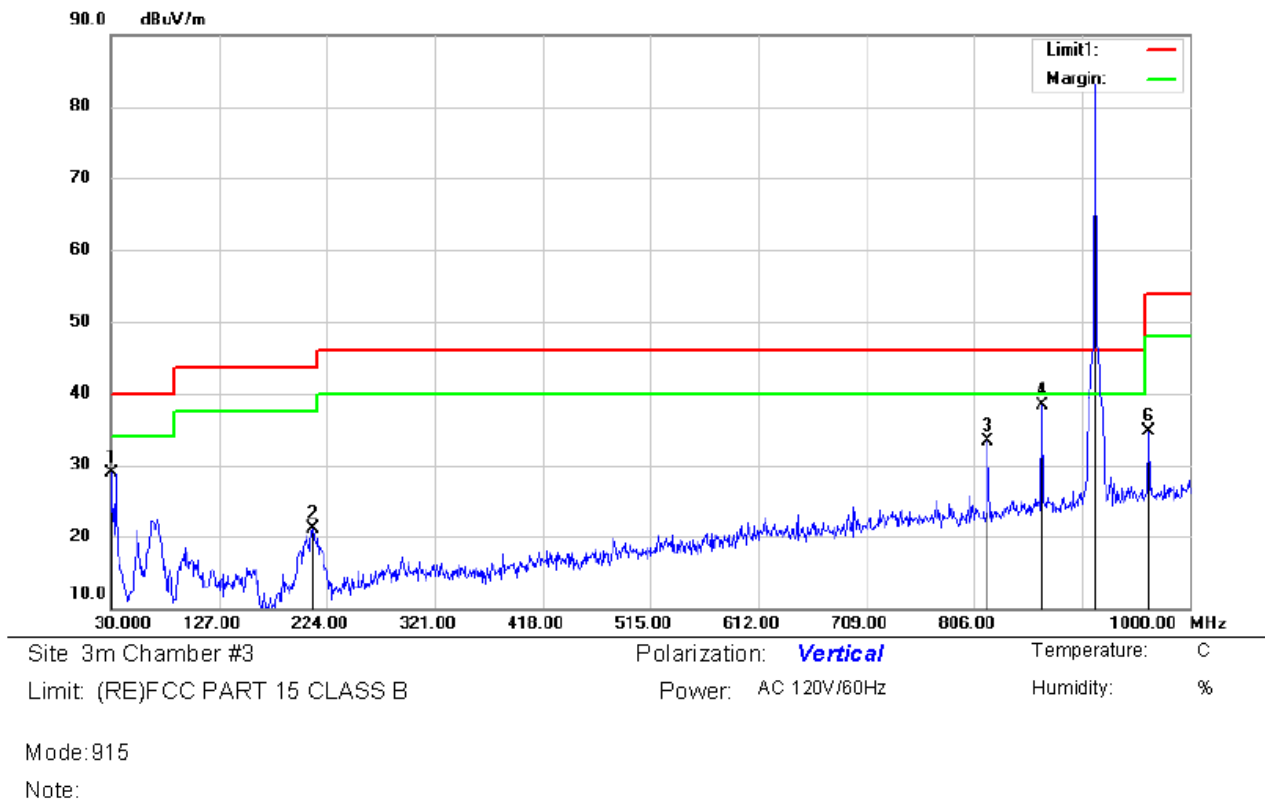
No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Antenna Height cm	Table Degree degree	Comment
1		33.8800	46.45	-17.39	29.06	40.00	-10.94	QP		
2		209.9350	37.77	-16.29	21.48	43.50	-22.02	QP		
3	I	826.3700	47.66	-3.14	44.52	46.00	-1.48	QP		
4		855.4700	41.34	-2.64	38.70	46.00	-7.30	QP		
5	*	903.0000	85.19	-1.65	83.54			Fundamental		
6		951.0150	37.59	-0.96	36.63	46.00	-9.37	QP		



