

FCC Test Report

Product Name	SOUND BAR + WIRELESS SUBWOOFER
Model No.	STUDIO SB 40
FCC ID.	2AJAA-STUDIOSB40

Applicant	Dongguan Meiloon Acoustic Equipments Co., Ltd.
Address	77, Yuanlin Road Fenghuanggang Ind Estate, Tangxia Town, 523727 Dongguan City, Guangdong Province, China.

Date of Receipt	Jun. 27, 2016
Issued Date	May. 17, 2017
Report No.	1750164R-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.

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Test Report

Issued Date: May. 17, 2017

Report No.: 1750164R-RFUSP23V00



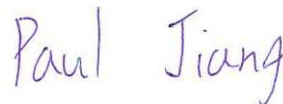
Product Name	SOUND BAR + WIRELESS SUBWOOFER
Applicant	Dongguan Meiloon Acoustic Equipments Co., Ltd.
Address	77, Yuanlin Road Fenghuanggang Ind Estate, Tangxia Town, 523727 Dongguan City, Guangdong Province, China.
Manufacturer	Klipsch Group, Inc.
Model No.	STUDIO SB 40
FCC ID.	2AJAA-STUDIOSB40
EUT Rated Voltage	AC 100-240V, 50-60Hz
EUT Test Voltage	AC 120V/60Hz
Trade Name	Jamo
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2016 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 DTS Meas Guidance v03r04
Test Result	Complied

Documented By :



(Adm. Assistant / Elephant Chen)

Tested By :



(Engineer / Paul Jiang)

Approved By :



(Director / Vincent Lin)

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1. GENERAL INFORMATION

1.1. EUT Description

Product Name	SOUND BAR + WIRELESS SUBWOOFER
Trade Name	Jamo
Model No.	STUDIO SB 40
FCC ID.	2AJAA-STUDIOSB40
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: DYS, M/N: DYS650-180280W-1 Input: AC 100-240V~50/60Hz Output: 18V==2.8A Cable Out: Non-shielded, 1.9m, with one ferrite core bonded.
Contain Module	CSR / CSR8670

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Taiwan Anjie Electronics	AJMP1J-C0016	PIFA	6.2dBi 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: (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 Soundbar with a built-in Bluetooth transceiver, 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.

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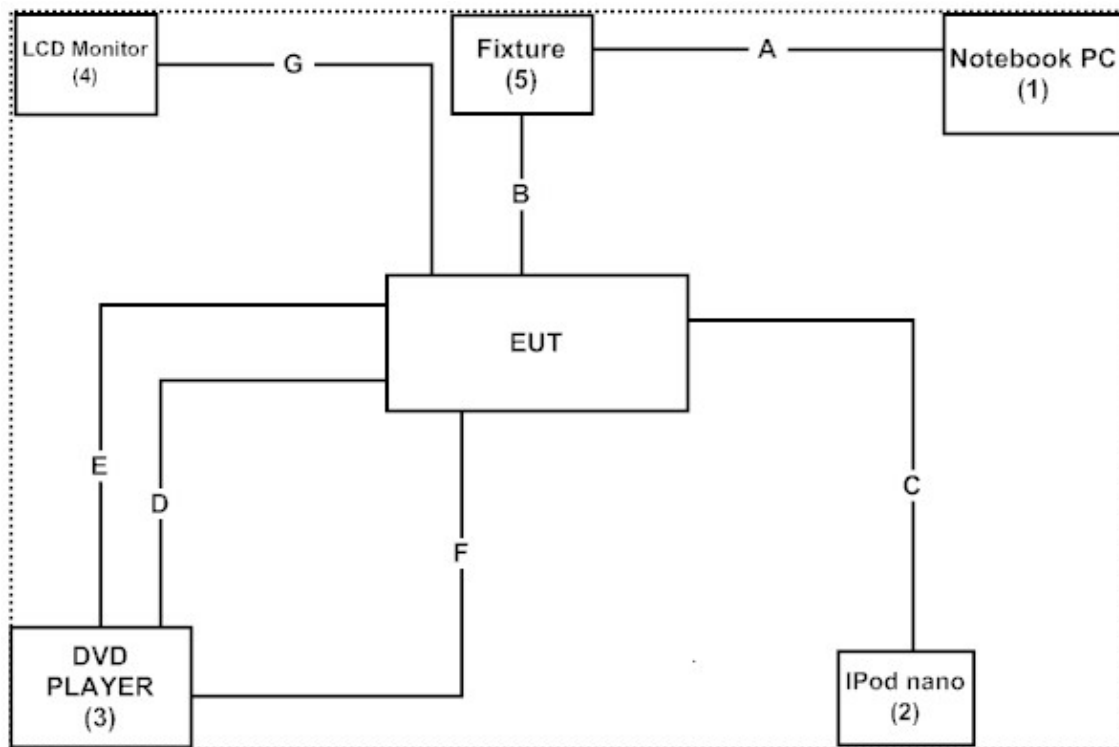
1.3. Tested System Details

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 Notebook PC	DELL	Latitude E5440	FS9TK32	Non-Shielded, 0.8m
2 iPod nano	Apple	A1199	YM733325VQ5	N/A
3 DVD PLAYER	Pioneer	DV-600AV	GHKD003531 LS	Non-Shielded, 1.8m
4 LCD Monitor	ASUS	VS229HA	F4LMQS135395	Non-Shielded, 1.8m
5 Fixture	N/A	N/A	N/A	N/A

Signal Cable Type	Signal cable Description
A USB Cable	Non-Shielded, 1.8m
B Fixture Cable	Non-Shielded, 0.02m, two PCS.
C iPod Cable	Non-Shielded, 1m
D Analog Cable	on-Shielded, 0.9m
E Fiber Cable	Non-Shielded, 1.9m
F HDMI Cable	Non-Shielded, 1.4m
G HDMI Cable	Non-Shielded, 1.4m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software "Blue Test v2.5.0" 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 DEKRA Testing and Certification Co., Ltd. Web Site:

<http://www.dekra.com.tw/english/about/certificates.aspx?bval=5>

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our Web site: http://www.dekra.com.tw/index_en.aspx

FCC Test Firm Registration Number: 92195

Site Description: Accredited by TAF
Accredited Number: 3023

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Taiwan, R.O.C.
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2. Conducted Emission

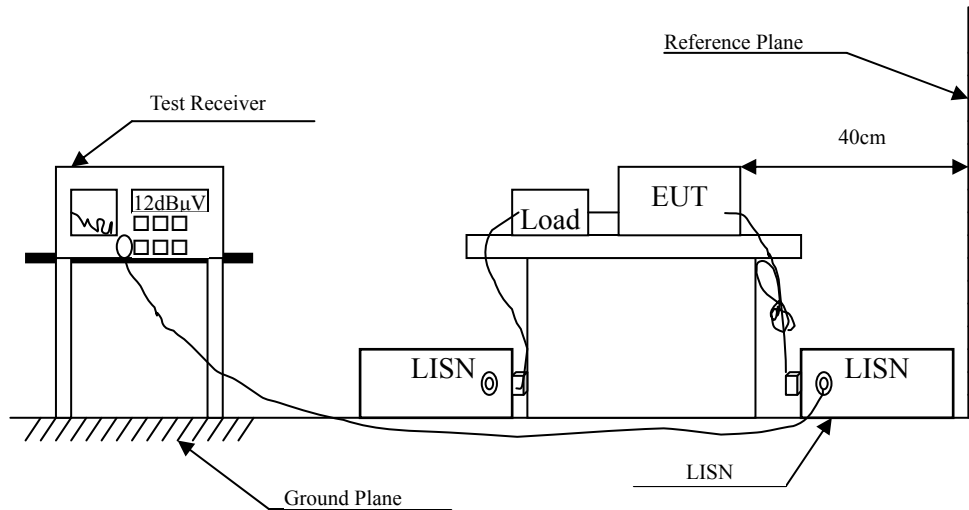
2.1. Test Equipment

	Equipment	Manufacturer	Model No. / Serial No.	Last Cal.	Due Cal.	Remark
X	Test Receiver	R & S	ESCS 30 / 825442/018	Sep., 2016	Sep., 2017	
X	Artificial Mains Network	R & S	ENV4200 / 848411/10	Feb., 2017	Feb., 2018	Peripherals
X	LISN	R & S	ESH3-Z5 / 825562/002	Feb., 2017	Feb., 2018	EUT
	DC LISN	Schwarzbeck	8226 / 176	Mar., 2017	Mar., 2018	EUT
X	Pulse Limiter	R & S	ESH3-Z2 / 357.8810.52	Feb., 2017	Feb., 2018	
	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 DTS test procedure of FCC KDB-558074 for compliance to FCC 47CFR Subpart C requirements.

