

# FCC Test Report

Product Name	GPS Controller(GPS Receiver)
Model No.	S Series-A
FCC ID.	ZK7SSERIES-A

Applicant	BAP Precision Ltd.
Address	6F., No.1-5, Ln. 1224, Zhongzheng Rd., Taoyuan City, Taoyuan County 330, Taiwan (R.O.C.)

Date of Receipt	March 03, 2015
Issued Date	Sep. 21, 2015
Report No.	1530073R-RFUSP01V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

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# Test Report

Issued Date: Sep. 21, 2015

Report No.: 1530073R-RFUSP01V00



Product Name	GPS Controller(GPS Receiver)
Applicant	BAP Precision Ltd.
Address	6F., No.1-5, Ln. 1224, Zhongzheng Rd., Taoyuan City, Taoyuan County 330, Taiwan (R.O.C.)
Manufacturer	Logwell Technology Co, Ltd.
Model No.	S Series-A
FCC ID.	ZK7SSERIES-A
EUT Rated Voltage	AC 100-240V, 50-60Hz
EUT Test Voltage	AC 120V/60Hz
Trade Name	BAP
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2014 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :

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Tested By :

*Nova chu*

( Engineer / Nova Chu )

Approved By :

*Vincent Lin*

( Director / Vincent Lin )

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## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	GPS Controller(GPS Receiver)
Trade Name	BAP
Model No.	S Series-A
FCC ID.	ZK7SSERIES-A
Frequency Range	2402 – 2480MHz
Channel Number	79
Type of Modulation	FHSS: GFSK(1Mbps) / $\pi$ /4DQPSK(2Mbps) / 8DPSK(3Mbps)
Antenna Type	Linear Polarization
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
Power Adapter	MFR: ENG, M/N: 3A-182WP05 Input: 100-240V ~ , 50-60Hz, 0.6A Output: 5V ---3A Cable Out: Non-Shielded, 1.8m
Mini USB Cable	Shielded, 1.3m, with one ferrite core bonded.

#### Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	cirocomm	86X	1.75 dBi for 2.4 GHz

Note:

1. The antenna of EUT conforms to FCC 15.203.

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 20:	2422 MHz	Channel 40:	2442 MHz	Channel 60:	2462 MHz
Channel 01:	2403 MHz	Channel 21:	2423 MHz	Channel 41:	2443 MHz	Channel 61:	2463 MHz
Channel 02:	2404 MHz	Channel 22:	2424 MHz	Channel 42:	2444 MHz	Channel 62:	2464 MHz
Channel 03:	2405 MHz	Channel 23:	2425 MHz	Channel 43:	2445 MHz	Channel 63:	2465 MHz
Channel 04:	2406 MHz	Channel 24:	2426 MHz	Channel 44:	2446 MHz	Channel 64:	2466 MHz
Channel 05:	2407 MHz	Channel 25:	2427 MHz	Channel 45:	2447 MHz	Channel 65:	2467 MHz
Channel 06:	2408 MHz	Channel 26:	2428 MHz	Channel 46:	2448 MHz	Channel 66:	2468 MHz
Channel 07:	2409 MHz	Channel 27:	2429 MHz	Channel 47:	2449 MHz	Channel 67:	2469 MHz
Channel 08:	2410 MHz	Channel 28:	2430 MHz	Channel 48:	2450 MHz	Channel 68:	2470 MHz
Channel 09:	2411 MHz	Channel 29:	2431 MHz	Channel 49:	2451 MHz	Channel 69:	2471 MHz
Channel 10:	2412 MHz	Channel 30:	2432 MHz	Channel 50:	2452 MHz	Channel 70:	2472 MHz
Channel 11:	2413 MHz	Channel 31:	2433 MHz	Channel 51:	2453 MHz	Channel 71:	2473 MHz
Channel 12:	2414 MHz	Channel 32:	2434 MHz	Channel 52:	2454 MHz	Channel 72:	2474 MHz
Channel 13:	2415 MHz	Channel 33:	2435 MHz	Channel 53:	2455 MHz	Channel 73:	2475 MHz
Channel 14:	2416 MHz	Channel 34:	2436 MHz	Channel 54:	2456 MHz	Channel 74:	2476 MHz
Channel 15:	2417 MHz	Channel 35:	2437 MHz	Channel 55:	2457 MHz	Channel 75:	2477 MHz
Channel 16:	2418 MHz	Channel 36:	2438 MHz	Channel 56:	2458 MHz	Channel 76:	2478 MHz
Channel 17:	2419 MHz	Channel 37:	2439 MHz	Channel 57:	2459 MHz	Channel 77:	2479 MHz
Channel 18:	2420 MHz	Channel 38:	2440 MHz	Channel 58:	2460 MHz	Channel 78:	2480 MHz
Channel 19:	2421 MHz	Channel 39:	2441 MHz	Channel 59:	2461 MHz		

Note:

1. The EUT is a GPS Controller(GPS Receiver) with a built-in WLAN 、Bluetooth transceiver, this report for Bluetooth.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. Bluetooth operation was evaluated at both 1Mb/s and 3Mb/s data rates. 2Mb/s data rate was found, through pre-testing, to produce emissions similar to those for 3Mb/s.

Test Mode	Mode 1: Transmit - 1Mbps (GFSK) Mode 2: Transmit - 3Mbps (8DPSK)
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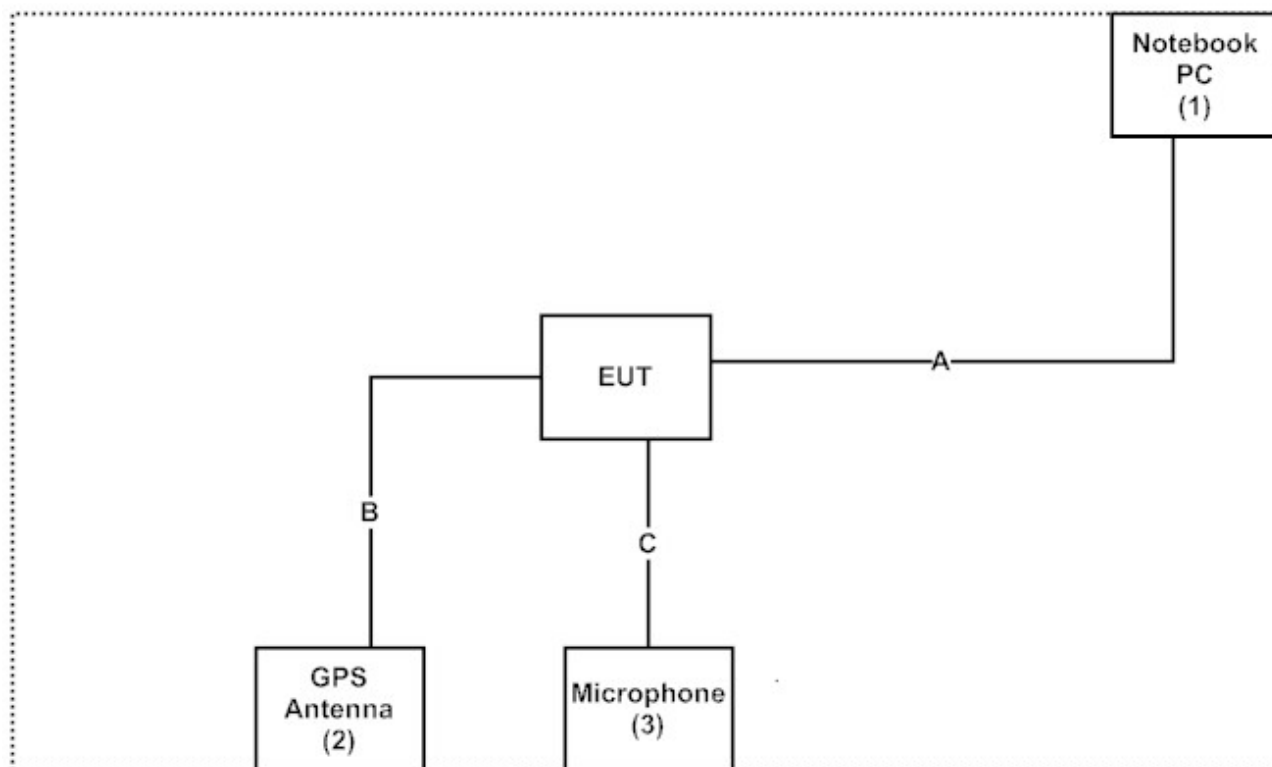
### 1.3. Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	DELL	PPT	N/A
2	GPS Antenna	BAP	N/A	N/A
3	Microphone	Yi Sheng	S-124	N/A

Signal Cable Type	Signal cable Description
A	Mini USB to Cable
B	GPS Antenna Cable
C	Microphone Cable

### 1.4. Configuration of Tested System



## **1.5. EUT Exercise Software**

1. Setup the EUT as shown in Section 1.4.
2. Execute software “RF Testt v1.0.0.1” on the EUT.
3. Configure the test mode, the test channel, and the data rate.
4. Press “OK” to start the continuous Transmit.
5. Verify that the EUT works properly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	30-65
Barometric pressure (mbar)	860-1060	950-1000

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site: <http://www.quietek.com/chinese/about/certificates.aspx?bval=5>  
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site: <http://www.quietek.com/>

Site Description: File on  
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FCC Engineering Laboratory  
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Registration Number: 92195

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E-Mail : [service@quietek.com](mailto:service@quietek.com)

FCC Accreditation Number: TW1014

## 2. Conducted Emission

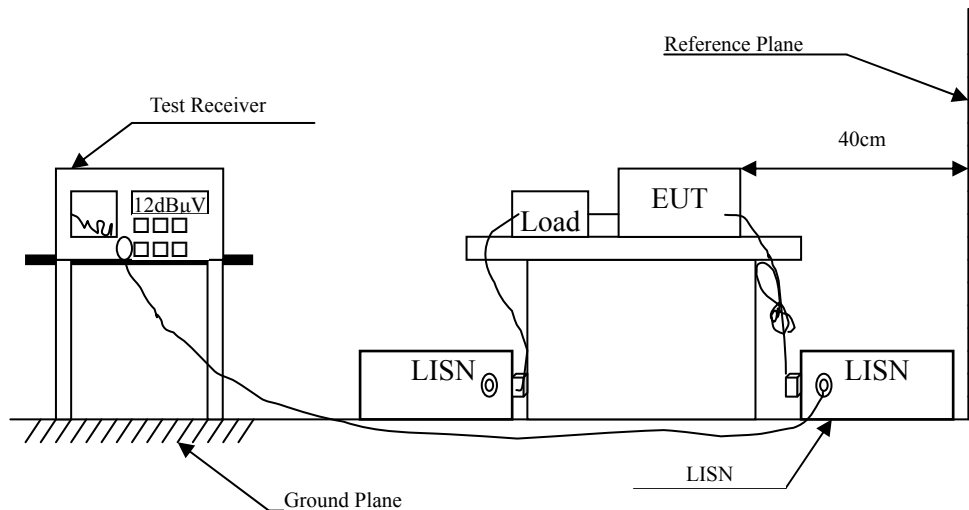
### 2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2015	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2015	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2015	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar., 2015	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2015	
	No.1 Shielded Room				

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked by "X" are used to measure the final test results.

### 2.2. Test Setup



### 2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dBμV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

Remarks: In the above table, the tighter limit applies at the band edges.

### 2.4. Test Procedure

The EUT and Peripherals are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs.)

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 2.5. Uncertainty

± 2.26 dB

## 2.6. Test Result of Conducted Emission

Product : GPS Controller(GPS Receiver)  
Test Item : Conducted Emission Test  
Power Line : Line 1  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV	Margin dB	Limit dBμV
<b>LINE 1</b>					
<b>Quasi-Peak</b>					
0.170	9.743	34.220	43.964	-21.465	65.429
0.216	9.739	30.030	39.769	-24.345	64.114
0.334	9.745	27.380	37.125	-23.618	60.743
0.490	9.752	32.180	41.932	-14.354	56.286
0.779	9.765	28.600	38.365	-17.635	56.000
7.920	9.910	27.320	37.230	-22.770	60.000
<b>Average</b>					
0.170	9.743	18.800	28.544	-26.885	55.429
0.216	9.739	22.700	32.439	-21.675	54.114
0.334	9.745	24.340	34.085	-16.658	50.743
0.490	9.752	24.580	34.332	-11.954	46.286
0.779	9.765	20.320	30.085	-15.915	46.000
7.920	9.910	21.530	31.440	-18.560	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Product : GPS Controller(GPS Receiver)  
Test Item : Conducted Emission Test  
Power Line : Line 2  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dBμV
	dB	dBμV	dBμV		
<b>LINE 2</b>					
<b>Quasi-Peak</b>					
0.173	9.747	31.650	41.397	-23.946	65.343
0.509	9.753	33.100	42.853	-13.147	56.000
0.771	9.775	28.660	38.435	-17.565	56.000
1.974	9.839	19.840	29.679	-26.321	56.000
6.685	9.900	23.990	33.890	-26.110	60.000
20.920	10.100	24.460	34.560	-25.440	60.000
<b>Average</b>					
0.173	9.747	12.100	21.847	-33.496	55.343
0.509	9.753	21.120	30.873	-15.127	46.000
0.771	9.775	18.660	28.435	-17.565	46.000
1.974	9.839	6.030	15.869	-30.131	46.000
6.685	9.900	16.290	26.190	-23.810	50.000
20.920	10.100	19.050	29.150	-20.850	50.000

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. "■" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

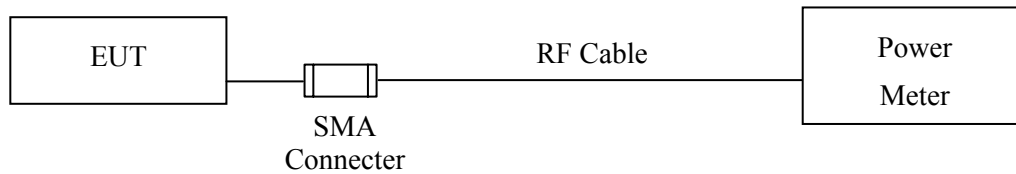
### 3. Peak Power Output

#### 3.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2015
X	Power Sensor	Anritsu	MA2411B/0738448	Jun., 2015

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by “X” are used to measure the final test results.

#### 3.2. Test Setup



#### 3.3. Limit

The maximum peak power shall be less 1Watt.

