FCC Test Report

FCC ID	:	**IE3VP459216**
Equipment	:	**Ruby Pro Presenter**
Model No.	:	**VP4592**
Brand Name	:	**SMK-Link**
Applicant	:	**SMK-Link Electronics Corp.**
Address	:	**3601-B Calle Tecate, Camarillo, CA 93012, USA**
Standard	:	**47 CFR FCC Part 15.249**
Received Date	:	**Jul. 13, 2016**
Tested Date	:	**Jul. 19 ~ 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

Testing Laboratory
2732

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Release Record

Report No.	Version	Description	Issued Date
FR671303	Rev. 01	Initial issue	Aug. 04, 2016

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 consumes DC power from battery, therefore this test is not required.			

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	printed	-2	N/A	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	DC 3V (1.5Vdc AA battery x2)

Note: The equipment tests are performed using a new battery.

1.1.4 Accessories

N/A

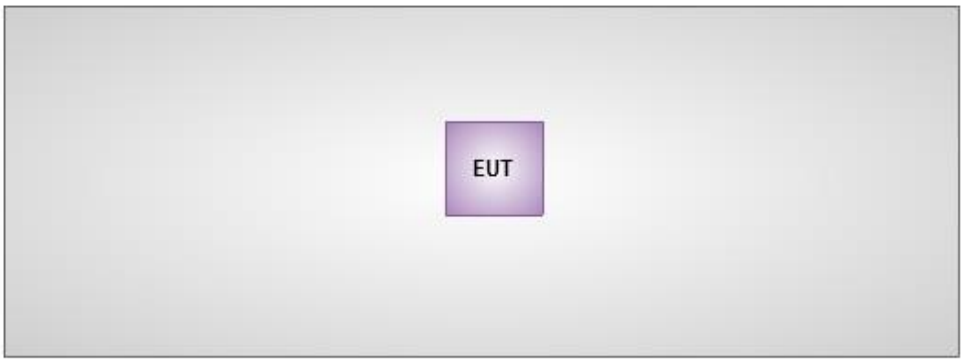
1.1.5 Channel List

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	---	---

1.2 Local Support Equipment List

Support Equipment List						
No.	Equipment	Brand	Model	S/N	FCC ID	Signal cable / Length (m)
---	---	---	---	---	---	---

1.3 Test Setup Chart

Test Setup Diagram


1.4 The Equipment List

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	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 Interval of instruments listed above is one year.					

Test Item	RF Conducted				
Test Site	(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 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
Radiated emission ≤ 1GHz	±3.66 dB
Radiated emission > 1GHz	±5.37 dB

2 Test Configuration

2.1 Testing Condition

Test Item	Test Site	Ambient Condition	Tested By
Radiated Emissions	03CH03-WS	20°C / 62-64%	Warren Lee
RF Conducted	TH01-WS	20°C / 62%	Felix Sung

- 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	2440	1 Mbps	---
Radiated Emissions > 1GHz	FSK	2408, 2440, 2474	1 Mbps	---
20dB bandwidth	FSK	2408, 2440, 2474	1 Mbps	---
Note: The EUT was pretested with 3 orientations placed on the table for the radiated emission measurement – X, Y, and Z-plane. The **Y-plane** results were found as the worst case and were shown in this report.				

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.

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:

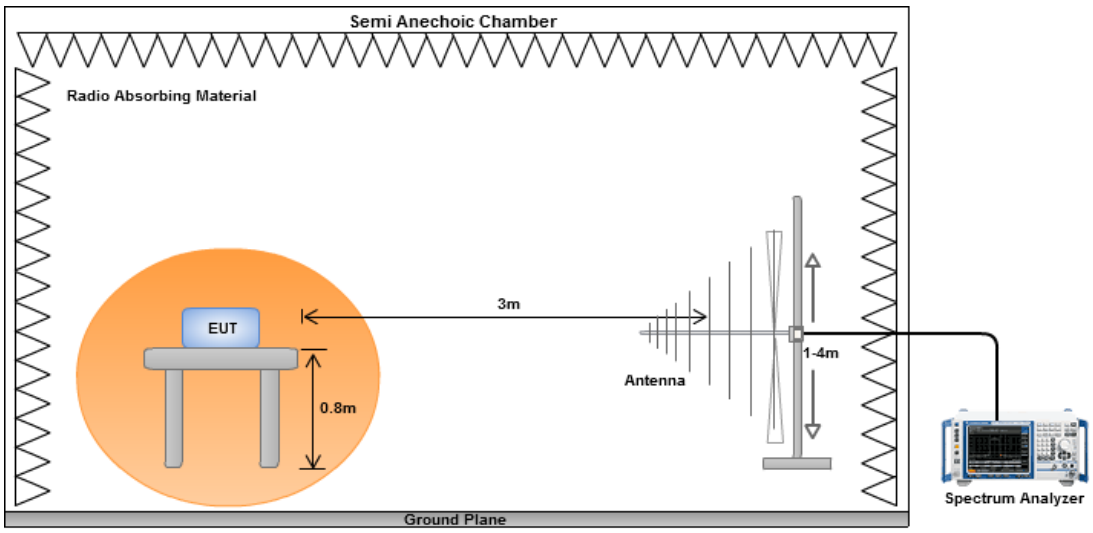
1. Radiated emission below 1GHz
   120kHz measurement bandwidth of test receiver and Quasi-peak detector is for radiated emission
2. Radiated emission above 1GHz / Peak value except fundamental
   RBW=1MHz, VBW=3MHz and Peak detector

   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. $$20\log(\text{Duty cycle}) = 20\log\frac{0.162\text{ ms} \times 14}{100\text{ ms}} = -32.89\text{dB}$$

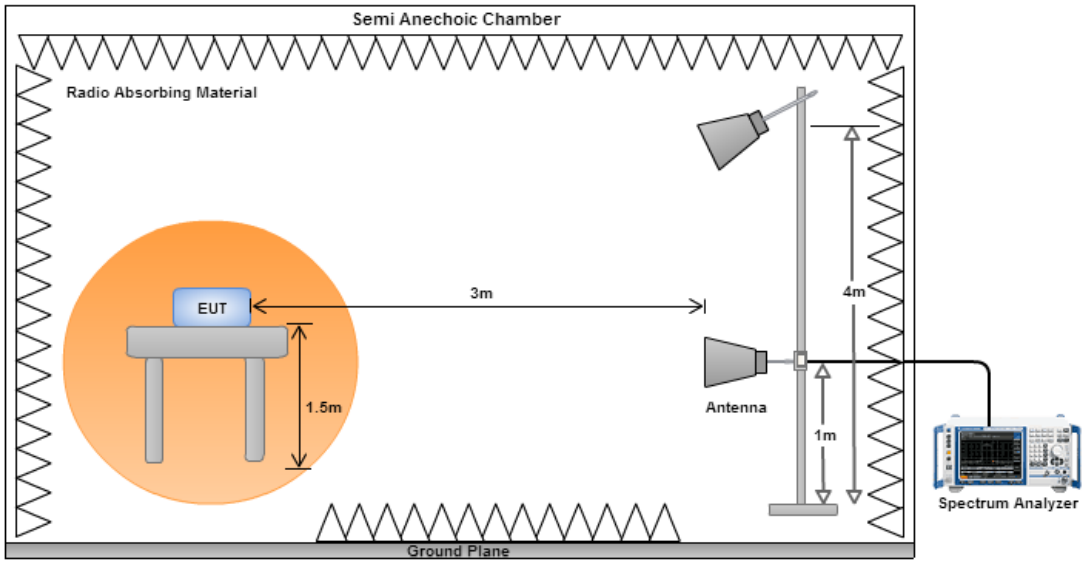
   Please see page 21 for plotted duty
4. Radiated emission above 1GHz / Average value for other emissions
   RBW=1MHz, VBW=10Hz and Peak detector
5. Radiated emission Peak value for fundamental
   RBW=3MHz, VBW=10MHz and Peak detector

