FCC Test Report

FCC ID	:	**IPH-A2401**
Equipment	:	**Outdoor GPS**
Model No.	:	**AA2401**
Brand Name	:	**GARMIN**
Applicant	:	**Garmin International**
Address	:	**1200 E. 151st Street Olathe, KS 66062**
Standard	:	**47 CFR FCC Part 15.249**
Received Date	:	**Aug. 08, 2016**
Tested Date	:	**Aug. 29 ~ Sep. 02, 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.

Reviewed by: **Approved by:**

Along Chen / Assistant Manager **Gary Chang / Manager**

Testing Laboratory 2732

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Release Record

Report No.	Version	Description	Issued Date
FR680802	Rev. 01	Initial issue	Sep. 26, 2016

Summary of Test Results

FCC Rules	Test Items	Measured	Result
15.207	AC Power Line Conducted Emissions	[dBuV]: 0.499MHz 32.71 (Margin -13.30dB) - 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

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
2402-2480	GFSK	2403-2479	1-77 [77]	1 Mbps

1.1.2 Antenna Details

Ant. No.	Type	Connector	Gain (dBi)	Remarks
1	Chip	N/A	-1.7	---

1.1.3 Power Supply Type of Equipment under Test (EUT)

Power Supply Type	2.4Vdc from battery (1.2Vdc battery x2) 5Vdc from adapter

1.1.4 Accessories

Accessories		
No.	**Equipment**	**Description**
1	AC Adapter	Brand Name: GARMIN Model Name: PSAI05R-050QL6 Power Rating: I/P: 100-240V, 50-60Hz, 0.3A, 10~20VA O/P: 5V, 1.0A
2	Ni-MH Battery	Brand Name: Garmin Model Name: 361-00071-00 Power Rating:1.2V, 2000mAh
3	USB cable	1m shielded with one core.

1.1.5 Channel List

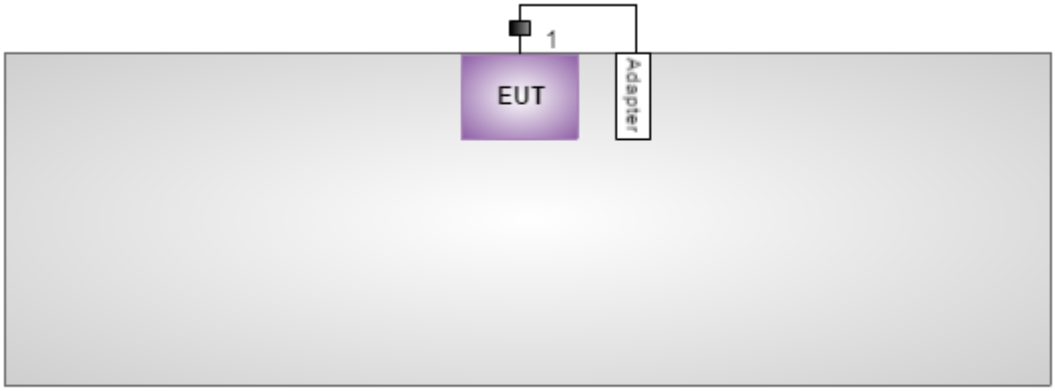
Frequency band (MHz)				2400~2483.5			
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	2403	21	2423	41	2443	61	2463
2	2404	22	2424	42	2444	62	2464
3	2405	23	2425	43	2445	63	2465
4	2406	24	2426	44	2446	64	2466
5	2407	25	2427	45	2447	65	2467
6	2408	26	2428	46	2448	66	2468
7	2409	27	2429	47	2449	67	2469
8	2410	28	2430	48	2450	68	2470
9	2411	29	2431	49	2451	69	2471
10	2412	30	2432	50	2452	70	2472
11	2413	31	2433	51	2453	71	2473
12	2414	32	2434	52	2454	72	2474
13	2415	33	2435	53	2455	73	2475
14	2416	34	2436	54	2456	74	2476
15	2417	35	2437	55	2457	75	2477
16	2418	36	2438	56	2458	76	2478
17	2419	37	2439	57	2459	77	2479
18	2420	38	2440	58	2460	---	---
19	2421	39	2441	59	2461	---	---
20	2422	40	2442	60	2462	---	---

1.2 Local Support Equipment List

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

1.3 Test Setup Chart

Test Setup Diagram



1. USB, 1m shielded with one core

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**
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.					

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. 04, 2016	Aug. 03, 2017
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
Preamplifier	EMC	EMC02325	980225	Aug. 05, 2016	Aug. 04, 2017
Preamplifier	Agilent	83017A	MY39501308	Oct. 02, 2015	Oct. 01, 2016
Preamplifier	EMC	EMC184045B	980192	Aug. 24, 2016	Aug. 23, 2017
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
Loop Antenna	R&S	HFH2-Z2	100330	Nov. 16, 2015	Nov. 15, 2016
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 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	±2.90 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	20°C / 59%	Howard Huang
Radiated Emissions	03CH02-WS	24-25°C / 62%	Vicent Yeh Kevin Lee
RF Conducted	TH01-WS	24°C / 64%	Vicent Yeh

- 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	GFSK	2457	1 Mbps	---
Field Strength of Fundamental	GFSK	2403, 2457, 2479	1 Mbps	---
Radiated Emissions ≤ 1GHz	GFSK	2457	1 Mbps	---
Radiated Emissions > 1GHz	GFSK	2403, 2457, 2479	1 Mbps	---
20dB bandwidth	GFSK	2403, 2457, 2479	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 Conducted Emissions

