

FCC Test Report

Product Name	Notebook
Model No.	EF20EA
FCC ID.	WL6-EF2BC40EA3

Applicant	ELITEGROUP COMPUTER SYSTEMS CO., LTD.
Address	No.239, Sec. 2, Ti Ding Blvd., Taipei, Taiwan

Date of Receipt	Sep. 01, 2015
Issued Date	Sep. 22, 2015
Report No.	1590121R-RFUSP23V00
Report Version	V1.0



The test results relate only to the samples tested.

The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

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

Test Report

Issued Date: Sep. 22, 2015

Report No.: 1590121R-RFUSP23V00



Product Name	Notebook
Applicant	ELITEGROUP COMPUTER SYSTEMS CO., LTD.
Address	No.239, Sec. 2, Ti Ding Blvd., Taipei, Taiwan
Manufacturer	Elitegroup Computer Systems(SIP) CO., LTD.
Model No.	EF20EA
FCC ID.	WL6-EF2BC40EA3
EUT Rated Voltage	AC 100-240V, 50-60Hz
EUT Test Voltage	AC 120V/60Hz
Trade Name	ECS
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2014 ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By :

Leven Huang

(Senior Adm. Specialist / Leven Huang)

Tested By :

Nova chu

(Engineer / Nova Chu)

Approved By :

Vincent Lin

(Director / Vincent Lin)

TABLE OF CONTENTS

Description	Page
1. GENERAL INFORMATION	5
1.1. EUT Description.....	5
1.2. Operational Description.....	7
1.3. Tested System Details.....	8
1.4. Configuration of Tested System	8
1.5. EUT Exercise Software	8
1.6. Test Facility	9
2. CONDUCTED EMISSION	10
2.1. Test Equipment.....	10
2.2. Test Setup	10
2.3. Limits.....	11
2.4. Test Procedure	11
2.5. Uncertainty	11
2.6. Test Result of Conducted Emission.....	12
3. PEAK POWER OUTPUT	14
3.1. Test Equipment.....	14
3.2. Test Setup	14
3.3. Limit	14
3.4. Test Procedure	14
3.5. Uncertainty	14
3.6. Test Result of Peak Power Output.....	15
4. RADIATED EMISSION	17
4.1. Test Equipment.....	17
4.2. Test Setup	17
4.3. Limits.....	18
4.4. Test Procedure	19
4.5. Uncertainty	19
4.6. Test Result of Radiated Emission.....	20
5. RF ANTENNA CONDUCTED TEST	28
5.1. Test Equipment.....	28
5.2. Test Setup	28
5.3. Limits.....	28
5.4. Test Procedure	28
5.5. Uncertainty	28
5.6. Test Result of RF Antenna Conducted Test.....	29
6. BAND EDGE	31
6.1. Test Equipment.....	31
6.2. Test Setup	31
6.3. Limit	32
6.4. Test Procedure	32
6.5. Uncertainty	32
6.6. Test Result of Band Edge	33
7. CHANNEL NUMBER.....	45
7.1. Test Equipment.....	45
7.2. Test Setup	45
7.3. Limit	45
7.4. Test Procedure	45
7.5. Uncertainty	45
7.6. Test Result of Channel Number.....	46
8. CHANNEL SEPARATION.....	48
8.1. Test Equipment.....	48
8.2. Test Setup	48
8.3. Limit	48
8.4. Test Procedure	48
8.5. Uncertainty	48
8.6. Test Result of Channel Separation.....	49
9. DWELL TIME.....	53
9.1. Test Equipment.....	53

9.2.	Test Setup	53
9.3.	Limit	53
9.4.	Test Procedure	53
9.5.	Uncertainty	53
9.6.	Test Result of Dwell Time	54
10.	OCCUPIED BANDWIDTH	58
10.1.	Test Equipment	58
10.2.	Test Setup	58
10.3.	Limits	58
10.4.	Test Procedure	58
10.5.	Uncertainty	58
10.6.	Test Result of Occupied Bandwidth	59
11.	EMI REDUCTION METHOD DURING COMPLIANCE TESTING	63
Attachment 1: EUT Test Photographs		
Attachment 2: EUT Detailed Photographs		

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Notebook
Trade Name	ECS
Model No.	EF20EA
FCC ID.	WL6-EF2BC40EA3
Frequency Range	2402 – 2480MHz
Channel Number	79
Type of Modulation	FHSS: GFSK(1Mbps) / π /4DQPSK(2Mbps) / 8DPSK(3Mbps)
Antenna Type	PIFA Antenna
Antenna Gain	Refer to the table “Antenna List”
Channel Control	Auto
Power Adapter	MFR: APD, M/N: WA-24Q12FU Input: AC 100-240V, 50-60Hz, 0.7A Output: DC 12V, 2A Cable Out: Non-Shielded, 1.5m
Contain Module	AMPAK / AP6234

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	JEM	13B130-FW4070 (Main)	PIFA Antenna	1.39dBi For 2.4GHz
2	WGT	13B130-FW4050 (Main)	PIFA Antenna	2.77dBi for 2.4 GHz

Note:

1. The antenna of EUT conforms to FCC 15.203.
2. Only the higher gain antenna was tested and recorded in this report.

Center 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. The EUT is a Notebook with a built-in 2.4GHz WLAN and Bluetooth transceiver. this report for Bluetooth.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. Bluetooth operation was evaluated at both 1Mb/s and 3Mb/s data rates. 2Mb/s data rate was found, through pre-testing, to produce emissions similar to those for 3Mb/s.

Test Mode	Mode 1: Transmit - 1Mbps (GFSK) Mode 2: Transmit - 3Mbps (8DPSK)
-----------	---

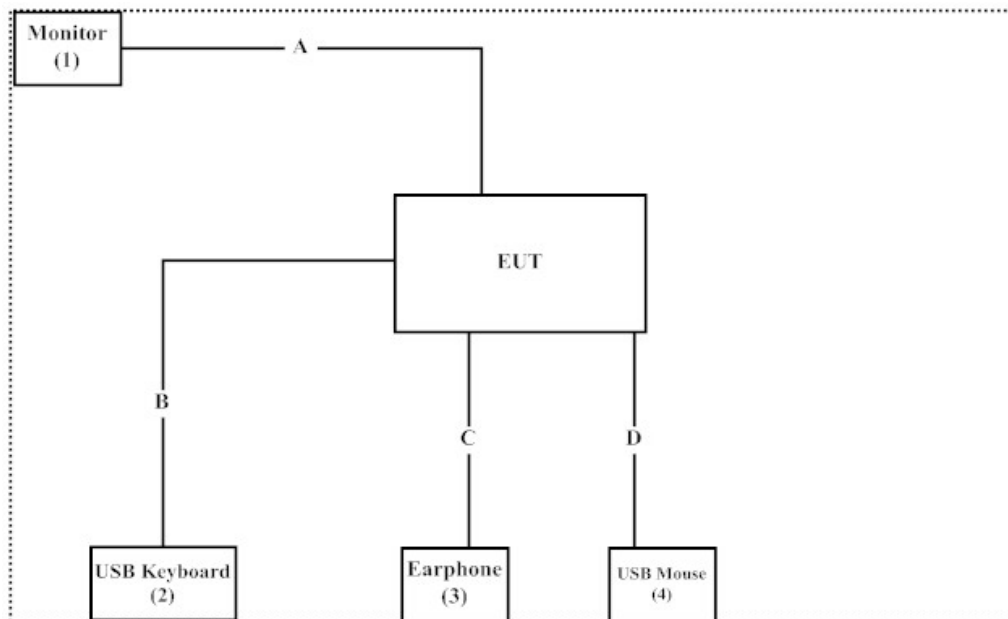
1.3. Tested System Details

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	Monitor	DELL	U2410f	CN-082WXD-72872-2 3E-ACDL	Non-Shielded, 1.8m
2	USB Keyboard	Logitech	Y-UR83	SY853UK	N/A
3	Earphone	Dr.AV	CD-806B	N/A	N/A
4	USB Mouse	DELL	MO56UOA	G0Y02ERZ	N/A

Signal Cable Type	Signal cable Description
A HDMI Cable	Non-Shielded, 1.8m
B Keyboard Cable	Non-Shielded, 1.8m
C Earphone Cable	Non-Shielded, 1.2m
D Mouse Cable	Non-Shielded, 1.8m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown on 1.4
- (2) Execute “WL 1.0” program on the EUT.
- (3) Configure the test mode, the test channel, and the data rate.
- (4) Start the continuous transmission.
- (5) Verify that the EUT works properly.

1.6. Test Facility

Ambient conditions in the laboratory:

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

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site: <http://www.quietek.com/chinese/about/certificates.aspx?bval=5>
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site: <http://www.quietek.com/>

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

Site Name: Quietek Corporation
Site Address: No.5-22, Ruishukeng,
Linkou Dist. New Taipei City 24451,
Taiwan, R.O.C.
TEL: 886-2-8601-3788 / FAX : 886-2-8601-3789
E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

2. Conducted Emission

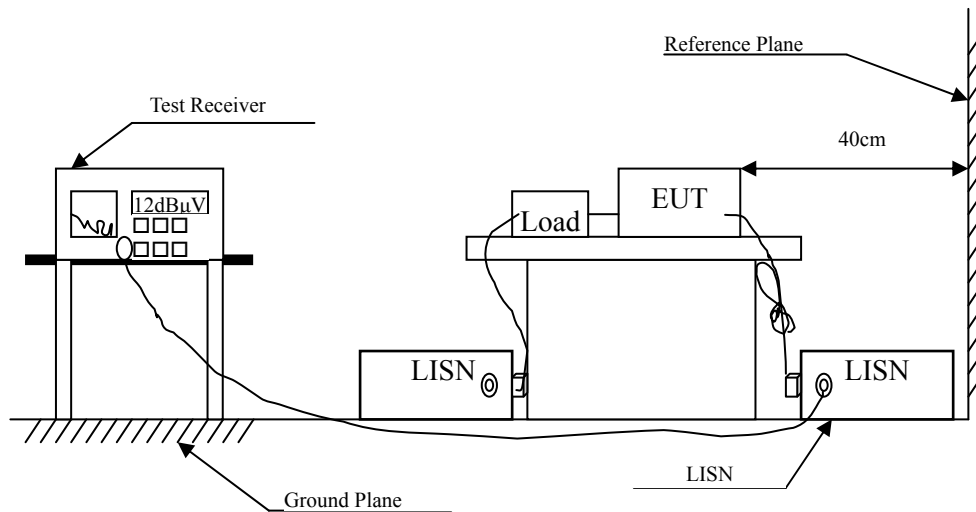
2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2015	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2015	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2015	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar., 2015	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2015	
	No.1 Shielded Room				

Note:

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

2.2. Test Setup



2.3. Limits

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

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

2.4. Test Procedure

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

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

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

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

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

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV	Margin dB	Limit dBμV
LINE 1					
Quasi-Peak					
0.150	9.764	36.660	46.424	-19.576	66.000
0.224	9.757	31.520	41.277	-22.609	63.886
0.373	9.768	30.710	40.478	-19.151	59.629
0.857	9.806	18.820	28.626	-27.374	56.000
4.830	9.986	23.520	33.506	-22.494	56.000
23.962	10.188	11.190	21.378	-38.622	60.000
Average					
0.150	9.764	31.980	41.744	-14.256	56.000
0.224	9.757	27.250	37.007	-16.879	53.886
0.373	9.768	22.050	31.818	-17.811	49.629
0.857	9.806	13.430	23.236	-22.764	46.000
4.830	9.986	14.580	24.566	-21.434	46.000
23.962	10.188	1.890	12.078	-37.922	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 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dBμV
	dB	dBμV	dBμV		
LINE 2					
Quasi-Peak					
0.162	9.761	36.400	46.161	-19.496	65.657
0.377	9.768	33.930	43.698	-15.816	59.514
0.853	9.805	18.080	27.885	-28.115	56.000
4.611	9.983	23.760	33.743	-22.257	56.000
14.244	10.214	13.950	24.164	-35.836	60.000
27.416	10.394	13.420	23.814	-36.186	60.000
Average					
0.162	9.761	31.530	41.291	-14.366	55.657
0.377	9.768	30.460	40.228	-9.286	49.514
0.853	9.805	12.190	21.995	-24.005	46.000
4.611	9.983	15.060	25.043	-20.957	46.000
14.244	10.214	6.710	16.924	-33.076	50.000
27.416	10.394	3.390	13.784	-36.216	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

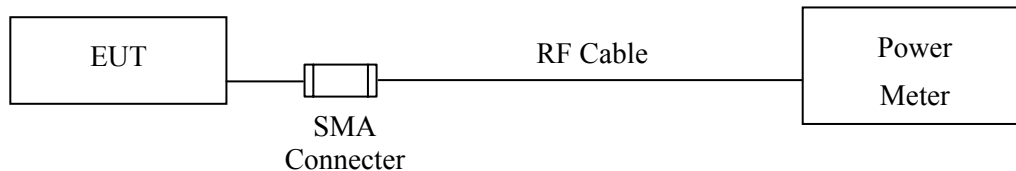
3. Peak Power Output

3.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2015
X	Power Sensor	Anritsu	MA2411B/0738448	Jun., 2015

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

3.2. Test Setup



3.3. Limit

The maximum peak power shall be less 1Watt.

3.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

3.5. Uncertainty

± 1.27 dB

3.6. Test Result of Peak Power Output

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

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	0.74	1 Watt= 30 dBm	Pass
Channel 39	2441.00	1.78	1 Watt= 30 dBm	Pass
Channel 78	2480.00	2.18	1 Watt= 30 dBm	Pass

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

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	-2.87	1 Watt= 30 dBm	Pass
Channel 39	2441.00	-2.43	1 Watt= 30 dBm	Pass
Channel 78	2480.00	-1.94	1 Watt= 30 dBm	Pass

4. Radiated Emission

4.1. Test Equipment

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

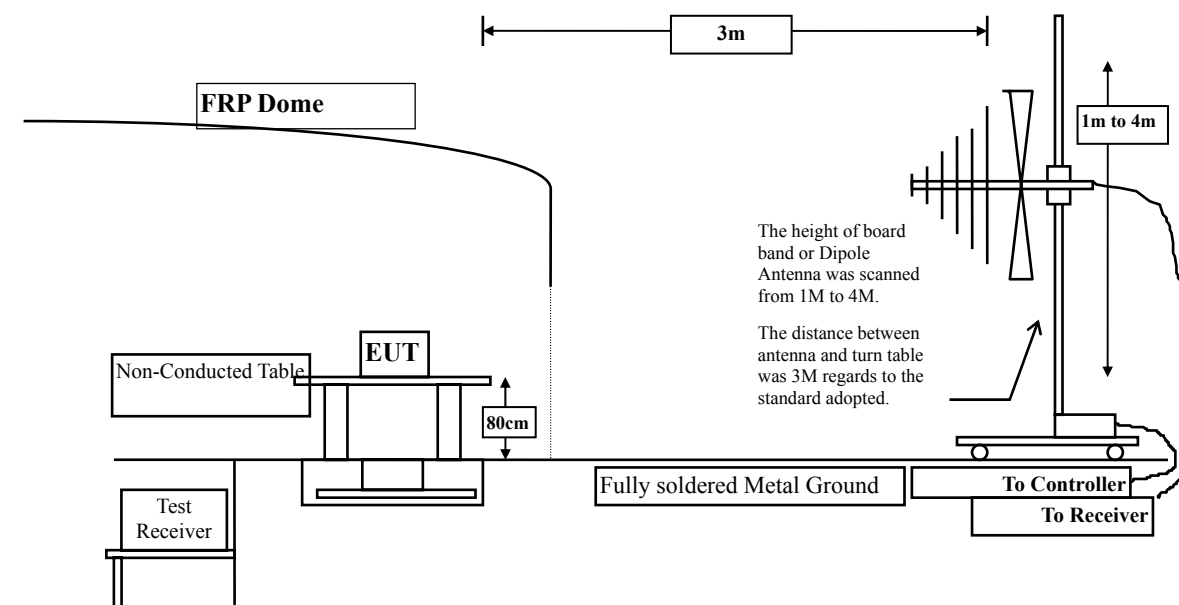
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X	Magnetic Loop Antenna	Teseq	HLA6121/ 37133	Sep, 2015
	X	Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	Jun., 2015
	X	EMI Test Receiver	R&S	ESCS 30/838251/ 001	Jun., 2015
	X	Coaxial Cable	QTK(Arnist)	RG 214/ LC003-RG	Jun., 2015
	X	Coaxial signal switch	Arnist	MP59B/ 6200798682	Jun., 2015

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct., 2014
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar., 2015
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan., 2015
	X	Horn Antenna	TRC	AH-0801/95051	Aug., 2015
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan., 2015
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul., 2015
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul., 2015

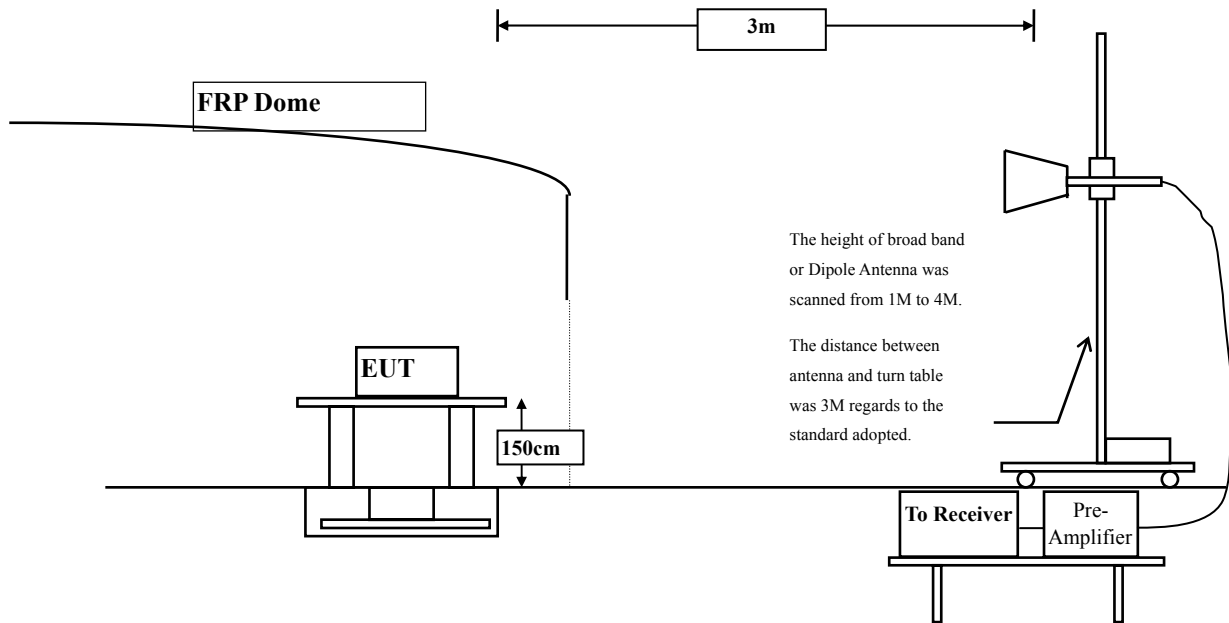
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with "X" are used to measure the final test results.

