

FCC Test Report

FCC ID : PRDRX0E
Equipment : 2.4G wireless dongle
Model No. : RXE
Brand Name : Acrox / hp
Applicant : ACROX Technologies Co., Ltd.
Address : 4F., No.89, Minshan St., Neihu Dist., Taipei City
114, Taiwan, R.O.C.
Standard : 47 CFR FCC Part 15.249
Received Date : Mar. 24, 2016
Tested Date : Mar. 24 ~ Mar. 25, 2016

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.

Approved & Reviewed by:



Gary Chang / Manager



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Release Record

Report No.	Version	Description	Issued Date
FR632401	Rev. 01	Initial issue	Apr. 01, 2016

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.159MHz 54.83 (Margin -10.69dB) - QP	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

1 General Description

1.1 Information

1.1.1 Specification of the Equipment under Test (EUT)

RF General Information				
Frequency Range (MHz)	Modulation	Ch. Freq. (MHz)	Channel Number	Data Rate
2400-2483.5	FSK	2408-2474	1-34 [34]	1 Mbps

1.1.2 Antenna Details

Ant. No.	Type	Gain (dBi)	Connector	Remark
1	PCB	-5	N/A	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	5Vdc from host.
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1.1.4 Accessories

N/A

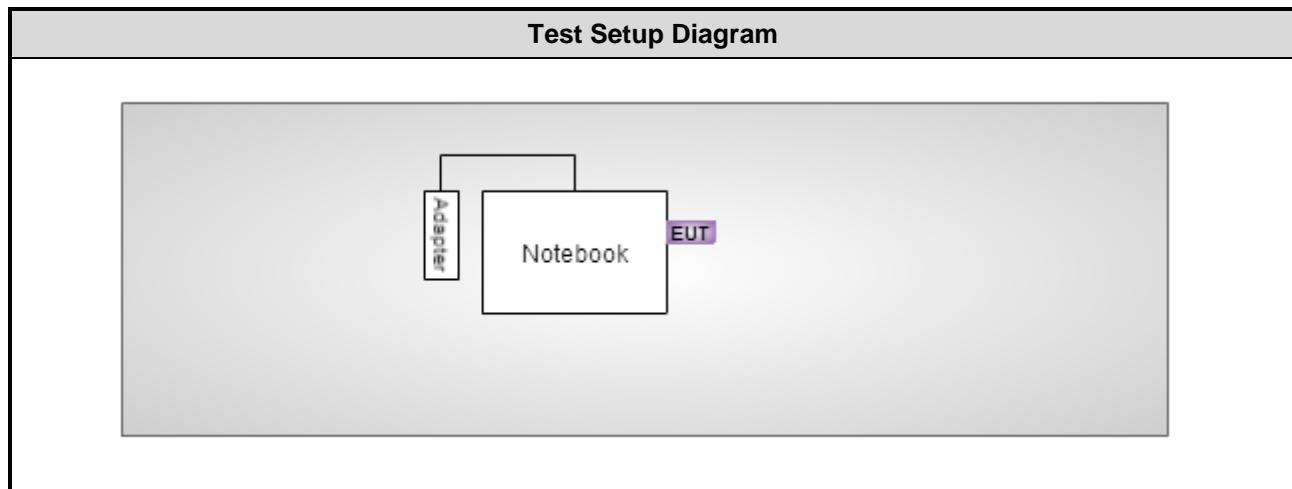
1.1.5 Channel List

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

1.2 Local Support Equipment List

Support Equipment List						
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)
1	Notebook	DELL	Latitude E6440	4NF4Z52	DoC	---

1.3 Test Setup Chart



1.4 The Equipment List

Test Item	RF Conducted				
Test Site	(TH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101063	Feb. 17, 2016	Feb. 16, 2017
Power Meter	Anritsu	ML2495A	1241002	Sep. 21, 2015	Sep. 20, 2016
Power Sensor	Anritsu	MA2411B	1207366	Sep. 21, 2015	Sep. 20, 2016
DC POWER SOURCE	GW INSTEK	GPC-3060D	EM884797	Oct. 20, 2015	Oct. 19, 2016
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA

Note: Calibration Interval of instruments listed above is one year.

Test Item	Radiated Emission				
Test Site	966 chamber1 / (03CH01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
Spectrum Analyzer	R&S	FSV40	101498	Dec. 13, 2015	Dec. 12, 2016
Receiver	R&S	ESR3	101658	Nov. 04, 2015	Nov. 03, 2016
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-522	Aug. 20, 2015	Aug. 19, 2016
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1096	Dec. 16, 2015	Dec. 15, 2016
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016
Loop Antenna	R&S	HFH2-Z2	11900	Nov. 16, 2015	Nov. 15, 2016
Loop Antenna Cable	KOAX KABEL	101354-BW	101354-BW	Dec. 10, 2015	Dec. 09, 2016
Preamplifier	Burgeon	BPA-530	SN:100219	Sep. 10, 2015	Sep. 09, 2016
Preamplifier	Agilent	83017A	MY39501308	Oct. 02, 2015	Oct. 01, 2016
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16014/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16019/4	Dec. 10, 2015	Dec. 09, 2016
RF Cable	HUBER+SUHNER	SUCOFLEX104	MY16139/4	Dec. 10, 2015	Dec. 09, 2016
LF cable 3M	Woken	CFD400NL-LW	CFD400NL-001	Dec. 10, 2015	Dec. 09, 2016
LF cable 10M	Woken	CFD400NL-LW	CFD400NL-002	Dec. 10, 2015	Dec. 09, 2016
Measurement Software	AUDIX	e3	6.120210g	NA	NA

Note: Calibration Interval of instruments listed above is one year.