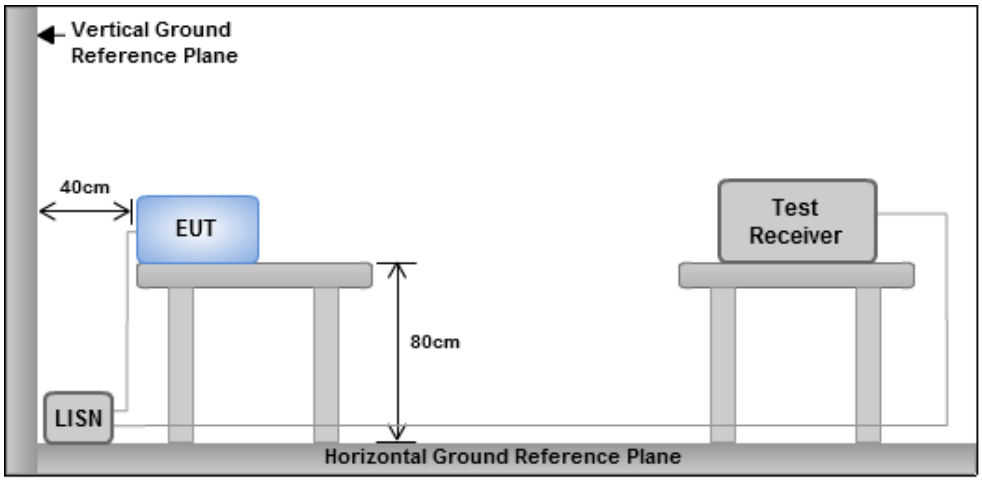
3.1.1 Limit of Conducted Emissions

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.

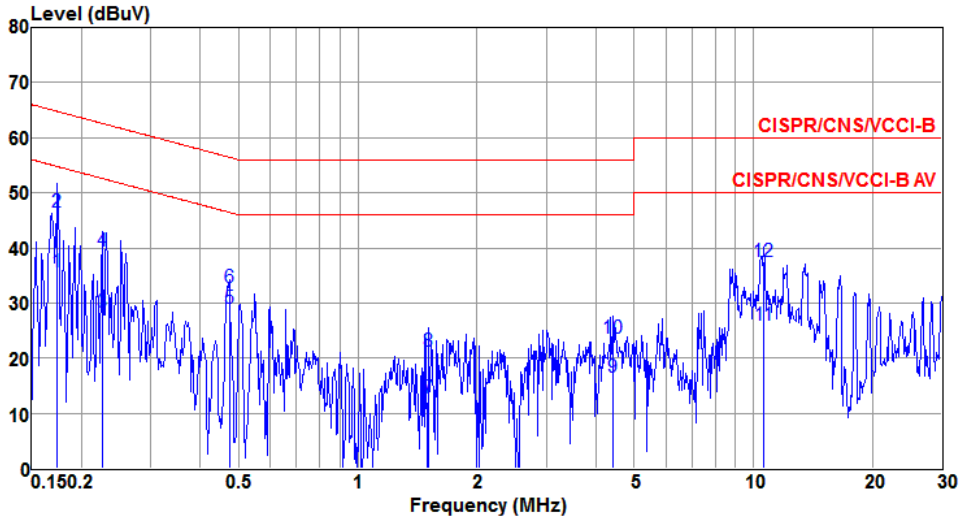
3.1.3 Test Setup



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

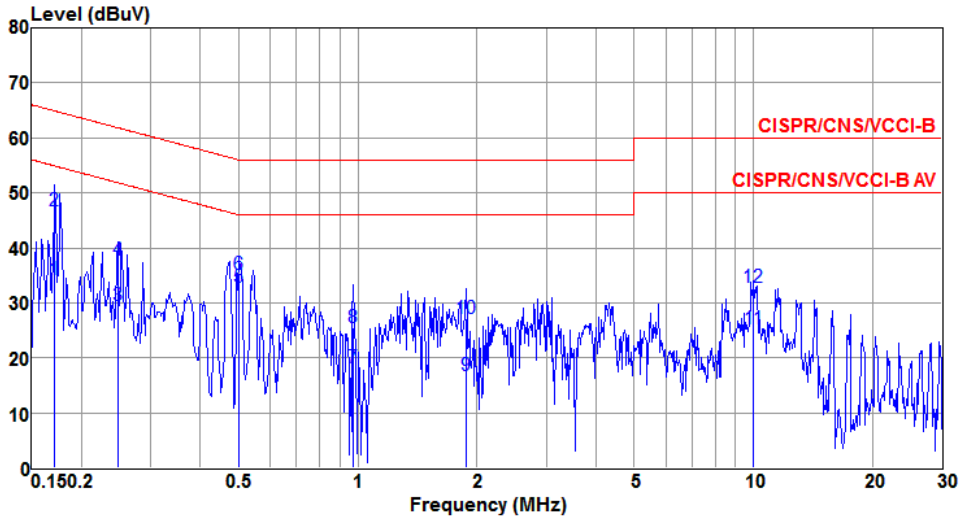
Power Phase	Line	Test Freq. (MHz)	2457



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.174	35.57	54.77	-19.20	34.97	0.58	0.02	Average
2	0.174	46.43	64.77	-18.34	45.83	0.58	0.02	QP
3	0.226	28.40	52.61	-24.21	28.14	0.24	0.02	Average
4	0.226	39.51	62.61	-23.10	39.25	0.24	0.02	QP
5@	0.474	29.13	46.45	-17.32	28.93	0.16	0.04	Average
6	0.474	32.70	56.45	-23.75	32.50	0.16	0.04	QP
7	1.503	12.80	46.00	-33.20	12.32	0.41	0.07	Average
8	1.503	21.30	56.00	-34.70	20.82	0.41	0.07	QP
9	4.430	16.48	46.00	-29.52	16.06	0.30	0.12	Average
10	4.430	23.66	56.00	-32.34	23.24	0.30	0.12	QP
11	10.620	25.94	50.00	-24.06	25.09	0.68	0.17	Average
12	10.620	37.51	60.00	-22.49	36.66	0.68	0.17	QP

