FCC Test Report

Product Name	Bluetooth Speaker
Model No.	LWB0502A
FCC ID.	2ASEB-LWB0502A

Applicant	Laiwin International Trading Co.,Ltd
Address	No. 2, Aly. 8, Ln. 2, Sec. 1, Minsheng N.Rd.,Guishan Dist., Taoyuan City 33391, Taiwan

Date of Receipt	Jul. 03, 2020
Issued Date	Dec. 08, 2020
Report No.	2070177R-E3032110108
Report Version	V1.0

Testing Laboratory
3023

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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The test report shall not be reproduced without the written approval of DEKRA Testing and Certification Co., Ltd.
Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test Report

Issued Date: Dec. 08, 2020
Report No.: 2070177R-E3032110108

Product Name	Bluetooth Speaker
Applicant	Laiwin International Trading Co.,Ltd
Address	No. 2, Aly. 8, Ln. 2, Sec. 1, Minsheng N.Rd.,Guishan Dist., Taoyuan City 33391, Taiwan
Manufacturer	Yuan Deng Metals Industrial Co.,Ltd.
Model No.	LWB0502A
FCC ID.	2ASEB-LWB0502A
EUT Rated Voltage	DC 5V (Power by USB) or DC 3.63V (Power by Battery)
EUT Test Voltage	DC 5V (Power by USB)
Trade Name	
Applicable Standard	FCC CFR Title 47 Part 15 Subpart C ANSI C63.4: 2014, ANSI C63.10: 2013
Test Result	Complied

Documented By : Jinn Chen

(Senior Adm. Specialist / Jinn Chen)

Tested By : Ivan Chuang

(Senior Engineer / Ivan Chuang)

Approved By :

(Director / Vincent Lin)

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Revision History

Report No.	Version	Description	Issued Date
2070177R-E3032110108	V1.0	Initial issue of report.	2020-12-08

1. GENERAL INFORMATION

1.1. EUT Description

Product Name	Bluetooth Speaker
Trade Name	
Model No.	LWB0502A
FCC ID.	2ASEB-LWB0502A
Frequency Range	2402 – 2480MHz
Channel Number	79
Type of Modulation	FHSS: GFSK(1Mbps) / π /4DQPSK(2Mbps) / 8DPSK(3Mbps)
Antenna Type	PCB Antenna
Channel Control	Auto
Antenna Gain	Refer to the table “Antenna List”
USB Cable	MFR: Fullglory, M/N: FAAF-MAAM10-A03Q Non-shielded, 1m
Audio Cable	MFR: Fullglory, M/N: FAAF-A447N Non-shielded, 1m

Antenna List

No.	Manufacturer	Part No.	Antenna Type	Peak Gain
1	FAE Electronics Shenzhen Co., Ltd.	LWB0502A	PCB Antenna	0dBi for 2.4 GHz

Note: 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 Bluetooth Speaker with built-in Bluetooth V2.1+EDR transceiver, this report for Bluetooth V2.1+EDR.
2. These tests were conducted on a sample for the purpose of demonstrating compliance of transmitter with Part 15 Subpart C Paragraph 15.247 for spread spectrum devices.
3. Regarding to the operation frequency, the lowest, middle and highest frequency are selected to perform the test.
4. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.
5. The test mode is based on the Bluetooth technology, while testing 1Mbps, 2Mbps and 3Mbps, the worst case is 1Mbps and 3Mbps, and only worse case data is recorded in this report.
6. The EUT employs Adaptive Frequency Hopping (AFH) which identifies sources of interference namely devices operating in 802.11 WLAN and excludes them from the list of available channels. The process of re-mapping reduces the number of test channels from 79 channels to a minimum number of 20 channels.

Test Mode	Mode 1: Transmit - 1Mbps Mode 2: Transmit - 3Mbps

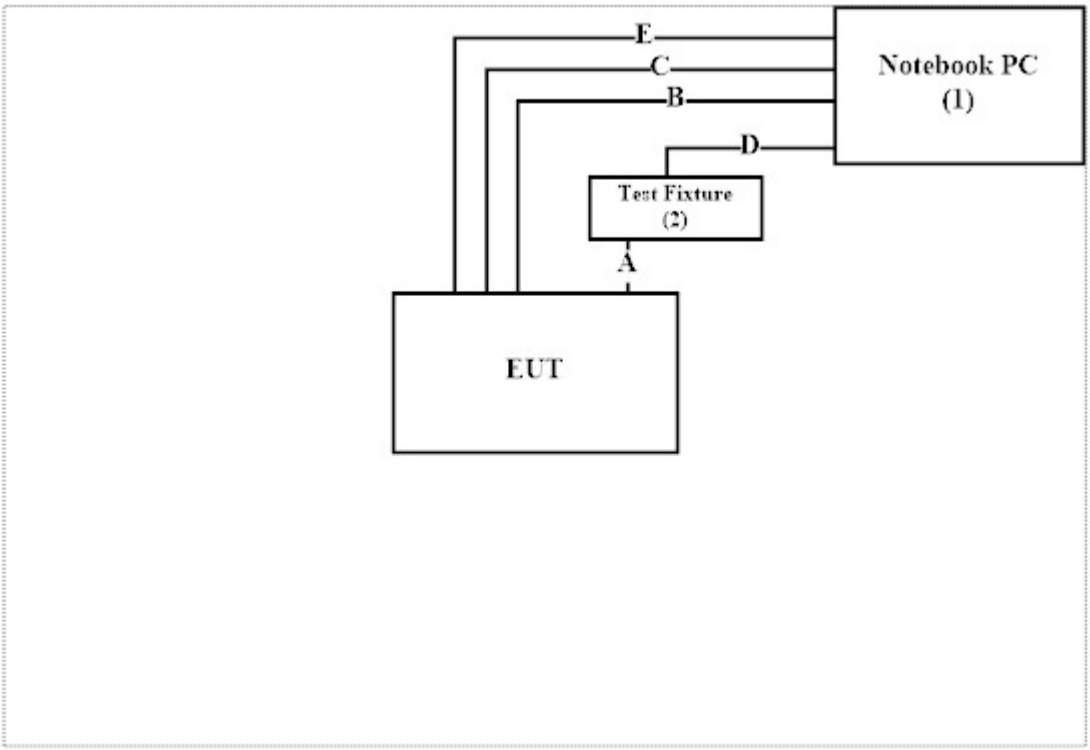
1.2. Tested System Details

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	P62G	416FJC2	N/A
2	Test Fixture	SLAB	CP2102 USB to TTL	N/A	N/A

Signal Cable Type		Signal cable Description
A	Signal Cable	Non-shielded, 0.2m
B	USB Cable	Non-shielded, 1m
C	Audio Cable	Shielded, 1m
D	USB Cable	Shielded, 1.8m
E	USB Cable	Non-shielded, 1m

1.3. Configuration of Tested System



1.4. EUT Exercise Software

1. Setup the EUT as shown in Section 1.3.
2. Execute software “BT FCC Tool v2.2.1” 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.

1.5. Test Facility

Ambient conditions in the laboratory:

Performed Item	Items	Required	Actual
Conducted Emission	Temperature (°C)	10~40 °C	24.1 °C
	Humidity (%RH)	10~90 %	65.6 %
Radiated Emission	Temperature (°C)	10~40 °C	21.5 °C
	Humidity (%RH)	10~90 %	68.4 %
Conductive	Temperature (°C)	10~40 °C	22 °C
	Humidity (%RH)	10~90 %	55 %

USA : FCC Registration Number: TW0023

Canada : IC Registration Number: 25880

Site Description : Accredited by TAF
Accredited Number: 3023

Test Laboratory : DEKRA Testing and Certification Co., Ltd
Address : No.159, Sec. 2, Wenhua 1st Rd., Linkou Dist., New Taipei City 24457, Taiwan, R.O.C.
Phone number : 886-2-2602-7968
Fax number : 866-2-2602-3286
Email address : info.tw@dekra.com
Website : http://www.dekra.com.tw

1.6. List of Test Equipment

For Conduction measurements /ASR1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	EMI Test Receiver	R&S	ESR7	101601	2020.05.28	2021.05.27
X	Two-Line V-Network	R&S	ENV216	101306	2020.03.25	2021.03.24
X	Two-Line V-Network	R&S	ENV216	101307	2020.04.17	2021.04.16
X	Coaxial Cable	DEKRA	RG400_BNC	RF001	2020.05.24	2021.05.23

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 : DEKRA Testing System V2.0

For Conducted measurements /ASR2

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Spectrum Analyzer	R&S	FSV30	103466	2019.12.16	2020.12.15
X	Spectrum Analyzer	Agilent	N9010A	MY55150401	2020.09.15	2021.09.14
X	Spectrum Analyzer (PXA)	Keysight	N9030B	MY56320509	2020.08.10	2021.08.09
X	Peak Power Analyzer	KEYSIGHT	8900B	MY51000539	2020.05.13	2021.05.12
X	Power Sensor	KEYSIGHT	N1923A	MY59240002	2020.05.22	2021.05.21
X	Power Sensor	KEYSIGHT	N1923A	MY59240003	2020.05.22	2021.05.21

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 : DEKRA Conduction Test System V9.0.5

For Radiated measurements /ACB1

	Equipment	Manufacturer	Model No.	Serial No.	Cali. Data	Due. Data
X	Loop Antenna	AMETEK	HLA6121	49611	2020.03.16	2021.03.15
X	Bi-Log Antenna	SCHWARZBECK	VULB9168	9168-953	2020.01.03	2021.01.02
X	Horn Antenna	ETS-Lindgren	3117	00201366	2020.09.21	2021.09.20
X	Horn Antenna	Com-Power	AH-840	101087	2020.06.08	2021.06.07
X	Pre-Amplifier	EMCI	EMC001330	980316	2020.06.23	2021.06.22
X	Pre-Amplifier	EMCI	EMC051835SE	980311	2020.06.23	2021.06.22
X	Pre-Amplifier	EMCI	EMC05820SE	980308	2020.09.18	2021.09.17
X	Pre-Amplifier	EMCI	EMC184045SE	980314	2020.06.10	2021.06.09
X	Filter	MICRO TRONICS	BRM50702	G251	2020.09.17	2021.09.16
	Filter	MICRO TRONICS	BRM50716	G188	2020.09.17	2021.09.16
X	EMI Test Receiver	R&S	ESR7	101602	2019.12.16	2020.12.15
X	Spectrum Analyzer	R&S	FSV40	101148	2020.03.16	2021.03.15
X	Coaxial Cable	SUHNER	SUCOFLEX 106	RF002	2020.07.03	2021.07.02
X	Mircoflex Cable	HUBER SUHNER	SUCOFLEX 102	MY3381/2	2020.06.10	2021.06.09

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 : DEKRA Testing System V2.0.

1.7. Uncertainty

Uncertainties have been calculated according to the DEKRA internal document, and is described in each test chapter of this report.

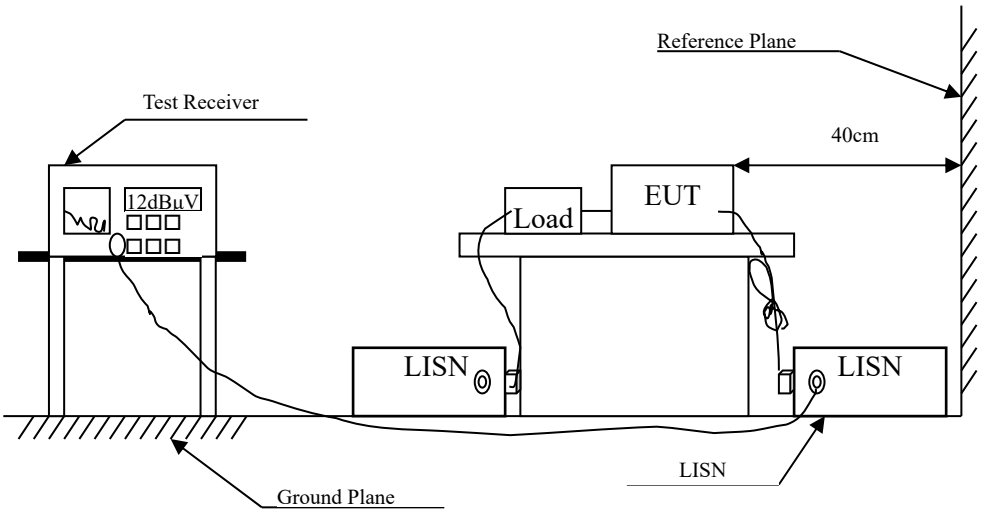
The reported expanded uncertainties are based on a standard uncertainty multiplied by a coverage factor of k=2, providing a level of confidence of approximately 95%.

Measurement uncertainties evaluated for each testing system and associated connections are given here to provide the system information for reference. Compliance determinations do not take into account measurement uncertainties for each testing system, but are based on the results of the compliance measurement.

Test item	**Uncertainty**	
Conducted Emission	±3.42 dB	
Peak Power Output	±0.91 dB	
Radiated Emission	Under 1GHz ±4.06 dB	Above 1GHz ±3.73 dB
RF Antenna Conducted Test	±2.53 dB	
Band Edge	Under 1GHz ±4.06 dB	Above 1GHz ±3.73 dB
Channel Number	N/A	
Channel Separation	±682.83 Hz	
Dwell Time	±2.31 ms	
Occupied Bandwidth	±682.83 Hz	
Duty Cycle	±2.31 ms	

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.)

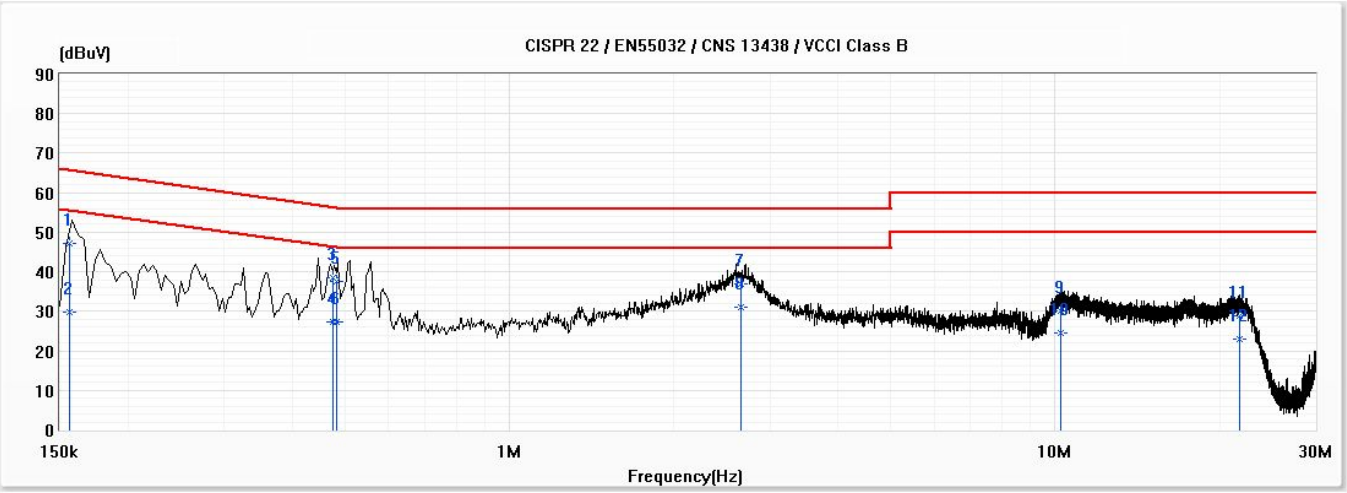
Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all the interface cables must be changed according to ANSI C63.4: 2014 on conducted measurement.

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

The EUT setup and the test procedure are according to ANSI C63.4, 2014 to comply with the requirements of FCC 47CFR Subpart C.

2.4. Test Result of Conducted Emission

Product : Bluetooth Speaker
Test Item : Conducted Emission Test
Power Line : L 1
Test Mode : Mode 2: Transmit - 3Mbps (2441MHz)
Test Date : 2020/11/18

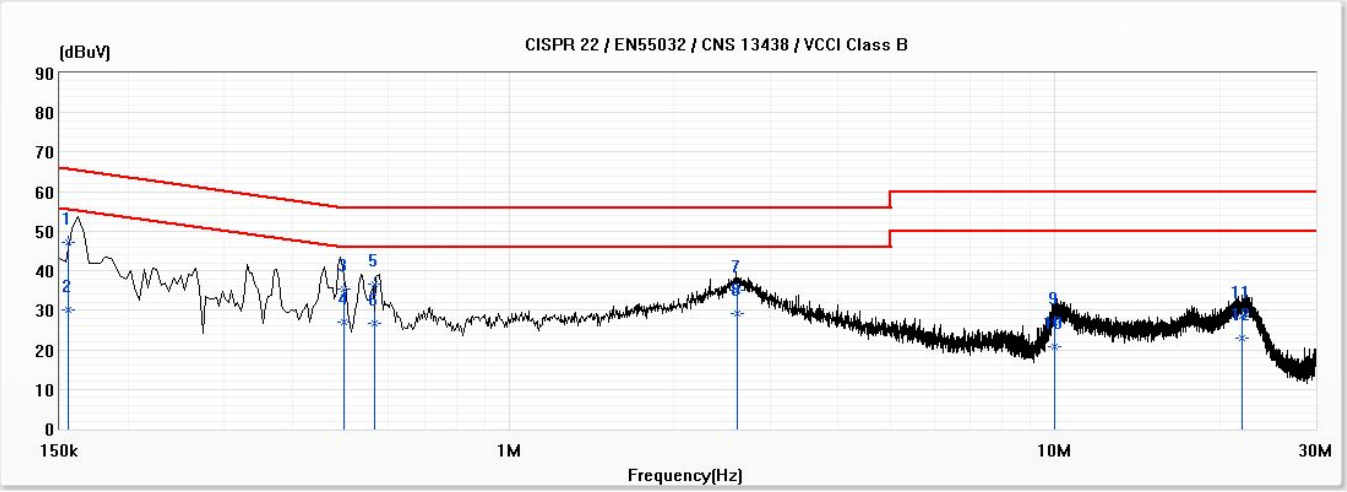


No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.156	47.22	65.66	-18.44	37.57	9.66	QP
2	0.156	29.87	55.66	-25.79	20.21	9.66	AV
3	0.474	38.41	56.44	-18.02	28.75	9.66	QP
4	0.474	27.23	46.44	-19.21	17.57	9.66	AV
5	0.484	37.49	56.28	-18.79	27.83	9.66	QP
6	0.484	27.38	46.28	-18.90	17.71	9.66	AV
7	2.652	36.89	56.00	-19.11	27.15	9.73	QP
*8	2.652	31.02	46.00	-14.98	21.29	9.73	AV
9	10.248	29.95	60.00	-30.05	20.06	9.89	QP
10	10.248	24.57	50.00	-25.43	14.67	9.89	AV
11	21.828	28.79	60.00	-31.21	18.82	9.97	QP
12	21.828	23.00	50.00	-27.00	13.04	9.97	AV

Note:

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

Product : Bluetooth Speaker
Test Item : Conducted Emission Test
Power Line : N
Test Mode : Mode 2: Transmit - 3Mbps (2441MHz)
Test Date : 2020/11/18



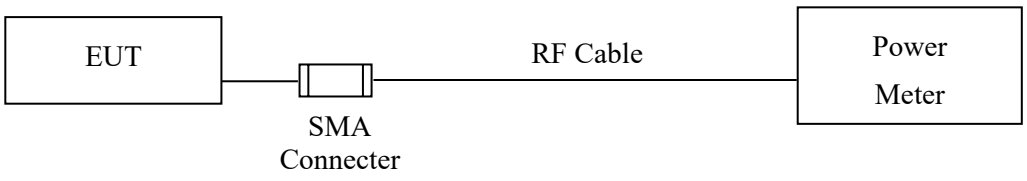
No	Frequency (MHz)	Emission Level (dBuV)	Limit (dBuV)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	0.156	47.16	65.69	-18.53	37.49	9.67	QP
2	0.156	30.18	55.69	-25.51	20.51	9.67	AV
3	0.498	35.46	56.03	-20.57	25.79	9.67	QP
4	0.498	27.13	46.03	-18.89	17.46	9.67	AV
5	0.567	36.50	56.00	-19.50	26.83	9.67	QP
6	0.567	26.84	46.00	-19.16	17.17	9.67	AV
7	2.612	35.16	56.00	-20.84	25.42	9.74	QP
*8	2.612	29.32	46.00	-16.68	19.58	9.74	AV
9	9.989	26.92	60.00	-33.08	17.01	9.91	QP
10	9.989	20.82	50.00	-29.18	10.91	9.91	AV
11	22.051	28.58	60.00	-31.42	18.52	10.06	QP
12	22.051	23.12	50.00	-26.88	13.06	10.06	AV

Note:

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

3. Peak Power Output

3.1. Test Setup



3.2. Limit

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

3.3. Test Procedure

Tested according to FHSS test procedure of KDB 558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

3.4. Test Result of Peak Power Output

Product : Bluetooth Speaker
Test Item : Peak Power Output
Test Mode : Mode 1: Transmit - 1Mbps
Test Date : 2020/10/26

Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	-2.05	0.125W = 20.97dBm	Pass
Channel 39	2441.00	-1.64	0.125W = 20.97dBm	Pass
Channel 78	2480.00	-0.70	0.125W = 20.97dBm	Pass

Note: For AFH mode using 20 hopping channels,the maximum output power limit is 0.125W.

Product : Bluetooth Speaker
Test Item : Peak Power Output
Test Mode : Mode 2: Transmit - 3Mbps
Test Date : 2020/10/26

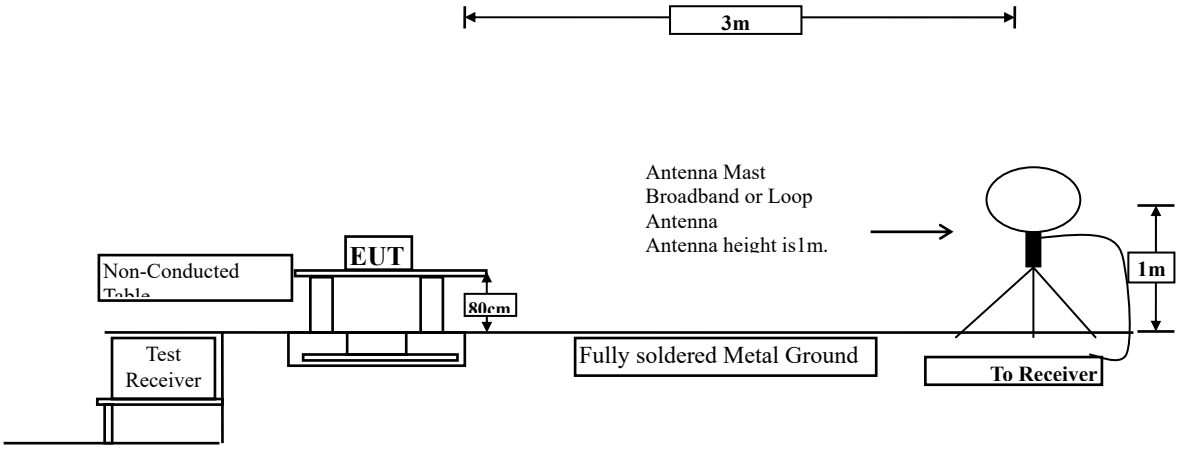
Channel No.	Frequency (MHz)	Measurement (dBm)	Required Limit	Result
Channel 00	2402.00	1.23	0.125W = 20.97dBm	Pass
Channel 39	2441.00	1.77	0.125W = 20.97dBm	Pass
Channel 78	2480.00	2.79	0.125W = 20.97dBm	Pass

Note: For AFH mode using 20 hopping channels,the maximum output power limit is 0.125W.