Test Item	Conducted Emission				
Test Site	Conduction room 1 / (CO01-WS)				
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until
EMC Receiver	R&S	ESCS 30	100169	Oct. 21, 2015	Oct. 20, 2016
LISN	SCHWARZBECK	Schwarzbeck 8127	8127-667	Nov. 13, 2015	Nov. 12, 2016
RF Cable-CON	EMC	EMCCFD300-BM-BM-6000	50821	Dec. 21, 2015	Dec. 20, 2016
Measurement Software	AUDIX	e3	6.120210k	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 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	±34.134 Hz
AC conducted emission	±2.92 dB
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.63 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
AC Conduction	CO01-WS	17°C / 60%	Sky Huang
Radiated Emissions	03CH01-WS	20-22°C / 61-63%	Felix Sung
RF Conducted	TH01-WS	22°C / 61%	Brad Wu

➤ FCC site registration No.: 181692

➤ IC site registration No.: 10807A-1

2.2 The Worst Test Modes and Channel Details

Test item	Mode	Test Frequency (MHz)	Data Rate	Test Configuration
AC Power Line Conducted Emissions	FSK	2408	1 Mbps	---
Field Strength of Fundamental	FSK	2408, 2440, 2474	1 Mbps	---
Radiated Emissions ≤ 1GHz	FSK	2408	1 Mbps	---
Radiated Emissions > 1GHz	FSK	2408, 2440, 2474	1 Mbps	---
20dB bandwidth	FSK	2408, 2440, 2474	1 Mbps	---

3 Transmitter Test Results

3.1 Conducted Emissions

3.1.1 Limit of Conducted Emissions

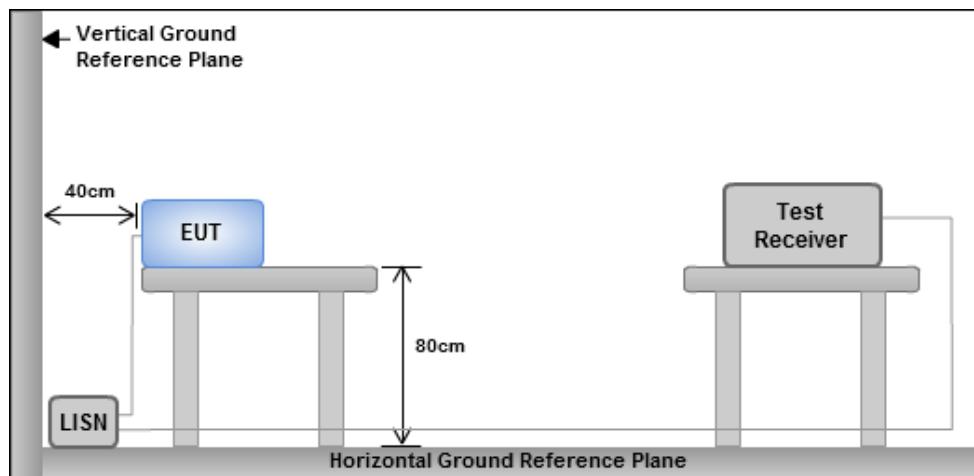
Conducted Emissions Limit		
Frequency Emission (MHz)	Quasi-Peak	Average
0.15-0.5	66 - 56 *	56 - 46 *
0.5-5	56	46
5-30	60	50

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

3.1.2 Test Procedures

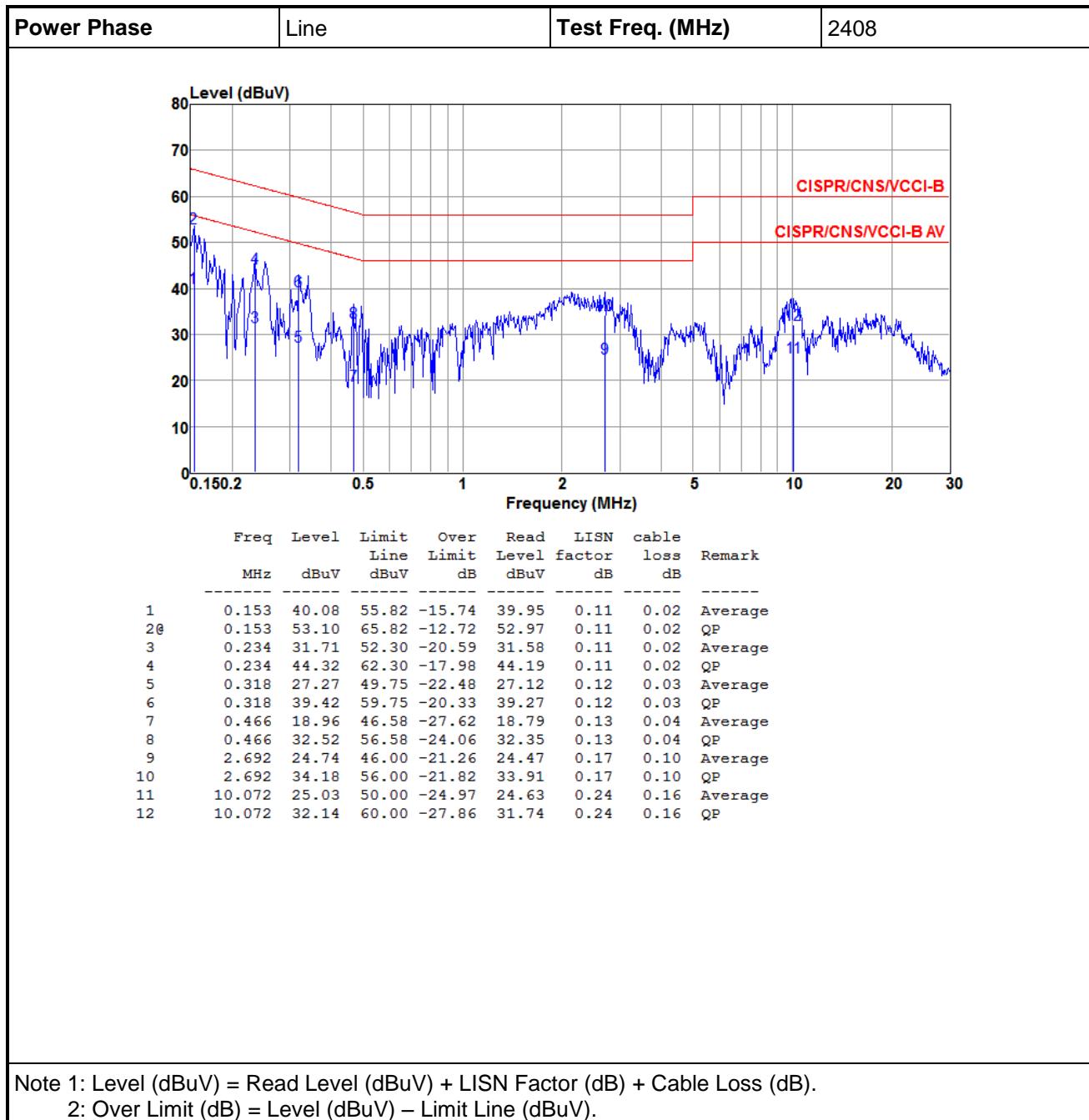
1. The device is placed on a test table, raised 80 cm above the reference ground plane. The vertical conducting plane is located 40 cm to the rear of the device.
2. The device is connected to line impedance stabilization network (LISN) and other accessories are connected to other LISN. Measured levels 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.

