

# FCC Test Report

Product Name : GPS Data Recorder

Trade Name : Qstarz

Model No. : BT-Q1000XT, BT-Q1000EX, BT-Q818XT,

BT-Q1000xx (xx=AA~ZZ)

FCC ID. : WDYQ1051001

Applicant : Qstarz International Co. Ltd.

Address : 6F-2, No. 160, Sec. 6, Ming-Chuan E. Rd., Nei-Hu,  
Taipei, Taiwan

Date of Receipt : Oct. 07, 2016

Issued Date : Nov. 10, 2016

Report No. : 16A0165R-RFUSP01V00

Report Version : V1.0



The test results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of QuieTek Corporation.

# Test Report Certification

Issued Date : Nov. 10, 2016

Report No. : 16A0165R-RFUSP01V00

**QuieTek**

a  DEKRA company

Product Name : GPS Data Recorder  
Applicant : Qstarz International Co. Ltd.  
Address : 6F-2, No. 160, Sec. 6, Ming-Chuan E. Rd., Nei-Hu, Taipei, Taiwan  
Manufacturer : Qstarz International Co. Ltd.  
Model No. : BT-Q1000XT, BT-Q1000EX, BT-Q818XT, BT-Q1000xx (xx=AA~ZZ)  
FCC ID. : WDYQ1051001  
EUT Voltage : DC 5V (Power by Charger)  
DC 3.7V (Power by battery)  
Trade Name : Qstarz  
Applicable Standard : FCC CFR Title 47 Part 15 Subpart C Section 15.247: 2015  
ANSI C63.10: 2013  
Test Lab : Hsin Chu Laboratory  
Test Result : Complied

The test results relate only to the samples tested.

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Documented By :



( Carol Tsai / Engineering Adm. Specialist )

Tested By :



( Ricky Lee / Engineer )

Approved By :



( Roy Wang / Director )

## Revision History

## Laboratory Information

We, **QuieTek Corporation**, are an independent RF consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted (audited or listed) by the following related bodies in compliance with ISO 17025 specified testing scopes:

Taiwan R.O.C. : TAF, Accreditation Number: 3024  
USA : FCC, Registration Number: 834100  
Canada : IC, Submission No: 181665 / IC Registration Number: 4075C-4

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/english/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/index\\_en.aspx](http://www.quietek.com/index_en.aspx)

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## 1. General Information

### 1.1. EUT Description

Product Name	GPS Data Recorder
Trade Name	Qstarz
Model No.	BT-Q1000XT, BT-Q1000EX, BT-Q818XT, BT-Q1000xx (xx=AA~ZZ)
Frequency Range/Channel Number	2402~2480MHz / 79 Channels
Type of Modulation	GFSK

Antenna Information	
Antenna Type	Chip antenna
Antenna Gain	0 dBi

Accessories Information	
USB Cable	Non-Shielded, 1m
Battery	HELIX / HX-N3650U-G, 3.7V

Working 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. This device is a GPS Data Recorder including BT 1.2 transmitting and receiving function.
2. The variation of model number is for different strategy of marketing.

The different of the each model is shown as below:

Model Number	Color	Description
BT-Q1000XT	Black	With Flash Memory. The difference is the software parameter setting.
BT-Q1000EX	Red	
BT-Q1000xx (xx=AA~ZZ)	N/A	
BT-Q818XT	Gray	Without Flash Memory

3. These test results on a sample of the device are for the purpose of demonstrating Compliance with Part 15 Subpart C Paragraph 15.247.
4. Regards to the frequency band operation; the lowest、middle and highest frequency of channel were selected to perform the test, and then shown on this report.
5. This device is a composite device in accordance with Part 15 regulations. The function of the receiving was tested and its test report number is 16A0165R-RFUSP12V00.

## 1.2. Test Mode

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in transmitting operation, which was shown in this test report and defined as follows:

Pre-Test Mode	
TX	Mode 1: Transmit
Final Test Mode	
TX	Mode 1: Transmit

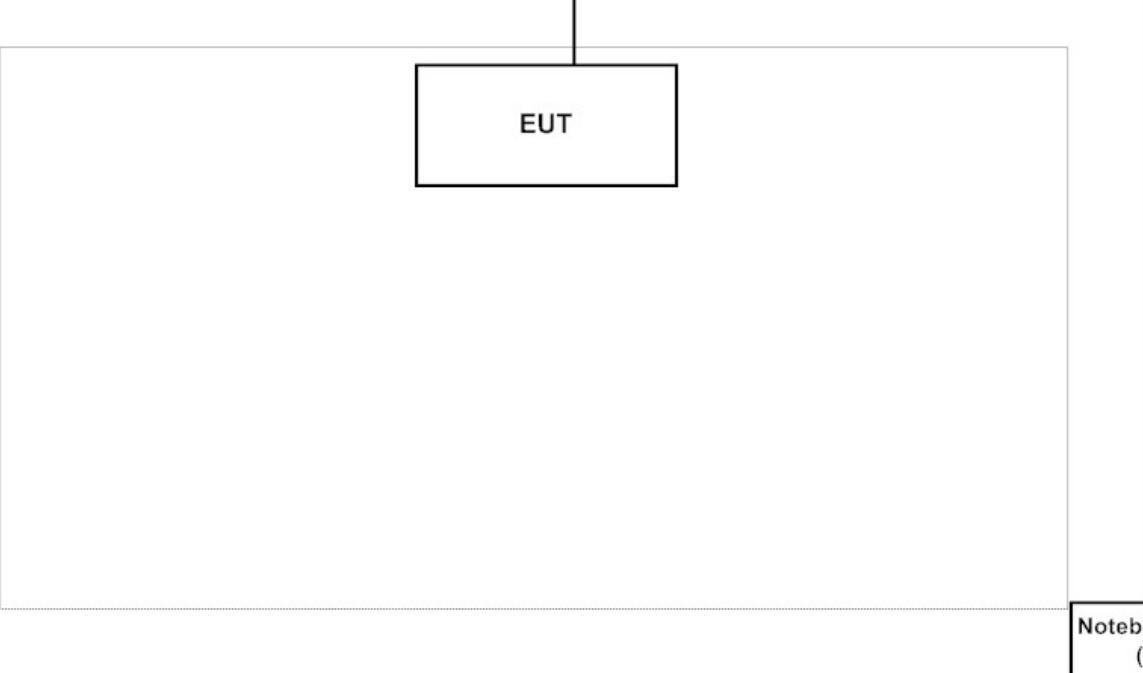
Emission	Mode 1
Conducted Emission	Yes
Peak Power Output	Yes
Radiated Emission (Under 1G)	Yes
Radiated Emission (Above 1G)	Yes
RF antenna conducted test	Yes
Band Edge	Yes
Number of hopping Frequency	Yes
Carrier Frequency Separation	Yes
Occupied Bandwidth	Yes
Dwell Time	Yes

### 1.3. Tested System Details

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

Product		Manufacturer	Model No.	Serial No.	FCC ID	Power Cord
1	Notebook PC	ASUS	X522EP	E5N0CV04 3264197	DoC	Non-Shielded, 1.8m, one ferrite core bonded

## 1.4. Configuration of tested System

Connection Diagram	
	
Signal Cable Type	Signal cable Description
A    USB Cable	Non-Shielded, 1m

## 1.5. EUT Exercise Software

1	Setup the EUT as shown in Section 1.4.
2	Execute the “BT Tester” command on the EUT.
3	Configure the test mode, select packet type, the test channel, and the data rate.
4	“Start TX to start the continuous transmitting
5	Verify that the EUT works properly.

## 1.6. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual
Temperature (°C)	FCC PART 15 C 15.207 Conducted Emission (FHSS)	15 - 35	23
Humidity (%RH)		25 - 75	50
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Peak Power Output (FHSS)	15 - 35	24
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Radiated Emission (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	54
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Band Edge (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	50
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Number of hopping Frequency (FHSS)	15 - 35	24
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Carrier Frequency Separation (FHSS)	15 - 35	24
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Occupied Bandwidth (FHSS)	15 - 35	24
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 RF antenna conducted test (FHSS)	15 - 35	24
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Dwell Time (FHSS)	15 - 35	24
Humidity (%RH)		25 - 75	45
Barometric pressure (mbar)		860 - 1060	950-1000

## 2. Conducted Emission

### 2.1. Test Equipment

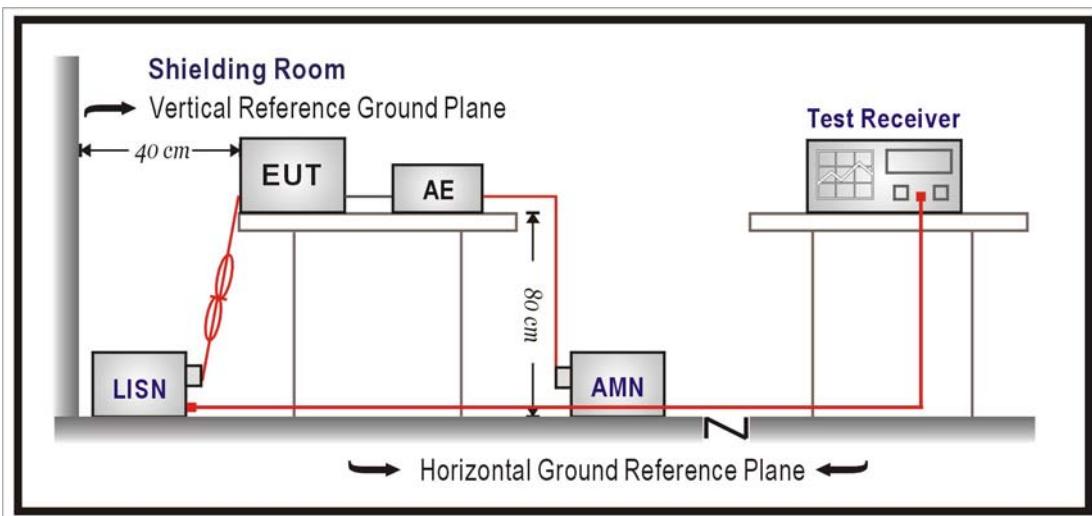
The following test equipments are used during the test:

Conducted Emission / SR2

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Artificial Mains Network	R&S	ENV4200	848411/010	2017/01/20
LISN	R&S	ENV216	100092	2017/08/16
Test Receiver	R&S	ESCS 30	825442/014	2017/06/29

Note: All equipments that need to calibrate are with calibration period of 1 year.

### 2.2. Test Setup



### 2.3. Limits

FCC Part 15 Subpart C Paragraph 15.207 Limits (dBuV)		
Frequency MHz	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 was setup according to ANSI C63.10: 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs.)

Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

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

## 2.5. Test Specification

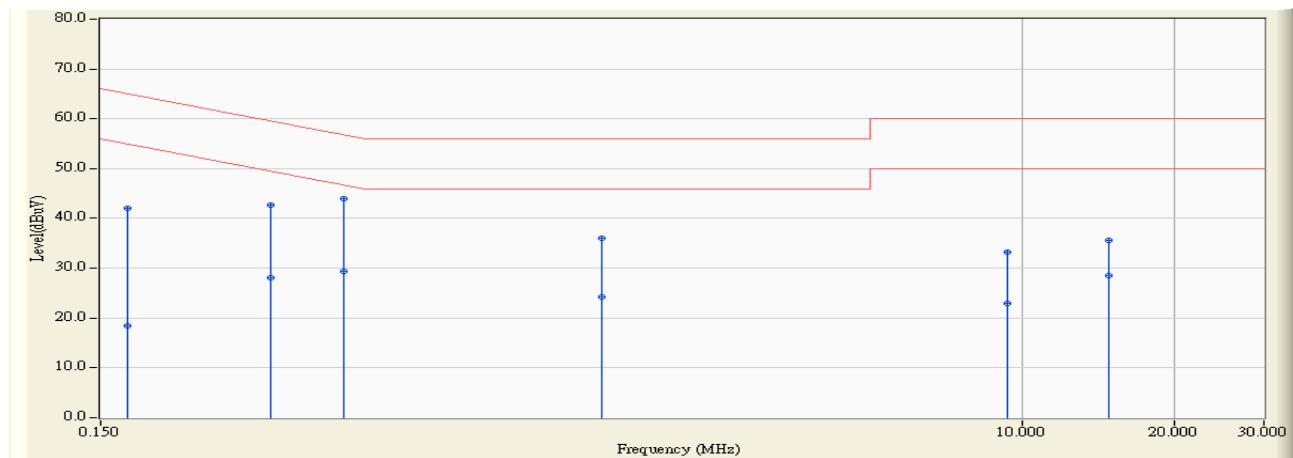
According to FCC Part 15 Subpart C Paragraph 15.207: 2015

## 2.6. Uncertainty

The measurement uncertainty is defined as  $\pm 2.26$  dB.

## 2.7. Test Result

Site : SR2	Time : 2016/11/09 - 14:09
Limit : CISPR_B_00M_QP	Margin : 10
Probe : SR2_LISN(16A)-6_0712 - Line1	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2441MHz

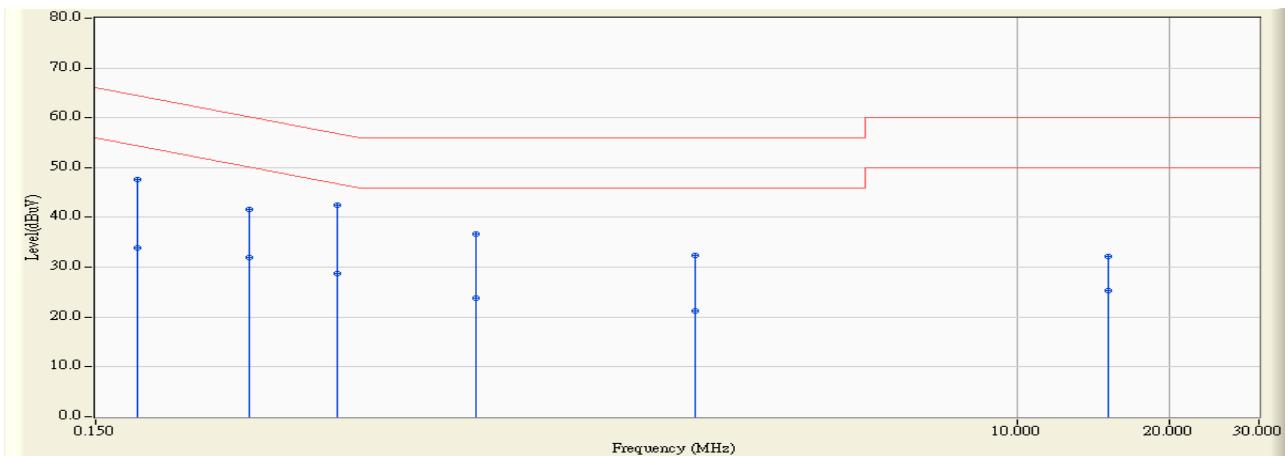


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.170	9.753	32.340	42.093	-22.890	64.983	QUASIPEAK
2	0.170	9.753	8.630	18.383	-36.600	54.983	AVERAGE
3	0.326	9.737	32.840	42.577	-16.981	59.558	QUASIPEAK
4	0.326	9.737	18.430	28.167	-21.391	49.558	AVERAGE
5	* 0.455	9.729	34.340	44.069	-12.720	56.789	QUASIPEAK
6	0.455	9.729	19.620	29.349	-17.440	46.789	AVERAGE
7	1.466	9.839	26.180	36.019	-19.981	56.000	QUASIPEAK
8	1.466	9.839	14.320	24.159	-21.841	46.000	AVERAGE
9	9.326	10.102	23.180	33.282	-26.718	60.000	QUASIPEAK
10	9.326	10.102	12.830	22.932	-27.068	50.000	AVERAGE
11	14.818	10.216	25.460	35.677	-24.323	60.000	QUASIPEAK
12	14.818	10.216	18.350	28.567	-21.433	50.000	AVERAGE

Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

Site : SR2	Time : 2016/11/09 - 14:10
Limit : CISPR_B_00M_QP	Margin : 10
Probe : SR2_LISN(16A)-6_0712 - Line2	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2441MHz



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.181	9.752	37.760	47.512	-16.916	64.428	QUASIPEAK
2		0.181	9.752	24.190	33.942	-20.486	54.428	AVERAGE
3		0.302	9.750	31.780	41.530	-18.648	60.178	QUASIPEAK
4		0.302	9.750	22.230	31.980	-18.198	50.178	AVERAGE
5	*	0.451	9.747	32.760	42.507	-14.353	56.861	QUASIPEAK
6		0.451	9.747	19.010	28.757	-18.103	46.861	AVERAGE
7		0.845	9.797	26.960	36.757	-19.243	56.000	QUASIPEAK
8		0.845	9.797	14.040	23.837	-22.163	46.000	AVERAGE
9		2.295	9.849	22.520	32.369	-23.631	56.000	QUASIPEAK
10		2.295	9.849	11.280	21.129	-24.871	46.000	AVERAGE
11		15.056	10.312	21.760	32.072	-27.928	60.000	QUASIPEAK
12		15.056	10.312	15.040	25.352	-24.648	50.000	AVERAGE

#### Note:

1. All Reading Levels are Quasi-Peak and average value.
2. " \* ", means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

### 3. Peak Power Output

#### 3.1. Test Equipment

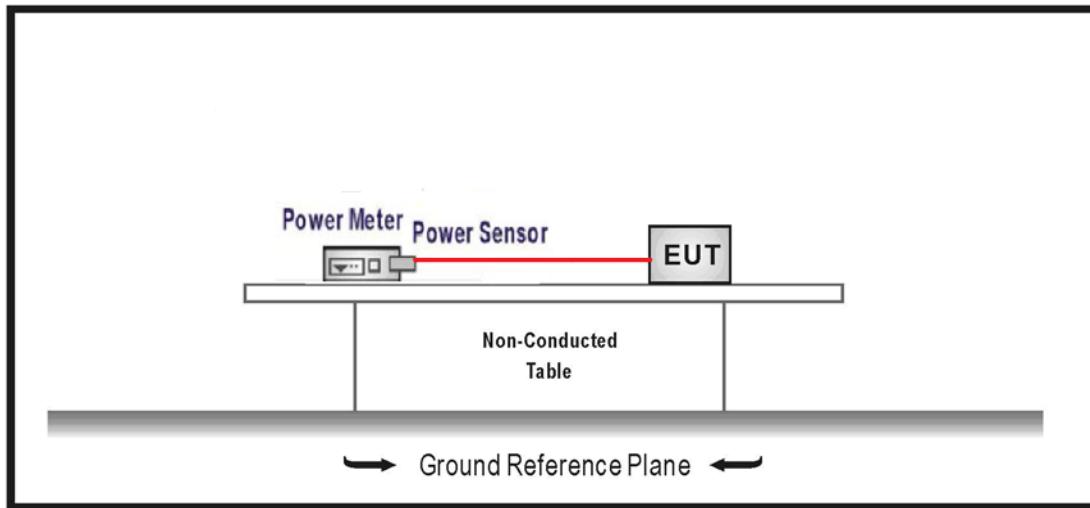
The following test equipment is used during the test:

##### Peak Power Output / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Power Meter	Agilent	N1911A	MY45101353	2017/09/29
Power Sensor	Agilent	N1921A	MY45241670	2017/09/28
USB Power Sensor	Keysight	U2021XA	MY54070005	NCR
Temperature & Humidity Chamber	WIT	TH-1S-B	1082101	2017/01/18

Note: All equipments that need to calibrate are with calibration period of 1 year.

