

APPLICATION CERTIFICATION FCC Part 15C

On Behalf of
Lightcomm Technology Co., Ltd.

Portable Bluetooth Speaker
Model No.: BTD15-E, NS-SPBTWAVE2,
NS-SPBTWAVE2-XX (XX=A-Z, a-z, 0-9, or blank) XX represents different color

FCC ID: XMF-SPBTWAVE2

Prepared for : Lightcomm Technology Co., Ltd.
Address : RM 1808 18/F FO TAN INDUSTRIAL CENTRE NOS. 26-28 AU
PUI WAN STREET FO TAN SHATIN NEW TERRITORIES

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Report No. : ATE20180326
Date of Test : Feb. 7--Mar. 1, 2018
Date of Report : Mar. 8, 2018

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Test Report Certification

Applicant : Lightcomm Technology Co., Ltd.
Address : RM 1808 18/F FO TAN INDUSTRIAL CENTRE NOS. 26-28 AU PUI
WAN STREET FO TAN SHATIN NEW TERRITORIES
Manufacturer : Lightcomm Technology Co., Ltd.
Address : RM 1808 18/F FO TAN INDUSTRIAL CENTRE NOS. 26-28 AU PUI
WAN STREET FO TAN SHATIN NEW TERRITORIES
Product : Portable Bluetooth Speaker
Model No. : BTD15-E, NS-SPBTWAVE2,
NS-SPBTWAVE2-XX (XX=A-Z, a-z, 0-9, or blank) XX represents different color

Measurement Procedure Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.247 ANSI C63.10: 2013

The device described above is tested by Shenzhen Accurate Technology Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C Section 15.247 limits. The measurement results are contained in this test report and Shenzhen Accurate Technology Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. Also, this report shows that the Equipment Under Test (EUT) is to be technically compliant with the FCC requirements.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Shenzhen Accurate Technology Co., Ltd.

Date of Test : Feb. 7--Mar. 1, 2018
Date of Report: Mar. 8, 2018

Prepared by :

Star Yang

(Star Yang, Engineer)

Approved &
Authorized Signer :

Sean Liu

(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Portable Bluetooth Speaker
Model Number	:	BTD15-E, NS-SPBTWAVE2, NS-SPBTWAVE2-XX (XX=A-Z, a-z, 0-9, or blank) XX represents different color (Note: Above models are identical in schematic, structure and critical components except for model name, So we prepare NS-SPBTWAVE2-BK for test.)
Bluetooth version	:	V4.1 classic mode
Frequency Range	:	2402MHz-2480MHz
Number of Channels	:	79
Antenna Gain(Max)	:	0dBi
Antenna type	:	PCB Antenna
Modulation mode	:	GFSK, $\pi/4$ DQPSK, 8DPSK
Trade Name	:	n.a
Rating	:	DC 3.7V (Powered by Lithium battery) or DC 5V (Powered by USB port)
Applicant Address	:	Lightcomm Technology Co., Ltd. RM 1808 18/F FO TAN INDUSTRIAL CENTRE NOS. 26-28 AU PUI WAN STREET FO TAN SHATIN NEW TERRITORIES
Manufacturer Address	:	Lightcomm Technology Co., Ltd. RM 1808 18/F FO TAN INDUSTRIAL CENTRE NOS. 26-28 AU PUI WAN STREET FO TAN SHATIN NEW TERRITORIES
Date of sample received	:	Feb. 24, 2018
Date of Test	:	Feb. 7--Mar. 1, 2018

2. MEASURING DEVICE AND TEST EQUIPMENT

Table 1: List of Test and Measurement Equipment

Kind of equipment	Manufacturer	Type	S/N	Calibrated dates	Calibrated until
EMI Test Receiver	Rohde&Schwarz	ESCS30	100307	Jan. 06, 2018	Jan. 05, 2019
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan. 06, 2018	Jan. 05, 2019
Spectrum Analyzer	Rohde&Schwarz	FSV-40	101495	Jan. 06, 2018	Jan. 05, 2019
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 06, 2018	Jan. 05, 2019
Pre-Amplifier	Rohde&Schwarz	CBLU118354 0-01	3791	Jan. 06, 2018	Jan. 05, 2019
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 12, 2018	Jan. 11, 2019
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 12, 2018	Jan. 11, 2019
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 12, 2018	Jan. 11, 2019
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 12, 2018	Jan. 11, 2019
Open Switch and Control Unit	Rohde&Schwarz	OSP120 + OSP-B157	101244 + 100866	Jan. 06, 2018	Jan. 05, 2019
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan. 06, 2018	Jan. 05, 2019
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 06, 2018	Jan. 05, 2019
Highpass Filter	Wainwright Instruments	WHKX3.6/18 G-10SS	N/A	Jan. 06, 2018	Jan. 05, 2019
Band Reject Filter	Wainwright Instruments	WRCG2400/2 485-2375/2510 -60/11SS	N/A	Jan. 06, 2018	Jan. 05, 2019

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

The mode is used: Transmitting mode

Low Channel: 2402MHz

Middle Channel: 2441MHz

High Channel: 2480MHz

Hopping

3.2.Configuration and peripherals

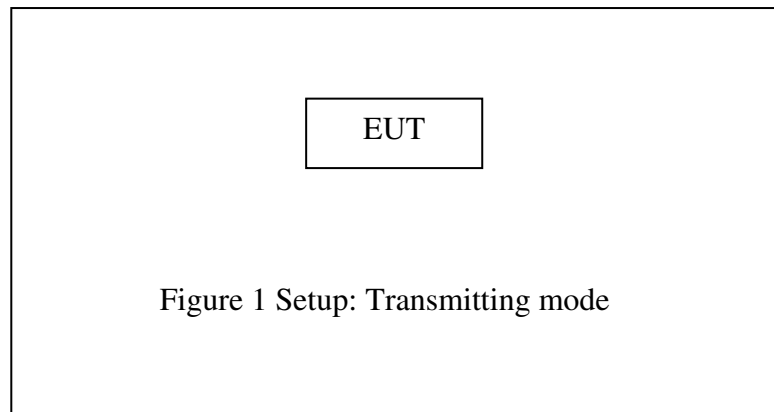


Figure 1 Setup: Transmitting mode

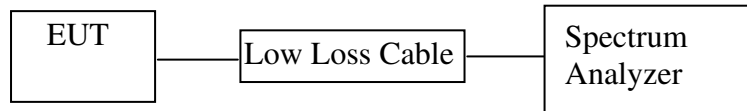
4. TEST PROCEDURES AND RESULTS

FCC&IC Rules	Description of Test	Result
Section 15.207	AC Power Line Conducted Emission Test	Compliant
Section 15.247(a)(1)	20dB Bandwidth Test	Compliant
Section 15.247(a)(1)	Carrier Frequency Separation Test	Compliant
Section 15.247(a)(1)(iii)	Number Of Hopping Frequency Test	Compliant
Section 15.247(a)(1)(iii)	Dwell Time Test	Compliant
Section 15.247(b)(1)	Maximum Peak Output Power Test	Compliant
Section 15.247(d) Section 15.209	Radiated Emission Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.247(d)	Conducted Spurious Emission Test	Compliant
Section 15.203	Antenna Requirement	Compliant

Remark: The RF module of the product is the same as the report ATE20180323, Part of the report's test data reference to report ATE20180323.

5. 20DB BANDWIDTH TEST

5.1. Block Diagram of Test Setup



(EUT: Portable Bluetooth Speaker)

5.2. The Requirement For Section 15.247(a)(1)

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.

5.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

5.4. Operating Condition of EUT

5.4.1. Setup the EUT and simulator as shown as Section 5.1.

5.4.2. Turn on the power of all equipment.

5.4.3. Let the EUT work in TX (Hopping off) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

5.5. Test Procedure

5.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

5.5.2. The RBW should be 1%~5% of OBW.

5.5.3. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

5.6.Test Result

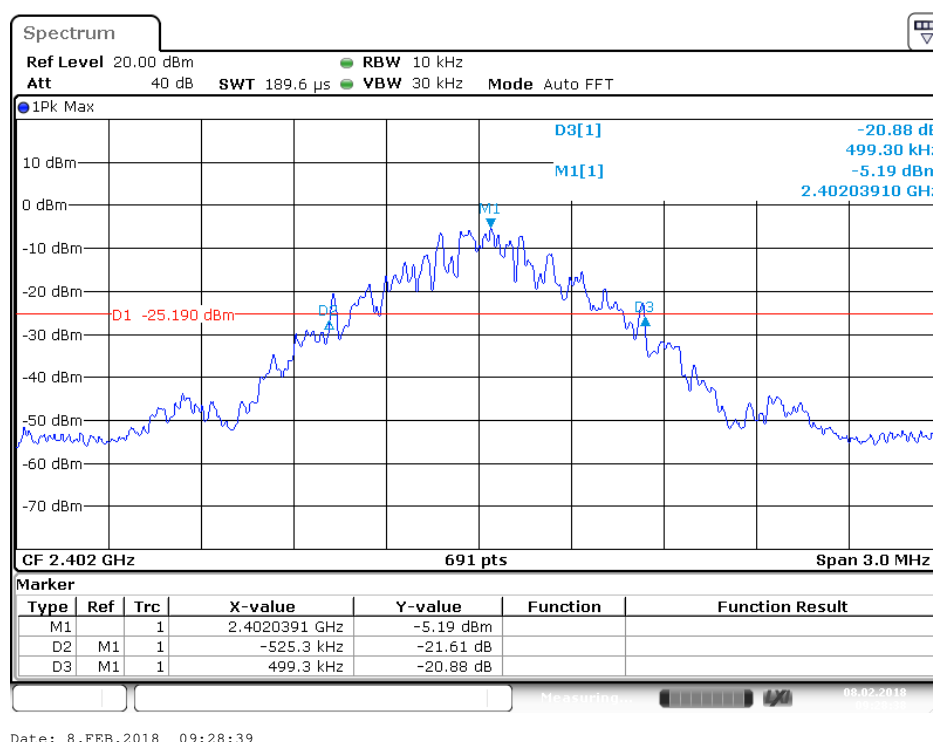
Channel	Frequency (MHz)	BDR mode 20dB Bandwidth (MHz)	EDR mode 20dB Bandwidth (MHz)	Result
Low	2402	1.0246	1.3198	Pass
Middle	2441	1.0246	1.3242	Pass
High	2480	1.0246	1.3242	Pass

Note: The RF module of the product is the same as the report ATE20180323, so the data Reference to report is ATE20180323.

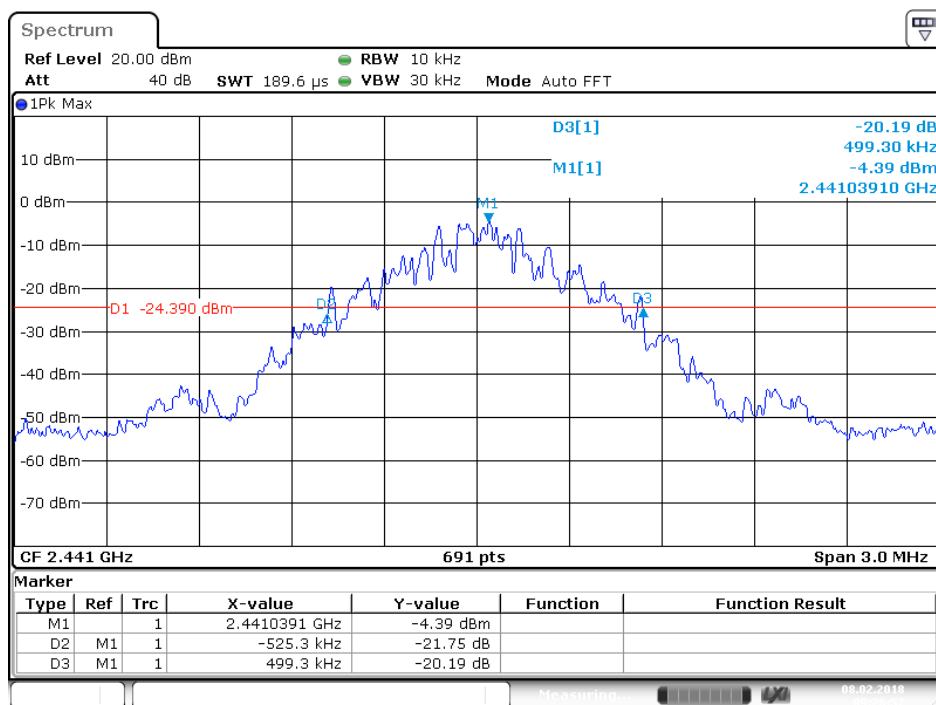
The spectrum analyzer plots are attached as below.

BDR Mode

Low channel

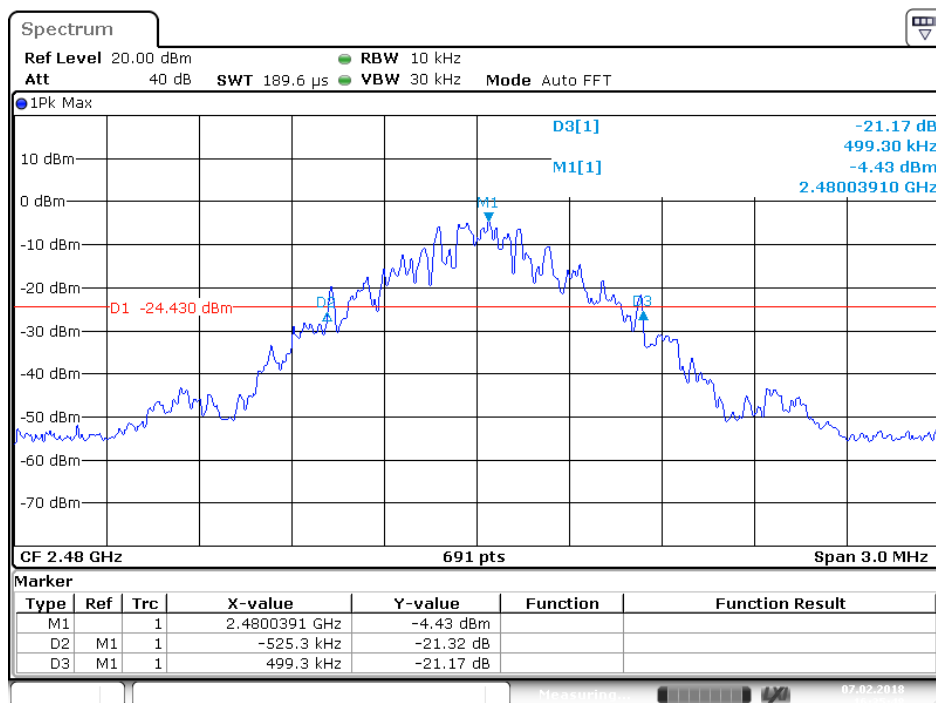


Middle channel



Date: 8.FEB.2018 09:26:57

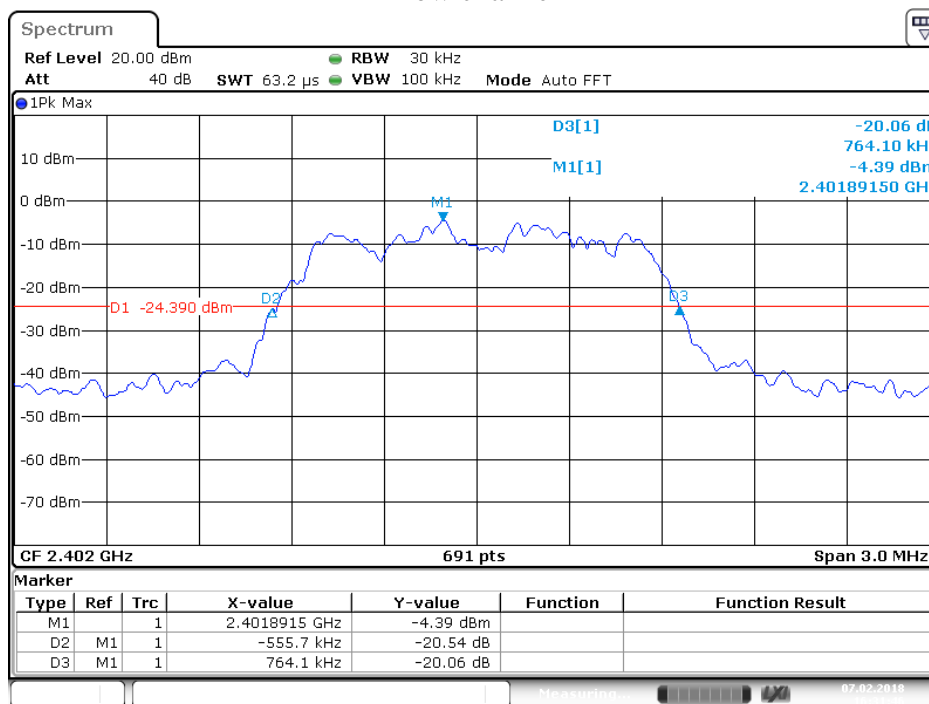
High channel



Date: 7.FEB.2018 16:35:49

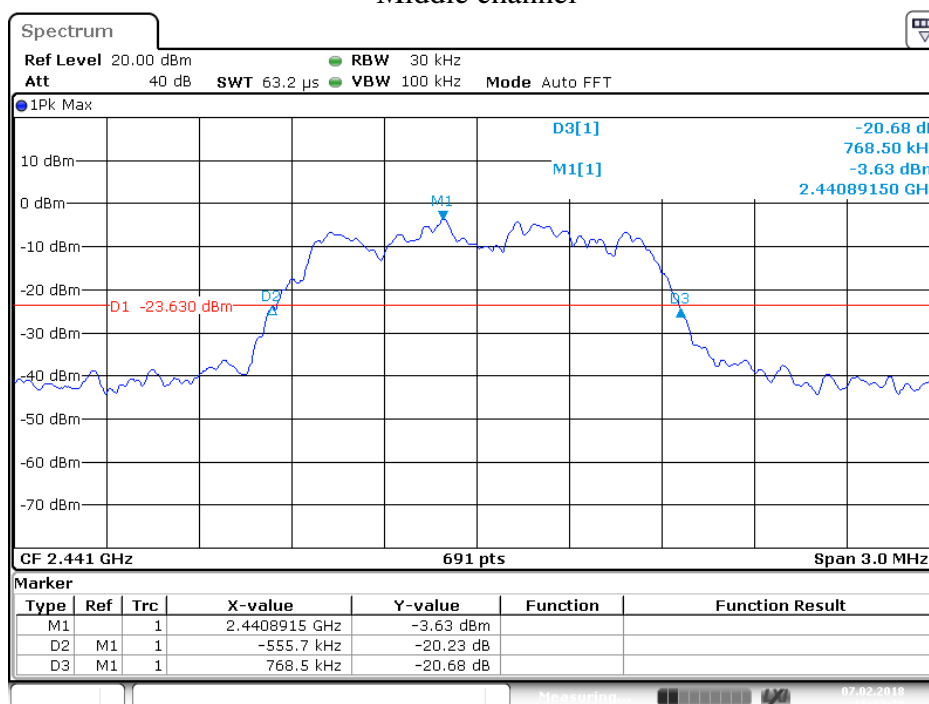
EDR Mode

Low channel



Date: 7.FEB.2018 16:31:46

Middle channel



Date: 7.FEB.2018 16:33:10

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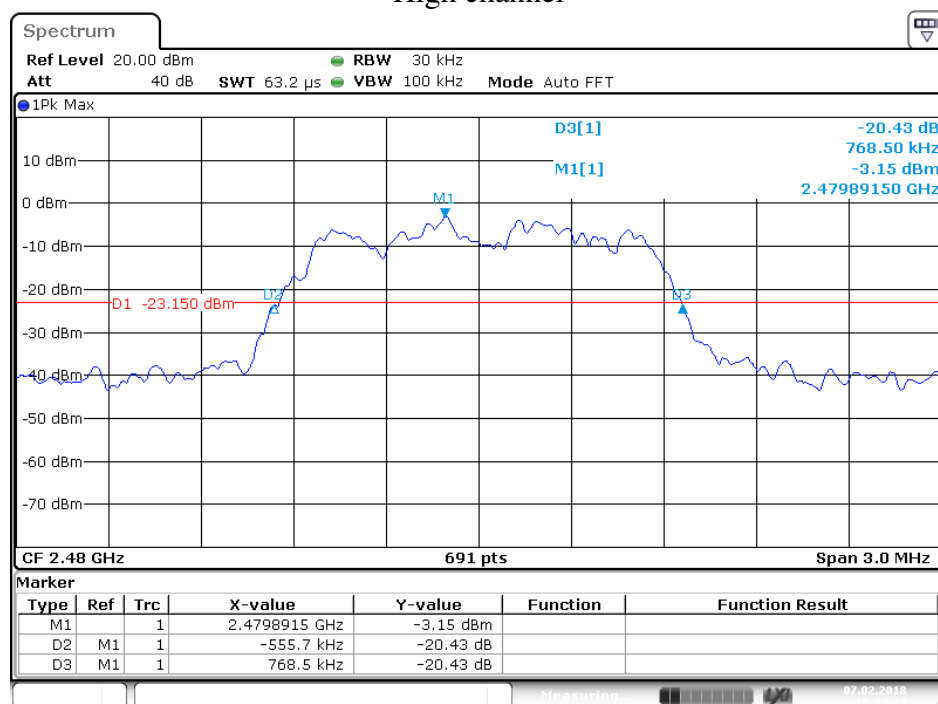
Tel: +86-755-26503290

Fax: +86-755-26503396

E-mail: webmaster@atc-lab.com

Http://www.atc-lab.com

High channel



Date: 7.FEB.2018 16:34:18

6. CARRIER FREQUENCY SEPARATION TEST

6.1. Block Diagram of Test Setup



(EUT: Portable Bluetooth Speaker)

6.2. The Requirement For Section 15.247(a)(1)

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. 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 125 mW. 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.

6.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

6.4. Operating Condition of EUT

6.4.1. Setup the EUT and simulator as shown as Section 6.1.

6.4.2. Turn on the power of all equipment.

6.4.3. Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

6.5. Test Procedure

6.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

6.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz. Adjust Span to 3MHz.

6.5.3. Set the adjacent channel of the EUT Maxhold another trace.

6.5.4. Measurement the channel separation

6.6. Test Result

EDR mode (Worse case)

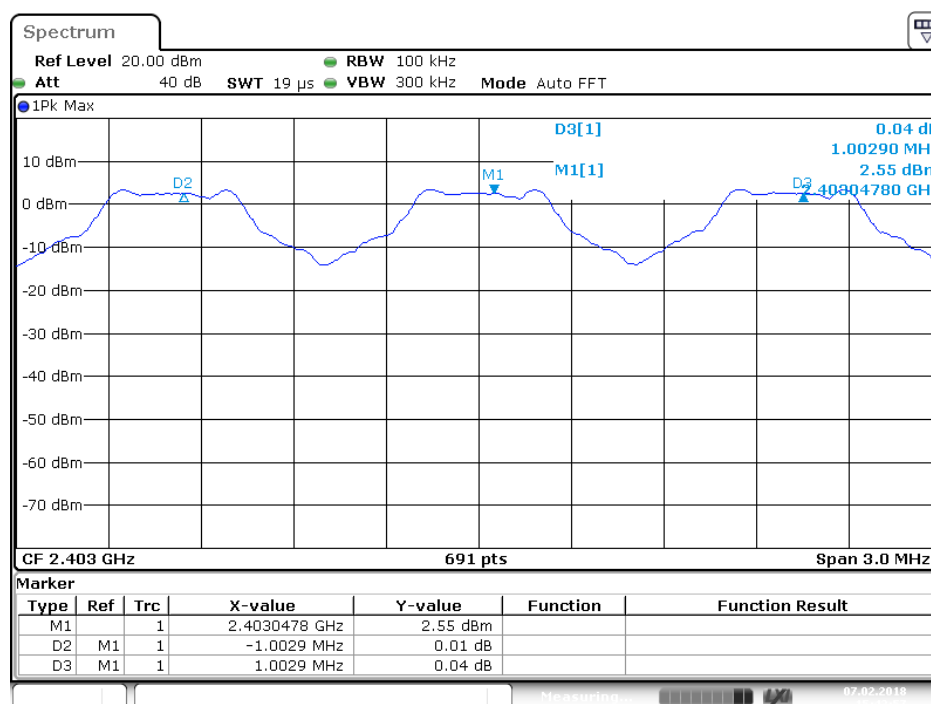
Channel	Frequency (MHz)	Channel Separation(MHz)	Limit (MHz)	Result
Low	2402	1.0029	25KHz or 2/3*20dB bandwidth	PASS
	2403			
Middle	2440	1.0029	25KHz or 2/3*20dB bandwidth	PASS
	2441			
High	2479	1.0029	25KHz or 2/3*20dB bandwidth	PASS
	2480			

Note: The RF module of the product is the same as the report ATE20180323, so the data Reference to report is ATE20180323.

The spectrum analyzer plots are attached as below.