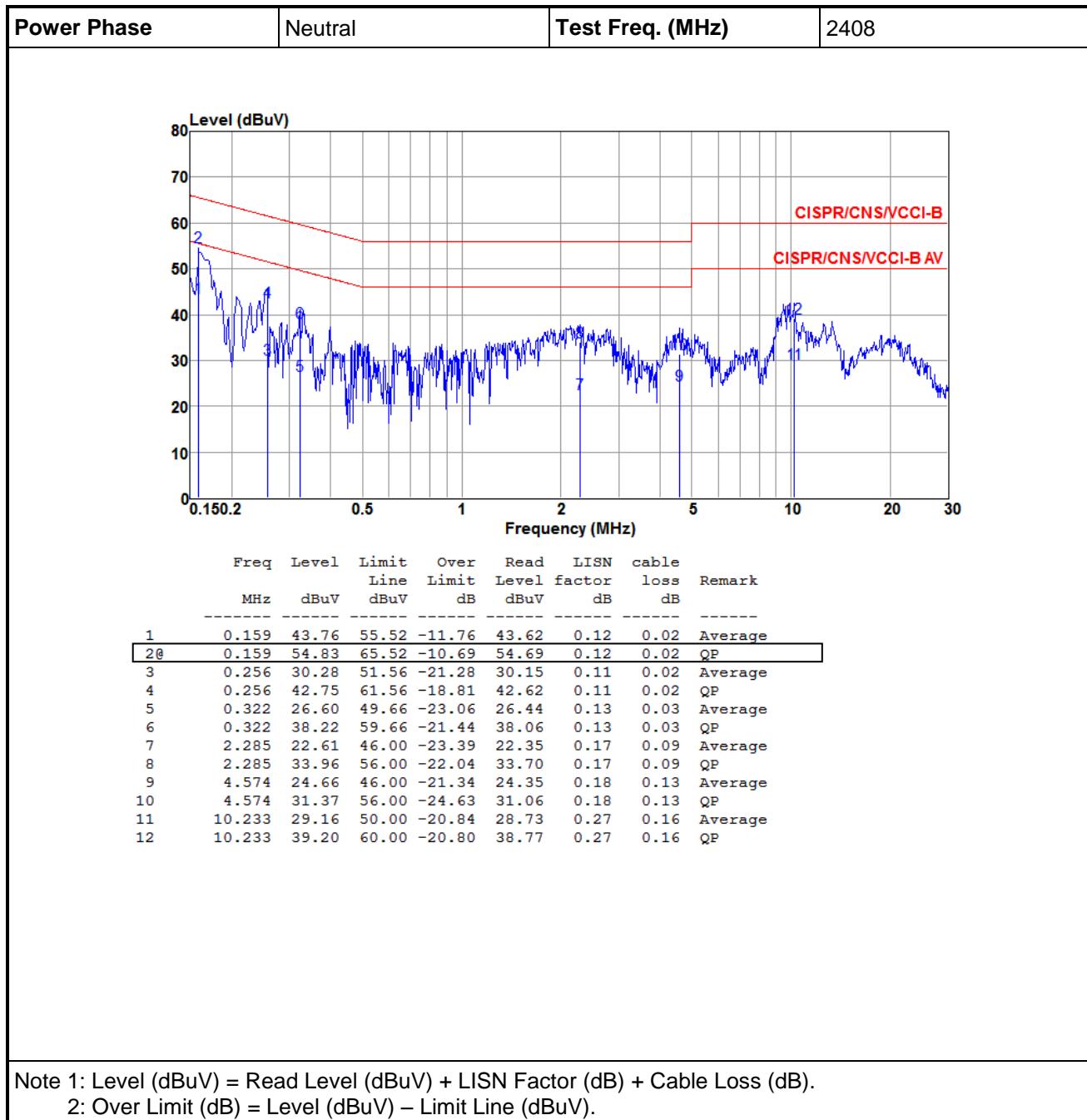
3.1.3 Test Setup



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





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)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

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 §15.209, whichever is the lesser attenuation.

Radiated emission limits in §15.209			
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:

Quasi-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

Radiated emission above 1GHz / Average value for field strength of fundamental and harmonics

The average value is: Average = Peak value + 20log(Duty cycle) Where the duty factor is calculated from following formula:

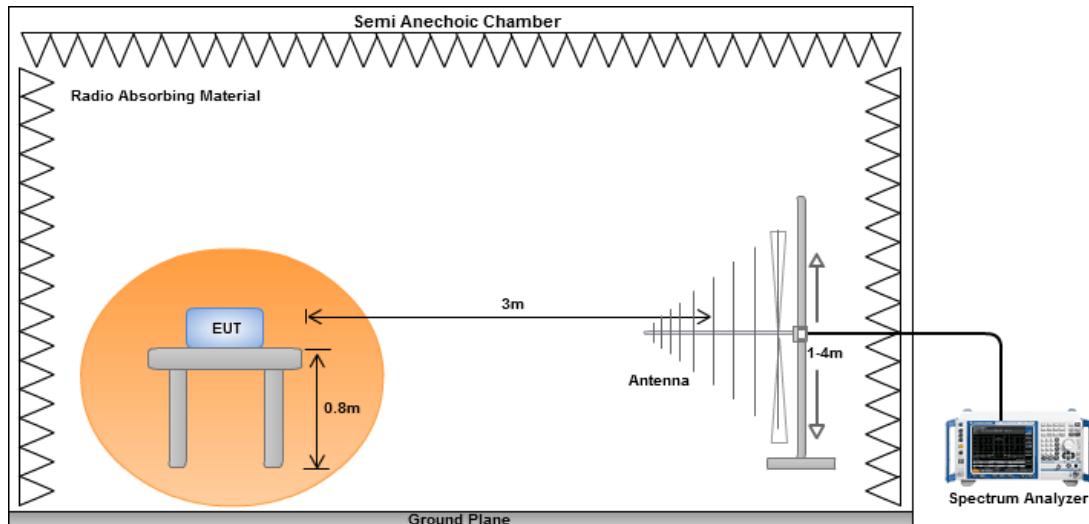
3.
$$20\log(\text{Duty cycle}) = 20\log \frac{20 * 0.15652 \text{ ms}}{100 \text{ ms}} = -30.09 \text{ dB}$$

