

# **FCC Test Report**

FCC ID : PRDMU43

Equipment : 2.4G Blue Trace Mouse

Model No. : GKV

Brand Name : ACROX

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 : Jul. 18, 2016 Tested Date : Jul. 20, 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

Ilac-MRA



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## **Release Record**

Report No.	Version	Description	Issued Date
FR671805	Rev. 01	Initial issue	Sep. 07, 2016

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## **Summary of Test Results**

FCC Rules	Test Items	Measured	Result				
15.207	AC Power Line Conducted Emissions	Note	N/A				
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				
Note: The EUT	Note: The EUT consumes DC power from battery, so the test is not required.						

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## 1 General Description

### 1.1 Information

### 1.1.1 Specification of the Equipment under Test (EUT)

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

#### 1.1.2 Antenna Details

Ant. No.	Туре	Gain (dBi)	Connector	Remark
1	printed	-2	N/A	

### 1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	3Vdc from battery (1.5Vdc AA battery x2).
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Note: The equipment tests are performed using a new battery.

#### 1.1.4 Accessories

N/A

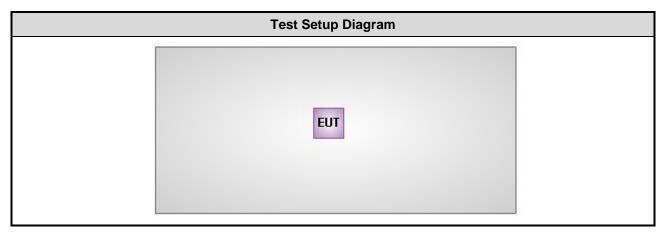
#### 1.1.5 Channel List

	Frequency band (MHz)				2400~	2483.5	
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2408	10	2426	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		

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## 1.2 Test Setup Chart



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## 1.3 The Equipment List

Test Item	Radiated Emission						
Test Site	966 chamber 3 / (03	CH03-WS)					
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until		
Spectrum Analyzer	R&S	FSV40	101063	Feb. 17, 2016	Feb. 16, 2017		
Receiver	Agilent	N9038A	MY53290044	Oct. 14, 2015	Oct. 13, 2016		
Bilog Antenna	SCHWARZBECK	VULB9168	VULB9168-685	Apr. 26, 2016	Apr. 25, 2017		
Horn Antenna 1G-18G	SCHWARZBECK	BBHA 9120 D	BBHA 9120 D 1206	Feb. 24, 2016	Feb. 23, 2017		
Horn Antenna 18G-40G	SCHWARZBECK	BBHA 9170	BBHA 9170517	Nov. 04, 2015	Nov. 03, 2016		
Preamplifier	EMC	EMC02325	980187	Sep. 21, 2015	Sep. 20, 2016		
Preamplifier	Agilent	83017A	MY53270014	Sep. 07, 2015	Sep. 06, 2016		
Preamplifier	EMC	EMC184045B	980192	Sep. 01, 2015	Aug. 31, 2016		
RF cable-3M	HUBER+SUHNER	SUCOFLEX104	MY22620/4	Feb. 05, 2016	Feb. 04, 2017		
RF cable-8M	HUBER+SUHNER	SUCOFLEX104	MY22600/4	Feb. 05, 2016	Feb. 04, 2017		
RF cable-1M	HUBER+SUHNER	SUCOFLEX104	MY22624/4	Feb. 05, 2016	Feb. 04, 2017		
LF cable-0.8M	EMC	EMC8D-NM-NM-800	EMC8D-NM-NM-800-001	Feb. 05, 2016	Feb. 04, 2017		
LF cable-3M	EMC	EMC8D-NM-NM-3000	131103	Feb. 05, 2016	Feb. 04, 2017		
LF cable-13M	EMC	EMC8D-NM-NM-13000	131104	Feb. 05, 2016	Feb. 04, 2017		
Measurement Software	AUDIX	e3	6.120210g	NA	NA		
Note: Calibration Inte	Note: Calibration Interval of instruments listed above is one year.						