3.1.4 Test Setup

Radiated Emissions below 1 GHz

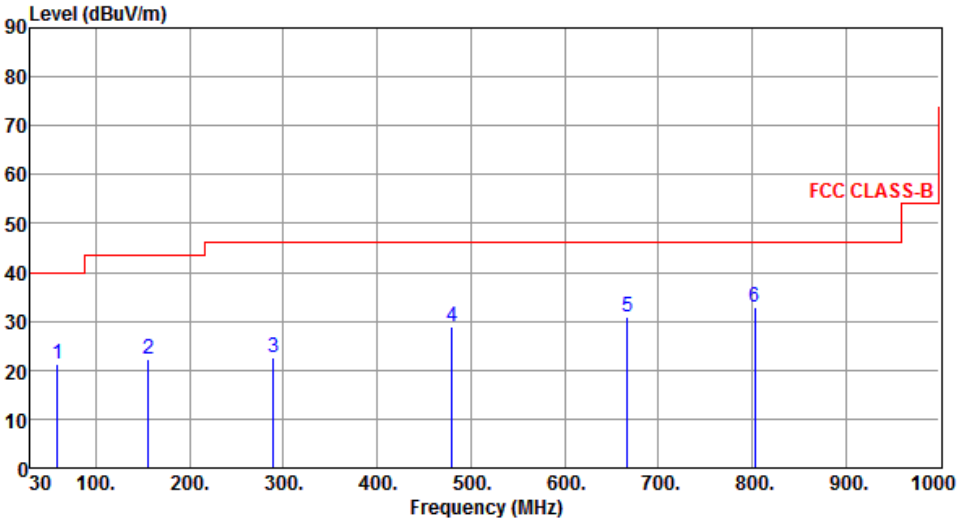


Radiated Emissions above 1 GHz



3.1.5 Transmitter Radiated Unwanted Emissions (Below 1GHz)

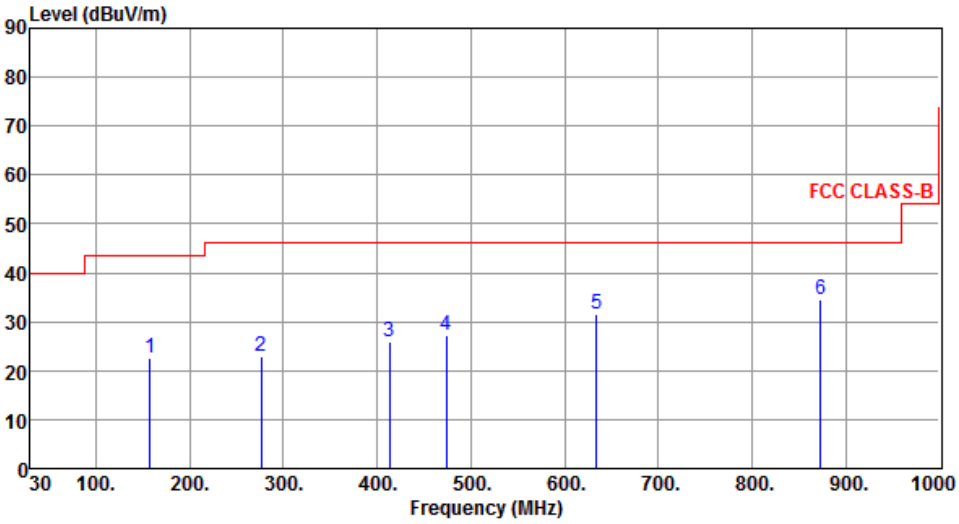
Modulation	FSK	Test Freq. (MHz)	2440
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	59.10	21.10	40.00	-18.90	29.54	-8.44	Peak	---	---
2	156.10	22.31	43.50	-21.19	30.36	-8.05	Peak	---	---
3	288.99	22.68	46.00	-23.32	30.65	-7.97	Peak	---	---
4	480.08	28.91	46.00	-17.09	32.10	-3.19	Peak	---	---
5	667.29	30.95	46.00	-15.05	30.80	0.15	Peak	---	---
6	803.09	33.04	46.00	-12.96	30.41	2.63	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	FSK	Test Freq. (MHz)	2440
Polarization	Vertical		