4.2. Test Setup

sBelow 1GHz



Above 1GHz



4.3. Limits

➤ General Radiated Emission Limits

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

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

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

4.4. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested compliance to FCC 47CFR 15.249 requirements.

Measuring the frequency range below 1GHz, the EUT is placed on a turn table which is 0.8 meter above ground, when measuring the frequency range above 1GHz, the EUT is placed on a turn table which is 1.5 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 between 1 meter and 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 C63.10: 2013 on radiated measurement.

The resolution bandwidth below 30MHz setting on the field strength meter is 9kHz and 30MHz~1GHz is 120kHz and above 1GHz is 1MHz.

Radiated emission measurements below 30MHz are made using Loop Antenna and 30MHz~1GHz are made using broadband Bilog antenna and above 1GHz are made using Horn Antennas.

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

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

The worst radiated emission is measured in the Open Area Test Site on the Final Measurement.

The measurement frequency range from 9kHz - 10th Harmonic of fundamental was investigated.

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: Transmit - 1Mbps (GFSK)(2402MHz)

Frequency MHz	Correct Factor dB	Reading Level dB μ V	Measurement Level dB μ V/m	Margin dB	Limit dB μ V/m
Horizontal					
Peak Detector:					
4804.000	3.327	43.320	46.647	-27.353	74.000
7206.000	10.136	38.400	48.536	-25.464	74.000
9608.000	13.706	38.550	52.256	-21.744	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4804.000	6.638	42.200	48.837	-25.163	74.000
7206.000	11.005	38.160	49.165	-24.835	74.000
9608.000	14.103	38.360	52.463	-21.537	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. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB μ V	dB μ V/m	dB	dB μ V/m
Horizontal					
Peak Detector:					
4882.000	3.001	41.780	44.781	-29.219	74.000
7323.000	11.846	38.590	50.437	-23.563	74.000
9764.000	12.563	38.260	50.823	-23.177	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4882.000	5.713	41.570	47.284	-26.716	74.000
7323.000	12.727	38.320	51.048	-22.952	74.000
9764.000	13.028	38.550	51.578	-22.422	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. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB μ V	dB μ V/m	dB	dB μ V/m
Horizontal					
Peak Detector:					
4960.000	2.760	42.270	45.030	-28.970	74.000
7440.000	12.567	39.520	52.086	-21.914	74.000
9920.000	13.456	39.610	53.066	-20.934	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4960.000	5.557	42.840	48.397	-25.603	74.000
7440.000	13.426	39.690	53.115	-20.885	74.000
9920.000	13.958	39.630	53.588	-20.412	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. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dB μ V/m
	dB	dB μ V	dB μ V/m		
Horizontal					
Peak Detector:					
4804.000	3.327	42.460	45.787	-28.213	74.000
7206.000	10.136	37.710	47.846	-26.154	74.000
9608.000	13.706	38.240	51.946	-22.054	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4804.000	6.638	43.100	49.737	-24.263	74.000
7206.000	11.005	38.190	49.195	-24.805	74.000
9608.000	14.103	38.560	52.663	-21.337	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. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

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

Horizontal

Peak Detector:

4882.000	3.001	42.320	45.321	-28.679	74.000
7323.000	11.846	39.750	51.597	-22.403	74.000
9764.000	12.563	38.580	51.143	-22.857	74.000

Average

Detector:

--

Vertical

Peak Detector:

4882.000	5.713	41.360	47.074	-26.926	74.000
7323.000	12.727	38.600	51.328	-22.672	74.000
9764.000	13.028	38.080	51.108	-22.892	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. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB μ V	dB μ V/m	dB	dB μ V/m
Horizontal					
Peak Detector:					
4960.000	2.760	41.290	44.050	-29.950	74.000
7440.000	12.567	38.980	51.546	-22.454	74.000
9920.000	13.456	39.360	52.816	-21.184	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4960.000	5.557	40.970	46.527	-27.473	74.000
7440.000	13.426	40.180	53.605	-20.395	74.000
9920.000	13.958	39.730	53.688	-20.312	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. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
99.840	-9.873	43.620	33.747	-9.753	43.500
324.880	-4.510	26.849	22.339	-23.661	46.000
499.480	1.991	31.199	33.189	-12.811	46.000
600.360	3.472	26.508	29.980	-16.020	46.000
802.120	6.356	31.355	37.711	-8.289	46.000
879.720	6.618	26.103	32.721	-13.279	46.000
Vertical					
128.940	-3.710	32.352	28.642	-14.858	43.500
299.660	-4.061	28.579	24.518	-21.482	46.000
447.100	-6.197	22.523	16.326	-29.674	46.000
584.840	-2.229	23.830	21.601	-24.399	46.000
802.120	2.966	26.683	29.649	-16.351	46.000
951.500	3.083	25.609	28.692	-17.308	46.000

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. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.

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

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dBμV	dBμV/m	dB	dBμV/m
Horizontal					
99.840	-9.873	42.205	32.332	-11.168	43.500
299.660	-4.751	31.674	26.923	-19.077	46.000
379.200	1.301	24.043	25.344	-20.656	46.000
600.360	3.472	25.710	29.182	-16.818	46.000
720.640	3.826	24.047	27.873	-18.127	46.000
802.120	6.356	29.573	35.929	-10.071	46.000
Vertical					
132.820	-3.932	23.937	20.005	-23.495	43.500
235.640	-6.910	22.694	15.784	-30.216	46.000
379.200	0.881	24.402	25.283	-20.717	46.000
542.160	1.855	22.991	24.846	-21.154	46.000
615.880	1.473	26.358	27.831	-18.169	46.000
802.120	2.966	28.364	31.330	-14.670	46.000

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. Measurement Level = Reading Level + Correct Factor.
5. Correct Factor = Antenna factor + Cable loss – Amplifier gain.
6. The average measurement was not performed when the peak measured data under the limit of average detection.
7. The emission levels of other frequencies are very lower than the limit and not show in test report.
8. No emission found between lowest internal used/generated frequency to 30MHz.

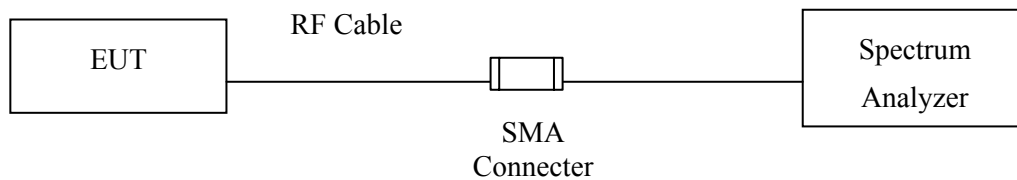
5. RF Antenna Conducted Test

5.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2015

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

5.2. Test Setup



5.3. Limits

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

5.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

5.5. Uncertainty

± 150Hz

5.6. Test Result of RF Antenna Conducted Test

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

Figure Channel 00:

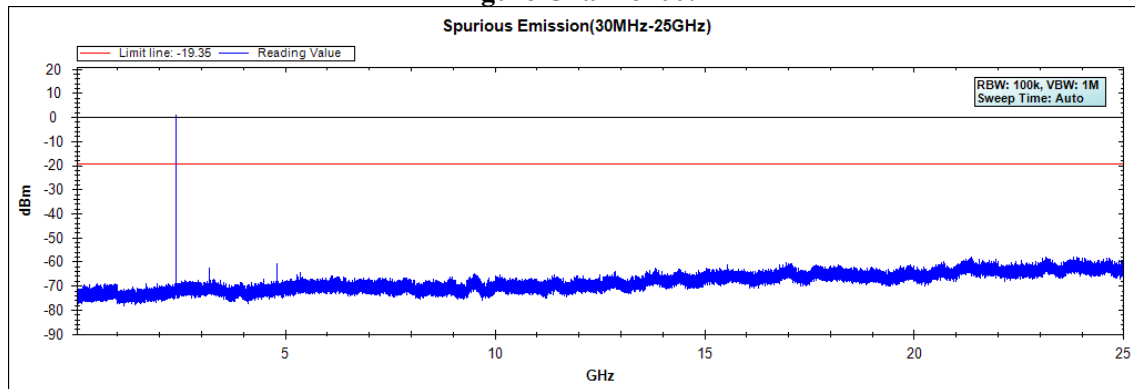


Figure Channel 39:

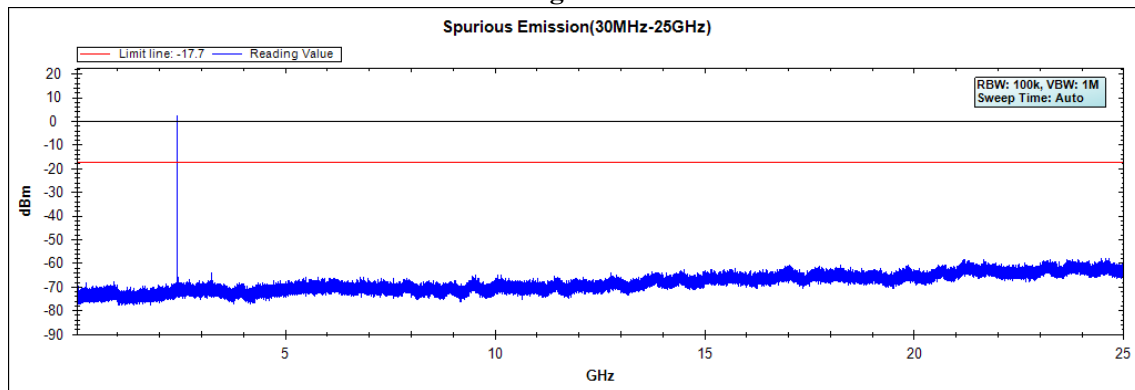
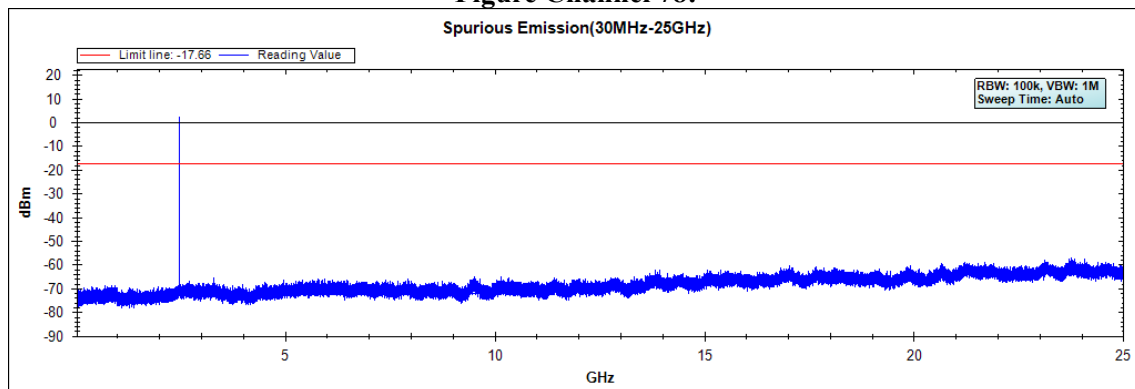


Figure Channel 78:



Note: The above test pattern is synthesized by multiple of the frequency range.

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

Figure Channel 00:

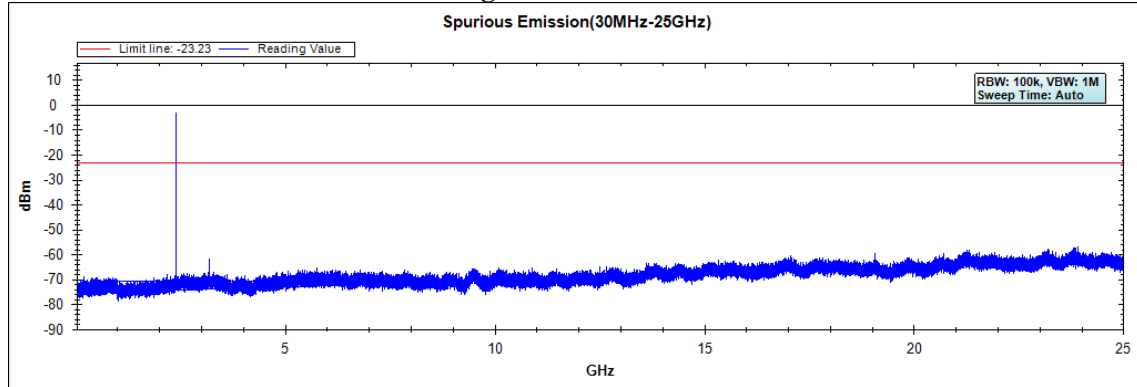


Figure Channel 39:

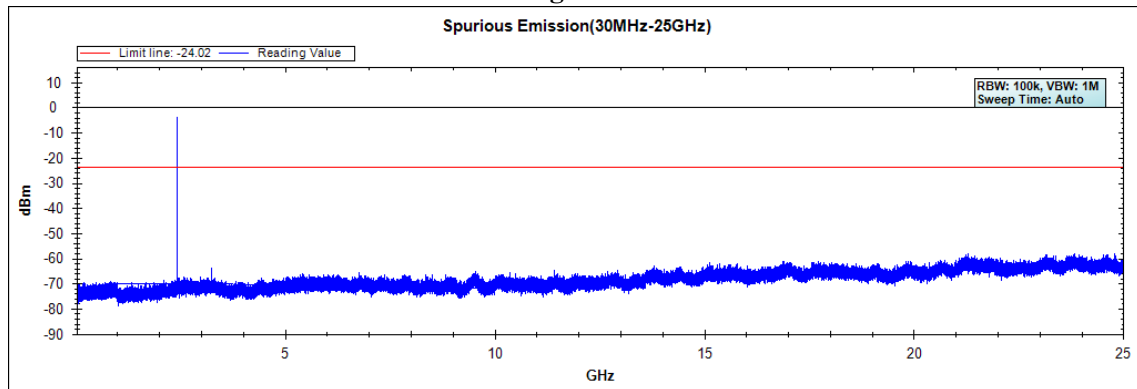
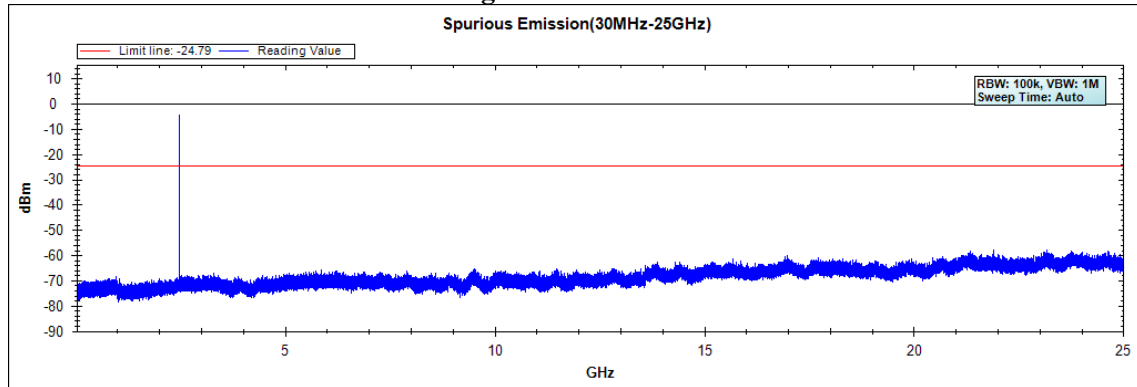


Figure Channel 78:



Note: The above test pattern is synthesized by multiple of the frequency range.