Test Item	RF Conducted							
Test Site	(TH01-WS)	TH01-WS)						
Instrument	Manufacturer	Model No.	Serial No.	Calibration Date	Calibration Until			
Spectrum Analyzer	Agilent	N9010A	MY53400091	Sep. 14, 2015	Sep. 13, 2016			
Power Meter	Anritsu	ML2495A	1241002	Sep. 21, 2015	Sep. 20, 2016			
Power Sensor	Anritsu	MA2411B	1207366	Sep. 21, 2015	Sep. 20, 2016			
Measurement Software	Sporton	Sporton_1	1.3.30	NA	NA			
Note: Calibration Inte	Note: Calibration Interval of instruments listed above is one year.							

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## 1.4 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

## 1.5 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			
Radiated emission ≤ 1GHz	±3.66 dB			
Radiated emission > 1GHz	±5.37 dB			

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## 2 Test Configuration

## 2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH03-WS	20-21°C / 64%	Warren Lee
RF Conducted	TH01-WS	20°C / 64%	Warren Lee

➤ FCC site registration No.: 207696➤ IC site registration No.: 10807C-1

### 2.2 The Worst Test Modes and Channel Details

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

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### 3 Transmitter Test Results

#### 3.1 Radiated Emission

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

#### 3.1.1 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

#### 3.1.2 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 as 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.

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#### 3.1.3 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:

- Radiated emission below 1GHz
- 1. 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. 
$$20\log \text{ (Duty cycle)} = 20\log \frac{0.15942 \text{ ms x 7}}{100 \text{ ms}} = -39.05 \text{dB}$$

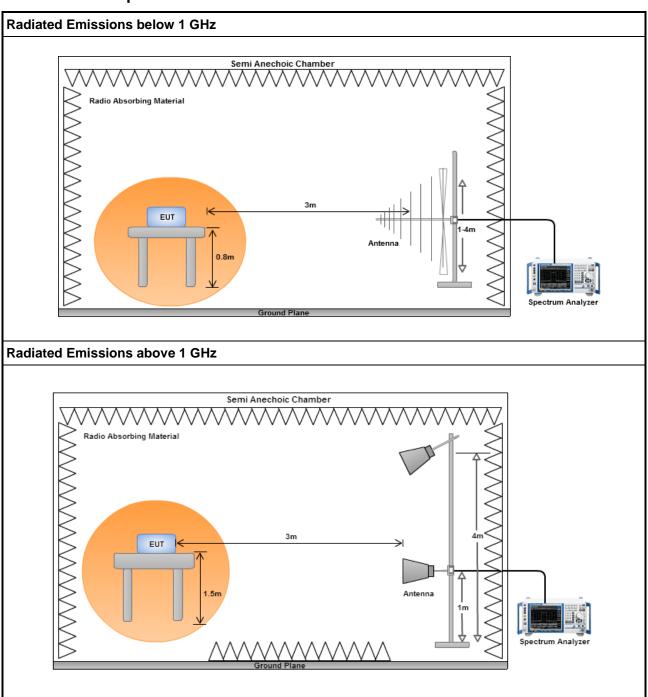
Please see page 21 for plotted duty

- 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

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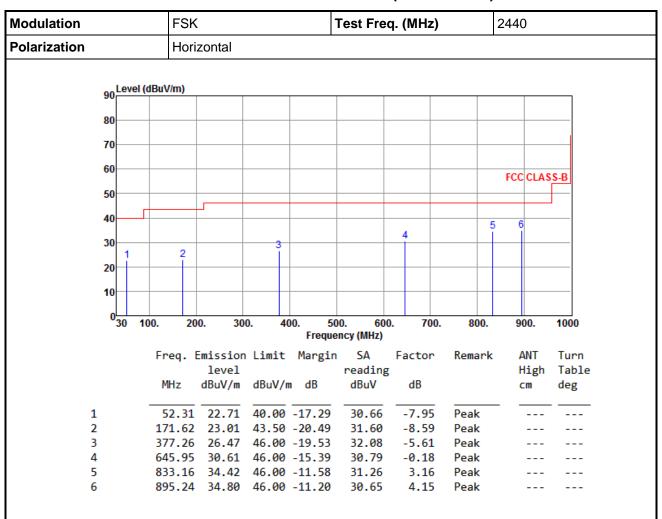
### 3.1.4 Test Setup



