

# FC

## Test Report

Product Name	Notebook
Model No.	MS-1058, MS-1058B, S271, S271B, S271R
FCC ID.	I4L-MS6855C2

Applicant	MICRO-STAR INTL Co., LTD.
Address	No. 69, Li-De St., Jung-He City, Taipei Hsien, Taiwan, R.O.C.

Date of Receipt	May. 16, 2007
Issued Date	June 11, 2007
Report No.	075L109-RFUSP06V01

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: June 11, 2007

Report No.: 075L109-RFUSP06V01



Product Name	Notebook
Applicant	MICRO-STAR INTL Co., LTD.
Address	No. 69, Li-De St., Jung-He City, Taipei Hsien, Taiwan, R.O.C.
Manufacturer	MICRO-STAR INTL Co., LTD.
Model No.	MS-1058, MS-1058B, S271, S271B, S271R
FCC ID.	I4L-MS6855C2
Rated Voltage	AC 120V/60Hz
Working Voltage	DC 5V
Trade Name	MSI
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2006 ANSI C63.4: 2003
Test Result	Complied



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Approved By : Gene Chang  
 ( President / Gene Chang )



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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

## 1. GENERAL INFORMATION

### 1.1. EUT Description

Product Name	Notebook
Trade Name	MSI
FCC ID.	I4L-MS6855C2
Model No.	MS-1058, MS-1058B, S271, S271B, S271R
Frequency Range	2402 - 2480MHz
Channel Number	79
Type of Modulation	FHSS
Antenna type	Connector
Channel Control	Auto
Antenna Gain	Refer to the table "Antenna List"
Power Adapter	MFR: LI SHIN, M/N: LSE0202C1990 Input: AC 100-240V, 50/60Hz, 1.5A Output: DC 19V, 4.74A Cable Out: Non-Shielded, 1.7m with one ferrite core bonded. Power Cord: Shielded, 1.7m

#### Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	HIGH-TEK	S79-1800280-H39	PIFA	0.96dBi for 2.4 GHz
2	YAGEO	S79-1800330-Y01	PIFA	-0.58dBi for 2.4 GHz
3	HIGH-TEK	S79-1800320-H39	PIFA	-1.64dBi for 2.4 GHz
4	HIGH-TEK	S79-1800220-H39	PIFA	-2.08dBi 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 a Notebook with a built-in 2.4GHz Bluetooth transceiver.
2. The EUT is including five models for different marketing requirement.
3. 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.
4. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
5. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

## 1.2. Operational Description

The EUT is an Notebook with a built-in 2.4GHz Bluetooth transceiver. The number of the channels is 79 in 2402-2480MHz. The device adapts the frequency hopping spread spectrum modulation. The antenna is connector-type and provides diversity function to improve the receiving function.

This device provides wireless technology that revolutionizes personal connectivity. It is the solution for the seamless integration of Bluetooth technology into personal computer enabling short-range wireless connections between desktop/laptop computers, Bluetooth-enabled peripherals, and portable handheld devices.

Test Mode	Mode 1: Transmitter (Antenna 1)
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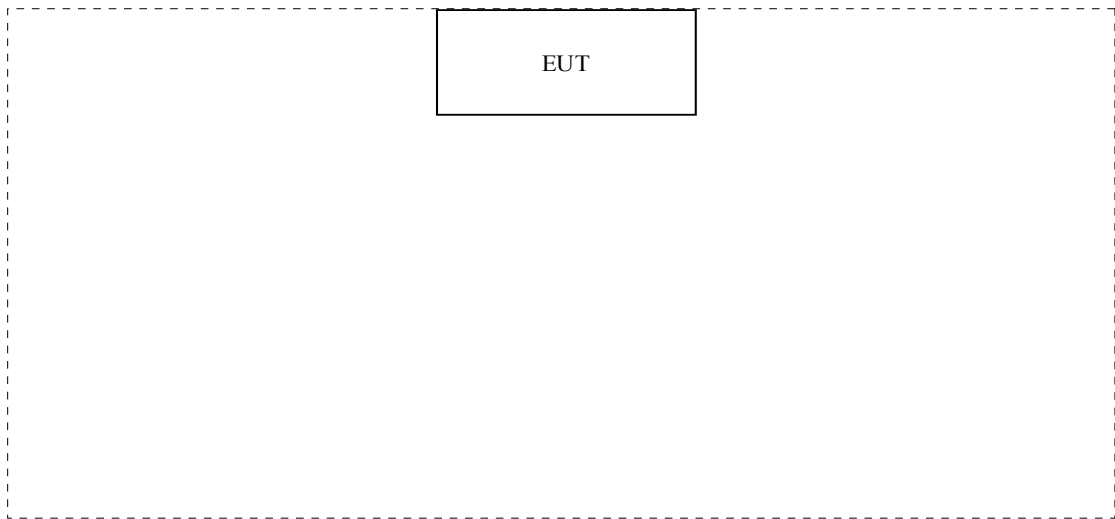
**1.3. Tested System Details**

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)	N/A	N/A	N/A	N/A	N/A

	Signal Cable Type	Signal cable Description
A.	N/A	N/A

**1.4. Configuration of Tested System**



**1.5. EUT Exercise Software**

- 1 Setup the EUT and simulators as shown on 1.4.
- 2 Turn on the power of all equipment.
- 3 Messages will be transmitted and received through EUT.
- 4 Test is based on the mandatory continuous transmitter.
- 5 Repeat the above procedure (3) to (4).



**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

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](mailto:service@quietek.com)  
 FCC Accreditation Number: TW1014



## 2. Conducted Emission

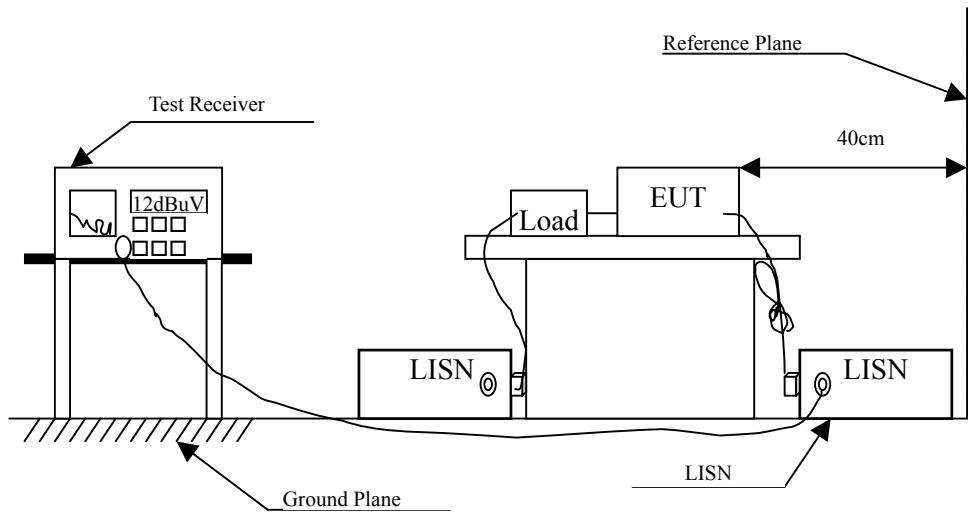
### 2.1. Test Equipment

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 30/825442/17	May, 2007	
2	L.I.S.N.	R & S	ESH3-Z5/825016/6	May, 2007	EUT
3	L.I.S.N.	Kyoritsu	KNW-407/8-1420-3	May, 2007	Peripherals
4	Pulse Limiter	R & S	ESH3-Z2	May, 2007	
5	No.1 Shielded Room			N/A	

Note: All instruments are calibrated every one year.

### 2.2. Test Setup



**2.3. Limits**

<b>FCC Part 15 Subpart C Paragraph 15.207 (dBuV) Limit</b>		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

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

**2.4. Test Procedure**

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm /50uH coupling impedance with 50ohm termination. (Please 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.

**2.5. Uncertainty**

± 2.26 dB

## 2.6. Test Result of Conducted Emission

Product : Notebook  
 Test Item : Conducted Emission Test  
 Power Line : Line 1  
 Test Mode : Mode 1: Transmitter (Antenna 1)(2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
<b>LINE 1</b>					
<b>Quasi-Peak</b>					
0.189	0.725	47.810	48.535	-16.351	64.886
0.380	0.300	42.200	42.500	-16.929	59.429
0.763	0.310	36.590	36.900	-19.100	56.000
1.400	0.330	36.670	37.000	-19.000	56.000
2.228	0.350	35.310	35.660	-20.340	56.000
25.002	1.200	20.360	21.560	-38.440	60.000
<b>Average</b>					
0.189	0.725	46.440	47.165	-7.721	54.886
0.380	0.300	40.060	40.360	-9.069	49.429
0.763	0.310	36.030	36.340	-9.660	46.000
1.400	0.330	35.230	35.560	-10.440	46.000
2.228	0.350	32.830	33.180	-12.820	46.000
25.002	1.200	14.660	15.860	-34.140	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

Product : Notebook  
 Test Item : Conducted Emission Test  
 Power Line : Line 2  
 Test Mode : Mode 1: Transmitter (Antenna 1)(2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
<b>LINE 2</b>					
<b>Quasi-Peak</b>					
0.189	0.300	47.650	47.950	-16.936	64.886
0.380	0.310	42.200	42.510	-16.919	59.429
0.763	0.320	36.430	36.750	-19.250	56.000
1.654	0.340	36.520	36.860	-19.140	56.000
4.072	0.400	33.560	33.960	-22.040	56.000
18.091	0.900	15.940	16.840	-43.160	60.000
<b>Average</b>					
0.189	0.300	45.950	46.250	-8.636	54.886
0.380	0.310	39.950	40.260	-9.169	49.429
0.763	0.320	35.800	36.120	-9.880	46.000
1.654	0.340	35.370	35.710	-10.290	46.000
4.072	0.400	29.010	29.410	-16.590	46.000
18.091	0.900	9.720	10.620	-39.380	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