2.5. Uncertainty

± 2.26 dB

2.6. Test Result of Conducted Emission

Product : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Conducted Emission Test
 Power Line : Line 1
 Test date : 2016.08.09
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Frequency MHz	Correct Factor dB	Reading Level dB μ V	Measurement Level dB μ V	Margin dB	Limit dB μ V
LINE 1					
Quasi-Peak					
0.177	9.679	27.210	36.889	-28.340	65.229
0.209	9.676	21.570	31.246	-33.068	64.314
0.240	9.677	16.270	25.947	-37.482	63.429
0.298	9.672	10.660	20.333	-41.438	61.771
0.392	9.672	14.190	23.862	-35.224	59.086
0.576	9.678	14.370	24.048	-31.952	56.000
Average					
0.177	9.679	7.050	16.729	-38.500	55.229
0.209	9.676	5.380	15.056	-39.258	54.314
0.240	9.677	4.400	14.077	-39.352	53.429
0.298	9.672	-0.540	9.133	-42.638	51.771
0.392	9.672	-0.090	9.582	-39.504	49.086
0.576	9.678	10.670	20.348	-25.652	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 : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Conducted Emission Test
 Power Line : Line 2
 Test date : 2016.08.09
 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	dB	dB μ V
LINE 2					
Quasi-Peak					
0.170	9.735	27.100	36.835	-28.594	65.429
0.216	9.737	21.980	31.717	-32.397	64.114
0.279	9.739	15.900	25.639	-36.675	62.314
0.369	9.741	24.900	34.641	-25.102	59.743
0.576	9.748	15.680	25.428	-30.572	56.000
8.326	9.943	3.710	13.653	-46.347	60.000
Average					
0.170	9.735	13.190	22.925	-32.504	55.429
0.216	9.737	12.860	22.597	-31.517	54.114
0.279	9.739	8.100	17.839	-34.475	52.314
0.369	9.741	9.920	19.661	-30.082	49.743
0.576	9.748	10.820	20.568	-25.432	46.000
8.326	9.943	-0.550	9.393	-40.607	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

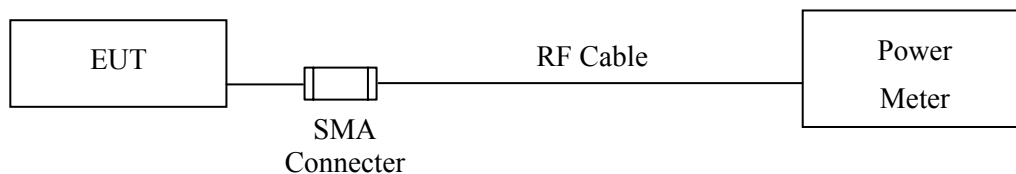
3. Peak Power Output

3.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
X	Power Meter	Anritsu	ML2495A/6K00003357	May, 2017	May, 2018
X	Power Sensor	Anritsu	MA2411B/0738448	Jun., 2016	Jun., 2017

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 9.1.3 PKPM1 Peak power meter method.

3.5. Uncertainty

± 1.19 dB

3.6. Test Result of Peak Power Output

Product : SOUND BAR + WIRELESS SUBWOOFER
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2016.08.09
Test Mode : Mode 1: Transmit - BLE (GFSK)

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	0.25	1 Watt= 29.80 dBm	Pass
Channel 19	2440.00	0.53	1 Watt= 29.80 dBm	Pass
Channel 39	2480.00	-0.41	1 Watt= 29.80 dBm	Pass

Note:

1. Peak Power Output Value = Reading value on power meter + cable loss
2. Required Limit = $30\text{dBm} - [6.2\text{dBi} - 6\text{dBi}] = 29.80\text{ dBm}$ for compliance to FCC 47CFR 15.247(b) (4) requirements.

4. Radiated Emission

4.1. Test Equipment

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

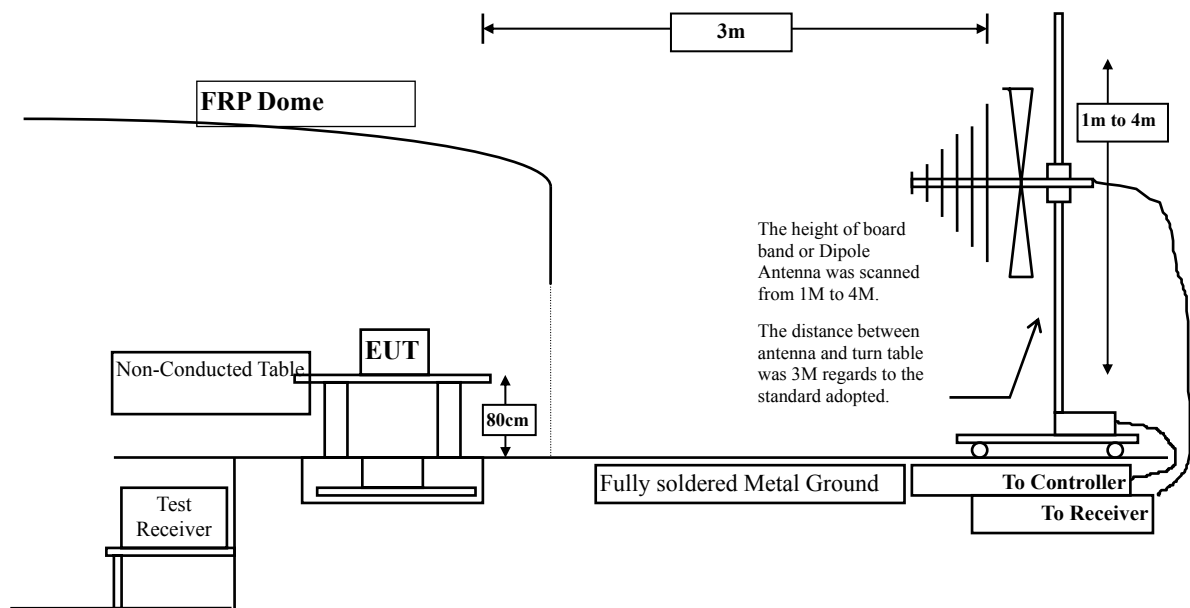
Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
☒ Site # 3	X Magnetic Loop Antenna	Teseq	HLA6121/ 37133	Sep, 2016	Sep, 2017
	X Bilog Antenna	Schaffner Chase	CBL6112B/ 2707	Jun., 2016	Jun., 2017
	X EMI Test Receiver	R&S	ESCS 30/838251/ 001	Jun., 2016	Jun., 2017
	X Coaxial Cable	QTK(Arnist)	RG 214/ LC003-RG	Jun., 2016	Jun., 2017
	X Coaxial signal switch	Arnist	MP59B/ 6200798682	Jun., 2016	Jun., 2017

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
☒ CB # 8	X Spectrum Analyzer	R&S	FSP40/ 100339	Oct., 2016	Oct., 2017
	X Horn Antenna	ETS-Lindgren	3117/ 35205	Mar., 2017	Mar., 2018
	X Horn Antenna	Schwarzbeck	BBHA9170/209	Jan., 2017	Jan., 2018
	X Horn Antenna	TRC	AH-0801/95051	Aug., 2016	Aug., 2017
	X Pre-Amplifier	EMCI	EMC012630SE/980210	Jan., 2017	Jan., 2018
	X Pre-Amplifier	MITEQ	JS41-001040000-58-5P/ 153945	Jul., 2016	Jul., 2017
	X Pre-Amplifier	NARDA	DBL-1840N506/013	Jul., 2016	Jul., 2017

