DEKRA

FCC Test Report

Product Name	Lenovo 700 Ultraportable Bluetooth Speaker
Model No.	LX001
FCC ID.	A5M-LX001

Applicant	Lenovo（Beijing）Limited
Address	No.6 Chuang Ye Road, Shangdi Information Industry Haidan District Beijing, 100085 China

Date of Receipt	Dec. 27, 2018
Issued Date	Feb. 11, 2019
Report No.	18C0536R-RFUSP01V00
Report Version	V1.0

ilac-MRA

TAF
Testing Laboratory
3023

Test Report

Issued Date: Feb. 11, 2019

Report No.: 18C0536R-RFUSP01V00

DEKRA

Product Name	Lenovo 700 Ultraportable Bluetooth Speaker
Applicant	Lenovo（Beijing）Limited
Address	No.6 Chuang Ye Road, Shangdi Information Industry Haidan District Beijing, 100085 China
Manufacturer	1.Lenovo（Beijing）Limited 2.Luxshare Electronic Technology (KunShan) Ltd.
Model No.	LX001
FCC ID.	A5M-LX001
EUT Rated Voltage	DC 3.85V (Power by battery) or DC 5V(Power by USB)
EUT Test Voltage	DC 5V (Power by USB)
Trade Name	Lenovo
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C: 2017 ANSI C63.4: 2014, ANSI C63.10: 2013 KDB 558074 D01 15.247 Meas Guidance v05
Test Result	Complied

Documented By　:

Rita Huang

(Senior Adm. Specialist / Rita Huang)

Tested By　　　:

Paul Jiang

(Engineer / Paul Jiang)

Approved By　　:

(Director / Vincent Lin)

TABLE OF CONTENTS

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Lenovo 700 Ultraportable Bluetooth Speaker
Trade Name	Lenovo
Model No.	LX001
FCC ID.	A5M-LX001
Frequency Range	2402-2480MHz
Channel Number	79
Type of Modulation	FHSS: GFSK(1Mbps) / π/4DQPSK(2Mbps) / 8DPSK(3Mbps)
Antenna Type	PIFA Antenna
Channel Control	Auto
Antenna Gain	Refer to the table "Antenna List"
USB Type C Cable	Shielded, 1.0m

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	LUXSHARE	N/A	PIFA Antenna	-0.1 dBi for 2.4 GHz

Note:

1. The antenna of EUT conforms to FCC 15.203.

Center Frequency of Each Channel:

Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
Channel 00:	2402 MHz	Channel 20:	2422 MHz	Channel 40:	2442 MHz	Channel 60:	2462 MHz
Channel 01:	2403 MHz	Channel 21:	2423 MHz	Channel 41:	2443 MHz	Channel 61:	2463 MHz
Channel 02:	2404 MHz	Channel 22:	2424 MHz	Channel 42:	2444 MHz	Channel 62:	2464 MHz
Channel 03:	2405 MHz	Channel 23:	2425 MHz	Channel 43:	2445 MHz	Channel 63:	2465 MHz
Channel 04:	2406 MHz	Channel 24:	2426 MHz	Channel 44:	2446 MHz	Channel 64:	2466 MHz
Channel 05:	2407 MHz	Channel 25:	2427 MHz	Channel 45:	2447 MHz	Channel 65:	2467 MHz
Channel 06:	2408 MHz	Channel 26:	2428 MHz	Channel 46:	2448 MHz	Channel 66:	2468 MHz
Channel 07:	2409 MHz	Channel 27:	2429 MHz	Channel 47:	2449 MHz	Channel 67:	2469 MHz
Channel 08:	2410 MHz	Channel 28:	2430 MHz	Channel 48:	2450 MHz	Channel 68:	2470 MHz
Channel 09:	2411 MHz	Channel 29:	2431 MHz	Channel 49:	2451 MHz	Channel 69:	2471 MHz
Channel 10:	2412 MHz	Channel 30:	2432 MHz	Channel 50:	2452 MHz	Channel 70:	2472 MHz
Channel 11:	2413 MHz	Channel 31:	2433 MHz	Channel 51:	2453 MHz	Channel 71:	2473 MHz
Channel 12:	2414 MHz	Channel 32:	2434 MHz	Channel 52:	2454 MHz	Channel 72:	2474 MHz
Channel 13:	2415 MHz	Channel 33:	2435 MHz	Channel 53:	2455 MHz	Channel 73:	2475 MHz
Channel 14:	2416 MHz	Channel 34:	2436 MHz	Channel 54:	2456 MHz	Channel 74:	2476 MHz
Channel 15:	2417 MHz	Channel 35:	2437 MHz	Channel 55:	2457 MHz	Channel 75:	2477 MHz
Channel 16:	2418 MHz	Channel 36:	2438 MHz	Channel 56:	2458 MHz	Channel 76:	2478 MHz
Channel 17:	2419 MHz	Channel 37:	2439 MHz	Channel 57:	2459 MHz	Channel 77:	2479 MHz
Channel 18:	2420 MHz	Channel 38:	2440 MHz	Channel 58:	2460 MHz	Channel 78:	2480 MHz
Channel 19:	2421 MHz	Channel 39:	2441 MHz	Channel 59:	2461 MHz		

Note:

1. The EUT is a Lenovo 700 Ultraportable Bluetooth Speaker with a built-in Bluetooth V3.0, V2.1+EDR transceiver, this report for Bluetooth V3.0, V2.1+EDR.

2. These tests were conducted on a sample for the purpose of demonstrating compliance of Bluetooth transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.

3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test

4. Bluetooth operation was evaluated at both 1Mb/s and 3Mb/s data rates. 2Mb/s data rate was found, through pre-testing, to produce emissions similar to those for 3Mb/s.

5. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

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

1.3. Tested System Details

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

	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook PC	DELL	Latitude 5580	GDZN7H2	Non-Shielded, 0.8m
2	Test Fixture	N/A	N/A	N/A	N/A

	Signal Cable Type	Signal cable Description
A	USB Cable	Shielded, 1.8m
B	UART Cable	Non-Shielded, 0.2m

1.4. Configuration of Tested System
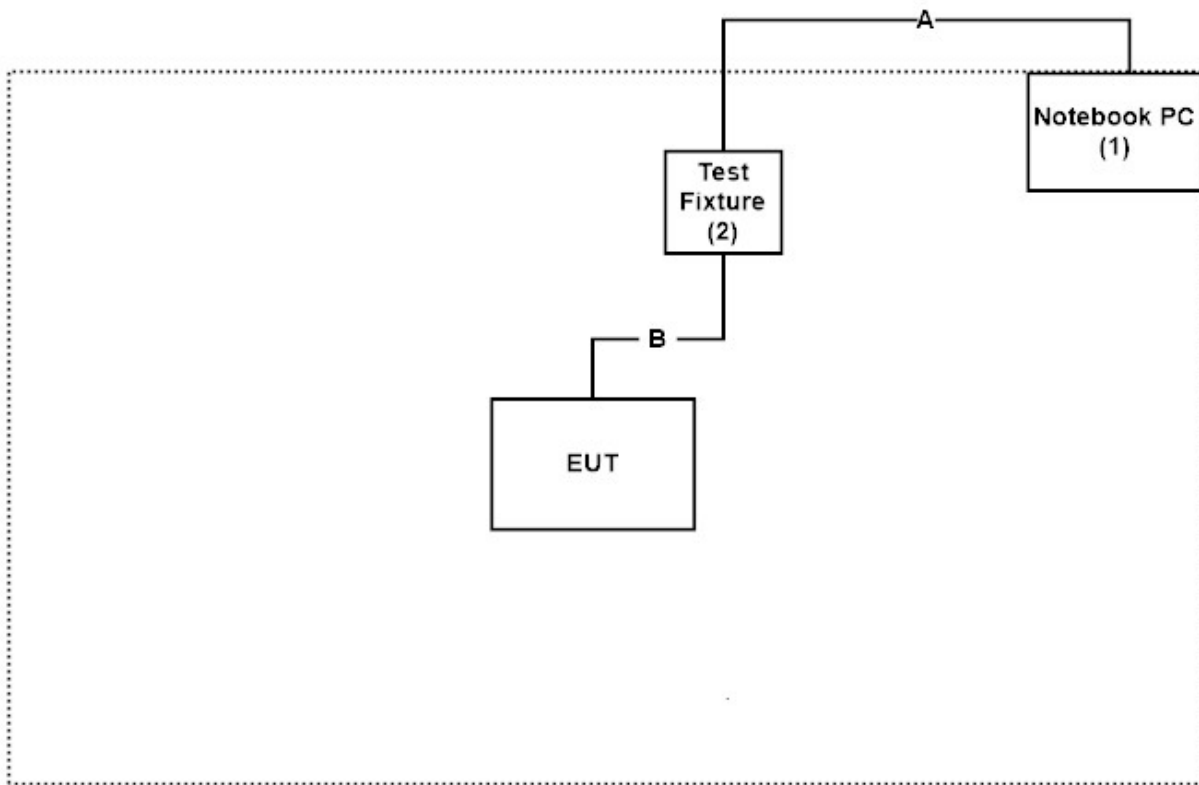
1.5. EUT Exercise Software

1. Setup the EUT as shown in Section 1.4.
2. Execute software " RTLBTAPP V5.2.2.16" 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	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

Site Description: Accredited by TAF
                    Accredited Number: 3023

Site Name: DEKRA Testing and Certification Co., Ltd
Site Address: No.5-22, Ruishukeng, Linkou Dist., New Taipei City 24451,
                   Taiwan, R.O.C.
                   TEL : 886-2-8601-3788 / FAX : 886-2-8601-3789
                   E-Mail : info.tw@dekra.com

FCC Accreditation Number: TW3023

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	2018/02/12	2019/02/11
X	Spectrum Analyzer	Agilent	N9010A	MY53470892	2018/09/27	2019/09/26
X	Peak Power Analyzer	Keysight	8990B	MY51000410	2018/08/01	2019/07/31
X	Wideband Power Sensor	Keysight	N1923A	MY56080003	2018/07/25	2019/07/24
X	Wideband Power Sensor	Keysight	N1923A	MY56080004	2018/07/25	2019/07/24
X	EMI Test Receiver	R&S	ESCS 30	100369	2018/11/19	2019/11/18
X	LISN	R&S	ESH3-Z5	836679/017	2019/02/09	2020/02/08
X	LISN	R&S	ENV216	100097	2019/02/09	2020/02/08
X	Coaxial Cable	DEKRA	RG 400	LC018-RG	2018/06/21	2019/06/20

For Radiated measurements /Site3/CB8

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Date	Due. Date
X	Spectrum Analyzer	R&S	FSP40	100170	2018/03/12	2019/03/11
X	Loop Antenna	Teseq	HLA6121	37133	2018/10/13	2019/10/12
X	Bilog Antenna	Schaffner Chase	CBL6112B	2707	2018/06/24	2019/06/23
X	Coaxial Cable	DEKRA	RG 214	LC003-RG	2018/06/14	2019/06/13
X	Pre-Amplifier	Jet-Power	JPA-10M1G33	170101000330010	2018/06/14	2019/06/13
X	Horn Antenna	ETS-Lindgren	3117	00135205	2018/05/03	2019/05/02
X	Horn Antenna	SCHWARZBECK	9120D	576	2018/12/18	2019/12/17
X	Pre-Amplifier	EMCI	EMC012630SE	980210	2018/04/10	2019/04/09
X	Horn Antenna	Com-Power	AH-840	101043	2019/01/09	2020/01/08
X	Amplifier + Cable	EMCI	EMC184045SE	980370	2018/03/21	2019/03/20
X	Filter	MICRO-TRONICS	BRM50702	G270	2018/08/06	2019/08/05
X	Filter	MICRO-TRONICS	BRM50716	G196	2018/08/06	2019/08/05

Note:
1. Loop Antenna is calibrated every two year, the other 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
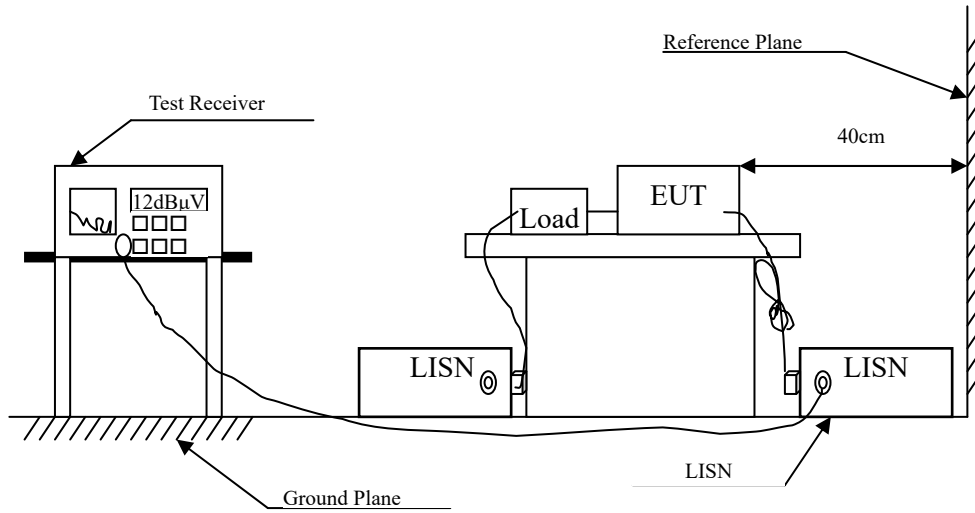
2.2. Limits

FCC Part 15 Subpart C Paragraph 15.207 (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.

2.3. 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 invested 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   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Conducted Emission Test
Power Line   :   Line 1
Test date   :   2019/01/23
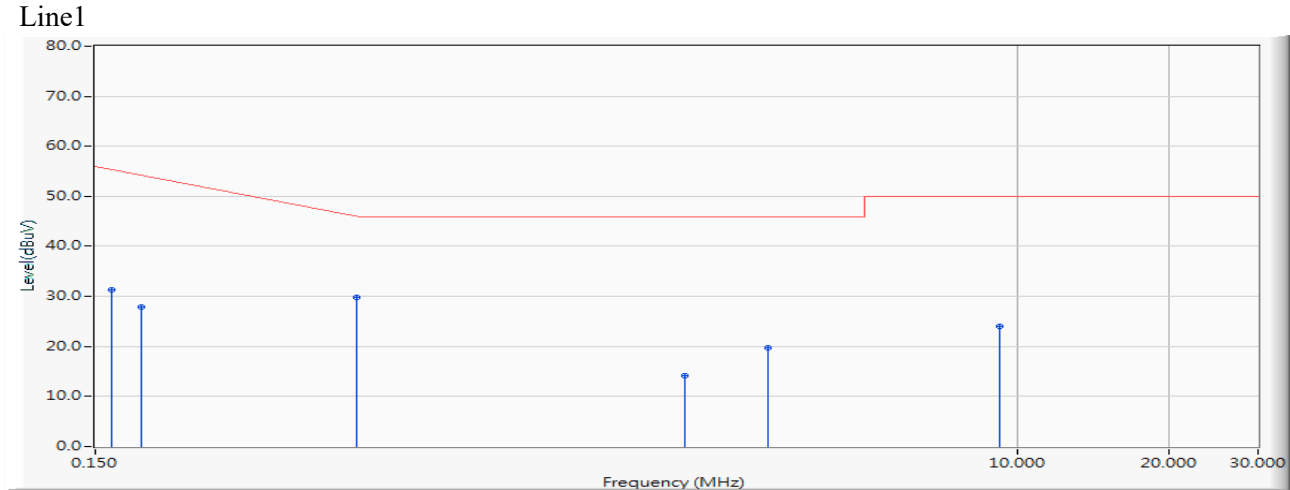Test Mode   :   Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Line1
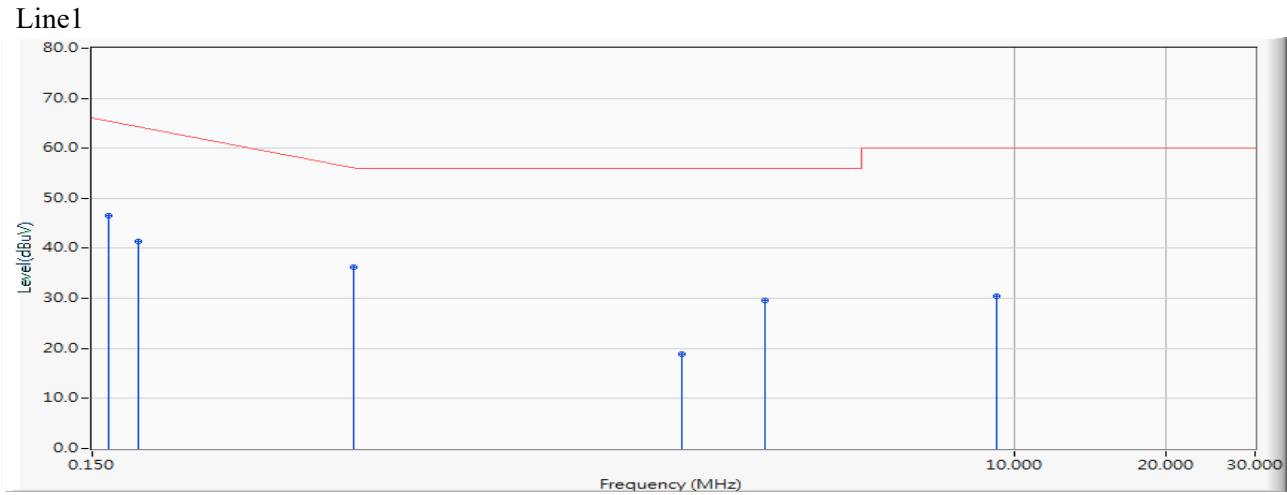
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.162	9.745	36.840	46.585	-19.072	65.657	QUASIPEAK
2		0.185	9.738	31.580	41.318	-23.682	65.000	QUASIPEAK
3		0.494	9.750	26.600	36.350	-19.821	56.171	QUASIPEAK
4		2.205	9.830	9.140	18.970	-37.030	56.000	QUASIPEAK
5		3.224	9.863	19.640	29.503	-26.497	56.000	QUASIPEAK
6		9.224	10.048	20.440	30.488	-29.512	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   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Conducted Emission Test
Power Line   :   Line 1
Test date   :   2019/01/23
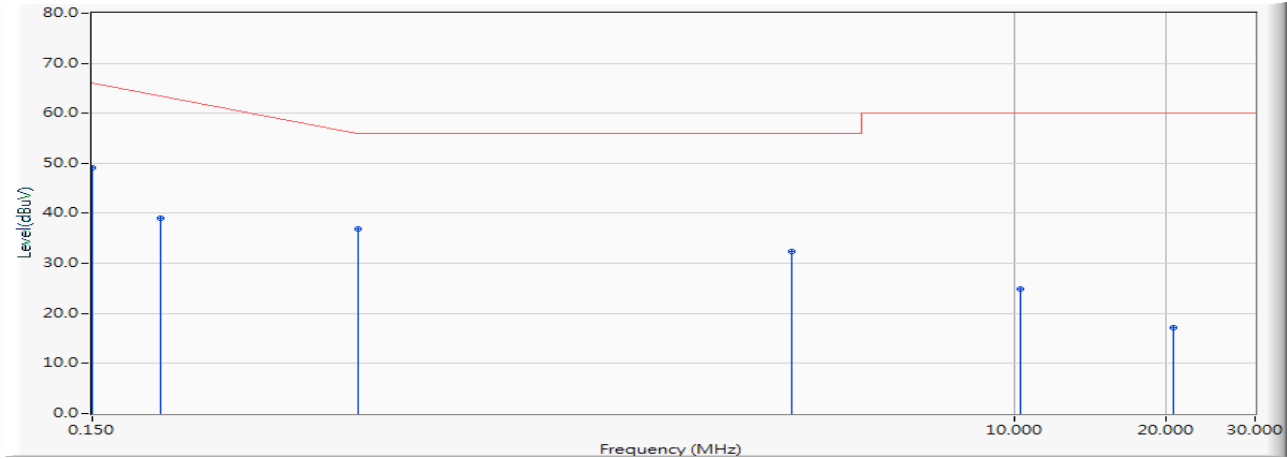Test Mode   :   Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Line1

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.162	9.745	21.670	31.415	-24.242	55.657	AVERAGE
2		0.185	9.738	18.130	27.868	-27.132	55.000	AVERAGE
3	*	0.494	9.750	20.130	29.880	-16.291	46.171	AVERAGE
4		2.205	9.830	4.340	14.170	-31.830	46.000	AVERAGE
5		3.224	9.863	9.910	19.773	-26.227	46.000	AVERAGE
6		9.224	10.048	13.970	24.018	-25.982	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 : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Conducted Emission Test
Power Line : Line 2
Test date : 2019/01/23
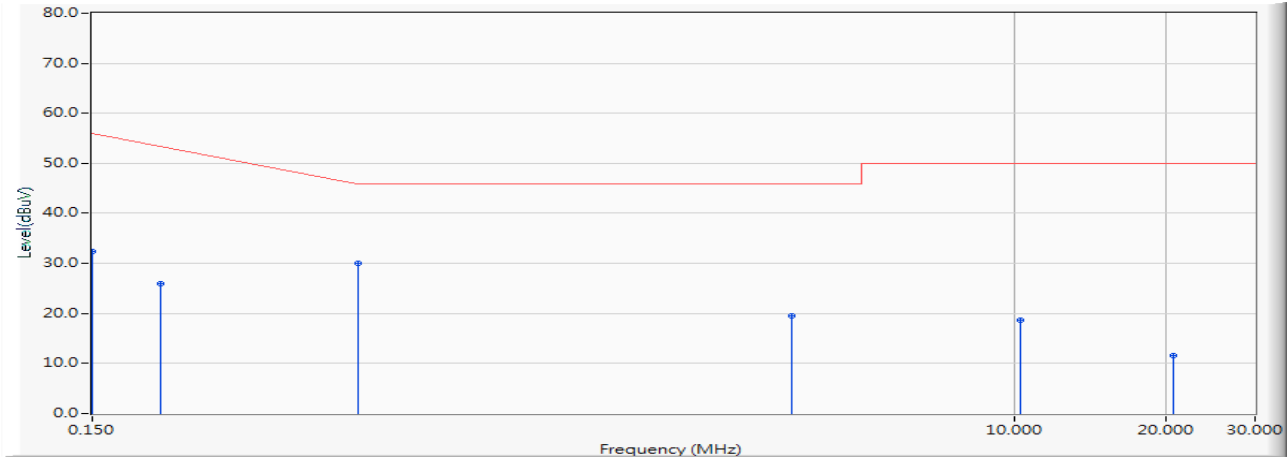Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Line2

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1	*	0.150	9.739	39.320	49.059	-16.941	66.000	QUASIPEAK
2		0.205	9.738	29.400	39.138	-25.291	64.429	QUASIPEAK
3		0.502	9.740	27.120	36.860	-19.140	56.000	QUASIPEAK
4		3.642	9.873	22.460	32.333	-23.667	56.000	QUASIPEAK
5		10.271	10.097	14.740	24.837	-35.163	60.000	QUASIPEAK
6		20.634	10.388	6.860	17.248	-42.752	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 : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Conducted Emission Test
Power Line : Line 2
Test date : 2019/01/23
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Line2

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV)	Margin (dB)	Limit (dBuV)	Detector Type
1		0.150	9.739	22.560	32.299	-23.701	56.000	AVERAGE
2		0.205	9.738	16.160	25.898	-28.531	54.429	AVERAGE
3	*	0.502	9.740	20.340	30.080	-15.920	46.000	AVERAGE
4		3.642	9.873	9.740	19.613	-26.387	46.000	AVERAGE
5		10.271	10.097	8.630	18.727	-31.273	50.000	AVERAGE
6		20.634	10.388	1.110	11.498	-38.502	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
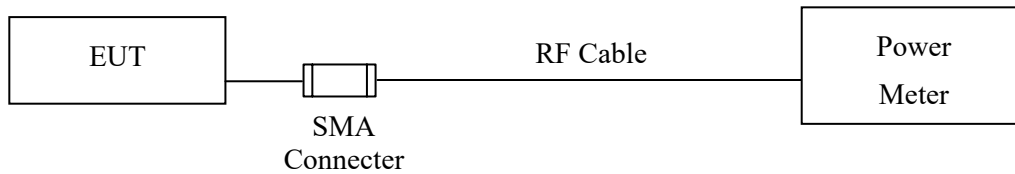
3.2. Limit

The maximum peak power shall be less 1Watt.