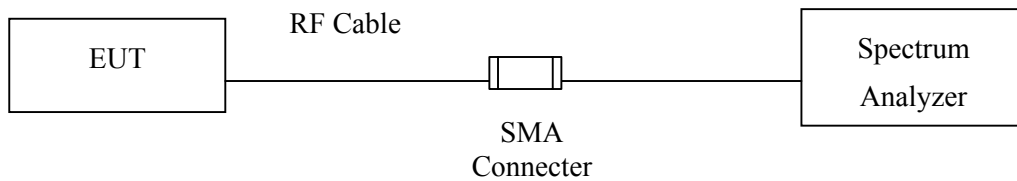
#### 3.1. Test Equipment

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

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2007
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2007

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. Uncertainty

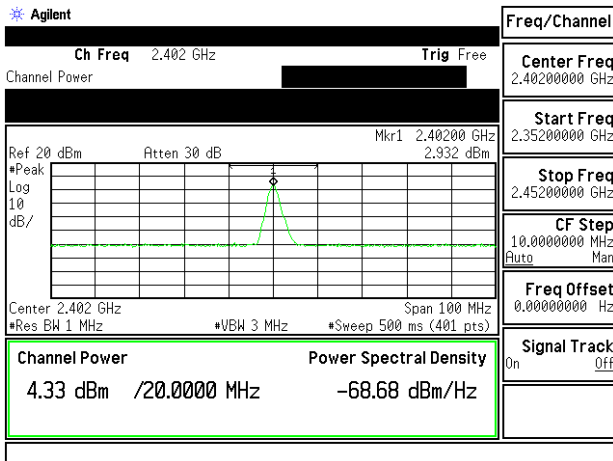
± 1.27 dB

### 3.5. Test Result of Peak Power Output

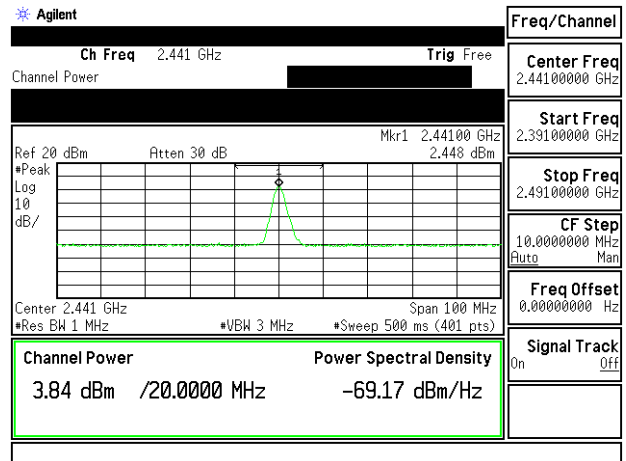
Product : Notebook  
 Test Item : Peak Power Output  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)

Channel No.	Frequency (MHz)	Measurement	Required Limit	Result
Channel 00	2402.00	4.33 dBm	1 Watt= 30 dBm	Pass
Channel 39	2441.00	3.84 dBm	1 Watt= 30 dBm	Pass
Channel 78	2480.00	3.42 dBm	1 Watt= 30 dBm	Pass

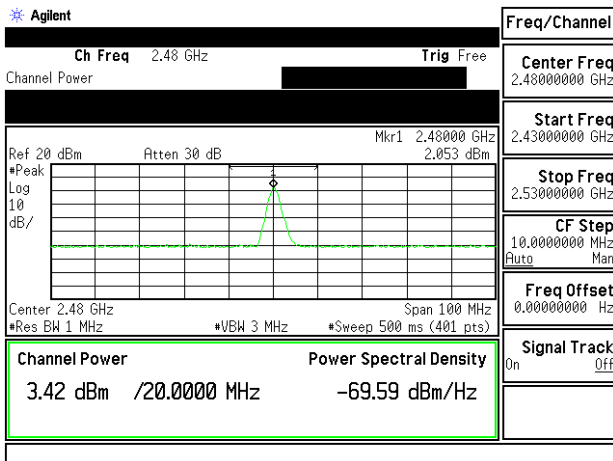
Channel 00



Channel 39



Channel 78



#### 4. Radiated Emission

##### 4.1. Test Equipment

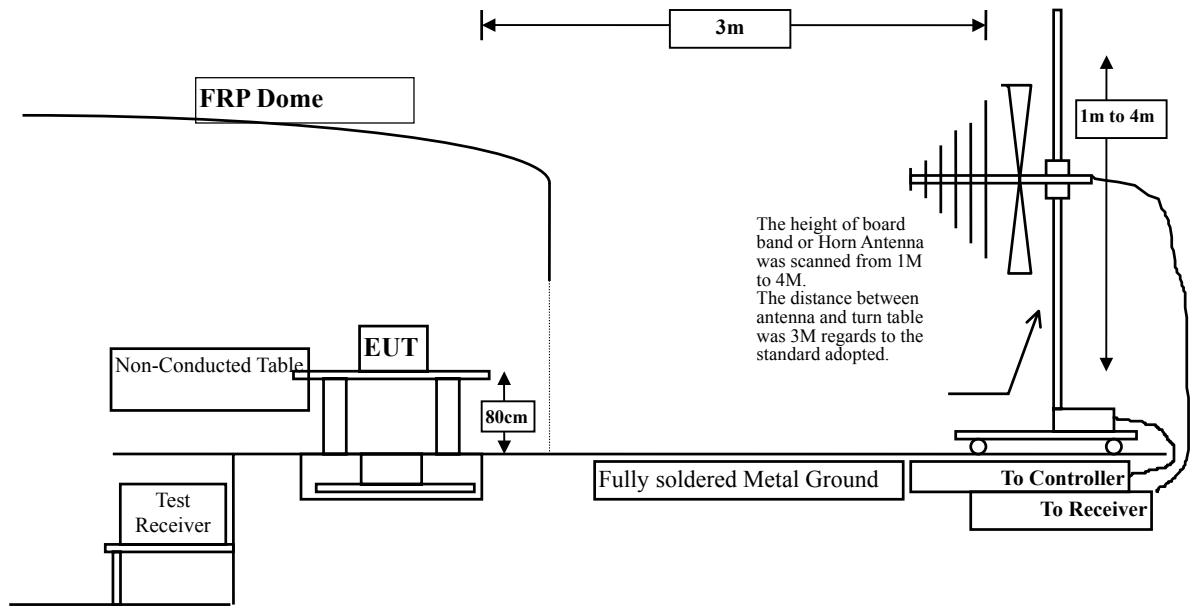
The following test equipments are used during the radiated emission test:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
<input type="checkbox"/> Site # 1	Test Receiver	R & S	ESVS 10 / 834468/003	May, 2007
	Spectrum Analyzer	Advantest	R3162/ 00803480	May, 2007
	Pre-Amplifier	Advantest	BB525C/ 3307A01812	May, 2007
	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	Sep., 2006
<input type="checkbox"/> Site # 2	Test Receiver	R & S	ESCS 30 / 836858 / 022	May, 2007
	Spectrum Analyzer	Advantest	R3162 / 100803466	May, 2007
	Pre-Amplifier	Advantest	BB525C/3307A01814	May, 2007
	Bilog Antenna	SCHAFFNER	CBL6112B / 2705	May, 2007
	Horn Antenna	ETS	3115 / 0005-6160	Sep., 2006
	Pre-Amplifier	QTK	QTK-AMP-01/ 0001	May, 2007
<input checked="" type="checkbox"/> Site # 3	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2007
	Spectrum Analyzer	HP	E4407B / US39440758	May, 2007
	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2007
	Horn Antenna	Schwarzbeck	BBHA9120D / 305, 306	July, 2006
	Horn Antenna	Schwarzbeck	BBHA9170 / 208, 209	July, 2006
	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2006
	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2007
	Pre-Amplifier	HP	8449B / 3008A01123	July, 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.



4.2. Test Setup



4.3. Limits

➤ General Radiated Emission Limits

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

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	uV/m @3m	dBuV/m@3m
30-88	100	40
88-216	150	43.5
216-960	200	46
Above 960	500	54

- Remarks:
1. RF Voltage (dBuV) = 20 log RF Voltage (uV)
  2. In the Above Table, the tighter limit applies at the band edges.
  3. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

#### 4.4. Test Procedure

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

The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4: 2003 on radiated measurement.

The additional latch filter below 1GHz was used to measure the level of harmonics radiated emission during field strength of harmonics measurement.

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

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 : Notebook  
 Test Item : Harmonic Radiated Emission  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(2402MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

##### Horizontal

##### Peak Detector:

4804.000	3.663	35.392	39.054	-34.946	74.000
7206.000	9.357	32.912	42.268	-31.732	74.000
9608.000	11.842	32.271	44.113	-29.887	74.000

##### Average Detector:

--

##### Vertical

##### Peak Detector:

4804.000	3.663	35.383	39.045	-34.955	74.000
7206.000	9.357	32.882	42.238	-31.762	74.000
9608.000	11.842	32.141	43.983	-30.017	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; 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.

Product : Notebook  
 Test Item : Harmonic Radiated Emission  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
------------------	-------------------------	--------------------------	--------------------------------	--------------	-----------------

**Horizontal**

**Peak Detector:**

4882.000	3.921	34.696	38.617	-35.383	74.000
7323.000	9.657	32.379	42.036	-31.964	74.000
9764.000	11.798	31.407	43.205	-30.795	74.000

**Average Detector:**

--

**Vertical**

**Peak Detector:**

4882.000	3.921	35.834	39.755	-34.245	74.000
7323.000	9.657	32.797	42.454	-31.546	74.000
9764.000	11.798	32.613	44.411	-29.589	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; 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.

