Test Report

Product Name : VFD Combo

Model No. : MS-6874

FCC ID. : I4L-MS6874

Applicant : MICRO-STAR INT'L Co., LTD.

Address : No. 69, Li-De St., Jung-He City, Taipei Hsien, Taiwan, R.O.C.

Date of Receipt : Dec. 22, 2006

Issued Date : Jan. 25, 2007

Report No. : 06CL130-RFUSP05V01

Test Report Certification

Issued Date: Jan. 25, 2007
Report No.: 06CL130-RFUSP05V01

QuieTek Corporation

Accredited by NIST (NVLAP)
NVLAP Lab Code: 200533-0

Product Name	:	VFD Combo
Applicant	:	MICRO-STAR INT'L Co., LTD.
Address	:	No. 69, Li-De St., Jung-He City, Taipei Hsien, Taiwan, R.O.C.
Manufacturer	:	MICRO-STAR INT'L Co., LTD.
Model No.	:	MS-6874
Rated Voltage	:	AC 120V/60Hz
Working Voltage	:	DC 5V (via USB)
Trade Name	:	MSI
Applicable Standard	:	FCC CFR Title 47 Part 15 Subpart C: 2005 ANSI C63.4: 2003
Test Result	:	Complied

NVLAP Lab Code: 200533-0

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 : Rita Huang
(Rita Huang)

Tested By : Dino Chen
(Dino Chen)

Approved By : George Chen
(George Chen)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	VFD Combo
Trade Name	MSI
Model No.	MS-6874
FCC ID.	I4L-MS6874
Frequency Range	802.11b/g: 2412-2462MHz Bluetooth: 2402-2480MHz
Number of Channels	802.11b/g: 11 Bluetooth: 80
Data Rate	802.11b: 1 - 11Mbps, 802.11g: 6 - 54Mbps Bluetooth: 2Mbps
Type of Modulation	DSSS/OFDM
Antenna Type	Chip
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	YAGEO	CAN4311153002451K	4dBi for 2.4 GHz

Frequency of Each Channel (802.11b/g):

Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 1:	2412 MHz	Channel 5:	2432 MHz	Channel 9:	2452 MHz
Channel 2:	2417 MHz	Channel 6:	2437 MHz	Channel 10:	2457 MHz
Channel 3:	2422 MHz	Channel 7:	2442 MHz	Channel 11:	2462 MHz
Channel 4:	2427 MHz	Channel 8:	2447 MHz		

Frequency of Each Channel (Bluetooth):

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

Note:

1. The EUT is a VFD Combo with two built-in 2.4GHz transceivers.
2. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
3. Lowest and highest data rates are tested in each mode. Only worst case is shown in the report. (802.11b is 11Mbps and 802.11g is 54Mbps)
4. These tests are conducted on a sample for demonstrating the compliance of 802.11b/g transmitter with Part 15 Subpart C Paragraph 15.247.

1.2. Operational Description

The EUT is a VFD Combo with two built-in 2.4GHz transceivers. The EUT is a module that provides 802.11b/g and Bluetooth wireless connections. 802.11b/g supports 11 channels in 2412-2462MHz and the data rates of 1, 2, 5.5, 6, 9, 11, 12, 18, 24, 36, 48 and 54Mbps. Bluetooth supports 79 channels in 2402-2480MHz and the data rate of 2Mbps. The signals of 802.11b/g are modulated by DSSS and OFDM. The signals of Bluetooth are modulated by FHSS. The antenna types are all chip.

Test Mode	Mode 1: Transmitter (802.11b 11Mbps)
	Mode 2: Transmitter (802.11g 54Mbps)

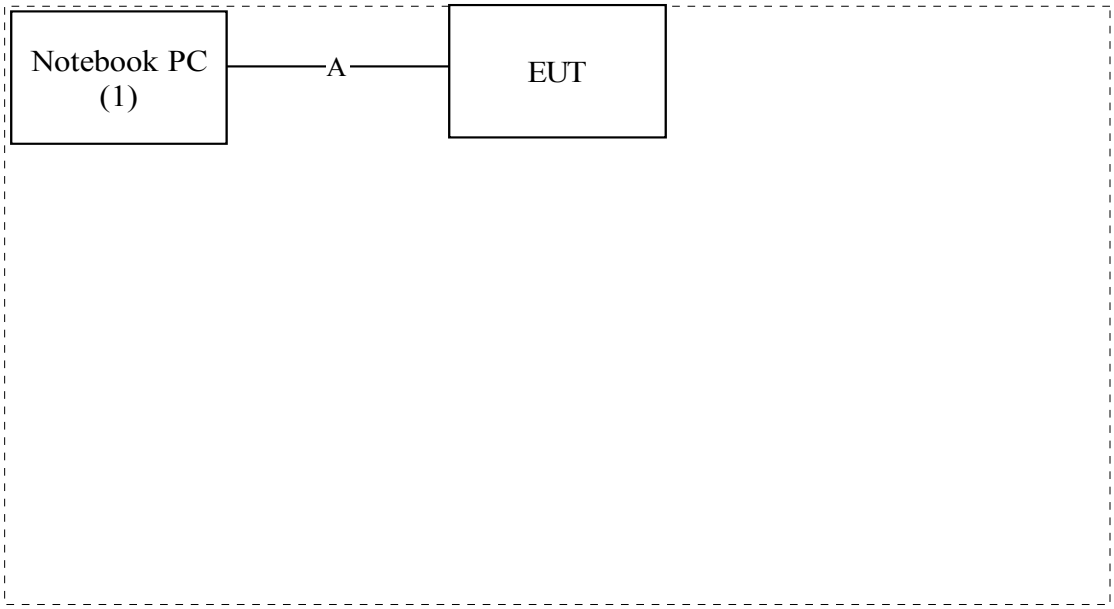
1.3. Tested System Datails

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.	FCC ID	Power Cord
(1)	Notebook PC	DELL	PP04X	2D2ZM1S	DoC	Non-Shielded, 0.8m

Signal Cable Type		Signal cable Description
A.	USB Cable	Shielded, 0.5m

1.4. Configuration of Test System



1.5. EUT Exercise Software

(1) Setup the EUT as shown in section 1.4
(2) Execute QAU2571W.exe (the continuous transmission program of 802.11b/g) on the notebook.
(3) Execute BlueTest.exe (the continuous transmission program of Bluetooth) on the notebook.
(4) Setup the test mode, the test channel, and the data rate.
(5) Press OK to start the transmission.
(6) Verify that the EUT works correctly.

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

Accreditation on NVLAP
NVLAP Lab Code: 200533-0

Site Name: Quietek Corporation
Site Address: No. 5-22, Ruei-Shu Valley, Ruei-Ping Tsuen,
Lin-Kou Shiang, Taipei,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

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2. Conducted Emission

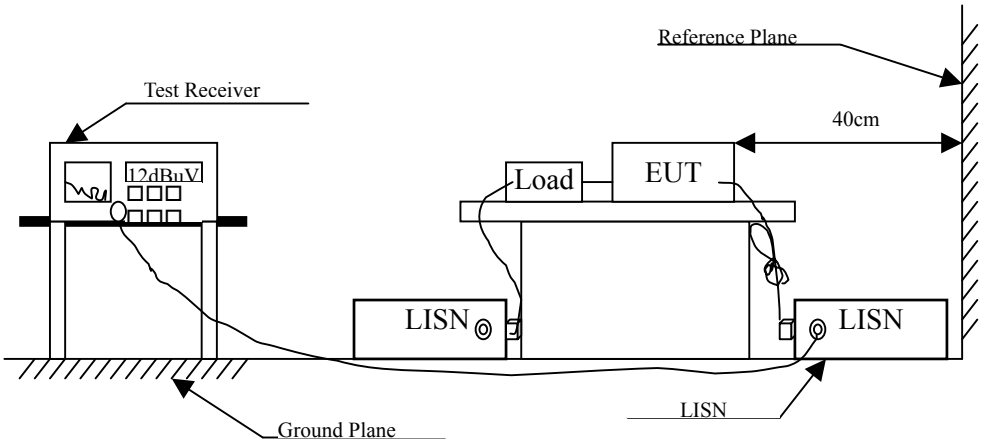
2.1. Test Equipment

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 30/825442/17	May, 2006	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2006	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2006	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2006	
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	
	uV	dBuV
0.15 - 0.50	66-56(註)	56-46(註)
0.50-5.0	56	46
5.0 - 30	60	50

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. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : VFD Combo
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2437MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.189	0.202	45.440	45.642	-19.244	64.886
0.310	0.214	40.200	40.414	-21.015	61.429
0.478	0.216	36.150	36.366	-20.263	56.629
0.627	0.218	37.860	38.078	-17.922	56.000
1.005	0.233	32.390	32.623	-23.377	56.000
4.841	0.394	21.740	22.134	-33.866	56.000
Average					
0.189	0.202	39.830	40.032	-14.854	54.886
0.310	0.214	34.060	34.274	-17.155	51.429
0.478	0.216	23.140	23.356	-23.273	46.629
0.627	0.218	31.520	31.738	-14.262	46.000
1.005	0.233	25.720	25.953	-20.047	46.000
4.841	0.394	16.030	16.424	-29.576	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
4. The Bluetooth transmitter is enabled and the transmission is in 2441MHz.

Product : VFD Combo
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2437MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.185	0.202	44.200	44.402	-20.598	65.000
0.322	0.214	41.620	41.834	-19.252	61.086
0.466	0.216	35.760	35.976	-20.995	56.971
0.638	0.218	36.350	36.568	-19.432	56.000
1.103	0.244	32.850	33.094	-22.906	56.000
2.982	0.309	25.970	26.279	-29.721	56.000
Average					
0.185	0.202	38.880	39.082	-15.918	55.000
0.322	0.214	34.230	34.444	-16.642	51.086
0.466	0.216	22.630	22.846	-24.125	46.971
0.638	0.218	31.280	31.498	-14.502	46.000
1.103	0.244	26.140	26.384	-19.616	46.000
2.982	0.309	19.880	20.189	-25.811	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
4. The Bluetooth transmitter is enabled and the transmission is in 2441MHz.

Product : VFD Combo
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2437MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 1					
Quasi-Peak					
0.189	0.202	47.090	47.292	-17.594	64.886
0.298	0.214	37.550	37.764	-24.007	61.771
0.486	0.216	36.750	36.966	-19.434	56.400
0.974	0.232	33.470	33.702	-22.298	56.000
3.158	0.322	24.520	24.842	-31.158	56.000
6.228	0.453	18.890	19.343	-40.657	60.000
Average					
0.189	0.202	41.190	41.392	-13.494	54.886
0.298	0.214	25.790	26.004	-25.767	51.771
0.486	0.216	21.770	21.986	-24.414	46.400
0.974	0.232	23.160	23.392	-22.608	46.000
3.158	0.322	19.090	19.412	-26.588	46.000
6.228	0.453	13.110	13.563	-36.437	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
4. The Bluetooth transmitter is enabled and the transmission is in 2441MHz.