#### 3.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

#### 3.5. Uncertainty

$\pm 1.27$  dB

### 3.6. Test Result of Peak Power Output

Product : GPS Controller(GPS Receiver)  
Test Item : Peak Power Output  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	-17.68	1 Watt= 30 dBm	Pass
Channel 39	2441.00	-15.22	1 Watt= 30 dBm	Pass
Channel 78	2480.00	-14.81	1 Watt= 30 dBm	Pass

Product : GPS Controller(GPS Receiver)  
Test Item : Peak Power Output  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	-16.62	1 Watt= 30 dBm	Pass
Channel 39	2441.00	-15.42	1 Watt= 30 dBm	Pass
Channel 78	2480.00	-14.67	1 Watt= 30 dBm	Pass

## 4. Radiated Emission

### 4.1. Test Equipment

The following test equipments are used during the radiated emission test:

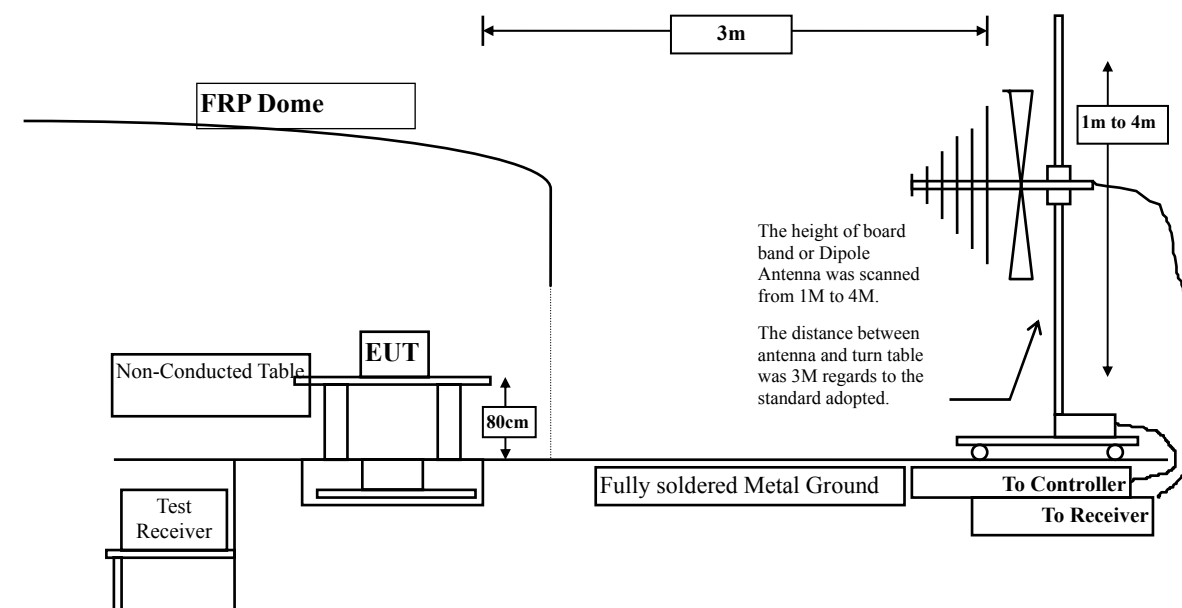
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X	Magnetic Loop Antenna	Teseq	HLA6121/ 37133	Sep, 2015
	X	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	Jun., 2015
	X	EMI Test Receiver	R&S	ESCS 30/838251/ 001	Jun., 2015
	X	Coaxial Cable	QTK(Arnist)	RG 214/ LC003-RG	Jun., 2015
	X	Coaxial signal switch	Arnist	MP59B/ 6200798682	Jun., 2015

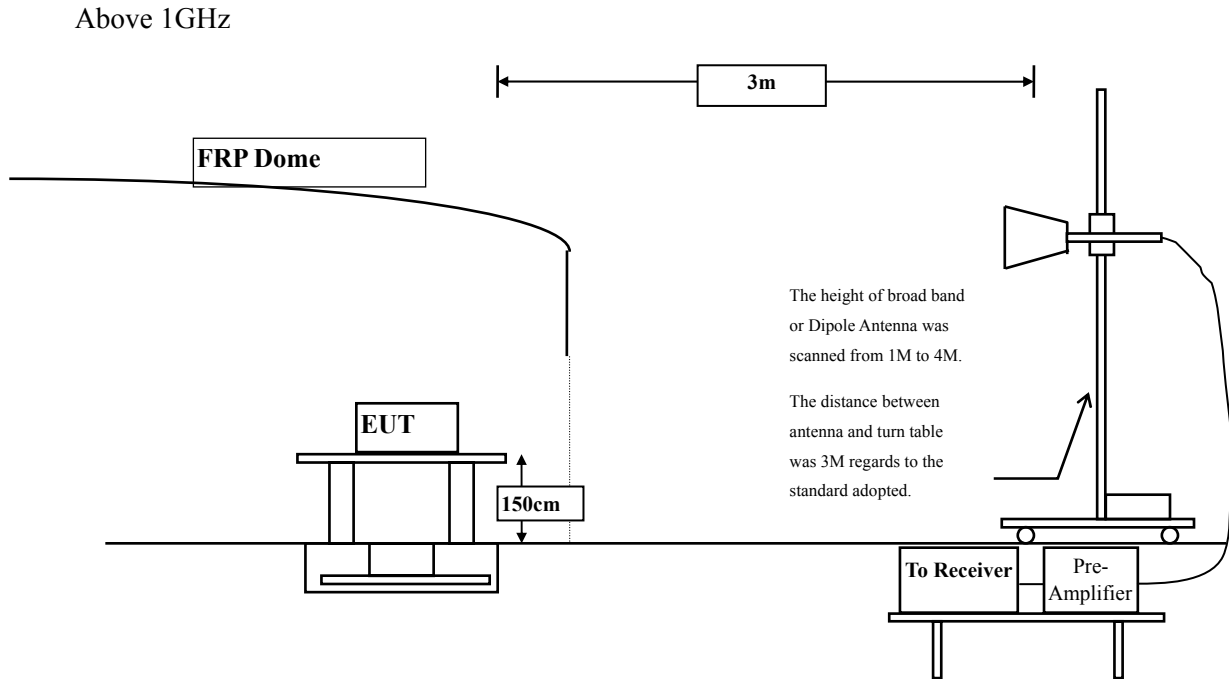
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct., 2014
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar., 2015
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan., 2015
	X	Horn Antenna	TRC	AH-0801/95051	Aug., 2015
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan., 2015
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul., 2015
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul., 2015

- Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.  
2. The test instruments marked with “X” are used to measure the final test results.

### 4.2. Test Setup

sBelow 1GHz





#### 4.3. Limits

##### ➤ General Radiated Emission Limits

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 20dB below the level of the fundamental or to the general radiated emission limits in paragraph 15.209, whichever is the lesser attenuation.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	uV/m @3m	dBμV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

- Remarks:
1. RF Voltage (dBμV) = 20 log RF Voltage (uV)
  2. In the Above Table, the tighter limit applies at the band edges.
  3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

#### 4.4. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.249 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 meter above ground.

The turn table is rotated 360 degrees to determine the position of the maximum emission level.

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned between 1 meter and 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

The measurement is divided into the Preliminary Measurement and the Final Measurement.

The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the emission, and the EUT is rotated in both height and polarization to maximize the measured emission. The emission is kept within the illumination area of the 3 dB bandwidth of the antenna.

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

#### 4.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

#### 4.6. Test Result of Radiated Emission

Product : GPS Controller(GPS Receiver)  
Test Item : Harmonic Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(2402MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dB $\mu$ V/m
	dB	dB $\mu$ V	dB $\mu$ V/m		
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4804.000	2.511	41.510	44.020	-29.980	74.000
7206.000	9.511	39.850	49.361	-24.639	74.000
9608.000	10.394	39.400	49.794	-24.206	74.000
<b>Average</b>					
<b>Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4804.000	2.923	41.410	44.332	-29.668	74.000
7206.000	9.988	40.090	50.079	-23.921	74.000
9608.000	10.847	39.240	50.087	-23.913	74.000
<b>Average</b>					
<b>Detector:</b>					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : GPS Controller(GPS Receiver)  
Test Item : Harmonic Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(2441MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB $\mu$ V	dB $\mu$ V/m	dB	dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4882.000	2.025	41.170	43.195	-30.805	74.000
7323.000	9.762	40.000	49.761	-24.239	74.000
9764.000	9.682	39.010	48.691	-25.309	74.000
<b>Average</b>					
<b>Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4882.000	2.488	40.980	43.468	-30.532	74.000
7323.000	10.375	39.970	50.344	-23.656	74.000
9764.000	10.315	39.140	49.455	-24.545	74.000
<b>Average</b>					
<b>Detector:</b>					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : GPS Controller(GPS Receiver)  
Test Item : Harmonic Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(2480MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB $\mu$ V	dB $\mu$ V/m	dB	dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4960.000	2.582	41.390	43.972	-30.028	74.000
7440.000	10.555	38.490	49.045	-24.955	74.000
9920.000	10.206	38.550	48.756	-25.244	74.000
<b>Average</b>					
<b>Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4960.000	3.398	41.450	44.849	-29.151	74.000
7440.000	11.214	38.370	49.584	-24.416	74.000
9920.000	11.245	38.740	49.985	-24.015	74.000
<b>Average</b>					
<b>Detector:</b>					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : GPS Controller(GPS Receiver)  
Test Item : Harmonic Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)(2402MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4804.000	2.511	41.380	43.890	-30.110	74.000
7206.000	9.511	39.310	48.821	-25.179	74.000
9608.000	10.394	39.220	49.614	-24.386	74.000
<b>Average</b>					
<b>Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4804.000	2.923	41.110	44.032	-29.968	74.000
7206.000	9.988	39.850	49.839	-24.161	74.000
9608.000	10.847	39.210	50.057	-23.943	74.000
<b>Average</b>					
<b>Detector:</b>					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : GPS Controller(GPS Receiver)  
Test Item : Harmonic Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB $\mu$ V	dB $\mu$ V/m	dB	dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4882.000	2.025	41.080	43.105	-30.895	74.000
7323.000	9.762	39.700	49.461	-24.539	74.000
9764.000	9.682	38.940	48.621	-25.379	74.000
<b>Average</b>					
<b>Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4882.000	2.488	41.050	43.538	-30.462	74.000
7323.000	10.375	39.960	50.334	-23.666	74.000
9764.000	10.315	39.140	49.455	-24.545	74.000
<b>Average</b>					
<b>Detector:</b>					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : GPS Controller(GPS Receiver)  
Test Item : Harmonic Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB $\mu$ V	dB $\mu$ V/m	dB	dB $\mu$ V/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4960.000	2.582	41.300	43.882	-30.118	74.000
7440.000	10.555	38.230	48.785	-25.215	74.000
9920.000	10.206	38.480	48.686	-25.314	74.000
<b>Average</b>					
<b>Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4960.000	3.398	40.910	44.309	-29.691	74.000
7440.000	11.214	37.940	49.154	-24.846	74.000
9920.000	11.245	38.390	49.635	-24.365	74.000
<b>Average</b>					
<b>Detector:</b>					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : GPS Controller(GPS Receiver)  
Test Item : General Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2441MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBμV	dBμV/m	dB	dBμV/m
<b>Horizontal</b>					
119.240	-7.291	40.477	33.187	-10.313	43.500
167.740	-9.816	43.527	33.711	-9.789	43.500
208.480	-10.485	45.461	34.975	-8.525	43.500
239.520	-6.878	40.597	33.719	-12.281	46.000
311.300	-4.651	37.714	33.063	-12.937	46.000
363.680	0.189	33.852	34.041	-11.959	46.000
<b>Vertical</b>					
167.740	-4.506	43.340	38.834	-4.666	43.500
181.320	-1.910	43.758	41.848	-1.652	43.500
208.480	-5.585	45.746	40.160	-3.340	43.500
295.780	-4.687	40.321	35.634	-10.366	46.000
363.680	0.079	33.913	33.992	-12.008	46.000
596.480	0.907	26.643	27.550	-18.450	46.000
901.060	1.858	26.476	28.334	-17.666	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

Product : GPS Controller(GPS Receiver)  
Test Item : General Radiated Emission  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB $\mu$ V	dB $\mu$ V/m	dB	dB $\mu$ V/m
<b>Horizontal</b>					
167.740	-9.816	43.177	33.361	-10.139	43.500
208.480	-10.485	45.475	34.989	-8.511	43.500
239.520	-6.878	42.359	35.481	-10.519	46.000
311.300	-4.651	38.686	34.035	-11.965	46.000
363.680	0.189	34.539	34.728	-11.272	46.000
468.440	3.544	26.420	29.964	-16.036	46.000
<b>Vertical</b>					
181.320	-1.910	44.241	42.331	-1.169	43.500
206.540	-5.509	43.501	37.992	-5.508	43.500
264.740	-5.071	36.953	31.883	-14.117	46.000
311.300	-4.071	35.216	31.145	-14.855	46.000
338.460	-1.640	33.873	32.232	-13.768	46.000
363.680	0.079	34.061	34.140	-11.860	46.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

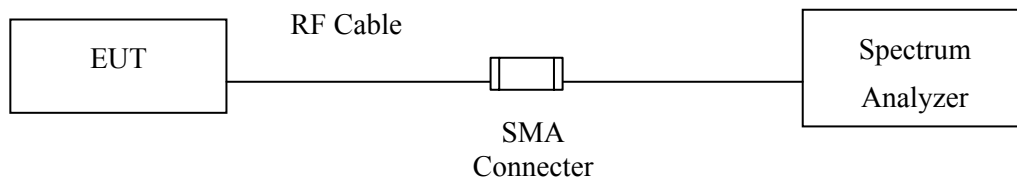
## 5. RF Antenna Conducted Test

### 5.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2015

Note: 1. All equipments are calibrated every one year.  
2. The test instruments Marked “X” are used to measure the final test results.

### 5.2. Test Setup



### 5.3. Limits

According to FCC Section 15.247(d). In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.

### 5.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

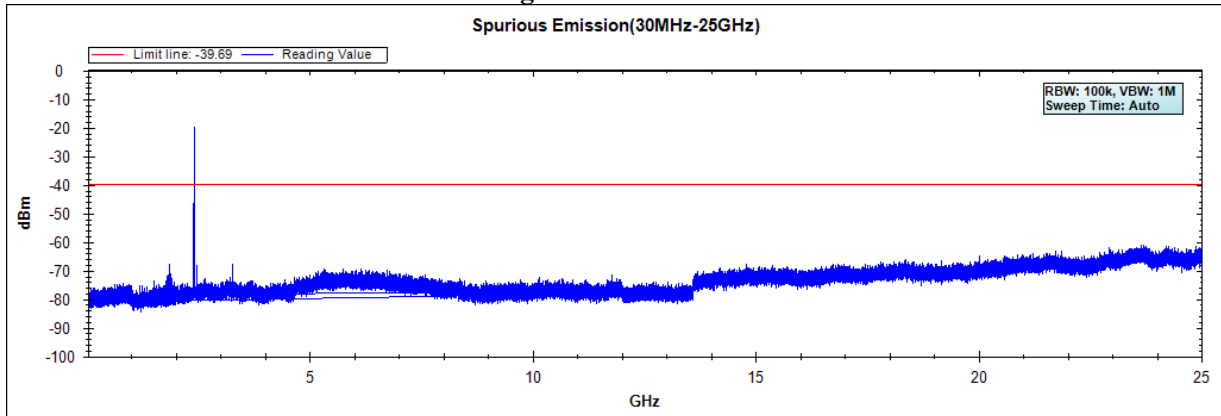
### 5.5. Uncertainty

± 150Hz

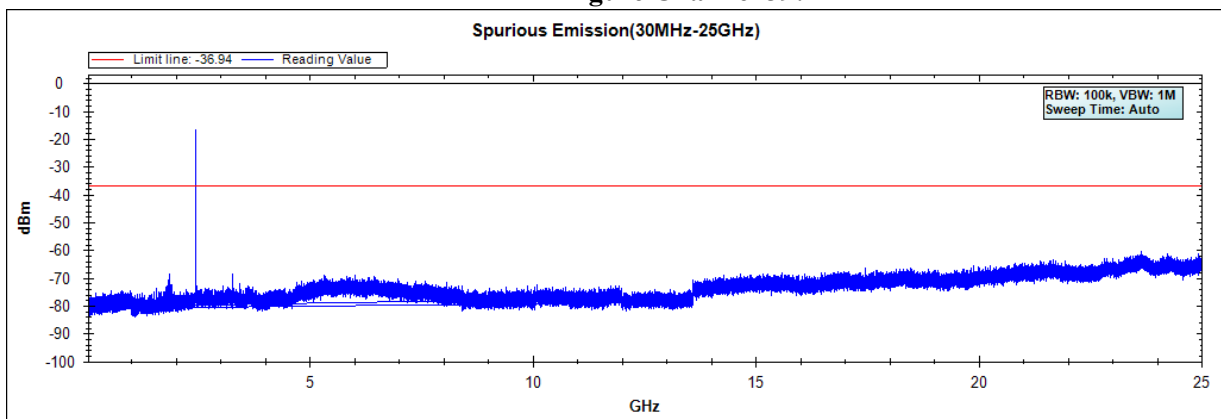
## 5.6. Test Result of RF Antenna Conducted Test

Product : GPS Controller(GPS Receiver)  
Test Item : RF Antenna Conducted Test  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

