

FCC Test Report

Product Name	SOUNDBOKS
Model No.	SOUNDBOKS
FCC ID.	2AJAASB3

Applicant	Dongguan Meiloon Acoustic Equipment Co., Ltd.
Address	77, Yuanlin Road, Feng Huang Gang Ind Estate, Tangxia Town, 523727 Dongguan City, Guangdong Province, China

Date of Receipt	Feb. 13, 2019
Issued Date	Aug. 14, 2019
Report No.	1940049R-RFUSP01V00
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: Aug. 14, 2019

Report No.: 1940049R-RFUSP01V00



Product Name	SOUNDBOKS
Applicant	Dongguan Meiloon Acoustic Equipment Co., Ltd.
Address	77, Yuanlin Road, Feng Huang Gang Ind Estate, Tangxia Town, 523727 Dongguan City, Guangdong Province, China
Manufacturer	SOUNDBOKS Inc
Model No.	SOUNDBOKS
FCC ID.	2AJAASB3
EUT Rated Voltage	AC 100-240V, 50-60Hz
EUT Test Voltage	AC 120V/50Hz
Trade Name	SOUNDBOKS
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2018 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 15.247 Meas Guidance v05
Test Result	Complied

Documented By

:



(Adm. Specialist / Vita Wang)

Tested By

:



(Engineer / Yunchen Chen)

Approved By

:



(Director / 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	SOUNDBOKS
Trade Name	SOUNDBOKS
Model No.	SOUNDBOKS
FCC ID.	2AJAASB3
Frequency Range	2403.5-2477.3MHz
Channel Number	49
Type of Modulation	FSK
Antenna Type	Printed PCB inverted-F Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
Power Adapter	MFR: DYS, M/N: DSC500-145330M Input: AC 100-240V, 50-60Hz, 1.3A Output: DC 1.45V 3.3A Cable Out: Non-Shielded, 1.9m

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	Eleven Engineering	RF1810057	Printed PCB inverted-F Antenna	3.77 dBi for 2.4GHz

Note: The antenna of EUT conforms to FCC 15.203.

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 01:	2403.5 MHz	Channel 21:	2434.3 MHz	Channel 41:	2465.0 MHz
Channel 02:	2405.1 MHz	Channel 22:	2435.8 MHz	Channel 42:	2466.6 MHz
Channel 03:	2406.6 MHz	Channel 23:	2437.4 MHz	Channel 43:	2468.1 MHz
Channel 04:	2408.1 MHz	Channel 24:	2438.9 MHz	Channel 44:	2469.6 MHz
Channel 05:	2409.7 MHz	Channel 25:	2440.4 MHz	Channel 45:	2471.2 MHz
Channel 06:	2411.2 MHz	Channel 26:	2442.0 MHz	Channel 46:	2472.7 MHz
Channel 07:	2412.8 MHz	Channel 27:	2443.5 MHz	Channel 47:	2474.2 MHz
Channel 08:	2414.3 MHz	Channel 28:	2445.0 MHz	Channel 48:	2475.8 MHz
Channel 09:	2415.8 MHz	Channel 29:	2446.6 MHz	Channel 49:	2477.3 MHz
Channel 10:	2417.4 MHz	Channel 30:	2448.1 MHz		
Channel 11:	2418.9 MHz	Channel 31:	2449.6 MHz		
Channel 12:	2420.4 MHz	Channel 32:	2451.2 MHz		
Channel 13:	2422.0 MHz	Channel 33:	2452.7 MHz		
Channel 14:	2423.5 MHz	Channel 34:	2454.3 MHz		
Channel 15:	2425.1 MHz	Channel 35:	2455.8 MHz		
Channel 16:	2426.6 MHz	Channel 36:	2457.3 MHz		
Channel 17:	2428.1 MHz	Channel 37:	2458.9 MHz		
Channel 18:	2429.7 MHz	Channel 38:	2460.4 MHz		
Channel 19:	2431.2 MHz	Channel 39:	2461.9 MHz		
Channel 20:	2432.7 MHz	Channel 40:	2463.5 MHz		

Note:

1. The EUT is a SOUNDBOKS with a built-in Bluetooth V4.2, V3.0, V2.1+EDR and Frequency hopping of 2.4GHz transceiver, this report for Frequency hopping of 2.4GHz.
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 -Frequency hopping of 2.4GHz
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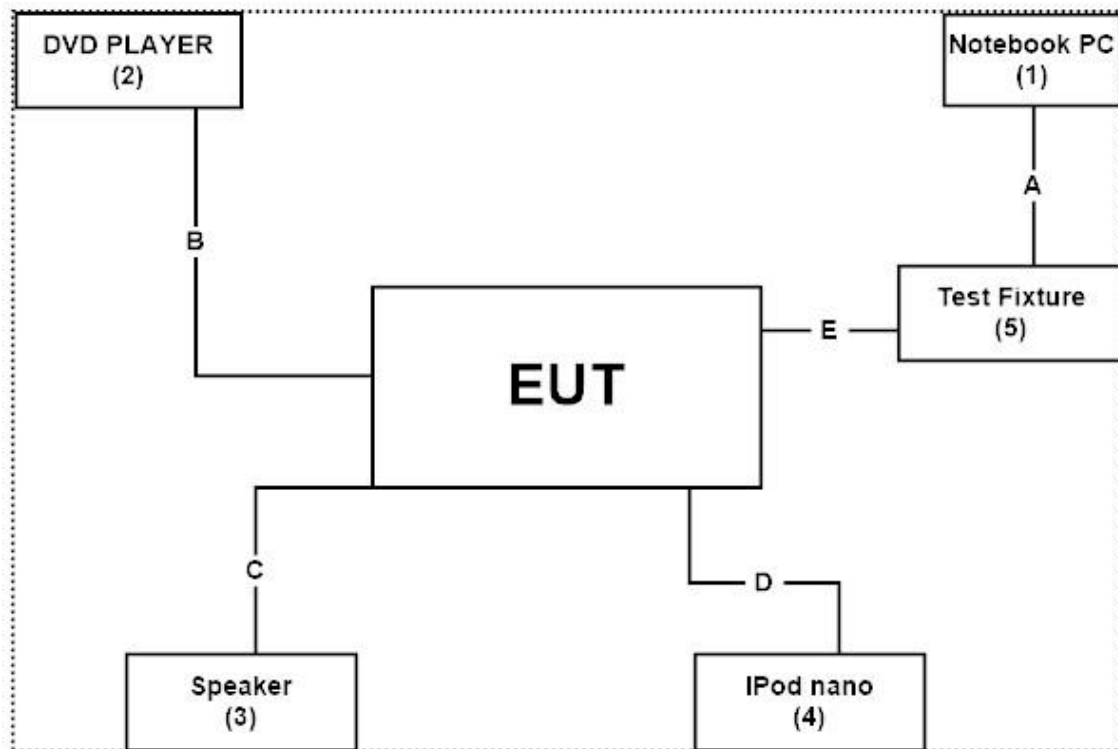
1.3. Tested System Details

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	HG26TZ1	Non-Shielded, 0.8m
2 DVD PLAYER	Pioneer	DV-600AV	GJKD006463LS	N/A
3 Speaker	PHILIPS	SBP1100	HS1A0825057486	Non-Shielded, 1.2m
4 IPod nano	Apple	A1199	5U7047U8VQ5	N/A
5 Test Fixture	Meiloon	N/A	N/A	N/A

Signal Cable Type	Signal cable Description
A USB Cable	Non-Shielded, 0.8m
B Audio Cable	Non-Shielded, 1.7m
C Audio Cable	Non-Shielded, 1.2m
D Audio Cable	Non-Shielded, 1.4m
E Signal Cable	Non-Shielded, 0.1m

1.4. Configuration of Tested System



1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software "Putty v0.62" on the Notebook PC.
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	50-65
Barometric pressure (mbar)	860-1060	950-1000

USA : FCC Registration Number: TW3023

Canada : IC Registration Number: 4075A

Site Description: Accredited by TAF
Accredited Number: 3023

Test Laboratory: DEKRA Testing and Certification Co., Ltd
Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451,
Taiwan, R.O.C.
Phone number: 886-2-8601-3788
Fax number: 886-2-8601-3789
Email address: info.tw@dekra.com
Website: <http://www.dekra.com.tw>

1.7. List of Test Equipment

For Conducted measurements /CB3/SR8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
	Temperature Chamber	WIT GROUP	TH-1S-B	EQ-201-00146	2019/02/12	2020/02/11
X	Spectrum Analyzer	Agilent	N9010A	MY53470892	2018/09/27	2019/09/26
X	Peak Power Analyzer	Keysight	8990B	MY51000410	2019/07/30	2020/07/29
X	Wideband Power Sensor	Keysight	N1923A	MY56080003	2019/07/25	2020/07/24
X	Wideband Power Sensor	Keysight	N1923A	MY56080004	2019/07/25	2020/07/24
X	EMI Test Receiver	R&S	ESCS 30	100369	2018/11/19	2019/11/18
X	LISN	R&S	ENV216	101105	2019/05/14	2020/03/29
X	LISN	R&S	ESH3-Z5	836679/014	2019/05/14	2020/04/01
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2019/06/21	2020/06/20

For Radiated measurements /Site3/CB8

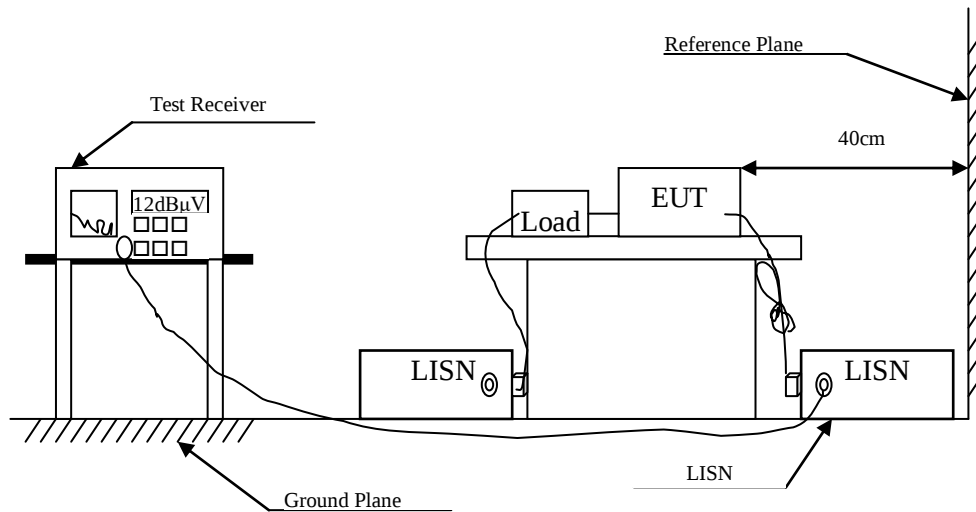
	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2019/03/12	2020/03/11
X	Loop Antenna	Teseq	HLA6121	37133	2018/10/13	2019/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2019/06/24	2020/06/23
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2019/06/14	2020/06/13
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330010	2019/06/14	2020/06/13
X	Horn Antenna	ETS-Lindgren	3117	00135205	2019/04/30	2020/04/29
X	Horn Antenna	SCHWARZBECK	9120D	576	2018/12/18	2019/12/17
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2019/04/10	2020/04/09
	Horn Antenna	Com-Power	AH-840	101043	2019/01/09	2020/01/08
	Amplifier + Cable	EMCI	EMC184045SE	980370	2019/03/21	2020/03/20
X	Filter	MICRO-TRONICS	BRM50702	G270	2019/08/08	2020/08/07
	Filter	MICRO-TRONICS	BRM50716	G196	2019/08/08	2020/08/07

Note:

1. All equipments are calibrated every one year.
2. The test instruments marked with "X" are used to measure the final test results.
3. Test Software version :Quietek EMI 2.0 V2.1.113.

2. Conducted Emission

2.1. Test Setup



2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (dB μ V) 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.

2.3. 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.

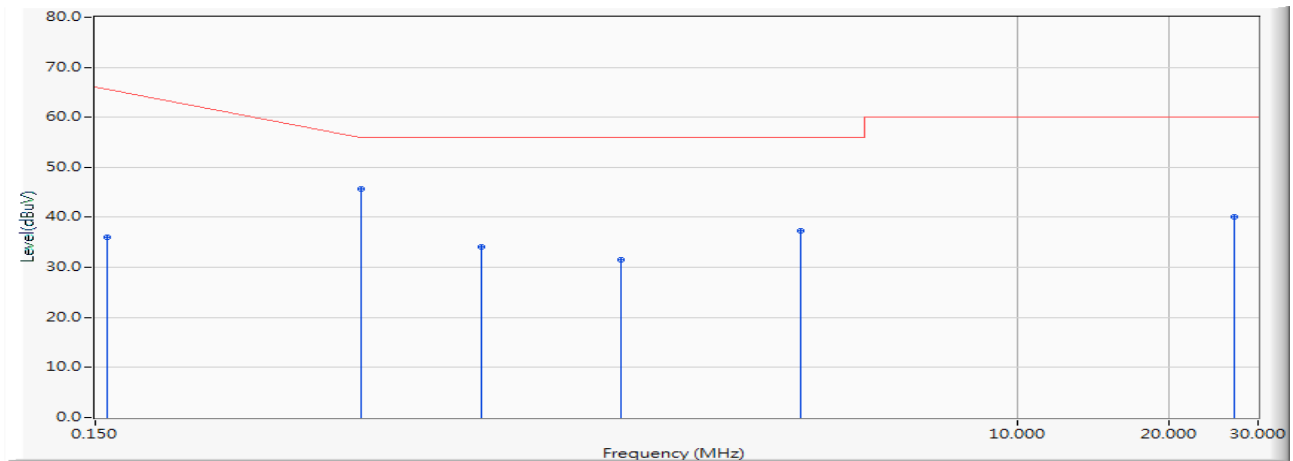
2.4. Uncertainty

± 2.26 dB

2.5. Test Result of Conducted Emission

Product : SOUNDBOKS
 Test Item : Conducted Emission Test
 Test date : 2019/05/29
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2440.4MHz)