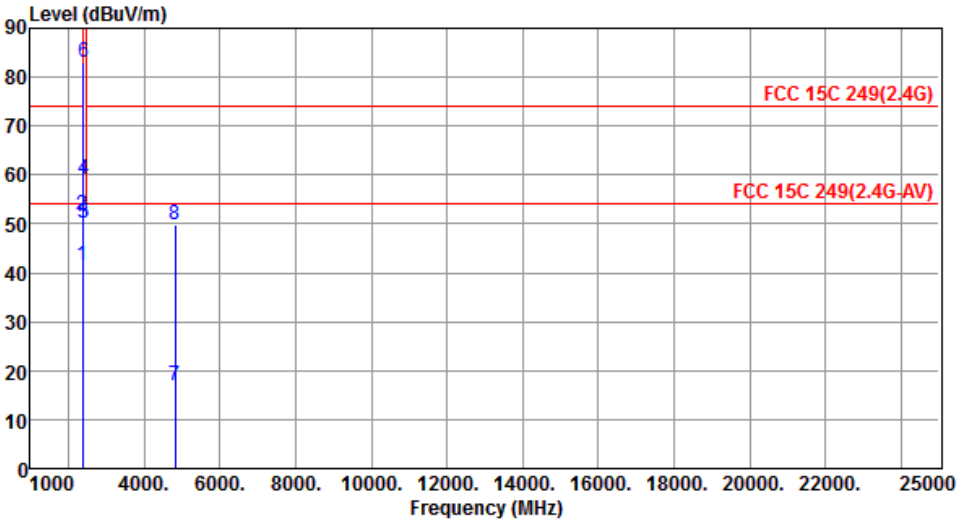


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	158.04	22.72	43.50	-20.78	30.74	-8.02	Peak	---	---
2	276.38	22.98	46.00	-23.02	31.30	-8.32	Peak	---	---
3	413.15	25.83	46.00	-20.17	30.44	-4.61	Peak	---	---
4	474.26	27.20	46.00	-18.80	30.46	-3.26	Peak	---	---
5	634.31	31.48	46.00	-14.52	31.79	-0.31	Peak	---	---
6	872.93	34.45	46.00	-11.55	30.64	3.81	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.

3.1.6 Transmitter Radiated Unwanted Emissions (Above 1GHz)

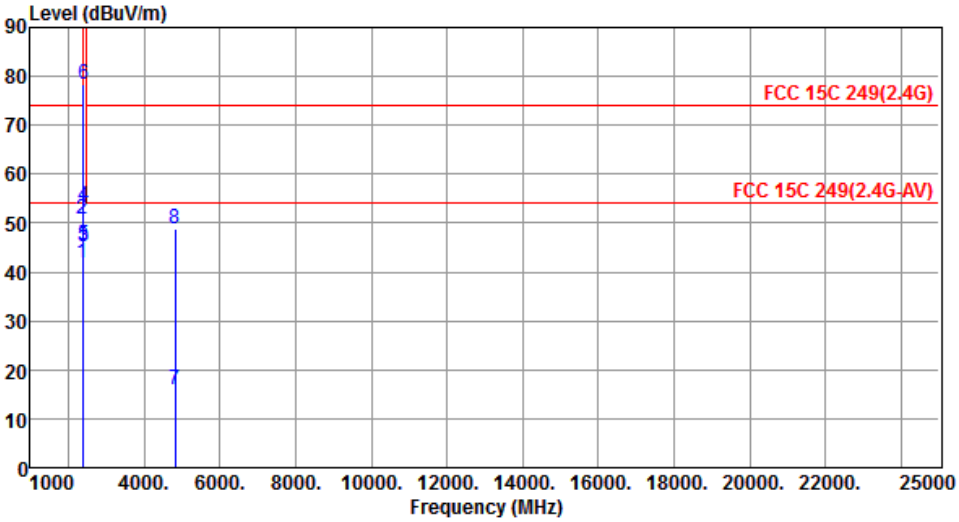
Modulation	FSK	**Test Freq. (MHz)**	2408
Polarization	Horizontal		



	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	41.55	54.00	-12.45	42.65	-1.10	Average	100	151
2	2390.00	51.80	74.00	-22.20	52.90	-1.10	Peak	100	151
3	2400.00	50.18	54.00	-3.82	51.23	-1.05	Average	100	151
4	2400.00	59.05	74.00	-14.95	60.10	-1.05	Peak	100	151
5	2408.00	50.29	94.00	-43.71	51.30	-1.01	Average	100	151
6	2408.00	83.18	114.00	-30.82	84.19	-1.01	Peak	100	151
7	4816.00	17.05	54.00	-36.95	11.77	5.28	Average	262	115
8	4816.00	49.94	74.00	-24.06	44.66	5.28	Peak	262	115

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).