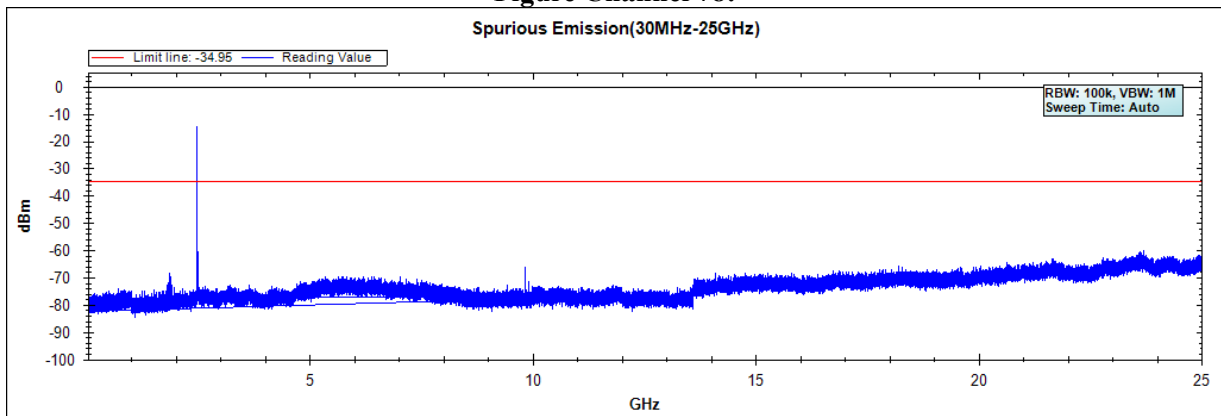
**Figure Channel 00:**



**Figure Channel 39:**



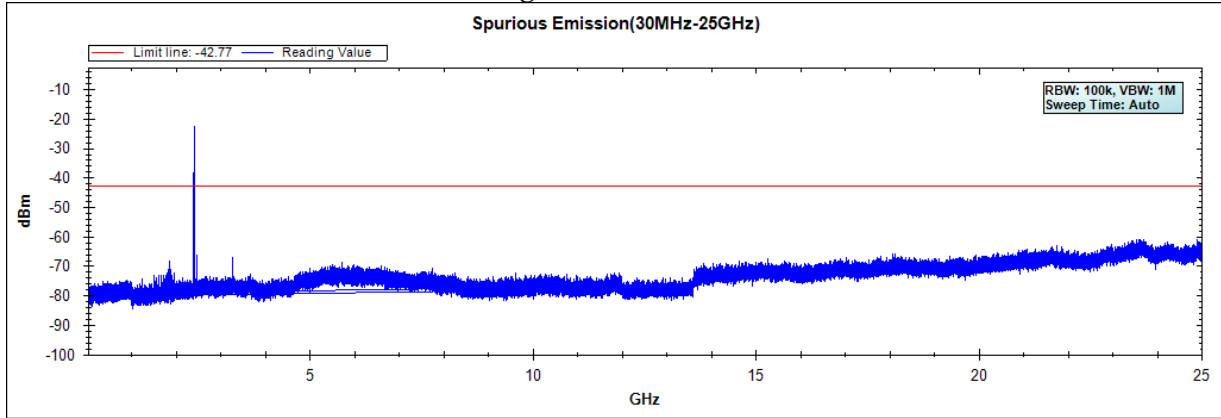
**Figure Channel 78:**



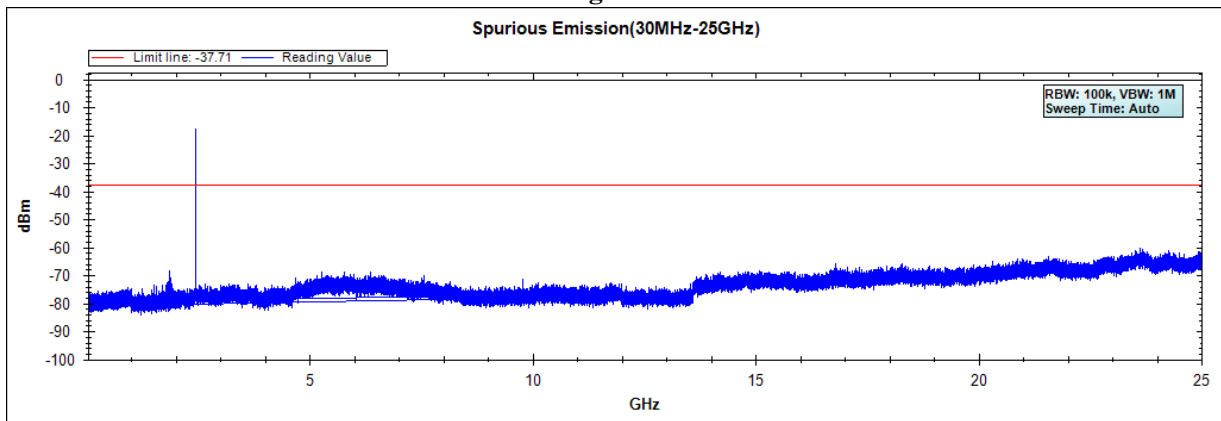
Note: The above test pattern is synthesized by multiple of the frequency range.

Product : GPS Controller(GPS Receiver)  
 Test Item : RF Antenna Conducted Test  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

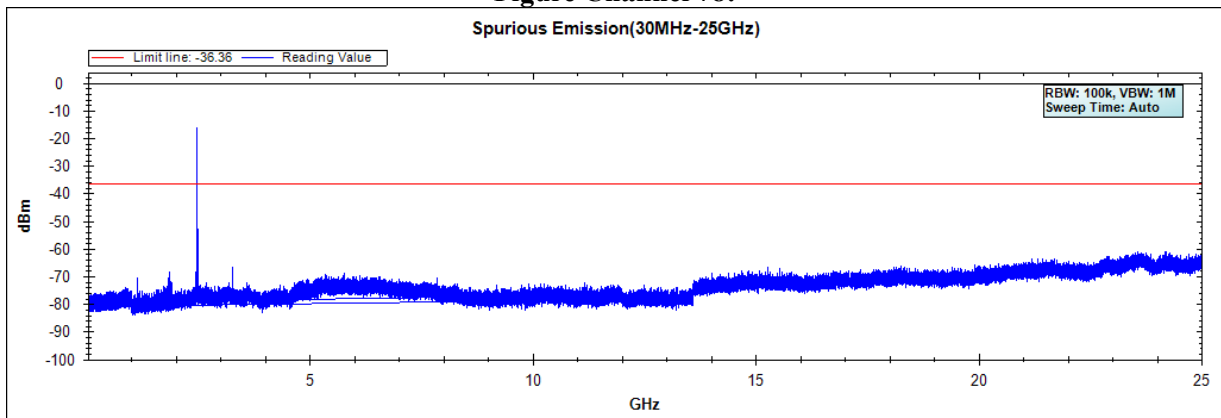
**Figure Channel 00:**



**Figure Channel 39:**



**Figure Channel 78:**



Note: The above test pattern is synthesized by multiple of the frequency range.

## 6. Band Edge

### 6.1. Test Equipment

#### RF Radiated Measurement:

The following test equipments are used during the band edge tests:

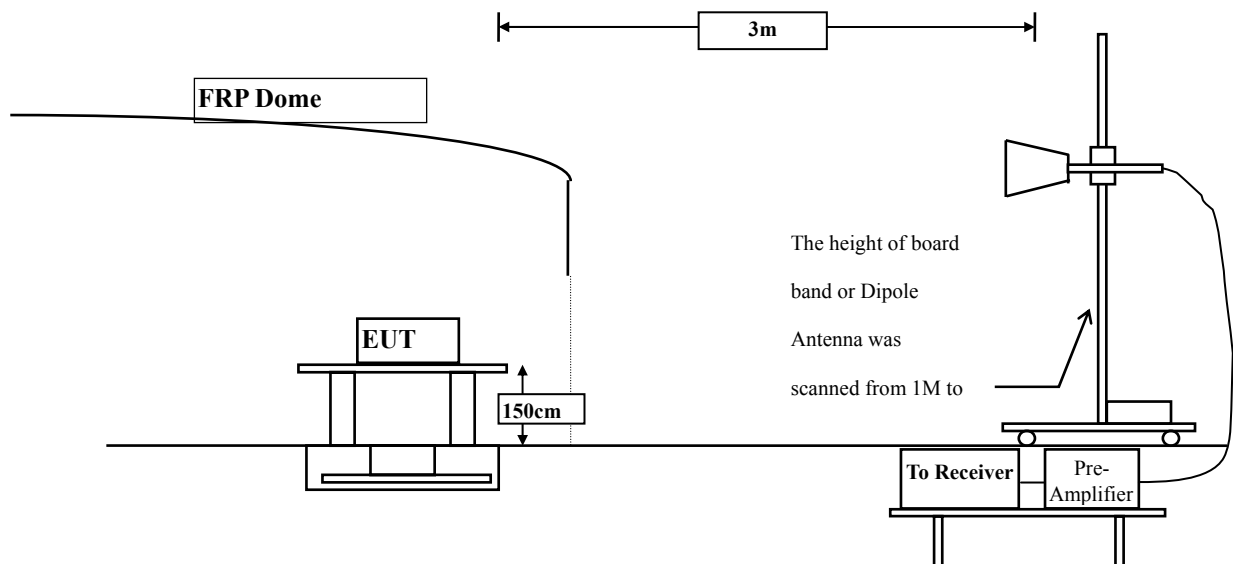
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct., 2014
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar., 2015
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan., 2015
	X	Horn Antenna	TRC	AH-0801/95051	Aug., 2015
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan., 2015
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul., 2015
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul., 2015

- Note:
1. All equipments are calibrated every one year.
  2. The test instruments marked by "X" are used to measure the final test results.

### 6.2. Test Setup

#### RF Radiated Measurement:

Above 1GHz



### 6.3. Limit

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

### 6.4. Test Procedure

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

The bandwidth setting below 1GHz and above 1GHz on the field strength meter is 120 kHz and 1MHz, respectively.

### 6.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

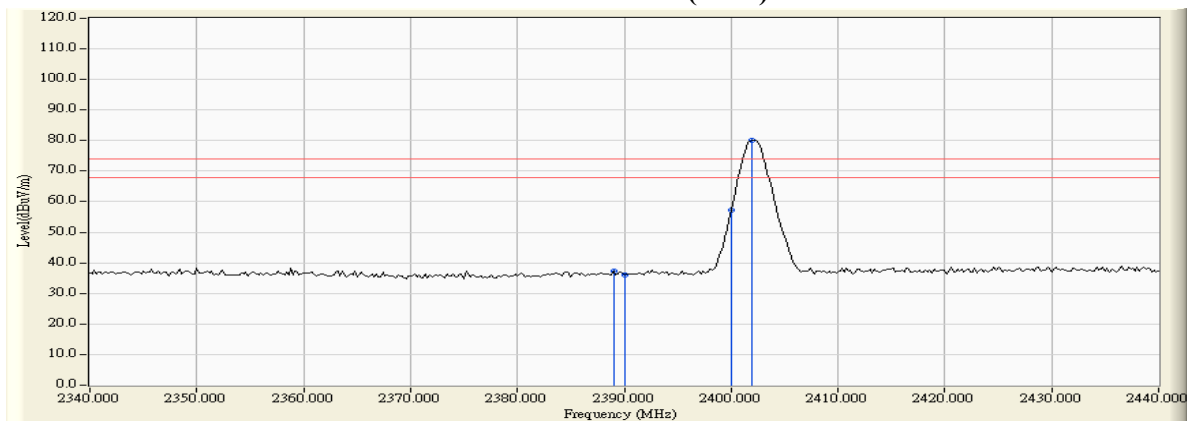
## 6.6. Test Result of Band Edge

Product : GPS Controller(GPS Receiver)  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

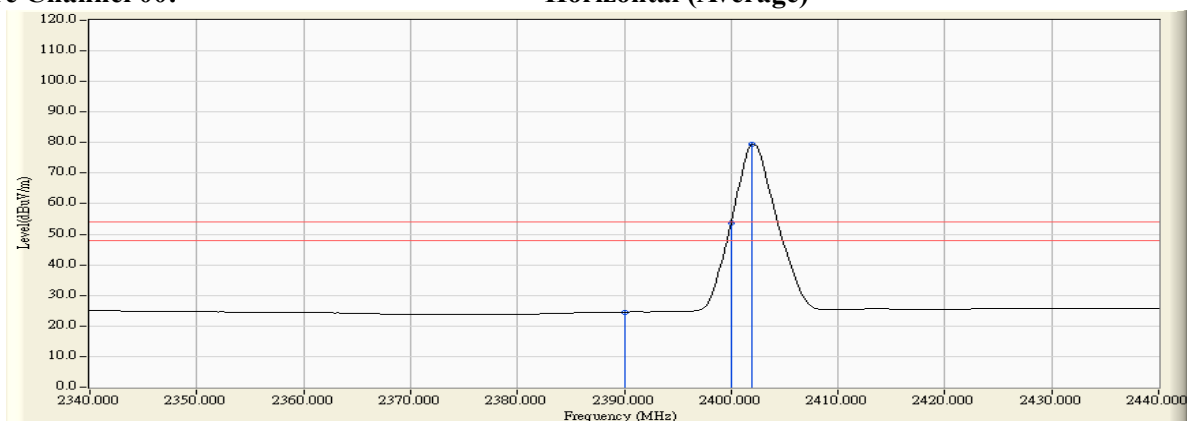
### RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2389.000	-2.692	40.021	37.330	74.00	54.00	Pass
00 (Peak)	2390.000	-2.687	38.861	36.174	74.00	54.00	Pass
00 (Peak)	2400.000	-2.660	60.078	57.418	--	--	--
00 (Peak)	2402.000	-2.657	82.636	79.979	--	--	--
00 (Average)	2390.000	-2.687	27.265	24.578	74.00	54.00	Pass
00 (Average)	2400.000	-2.660	56.443	53.783	--	--	--
00 (Average)	2402.000	-2.657	81.971	79.314	--	--	--

**Figure Channel 00: Horizontal (Peak)**



**Figure Channel 00: Horizontal (Average)**



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “\*”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

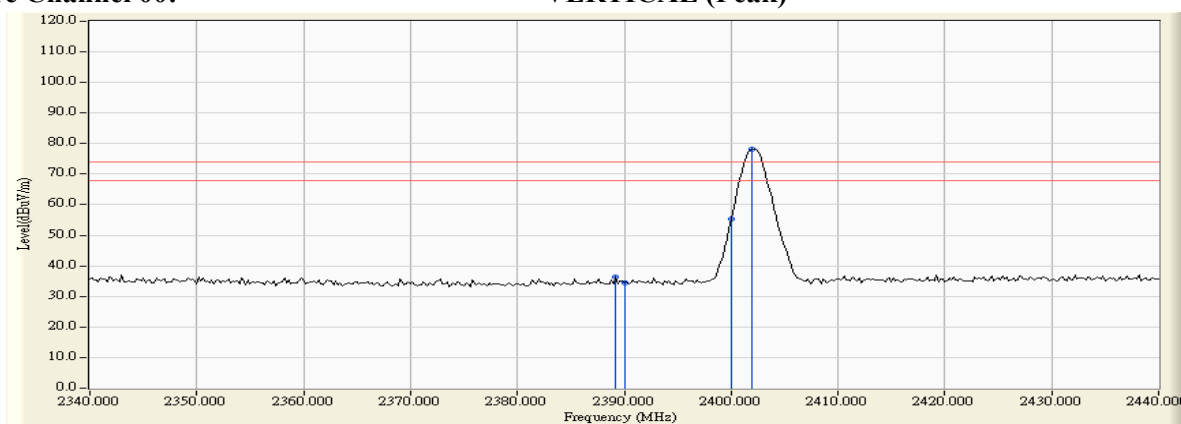
Product : GPS Controller(GPS Receiver)  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

**RF Radiated Measurement (VERTICAL):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2389.200	-4.156	40.599	36.443	74.00	54.00	Pass
00 (Peak)	2390.000	-4.159	38.528	34.369	74.00	54.00	Pass
00 (Peak)	2400.000	-4.171	59.507	55.336	--	--	--
00 (Peak)	2402.000	-4.171	82.237	78.066	--	--	--
00 (Average)	2390.000	-4.159	27.099	22.940	74.00	54.00	Pass
00 (Average)	2400.000	-4.171	55.977	51.806	--	--	--
00 (Average)	2402.000	-4.171	81.602	77.431	--	--	--