Line 1



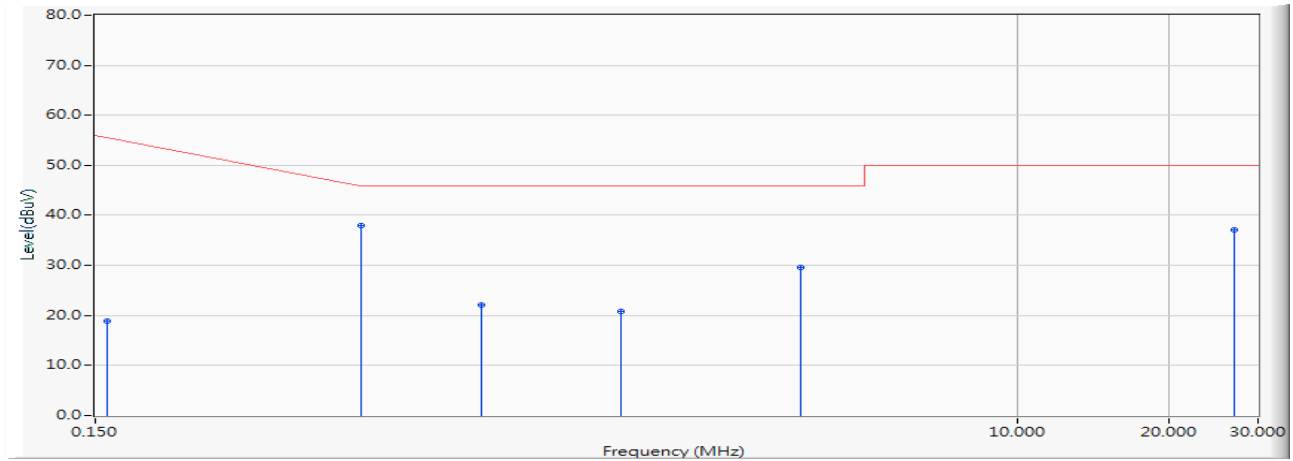
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.158	9.656	26.320	35.976	-29.795	65.771	QUASIPeAK
2	*	0.505	9.670	35.980	45.650	-10.350	56.000	QUASIPeAK
3		0.873	9.685	24.340	34.025	-21.975	56.000	QUASIPeAK
4		1.646	9.727	21.900	31.627	-24.373	56.000	QUASIPeAK
5		3.740	9.795	27.440	37.235	-18.765	56.000	QUASIPeAK
6		26.880	10.214	29.980	40.194	-19.806	60.000	QUASIPeAK

Note:

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

Product : SOUNDBOKS
 Test Item : Conducted Emission Test
 Test date : 2019/05/29
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2440.4MHz)

Line 1



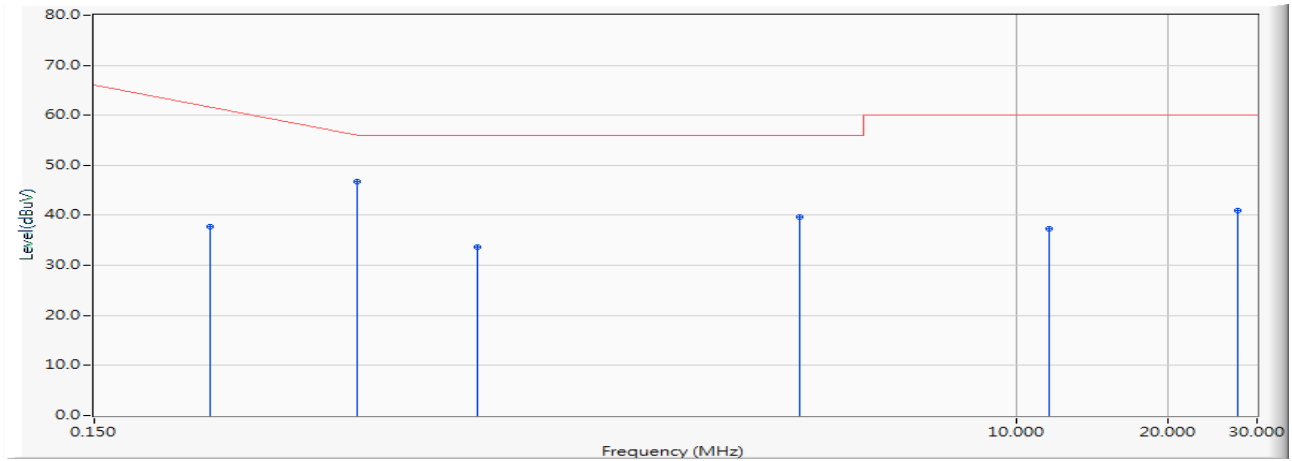
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.158	9.656	9.190	18.846	-36.925	55.771	AVERAGE
2	*	0.505	9.670	28.260	37.930	-8.070	46.000	AVERAGE
3		0.873	9.685	12.410	22.095	-23.905	46.000	AVERAGE
4		1.646	9.727	11.180	20.907	-25.093	46.000	AVERAGE
5		3.740	9.795	19.800	29.595	-16.405	46.000	AVERAGE
6		26.880	10.214	26.850	37.064	-12.936	50.000	AVERAGE

Note:

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

Product : SOUNDBOKS
 Test Item : Conducted Emission Test
 Test date : 2019/05/29
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2440.4MHz)

Line 2



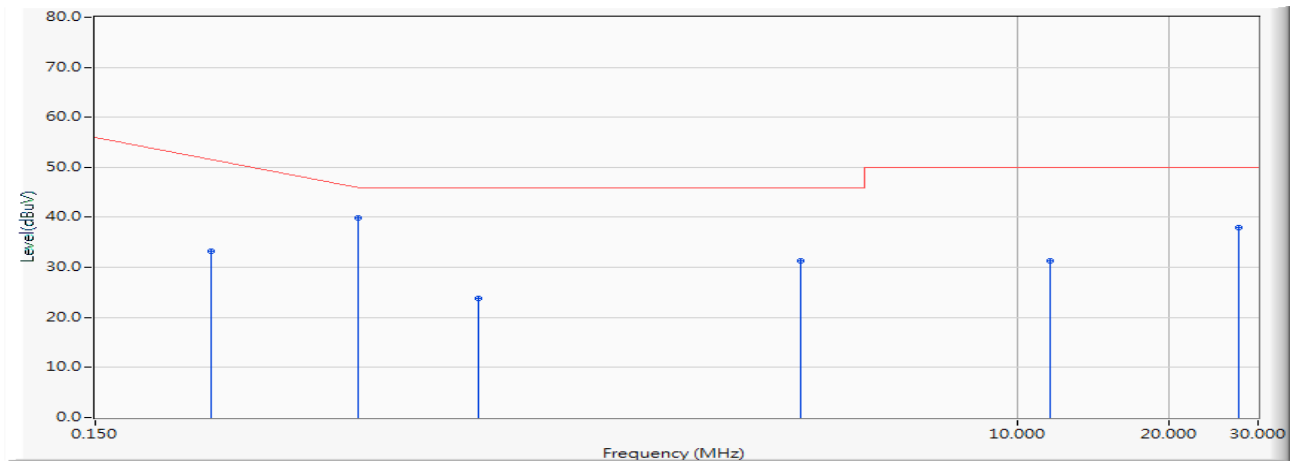
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.255	9.690	28.020	37.710	-25.290	63.000	QUASIPeAK
2	*	0.498	9.700	36.980	46.680	-9.377	56.057	QUASIPeAK
3		0.857	9.725	24.000	33.725	-22.275	56.000	QUASIPeAK
4		3.740	9.835	29.860	39.695	-16.305	56.000	QUASIPeAK
5		11.642	10.099	27.260	37.359	-22.641	60.000	QUASIPeAK
6		27.439	10.459	30.480	40.939	-19.061	60.000	QUASIPeAK

Note:

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

Product : SOUNDBOKS
 Test Item : Conducted Emission Test
 Test date : 2019/05/29
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2440.4MHz)

Line 2



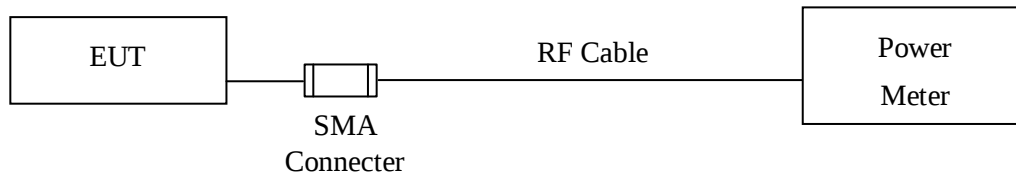
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.255	9.690	23.600	33.290	-19.710	53.000	AVERAGE
2	*	0.498	9.700	30.270	39.970	-6.087	46.057	AVERAGE
3		0.857	9.725	14.060	23.785	-22.215	46.000	AVERAGE
4		3.740	9.835	21.560	31.395	-14.605	46.000	AVERAGE
5		11.642	10.099	21.280	31.379	-18.621	50.000	AVERAGE
6		27.439	10.459	27.440	37.899	-12.101	50.000	AVERAGE

Note:

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

3. Peak Power Output

3.1. Test Setup



3.2. Limit

The maximum peak power shall be less 0.125Watt.

3.3. Test Procedure

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

3.4. Uncertainty

± 1.19 dB

3.5. Test Result of Peak Power Output

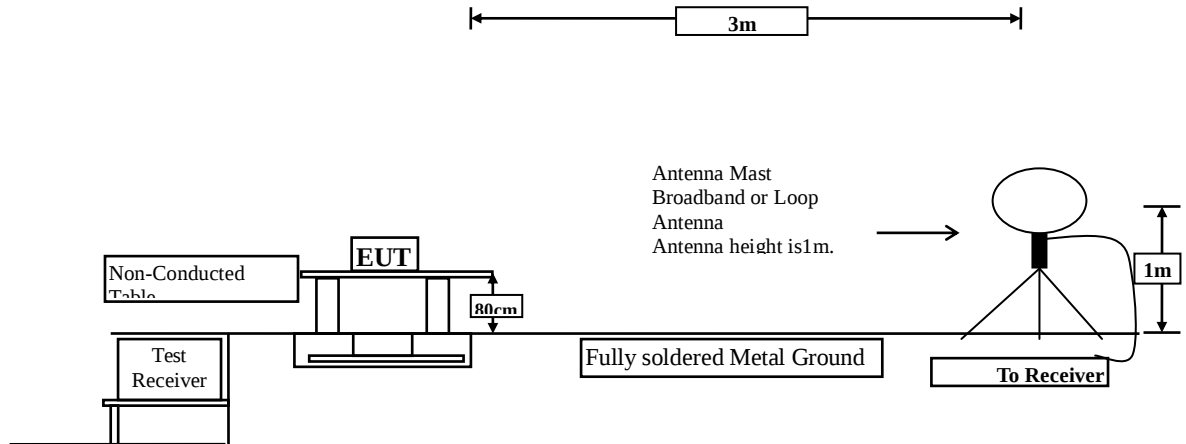
Product : SOUNDBOKS
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2019/05/21
Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz

Channel No.	Frequency (MHz)	Peak Measurement (dBm)	Required Limit	Result
Channel 01	2403.50	12.74	<21dBm	Pass
Channel 25	2440.40	12.71	<21dBm	Pass
Channel 49	2477.30	12.54	<21dBm	Pass

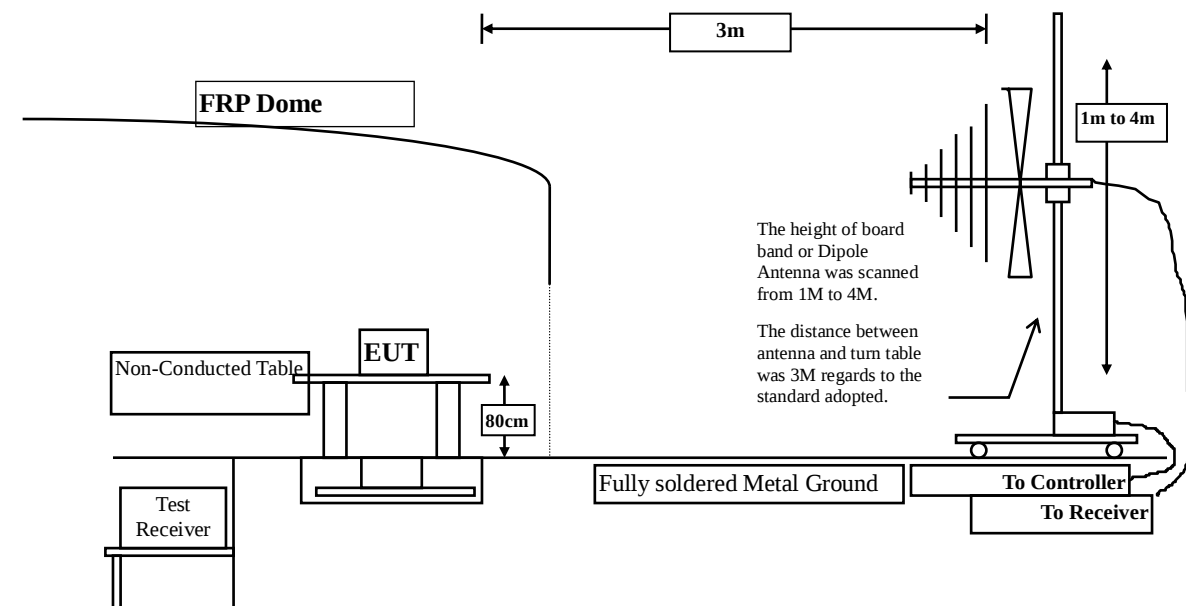
4. Radiated Emission

4.1. Test Setup

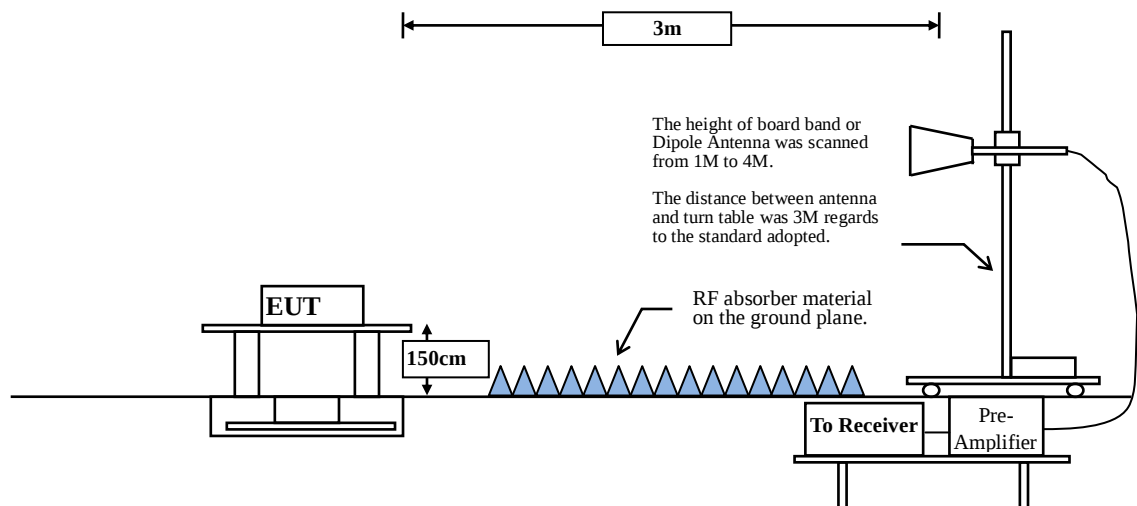
Under 30MHz



Below 1GHz



Above 1GHz



4.2. 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.