Product : Notebook  
 Test Item : Harmonic Radiated Emission  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(2480MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
<b>Peak Detector:</b>					
4960.000	4.197	33.701	37.897	-36.103	74.000
7440.000	9.951	31.839	41.790	-32.210	74.000
9920.000	11.856	32.803	44.659	-29.341	74.000
<b>Average Detector:</b>					
--					
<b>Vertical</b>					
<b>Peak Detector:</b>					
4960.000	4.197	34.784	38.980	-35.020	74.000
7440.000	9.951	32.273	42.224	-31.776	74.000
9920.000	11.856	32.038	43.894	-30.106	74.000
<b>Average Detector:</b>					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above are performed with peak and/or average measurements as necessary.
2. Receiver setting (Peak Detector) : RBW:1MHz; VBW:1MHz; Span:100MHz ◦
3. Receiver setting (AVG Detector) : RBW:1MHz; VBW:30Hz; Span:20MHz ◦
4. Emission Level = Reading Level + 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.

Product : Notebook  
 Test Item : General Radiated Emission  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
<b>Horizontal</b>					
124.575	12.869	19.287	32.156	-11.344	43.500
192.475	9.304	28.042	37.346	-6.154	43.500
301.600	14.066	19.834	33.900	-12.100	46.000
401.025	16.644	22.226	38.870	-7.130	46.000
481.050	18.786	22.104	40.890	-5.110	46.000
798.725	21.908	13.986	35.894	-10.106	46.000
<b>Vertical</b>					
136.700	12.421	21.280	33.701	-9.799	43.500
192.475	9.304	27.902	37.206	-6.294	43.500
301.600	14.066	23.945	38.011	-7.989	46.000
401.025	16.644	23.533	40.177	-5.823	46.000
481.050	18.786	23.114	41.900	-4.100	46.000
798.725	21.908	15.191	37.099	-8.901	46.000

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. Band Edge

### 5.1. Test Equipment

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

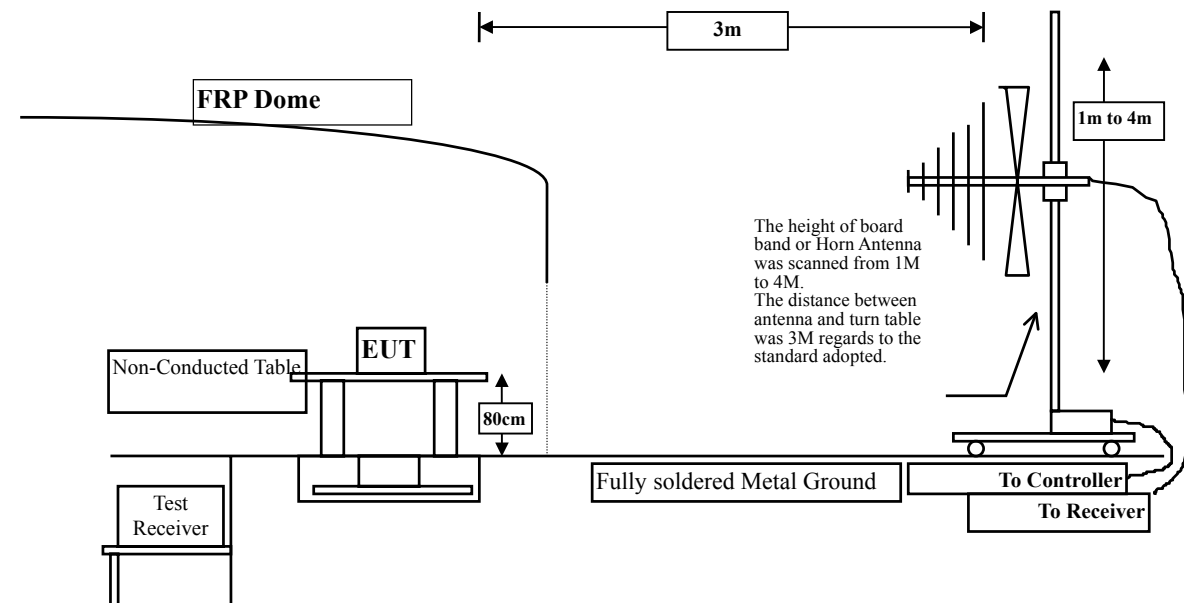
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2007
X	Spectrum Analyzer	HP	E4407B / US39440758	May, 2007
X	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2007
X	Horn Antenna	Schwarzbeck	BBHA9120D / 305, 306	July, 2006
X	Horn Antenna	Schwarzbeck	BBHA9170 / 208, 209	July, 2006
X	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2006
X	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2007
X	Pre-Amplifier	HP	8449B / 3008A01123	July, 2006

Test Site Site 3

- Note:
1. All equipments 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 Radiated Measurement:



### 5.3. Limit

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

### 5.4. Test Procedure

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

The antenna can move up and down between 1 meter and 4 meters to find out the maximum emission level.

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.4:2003 on radiated measurement.

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

### 5.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz



### 5.6. Test Result of Band Edge

Product : Notebook  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(BT:2402MHz+WLA:2412MHz)

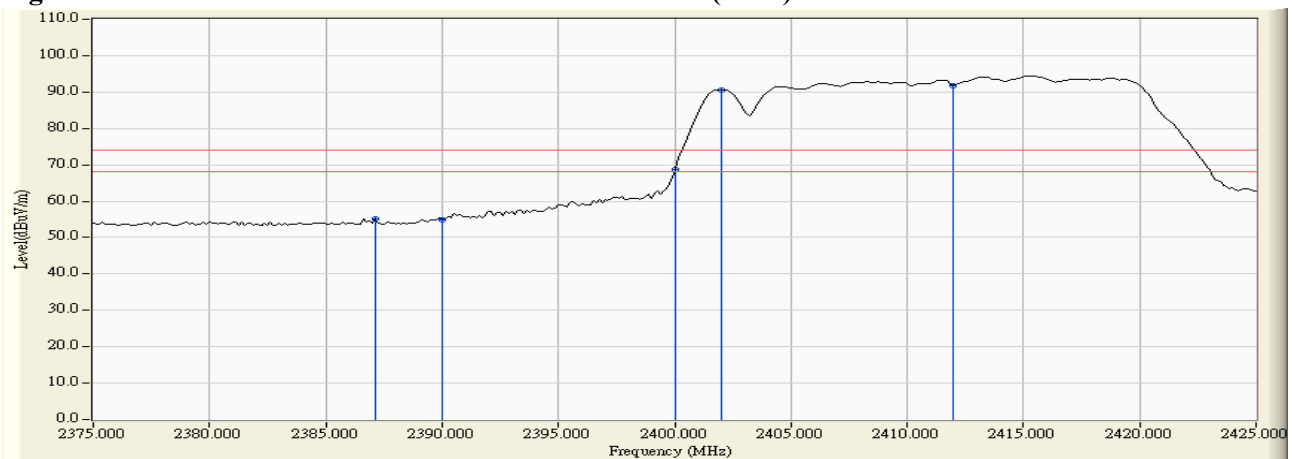
**RF Radiated Measurement:**

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
00	<2400	>20	Pass

**RF Radiated Measurement (Horizontal):**

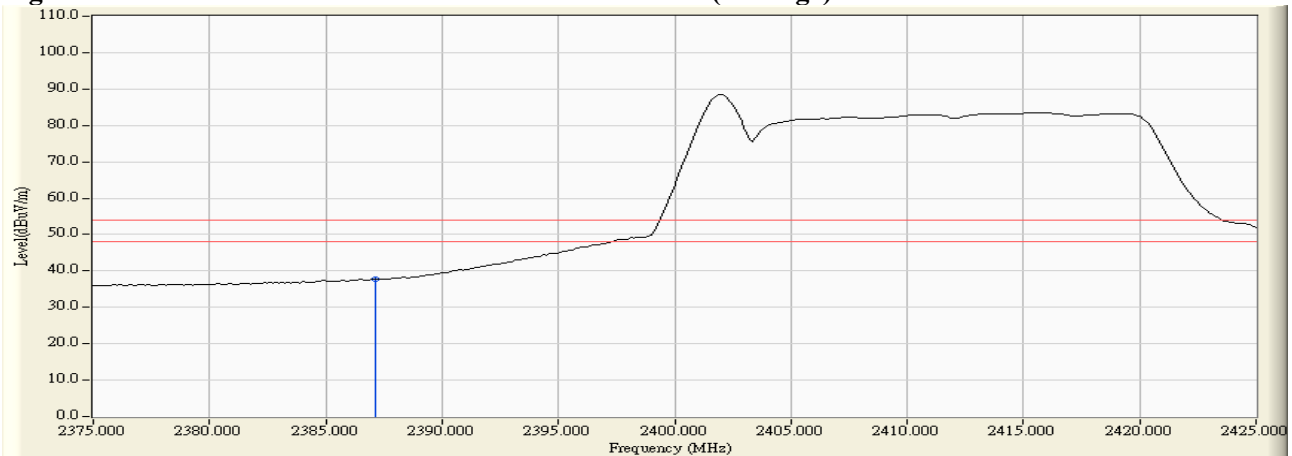
Channel	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2387.125	-2.391	57.454	55.063	74.00	54.00	Pass
00 (Average)	2387.125	-2.391	40.025	37.634	74.00	54.00	Pass

**Figure Channel 00: Horizontal (Peak)**



Note: RBW=1MHz, VBW=1MHz, Sweep Time=500ms.

**Figure Channel 00: Horizontal (Average)**



Note: RBW=1MHz, VBW=3KHz, Sweep Time=500ms.