Product : VFD Combo
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2437MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.154	0.202	48.880	49.082	-16.804	65.886
0.189	0.202	47.210	47.412	-17.474	64.886
0.302	0.212	38.050	38.262	-23.395	61.657
0.408	0.215	37.180	37.395	-21.234	58.629
0.869	0.231	32.300	32.531	-23.469	56.000
2.939	0.309	26.040	26.349	-29.651	56.000
Average					
0.154	0.202	38.700	38.902	-16.984	55.886
0.189	0.202	41.590	41.792	-13.094	54.886
0.302	0.212	25.790	26.002	-25.655	51.657
0.408	0.215	29.290	29.505	-19.124	48.629
0.869	0.231	21.600	21.831	-24.169	46.000
2.939	0.309	19.640	19.949	-26.051	46.000

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
4. The Bluetooth transmitter is enabled and the transmission is in 2441MHz.

3. Peak Power Output

3.1. Test Equipment

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

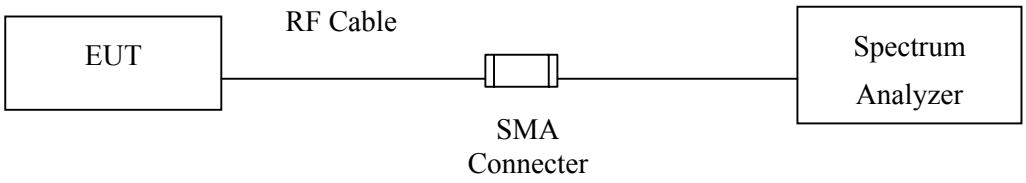
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2006

Note: 1. All instruments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

3.2. Test Setup

Conduction Power Measurement



3.3. Limits

The maximum peak power shall be less 1 Watt.

3.4. Uncertainty

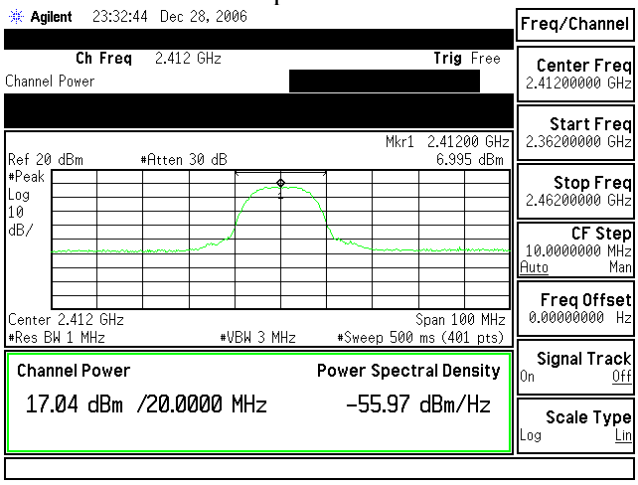
± 1.27 dB

3.5. Test Result of Peak Power Output

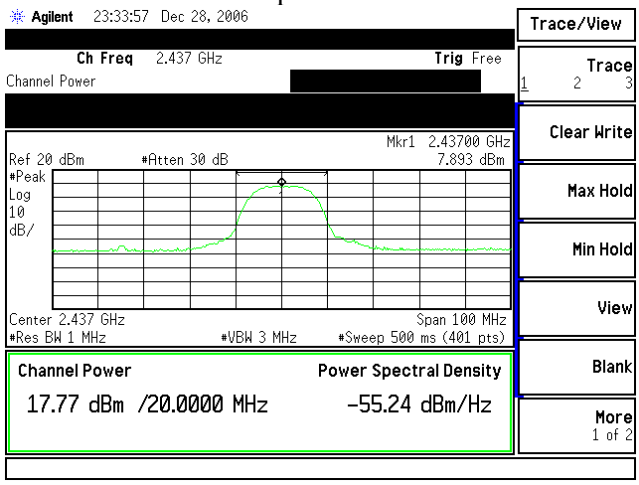
Product : VFD Combo
Test Item : Peak Power Output Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps)

Channel No.	Frequency (MHz)	Measurement	Required Limit	Result
1	2412.00	17.04dBm	1Watt= 30 dBm	Pass
6	2437.00	17.77dBm	1Watt= 30 dBm	Pass
11	2462.00	17.82dBm	1Watt= 30 dBm	Pass

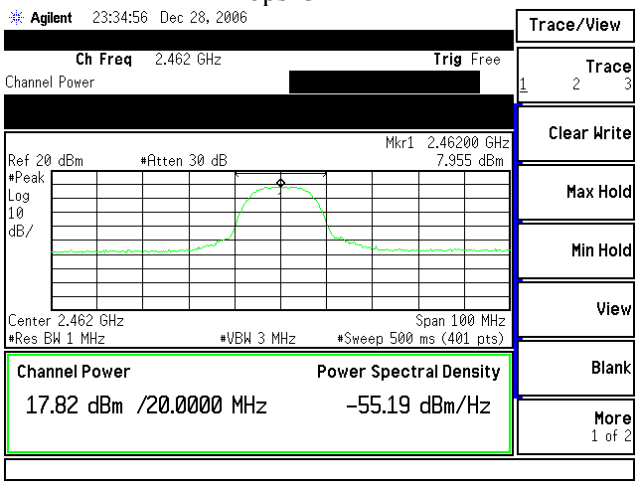
1Mbps-CH01



1Mbps-CH 06



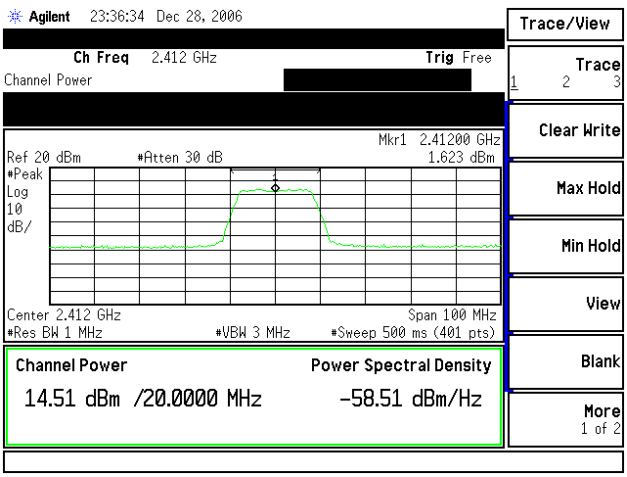
1Mbps-CH11



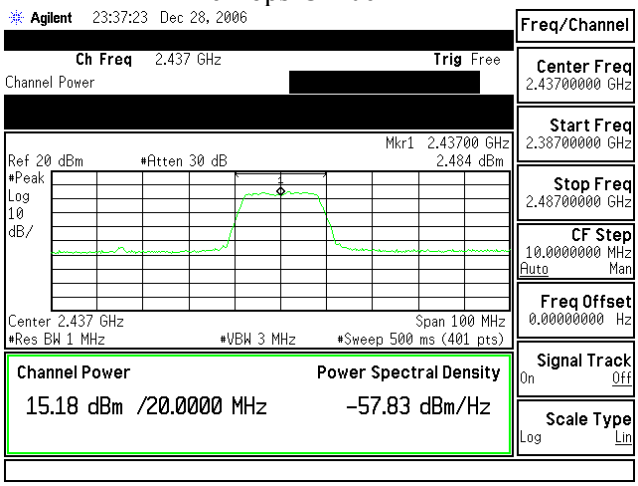
Product : VFD Combo
Test Item : Peak Power Output Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps)

Channel No.	Frequency (MHz)	Measurement	Required Limit	Result
1	2412.00	14.51dBm	1Watt= 30 dBm	Pass
6	2437.00	15.18dBm	1Watt= 30 dBm	Pass
11	2462.00	15.26dBm	1Watt= 30 dBm	Pass

