

FCC Test Report

Product Name	FIELDBOOK
Model No.	E1
FCC ID.	XGIFBE1

Applicant	LOGIC INSTRUMENT S.A.
Address	43 Avenue de l'Europe, BP60012, 95330 DOMONT cedex, France.

Date of Receipt	Jul. 04, 2013
Issued Date	Aug. 13, 2013
Report No.	137173R-RFUSP43V01
Report Version	V1.0



The Test Results relate only to the samples tested.

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

Test Report Certification

Issued Date: Aug. 13, 2013

Report No.: 137173R-RFUSP43V01



Product Name	FIELDBOOK
Applicant	LOGIC INSTRUMENT S.A.
Address	43 Avenue de l'Europe, BP60012, 95330 DOMONT cedex, France.
Manufacturer	Ubiqconn Technology, Inc.
Model No.	E1
FCC ID.	XGIFBE1
EUT Rated Voltage	AC 100-240V, 50-60Hz
EUT Test Voltage	AC 120V/60Hz
Trade Name	TETRA RUGGED COMPUTERS
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2012 ANSI C63.4: 2003, ANSI C63.10: 2009
Test Result	Complied

The Test Results relate only to the samples tested.

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Documented By

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(Manager / Vincent Lin)

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Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	FIELDBOOK
Trade Name	TETRA RUGGED COMPUTERS
Model No.	E1
FCC ID.	XGIFBE1
Frequency Range	2402 – 2480MHz
Channel Number	V4.0: 40CH
Type of Modulation	V4.0: GFSK(1Mbps)
Antenna Type	PIFA Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
Power Adapter	MFR: ELEMENTECH, M/N: AU12412030 Input: AC 100-240V, 50/60Hz, 0.6A Output: DC 12V, 2A Cable Out: Non-Shielded, 1.6m

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Ethertronics Inc.	5001510	PIFA Antenna	2.2dBi For 2.4GHz

Note: The antenna of EUT is conform to FCC 15.203.

Center Frequency of Each Channel: (For V4.0)

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 01:	2404 MHz	Channel 02:	2406 MHz	Channel 03:	2408 MHz
Channel 04:	2410 MHz	Channel 05:	2412 MHz	Channel 06:	2414 MHz	Channel 07:	2416 MHz
Channel 08:	2418 MHz	Channel 09:	2420 MHz	Channel 10:	2422 MHz	Channel 11:	2424 MHz
Channel 12:	2426 MHz	Channel 13:	2428 MHz	Channel 14:	2430 MHz	Channel 15:	2432 MHz
Channel 16:	2434 MHz	Channel 17:	2436 MHz	Channel 18:	2438 MHz	Channel 19:	2440 MHz
Channel 20:	2442 MHz	Channel 21:	2444 MHz	Channel 22:	2446 MHz	Channel 23:	2448 MHz
Channel 24:	2450 MHz	Channel 25:	2452 MHz	Channel 26:	2454 MHz	Channel 27:	2456 MHz
Channel 28:	2458 MHz	Channel 29:	2460 MHz	Channel 30:	2462 MHz	Channel 31:	2464 MHz
Channel 32:	2466 MHz	Channel 33:	2468 MHz	Channel 34:	2470 MHz	Channel 35:	2472 MHz
Channel 36:	2474 MHz	Channel 37:	2476 MHz	Channel 38:	2478 MHz	Channel 39:	2480 MHz

Note:

1. This device is a FIELDBOOK, Contains functions and so on WLAN 、Bluetooth, This report for Bluetooth V4.0.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

Test Mode	Mode 1: Transmit - BLE (GFSK)
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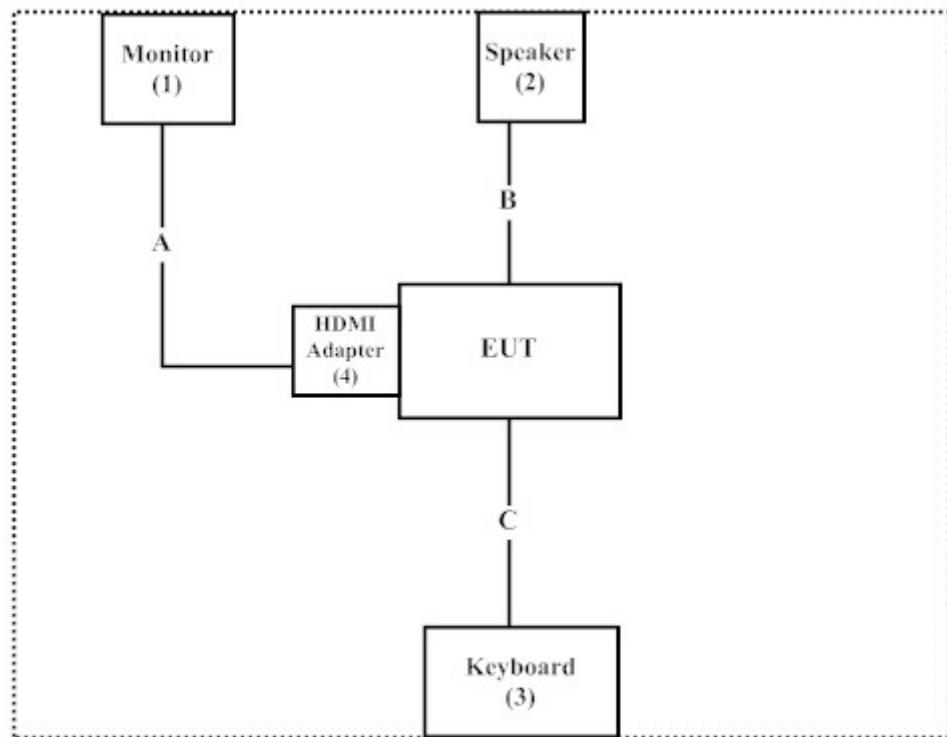
1.3. Tested System Details

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

Product	Manufacturer	Model No.	Serial No.	Power Cord
1 Monitor	DELL	ST232029	N/A	N/A
2 Speaker	PHILIPS	SBP1100	HS1A0825057486	N/A
3 Keyboard	Logitech	Y-UR83	SY853UK	N/A
4 HDMI Adapter	Avier	N/A	N/A	N/A

Signal Cable Type		Signal cable Description
A	HDMI Cable	Non-Shielded, 1.5m
B	Speaker Cable	Non-Shielded, 1.5m
C	Keyboard Cable	Non-Shielded, 1.2m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

- (1) Setup the EUT as shown in Section 1.4.
- (2) Execute program “Terminal Emulator v1.0.45” on the EUT.
- (3) Configure the test mode, the test channel, and the data rate.
- (4) Press “OK” to start the continuous Transmit.
- (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/tw/ctg/cts/accreditations.htm>

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

Site Description: File on
Federal Communications Commission
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7435 Oakland Mills Road
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Registration Number: 92195

Site Description: Accredited by TAF
Accredited Number: 0914

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E-Mail : service@quietek.com

FCC Accreditation Number: TW1014

2. Conducted Emission

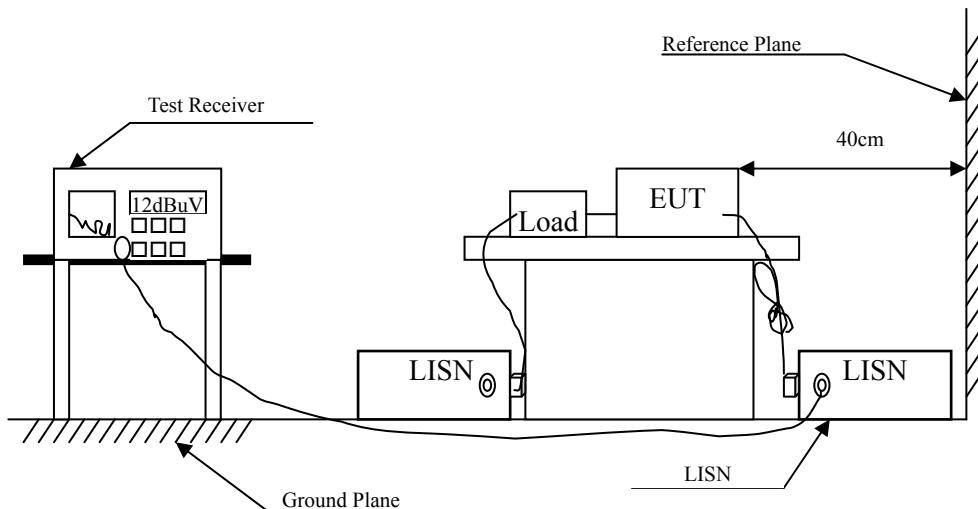
2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2012	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2013	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2013	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar, 2013	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2013	
	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 (dBuV) Limit		
Frequency MHz	Limits	
	QP	AV
0.15 - 0.50	66-56	56-46
0.50-5.0	56	46
5.0 - 30	60	50

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

2.4. Test Procedure

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

Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.10: 2009 on conducted measurement.

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

The EUT was setup to ANSI C63.10, 2009; 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 : FIELDBOOK
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV	Margin dB	Limit dBuV
LINE 1					
Quasi-Peak					
0.185	9.698	40.440	50.138	-14.862	65.000
0.224	9.700	31.420	41.120	-22.766	63.886
0.455	9.710	35.900	45.610	-11.676	57.286
0.802	9.726	21.720	31.446	-24.554	56.000
1.068	9.738	22.590	32.328	-23.672	56.000
4.423	9.820	20.700	30.520	-25.480	56.000
Average					
0.185	9.698	30.410	40.108	-14.892	55.000
0.224	9.700	17.420	27.120	-26.766	53.886
0.455	9.710	26.870	36.580	-10.706	47.286
0.802	9.726	10.220	19.946	-26.054	46.000
1.068	9.738	15.870	25.608	-20.392	46.000
4.423	9.820	14.920	24.740	-21.260	46.000

Note:

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

Product : FIELDBOOK
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV	dB	dBuV
LINE 2					
Quasi-Peak					
0.185	9.678	39.460	49.138	-15.862	65.000
0.228	9.680	33.040	42.720	-21.051	63.771
0.279	9.682	29.040	38.722	-23.592	62.314
0.466	9.691	32.770	42.461	-14.510	56.971
1.068	9.728	22.910	32.638	-23.362	56.000
3.037	9.800	19.040	28.840	-27.160	56.000
Average					
0.185	9.678	28.770	38.448	-16.552	55.000
0.228	9.680	21.620	31.300	-22.471	53.771
0.279	9.682	19.150	28.832	-23.482	52.314
0.466	9.691	26.600	36.291	-10.680	46.971
1.068	9.728	15.430	25.158	-20.842	46.000
3.037	9.800	11.400	21.200	-24.800	46.000

Note:

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

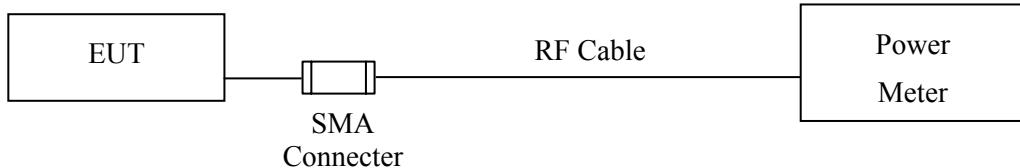
3. Peak Power Output

3.1. Test Equipment

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
X Power Meter	Anritsu	ML2495A/6K00003357	May, 2013
X Power Sensor	Anritsu	MA2411B/0738448	Jun., 2013

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 tested according to DTS test procedure of KDB 558074 for compliance to FCC 47CFR 15.247 requirements. The maximum peak conducted output power using KDB 558074 section 9.1.3 PKPM1 Peak power meter method.

3.5. Uncertainty

± 1.27 dB

3.6. Test Result of Peak Power Output

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

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	7.01	1 Watt= 30 dBm	Pass
Channel 19	2440.00	7.45	1 Watt= 30 dBm	Pass
Channel 39	2480.00	7.53	1 Watt= 30 dBm	Pass

4. Radiated Emission

4.1. Test Equipment

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

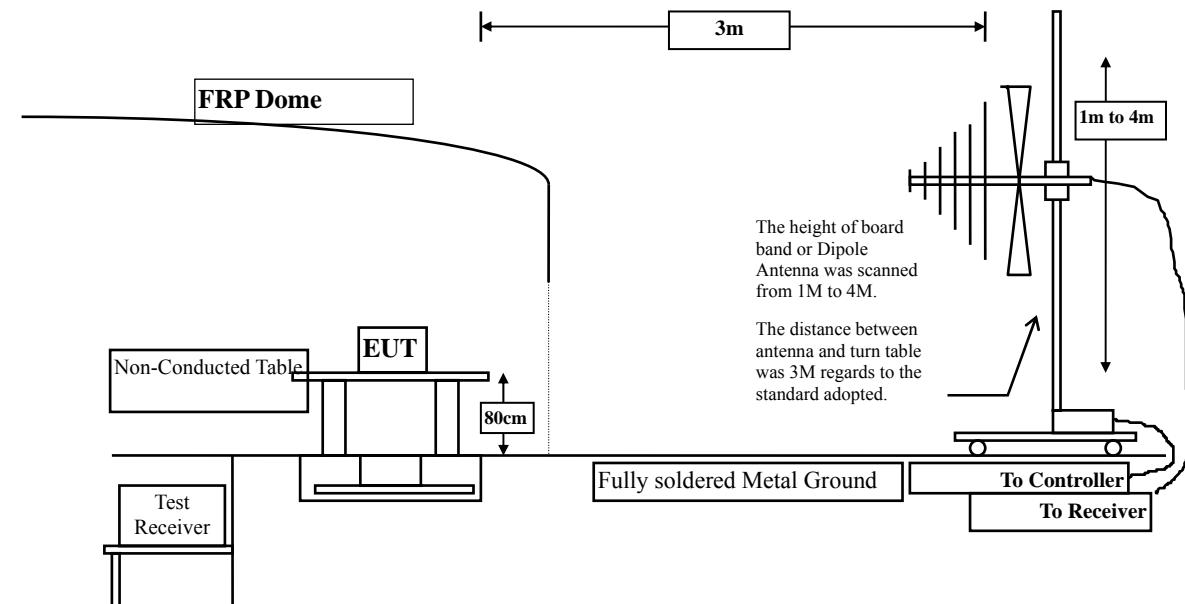
Test Site	Equipment		Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X Loop Antenna		Teseq	HLA6120 / 26739	Jul., 2013
	X Bilog Antenna		Schaffner Chase	CBL6112B/2673	Sep., 2012
	X Horn Antenna		Schwarzbeck	BBHA9120D/D305	Sep., 2012
	X Horn Antenna		Schwarzbeck	BBHA9170/208	Jul., 2013
	X Pre-Amplifier		Agilent	8447D/2944A09549	Sep., 2012
	X Spectrum Analyzer		Agilent	E4407B / US39440758	May, 2013
	X Test Receiver		R & S	ESCS 30/ 825442/018	Sep., 2012
	X Coaxial Cable		QuietTek	QTK-CABLE/ CAB5	Feb., 2013
	X Controller		QuietTek	QTK-CONTROLLER/ CTRL3	N/A
X Coaxial Switch		Anritsu	MP59B/6200265729	N/A	N/A