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)	2457



	Freq MHz	Level dBuV	Limit Line dBuV	Over Limit dB	Read Level dBuV	LISN factor dB	cable loss dB	Remark
1	0.171	34.15	54.90	-20.75	33.56	0.57	0.02	Average
2	0.171	46.76	64.90	-18.14	46.17	0.57	0.02	QP
3	0.247	29.60	51.86	-22.26	29.37	0.21	0.02	Average
4	0.247	37.66	61.86	-24.20	37.43	0.21	0.02	QP
5@	0.499	32.71	46.01	-13.30	32.51	0.16	0.04	Average
6	0.499	35.09	56.01	-20.92	34.89	0.16	0.04	QP
7	0.974	18.09	46.00	-27.91	17.76	0.27	0.06	Average
8	0.974	25.58	56.00	-30.42	25.25	0.27	0.06	QP
9	1.878	16.87	46.00	-29.13	16.57	0.22	0.08	Average
10	1.878	27.10	56.00	-28.90	26.80	0.22	0.08	QP
11	10.019	25.36	50.00	-24.64	24.68	0.52	0.16	Average
12	10.019	32.80	60.00	-27.20	32.12	0.52	0.16	QP

Note 1: Level (dBuV) = Read Level (dBuV) + LISN Factor (dB) + Cable Loss (dB).
2: Over Limit (dB) = Level (dBuV) – Limit Line (dBuV).

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 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:

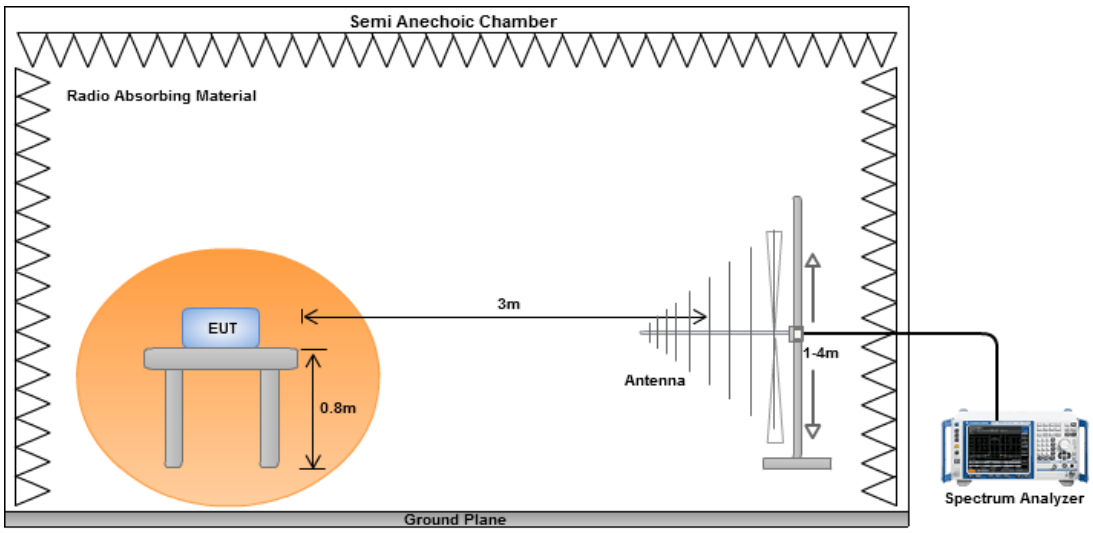
$$20\log(\text{Duty cycle}) = 20\log\frac{1^{*}\ 0.20435\ \text{ms}}{100\ \text{ms}} = -53.79\ \text{dB}$$

   Please see page 25 for plotted duty

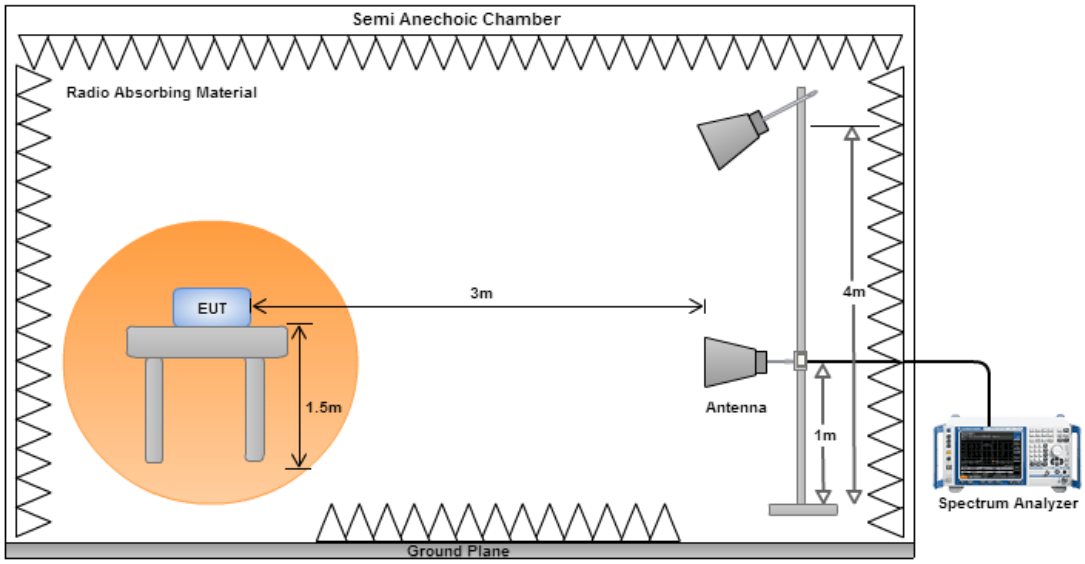
4. Radiated emission above 1GHz / Average value for other emissions
   RBW=1MHz, VBW=10Hz and Peak detector
5. Radiated emission Peak value for fundamental
   RBW=3MHz, VBW=10MHz and Peak detector