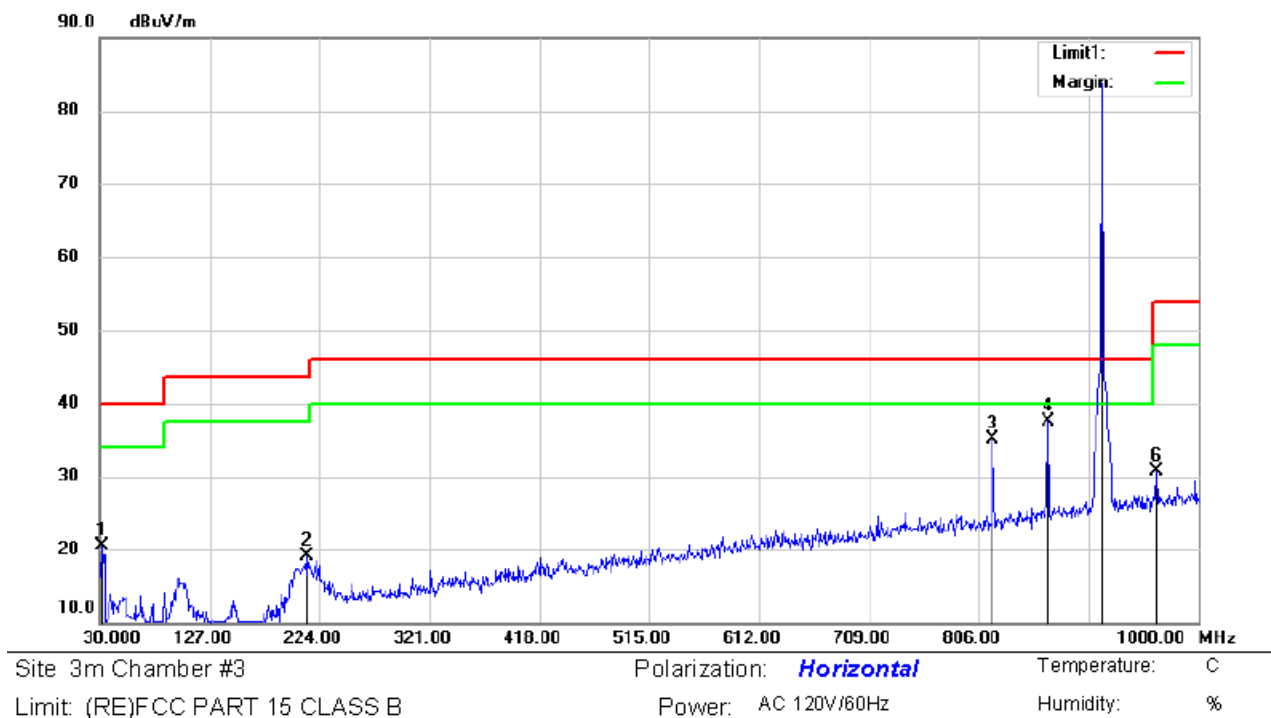
Mode: 903

Note:

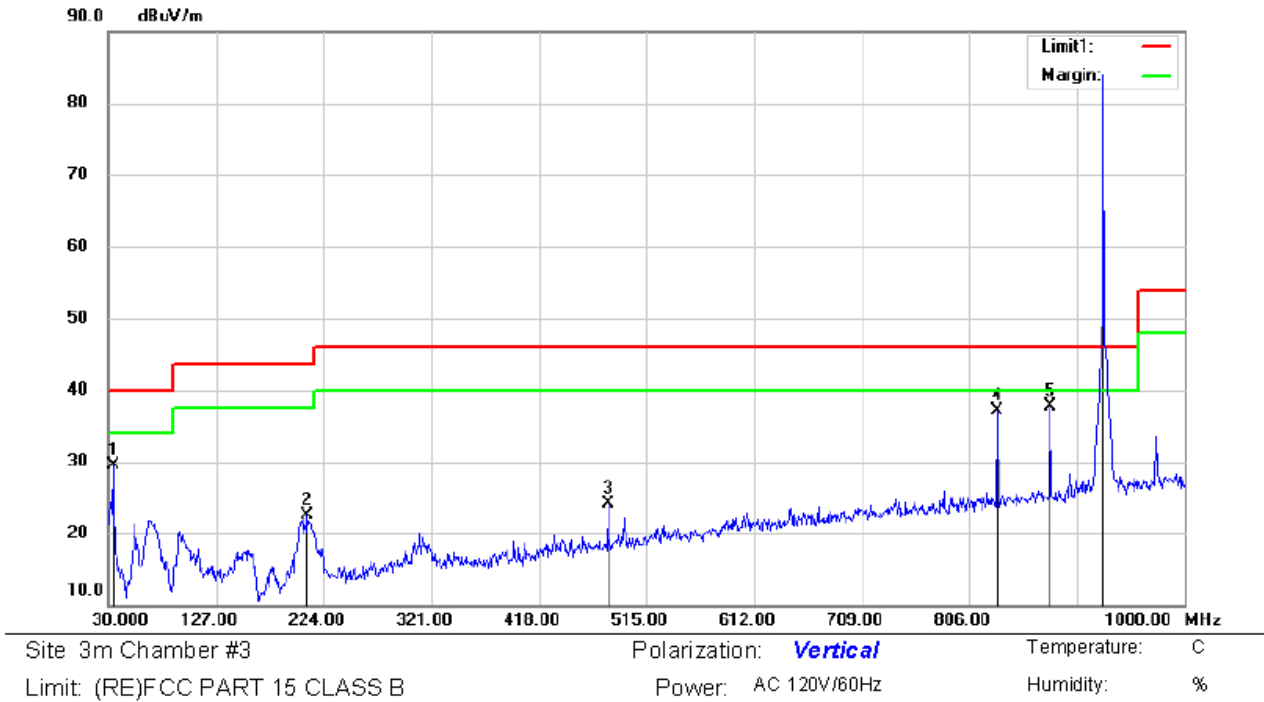
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		33.8800	38.84	-17.39	21.45	40.00	-18.55	QP		
2		211.3900	36.93	-16.21	20.72	43.50	-22.78	QP		
3		806.9700	37.26	-3.40	33.86	46.00	-12.14	QP		
4	I	855.4700	43.09	-2.64	40.45	46.00	-5.55	QP		
5	*	903.4850	85.22	-1.63	83.59			Fundamental		
6	I	951.0150	41.18	-0.96	40.22	46.00	-5.78	QP		



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree degree	Comment
1		30.0000	46.11	-17.24	28.87	40.00	-11.13	QP			
2		211.8750	37.27	-16.19	21.08	43.50	-22.42	QP			
3		819.0950	36.62	-3.24	33.38	46.00	-12.62	QP			
4		867.1100	40.56	-2.18	38.38	46.00	-7.62	QP			
5	*	915.1250	84.43	-1.37	83.06			Fundamental			
6		963.1400	35.53	-0.80	34.73	54.00	-19.27	QP			



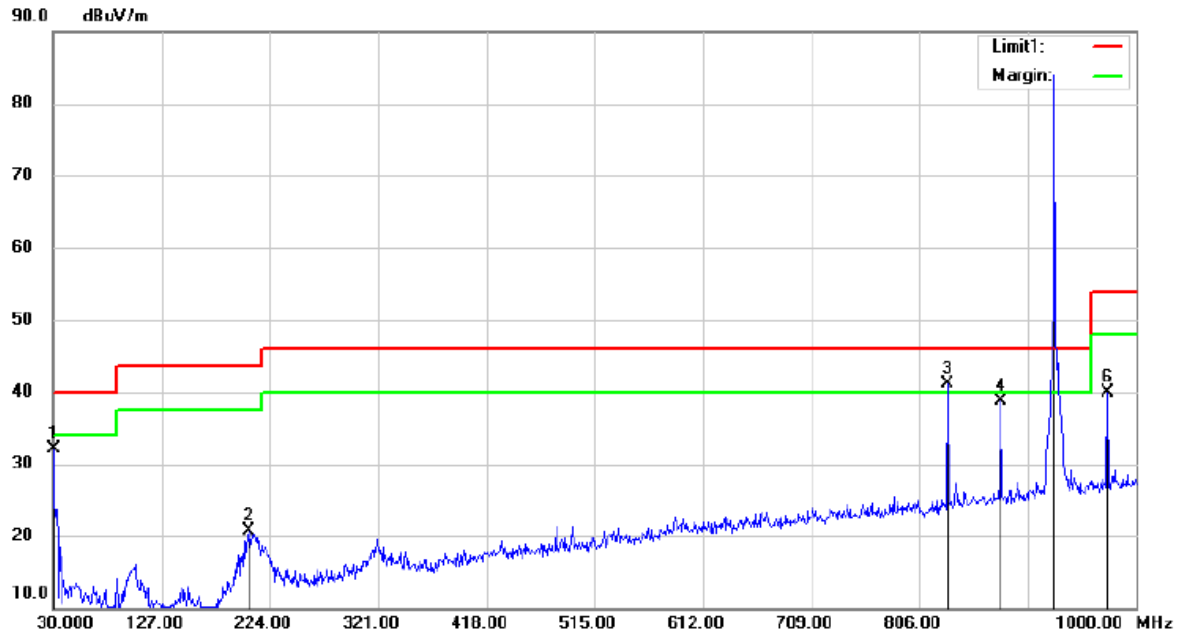
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1		31.9400	37.75	-17.32	20.43	40.00	-19.57	QP		
2		212.8450	35.23	-16.15	19.08	43.50	-24.42	QP		
3		819.0950	38.29	-3.24	35.05	46.00	-10.95	QP		
4		867.1100	39.78	-2.18	37.60	46.00	-8.40	QP		
5	*	915.1250	85.17	-1.37	83.80			Fundamental		
6		963.1400	31.51	-0.80	30.71	54.00	-23.29	QP		