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

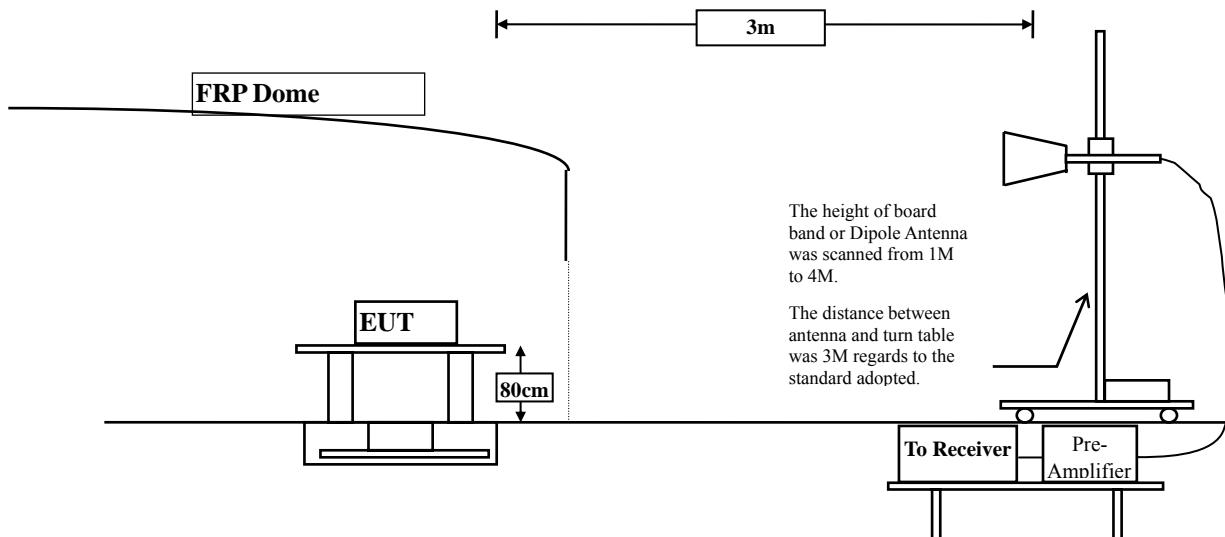
2. The test instruments marked by “X” are used to measure the final test results.

4.2. Test Setup

Below 1GHz



Above 1GHz



4.3. Limits

➤ General Radiated Emission Limits

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

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency MHz	Field strength (microvolts/meter)	Measurement distance (meter)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Remarks:

1. RF Voltage (dBuV) = $20 \log \text{RF Voltage (uV)}$
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, 2009 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 C63.10:2009 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 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 : FIELDBOOK
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4804.000	2.511	54.220	56.730	-17.270	74.000
7206.000	9.511	38.580	48.091	-25.909	74.000
9608.000	10.394	38.830	49.224	-24.776	74.000
Average					
Detector:					
4804.000	2.511	42.240	44.750	-9.250	54.000
Vertical					
Peak Detector:					
4804.000	2.923	56.500	59.422	-14.578	74.000
7206.000	9.988	39.630	49.619	-24.381	74.000
9608.000	10.847	38.990	49.837	-24.163	74.000
Average					
Detector:					
4804.000	2.923	43.990	46.912	-7.088	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. 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 : FIELDBOOK
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4880.000	2.038	54.890	56.928	-17.072	74.000
7320.000	9.699	37.950	47.649	-26.351	74.000
9760.000	9.665	38.400	48.065	-25.935	74.000
Average					
Detector:					
4880.000	2.038	42.820	44.858	-9.142	54.000
Vertical					
Peak Detector:					
4880.000	2.499	58.860	61.359	-12.641	74.000
7320.000	10.303	38.390	48.693	-25.307	74.000
9760.000	10.299	38.490	48.790	-25.210	74.000
Average					
Detector:					
4880.000	2.499	45.740	48.239	-5.761	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. 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 : FIELDBOOK
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)(2480MHz)

Frequency MHz	Correct Factor	Reading Level dBuV	Measurement Level dBuV/m	Margin dB	Limit dBuV/m
Horizontal					
Peak Detector:					
4960.000	2.582	57.590	60.172	-13.828	74.000
7440.000	10.555	38.700	49.255	-24.745	74.000
9920.000	10.206	38.660	48.866	-25.134	74.000
Average					
Detector:					
4960.000	2.582	44.670	47.252	-6.748	54.000
Vertical					
Peak Detector:					
4960.000	3.398	60.670	64.069	-9.931	74.000
7440.000	11.214	38.890	50.104	-23.896	74.000
9920.000	11.245	38.560	49.805	-24.195	74.000
Average					
Detector:					
4960.000	3.398	46.910	50.309	-3.691	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. 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 : FIELDBOOK
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency	Correct Factor	Reading Level	Measurement Level	Margin	Limit
MHz	dB	dBuV	dBuV/m	dB	dBuV/m
Horizontal					
152.220	-7.926	38.225	30.299	-13.201	43.500
260.860	-5.460	38.363	32.903	-13.097	46.000
538.280	3.316	34.595	37.911	-8.089	46.000
769.140	5.118	29.879	34.997	-11.003	46.000
844.800	6.442	25.653	32.095	-13.905	46.000
922.400	6.670	34.257	40.927	-5.073	46.000
Vertical					
152.220	-5.306	34.807	29.501	-13.999	43.500
307.420	-4.030	39.017	34.987	-11.013	46.000
394.720	-1.697	33.444	31.747	-14.253	46.000
538.280	1.996	37.338	39.334	-6.666	46.000
691.540	2.092	25.351	27.443	-18.557	46.000
922.400	3.200	30.989	34.189	-11.811	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.

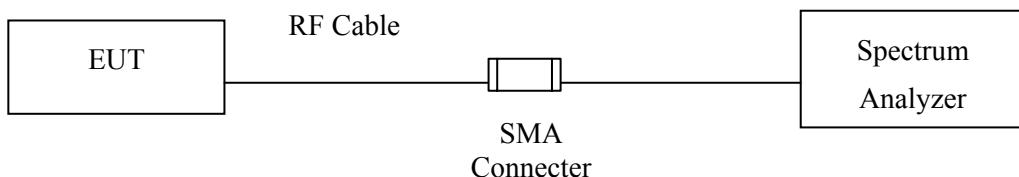
5. RF Antenna Conducted Test

5.1. Test Equipment

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2013
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2013
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2013

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 tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

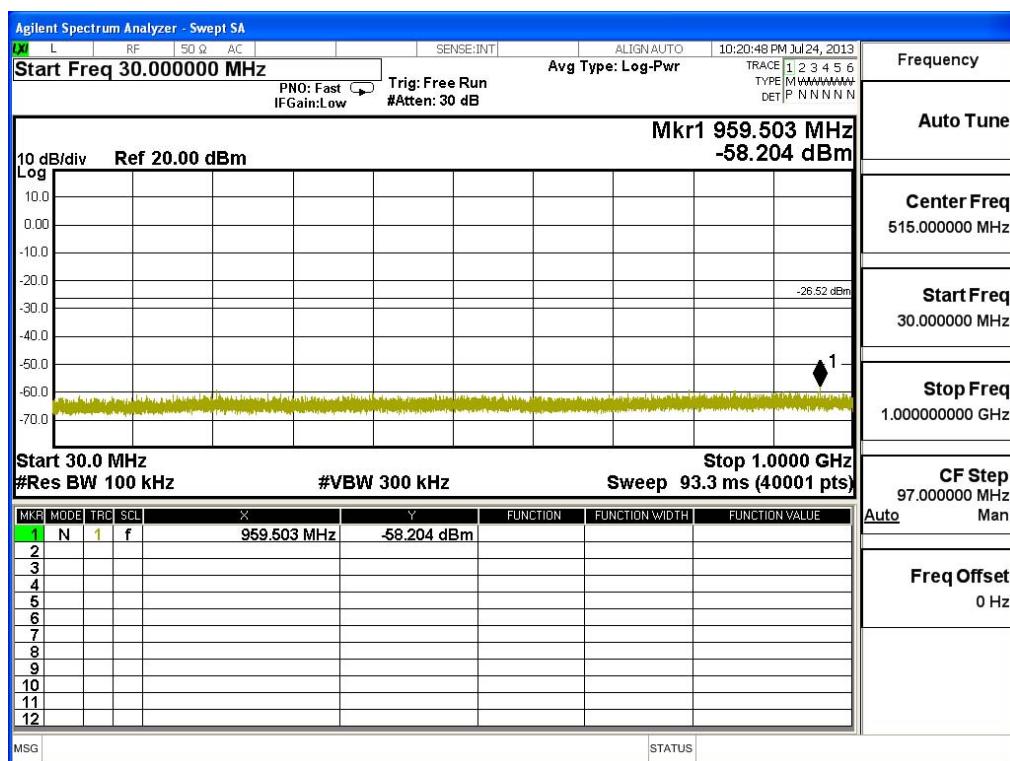
5.5. Uncertainty

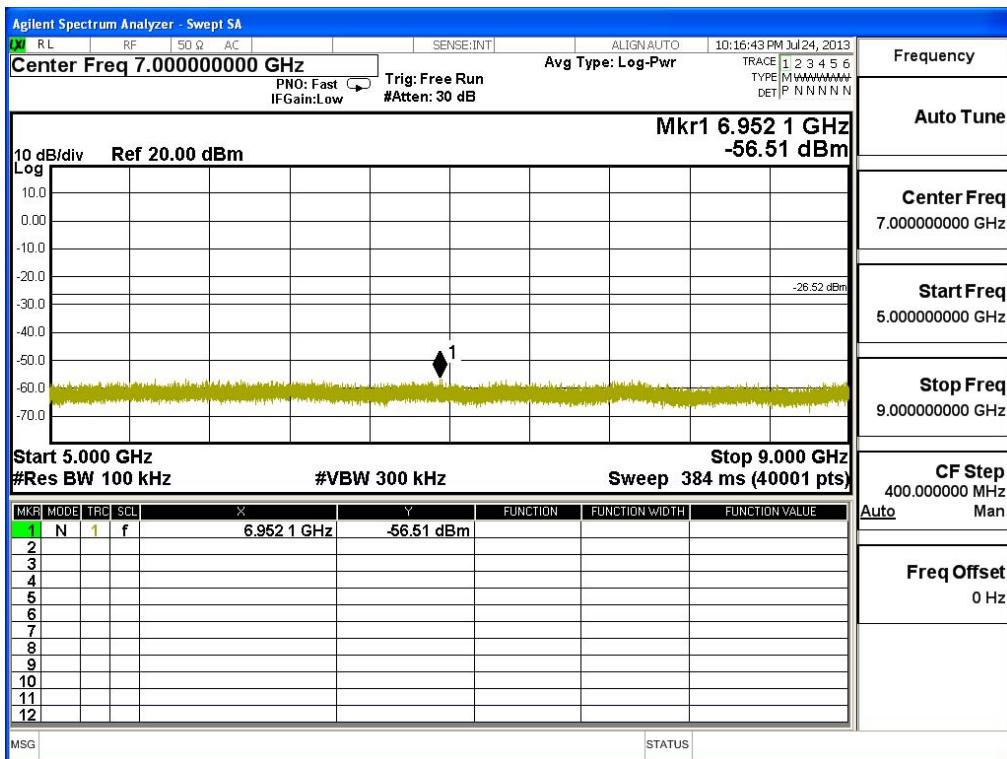
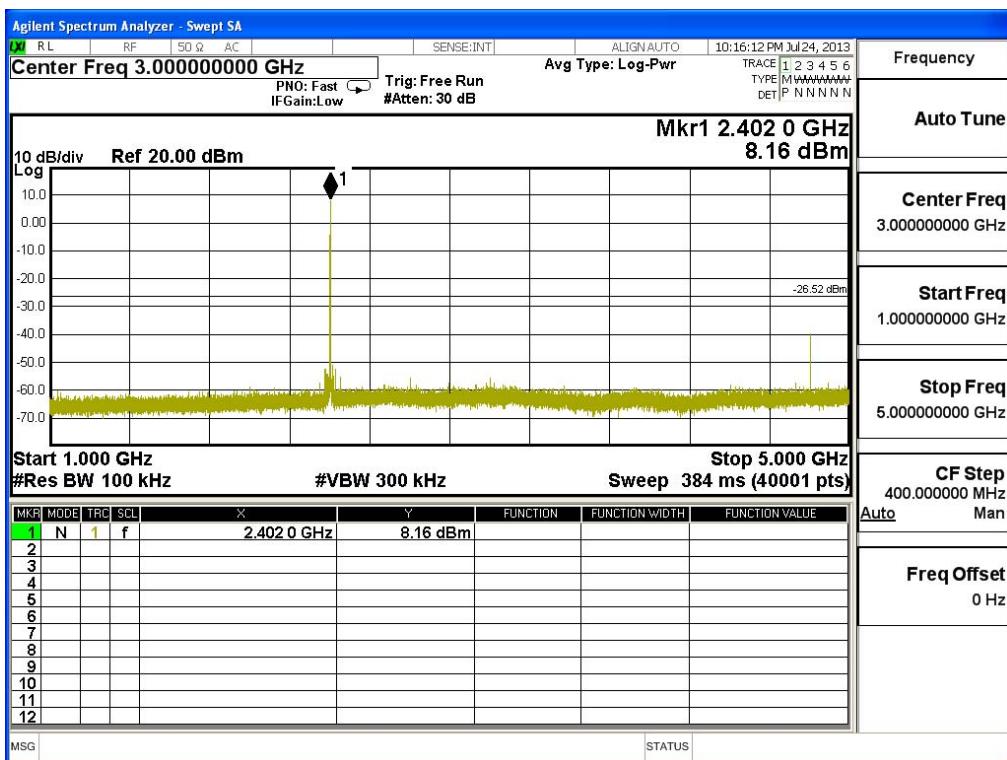
± 150Hz

