FCC RF Test Report

APPLICANT : Zhejiang Lingzhu Technology Co., Ltd.

EQUIPMENT : Smart Tag
MODEL NAME : TTFM-11

FCC ID : 2BEWX-TTFM-11

STANDARD : FCC Part 15 Subpart C §15.247

CLASSIFICATION : (DTS) Digital Transmission System

TEST DATE(S) : May 11, 2024 ~ May 16, 2024

We, Sporton International Inc. (Kunshan), would like to declare that the tested sample has been evaluated in accordance with the test procedures and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Kunshan), the test report shall not be reproduced except in full.

JasonJia

Approved by: Jason Jia





Report No. : FR442311

Sporton International Inc. (Kunshan)

No. 1098, Pengxi North Road, Kunshan Economic Development Zone Jiangsu Province 215300 People's Republic of China

Sporton International Inc. (Kunshan)

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR442311	Rev. 01	Initial issue of report	Jun. 13, 2024

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SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.1	-	99% Bandwidth	-	Report only	-
3.2	15.247(b)(3)	Peak Output Power	≤ 30dBm	Pass	-
3.3	15.247(e)	Power Spectral Density	Power Spectral Density ≤ 8dBm/3kHz Pass		-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	≤ 20dBc Pass		1
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	Pass		Under limit 8.47 dB at 47.460 MHz
	15.207	AC Conducted Emission 15.207(a) Not Applicable		1	
3.6	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Remark 1: The device is powered by battery only.

Conformity Assessment Condition:

- The test results (PASS/FAIL) with all measurement uncertainty excluded are presented against the regulation limits or
 in accordance with the requirements stipulated by the applicant/manufacturer who shall bear all the risks of
 non-compliance that may potentially occur if measurement uncertainty is taken into account.
- 2. The measurement uncertainty please refer to each test result in the section "Measurement Uncertainty"

Disclaimer:

The product specifications of the EUT presented in the test report that may affect the test assessments are declared by the manufacturer who shall take full responsibility for the authenticity.

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1 General Description

1.1 Applicant

Zhejiang Lingzhu Technology Co., Ltd.

Room 302, No 1 Building Huace Center, Xihu District, Hangzhou City, Zhejiang Province, China

1.2 Manufacturer

Zhejiang Lingzhu Technology Co., Ltd.

Room 302, No 1 Building Huace Center, Xihu District, Hangzhou City, Zhejiang Province, China

1.3 Product Feature of Equipment Under Test

Product Feature				
Equipment	Smart Tag			
Model Name	TTFM-11			
FCC ID	2BEWX-TTFM-11			
SN Code	Conducted: DC2350456B0C0000 Radiation: DC2350456B0C0000			
EUT Stage	Production Unit			

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification of Equipment Under Test

Standards-related Product Specification				
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz			
Number of Channels	40			
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)			
Maximum Output Power to Antenna	BLE 1Mbps: 0.40 dBm (0.0011 W)			
<u>'</u>	BLE 2Mbps: 0.42 dBm (0.0011 W)			
Antenna Type / Gain	PCB Antenna type with gain -0.44 dBi			
Type of Modulation	Bluetooth LE : GFSK			

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1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Testing Location

Sporton International Inc. (Kunshan) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.02.

Test Firm	Sporton International Inc. (Kunshan)					
	No. 1098, Pengxi North Road, Kunshan Economic Development Zone					
Test Site Location	Jiangsu Province 215300 People's Republic of China					
	TEL: +86-512-57900158					
	Sporton Sito No	ECC Designation No.	FCC Test Firm			
Test Site No.	Sporton Site No.	FCC Designation No.	Registration No.			
	03CH03-KS TH01-KS	CN1257	314309			

1.7 Test Software

Item	Site	Manufacturer	Name	Version
1.	TH01-KS	SPORTON	FCC 15C-15E Test Tools Ver10.0_210607	10.0
2.	03CH03-KS	AUDIX	E3	210616

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 15 Subpart C §15.247
- FCC KDB 558074 D01 15.247 Meas Guidance v05r02
- ANSI C63.10-2013

Remark:

- All test items were verified and recorded according to the standards and without any deviation during the test.
- 2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

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2 Test Configuration of Equipment Under Test

2.1 Carrier Frequency Channel

Frequency Band	Channel	Freq. (MHz)	Channel	Freq. (MHz)
	0	2402	21	2444
	1	2404	22	2446
	2	2406	23	2448
	3	2408	24	2450
	4	2410	25	2452
	5	2412	26	2454
	6	2414	27	2456
	7 8 9	2416	28	2458
		2418	29	2460
		2420	30	2462
2400-2483.5 MHz	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13 14 15	2428	34	2470
		2430	35	2472
		2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-

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2.2 Test Mode

a. The EUT has been associated with peripherals and configuration operated in a manner tended to maximize its emission characteristics in a typical application. Frequency range investigated: radiation emission (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). For radiated measurement, pre-scanned in three orthogonal panels, X, Y, Z. The worst cases (X plane) were recorded in this report.

The following summary table is showing all test modes to demonstrate in compliance with the standard.

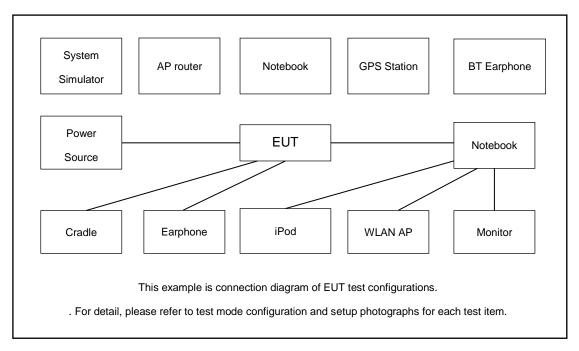
	Summary table of Test Cases
Took Itom	Data Rate / Modulation
Test Item	Bluetooth – LE / GFSK
	Mode 1: Bluetooth Tx CH00_2402 MHz_BLE 1Mbps
	Mode 2: Bluetooth Tx CH19_2440 MHz_BLE 1Mbps
Conducted	Mode 3: Bluetooth Tx CH39_2480 MHz_BLE 1Mbps
TCs	Mode 4: Bluetooth Tx CH00_2402 MHz_BLE 2Mbps
	Mode 5: Bluetooth Tx CH19_2440 MHz_BLE 2Mbps
	Mode 6: Bluetooth Tx CH39_2480 MHz_BLE 2Mbps
	Mode 1: Bluetooth Tx CH00_2402 MHz_BLE 1Mbps
	Mode 2: Bluetooth Tx CH19_2440 MHz_BLE 1Mbps
Radiated	Mode 3: Bluetooth Tx CH39_2480 MHz_BLE 1Mbps
TCs	Mode 4: Bluetooth Tx CH00_2402 MHz_BLE 2Mbps
	Mode 5: Bluetooth Tx CH19_2440 MHz_BLE 2Mbps
	Mode 6: Bluetooth Tx CH39_2480 MHz_BLE 2Mbps

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2.3 Connection Diagram of Test System



Note: The notebook is for debugging parameters that is not charging function.

2.4 EUT Operation Test Setup

For BLE function, the engineering test program was provided and enabled to make EUT continuous transmit.

2.5 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

Example:

The spectrum analyzer offset is derived from RF cable loss.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 5.6 dB.

 $Offset(dB) = RF \ cable \ loss(dB).$ = 5.6 (dB) Report No. : FR442311

3 Test Result

3.1 6dB Bandwidth Measurement

3.1.1 Limit of 6dB Bandwidth

The minimum 6 dB bandwidth shall be at least 500 kHz.

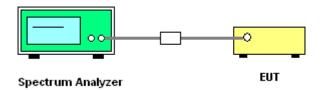
3.1.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.1.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 11.8
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 100 kHz. Set the Video bandwidth (VBW) = 300 kHz. In order to make an accurate measurement. The 6 dB bandwidth must be greater than 500 kHz.
- 5. Measure and record the results in the test report.