Please see page 24 for plotted duty

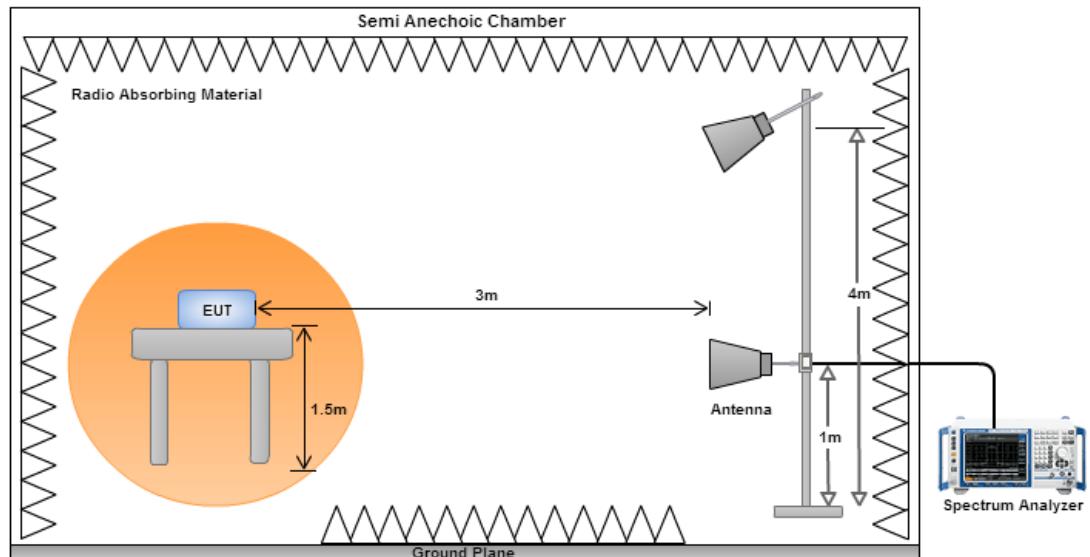
4. Radiated emission above 1GHz / Average value for other emissions
RBW=1MHz, VBW=10Hz and Peak detector
5. Radiated emission Peak value for fundamental
RBW=3MHz, VBW=10MHz and Peak detector