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

$\pm$ 1.19 dB

3.5. Test Result of Peak Power Output

Product   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Peak Power Output
Test Site   :   No.3 OATS
Test date   :   2019/01/18
Test Mode   :   Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	6.83	1 Watt= 30 dBm	Pass
Channel 39	2441.00	6.50	1 Watt= 30 dBm	Pass
Channel 78	2480.00	7.24	1 Watt= 30 dBm	Pass

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Peak Power Output
Test Site : No.3 OATS
Test date : 2019/01/18
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	9.28	1 Watt= 30 dBm	Pass
Channel 39	2441.00	9.49	1 Watt= 30 dBm	Pass
Channel 78	2480.00	10.25	1 Watt= 30 dBm	Pass

4. Radiated Emission

4.1. Test Setup

Under 30MHz

Below 1GHz

Above 1GHz

The height of board band or Dipole Antenna was scanned from 1M to 4M.

The distance between antenna and turn table was 3M regards to the standard adopted.

RF absorber material on the ground plane.
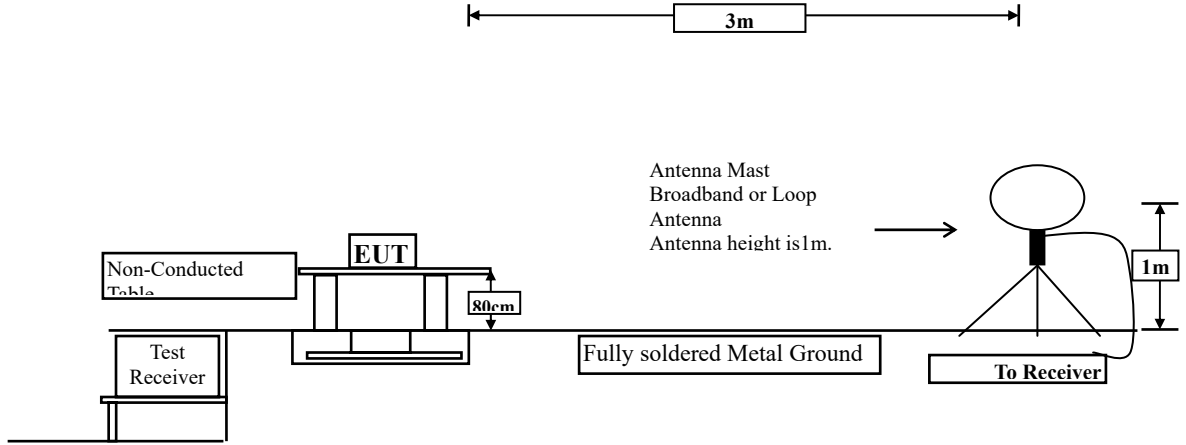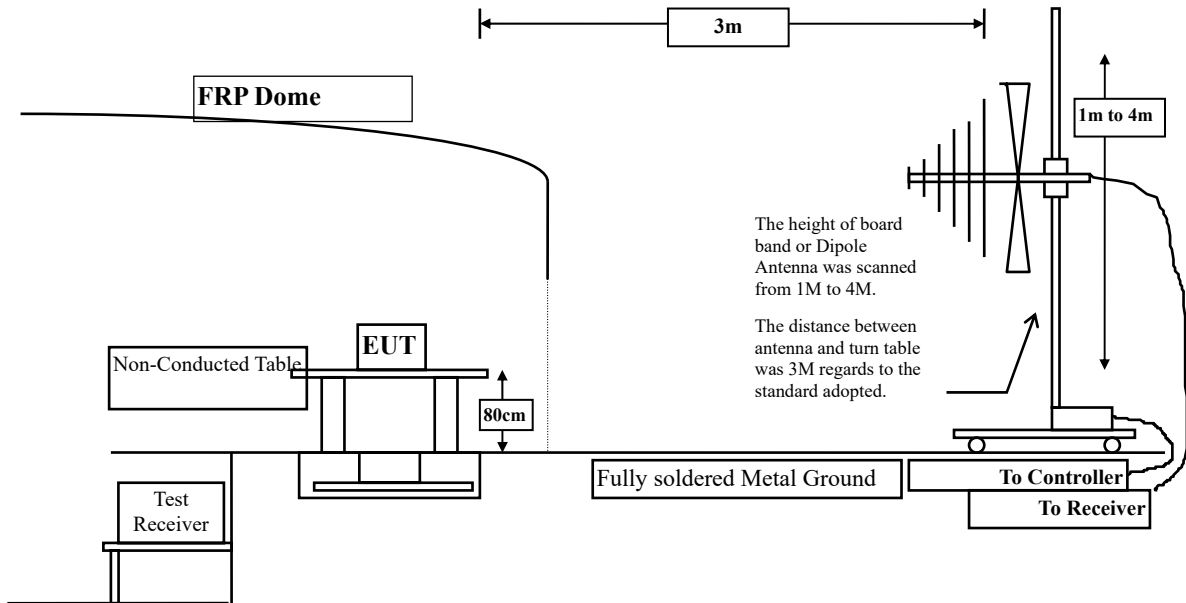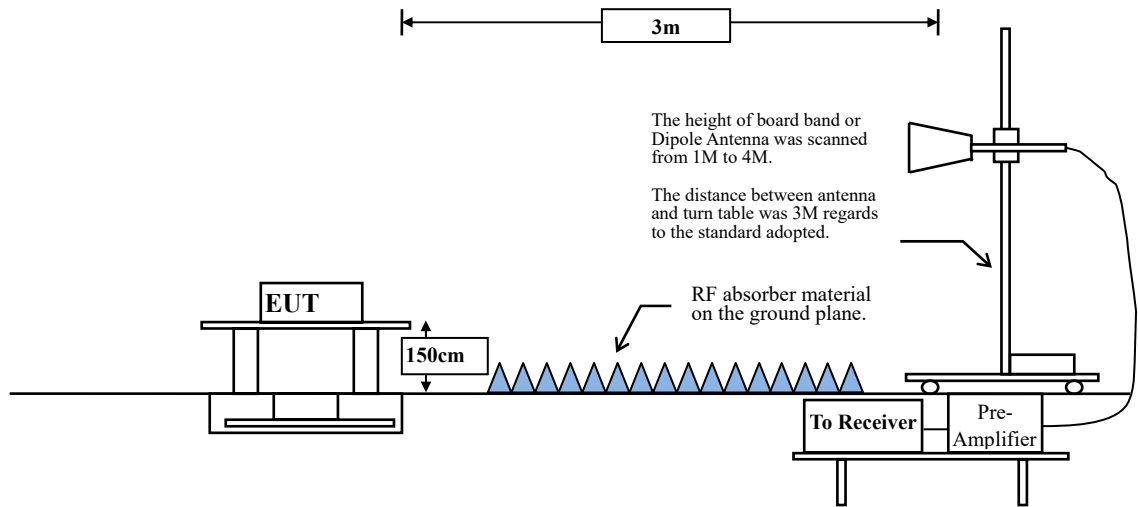
4.2. Limits

➤ 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 (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.

4.3. 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 form 9kHz - 10th Harmonic of fundamental was investigated.
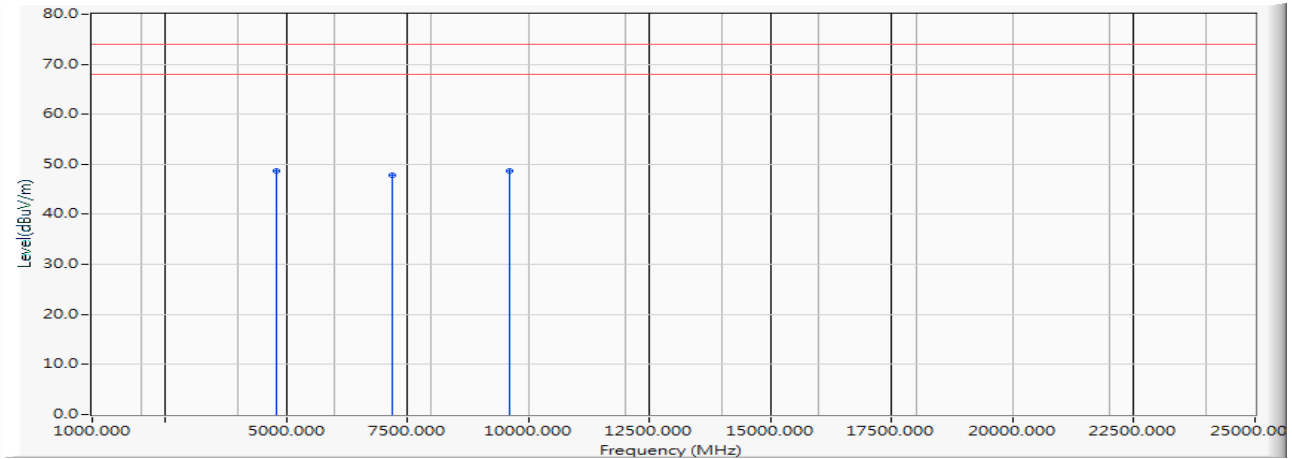

4.4. Uncertainty

$\pm$ 4.08 dB above 1GHz

$\pm$ 4.22 dB below 1GHz

4.5. Test Result of Radiated Emission

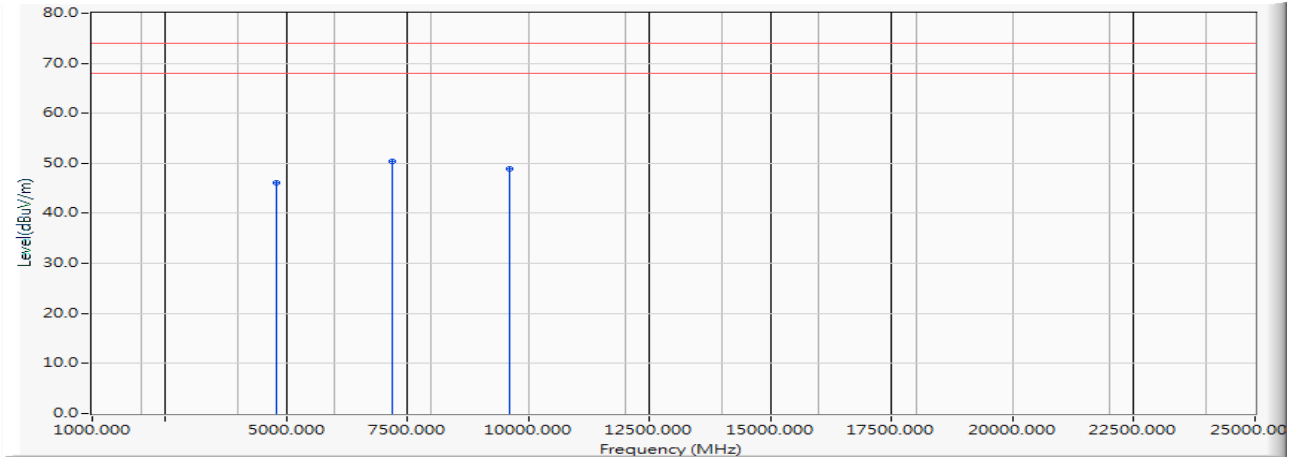|	
Product	: Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	: Harmonic Radiated Emission
Test Site	: No.3 OATS
Test date	: 2019/01/22
Test Mode	: Mode 1: Transmit - 1Mbps (GFSK)(2402MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4804.000	2.511	46.230	48.740	-25.260	74.000	PEAK
2		7206.000	9.511	38.260	47.771	-26.229	74.000	PEAK
3		9608.000	10.394	38.320	48.714	-25.286	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   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Harmonic Radiated Emission
Test Site   :   No.3 OATS
Test date   :   2019/01/22
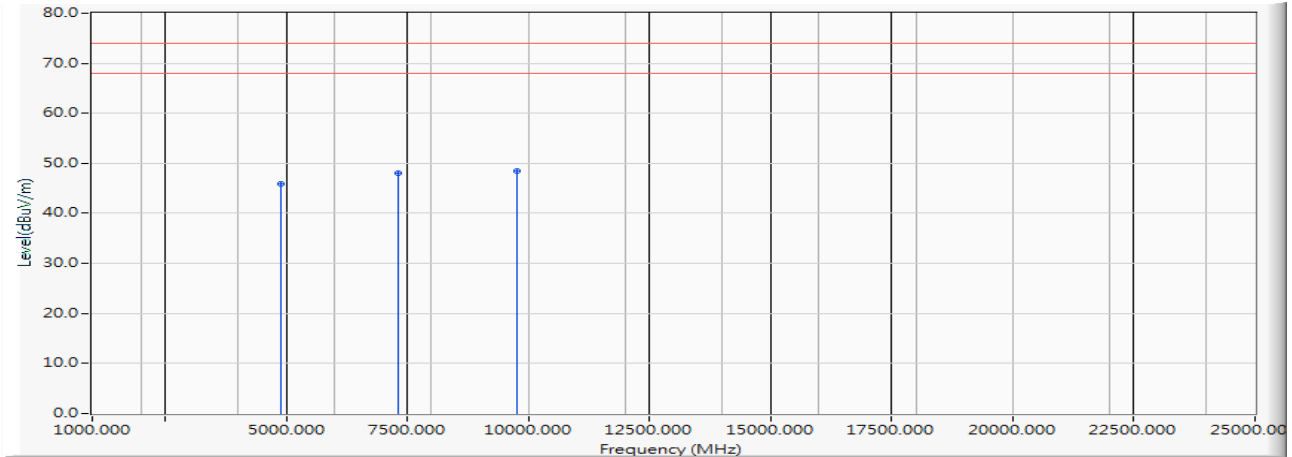Test Mode   :   Mode 1: Transmit - 1Mbps (GFSK)(2402MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	2.923	43.190	46.112	-27.888	74.000	PEAK
2	*	7206.000	9.988	40.380	50.369	-23.631	74.000	PEAK
3		9608.000	10.847	38.160	49.007	-24.993	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   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Harmonic Radiated Emission
Test Site   :   No.3 OATS
Test date   :   2019/01/22
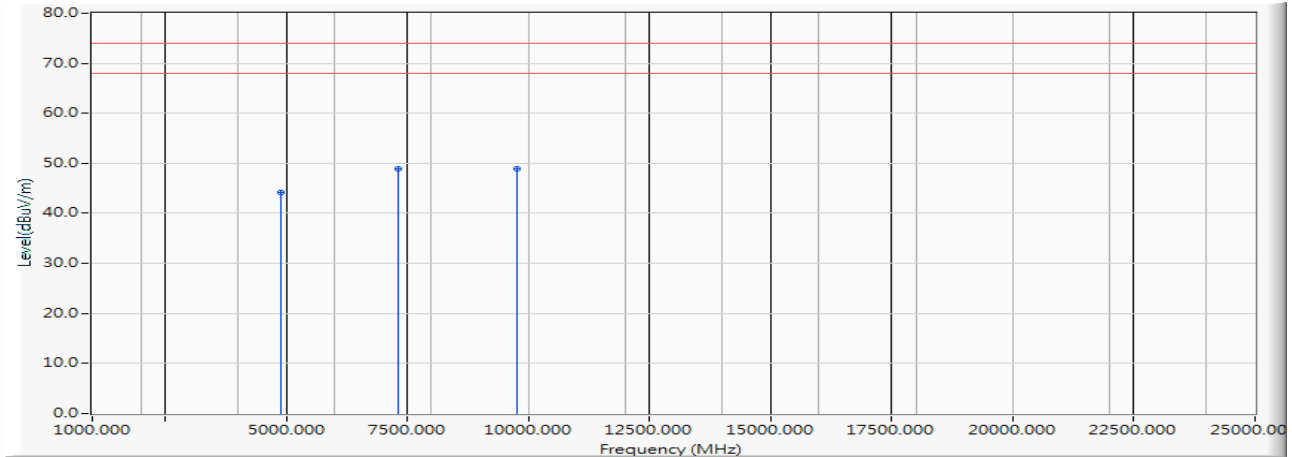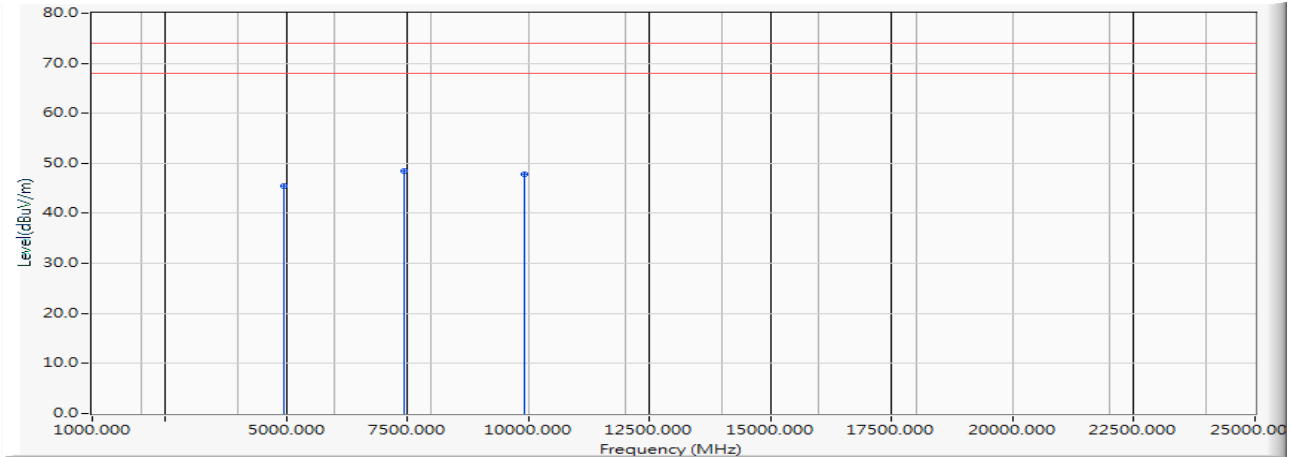Test Mode   :   Mode 1: Transmit - 1Mbps (GFSK)(2441MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4882.000	2.025	43.770	45.795	-28.205	74.000	PEAK
2		7323.000	9.762	38.270	48.031	-25.969	74.000	PEAK
3	*	9764.000	9.682	38.690	48.371	-25.629	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 : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2019/01/22
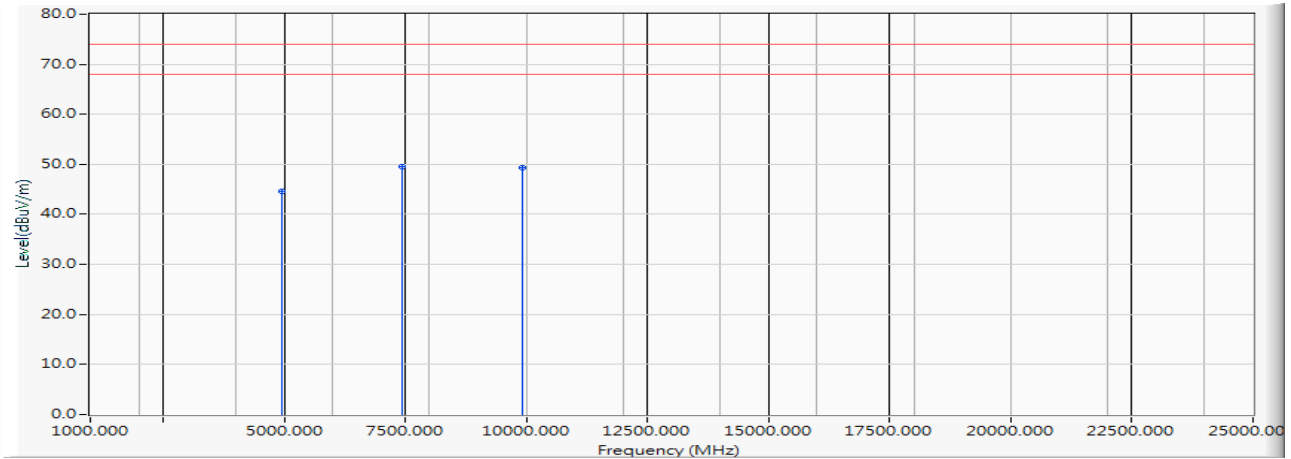Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(2441MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4882.000	2.488	41.690	44.178	-29.822	74.000	PEAK
2	*	7323.000	10.375	38.510	48.884	-25.116	74.000	PEAK
3		9764.000	10.315	38.490	48.805	-25.195	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 : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2019/01/22
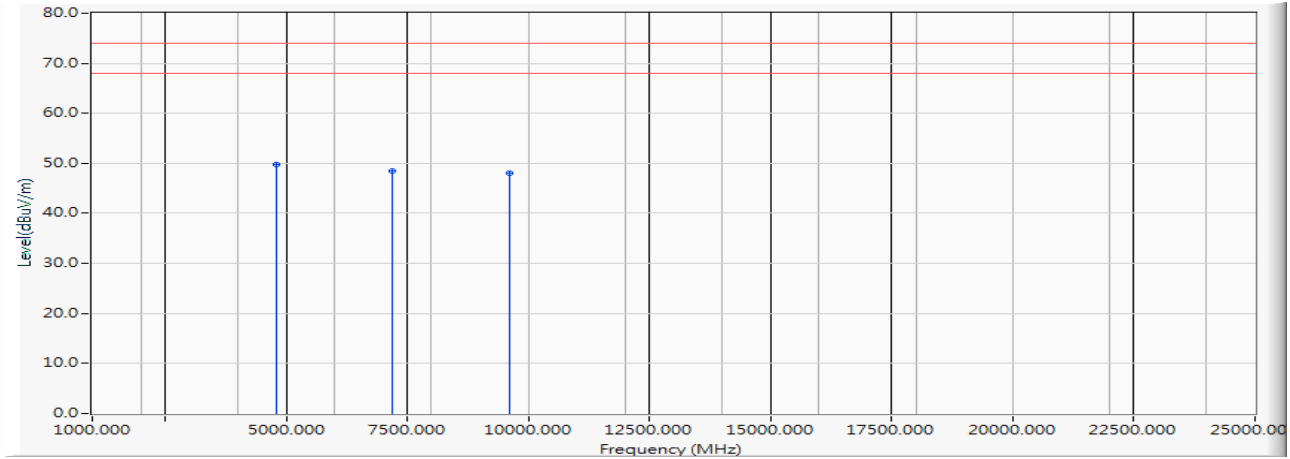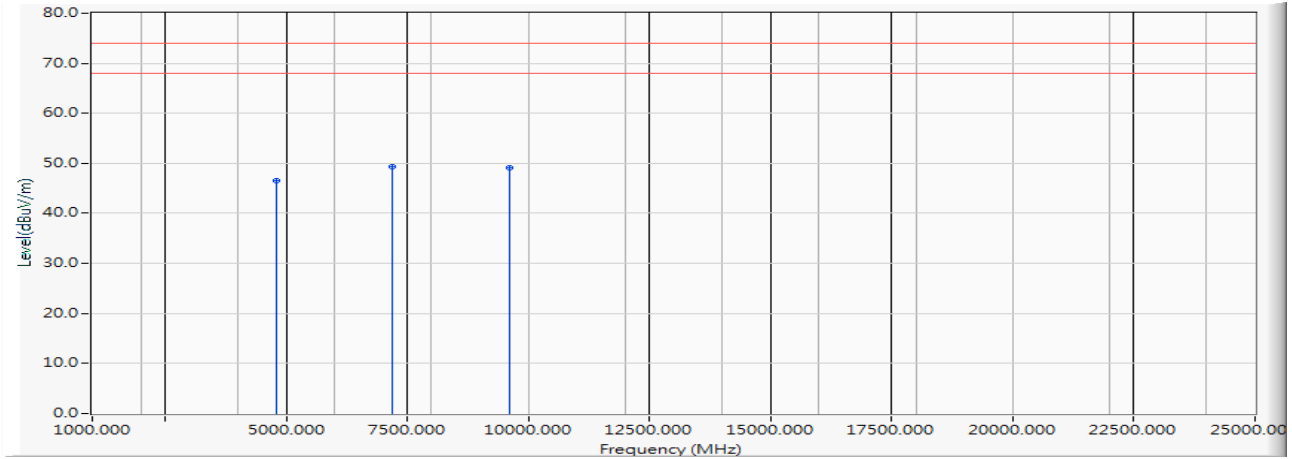Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(2480MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4960.000	2.582	42.900	45.482	-28.518	74.000	PEAK
2	*	7440.000	10.555	37.840	48.395	-25.605	74.000	PEAK
3		9920.000	10.206	37.680	47.886	-26.114	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	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2019/01/22
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)(2480MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4960.000	3.398	41.250	44.649	-29.351	74.000	PEAK
2	*	7440.000	11.214	38.400	49.614	-24.386	74.000	PEAK
3		9920.000	11.245	38.120	49.365	-24.635	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 : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2019/01/22
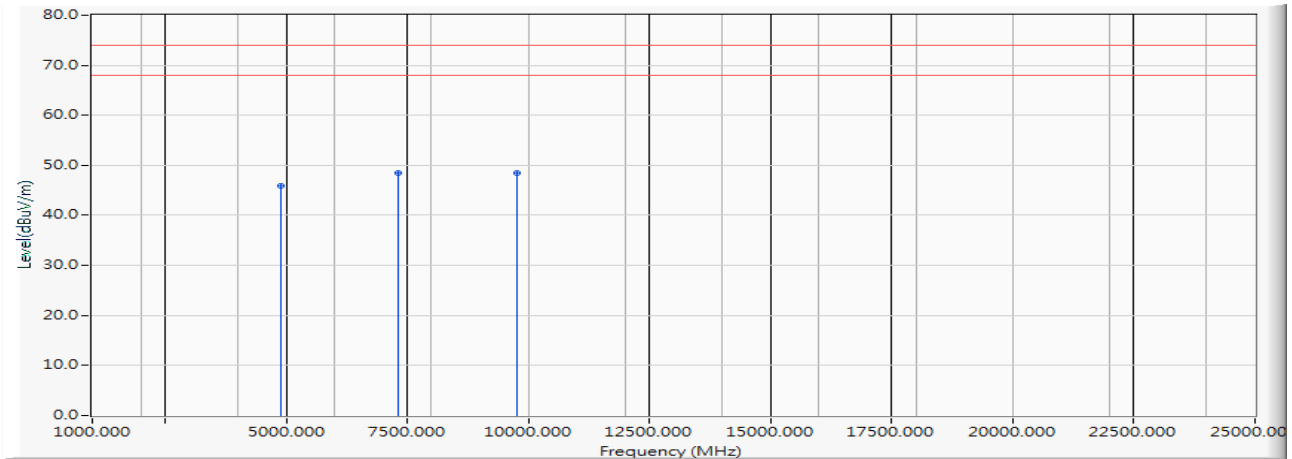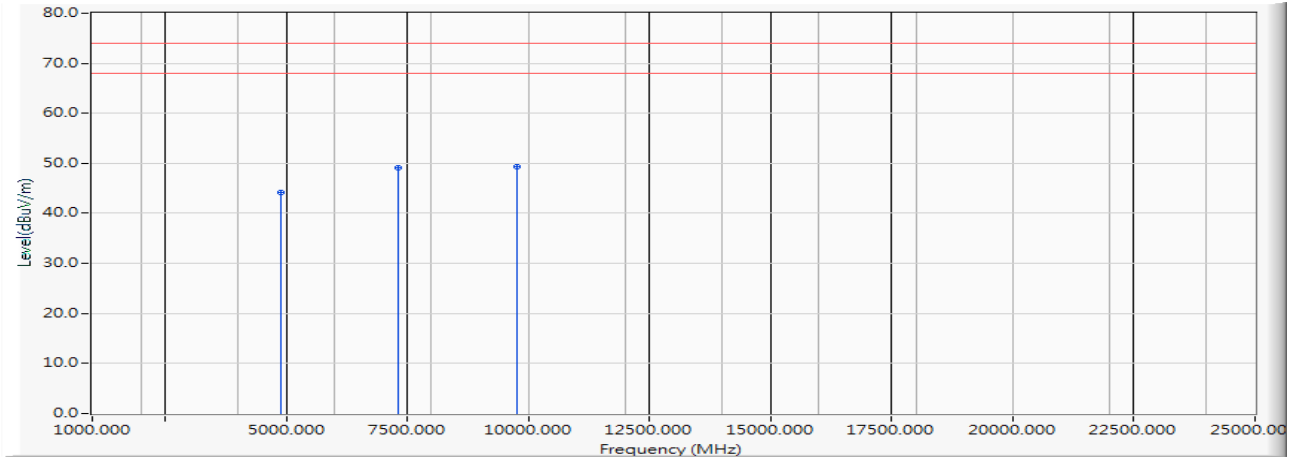Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)(2402MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	4804.000	2.511	47.310	49.820	-24.180	74.000	PEAK
2		7206.000	9.511	38.920	48.431	-25.569	74.000	PEAK
3		9608.000	10.394	37.680	48.074	-25.926	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	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2019/01/22
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK)(2402MHz)