6. Band Edge

6.1. Test Equipment

RF Radiated Measurement:

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

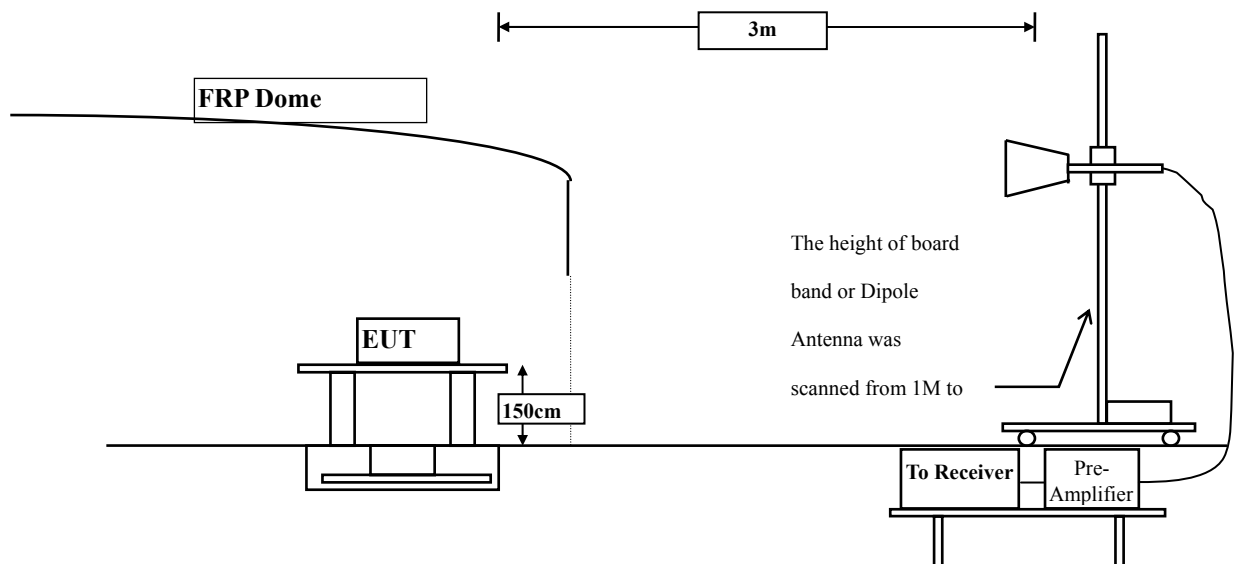
Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ CB # 8	X	Spectrum Analyzer	R&S	FSP40/ 100339	Oct., 2014
	X	Horn Antenna	ETS-Lindgren	3117/ 35205	Mar., 2015
	X	Horn Antenna	Schwarzbeck	BBHA9170/209	Jan., 2015
	X	Horn Antenna	TRC	AH-0801/95051	Aug., 2015
	X	Pre-Amplifier	EMCI	EMC012630SE/980210	Jan., 2015
	X	Pre-Amplifier	MITEQ	JS41-001040000-58-5P/153945	Jul., 2015
	X	Pre-Amplifier	NARDA	DBL-1840N506/013	Jul., 2015

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

6.2. Test Setup

RF Radiated Measurement:

Above 1GHz



6.3. Limit

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

6.4. Test Procedure

The EUT is placed on a turn table which is 1.5 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 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 C63.10: 2013 on radiated measurement.

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

6.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

6.6. Test Result of Band Edge

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

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2375.900	-1.186	46.100	44.914	74.00	54.00	Pass
00 (Peak)	2390.000	-1.131	44.530	43.399	74.00	54.00	Pass
00 (Peak)	2400.000	-1.084	67.810	66.727	--	--	--
00 (Peak)	2401.800	-1.074	98.239	97.165	--	--	--
00 (Average)	2390.000	-1.131	32.079	30.948	74.00	54.00	Pass
00 (Average)	2400.000	-1.084	45.778	44.695	--	--	--
00 (Average)	2402.000	-1.073	84.429	83.357	--	--	--

Figure Channel 00: Horizontal (Peak)

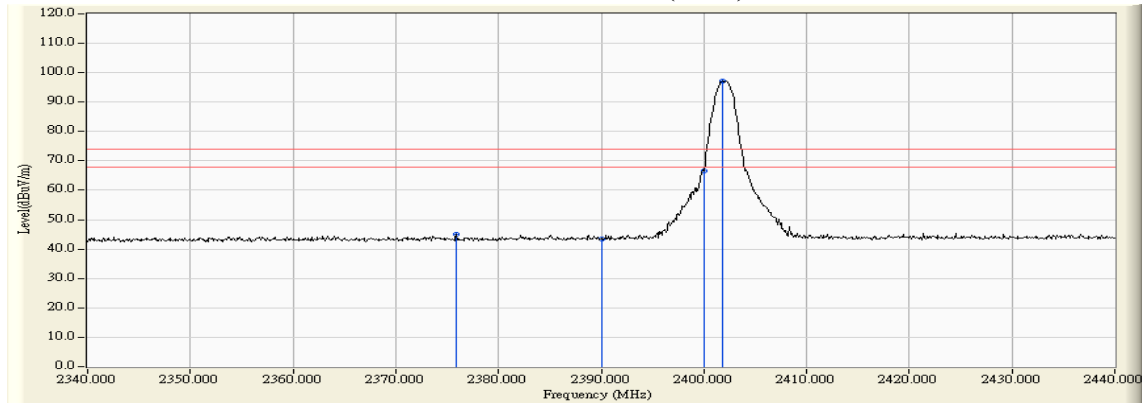
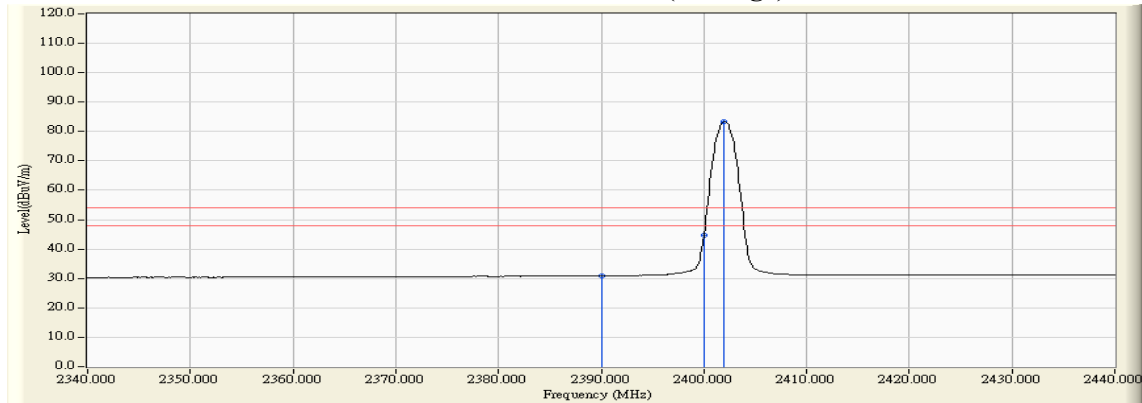


Figure Channel 00: Horizontal (Average)



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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

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

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2390.000	-1.725	45.378	43.653	74.00	54.00	Pass
00 (Peak)	2400.000	-1.733	67.838	66.106	--	--	--
00 (Peak)	2401.900	-1.729	97.881	96.152	--	--	--
00 (Average)	2390.000	-1.725	31.901	30.176	74.00	54.00	Pass
00 (Average)	2400.000	-1.733	45.942	44.210	--	--	--
00 (Average)	2402.000	-1.729	84.224	82.495	--	--	--

Figure Channel 00: VERTICAL (Peak)

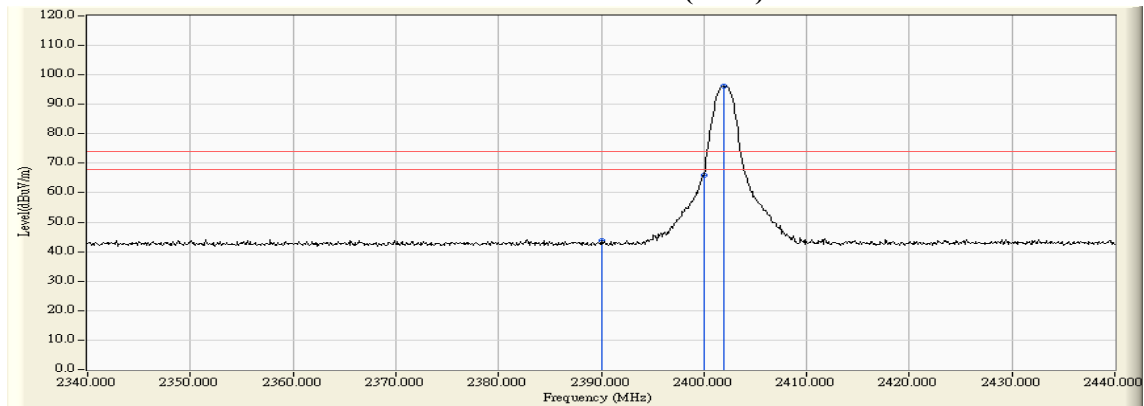
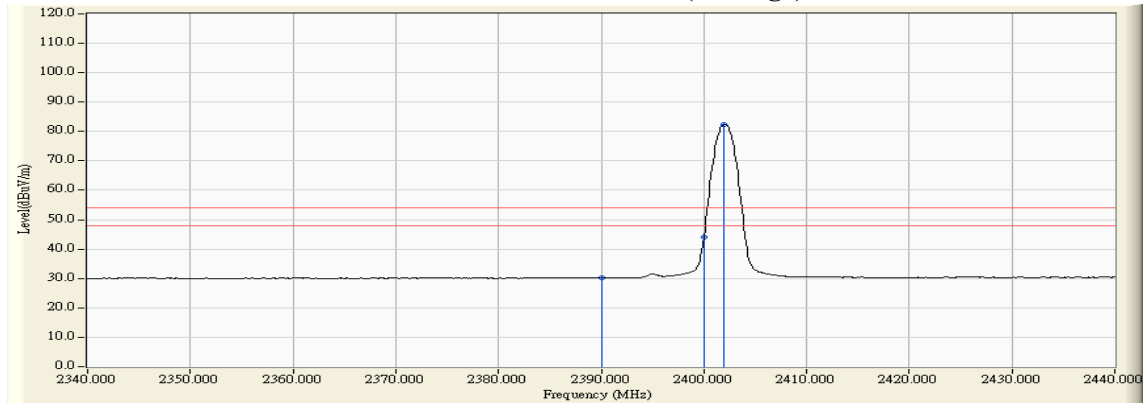


Figure Channel 00: VERTICAL (Average)



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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

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

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
78 (Peak)	2479.800	-0.582	98.245	97.663	--	--	--
78 (Peak)	2483.500	-0.558	57.770	57.212	74.00	54.00	Pass
78 (Average)	2480.000	-0.581	84.482	83.901	--	--	--
78 (Average)	2483.500	-0.558	33.650	33.092	74.00	54.00	Pass

Figure Channel 78: Horizontal (Peak)

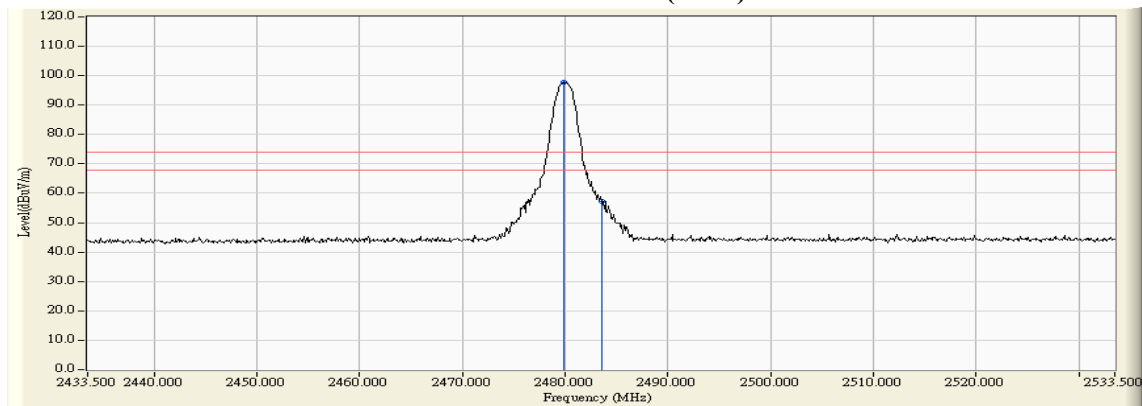
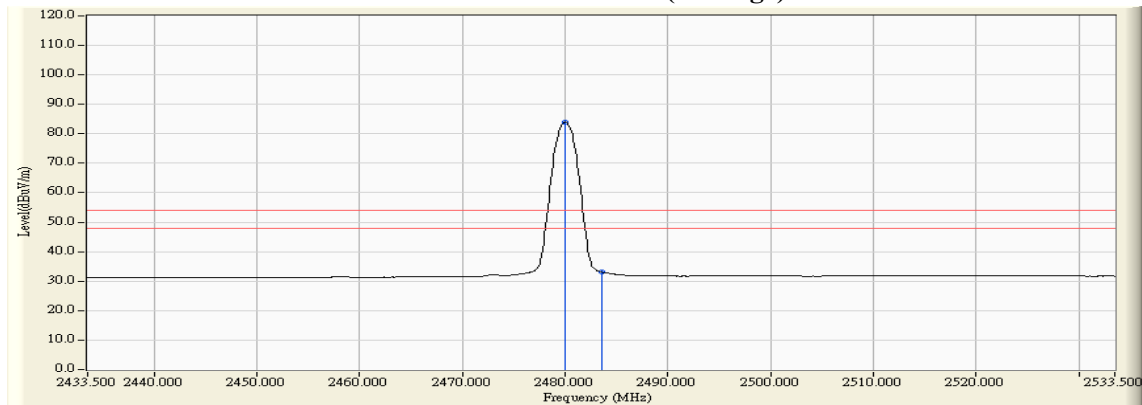


Figure Channel 78: Horizontal (Average)



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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

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

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
78 (Peak)	2480.100	-1.324	99.790	98.466	--	--	--
78 (Peak)	2483.500	-1.305	58.344	57.039	74.00	54.00	Pass
78 (Average)	2480.000	-1.324	85.980	84.656	--	--	--
78 (Average)	2483.500	-1.305	34.475	33.170	74.00	54.00	Pass

Figure Channel 78:

VERTICAL (Peak)