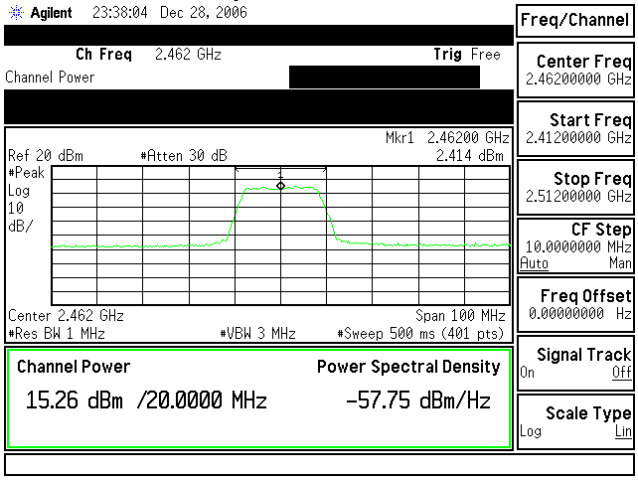
6Mbps-CH01



6Mbps-CH 06



6Mbps-CH11



4. Radiated Emission

4.1. Test Equipment

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

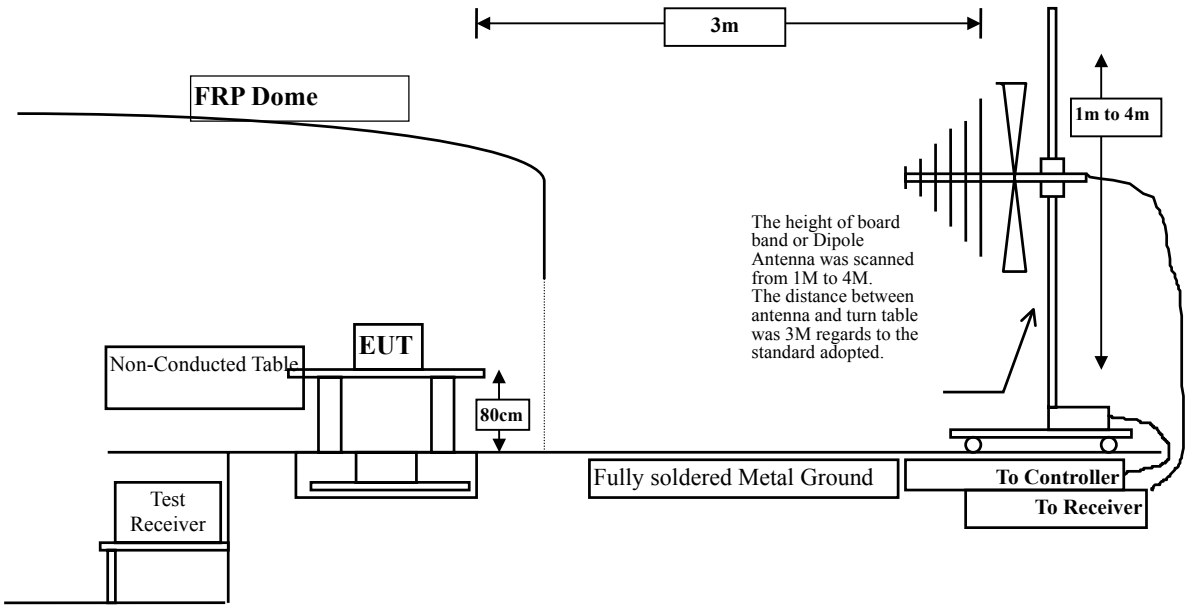
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Site # 1		Test Receiver	R & S	ESCS 30 / 825442/14	May, 2006
		Spectrum Analyzer	Advantest	R3261C / 71720140	May, 2006
		Pre-Amplifier	HP	8447D/3307A01812	May, 2006
		Bilog Antenna	Chase	CBL6112B / 12452	Sep., 2006
		Horn Antenna	EM	EM6917 / 103325	May, 2006
Site # 2		Test Receiver	R & S	ESCS 30 / 825442/17	May, 2006
		Spectrum Analyzer	Advantest	R3261C / 71720609	May, 2006
		Pre-Amplifier	HP	8447D/3307A01814	May, 2006
		Bilog Antenna	Chase	CBL6112B / 2455	Sep., 2006
		Horn Antenna	EM	EM6917 / 103325	May, 2006
Site # 3	X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2006
	X	Spectrum Analyzer	Advantest	R3162 / 100803480	May, 2006
	X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2006
	X	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2006
	X	Horn Antenna	ETS	3115 / 0005-6160	July, 2006
	X	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2006

Note: 1. All instruments are calibrated every one year.

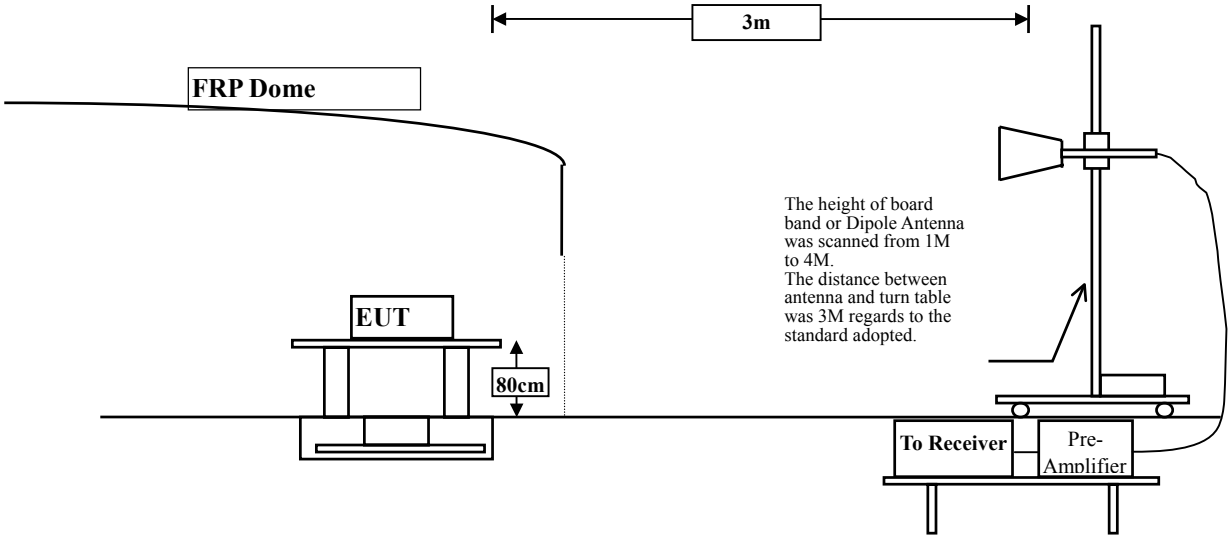
2. The test instruments marked by "X" are used to measure the final test results.

4.2. Test Setup

Below 1GHz



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(a) 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: 2003 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. Uncertainty

± 3.8 dB below 1GHz
± 3.9 dB above 1GHz

4.6. Test Result of Radiated Emission

Product : VFD Combo
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2412MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4804.000	3.737	48.405	52.142	-21.858	74.000
4824.000	3.781	42.690	46.471	-27.529	74.000
7206.000	10.741	37.581	48.322	-25.678	74.000
7236.000	10.969	37.140	48.109	-25.891	74.000
9608.000	14.854	38.325	53.179	-20.821	74.000
9648.000	14.882	41.097	55.979	-18.021	74.000
Average Detector:					
9648.000	14.882	34.166	49.048	-4.952	54.000
Vertical					
Peak Detector:					
4804.000	3.737	46.149	49.886	-24.114	74.000
4824.000	3.781	42.967	46.748	-27.252	74.000
7206.000	10.741	37.442	48.183	-25.817	74.000
7236.000	10.969	38.291	49.260	-24.740	74.000
9608.000	14.854	37.757	52.611	-21.389	74.000
9648.000	14.882	40.377	55.259	-18.741	74.000
Average Detector:					
9648.000	14.882	33.491	48.373	-5.627	54.000

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:30Hz (802.11b/g) or 3kHz (Bluetooth); 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.
6. The Bluetooth transmitter is enabled and the transmission is in 2402MHz.

Product : VFD Combo
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2437 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4874.000	3.913	40.812	44.725	-29.275	74.000
4882.000	3.932	45.469	49.401	-24.599	74.000
7311.000	11.547	37.226	48.773	-25.227	74.000
7323.000	11.633	37.479	49.111	-24.889	74.000
9748.000	14.260	40.229	54.489	-19.511	74.000
9764.000	13.740	36.458	50.198	-23.802	74.000
Average Detector:					
9748.000	14.260	33.310	47.570	-6.430	54.000
Vertical					
Peak Detector:					
4874.000	3.913	42.987	46.900	-27.100	74.000
4882.000	3.932	45.460	49.392	-24.608	74.000
7311.000	11.547	38.107	49.654	-24.346	74.000
7323.000	11.633	38.098	49.730	-24.270	74.000
9748.000	14.260	39.920	54.180	-19.820	74.000
9764.000	13.740	37.901	51.641	-22.359	74.000
Average Detector:					
9748.000	14.260	33.905	48.165	-5.835	54.000

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:30Hz (802.11b/g) or 3kHz (Bluetooth); 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.
6. The Bluetooth transmitter is enabled and the transmission is in 2441MHz.

Product : VFD Combo
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2462 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4924.000	4.054	38.918	42.972	-31.028	74.000
4960.000	4.151	41.956	46.106	-27.894	74.000
7386.000	11.873	37.461	49.335	-24.665	74.000
7440.000	12.067	39.244	51.310	-22.690	74.000
9848.000	13.462	39.255	52.717	-21.283	74.000
9920.000	13.472	38.449	51.920	-22.080	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4924.000	4.054	41.984	46.038	-27.962	74.000
4960.000	4.151	43.344	47.494	-26.506	74.000
7386.000	11.873	36.827	48.701	-25.299	74.000
7440.000	12.067	39.162	51.228	-22.772	74.000
9848.000	13.462	39.162	52.624	-21.376	74.000
9920.000	13.472	40.058	53.529	-20.471	74.000
Average Detector:					
--					

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 (802.11b/g) or 3kHz (Bluetooth); 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.
6. The Bluetooth transmitter is enabled and the transmission is in 2480MHz.

Product : VFD Combo
Test Item : Harmonic Radiated Emission Data
Test Site : No.3OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2412 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4804.000	3.737	47.824	51.561	-22.439	74.000
4824.000	3.781	38.129	41.910	-32.090	74.000
7206.000	10.741	38.074	48.815	-25.185	74.000
7236.000	10.969	37.741	48.710	-25.290	74.000
9608.000	14.854	37.306	52.160	-21.840	74.000
9648.000	14.882	38.093	52.975	-21.025	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4804.000	3.737	47.271	51.008	-22.992	74.000
4824.000	3.781	39.102	42.883	-31.117	74.000
7206.000	10.741	37.554	48.295	-25.705	74.000
7236.000	10.969	37.974	48.943	-25.057	74.000
9608.000	14.854	38.743	53.597	-20.403	74.000
9648.000	14.882	39.551	54.433	-19.567	74.000
Average Detector:					
9648.000	14.882	30.987	45.869	-8.131	54.000

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:30Hz (802.11b/g) or 3kHz (Bluetooth); 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.
6. The Bluetooth transmitter is enabled and the transmission is in 2402MHz.

Product : VFD Combo
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2437 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4874.000	3.913	38.369	42.282	-31.718	74.000
4882.000	3.932	44.918	48.850	-25.150	74.000
7311.000	11.547	37.859	49.406	-24.594	74.000
7323.000	11.633	37.553	49.185	-24.815	74.000
9748.000	14.260	37.384	51.644	-22.356	74.000
9764.000	13.740	37.022	50.762	-23.238	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4874.000	3.913	38.890	42.803	-31.197	74.000
4882.000	3.932	47.838	51.770	-22.230	74.000
7311.000	11.547	37.436	48.983	-25.017	74.000
7323.000	11.633	37.785	49.417	-24.583	74.000
9748.000	14.260	38.791	53.051	-20.949	74.000
9764.000	13.740	37.570	51.310	-22.690	74.000
Average Detector:					
--					

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 (802.11b/g) or 3kHz (Bluetooth); 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.
6. The Bluetooth transmitter is enabled and the transmission is in 2441MHz.

Product : VFD Combo
Test Item : Harmonic Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2462 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
Peak Detector:					
4924.000	4.054	38.091	42.145	-31.855	74.000
4960.000	4.151	43.498	47.648	-26.352	74.000
7386.000	11.873	37.174	49.048	-24.952	74.000
7440.000	12.067	39.218	51.284	-22.716	74.000
9848.000	13.462	37.167	50.629	-23.371	74.000
9920.000	13.472	38.175	51.646	-22.354	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4924.000	4.054	38.492	42.546	-31.454	74.000
4960.000	4.151	43.432	47.582	-26.418	74.000
7386.000	11.873	37.821	49.695	-24.305	74.000
7440.000	12.067	38.301	50.367	-23.633	74.000
9848.000	13.462	37.006	50.468	-23.532	74.000
9920.000	13.472	41.038	54.509	-19.491	74.000
Average Detector:					
9920.000	13.472	33.596	47.067	-6.933	54.000

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:30Hz (802.11b/g) or 3kHz (Bluetooth); 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.
6. The Bluetooth transmitter is enabled and the transmission is in 2480MHz.

