



Test Report

Product Name : GM-120 Handheld GPS
Model No. : GM-120XX
FCC ID. : RJIGM-120XX

Applicant : Holux Technology, Inc.
Address : 1F, No.30, R&D Rd. II, Hsinchu City 300, Taiwan
(R.O.C.)

Date of Receipt : 2006/11/16
Issued Date : 2006/12/26
Report No. : 06BH069-RF-US-P05V01

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 : 2006/12/26

Report No. : 06BH069-RFUSP06V01



Product Name : GM-120 Handheld GPS
 Applicant : Holux Technology, Inc.
 Address : 1F, No.30, R&D Rd. II, Hsinchu City 300, Taiwan (R.O.C.)
 Manufacturer : Holux Technology, Inc.
 Model No. : GM-120XX
 FCC ID. : RJIGM-120XX
 Rated Voltage : AC 120 V / 60 Hz
 EUT Voltage : AC 120 V / 60 Hz
 Trade Name : **HOLUX**
 Applicable Standard : FCC CFR Title 47 Part 15 Subpart C Section 15.247
 Test Result : Complied

The test results relate only to the samples tested.

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Documented By : Carol Tsai
 (Carol Tsai)
 Reviewed By : Sam Liew
 (Sam Liew)
 Approved By : Roy Wang
 (Roy Wang)

TABLE OF CONTENTS

Description	Page
1. General Information	5
1.1. EUT Description	5
1.2. Operational Description	7
1.3. Test Mode	8
1.4. Tested System Details	9
1.5. Configuration of tested System	10
1.6. EUT Exercise Software	11
1.7. Test Facility	12
2. Conducted Emission	14
2.1. Test Equipment	14
2.2. Test Setup	14
2.3. Limits	15
2.4. Test Procedure	15
2.5. Test Specification	15
2.6. Test Result	16
2.7. Test Photo	20
3. Peak Power Output	21
3.1. Test Equipment	21
3.2. Test Setup	21
3.3. Limits	21
3.4. Test Specification	21
3.5. Test Result	22
4. Radiated Emission	23
4.1. Test Equipment	23
4.2. Test Setup	23
4.3. Limits	24
4.4. Test Procedure	24
4.5. Test Specification	24
4.6. Test Result	25
4.7. Test Photo	33
5. Band Edge	35
5.1. Test Equipment	35
5.2. Test Setup	36
5.3. Limits	37
5.4. Test Procedure	37
5.5. Test Specification	37
5.6. Test Result	38
6. Channel of Number	42
6.1. Test Equipment	42
6.2. Test Setup	42
6.3. Limits	42
6.4. Test Specification	42
6.5. Test Result	43

7.	Channel Separation	44
7.1.	Test Equipment.....	44
7.2.	Test Setup	44
7.3.	Limits	44
7.4.	Test Specification.....	44
7.5.	Test Result.....	45
8.	Occupied Bandwidth	46
8.1.	Test Equipment.....	46
8.2.	Test Setup	46
8.3.	Limits	46
8.4.	Test Specification.....	46
8.5.	Test Result.....	47
9.	Dwell Time	48
9.1.	Test Equipment.....	48
9.2.	Test Setup	48
9.3.	Limits	48
9.4.	Test Specification.....	48
9.5.	Test Result.....	49
Attachement.....		52
	EUT Photograph.....	52

1. General Information

1.1. EUT Description

Product Name	GM-120 Handheld GPS
Trade Name	HOLUX
Model No.	GM-120XX
Frequency Range	2402~2480MHz
Channel Number	79
Type of Modulation	FHSS
Channel Control	Auto
Antenna Type	Microstrip Antenna
Antenna Gain	-4.25dBi

Component	
USB Cable	Non-Shielded, 1.4m
Power Adapter	ELEMENTECH, K-1910U I/P: AC 100-240V / 50/60Hz O/P: DC 5V / 1A Cable Out: Non-Shielded, 0.14m

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		

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals. Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. The transmitter is presented with a continuous data stream. In addition, a system employing short transmission bursts must comply with the definition of a frequency hopping system and must distribute its 79 channels and over the minimum number of hopping channels (75 channels).

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

Note:

1. This device is a GM-120 Handheld GPS included a 2.4GHz receiving function, and 2.4GHz transmitting function.
2. The different of the each model is shown as below:

Model Number	Description
GM-120XX	XX=A~Z

3. These tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
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 receiving was measured and made a test report that the report number is 06BH069-RFUSP01V02 under Declaration of Conformity.

1.3. 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:

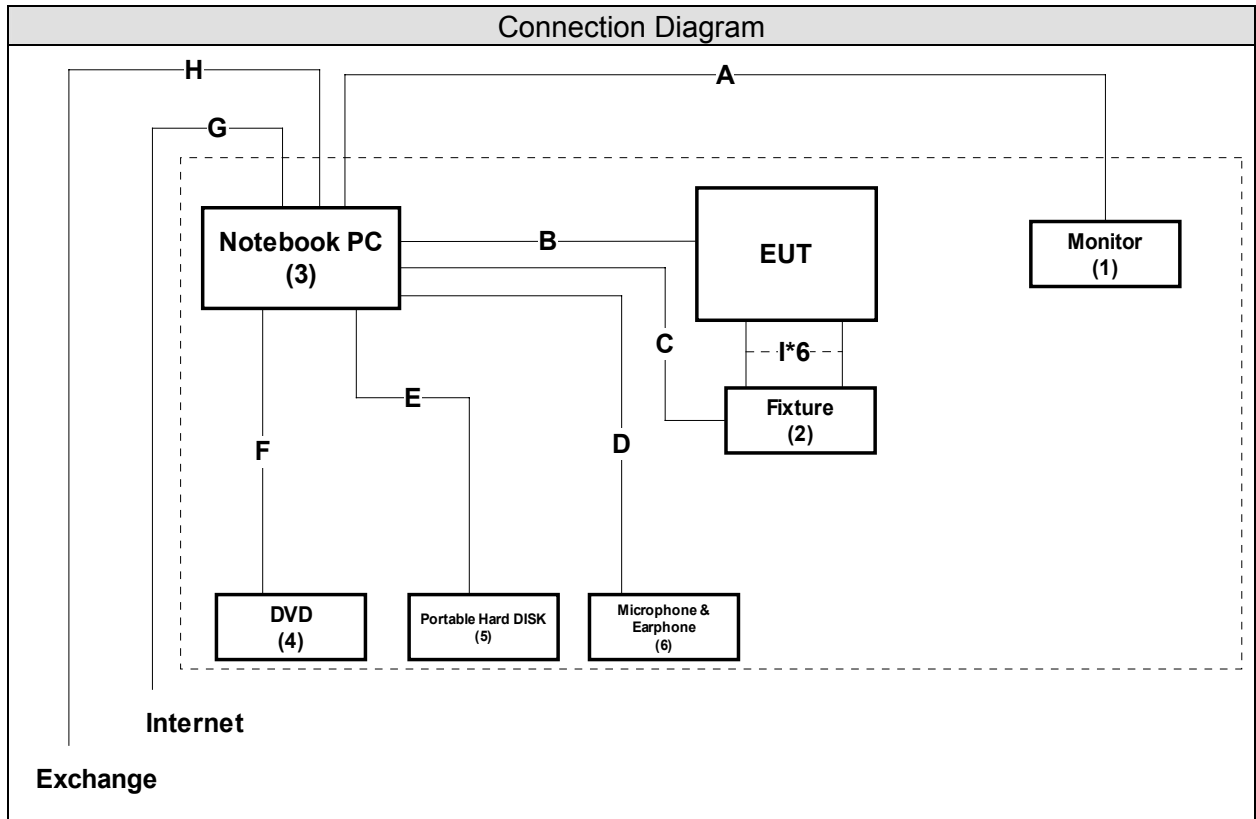
Pre-Test Mode	
EMI	Mode 1: Transmit
Final Test Mode	
EMI	Mode 1: Transmit

1.4. 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	Monitor	CHI MEI	A170E1-09	3UC120955RA 0033	DoC	Non-Shielded, 1.8m
2	Fixture	Air 2U	N/A	N/A	DoC	--
3	Notebook PC	DELL	LATITUDE D400	GK43D1S	DoC	Non-shielded, 1.7m, one ferrite core bonded
4	DVD	DELL	PD01S	P0690A01	DoC	N/A
5	Portable Hard DISK	Top Disk Enterprise	Me-910	220948	DoC	--
6	Microphone & Earphone	Ronald	MOE060	N/A	DoC	--

1.5. Configuration of tested System



Signal Cable Type		Signal cable Description
A	VGA Cable	Shielded, 1.6m
B	USB Cable	Non-Shielded, 1.4m
C	RS232 Cable	Non-Shielded, 1.6m
D	Microphone & Earphone Cable	Non-Shielded, 1.2m
E	USB Portable Hard DISK Cable	Non-Shielded, 1.7m
F	USB Cable	Non-Shielded, 0.6m
G	LAN Cable	Non-Shielded, 3m
H	Telecom Cable	Non-Shielded, 3m
I	Signal Cable	Non-Shielded, 0.1m, 6 PCS

1.6. EUT Exercise Software

1	Setup the EUT and simulators as shown on 1.4.
2	Turn on the power of all equipment.
3	Boot the Notebook PC from Hard Disk.
4	Data will be communicated between Notebook PC and EUT.
5	All the peripheral will be retrieved during the test.
6	Repeat the above procedure (4) to (5).

1.7. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required (IEC 68-1)	Actual
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 Channel Of Number (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	53
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Channel Separation (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	58
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Dwell Time (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	58
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Occupied Bandwidth (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	59
Barometric pressure (mbar)		860 - 1060	950-1000
Temperature (°C)	FCC PART 15 C 15.247 Peak Power Output (FHSS)	15 - 35	25
Humidity (%RH)		25 - 75	58
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	65
Barometric pressure (mbar)		860 - 1060	950-1000

Site Description:

January 24, 2005 File on
Federal Communications Commission
Laboratory Division
7435 Oakland Mills Road
Columbia, MD 21046
Registration Number: 365520



Accredited by CNLA
Accreditation Number: 1313
Effective through: September 27, 2007



1313
ILAC MRA

Accredited by NVLAP
NVLAP Lab Code: 200347-0
Effective through: September 30, 2006



Site Name: Quietek Corporation

Site Address: No.75-1, Wang-Yeh Valley, Yung-Hsing,
Chiung-Lin, Hsin-Chu County,
Taiwan, R.O.C.
TEL : 886-3-592-8858 / FAX : 886-3-592-8859
E-Mail : service@quietek.com

2. Conducted Emission

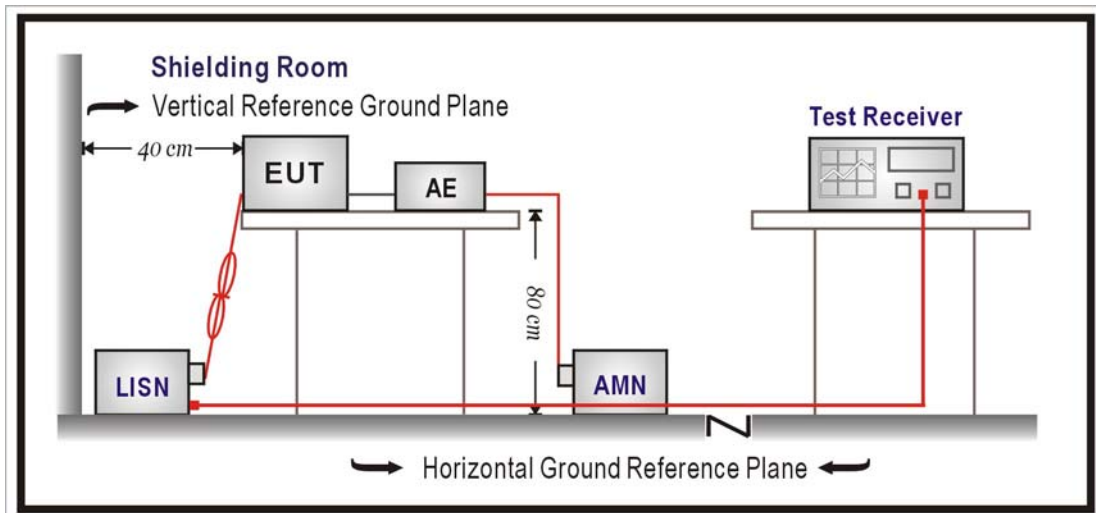
2.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/018	Sep., 2006	
2	Artificial Mains Network	R & S	ENV4200/848411/10	Feb., 2006	Peripherals
3	LISN	R & S	ESH3-Z5/825562/002	Feb., 2006	EUT
4	Pulse Limiter	R & S	ESH3-Z2/357.8810.52	Feb., 2006	
5	No.2 Shielded Room			N/A	

Note: All equipment upon which need to calibrated 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