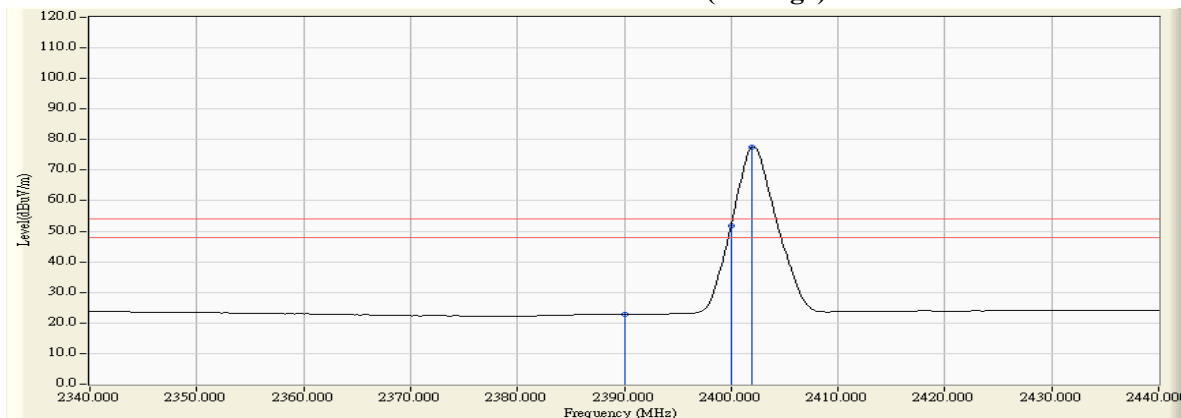
**Figure Channel 00:**

**VERTICAL (Peak)**



**Figure Channel 00:**

**VERTICAL (Average)**



Note:

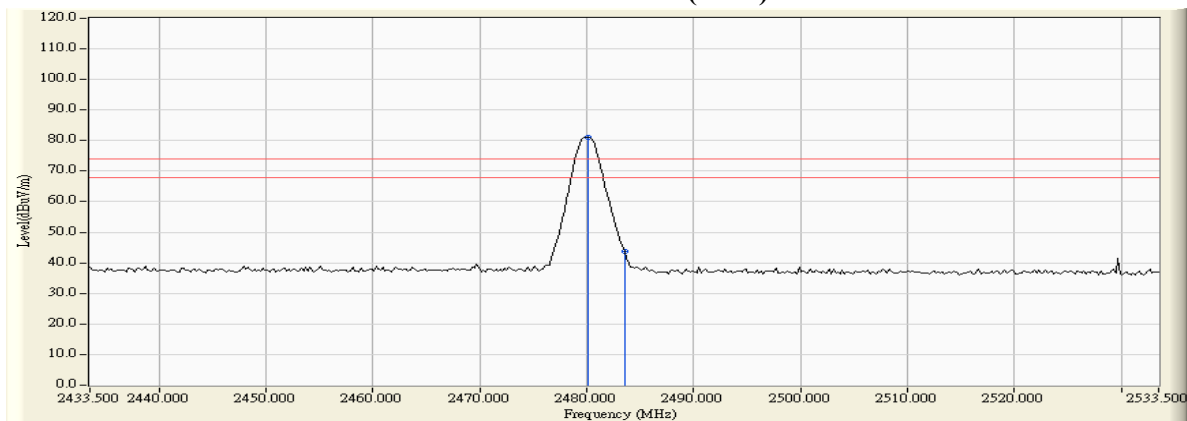
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ \* ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : GPS Controller(GPS Receiver)  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

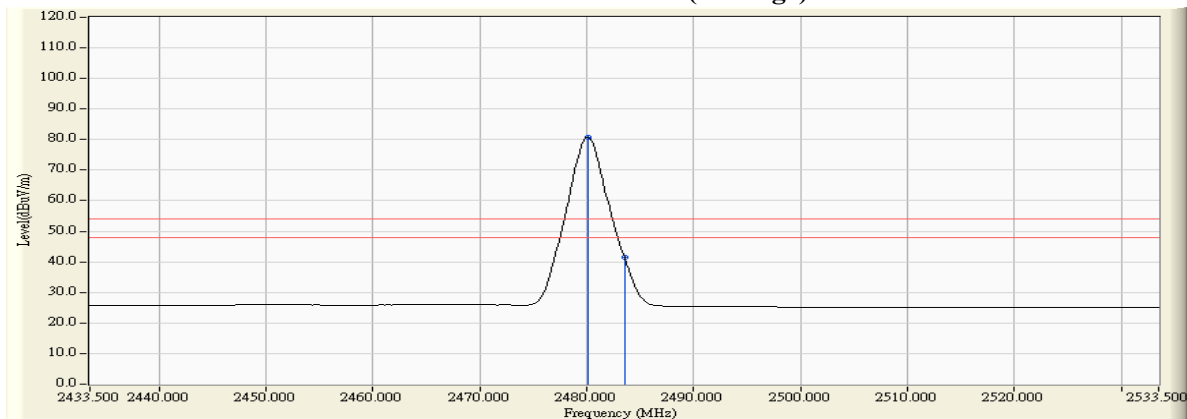
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
78 (Peak)	2480.100	-2.605	83.816	81.211	--	--	Pass
78 (Peak)	2483.500	-2.601	46.436	43.834	74.00	54.00	Pass
78 (Average)	2480.100	-2.605	83.287	80.682	--	--	Pass
78 (Average)	2483.500	-2.601	44.132	41.530	74.00	54.00	Pass

**Figure Channel 78: Horizontal (Peak)**



**Figure Channel 78: Horizontal (Average)**



Note:

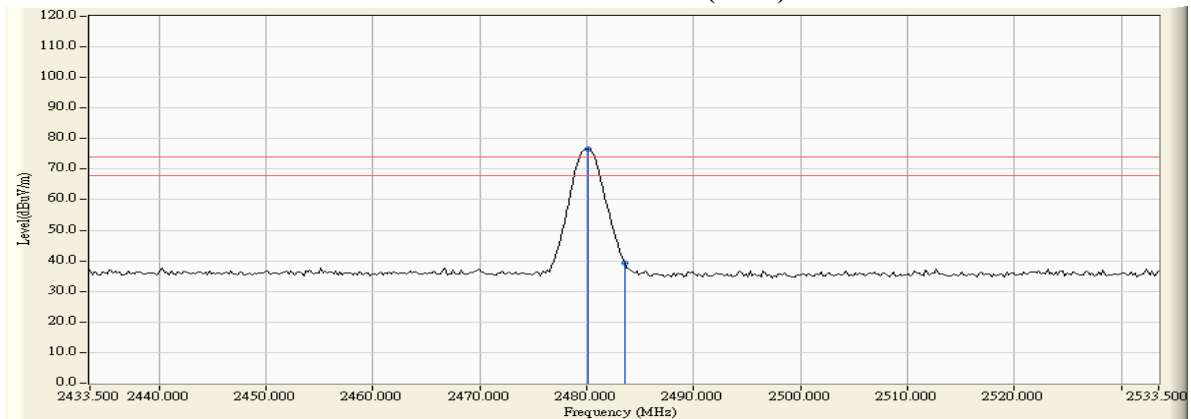
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ \* ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : GPS Controller(GPS Receiver)  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

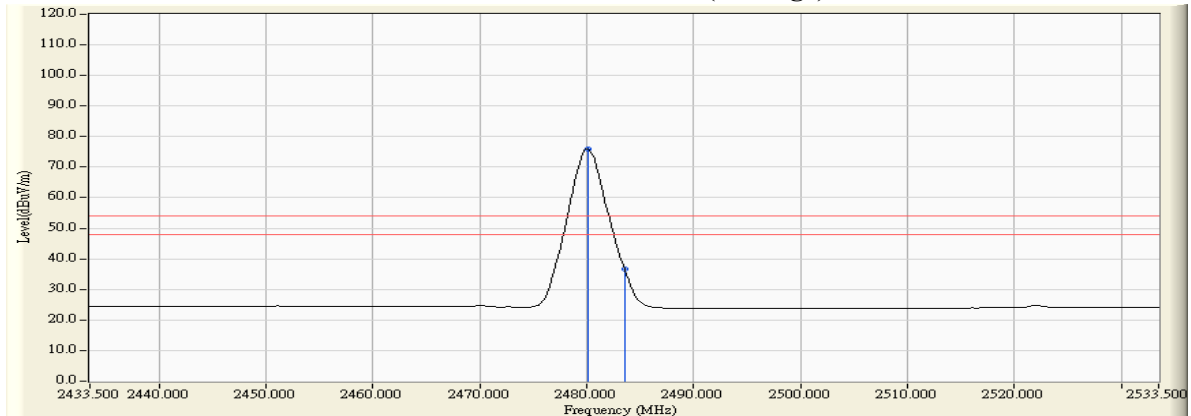
**RF Radiated Measurement (VERTICAL):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
78 (Peak)	2480.100	-3.977	80.440	76.463	--	--	Pass
78 (Peak)	2483.500	-3.966	43.316	39.349	74.00	54.00	Pass
78 (Average)	2480.100	-3.977	79.917	75.940	--	--	Pass
78 (Average)	2483.500	-3.966	40.624	36.657	74.00	54.00	Pass

**Figure Channel 78: VERTICAL (Peak)**



**Figure Channel 78: VERTICAL (Average)**



Note:

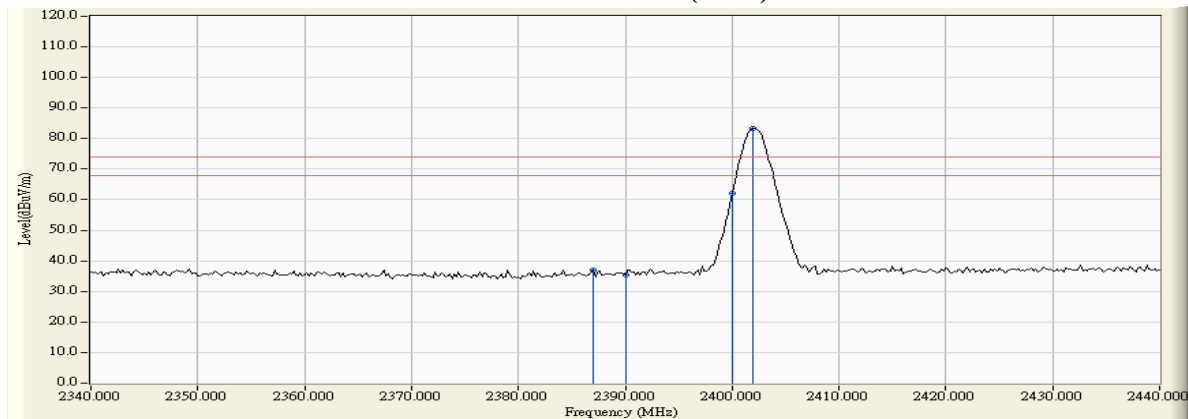
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ \* ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : GPS Controller(GPS Receiver)  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

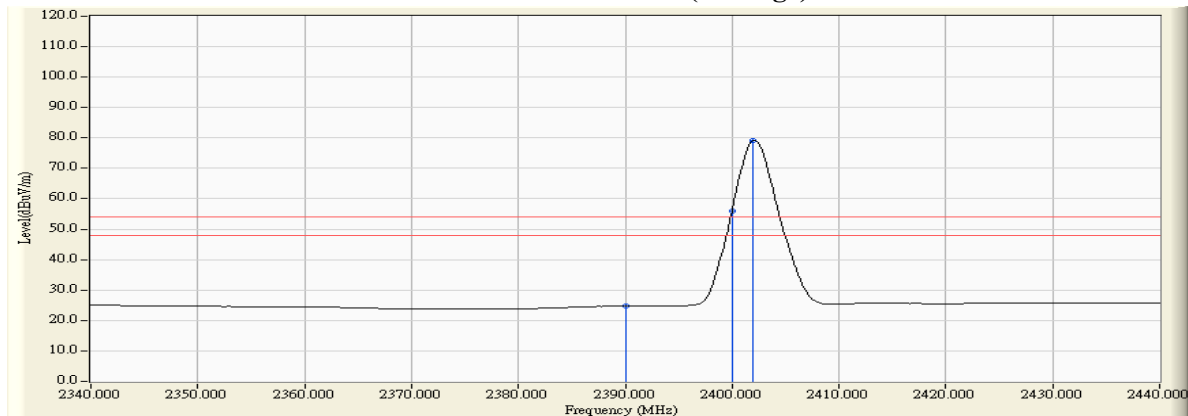
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Result
00 (Peak)	2387.000	-2.701	39.656	36.956	74.00	54.00	Pass
00 (Peak)	2390.000	-2.687	38.045	35.358	74.00	54.00	Pass
00 (Peak)	2400.000	-2.660	64.847	62.187	--	--	--
00 (Peak)	2402.000	-2.657	85.984	83.327	--	--	--
00 (Average)	2390.000	-2.687	27.384	24.697	74.00	54.00	Pass
00 (Average)	2400.000	-2.660	58.740	56.080	--	--	--
00 (Average)	2402.000	-2.657	81.643	78.986	--	--	--

**Figure Channel 00: Horizontal (Peak)**



**Figure Channel 00: Horizontal (Average)**



Note:

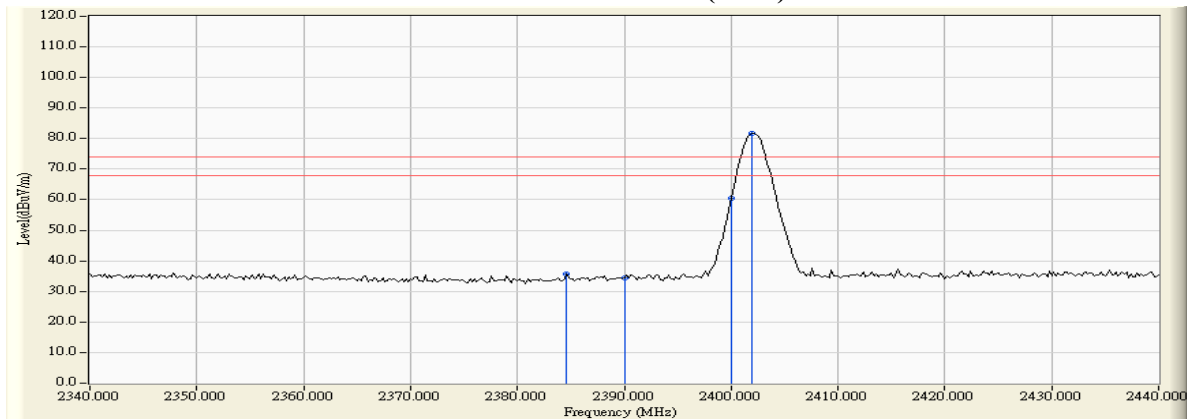
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ \* ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : GPS Controller(GPS Receiver)  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

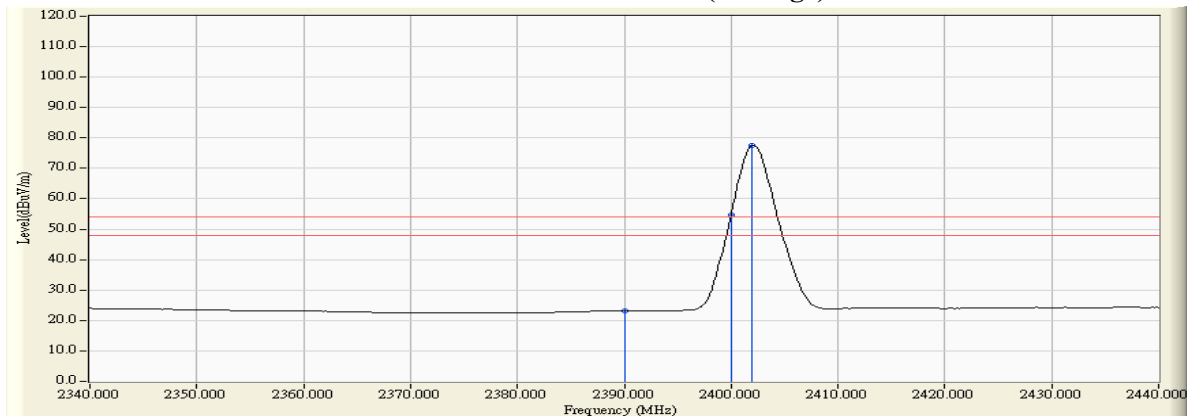
**RF Radiated Measurement (VERTICAL):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dB $\mu$ V)	Emission Level (dB $\mu$ V/m)	Peak Limit (dB $\mu$ V/m)	Average Limit (dB $\mu$ V/m)	Result
00 (Peak)	2384.600	-4.141	39.958	35.817	74.00	54.00	Pass
00 (Peak)	2390.000	-4.159	38.729	34.570	74.00	54.00	Pass
00 (Peak)	2400.000	-4.171	64.782	60.611	--	--	--
00 (Peak)	2402.000	-4.171	85.871	81.700	--	--	--
00 (Average)	2390.000	-4.159	27.301	23.142	74.00	54.00	Pass
00 (Average)	2400.000	-4.171	58.924	54.753	--	--	--
00 (Average)	2402.000	-4.171	81.579	77.408	--	--	--