Vertical

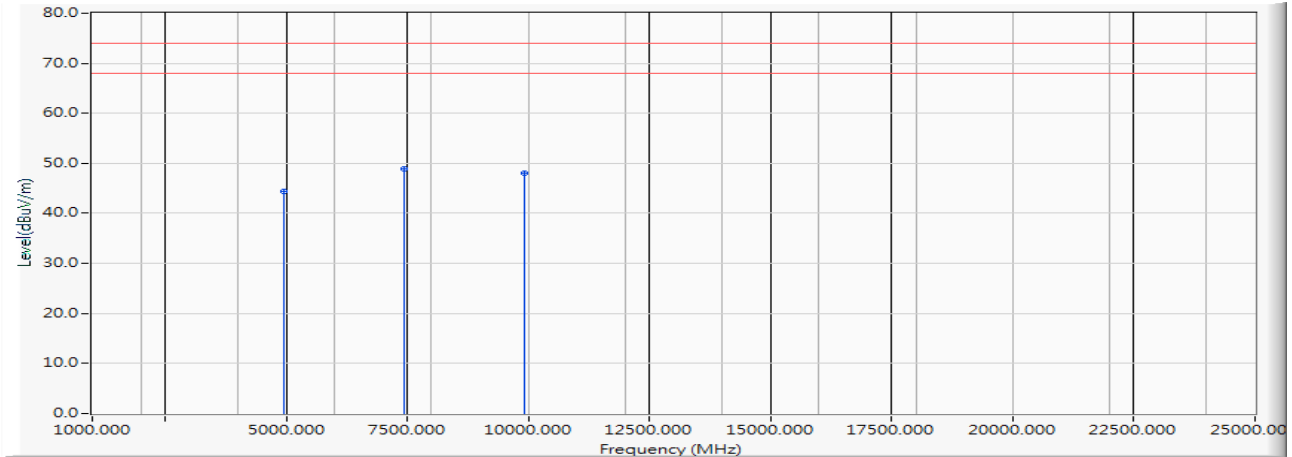|		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4804.000	2.923	43.660	46.582	-27.418	74.000	PEAK
2	*	7206.000	9.988	39.350	49.339	-24.661	74.000	PEAK
3		9608.000	10.847	38.280	49.127	-24.873	74.000	PEAK

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	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2019/01/22
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4882.000	2.025	43.920	45.945	-28.055	74.000	PEAK
2		7323.000	9.762	38.670	48.431	-25.569	74.000	PEAK
3	*	9764.000	9.682	38.840	48.521	-25.479	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 : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2019/01/22
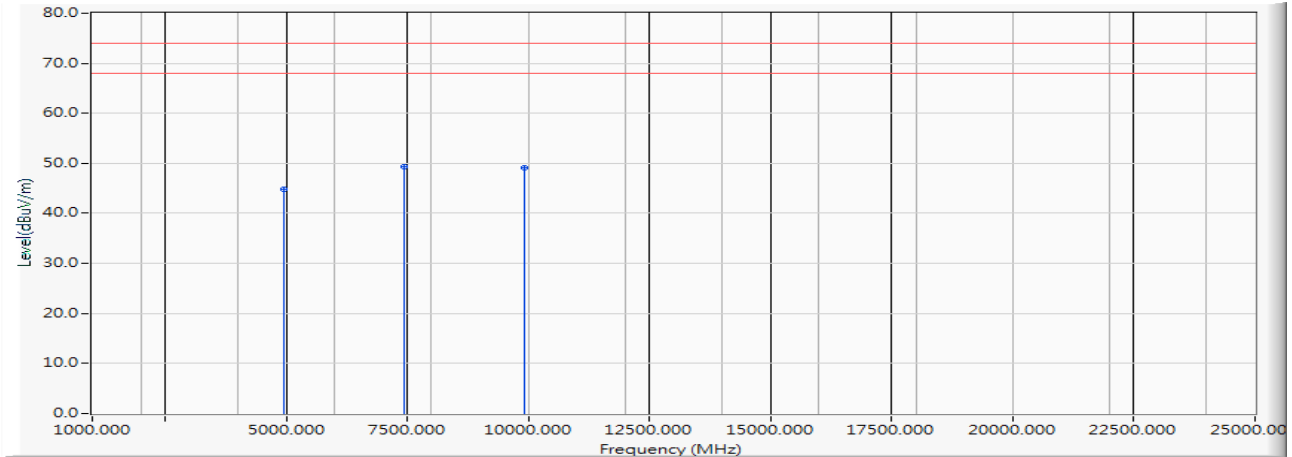Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)
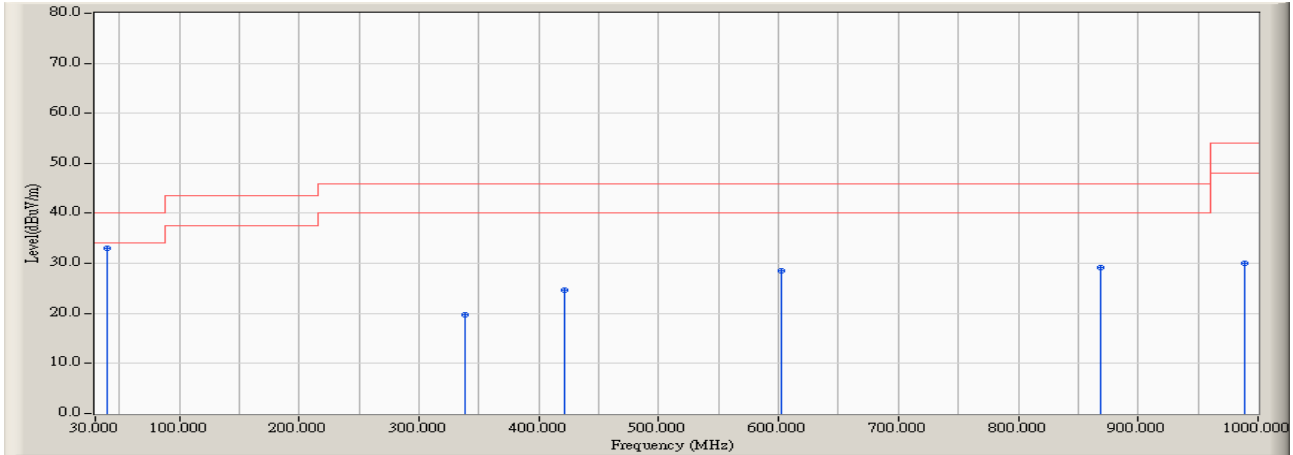
Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4882.000	2.488	41.680	44.168	-29.832	74.000	PEAK
2		7323.000	10.375	38.650	49.024	-24.976	74.000	PEAK
3	*	9764.000	10.315	38.960	49.275	-24.725	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 : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Harmonic Radiated Emission
Test Site : No.3 OATS
Test date : 2019/01/22
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)
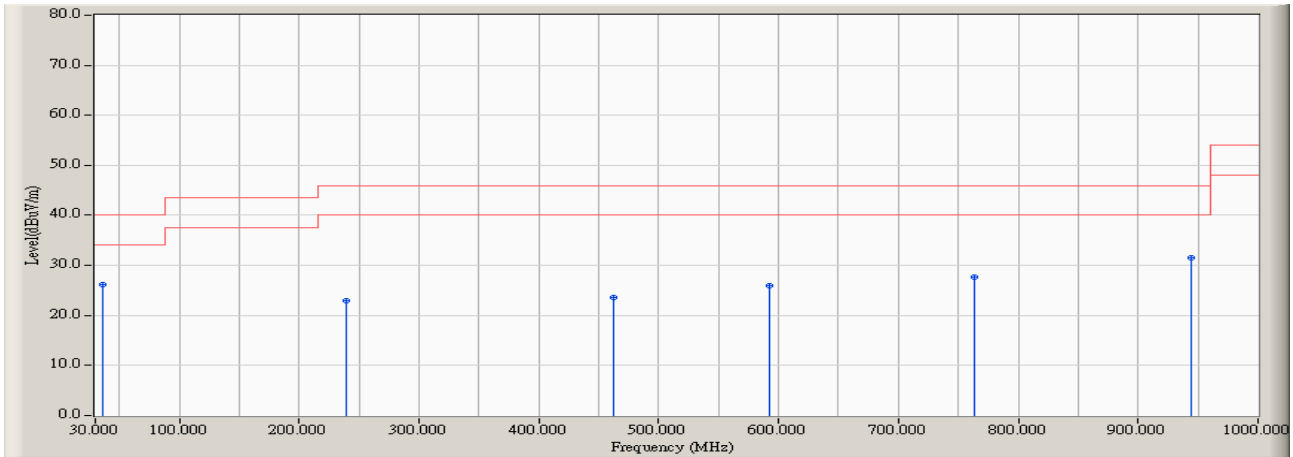
Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4960.000	2.582	41.760	44.342	-29.658	74.000	PEAK
2	*	7440.000	10.555	38.290	48.845	-25.155	74.000	PEAK
3		9920.000	10.206	37.920	48.126	-25.874	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   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Harmonic Radiated Emission
Test Site   :   No.3 OATS
Test date   :   2019/01/22
Test Mode   :   Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		4960.000	3.398	41.340	44.739	-29.261	74.000	PEAK
2	*	7440.000	11.214	38.140	49.354	-24.646	74.000	PEAK
3		9920.000	11.245	37.860	49.105	-24.895	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   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   General Radiated Emission
Test Site   :   No.3 OATS
Test date   :   2019/01/23
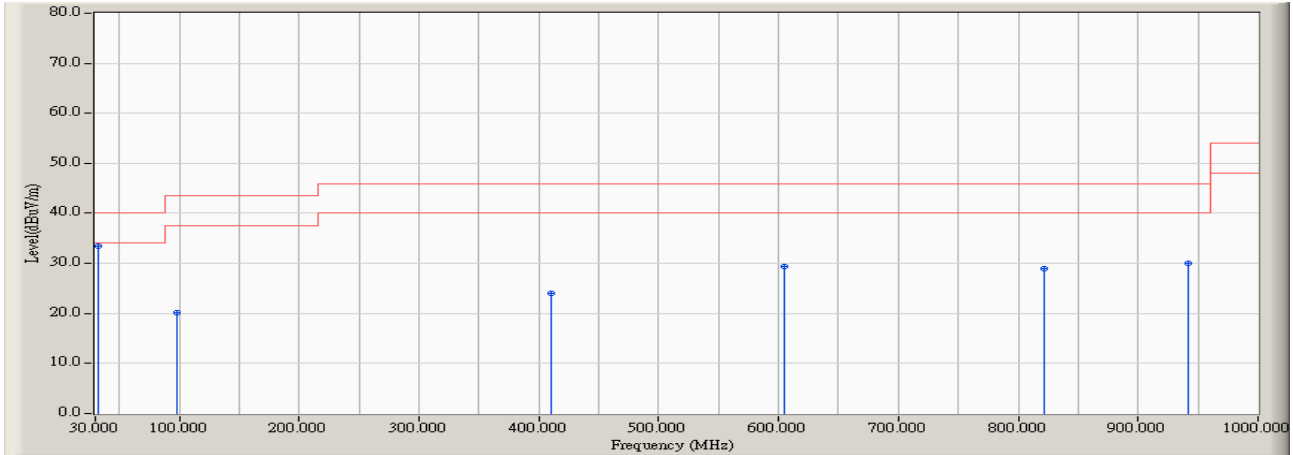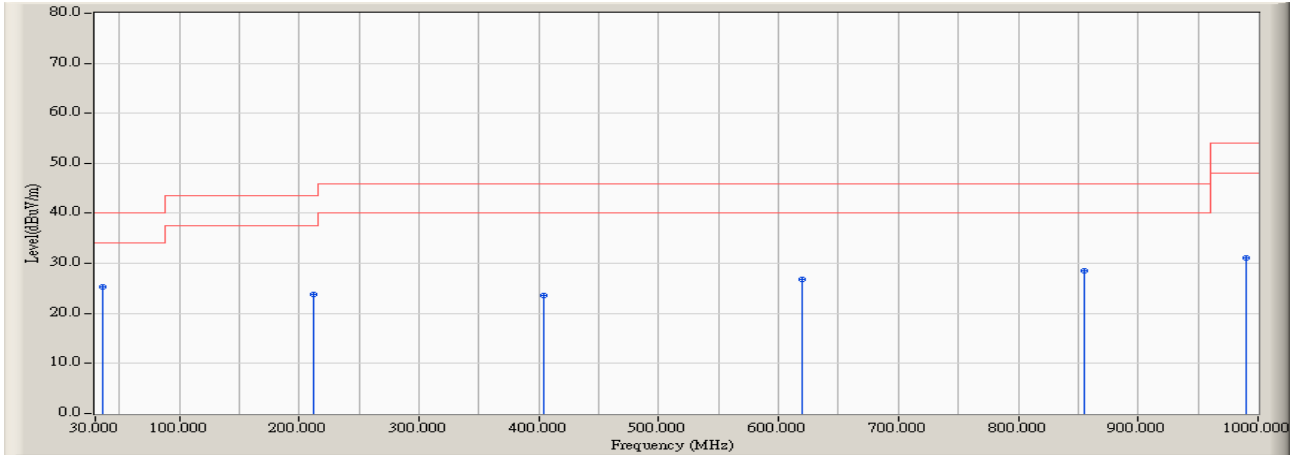Test Mode   :   Mode 1: Transmit - 1Mbps (GFSK) (2441MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	39.700	3.796	29.249	33.045	-6.955	40.000	QUASIPEAK
2		338.460	-2.503	22.144	19.641	-26.359	46.000	QUASIPEAK
3		421.880	1.836	22.728	24.564	-21.436	46.000	QUASIPEAK
4		602.300	7.225	21.325	28.550	-17.450	46.000	QUASIPEAK
5		868.080	7.816	21.428	29.244	-16.756	46.000	QUASIPEAK
6		988.360	8.763	21.260	30.023	-23.977	54.000	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.
8. No emission found between lowest internal used/generated frequency to 30MHz.

Product	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	General Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2019/01/23
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2441MHz)

Vertical

|		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	35.820	-4.215	30.309	26.094	-13.906	40.000	QUASIPEAK
2		239.520	-0.167	23.063	22.896	-23.104	46.000	QUASIPEAK
3		462.620	1.113	22.390	23.503	-22.497	46.000	QUASIPEAK
4		592.600	3.699	22.288	25.987	-20.013	46.000	QUASIPEAK
5		763.320	5.388	22.189	27.577	-18.423	46.000	QUASIPEAK
6		943.740	9.135	22.322	31.457	-14.543	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.
8. No emission found between lowest internal used/generated frequency to 30MHz.

Product	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	General Radiated Emission
Test Site	:	No.3 OATS
Test date	:	2019/01/23
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	31.940	4.575	28.926	33.501	-6.499	40.000	QUASIPEAK
2		97.900	-3.708	23.870	20.162	-23.338	43.500	QUASIPEAK
3		410.240	1.753	22.322	24.075	-21.925	46.000	QUASIPEAK
4		604.240	7.199	22.103	29.302	-16.698	46.000	QUASIPEAK
5		821.520	7.861	21.018	28.879	-17.121	46.000	QUASIPEAK
6		941.800	8.242	21.855	30.097	-15.903	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.
8. No emission found between lowest internal used/generated frequency to 30MHz.

