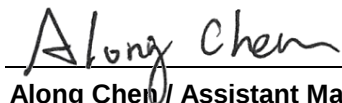


FCC Test Report

FCC ID : SWX-UBB
Equipment : UniFi Building Bridge
Model No. : UBB
Brand Name : UBIQUITI
Applicant : Ubiquiti Networks, Inc.
Address : 685 Third Avenue, 27th Floor New York, New York 10017 USA
Standard : 47 CFR FCC Part 15.249
Received Date : May 22, 2019
Tested Date : May 22 ~ May 23, 2019

We, International Certification Corp., would like to declare that the tested sample has been evaluated and in compliance with the requirement of the above standards. The test results contained in this report refer exclusively to the product. It may be duplicated completely for legal use with the approval of the applicant. It shall not be reproduced except in full without the written approval of our laboratory.

Reviewed by:



Along Chen / Assistant Manager

Approved by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR952201	Rev. 01	Initial issue	Jun. 11, 2019

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.564MHz 34.74 (Margin -11.26dB) - AV	Pass
15.249(a)	Field Strength of Fundamental	Meet the requirement of limit	Pass
15.249(a)(d)	Field Strength of Harmonics and Emissions Radiated outside of the Specified Frequency Bands	Meet the requirement of limit	Pass
15.215(c)	20dB bandwidth	Meet the requirement of limit	Pass
15.203	Antenna Requirement	Meet the requirement of limit	Pass

Declaration of Conformity:

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (MHz)	Bluetooth Mode	Ch. Freq. (MHz)	Channel Number	Data Rate
2400-2483.5	V4.1 LE	2402-2480	0-39 [40]	1 Mbps
Note 1: Bluetooth LE (Low energy) uses GFSK modulation.				

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remark
1	internal antenna	R-SMA	2	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	48Vdc from POE
-------------------	----------------

1.1.4 Accessories

Accessories		
No.	Equipment	Description
1	POE	Brand: UBIQUITI Model: GP-V480-032G Power Rating: I/P: 100-240Vac, 50/60Hz, 0.5A(Max) O/P: 48Vdc, 0.32A Power Line: 0.7m non-shielded without core

1.1.5 Channel List

Frequency band (MHz)				2400~2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
37	2402	9	2422	18	2442	28	2462
0	2404	10	2424	19	2444	29	2464
1	2406	38	2426	20	2446	30	2466
2	2408	11	2428	21	2448	31	2468
3	2410	12	2430	22	2450	32	2470
4	2412	13	2432	23	2452	33	2472
5	2414	14	2434	24	2454	34	2474
6	2416	15	2436	25	2456	35	2476
7	2418	16	2438	26	2458	36	2478
8	2420	17	2440	27	2460	39	2480

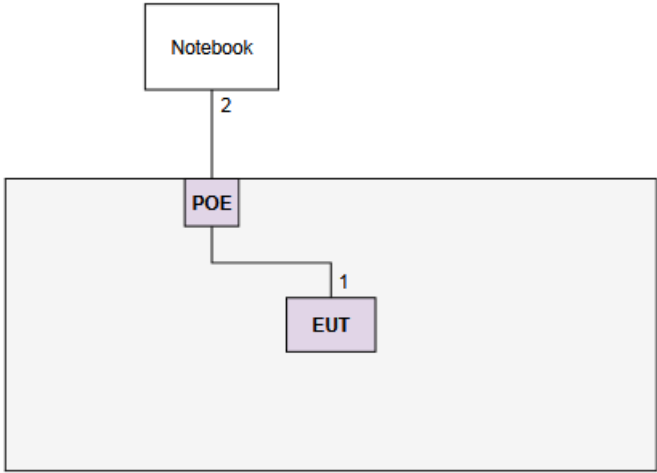
1.1.6 Test Tool and Duty Cycle

Test Tool	By putty command, V 0.6	
Duty Cycle and Duty Factor	Duty Cycle (%)	Duty Factor (dB)
	68.28	1.66

1.2 Local Support Equipment List

Support Equipment List					
No.	Equipment	Brand	Model	FCC ID	Remarks
1	Notebook	DELL	Latitude E6430	DoC	---

1.3 Test Setup Chart

Test Setup Diagram	
Kept in control area 	
No.	Signal cable / Length (m)
1	RJ45, 1m non-shielded.
2	RJ45, 10m non-shielded.

