

APPLICATION CERTIFICATION FCC Part 15C
On Behalf of
ILOGIC Technology Limited

Bluetooth Smart Module
Model No.: ILT5x, ILT51x, ILT52x, ILT51822-A1, ILT52832

FCC ID: 2AAXH-ILT51822

Prepared for : ILOGIC Technology Limited.
Address : Unit3103, 31/F, One Midtown, NO.11 Hoi Shing
Road, Tsuen Wan, Hong Kong.

Prepared by : ACCURATE TECHNOLOGY CO., LTD
Address : F1, Bldg. A, Chan Yuan New Material Port, Keyuan
Rd. Science & Industry Park, Nan Shan, Shenzhen,
Guangdong P.R. China

Tel: (0755) 26503290
Fax: (0755) 26503396

Report No. : ATE20160862
Date of Test : May 12, 2016--May 21, 2016
Date of Report : May 23, 2016

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Test Report Certification

Applicant : ILOGIC Technology Limited
Manufacturer : ILOGIC Technology Limited
EUT Description : Bluetooth Smart Module
(A) MODEL NO.: ILT5x, ILT51x, ILT52x, ILT51822-A1, ILT52832
(B) TRADE NAME.: ILOGICTECH
(C) Test Voltage: DC 3V

Measurement Procedure Used:

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

The EUT was tested according to DTS test procedure of Apr 08, 2016 KDB558074 D01 DTS Meas Guidance v03r05 for compliance to FCC 47CFR 15.247 requirements

The device described above is tested by 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 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 ACCURATE TECHNOLOGY CO. LTD.

Date of Test : May 12, 2016--May 21, 2016
Date of Report: May 23, 2016

Prepared by :

Tim Zhang
(Tim.zhang, Engineer)

Approved & Authorized Signer :

Sean Liu
(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT	:	Bluetooth Smart Module
Model Number	:	ILT5x, ILT51x, ILT52x, ILT51822-A1, ILT52832 (Note: ALL the models are identical except for the model name. So we prepare the ILT5x for test.)
Bluetooth version	:	BT V4.0 LE Mode
Frequency Range	:	2402MHz-2480MHz
Number of Channels	:	40
Antenna Gain	:	0dBi
Antenna type	:	PCB Antenna
Trade Name	:	ILOGICTECH
Test Voltage	:	DC 3V
Modulation mode	:	GFSK for BT V4.0 LE
Applicant	:	ILOGIC Technology Limited
Address	:	Unit3103, 31/F, One Midtown, NO.11 Hoi Shing Road, Tsuen Wan, Hong Kong.
Manufacturer	:	ILOGIC Technology Limited
Address	:	Unit3103, 31/F, One Midtown, NO.11 Hoi Shing Road, Tsuen Wan, Hong Kong.
Date of sample received	:	May 12, 2016
Date of Test	:	May 12, 2016--May 21, 2016

1.2.Carrier Frequency of Channels

Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
0	2402	10	2422	20	2442	30	2462
1	2404	11	2424	21	2444	31	2464
2	2406	12	2426	22	2446	32	2466
3	2408	13	2428	23	2448	33	2468
4	2410	14	2430	24	2450	34	2470
5	2412	15	2432	25	2452	35	2472
6	2414	16	2434	26	2454	36	2474
7	2416	17	2436	27	2456	37	2476
8	2418	18	2438	28	2458	38	2478
9	2420	19	2440	29	2460	39	2480

1.3.Special Accessory and Auxiliary Equipment

N/A

1.4. Description of Test Facility

EMC Lab : Accredited by TUV Rheinland Shenzhen

Listed by FCC
The Registration Number is 752051

Listed by Industry Canada
The Registration Number is 5077A-2

Accredited by China National Accreditation Committee
for Laboratories
The Certificate Registration Number is L3193

Name of Firm : ACCURATE TECHNOLOGY CO. LTD

Site Location : F1, Bldg. A, Changyuan New Material Port, Keyuan Rd.
Science & Industry Park, Nanshan, Shenzhen, Guangdong
P.R. China

1.5. Measurement Uncertainty

Conducted Emission Expanded Uncertainty = 2.23dB, k=2

Radiated emission expanded uncertainty = 3.08dB, k=2
(9kHz-30MHz)

Radiated emission expanded uncertainty = 4.42dB, k=2
(30MHz-1000MHz)

Radiated emission expanded uncertainty = 4.06dB, k=2
(Above 1GHz)

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. 10, 2016	Jan. 09, 2017
EMI Test Receiver	Rohde&Schwarz	ESPI3	101526/003	Jan. 10, 2016	Jan. 09, 2017
Spectrum Analyzer	Agilent	E7405A	MY45115511	Jan. 10, 2016	Jan. 09, 2017
Pre-Amplifier	Rohde&Schwarz	CBLU118354 0-01	3791	Jan. 10, 2016	Jan. 09, 2017
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 14, 2016	Jan. 13, 2017
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 14, 2016	Jan. 13, 2017
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 14, 2016	Jan. 12, 2017
Horn Antenna	Schwarzbeck	BBHA9170	9170-359	Jan. 14, 2016	Jan. 13, 2017
LISN	Rohde&Schwarz	ESH3-Z5	100305	Jan. 10, 2016	Jan. 09, 2017
LISN	Schwarzbeck	NSLK8126	8126431	Jan. 10, 2016	Jan. 09, 2017
Highpass Filter	Wainwright Instruments	WHKX3.6/18 G-10SS	N/A	Jan. 10, 2016	Jan. 09, 2017
Band Reject Filter	Wainwright Instruments	WRCG2400/2 485-2375/2510 -60/11SS	N/A	Jan. 10, 2016	Jan. 09, 2017

3. OPERATION OF EUT DURING TESTING

3.1.Operating Mode

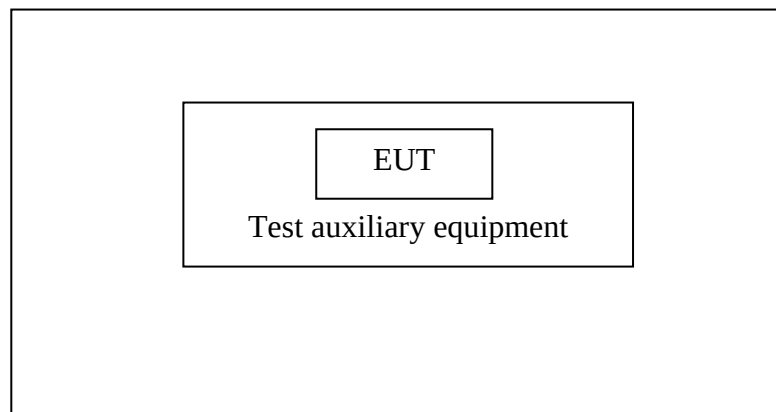
The mode is used: **BLE Transmitting mode**

Low Channel: 2402MHz

Middle Channel: 2440MHz

High Channel: 2480MHz

3.2.Configuration and peripherals



Setup: Transmitting mode

4. TEST PROCEDURES AND RESULTS

FCC Rules	Description of Test	Result
Section 15.247(a)(2)	6dB Bandwidth Test	Compliant
Section 15.247(e)	Power Spectral Density Test	Compliant
Section 15.247(b)(3)	Maximum Peak Output Power Test	Compliant
Section 15.247(d)	Band Edge Compliance Test	Compliant
Section 15.247(d) Section 15.209	Radiated Spurious Emission Test	Compliant
Section 15.247(d)	Conducted Spurious Emission Test	Compliant
Section 15.207	AC Power Line Conducted Emission Test	N/A
Section 15.203	Antenna Requirement	Compliant

Note: The power supply mode of the EUT is DC 3V, According to the FCC standard requirements, conducted emission is not applicable.

5. 6DB BANDWIDTH MEASUREMENT

5.1. Block Diagram of Test Setup



(EUT: Bluetooth Smart Module)

5.2. The Requirement For Section 15.247(a)(2)

Section 15.247(a)(2): Systems using digital modulation techniques may operate in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

5.3. 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.

5.4. Operating Condition of EUT

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

5.4.2. Turn on the power of all equipment.

5.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480 MHz. We select 2402MHz, 2440MHz, 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. Set RBW of spectrum analyzer to 100 kHz and VBW to 300 kHz.

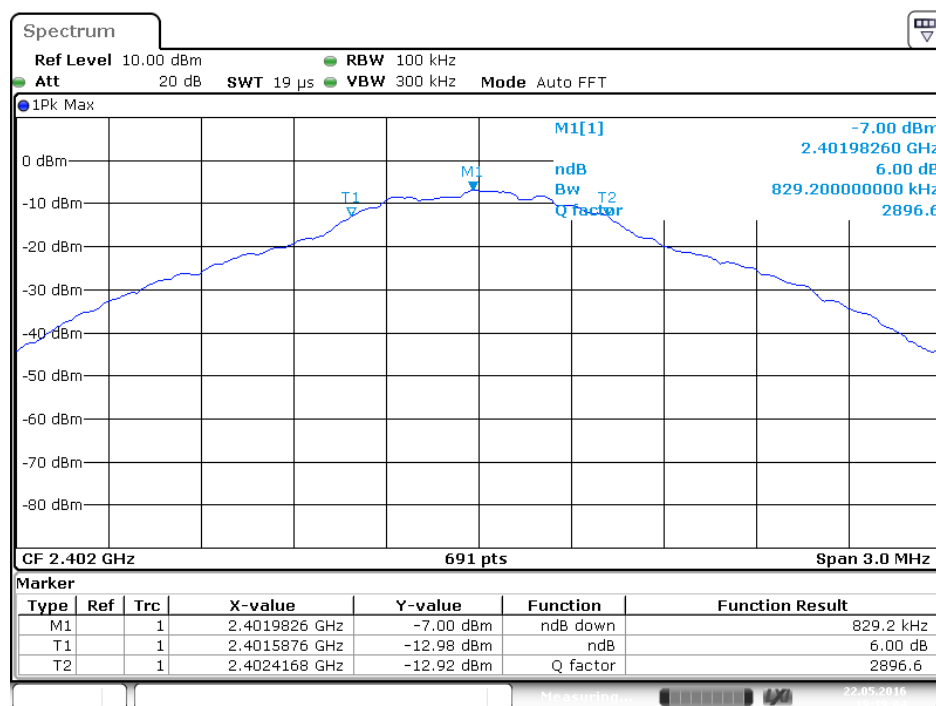
5.5.3. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

5.6.Test Result

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit(MHz)	PASS/FAIL
0	2402	0.8292	0.5	PASS
19	2440	0.8336	0.5	PASS
39	2480	0.7771	0.5	PASS

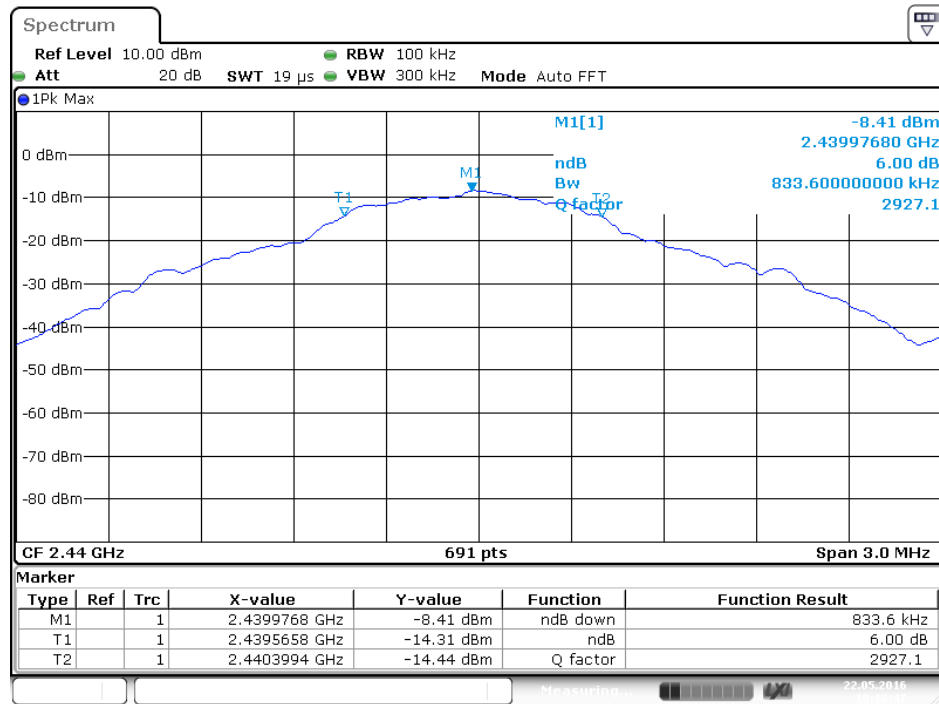
The spectrum analyzer plots are attached as below.