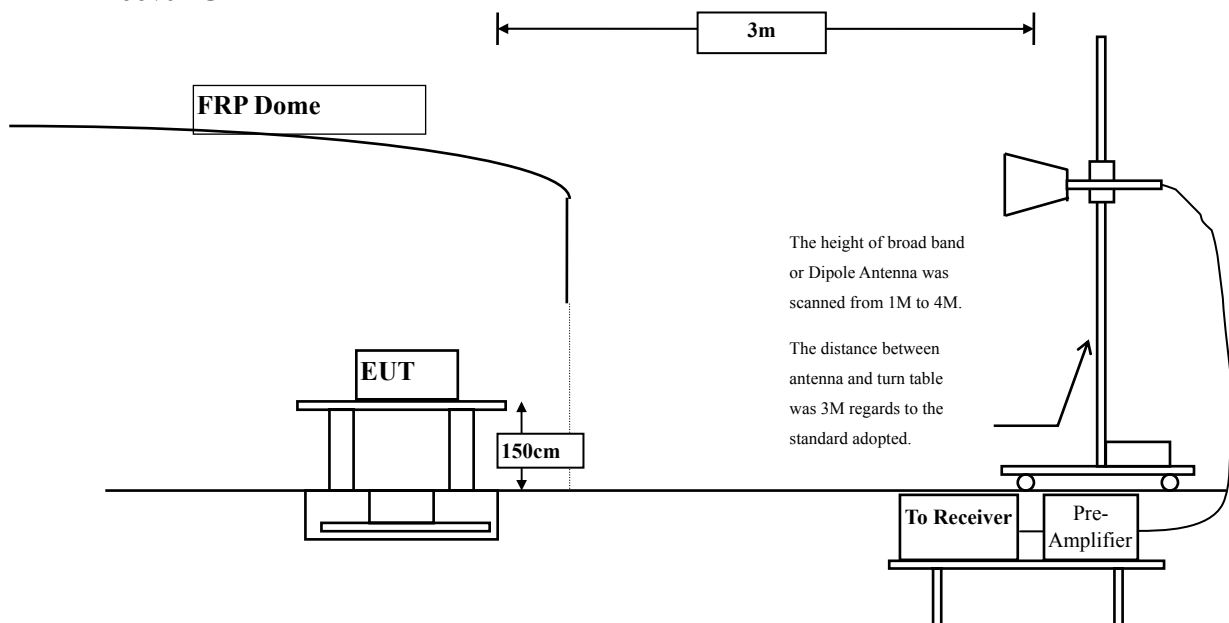
- Note:
1. All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.
 2. The test instruments marked with "X" are used to measure the final test results.

4.2. Test Setup

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 (dB μ V) = 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

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.6. Test Result of Radiated Emission

Product : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2016.08.09
 Test Mode : Mode 1: Transmit - BLE (GFSK)(2402MHz)

Frequency MHz	Correct Factor dB	Reading Level dBμV	Measurement Level dBμV/m	Margin dB	Limit dBμV/m
Horizontal					
Peak Detector:					
4804.000	3.327	34.540	37.867	-36.133	74.000
7206.000	10.136	31.120	41.256	-32.744	74.000
9608.000	13.706	30.990	44.696	-29.304	74.000
Average Detector:					
--					
Vertical					
Peak Detector:					
4804.000	6.638	35.420	42.057	-31.943	74.000
7206.000	11.005	30.370	41.375	-32.625	74.000
9608.000	14.103	31.150	45.253	-28.747	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 : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2016.08.09
 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	3.010	36.150	39.160	-34.840	74.000
7320.000	11.833	32.110	43.944	-30.056	74.000
9760.000	12.580	32.250	44.831	-29.169	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4880.000	5.738	36.050	41.788	-32.212	74.000
7320.000	12.703	31.980	44.683	-29.317	74.000
9760.000	13.052	32.350	45.402	-28.598	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 : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2016.08.09
 Test Mode : Mode 1: Transmit - BLE (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	35.680	38.440	-35.560	74.000
7440.000	12.567	31.540	44.106	-29.894	74.000
9920.000	13.456	31.610	45.066	-28.934	74.000
Average					
Detector:					
--					
Vertical					
Peak Detector:					
4960.000	5.557	35.690	41.247	-32.753	74.000
7440.000	13.426	31.810	45.235	-28.765	74.000
9920.000	13.958	32.680	46.638	-27.362	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 : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test date : 2016.08.09
 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					
125.060	-7.335	46.990	39.655	-3.845	43.500
253.100	-5.669	46.788	41.119	-4.881	46.000
383.080	1.305	37.378	38.683	-7.317	46.000
485.900	1.316	36.551	37.867	-8.133	46.000
602.300	3.794	31.822	35.616	-10.384	46.000
685.720	2.944	34.631	37.575	-8.425	46.000
Vertical					
144.460	-5.503	42.113	36.610	-6.890	43.500
218.180	-6.306	40.919	34.613	-11.387	46.000
322.940	-3.616	38.956	35.341	-10.659	46.000
600.360	1.302	32.180	33.482	-12.518	46.000
833.160	1.716	34.259	35.975	-10.025	46.000
955.380	2.956	36.956	39.912	-6.088	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

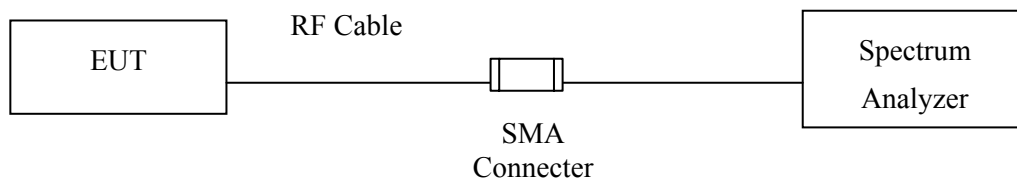
5.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2016	Jun., 2017
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2016	Jun., 2017
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2017	Apr., 2018

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.

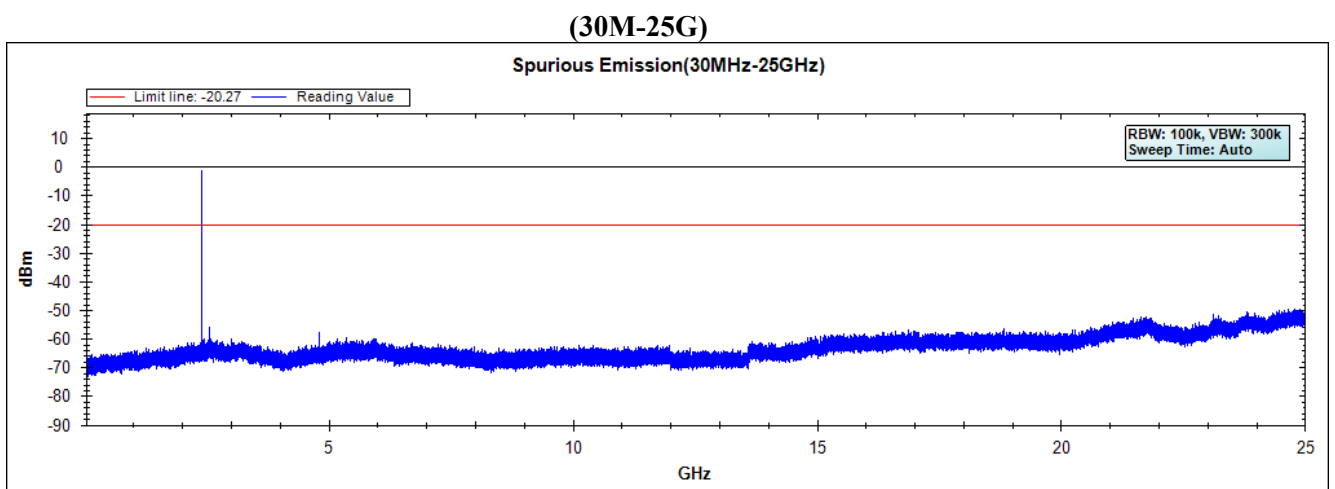
5.5. Uncertainty

± 1.20dB

5.6. Test Result of RF Antenna Conducted Test

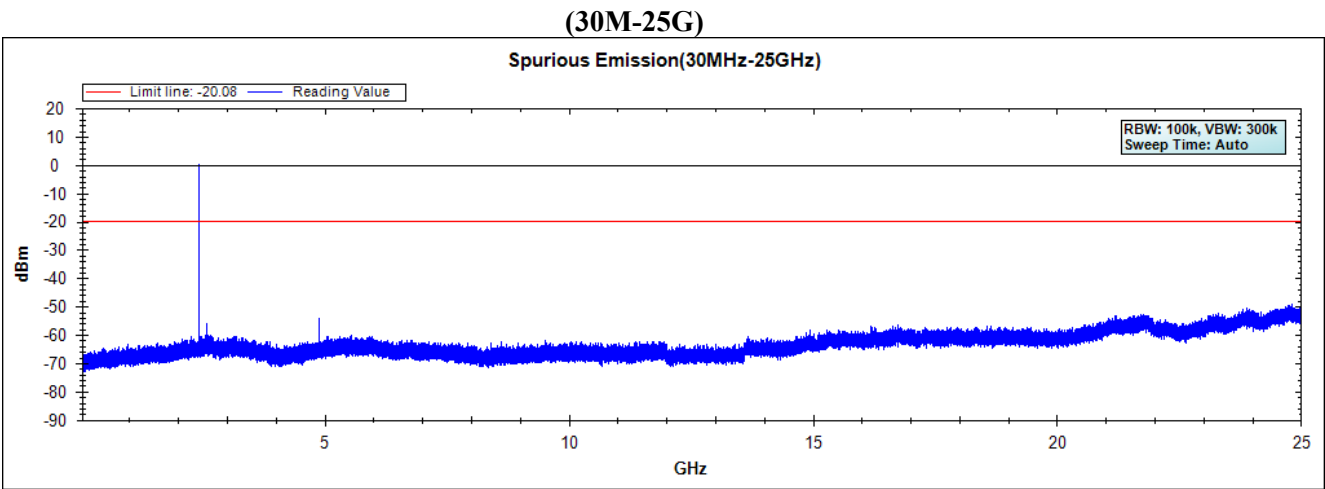
Product : SOUND BAR + WIRELESS SUBWOOFER
Test Item : RF Antenna Conducted Test
Test Site : No.3 OATS
Test date : 2016.08.09
Test Mode : Mode 1: Transmit - BLE (GFSK)

