

Test Report of FCC Part 15 C for FCC Certificate

On Behalf of

ShenZhen Haiman Speaker Co.,LTD.

FCC ID: YTS-CAPS-258
Product Description: Portable wireless bluetooth speaker
Model No.: Caps-258
Trademark: Haiman

Prepared for: **ShenZhen Haiman Speaker Co.,LTD.**
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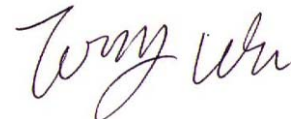
Report No.: BCT10IR-1409E
Issue Date: September 26, 2010
Test Date: September 1~26, 2010

Test by:

Reviewed By:



Kendy Wang



Tony Wu

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1. GENERAL INFORMATION

1.1 Product Description for Equipment Under Test (EUT)

Client Information

Applicant: **ShenZhen Haiman Speaker Co.,LTD.**
Address of applicant: Room 2101-2102, Baotong Building, Baomin Roadone,Bao'an District Shenzhen, China
Manufacturer: **ShenZhen Haiman Speaker Co.,LTD.**
Address of manufacturer: Room 2101-2102, Baotong Building, Baomin Roadone,Bao'an District Shenzhen, China

General Description of E.U.T

Items	Description
EUT Description:	Portable wireless bluetooth speaker
Trade Name:	Haiman
Model No.:	Caps-258
Type of Modulation:	FHSS
Frequency Band:	2402 MHz ~ 2480 MHz
Number of Channels:	79
Channel Bandwidth:	1 MHz
Antenna Type:	Built-in Antenna
Rated Voltage:	Input:5VDC 500mA or powered by battery

** The test data gathered are from the production sample provided by the manufacturer.*

1.2 Related Submittal(s) / Grant (s)

This submittal(s) is a test report based on the Electromagnetic Interference (EMI) tests performed on the EUT. The EMI measurements were performed according to the measurement procedure described in ANSI C63.4 - 2003.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.207, and 15.247 rules.

1.3 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4 - 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. Radiated testing was performed at an antenna to EUT distance 3 meters.

1.4 Test Facility

All measurement required was performed at laboratory of Bontek Compliance Testing Laboratory Ltd at 1/F, Block East H-3, OCT Eastern Ind. Zone, Qiaocheng East Road, Nanshan, Shenzhen, China and SGS-CSTC Standards Technical Services Co., Ltd ShenZhen Branch EMC Lab at No.1 Workshop, M-10, Middle Section, Science&Technology Park, Shenzhen 518057, Cina

The test facility is recognized, certified, or accredited by the following organizations:

FCC – Registration No.: 338263

BONTEK COMPLIANCE TESTING LABORATORY LTD. , EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 338263, March, 2008.

IC Registration No.: 7631A

The 3m alternate test site of BONTEK COMPLIANCE TESTING LABORATORY LTD. EMC Laboratory has been registered by Certification and Engineer Bureau of Industry Canada for the performance of with Registration NO.: 7631A on August 2009.

CNAS - Registration No.: L3923

BONTEK COMPLIANCE TESTING LABORATORY LTD. to ISO/IEC 17025:25 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.The acceptance letter from the CNAS is maintained in our files: Registration:L3923,February,2009.

TUV - Registration No.: UA 50145371-0001

BONTEK COMPLIANCE TESTING LABORATORY LTD. An assessment of the laboratory was conducted according to the"Procedures and Conditions for EMC Test Laboratories"with reference to EN ISO/IEC 17025 by a TUV Rheinland auditor. Audit Report NO. 17010783-001

2. SYSTEM TEST CONFIGURATION

The tests documented in this report were performed in accordance with ANSI C63.4-2003 and FCC CFR 47 Part 15 Subpart C.

2.1 EUT Configuration

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

2.2 EUT Exercise

The calibrated antennas used to sample the radiated field strength are mounted on a non-conductive, motorized antenna mast 3 or 10 meters from the leading edge of the turntable.

2.3 General Test Procedures

Conducted Emissions The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 7.1 of ANSI C63.4-2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-Peak detector mode.

Radiated Emissions The EUT is placed on a turntable, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4-2003.

2.4 List of Measuring Equipments Used

Test equipments list of BONTEK COMPLIANCE TESTING LABORATORY LTD.

No.	Equipment	Manufacturer	Model No.	Serial No.	Cal date	Cal due date
1	EMI Test Receiver	R&S	ESCI	100687	2010-4-14	2011-4-13
2	EMI Test Receiver	R&S	ESPI	100097	2010-4-14	2011-4-13
3	Spectrum Analyzer	R&S	FSEK 30	835253/002	2010-4-14	2011-4-13
4	Amplifier	HP	8447D	1937A02492	2010-4-14	2011-4-13
5	Single Power Conductor Module	FCC	FCC-LISN-5-50-1-01-CISPR25	07101	2010-4-14	2011-4-13
6	Single Power Conductor Module	FCC	FCC-LISN-5-50-1-01-CISPR25	07102	2010-4-14	2011-4-13
7	Power Clamp	SCHWARZBECK	MDS-21	3812	2010-4-14	2011-4-13
8	Positioning Controller	C&C	CC-C-1F	MF7802113	N/A	N/A
9	Electrostatic Discharge Simulator	TESEQ	NSG437	125	2010-4-14	2011-4-13
10	Fast Transient Burst Generator	SCHAFFNER	MODULA6150	34572	2010-4-14	2011-4-13
11	Fast Transient Noise Simulator	Noiseken	FNS-105AX	31485	2010-4-14	2011-4-13
12	Color TV Pattern Generator	PHILIPS	PM5418	TM209947	N/A	N/A
13	Power Frequency Magnetic Field Generator	EVERFINE	EMS61000-8K	608002	2010-4-14	2011-4-13
14	Capacitive Coupling Clamp	TESEQ	CDN8014	25096	2010-4-14	2011-4-13
15	High Field Biconical Antenna	ELECTRO-METRICS	EM-6913	166	2010-4-14	2011-4-13
16	Log Periodic Antenna	ELECTRO-METRICS	EM-6950	811	2010-4-14	2011-4-13
17	Remote Active Vertical Antenna	ELECTRO-METRICS	EM-6892	304	2010-4-14	2011-4-13
18	TRILOG Broadband Test-Antenna	SCHWARZBECK	VULB9163	9163-324	2010-4-14	2011-4-13
19	Horn Antenna	SCHWARZBECK	BBHA9120A	B08000991-0001	2010-4-14	2011-4-13

20	Teo Line Single Phase Module	SCHWARZBEC K	NSLK8128	D-69250	2010-4-14	2011-4-13
21	10dB attenuator	SCHWARZBEC K	MTAIMP-136	R65.90.0001#06	2010-4-14	2011-4-13
22	Electric bridge	Zentech	100 LCR METER	803024	N/A	N/A
23	RF Current Probe	FCC	F-33-4	80	2010-4-14	2011-4-13
24	SIGNAL GENERATOR	HP	8647A	3349A02296	2010-4-14	2011-4-13
25	MICROWAVE AMPLIFIER	HP	8349B	2627A00994	2010-4-14	2011-4-13
26	Triple-Loop Antenna	EVERFINE	LLA-2	607004	2010-4-14	2011-4-13
27	CDN	FRANKONIA	M2+M3	A3027019	2010-4-14	2011-4-13
28	6dB Attenuator	FRANKONIA	75-A-FFN-06	1001698	2010-4-14	2011-4-13
29	EMV-Mess- Systeme GMBH	FRANKONIA	FLL-75	1020A1109	2010-4-14	2011-4-13
30	EM Injection Clamp	FCC	F-203I-13mm	091536	2010-4-14	2011-4-13
31	9KHz-2.4GHz Signal generator	MARCONI INSTRUMENTS	2024	112260/042	2010-4-14	2011-4-13

2.5 Test AUX Device:

AUX Description:	Manufacturer	Model No.	Certificate	CABLE
Monitor	Dell	E178Pc	CE, FCC	1.5m Unshielded Power Cord 1.8m shielded data Cable with core
Keyboard	Dell	L100	CE, FCC	1.8m shielded data Cable with core
Mouse	Dell	OCJ339	CE, FCC	1.8m shielded data Cable
PC	Dell	KV335	CE, FCC	1.5m Unshielded Power line

3. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
15.203/15.247(b)/(c)	Antenna Requirement	Pass
15.207	Conducted Emission	Pass
15.247(a)(1)	Hopping Channel Bandwidth	Pass
15.247(a)(1)	Hopping Channel Separation	Pass
15.247(a)(1)	Number of Hopping Frequency Used	Pass
15.247(a)(1)(iii)	Dwell Time of Each Frequency	Pass
15.247(b)(1)	Maximum Peak Output Power	Pass
15.247(d)	Band Edges Emission	Pass
15.247(d)	Spurious Radiated Emission	Pass

4. ANTENNA REQUIREMENT

4.1 Standard Applicable

Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Section 15.247(b)/(c):

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

If the intentional radiator is used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

4.2 Antenna Connected Construction

The antenna connector is designed with permanent attachment and no consideration of replacement.

5. CONDUCTED EMISSION

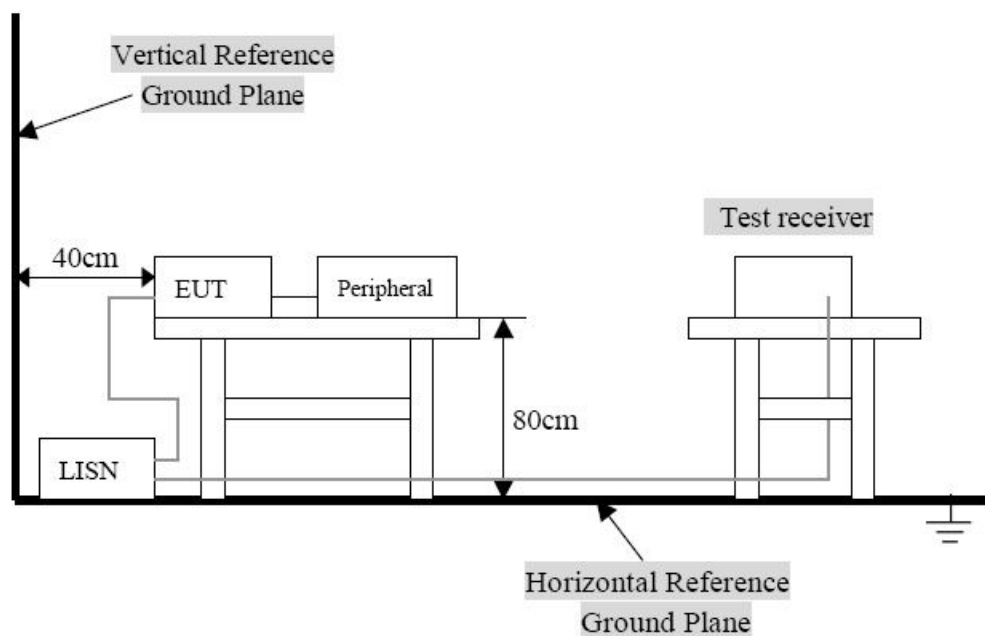
5.1 Applicable Standard

Refer to FCC §15.207.

For a Low-power Radio-frequency Device is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency Range (MHz)	Limits (dBuV)	
	Quasi-Peak	Average
0.150~0.500	66~56	56~46
0.500~5.000	56	46
5.000~30.00	60	50

5.2 Test Setup Diagram



Remark: The EUT was connected to USB of notebook whose adapter is a 120 VAC/ 60Hz power source.

