Test Report

Product Name : iGPS-BT Bluetooth GPS receiver

Model No. : 360-1000-xx (GPS receiver), 361-1000-xx (Bluetooth Dock)

FCC ID.: Q7M-IGPS-BT

Applicant : Pharos Science & Applications, Inc.

Address : 411 Amapola Ave., Torrance, CA 90501

Date of Receipt : May. 12, 2003

Date of Test : Jun. 18, 2003

Report No. : 035H026FI

Test Report Certification

Test Date : Jun. 18, 2003
Report No. : 035H026FI

Accredited by NIST (NVLAP)
NVLAP Lab Code: 200347-0

Product Name	:	iGPS-BT Bluetooth GPS receiver
Applicant	:	Pharos Science & Applications, Inc.
Address	:	411 Amapola Ave., Torrance, CA 90501
Manufacturer	:	AboCom System, Inc.
Model No.	:	360-1000-xx (GPS receiver), 361-1000-xx (Bluetooth Dock)
FCC ID.	:	Q7M-IGPS-BT
Rated Voltage	:	DC 3.3V (Power by Battery)
Trade Name	:	PHAROS
Measurement Standard	:	FCC Part 15 Subpart C Paragraph 15.247
Measurement Procedure	:	ANSI C63.4: 1992
Test Result	:	Complied

NVLAP Lab Code : 200347-0

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.
This report must not be used to claim product endorsement by NVLAP any agency of the U.S. Government

Documented By : Carol Tsai
(Carol Tsai)

Tested By : Ken Hsu
(Ken Hsu)

Approved By :
(Kevin Wang)

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	:	iGPS-BT Bluetooth GPS receiver
Trade Name	:	PHAROS
FCC ID.	:	Q7M-IGPS-BT
Model No.	:	360-1000-xx (GPS receiver), 361-1000-xx (Bluetooth Dock)
Frequency Range	:	2402MHz to 2480MHz
Channel Number	:	78
Type of Modulation	:	Frequency Hopping Spread Spectrum
Antenna Type	:	Soldered on PCB
Channel Control	:	By software
Power Adapter	:	Farlight Energy, S08AB042030 Cable Out: Non-shielded, 1.8m.

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 hopsets 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. 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.
2. Regards to the frequency band operation; the lowest、middle and highest frequency of channel were selected to perform the test, then shown on this report.
3. This device is a composite device in accordance with Part 15 regulations. The function for the receiver was, measured and made a test report that the report number is 035H026F, certified under Declaration of Conformity.
4. The Bluetooth GPS receiver transmits GPS signal to the Pocket PC (or other BT enabled devices) for mapping / navigation applications.
5. The 360-1000-xx (GPS receiver), 361-1000-xx (Bluetooth Dock), xx: any number from 0 to 9, for different enclosure color.
6. QuieTek had verified among construction and function in typical operation, then shown in this test report.

1.2. Operational Description

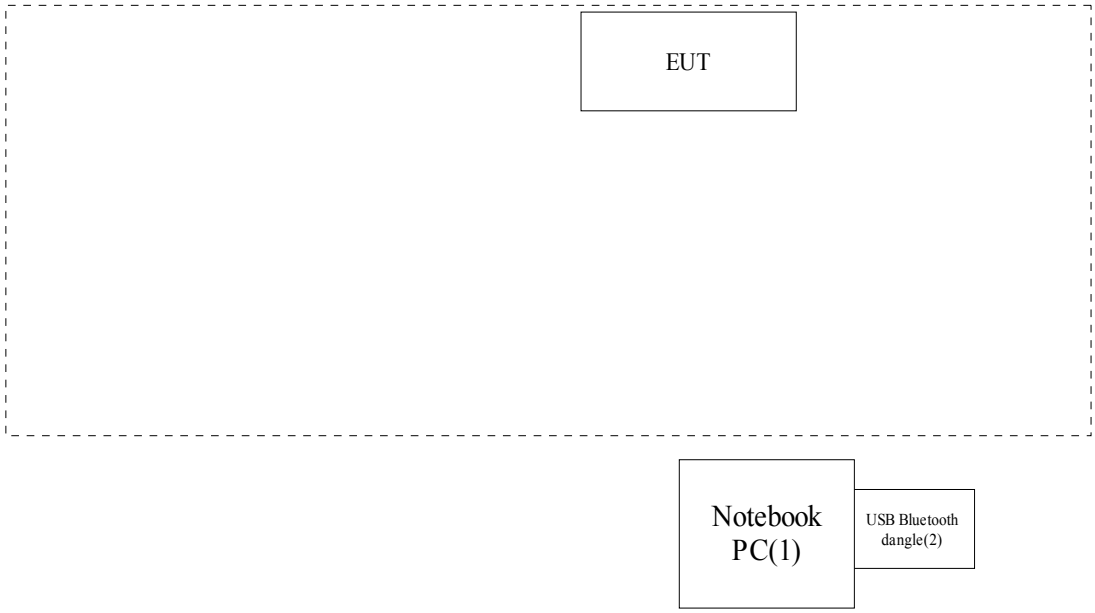
The EUT is an serial iGPS-BT Bluetooth GPS receiver with 78 channels.
This device provides wireless technology that revolutionizes personal connectivity. It is the solution for the seamless integration of Bluetooth technology into personal computer enabling short-range wireless connections between desktop/laptop computers, Bluetooth-enabled peripherals (printers, faxes,….), portable handheld devices, and connectivity to the Internet.

1.3. Tested System Details

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

Product		Manufacturer	Model No.	Serial No.	Power Cord
(1)	Notebook PC	DELL	Latitude 600	N/A	Non-shielded, 1.7m, a ferrite core bonded
(2)	USB Bluetooth dangle	AboCom	UBT1000	N/A	--

1.4. Configuration of Tested System



1.5. EUT Exercise Software

(1) Setup the EUT and simulators as shown on 1.4.

(2) Turn on the power of all equipment.

(3) Notebook PC reads data from disk.

(4) Data will be transmitting through EUT.

(5) The transmitted status will be shown on the monitor.

(6) Repeat the above procedure (4) to (5).