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : General Radiated Emission
Test Site : No.3 OATS
Test date : 2019/01/23
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2441MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	35.820	-4.215	29.618	25.403	-14.597	40.000	QUASIPEAK
2		212.360	0.160	23.623	23.783	-19.717	43.500	QUASIPEAK
3		404.420	0.920	22.771	23.691	-22.309	46.000	QUASIPEAK
4		619.760	4.001	22.816	26.817	-19.183	46.000	QUASIPEAK
5		854.500	7.614	20.946	28.560	-17.440	46.000	QUASIPEAK
6		990.300	9.344	21.717	31.061	-22.939	54.000	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.
8. No emission found between lowest internal used/generated frequency to 30MHz.

5. RF Antenna Conducted Test

5.1. Test Setup
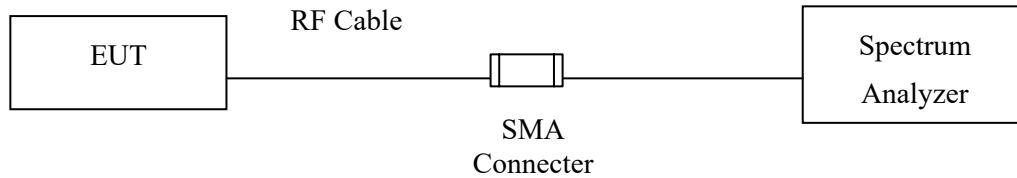
5.2. Limits

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

$\pm$ 1.20dB

5.5. Test Result of RF Antenna Conducted Test

Product	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	RF Antenna Conducted Test
Test Site	:	No.3 OATS
Test date	:	2019/01/23
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK)

Figure Channel 00:
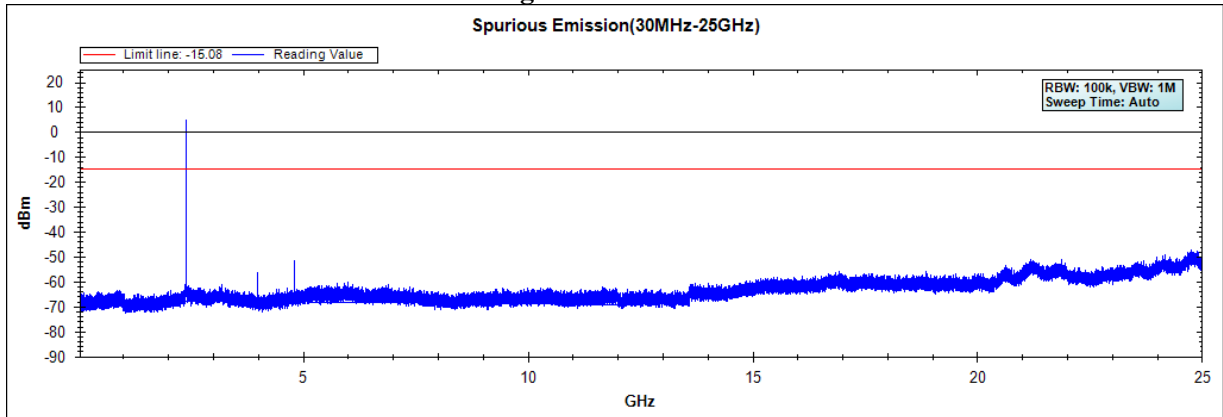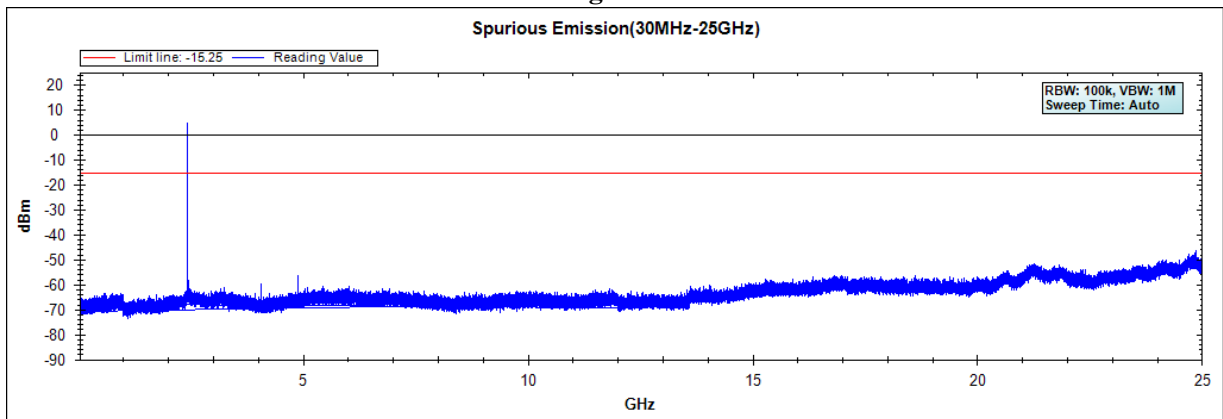
Figure Channel 39:

Figure Channel 78:
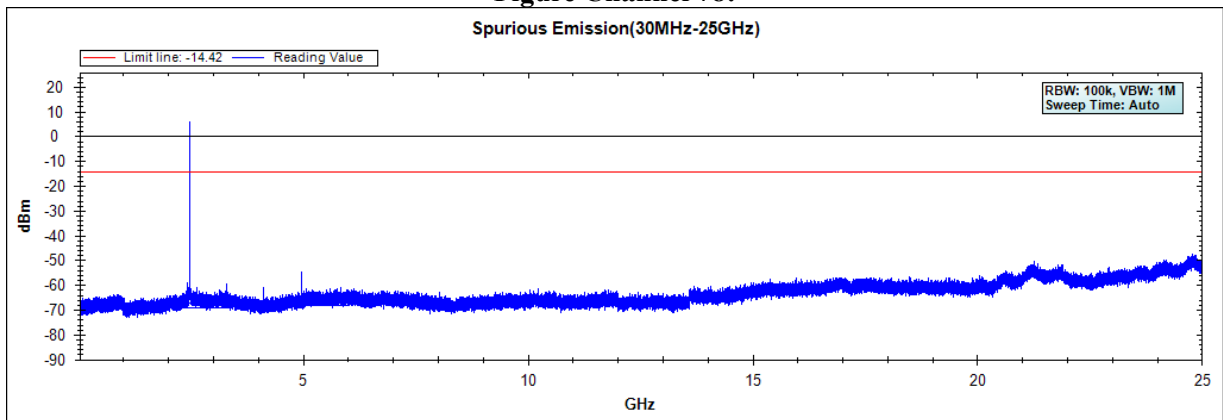
Note: The above test pattern is synthesized by multiple of the frequency range.

Product	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	RF Antenna Conducted Test
Test Site	:	No.3 OATS
Test date	:	2019/01/23
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK)

Figure Channel 00:
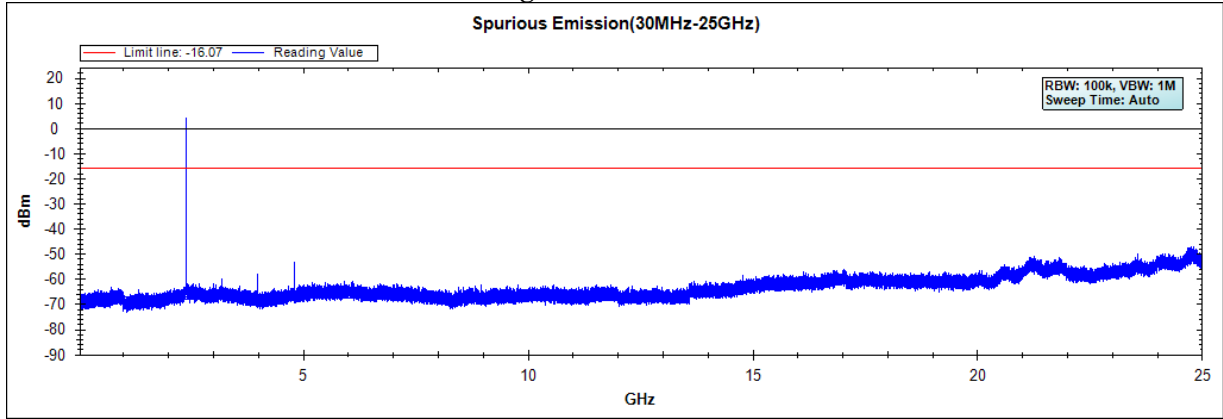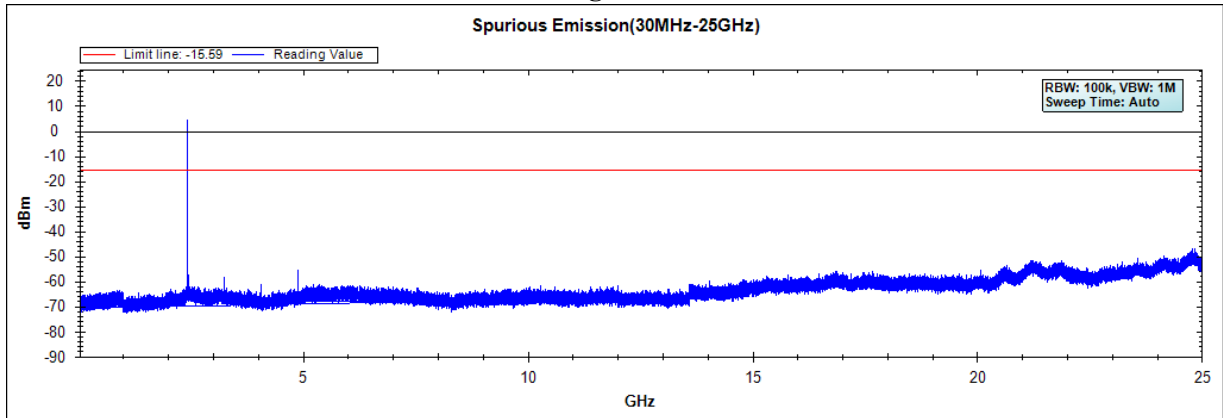
Figure Channel 39:

Figure Channel 78:
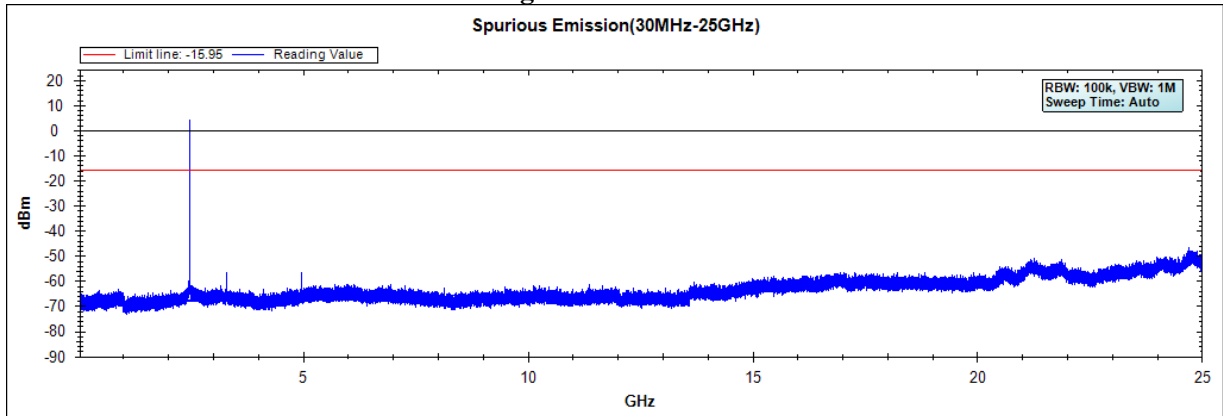
Note: The above test pattern is synthesized by multiple of the frequency range.

6. Band Edge

6.1. Test Setup

RF Radiated Measurement:

Above 1GHz
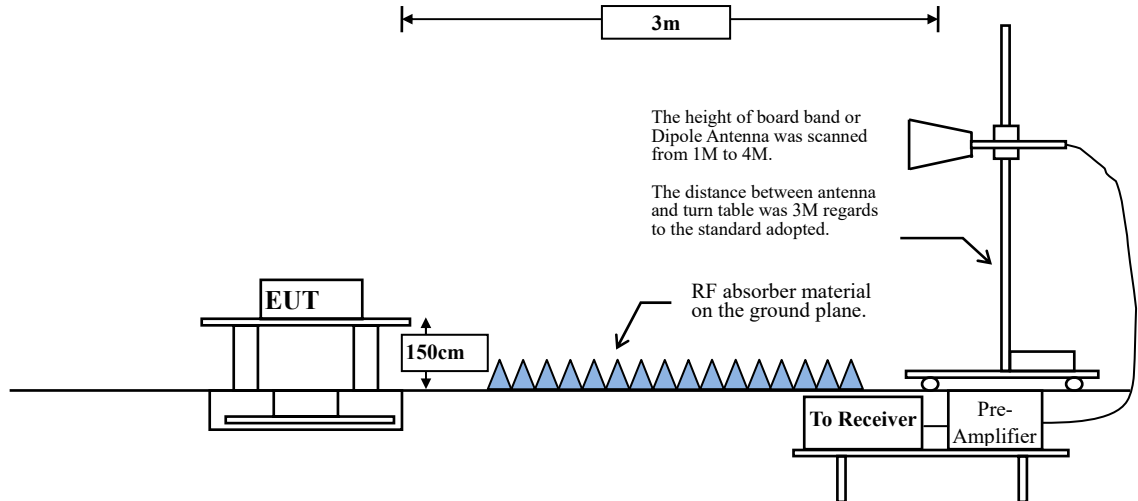
RF Conducted Measurement
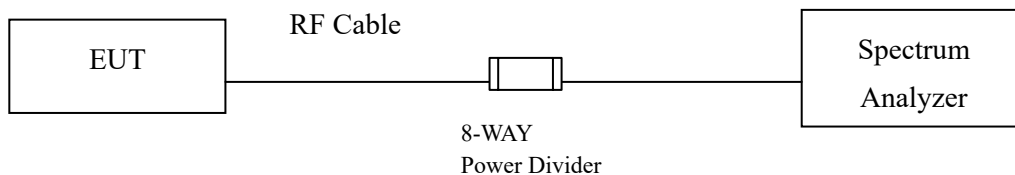
6.2. Limit

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

$\pm$ 4.08 dB above 1GHz

$\pm$ 4.22 dB below 1GHz

6.5. Test Result of Band Edge

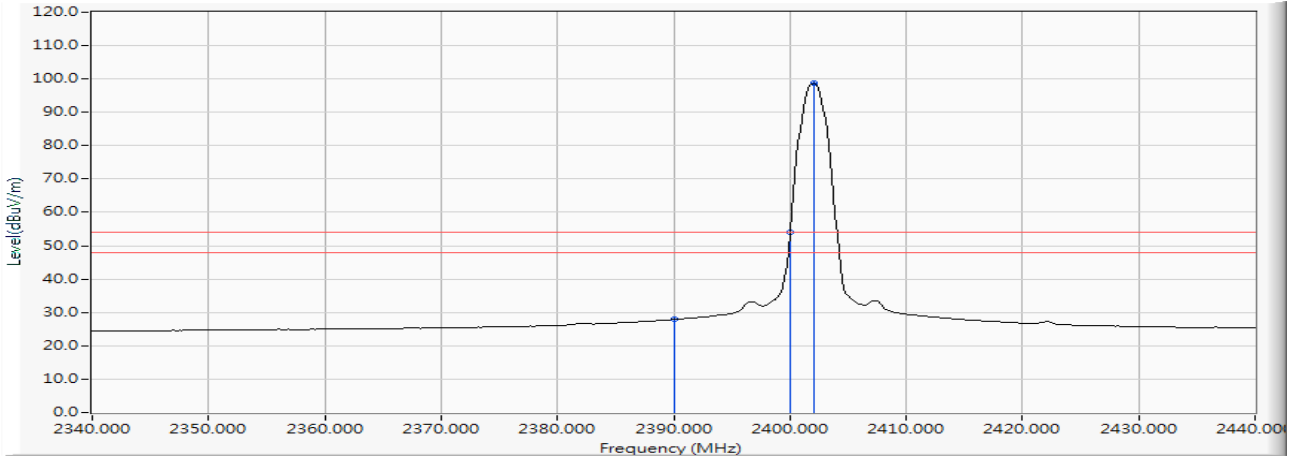|		
Product	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2019/01/23
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

Horizontal
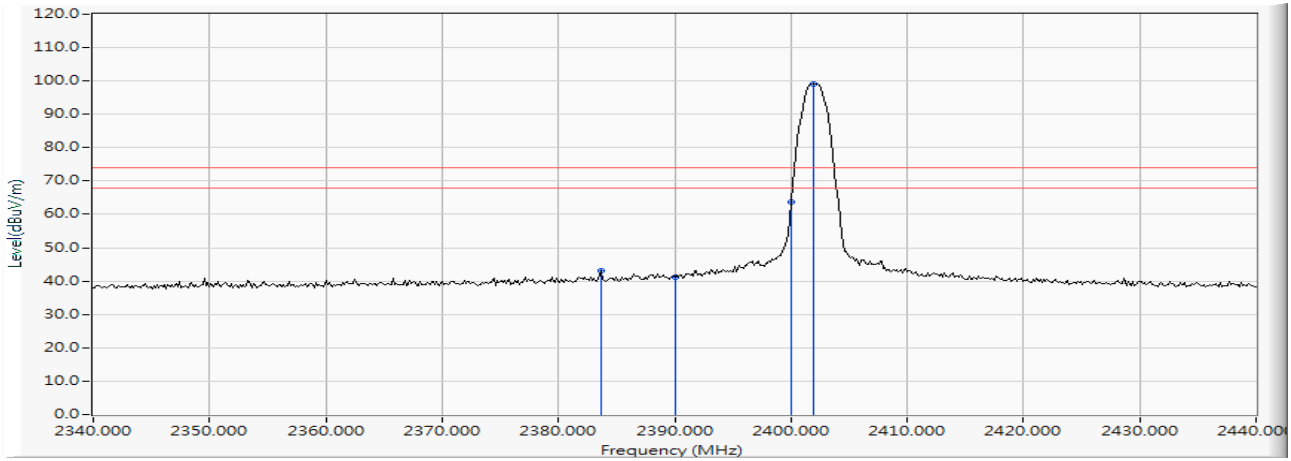
		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2383.623	-2.715	45.824	43.109	-30.891	74.000	PEAK
2		2390.000	-2.687	43.956	41.269	-32.731	74.000	PEAK
3		2400.000	-2.660	66.451	63.791	-10.209	74.000	PEAK
4	*	2401.884	-2.658	101.890	99.232	25.232	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