1.4 The Equipment List

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Receiver	R&S	ESR3	101657	Jan. 08, 2019	Jan. 07, 2020
LISN	R&S	ENV216	101579	Mar. 08, 2019	Mar. 07, 2020
RF Cable-CON	Woken	CFD200-NL	CFD200-NL-001	Oct. 23, 2018	Oct. 23, 2019
Measurement Software	AUDIX	e3	6.120210k	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

Test Item	Radiated Emission				
Test Site	966 chamber 3 / (03CH03-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101499	Jan. 07, 2019	Jan. 06, 2020
Receiver	R&S	ESR3	101658	Dec. 11, 2018	Dec. 10, 2019
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 17, 2019	Apr. 16, 2020
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Jan. 07, 2019	Jan. 06, 2020
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 15, 2018	Nov. 14, 2019
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 09, 2018	Nov. 08, 2019
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Oct. 08, 2018	Oct. 07, 2019
Preamplifier	EMC	EMC02325	980187	Aug. 24, 2018	Aug. 23, 2019
Preamplifier	Agilent	83017A	MY53270014	Aug. 09, 2018	Aug. 08, 2019
Preamplifier	EMC	EMC184045B	980192	Aug. 09, 2018	Aug. 08, 2019
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Oct. 01, 2018	Sep. 30, 2019
RF cable-8M	EMC	EMC104-SM-SM-8000	181107	Oct. 01, 2018	Sep. 30, 2019
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Oct. 01, 2018	Sep. 30, 2019
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Oct. 01, 2018	Sep. 30, 2019
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Oct. 01, 2018	Sep. 30, 2019
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Oct. 01, 2018	Sep. 30, 2019
Measurement Software	AUDIX	e3	6.120210g	NA	NA
Note: Calibration Interval of instruments listed above is one year.					

1.5 Test Standards

According to the specification of EUT, the EUT must comply with following standards and KDB documents.

47 CFR FCC Part 15.249

ANSI C63.10-2013

1.6 Deviation from Test Standard and Measurement Procedure

None

1.7 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level (based on a coverage factor ($k=2$))

Measurement Uncertainty	
Parameters	Uncertainty
Bandwidth	± 34.130 Hz
AC conducted emission	± 2.92 dB
Radiated emission ≤ 1 GHz	± 3.96 dB
Radiated emission > 1 GHz	± 4.51 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	22°C / 58%	Alex Tsai
Radiated Emissions	03CH03-WS	25°C / 61%	Roger Lu

- FCC Designation No.: TW0009
- FCC site registration No.: 207696
- ISSED#: 10807A
- CAB identifier: TW2732

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Data Rate	Test Configuration
AC Power Line Conducted Emissions	BT LE	2480	1 Mbps	---
Field Strength of Fundamental	BT LE	2402, 2440, 2480	1 Mbps	---
Radiated Emissions ≤ 1GHz	BT LE	2480	1 Mbps	---
Radiated Emissions > 1GHz	BT LE	2402, 2440, 2480	1 Mbps	---
20dB bandwidth	BT LE	2402, 2440, 2480	1 Mbps	---

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

Note 1: * Decreases with the logarithm of the frequency.

3.1.2 Test Procedures

1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels of AC power line conducted emission are across the 50 Ω LISN port.
3. AC conducted emission measurements is made over frequency range from 150 kHz to 30 MHz.
4. This measurement was performed with AC 120V / 60Hz.

3.1.3 Test Setup



- Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes

3.1.4 Test Result of Conducted Emissions

Power Phase	Line	Test Freq. (MHz)	2480
Level (dBuV) </			

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).

