

FCC Test Report

Product Name	OTT BOX
Model No.	SB520
FCC ID.	JCK-SB5204KOTTBK

Applicant	Giga Byte Technology Co Ltd.
Address	No.6, Bau Chiang Road,Hsin-Tien,Taipei Hsien,Taiwan

Date of Receipt	Aug. 04, 2015
Issued Date	Sep. 01, 2015
Report No.	1580191R-RFUSP23V00-A
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.

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Test Report

Issued Date: Sep. 01, 2015

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Product Name	OTT BOX
Applicant	Giga Byte Technology Co Ltd.
Address	No.6, Bau Chiang Road,Hsin-Tien,Taipei Hsien,Taiwan
Manufacturer	GIGA-BYTE TECHNOLOGY CO., LTD
Model No.	SB520
FCC ID.	JCK-SB5204KOTTBK
EUT Rated Voltage	AC 100-240V, 50/60Hz
EUT Test Voltage	AC 120V/60Hz
Trade Name	GIGABYTE
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2014 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v03r03
Test Result	Complied

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	OTT BOX
Trade Name	GIGABYTE
Model No.	SB520
FCC ID.	JCK-SB5204KOTTBK
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”
Remote control	1set
HDMI Cable	Shielded, 1.2m
IR Cable	Non-Shielded, 1.8m
Power Adapter	MFR: APD, M/N: WB-18D12R Input: AC 100-240V~50-60Hz, 0.5A Max Output: 12V==1.5A Cable Out: Non-Shielded, 1.5m, with one ferrite core bonded.

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	ACON	APP6P-701316	PIFA	-0.54dBi for 2.4 GHz

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. The EUT is a OTT BOX with a built-in 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.

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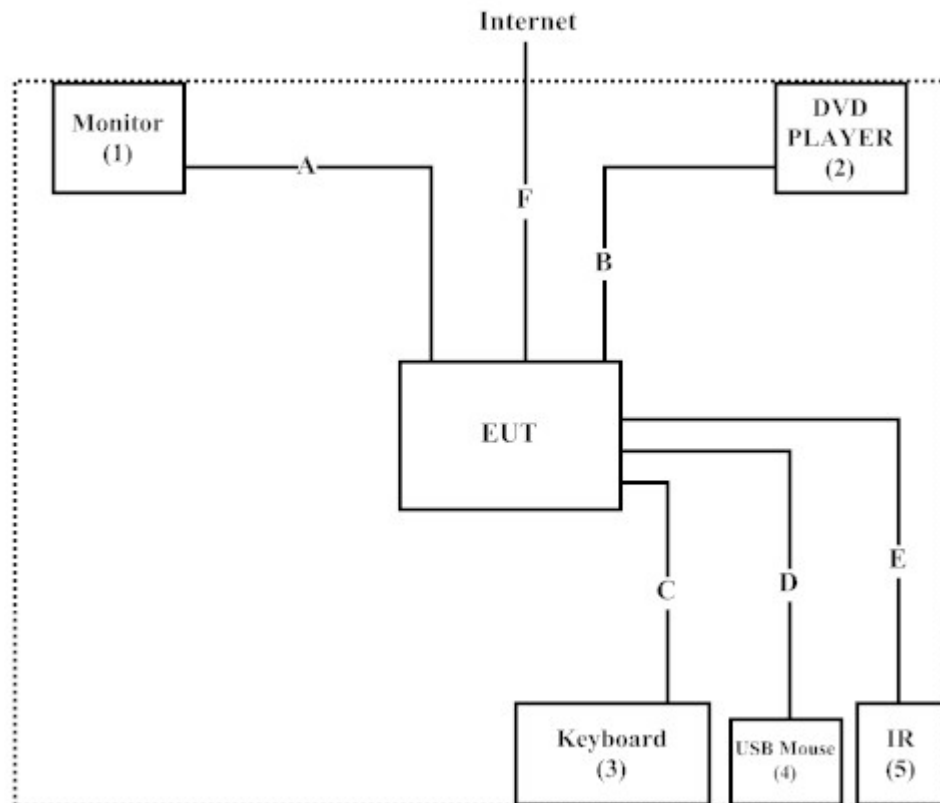
1.3. Tested System Details

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	2407WFPb	CN-0FC255-46633-67T-047S	Non-Shielded, 1.8m
2 DVD PLAYER	Panasonic	DVD-S97	VC6GG001022R	Non-Shielded, 1.8m
3 Keyboard	DELL	SK-8115	MY-0DJ325-71619-6A3-1911	N/A
4 USB Mouse	DELL	M056U0A	F0Y01YEQ	N/A
5 IR	Always Tai Lai CO.,LTD.	Y001-0572	N/A	N/A

Signal Cable Type	Signal cable Description
A HDMI Cable	Shielded, 1.2m
B OPTICAL Cable	Non-Shielded, 1.8m
C USB Cable	Shielded, 1.8m, with one ferrite core bonded.
D USB Cable	Shielded, 1.8m
E IR Cable	Non-Shielded, 1.8m
F RJ-45 Cable	Non-Shielded, 3m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute “Ampak RF Test Tool V5.2” 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
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FCC Accreditation Number: TW1014

2. Conducted Emission

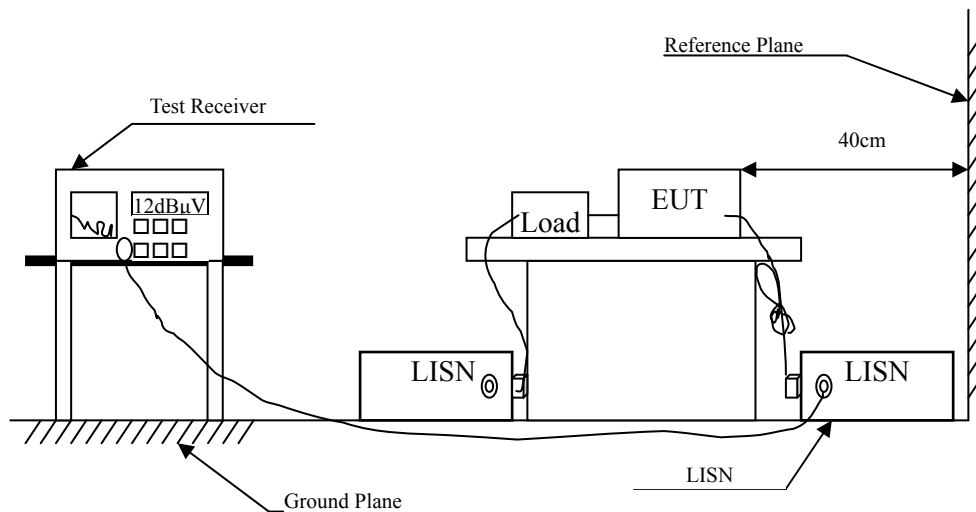
2.1. Test Equipment

	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 : OTT BOX
Test Item : Conducted Emission Test
Power Line : Line 1
Test Mode : Mode 1: Transmit - BLE (GFSK)

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV	Margin dB	Limit dBμV
LINE 1					
Quasi-Peak					
0.150	9.661	34.920	44.581	-21.419	66.000
0.177	9.653	31.710	41.363	-23.866	65.229
0.240	9.653	27.360	37.013	-26.416	63.429
0.322	9.657	21.000	30.657	-30.429	61.086
0.443	9.664	15.230	24.894	-32.735	57.629
0.662	9.676	14.690	24.366	-31.634	56.000
Average					
0.150	9.661	19.320	28.981	-27.019	56.000
0.177	9.653	19.390	29.043	-26.186	55.229
0.240	9.653	18.170	27.823	-25.606	53.429
0.322	9.657	12.890	22.547	-28.539	51.086
0.443	9.664	6.200	15.864	-31.765	47.629
0.662	9.676	6.530	16.206	-29.794	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 : OTT BOX
Test Item : Conducted Emission Test
Power Line : Line 2
Test Mode : Mode 1: Transmit - BLE (GFSK)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dBμV
	dB	dBμV	dBμV		
LINE 2					
Quasi-Peak					
0.181	9.659	29.790	39.449	-25.665	65.114
0.212	9.661	26.540	36.201	-28.028	64.229
0.240	9.663	23.800	33.463	-29.966	63.429
0.291	9.661	16.370	26.031	-35.940	61.971
0.384	9.660	18.660	28.320	-30.994	59.314
0.615	9.673	13.400	23.073	-32.927	56.000
Average					
0.181	9.659	15.410	25.069	-30.045	55.114
0.212	9.661	12.730	22.391	-31.838	54.229
0.240	9.663	10.900	20.563	-32.866	53.429
0.291	9.661	3.480	13.141	-38.830	51.971
0.384	9.660	11.240	20.900	-28.414	49.314
0.615	9.673	2.600	12.273	-33.727	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

