

APPLICATION CERTIFICATION FCC Part 15C

On Behalf of

SEVEN LIKE CO., LIMITED

Bluetooth Smart Thermometer

Model No.: BTH-01J, NS-BTH01J, TQ-T-502, SKB-01J

FCC ID: 2ACD3-BTH01J

Prepared for : SEVEN LIKE CO., LIMITED
Address : RM3128, Nanguang Jiejia Bldg., Futian District, Shenzhen,
Guangdong, P.R.C

Prepared by : 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: (0755) 26503290
Fax: (0755) 26503396

Report No. : ATE20180395
Date of Test : March 21-March 22, 2018
Date of Report : March 23, 2018

TABLE OF CONTENTS

Description	Page
Test Report Certification	
1. GENERAL INFORMATION	5
1.1. Description of Device (EUT).....	5
1.2. Carrier Frequency of Channels.....	5
1.3. Special Accessory and Auxiliary Equipment	6
1.4. Description of Test Facility	6
1.5. Measurement Uncertainty.....	6
2. MEASURING DEVICE AND TEST EQUIPMENT	7
3. OPERATION OF EUT DURING TESTING	8
3.1. Operating Mode.....	8
3.2. Configuration and peripherals	8
4. TEST PROCEDURES AND RESULTS	9
5. 6DB BANDWIDTH MEASUREMENT.....	10
5.1. Block Diagram of Test Setup.....	10
5.2. The Requirement For Section 15.247(a)(2).....	10
5.3. EUT Configuration on Measurement	10
5.4. Operating Condition of EUT	10
5.5. Test Procedure	10
5.6. Test Result	11
6. MAXIMUM PEAK OUTPUT POWER	13
6.1. Block Diagram of Test Setup.....	13
6.2. The Requirement For Section 15.247(b)(3).....	13
6.3. EUT Configuration on Measurement	13
6.4. Operating Condition of EUT	13
6.5. Test Procedure	13
6.6. Test Result	14
7. POWER SPECTRAL DENSITY MEASUREMENT.....	16
7.1. Block Diagram of Test Setup.....	16
7.2. The Requirement For Section 15.247(e).....	16
7.3. EUT Configuration on Measurement	16
7.4. Operating Condition of EUT	16
7.5. Test Procedure	16
7.6. Test Result	17
8. BAND EDGE COMPLIANCE TEST	19
8.1. Block Diagram of Test Setup.....	19
8.2. The Requirement For Section 15.247(d)	19
8.3. EUT Configuration on Measurement	19
8.4. Operating Condition of EUT	19
8.5. Test Procedure	20
8.6. Test Result	20
9. RADIATED SPURIOUS EMISSION TEST	26
9.1. Block Diagram of Test Setup.....	26
9.2. The Limit For Section 15.247(d)	27
9.3. Restricted bands of operation	28
9.4. Configuration of EUT on Measurement	28

- 9.5. Operating Condition of EUT29
- 9.6. Test Procedure29
- 9.7. Data Sample.....30
- 9.8. The Field Strength of Radiation Emission Measurement Results30
- 10. ANTENNA REQUIREMENT.....43**
- 10.1. The Requirement43
- 10.2. Antenna Construction43

Test Report Certification

Applicant : SEVEN LIKE CO., LIMITED
Manufacturer : SEVEN LIKE CO., LIMITED
EUT Description : Bluetooth Smart Thermometer
Model No. : BTH-01J, NS-BTH01J, TQ-T-502, SKB-01J
Trade Name : N/A

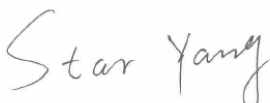
Measurement Procedure Used:


FCC Rules and Regulations Part 15 Subpart C Section 15.247: 2018
ANSI C63.10: 2013


The EUT was tested according to DTS test procedure of Apr 05, 2017 KDB558074 D01 DTS Meas Guidance v04 for compliance to FCC 47CFR 15.247 requirements

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 : March 21-March 22, 2018
Date of Report : March 23, 2018

Test Engineer : 
(Star Yang, Engineer)

Prepared by : 
(Star Yang, Engineer)

Approved & Authorized Signer : 
(Sean Liu, Manager)

1. GENERAL INFORMATION

1.1. Description of Device (EUT)

EUT : Bluetooth Smart Thermometer

Model Number : BTH-01J, NS-BTH01J, TQ-T-502, SKB-01J
 (Note: Above models are identical in schematic, structure and critical components except for model name, So we prepare BTH-01J for test.)

Bluetooth version : V4.2 BLE

Frequency Range : 2402MHz-2480MHz

Number of Channels : 40

Antenna Gain : 0dBi

Antenna type : PCB Antenna

Power Supply : DC 3V (Powered by battery)

Modulation mode : GFSK

Hardware version : V1.0

Software version : V1.0

Applicant : SEVEN LIKE CO., LIMITED
 Address : RM3128, Nanguang Jiejia Bldg., Futian District, Shenzhen, Guangdong, P.R.C

Manufacturer : SEVEN LIKE CO., LIMITED
 Address : RM3128, Nanguang Jiejia Bldg., Futian District, Shenzhen, Guangdong, P.R.C

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	:	Recognition of accreditation by Federal Communications Commission (FCC) The Designation Number is CN1189 The Registration Number is 708358
		Listed by Innovation, Science and Economic Development Canada (ISED) The Registration Number is 5077A-2
		Accredited by China National Accreditation Service for Conformity Assessment (CNAS) The Registration Number is CNAS L3193
		Accredited by American Association for Laboratory Accreditation (A2LA) The Certificate Number is 4297.01
Name of Firm	:	Shenzhen Accurate Technology Co., Ltd.
Site Location	:	1/F., Building A, Changyuan New Material Port, Science & Industry Park, Nanshan District, Shenzhen, Guangdong, P.R. China

1.5.Measurement Uncertainty

Conducted Emission Expanded Uncertainty	=	2.23dB, k=2
Radiated emission expanded uncertainty (9kHz-30MHz)	=	3.08dB, k=2
Radiated emission expanded uncertainty (30MHz-1000MHz)	=	4.42dB, k=2
Radiated emission expanded uncertainty (Above 1GHz)	=	4.06dB, k=2

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	ESPI3	101526/003	Jan. 06, 2018	1 Year
Pre-Amplifier	Rohde&Schwarz	CBLU1183540-01	3791	Jan. 06, 2018	1 Year
Loop Antenna	Schwarzbeck	FMZB1516	1516131	Jan. 12, 2018	1 Year
Bilog Antenna	Schwarzbeck	VULB9163	9163-323	Jan. 12, 2018	1 Year
Horn Antenna	Schwarzbeck	BBHA9120D	9120D-655	Jan. 12, 2018	1 Year
Highpass Filter	Wainwright Instruments	WHKX3.6/18G-10S	N/A	Jan. 06, 2018	1 Year
Band Reject Filter	Wainwright Instruments	WRCG2400/2485-2375/2510-60/11SS	N/A	Jan. 06, 2018	1 Year
RF COAXIAL CABLE	SUHNER	N-5m(Frequency range:9KHz-26.5GHz)	NO.3	Jan. 06, 2018	1 Year
RF COAXIAL CABLE	SUHNER	N-5m(Frequency range:9KHz-26.5GHz)	NO.4	Jan. 06, 2018	1 Year
RF COAXIAL CABLE	SUHNER	N-1m(Frequency range:9KHz-26.5GHz)	NO.5	Jan. 06, 2018	1 Year
RF COAXIAL CABLE	SUHNER	N-1m(Frequency range:9KHz-26.5GHz)	NO.6	Jan. 06, 2018	1 Year
Temporary antenna connector	NTGS	14AE	N/A	Mar. 21, 2018	N/A

Note: The temporary antenna connector is soldered on the PCB board in order to perform conducted tests and this temporary antenna connector is listed in the equipment list.

3. OPERATION OF EUT DURING TESTING

3.1. Operating Mode

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

Low Channel: 2402MHz

Middle Channel: 2440MHz

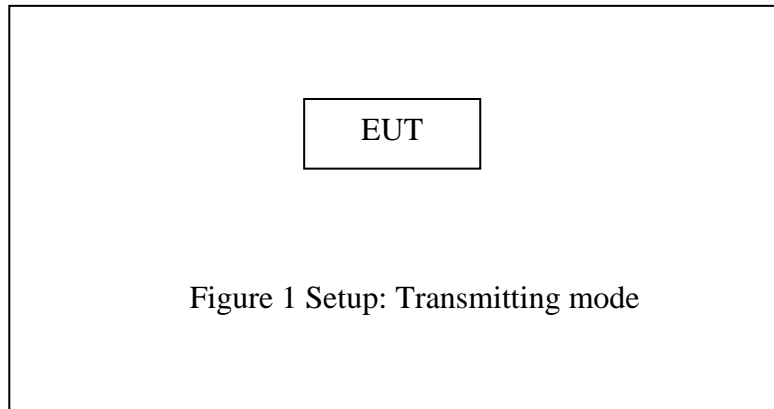
High Channel: 2480MHz

Note: The equipment under test (EUT) was tested under new battery.

The Bluetooth has been tested under continuous transmission mode.

Its duty cycle setting is greater than 98%.

3.2. Configuration and peripherals



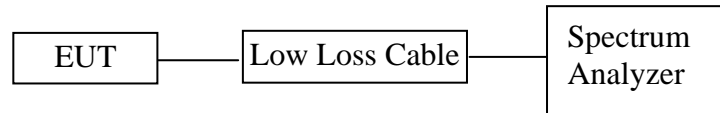
4. TEST PROCEDURES AND RESULTS

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 15.207	AC Power Line Conducted Emission Test	N/A
Section 15.203	Antenna Requirement	Compliant

The EUT is powered by DC 3V battery, so the conducted emission test is not applicable and skipped.

5. 6DB BANDWIDTH MEASUREMENT

5.1. Block Diagram of Test Setup



(EUT: Bluetooth Smart Thermometer)

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 2402-2480MHz. 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

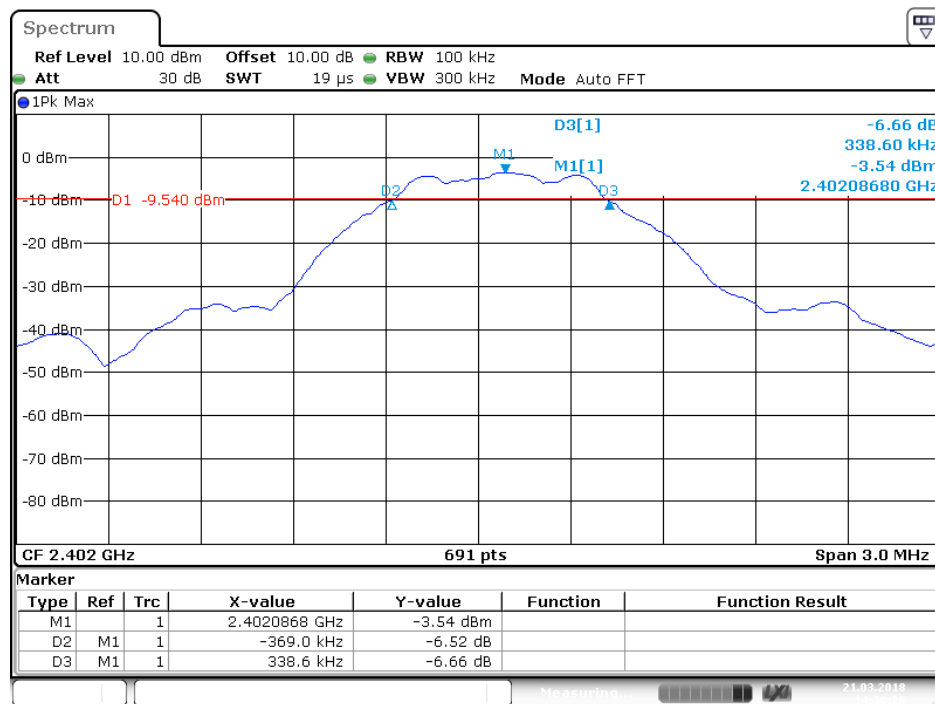
Test Lab: Shielding room

Test Engineer: Star

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit(MHz)	PASS/FAIL
0	2402	0.708	0.5	PASS
19	2440	0.690	0.5	PASS
39	2480	0.690	0.5	PASS