2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

Power Phase	Neutral	Test Freq. (MHz)	2480																																																																																																																																							
Level (dBUV) Frequency (MHz) <table><thead><tr><th></th><th>Freq MHz</th><th>Level dBUV</th><th>Limit Line dBUV</th><th>Over Limit dB</th><th>Read Level dBUV</th><th>LISN factor dB</th><th>cable loss dB</th><th>Remark</th></tr></thead><tbody><tr><td>1</td><td>0.150</td><td>28.14</td><td>56.00</td><td>-27.86</td><td>18.41</td><td>9.57</td><td>0.05</td><td>Average</td></tr><tr><td>2</td><td>0.150</td><td>47.03</td><td>66.00</td><td>-18.97</td><td>37.30</td><td>9.57</td><td>0.05</td><td>QP</td></tr><tr><td>3</td><td>0.174</td><td>28.09</td><td>54.77</td><td>-26.68</td><td>18.32</td><td>9.58</td><td>0.06</td><td>Average</td></tr><tr><td>4</td><td>0.174</td><td>43.59</td><td>64.77</td><td>-21.18</td><td>33.82</td><td>9.58</td><td>0.06</td><td>QP</td></tr><tr><td>5*</td><td>0.561</td><td>34.69</td><td>46.00</td><td>-11.31</td><td>24.82</td><td>9.62</td><td>0.09</td><td>Average</td></tr><tr><td>6</td><td>0.561</td><td>41.81</td><td>56.00</td><td>-14.19</td><td>31.94</td><td>9.62</td><td>0.09</td><td>QP</td></tr><tr><td>7</td><td>0.826</td><td>21.52</td><td>46.00</td><td>-24.48</td><td>11.58</td><td>9.63</td><td>0.10</td><td>Average</td></tr><tr><td>8</td><td>0.826</td><td>28.55</td><td>56.00</td><td>-27.45</td><td>18.61</td><td>9.63</td><td>0.10</td><td>QP</td></tr><tr><td>9</td><td>3.276</td><td>21.36</td><td>46.00</td><td>-24.64</td><td>11.19</td><td>9.66</td><td>0.25</td><td>Average</td></tr><tr><td>10</td><td>3.276</td><td>27.59</td><td>56.00</td><td>-28.41</td><td>17.42</td><td>9.66</td><td>0.25</td><td>QP</td></tr><tr><td>11</td><td>19.428</td><td>35.13</td><td>50.00</td><td>-14.87</td><td>24.27</td><td>9.81</td><td>0.60</td><td>Average</td></tr><tr><td>12</td><td>19.428</td><td>41.48</td><td>60.00</td><td>-18.52</td><td>30.62</td><td>9.81</td><td>0.60</td><td>QP</td></tr><tr><td>13</td><td>22.535</td><td>29.78</td><td>50.00</td><td>-20.22</td><td>18.78</td><td>9.81</td><td>0.64</td><td>Average</td></tr><tr><td>14</td><td>22.535</td><td>36.18</td><td>60.00</td><td>-23.82</td><td>25.18</td><td>9.81</td><td>0.64</td><td>QP</td></tr></tbody></table> Note 1: Level (dBUV) = Read Level (dBUV) + LISN Factor (dB) + Cable Loss (dB). 2: Over Limit (dB) = Level (dBUV) – Limit Line (dBUV).					Freq MHz	Level dBUV	Limit Line dBUV	Over Limit dB	Read Level dBUV	LISN factor dB	cable loss dB	Remark	1	0.150	28.14	56.00	-27.86	18.41	9.57	0.05	Average	2	0.150	47.03	66.00	-18.97	37.30	9.57	0.05	QP	3	0.174	28.09	54.77	-26.68	18.32	9.58	0.06	Average	4	0.174	43.59	64.77	-21.18	33.82	9.58	0.06	QP	5*	0.561	34.69	46.00	-11.31	24.82	9.62	0.09	Average	6	0.561	41.81	56.00	-14.19	31.94	9.62	0.09	QP	7	0.826	21.52	46.00	-24.48	11.58	9.63	0.10	Average	8	0.826	28.55	56.00	-27.45	18.61	9.63	0.10	QP	9	3.276	21.36	46.00	-24.64	11.19	9.66	0.25	Average	10	3.276	27.59	56.00	-28.41	17.42	9.66	0.25	QP	11	19.428	35.13	50.00	-14.87	24.27	9.81	0.60	Average	12	19.428	41.48	60.00	-18.52	30.62	9.81	0.60	QP	13	22.535	29.78	50.00	-20.22	18.78	9.81	0.64	Average	14	22.535	36.18	60.00	-23.82	25.18	9.81	0.64	QP
	Freq MHz	Level dBUV	Limit Line dBUV	Over Limit dB	Read Level dBUV	LISN factor dB	cable loss dB	Remark																																																																																																																																		
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3.2 Radiated Emission

This section includes field strength of fundamental, field strength of harmonics and emissions radiated outside of the operating frequency bands.

3.2.1 Limit of field strength of fundamental and field strength of harmonics

Fundamental Frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
2400–2483.5 MHz	50	500

3.2.2 Limit of Unwanted Emissions

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in below table, whichever is the lesser attenuation.