3.2.4 Test Setup

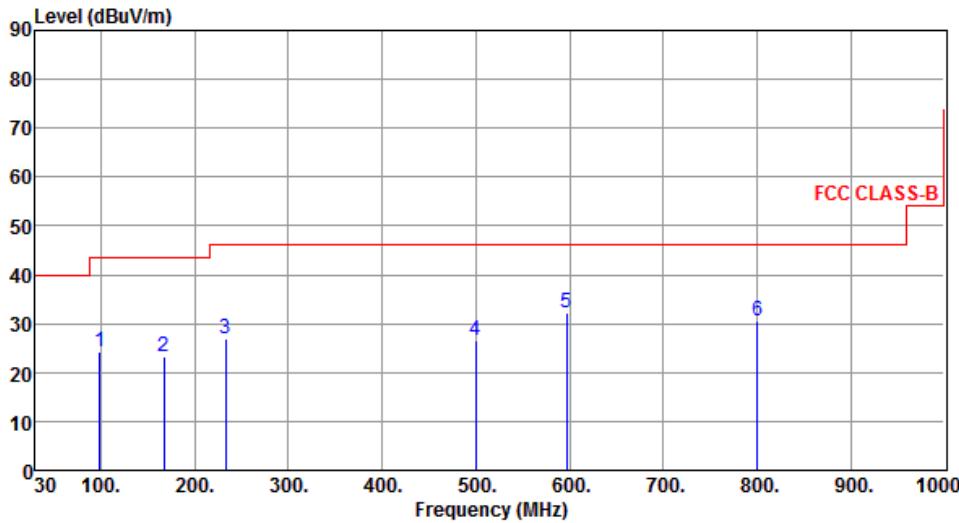
Radiated Emissions below 1 GHz

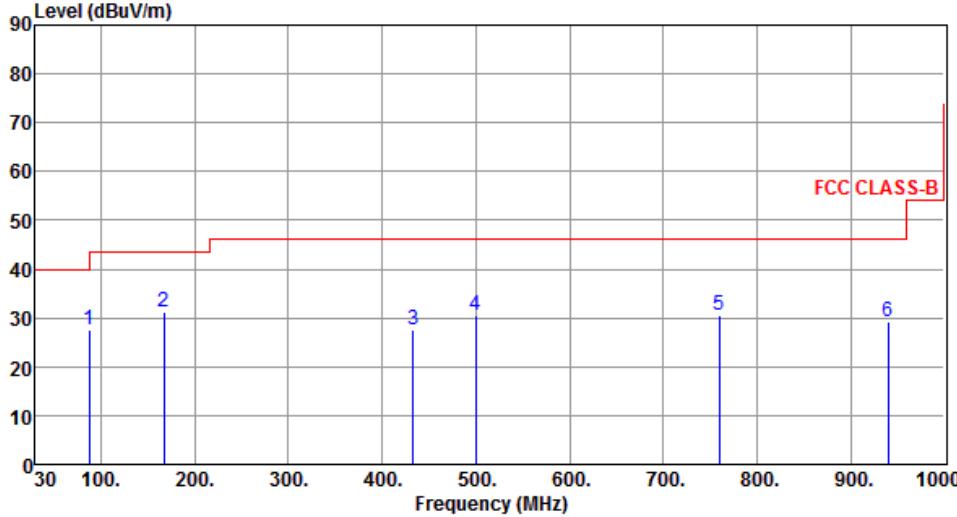


Radiated Emissions above 1 GHz

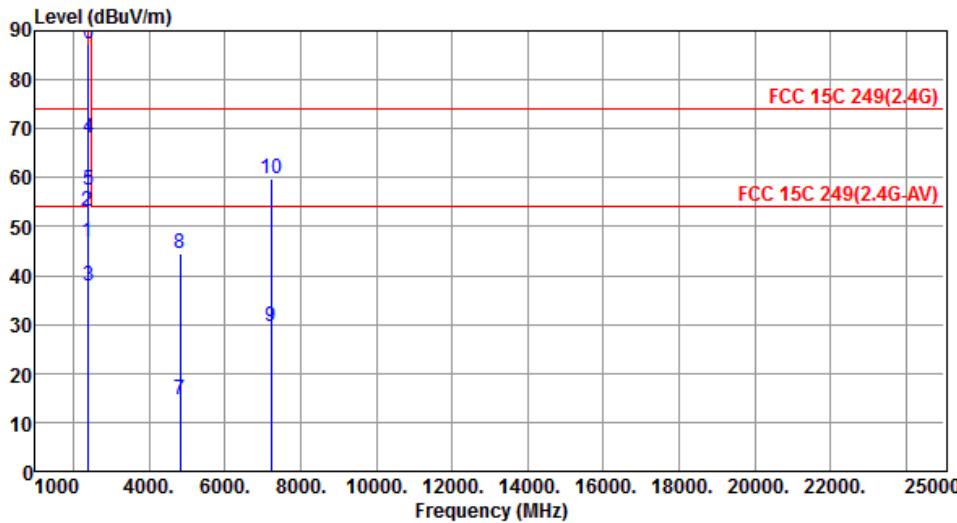


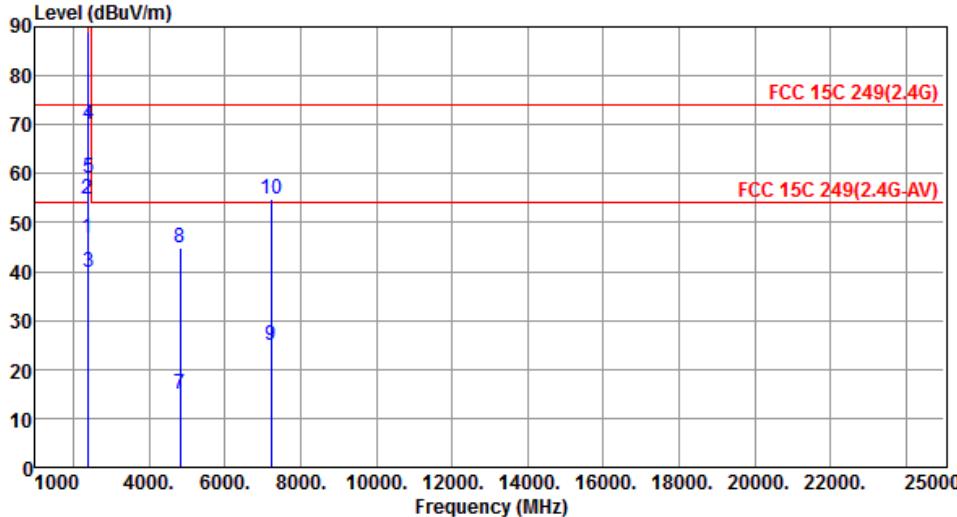
3.2.5 Transmitter Radiated Unwanted Emissions (Below 1GHz)

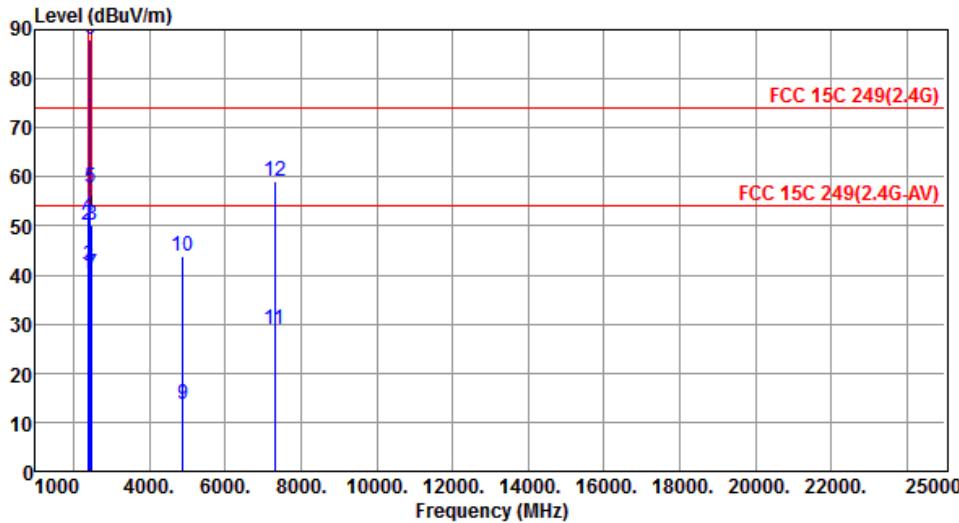
Modulation	FSK	Test Freq. (MHz)	2408																																																																								
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<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Freq.</th> <th style="text-align: left;">Emission</th> <th style="text-align: left;">Limit</th> <th style="text-align: left;">Margin</th> <th style="text-align: left;">SA</th> <th style="text-align: left;">Factor</th> <th style="text-align: left;">Remark</th> <th style="text-align: left;">ANT</th> <th style="text-align: left;">Turn</th> </tr> <tr> <th style="text-align: left;">MHz</th> <th style="text-align: left;">level</th> <th style="text-align: left;">dBuV/m</th> <th style="text-align: left;">dB</th> <th style="text-align: left;">reading</th> <th style="text-align: left;">dBuV</th> <th style="text-align: left;">dB</th> <th style="text-align: left;">High</th> <th style="text-align: left;">Table</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>98.87</td> <td>24.29</td> <td>43.50</td> <td>-19.21</td> <td>45.79</td> <td>-21.50</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>2</td> <td>166.77</td> <td>23.12</td> <td>43.50</td> <td>-20.38</td> <td>40.07</td> <td>-16.95</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>3</td> <td>232.73</td> <td>26.91</td> <td>46.00</td> <td>-19.09</td> <td>45.33</td> <td>-18.42</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>4</td> <td>499.48</td> <td>26.68</td> <td>46.00</td> <td>-19.32</td> <td>37.81</td> <td>-11.13</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>5</td> <td>596.48</td> <td>32.09</td> <td>46.00</td> <td>-13.91</td> <td>41.67</td> <td>-9.58</td> <td>Peak</td> <td>---</td> </tr> <tr> <td>6</td> <td>800.18</td> <td>30.40</td> <td>46.00</td> <td>-15.60</td> <td>36.92</td> <td>-6.52</td> <td>Peak</td> <td>---</td> </tr> </tbody> </table>				Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn	MHz	level	dBuV/m	dB	reading	dBuV	dB	High	Table	1	98.87	24.29	43.50	-19.21	45.79	-21.50	Peak	---	2	166.77	23.12	43.50	-20.38	40.07	-16.95	Peak	---	3	232.73	26.91	46.00	-19.09	45.33	-18.42	Peak	---	4	499.48	26.68	46.00	-19.32	37.81	-11.13	Peak	---	5	596.48	32.09	46.00	-13.91	41.67	-9.58	Peak	---	6	800.18	30.40	46.00	-15.60	36.92	-6.52	Peak	---
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3.2.6 Transmitter Radiated Unwanted Emissions (Above 1GHz)

