

FC

Test Report

Product Name	Smart Handheld
Model No.	M900DF
FCC ID.	HLZSHM900DF

Applicant	Acer Incorporated
Address	8F, 88, Sec. 1, Hsin Tai Wu Rd., Hsichih, Taipei Hsien 221, Taiwan

Date of Receipt	Dec. 12, 2009
Issued Date	Jan. 06, 2010
Report No.	09C210R-RFUSP43V01
Report Version	V1.0

The Test Results relate only to the samples tested.

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

Test Report Certification

Issued Date: Jan. 06, 2010

Report No.: 09C210R-RFUSP43V01



Product Name	Smart Handheld
Applicant	Acer Incorporated
Address	8F, 88, Sec. 1, Hsin Tai Wu Rd., Hsichih, Taipei Hsien 221, Taiwan
Manufacturer	Compal Communications, INC.
Model No.	M900DF
FCC ID.	HLZSHM900DF
EUT Rated Voltage	DC 3.7V
EUT Test Voltage	AC 120V/60Hz
Trade Name	acer
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2008 ANSI C63.4: 2003
Test Result	Complied



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Documented By : Rita Huang
 (Engineering Adm. Specialist /
 Rita Huang)



Tested By : NoNo Chang
 (Engineer / Nono Chang)



Approved By : [Signature]
 (Manager / Vincent Lin)

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Smart Handheld
Trade Name	acer
Model No.	M900DF
FCC ID.	HLZSHM900DF
Frequency Range	2402 – 2480MHz
Channel Number	79
Type of Modulation	GFSK(1Mbps)/ π /4DQPSK(2Mbps) / 8DPSK(3Mbps)
Antenna Type	PCB Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
Power Adapter	MFR: PHIHONG, M/N: PSAC05R-050 Input: AC 100-240V~300mA, 50-60Hz 12-18VA Output: DC +5V, 1A MAX. Cable Out: Non-Shielded, 1.4m

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	acer	N/A	-3.56 dBi for 2.4 GHz

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. This device is an Smart Handheld with a built-in 2.4GHz Bluetooth V2.1+EDR transceiver.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

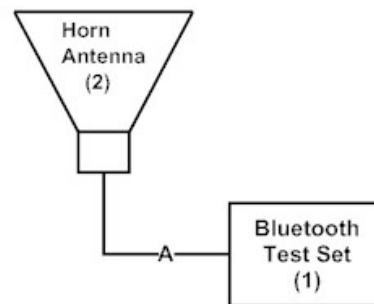
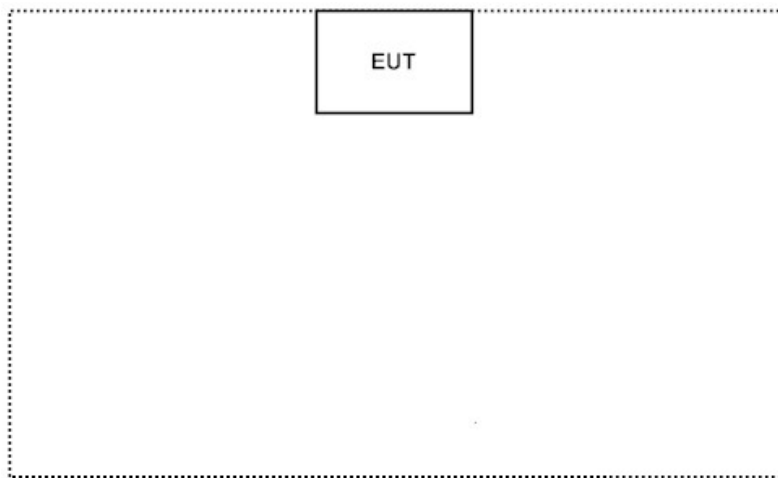
1.3. Tested System Details

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.	Bluetooth Test Set	Anritsu	MT8852A	N/A	Non-Shielded, 1.6m
2.	Horn Antenna	SCHWARZBECK	Bbha9210D	N/A	N/A

	Signal Cable Type	Signal cable Description
A.	RF Cable	Shielded, 1.0m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- (1) Setup the EUT and simulators as shown on 1.4
- (2) Enable the Bluetooth function of the EUT.
- (3) The Bluetooth simulator (MT8852B) uses in controlling EUT to transmit continuously.
- (4) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

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

The related certificate for our laboratories about the test site and management system can be downloaded from Quietek Corporation’s Web Site : <http://tw.quietek.com/tw/emc/accreditations/accreditations.htm>

The address and introduction of Quietek Corporation’s laboratories can be founded in our Web site : <http://www.quietek.com/>

Site Description: File on
 Federal Communications Commission
 FCC Engineering Laboratory
 7435 Oakland Mills Road
 Columbia, MD 21046
 Registration Number: 92195



Accreditation on NVLAP
 NVLAP Lab Code: 200533-0



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FCC Accreditation Number: TW1014



2. Conducted Emission

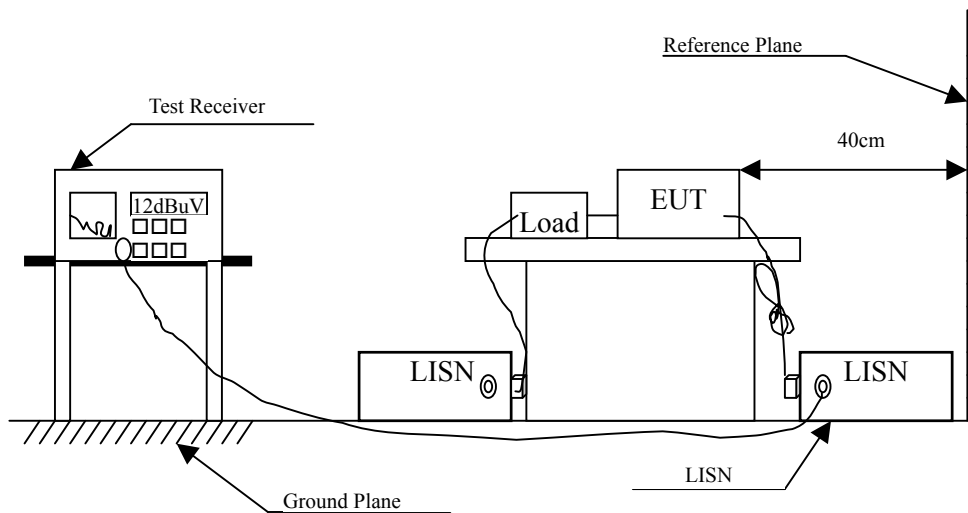
2.1. Test Equipment

The following test equipment are used during the conducted emission test:

Item	Instrument	Manufacturer	Type No./Serial No	Last Cal.	Remark
1	Test Receiver	R & S	ESCS 30/825442/014	Feb., 2009	
2	L.I.S.N.	R & S	ESH3-Z5/825562/002	Feb., 2009	EUT
3	L.I.S.N.	R & S	ENV4200/848411/010	Feb., 2009	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2/100410	July, 2009	
5	No.1 Shielded Room			N/A	

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

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2003 on conducted measurement.

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

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 1					
Quasi-Peak					
0.259	9.670	29.080	38.750	-24.136	62.886
0.564	9.640	28.540	38.180	-17.820	56.000
0.713	9.630	26.340	35.970	-20.030	56.000
1.068	9.670	24.750	34.420	-21.580	56.000
1.568	9.680	24.310	33.990	-22.010	56.000
3.322	9.690	24.090	33.780	-22.220	56.000
Average					
0.259	9.670	19.930	29.600	-23.286	52.886
0.564	9.640	16.740	26.380	-19.620	46.000
0.713	9.630	14.050	23.680	-22.320	46.000
1.068	9.670	12.680	22.350	-23.650	46.000
1.568	9.680	12.680	22.360	-23.640	46.000
3.322	9.690	12.030	21.720	-24.280	46.000

Note:

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

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 2					
Quasi-Peak					
0.197	9.719	31.990	41.709	-22.948	64.657
0.259	9.680	29.560	39.240	-23.646	62.886
0.314	9.660	25.910	35.570	-25.744	61.314
0.384	9.650	24.320	33.970	-25.344	59.314
0.521	9.640	25.830	35.470	-20.530	56.000
1.560	9.680	20.030	29.710	-26.290	56.000
15.025	10.000	19.510	29.510	-30.490	60.000
Average					
0.197	9.719	18.770	28.489	-26.168	54.657
0.259	9.680	18.650	28.330	-24.556	52.886
0.314	9.660	14.780	24.440	-26.874	51.314
0.384	9.650	12.750	22.400	-26.914	49.314
0.521	9.640	17.470	27.110	-18.890	46.000
1.560	9.680	11.530	21.210	-24.790	46.000
15.025	10.000	5.050	15.050	-34.950	50.000

Note:

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

3. Peak Power Output

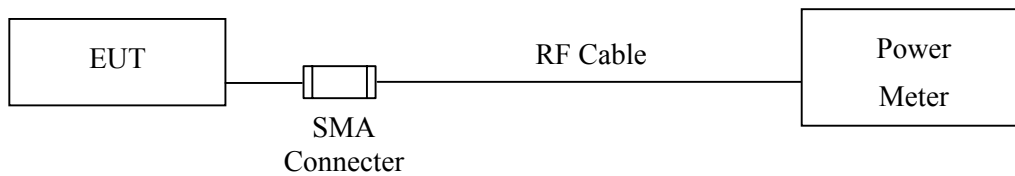
3.1. Test Equipment

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

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X Power Meter	Anritsu	ML2495A/6K00003357	May, 2009
X Power Sensor	Anritsu	MA2491A/034457	May, 2009

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

3.2. Test Setup



3.3. Limit

The maximum peak power shall be less 1Watt.