Mode: 927

Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		33.8800	46.83	-17.39	29.44	40.00	-10.56	QP		
2		209.4500	38.69	-16.27	22.42	43.50	-21.08	QP		
3		480.0800	33.05	-9.03	24.02	46.00	-21.98	QP		
4		831.2200	40.20	-3.04	37.16	46.00	-8.84	QP		
5		879.2350	39.94	-2.19	37.75	46.00	-8.25	QP		
6	*	927.2500	85.08	-1.24	83.84			Fundamental		



Site 3m Chamber #3

Polarization: **Horizontal**

Temperature: C

Limit: (RE)FCC PART 15 CLASS B

Power: AC 120V/60Hz

Humidity: %

Mode: 927

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Over dB	Detector	Antenna Height cm	Table Degree	Comment
1		30.4850	49.36	-17.26	32.10	40.00	-7.90	QP			
2		205.5700	36.82	-16.13	20.69	43.50	-22.81	QP			
3	!	831.2200	44.14	-3.04	41.10	46.00	-4.90	QP			
4		879.2350	40.97	-2.19	38.78	46.00	-7.22	QP			
5	*	927.2500	85.13	-1.24	83.89			Fundamental			
6		975.2650	40.39	-0.48	39.91	54.00	-14.09	QP			

8.3 CONDUCTED EMISSIONS TEST

8.3.1 Applicable Standard

According to FCC Part 15.207(a)

8.3.2 Conformance Limit

Frequency(MHz)	Conducted Emission Limit	
	Quasi-peak	Average
0.15-0.5	66-56	56-46
0.5-5.0	56	46
5.0-30.0	60	50

Note: 1. The lower limit shall apply at the transition frequencies
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50MHz.