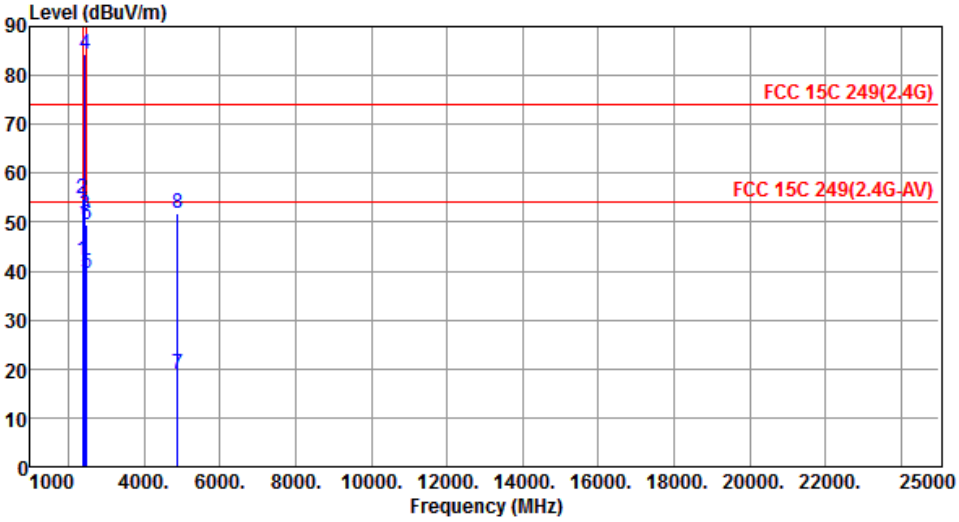
Modulation	FSK	Test Freq. (MHz)	2408
Polarization	Vertical		



	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	41.75	54.00	-12.25	42.85	-1.10	Average	400	265
2	2390.00	50.88	74.00	-23.12	51.98	-1.10	Peak	400	265
3	2400.00	45.24	54.00	-8.76	46.29	-1.05	Average	400	265
4	2400.00	53.54	74.00	-20.46	54.59	-1.05	Peak	400	265
5	2408.00	45.34	94.00	-48.66	46.35	-1.01	Average	400	265
6	2408.00	78.23	114.00	-35.77	79.24	-1.01	Peak	400	265
7	4816.00	15.98	54.00	-38.02	10.70	5.28	Average	265	114
8	4816.00	48.87	74.00	-25.13	43.59	5.28	Peak	265	114

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).

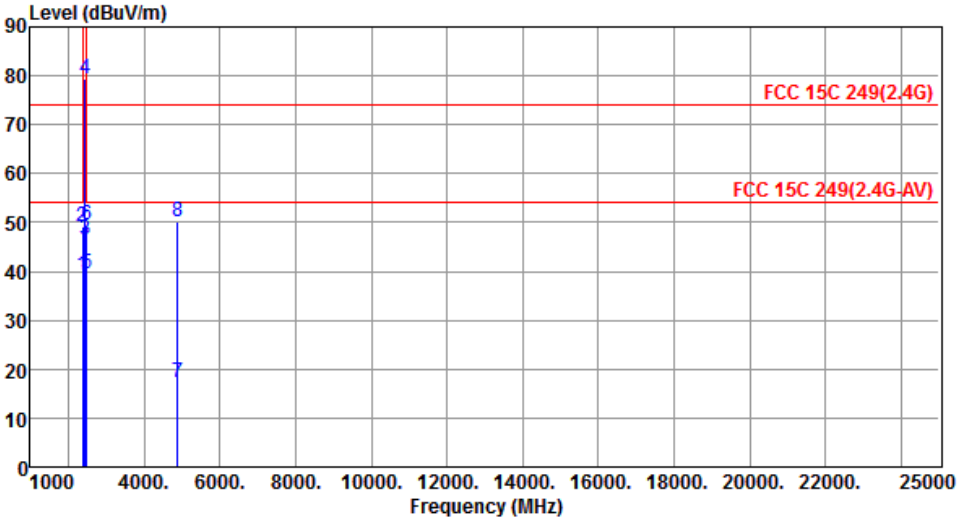
Modulation	FSK	**Test Freq. (MHz)**	2440
Polarization	Horizontal		



	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	42.21	54.00	-11.79	43.31	-1.10	Average	100	131
2	2390.00	54.82	74.00	-19.18	55.92	-1.10	Peak	100	131
3	2440.00	51.37	94.00	-42.63	52.21	-0.84	Average	100	131
4	2440.00	84.26	114.00	-29.74	85.10	-0.84	Peak	100	131
5	2483.50	39.67	54.00	-14.33	40.28	-0.61	Average	100	131
6	2483.50	49.64	74.00	-24.36	50.25	-0.61	Peak	100	131
7	4880.00	18.99	54.00	-35.01	13.56	5.43	Average	100	188
8	4880.00	51.88	74.00	-22.12	46.45	5.43	Peak	100	188

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).