Product : VFD Combo
Test Item : General Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2437 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
119.725	12.953	25.628	38.581	-4.919	43.500
359.800	15.288	22.227	37.515	-8.485	46.000
481.050	18.786	21.964	40.750	-5.250	46.000
599.875	19.999	22.802	42.801	-3.199	46.000
721.125	20.929	17.921	38.850	-7.150	46.000
900.575	22.049	19.409	41.458	-4.542	46.000
Vertical					
119.725	11.494	26.746	38.240	-5.260	43.500
481.050	18.586	17.624	36.210	-9.790	46.000
599.875	21.898	16.646	38.544	-7.456	46.000
721.125	22.229	14.211	36.440	-9.560	46.000
839.950	21.403	19.481	40.884	-5.116	46.000
961.200	23.009	20.862	43.871	-10.129	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 pretested. Only the worst case is shown on the report.
5. The Bluetooth transmitter is enabled and the transmission is in 2441MHz.

Product : VFD Combo
Test Item : General Radiated Emission Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2437 MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
119.725	12.953	24.588	37.541	-5.959	43.500
359.800	15.288	21.259	36.547	-9.453	46.000
481.050	18.786	21.468	40.254	-5.746	46.000
599.875	19.999	22.675	42.674	-3.326	46.000
900.575	22.049	18.649	40.698	-5.302	46.000
961.200	22.909	21.338	44.247	-9.753	54.000
Vertical					
71.225	7.715	26.844	34.558	-5.442	40.000
119.725	11.494	26.047	37.541	-5.959	43.500
481.050	18.586	17.659	36.245	-9.755	46.000
599.875	21.898	16.516	38.414	-7.586	46.000
839.950	21.403	18.454	39.857	-6.143	46.000
961.200	23.009	20.212	43.221	-10.779	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 pretested. Only the worst case is shown on the report.
5. The Bluetooth transmitter is enabled and the transmission is in 2480MHz.

5. Band Edge

5.1. Test Equipment

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

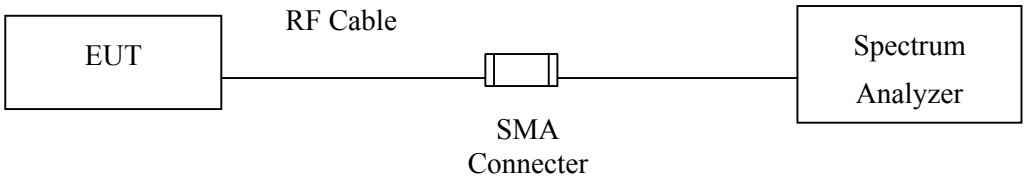
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	HP	E4407B / US39440758	May, 2006
X	Test Receiver	R & S	ESCS 30 / 825442/14	May, 2006
X	Spectrum Analyzer	Advantest	R3261C / 71720140	May, 2006
X	Pre-Amplifier	HP	8447D/3307A01812	May, 2006
X	Bilog Antenna	Chase	CBL6112B / 12452	Sep., 2006
X	Horn Antenna	EM	EM6917 / 103325	May, 2006

Note: 1. All instruments are calibrated every one year.

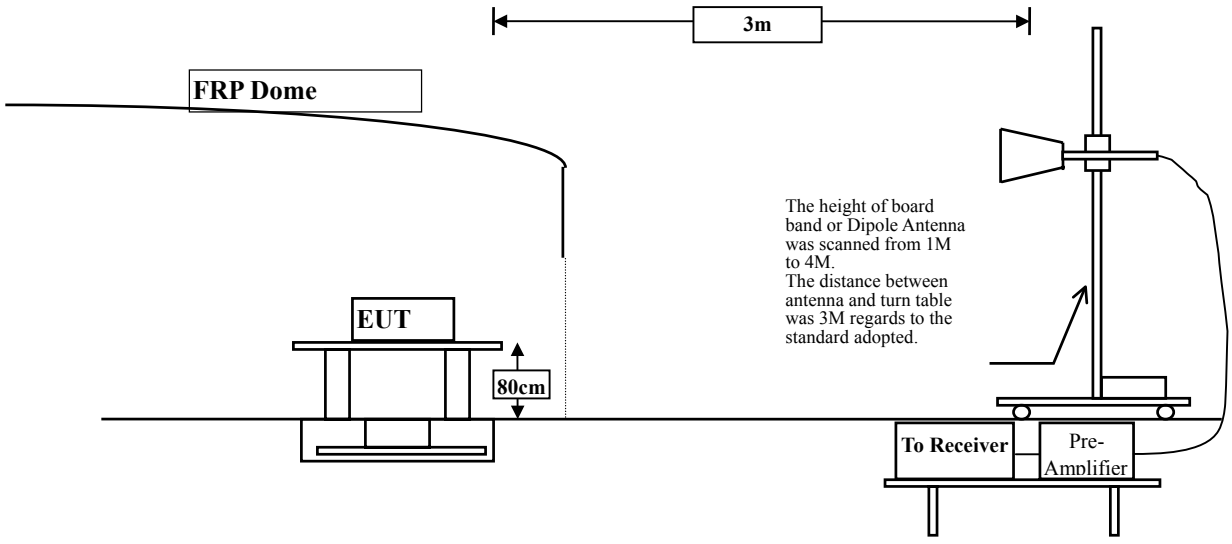
2. The test instruments marked by "X" are used to measure the final test results.

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 (R&S Test Receiver ESCS 30)is 120 kHz, above 1GHz are 1 MHz.

5.5. Uncertainty

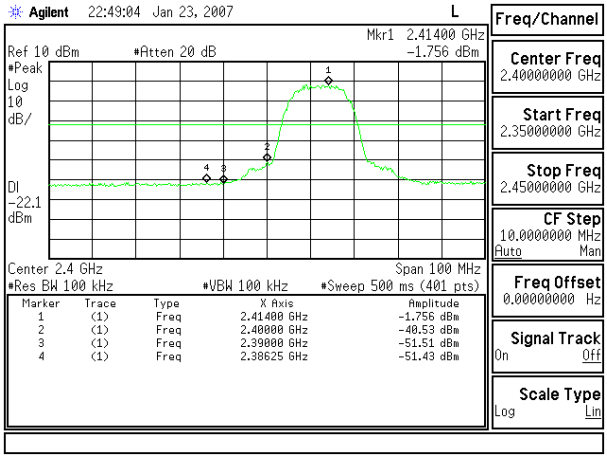
Conducted is ± 1 MHz
Radiated is ± 3.9 dB.

5.6. Test Result of Band Edge

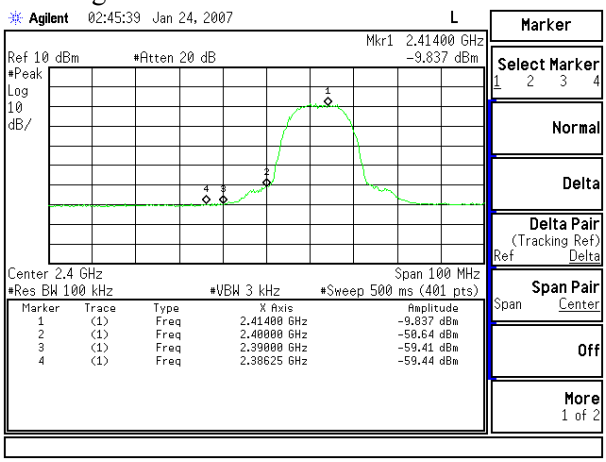
Product : VFD Combo
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2412 MHz)

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
01	<2400	>20	Pass

Peak



Average



Fundamental Field Strength:

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)
Horizontal				
01 (Peak)	2412.000	-2.181	97.446	95.265
01 (Avg)	2412.000	-2.181	90.231	88.050
Vertical				
01(Peak)	2412.000	-2.181	102.870	100.689
01 (Avg)	2412.000	-2.181	96.020	93.839

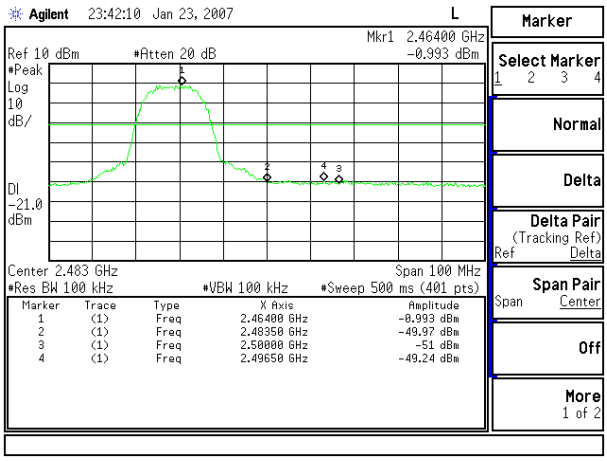
Note:

1. The peak conducted emission plot shows 49.67 dBc between the carrier and the maximum emission in the restricted band. The maximum fundamental field strength in the peak measurement is 100.689 dBuV/m. So the maximum field strength in the restricted band is 100.689 – 49.67 = 51.02 dBuV/m which is under 74 dBuV/m.
2. The average conducted emission plot shows 49.60 dBc between the carrier and the maximum emission in the restricted band. The maximum fundamental field strength in the average measurement is 93.839 dBuV/m. So the maximum field strength in the restricted band is 93.839 – 49.60 = 44.24 dBuV/m which is under 54 dBuV/m.