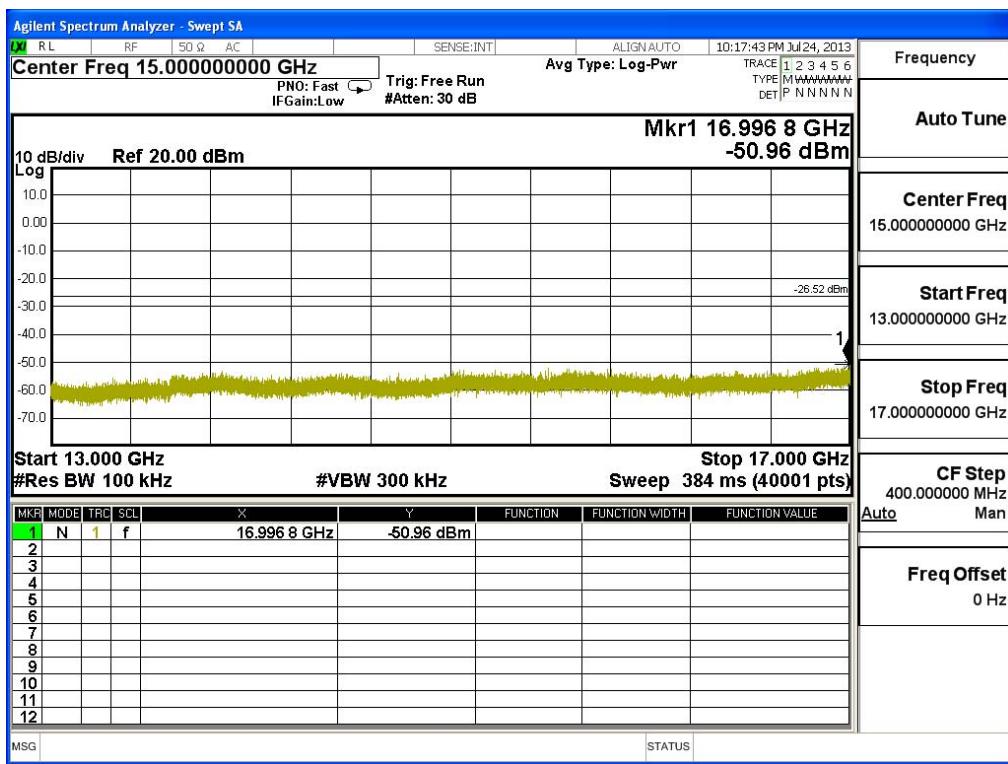
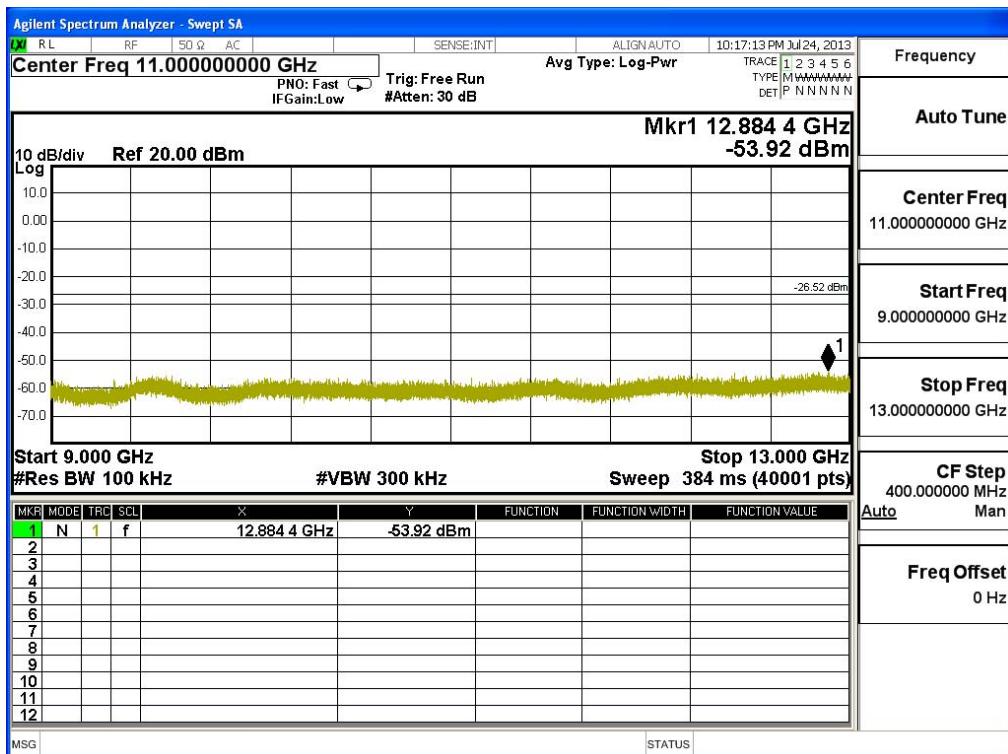
5.6. Test Result of RF Antenna Conducted Test

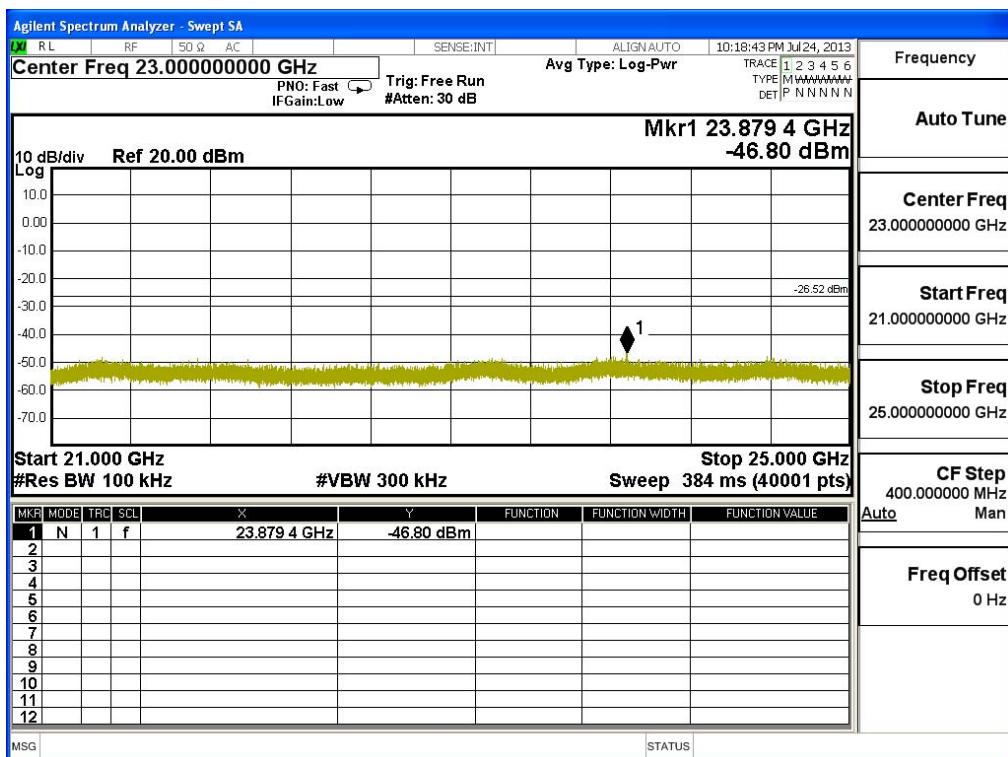
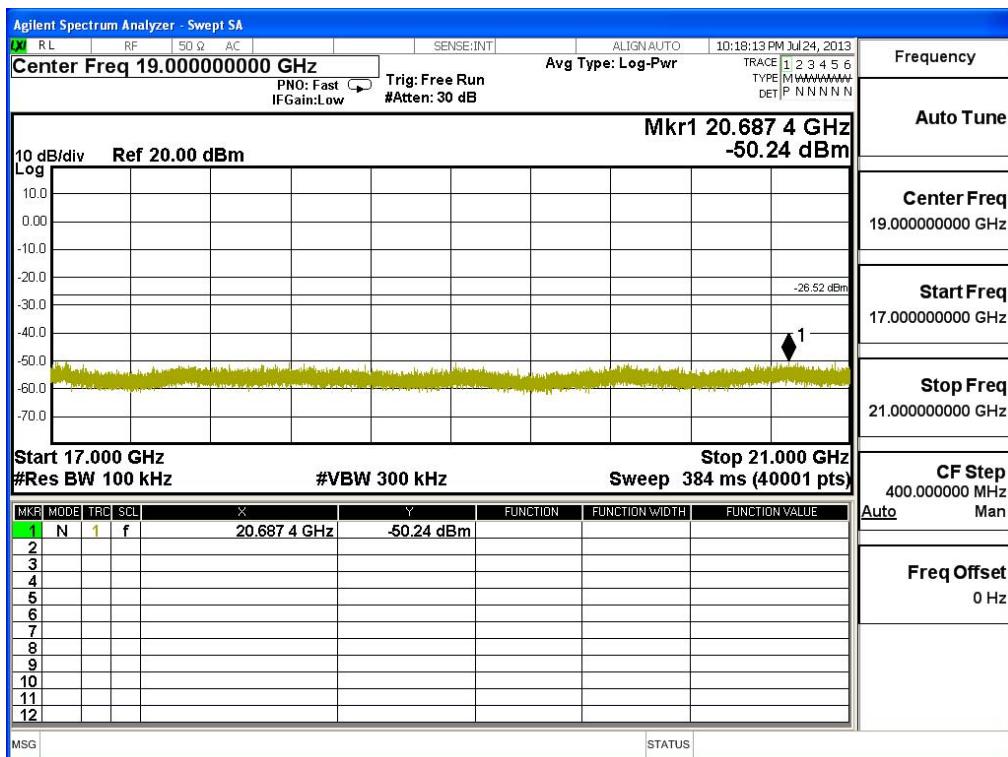
Product : FIELDBOOK
 Test Item : RF Antenna Conducted Test
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)

Figure Channel 00:



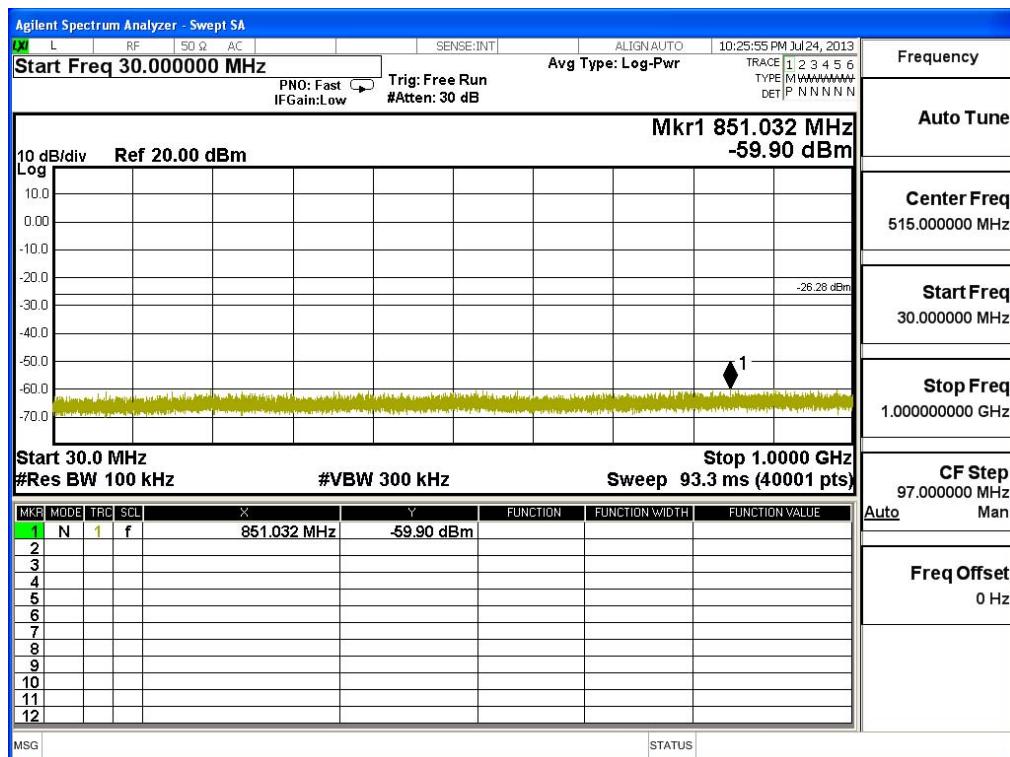


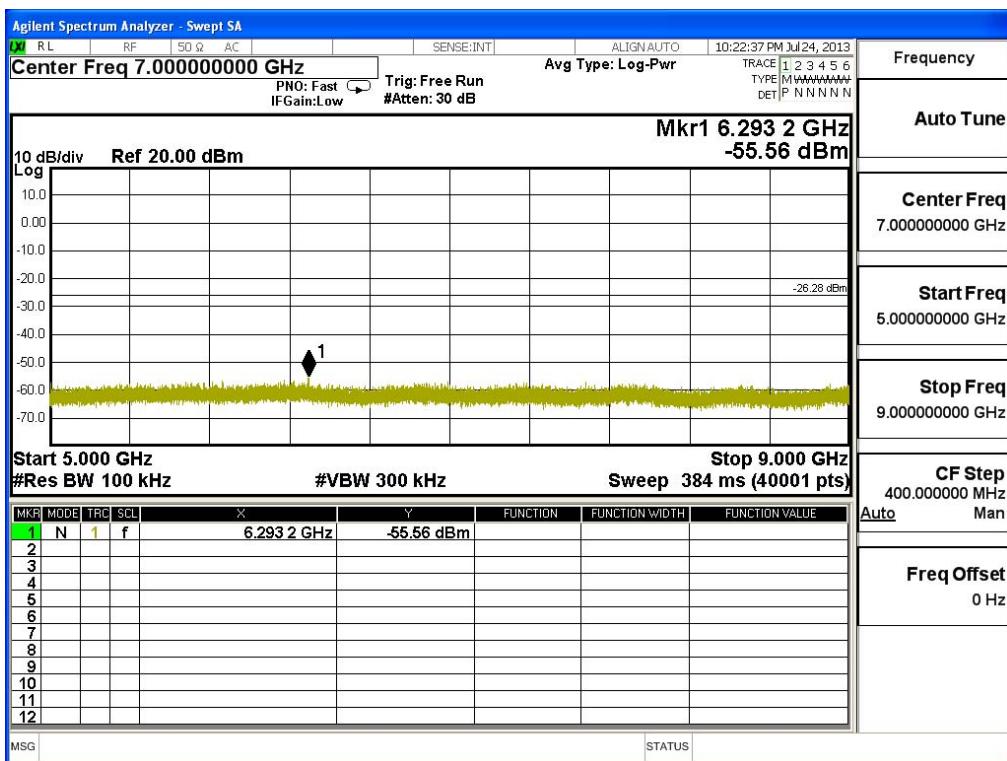
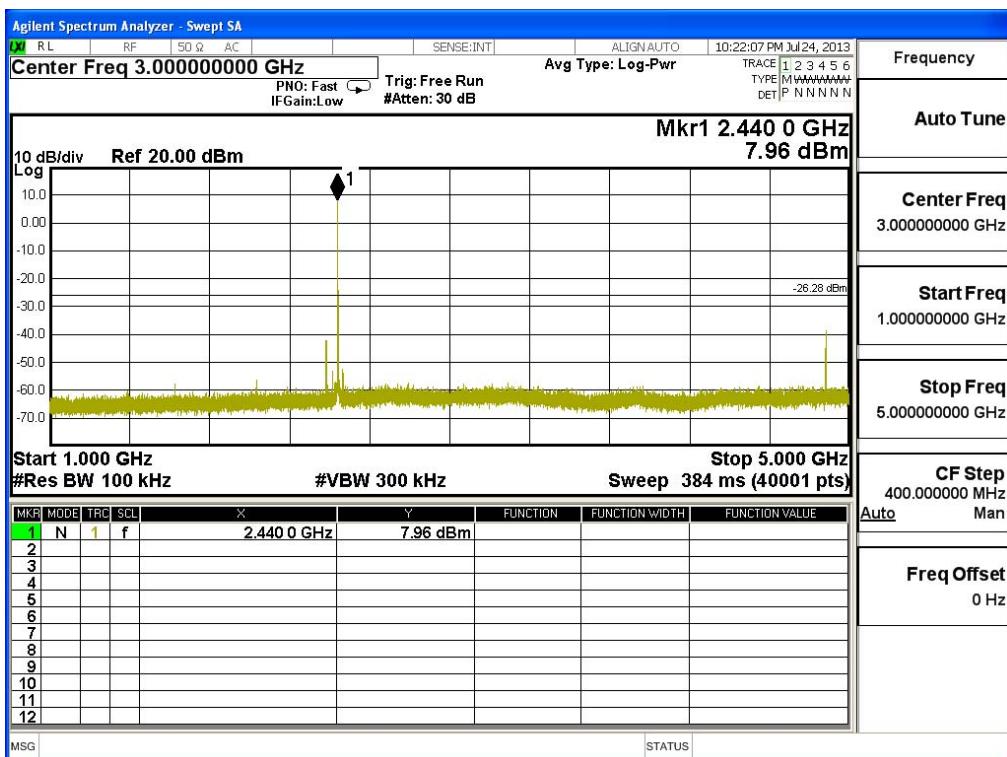


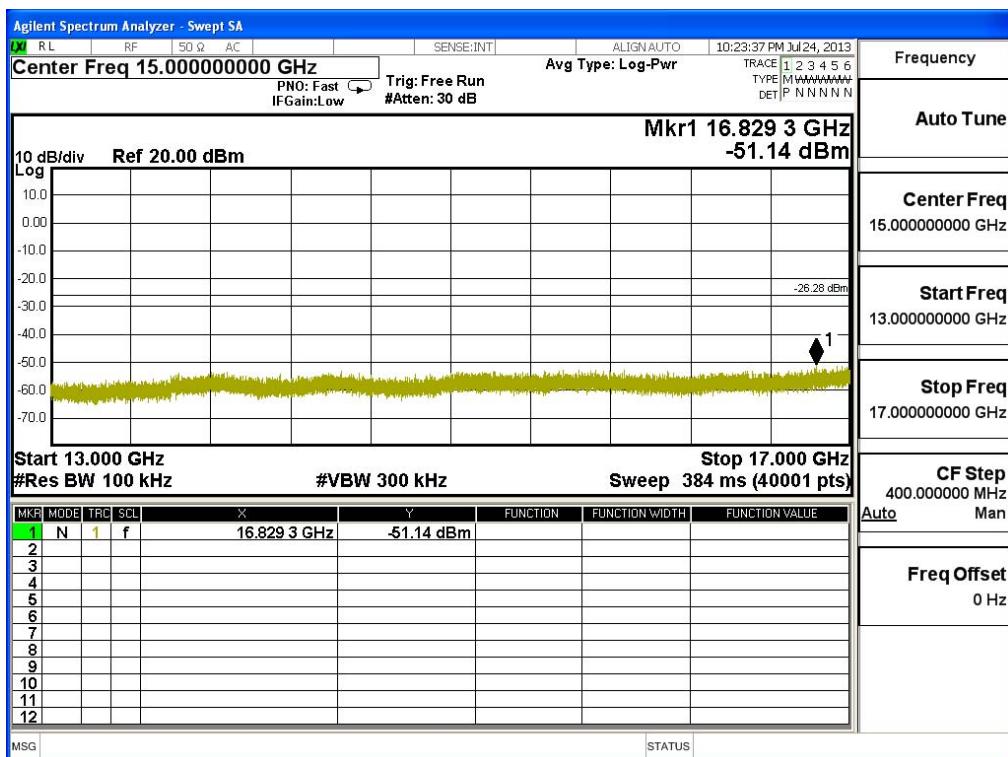
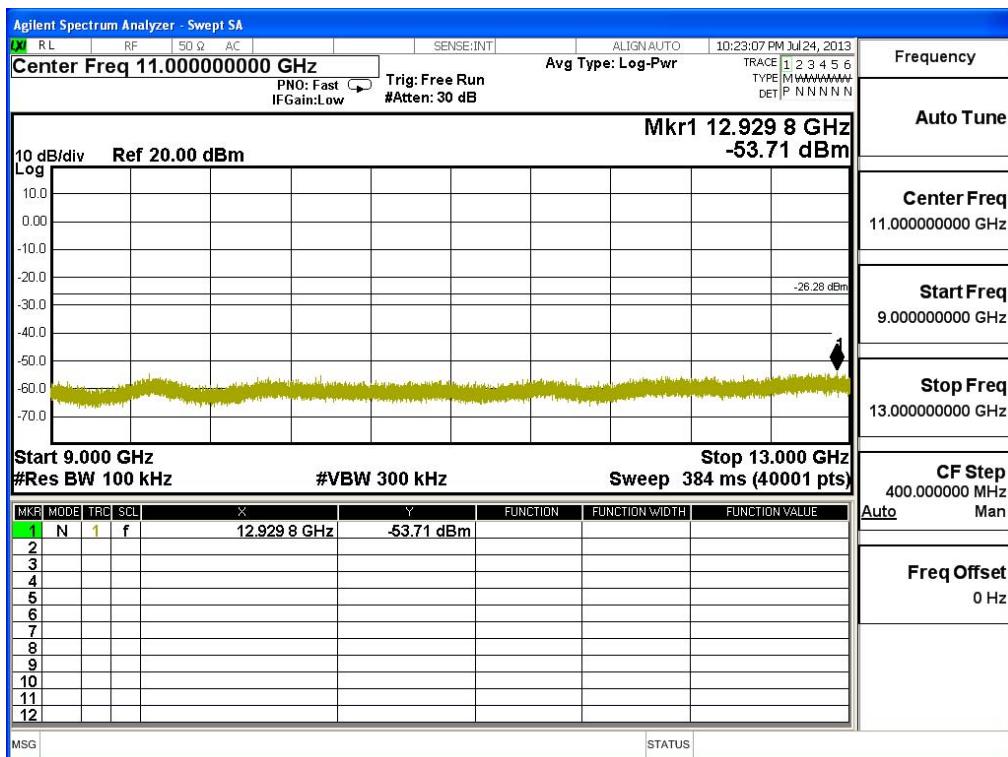


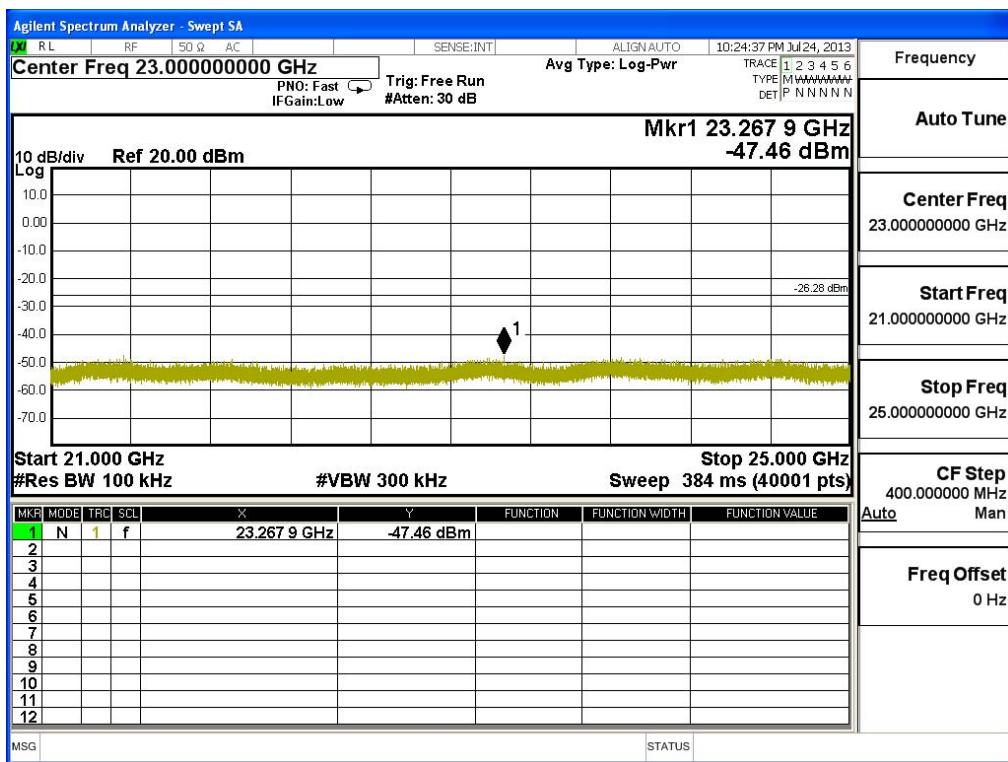
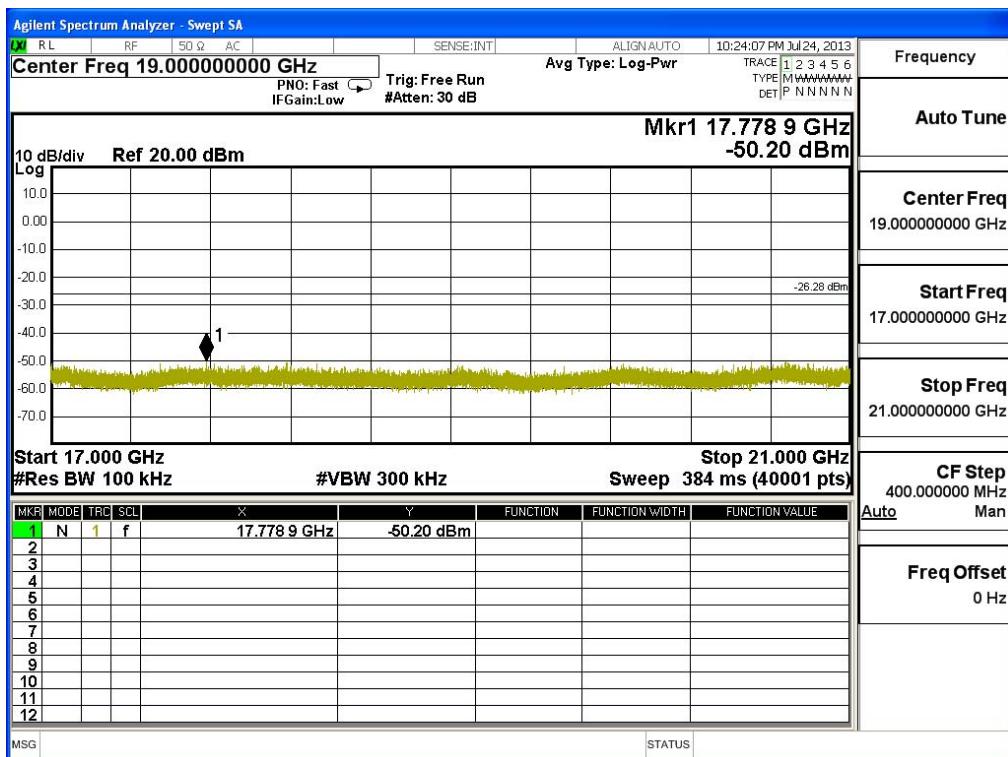
Product : FIELDBOOK
 Test Item : RF Antenna Conducted Test
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)

Figure Channel 19:



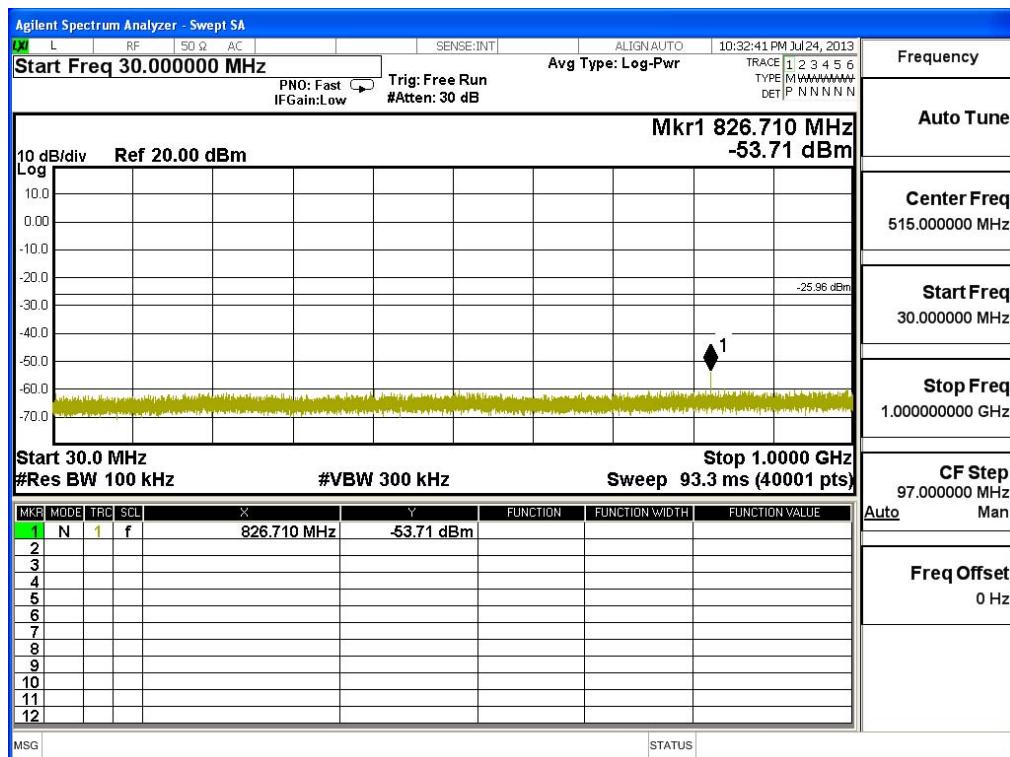


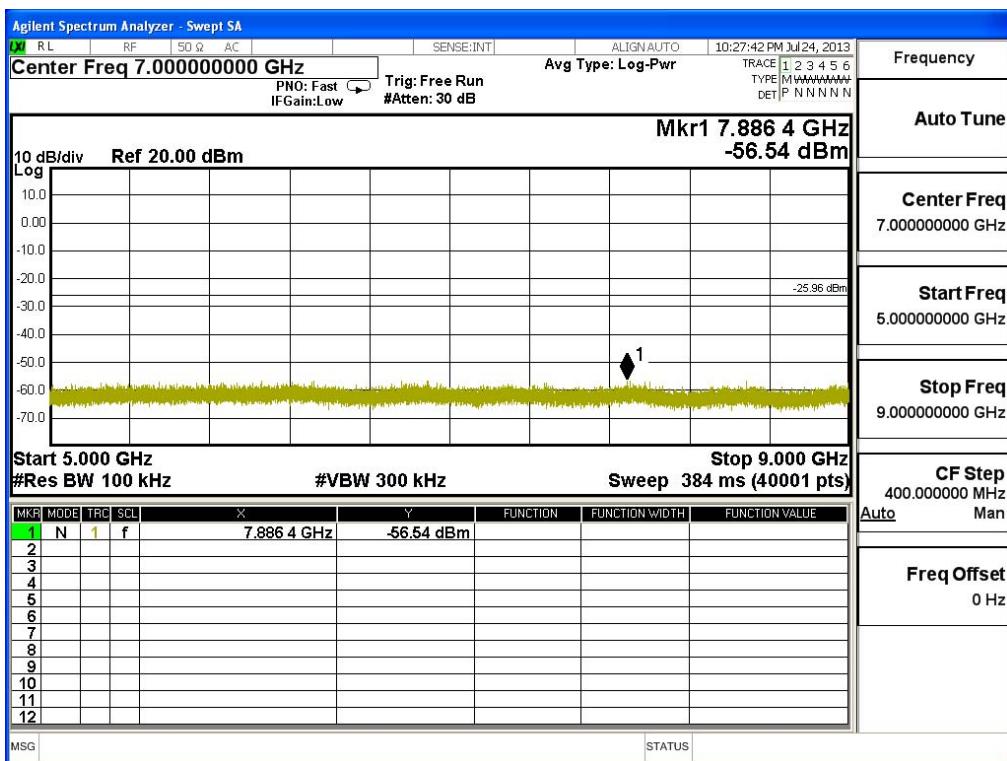
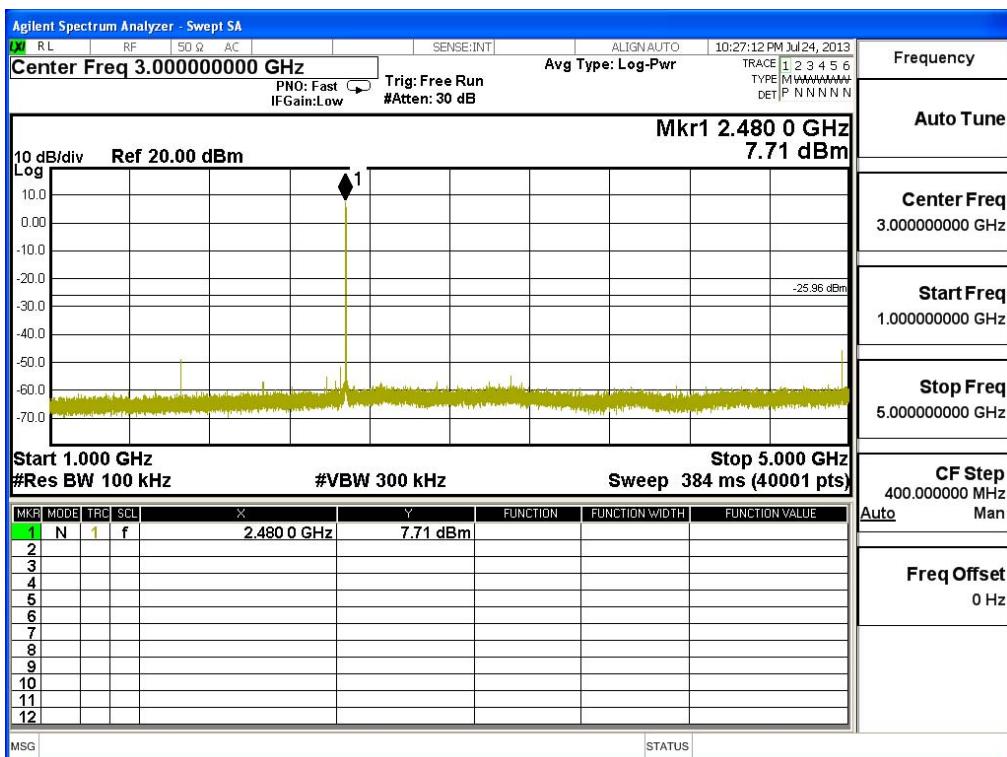


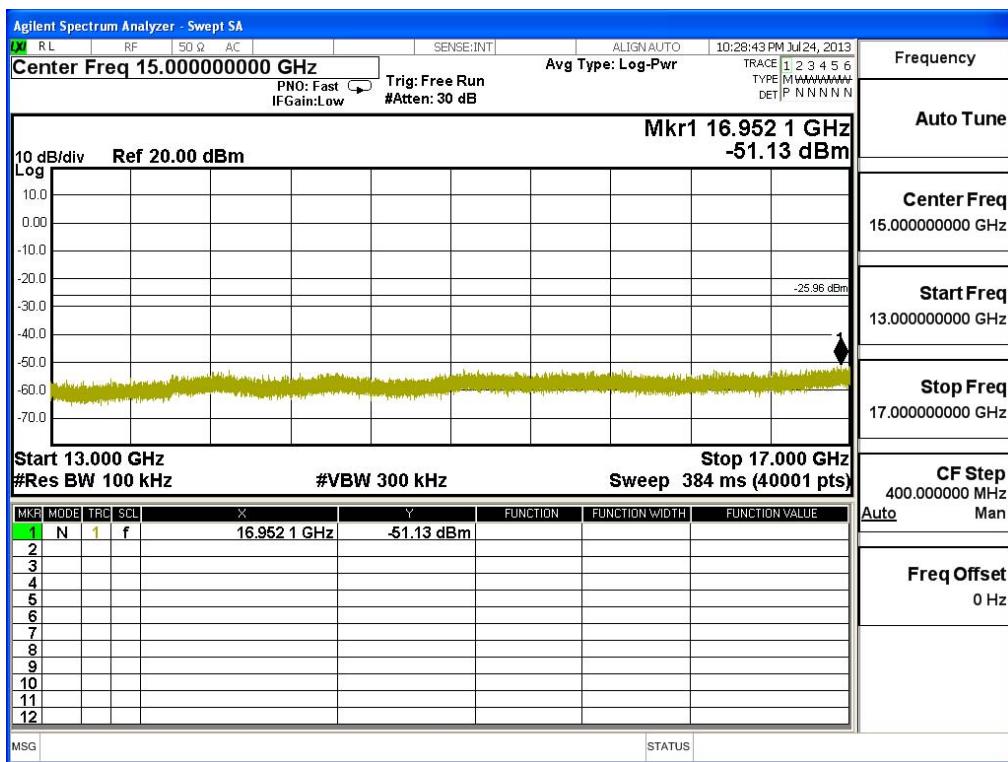
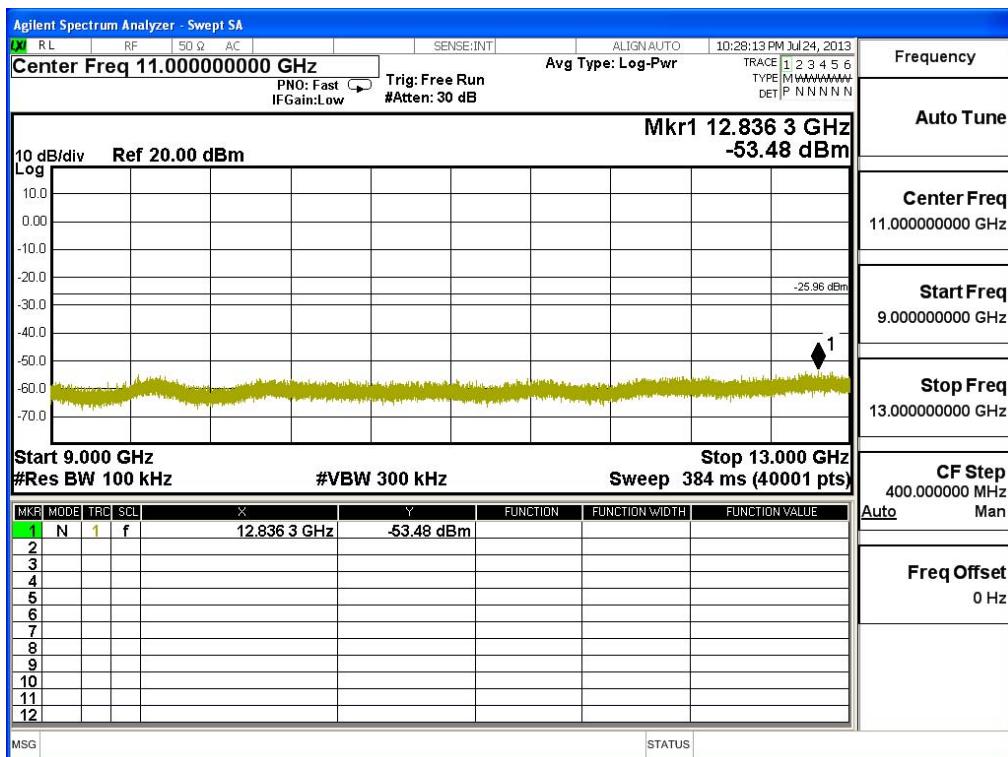


