

FC

Test Report

Product Name	PND
Model No.	MS-5654
FCC ID.	I4L-MS5654

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	Feb..22, 2008
Issued Date	Apr. 23, 2008
Report No.	082260R-RFUSP06V01
Version	V1.0

The Test Results relate only to the samples tested.

The test report shall not be reproduced except in full without the written approval of Quietek Corporation.


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

Test Report Certification

Issued Date: Apr. 23, 2008

Report No.: 082260R-RFUSP06V01



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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-5654	
FCC ID.	I4L-MS5654	
Rated Voltage	AC 120V/60Hz	
Working Voltage	DC 12V (Power by car charger)	
Trade Name	MSI	
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2007 ANSI C63.4: 2003	 NVLAP Lab Code: 200533-0
Test Result	Complied	

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Documented By : Leven Huang
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Approved By : Vincent Lin
 (Deputy Manager / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	PND
Trade Name	MSI
FCC ID.	I4L-MS5654
Model No.	MS-5654
Frequency Range	2402 - 2480MHz
Channel Number	79
Type of Modulation	GFSK(1Mbps)/ π /4DQPSK(2Mbps) / 8DPSK(3Mbps)
Antenna type	Soldered on PCB
Channel Control	Auto
Antenna Gain	Refer to the table "Antenna List"

Antenna List

No.	Manufacturer	Part No.	Peak Gain
1	Yageo	I9D-4311110-Y01	4.0 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		

Note:

1. This device is a PND with a built-in 2.4GHz Bluetooth 2.0+EDR(Enhanced Data Rate) 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 Frequency hopping spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency channel are selected to be tested.

1.2. Operational Description

The EUT is a PND with a built-in 2.4GHz Bluetooth 2.0+EDR(Enhanced Data Rate) 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 -1Mbps(GFSK)
	Mode 2: Transmitter -3Mbps(8DPSK)

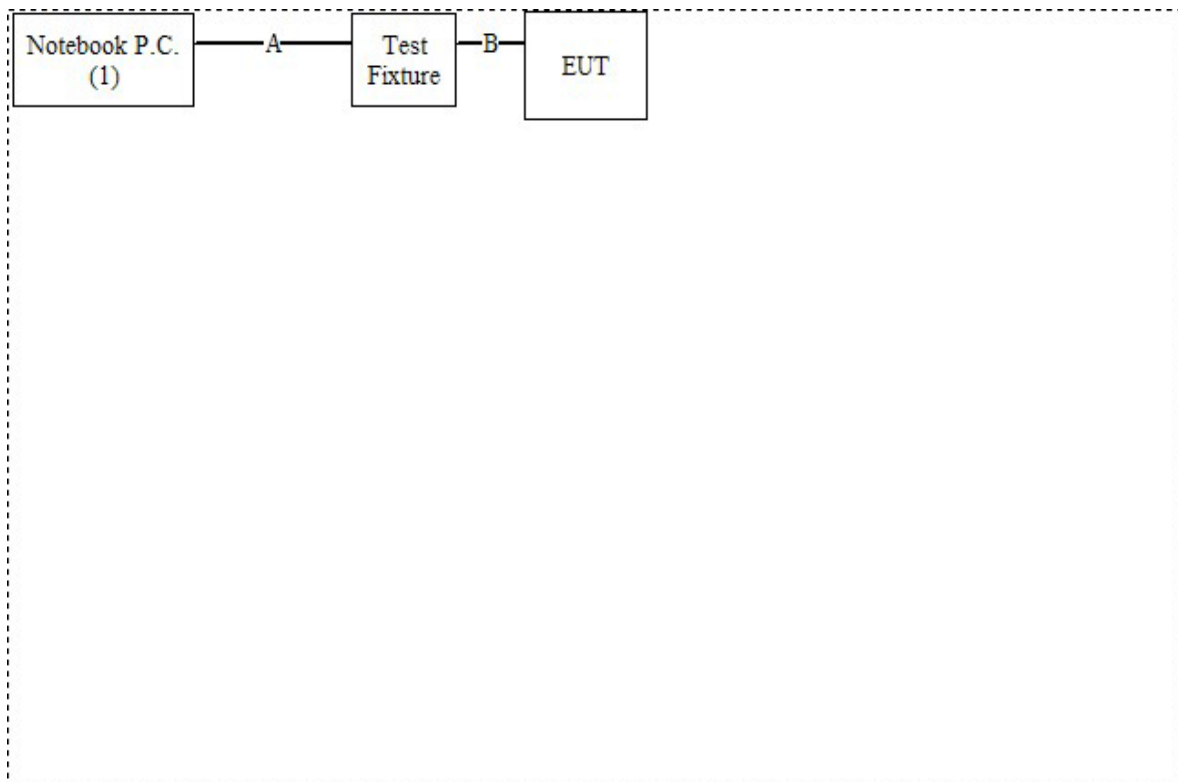
1.3. Tested System Details

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

Product	Manufacturer	Model No.	Serial No.	Power Cord
(1) Notebook P.C.	DELL	PPT	N/A	Non-Shielded 0.8m

Signal Cable Type	Signal cable Description
A. USB Cable	Shielded, 1.5m
B. Controller Cable	Non-Shielded, 0.2m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in section 1.4
- (2) Execute the CSR program (the continuous transmission program) on the EUT
- (3) Setup the test mode, the test channel, and the data rate.
- (4) Press OK to start the transmission.
- (5) 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	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
 Registration Number: 92195



Accreditation on NVLAP
 NVLAP Lab Code: 200533-0



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FCC Accreditation Number: TW1014



2. Conducted Emission

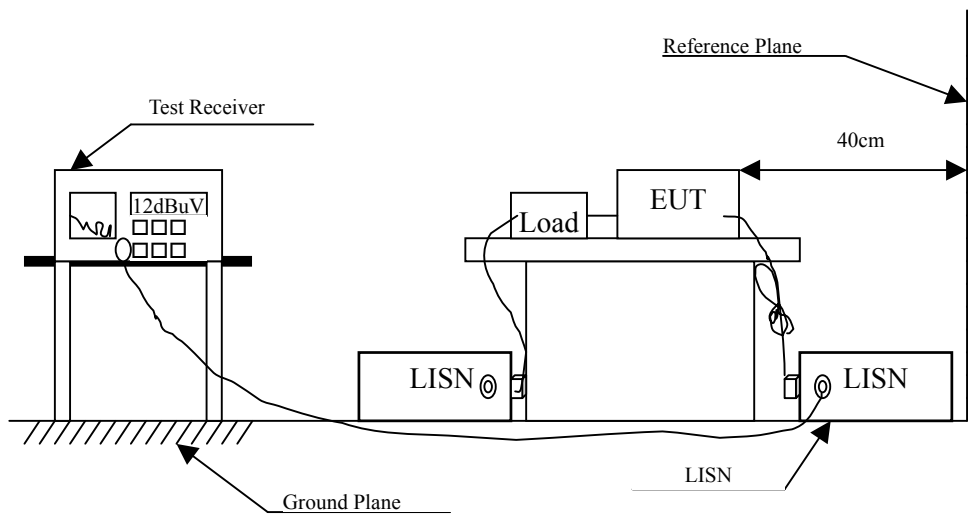
2.1. Test Equipment

The following test equipments 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: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

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 was setup according to ANSI C63.4, 2003 and tested according to FCC Public Notice DA 00-705.

The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs.)

Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

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 : PND
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK) (2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 1					
Quasi-Peak					
0.197	0.670	46.640	47.310	-17.347	64.657
0.263	0.314	38.880	39.194	-23.577	62.771
1.119	0.320	30.050	30.370	-25.630	56.000
3.630	0.390	35.300	35.690	-20.310	56.000
6.142	0.470	35.700	36.170	-23.830	60.000
13.470	0.940	47.830	48.770	-11.230	60.000
Average					
0.197	0.670	41.350	42.020	-12.637	54.657
0.263	0.314	34.790	35.104	-17.667	52.771
1.119	0.320	27.530	27.850	-18.150	46.000
3.630	0.390	32.110	32.500	-13.500	46.000
6.142	0.470	33.600	34.070	-15.930	50.000
13.470	0.940	43.860	44.800	-5.200	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 : PND
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK) (2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 2					
Quasi-Peak					
0.201	0.300	45.470	45.770	-18.773	64.543
0.263	0.300	40.800	41.100	-21.671	62.771
0.791	0.320	34.130	34.450	-21.550	56.000
1.849	0.340	32.040	32.380	-23.620	56.000
5.748	0.430	36.170	36.600	-23.400	60.000
13.338	0.829	47.590	48.419	-11.581	60.000
Average					
0.201	0.300	37.710	38.010	-16.533	54.543
0.263	0.300	39.050	39.350	-13.421	52.771
0.791	0.320	32.250	32.570	-13.430	46.000
1.849	0.340	30.950	31.290	-14.710	46.000
5.748	0.430	34.430	34.860	-15.140	50.000
13.338	0.829	42.790	43.619	-6.381	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 : PND
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK) (2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 1					
Quasi-Peak					
0.197	0.670	46.500	47.170	-17.487	64.657
0.396	0.300	34.730	35.030	-23.941	58.971
0.990	0.311	32.300	32.611	-23.389	56.000
3.630	0.390	35.220	35.610	-20.390	56.000
6.009	0.470	35.390	35.860	-24.140	60.000
13.338	0.929	47.310	48.239	-11.761	60.000
Average					
0.197	0.670	41.100	41.770	-12.887	54.657
0.396	0.300	32.870	33.170	-15.801	48.971
0.990	0.311	30.840	31.151	-14.849	46.000
3.630	0.390	31.670	32.060	-13.940	46.000
6.009	0.470	33.240	33.710	-16.290	50.000
13.338	0.929	43.190	44.119	-5.881	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 : PND
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK) (2441MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 2					
Quasi-Peak					
0.201	0.300	45.640	45.940	-18.603	64.543
0.263	0.300	39.300	39.600	-23.171	62.771
0.529	0.310	38.750	39.060	-16.940	56.000
1.189	0.330	33.390	33.720	-22.280	56.000
5.943	0.430	36.840	37.270	-22.730	60.000
13.072	0.795	47.120	47.915	-12.085	60.000
Average					
0.201	0.300	37.630	37.930	-16.613	54.543
0.263	0.300	38.720	39.020	-13.751	52.771
0.529	0.310	36.680	36.990	-9.010	46.000
1.189	0.330	31.490	31.820	-14.180	46.000
5.943	0.430	34.420	34.850	-15.150	50.000
13.072	0.795	43.410	44.205	-5.795	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

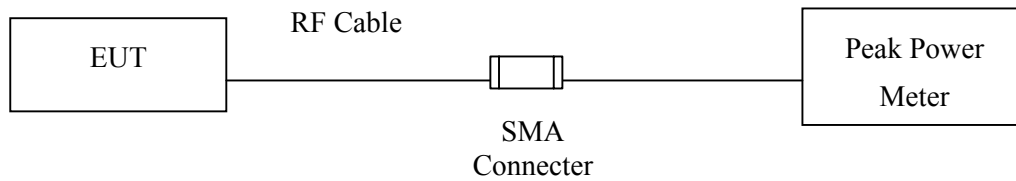
The following test equipments are used during the radiated emission tests:

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2007
X	Power Sensor	Anritsu	MA2491A/034457	May, 2007

- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

3.2. Test Setup

Conducted Measurement



3.3. Test procedures

The EUT was setup according to ANSI C63.4, 2003 for compliance to FCC 47CFR 15.247 requirements

3.4. Limit

For frequency hopping systems in the 2400-2483.5 MHz band employing at least 75 hopping channels: 1Watt.

For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watt.

3.5. Uncertainty

± 1.27 dB

3.6. Test Result of Peak Power Output

Product : PND
Test Item : Peak Power Output
Test Site : No.3 OATS
Test Mode : Mode 1: Transmitter -1Mbps(GFSK)

Channel No.	Frequency (MHz)	Cable loss (dB)	Peak Power Output (dBm)	Limit (dBm)	Result
Channel 00	2402.00	0.5	-1.98	30	Pass
Channel 39	2441.00	0.5	-1.36	30	Pass
Channel 78	2480.00	0.5	-2.12	30	Pass

Note: Peak Power Output =Reading value on peak power meter + cable loss

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

Channel No.	Frequency (MHz)	Cable loss (dB)	Peak Power Output (dBm)	Limit (dBm)	Result
Channel 00	2402.00	0.5	-3.15	30	Pass
Channel 39	2441.00	0.5	-2.75	30	Pass
Channel 78	2480.00	0.5	-3.87	30	Pass

Note: Peak Power Output = Reading value on peak power meter + cable loss

4. Radiated Emission

4.1. Test Equipment

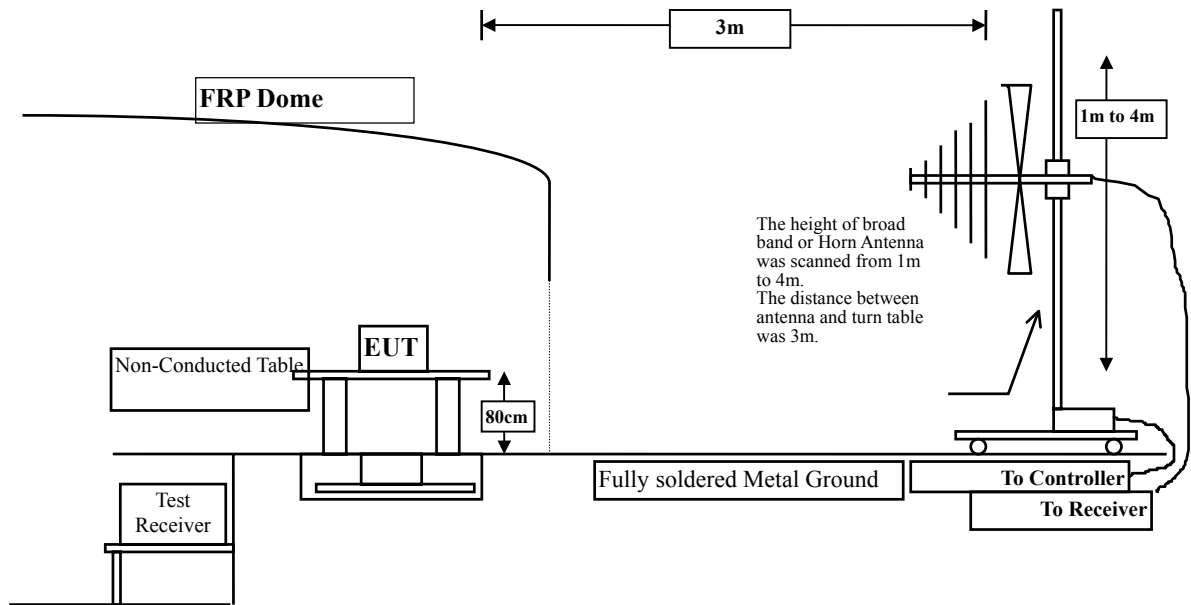
The following test equipments are used during the radiated emission test:

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., 2007
<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., 2007
	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, 2007
	Horn Antenna	Schwarzbeck	BBHA9170 / 208, 209	July, 2007
	Pre-Amplifier	QTK	QTK-AMP-01 / 0001	July, 2007
	Pre-Amplifier	QTK	QTK-AMP-03 / 0003	May, 2007
	Pre-Amplifier	HP	8449B / 3008A01123	July, 2007

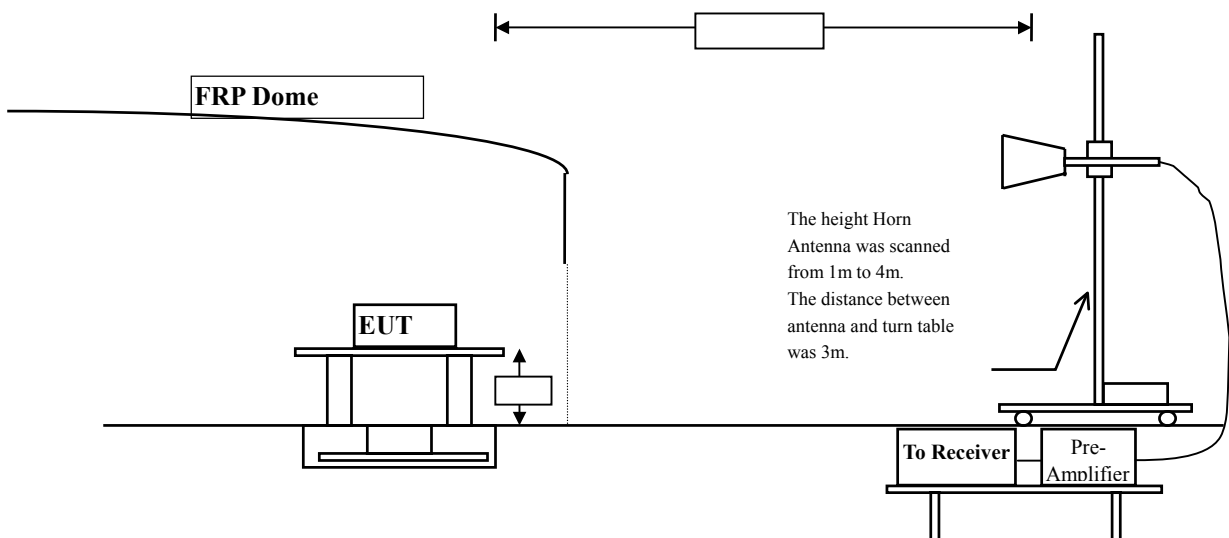
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with "X" are used to measure the final test results.