3.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

3.5. Uncertainty

± 1.27 dB

3.6. Test Result of Peak Power Output

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

Channel No.	Frequency (MHz)	Measurement	Required Limit	Result
Channel 00	2402.00	4.80dBm	1 Watt= 30 dBm	Pass
Channel 39	2441.00	4.74dBm	1 Watt= 30 dBm	Pass
Channel 78	2480.00	4.28dBm	1 Watt= 30 dBm	Pass

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

Channel No.	Frequency (MHz)	Measurement	Required Limit	Result
Channel 00	2402.00	6.49dBm	1 Watt= 30 dBm	Pass
Channel 39	2441.00	6.46dBm	1 Watt= 30 dBm	Pass
Channel 78	2480.00	6.24dBm	1 Watt= 30 dBm	Pass

4. Radiated Emission

4.1. Test Equipment

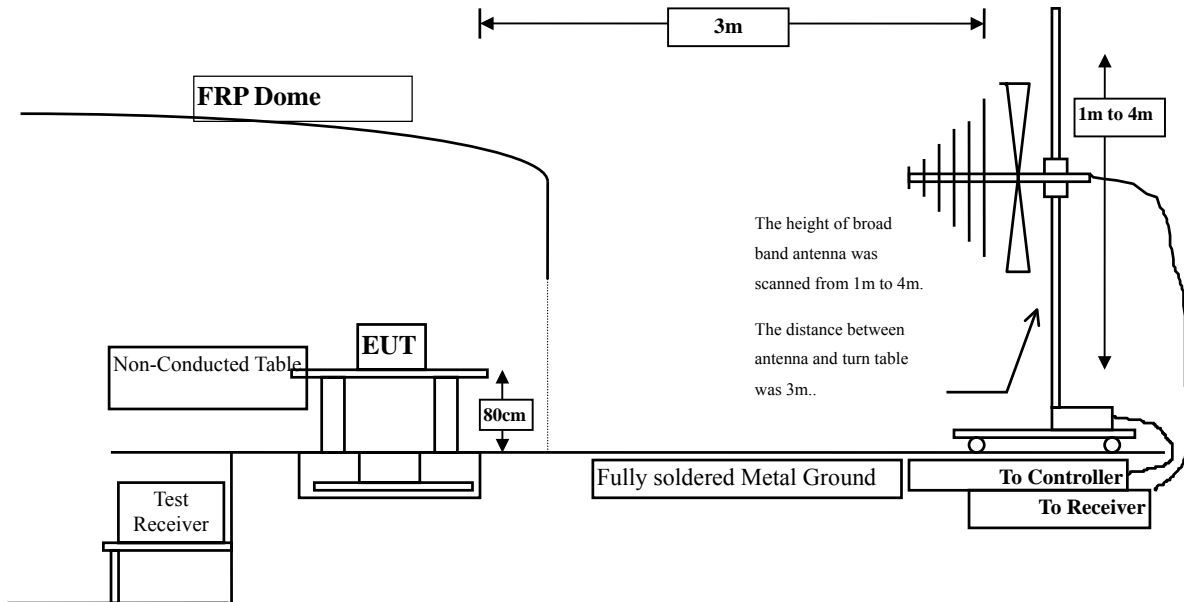
The following test equipments are used during the radiated emission test:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2009
	X Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2009
	X Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2009
	X Pre-Amplifier	AGILENT	8447D/2944A09549	Sep., 2009
	X Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2009
	X Spectrum Analyzer	Advantest	R3162/91700283	Oct., 2009
	X Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2009
	X Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	X Coaxial Switch	Anritsu	MP59B/6200265729	N/A

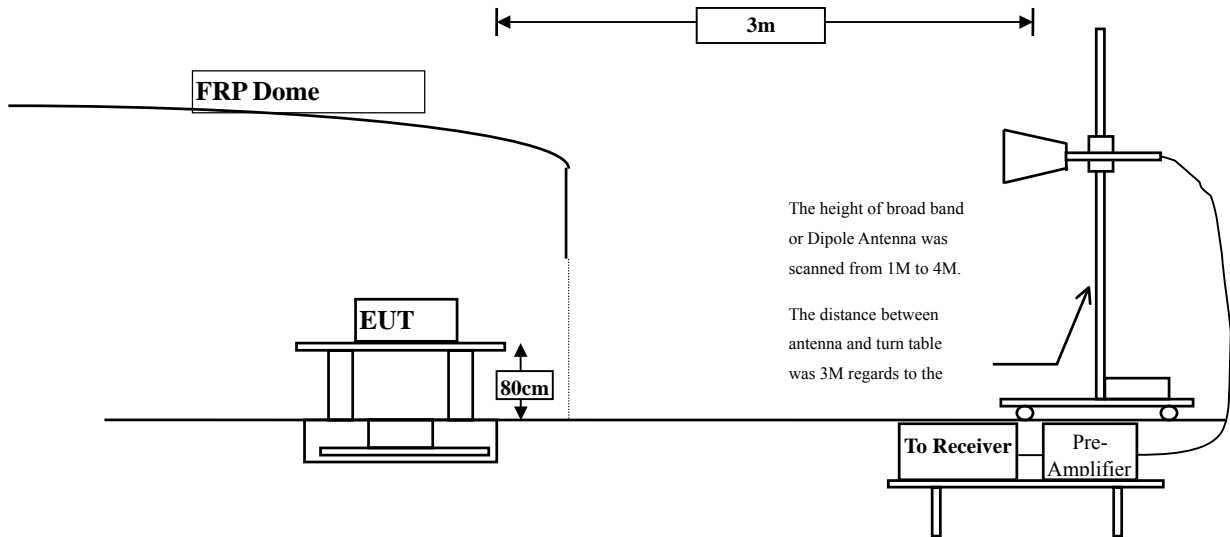
- Note: 1. All equipments are calibrated every one year.
 2. The test instruments marked by "X" are used to measure the final test results.

4.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.3. Limits

➤ **General Radiated Emission Limits**

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

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	uV/m @3m	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 was setup according to ANSI C63.4, 2003 and tested according to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

The EUT is placed on a turn table which is 0.8 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4:2003 on radiated measurement.

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

Radiated emission measurements below 1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

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

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

The worst radiated emission is measured on the Final Measurement.

The frequency range from 30MHz to 10th harmonics is checked.

4.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

4.6. Test Result of Radiated Emission

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

Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
4804.000	9.612	38.250	47.862	-26.138	74.000
7206.000	14.293	35.980	50.272	-23.728	74.000
9608.000	19.660	35.450	55.110	-17.560	74.000
Vertical					
4804.000	8.330	37.820	46.150	-27.850	74.000
7206.000	15.409	35.480	50.889	-23.111	74.000
9608.000	18.870	36.280	55.150	-18.850	74.000

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:10Hz; Span:20MHz °
4. Emission Level = Reading Level + Correct Factor.
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.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
9608	55.110	-2.513	52.597	-1.403	54.000
Vertical					
9608	55.150	-2.513	52.637	-1.363	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 11.
3. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
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.

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

Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
4882.000	9.489	37.420	46.909	-27.091	74.000
7323.000	14.568	35.190	49.758	-24.242	74.000
9764.000	20.055	35.580	55.635	-17.365	74.000
Vertical					
4882.000	8.979	37.720	46.699	-27.301	74.000
7323.000	15.262	34.612	49.874	-24.126	74.000
9764.000	19.255	36.280	55.535	-18.465	74.000

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:10Hz; Span:20MHz ◦
4. Emission Level = Reading Level + Correct Factor.
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.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
9764	55.635	-2.513	53.122	-0.878	54.000
Vertical					
9764	55.535	-2.513	53.022	-0.978	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 11.
3. If Duty Cycle is smaller than -20dB,based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
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.

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

Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
4960.000	9.418	37.750	47.167	-26.833	74.000
7440.000	15.012	34.960	49.973	-24.027	74.000
9920.000	19.754	35.730	55.484	-17.516	74.000
Vertical					
4960.000	9.717	37.250	46.966	-27.034	74.000
7440.000	15.386	35.950	51.336	-22.664	74.000
9920.000	18.897	36.370	55.267	-18.733	74.000

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:10Hz; Span:20MHz ◦
4. Emission Level = Reading Level + Correct Factor.
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.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
9920	55.484	-2.513	52.971	-1.029	54.000
Vertical					
9920	55.267	-2.513	52.754	-1.246	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 11.
3. If Duty Cycle is smaller than -20dB,based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
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.

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

Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
4804.000	9.612	43.050	52.662	-21.338	74.000
7206.000	14.293	35.740	50.032	-23.968	74.000
9608.000	19.660	35.580	55.240	-17.760	74.000
Vertical					
4804.000	8.330	41.620	49.950	-24.050	74.000
7206.000	15.409	35.380	50.789	-23.211	74.000
9608.000	18.870	36.280	55.150	-17.850	74.000

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:10Hz; Span:20MHz °
4. Emission Level = Reading Level + Correct Factor.
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.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
9608	55.24	-6.685	48.555	-5.445	54.000
Vertical					
9608	55.15	-6.685	48.465	-5.535	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 11.
3. If Duty Cycle is smaller than -20dB,based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
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.

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

Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
4882.000	9.489	38.150	47.639	-26.361	74.000
7323.000	14.568	35.480	50.048	-23.952	74.000
9764.000	20.055	35.160	55.215	-18.185	74.000
Vertical					
4882.000	8.979	37.480	46.459	-27.541	74.000
7323.000	15.262	34.820	50.082	-23.918	74.000
9764.000	19.255	35.850	55.105	-17.895	74.000

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:10Hz; Span:20MHz ◦
4. Emission Level = Reading Level + Correct Factor.
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.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
9764	55.215	-6.685	48.530	-5.470	54.000
Vertical					
9764	55.105	-6.685	48.420	-5.580	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 11.
3. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
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.

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

Peak Detector:

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
4960.000	9.418	37.220	46.637	-27.363	74.000
7440.000	15.012	35.590	50.603	-23.397	74.000
9920.000	19.754	35.390	55.144	-18.256	74.000
Vertical					
4960.000	9.717	37.250	46.966	-27.034	74.000
7440.000	15.386	35.620	51.006	-22.994	74.000
9920.000	18.897	36.150	55.047	-18.853	74.000

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:10Hz; Span:20MHz ◦
4. Emission Level = Reading Level + Correct Factor.
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.