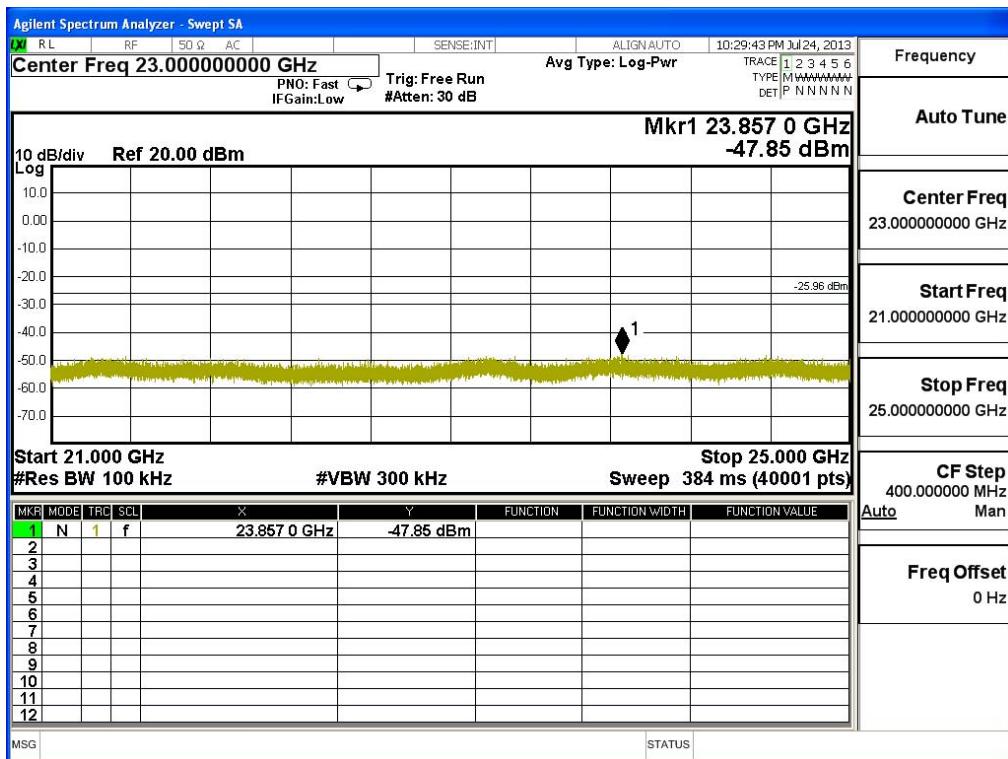
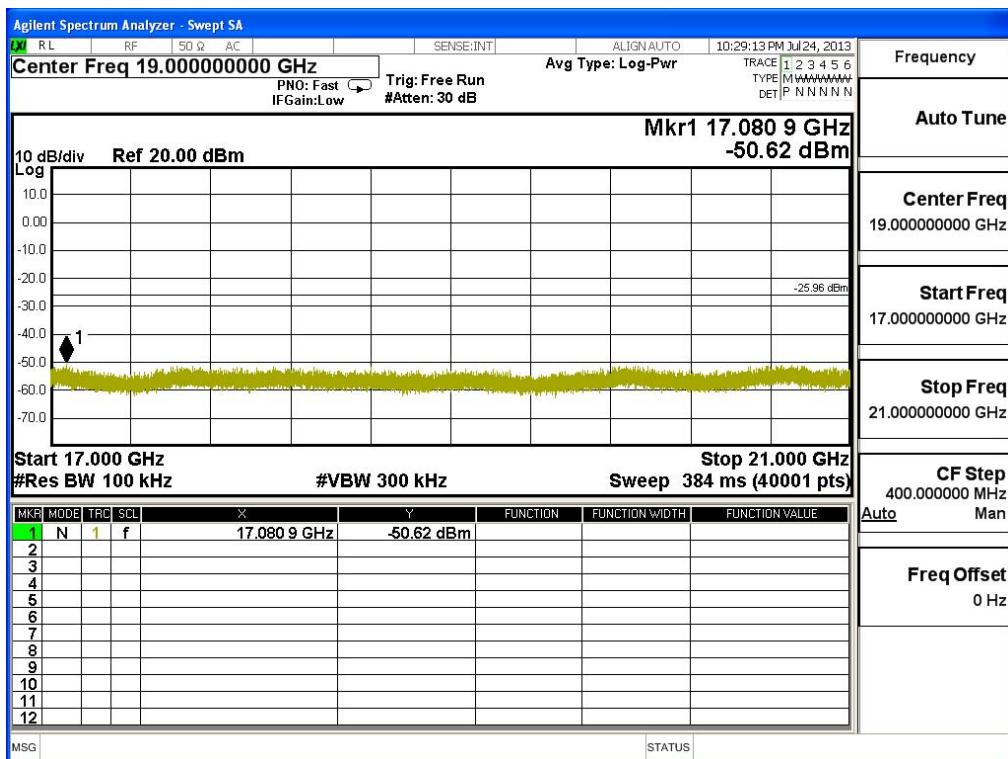
Product : FIELDBOOK
 Test Item : RF Antenna Conducted Test
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)

Figure Channel 39:









6. Band Edge

6.1. Test Equipment

RF Conducted Measurement

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

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2013
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2013
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2013

RF Radiated Measurement:

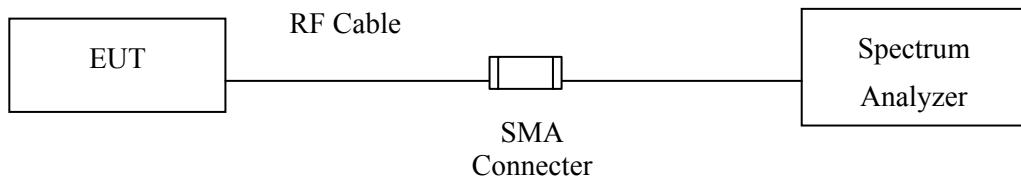
The following test equipments are used during the band edge tests:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2012
	X Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2012
	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2013
	X Pre-Amplifier	Agilent	8447D/2944A09549	Sep., 2012
	X Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2013
	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2012
	X Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2013
	X Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	X Coaxial Switch	Anritsu	MP59B/6200265729	N/A

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

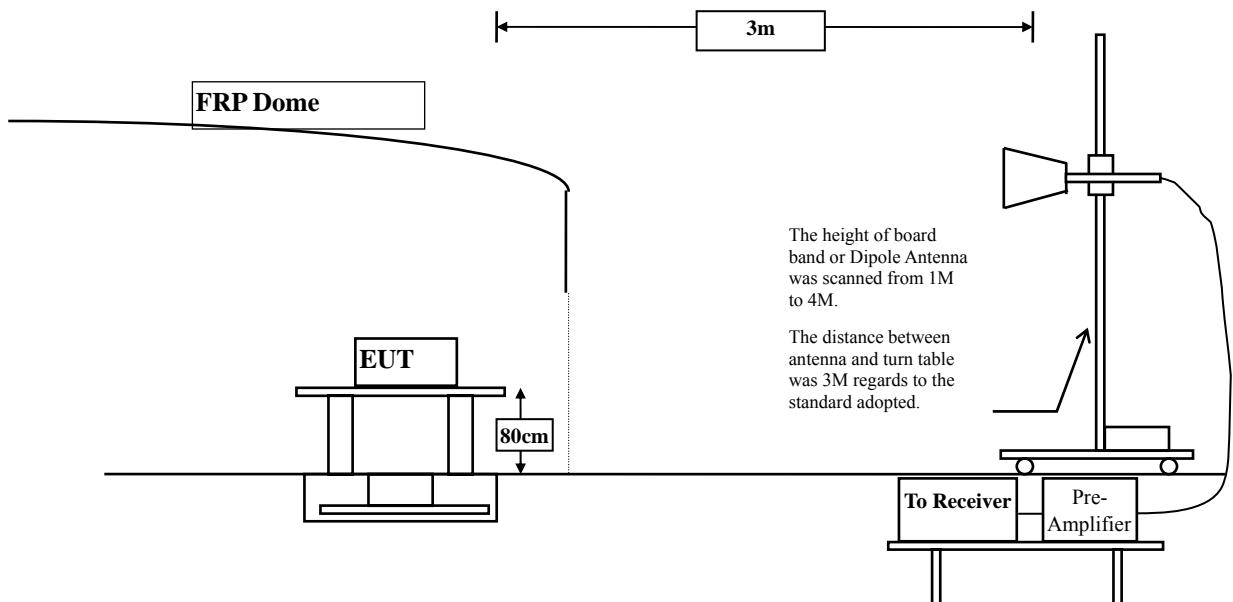
6.2. Test Setup

RF Conducted Measurement



RF Radiated Measurement:

Above 1GHz



6.3. Limit

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

6.4. Test Procedure

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

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

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10:2009 on radiated measurement.

The bandwidth below 1GHz setting on the field strength meter is 120 kHz, above 1GHz are 1 MHz. The EUT was setup to ANSI C63.10, 2009.

6.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

6.6. Test Result of Band Edge

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

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2479.900	32.155	71.432	103.587	--	--	Pass
00 (Peak)	2483.500	32.182	24.350	56.532	74.00	54.00	Pass
00 (Peak)	2492.100	32.247	24.579	56.826	74.00	54.00	Pass
00 (Average)	2479.900	32.155	50.337	82.492	--	--	Pass
00 (Average)	2483.500	32.182	15.101	47.283	74.00	54.00	Pass
00 (Average)	2492.100	32.247	12.326	44.573	74.00	54.00	Pass

Figure Channel 00:

Horizontal (Peak)

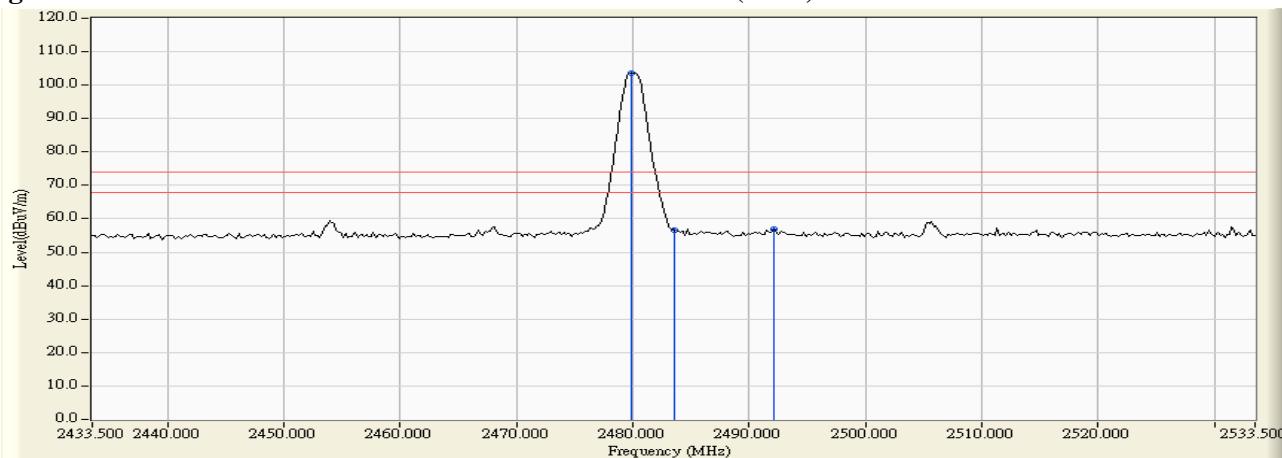
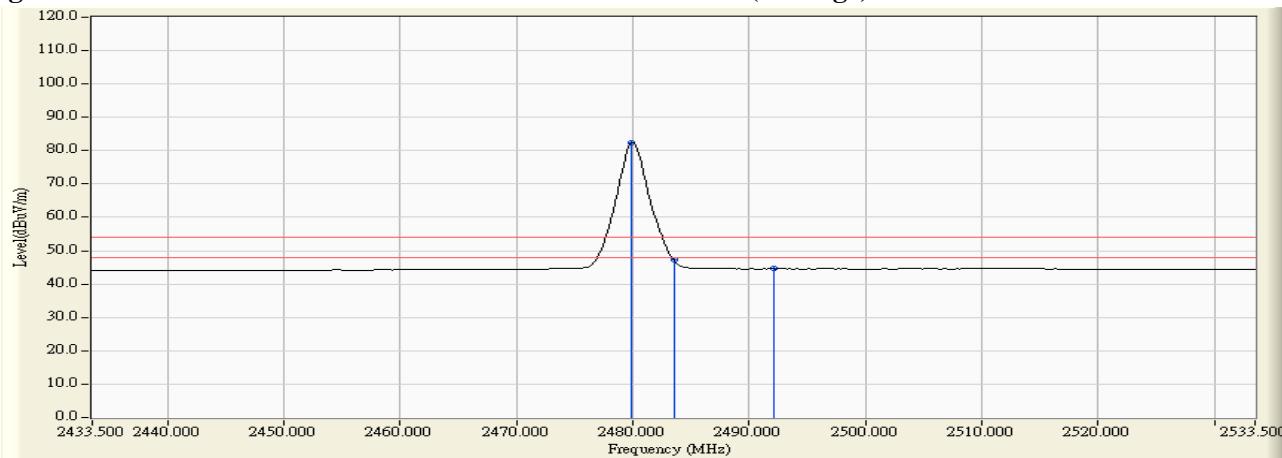


Figure Channel 00:

Horizontal (Average)



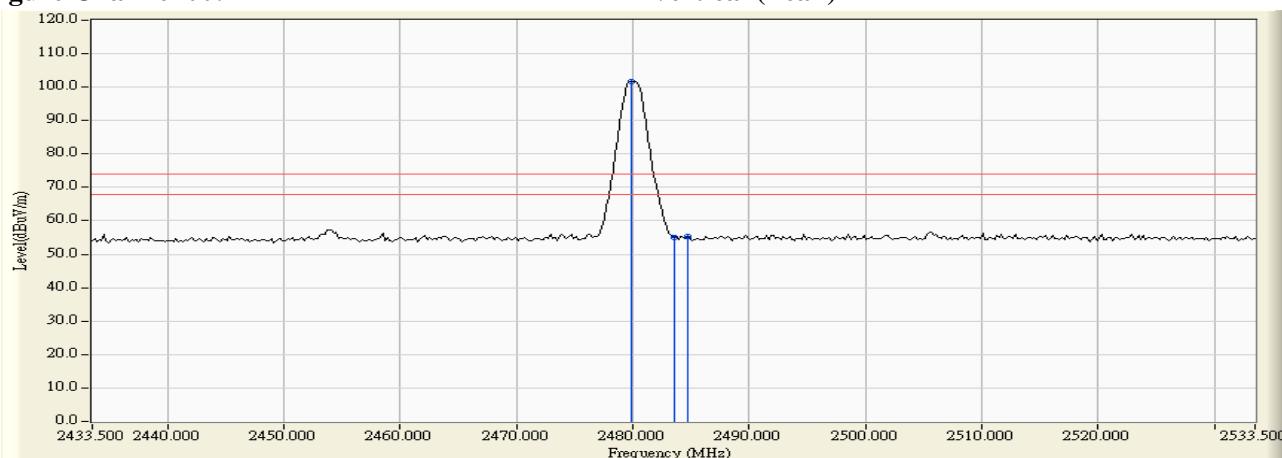
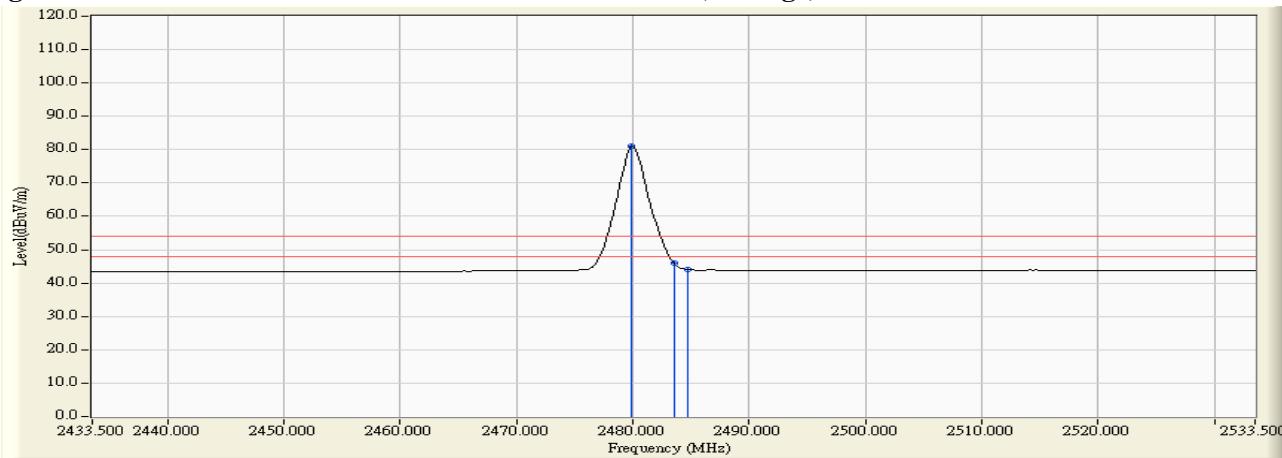
Note:

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

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

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
00 (Peak)	2479.900	31.411	70.287	101.698	--	--	Pass
00 (Peak)	2483.500	31.435	23.716	55.151	74.00	54.00	Pass
00 (Peak)	2484.700	31.444	23.816	55.259	74.00	54.00	Pass
00 (Average)	2479.900	31.411	49.532	80.943	--	--	Pass
00 (Average)	2483.500	31.435	14.624	46.059	74.00	54.00	Pass
00 (Average)	2484.700	31.444	12.610	44.053	74.00	54.00	Pass

Figure Channel 00:
Vertical (Peak)

Figure Channel 00:
Vertical (Average)


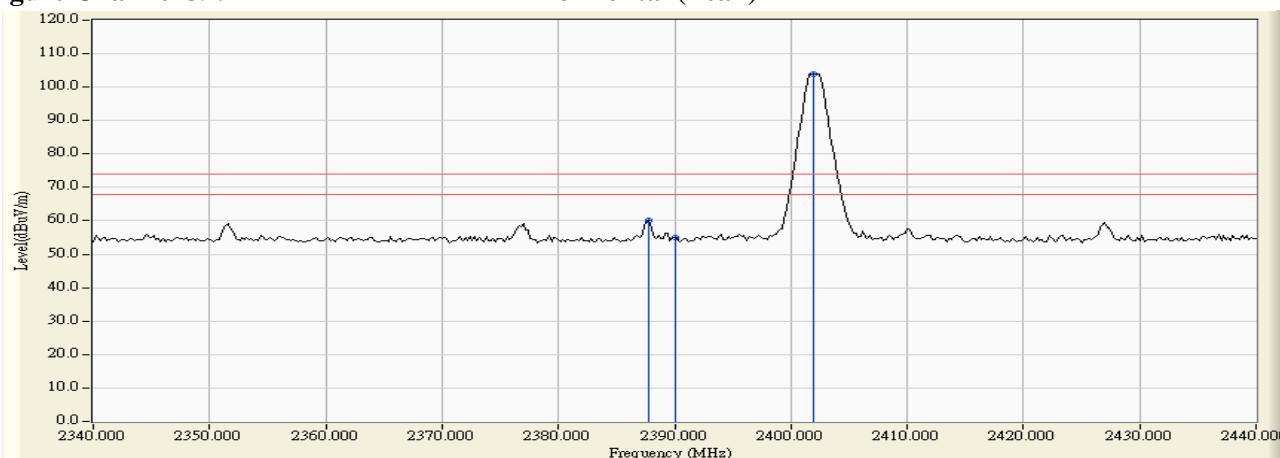
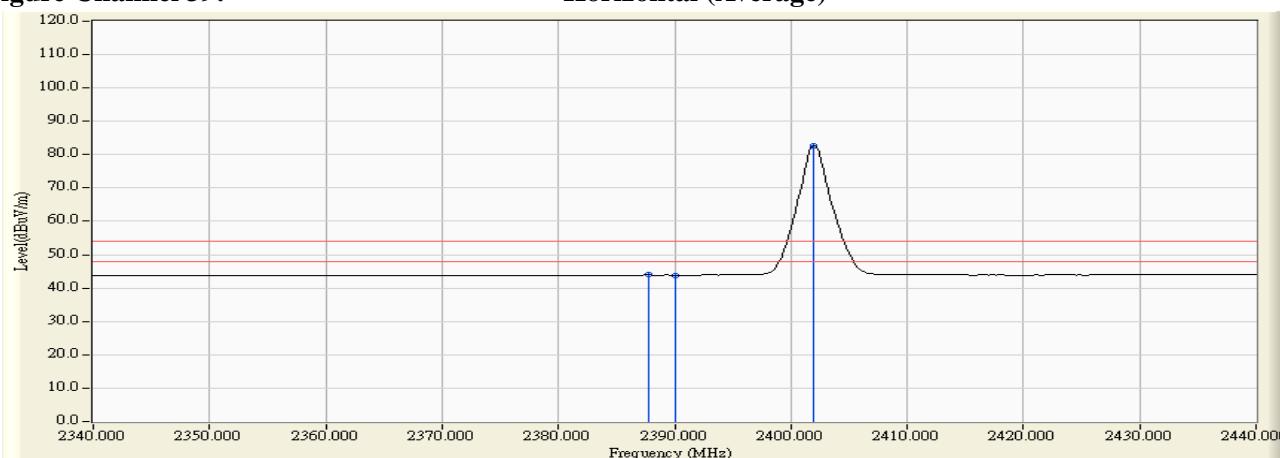
Note:

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

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

RF Radiated Measurement (Horizontal):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
39 (Peak)	2387.800	31.501	28.518	60.019	74.00	54.00	Pass
39 (Peak)	2390.000	31.509	23.465	54.974	74.00	54.00	Pass
39 (Peak)	2402.000	31.573	72.430	104.004	--	--	Pass
39 (Average)	2387.800	31.501	12.435	43.936	74.00	54.00	Pass
39 (Average)	2390.000	31.509	12.346	43.855	74.00	54.00	Pass
39 (Average)	2402.000	31.573	51.048	82.622	--	--	Pass

Figure Channel 39:
Horizontal (Peak)

Figure Channel 39:
Horizontal (Average)


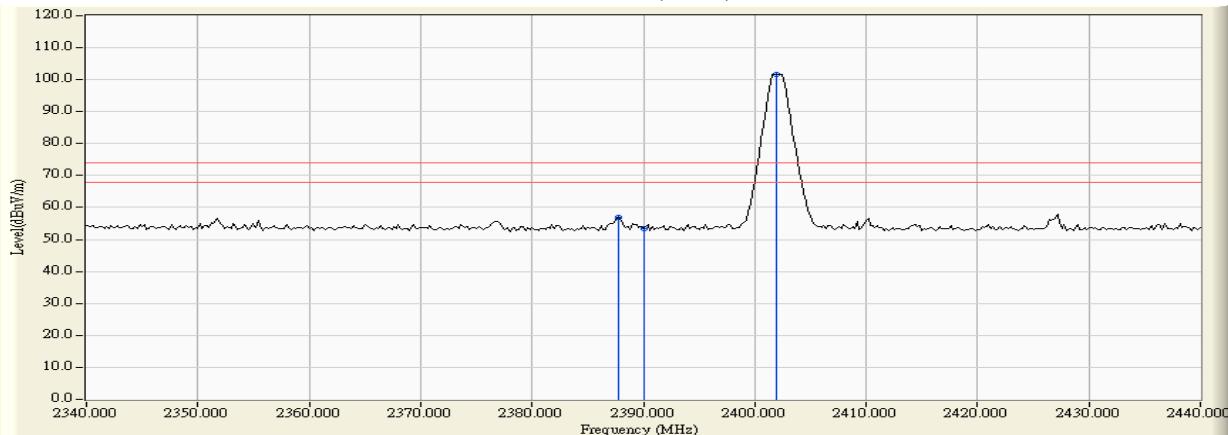
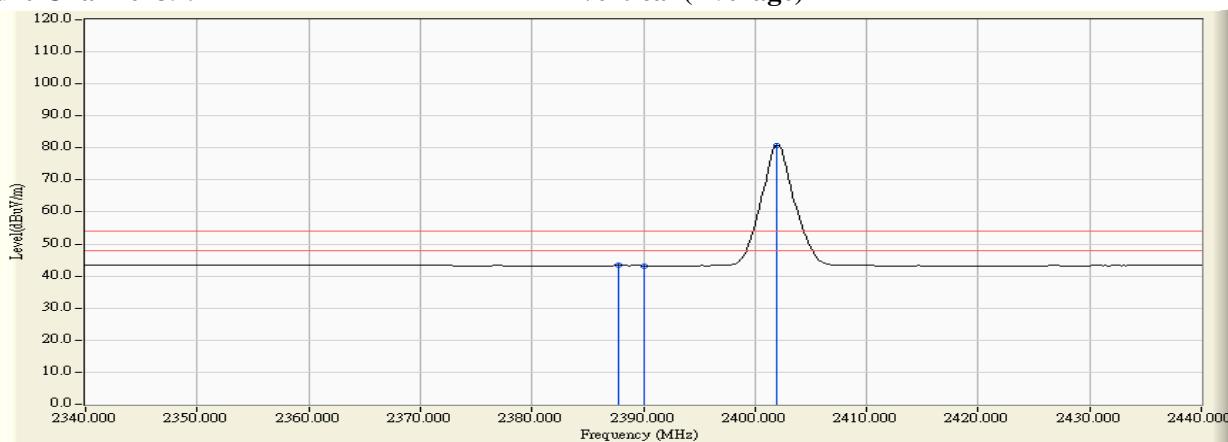
Note:

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

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

RF Radiated Measurement (Vertical):

Channel No.	Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Emission Level (dBuV/m)	Peak Limit (dBuV/m)	Average Limit (dBuV/m)	Result
39 (Peak)	2387.800	30.925	25.901	56.826	74.00	54.00	Pass
39 (Peak)	2390.000	30.915	22.436	53.351	74.00	54.00	Pass
39 (Peak)	2402.000	30.917	70.869	101.786	--	--	Pass
39 (Average)	2387.800	30.925	12.393	43.318	74.00	54.00	Pass
39 (Average)	2390.000	30.915	12.294	43.209	74.00	54.00	Pass
39 (Average)	2402.000	30.917	49.961	80.878	--	--	Pass

Figure Channel 39:
Vertical (Peak)

Figure Channel 39:
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. Occupied Bandwidth (6dB BW)

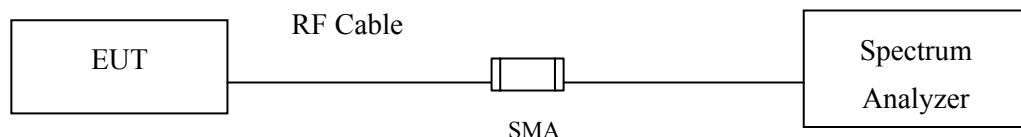
7.1. Test Equipment

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2013
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2013
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2013

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. Limits

The minimum bandwidth shall be at least 500 kHz.

7.4. Test Procedure

The EUT was setup according to ANSI C63.10 2009; tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

Set RBW = 1-5% of the emission bandwidth, $VBW \geq 3 * RBW$

7.5. Uncertainty

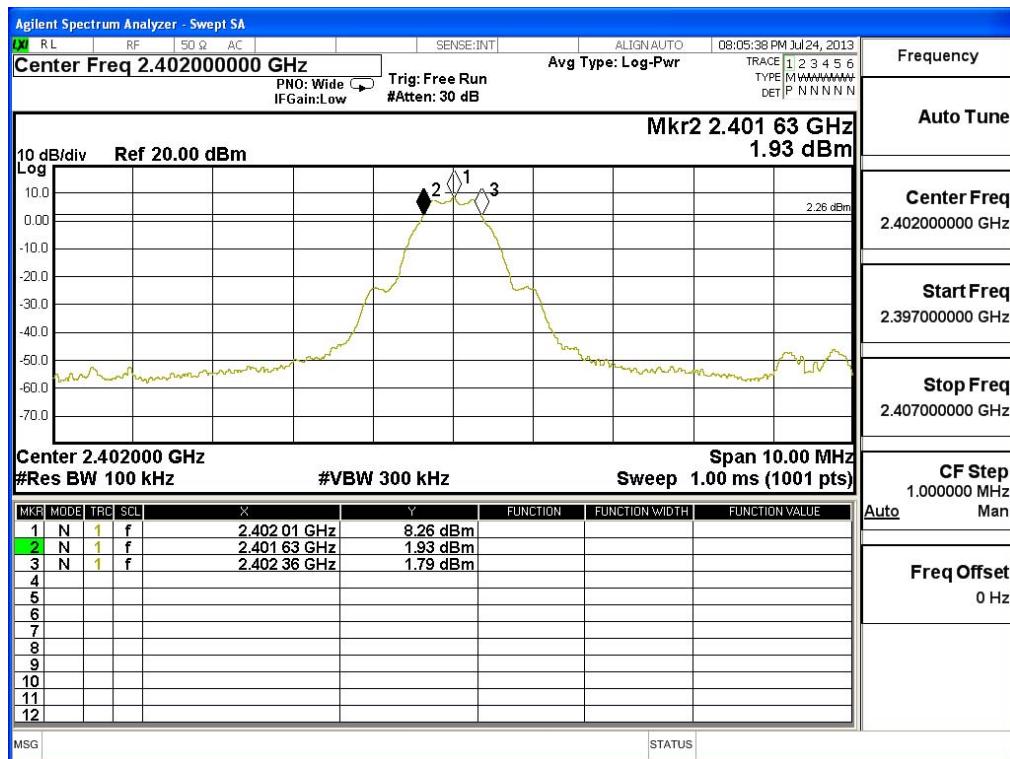
$\pm 150\text{Hz}$

7.6. Test Result of Occupied Bandwidth

Product : FIELDBOOK
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	730.0	>500	Pass