3.1.4 Test Setup



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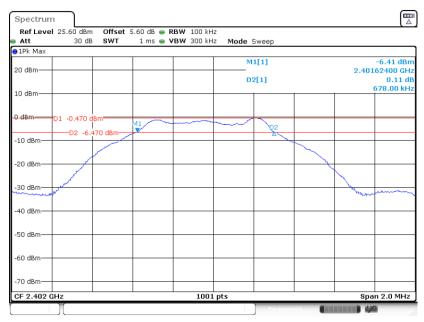
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3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

BLE 1Mbps

6 dB Bandwidth Plot on Channel 00



Date: 11.MAY.2024 16:07:45

6 dB Bandwidth Plot on Channel 19



Date: 11.MAY.2024 16:10:37

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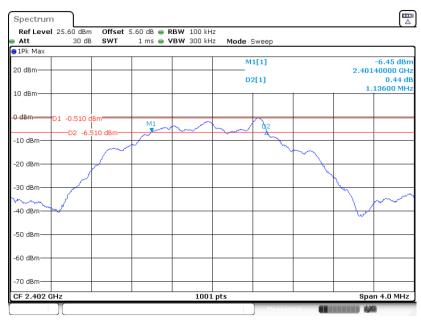
6 dB Bandwidth Plot on Channel 39



Date: 11.MAY.2024 16:12:43

BLE 2Mbps

6 dB Bandwidth Plot on Channel 00

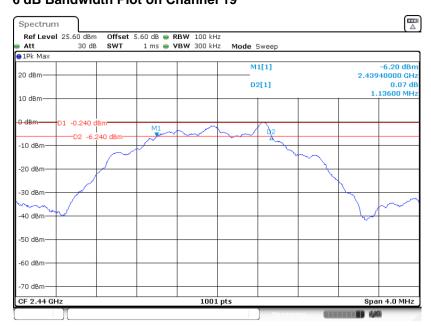


Date: 11.MAY.2024 16:15:53

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6 dB Bandwidth Plot on Channel 19



Date: 11.MAY.2024 16:19:47

6 dB Bandwidth Plot on Channel 39



Date: 11.MAY.2024 16:21:58

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3.2 Output Power Measurement

3.2.1 Limit of Output Power

For systems using digital modulation in the 2400-2483.5MHz, the limit for peak output power is 30dBm. If transmitting antenna of directional gain greater than 6dBi is used, the peak output power from the intentional radiator shall be reduced below the above stated value by the amount in dB that the directional gain of the antenna exceeds 6 dBi. In case of point-to-point operation, the limit has to be reduced by 1dB for every 3dB that the directional gain of the antenna exceeds 6dBi.

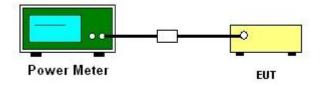
3.2.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.2.3 Test Procedures

- The testing follows the Measurement Procedure of ANSI C63.10-2013 clause 11.9.1.3 PKPM1 Peak power meter or ANSI C63.10-2013 clause 11.9.2.3.1 Method AVGPM method.
- 2. The RF output of EUT was connected to the power meter by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Measure the conducted output power and record the results in the test report.

3.2.4 Test Setup



3.2.5 Test Result of Peak Output Power

Please refer to Appendix A.

3.2.6 Test Result of Average Output Power (Reporting Only)

Please refer to Appendix A.

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3.3 Power Spectral Density Measurement

3.3.1 Limit of Power Spectral Density

The peak power spectral density shall not be greater than 8dBm in any 3kHz band at any time interval of continuous transmission.

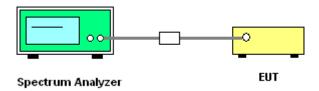
3.3.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.3.3 Test Procedures

- The testing follows Measurement Procedure of ANSI C63.10-2013 clause 11.10.2 Method PKPSD.
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Make the measurement with the spectrum analyzer's resolution bandwidth (RBW) = 3 kHz. Video bandwidth VBW = 10 kHz In order to make an accurate measurement, set the span to 1.5 times DTS Channel Bandwidth. (6dB BW)
- 5. Detector = peak, Sweep time = auto couple, Trace mode = max hold, Allow trace to fully stabilize. Use the peak marker function to determine the maximum power level.
- 6. Measure and record the results in the test report.
- 7. The Measured power density (dBm)/ 100kHz is a reference level and used as 20dBc down limit line for Conducted Band Edges and Conducted Spurious Emission.

3.3.4 Test Setup



3.3.5 Test Result of Power Spectral Density

Please refer to Appendix A.

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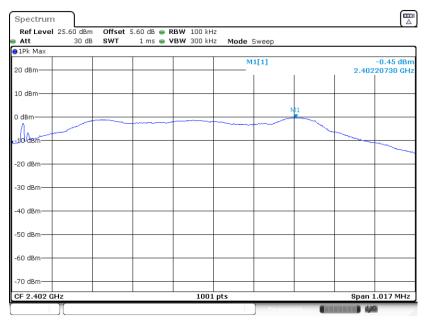
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3.3.6 Test Result of Power Spectral Density Plots (100kHz)

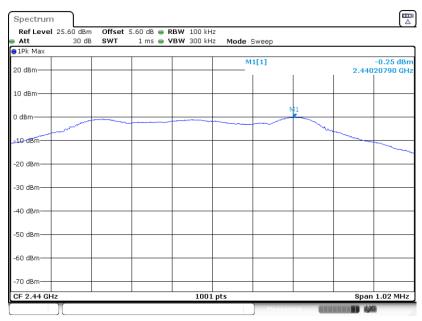
BLE 1Mbps

PSD 100kHz Plot on Channel 00



Date: 11.MAY.2024 16:08:24

PSD 100kHz Plot on Channel 19



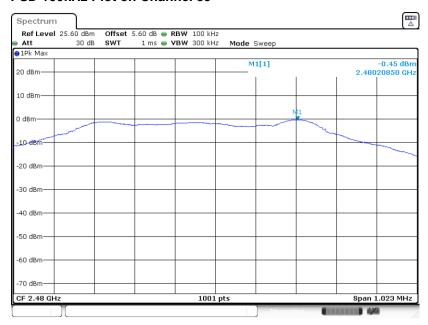
Date: 11.MAY.2024 16:11:15

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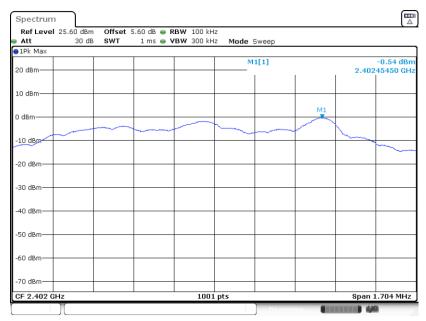
PSD 100kHz Plot on Channel 39



Date: 11.MAY.2024 16:13:22

BLE 2Mbps

PSD 100kHz Plot on Channel 00



Date: 11.MAY.2024 16:18:18

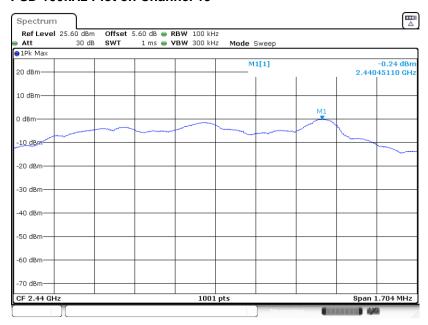
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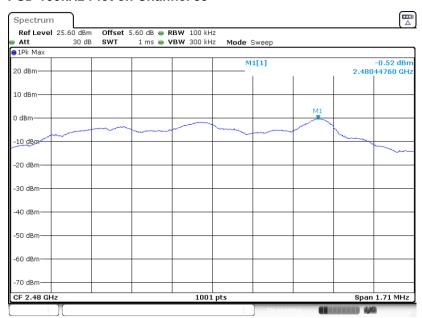
FCC RF Test Report