Average Detector:

Frequency MHz	Peak Measurement dBuV/m	Duty Cycle Factor dB	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
9920	55.144	-6.685	48.459	-5.541	54.000
Vertical					
9920	55.047	-6.685	48.362	-5.638	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle
2. The Duty Cycle is refer to section 11.
3. If Duty Cycle is smaller than -20dB, based on FCC part15 the duty cycle correction factor is -20dB for calculating average emission.
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.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
332.640	-4.429	30.050	25.621	-20.379	46.000
544.100	2.992	23.964	26.956	-19.044	46.000
629.460	1.079	25.582	26.661	-19.339	46.000
745.860	2.793	24.690	27.484	-18.516	46.000
794.360	4.797	22.934	27.731	-18.269	46.000
837.040	4.723	34.535	39.258	-6.742	46.000
Vertical					
159.980	-6.610	40.017	33.407	-10.093	43.500
332.640	-5.159	28.218	23.059	-22.941	46.000
515.000	-1.596	26.843	25.247	-20.753	46.000
687.660	2.002	22.458	24.460	-21.540	46.000
837.040	1.843	35.901	37.744	-8.256	46.000
967.020	7.541	22.348	29.889	-24.111	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. “█” means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The radiated emissions below 1GHz of the lowest, middle, highest frequency are pre-tested. Only the worst case is shown on the report.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
171.620	-10.747	40.000	29.253	-14.247	43.500
435.460	-2.388	28.299	25.911	-20.089	46.000
612.000	3.324	23.416	26.740	-19.260	46.000
691.540	3.235	23.855	27.090	-18.910	46.000
819.580	5.509	22.777	28.286	-17.714	46.000
935.980	5.922	23.780	29.702	-16.298	46.000
Vertical					
328.760	-5.361	30.863	25.502	-20.498	46.000
515.000	-1.596	26.812	25.216	-20.784	46.000
689.600	2.094	24.287	26.381	-19.619	46.000
745.860	1.313	26.394	27.708	-18.292	46.000
825.400	3.125	24.377	27.501	-18.499	46.000
967.020	7.541	22.664	30.205	-23.795	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. "█" means the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.
4. The radiated emissions below 1GHz of the lowest, middle, highest frequency are pre-tested. Only the worst case is shown on the report.

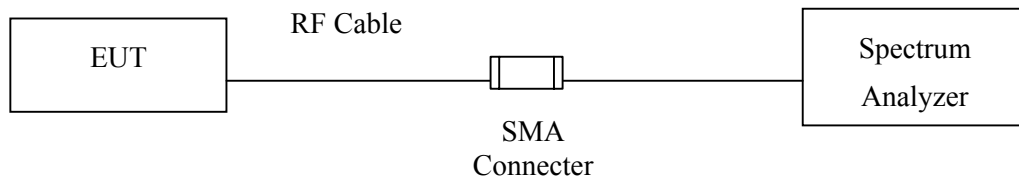
5. RF Antenna Conducted Test

5.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100339	Jun, 2009
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2009
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

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

5.2. Test Setup



5.3. Limits

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

5.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

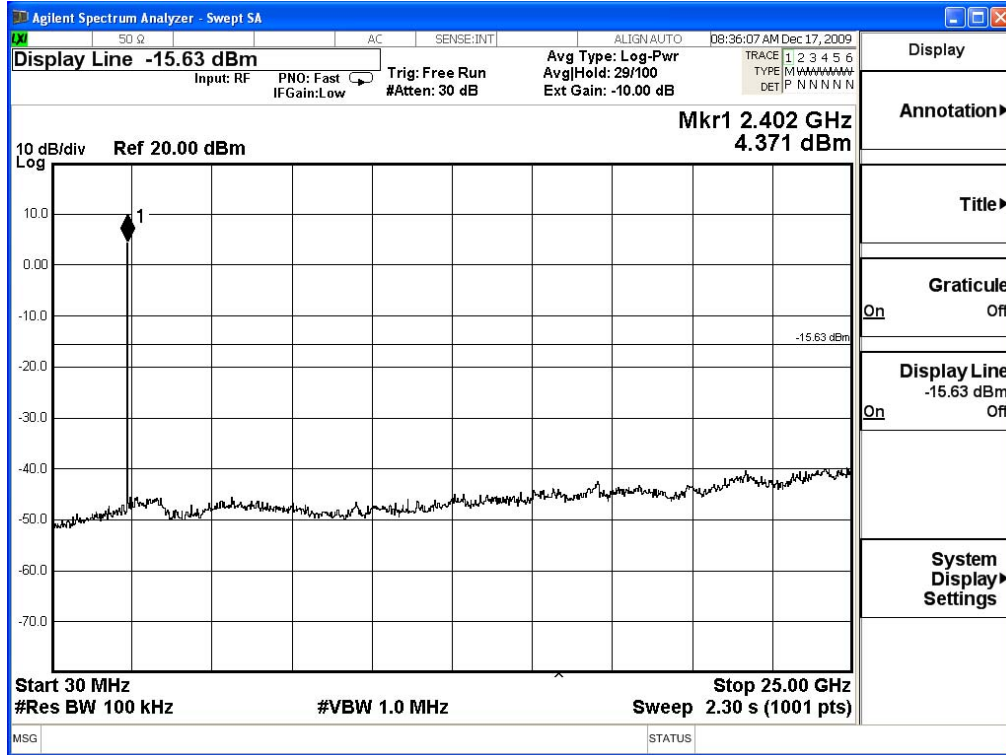
5.5. Uncertainty

± 150Hz

5.6. Test Result of RF Antenna Conducted Test

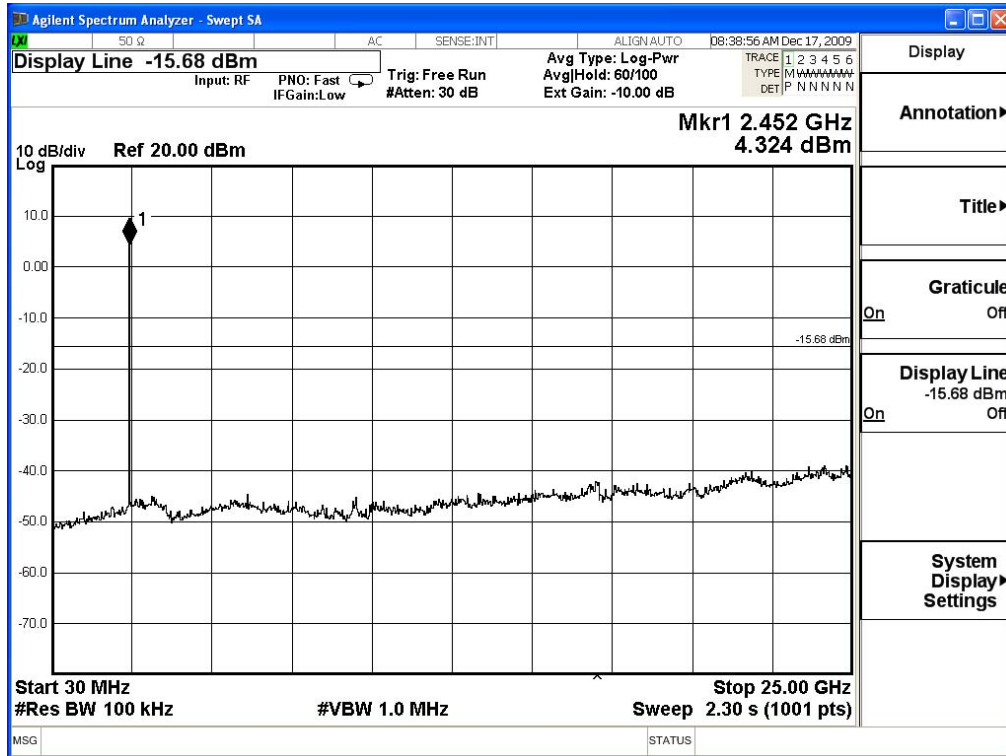
Product : Smart Handheld
 Test Item : RF Antenna Conducted Test
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Figure Channel 00: 30MHz-25GHz



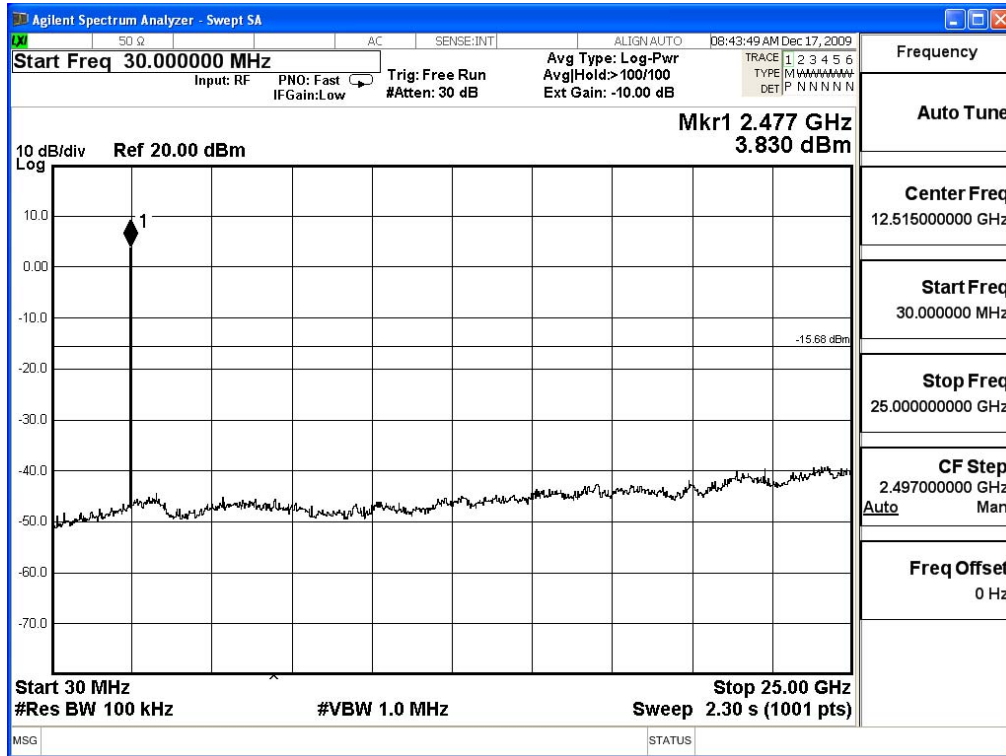
Product : Smart Handheld
 Test Item : RF Antenna Conducted Test
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Figure Channel 39: 30MHz-25GHz