4.2. Test Setup

Radiated Emission Below 1GHz



Radiated Emission Above 1GHz



4.3. Limits

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

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

Remarks: E field strength (dBuV/m) = 20 log E field strength (uV/m)

4.4. Test Procedure

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 beamwidth 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 : PND
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)(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	47.810	51.473	-22.527	74.000
7206.000	9.357	36.380	45.736	-28.264	74.000
9608.000	11.842	35.760	47.602	-26.398	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4804.000	3.663	50.170	53.833	-20.167	74.000
7206.000	9.357	36.050	45.406	-28.594	74.000
9608.000	11.842	36.370	48.212	-25.788	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : PND
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)(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	48.690	52.611	-21.389	74.000
7323.000	9.657	36.160	45.817	-28.183	74.000
9764.000	11.798	36.090	47.888	-26.112	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4882.000	3.921	54.640	58.561	-15.439	74.000
7323.000	9.657	36.030	45.687	-28.313	74.000
9764.000	11.798	36.220	48.018	-25.982	74.000
Average Detector:					
4882.000	3.921	40.610	44.531	-9.469	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4960.000	4.197	49.500	53.696	-20.304	74.000
7440.000	9.951	35.200	45.151	-28.849	74.000
9920.000	11.856	36.680	48.536	-25.464	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4960.000	4.197	52.230	56.426	-17.574	74.000
7440.000	9.951	35.060	45.011	-28.989	74.000
9920.000	11.856	36.150	48.006	-25.994	74.000
Average Detector:					
4960.000	4.197	45.690	49.886	-4.114	54.000

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : PND
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK) (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	45.360	49.023	-24.977	74.000
7206.000	9.357	36.450	45.806	-28.194	74.000
9608.000	11.842	35.860	47.702	-26.298	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4804.000	3.663	46.000	49.663	-24.337	74.000
7206.000	9.357	36.020	45.376	-28.624	74.000
9608.000	11.842	35.070	46.912	-27.088	74.000
Average Detector:					
--					

Note:

- All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
- Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
- Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
- " * ", means this data is the worst emission level.
- Measurement Level = Reading Level + Correct Factor.
- The average measurement was not performed when the peak measured data under the limit of average detection.

Product : PND
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK) (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	45.100	49.021	-24.979	74.000
7323.000	9.657	36.360	46.017	-27.983	74.000
9764.000	11.798	36.530	48.328	-25.672	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4882.000	3.921	46.300	50.221	-23.779	74.000
7323.000	9.657	35.300	44.957	-29.043	74.000
9764.000	11.798	36.710	48.508	-25.492	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4960.000	4.197	44.340	48.536	-25.464	74.000
7440.000	9.951	34.460	44.411	-29.589	74.000
9920.000	11.856	35.990	47.846	-26.154	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4960.000	4.197	47.200	51.396	-22.604	74.000
7440.000	9.951	35.300	45.251	-28.749	74.000
9920.000	11.856	35.960	47.816	-26.184	74.000
Average Detector:					
--					

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
359.800	15.288	19.876	35.164	-21.236	56.400
396.660	16.228	17.755	33.983	-22.417	56.400
528.580	18.638	14.251	32.889	-23.511	56.400
695.420	20.912	10.752	31.664	-24.736	56.400
782.720	21.519	14.114	35.633	-20.767	56.400
912.700	22.319	10.275	32.594	-23.806	56.400
Vertical					
227.880	11.118	24.934	36.052	-20.348	56.400
352.040	15.309	16.271	31.580	-24.820	56.400
528.580	18.993	10.758	29.751	-26.649	56.400
623.640	21.210	10.700	31.910	-24.490	56.400
782.720	22.269	9.641	31.910	-24.490	56.400
912.700	24.019	4.895	28.914	-27.486	56.400

Note:

1. All Readings below 1GHz are Quasi-Peak Value
2. "█" means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

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

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
322.940	13.905	22.019	35.924	-20.476	56.400
474.260	18.584	14.407	32.991	-23.409	56.400
623.640	20.810	12.043	32.853	-23.547	56.400
707.060	20.626	14.640	35.266	-21.134	56.400
782.720	21.519	12.724	34.243	-22.157	56.400
912.700	22.319	11.871	34.190	-22.210	56.400
Vertical					
262.800	14.735	17.196	31.931	-24.469	56.400
396.660	17.644	10.311	27.955	-28.445	56.400
528.580	18.993	11.790	30.783	-25.617	56.400
623.640	21.210	7.419	28.629	-27.771	56.400
668.260	19.901	12.603	32.504	-23.896	56.400
796.300	21.884	10.303	32.187	-24.213	56.400

Note:

- 1 All Readings below 1GHz are Quasi-Peak Value
2. "█" means this data is the worst emission level.
3. Measurement Level = Reading Level + Correct Factor.

5. Spurious RF Conducted Emissions

5.1. Test Equipment

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

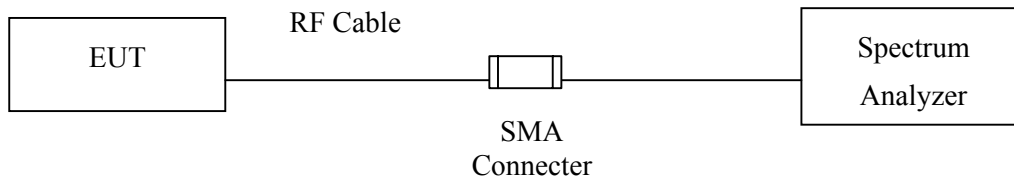
Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X Spectrum Analyzer	R & S	FSP40 / 100170	Nov, 2007
Test Site	Site 3		

Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

2. The test instruments marked with “X” are used to measure the final test results.

5.2. Test Setup

Spurious RF Conducted 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 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.

Set RBW=100KHz, VBW ≥ RBW, Sweep = auto, Detector function = peak

Trace = max hold

5.5. Uncertainty

± 3.9 dB above 1GHz

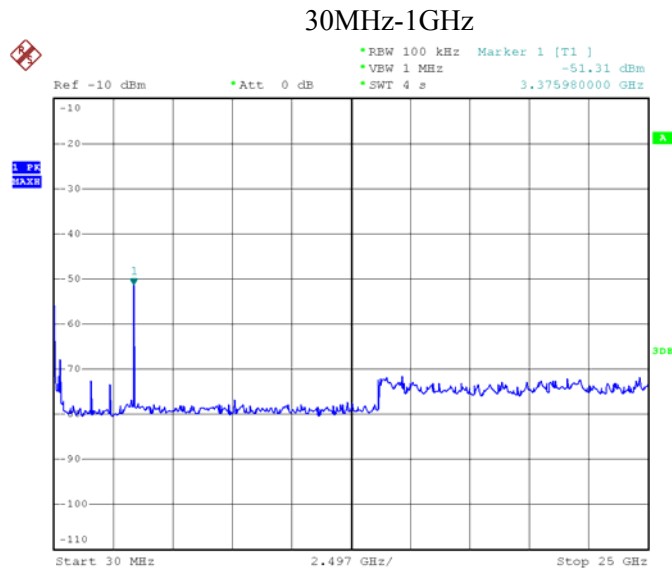
± 3.8 dB below 1GHz

5.6. Test Result of Spurious RF Conducted Emissions

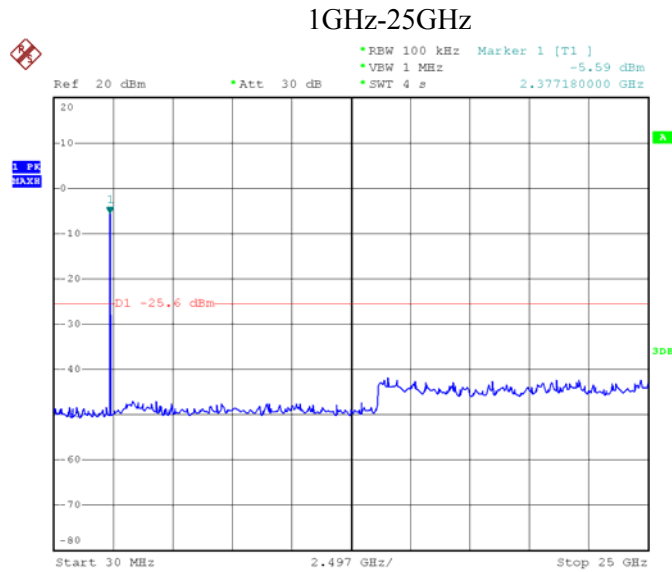
Product : PND
 Test Item : Spurious RF Conducted Emissions
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)

Spurious RF Conducted Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
00	2402	>20dB	Pass



Date: 15.MAR.2008 05:48:30

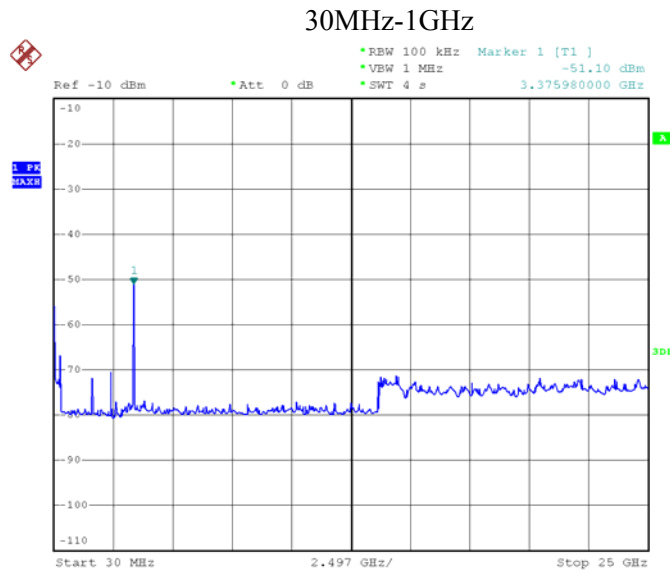


Date: 15.MAR.2008 05:46:59

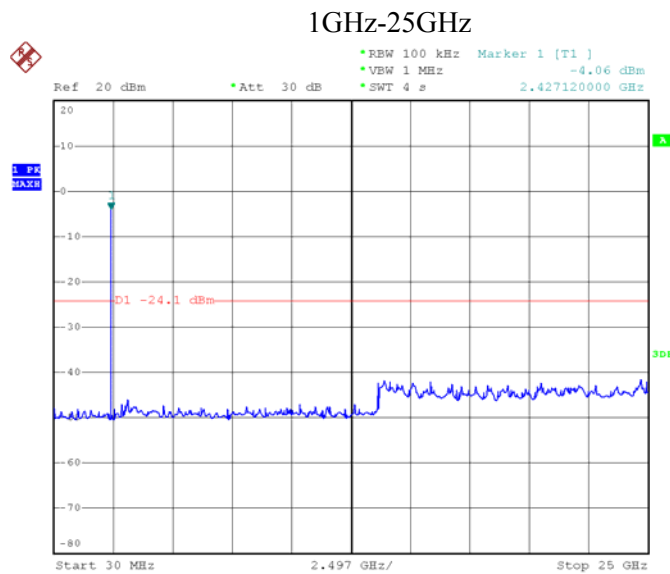
Product : PND
 Test Item : Spurious RF Conducted Emissions
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)

Spurious RF Conducted Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
39	2441	>20dB	Pass



Date: 15.MAR.2008 05:48:57

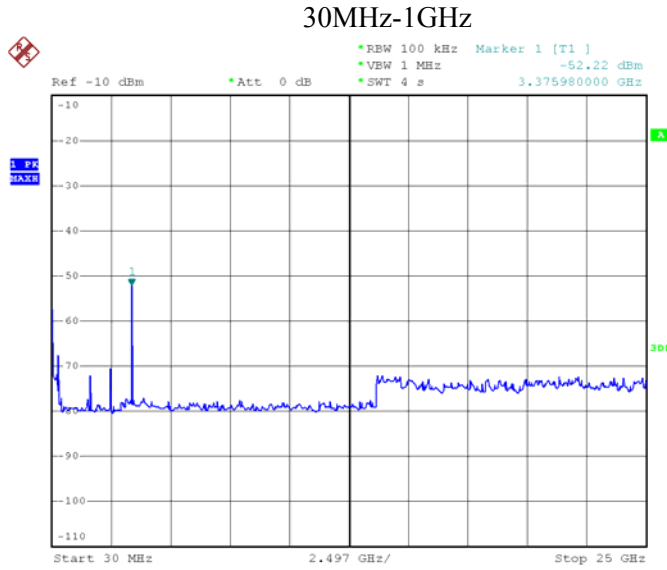


Date: 15.MAR.2008 05:47:30

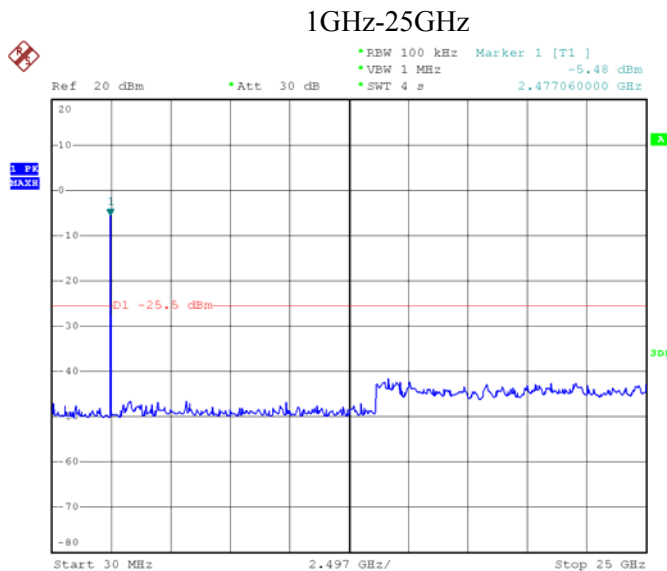
Product : PND
 Test Item : Spurious RF Conducted Emissions
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)

Spurious RF Conducted Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
78	2480	>20dB	Pass



Date: 15.MAR.2008 05:49:23

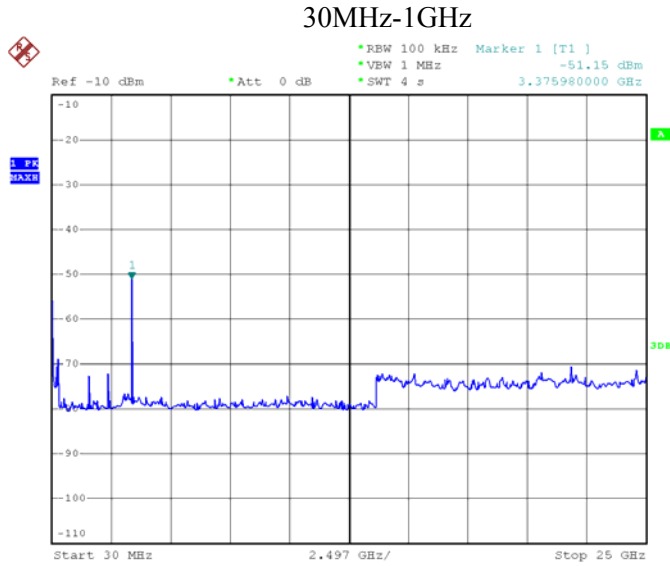


Date: 15.MAR.2008 05:47:57

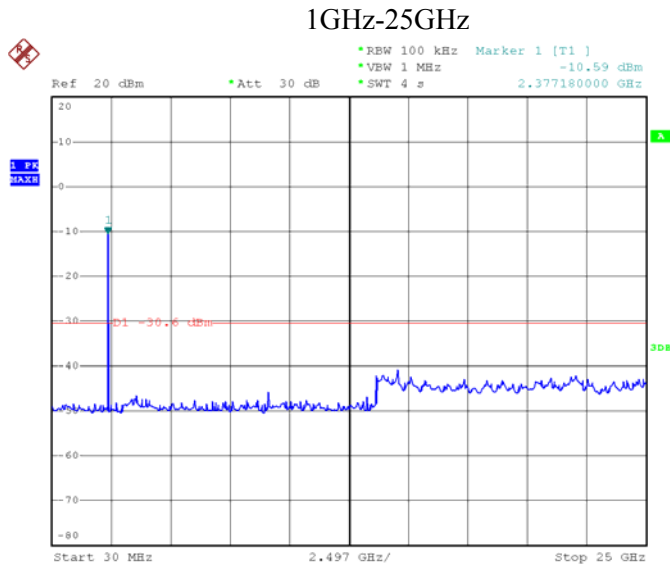
Product : PND
 Test Item : Spurious RF Conducted Emissions
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)

Spurious RF Conducted Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
00	2402	>20dB	Pass



Date: 15.MAR.2008 05:49:59



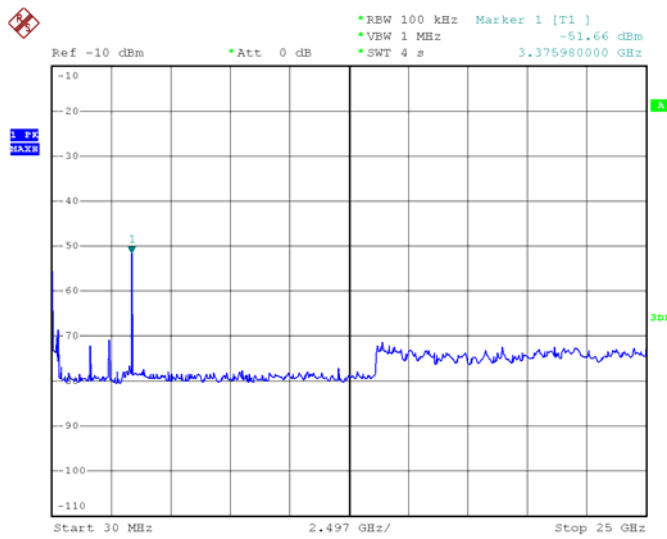
Date: 15.MAR.2008 05:51:14

Product : PND
 Test Item : Spurious RF Conducted Emissions
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)

Spurious RF Conducted Measurement:

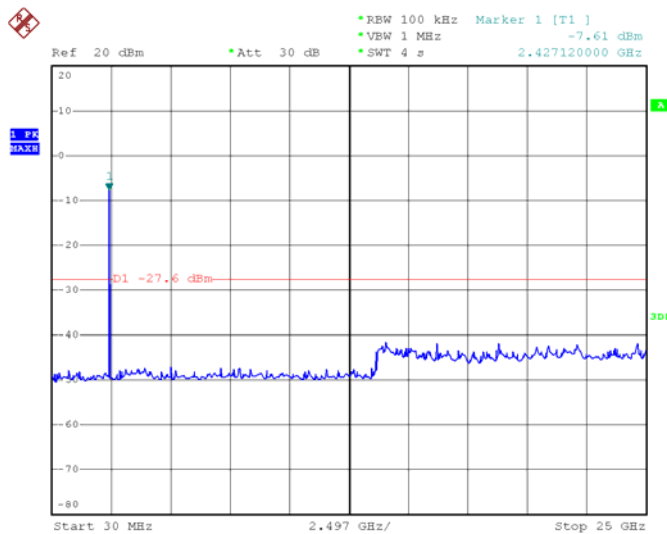
Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
39	2441	>20dB	Pass