**Figure Channel 00: VERTICAL (Peak)**



**Figure Channel 00: VERTICAL (Average)**



Note:

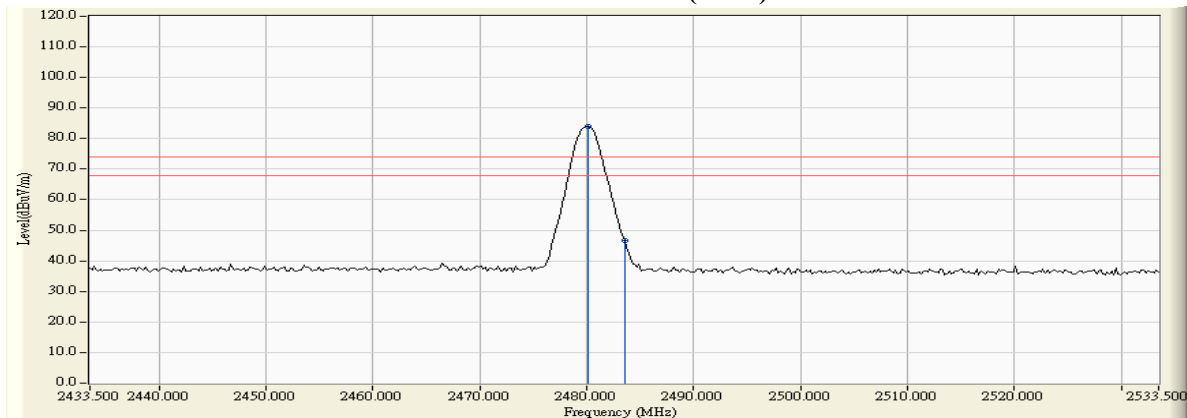
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " \* ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : GPS Controller(GPS Receiver)  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

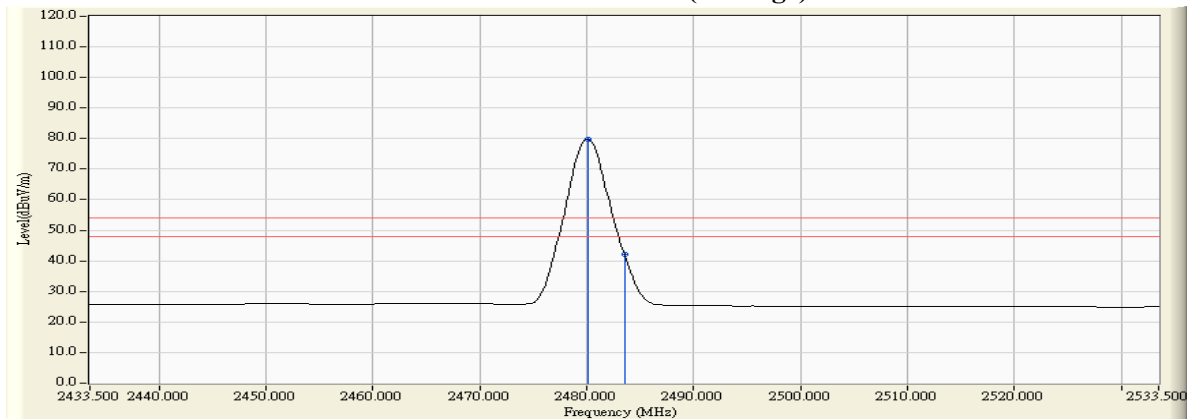
**RF Radiated Measurement (Horizontal):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
78 (Peak)	2480.100	-2.605	86.701	84.096	--	--	Pass
78 (Peak)	2483.500	-2.601	49.136	46.534	74.00	54.00	Pass
78 (Average)	2480.100	-2.605	82.407	79.802	--	--	Pass
78 (Average)	2483.500	-2.601	44.738	42.136	74.00	54.00	Pass

**Figure Channel 00: Horizontal (Peak)**



**Figure Channel 00: Horizontal (Average)**



Note:

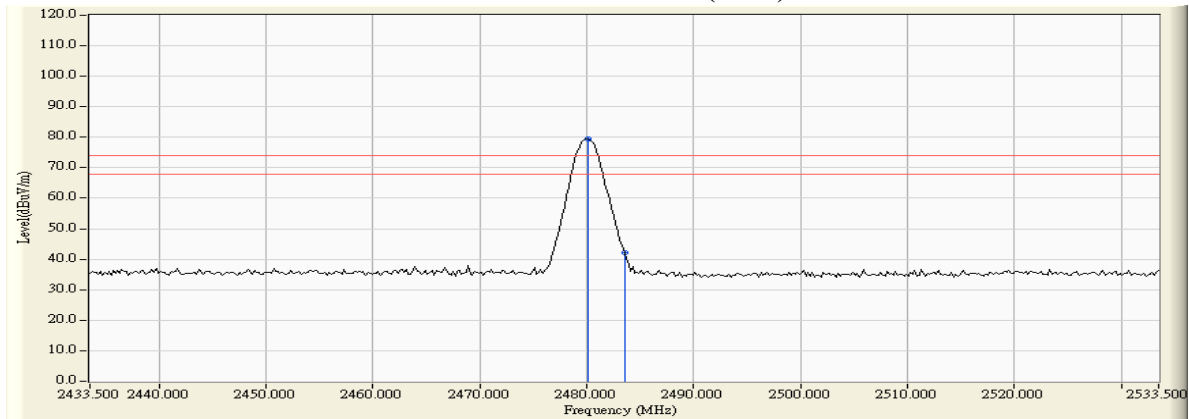
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ \* ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

Product : GPS Controller(GPS Receiver)  
Test Item : Band Edge  
Test Site : No.3 OATS  
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

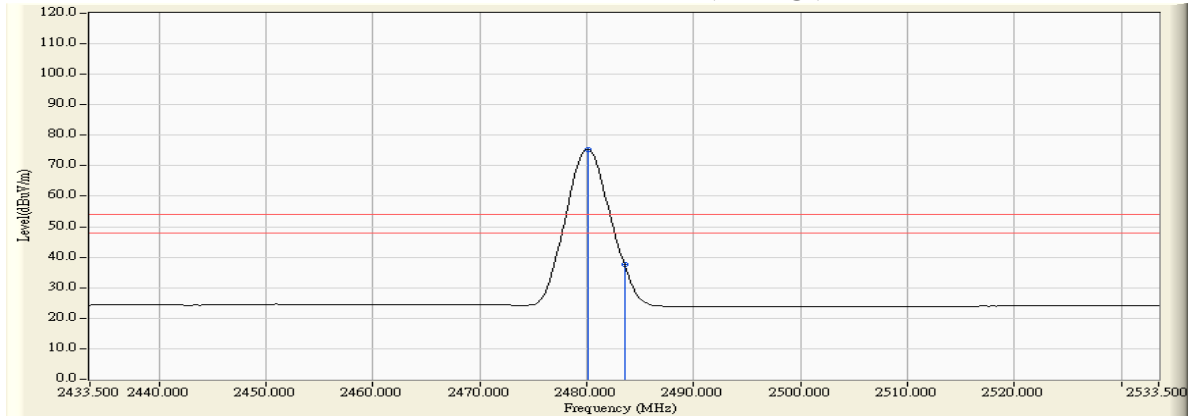
**RF Radiated Measurement (VERTICAL):**

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
78 (Peak)	2480.100	-3.977	83.566	79.589	--	--	Pass
78 (Peak)	2483.500	-3.966	46.217	42.250	74.00	54.00	Pass
78 (Average)	2480.100	-3.977	79.267	75.290	--	--	Pass
78 (Average)	2483.500	-3.966	41.506	37.539	74.00	54.00	Pass

**Figure Channel 78: VERTICAL (Peak)**



**Figure Channel 78: VERTICAL (Average)**



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. " \* ", means this data is the worst emission level.
5. Measurement Level = Reading Level + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

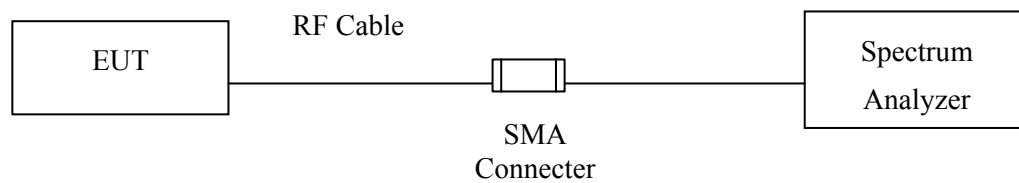
## 7. Channel Number

### 7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2015

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by “X” are used to measure the final test results.

### 7.2. Test Setup



### 7.3. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

### 7.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 7.5. Uncertainty

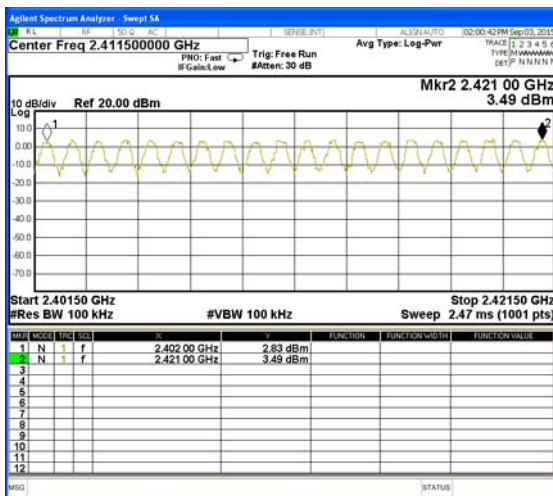
N/A

## 7.6. Test Result of Channel Number

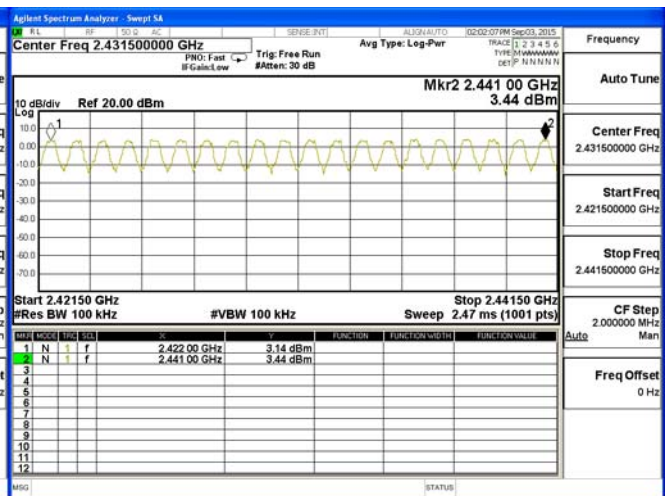
Product : GPS Controller(GPS Receiver)  
 Test Item : Channel Number  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

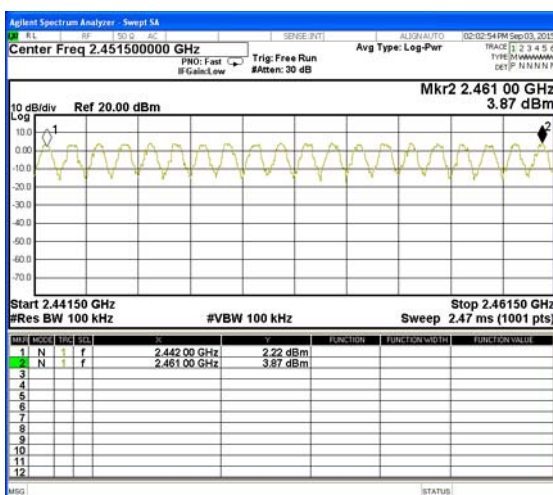
### 2402-2421MHz



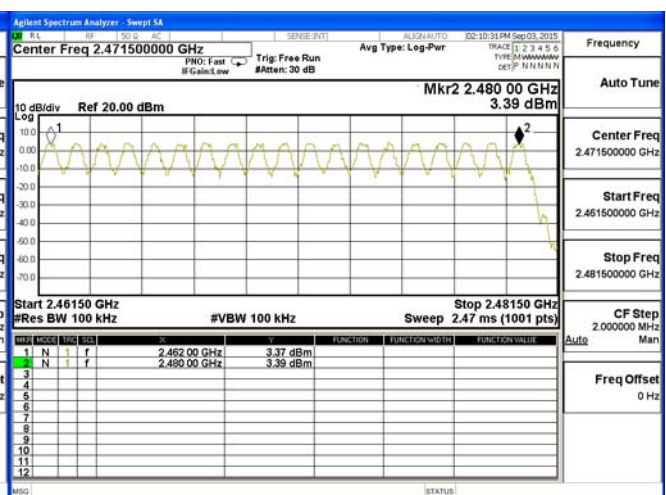
### 2422-2441MHz



### 2442-2461MHz



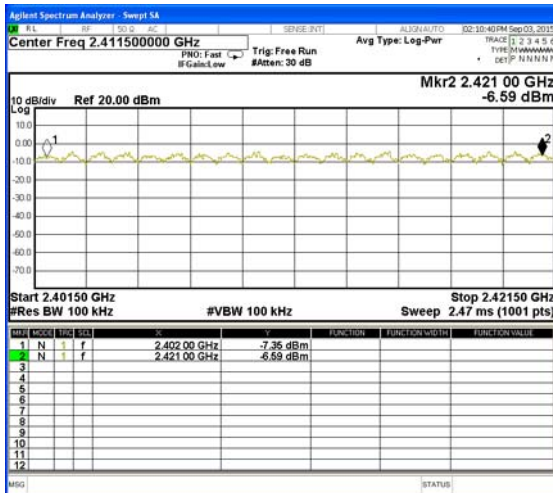
### 2462-2480MHz



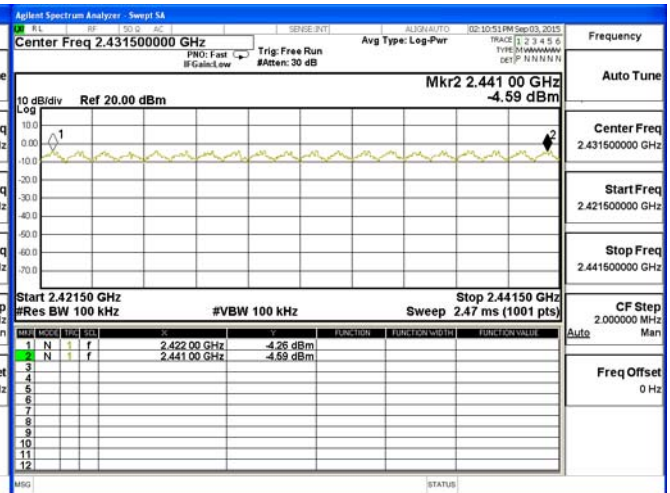
Product : GPS Controller(GPS Receiver)  
 Test Item : Channel Number  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