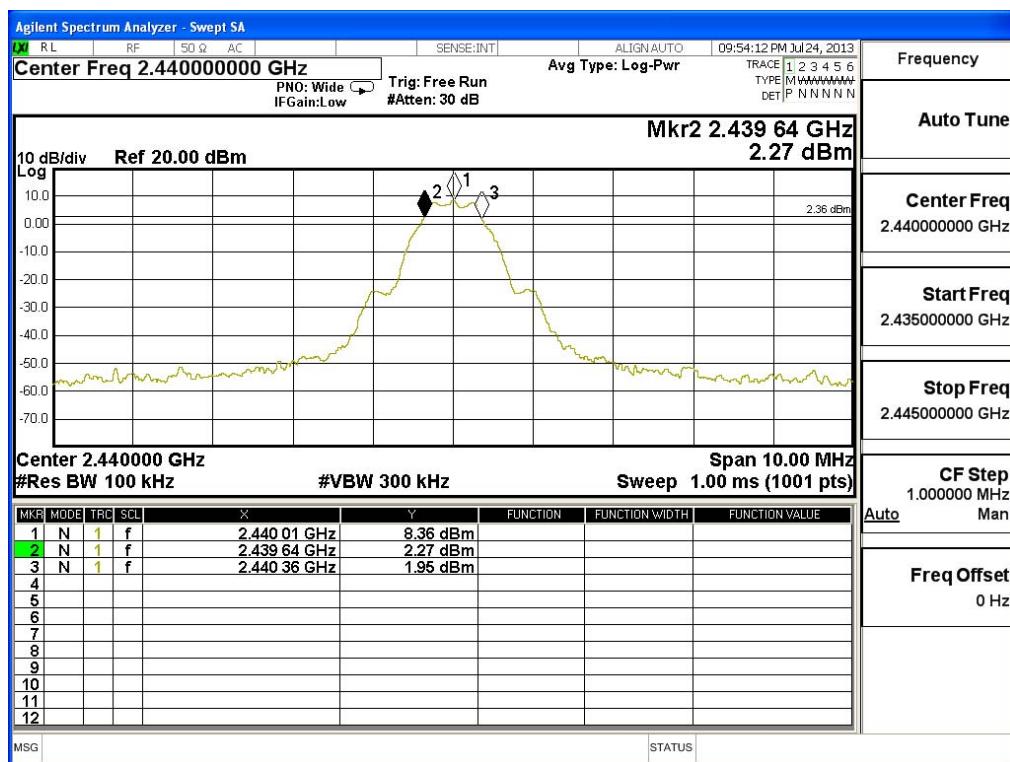
Figure Channel 00:



Product : FIELDBOOK
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
19	2440	720.0	>500	Pass

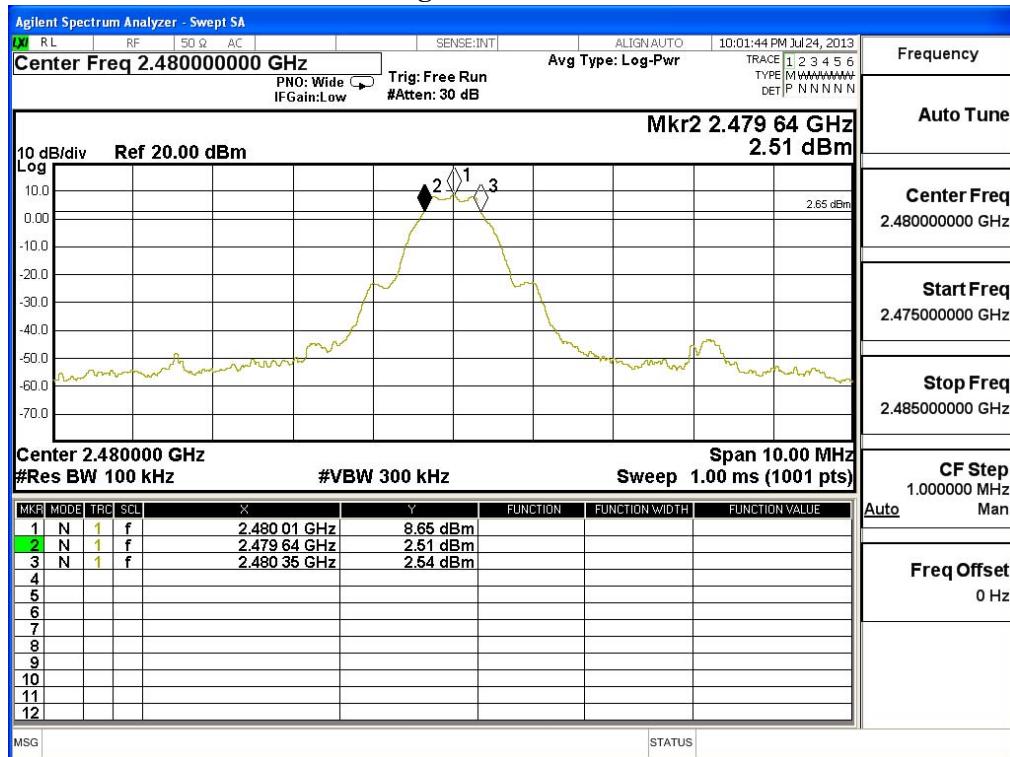
Figure Channel 19:



Product : FIELDBOOK
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
39	2480	710.0	>500	Pass

Figure Channel 39:



8. Power Density

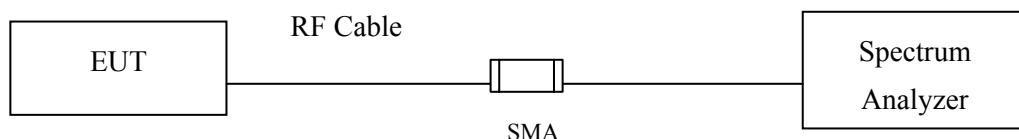
8.1. Test Equipment

Equipment	Manufacturer	Model No./Serial No.	Last Cal.
Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2013
Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2013
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2013

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. Limits

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

8.4. Test Procedure

The EUT was setup according to ANSI C63.10: 2009, the maximum power spectral density using KDB 558074 section 10.2 PKPSD (peak PSD) method.

8.5. Uncertainty

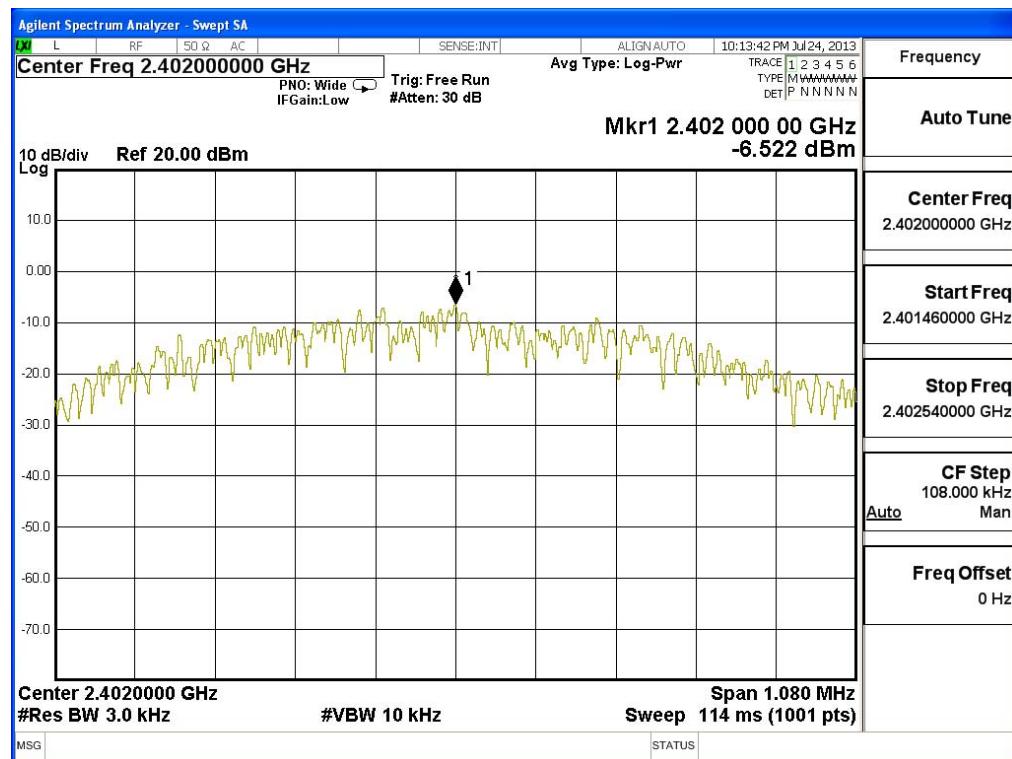
± 1.27 dB

8.6. Test Result of Power Density

Product : FIELDBOOK
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	-6.522	< 8dBm	Pass

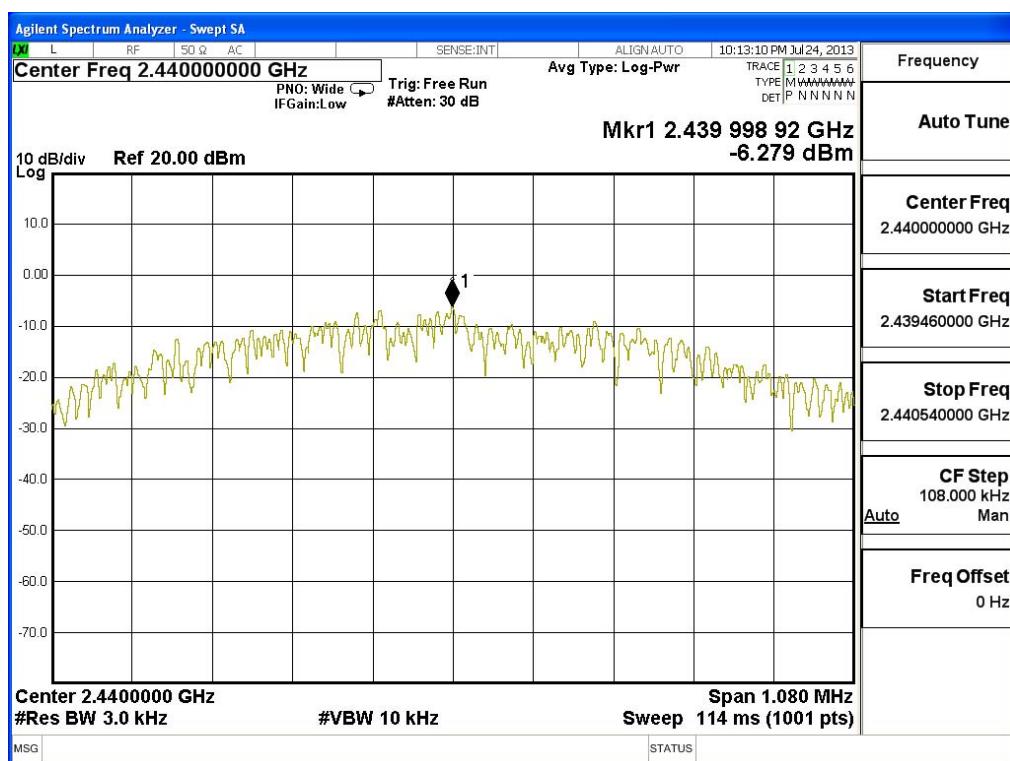
Figure Channel 00:



Product : FIELDBOOK
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
19	2440	-6.279	< 8dBm	Pass

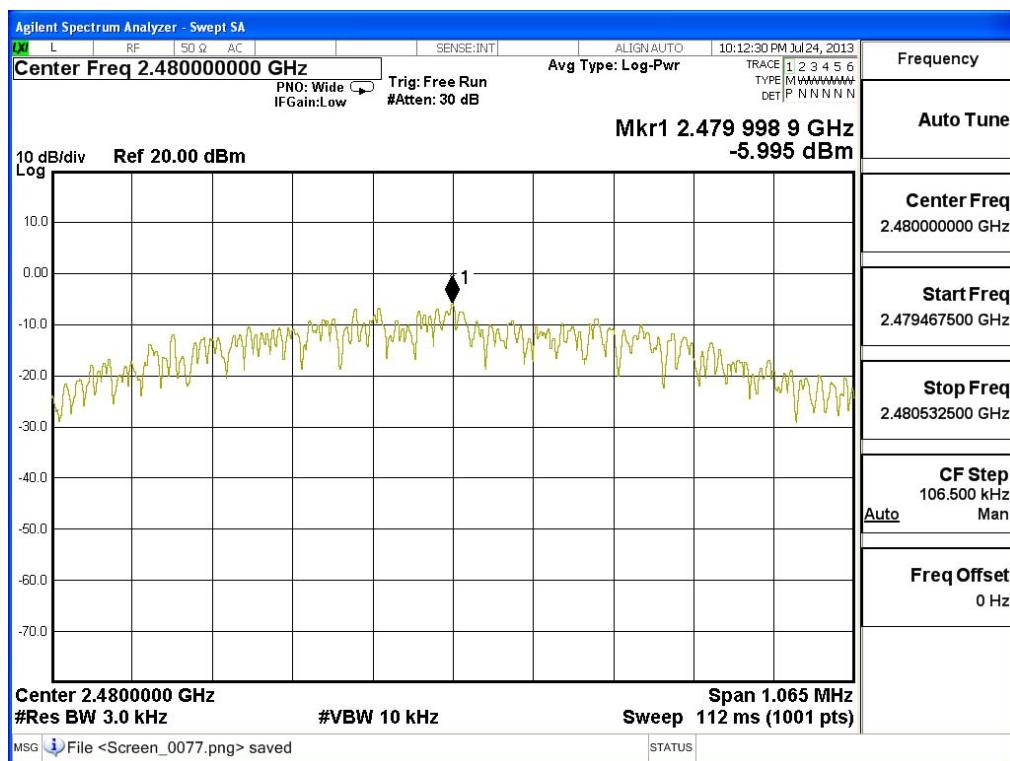
Figure Channel 19:



Product : FIELDBOOK
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2480	-5.995	< 8dBm	Pass

Figure Channel 39:



9. EMI Reduction Method During Compliance Testing

No modification was made during testing.