4.3. Test Procedure

The EUT was setup according to ANSI C63.10, 2013 and tested 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.

4.4. Uncertainty

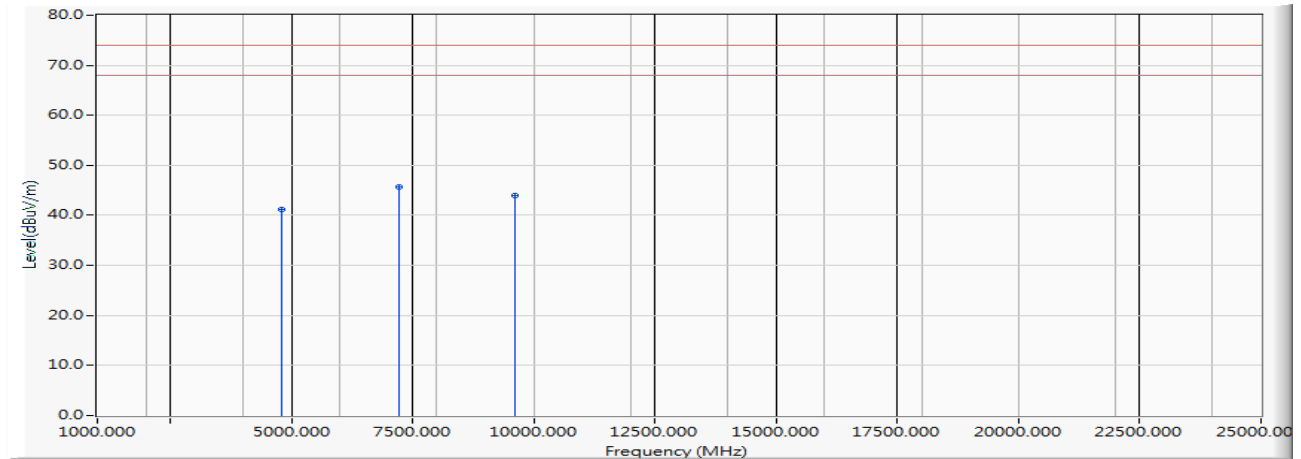
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

4.5. Test Result of Radiated Emission

Product : SOUNDBOKS
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz(2403.5MHz)

Horizontal



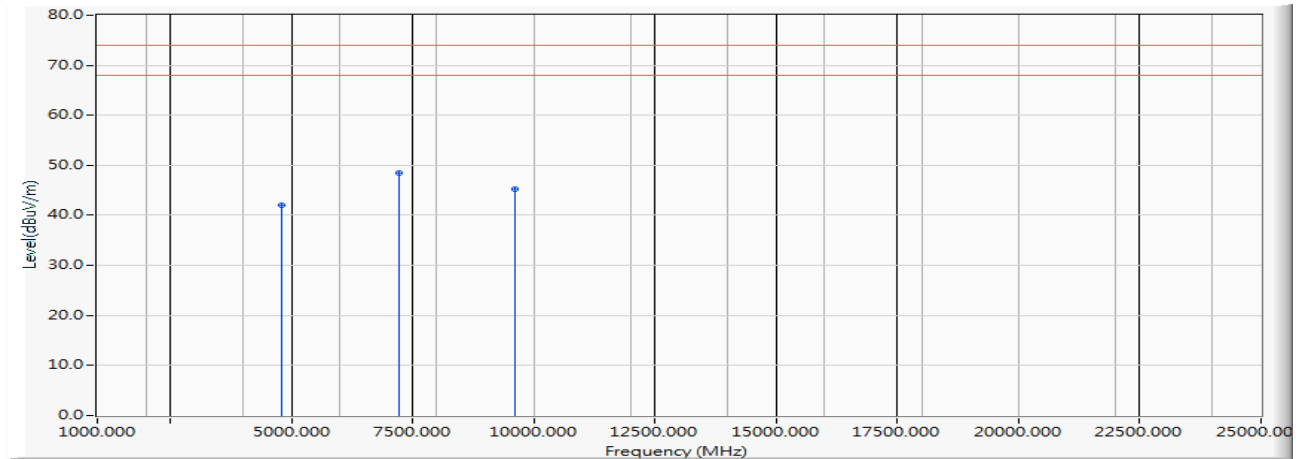
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4807.000	-19.874	60.980	41.106	-32.894	74.000	PEAK
2	*	7210.500	-16.561	62.140	45.578	-28.422	74.000	PEAK
3		9614.000	-14.245	58.110	43.865	-30.135	74.000	PEAK

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 : SOUNDBOKS
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz(2403.5MHz)

Vertical



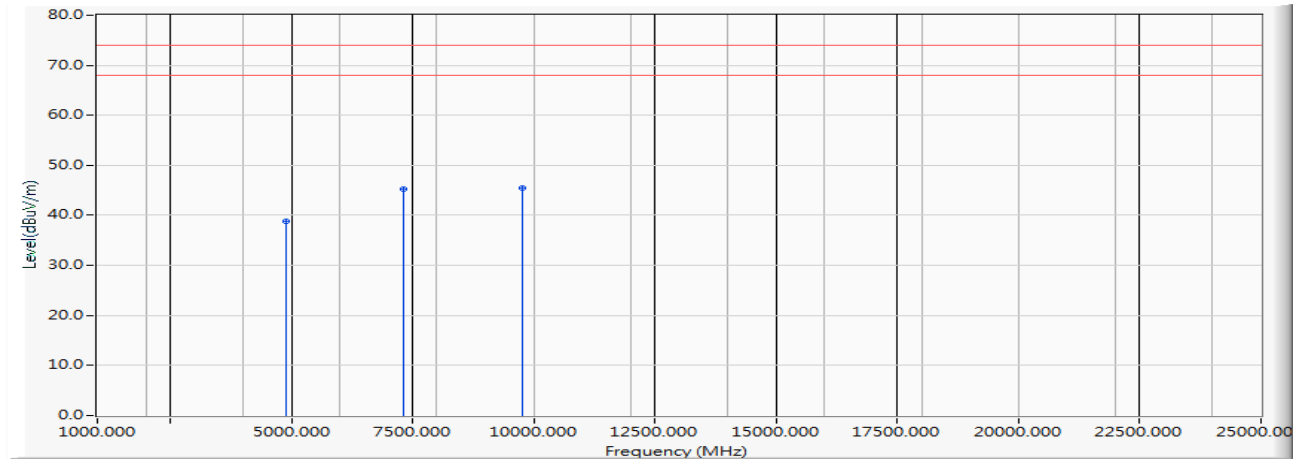
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4807.000	-19.874	61.840	41.966	-32.034	74.000	PEAK
2	*	7210.500	-16.561	65.140	48.578	-25.422	74.000	PEAK
3		9614.000	-13.837	58.990	45.153	-28.847	74.000	PEAK

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 : SOUNDBOKS
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz(2440.4MHz)

Horizontal



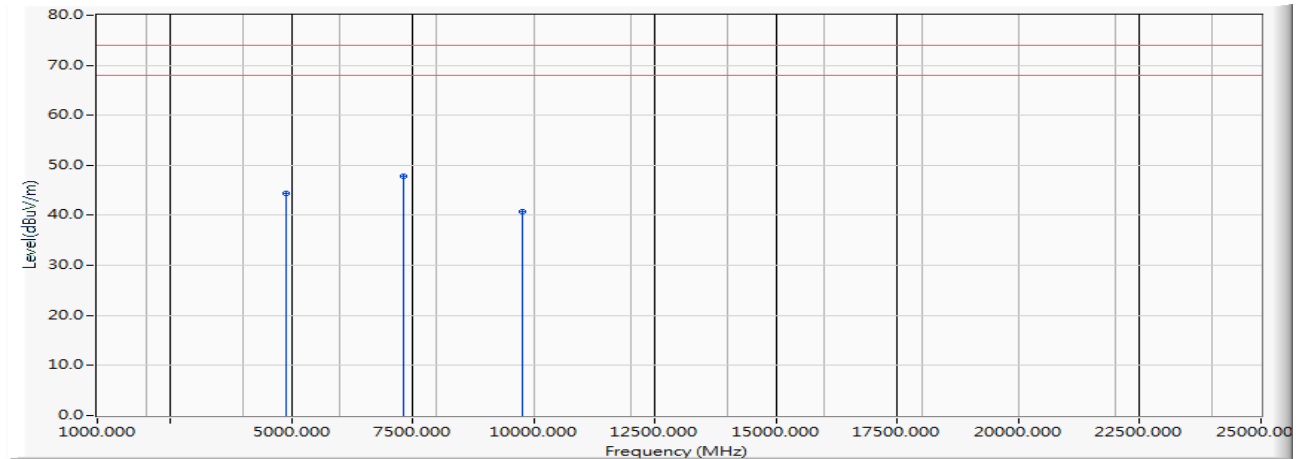
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4880.800	-20.314	59.190	38.877	-35.123	74.000	PEAK
2		7321.200	-15.517	60.780	45.262	-28.738	74.000	PEAK
3	*	9761.600	-15.381	60.780	45.398	-28.602	74.000	PEAK

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 : SOUNDBOKS
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz(2440.4MHz)

Vertical



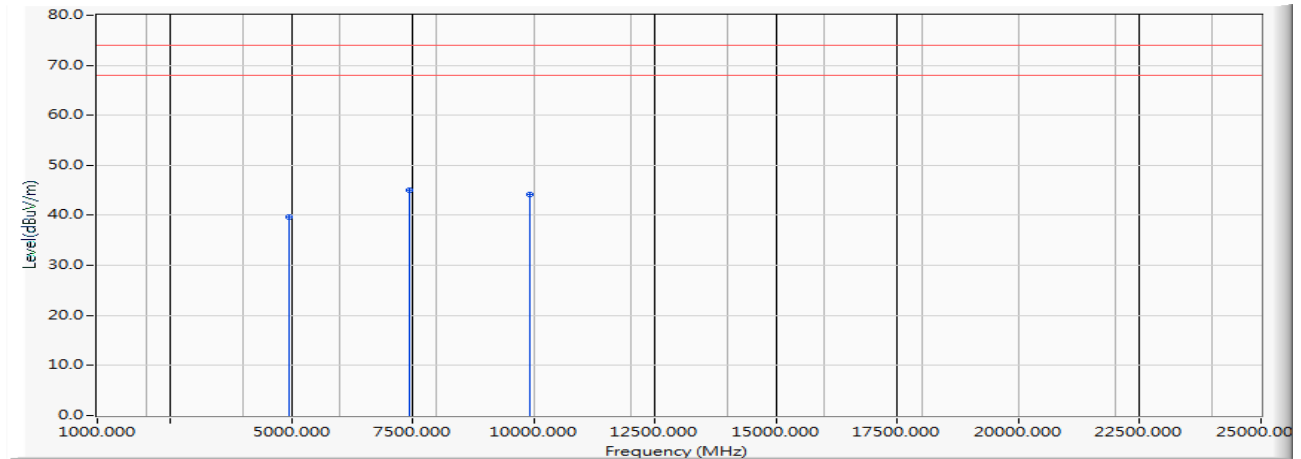
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4880.800	-20.314	64.730	44.417	-29.583	74.000	PEAK
2	*	7321.200	-14.642	62.490	47.847	-26.153	74.000	PEAK
3		9761.600	-14.912	55.750	40.837	-33.163	74.000	PEAK

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 : SOUNDBOKS
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz(2477.3MHz)

Horizontal



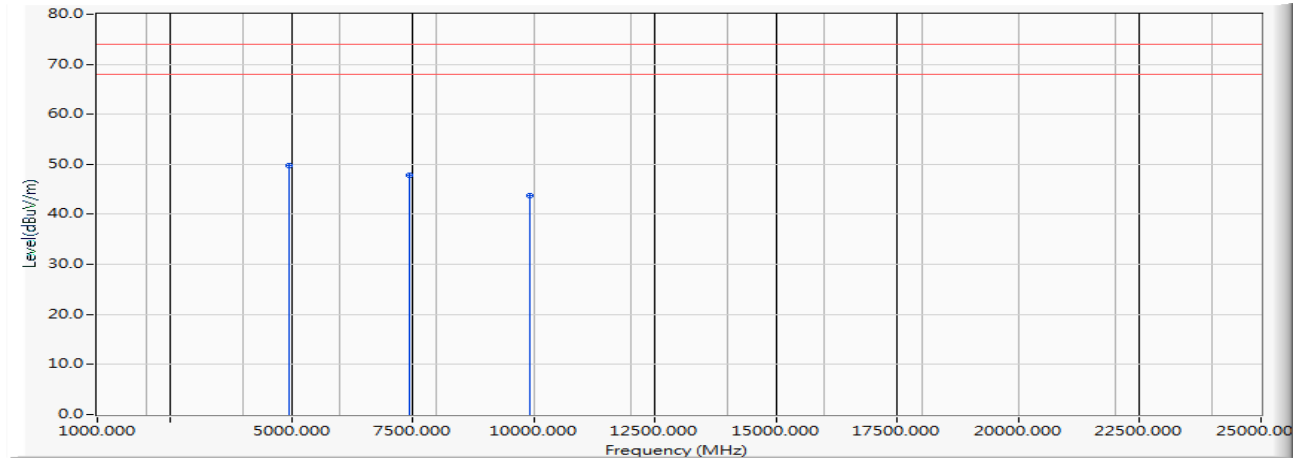
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4954.600	-20.661	60.340	39.679	-34.321	74.000	PEAK
2	*	7431.000	-14.473	59.600	45.128	-28.872	74.000	PEAK
3		9909.200	-14.706	58.860	44.154	-29.846	74.000	PEAK