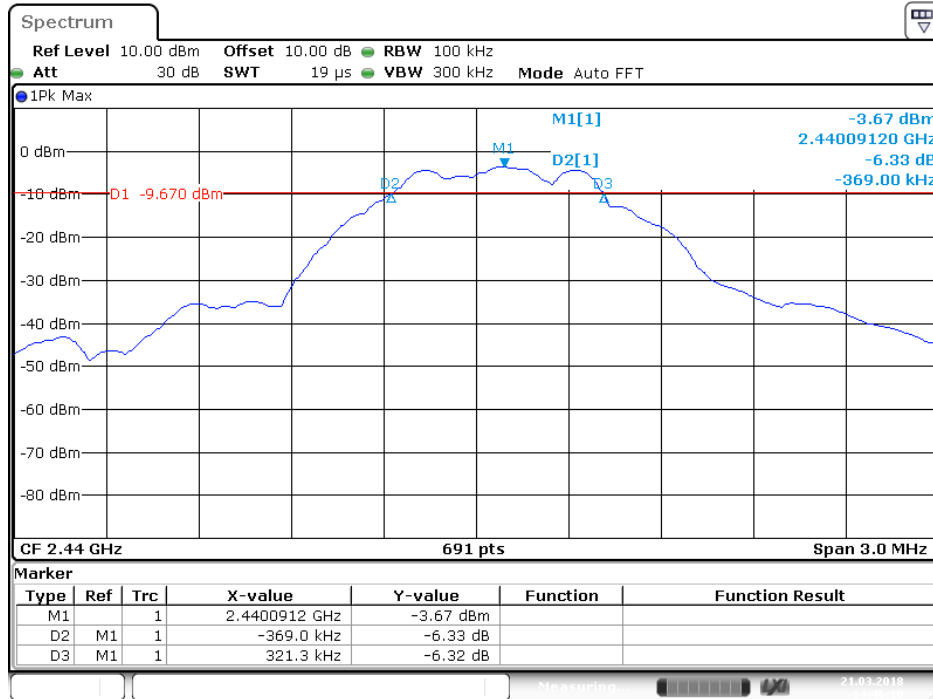
The spectrum analyzer plots are attached as below.

channel 0



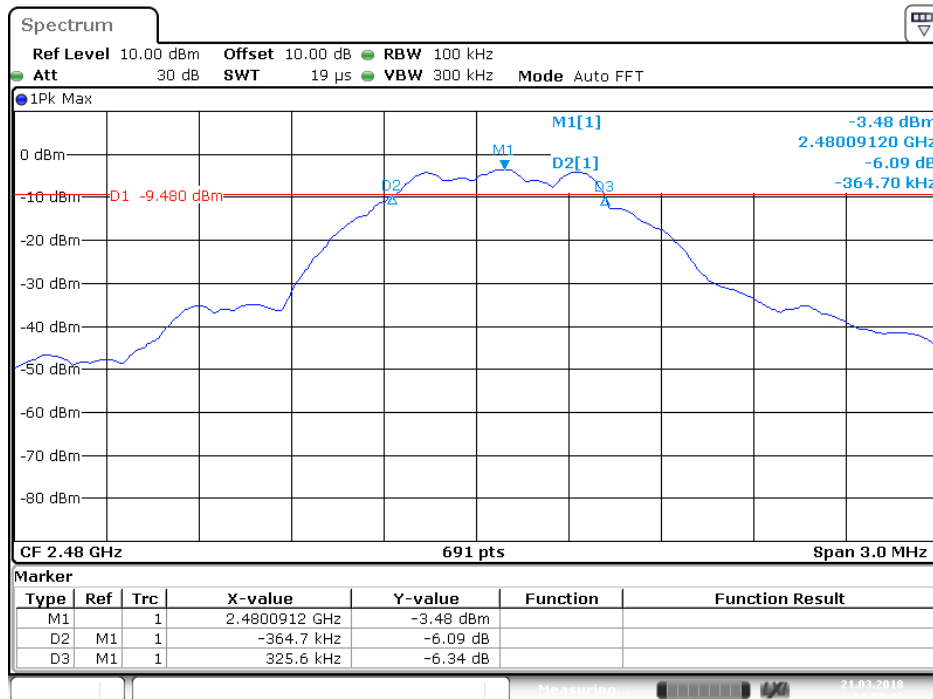
Date: 21.MAR.2018 14:38:26

channel 19



Date: 21.MAR.2018 14:46:10

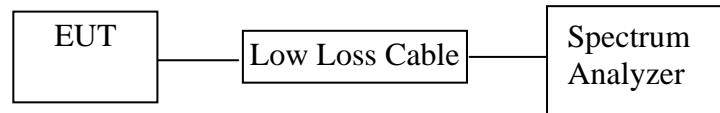
channel 39



Date: 21.MAR.2018 14:50:49

6. MAXIMUM PEAK OUTPUT POWER

6.1. Block Diagram of Test Setup



(EUT: Bluetooth Smart Thermometer)

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 2402-2480MHz. 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. Set RBW of spectrum analyzer to 1 MHz and VBW to 3MHz.

6.5.3. Measurement the maximum peak output power.

6.6. Test Result

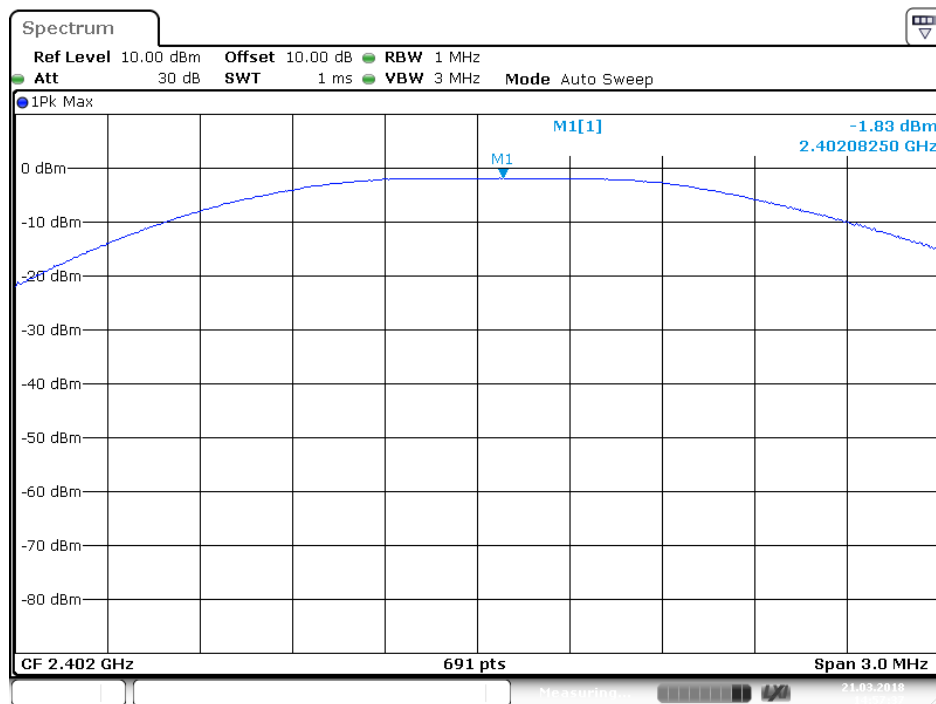
Test Lab: Shielding room

Test Engineer: Star

Channel	Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
0	2402	-1.83	30	PASS
19	2440	-2.50	30	PASS
39	2480	-2.73	30	PASS

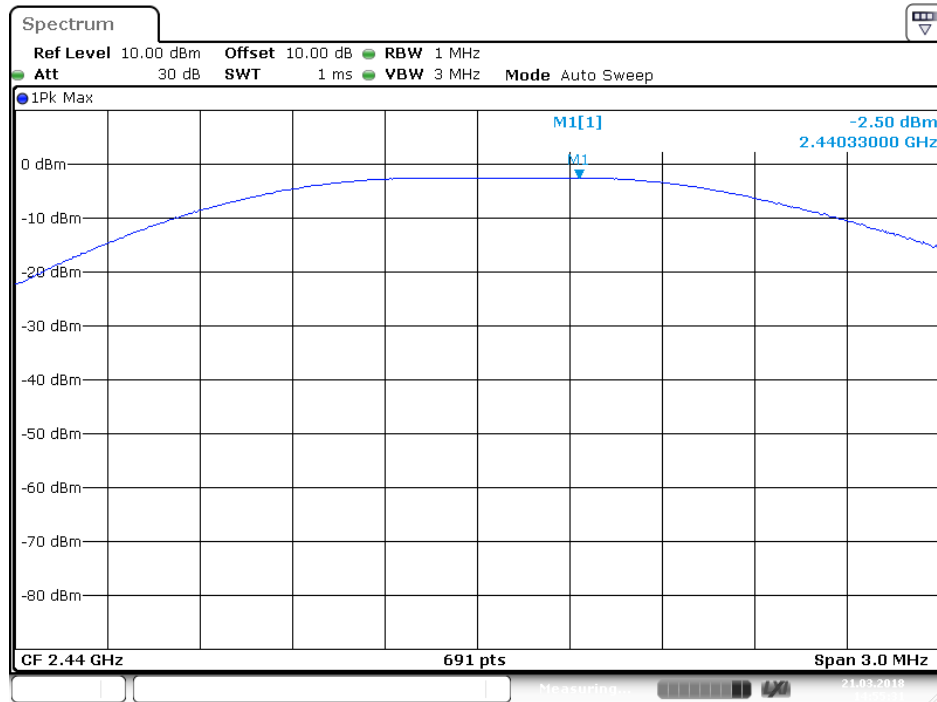
The spectrum analyzer plots are attached as below.

channel 0

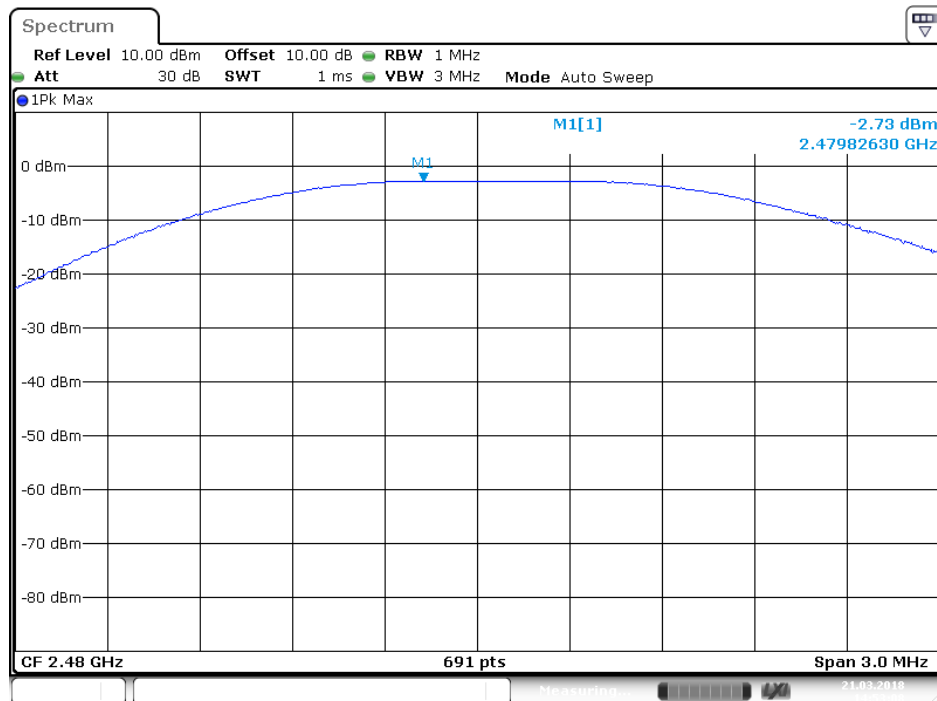


Date: 21.MAR.2018 14:57:37

channel 19

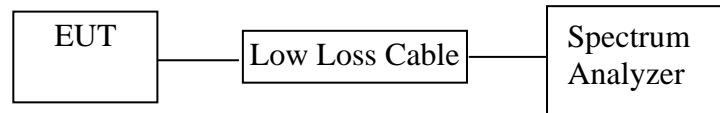


channel 39



7. POWER SPECTRAL DENSITY MEASUREMENT

7.1. Block Diagram of Test Setup



(EUT: Bluetooth Smart Thermometer)

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 2402-2480MHz. We select 2402MHz, 2440MHz, and 2480MHz TX frequency to transmit.