5.3 Test Result

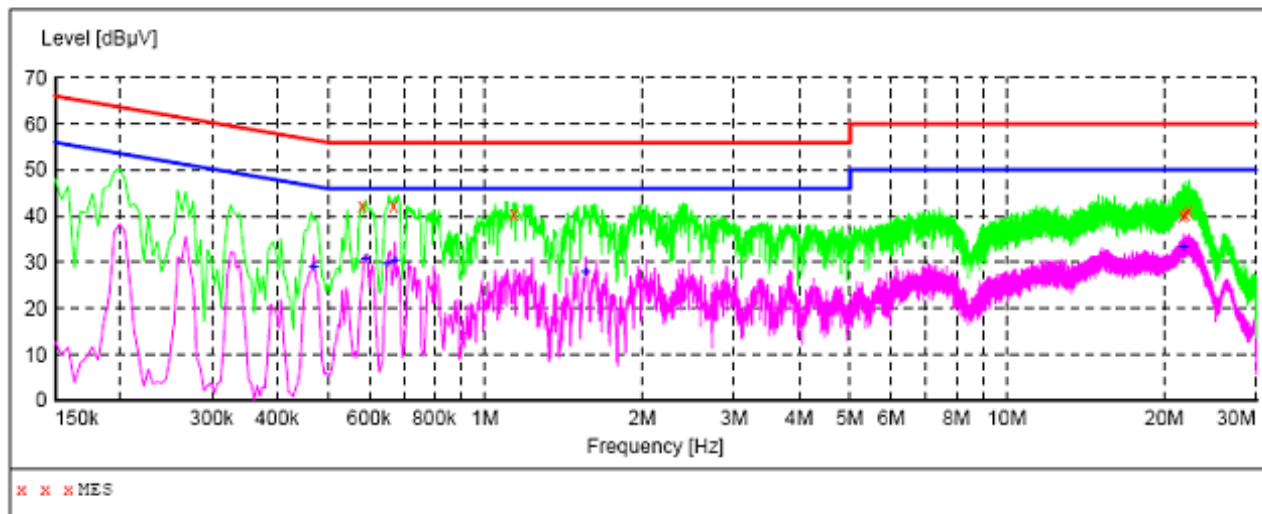
Temperature (°C) : 23~25	EUT: Portable wireless bluetooth speaker
Humidity (%RH) : 45~58	M/N: Caps-258
Barometric Pressure (mbar) : 950~1000	Operation Condition:Charging Mode

Conducted Emission:

EUT: Portable wireless bluetooth speaker M/N: Caps-258
Operating Condition: Charging Mode
Test Site: Shielded Room
Operator: Andy
Test Specification: AC/DC adapter of notebook (AC 120V/60Hz)
Comment: Live Line

SCAN TABLE: "Voltage (150K-30M) FIN"

Short Description: 150K-30M Voltage



MEASUREMENT RESULT

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.582000	42.20	9.9	56	13.8	QP	L1	GND
0.667500	42.30	9.9	56	13.7	QP	L1	GND
1.135500	40.30	9.9	56	15.7	QP	L1	GND
21.700500	40.10	9.7	60	19.9	QP	L1	GND
21.979500	40.50	9.7	60	19.5	QP	L1	GND
22.245000	41.00	9.7	60	19.0	QP	L1	GND

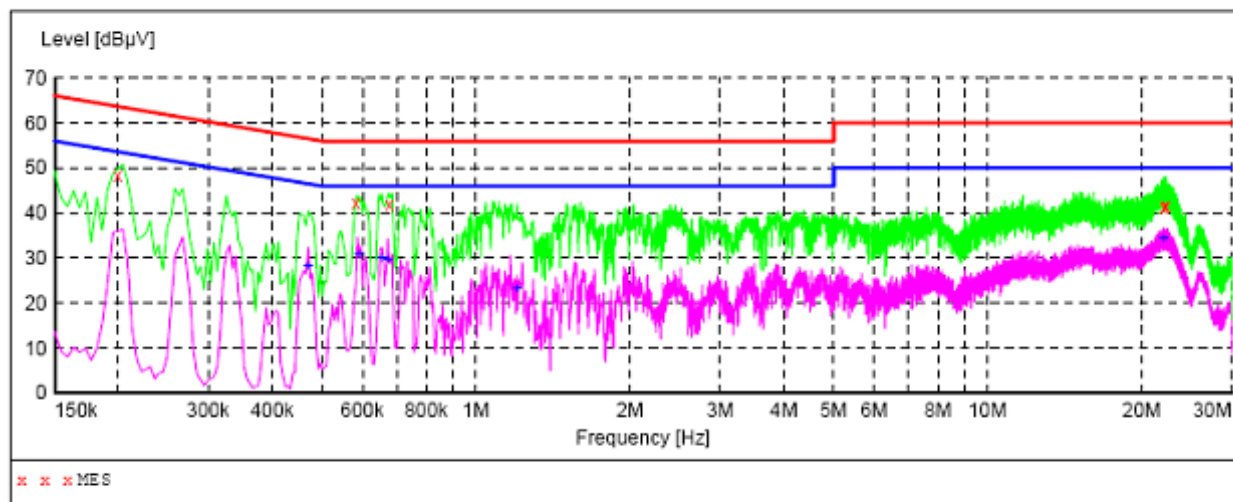
MEASUREMENT RESULT

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.469500	28.80	9.9	47	17.7	AV	L1	GND
0.591000	30.80	9.9	46	15.2	AV	L1	GND
0.649500	29.80	9.9	46	16.2	AV	L1	GND
0.672000	30.20	9.9	46	15.8	AV	L1	GND
1.558500	27.80	9.9	46	18.2	AV	L1	GND
21.835500	33.30	9.7	50	16.7	AV	L1	GND

Conducted Emission:

EUT: Portable wireless bluetooth speaker M/N:Caps-258
Operating Condition: Charging Mode
Test Site: Shielded Room
Operator: Andy
Test Specification: AC/DC adapter of notebook (AC 120V/60Hz)
Comment: Neutral Line

SCAN TABLE: "Voltage (150K-30M) FIN"
Short Description: 150K-30M Voltage



MEASUREMENT RESULT

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.199500	48.30	9.9	64	15.3	QP	N	GND
0.582000	42.30	9.9	56	13.7	QP	N	GND
0.676500	41.90	9.9	56	14.1	QP	N	GND
22.119000	41.30	9.7	60	18.7	QP	N	GND
22.222500	41.50	9.7	60	18.5	QP	N	GND
22.276500	41.40	9.7	60	18.6	QP	N	GND

MEASUREMENT RESULT

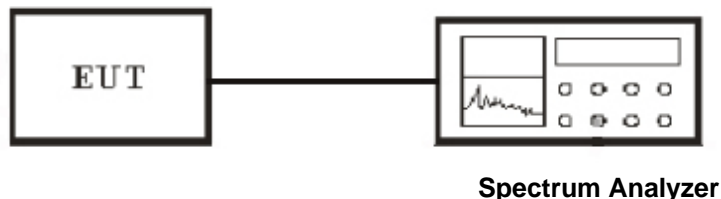
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.469500	28.10	9.9	47	18.4	AV	N	GND
0.591000	30.80	9.9	46	15.2	AV	N	GND
0.654000	30.10	9.9	46	15.9	AV	N	GND
0.672000	29.60	9.9	46	16.4	AV	N	GND
1.203000	23.20	9.9	46	22.8	AV	N	GND
22.087500	34.40	9.7	50	15.6	AV	N	GND

6. Test of Hopping Channel Bandwidth

6.1 Applicable Standard

Section 15.247(a)(1): 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.

6.2 EUT Setup



6.3 Test Equipment List and Details

See section 2.4.

6.4 Test Procedure

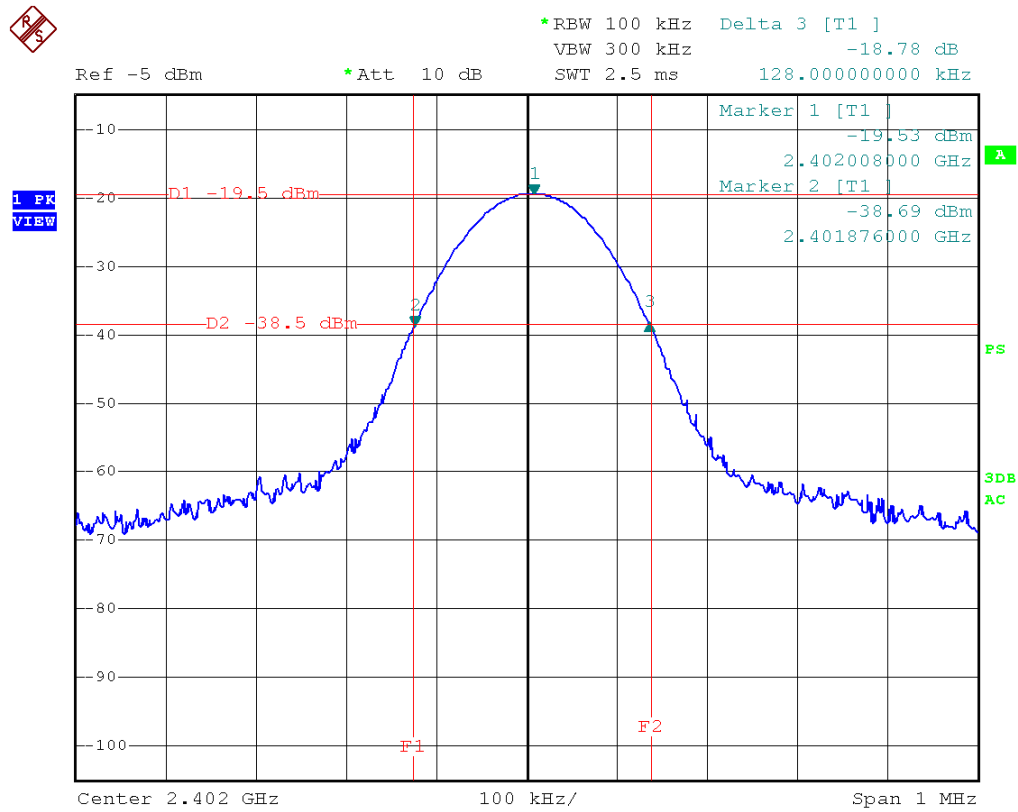
1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 30KHz and VBW to 100KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.
4. The spectrum width with level higher than 20dB below the peak level.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

6.5 Test Result

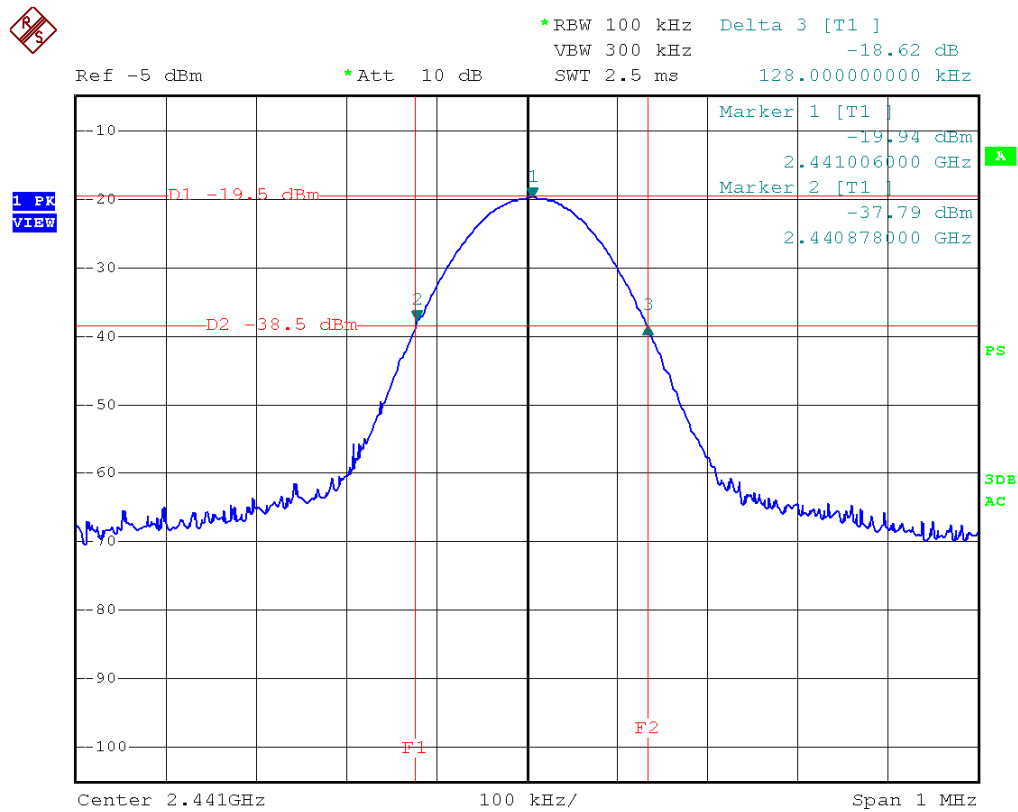
Temperature (°C) : 22~23	EUT: Portable wireless bluetooth speaker
Humidity (%RH) : 50~54	M/N: Caps-258
Barometric Pressure (mbar) : 950~1000	Operation Condition: Tx Mode