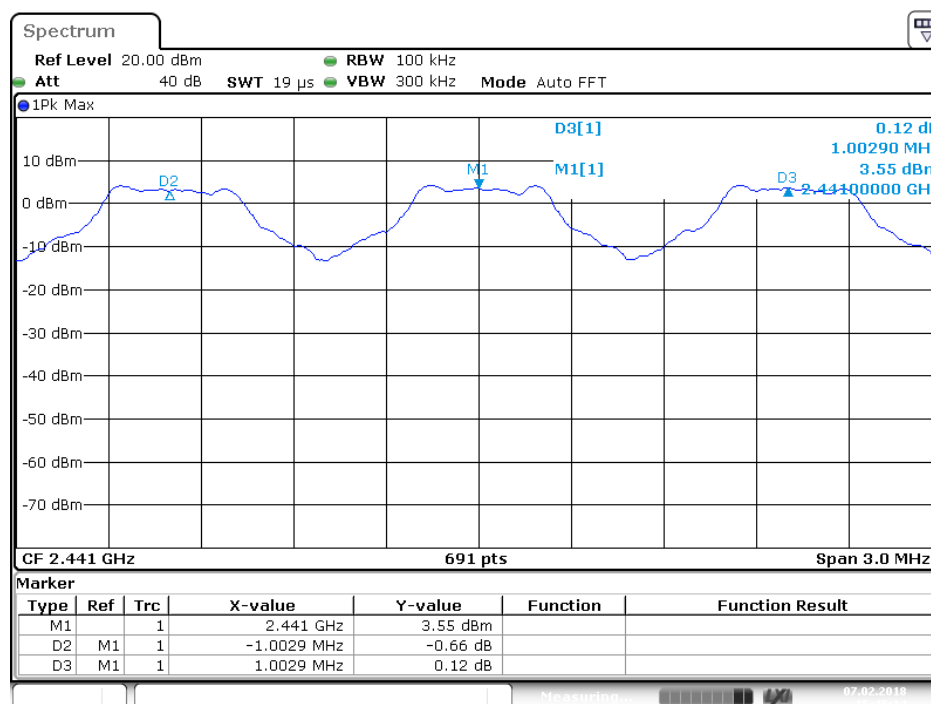
EDR Mode

Low channel



Date: 7.FEB.2018 15:43:57

Middle channel



Date: 7.FEB.2018 15:45:14

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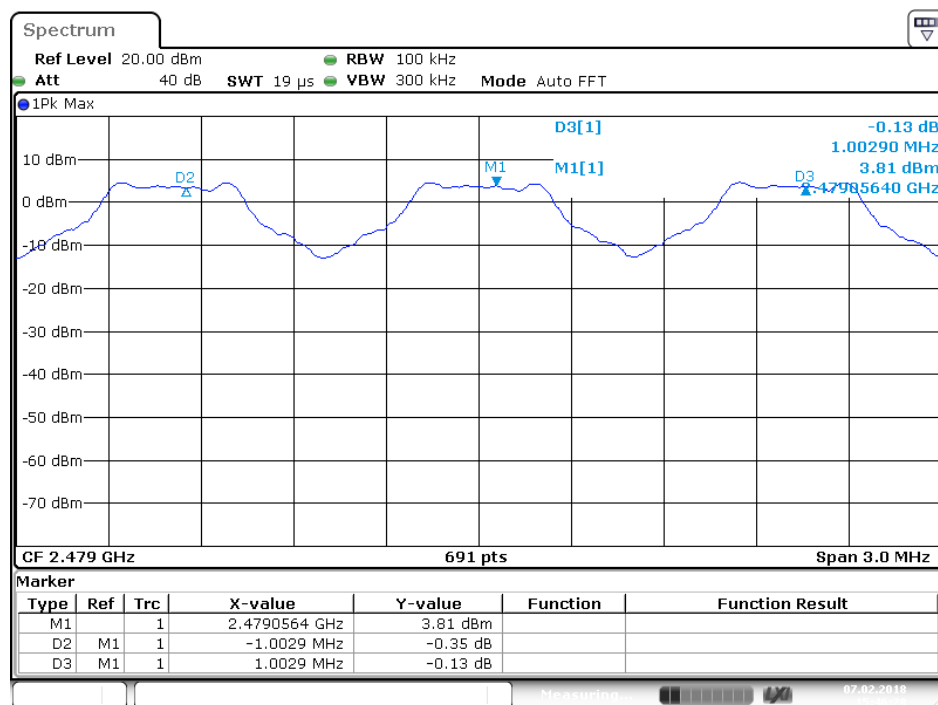
Tel: +86-755-26503290

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E-mail: webmaster@atc-lab.com

Http://www.atc-lab.com

High channel



Date: 7.FEB.2018 15:46:28

7. NUMBER OF HOPPING FREQUENCY TEST

7.1. Block Diagram of Test Setup



(EUT: Portable Bluetooth Speaker)

7.2. The Requirement For Section 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

7.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

7.4. Operating Condition of EUT

7.4.1. Setup the EUT and simulator as shown as Section 7.1.

7.4.2. Turn on the power of all equipment.

7.4.3. Let the EUT work in TX (Hopping on) modes measure it.

7.5. Test Procedure

7.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

7.5.2. Set the spectrum analyzer as Span=90MHz, RBW=100 kHz, VBW=300 kHz.

7.5.3. Max hold, view and count how many channel in the band.

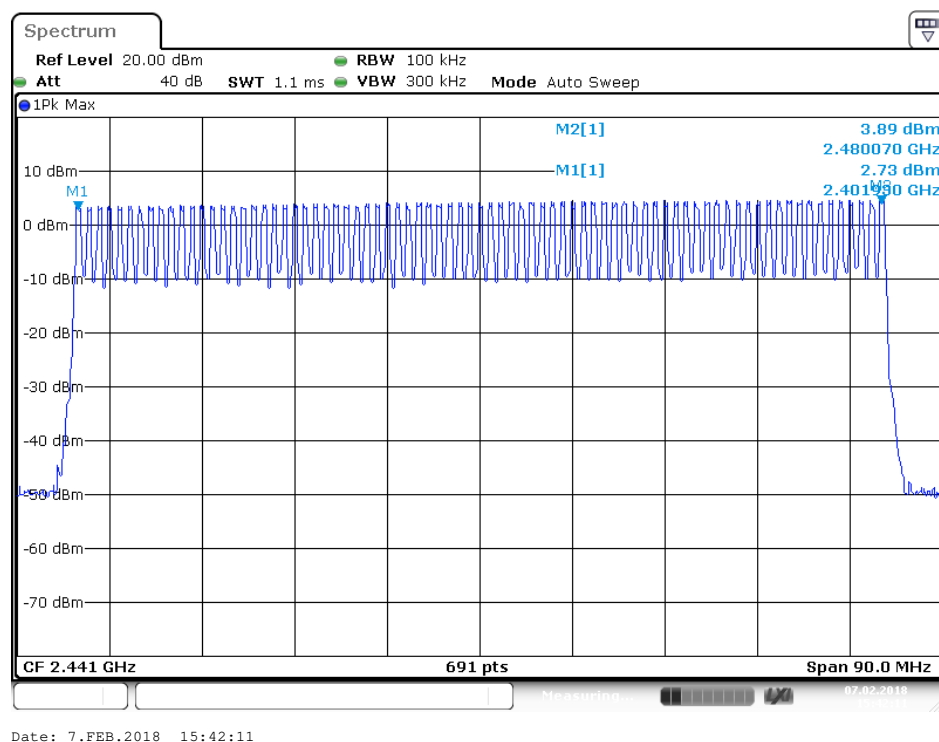
7.6.Test Result

Total number of hopping channel	Measurement result(CH)	Limit(CH)
	79	≥ 15

Note: The RF module of the product is the same as the report ATE20180323, so the data Reference to report is ATE20180323.

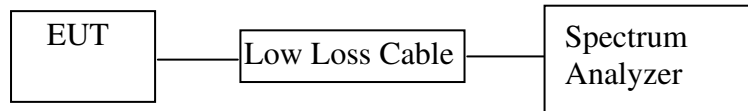
The spectrum analyzer plots are attached as below.

Number of hopping channels(GFSK)



8. DWELL TIME TEST

8.1. Block Diagram of Test Setup



(EUT: Portable Bluetooth Speaker)

8.2. The Requirement For Section 15.247(a)(1)(iii)

Section 15.247(a)(1)(iii): 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.

8.3. EUT Configuration on Measurement

The equipment are installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

8.4. Operating Condition of EUT

8.4.1. Setup the EUT and simulator as shown as Section 8.1.

8.4.2. Turn on the power of all equipment.

8.4.3. Let the EUT work in TX (Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

8.5. Test Procedure

8.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

8.5.2. Set center frequency of spectrum analyzer = operating frequency.

8.5.3. Set the spectrum analyzer as RBW=1MHz, VBW=3MHz, Span=0Hz, Adjust Sweep=5ms, 10ms, 15ms. Get the pulse time.

8.5.4. Repeat above procedures until all frequency measured were complete.

8.6. Test Result

BDR Mode

Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2402	0.413	132.16	400
	2441	0.413	132.16	400
	2480	0.420	134.40	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2 \times 79)) \times 31.6$				
DH3	2402	1.696	271.36	400
	2441	1.681	268.96	400
	2480	1.681	268.96	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4 \times 79)) \times 31.6$				
DH5	2402	2.935	313.07	400
	2441	2.957	315.41	400
	2480	2.957	315.41	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6 \times 79)) \times 31.6$				

EDR Mode

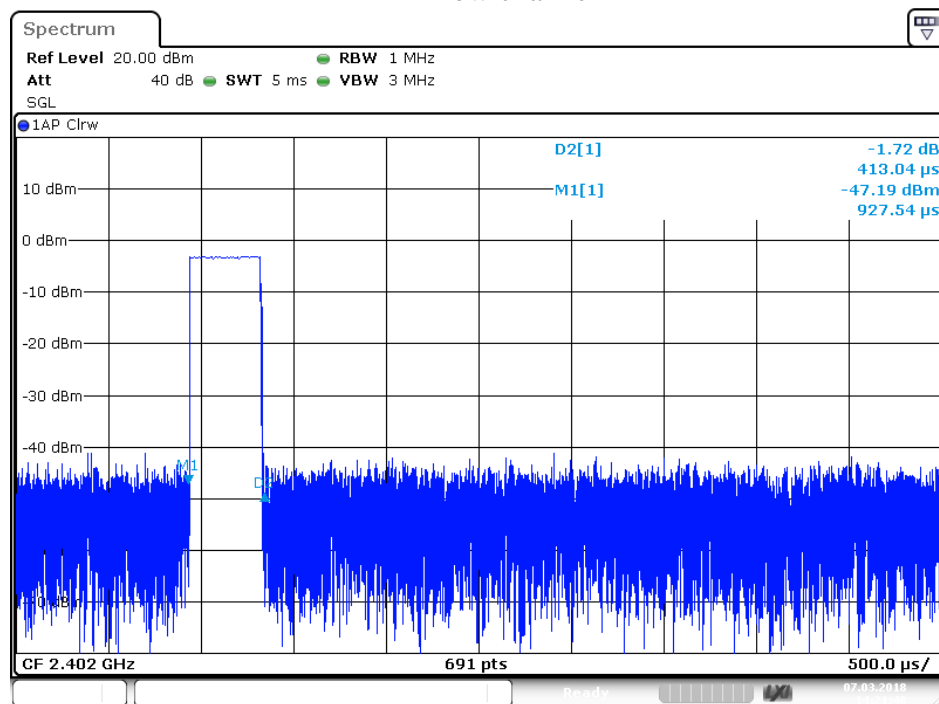
Mode	Channel Frequency (MHz)	Pulse Time (ms)	Dwell Time (ms)	Limit (ms)
DH1	2402	0.428	136.96	400
	2441	0.435	139.20	400
	2480	0.428	136.96	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(2 \times 79)) \times 31.6$				
DH3	2402	1.696	271.36	400
	2441	1.696	271.36	400
	2480	1.696	271.36	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(4 \times 79)) \times 31.6$				
DH5	2402	2.957	315.41	400
	2441	2.957	315.41	400
	2480	2.957	315.41	400
A period transmit time = $0.4 \times 79 = 31.6$ Dwell time = pulse time $\times (1600/(6 \times 79)) \times 31.6$				

Note: The RF module of the product is the same as the report ATE20180323, so the data Reference to report is ATE20180323.

The spectrum analyzer plots are attached as below.