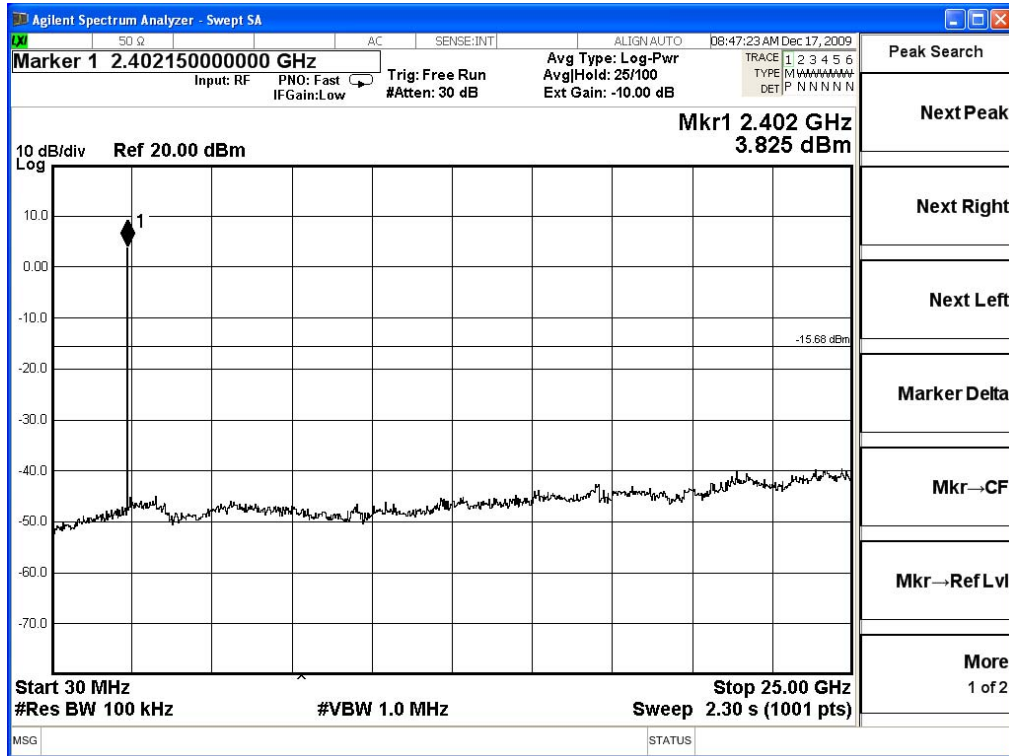
Product : Smart Handheld
 Test Item : RF Antenna Conducted Test
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Figure Channel 78: 30MHz-25GHz



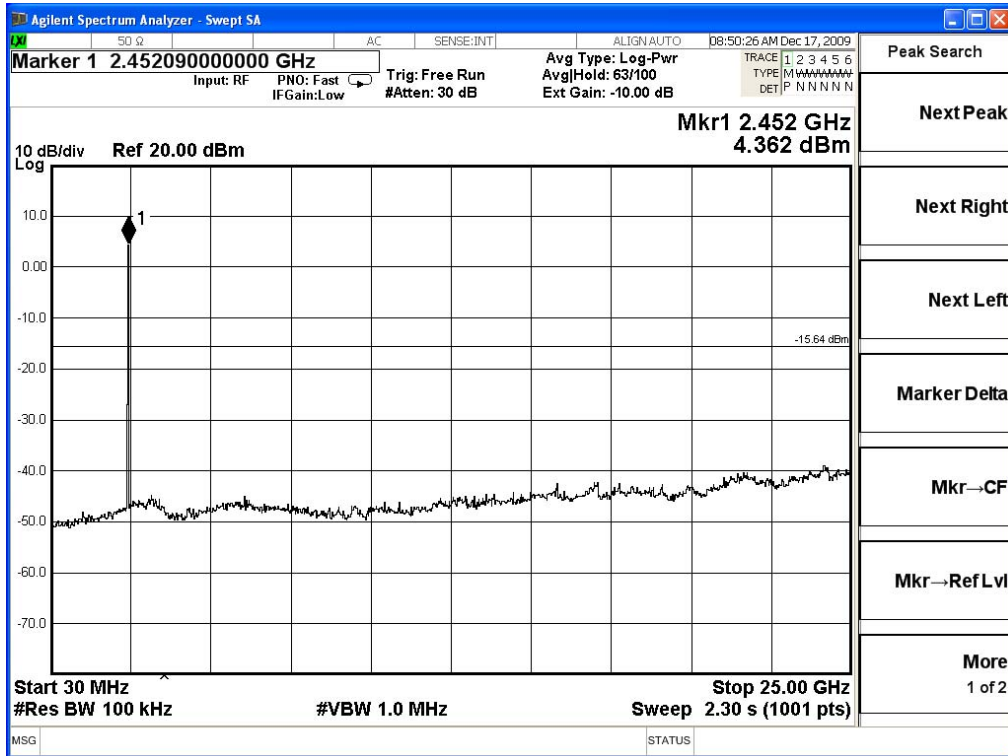
Product : Smart Handheld
 Test Item : RF Antenna Conducted Test
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Figure Channel 00: 30MHz-25GHz



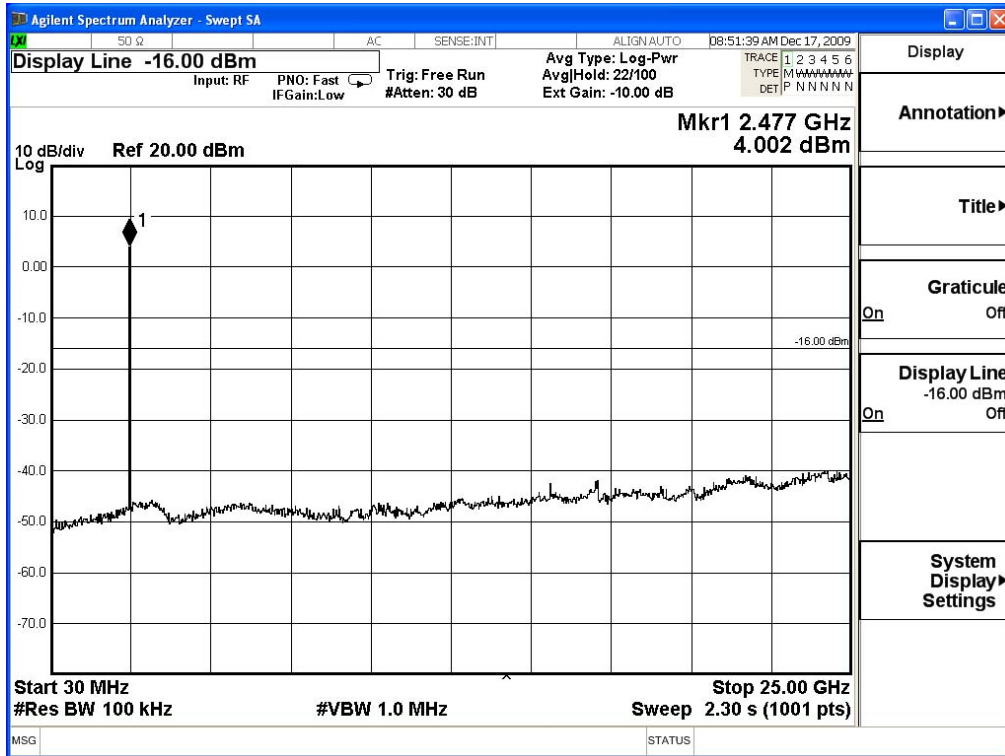
Product : Smart Handheld
 Test Item : RF Antenna Conducted Test
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Figure Channel 39: 30MHz-25GHz



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

Figure Channel 78: 30MHz-25GHz



6. Band Edge

6.1. Test Equipment

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

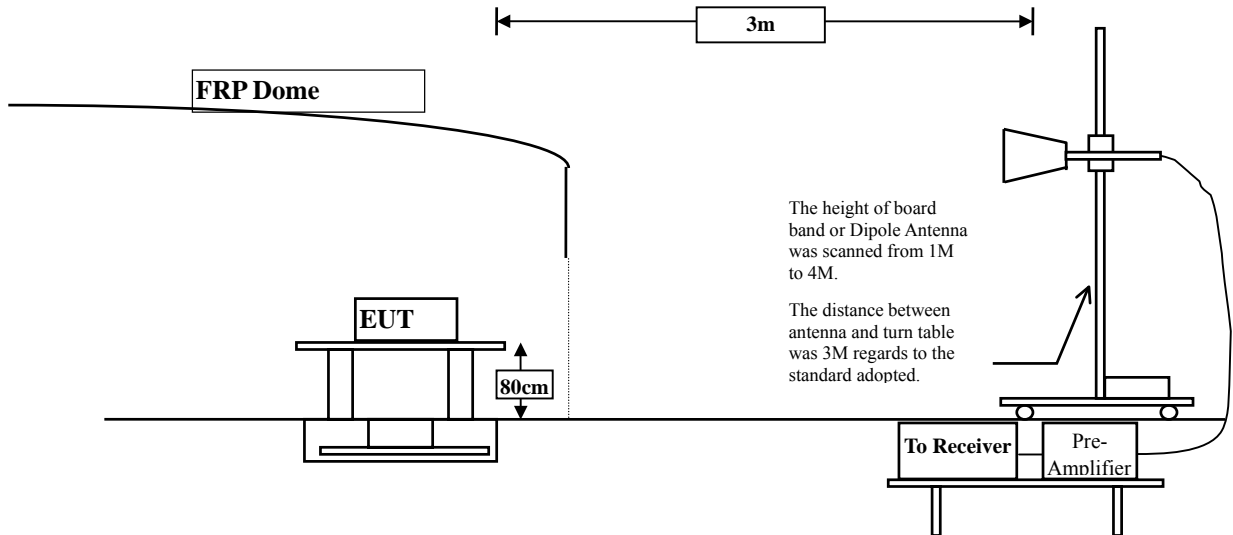
Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2009
	X Pre-Amplifier	HP	8447D/2944A09549	Sep., 2009
	X Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2009
	X Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2009
	X Coaxial Cable	QuietTek	QTK-CABLE/ CAB5	Feb., 2009
	X Controller	QuietTek	QTK-CONTROLLER/ CTRL3	N/A
	X Coaxial Switch	Anritsu	MP59B/6200265729	N/A