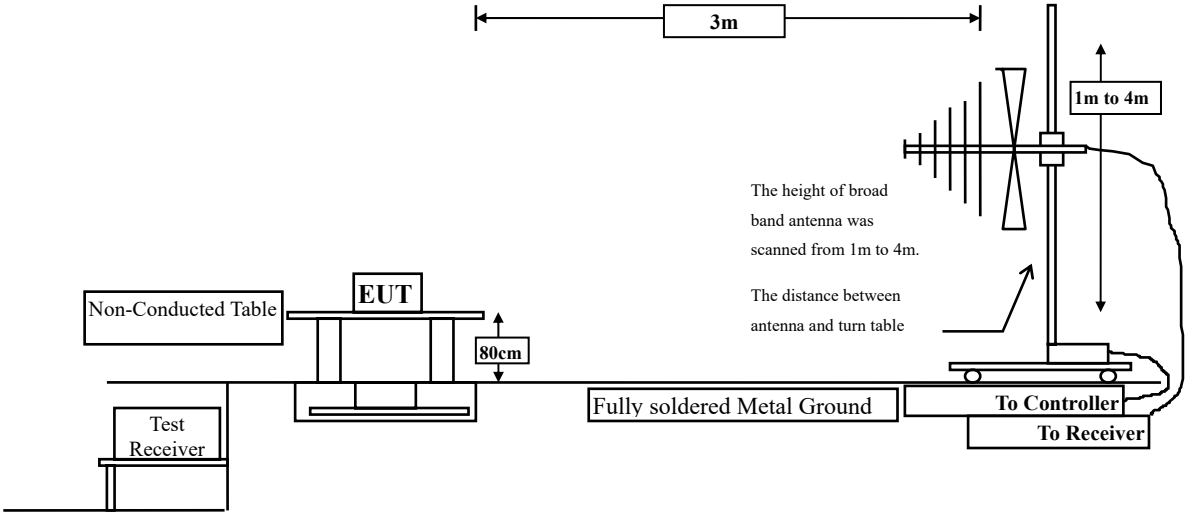
4. Radiated Emission

4.1. Test Setup

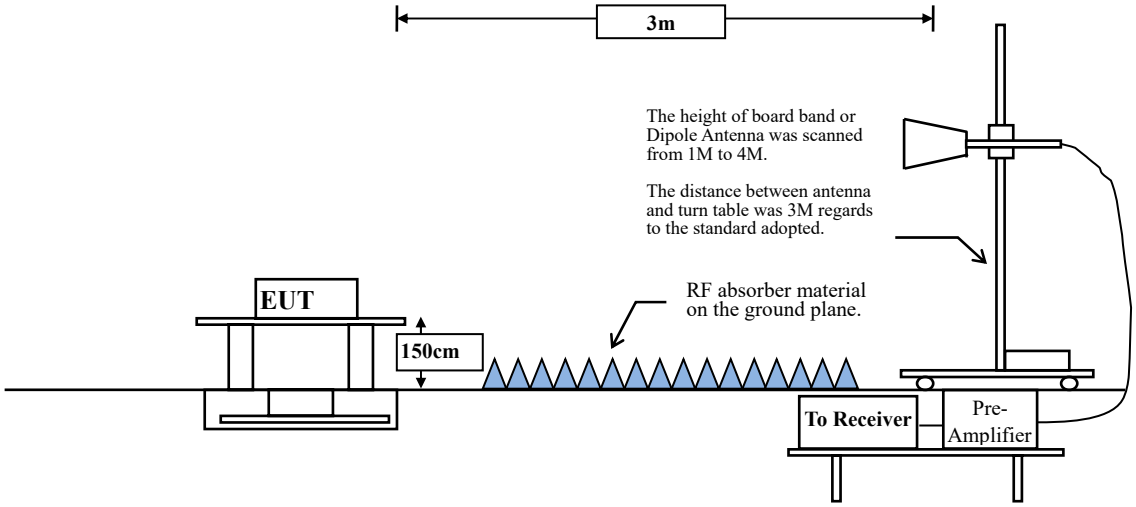
Radiated Emission Under 30MHz



Radiated Emission Below 1GHz



Radiated Emission 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 (dBuV) = 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.

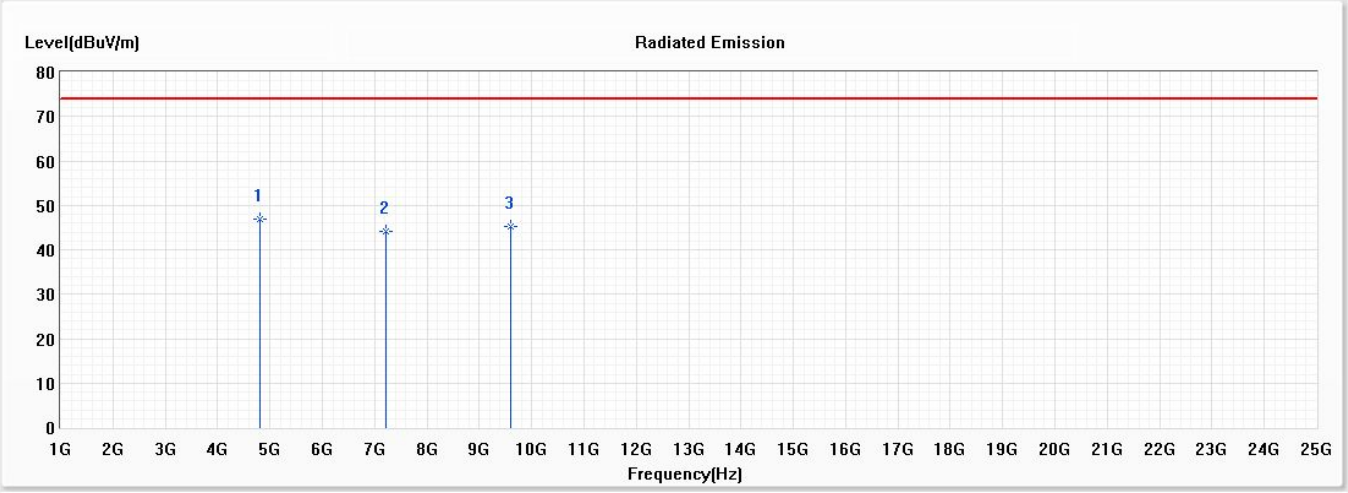
The suspected frequencies are searched for in Preliminary Measurement with the measurement antenna kept pointed at the source of the emission both in azimuth and elevation, with the polarization of the antenna oriented for maximum response. The antenna is pointed at an angle towards the source of the 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 measurement frequency range form 9kHz - 10th Harmonic of fundamental was investigated.

4.4. Test Result of Radiated Emission

Product : Bluetooth Speaker
Test Item : Harmonic Radiated Emission
Test Mode : Mode 1: Transmit - 1Mbps(2402MHz)
Test Date : 2020/10/28

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4804.000	47.02	74.00	-26.98	51.29	-4.27	PK
2	7206.000	44.12	74.00	-29.88	44.80	-0.68	PK
3	9608.000	45.29	74.00	-28.71	43.34	1.95	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

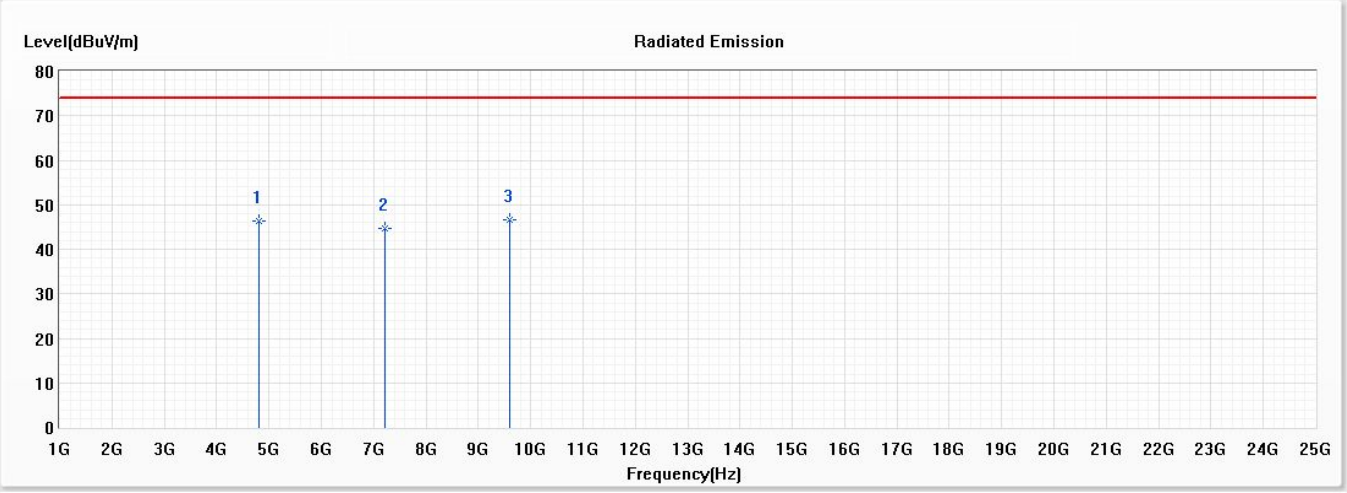
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit - 1Mbps(2402MHz)
Test Date	:	2020/10/28

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	4804.000	46.44	74.00	-27.56	50.71	-4.27	PK
2	7206.000	44.73	74.00	-29.27	45.41	-0.68	PK
* 3	9608.000	46.55	74.00	-27.45	44.60	1.95	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

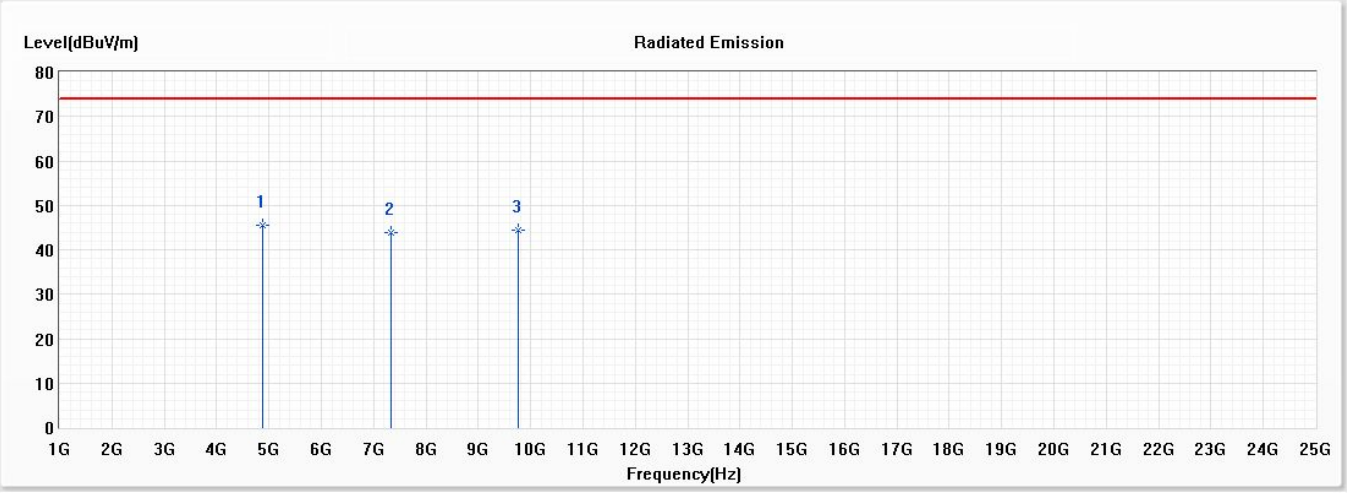
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product : Bluetooth Speaker
Test Item : Harmonic Radiated Emission
Test Mode : Mode 1: Transmit - 1Mbps(2441MHz)
Test Date : 2020/10/28

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4882.000	45.58	74.00	-28.42	49.91	-4.33	PK
2	7323.000	43.86	74.00	-30.14	44.56	-0.70	PK
3	9764.000	44.35	74.00	-29.65	42.33	2.02	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

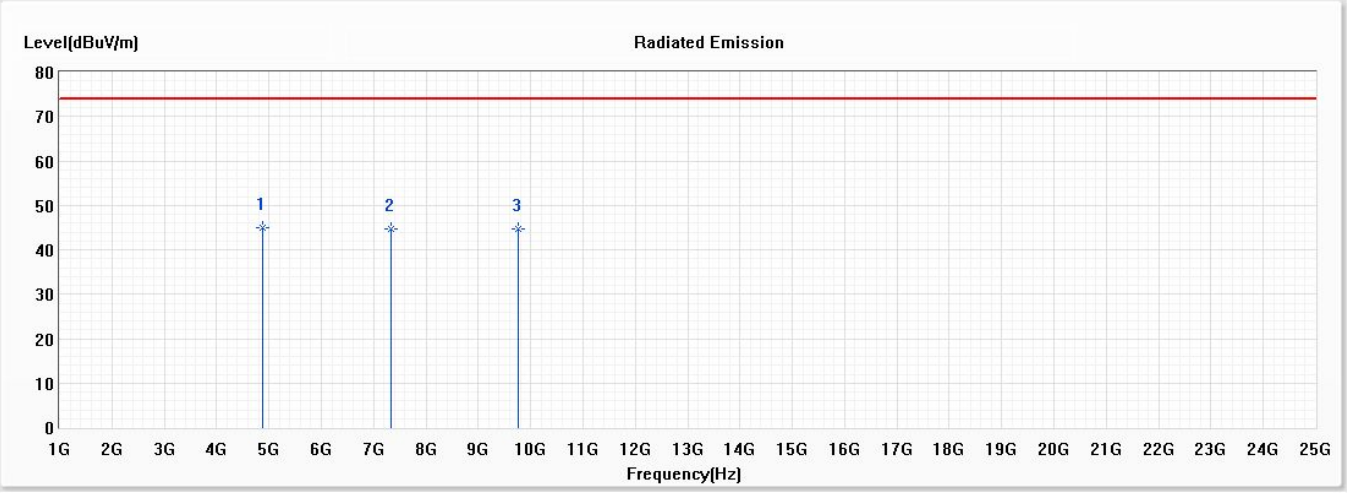
Frequency MHz	Peak Measurement dBµV/m	Duty Cycle Factor dB	Average Measurement dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit - 1Mbps(2441MHz)
Test Date	:	2020/10/28

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4882.000	44.97	74.00	-29.03	49.30	-4.33	PK
2	7323.000	44.81	74.00	-29.19	45.51	-0.70	PK
3	9764.000	44.56	74.00	-29.44	42.54	2.02	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

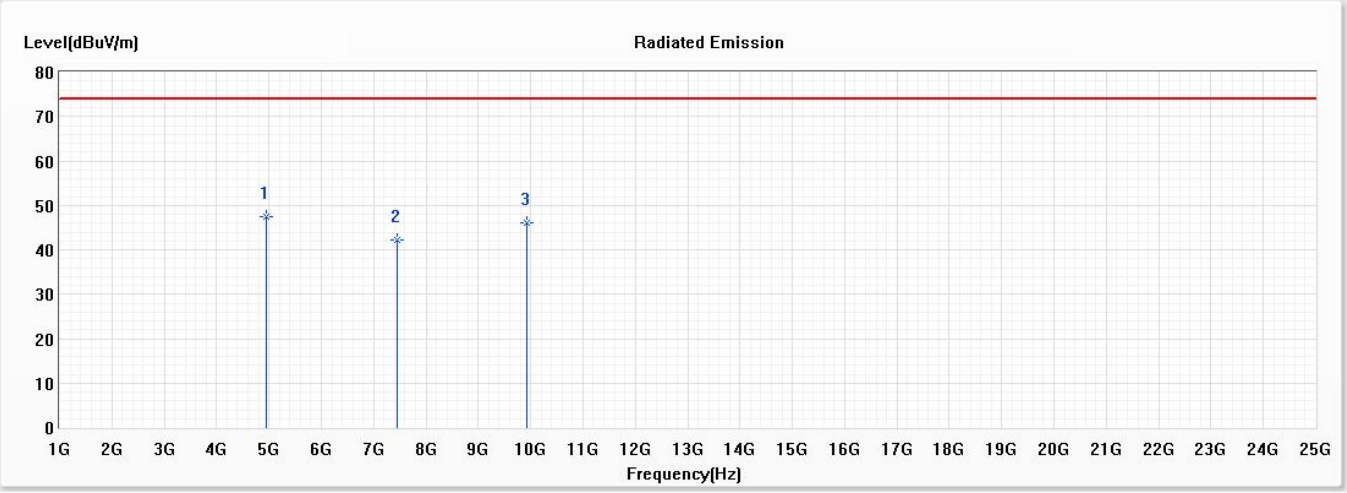
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit - 1Mbps(2480MHz)
Test Date	:	2020/10/28

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4960.000	47.36	74.00	-26.64	51.43	-4.07	PK
2	7440.000	42.29	74.00	-31.71	42.98	-0.69	PK
3	9920.000	46.04	74.00	-27.96	43.78	2.26	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

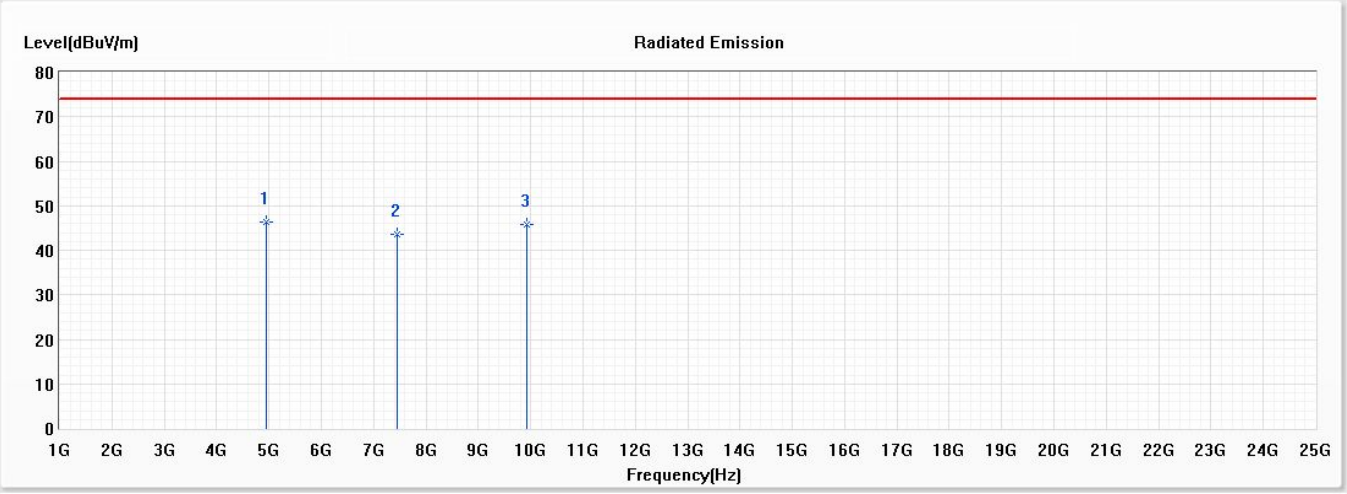
Frequency MHz	Peak Measurement dBµV/m	Duty Cycle Factor dB	Average Measurement dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 1: Transmit - 1Mbps(2480MHz)
Test Date	:	2020/10/28

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4960.000	46.22	74.00	-27.78	50.29	-4.07	PK
2	7440.000	43.63	74.00	-30.37	44.32	-0.69	PK
3	9920.000	45.80	74.00	-28.20	43.54	2.26	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

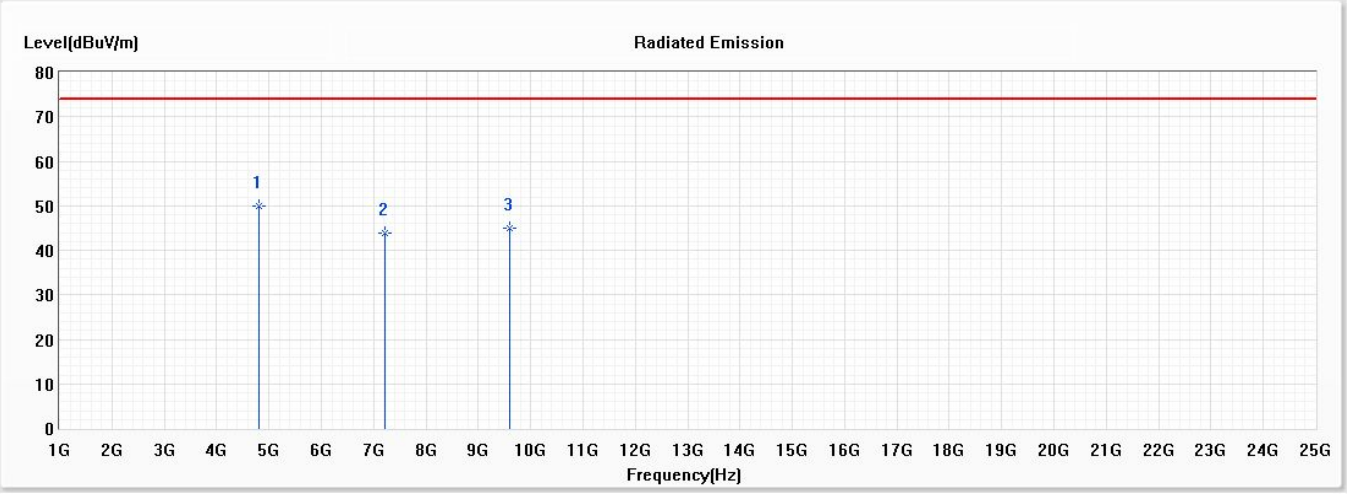
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 2: Transmit - 3Mbps(2402MHz)
Test Date	:	2020/10/28

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4804.000	50.03	74.00	-23.97	54.30	-4.27	PK
2	7206.000	43.90	74.00	-30.10	44.58	-0.68	PK
3	9608.000	45.10	74.00	-28.90	43.15	1.95	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