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#### 3.1.5 Transmitter Radiated Unwanted Emissions (Below 1GHz)



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

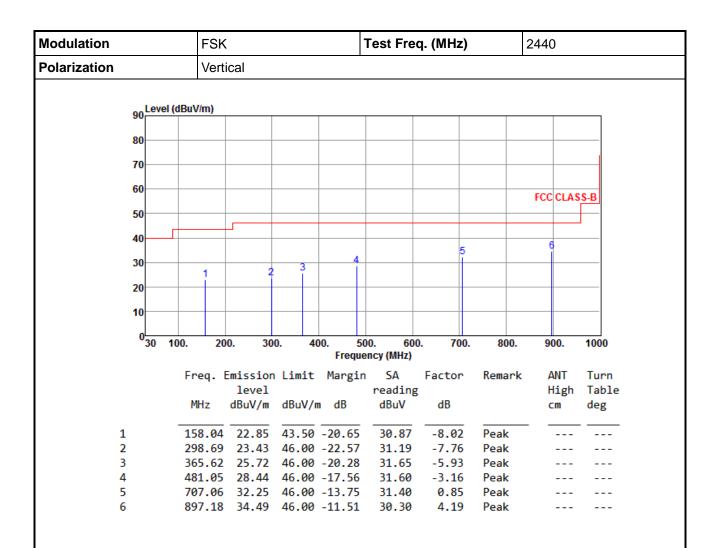
\*Factor includes antenna factor, cable loss and amplifier gain

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.

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\*Factor includes antenna factor, cable loss and amplifier gain

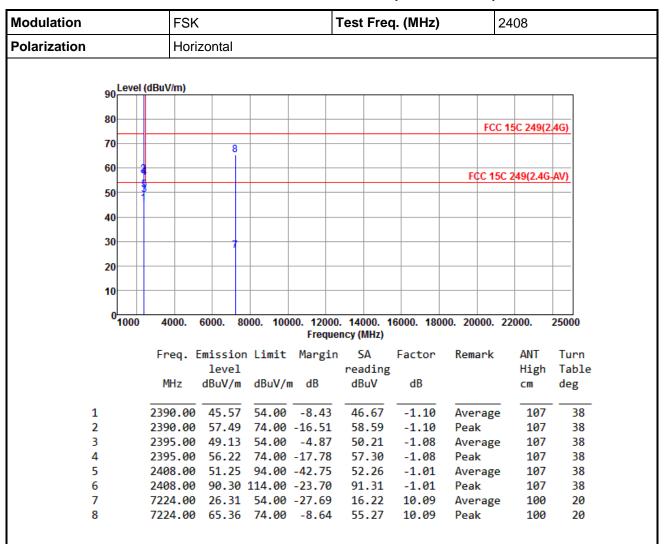
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

Note 3: All spurious emissions below 30MHz are more than 20 dB below the limit.