Radiated emission limits			
Frequency Range (MHz)	Field Strength (uV/m)	Field Strength (dBuV/m)	Measure Distance (m)
0.009~0.490	2400/F(kHz)	48.5 - 13.8	300
0.490~1.705	24000/F(kHz)	33.8 - 23	30
1.705~30.0	30	29	30
30~88	100	40	3
88~216	150	43.5	3
216~960	200	46	3
Above 960	500	54	3

Note 1:
Qusai-Peak value is measured for frequency below 1GHz except for 9–90 kHz, 110–490 kHz frequency band. Peak and average value are measured for frequency above 1GHz. The limit on average radio frequency emission is as above table. The limit on peak radio frequency emissions is 20 dB above the maximum permitted average emission limit

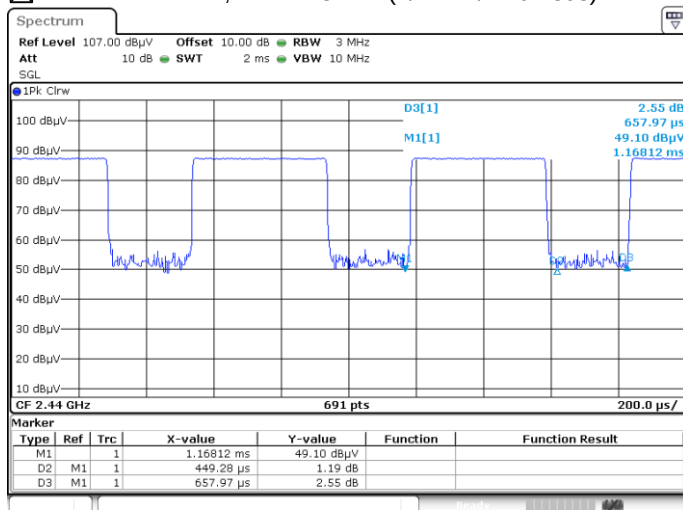
Note 2:
Measurements may be performed at a distance other than what is specified provided. When performing measurements at a distance other than that specified, the results shall be extrapolated to the specified distance using an extrapolation factor as below, Frequency at or above 30 MHz: 20 dB/decade Frequency below 30 MHz: 40 dB/decade.

3.2.3 Test Procedures

1. Measurement is made at a semi-anechoic chamber that incorporates a turntable allowing a EUT rotation of 360°. A continuously-rotating, remotely-controlled turntable is installed at the test site to support the EUT and facilitate determination of the direction of maximum radiation for each EUT emission frequency. The EUT is placed at test table. For emissions testing at or below 1 GHz, the table height is 80 cm above the reference ground plane. For emission measurements above 1 GHz, the table height is 1.5 m
2. Measurement is made with the antenna positioned in both the horizontal and vertical planes of polarization. The measurement antenna is varied in height (1m ~ 4m) above the reference ground plane to obtain the maximum signal strength. Distance between EUT and antenna is 3 m.
3. This investigation is performed with the EUT rotated 360°, the antenna height scanned between 1 m and 4 m, and the antenna rotated to repeat the measurements for both the horizontal and vertical antenna polarizations.

Note:

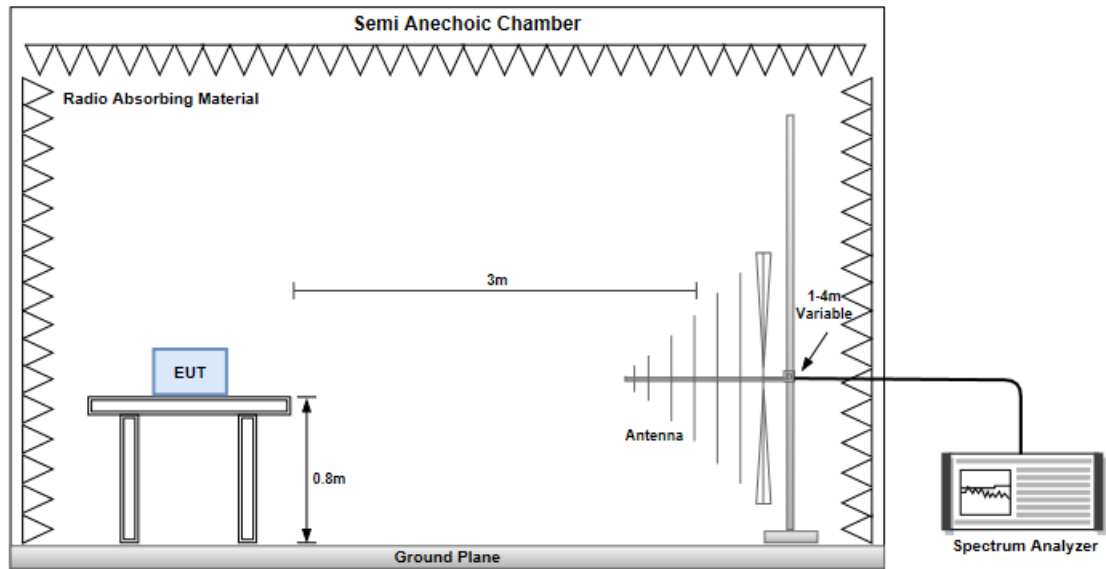
1. Radiated emission below 1GHz
120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission
2. Radiated emission above 1GHz / Peak value except fundamental
RBW=1MHz, VBW=3MHz and Peak detector
3. Radiated emission above 1GHz / Average value
☐ 1. PK value + DCCF
☒ 2. RBW= 1 MHz , VBW = 3 kHz ($1/T = 1 / 449.28\mu s$)



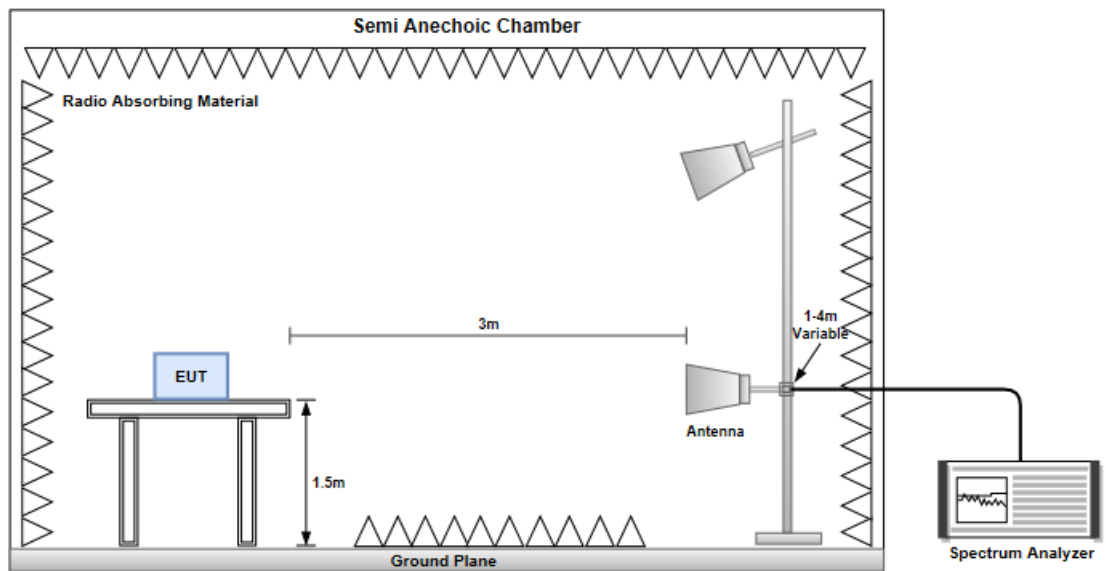
4. Radiated emission Peak value for fundamental
RBW=2MHz, VBW=10MHz and Peak detector
5. Radiated emission Average value for fundamental
RBW=1MHz, VBW=3kHz and Peak detector