30MHz-1GHz



Date: 15.MAR.2008 05:50:24

1GHz-25GHz

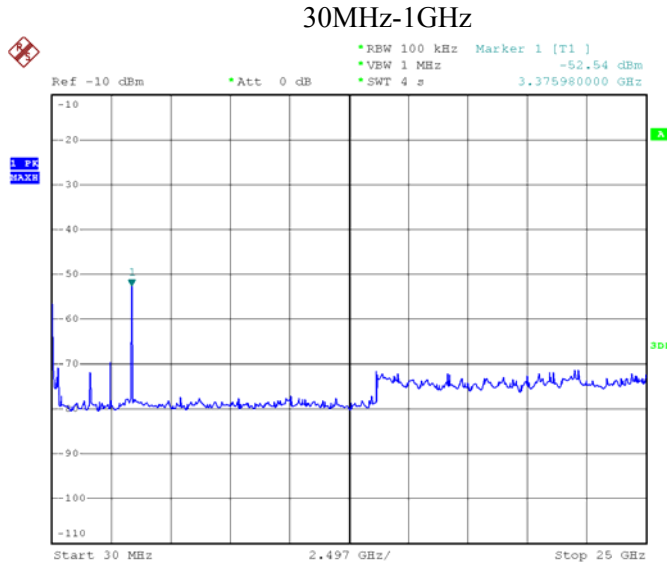


Date: 15.MAR.2008 05:51:41

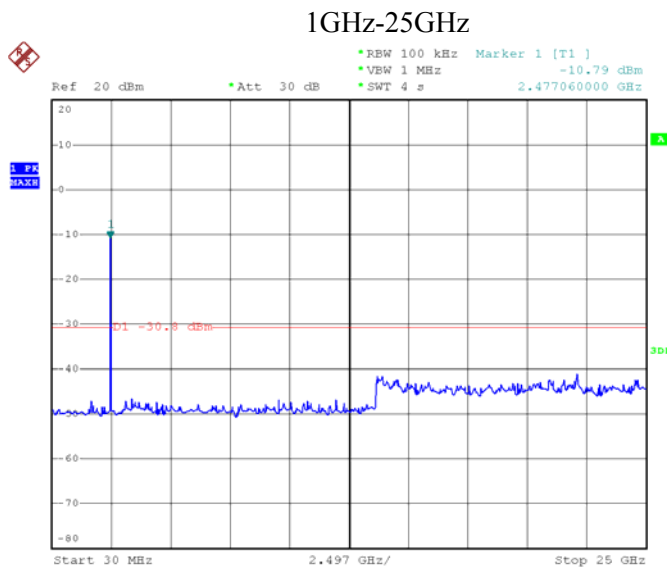
Product : PND
 Test Item : Spurious RF Conducted Emissions
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)

Spurious RF Conducted Measurement:

Channel No.	Frequency (MHz)	Required Limit (dBc)	Result
78	2480	>20dB	Pass



Date: 15.MAR.2008 05:50:50



Date: 15.MAR.2008 05:52:04

6. Radiated Emission Band Edge

6.1. Test Equipment

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

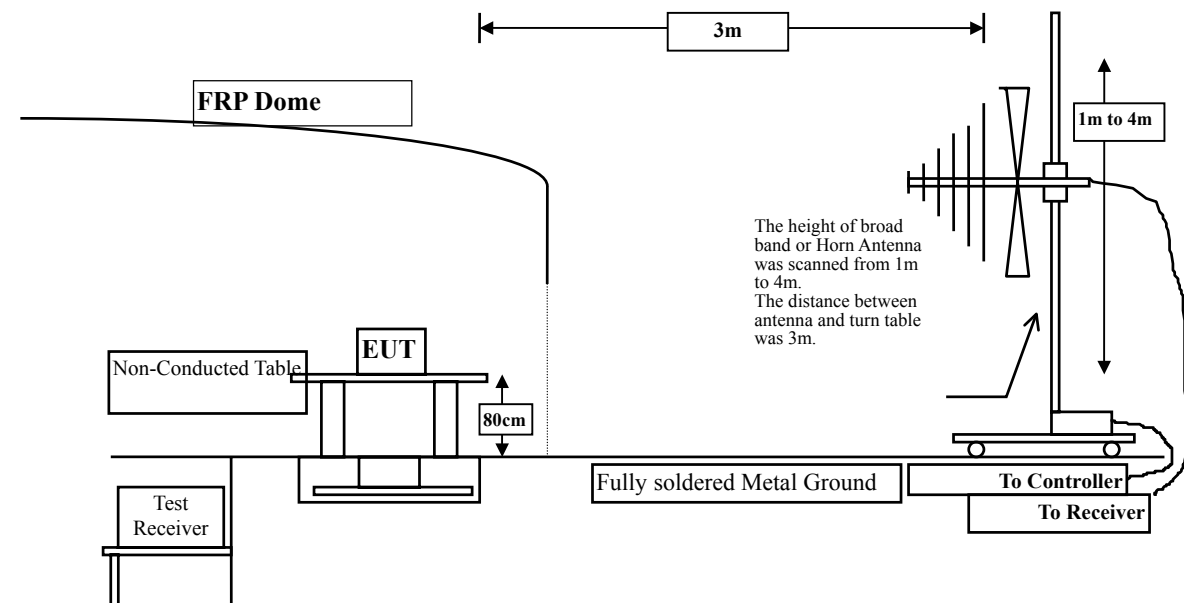
	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Test Receiver	R & S	ESI 26 / 838786 / 004	May, 2007
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2007
X	Bilog Antenna	SCHAFFNER	CBL6112B / 2697	May, 2007
X	Horn Antenna	Schwarzbeck	BBHA9120D / 305, 306	July, 2007
X	Horn Antenna	Schwarzbeck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

Test Site Site 3

- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

6.2. Test Setup

RF Radiated Measurement:



6.3. Limit

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.

6.4. 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.

6.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

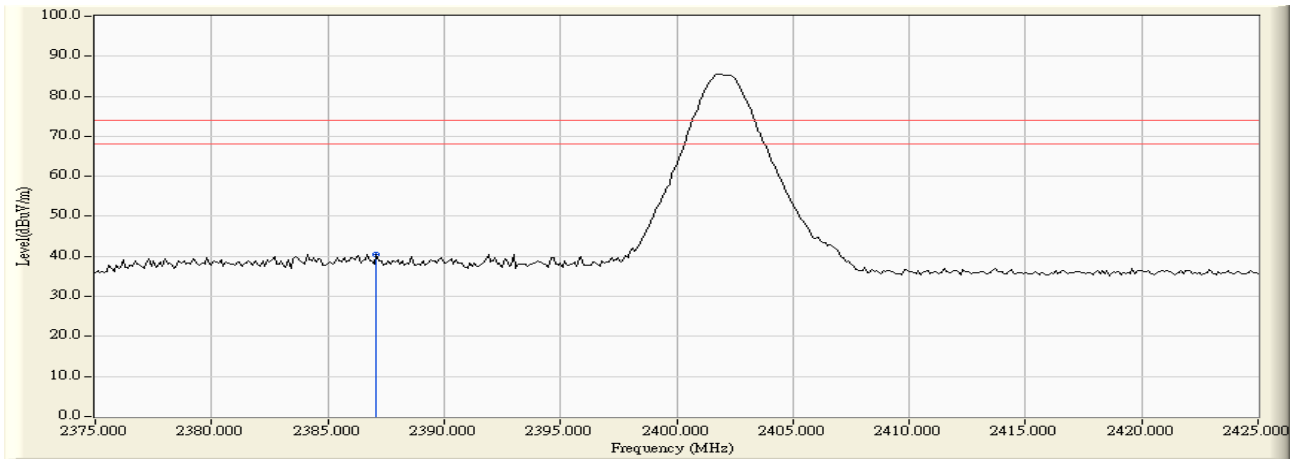
6.6. Test Result of Band Edge

Product : PND
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)(2402MHz)

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)	2387.100	-2.391	42.920	40.529	74.00	54.00	Pass

Figure Channel 00: (Horizontal) (Peak)



Note:

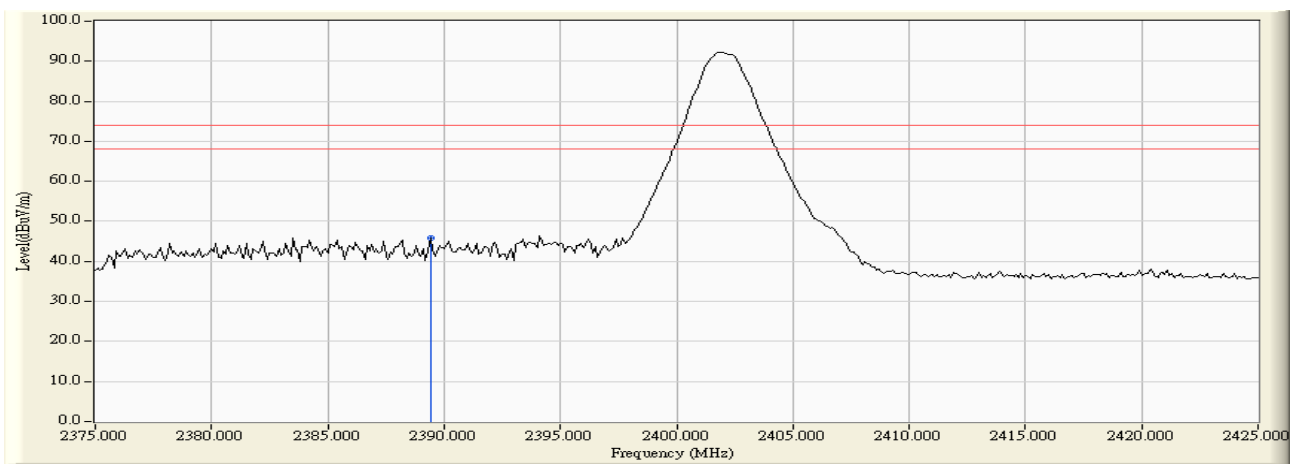
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : PND
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)(2402MHz)

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)	2389.400	-2.381	48.300	45.920	74.00	54.00	Pass

Figure Channel 00: (Vertical) (Peak)



Note:

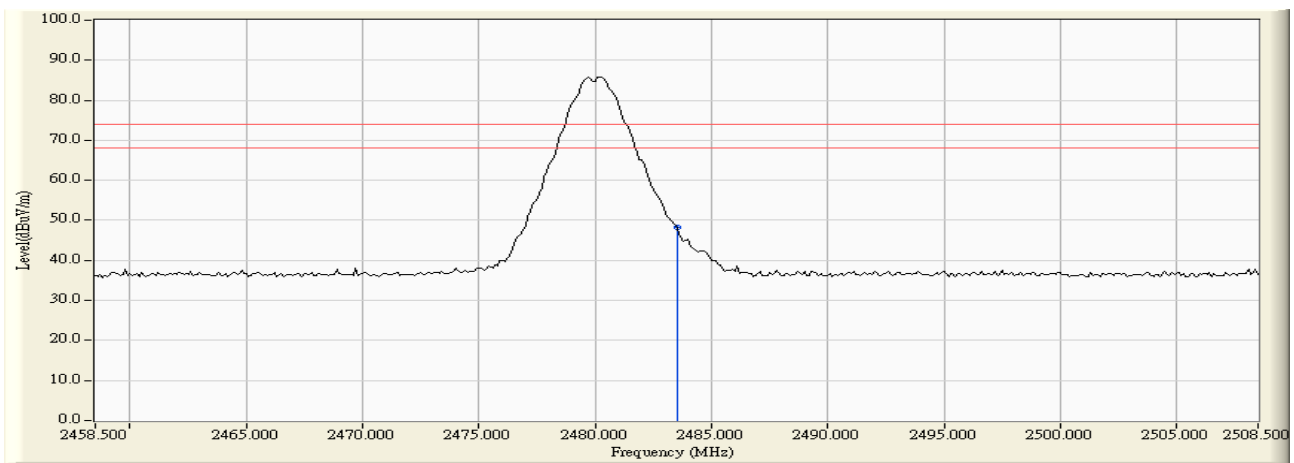
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : PND
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)(2480MHz)

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)	2483.500	-1.937	50.125	48.188	74.00	54.00	Pass

Figure Channel 78: (Horizontal) (Peak)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : PND
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)(2480MHz)

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)	2483.500	-1.937	57.196	55.259	74.00	54.00	Pass
78(Average)	2483.500	-1.937	53.087	51.150	74.00	54.00	Pass

Figure Channel 78: (Vertical) (Peak)

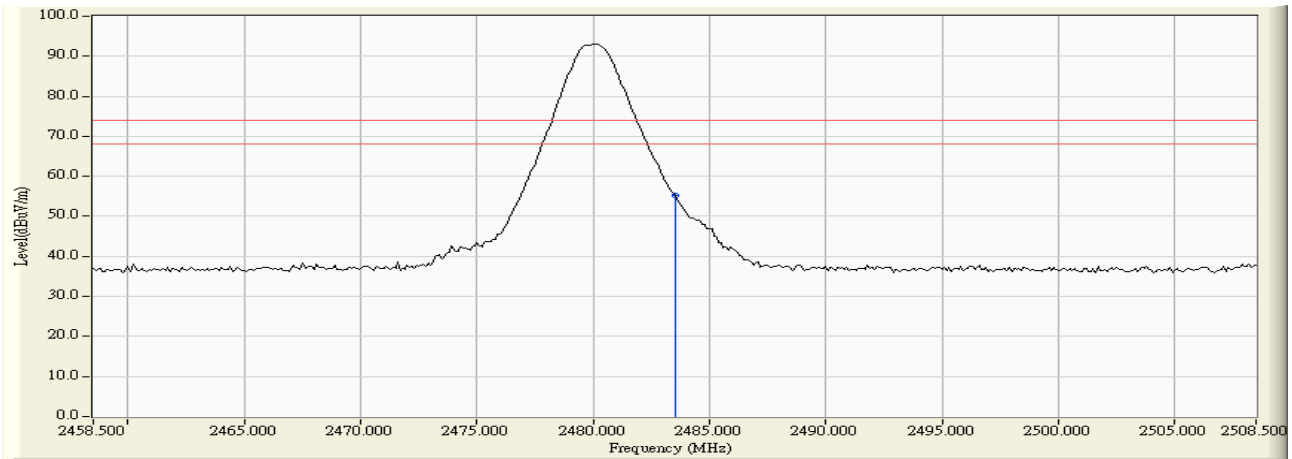
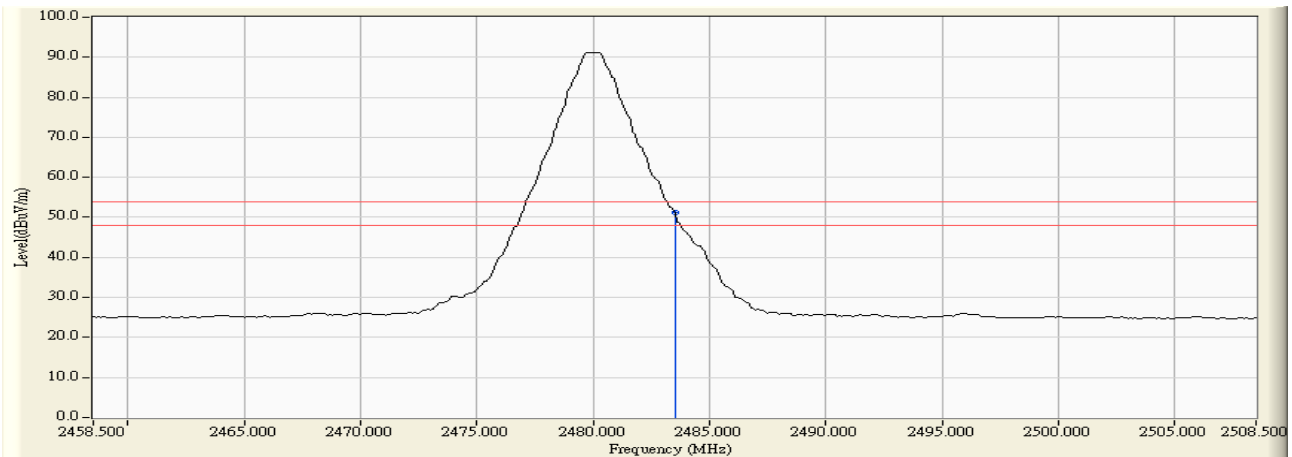


Figure Channel 78: (Vertical) (Average)



Note:

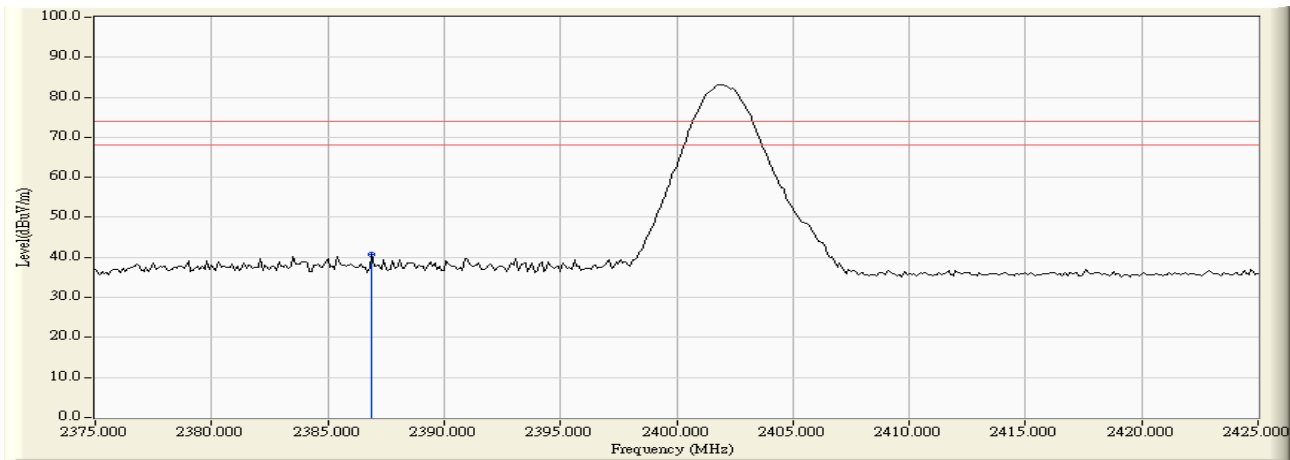
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : PND
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)(2402MHz)

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)	2386.900	-2.393	43.026	40.634	74.00	54.00	Pass

Figure Channel 00: (Horizontal) (Peak)



Note:

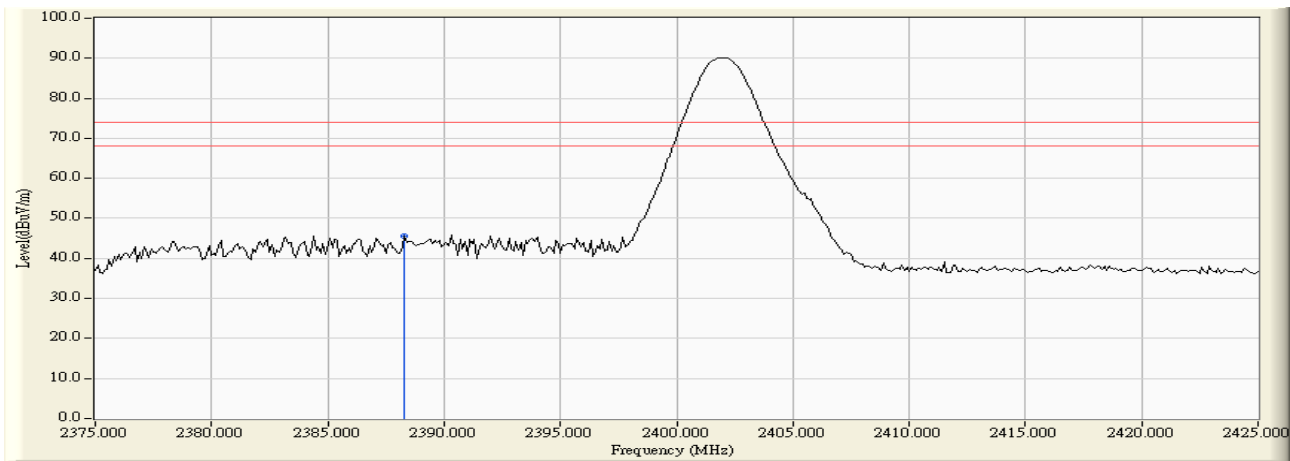
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : PND
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)(2402MHz)

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)	2388.300	-2.385	48.058	45.672	74.00	54.00	Pass
00 (Peak)	--	--	--	--	74.00	54.00	Pass

Figure Channel 00: (Vertical) (Peak)



Note:

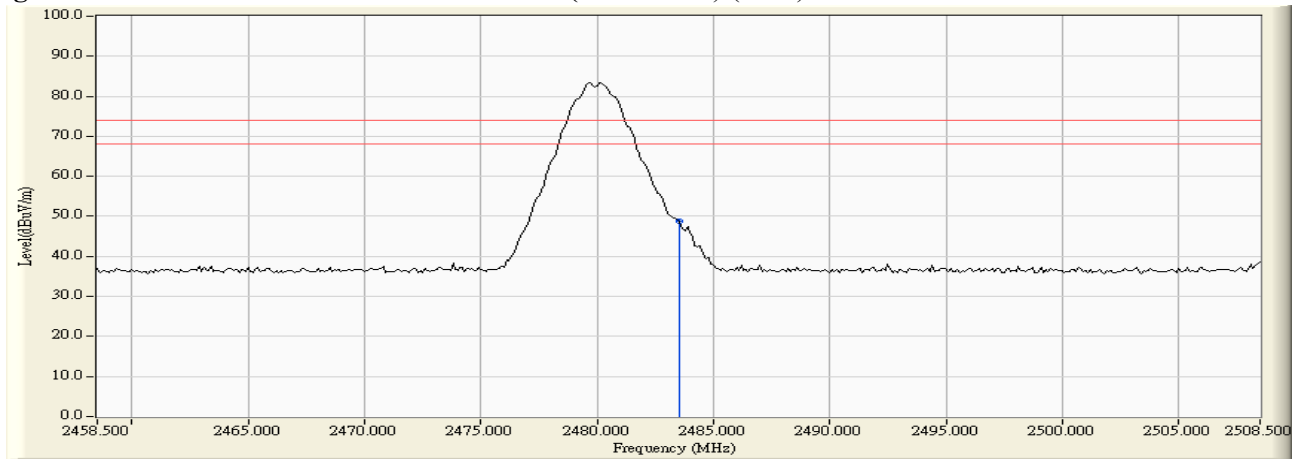
1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : PND
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)(2480MHz)

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)	2483.500	-1.937	50.636	48.699	74.00	54.00	Pass
78(Average)	--	--	--	--	74.00	54.00	Pass

Figure Channel 78: (Horizontal) (Peak)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : PND
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)(2480MHz)

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)	2483.500	-1.937	57.653	55.716	74.00	54.00	Pass
78(Average)	2483.500	-1.937	49.962	48.025	74.00	54.00	Pass

Figure Channel 78: (Vertical) (Peak)

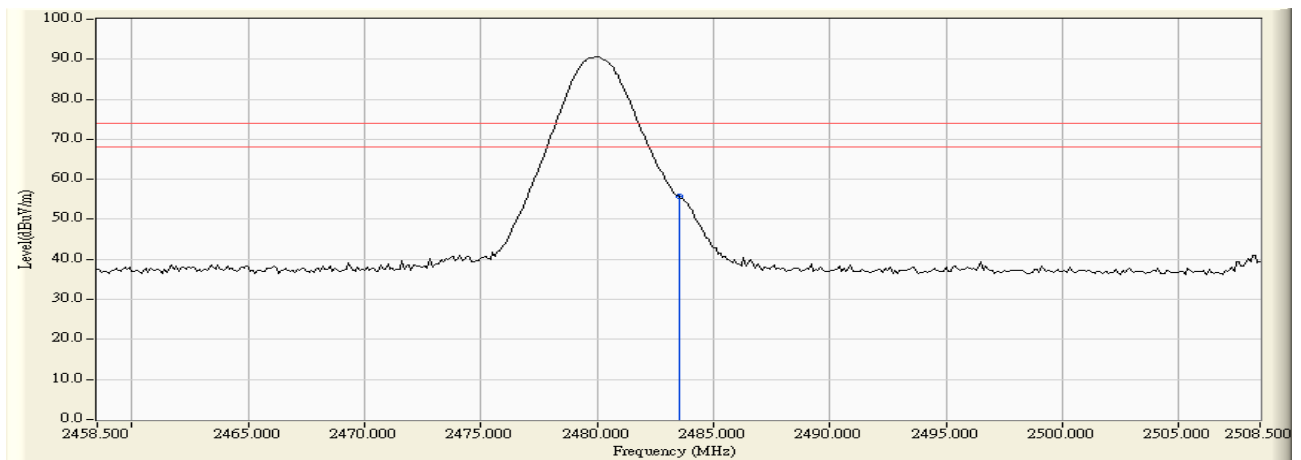
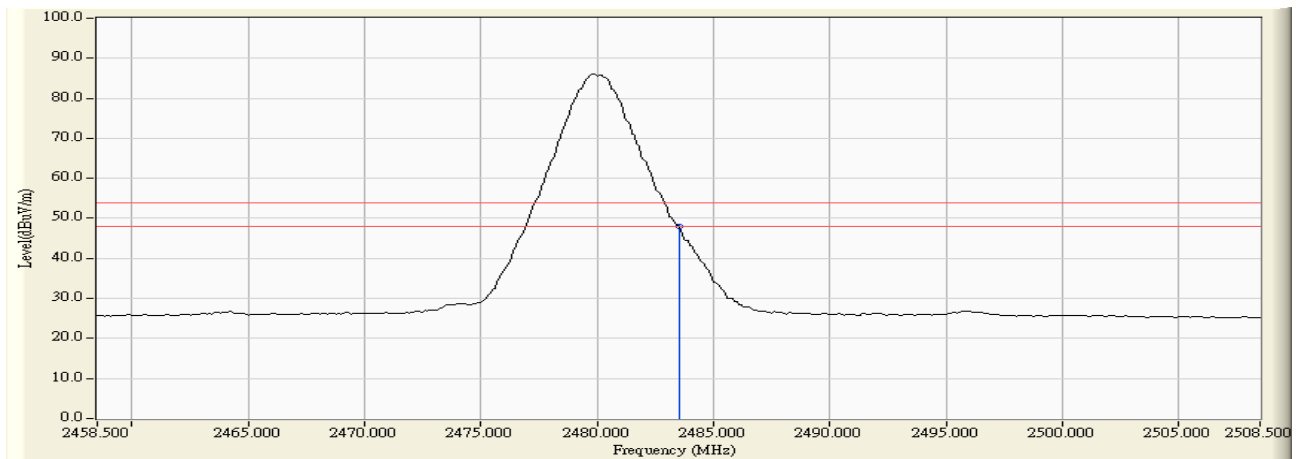


Figure Channel 78: (Vertical) (Average)



Note:

1. All readings above 1GHz are performed with peak and/or average measurements as necessary.
2. Peak measurements: RBW = 1MHz, VBW = 3 MHz, Sweep: Auto.
3. Average measurements: RBW = 1MHz, VBW = 10 Hz, Sweep: Auto.
4. “ * ”, means this data is the worst emission level.
5. Measurement Level = Reading Level + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection..

7. Channel Number

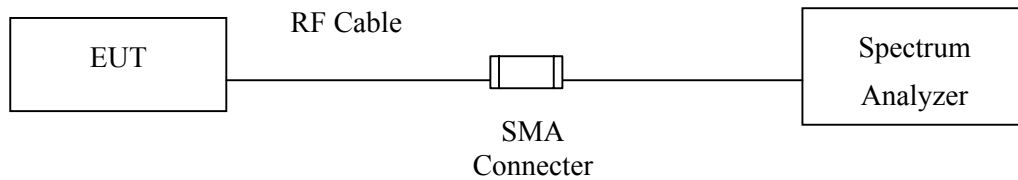
7.1. Test Equipment

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

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R & S	FSP40 / 100170	Nov, 2007
X Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2007

- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

7.2. Test Setup



7.3. Limit

Number of hopping frequencies ≥ 75

7.4. Test Procedures

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

Span = the frequency band of operation

RBW $\geq 1\%$ of the span , VBW \geq RBW

Sweep = auto, Detector function = peak, Trace = max hold

7.5. Uncertainty

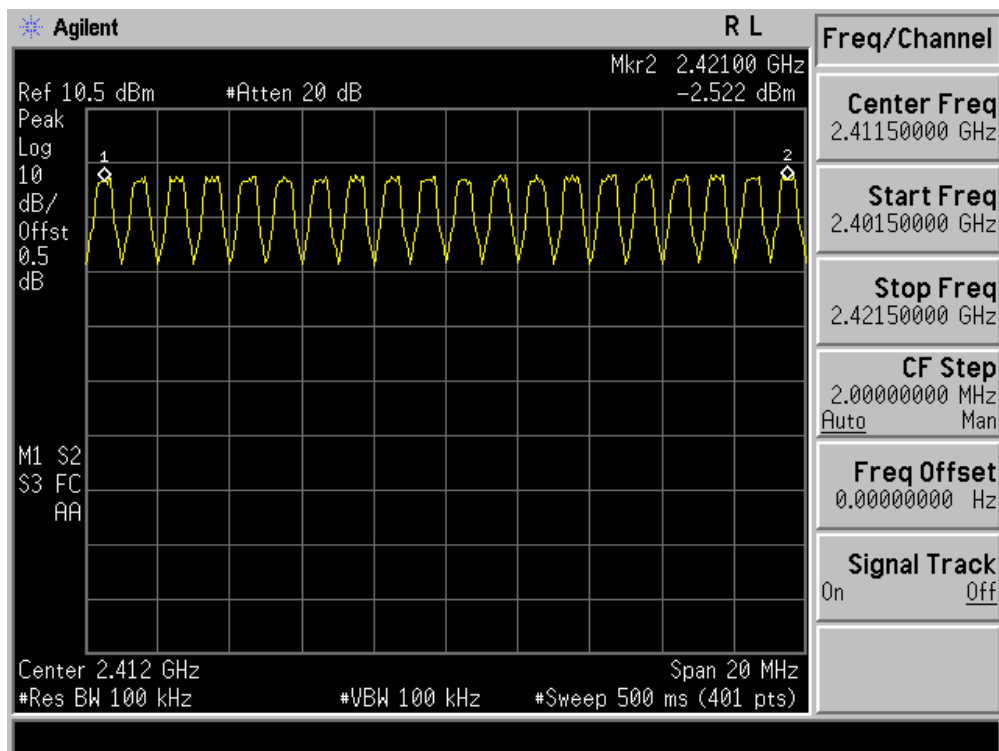
N/A

7.6. Test Result of Channel Number

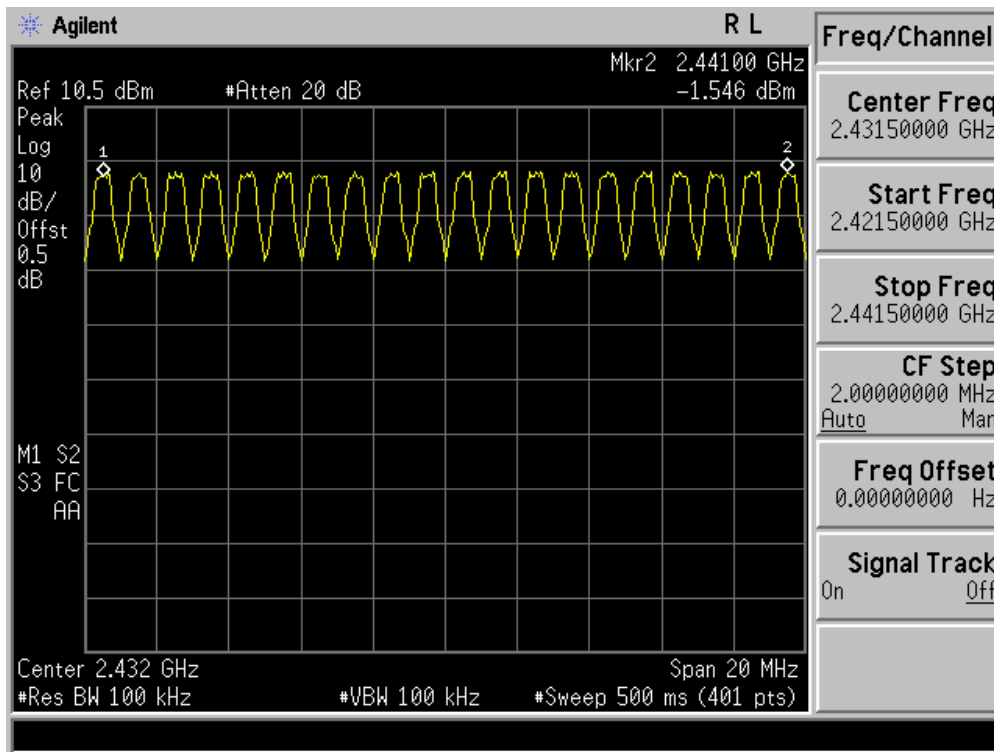
Product : PND
 Test Item : Channel Number
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)