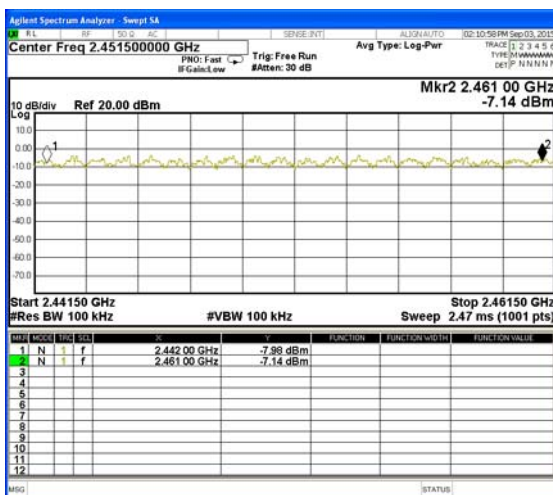
2402-2421MHz



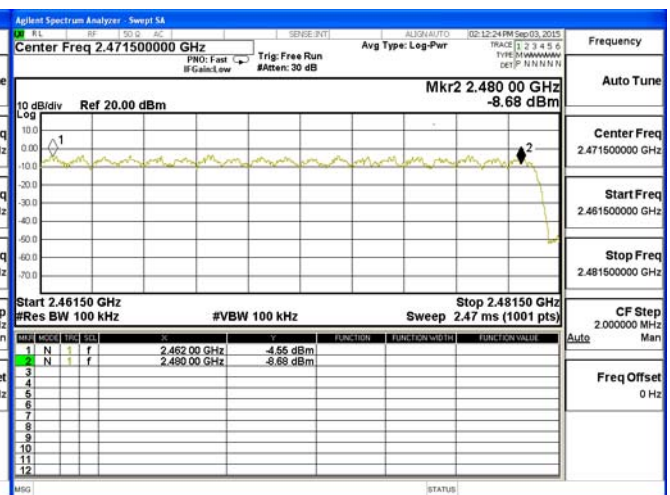
2422-2441MHz



2442-2461MHz



2462-2480MHz



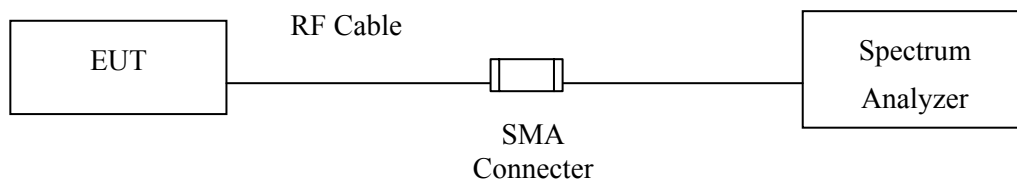
## 8. Channel Separation

### 8.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2015

Note: 1. All equipments are calibrated every one year.  
2. The test instruments mark by "X" are used to measure the final test results.

### 8.2. Test Setup



### 8.3. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

### 8.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 8.5. Uncertainty

$\pm 150\text{Hz}$

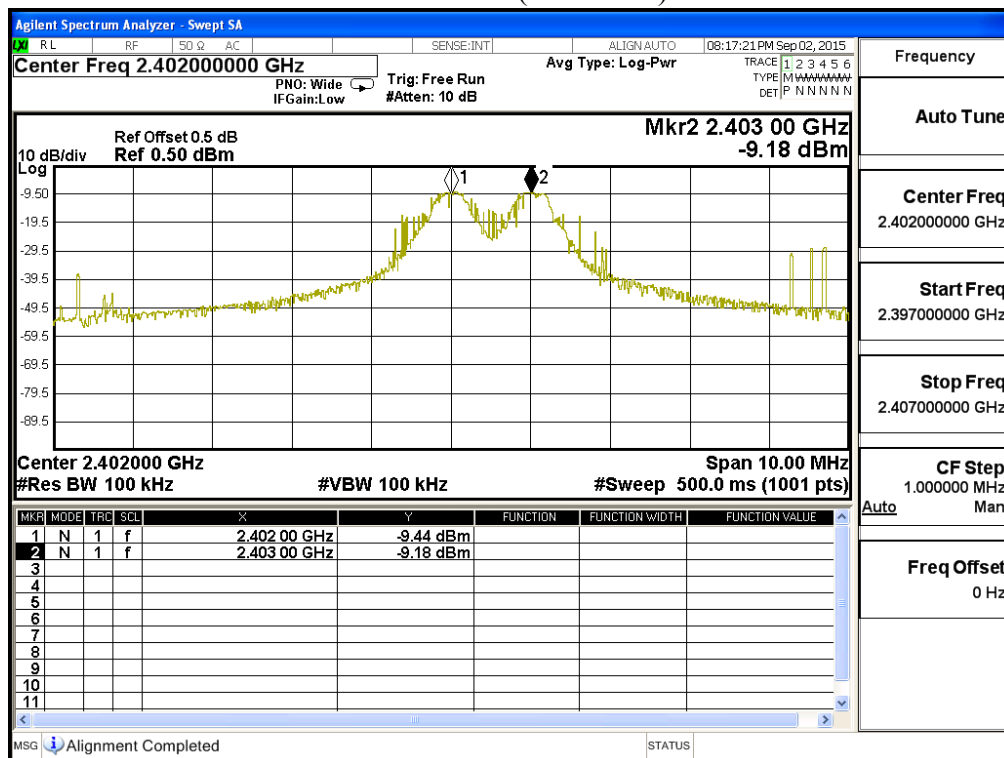
## 8.6. Test Result of Channel Separation

Product : GPS Controller(GPS Receiver)  
 Test Item : Channel Separation  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

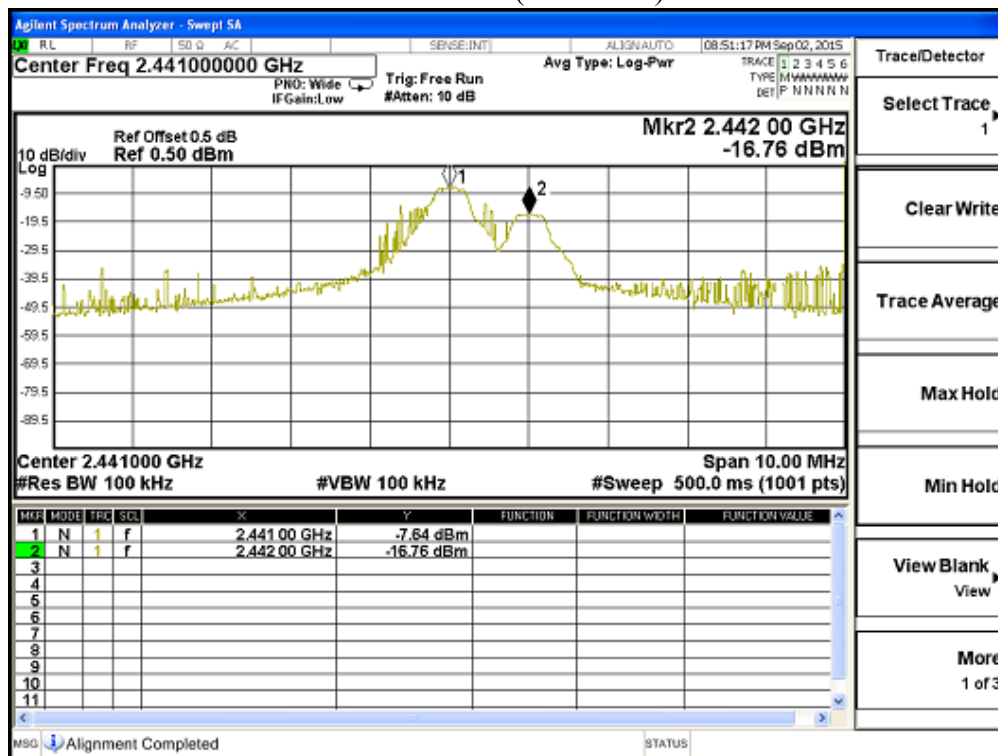
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	820.0	Pass
39	2441	1000	>25 kHz	726.7	Pass
78	2480	1000	>25 kHz	680.0	Pass

NOTE: The 20dB Bandwidth is refer to section 10.

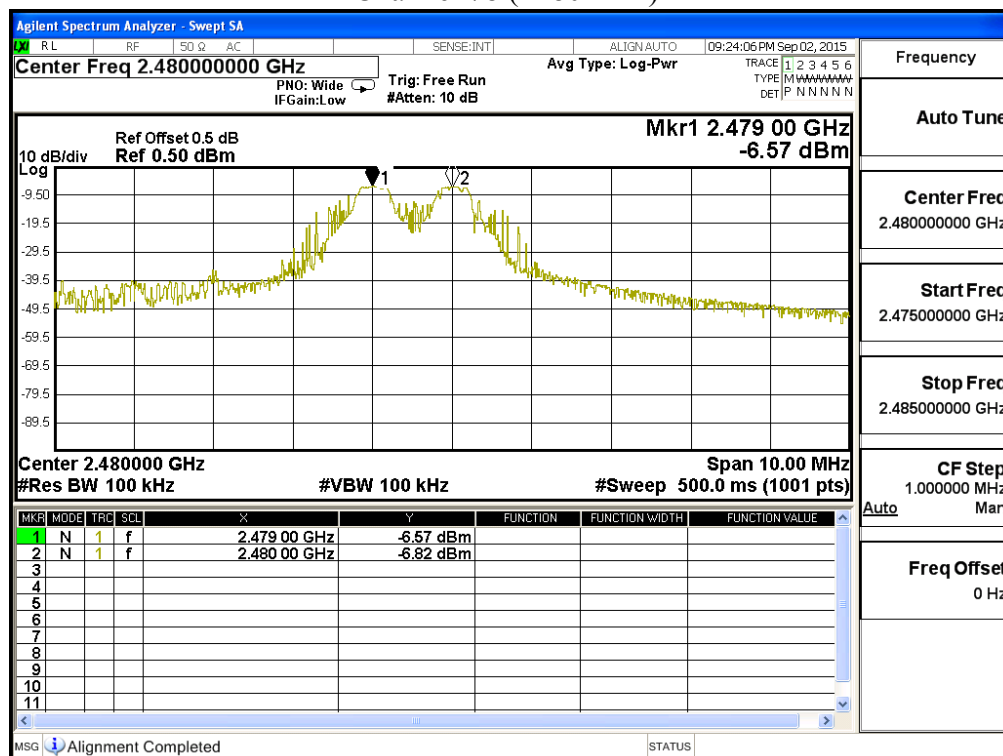
Channel 00 (2402MHz)



### Channel 39 (2441MHz)



### Channel 78 (2480MHz)

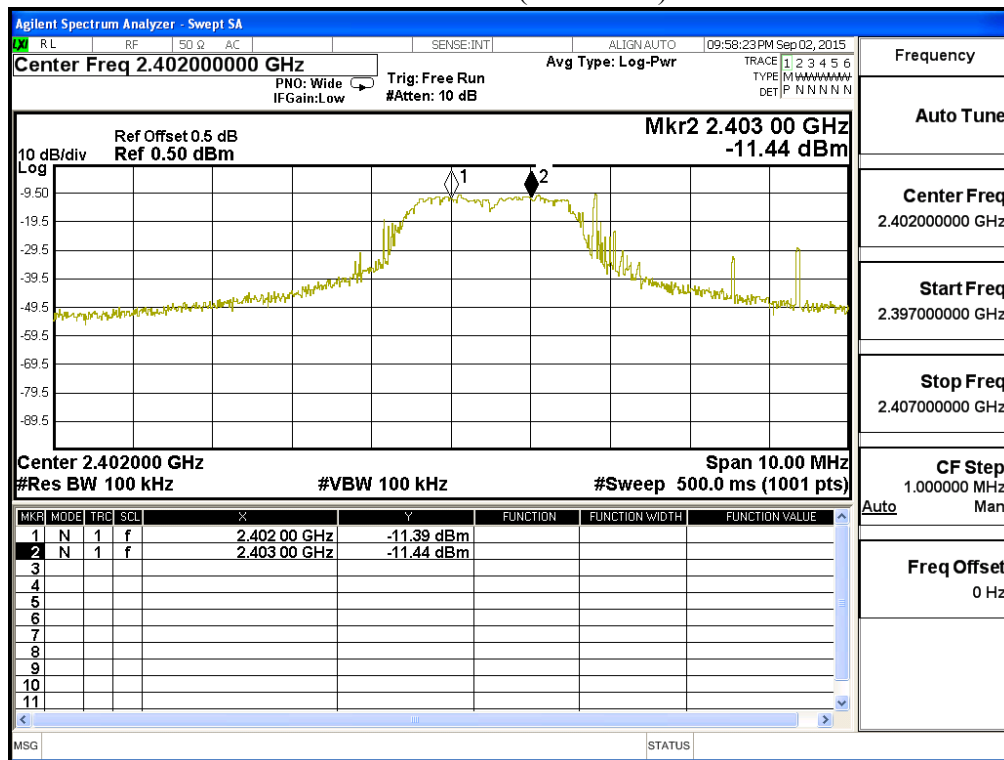


Product : GPS Controller(GPS Receiver)  
 Test Item : Channel Separation  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

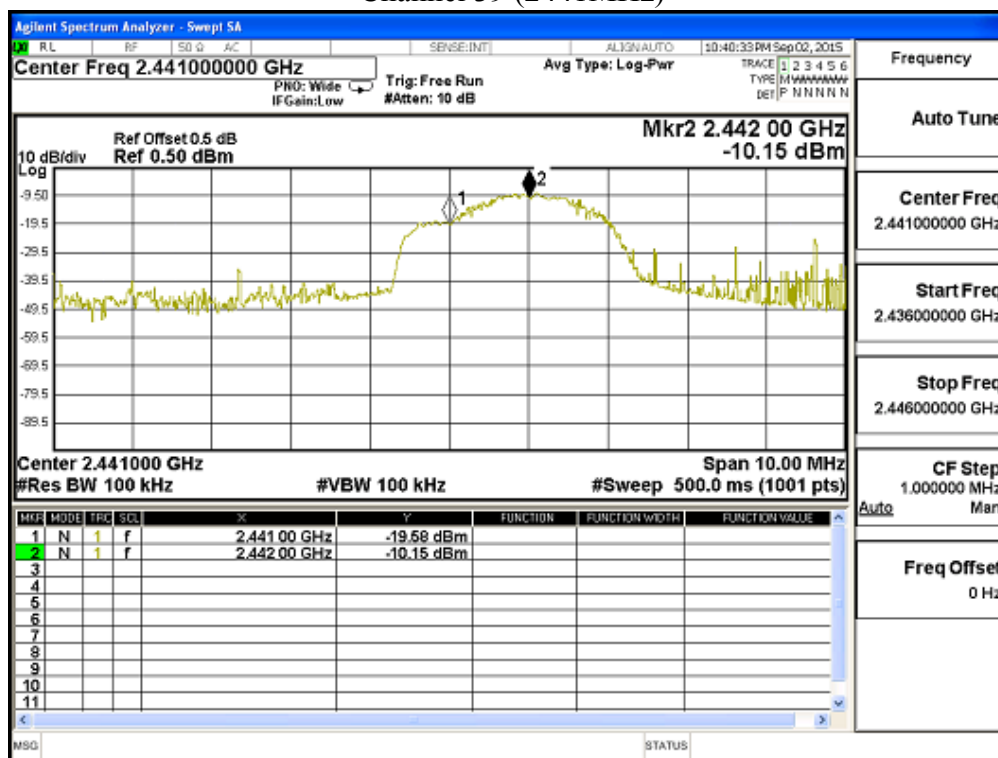
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	980.0	Pass
39	2441	1000	>25 kHz	953.3	Pass
78	2480	1000	>25 kHz	900.0	Pass

NOTE: The 20dB Bandwidth is refer to section 10.