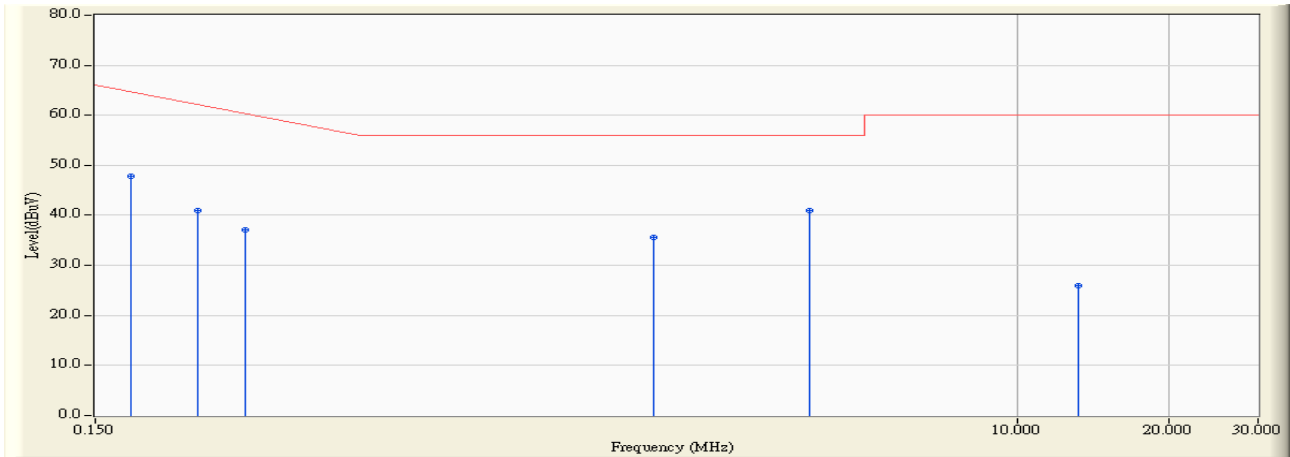
The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refers 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 of the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement. Conducted emissions were invested over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

2.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.207: 2004

2.6. Test Result

Site : QuieTek Shielding Room2	Time : 2006/12/12 - 09:35
Limit : CISPR_B_00M_QP	Margin : 0
EUT : GM-120 Handheld GPS	Probe : SR3_LISN(16A) - Line1
Power : AC 120V/60Hz	Note : TX

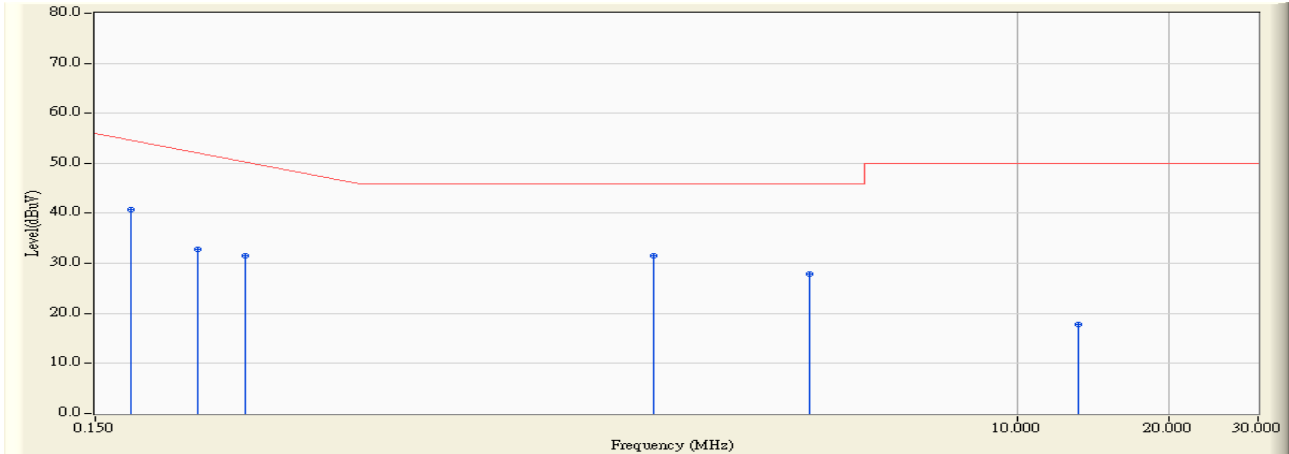


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	0.177	0.246	47.540	47.786	-17.443	65.229	QUASPEAK
2	0.240	0.260	40.630	40.890	-22.539	63.429	QUASPEAK
3	0.298	0.277	36.790	37.067	-24.704	61.771	QUASPEAK
4	1.912	0.580	35.060	35.640	-20.360	56.000	QUASPEAK
5	* 3.884	0.830	40.050	40.880	-15.120	56.000	QUASPEAK
6	13.267	1.550	24.360	25.910	-34.090	60.000	QUASPEAK

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 : QuieTek Shielding Room2	Time : 2006/12/12 - 09:35
Limit : CISPR_B_00M_AV	Margin : 0
EUT : GM-120 Handheld GPS	Probe : SR3_LISN(16A) - Line1
Power : AC 120V/60Hz	Note : TX

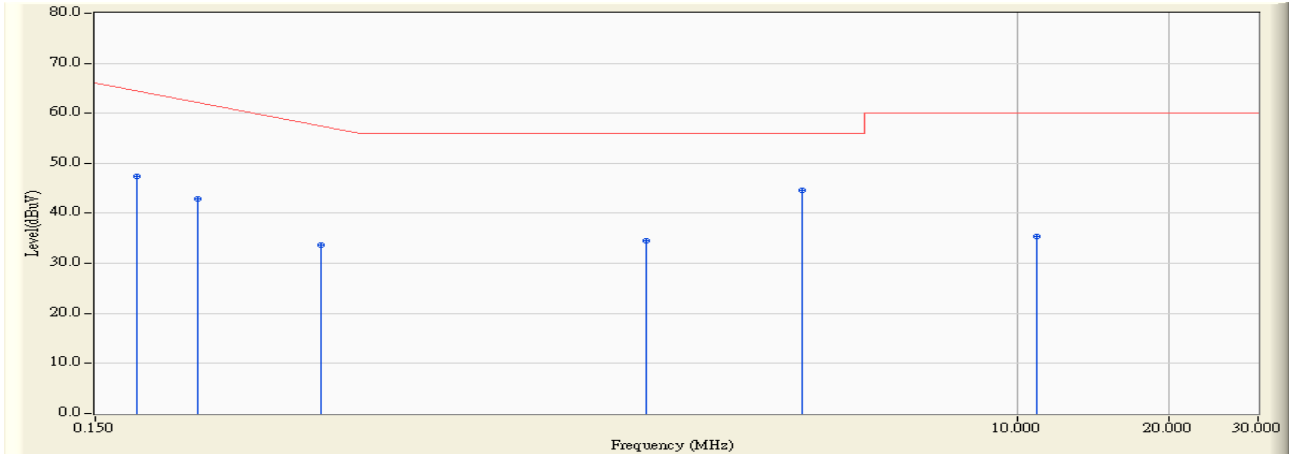


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.177	0.246	40.480	40.726	-14.503	55.229	AVERAGE
2		0.240	0.260	32.550	32.810	-20.619	53.429	AVERAGE
3		0.298	0.277	31.240	31.517	-20.254	51.771	AVERAGE
4	*	1.912	0.580	30.930	31.510	-14.490	46.000	AVERAGE
5		3.884	0.830	26.990	27.820	-18.180	46.000	AVERAGE
6		13.267	1.550	16.310	17.860	-32.140	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 : QuieTek Shielding Room2	Time : 2006/12/12 - 09:41
Limit : CISPR_B_00M_QP	Margin : 0
EUT : GM-120 Handheld GPS	Probe : SR3_LISN(16A) - Line2
Power : AC 120V/60Hz	Note : TX

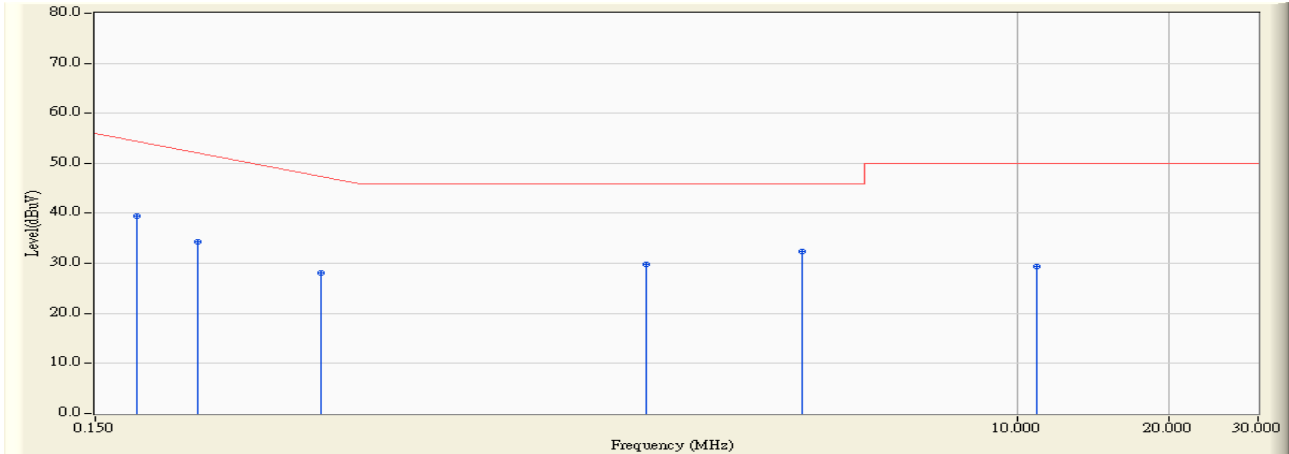


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.181	0.147	47.260	47.407	-17.707	65.114	QUASPEAK
2		0.240	0.160	42.730	42.890	-20.539	63.429	QUASPEAK
3		0.420	0.200	33.510	33.710	-24.576	58.286	QUASPEAK
4		1.849	0.280	34.190	34.470	-21.530	56.000	QUASPEAK
5	*	3.759	0.420	44.210	44.630	-11.370	56.000	QUASPEAK
6		10.927	0.750	34.730	35.480	-24.520	60.000	QUASPEAK

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 : QuieTek Shielding Room2	Time : 2006/12/12 - 09:41
Limit : CISPR_B_00M_AV	Margin : 0
EUT : GM-120 Handheld GPS	Probe : SR3_LISN(16A) - Line2
Power : AC 120V/60Hz	Note : TX



		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.181	0.147	39.370	39.517	-15.597	55.114	AVERAGE
2		0.240	0.160	34.140	34.300	-19.129	53.429	AVERAGE
3		0.420	0.200	27.940	28.140	-20.146	48.286	AVERAGE
4		1.849	0.280	29.610	29.890	-16.110	46.000	AVERAGE
5	*	3.759	0.420	32.050	32.470	-13.530	46.000	AVERAGE
6		10.927	0.750	28.660	29.410	-20.590	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

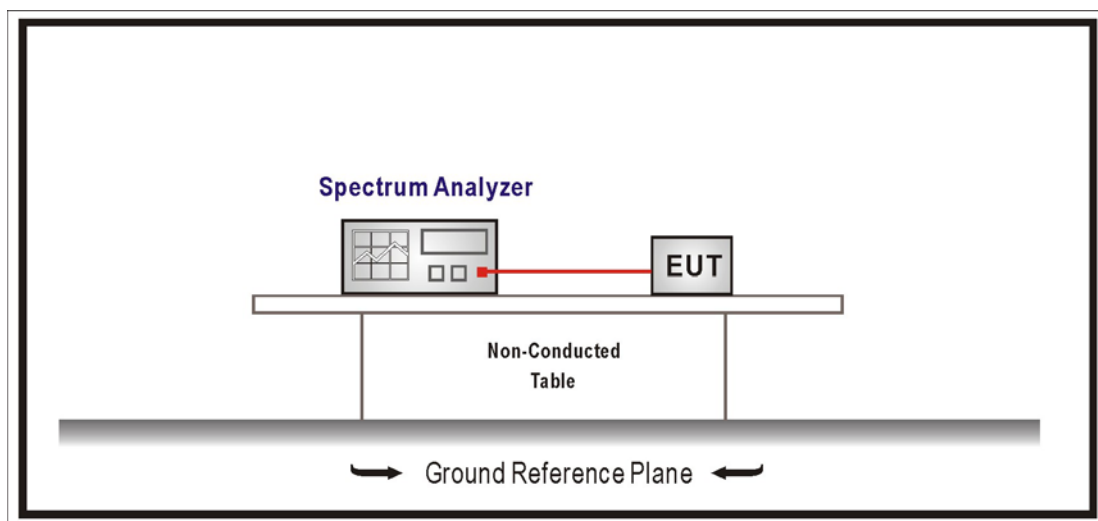
3.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	Power Meter	Agilent	E4416A / GB41291630	May, 2006
2	Power Sensor	Agilent	E9323A / US40411166	Apr., 2006
3	No.1 OATS			Sep., 2006

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

3.2. Test Setup



3.3. Limits

For frequency hopping systems operating in the 902-928 MHz band: 1 Watt for systems employing at least 50 hopping channels; and, 0.25 Watts for systems employing less than 50 hopping channels.