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#### 3.1.6 Transmitter Radiated Unwanted Emissions (Above 1GHz)



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

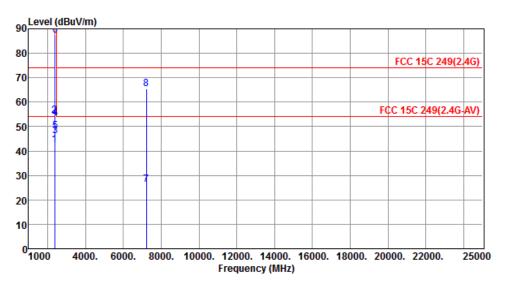
\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation	FSK	Test Freq. (MHz)	2408
Polarization	Vertical		



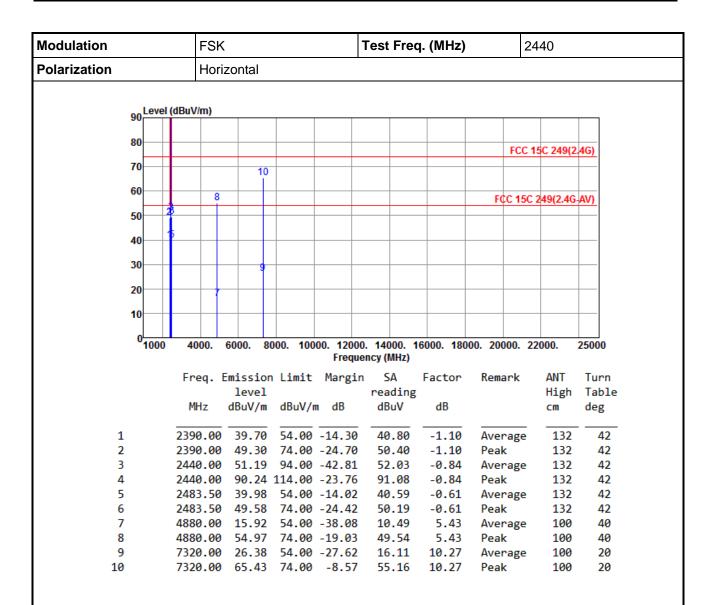
	Freq.	Emission	Limit	Margin	SA	Factor	Remark	ANT	Turn
		level			reading			High	Table
	MHz	dBuV/m	dBuV/m	dB	dBuV	dB		cm	deg
1	2390.00	42.66	54.00	-11.34	43.76	-1.10	Average	307	15
2	2390.00	54.53	74.00	-19.47	55.63	-1.10	Peak	307	15
3	2395.00	46.25	54.00	-7.75	47.33	-1.08	Average	307	15
4	2395.00	53.41	74.00	-20.59	54.49	-1.08	Peak	307	15
5	2408.00	48.30	94.00	-45.70	49.31	-1.01	Average	307	15
6	2408.00	87.35	114.00	-26.65	88.36	-1.01	Peak	307	15
7	7224.00	26.23	54.00	-27.77	16.14	10.09	Average	265	155
8	7224.00	65.28	74.00	-8.72	55.19	10.09	Peak	265	155

\*Factor includes antenna factor, cable loss and amplifier gain

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

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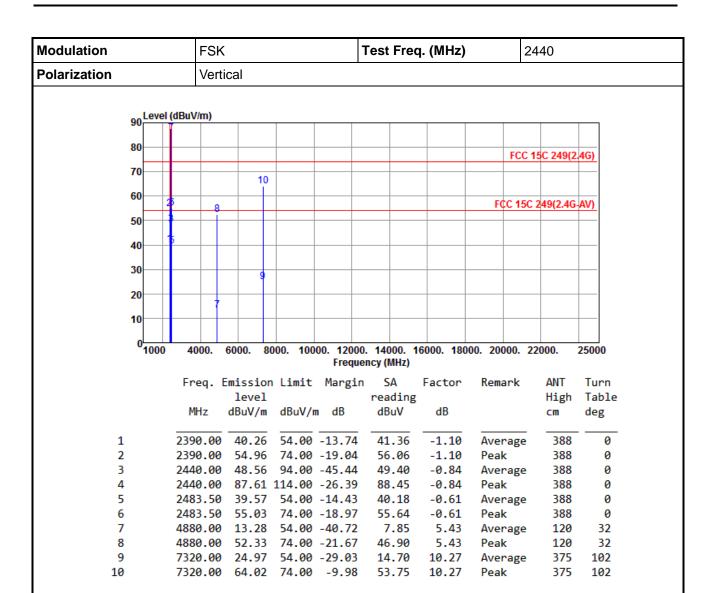