3.2.4 Test Setup

Radiated Emissions below 1 GHz

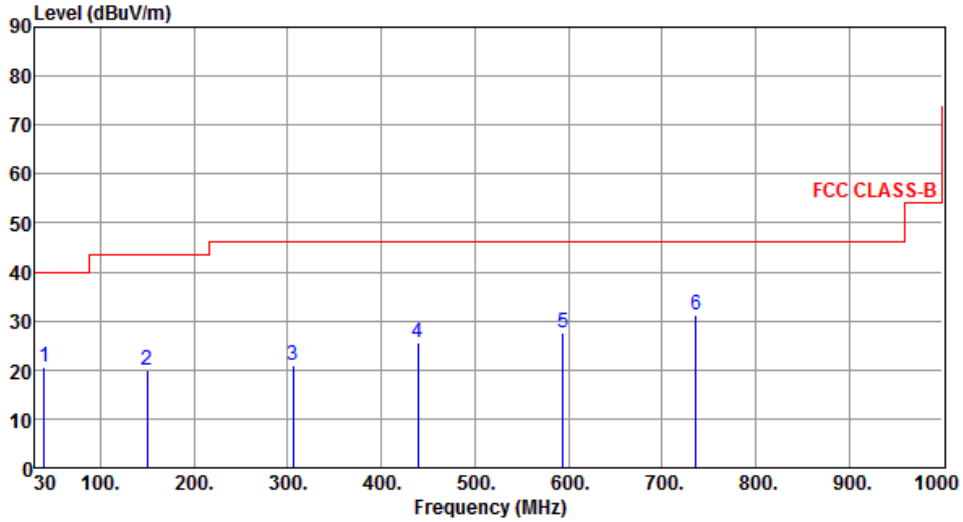


Radiated Emissions above 1 GHz



3.2.5 Transmitter Radiated Unwanted Emissions (Below 1GHz)

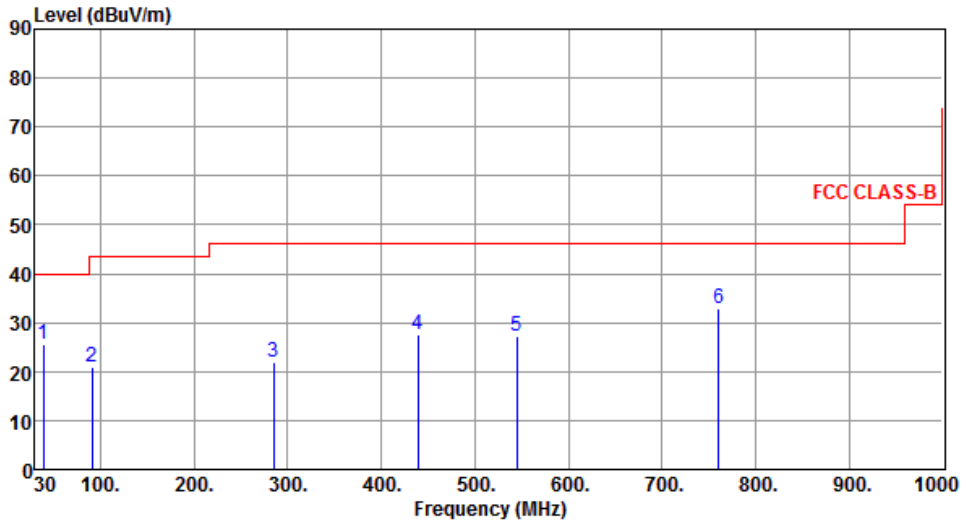
Modulation	GFSK	**Test Freq. (MHz)**	2457
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	39.70	20.71	40.00	-19.29	28.59	-7.88	Peak	---	---
2	150.28	19.85	43.50	-23.65	28.20	-8.35	Peak	---	---
3	305.48	20.82	46.00	-25.18	28.38	-7.56	Peak	---	---
4	439.34	25.41	46.00	-20.59	29.66	-4.25	Peak	---	---
5	594.54	27.52	46.00	-18.48	28.60	-1.08	Peak	---	---
6	736.16	31.23	46.00	-14.77	30.04	1.19	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)	2457
Polarization	Vertical		

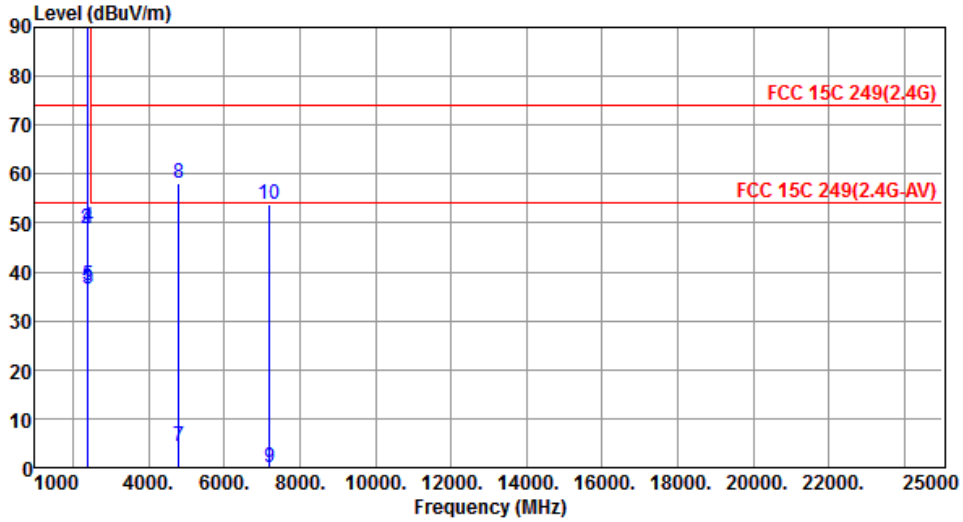


	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	38.73	25.54	40.00	-14.46	33.57	-8.03	Peak	---	---
2	91.11	20.83	43.50	-22.67	35.21	-14.38	Peak	---	---
3	285.11	21.92	46.00	-24.08	29.95	-8.03	Peak	---	---
4	439.34	27.62	46.00	-18.38	31.87	-4.25	Peak	---	---
5	545.07	27.19	46.00	-18.81	29.41	-2.22	Peak	---	---
6	760.41	32.90	46.00	-13.10	31.33	1.57	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.