Product : Notebook  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(BT:2402MHz+WLA:2412MHz)

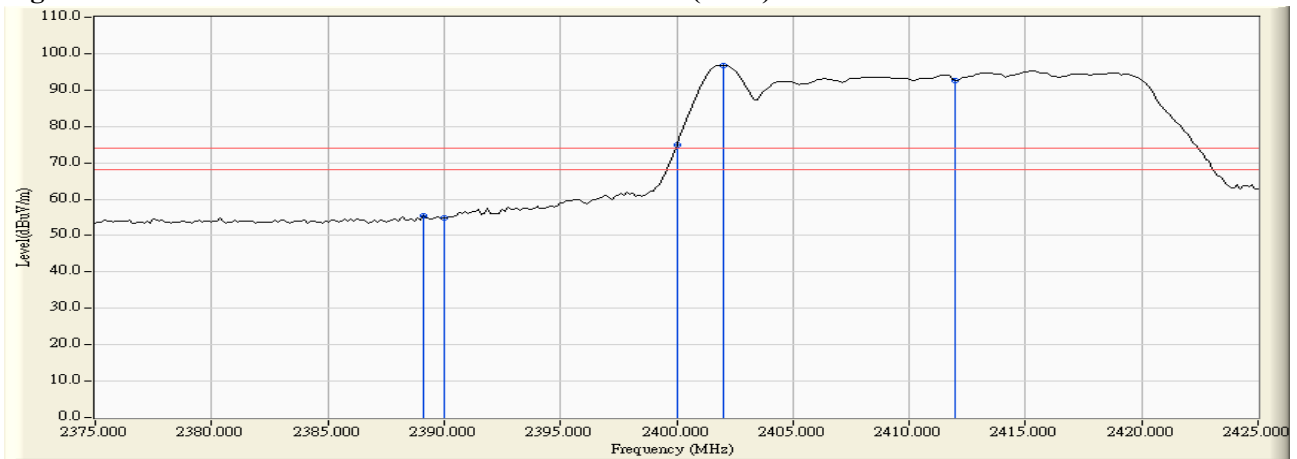
**RF Radiated Measurement:**

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
00	<2400	>20	Pass

**RF Radiated Measurement (Vertical):**

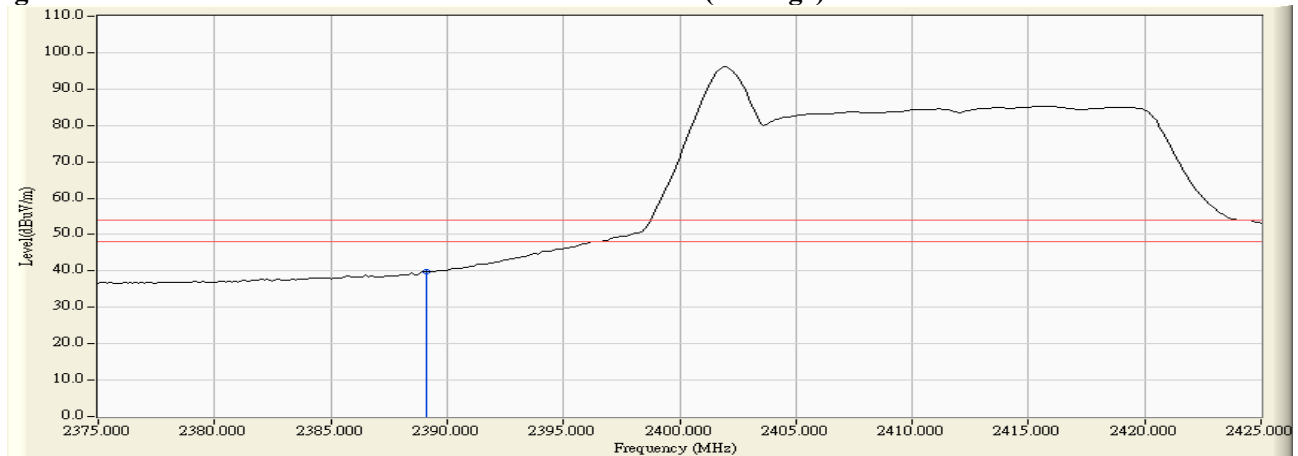
Channel	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2389.125	-2.382	57.784	55.403	74.00	54.00	Pass
00(Average)	2389.125	-2.382	42.115	39.734	74.00	54.00	Pass

**Figure Channel 00: Vertical (Peak)**



Note: RBW=1MHz, VBW=1MHz, Sweep Time=500ms.

**Figure Channel 00: Vertical (Average)**



Note: RBW=1MHz, VBW=3KHz, Sweep Time=500ms.

Product : Notebook  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(BT:2480MHz+WLA:2462MHz)

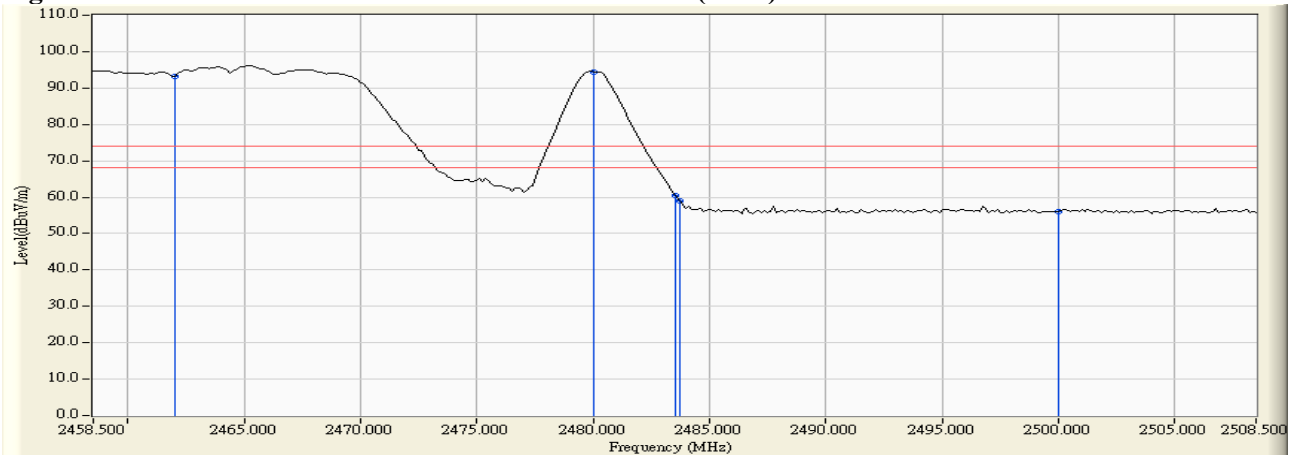
**RF Radiated Measurement:**

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
78	>2483.5	>20	Pass

**RF Radiated Measurement (Horizontal):**

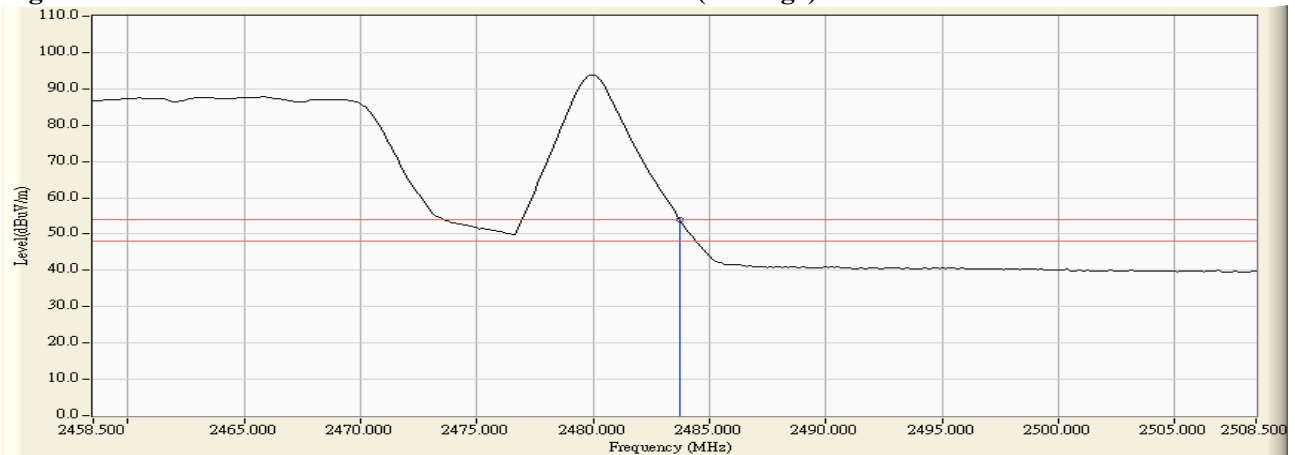
Channel	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
78(Peak)	2483.750	-1.936	60.904	58.968	74.00	54.00	Pass
78(Average)	2483.750	-1.936	55.817	53.881	74.00	54.00	Pass

**Figure Channel 78: Horizontal (Peak)**



Note: RBW=1MHz, VBW=1MHz, Sweep Time=500ms.

**Figure Channel 78: Horizontal (Average)**



Note: RBW=1MHz, VBW=3KHz, Sweep Time=500ms.