Figure Channel 00:



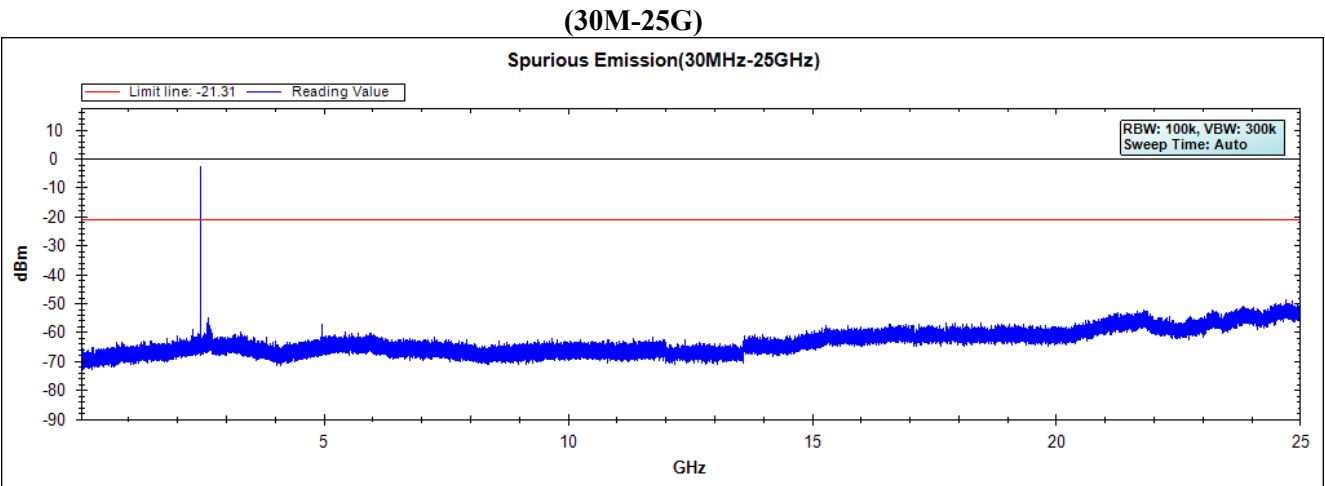
Product : SOUND BAR + WIRELESS SUBWOOFER
Test Item : RF Antenna Conducted Test
Test Site : No.3 OATS
Test date : 2016.08.09
Test Mode : Mode 1: Transmit - BLE (GFSK)

Figure Channel 19:



Product : SOUND BAR + WIRELESS SUBWOOFER
Test Item : RF Antenna Conducted Test
Test Site : No.3 OATS
Test date : 2016.08.09
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.	Due Cal.
X Spectrum Analyzer	R&S	FSP40 / 100170	Jun, 2016	Jun, 2017
X Spectrum Analyzer	Agilent	E4407B / US39440758	Jun, 2016	Jun, 2017
X Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2017	Apr., 2018

RF Radiated Measurement:

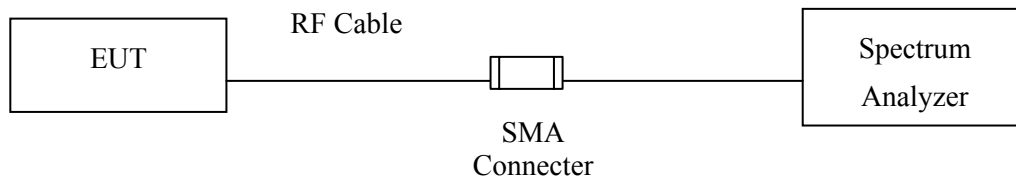
The following test equipments are used during the band edge tests:

Test Site	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
☒ CB # 8	X Spectrum Analyzer	R&S	FSP40/ 100339	Oct., 2016	Oct., 2017
	X Horn Antenna	ETS-Lindgren	3117/ 35205	Mar., 2017	Mar., 2018
	X Horn Antenna	Schwarzbeck	BBHA9170/209	Jan., 2017	Jan., 2018
	X Horn Antenna	TRC	AH-0801/95051	Aug., 2016	Aug., 2017
	X Pre-Amplifier	EMCI	EMC012630SE/980210	Jan., 2017	Jan., 2018
	X Pre-Amplifier	MITEQ	JS41-001040000-58-5P/ 153945	Jul., 2016	Jul., 2017
	X Pre-Amplifier	NARDA	DBL-1840N506/013	Jul., 2016	Jul., 2017

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

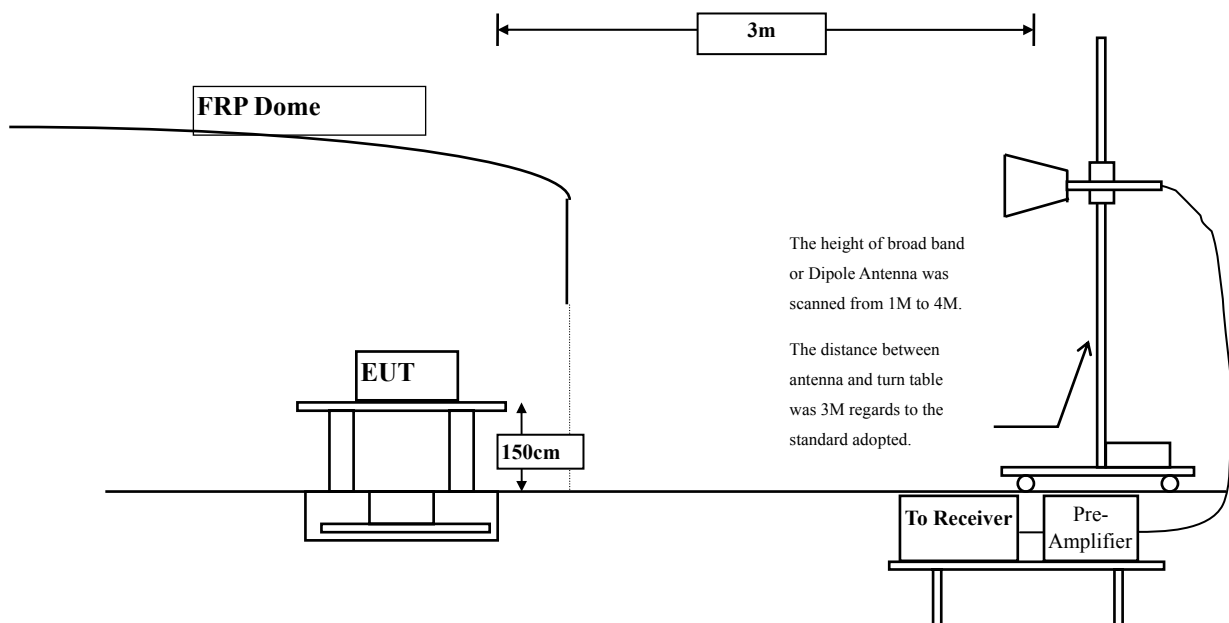
6.2. Test Setup

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 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

± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

6.6. Test Result of Band Edge

Product : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2016.08.09
 Test Mode : Mode 1: Transmit - BLE (GFSK)