3.2.6 Transmitter Radiated Unwanted Emissions (Above 1GHz)

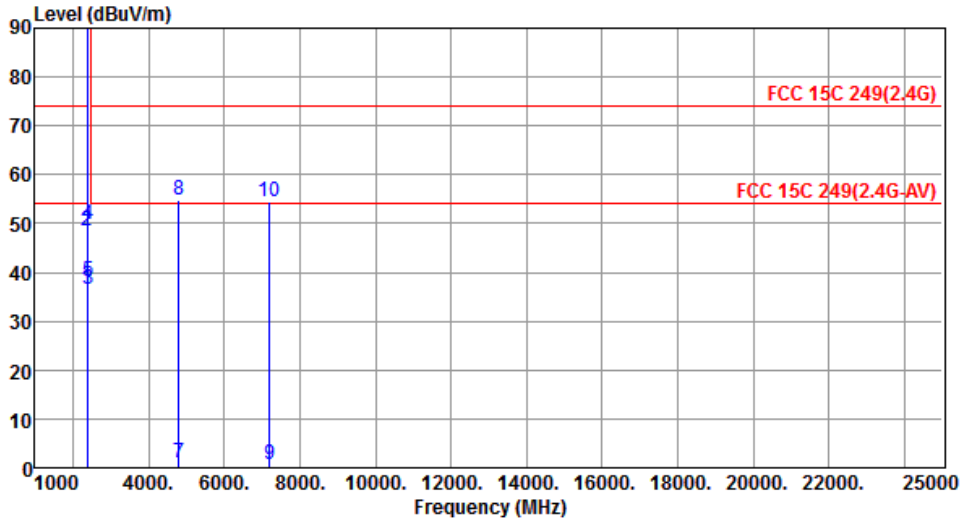
Modulation	GFSK	**Test Freq. (MHz)**	2403
Polarization	Horizontal		



	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	36.36	54.00	-17.64	39.71	-3.35	Average	371	195
2	2390.00	48.74	74.00	-25.26	52.09	-3.35	Peak	371	195
3	2400.00	36.50	54.00	-17.50	39.80	-3.30	Average	371	195
4	2400.00	49.02	74.00	-24.98	52.32	-3.30	Peak	371	195
5	2403.00	37.18	94.00	-56.82	40.47	-3.29	Average	371	195
6	2403.00	90.97	114.00	-23.03	94.26	-3.29	Peak	371	195
7	4806.00	4.41	54.00	-49.59	0.88	3.53	Average	100	207
8	4806.00	58.20	74.00	-15.80	54.67	3.53	Peak	100	207
9	7209.00	0.12	54.00	-53.88	-8.26	8.38	Average	186	189
10	7209.00	53.91	74.00	-20.09	45.53	8.38	Peak	186	189

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).

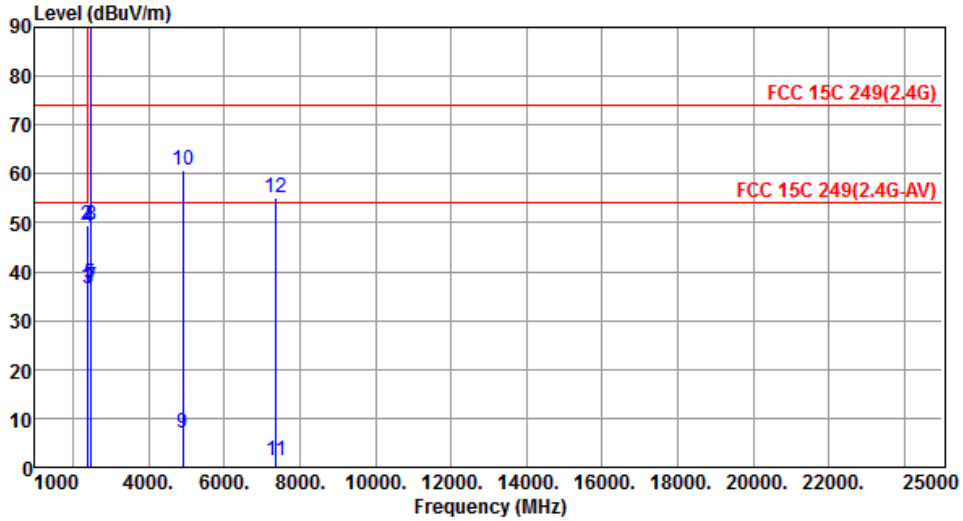
Modulation	GFSK	Test Freq. (MHz)	2403
Polarization	Vertical		



	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	36.44	54.00	-17.56	39.79	-3.35	Average	300	215
2	2390.00	48.57	74.00	-25.43	51.92	-3.35	Peak	300	215
3	2400.00	36.47	54.00	-17.53	39.77	-3.30	Average	300	215
4	2400.00	49.68	74.00	-24.32	52.98	-3.30	Peak	300	215
5	2403.00	38.26	94.00	-55.74	41.55	-3.29	Average	300	215
6	2403.00	92.05	114.00	-21.95	95.34	-3.29	Peak	300	215
7	4806.00	1.03	54.00	-52.97	-2.50	3.53	Average	104	66
8	4806.00	54.82	74.00	-19.18	51.29	3.53	Peak	104	66
9	7209.00	0.78	54.00	-53.22	-7.60	8.38	Average	100	272
10	7209.00	54.57	74.00	-19.43	46.19	8.38	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).