Product : Notebook  
 Test Item : Band Edge  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(BT:2480MHz+WLA:2462MHz)

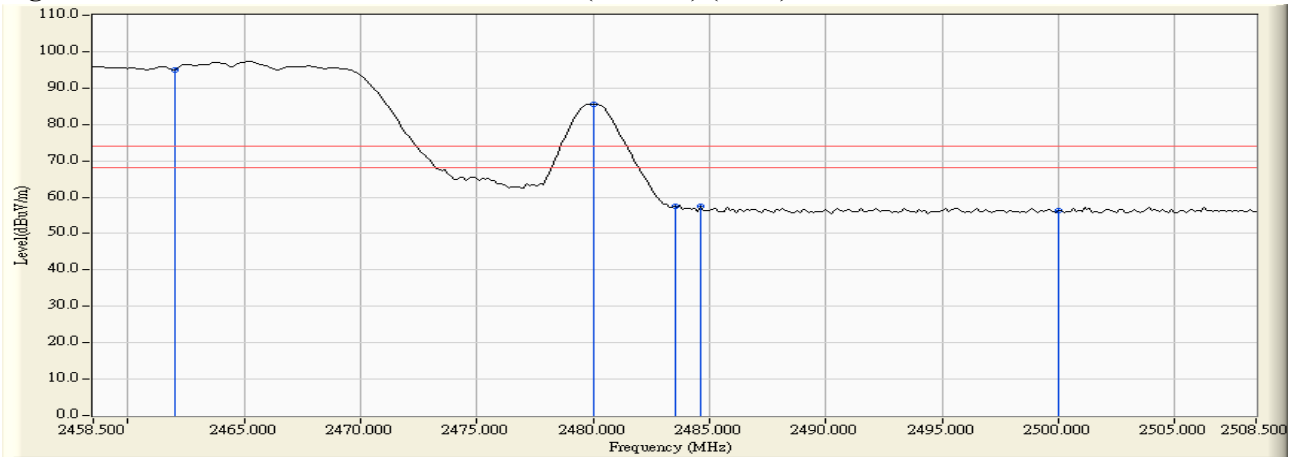
**RF Radiated Measurement:**

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
78	>2483.5	>20	Pass

**RF Radiated Measurement (Vertical):**

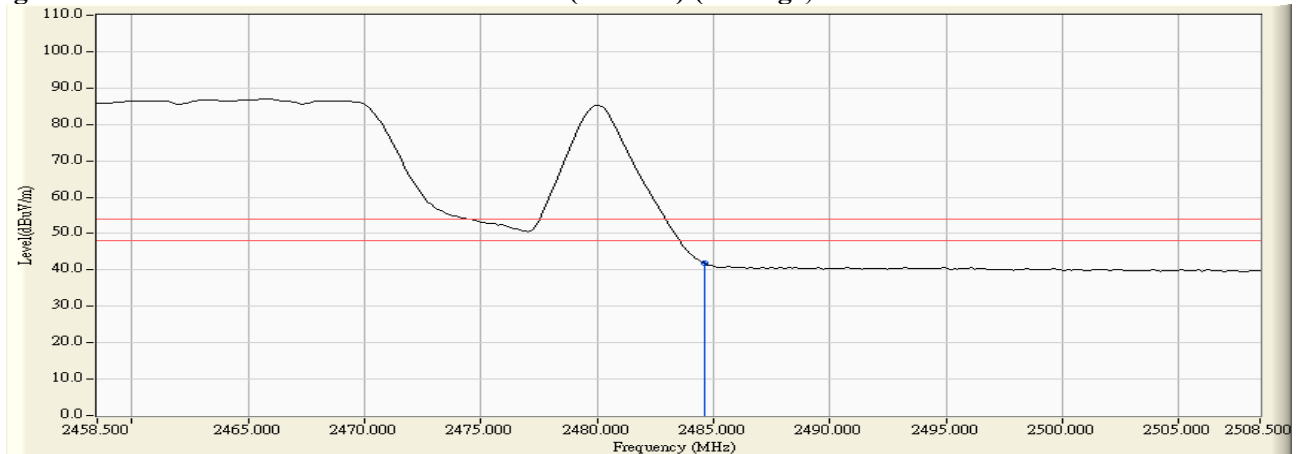
Channel	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
78(Peak)	2484.625	-1.934	59.504	57.571	74.00	54.00	Pass
78(Average)	2484.625	-1.934	43.827	41.894	74.00	54.00	Pass

**Figure Channel 78: (Vertical) (Peak)**



Note: RBW=1MHz, VBW=1MHz, Sweep Time=500ms.

**Figure Channel 78: (Vertical) (Average)**



Note: RBW=1MHz, VBW=3KHz, Sweep Time=500ms.

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

**6. Channel Number**

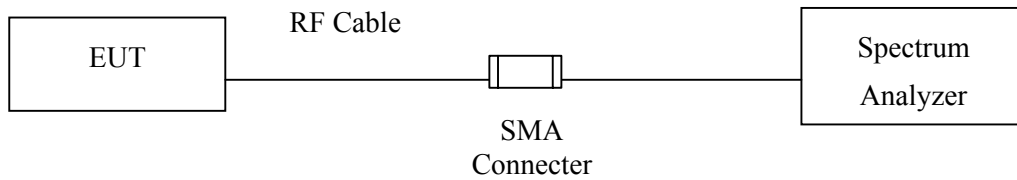
**6.1. Test Equipment**

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

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2007
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2007

- 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**



**6.3. Limit**

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

**6.4. Uncertainty**

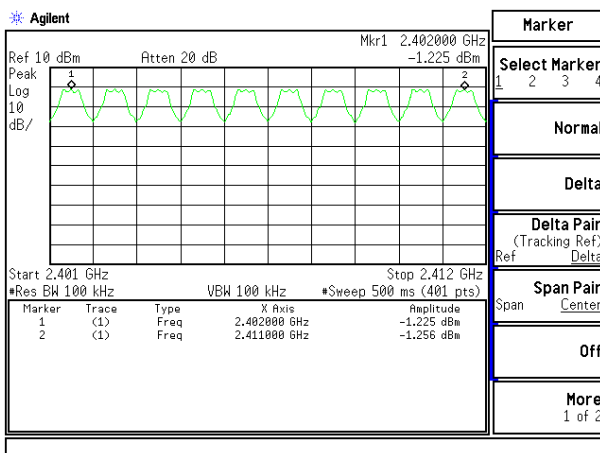
N/A

### 6.5. Test Result of Channel Number

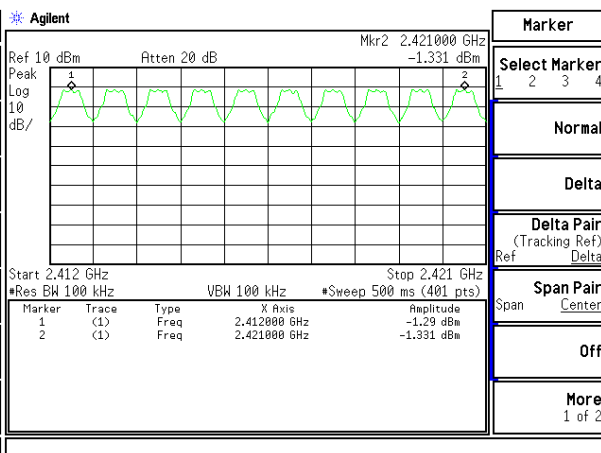
Product : Notebook  
 Test Item : Channel Number  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)