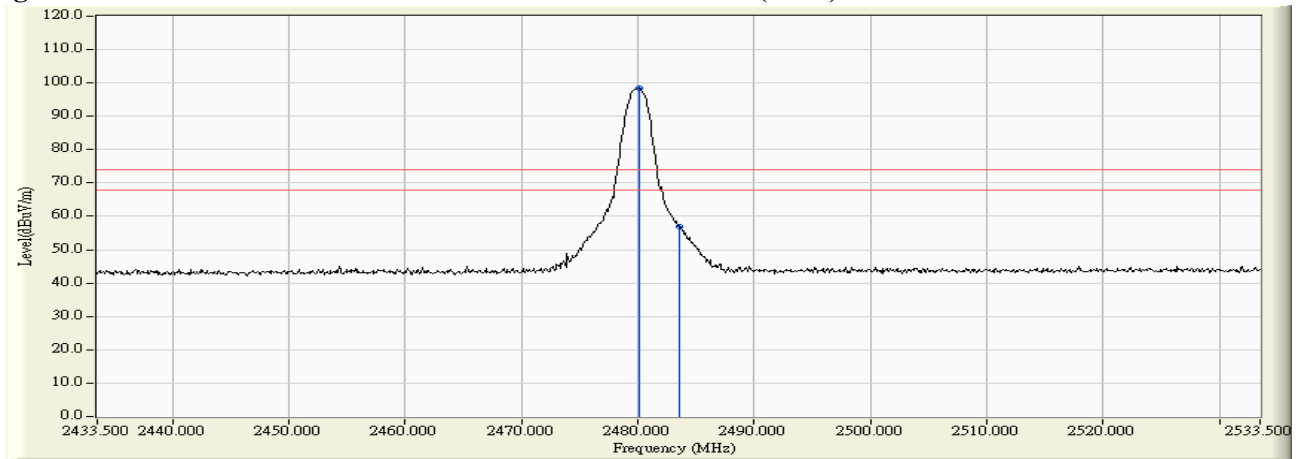
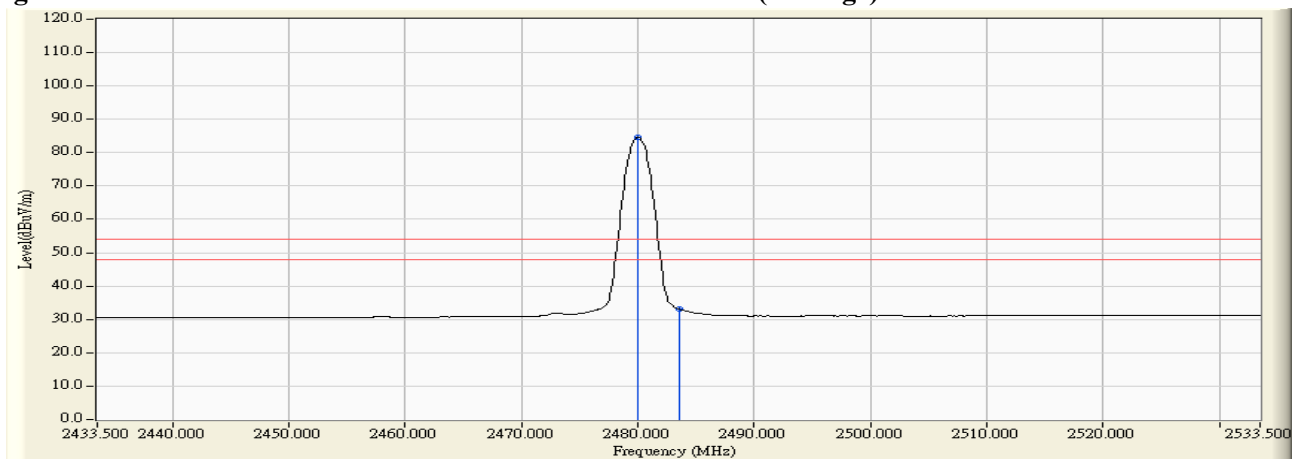


Figure Channel 78:

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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

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

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2388.800	-1.135	45.602	44.466	74.00	54.00	Pass
00 (Peak)	2390.000	-1.131	44.262	43.131	74.00	54.00	Pass
00 (Peak)	2400.000	-1.084	65.720	64.637	--	--	--
00 (Peak)	2402.000	-1.073	96.163	95.091	--	--	--
00 (Average)	2390.000	-1.131	31.962	30.831	74.00	54.00	Pass
00 (Average)	2400.000	-1.084	50.011	48.928	--	--	--
00 (Average)	2402.000	-1.073	80.414	79.342	--	--	--

Figure Channel 00: Horizontal (Peak)

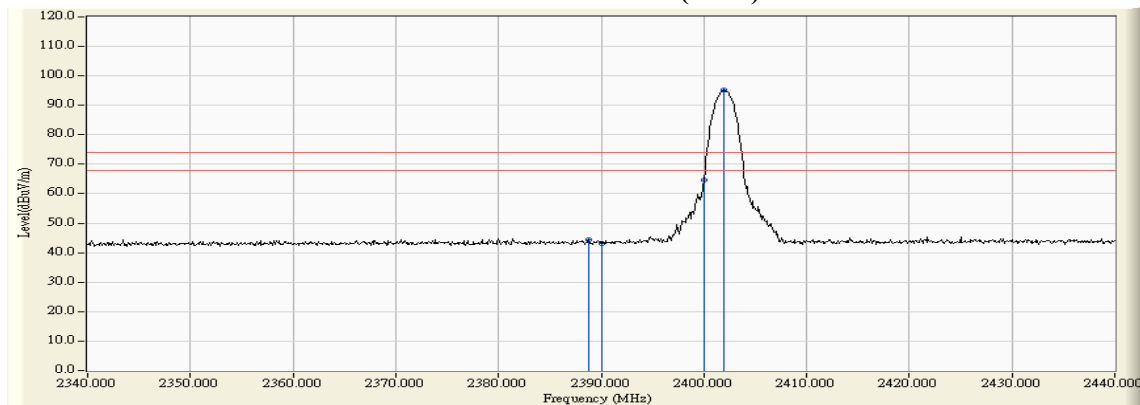
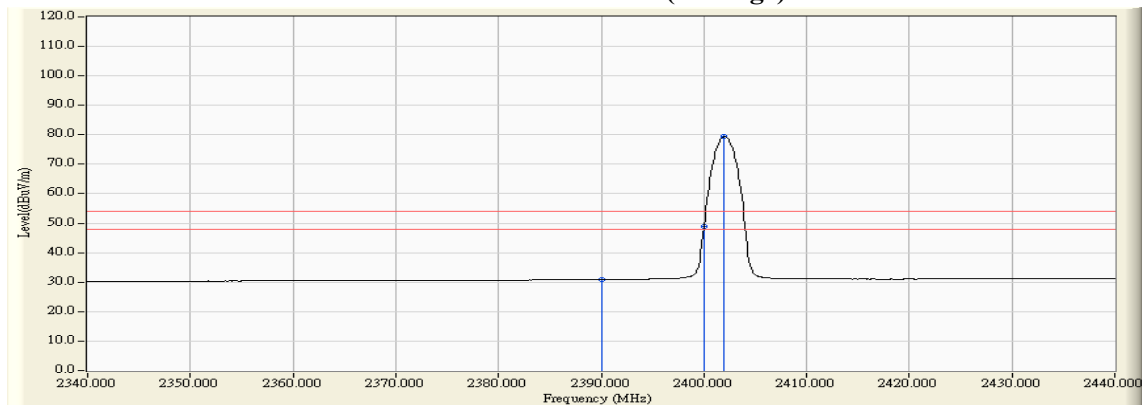


Figure Channel 00: Horizontal (Average)



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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

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

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2380.100	-1.678	45.623	43.944	74.00	54.00	Pass
00 (Peak)	2390.000	-1.725	44.054	42.329	74.00	54.00	Pass
00 (Peak)	2400.000	-1.733	67.593	65.861	--	--	--
00 (Peak)	2402.000	-1.729	96.014	94.285	--	--	--
00 (Average)	2390.000	-1.725	31.931	30.206	74.00	54.00	Pass
00 (Average)	2400.000	-1.733	49.908	48.176	--	--	--
00 (Average)	2402.000	-1.729	80.297	78.568	--	--	--

Figure Channel 00:

VERTICAL (Peak)

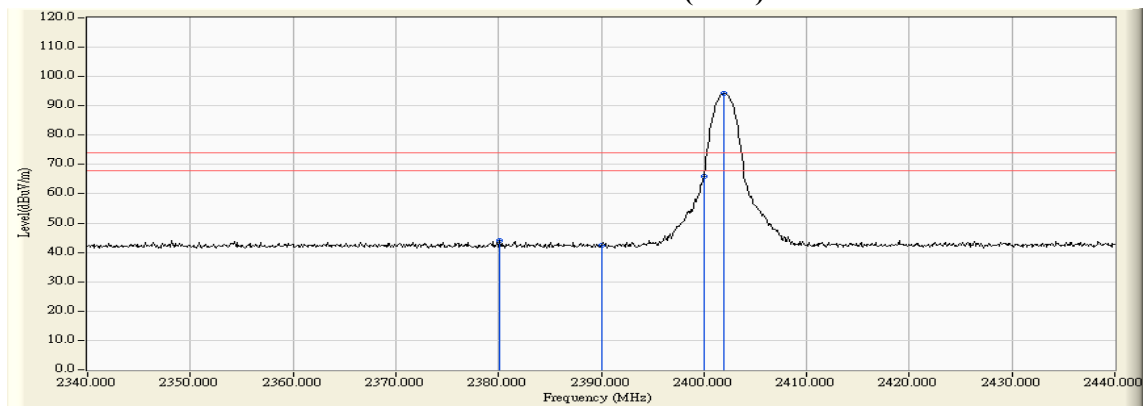
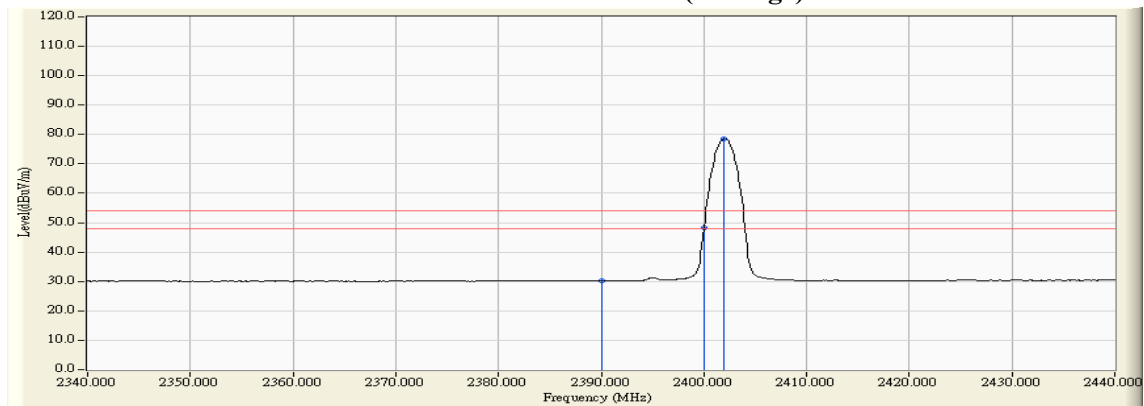


Figure Channel 00:

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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

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

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
78 (Peak)	2480.000	-0.581	96.093	95.512	--	--	--
78 (Peak)	2483.500	-0.558	54.569	54.011	74.00	54.00	Pass
78 (Average)	2480.000	-0.581	80.482	79.901	--	--	--
78 (Average)	2483.500	-0.558	32.997	32.439	74.00	54.00	Pass

Figure Channel 00:

Horizontal (Peak)

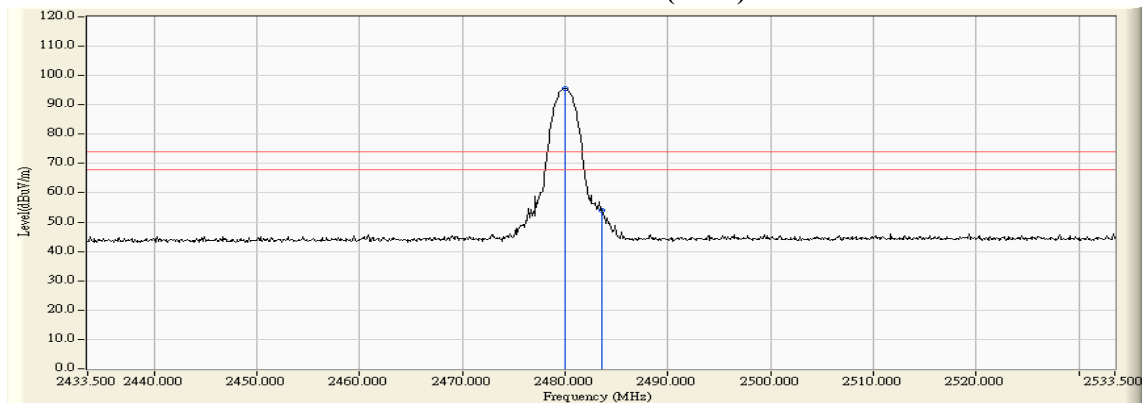
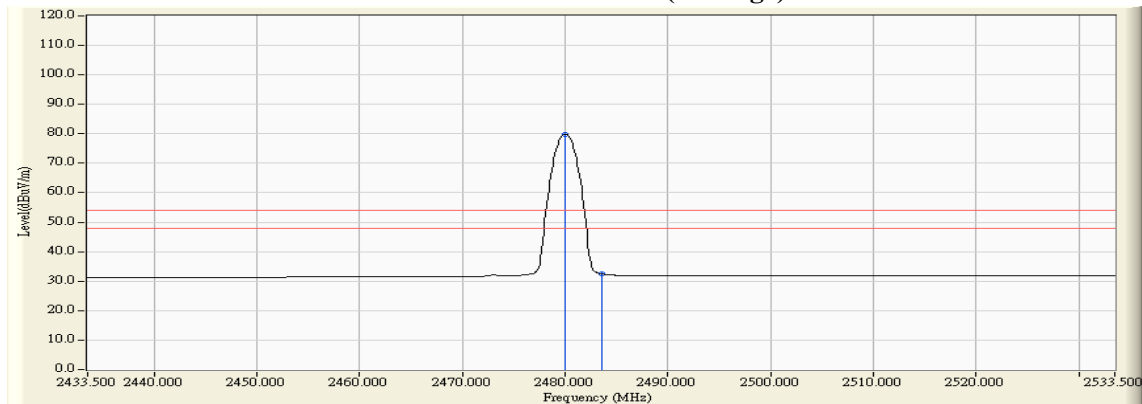


Figure Channel 00:

Horizontal (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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

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

RF Radiated Measurement (VERTICAL):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
78 (Peak)	2480.000	-1.324	97.247	95.923	--	--	--
78 (Peak)	2483.500	-1.305	54.485	53.180	74.00	54.00	Pass
78 (Average)	2480.000	-1.324	81.675	80.351	--	--	--
78 (Average)	2483.500	-1.305	33.174	31.869	74.00	54.00	Pass

Figure Channel 78: VERTICAL (Peak)

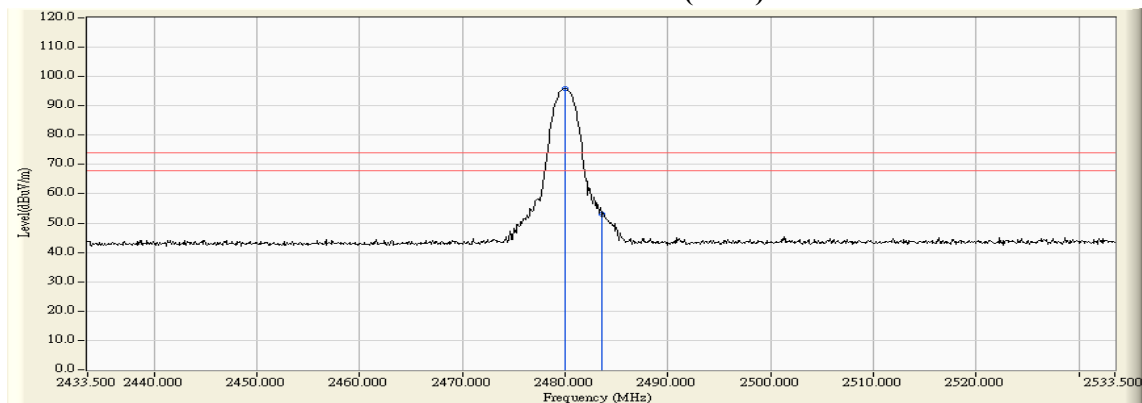
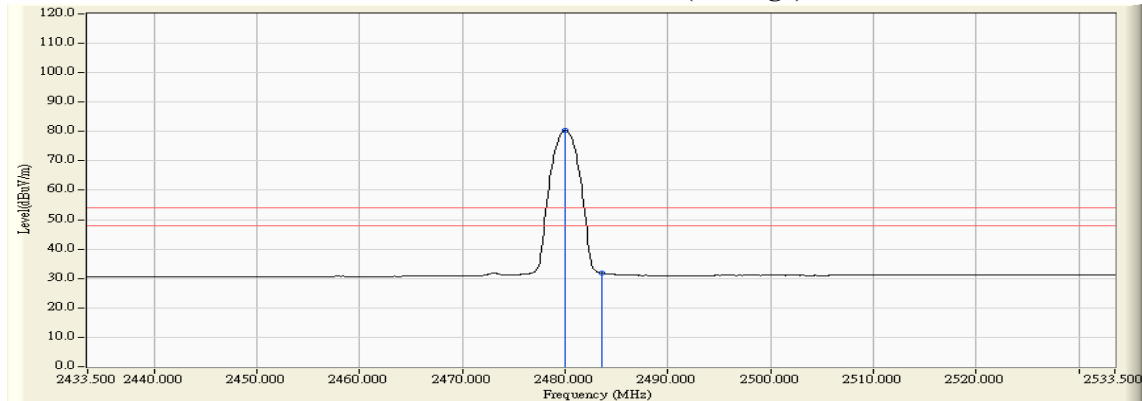


Figure Channel 78: VERTICAL (Average)



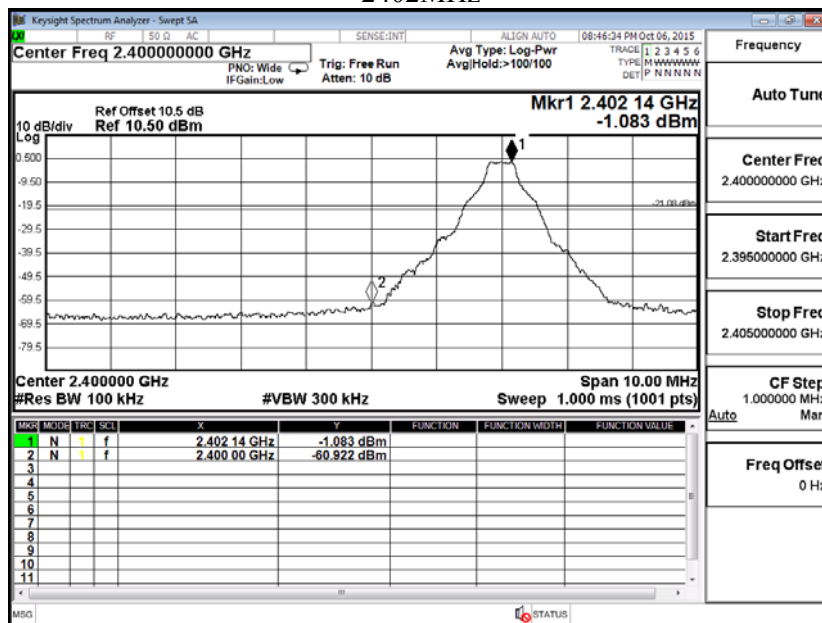
Note:

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 + Correction Factor.
6. The average measurement was not performed when the peak measured data is under the limit of average detection.