1.6. Test Facility

Ambient conditions in the laboratory:

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	20-35
Humidity (%RH)	25-75	50-65
Barometric pressure (mbar)	860-1060	950-1000

Site Description: November 3, 1998 File on
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046
Reference 31040/SIT1300F2

August 30, 2001 Accreditation on NVLAP
NVLAP Lab Code: 200347-0

NVLAP Lab Code : 200347-0

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

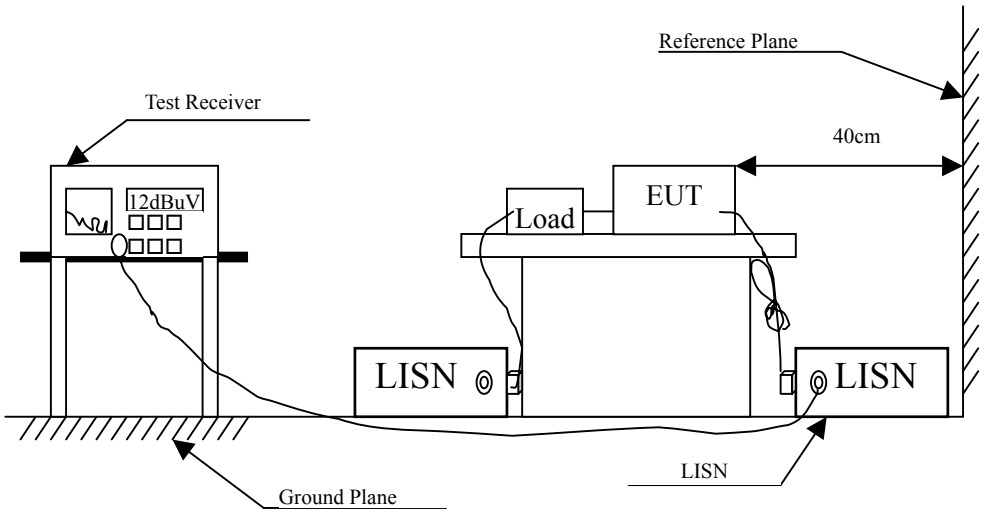
2.1. Test Equipment

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	Aug., 2002	
2	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2003	Peripherals
3	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2003	EUT
4	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2003	
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 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

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

2.4. Test Procedure

The EUT and 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 C63.4:1992 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 Result of Conducted Emission

Product : iGPS-BT Bluetooth GPS receiver
Test Item : Conducted Emission
Power Line : Line 1
Test Mode : Normal Operation

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.157	-0.01	0.10	54.98	55.07	65.62
	0.312	0.00	0.17	51.22	51.39	59.92
*	0.466	0.02	0.21	47.92	48.15	56.58
	0.625	0.03	0.24	36.26	36.52	56.00
	0.936	0.03	0.27	33.05	33.35	56.00
	1.076	0.03	0.29	32.80	33.12	56.00
Average						
	0.157	-0.01	0.10	51.86	51.95	55.62
	0.312	0.00	0.17	48.64	48.81	49.92
	0.466	0.02	0.21	44.73	44.96	46.58
	0.625	0.03	0.24	34.68	34.94	46.00
	0.936	0.03	0.27	32.00	32.30	46.00
	1.075	0.03	0.29	32.85	33.17	46.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

Product : iGPS-BT Bluetooth GPS receiver
Test Item : Conducted Emission
Power Line : Line 2
Test Mode : Normal Operation

	Frequency	Cable Loss	Probe Factor	Reading Level	Emission Level	Limits
	MHz	dB	dB	dBuV	dBuV	dBuV
Quasi-Peak						
	0.156	-0.01	0.10	50.00	50.09	65.67
	0.311	0.00	0.17	45.60	45.77	59.94
*	0.467	0.02	0.21	42.75	42.98	56.57
	0.623	0.03	0.24	32.00	32.26	56.00
	0.935	0.03	0.27	27.39	27.69	56.00
	1.232	0.04	0.30	23.31	23.65	56.00
Average						
	0.156	-0.01	0.10	39.70	39.79	55.67
	0.311	0.00	0.17	36.35	36.52	49.94
	0.467	0.02	0.21	35.20	35.43	46.57
	0.623	0.03	0.24	25.96	26.22	46.00
	0.935	0.03	0.27	23.40	23.70	46.00
	1.232	0.04	0.30	20.85	21.19	46.00

Note:

1. All Reading Levels are Quasi-Peak and Average value.
2. " * ", means this data is the worst emission level.
3. Emission Level = Reading Level + LISN Factor + Cable Loss.

3. Peak Power Output

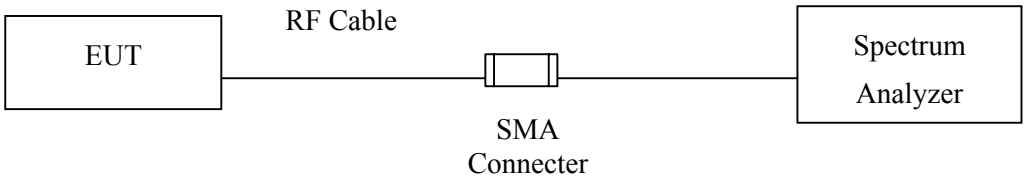
3.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2003	
2	No.1 OATS			Sep., 2002	

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

3.2. Test Setup



3.3. Limit

The maximum peak power shall be less 1 Watt.

3.4. Test Result of Peak Power Output

Product : iGPS-BT Bluetooth GPS receiver
Test Item : Peak Power Output
Test Site : No.1 OATS
Test Mode : Normal Operation

Channel No.	Frequency(MHz)	Measurement	Required Limit	Result
Channel 00	2402.06	-3.45dBm	1 Watt= 30 dBm	Pass
Channel 39	2441.06	-3.64dBm	1 Watt= 30 dBm	Pass
Channel 78	2480.06	-6.16dBm	1 Watt= 30 dBm	Pass

Note:

1. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。

4. Radiated Emission

4.1. Test Equipment

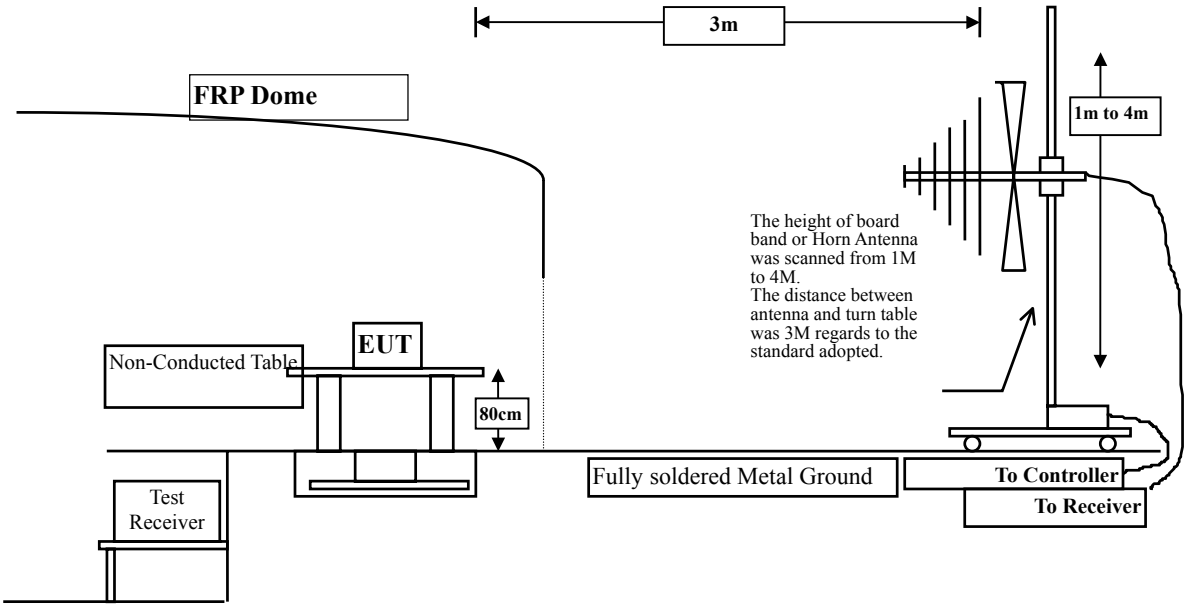
The following test equipment are used during the test:

Item		Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	X	Test Receiver	R & S	ESCS 30 / 825442/017	Jan., 2003
2	X	Spectrum Analyzer	Advantest	R3261C / 81720266	N/A
3	X	Pre-Amplifier	HP	8447D / 2944A09276	N/A
4	X	Bilog Antenna	Chase	CBL6112B / 2455	Sep., 2002
5	X	Spectrum Analyzer	R & S	FSP40 / 100005	Aug., 2002
6	X	Pre-Amplifier	HP	8449B / 3008A01123	Feb., 2003
7	X	Horn Antenna	Schwarzbeck	BBHA 9120D / BBHA9120D312	Sep., 2002
8	No.1 OATS				Sep., 2002

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



4.3. Limits

➢ **General Radiated Emission Limits**

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

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
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 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 C63.4:1992 on radiated measurement.
The additional latch filter below 1GHz was used to measure the level of harmonics radiated emission during field dtrength of harmonics measurement.
The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30)is 120 kHz, above 1GHz are 1 MHz.
The frequency range from 30MHz to 10th harminics is checked.

4.5. Test Result of Radiated Emission

Product : iGPS-BT Bluetooth GPS receiver
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 00

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level		Emission Level	Margin	Limit
MHz	dB	dB/m	dB	dBuV		dBuV/m	dB	dBuV/m
Horizontal								
Peak Detector:								
4804.500	4.23	31.26	34.38	39.63		40.74	33.26	74.00
7205.800	5.61	36.53	34.92	39.76		46.98	27.02	74.00
9607.800	6.98	37.94	34.49	37.46	<	47.89	26.11	74.00
12010.20	8.37	38.62	33.21	36.49	<	50.27	23.73	74.00
Vertical								
Peak Detector:								
4803.900	4.23	31.26	34.38	40.19		41.30	32.70	74.00
7206.200	5.61	36.53	34.92	37.83		45.05	28.95	74.00
9608.300	6.98	37.94	34.49	36.48	<	46.91	27.09	74.00
12009.90	8.37	38.62	33.21	35.43	<	49.21	24.79	74.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. 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 : iGPS-BT Bluetooth GPS receiver
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 39

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level		Emission Level	Margin	Limit
MHz	dB	dB/m	dB	dBuV		dBuV/m	dB	dBuV/m
Horizontal								
Peak Detector:								
4882.200	4.27	31.37	34.37	38.46		39.74	34.26	74.00
7323.200	5.68	36.57	34.98	37.89		45.15	28.85	74.00
9763.600	7.07	38.13	34.31	37.20	<	48.09	25.91	74.00
12205.30	8.48	38.49	33.32	36.42	<	50.06	23.94	74.00
Vertical								
Peak Detector:								
4882.200	4.27	31.37	34.37	39.31		40.59	33.41	74.00
7322.800	5.68	36.57	34.98	38.26		45.52	28.48	74.00
9764.300	7.07	38.13	34.31	36.15	<	47.04	26.96	74.00
12204.80	8.48	38.50	33.32	35.61	<	49.26	24.74	74.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. 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 : iGPS-BT Bluetooth GPS receiver
Test Item : Harmonic Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 78

Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level		Emission Level	Margin	Limit
MHz	dB	dB/m	dB	dBuV		dBuV/m	dB	dBuV/m
Horizontal								
Peak Detector:								
4960.300	4.32	31.50	34.36	41.11		42.57	31.43	74.00
7440.900	5.75	36.54	35.04	40.55		47.80	26.20	74.00
9920.300	7.17	38.15	34.10	37.28	<	48.50	25.50	74.00
12399.70	8.59	38.37	33.45	36.51	<	50.02	23.98	74.00
Vertical								
Peak Detector:								
4959.900	4.32	31.50	34.36	41.71		43.17	30.83	74.00
7440.000	5.75	36.54	35.04	38.64		45.89	28.11	74.00
9919.900	7.17	38.15	34.10	36.56	<	47.78	26.22	74.00
12399.90	8.59	38.37	33.45	35.43	<	48.94	25.06	74.00

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz。
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz。
4. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.
5. 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 : iGPS-BT Bluetooth GPS receiver
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 00

	Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal:								
	150.280	1.51	9.23	26.89	39.60	23.45	20.05	43.50
	251.160	1.92	9.46	26.93	40.20	24.65	21.35	46.00
	298.690	2.12	13.52	26.95	41.60	30.29	15.71	46.00
	544.100	3.13	21.87	26.57	31.80	30.23	15.77	46.00
	808.910	4.22	23.46	26.15	30.80	32.32	13.68	46.00
*	903.000	4.60	25.01	26.00	30.00	33.61	12.39	46.00
Vertical:								
	49.400	1.10	11.64	26.86	44.80	30.68	9.32	40.00
	100.810	1.31	17.44	26.88	41.80	33.67	9.83	43.50
*	194.900	1.69	16.62	26.91	44.60	36.00	7.50	43.50
	251.160	1.92	12.66	26.93	50.60	38.26	7.74	46.00
	299.660	2.12	17.53	26.95	42.40	35.10	10.90	46.00
	498.510	2.94	16.94	26.64	38.20	31.44	14.56	46.00

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. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.

Product : iGPS-BT Bluetooth GPS receiver
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 39

	Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal:								
	151.250	1.52	9.32	26.89	39.80	23.74	19.76	43.50
	316.150	2.19	14.14	26.92	41.00	30.41	15.59	46.00
	539.250	3.11	21.77	26.57	32.40	30.70	15.30	46.00
	587.750	3.31	21.43	26.50	34.40	32.64	13.36	46.00
*	799.210	4.18	22.73	26.17	35.20	35.95	10.05	46.00
	909.790	4.63	25.09	25.99	29.40	33.12	12.88	46.00
Vertical:								
	99.840	1.30	17.11	26.88	42.40	33.93	9.57	43.50
*	151.250	1.52	16.91	26.89	44.80	36.33	7.17	43.50
	194.900	1.69	16.62	26.91	44.60	36.00	7.50	43.50
	300.630	2.13	17.48	26.95	42.80	35.46	10.54	46.00
	498.510	2.94	16.94	26.64	38.20	31.44	14.56	46.00
	808.910	4.22	24.34	26.15	31.00	33.40	12.60	46.00

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. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.