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 : SOUNDBOKS
 Test Item : Harmonic Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz(2477.3MHz)

Vertical



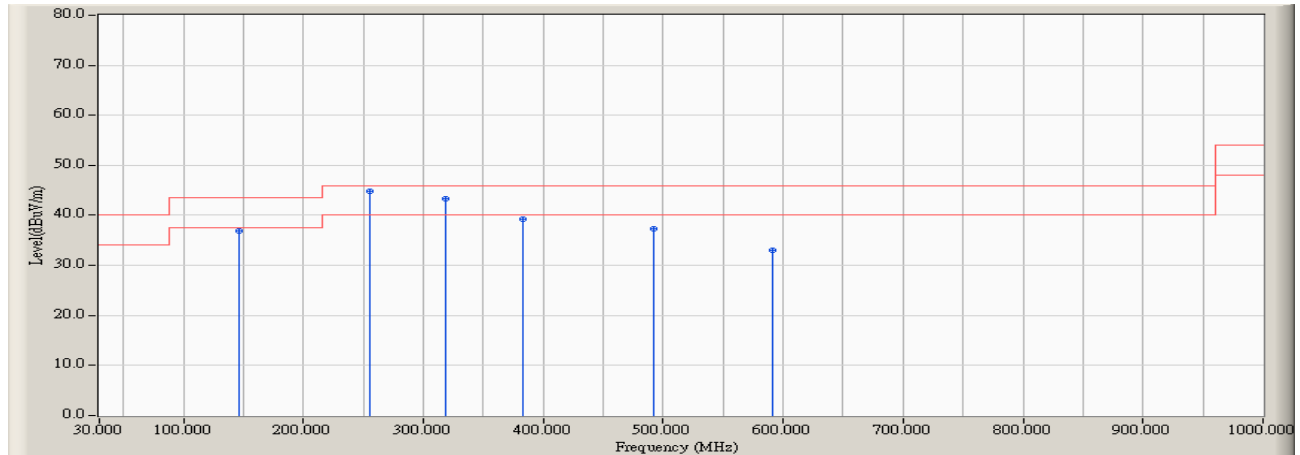
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4954.600	-17.884	67.560	49.675	-24.325	74.000	PEAK
2		7431.900	-14.473	62.270	47.796	-26.204	74.000	PEAK
3		9909.200	-14.706	58.560	43.854	-30.146	74.000	PEAK

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 : SOUNDBOKS
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/05/28
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2440.4MHz)

Horizontal



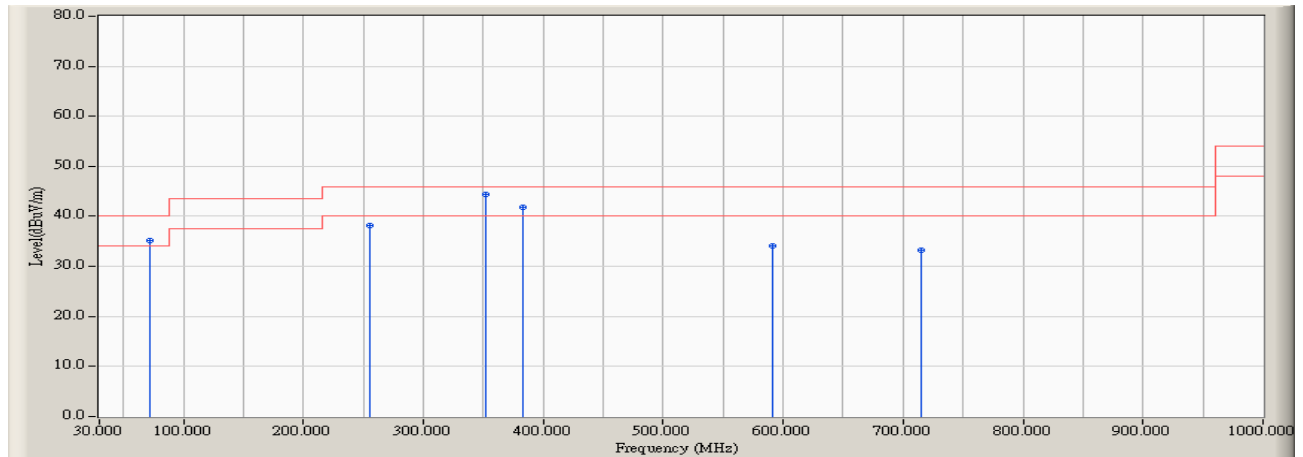
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		146.400	-1.617	38.578	36.961	-6.539	43.500	QUASIPeAK
2	*	255.040	1.071	43.739	44.810	-1.190	46.000	QUASIPeAK
3		319.060	2.324	40.978	43.302	-2.698	46.000	QUASIPeAK
4		383.080	4.449	34.738	39.187	-6.813	46.000	QUASIPeAK
5		491.720	6.545	30.675	37.220	-8.780	46.000	QUASIPeAK
6		590.660	8.236	24.792	33.028	-12.972	46.000	QUASIPeAK

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 : SOUNDBOKS
 Test Item : General Radiated Emission
 Test Site : No.3 OATS
 Test date : 2019/05/28
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2440.4MHz)

Vertical



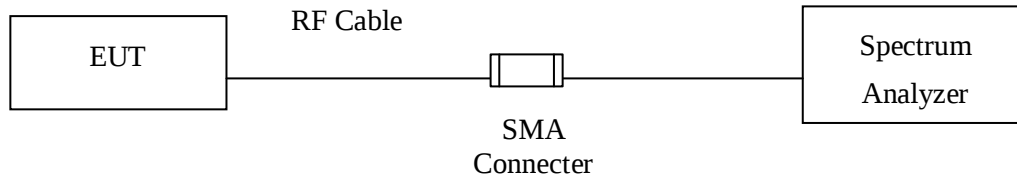
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		72.680	-6.776	41.959	35.183	-4.817	40.000	QUASIPeAK
2		255.040	1.071	37.078	38.149	-7.851	46.000	QUASIPeAK
3	*	352.040	3.477	40.905	44.382	-1.618	46.000	QUASIPeAK
4		383.080	4.449	37.343	41.792	-4.208	46.000	QUASIPeAK
5		590.660	8.236	25.808	34.044	-11.956	46.000	QUASIPeAK
6		714.820	9.614	23.731	33.345	-12.655	46.000	QUASIPeAK

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.

5. RF Antenna Conducted Test

5.1. Test Setup



5.2. 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.

5.3. Test Procedure

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

5.4. Uncertainty

$\pm 1.20\text{dB}$

5.5. Test Result of RF Antenna Conducted Test

Product : SOUNDBOKS
Test Item : RF Antenna Conducted Test
Test Site : No.3 OATS
Test date : 2019/05/20
Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz

Figure Channel 01:

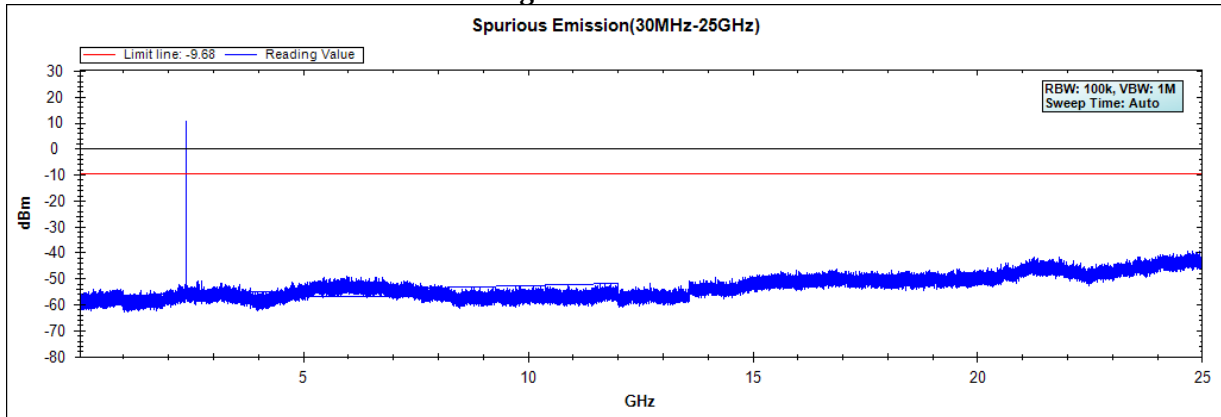


Figure Channel 25:

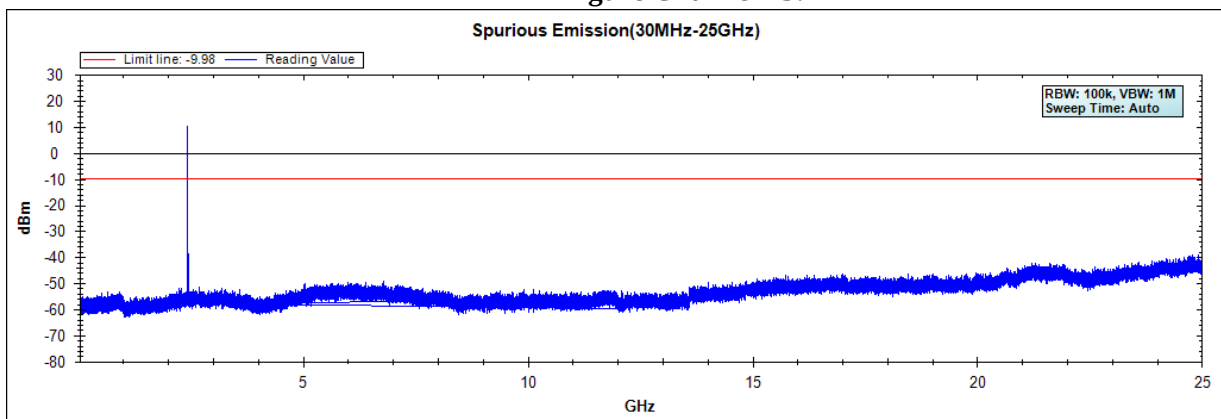
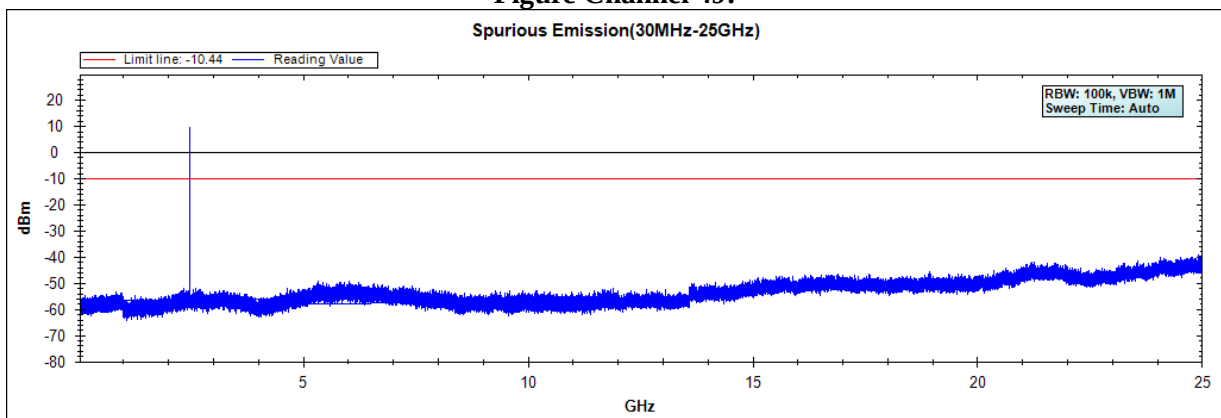


Figure Channel 49:



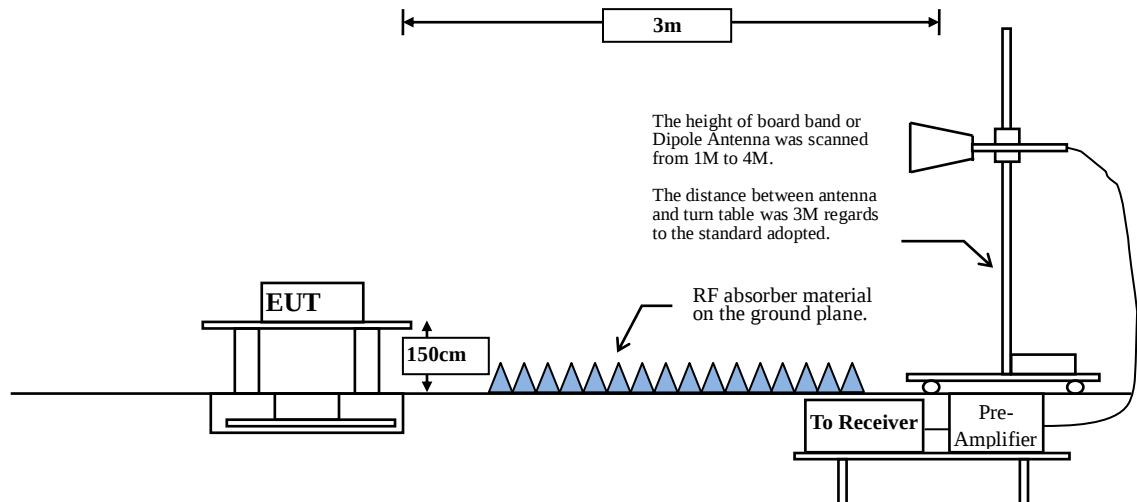
Note: The above test pattern is synthesized by multiple of the frequency range.