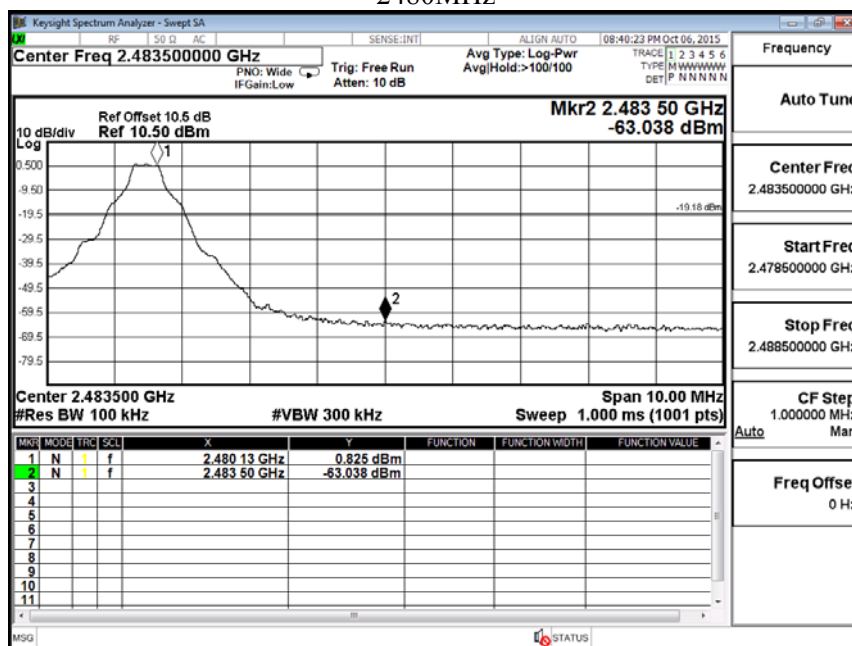
Product : Notebook
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Test Frequency (MHz)	Measurement Level Δ (dB)	Limit Δ (dB)	Result
2402	59.84	>20	PASS
2480	63.86	>20	PASS

2402MHz



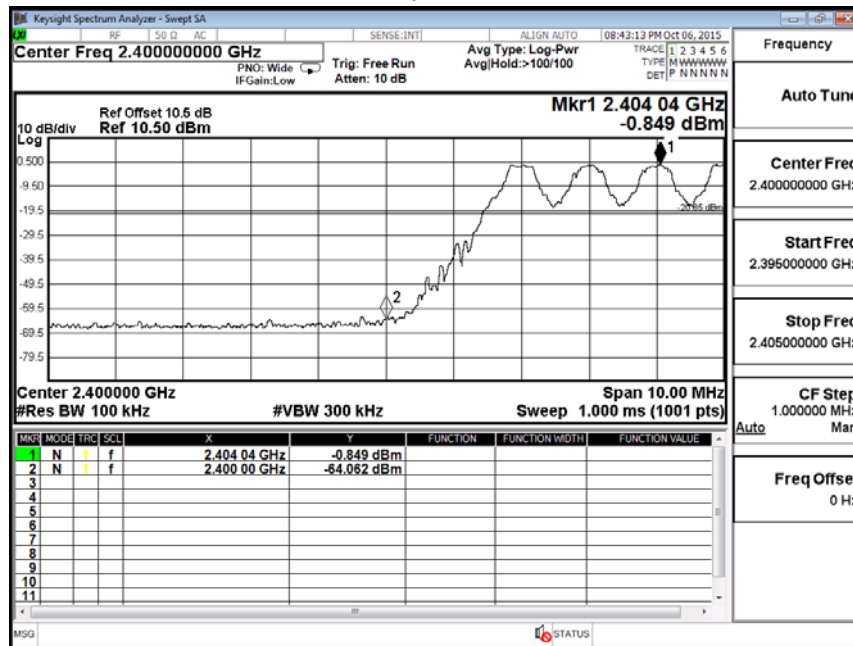
2480MHz



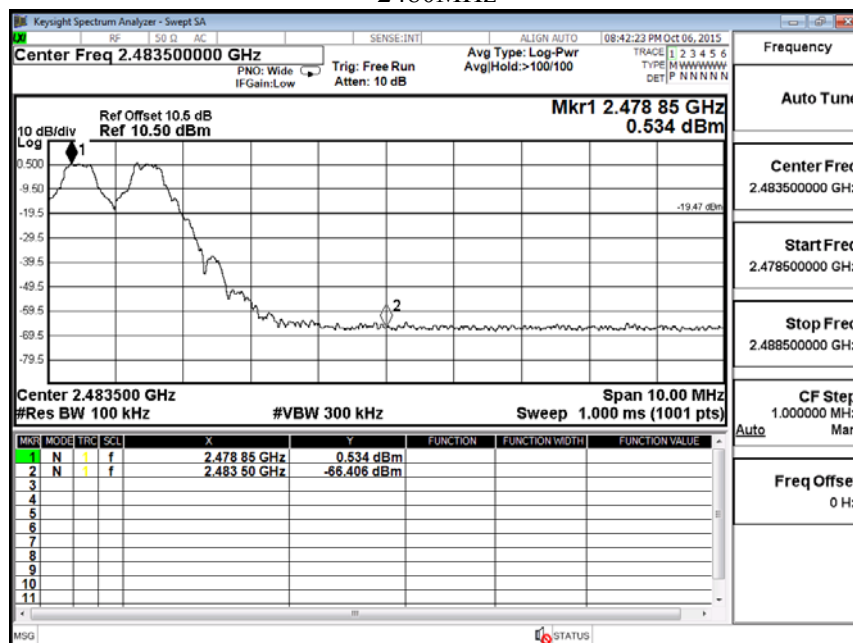
Product : Notebook
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (Hopping)

Test Frequency (MHz)	Measurement Level Δ (dB)	Limit Δ (dB)	Result
2402	63.21	>20	PASS
2480	66.94	>20	PASS

2402MHz



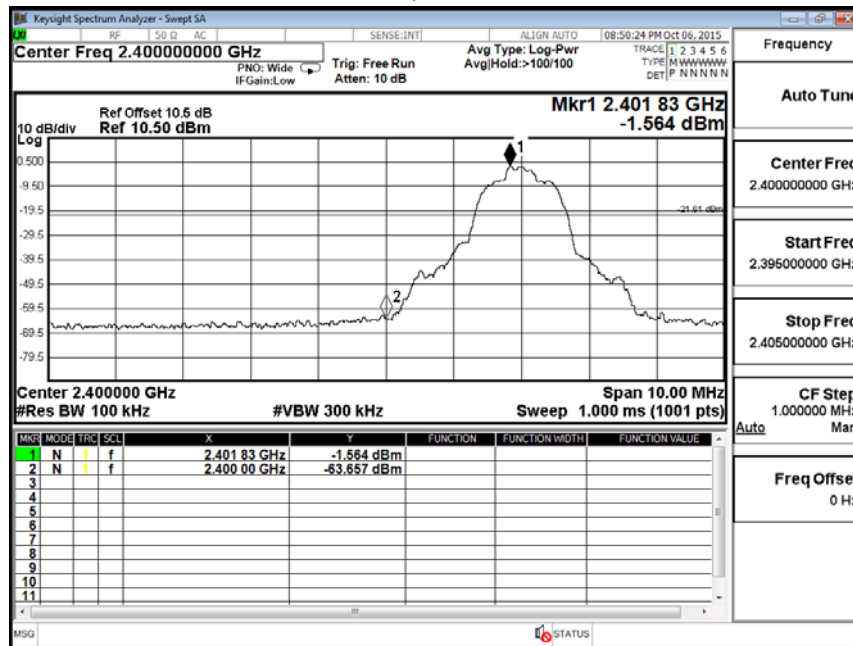
2480MHz



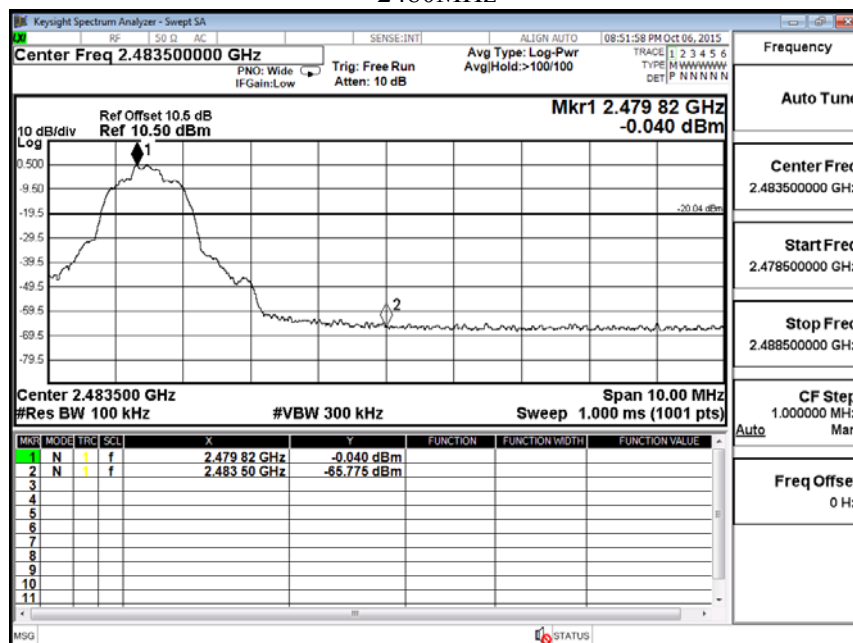
Product : Notebook
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Test Frequency (MHz)	Measurement Level Δ (dB)	Limit Δ (dB)	Result
2402	62.09	>20	PASS
2480	65.74	>20	PASS

2402MHz



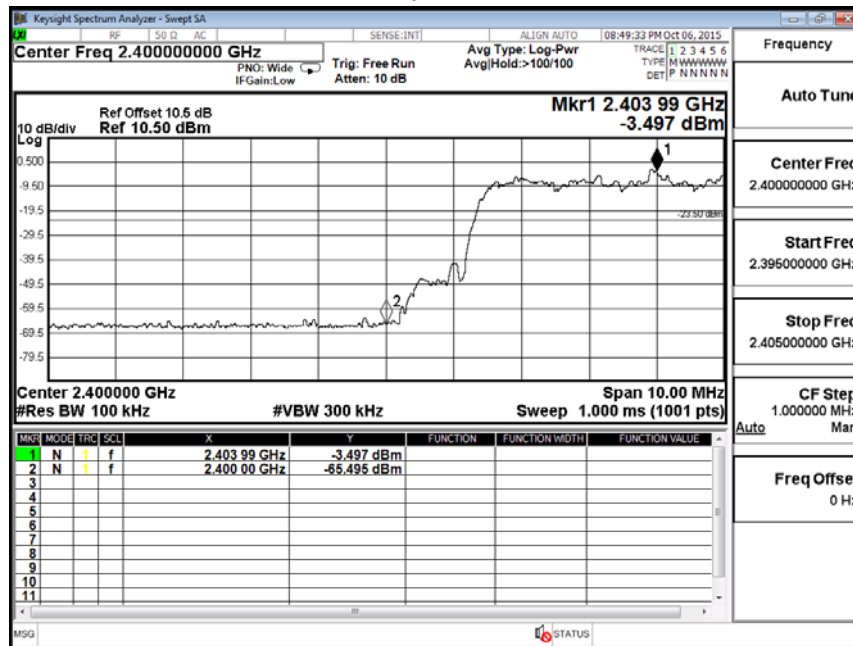
2480MHz



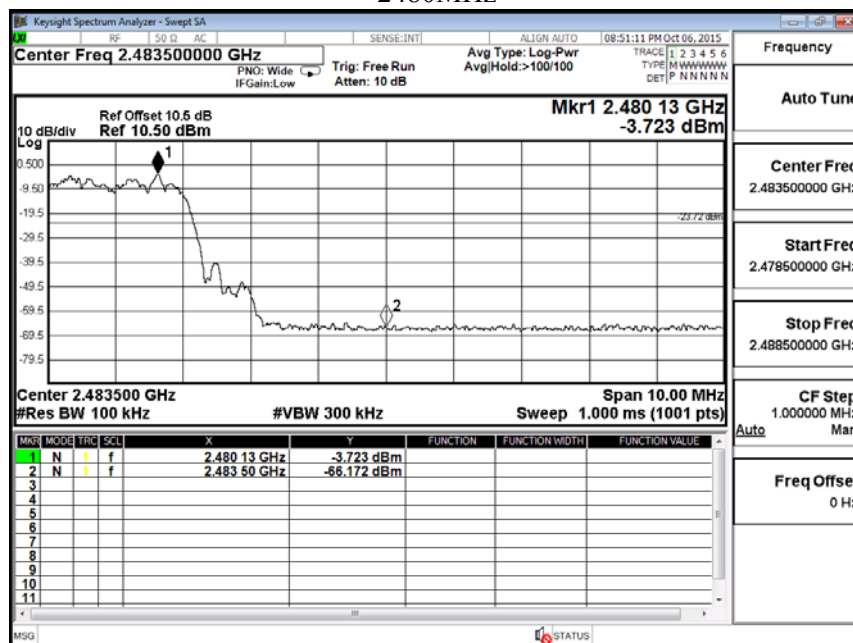
Product : Notebook
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Hopping)

Test Frequency (MHz)	Measurement Level Δ (dB)	Limit Δ (dB)	Result
2402	62.00	>20	PASS
2480	62.45	>20	PASS

2402MHz



2480MHz



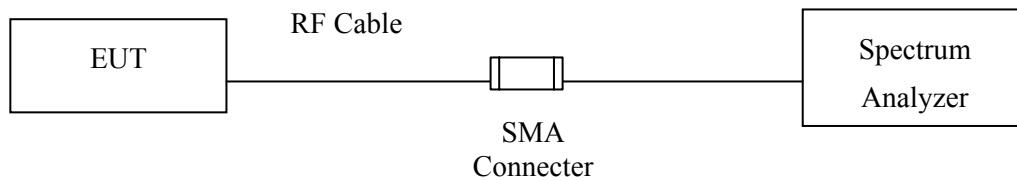
7. Channel Number

7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2015

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

7.2. Test Setup



7.3. Limit

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

7.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

7.5. Uncertainty

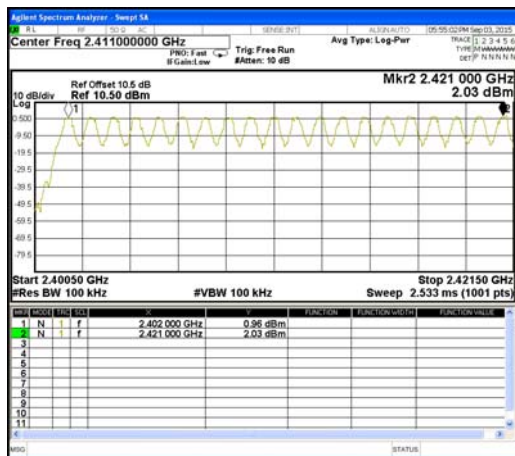
N/A

7.6. Test Result of Channel Number

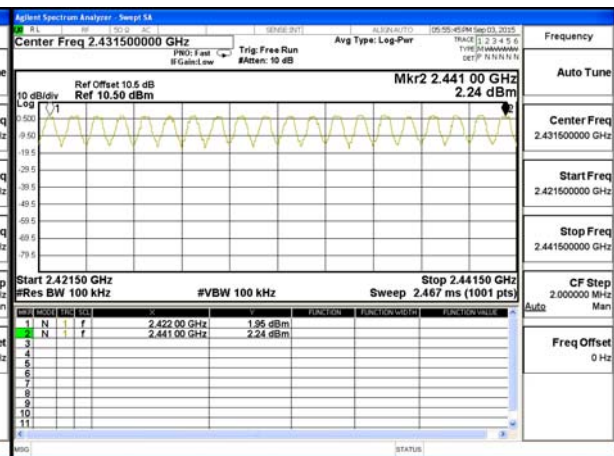
Product : Notebook
Test Item : Channel Number
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

