

Test Report

FCC Part15 Subpart C

Product Name : BLUETOOTH SPEAKER
Model No. : LTG200
FCC ID : Y2SLTG200
IC : 9452A-LTG200

Applicant : LIBRATONE A/S
Address : Sundkaj 9, DK-2150 Nordhavn, Denmark

Date of Receipt : Apr. 04, 2016
Test Date : Apr. 04, 2016~ Apr. 04, 2016
Issued Date : Apr. 28, 2016
Report No. : 1632020R-RF-US-P06V01
Report Version : V 1.1

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 of the equipment and evaluated measurement uncertainty herein.

This report must not be used to claim product endorsement by TAF or any agency of the government.

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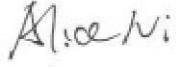
Test Report Certification

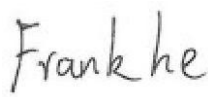
Issued Date : Apr. 28, 2016

Report No. : 1632020R-RF-US-P06V01



Product Name : BLUETOOTH SPEAKER
Applicant : LIBRATONE A/S
Address : Sundkaj 9, DK-2150 Nordhavn, Denmark
Manufacturer : LIBRATONE A/S
Address : Sundkaj 9, DK-2150 Nordhavn, Denmark
Model No. : LTG200
FCC ID : Y2SLTG200
IC : 9452A-LTG200
Brand Name : LIBRATONE
EUT Voltage : DC 5V
Applicable Standard : FCC CFR Title 47 Part 15 Subpart C: 2015
ANSI C63.4: 2014; ANSI C63.10: 2013
Industry Canada RSS-Gen Issue 4/RSS-247 Issue 1
Test Result : Complied
Performed Location : Quietek Corporation - Suzhou EMC Laboratory
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FCC Registration Number: 800392; IC Lab Code: 4075B

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Laboratory Information

We, **QuieTek Corporation**, are an independent EMC and safety consultancy that was established the whole facility in our laboratories. The test facility has been accredited/accepted(audited or listed) by the following related bodies in compliance with ISO 17025, EN 45001 and specified testing scope:

Taiwan R.O.C.	:	BSMI, NCC, TAF
USA	:	FCC
Japan	:	VCCI
China	:	CNAS

The related certificate for our laboratories about the test site and management system can be downloaded from QuieTek Corporation's Web Site : <http://www.quietek.com/english/about/certificates.aspx?bval=5>
The address and introduction of QuieTek Corporation's laboratories can be founded in our Web site : http://www.quietek.com/index_en.aspx
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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
1632087R-RF-US-P06V01	V1.0	Initial Issued Report	Apr. 19, 2016
1632087R-RF-US-P06V01	V1.1	Modified the 20dB bandwidth, power and hopping number. Change the address of the applicant and manufacturer	Apr. 28, 2016

1. General Information

1.1. EUT Description

Product Name	BLUETOOTH SPEAKER
Model No.	LTG200
Working Voltage	DC 5V
Bluetooth Specification	V3.0+V4.0
Frequency Range	2402- 2480 MHz
Channel Number	V3.0: 79 V4.0: 40
Channel Separation	V3.0: 1MHz V4.0: 2MHz
Type of Modulation	V3.0: GFSK, Pi/4 DQPSK, 8DPSK V4.0: GFSK
Data Rate	V3.0: 1Mbps(GFSK), 2Mbps(Pi/4 DQPSK), 3Mbps (8DPSK) V4.0: 1Mbps(GFSK)
Antenna Type	Reference to Antenna List
Peak Antenna Gain	Reference to Antenna List

Bluetooth Working Frequency of Each Channel: (For V3.0)

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

Bluetooth Antenna List

Antenna	Manufacturer	Model No.	Peak Gain
Metal Antenna	N/A	N/A	0dBi for 2.4GHz

1.2 Mode of Operation

QuieTek has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

Test Mode
Mode 1: Transmitter-1Mbps(GFSK_DH5)
Mode 2: Transmitter-2Mbps(Pi/4 DQPSK_DH5)
Mode 3: Transmitter-3Mbps(8DPSK_DH5)

Note:

1. For portable device, radiated spurious emission was verified over X, Y, Z Axis, and shown the worst case on this report.
2. Regards to the frequency band operation for systems using FHSS modulation: normal operation (hopping) was selected to test for conducted, and the lowest, highest frequency channel for radiation spurious test.
3. The extreme test condition for voltage and temperature were declared by the manufacturer.
4. The reading values of all the test items contain cable loss.

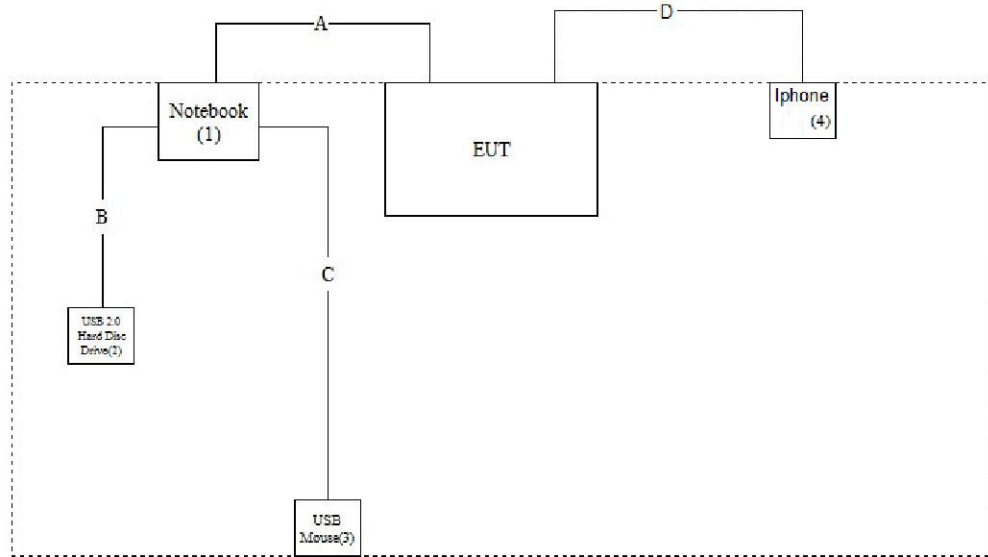
1.3 Tested System Details

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

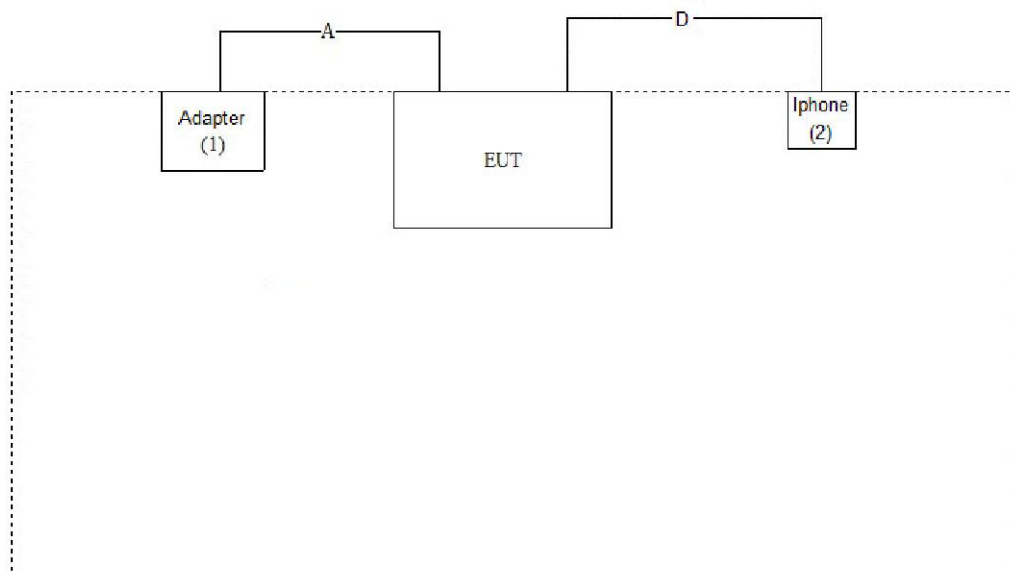
Product		Manufacturer	Model No.	Serial No.	Power Cord
1	Notebook	lenovo	U430	N/A	Power by adapter
2	USB 2.0 Hard Disc Drive	Lenovo	F310	OA0568122701563	Power by Notebook
3	USB Mouse	DELL	MO56UOA	G0X03EGU	Power by Notebook
4	iPod touch	Apple	A1421	CCQN53YKG22V	Power by Battery

1.4 Configuration of Tested System

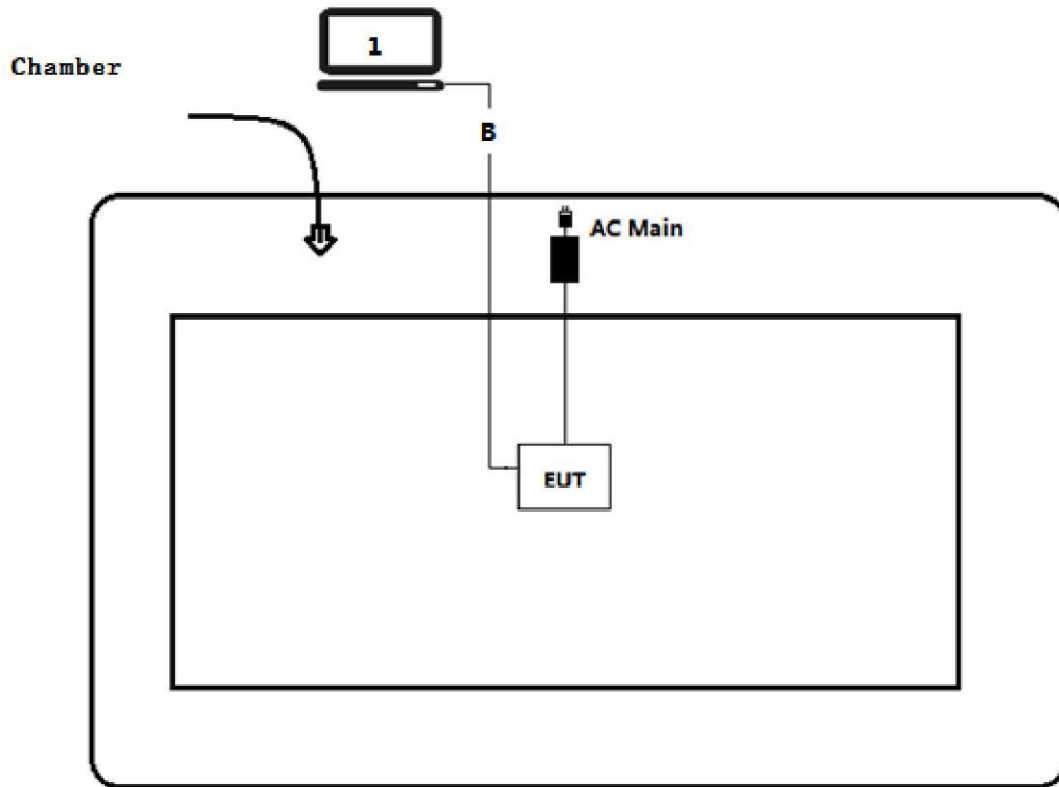
Connection Diagram(Conducted Emission) Powered by Notebook



Connection Diagram(Conducted Emission) Powered by Adapter



Connection Diagram(Radiated Emission)



Signal Cable Type		Signal cable Description
A	Mini USB Cable	Shielded, 1.0m
B	USB 2.0 Cable	Shielded, 0.5m
C	USB Mouse Cable	Shielded, 1.8m
D	Audio Cable	Shielded, 0.5m

1.5 EUT Exercise Software

1	Setup the EUT and simulators as shown on above.
2	Turn on the power of all equipment.
3	Run the RF test software, and set the test mode and channel, then press OK to start continue Transmit.

2. Technical Test

2.1. Summary of Test Result

☒ No deviations from the test standards

☐ Deviations from the test standards as below description:

For FCC

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.207	Yes	No
Emissions in restricted frequency bands	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.209	Yes	No
20dB Bandwidth	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(a)(1)	Yes	No
Carrier Frequency Separation	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(a)(1)	Yes	No
Number of Hopping Frequencies	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(a)(1)(iii)	Yes	No
Time of Occupancy (Dwell Time)	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(a)(1)(iii)	Yes	No
Peak Output Power	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.247(b)(1)	Yes	No
Emissions in non-restricted frequency bands	FCC CFR Title 47 Part 15 Subpart C: 2015 Section 15.215(c), 15.247(d)	Yes	No
Radiated Emission Band Edge	FCC CFR Title 47 Part 15 Subpart C: 2015 15.247(d)	Yes	No

For IC

Performed Test Item	Normative References	Test Performed	Deviation
Conducted Emission	RSS-Gen Issue 4 Section 8.8	Yes	No
Radiated Emission	RSS-Gen Issue 4 Section 8.9	Yes	No
20dB Bandwidth	RSS-247 Issue 1 Section 5.1	Yes	No
Carrier Frequency Separation	RSS-247 Issue 1 Section 5.1	Yes	No
Number of Hopping Frequencies	RSS-247 Issue 1 Section 5.1	Yes	No
Time of Occupancy (Dwell Time)	RSS-247 Issue 1 Section 5.1	Yes	No
Peak Output Power	RSS-247 Issue 1 Section 5.4	Yes	No
Emissions in non-restricted frequency bands	RSS-247 Issue 1 Section 5.5	Yes	No
Radiated Emission Band Edge	RSS-Gen Issue 4 Section 8.10	Yes	No

2.2. Test Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	21
Humidity (%RH)	25-75	50
Barometric pressure (mbar)	860-1060	950-1000

3. Conducted Emission

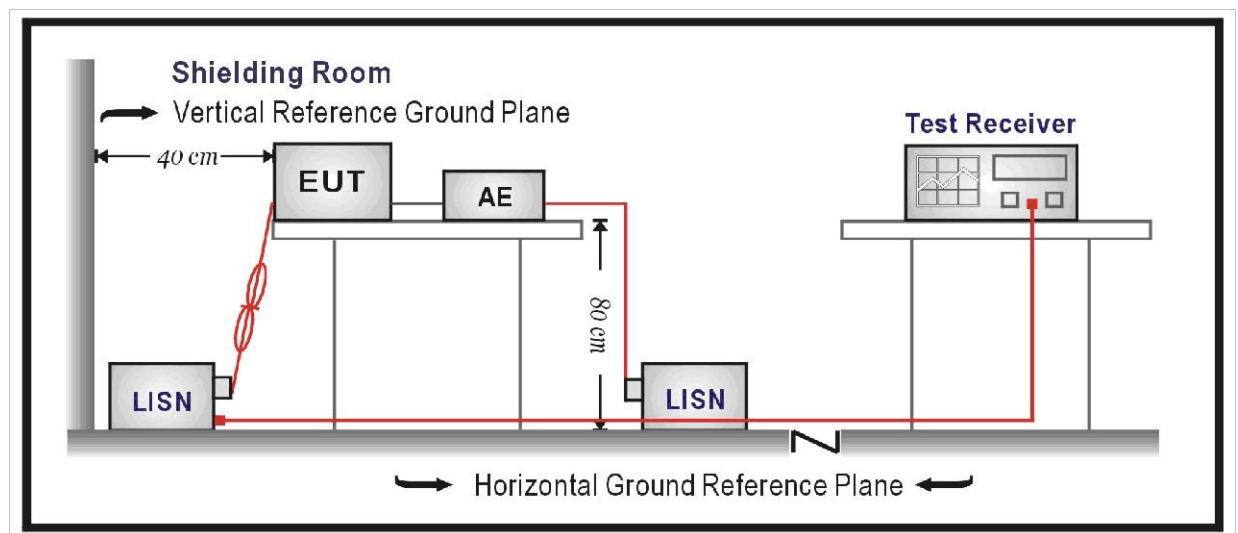
3.1. Test Equipment

Conducted Emission / TR-1

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100726	2017.03.05
Two-Line V-Network	R&S	ENV216	100043	2017.03.05
Two-Line V-Network	R&S	ENV216	100044	2016.09.16
50ohm Coaxial Switch	Anritsu	MP59B	6200464462	2017.03.01
50ohm Termination	SHX	TF2	07081401	2016.09.16
Temperature/Humidity Meter	zhicheng	ZC1-2	TR1-TH	2017.01.04

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

3.2. Test Setup



3.3. Limit

FCC Part 15 Subpart C Paragraph 15.207 Limits		
Frequency (MHz)	QP (dBuV)	AV (dBuV)
0.15 - 0.50	66 - 56	56 - 46
0.50 - 5.0	56	46
5.0 - 30	60	50

Note 1: The lower limit shall apply at the transition frequencies.

Note 2: The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.5 MHz.

3.4. Test Procedure

According to FCC ANSI C63.4: 2014 & ANSI C63.10: 2013.

The EUT was placed on a platform of nominal size, 1 m by 1.5 m, raised 80 cm above the conducting ground plane. The vertical conducting plane was located 40 cm to the rear of the EUT. All other surfaces of EUT were at least 80 cm from any other grounded conducting surface. The EUT and simulators are connected to the main power through a line impedance stabilization network (LISN). The LISN provides a 50 ohm /50uH coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN. (Please refer to the block diagram of the test setup and photographs)

Each current-carrying conductor of the EUT power cord, except the ground (safety) conductor, was individually connected through a LISN to the input power source.

The excess length of the power cord between the EUT and the LISN receptacle were folded back and forth at the center of the lead to form a bundle not exceeding 40 cm in length.

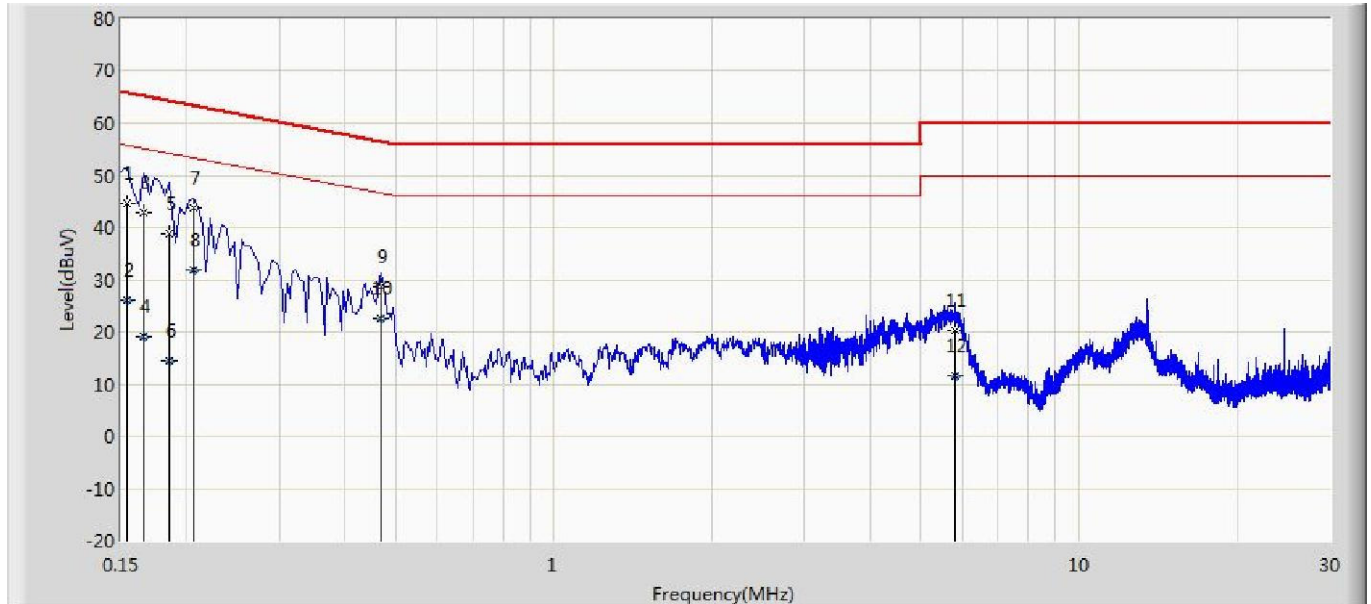
Conducted emissions were investigated over the frequency range from 0.15MHz to 30MHz using a receiver bandwidth of 9kHz.

3.5. Uncertainty

The measurement uncertainty is defined as ± 2.02 dB

3.6. Test Result

Site: TR1	Time: 2016/04/11
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode1 Powered by Notebook	

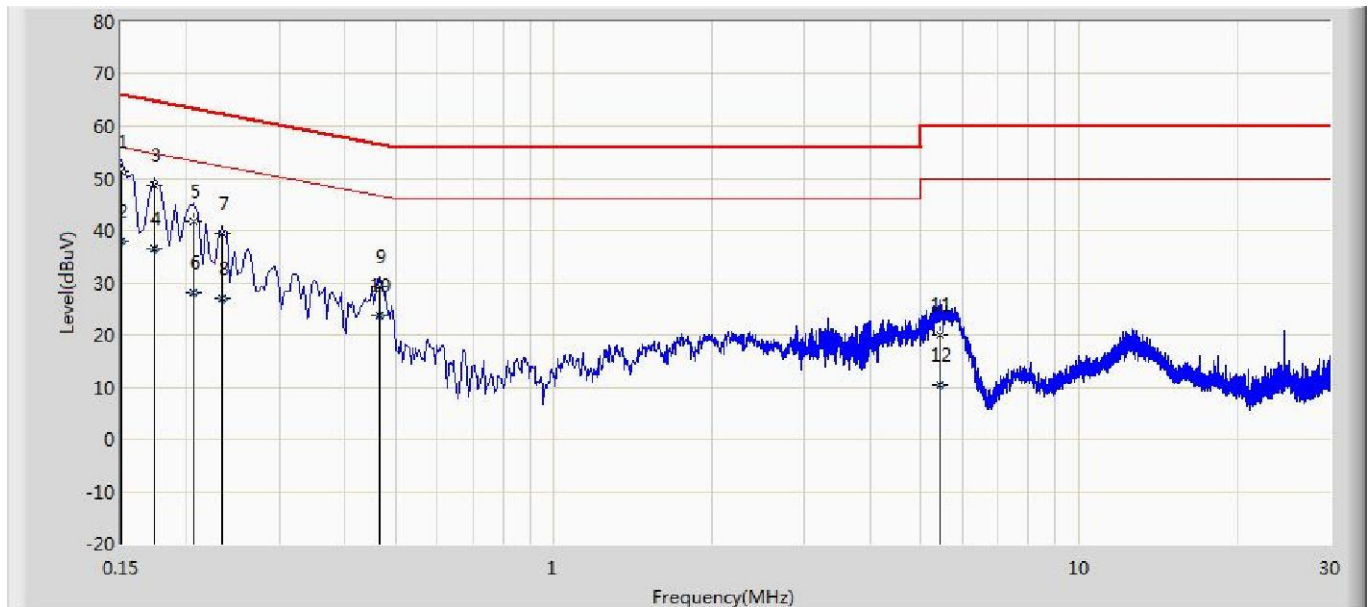


No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
1		0.154	44.745	35.012	-21.036	65.781	9.673	0.060	0.000	QP
2		0.154	26.230	16.497	-29.551	55.781	9.673	0.060	0.000	AV
3		0.166	42.832	33.107	-22.326	65.158	9.665	0.060	0.000	QP
4		0.166	19.148	9.423	-36.010	55.158	9.665	0.060	0.000	AV
5		0.186	38.898	29.186	-25.315	64.213	9.652	0.060	0.000	QP
6		0.186	14.367	4.655	-39.846	54.213	9.652	0.060	0.000	AV
7	*	0.206	43.742	34.032	-19.623	63.365	9.650	0.060	0.000	QP
8		0.206	31.996	22.286	-21.369	53.365	9.650	0.060	0.000	AV
9		0.470	28.575	18.875	-27.939	56.514	9.630	0.070	0.000	QP
10		0.470	22.705	13.005	-23.809	46.514	9.630	0.070	0.000	AV
11		5.818	20.201	10.341	-39.799	60.000	9.680	0.180	0.000	QP
12		5.818	11.710	1.850	-38.290	50.000	9.680	0.180	0.000	AV

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Site: TR1	Time: 2016/04/11
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode1 Powered by Notebook	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
1	*	0.150	51.186	41.450	-14.814	66.000	9.676	0.060	0.000	QP
2		0.150	37.832	28.096	-18.168	56.000	9.676	0.060	0.000	AV
3		0.174	48.755	39.030	-16.012	64.767	9.665	0.060	0.000	QP
4		0.174	36.450	26.725	-18.317	54.767	9.665	0.060	0.000	AV
5		0.206	41.784	32.064	-21.581	63.365	9.660	0.060	0.000	QP
6		0.206	28.001	18.281	-25.364	53.365	9.660	0.060	0.000	AV
7		0.234	39.291	29.571	-23.016	62.307	9.660	0.060	0.000	QP
8		0.234	27.066	17.346	-25.241	52.307	9.660	0.060	0.000	AV
9		0.466	29.385	19.685	-27.200	56.585	9.630	0.070	0.000	QP
10		0.466	23.634	13.934	-22.951	46.585	9.630	0.070	0.000	AV
11		5.438	19.882	10.042	-40.118	60.000	9.670	0.170	0.000	QP
12		5.438	10.333	0.493	-39.667	50.000	9.670	0.170	0.000	AV

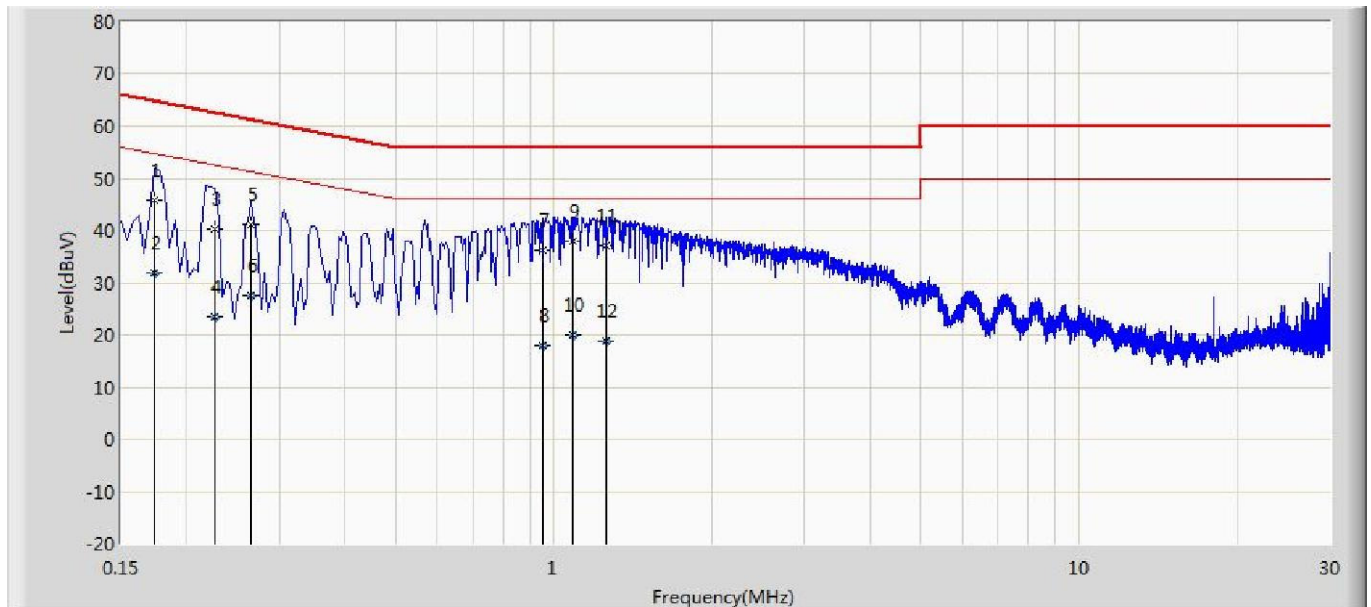
Note:

1. " * ", means this data is the worst emission level.