Product : iGPS-BT Bluetooth GPS receiver
Test Item : General Radiated Emission
Test Site : No.1 OATS
Test Mode : Channel 78

	Freq.	Cable Loss	Probe Factor	PreAMP	Reading Level	Emission Level	Margin	Limit
	MHz	dB	dB/m	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal:								
	149.310	1.51	9.15	26.89	44.20	27.96	15.54	43.50
	314.210	2.18	14.07	26.93	41.20	30.52	15.48	46.00
	543.130	3.12	21.85	26.57	32.20	30.61	15.39	46.00
	586.780	3.30	21.47	26.50	34.40	32.68	13.32	46.00
*	821.520	4.27	24.46	26.13	30.80	33.40	12.60	46.00
	892.330	4.56	24.90	26.02	29.80	33.24	12.76	46.00
Vertical:								
	100.810	1.31	17.44	26.88	41.80	33.67	9.83	43.50
	151.250	1.52	16.91	26.89	44.00	35.53	7.97	43.50
*	194.900	1.69	16.62	26.91	45.00	36.40	7.10	43.50
	251.160	1.92	12.66	26.93	47.40	35.06	10.94	46.00
	298.690	2.12	17.42	26.95	44.80	37.39	8.61	46.00
	802.120	4.19	24.12	26.16	31.80	33.95	12.05	46.00

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. Emission Level = Reading Level + Probe Factor + Cable Loss – PreAMP.

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.	Remark
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2003	
2	No.1 OATS			Sep., 2002	

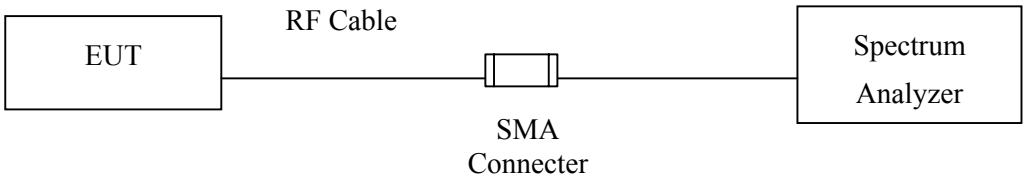
RF Radiated Measurement:

Item		Equipment	Manufacturer	Model No. / Serial No.	Last Cal.
1	X	Spectrum Analyzer	R & S	FSP40 / 100005	Aug., 2002
2	X	Pre-Amplifier	HP	8449B / 3008A01123	Feb., 2003
3		Loop Antenna	R & S	HFH2-Z2 / 833799/004	Sep., 2002
4		BiconiLog Antenna	Schwarzbeck	VULB 9166 / 1061	Sep., 2002
5		Bilog Antenna	Chase	CBL6112B / 2455	Sep., 2002
6	X	Horn Antenna	Schwarzbeck	BBHA 9120D / BBHA9120D312	Sep., 2002
7		No.1 OATS			Sep., 2002

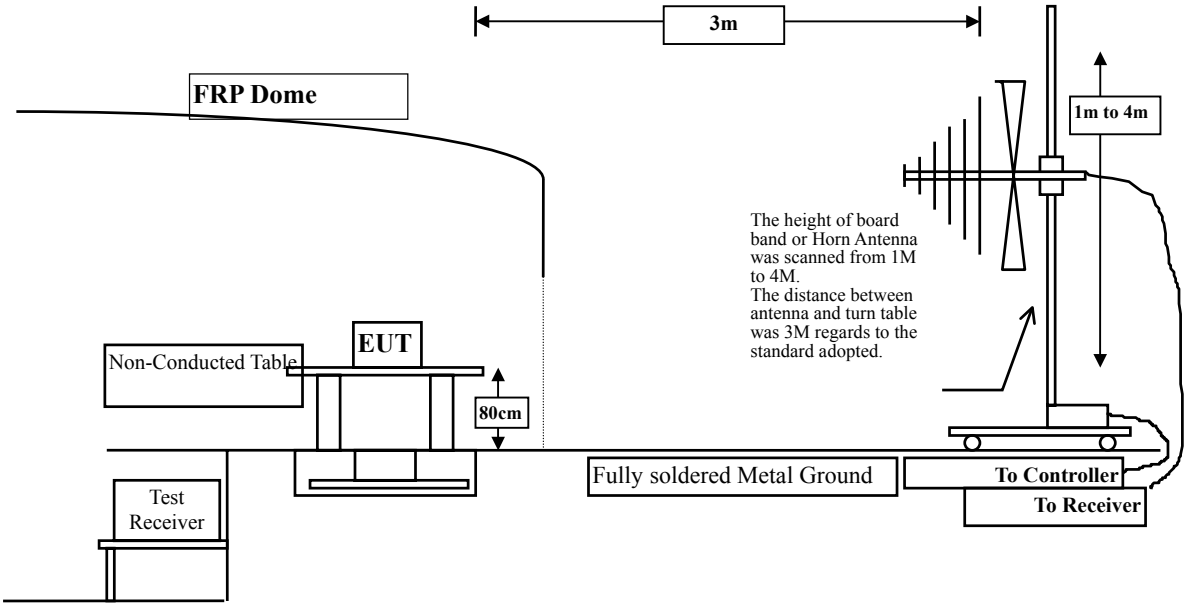
Note: 1. All equipments that need to calibrate are with calibration period of 1 year.
2. Mark "X" test instruments are used to measure the final test results.

5.2. Test Setup

RF Conducted Measurement:



RF Radiated Measurement:



5.3. Limit

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

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 C63.4:1992 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter (R&S Test Receiver ESCS 30)is 120 kHz, above 1GHz are 1 MHz.

5.5. Test Result of Band Edge

Product : iGPS-BT Bluetooth GPS receiver
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Channel 00

RF Radiated Measurement:

Polarization	Frequency (MHz)	Required Limit (dBc)	Result
Horizontal	<2400	>20	Pass
Vertical	<2400	>20	Pass

Figure Channel 00: (Horizontal)

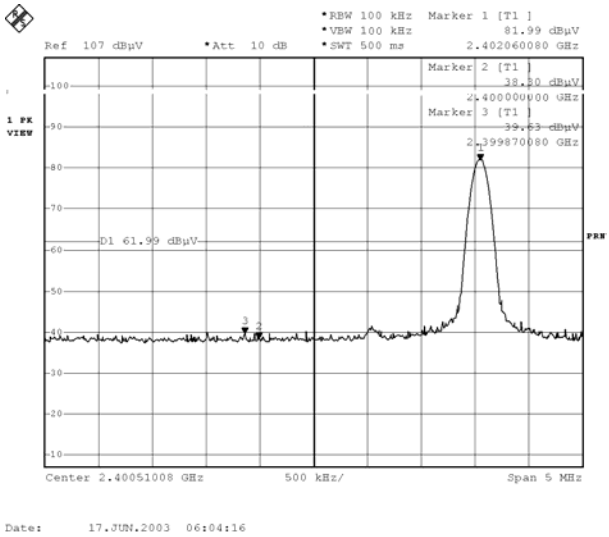
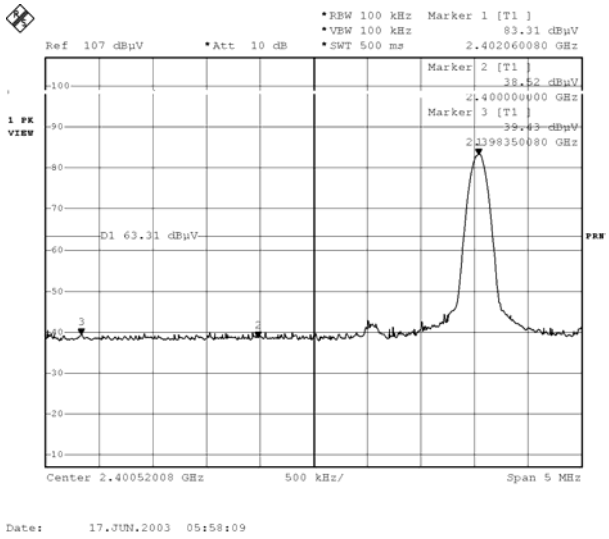