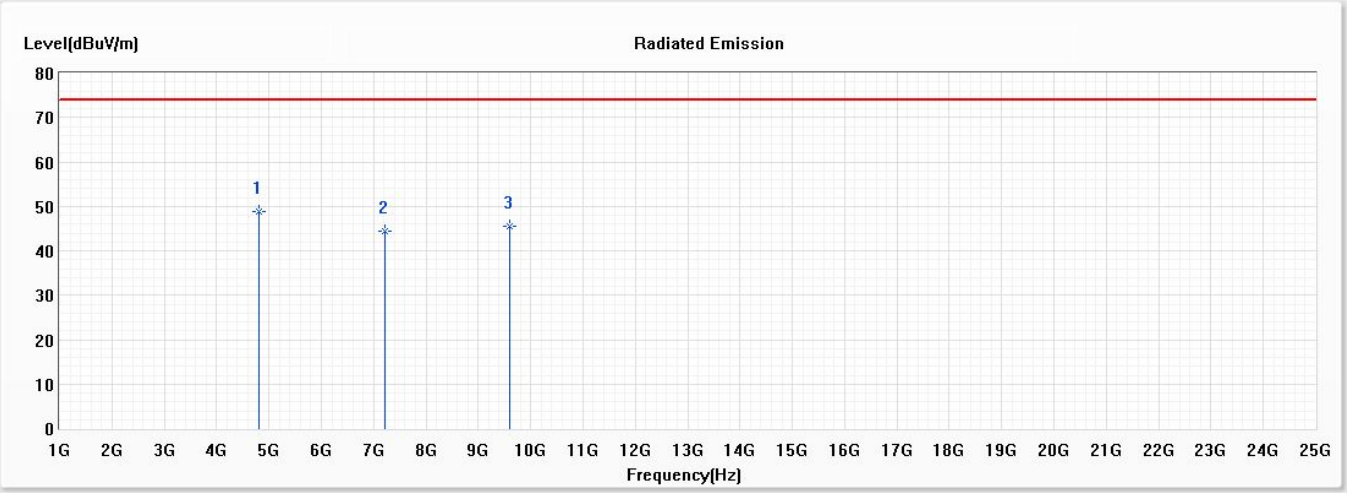
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 2: Transmit - 3Mbps(2402MHz)
Test Date	:	2020/10/28

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4804.000	48.87	74.00	-25.13	53.14	-4.27	PK
2	7206.000	44.53	74.00	-29.47	45.21	-0.68	PK
3	9608.000	45.65	74.00	-28.35	43.70	1.95	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

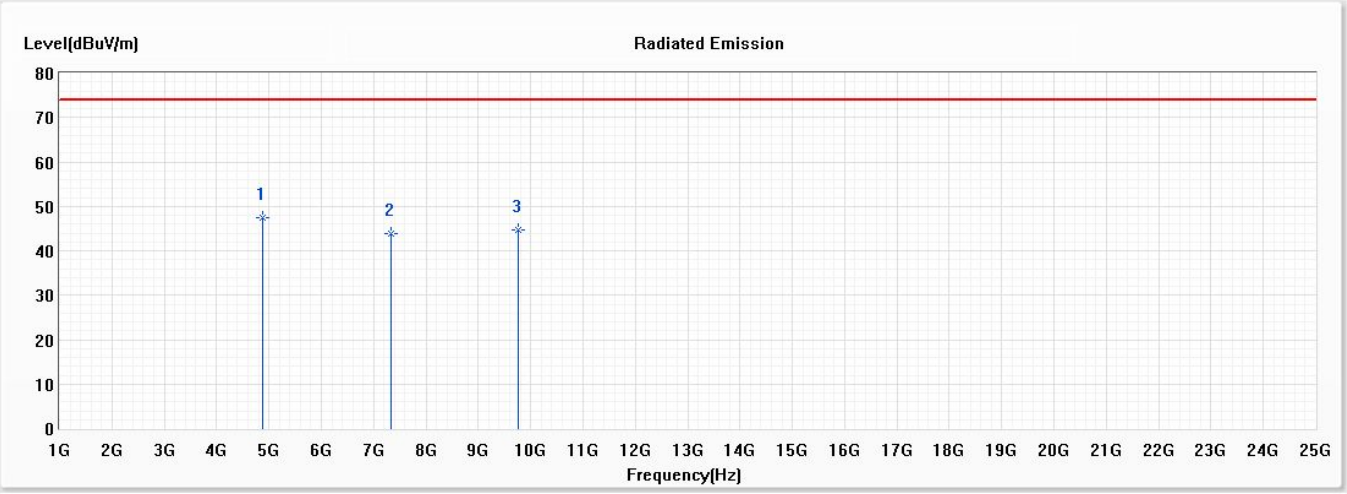
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 2: Transmit - 3Mbps (2441MHz)
Test Date	:	2020/10/28

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4882.000	47.46	74.00	-26.54	51.79	-4.33	PK
2	7323.000	43.93	74.00	-30.07	44.63	-0.70	PK
3	9764.000	44.66	74.00	-29.34	42.64	2.02	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

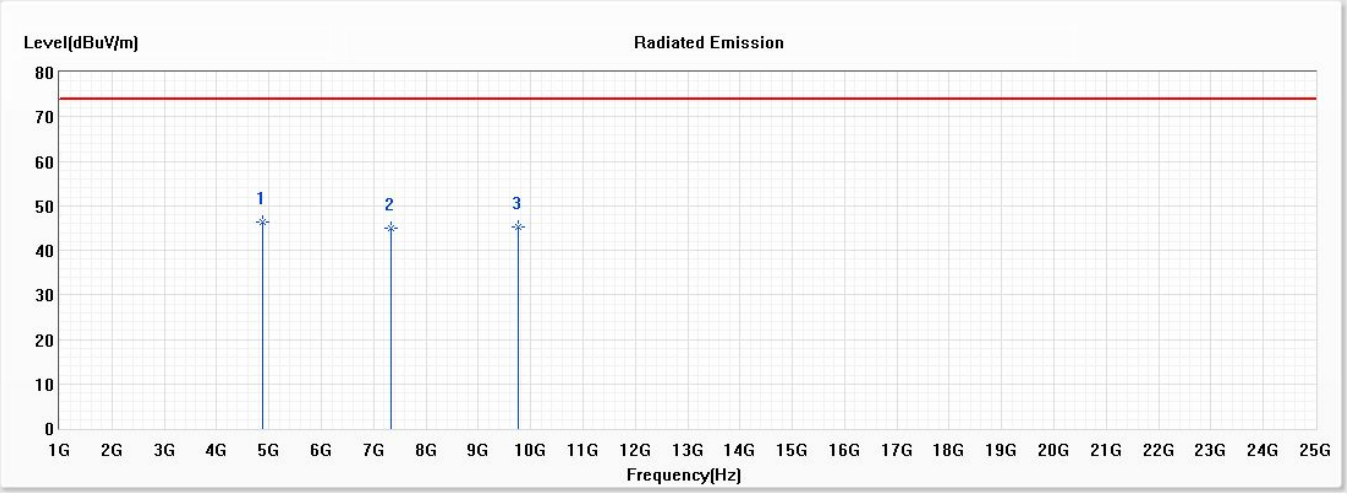
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 2: Transmit - 3Mbps (2441MHz)
Test Date	:	2020/10/28

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4882.000	46.40	74.00	-27.60	50.73	-4.33	PK
2	7323.000	44.94	74.00	-29.06	45.64	-0.70	PK
3	9764.000	45.37	74.00	-28.63	43.35	2.02	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

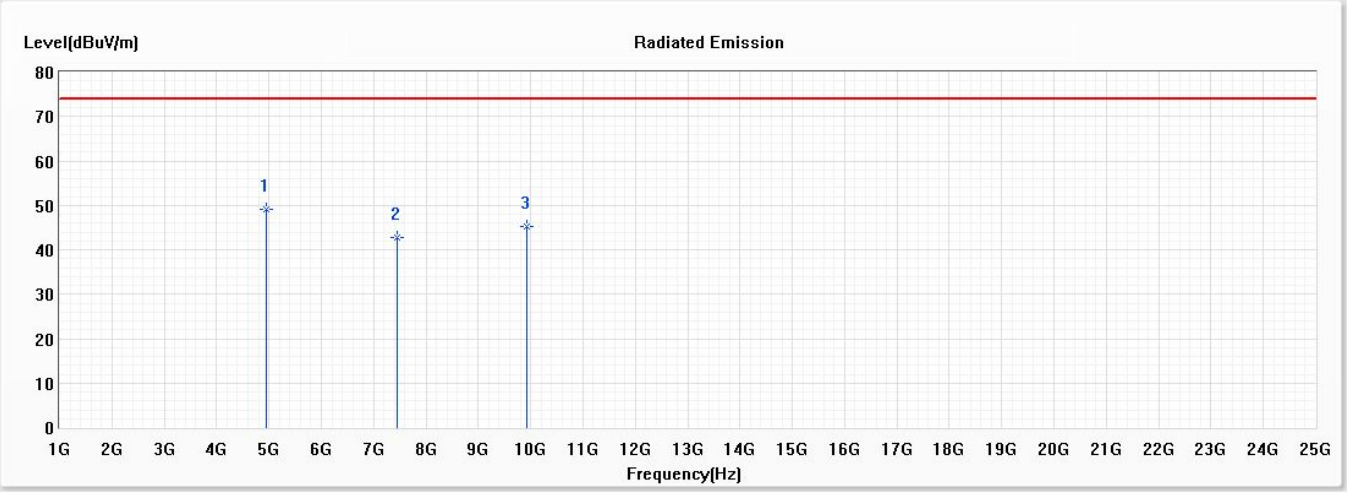
Frequency MHz	Peak Measurement dBμV/m	Duty Cycle Factor dB	Average Measurement dBμV/m	Margin dB	Peak Limit dBμV/m	Average Limit dBμV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 2: Transmit - 3Mbps (2480MHz)
Test Date	:	2020/10/28

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4960.000	49.21	74.00	-24.79	53.28	-4.07	PK
2	7440.000	42.63	74.00	-31.37	43.32	-0.69	PK
3	9920.000	45.24	74.00	-28.76	42.98	2.26	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

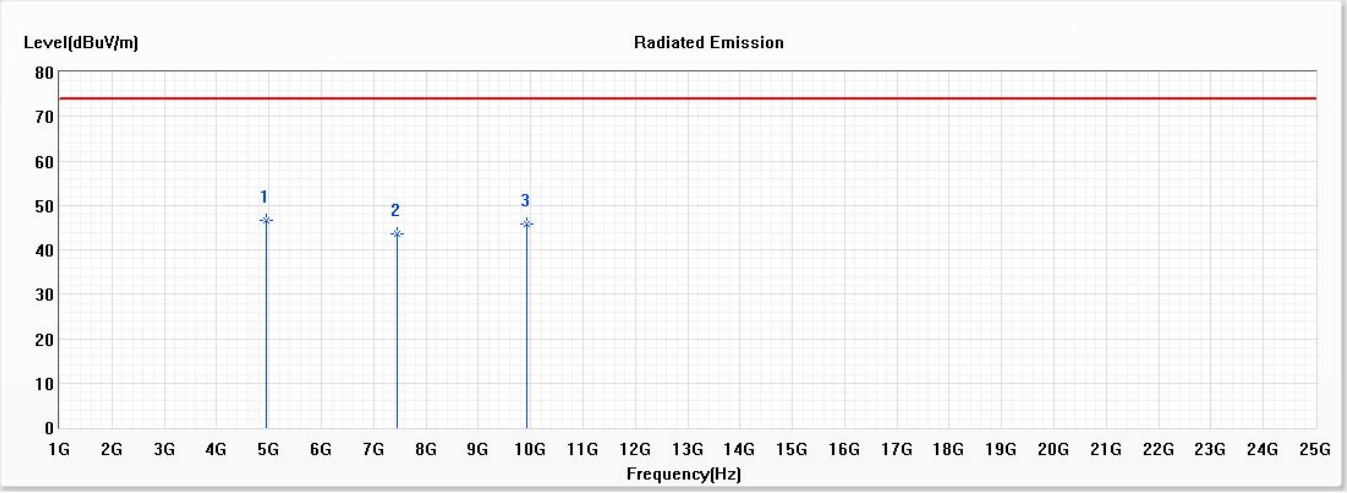
Frequency MHz	Peak Measurement dBµV/m	Duty Cycle Factor dB	Average Measurement dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Harmonic Radiated Emission
Test Mode	:	Mode 2: Transmit - 3Mbps (2480MHz)
Test Date	:	2020/10/28

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
* 1	4960.000	46.69	74.00	-27.31	50.76	-4.07	PK
2	7440.000	43.60	74.00	-30.40	44.29	-0.69	PK
3	9920.000	45.69	74.00	-28.31	43.43	2.26	PK

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. Measurement Level = Reading Level + Correct Factor.
4. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
5. The average measurement was not performed when the peak measured data under the limit of average detection.
6. The emission levels of other frequencies are very lower than the limit and not show in test report.

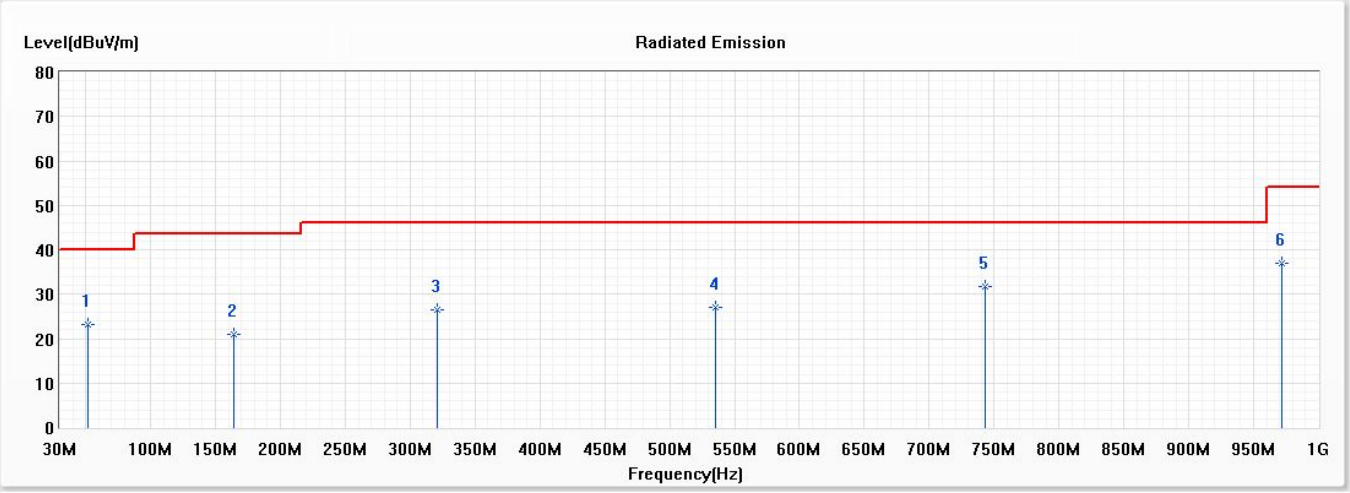
Frequency MHz	Peak Measurement dBµV/m	Duty Cycle Factor dB	Average Measurement dBµV/m	Margin dB	Peak Limit dBµV/m	Average Limit dBµV/m
Average Detector:						
--	--	--	--	--	74.000	54.000

Note:

1. AVG Measurement=Peak Measurement + Duty Cycle Correct Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	General Radiated Emission
Test Mode	:	Mode 2: Transmit - 3Mbps (2441MHz)
Test Date	:	2020/11/18

Horizontal



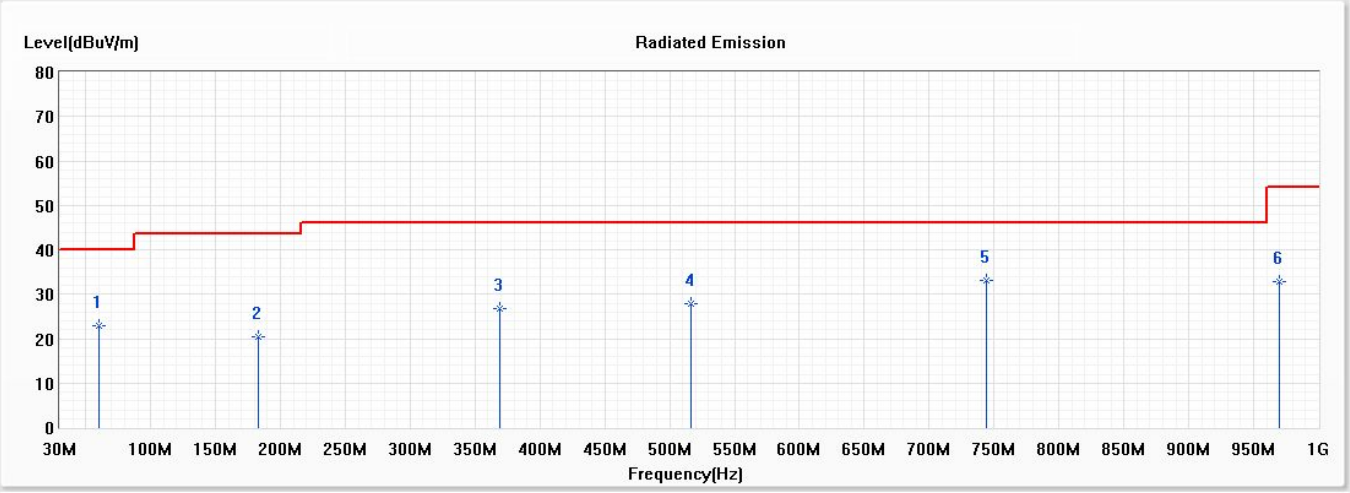
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	51.340	23.13	40.00	-16.87	33.41	-10.28	QP
2	163.860	21.02	43.50	-22.48	31.46	-10.44	QP
3	321.000	26.43	46.00	-19.57	35.26	-8.83	QP
4	535.370	26.98	46.00	-19.02	31.32	-4.34	QP
* 5	742.950	31.63	46.00	-14.37	32.56	-0.93	QP
6	971.870	37.09	54.00	-16.91	35.35	1.74	QP

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. No emission found between lowest internal used/generated frequency to 30MHz.

Product	:	Bluetooth Speaker
Test Item	:	General Radiated Emission
Test Mode	:	Mode 2: Transmit - 3Mbps (2441MHz)
Test Date	:	2020/11/18

Vertical



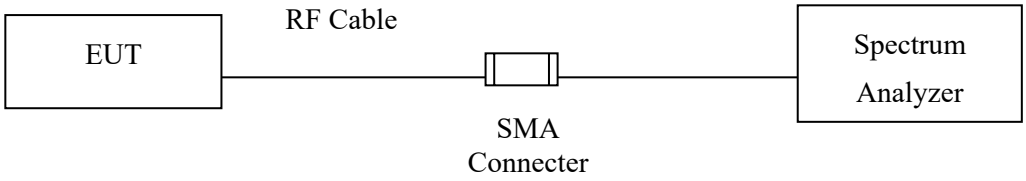
No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	60.070	23.01	40.00	-16.99	34.12	-11.11	QP
2	183.260	20.30	43.50	-23.20	32.24	-11.94	QP
3	369.500	26.71	46.00	-19.29	34.40	-7.69	QP
4	515.970	27.83	46.00	-18.17	32.36	-4.53	QP
* 5	743.920	33.09	46.00	-12.91	33.99	-0.90	QP
6	969.930	32.91	54.00	-21.09	31.18	1.73	QP

Note:

1. All Readings below 1GHz are Quasi-Peak, above 1GHz are performed with peak and/or average measurements as necessary.
2. Measurement Level = Reading Level + Correct Factor.
3. Correct Factor = Antenna factor + Cable loss –Amplifier gain.
4. The emission levels of other frequencies are very lower than the limit and not show in test report.
5. 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

Tested according to FHSS test procedure of KDB558074 section 9 b) for compliance to FCC 47CFR 15.247 requirements.

5.4. Test Result of RF Antenna Conducted Test

Product	:	Bluetooth Speaker
Test Item	:	RF Antenna Conducted Test
Test Mode	:	Mode 1: Transmit - 1Mbps
Test Date	:	2020/11/11

Figure Channel 00:

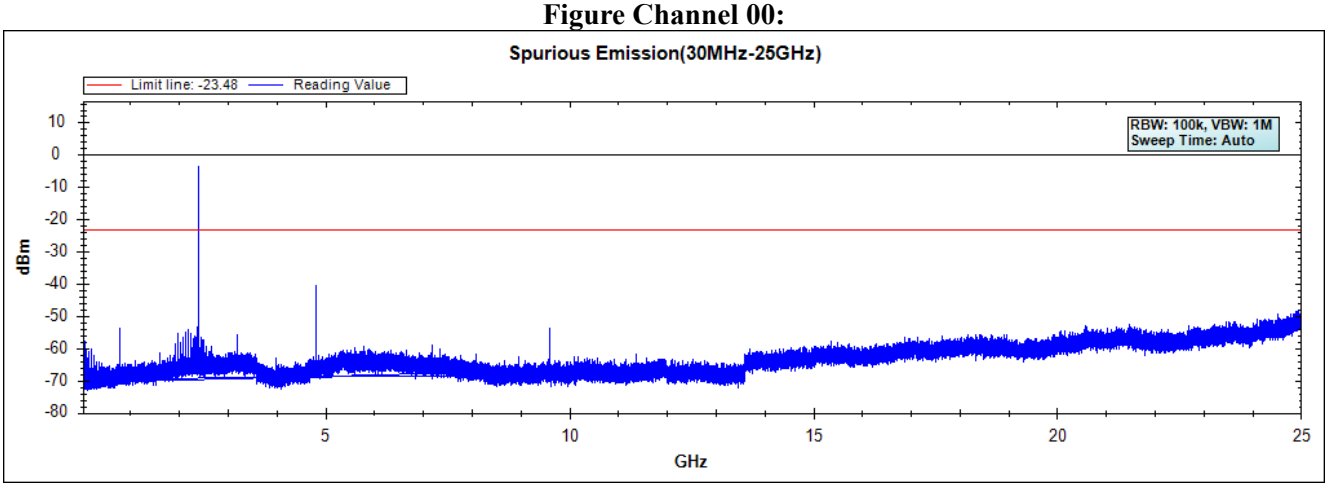


Figure Channel 39:

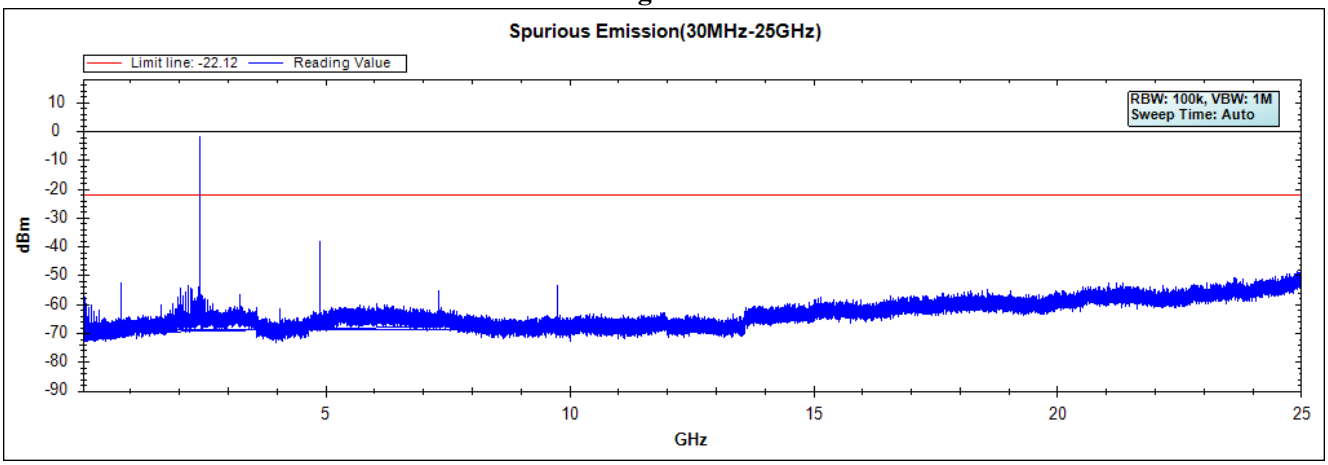
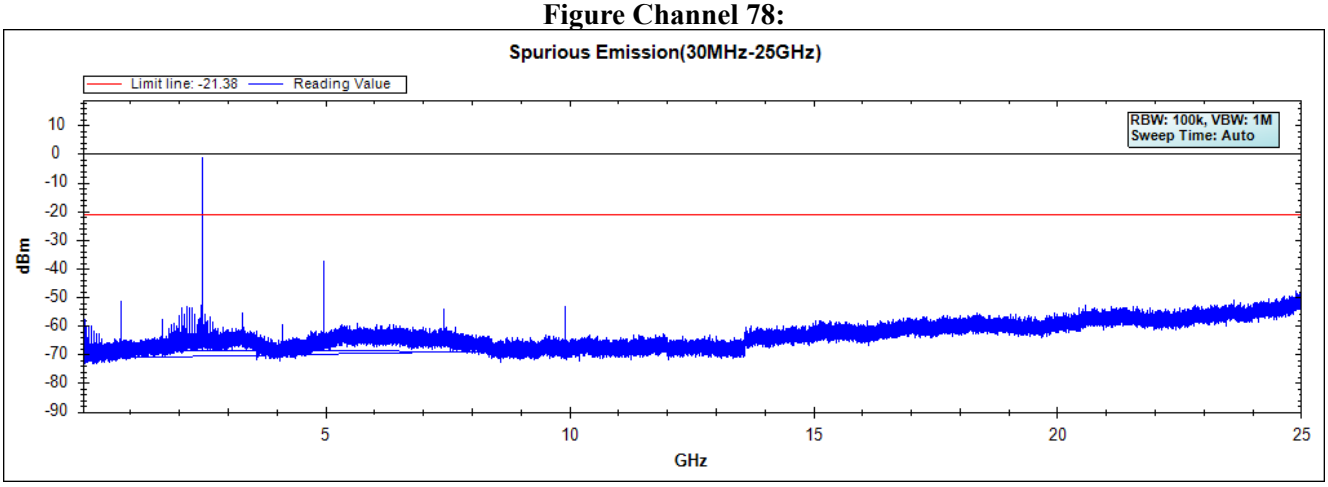


Figure Channel 78:



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

Product	:	Bluetooth Speaker
Test Item	:	RF Antenna Conducted Test
Test Mode	:	Mode 2: Transmit - 3Mbps
Test Date	:	2020/11/11

Figure Channel 00:

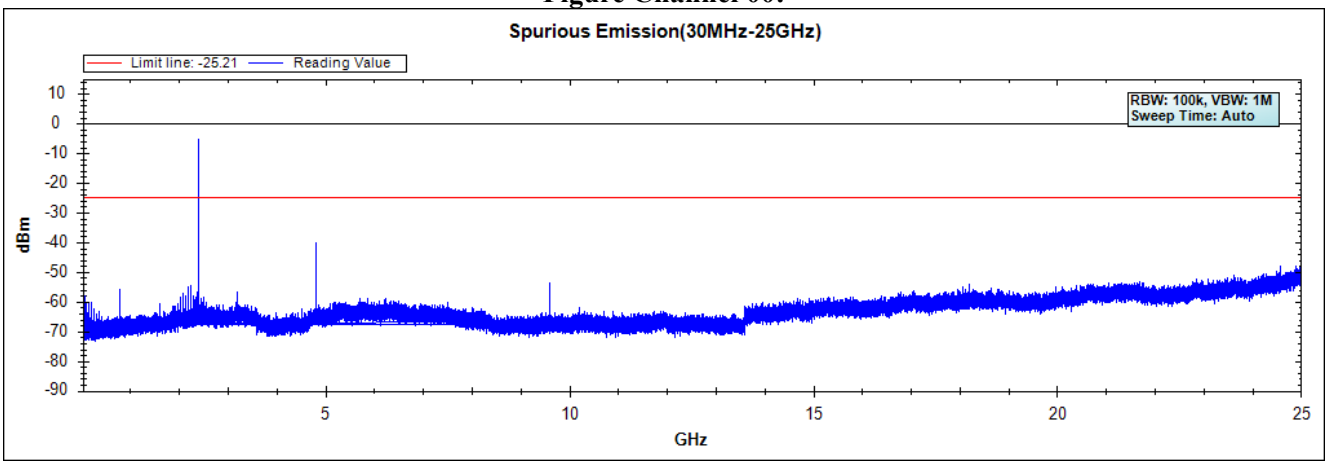


Figure Channel 39:

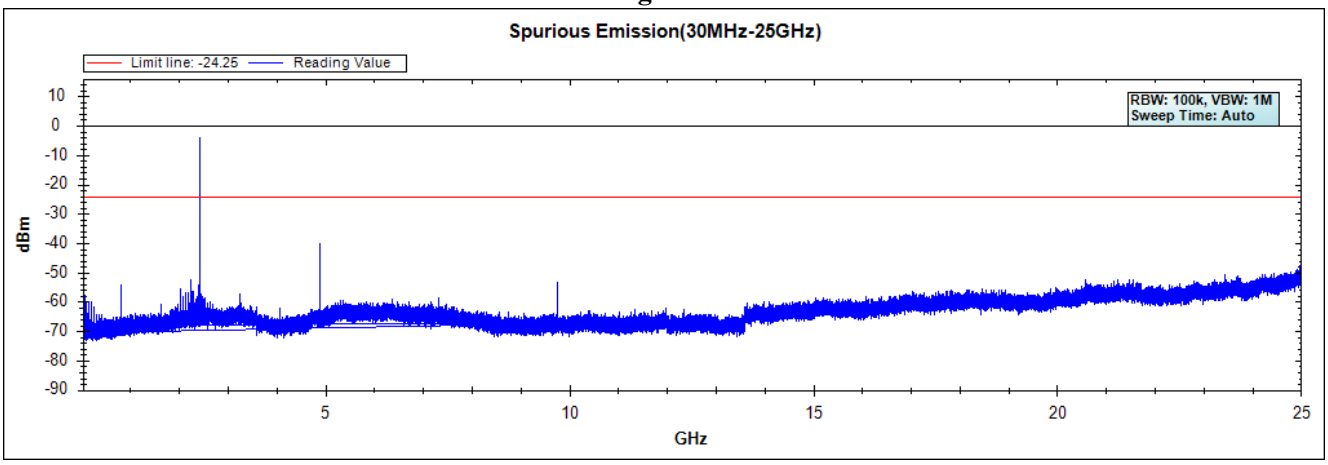
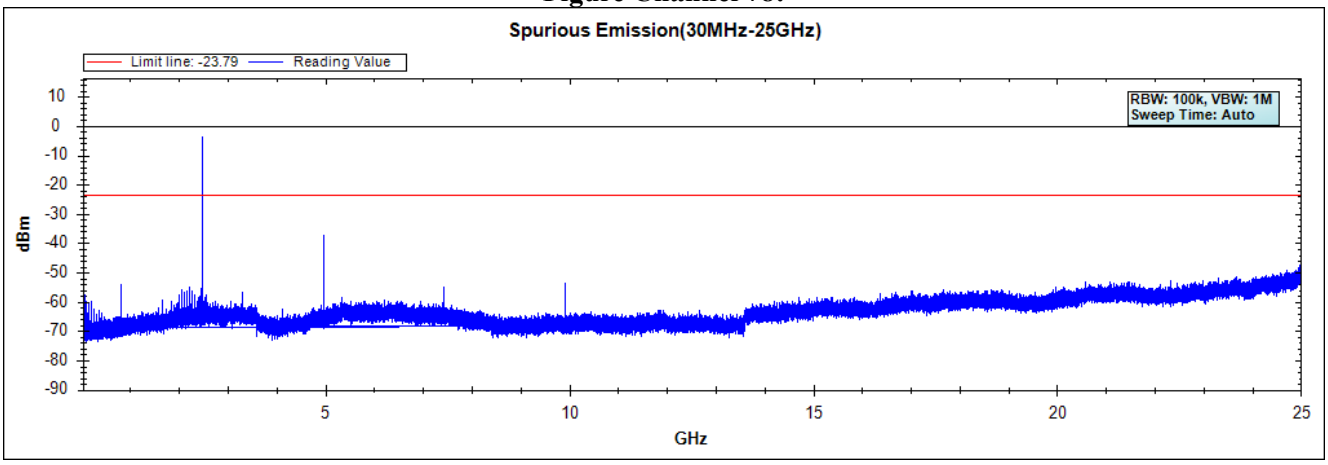


Figure Channel 78:

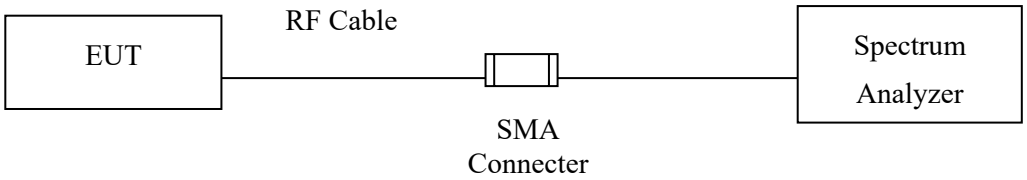


Note: The above test pattern is synthesized by multiple of the frequency range.

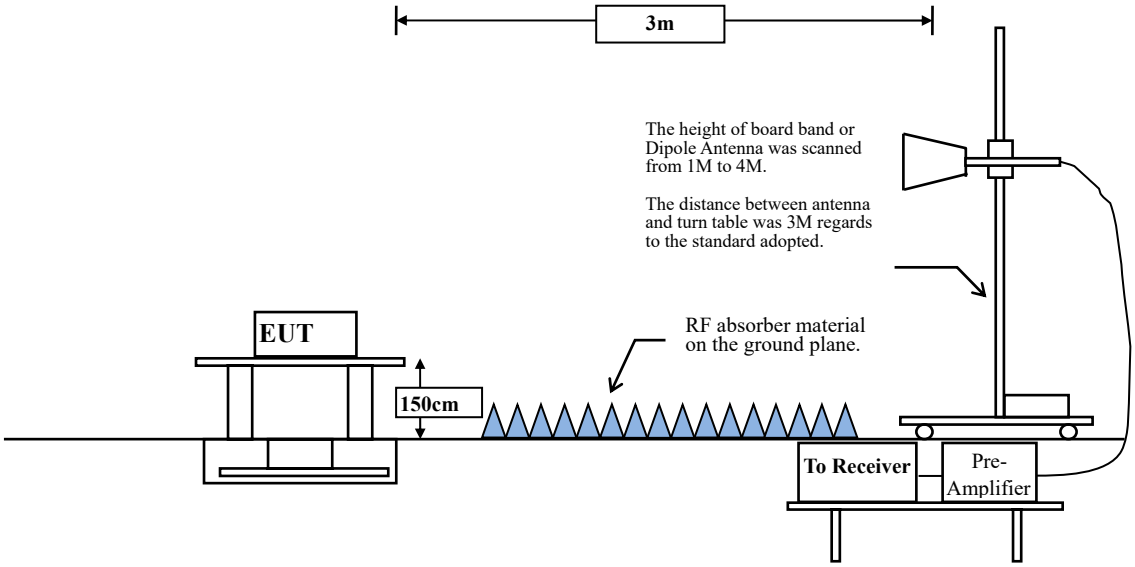
6. Band Edge

6.1. Test Setup

RF Conducted Measurement



RF Radiated Measurement:



6.2. Limit

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. 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)).

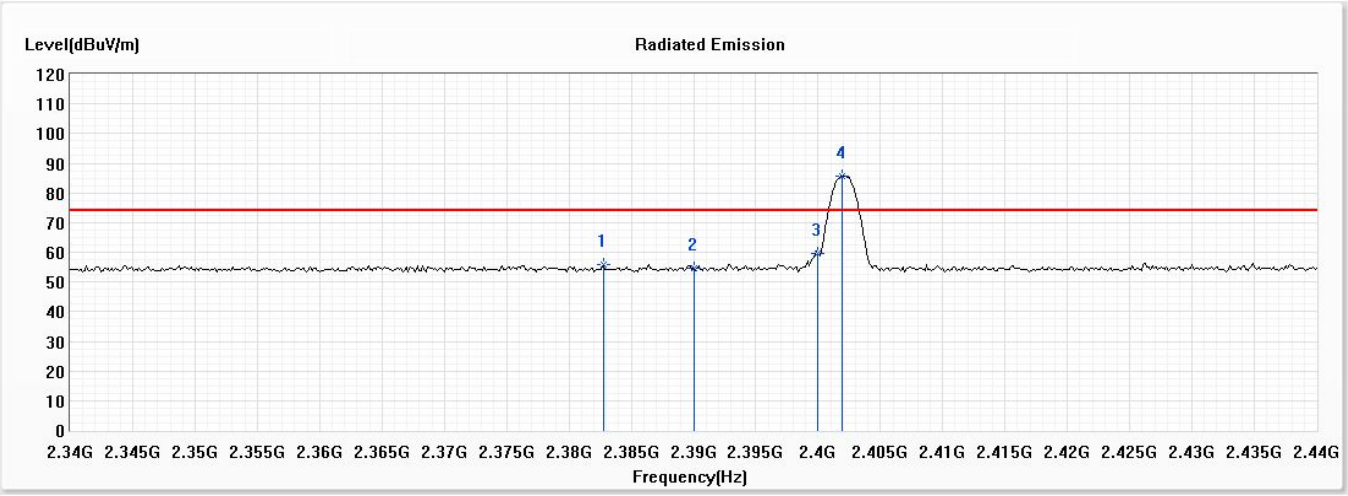
6.3. Test Procedure

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. Test Result of Band Edge

Product : Bluetooth Speaker
Test Item : Band Edge
Test Mode : Mode 1: Transmit - 1Mbps (2402MHz)
Test Date : 2020/11/13

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2382.754	55.73	74.00	-18.27	44.58	11.15	PK
2	2390.000	54.66	74.00	-19.34	43.47	11.19	PK
3	2400.000	59.48	--	--	48.26	11.22	PK
4	2401.884	85.53	--	--	74.30	11.23	PK

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. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

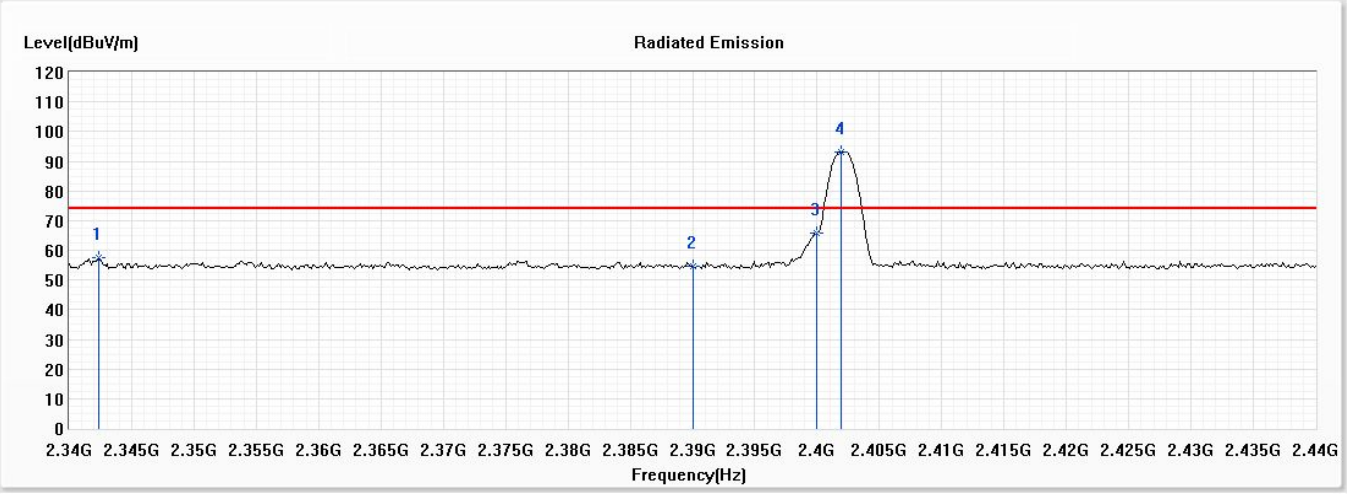
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
00 (Average)	2382.754	55.730	-24.731	30.999	-23.001	54.000	Pass
00 (Average)	2390.000	54.660	-24.731	29.929	-24.071	54.000	Pass
00 (Average)	2400.000	59.480	-24.731	34.749	--	--	Pass
00 (Average)	2401.884	85.530	-24.731	60.799	--	--	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Band Edge
Test Mode	:	Mode 1: Transmit - 1Mbps (2402MHz)
Test Date	:	2020/11/13

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2342.319	57.46	74.00	-16.54	46.48	10.98	PK
2	2390.000	54.62	74.00	-19.38	43.43	11.19	PK
3	2400.000	65.74	--	--	54.52	11.22	PK
4	2401.884	93.08	--	--	81.85	11.23	PK

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. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

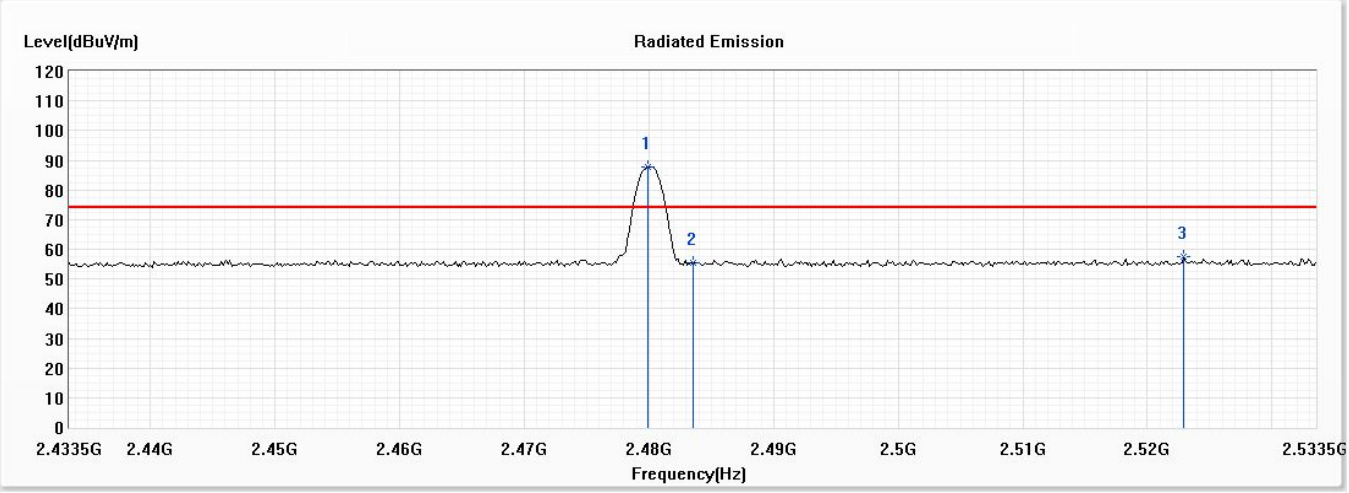
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
00 (Average)	2342.319	57.460	-24.731	32.729	-21.271	54.000	Pass
00 (Average)	2390.000	54.620	-24.731	29.889	-24.111	54.000	Pass
00 (Average)	2400.000	65.740	-24.731	41.009	--	--	Pass
00 (Average)	2401.884	93.080	-24.731	68.349	--	--	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Band Edge
Test Mode	:	Mode 1: Transmit - 1Mbps (2480MHz)
Test Date	:	2020/11/13

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2479.877	87.67	--	--	76.20	11.47	PK
2	2483.500	55.53	74.00	-18.47	44.05	11.48	PK
3	2522.920	57.48	74.00	-16.52	45.89	11.59	PK

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. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

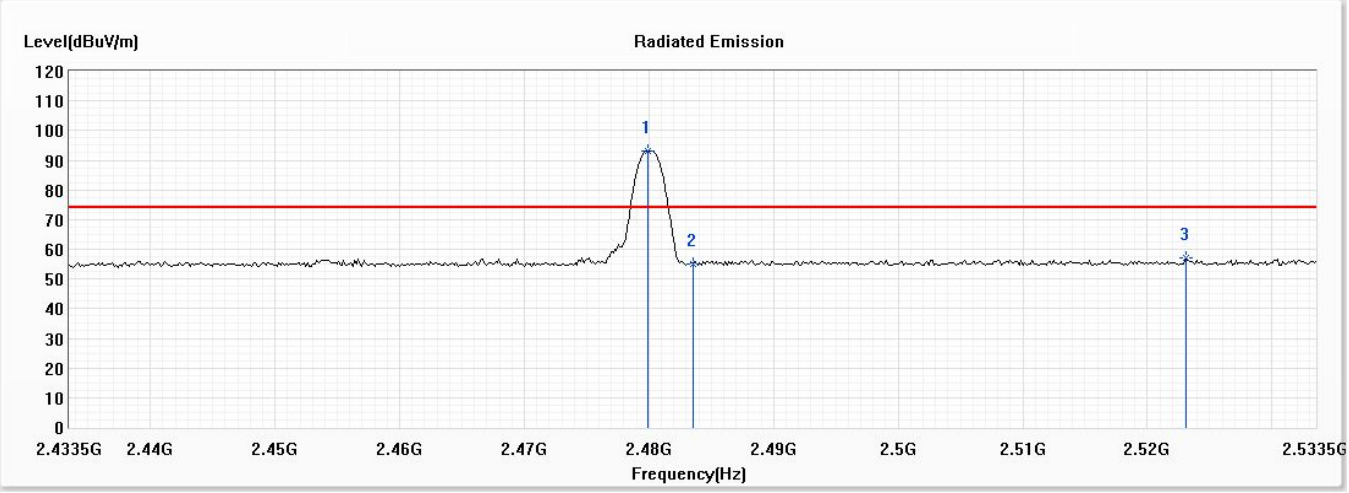
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
78 (Average)	2479.877	87.670	-24.731	62.939	--	--	Pass
78 (Average)	2483.500	55.530	-24.731	30.799	-23.201	54.000	Pass
78 (Average)	2522.920	57.480	-24.731	32.749	-21.251	54.000	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Band Edge
Test Mode	:	Mode 1: Transmit - 1Mbps (2480MHz)
Test Date	:	2020/11/13

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2479.877	93.18	--	--	81.71	11.47	PK
2	2483.500	55.03	74.00	-18.97	43.55	11.48	PK
3	2523.065	56.99	74.00	-17.01	45.40	11.59	PK

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. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