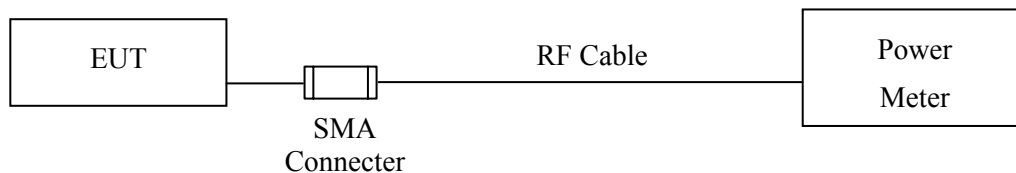
3. Peak Power Output

3.1. Test Equipment

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

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 9.1.2 PKPM1 Peak power meter method.

3.5. Uncertainty

± 1.27 dB

3.6. Test Result of Peak Power Output

Product : OTT BOX
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	2.11	1 Watt= 30 dBm	Pass
Channel 19	2440.00	5.02	1 Watt= 30 dBm	Pass
Channel 39	2480.00	5.51	1 Watt= 30 dBm	Pass

4. Radiated Emission

4.1. Test Equipment

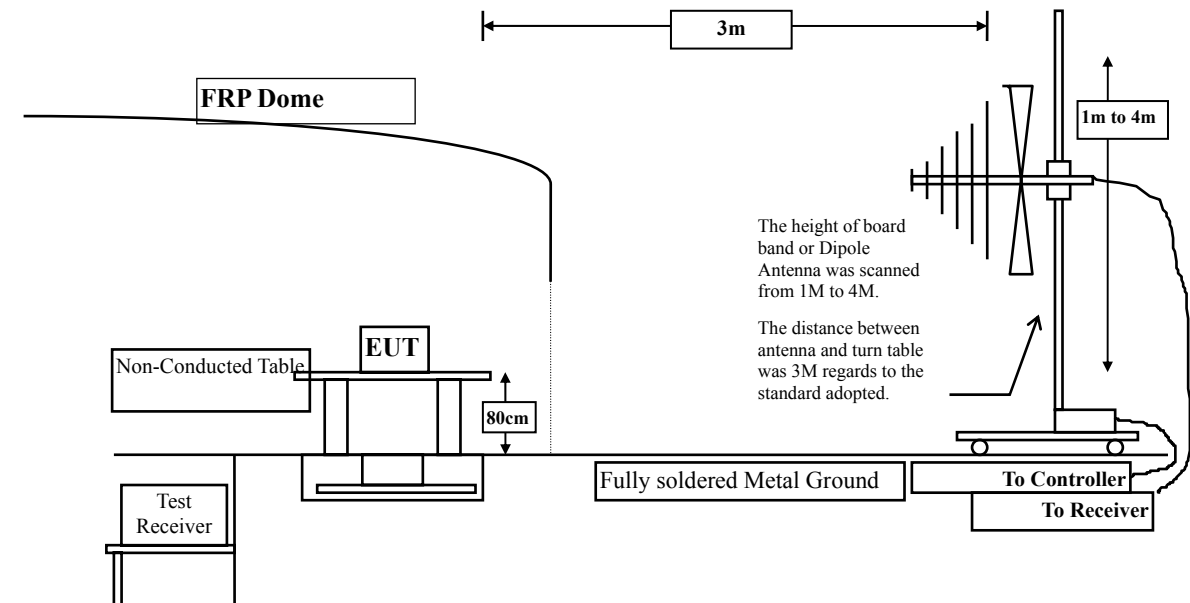
The following test equipments are used during the radiated emission test:

Test Site		Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3	X	Loop Antenna	Teseq	HLA6120 / 26739	Jul., 2015
	X	Bilog Antenna	Schaffner Chase	CBL6112B/2673	Sep., 2015
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305	Sep., 2015
	X	Horn Antenna	Schwarzbeck	BBHA9170/208	Jul., 2015
	X	Pre-Amplifier	Agilent	8447D/2944A09549	Sep., 2015
	X	Spectrum Analyzer	Agilent	E4407B / US39440758	May, 2015
	X	Test Receiver	R & S	ESCS 30/ 825442/018	Sep., 2015
	X	Coaxial Cable	QuieTek	QTK-CABLE/ CAB5	Feb., 2015
	X	Controller	QuieTek	QTK-CONTROLLER/ CTRL3	N/A
	X	Coaxial Switch	Anritsu	MP59B/6200265729	N/A

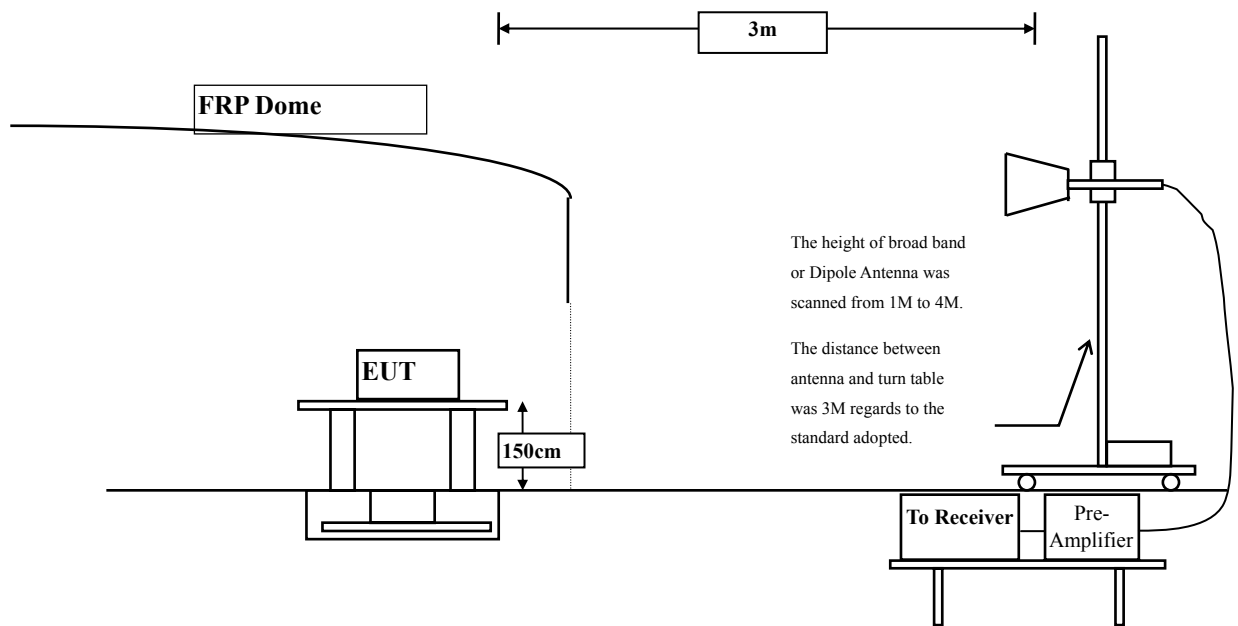
- Note:
1. All equipments are calibrated every one year.
 2. The test instruments marked by “X” are used to measure the final test results.