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

2402-2421MHz



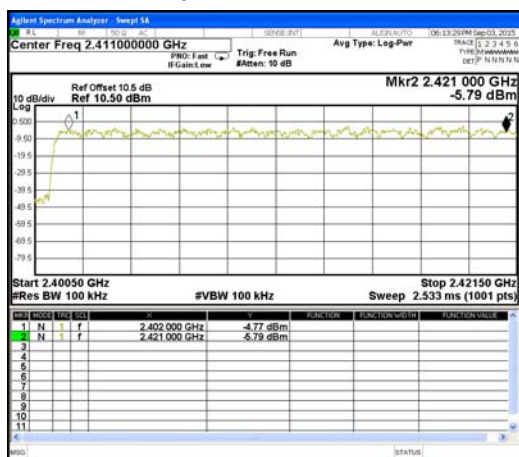
2422-2441MHz



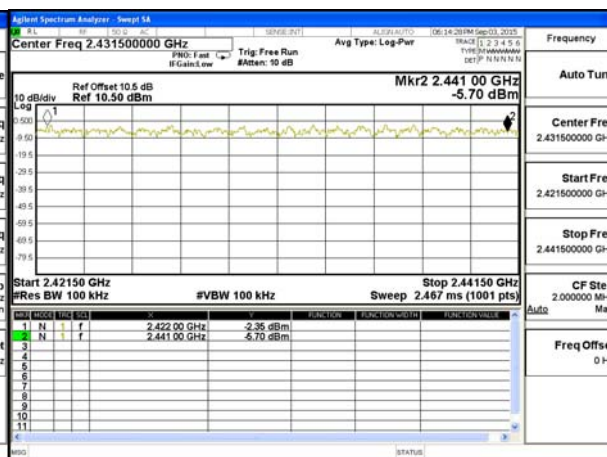
Product : Notebook
 Test Item : Channel Number
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

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

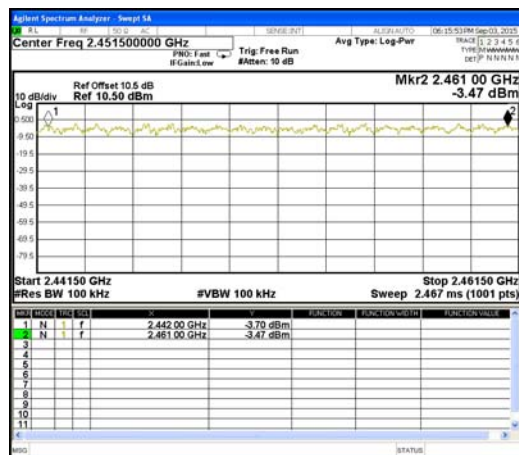
2402-2421MHz



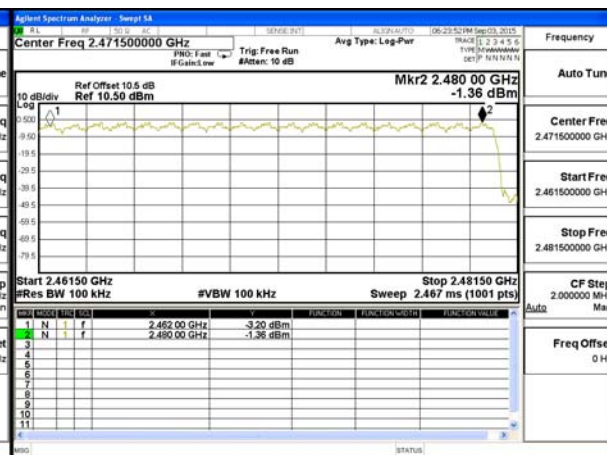
2422-2441MHz



2442-2461MHz



2462-2480MHz



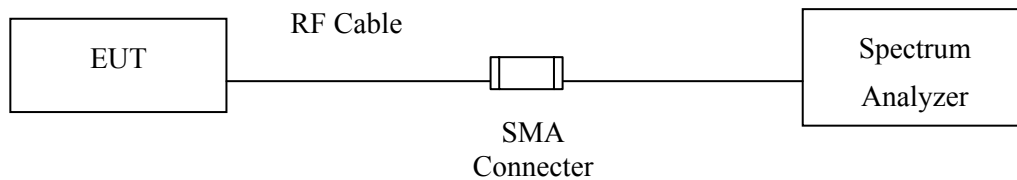
8. Channel Separation

8.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2015

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

8.2. Test Setup



8.3. Limit

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

8.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

8.5. Uncertainty

$\pm 150\text{Hz}$

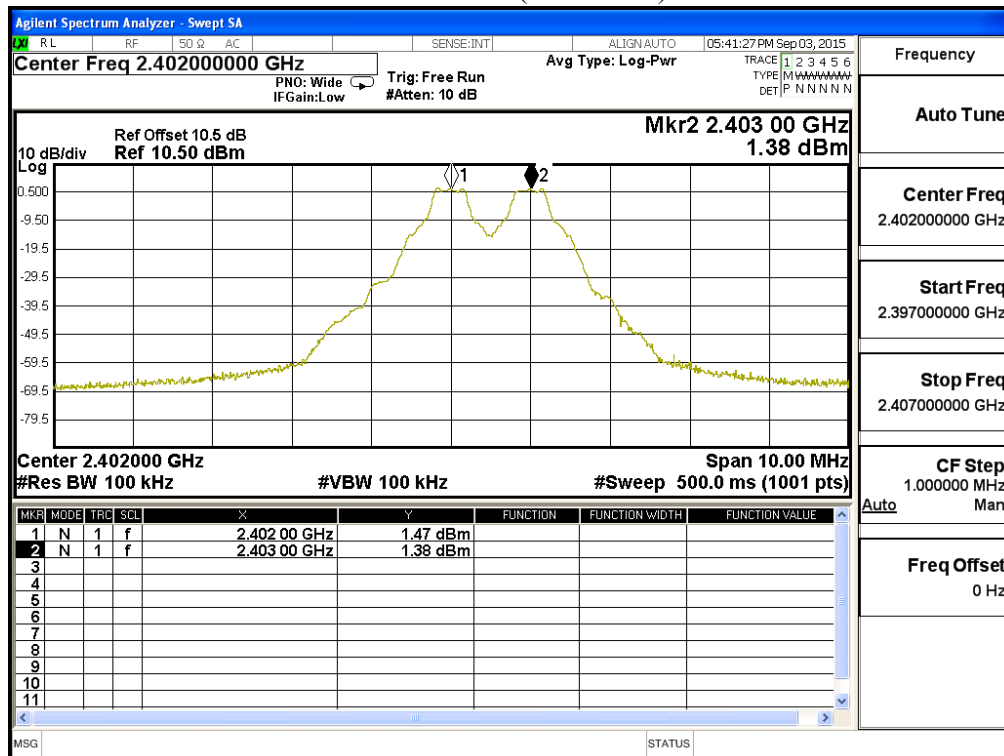
8.6. Test Result of Channel Separation

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

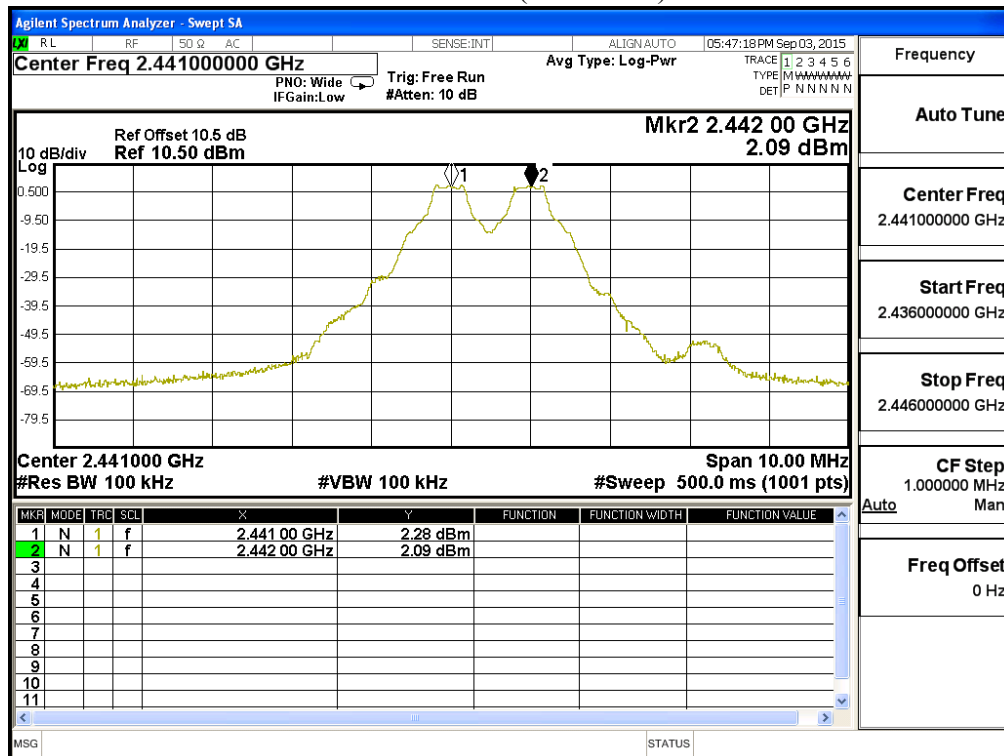
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	766.7	Pass
39	2441	1000	>25 kHz	766.7	Pass
78	2480	1000	>25 kHz	760.0	Pass

NOTE: The 20dB Bandwidth is refer to section 10.

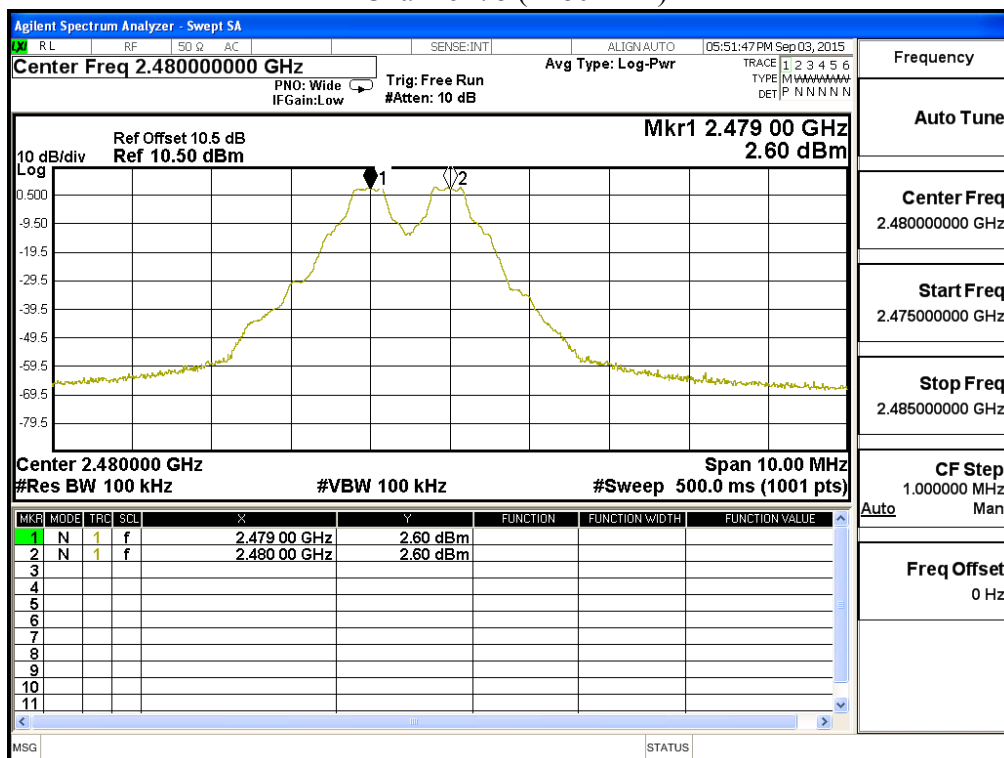
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)

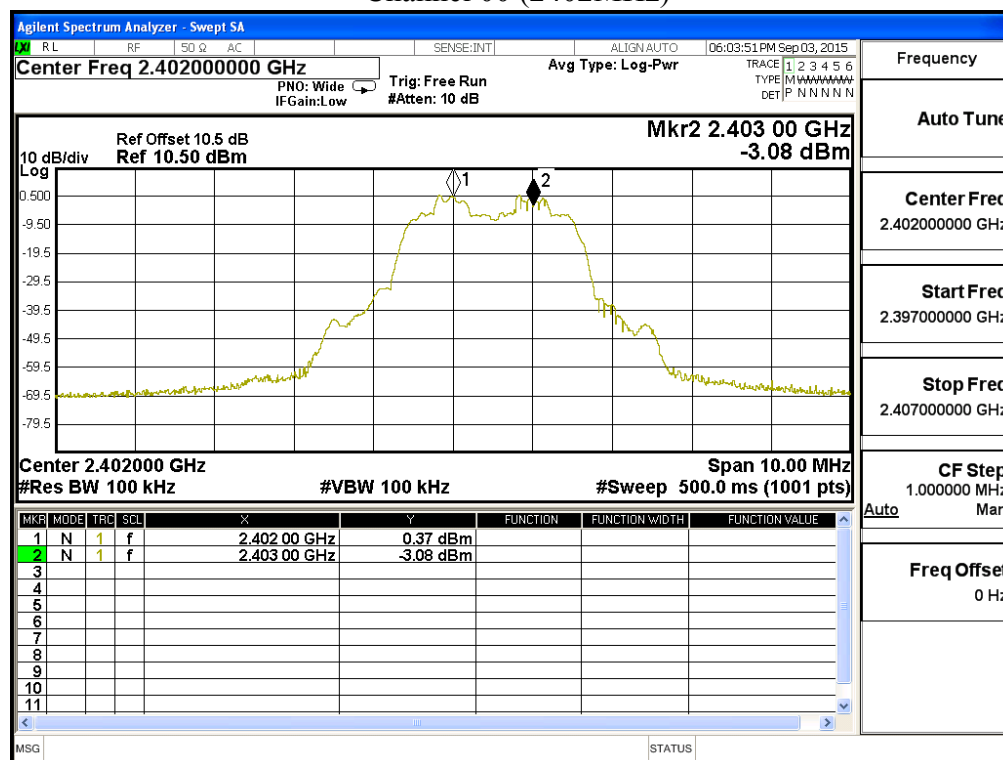


Product : Notebook
 Test Item : Channel Separation
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

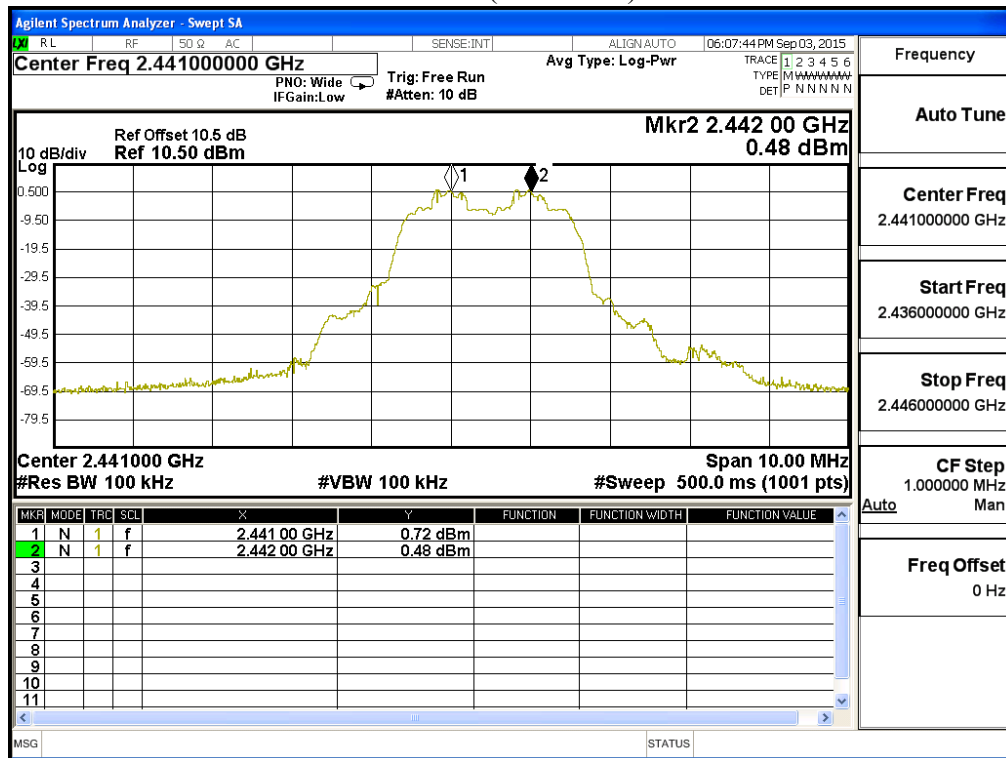
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	953.3	Pass
39	2441	1000	>25 kHz	946.7	Pass
78	2480	1000	>25 kHz	953.3	Pass

NOTE: The 20dB Bandwidth is refer to section 10.