Modulation	FSK	Test Freq. (MHz)	2408																																																																																																													
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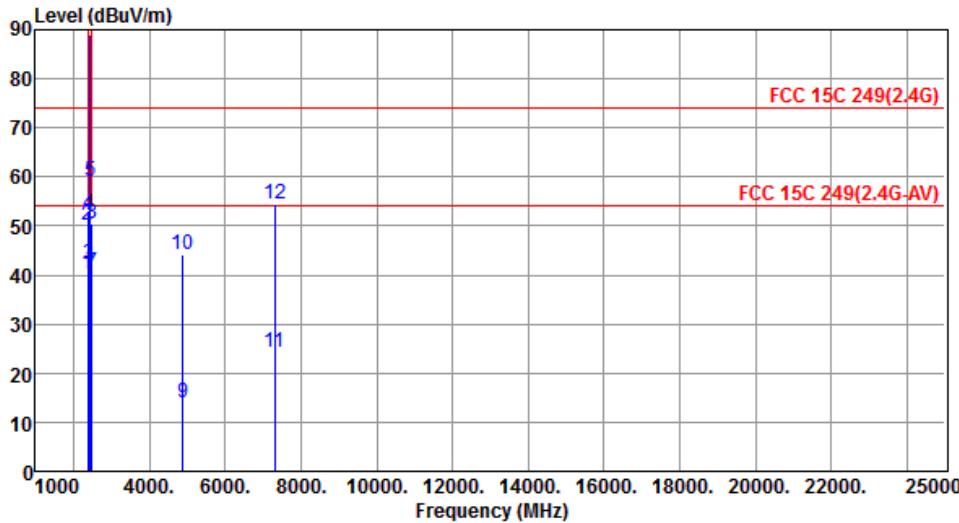
Modulation	FSK	Test Freq. (MHz)	2408																																																																																																													
Polarization	Vertical																																																																																																															
 <p>The plot shows a spectral emission mask with two horizontal red lines representing the FCC 15C 249(2.4G) and FCC 15C 249(2.4G-AV) limits. Blue vertical lines indicate the emission levels at various frequencies. The x-axis represents Frequency in MHz from 1000 to 25000, and the y-axis represents Level in dBuV/m from 0 to 90.</p>																																																																																																																
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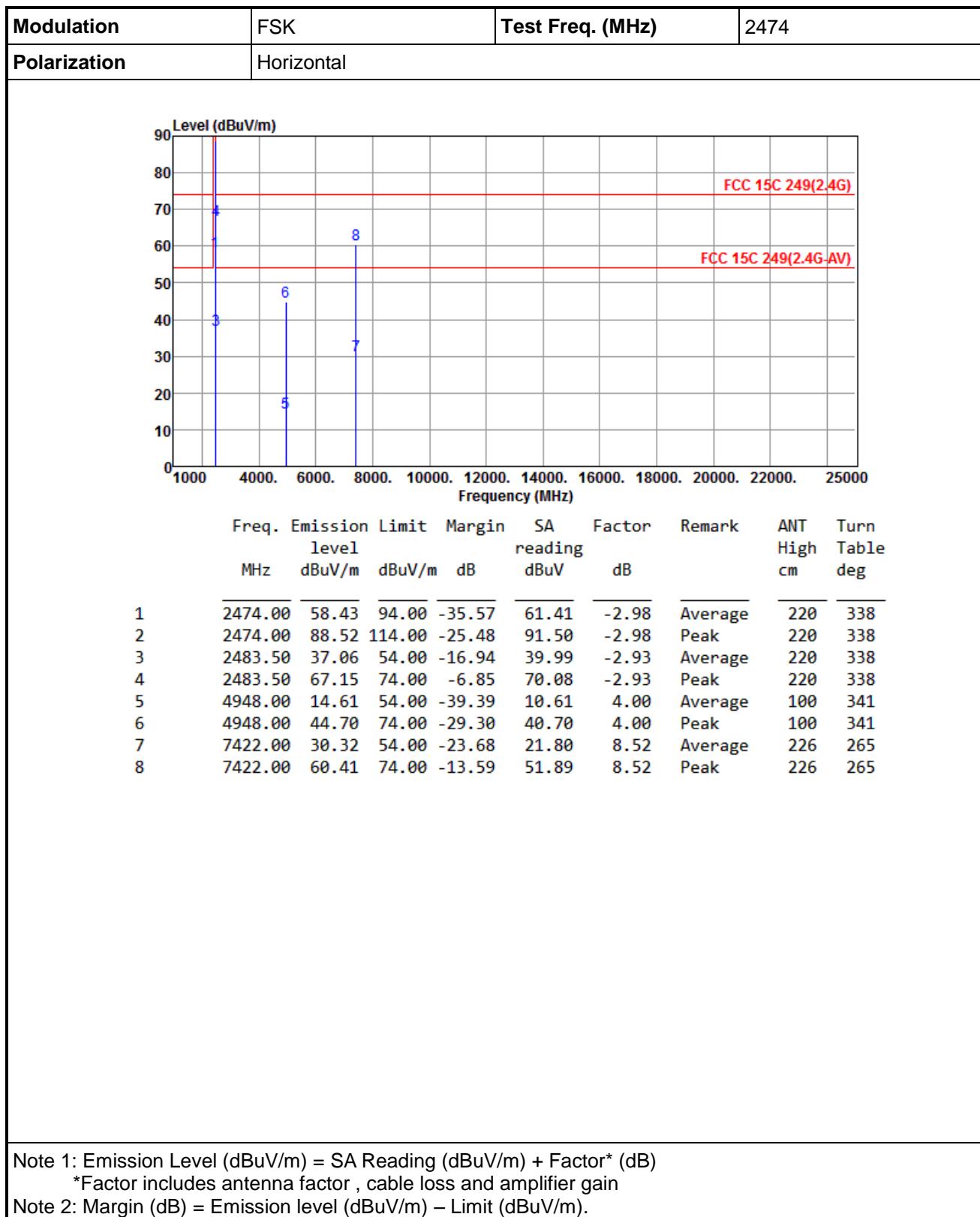
Modulation	FSK	Test Freq. (MHz)	2440					
Polarization	Horizontal							
 FCC 15C 249(2.4G)								
FCC 15C 249(2.4G-AV)								
1	2390.00	40.12	54.00 -13.88	43.47	-3.35	Average	144	201
2	2390.00	50.05	74.00 -23.95	53.40	-3.35	Peak	144	201
3	2400.00	41.94	54.00 -12.06	45.24	-3.30	Average	144	201
4	2400.00	52.02	74.00 -21.98	55.32	-3.30	Peak	144	201
5	2440.00	57.92	94.00 -36.08	61.05	-3.13	Average	144	201
6	2440.00	88.01	114.00 -25.99	91.14	-3.13	Peak	144	201
7	2483.50	40.15	54.00 -13.85	43.08	-2.93	Average	144	201
8	2483.50	50.31	74.00 -23.69	53.24	-2.93	Peak	144	201
9	4880.00	13.69	54.00 -40.31	9.92	3.77	Average	100	336
10	4880.00	43.78	74.00 -30.22	40.01	3.77	Peak	100	336
11	7320.00	28.92	54.00 -25.08	20.49	8.43	Average	100	272
12	7320.00	59.01	74.00 -14.99	50.58	8.43	Peak	100	272