#### 3.2. Test Setup



### **3.3. Test procedures**

The EUT was tested according to DTS test procedure section 9.1.2 of KDB558074 v03r05 measurement to FCC 47CFR 15.247 requirements.

### **3.4. Limits**

The maximum peak power shall be less 1 Watt.

### **3.5. Test Specification**

According to FCC Part 15 Subpart C Paragraph 15.247: 2015

### **3.6. Uncertainty**

The measurement uncertainty is defined as  $\pm 1.27$  dB.

### 3.7. Test Result

Product	GPS Data Recorder		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2016/10/17	Test Site	SR7

#### GFSK

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	-1.75	30	Pass
39	2441	-0.83	30	Pass
78	2480	-0.94	30	Pass

## 4. Radiated Emission

### 4.1. Test Equipment

The following test equipments are used during the test:

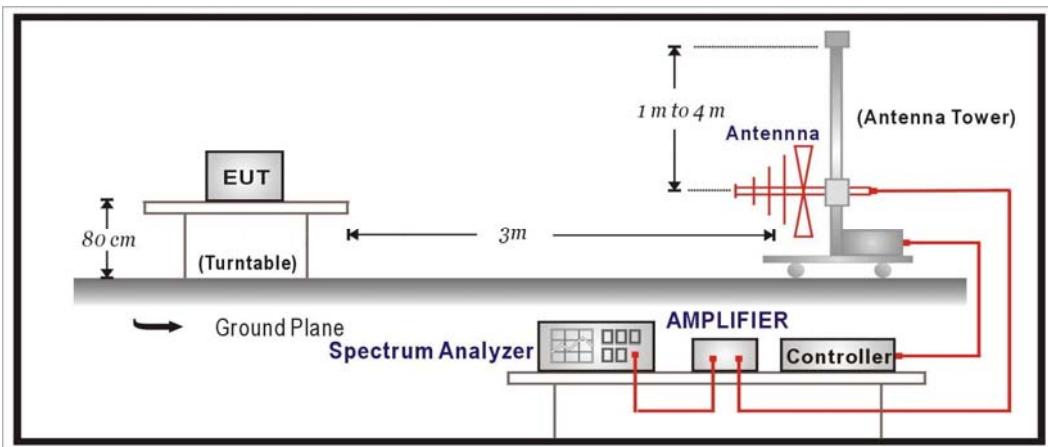
#### Radiated Emission / CB1

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Bilog Antenna	Schaffner	CBL6112B	2895	2017/08/14
Double Ridged Guide Horn Antenna	Schwarzbeck	BBHA 9120	D743	2017/01/14
Pre-Amplifier	EMCI	EMC0031835	980233	2017/01/26
Pre-Amplifier	QuieTek	AP-025C	CHM-0706049	2017/01/03
Spectrum Analyzer	Agilent	E4440A	MY46187335	2016/12/24
K Type Cable	Huber+Suhner	SF 102	25623/2	2017/01/11
Horn Antenna	Schwarzbeck	BBHA 9170	203	2017/08/28
Magnetic Loop Antenna	Teseq	HLA 6121	44287	2017/10/25

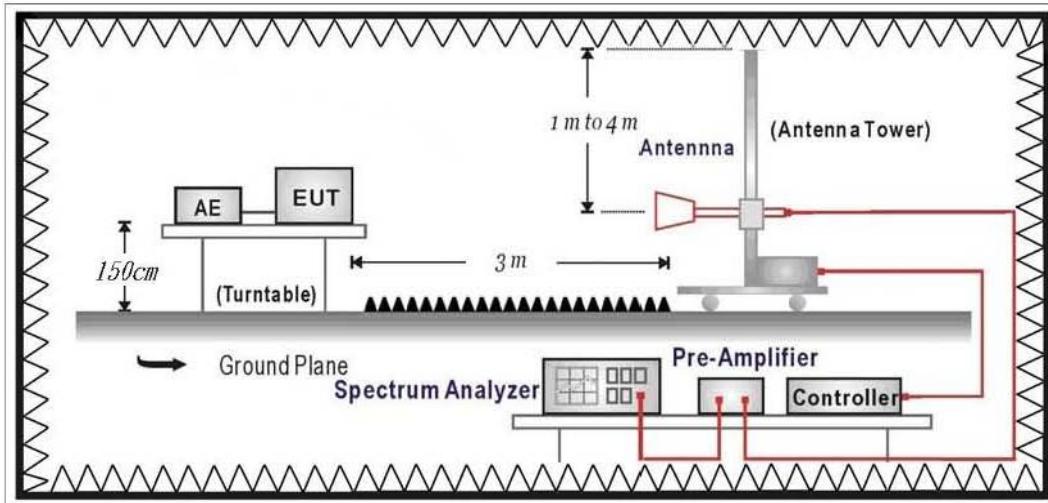
Note: All equipments that need to calibrate are with calibration period of 1 year.

## 4.2. Test Setup

Under 1GHz Test Setup:



Above 1GHz Test Setup:



## 4.3. 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	dBuV/m	dBuV/m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

Remark: E field strength (dBuV/m) =  $20 \log E$  field strength (uV/m)

#### 4.4. Test Procedure

The EUT was setup according to ANSI C63.10: 213 and tested according to FHSS test procedure of KDB558074 v03r05 for compliance to FCC 47CFR 15.247 requirements.

The EUT and its simulators are placed on a turn table which is 0.8 and 1.5 meter above ground. The turn table can rotate 360 degrees to determine the position of the maximum emission level.

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: 213 on radiated measurement.

On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a quasi-peak detector function and on any frequency or frequencies above 1000 MHz the radiated limits shown are based upon the use of measurement instrumentation employing an average detector function. When average radiated emission measurement are included emission measurement below 1000 MHz, there also is a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit. The bandwidth below 1GHz setting on the field strength meter is 120 kHz and above 1GHz is 1MHz.

#### 4.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2015

#### 4.6. Uncertainty

The measurement uncertainty

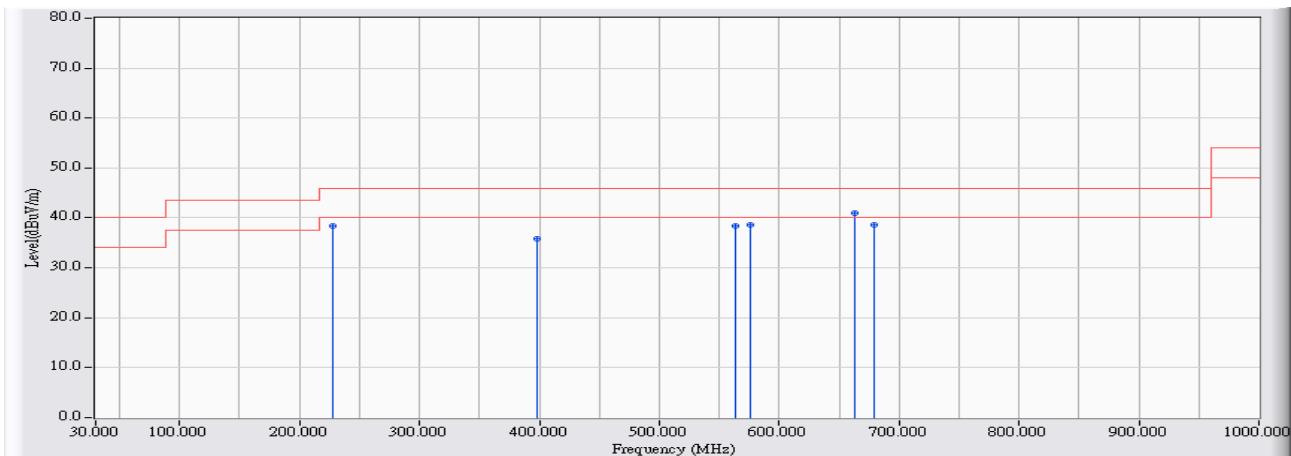
30MHz~1GHz as  $\pm 3.43\text{dB}$

1GHz~26.5Ghz as  $\pm 3.65\text{dB}$

## 4.7. Test Result

### 30MHz-1GHz Spurious

Site : CB1	Time : 2016/11/01 - 15:44
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB1_FCC_30M-1G-4_9161 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2402MHz

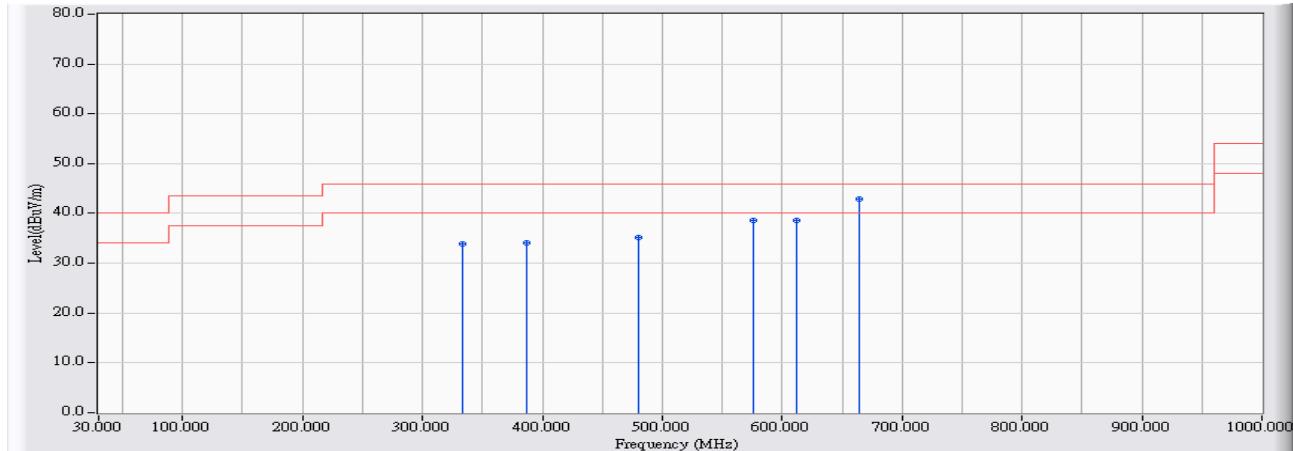


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	227.860	12.161	26.135	38.296	-7.704	46.000	QUASIPEAK
2	398.563	15.932	19.851	35.783	-10.217	46.000	QUASIPEAK
3	563.932	19.000	19.462	38.462	-7.538	46.000	QUASIPEAK
4	575.958	19.234	19.288	38.522	-7.478	46.000	QUASIPEAK
5	* 662.668	20.555	20.309	40.864	-5.136	46.000	QUASIPEAK
6	678.962	20.777	17.895	38.672	-7.328	46.000	QUASIPEAK

#### Note:

1. All Reading Levels are Quasi-Peak value.
2. “ \* ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	Time : 2016/11/01 - 15:50
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB1_FCC_30M-1G-4_9161 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2402MHz

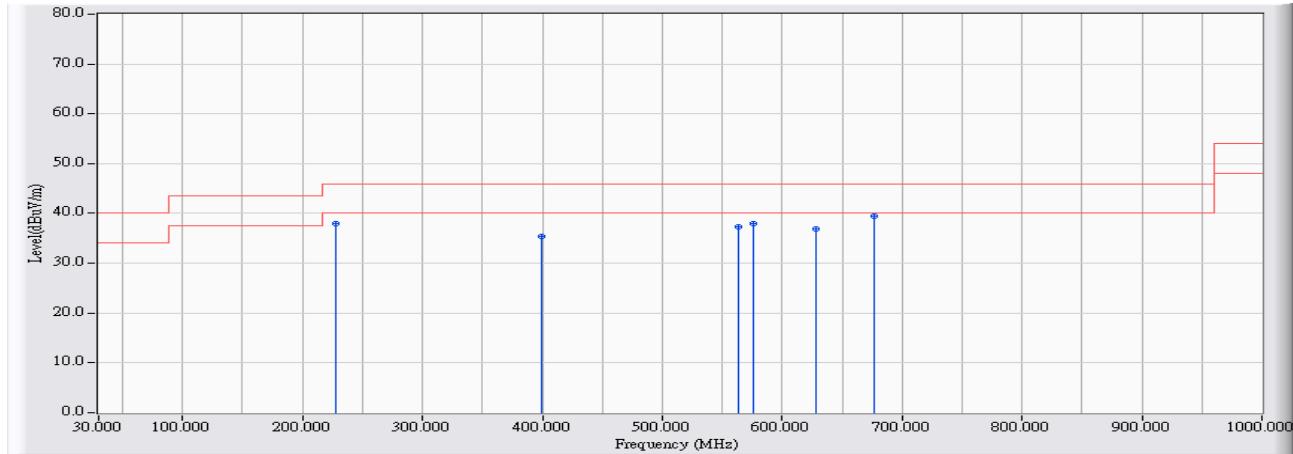


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	333.192	14.436	19.467	33.903	-12.097	46.000	QUASIPEAK
2	386.536	15.656	18.542	34.198	-11.802	46.000	QUASIPEAK
3	479.938	17.512	17.639	35.151	-10.849	46.000	QUASIPEAK
4	575.958	19.234	19.452	38.686	-7.314	46.000	QUASIPEAK
5	612.136	19.869	18.682	38.550	-7.450	46.000	QUASIPEAK
6	*	20.571	22.253	42.824	-3.176	46.000	QUASIPEAK

#### Note:

1. All Reading Levels are Quasi-Peak value.
2. “ \* ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	Time : 2016/11/01 - 15:57
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB1_FCC_30M-1G-4_9161 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2441MHz

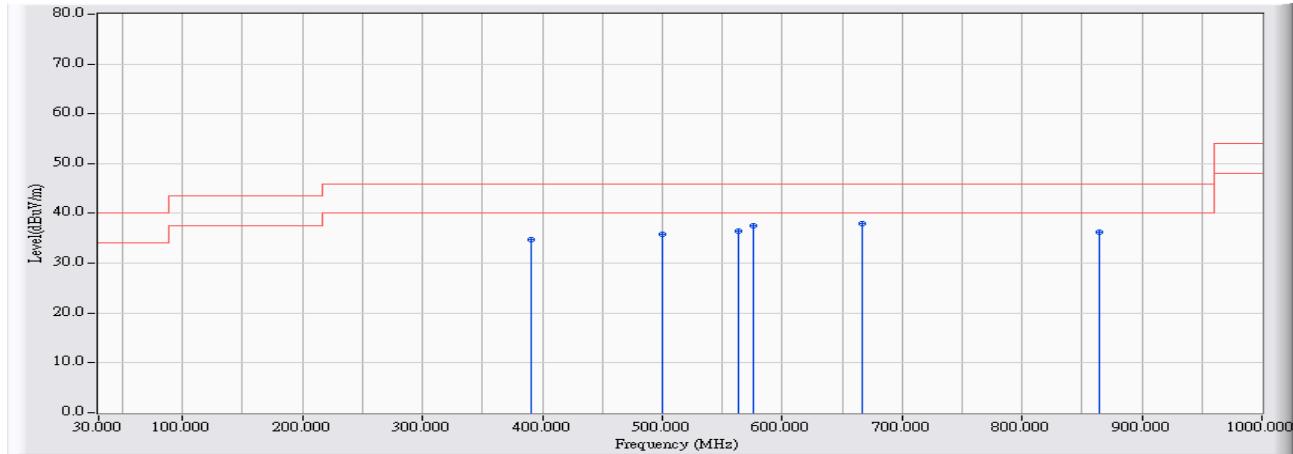


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	227.763	12.162	25.738	37.900	-8.100	46.000	QUASIPEAK
2	399.824	15.960	19.489	35.450	-10.550	46.000	QUASIPEAK
3	563.932	19.000	18.222	37.222	-8.778	46.000	QUASIPEAK
4	575.958	19.234	18.800	38.034	-7.966	46.000	QUASIPEAK
5	627.654	20.079	16.786	36.865	-9.135	46.000	QUASIPEAK
6	*	20.752	18.628	39.380	-6.620	46.000	QUASIPEAK

## Note:

1. All Reading Levels are Quasi-Peak value.
2. “ \* ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	Time : 2016/11/01 - 16:06
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB1_FCC_30M-1G-4_9161 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2441MHz

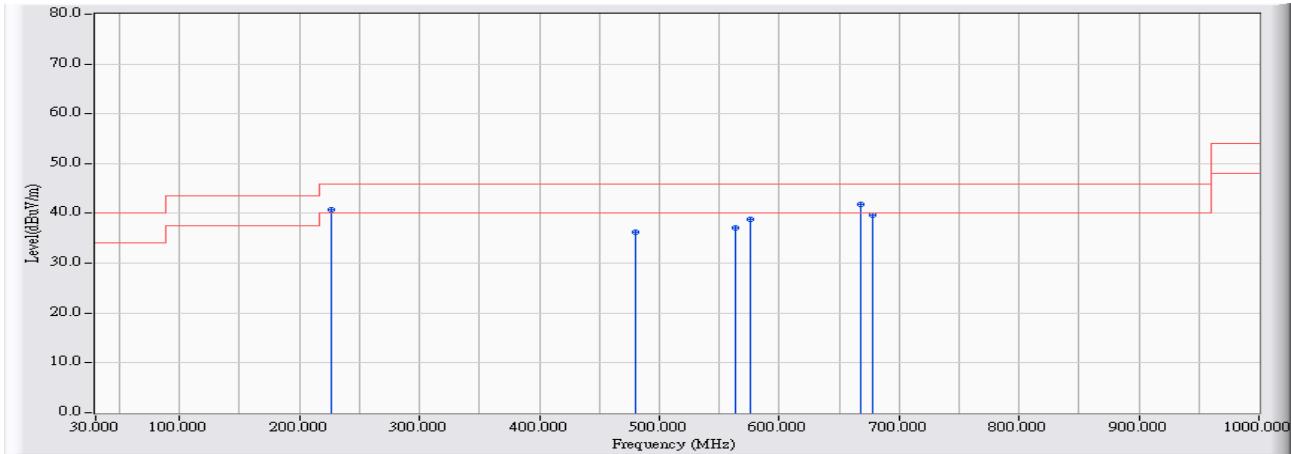


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	390.804	15.753	19.089	34.843	-11.157	46.000	QUASIPEAK
2	500.209	17.758	18.124	35.882	-10.118	46.000	QUASIPEAK
3	563.932	19.000	17.372	36.372	-9.628	46.000	QUASIPEAK
4	575.958	19.234	18.293	37.527	-8.473	46.000	QUASIPEAK
5	* 666.547	20.607	17.321	37.929	-8.071	46.000	QUASIPEAK
6	864.020	23.046	13.249	36.295	-9.705	46.000	QUASIPEAK

## Note:

1. All Reading Levels are Quasi-Peak value.
2. “ \* ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	Time : 2016/11/01 - 16:11
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB1_FCC_30M-1G-4_9161 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2480MHz