2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

All the low ,middle and high channels of all different modes are investigated, and only report the worst case.

Site: TR1	Time: 2016/04/11
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Line
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode1 Powered by Adapter	

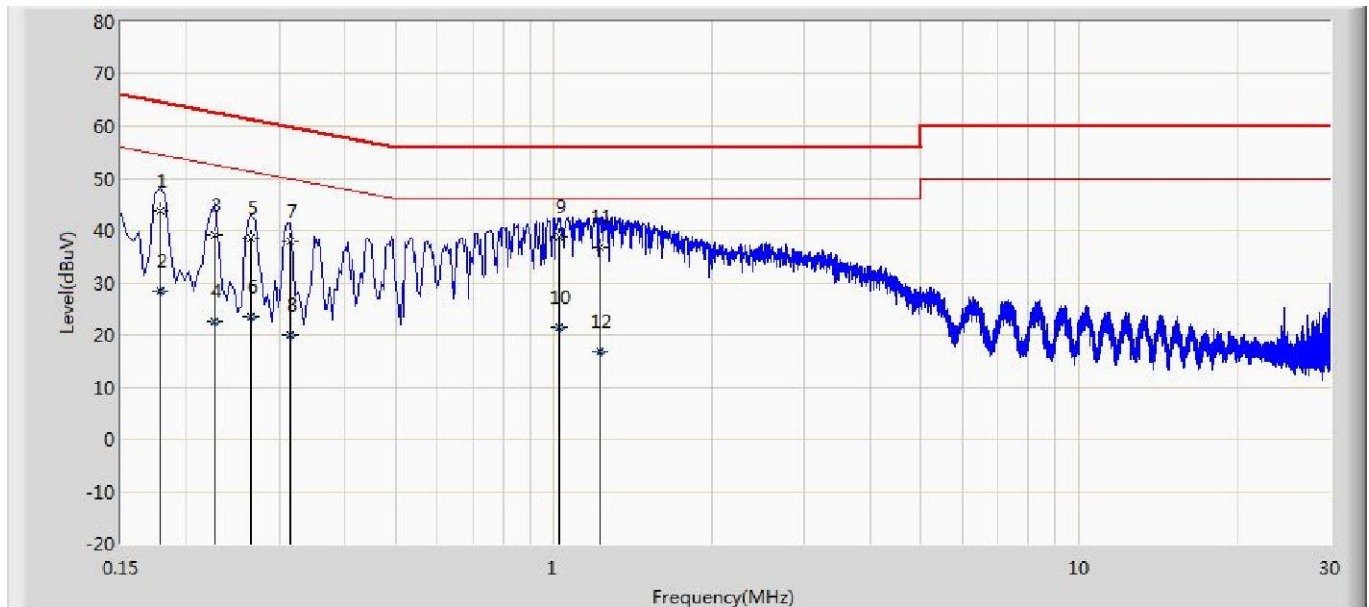


No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
1		0.174	45.659	35.939	-19.108	64.767	9.660	0.060	0.000	QP
2		0.174	31.912	22.192	-22.855	54.767	9.660	0.060	0.000	AV
3		0.226	40.288	30.578	-22.307	62.595	9.650	0.060	0.000	QP
4		0.226	23.386	13.676	-29.209	52.595	9.650	0.060	0.000	AV
5		0.266	41.183	31.479	-20.059	61.242	9.644	0.060	0.000	QP
6		0.266	27.416	17.712	-23.826	51.242	9.644	0.060	0.000	AV
7		0.954	36.255	26.545	-19.745	56.000	9.630	0.080	0.000	QP
8		0.954	17.987	8.277	-28.013	46.000	9.630	0.080	0.000	AV
9	*	1.086	38.031	28.321	-17.969	56.000	9.630	0.080	0.000	QP
10		1.086	19.956	10.246	-26.044	46.000	9.630	0.080	0.000	AV
11		1.258	36.961	27.251	-19.039	56.000	9.630	0.080	0.000	QP
12		1.258	18.956	9.246	-27.044	46.000	9.630	0.080	0.000	AV

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

Site: TR1	Time: 2016/04/11
Limit: FCC_Part15.107_CE_AC Power_ClassB	Margin: 0
Probe: ENV216_101044(0.009-30MHz)	Polarity: Neutral
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode1 Powered by Adapter	



No	Mark	Frequency (MHz)	Measure Level (dBuV)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV)	Probe (dB)	Cable (dB)	Amp (dB)	Type
1		0.178	43.793	34.069	-20.785	64.578	9.664	0.060	0.000	QP
2		0.178	28.441	18.717	-26.137	54.578	9.664	0.060	0.000	AV
3		0.226	39.189	29.469	-23.406	62.595	9.660	0.060	0.000	QP
4		0.226	22.468	12.748	-30.127	52.595	9.660	0.060	0.000	AV
5		0.266	38.593	28.879	-22.649	61.242	9.654	0.060	0.000	QP
6		0.266	23.506	13.792	-27.736	51.242	9.654	0.060	0.000	AV
7		0.314	38.081	28.371	-21.783	59.864	9.650	0.060	0.000	QP
8		0.314	19.992	10.282	-29.872	49.864	9.650	0.060	0.000	AV
9	*	1.026	38.897	29.187	-17.103	56.000	9.630	0.080	0.000	QP
10		1.026	21.508	11.798	-24.492	46.000	9.630	0.080	0.000	AV
11		1.226	36.750	27.040	-19.250	56.000	9.630	0.080	0.000	QP
12		1.226	16.751	7.041	-29.249	46.000	9.630	0.080	0.000	AV

Note:

1. " * ", means this data is the worst emission level.

2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).

All the low ,middle and high channels of all different modes are investigated, and only report the worst case.

4. Emissions in restricted frequency bands

4.1. Test Equipment

Emissions in restricted frequency bands / AC-2

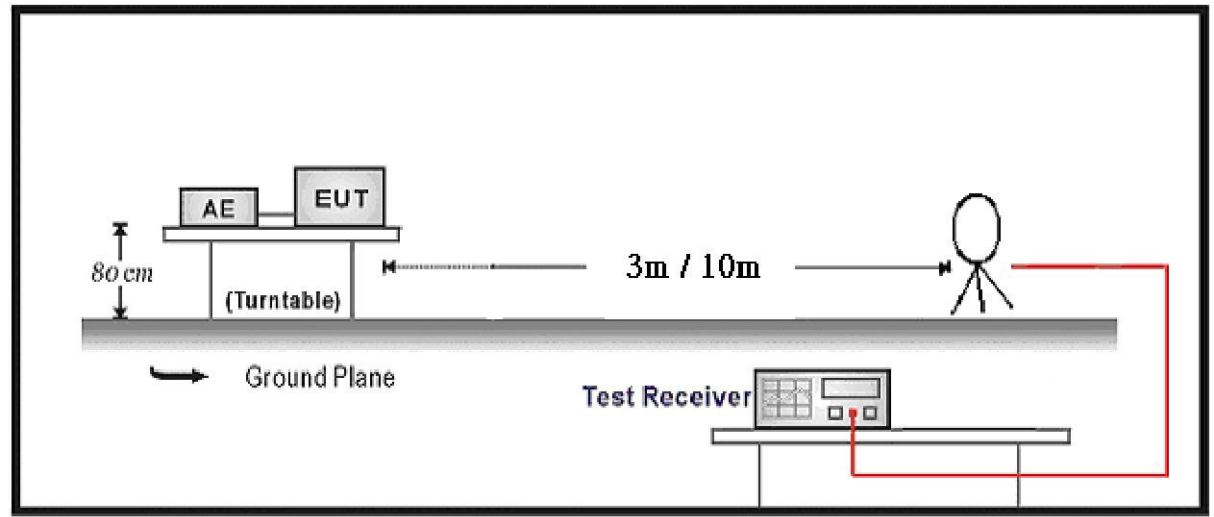
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
EMI Test Receiver	R&S	ESCI	100573	2017.03.05
Loop Antenna	R&S	HFH2-Z2	833799/003	2016.11.25
Bilog Antenna	Teseq GmbH	CBL6112D	27611	2016.10.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC2-C	2017.02.28
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC2-TH	2017.01.04

Emissions in restricted frequency bands / AC-5

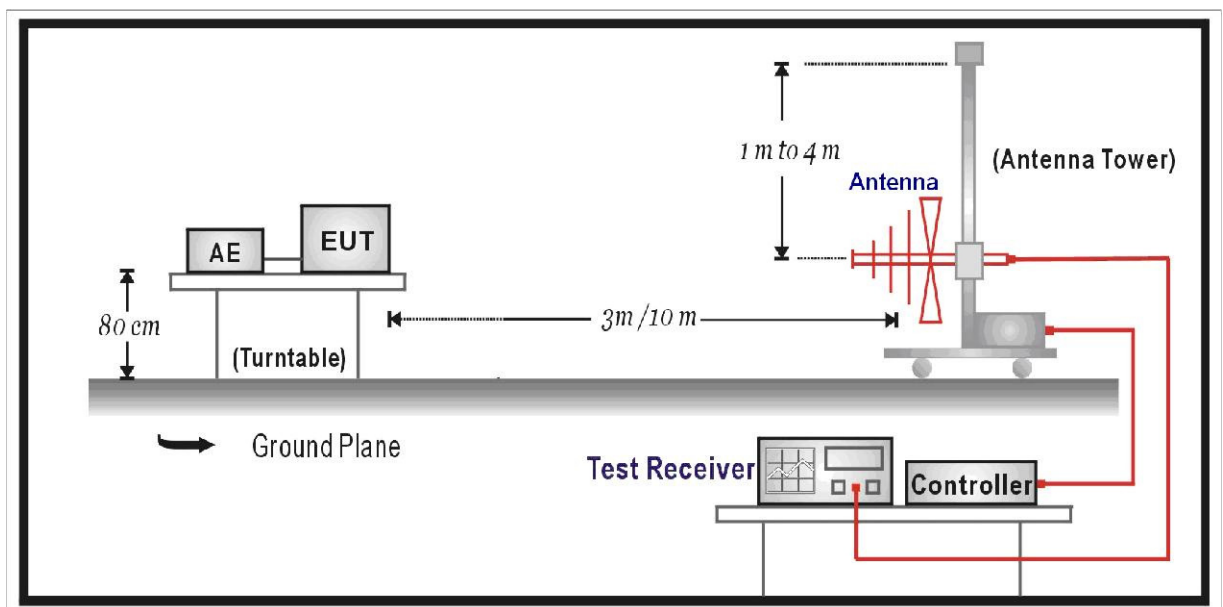
Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04
Preamplifier	Miteq	NSP1800-25	1364185	2016.05.03
Preamplifier	QuieTek	AP-040G	CHM-0906001	2016.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2016.10.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	499	2017.06.08
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2017.04.10
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2017.02.28
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2017.02.28
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2017.02.28
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2017.01.04

4.2. Test Setup

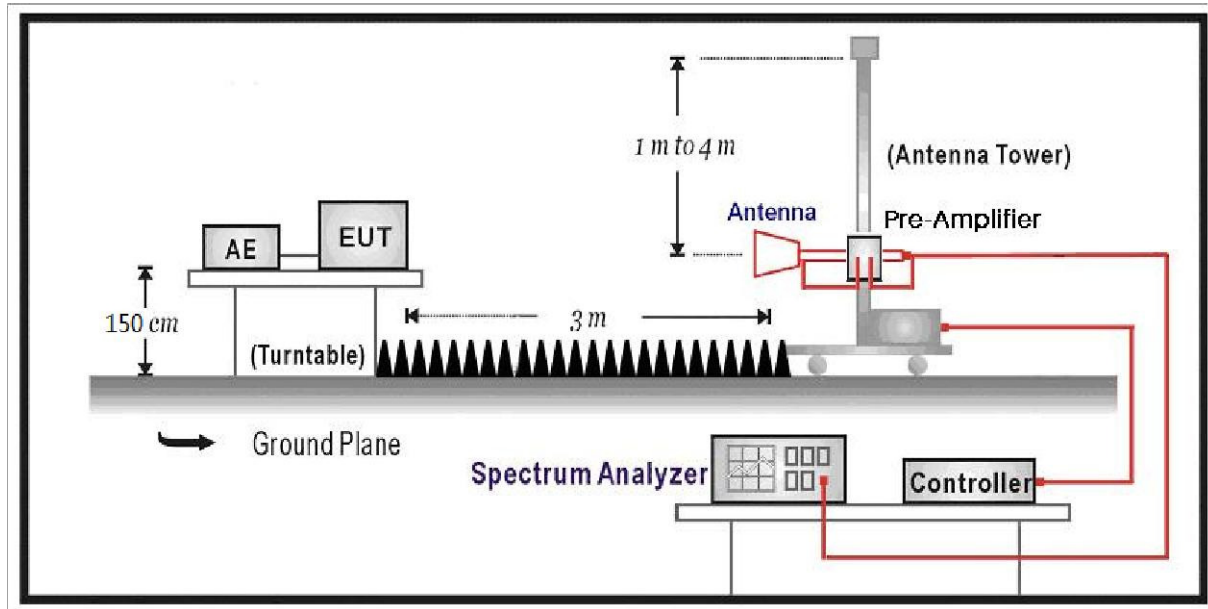
Below 30MHz Test Setup:



Below 1GHz Test Setup:



Above 1GHz Test Setup:



4.3. Limit

FCC Part 15 Subpart C Paragraph 15.209		
Frequency (MHz)	Distance (m)	Level (dBuV/m)
30 - 88	3	40
88 - 216	3	43.5
216 - 960	3	46
Above 960	3	54

Note 1: The lower limit shall apply at the transition frequency.

Note 2: Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

Note 3: E field strength (dBuV/m) = 20 log E field strength (uV/m)

4.4. Test Procedure

According to ANSI C63.4: 2014; ANSI C63.10: 2013.

The EUT is placed on a turn table which is 1.5 meter for above 1G and 0.8 meter for below 1G above ground. The turn table is rotated 360 degrees to determine the position of the maximum emission level. The EUT was positioned such that the distance from antenna to the EUT was 3 meters.

The antenna is scanned from 1 meter to 4 meters to find out the maximum emission level. This is repeated for both horizontal and vertical polarization of the antenna. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.4: 2014 on radiated measurement.

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

The frequency range from 30MHz to 10th harmonic is checked.

Note: When doing emission measurement above 1GHz, the horn antenna will be bended down a little (as horn antenna has the narrow beamwidth) in order to keeping the antenna in the “cone of radiation” of EUT. The 3dB beamwidth is 60~10 degrees for H-plane and 90~10 degrees for E-plane.

According to ANSI C63.10: 2013& ANSI C63.4: 2014

This test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 15.205 of FCC part 15. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b) of FCC part 15.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209 of FCC Part 15. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit of FCC part 15.

If the emission on which a radiated measurement must be made is located at the edge of the authorized band of operation, then the alternative “marker-delta” method may be employed.

4.5. Uncertainty

The measurement uncertainty above 1G is defined as ± 3.9 dB

below 1G is defined as ± 3.8 dB

4.6. Test Result

Mode 1: Transmitter-1Mbps(GFSK_DH5)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	4804.0	31.2	8.0	39.2	54(Note3)	14.8	PK
	V	4804.0	31.5	8.0	39.5	54(Note3)	14.5	PK
	H	7206.0	28.9	12.8	41.7	54(Note3)	12.3	PK
	V	7206.0	31.1	12.8	43.9	54(Note3)	10.1	PK
	H	9608.0	28.1	16.1	44.2	54(Note3)	9.8	PK
	V	9608.0	27.9	16.0	43.9	54(Note3)	10.1	PK
39	H	4882.0	31.5	8.2	39.7	54(Note3)	14.3	PK
	V	4882.0	31.4	8.2	39.6	54(Note3)	14.4	PK
	H	7324.0	28.8	13.0	41.8	54(Note3)	12.2	PK
	V	7323.1	29.7	13.0	42.7	54(Note3)	11.3	PK
	H	9764.0	28.1	16.2	44.3	54(Note3)	9.7	PK
	V	9764.0	27.5	16.3	43.8	54(Note3)	10.2	PK
78	H	4960.0	31.0	8.5	39.5	54(Note3)	15.5	PK
	V	4960.0	28.8	8.5	37.3	54(Note3)	14.5	PK
	H	7443.0	28.9	13.2	42.1	54(Note3)	11.9	PK
	V	7440.0	29.5	13.2	42.7	54(Note3)	11.3	PK
	H	9920.0	27.3	16.1	43.4	54(Note3)	10.6	PK
	V	9920.0	26.1	16.1	42.2	54(Note3)	11.8	PK

Note 1: The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

3: Measure Level = Reading Level + Factor.

Mode 2: Transmitter-2Mbps(Pi/4 DQPSK _DH5)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	4804.0	31.5	8	39.5	54(Note3)	14.5	PK
	V	4804.0	33.1	8	41.1	54(Note3)	12.6	PK
	H	7206.0	29.2	12.8	42.0	54(Note3)	12.0	PK
	V	7206.0	31.5	12.8	44.3	54(Note3)	9.7	PK
	H	9608.0	27.6	16.1	43.7	54(Note3)	10.3	PK
	V	9608.0	29.3	16	45.3	54(Note3)	8.7	PK
39	H	4882.0	30.7	8.2	38.9	54(Note3)	15.1	PK
	V	4882.0	31.7	8.2	39.9	54(Note3)	14.1	PK
	H	7324.0	29.7	13	42.7	54(Note3)	11.3	PK
	V	7323.0	28.5	13	41.5	54(Note3)	12.5	PK
	H	9764.0	28.9	16.2	45.1	54(Note3)	8.9	PK
	V	9764.0	27.3	16.3	43.6	54(Note3)	10.4	PK
78	H	4960.0	31.5	8.5	40.0	54(Note3)	14.0	PK
	V	4960.0	31.4	8.5	39.9	54(Note3)	14.1	PK
	H	7443.0	29.6	13.2	42.8	54(Note3)	11.2	PK
	V	7440.0	29.4	13.2	42.6	54(Note3)	11.4	PK
	H	9920.0	27.7	16.1	43.8	54(Note3)	10.2	PK
	V	9920.0	28.6	16.1	44.7	54(Note3)	9.3	PK

Note 1: The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

3: Measure Level = Reading Level + Factor.

Mode 3: Transmitter-3Mbps(8DPSK_DH5)

CH	Antenna	Frequency (MHz)	Reading Level (dBuV/m)	Factor (dB)	Measure Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector
0	H	4808.0	31.4	8	39.4	54(Note3)	14.6	PK
	V	4808.0	30.1	8	38.1	54(Note3)	15.9	PK
	H	7206.0	28.9	12.8	41.7	54(Note3)	12.3	PK
	V	7206.0	27.9	12.8	40.7	54(Note3)	13.3	PK
	H	9608.0	28.6	16.1	44.7	54(Note3)	9.3	PK
	V	9608.0	28.4	16	44.4	54(Note3)	9.6	PK
39	H	4882.0	31.1	8.2	39.3	54(Note3)	14.7	PK
	V	4882.0	31.7	8.2	39.9	54(Note3)	14.1	PK
	H	7323.0	28.8	13	41.8	54(Note3)	12.2	PK
	V	7323.0	31.5	13	44.5	54(Note3)	9.5	PK
	H	9764.0	29.5	16.2	45.7	54(Note3)	8.3	PK
	V	9764.0	29.9	16.3	46.2	54(Note3)	7.8	PK
78	H	4960.0	27.7	8.5	36.2	54(Note3)	17.8	PK
	V	4960.0	32.7	8.5	41.2	54(Note3)	12.8	PK
	H	7440.0	28.1	13.2	41.3	54(Note3)	12.7	PK
	V	7440.0	29.7	13.2	42.9	54(Note3)	11.1	PK
	H	9920.0	28.5	16.1	44.6	54(Note3)	9.4	PK
	V	9920.0	27.3	16.1	43.4	54(Note3)	10.6	PK

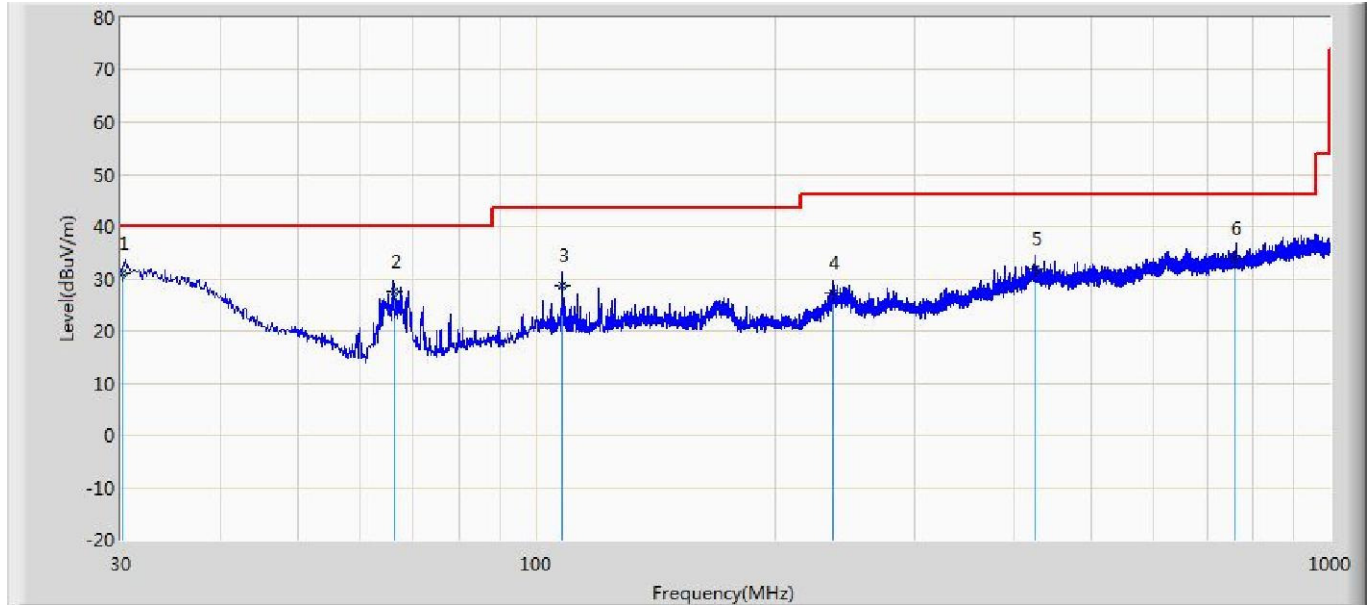
Note 1: The test frequency range, 9kHz~30MHz, 18GHz~25GHz, both of the worst case are at least 6dB below the limits, therefore no data appear in the report.