channel 0



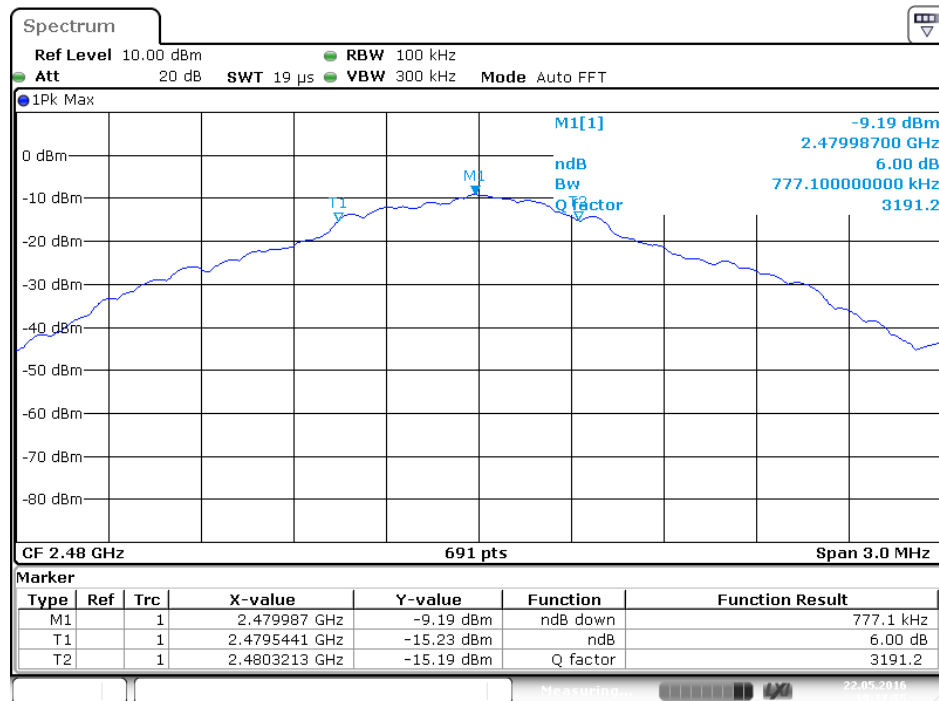
Date: 22.MAY.2016 19:19:05

channel 19



Date: 22.MAY.2016 19:16:48

channel 39



Date: 22.MAY.2016 19:17:56

6. MAXIMUM PEAK OUTPUT POWER

6.1. Block Diagram of Test Setup



(EUT: Bluetooth Smart Module)

6.2. The Requirement For Section 15.247(b)(3)

Section 15.247(b)(3): For systems using digital modulation in the 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz bands: 1 Watt.

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 7.1.

6.4.2. Turn on the power of all equipment.

6.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480 MHz. We select 2402MHz, 2440MHz, 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. Test method is options 1 from KDB558074 D01 DTS Meas Guidance v03r05

6.5.3. Set RBW of spectrum analyzer to 1 MHz and VBW to 3 MHz.

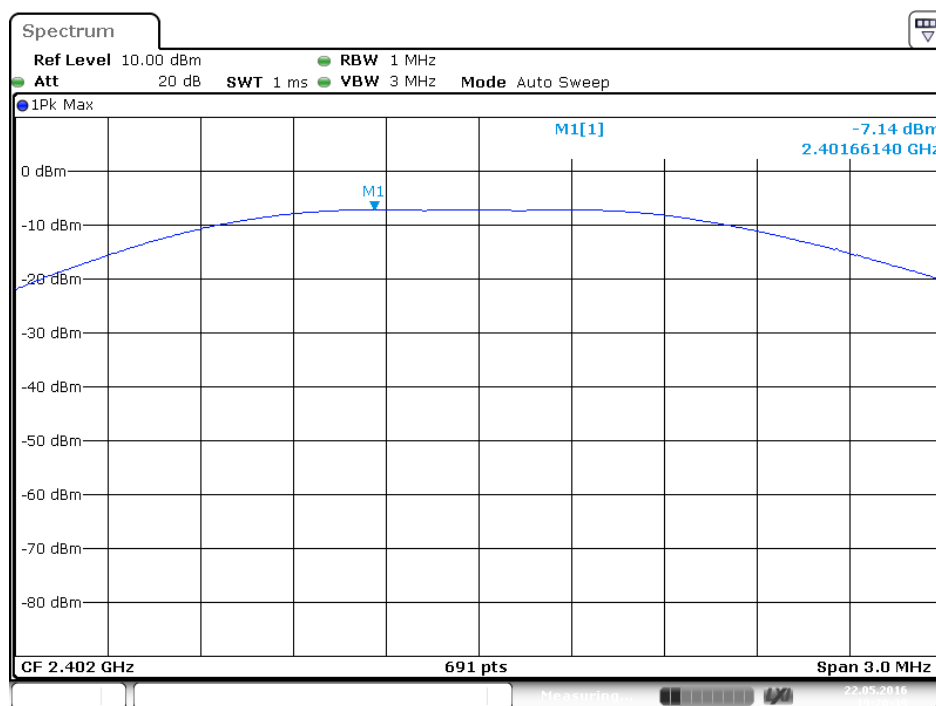
6.5.4. Measurement the maximum peak output power.

6.6.Test Result

Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
0	2402	-7.14	30	PASS
19	2440	-8.31	30	PASS
39	2480	-9.35	30	PASS

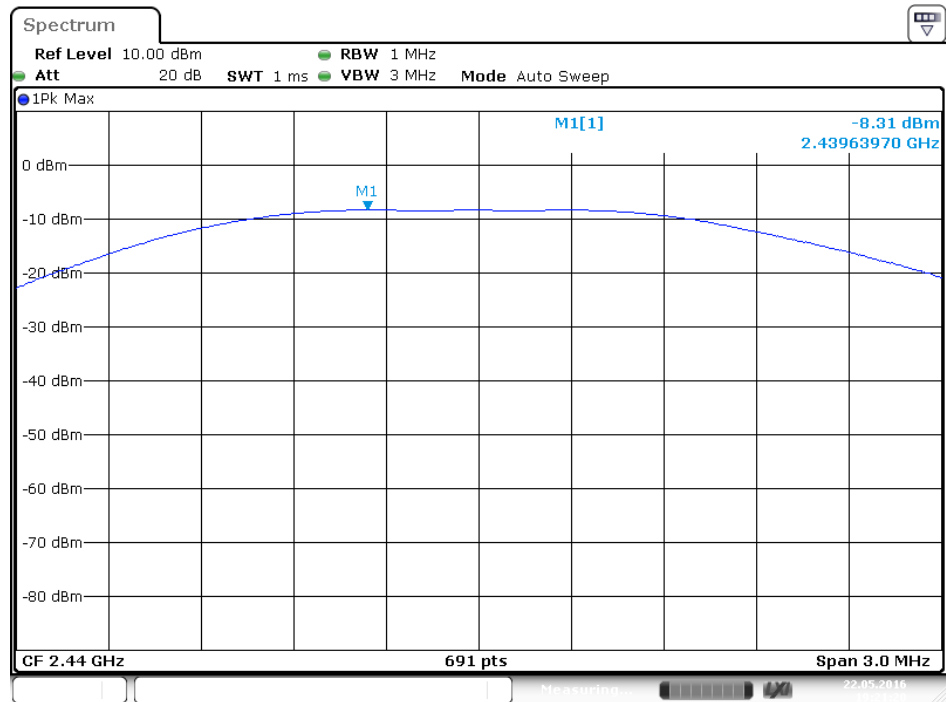
The spectrum analyzer plots are attached as below.

channel 0



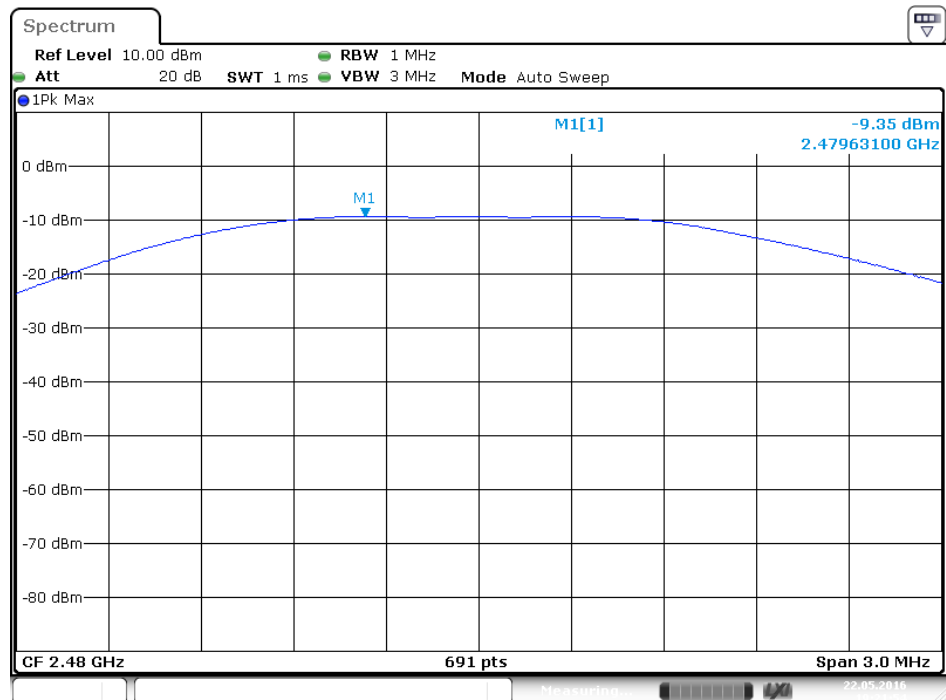
Date: 22.MAY.2016 19:20:39

channel 19



Date: 22.MAY.2016 19:21:21

channel 39



Date: 22.MAY.2016 19:21:54

7. POWER SPECTRAL DENSITY MEASUREMENT

7.1. Block Diagram of Test Setup



(EUT: Bluetooth Smart Module)

7.2. The Requirement For Section 15.247(e)

Section 15.247(e): For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

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 8.1.

7.4.2. Turn on the power of all equipment.

7.4.3. Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

7.5. Test Procedure

7.5.1. The EUT was tested according to DTS test procedure of Apr 08, 2016 KDB558074 D01 DTS Meas Guidance v03r05 for compliance to FCC 47CFR 15.247 requirements.

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

7.5.3. Measurement Procedure PKPSD:

7.5.4. This procedure must be used if maximum peak conducted output power was used to demonstrate compliance to the fundamental output power limit, and is optional if the maximum (average) conducted output power was used to demonstrate compliance.

1. Set analyzer center frequency to DTS channel center frequency.
2. Set the span to 1.5 times the DTS channel bandwidth.
3. Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$.
4. Set the VBW $\geq 3 \times \text{RBW}$.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum amplitude level.
10. If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

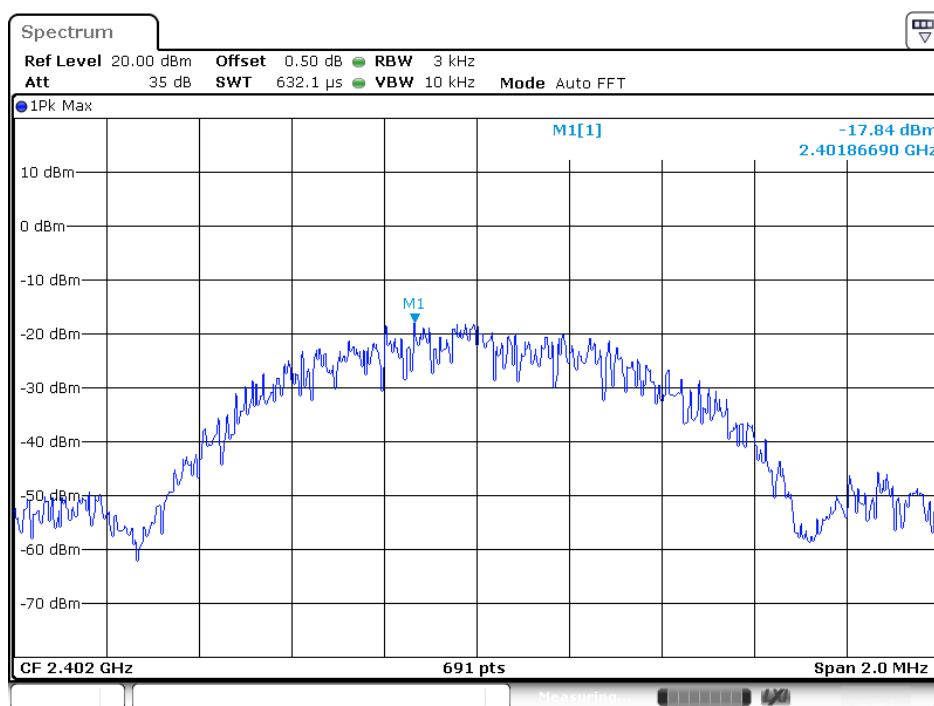
7.5.5. Measurement the maximum power spectral density.