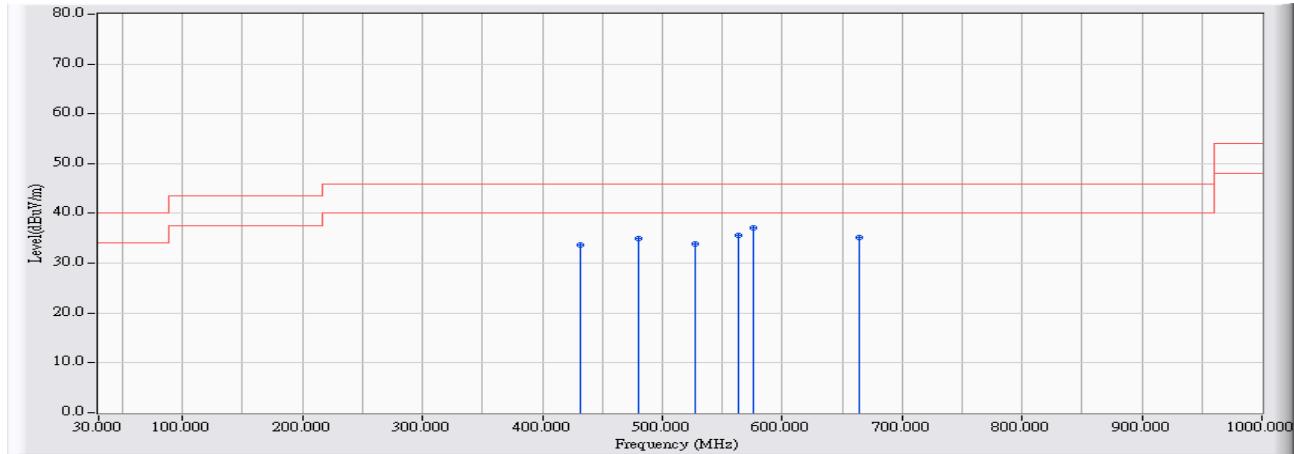


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	226.890	12.171	28.540	40.711	-5.289	46.000	QUASIPEAK
2	480.035	17.513	18.836	36.350	-9.650	46.000	QUASIPEAK
3	563.932	19.000	18.111	37.111	-8.889	46.000	QUASIPEAK
4	575.958	19.234	19.527	38.761	-7.239	46.000	QUASIPEAK
5	*	20.621	21.275	41.896	-4.104	46.000	QUASIPEAK
6	677.313	20.754	19.001	39.755	-6.245	46.000	QUASIPEAK

## Note:

1. All Reading Levels are Quasi-Peak value.
2. “ \* ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

Site : CB1	Time : 2016/11/01 - 16:16
Limit : FCC_CLASS_B_03M_QP	Margin : 6
Probe : CB1_FCC_30M-1G-4_9161 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2480MHz



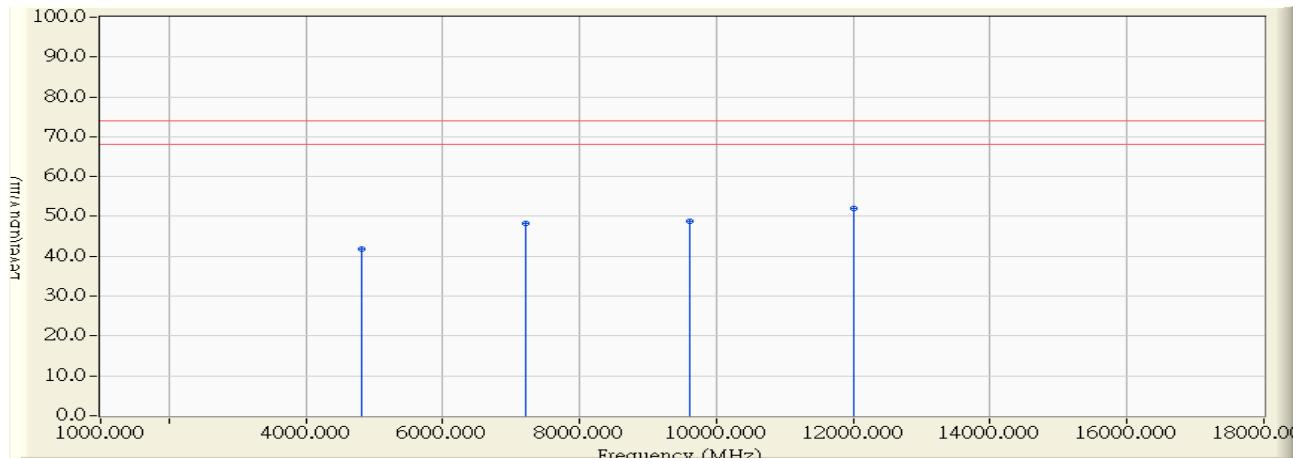
	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	431.928	16.724	16.941	33.665	-12.335	46.000	QUASIPEAK
2	479.938	17.512	17.507	35.019	-10.981	46.000	QUASIPEAK
3	527.948	18.298	15.531	33.829	-12.171	46.000	QUASIPEAK
4	563.932	19.000	16.601	35.601	-10.399	46.000	QUASIPEAK
5	*	19.234	17.831	37.065	-8.935	46.000	QUASIPEAK
6	664.123	20.575	14.685	35.260	-10.740	46.000	QUASIPEAK

Note:

1. All Reading Levels are Quasi-Peak value.
2. “ \* ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor

**Harmonic & Spurious:**

Site : CB1	Time : 2016/10/20 - 13:49
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2402MHz

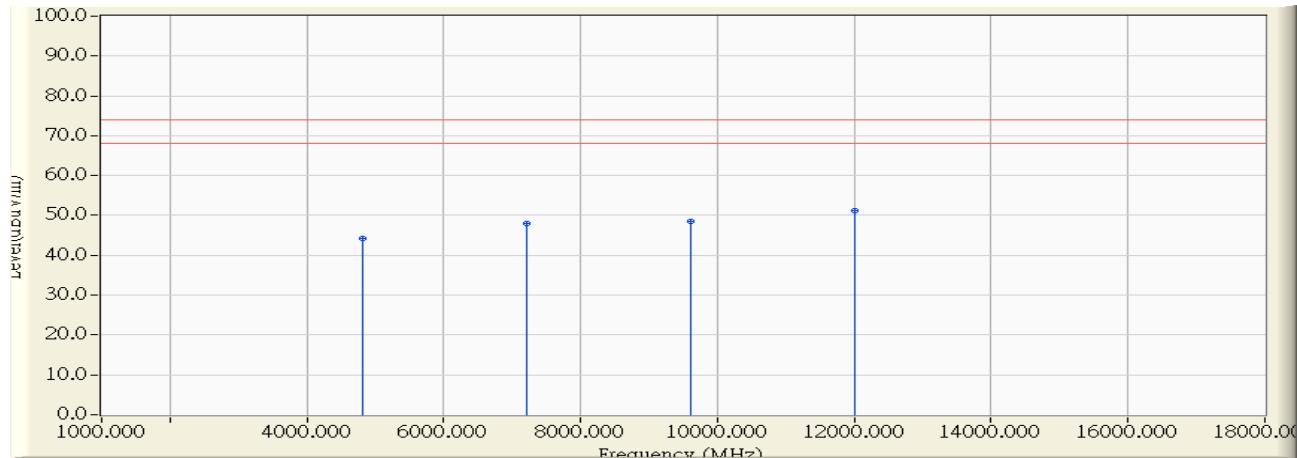


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	-1.624	43.570	41.946	-32.054	74.000	PEAK
2		7206.000	6.917	41.390	48.307	-25.693	74.000	PEAK
3		9608.000	8.452	40.330	48.782	-25.218	74.000	PEAK
4	*	12010.000	11.618	40.450	52.067	-21.933	74.000	PEAK

**Note:**

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	Time : 2016/10/20 - 14:02
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2402MHz

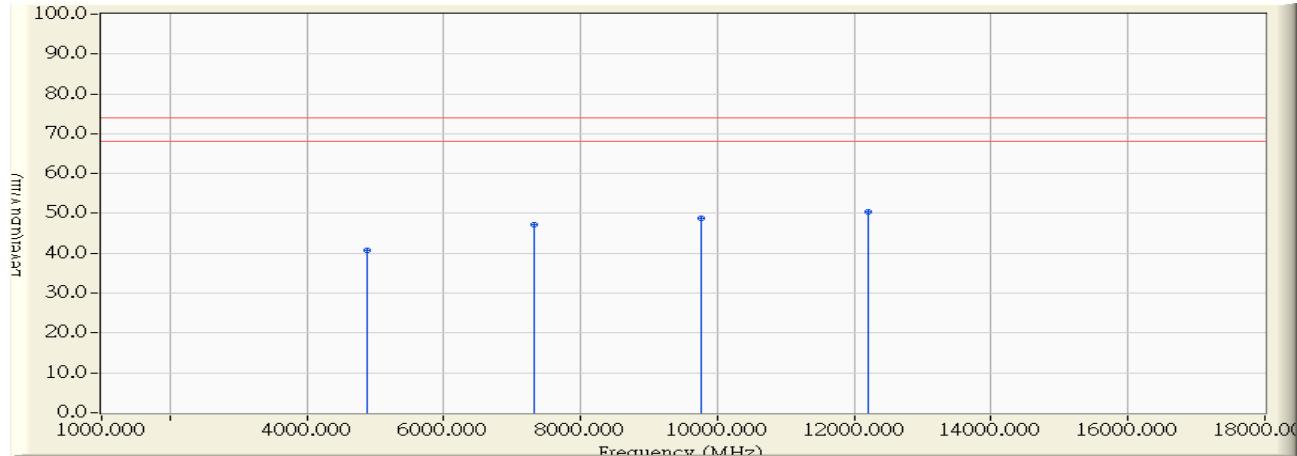


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type	
1	4804.000	-0.677	44.850	44.174	-29.826	74.000	PEAK	
2	7206.000	6.417	41.620	48.037	-25.963	74.000	PEAK	
3	9608.000	8.014	40.590	48.604	-25.396	74.000	PEAK	
4	*	12010.000	11.145	40.120	51.264	-22.736	74.000	PEAK

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	Time : 2016/10/20 - 14:12
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2441MHz

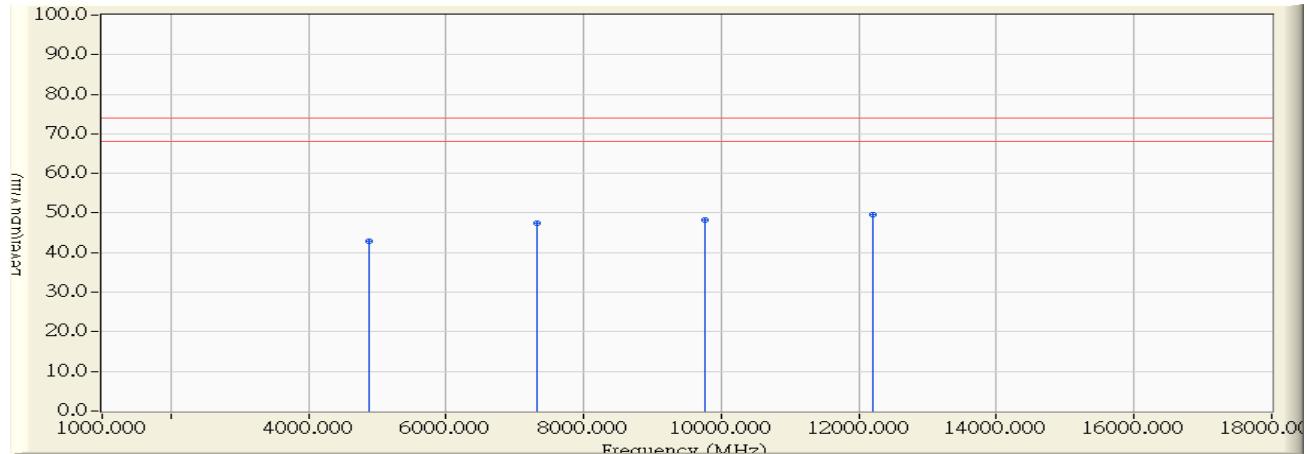


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4882.000	-1.434	42.070	40.636	-33.364	74.000	PEAK
2	7323.000	7.170	40.110	47.280	-26.720	74.000	PEAK
3	9764.000	9.305	39.610	48.916	-25.084	74.000	PEAK
4	*	11.431	38.980	50.410	-23.590	74.000	PEAK

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	Time : 2016/10/20 - 14:25
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2441MHz

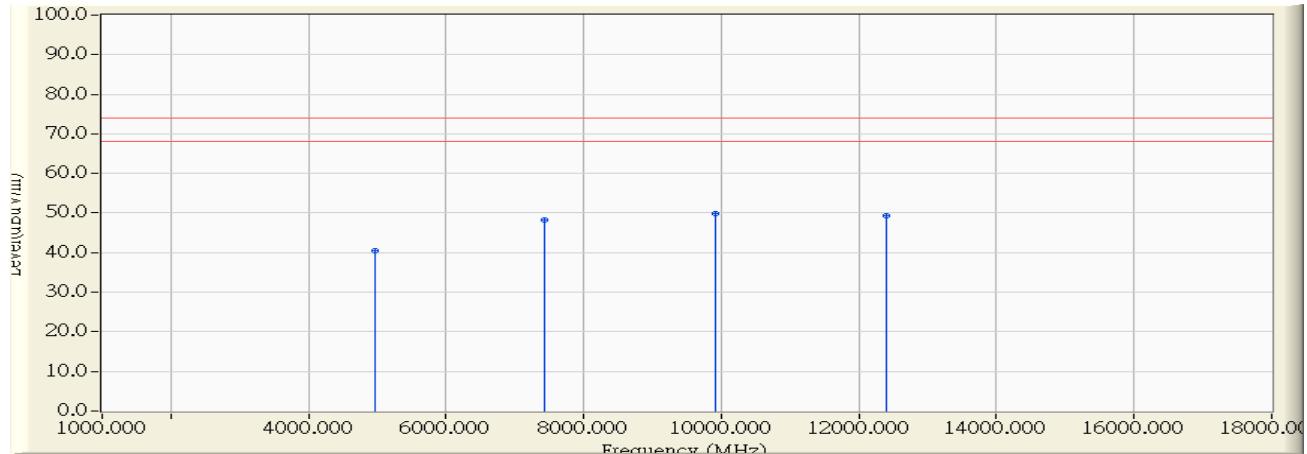


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4882.000	-0.681	43.600	42.919	-31.081	74.000	PEAK
2	7323.000	6.670	40.740	47.410	-26.590	74.000	PEAK
3	9764.000	8.633	39.610	48.244	-25.756	74.000	PEAK
4	*	11.153	38.520	49.672	-24.328	74.000	PEAK

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	Time : 2016/10/20 - 14:31
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2480MHz

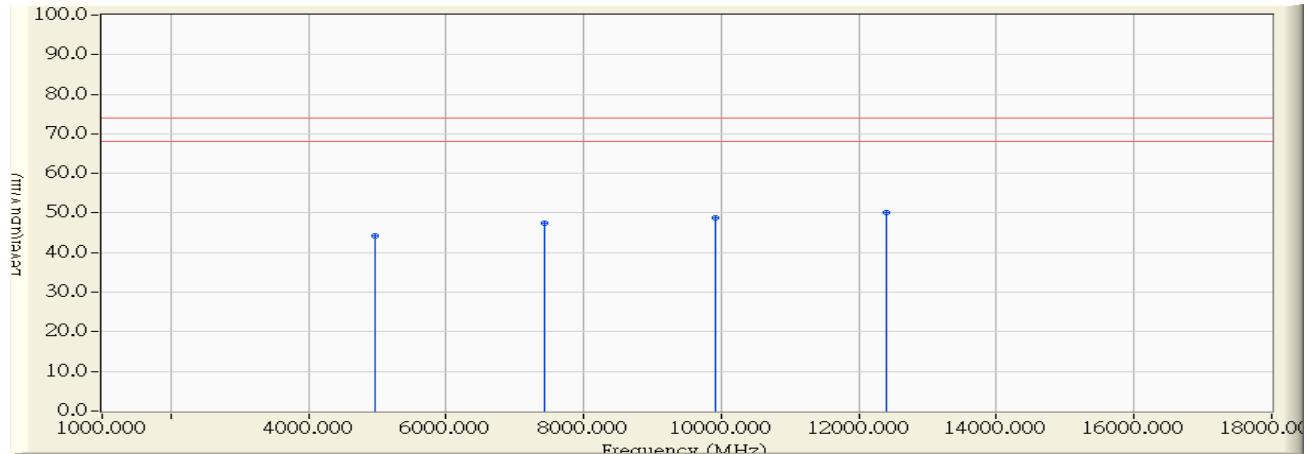


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4960.000	-1.243	41.850	40.607	-33.393	74.000	PEAK
2	7440.000	7.424	40.780	48.203	-25.797	74.000	PEAK
3	*	10.160	39.730	49.890	-24.110	74.000	PEAK
4	12400.000	11.245	38.170	49.414	-24.586	74.000	PEAK

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

Site : CB1	Time : 2016/10/20 - 14:35
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2480MHz



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	4960.000	-0.686	44.880	44.194	-29.806	74.000	PEAK
2	7440.000	6.924	40.530	47.453	-26.547	74.000	PEAK
3	9920.000	9.254	39.460	48.714	-25.286	74.000	PEAK
4	* 12400.000	11.162	38.890	50.051	-23.949	74.000	PEAK

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The Emission above 13GHz were not included is because their levels are too low.

## 5. RF antenna conducted test

### 5.1. Test Equipment

The following test equipment is used during the test:

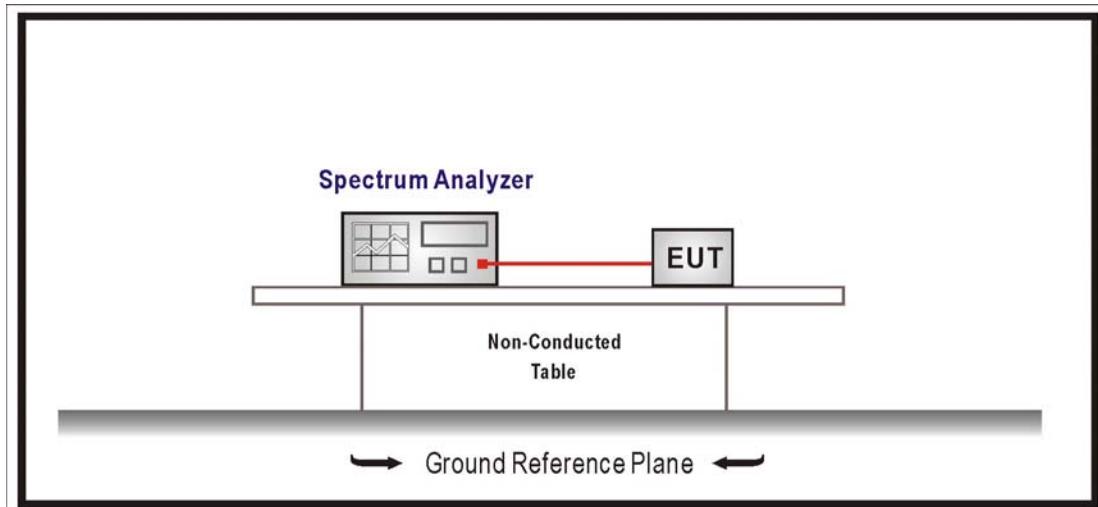
RF antenna conducted test / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/08/08
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/05
Signal Analyzer	R&S	FSV7	101650	2016/11/30

Note: All equipments that need to calibrate are with calibration period of 1 year.

### 5.2. Test Setup

RF Conducted Measurement:



### 5.3. Limits

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 an RF conducted or 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)).

### 5.4. Test Procedure

The EUT was setup according to ANSI C63.10: 213 and tested according to DTS test procedure section 11.2 of KDB558074 v03r05 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 100 kHz, Set VBW> RBW, scan up through 10th harmonic.