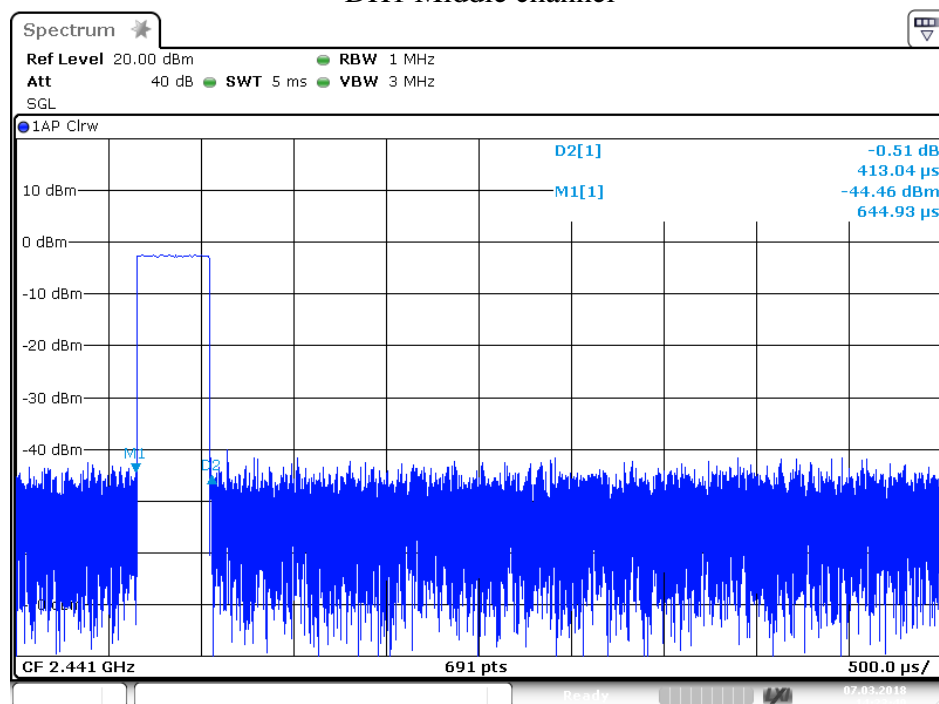
BDR Mode

DH1 Low channel



Date: 7.MAR.2018 14:21:49

DH1 Middle channel

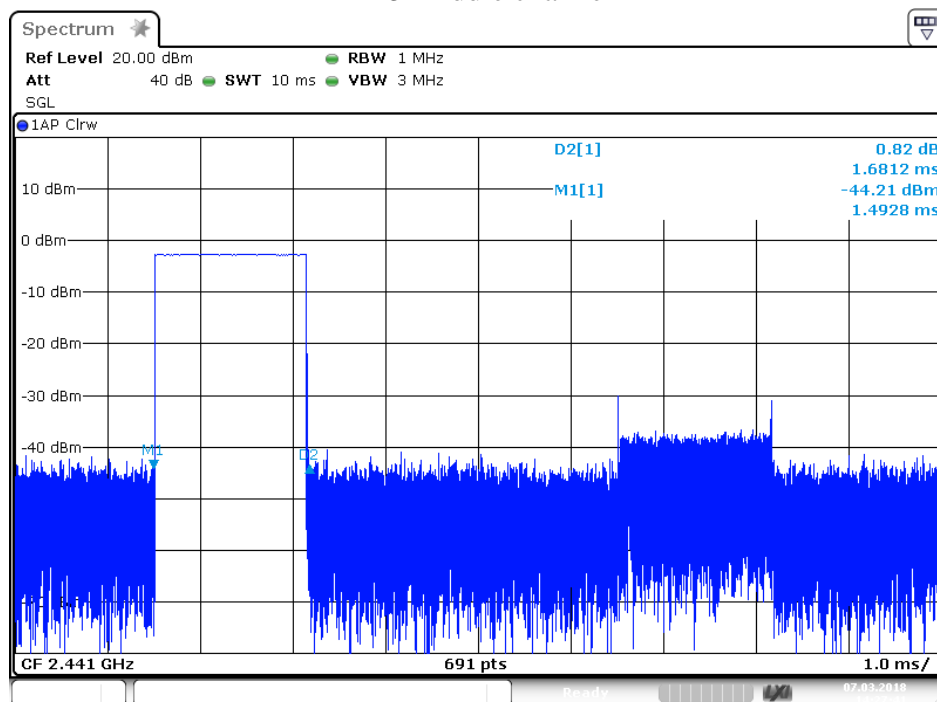


Date: 7.MAR.2018 14:23:50

Date: 7.MAR.2018 14:24:31

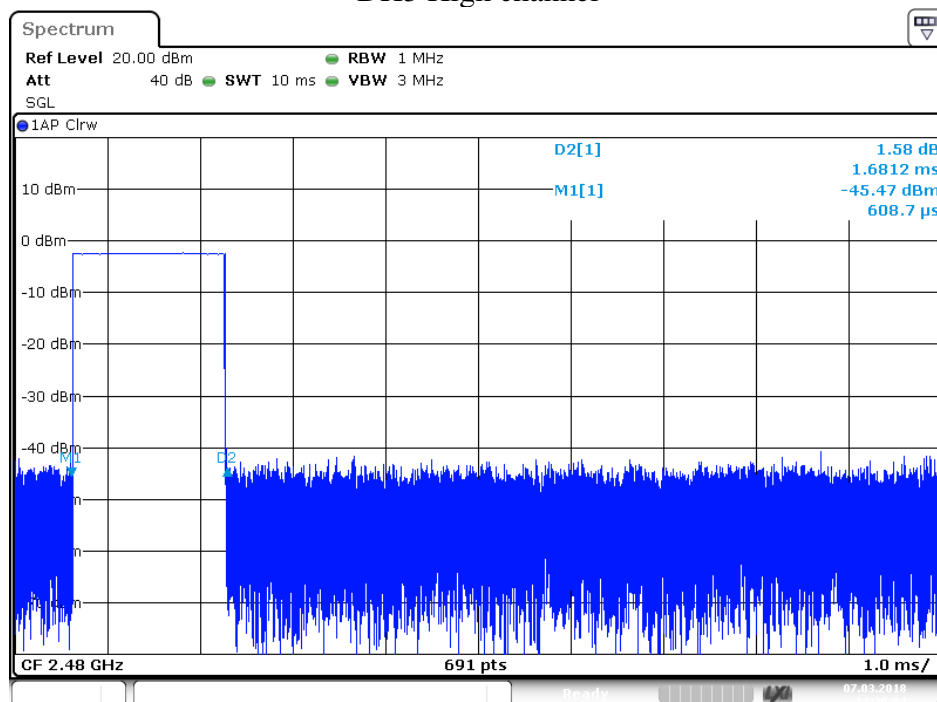
Date: 7.MAR.2018 14:29:31

DH3 Middle channel



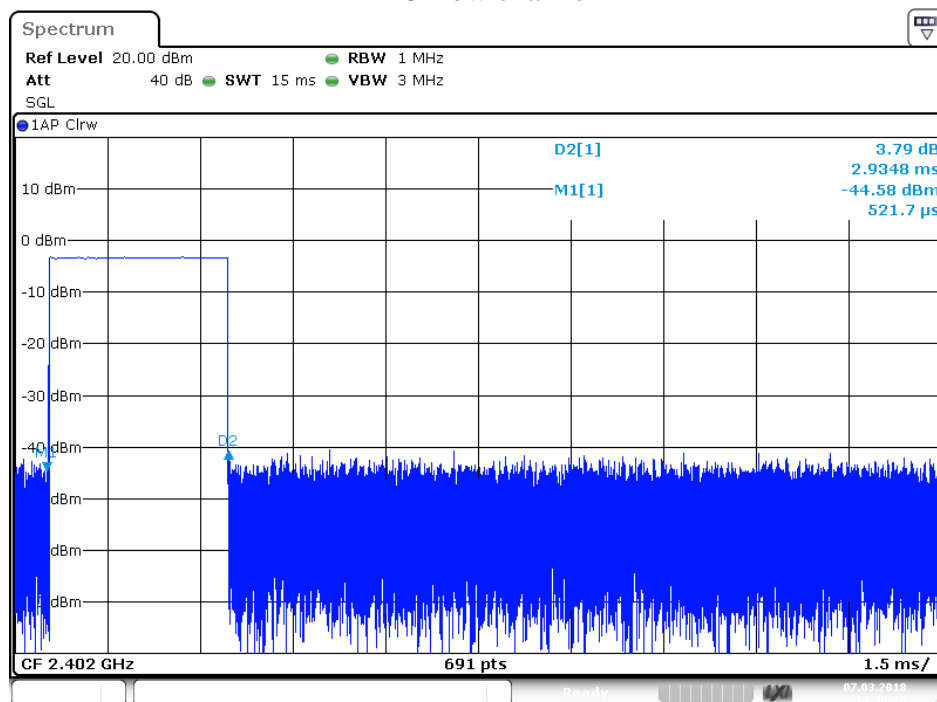
Date: 7.MAR.2018 14:27:41

DH3 High channel



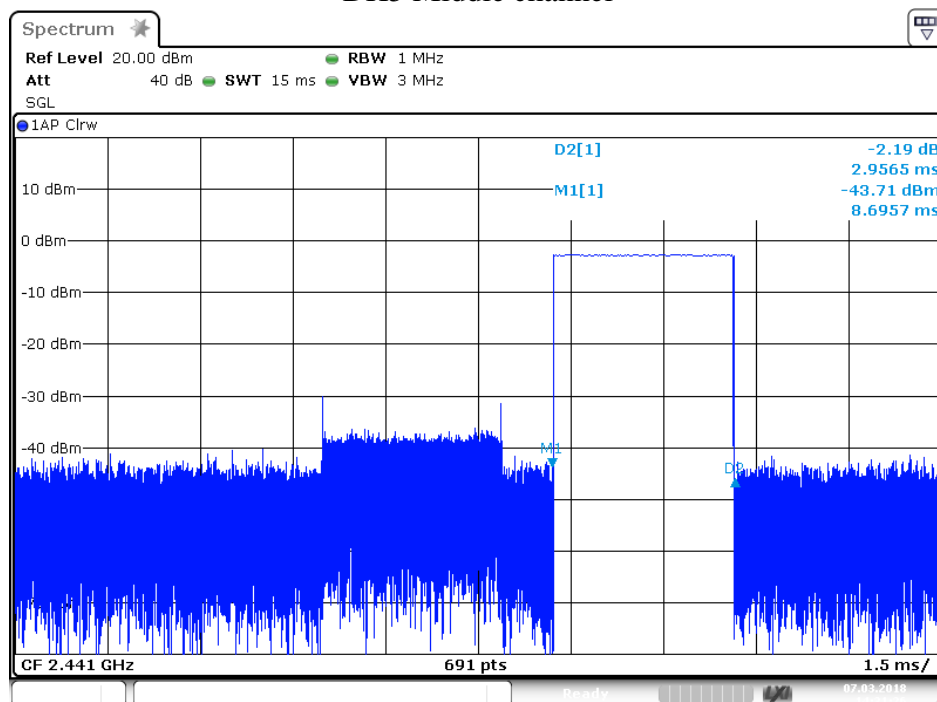
Date: 7.MAR.2018 14:26:05

DH5 Low channel



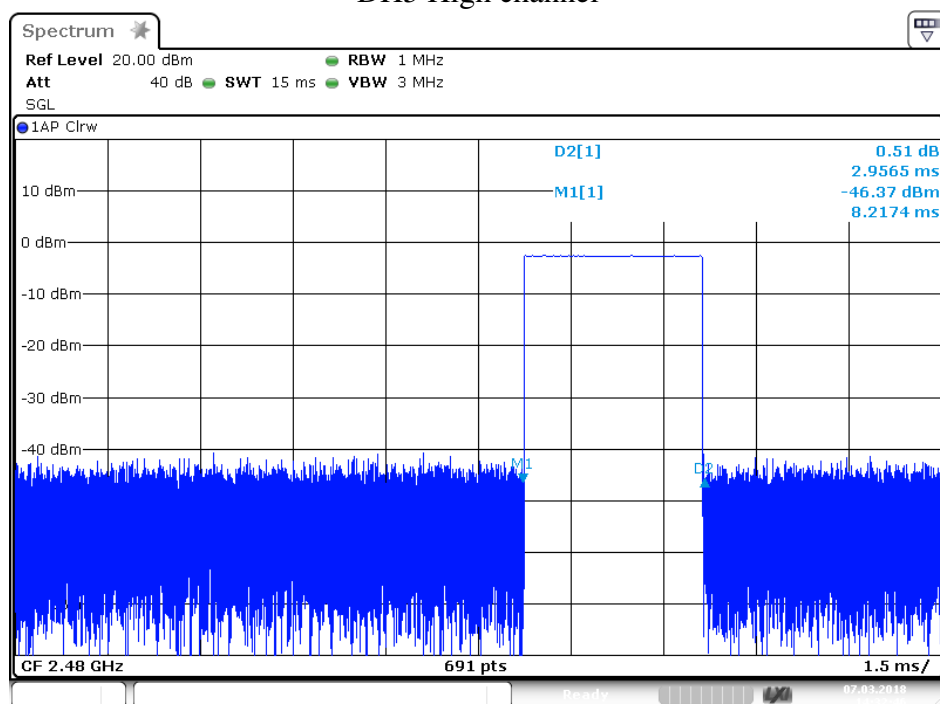
Date: 7.MAR.2018 14:30:27

DH5 Middle channel



Date: 7.MAR.2018 14:31:27

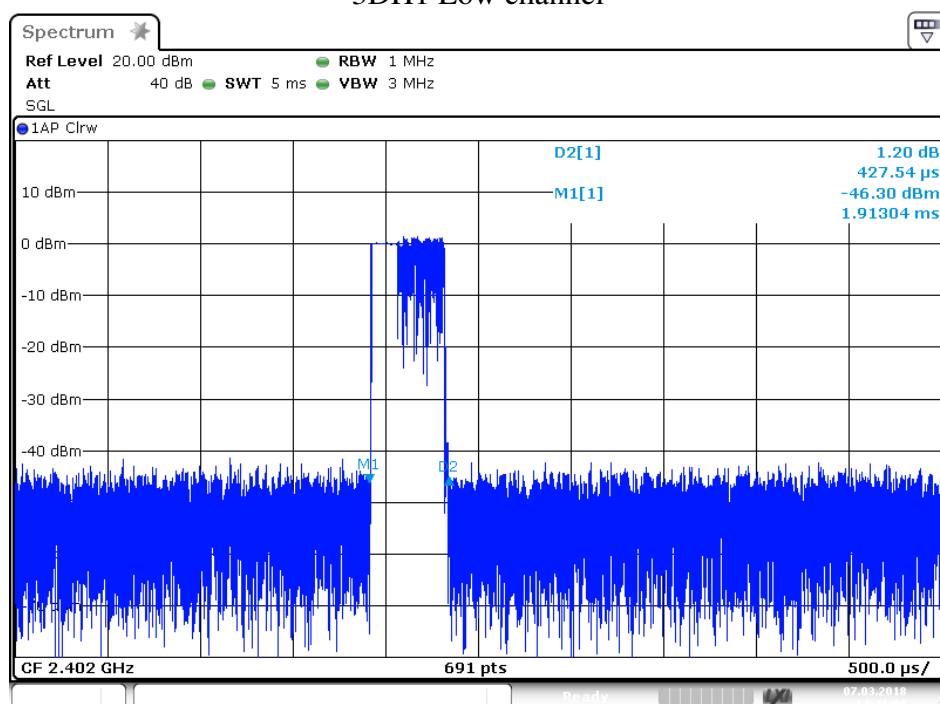
DH5 High channel



Date: 7.MAR.2018 14:32:47

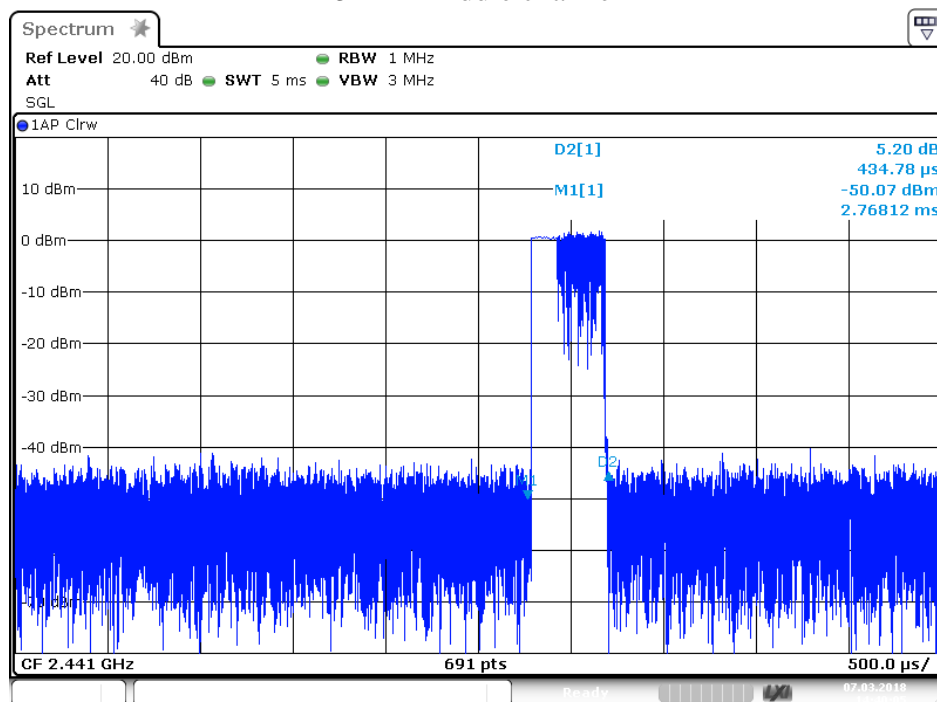
EDR Mode

3DH1 Low channel



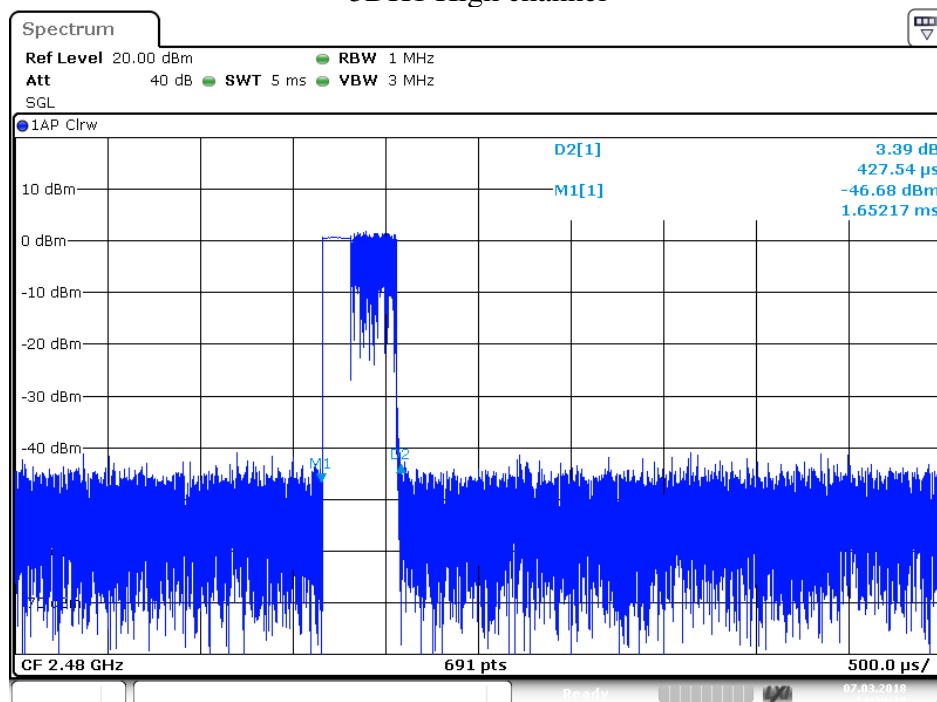
Date: 7.MAR.2018 14:41:00

3DH1 Middle channel



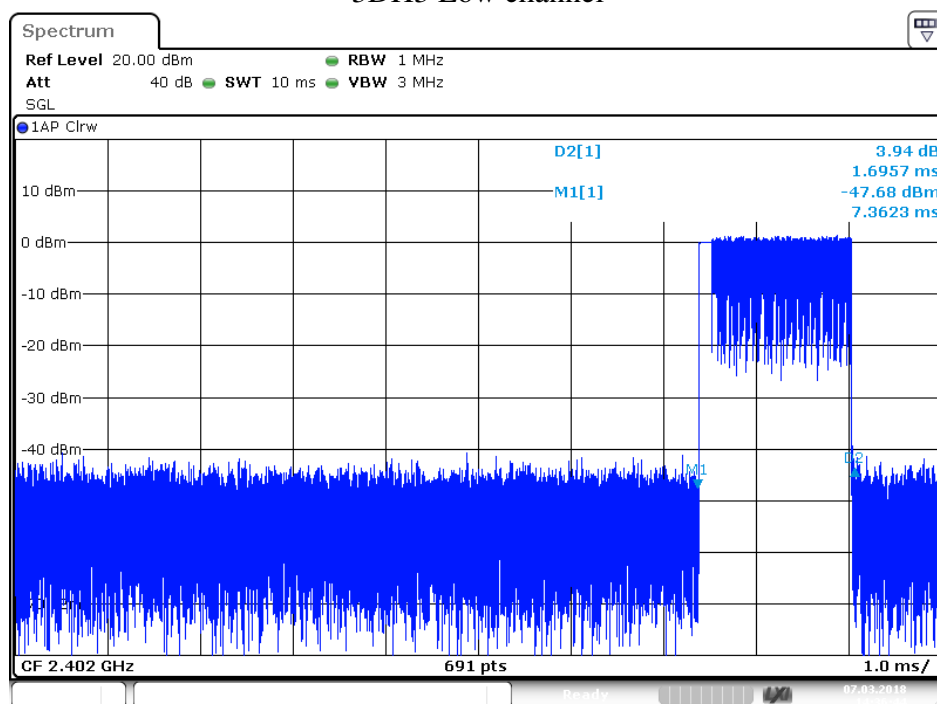
Date: 7.MAR.2018 14:40:05

3DH1 High channel



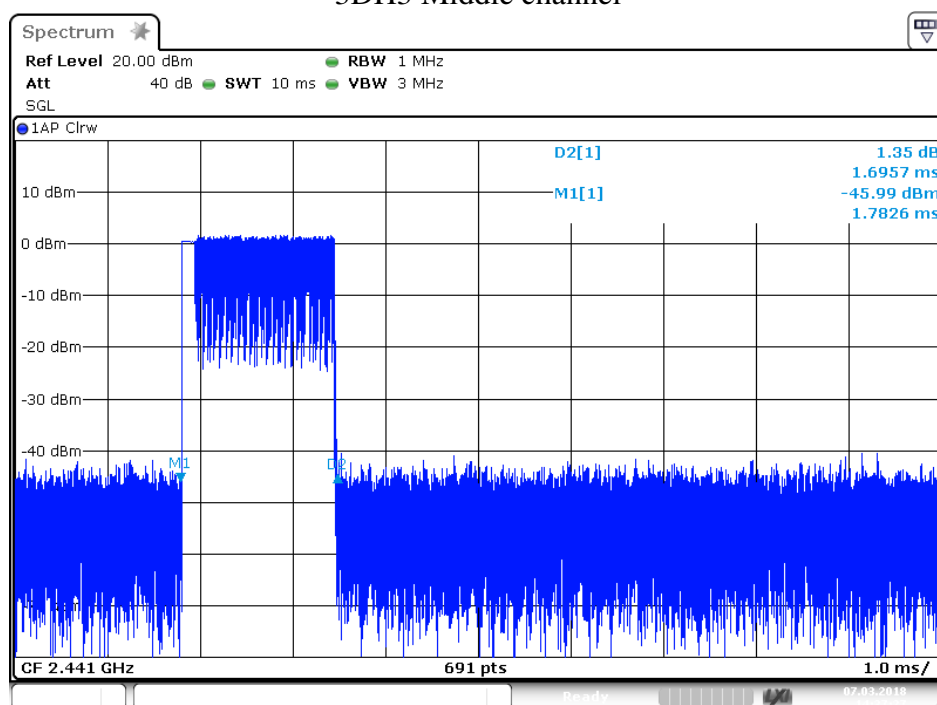
Date: 7.MAR.2018 14:39:21

3DH3 Low channel



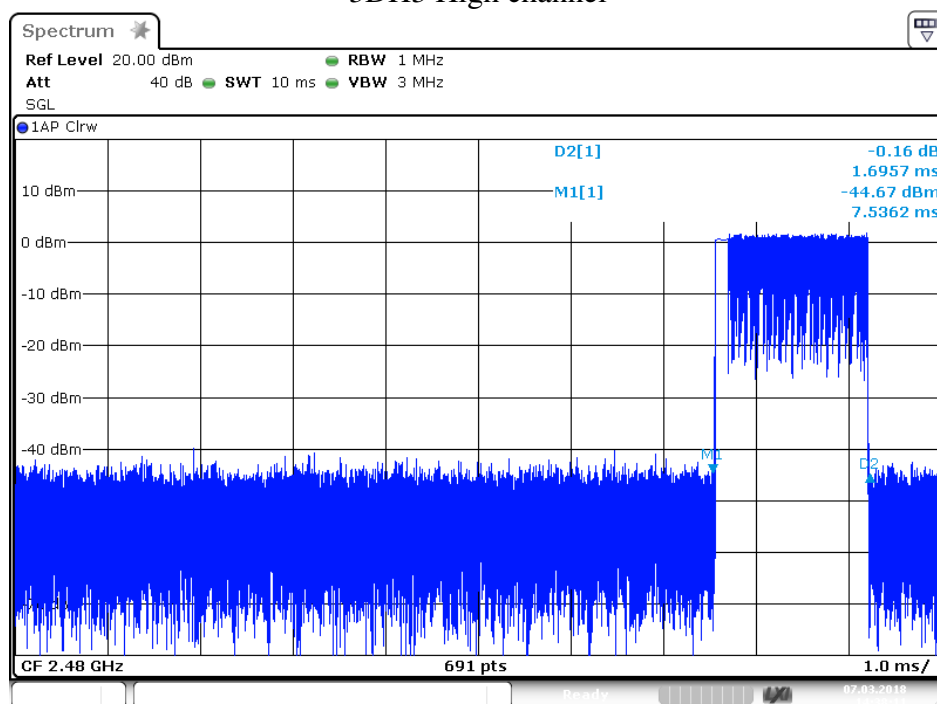
Date: 7.MAR.2018 14:36:44

3DH3 Middle channel



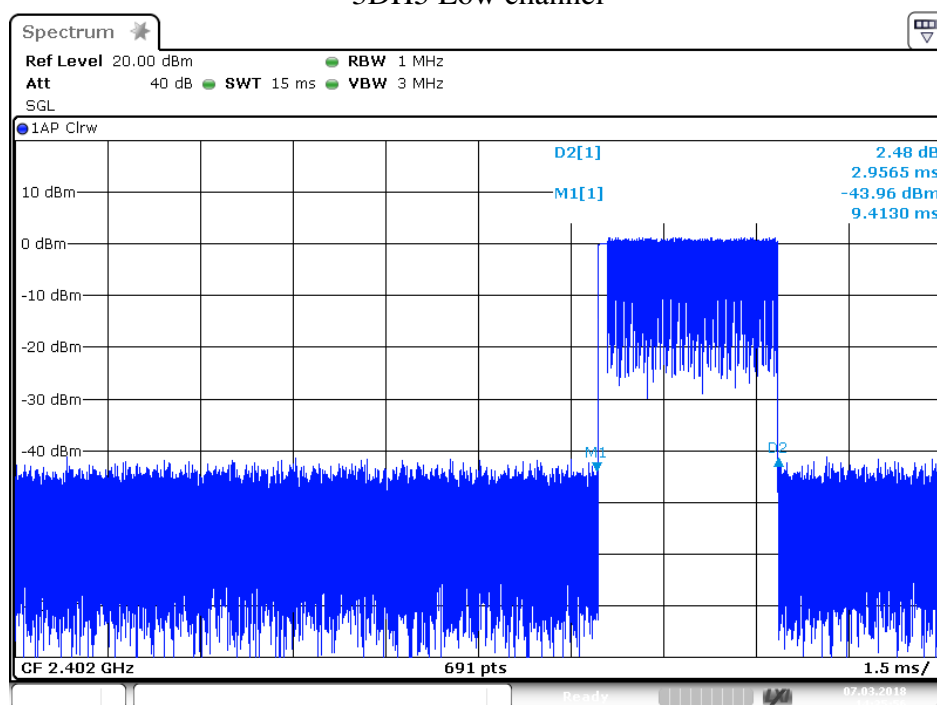
Date: 7.MAR.2018 14:37:28

3DH3 High channel



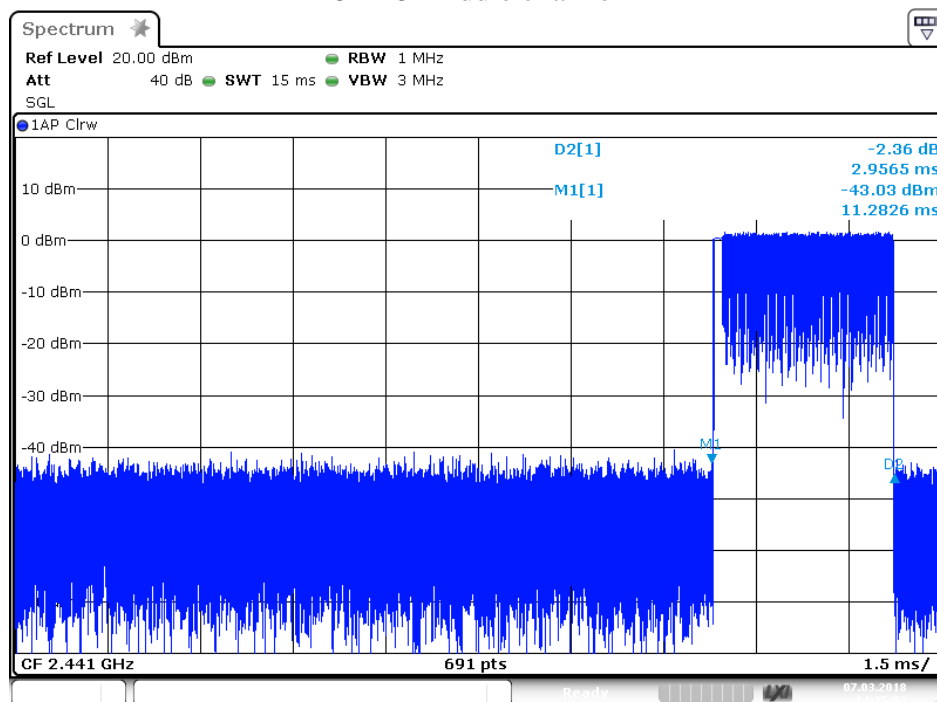
Date: 7.MAR.2018 14:38:12

3DH5 Low channel



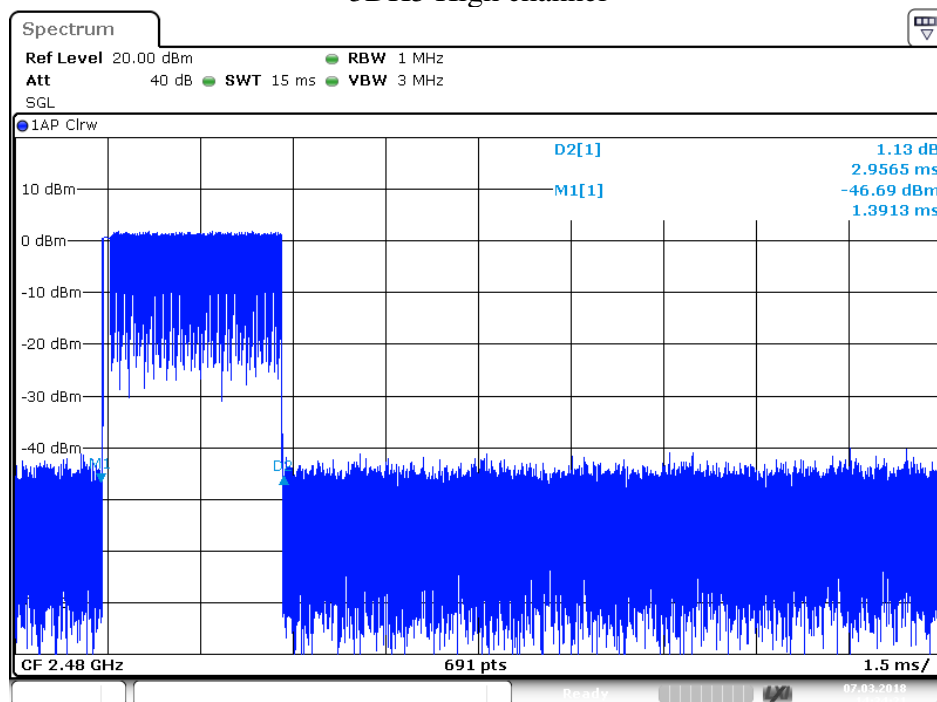
Date: 7.MAR.2018 14:35:56

3DH5 Middle channel



Date: 7.MAR.2018 14:35:03

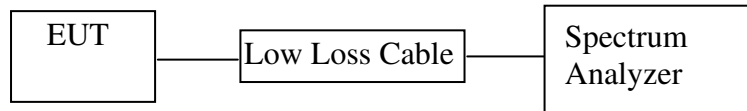
3DH5 High channel



Date: 7.MAR.2018 14:34:22

9. MAXIMUM PEAK OUTPUT POWER TEST

9.1. Block Diagram of Test Setup



(EUT: Portable Bluetooth Speaker)

9.2. The Requirement For Section 15.247(b)(1)

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 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.

9.3. EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

9.4. Operating Condition of EUT

9.4.1. Setup the EUT and simulator as shown as Section 9.1.

9.4.2. Turn on the power of all equipment.

9.4.3. Let the EUT work in TX (Hopping off) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

9.5. Test Procedure

9.5.1. The transmitter output was connected to the spectrum analyzer through a low loss cable.

9.5.2. Set RBW of spectrum analyzer to 1MHz and VBW to 3MHz for BDR mode

9.5.3. Set RBW of spectrum analyzer to 3MHz and VBW to 10MHz for EDR mode

9.5.4.Measurement the maximum peak output power.

9.6.Test Result

BDR Mode

Frequency (MHz)	Maximum peak conducted output power (dBm/W)	e.i.r.p. (dBm/W)	Limits dBm / W
2402	3.69/0.0023	3.69/0.0023	21 / 0.125
2441	4.41/0.0026	4.41/0.0026	21 / 0.125
2480	4.98/0.0031	4.98/0.0031	21 / 0.125

EDR Mode

Frequency (MHz)	Maximum peak conducted output power (dBm/W)	e.i.r.p. (dBm/W)	Limits dBm / W
2402	5.51/0.0036	5.51/0.0036	21 / 0.125
2441	6.22/0.0042	6.22/0.0042	21 / 0.125
2480	6.60/0.0046	6.60/0.0046	21 / 0.125

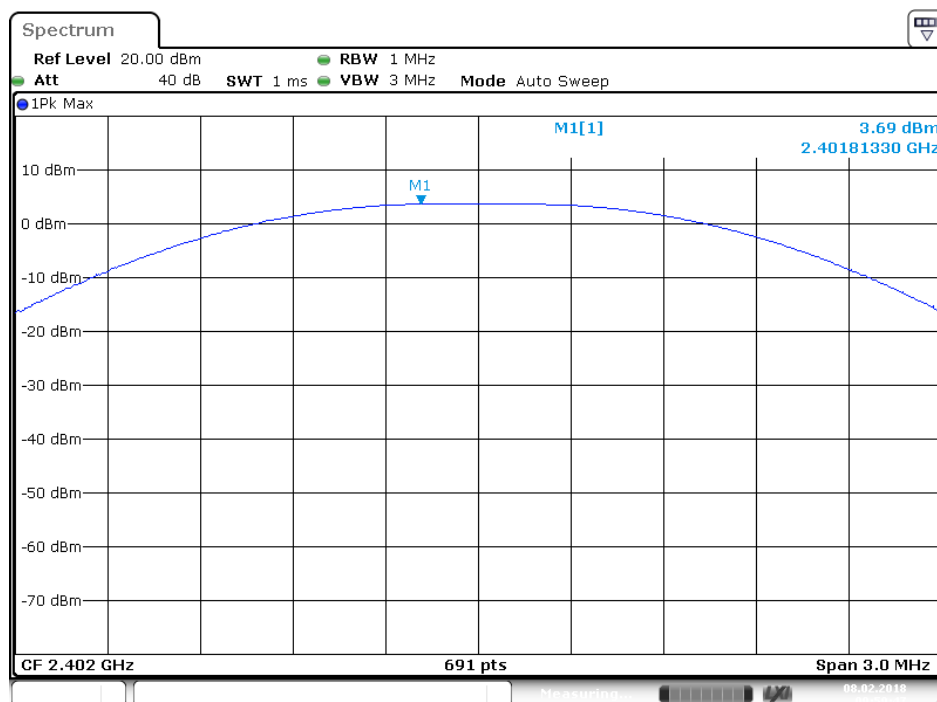
Note: e.i.r.p= Maximum peak conducted output power+Antenna gain(0dBi)

The RF module of the product is the same as the report ATE20180323, so the data Reference to report is ATE20180323.

The spectrum analyzer plots are attached as below.

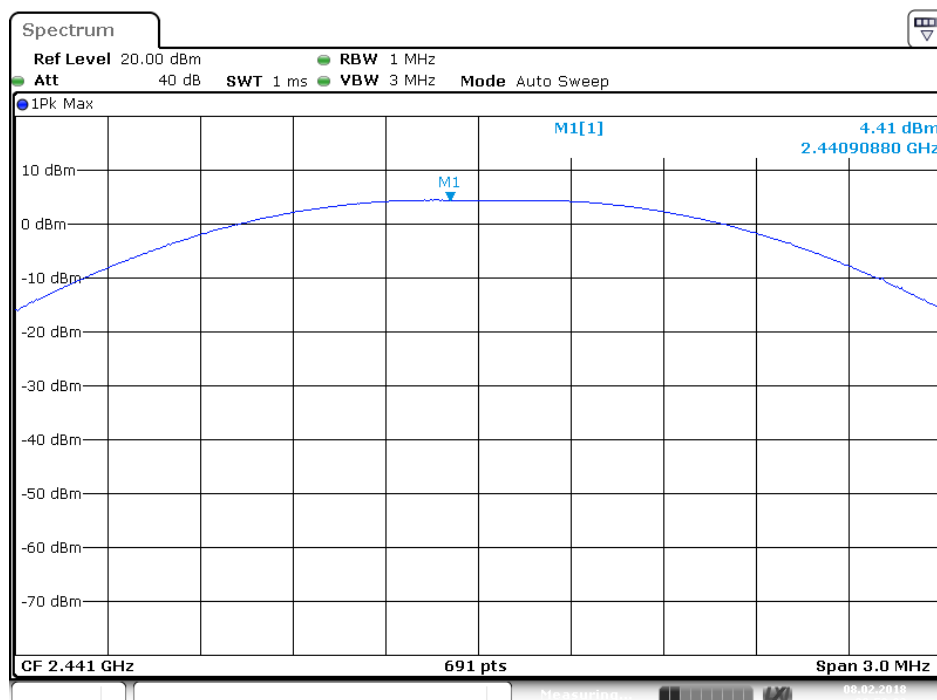
BDR Mode

Low channel



Date: 8.FEB.2018 09:59:47

Middle channel



Date: 8.FEB.2018 09:59:02

shenzhen Accurate Technology Co., Ltd.