7.6.Test Result

CHANNEL NUMBER	FREQUENCY (MHz)	PSD (dBm/3KHz)	LIMIT (dBm/3KHz)	PASS/FAIL
0	2402	-17.84	8	PASS
19	2440	-17.28	8	PASS
39	2480	-16.87	8	PASS

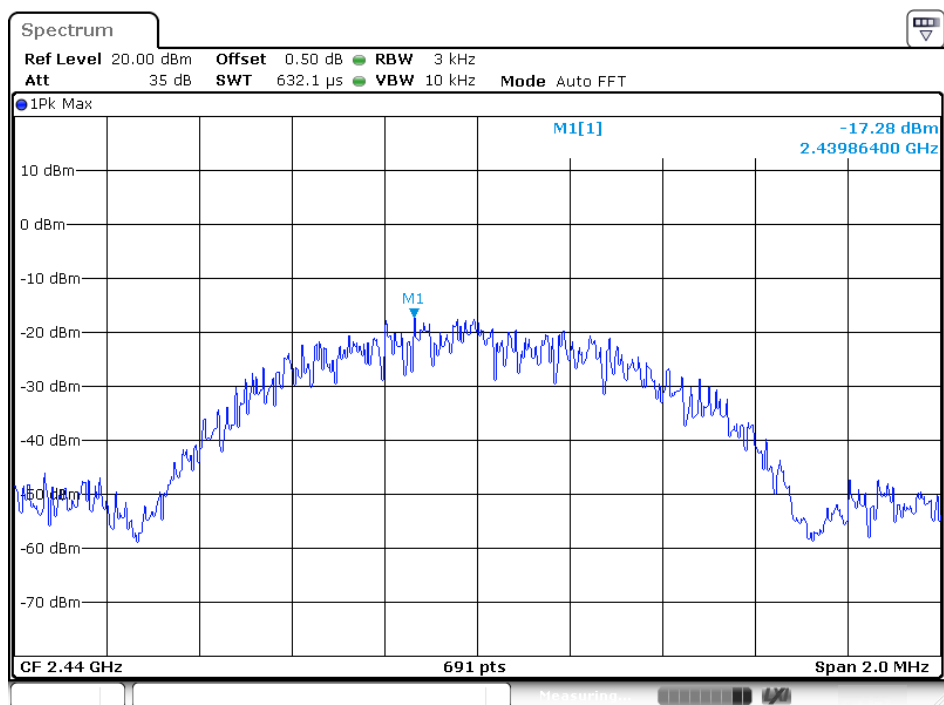
The spectrum analyzer plots are attached as below.

channel 0



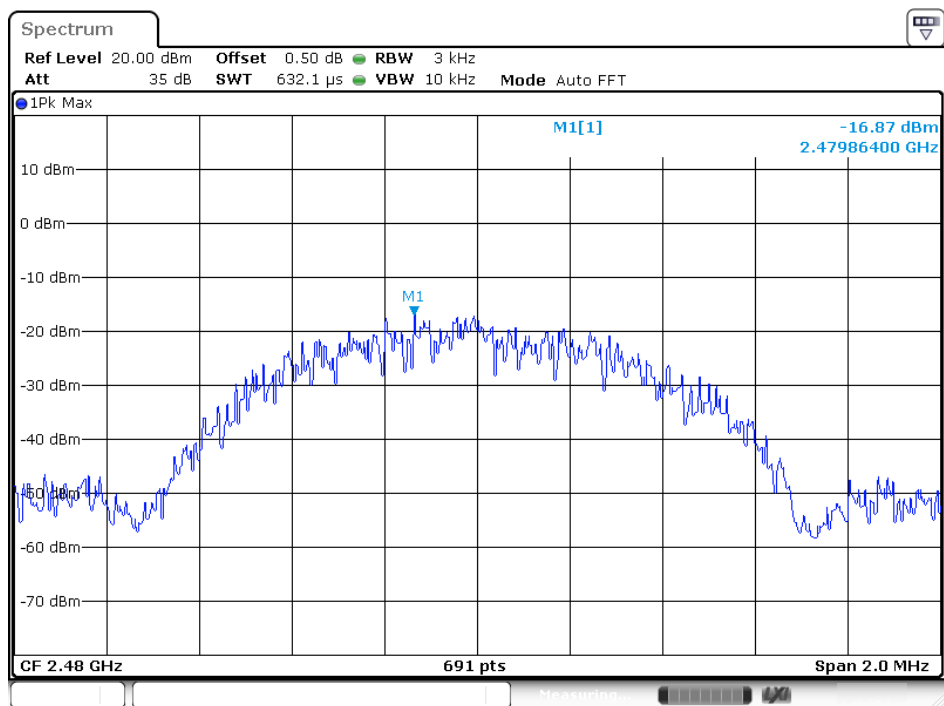
Date: 22.May.2016 16:46:53

channel 19



Date: 22.May.2016 16:46:29

channel 39



Date: 22.May.2016 16:45:45

8. BAND EDGE COMPLIANCE TEST

8.1. Block Diagram of Test Setup



(EUT: Bluetooth Smart Module)

8.2. 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).

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 9.1.

8.4.2. Turn on the power of all equipment.

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

8.5. Test Procedure

Conducted Band Edge:

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

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

8.5.3. Radiate Band Edge:

8.5.4. The EUT is placed on a turntable, which is 1.5m above the ground plane and worked at highest radiated power.

8.5.5. The turntable was rotated for 360 degrees to determine the position of maximum emission level.

8.5.6. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.

8.5.7. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:

8.5.8. RBW=1MHz, VBW=1MHz

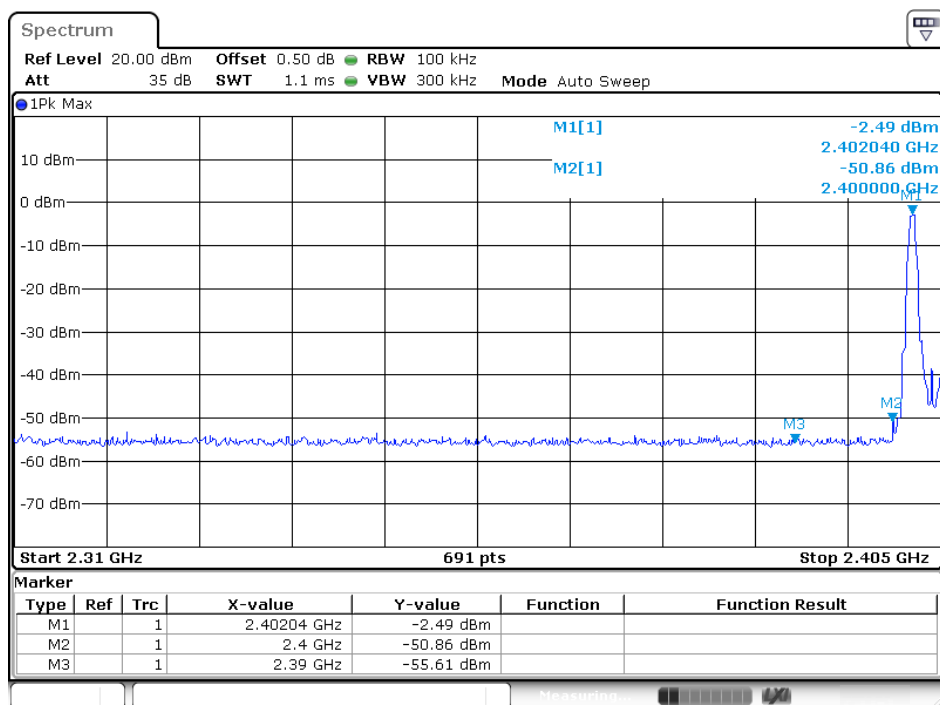
8.5.9. The band edges was measured and recorded.

8.6. Test Result

Pass

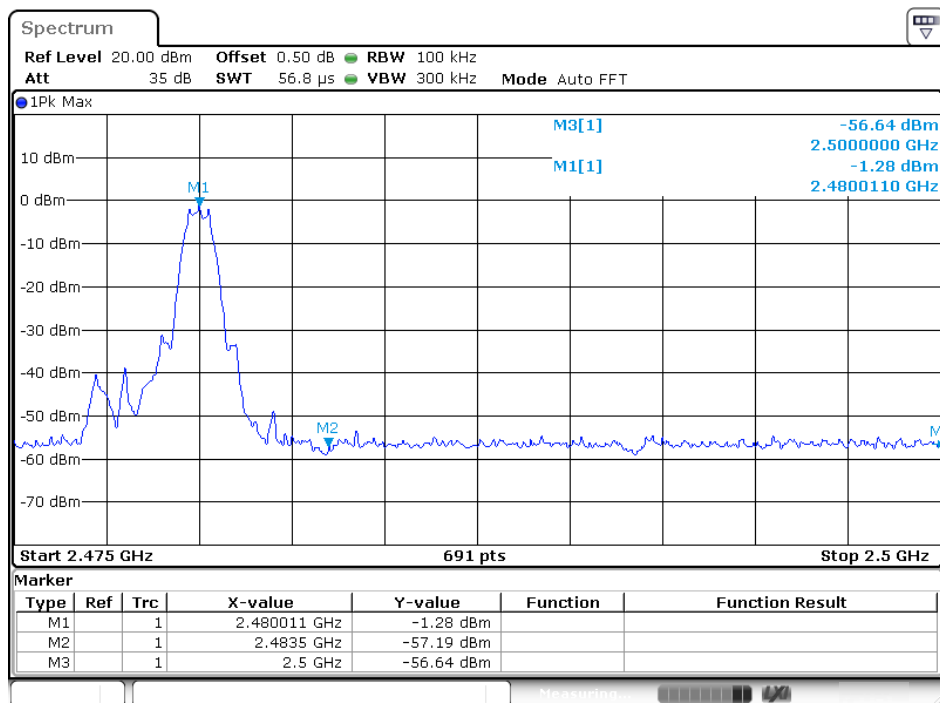
Channel	Frequency	Delta peak to band emission	Limit(dBc)
0	2.4GHz	48.37	20
39	2.4835GHz	55.91	20

channel 0



Date: 22.May.2016 16:48:29

channel 39



Date: 22.May.2016 16:49:30

Radiated Band Edge Result

Date of Test:	May 22, 2016	Temperature:	25°C
EUT:	Bluetooth Smart Module	Humidity:	50%
Model No.:	ILT5x	Power Supply:	DC 3V
Test Mode:	TX (2402MHz) GFSK	Test Engineer:	Star

Frequency (MHz)	Reading(dBμV/m)		Factor(dB) Corr.	Result(dBμV/m)		Limit(dBμV/m)		Margin(dB)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
2390.000	33.40	40.80	-8.00	25.40	32.80	54.00	74.00	-28.60	-41.20	Vertical
2400.000	47.40	55.78	-7.97	39.43	47.81	54.00	74.00	-14.57	-26.19	Vertical
2390.000	32.40	41.20	-8.00	24.40	33.20	54.00	74.00	-29.60	-40.80	Horizontal
2400.000	49.78	57.34	-7.97	41.81	49.37	54.00	74.00	-12.19	-24.63	Horizontal

Date of Test:	May 22, 2016	Temperature:	25°C
EUT:	Bluetooth Smart Module	Humidity:	50%
Model No.:	ILT5x	Power Supply:	DC 3V
Test Mode:	TX (2480MHz) GFSK	Test Engineer:	Star

Frequency (MHz)	Reading(dBμV/m)		Factor(dB) Corr.	Result(dBμV/m)		Limit(dBμV/m)		Margin(dB)		Polarization
	AV	PEAK		AV	PEAK	AV	PEAK	AV	PEAK	
2483.500	40.14	48.46	-7.76	32.38	40.70	54.00	74.00	-21.62	-33.30	Vertical
2500.000	34.67	42.41	-7.71	26.92	34.70	54.00	74.00	-27.04	-39.30	Vertical
2483.500	41.79	49.05	-7.76	34.03	41.29	54.00	74.00	-19.97	-32.71	Horizontal
2500.000	33.22	41.12	-7.71	25.51	33.41	54.00	74.00	-28.49	-40.59	Horizontal

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.