### 5.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2015

### 5.6. Uncertainty

Conducted is defined as  $\pm 1.27\text{dB}$

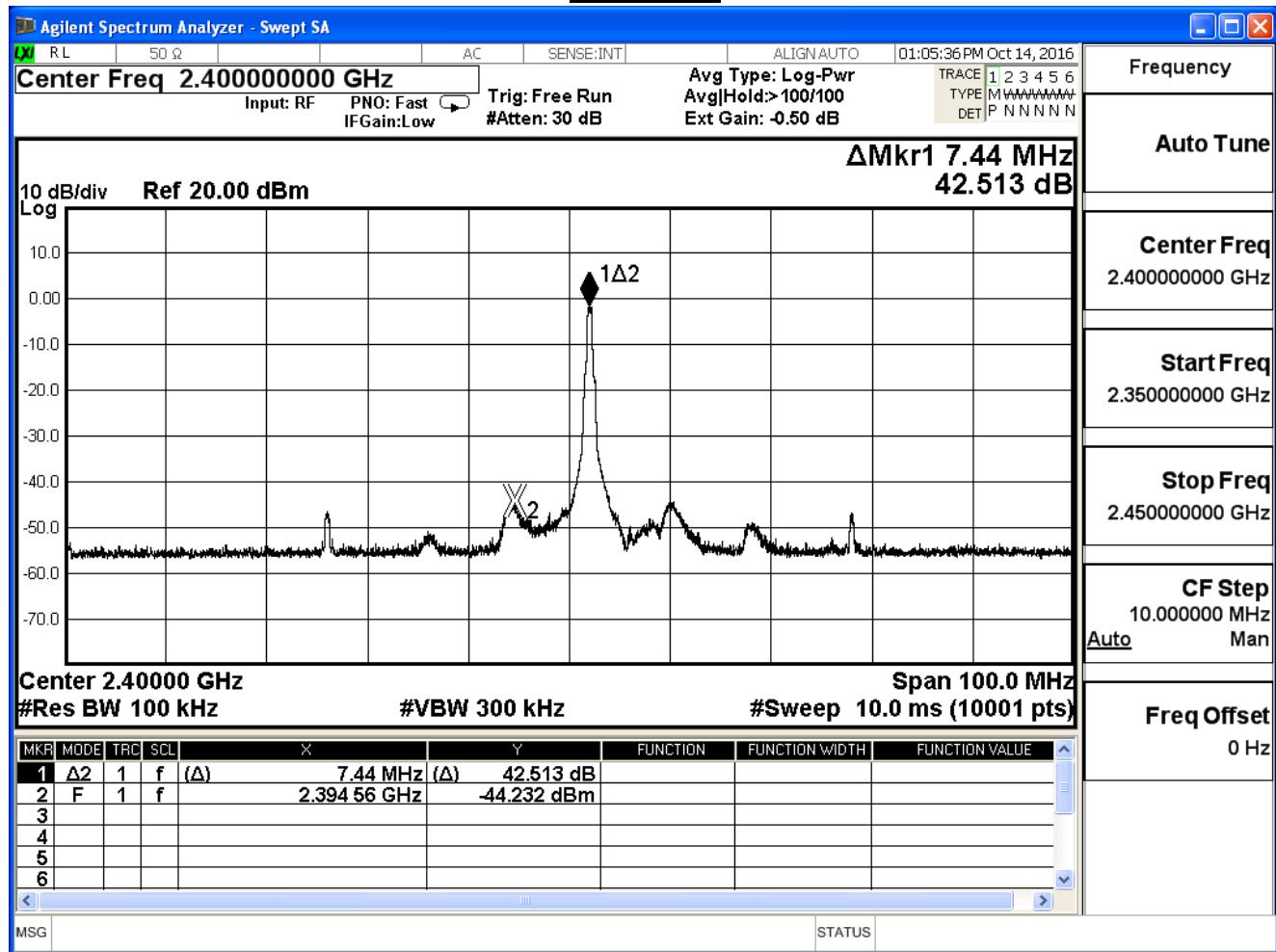
## 5.7. Test Result

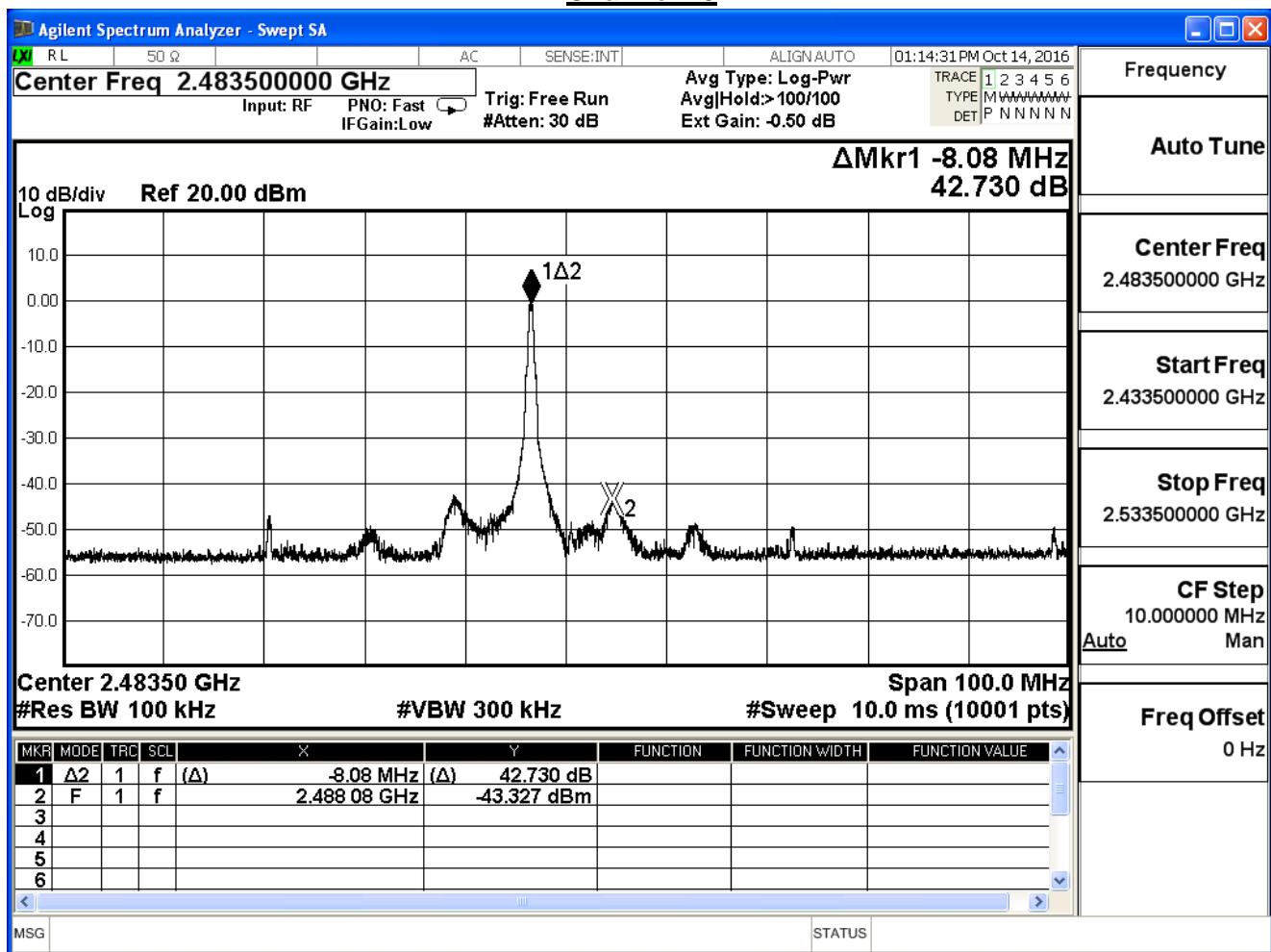
Product	GPS Data Recorder		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2016/10/14	Test Site	SR7

GFSK

Channel	Frequency (MHz)	Measure Level (dBc)	Limit (dBc)	Result
00	2402	42.513	≥20	Pass
78	2480	42.730	≥20	Pass

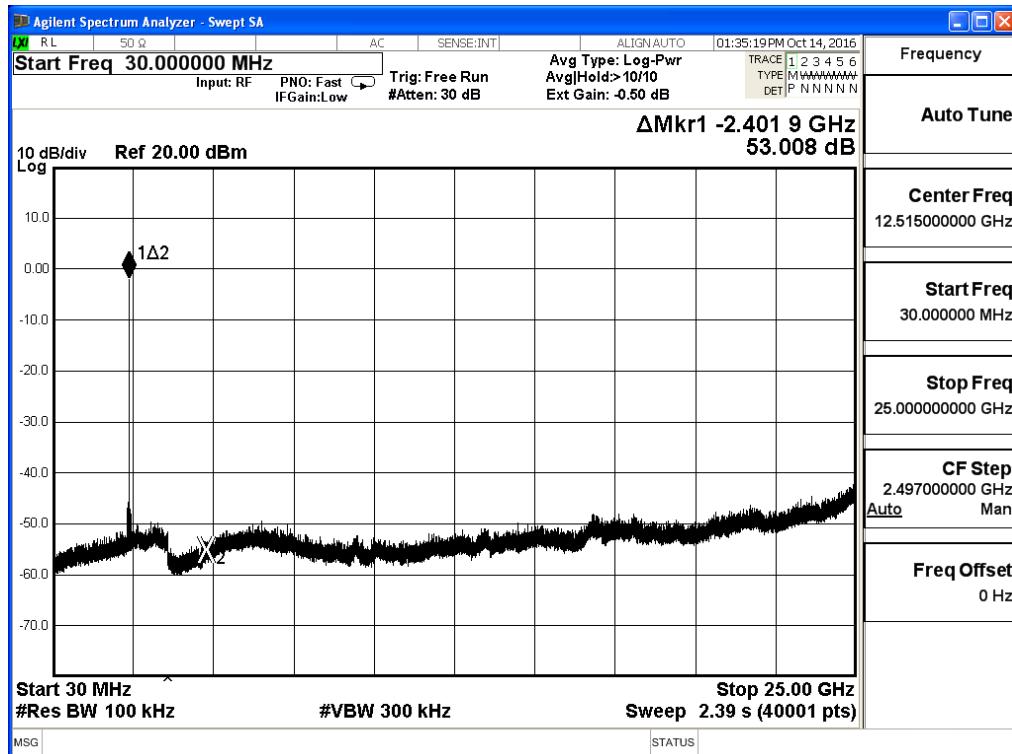
### Channel 00



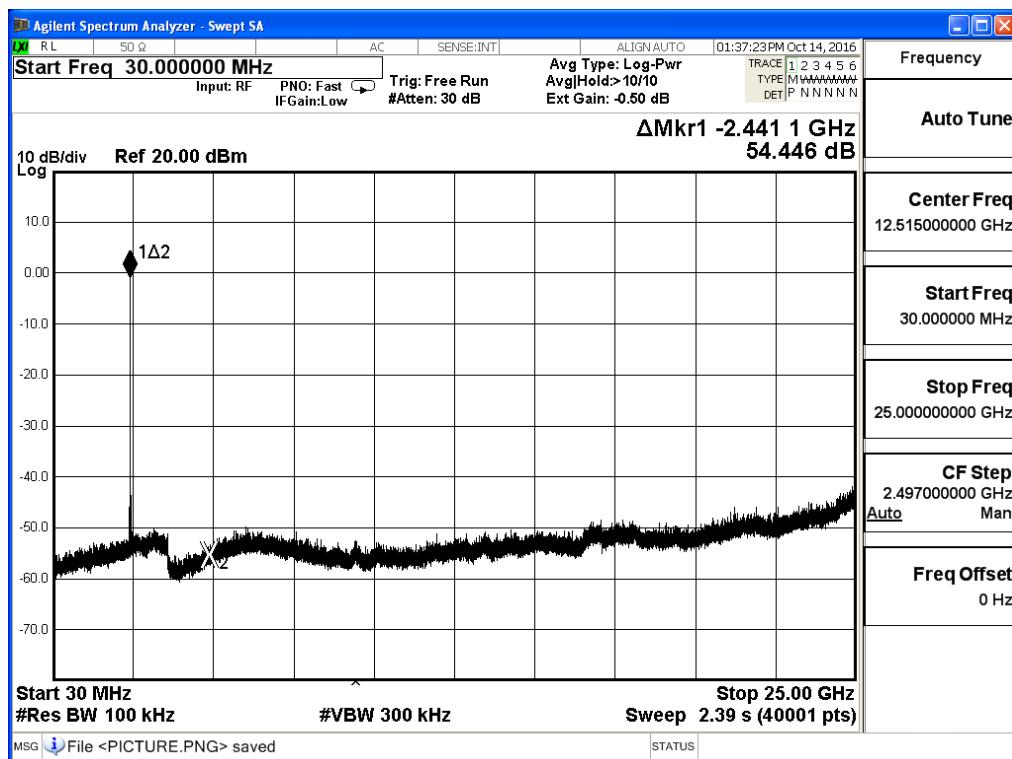
Channel 78

Product	GPS Data Recorder		
Test Item	RF antenna conducted test		
Test Mode	Mode 1: Transmit		
Date of Test	2016/10/14	Test Site	SR7

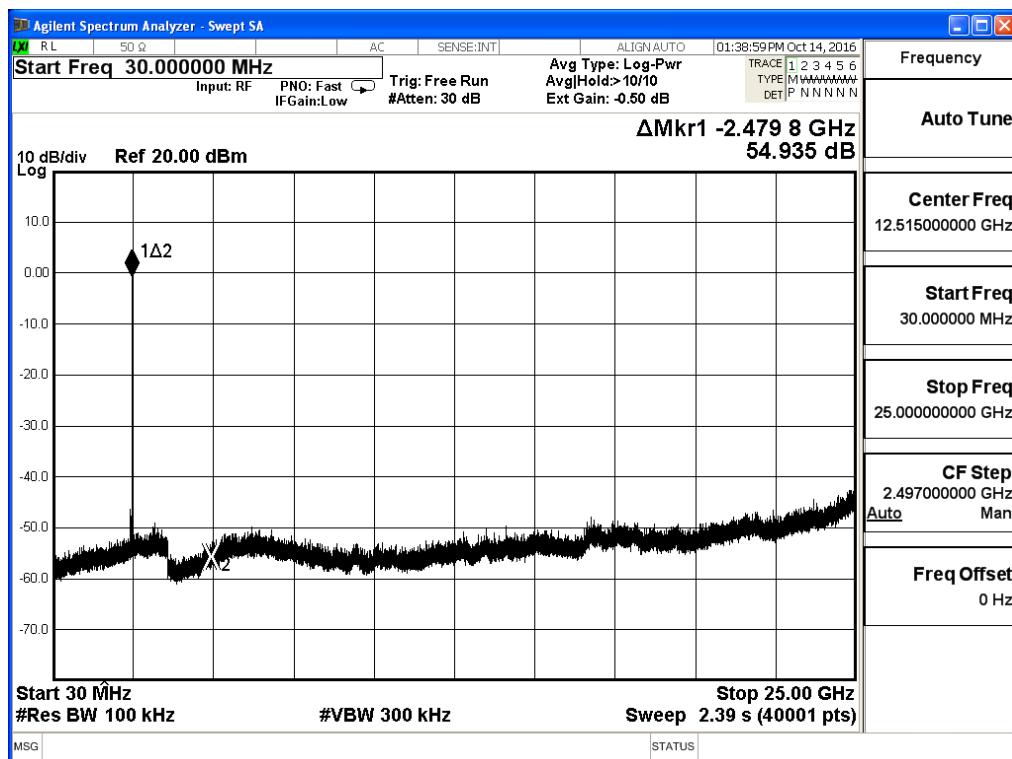
## Channel 00 (30MHz-25GHz)- GFSK



## Channel 39 (30MHz-25GHz)- GFSK



## Channel 78 (30MHz-25GHz)- GFSK



## 6. Band Edge

### 6.1. Test Equipment

The following test equipments are used during the test:

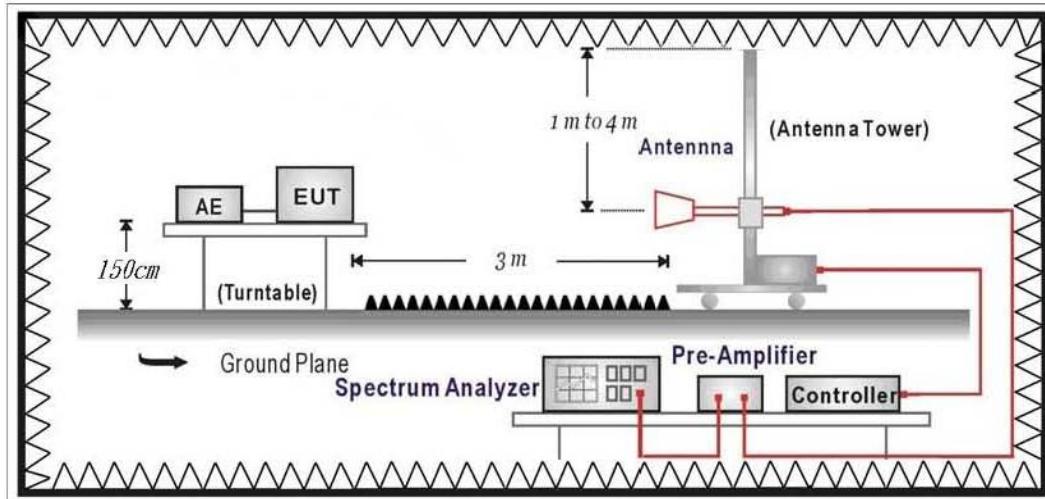
#### Band Edge / CB1

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Double Ridged Guide Horn Antenna	Schwarzbeck	BBHA 9120	D743	2017/01/14
Spectrum Analyzer	Agilent	E4440A	MY46187335	2016/12/24
k Type Cable	Huber+Suhner	SF 102	25623/2	2017/01/11
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/05

Note: All equipments that need to calibrate are with calibration period of 1 year.

### 6.2. Test Setup

RF Radiated Measurement:



### 6.3. 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.

### 6.4. Test Procedure

The EUT was setup according to ANSI C63.10: 213 and tested according to DTS test procedure of KDB558074 v03r05 for compliance to FCC 47CFR 15.247 requirements.

The EUT and its simulators are placed on a turn table which is 1.5 meter above ground. The turn table can rotate 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: 213 on radiated measurement.