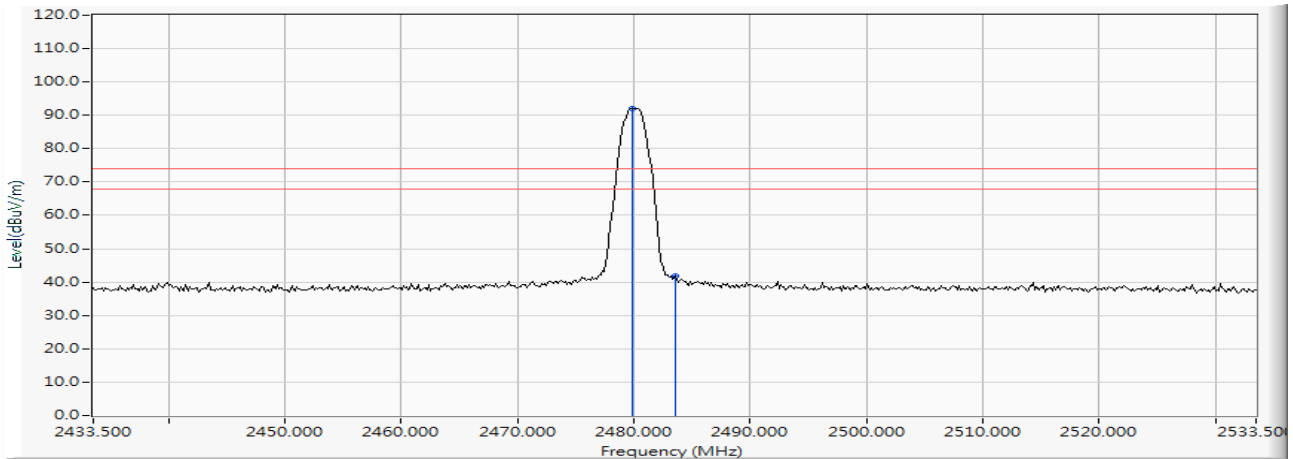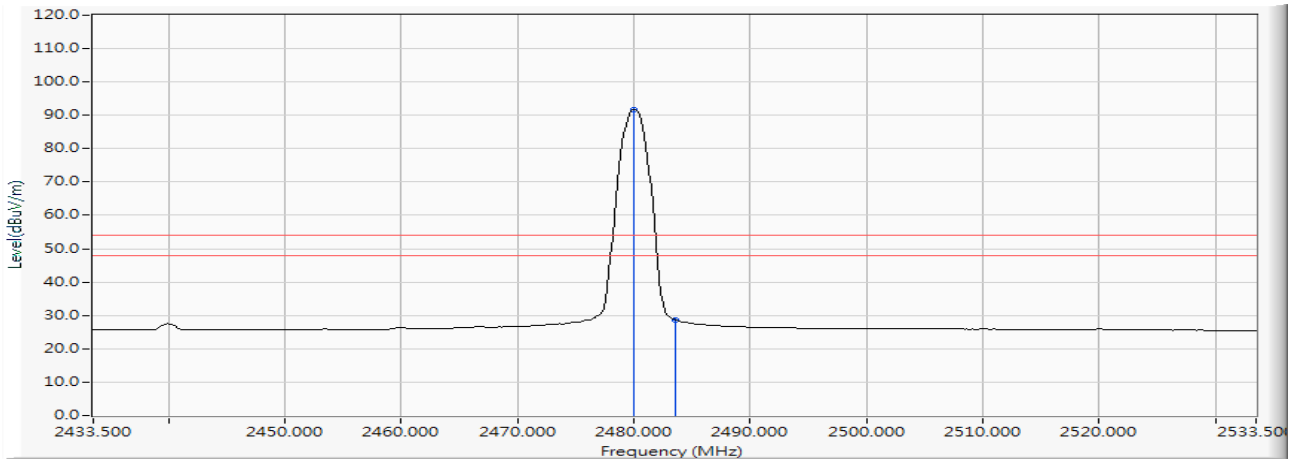| Product	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2019/01/23
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	-2.687	31.526	28.839	-25.161	54.000	AVERAGE
2		2400.000	-2.660	56.785	54.125	0.125	54.000	AVERAGE
3	*	2402.029	-2.657	101.509	98.852	44.852	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2019/01/23
Test Mode	:	Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2388.551	-4.154	45.121	40.967	-33.033	74.000	PEAK
2		2390.000	-4.159	44.895	40.736	-33.264	74.000	PEAK
3		2400.000	-4.171	67.885	63.714	-10.286	74.000	PEAK
4	*	2401.884	-4.171	103.182	99.011	25.011	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Band Edge
Test Site   :   No.3 OATS
Test date   :   2019/01/23
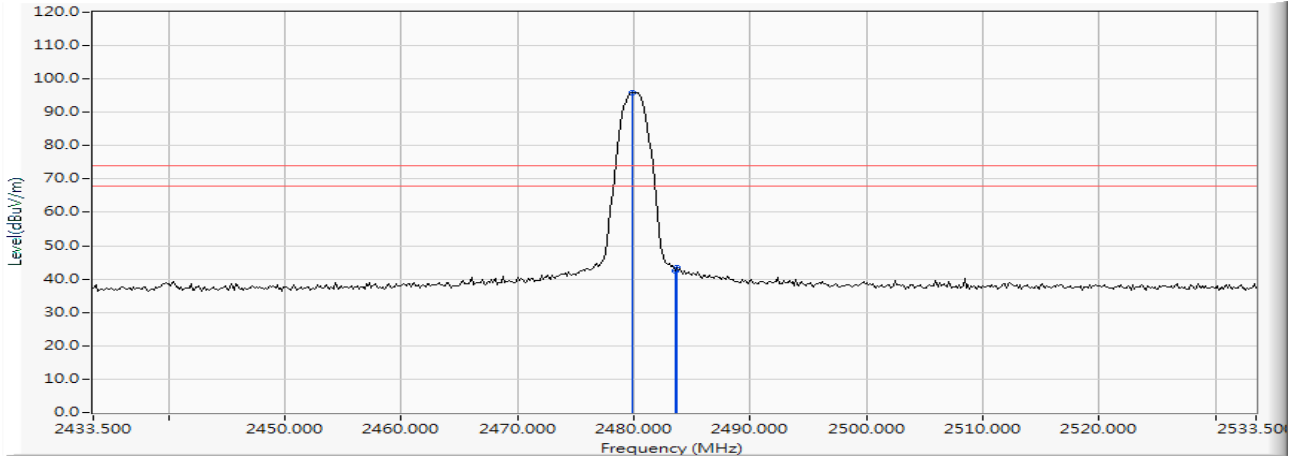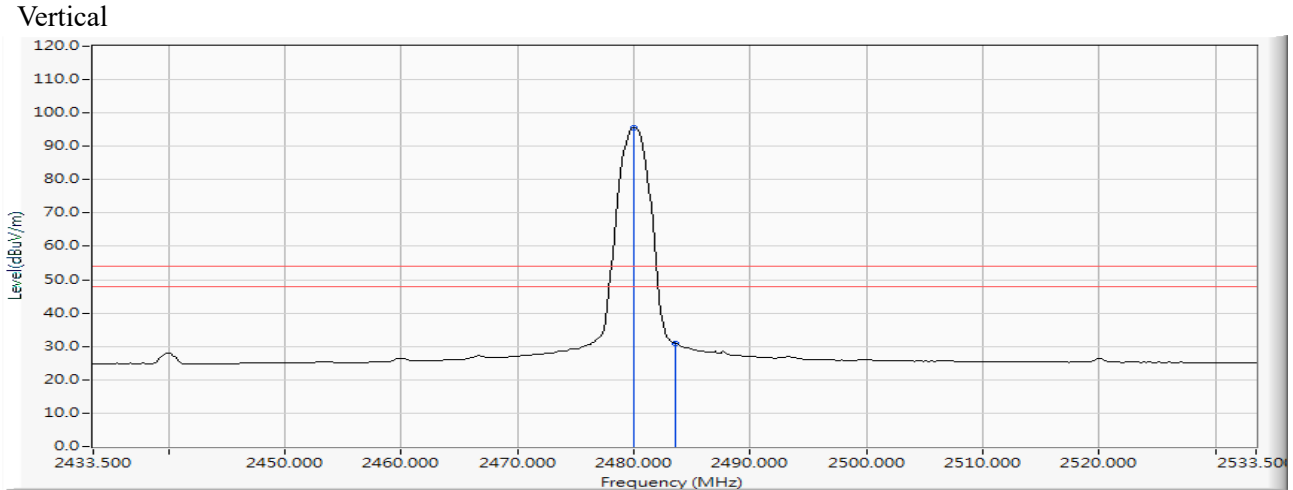Test Mode   :   Mode 1: Transmit - 1Mbps (GFSK) (2402MHz)

Vertical

		Frequency	Correct Factor	Reading Level	Measure Level	Margin	Limit	Detector Type
		(MHz)	(dB)	(dBuV)	(dBuV/m)	(dB)	(dBuV/m)	
1		2390.000	-4.159	31.995	27.836	-26.164	54.000	AVERAGE
2		2400.000	-4.171	58.094	53.923	-0.077	54.000	AVERAGE
3	*	2402.029	-4.171	102.816	98.645	44.645	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/01/23
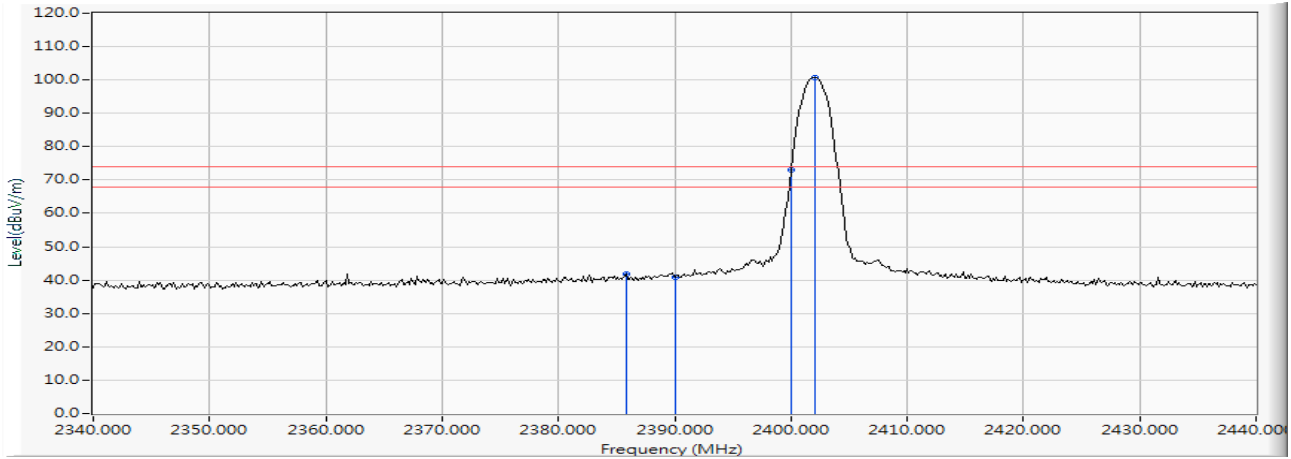Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.877	-2.605	94.758	92.153	18.153	74.000	PEAK
2		2483.500	-2.601	44.435	41.833	-32.167	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/01/23
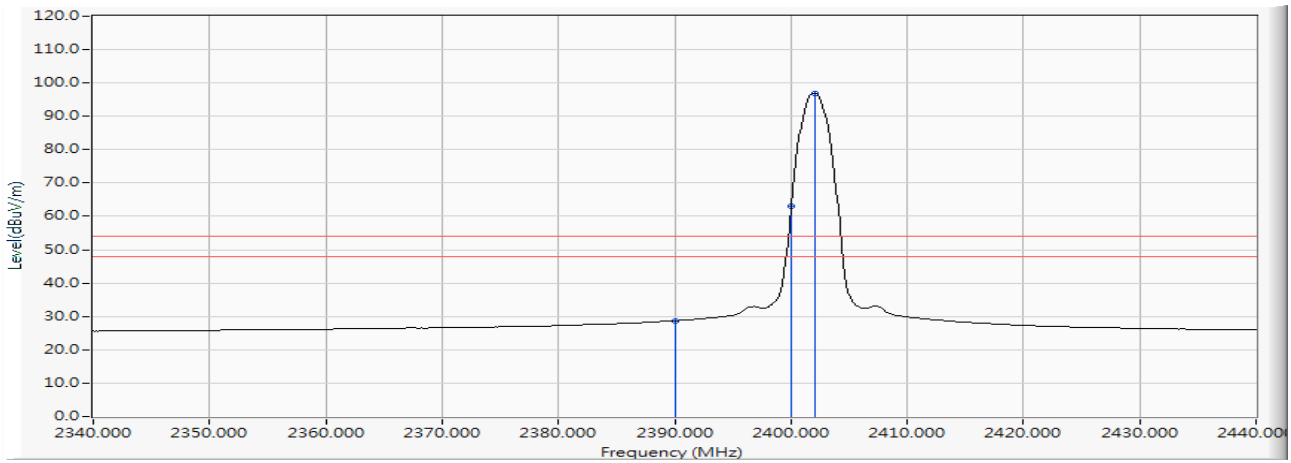Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-2.605	94.365	91.760	37.760	54.000	AVERAGE
2		2483.500	-2.601	31.376	28.774	-25.226	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/01/23
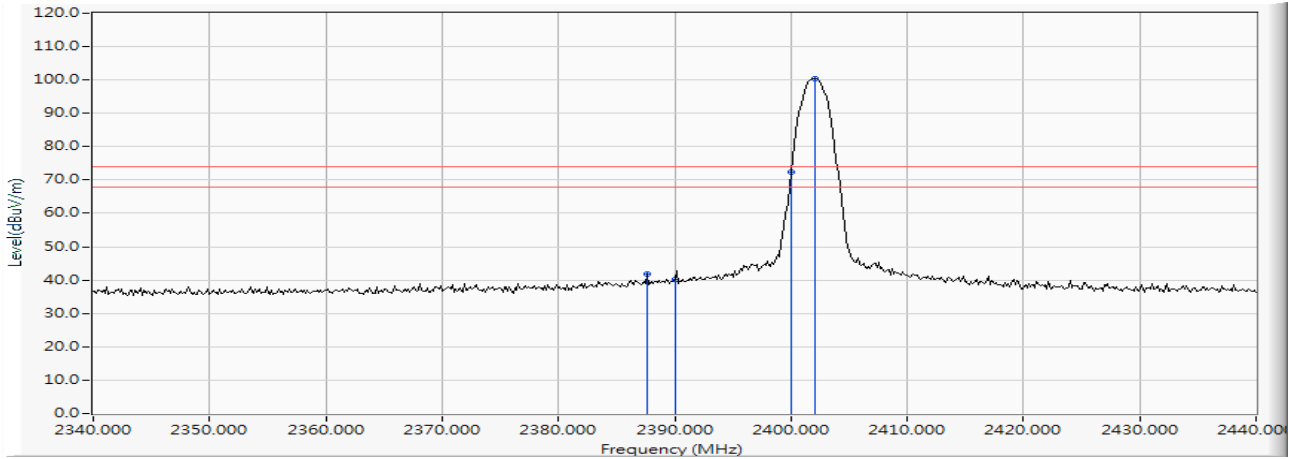Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2479.877	-3.978	99.915	95.937	21.937	74.000	PEAK
2		2483.500	-3.966	46.545	42.578	-31.422	74.000	PEAK
3		2483.645	-3.966	47.539	43.573	-30.427	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

![DEKRA]

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/01/23
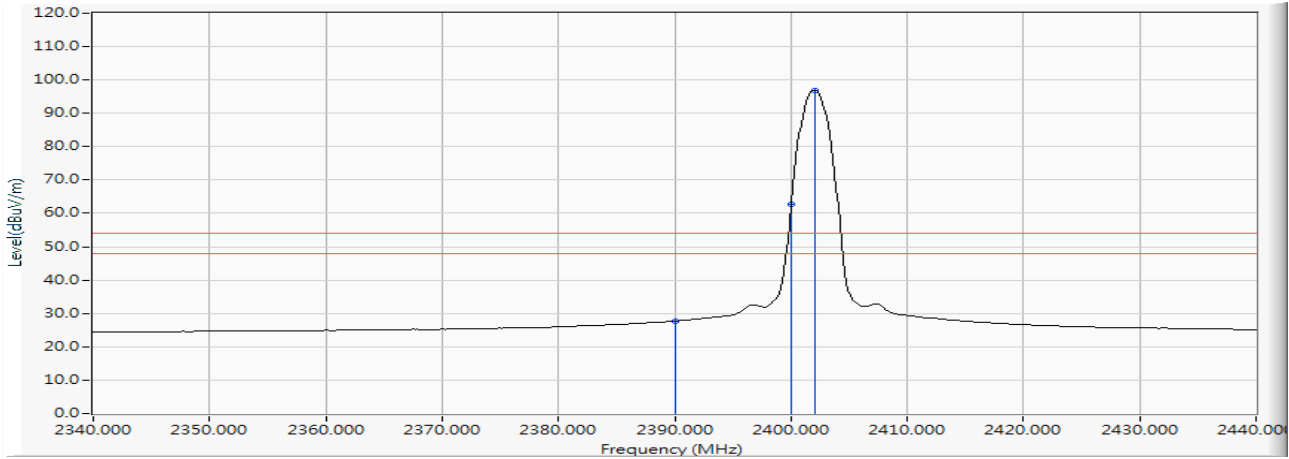Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (2480MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-3.978	99.548	95.570	41.570	54.000	AVERAGE
2		2483.500	-3.966	34.964	30.997	-23.003	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/01/23
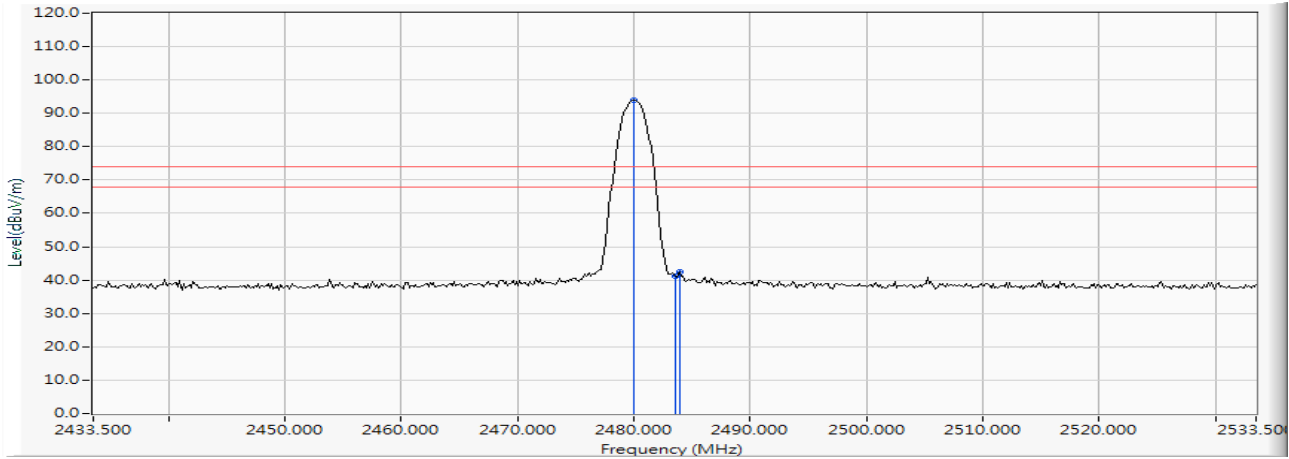Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2385.797	-2.706	44.676	41.971	-32.029	74.000	PEAK
2		2390.000	-2.687	43.685	40.998	-33.002	74.000	PEAK
3		2400.000	-2.660	75.607	72.947	-1.053	74.000	PEAK
4	*	2402.029	-2.657	103.311	100.654	26.654	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Band Edge
Test Site   :   No.3 OATS
Test date   :   2019/01/23
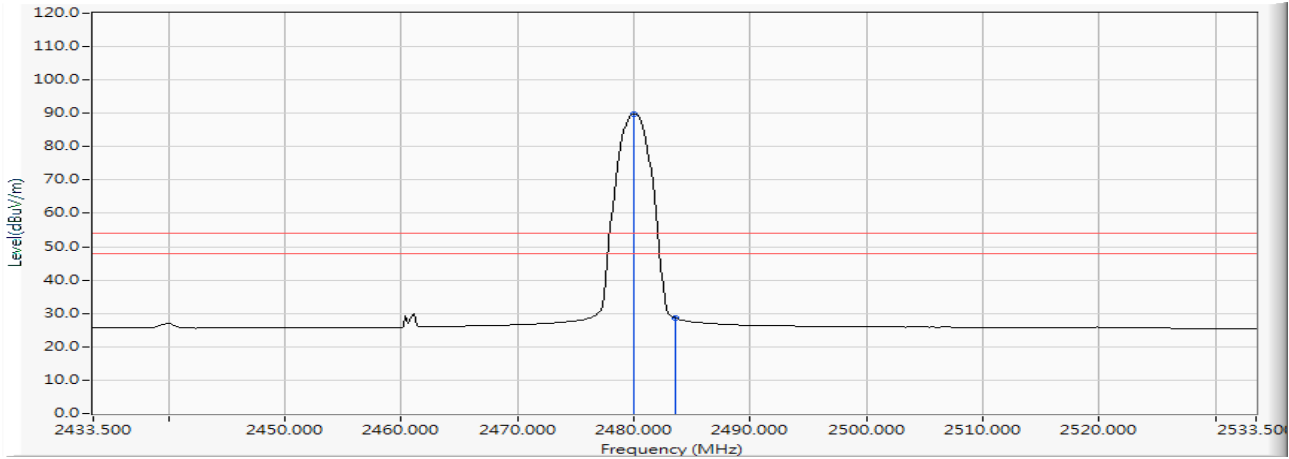Test Mode   :   Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	-2.687	31.353	28.666	-25.334	54.000	AVERAGE
2		2400.000	-2.660	65.592	62.932	8.932	54.000	AVERAGE
3	*	2402.029	-2.657	99.561	96.904	42.904	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2019/01/23
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2387.681	-4.151	46.104	41.953	-32.047	74.000	PEAK
2		2390.000	-4.159	44.359	40.200	-33.800	74.000	PEAK
3		2400.000	-4.171	76.634	72.463	-1.537	74.000	PEAK
4	*	2402.029	-4.171	104.674	100.503	26.503	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/01/23
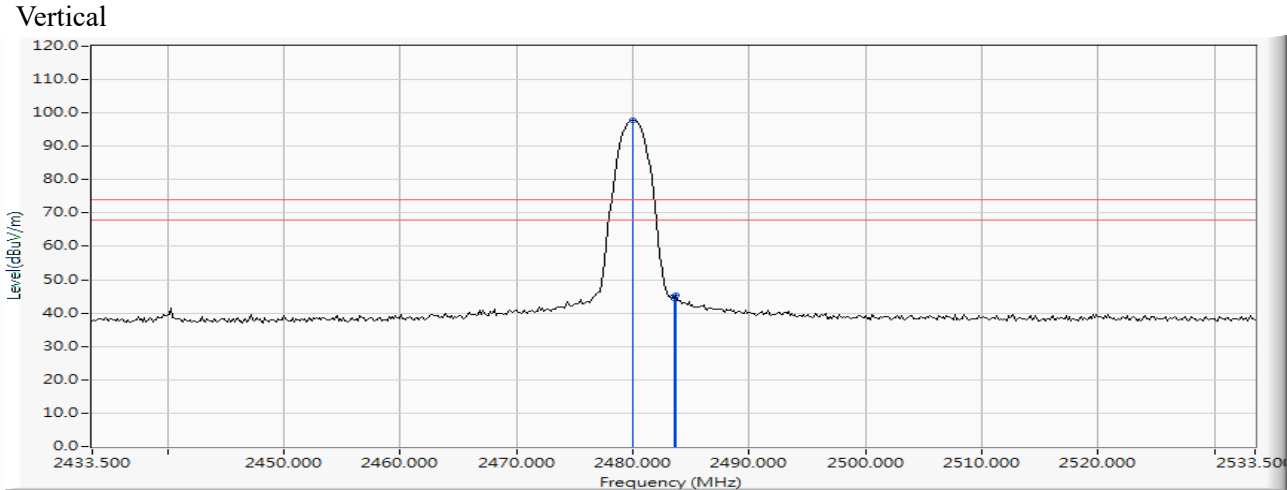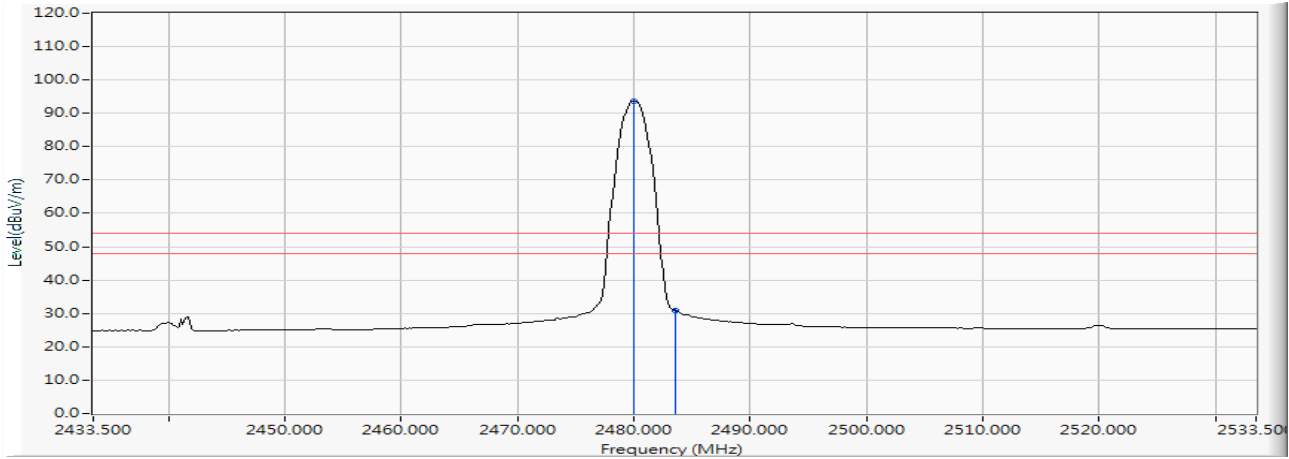Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1		2390.000	-4.159	31.859	27.700	-26.300	54.000	AVERAGE
2		2400.000	-4.171	66.954	62.783	8.783	54.000	AVERAGE
3	*	2402.029	-4.171	100.926	96.755	42.755	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

DEKRA

Product	:	Lenovo 700 Ultraportable Bluetooth Speaker
Test Item	:	Band Edge
Test Site	:	No.3 OATS
Test date	:	2019/01/23
Test Mode	:	Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-2.605	96.536	93.931	19.931	74.000	PEAK
2		2483.500	-2.601	43.720	41.118	-32.882	74.000	PEAK
3		2483.935	-2.601	44.917	42.316	-31.684	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/01/23
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

Horizontal

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-2.605	92.473	89.868	35.868	54.000	AVERAGE
2		2483.500	-2.601	31.223	28.621	-25.379	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/01/23
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-3.978	101.829	97.851	23.851	74.000	PEAK
2		2483.500	-3.966	48.248	44.281	-29.719	74.000	PEAK
3		2483.645	-3.966	49.440	45.474	-28.526	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test date : 2019/01/23
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2480MHz)

Vertical

		Frequency (MHz)	Correct Factor (dB)	Reading Level (dBuV)	Measure Level (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Detector Type
1	*	2480.022	-3.978	97.755	93.777	39.777	54.000	AVERAGE
2		2483.500	-3.966	34.854	30.887	-23.113	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 + Correct Factor.
6. The average measurement was not performed when the peak measured data under the limit of average detection.