Job No.: STAR2016 #252

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: Bluetooth Smart Module

Mode: TX 2402MHz

Model: ILT5X

Manufacturer: ILOGIC

Polarization: Horizontal

Power Source: DC 3V

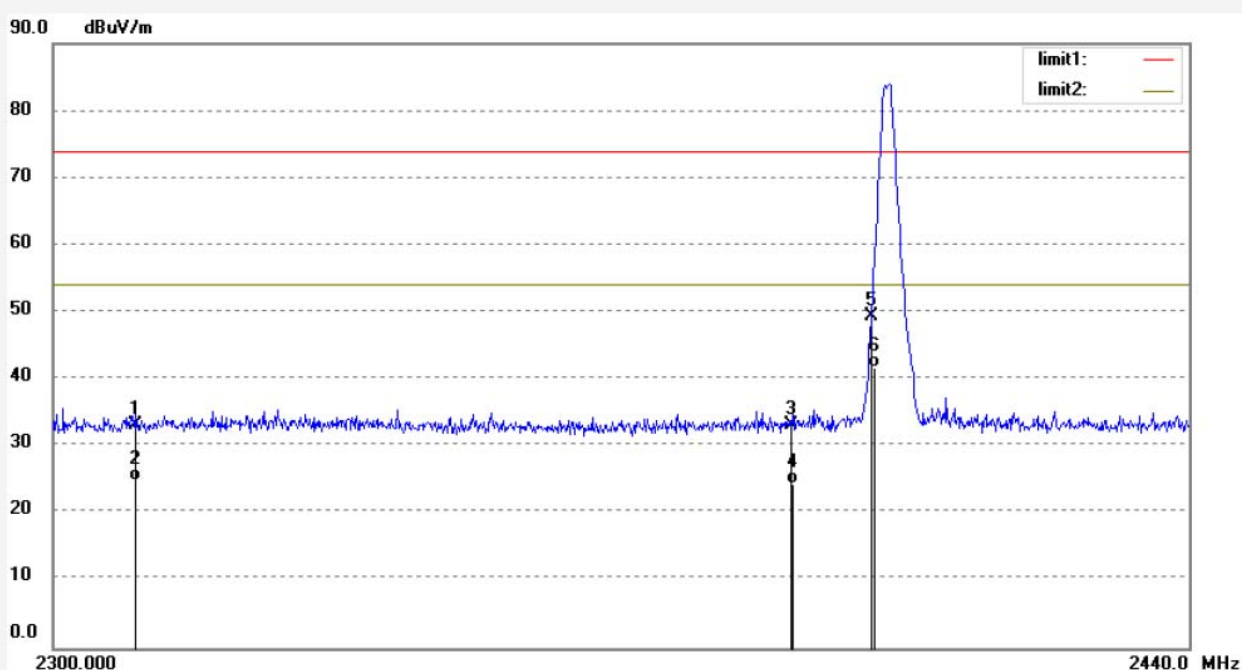
Date: 16/05/22/

Time: 11/40/38

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20160862



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2310.000	41.39	-8.21	33.18	74.00	-40.82	peak			
2	2310.000	33.00	-8.21	24.79	54.00	-29.21	AVG			
3	2390.000	41.20	-8.00	33.20	74.00	-40.80	peak			
4	2390.000	32.40	-8.00	24.40	54.00	-29.60	AVG			
5	2400.000	57.34	-7.97	49.37	74.00	-24.63	peak			
6	2400.000	49.78	-7.97	41.81	54.00	-12.19	AVG			

Job No.: STAR2016 #253

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: Bluetooth Smart Module

Mode: TX 2402MHz

Model: ILT5X

Manufacturer: ILOGIC

Polarization: Vertical

Power Source: DC 3V

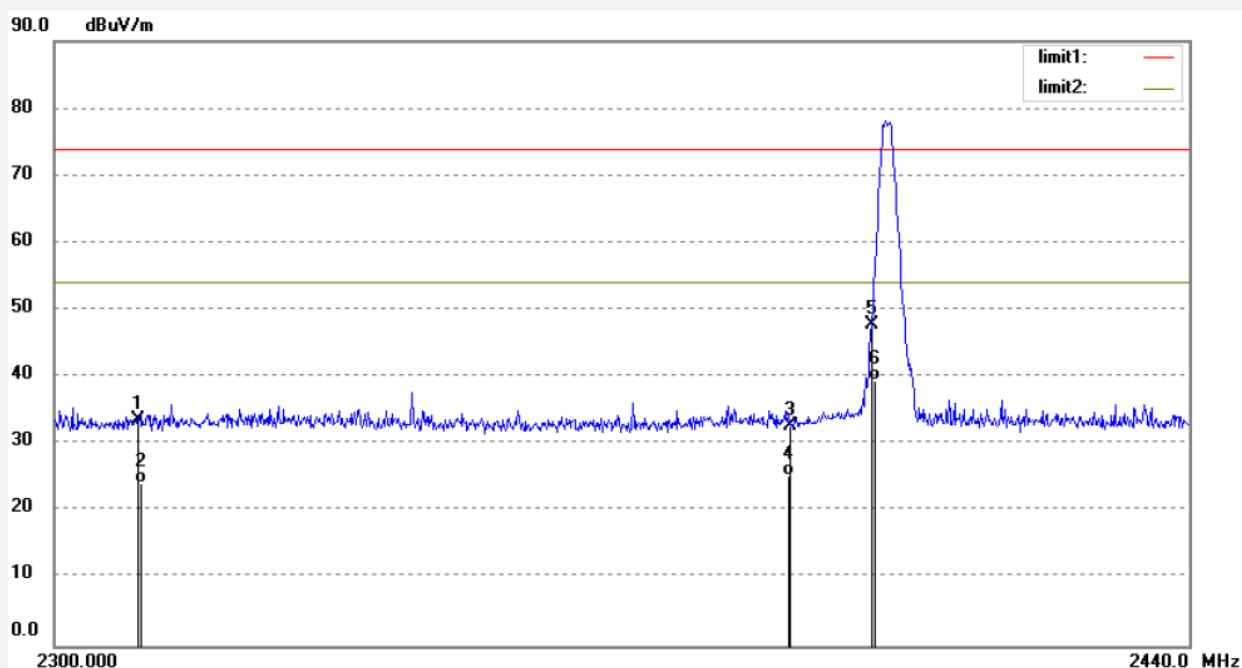
Date: 16/05/22/

Time: 11/44/38

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20160862



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2310.000	41.89	-8.21	33.68	74.00	-40.32	peak			
2	2310.000	32.47	-8.21	24.26	54.00	-29.74	AVG			
3	2390.000	40.80	-8.00	32.80	74.00	-41.20	peak			
4	2390.000	33.40	-8.00	25.40	54.00	-28.60	AVG			
5	2400.000	55.78	-7.97	47.81	74.00	-26.19	peak			
6	2400.000	47.40	-7.97	39.43	54.00	-14.57	AVG			



ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: STAR2016 #254

Standard: FCC PK

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: Bluetooth Smart Module

Mode: TX 2480MHz

Model: ILT5X

Manufacturer: ILOGIC

Polarization: Horizontal

Power Source: DC 3V

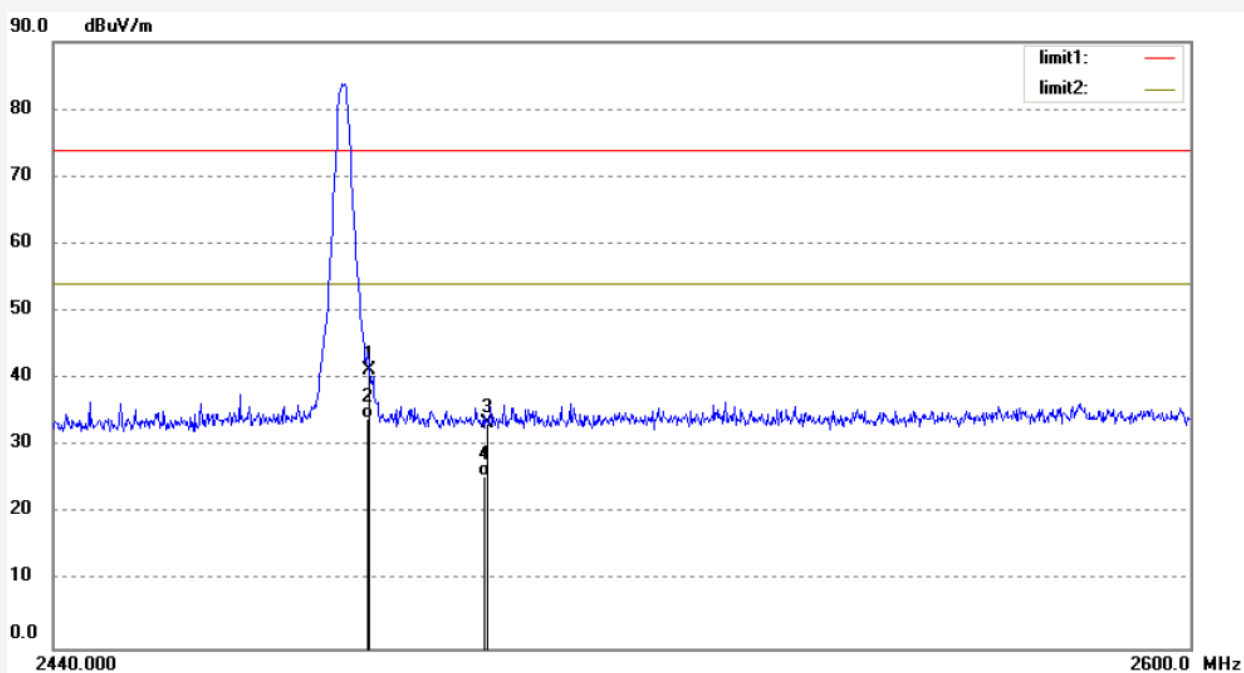
Date: 16/05/22/

Time: 11/48/54

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20160862

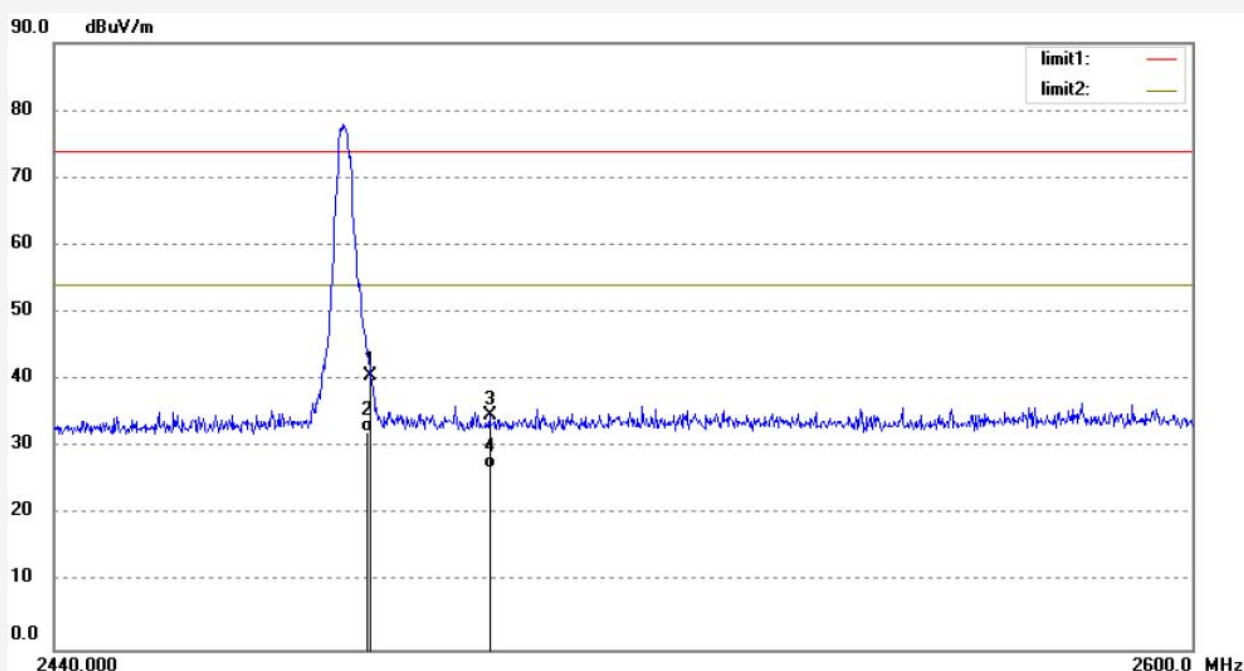


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	49.05	-7.76	41.29	74.00	-32.71	peak			
2	2483.500	41.79	-7.76	34.03	54.00	-19.97	AVG			
3	2500.000	41.12	-7.71	33.41	74.00	-40.59	peak			
4	2500.000	33.22	-7.71	25.51	54.00	-28.49	AVG			

Job No.: STAR2016 #255
Standard: FCC PK
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: Bluetooth Smart Module
Mode: TX 2480MHz
Model: ILT5X
Manufacturer: ILOGIC

Polarization: Vertical
Power Source: DC 3V
Date: 16/05/22/
Time: 11/53/51
Engineer Signature: star
Distance: 3m

Note: Report No.:ATE20160862

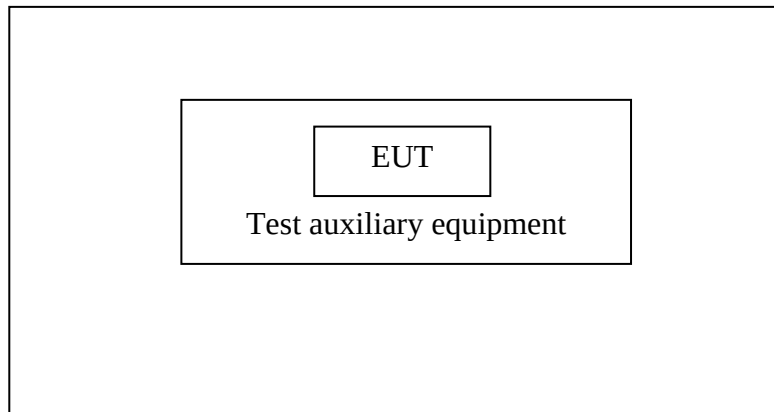


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2483.500	48.46	-7.76	40.70	74.00	-33.30	peak			
2	2483.500	40.14	-7.76	32.38	54.00	-21.62	AVG			
3	2500.000	42.41	-7.71	34.70	74.00	-39.30	peak			
4	2500.000	34.67	-7.71	26.96	54.00	-27.04	AVG			