Address: 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

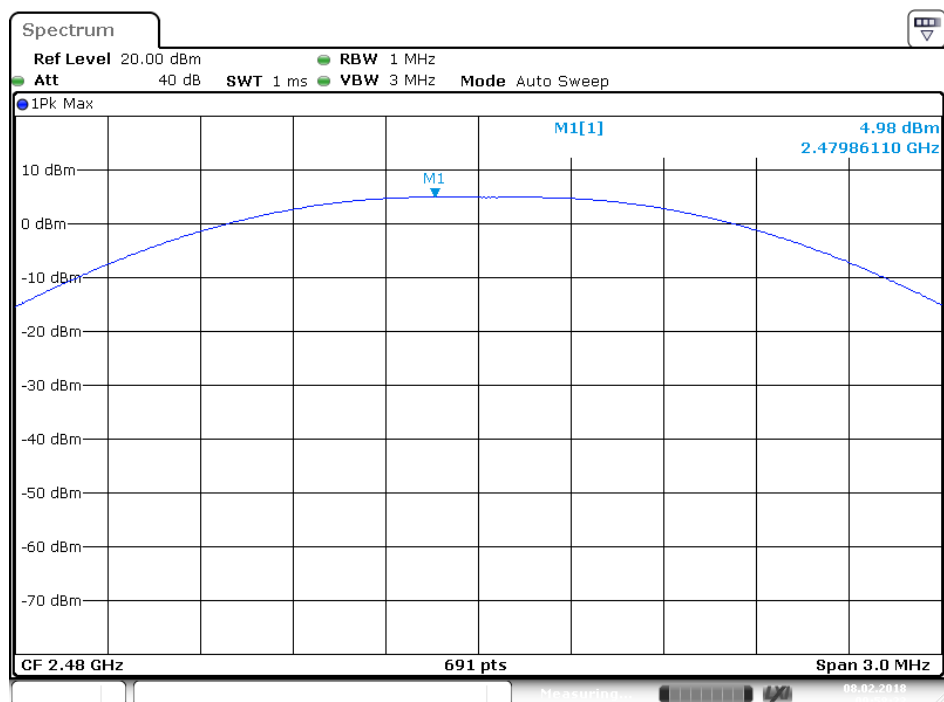
Tel: +86-755-26503290

Fax: +86-755-26503396

E-mail: webmaster@atc-lab.com

Http://www.atc-lab.com

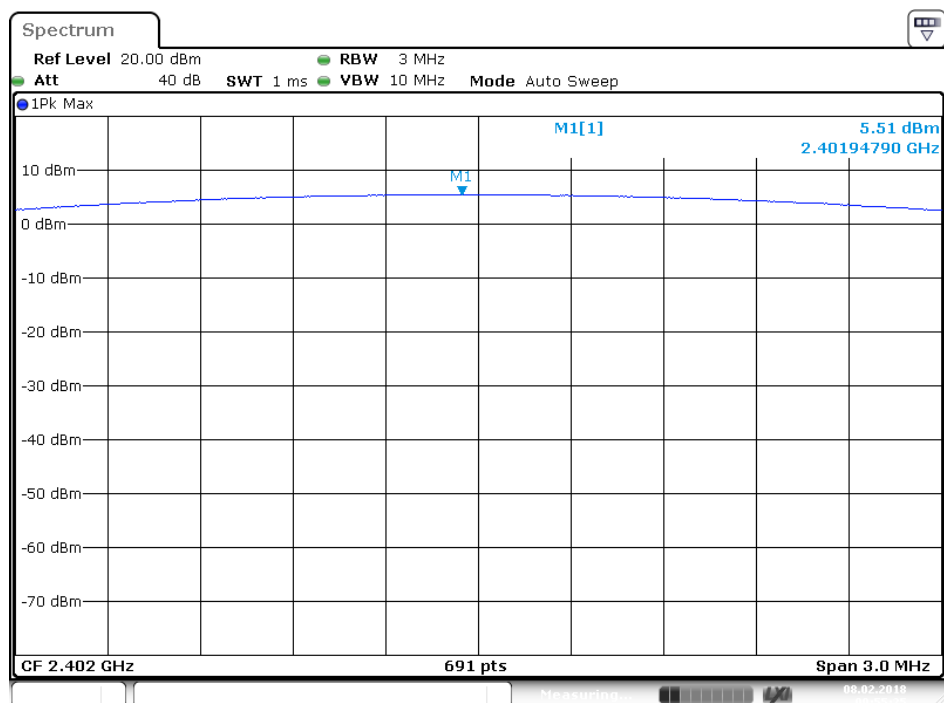
High channel



Date: 8.FEB.2018 09:58:23

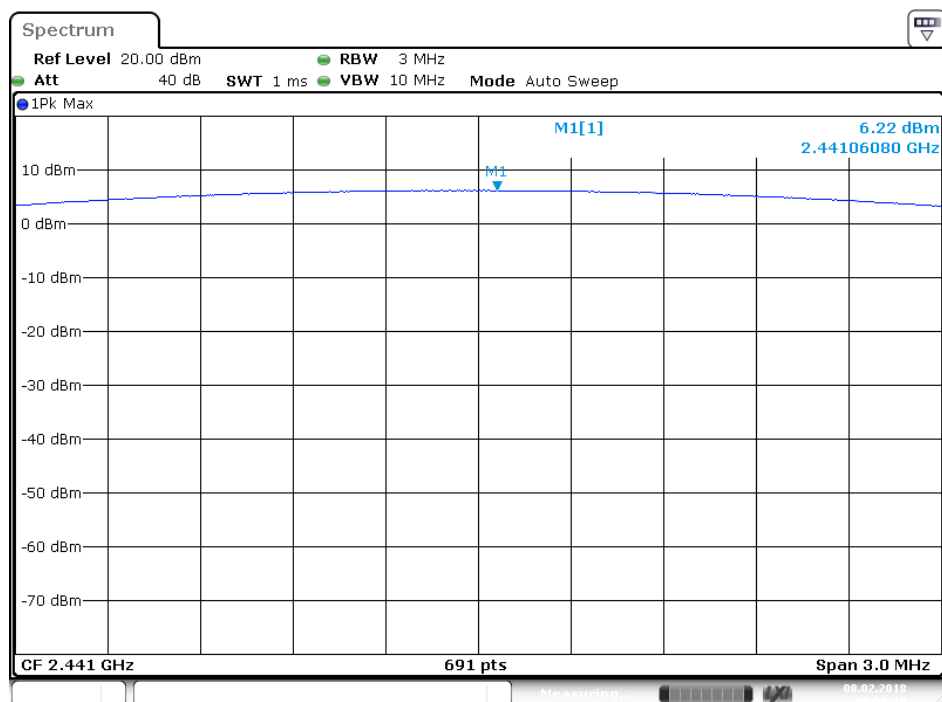
EDR Mode

Low channel



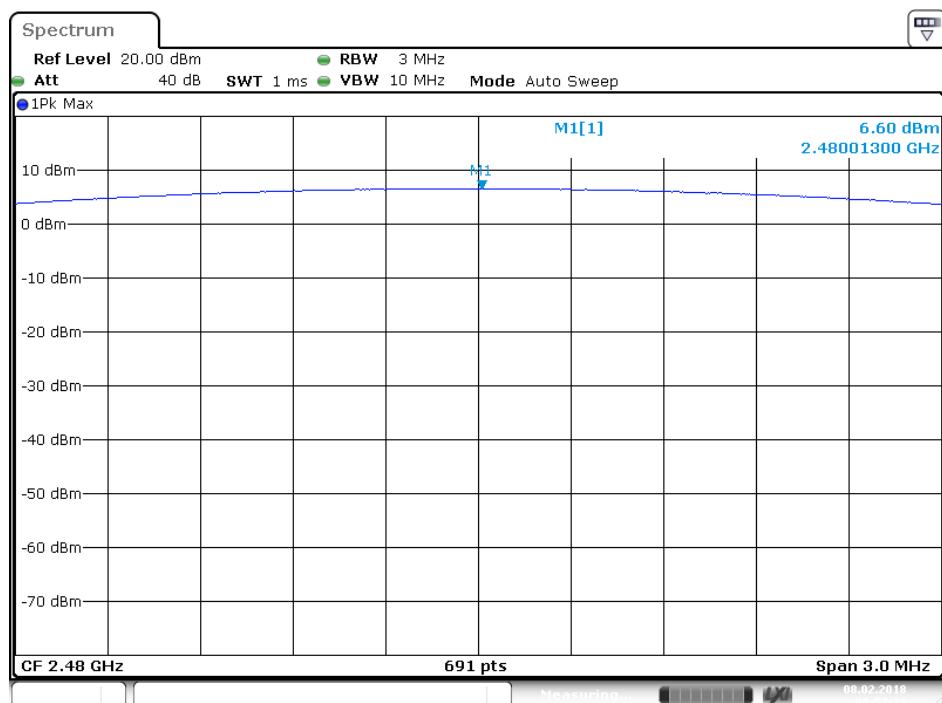
Date: 8.FEB.2018 09:55:25

Middle channel



Date: 8.FEB.2018 09:56:11

High channel

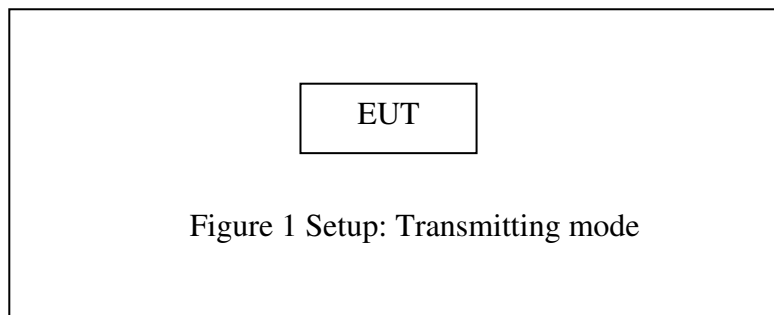


Date: 8.FEB.2018 09:57:21

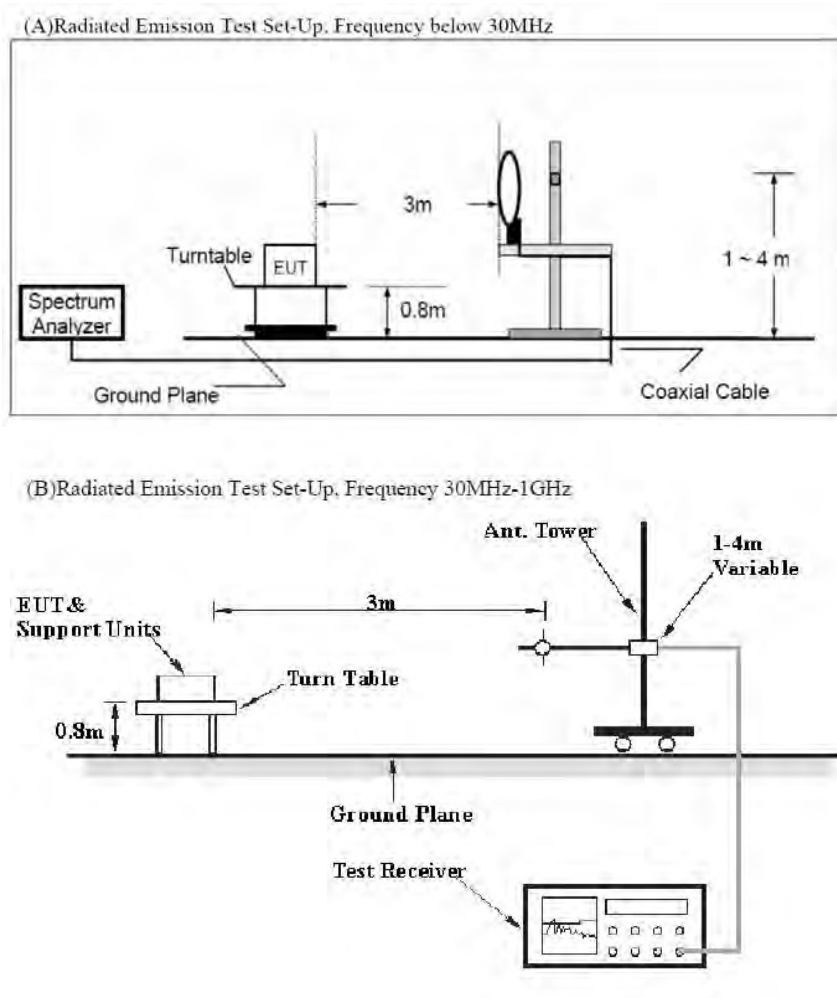
10. RADIATED EMISSION TEST

10.1. Block Diagram of Test Setup

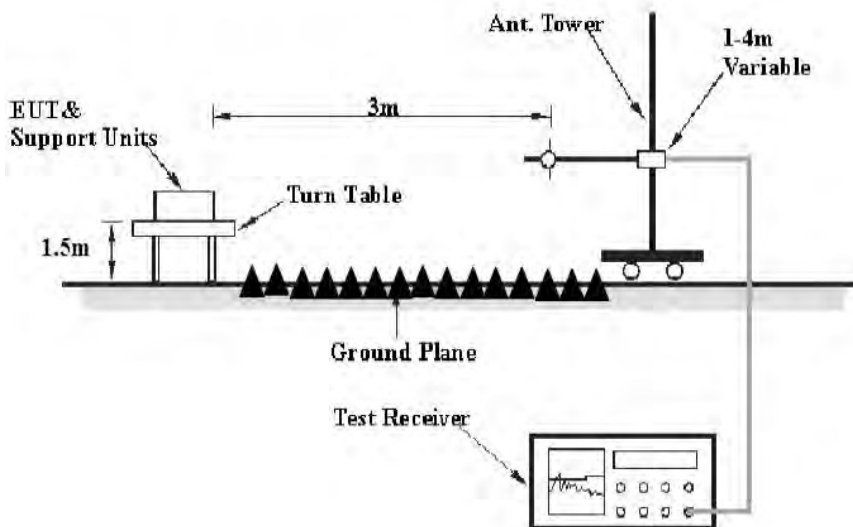
10.1.1. Block diagram of connection between the EUT and peripherals



10.1.2. Semi-Anechoic Chamber Test Setup Diagram



(C) Radiated Emission Test Set-Up, Frequency above 1GHz



10.2.The Limit For Section 15.247(d)

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, 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, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

10.3.Restricted bands of operation

10.3.1.FCC Part 15.205 Restricted bands of operation

(a) Except as shown in paragraph (d) of this section, Only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090-0.110	16.42-16.423	399.9-410	4.5-5.15
¹ 0.495-0.505	16.69475-16.69525	608-614	5.35-5.46
2.1735-2.1905	16.80425-16.80475	960-1240	7.25-7.75
4.125-4.128	25.5-25.67	1300-1427	8.025-8.5
4.17725-4.17775	37.5-38.25	1435-1626.5	9.0-9.2
4.20725-4.20775	73-74.6	1645.5-1646.5	9.3-9.5
6.215-6.218	74.8-75.2	1660-1710	10.6-12.7
6.26775-6.26825	108-121.94	1718.8-1722.2	13.25-13.4
6.31175-6.31225	123-138	2200-2300	14.47-14.5
8.291-8.294	149.9-150.05	2310-2390	15.35-16.2
8.362-8.366	156.52475-156.52525	2483.5-2500	17.7-21.4
8.37625-8.38675	156.7-156.9	2690-2900	22.01-23.12
8.41425-8.41475	162.0125-167.17	3260-3267	23.6-24.0
12.29-12.293	167.72-173.2	3332-3339	31.2-31.8
12.51975-12.52025	240-285	3345.8-3358	36.43-36.5
12.57675-12.57725	322-335.4	3600-4400	(²)
13.36-13.41			

¹Until February 1, 1999, this restricted band shall be 0.490-0.510

²Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emission appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000MHz, Compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

10.4.Configuration of EUT on Measurement

The equipment is installed on Radiated Emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

10.5. Test Procedure

The EUT and its simulators are placed on a turntable, which is 0.8 meter high above ground (Below 1GHz). The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground (Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for Quasi-peak at frequency below 1GHz.
2. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
4. All modes of operation were investigated and the worst-case emissions are reported.

10.6. Data Sample

Frequency (MHz)	Reading (dB μ v)	Factor (dB/m)	Result (dB μ v/m)	Limit (dB μ v/m)	Margin (dB)	Remark
X.XX	48.69	-13.35	35.34	46	-10.66	QP

Frequency(MHz) = Emission frequency in MHz

Reading(dB μ v) = Uncorrected Analyzer/Receiver reading

Factor (dB/m) = Antenna factor + Cable Loss – Amplifier gain

Result(dB μ v/m) = Reading(dB μ v) + Factor(dB/m)

Limit (dB μ v/m) = Limit stated in standard

Margin (dB) = Result(dB μ v/m) - Limit (dB μ v/m)

QP = Quasi-peak Reading

Calculation Formula:

Margin(dB) = Result (dB μ V/m)–Limit(dB μ V/m)

Result(dB μ V/m)= Reading(dB μ V)+ Factor(dB/m)

The “Margin” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the limit.

10.7.The Field Strength of Radiation Emission Measurement Results

Note: 1.We tested GFSK mode, $\Pi/4$ -DQPSK Mode & 8QPSK mode and recorded the worst case data (GFSK mode) for all test mode.

The spectrum analyzer plots are attached as below.

9kHz-30MHz test data

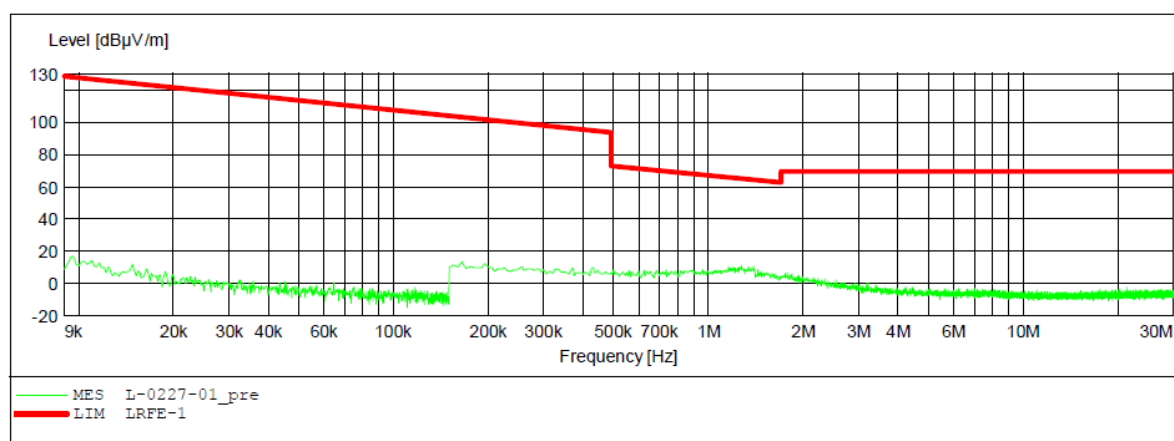
ACCURATE TECHNOLOGY CO., LTD

FCC Class B 3M Radiated

EUT: Portable Bluetooth Speaker M/N: NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: TX 2402MHz (Bluetooth)
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: X
 Start of Test: 2018-2-27 /

SCAN TABLE: "LFRE Fin"

Short Description:			_SUB STD VTERM2 1.70				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer	
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M	
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M	



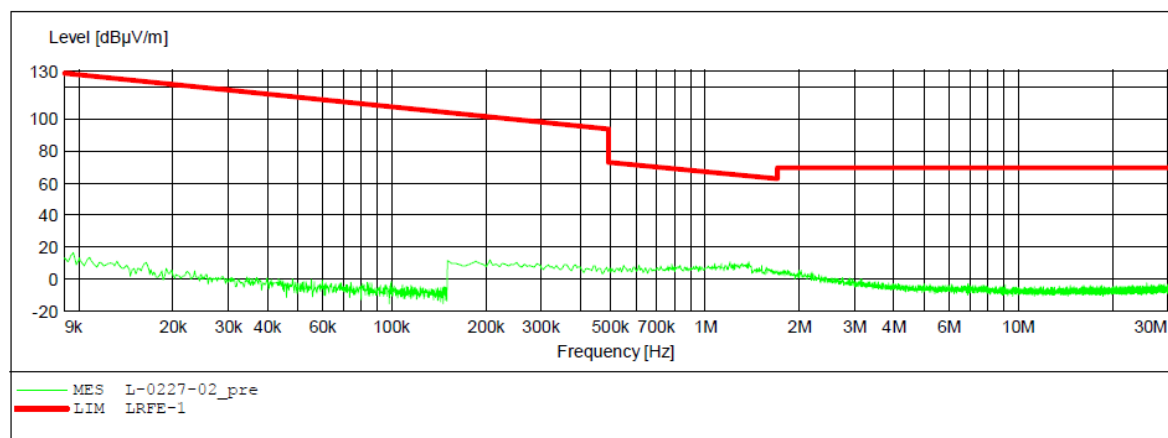
ACCURATE TECHNOLOGY CO., LTD

FCC Class B 3M Radiated

EUT: Portable Bluetooth Speaker M/N: NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: TX 2402MHz (Bluetooth)
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Y
 Start of Test: 2018-2-27 /

SCAN TABLE: "LFRE Fin"

Short Description:			_SUB_STD_VTERM2 1.70			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



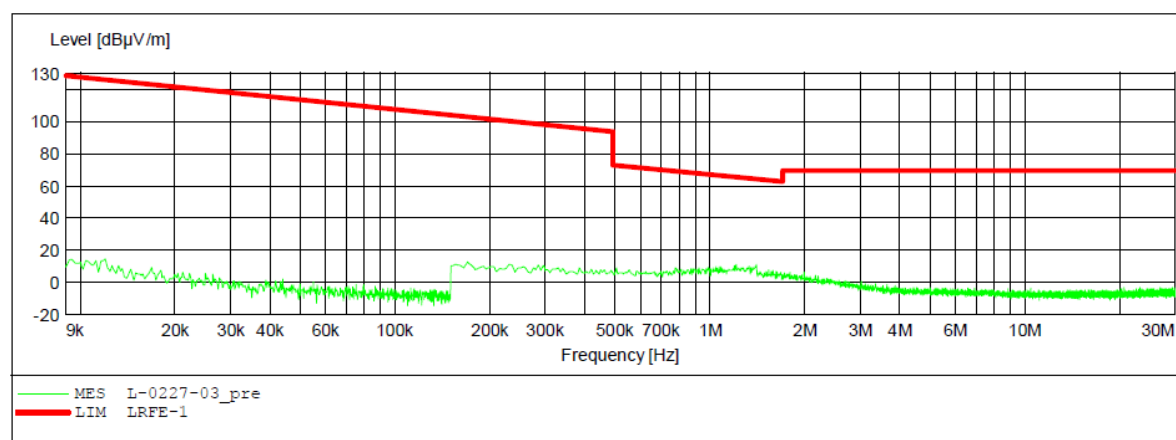
ACCURATE TECHNOLOGY CO., LTD

FCC Class B 3M Radiated

EUT: Portable Bluetooth Speaker M/N: NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: TX 2402MHz (Bluetooth)
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Z
 Start of Test: 2018-2-27 /

SCAN TABLE: "LFRE Fin"

Short Description:			_SUB_STD_VTERM2 1.70				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer	
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M	
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M	



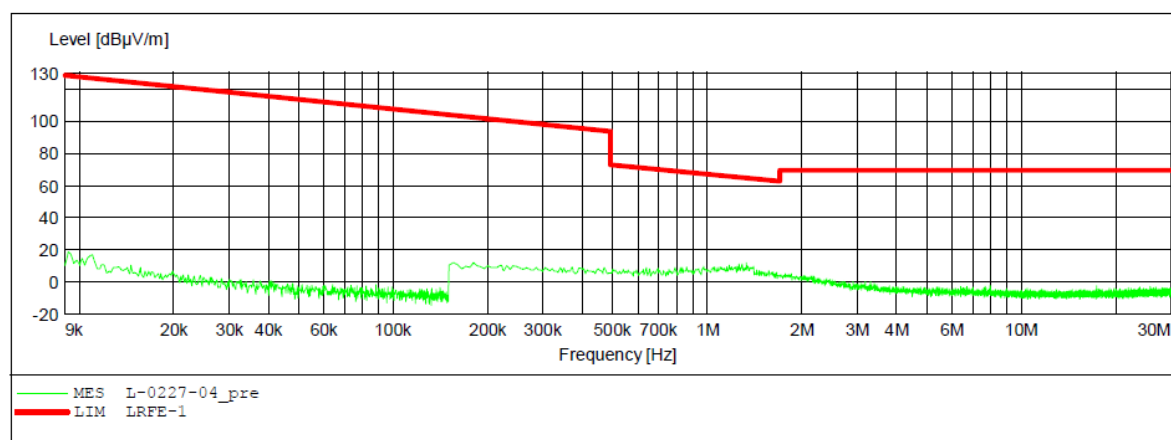
ACCURATE TECHNOLOGY CO.,LTD

FCC Class B 3M Radiated

EUT: Portable Bluetooth Speaker M/N:NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: TX 2441MHz (Bluetooth)
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: X
 Start of Test: 2018-2-27 /

SCAN TABLE: "LFRE Fin"

Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



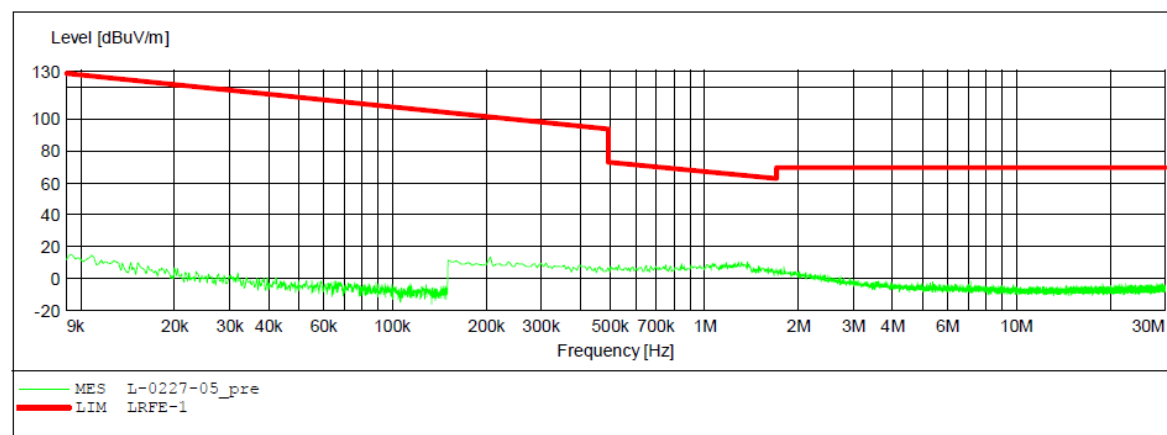
ACCURATE TECHNOLOGY CO., LTD

FCC Class B 3M Radiated

EUT: Portable Bluetooth Speaker M/N: NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: TX 2441MHz (Bluetooth)
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Y
 Start of Test: 2018-2-27 /

SCAN TABLE: "LFRE Fin"

Short Description:			_SUB_STD_VTERM2 1.70				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer	
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M	
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M	



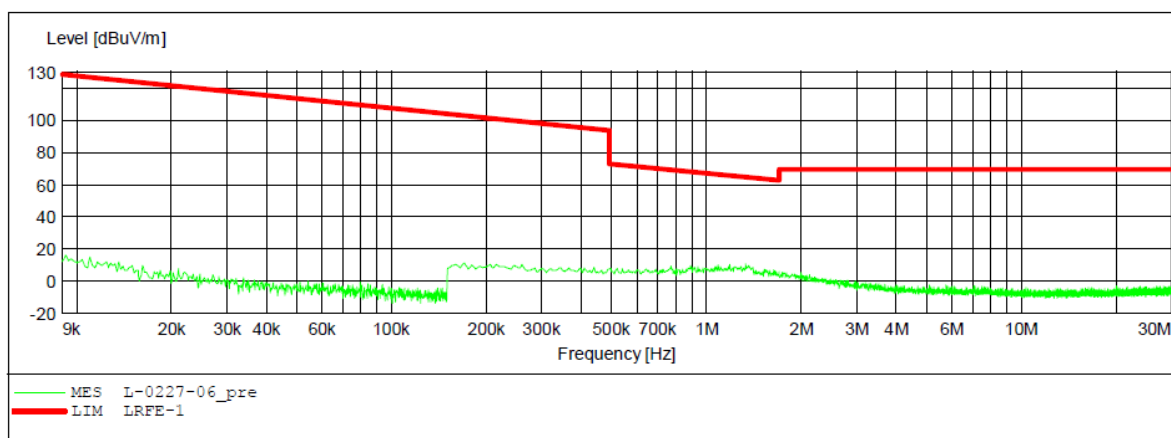
ACCURATE TECHNOLOGY CO., LTD

FCC Class B 3M Radiated

EUT: Portable Bluetooth Speaker M/N: NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: TX 2441MHz (Bluetooth)
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Z
 Start of Test: 2018-2-27 /

SCAN TABLE: "LFRE Fin"

Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M



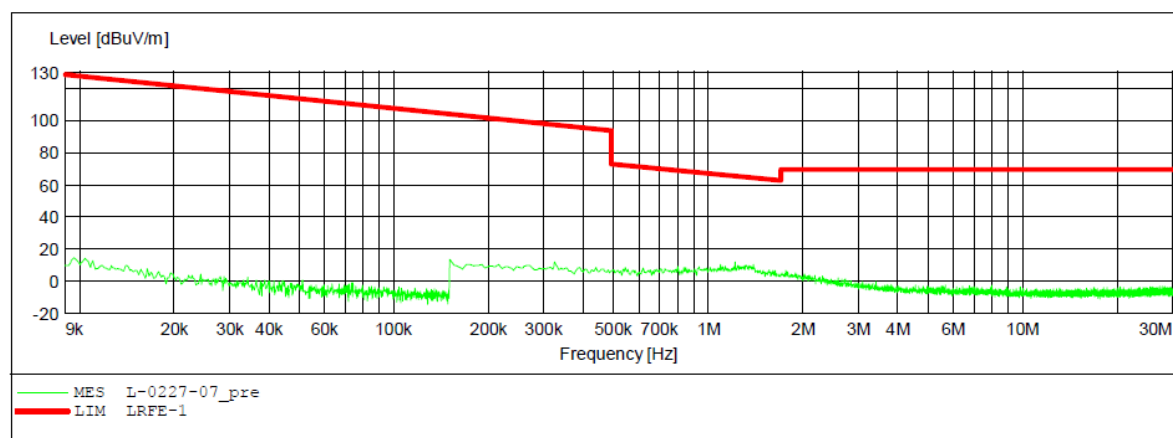
ACCURATE TECHNOLOGY CO., LTD

FCC Class B 3M Radiated

EUT: Portable Bluetooth Speaker M/N: NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: TX 2480MHz (Bluetooth)
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: X
 Start of Test: 2018-2-27 /

SCAN TABLE: "LFRE Fin"

Short Description:			_SUB_STD_VTERM2 1.70				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer	
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M	
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M	



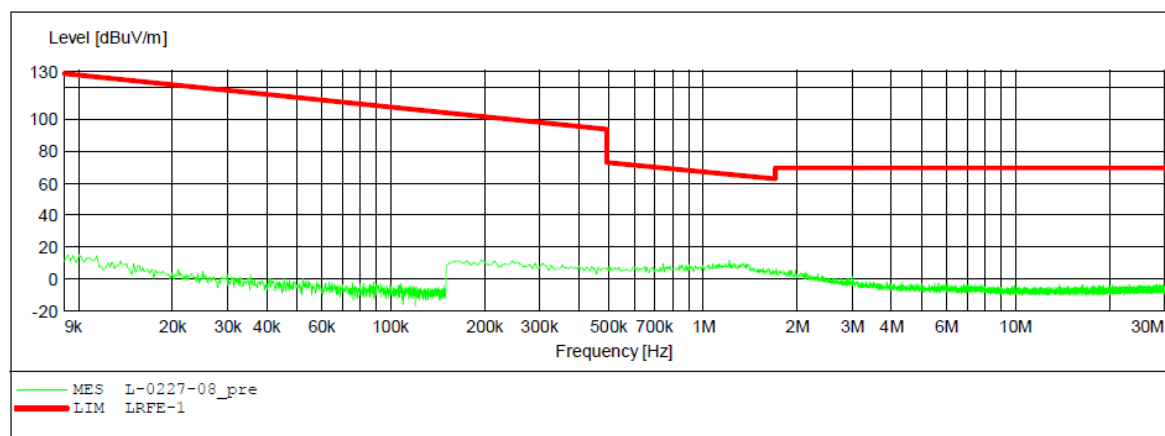
ACCURATE TECHNOLOGY CO., LTD

FCC Class B 3M Radiated

EUT: Portable Bluetooth Speaker M/N: NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: TX 2480MHz (Bluetooth)
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Y
 Start of Test: 2018-2-27 /

SCAN TABLE: "LFRE Fin"

Short Description:			_SUB_STD_VTERM2 1.70				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer	
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M	
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M	



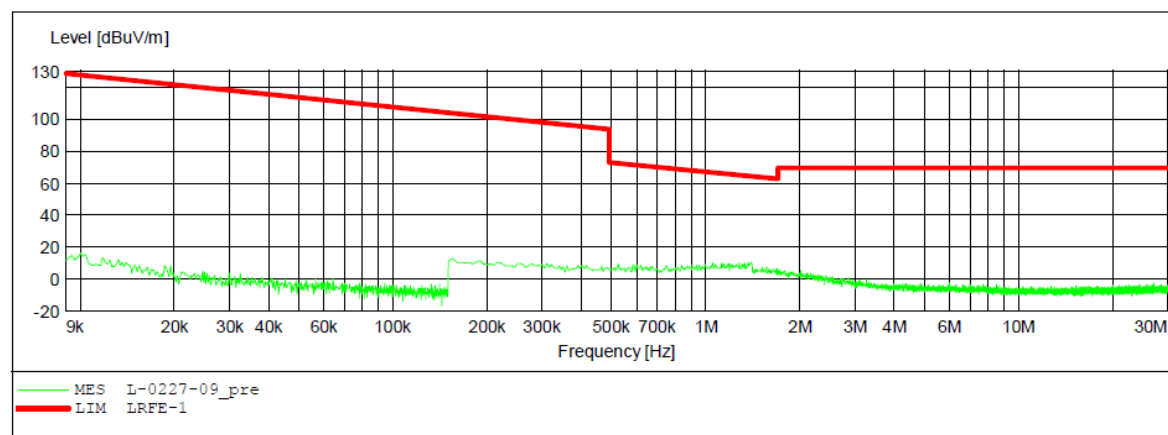
ACCURATE TECHNOLOGY CO., LTD

FCC Class B 3M Radiated

EUT: Portable Bluetooth Speaker M/N: NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: TX 2480MHz (Bluetooth)
 Test Site: 2# Chamber
 Operator: WADE
 Test Specification: DC 3.7V
 Comment: Z
 Start of Test: 2018-2-27 /

SCAN TABLE: "LFRE Fin"

Short Description:			_SUB_STD_VTERM2 1.70				
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer	
9.0 kHz	150.0 kHz	100.0 Hz	QuasiPeak	1.0 s	200 Hz	1516M	
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak	1.0 s	9 kHz	1516M	



30MHz-1000MHz test data



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Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2018 #480

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2402MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