2: This limit applies for using average detector, if the test result on peak is lower than average limit, then average measurement needn't be performed.

3: Measure Level = Reading Level + Factor.

The worst case of Radiated Emission below 1GHz:

Site: AC3	Time: 2016/04/11
Limit: FCC_Part15.109_RE(3m)_ClassB	Margin: 0
Probe: AC3_10m (30-1000MHz)	Polarity: Horizontal
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1	

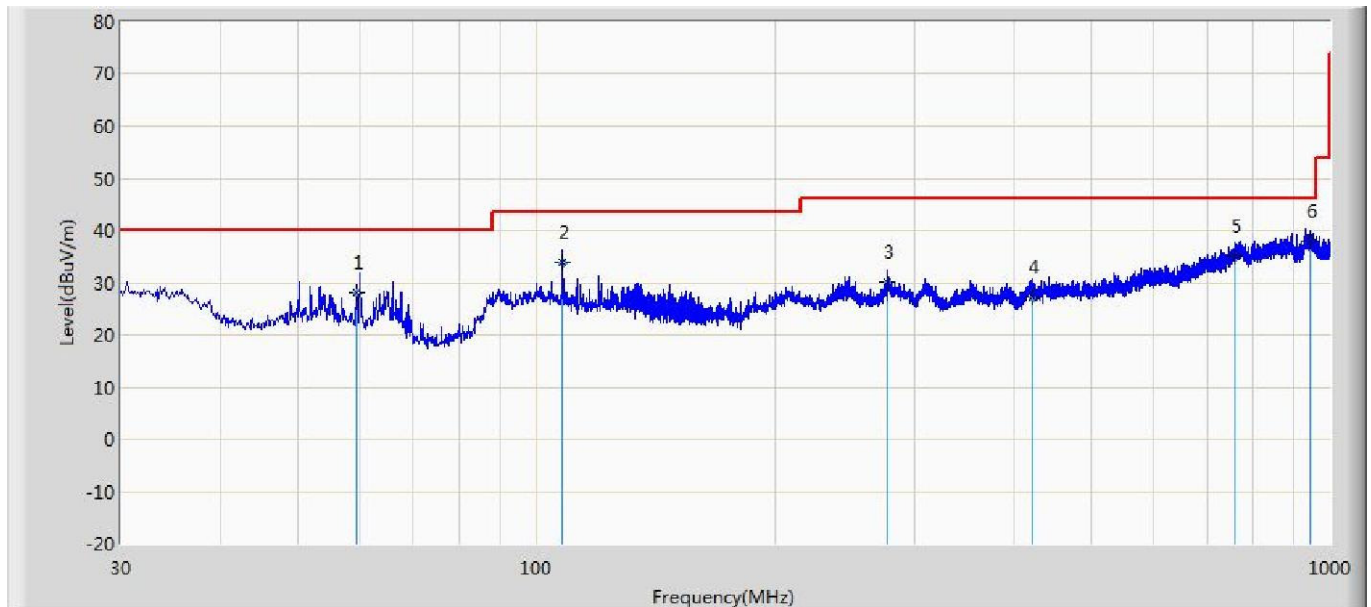


No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1	*	30.101	31.115	34.855	-8.885	40.000	18.741	0.601	23.082	141	310	QP
2		66.200	27.411	43.222	-12.589	40.000	6.376	0.873	23.060	200	194	QP
3		108.101	28.551	38.661	-14.949	43.500	11.910	1.125	23.145	196	360	QP
4		236.504	27.153	37.704	-18.847	46.000	11.080	1.659	23.290	100	94	QP
5		425.401	31.869	35.995	-14.131	46.000	16.508	2.270	22.904	200	163	QP
6		760.204	33.804	33.495	-12.196	46.000	19.841	3.040	22.572	200	113	QP

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).
3. All the low ,middle and high channels of all different modes are investigated, and only report the worst case.

Site: AC3	Time: 2016/04/11
Limit: FCC_Part15.109_RE(3m)_ClassB	Margin: 0
Probe: AC3_10m (30-1000MHz)	Polarity: Vertical
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Probe (dB/m)	Cable (dB)	Amp (dB)	Ant Pos (cm)	Table Pos (deg)	Type
1		59.512	28.256	43.868	-11.744	40.000	6.588	0.834	23.034	200	108	QP
2		107.822	33.786	43.929	-9.714	43.500	11.882	1.122	23.148	104	31	QP
3		276.601	30.114	38.588	-15.886	46.000	12.866	1.790	23.130	108	0	QP
4		420.914	27.193	31.445	-18.807	46.000	16.418	2.260	22.930	177	360	QP
5		758.601	34.985	34.699	-11.015	46.000	19.835	3.040	22.589	100	141	QP
6	*	946.500	37.876	35.966	-8.124	46.000	20.872	3.390	22.352	100	144	QP

Note:

1. " * ", means this data is the worst emission level.
2. Measurement Level = Reading Level + Factor(Probe+Cable-Amp).
3. All the low ,middle and high channels of all different modes are investigated, and only report the worst case.

5. 20dB Bandwidth

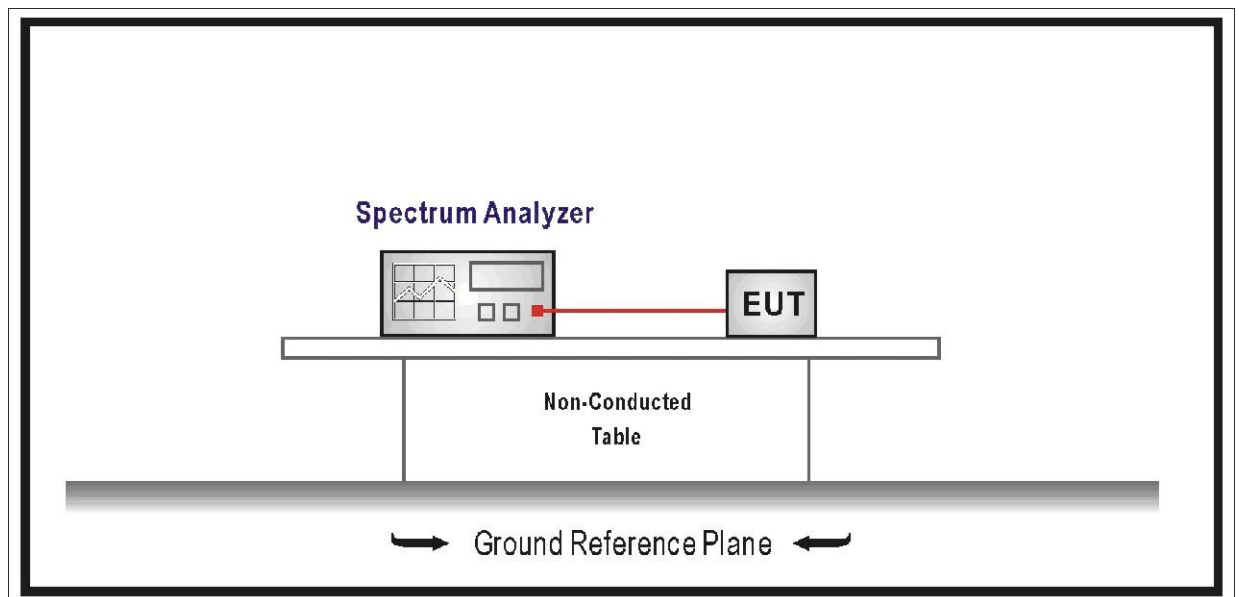
5.1 Test Equipment

20dB Bandwidth / TR8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2017.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

5.2 Test Setup



5.3 Limit

- For frequency hopping systems operating in 2400-2483.5 MHz band, no limitation.
- For frequency hopping systems operating in 902-928 MHz band, the maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
- For frequency hopping systems operating in 5725-5850 MHz band, the maximum 20 dB bandwidth of the hopping channel is 1 MHz.

The 20dB bandwidth must be contained within the frequency band designated in the rule section under which the equipment is operated.

5.4 Test Procedure

According to ANSI C63.10: 2013& ANSI C63.4: 2014

Use the following spectrum analyzer settings:

Span = approximately 2 to 3 times the 20dB bandwidth, centered on a hopping channel

RBW $\geq$ 1% of the 20dB bandwidth

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

The EUT should be transmitting at its maximum data rate. Allow the trace to stabilize.

Use the marker-to-peak function to set the marker to the peak of the emission. Use the marker-delta function to measure 20 dB down one side of the emission. Reset the marker-delta function, and move the marker to the other side of the emission, until it is (as close as possible to) even with the reference marker level. The marker-delta reading at this point is the 20 dB bandwidth of the emission. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

5.5 Uncertainty

The measurement uncertainty is defined as ± 1 kHz

5.6 Test Result

Product	:	BLUETOOTH SPEAKER
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	880.8	852.75
39	2441	883.3	858.60
78	2480	882.0	862.59

Channel 00 (2402MHz)



Channel 39 (2441MHz)



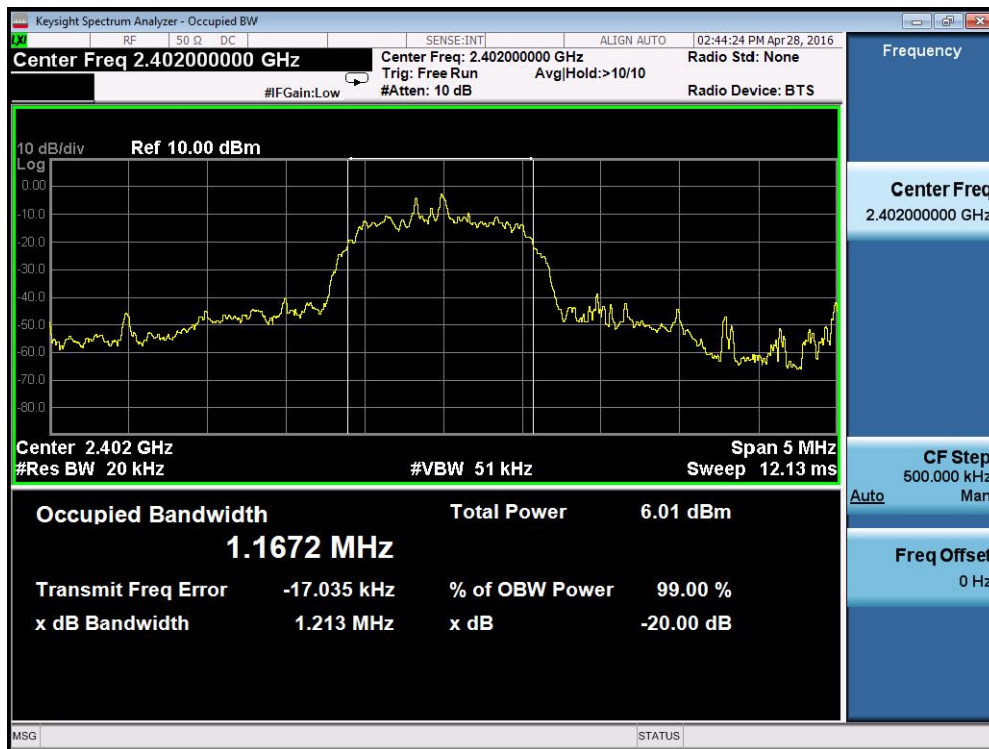
Channel 78 (2480MHz)



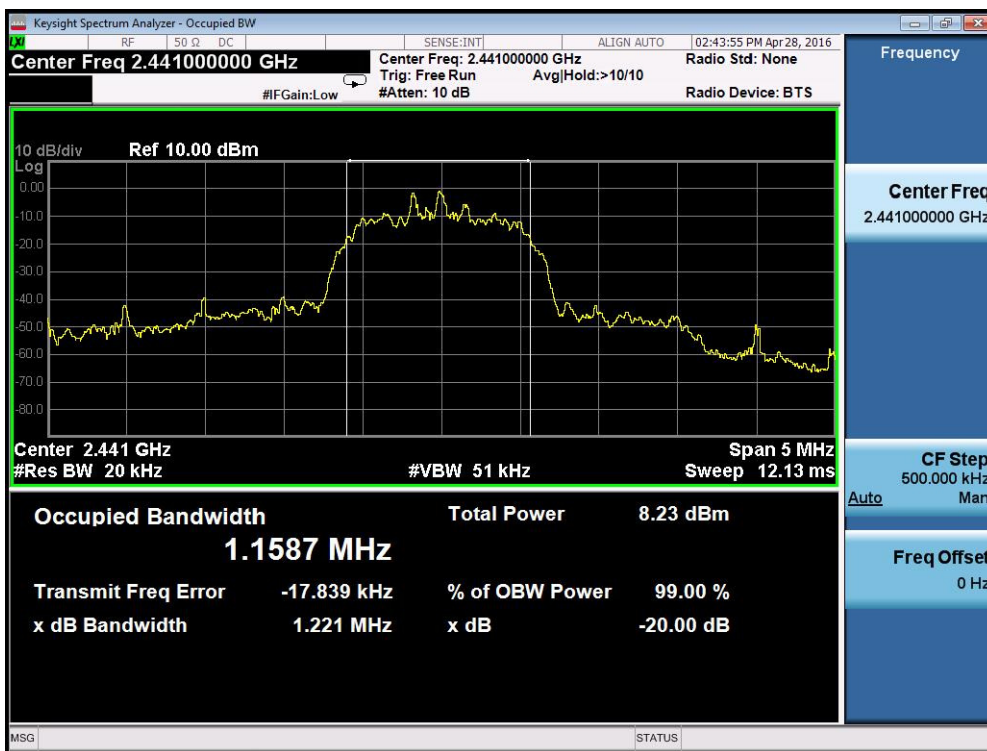
Product	:	BLUETOOTH SPEAKER
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	1213	1167.2
39	2441	1221	1158.7
78	2480	1219	1162.4

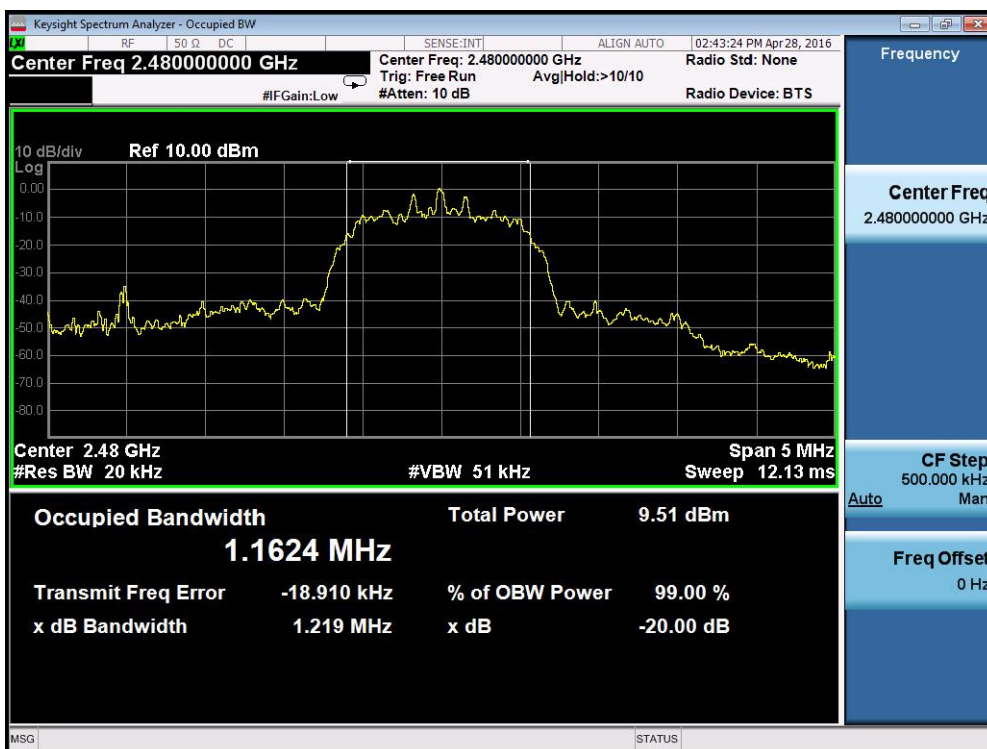
Channel 00 (2402MHz)



Channel 39 (2441MHz)



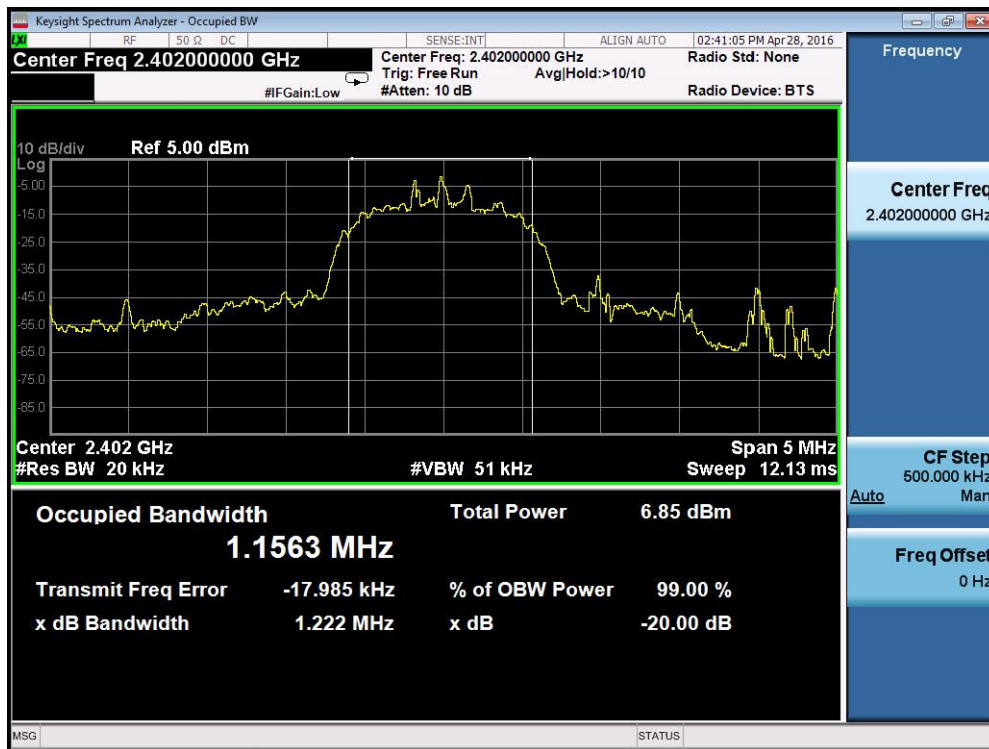
Channel 78 (2480MHz)



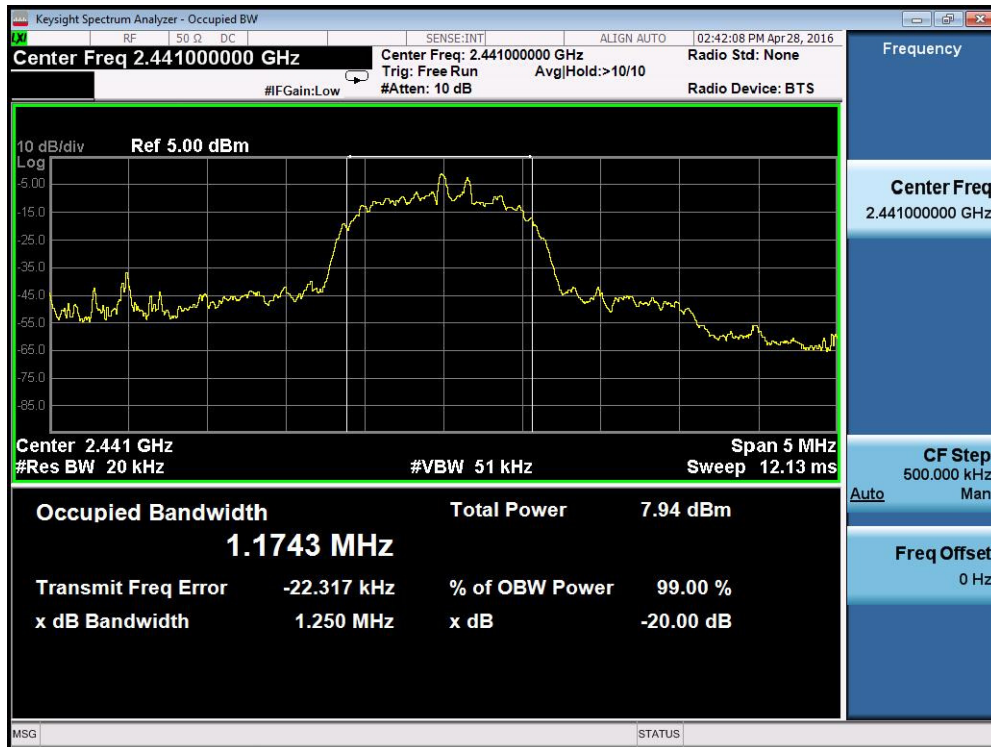
Product	:	BLUETOOTH SPEAKER
Test Item	:	Occupied Bandwidth
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)
00	2402	1222	1156.3
39	2441	1250	1174.3
78	2480	1233	1158.7

Channel 00 (2402MHz)



Channel 39 (2441MHz)



Channel 78 (2480MHz)



6. Carrier Frequency Separation

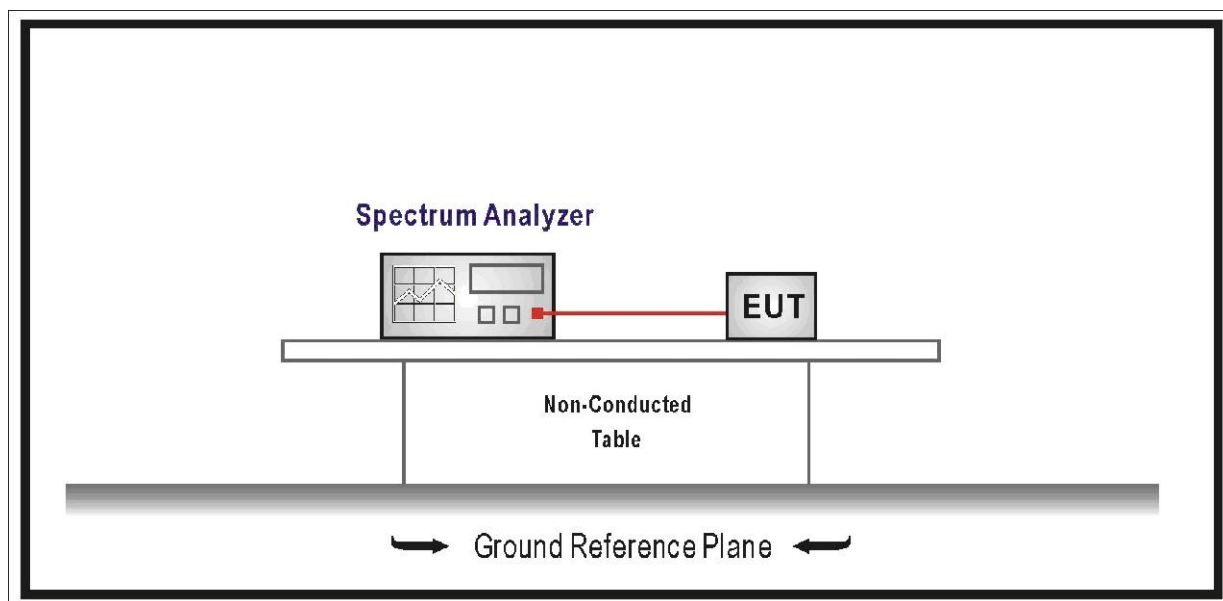
6.1. Test Equipment

Carrier Frequency Separation / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2017.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

6.2. Test Setup



6.3. 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. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping

channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

- For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
- Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

6.4. Test Procedure

According to ANSI C63.10: 2013& ANSI C63.4: 2014

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = wide enough to capture the peaks of two adjacent channels

Resolution (or IF) Bandwidth (RBW) $\geq$ 1% of the span

Video (or Average) Bandwidth VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.