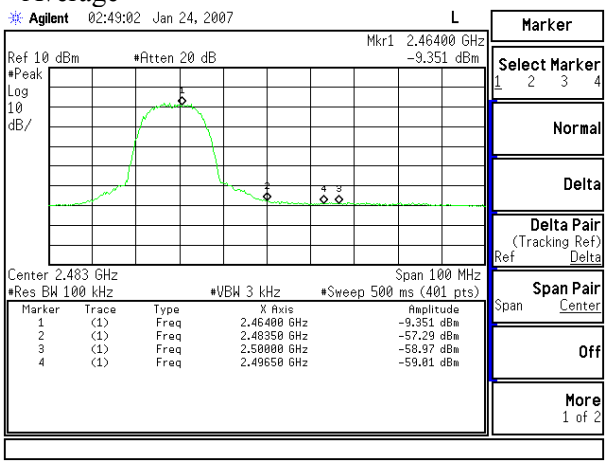
Product : VFD Combo
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2462 MHz)

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
11	>2483.5	>20	Pass

Peak



Average



Fundamental Field Strength:

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)
Horizontal				
11 (Peak)	2462.000	-1.986	96.441	94.456
11 (Avg)	2462.000	-1.986	89.470	87.485
Vertical				
11 (Peak)	2462.000	-1.986	101.624	99.639
11 (Avg)	2462.000	-1.986	94.477	92.492

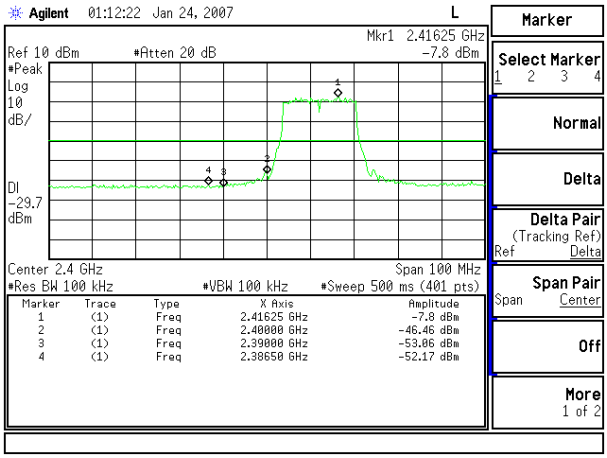
Note:

1. The peak conducted emission plot shows 48.25 dBc between the carrier and the maximum emission in the restricted band. The maximum fundamental field strength in the peak measurement is 99.639 dBuV/m. So the maximum field strength in the restricted band is 99.639 – 48.25 = 51.39 dBuV/m which is under 74 dBuV/m.
2. The average conducted emission plot shows 49.66 dBc between the carrier and the maximum emission in the restricted band. The maximum fundamental field strength in the average measurement is 92.492 dBuV/m. So the maximum field strength in the restricted band is 92.492 – 49.66 = 42.83 dBuV/m which is under 54 dBuV/m.

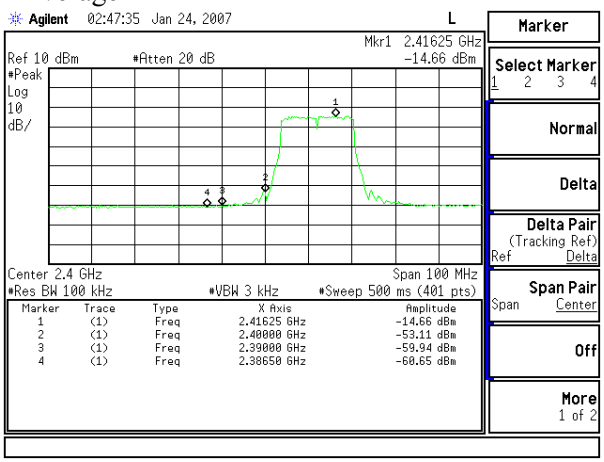
Product : VFD Combo
Test Item : Band Edge Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2412 MHz)

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
01	<2400	>20	Pass

Peak



Average



Fundamental Field Strength:

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)
Horizontal				
01 (Peak)	2412.000	-2.181	90.474	88.293
01 (Avg)	2412.000	-2.181	81.539	79.358
Vertical				
01(Peak)	2412.000	-2.181	97.249	95.068
01 (Avg)	2412.000	-2.181	88.295	86.114

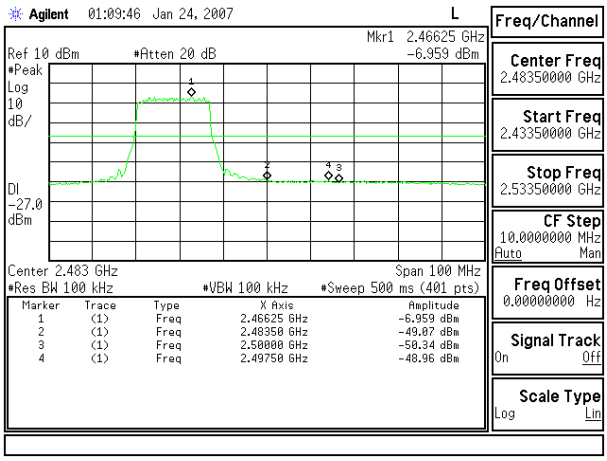
Note:

1. The peak conducted emission plot shows 44.37 dBc between the carrier and the maximum emission in the restricted band. The maximum fundamental field strength in the peak measurement is 95.068 dBuV/m. So the maximum field strength in the restricted band is 95.068 – 44.37 = 50.70 dBuV/m which is under 74 dBuV/m.
2. The average conducted emission plot shows 45.99 dBc between the carrier and the maximum emission in the restricted band. The maximum fundamental field strength in the average measurement is 86.114 dBuV/m. So the maximum field strength in the restricted band is 86.114 – 45.99 = 40.12 dBuV/m which is under 54 dBuV/m.

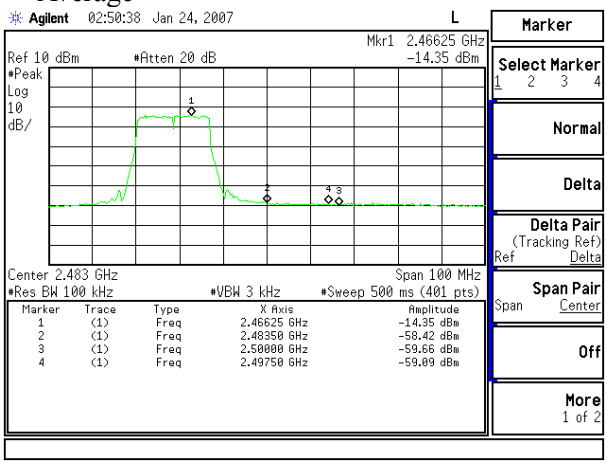
Product : VFD Combo
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2462 MHz)

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
11	>2483.5	>20	Pass

Peak



Average



Fundamental Field Strength:

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)
Horizontal				
11 (Peak)	2462.000	-1.986	90.204	88.219
11 (Avg)	2462.000	-1.986	81.932	79.947
Vertical				
11 (Peak)	2462.000	-1.986	96.095	94.110
11 (Avg)	2462.000	-1.986	88.036	86.051

Note:

1. The peak conducted emission plot shows 42.00 dBc between the carrier and the maximum emission in the restricted band. The maximum fundamental field strength in the peak measurement is 94.110 dBuV/m. So the maximum field strength in the restricted band is 94.110 – 42.00 = 52.11 dBuV/m which is under 74 dBuV/m.
2. The average conducted emission plot shows 44.74 dBc between the carrier and the maximum emission in the restricted band. The maximum fundamental field strength in the average measurement is 86.051 dBuV/m. So the maximum field strength in the restricted band is 86.051 – 44.74 = 41.31 dBuV/m which is under 54 dBuV/m.

6. Occupied Bandwidth

6.1. Test Equipment

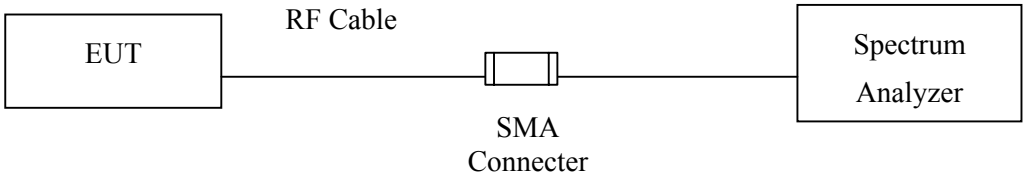
The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2006

Note: 1. All instruments are calibrated every one year.

2. The test instruments marked by "X" are used to measure the final test results.

6.2. Test Setup



6.3. Limits

The minimum bandwidth shall be at least 500kHz.

6.4. Uncertainty

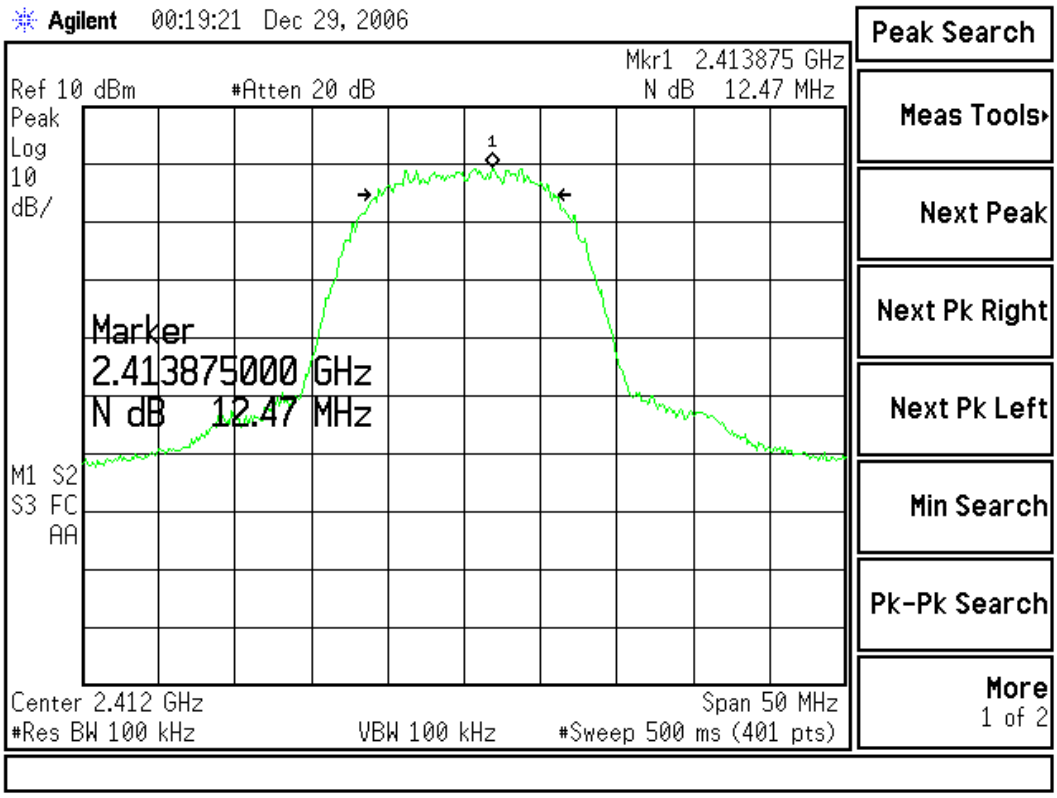
± 150Hz

6.5. Test Result of Occupied Bandwidth

Product : VFD Combo
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412.00	12470	>500	Pass