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 (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 according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 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 : OTT BOX
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK)(2402MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level	dB	dB μ V/m
Horizontal					
Peak Detector:					
4804.000	2.511	44.310	46.820	-27.180	74.000
7206.000	9.511	40.030	49.541	-24.459	74.000
9608.000	10.394	39.260	49.654	-24.346	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4804.000	2.923	48.830	51.752	-22.248	74.000
7206.000	9.988	39.880	49.869	-24.131	74.000
9608.000	10.847	39.290	50.137	-23.863	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 : OTT BOX
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

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:					
4880.000	2.038	45.990	48.028	-25.972	74.000
7320.000	9.699	40.400	50.099	-23.901	74.000
9760.000	9.665	39.160	48.825	-25.175	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4880.000	2.499	45.990	48.489	-25.511	74.000
7320.000	10.303	37.470	47.773	-26.227	74.000
9760.000	10.299	39.970	50.270	-23.730	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 : OTT BOX
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

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:					
4960.000	2.582	44.180	46.762	-27.238	74.000
7440.000	10.555	38.530	49.085	-24.915	74.000
9920.000	10.206	38.080	48.286	-25.714	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4960.000	2.582	43.380	45.962	-28.038	74.000
7440.000	10.555	38.780	49.335	-24.665	74.000
9920.000	10.206	39.240	49.446	-24.554	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 : OTT BOX
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency	Correct	Reading	Measurement	Margin	Limit
MHz	Factor	Level	Level		
	dB	dB μ V	dB μ V/m	dB	dB μ V/m
Horizontal					
159.980	-10.030	43.680	33.649	-9.851	43.500
291.900	-5.202	41.864	36.662	-9.338	46.000
425.760	-0.183	42.498	42.315	-3.685	46.000
604.240	4.289	34.361	38.651	-7.349	46.000
730.340	3.819	34.921	38.740	-7.260	46.000
856.440	7.114	30.261	37.375	-8.625	46.000
Vertical					
119.240	-3.571	36.585	33.015	-10.485	43.500
297.720	-4.356	38.665	34.309	-11.691	46.000
464.560	-3.486	43.232	39.746	-6.254	46.000
621.700	0.347	40.146	40.493	-5.507	46.000
743.920	0.718	39.172	39.890	-6.110	46.000
930.160	3.830	33.875	37.705	-8.295	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.

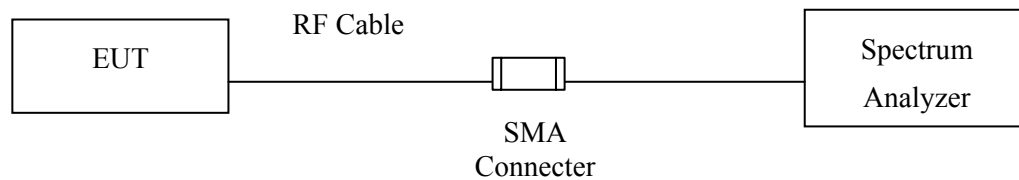
5. RF Antenna Conducted Test

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

Figure Channel 00:

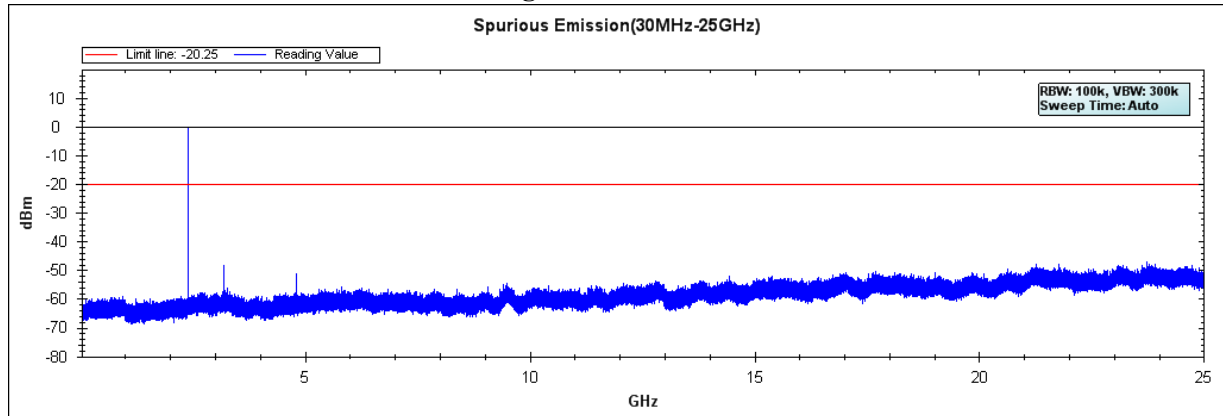


Figure Channel 19:

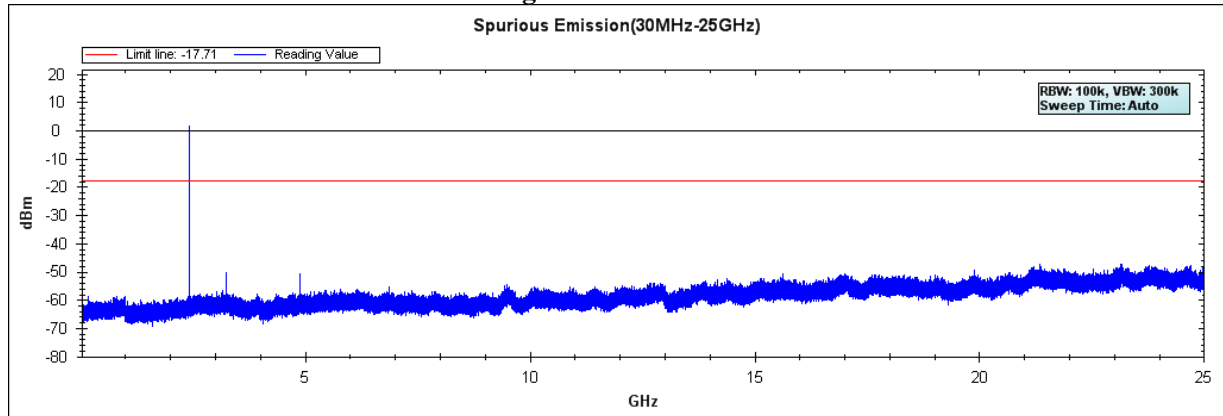
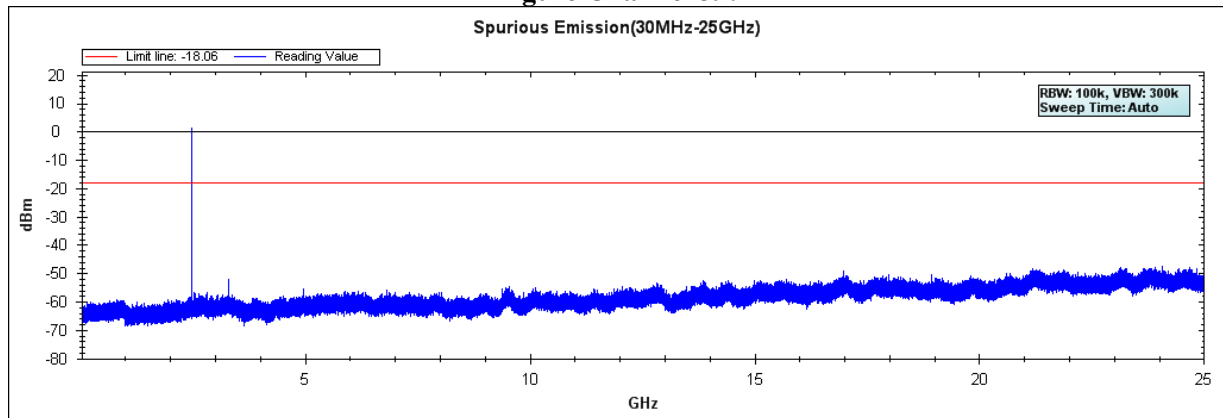


Figure Channel 39:



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:

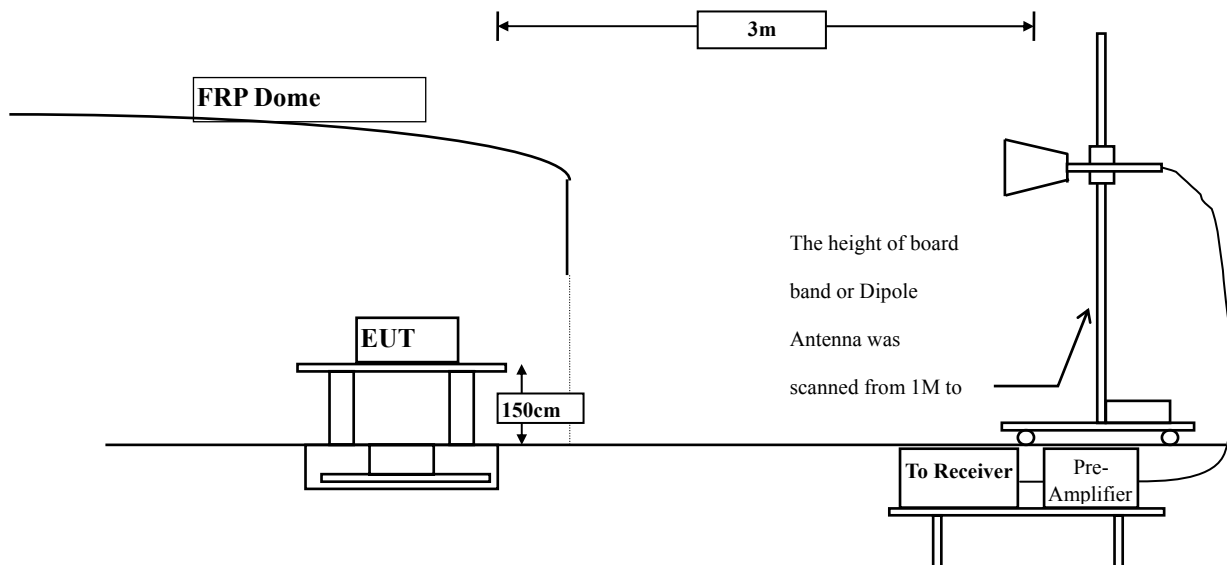
Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.
☒ Site # 3		Bilog Antenna	Schaffner Chase	CBL6112B/2673
	X	Horn Antenna	Schwarzbeck	BBHA9120D/D305
		Horn Antenna	Schwarzbeck	BBHA9170/208
	X	Pre-Amplifier	Agilent	8447D/2944A09549
	X	Spectrum Analyzer	Agilent	E4407B / US39440758
		Test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

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 was setup according to ANSI C63.10, 2013 and tested according to DTS test procedure of KDB558074 for compliance to FCC 47CFR 15.247 requirements.

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 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 C63.10:2013 on radiated measurement.

6.5. Uncertainty

± 3.9 dB above 1GHz

± 3.8 dB below 1GHz

6.6. Test Result of Band Edge

Product : OTT BOX
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 (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2375.800	-1.187	45.057	43.871	74.00	54.00	Pass
00 (Peak)	2390.000	-1.131	38.188	37.057	74.00	54.00	Pass
00 (Peak)	2402.200	-1.072	92.944	91.873	--	--	--
00 (Average)	2376.000	-1.186	32.853	31.668	74.00	54.00	Pass
00 (Average)	2390.000	-1.131	25.403	24.272	74.00	54.00	Pass
00 (Average)	2402.000	-1.073	67.920	66.848	--	--	--

Figure Channel 00:

Horizontal (Peak)

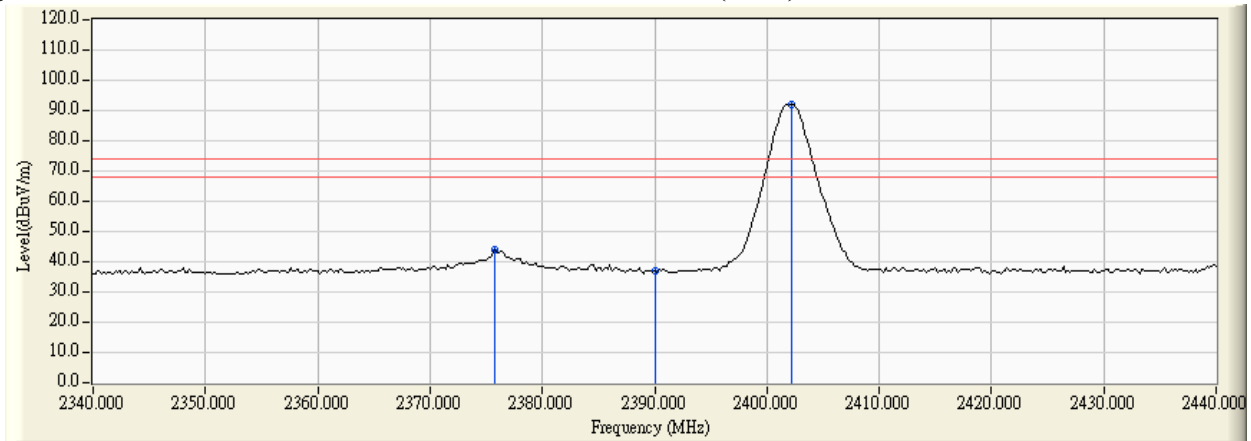
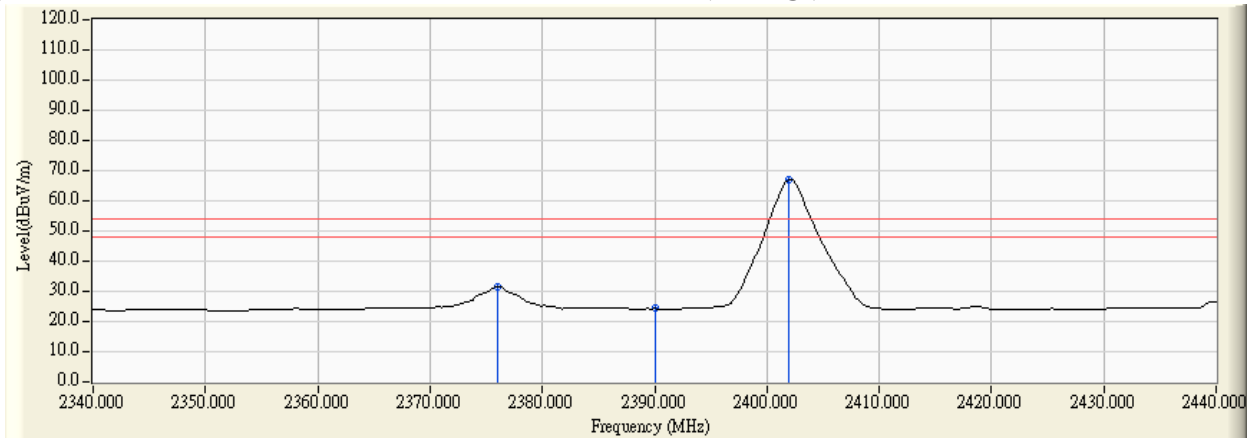


Figure Channel 00:

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 : OTT BOX
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 (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
00 (Peak)	2376.000	-1.660	50.801	49.141	74.00	54.00	Pass
00 (Peak)	2390.000	-1.725	37.987	36.262	74.00	54.00	Pass
00 (Peak)	2402.200	-1.729	85.000	83.272	--	--	--
00 (Average)	2376.000	-1.660	39.961	38.301	74.00	54.00	Pass
00 (Average)	2390.000	-1.725	25.644	23.919	74.00	54.00	Pass
00 (Average)	2402.000	-1.729	62.636	60.907	--	--	--

Figure Channel 00: Vertical (Peak)