6.5. Uncertainty

The measurement uncertainty is defined as ± 1 kHz

6.6. Test Result

Product	:	BLUETOOTH SPEAKER
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
00	2402	1000	>25 kHz or 2/3 of 20 dB BW	Pass
39	2441	1000	>25 kHz or 2/3 of 20 dB BW	Pass
78	2480	1000	>25 kHz or 2/3 of 20 dB BW	Pass

Channel 00 (2402MHz)



Channel 39 (2441MHz)



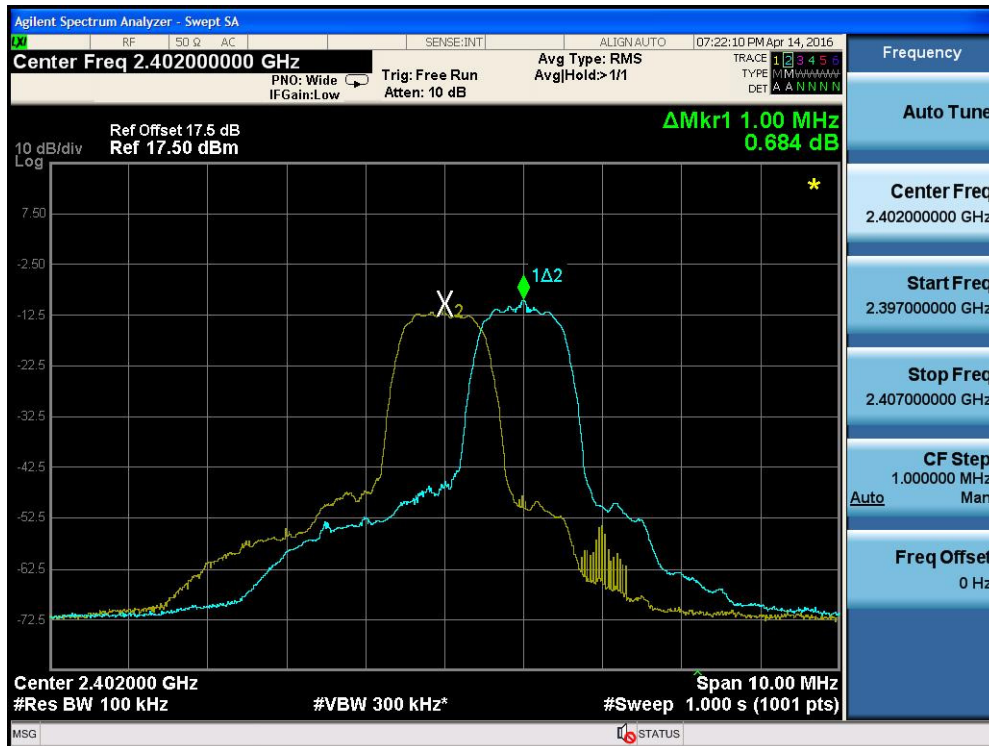
Channel 78 (2480MHz)



Product	:	BLUETOOTH SPEAKER
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
00	2402	1000	>25 kHz or 2/3 of 20 dB BW	Pass
39	2441	1000	>25 kHz or 2/3 of 20 dB BW	Pass
78	2480	1000	>25 kHz or 2/3 of 20 dB BW	Pass

Channel 00 (2402MHz)



Channel 39 (2441MHz)



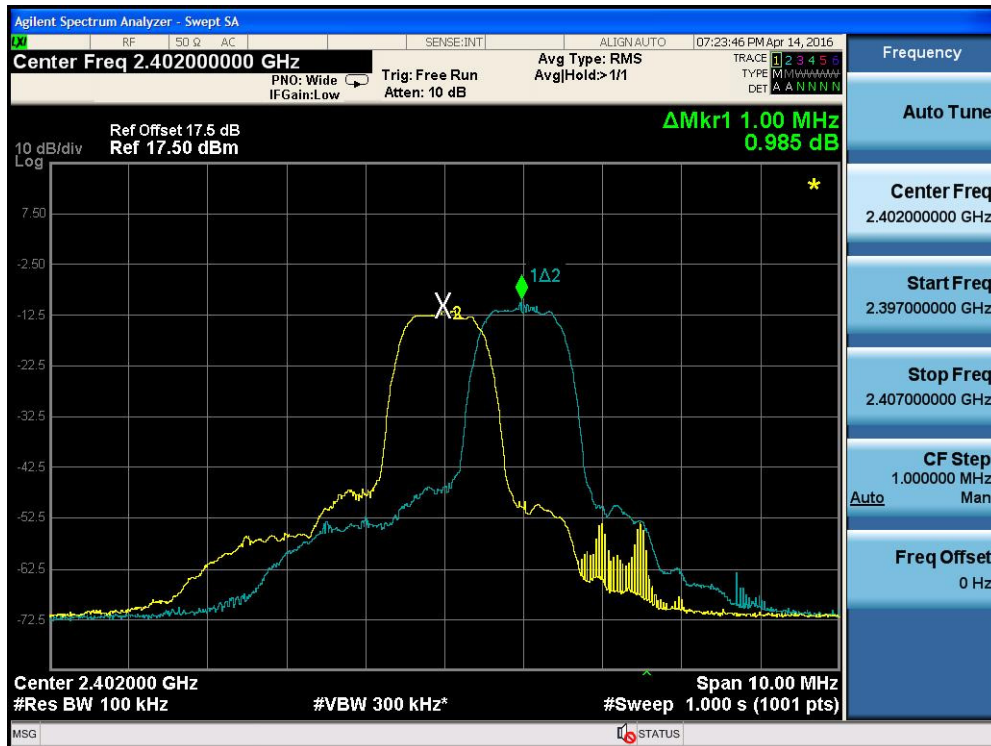
Channel 78 (2480MHz)

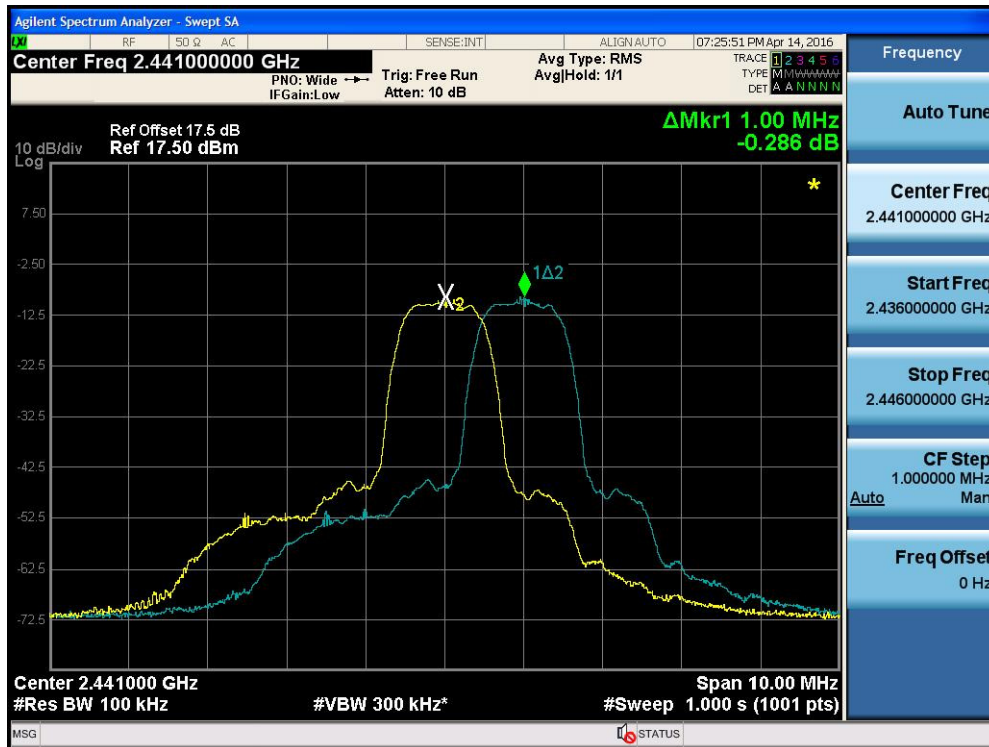


Product	:	BLUETOOTH SPEAKER
Test Item	:	Carrier Frequency Separation
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel No.	Frequency (MHz)	Carrier Frequency Separation (kHz)	Limit (kHz)	Result
00	2402	1000	>25 kHz or 2/3 of 20 dB BW	Pass
39	2441	1000	>25 kHz or 2/3 of 20 dB BW	Pass
78	2480	1000	>25 kHz or 2/3 of 20 dB BW	Pass

Channel 00 (2402MHz)





7. Number of Hopping Frequencies

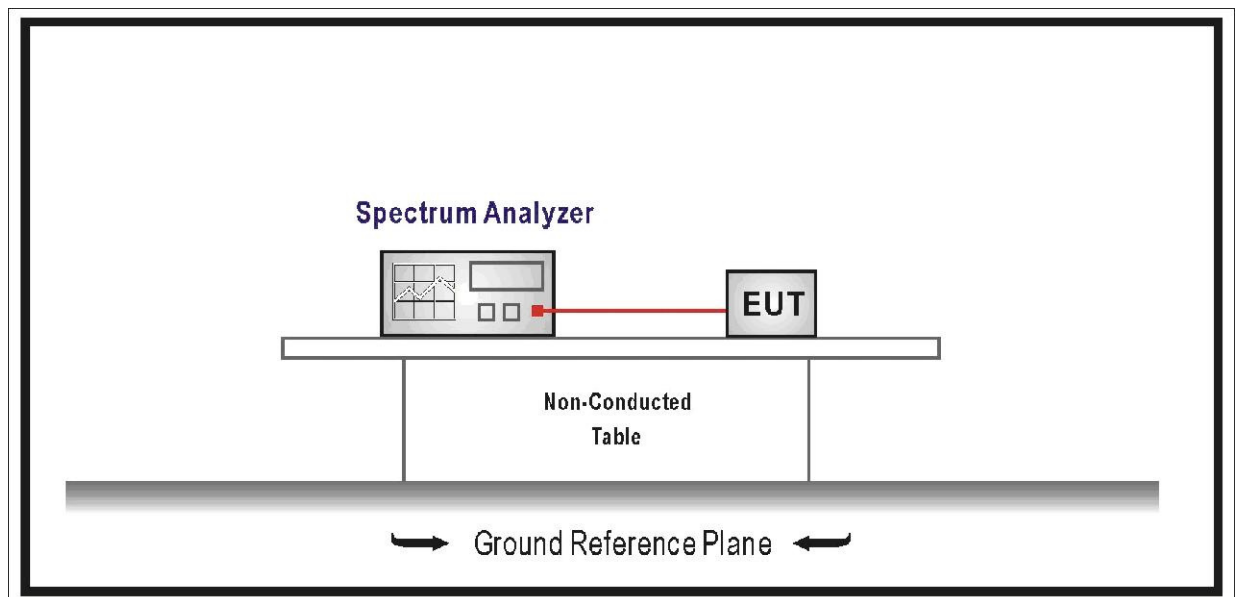
7.1. Test Equipment

Number of Hopping Frequencies / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2017.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

7.2. Test Setup



7.3. Limit

- For frequency hopping systems operating in the 2400-2483.5 MHz band shall use at least 15 hopping frequencies.
- For frequency hopping systems operating in 902-928 MHz band shall use at least 50 hopping frequencies.
- For frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75 hopping frequencies.

7.4. Test Procedure

According to ANSI C63.10: 2013& ANSI C63.4: 2014

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = the frequency band of operation

RBW $\geq$ 1% of the span

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. It may prove necessary to bread the span up to sections, in order to clearly show all of the hopping frequencies.

7.5. Uncertainty

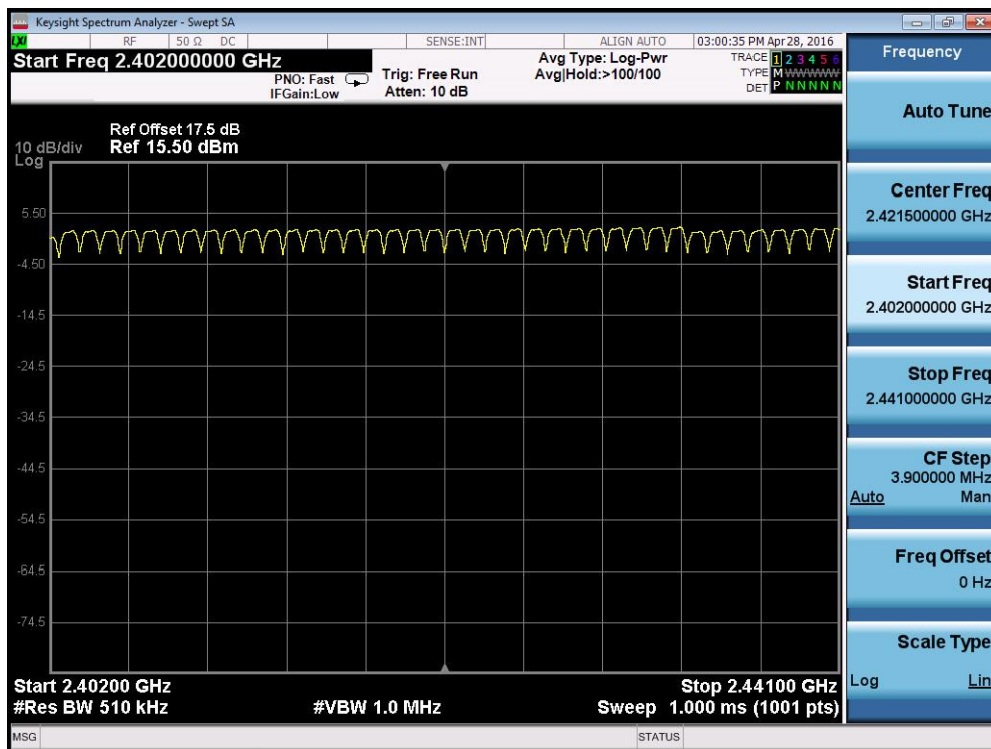
The measurement uncertainty is defined as ± 1 kHz

7.6. Test Result

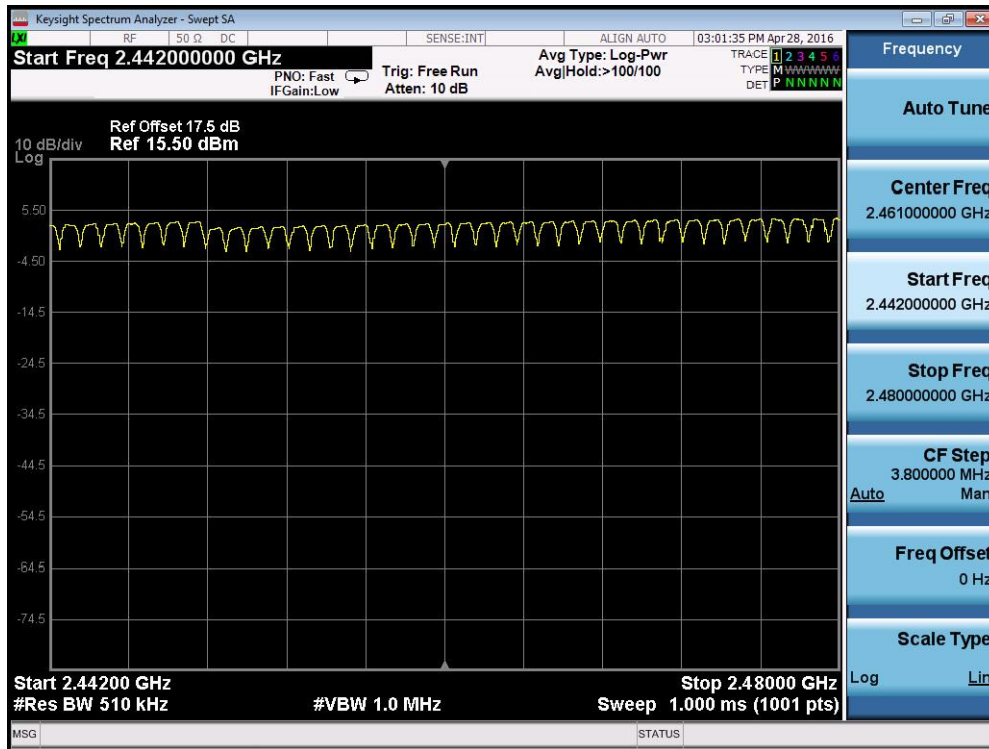
Product	:	BLUETOOTH SPEAKER
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Frequency Band (MHz)	Number of Hopping Frequencies	Limit	Result
2400 - 2483.5	79	>15	Pass

2402 - 2441 MHz



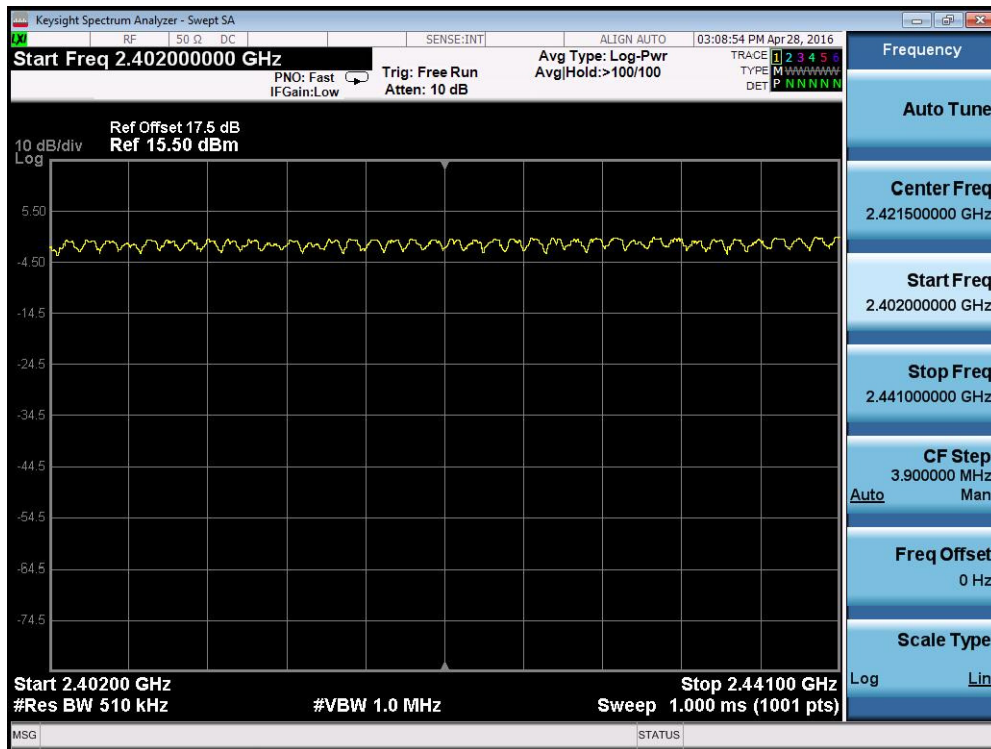
2442 - 2480 MHz



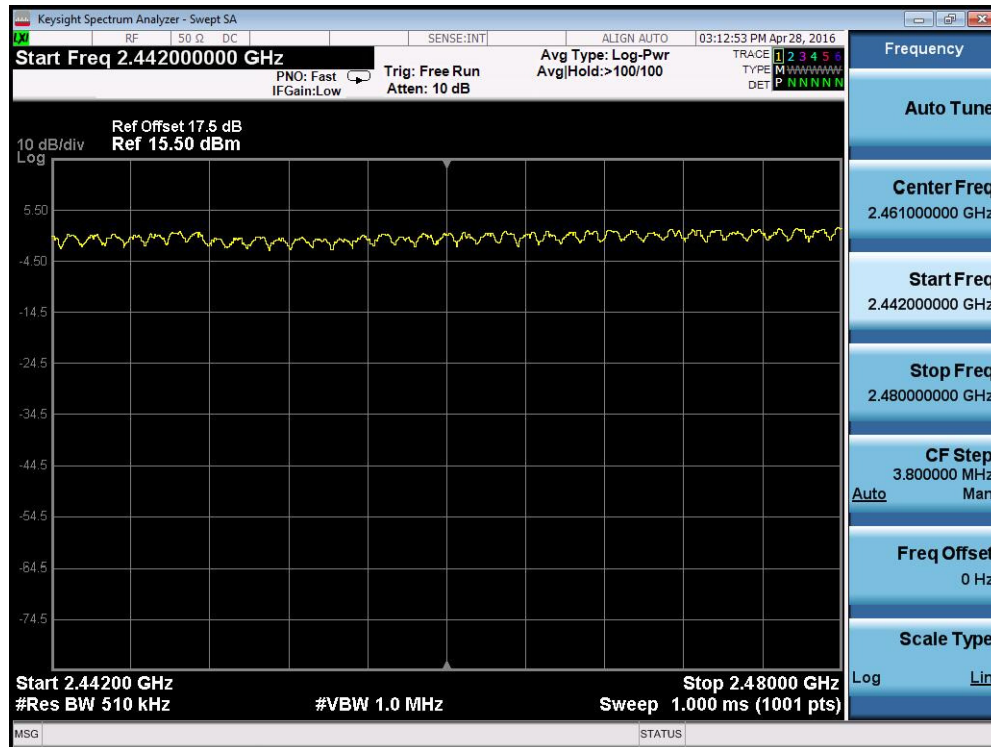
Product	:	BLUETOOTH SPEAKER
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Frequency Band (MHz)	Number of Hopping Frequencies	Limit	Result
2400 - 2483.5	79	>15	Pass