For frequency hopping systems in the 2400-2483.5 MHz band employing at least 75 hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1Watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watt.

3.4. Test Specification

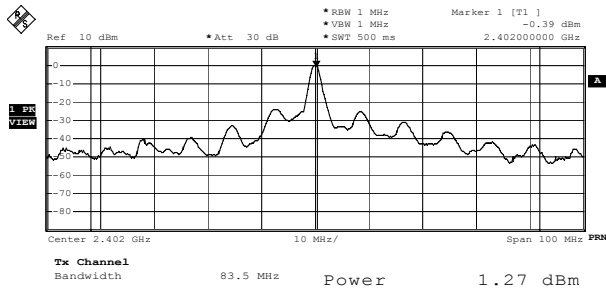
According to FCC Part 15 Subpart C Paragraph 15.247: 2004

3.5. Test Result

Product	GM-120 Handheld GPS		
Test Item	Peak Power Output		
Test Mode	Mode 1: Transmit		
Date of Test	2006/11/21	Test Site	No.1 OATS

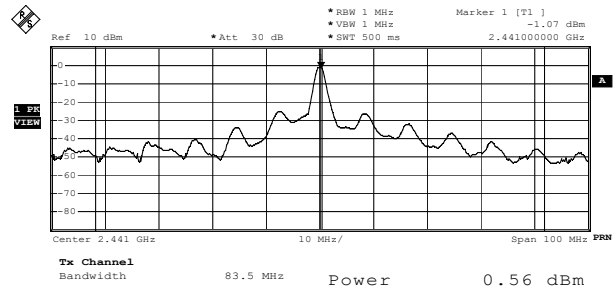
Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402.00	1.27	1Watt = 30 dBm	Pass
39	2441.00	0.56	1Watt= 30 dBm	Pass
78	2480.00	-1.17	1Watt= 30 dBm	Pass

Channel 00



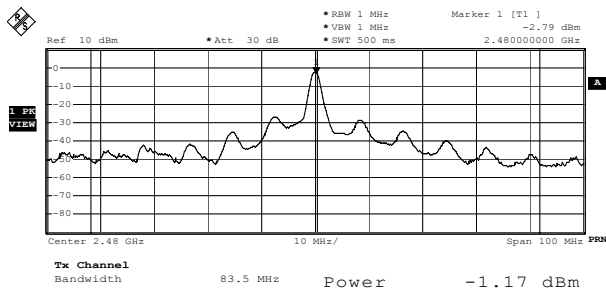
Date: 21.NOV.2006 17:03:33

Channel 39



Date: 21.NOV.2006 17:02:00

Channel 78



Date: 21.NOV.2006 16:59:29

4. Radiated Emission

4.1. Test Equipment

The following test equipment are used during the test:

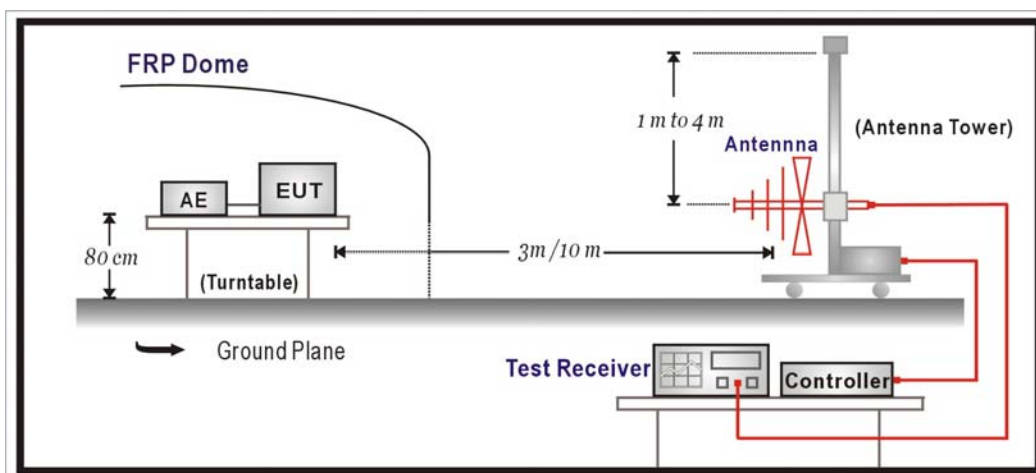
Radiated Emission / Site1

Instrument	Manufacturer	Type No.	Serial No	Cal. Date
Bilog Antenna	Schaffner	CBL6112B	2895	2006/09/03
Horn Antenna	Schwarzbeck	BBHA 9120D	BBHA9120D312	2006/07/29
Pre-Amplifier	HP	8447D	2944A09276	2006/02/15
Pre-Amplifier	HP	8449B	3008A01123	N/A
Spectrum Analyzer	R & S	FSP40	100005	2006/08/25
Spectrum Analyzer	Advantest	R3162	120300649	2006/01/19
Test Receiver	R & S	ESCS 30	825442/017	2006/02/17

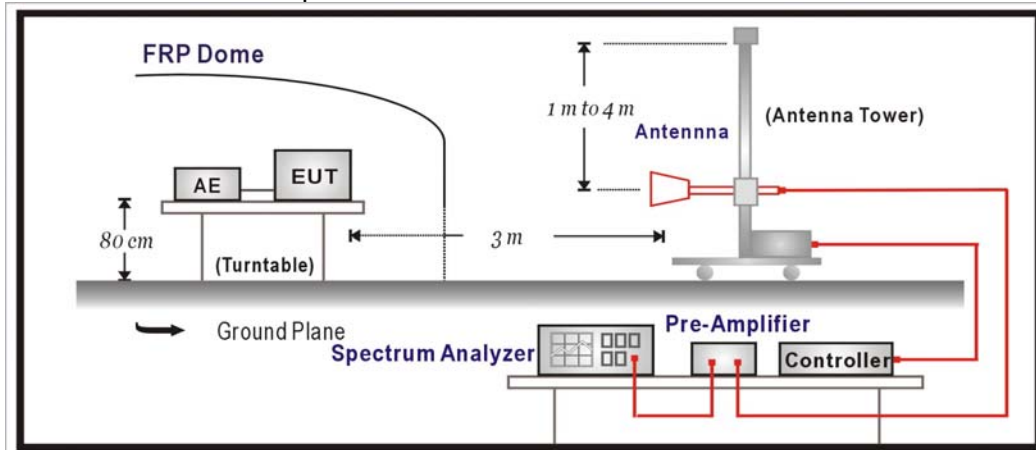
- Note: 1. All equipments that need to calibrate are with calibration period of 1 year.
 2. Mark "X" test instruments are used to measure the final test results.

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

- Remarks :
1. RF Voltage (dBuV) = 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 and its simulators are placed on a turn table which is 0.8 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 C63.4:2003 on radiated measurement.

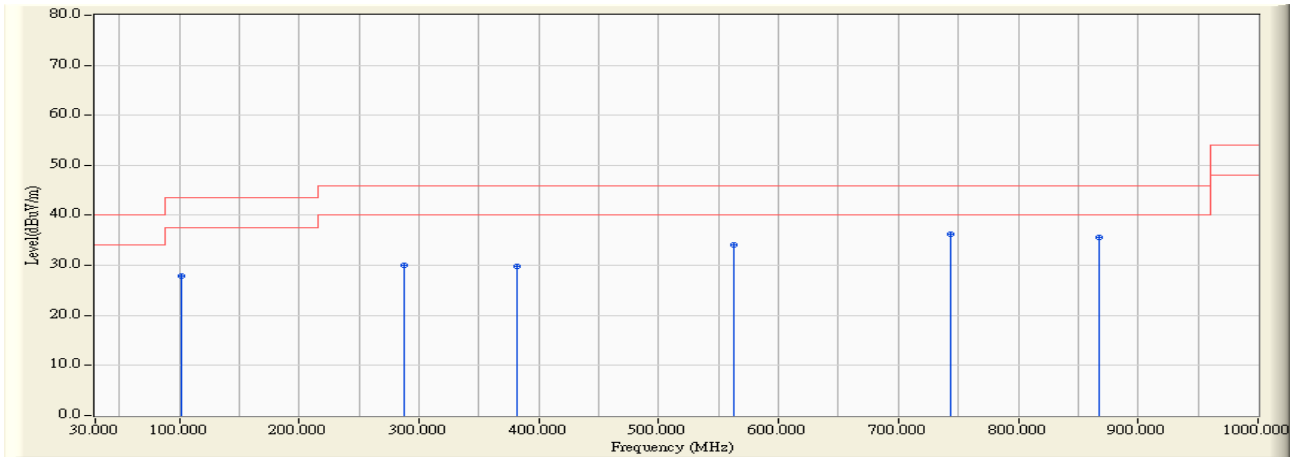
On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a quasi-peak detector function and on any frequency or frequencies above 1000 MHz the radiated limits shown are based upon the use of measurement instrumentation employing an average 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 15.209: 2004

4.6. Test Result

Site : Site 1	Time : 2006/12/18 - 18:02
Limit : FCC_CLASS_B_03M_QP	Margin : 6
EUT : GM-120 Handheld GPS	Probe : FCC_RF_30-1G(200605) - HORIZONTAL
Power : AC 120V/60Hz	Note : CH39-TX

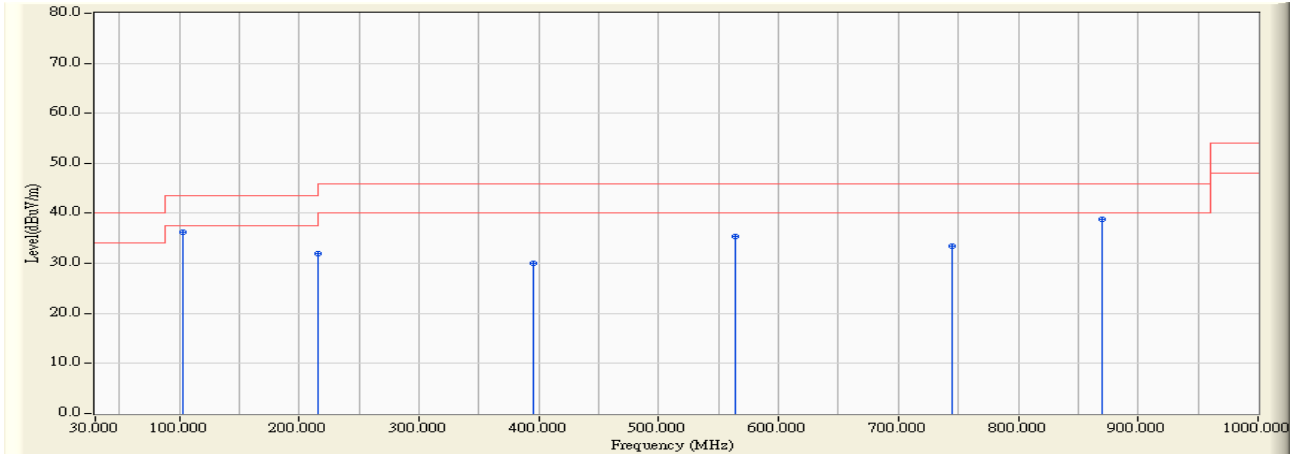


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	102.057	-7.966	35.800	27.834	-15.666	43.500	PEAK
2	287.743	-6.861	36.800	29.939	-16.061	46.000	PEAK
3	381.971	-3.541	33.401	29.859	-16.141	46.000	PEAK
4	562.114	3.816	30.200	34.016	-11.984	46.000	PEAK
5	* 743.643	4.391	31.800	36.191	-9.809	46.000	PEAK
6	866.971	4.883	30.800	35.683	-10.317	46.000	PEAK

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 : Site 1	Time : 2006/12/18 - 18:03
Limit : FCC_CLASS_B_03M_QP	Margin : 6
EUT : GM-120 Handheld GPS	Probe : FCC_RF_30-1G(200605) - VERTICAL
Power : AC 120V/60Hz	Note : CH39-TX

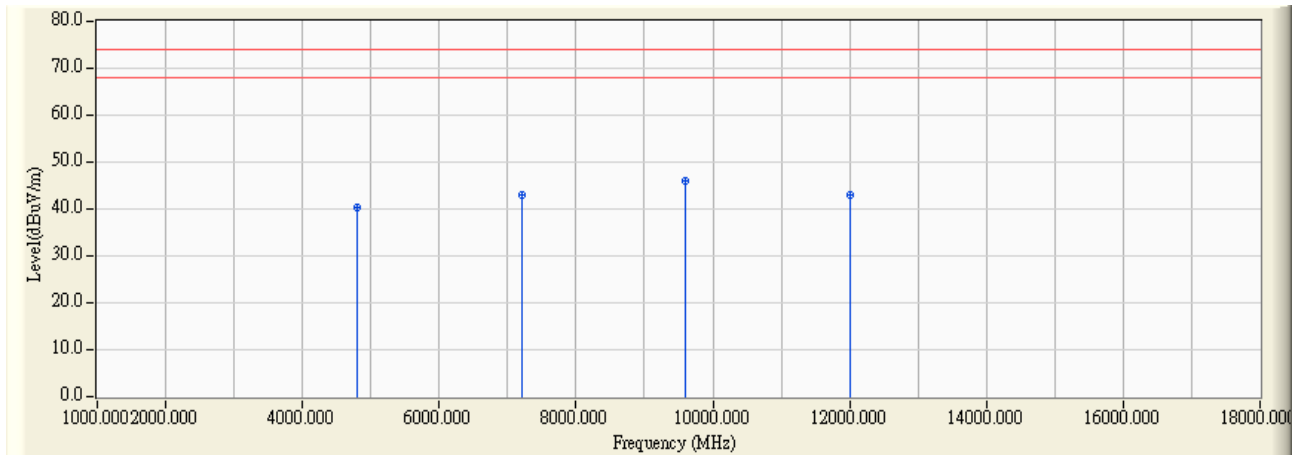


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		103.443	-0.753	37.000	36.247	-7.253	43.500	PEAK
2		215.686	-5.926	37.800	31.874	-11.626	43.500	PEAK
3		395.829	-0.520	30.600	30.080	-15.920	46.000	PEAK
4		563.500	1.660	33.800	35.460	-10.540	46.000	PEAK
5		745.029	1.853	31.600	33.453	-12.547	46.000	PEAK
6	*	869.743	3.926	35.000	38.926	-7.074	46.000	PEAK