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)	2363.913	31.406	28.154	59.561	74.00	54.00	Pass
00 (Peak)	2390.000	31.509	26.061	57.570	74.00	54.00	Pass
00 (Peak)	2400.000	31.561	31.678	63.239	--	--	Pass
00 (Peak)	2402.319	31.575	63.418	94.994	--	--	--
00 (Average)	2342.174	31.322	14.713	46.035	74.00	54.00	Pass
00 (Average)	2390.000	31.509	13.456	44.965	74.00	54.00	Pass
00 (Average)	2400.000	31.561	16.526	48.087	--	--	Pass
00 (Average)	2402.029	31.573	44.339	75.913	--	--	--

Figure Channel 00:

Horizontal (Peak)

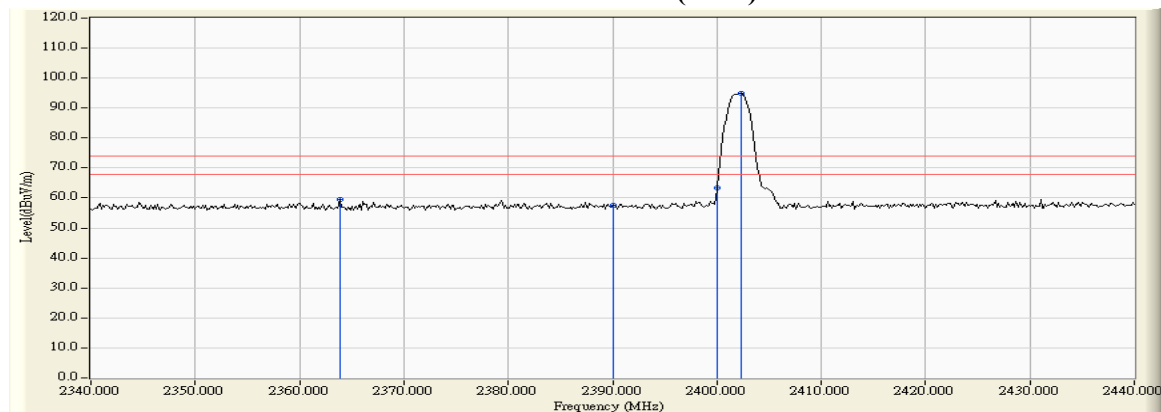
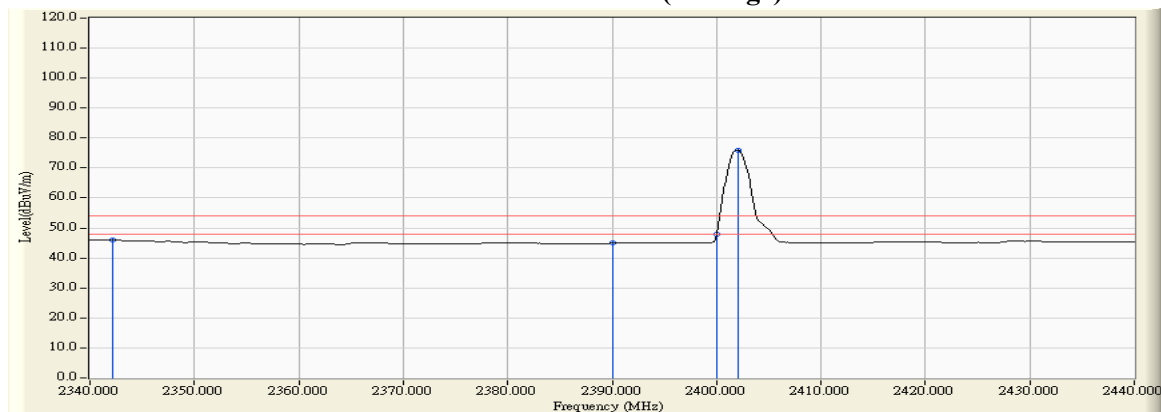


Figure Channel 00:

Horizontal (Average)



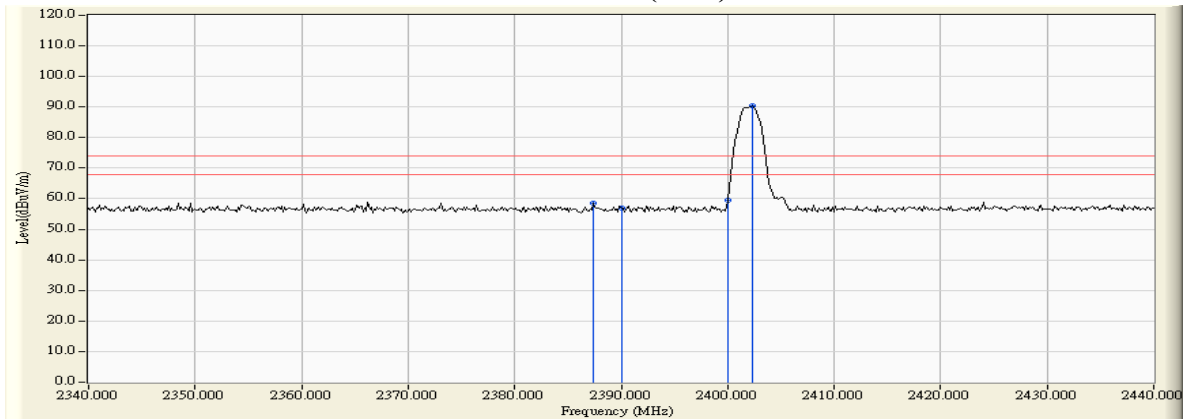
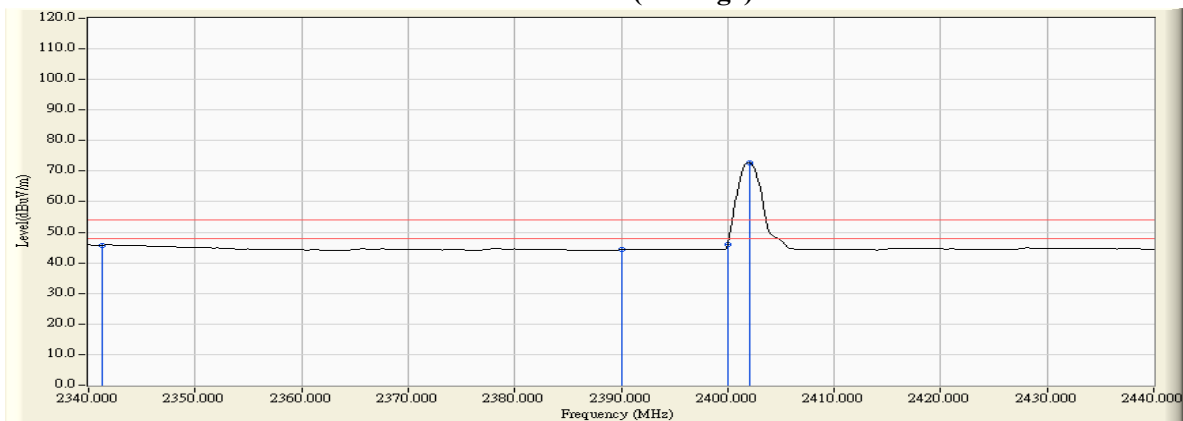
Note:

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 : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2016.08.09
 Test Mode : Mode 1: Transmit - BLE (GFSK)

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)	2387.391	30.927	27.606	58.533	74.00	54.00	Pass
00 (Peak)	2390.000	30.915	25.969	56.884	74.00	54.00	Pass
00 (Peak)	2400.000	30.912	28.666	59.578	--	--	Pass
00 (Peak)	2402.319	30.918	59.338	90.256	--	--	--
00 (Average)	2341.304	31.142	14.658	45.799	74.00	54.00	Pass
00 (Average)	2390.000	30.915	13.430	44.345	74.00	54.00	Pass
00 (Average)	2400.000	30.912	15.117	46.029	--	--	Pass
00 (Average)	2402.029	30.917	41.799	72.716	--	--	--

Figure Channel 00: Vertical (Peak)

Figure Channel 00: Vertical (Average)