PSD 100kHz Plot on Channel 19



Date: 11.MAY.2024 16:20:26

PSD 100kHz Plot on Channel 39



Date: 11.MAY.2024 16:22:36

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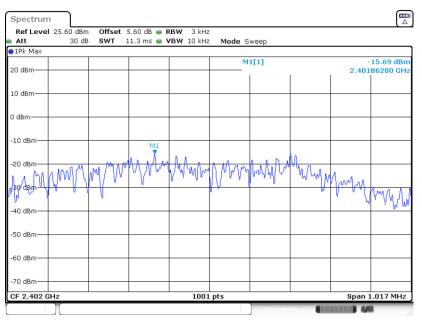
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3.3.7 Test Result of Power Spectral Density Plots (3kHz)

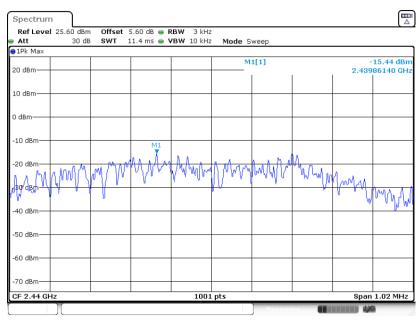
BLE 1Mbps

PSD 3kHz Plot on Channel 00



Date: 11.MAY.2024 16:08:04

PSD 3kHz Plot on Channel 19

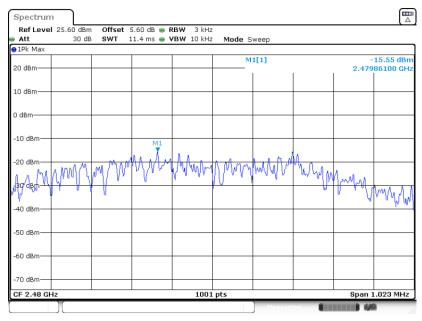


Date: 11.MAY.2024 16:10:56

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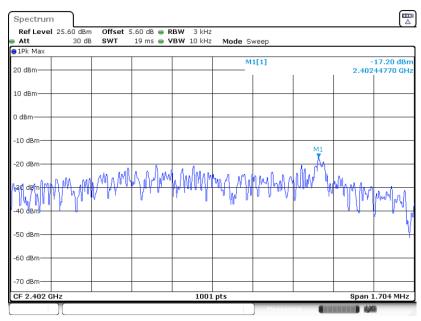
PSD 3kHz Plot on Channel 39



Date: 11.MAY.2024 16:13:03

BLE 2Mbps

PSD 3kHz Plot on Channel 00



Date: 11.MAY.2024 16:16:13

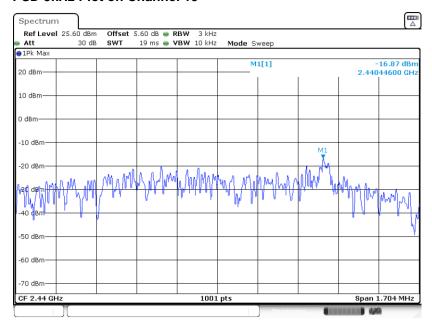
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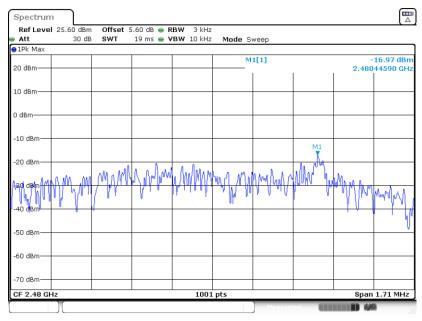
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PSD 3kHz Plot on Channel 19



Date: 11.MAY.2024 16:20:07

PSD 3kHz Plot on Channel 39



Date: 11.MAY.2024 16:22:17

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3.4 Conducted Band Edges and Spurious Emission Measurement

3.4.1 Limit of Conducted Band Edges and Spurious Emission

All harmonics/spurious must be at least 20 dB down from the highest emission level within the authorized band.

3.4.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

3.4.3 Test Procedure

- 1. The testing follows ANSI C63.10-2013 clause 11.13
- 2. The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 3. Set to the maximum power setting and enable the EUT transmit continuously.
- 4. Set RBW = 100 kHz, VBW=300 kHz, Peak Detector. Unwanted Emissions measured in any 100 kHz bandwidth outside of the authorized frequency band shall be attenuated by at least 20 dB relative to the maximum in-band peak PSD level in 100 kHz when maximum peak conducted output power procedure is used. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, the attenuation required under this paragraph shall be 30 dB instead of 20 dB.
- 5. Measure and record the results in the test report.
- 6. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.

3.4.4 Test Setup



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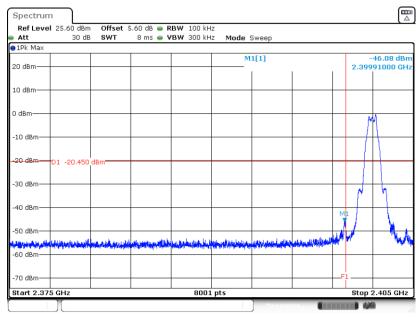
Report Template No.: BU5-FR15CBLE Version 2.0

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3.4.5 Test Result of Conducted Band Edges Plots

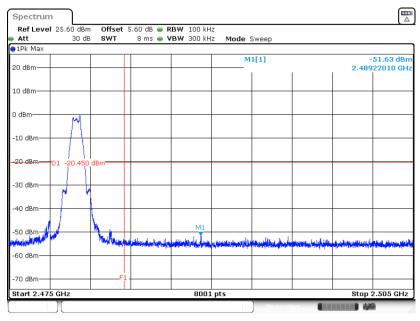
BLE 1Mbps

Low Band Edge Plot on Channel 00



Date: 11.MAY.2024 16:08:43

High Band Edge Plot on Channel 39



Date: 11.MAY.2024 16:13:41

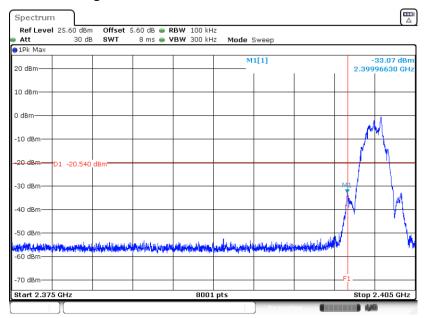
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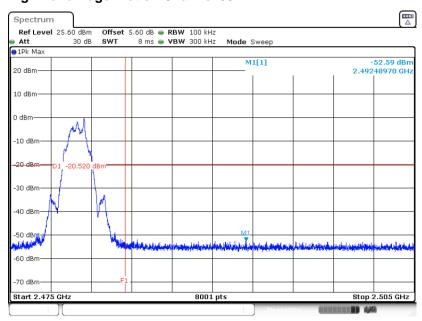
BLE 2Mbps

Low Band Edge Plot on Channel 00



Date: 11.MAY.2024 16:18:35

High Band Edge Plot on Channel 39



Date: 11.MAY.2024 16:22:55

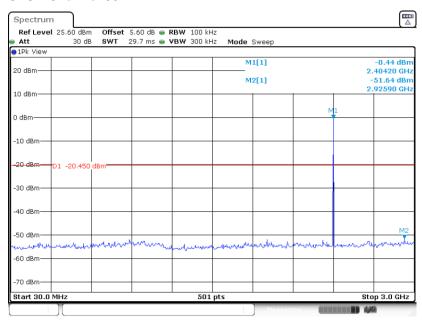
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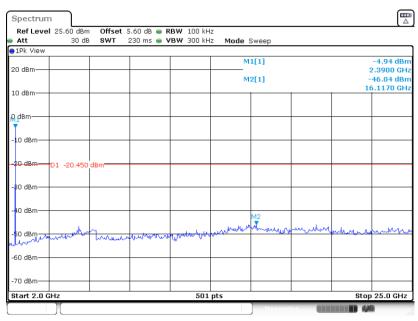
3.4.6 Test Result of Conducted Spurious Emission Plots