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

6.2. Test Setup

RF Radiated Measurement:

Above 1GHz



6.3. Limit

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

6.4. Test Procedure

The EUT 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. The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

6.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

6.6. Test Result of Band Edge

Product : Smart Handheld
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Reading Level [dBuV]	Correction Factor [dB/m]	Emission Level [dBuV/m]	Detector
Horizontal	2402	36.599	67.69	104.288	Peak
Vertical	2402	35.588	65.71	101.297	Peak

Note: 1: Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Detector
Horizontal	2386.6	104.288	50.662	53.626	Peak
Vertical	2386.6	101.297	50.662	50.635	Peak

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

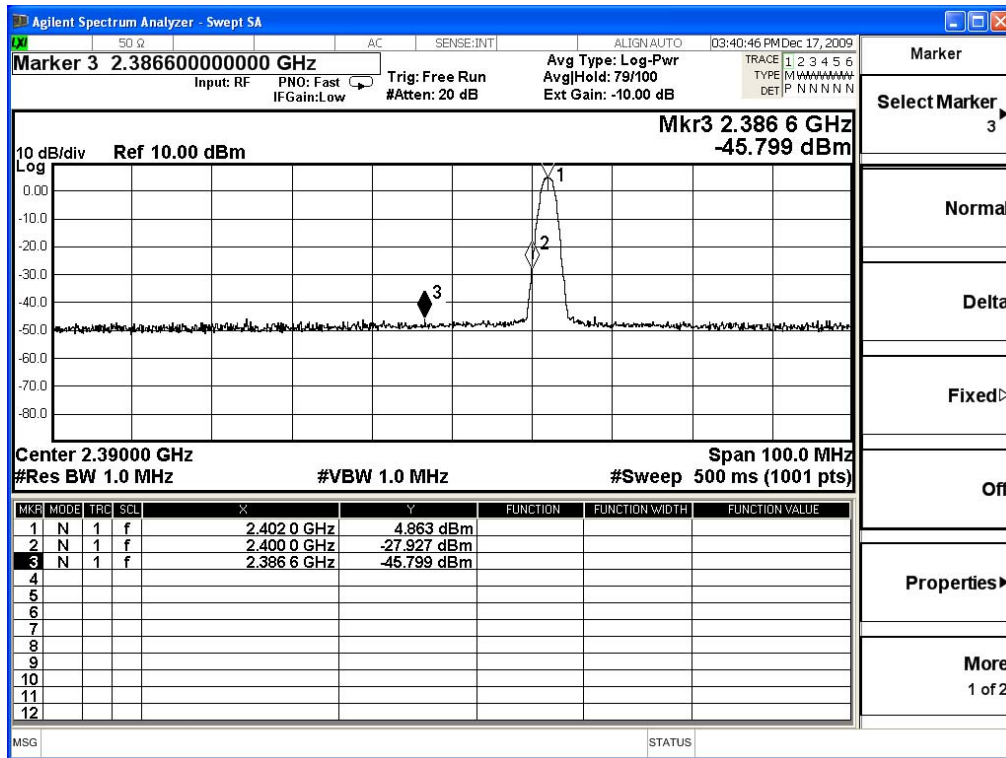
$$\text{Band Edge field Strength} = F - \Delta$$

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

The Average Field Strength is Peak Field Strength + duty cycle

Peak Detector of conducted Band Edge Delta



Product : Smart Handheld
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Reading Level [dBuV]	Correction Factor [dB/m]	Emission Level [dBuV/m]	Detector
Horizontal	2480	36.706	65.89	102.596	Peak
Vertical	2480	36.162	66.55	102.712	Peak

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Detector
Horizontal	2483.8	102.596	51.406	51.190	Peak
Vertical	2483.8	102.712	51.406	51.306	Peak

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

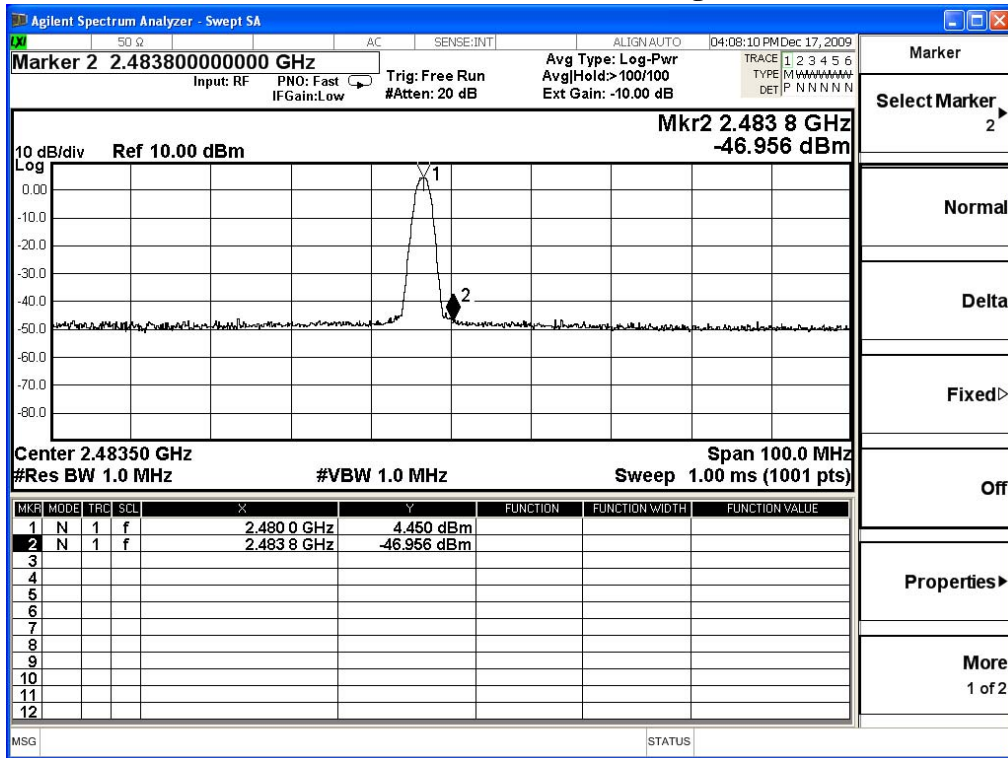
$$\text{Band Edge field Strength} = F - \Delta$$

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

The Average Field Strength is Peak Field Strength + duty cycle

Peak Detector of conducted Band Edge Delta



Product : Smart Handheld
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Reading Level [dBuV]	Correction Factor [dB/m]	Emission Level [dBuV/m]	Detector
Horizontal	2402	36.599	68.75	105.348	Peak
Vertical	2402	35.588	66.95	102.537	Peak

Note: 1: Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Detector
Horizontal	2386.2	105.348	53.049	52.299	Peak
Vertical	2386.2	102.537	53.049	49.488	Peak

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

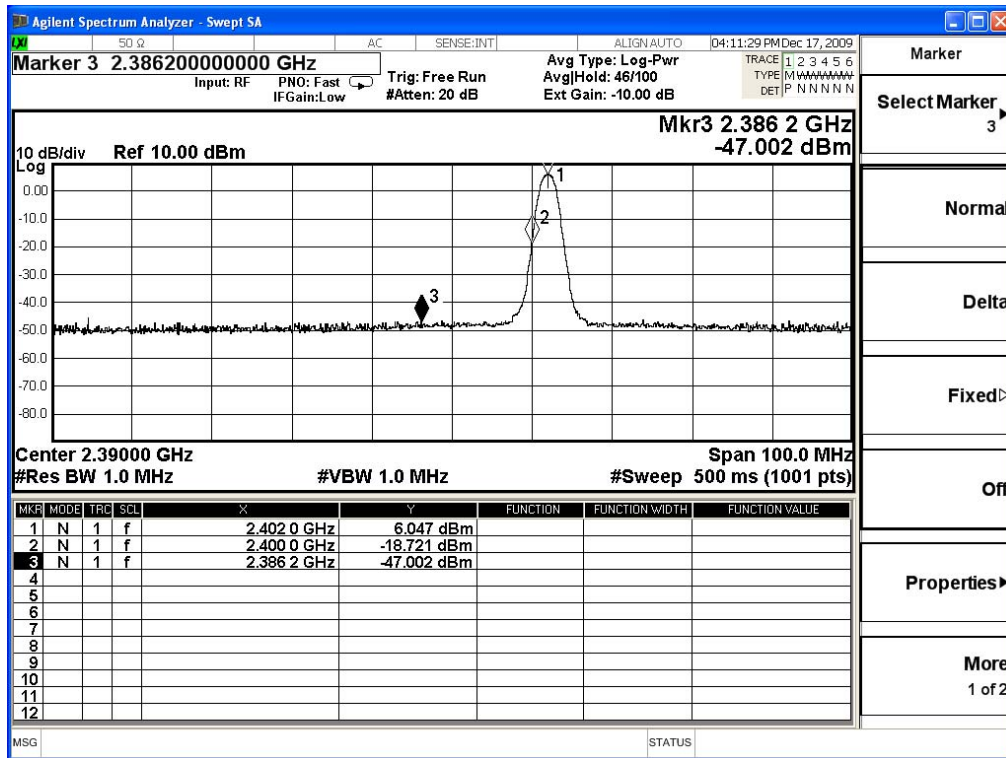
$$\text{Band Edge field Strength} = F - \Delta$$

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

The Average Field Strength is Peak Field Strength + duty cycle

Peak Detector of conducted Band Edge Delta



Product : Smart Handheld
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Fundamental Filed Strength

Antenna Pole	Frequency [MHz]	Reading Level [dBuV]	Correction Factor [dB/m]	Emission Level [dBuV/m]	Detector
Horizontal	2480	36.706	67.51	104.216	Peak
Vertical	2480	36.162	67.42	103.582	Peak

Note: 1:Spectrum Analyzer setting:

Peak detector: RBW=1MHz, VBW=1MHz

Average detector: RBW=1MHz, VBW=10Hz

Band Edge Test Data

Antenna Pole	Test Frequency (MHz)	Fundamental (dBuV/m)	Δ (dB)	Band Edge Field Strength (dBuV/m)	Detector
Horizontal	2483.5	104.216	52.935	51.281	Peak
Vertical	2483.5	103.582	52.935	50.647	Peak

Note:

The Band Edge Field Strength was calculated using the Fundamental and Conducted Band Edge measurements per the Marker-Delta Method with the following formula:

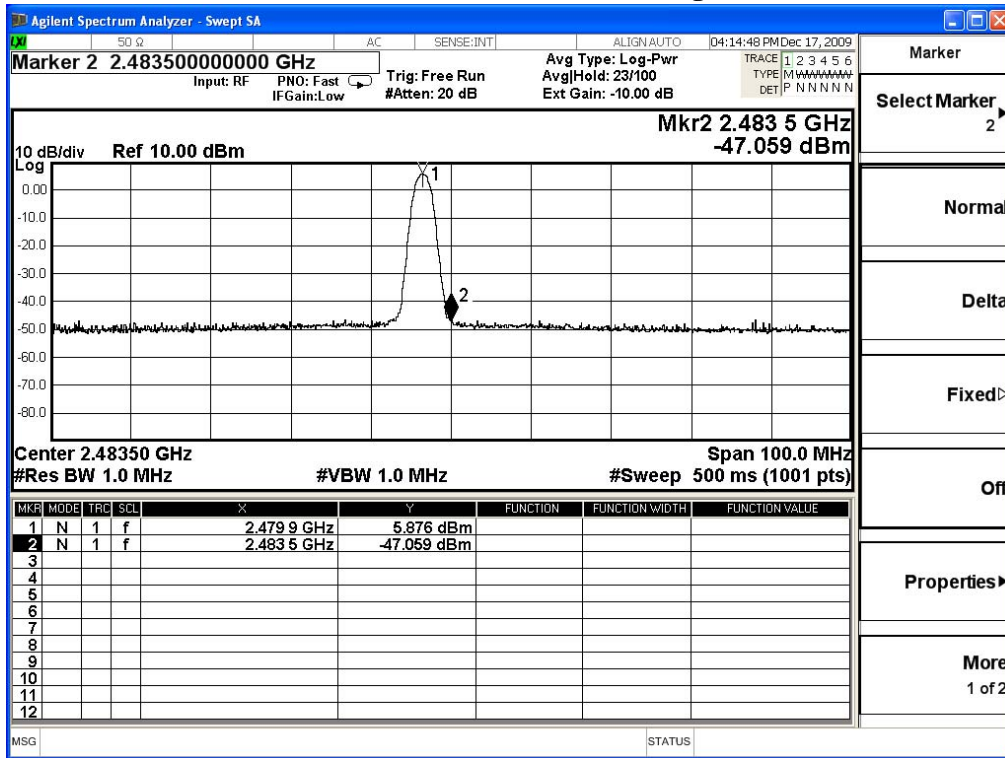
$$\text{Band Edge field Strength} = F - \Delta$$

F = Fundamental field Strength (Peak or Average)

Δ = Conducted Band Edge Delta (Peak or Average)

The Average Field Strength is Peak Field Strength + duty cycle

Peak Detector of conducted Band Edge Delta



7. Channel Number

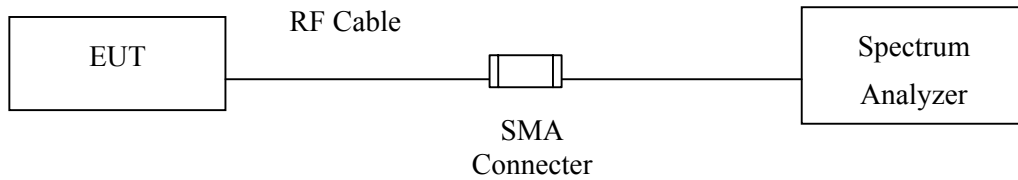
7.1. Test Equipment

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

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100339	Jun, 2009
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2009
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

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

7.2. Test Setup



7.3. Limit

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

7.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

7.5. Uncertainty

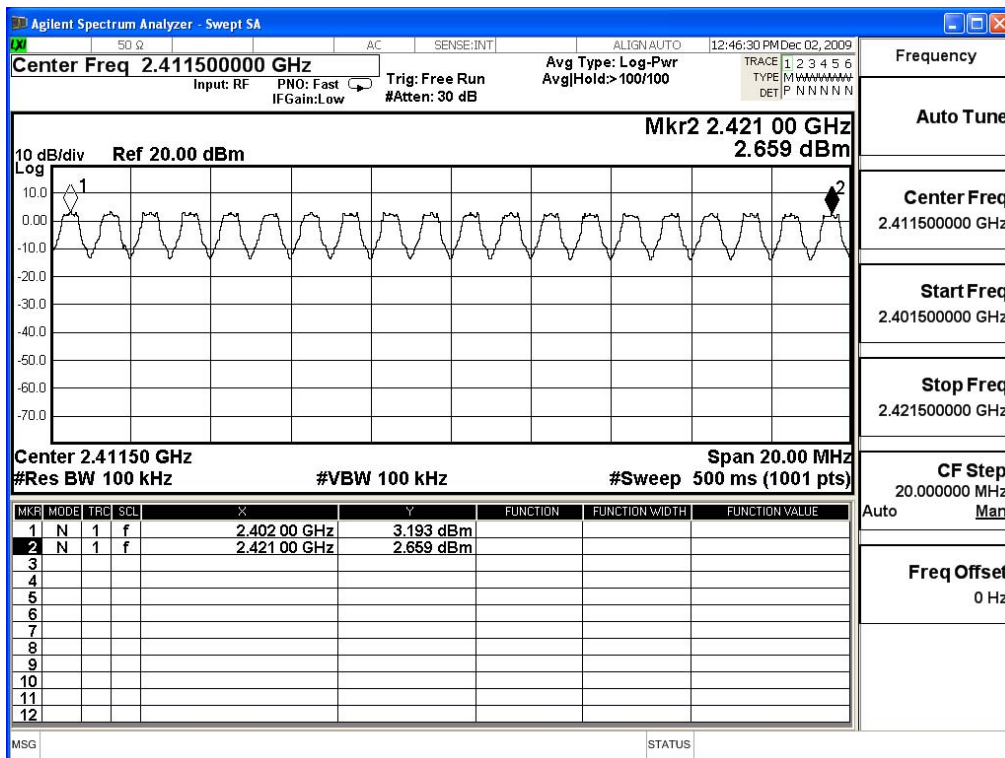
N/A

7.6. Test Result of Channel Number

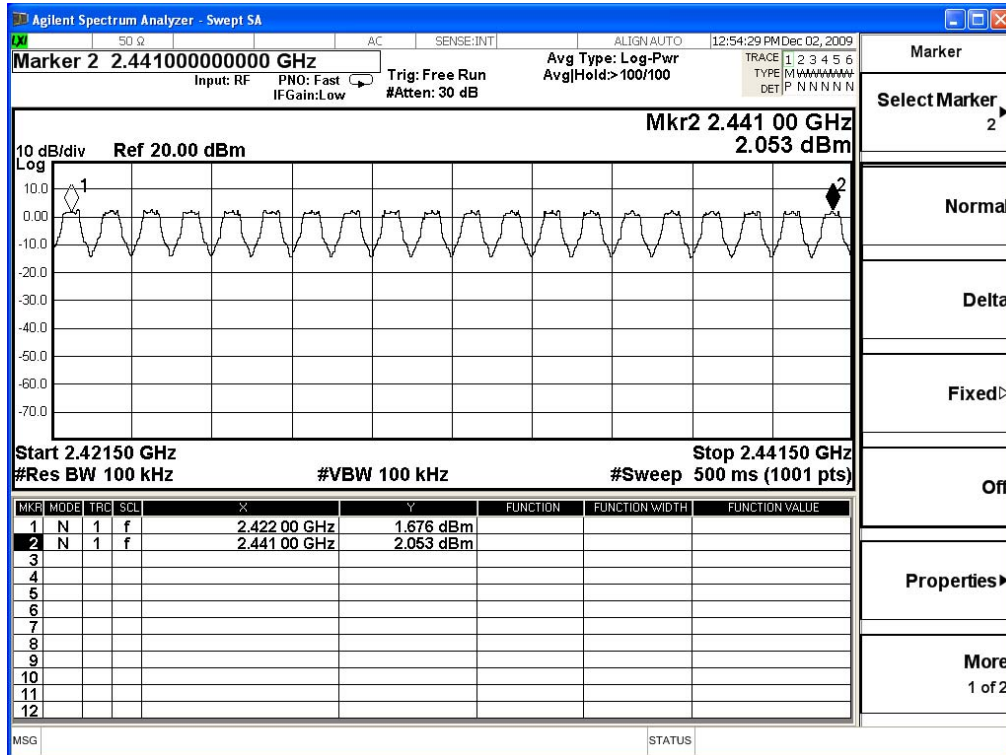
Product : Smart Handheld
 Test Item : Channel Number
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