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 : Site 1	Time : 2006/12/13 - 11:31
Limit : FCC_SpartC_15.247_H_03M_PK	Margin : 6
EUT : GM-120 Handheld GPS	Probe : FCC_RF_1G-18G(2005-3) - HORIZONTAL
Power : AC 120V/60Hz	Note : CH00-TX

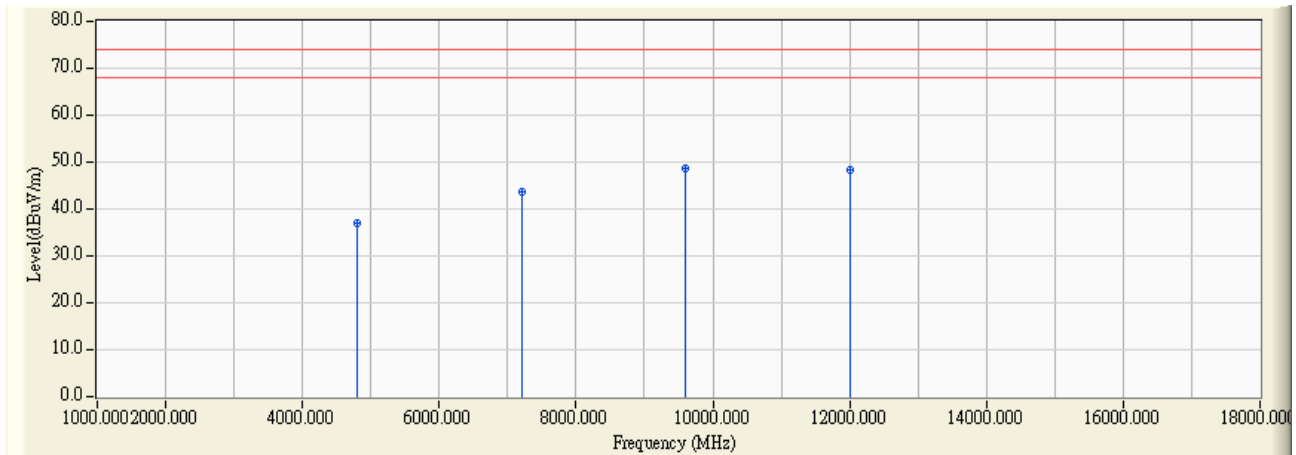


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit		Detector Type
						(Peak) (dBuV/m)	(Average) (dBuV/m)	
1	4803.850	3.593	36.800	40.393	-33.607	74.000	54.000	PEAK
2	7206.350	8.692	34.410	43.102	-30.898	74.000	54.000	PEAK
3	* 9608.050	12.690	33.300	45.990	-28.010	74.000	54.000	PEAK
4	12010.050	11.029	31.920	42.948	-31.052	74.000	54.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. 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 : Site 1	Time : 2006/12/13 - 11:45
Limit : FCC_SpartC_15.247_H_03M_PK	Margin : 6
EUT : GM-120 Handheld GPS	Probe : FCC_RF_1G-18G(2005-3) - VERTICAL
Power : AC 120V/60Hz	Note : CH00-TX

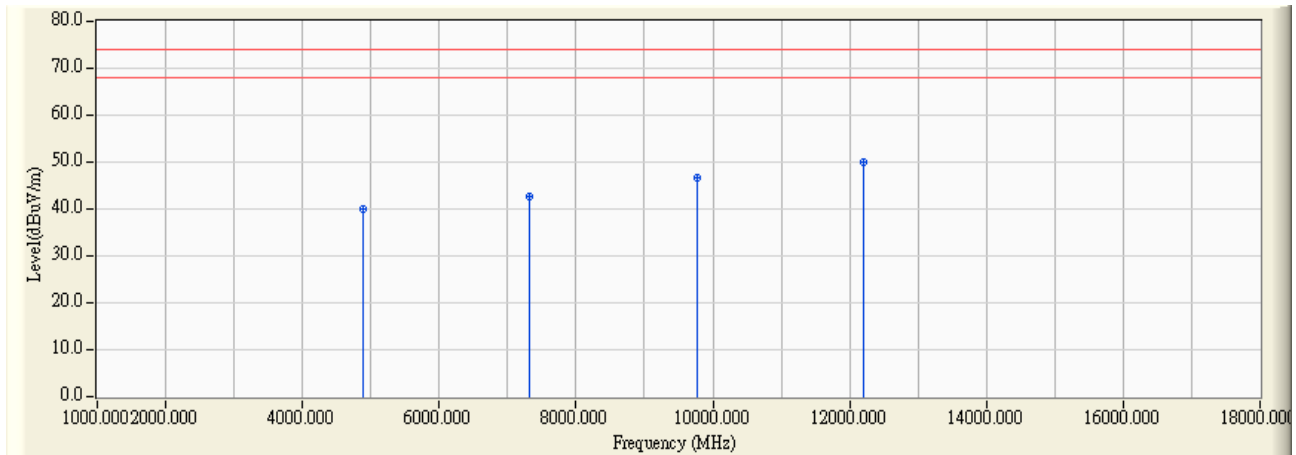


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit		Detector Type
						(Peak) (dBuV/m)	(Average) (dBuV/m)	
1	4804.050	1.812	35.050	36.862	-37.138	74.000	54.000	PEAK
2	7206.250	8.636	35.010	43.646	-30.354	74.000	54.000	PEAK
3	* 9607.950	14.677	33.830	48.507	-25.493	74.000	54.000	PEAK
4	12010.250	16.610	31.820	48.429	-25.571	74.000	54.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. 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 : Site 1	Time : 2006/12/13 - 11:57
Limit : FCC_SpartC_15.247_H_03M_PK	Margin : 6
EUT : GM-120 Handheld GPS	Probe : FCC_RF_1G-18G(2005-3) - HORIZONTAL
Power : AC 120V/60Hz	Note : CH39-TX

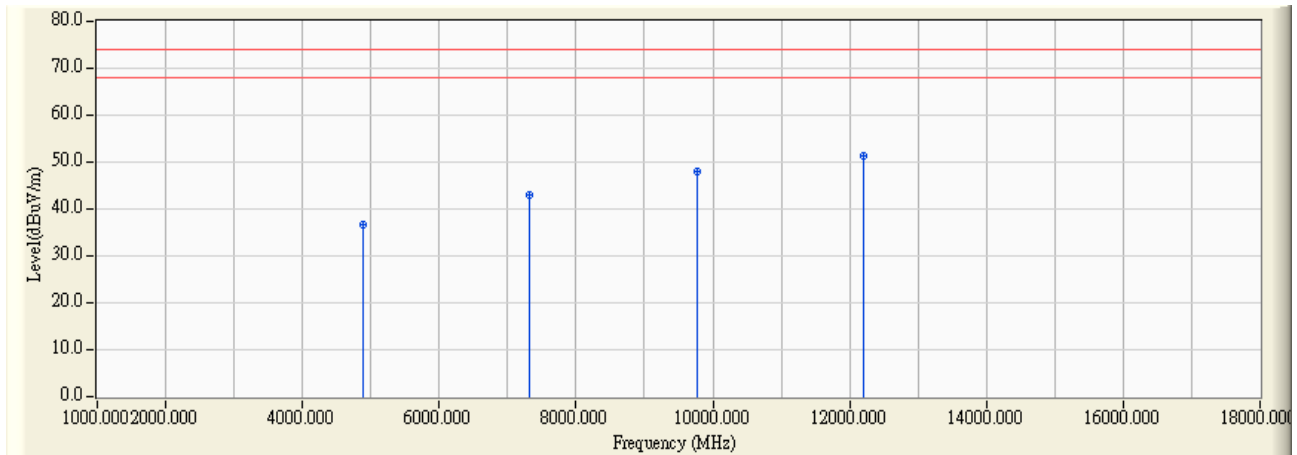


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit		Detector Type
						(Peak) (dBuV/m)	(Average) (dBuV/m)	
1	4881.950	4.143	35.910	40.052	-33.948	74.000	54.000	PEAK
2	7323.150	8.859	33.880	42.739	-31.261	74.000	54.000	PEAK
3	9763.950	13.218	33.430	46.647	-27.353	74.000	54.000	PEAK
4	* 12204.950	18.117	31.840	49.957	-24.043	74.000	54.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. 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 : Site 1	Time : 2006/12/13 - 12:06
Limit : FCC_SpartC_15.247_H_03M_PK	Margin : 6
EUT : GM-120 Handheld GPS	Probe : FCC_RF_1G-18G(2005-3) - VERTICAL
Power : AC 120V/60Hz	Note : CH39-TX

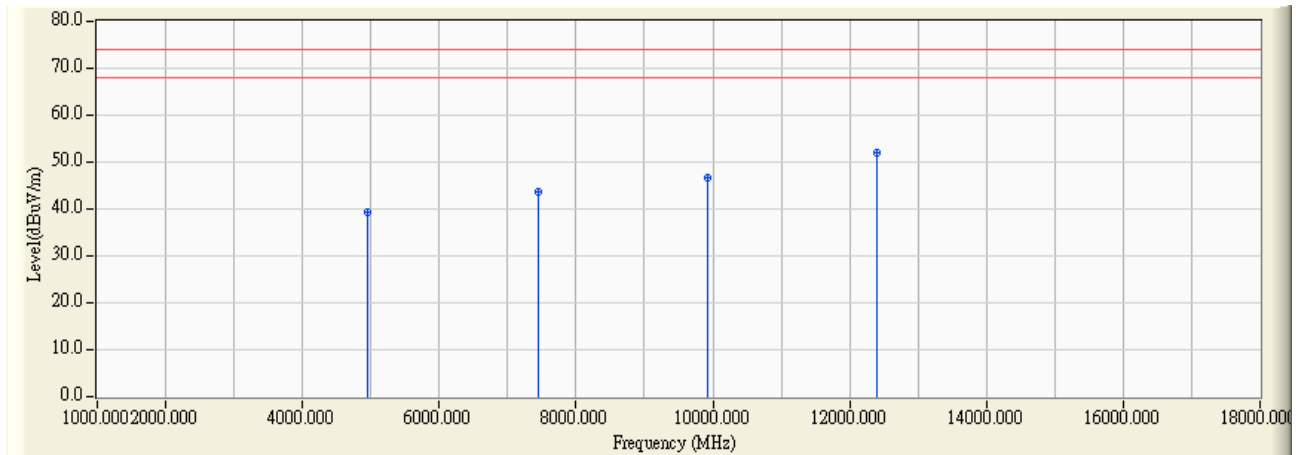


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit		Detector Type
						(Peak) (dBuV/m)	(Average) (dBuV/m)	
1	4882.050	2.503	34.060	36.563	-37.437	74.000	54.000	PEAK
2	7323.050	8.859	34.040	42.899	-31.101	74.000	54.000	PEAK
3	9764.150	15.218	32.620	47.838	-26.162	74.000	54.000	PEAK
4	* 12205.050	19.567	31.600	51.167	-22.833	74.000	54.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. 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 : Site 1	Time : 2006/12/13 - 13:07
Limit : FCC_SpartC_15.247_H_03M_PK	Margin : 6
EUT : GM-120 Handheld GPS	Probe : FCC_RF_1G-18G(2005-3) - HORIZONTAL
Power : AC 120V/60Hz	Note : CH78-TX