9. RADIATED SPURIOUS EMISSION TEST

9.1. Block Diagram of Test Setup

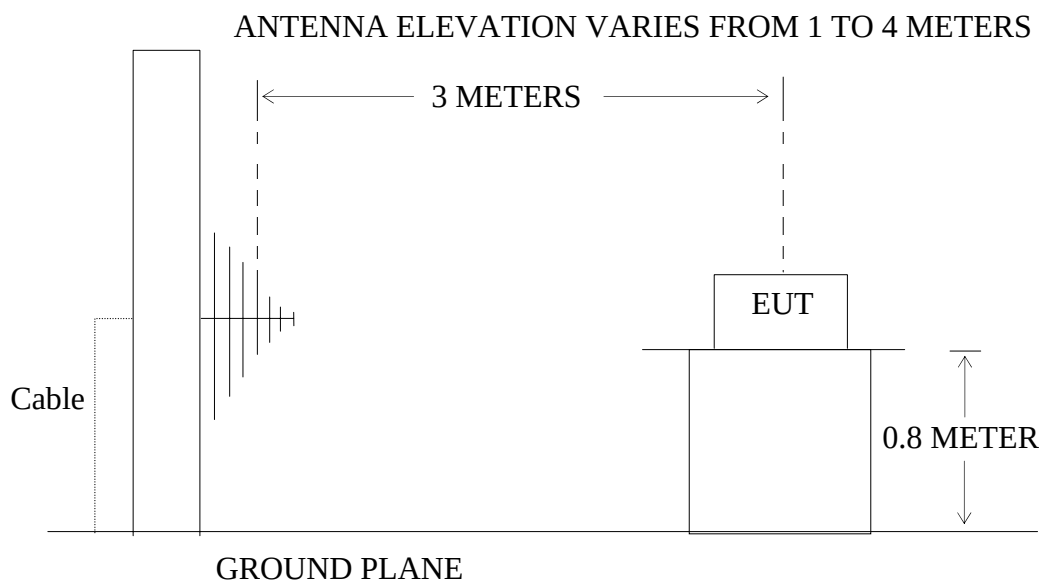
9.1.1. Block diagram of connection between the EUT and peripherals



Setup: Transmitting mode

(EUT: Bluetooth Smart Module)

9.1.2. Semi-Anechoic Chamber Test Setup Diagram



9.2.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).

9.3.Restricted bands of operation

9.3.1.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.

9.4.Configuration of EUT on Measurement

The equipment are 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.

9.5.Operating Condition of EUT

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

9.5.2.Turn on the power of all equipment.

9.5.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480 MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

9.6.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. The EUT was tested in 3 orthogonal planes.

The bandwidth of test receiver is set at 9 kHz in below 30MHz. and set at 120 kHz in 30-1000MHz, and 1MHz in above 1000MHz.

The frequency range from 9 kHz to 25GHz is checked.

The final measurement in band 9-90 kHz, 110-490 kHz and above 1000MHz is performed with Average detector. Except those frequency bands mention above, the final measurement for frequencies below 1000MHz is performed with Quasi Peak detector.

The field strength is calculated by adding the antenna factor, and cable loss, and subtracting the amplifier gain from the measured reading. The basic equation calculation is as follows:

Result = Reading + Corrected Factor

Where Corrected Factor = Antenna Factor + Cable Loss – Amplifier Gain

9.7.The Field Strength of Radiation Emission Measurement Results

PASS.

Note: 1. Emissions attenuated more than 20 dB below the permissible value are not reported.

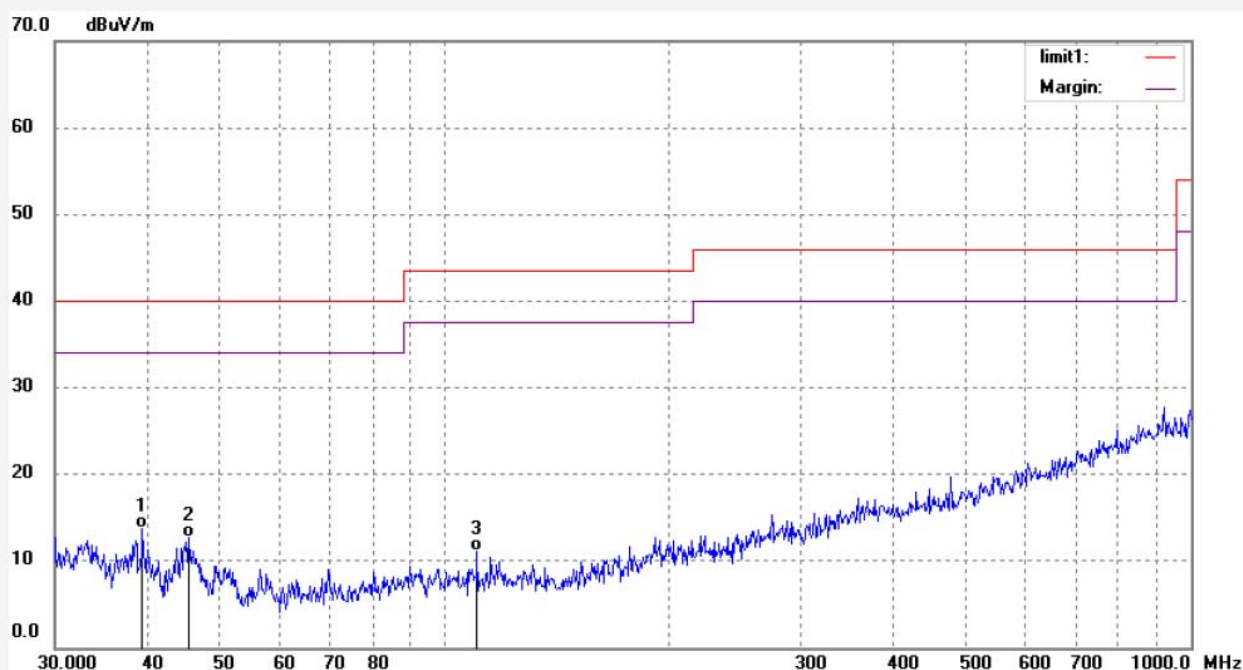
2. *: Denotes restricted band of operation.

3.The radiation emissions from 18-25GHz are not reported, because the test values lower than the limits of 20dB.

Job No.: ricky 2016 #629
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: Bluetooth Smart Module
Mode: TX 2402MHz
Model: ILT5X
Manufacturer: ILOGIC

Polarization: Horizontal
Power Source: DC 3V
Date: 16/05/22/
Time: 16/20/32
Engineer Signature:
Distance: 3m

Note: Report NO.:ATE20160862

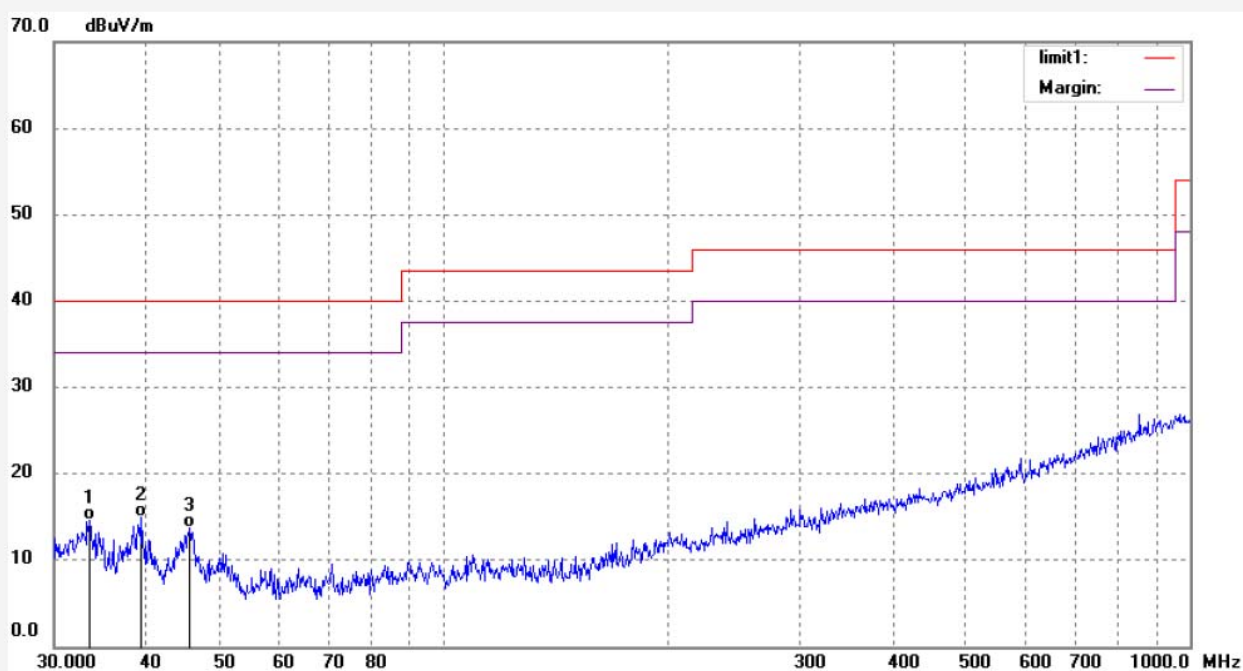


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	39.3204	32.67	-18.88	13.79	40.00	-26.21	QP			
2	45.4130	32.25	-19.49	12.76	40.00	-27.24	QP			
3	110.4693	32.22	-21.08	11.14	43.50	-32.36	QP			

Job No.: ricky 2016 #630
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: Bluetooth Smart Module
Mode: TX 2402MHz
Model: ILT5X
Manufacturer: ILOGIC

Polarization: Vertical
Power Source: DC 3V
Date: 16/05/22/
Time: 16/22/35
Engineer Signature:
Distance: 3m

Note: Report NO.:ATE20160862

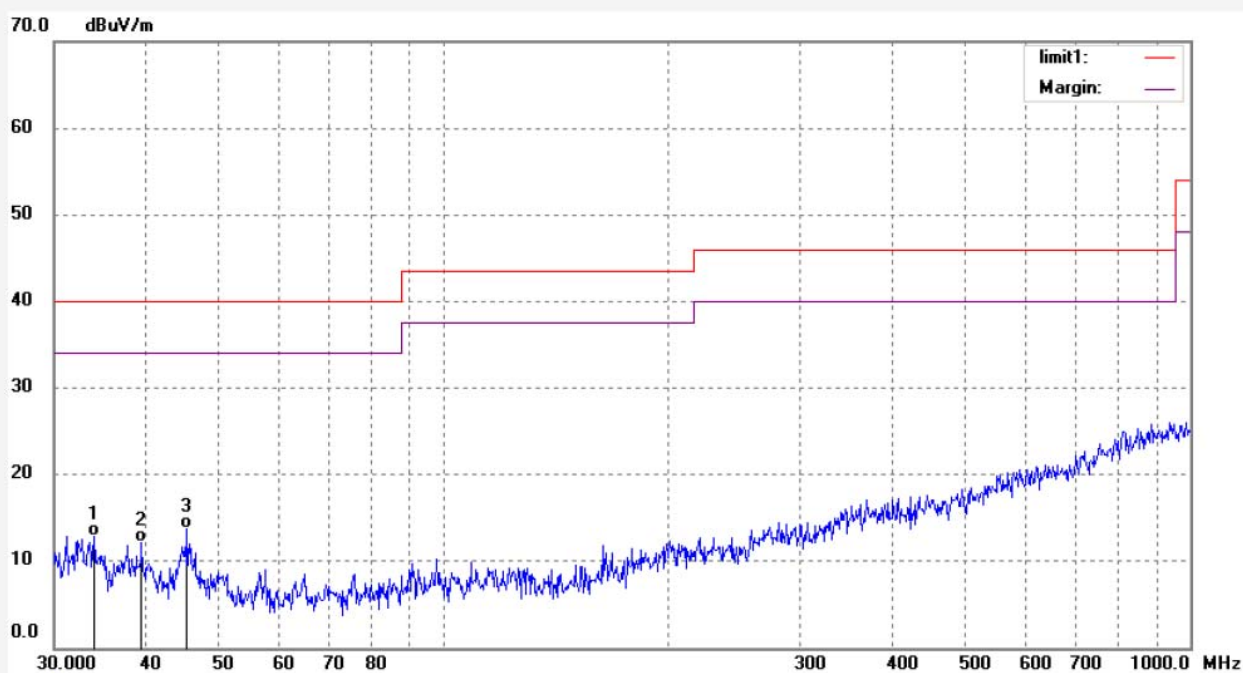


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	33.4522	31.94	-17.28	14.66	40.00	-25.34	QP			
2	39.3204	33.81	-18.88	14.93	40.00	-25.07	QP			
3	45.5729	33.23	-19.52	13.71	40.00	-26.29	QP			