\*Factor includes antenna factor, cable loss and amplifier gain

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

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\*Factor includes antenna factor, cable loss and amplifier gain

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

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Modulation		FSK To					Test Freq. (MHz)			2474	2474		
Polarization			Hor	izontal			•				•		
	90 Lev	el (dBu	V/m)										$\neg$
	80												_
										F	CC 15C 2	49(2.4	IG)
	70				8								
	60	<del>                                     </del>	6							FCC	15C 249(	2 4G /	W)
	50	-	ů							100	150 245(	2.407	
	40												
	30				7								_
	20												
			5										
	10												
	0 <mark>100</mark>	0	4000.	6000.	8000	10000. 120	000 140	00. 16	000 180	00 20000	22000	2	5000
	100		1000.	0000.			quency (N			20000	. ZZOOO		
		F	req.	Emissi	on Lim	it Marg	in S	Δ	Factor	Remark	c AN	IT	Turn
				leve				ding				_	Table
			MHz	dBuV/ı	n dBu	V/m dB	dBı	υV	dB		CI	1	deg
1	L	24	74.00	53.6	5 94.	00 -40.3	4 54	.33	-0.67	Averag	 ge 1	100	40
2		24	74.00	92.7	1 114.	00 -21.2		.38	-0.67	Peak		100	40
3	3					00 -5.3		. 22	-0.61	Averag	_	100	40
4						00 -16.3		. 25	-0.61	Peak		100	40
5		//9	18 00	1/1 1/	1 5/1	00 -39.8	6 8	. 54	5.60	Averag	TO 3	308	225

74.00 -20.81

47.59

14.57

5.60

10.51

10.51

Peak

Peak

Average

308

100

100

225

20

20

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).

4948.00 53.19

7422.00 25.08 54.00 -28.92

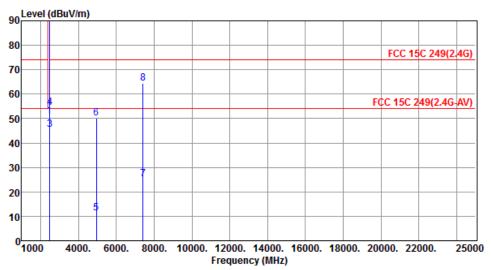
7422.00 64.13 74.00 -9.87 53.62

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Modulation	FSK	Test Freq. (MHz)	2474
Polarization	Vertical		