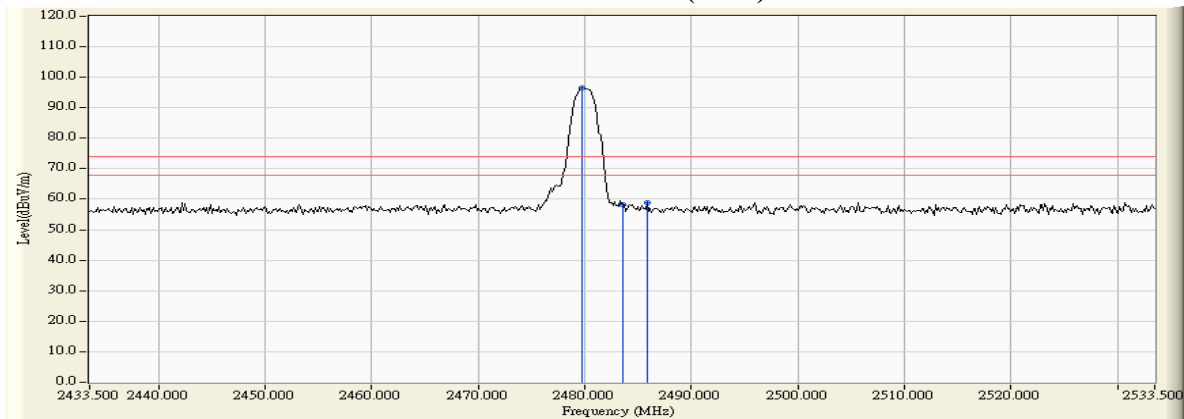
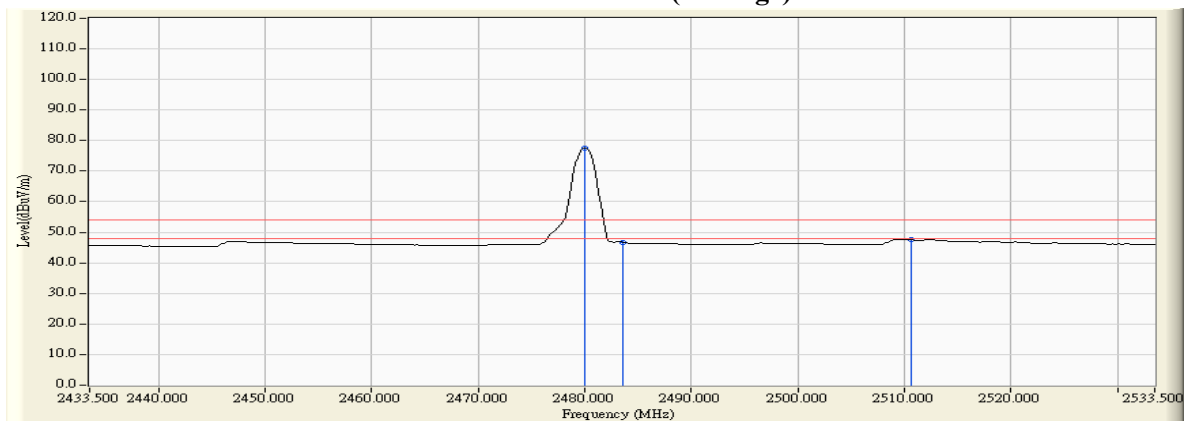
Note:

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 : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2016.08.09
 Test Mode : Mode 1: Transmit - BLE (GFSK)

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
39 (Peak)	2479.732	32.154	64.386	96.540	--	--	--
39 (Peak)	2483.500	32.182	25.977	58.159	74.00	54.00	Pass
39 (Peak)	2485.819	32.199	26.608	58.808	74.00	54.00	Pass
39 (Average)	2480.022	32.156	45.464	77.620	--	--	--
39 (Average)	2483.500	32.182	14.589	46.771	74.00	54.00	Pass
39 (Average)	2510.601	32.251	15.255	47.506	74.00	54.00	Pass

Figure Channel 39:
Horizontal (Peak)

Figure Channel 39:
Horizontal (Average)


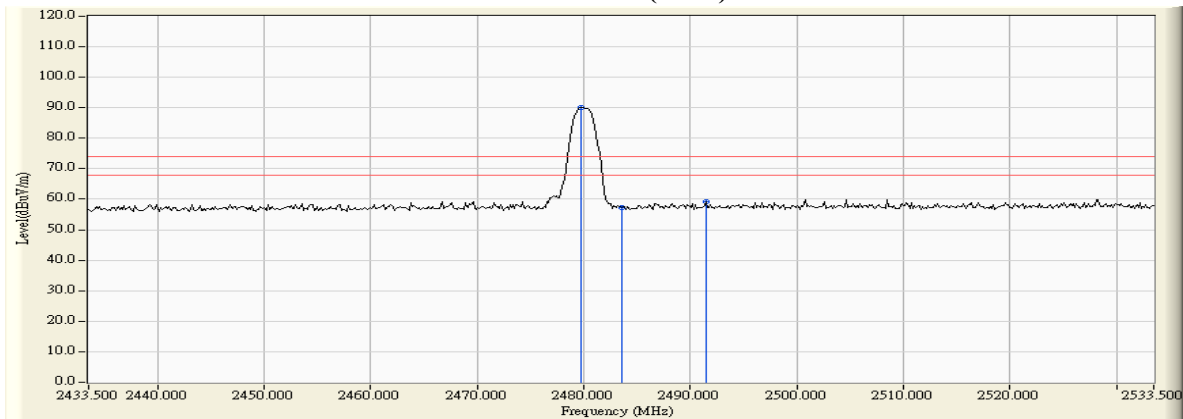
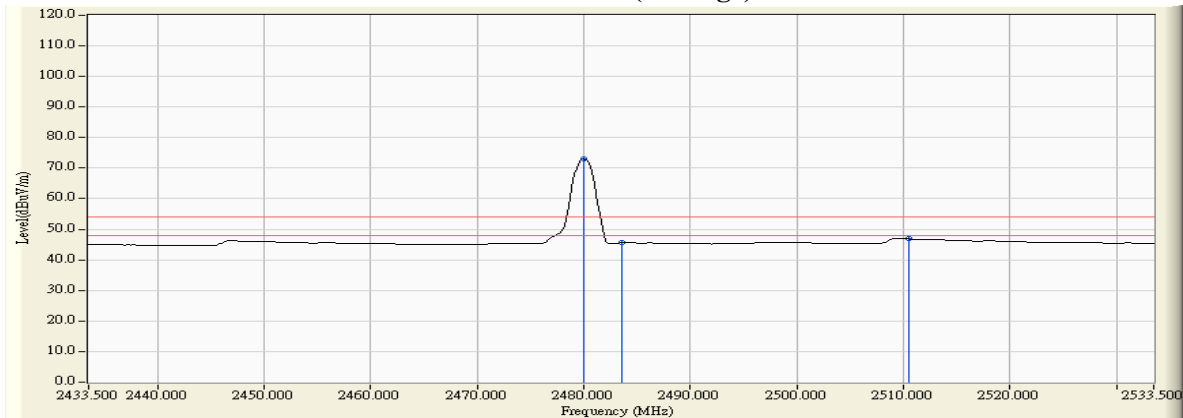
Note:

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 : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2016.08.09
 Test Mode : Mode 1: Transmit - BLE (GFSK)

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)	2479.732	31.410	58.768	90.178	--	--	--
39 (Peak)	2483.500	31.435	25.829	57.264	74.00	54.00	Pass
39 (Peak)	2491.471	31.489	27.849	59.338	74.00	54.00	Pass
39 (Average)	2480.022	31.412	41.574	72.986	--	--	--
39 (Average)	2483.500	31.435	14.098	45.533	74.00	54.00	Pass
39 (Average)	2510.457	31.548	15.279	46.827	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.

7. 6dB Bandwidth

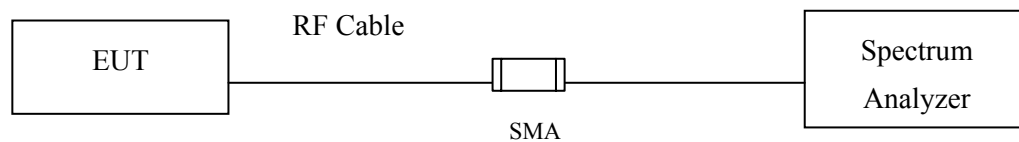
7.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2016	Jun., 2017
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2016	Jun., 2017
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2017	Apr., 2018