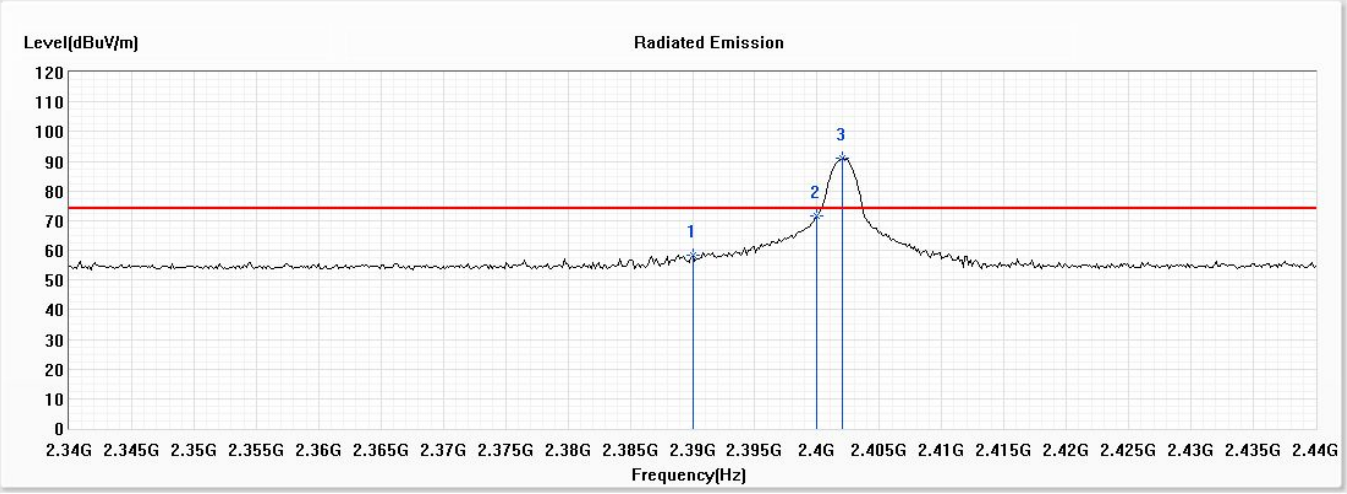
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
78 (Average)	2479.877	93.180	-24.731	68.449	--	--	Pass
78 (Average)	2483.500	55.030	-24.731	30.299	-23.701	54.000	Pass
78 (Average)	2523.065	56.990	-24.731	32.259	-21.741	54.000	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Band Edge
Test Mode	:	Mode 2: Transmit - 3Mbps (2402MHz)
Test Date	:	2020/11/13

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2390.000	58.27	74.00	-15.73	47.08	11.19	PK
2	2400.000	71.61	--	--	60.39	11.22	PK
3	2402.029	90.92	--	--	79.69	11.23	PK

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. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

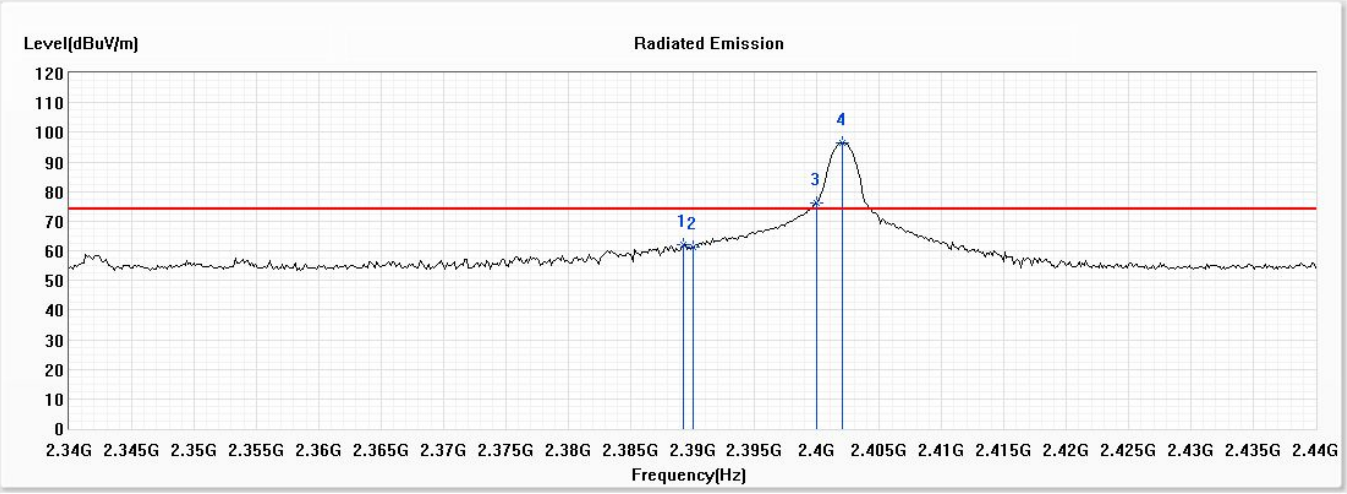
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
00 (Average)	2390.000	58.270	-25.036	33.234	-20.766	54.000	Pass
00 (Average)	2400.000	71.610	-25.036	46.574	--	--	Pass
00 (Average)	2402.029	90.920	-25.036	65.884	--	--	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Band Edge
Test Mode	:	Mode 2: Transmit - 3Mbps (2402MHz)
Test Date	:	2020/11/13

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2389.275	62.05	74.00	-11.95	50.86	11.19	PK
2	2390.000	61.19	74.00	-12.81	50.00	11.19	PK
3	2400.000	76.28	--	--	65.06	11.22	PK
4	2402.029	96.53	--	--	85.30	11.23	PK

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. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

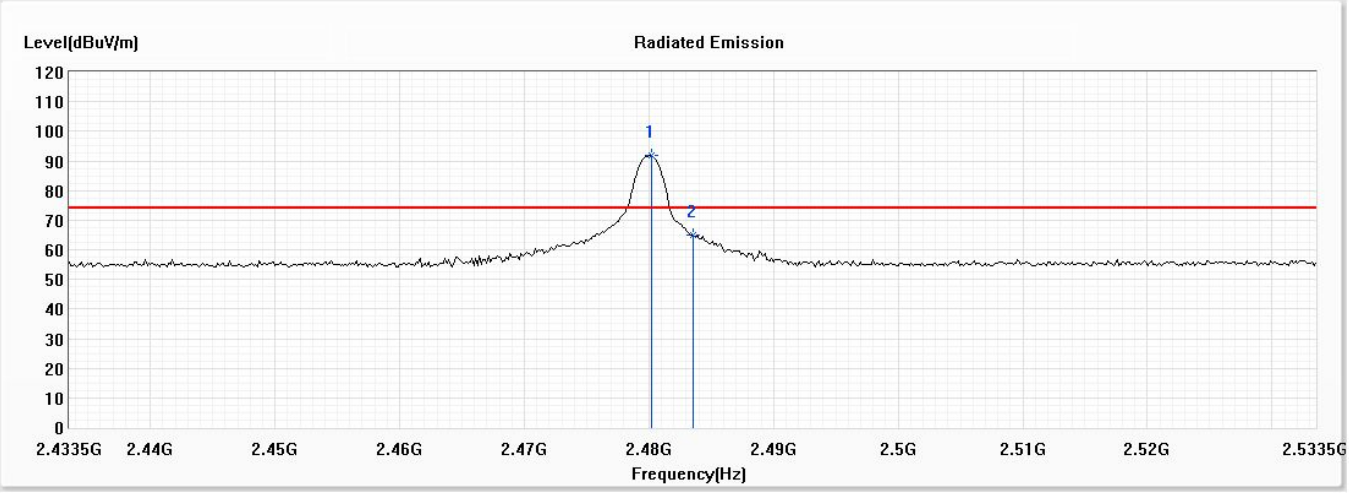
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
00 (Average)	2389.275	62.050	-25.036	37.014	-16.986	54.000	Pass
00 (Average)	2390.000	61.190	-25.036	36.154	-17.846	54.000	Pass
00 (Average)	2400.000	76.280	-25.036	51.244	--	--	Pass
00 (Average)	2402.029	96.530	-25.036	71.494	--	--	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Bluetooth Speaker
Test Item : Band Edge
Test Mode : Mode 2: Transmit - 3Mbps (2480MHz)
Test Date : 2020/11/13

Horizontal



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2480.167	91.70	--	--	80.23	11.47	PK
2	2483.500	65.06	74.00	-8.94	53.58	11.48	PK

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. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

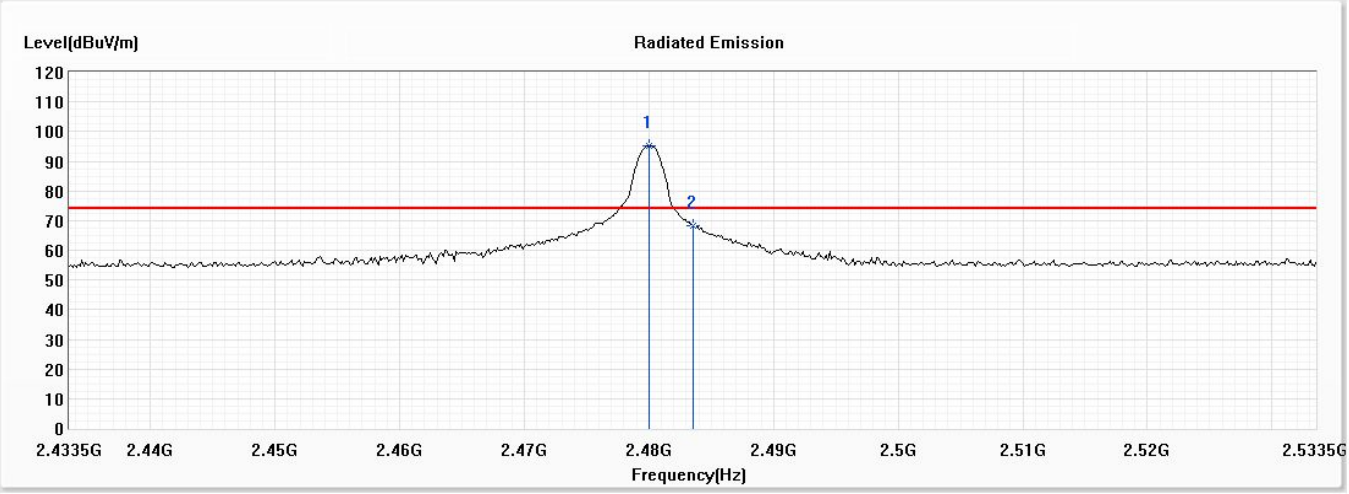
Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
78 (Average)	2480.167	91.700	-25.036	66.664	--	--	Pass
78 (Average)	2483.500	65.060	-25.036	40.024	-13.976	54.000	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product	:	Bluetooth Speaker
Test Item	:	Band Edge
Test Mode	:	Mode 2: Transmit - 3Mbps (2480MHz)
Test Date	:	2020/11/13

Vertical



No	Frequency (MHz)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Reading Level (dBuV)	Correct Factor (dB)	Detector Type
1	2480.022	95.14	--	--	83.67	11.47	PK
2	2483.500	68.37	74.00	-5.63	56.89	11.48	PK

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. Measurement Level = Reading Level + Correct Factor.
4. The average measurement was not performed when the peak measured data under the limit of average detection.

Channel No.	Frequency (MHz)	Peak Measurement (dBµV/m)	Duty Cycle Factor (dB)	Average Measurement (dBµV/m)	Margin (dB)	Average Limit (dBµV/m)	Result
78 (Average)	2480.022	95.140	-25.036	70.104	--	--	Pass
78 (Average)	2483.500	68.370	-25.036	43.334	-10.666	54.000	Pass

Note:

1. Average Measurement=Peak Measurement + Duty Cycle Factor
2. The Duty Cycle is refer to section 11.

Product : Bluetooth Speaker
Test Item : Band Edge
Test Mode : Mode 1: Transmit - 1Mbps(Hopping off)
Test Date : 2020/11/11

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00:

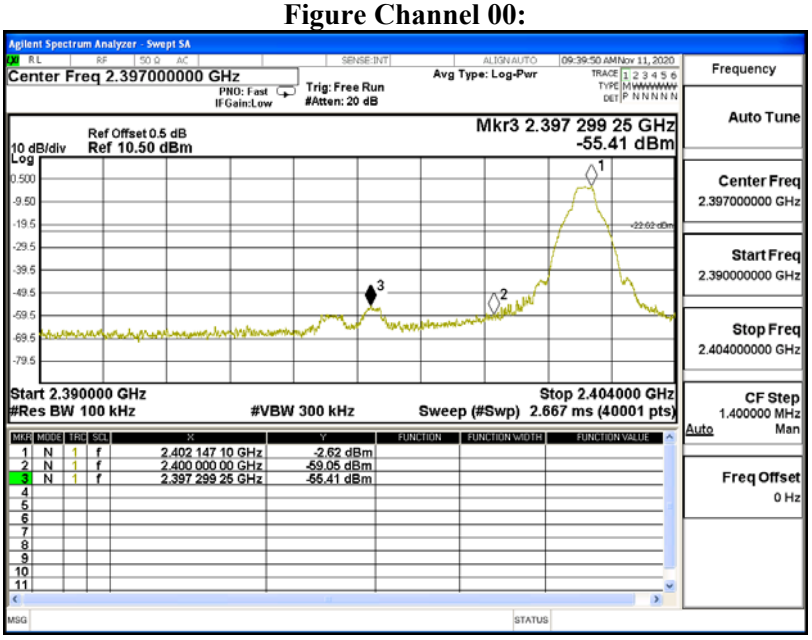
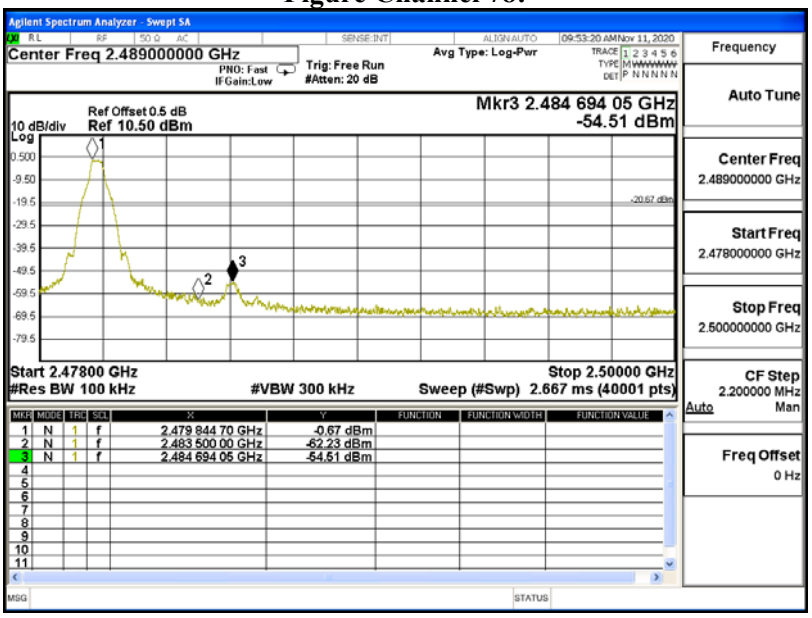


Figure Channel 78:



Product : Bluetooth Speaker
Test Item : Band Edge
Test Mode : Mode 2: Transmit - 3Mbps (Hopping off)
Test Date : 2020/11/11

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel 00:

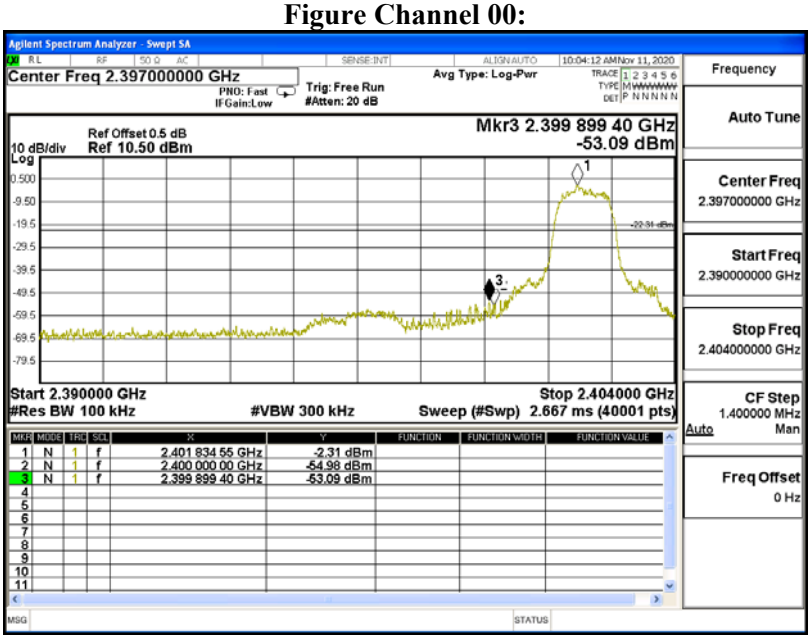
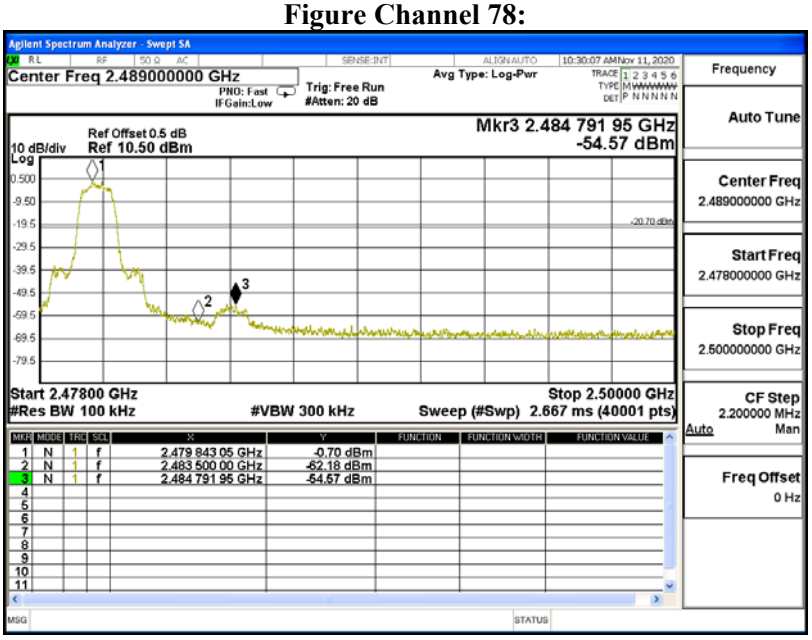


Figure Channel 78:



Product : Bluetooth Speaker
Test Item : Band Edge
Test Mode : Mode 1: Transmit - 1Mbps(Hopping on)
Test Date : 2020/11/11

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel Hopping:

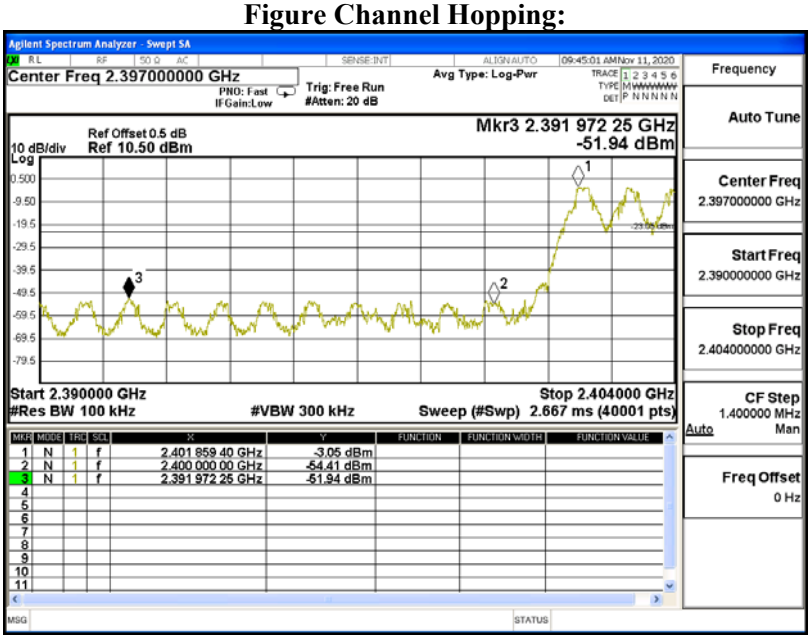
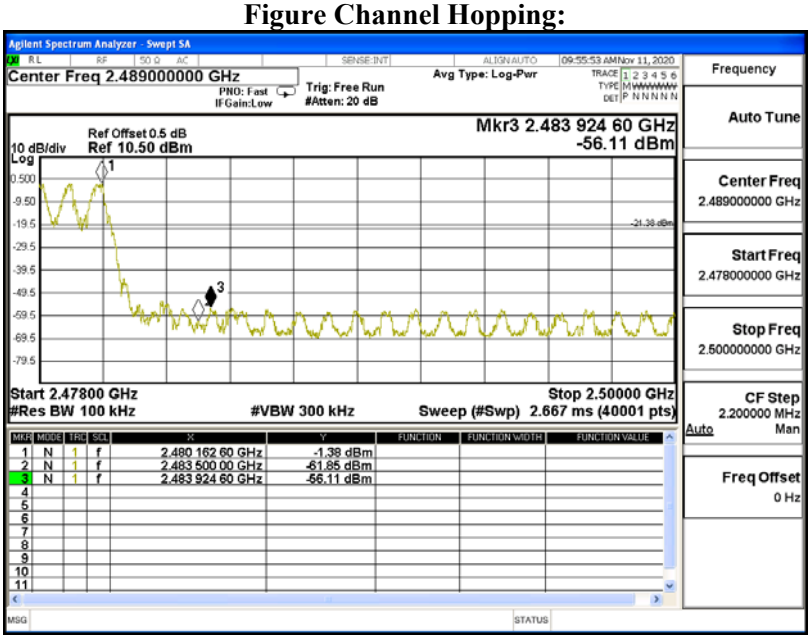


Figure Channel Hopping:



Product : Bluetooth Speaker
Test Item : Band Edge
Test Mode : Mode 2: Transmit - 3Mbps (Hopping on)
Test Date : 2020/11/11

Measurement Level Δ (dB)	Result
> 20	PASS

Figure Channel Hopping:

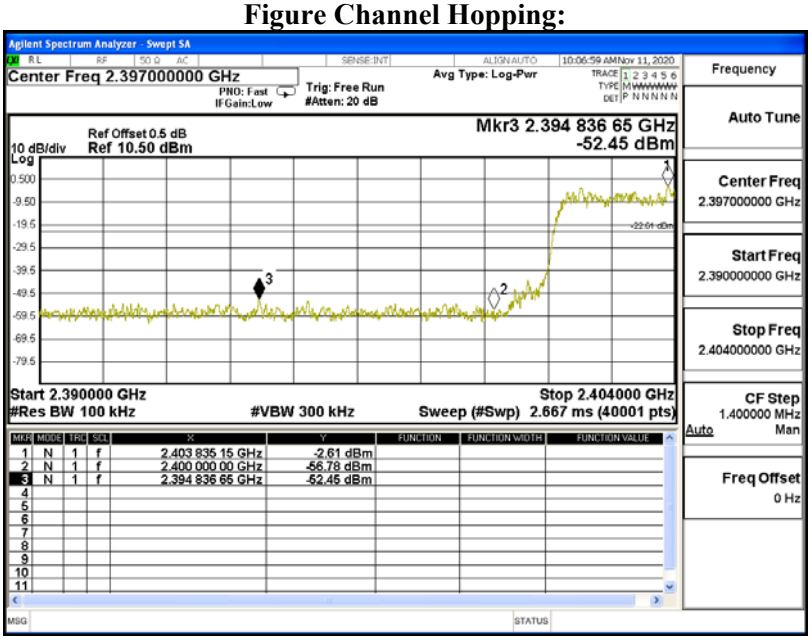
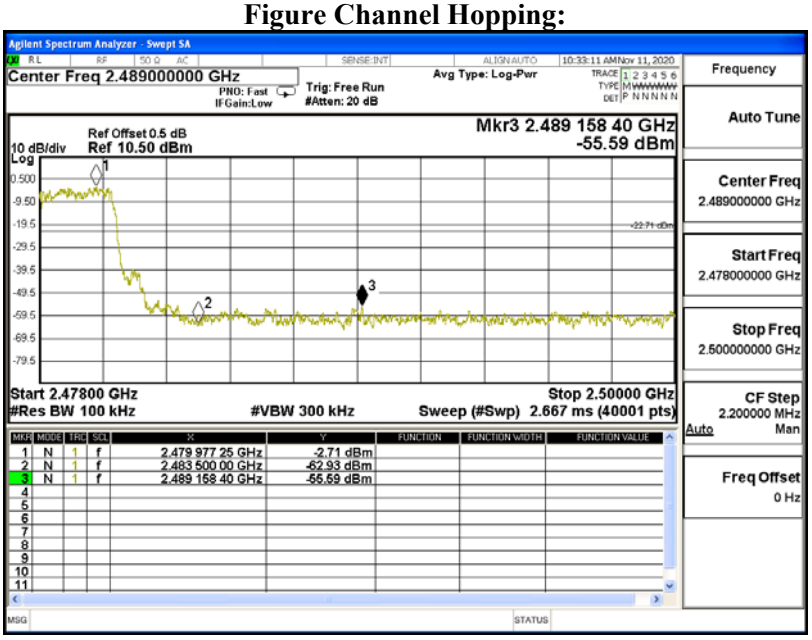
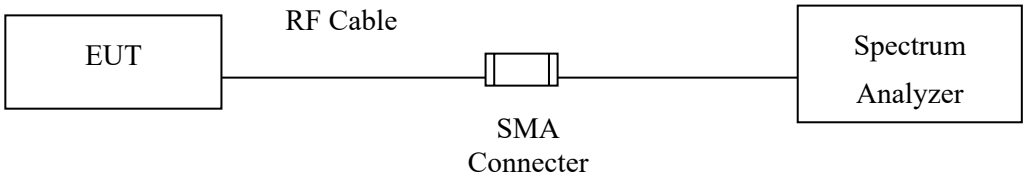


Figure Channel Hopping:



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

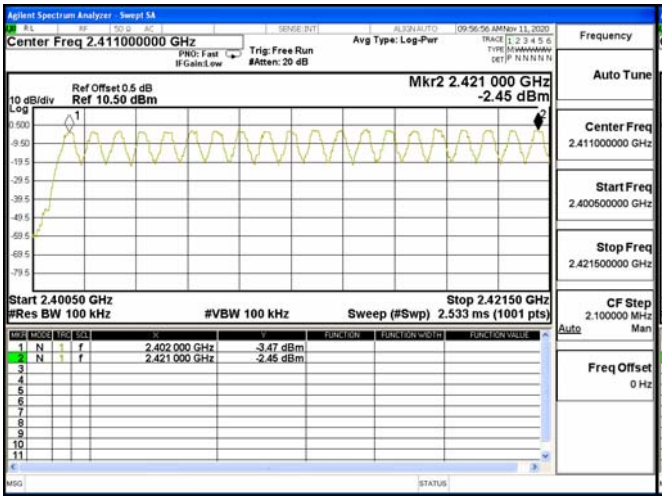
Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

7.4. Test Result of Channel Number

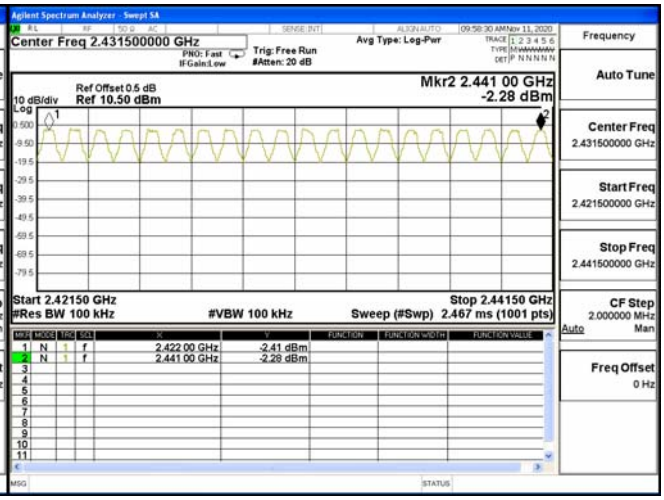
Product : Bluetooth Speaker
Test Item : Channel Number
Test Mode : Mode 1: Transmit - 1Mbps
Test Date : 2020/11/11

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>15	Pass

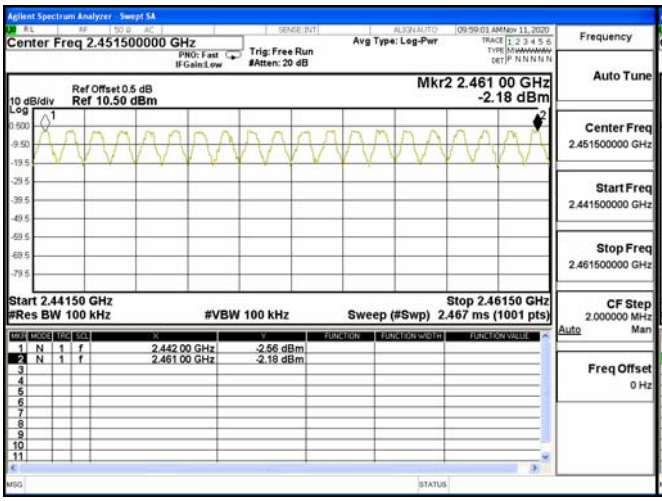
2402-2421MHz



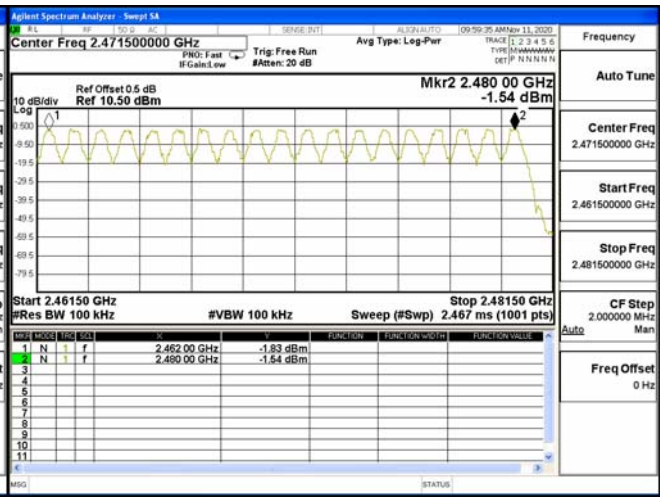
2422-2441MHz



2442-2461MHz



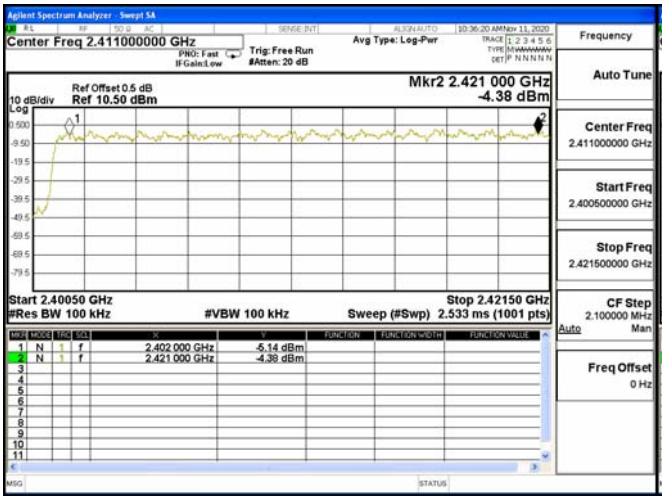
2462-2480MHz



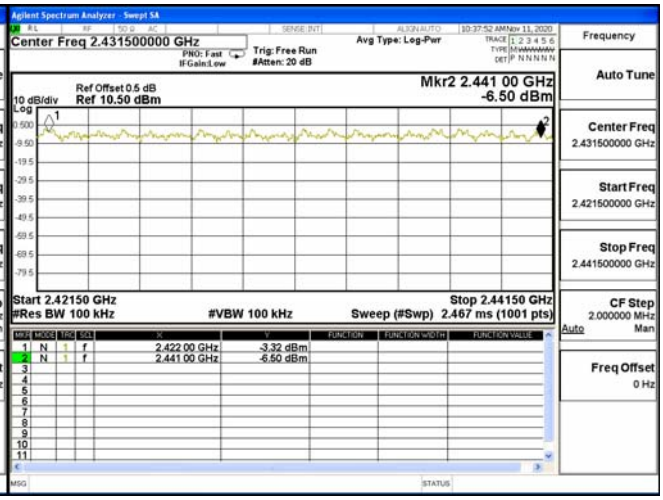
Product : Bluetooth Speaker
Test Item : Channel Number
Test Mode : Mode 2: Transmit - 3Mbps
Test Date : 2020/11/11

Frequency Range (MHz)	Measurement (Hopping Channel)	Required Limit (Hopping Channel)	Result
2402 ~ 2480	79	>15	Pass

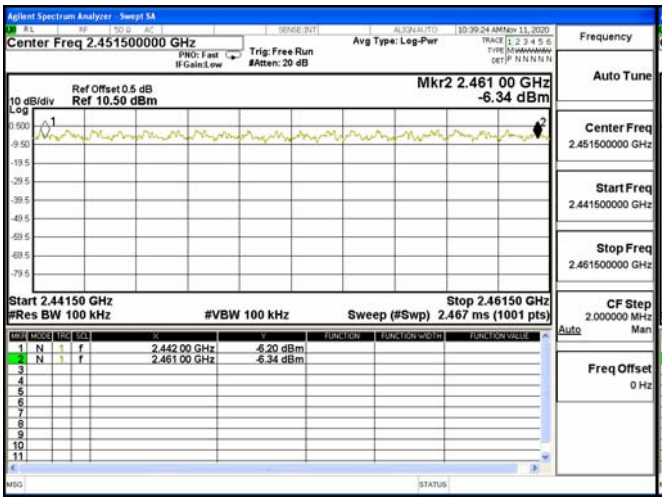
2402-2421MHz



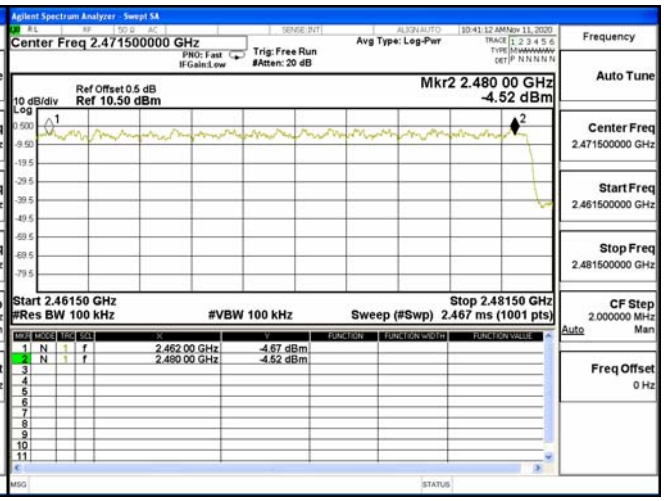
2422-2441MHz



2442-2461MHz

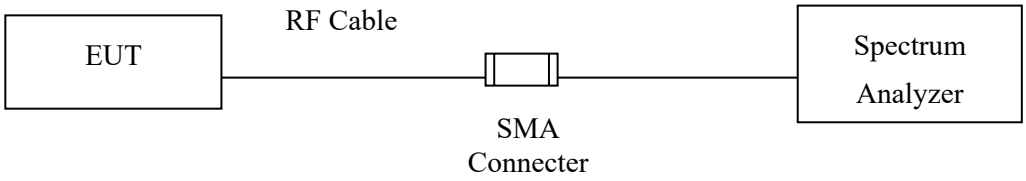


2462-2480MHz



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

Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

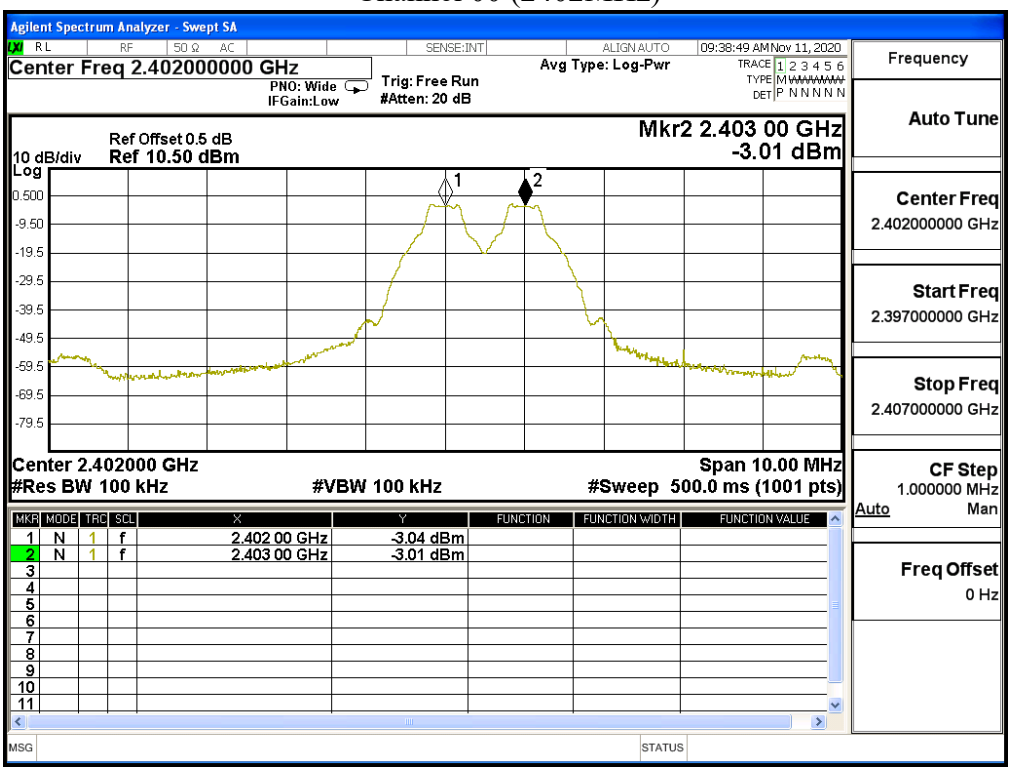
8.4. Test Result of Channel Separation

Product : Bluetooth Speaker
Test Item : Channel Separation
Test Mode : Mode 1: Transmit - 1Mbps
Test Date : 2020/11/11

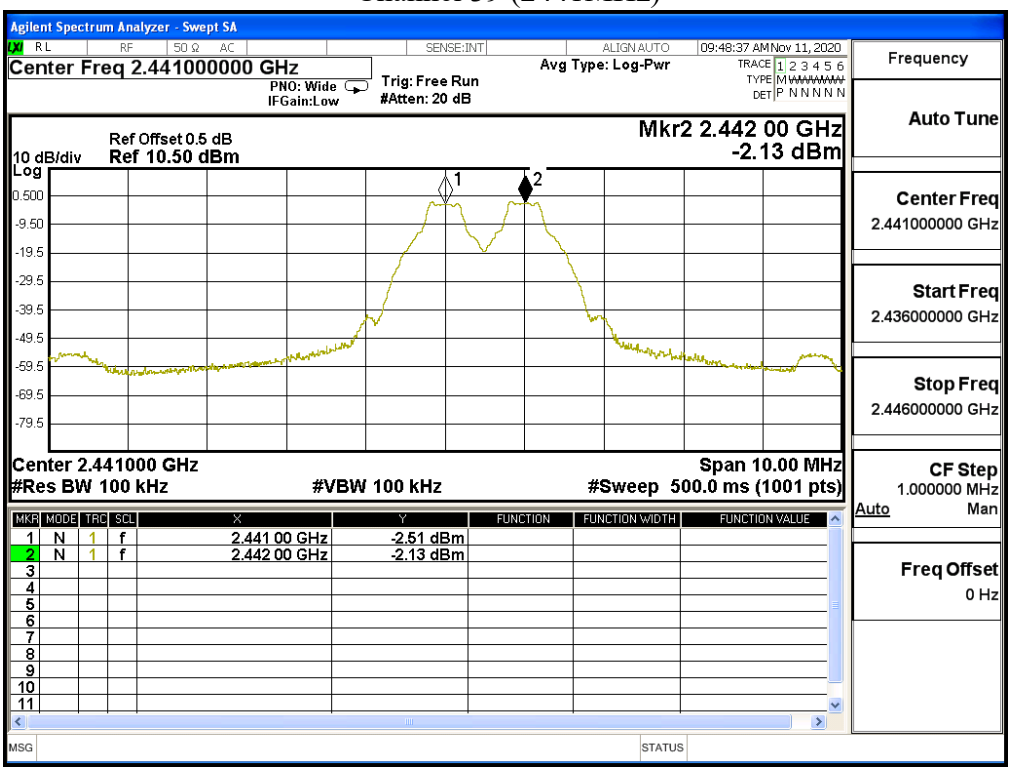
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	626.0	Pass
39	2441	1000	>25 kHz	624.0	Pass
78	2480	1000	>25 kHz	624.0	Pass

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

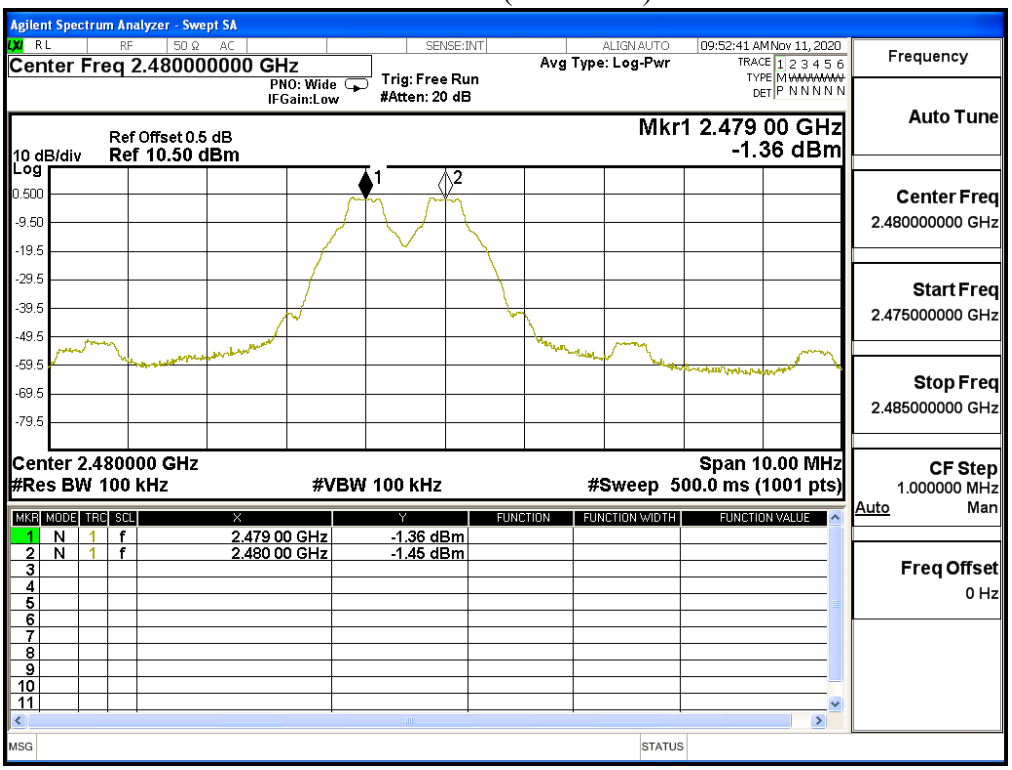
Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)

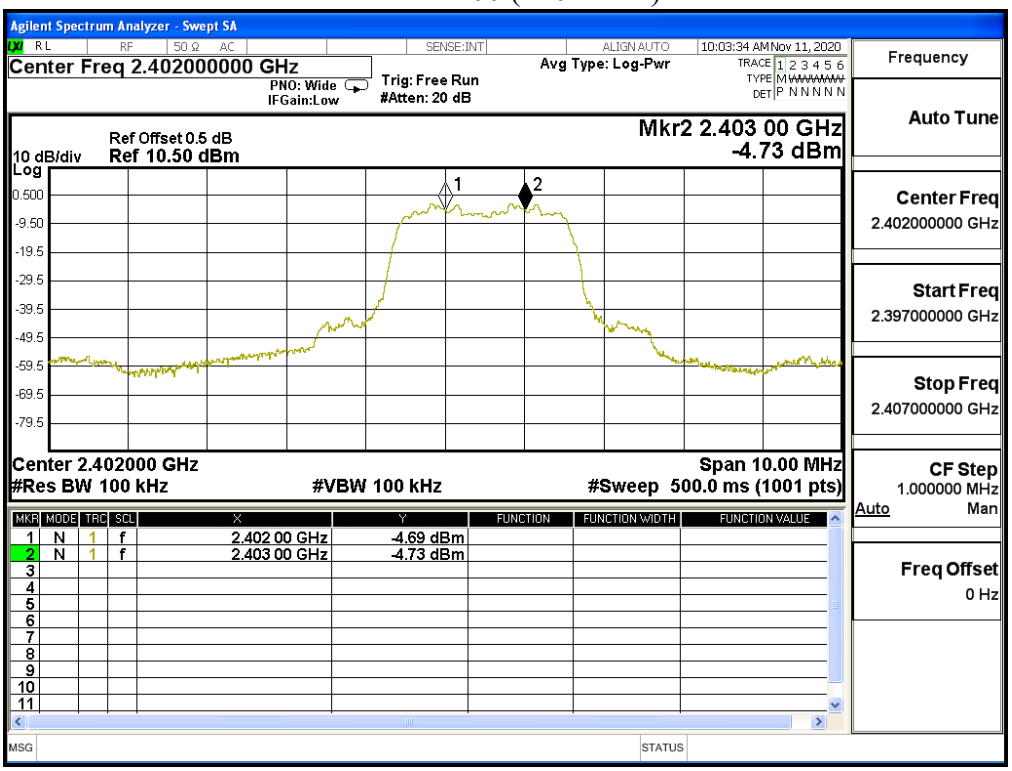


Product : Bluetooth Speaker
Test Item : Channel Separation
Test Mode : Mode 2: Transmit - 3Mbps
Test Date : 2020/10/26