Figure Channel 00: (Vertical)



Product : iGPS-BT Bluetooth GPS receiver
Test Item : Band Edge
Test Site : No.1 OATS
Test Mode : Channel 78

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)	2483.800	42.20	27.58	2.90	34.58	38.10	74	Pass
78 (Vertical)	2483.600	42.30	27.58	2.90	34.58	38.20	74	Pass

Figure Channel 78: (Horizontal)

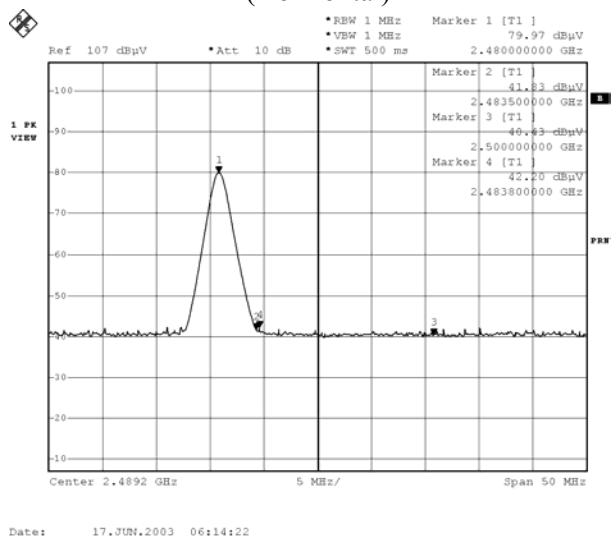
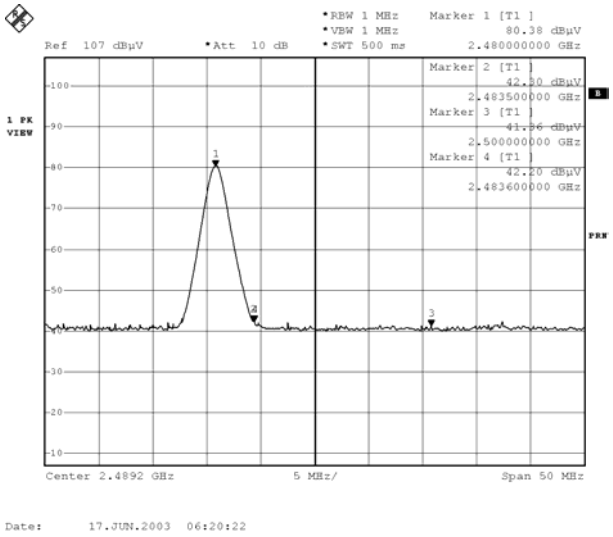


Figure Channel 78: (Vertical)



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. Occupied Bandwidth

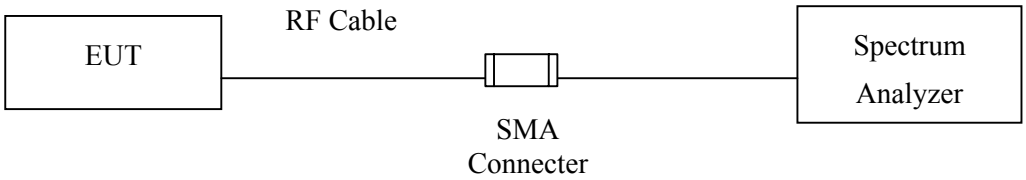
6.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2003	
2	No.1 OATS			Sep., 2002	

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

6.2. Test Setup



6.3. Limit

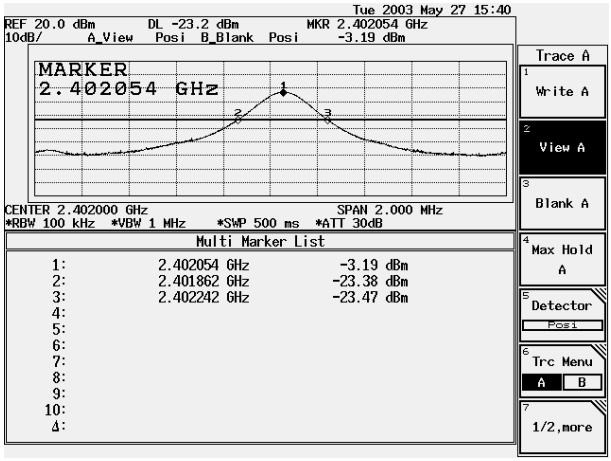
The maximum 20 dB bandwidth of the hopping channel is 1 MHz.

6.4. Test Result of Occupied Bandwidth

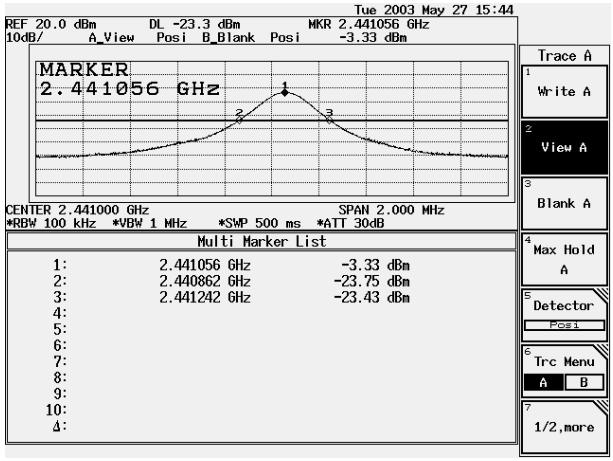
Product : iGPS-BT Bluetooth GPS receiver
Test Item : Occupied Bandwidth
Test Site : No.1 OATS
Test Mode : Normal Operation

Channel No.	Frequency (MHz)	Measurement Level (MHz)	Required Limit (MHz)	Result
00	2.402054	0.38	<1	Pass
39	2.441056	0.38	<1	Pass
78	2.480056	0.38	<1	Pass

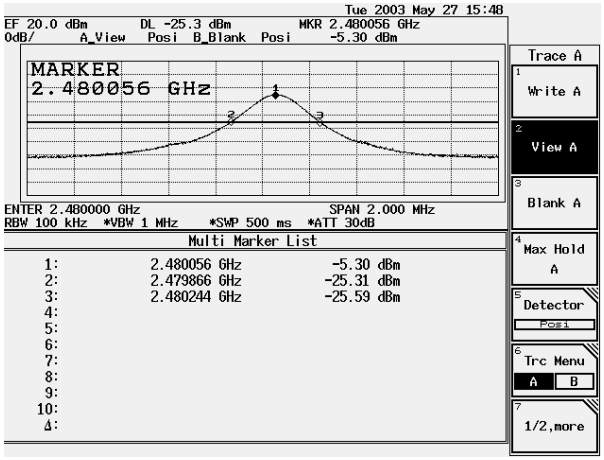
Channel 00



Channel 38



Channel 78:



7. Channel of Number

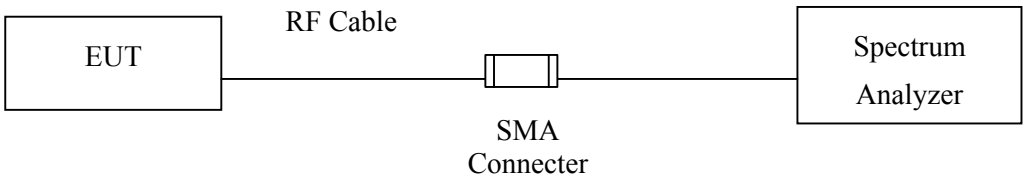
7.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2003	
2	No.1 OATS			Sep., 2002	

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

7.2. Test Setup



7.3. Limit

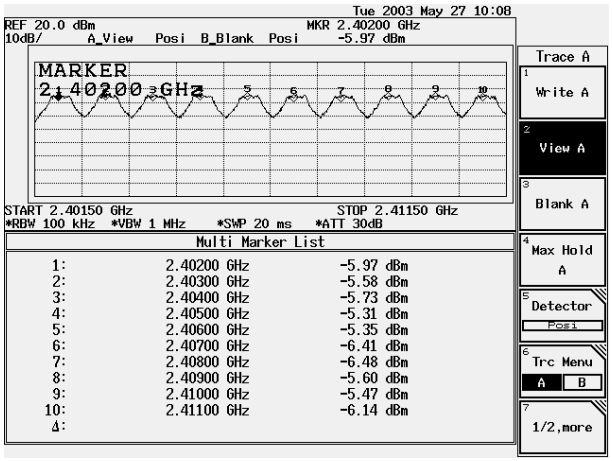
Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 75 hopping frequencies.

7.4. Test Result of Channel Number

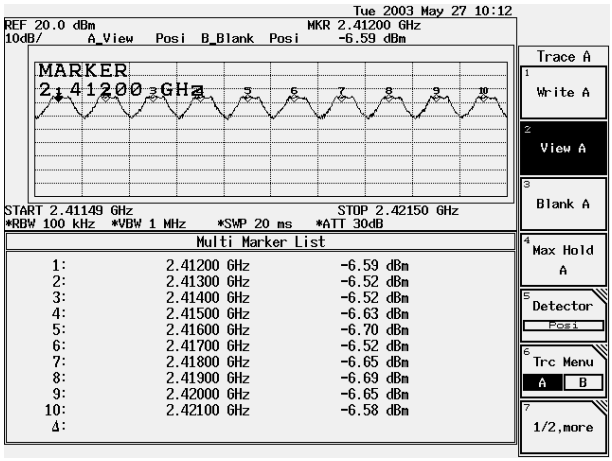
Product : iGPS-BT Bluetooth GPS receiver
Test Item : Channel Number
Test Site : No.1 OATS
Test Mode : Normal Operation

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

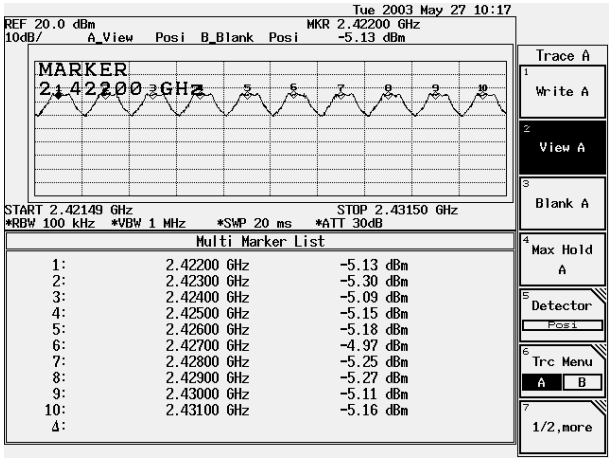
2402-2411MHz



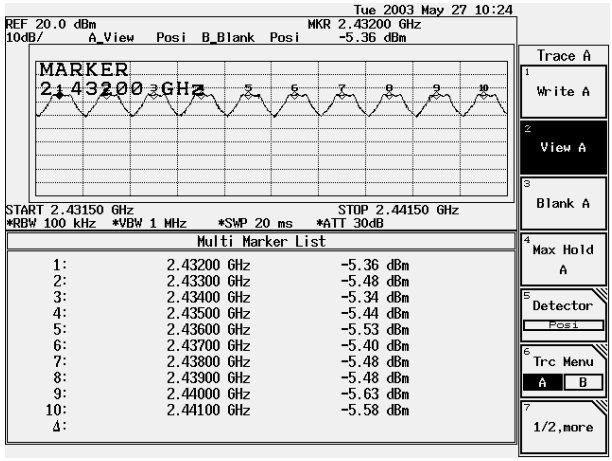
2412-2421MHz



2422-2431MHz

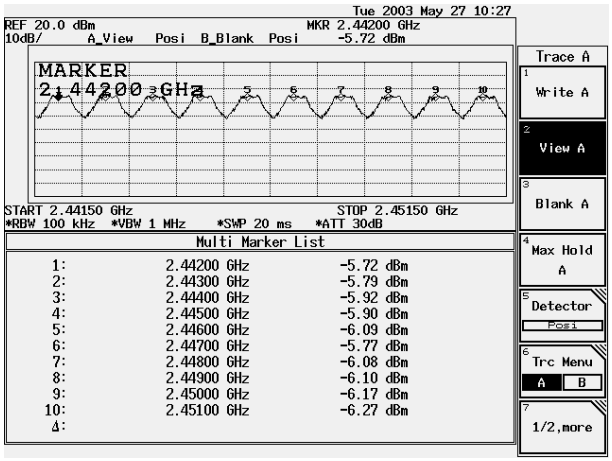


2432-2441MHz

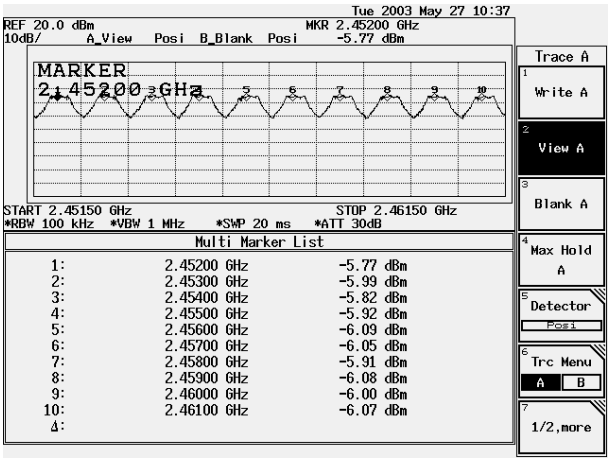


Product : iGPS-BT Bluetooth GPS receiver
Test Item : Channel Number
Test Site : No.1 OATS
Test Mode : Normal Operation