Job No.: ricky 2016 #628
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: Bluetooth Smart Module
Mode: TX 2440MHz
Model: ILT5X
Manufacturer: ILOGIC

Polarization: Horizontal
Power Source: DC 3V
Date: 16/05/22/
Time: 16/18/49
Engineer Signature:
Distance: 3m

Note: Report NO.:ATE20160862

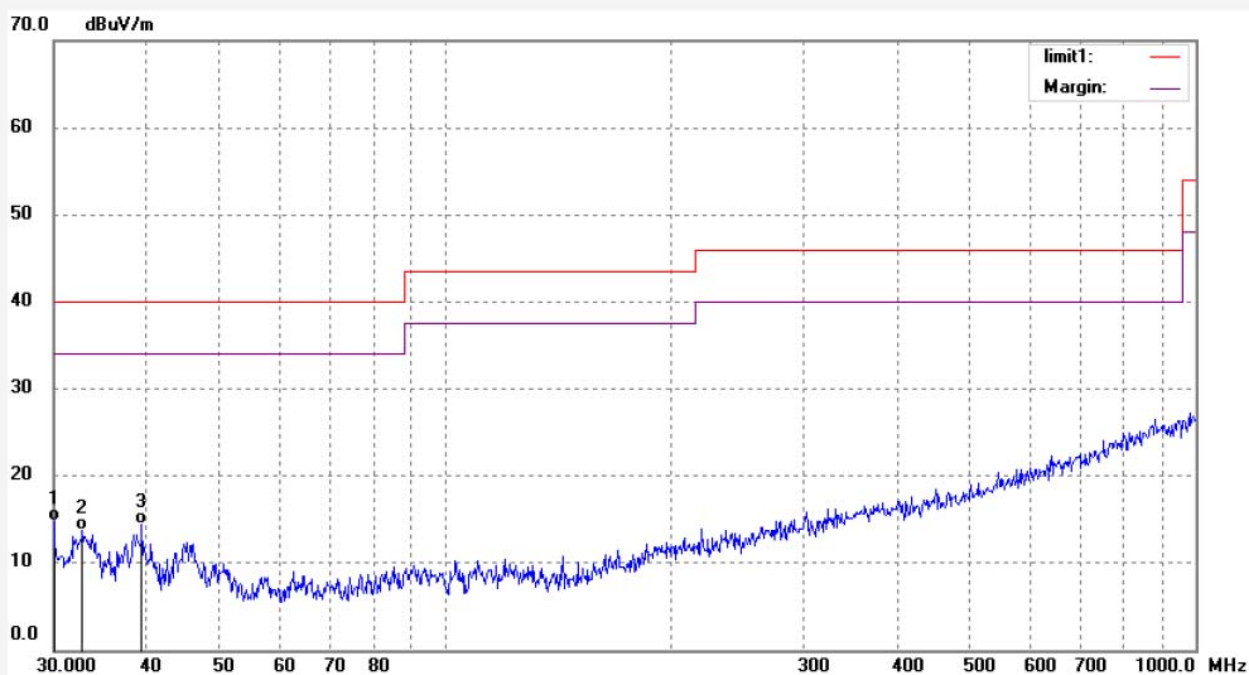


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	33.9256	30.30	-17.36	12.94	40.00	-27.06	QP			
2	39.3204	31.05	-18.88	12.17	40.00	-27.83	QP			
3	45.2538	33.15	-19.45	13.70	40.00	-26.30	QP			

Job No.: ricky 2016 #627
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: Bluetooth Smart Module
Mode: TX 2440MHz
Model: ILT5X
Manufacturer: ILOGIC

Polarization: Vertical
Power Source: DC 3V
Date: 16/05/22/
Time: 16/17/40
Engineer Signature:
Distance: 3m

Note: Report NO.:ATE20160862

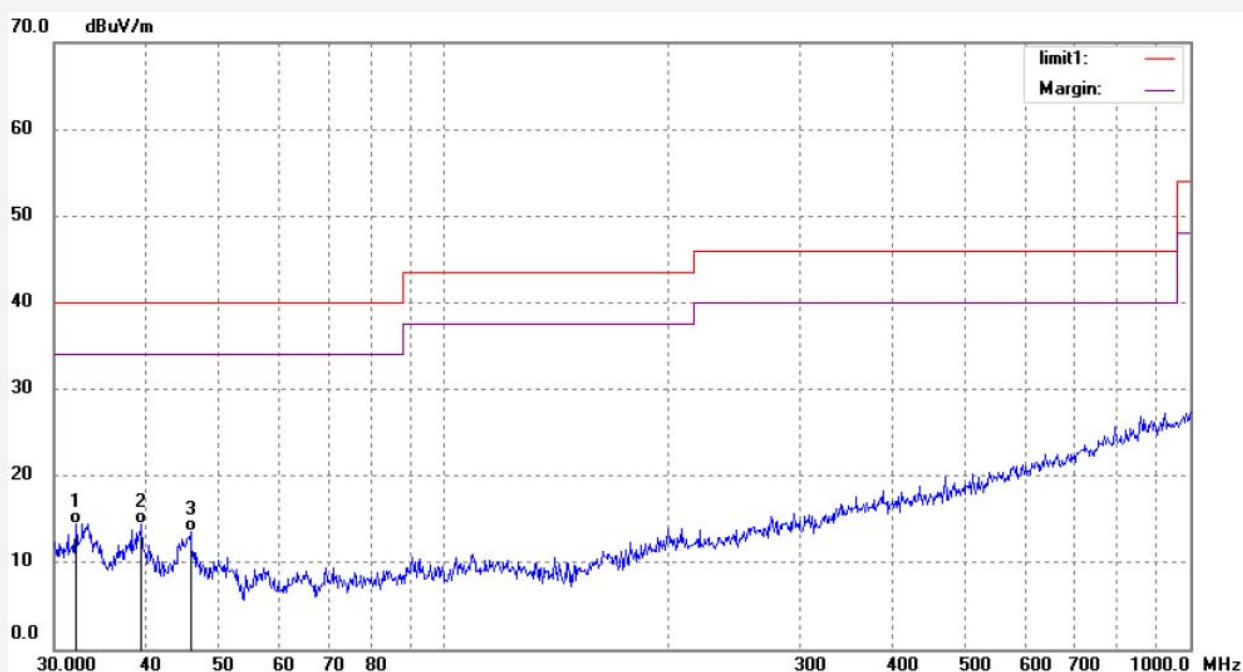


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	30.0000	31.62	-16.80	14.82	40.00	-25.18	QP			
2	32.7544	30.86	-17.19	13.67	40.00	-26.33	QP			
3	39.3204	33.31	-18.88	14.43	40.00	-25.57	QP			

Job No.: ricky 2016 #625
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: Bluetooth Smart Module
Mode: TX 2480MHz
Model: ILT5X
Manufacturer: ILOGIC

Polarization: Horizontal
Power Source: DC 3V
Date: 16/05/22/
Time: 16/12/29
Engineer Signature:
Distance: 3m

Note: Report NO.:ATE20160862

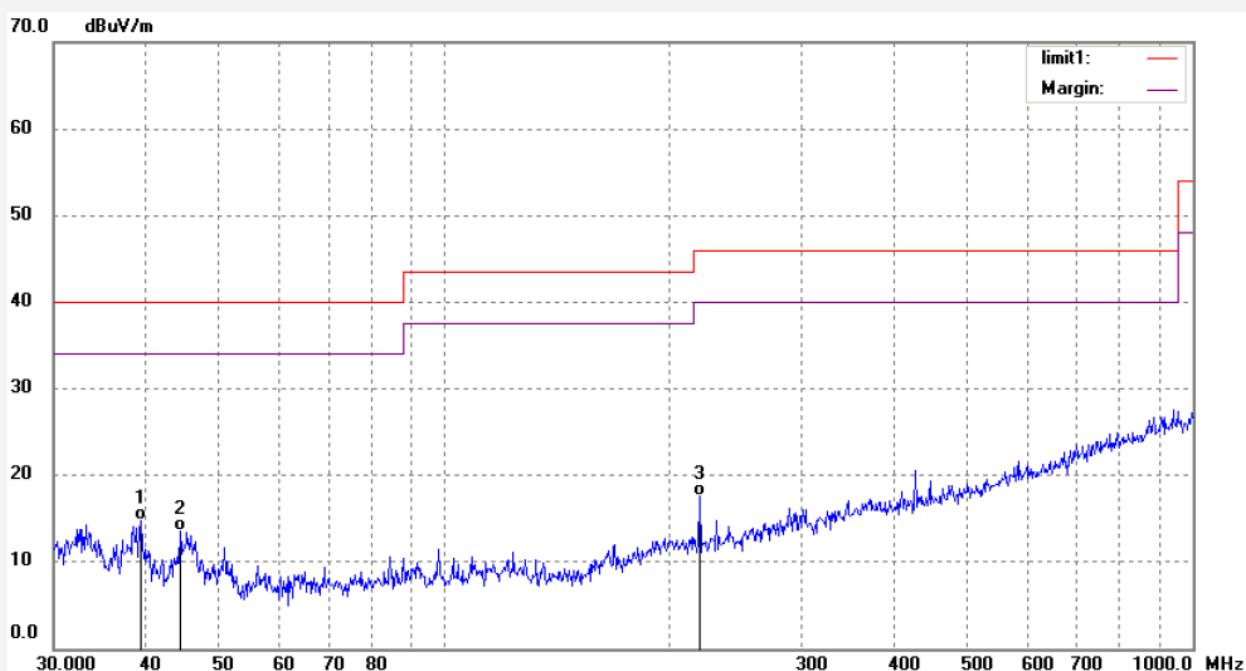


No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	32.0711	31.60	-17.09	14.51	40.00	-25.49	QP			
2	39.3204	33.25	-18.88	14.37	40.00	-25.63	QP			
3	45.7333	33.17	-19.58	13.59	40.00	-26.41	QP			

Job No.: ricky 2016 #626
Standard: FCC Class B 3M Radiated
Test item: Radiation Test
Temp.(C)/Hum.(%) 25 C / 55 %
EUT: Bluetooth Smart Module
Mode: TX 2480MHz
Model: ILT5X
Manufacturer: ILOGIC

Polarization: Vertical
Power Source: DC 3V
Date: 16/05/22/
Time: 16/13/35
Engineer Signature:
Distance: 3m

Note: Report NO.:ATE20160862



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	39.3204	33.66	-18.88	14.78	40.00	-25.22	QP			
2	44.3098	32.85	-19.35	13.50	40.00	-26.50	QP			
3	219.1785	36.01	-18.40	17.61	46.00	-28.39	QP			

Job No.: STAR2016 #631

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: Bluetooth Smart Module

Mode: TX 2402MHz

Model: ILT5X

Manufacturer: ILOGIC

Polarization: Horizontal

Power Source: DC 3V

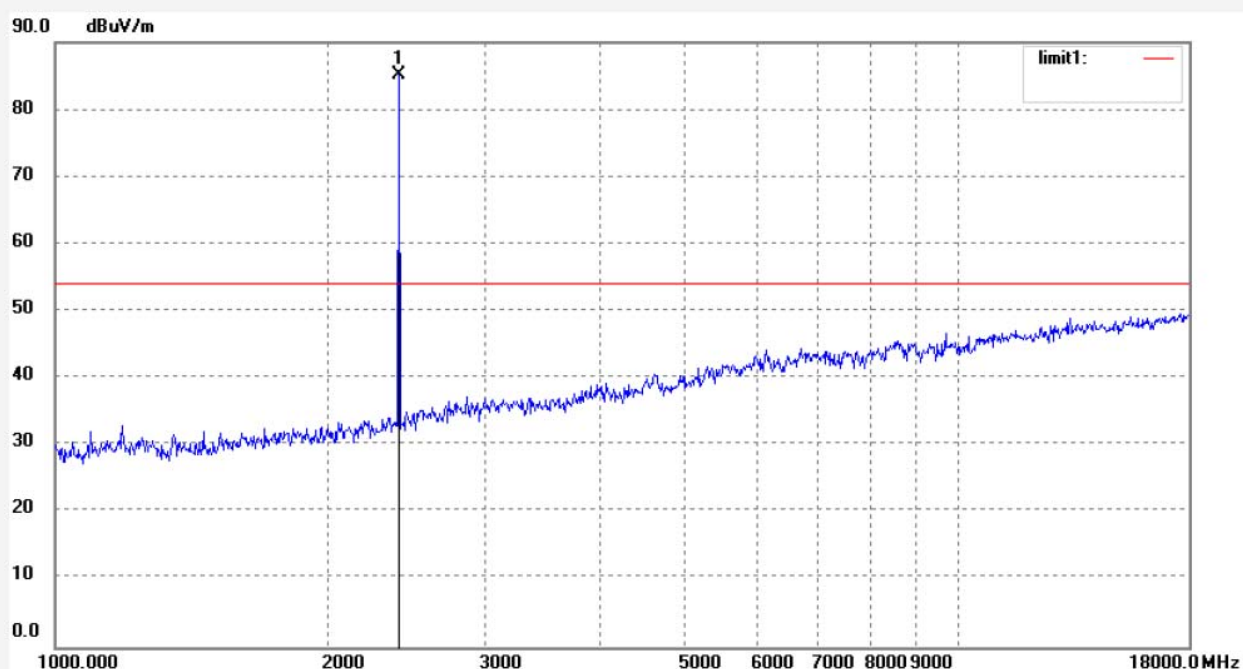
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Time: 10/35/42