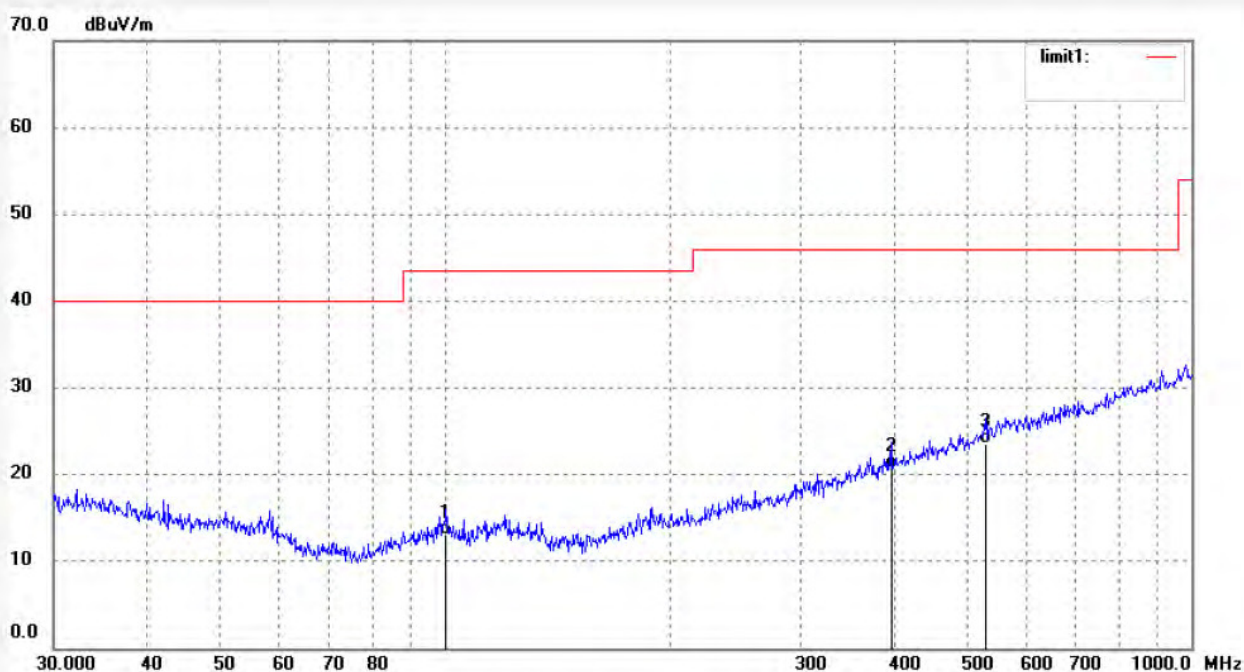
Date: 18/02/09/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	100.5806	26.10	-13.14	12.96	43.50	-30.54	QP			
2	396.2414	27.32	-6.59	20.73	46.00	-25.27	QP			
3	530.1014	27.27	-3.67	23.60	46.00	-22.40	QP			

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Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2018 #479

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2402MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

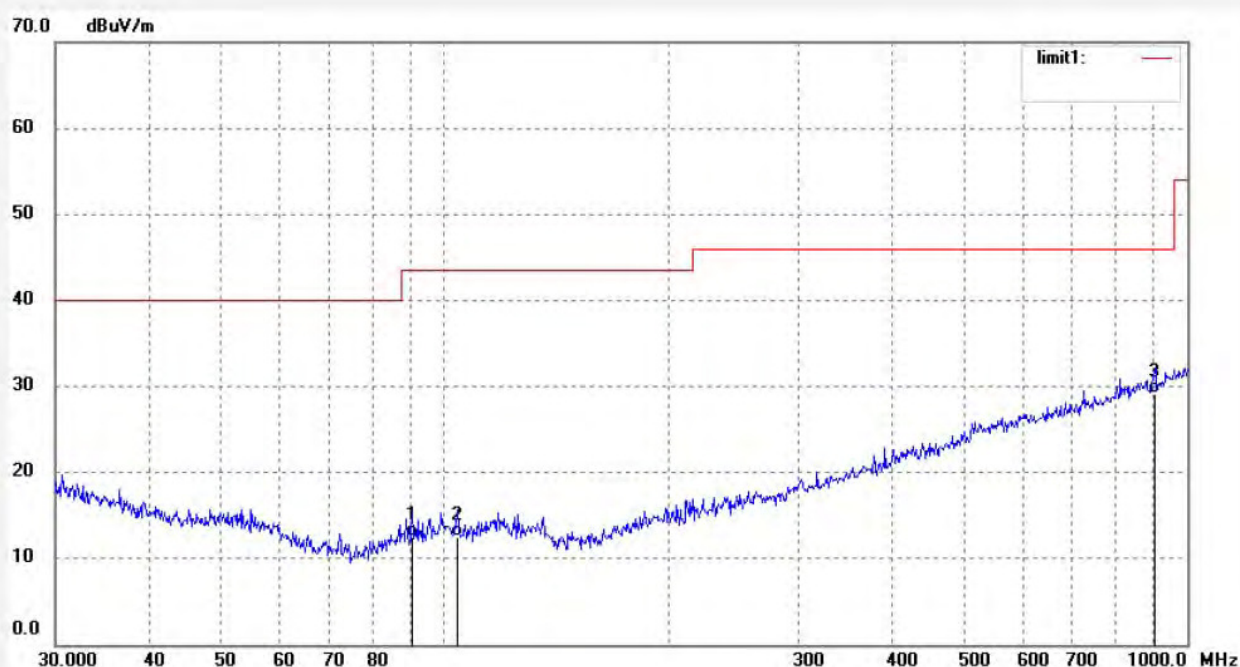
Date: 18/02/09/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	90.5374	27.58	-14.98	12.60	43.50	-30.90	QP			
2	104.1701	26.32	-13.73	12.59	43.50	-30.91	QP			
3	903.3093	26.92	2.20	29.12	46.00	-16.88	QP			



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Job No.: LGW2018 #481

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2441MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

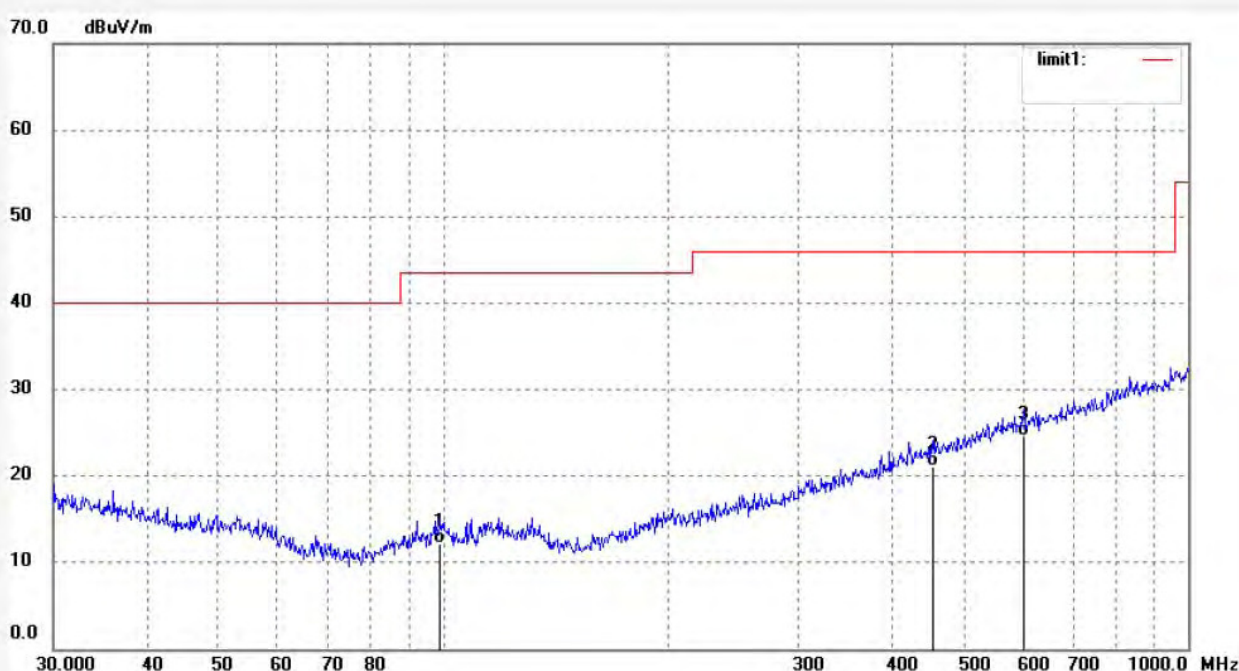
Date: 18/02/09/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	99.1796	25.43	-13.33	12.10	43.50	-31.40	QP			
2	454.3100	26.33	-5.28	21.05	46.00	-24.95	QP			
3	601.4265	26.95	-2.37	24.58	46.00	-21.42	QP			

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Job No.: LGW2018 #482

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2441MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

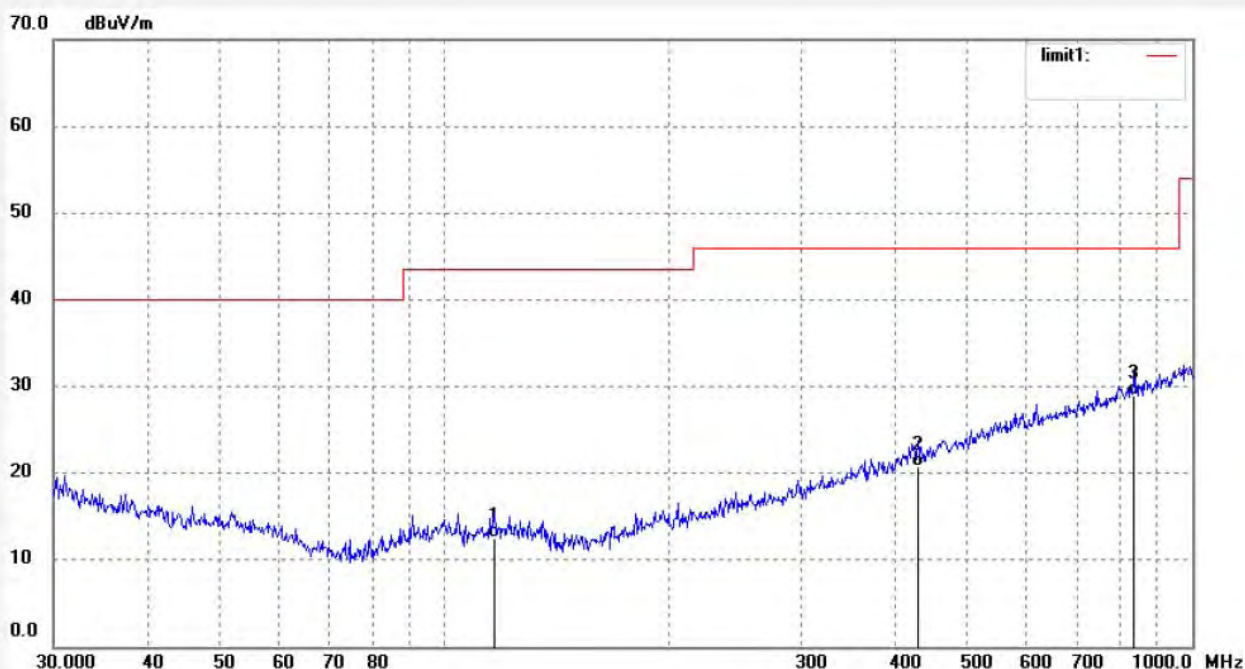
Date: 18/02/09/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	116.5400	25.63	-13.06	12.57	43.50	-30.93	QP			
2	429.5228	26.34	-5.64	20.70	46.00	-25.30	QP			
3	836.2441	27.46	1.45	28.91	46.00	-17.09	QP			

Job No.: LGW2018 #484

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2480MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

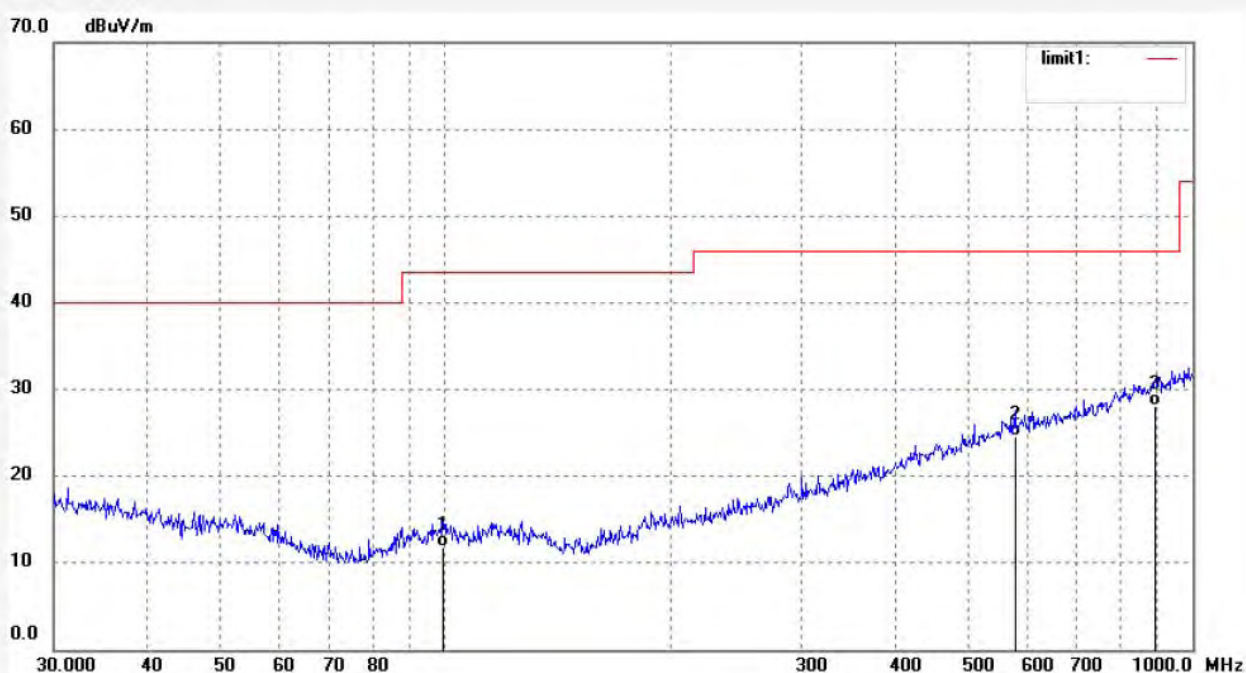
Date: 18/02/09/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	99.5279	25.05	-13.21	11.84	43.50	-31.66	QP			
2	578.6698	27.20	-2.56	24.64	46.00	-21.36	QP			
3	890.7278	26.00	2.16	28.16	46.00	-17.84	QP			

Job No.: LGW2018 #483

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2480MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

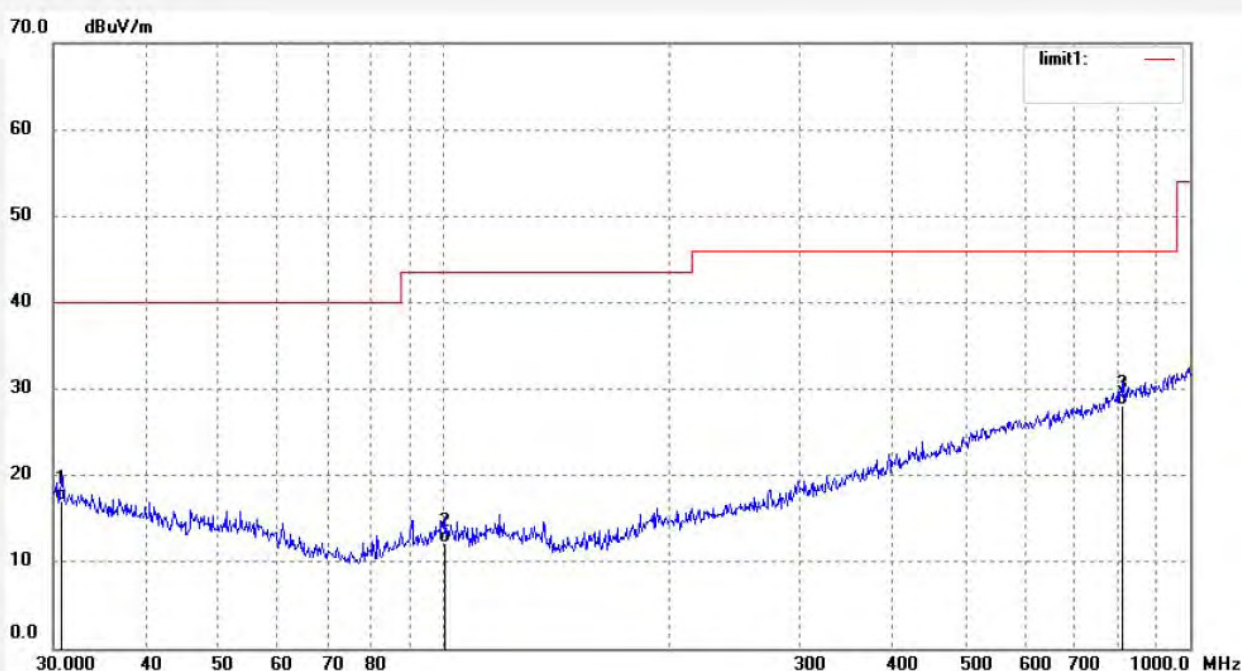
Date: 18/02/09/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



1GHz-18GHz test data



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Job No.: LGW2018 #447

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2402MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

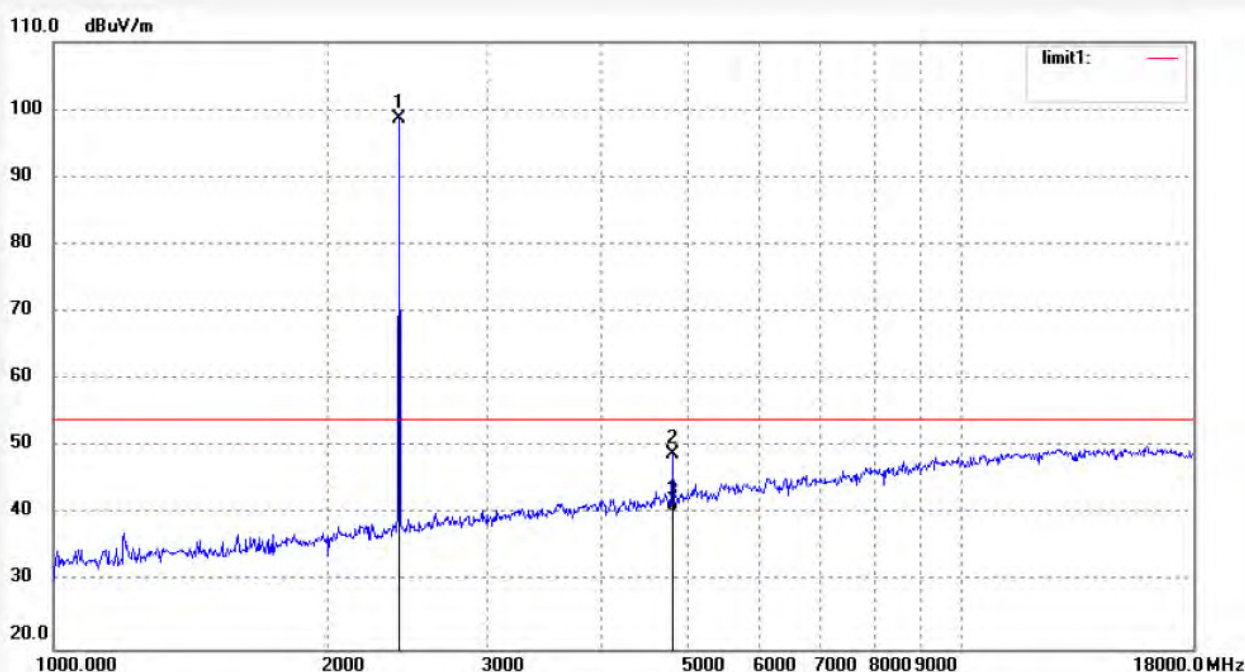
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.000	97.84	0.89	98.73	/	/	peak			
2	4804.024	41.54	7.40	48.94	74.00	-25.06	peak			
3	4804.024	32.95	7.40	40.35	54.00	-13.65	AVG			

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Job No.: LGW2018 #448

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2402MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

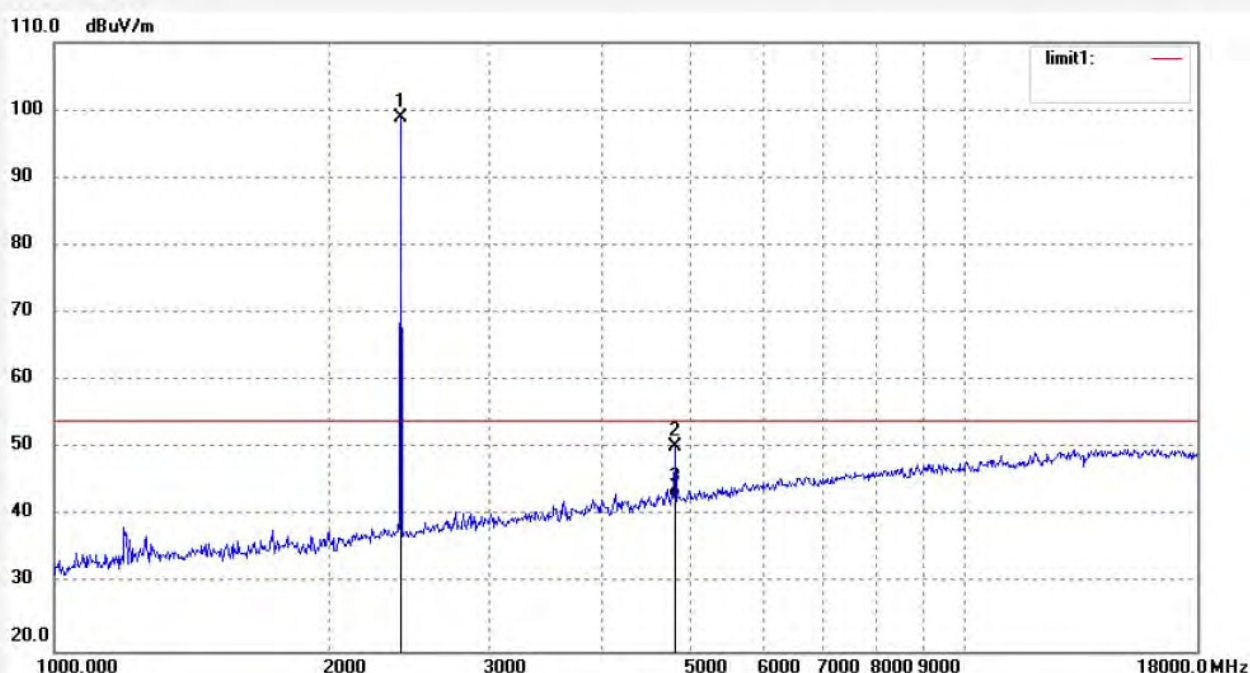
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.000	97.95	0.89	98.84	/	/	peak			
2	4804.025	42.86	7.40	50.26	74.00	-23.74	peak			
3	4804.025	35.14	7.40	42.54	54.00	-11.46	AVG			



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Job No.: LGW2018 #451

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2441MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

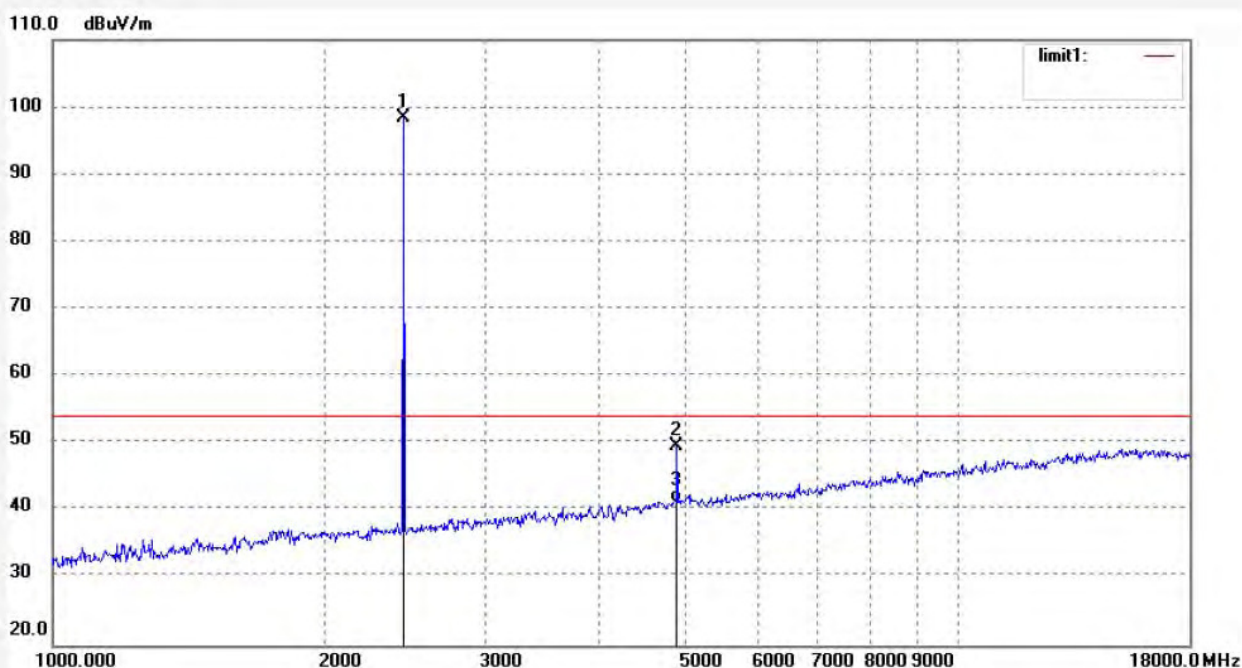
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2441.000	97.41	1.06	98.47	/	/	peak			
2	4882.026	41.49	8.11	49.60	74.00	-24.40	peak			
3	4882.026	33.14	8.11	41.25	54.00	-12.75	AVG			



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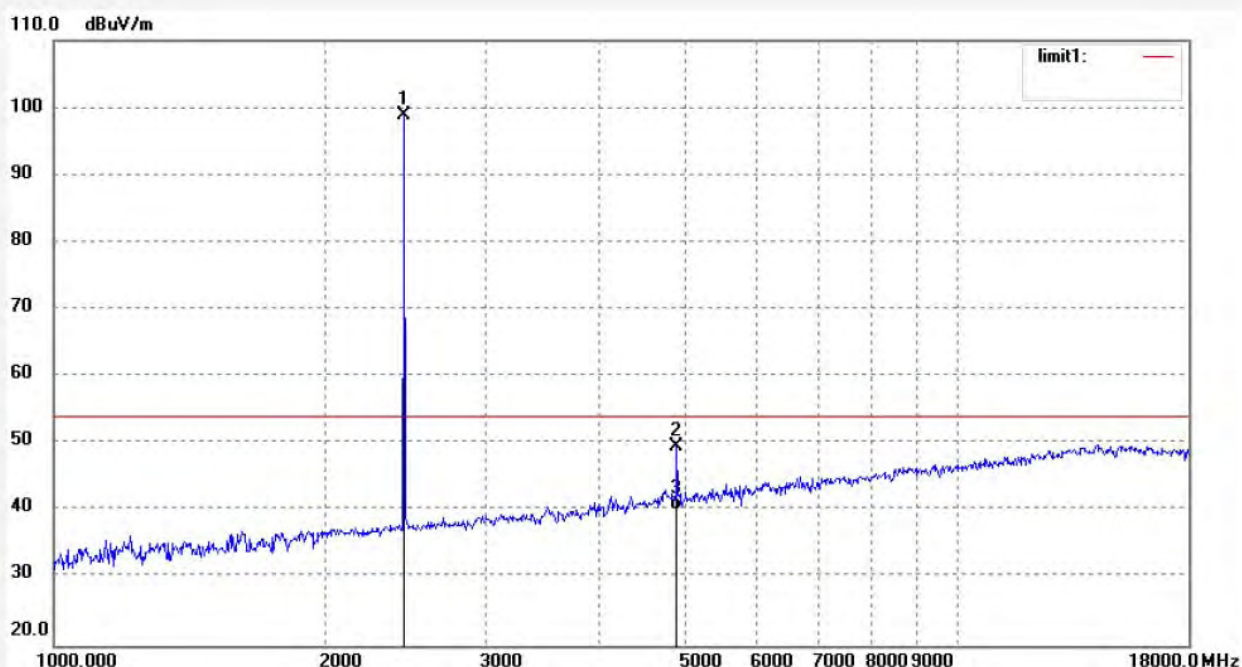
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Site: 2# Chamber
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Job No.: LGW2018 #452
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Portable Bluetooth Speaker
Mode: TX 2441MHz
Model: NS-SPBTWAVE2-BK
Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical
Power Source: DC 3.7V
Date: 18/02/08/
Time:
Engineer Signature: WADE
Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2441.000	97.83	1.06	98.89	/	/	peak			
2	4882.027	41.43	8.11	49.54	74.00	-24.46	peak			
3	4882.027	32.13	8.11	40.24	54.00	-13.76	AVG			