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

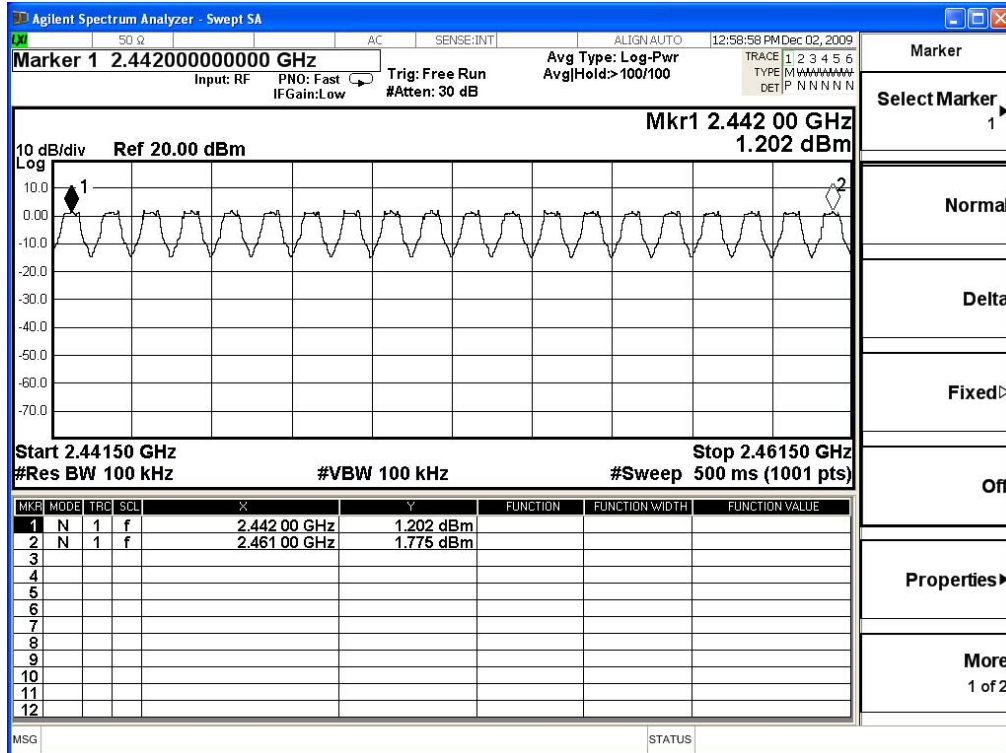
2402-2421MHz



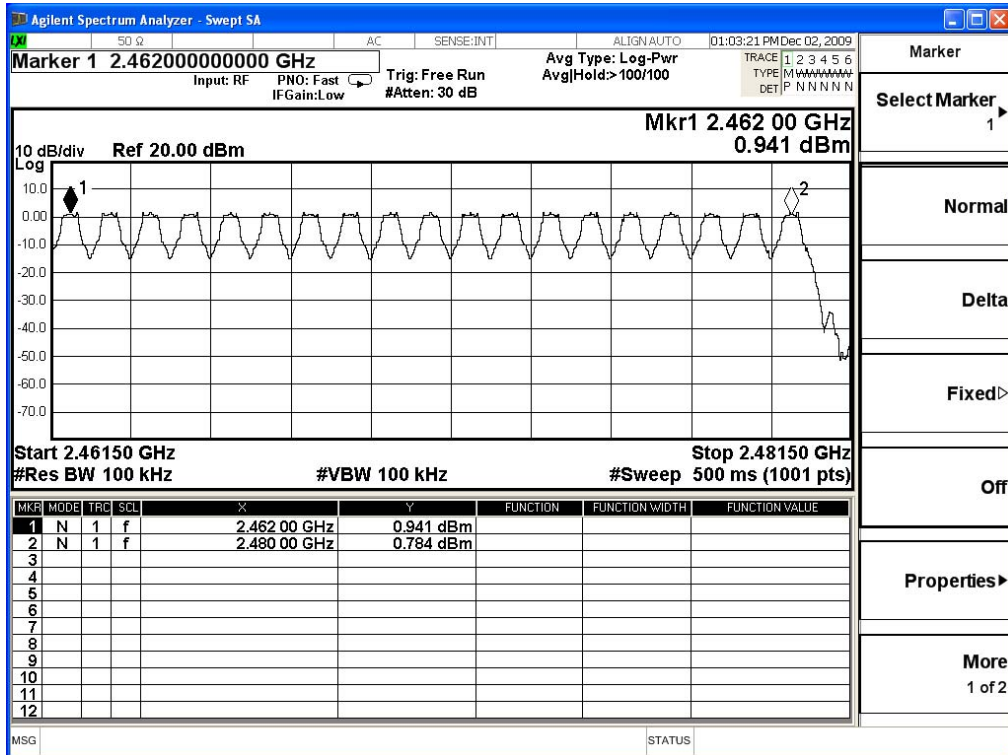
2422-2441MHz



2442-2461MHz



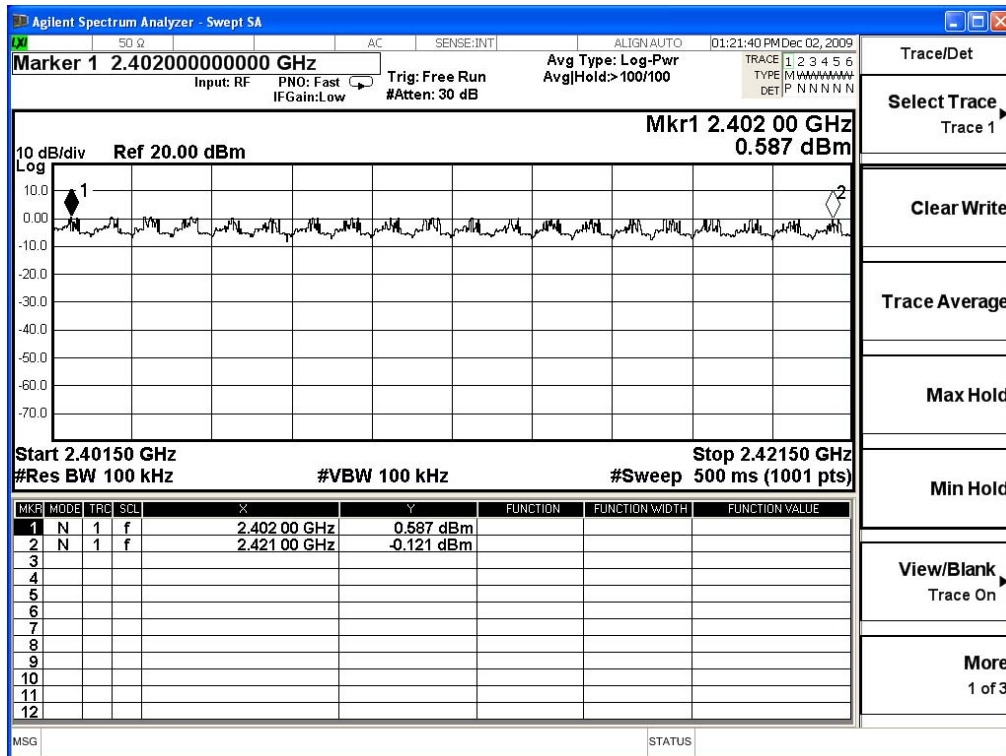
2462-2480MHz



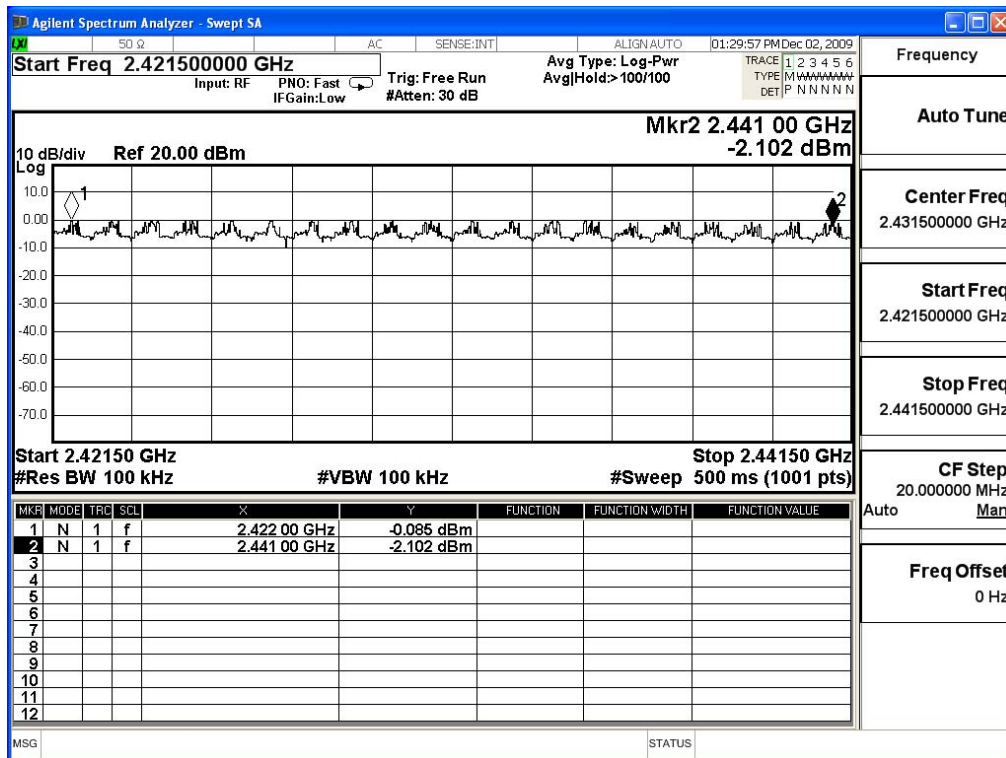
Product : Smart Handheld
 Test Item : Channel Number
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