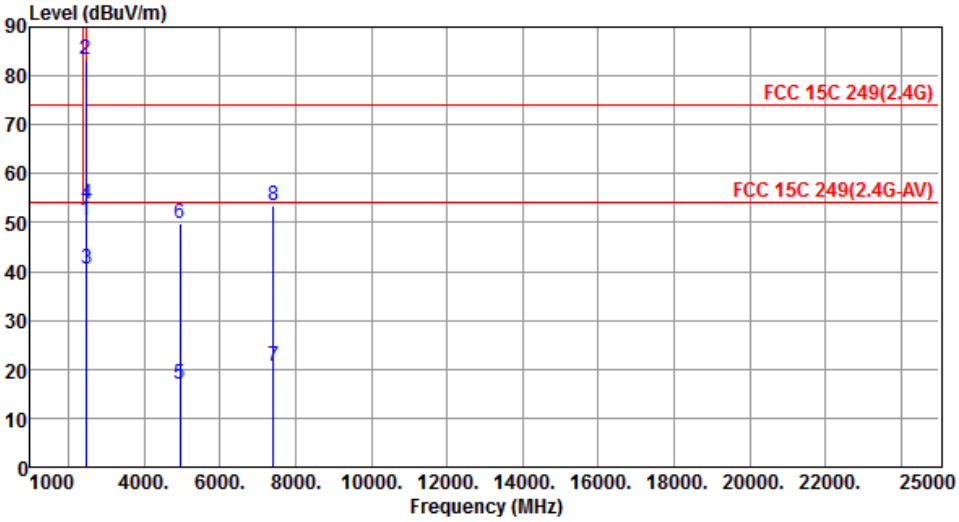
Modulation	FSK	Test Freq. (MHz)	2440
Polarization	Vertical		



	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	39.03	54.00	-14.97	40.13	-1.10	Average	400	99
2	2390.00	49.16	74.00	-24.84	50.26	-1.10	Peak	400	99
3	2440.00	46.40	94.00	-47.60	47.24	-0.84	Average	400	99
4	2440.00	79.29	114.00	-34.71	80.13	-0.84	Peak	400	99
5	2483.50	39.57	54.00	-14.43	40.18	-0.61	Average	400	99
6	2483.50	49.56	74.00	-24.44	50.17	-0.61	Peak	400	99
7	4880.00	17.40	54.00	-36.60	11.97	5.43	Average	245	158
8	4880.00	50.29	74.00	-23.71	44.86	5.43	Peak	245	158

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).

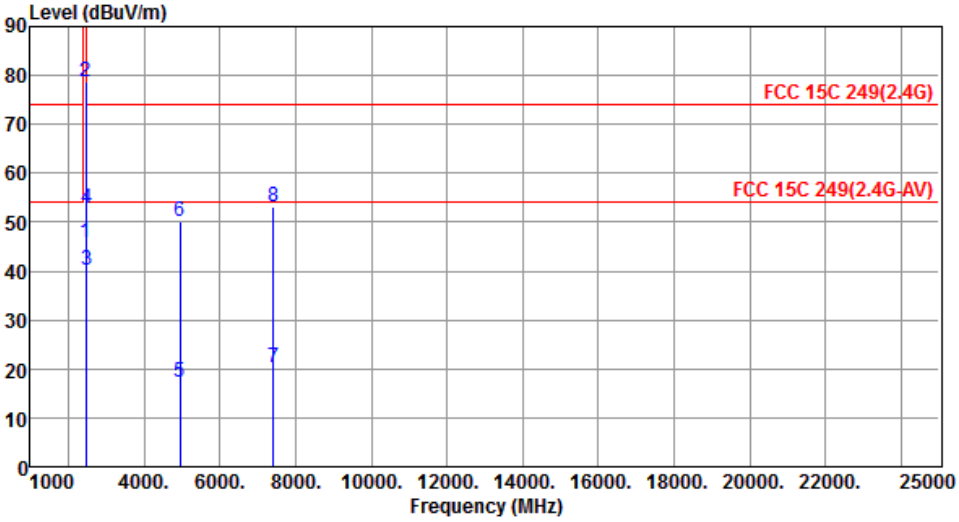
Modulation	FSK	Test Freq. (MHz)	2474
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2474.00	50.57	94.00	-43.43	51.24	-0.67	Average	100	148
2	2474.00	83.46	114.00	-30.54	84.13	-0.67	Peak	100	148
3	2483.50	40.67	54.00	-13.33	41.28	-0.61	Average	100	148
4	2483.50	53.64	74.00	-20.36	54.25	-0.61	Peak	100	148
5	4948.00	17.04	54.00	-36.96	11.44	5.60	Average	100	193
6	4948.00	49.93	74.00	-24.07	44.33	5.60	Peak	100	193
7	7422.00	20.60	54.00	-33.40	10.09	10.51	Average	265	318
8	7422.00	53.49	74.00	-20.51	42.98	10.51	Peak	265	318