7.5. Test Procedure

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

7.5.2. Measurement Procedure PKPSD:

7.5.3. 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 3kHz) and repeat.

7.5.4.Measurement the maximum power spectral density.

7.6.Test Result

Test Lab: Shielding room

Test Engineer: Star

CHANNEL NUMBER	FREQUENCY (MHz)	PSD (dBm/3KHz)	LIMIT (dBm/3KHz)	PASS/FAIL
0	2402	-14.29	8	PASS
19	2440	-14.18	8	PASS
39	2480	-14.76	8	PASS

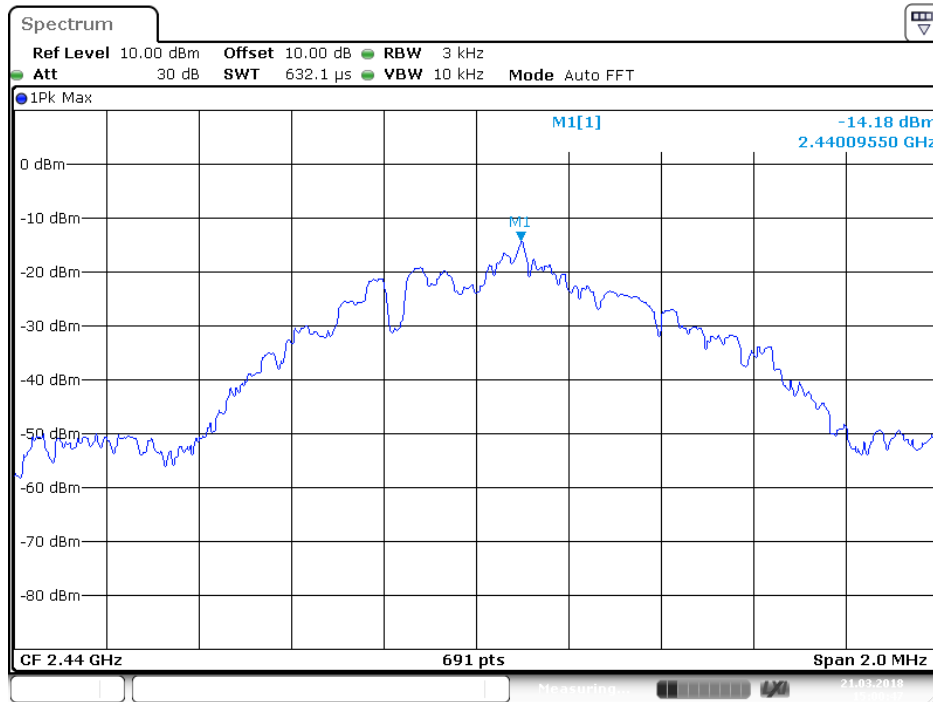
The spectrum analyzer plots are attached as below.

channel 0



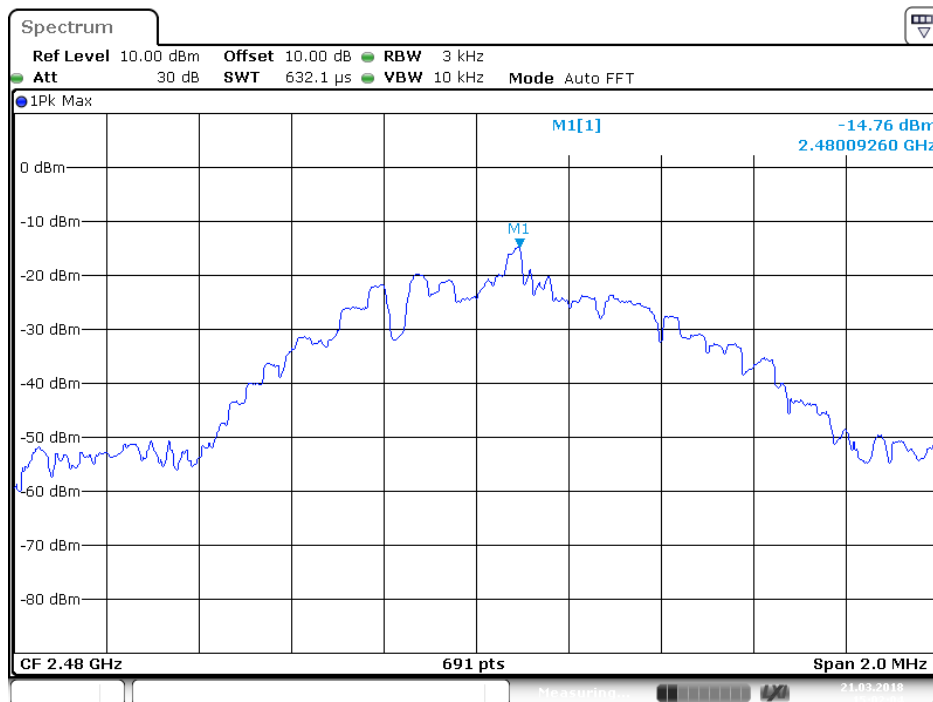
Date: 21.MAR.2018 14:59:16

channel 19



Date: 21.MAR.2018 15:00:47

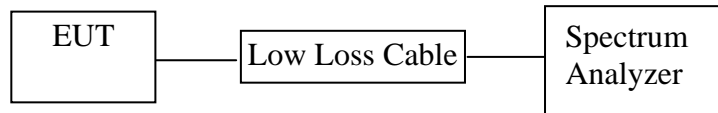
channel 39



Date: 21.MAR.2018 15:02:04

8. BAND EDGE COMPLIANCE TEST

8.1. Block Diagram of Test Setup



(EUT: Bluetooth Smart Thermometer)

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 2402-2480MHz. 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.

Test Lab: Shielding room

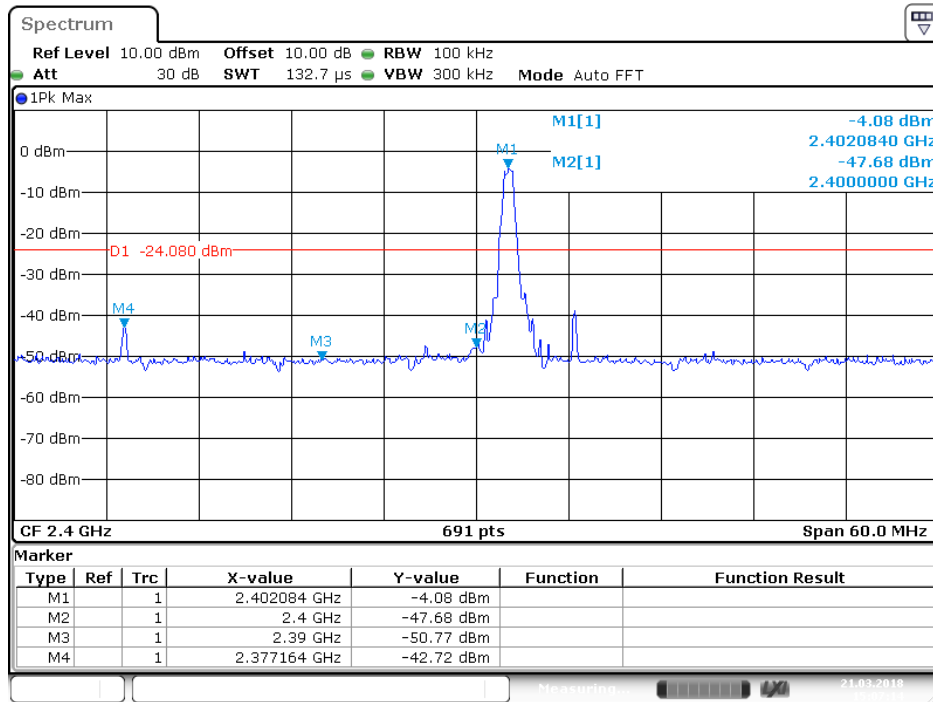
Test Engineer: Star

Conducted Band Edge Result

Channel	Frequency	Delta peak to band emission	Limit(dBc)
0	2.402GHz	43.60	20
39	2.480GHz	46.25	20

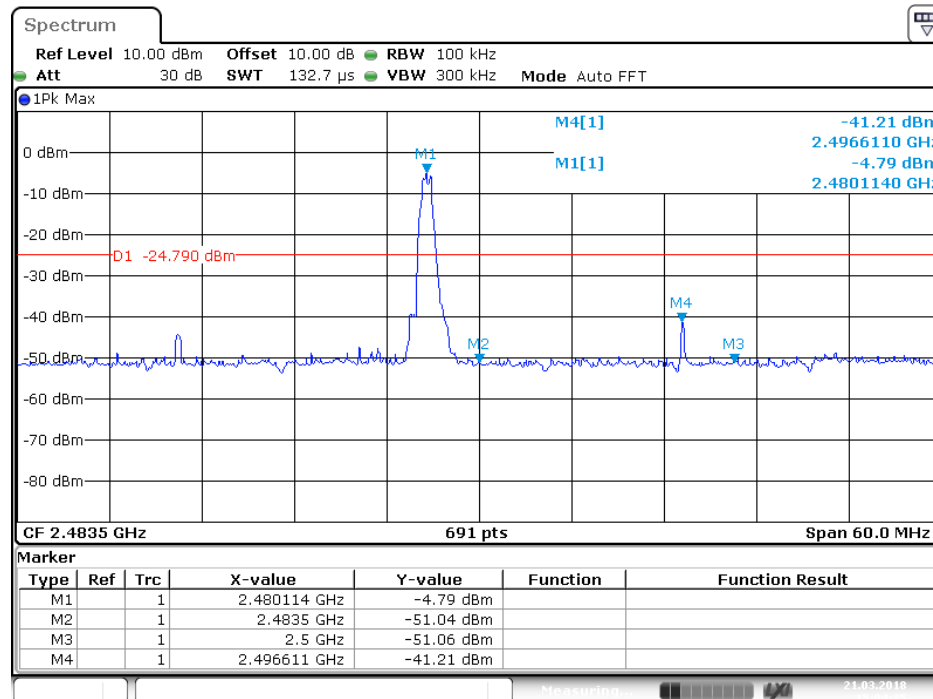
The spectrum analyzer plots are attached as below.

channel 0



Date: 21.MAR.2018 15:07:14

channel 39



Date: 21.MAR.2018 15:04:36

Radiated Band Edge Result

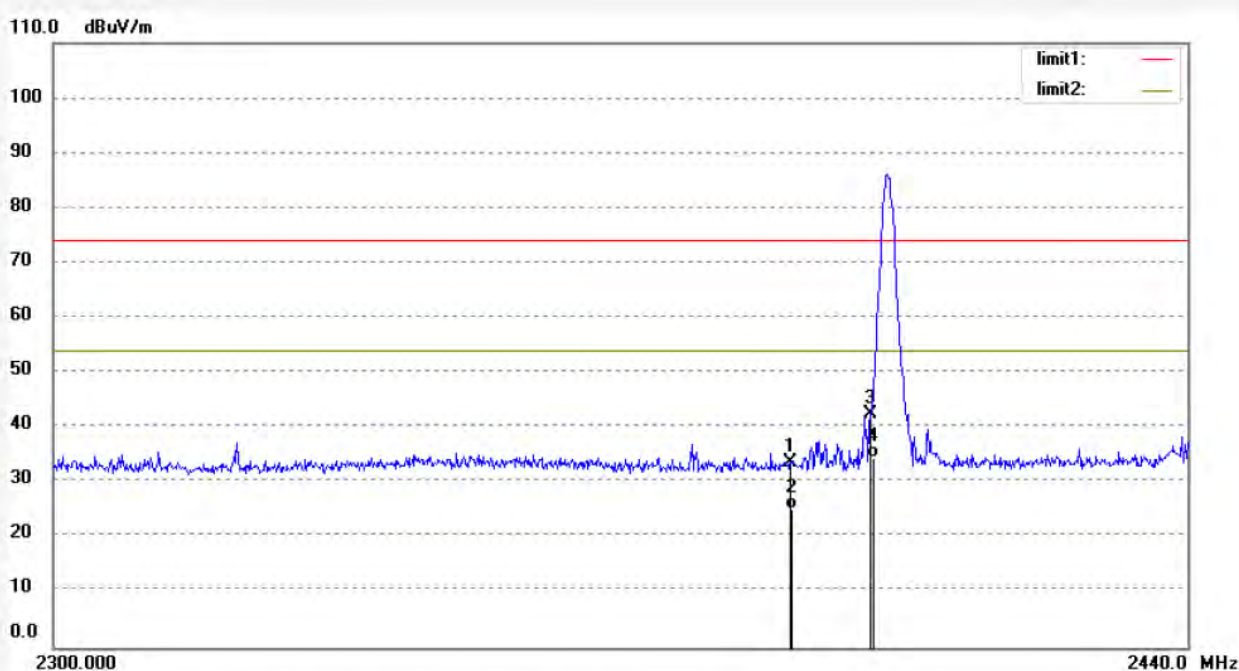
ACCURATE TECHNOLOGY CO., LTD.