8.3.3 Test Configuration

Test according to clause 7.3 conducted emission test setup

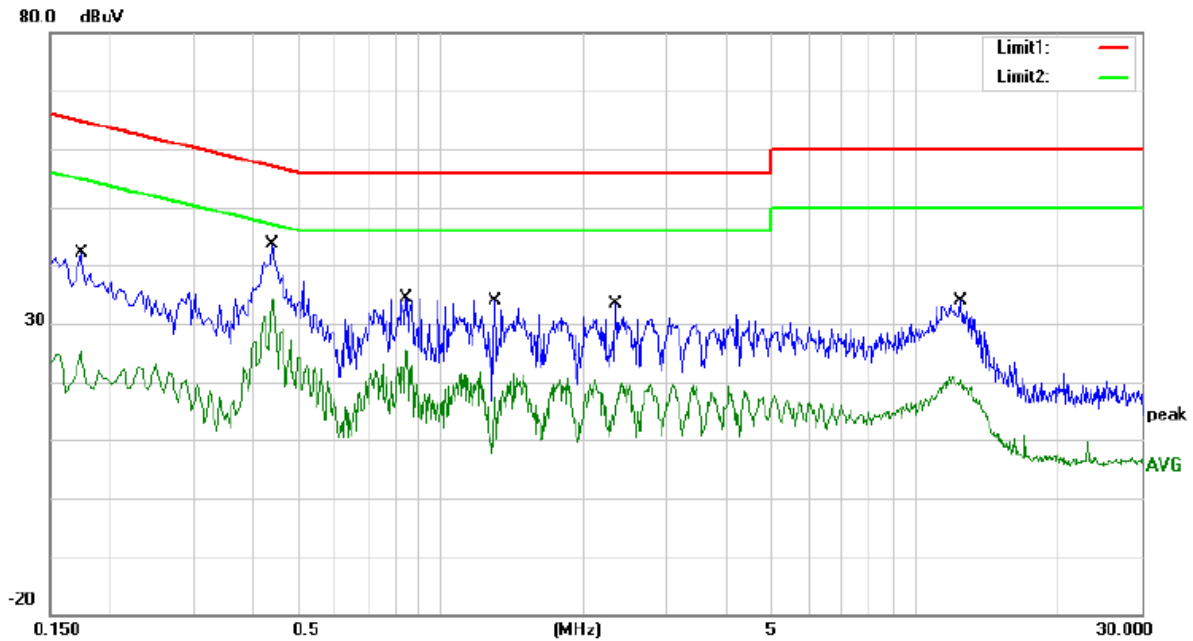
8.3.4 Test Procedure

The EUT was placed on a table which is 0.8m above ground plane.
Maximum procedure was performed on the highest emissions to ensure EUT compliance.
Repeat above procedures until all frequency measured were complete.

8.3.5 Test Results

Pass

The 120V & 240V voltage have been tested, and the worst result recorded was report as below:



Site Conduction #1

Phase: **L1**

Temperature: 24.9

Limit: (CE)FCC PART 15 class B QP

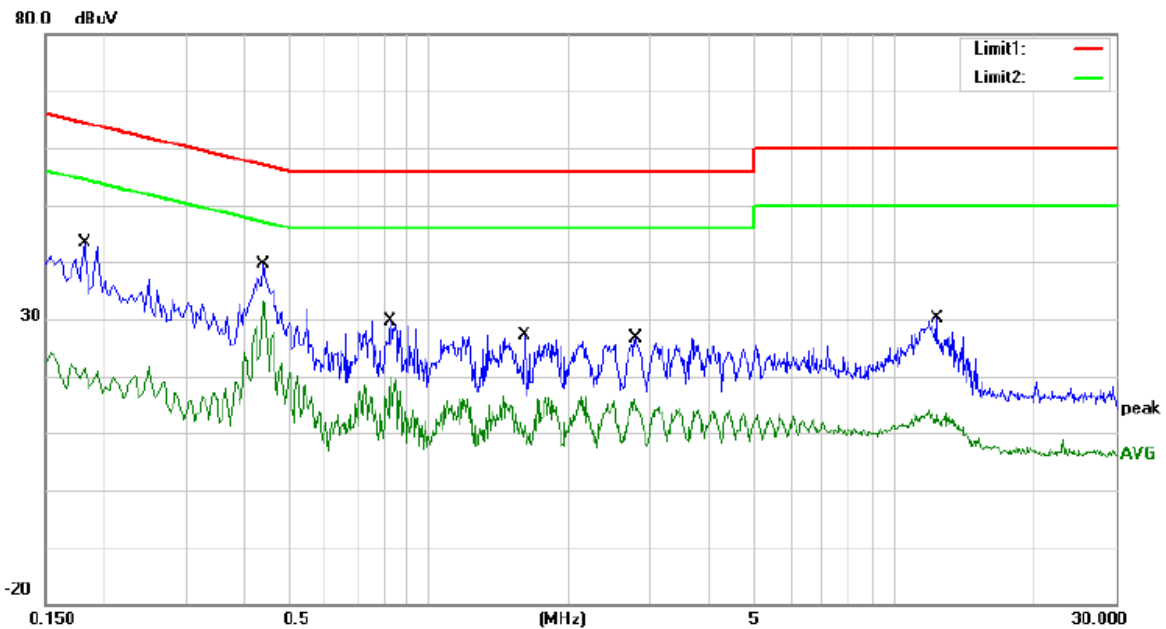
Power: AC 120V/60Hz

Humidity: 54 %

Mode: TX

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1740	32.61	9.56	42.17	64.77	-22.60	QP	
2		0.1740	15.50	9.56	25.06	54.77	-29.71	AVG	
3		0.4420	34.07	9.57	43.64	57.02	-13.38	QP	
4	*	0.4420	24.66	9.57	34.23	47.02	-12.79	AVG	
5		0.8460	24.70	9.58	34.28	56.00	-21.72	QP	
6		0.8460	15.71	9.58	25.29	46.00	-20.71	AVG	
7		1.2980	24.28	9.60	33.88	56.00	-22.12	QP	
8		1.2980	12.09	9.60	21.69	46.00	-24.31	AVG	
9		2.3340	23.83	9.61	33.44	56.00	-22.56	QP	
10		2.3340	10.80	9.61	20.41	46.00	-25.59	AVG	
11		12.4740	23.96	9.84	33.80	60.00	-26.20	QP	
12		12.4740	11.14	9.84	20.98	50.00	-29.02	AVG	



Site: Conduction #1

Phase: **N**

Temperature: 24.9

Limit: (CE)FCC PART 15 class B_QP

Power: AC 120V/60Hz

Humidity: 54 %

Mode: TX

Note:

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1		0.1820	33.92	9.56	43.48	64.39	-20.91	QP	
2		0.1820	12.51	9.56	22.07	54.39	-32.32	AVG	
3		0.4420	30.14	9.57	39.71	57.02	-17.31	QP	
4	*	0.4420	23.47	9.57	33.04	47.02	-13.98	AVG	
5		0.8300	20.14	9.58	29.72	56.00	-26.28	QP	
6		0.8300	10.39	9.58	19.97	46.00	-26.03	AVG	
7		1.6060	17.63	9.60	27.23	56.00	-28.77	QP	
8		1.6060	6.96	9.60	16.56	46.00	-29.44	AVG	
9		2.7940	17.00	9.62	26.62	56.00	-29.38	QP	
10		2.7940	6.31	9.62	15.93	46.00	-30.07	AVG	
11		12.3740	20.34	9.84	30.18	60.00	-29.82	QP	
12		12.3740	4.40	9.84	14.24	50.00	-35.76	AVG	

8.4 ANTENNA APPLICATION

8.4.1 Antenna Requirement

Standard	Requirement
FCC CRF Part 15.203	An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced 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 §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 §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.

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.

8.4.2 Result

PASS.

- The EUT has 1 antennas: an Metal Pifa antenna for 902-928 MHz, antenna has a gain of -3 dBi;
- Note:
- ☒ Antenna use a permanently attached antenna which is not replaceable.
 - ☐ Not using a standard antenna jack or electrical connector for antenna replacement
 - ☐ The antenna has to be professionally installed (please provide method of installation)

which in accordance to section 15.203, please refer to the internal photos.

Detail of factor for radiated emission

Frequency(MHz)	Ant_F(dB)	Cab_L(dB)	Preamp(dB)	Correct Factor(dB)
0.009	20.6	0.03	\	20.63
0.15	20.7	0.1	\	20.8
1	20.9	0.15	\	21.05
10	20.1	0.28	\	20.38
30	18.8	0.45	\	19.25
30	11.7	0.62	27.9	-15.58
100	12.5	1.02	27.8	-14.28
300	12.9	1.91	27.5	-12.69
600	19.2	2.92	27	-4.88
800	21.1	3.54	26.6	-1.96
1000	22.3	4.17	26.2	0.27
1000	25.6	1.76	41.4	-14.04
3000	28.9	3.27	43.2	-11.03
5000	31.1	4.2	44.6	-9.3
8000	36.2	5.95	44.7	-2.55
10000	38.4	6.3	43.9	0.8
12000	38.5	7.14	42.3	3.34
15000	40.2	8.15	41.4	6.95
18000	45.4	9.02	41.3	13.12
18000	37.9	1.81	47.9	-8.19
21000	37.9	1.95	48.7	-8.85
25000	39.3	2.01	42.8	-1.49
28000	39.6	2.16	46.0	-4.24
31000	41.2	2.24	44.5	-1.06
34000	41.5	2.29	46.6	-2.81
37000	43.8	2.30	46.4	-0.3
40000	43.2	2.50	42.2	3.5