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, $VBW \geq 3 \cdot RBW$

7.5. Uncertainty

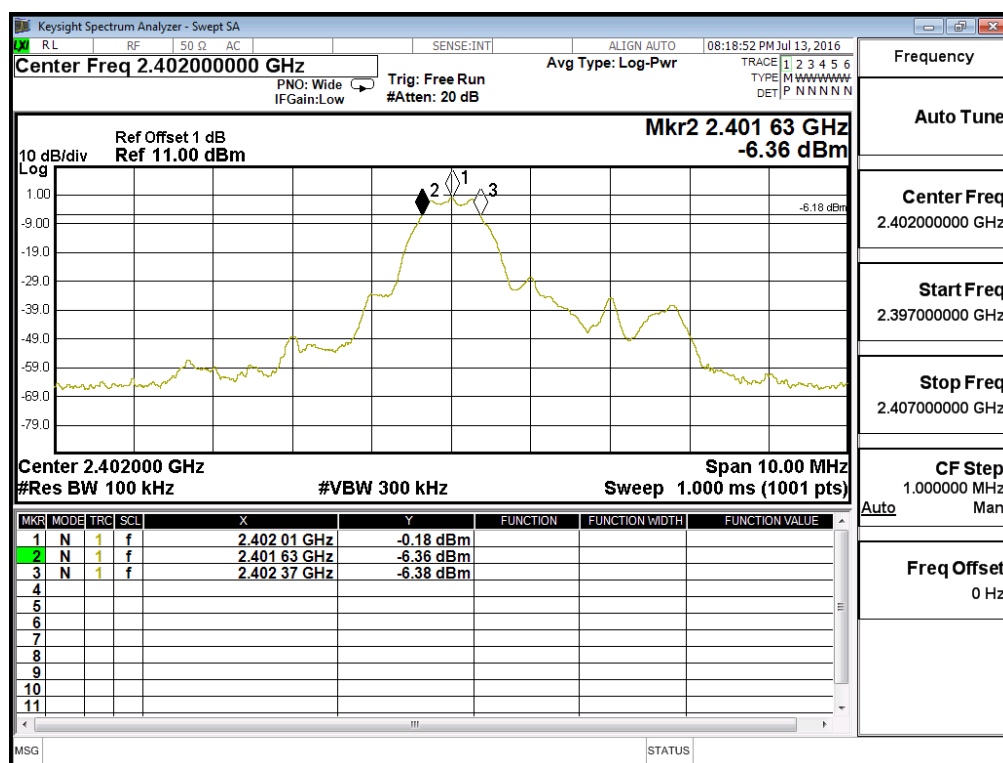
$\pm 283\text{Hz}$

7.6. Test Result of 6dB Bandwidth

Product : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : 6dB 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	740	>500	Pass

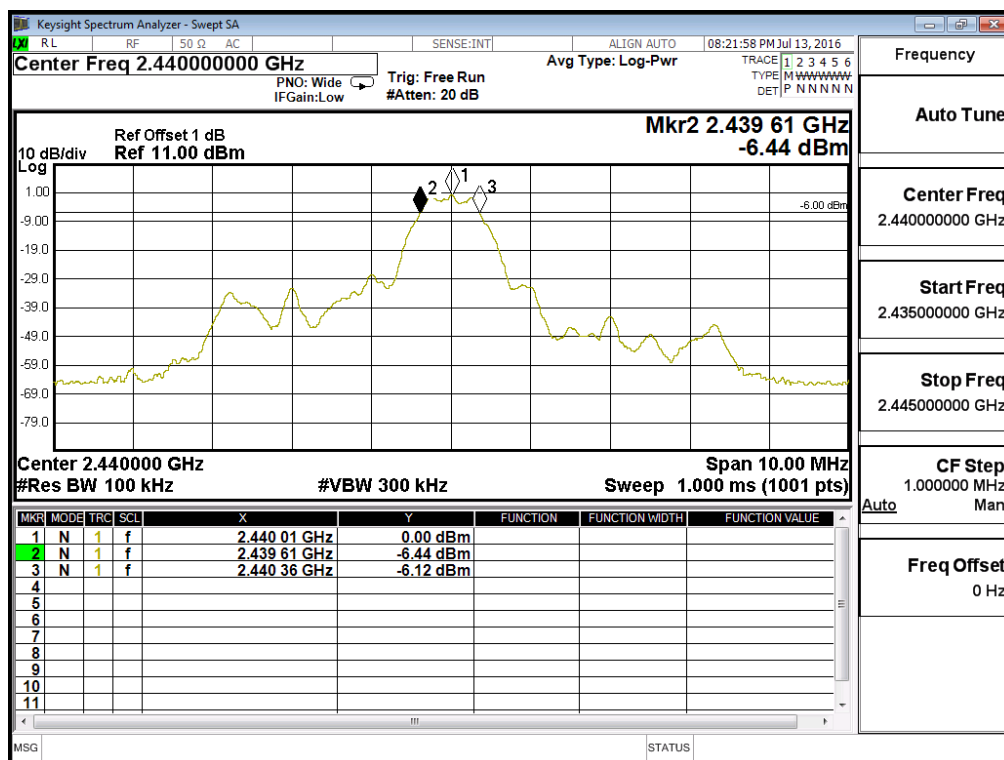
Figure Channel 00:



Product : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : 6dB 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	750	>500	Pass

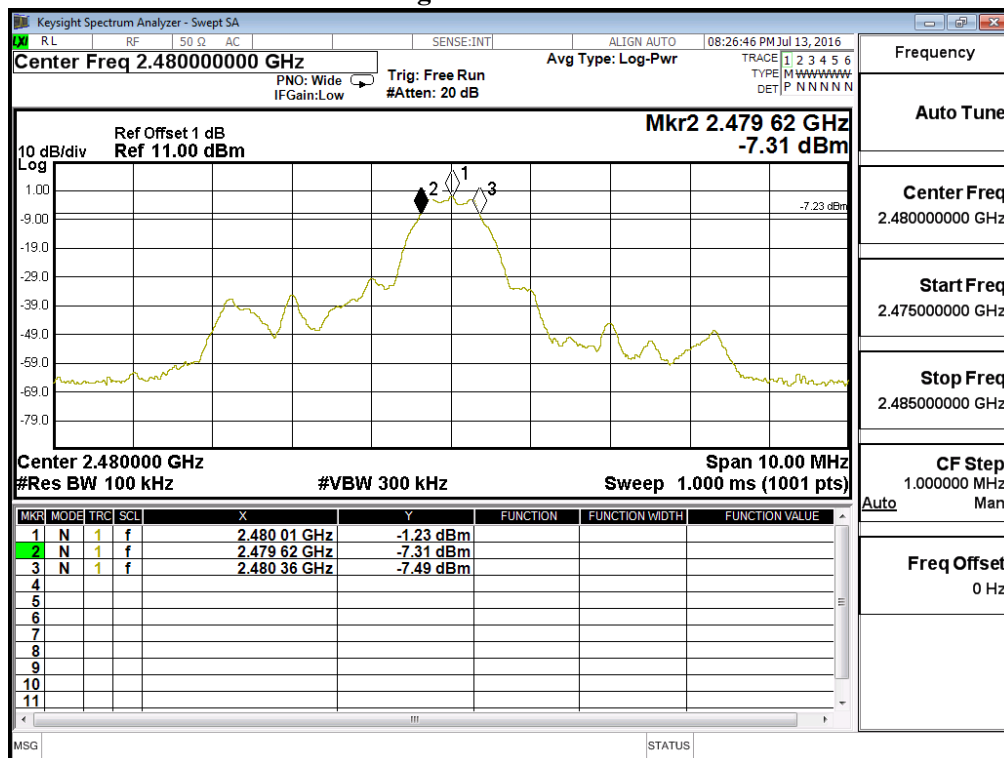
Figure Channel 19:



Product : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : 6dB 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	740	>500	Pass

Figure Channel 39:



8. Power Density

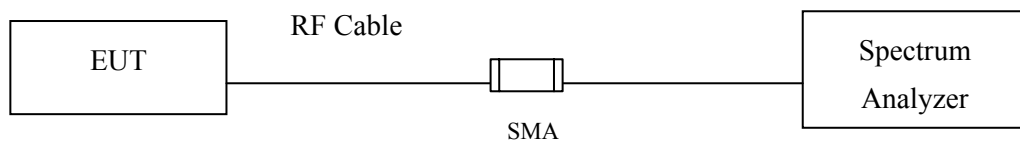
8.1. Test Equipment

	Equipment	Manufacturer	Model No./Serial No.	Last Cal.	Due Cal.
	Spectrum Analyzer	R&S	FSP40 / 100170	Jun., 2016	Jun., 2017
	Spectrum Analyzer	Agilent	E4407B / US39440758	Jun., 2016	Jun., 2017
X	Spectrum Analyzer	Agilent	N9010A / MY48030495	Apr., 2017	Apr., 2018