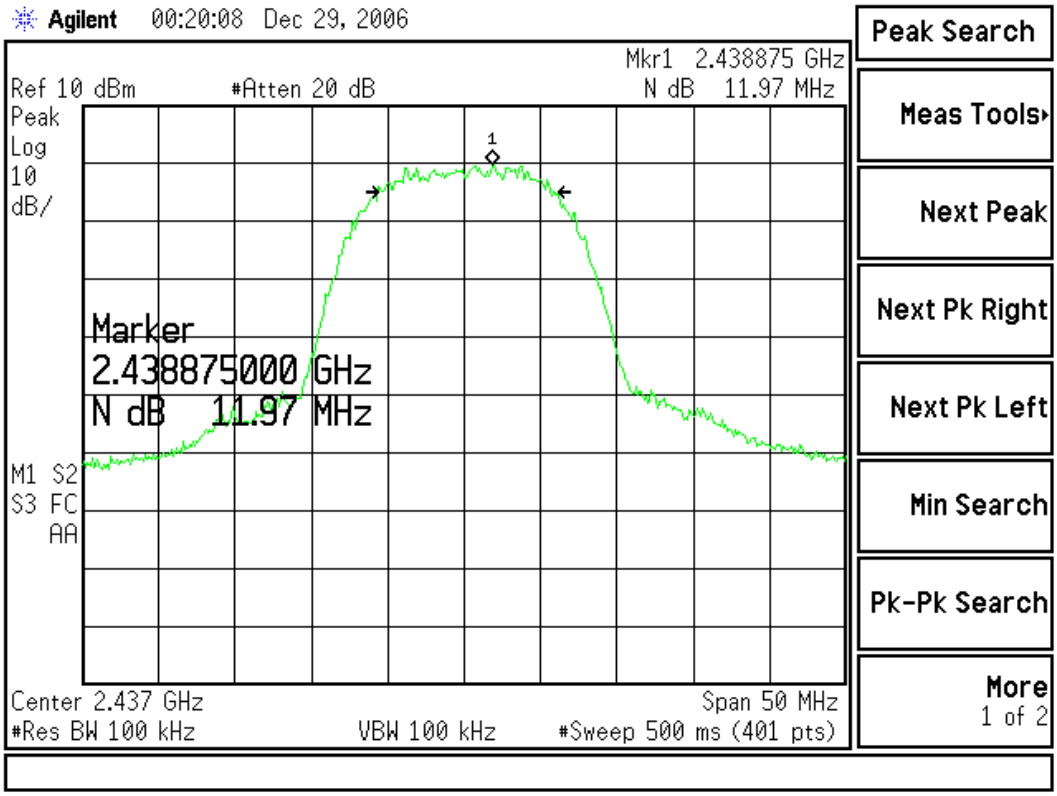
Figure Channel 1:



Product : VFD Combo
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
6	2437.00	11970	>500	Pass

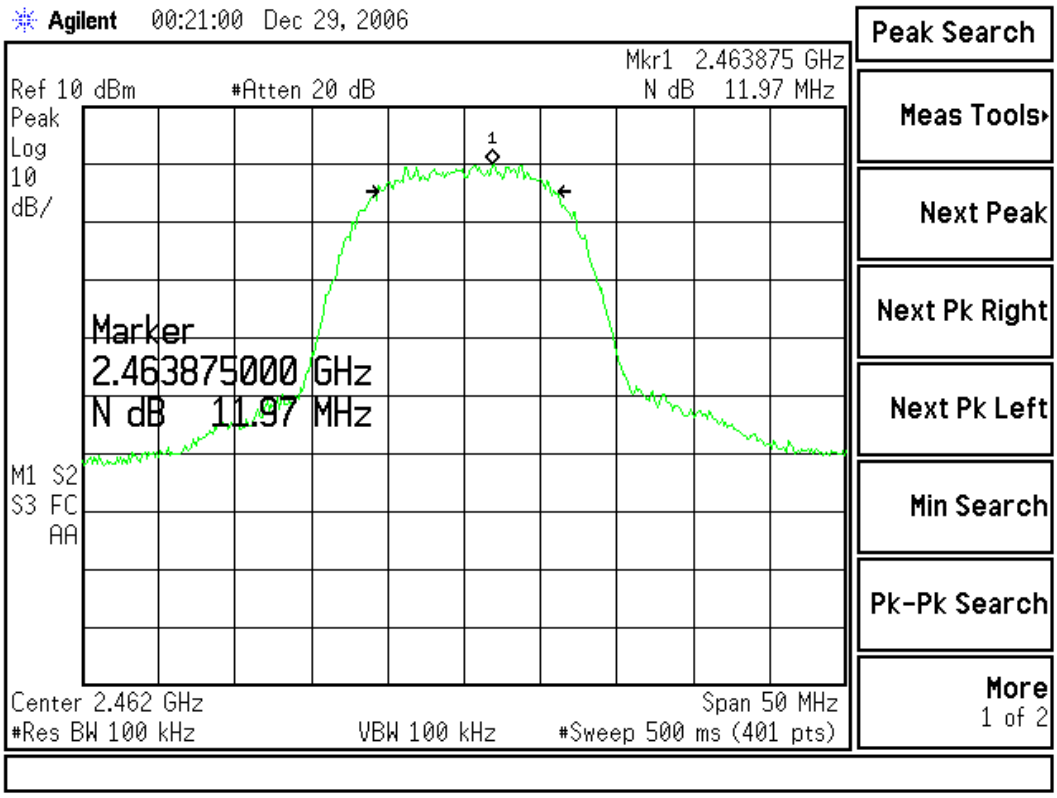
Figure Channel 6:



Product : VFD Combo
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
11	2462.00	11970	>500	Pass

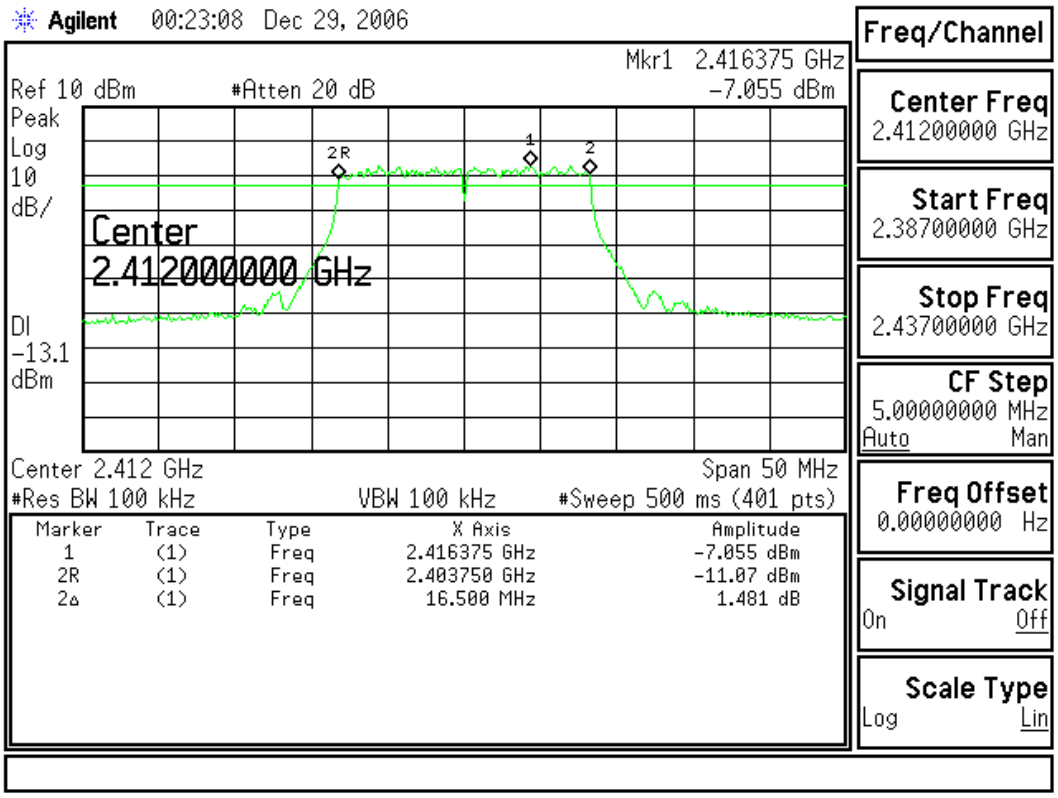
Figure Channel 11:



Product : VFD Combo
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
1	2412.00	16500	>500	Pass

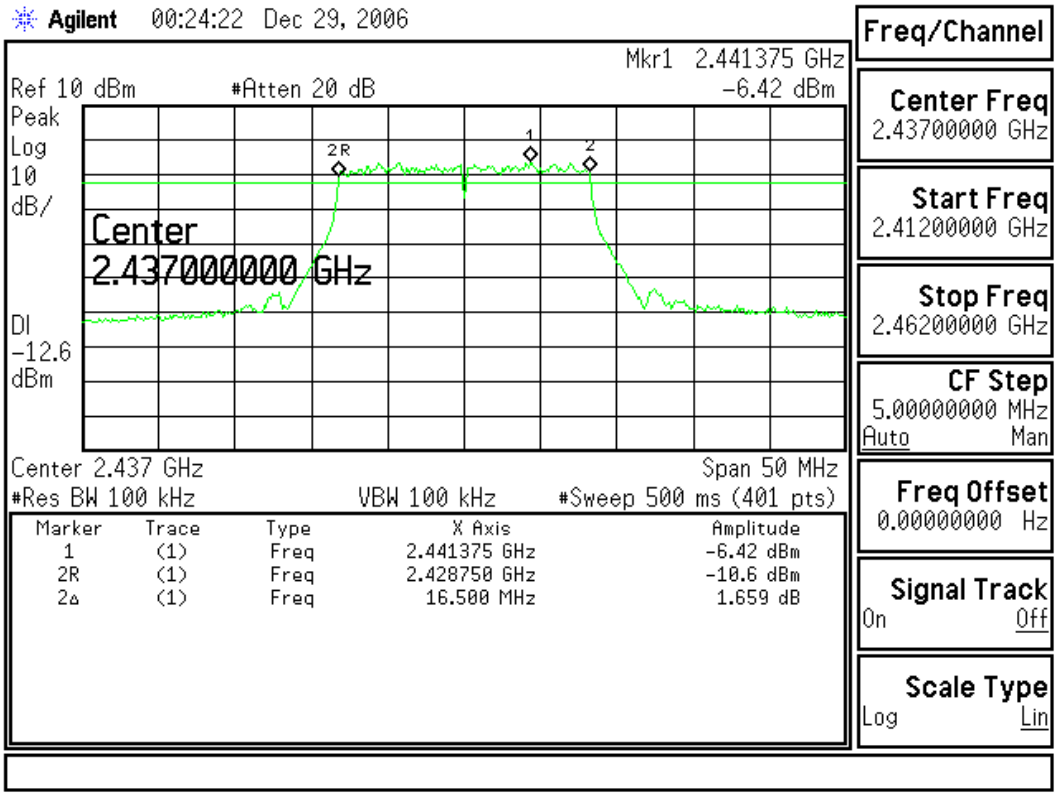
Figure Channel 1:



Product : VFD Combo
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
6	2437.00	16500	>500	Pass

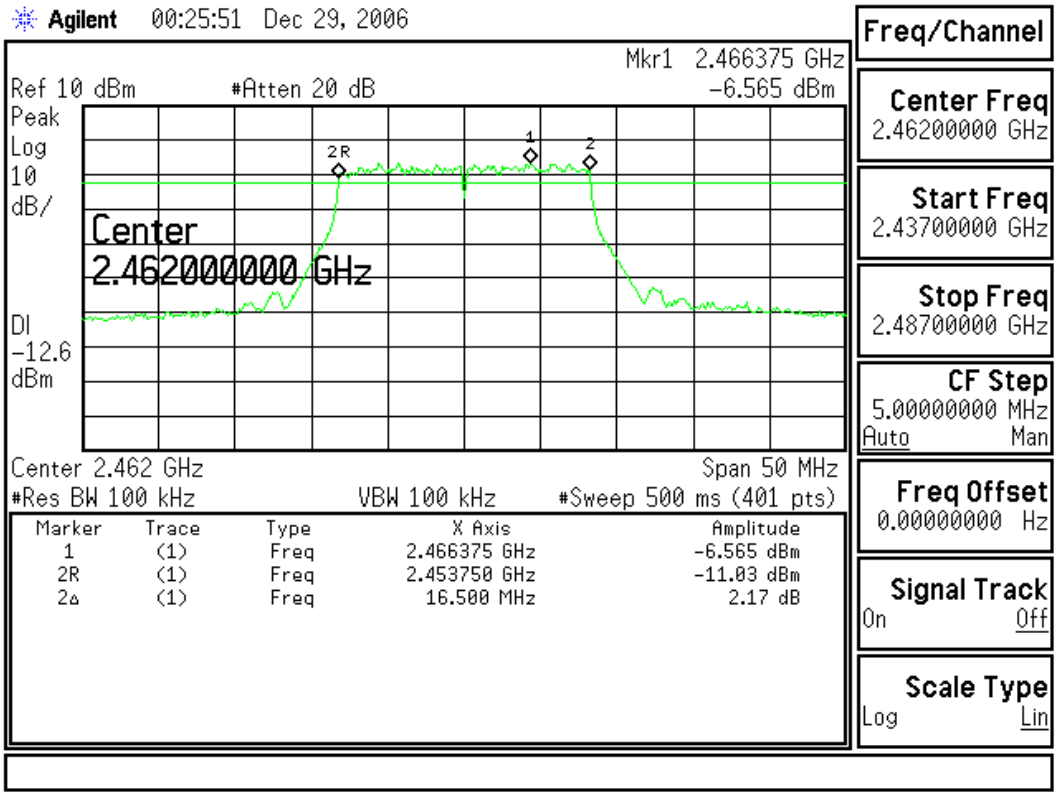
Figure Channel 6:



Product : VFD Combo
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
11	2462.00	16500	>500	Pass

Figure Channel 11:



7. Power Density

7.1. Test Equipment

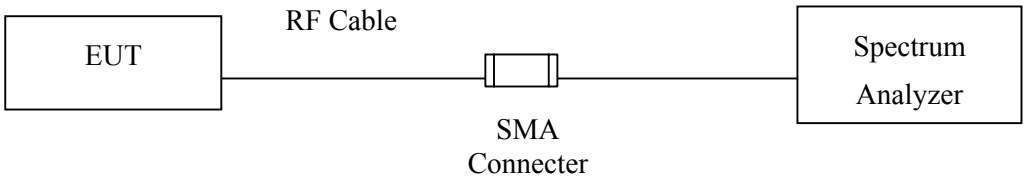
The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2006

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. Limits

The transmitted power density averaged over any 1 second interval shall not be greater +8dBm in any 3kHz bandwidth.

7.4. Uncertainty

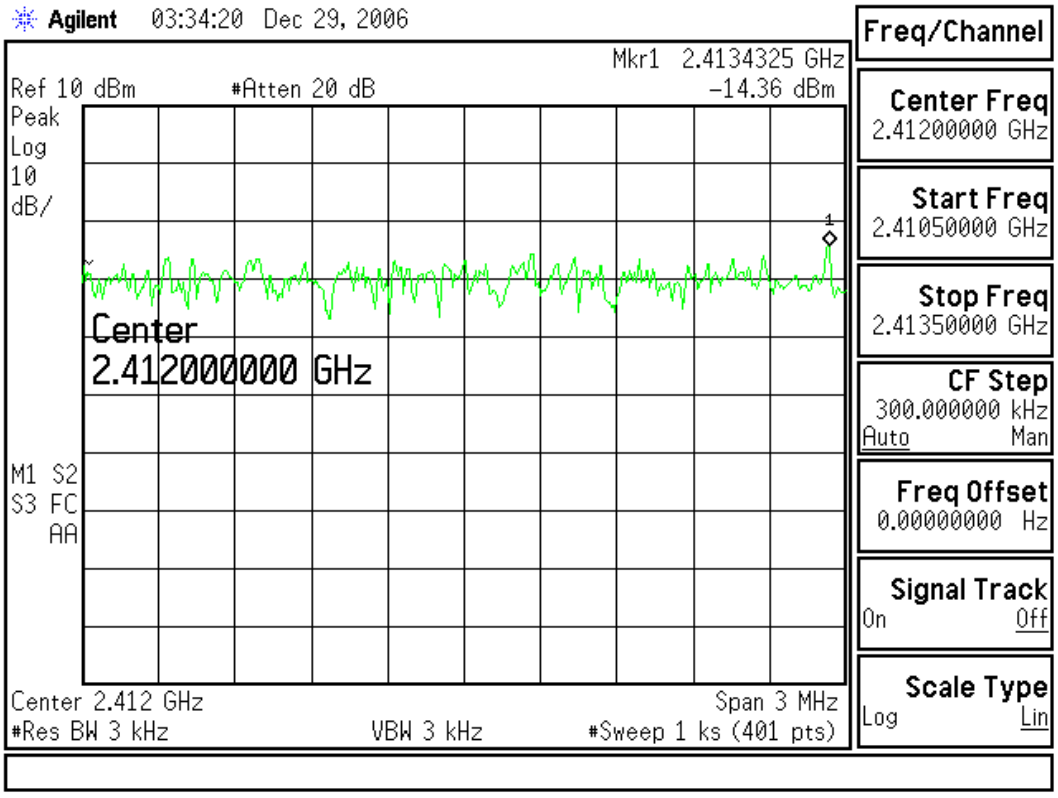
± 1.27 dB

7.5. Test Result of Power Density

Product : VFD Combo
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412.00	-14.36	< 8dBm	Pass

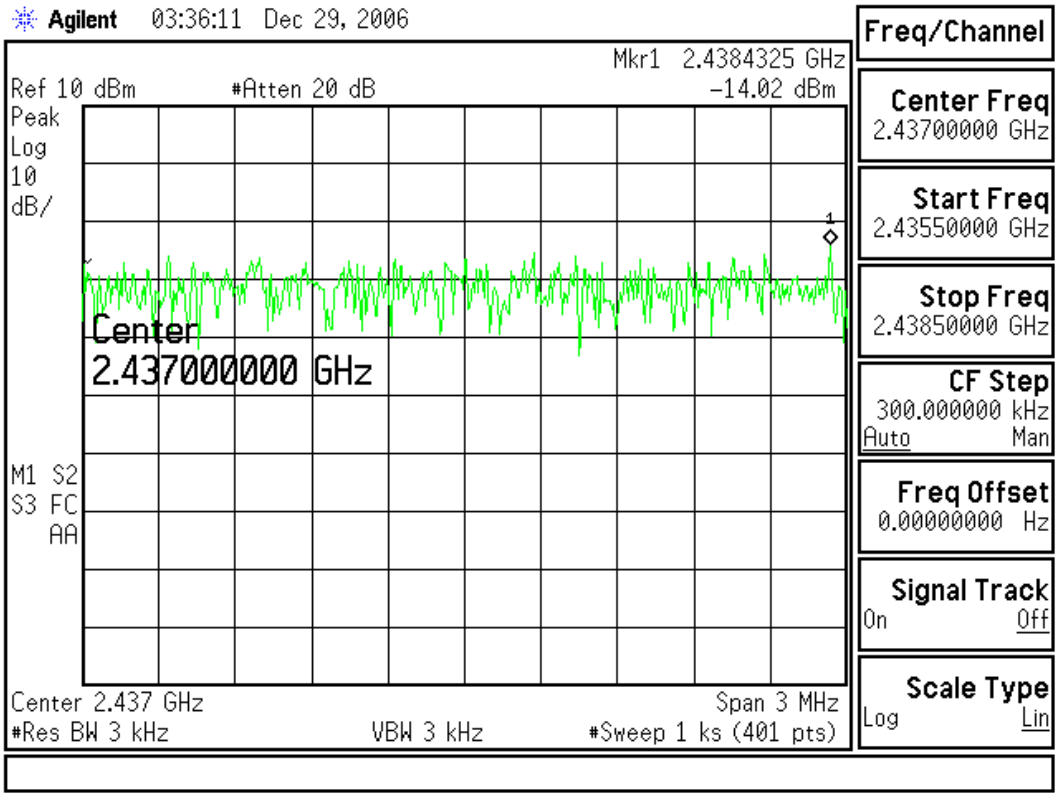
Figure Channel 1:



Product : VFD Combo
Test Item : Power Density Data
Test Site : No.3OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
6	2437.000	-14.02	< 8dBm	Pass