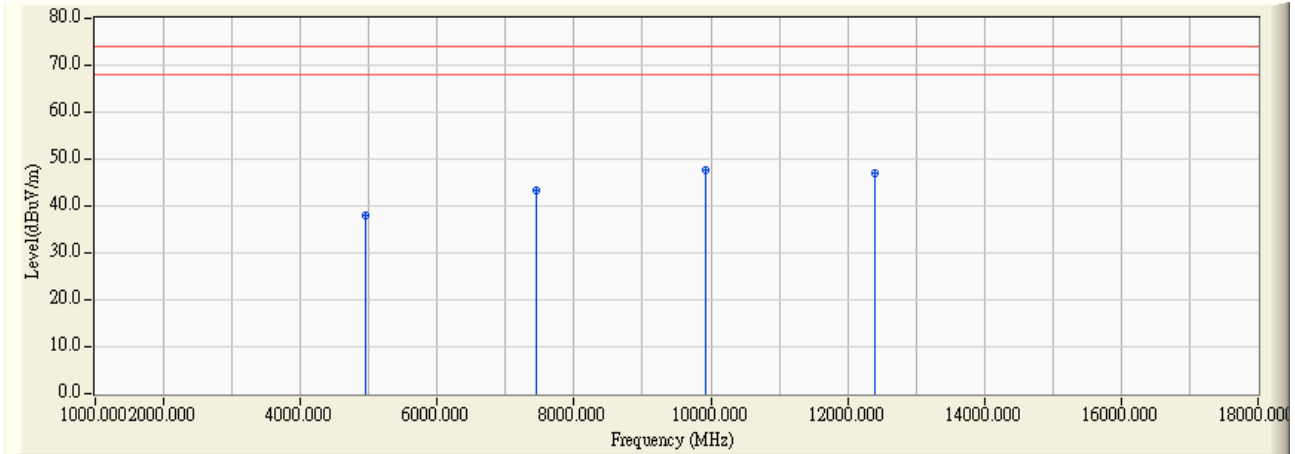


	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit		Detector Type
						(Peak) (dBuV/m)	(Average) (dBuV/m)	
1	4959.850	4.400	35.080	39.480	-34.520	74.000	54.000	PEAK
2	7439.850	9.016	34.700	43.716	-30.284	74.000	54.000	PEAK
3	9920.250	14.543	32.040	46.582	-27.418	74.000	54.000	PEAK
4	* 12400.250	20.684	31.260	51.944	-22.056	74.000	54.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. 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 : Site 1	Time : 2006/12/13 - 13:29
Limit : FCC_SpartC_15.247_H_03M_PK	Margin : 6
EUT : GM-120 Handheld GPS	Probe : FCC_RF_1G-18G(2005-3) - VERTICAL
Power : AC 120V/60Hz	Note : CH78-TX



	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit		Detector Type
						(Peak) (dBuV/m)	(Average) (dBuV/m)	
1	4960.350	2.919	34.940	37.859	-36.141	74.000	54.000	PEAK
2	7439.950	9.017	34.190	43.206	-30.794	74.000	54.000	PEAK
3	* 9919.850	15.340	32.350	47.690	-26.310	74.000	54.000	PEAK
4	12400.150	16.164	30.980	47.144	-26.856	74.000	54.000	PEAK

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. “ * ”, means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. 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.

5. Band Edge

5.1. Test Equipment

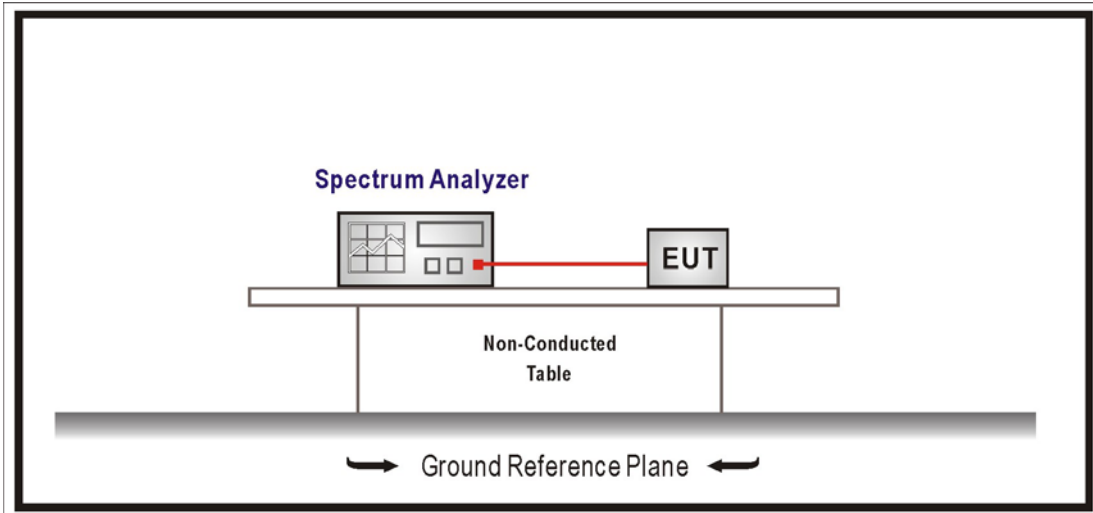
The following test equipment are used during the test:

RF Conducted Measurement:					
Item	Equipment		Manufacturer	Model No. / Serial No.	Last Cal.
1	Spectrum Analyzer		R & S	FSP / 100561	Mar., 2006
2	No.1 OATS				Sep., 2006
RF Radiated Measurement:					
Item		Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	X	Spectrum Analyzer	R & S	FSP40 / 100005	Aug., 2006
2	X	Pre-Amplifier	HP	8449B / 3008A01123	Feb., 2006
3		Loop Antenna	R & S	HFH2-Z2 / 833799/004	Sep., 2006
4		BiconiLog Antenna	Schwarzbeck	VULB 9166 / 1061	Sep., 2006
5		Bilog Antenna	Chase	CBL6112B / 2455	Sep., 2006
6	X	Horn Antenna	Schwarzbeck	BBHA 9120D / BBHA9120D312	Sep., 2006
7	No.1 OATS				Sep., 2006

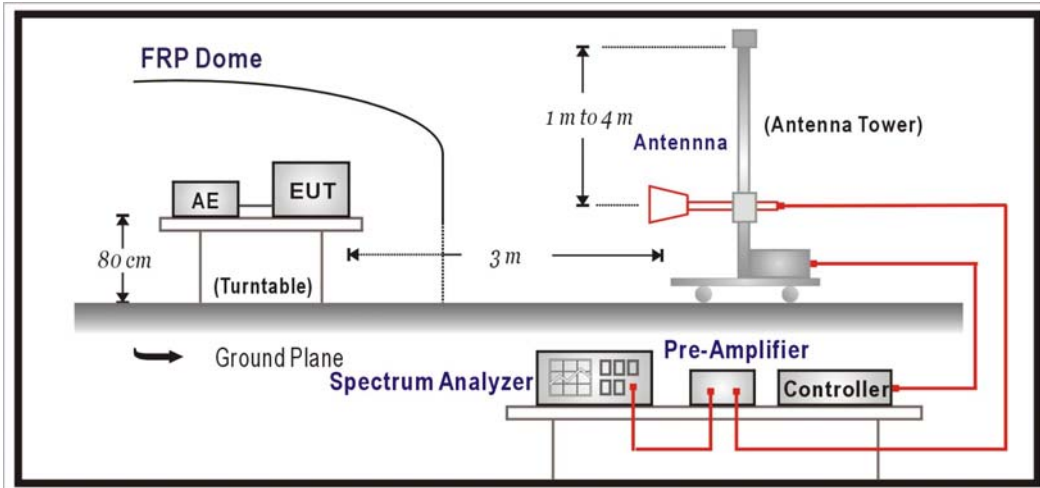
- Note: 1. All equipments that need to calibrate are with calibration period of 1 year.
 2. Mark "X" test instruments are used to measure the final test results.

5.2. Test Setup

RF Conducted Measurement:



RF Radiated 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 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)).

5.4. Test Procedure

The EUT and its simulators are placed on a turn table which is 0.8 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 C63.4:2003 on radiated measurement.

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

5.5. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2004

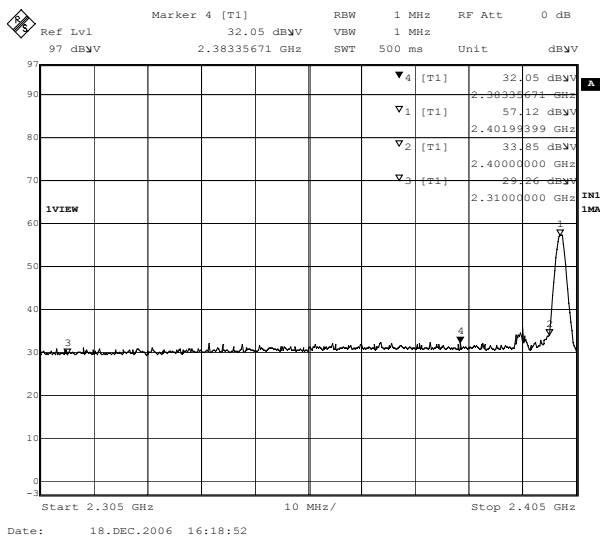
5.6. Test Result

Product	GM-120 Handheld GPS		
Test Item	Band Edge		
Test Mode	Mode 1: Transmit		
Date of Test	2006/12/18	Test Site	No.1 OATS

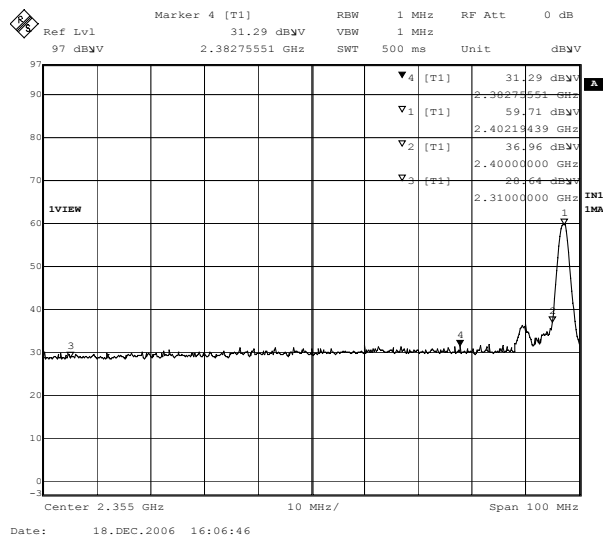
RF Radiated Measurement: (Peak Detector)

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Probe Factor (dB/m)	Cable Loss (dB)	PreAMP (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Result
00(Horizontal)	2383.357	32.050	24.452	4.504	0.00	61.006	74	Pass
00(Vertical)	2382.755	31.290	22.850	4.503	0.00	58.644	74	Pass

Horizontal



Vertical



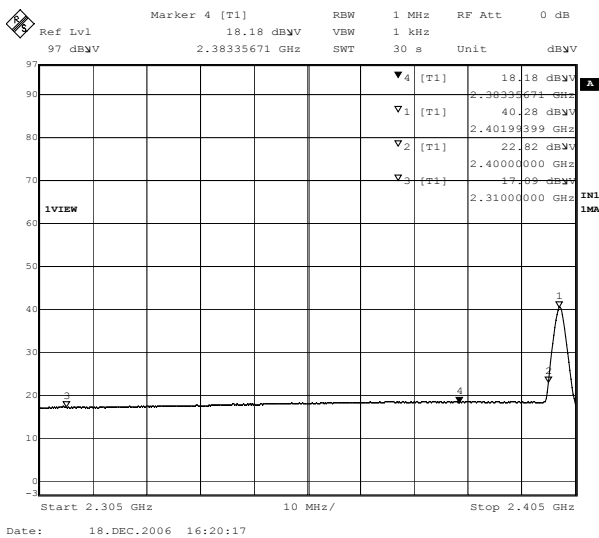
Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product	GM-120 Handheld GPS		
Test Item	Band Edge		
Test Mode	Mode 1: Transmit		
Date of Test	2006/12/18	Test Site	No.1 OATS

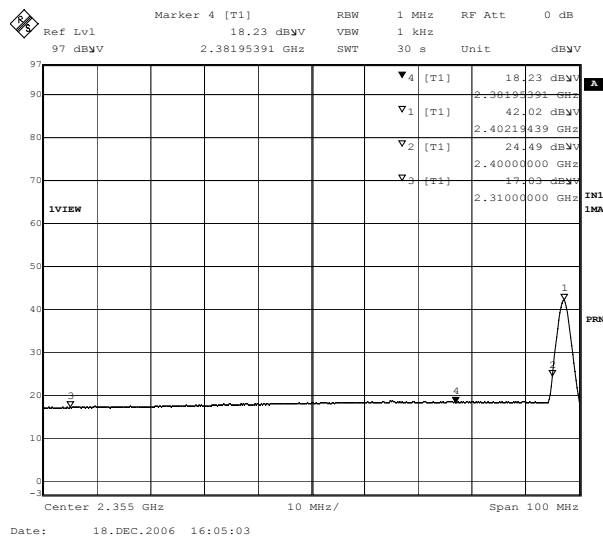
RF Radiated Measurement: (Average Detector)

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Probe Factor (dB/m)	Cable Loss (dB)	PreAMP (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Result
00(Horizontal)	2383.357	18.180	24.452	4.504	0.00	47.136	54	Pass
00(Vertical)	2381.954	18.230	22.847	4.503	0.00	45.580	54	Pass