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

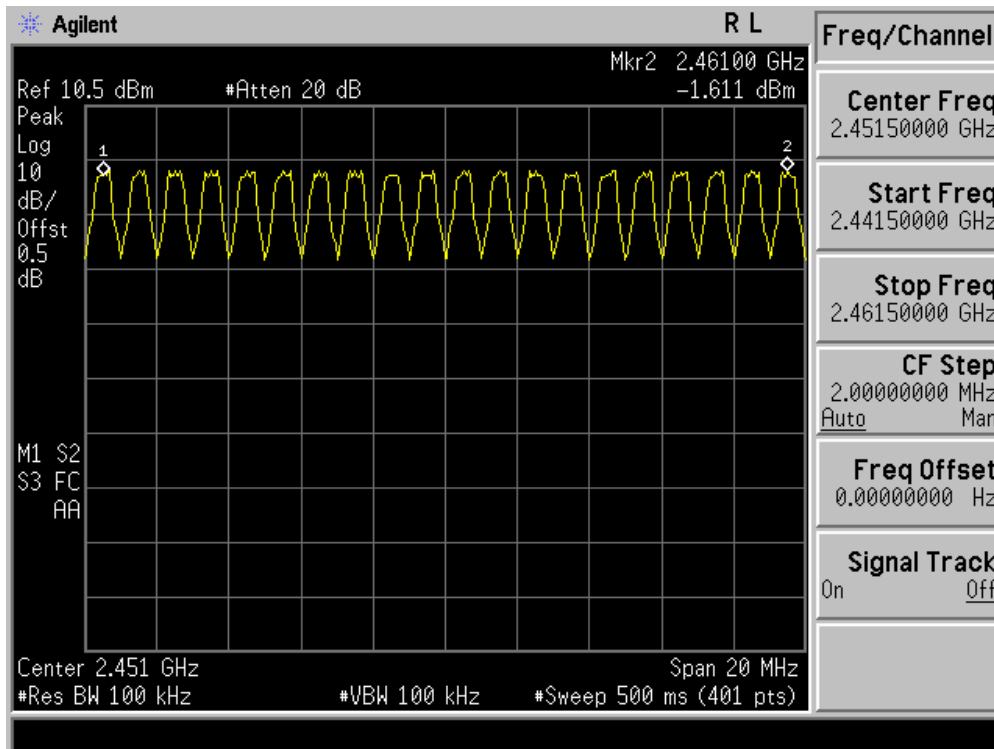
2402-2421MHz



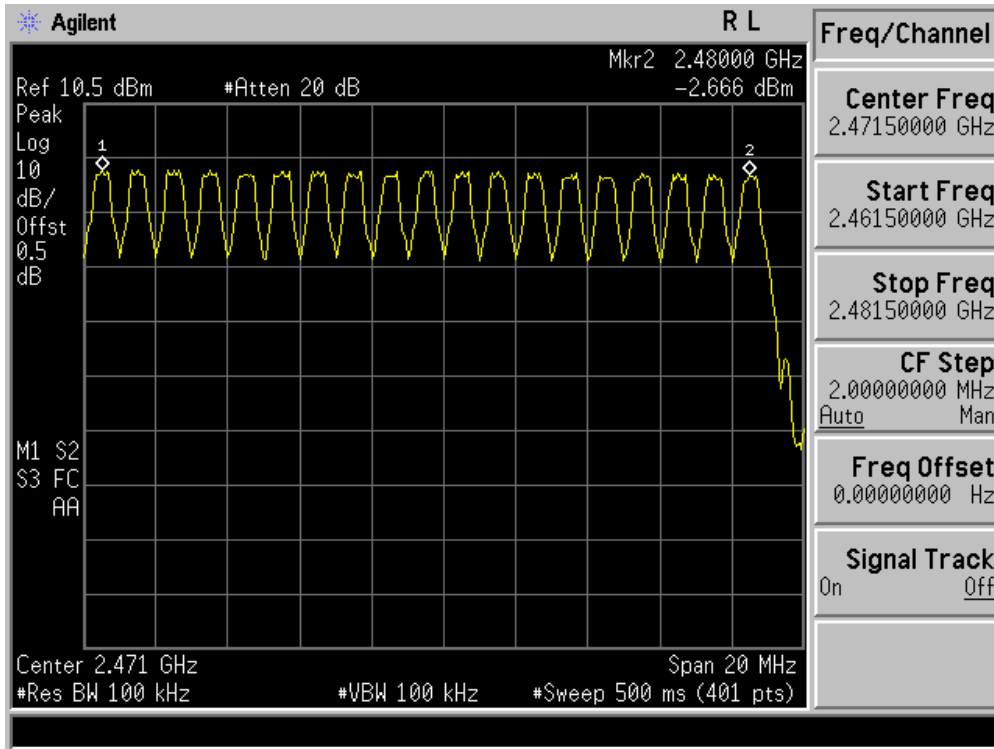
2422-2441MHz



2442-2461MHz



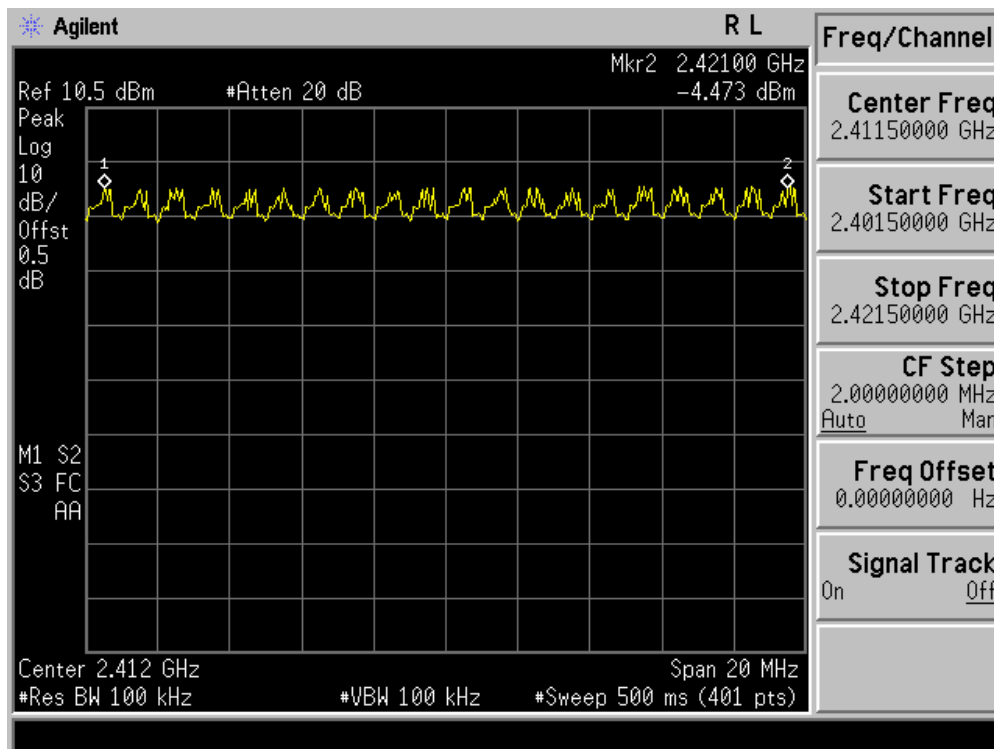
2462-2480MHz



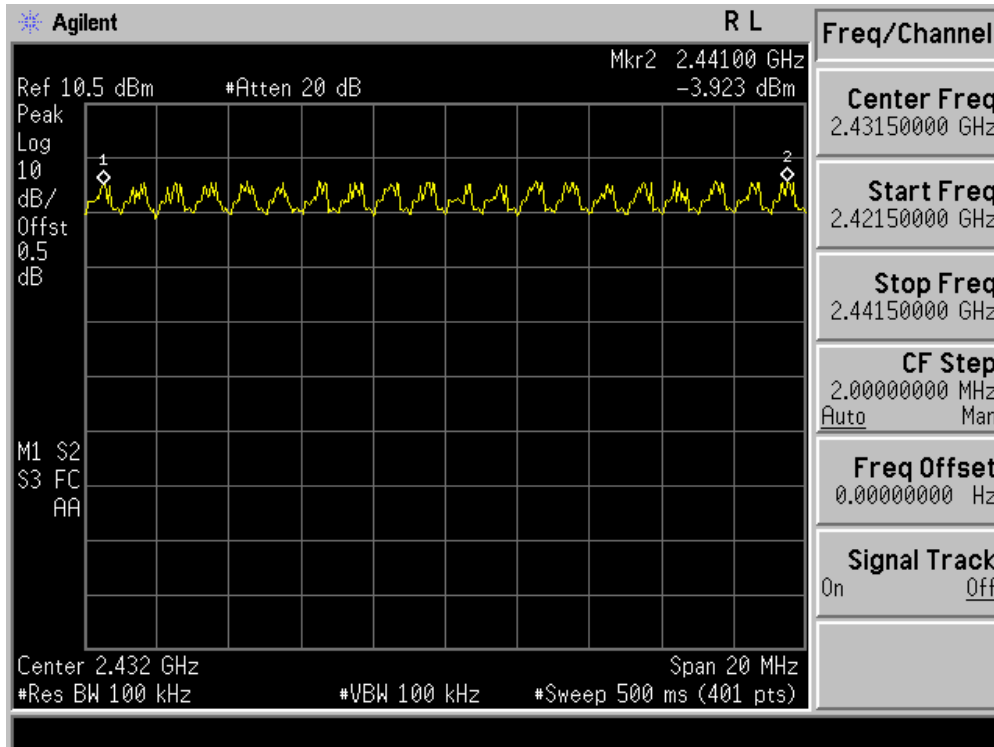
Product : PND
 Test Item : Channel Number
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)

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

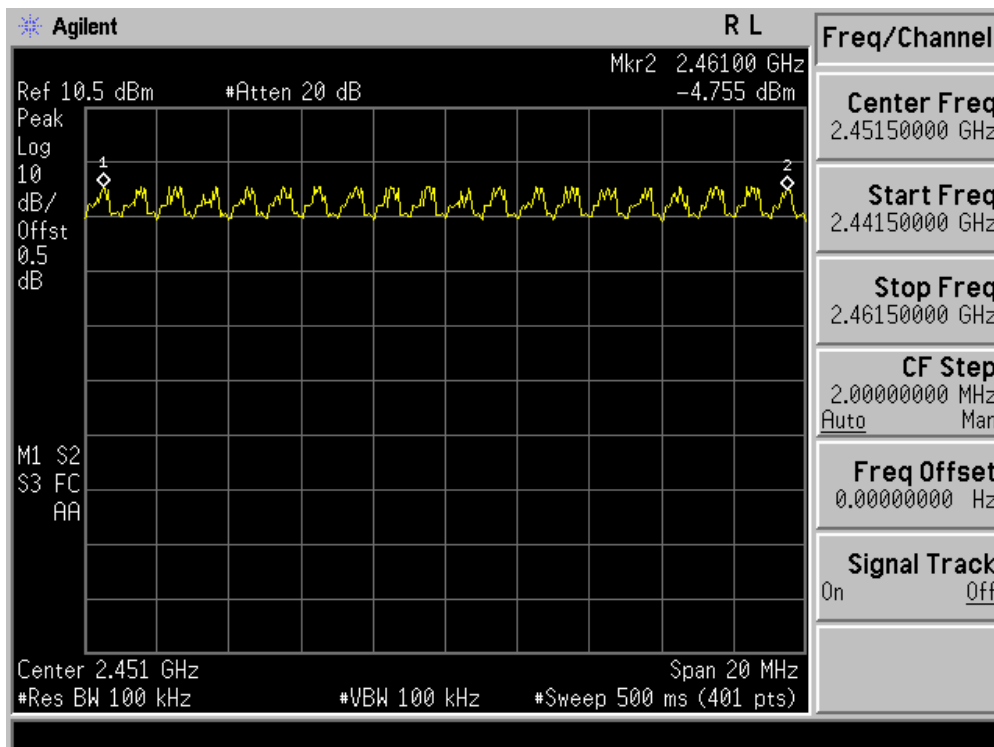
2402-2421MHz



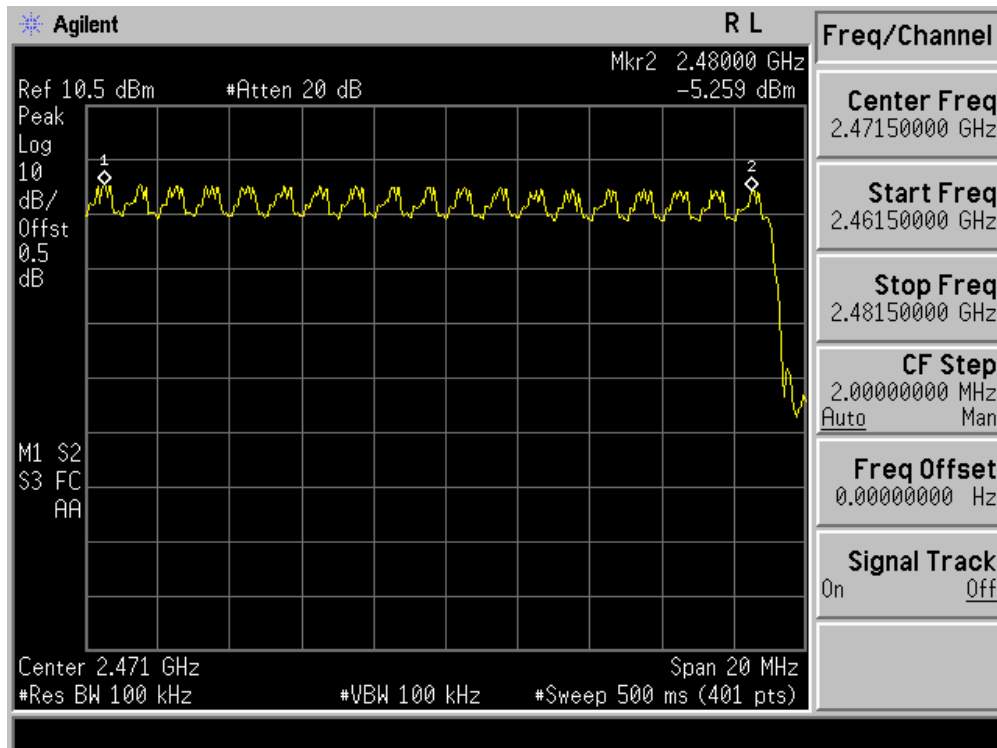
2422-2441MHz



2442-2461MHz



2462-2480MHz



8. Channel Separation

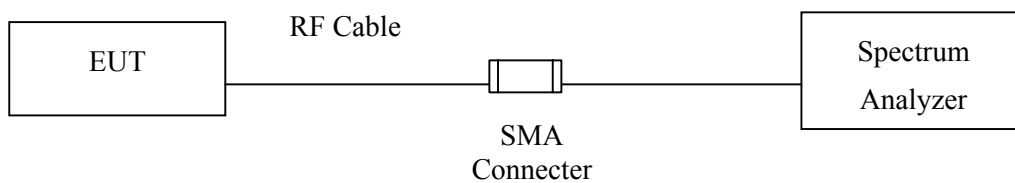
8.1. Test Equipment

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

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R & S	FSP40 / 100170	Nov, 2007
X Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2007

- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “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 20 dB bandwidth of the hopping channel, whichever is greater.

8.4. Test Procedures

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

Span = Capture the peaks of two adjacent channels

Resolution Bandwidth (RBW) \geq 1% of the span, VBW \geq RBW

Sweep = auto, Detector function = peak, Trace = max hold

8.5. Uncertainty

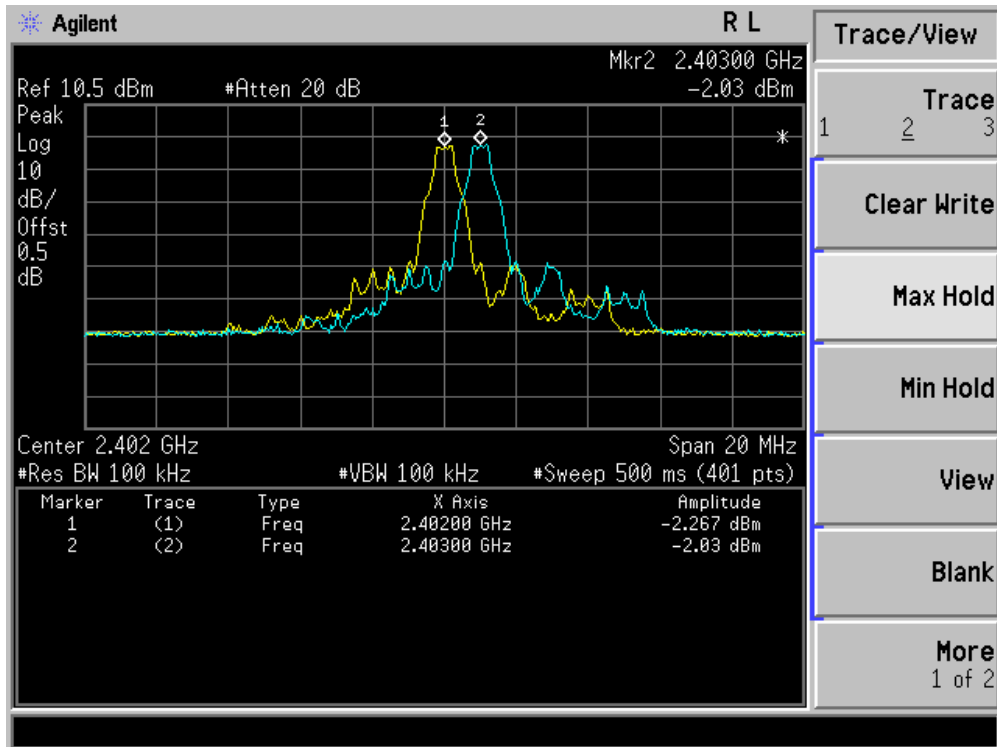
\pm 150Hz

8.6. Test Result of Channel Separation

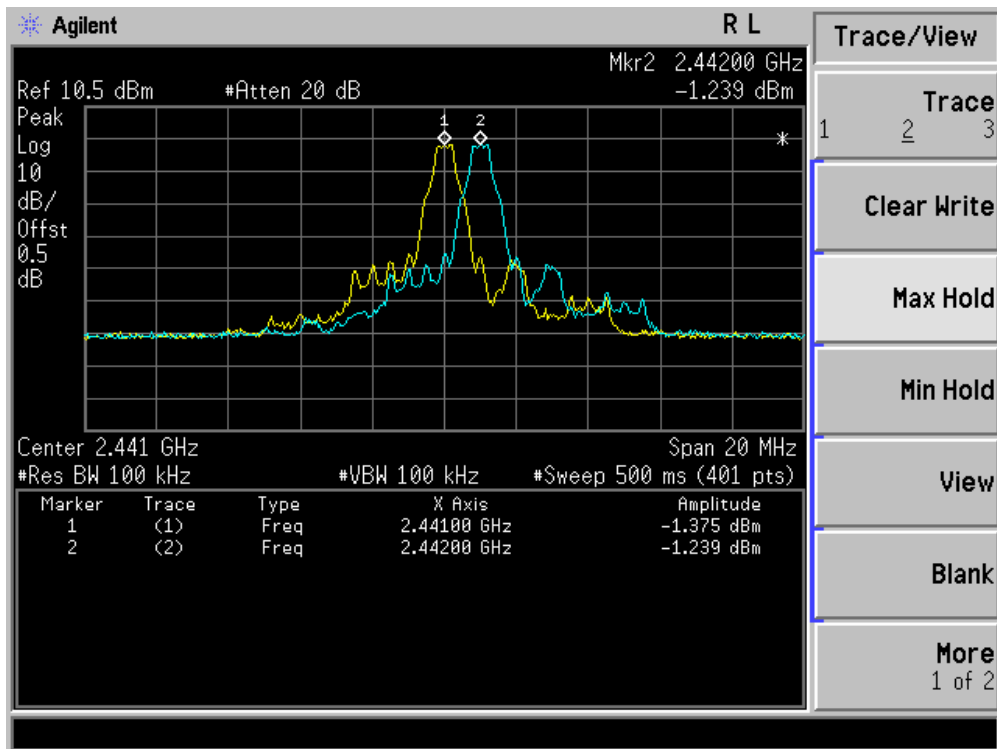
Product : PND
 Test Item : Channel Separation
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)

Frequency Range (MHz)	Measured Result (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