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

± 1.20 dB

8.6. Test Result of Power Density

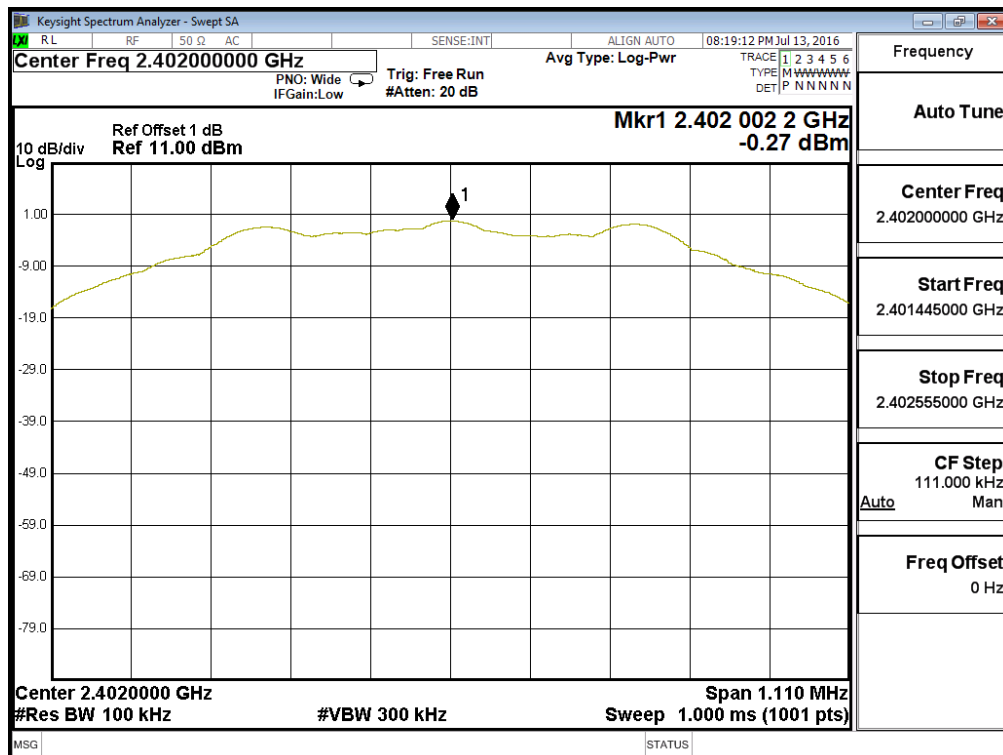
Product : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2402MHz)

Channel No.	Frequency (MHz)	Measure Level (dBm)	Required Limit (dBm)	Result
00	2402	-0.270	≤ 7.8 dBm	Pass

Note:

1. Required Limit= 8dBm-[6.2dBi-6dBi]=7.80 dBm for compliance to FCC 47CFR 15.247(b) (4) requirements.

Figure Channel 00:



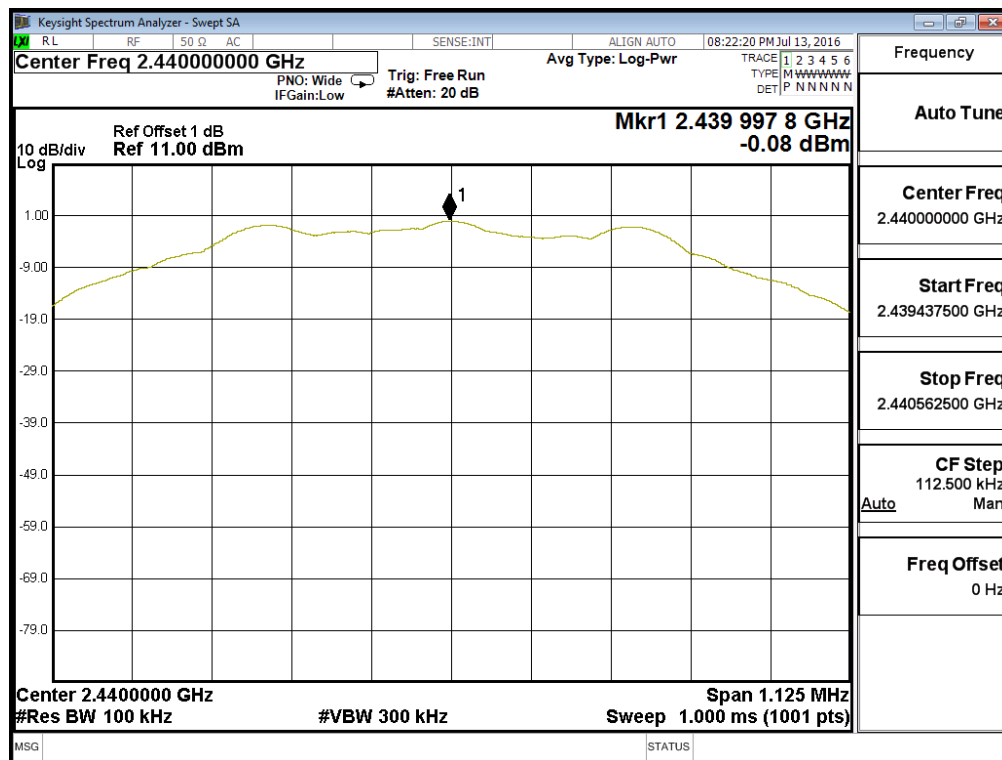
Product : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Power Density Data
 Test Site : No.3OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2440MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
19	2440	-0.080	$\leq 7.8\text{dBm}$	Pass

Note:

1. Required Limit= $8\text{dBm} - [6.2\text{dBi} - 6\text{dBi}] = 7.80\text{ dBm}$ for compliance to FCC 47CFR 15.247(b) (4) requirements.

Figure Channel 19:



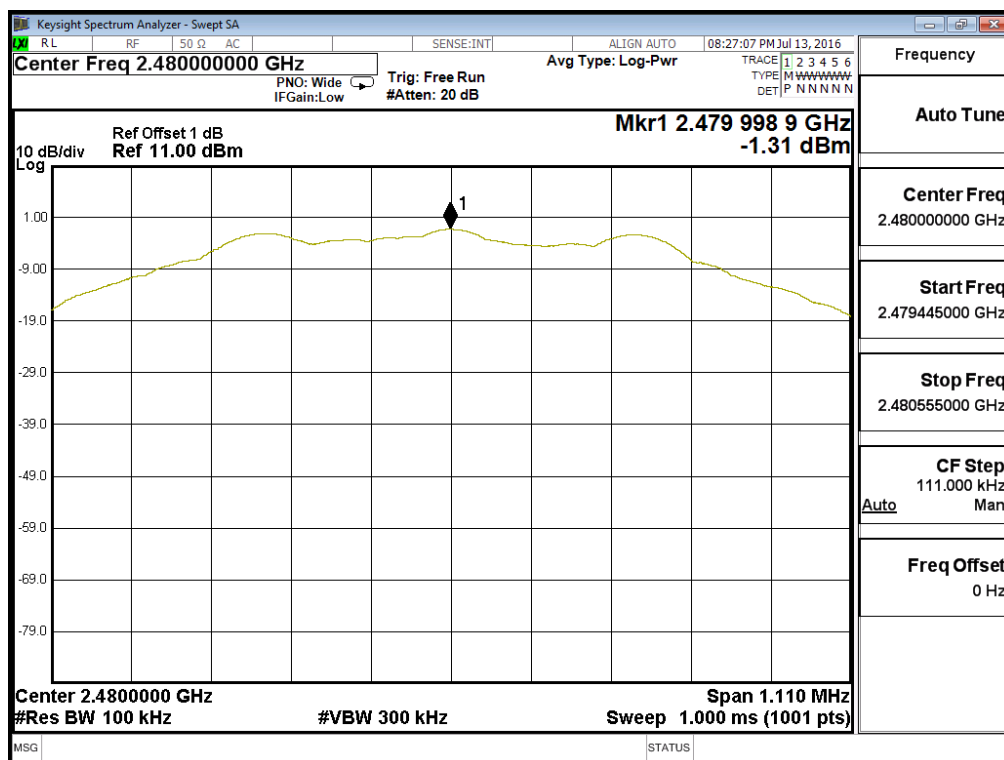
Product : SOUND BAR + WIRELESS SUBWOOFER
 Test Item : Power Density Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit - BLE (GFSK) (2480MHz)

Channel No.	Frequency (MHz)	Measurement Level (dBm)	Required Limit (dBm)	Result
39	2480	-1.310	≤ 7.8 dBm	Pass

Note:

1. Required Limit= 8dBm-[6.2dBi-6dBi]=7.80 dBm for compliance to FCC 47CFR 15.247(b) (4) requirements.

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