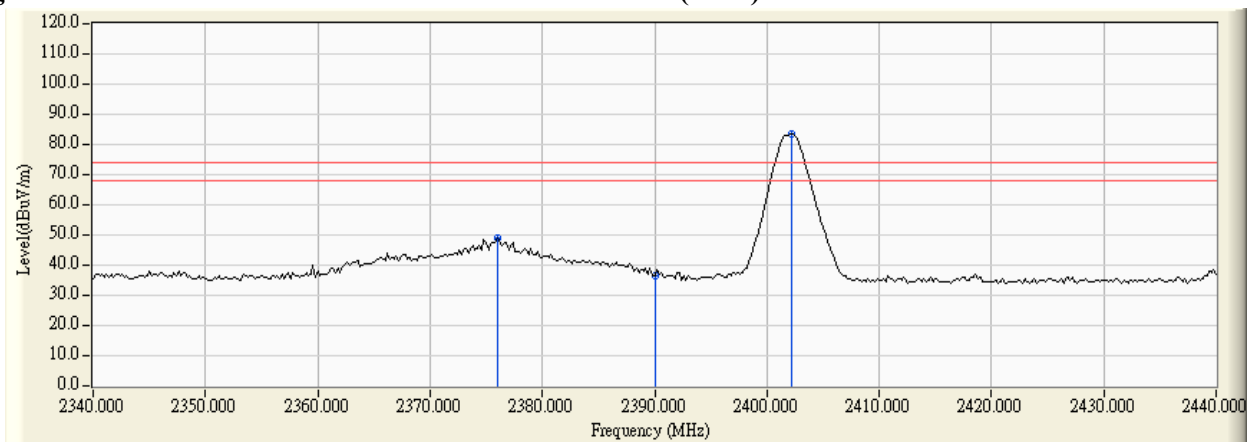
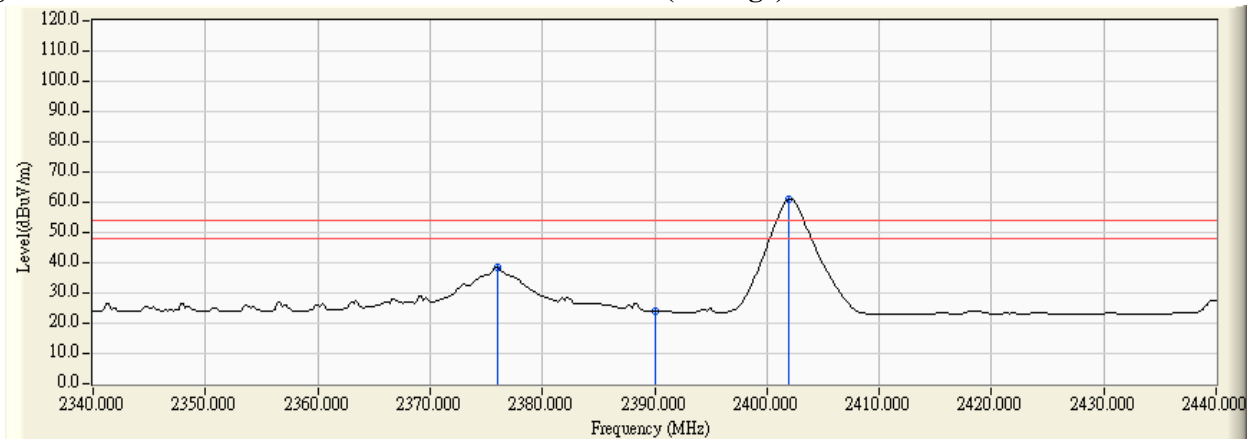


Figure Channel 00: Vertical (Average)



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 : OTT BOX
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 (dB μ V)	Emission Level (dB μ V/m)	Peak Limit (dB μ V/m)	Average Limit (dB μ V/m)	Result
39 (Peak)	2480.300	-0.579	94.747	94.168	--	--	--
39 (Peak)	2483.500	-0.558	57.845	57.287	74.00	54.00	Pass
39 (Average)	2480.100	-0.580	69.169	68.589	--	--	--
39 (Average)	2483.500	-0.558	44.027	43.469	74.00	54.00	Pass

Figure Channel 39:

Horizontal (Peak)

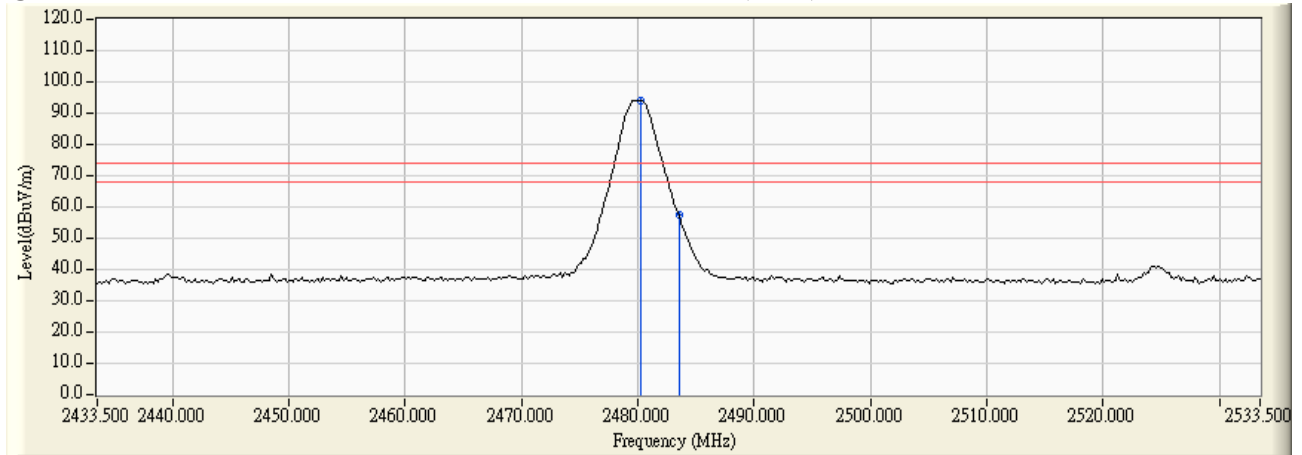
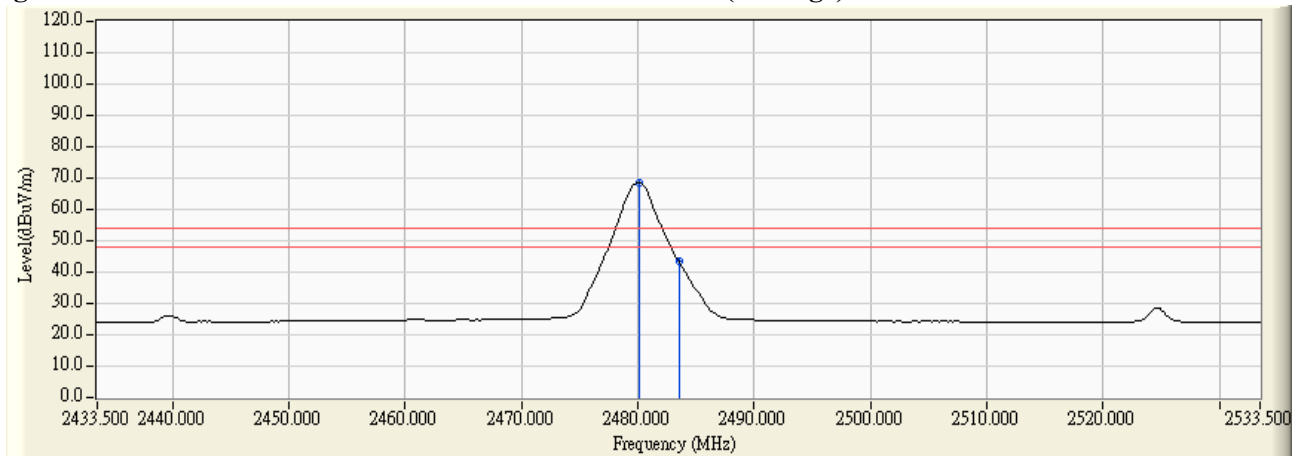


Figure Channel 39:

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 : OTT BOX
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 (dBμV)	Emission Level (dBμV/m)	Peak Limit (dBμV/m)	Average Limit (dBμV/m)	Result
39 (Peak)	2479.700	-1.325	86.535	85.209	--	--	--
39 (Peak)	2483.500	-1.305	49.681	48.376	74.00	54.00	Pass
39 (Average)	2480.100	-1.324	63.698	62.374	--	--	--
39 (Average)	2483.500	-1.305	38.789	37.484	74.00	54.00	Pass