 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.: star2018 #70	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3V
Test item: Radiation Test	Date: 2018-3-22
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9:27:28
EUT: Bluetooth Smart Thermometer	Engineer Signature: star
Mode: TX 2402MHz	Distance: 3m
Model: BTH-01J	
Manufacturer: SEVEN LIKE	

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	41.61	-8.00	33.61	74.00	-40.39	peak			
2	2390.000	33.20	-8.00	25.20	54.00	-28.80	AVG			
3	2400.000	50.49	-7.97	42.52	74.00	-31.48	peak			
4	2400.000	42.54	-7.97	34.57	54.00	-19.43	AVG			

Job No.: star2018 #69

Standard: FCC PK

Test item: Radiation Test

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

EUT: Bluetooth Smart Thermometer

Mode: TX 2402MHz

Model: BTH-01J

Manufacturer: SEVEN LIKE

Polarization: Vertical

Power Source: DC 3V

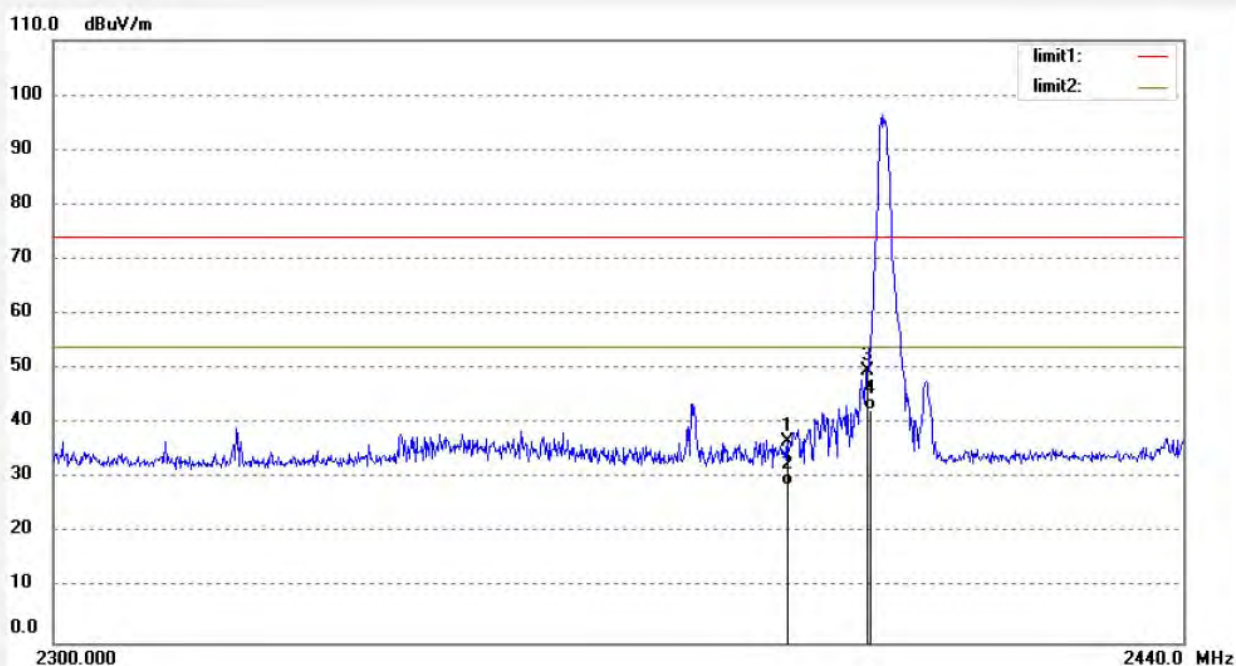
Date: 2018-3-22

Time: 9:26:12

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2390.000	44.79	-8.00	36.79	74.00	-37.21	peak			
2	2390.000	36.87	-8.00	28.87	54.00	-25.13	AVG			
3	2400.000	57.49	-7.97	49.52	74.00	-24.48	peak			
4	2400.000	50.41	-7.97	42.44	54.00	-11.56	AVG			

Job No.: star2018 #67

Standard: FCC PK

Test item: Radiation Test

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

EUT: Bluetooth Smart Thermometer

Mode: TX 2480MHz

Model: BTH-01J

Manufacturer: SEVEN LIKE

Polarization: Horizontal

Power Source: DC 3V

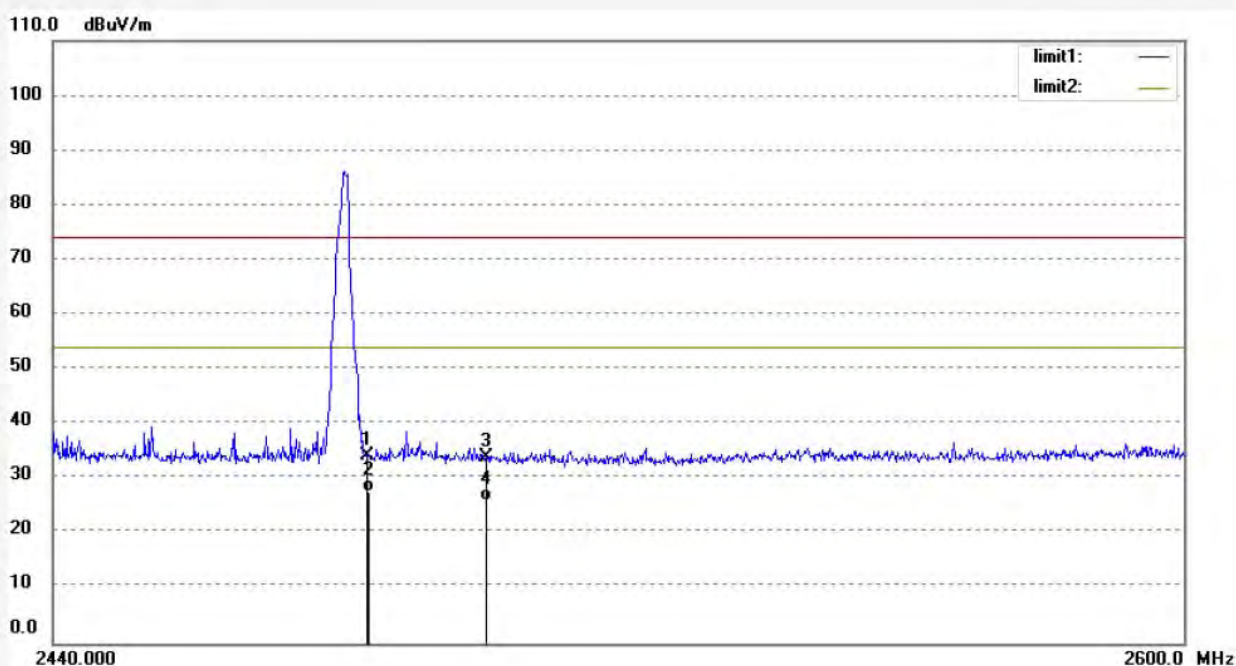
Date: 2018-3-22

Time: 9:22:46

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20180395



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	42.11	-7.76	34.35	74.00	-39.65	peak			
2	2483.500	35.31	-7.76	27.55	54.00	-26.45	AVG			
3	2500.000	41.69	-7.71	33.98	74.00	-40.02	peak			
4	2500.000	33.69	-7.71	25.98	54.00	-28.02	AVG			



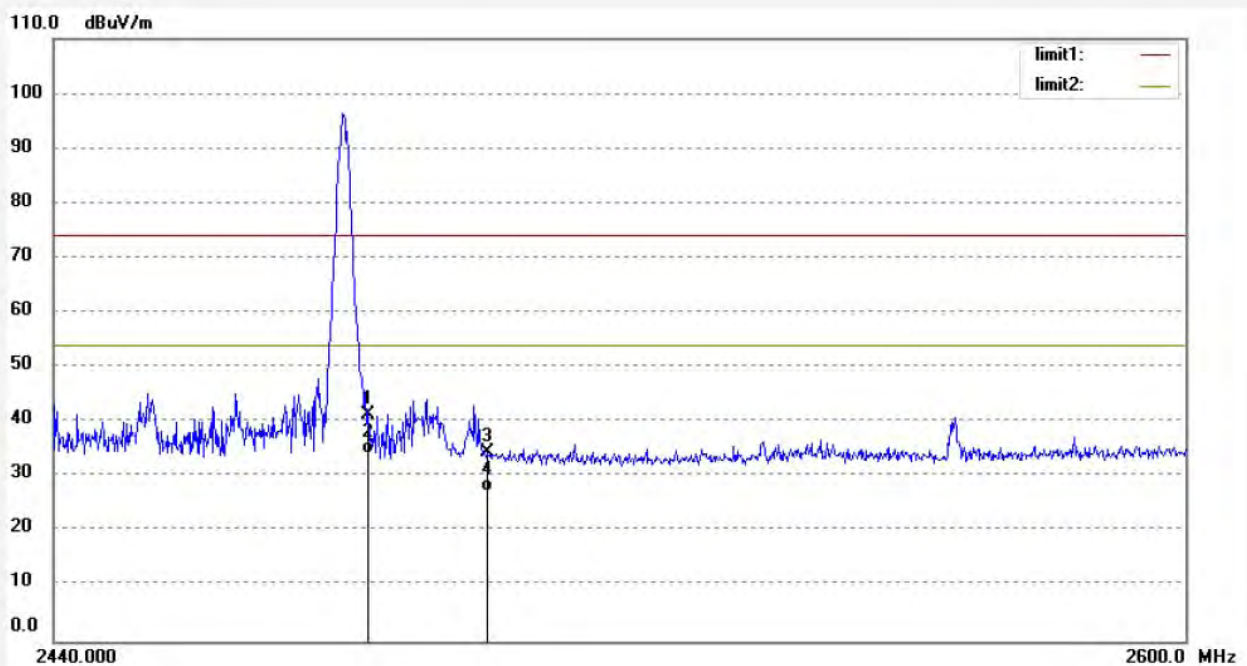
ACCURATE TECHNOLOGY CO., LTD.