3.2.4 Test Setup

Radiated Emissions below 1 GHz

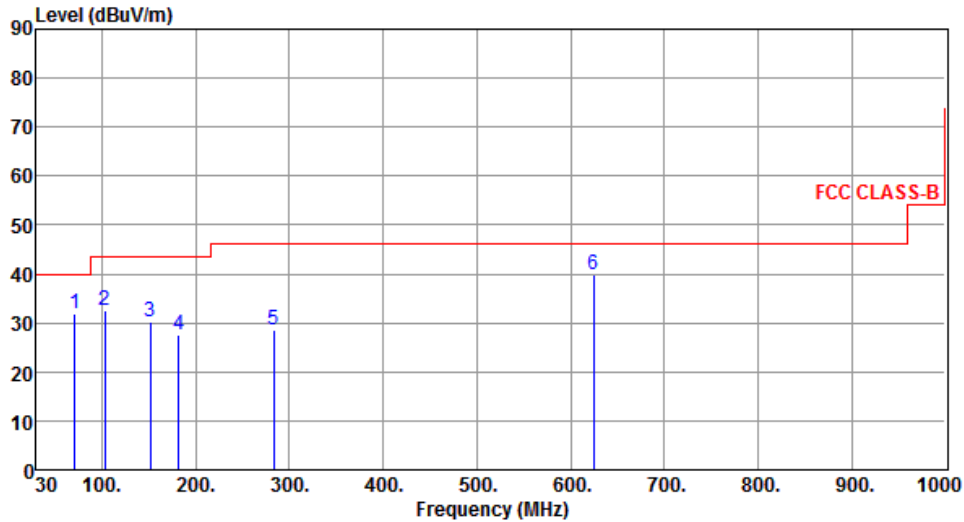


Radiated Emissions above 1 GHz



3.2.5 Transmitter Radiated Unwanted Emissions (Below 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		



The graph displays the radiated unwanted emissions for a transmitter. The y-axis represents the Level in dBuV/m, ranging from 0 to 90. The x-axis represents the Frequency in MHz, ranging from 30 to 1000. A red line indicates the FCC CLASS-B limit, which is 40 dBuV/m from 30 to 100 MHz, 45 dBuV/m from 100 to 300 MHz, and 55 dBuV/m from 300 to 1000 MHz. Six measured peaks are labeled with blue numbers 1 through 6. Peak 6 is the highest, reaching approximately 40 dBuV/m at 624.61 MHz.

	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	70.74	31.88	40.00	-8.12	42.80	-10.92	Peak	---	---
2	102.75	32.43	43.50	-11.07	45.72	-13.29	Peak	---	---
3	151.25	30.08	43.50	-13.42	38.80	-8.72	Peak	---	---
4	182.29	27.65	43.50	-15.85	38.24	-10.59	Peak	---	---
5	283.17	28.53	46.00	-17.47	37.40	-8.87	Peak	---	---
6	624.61	39.69	46.00	-6.31	40.19	-0.50	Peak	---	---

Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
 *Factor includes antenna factor , cable loss and amplifier gain
 Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).
 Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Level (dBuV/m) 90 80 70 60 50 40 30 20 10 0 30 100 200 300 400 500 600 700 800 900 1000 Frequency (MHz) 1 2 3 4 5 6 42.61 53.95 78.53 94.99 149.31 624.61 36.33 37.44 36.14 34.76 32.88 35.89 40.00 40.00 40.00 43.50 43.50 46.00 -3.67 -2.56 -3.86 -8.74 -10.62 -10.11 45.31 46.30 49.20 49.12 41.71 36.39 -8.98 -8.86 -13.06 -14.36 -8.83 -0.50 Peak QP QP Peak Peak Peak --- 100 100 --- --- --- --- 5 213 --- --- --- FCC CLASS-B </			

3.2.6 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Horizontal		
Level (dBuV/m) </			

Modulation	GFSK	Test Freq. (MHz)	2402
Polarization	Vertical		

	Freq. MHz	Emission level dBUV/m	Limit dBUV/m	Margin dB	SA reading dBUV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2390.00	39.40	54.00	-14.60	40.36	-0.96	Average	179	150
2	2390.00	52.58	74.00	-21.42	53.54	-0.96	Peak	179	150
3	2400.00	41.64	54.00	-12.36	42.63	-0.99	Average	179	150
4	2400.00	53.87	74.00	-20.13	54.86	-0.99	Peak	179	150
5	2402.00	89.00	94.00	-5.00	89.99	-0.99	Average	179	150
6	2402.00	90.07	114.00	-23.93	91.06	-0.99	Peak	179	150
7	7206.00	39.34	54.00	-14.66	29.09	10.25	Average	100	135
8	7206.00	51.79	74.00	-22.21	41.54	10.25	Peak	100	135
9	12010.00	47.54	54.00	-6.46	32.74	14.80	Average	150	120
10	12010.00	58.61	74.00	-15.39	43.81	14.80	Peak	150	120

Note 1: Emission Level (dBUV/m) = SA Reading (dBUV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBUV/m) – Limit (dBUV/m).