Modulation Type	Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	Min. Limit (kHz)
FHSS	Low	2402.00	961	>25
FHSS	Middle	2441.00	910	>25
FHSS	High	2480.00	960	>25

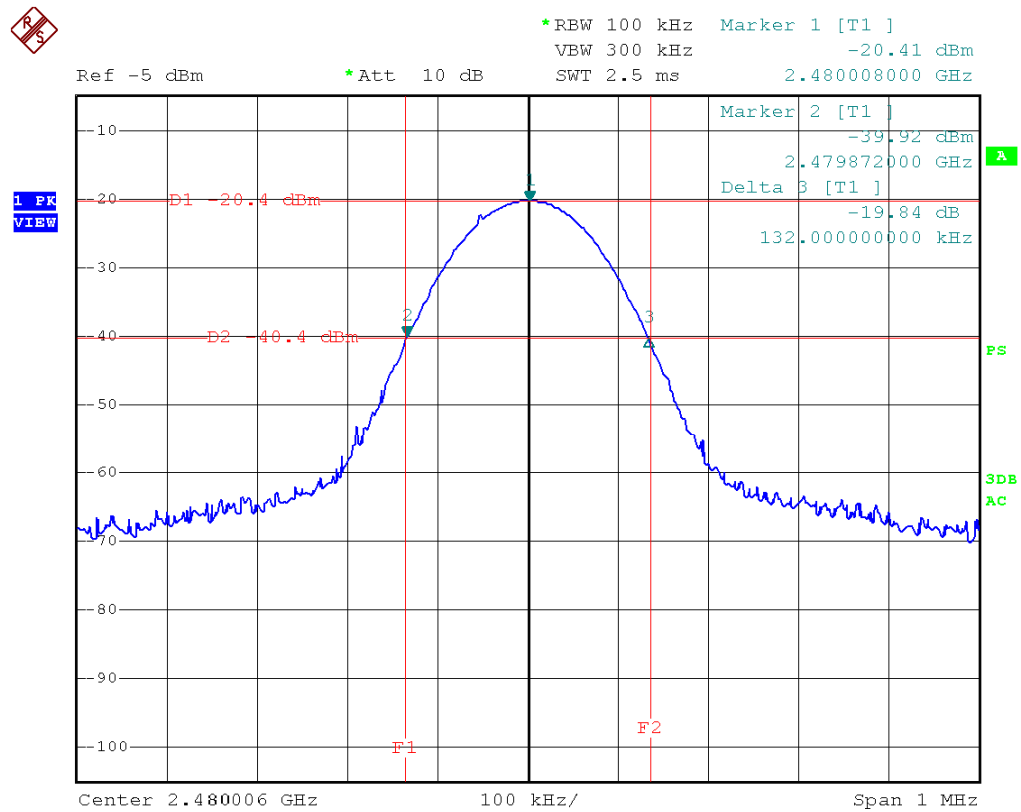
Channel Low :



Channel Middle :



Channel High :

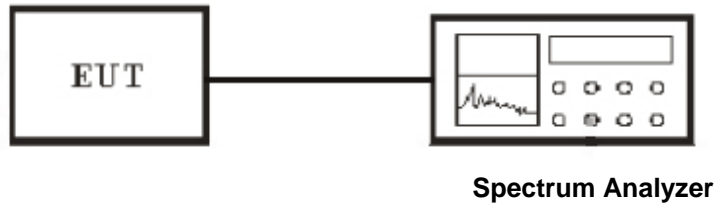


7. Test of Hopping Channel Separation

7.1 Applicable Standard

Section 15.247(a)(1): 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.

7.2 EUT Setup



7.3 Test Equipment List and Details

See section 2.4.

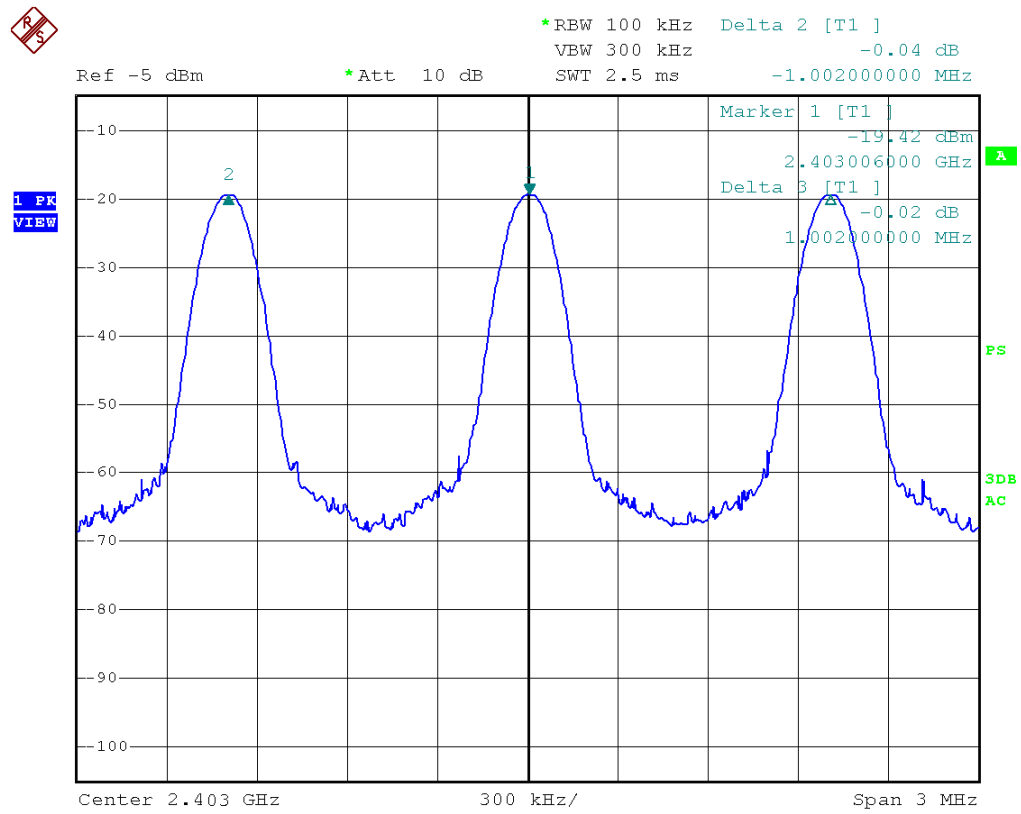
7.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.
4. The Hopping Channel Separation is defined as the separation between 2 neighboring hopping frequencies.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

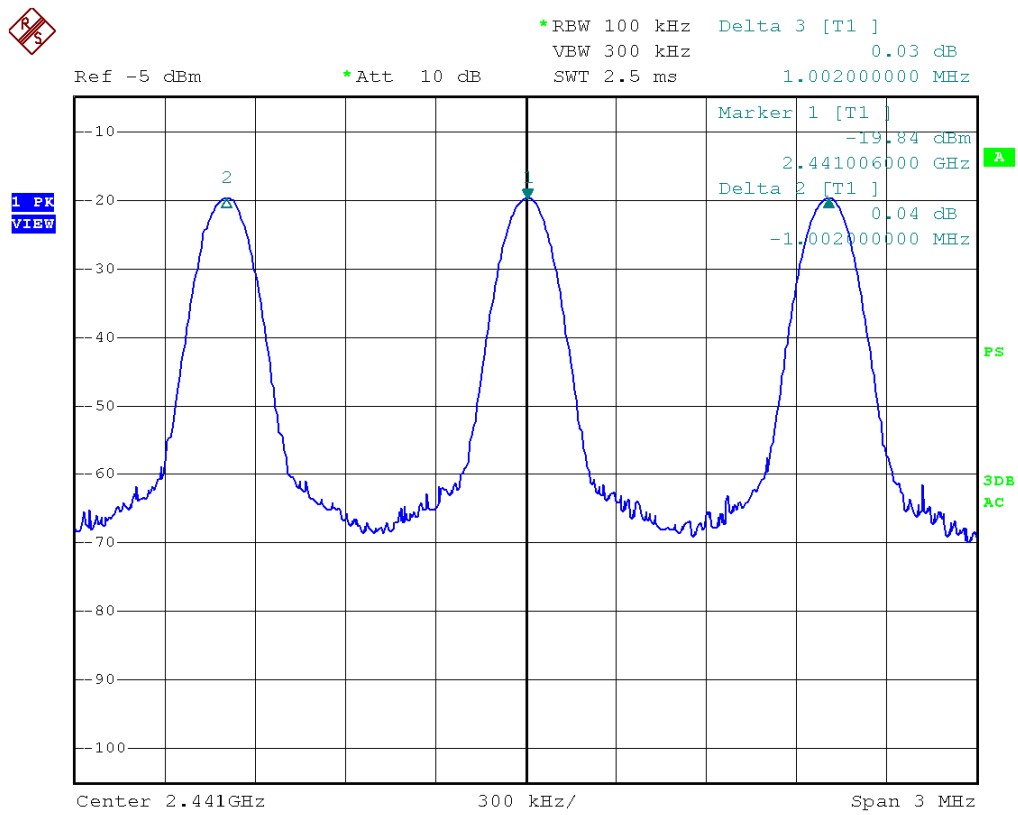
7.5 Test Result

Temperature (°C) : 22~23	EUT: Portable wireless bluetooth speaker
Humidity (%RH) : 50~54	M/N: Caps-258
Barometric Pressure (mbar) : 950~1000	Operation Condition: Tx Mode

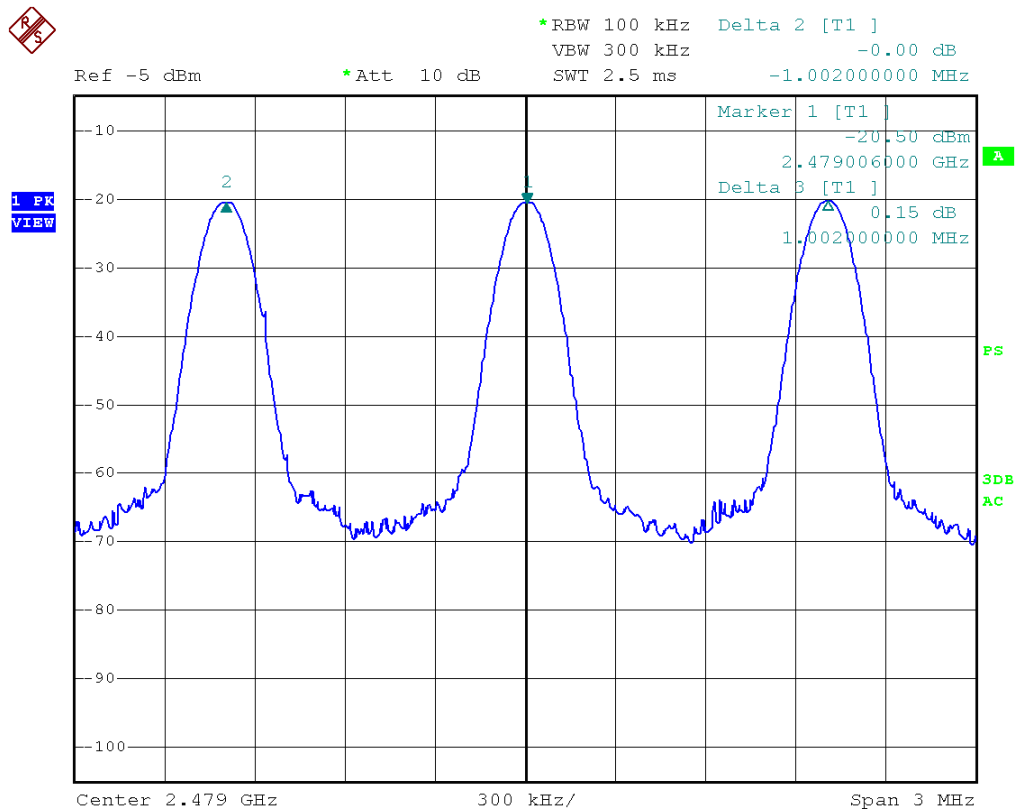
Channel Low :



Channel Middle :



Channel High :

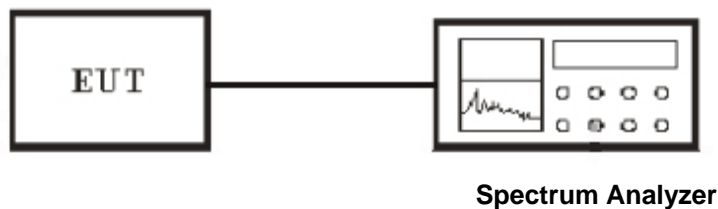


8. Test of Number of Hopping Frequency

8.1 Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 15 non-overlapping hopping channels. Frequency hopping system which use fewer than 75 hopping frequencies may employ intelligent hopping techniques to avoid interference to other transmissions. Frequency hopping system may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 non-overlapping channels are used.