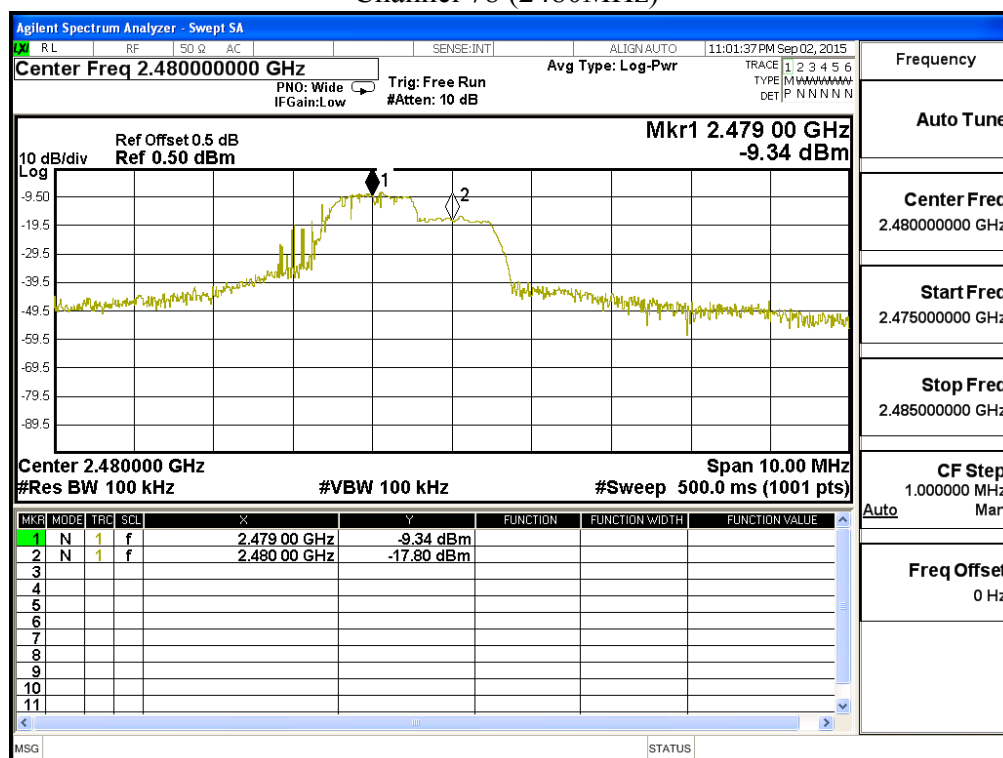
### Channel 00 (2402MHz)



### Channel 39 (2441MHz)



### Channel 78 (2480MHz)



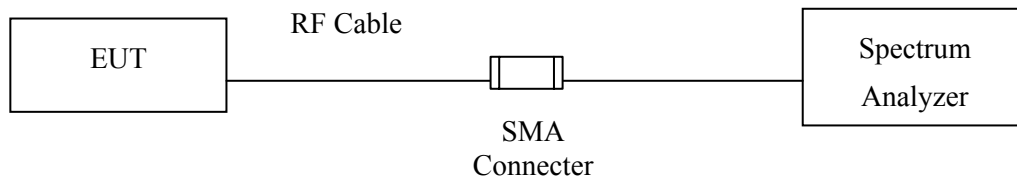
## 9. Dwell Time

### 9.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2015

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by “X” are used to measure the final test results.

### 9.2. Test Setup



### 9.3. Limit

The dwell time shall be the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

### 9.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 9.5. Uncertainty

$\pm 25\text{msec}$

## 9.6. Test Result of Dwell Time

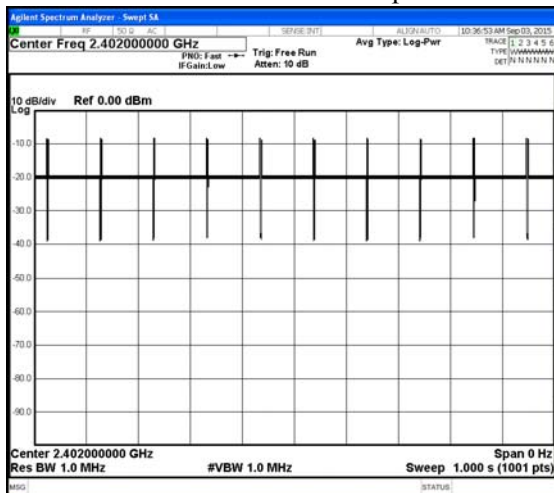
Product : GPS Controller(GPS Receiver)  
Test Item : Dwell Time  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2402	100.400	9	1000	0.90	0.361	0.4	Pass
2441	100.000	9	1000	0.90	0.360	0.4	Pass
2480	100.000	9	1000	0.90	0.360	0.4	Pass

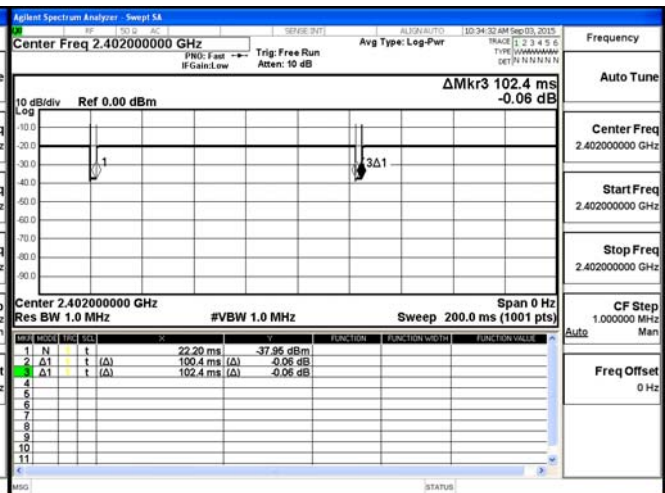
Duty cycle = ((Time slot length(ms)\*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) \* (79\*0.4)

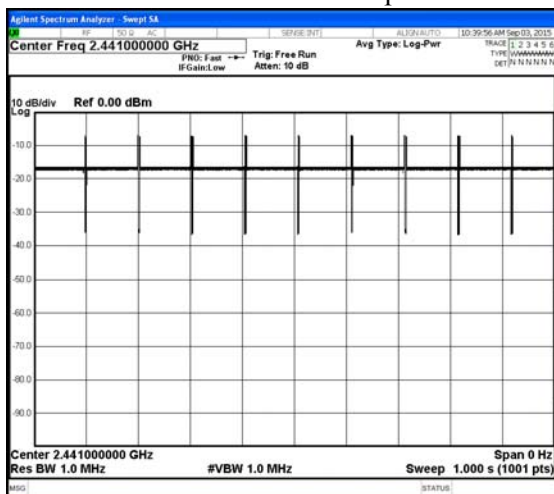
CH 00 Time Interval between hops



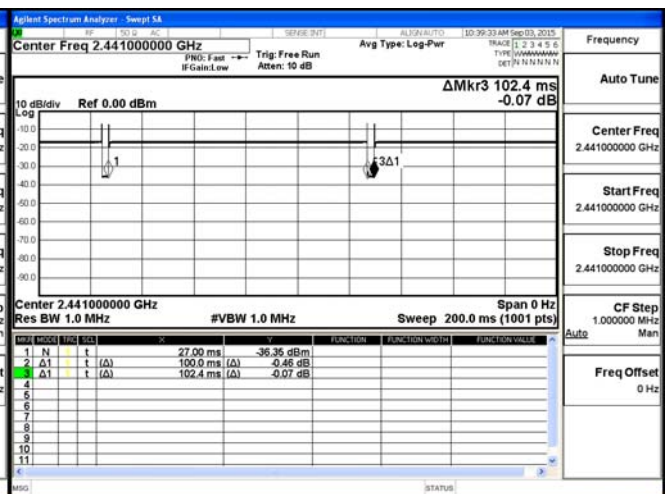
CH 00 Transmission Time



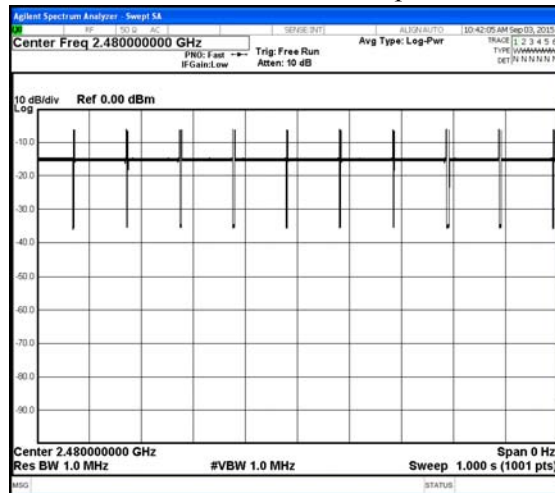
CH39 Time Interval between hops



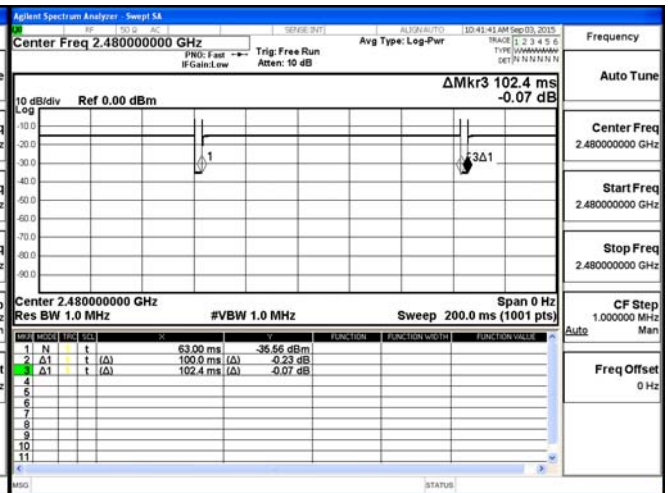
CH 39Transmission Time



## CH 78 Time Interval between hops



## CH 78 Transmission Time



Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

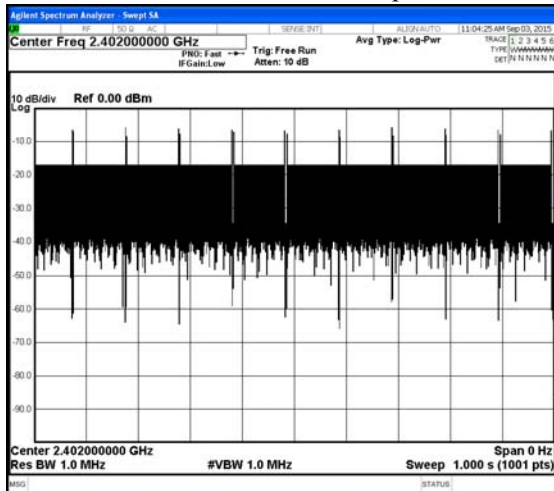
Product : GPS Controller(GPS Receiver)  
 Test Item : Dwell Time  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2402	100.000	9	1000	0.90	0.360	0.4	Pass
2441	92.400	9	1000	0.83	0.333	0.4	Pass
2480	100.000	9	1000	0.90	0.360	0.4	Pass

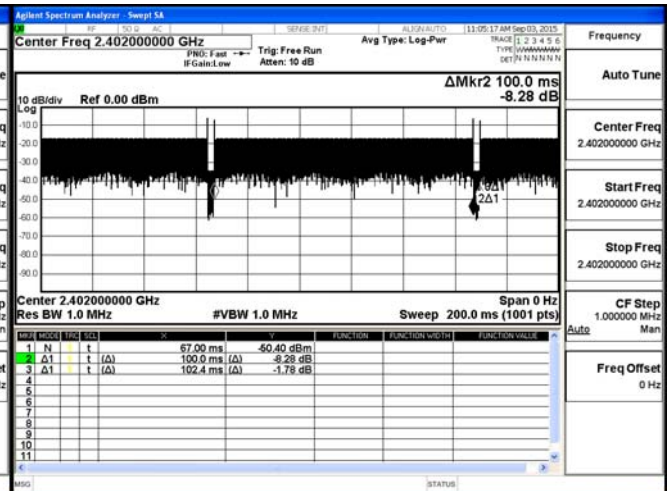
Duty cycle = ((Time slot length(ms)\*Hopping of Number) / Sweep time (ms))

Dwell time = (Duty cycle /79) \* (79\*0.4)

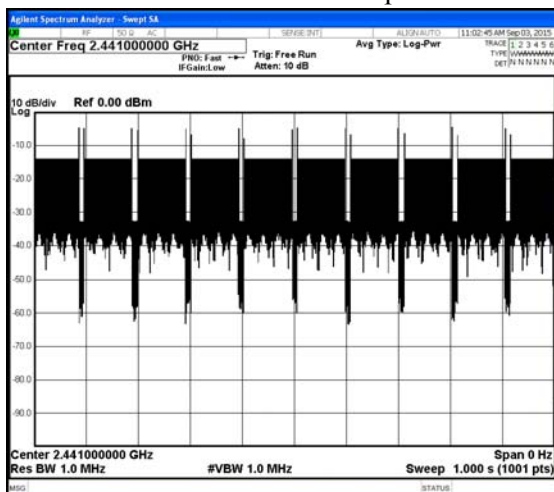
CH 00 Time Interval between hops



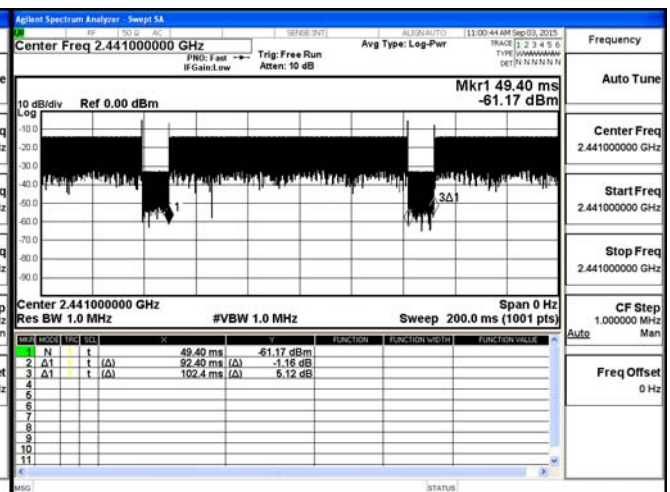
CH 00 Transmission Time



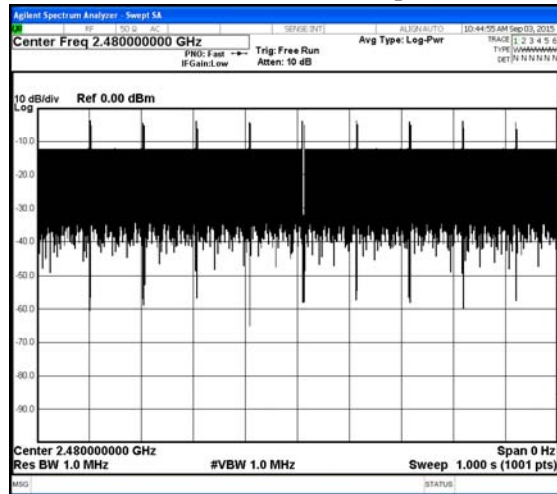
CH39 Time Interval between hops



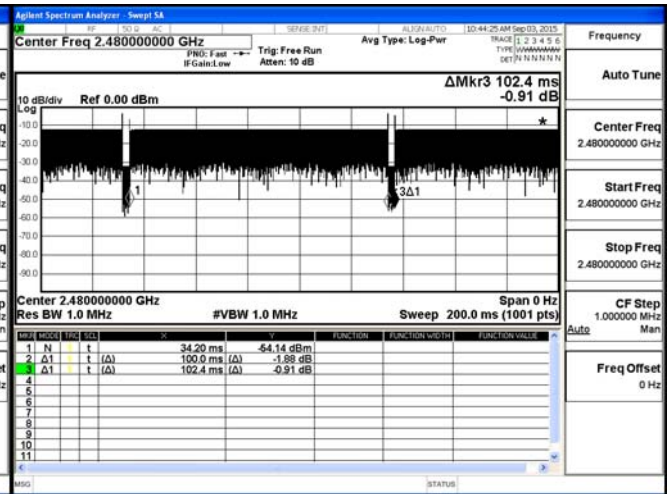
CH 39 Transmission Time



## CH 78 Time Interval between hops



## CH 78 Transmission Time



Note:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case is shown on the report.