Modulation	GFSK	Test Freq. (MHz)	2440
Polarization	Horizontal		
Level (dBUV/m) </			

Modulation	GFSK	Test Freq. (MHz)	2440
Polarization	Vertical		
Level (dBuV/m)			

Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Horizontal		
Level (dBUV/m)			

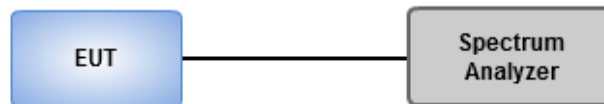
Modulation	GFSK	Test Freq. (MHz)	2480
Polarization	Vertical		
Level (dBUV/m)			

3.3 20dB and Occupied Bandwidth

3.3.1 Test Procedures

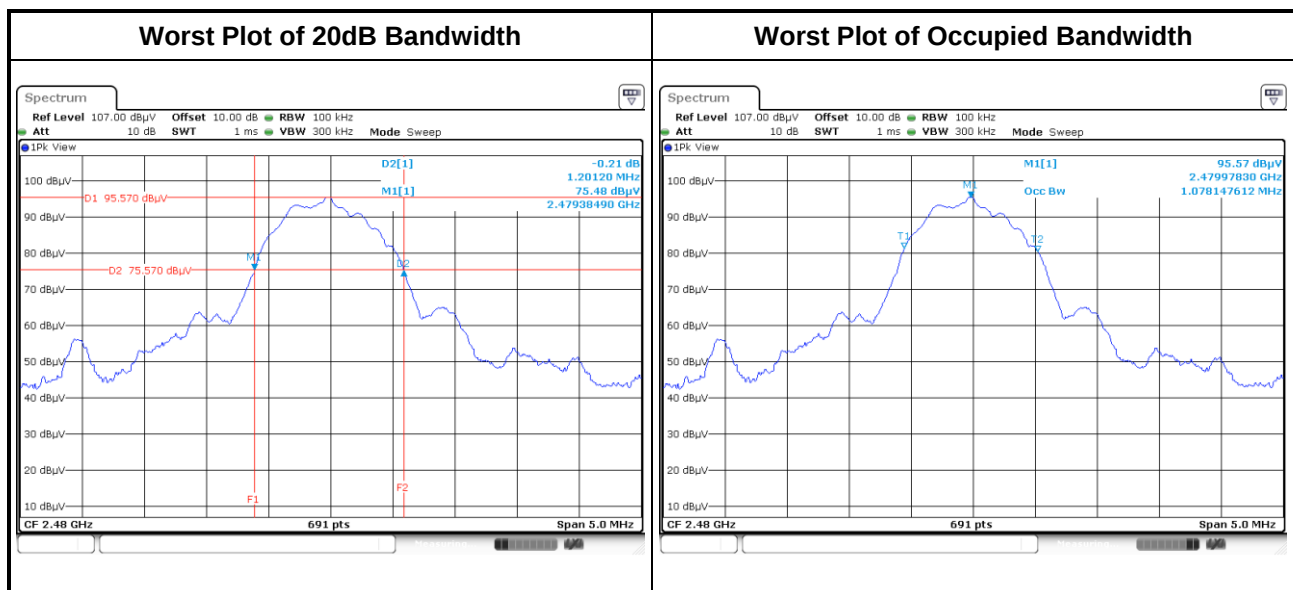
1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak, Trace mode = max hold
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower) that are attenuated by 20dB relative to the maximum level measured in the fundamental emission.
5. Use the occupied measurement function of spectrum analyzer to measure 99% occupied bandwidth.

3.3.2 Test Setup



3.3.3 20dB and Occupied Bandwidth

Freq. (MHz)	20dB Bandwidth (MHz)	Occupied Bandwidth (MHz)
2402	1.17	1.07
2440	1.19	1.07
2480	1.20	1.08



4 Test laboratory information

Established in 2012, ICC provides foremost EMC & RF Testing and advisory consultation services by our skilled engineers and technicians. Our services employ a wide variety of advanced edge test equipment and one of the widest certification extents in the business.

International Certification Corp (EMC and Wireless Communication Laboratory), it is our definitive objective is to institute long term, trust-based associations with our clients. The expectation we set up with our clients is based on outstanding service, practical expertise and devotion to a certified value structure. Our passion is to grant our clients with best EMC / RF services by oriented knowledgeable and accommodating staff.

Our Test sites are located at Linkou District and Kwei Shan District. Location map can be found on our website <http://www.icertifi.com.tw>.

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