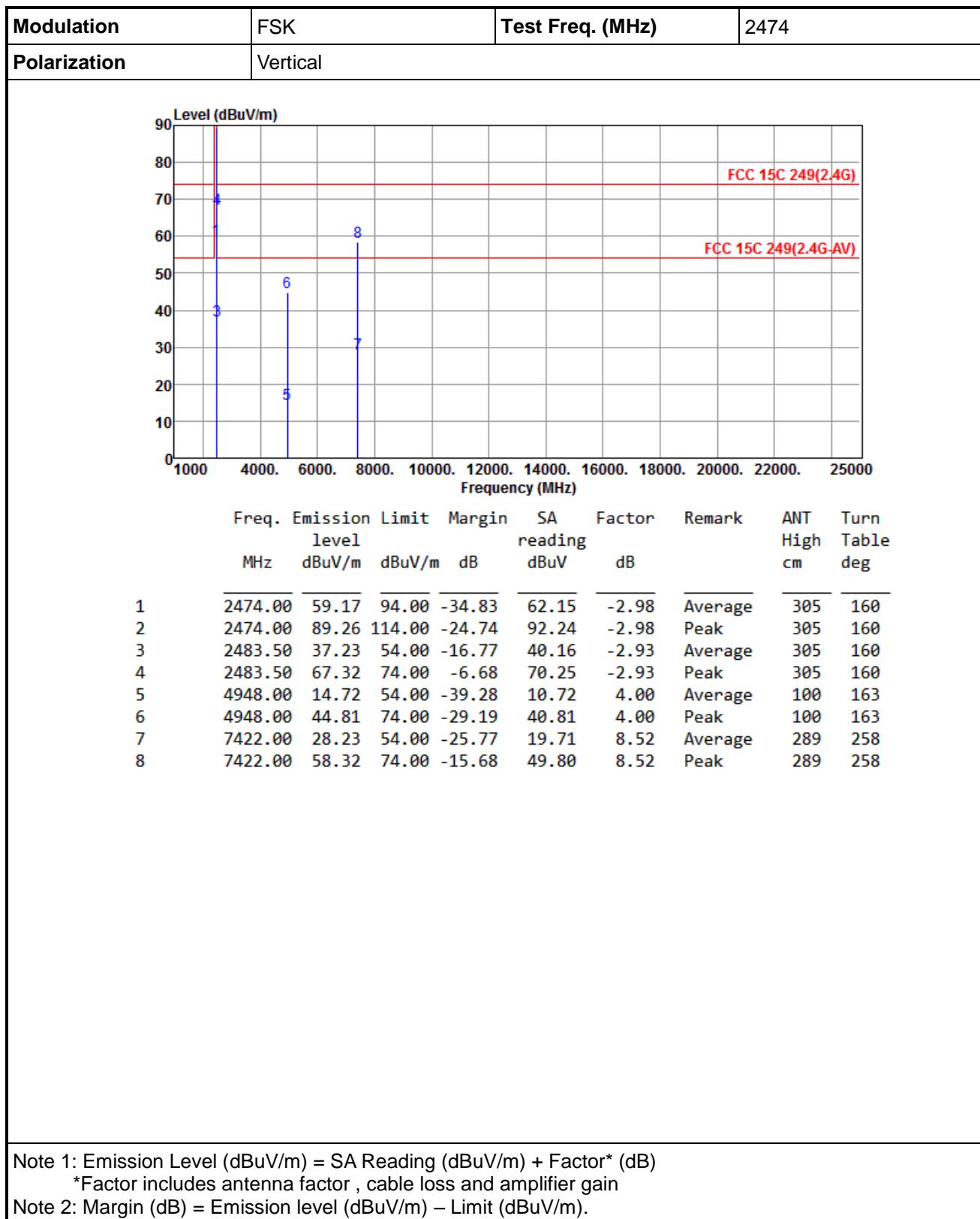
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)