### 6.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2015

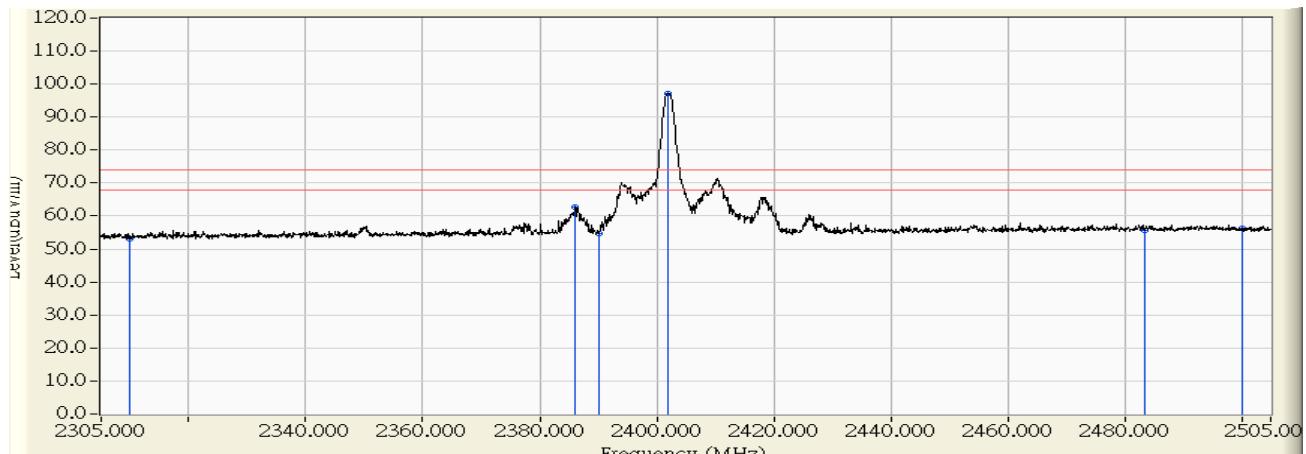
### 6.6. Uncertainty

The measurement uncertainty

± 3.9 dB above 1GHz

## 6.7. Test Result

Site : CB1	Time : 2016/10/20 - 10:45
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2402MHz

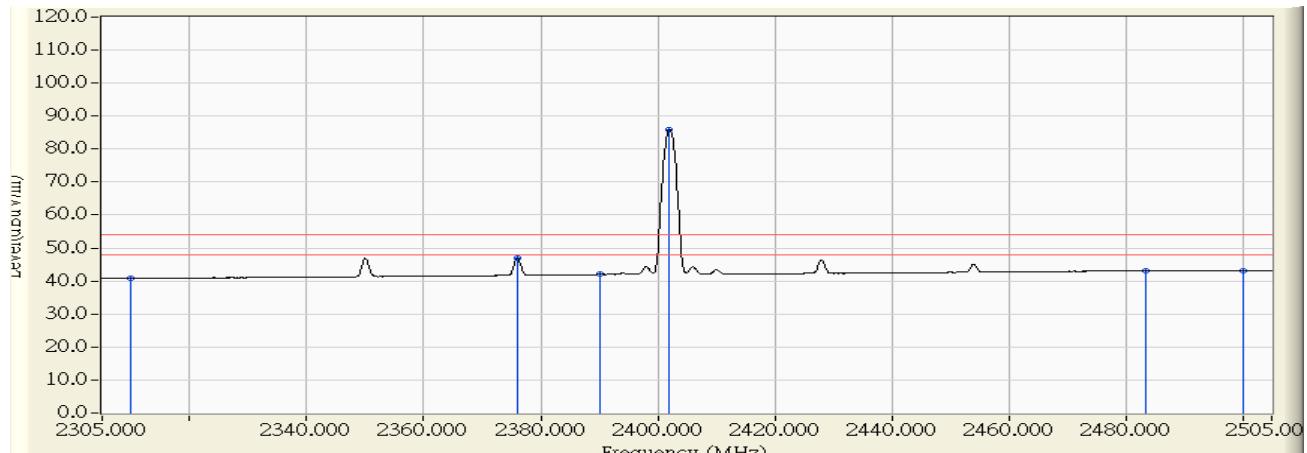


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	28.899	24.061	52.959	-21.041	74.000	PEAK
2	2386.000	29.725	33.077	62.802	-11.198	74.000	PEAK
3	2390.000	29.768	24.855	54.623	-19.377	74.000	PEAK
4	* 2401.900	29.897	67.145	97.042	23.042	74.000	PEAK
5	2483.500	30.738	25.075	55.814	-18.186	74.000	PEAK
6	2500.000	30.740	25.669	56.408	-17.592	74.000	PEAK

### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 10:46
Limit : FCC_SpartC_15.209_03M_AV	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2402MHz

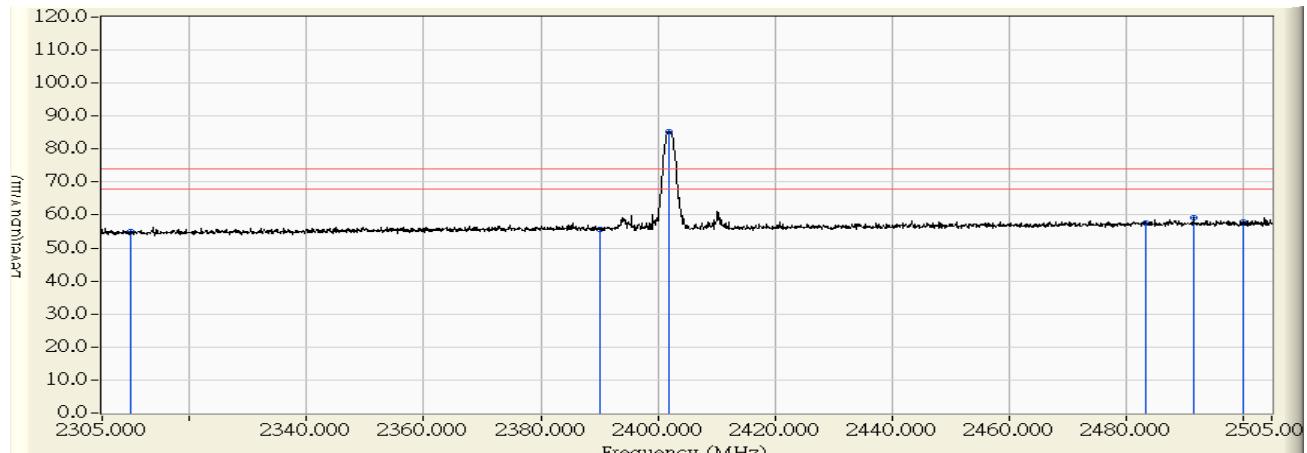


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	28.899	11.914	40.812	-13.188	54.000	AVERAGE
2	2375.900	29.615	17.241	46.856	-7.144	54.000	AVERAGE
3	2390.000	29.768	12.277	42.045	-11.955	54.000	AVERAGE
4	* 2402.000	29.898	56.137	86.036	32.036	54.000	AVERAGE
5	2483.500	30.738	12.336	43.075	-10.925	54.000	AVERAGE
6	2500.000	30.740	12.333	43.072	-10.928	54.000	AVERAGE

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 10:52
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2402MHz

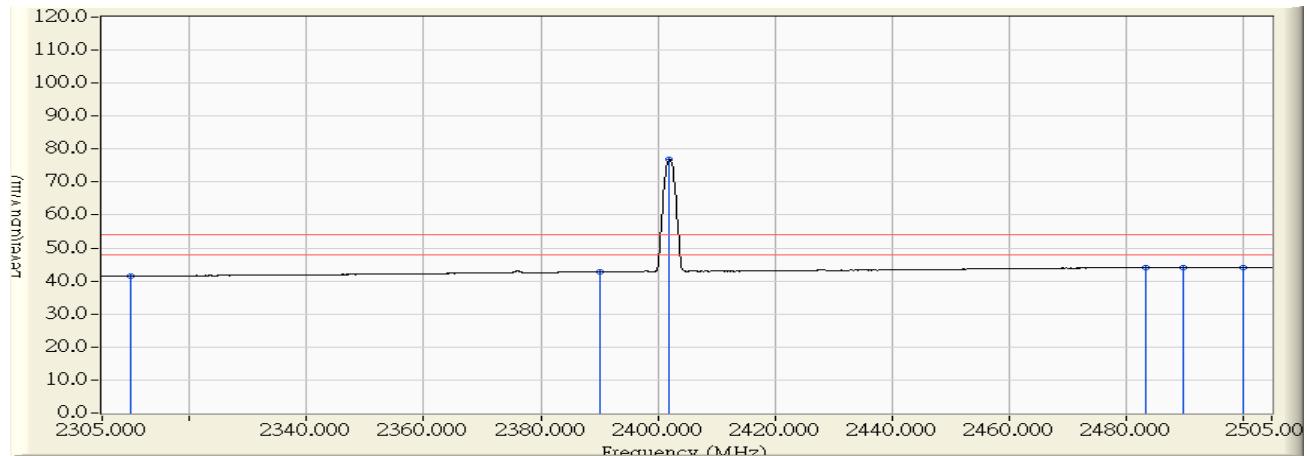


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	29.553	25.580	55.132	-18.868	74.000	PEAK
2	2390.000	30.582	25.129	55.711	-18.289	74.000	PEAK
3	* 2402.000	30.736	54.559	85.296	11.296	74.000	PEAK
4	2483.500	31.739	25.761	57.501	-16.499	74.000	PEAK
5	2491.600	31.762	27.452	59.214	-14.786	74.000	PEAK
6	2500.000	31.774	26.158	57.931	-16.069	74.000	PEAK

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 10:53
Limit : FCC_SpartC_15.209_03M_AV	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2402MHz



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	29.553	11.905	41.457	-12.543	54.000	AVERAGE
2	2390.000	30.582	12.176	42.758	-11.242	54.000	AVERAGE
3	* 2402.000	30.736	46.190	76.927	22.927	54.000	AVERAGE
4	2483.500	31.739	12.469	44.209	-9.791	54.000	AVERAGE
5	2489.800	31.757	12.365	44.122	-9.878	54.000	AVERAGE
6	2500.000	31.774	12.343	44.116	-9.884	54.000	AVERAGE

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 10:59
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2441MHz



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	28.899	24.781	53.679	-20.321	74.000	PEAK
2	2389.000	29.757	28.041	57.798	-16.202	74.000	PEAK
3	2390.000	29.768	24.853	54.621	-19.379	74.000	PEAK
4	* 2441.100	30.324	68.025	98.349	24.349	74.000	PEAK
5	2483.500	30.738	24.864	55.603	-18.397	74.000	PEAK
6	2492.100	30.745	27.004	57.749	-16.251	74.000	PEAK
7	2500.000	30.740	25.428	56.167	-17.833	74.000	PEAK

## Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 11:01
Limit : FCC_SpartC_15.209_03M_AV	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2441MHz

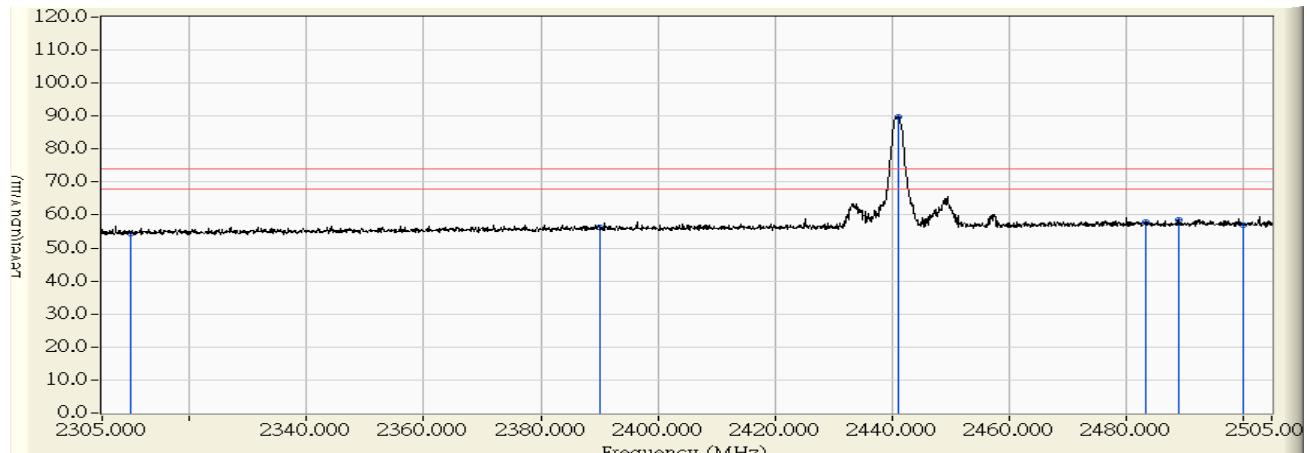


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	28.899	11.909	40.807	-13.193	54.000	AVERAGE
2	2388.900	29.756	13.508	43.264	-10.736	54.000	AVERAGE
3	2390.000	29.768	12.313	42.081	-11.919	54.000	AVERAGE
4	* 2441.000	30.323	56.816	87.139	33.139	54.000	AVERAGE
5	2483.500	30.738	12.373	43.112	-10.888	54.000	AVERAGE
6	2493.100	30.746	15.089	45.835	-8.165	54.000	AVERAGE
7	2500.000	30.740	12.360	43.099	-10.901	54.000	AVERAGE

## Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 11:06
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2441MHz



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	29.553	24.925	54.477	-19.523	74.000	PEAK
2	2390.000	30.582	25.744	56.326	-17.674	74.000	PEAK
3	* 2441.100	31.240	58.405	89.645	15.645	74.000	PEAK
4	2483.500	31.739	26.016	57.756	-16.244	74.000	PEAK
5	2489.000	31.755	26.722	58.477	-15.523	74.000	PEAK
6	2500.000	31.774	25.021	56.794	-17.206	74.000	PEAK

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 11:06
Limit : FCC_SpartC_15.209_03M_AV	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2441MHz

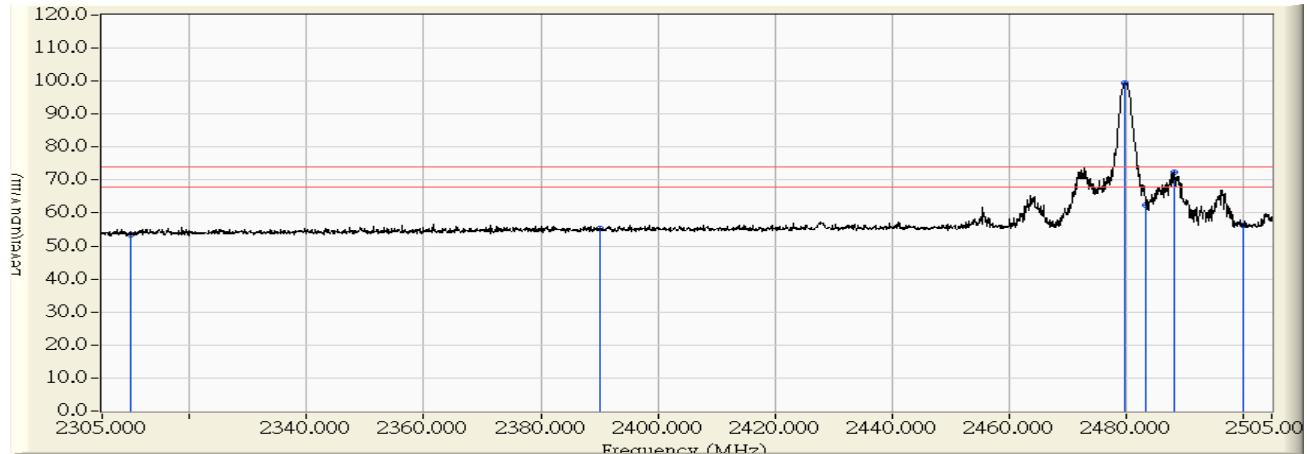


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	29.553	11.946	41.498	-12.502	54.000	AVERAGE
2	2390.000	30.582	12.155	42.737	-11.263	54.000	AVERAGE
3	* 2441.000	31.239	49.303	80.542	26.542	54.000	AVERAGE
4	2483.500	31.739	12.320	44.060	-9.940	54.000	AVERAGE
5	2492.900	31.766	12.609	44.375	-9.625	54.000	AVERAGE
6	2500.000	31.774	12.324	44.097	-9.903	54.000	AVERAGE

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 11:11
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2480MHz



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	28.899	24.662	53.560	-20.440	74.000	PEAK
2	2390.000	29.768	25.519	55.287	-18.713	74.000	PEAK
3	* 2479.900	30.736	68.575	99.311	25.311	74.000	PEAK
4	2483.500	30.738	31.578	62.317	-11.683	74.000	PEAK
5	2488.300	30.743	41.540	72.282	-1.718	74.000	PEAK
6	2500.000	30.740	25.605	56.344	-17.656	74.000	PEAK

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 11:12
Limit : FCC_SpartC_15.209_03M_AV	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - HORIZONTAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2480MHz

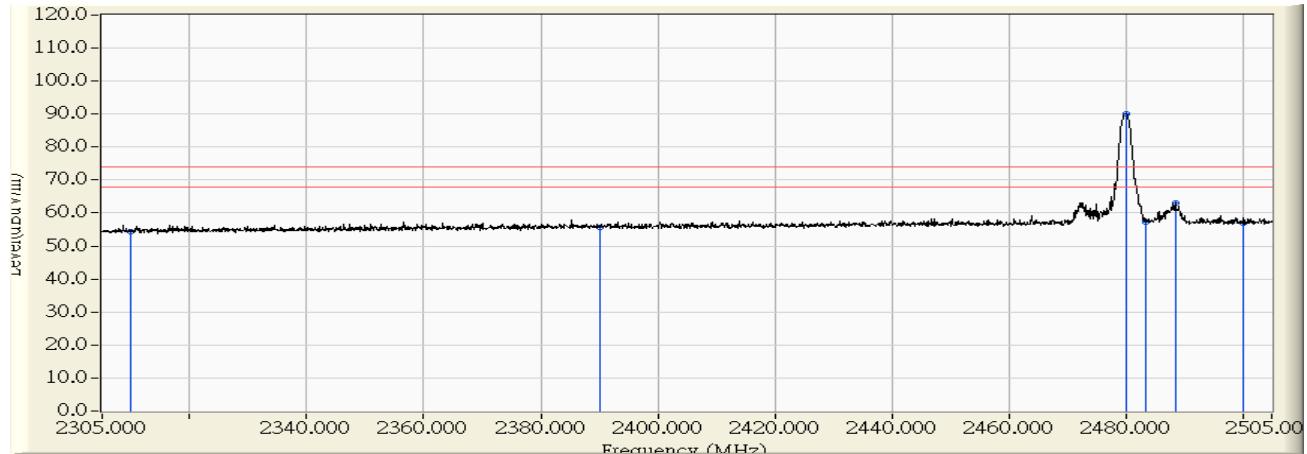


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	28.899	11.974	40.872	-13.128	54.000	AVERAGE
2	2390.000	29.768	12.157	41.925	-12.075	54.000	AVERAGE
3	* 2480.100	30.736	57.432	88.168	34.168	54.000	AVERAGE
4	2483.500	30.738	14.469	45.208	-8.792	54.000	AVERAGE
5	2488.000	30.742	13.535	44.277	-9.723	54.000	AVERAGE
6	2500.000	30.740	12.403	43.142	-10.858	54.000	AVERAGE

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 11:20
Limit : FCC_SpartC_15.209_03M_PK	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2480MHz



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	29.553	24.938	54.490	-19.510	74.000	PEAK
2	2390.000	30.582	25.235	55.817	-18.183	74.000	PEAK
3	* 2480.100	31.730	58.351	90.082	16.082	74.000	PEAK
4	2483.500	31.739	25.612	57.352	-16.648	74.000	PEAK
5	2488.600	31.754	31.384	63.138	-10.862	74.000	PEAK
6	2500.000	31.774	25.150	56.923	-17.077	74.000	PEAK

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Site : CB1	Time : 2016/10/20 - 11:20
Limit : FCC_SpartC_15.209_03M_AV	Margin : 6
Probe : CB1_FCC_EFS_1-18G_H2 - VERTICAL	Power : DC 5V (Power by Charger)
EUT : GPS Data Recorder	Note : 2480MHz



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	2310.000	29.553	11.981	41.533	-12.467	54.000	AVERAGE
2	2390.000	30.582	12.218	42.800	-11.200	54.000	AVERAGE
3	* 2480.000	31.730	48.556	80.286	26.286	54.000	AVERAGE
4	2483.500	31.739	12.565	44.305	-9.695	54.000	AVERAGE
5	2488.300	31.753	12.535	44.288	-9.712	54.000	AVERAGE
6	2500.000	31.774	12.343	44.116	-9.884	54.000	AVERAGE

#### Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 1MHz, 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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

## 7. Number of hopping frequency

### 7.1. Test Equipment

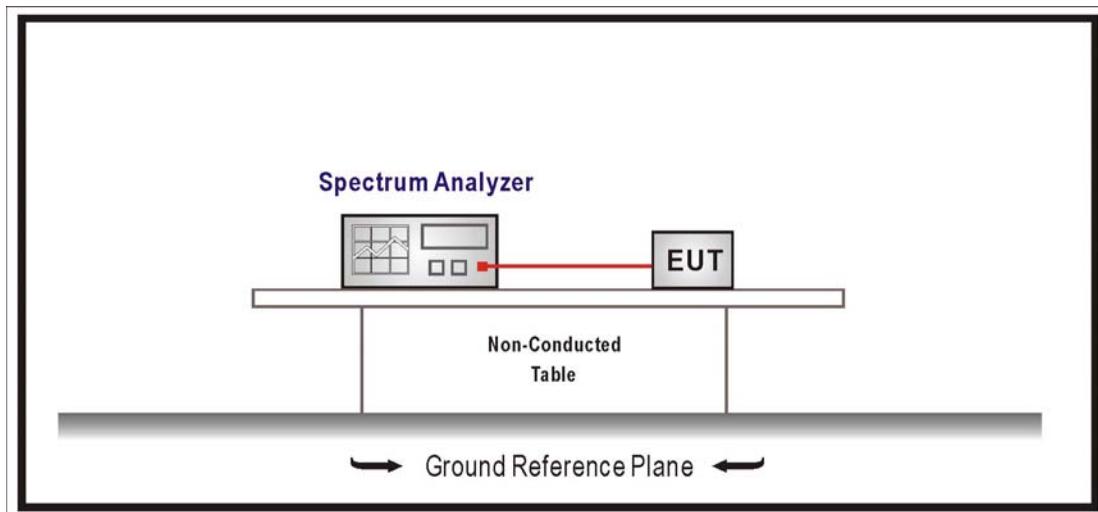
The following test equipment is used during the test:

Number of hopping frequency / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/08/08
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/05
Signal Analyzer	R&S	FSV7	101650	2016/11/30

Note: All equipments that need to calibrate are with calibration period of 1 year.