2402 - 2441 MHz



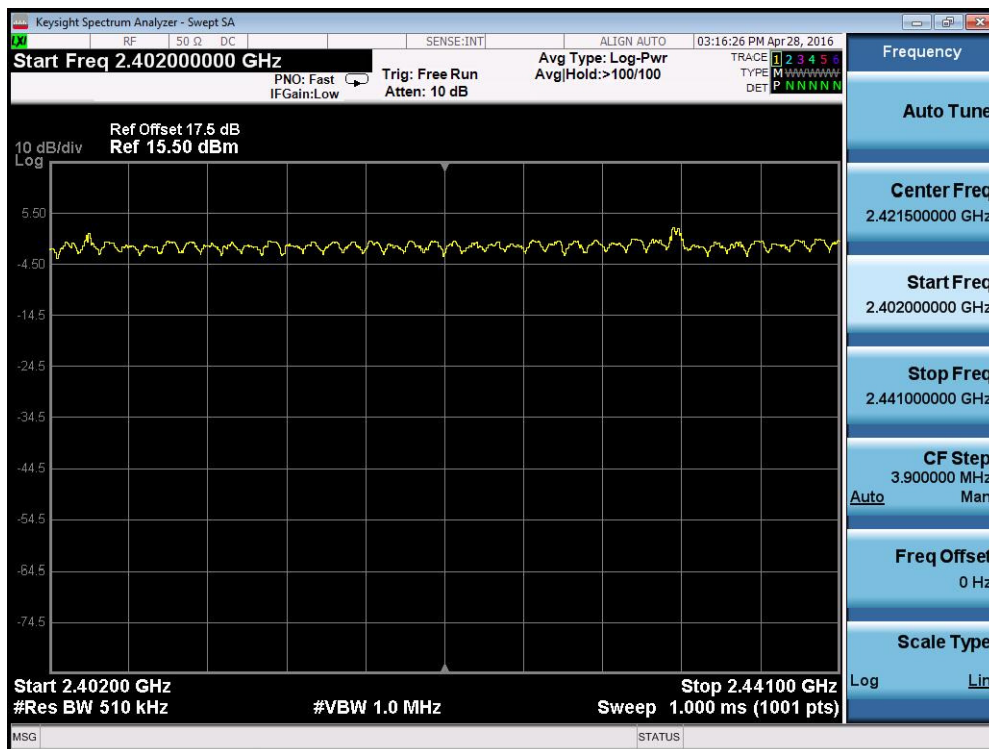
2442 - 2480 MHz



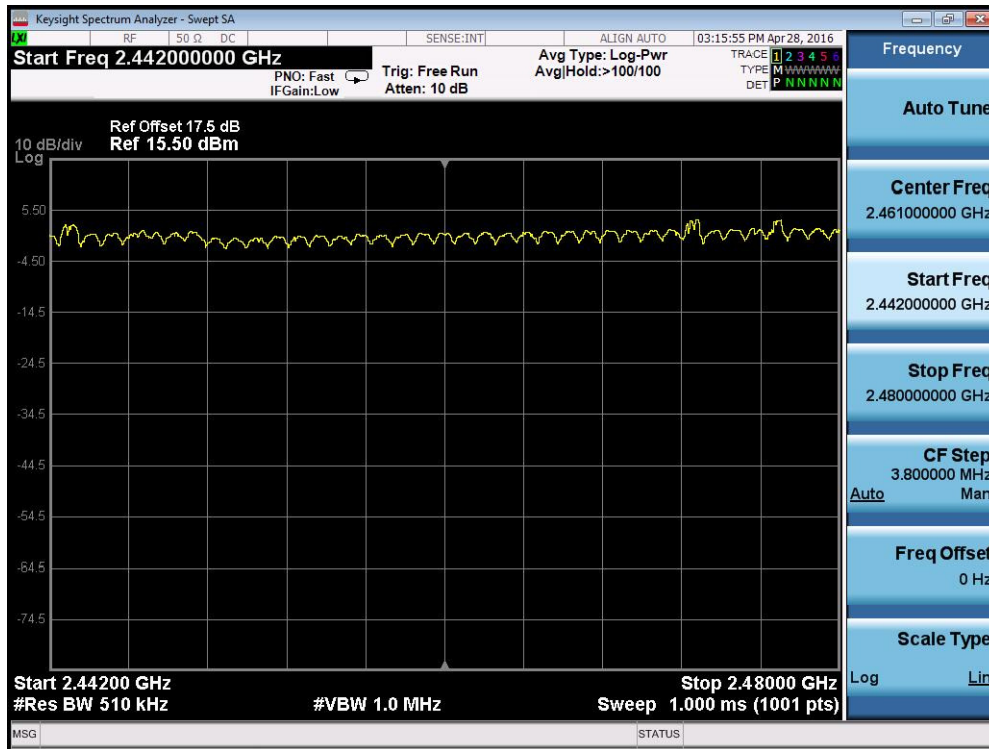
Product	:	BLUETOOTH SPEAKER
Test Item	:	Number of Hopping Frequencies
Test Site	:	TR-8
Test Mode	:	Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Frequency Band (MHz)	Number of Hopping Frequencies	Limit	Result
2400 - 2483.5	79	>15	Pass

2402 - 2441 MHz



2442 - 2480 MHz



8. Time of Occupancy (Dwell Time)

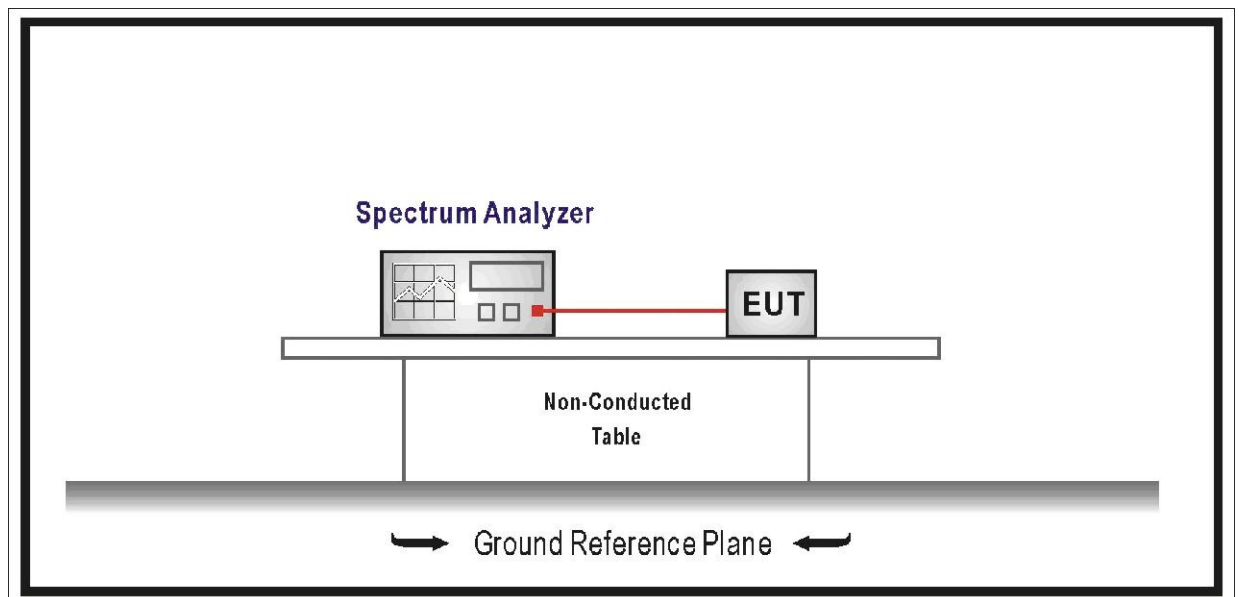
8.1. Test Equipment

Time of Occupancy (Dwell Time) / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2017.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

8.2. Test Setup



8.3. Limit

- For frequency hopping systems operating in the 902-928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; If the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz.
- Frequency hopping systems operating in the 5725-5850 MHz band shall use at least 75

hopping frequencies. The maximum 20 dB bandwidth of the hopping channel is 1 MHz. The average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 30 second period.

- Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

8.4. Test Procedure

According to ANSI C63.10: 2013& ANSI C63.4: 2014

The EUT must have its hopping function enabled. Use the following spectrum analyzer settings:

Span = zero span, centered on a hopping channel

RBW = 1MHz

VBW $\geq$ RBW

Sweep = as necessary to capture the entire dwell time per hopping channel

Detector function = peak

Trace = max hold

If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.

8.5. Uncertainty

The measurement uncertainty is defined as ± 0.1 us

8.6. Test Result

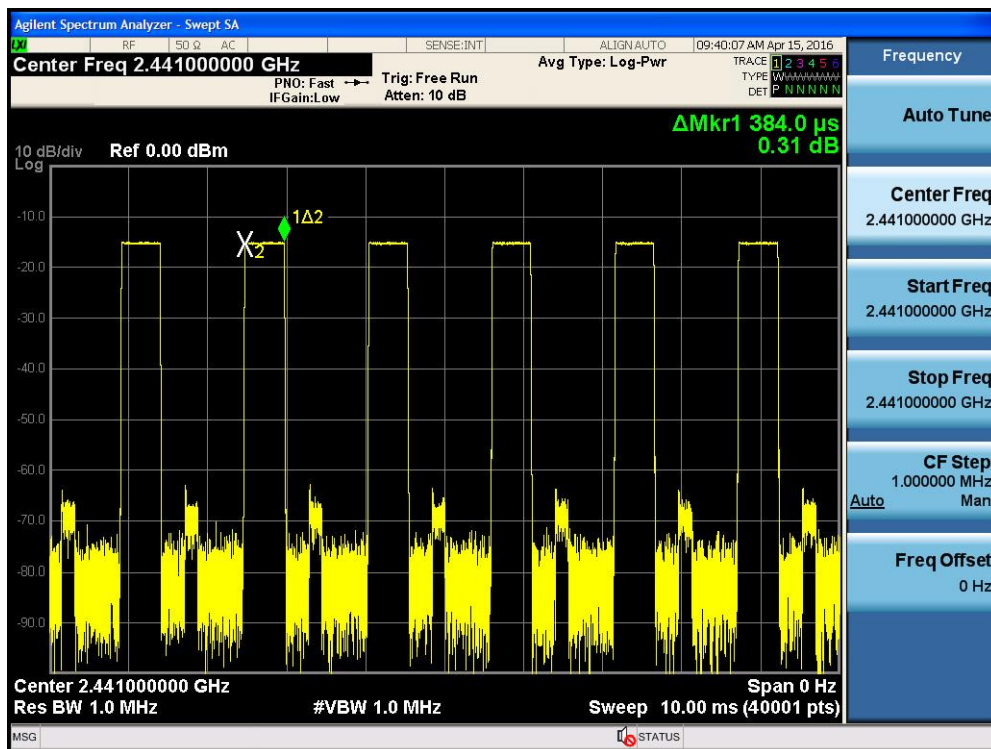
Product	:	BLUETOOTH SPEAKER
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-1Mbps (GFSK_DH1)

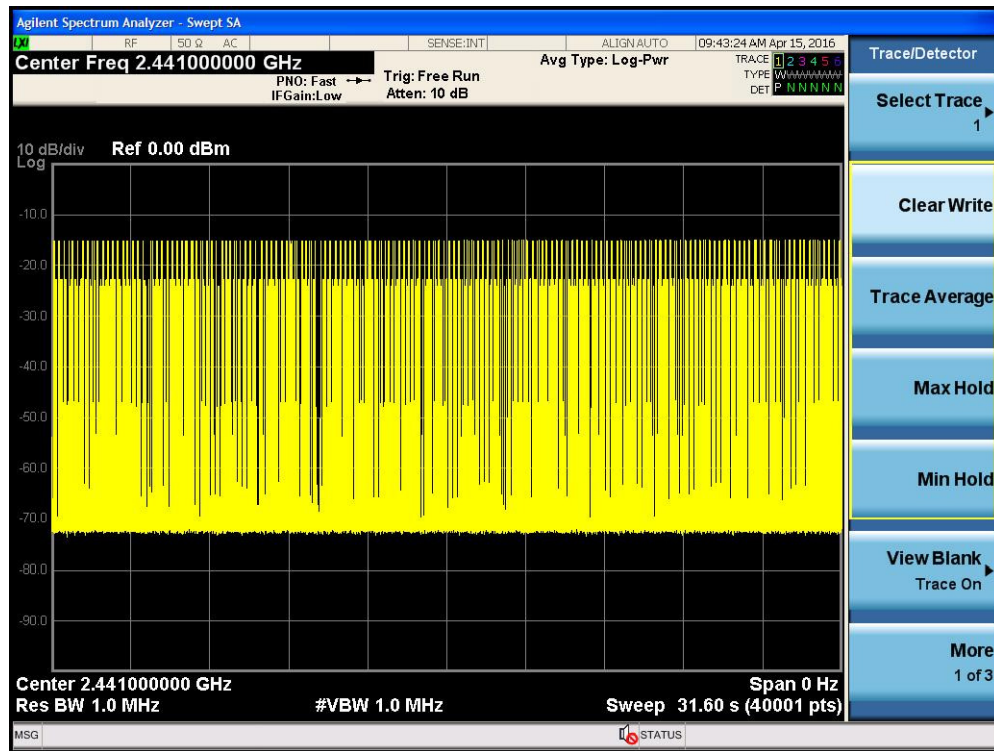
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	134.784	< 400	Pass

Test Time Period: $0.4 \times 79 = 31.6 \text{ sec}$.

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $0.384 \text{ ms} \times 351 = 134.784 \text{ msec}$

Channel 39 (2441MHz)-(DH1)





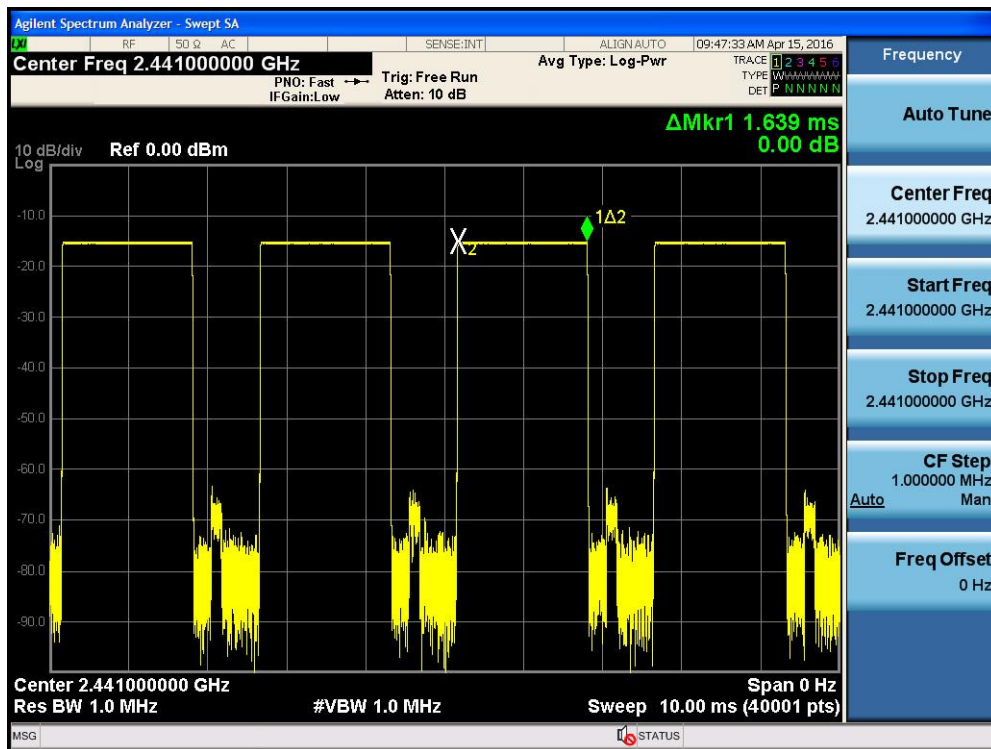
Product	:	BLUETOOTH SPEAKER
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-1Mbps (GFSK_DH3)

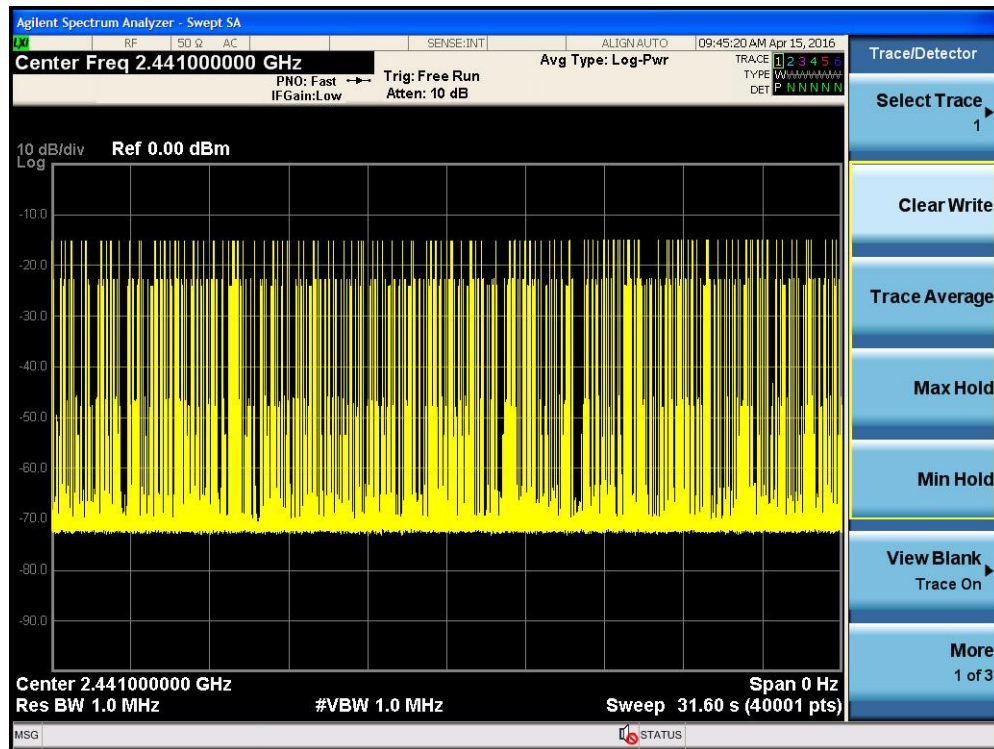
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	309.771	< 400	Pass

Test Time Period: $0.4 \times 79 = 31.6 \text{ sec}$.

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $1.639 \text{ ms} \times 189 = 309.771 \text{ msec}$

Channel 39 (2441MHz) - (DH3)





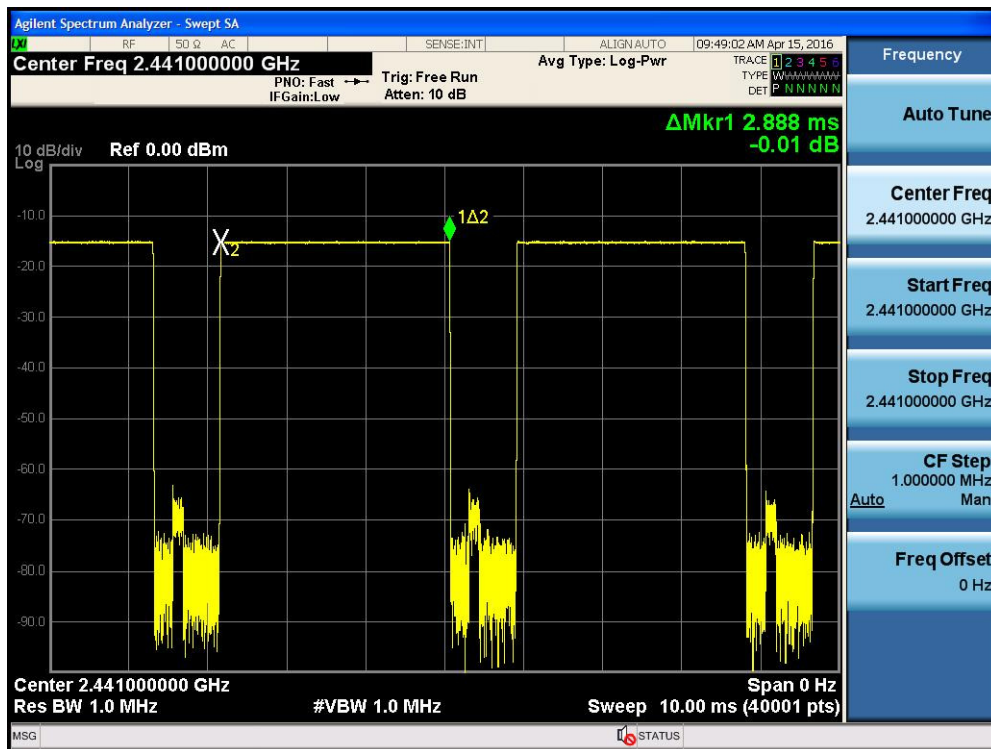
Product	:	BLUETOOTH SPEAKER
Test Item	:	Time of Occupancy (Dwell Time)
Test Site	:	TR-8
Test Mode	:	Transmitter-1Mbps (GFSK_DH5)

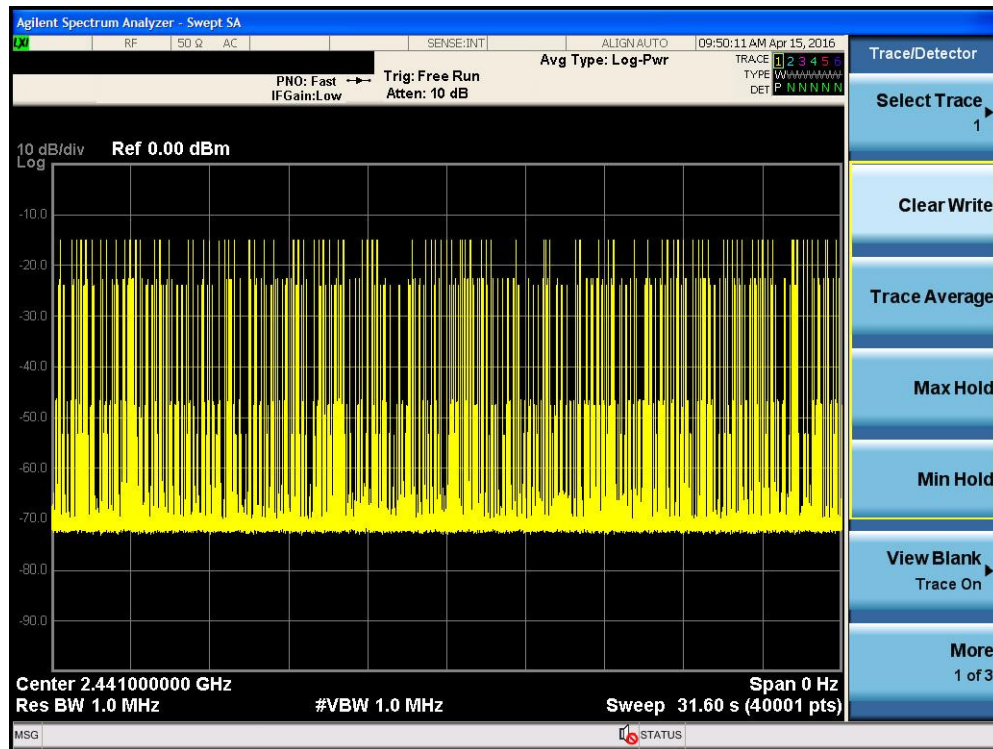
Channel No.	Frequency (MHz)	Time of Occupancy (ms)	Limit (ms)	Result
39	2441	340.784	< 400	Pass

Test Time Period: $0.4 \times 79 = 31.6 \text{ sec}$.

- 2441MHz, The Maximum Occupancy Time Within 31.6sec: $2.888 \text{ ms} \times 118 = 340.784 \text{ msec}$

Channel 39 (2441MHz) - (DH5)





9. Peak Output Power

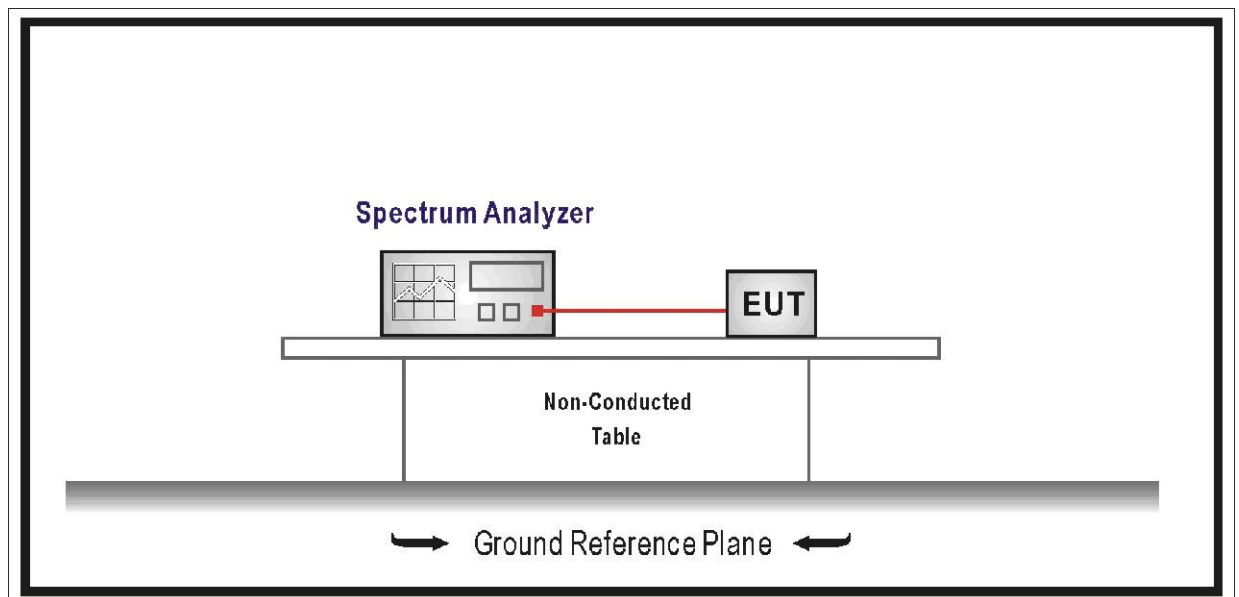
9.1. Test Equipment

Peak Output Power / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2017.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

9.2. Test Setup



9.3. 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.
- For frequency hopping systems operating in the 902-928 MHz band: 1 watt for systems employing at least 50 hopping channels; and, 0.25 watts for systems employing less than 50 hopping channels, but at least 25 hopping channels.