Horizontal



Vertical



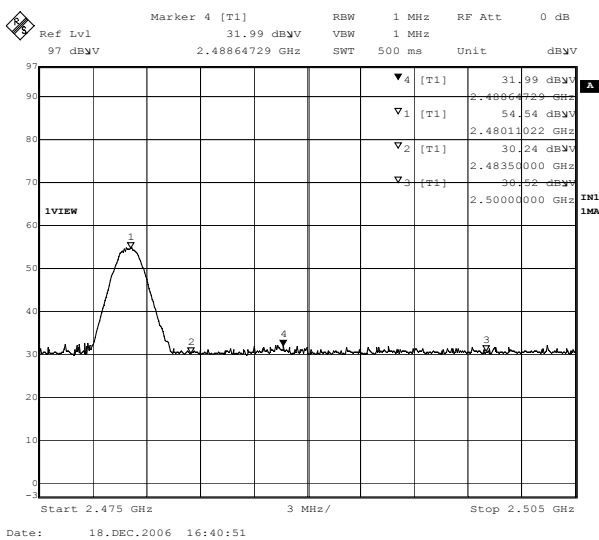
Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product	GM-120 Handheld GPS		
Test Item	Band Edge		
Test Mode	Mode 1: Transmit		
Date of Test	2006/12/18	Test Site	No.1 OATS

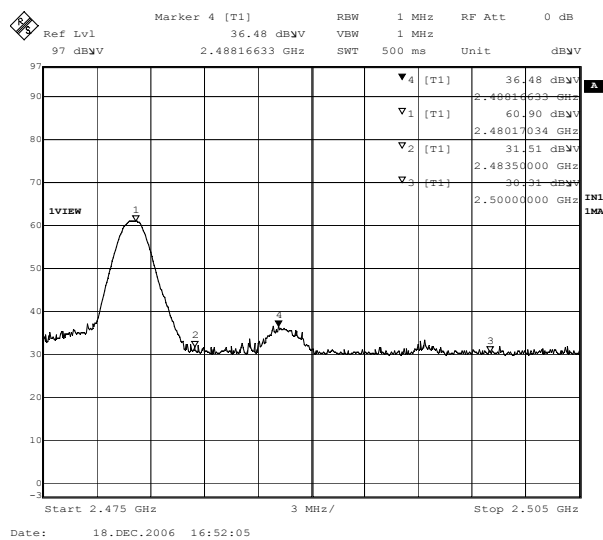
RF Radiated Measurement: (Peak Detector)

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Probe Factor (dB/m)	Cable Loss (dB)	PreAMP (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Result
78(Horizontal)	2488.647	31.990	24.733	4.576	0.00	61.298	74	Pass
78(Vertical)	2488.167	36.480	23.132	4.575	0.00	64.187	74	Pass

Horizontal



Vertical



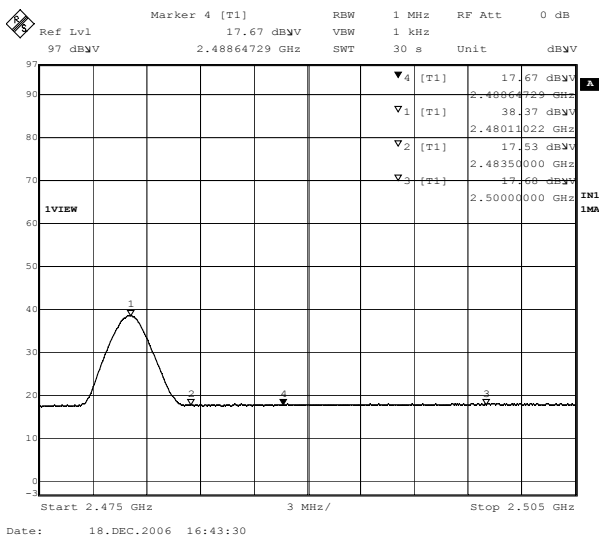
Note: The average measurement was not performed when the peak measured data under the limit of average detection. If the readings given are average, peak measurement should also be supplied.

Product	GM-120 Handheld GPS		
Test Item	Band Edge		
Test Mode	Mode 1: Transmit		
Date of Test	2006/12/18	Test Site	No.1 OATS

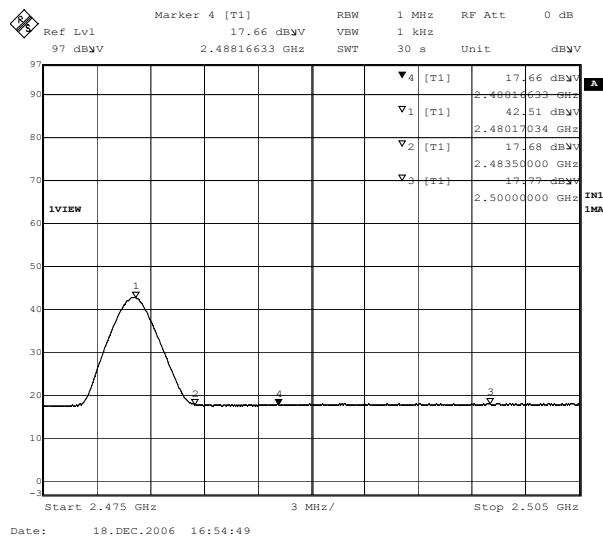
RF Radiated Measurement: (Average Detector)

Channel No.	Frequency (MHz)	Reading Level (dBuV)	Probe Factor (dB/m)	Cable Loss (dB)	PreAMP (dB)	Emission Level (dBuV/m)	Limit (dBuV/m)	Result
78(Horizontal)	2488.647	17.670	24.733	4.576	0.00	46.978	54	Pass
78(Vertical)	2488.167	17.660	23.132	4.575	0.00	45.367	54	Pass

Horizontal



Vertical



Note: 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.

6. Channel of Number

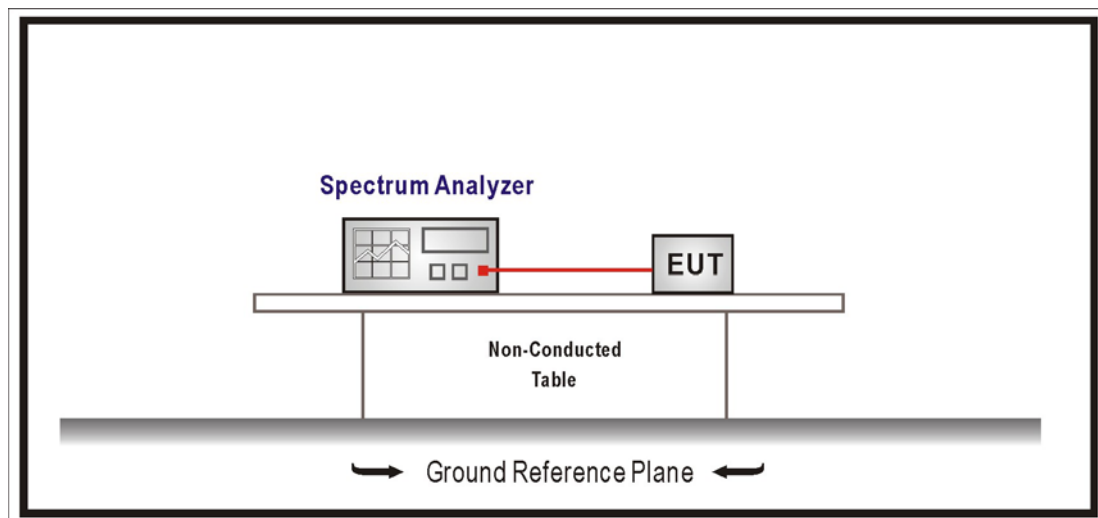
6.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2006
2	No.1 OATS			Sep., 2006

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

6.2. Test Setup



6.3. 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.

6.4. Test Specification

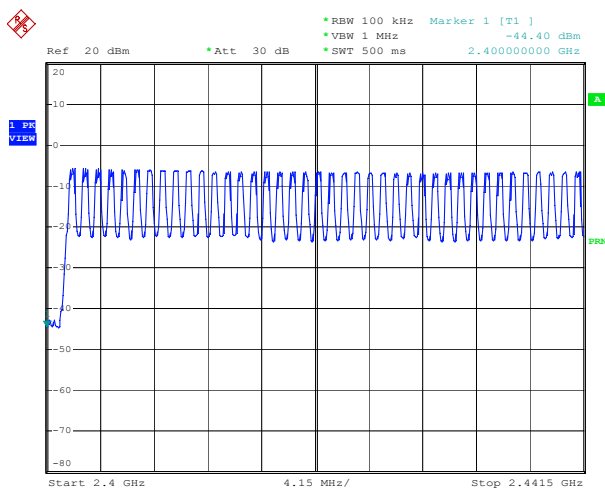
According to FCC Part 15 Subpart C Paragraph 15.247: 2004

6.5. Test Result

Product	GM-120 Handheld GPS		
Test Item	Channel of Number		
Test Mode	Mode 1: Transmit		
Date of Test	2006/11/21	Test Site	No.1 OATS

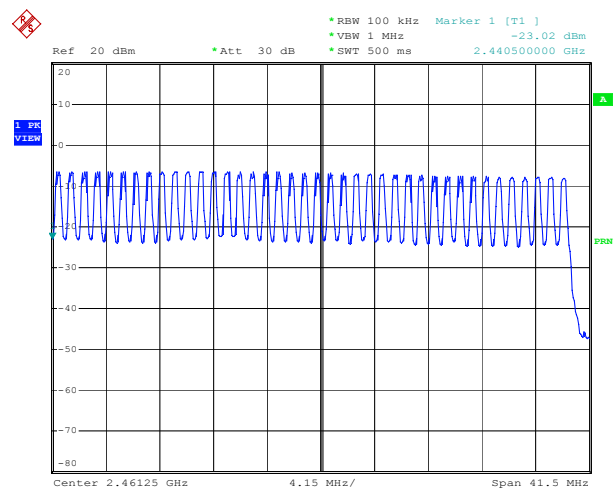
Frequency Range (MHz)	Measure Level (Hopping Channel)	Limit (Hopping Channel)	Result
2402 ~ 2480	79	>75	Pass

2402-2440MHz



Date: 11.DEC.2006 14:27:24

2441-2480MHz



Date: 11.DEC.2006 14:35:14

7. Channel Separation

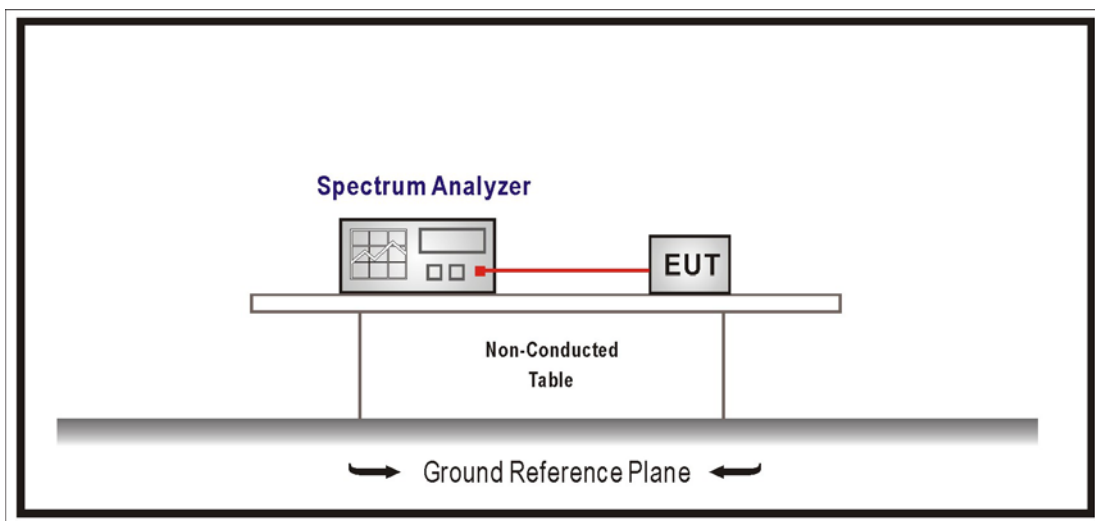
7.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2006
2	No.1 OATS			Sep., 2006

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

7.2. Test Setup



7.3. Limits

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.