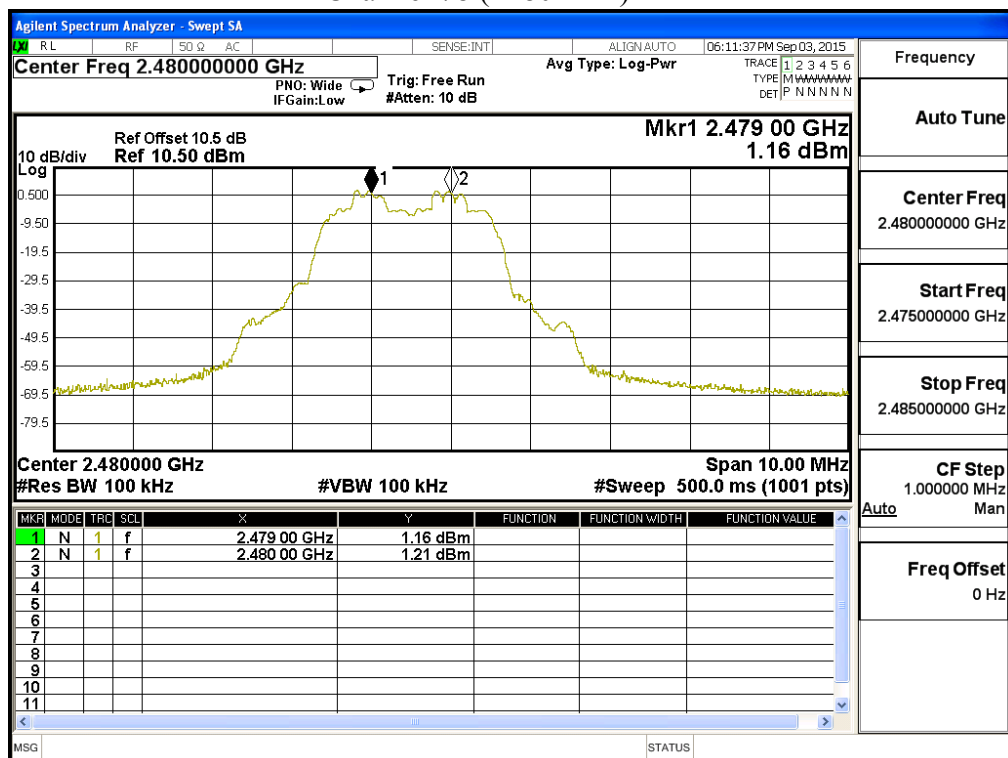
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



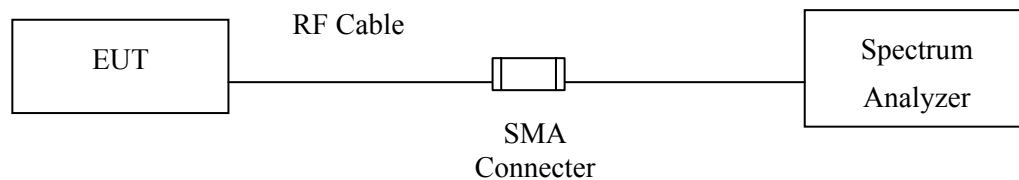
9. Dwell Time

9.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2015

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. Limit

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

9.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

9.5. Uncertainty

$\pm 25\text{msec}$

9.6. Test Result of Dwell Time

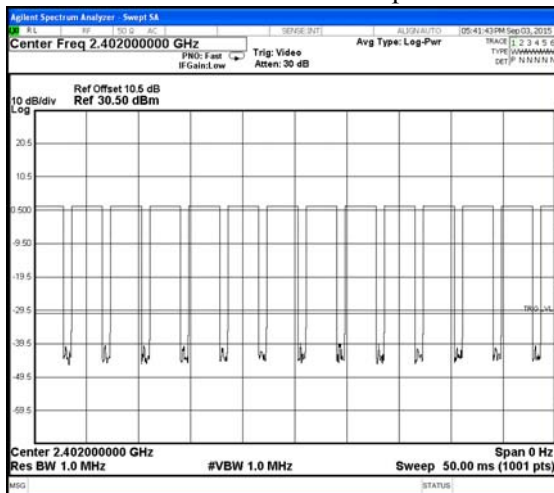
Product : Notebook
Test Item : Dwell Time
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2402	2.890	13	50	0.75	0.301	0.4	Pass
2441	2.890	13	50	0.75	0.301	0.4	Pass
2480	2.890	13	50	0.75	0.301	0.4	Pass

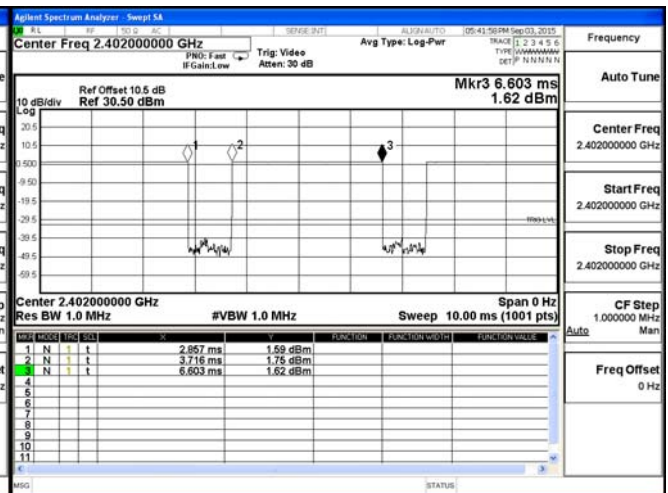
Duty cycle = ((Time slot length(ms)*Hopping of Number) / Sweep time (ms)

Dwell time = (Duty cycle /79) * (79*0.4)

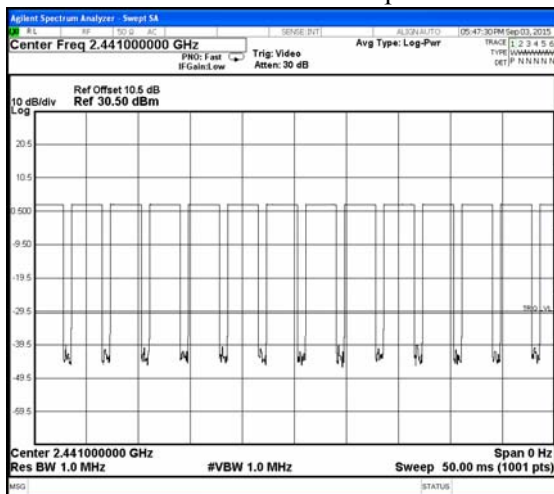
CH 00 Time Interval between hops



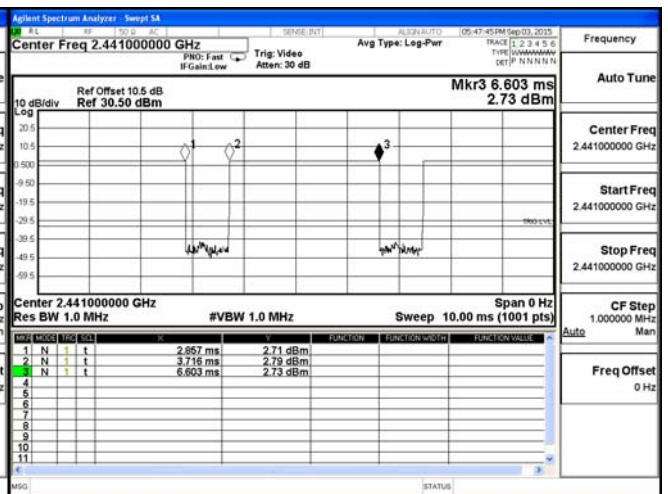
CH 00 Transmission Time



CH39 Time Interval between hops

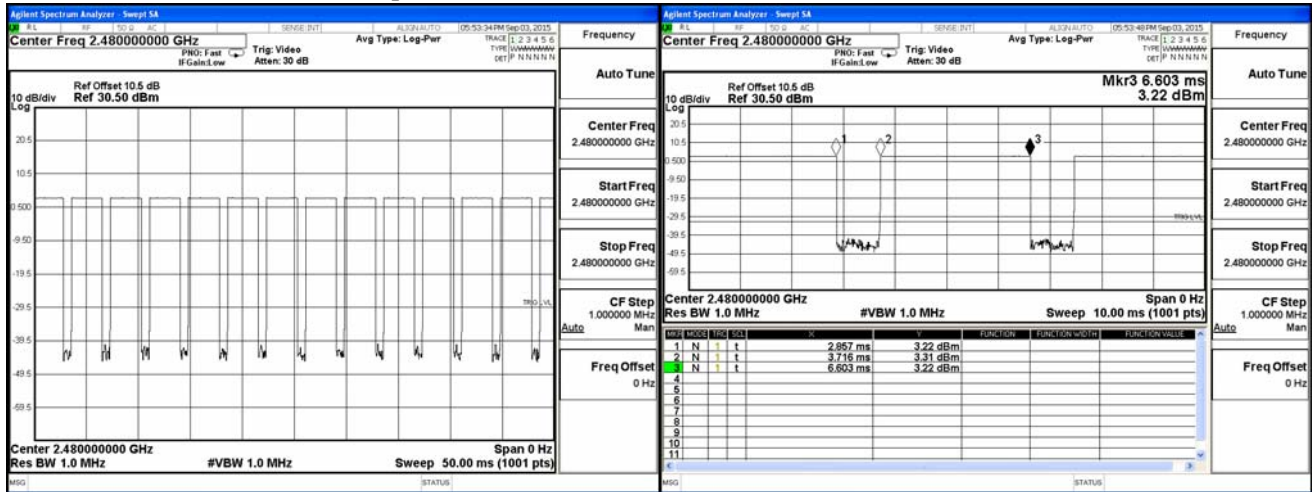


CH 39Transmission Time



CH 78 Time Interval between hops

CH 78 Transmission Time



Note:

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

Product : Notebook
 Test Item : Dwell Time
 Test Site : No.3 OATS
 Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Channel 00,39,78 –DH5)

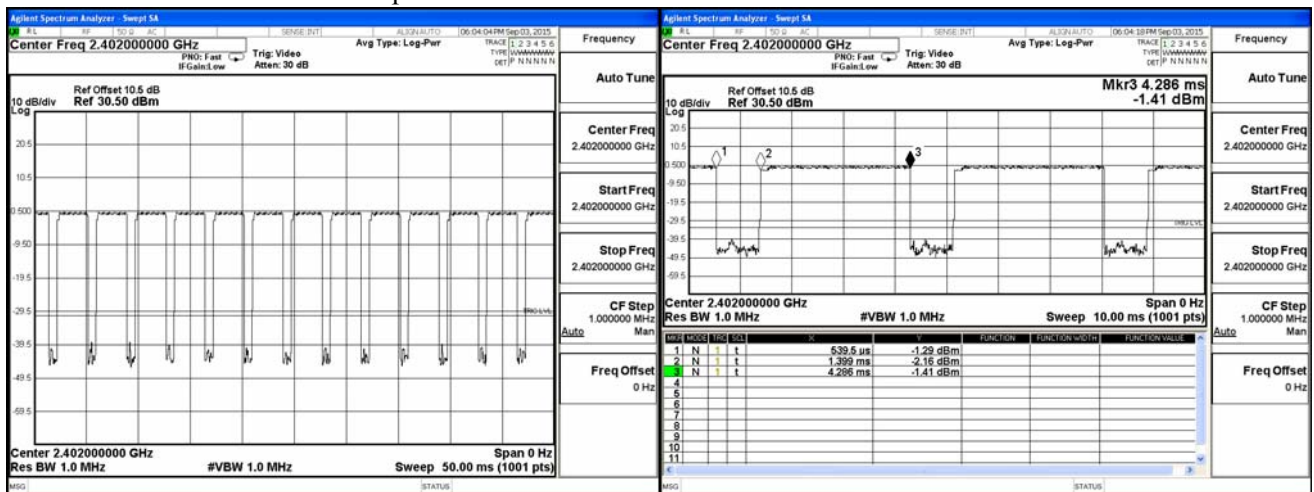
Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Duty cycle	Dwell Time (Sec)	Limit (Sec)	Result
2402	2.890	13	50	0.75	0.301	0.4	Pass
2441	2.890	13	50	0.75	0.301	0.4	Pass
2480	2.890	13	50	0.75	0.301	0.4	Pass

Duty cycle = ((Time slot length(ms)*Hopping of Number) / Sweep time (ms))

Dwell time = (Duty cycle /79) * (79*0.4)

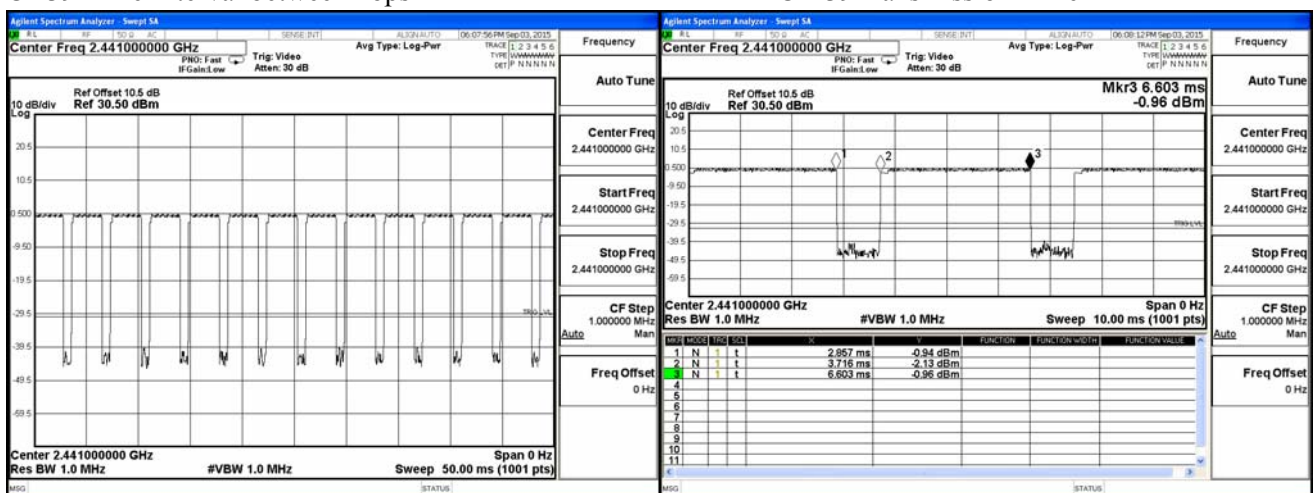
CH 00 Time Interval between hops

CH 00 Transmission Time



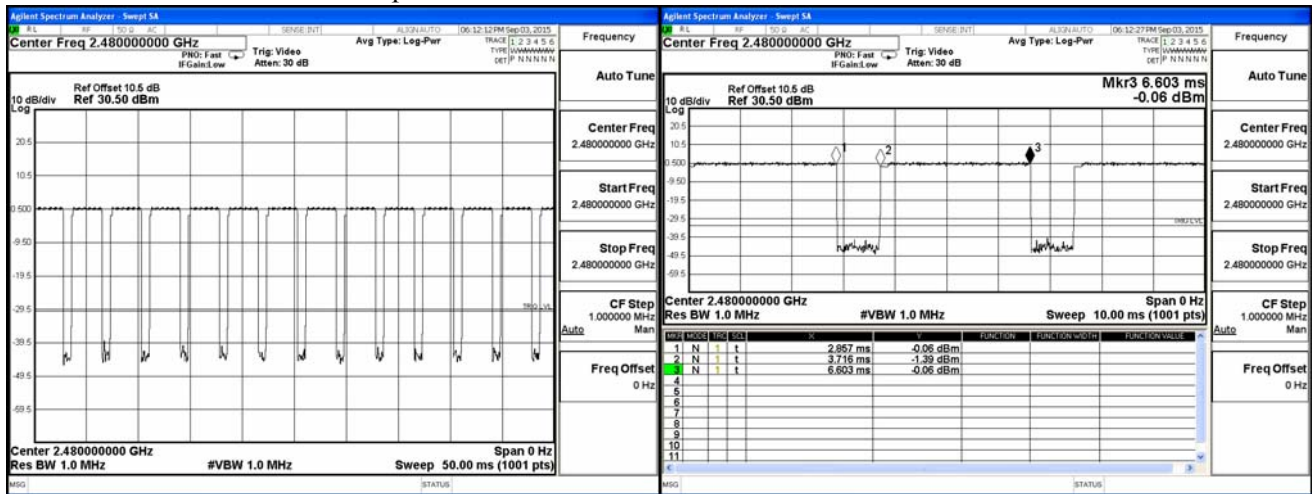
CH39 Time Interval between hops

CH 39 Transmission Time



CH 78 Time Interval between hops

CH 78 Transmission Time



Note:

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

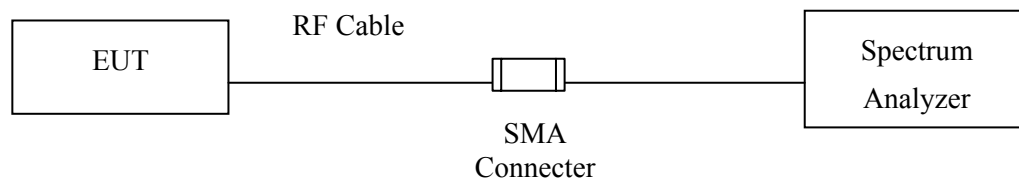
10. Occupied Bandwidth

10.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2015
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2015
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2015

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

10.2. Test Setup



10.3. Limits

N/A

10.4. Test Procedure

The EUT was setup to ANSI C63.4, 2014; tested to FHSS test procedure of FCC Public Notice DA 00-705 for compliance to FCC 47CFR 15.247 requirements.