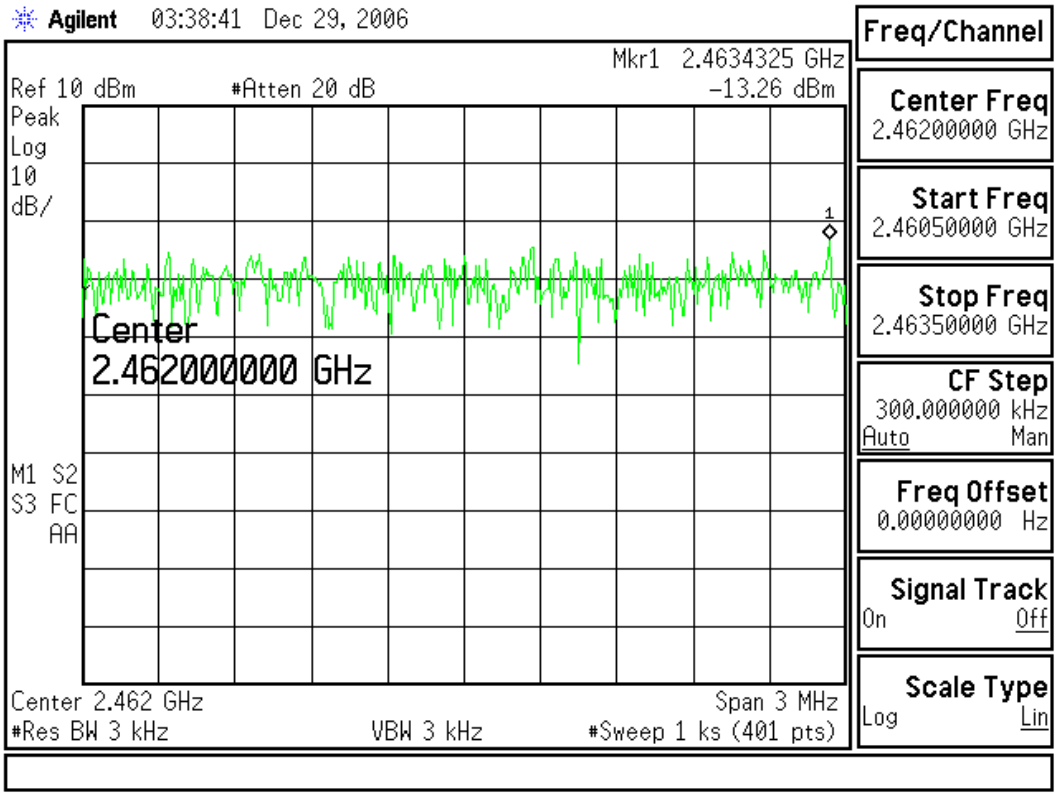
Figure Channel 6:



Product : VFD Combo
Test Item : Density Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter (802.11b 11Mbps) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
11	2462.00	-13.26	< 8dBm	Pass

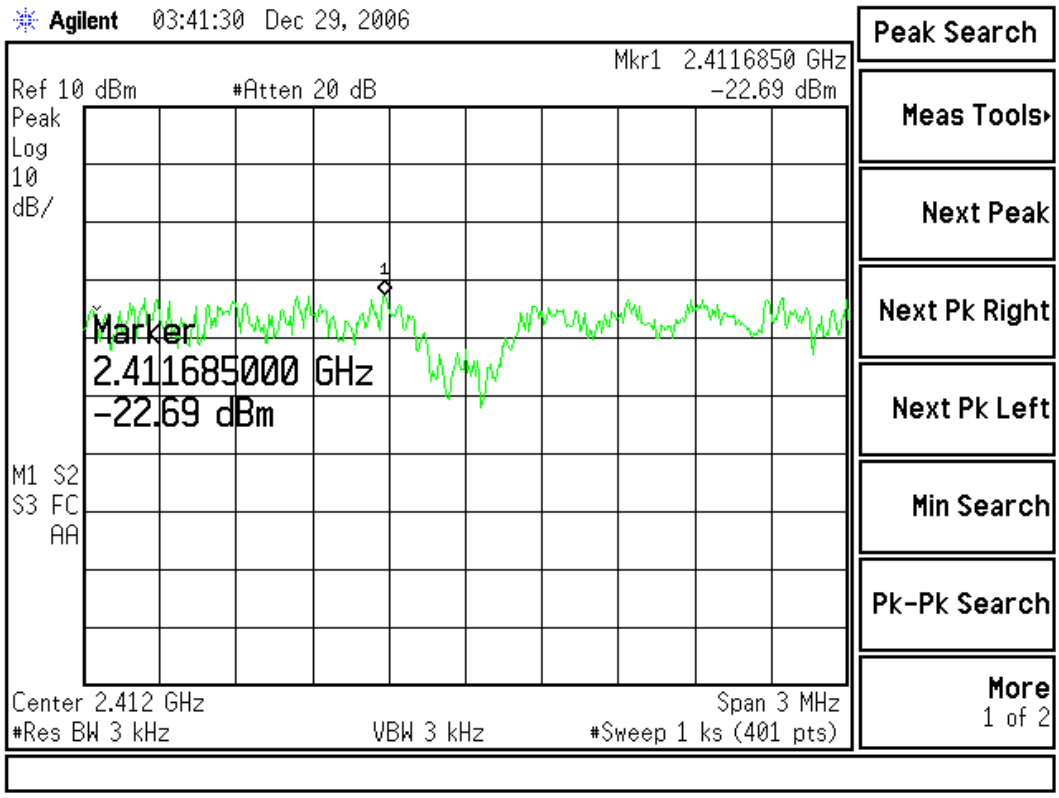
Figure Channel 11:



Product : VFD Combo
Test Item : Power Density Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2412MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
1	2412.00	-22.69	< 8dBm	Pass

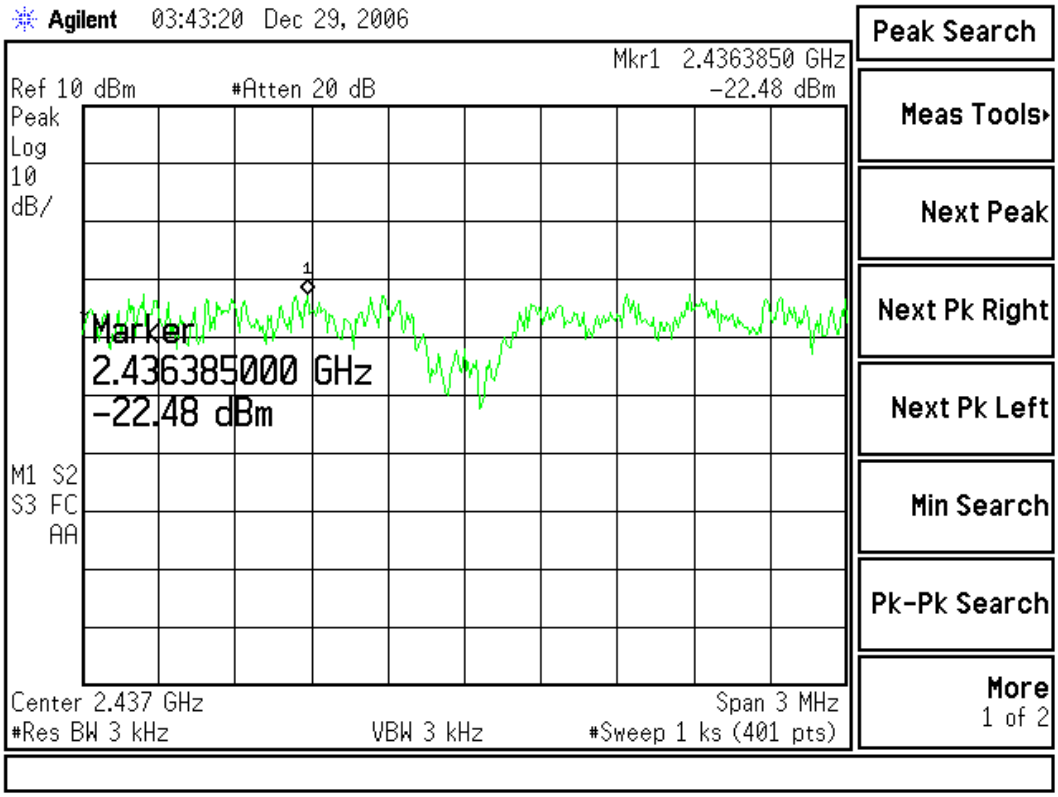
Figure Channel 1:



Product : VFD Combo
Test Item : Power Density Data
Test Site : No.3OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2437MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
6	2437.000	-22.48	< 8dBm	Pass

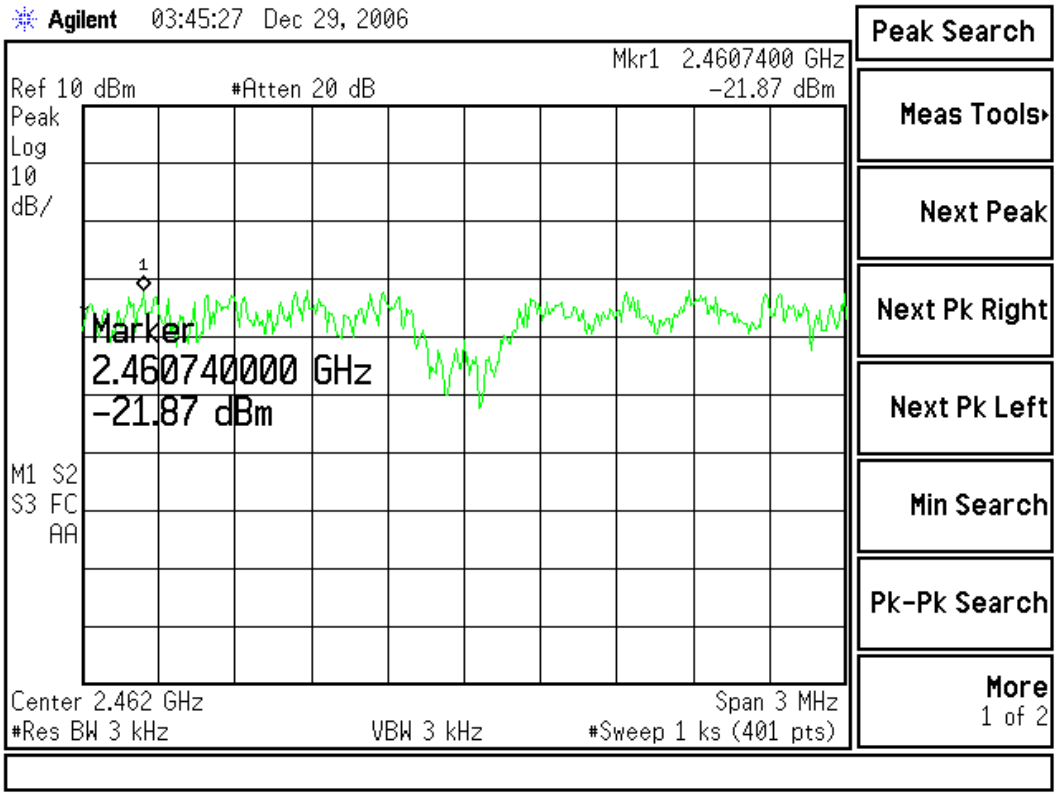
Figure Channel 6:



Product : VFD Combo
Test Item : Density Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter (802.11g 54Mbps) (2462MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
11	2462.00	-21.847	< 8dBm	Pass

Figure Channel 11:



8. EMI Reduction Method During Compliance Testing

No modification was made during testing.