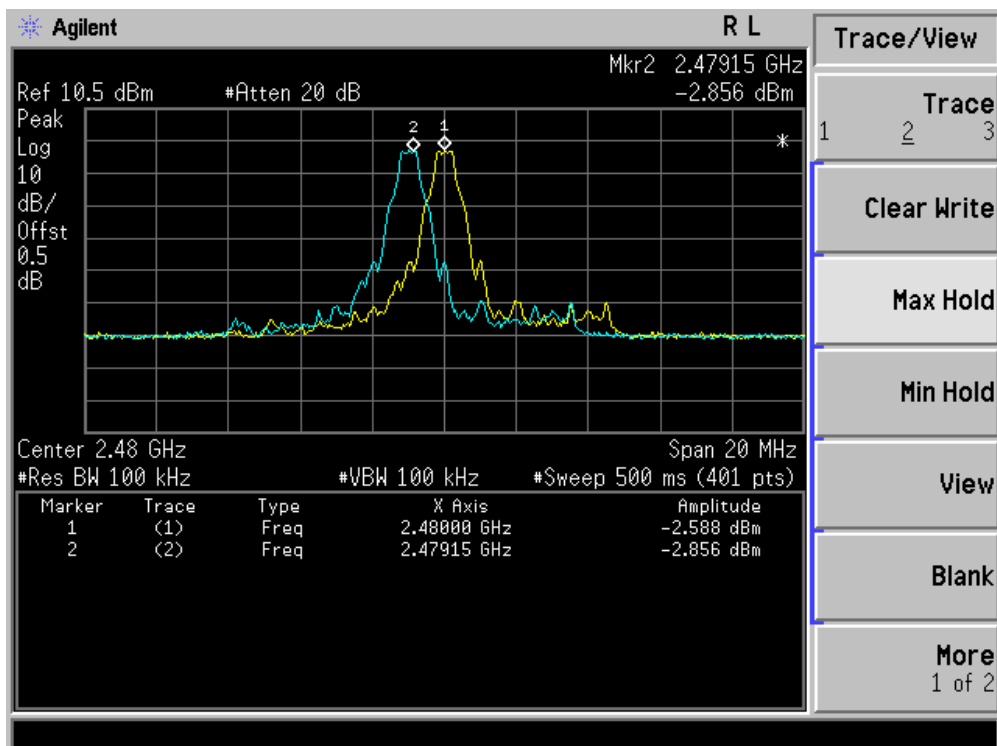
2402-2403MHz



2441-2442MHz



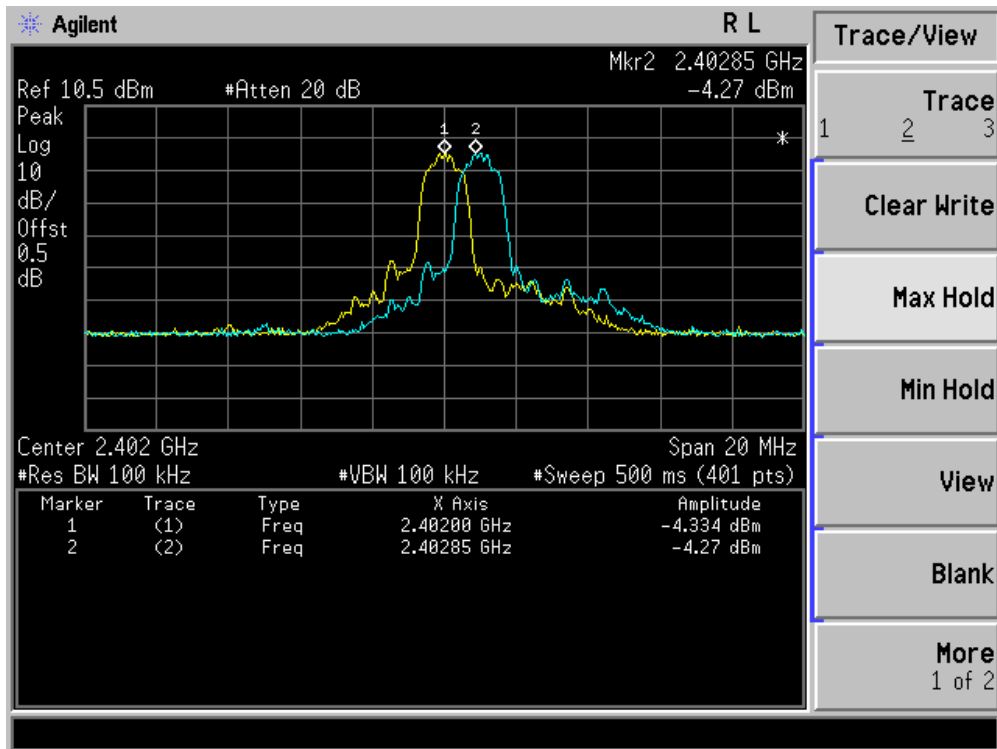
2479-2480MHz



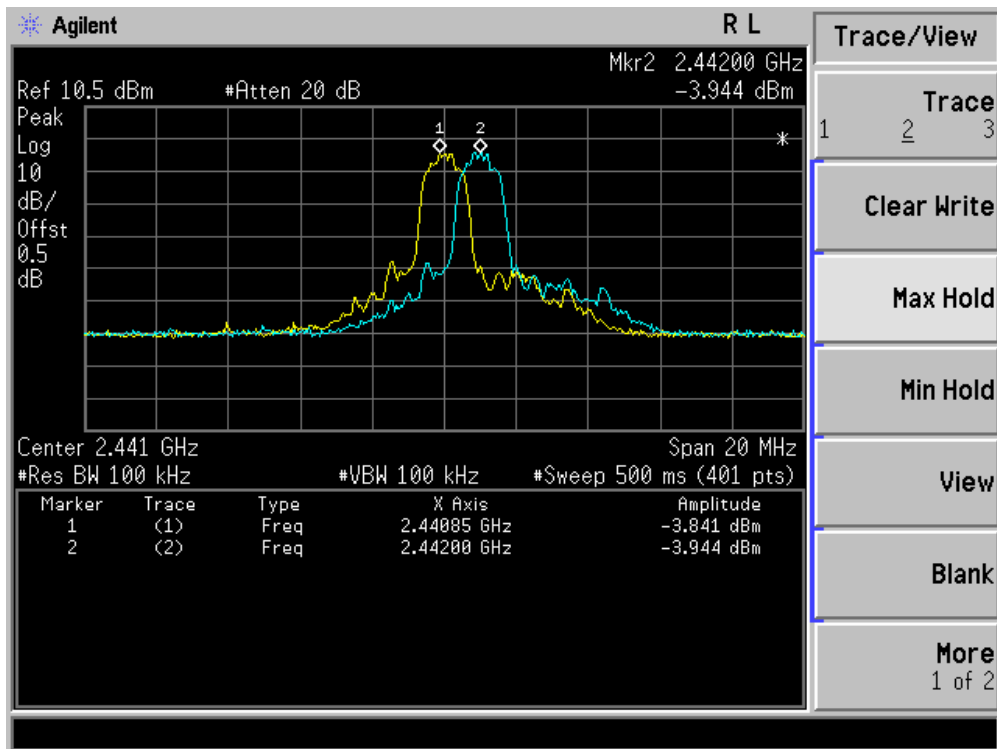
Product : PND
 Test Item : Channel Separation
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)

Frequency Range (MHz)	Measured Result (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

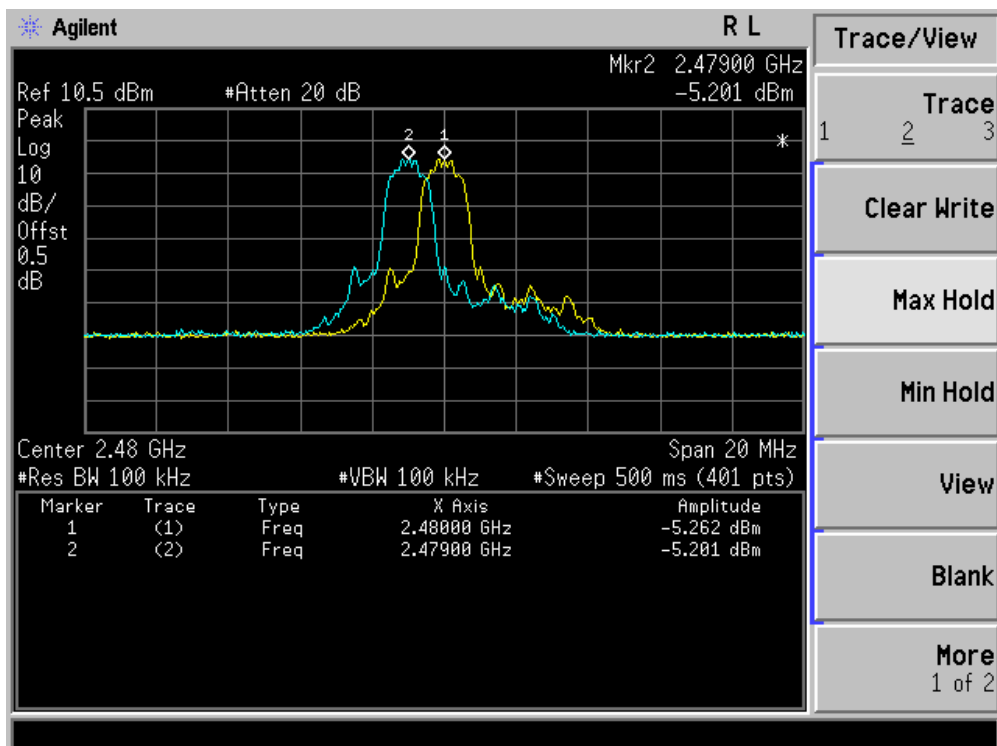
2402-2403MHz



2441-2442MHz



2479-2480MHz



9. Dwell Time

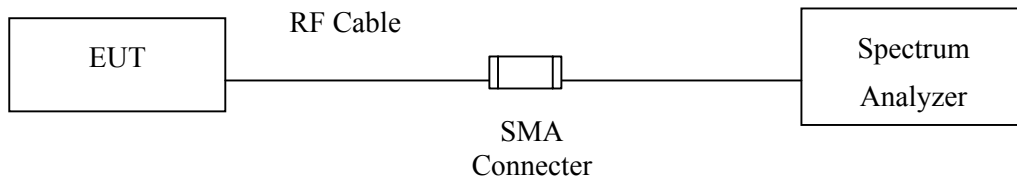
9.1. Test Equipment

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

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R & S	FSP40 / 100170	Nov, 2007
X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2007

Note: 1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

9.2. Test Setup



9.3. Limit

For frequency hopping systems operating in the 2400-2483.5 MHz bands. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

9.4. Test Procedures

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 hopping function of the EUT is enabled.

Span = zero span, centered on a hopping channel

RBW = 1 MHz, VBW ≥ RBW

Sweep = Capture the entire dwell time per hopping channel

Detector function = peak, Trace = max hold

9.5. Uncertainty

± 25msec

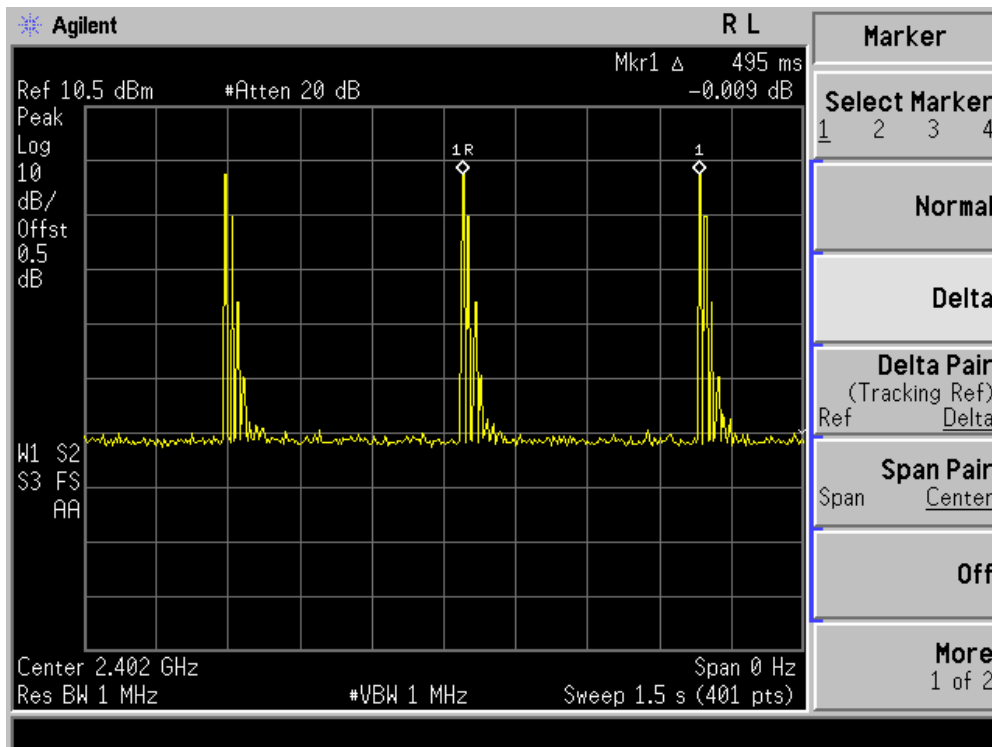
9.6. Test Result of Dwell Time

Product : PND
 Test Item : Dwell Time
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)(DH5)

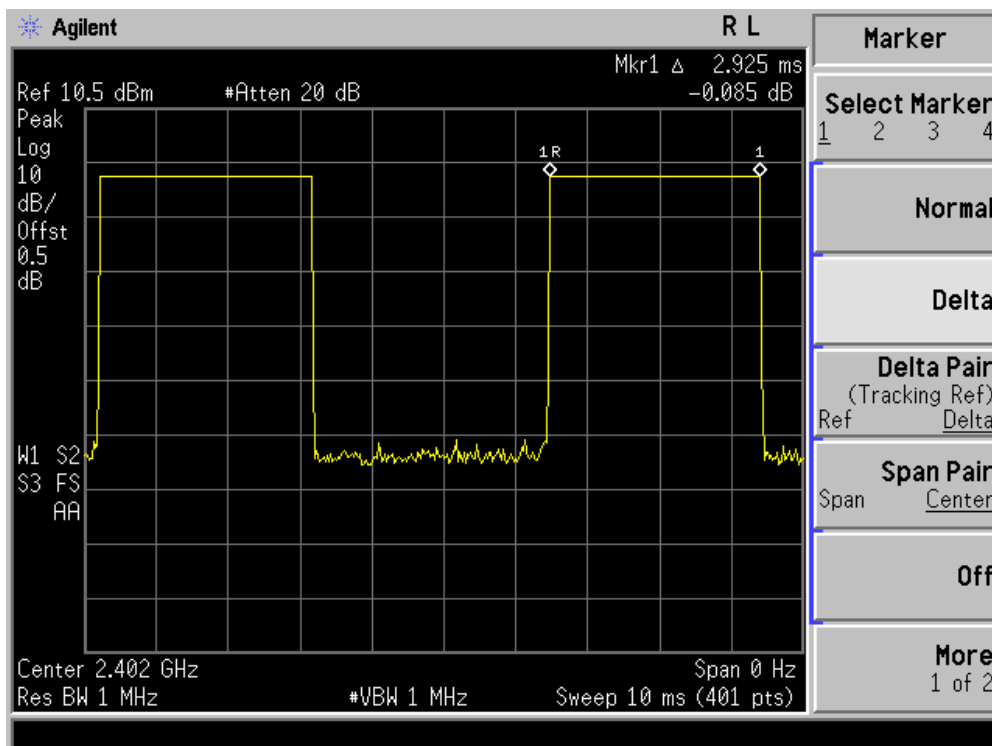
Channel No.	Frequency (MHz)	Time Interval between hops (ms)	Transmission Time (us)	Dwell Time (ms)	Limit (ms)	Result
00	2402	495	2925	186.7272727	400	Pass
39	2441	495	2925	186.7272727	400	Pass
78	2480	495	2900	185.1313131	400	Pass

Note: Dwell Time = $79 * 400 / \text{Time Interval Between Hops} * \text{Transmission Time} / 1000$