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.: star2018 #68	Polarization: Vertical
Standard: FCC PK	Power Source: DC 3V
Test item: Radiation Test	Date: 2018-3-22
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9:24:06
EUT: Bluetooth Smart Thermometer	Engineer Signature: star
Mode: TX 2480MHz	Distance: 3m
Model: BTH-01J	
Manufacturer: SEVEN LIKE	

Note: Report No.:ATE20180395



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	49.28	-7.76	41.52	74.00	-32.48	peak			
2	2483.500	41.87	-7.76	34.11	54.00	-19.89	AVG			
3	2500.000	42.34	-7.71	34.63	74.00	-39.37	peak			
4	2500.000	35.09	-7.71	27.38	54.00	-26.62	AVG			

Note:

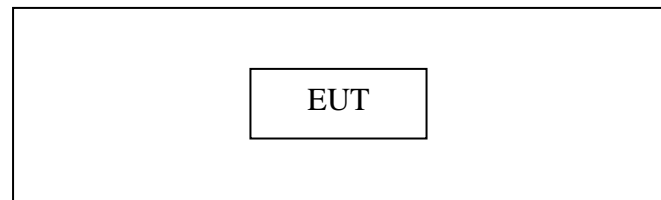
1. Emissions attenuated more than 20 dB below the permissible value are not reported.
2. The field strength is calculated by adding the antenna factor, high pass filter loss(if used) and cable loss, and subtracting the amplifier gain(if any)from the measured reading. The basic equation calculation is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

$$\text{Result} = \text{Reading} + \text{Corrected Factor}$$

9. RADIATED SPURIOUS EMISSION TEST

9.1. Block Diagram of Test Setup

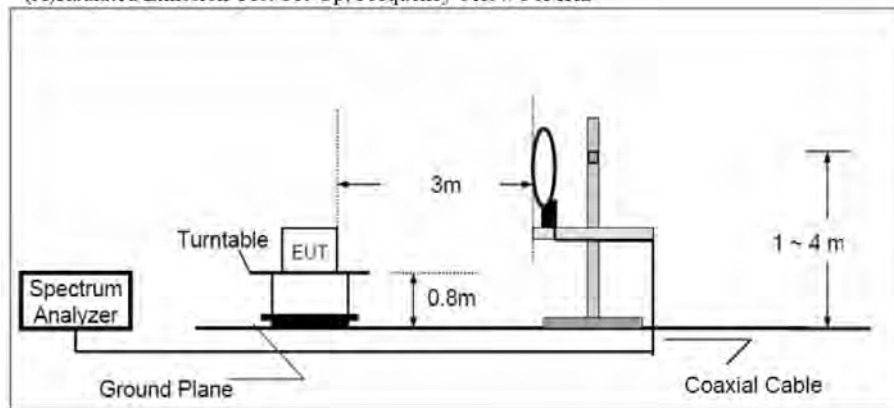
9.1.1. Block diagram of connection between the EUT and peripherals



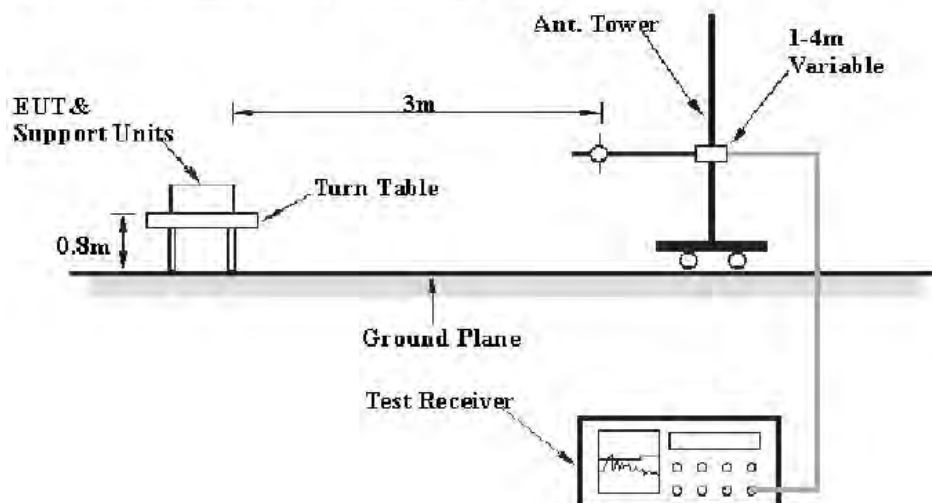
Setup: Transmitting mode

9.1.2. Semi-Anechoic Chamber Test Setup Diagram

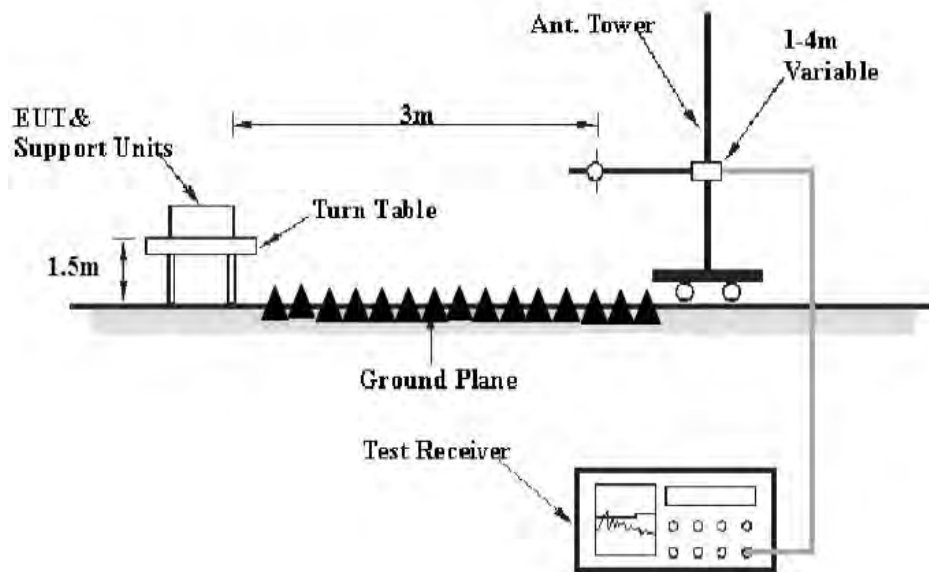
(A) Radiated Emission Test Set-Up, Frequency below 30MHz



(B) Radiated Emission Test Set-Up, Frequency 30MHz-1GHz



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



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 10.1.

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 2402-2480MHz. 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. This EUT was tested in 3 orthogonal positions and the worst case position data was reported.

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 26.5GHz 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.

9.7.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	43.85	-22.22	21.63	43.5	-21.87	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.

9.8.The Field Strength of Radiation Emission Measurement Results

Pass.

Test Lab: 3m Anechoic chamber

Test Engineer: Star

The frequency range from 9kHz to 26.5GHz is checked.

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 9kHz-30MHz and 18-26.5GHz are not reported, because the test values lower than the limits of 20dB.

The spectrum analyzer plots are attached as below.

Below 1GHz


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.: star2018 #55

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

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

EUT: Bluetooth Smart Thermometer

Mode: TX 2402MHz

Model: BTH-01J

Manufacturer: SEVEN LIKE

Polarization: Horizontal

Power Source: DC 3V

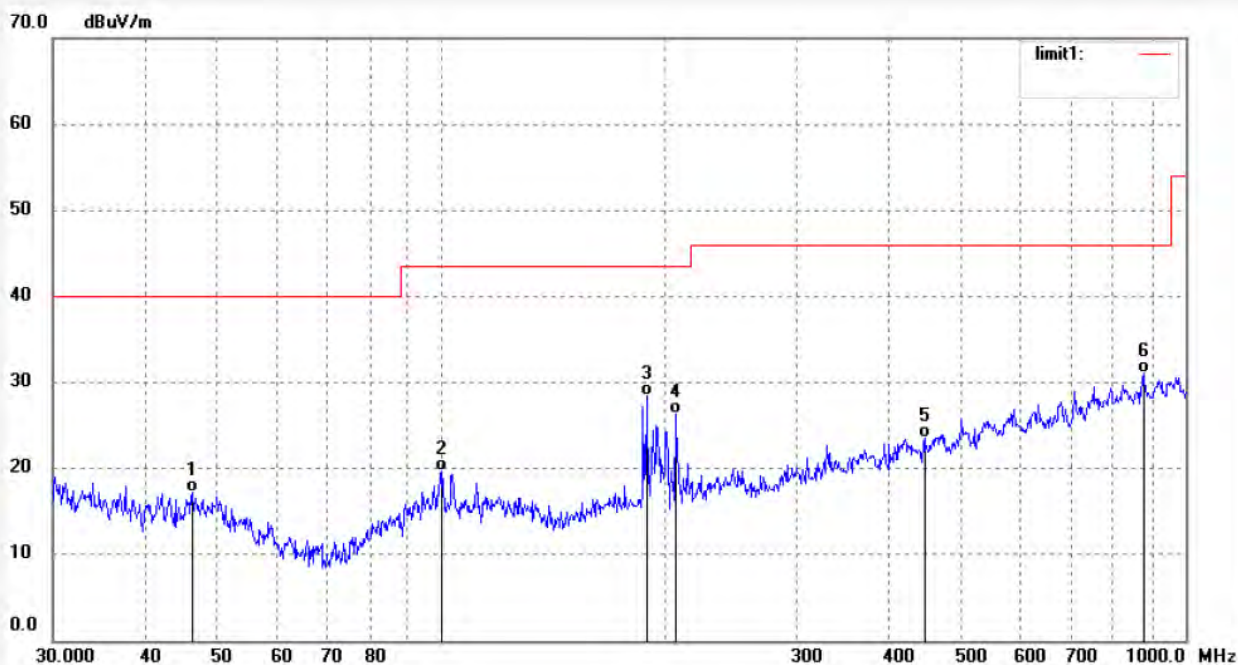
Date: 18/03/22/

Time: 9/00/31

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	46.2180	36.87	-19.64	17.23	40.00	-22.77	QP			
2	100.1187	38.25	-18.60	19.65	43.50	-23.85	QP			
3	188.4442	47.70	-19.22	28.48	43.50	-15.02	QP			
4	206.4701	45.27	-18.98	26.29	43.50	-17.21	QP			
5	445.6931	36.77	-13.17	23.60	46.00	-22.40	QP			
6	878.0931	36.96	-5.94	31.02	46.00	-14.98	QP			