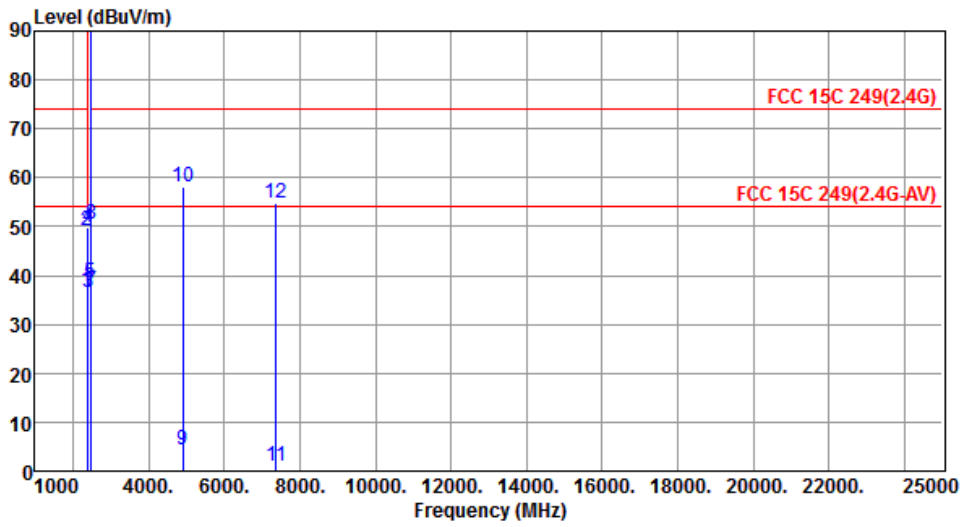
Modulation	GFSK	Test Freq. (MHz)	2457
Polarization	Horizontal		



	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	36.70	54.00	-17.30	40.05	-3.35	Average	354	193
2	2390.00	49.33	74.00	-24.67	52.68	-3.35	Peak	354	193
3	2400.00	36.64	54.00	-17.36	39.94	-3.30	Average	354	193
4	2400.00	49.17	74.00	-24.83	52.47	-3.30	Peak	354	193
5	2457.00	37.39	94.00	-56.61	40.44	-3.05	Average	354	193
6	2457.00	91.18	114.00	-22.82	94.23	-3.05	Peak	354	193
7	2483.50	37.00	54.00	-17.00	39.93	-2.93	Average	354	193
8	2483.50	49.47	74.00	-24.53	52.40	-2.93	Peak	354	193
9	4914.00	6.96	54.00	-47.04	3.07	3.89	Average	100	204
10	4914.00	60.75	74.00	-13.25	56.86	3.89	Peak	100	204
11	7371.00	1.34	54.00	-52.66	-7.12	8.46	Average	100	180
12	7371.00	55.13	74.00	-18.87	46.67	8.46	Peak	100	180

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).

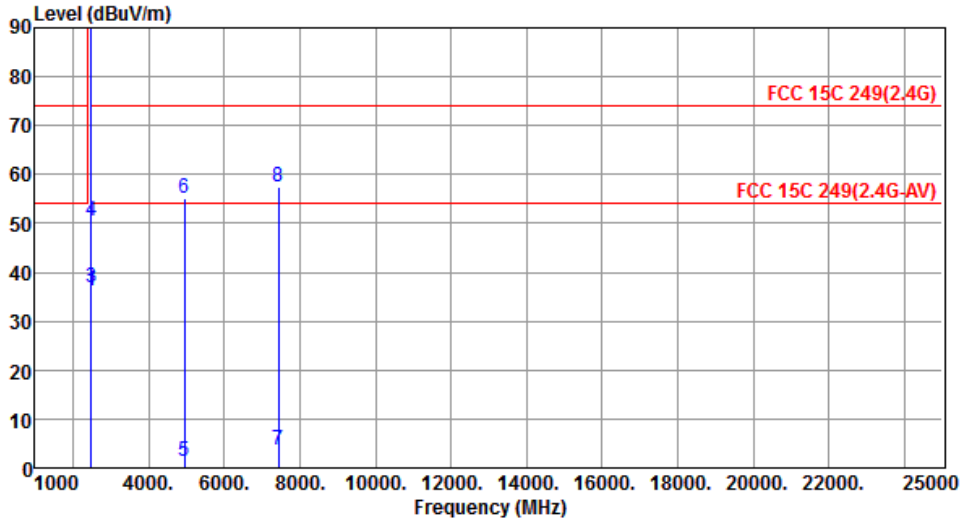
Modulation	GFSK	Test Freq. (MHz)	2457
Polarization	Vertical		



	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	36.80	54.00	-17.20	40.15	-3.35	Average	316	208
2	2390.00	49.26	74.00	-24.74	52.61	-3.35	Peak	316	208
3	2400.00	36.48	54.00	-17.52	39.78	-3.30	Average	316	208
4	2400.00	49.85	74.00	-24.15	53.15	-3.30	Peak	316	208
5	2457.00	38.55	94.00	-55.45	41.60	-3.05	Average	316	208
6	2457.00	92.34	114.00	-21.66	95.39	-3.05	Peak	316	208
7	2483.50	36.99	54.00	-17.01	39.92	-2.93	Average	316	208
8	2483.50	50.53	74.00	-23.47	53.46	-2.93	Peak	316	208
9	4914.00	4.43	54.00	-49.57	0.54	3.89	Average	107	39
10	4914.00	58.22	74.00	-15.78	54.33	3.89	Peak	107	39
11	7371.00	0.93	54.00	-53.07	-7.53	8.46	Average	100	4
12	7371.00	54.72	74.00	-19.28	46.26	8.46	Peak	100	4

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).