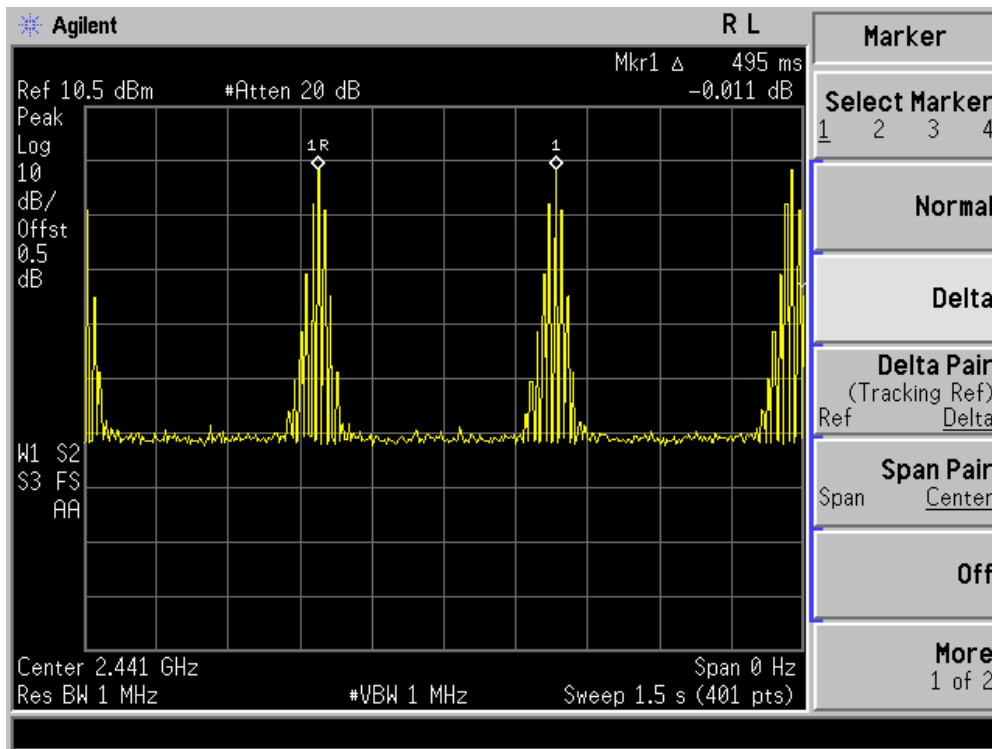
CH00 Time Interval between hops



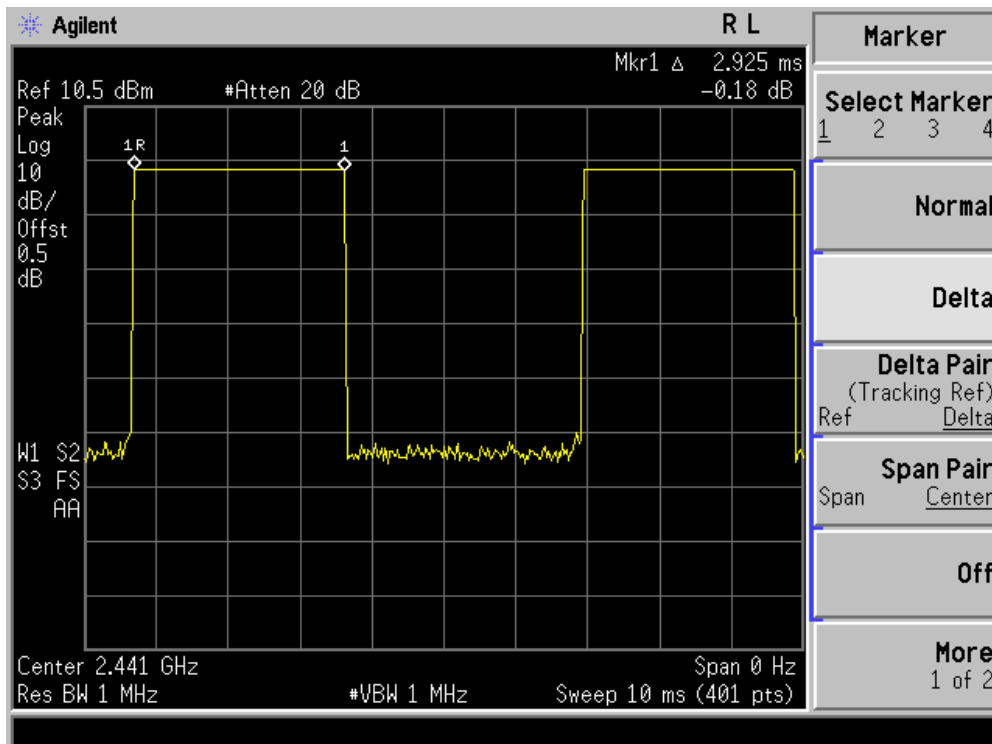
CH00 Transmission Time



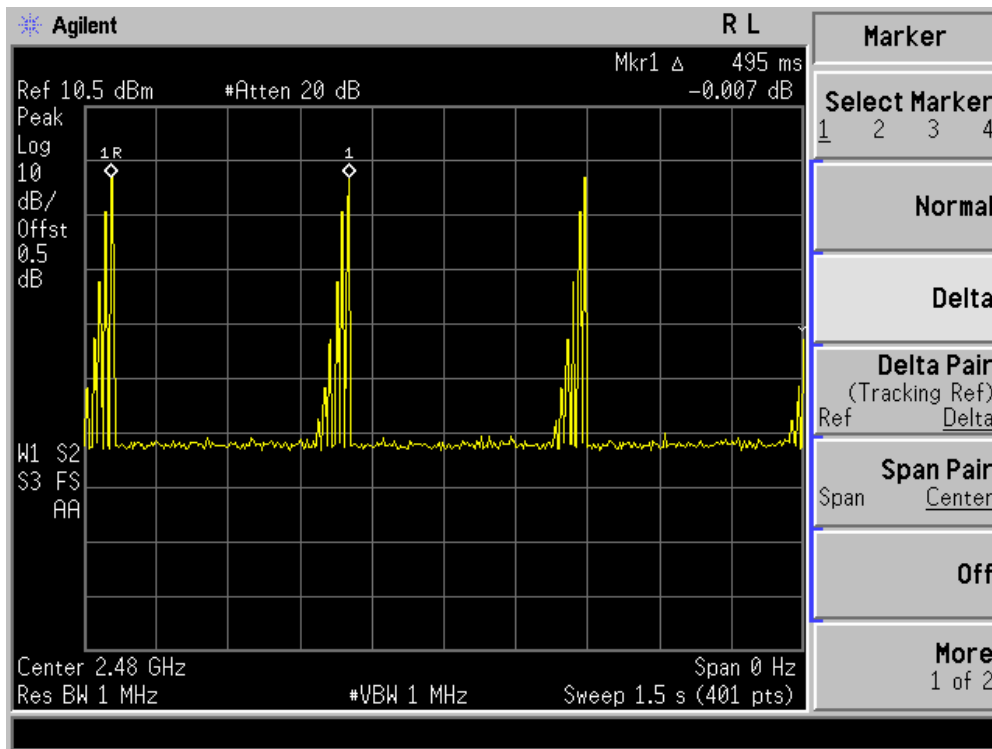
CH39 TIME INTERVAL BETWEEN HOPS



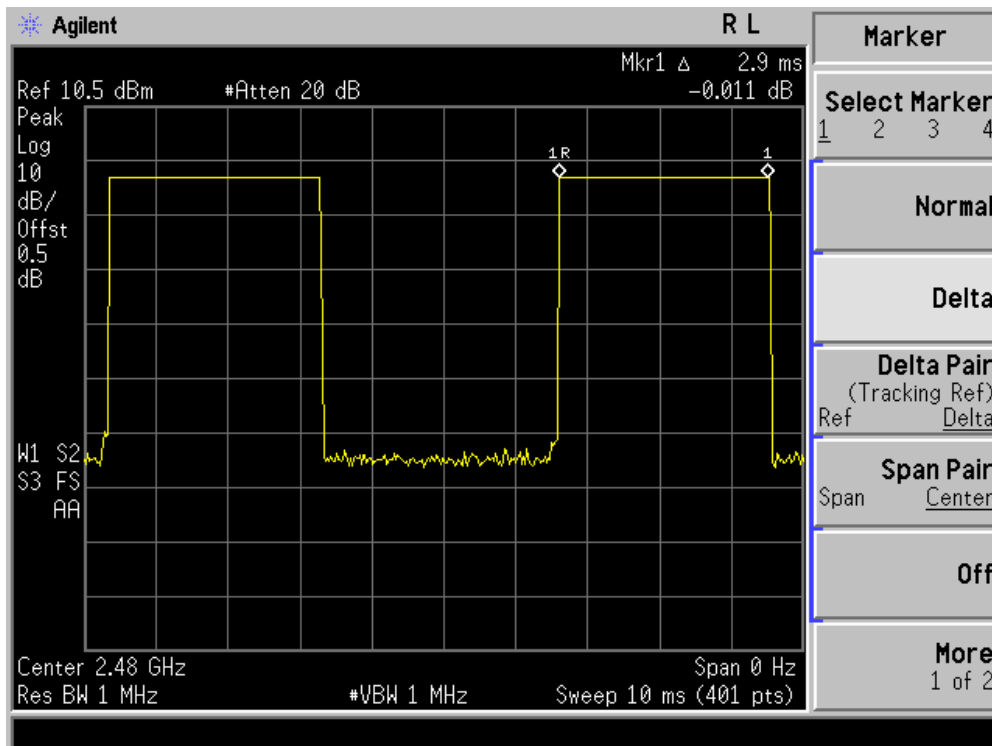
CH39 Transmission Time



CH78 Time Interval between hops



CH78 Transmission Time



NOTE:

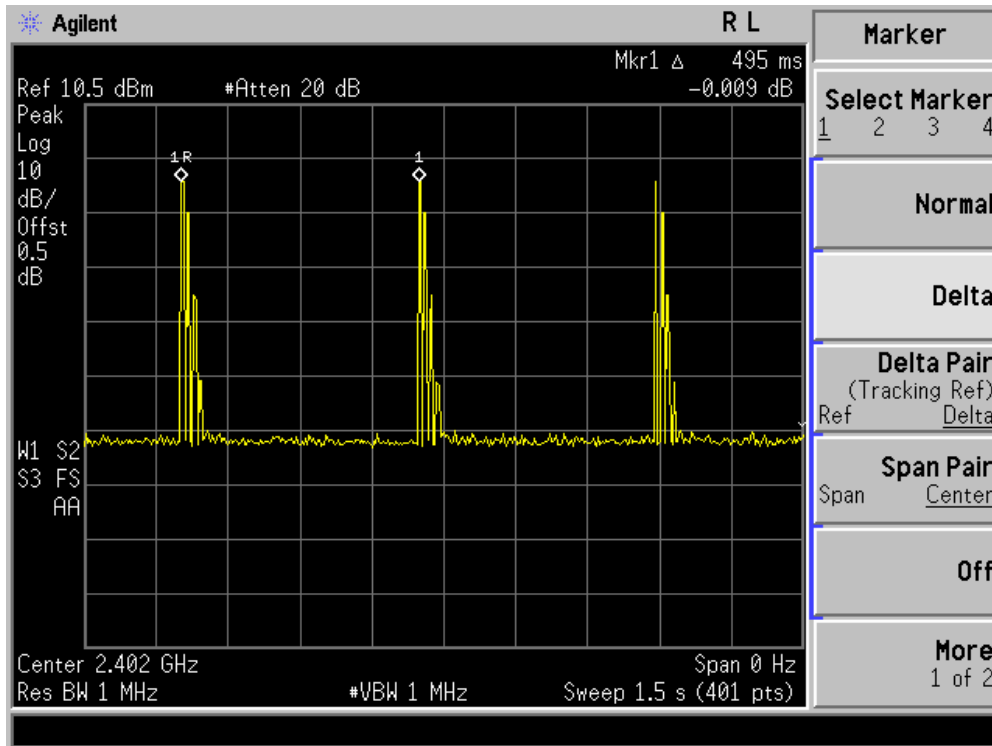
The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case DH5 is shown on the report.

Product : PND
Test Item : Dwell Time
Test Site : No.3 OATS
Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)(DH5)

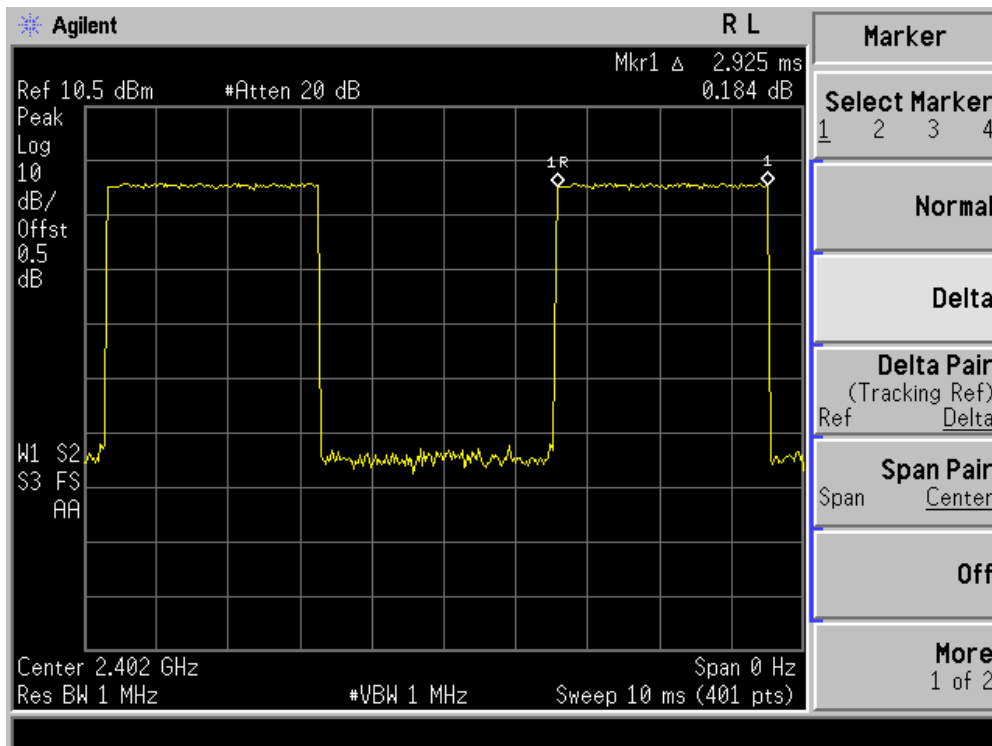
Channel No.	Frequency (MHz)	Time Interval between hops (ms)	Transmission Time (us)	Dwell Time (ms)	Limit (ms)	Result
00	2402	495	2925	186.7272727	400	Pass
39	2441	495	2925	186.7272727	400	Pass
78	2480	495	2900	185.1313131	400	Pass

Note: Dwell Time = $79 * 400 / \text{Time Interval Between Hops} * \text{Transmission Time} / 1000$

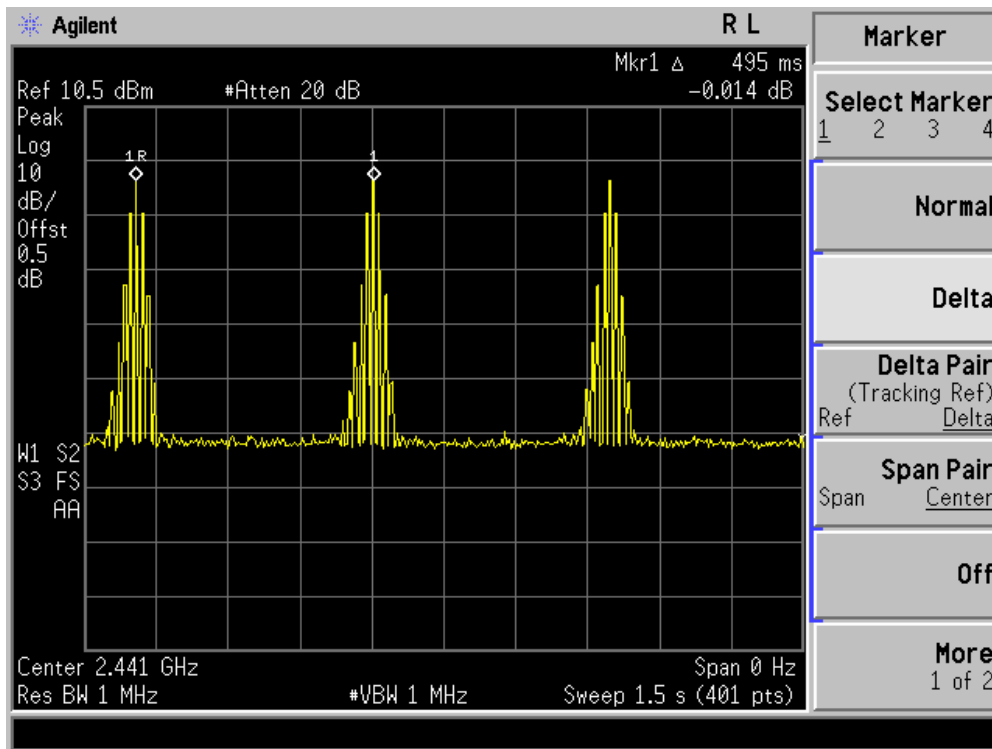
CH00 Time Interval between hops



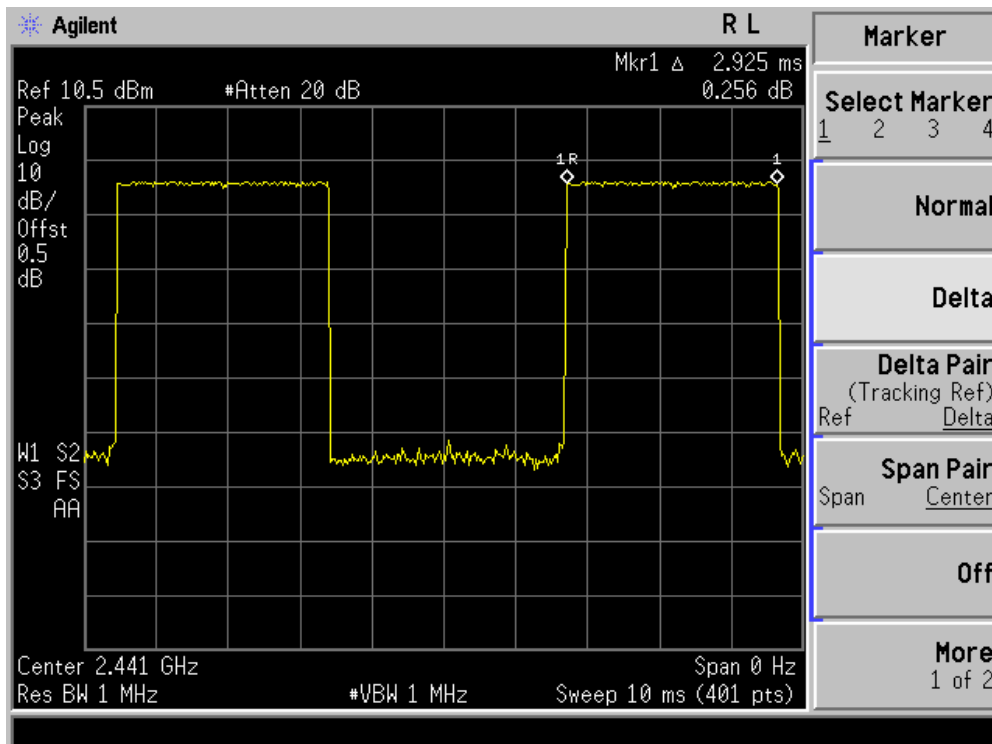
CH00 Transmission Time



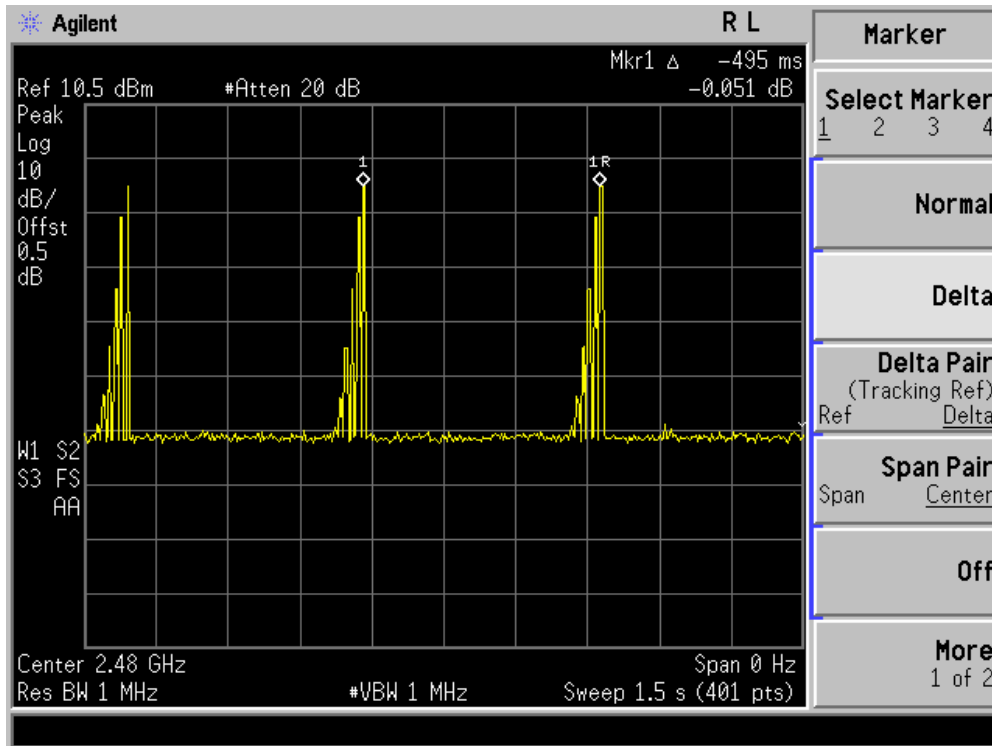
CH39 TIME INTERVAL BETWEEN HOPS



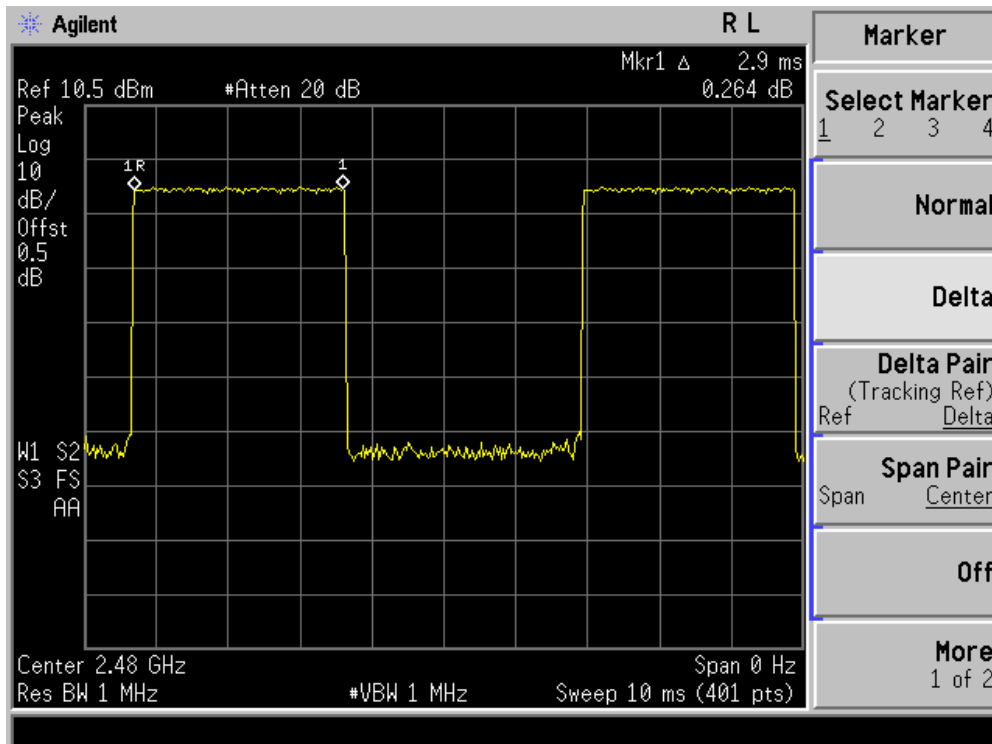
CH39 Transmission Time



CH78 TIME INTERVAL BETWEEN HOPS



CH78 Transmission Time



NOTE:

The dwell times of the packet type of DH1, DH3, and DH5 are tested. Only the worst case DH5 is shown on the report.