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Job No.: LGW2018 #454

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2480MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

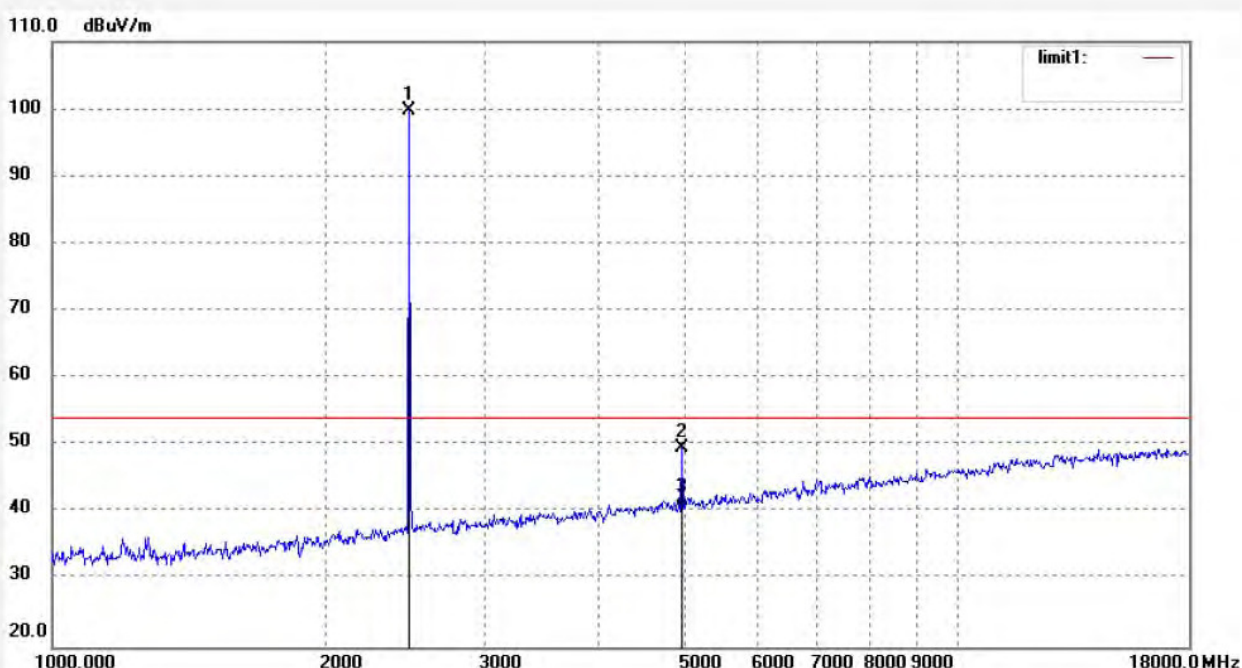
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	98.62	1.10	99.72	/	/	peak			
2	4960.027	41.04	8.60	49.64	74.00	-24.36	peak			
3	4960.027	31.97	8.60	40.57	54.00	-13.43	AVG			

Job No.: LGW2018 #453

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2480MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

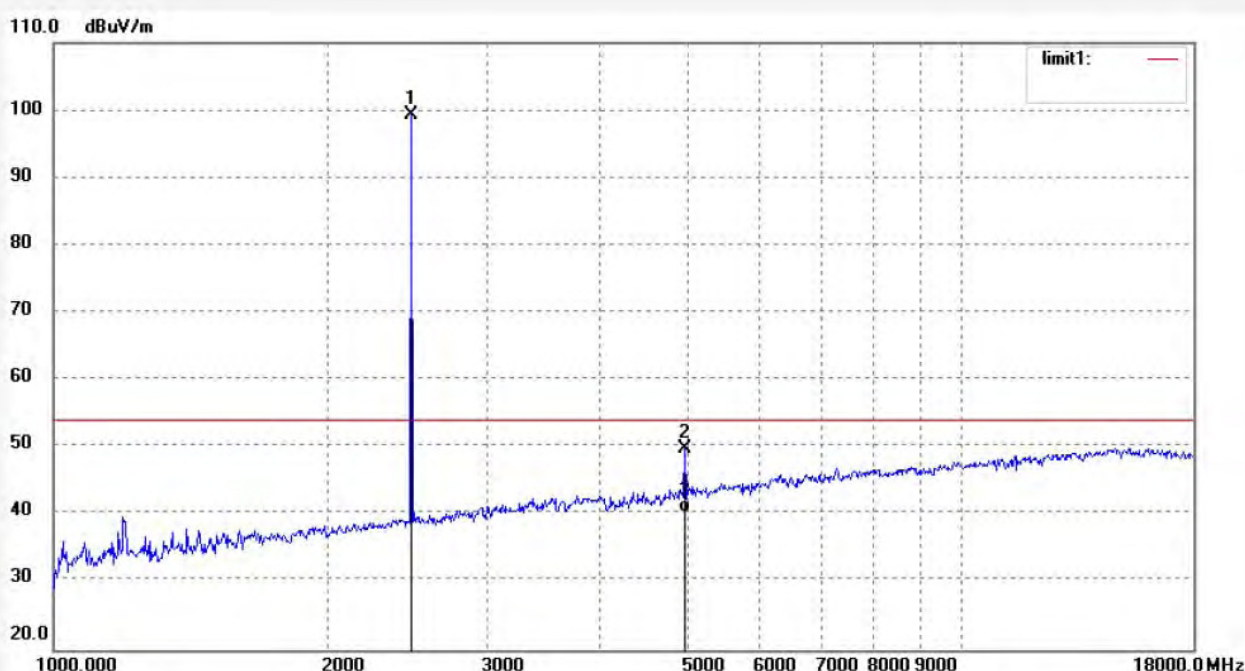
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.000	98.17	1.10	99.27	/	/	peak			
2	4960.028	41.16	8.60	49.76	74.00	-24.24	peak			
3	4960.028	31.67	8.60	40.27	54.00	-13.73	AVG			

18GHz-26.5GHz test data



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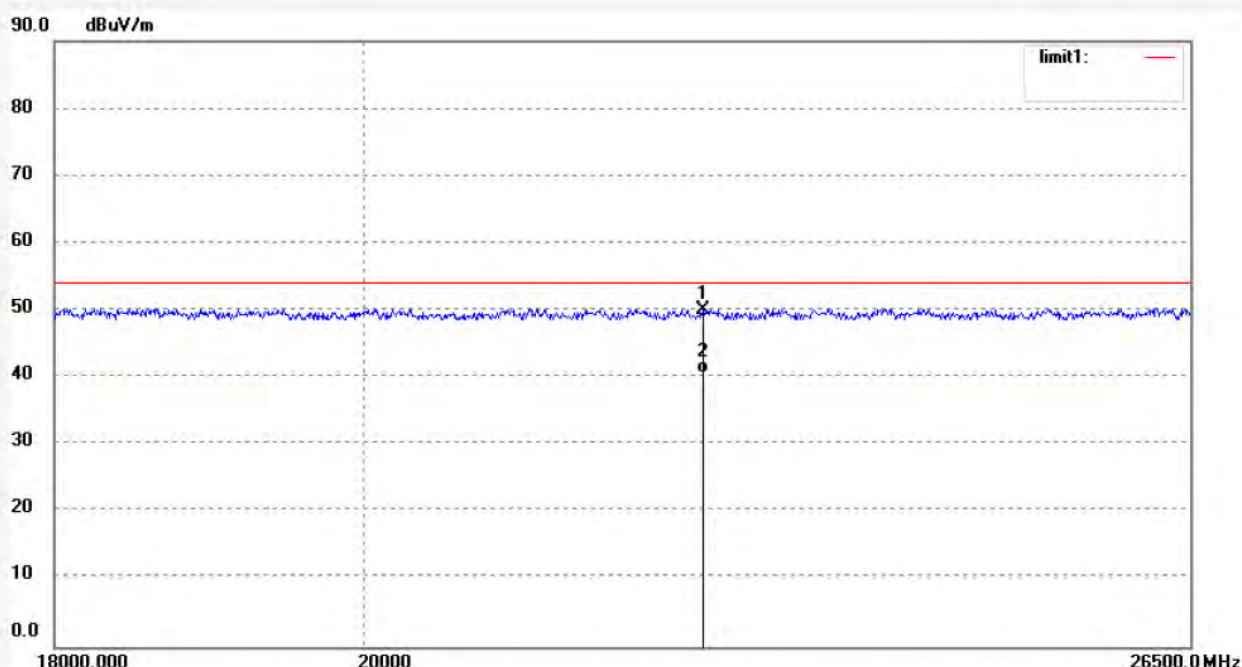
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Job No.: LGW2018 #458
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT: Portable Bluetooth Speaker
Mode: TX 2402MHz
Model: NS-SPBTWAVE2-BK
Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Horizontal
Power Source: DC 3.7V
Date: 18/02/08/
Time:
Engineer Signature: WADE
Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	22448.395	10.30	39.79	50.09	74.00	-23.91	peak			
2	22448.395	0.78	39.79	40.57	54.00	-13.43	AVG			

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Job No.: LGW2018 #457

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2402MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

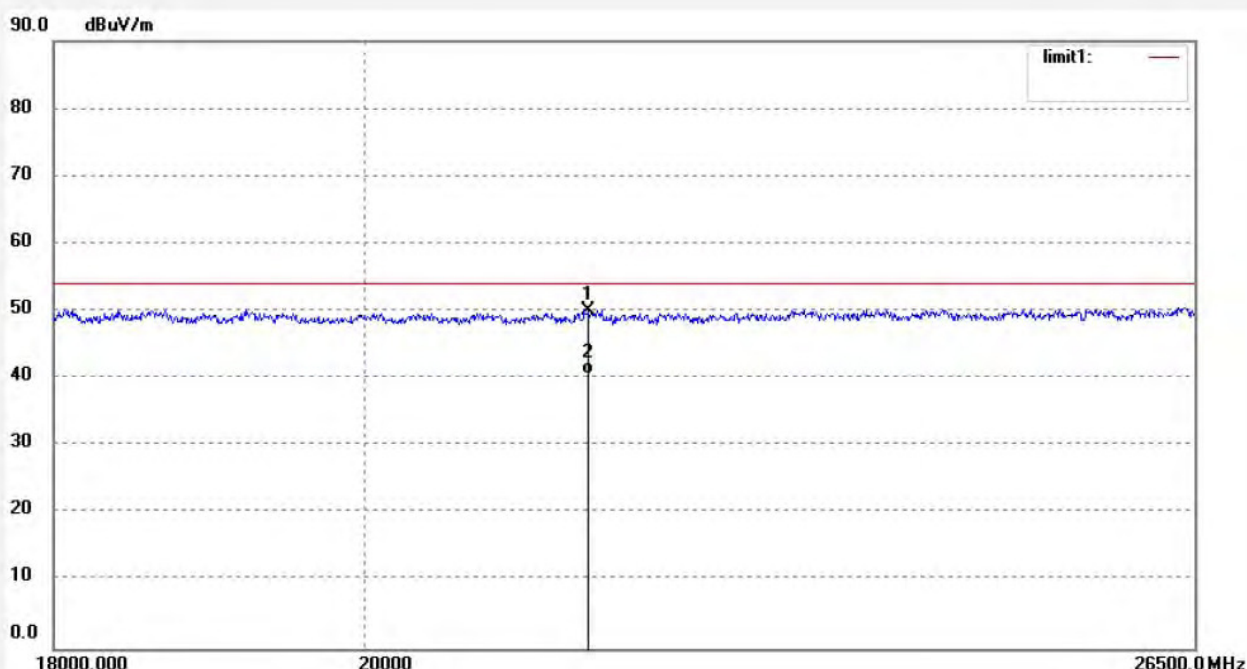
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	21580.029	10.83	39.26	50.09	74.00	-23.91	peak			
2	21580.029	1.38	39.26	40.64	54.00	-13.36	AVG			

Job No.: LGW2018 #459

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2441MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

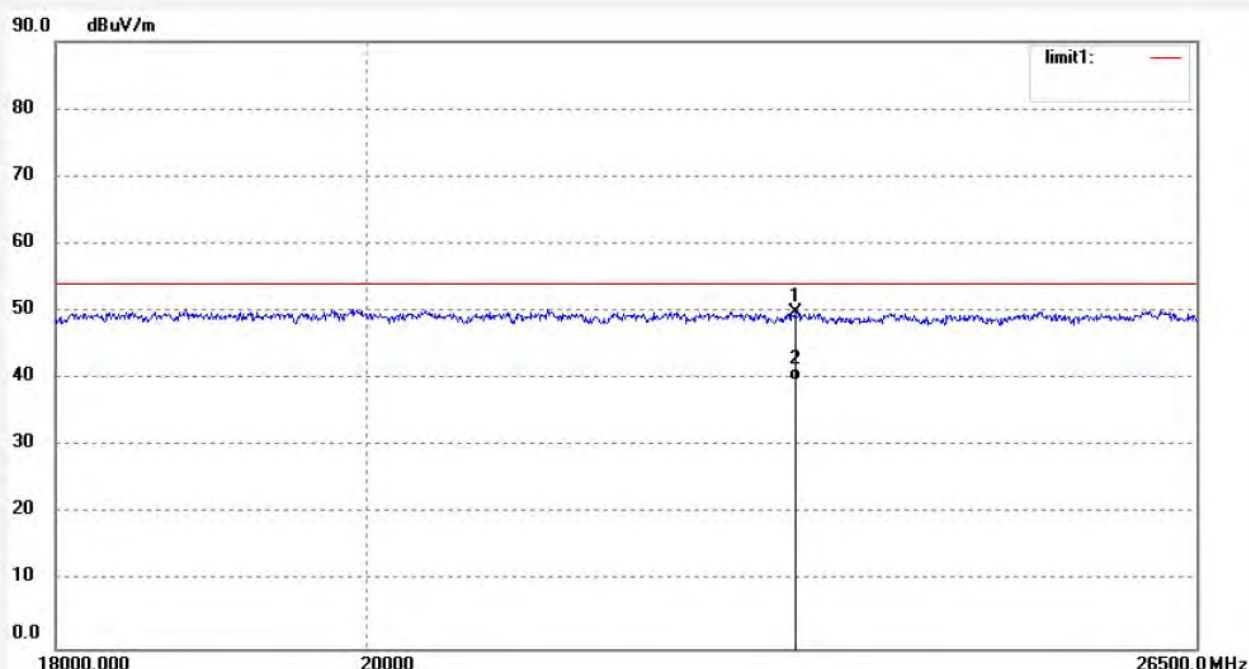
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	23126.997	10.04	39.69	49.73	74.00	-24.27	peak			
2	23126.997	-0.04	39.69	39.65	54.00	-14.35	AVG			

Job No.: LGW2018 #460

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2441MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

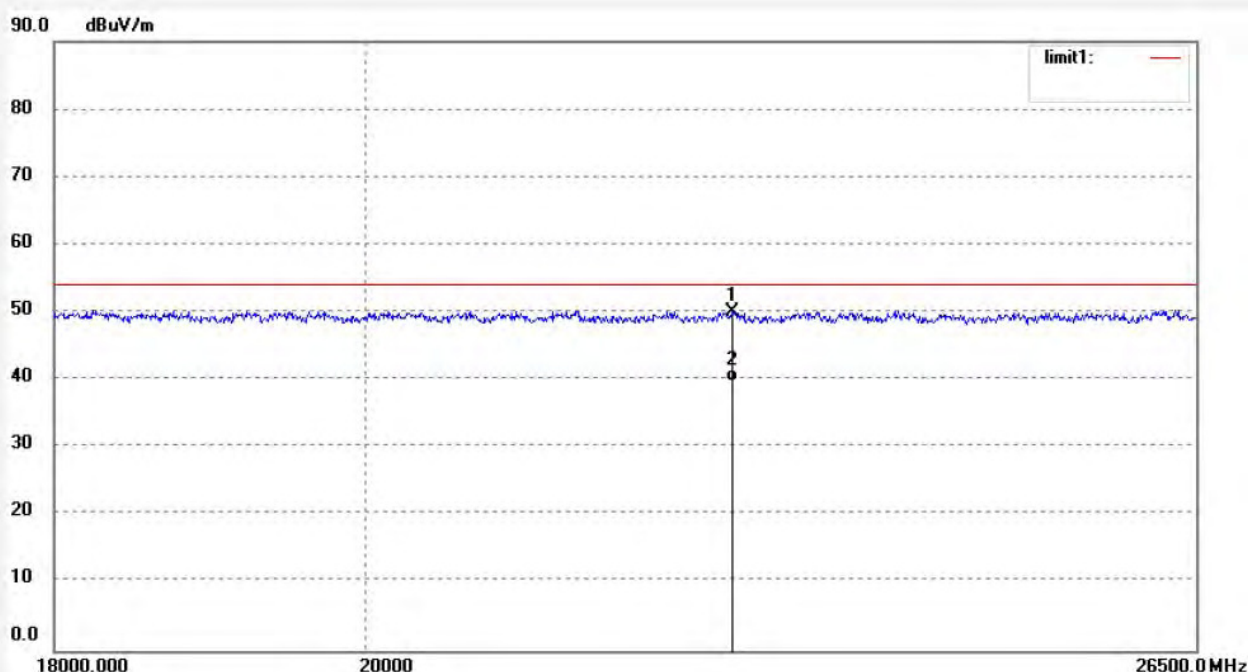
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	22648.982	10.48	39.51	49.99	74.00	-24.01	peak			
2	22648.982	0.10	39.51	39.61	54.00	-14.39	AVG			

Job No.: LGW2018 #462

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2480MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

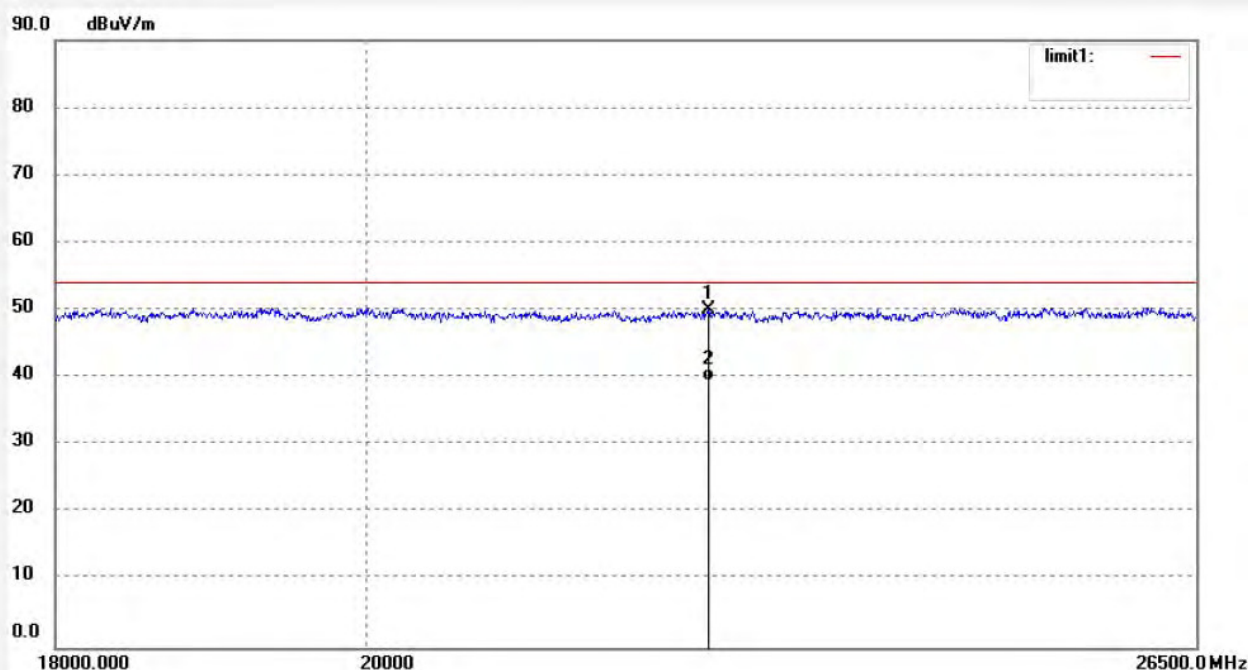
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	22465.767	10.14	39.81	49.95	74.00	-24.05	peak			
2	22465.767	-0.40	39.81	39.41	54.00	-14.59	AVG			

Job No.: LGW2018 #461

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2480MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

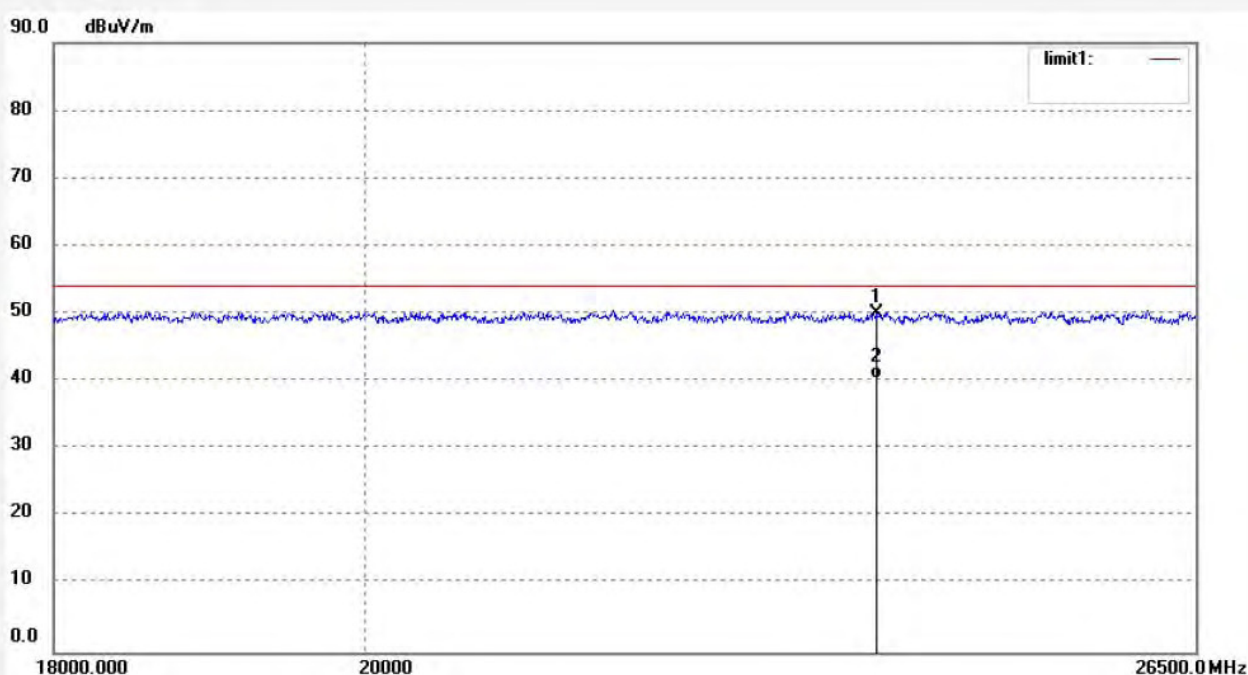
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

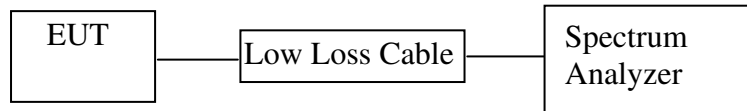
Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	23789.280	10.31	39.71	50.02	74.00	-23.98	peak			
2	23789.280	0.61	39.71	40.32	54.00	-13.68	AVG			

11.BAND EDGE COMPLIANCE TEST

11.1.Block Diagram of Test Setup



(EUT:Portable Bluetooth Speaker)

11.2.The Requirement For Section 15.247(d)

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, 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, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

11.3.EUT Configuration on Measurement

The equipment are installed on the emission Measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

11.4.Operating Condition of EUT

11.4.1.Setup the EUT and simulator as shown as Section 11.1.

11.4.2.Turn on the power of all equipment.

11.4.3.Let the EUT work in TX (Hopping off, Hopping on) modes measure it. The transmit frequency are 2402-2480MHz. We select 2402MHz, 2480MHz TX frequency to transmit.

11.5. Test Procedure

11.5.1. The transmitter output was connected to the spectrum analyzer via a low loss cable.

11.5.2. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz with convenient frequency span including 100 kHz bandwidth from band edge.

11.5.3. The band edges was measured and recorded.

11.6. Test Result

Non-hopping mode

Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
BDR mode		
2400.00	45.53	> 20dBc
2486.38	54.80	> 20dBc
EDR mode		
2400.00	45.22	> 20dBc
2483.5	50.19	> 20dBc

Hopping mode

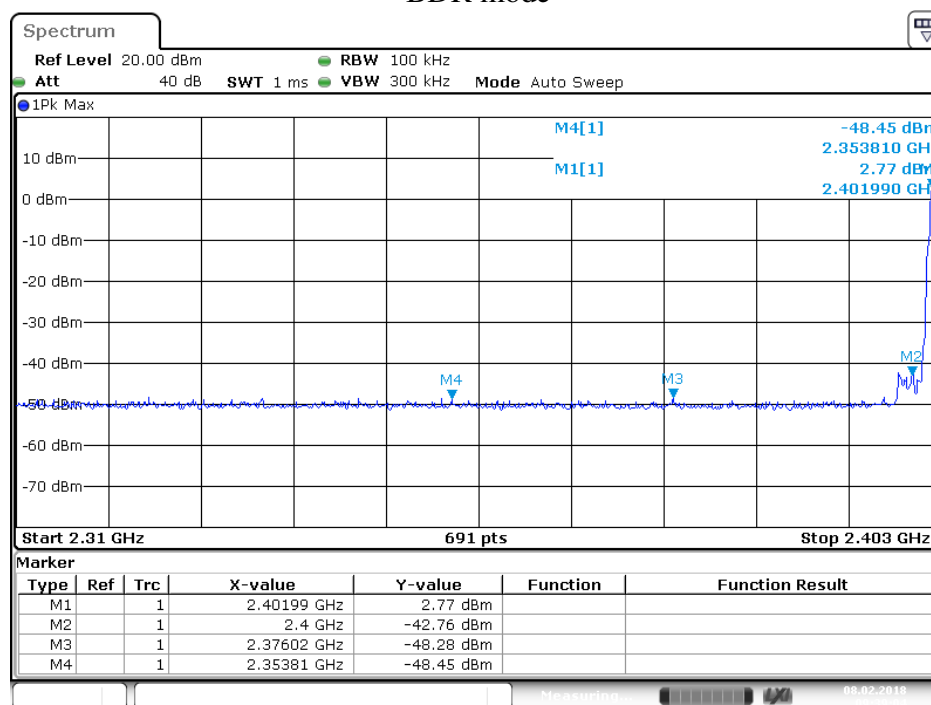
Frequency (MHz)	Result of Band Edge (dBc)	Limit of Band Edge (dBc)
BDR mode		
2361.49	46.50	> 20dBc
2487.73	49.21	> 20dBc
EDR mode		
2363.96	49.56	> 20dBc
2486.76	47.84	> 20dBc

Note: The RF module of the product is the same as the report ATE20180323, so the conduction Band Edge data Reference to report is ATE20180323.

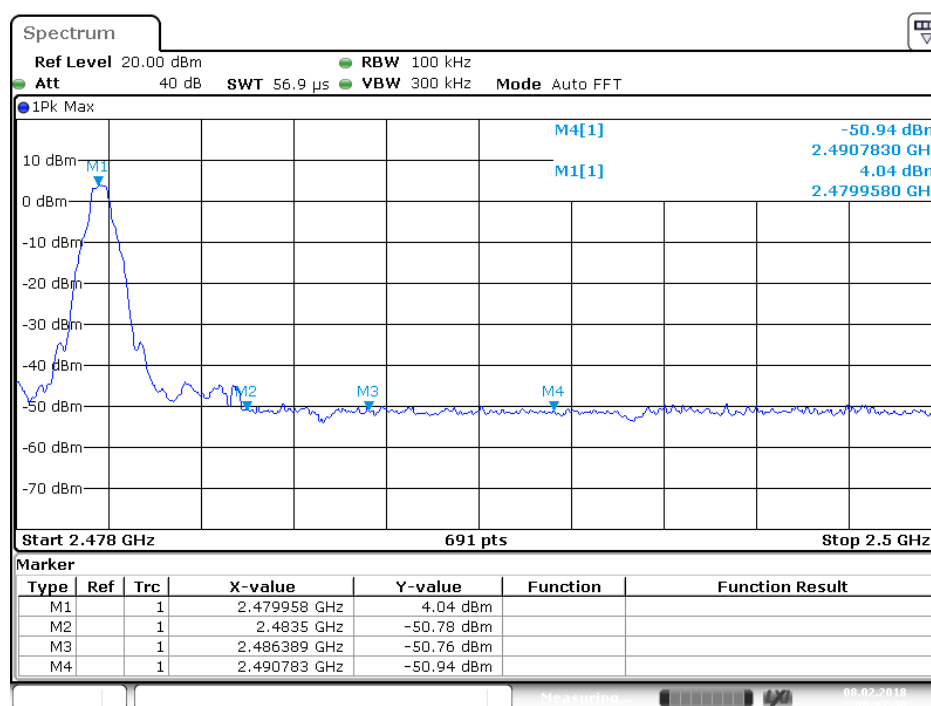
The spectrum analyzer plots are attached as below.