Figure Channel 39: Vertical (Peak)

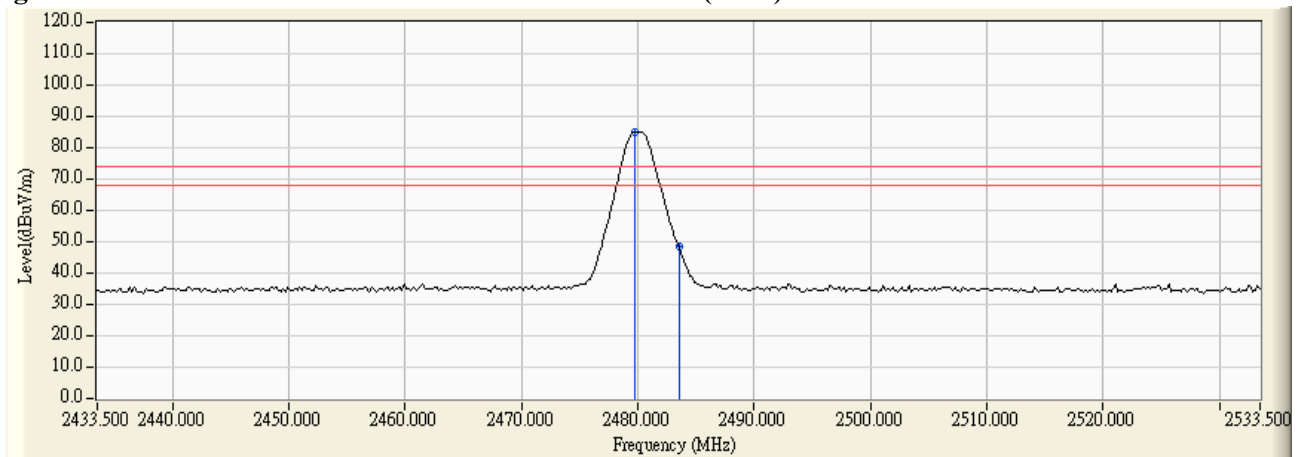
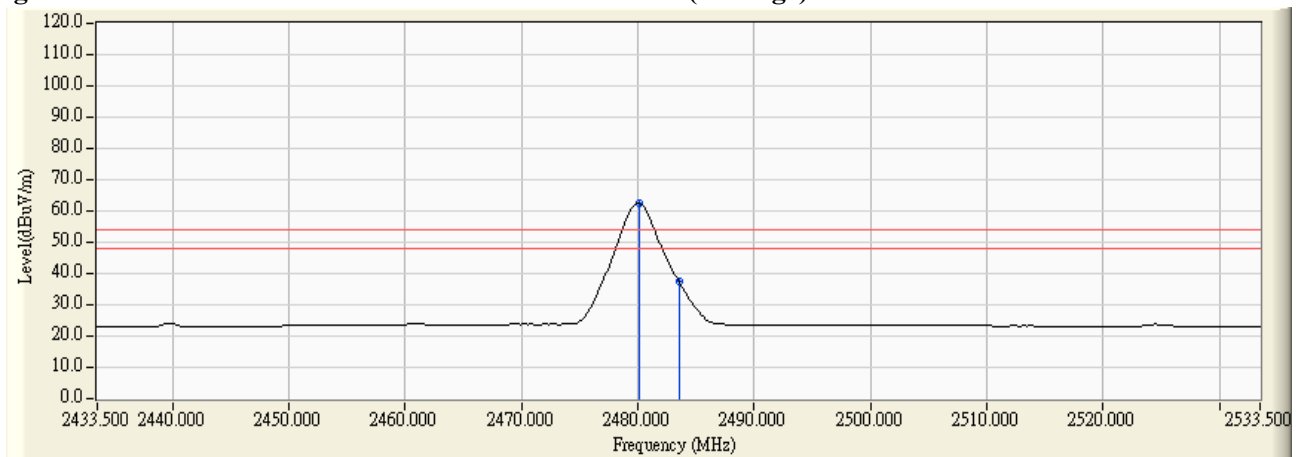


Figure Channel 39: Vertical (Average)

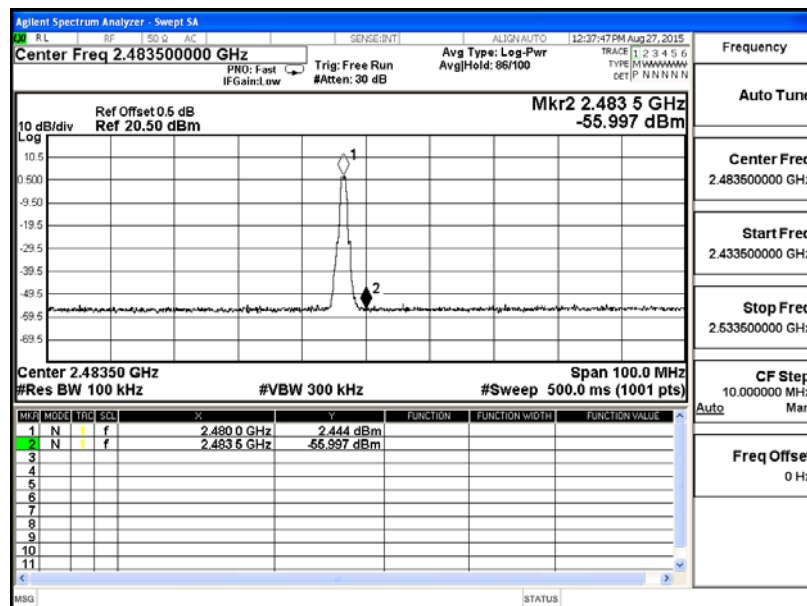
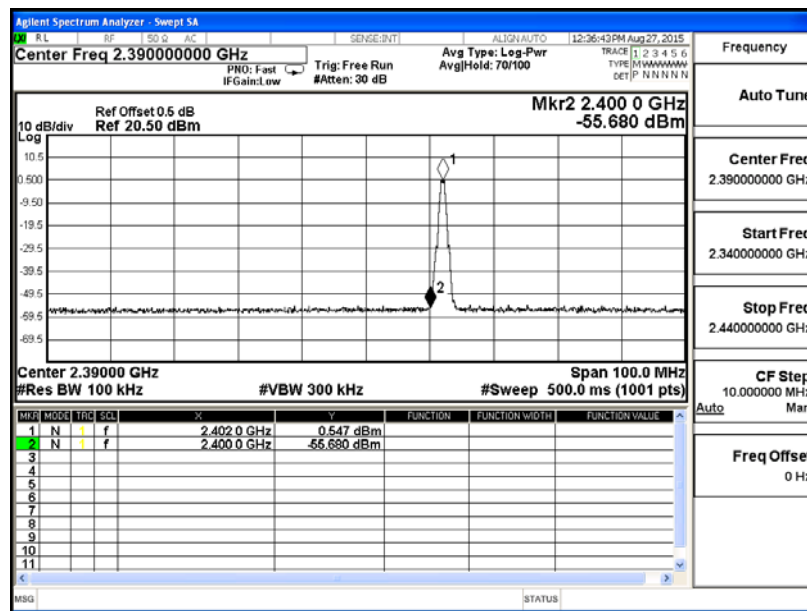


Note:

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.