7.4. Test Specification

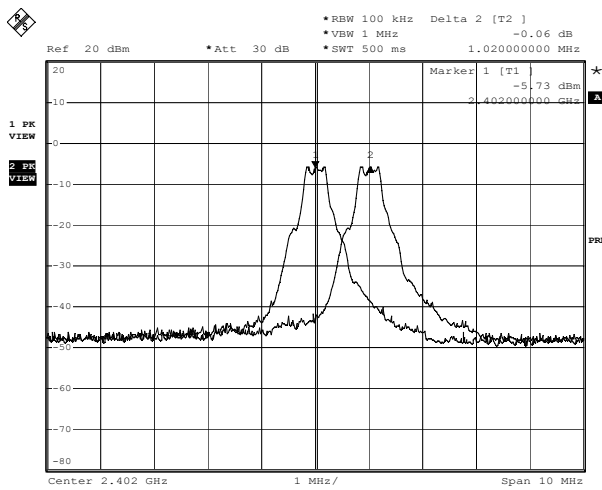
According to FCC Part 15 Subpart C Paragraph 15.247: 2004

7.5. Test Result

Product	GM-120 Handheld GPS		
Test Item	Channel Separation		
Test Mode	Mode 1: Transmit		
Date of Test	2006/11/21	Test Site	No.1 OATS

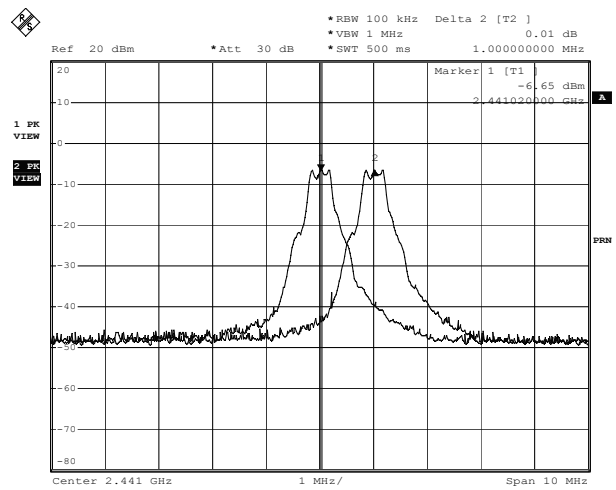
Channel No.	Frequency (MHz)	Measure Level (kHz)	Limit		Result
			(kHz)	Bandwidth (dB)	
00	2402.00	1020	>25	>20	Pass
39	2441.00	1000	>25	>20	Pass
78	2480.00	1000	>25	>20	Pass

Channel 00



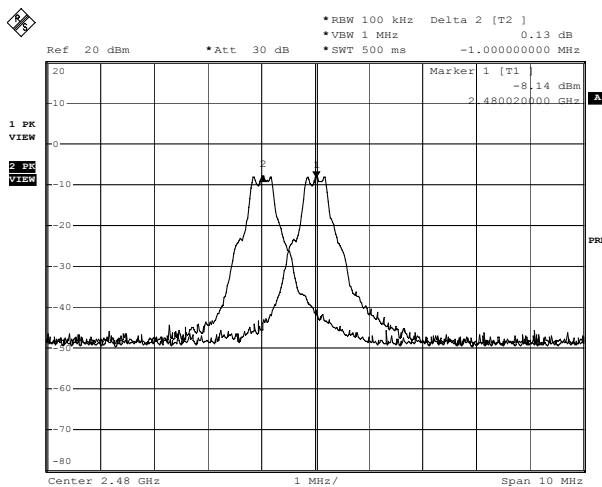
Date: 11.DEC.2006 14:50:38

Channel 39



Date: 11.DEC.2006 14:55:05

Channel 78



Date: 11.DEC.2006 14:59:20

8. Occupied Bandwidth

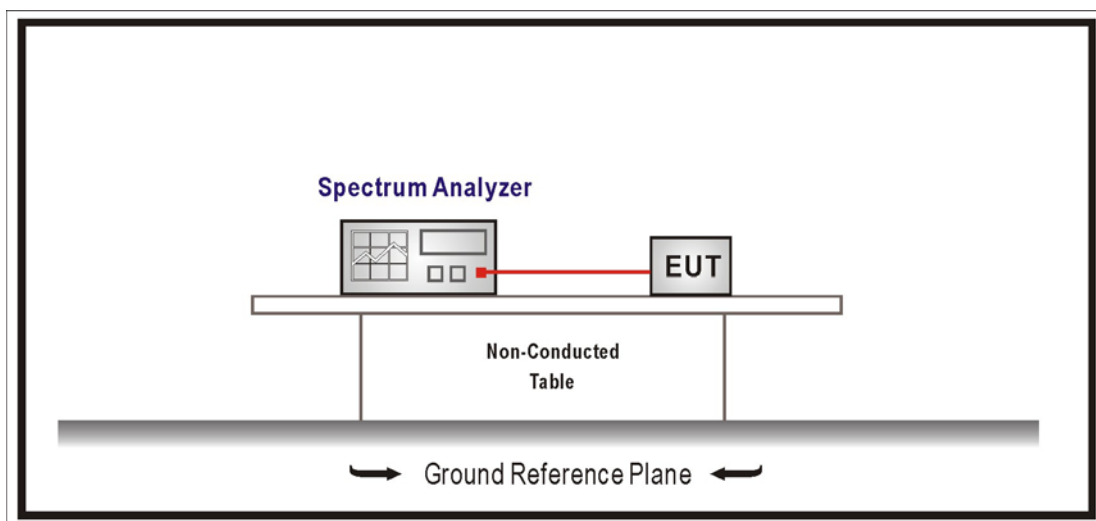
8.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2006
2	No.1 OATS			Sep., 2006

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

8.2. Test Setup



8.3. 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.

8.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2004

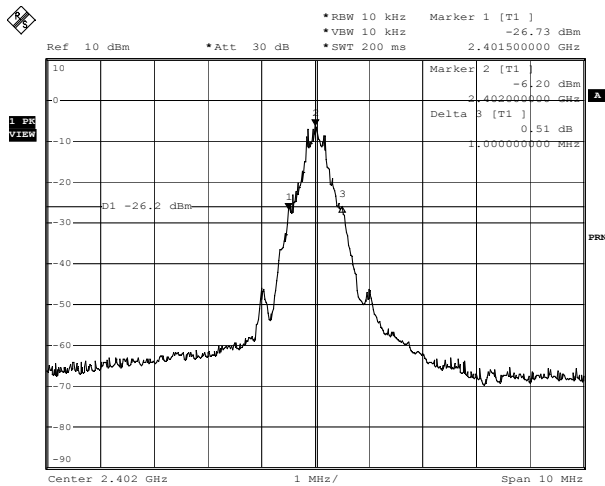
8.5. Test Result

Product	GM-120 Handheld GPS		
Test Item	Occupied Bandwidth		
Test Mode	Mode 1: Transmit		
Date of Test	2006/11/21	Test Site	No.1 OATS

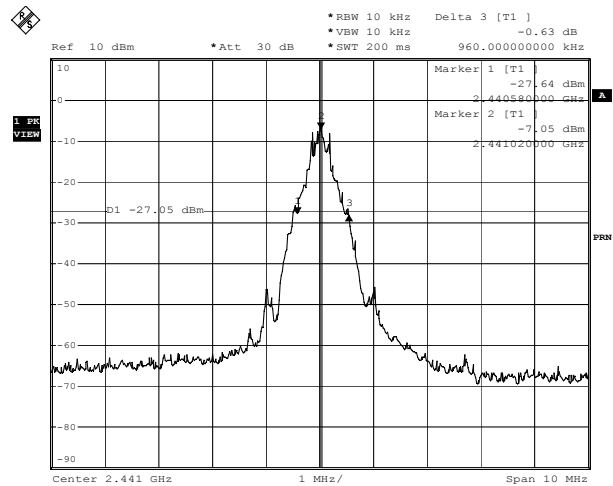
Channel No.	Frequency (MHz)	Measure Level (MHz)	Limit (MHz)	Result
00	2402.00	1	<1	Pass
39	2441.00	0.96	<1	Pass
78	2480.00	0.96	<1	Pass

Channel 00

Channel 39

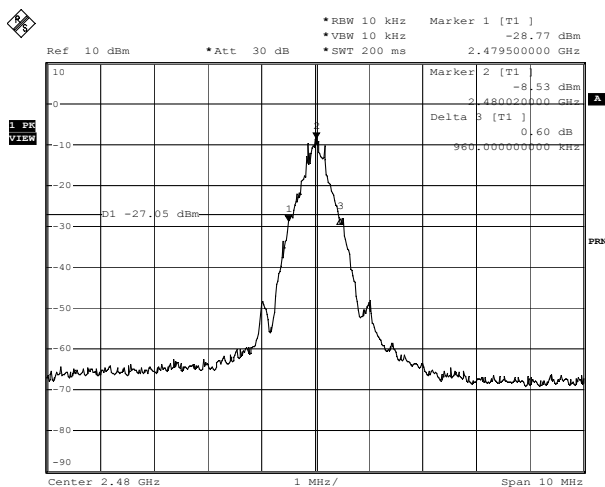


Date: 21.NOV.2006 17:21:22



Date: 21.NOV.2006 17:26:10

Channel 78



Date: 21.NOV.2006 17:29:05

9. Dwell Time

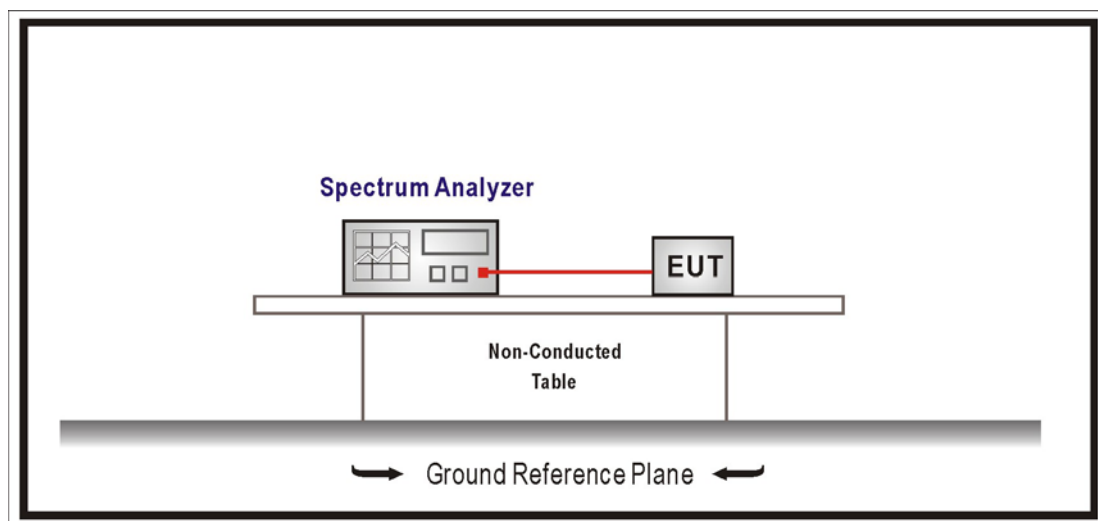
9.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2006
2	No.1 OATS			Sep., 2006

Note: 1. 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. 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.

9.4. Test Specification

According to FCC Part 15 Subpart C Paragraph 15.247: 2004

9.5. Test Result

Product	GM-120 Handheld GPS		
Test Item	Dwell Time		
Test Mode	Mode 1: Transmit		
Date of Test	2006/12/11	Test Site	No.1 OATS

Occupancy Time of Frequency Hopping System-DH 1

A) 2402MHz Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $16/20\text{msec} = 800 / \text{sec}$

The Maximum Occupancy Time Within 31.6sec: $0.00014 \times (800/79) \times 31.6 = 0.0448\text{sec}$.

B) 2441MHz Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $15/20\text{msec} = 750 / \text{sec}$

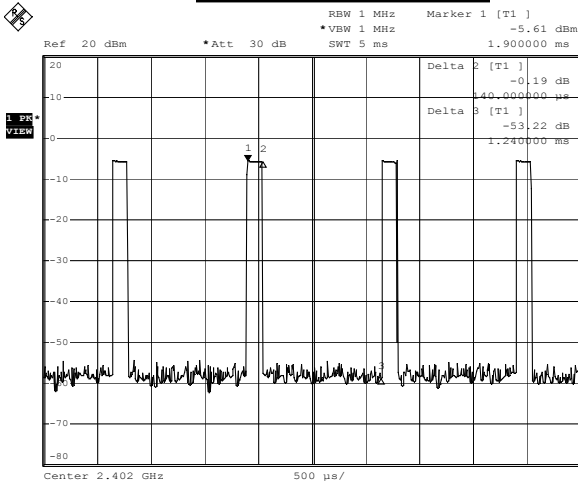
The Maximum Occupancy Time Within 31.6sec: $0.00015 \times (750/79) \times 31.6 = 0.045\text{sec}$.

C) 2480MHz Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $15/20\text{msec} = 750 / \text{sec}$

The Maximum Occupancy Time Within 31.6sec: $0.00014 \times (750/79) \times 31.6 = 0.042\text{sec}$.

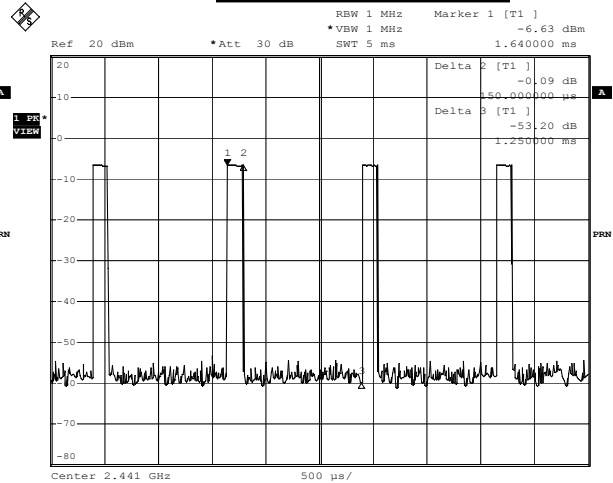
Test Result: The Average Occupancy Time of Each Highest , Middle and Lowest Channel Is Less Than 0.4sec , And Corresponds to The Standard .