8.2 EUT Setup



8.3 Test Equipment List and Details

See section 2.4.

8.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.
4. Observe frequency hopping in 2400MHz~2483.5MHz, there are at least 32 non-overlapping channels.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

8.5 Test Result

Temperature (°C) : 22~23	EUT: Portable wireless bluetooth speaker
Humidity (%RH) : 50~54	M/N: Caps-258
Barometric Pressure (mbar) : 950~1000	Operation Condition: Tx Mode

Modulation Type	Frequency (MHz)	Number of Hopping Channels	Min. Limit (kHz)
FHSS	2402.0~2480.0	79	>15

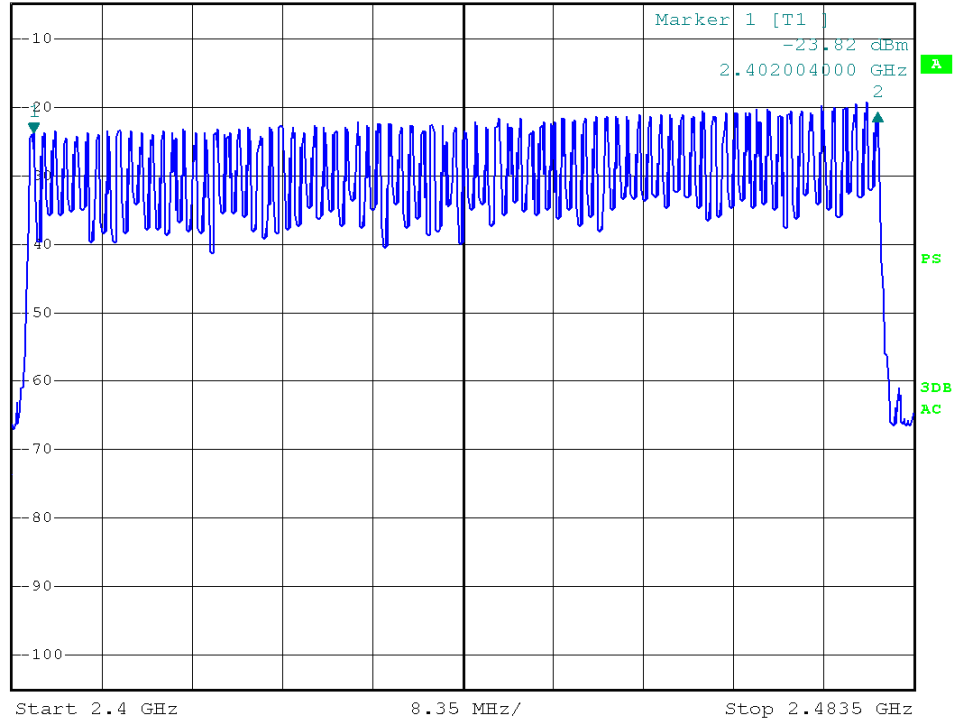


*RBW 100 kHz Delta 2 [T1]
VBW 300 kHz 3.02 dB
SWT 10 ms 78.156000000 MHz

Ref -5 dBm

*Att 10 dB

1 PK
VIEW

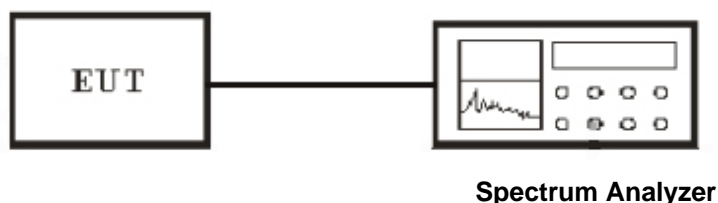


9. Test of Dwell Time of Each Frequency

9.1 Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4seconds multiplied by the number of hopping channels employed.

9.2 EUT Setup



9.3 Test Equipment List and Details

See section 2.4.

9.4 Test Procedure

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 1000kHz and VBW to 1000kHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is more than once pulse time.
4. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
5. Measure the maximum time duration of one single pulse.

9.5 Test Result

Temperature (°C) : 22~23	EUT: Portable wireless bluetooth speaker
Humidity (%RH) : 50~54	M/N: Caps-258
Barometric Pressure (mbar) : 950~1000	Operation Condition: Tx Mode

Modulation Type	Channel No.	Frequency (MHz)	Dwell Time (ms)	Limit (ms)
FHSS	Low	2402.00	115.20	400
FHSS	Middle	2441.00	119.04	400
FHSS	High	2480.00	119.04	400

A period time = $0.4 \text{ (ms)} * 79 = 31.6 \text{ (s)}$

CH Low:

DH1 time slot = $0.360 \text{ (ms)} * (1600/(2*79)) * 31.6 = 115.20 \text{ (ms)}$

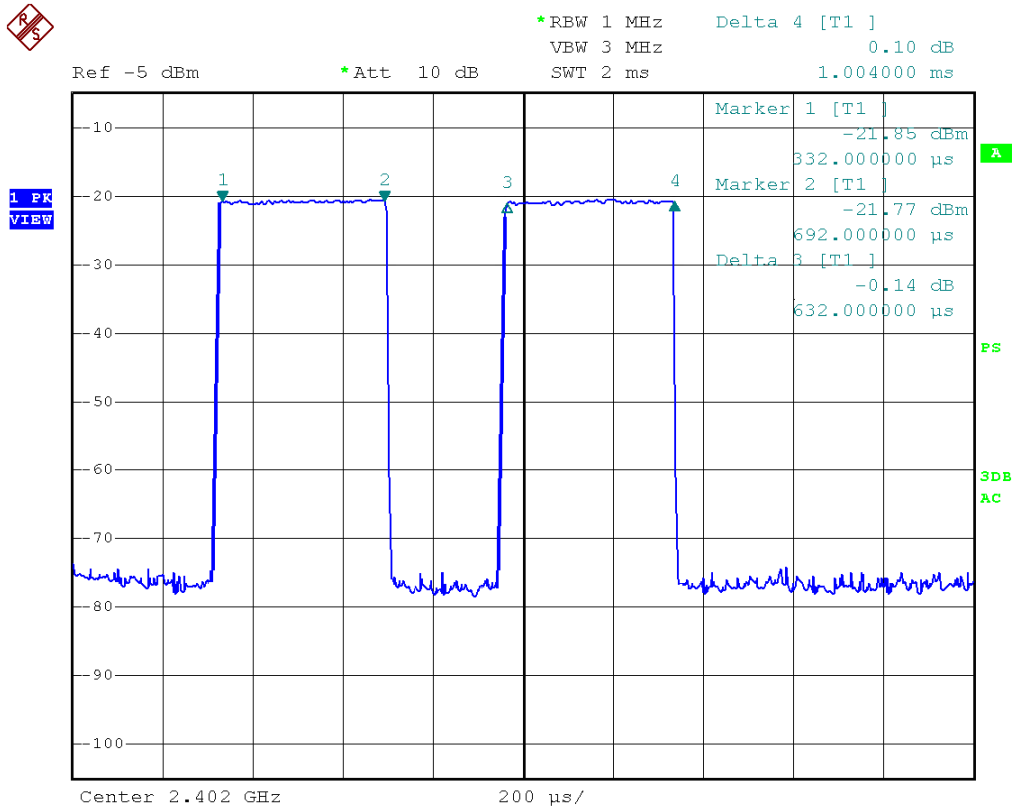
CH Mid:

DH1 time slot = $0.372 \text{ (ms)} * (1600/(2*79)) * 31.6 = 119.04 \text{ (ms)}$

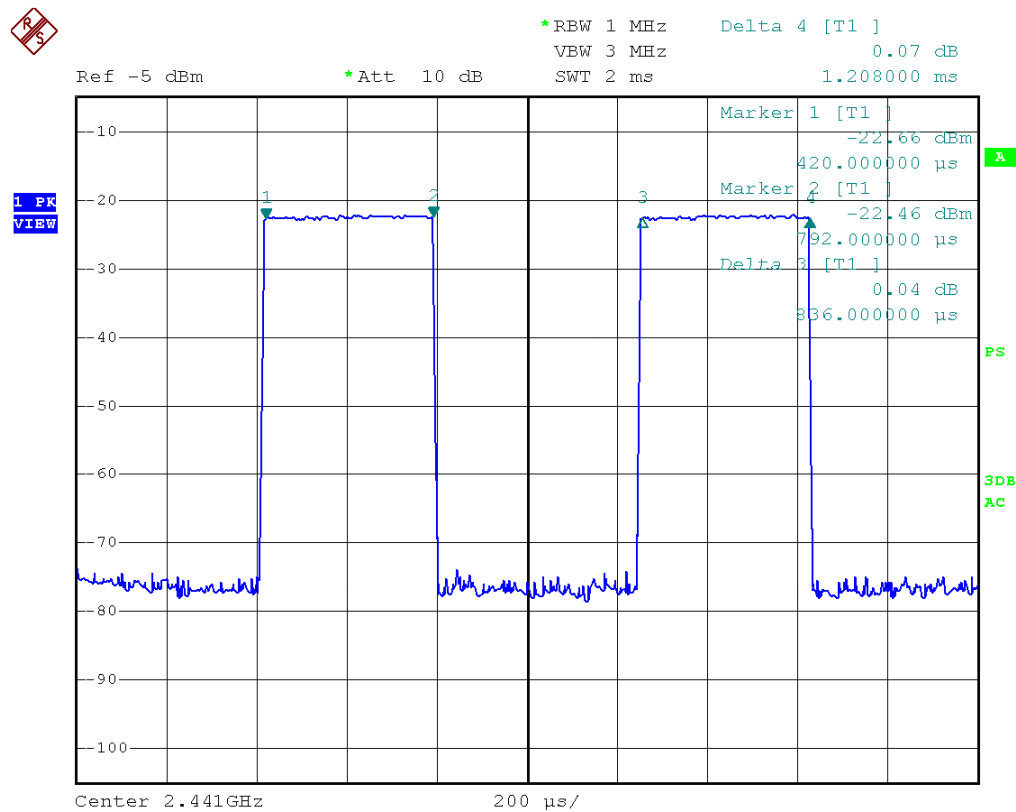
CH High:

DH1 time slot = $0.372 \text{ (ms)} * (1600/(2*79)) * 31.6 = 119.04 \text{ (ms)}$

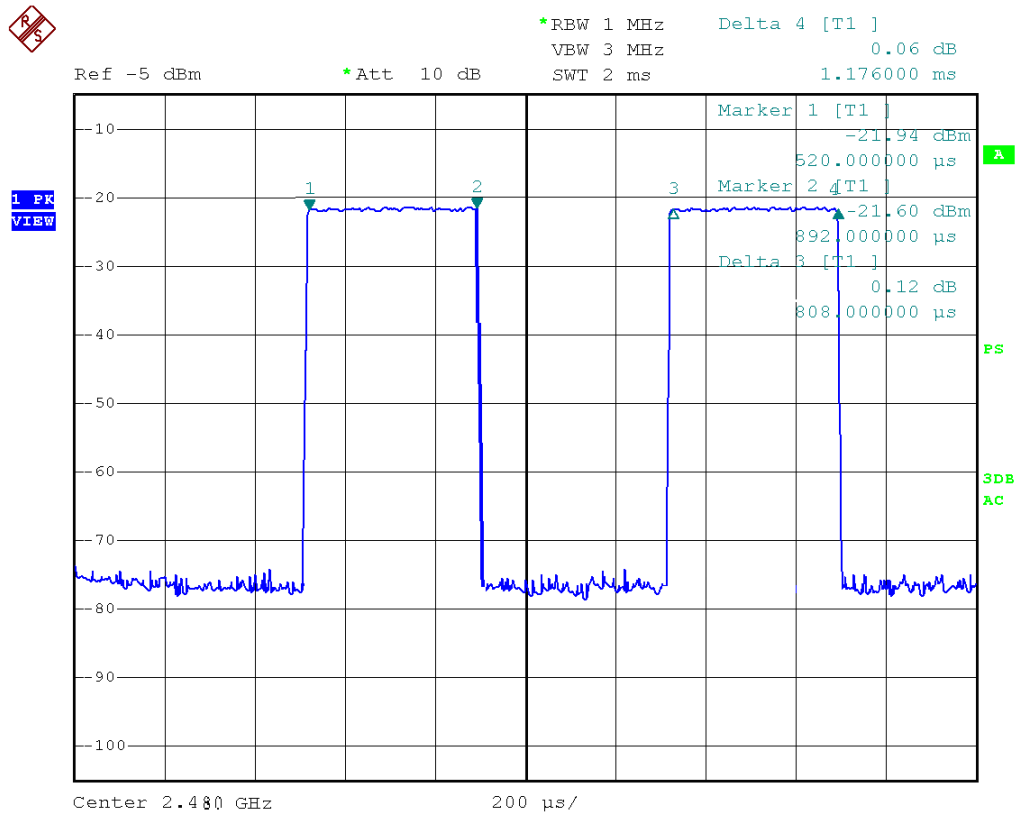
Channel Low :



Channel Middle :



Channel High :

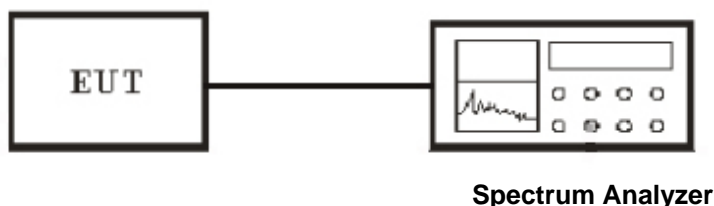


10. Test of Maximum Peak Output Power

10.1 Applicable Standard

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels and The maximum peak output power shall not exceed 1 watt. For all other frequency hopping systems in this frequency band, The maximum peak output power shall not exceed 0.125 watt.