Product : OTT BOX
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK)

Test Frequency (MHz)	Measurement Level Δ (dB)	Limit Δ (dB)	Result
2402	56.23	>20	PASS
2480	58.44	>20	PASS



7. Occupied Bandwidth (6dB BW)

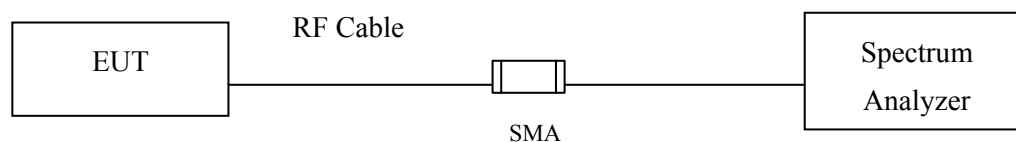
7.1. Test Equipment

	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 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 2013; 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 : OTT BOX
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - BLE (GFSK)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	740.0	>500	Pass
19	2440	750.0	>500	Pass
39	2480	750.0	>500	Pass

Figure Channel 00:

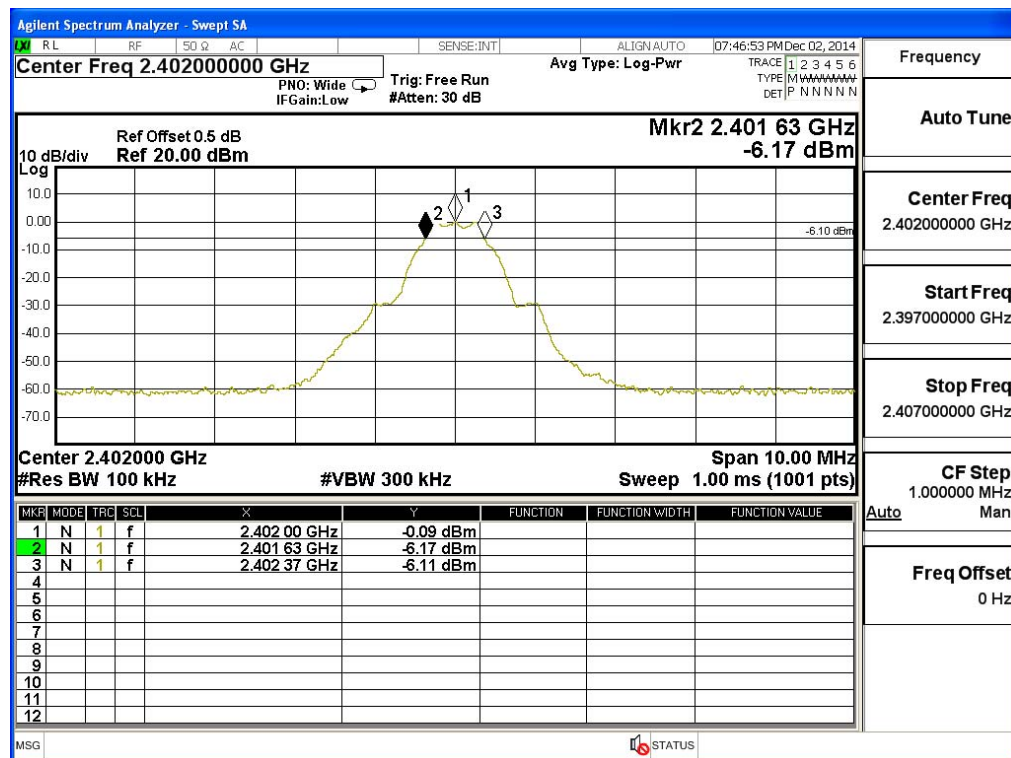


Figure Channel 19:

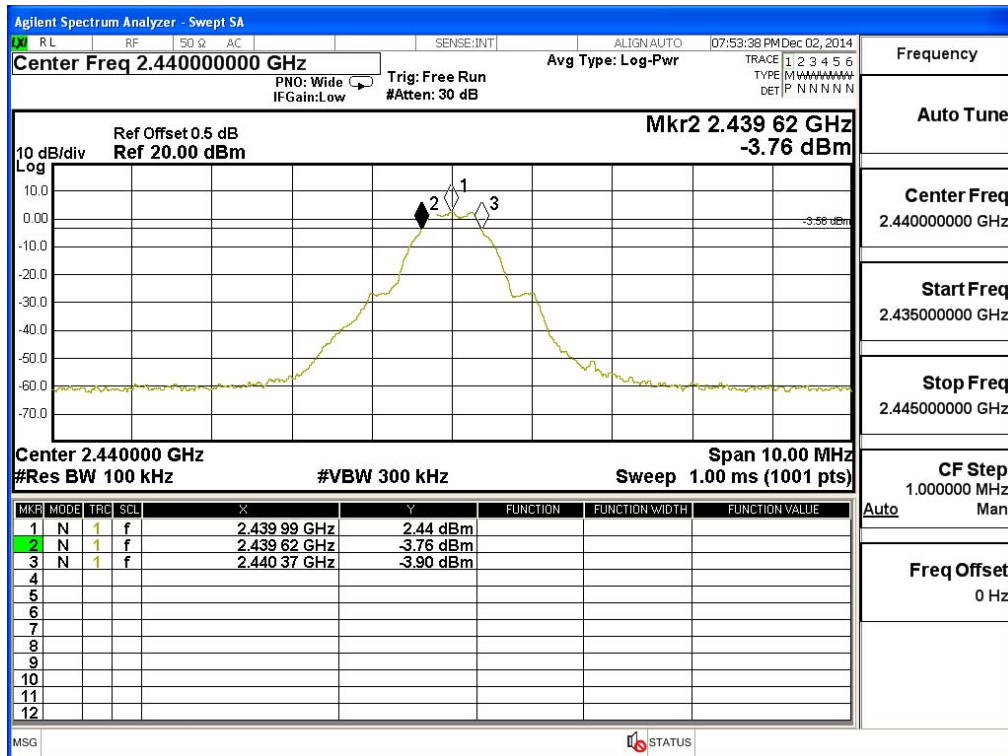
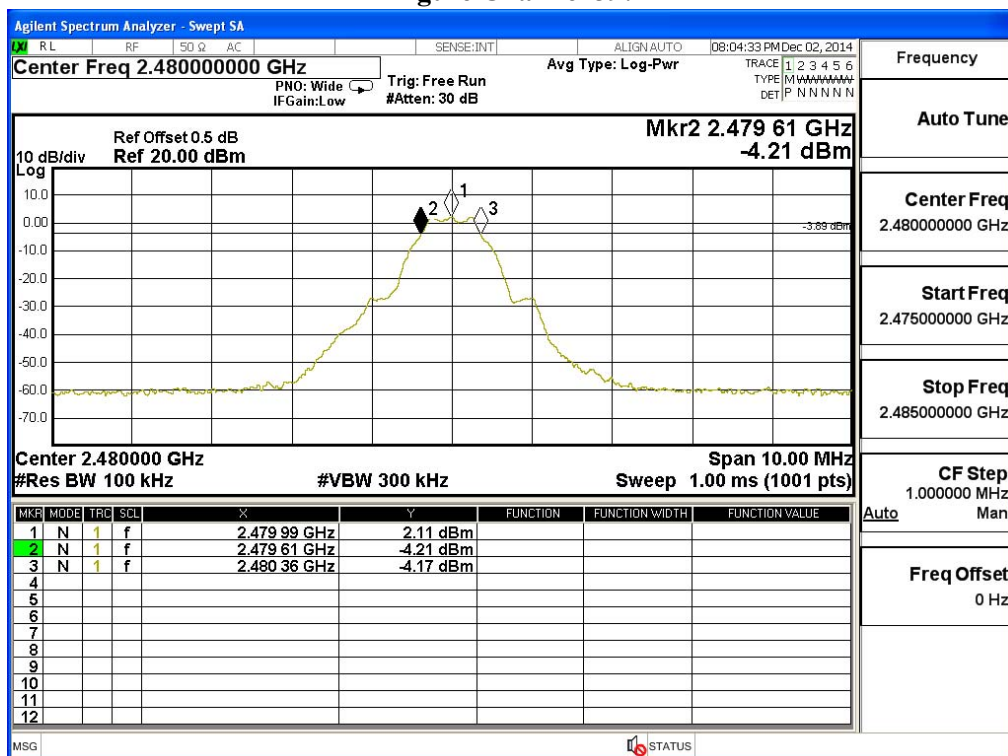


Figure Channel 39:



8. Power Density

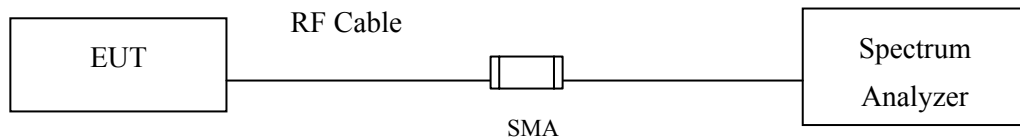
8.1. Test Equipment

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

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: 2013, 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 : OTT BOX
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Limit (dBm)	Result
00	2402	-0.250	< 8dBm	Pass
19	2440	2.290	< 8dBm	Pass
39	2480	1.940	< 8dBm	Pass

Figure Channel 00:

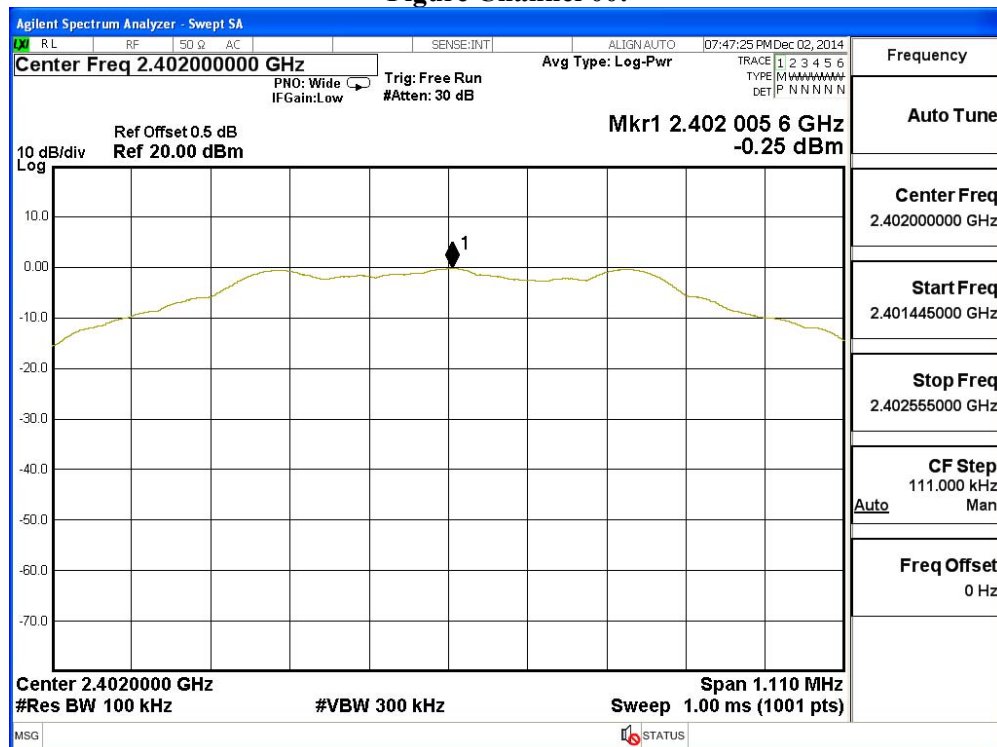


Figure Channel 19:

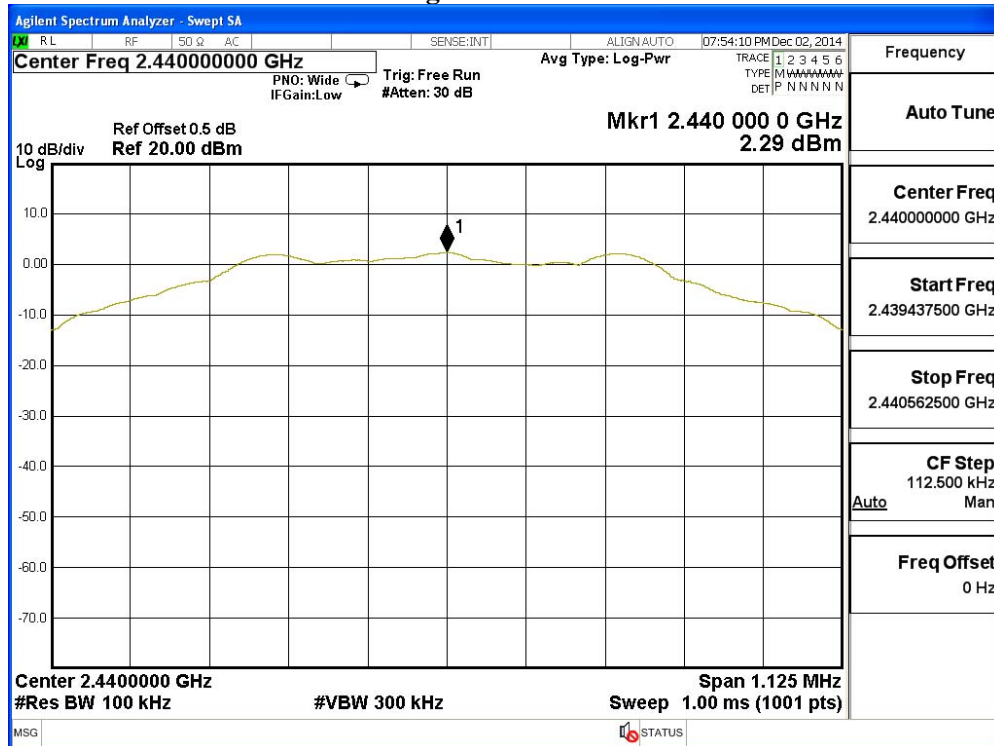
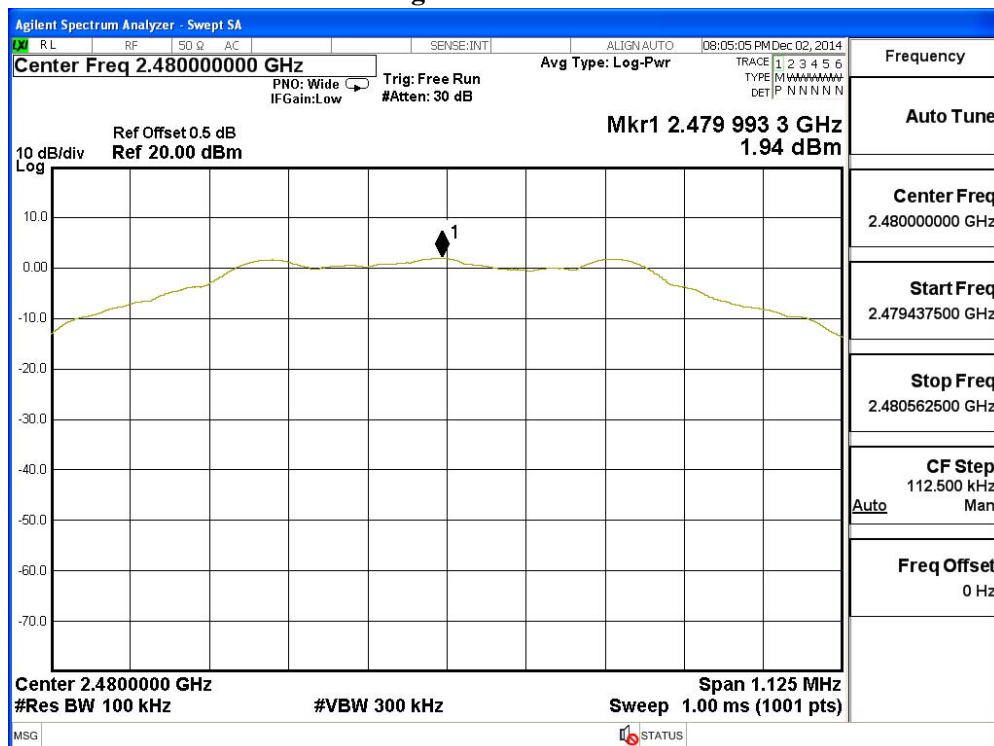


Figure Channel 39:



9. EMI Reduction Method During Compliance Testing

No modification was made during testing.

Attachment 1: EUT Test Photographs

Attachment 2: EUT Detailed Photographs