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20160862



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.599	92.81	-7.60	85.21			peak			

Job No.: STAR2016 #632

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: Bluetooth Smart Module

Mode: TX 2402MHz

Model: ILT5X

Manufacturer: ILOGIC

Polarization: Vertical

Power Source: DC 3V

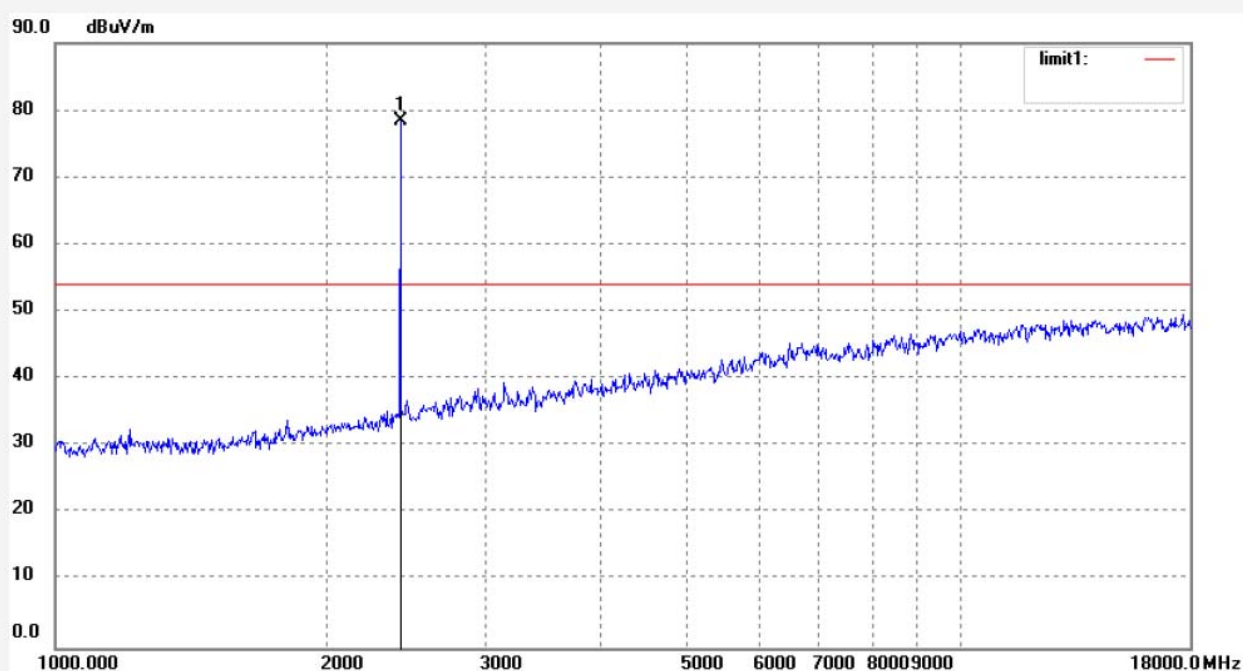
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Time: 10/40/14

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20160862



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.600	86.02	-7.60	78.42			peak			

Job No.: STAR2016 #634

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: Bluetooth Smart Module

Mode: TX 2440MHz

Model: ILT5X

Manufacturer: ILOGIC

Polarization: Horizontal

Power Source: DC 3V

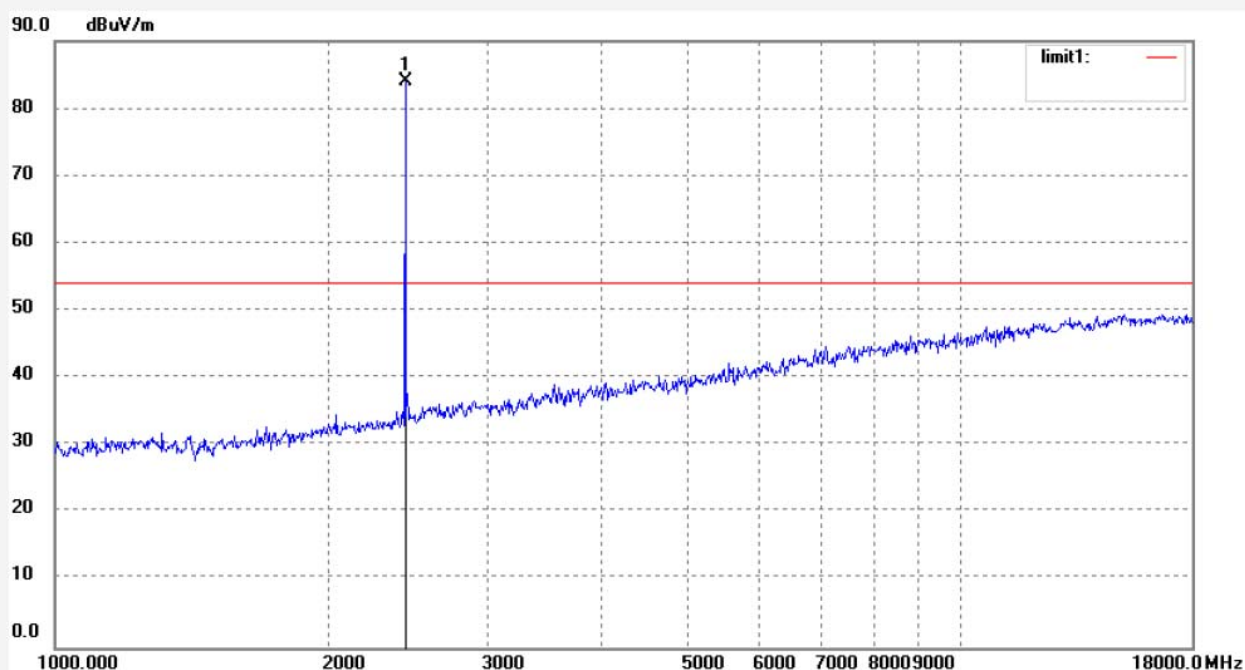
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Time: 10/51/19

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20160862



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2440.802	91.53	-7.49	84.04			peak			

Job No.: STAR2016 #633

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: Bluetooth Smart Module

Mode: TX 2440MHz

Model: ILT5X

Manufacturer: ILOGIC

Polarization: Vertical

Power Source: DC 3V

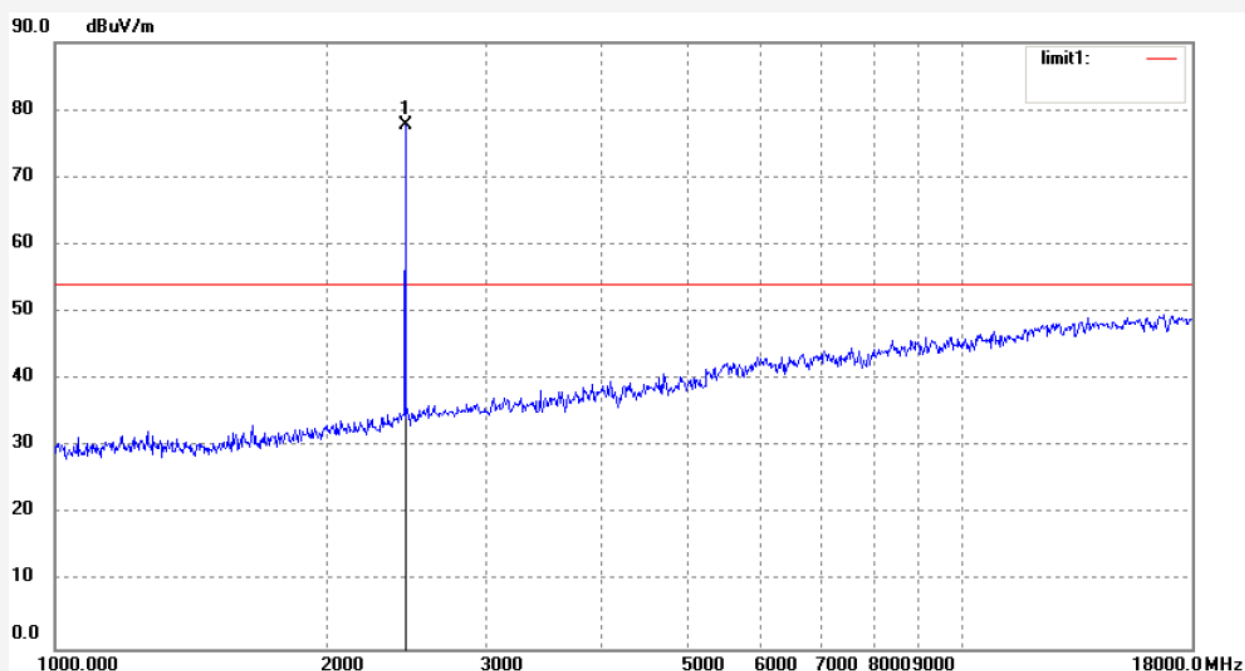
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Time: 10/46/25

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20160862



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2440.807	85.25	-7.49	77.76			peak			

Job No.: STAR2016 #635

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: Bluetooth Smart Module

Mode: TX 2480MHz

Model: ILT5X

Manufacturer: ILOGIC

Polarization: Horizontal

Power Source: DC 3V

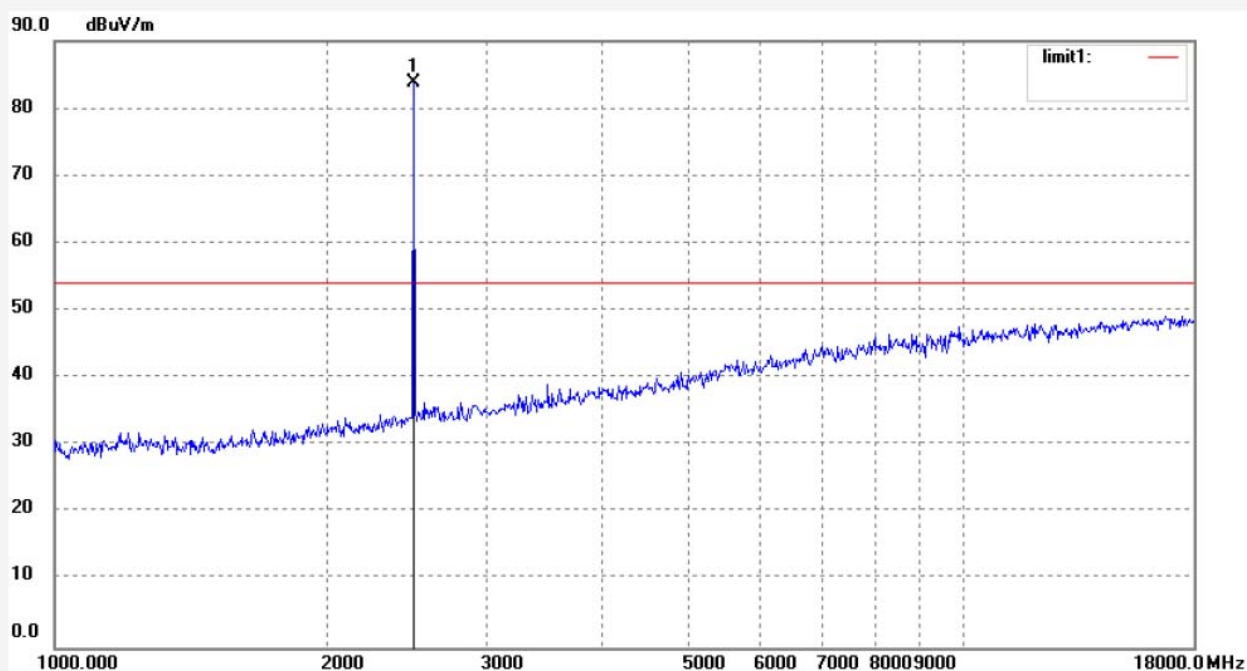
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Time: 10/56/32

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20160862



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.167	91.20	-7.38	83.82			peak			



ACCURATE TECHNOLOGY CO., LTD.