6. Band Edge

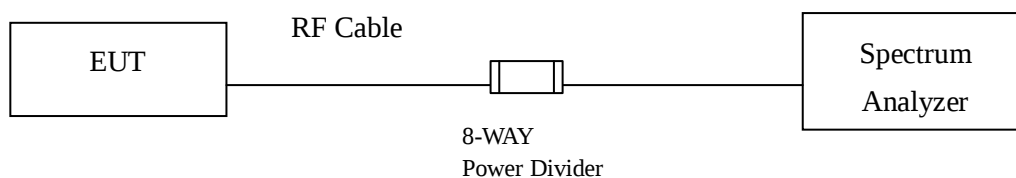
6.1. Test Setup

RF Radiated Measurement:

Above 1GHz



RF Conducted Measurement



6.2. 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)).

6.3. Test Procedure

The EUT is placed on a turn table which is 1.5 meter above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

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

Both horizontal and vertical polarization of the antenna are set on measurement. In order to find the maximum emission, all of the interface cables must be manipulated according to ANSI C63.10: 2013 on radiated measurement.

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

6.4. Uncertainty

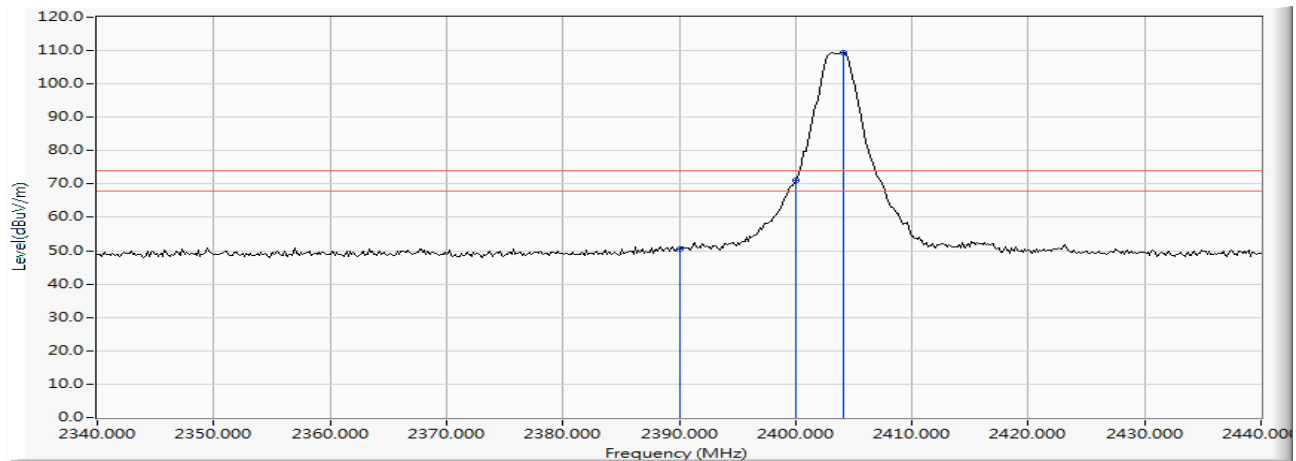
± 4.08 dB above 1GHz

± 4.22 dB below 1GHz

6.5. Test Result of Band Edge

Product : SOUNDBOKS
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2403.5MHz)

Horizontal



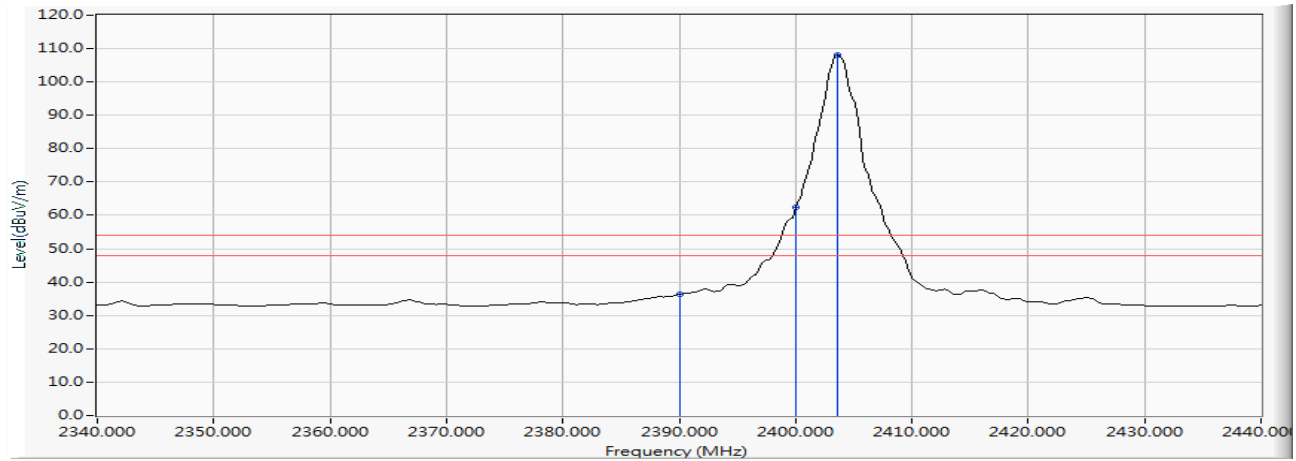
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	6.474	44.079	50.554	-23.446	74.000	PEAK
2		2400.000	6.528	64.638	71.166	--	--	PEAK
3	*	2404.058	6.553	102.906	109.459	--	--	PEAK

Note:

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

Product : SOUNDBOKS
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2403.5MHz)

Horizontal

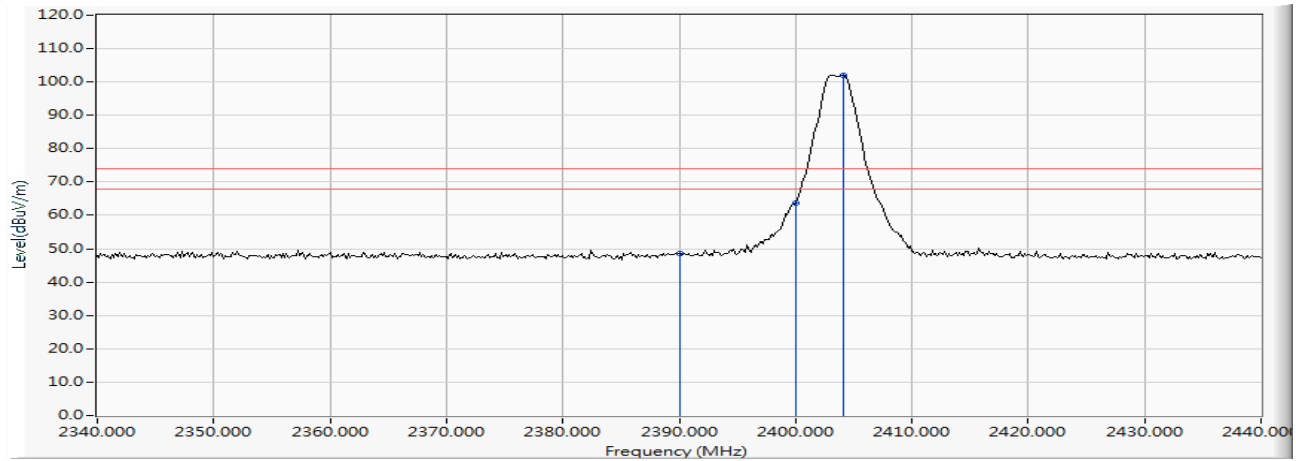


		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	6.474	29.877	36.352	-17.648	54.000	AVERAGE
2		2400.000	6.528	55.871	62.399	--	--	AVERAGE
3	*	2403.623	6.550	101.672	108.222	--	--	AVERAGE

Note:

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

Product : SOUNDBOKS
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2403.5MHz)

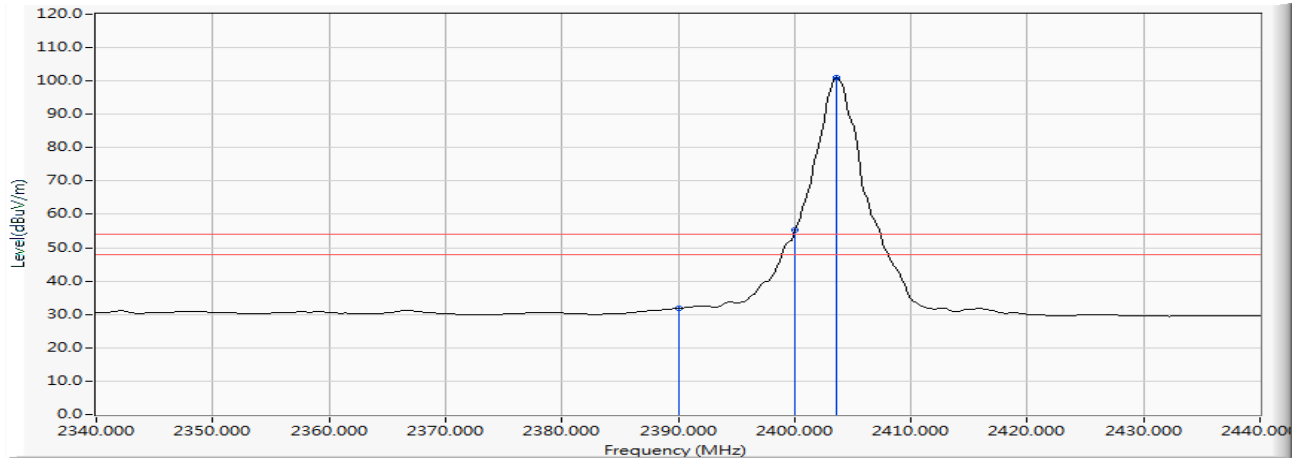
Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	5.880	42.709	48.590	-25.410	74.000	PEAK
2		2400.000	5.879	57.908	63.787	--	--	PEAK
3	*	2404.058	5.889	96.226	102.115	--	--	PEAK

Note:

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

Product : SOUNDBOKS
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2403.5MHz)

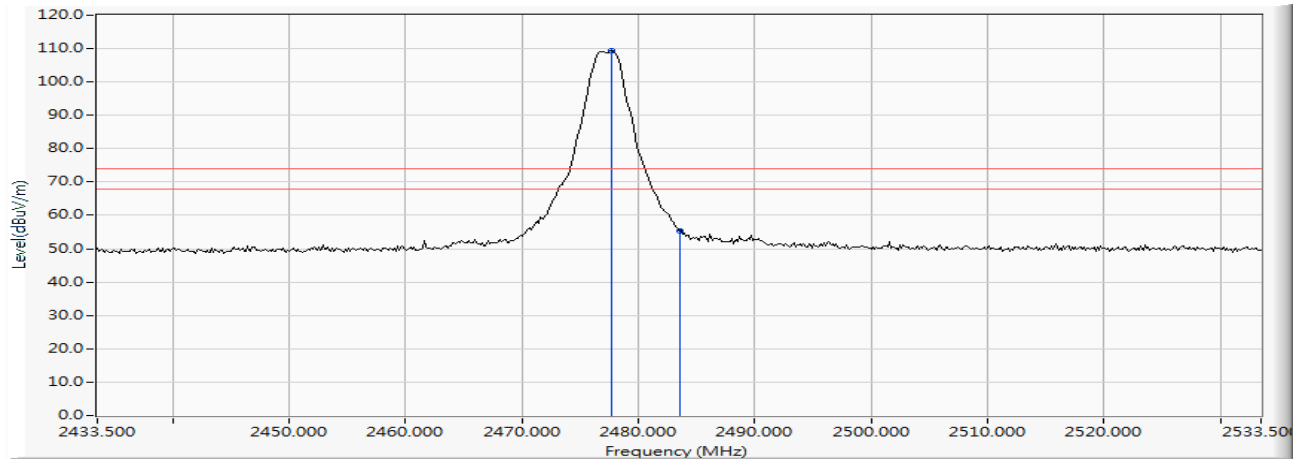
Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	5.880	26.036	31.917	-22.083	54.000	AVERAGE
2		2400.000	5.879	49.336	55.215	--	--	AVERAGE
3	*	2403.623	5.888	95.014	100.902	--	--	AVERAGE

Note:

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

Product : SOUNDBOKS
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2477.3MHz)

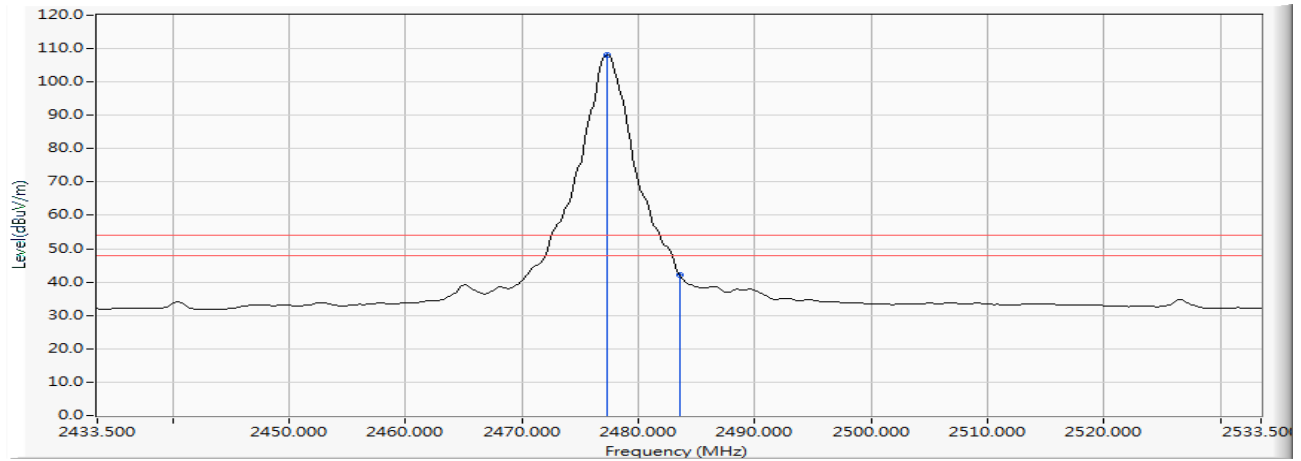
Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2477.703	7.069	102.240	109.309	--	--	PEAK
2		2483.500	7.110	48.229	55.339	-18.661	74.000	PEAK