Hop rate-2402MHz



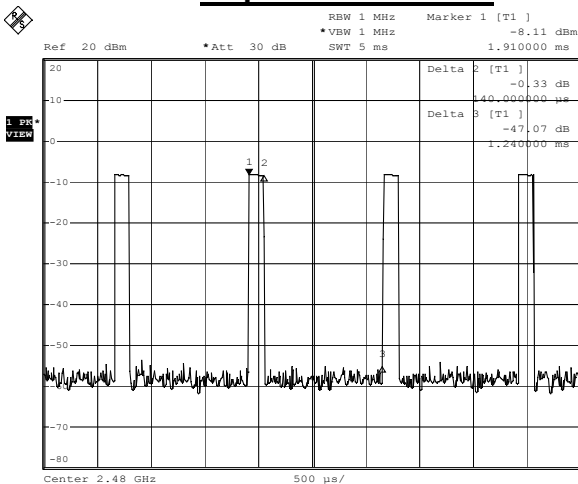
Date: 11.DEC.2006 15:21:48

Hop rate-2441MHz



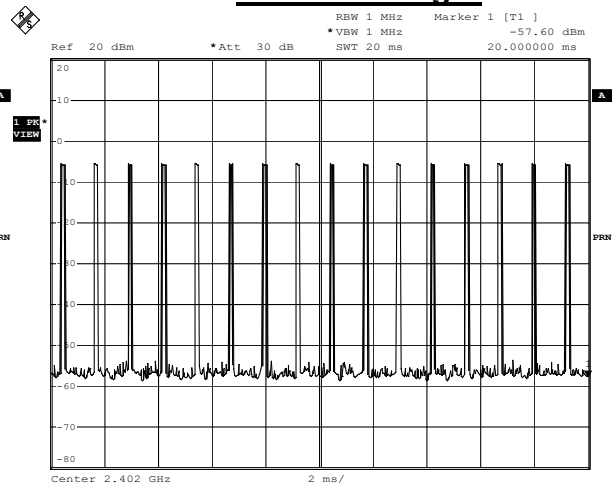
Date: 11.DEC.2006 15:45:19

Hop rate-2480MHz



Date: 11.DEC.2006 15:49:26

Time slot length



Date: 11.DEC.2006 15:10:20

Note: Dwell time = time slot length * hop rate / number of hopping channels * period

Product	GM-120 Handheld GPS		
Test Item	Dwell Time		
Test Mode	Mode 1: Transmit		
Date of Test	2006/12/11	Test Site	No.1 OATS

Occupancy Time of Frequency Hopping System-DH 3

A) 2402MHz Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $16/20\text{msec} = 800/\text{sec}$

The Maximum Occupancy Time Within 31.6sec: $0.00019 \times (800/79) \times 31.6 = 0.0608\text{sec}$ ◦

B) 2441MHz Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $16/20\text{msec} = 800/\text{sec}$

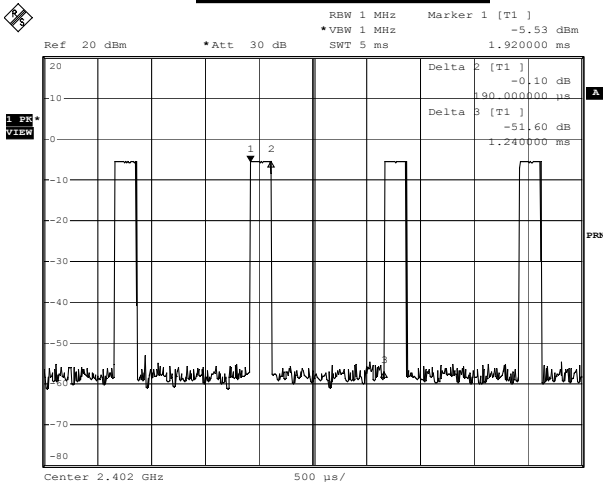
The Maximum Occupancy Time Within 31.6sec: $0.0002 \times (800/79) \times 31.6 = 0.064\text{sec}$ ◦

C) 2480MHz Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $16/20\text{msec} = 800/\text{sec}$

The Maximum Occupancy Time Within 31.6sec: $0.0002 \times (800/79) \times 31.6 = 0.064\text{sec}$ ◦

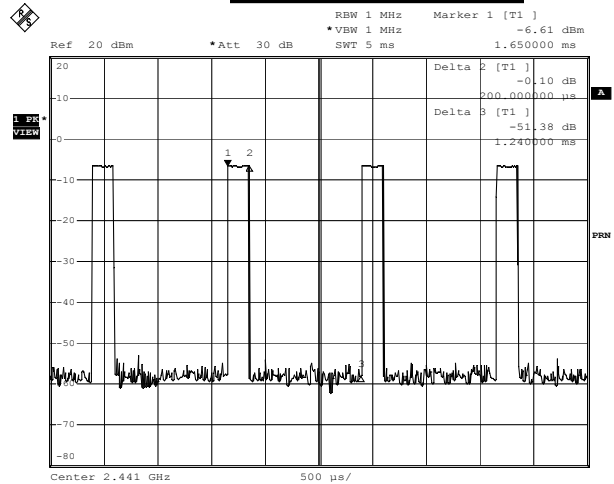
Test Result: The Average Occupancy Time of Each Highest , Middle and Lowest Channel Is Less Than 0.4sec , And Corresponds to The Standard ◦

Hop rate-2402MHz



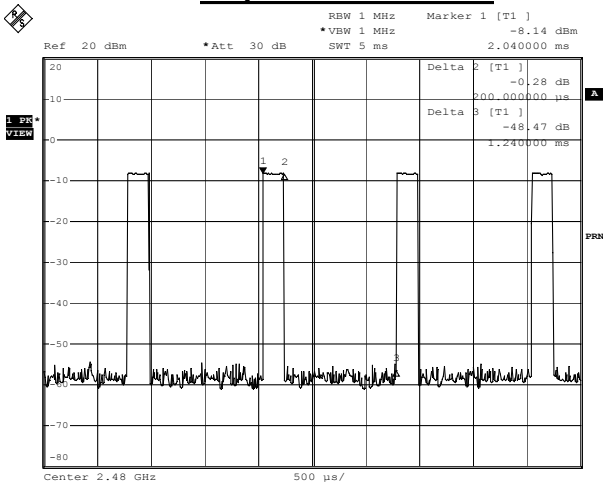
Date: 11.DEC.2006 15:35:32

Hop rate-2441MHz



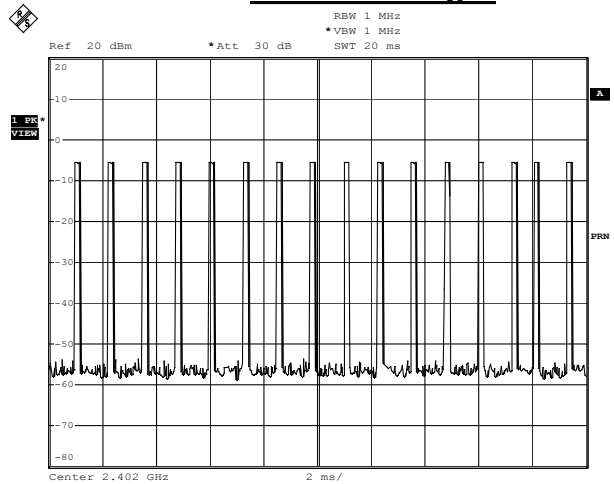
Date: 11.DEC.2006 15:43:32

Hop rate-2480MHz



Date: 11.DEC.2006 15:50:20

Time slot length



Date: 11.DEC.2006 15:24:39

Note: Dwell time = time slot length * hop rate / number of hopping channels * period

Product	GM-120 Handheld GPS		
Test Item	Dwell Time		
Test Mode	Mode 1: Transmit		
Date of Test	2006/12/11	Test Site	No.1 OATS

Occupancy Time of Frequency Hopping System-DH 3

A) 2402MHz Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $16/20\text{msec} = 800/\text{sec}$

The Maximum Occupancy Time Within 31.6sec: $0.00023 \times (800/79) \times 31.6 = 0.0736\text{sec}$ ◦

B) 2441MHz Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $16/20\text{msec} = 800/\text{sec}$

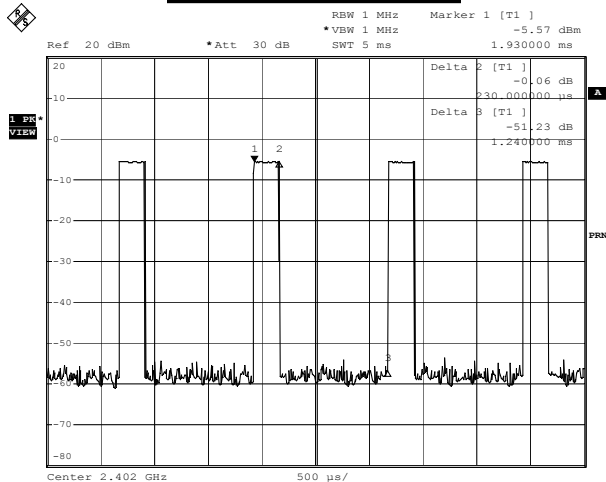
The Maximum Occupancy Time Within 31.6sec: $0.00024 \times (800/79) \times 31.6 = 0.0768\text{sec}$ ◦

C) 2480MHz Test Time Period: $0.4 \times 79 = 31.6\text{sec}$, Hopping Times Within 1sec: $16/20\text{msec} = 800/\text{sec}$

The Maximum Occupancy Time Within 31.6sec: $0.00024 \times (800/79) \times 31.6 = 0.0768\text{sec}$ ◦

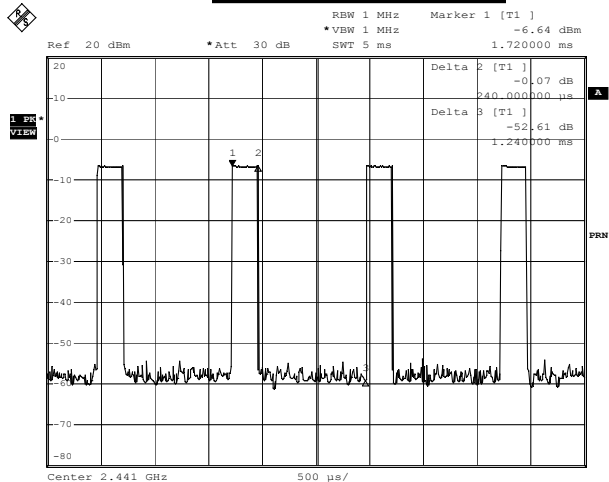
Test Result: The Average Occupancy Time of Each Highest , Middle and Lowest Channel Is Less Than 0.4sec , And Corresponds to The Standard ◦

Hop rate-2402MHz



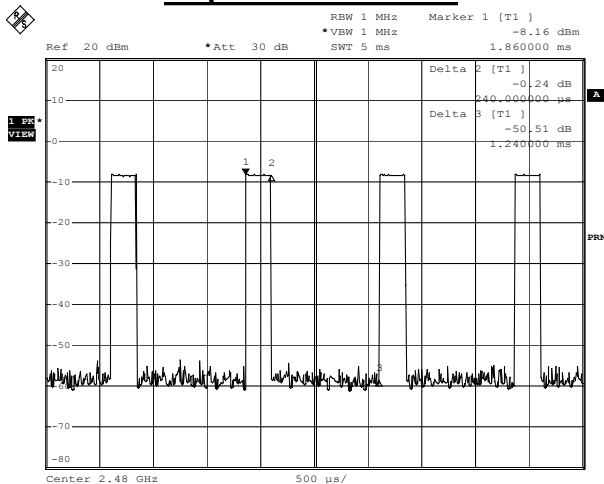
Date: 11.DEC.2006 15:31:37

Hop rate-2441MHz



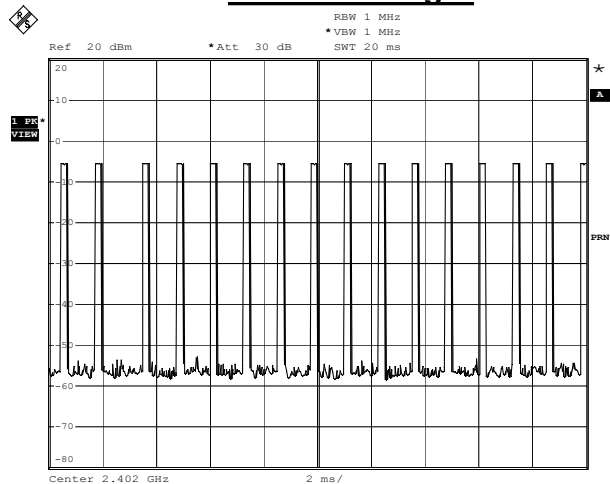
Date: 11.DEC.2006 15:44:23

Hop rate-2480MHz



Date: 11.DEC.2006 15:51:08

Time slot length



Date: 11.DEC.2006 15:37:51

Note: Dwell time = time slot length * hop rate / number of hopping channels * period