F1,Bldg,A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China

Site: 1# Chamber

Tel:+86-0755-26503290

Fax:+86-0755-26503396

Job No.: STAR2016 #636

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

Temp.(C)/Hum.(%) 25 C / 55 %

EUT: Bluetooth Smart Module

Mode: TX 2480MHz

Model: ILT5X

Manufacturer: ILOGIC

Polarization: Vertical

Power Source: DC 3V

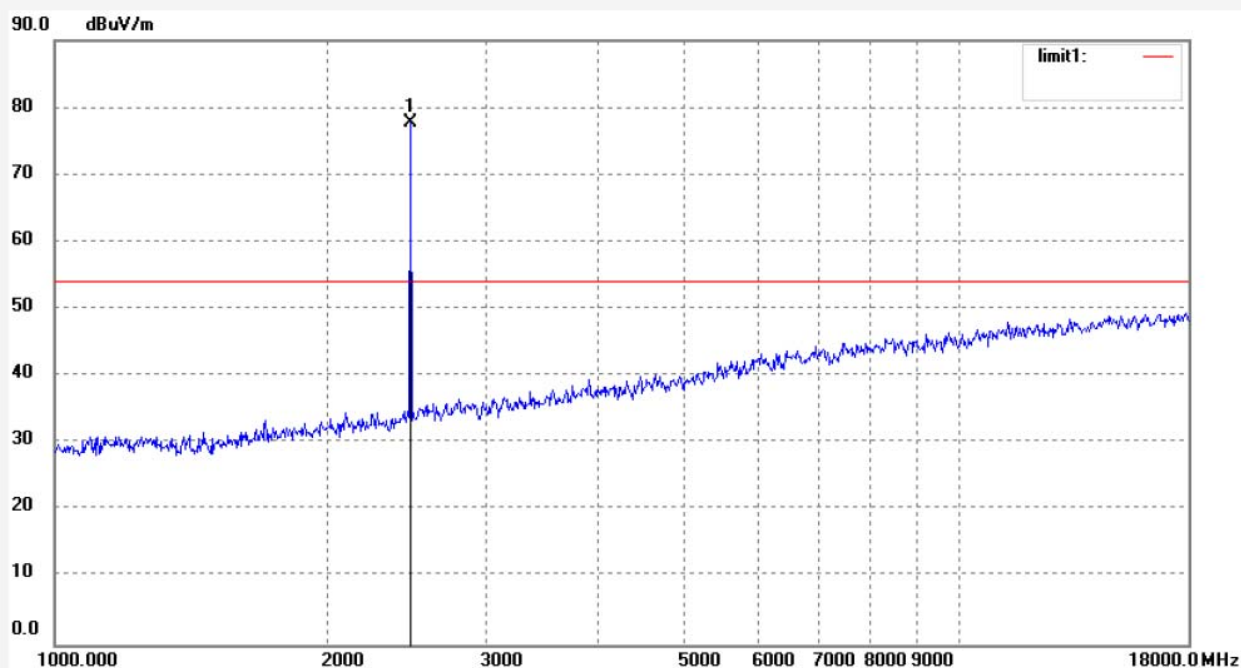
Date: 16/05/22/

Time: 11/01/45

Engineer Signature: star

Distance: 3m

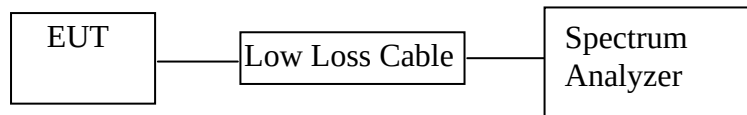
Note: Report No.:ATE20160862



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.238	85.12	-7.38	77.74			peak			

10.CONDUCTED SPURIOUS EMISSION COMPLIANCE TEST

10.1.Block Diagram of Test Setup



(EUT: Bluetooth Smart Module)

10.2.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).

10.3.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.

10.4.Operating Condition of EUT

10.4.1.Setup the EUT and simulator as shown as Section 10.1.

10.4.2.Turn on the power of all equipment.

10.4.3.Let the EUT work in TX modes measure it. The transmit frequency are 2402-2480 MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

10.5. Test Procedure

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

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

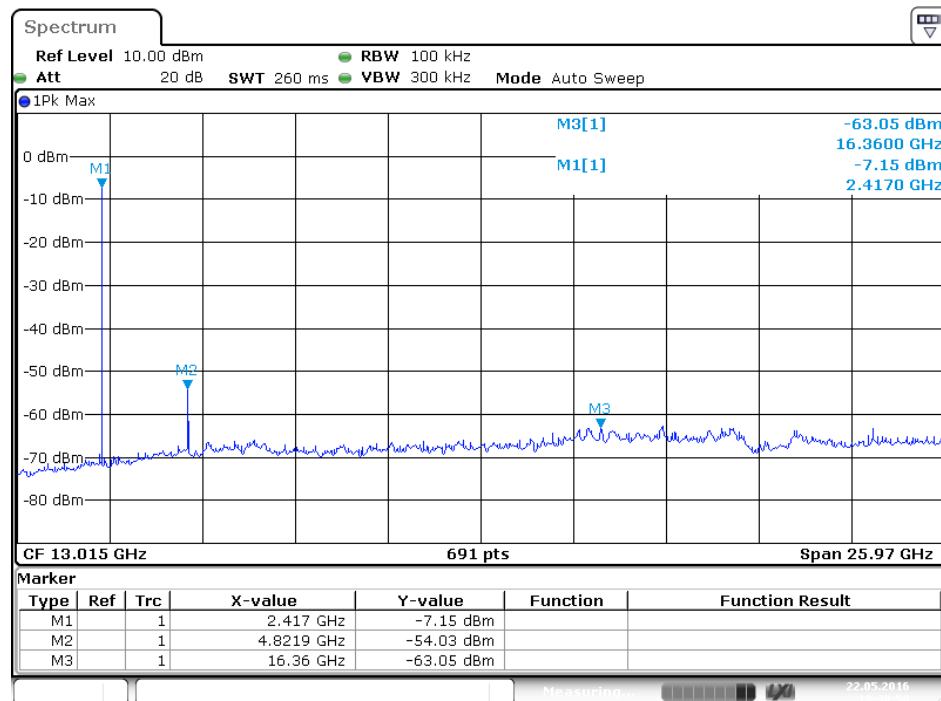
10.5.3. The Conducted Spurious Emission was measured and recorded.

10.6. Test Result

Pass.

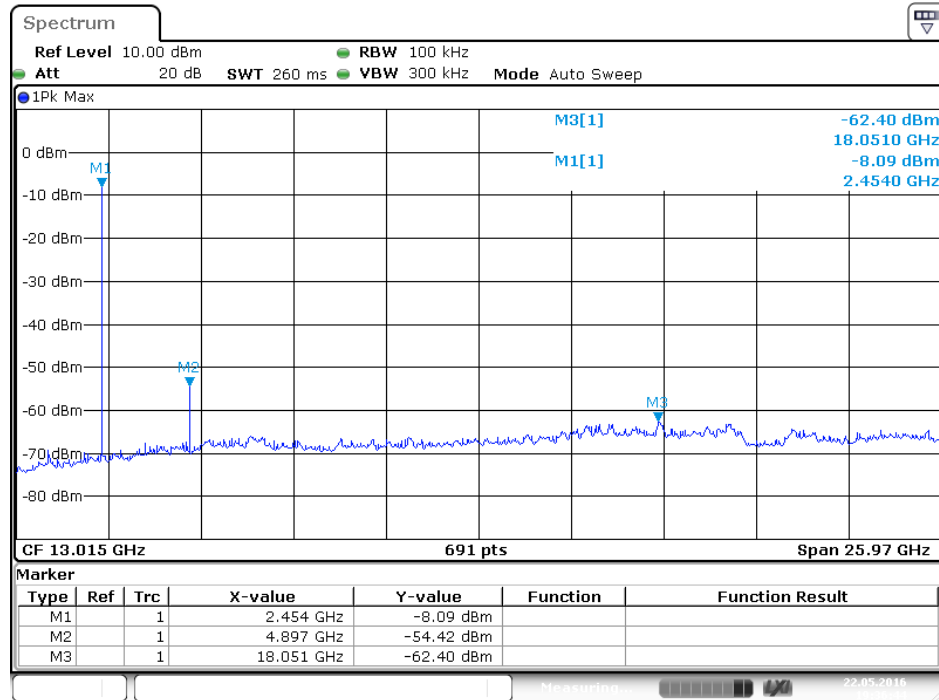
The spectrum analyzer plots are attached as below.

BLE Channel Low 2402MHz



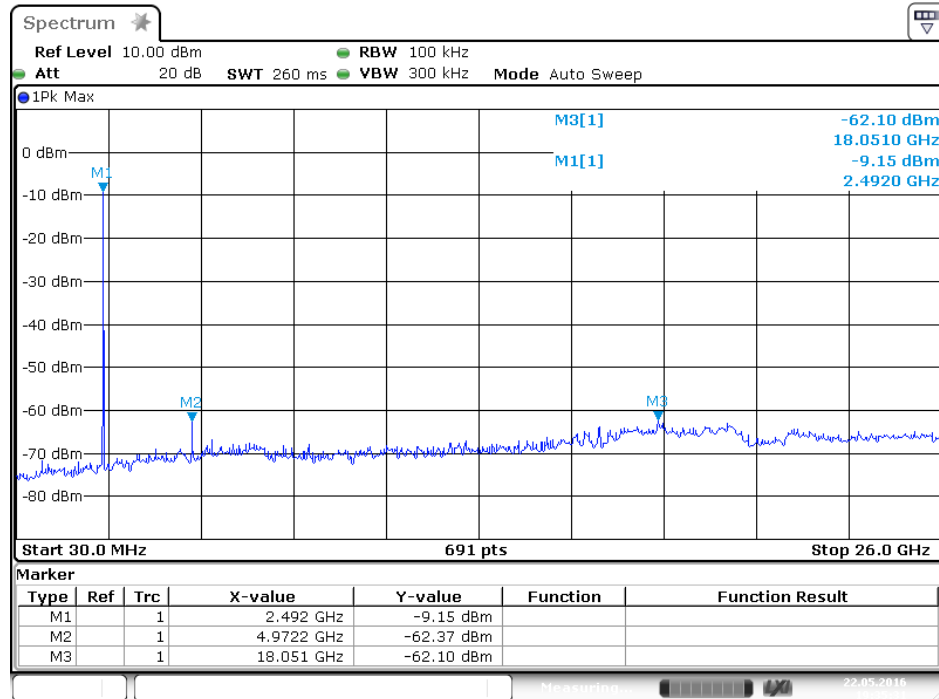
Date: 22.MAY.2016 19:38:59

BLE Channel Middle 2440MHz



Date: 22.MAY.2016 19:36:45

BLE Channel High 2480MHz



Date: 22.MAY.2016 19:35:32

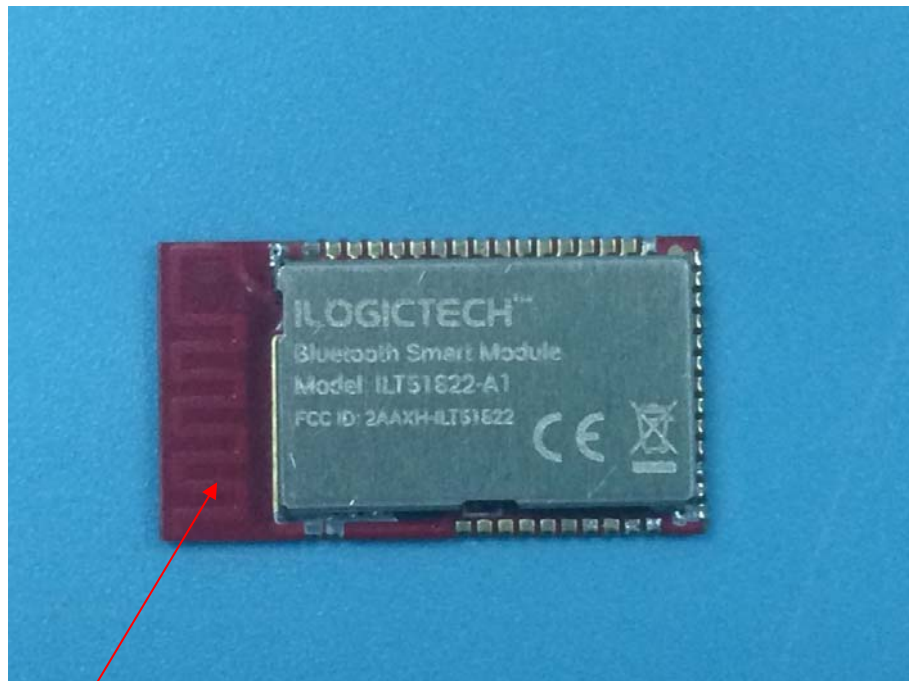
11.ANTENNA REQUIREMENT

11.1.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.

11.2.Antenna Construction

The module must contain a permanently attached antenna, or contain a unique antenna connector, and be marketed and operated only with specific antenna(s), per Sections 15.203, 15.204(b), 15.204(c), 15.212(a), 2.929(b); The Antenna gain of EUT is 0dBi. Therefore, the equipment complies with the antenna requirement.



Antenna