Job No.: star2018 #56

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

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

EUT: Bluetooth Smart Thermometer

Mode: TX 2402MHz

Model: BTH-01J

Manufacturer: SEVEN LIKE

Polarization: Vertical

Power Source: DC 3V

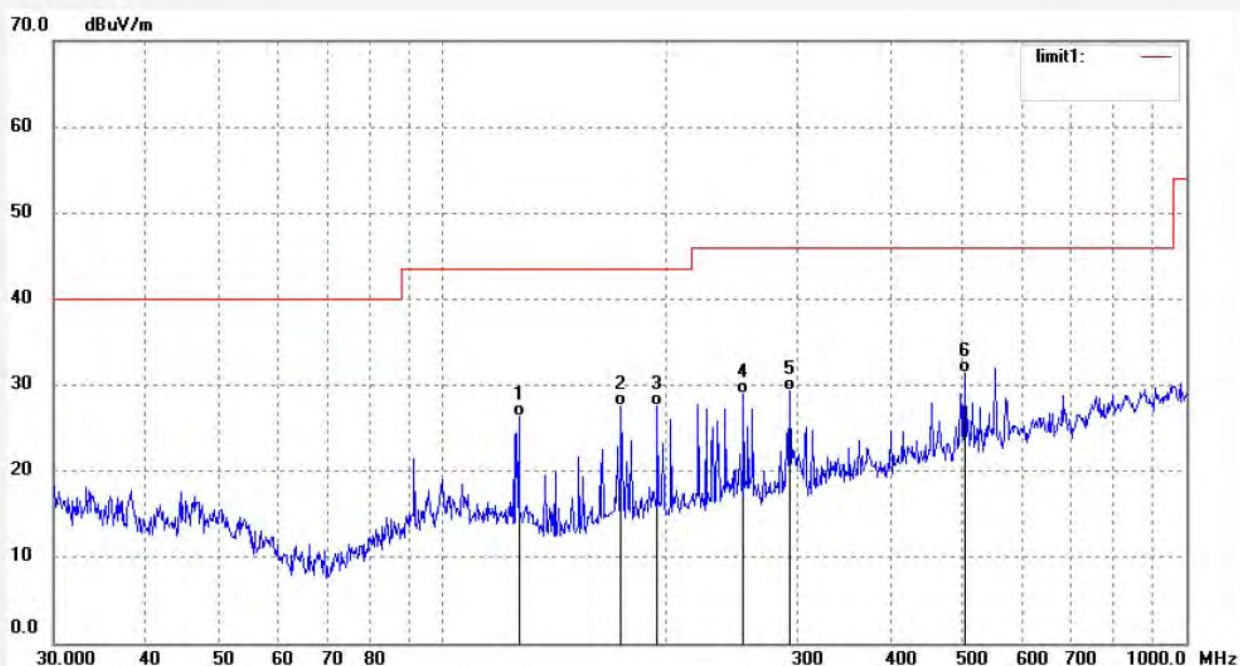
Date: 18/03/22/

Time: 9/01/14

Engineer Signature: star

Distance: 3m

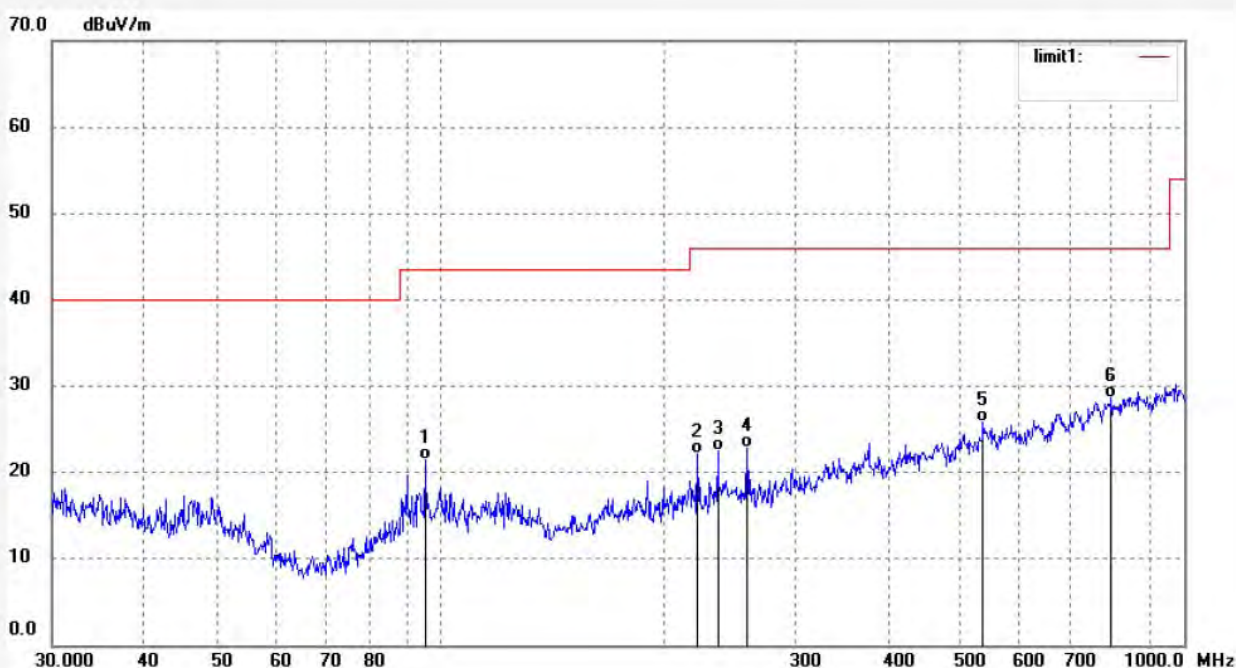
Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	126.6931	46.47	-20.13	26.34	43.50	-17.16	QP			
2	173.8146	47.68	-20.09	27.59	43.50	-15.91	QP			
3	194.4985	46.57	-19.09	27.48	43.50	-16.02	QP			
4	254.0312	46.80	-17.82	28.98	46.00	-17.02	QP			
5	293.3933	46.10	-16.73	29.37	46.00	-16.63	QP			
6	504.0151	43.50	-12.00	31.50	46.00	-14.50	QP			

Job No.: star2018 #58	Polarization: Horizontal
Standard: FCC Class B 3M Radiated	Power Source: DC 3V
Test item: Radiation Test	Date: 18/03/22/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/02/48
EUT: Bluetooth Smart Thermometer	Engineer Signature: star
Mode: TX 2440MHz	Distance: 3m
Model: BTH-01J	
Manufacturer: SEVEN LIKE	

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	95.3131	41.14	-19.70	21.44	43.50	-22.06	QP			
2	221.5010	40.54	-18.45	22.09	46.00	-23.91	QP			
3	235.9621	40.40	-17.94	22.46	46.00	-23.54	QP			
4	258.5333	40.66	-17.82	22.84	46.00	-23.16	QP			
5	536.9208	36.98	-11.23	25.75	46.00	-20.25	QP			
6	798.6204	35.57	-6.91	28.66	46.00	-17.34	QP			

Job No.: star2018 #57

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

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

EUT: Bluetooth Smart Thermometer

Mode: TX 2440MHz

Model: BTH-01J

Manufacturer: SEVEN LIKE

Polarization: Vertical

Power Source: DC 3V

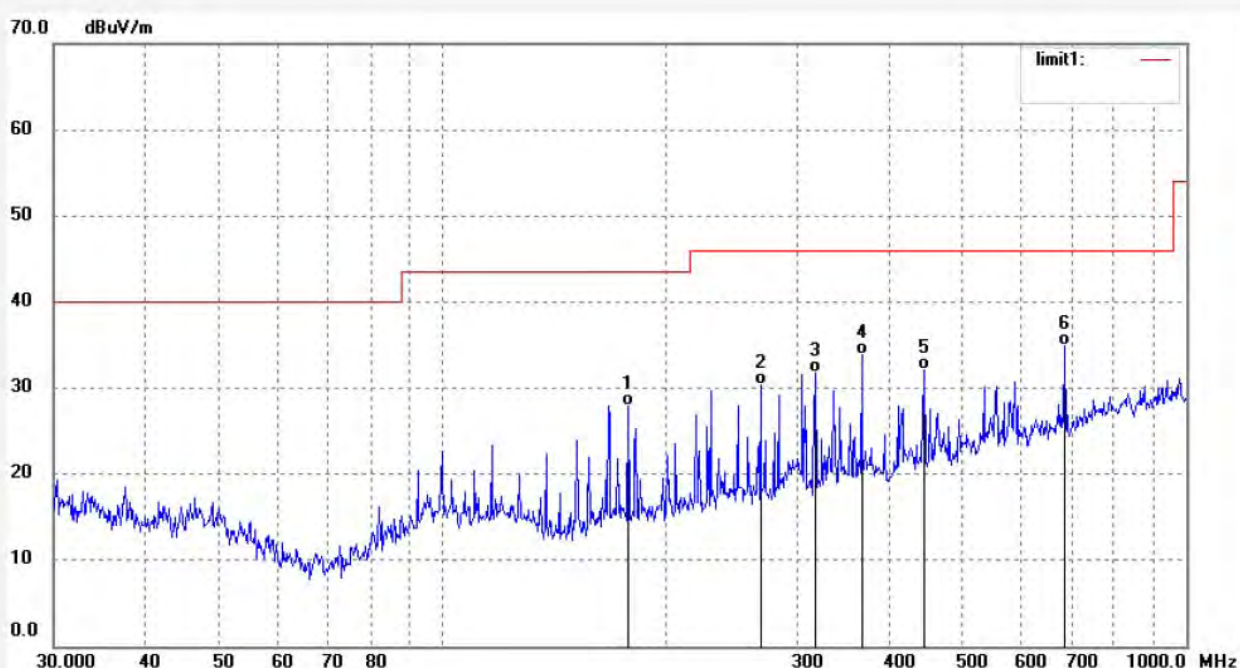
Date: 18/03/22/

Time: 9/02/07

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	177.5178	47.98	-20.01	27.97	43.50	-15.53	QP			
2	267.7787	47.79	-17.43	30.36	46.00	-15.64	QP			
3	316.9717	47.82	-16.12	31.70	46.00	-14.30	QP			
4	366.0865	48.71	-14.83	33.88	46.00	-12.12	QP			
5	444.1299	45.37	-13.19	32.18	46.00	-13.82	QP			
6	686.6341	44.18	-9.20	34.98	46.00	-11.02	QP			

Job No.: star2018 #59

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

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

EUT: Bluetooth Smart Thermometer

Mode: TX 2480MHz

Model: BTH-01J

Manufacturer: SEVEN LIKE

Polarization: Horizontal

Power Source: DC 3V

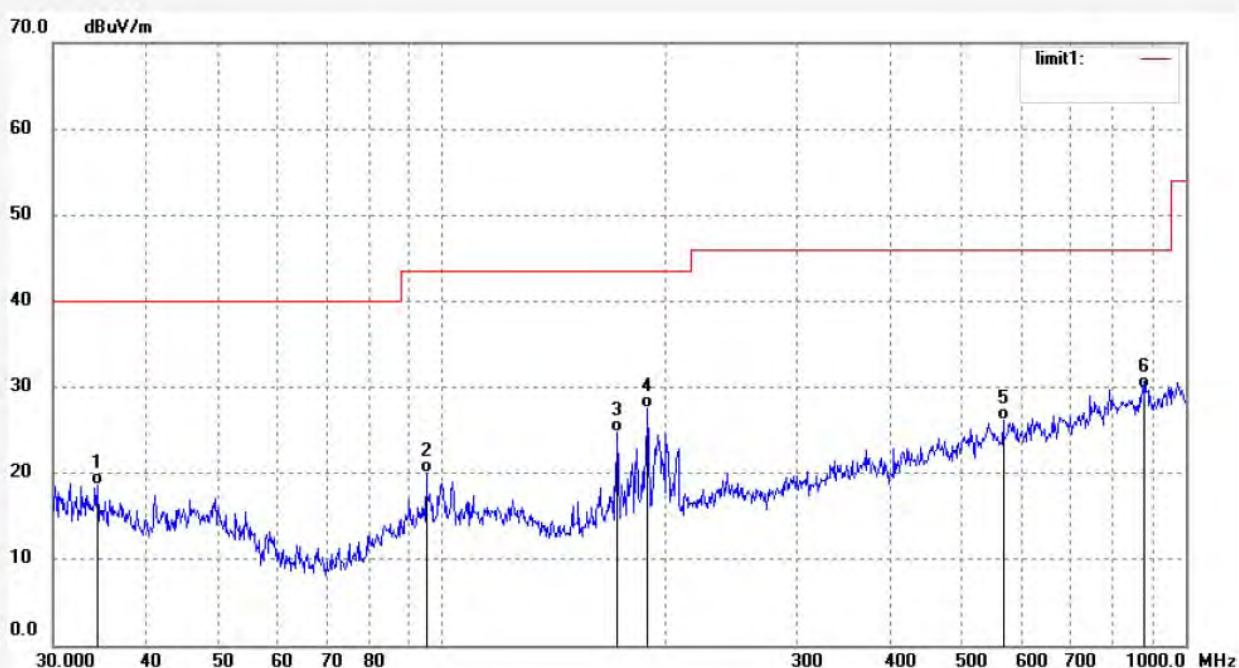
Date: 18/03/22/

Time: 9/03/33

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	34.4059	36.84	-18.24	18.60	40.00	-21.40	QP			
2	95.3131	39.80	-19.70	20.10	43.50	-23.40	QP			
3	171.9921	44.89	-20.10	24.79	43.50	-18.71	QP			
4	189.1075	46.82	-19.21	27.61	43.50	-15.89	QP			
5	567.9696	36.81	-10.67	26.14	46.00	-19.86	QP			
6	875.0132	35.79	-5.97	29.82	46.00	-16.18	QP			