10.2 EUT Setup



10.3 Test Equipment List and Details

See section 2.4.

10.4 Test Procedure

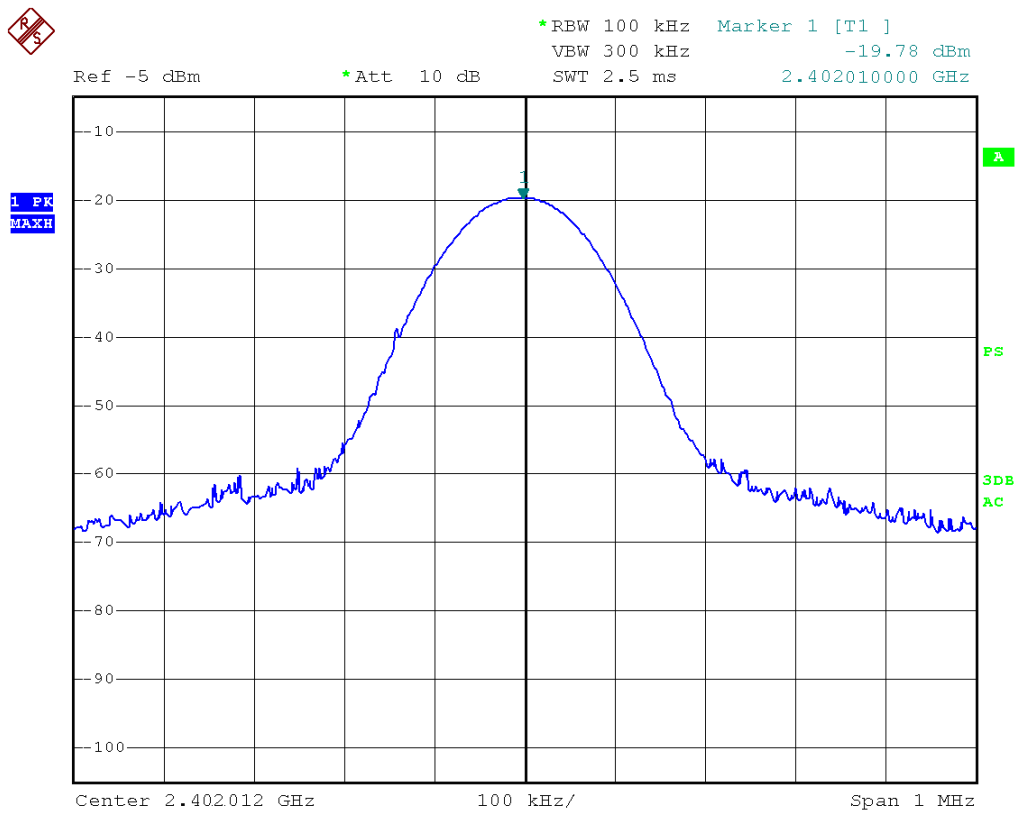
1. The transmitter output was connected to the peak power meter and recorded the peak value.
2. Peak power meter parameter set to auto attenuator and filter is the same as.
3. Repeated the 1 for the middle and highest channel of the EUT.

10.5 Test Result

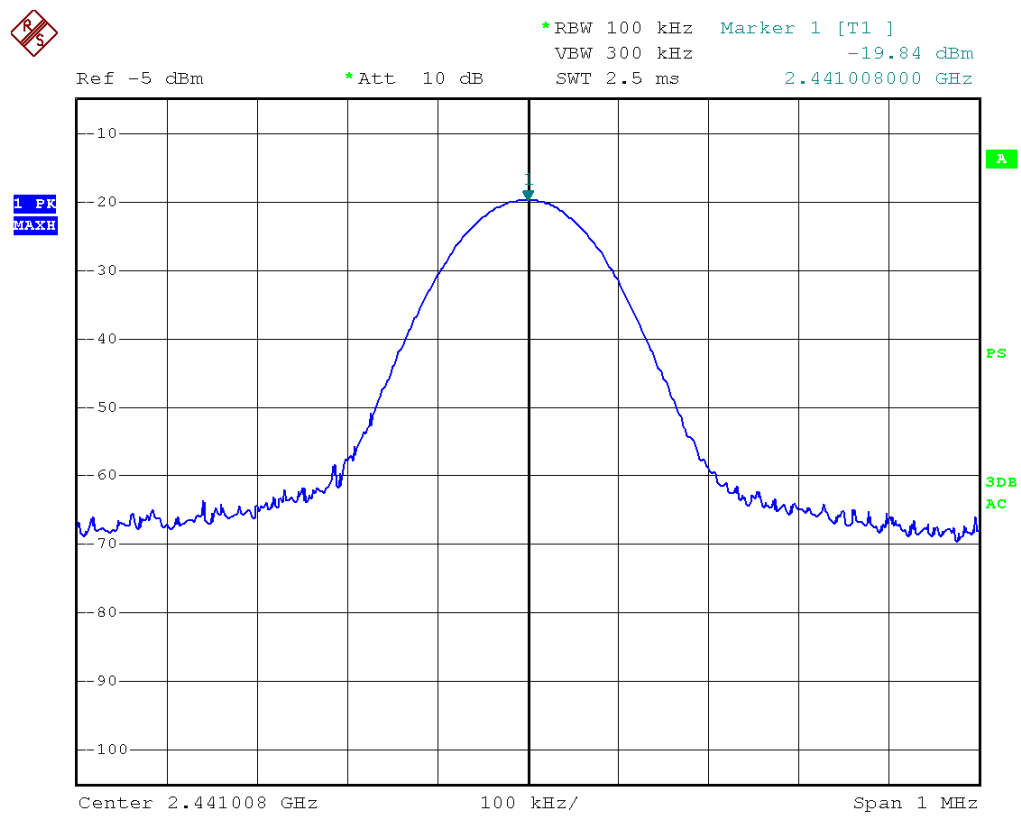
Temperature (°C) : 22~23	EUT: Portable wireless bluetooth speaker
Humidity (%RH) : 50~54	M/N: Caps-258
Barometric Pressure (mbar) : 950~1000	Operation Condition: Tx Mode

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)	Margin (dB)
FHSS	Low	2402.00	-19.78	20.9	40.68
FHSS	Middle	2441.00	-19.84	20.9	40.74
FHSS	High	2480.00	-20.72	20.9	41.62

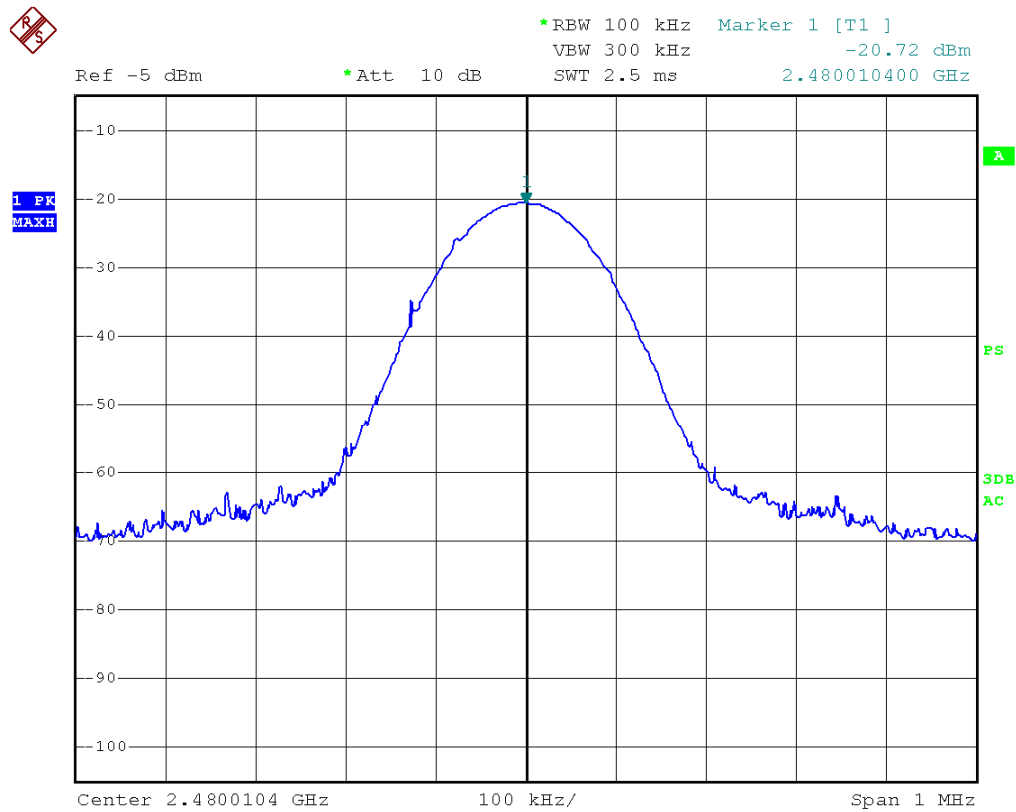
Channel Low :



Channel Middle :



Channel High :



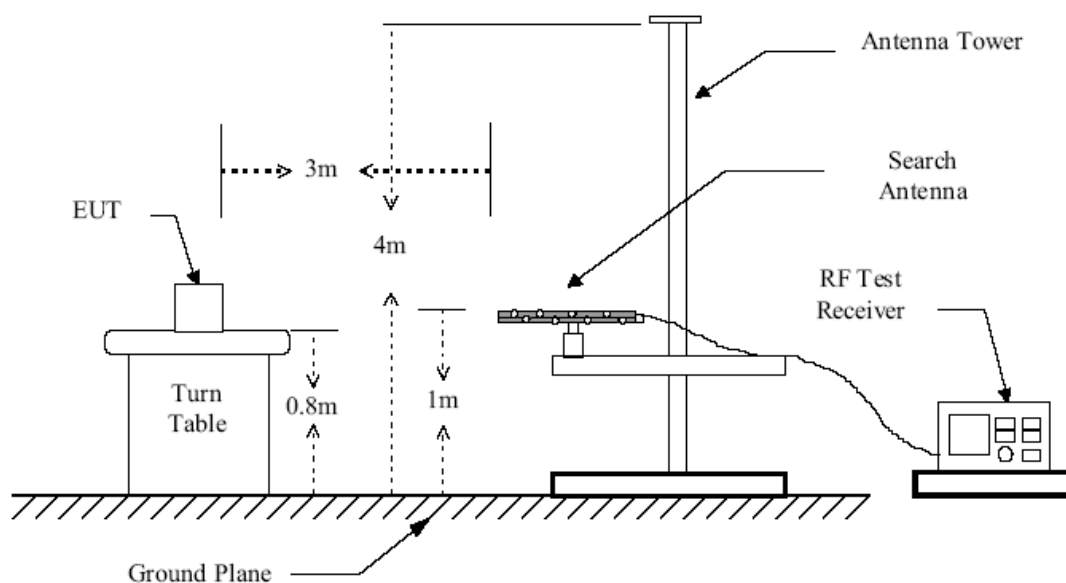
11. Test of Band Edges Emission

11.1 Applicable Standard

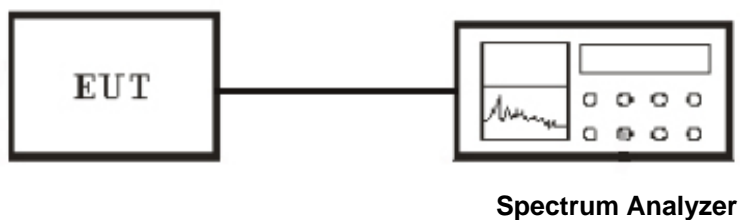
Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

11.2 EUT Setup

Radiated Measurement Setup



Conducted Measurement Setup



11.3 Test Equipment List and Details

See section 2.4.