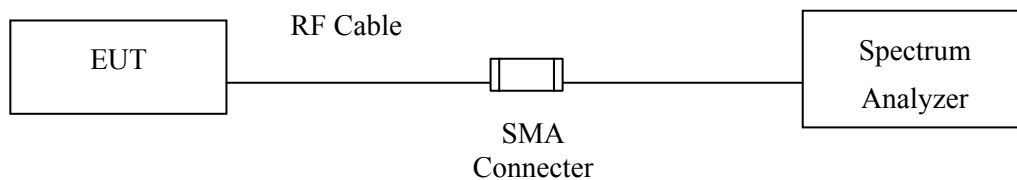
## 10. Occupied Bandwidth

### 10.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2015

Note: 1. All equipments are calibrated every one year.  
2. The test instruments marked by “X” are used to measure the final test results.

### 10.2. Test Setup



### 10.3. Limits

N/A

### 10.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

### 10.5. Uncertainty

$\pm 150\text{Hz}$

## 10.6. Test Result of Occupied Bandwidth

Product : GPS Controller(GPS Receiver)  
Test Item : Occupied Bandwidth Data  
Test Site : No.3 OATS  
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1230	--	NA
39	2441	1090	--	NA
78	2480	1020	--	NA

**Figure Channel 00:**

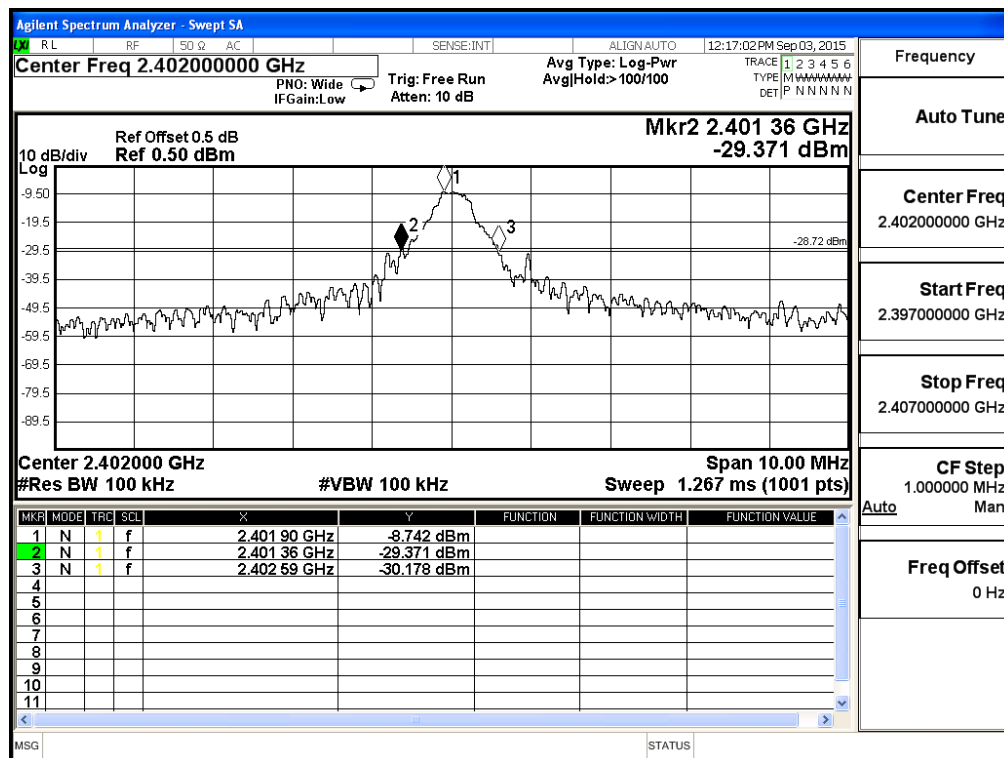


Figure Channel 39:

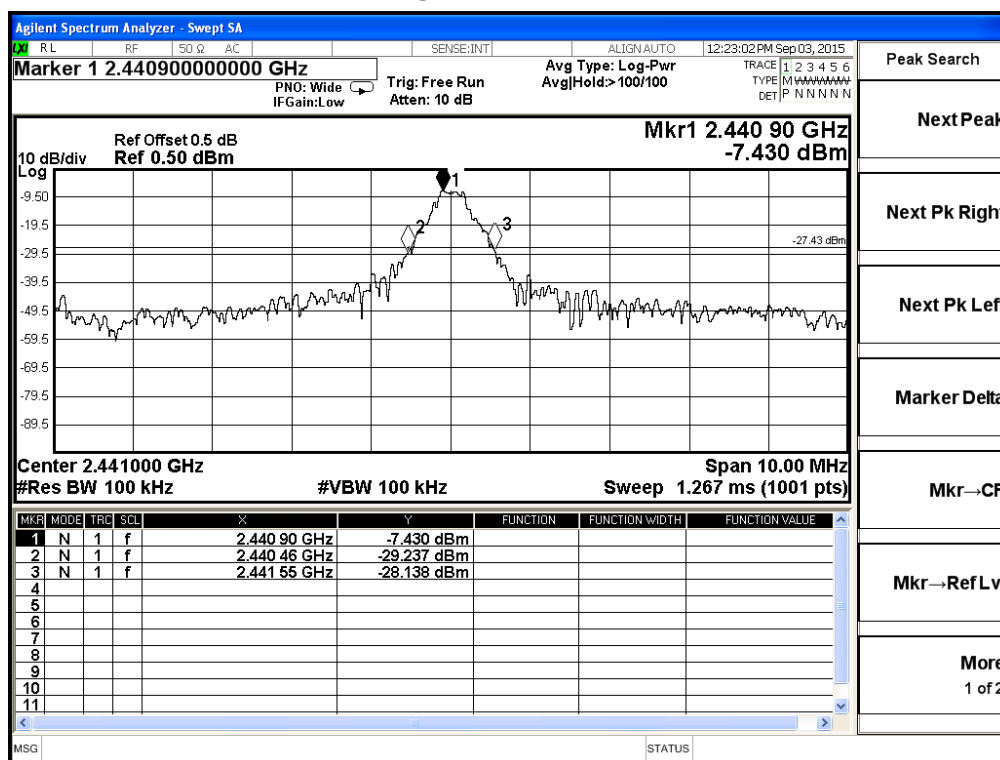
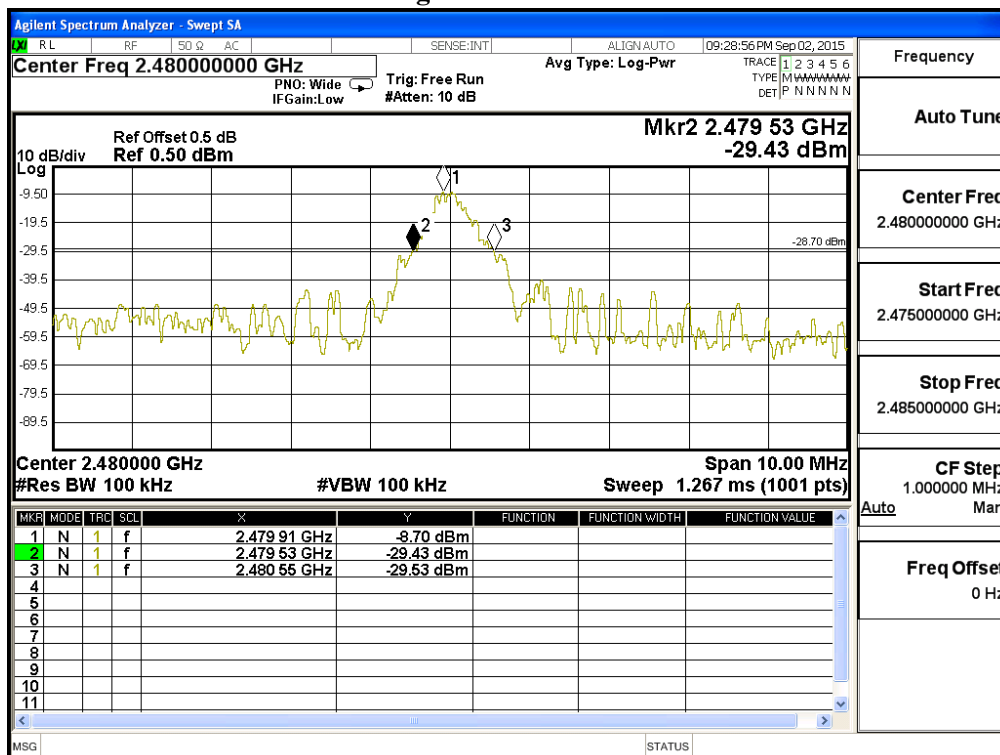


Figure Channel 78:



Product : GPS Controller(GPS Receiver)  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1470	--	NA
39	2441	1430	--	NA
78	2480	1350	--	NA

Figure Channel 00:

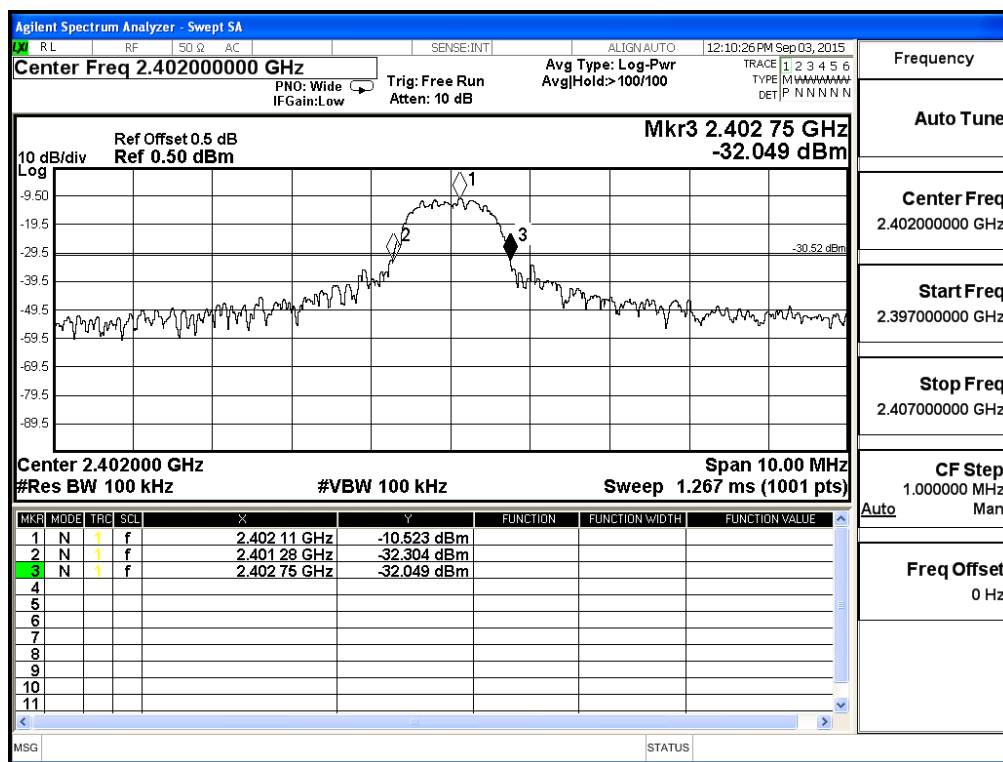


Figure Channel 39:

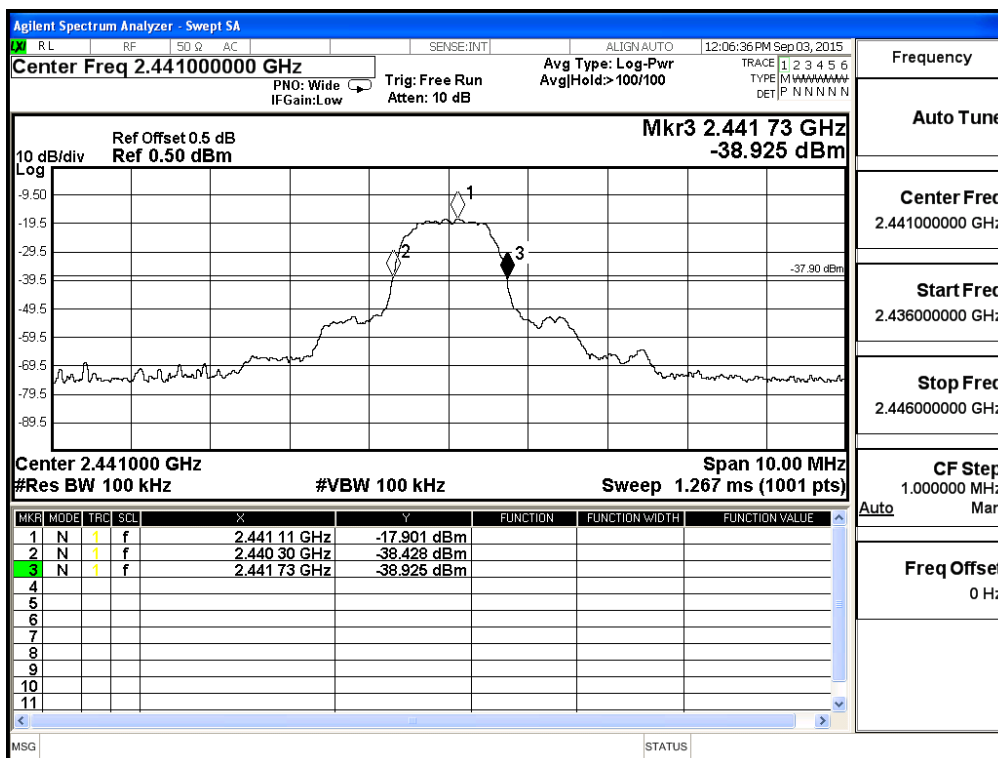
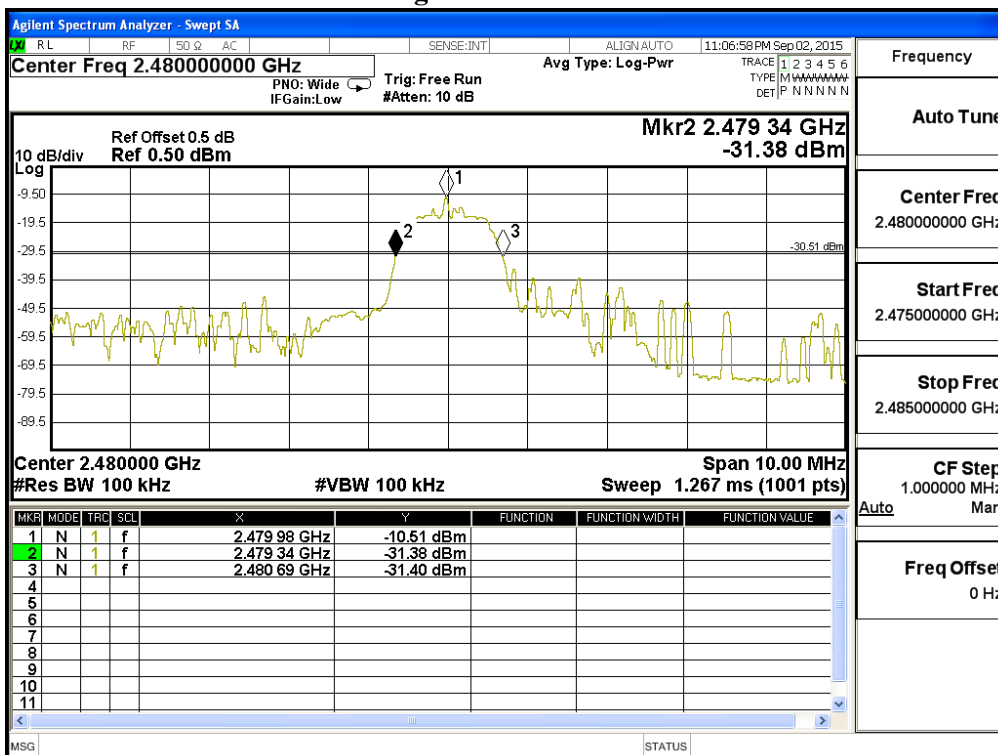


Figure Channel 78:



## **11. EMI Reduction Method During Compliance Testing**

No modification was made during testing.

## Attachment 1: EUT Test Photographs

## Attachment 2: EUT Detailed Photographs