Note: the conducted output power limit specified above is based on the use the antennas with

directional gains that do not exceed 6 dBi are used, the conducted output power from the intentional radiator shall be reduced below the stated values above, as appropriate, by the amount in dB that the directional gain of antenna exceeds 6 dBi.

9.4. Test Procedure

According to ANSI C63.10: 2013& ANSI C63.4: 2014

Use the following spectrum analyzer settings:

Span = approximately 5 times the 20dB bandwidth, centered on a hopping channel

RBW > the 20 dB bandwidth of the emission being measured.

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power (don't forget added the external attenuation and cable loss).

9.5. Uncertainty

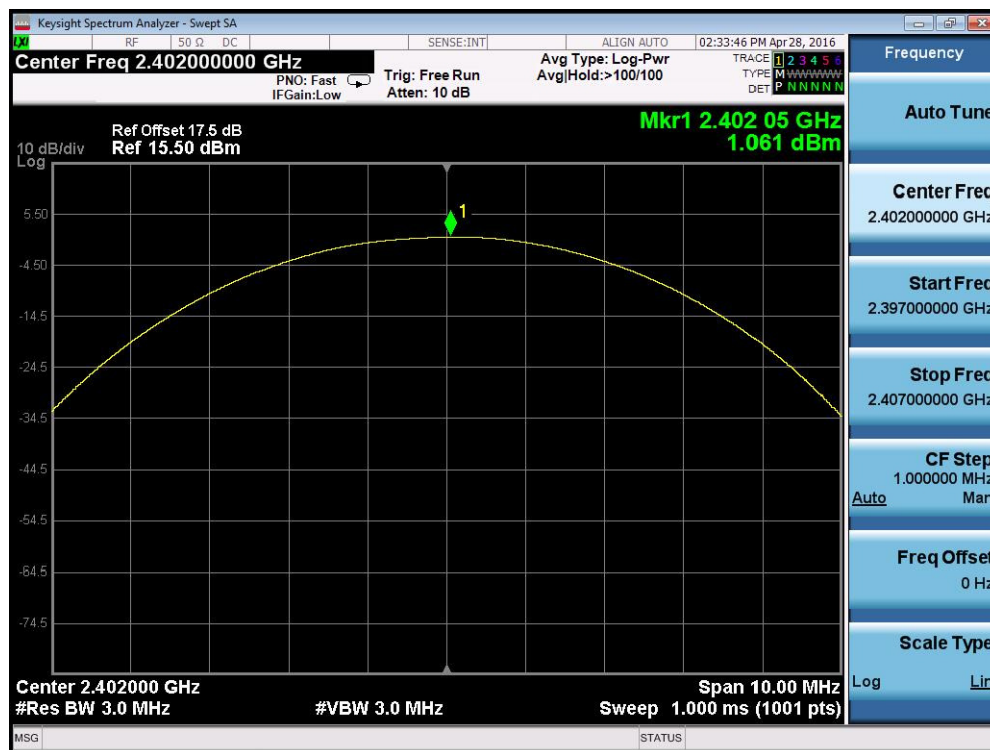
The measurement uncertainty is defined as ± 1.0 dB

9.6. Test Result

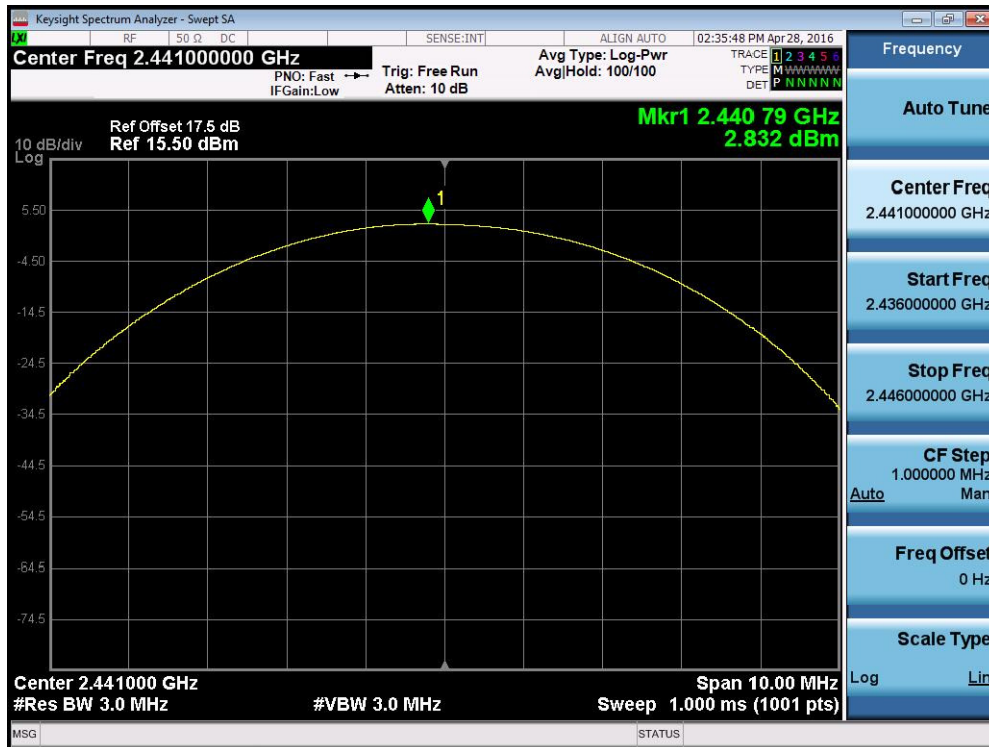
Product	:	BLUETOOTH SPEAKER
Test Item	:	Power Output
Test Site	:	TR-8
Test Mode	:	Mode 1: Transmitter-1Mbps (GFSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	1.061	30.00	Pass
39	2441	2.832	30.00	Pass
78	2480	4.250	30.00	Pass

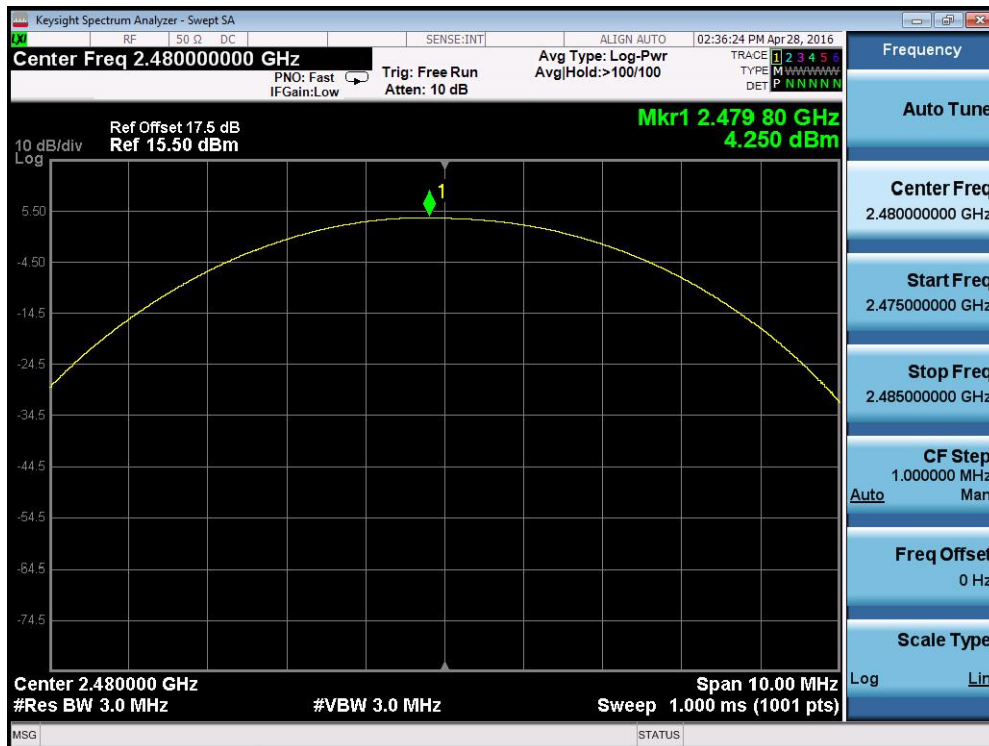
DH5 2402MHz



DH5 2441MHz



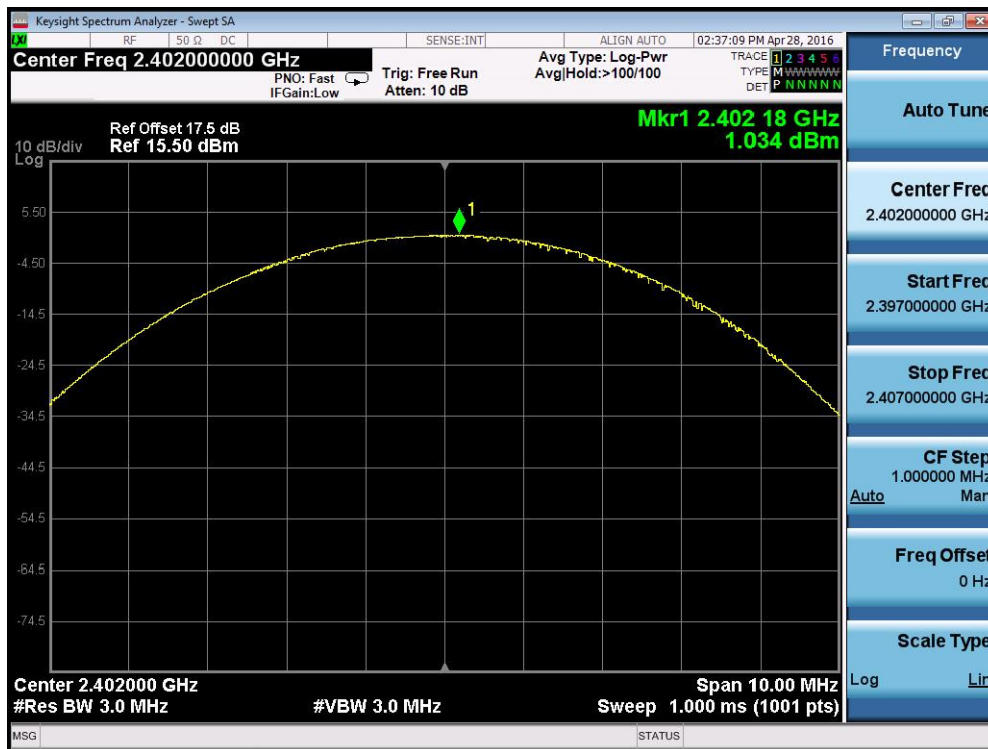
DH5 2480MHz



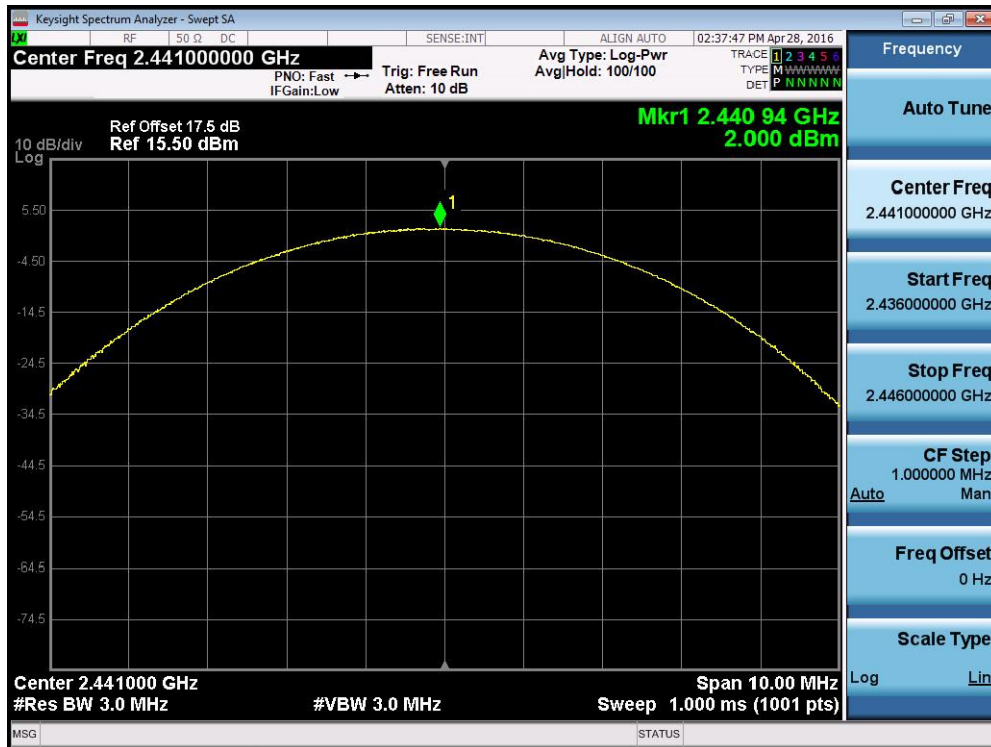
Product	: BLUETOOTH SPEAKER
Test Item	: Power Output
Test Site	: TR-8
Test Mode	: Mode 2: Transmitter-2Mbps (Pi/4 DQPSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	1.034	30.00	Pass
39	2441	2.000	30.00	Pass
78	2480	4.217	30.00	Pass

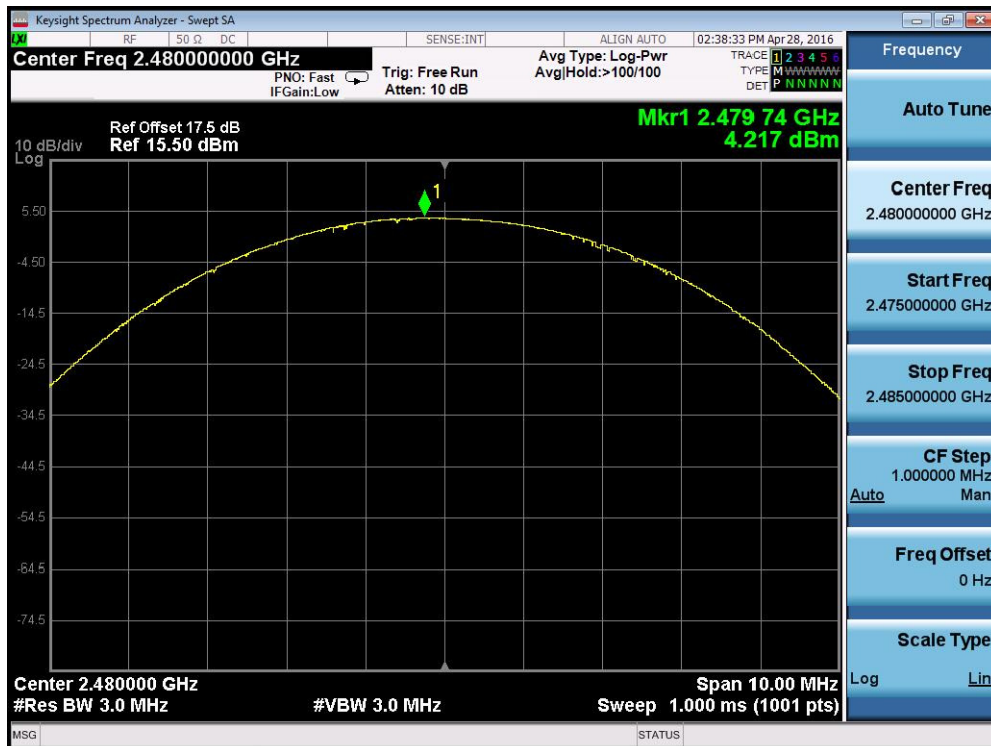
2DH5 2402MHz



2DH5 2441MHz



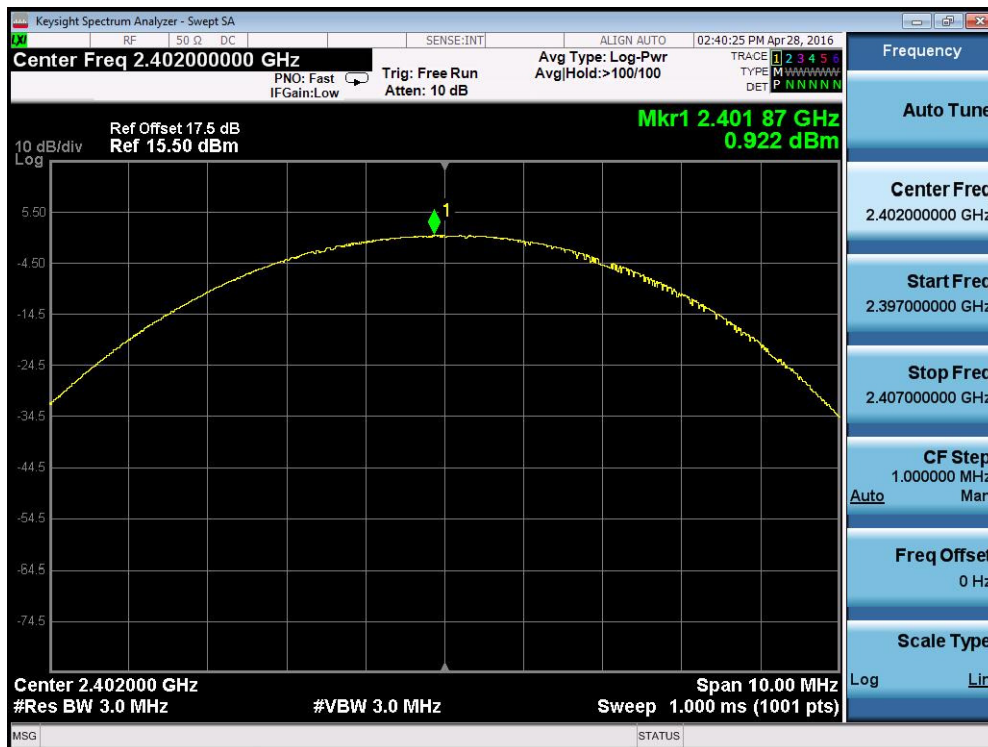
2DH5 2480MHz



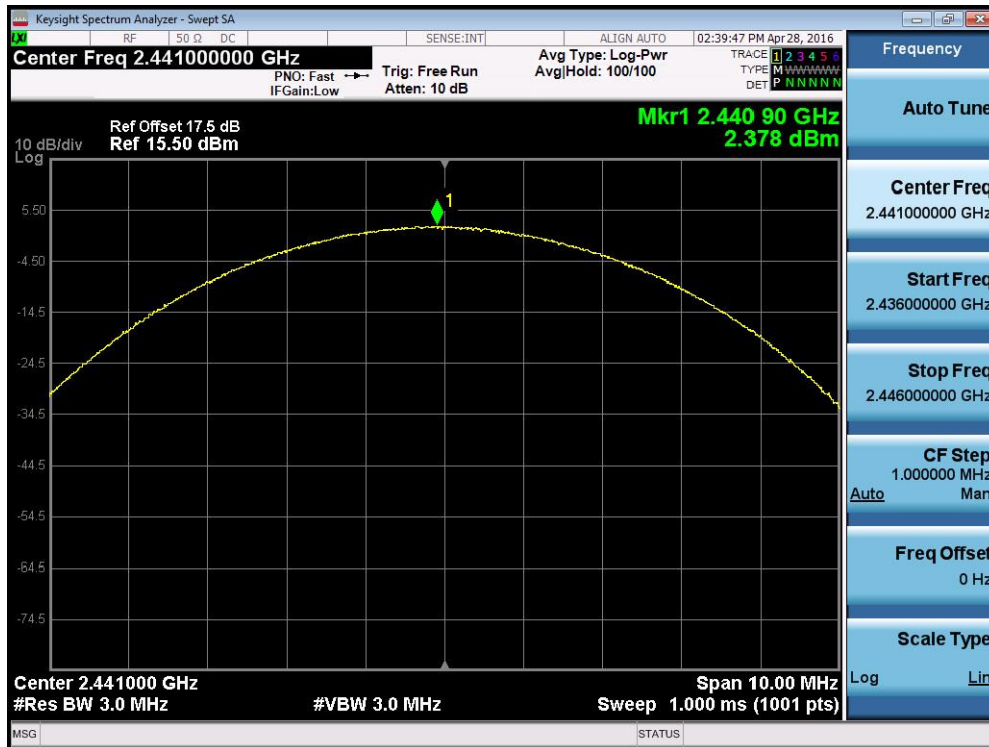
Product	: BLUETOOTH SPEAKER
Test Item	: Power Output
Test Site	: TR-8
Test Mode	: Mode 3: Transmitter-3Mbps (8DPSK_DH5)

Channel No.	Frequency (MHz)	Measurement Power Output (dBm)	Limit (dBm)	Result
0	2402	0.922	30.00	Pass
39	2441	2.378	30.00	Pass
78	2480	4.193	30.00	Pass

3DH5 2402MHz



3DH5 2441MHz



3DH5 2480MHz



10. Emissions in non-restricted frequency bands

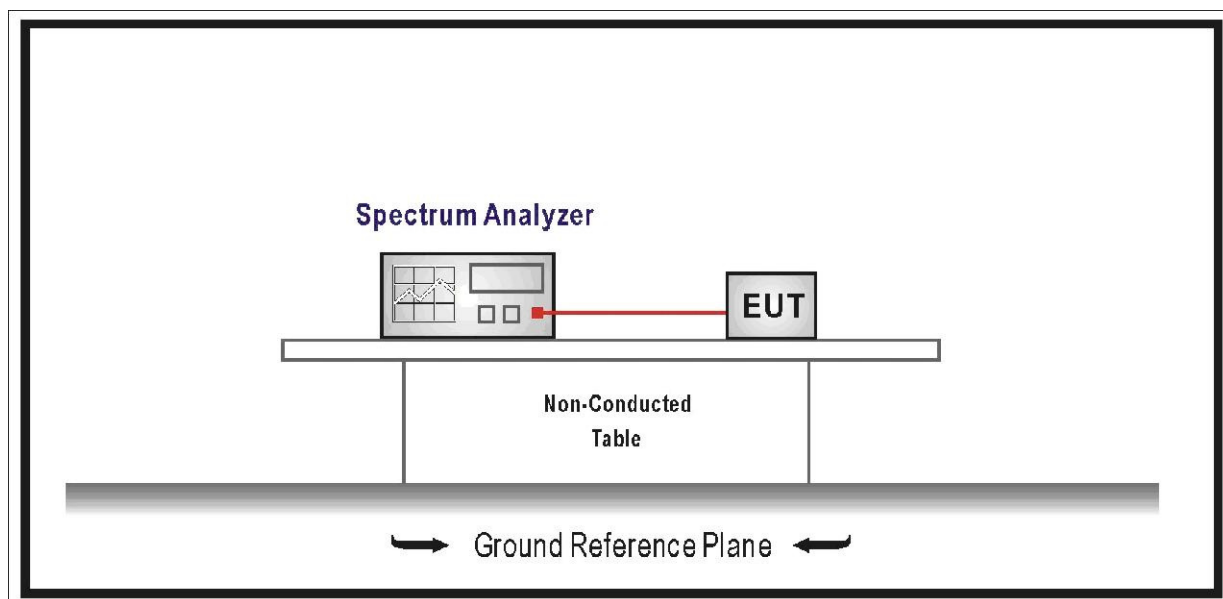
11.1. Test Equipment

Emissions in non-restricted frequency bands / TR-8

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04
Temperature/Humidity Meter	Zhicheng	ZC1-2	TR8-TH	2017.04.03

Note: All equipments are calibrated with traceable calibrations. Each calibration is traceable to the national or international standards.

11.2. Test Setup



11.3. Limit

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 a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted or a radiated 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) of FCC part 15 is not required.

11.4. Test Procedure

According to ANSI C63.10: 2013.