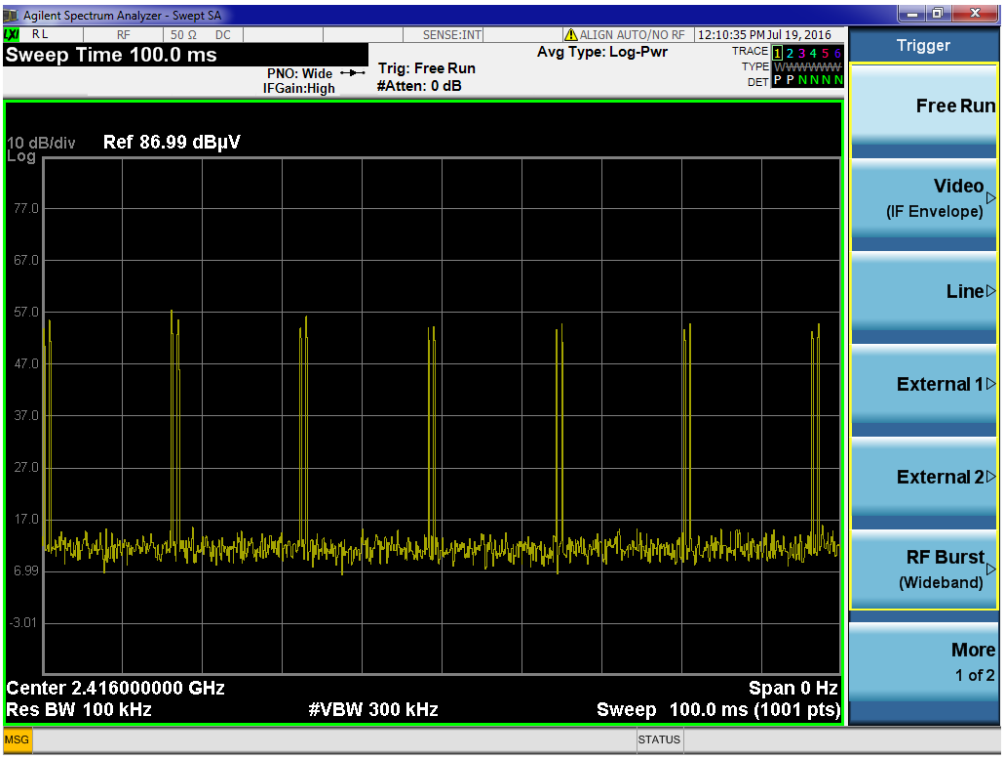
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