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

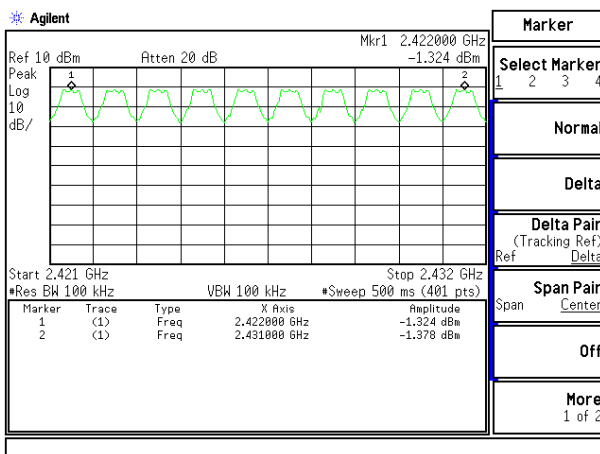
**2402-2411MHz**



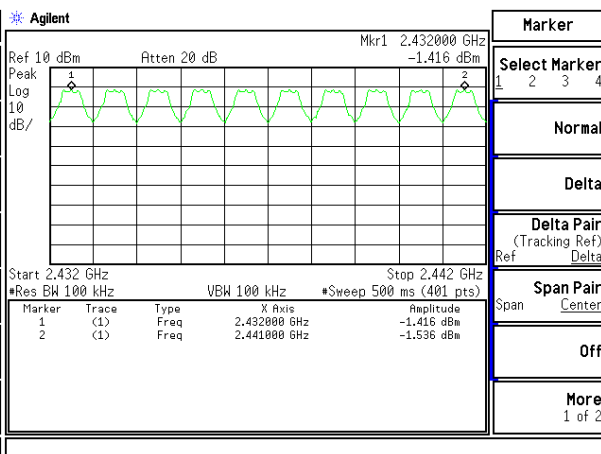
**2412-2421MHz**



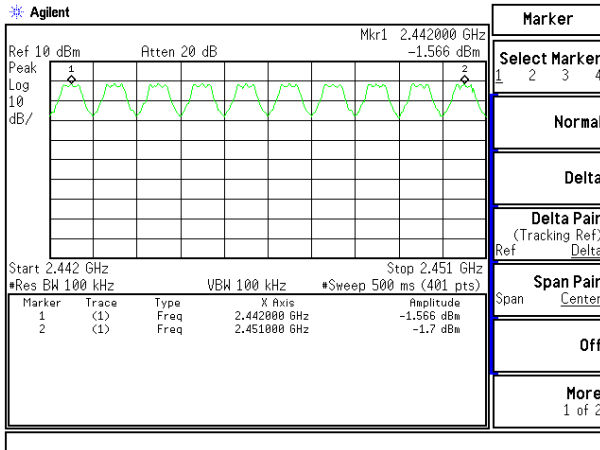
**2422-2431MHz**



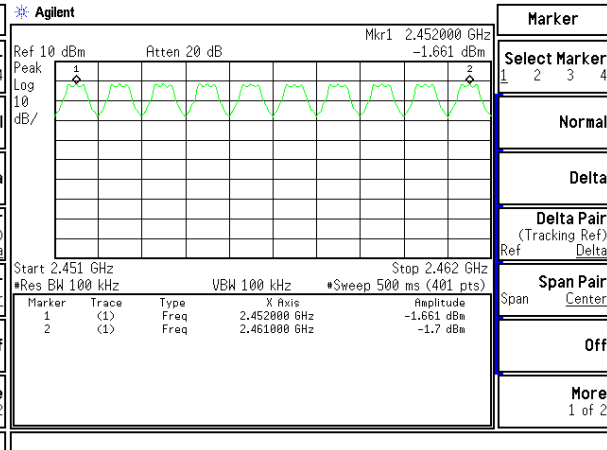
**2432-2441MHz**



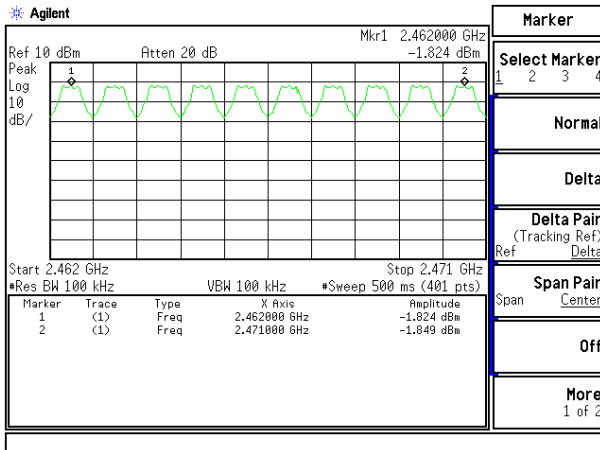
**2442-2451MHz**



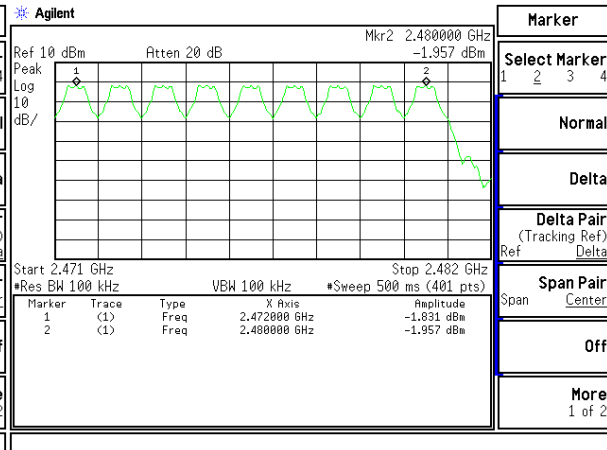
**2452-2461MHz**



**2462-2471MHz**



**2472-2480MHz**



**7. Channel Separation**

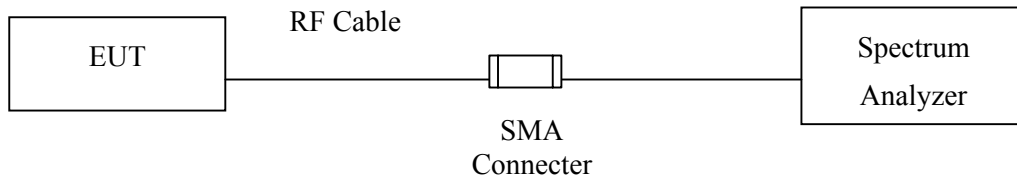
**7.1. Test Equipment**

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

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2007
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2007

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

**7.2. Test Setup**



**7.3. Limit**

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

**7.4. Uncertainty**

± 150Hz

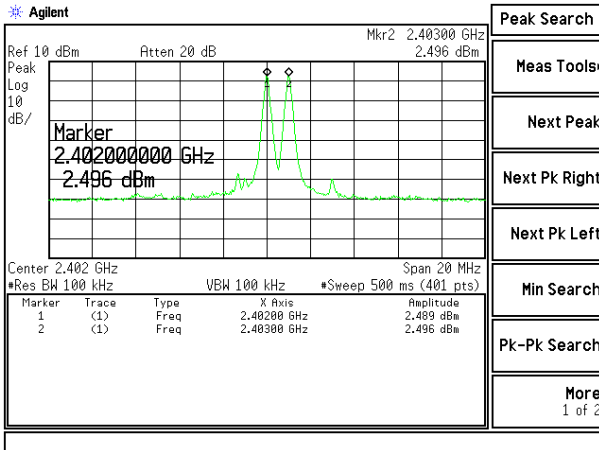


### 7.5. Test Result of Channel Separation

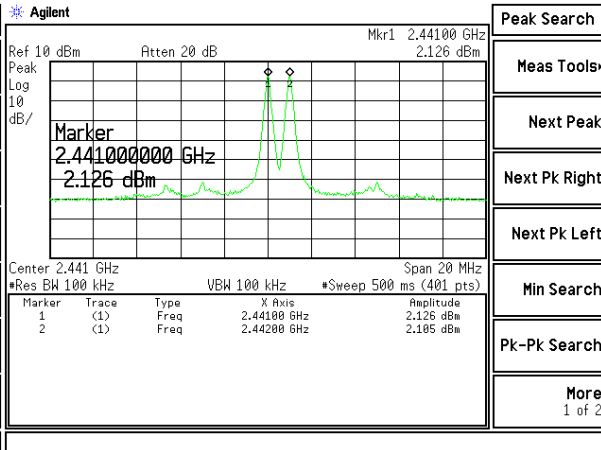
Product : Notebook  
 Test Item : Channel Separation  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)

Frequency (MHz)	Measurement Level (MHz)	Required Limit	Result
2402	1.00	>25 kHz or 2/3 * 20 dB BW	Pass
2441	1.00	>25 kHz or 2/3 * 20 dB BW	Pass
2480	1.00	>25 kHz or 2/3 * 20 dB BW	Pass

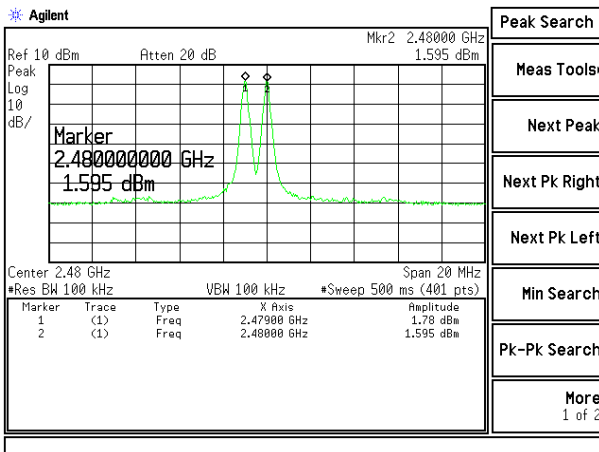
Channel 00 2402MHz



Channel 39 2441MHz



Channel 78 2480 MHz



**8. Dwell Time**

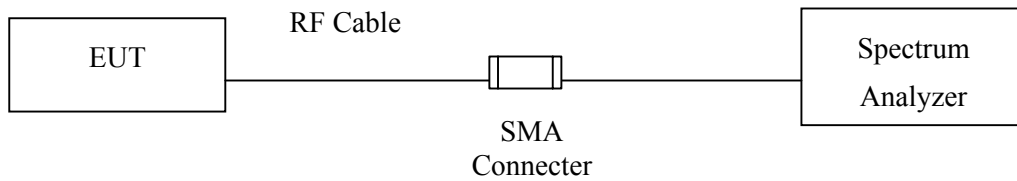
**8.1. Test Equipment**

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

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2007
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2007

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

**8.2. Test Setup**



**8.3. Limit**

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

**8.4. Uncertainty**

± 25msec

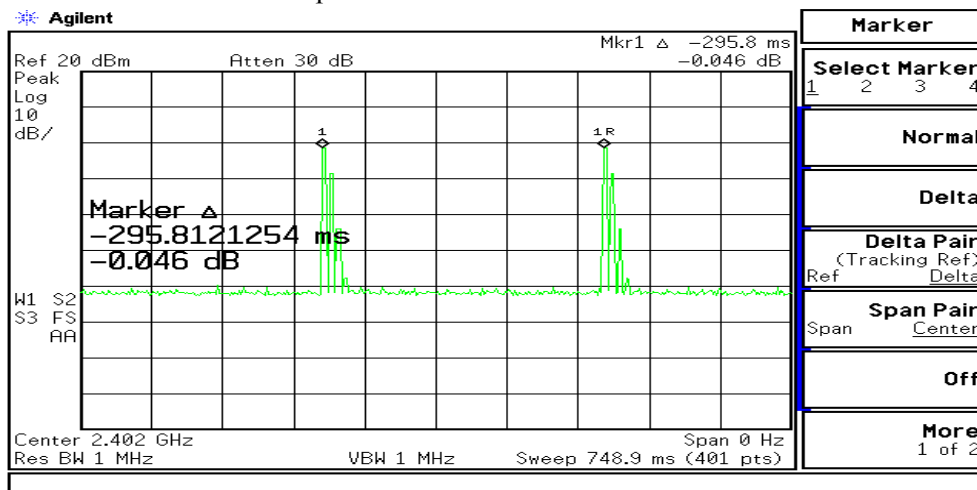
### 8.5. Test Result of Dwell Time

Product : Notebook  
 Test Item : Dwell Time  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(Channel 00,39,78 –DH5)