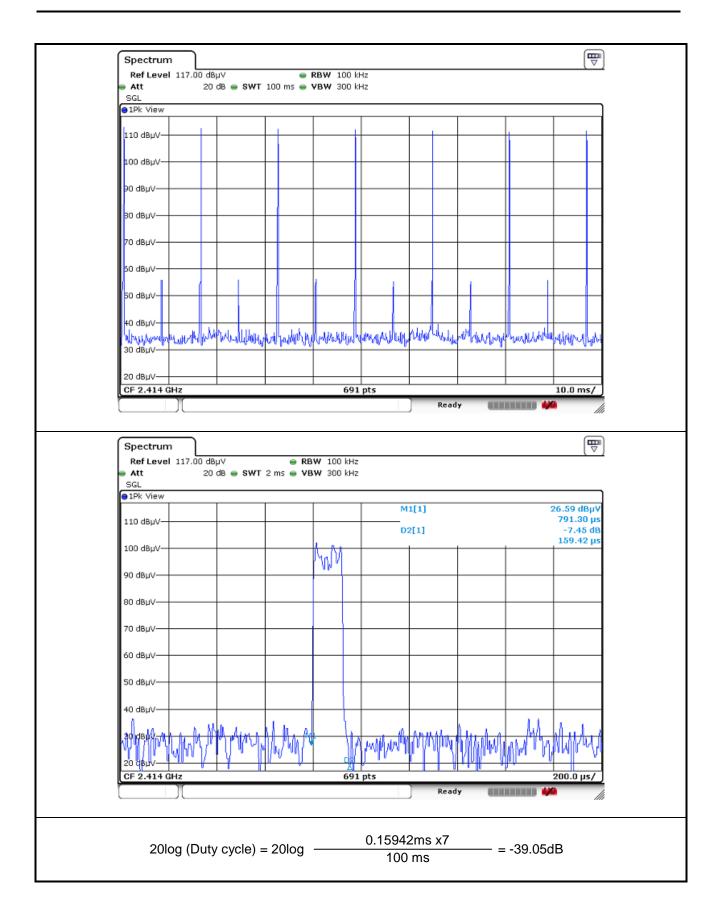
	Freq.   MHz	Emission level dBuV/m	dBuV/m	Ü	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
	1112	abav/iii	abav, iii	ub.	abav	ub		CIII	ucg
1	2474.00	50.66	94.00	-43.34	51.33	-0.67	Average	325	15
2	2474.00	89.71	114.00	-24.29	90.38	-0.67	Peak	325	15
3	2483.50	45.58	54.00	-8.42	46.19	-0.61	Average	325	15
4	2483.50	54.57	74.00	-19.43	55.18	-0.61	Peak	325	15
5	4948.00	11.20	54.00	-42.80	5.60	5.60	Average	295	165
6	4948.00	50.25	74.00	-23.75	44.65	5.60	Peak	295	165
7	7422.00	25.28	54.00	-28.72	14.77	10.51	Average	269	136
8	7422.00	64.33	74.00	-9.67	53.82	10.51	Peak	269	136

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).

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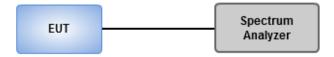


### 3.2 20dB and Occupied Bandwidth

#### 3.2.1 Test Procedures

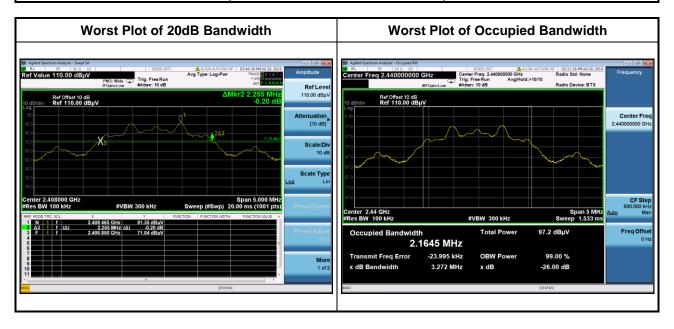
- 1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
- 2. Detector = Peak(20 dB bandwidth) / Sample(Occupied bandwidth), Trace mode = max hold.
- 3. Sweep = auto couple, Allow the trace to stabilize.
- 4. Measure the maximum width of the emission that is constrained by the frequencies 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 specturm analyzer to measure 99% occupied bandwidth

#### 3.2.2 Test Setup



#### 3.2.3 20dB and Occupied Bandwidth

Freq. (MHz)	20dB Bandwidth (MHz)	Occupied Bandwidth (MHz)
2408	2.26	2.15
2440	2.25	2.16
2474	2.18	2.16



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## 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 Hsiang. Location map can be found on our website <a href="http://www.icertifi.com.tw">http://www.icertifi.com.tw</a>.

#### Linkou

Tel: 886-2-2601-1640 No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City,

Taiwan, R.O.C.

#### Kwei Shan

Tel: 886-3-271-8666 No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.

#### Kwei Shan Site II

Tel: 886-3-271-8640

No. 14-1, Lane 19, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C..

If you have any suggestion, please feel free to contact us as below information

Tel: 886-3-271-8666 Fax: 886-3-318-0155

Email: ICC\_Service@icertifi.com.tw

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