Non-hopping mode

BDR mode

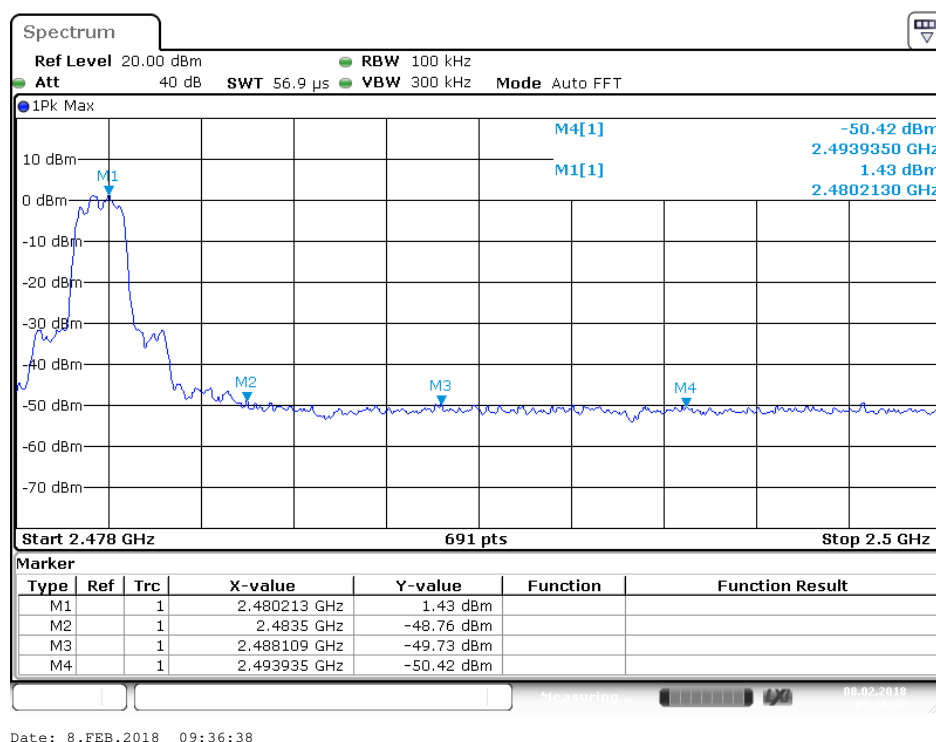
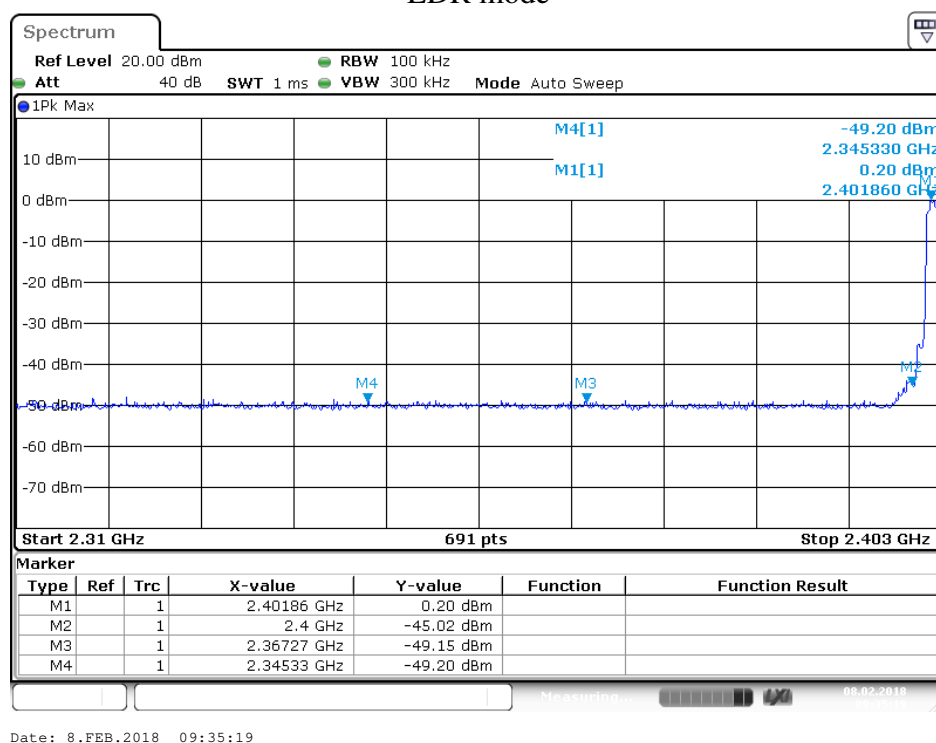


Date: 8.FEB.2018 09:39:04



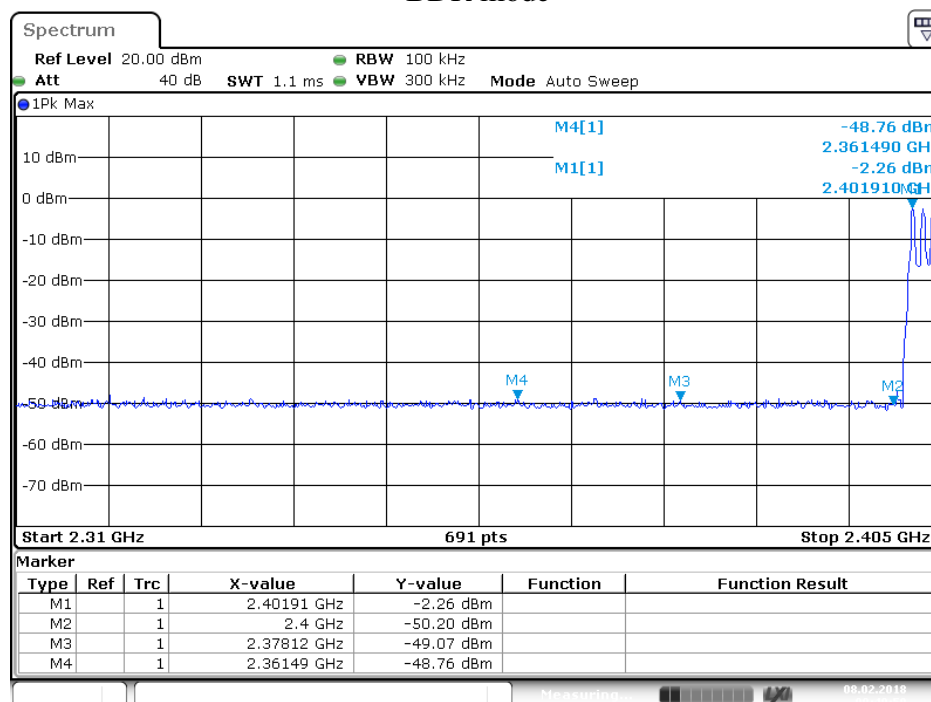
Date: 8.FEB.2018 09:37:40

EDR mode

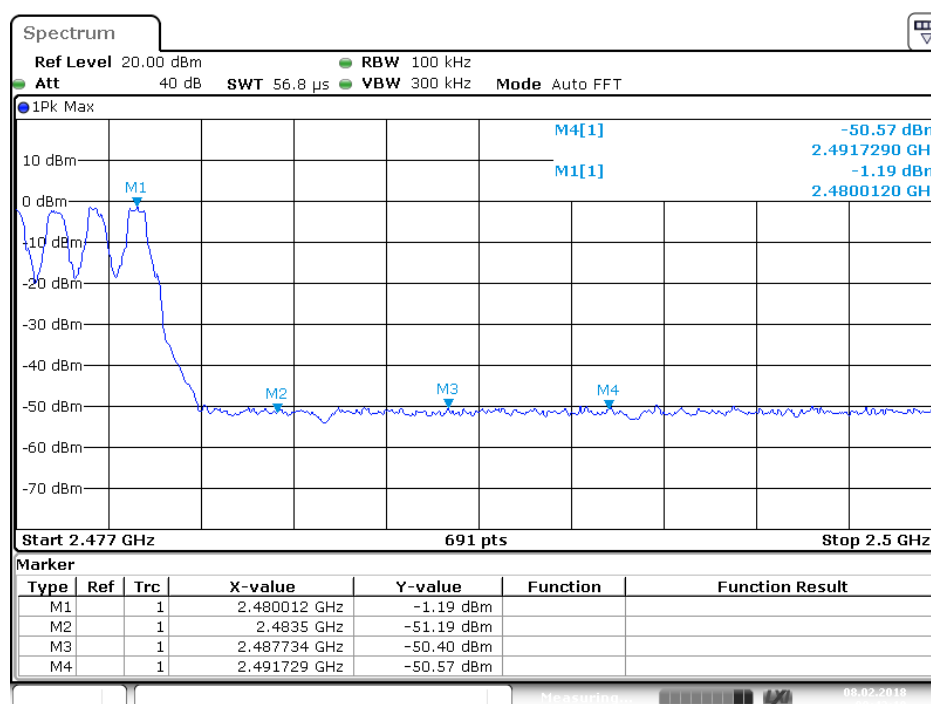


hopping mode

BDR mode

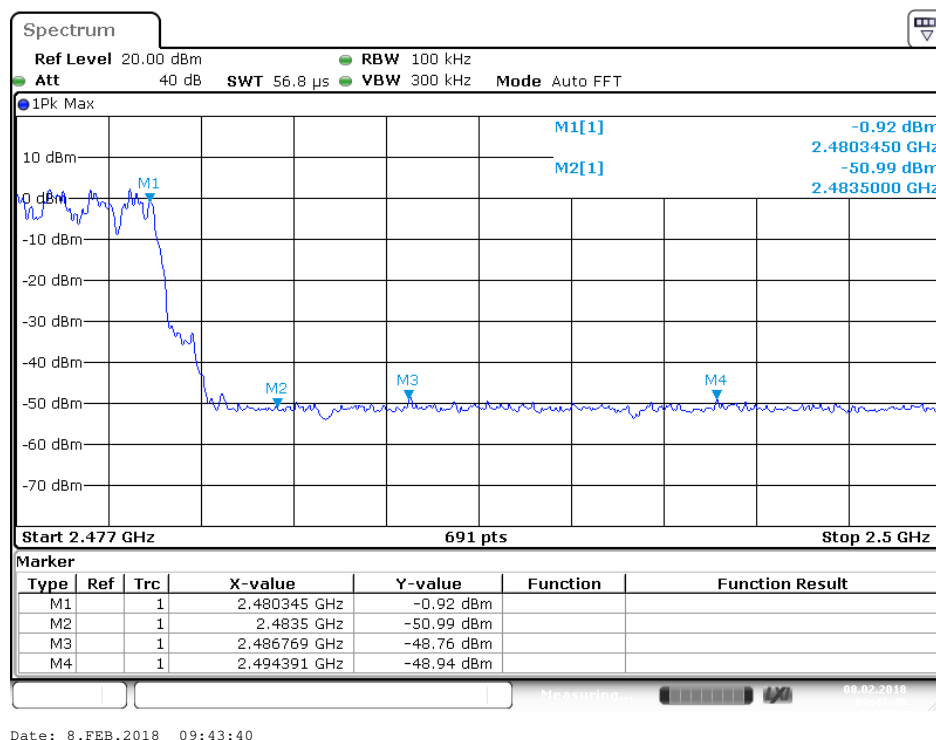
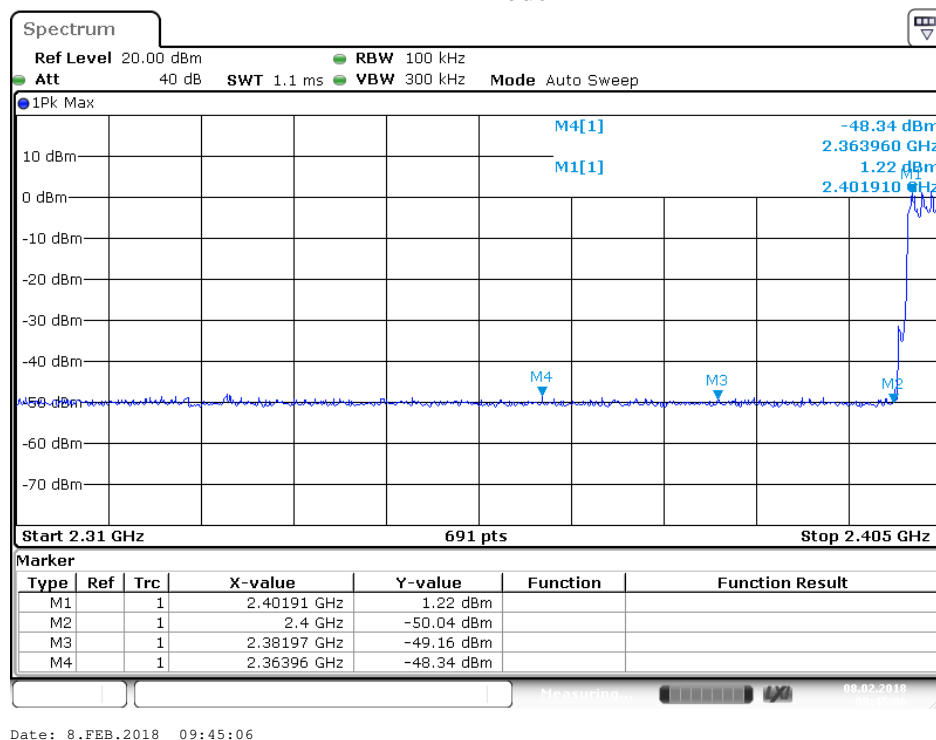


Date: 8.FEB.2018 09:40:59



Date: 8.FEB.2018 09:42:19

EDR mode



Radiated Band Edge Result

Note:

1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

3. Display the measurement of peak values.

Test Procedure:

The EUT and its simulators are placed on a turntable, which is 1.5 meter high above ground(Above 1GHz). The turntable can rotate 360 degrees to determine the position of the maximum emission level. EUT is set 3.0 meters away from the receiving antenna, which is mounted on an antenna tower. The antenna can be moved up and down between 1.0 meter and 4 meters to find out the maximum emission level. Broadband antenna (calibrated bi-log antenna) is used as receiving antenna. Both horizontal and vertical polarizations of the antenna are set on measurement. In order to find the maximum emission levels, all of the EUT location must be manipulated according to ANSI C63.10:2013 on radiated emission measurement. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

Let the EUT work in TX (Hopping off, Hopping on) modes measure it.

We select 2402MHz, 2480MHz TX frequency to transmit(Hopping off mode).

We select 2402-2480MHz TX frequency to transmit(Hopping on mode).

During the radiated emission test, the spectrum analyzer was set with the following configurations:

- 1.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 3MHz for peak measurement with peak detector at frequency above 1GHz.
- 2.The resolution bandwidth of test receiver/spectrum analyzer is 1MHz and video bandwidth is 10Hz for Average measurement with peak detection at frequency above 1GHz.
- 3.All modes of operation were investigated and the worst-case emissions are reported.

Non-hopping mode



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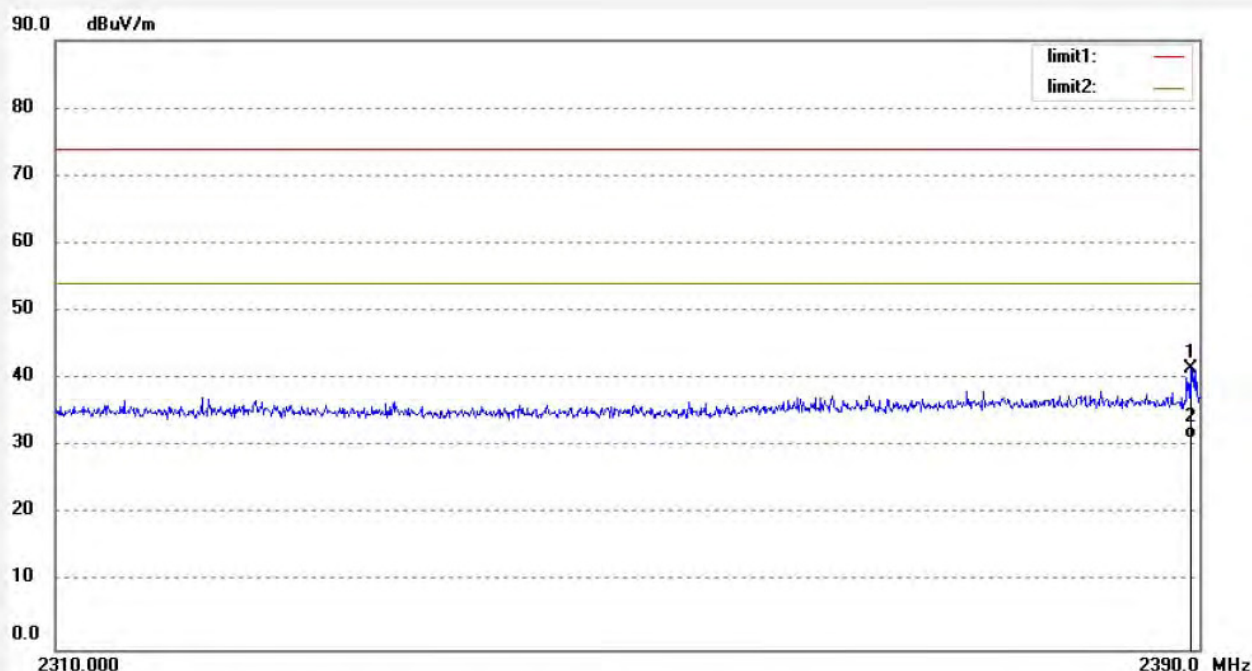
Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2018 #450	Polarization: Horizontal
Standard: FCC (Band Edge)	Power Source: DC 3.7V
Test item: Radiation Test	Date: 18/02/08/
Temp.(C)/Hum.(%) 23 C / 48 %	Time:
EUT: Portable Bluetooth Speaker	Engineer Signature: WADE
Mode: TX 2402MHz	Distance: 3m
Model: NS-SPBTWAVE2-BK	
Manufacturer: Lightcomm Technology Co., Ltd.	

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2389.360	40.79	0.79	41.58	74.00	-32.42	peak			
2	2389.360	30.45	0.79	31.24	54.00	-22.76	AVG			

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Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2018 #449

Standard: FCC (Band Edge)

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2402MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

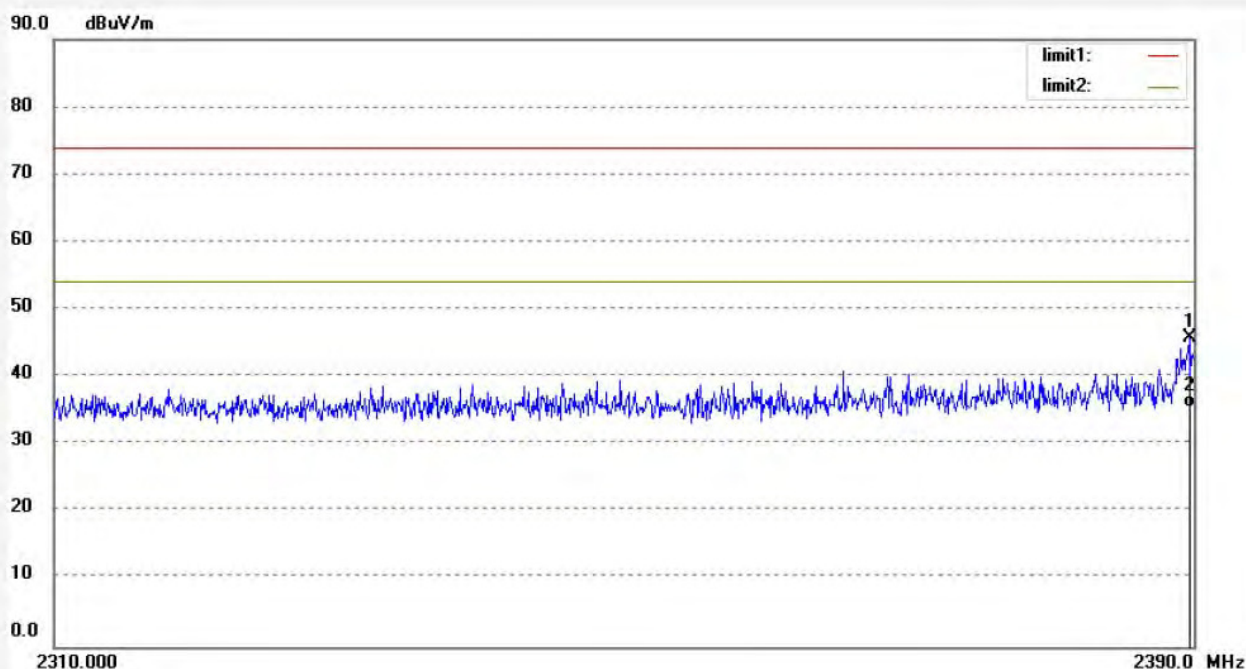
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2389.680	45.05	0.79	45.84	74.00	-28.16	peak			
2	2389.680	34.62	0.79	35.41	54.00	-18.59	AVG			

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Job No.: LGW2018 #455

Standard: FCC (Band Edge)

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2480MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Horizontal

Power Source: DC 3.7V

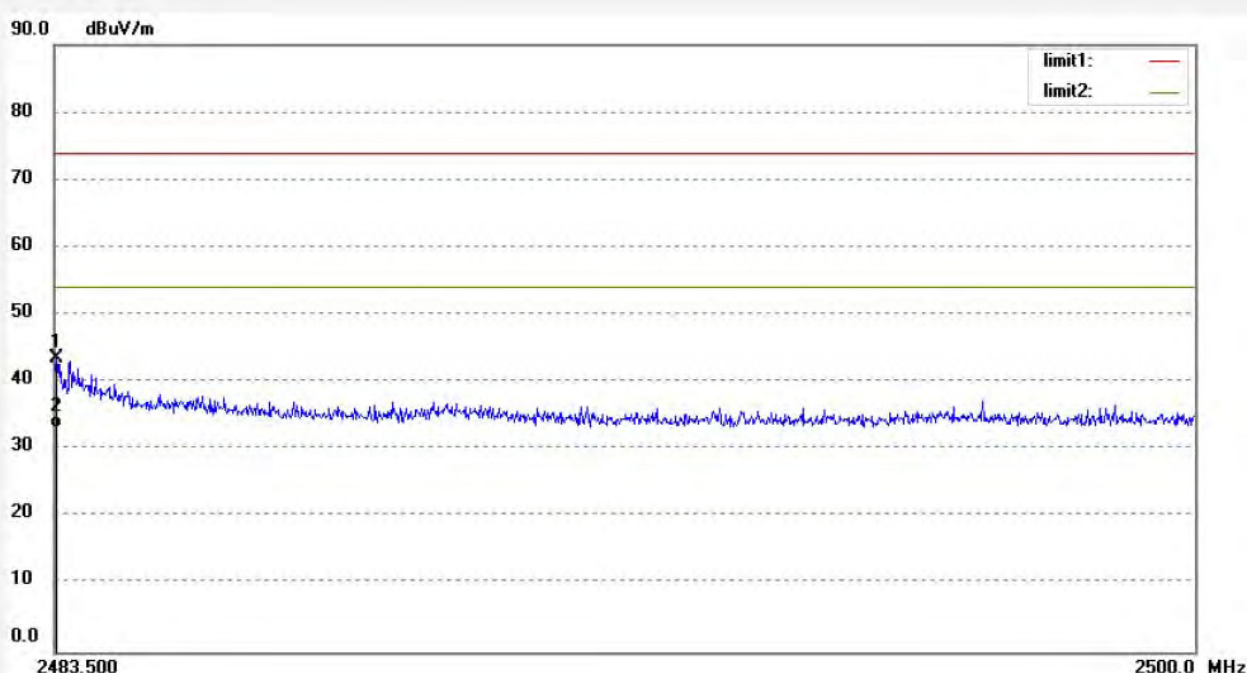
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.533	42.36	1.10	43.46	74.00	-30.54	peak			
2	2483.533	32.16	1.10	33.26	54.00	-20.74	AVG			



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Site: 2# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: LGW2018 #456

Standard: FCC (Band Edge)

Test item: Radiation Test

Temp.(C)/Hum.(%) 23 C / 48 %

EUT: Portable Bluetooth Speaker

Mode: TX 2480MHz

Model: NS-SPBTWAVE2-BK

Manufacturer: Lightcomm Technology Co., Ltd.