Use the following spectrum analyzer settings:

Span = wide enough to capture the peak level of the in-band emission and all spurious emissions (e.g., harmonics) from the lowest frequency generated in the EUT up through the 10th harmonic. Typically, several plots are required to cover this entire span.

RBW = 100 kHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Allow the trace to stabilize. Set the marker on the peak of any spurious emission recorded.

The level displayed must comply with the limit specified in this section.

11.5. Uncertainty

The measurement uncertainty is defined as ± 1.0 dB

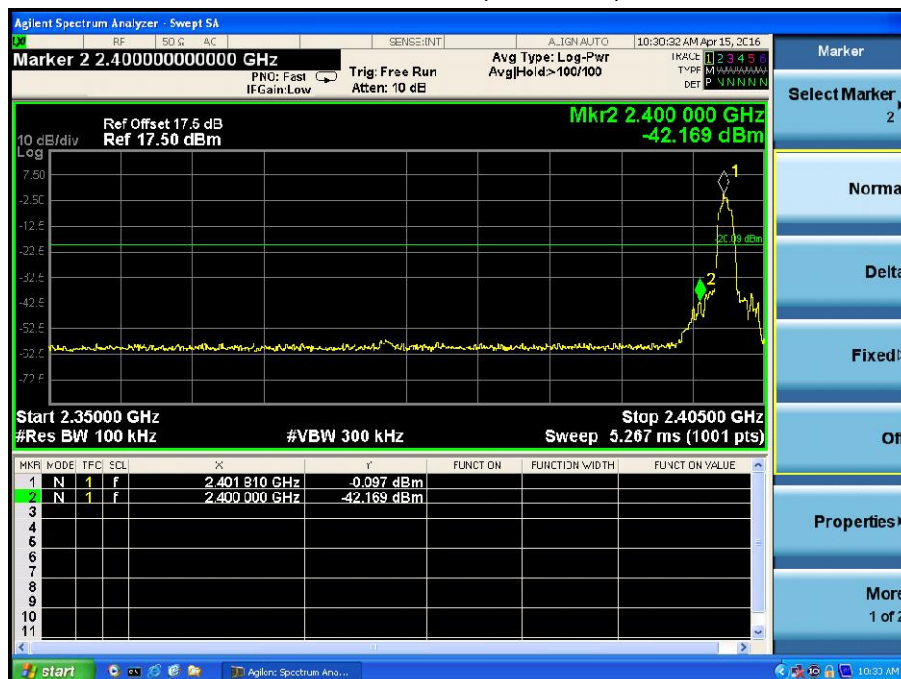
11.6. Test Result

Product	:	BLUETOOTH SPEAKER
Test Item	:	Emissions in non-restricted frequency bands
Test Site	:	TR-8

Mode	Channel	Test Frequency (MHz)	In-Band PSD[a] (dBm/100kHz)	Frequency (MHz)	Out-Band PSD[b] (dBm/100kHz)	[a]-[b] (dB)	Limit (dB)	Result
1	00	2402	0.24	2400.00	-49.70	49.94	>20	Pass
1	78	2480	3.69	2483.50	-58.96	62.65	>20	Pass
2	00	2402	0.03	2400.00	-42.72	42.75	>20	Pass
2	78	2480	3.51	2483.50	-58.06	61.57	>20	Pass
3	00	2402	-0.10	2400.00	-42.17	42.07	>20	Pass
3	78	2480	3.32	2483.50	-58.30	61.62	>20	Pass

Note: The worst case of Emissions in non-restricted frequency bands as below:

Mode 3 CH00(2402MHz)



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

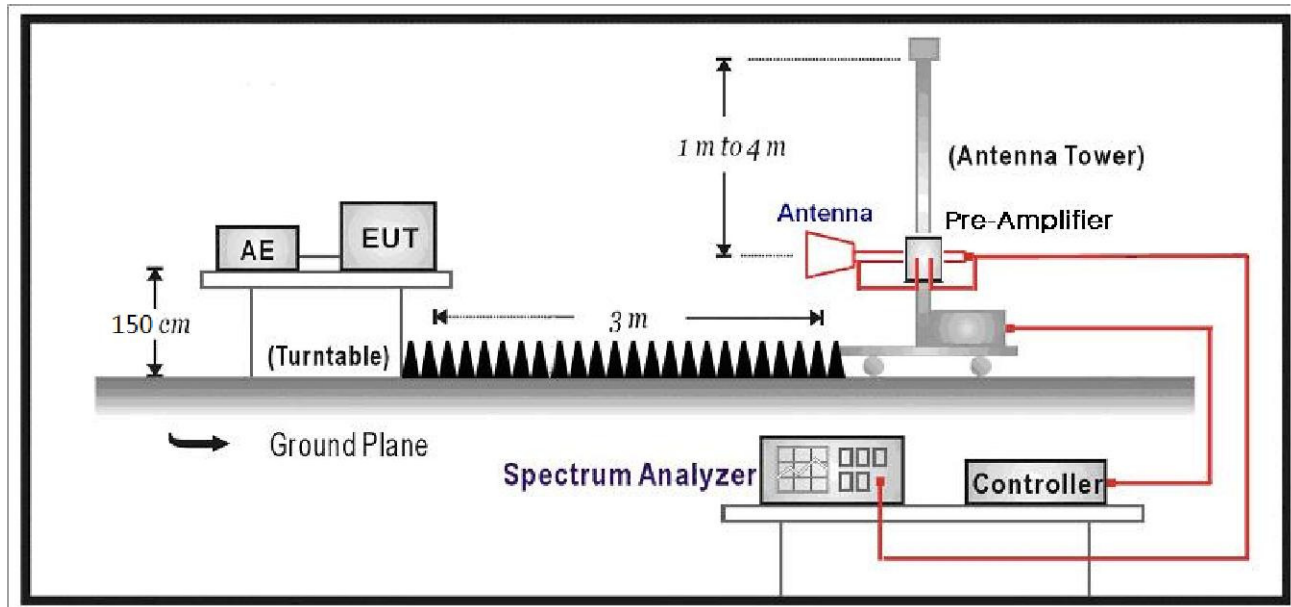
11. Radiated Emission Band Edge

12.1. Test Equipment

☒ Radiated Emission Band Edge / AC-5

Instrument	Manufacturer	Type No.	Serial No.	Cal. Due Date
Spectrum Analyzer	Agilent	N9010A	MY48030494	2017.02.04
Preamplifier	Miteq	NSP1800-25	1364185	2016.05.03
Preamplifier	QuieTek	AP-040G	CHM-0906001	2016.05.03
Bilog Antenna	Teseq GmbH	CBL6112D	27612	2016.10.15
Broad-Band Horn Antenna	Schwarzbeck	BBHA9120D	733	2017.02.26
DRG Horn	ETS-Lindgren	3117	00167055	2016.07.16
Broad-Band Horn Antenna	Schwarzbeck	BBHA9170	294	2017.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C1	2017.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 106	AC5-C2	2017.03.01
Coaxial Cable	Huber+Suhner	SUCOFLEX 102	AC5-C3	2016.08.07
Temperature/Humidity Meter	Zhicheng	ZC1-2	AC5-TH	2017.01.04

12.2. Test Setup



12.3. Limit

Radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) of FCC part 15, must also comply with the radiated emission limits specified in Section 15.209(a) of FCC part 15.

12.4. Test Procedure

According to ANSI C63.10: 2013& ANSI C63.4: 2014

This test is required for any spurious emission or modulation product that falls in a Restricted Band, as defined in Section 15.205 of FCC part 15. It must be performed with the highest gain of each type of antenna proposed for use with the EUT. Use the following spectrum analyzer settings:

Span = wide enough to fully capture the emission being measured

RBW = 1 MHz for $f \geq 1$ GHz, 100 kHz for $f < 1$ GHz

VBW $\geq$ RBW

Sweep = auto

Detector function = peak

Trace = max hold

Follow the guidelines in ANSI C63.4 with respect to maximizing the emission by rotating the EUT, measuring the emission while the EUT is situated in three orthogonal planes (if appropriate), adjusting the measurement antenna height and polarization, etc. A pre-amp and a high pass filter are required for this test, in order to provide the measuring system with

sufficient sensitivity. Allow the trace to stabilize. The peak reading of the emission, after being corrected by the antenna factor, cable loss, pre-amp gain, etc., is the peak field strength, which must comply with the limit specified in Section 15.35(b) of FCC part 15.

Now set the VBW to 10 Hz, while maintaining all of the other instrument settings. This peak level, once corrected, must comply with the limit specified in Section 15.209 of FCC Part 15. If the dwell time per channel of the hopping signal is less than 100 ms, then the reading obtained with the 10 Hz VBW may be further adjusted by a “duty cycle correction factor”, derived from $20\log(\text{dwell time}/100 \text{ ms})$, in an effort to demonstrate compliance with the 15.209 limit of FCC part 15.

If the emission on which a radiated measurement must be made is located at the edge of the authorized band of operation, then the alternative “marker-delta” method may be employed.

12.5. Uncertainty

The measurement uncertainty above 1G is defined as $\pm 3.9 \text{ dB}$

below 1G is defined as $\pm 3.8 \text{ dB}$

12.6. Test Result

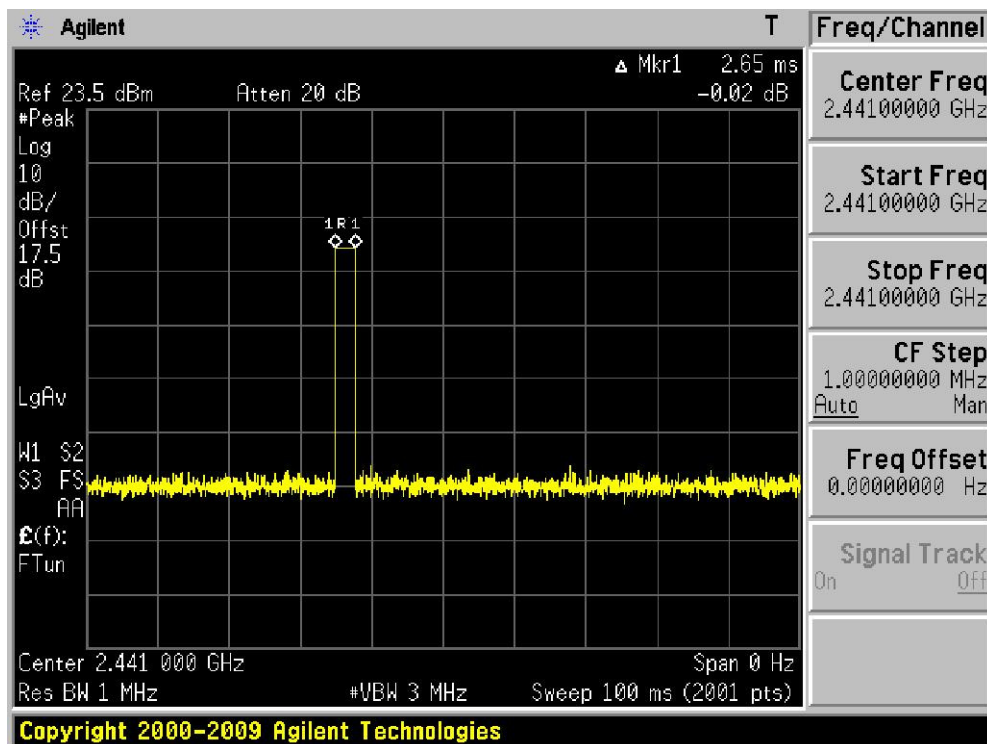
All of the test result shown indicates the worst case, and spectrum analyzer parameters setting as shown below:

Peak detector: RBW = 1MHz, VBW = 3MHz, sweep time = 200ms;

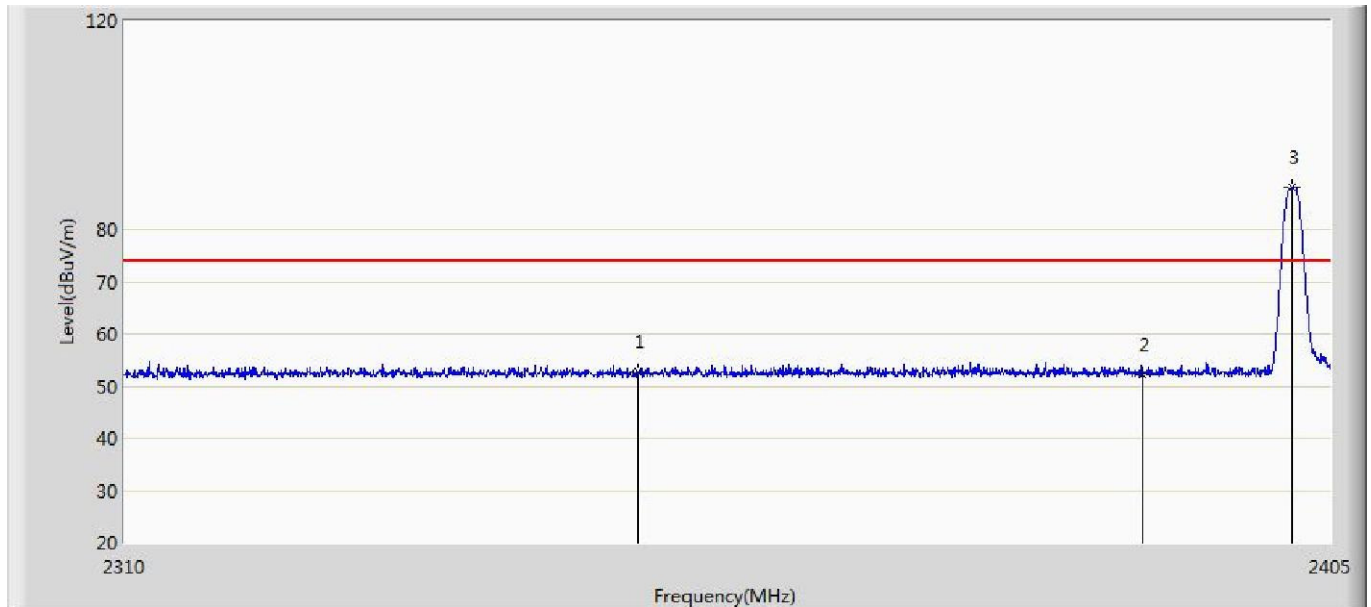
Average = Peak Measure Level+ Duty Factor

Duty Factor= $20 \cdot \log(\text{Pulse Number} \cdot \text{On Time} / 100) = -31.54\text{dB}$ in worst condition in normal use.

Pulse Number



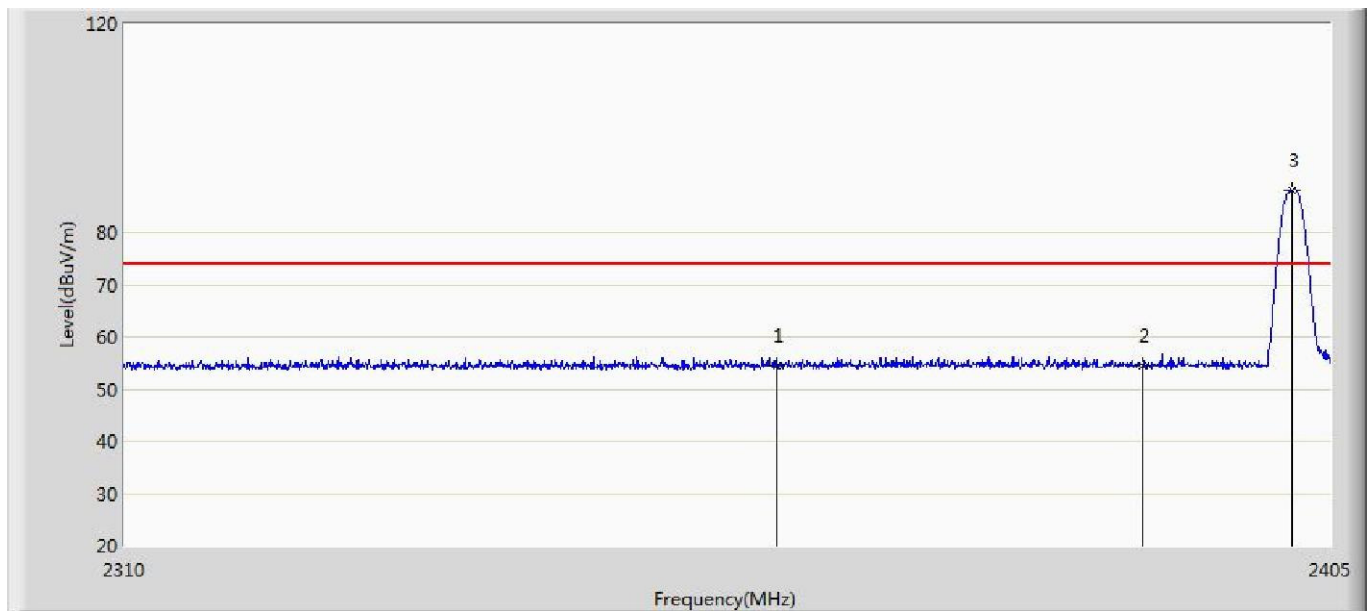
Engineer:	
Site: AC5	Time: 2016/04/12 - 09:22
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2402Mhz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2350.000	52.611	15.364	-21.389	74.000	37.247	PK
2		2390.000	52.233	14.878	-21.767	74.000	37.355	PK
3	*	2402.000	87.991	50.649	N/A	N/A	37.341	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2350.000	52.611	21.071	-32.929	54.000	-31.54	AV
2		2390.000	52.233	20.693	-33.307	54.000	-31.54	AV
3	*	2402.000	87.991	56.451	N/A	N/A	-31.54	AV

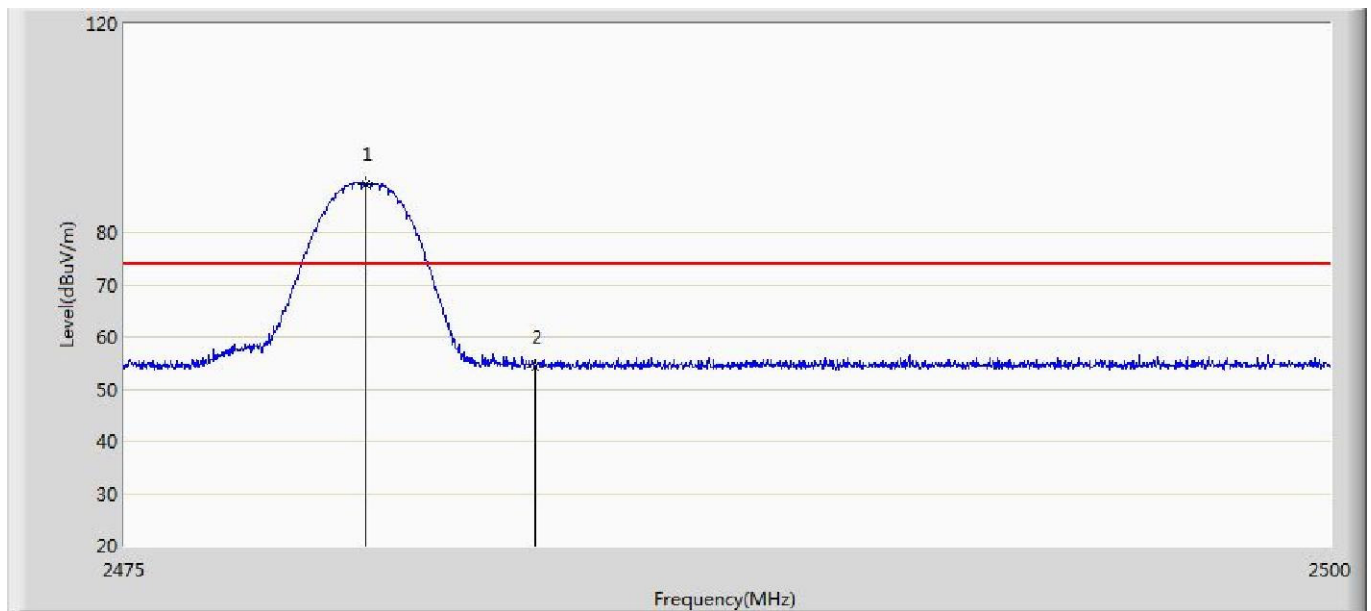
Engineer:	
Site: AC5	Time: 2016/04/12 - 09:26
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2402Mhz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2361.000	54.394	17.114	-19.606	74.000	37.280	PK
2		2390.000	54.467	17.112	-19.533	74.000	37.355	PK
3	*	2402.000	88.198	50.856	N/A	N/A	37.341	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2361.000	54.394	22.854	-31.146	54.000	-31.54	AV
2		2390.000	54.467	22.927	-31.073	54.000	-31.54	AV
3	*	2402.000	88.198	56.658	N/A	N/A	-31.54	AV

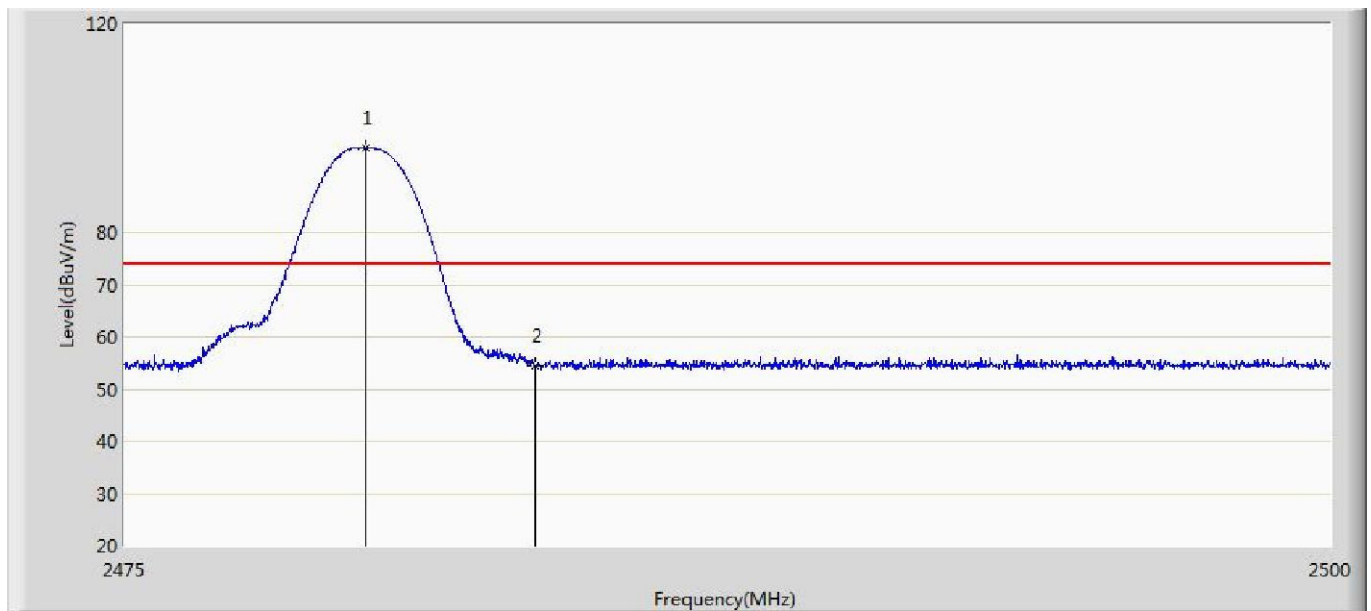
Engineer:	
Site: AC5	Time: 2016/04/12 - 09:31
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2480Mhz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.000	89.353	51.867	N/A	N/A	37.486	PK
2		2483.500	54.134	16.623	-19.866	74.000	37.511	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1	*	2480.000	89.353	57.813	N/A	N/A	-31.54	AV
2		2483.500	54.134	22.594	-31.406	54.000	-31.54	AV