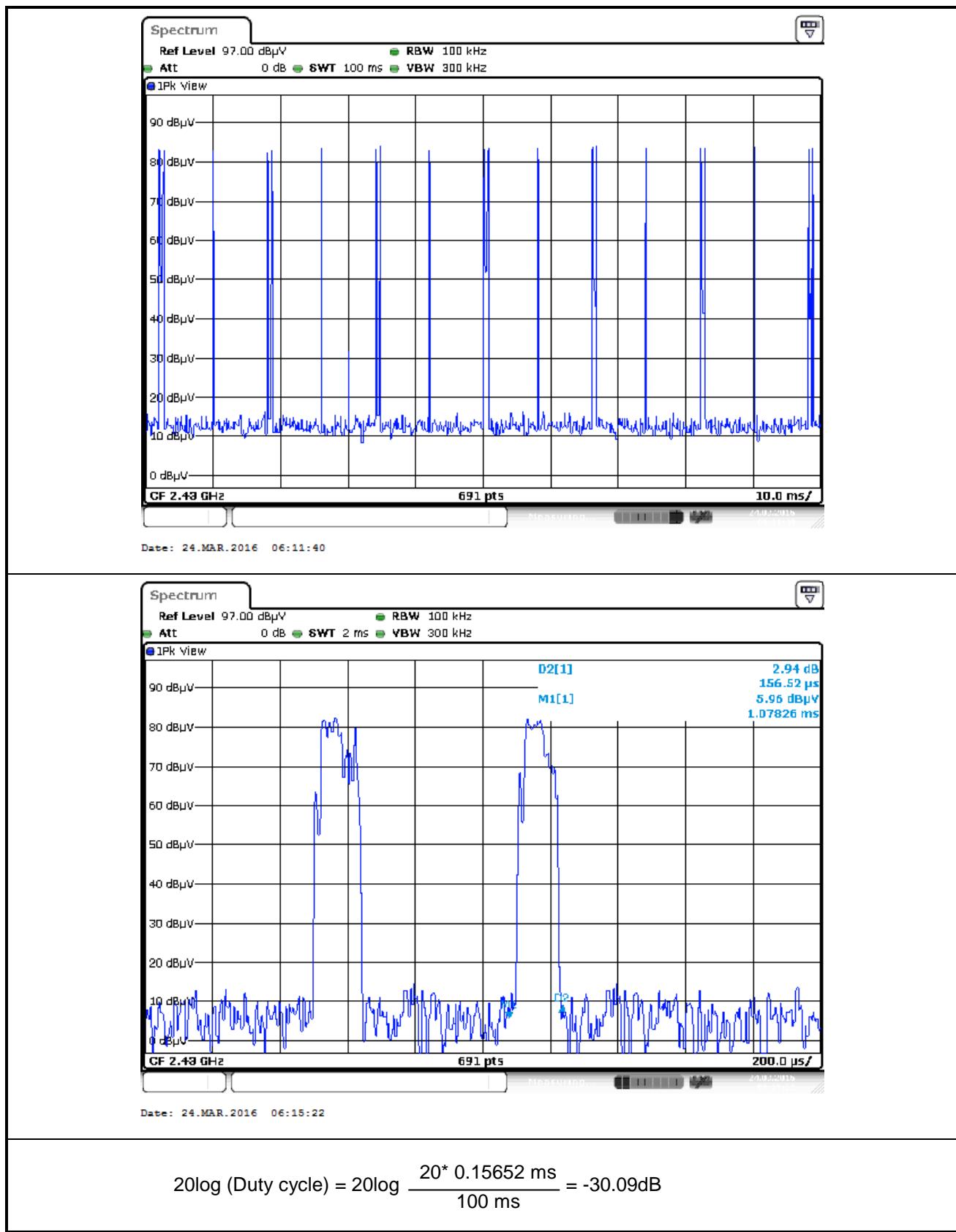
*Factor includes antenna factor , cable loss and amplifier gain

Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Modulation	FSK	Test Freq. (MHz)	2440																																																																																																																																																
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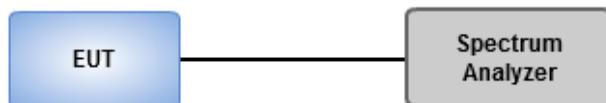


3.3 20dB and Occupied Bandwidth

3.3.1 Test Procedures

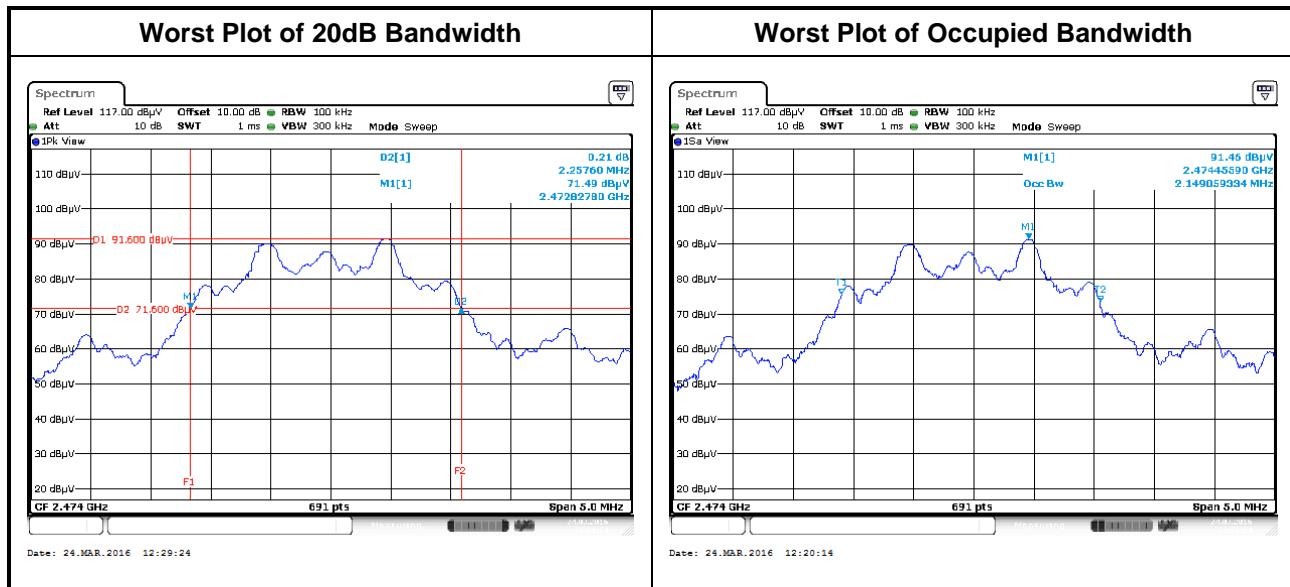
1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak(20 dB bandwidth) / Sample(Occupied bandwidth), Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated 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)
2408	2.23	2.16
2440	2.22	2.44
2474	2.26	2.47



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, 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 Hsiang. Location map can be found on our website <http://www.icertifi.com.tw>.

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