11.4 Test Procedure

Conducted Measurement

1. The transmitter is set to the lowest channel.
2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth from lower band edge. Then detector set to peak and max hold this trace.
4. The lowest band edges emission was measured and recorded.
5. The transmitter set to the highest channel and repeated 2~4.

Radiated Measurement

1. Configure the EUT according to ANSI C63.4-2009
2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
4. For band edge emission, the antenna tower was scan (from 1 M to 4 M) and then the turn table was rotated (from 0 degree to 360 degrees) to find the maximum reading.
5. For band edge emission, use 1MHz VBW and 1MHz RBW for reading under AV and use 1MHz VBW and 1MHz RBW for reading under PK.

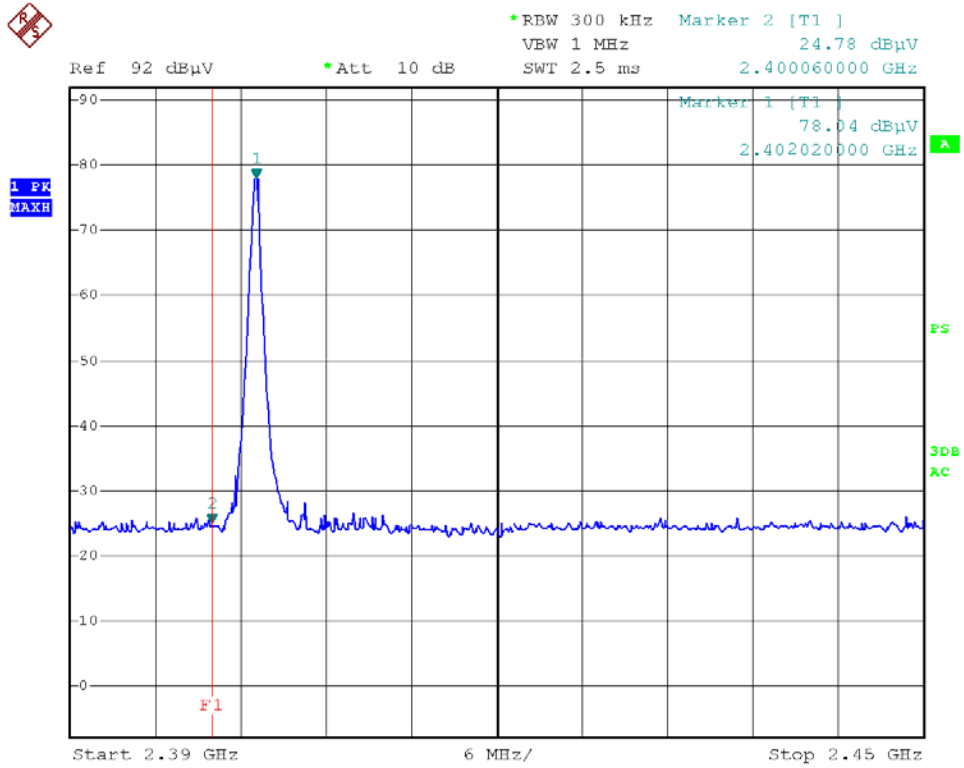
11.5 Test Result

Temperature (°C) : 22~23	EUT: Portable wireless bluetooth speaker
Humidity (%RH) : 50~54	M/N: Caps-258
Barometric Pressure (mbar) : 950~1000	Operation Condition: Tx Mode

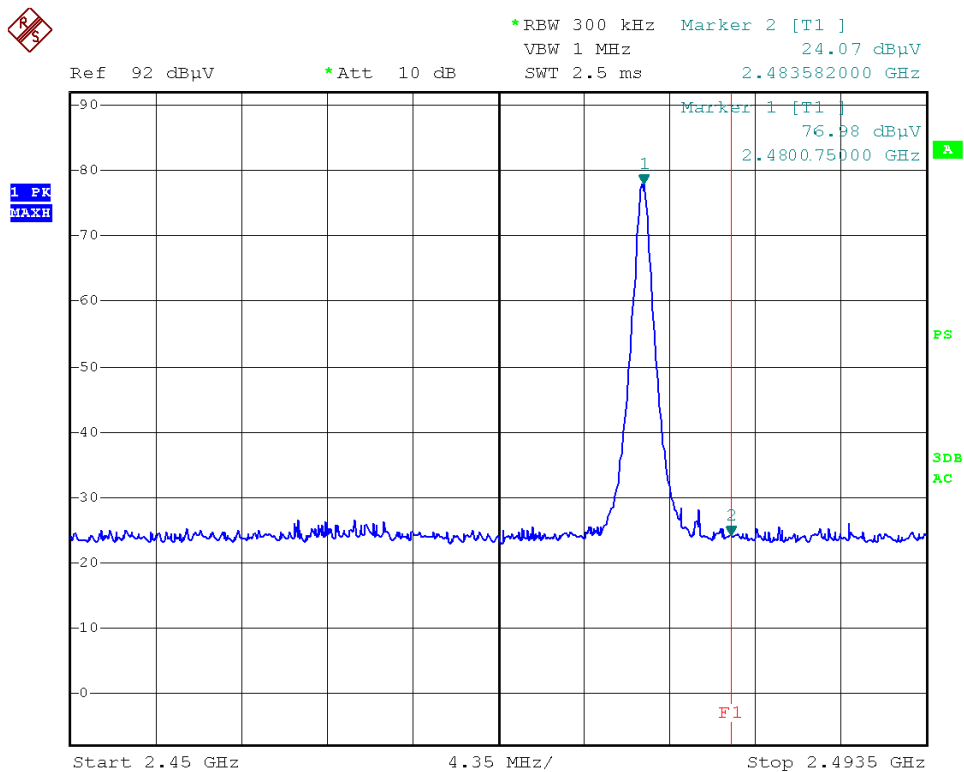
Radiated Test Result

Frequency(MHz)
<2400
>2483.5

The worst frequency range of Low Channel



The worst frequency range of High Channel



12. Test of Spurious Radiated Emission

12.1 Applicable Standard

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 a radiated measurement. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

12.2 EUT Setup

Radiated Measurement Setup

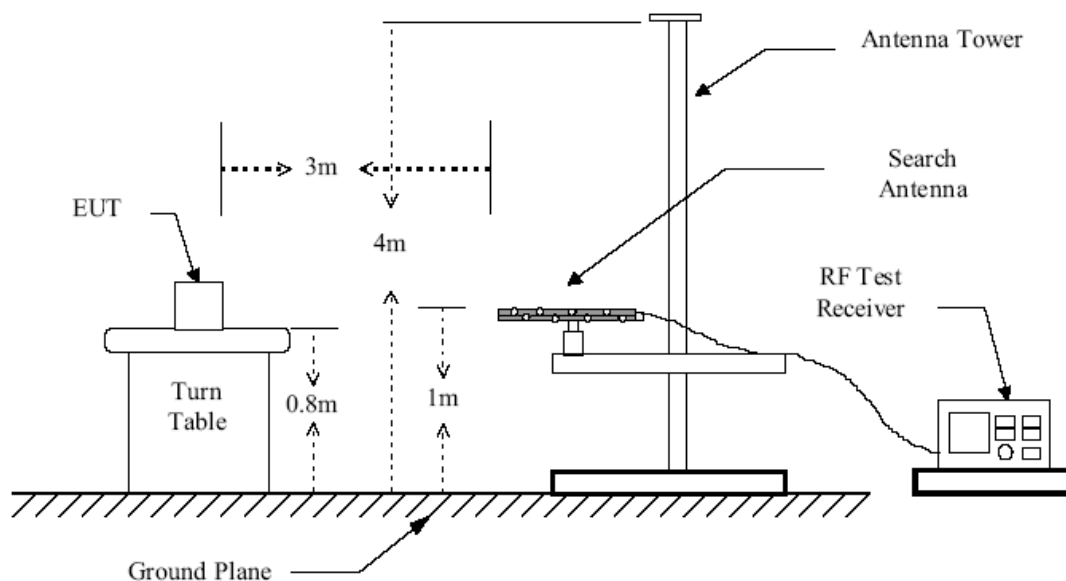


Figure 1 : Frequencies measured below 1 GHz configuration

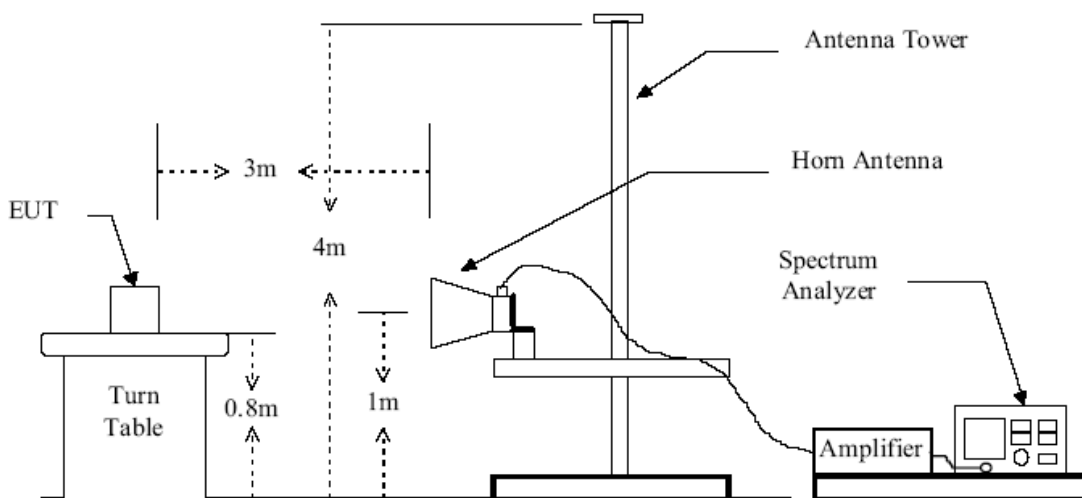
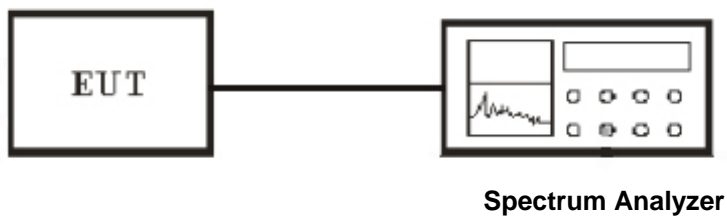


Figure 2 : Frequencies measured above 1 GHz configuration

Conducted Measurement Setup



12.3 Test Equipment List and Details

See section 2.4.

12.4 Test Procedure

Radiated Measurement

1. Configure the EUT according to ANSI C63.4-2003
2. The EUT was placed on the top of the turntable 0.8 meter above ground.
3. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
4. Power on the EUT and all the supporting units.
5. The turntable was rotated by 360 degrees to determine the position of the highest radiation.

6. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
7. For each suspected emission, the antenna tower was scanned (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
8. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.

Conducted Measurement

1. For emission above 1GHz,conducted measurement method is used.
2. The transmitter is set to the lowest channel.
3. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
4. Set RBW to 1 MHz and VBW to 3 MHz, Then detector set to peak and max hold this trace.
5. The lowest band edges emission was measured and recorded.
6. The transmitter set to the highest channel and repeated 2~4.