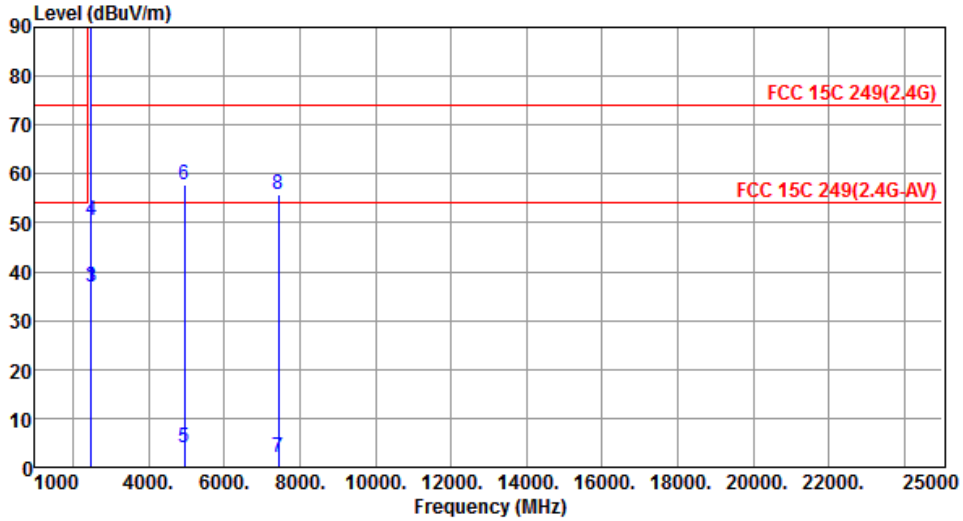
Modulation	GFSK	Test Freq. (MHz)	2479
Polarization	Horizontal		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2479.00	36.20	94.00	-57.80	39.14	-2.94	Average	391	195
2	2479.00	89.99	114.00	-24.01	92.93	-2.94	Peak	391	195
3	2483.50	36.97	54.00	-17.03	39.90	-2.93	Average	391	195
4	2483.50	50.34	74.00	-23.66	53.27	-2.93	Peak	391	195
5	4958.00	1.45	54.00	-52.55	-2.58	4.03	Average	100	203
6	4958.00	55.24	74.00	-18.76	51.21	4.03	Peak	100	203
7	7437.00	3.81	54.00	-50.19	-4.74	8.55	Average	137	187
8	7437.00	57.60	74.00	-16.40	49.05	8.55	Peak	137	187

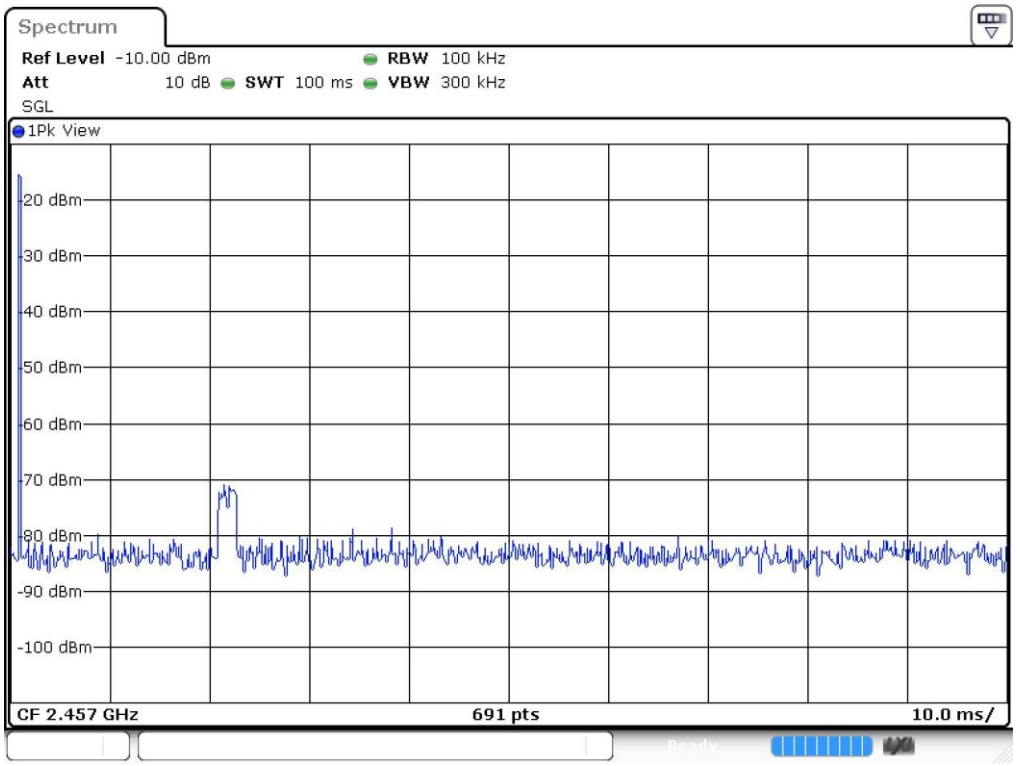
Note 1: Emission Level (dBuV/m) = SA Reading (dBuV/m) + Factor* (dB)
*Factor includes antenna factor , cable loss and amplifier gain
Note 2: Margin (dB) = Emission level (dBuV/m) – Limit (dBuV/m).