Note:

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

Product : SOUNDBOKS
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2477.3MHz)

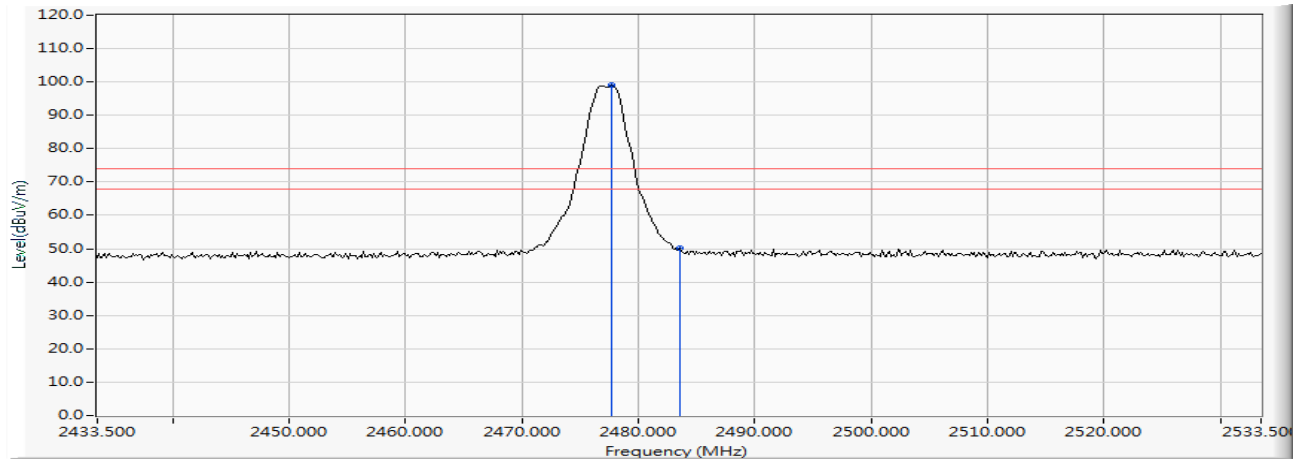
Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2477.268	7.066	101.073	108.139	--	--	AVERAGE
2		2483.500	7.110	35.180	42.290	-11.710	54.000	AVERAGE

Note:

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

Product : SOUNDBOKS
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2477.3MHz)

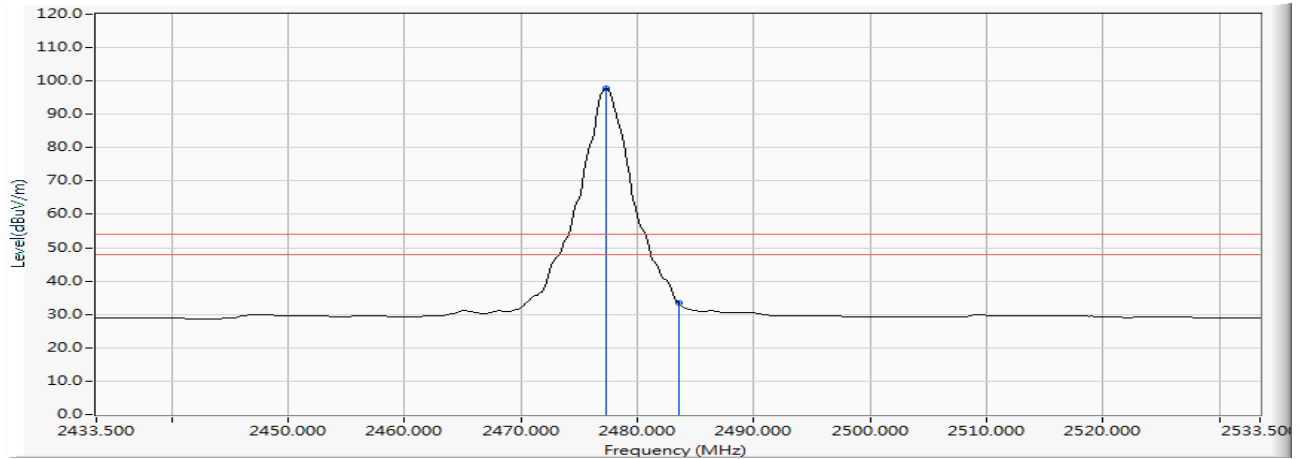
Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2477.703	6.327	92.606	98.933	--	--	PEAK
2		2483.500	6.363	43.828	50.191	-23.809	74.000	PEAK

Note:

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

Product : SOUNDBOKS
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test date : 2019/05/23
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz (2477.3MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2477.268	6.324	91.406	97.730	--	--	AVERAGE
2		2483.500	6.363	26.940	33.303	-20.697	54.000	AVERAGE

Note:

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

Product : SOUNDBOKS
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz(Hopping off)

Measurement Level	Result
Δ (dB)	
> 20	PASS

Figure Channel 01:

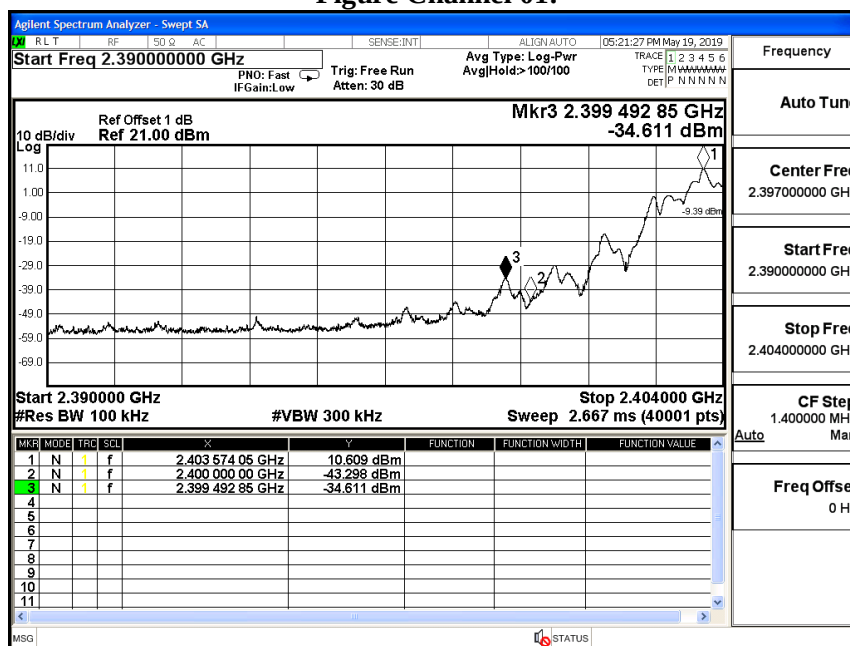
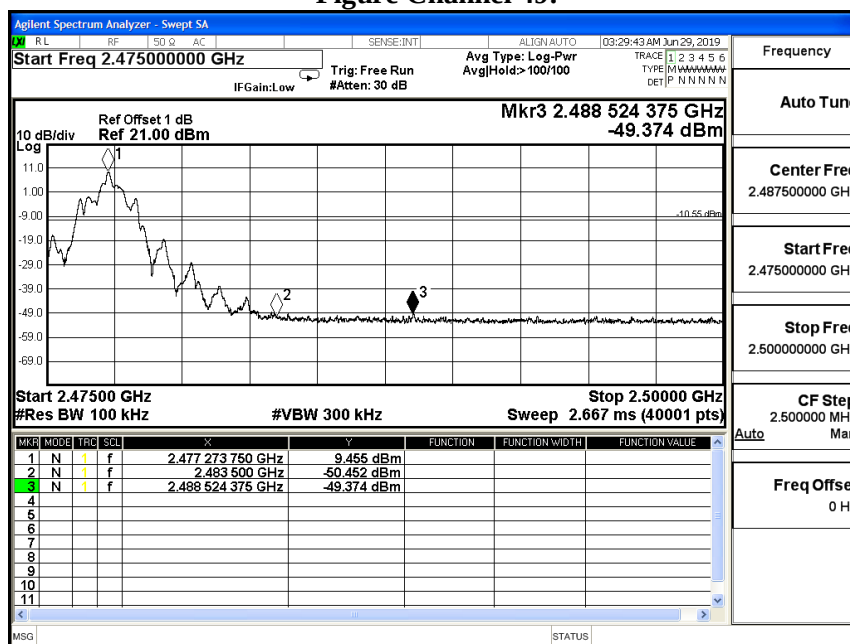


Figure Channel 49:



Product : SOUNDBOKS
 Test Item : Band Edge
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz(Hopping on)

Measurement Level	Result
Δ (dB)	
> 20	PASS

Figure Channel 01 Hopping:

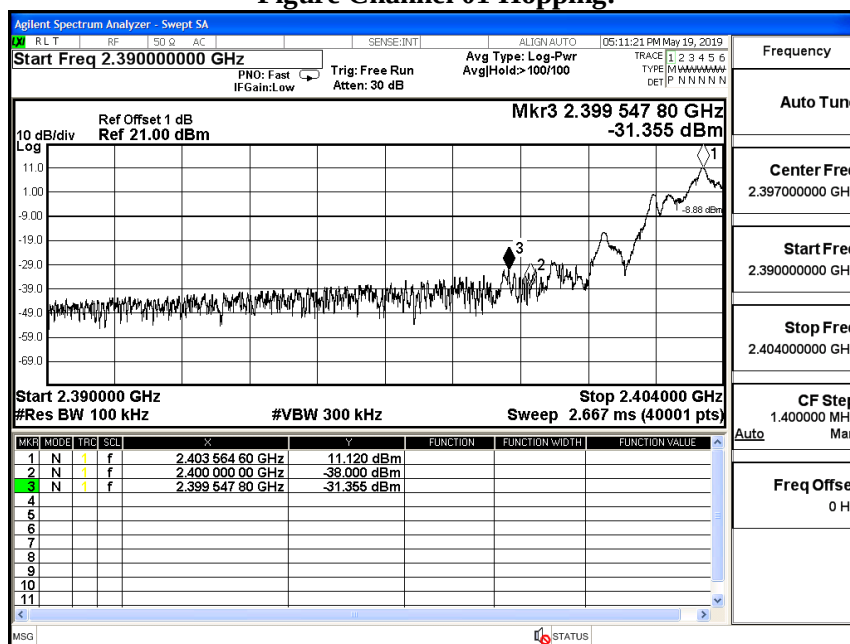
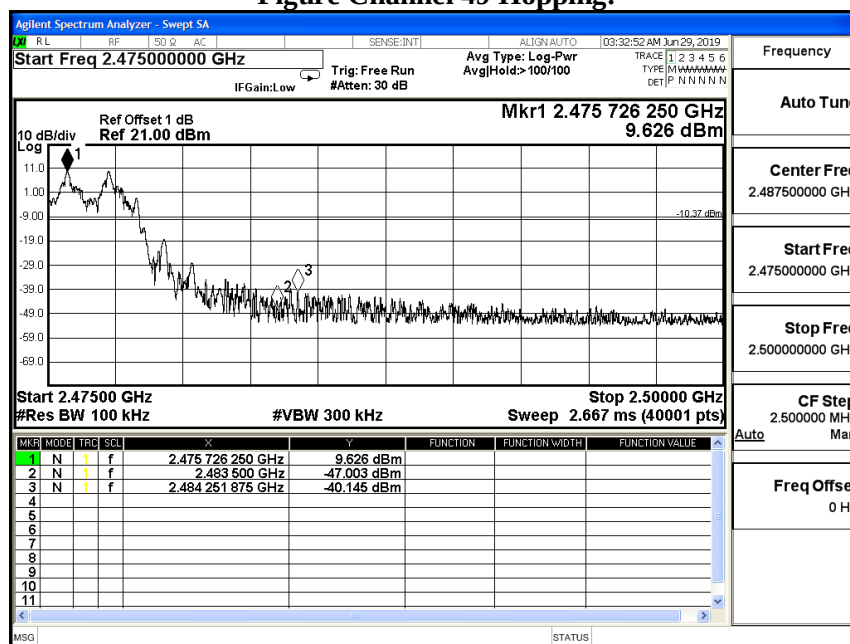
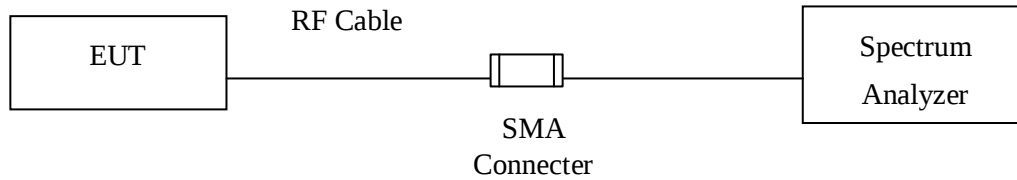


Figure Channel 49 Hopping:



7. Channel Number

7.1. Test Setup



7.2. Limit

Frequency hopping systems operating in the 2400-2483.5 MHz bands shall use at least 15 hopping frequencies.