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(Hopping off)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00:

Figure Channel 78:

Product   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Band Edge
Test Site   :   No.3 OATS
Test Mode   :   Mode 2: Transmit - 3Mbps (8DPSK) (Hopping off)

Measurement Level Δ (dB)	Result
> 20	PASS
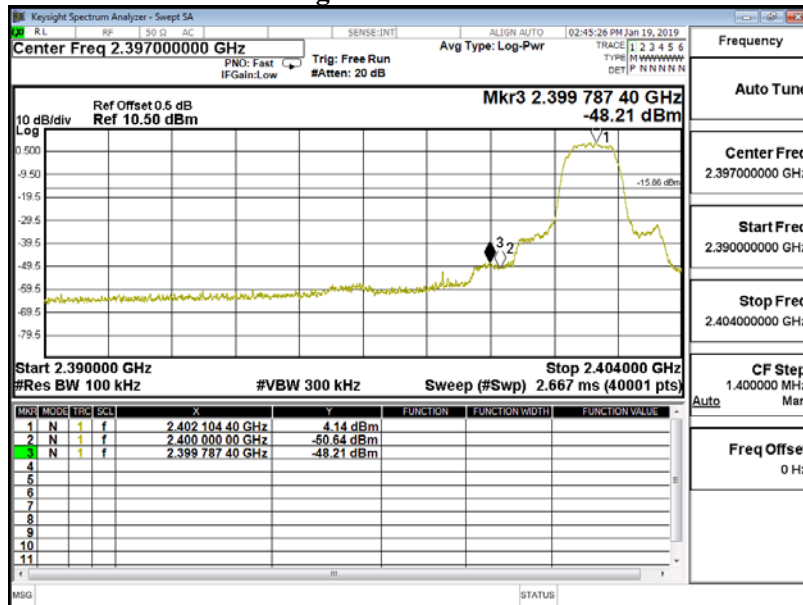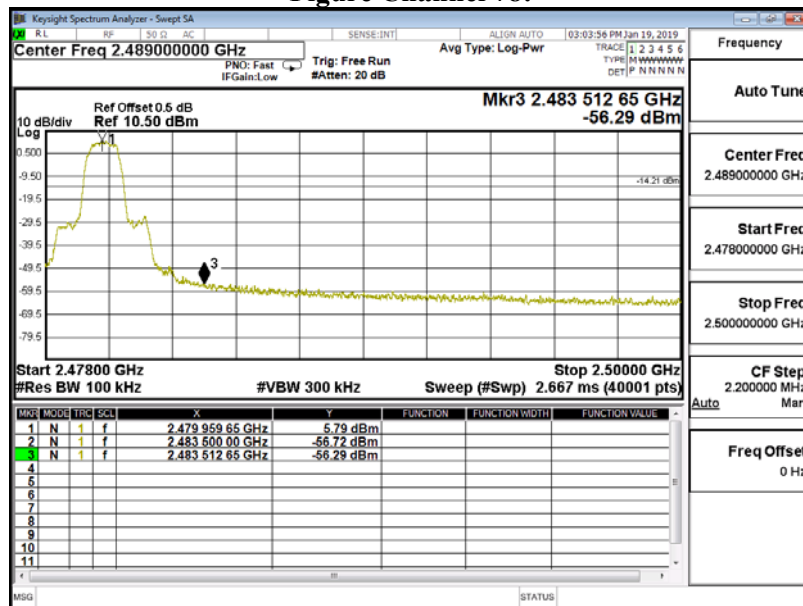
Figure Channel 00:

Figure Channel 78:

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)(Hopping on)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00 Hopping:
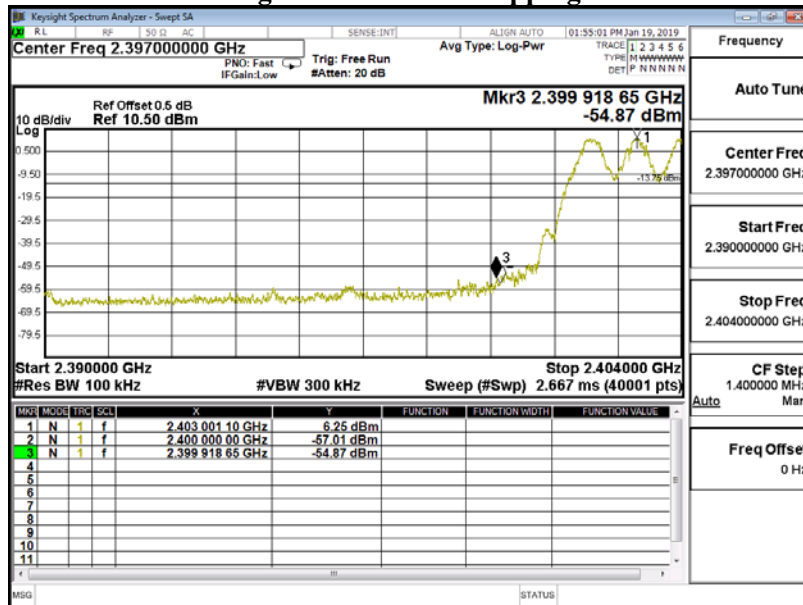
Figure Channel 78 Hopping:
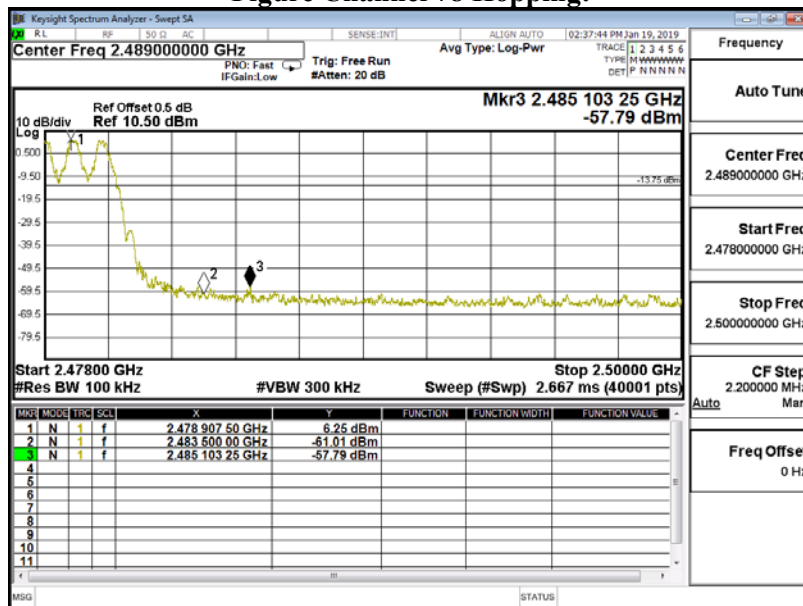
Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Band Edge
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (Hopping on)

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00 Hopping:
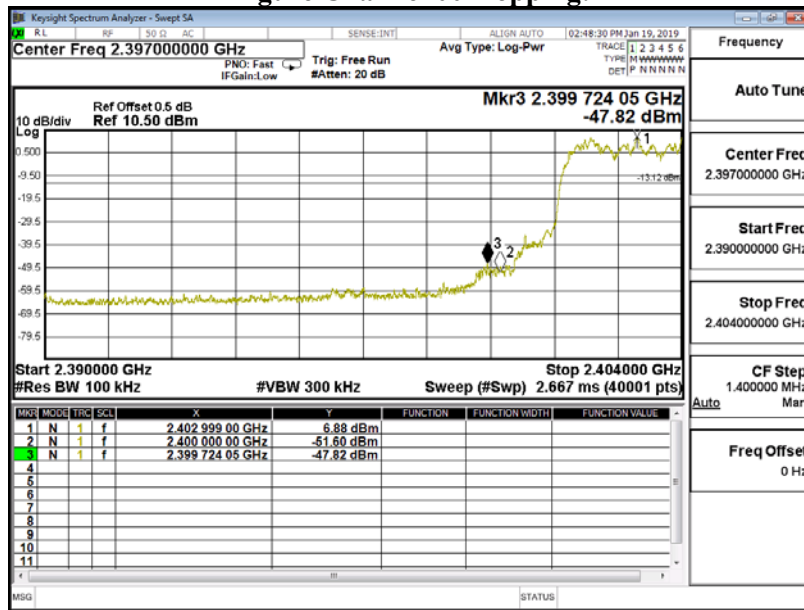
Figure Channel 78 Hopping:
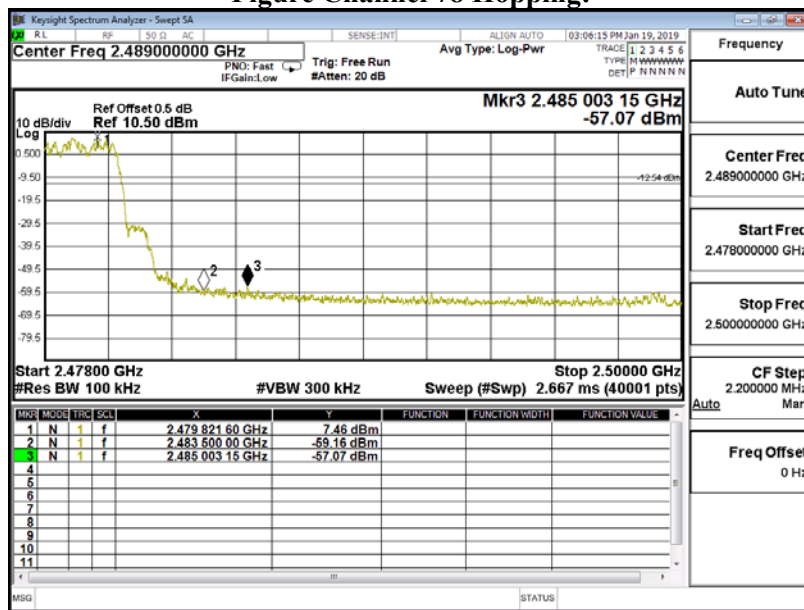
7. Channel Number

7.1. Test Setup
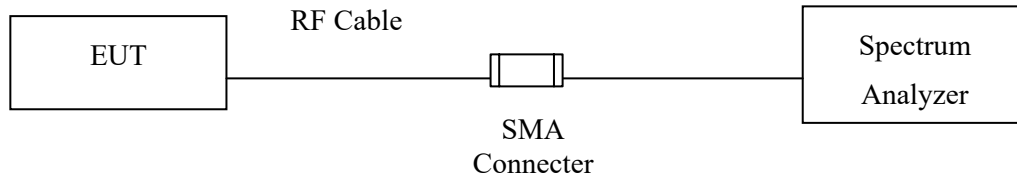
7.2. Limit

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

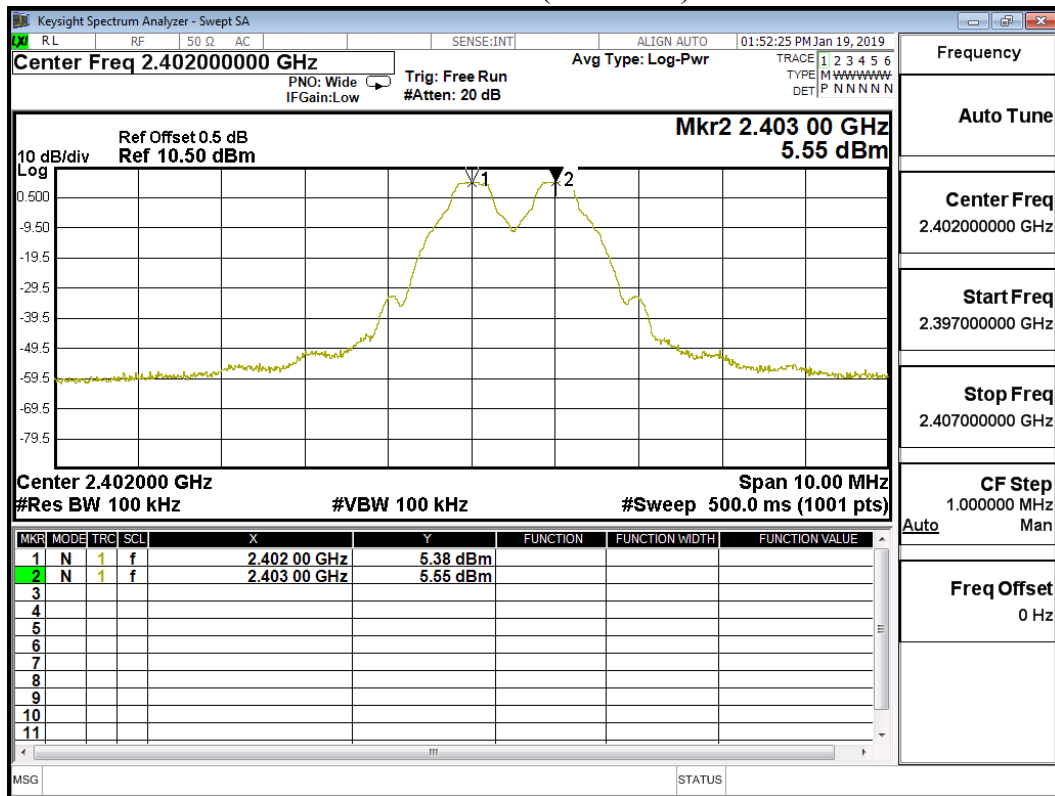## 7.5. Test Result of Channel Number

Product   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Channel Number
Test Site   :   No.3 OATS
Test Mode   :   Mode 1: Transmit - 1Mbps (GFSK)

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

2402-2421MHz   **2422-2441MHz**
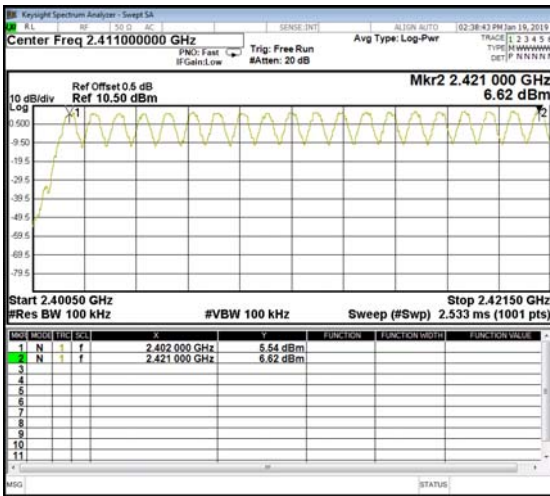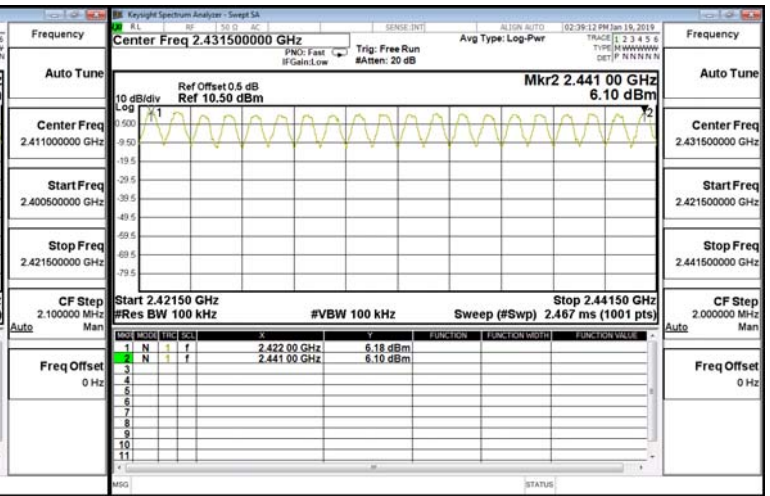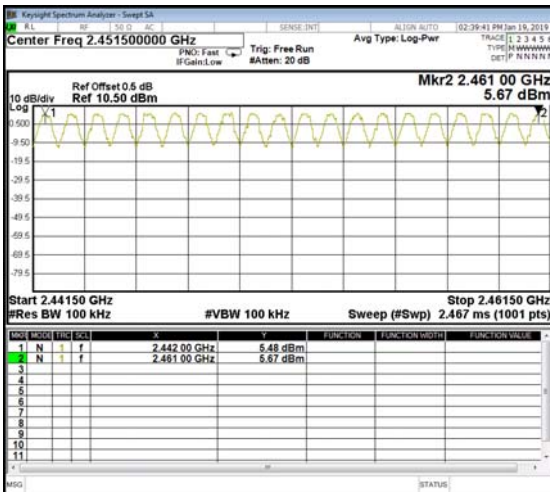
**2442-2461MHz**   **2462-2480MHz**
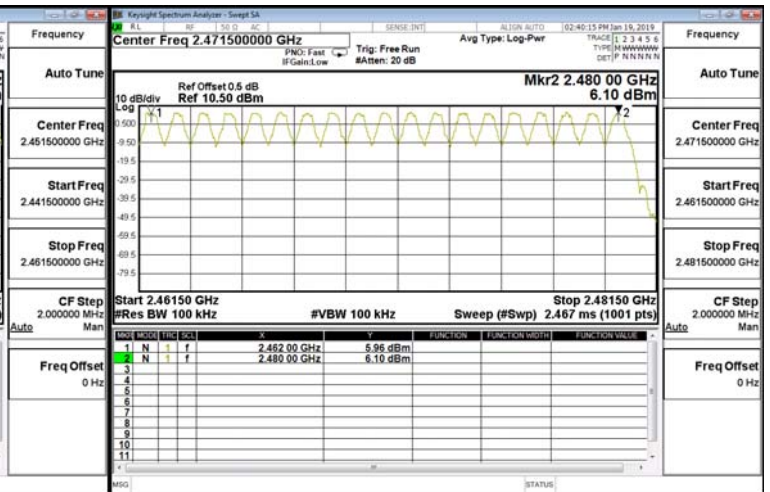
Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Channel Number
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

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

2402-2421MHz
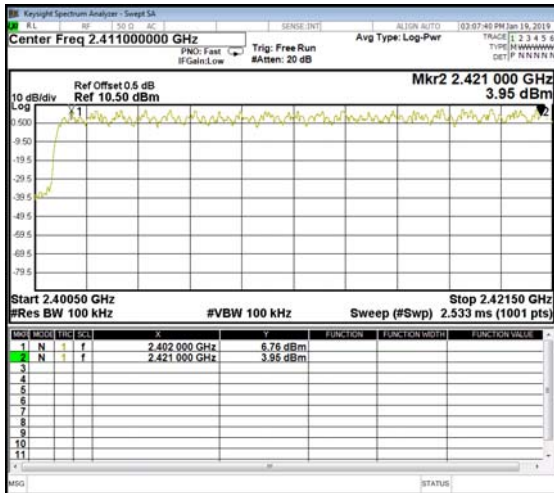
2422-2441MHz
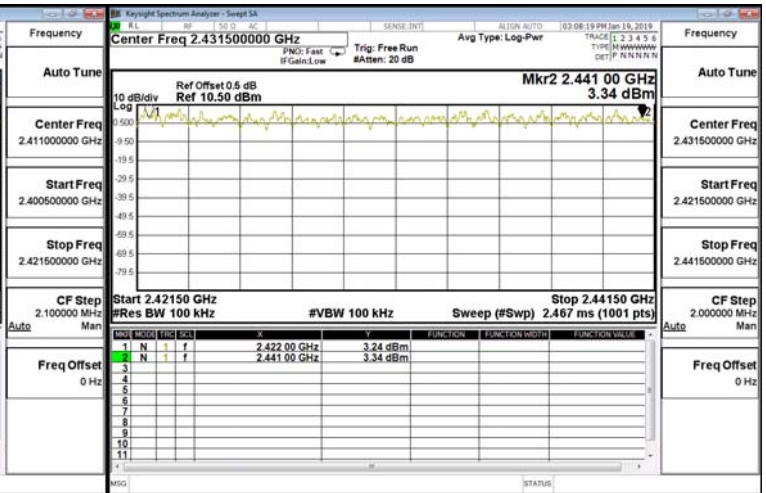
2442-2461MHz
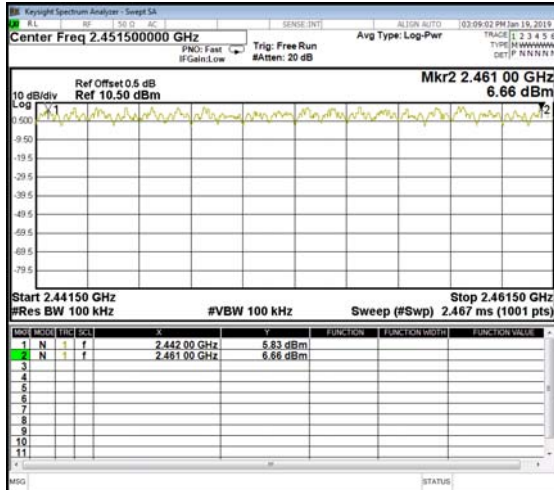
2462-2480MHz
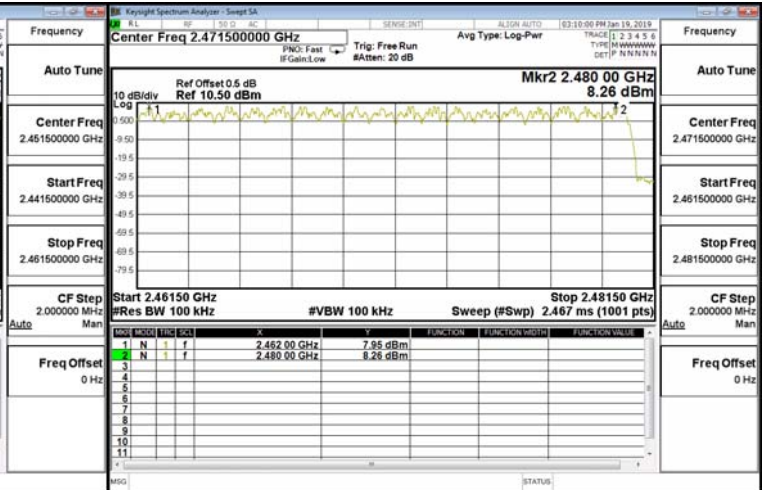
8. Channel Separation