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



Date: 11.MAY.2024 16:09:04

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



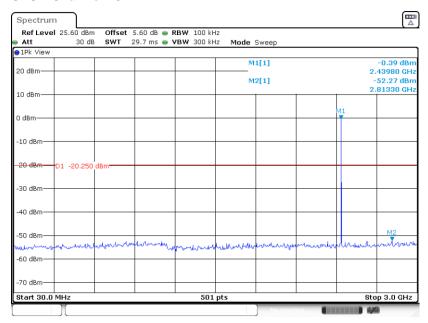
Date: 11.MAY.2024 16:09:24

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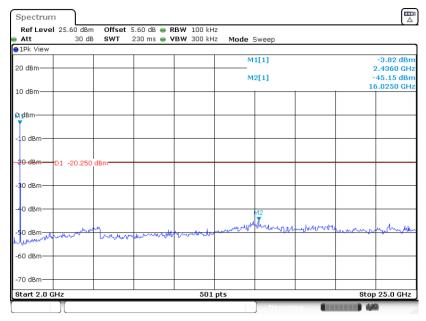
Report No. : FR442311

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19



Date: 11.MAY.2024 16:11:36

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 19



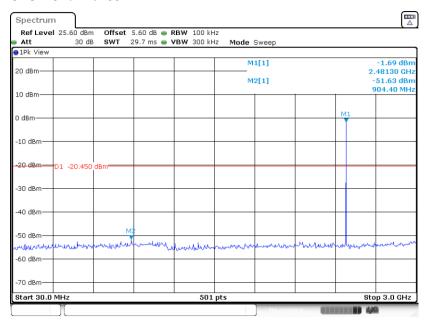
Date: 11.MAY.2024 16:11:56

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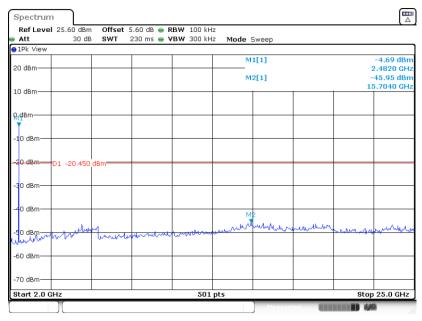
Report No. : FR442311

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39



Date: 11.MAY.2024 16:14:02

Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 39



Date: 11.MAY.2024 16:14:22

Sporton International Inc. (Kunshan)

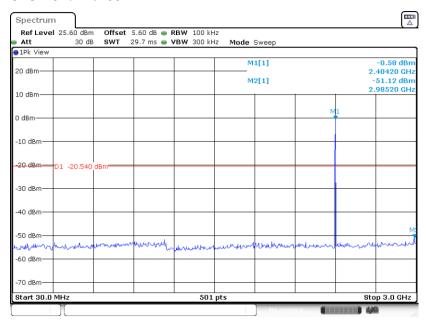
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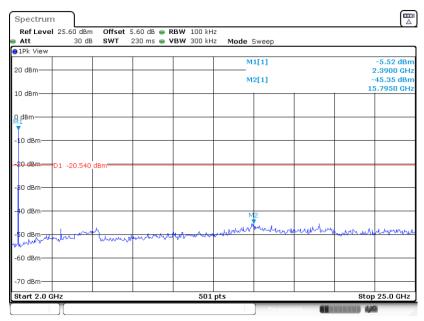
Report No. : FR442311

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00



Date: 11.MAY.2024 16:18:50

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 00



Date: 11.MAY.2024 16:19:09

Sporton International Inc. (Kunshan) TEL: +86-512-57900158

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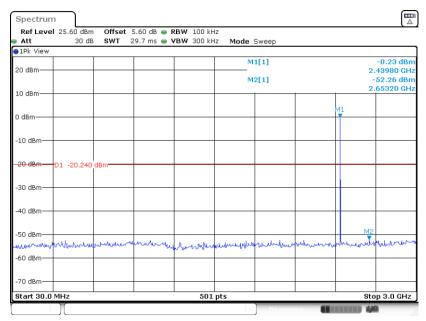
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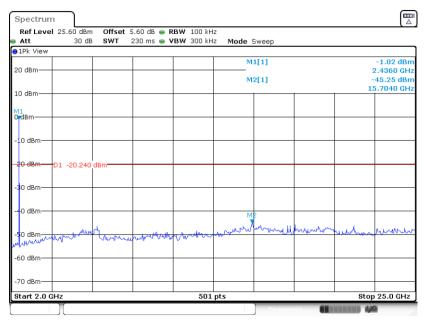
Report No. : FR442311

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19



Date: 11.MAY.2024 16:20:47

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 19



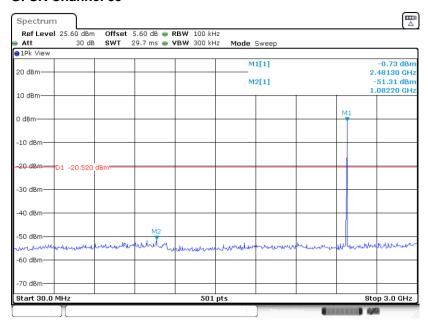
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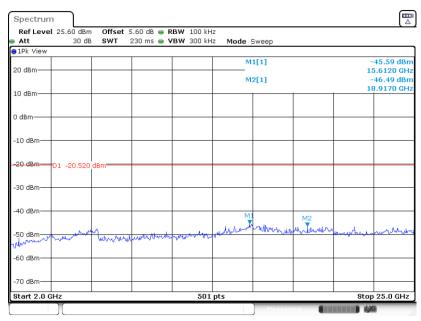
Report No. : FR442311

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39



Date: 11.MAY.2024 16:23:16

Conducted Spurious Emission Plot on Bluetooth LE 2Mbps GFSK Channel 39



Date: 11.MAY.2024 16:23:37

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3.5 Radiated Band Edges and Spurious Emission Measurement

3.5.1 Limit of Radiated Band Edges and Spurious Emission

In any 100 kHz bandwidth outside the intentional radiator frequency band, all harmonics/spurious must be at least 20 dB below the highest emission level within the authorized band. If the output power of this device was measured by spectrum analyzer, the attenuation under this paragraph shall be 30 dB instead of 20 dB. In addition, radiated emissions which fall in the restricted bands must also comply with the limits as below.

Frequency	Field Strength	Measurement Distance
(MHz)	(microvolts/meter)	(meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.5.2 Measuring Instruments

The section 4.0 of List of Measuring Equipment of this test report is used for test.

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3.5.3 Test Procedures

- 1. The testing follows ANSI C63.10-2013 clause 11.11 & 11.12
- 2. The EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading. A pre-amp and a high pass filter are used for the test in order to get better signal level.
- 3. The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
- The EUT was set 3 meters from the interference receiving antenna, which was mounted on the 4. top of a variable height antenna tower.
- 5. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level
- 6. For testing below 1GHz, if the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the CISPR quasi-peak method and reported.
- For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than 7. peak limit (that means the emission level in average mode also complies with the limit in average mode), then peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.
- 8. Use the following spectrum analyzer settings:
 - (1) Span shall wide enough to fully capture the emission being measured;
 - (2) Set RBW=100 kHz for f < 1 GHz; VBW ≥ RBW; Sweep = auto; Detector function = peak; Trace = max hold;
 - (3) Set RBW = 1 MHz, VBW= 3MHz for $f \ge 1$ GHz for peak measurement. For average measurement:
 - VBW = 10 Hz, when duty cycle is no less than 98 percent.
 - VBW ≥ 1/T, when duty cycle is less than 98 percent where T is the minimum transmission duration over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation.