7.3. Test Procedure

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

7.4. Uncertainty

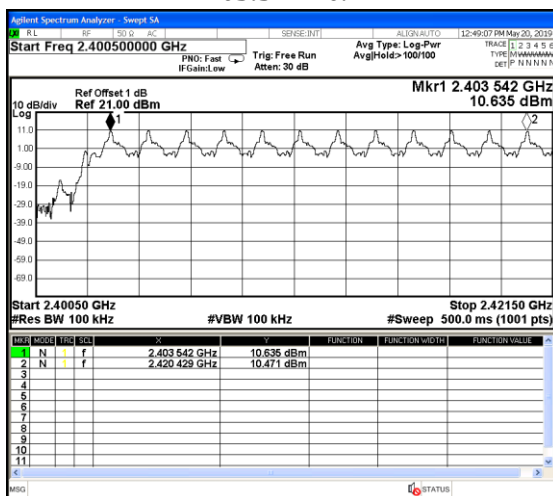
N/A

7.5. Test Result of Channel Number

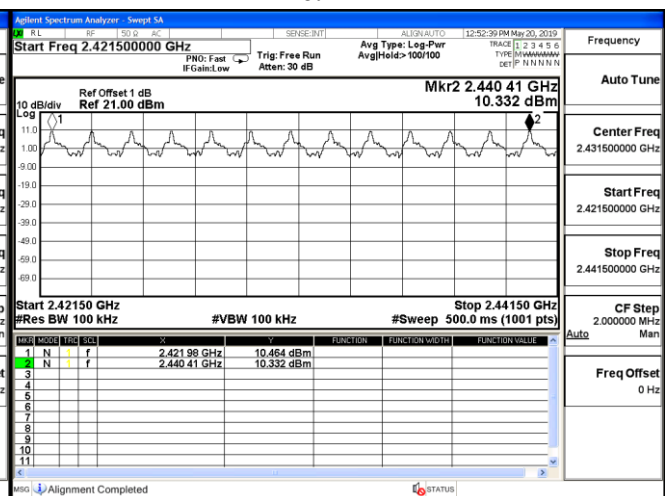
Product : SOUNDBOKS
 Test Item : Channel Number
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2403.5-2477.3	49	>15	Pass

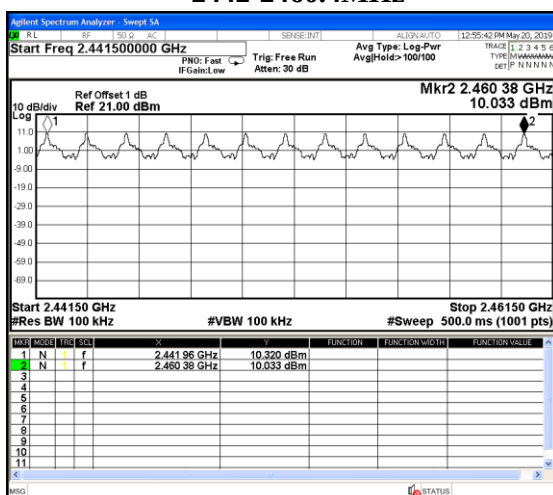
2403.5-2420.4MHz



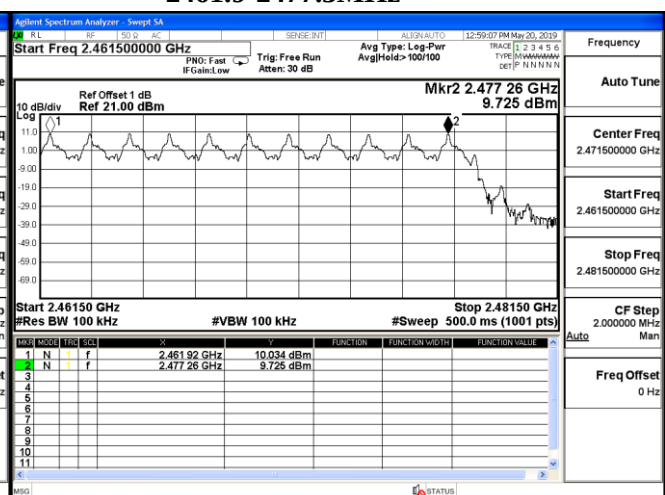
2422-2440.4MHz



2442-2460.4MHz

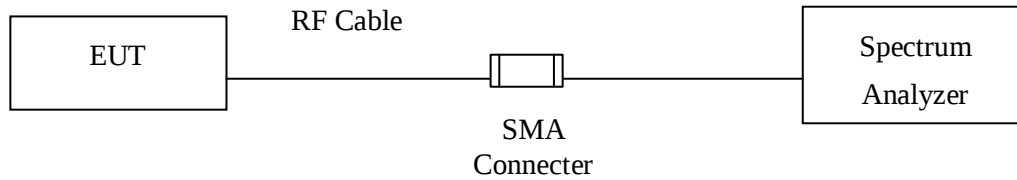


2461.9-2477.3MHz



8. Channel Separation

8.1. Test Setup



8.2. Limit

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

8.3. Test Procedure

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

8.4. Uncertainty

$\pm 283\text{Hz}$

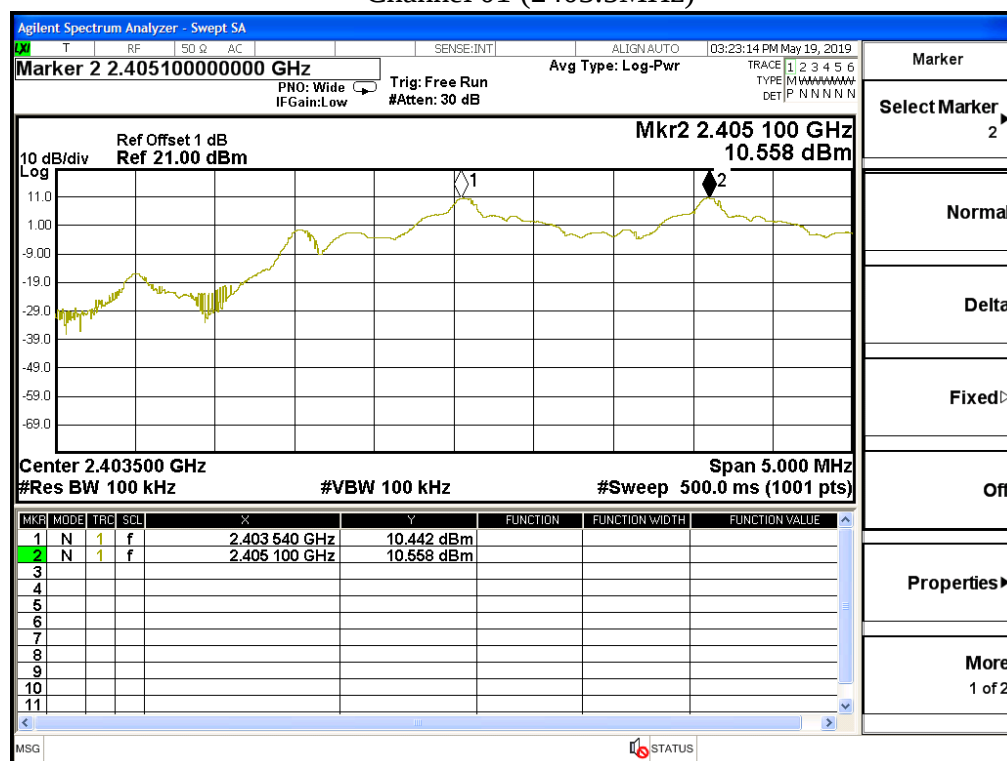
8.5. Test Result of Channel Separation

Product : SOUNDBOKS
 Test Item : Channel Separation
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz

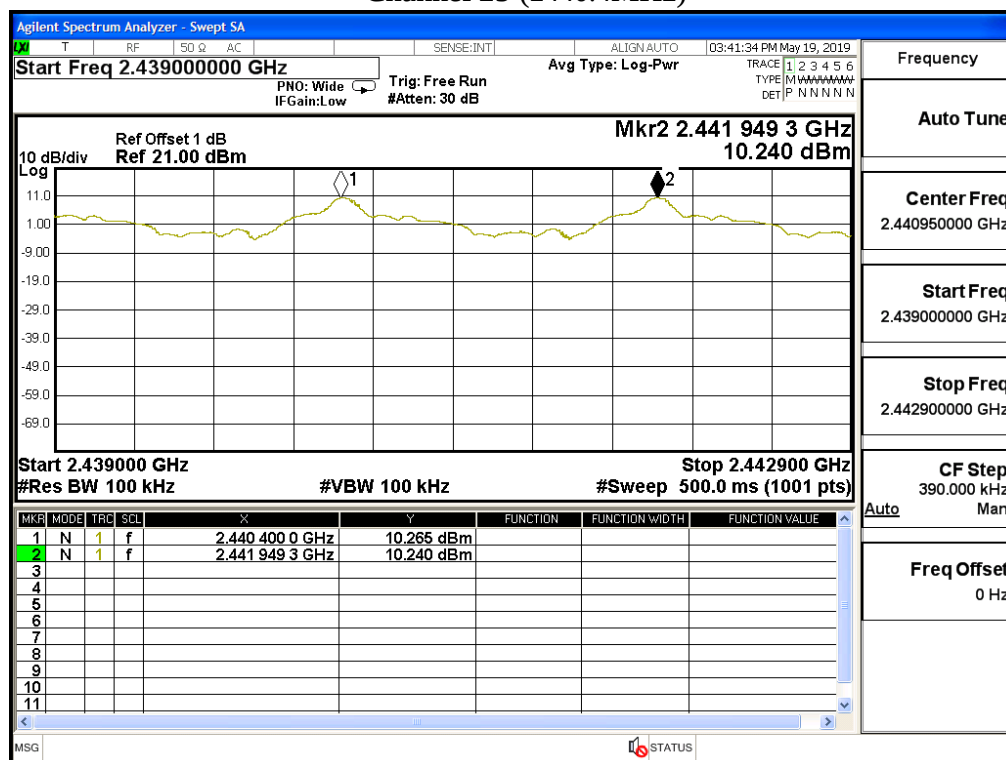
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
01	2403.5	1560	>25 kHz	1492.0	Pass
25	2440.4	1549	>25 kHz	1490.0	Pass
49	2477.3	1525	>25 kHz	1494.0	Pass

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

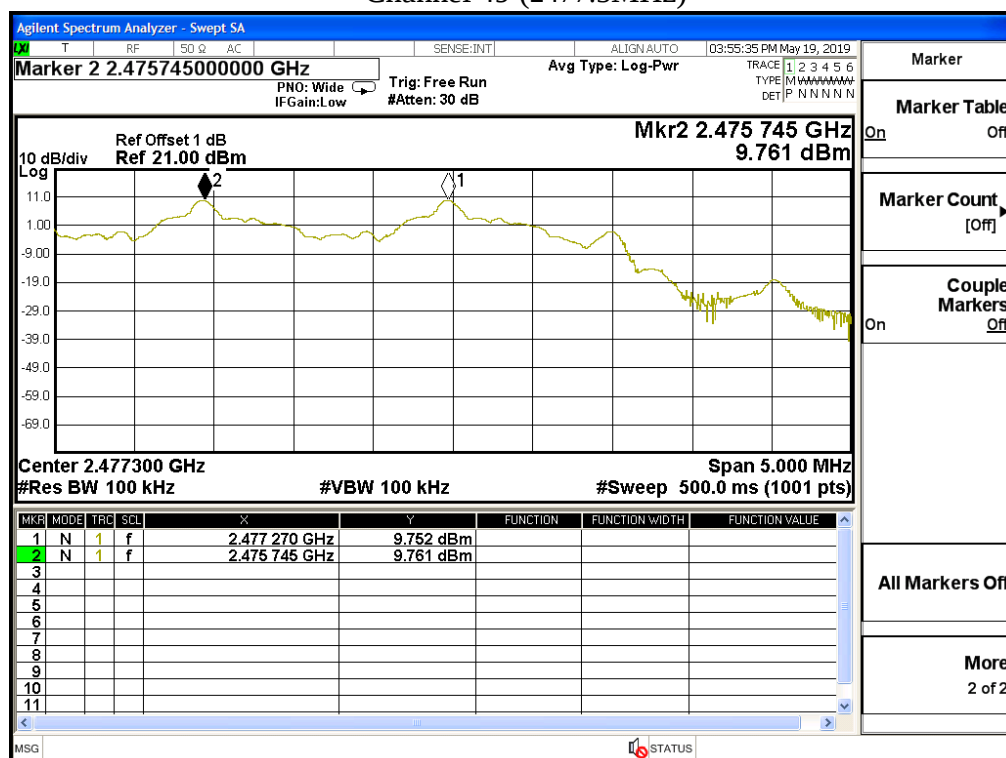
Channel 01 (2403.5MHz)



Channel 25 (2440.4MHz)

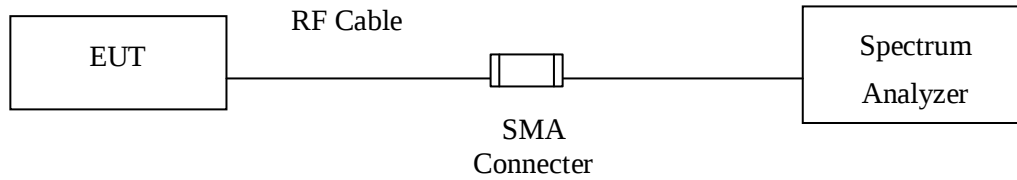


Channel 49 (2477.3MHz)



9. Dwell Time

9.1. Test Setup



9.2. Limit

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

9.3. Test Procedure

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

9.4. Uncertainty

$\pm 25\text{msec}$

9.5. Test Result of Dwell Time

Product : SOUNDBOKS
 Test Item : Dwell Time
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz

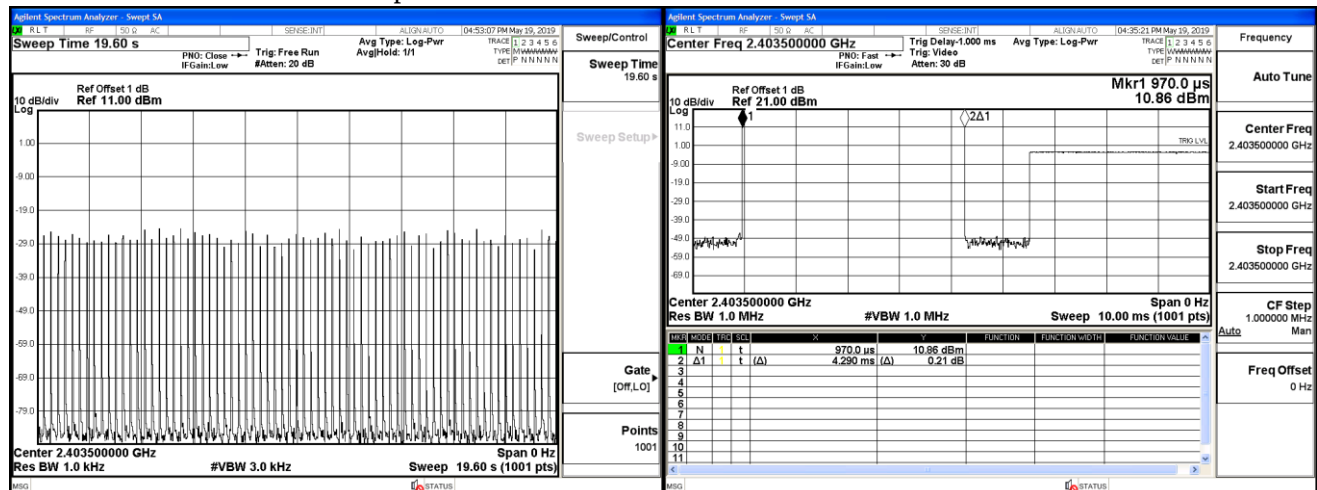
Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Dwell Time (ms)	Limit (ms)	Result
2403.5	4.290	71	19600	304.590	400	Pass
2440.4	4.290	72	19600	308.880	400	Pass
2477.3	4.290	71	19600	304.590	400	Pass