10.5. Uncertainty

$\pm 150\text{Hz}$

10.6. Test Result of Occupied Bandwidth

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

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1150	--	NA
39	2441	1150	--	NA
78	2480	1140	--	NA

Figure Channel 00:

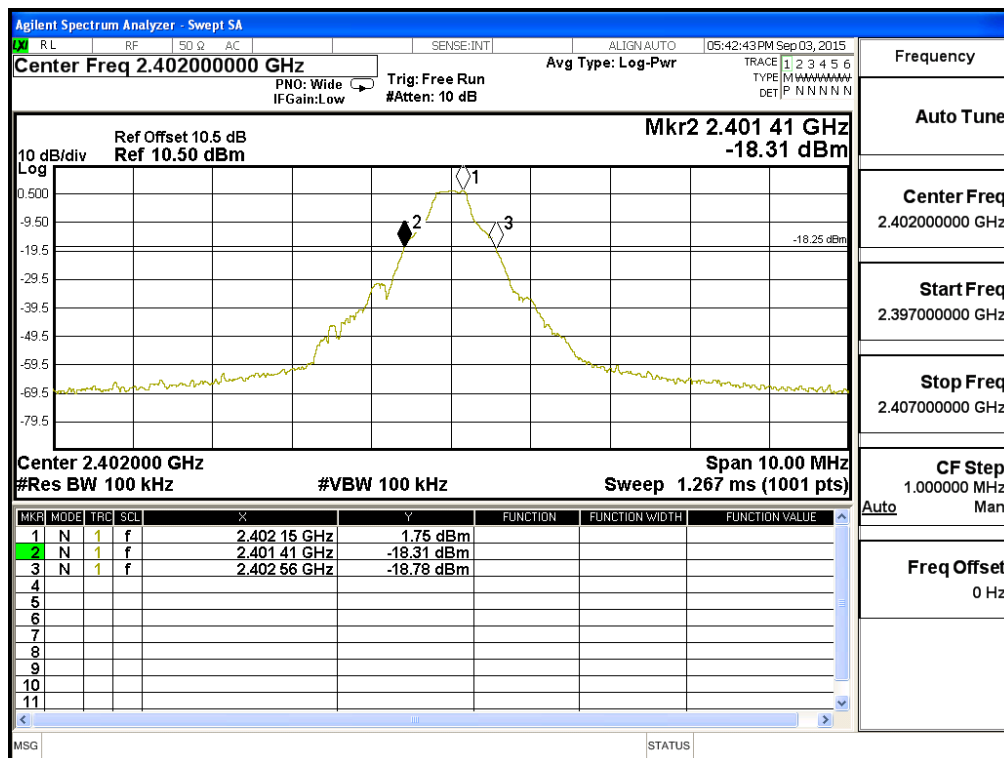


Figure Channel 39:

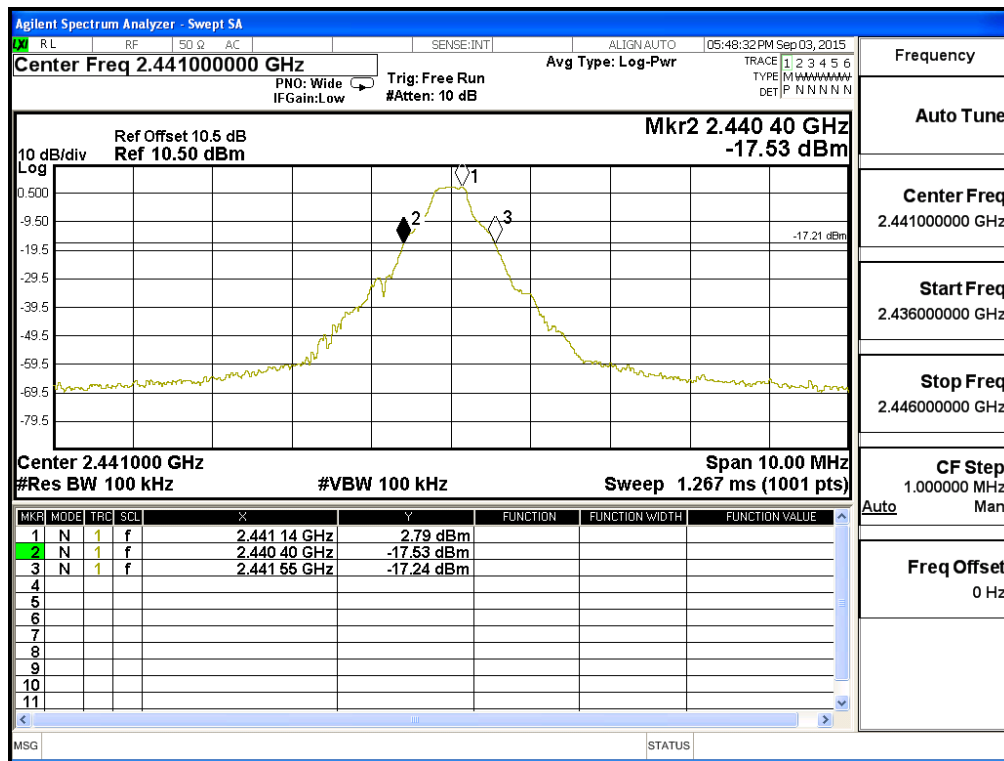
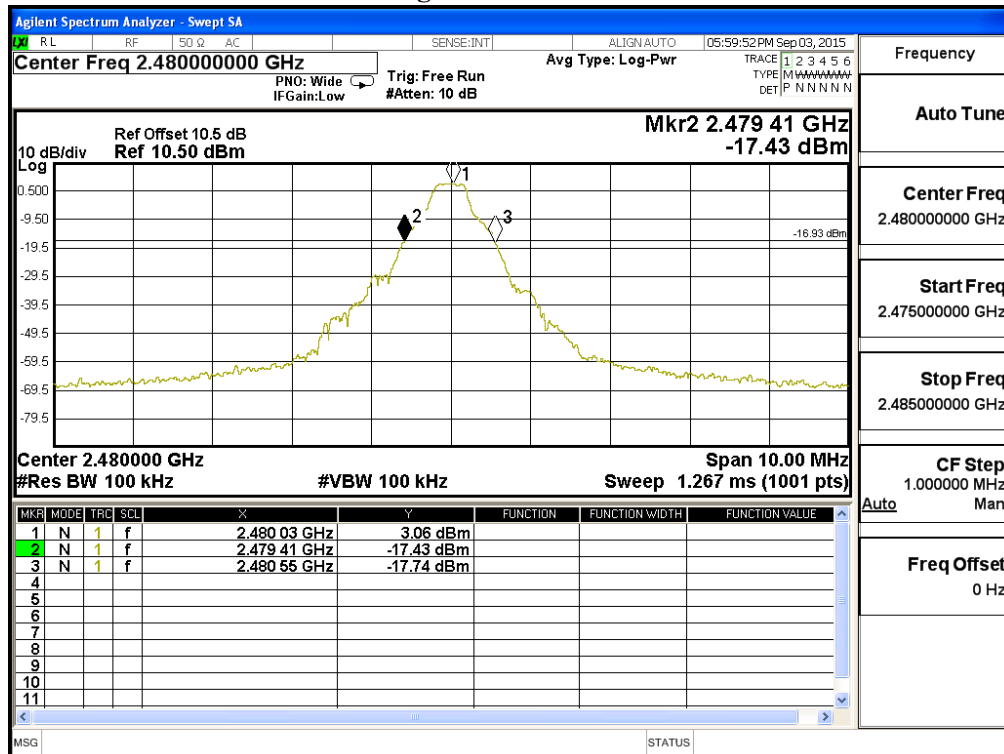


Figure Channel 78:



Product : Notebook
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1430	--	NA
39	2441	1420	--	NA
78	2480	1430	--	NA

Figure Channel 00:

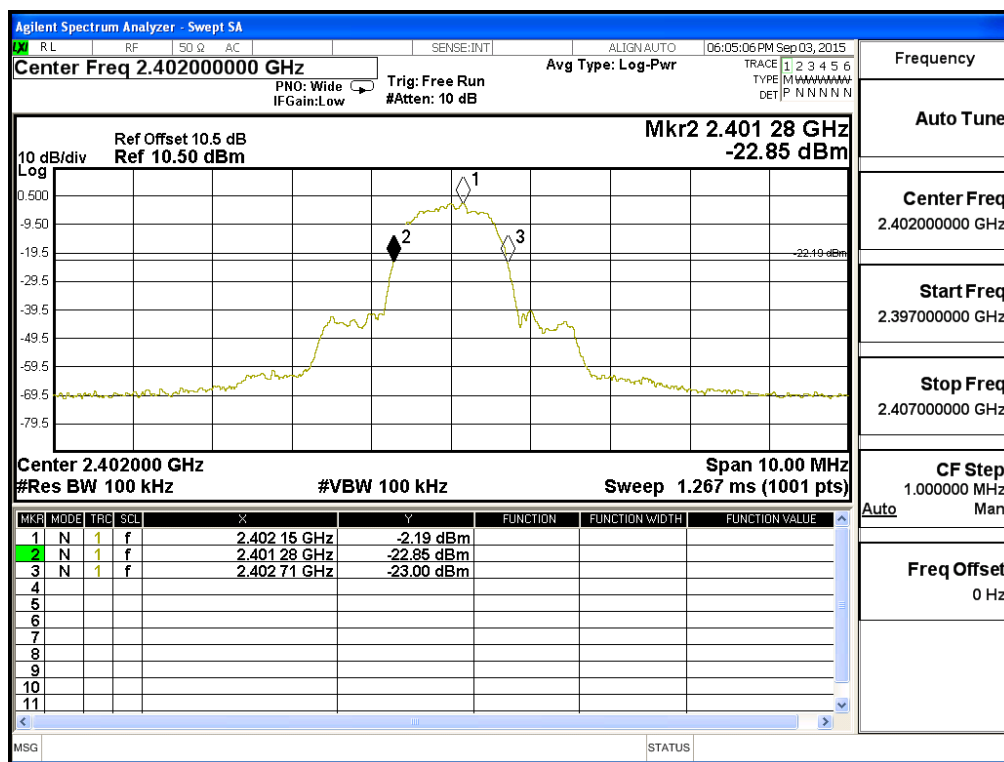


Figure Channel 39:

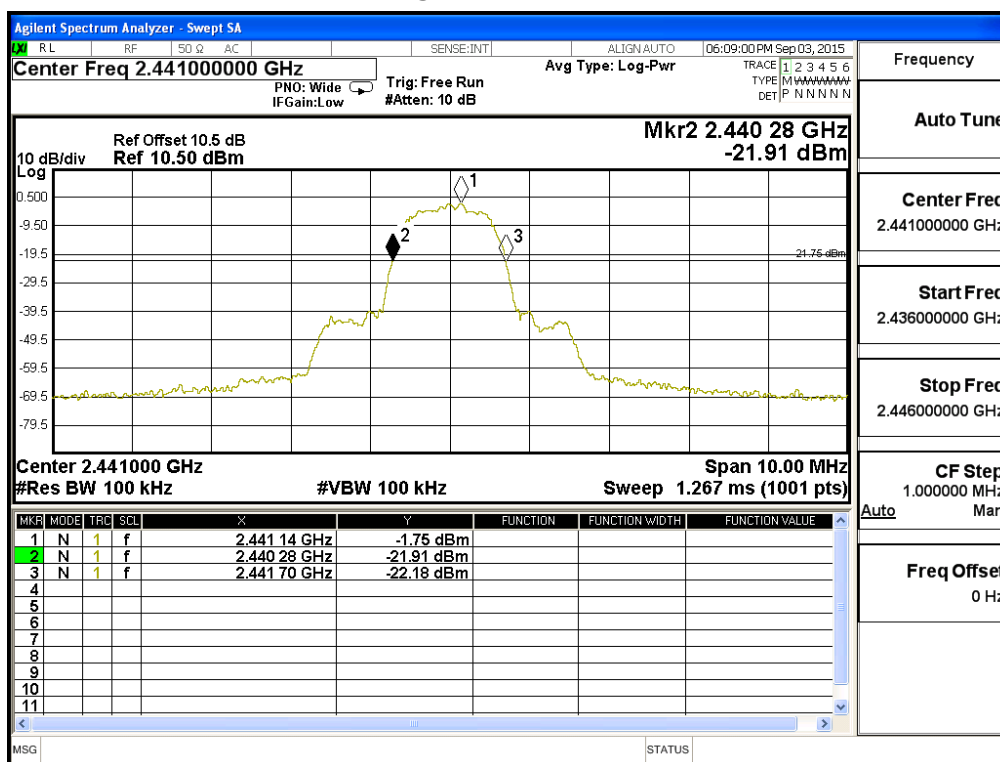
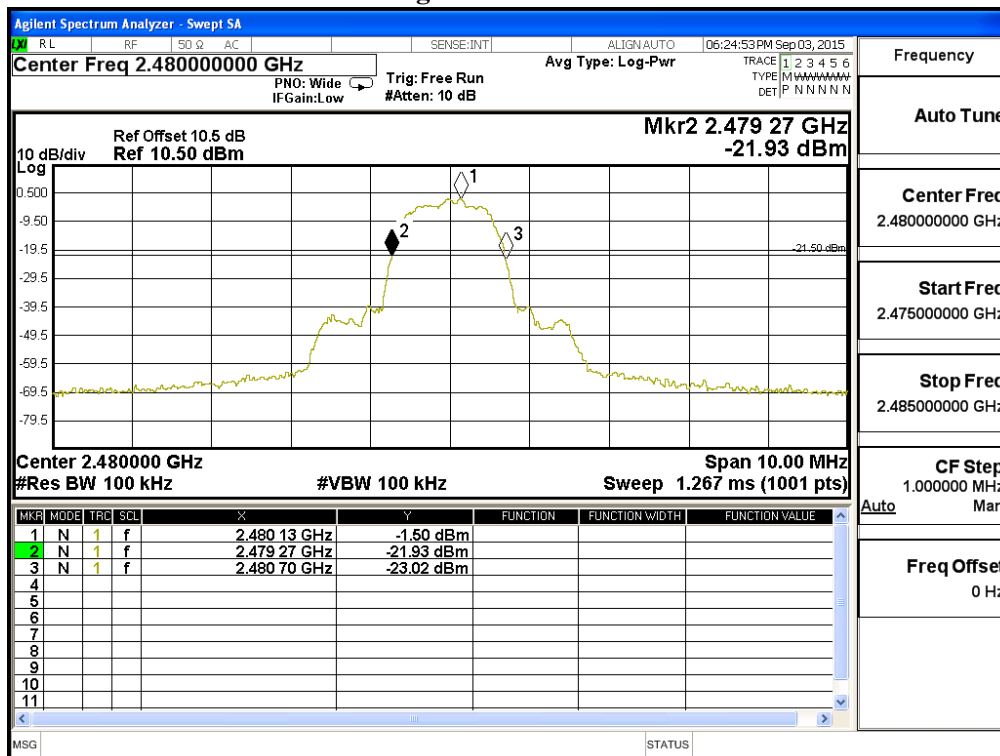


Figure Channel 78:



11. EMI Reduction Method During Compliance Testing

No modification was made during testing.