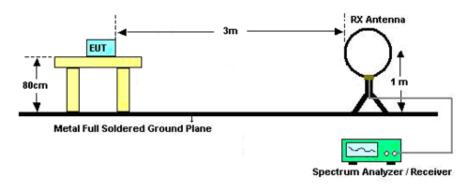
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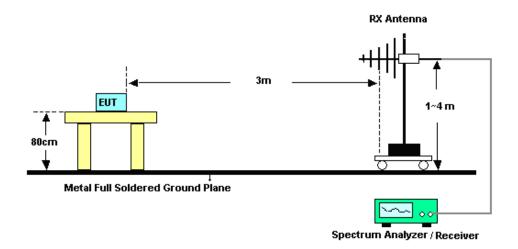
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3.5.4 Test Setup

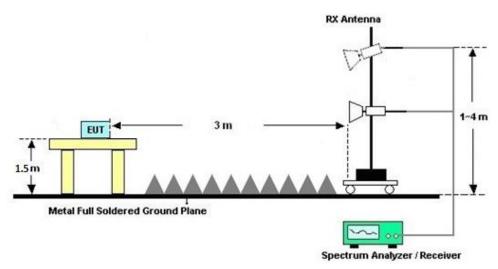
For radiated emissions below 30MHz



For radiated emissions from 30MHz to 1GHz



For radiated emissions above 1GHz



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3.5.5 Test Results of Radiated Spurious Emissions (9 kHz ~ 30 MHz)

The low frequency, which started from 9 kHz to 30MHz, was pre-scanned and the result which was 20dB lower than the limit line was not reported.

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There is a comparison data of both open-field test site and semi-Anechoic chamber, and the result came out very similar.

3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix B.

3.5.7 Duty Cycle

Please refer to Appendix C.

3.5.8 Test Result of Radiated Spurious Emission (30MHz ~ 10th Harmonic or 40GHz, whichever is lower)

Please refer to Appendix B.

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3.6 Antenna Requirements

3.6.1 Standard Applicable

If directional gain of transmitting antennas is greater than 6dBi, the power shall be reduced by the same level in dB comparing to gain minus 6dBi. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the rule.

3.6.2 Antenna Anti-Replacement Construction

An embedded-in antenna design is used.

3.6.3 Antenna Gain

The antenna peak gain of EUT is less than 6 dBi. Therefore, it is not necessary to reduce maximum peak output power limit.

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4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101040	10Hz~40GHz	Oct. 11, 2023	May 11, 2024	Oct. 10, 2024	Conducted (TH01-KS)
Pulse Power Senor	Anritsu	MA2411B	0917070	300MHz~40GH z	Jan. 02, 2024	May 11, 2024	Jan. 01, 2025	Conducted (TH01-KS)
Power Meter	Anritsu	ML2495A	1005002	50MHz Bandwidth	Jan. 02, 2024	May 11, 2024	Jan. 01, 2025	Conducted (TH01-KS)
EMI Test Receiver	Keysight	N9038A	MY564000 04	3Hz~8.5GHz;M ax 30dBm	Oct. 10, 2023	May 16, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
EXA Spectrum Analyzer	Keysight	N9010A	MY553705 28	10Hz-44GHz	Oct. 11, 2023	May 16, 2024	Oct. 10, 2024	Radiation (03CH03-KS)
Loop Antenna	R&S	HFH2-Z2	100321	9kHz~30MHz	Oct. 10, 2023	May 16, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
Bilog Antenna	TeseQ	CBL6112D	23182	30MHz-1GHz	Dec. 20, 2023	May 16, 2024	Dec. 19, 2024	Radiation (03CH03-KS)
Double Ridge Horn Antenna	ETS-Lindgren	3117	75957	1GHz~18GHz	Dec. 21, 2023	May 16, 2024	Dec. 20, 2024	Radiation (03CH03-KS)
SHF-EHF Horn	com-power	AH-840	101116	18GHz~40GHz	Oct. 10, 2023	May 16, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
Amplifier	SONOMA	310N	413740	30MHz ~1000MHz	Jan. 05, 2024	May 16, 2024	Jan. 04, 2025	Radiation (03CH03-KS)
Amplifier	EM	EM18G40GA	060851	18~40GHz	Jan. 05, 2024	May 16, 2024	Jan. 04, 2025	Radiation (03CH03-KS)
high gain Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	2082394	1Ghz-18Ghz	Jan. 05, 2024	May 16, 2024	Jan. 04, 2025	Radiation (03CH03-KS)
Amplifier	Keysight	83017A	MY532703 19	1GHz~26.5GHz	Oct. 10, 2023	May 16, 2024	Oct. 09, 2024	Radiation (03CH03-KS)
AC Power Source	Chroma	61601	F1040900 04	N/A	NCR	May 16, 2024	NCR	Radiation (03CH03-KS)
Turn Table	ChamPro	EM 1000-T	060762-T	0~360 degree	NCR	May 16, 2024	NCR	Radiation (03CH03-KS)
Antenna Mast	ChamPro	EM 1000-A	060762-A	1 m~4 m	NCR	May 16, 2024	NCR	Radiation (03CH03-KS)

NCR: No Calibration Required

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5 Measurement Uncertainty

The measurement uncertainties shown below were calculated in accordance with the requirements of ANSI 63.10-2013. All the measurement uncertainty value were shown with a coverage K=2 to indicate 95% level of confidence. The measurement data show herein meets or exceeds the CISPR measurement uncertainty values specified in CISPR 16-4-2 and can be compared directly to specified limit to determine compliance.

Uncertainty of Conducted Measurement

Conducted Spurious Emission & Bandedge	±2.26 dB
Occupied Channel Bandwidth	±0.1%
Conducted Power	±0.46 dB
Conducted Power Spectral Density	±0.88 dB
Frequency	±0.4 Hz

<u>Uncertainty of Radiated Emission Measurement (9 KHz ~ 30 MHz)</u>

Measuring Uncertainty for a Level of Confidence	3.30 dB
of 95% (U = 2Uc(y))	3.30 db

Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence	6.08dB
of 95% (U = 2Uc(y))	0.00UB

Uncertainty of Radiated Emission Measurement (1 GHz ~ 18 GHz)

-	
Measuring Uncertainty for a Level of Confidence	5.18 dB
of 95% (U = 2Uc(y))	3.10 UB

Uncertainty of Radiated Emission Measurement (18 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.22 dB
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----- THE END -----

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Appendix A. Conducted Test Results

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Bluetooth Low Energy

ſ	Test Engineer:	Jacob Zhang	Temperature:	20~26	°C
ľ	Test Date:	2024/5/11	Relative Humidity:	40~51	%

BLE1M-Ant1

TEST RESULTS DATA 6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	1Mbps	1	0	2402	1.01	0.68	0.50	Pass
BLE	1Mbps	1	19	2440	1.01	0.68	0.50	Pass
BLE	1Mbps	1	39	2480	1.01	0.68	0.50	Pass

TEST RESULTS DATA Peak Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	1Mbps	1	0	2402	0.13	30.00	-0.44	-0.31	36.00	Pass
BLE	1Mbps	1	19	2440	0.40	30.00	-0.44	-0.04	36.00	Pass
BLE	1Mbps	1	39	2480	0.11	30.00	-0.44	-0.33	36.00	Pass

TEST RESULTS DATA Average Power Table (Reporting Only)

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)
BLE	1Mbps	1	0	2402	3.80	0.06
BLE	1Mbps	1	19	2440	3.80	0.07
BLE	1Mbps	1	39	2480	3.80	0.02

Power setting is 2

TEST RESULTS DATA Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	1Mbps	1	0	2402	-0.45	-15.69	-0.44	8.00	Pass
BLE	1Mbps	1	19	2440	-0.25	-15.44	-0.44	8.00	Pass
BLE	1Mbps	1	39	2480	-0.45	-15.55	-0.44	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 20dBc limit.