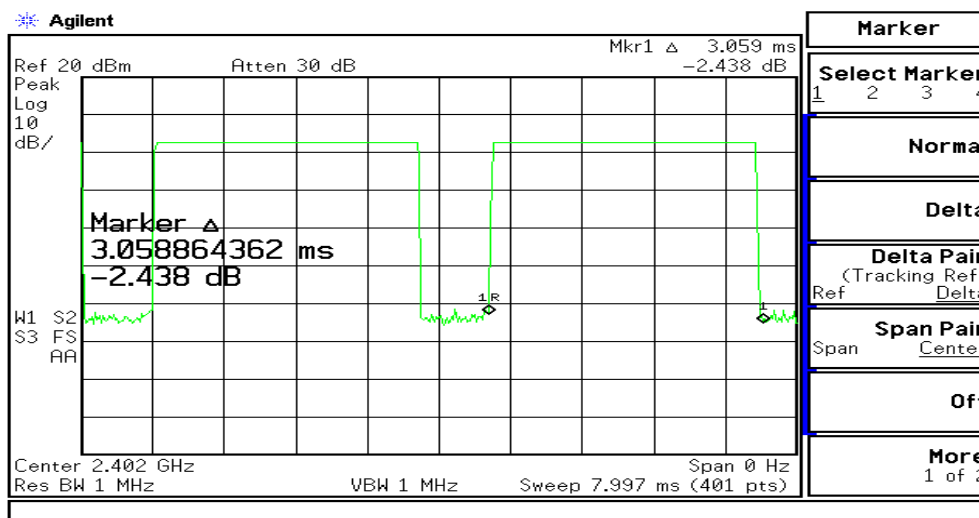
Channel No.	Frequency (MHz)	Time Interval between hops (ms)	Transmission Time (us)	Dwell Time (ms)	Limit (ms)	Result
00	2402	295.812	3058.864	326.761938	400	Pass
39	2441	295.812	3098.849	331.033320	400	Pass
78	2480	296.454	3038.871	323.923184	400	Pass

Note: Dwell Time = 79 \* 400 / Time Interval Between Hops \* Transmission Time / 1000

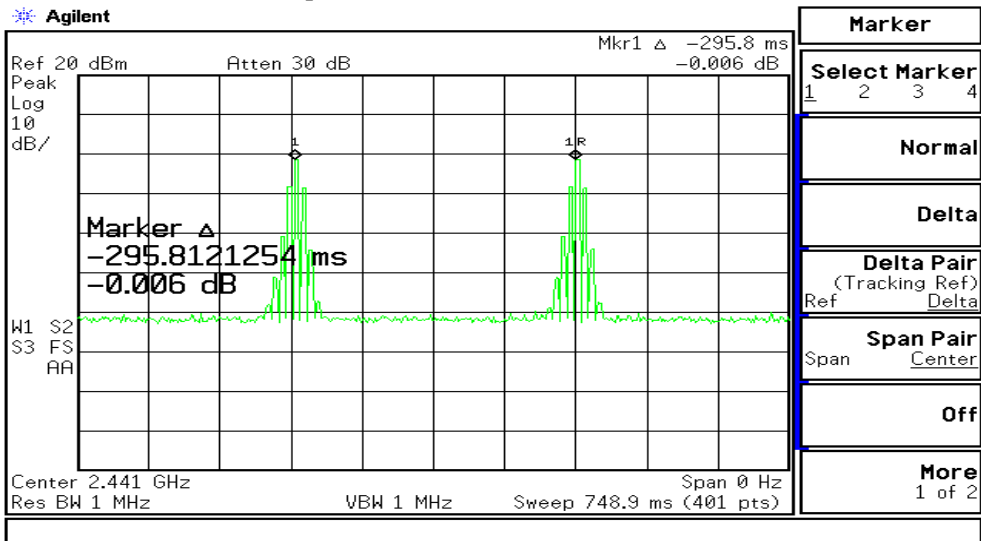
CH 2402MHz Time Interval between hops



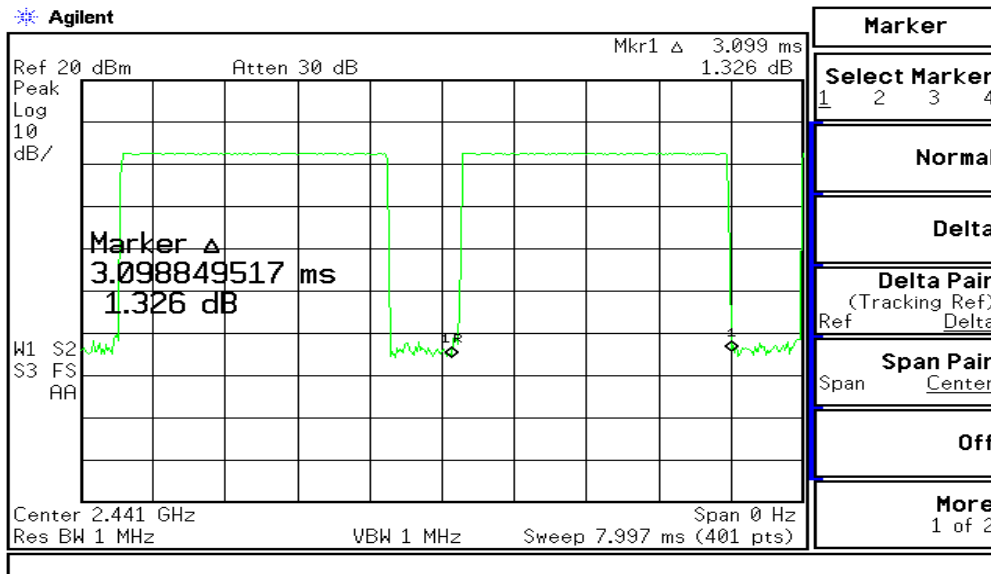
CH 2402MHz Transmission Time



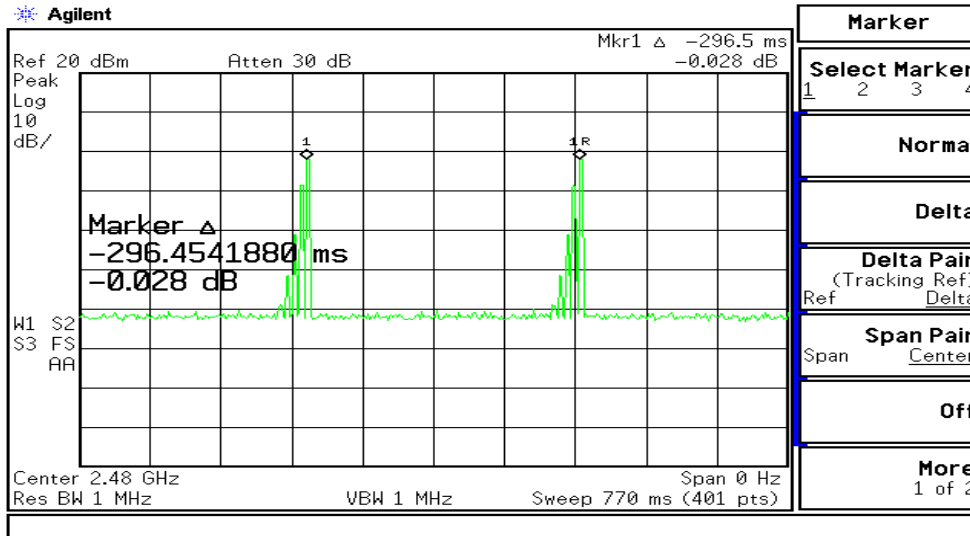
CH 2441MHz Time Interval between hops



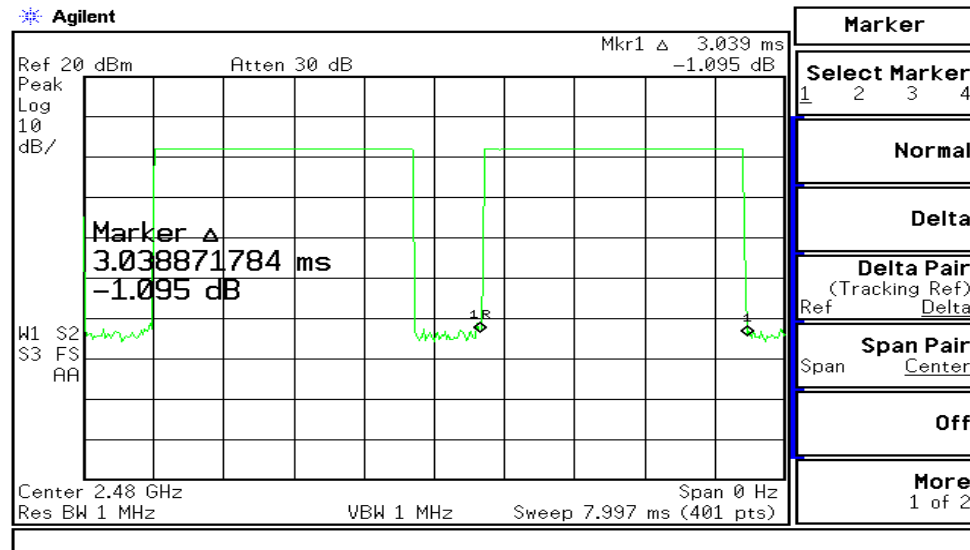
CH 2441MHz Transmission Time



CH 2480MHz Time Interval between hops



CH 2480MHz Transmission Time



Note:

The dwell times of the packet type of DH1, DH3, and DH3 are tested. Only the worst case is shown on the report.