12.5 Test Result

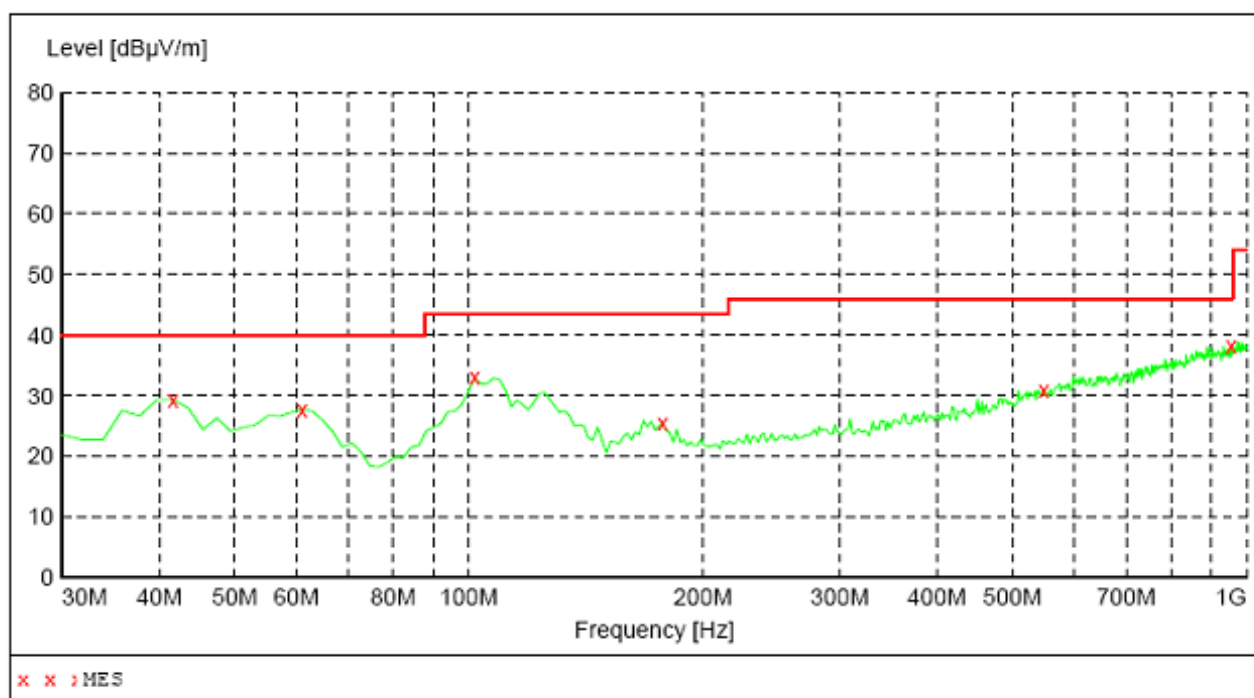
Temperature (°C) : 22~23	EUT: Portable wireless bluetooth speaker
Humidity (%RH) : 50~54	M/N: Caps-258
Barometric Pressure (mbar) : 950~1000	Operation Condition: Normal operation

Spurious Emission (30~1000MHz)

EUT: Portable wireless bluetooth speaker
M/N: Caps-258
Operating Condition: Normal Operation
Test Site: 3m CHAMBER
Operator: Chen
Test Specification: DC 5V
Comment: Polarization: Horizontal
Tem:25°C Hum:50%

SWEEP TABLE: "test (30M-1G)"

Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



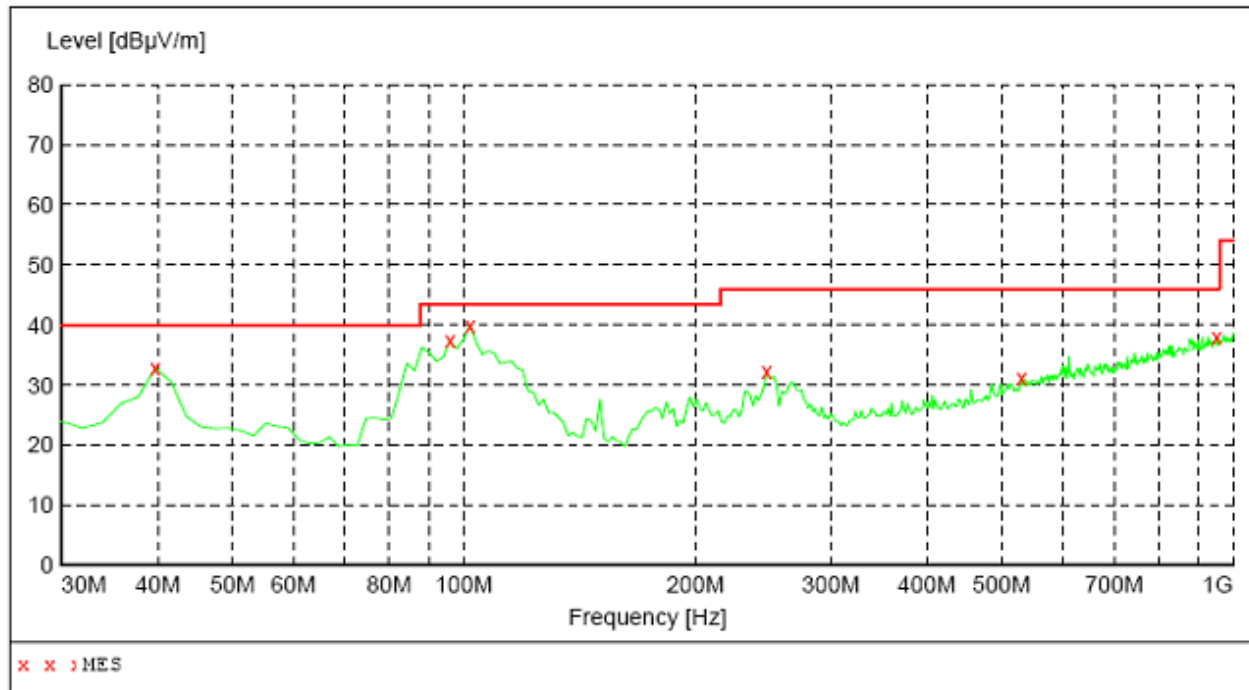
MEASUREMENT RESULT:

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
41.640000	29.30	15.9	40.0	10.7	QP	100.0	0.00	HORIZONTAL
61.040000	27.80	14.2	40.0	12.2	QP	100.0	0.00	HORIZONTAL
101.780000	33.00	17.4	43.5	10.5	QP	100.0	0.00	HORIZONTAL
177.440000	25.50	14.9	43.5	18.0	QP	100.0	0.00	HORIZONTAL
547.980000	31.00	25.1	46.0	15.0	QP	100.0	0.00	HORIZONTAL
955.380000	38.20	31.8	46.0	7.8	QP	100.0	0.00	HORIZONTAL

EUT: Portable wireless bluetooth speaker
M/N: Caps-258
Operating Condition: Normal Operation
Test Site: 3m CHAMBER
Operator: Chen
Test Specification: DC 5V
Comment: Polarization: Vertical
Tem:25°C Hum:50%

SWEEP TABLE: "test (30M-1G)"

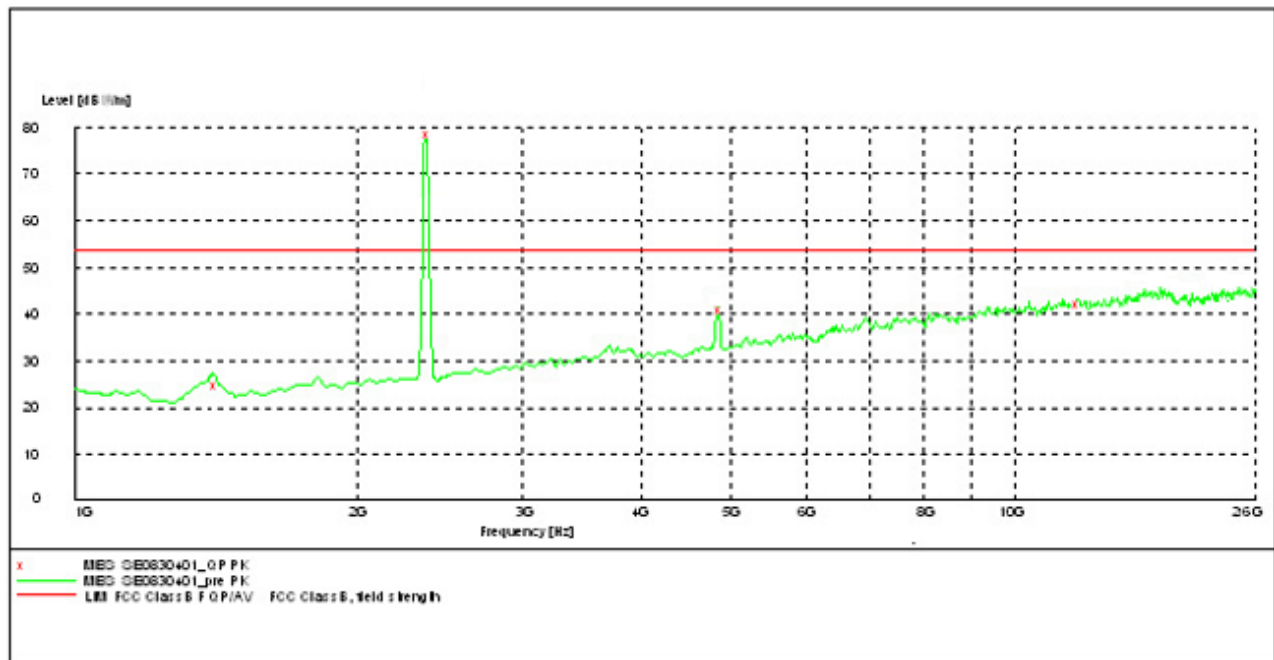
Short Description:		Field Strength			
Start	Stop	Detector	Meas.	IF	Transducer
Frequency	Frequency		Time	Bandw.	
30.0 MHz	1.0 GHz	MaxPeak	Coupled	100 kHz	VULB9163 NEW



MEASUREMENT RESULT:

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
39.700000	32.80	15.8	40.0	7.2	QP	100.0	0.00	VERTICAL
95.960000	37.40	17.2	43.5	6.1	QP	100.0	0.00	VERTICAL
101.780000	40.00	17.4	43.5	3.5	QP	100.0	0.00	VERTICAL
247.280000	32.20	17.2	46.0	13.8	QP	100.0	0.00	VERTICAL
530.520000	31.30	24.7	46.0	14.7	QP	100.0	0.00	VERTICAL
951.500000	38.00	31.8	46.0	8.0	QP	100.0	0.00	VERTICAL

The mid channel(2441MHz)is the worst Spurious Emissions data above 1GHz of horizontal



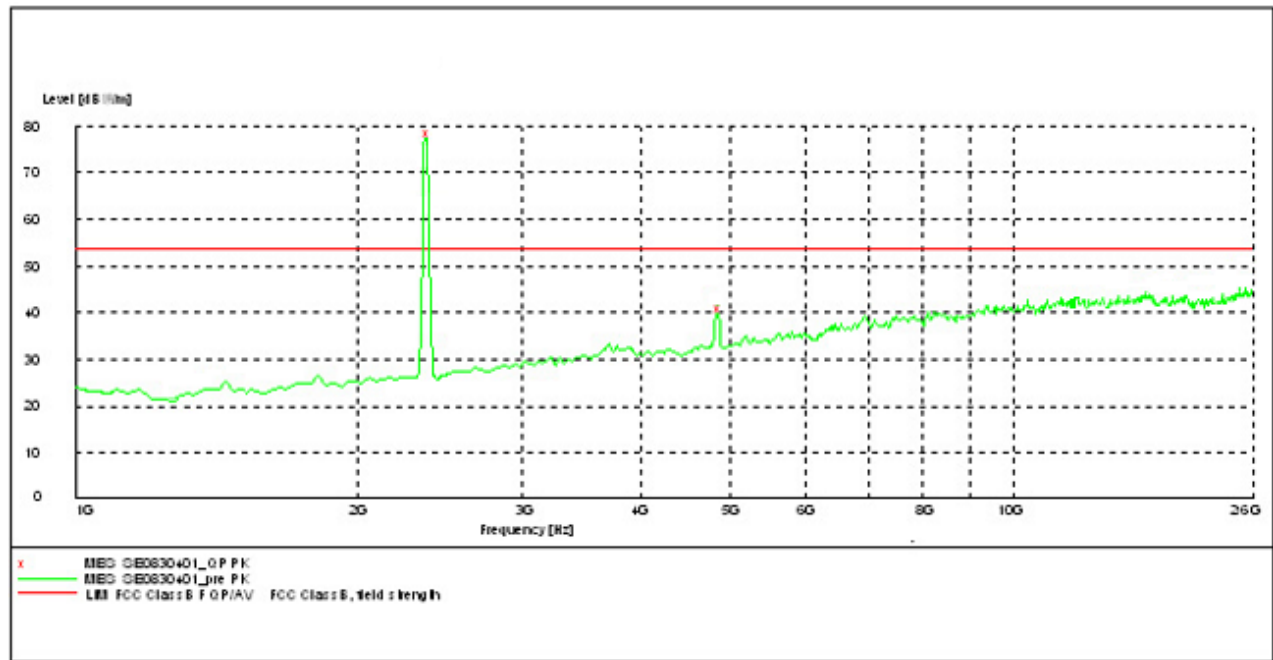
MEASUREMENT RESULT:

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
2441.020000	79.40	31.2	94.0	14.6	PK	100.0	0.00	HORIZONTAL
4882.260000	40.20	32.3	54.0	13.8	PK	100.0	0.00	HORIZONTAL

MEASUREMENT RESULT:

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
2441.020000	78.68	31.2	84.0	5.3	AV	100.0	0.00	HORIZONTAL
4882.260000	36.40	32.3	44.0	5.4	AV	100.0	0.00	HORIZONTAL

The mid channel(2441MHz)is the worst Spurious Emissions data above 1GHz of Vertical



MEASUREMENT RESULT:

Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
2441.000000	79.80	31.2	94.0	14.2	PK	100.0	0.00	VERTICAL
4882.000000	40.10	32.3	54.0	13.9	PK	100.0	0.00	VERTICAL

MEASUREMENT RESULT

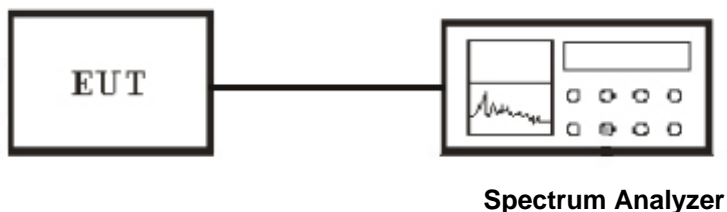
Frequency MHz	Level dBμV/m	Transd dB	Limit dBμV/m	Margin dB	Det.	Height cm	Azimuth deg	Polarization
2441.000000	79.10	31.2	84.0	4.9	AV	100.0	0.00	VERTICAL
4882.000000	34.00	32.3	44.0	6.0	AV	100.0	0.00	VERTICAL

13. Test of Peak Power Spectral Density

13.1 Applicable Standard

According to § 15.247(d), for direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3kHz band during any time interval of continuous transmission.

13.2 EUT Setup



13.3 Test Equipment List and Details

See section 2.4.

13.4 Test Procedure

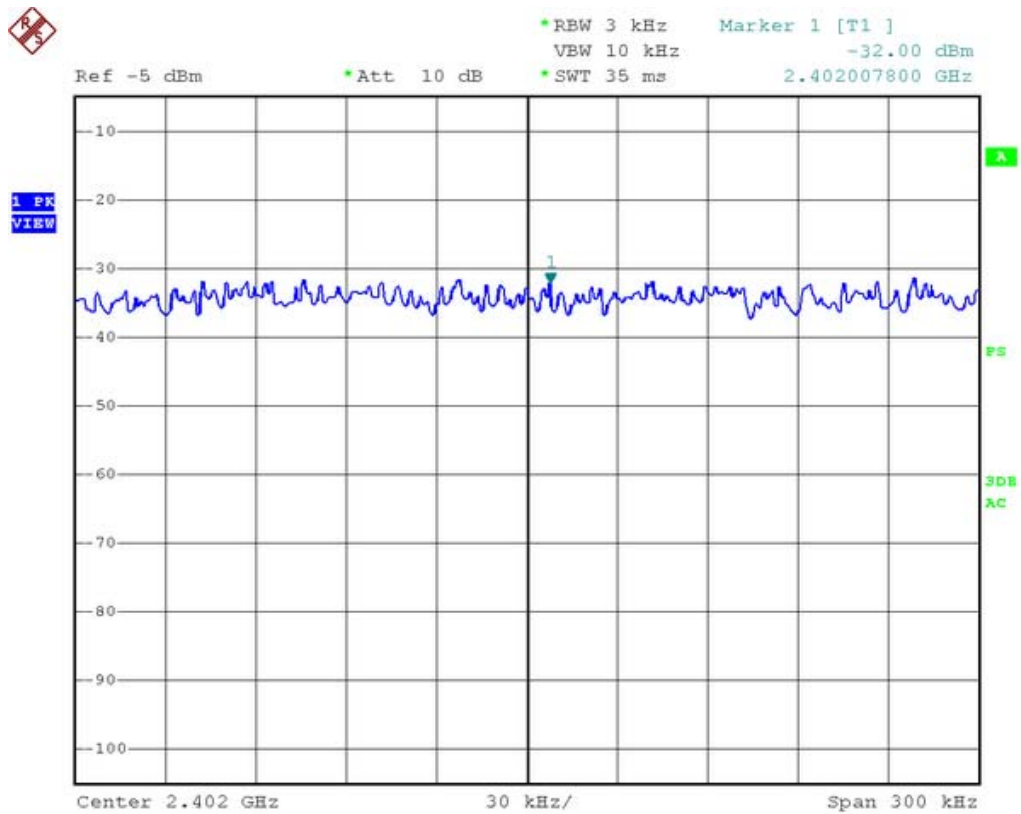
1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 3KHz, VBW = 10KHz, Span = 300KHz, Sweep=100s
4. Record the max. reading.
5. Repeat above procedures until all frequency measured were complete.

13.5 Test Result

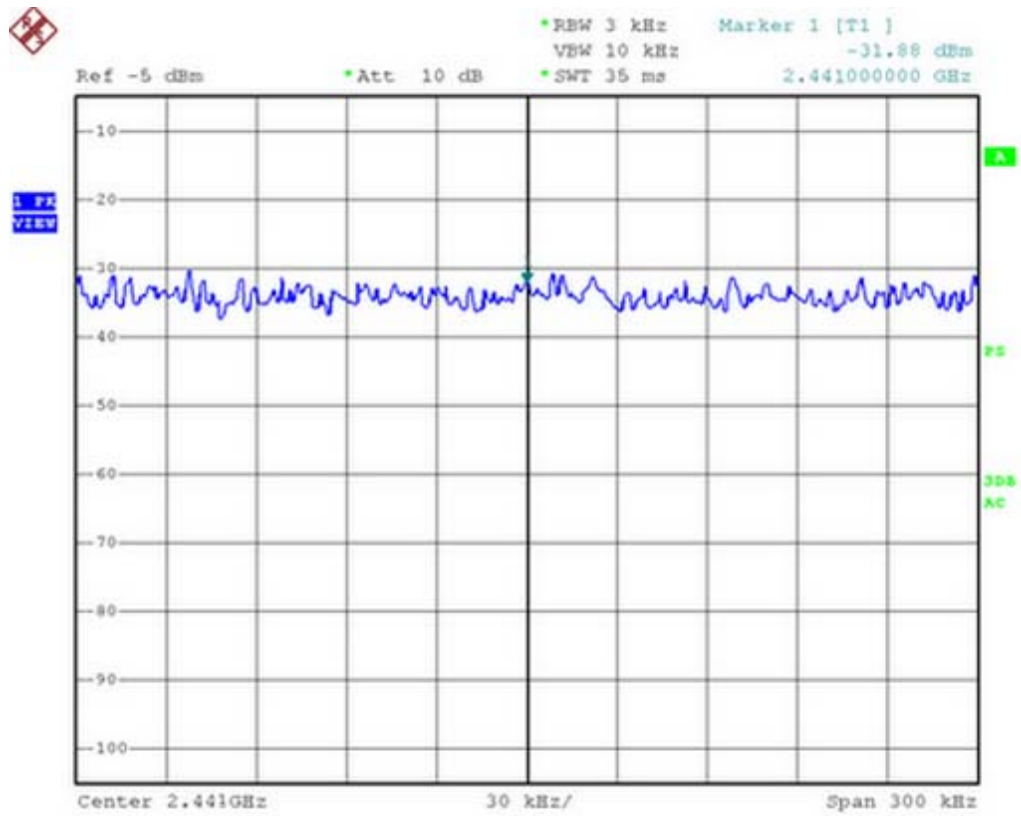
Temperature (°C) : 22~23	EUT: Portable wireless bluetooth speaker
Humidity (%RH) : 50~54	M/N: Caps-258
Barometric Pressure (mbar) : 950~1000	Operation Condition: Tx Mode

CH	RF Power Density Reading (dBm)	Cable loss (dB)	RF Power Density Level (dBm)	Maximum Limit (dBm)
Low	-32.00	1.20	-30.80	8
Mid	-31.88	1.20	-30.68	8
High	-32.09	1.20	-30.89	8

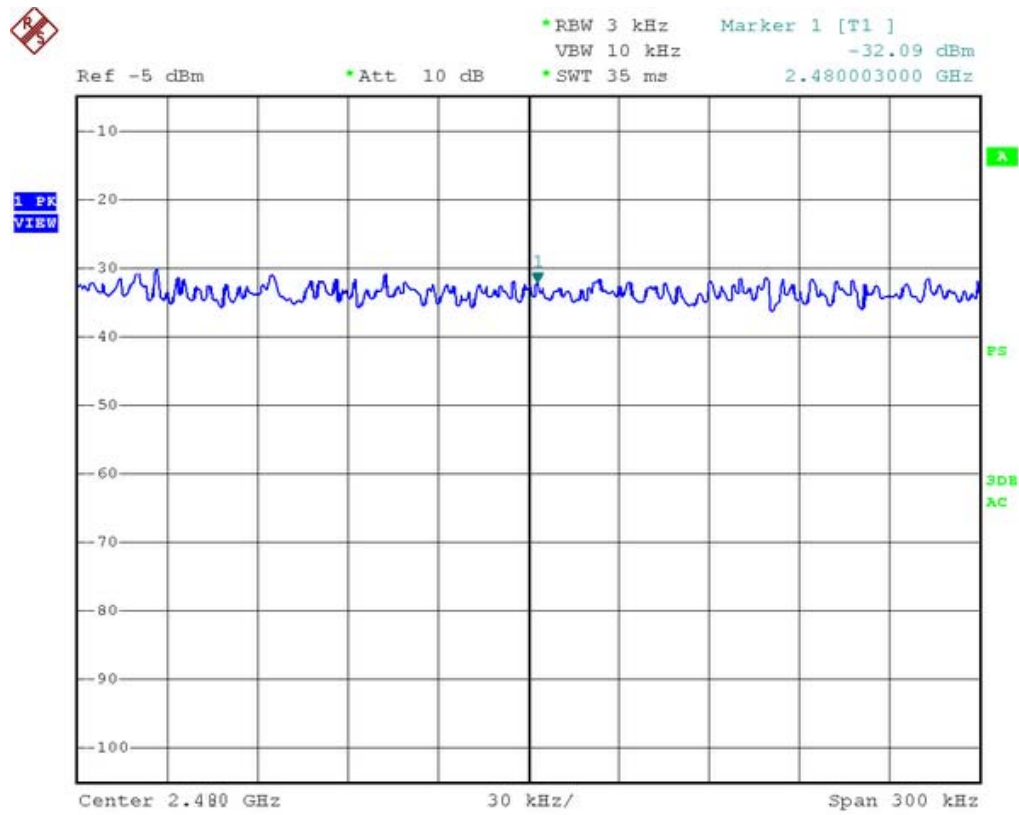
Channel Low :



Channel Mid :



Channel High :



14. RF EXPOSURE

14.1 Applicable Standard

According to § 15.247(b)(4) and § 1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensure that the public is not exposed to radio frequency energy level in excess of the Commission's guideline.

14.2 Test Result

This is a portable device and the Max peak output power is -19.78dBm (0.0105mW) lower than low threshold 60fGHz mW (24.896mW), $d < 2.5\text{cm}$ in general population category. So the SAR measurement is not necessary.