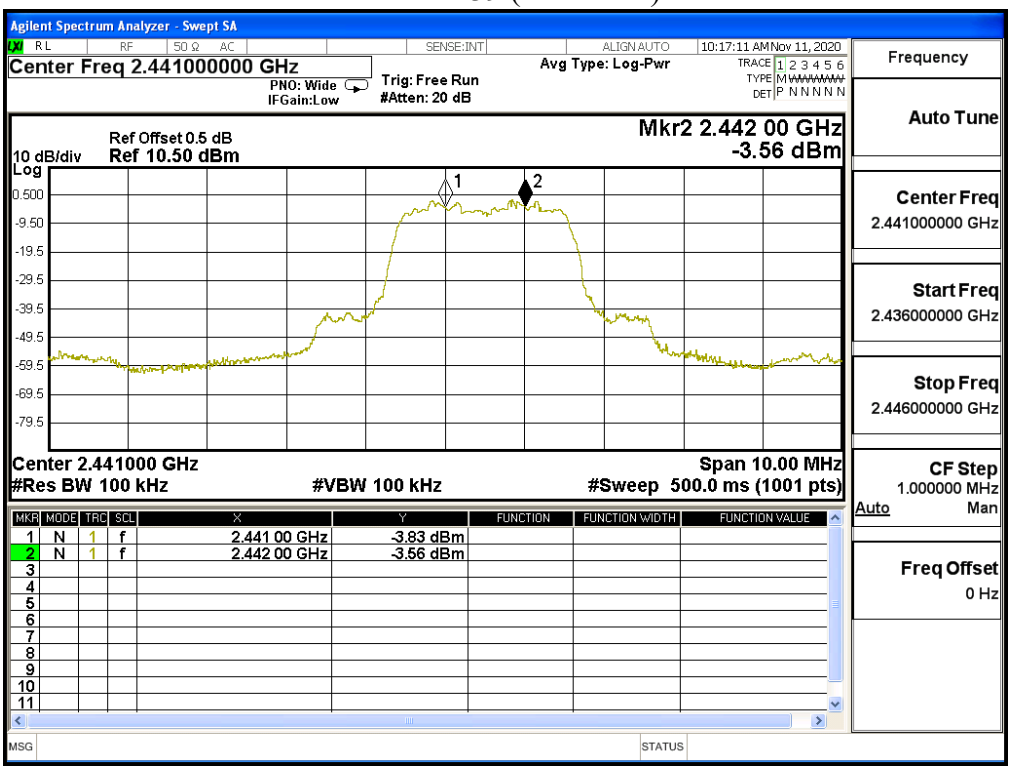
Channel No.	Frequency (MHz)	Measurement Level (kHz)	Limit (kHz)	Limit of (2/3)*20dB Bandwidth (kHz)	Result
00	2402	1000	>25 kHz	862.0	Pass
39	2441	1000	>25 kHz	864.0	Pass
78	2480	1000	>25 kHz	864.0	Pass

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

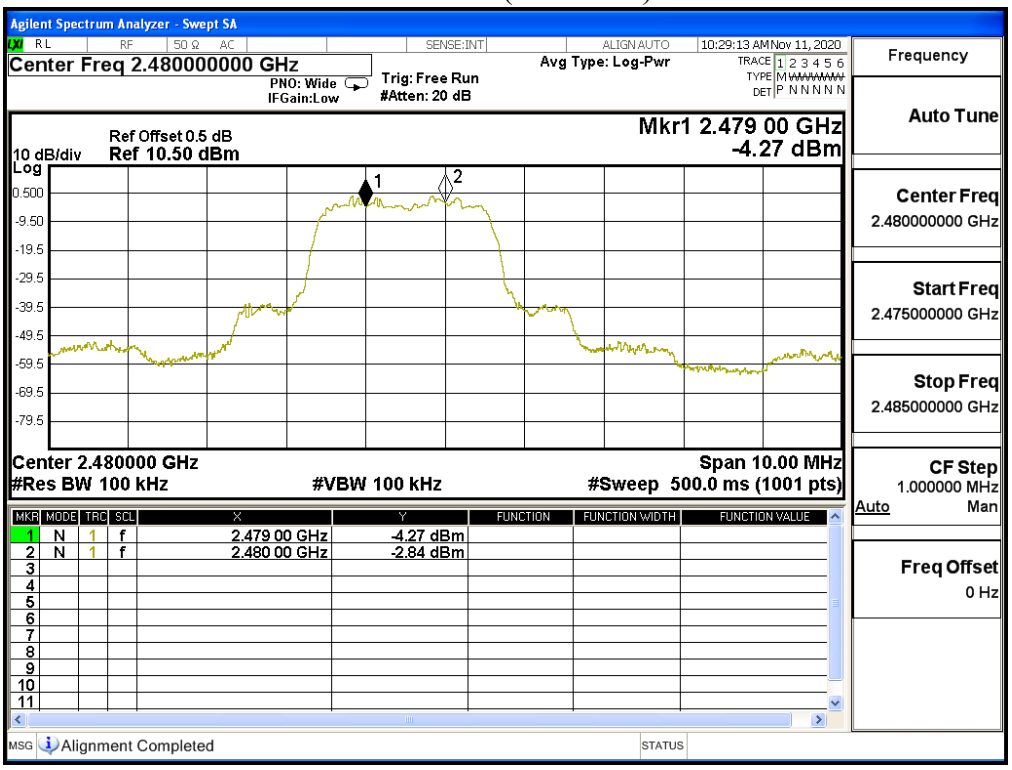
Channel 00 (2402MHz)



Channel 39 (2441MHz)

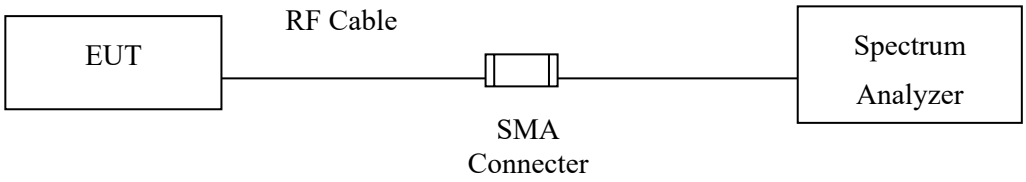


Channel 78 (2480MHz)



9. Dwell Time

9.1. Test Setup



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

Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

9.4. Test Result of Dwell Time

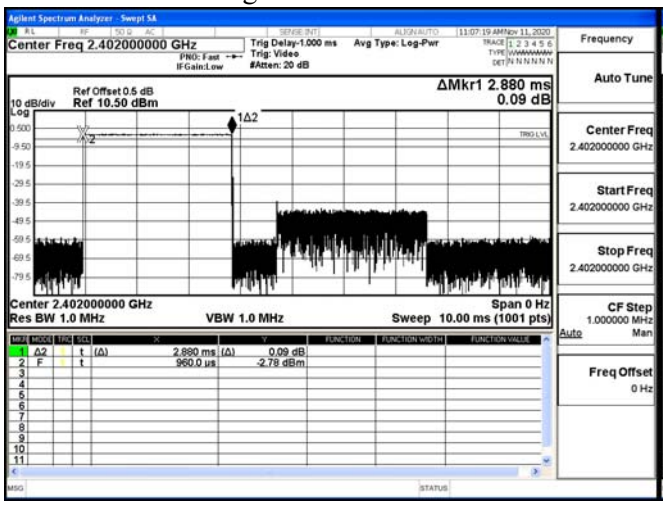
Product : Bluetooth Speaker
Test Item : Dwell Time
Test Mode : Mode 1: Transmit - 1Mbps (Channel 00,39,78)
Test Date : 2020/10/26

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Dwell Time (ms)	Limit (ms)	Result
2402	2.880	106	31600	305.280	400	Pass
2441	2.880	106	31600	305.280	400	Pass
2480	2.860	106	31600	303.160	400	Pass

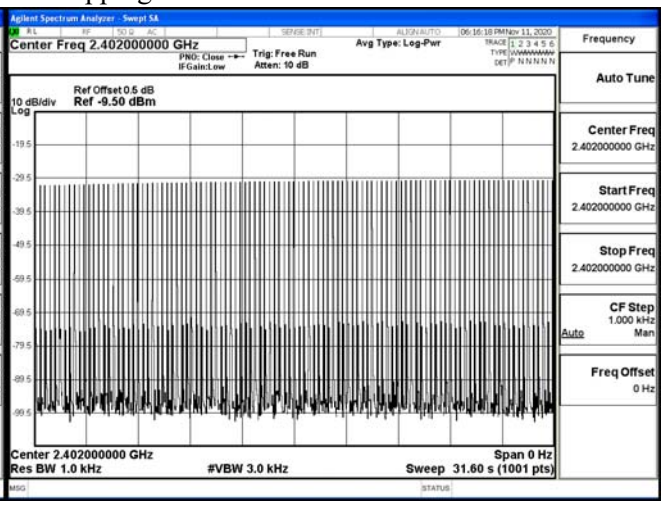
Dwell time = Time slot length(ms)*Hopping of Number

Dwell time in AFH mode / 20 channels with hopping rate 800 hops /sec.

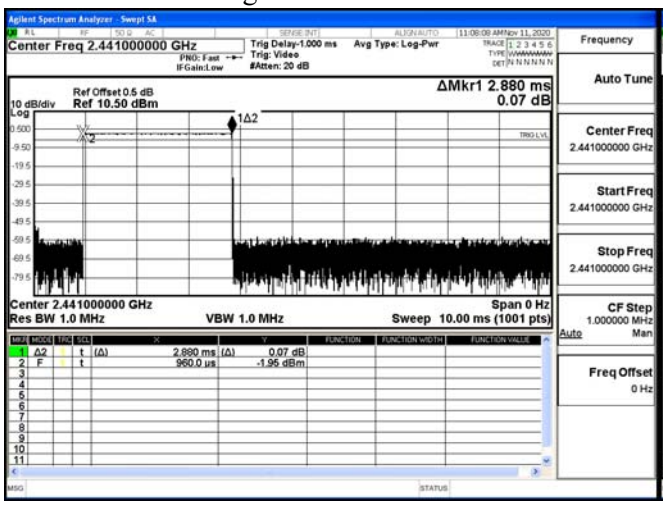
CH 00 Time slot length



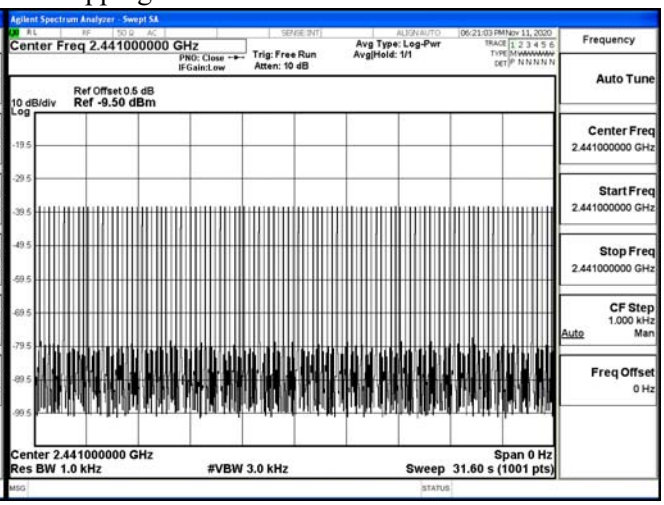
CH 00 Hopping of Number



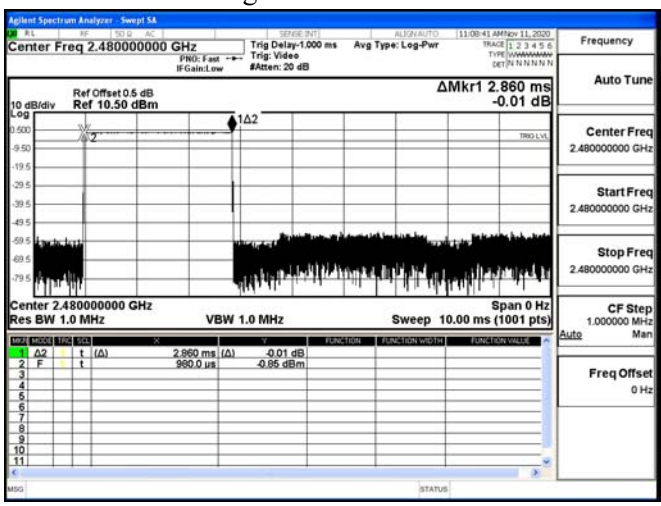
CH 39 Time slot length



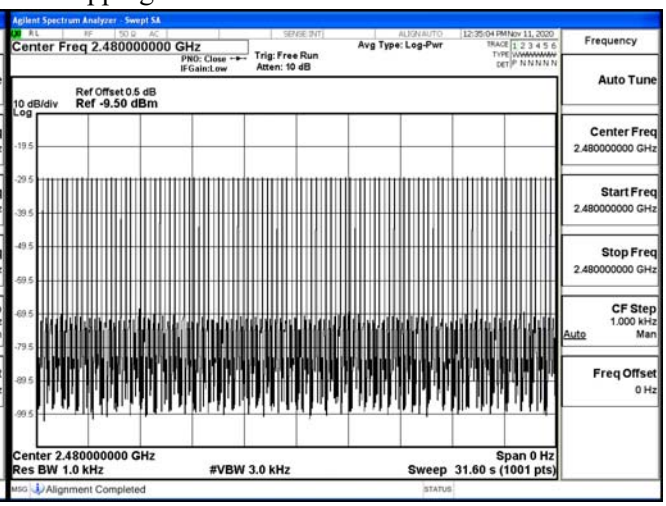
CH 39 Hopping of Number



CH 78 Time slot length



CH 78 Hopping of Number



Note:

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

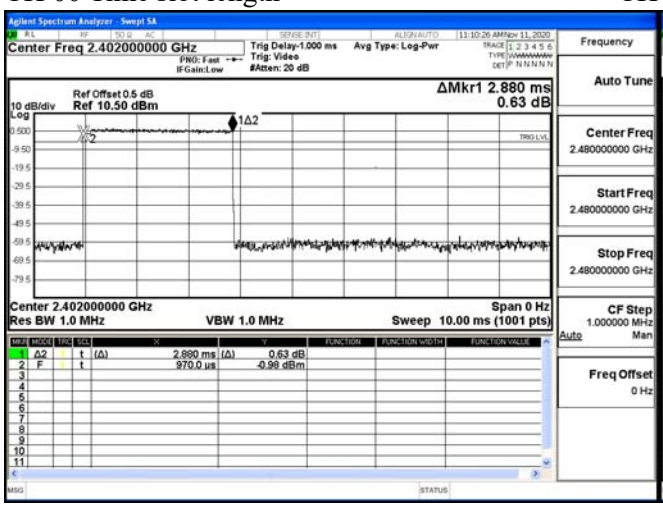
Product	:	Bluetooth Speaker
Test Item	:	Dwell Time
Test Mode	:	Mode 2: Transmit - 3Mbps (Channel 00,39,78)
Test Date	:	2020/10/26

Frequency (MHz)	Time slot length (ms)	Hopping of Number	Sweep time (ms)	Dwell Time (ms)	Limit (ms)	Result
2402	2.880	106	31600	305.280	400	Pass
2441	2.890	107	31600	309.230	400	Pass
2480	2.880	106	31600	305.280	400	Pass

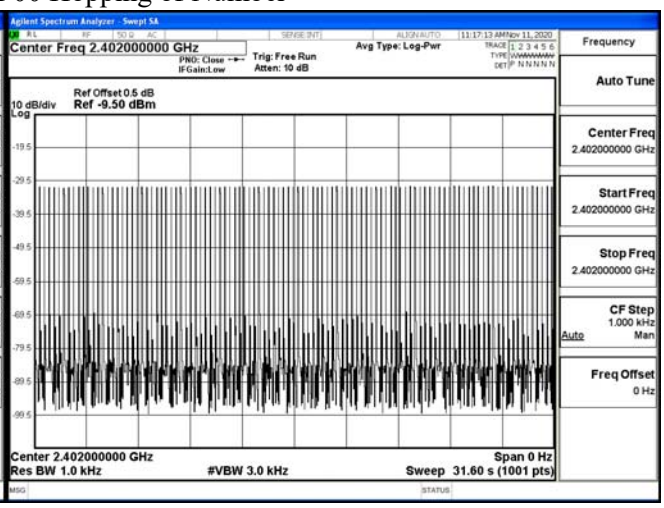
Dwell time = Time slot length(ms)*Hopping of Number

Dwell time in AFH mode / 20 channels with hopping rate 800 hops /sec.

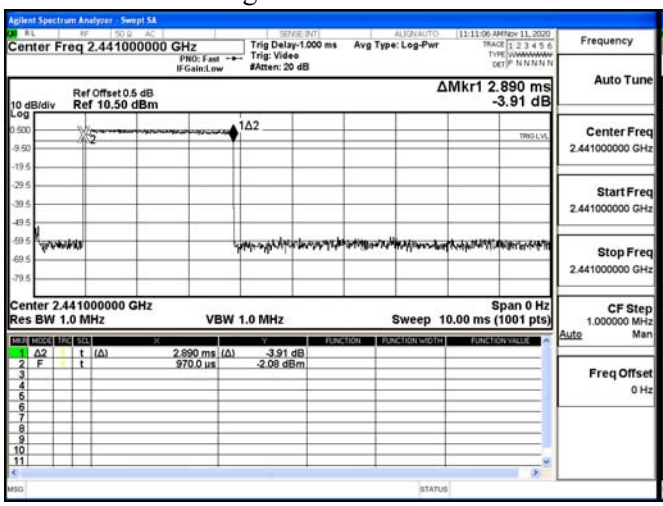
CH 00 Time slot length



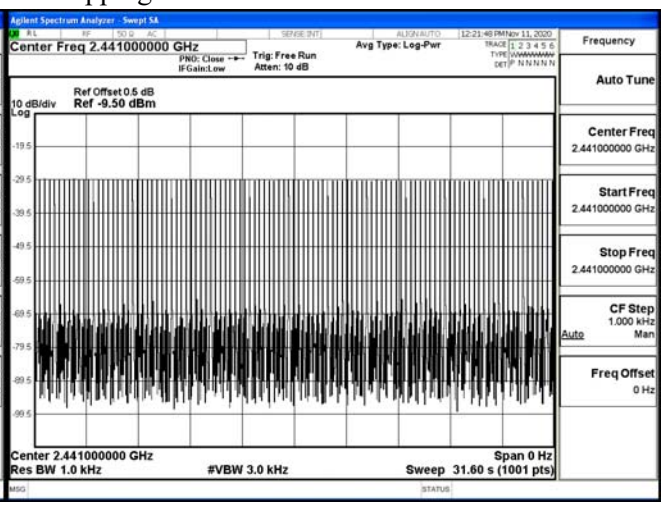
CH 00 Hopping of Number



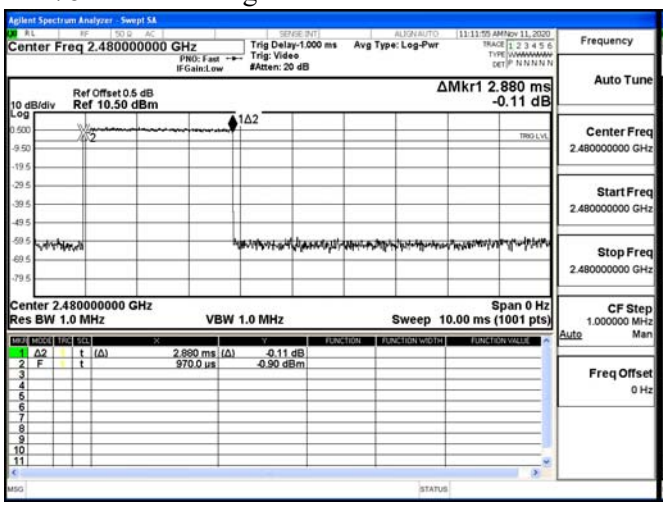
CH 39 Time slot length



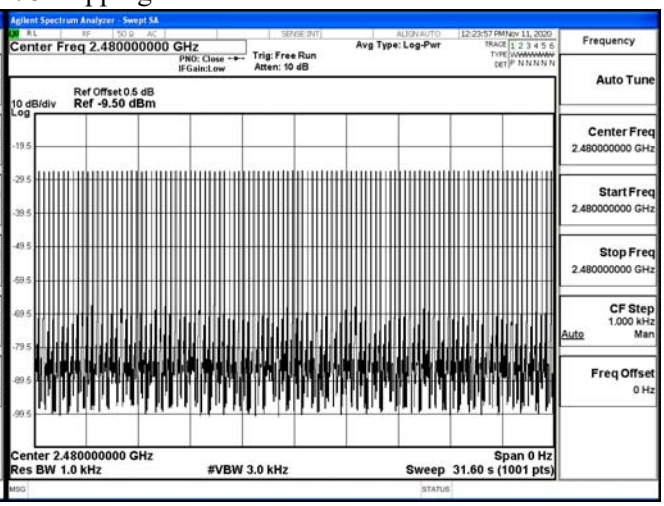
CH 39 Hopping of Number



CH 78 Time slot length



CH 78 Hopping of Number

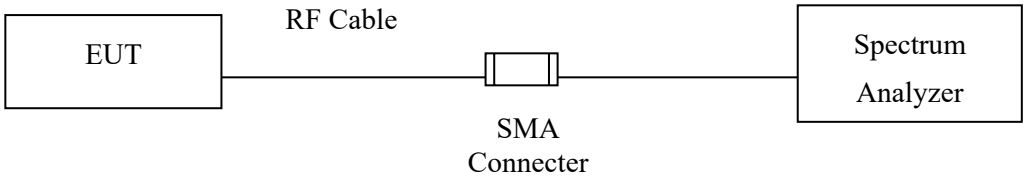


Note:

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

Tested according to FHSS test procedure of KDB558074 section 9 (b for compliance to FCC 47CFR 15.247 requirements.