### 7.2. Test Setup



### 7.3. Limits

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

For frequency hopping systems operating in the 2400-2483.5 MHz bands, which use fewer than 75 hopping frequencies, may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels are used.

For frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies.

### 7.4. Test Procedures

The EUT was setup according to ANSI C63.10: 2013 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements ,

Span = the frequency band of operation ,RBW  $\geq$  1% of the span, VBW  $\geq$  RBW,

Sweep = auto, Detector function = peak, Trace = max hold.

### 7.5. Test Specification

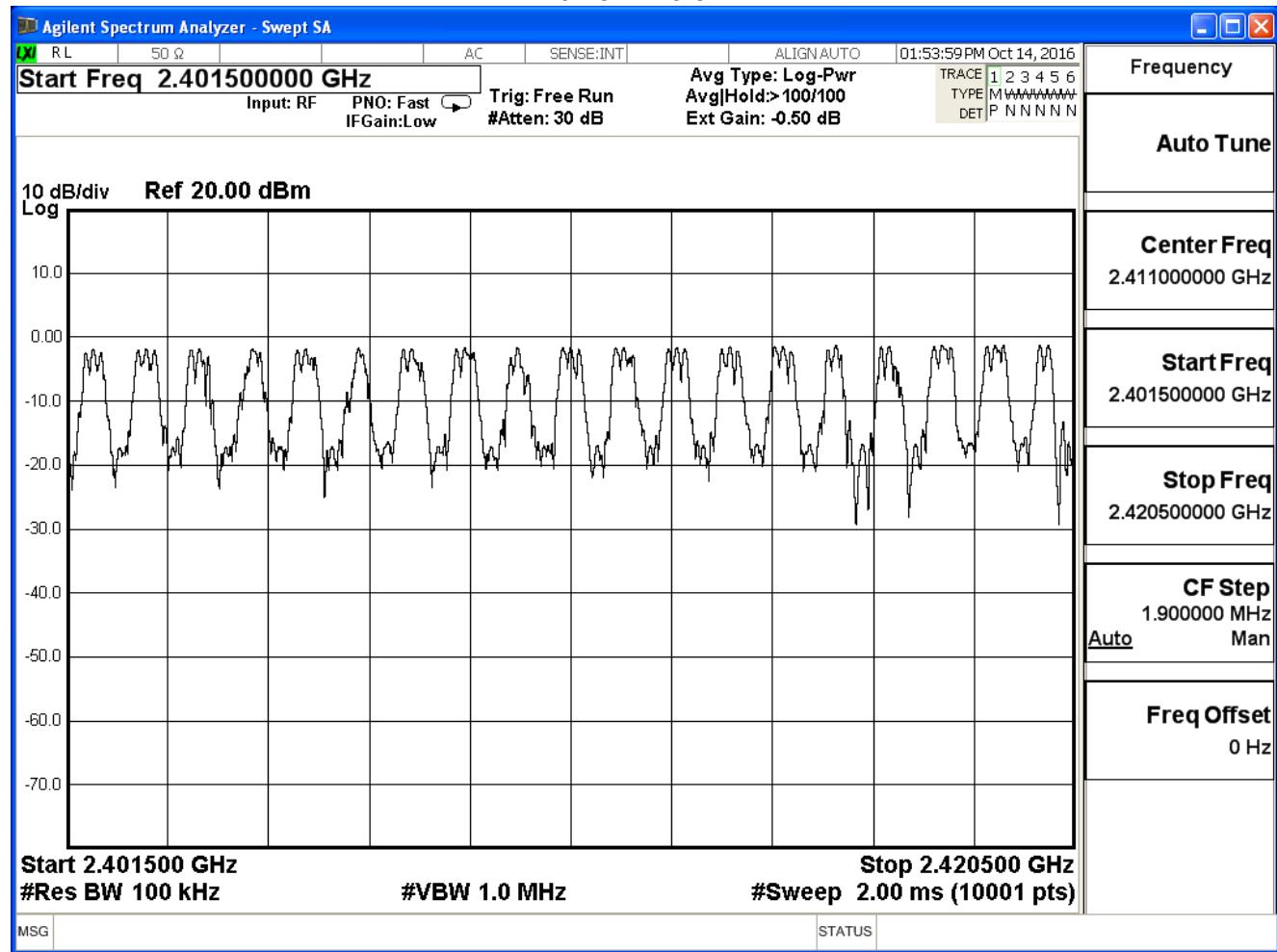
According to FCC Part 15 Subpart C Paragraph 15.247: 2015

## 7.6. Test Result

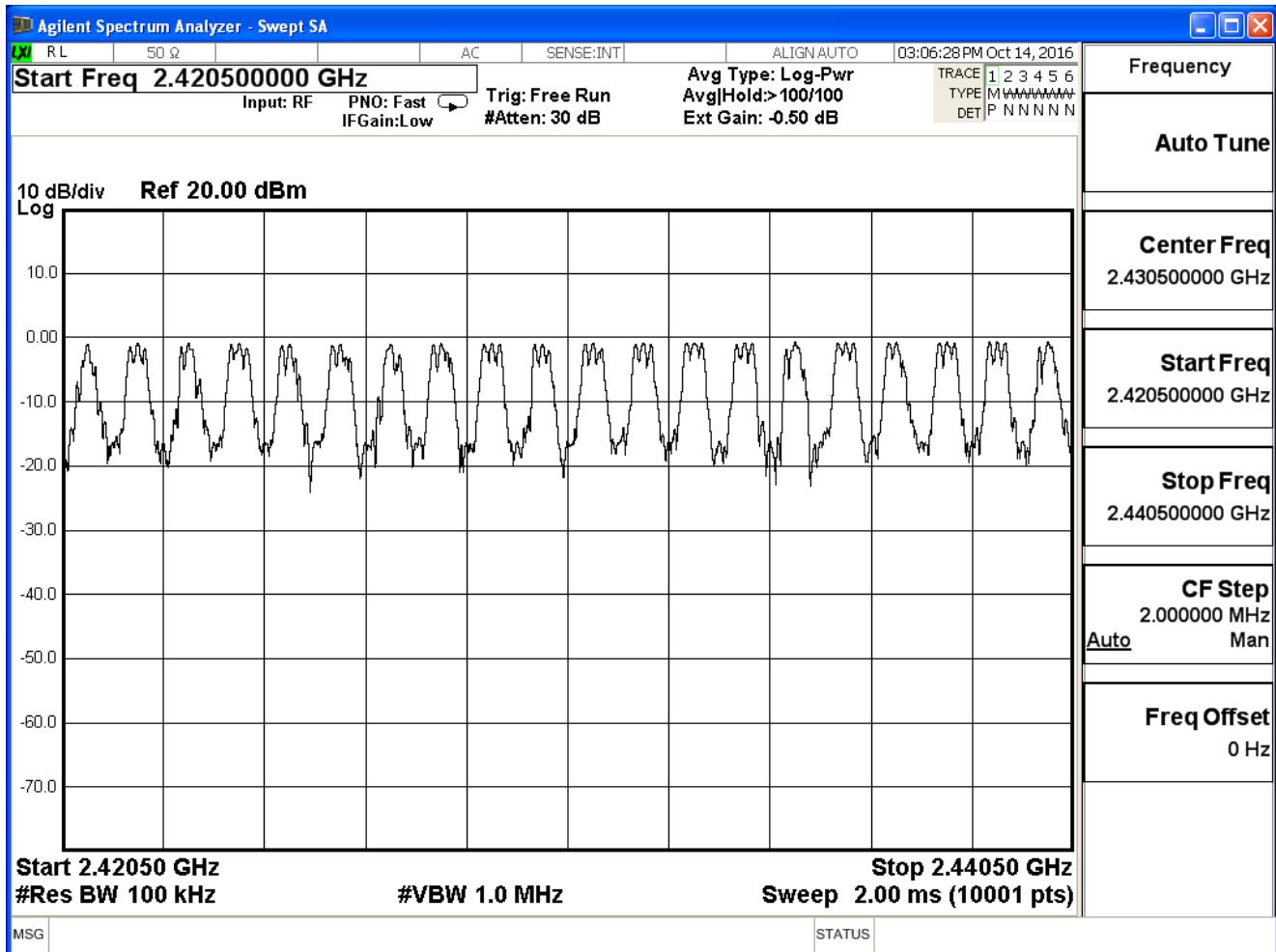
Product	GPS Data Recorder		
Test Item	Number of hopping frequency		
Test Mode	Mode 1: Transmit		
Date of Test	2016/10/14	Test Site	SR7

Frequency Range (MHz)	Measure Level (Channels)	Limit (Channels)	Result
2402 - 2480	79	≥ 75	PASS

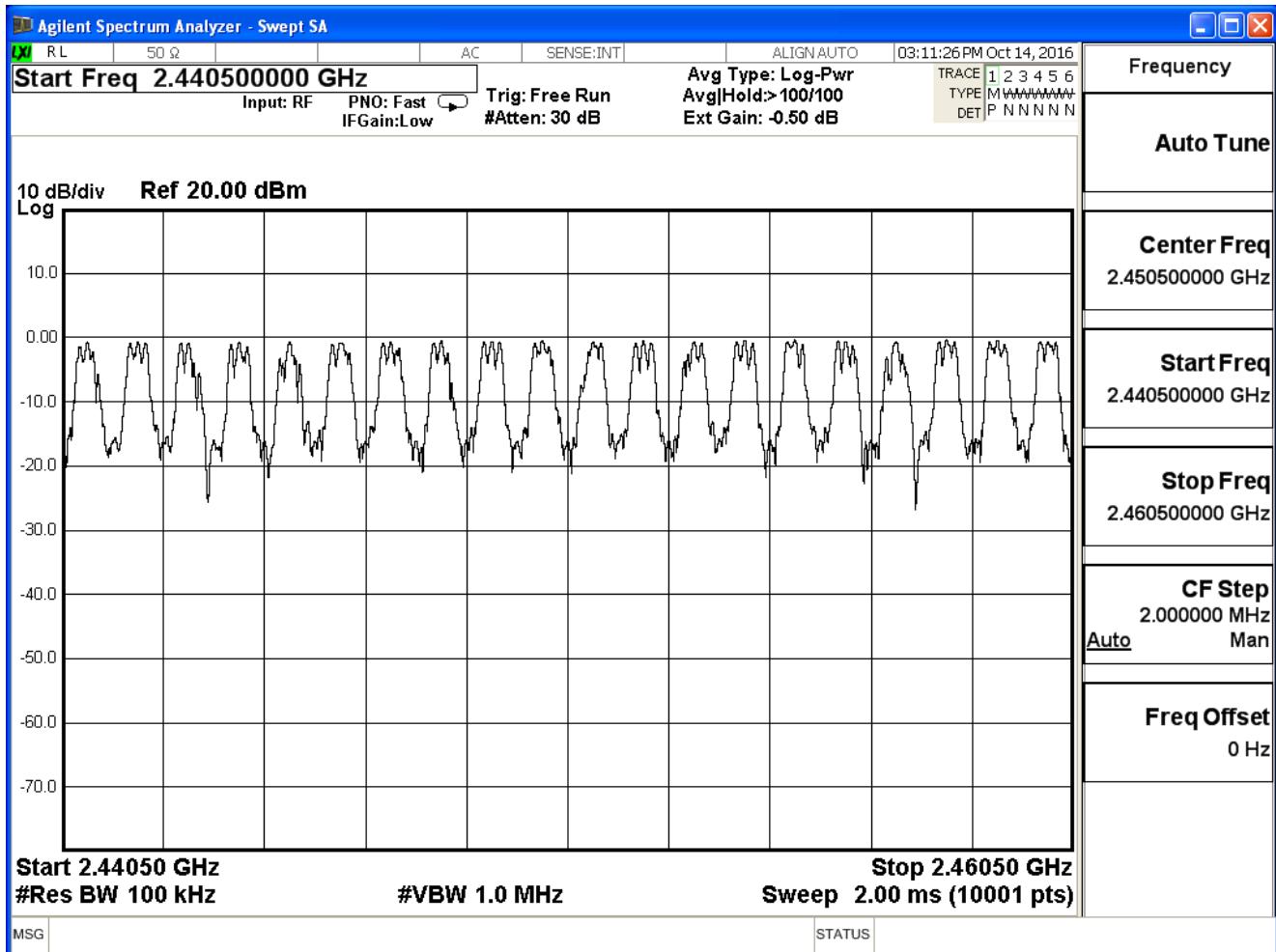
2401.5-2420.5MHz



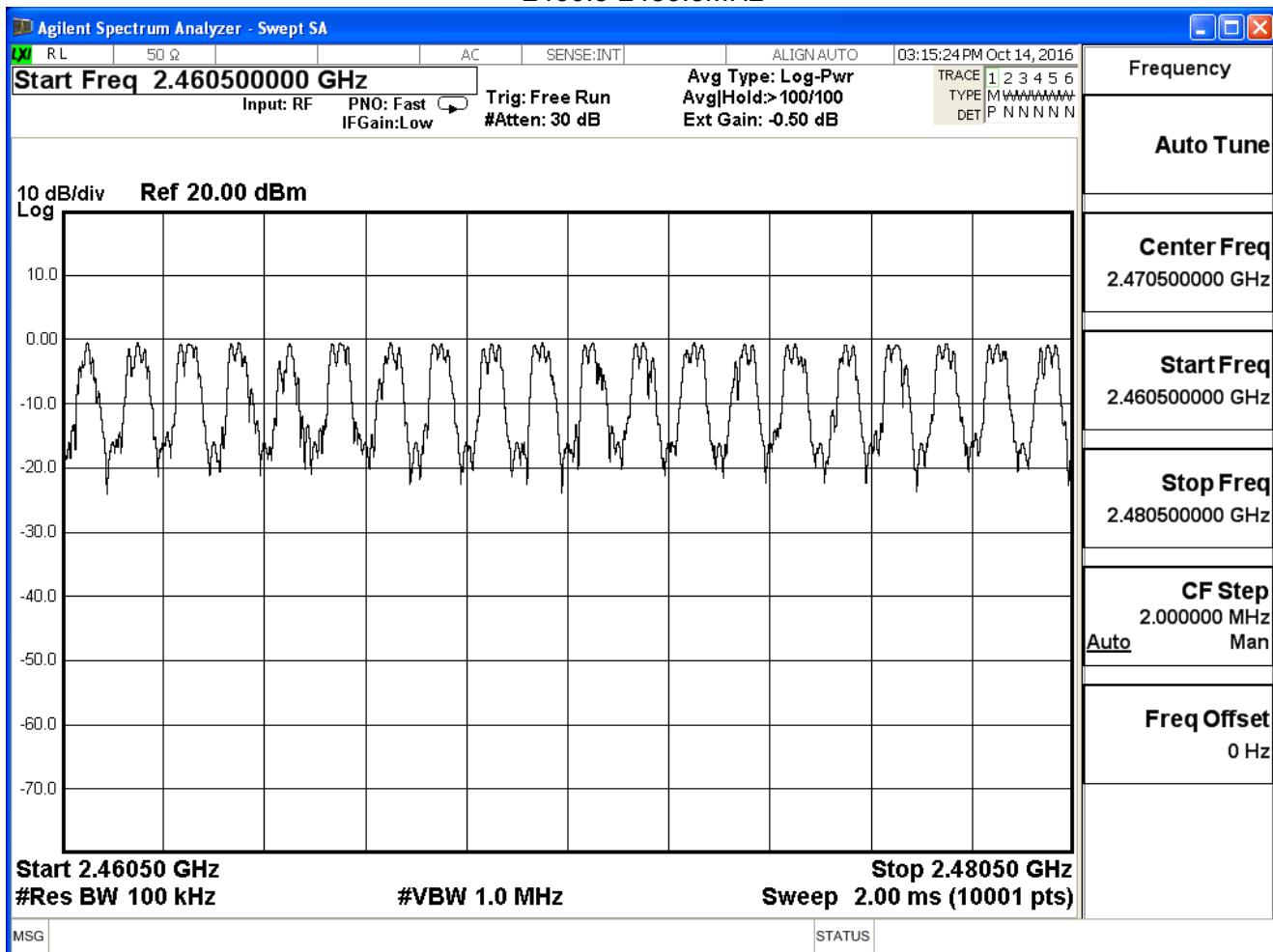
2420.5-2440.5MHz



2440.5-2460.5MHz



2460.5-2480.5MHz



## 8. Carrier Frequency Separation

### 8.1. Test Equipment

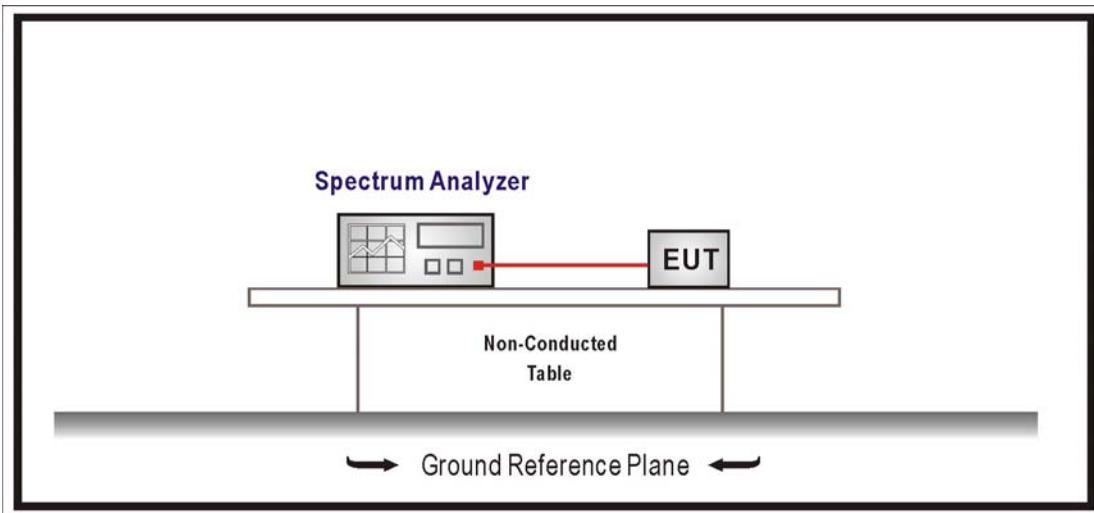
The following test equipment is used during the test:

Carrier Frequency Separation / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/08/08
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/05
Signal Analyzer	R&S	FSV7	101650	2016/11/30

Note: All equipments that need to calibrate are with calibration period of 1 year.