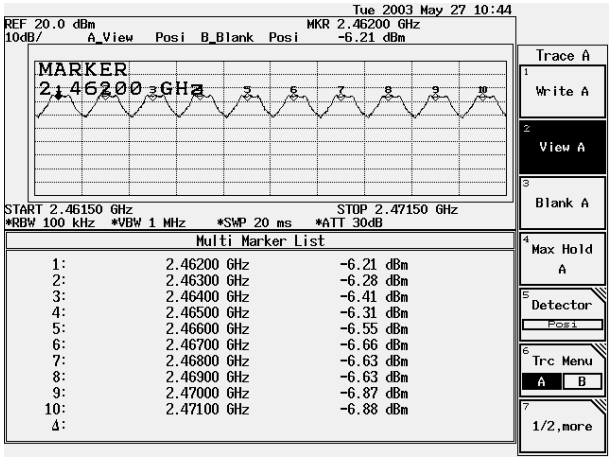
2441-2451MHz



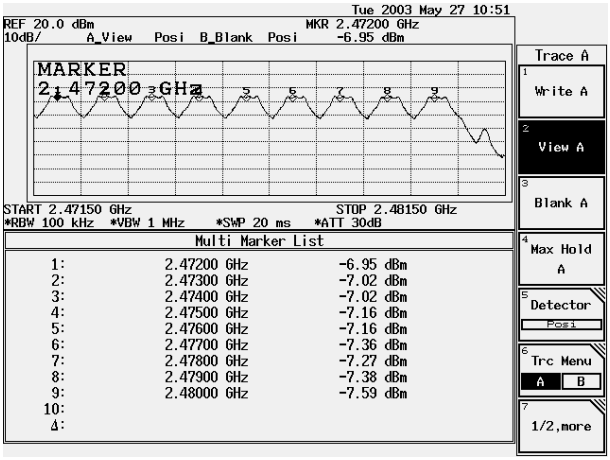
2452-2461MHz



2462-2471MHz



2472-2480MHz



8. Channel Separation

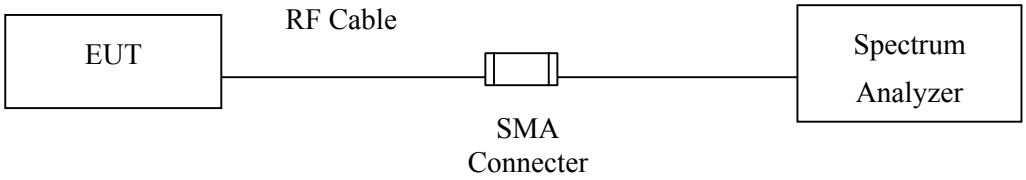
8.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2003	
2	No.1 OATS			Sep., 2002	

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

8.2. Test Setup



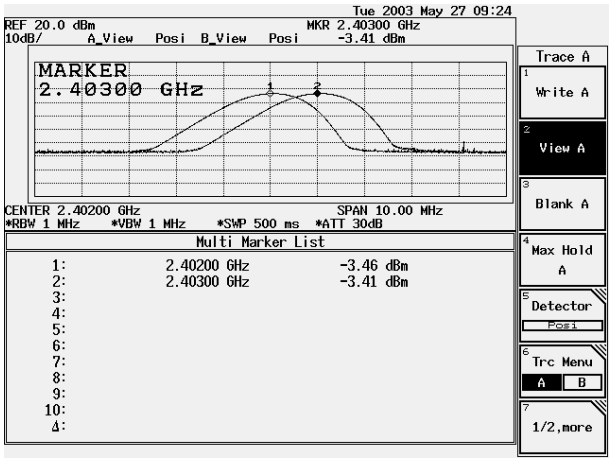
8.3. Limit

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

8.4. Test Result of Channel Separation

Product : iGPS-BT Bluetooth GPS receiver
Test Item : Channel Separation
Test Site : No.1 OATS
Test Mode : Normal Operation

Measurement Level (MHz)	Required Limit (kHz)	Result
1.00	>25	Pass



9. Dwell Time

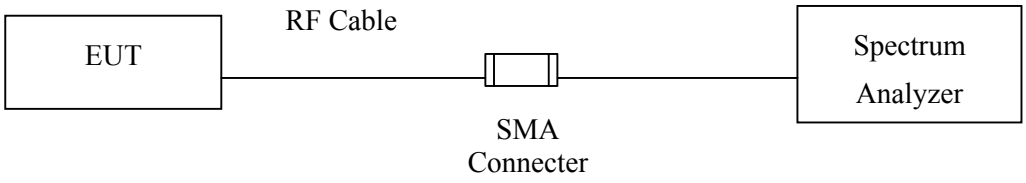
9.1. Test Equipment

The following test equipment are used during the test:

Item	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
1	Spectrum Analyzer	R & S	FSP / 100561	Mar., 2003	
2	No.1 OATS			Sep., 2002	

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

9.2. Test Setup



9.3. Limit

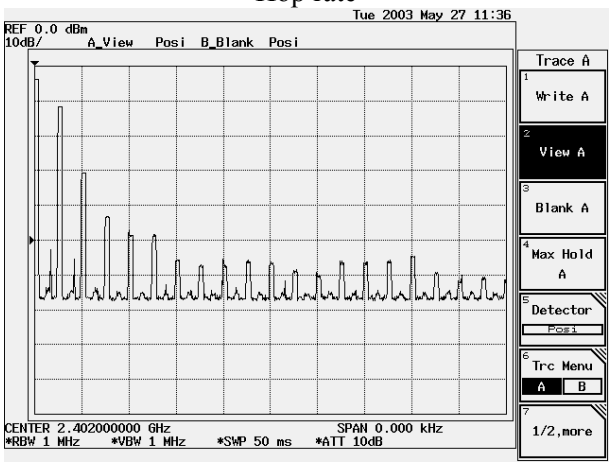
The dwell time shall be the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

9.4. Test Result of Dwell Time

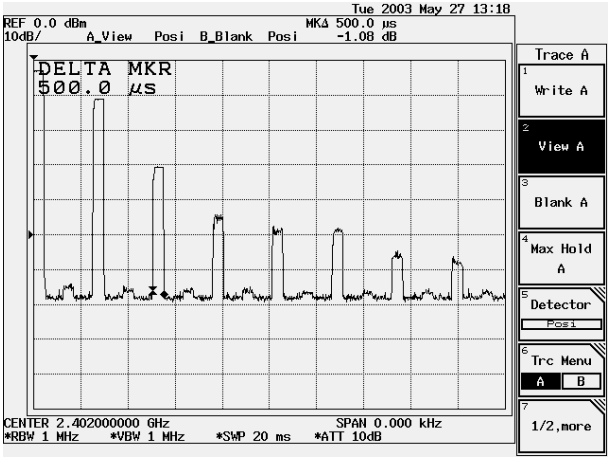
Product : iGPS-BT Bluetooth GPS receiver
Test Item : Dwell Time
Test Site : No.1 OATS
Test Mode : Channel 00