10.4. Test Result of Occupied Bandwidth

Product : Bluetooth Speaker
Test Item : Occupied Bandwidth Data
Test Mode : Mode 1: Transmit - 1Mbps
Test Date : 2020/10/26

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	939	--	NA
39	2441	936	--	NA
78	2480	936	--	NA

Figure Channel 00:

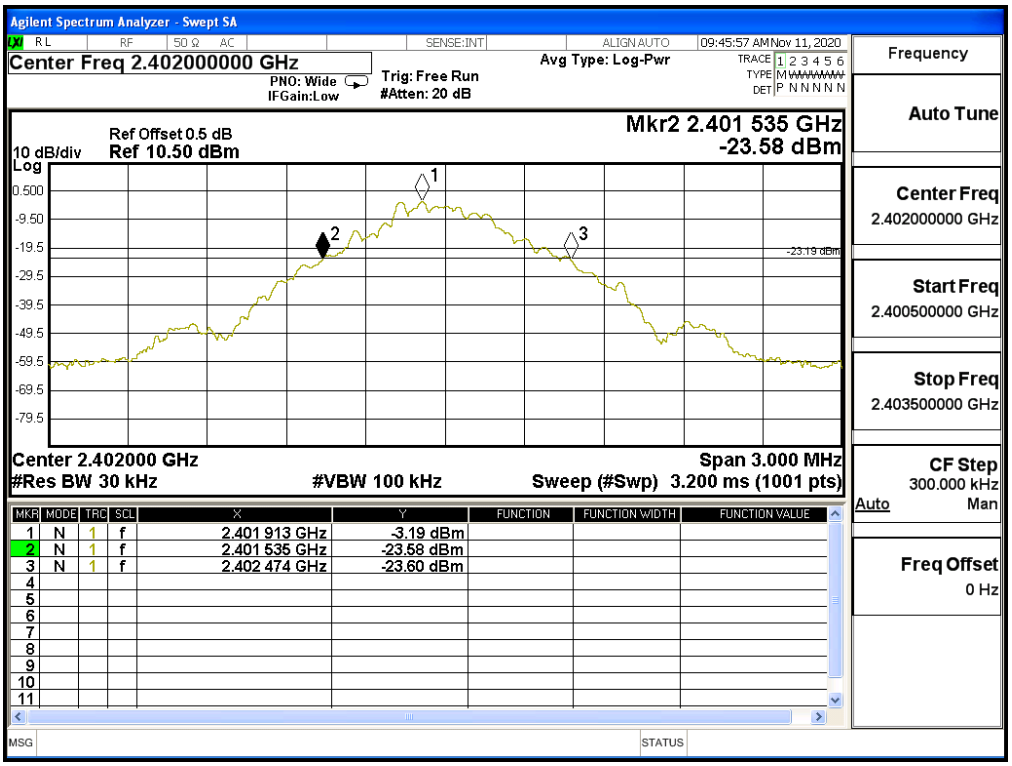


Figure Channel 39:

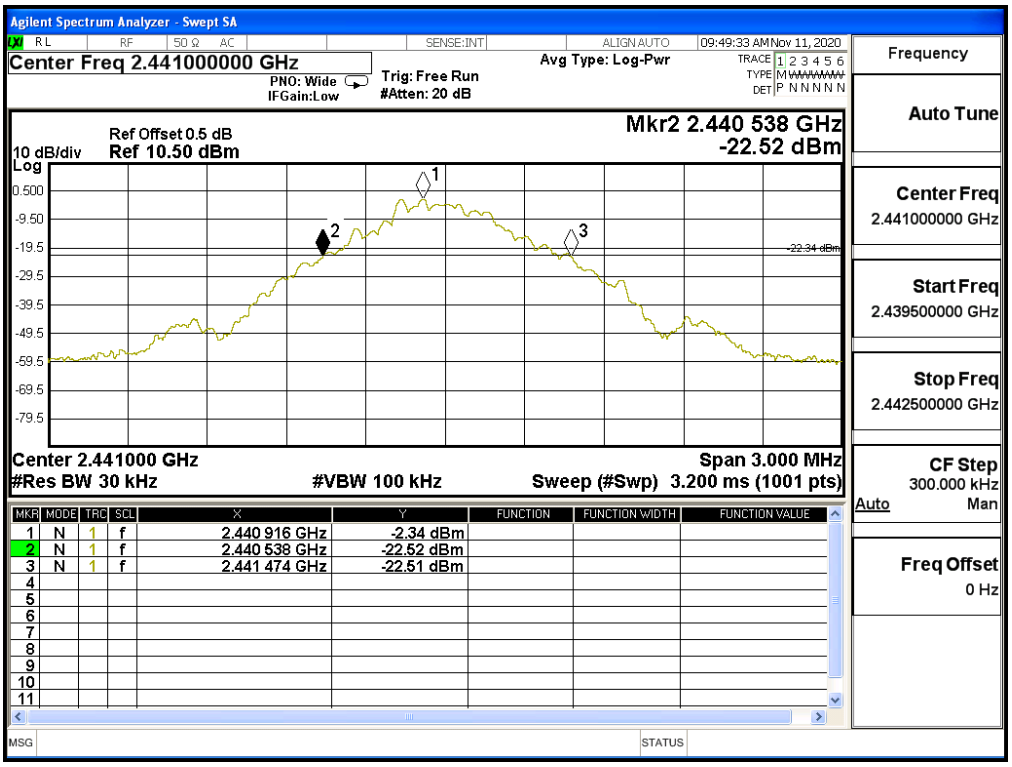
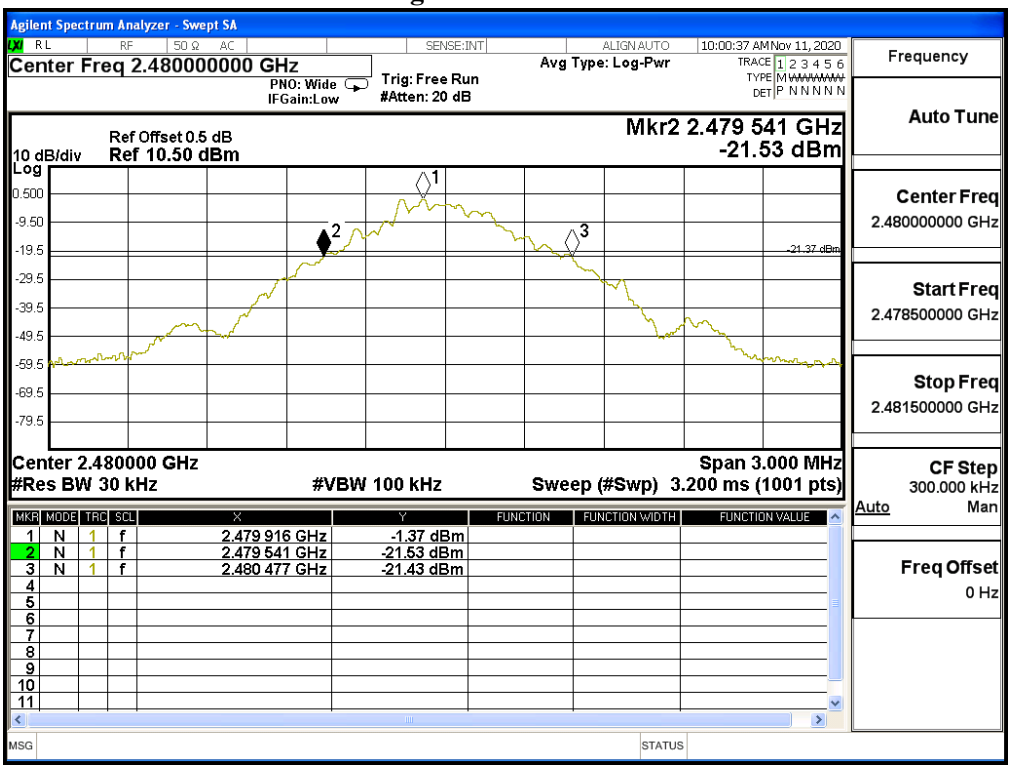


Figure Channel 78:



Product : Bluetooth Speaker
Test Item : Occupied Bandwidth Data
Test Mode : Mode 2: Transmit - 3Mbps (2402MHz)
Test Date : 2020/10/26

Channel No.	Frequency (MHz)	Measurement Level (kHz)	Required Limit (kHz)	Result
00	2402	1293	--	NA
39	2441	1296	--	NA
78	2480	1296	--	NA

Figure Channel 00:

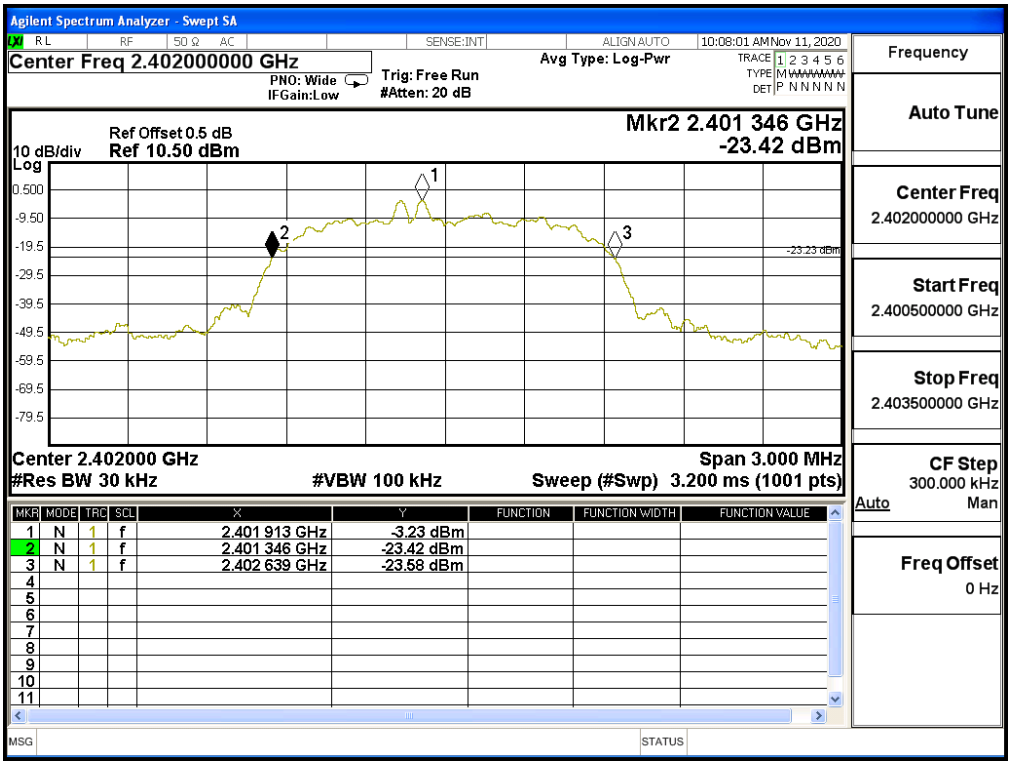


Figure Channel 39:

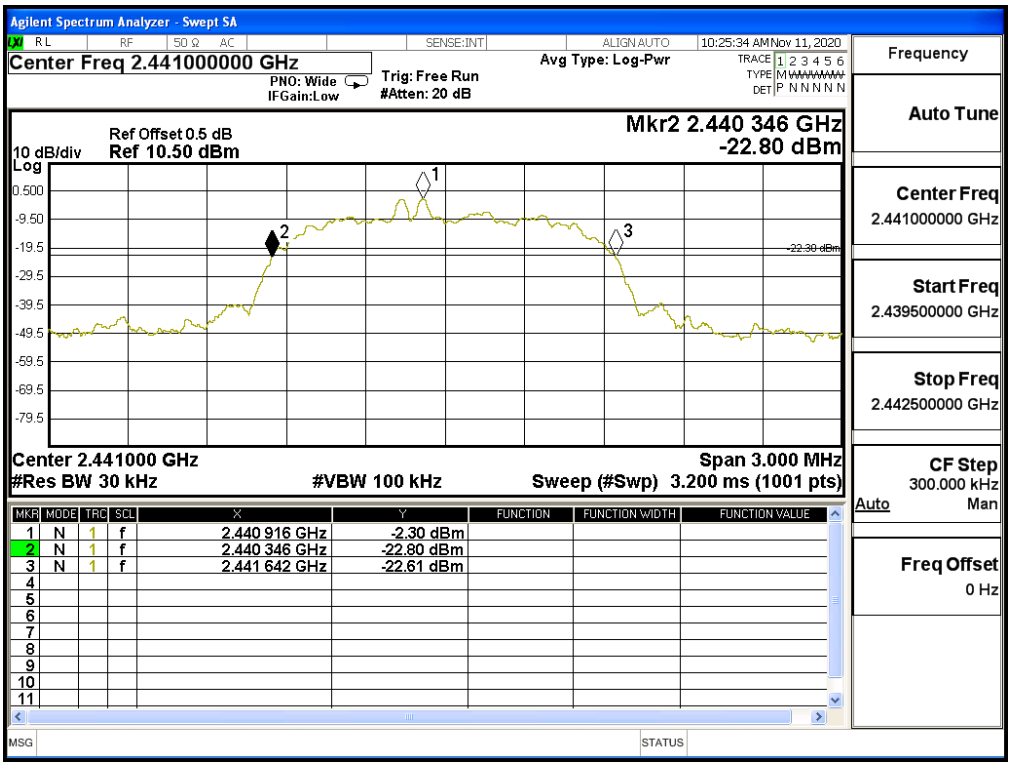
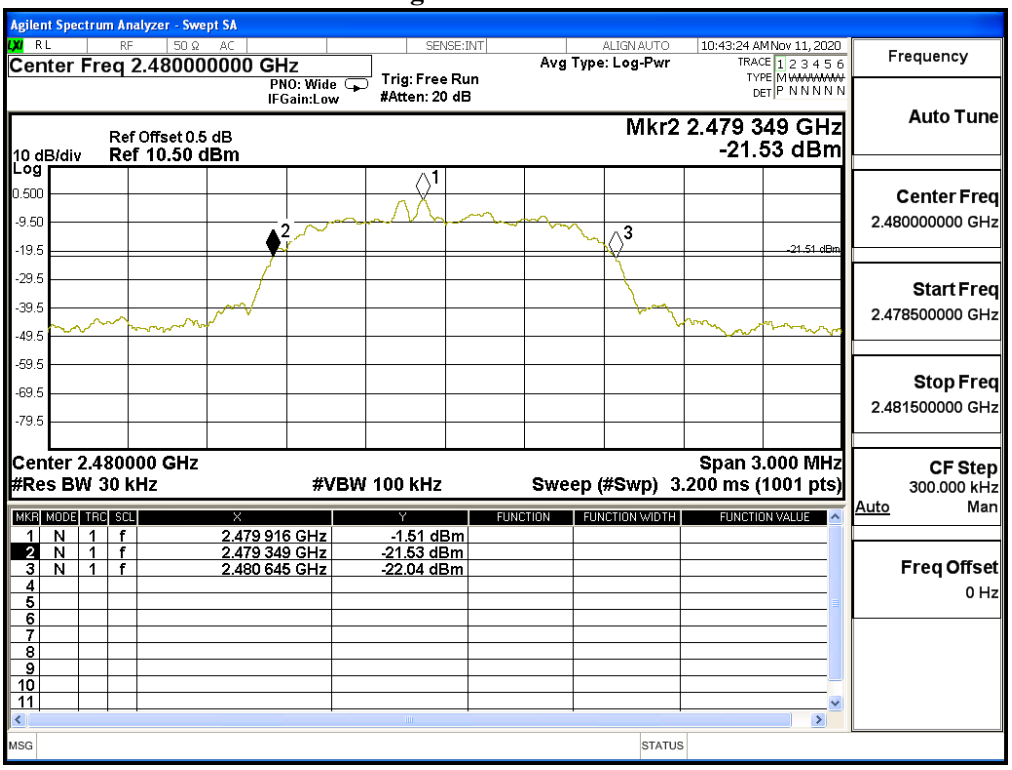
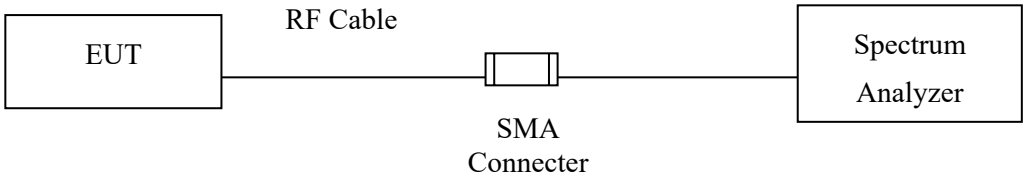


Figure Channel 78:



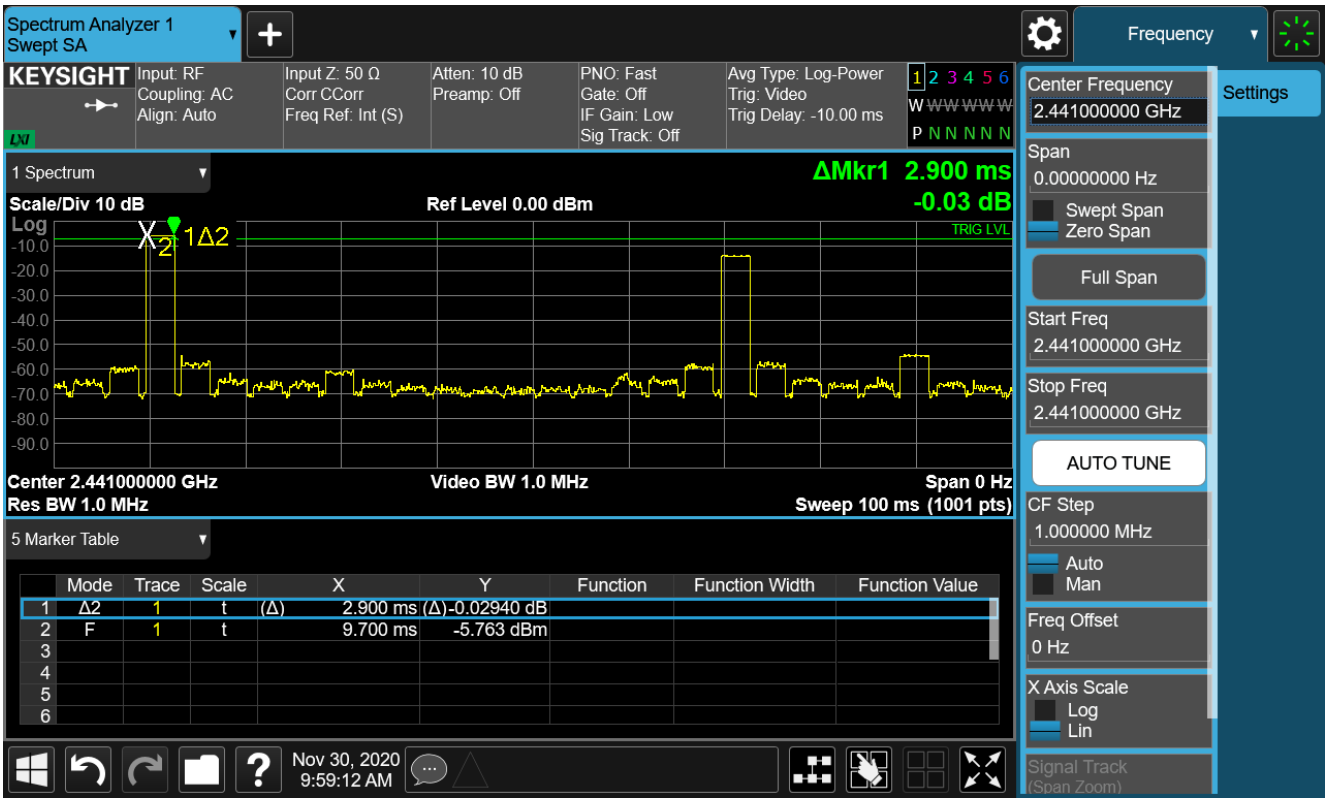
11. Duty Cycle

11.1. Test Setup



11.2. Test Result of Duty Cycle

Product : Bluetooth Speaker
Test Item : Duty Cycle Data
Test Mode : Mode 1: Transmit - 1Mbps



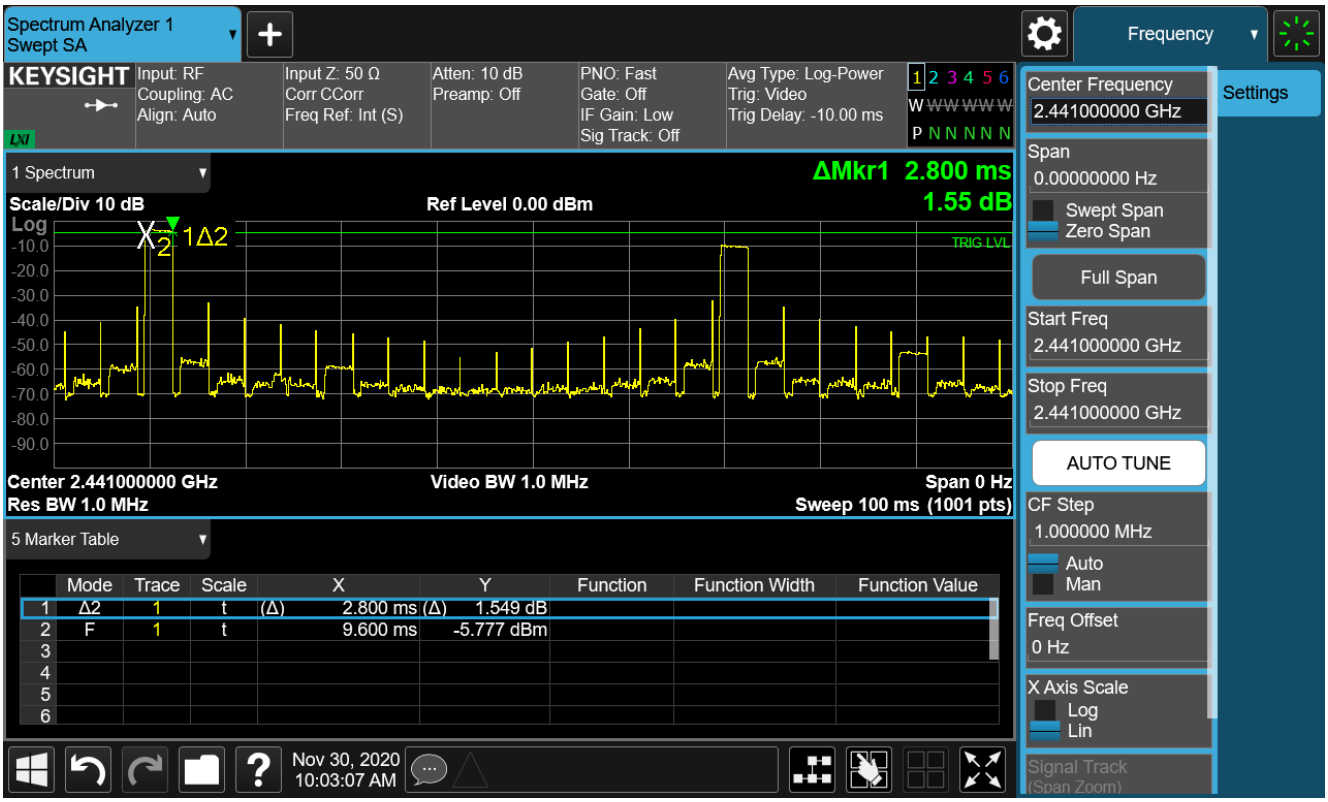
Time on of 100ms= 2.9ms*2= 5.8ms

Duty Cycle=5.8ms / 100ms= 0.058

Duty Cycle correction factor= 20 LOG 0.058= -24.731 dB

Duty Cycle correction factor	**-24.731**	**dB**

Product : Bluetooth Speaker
Test Item : Duty Cycle Data
Test Mode : Mode 2: Transmit - 3Mbps



Time on of 100ms= 2.8ms*2= 5.6ms

Duty Cycle=5.6ms / 100ms= 0.056

Duty Cycle correction factor= 20 LOG 0.056= -25.036 dB

Duty Cycle correction factor	**-25.036**	**dB**

12. EMI Reduction Method During Compliance Testing

No modification was made during testing.