### 8.2. Test Setup



### 8.3. Limits

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

#### 8.4. Test Procedures

The EUT was setup according to ANSI C63.10: 2013 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements

Span = wide enough to capture the peaks of two adjacent channels

Resolution Bandwidth (RBW)  $\geq$  1% of the span, VBW  $\geq$  RBW

Sweep = auto, Detector function = peak, Trace = max hold

#### 8.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2015

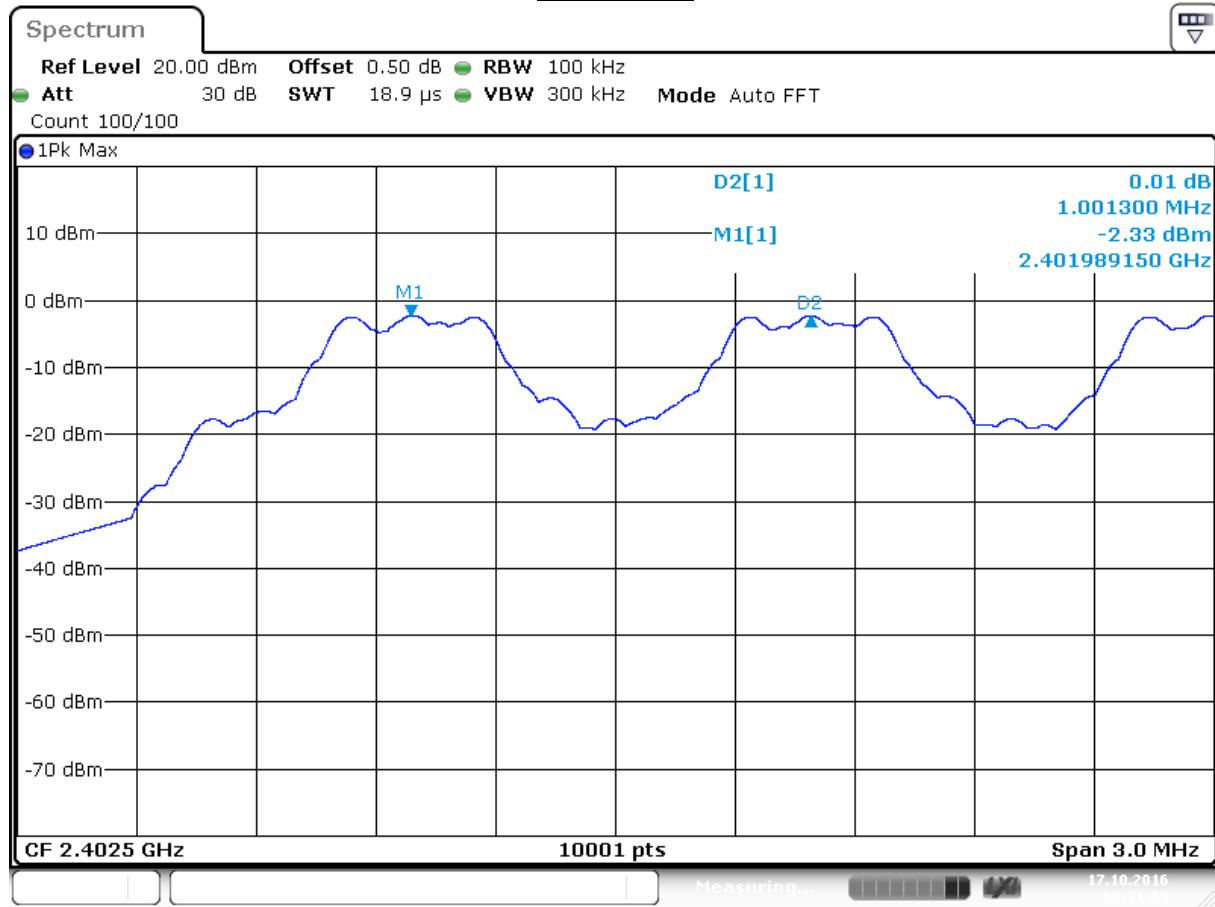
## 8.6. Test Result

Product	GPS Data Recorder		
Test Item	Carrier Frequency Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2016/10/17	Test Site	SR7

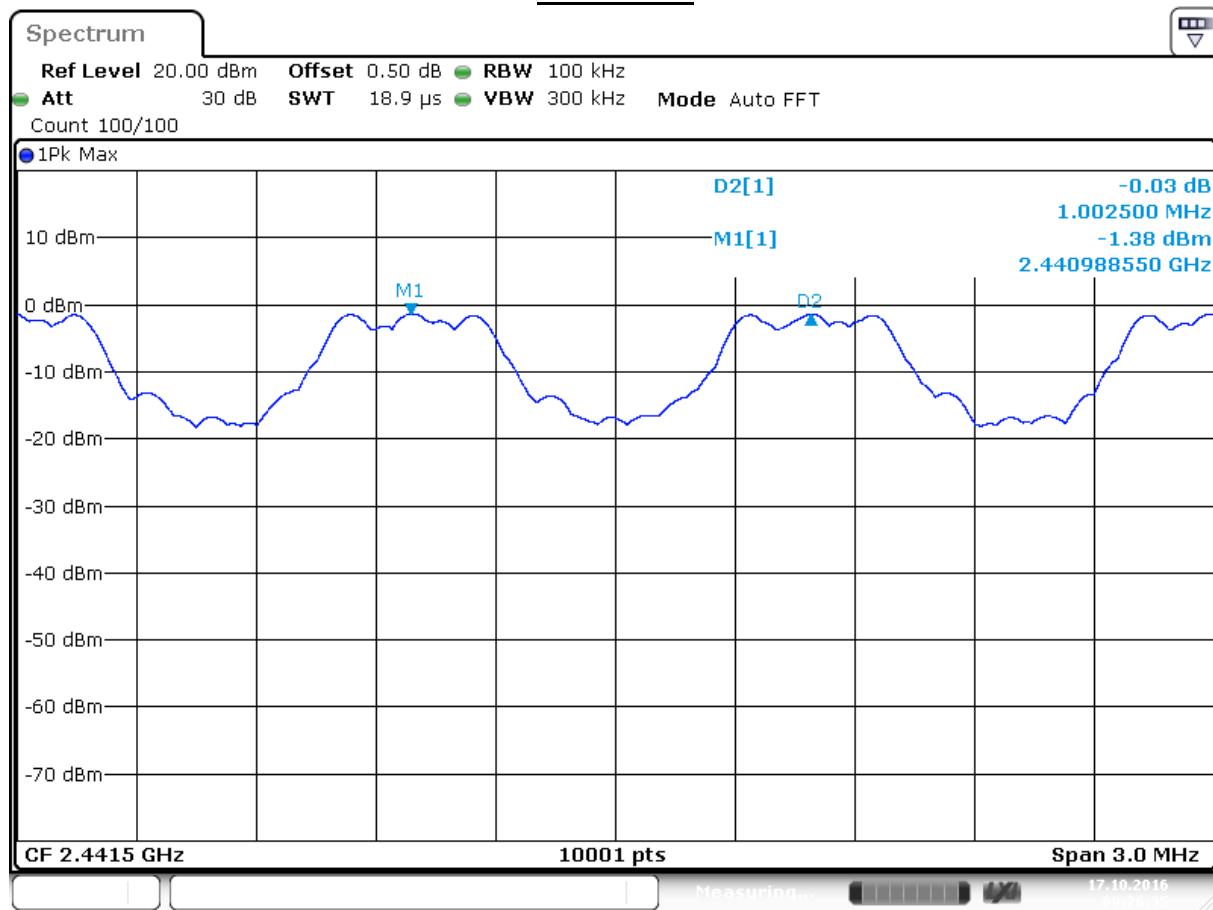
GFSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
00	2402	1.0013	≥0.76	Pass
39	2441	1.0025	≥0.76	Pass
78	2480	1.0040	≥0.76	Pass

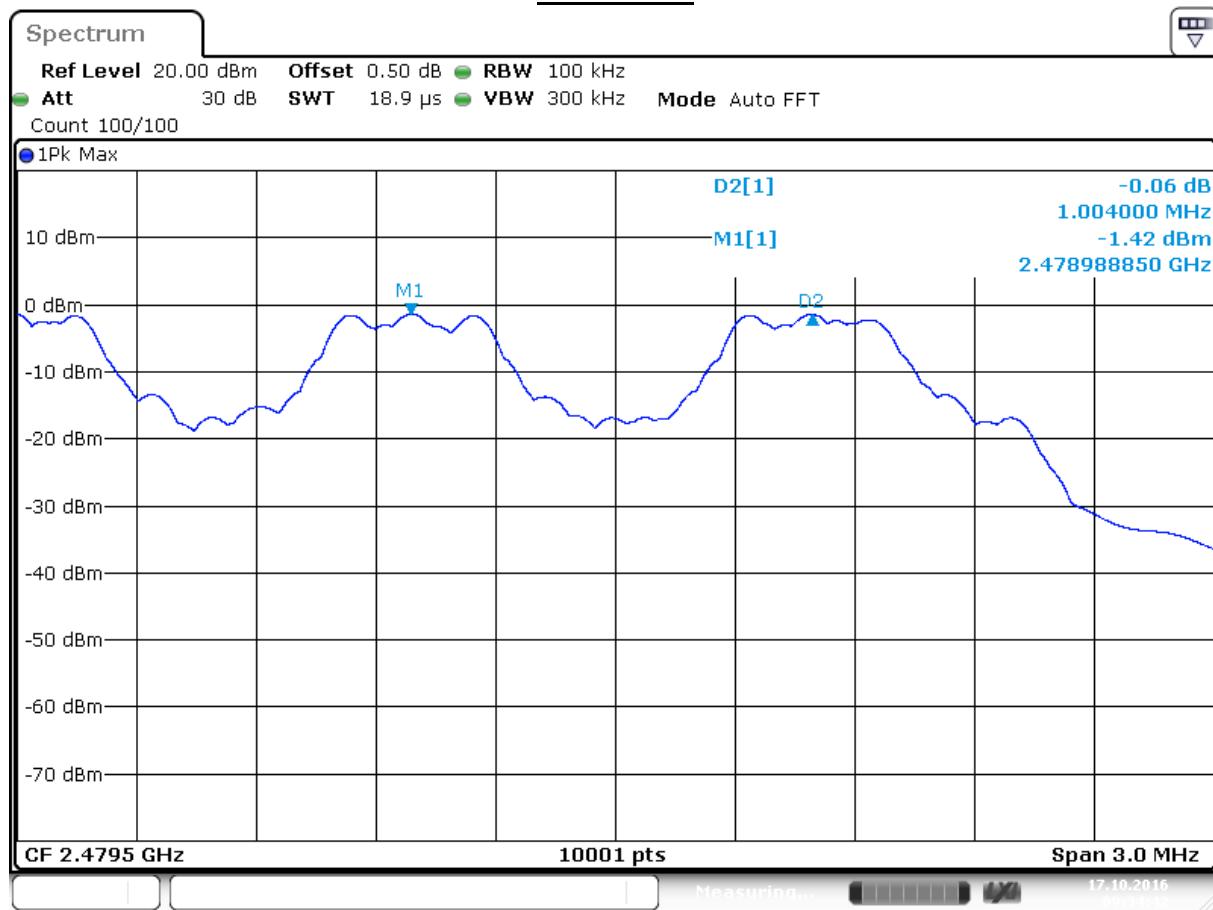
### Channel 00



Date: 17.OCT.2016 09:31:03

Channel 39

Date: 17.OCT.2016 09:26:35

Channel 78

## 9. Occupied Bandwidth

### 9.1. Test Equipment

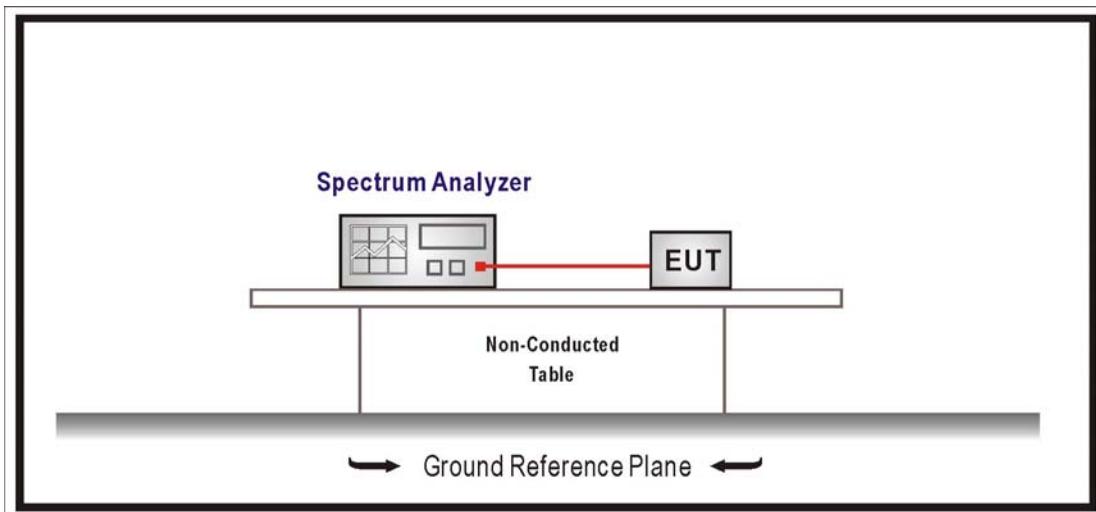
The following test equipment is used during the test:

#### Occupied Bandwidth / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/08/08
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/05
Signal Analyzer	R&S	FSV7	101650	2016/11/30

Note: All equipments that need to calibrate are with calibration period of 1 year.

### 9.2. Test Setup



### 9.3. Limits

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.

For frequency hopping systems operating in the 5725-5850 MHz bands. The maximum 20 dB bandwidth of the hopping channel is 1 MHz.

For 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.

### 9.4. Test Procedures

The EUT was setup according to ANSI C63.10: 2013 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel  
RBW  $\geq$  1% of the 20 dB bandwidth, VBW  $\geq$  RBW , Sweep = auto, Detector function = peak, Trace = max hold , The EUT should be transmitting at its maximum data rate.

### 9.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2015

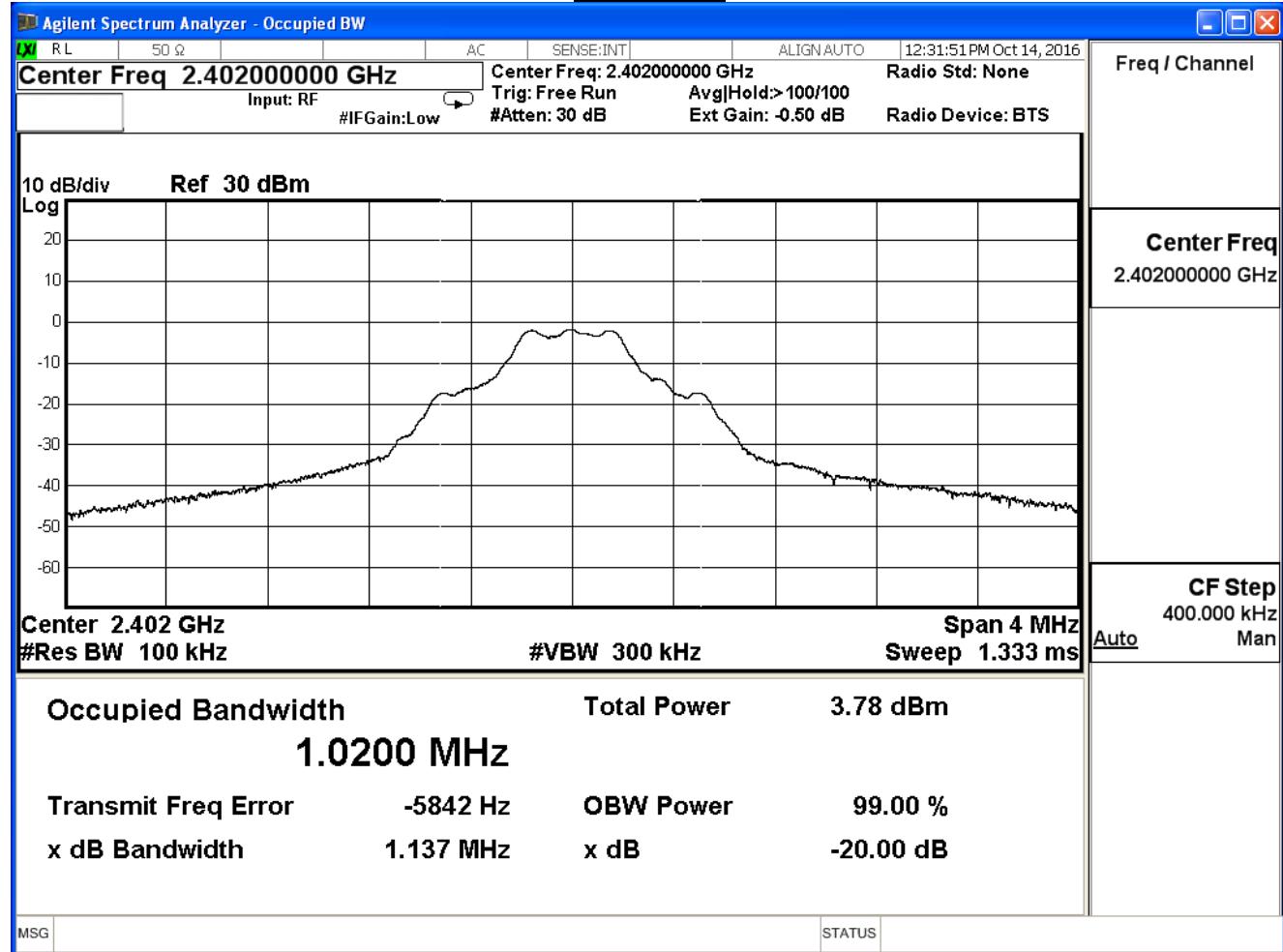
## 9.6. Test Result

Product	GPS Data Recorder		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2016/10/14	Test Site	SR7