Measurement Level (sec)	Required Limit (sec)	Result
Period＝0.4 (sec) * 79 (number of channel)＝31.6 (sec) Hop rate＝40 / 50 (ms)＝800 / sec Time slot length＝500 (μs)＝0.0005 (sec) Dwell Time＝0.0005 * 800 / 79 * 31.6＝0.16 (sec)	<0.4 (sec)	Pass

Hop rate



Time slot length

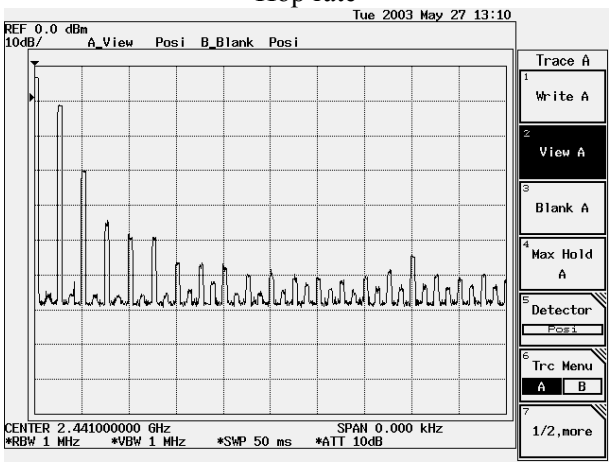


Note: Dwell time＝time slot length * hop rate / number of hopping channels * period

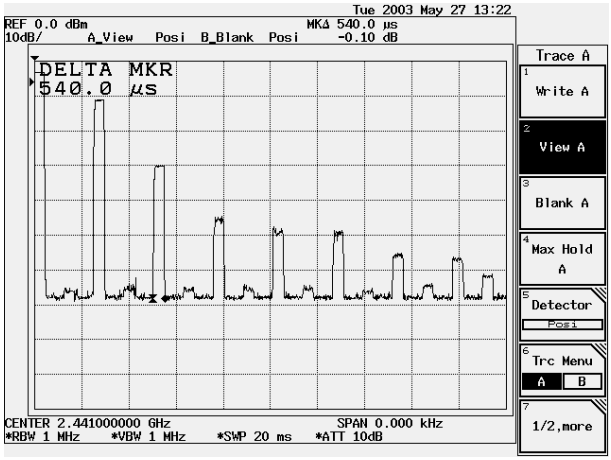
Product : iGPS-BT Bluetooth GPS receiver
Test Item : Dwell Time
Test Site : No.1 OATS
Test Mode : Channel 39

Measurement Level (sec)	Required Limit (sec)	Result
Period＝0.4 (sec) * 79 (number of channel)＝31.6 (sec) Hop rate＝40 / 50 (ms)＝800 / sec Time slot length＝540 (μs)＝0.00054 (sec) Dwell Time＝0.00054 * 800 / 79 * 31.6＝0.1728 (sec)	<0.4 (sec)	Pass

Hop rate



Time slot length

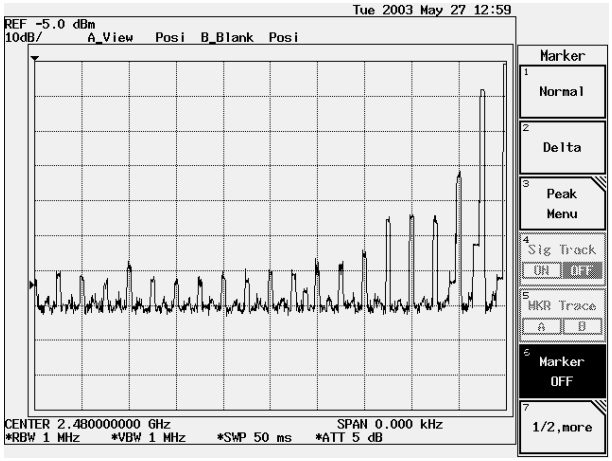


Note: Dwell time＝time slot length * hop rate / number of hopping channels * period

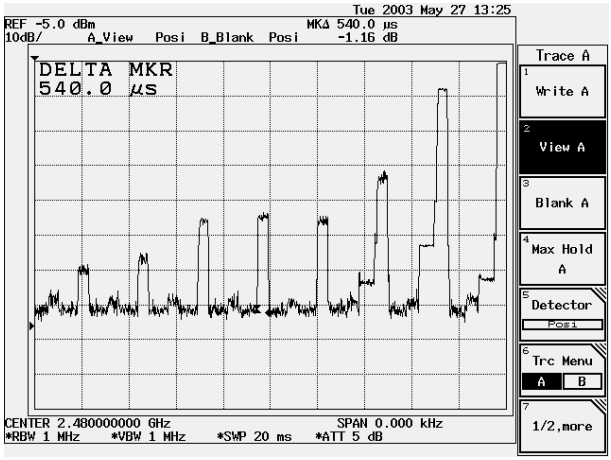
Product : iGPS-BT Bluetooth GPS receiver
Test Item : Dwell Time
Test Site : No.1 OATS
Test Mode : Channel 78

Measurement Level (sec)	Required Limit (sec)	Result
Period＝0.4 (sec) * 79 (number of channel)＝31.6 (sec) Hop rate＝40 / 50 (ms)＝800 / sec Time slot length＝540 (μs)＝0.00054 (sec) Dwell Time＝0.00054 *800 / 79 * 31.6＝0.1728 (sec)	<0.4 (sec)	Pass

Hop rate



Time slot length



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

10. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1 : EUT Test Photographs

Attachment 2 : EUT Detailed Photographs

RF Exposure Evaluation declaration

Product Name : iGPS-BT Bluetooth GPS receiver
Model No.: 360-1000-xx (GPS receiver), 361-1000-xx (Bluetooth Dock)
FCC ID.: Q7M-IGPS-BT

Applicant : Pharos Science & Applications, Inc.
Address : 411 Amapola Ave., Torrance, CA 90501

Date of Receipt : May. 12, 2003
Date of Declaration : Jun. 18, 2003
Report No. : 035H026FI

1. RF Exposure Evaluation

1.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)
LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (Minutes)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula
Friis transmission formula: $Pd = (Pout*G)/(4*pi*r^2)$

Where
Pd = power density in mW/cm^2
Pout = output power to antenna in mW
G = gain of antenna in linear scale
Pi = 3.1416
R = distance between observation point and center of the radiator in cm

Pd id the limit of MPE, 1 mW/cm^2. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

1.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.
The temperature and related humidity: 18℃and 78％ RH.

1.3. Test Result of RF Exposure Evaluation

Product : iGPS-BT Bluetooth GPS receiver
Test Item : RF Exposure Evaluation
Test Site : No.1 OATS
Test Mode : Normal Operation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2dBi or 1.58 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm^2)
00	2402.00	0.4519	0.00014
39	2439.00	0.4325	0.00014
78	2480.00	0.2421	0.00008

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm^2.