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Bluetooth Low Energy

Test Engineer:	Jacob Zhang	Temperature:	20~26	°C
Test Date:	2024/5/11	Relative Humidity:	40~51	%

BLE2M-Ant1

TEST RESULTS DATA 6dB and 99% Occupied Bandwidth

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	99% Occupied BW (MHz)	6dB BW (MHz)	6dB BW Limit (MHz)	Pass/Fail
BLE	2Mbps	1	0	2402	2.01	1.14	0.50	Pass
BLE	2Mbps	1	19	2440	2.01	1.14	0.50	Pass
BLE	2Mbps	1	39	2480	2.01	1.14	0.50	Pass

TEST RESULTS DATA Peak Power Table

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak Conducted Power (dBm)	Conducted Power Limit (dBm)	DG (dBi)	EIRP Power (dBm)	EIRP Power Limit (dBm)	Pass /Fail
BLE	2Mbps	1	0	2402	0.18	30.00	-0.44	-0.26	36.00	Pass
BLE	2Mbps	1	19	2440	0.42	30.00	-0.44	-0.02	36.00	Pass
BLE	2Mbps	1	39	2480	0.21	30.00	-0.44	-0.23	36.00	Pass

TEST RESULTS DATA Average Power Table (Reporting Only)

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Duty Factor (dB)	Average Conducted Power (dBm)					
BLE	2Mbps	1	0	2402	6.19	0.01					
BLE	2Mbps	1	19	2440	6.19	0.23					
BLE	2Mbps	1	39	2480	6.19	0.16					
Power s	Power setting is 2										

TEST RESULTS DATA Peak Power Density

Mod.	Data Rate	NTX	CH.	Freq. (MHz)	Peak PSD (dBm /100kHz)	Peak PSD (dBm /3kHz)	DG (dBi)	Peak PSD Limit (dBm /3kHz)	Pass/Fail
BLE	2Mbps	1	0	2402	-0.54	-17.20	-0.44	8.00	Pass
BLE	2Mbps	1	19	2440	-0.24	-16.87	-0.44	8.00	Pass
BLE	2Mbps	1	39	2480	-0.52	-16.97	-0.44	8.00	Pass

Note: PSD (dBm/ 100kHz) is a reference level used for Conducted Band Edges and Conducted Spurious Emission 20dBc limit.

Appendix B. Radiated Spurious Emission Test Data

Test Engineer :	Jake	Relative Humidity :	41~ 42 %	
	dano	Temperature :	22 ~ 23 ℃	

Radiated Spurious Emission Test Modes

Mode	Band (MHz)	Antenna	Modulation	Channel	Frequency	Data Rate	RU	Remark
Mode 1	2400-2483.5	SISO	Bluetooth-LE_GSFK	00	2402	1Mbps	-	-
Mode 2	2400-2483.5	SISO	Bluetooth-LE_GSFK	19	2440	1Mbps	-	-
Mode 3	2400-2483.5	SISO	Bluetooth-LE_GSFK	39	2480	1Mbps	-	-
Mode 4	2400-2483.5	SISO	Bluetooth-LE_GSFK	00	2402	2Mbps	-	-
Mode 5	2400-2483.5	SISO	Bluetooth-LE_GSFK	19	2440	2Mbps	-	-
Mode 6	2400-2483.5	SISO	Bluetooth-LE_GSFK	39	2480	2Mbps	-	-

Summary of each worse mode

Mode	Modulation	Ch.	Freq. (MHz)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pol.	Peak Avg.	Result	Remark
1	Bluetooth-LE_GSFK	00	2311.17	38.90	54.00	-15.10	V	AVERAGE	Pass	Band Edge
1	Bluetooth-LE_GSFK	00	4804.00	41.23	74.00	-32.77	V	PEAK	Pass	Harmonic
2	Bluetooth-LE_GSFK	19	-	-	-	-	-	-	-	Band Edge
2	Bluetooth-LE_GSFK	19	7320.00	42.29	74.00	-31.71	V	PEAK	Pass	Harmonic
3	Bluetooth-LE_GSFK	39	2486.02	39.79	54.00	-14.21	V	AVERAGE	Pass	Band Edge
3	Bluetooth-LE_GSFK	39	7440.00	42.69	74.00	-31.31	Н	PEAK	Pass	Harmonic
4	Bluetooth-LE_GSFK	00	2381.89	40.41	54.00	-13.59	V	AVERAGE	Pass	Band Edge
4	Bluetooth-LE_GSFK	00	4804.00	40.48	74.00	-33.52	Н	PEAK	Pass	Harmonic
5	Bluetooth-LE_GSFK	19	-	-	-	-	-	-	-	Band Edge
5	Bluetooth-LE_GSFK	19	7320.00	42.98	74.00	-31.02	Н	PEAK	Pass	Harmonic
6	Bluetooth-LE_GSFK	39	2483.62	40.71	54.00	-13.29	V	AVERAGE	Pass	Band Edge
6	Bluetooth-LE_GSFK	39	7440.00	42.74	74.00	-31.26	V	PEAK	Pass	Harmonic

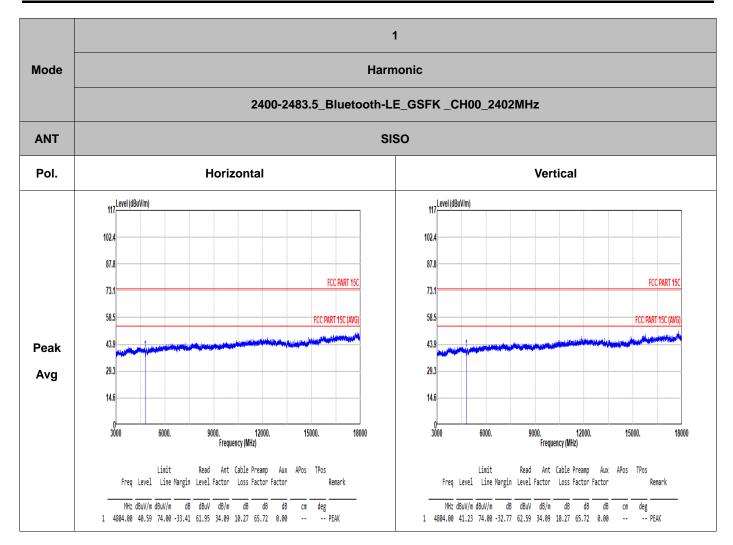
Sporton International Inc. (Kunshan) TEL: +86-512-57900158

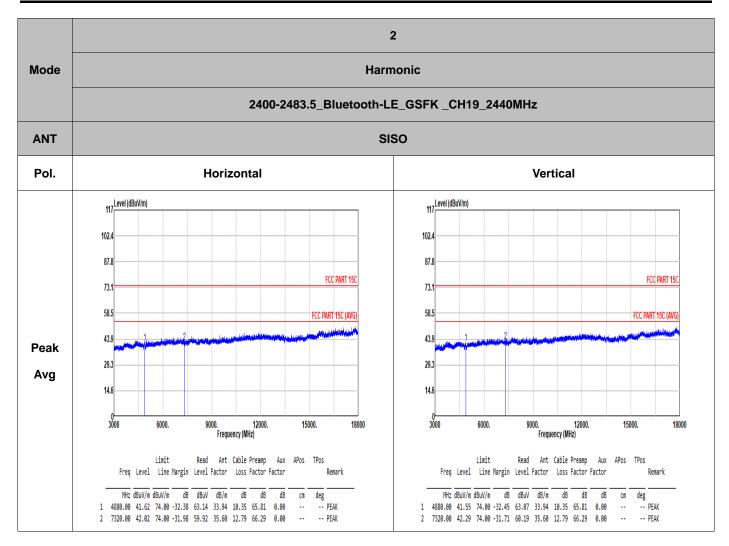
FCC ID: 2BEWX-TTFM-11

1 Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH00_2402MHz SISO **ANT** Pol. Horizontal **Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 150 FCC PART 150 65.0 65.0 48.8 48.8 **Peak** 32.5 32.5 16.3 16.3 2310 1000 2336. 2388. 2414. 2440 1400. 2600. 3000 2362. 2200. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg dB deg 1 2382.28 49.43 74.00 -24.57 41.36 31.78 7.15 36.86 6.00 130 162 PEAK 1 2402.00 91.63 ----- 83.40 31.91 7.18 36.86 6.00 130 162 PEAK 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG FCC PART 15C (AVG 48.8 48.8 Avg 32.5 32.5 16.3 16.3 0<u>-</u> 2310 2362. Frequency (MHz) 1000 2336. 2388. 2414. 2440 1400. 3000 Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2371.88 38.88 54.00 -15.12 30.91 31.70 7.14 36.87 6.00 130 162 AVERAGE 1 2402.00 90.64 ----- 82.41 31.91 7.18 36.86 6.00 130 162 AVERAGE