8.1. Test Setup
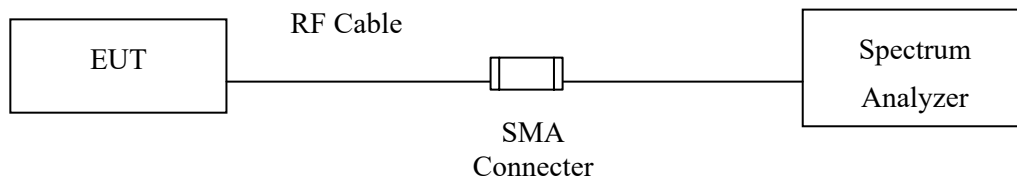
8.2. Limit

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

± 283Hz

8.5. Test Result of Channel Separation

Product   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Channel Separation
Test Site   :   No.3 OATS
Test Mode   :   Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	648.0	Pass
39	2441	1000	>25 kHz	680.0	Pass
78	2480	1000	>25 kHz	648.0	Pass

NOTE: The 20dB Bandwidth is refer to section 10.
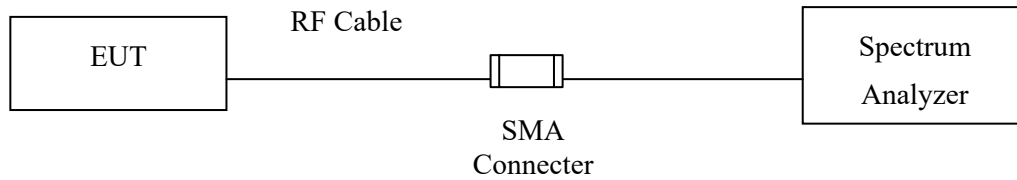
Channel 00 (2402MHz)

Channel 39 (2441MHz)
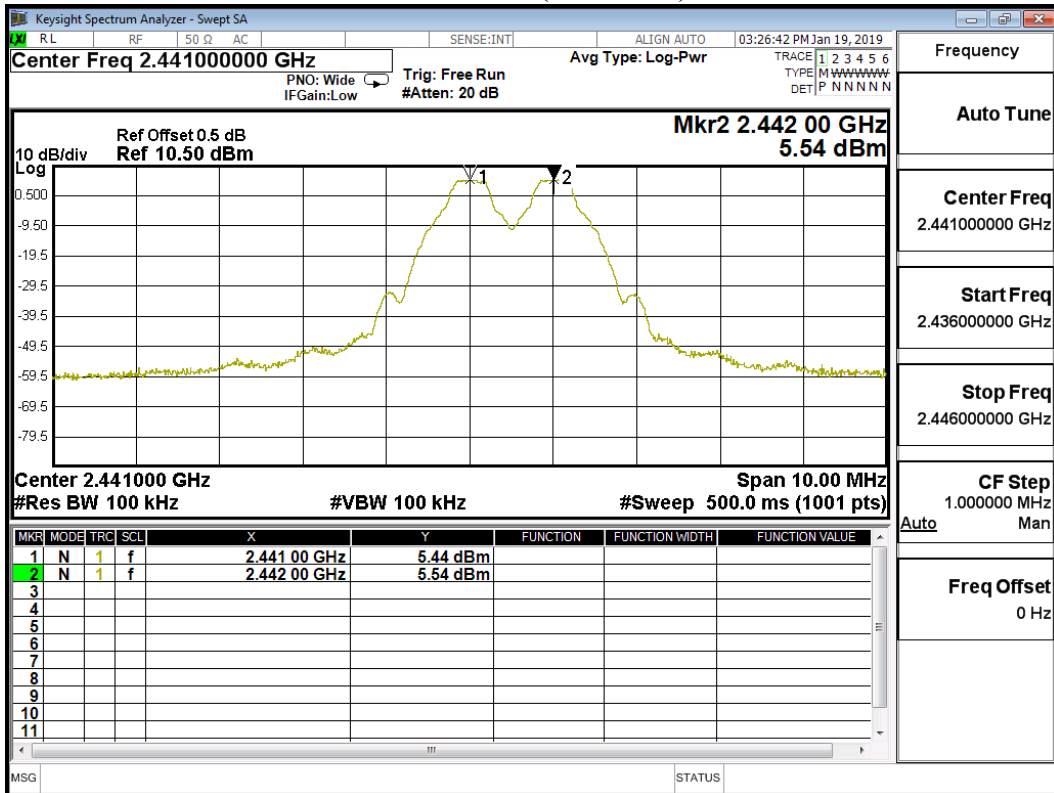
Channel 78 (2480MHz)
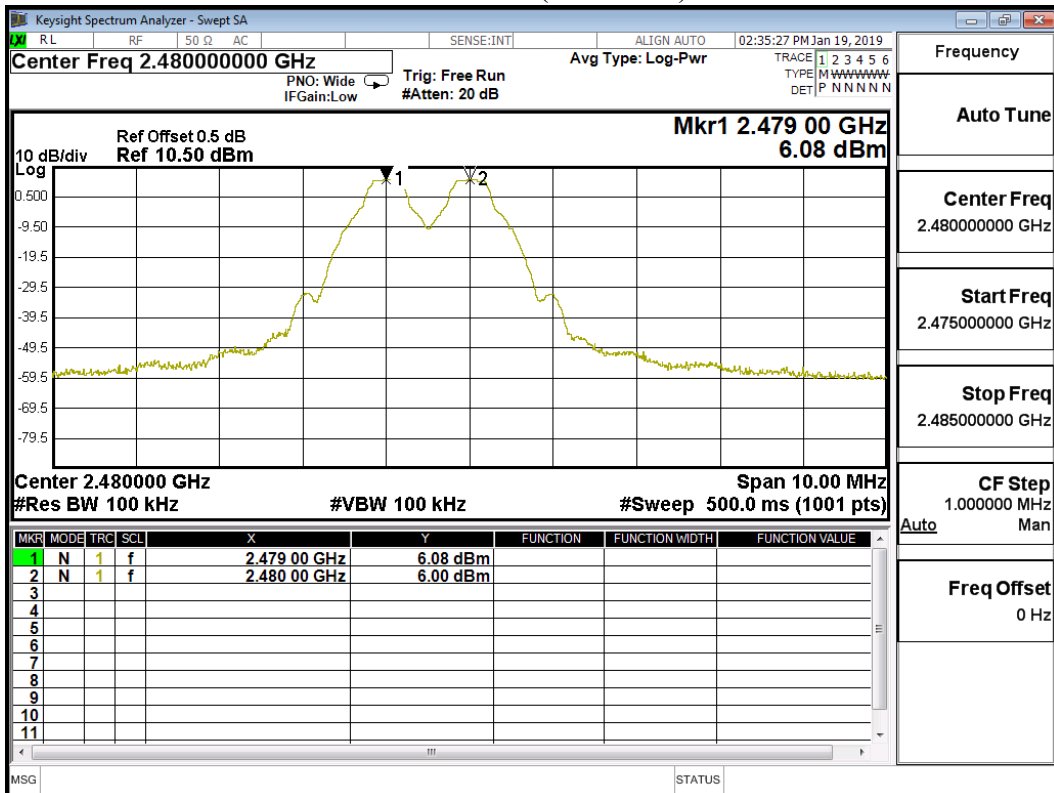
Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Channel Separation
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	904.0	Pass
39	2441	1000	>25 kHz	904.0	Pass
78	2480	1000	>25 kHz	904.0	Pass

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

Channel 00 (2402MHz)
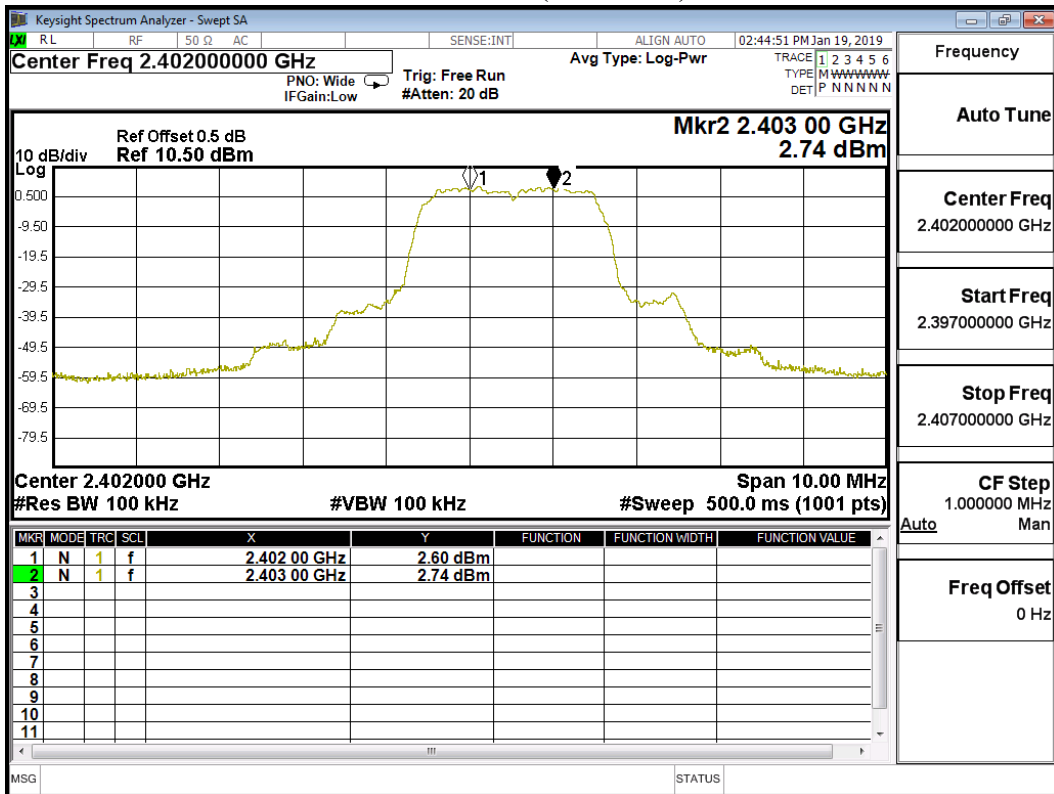
Channel 39 (2441MHz)
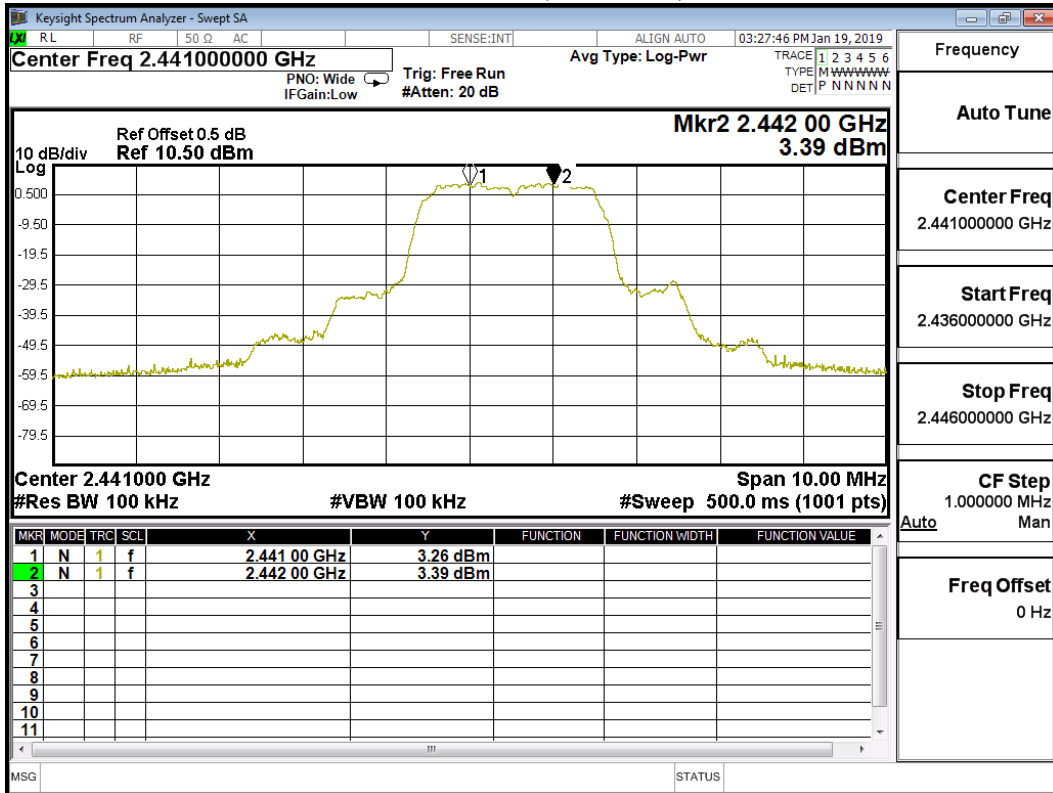
Channel 78 (2480MHz)
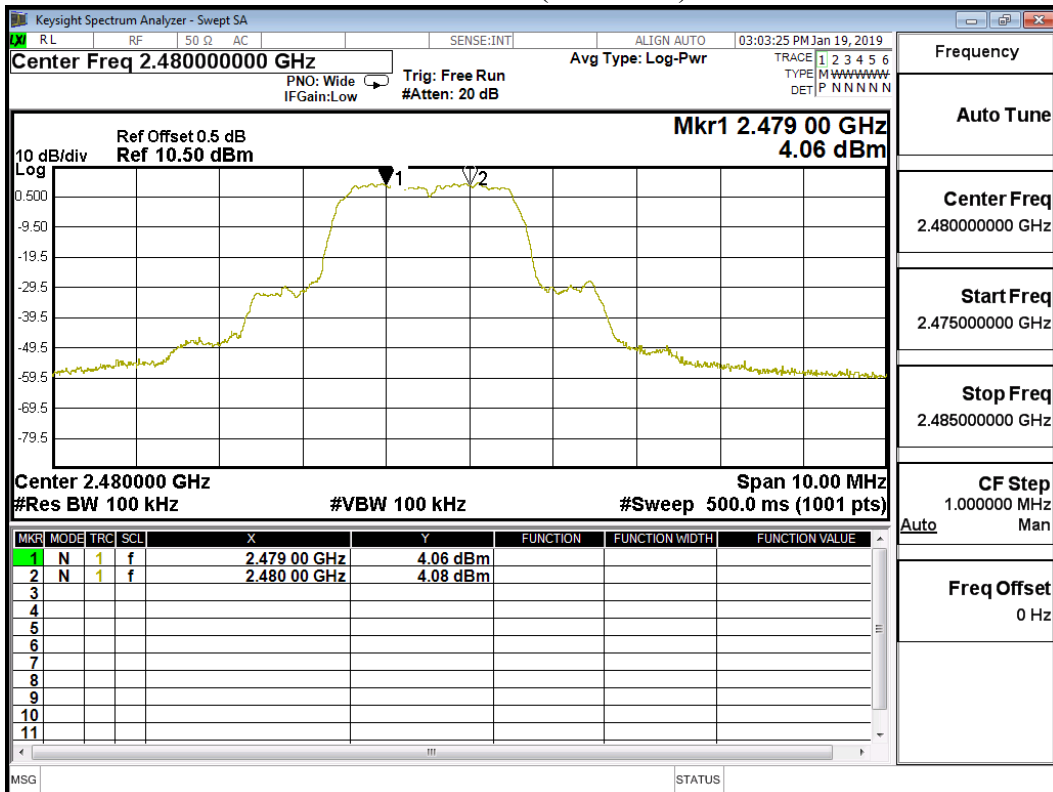
9. Dwell Time

9.1. Test Setup

```
┌─────────┐      RF Cable              ┌──────────────┐
│         │                           │   Spectrum   │
│   EUT   │──────────────┤ ├──────────│   Analyzer   │
│         │                           │              │
└─────────┘                           └──────────────┘
                         SMA
                       Connecter
```

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

$\pm$ 25msec

9.5. Test Result of Dwell Time

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Dwell Time
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Dwell Time (ms)	Limit (ms)	Result
2402	2.890	101	31600	291.890	400	Pass
2441	2.890	107	31600	309.230	400	Pass
2480	2.890	100	31600	289.000	400	Pass

Dwell time = Time slot length*Hopping of number

Sweep time= 79 CHannel * 0.4
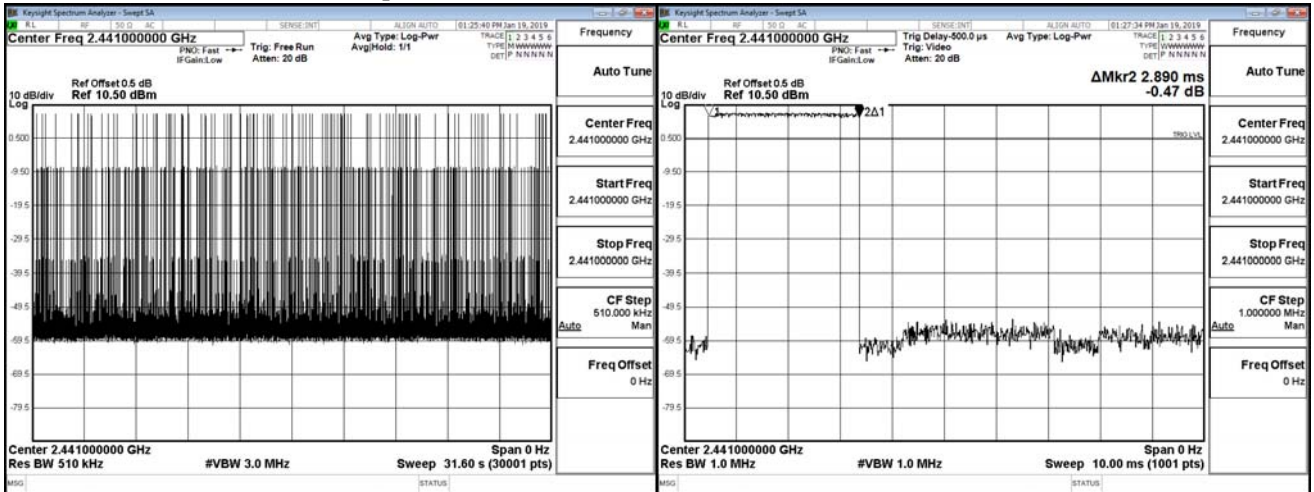
CH 00 Time Interval between hops   CH 00 Transmission Time
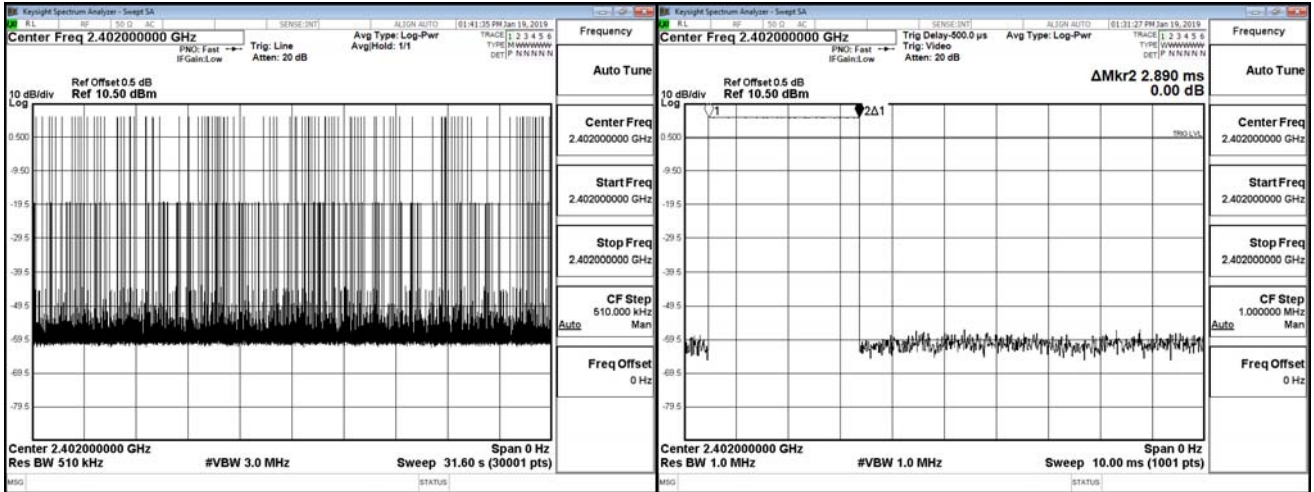

CH39 Time Interval between hops   CH 39Transmission Time
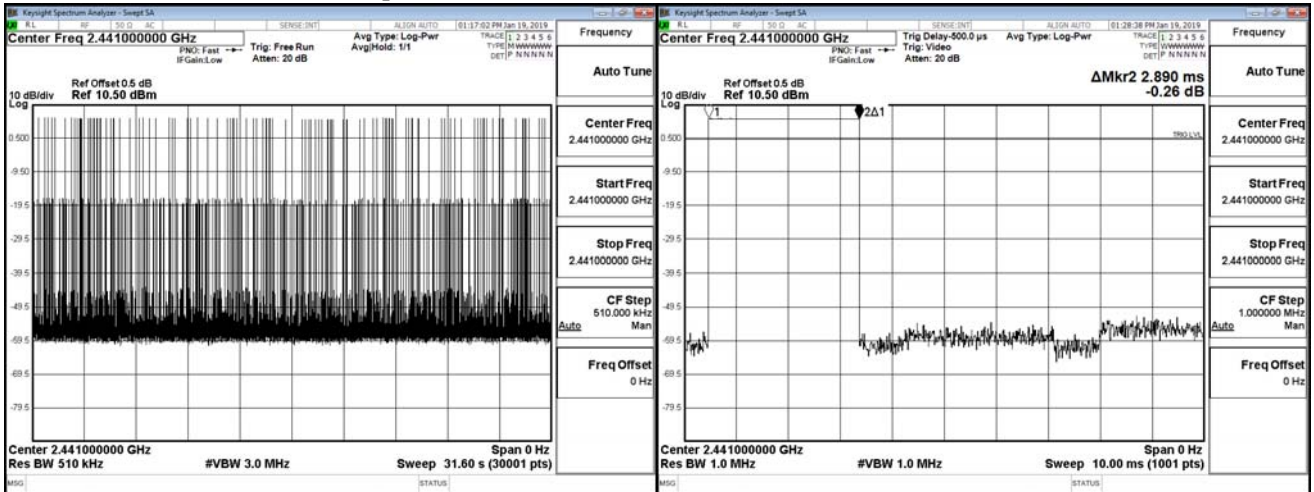
CH 78 Time Interval between hops   CH 78 Transmission Time
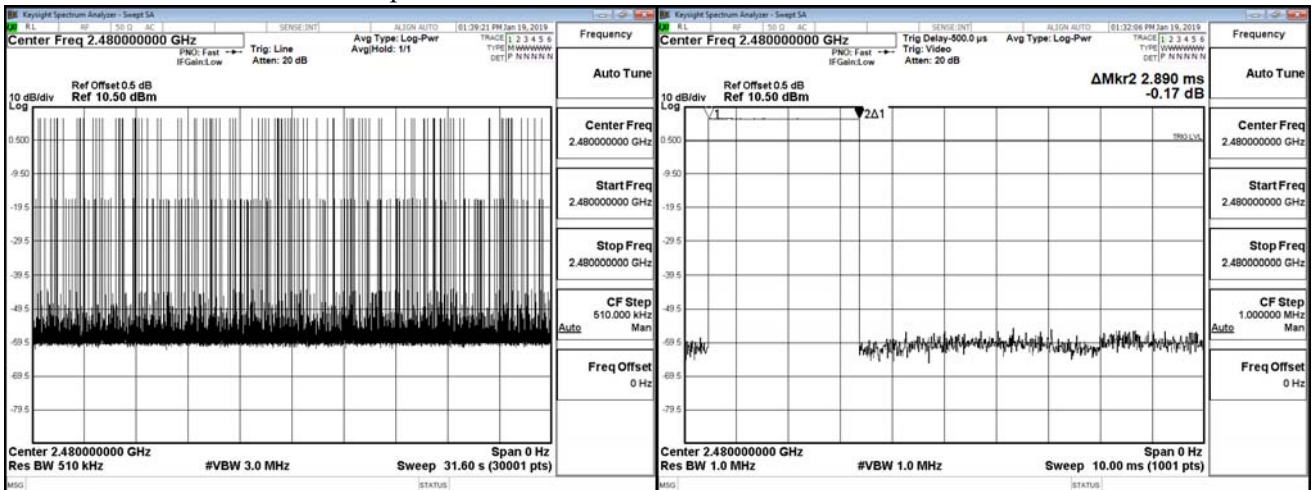
Note:

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

Product   :   Lenovo 700 Ultraportable Bluetooth Speaker
Test Item   :   Dwell Time
Test Site   :   No.3 OATS
Test Mode   :   Mode 2: Transmit - 3Mbps (8DPSK) (Channel 00,39,78 –DH5)

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Dwell Time (Sec)	Limit (Sec)	Result
2402	2.900	99	31600	287.100	400	Pass
2441	2.890	110	31600	317.900	400	Pass
2480	2.890	106	31600	306.340	400	Pass

Dwell time =   Time slot length*Hopping of number

Sweep time= 79 CHannel * 0.4

CH 00 Time Interval between hops   CH 00 Transmission Time
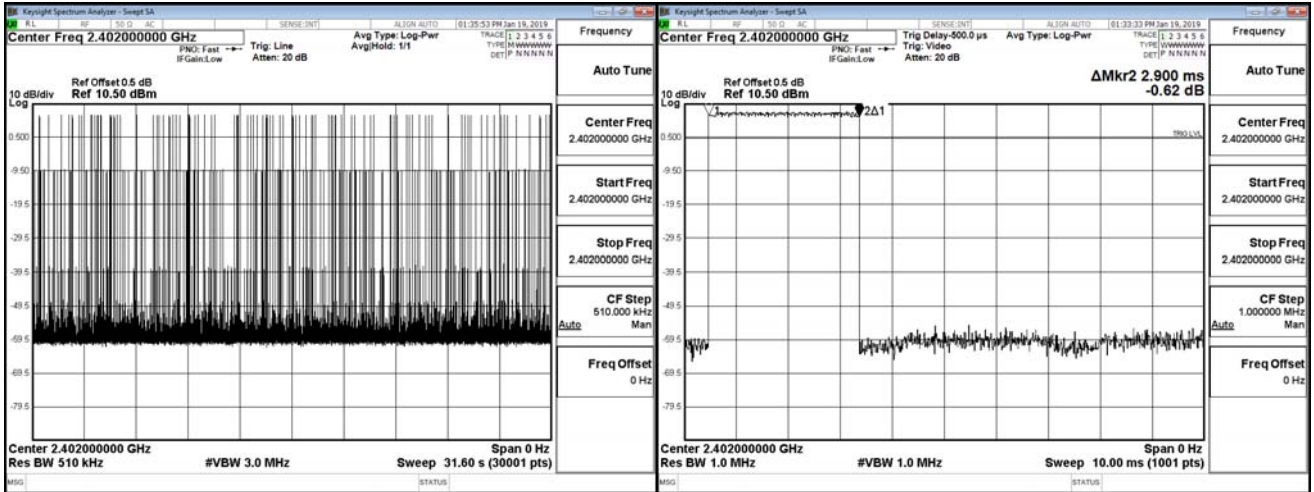
CH39 Time Interval between hops   CH 39Transmission Time

CH 78 Time Interval between hops   CH 78 Transmission Time
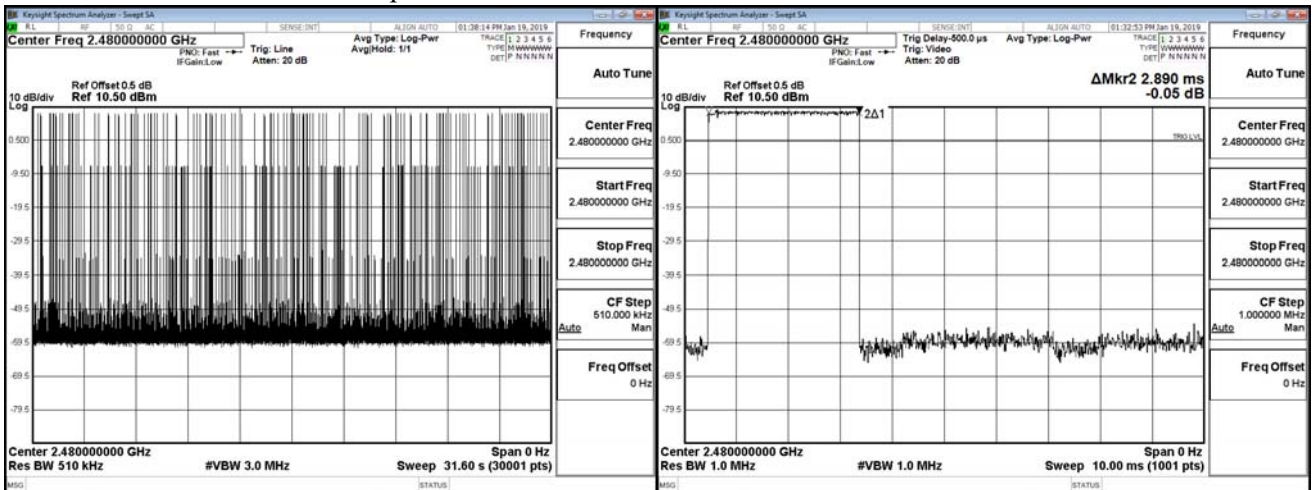
Note:

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

10. Occupied Bandwidth

10.1. Test Setup
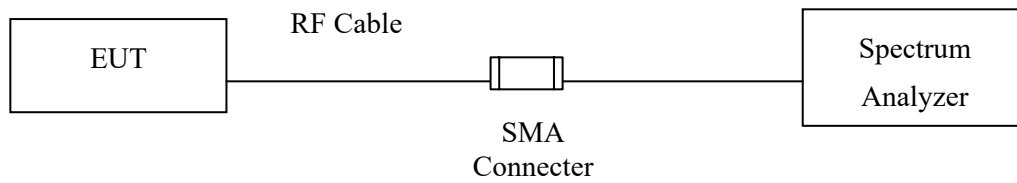
10.2. Limits

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.
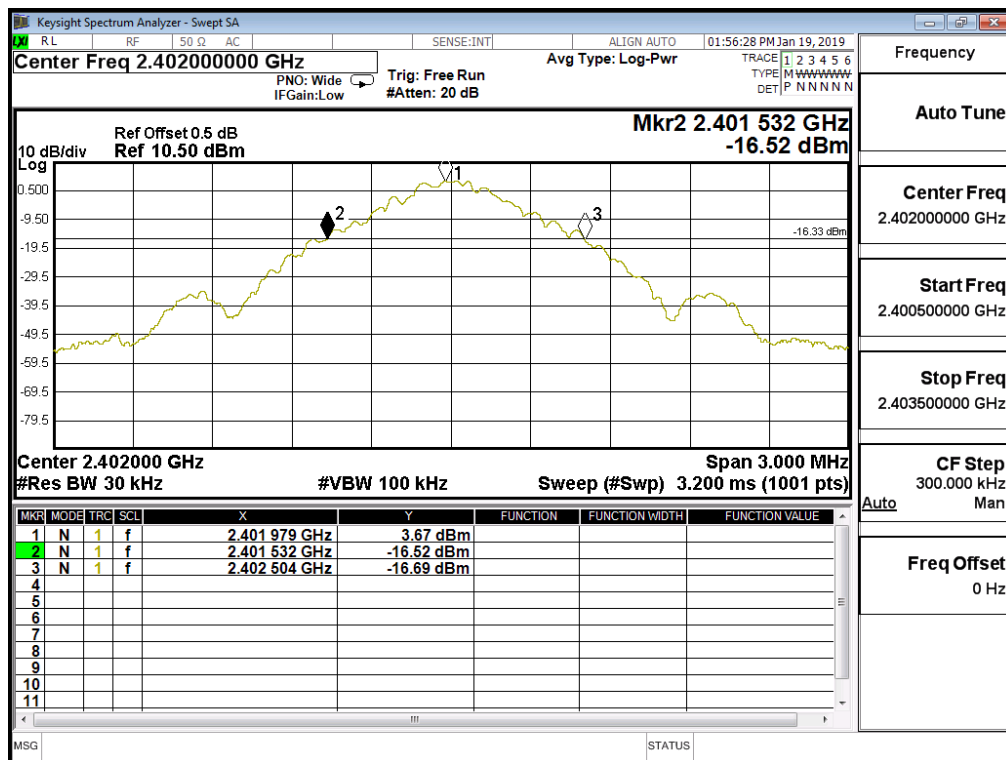
10.4. Uncertainty

± 283Hz

10.5. Test Result of Occupied Bandwidth
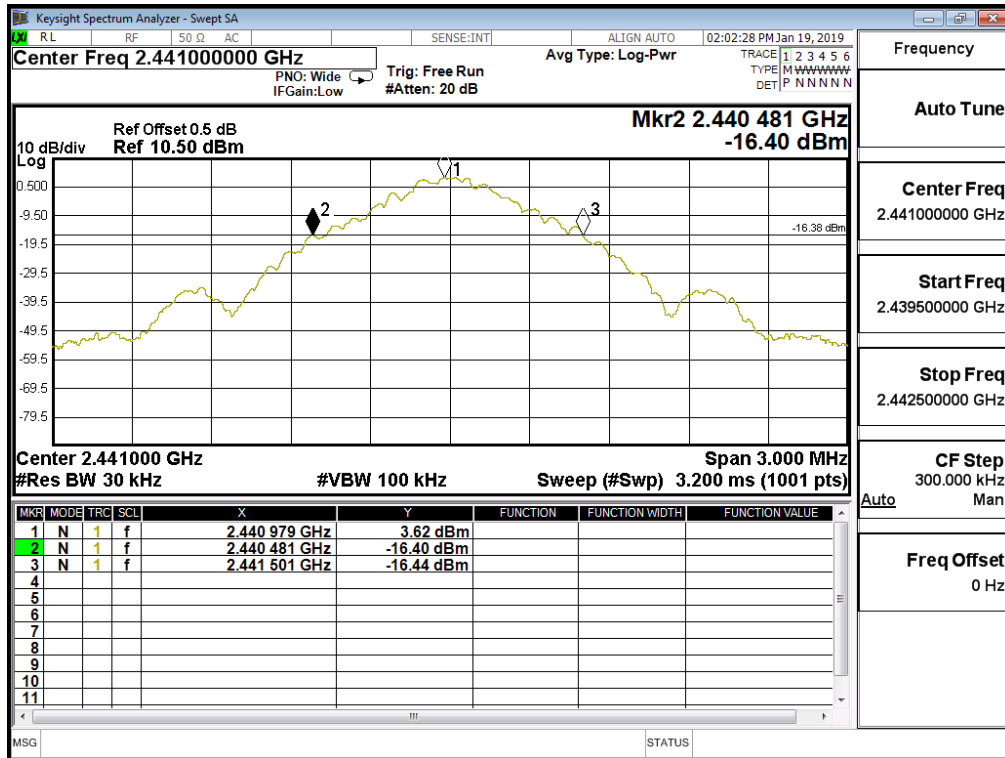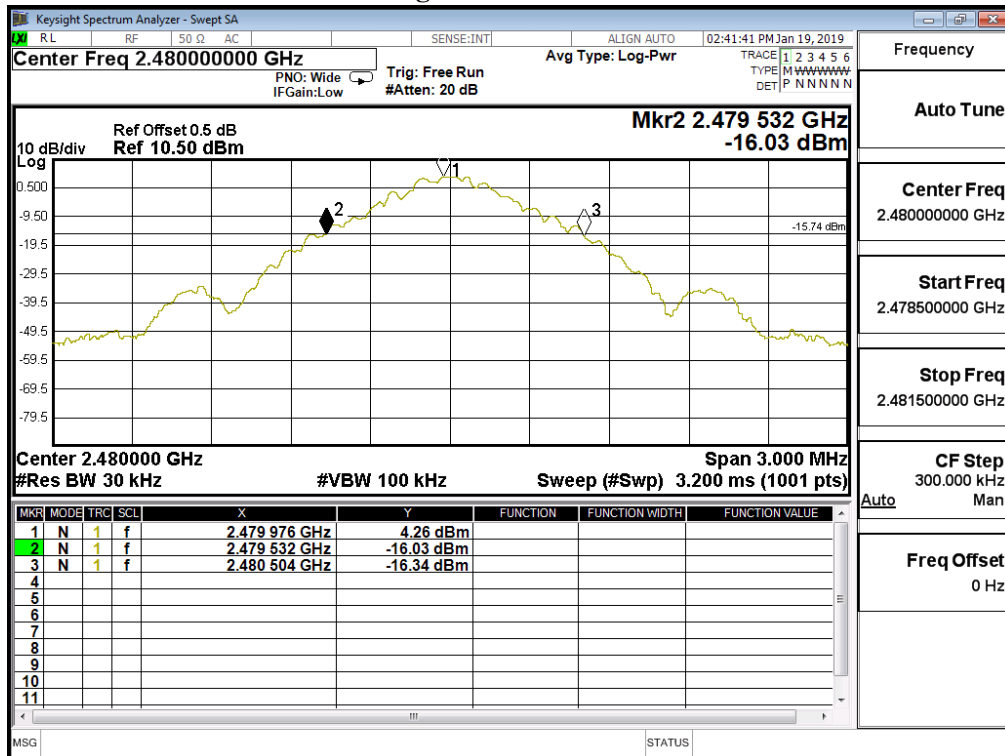
Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 1: Transmit - 1Mbps (GFSK)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	972	--	NA
39	2441	1020	--	NA
78	2480	972	--	NA

Figure Channel 00:

Figure Channel 39:

Figure Channel 78:

Product : Lenovo 700 Ultraportable Bluetooth Speaker
Test Item : Occupied Bandwidth Data
Test Site : No.3 OATS
Test Mode : Mode 2: Transmit - 3Mbps (8DPSK) (2402MHz)

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1356	--	NA
39	2441	1356	--	NA
78	2480	1356	--	NA

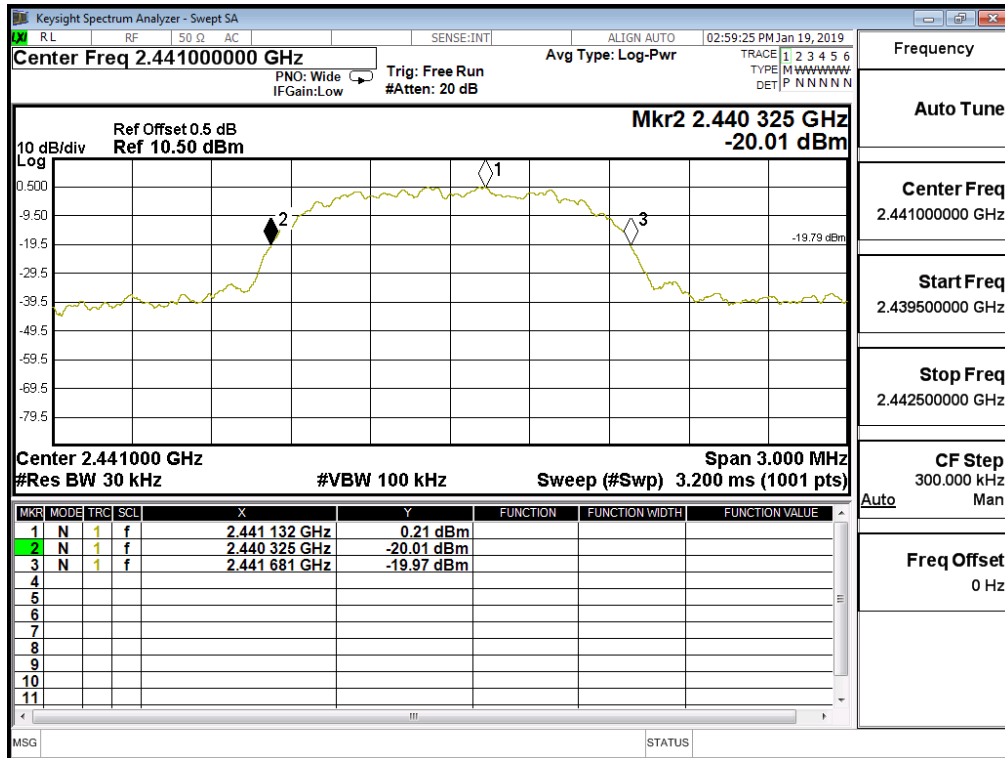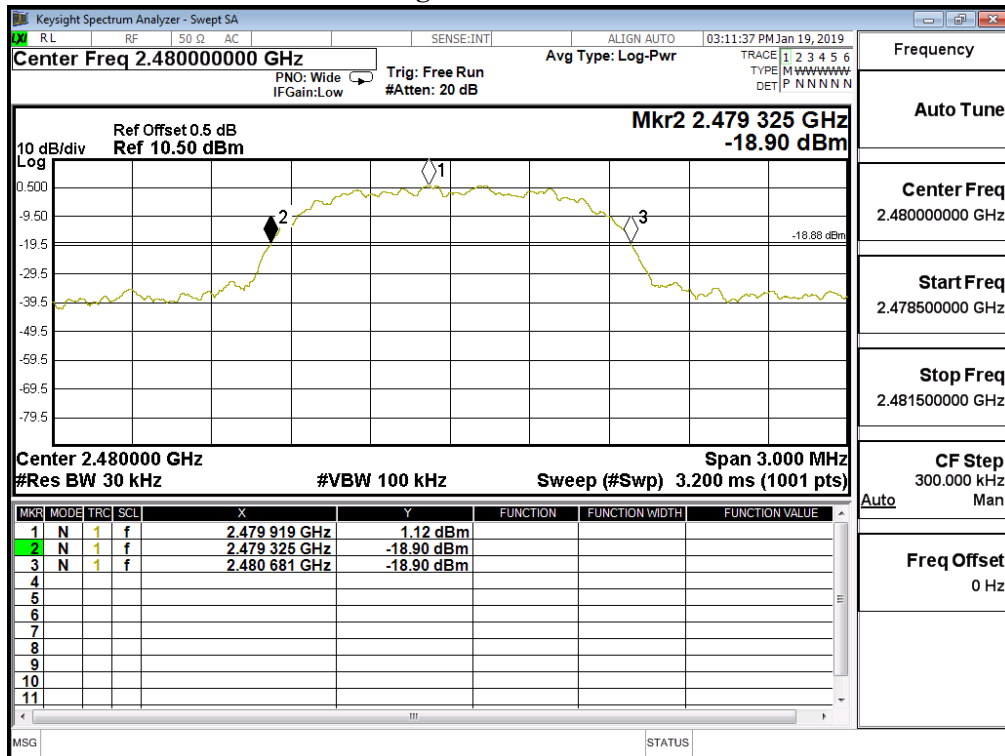**Figure Channel 00:**
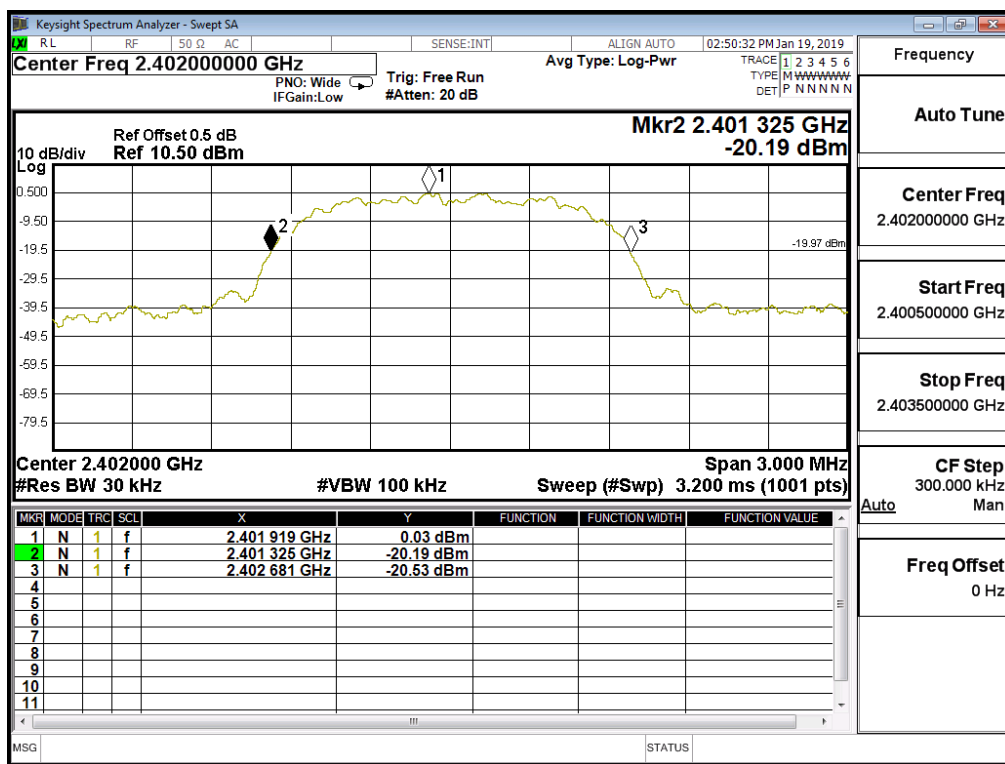
Figure Channel 39:

Figure Channel 78:

11. EMI Reduction Method During Compliance Testing

No modification was made during testing.