Job No.: star2018 #60

Standard: FCC Class B 3M Radiated

Test item: Radiation Test

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

EUT: Bluetooth Smart Thermometer

Mode: TX 2480MHz

Model: BTH-01J

Manufacturer: SEVEN LIKE

Polarization: Vertical

Power Source: DC 3V

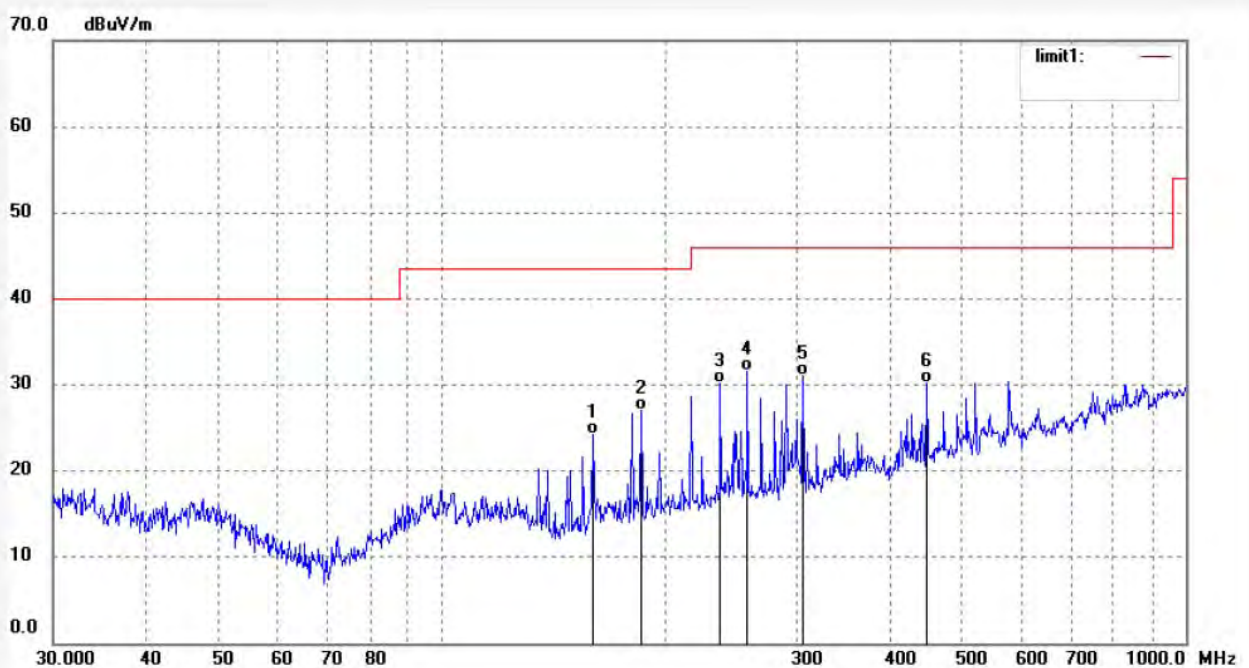
Date: 18/03/22/

Time: 9/04/15

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	159.7586	45.11	-20.87	24.24	43.50	-19.26	QP			
2	185.1625	46.31	-19.23	27.08	43.50	-16.42	QP			
3	236.7927	48.16	-17.92	30.24	46.00	-15.76	QP			
4	257.6265	49.35	-17.83	31.52	46.00	-14.48	QP			
5	306.0282	47.51	-16.49	31.02	46.00	-14.98	QP			
6	448.8360	43.37	-13.11	30.26	46.00	-15.74	QP			

Above 1GHz

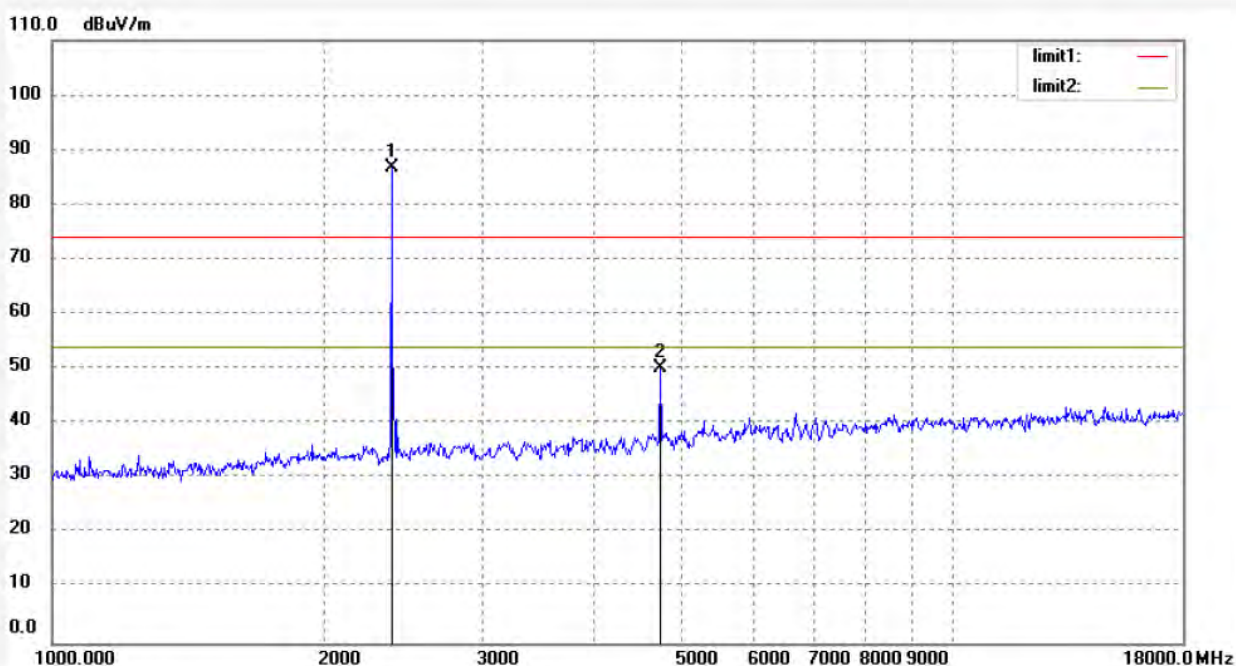

ACCURATE TECHNOLOGY CO., LTD.

 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.: star2018 #62	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3V
Test item: Radiation Test	Date: 18/03/22/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/10/35
EUT: Bluetooth Smart Thermometer	Engineer Signature: star
Mode: TX 2402MHz	Distance: 3m
Model: BTH-01J	
Manufacturer: SEVEN LIKE	

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.019	94.70	-8.03	86.67			peak			
2	4804.057	52.79	-2.53	50.26	74.00	-23.74	peak			

Job No.: star2018 #61

Standard: FCC PK

Test item: Radiation Test

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

EUT: Bluetooth Smart Thermometer

Mode: TX 2402MHz

Model: BTH-01J

Manufacturer: SEVEN LIKE

Polarization: Vertical

Power Source: DC 3V

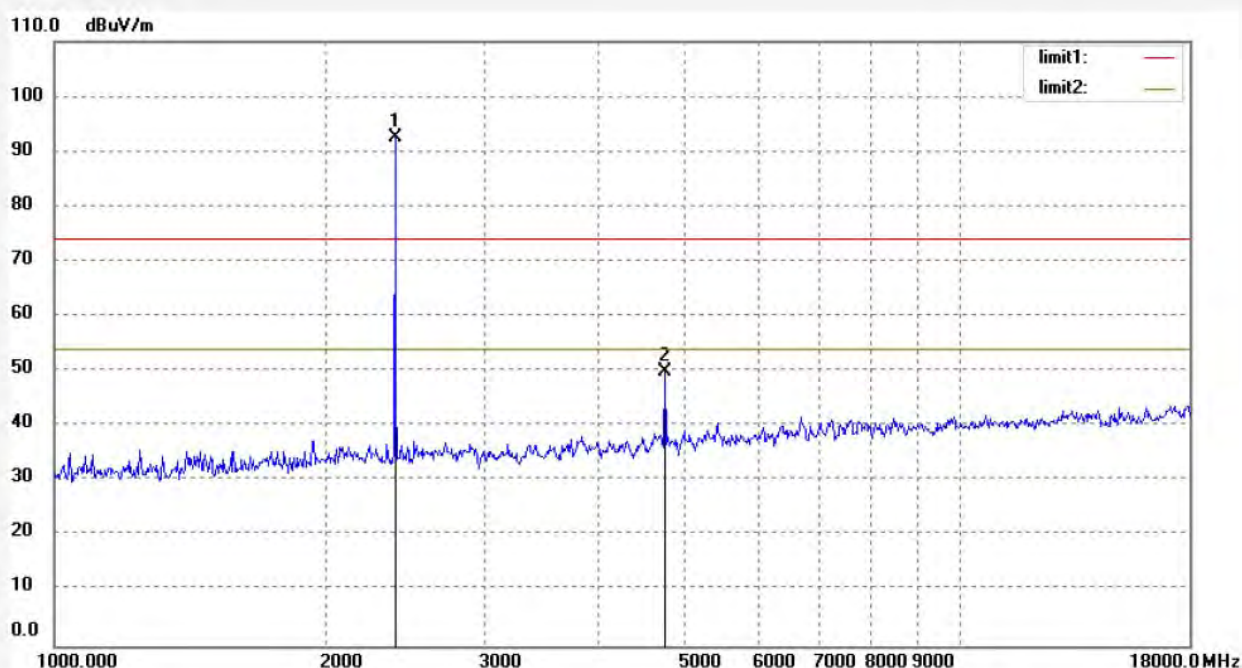
Date: 18/03/22/

Time: 9/09/05

Engineer Signature: star

Distance: 3m

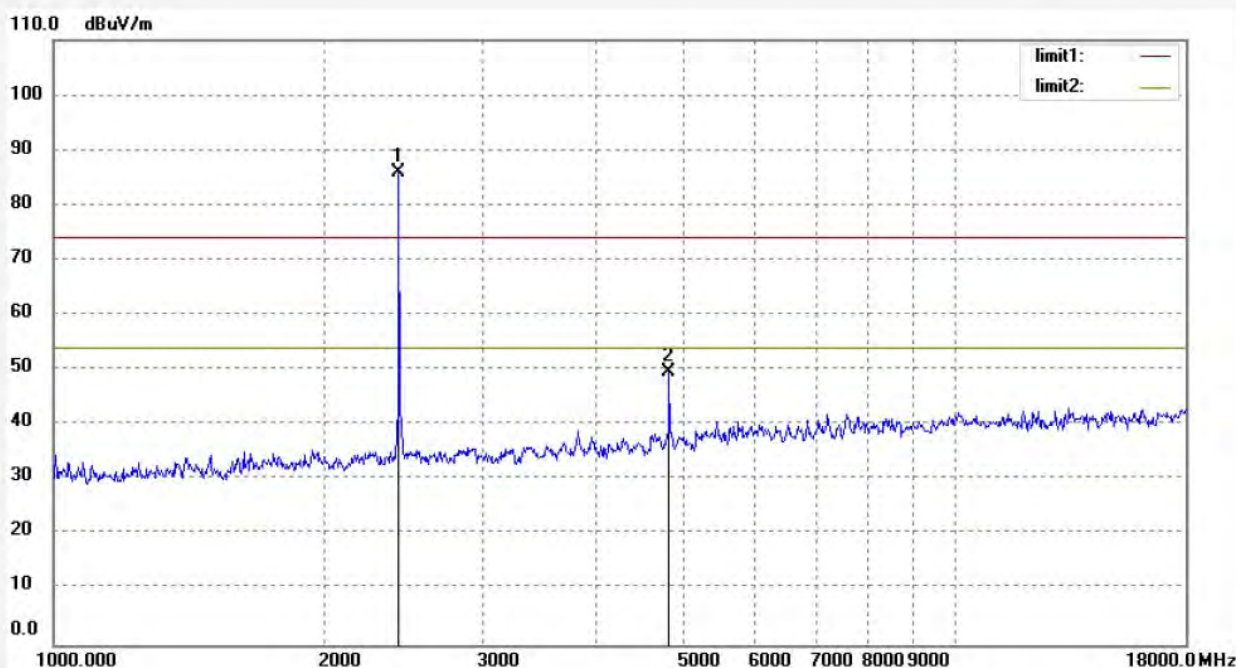
Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2402.019	100.45	-8.03	92.42			peak			
2	4804.057	52.35	-2.53	49.82	74.00	-24.18	peak			