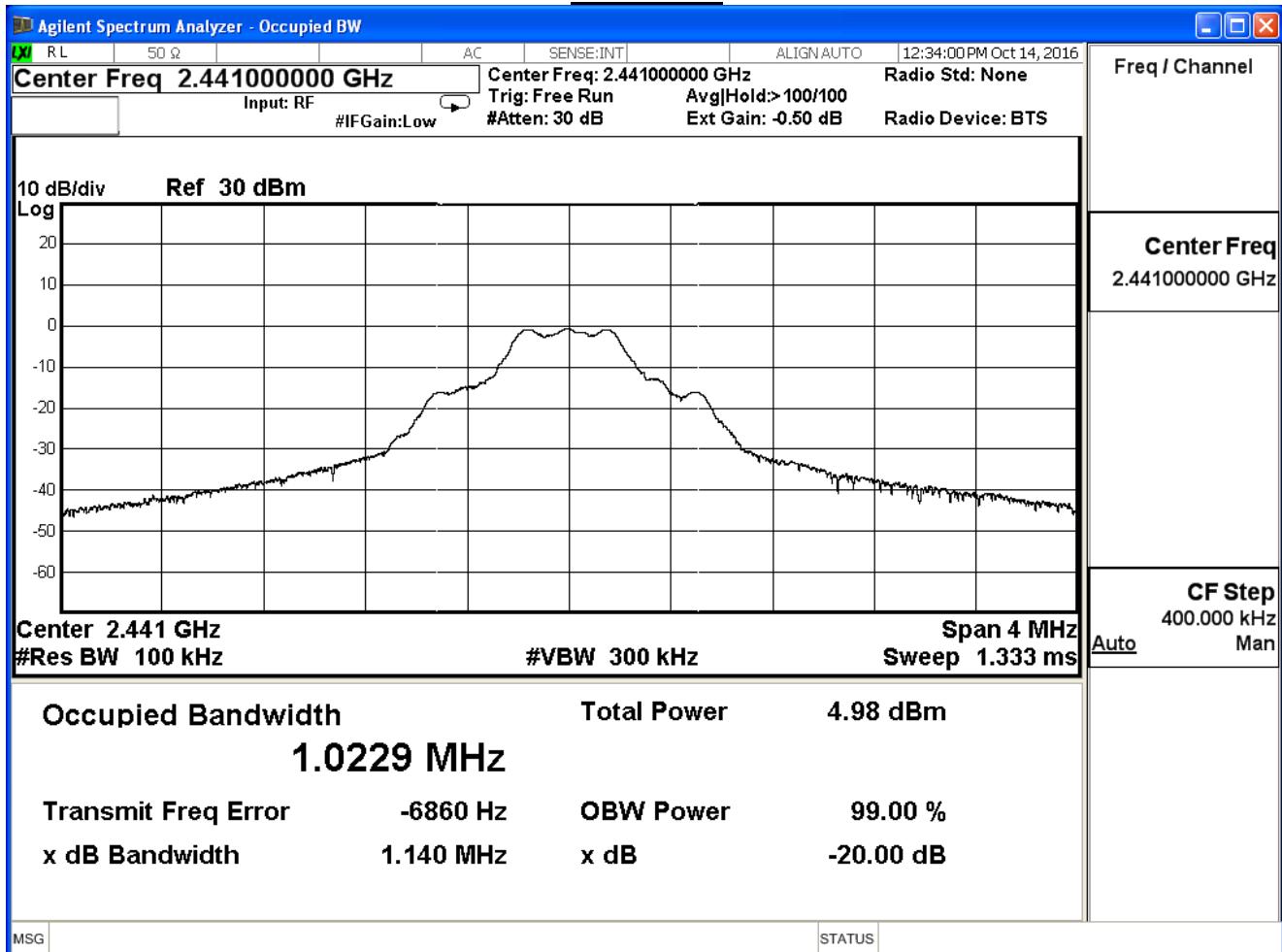
### GFSK

Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
00	2402	1.137	≥ 0.5	Pass
39	2441	1.140	≥ 0.5	Pass
78	2480	1.136	≥ 0.5	Pass

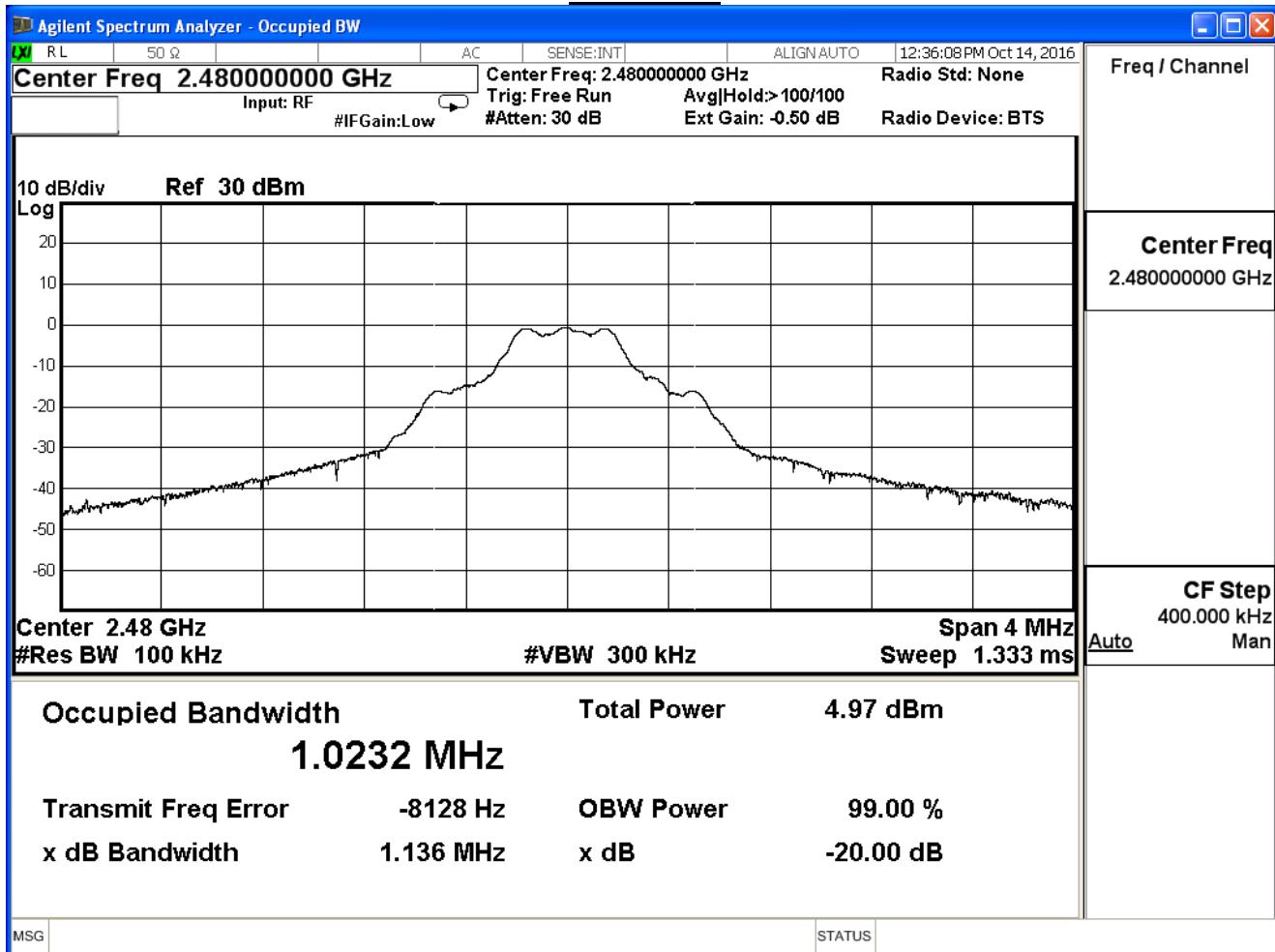
### Channel 00



## Channel 39



## Channel 78



## 10. Dwell Time

### 10.1. Test Equipment

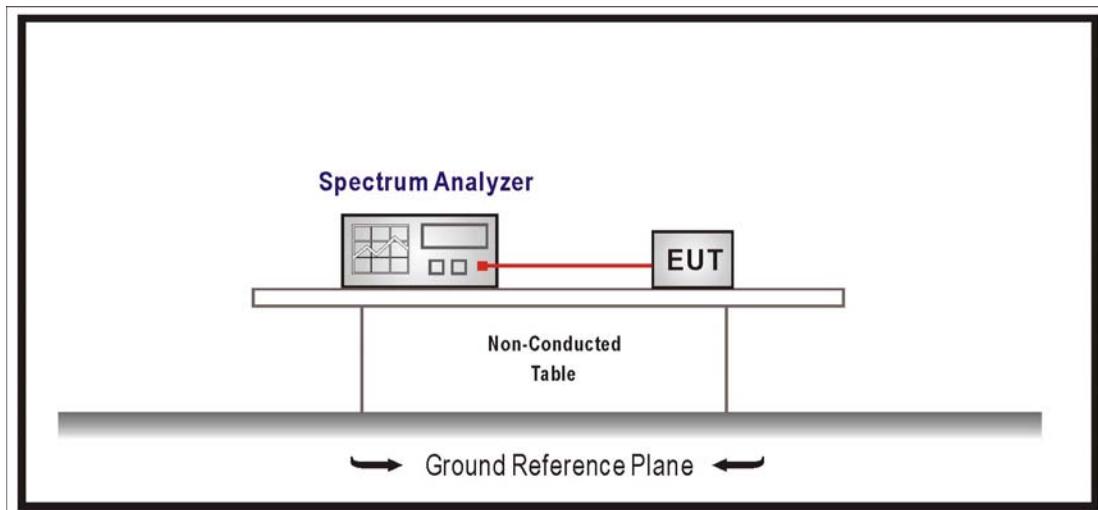
The following test equipment is used during the test:

Dwell Time / SR7

Instrument	Manufacturer	Model No.	Serial No	Next Cal. Date
Spectrum Analyzer	Agilent	N9010A	US47140172	2017/08/08
Signal & Spectrum Analyzer	R&S	FSV40	101049	2017/01/05
Signal Analyzer	R&S	FSV7	101650	2016/11/30

Note: All equipments that need to calibrate are with calibration period of 1 year.

### 10.2. Test Setup



### 10.3. Limits

For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period.

For frequency hopping systems operating in the 2400-2483.5 MHz bands. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

For frequency hopping systems operating in the 5725-5850 MHz bands. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

### 10.4. Test Procedures

The EUT was setup according to ANSI C63.10: 2013 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements

Span = zero span, centered on a hopping channel , RBW = 1 MHz, VBW  $\geq$  RBW ,

Sweep = as necessary to capture the entire dwell time per hopping channel ,

Detector function = peak, Trace = max hold.

### 10.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2015

## 10.6. Test Result

Product	GPS Data Recorder		
Test Item	Dwell Time		
Test Mode	Mode 1: Transmit		
Date of Test	2016/10/17	Test Site	SR7

GFSK, DH5

Occupancy Time of Frequency Hopping System

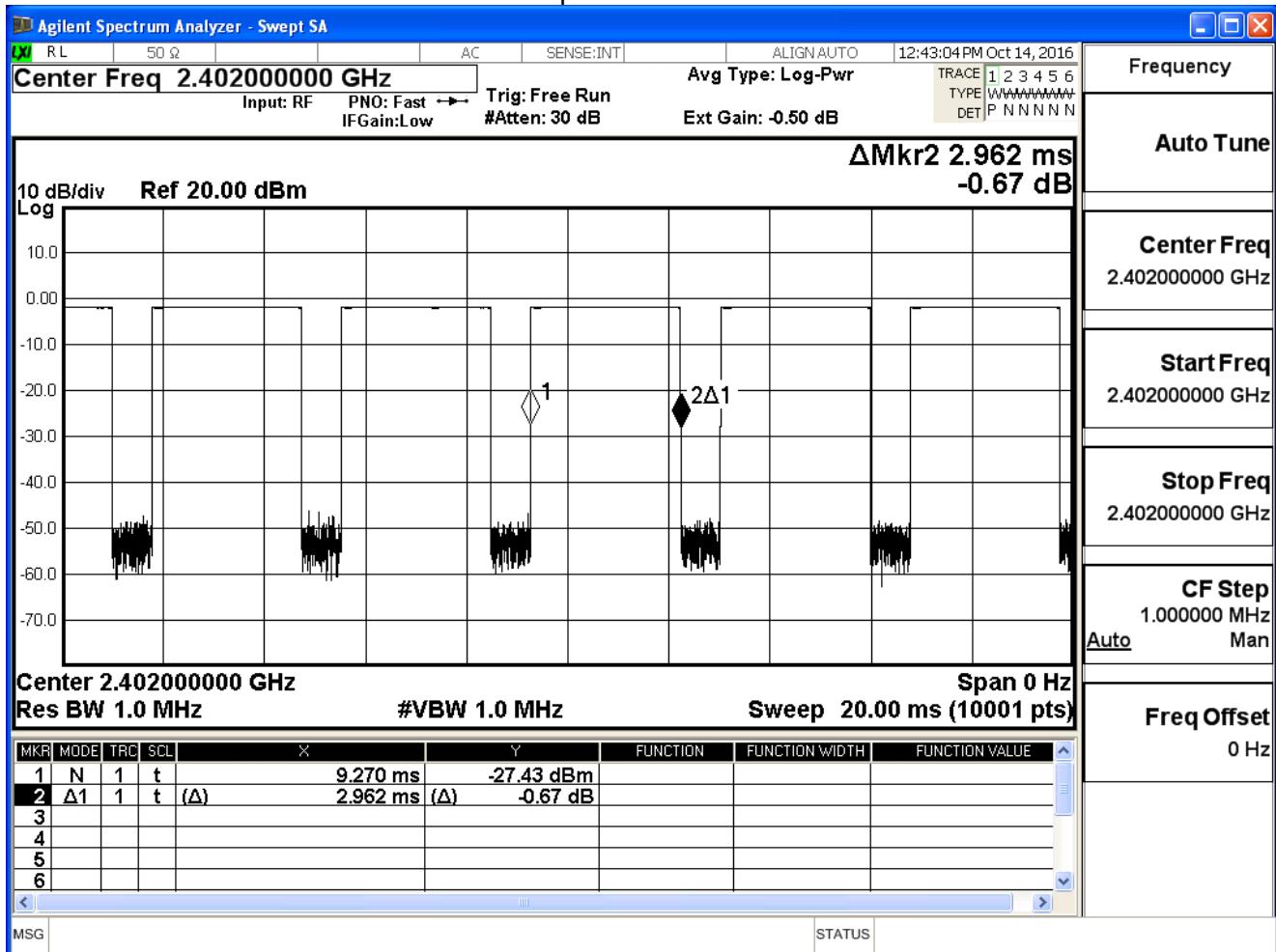
A) 2402MHz Test Time Period:  $0.4 \times 79 = 31.60$ sec , Time slot length : 2.962 ms = 0.002962 sec  
 Dwell Time : 0.002962 \*  $(266.67/79) \times 31.60 = 0.3159$ sec .

B) 2441MHz Test Time Period:  $0.4 \times 79 = 31.60$ sec , Time slot length : 2.962ms = 0.002962 sec  
 Dwell Time : 0.002962 \*  $(266.67/79) \times 31.60 = 0.3159$ sec .

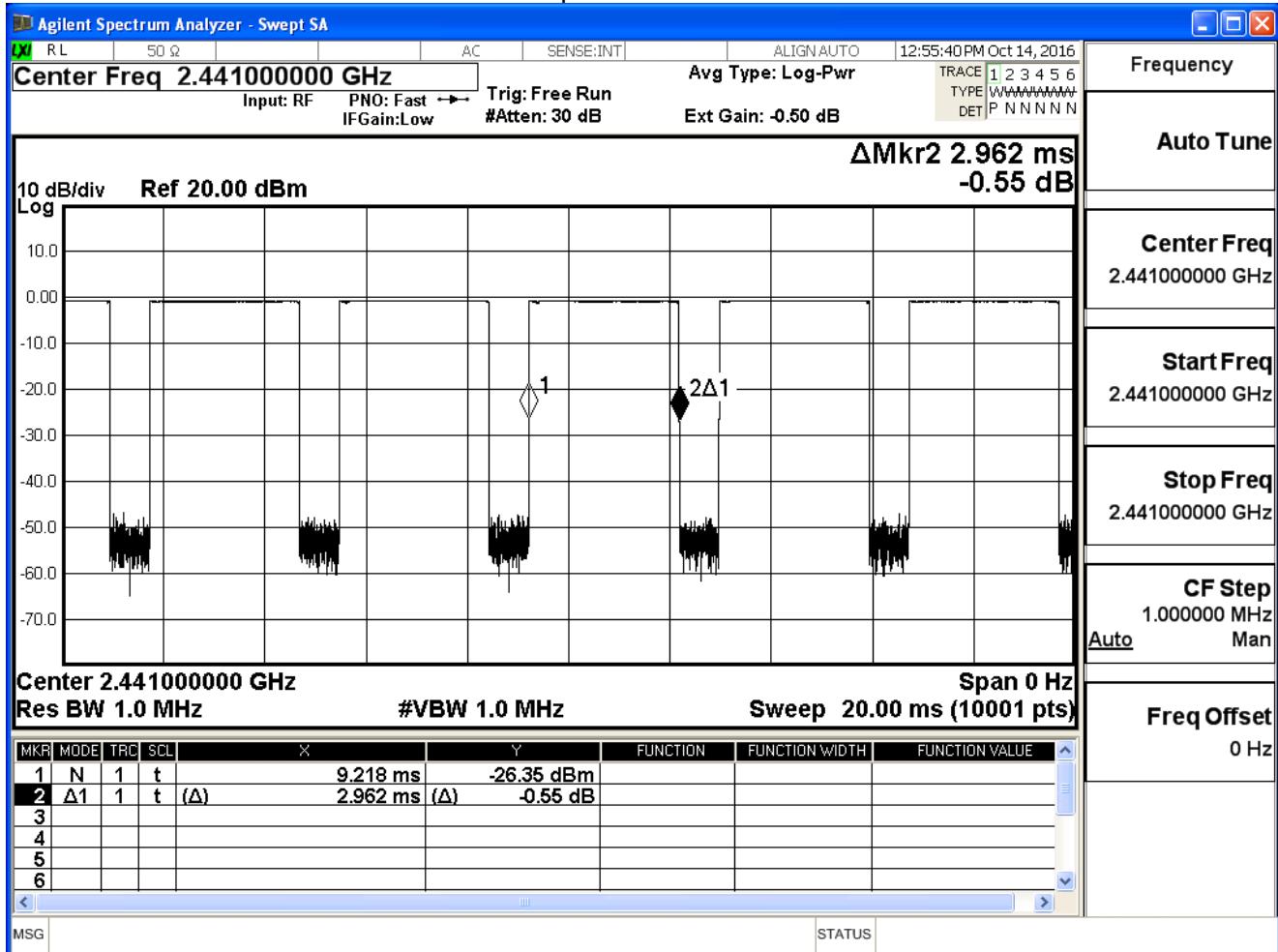
C) 2480MHz Test Time Period:  $0.4 \times 79 = 31.60$ sec , Time slot length : 2.964ms = 0.002964 sec  
 Dwell Time : 0.002964 \*  $(266.67/79) \times 31.60 = 0.3162$ sec .

Test Result: The Average Occupancy Time of Each Highest , Middle and Lowest Channel Is Less Than 0.4sec , And Corresponds to The Standard .

## Hop rate-2402MHz



## Hop rate-2441MHz



## Hop rate-2480MHz