TEL: +86-512-57900158 FCC ID: 2BEWX-TTFM-11

1 Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH00_2402MHz SISO **ANT** Pol. **Vertical Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 150 FCC PART 150 65.0 65.0 48.8 48.8 **Peak** 32.5 32.5 16.3 16.3 2310 1000 2336. 2388. 2414. 2440 1400. 2600. 3000 2362. 2200. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB deg dB deg 1 2330.93 49.24 74.00 -24.76 41.62 31.42 7.07 36.87 6.00 334 63 PEAK 1 2402.00 90.77 ----- 82.54 31.91 7.18 36.86 6.00 334 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG FCC PART 15C (AVG 48.8 48.8 Avg 32.5 32.5 16.3 16.3 2310 1000 2362. 2 Frequency (MHz) 2336. 2388. 2414. 2440 1400. 3000 Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2311.17 38.90 54.00 -15.10 31.46 31.28 7.04 36.88 6.00 334 63 AVERAGE 1 2402.00 89.85 ----- 81.62 31.91 7.18 36.86 6.00 334





TEL: +86-512-57900158 FCC ID: 2BEWX-TTFM-11

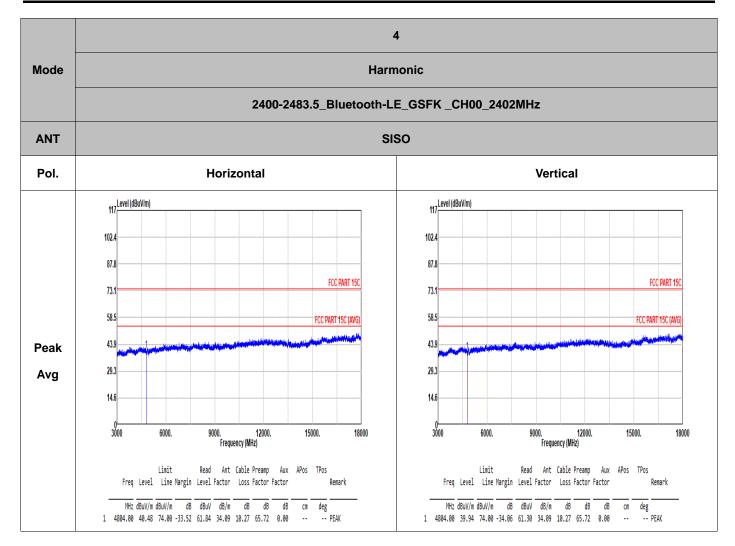
3 Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH39_2480MHz SISO **ANT** Pol. Horizontal **Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 150 FCC PART 150 65.0 65.0 48.8 48.8 **Peak** 32.5 32.5 16.3 16.3 2440 1000 2452. 2464. 2476. 2488. 2500 1400. 2600. 3000 2200. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg dB 1 2491.36 50.84 74.00 -23.16 42.08 32.27 7.34 36.85 6.00 388 163 PEAK 1 2480.00 87.92 ----- 79.23 32.22 7.32 36.85 6.00 388 163 PEAK 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG FCC PART 15C (AVG 48.8 48.8 Avg 32.5 32.5 16.3 16.3 0<u>-</u> 2440 1000 2452. 2488. 2500 1400. 3000 Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2499.52 39.56 54.00 -14.44 30.75 32.30 7.36 36.85 6.00 388 163 AVERAGE 1 2480.00 86.99 ----- 78.30 32.22 7.32 36.85 6.00 388 163 AVERAGE

3 Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH39_2480MHz SISO **ANT** Pol. **Vertical Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 150 FCC PART 150 65.0 65.0 48.8 48.8 **Peak** 32.5 32.5 16.3 16.3 2440 1000 2452. 2464. 2476. 2488. 2500 1400. 2600. 3000 1800. 2200. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg dB deg 1 2496.64 50.04 74.00 -23.96 41.25 32.29 7.35 36.85 6.00 306 1 2480.00 86.96 ----- 78.27 32.22 7.32 36.85 6.00 306 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG FCC PART 15C (AVG 48.8 48.8 Avg 32.5 32.5 16.3 16.3 0<u>--</u> 2440 1000 2452. 2488. 2500 1400. 1800. 3000 Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2486.02 39.79 54.00 -14.21 31.07 32.24 7.33 36.85 6.00 306 64 AVERAGE 1 2480.00 85.98 ----- 77.29 32.22 7.32 36.85 6.00 306

3 Mode Harmonic 2400-2483.5_Bluetooth-LE_GSFK _CH39_2480MHz SISO **ANT** Pol. Horizontal Vertical 117 Level (dBuV/m) 117 Level (dBuV/m) 102.4 102.4 87.8 87.8 FCC PART 15C FCC PART 15C 73.1 73.1 58.5 58.5 43.9 Peak 29.3 29.3 Avg 9000. Frequency (MHz) 3000 9000. 12000. Frequency (MHz) 18000 12000. 18000 Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB 1 4960.00 42.04 74.00 -31.96 63.55 33.96 10.44 65.91 0.00 1 4960.00 41.44 74.00 -32.56 62.95 33.96 10.44 65.91 0.00 -- PEAK 2 7440.00 42.69 74.00 -31.31 60.64 35.64 12.93 66.52 0.00 --2 7440.00 42.41 74.00 -31.59 60.36 35.64 12.93 66.52 0.00

4 Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH00_2402MHz SISO **ANT** Pol. Horizontal **Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 150 FCC PART 150 65.0 65.0 48.8 48.8 **Peak** 32.5 32.5 16.3 16.3 2310 1000 2336. 2388. 2414. 2440 1400. 2600. 3000 2362. 2200. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg dB deg 1 2383.71 49.48 74.00 -24.52 41.40 31.79 7.15 36.86 6.00 185 160 PEAK 1 2402.00 91.25 ----- 83.02 31.91 7.18 36.86 6.00 185 160 PEAK 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG FCC PART 15C (AVG 48.8 48.8 Avg 32.5 32.5 16.3 16.3 0<u>-</u> 2310 1000 2362. 2 Frequency (MHz) 2336. 2388. 2414. 2440 1400. 3000 Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2378.90 39.99 54.00 -14.01 31.95 31.75 7.15 36.86 6.00 185 160 AVERAGE 1 2402.00 89.59 ----- 81.36 31.91 7.18 36.86 6.00 185 160 AVERAGE

4 Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH00_2402MHz SISO **ANT** Pol. **Vertical Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 150 FCC PART 150 65.0 65.0 48.8 48.8 **Peak** 32.5 32.5 16.3 16.3 2310 1000 2336. 2388. 2414. 2440 1400. 2600. 3000 2362. 2200. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB deg dB deg 1 2344.45 49.92 74.00 -24.08 42.19 31.51 7.09 36.87 6.00 333 62 PEAK 1 2402.00 90.69 ----- 82.46 31.91 7.18 36.86 6.00 333 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG FCC PART 15C (AVG 48.8 48.8 Avg 32.5 32.5 16.3 16.3 0<u>-</u> 2310 1000 2362. 2 Frequency (MHz) 2336. 2388. 2414. 2440 1400. 3000 Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2381.89 40.41 54.00 -13.59 32.35 31.77 7.15 36.86 6.00 333 62 AVERAGE 1 2402.00 88.52 ----- 80.29 31.91 7.18 36.86 6.00 333