Job No.: star2018 #63	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3V
Test item: Radiation Test	Date: 18/03/22/
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9/12/32
EUT: Bluetooth Smart Thermometer	Engineer Signature: star
Mode: TX 2440MHz	Distance: 3m
Model: BTH-01J	
Manufacturer: SEVEN LIKE	

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2440.021	93.88	-7.93	85.95			peak			
2	4880.024	51.79	-2.25	49.54	74.00	-24.46	peak			

Job No.: star2018 #64

Standard: FCC PK

Test item: Radiation Test

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

EUT: Bluetooth Smart Thermometer

Mode: TX 2440MHz

Model: BTH-01J

Manufacturer: SEVEN LIKE

Polarization: Vertical

Power Source: DC 3V

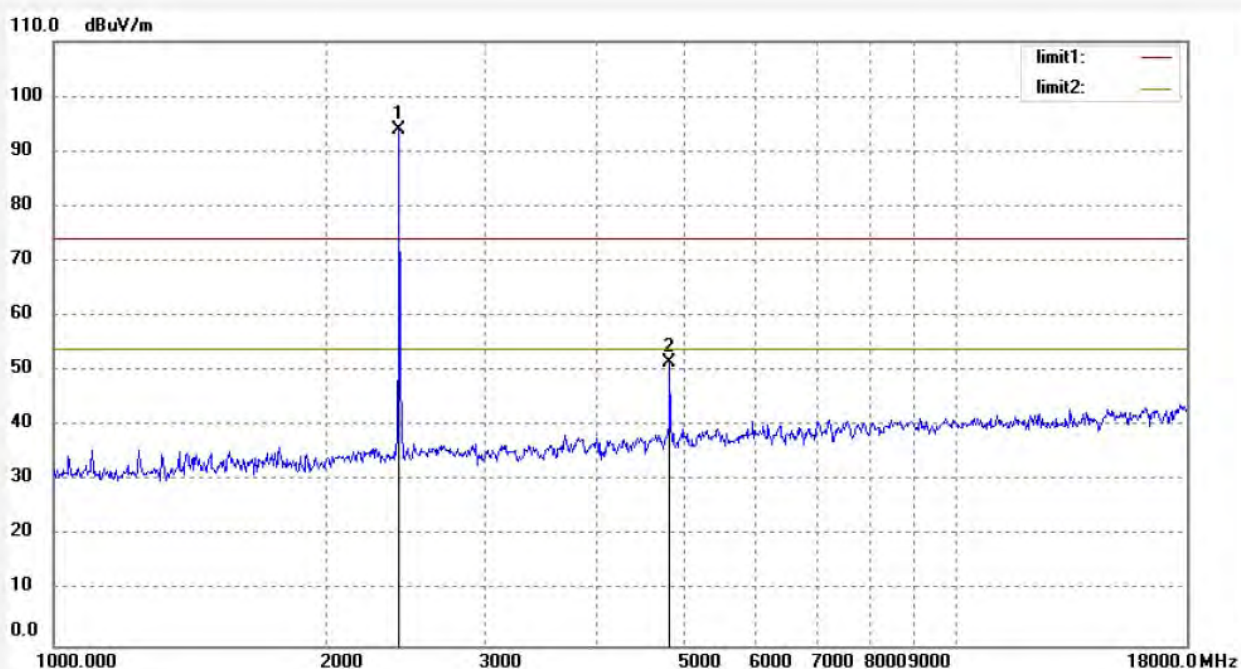
Date: 18/03/22/

Time: 9/14/41

Engineer Signature: star

Distance: 3m

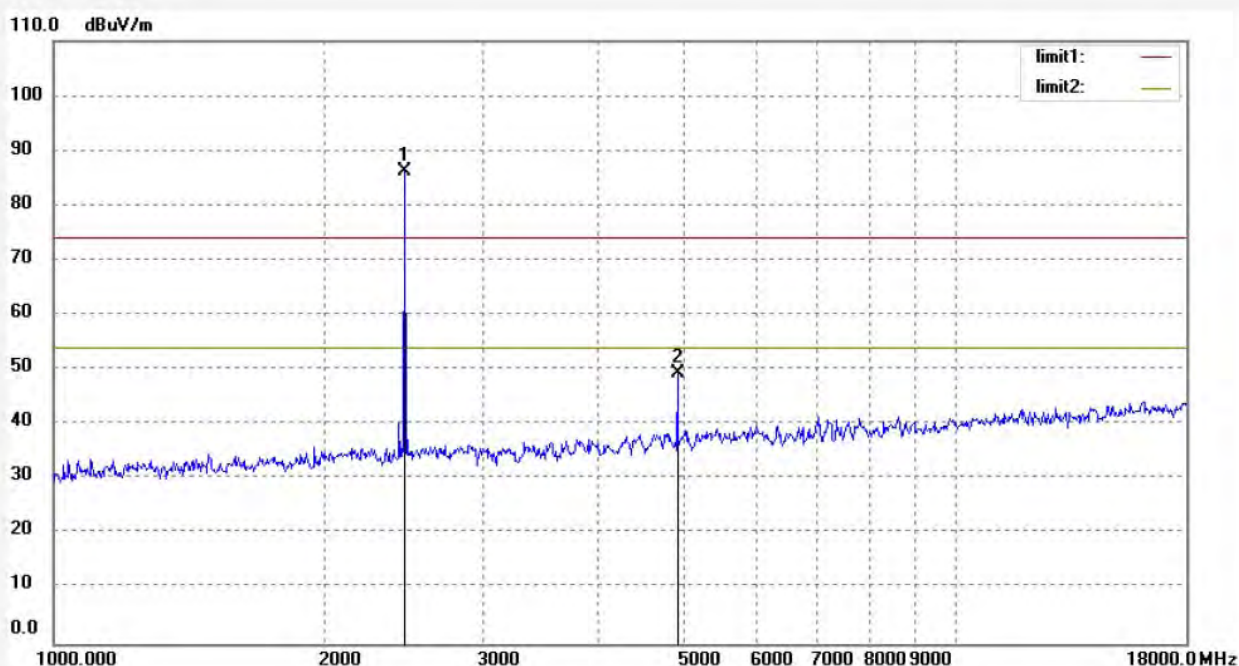
Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2440.021	101.87	-7.93	93.94			peak			
2	4880.024	53.89	-2.25	51.64	74.00	-22.36	peak			

Job No.: star2018 #66	Polarization: Horizontal
Standard: FCC PK	Power Source: DC 3V
Test item: Radiation Test	Date: 2018-3-22
Temp.(C)/Hum.(%) 25 C / 55 %	Time: 9:19:08
EUT: Bluetooth Smart Thermometer	Engineer Signature: star
Mode: TX 2480MHz	Distance: 3m
Model: BTH-01J	
Manufacturer: SEVEN LIKE	

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.034	94.04	-7.84	86.20			peak			
2	4960.044	51.27	-1.92	49.35	74.00	-24.65	peak			

Job No.: star2018 #65

Standard: FCC PK

Test item: Radiation Test

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

EUT: Bluetooth Smart Thermometer

Mode: TX 2480MHz

Model: BTH-01J

Manufacturer: SEVEN LIKE

Polarization: Vertical

Power Source: DC 3V

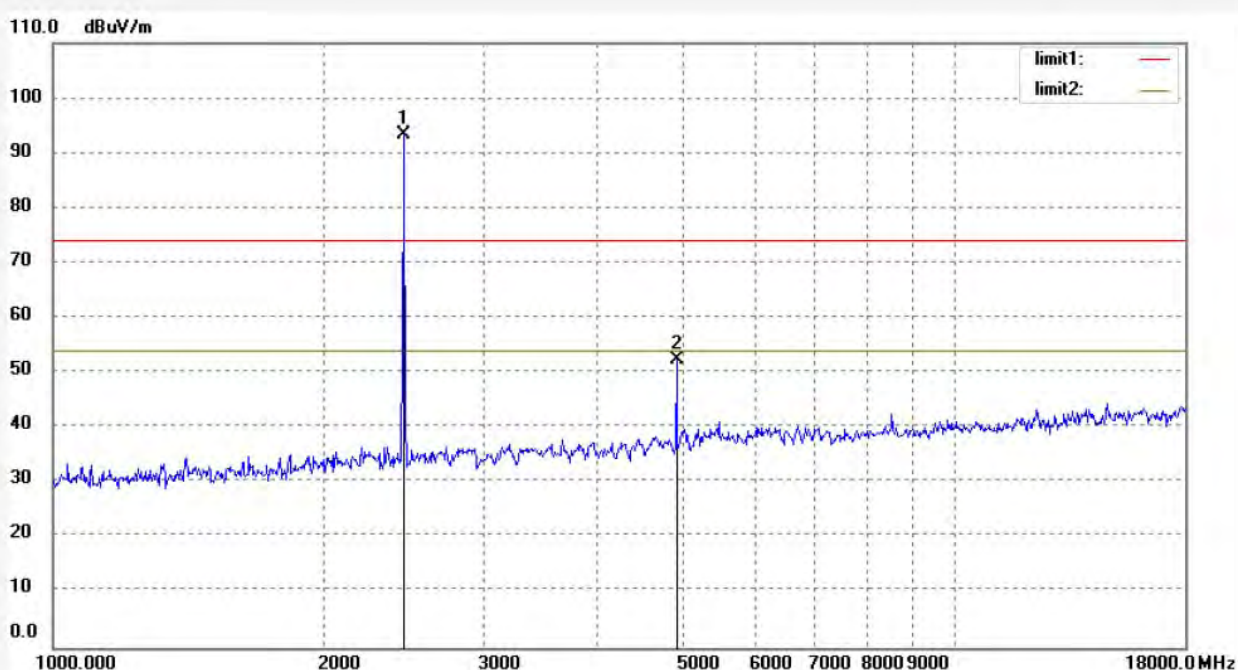
Date: 2018-3-22

Time: 9:17:30

Engineer Signature: star

Distance: 3m

Note: Report No.:ATE20180395



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	2480.034	101.31	-7.84	93.47			peak			
2	4960.144	54.22	-1.92	52.30	74.00	-21.70	peak			

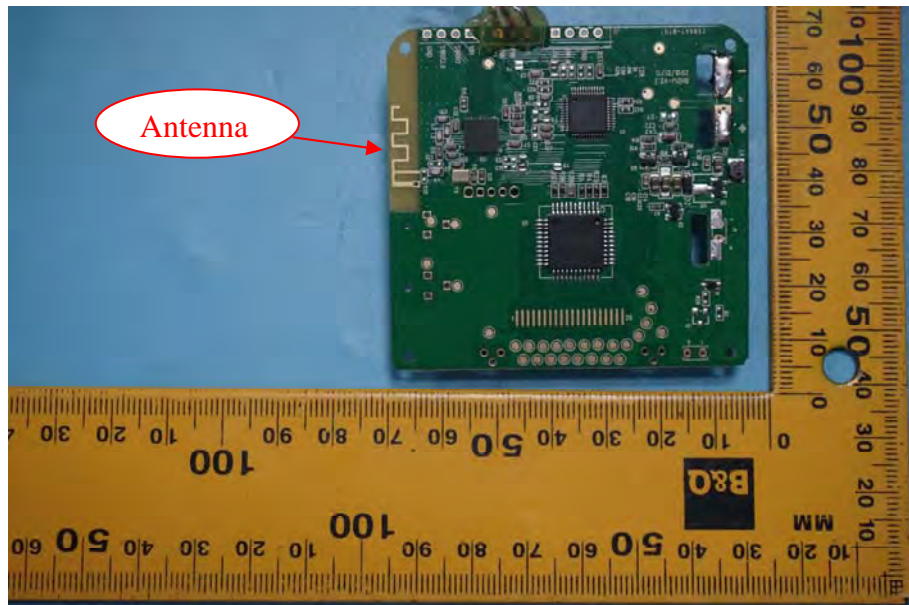
10. ANTENNA REQUIREMENT

10.1. 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.

10.2. Antenna Construction

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



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