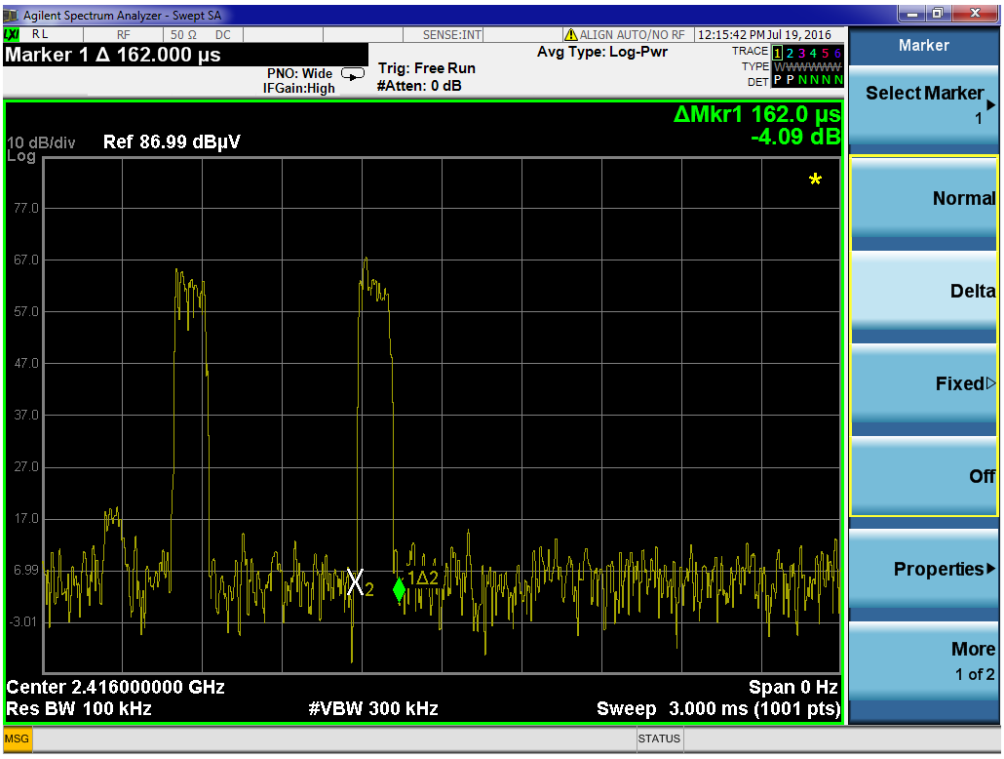
Modulation	FSK	Test Freq. (MHz)	2474
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2474.00	45.70	94.00	-48.30	46.37	-0.67	Average	397	156
2	2474.00	78.59	114.00	-35.41	79.26	-0.67	Peak	397	156
3	2483.50	40.28	54.00	-13.72	40.89	-0.61	Average	397	156
4	2483.50	52.66	74.00	-21.34	53.27	-0.61	Peak	397	156
5	4948.00	17.30	54.00	-36.70	11.70	5.60	Average	100	162
6	4948.00	50.19	74.00	-23.81	44.59	5.60	Peak	100	162
7	7422.00	20.20	54.00	-33.80	9.69	10.51	Average	186	123
8	7422.00	53.09	74.00	-20.91	42.58	10.51	Peak	186	123

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).





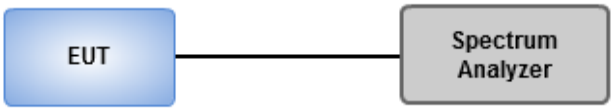
$$20\log(\text{Duty cycle}) = 20\log\frac{0.162\text{ms} \times 14}{100\text{ ms}} = -32.89\text{dB}$$

3.2 20dB and Occupied Bandwidth

3.2.1 Test Procedures

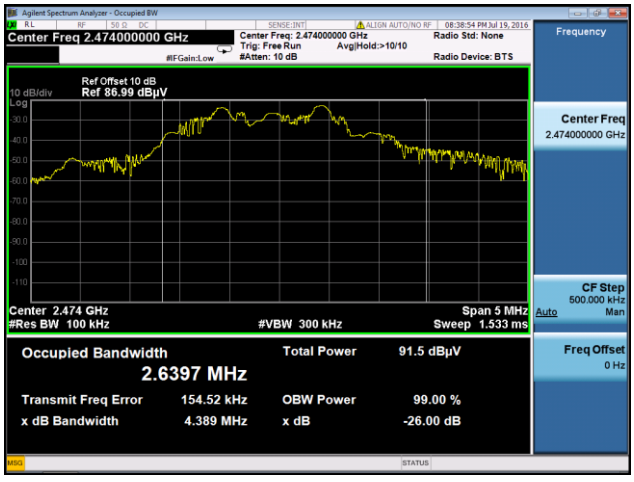
1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak(20 dB bandwidth) / Sample(Occupied bandwidth), Trace mode = max hold.
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated 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	2.59	2.57
2440	2.63	2.40
2474	2.40	2.64

Worst Plot of 20dB Bandwidth	Worst Plot of Occupied Bandwidth
	

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 http://www.icertifi.com.tw.

Linkou	**Kwei Shan**	**Kwei Shan Site II**
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If you have any suggestion, please feel free to contact us as below information

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