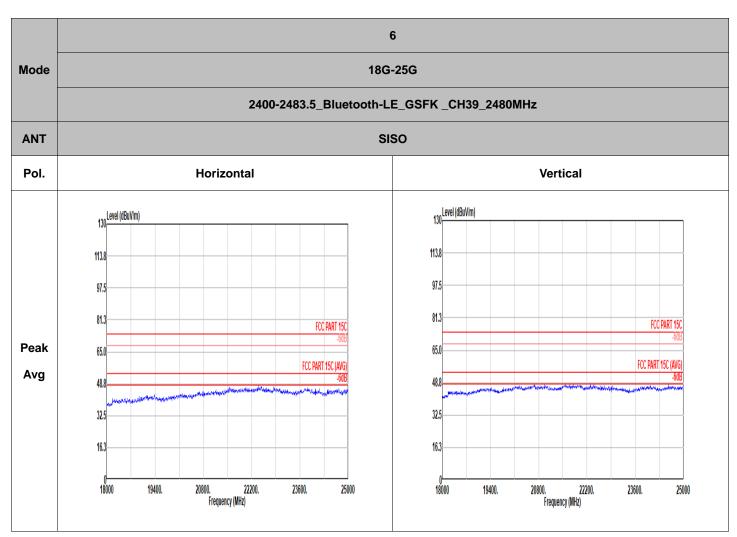
	5											
Mode	Harmonic 2400-2483.5_Bluetooth-LE_GSFK _CH19_2440MHz											
ANT	siso											
Pol.	Horizontal	Vertical										
Peak Avg	102.4 87.8 73.1 58.5 43.9 29.3 14.6 3000 6000. 9000. 12000. 15000. 18000 Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 4880.00 41.16 74.00 -32.84 62.68 33.94 10.35 65.81 0.00 PEAK 2 7320.00 42.98 74.00 -31.02 60.88 35.60 12.79 66.29 0.00 PEAK	1172 102.4 87.8 FCC PART 15C 150.0 150.0 180.00 14.6 14.										

TEL: +86-512-57900158 FCC ID: 2BEWX-TTFM-11

6 Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH39_2480MHz SISO **ANT** Pol. Horizontal **Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 150 FCC PART 150 65.0 65.0 48.8 48.8 **Peak** 32.5 32.5 16.3 16.3 2440 1000 2452. 2464. 2476. 2488. 2500 1400. 2600. 3000 2200. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg dB 1 2493.52 50.01 74.00 -23.99 41.24 32.27 7.35 36.85 6.00 387 167 PEAK 1 2480.00 87.64 ----- 78.95 32.22 7.32 36.85 6.00 387 167 PEAK 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG FCC PART 15C (AVG 48.8 48.8 Avg 32.5 32.5 16.3 16.3 0<u>--</u> 2440 1000 2452. 2488. 2500 1400. 3000 Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2493.46 40.69 54.00 -13.31 31.92 32.27 7.35 36.85 6.00 387 167 AVERAGE 1 2480.00 85.76 ----- 77.07 32.22 7.32 36.85 6.00 387 167 AVERAGE

6 Mode **Band Edge** 2400-2483.5_Bluetooth-LE_GSFK _CH39_2480MHz SISO **ANT** Pol. **Vertical Fundamental** 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 FCC PART 150 FCC PART 150 65.0 65.0 48.8 48.8 **Peak** 32.5 32.5 16.3 16.3 2440 1000 2452. 2464. 2476. 2488. 2500 1400. 2600. 3000 2200. Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB deg dB deg 1 2483.56 50.11 74.00 -23.89 41.40 32.23 7.33 36.85 6.00 305 1 2480.00 86.99 ----- 78.30 32.22 7.32 36.85 6.00 305 130 Level (dBuV/m) 130 Level (dBuV/m) 113.8 113.8 97.5 97.5 81.3 81.3 65.0 65.0 FCC PART 15C (AVG FCC PART 15C (AVG 48.8 48.8 Avg 32.5 32.5 16.3 16.3 0<u>--</u> 2440 1000 2452. 2488. 2500 1400. 3000 Frequency (MHz) Frequency (MHz) Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Remark Freq Level Line Margin Level Factor Loss Factor Factor Remark MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB cm deg 1 2483.62 40.71 54.00 -13.29 32.00 32.23 7.33 36.85 6.00 305 65 AVERAGE 1 2480.00 84.77 ----- 76.08 32.22 7.32 36.85 6.00 305

6 Mode Harmonic 2400-2483.5_Bluetooth-LE_GSFK _CH39_2480MHz SISO **ANT** Pol. Horizontal Vertical 117 Level (dBuV/m) 117 Level (dBuV/m) 102.4 102.4 87.8 87.8 FCC PART 15C FCC PART 15C 73.1 73.1 58.5 58.5 43.9 43.9 **Peak** 29.3 Avg 9000. Frequency (MHz) 3000 9000. 12000. Frequency (MHz) 18000 12000. 18000 Limit Read Ant Cable Preamp Aux APos TPos Limit Read Ant Cable Preamp Aux APos TPos Freq Level Line Margin Level Factor Loss Factor Factor Freq Level Line Margin Level Factor Loss Factor Factor MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB MHz dBuV/m dBuV/m dB dBuV dB/m dB dB dB 1 4960.00 40.96 74.00 -33.04 62.47 33.96 10.44 65.91 0.00 1 4960.00 41.91 74.00 -32.09 63.42 33.96 10.44 65.91 0.00 -- PEAK 2 7440.00 42.39 74.00 -31.61 60.34 35.64 12.93 66.52 0.00 --2 7440.00 42.74 74.00 -31.26 60.69 35.64 12.93 66.52 0.00



Note: Only the worst case has assessed 18G ~25GHz to test.

TEL: +86-512-57900158 FCC ID: 2BEWX-TTFM-11

6 Mode LF 2400-2483.5_Bluetooth-LE_GSFK _CH39_2480MHz **ANT** SISO Pol. Horizontal Vertical 80 Level (dBuV/m) 70.0 70.0 FCC PART 15C FCC PART 150 40.0 40.0 30.0 10.0 10.0 Peak -2030 100. 300. 400. 500. 800. 900. 100. 300. 400. 500. 700. 900. 1000 Frequency (MHz) Frequency (MHz) Over Limit ReadAntenna Cable Preamp A/Pos T/Pos Freq Level Limit Line Level Factor Loss Factor Over Limit ReadAntenna Cable Preamp A/Pos T/Pos dB dBuV/m dBuV dB/m dB dBuV/m dBuV dB/m 38.97 21.43 -18.57 40.00 28.13 24.93 6.51 32.14 81.41 18.34 -21.66 40.00 35.68 13.53 1.20 32.07 164.83 20.79 -22.71 43.50 35.00 16.03 1.86 32.10 199.75 26.00 -17.50 43.50 41.00 15.03 2.07 21.96 677.96 26.87 -19.13 46.00 28.26 27.64 3.80 32.23 956.35 32.47 -13.53 46.00 27.58 31.29 4.50 30.90
 47.46
 31.53
 -8.47
 48.08
 46.96
 15.93
 0.74
 22.10

 96.93
 21.55
 -21.95
 43.59
 36.56
 15.64
 1.42
 32.07

 172.59
 26.27
 -17.23
 43.59
 41.13
 15.35
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 32.12

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 43.59
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 32.18

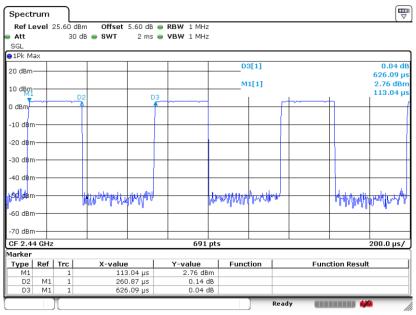
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 28.63
 -17.37
 46.00
 28.54
 28.18
 3.98
 32.07

 932.10
 31.37
 -14.63
 46.00
 27.86
 30.15
 4.44
 31.08
 --- Peak --- Peak
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--- Peak
--- Peak
--- Peak --- Peak --- Peak --- Peak --- Peak --- Peak

Appendix C. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth LE 1Mbps	41.67	0.261	3.722	3.9KHZ
Bluetooth LE 2Mbps	24.07	0.151	6.635	7.5KHZ

Bluetooth LE 1Mbps



Bluetooth LE 2Mbps