10. Occupied Bandwidth

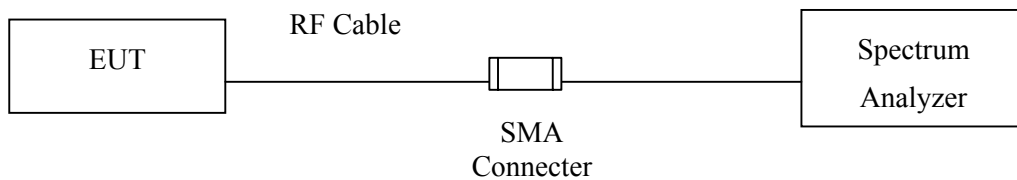
10.1. Test Equipment

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

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R & S	FSP40 / 100170	Nov, 2007
X Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2007

- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with “X” are used to measure the final test results.

10.2. Test Setup



10.3. Limits

N/A

10.4. Test Procedures

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

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20 dB bandwidth, centered on a hopping channel

RBW \geq 1% of the 20 dB bandwidth, VBW \geq RBW

Sweep = auto, Detector function = peak, Trace = max hold

The EUT should be transmitting at its maximum data rate.

10.5. Uncertainty

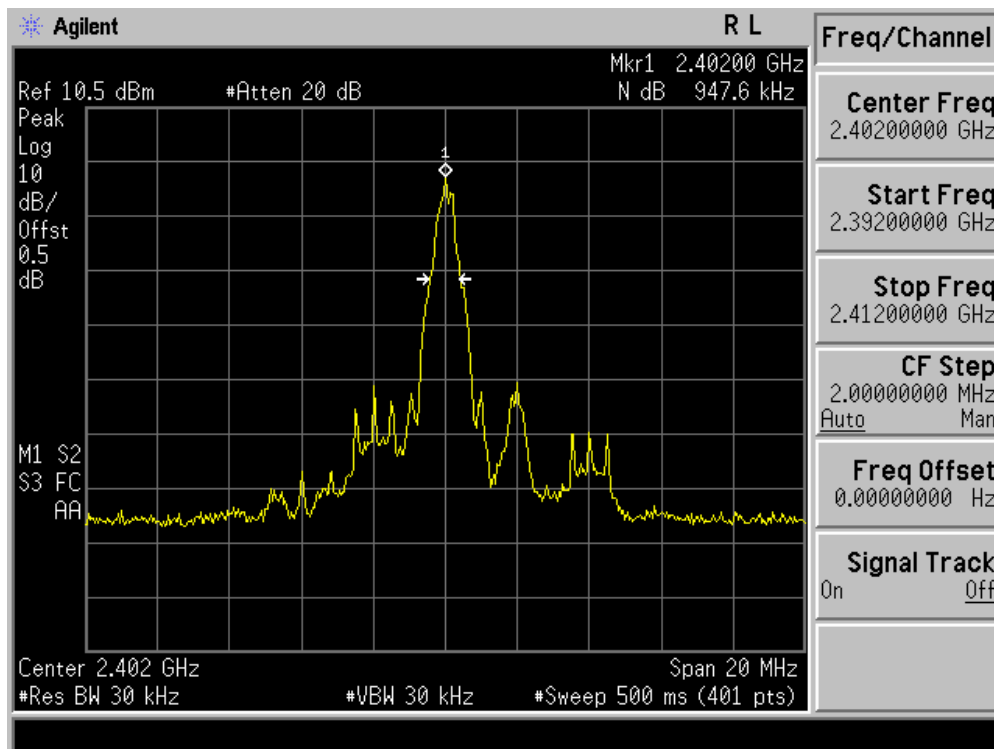
\pm 150Hz

10.6. Test Result of Occupied Bandwidth

Product : PND
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)

Channel No.	Frequency (MHz)	20 dB bandwidth (kHz)	Required Limit (kHz)	Result
00	2402	947.6	--	Pass

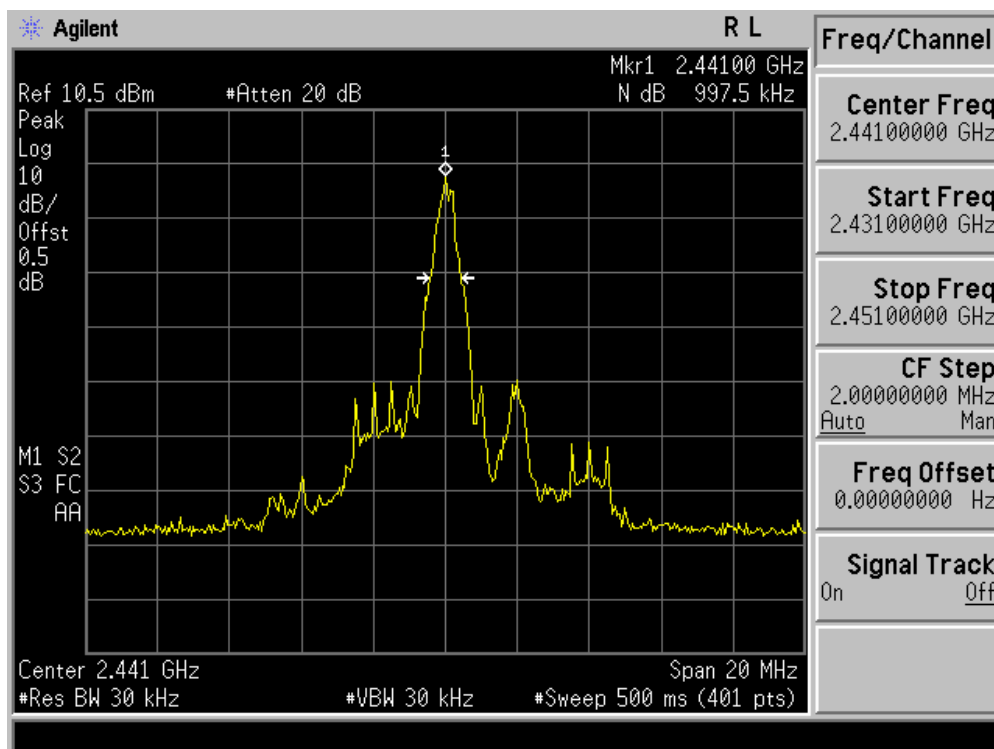
Figure Channel 00:



Product : PND
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)

Channel No.	Frequency (MHz)	20dB bandwidth (kHz)	Required Limit (kHz)	Result
39	2441	997.5	--	Pass

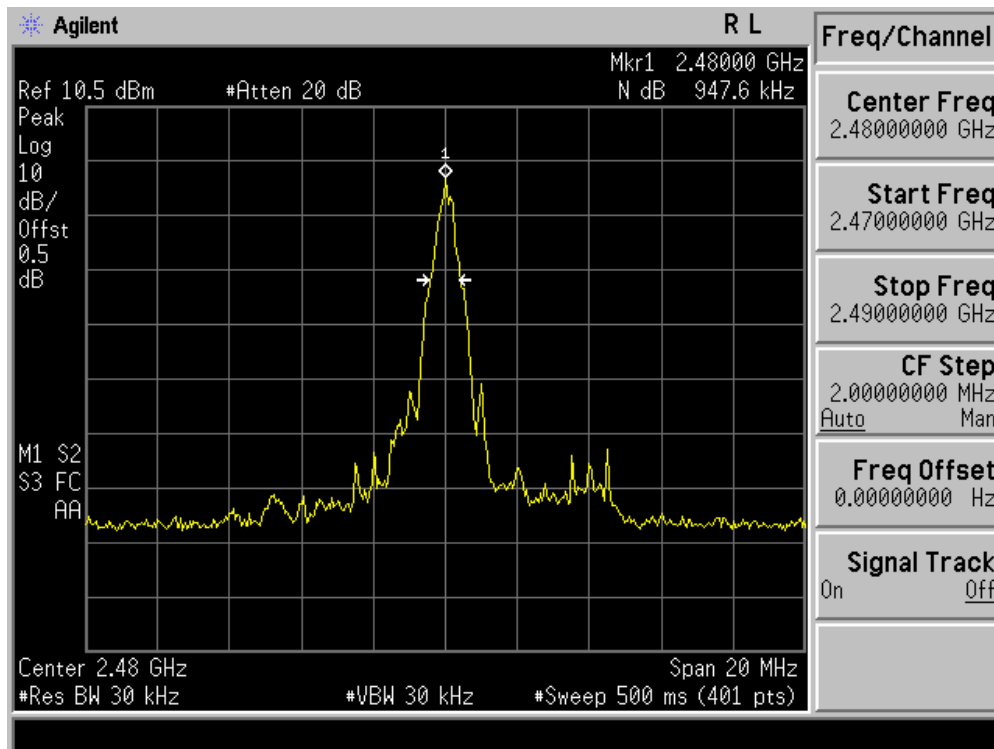
Figure Channel 39:



Product : PND
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmitter -1Mbps(GFSK)

Channel No.	Frequency (MHz)	20dB bandwidth (kHz)	Required Limit (kHz)	Result
78	2480	947.6	--	Pass

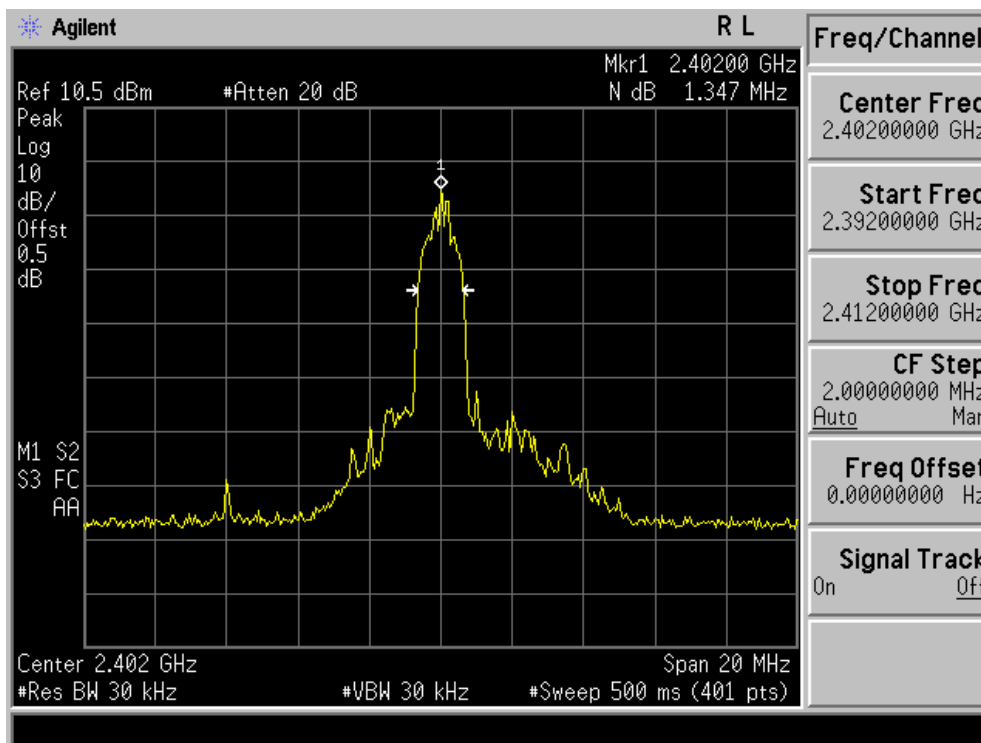
Figure Channel 78:



Product : PND
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)

Channel No.	Frequency (MHz)	20 dB bandwidth (kHz)	Required Limit (kHz)	Result
00	2402	1347	--	Pass

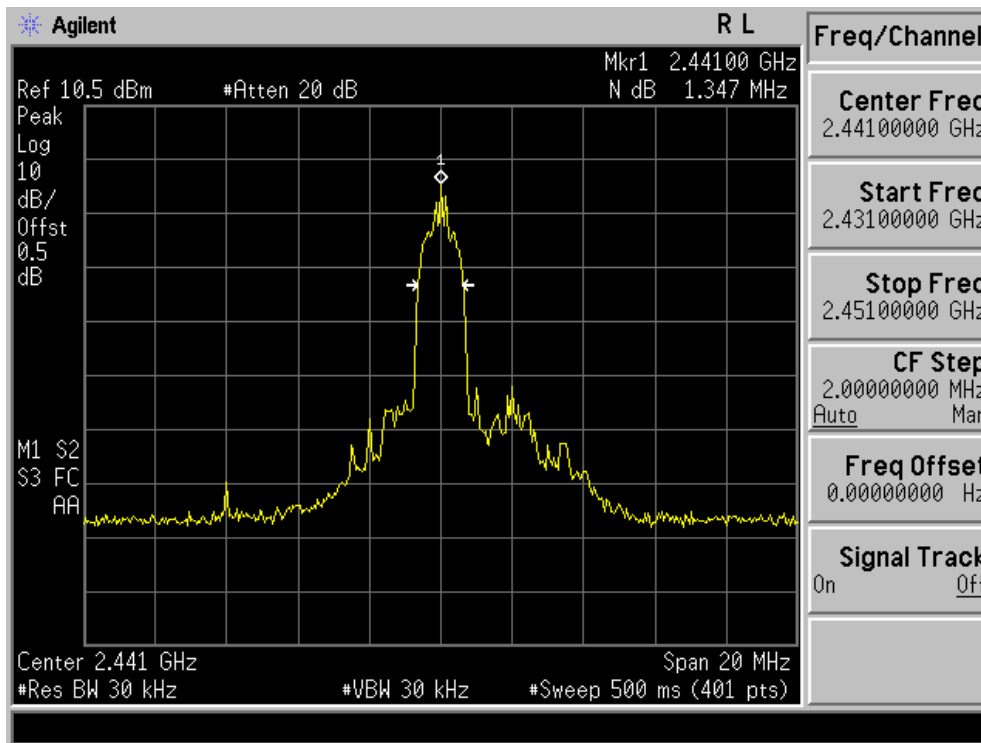
Figure Channel 00:



Product : PND
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)

Channel No.	Frequency (MHz)	20dB bandwidth (kHz)	Required Limit (kHz)	Result
39	2441	1347	--	Pass

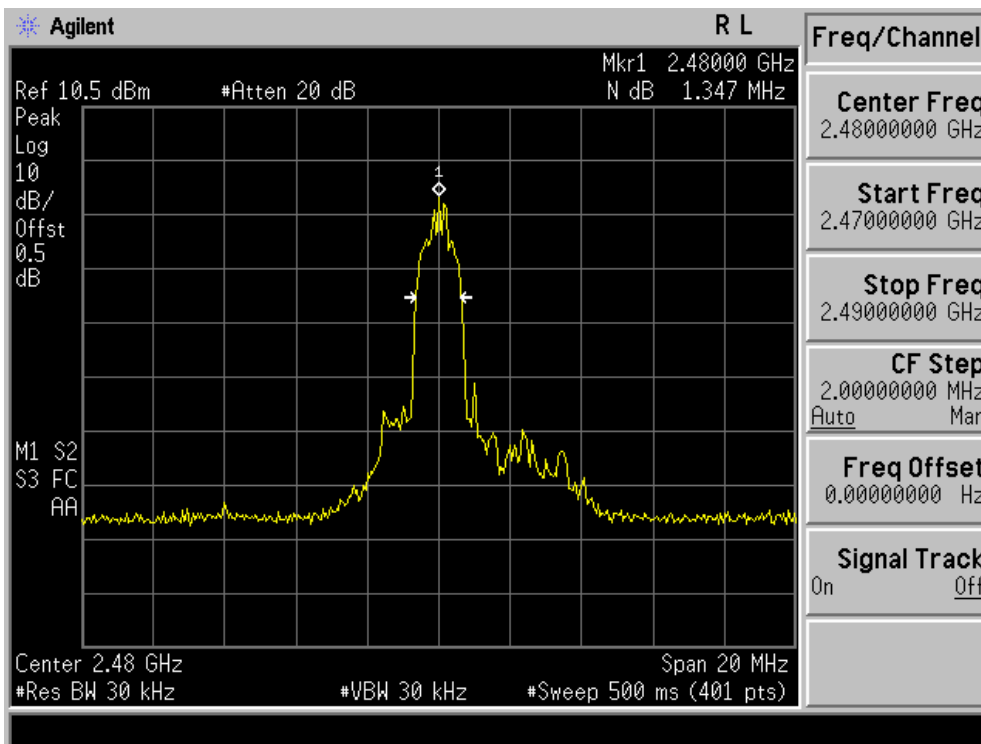
Figure Channel 39:



Product : PND
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmitter -3Mbps(8DPSK)

Channel No.	Frequency (MHz)	20dB bandwidth (kHz)	Required Limit (kHz)	Result
78	2480	1347	--	Pass

Figure Channel 78:



11. EMI Reduction Method During Compliance Testing

No modification was made during testing.