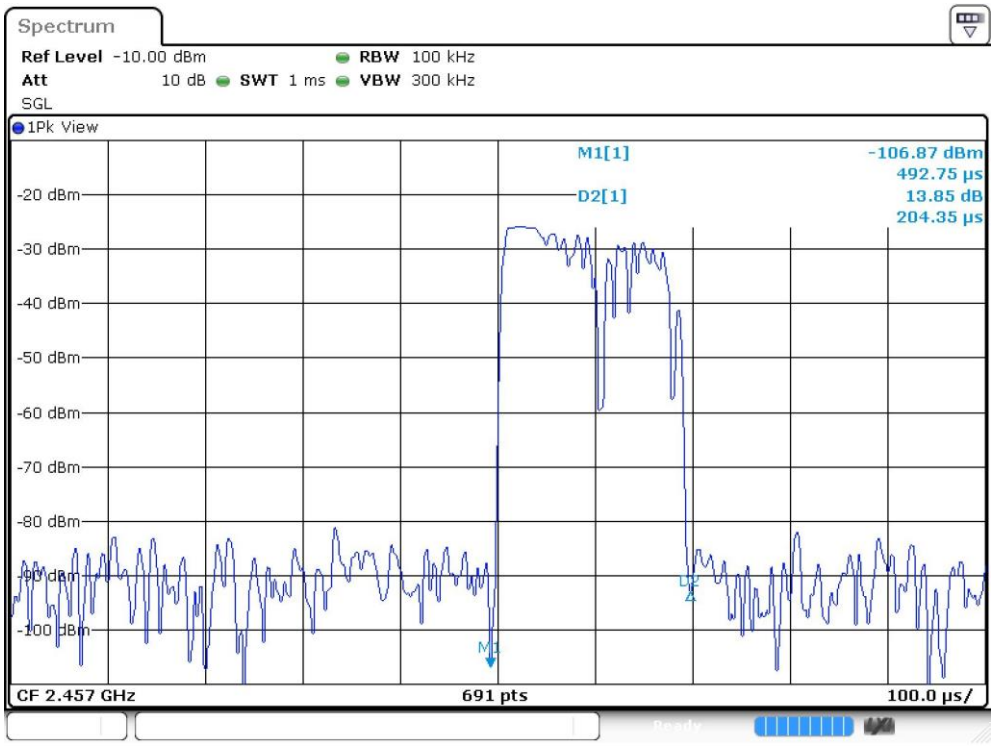
Modulation	GFSK	Test Freq. (MHz)	2479
Polarization	Vertical		



	Freq. MHz	Emission level dBuV/m	Limit dBuV/m	Margin dB	SA reading dBuV	Factor dB	Remark	ANT High cm	Turn Table deg
1	2479.00	36.95	94.00	-57.05	39.89	-2.94	Average	311	209
2	2479.00	90.74	114.00	-23.26	93.68	-2.94	Peak	311	209
3	2483.50	36.97	54.00	-17.03	39.90	-2.93	Average	311	209
4	2483.50	50.37	74.00	-23.63	53.30	-2.93	Peak	311	209
5	4958.00	4.15	54.00	-49.85	0.12	4.03	Average	104	19
6	4958.00	57.94	74.00	-16.06	53.91	4.03	Peak	104	19
7	7437.00	2.06	54.00	-51.94	-6.49	8.55	Average	104	6
8	7437.00	55.85	74.00	-18.15	47.30	8.55	Peak	104	6

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).





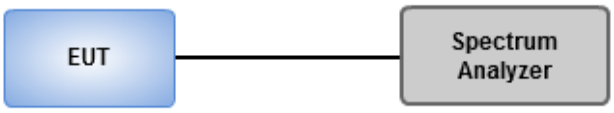
$$20\log(\text{Duty cycle}) = 20\log\frac{1^{*}\ 0.20435\ \text{ms}}{100\ \text{ms}} = -53.79\text{dB}$$

3.3 20dB and Occupied Bandwidth

3.3.1 Test Procedures

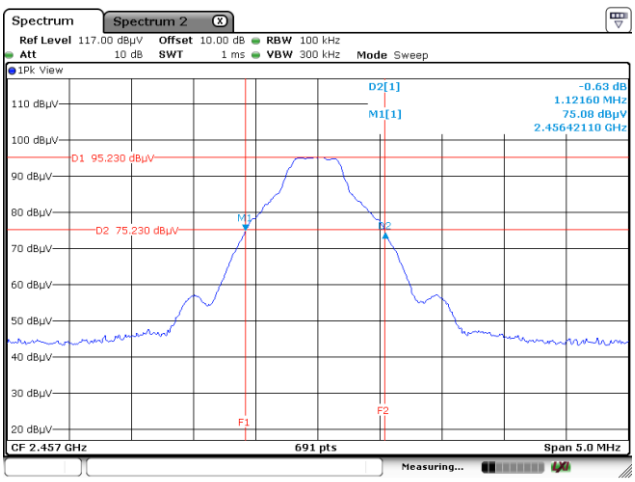
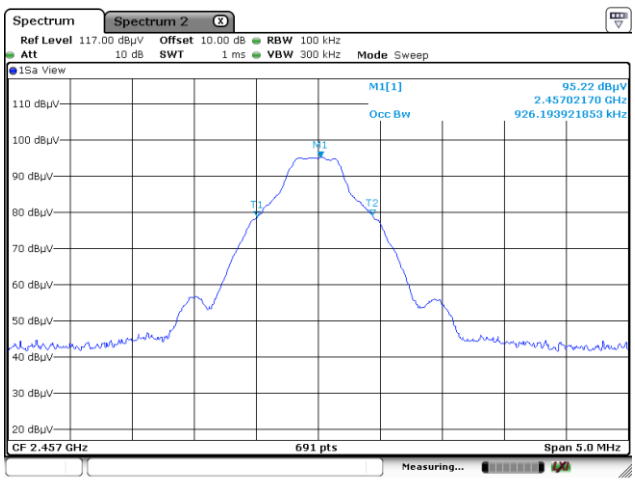
1. Set resolution bandwidth (RBW) = 100 kHz, Video bandwidth = 300 kHz.
2. Detector = Peak(20 dB bandwidth) / Sample(Occupied bandwidth), Trace mode = max hold
3. Sweep = auto couple, Allow the trace to stabilize.
4. Measure the maximum width of the emission that is constrained by the frequencies associated 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 specturm 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)
2403	1.08	0.87
2457	1.12	0.93
2479	1.09	0.88

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**
Tel: 886-2-2601-1640	Tel: 886-3-271-8666	Tel: 886-3-271-8640
No. 30-2, Ding Fwu Tsuen, Lin Kou District, New Taipei City, Taiwan, R.O.C.	No. 3-1, Lane 6, Wen San 3rd St., Kwei Shan District, Tao Yuan City 333, Taiwan, R.O.C.	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.

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