**9. Occupied Bandwidth**

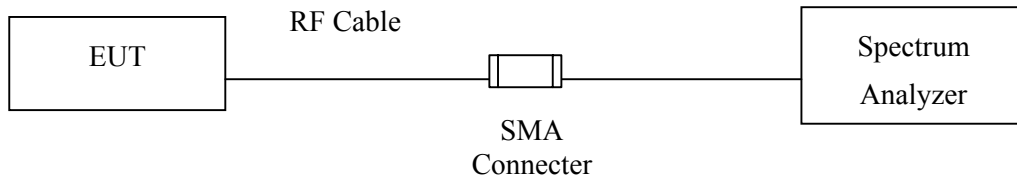
**9.1. Test Equipment**

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

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2007
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2007

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

**9.2. Test Setup**



**9.3. Limits**

N/A

**9.4. Uncertainty**

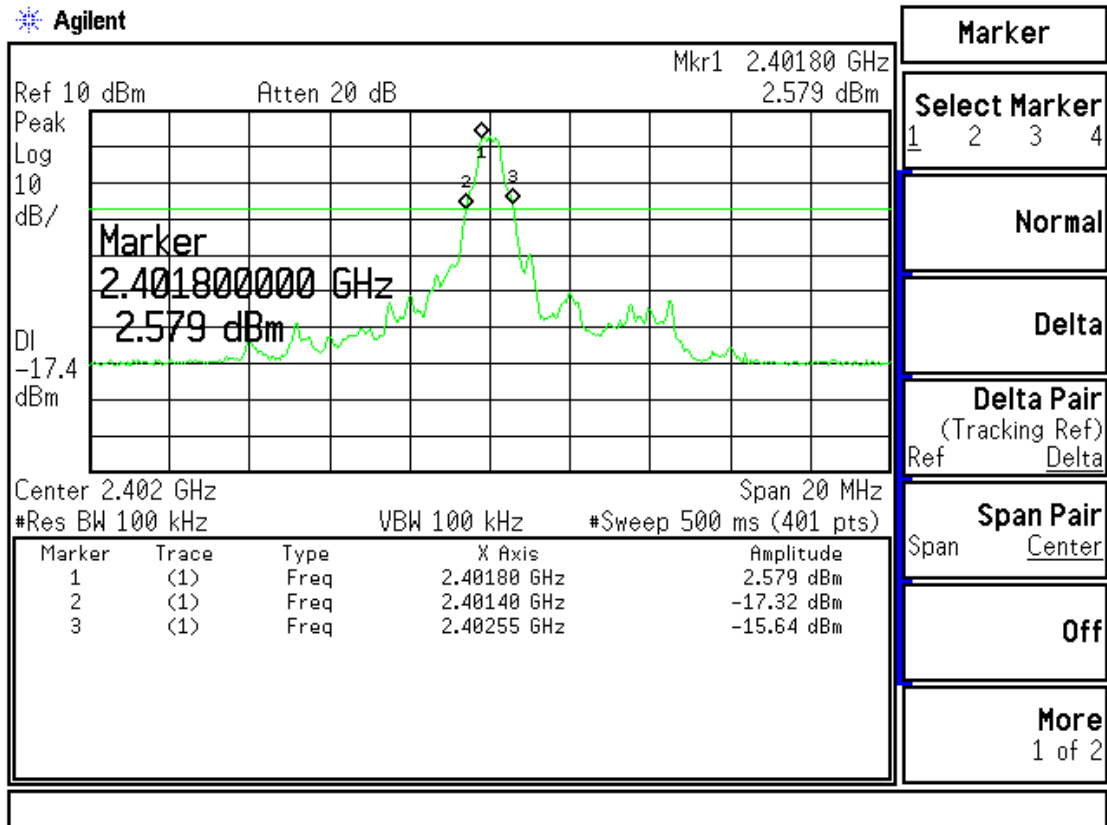
± 150Hz

### 9.5. Test Result of Occupied Bandwidth

Product : Notebook  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1150	--	NA

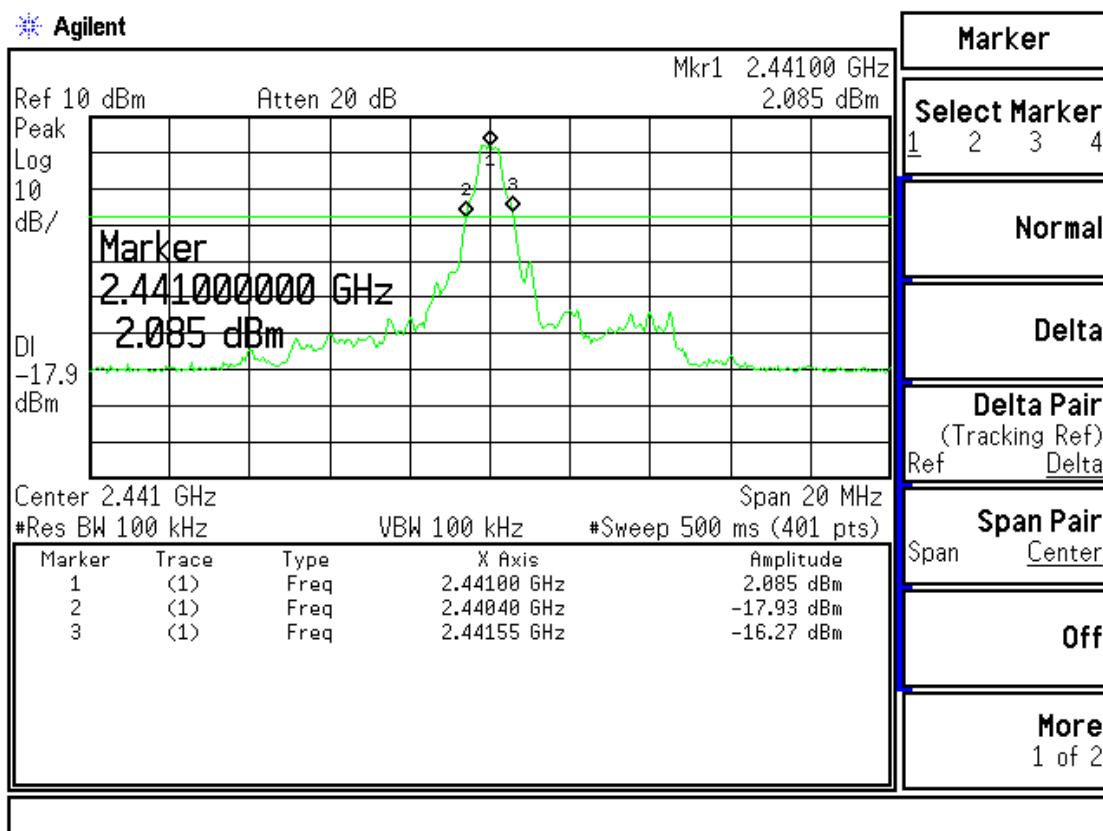
Figure Channel 00:



Product : Notebook  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(2441MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2441	1150	--	NA

**Figure Channel 39:**

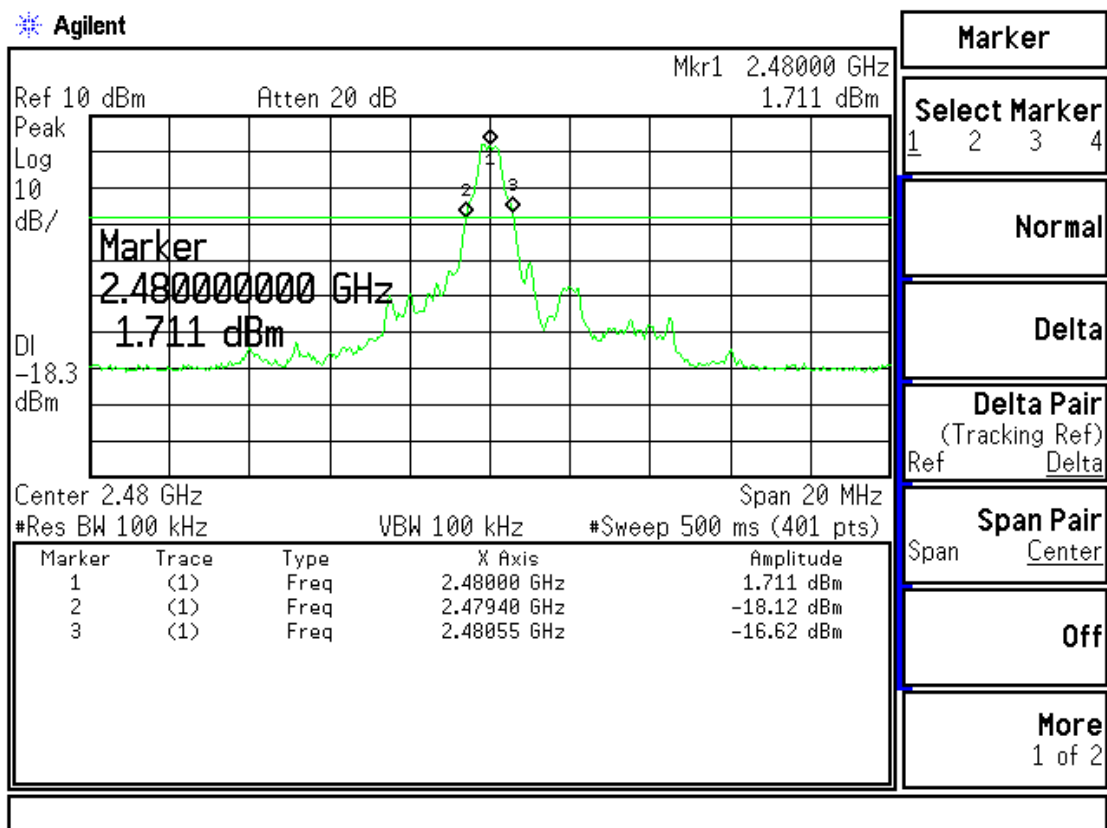




Product : Notebook  
 Test Item : Occupied Bandwidth Data  
 Test Site : No.3 OATS  
 Test Mode : Mode 1: Transmitter (Antenna 1)(2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
78	2480	1150	--	NA

**Figure Channel 78:**



## 10. EMI Reduction Method During Compliance Testing

No modification was made during testing.