Dwell time = Time slot length*Hopping of number

Sweep time= 49 CHannel * 0.4

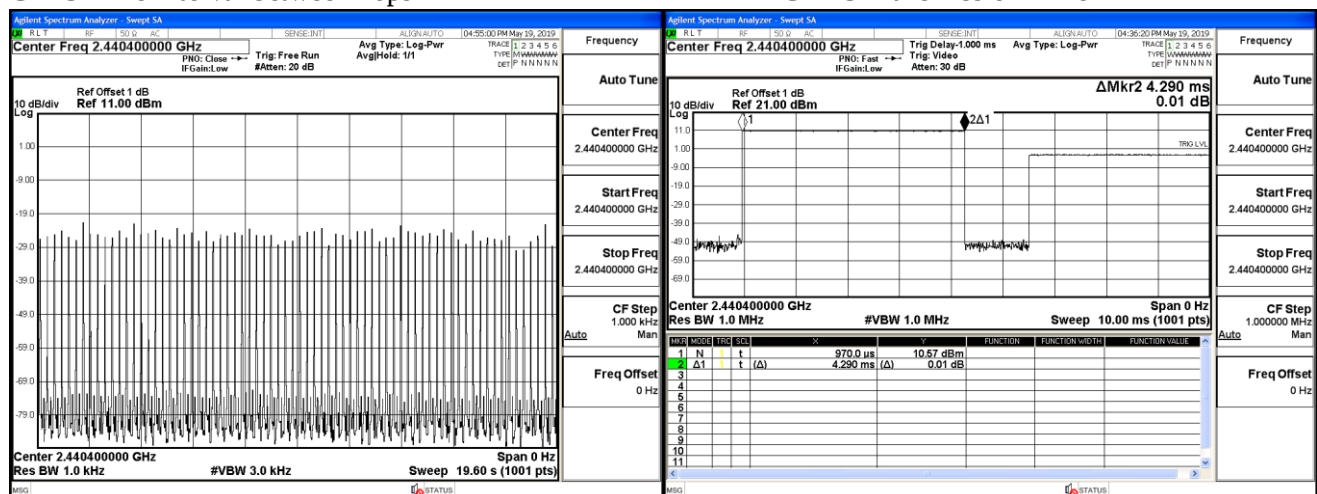
CH 01 Time Interval between hops

CH 01 Transmission Time



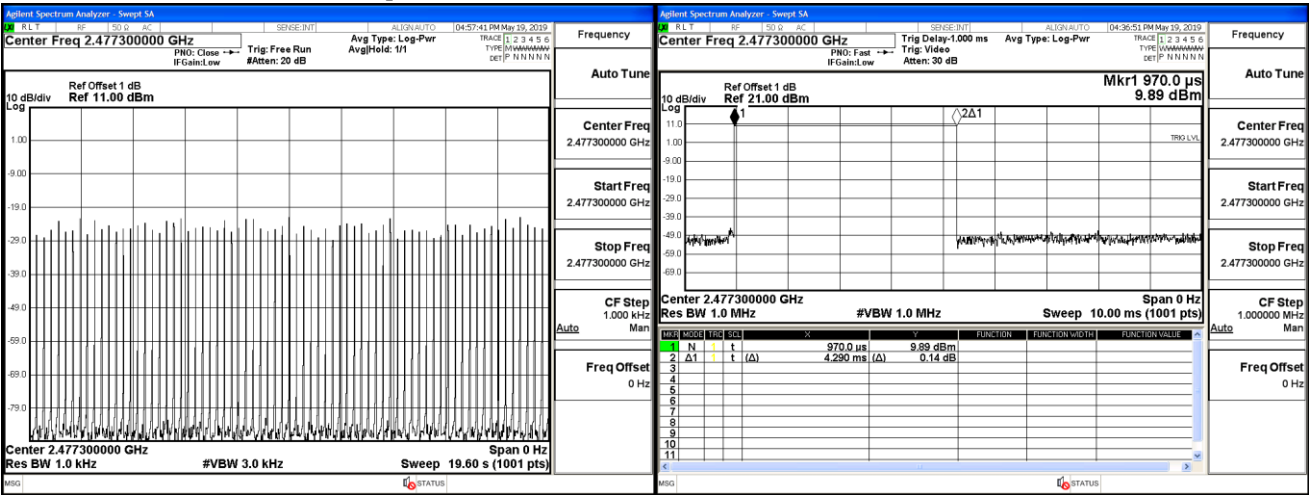
CH25 Time Interval between hops

CH 25 Transmission Time



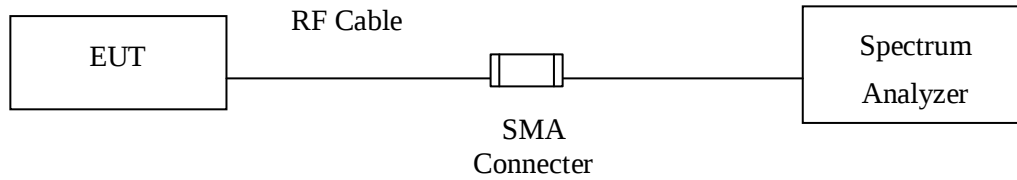
CH 49 Time Interval between hops

CH 49 Transmission Time



10. Occupied Bandwidth

10.1. Test Setup



10.2. Limits

N/A

10.3. Test Procedure

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

10.4. Uncertainty

$\pm 283\text{Hz}$

10.5. Test Result of Occupied Bandwidth

Product : SOUNDBOKS
 Test Item : Occupied Bandwidth Data
 Test Site : No.3 OATS
 Test Mode : Mode 1: Transmit -Frequency hopping of 2.4GHz

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
01	2403.5	2238	--	NA
25	2440.4	2235	--	NA
49	2477.3	2241	--	NA

Figure Channel 01:

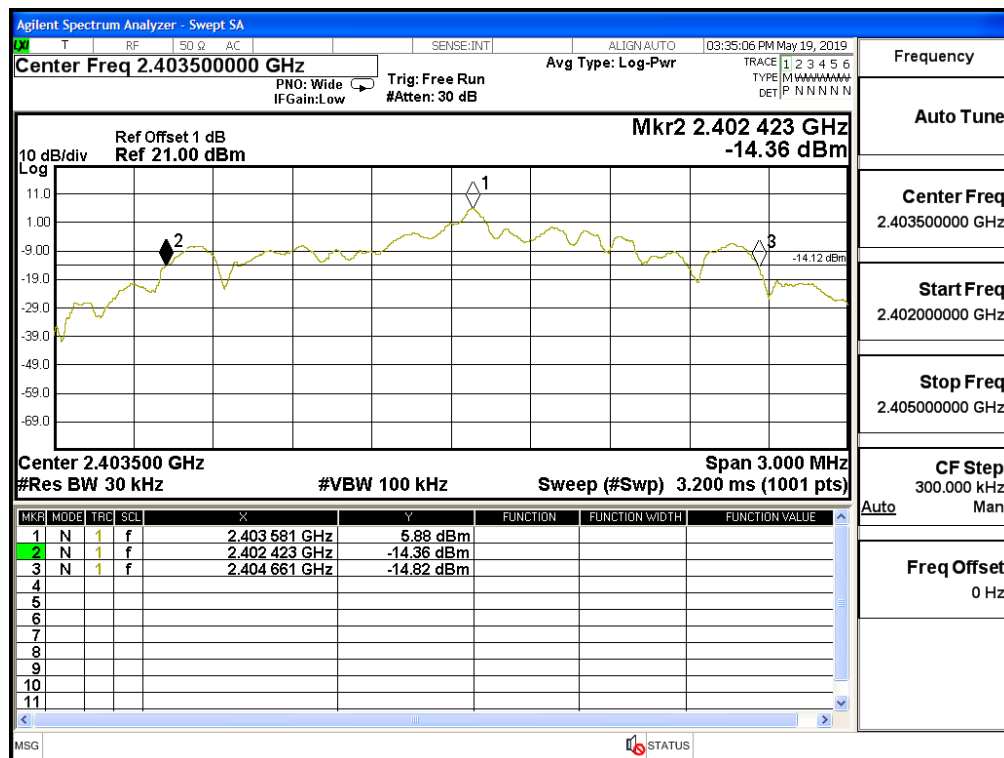


Figure Channel 25:

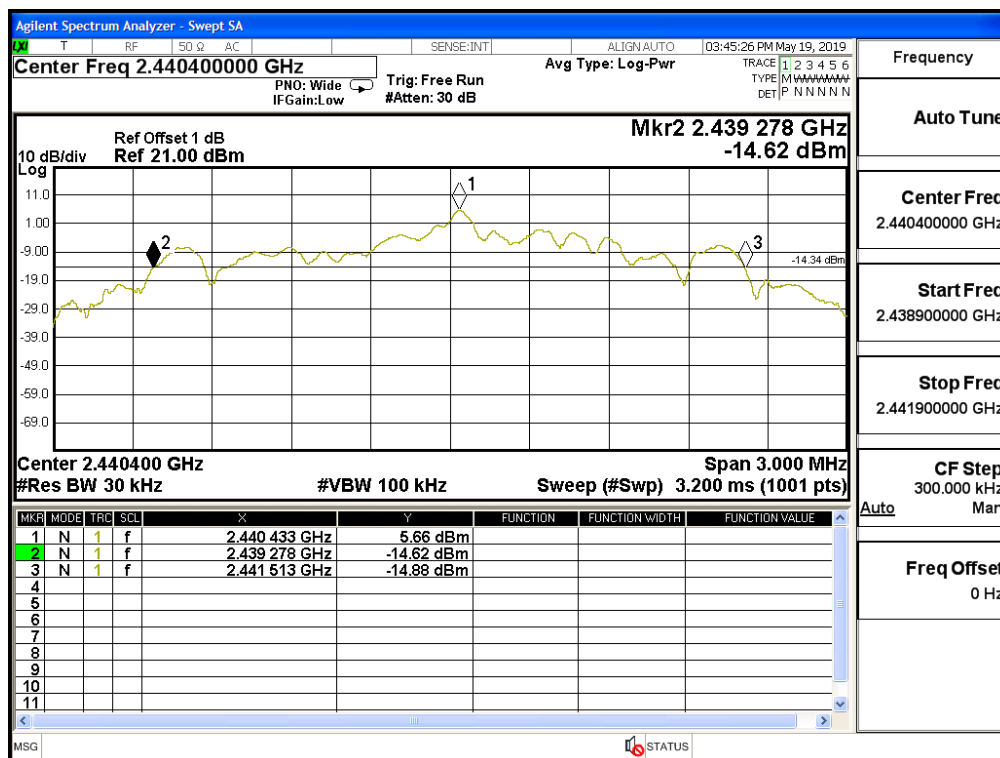
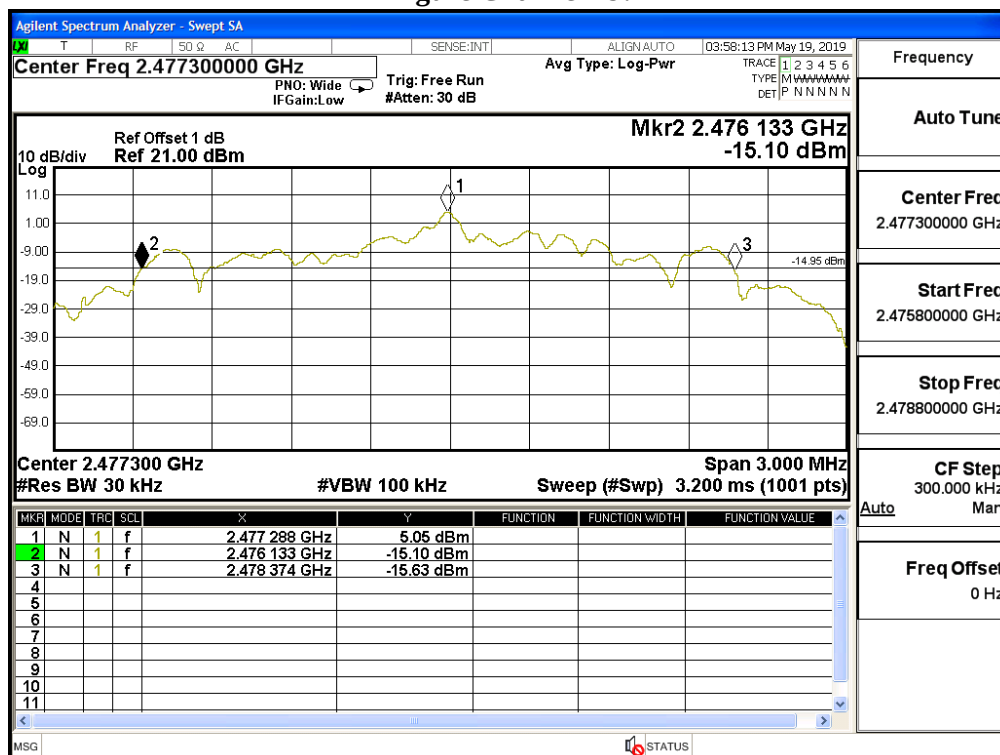


Figure Channel 49:



11. EMI Reduction Method During Compliance Testing

No modification was made during testing.