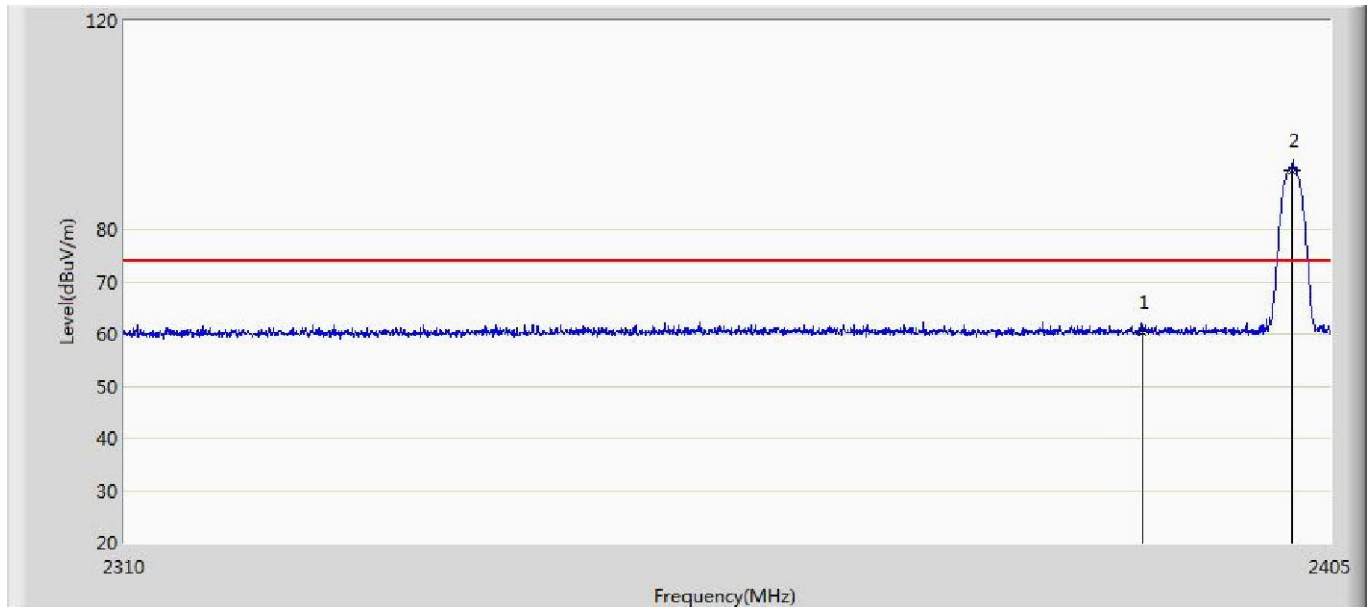
Engineer:	
Site: AC5	Time: 2016/04/12 - 09:36
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2480Mhz by DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.000	96.160	58.674	N/A	N/A	37.486	PK
2		2483.500	54.534	17.023	-19.466	74.000	37.511	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1	*	2480.000	96.160	64.620	N/A	N/A	-31.54	AV
2		2483.500	54.534	22.994	-31.006	54.000	-31.54	AV

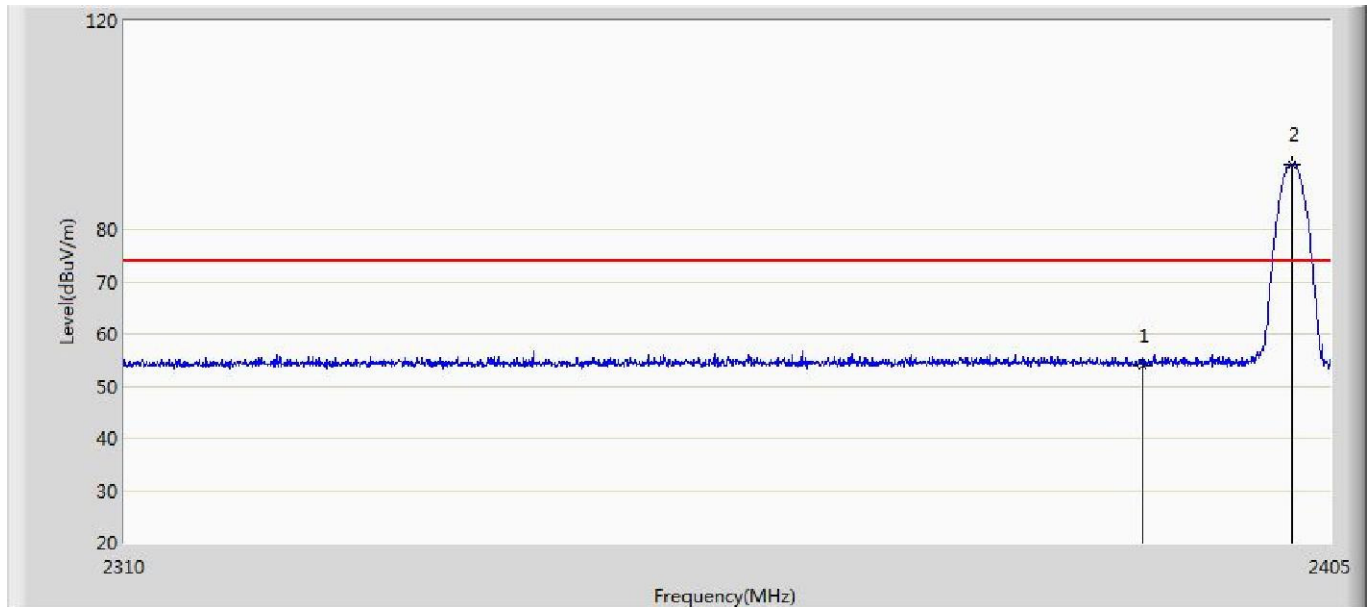
Engineer:	
Site: AC5	Time: 2016/04/12 - 09:40
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2402Mhz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	60.183	22.828	-13.817	74.000	37.355	PK
2	*	2402.000	91.356	54.014	N/A	N/A	37.341	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2390.000	60.183	28.643	-25.357	54.000	-31.54	AV
2	*	2402.000	91.356	59.816	N/A	N/A	-31.54	AV

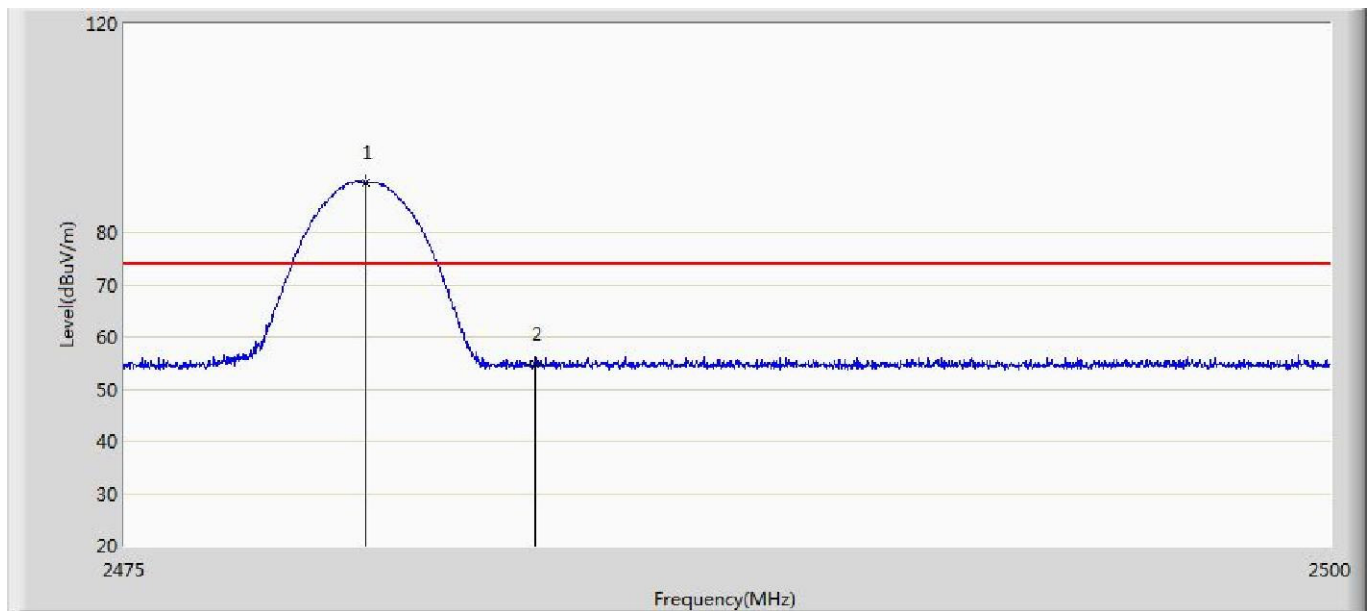
Engineer:	
Site: AC5	Time: 2016/04/12 - 14:50
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2402Mhz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	53.792	16.437	-20.208	74.000	37.355	PK
2	*	2402.000	92.322	54.980	N/A	N/A	37.341	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2390.000	53.792	22.252	-31.748	54.000	-31.54	AV
2	*	2402.000	92.322	60.782	N/A	N/A	-31.54	AV

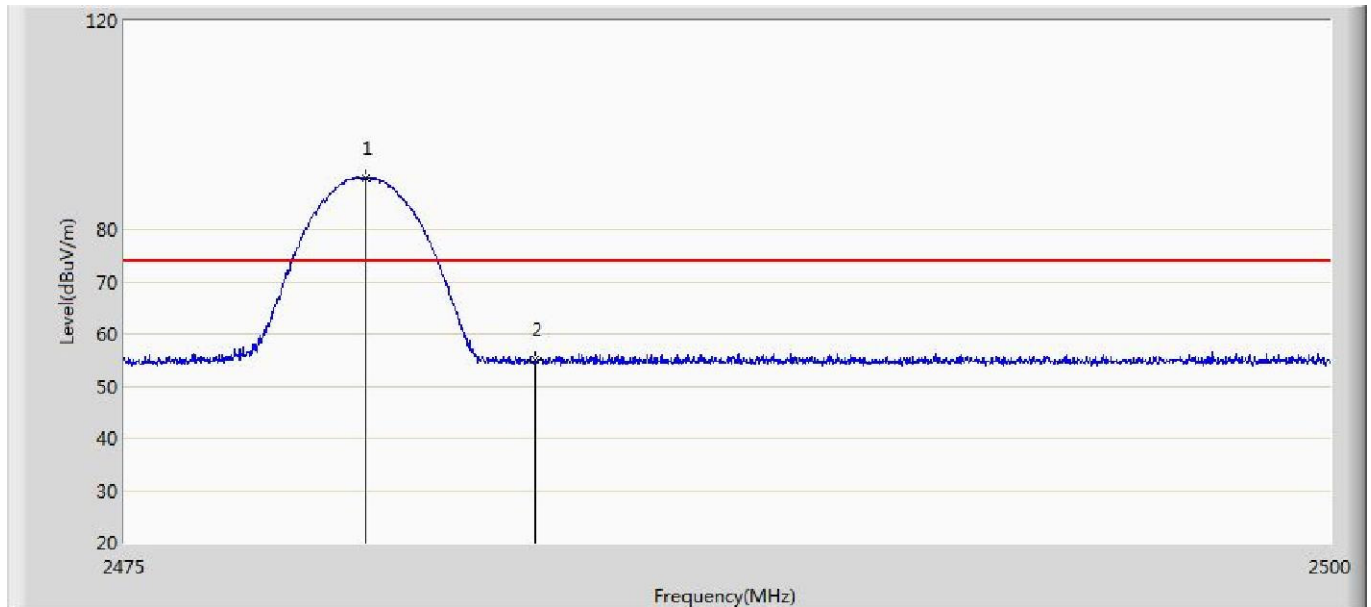
Engineer:	
Site: AC5	Time: 2016/04/12 - 14:56
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2480Mhz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.000	89.575	52.089	N/A	N/A	37.486	PK
2		2483.500	54.831	17.320	-19.169	74.000	37.511	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1	*	2480.000	89.575	58.035	N/A	N/A	-31.54	AV
2		2483.500	54.831	23.291	-30.709	54.000	-31.54	AV

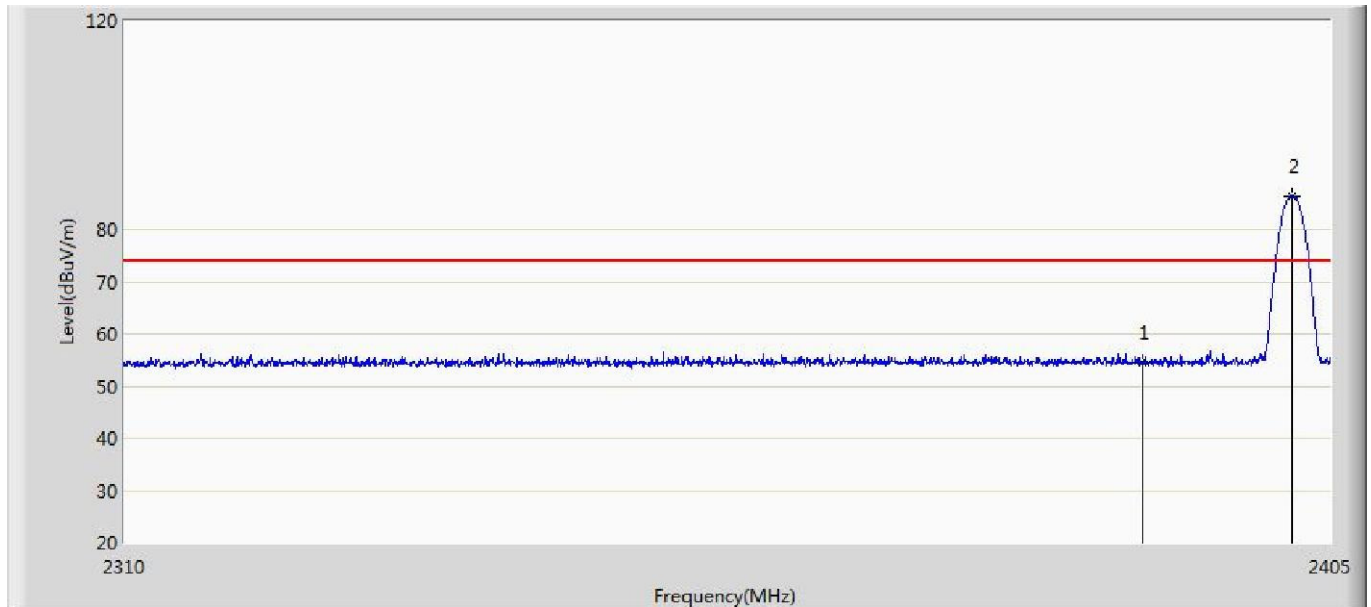
Engineer:	
Site: AC5	Time: 2016/04/12 - 15:01
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2480Mhz by 2DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.000	89.788	52.302	N/A	N/A	37.486	PK
2		2483.500	54.949	17.438	-19.051	74.000	37.511	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1	*	2480.000	89.788	58.248	N/A	N/A	-31.54	AV
2		2483.500	54.949	23.409	-30.591	54.000	-31.54	AV

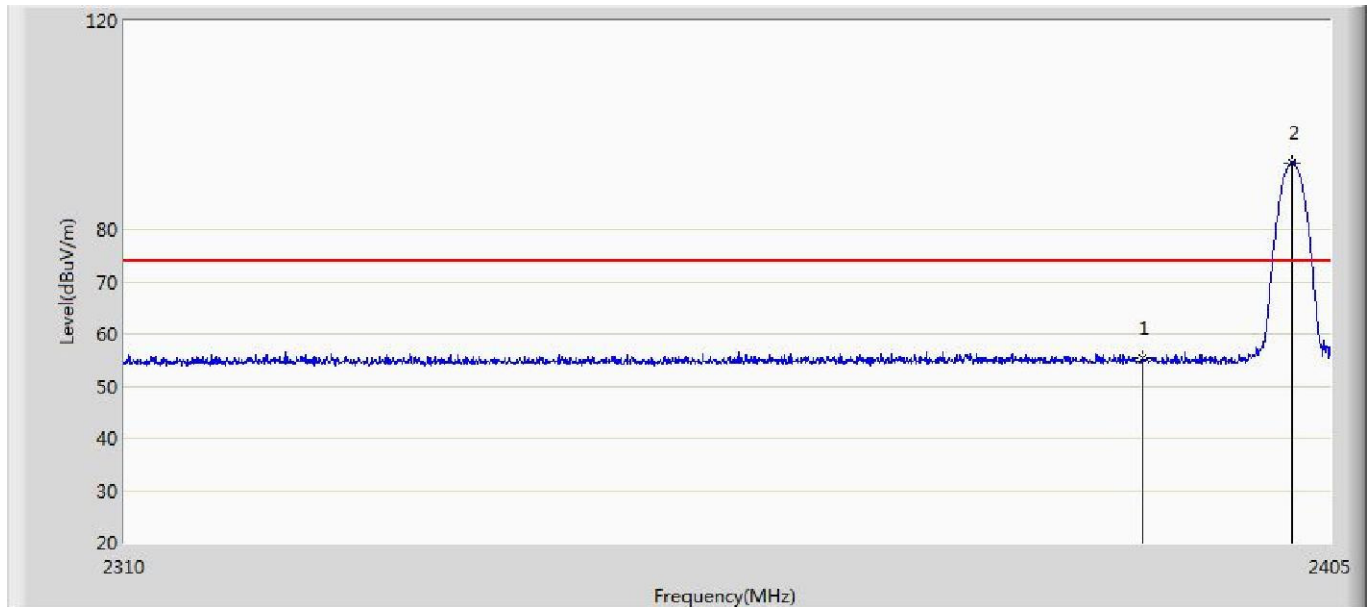
Engineer:	
Site: AC5	Time: 2016/04/12 - 15:05
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2402Mhz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	54.552	17.197	-19.448	74.000	37.355	PK
2	*	2402.000	86.411	49.069	N/A	N/A	37.341	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2390.000	54.552	23.012	-30.988	54.000	-31.54	AV
2	*	2402.000	86.411	54.871	N/A	N/A	-31.54	AV

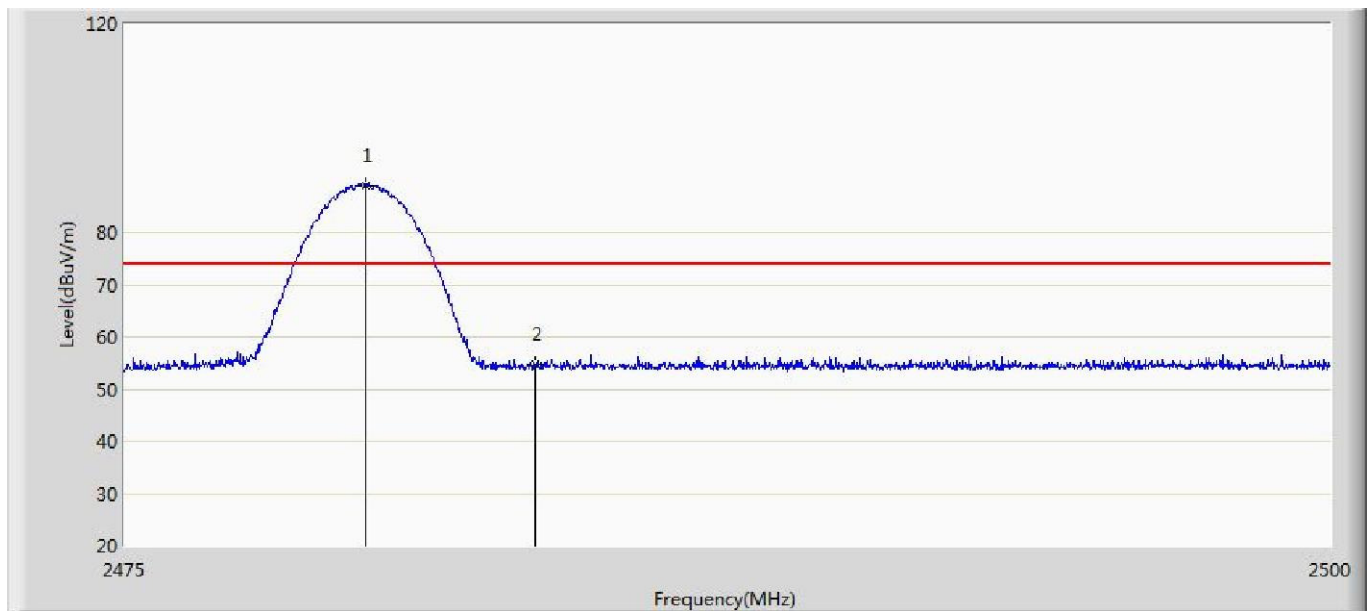
Engineer:	
Site: AC5	Time: 2016/04/12 - 15:11
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2402Mhz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1		2390.000	55.307	17.952	-18.693	74.000	37.355	PK
2	*	2402.000	92.713	55.371	N/A	N/A	37.341	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1		2390.000	55.307	23.767	-30.233	54.000	-31.54	AV
2	*	2402.000	92.713	61.173	N/A	N/A	-31.54	AV

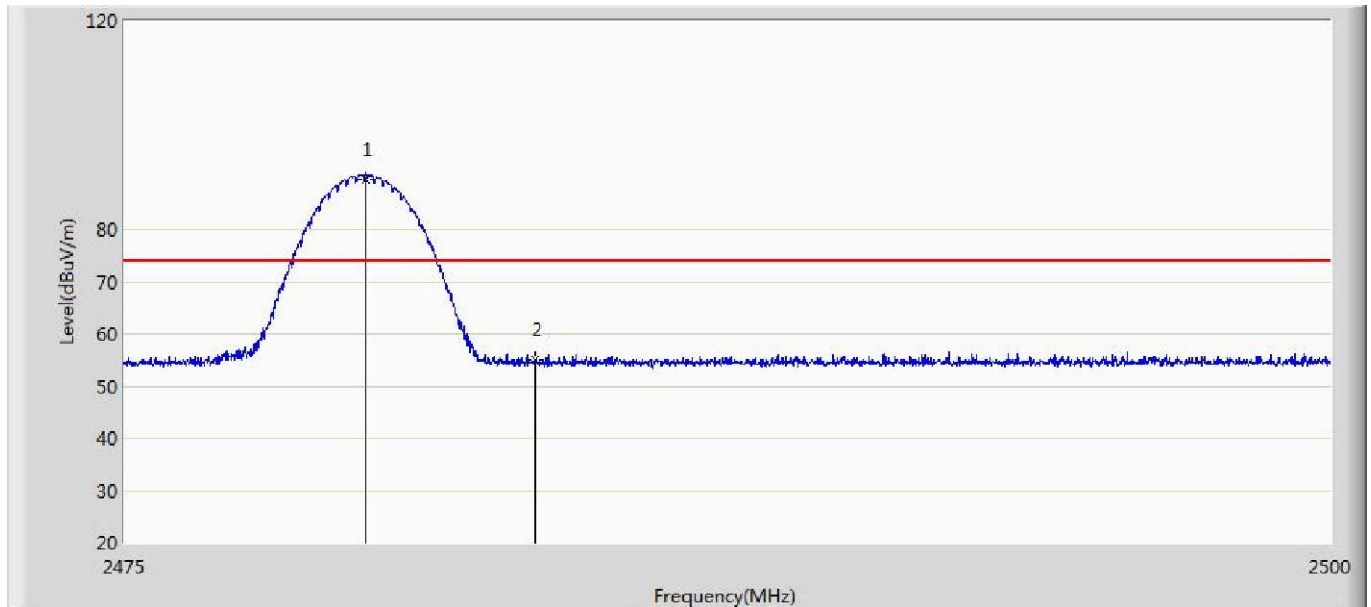
Engineer:	
Site: AC5	Time: 2016/04/12 - 15:27
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Horizontal
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2480Mhz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.000	89.096	51.610	N/A	N/A	37.486	PK
2		2483.500	54.695	17.184	-19.305	74.000	37.511	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1	*	2480.000	89.096	57.556	N/A	N/A	-31.54	AV
2		2483.500	54.695	23.155	-30.845	54.000	-31.54	AV

Engineer:	
Site: AC5	Time: 2016/04/12 - 15:31
Limit: FCC_Part15.209_RE(3m)	Margin: 0
Probe: Horn_3117_00167055(1-18GHz)	Polarity: Vertical
EUT: BLUETOOTH SPEAKER	Power: AC 120V/60Hz
Note: Mode 1:Transmit at CH2480Mhz by 3DH5	



No	Mark	Frequency (MHz)	Measure Level (dBuV/m)	Reading Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Factor (dB)	Type
1	*	2480.000	89.593	52.107	N/A	N/A	37.486	PK
2		2483.500	55.123	17.612	-18.877	74.000	37.511	PK

No	Mark	Frequency (MHz)	Peak Level (dBuV/m)	AV Level (dBuV)	Over Limit (dB)	Limit (dBuV/m)	Duty Factor (dB)	Type
1	*	2480.000	89.593	58.053	N/A	N/A	-31.54	AV
2		2483.500	55.123	23.583	-30.417	54.000	-31.54	AV

————— The End —————