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

2402-2421MHz

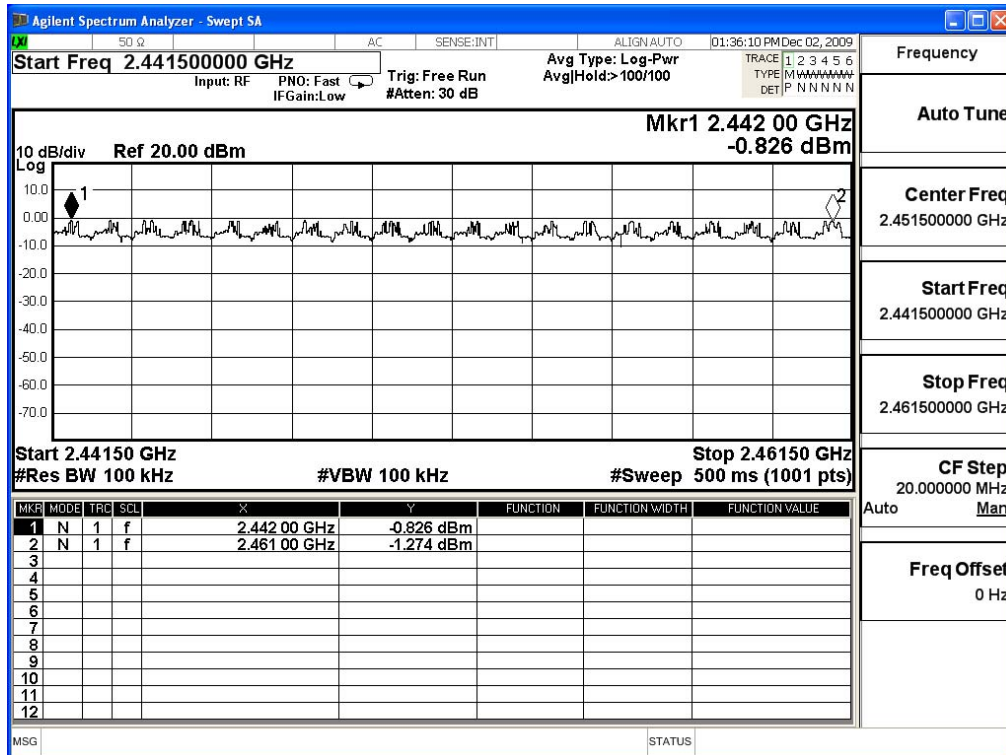


2422-2441MHz



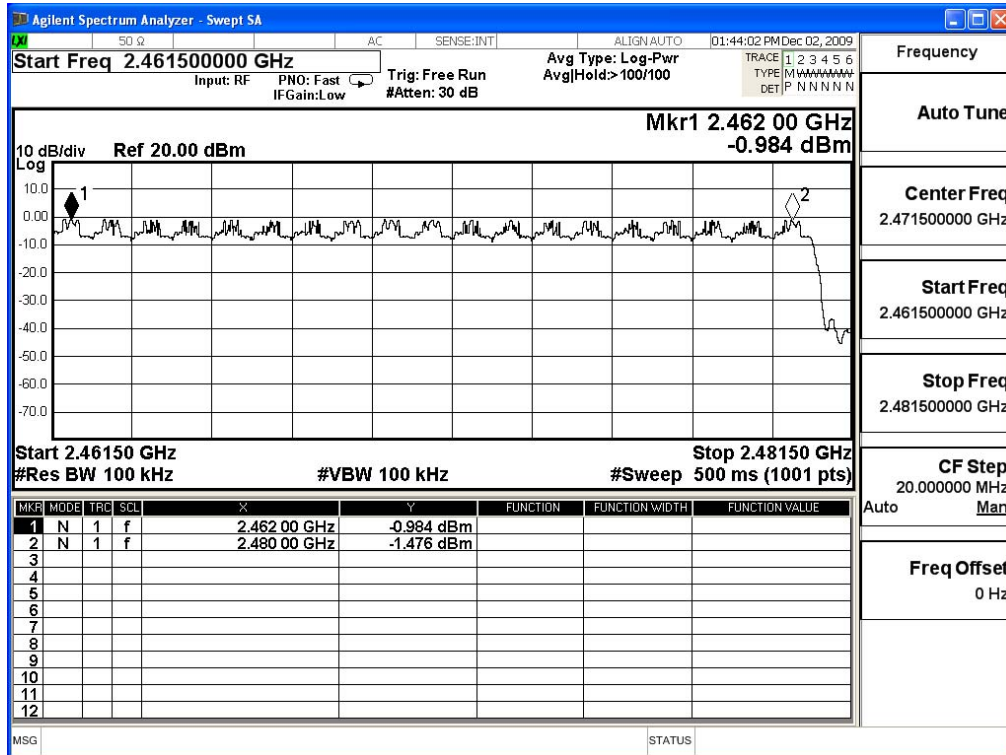
Frequency	
Auto Tune	
Center Freq	2.431500000 GHz
Start Freq	2.421500000 GHz
Stop Freq	2.441500000 GHz
CF Step	20.000000 MHz
Auto Man	
Freq Offset	0 Hz

2442-2461MHz



Frequency	
Auto Tune	
Center Freq	2.451500000 GHz
Start Freq	2.441500000 GHz
Stop Freq	2.461500000 GHz
CF Step	20.000000 MHz
Auto Man	
Freq Offset	0 Hz

2462-2480MHz



8. Channel Separation

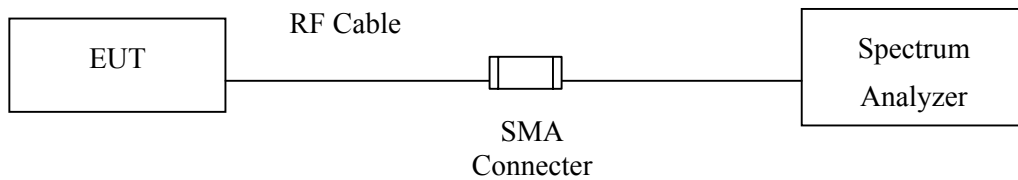
8.1. Test Equipment

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

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100339	Jun, 2009
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2009
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2009

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

8.2. Test Setup



8.3. Limit

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 2/3*(20 dB bandwidth) of the hopping channel, whichever is greater.

8.4. Test Procedure

The EUT was setup to ANSI C63.4, 2003; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

8.5. Uncertainty

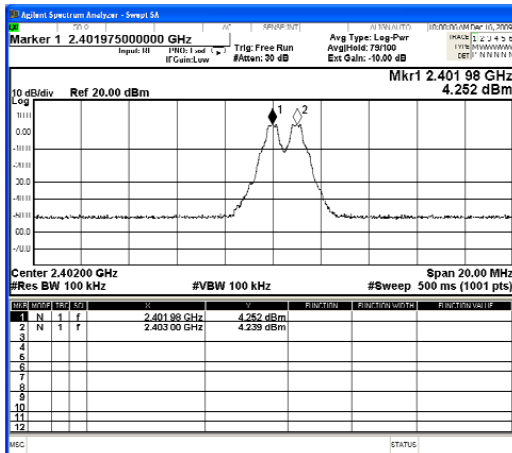
± 150Hz

8.6. Test Result of Channel Separation

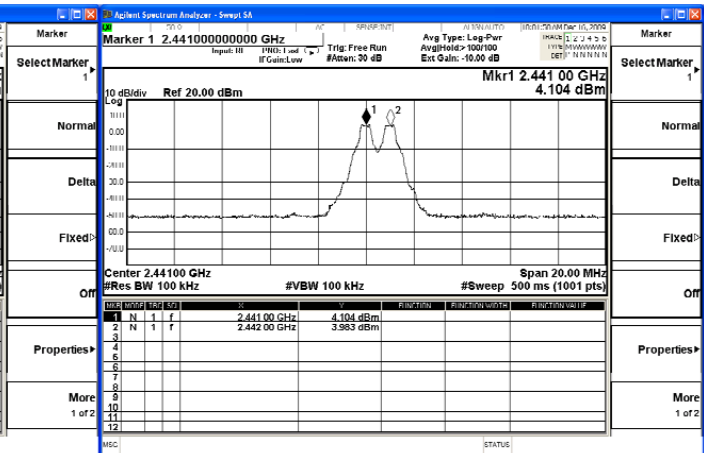
Product : Smart Handheld
 Test Item : Channel Separation
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
2402	1000	>25 kHz	746.7	Pass
2441	1000	>25 kHz	746.7	Pass
2480	1000	>25 kHz	753.3	Pass

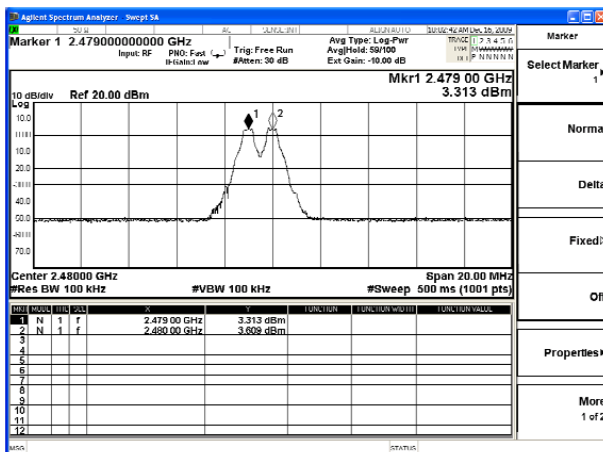
Channel 00 2402MHz



Channel 39 2441MHz



Channel 78 2480 MHz

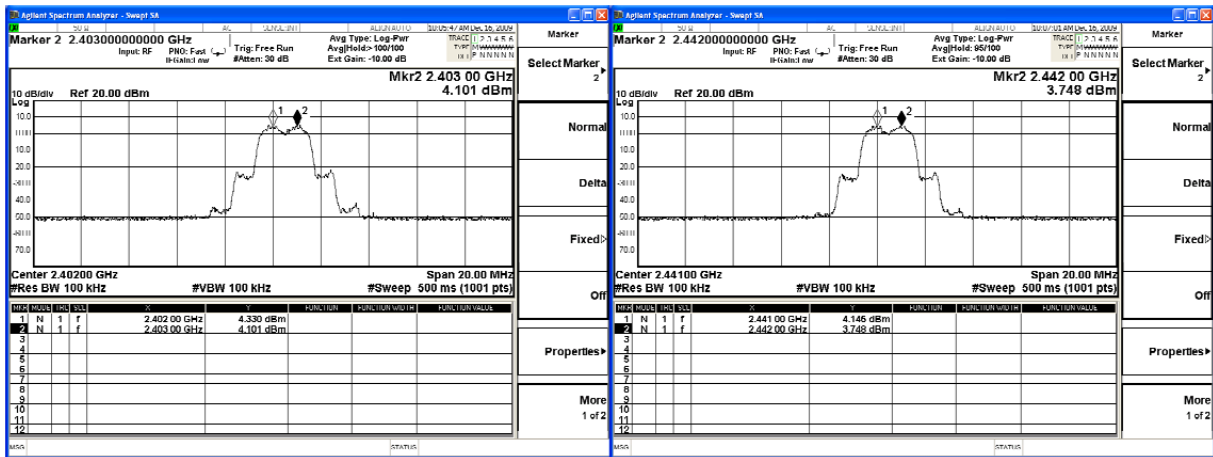


Product : Smart Handheld
 Test Item : Channel Separation
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
2402	1000	>25 kHz	933.3	Pass
2441	1000	>25 kHz	926.7	Pass
2480	1000	>25 kHz	926.7	Pass

Channel 00 2402MHz

Channel 39 2441MHz



Channel 78 2480 MHz