Polarization: Vertical

Power Source: DC 3.7V

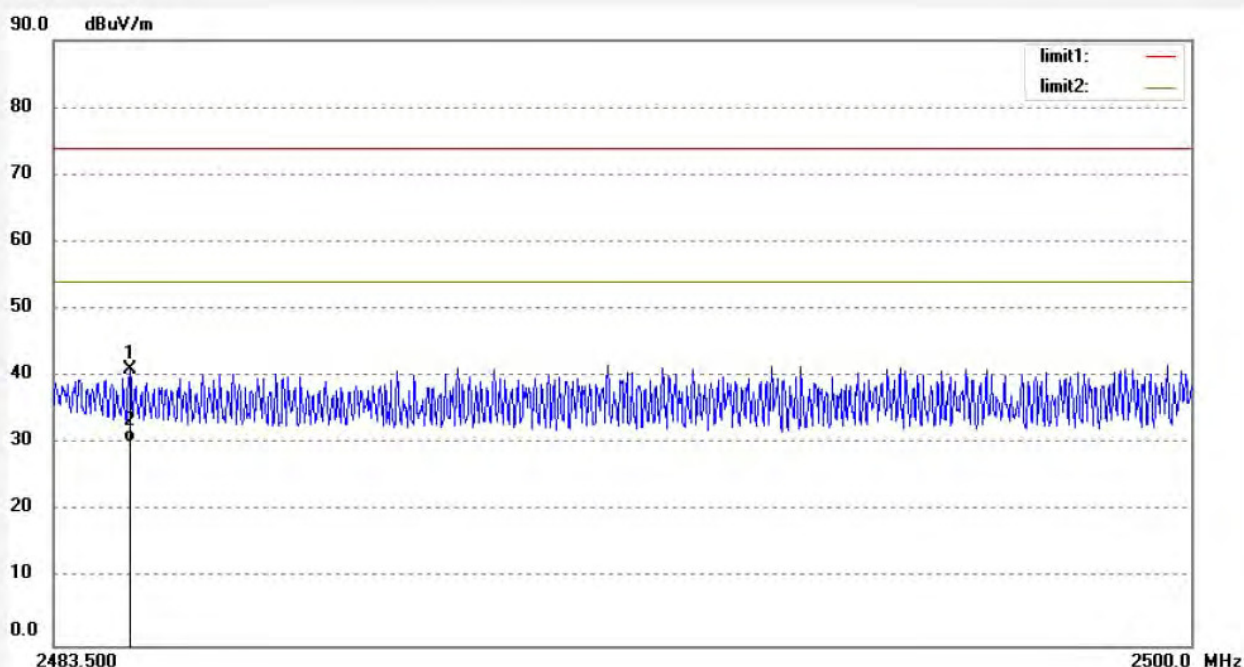
Date: 18/02/08/

Time:

Engineer Signature: WADE

Distance: 3m

Note: Bluetooth



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2484.606	39.85	1.10	40.95	74.00	-33.05	peak			
2	2484.606	29.17	1.10	30.27	54.00	-23.73	AVG			

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Address: 1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

Tel: +86-755-26503290

Fax: +86-755-26503396

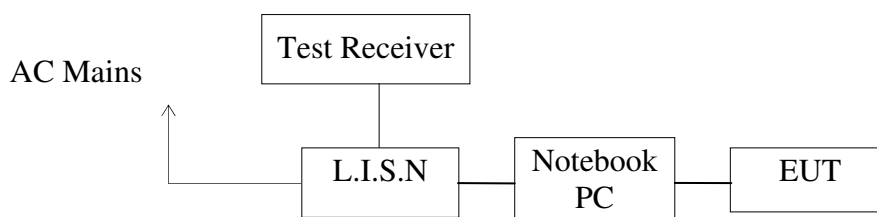
E-mail: webmaster@atc-lab.com

Http://www.atc-lab.com

12.AC POWER LINE CONDUCTED EMISSION FOR FCC PART

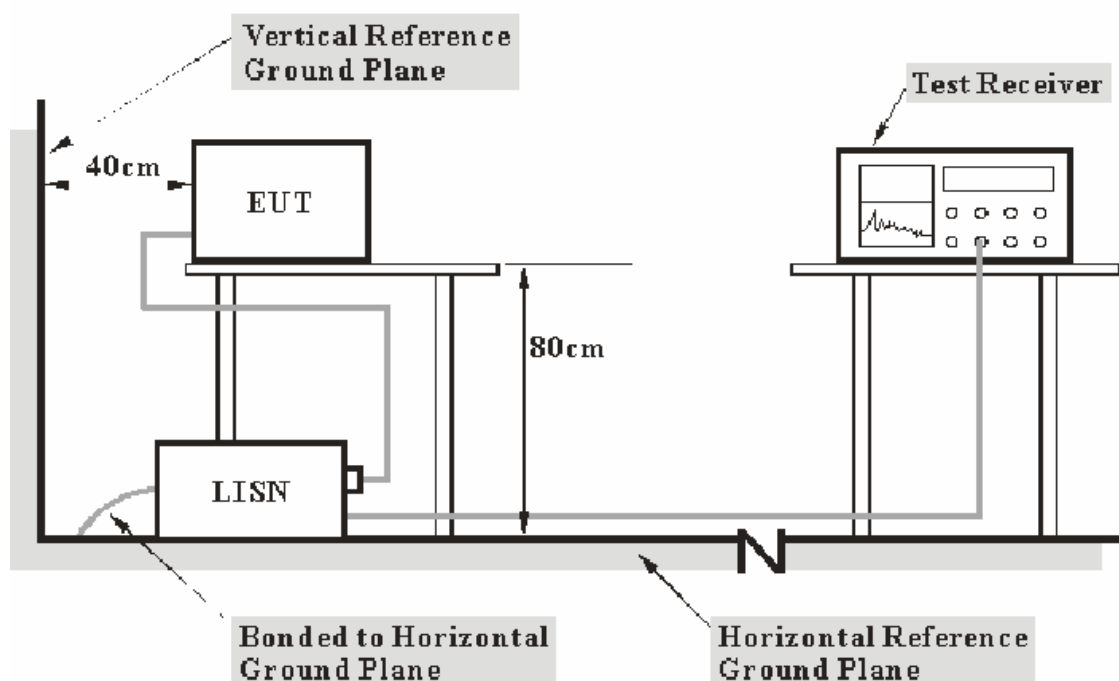
15 SECTION 15.207(A)

12.1.Block Diagram of Test Setup



(EUT:Portable Bluetooth Speaker)

12.2.Test System Setup



- Note:**
1. Support units were connected to second LISN.
 2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

12.3.Power Line Conducted Emission Measurement Limits

Frequency (MHz)	Limit dB(μ V)	
	Quasi-peak Level	Average Level
0.15 - 0.50	66.0 – 56.0 *	56.0 – 46.0 *
0.50 - 5.00	56.0	46.0
5.00 - 30.00	60.0	50.0
NOTE1: The lower limit shall apply at the transition frequencies.		
NOTE2: The limit decreases linearly with the logarithm of the frequency in the range 0.15MHz to 0.50MHz.		

12.4.Configuration of EUT on Measurement

The equipments are installed on Power Line Conducted Emission Measurement to meet the commission requirement and operating regulations in a manner, which tends to maximize its emission characteristics in a normal application.

12.5.Operating Condition of EUT

12.5.1.Setup the EUT and simulator as shown as Section 12.1.

12.5.2.Turn on the power of all equipment.

12.5.3.Let the EUT work in test mode and measure it.

12.6.Test Procedure

The EUT is put on the plane 0.8m high above the ground by insulating support and is connected to the power mains through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm coupling impedance for the EUT system. Please refer the block diagram of the test setup and photographs. Both sides of AC lines are checked to find out the maximum conducted emission. In order to find the maximum emission levels, the relative positions of equipment and all of the interface cables shall be changed according to ANSI C63.4: 2014 on Conducted Emission Measurement.

The bandwidth of test receiver (R & S ESCS30) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked.

12.7.Data Sample

Frequency (MHz)	Transducer value (dB)	QuasiPeak Level (dBμV)	Average Level (dBμV)	QuasiPeak Limit (dBμV)	Average Limit (dBμV)	QuasiPeak Margin (dB)	Average Margin (dB)	Remark (Pass/Fail)
X.XX	10.5	51.1	34.2	56.0	46.0	4.9	11.8	Pass

Frequency(MHz) = Emission frequency in MHz

Transducer value(dB) = Insertion loss of LISN + Cable Loss

Level(dBμV) = Quasi-peak Reading/Average Reading + Transducer value

Limit (dBμV) = Limit stated in standard

Margin = Limit (dBμV) - Level (dBμV)

Calculation Formula:

Margin = Limit (dBμV) - Level (dBμV)

12.8.Power Line Conducted Emission Measurement Results

PASS.

The frequency range from 150kHz to 30MHz is checked.

Test mode : BT Communication (AC 120V/60Hz)								
MEASUREMENT RESULT: "TUV-0227-03_fin"								
2/27/2018								
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE	
0.150000	53.40	10.5	66	12.6	QP	L1	GND	
0.480000	39.60	10.7	56	16.7	QP	L1	GND	
4.520000	33.50	11.1	56	22.5	QP	L1	GND	
MEASUREMENT RESULT: "TUV-0227-03_fin2"								
2/27/2018								
Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE	
0.495000	37.10	10.7	46	9.0	AV	L1	GND	
2.120000	26.90	11.0	46	19.1	AV	L1	GND	
23.995000	22.10	11.5	50	27.9	AV	L1	GND	

MEASUREMENT RESULT: "TUV-0227-04_fin"

2/27/2018

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.170000	49.00	10.5	65	16.0	QP	N	GND
0.485000	40.30	10.7	56	16.0	QP	N	GND
3.660000	30.80	11.1	56	25.2	QP	N	GND

MEASUREMENT RESULT: "TUV-0227-04_fin2"

2/27/2018

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.490000	36.90	10.7	46	9.3	AV	N	GND
2.130000	26.90	11.0	46	19.1	AV	N	GND
17.380000	17.10	11.4	50	32.9	AV	N	GND

Emissions attenuated more than 20 dB below the permissible value are not reported.

The spectral diagrams are attached as below.

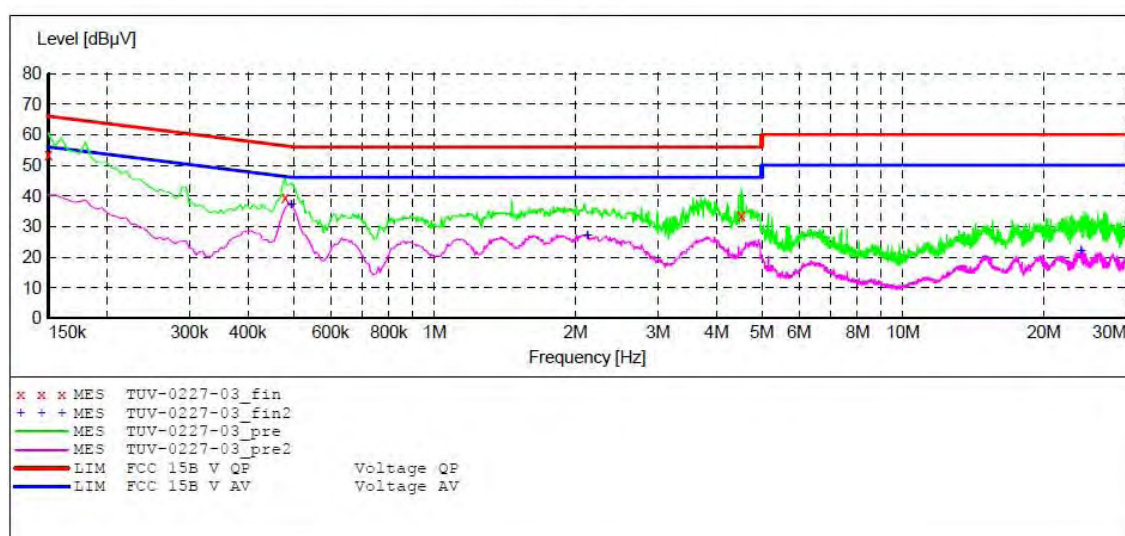
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC PART 15 C

EUT: Portable Bluetooth Speaker M/N: NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: BT Communication
 Test Site: 1#Shielding Room
 Operator: WADE
 Test Specification: L 120V/60Hz
 Comment: Mains port
 Start of Test: 2/27/2018 /

SCAN TABLE: "V 9K-30MHz fin"

Short Description: _SUB STD VTERM2 1.70
 Start Stop Step Detector Meas. IF Transducer
 Frequency Frequency Width Time Bandw.
 9.0 kHz 150.0 kHz 100.0 Hz QuasiPeak 1.0 s 200 Hz NSLK8126 2008
 Average
 150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008
 Average



MEASUREMENT RESULT: "TUV-0227-03_fin"

2/27/2018

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.150000	53.40	10.5	66	12.6	QP	L1	GND
0.480000	39.60	10.7	56	16.7	QP	L1	GND
4.520000	33.50	11.1	56	22.5	QP	L1	GND

MEASUREMENT RESULT: "TUV-0227-03_fin2"

2/27/2018

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.495000	37.10	10.7	46	9.0	AV	L1	GND
2.120000	26.90	11.0	46	19.1	AV	L1	GND
23.995000	22.10	11.5	50	27.9	AV	L1	GND

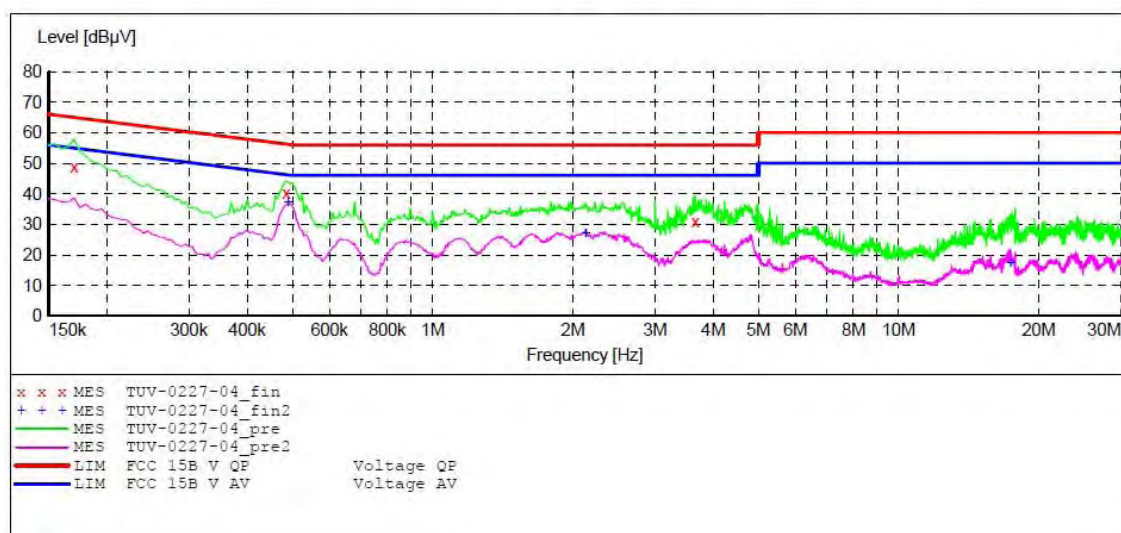
ACCURATE TECHNOLOGY CO., LTD

CONDUCTED EMISSION STANDARD FCC PART 15 C

EUT: Portable Bluetooth Speaker M/N: NS-SPBTWAVE2-BK
 Manufacturer: Lightcomm Technology Co., Ltd.
 Operating Condition: BT Communication
 Test Site: 1#Shielding Room
 Operator: WADE
 Test Specification: N 120V/60Hz
 Comment: Mains port
 Start of Test: 2/27/2018 /

SCAN TABLE: "V 9K-30MHz fin"

Short Description: _SUB_STD_VTERM2 1.70
 Start Stop Step Detector Meas. IF Transducer
 Frequency Frequency Width Time Bandw.
 9.0 kHz 150.0 kHz 100.0 Hz QuasiPeak 1.0 s 200 Hz NSLK8126 2008
 Average
 150.0 kHz 30.0 MHz 5.0 kHz QuasiPeak 1.0 s 9 kHz NSLK8126 2008
 Average



MEASUREMENT RESULT: "TUV-0227-04_fin"

2/27/2018

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.170000	49.00	10.5	65	16.0	QP	N	GND
0.485000	40.30	10.7	56	16.0	QP	N	GND
3.660000	30.80	11.1	56	25.2	QP	N	GND

MEASUREMENT RESULT: "TUV-0227-04_fin2"

2/27/2018

Frequency MHz	Level dBμV	Transd dB	Limit dBμV	Margin dB	Detector	Line	PE
0.490000	36.90	10.7	46	9.3	AV	N	GND
2.130000	26.90	11.0	46	19.1	AV	N	GND
17.380000	17.10	11.4	50	32.9	AV	N	GND

13.CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

13.1.Block Diagram of Test Setup



(EUT:Portable Bluetooth Speaker)

13.2.The Requirement For Section 15.247(d)

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, 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, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a).

13.3.EUT Configuration on Measurement

The equipment is installed on the emission measurement to meet the commission requirements and operating regulations in a manner which tends to maximize its emission characteristics in normal application.

13.4.Operating Condition of EUT

13.4.1.Setup the EUT and simulator as shown as Section 14.1.

13.4.2.Turn on the power of all equipment.

13.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480 MHz. We select 2402MHz, 2441MHz, and 2480MHz TX frequency to transmit.

13.5. Test Procedure

13.5.1. The transmitter output was connected to the spectrum analyzer via a low loss cable.

13.5.2. Set RBW of spectrum analyzer to 100kHz and VBW to 300kHz

13.5.3. The Conducted Spurious Emission was measured and recorded.

13.6. Test Result

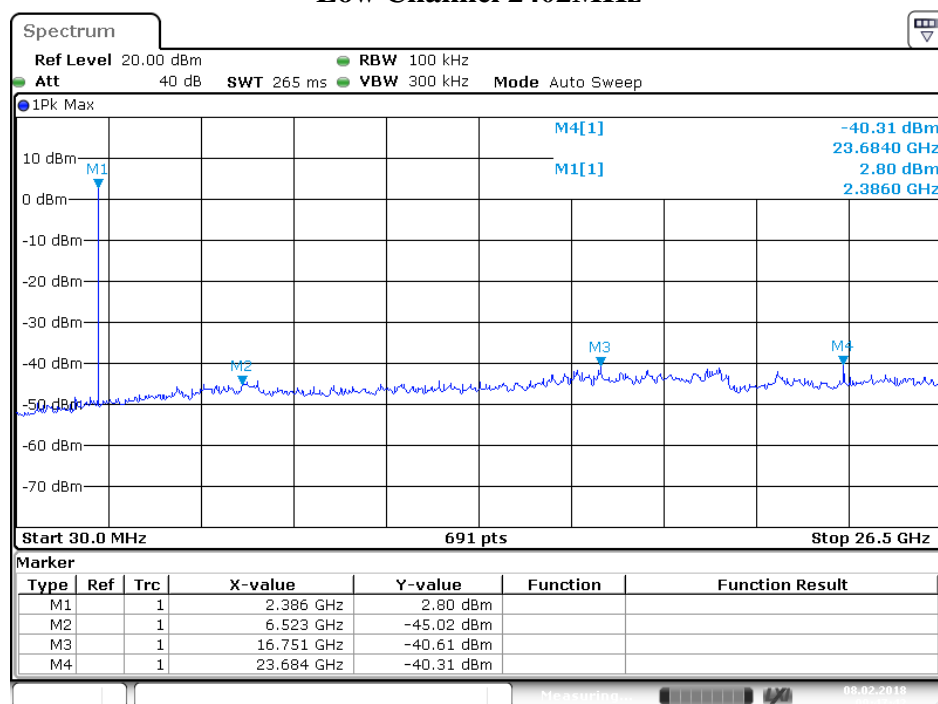
Pass.

Note: The RF module of the product is the same as the report ATE20180323, so the data Reference to report is ATE20180323.

The spectrum analyzer plots are attached as below.

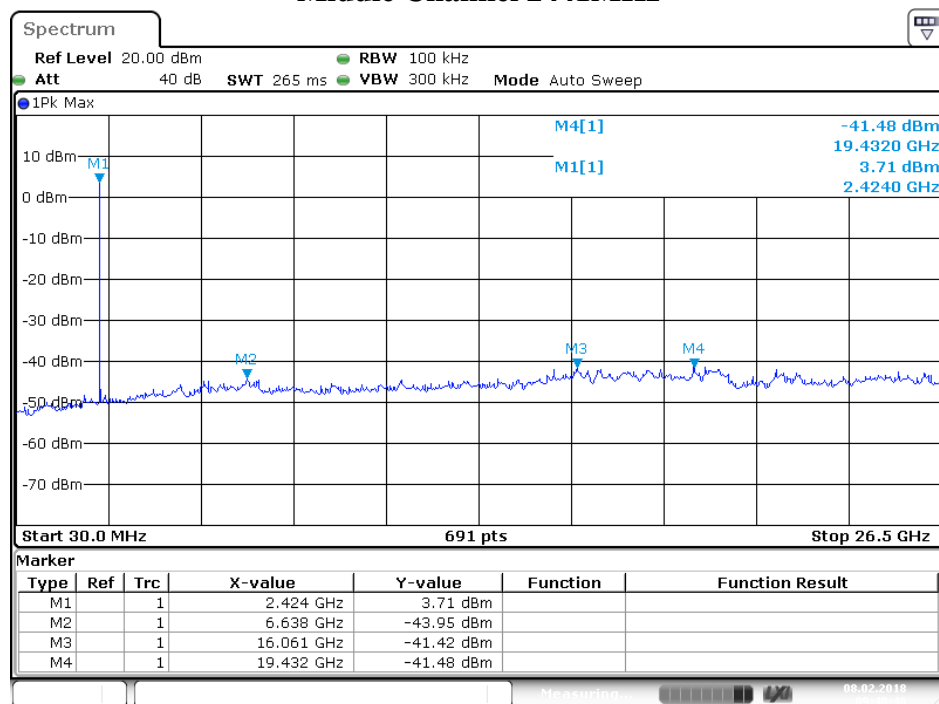
BDR mode

Low Channel 2402MHz



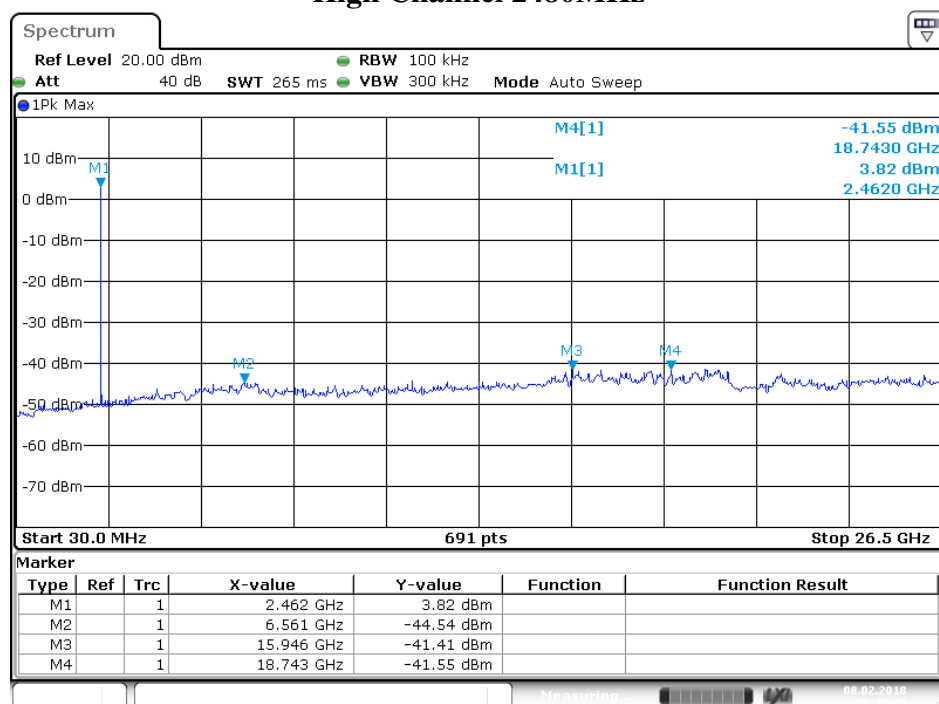
Date: 8.FEB.2018 09:47:42

Middle Channel 2441MHz



Date: 8.FEB.2018 09:48:46

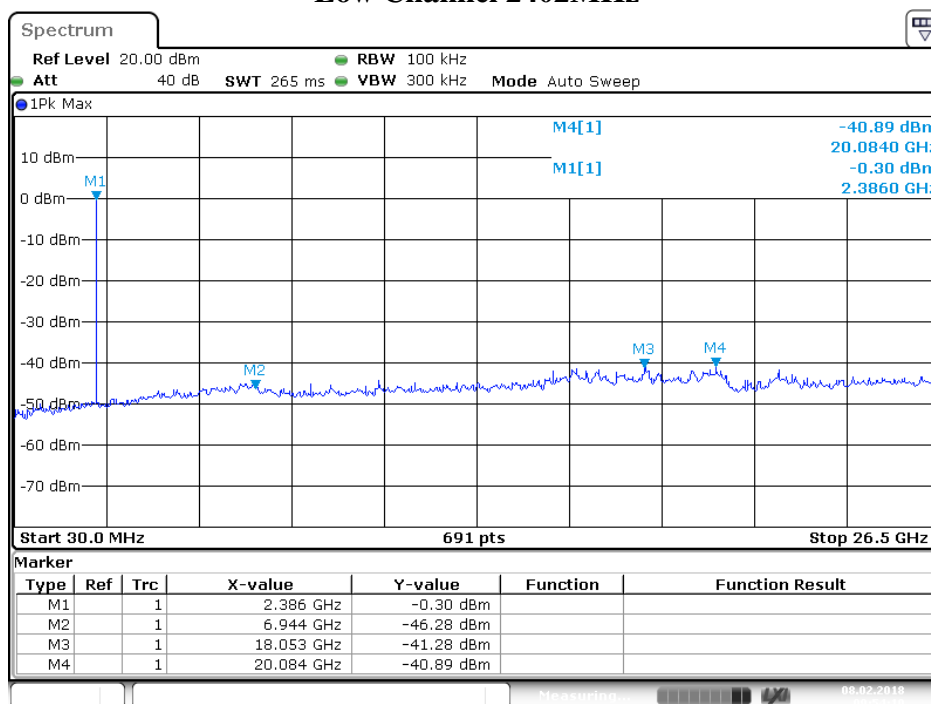
High Channel 2480MHz



Date: 8.FEB.2018 09:49:49

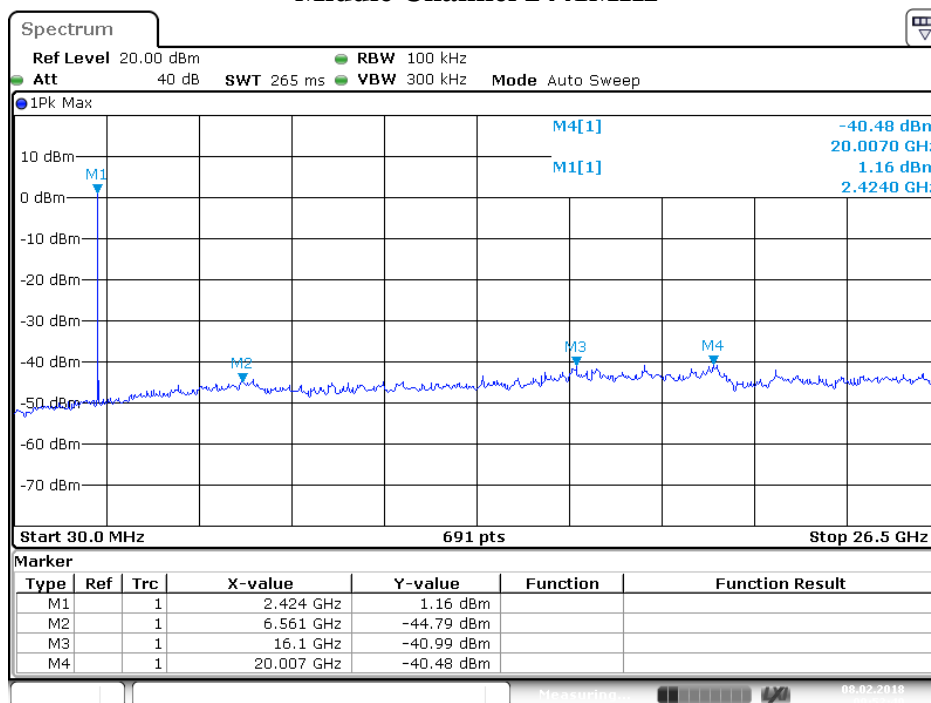
EDR mode

Low Channel 2402MHz



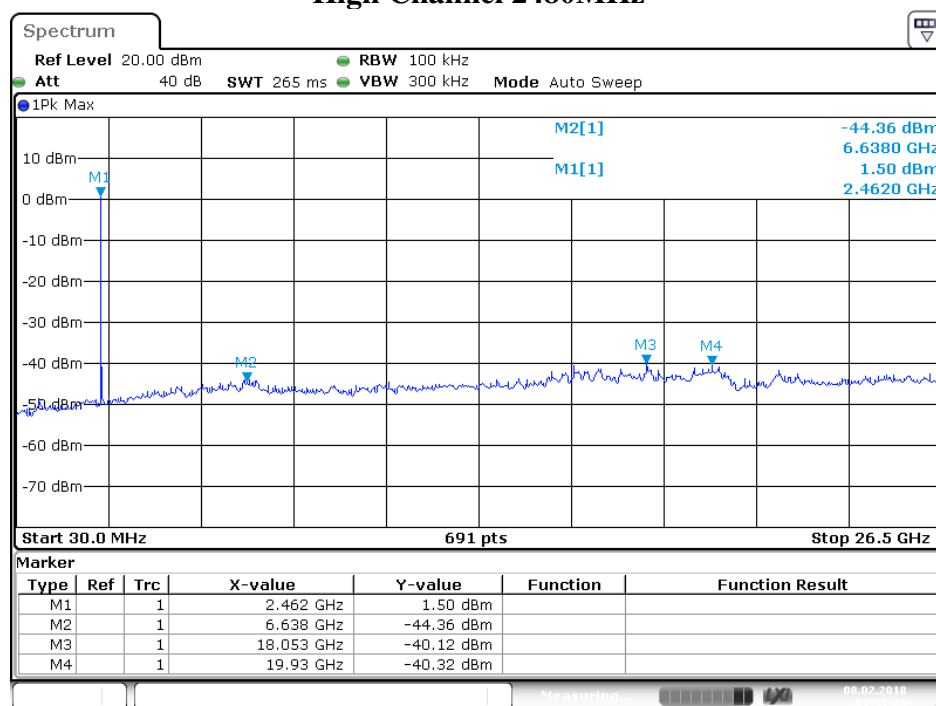
Date: 8.FEB.2018 09:54:10

Middle Channel 2441MHz



Date: 8.FEB.2018 09:52:40

High Channel 2480MHz



Date: 8.FEB.2018 09:51:23

14.ANTENNA REQUIREMENT

14.1.The Requirement

According to 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.

14.2.Antenna Construction

Device is equipped with permanent attached antenna, which isn't displaced by other antenna. The Max Antenna gain of EUT is 0dBi. Therefore, the equipment complies with the antenna requirement of Section 15.203.

******* End of Test Report *******