# **FCC RF Test Report**

APPLICANT : Amazon.com Services LLC

**EQUIPMENT**: Wireless Remote

MODEL NAME : G25N8L

FCC ID : 2A4DH-2587

STANDARD : FCC Part 15 Subpart C §15.247

CLASSIFICATION : (DTS) Digital Transmission System

TEST DATE(S) : Apr. 13, 2022 ~ Apr. 15, 2022

We, Sporton International Inc. (ShenZhen), 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. (ShenZhen), the test report shall not be reproduced except in full.

JasonJia

Approved by: Jason Jia





Report No.: FR210405-01

## Sporton International Inc. (ShenZhen)

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055

People's Republic of China

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 1 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

# **TABLE OF CONTENTS**

RE	/ISIOI	N HISTORY	3
SUI	MMAR	Y OF TEST RESULT	4
1	GENE	ERAL DESCRIPTION	5
	1.1	Applicant	5
	1.2	Product Feature of Equipment Under Test	5
	1.3	Product Specification of Equipment Under Test	5
	1.4	Modification of EUT	5
	1.5	Testing Location	6
	1.6	Test Software	6
	1.7	Applicable Standards	6
2	TEST	CONFIGURATION OF EQUIPMENT UNDER TEST	7
	2.1	Carrier Frequency Channel	7
	2.2	Test Mode	8
	2.3	Connection Diagram of Test System	8
	2.4	Support Unit used in test configuration and system	9
	2.5	EUT Operation Test Setup	9
	2.6	Measurement Results Explanation Example	9
3	TEST	RESULT	10
	3.1	6dB and 99% Bandwidth Measurement	10
	3.2	Output Power Measurement	17
	3.3	Power Spectral Density Measurement	18
	3.4	Conducted Band Edges and Spurious Emission Measurement	25
	3.5	Radiated Band Edges and Spurious Emission Measurement	34
	3.6	Antenna Requirements	38
4	LIST	OF MEASURING EQUIPMENT	39
5	UNCE	ERTAINTY OF EVALUATION	40
API	PENDI	X A. CONDUCTED TEST RESULTS	
API	PENDI	X B. RADIATED SPURIOUS EMISSION	
API	PENDI	X C. RADIATED SPURIOUS EMISSION PLOTS	
API	PENDI	X D. DUTY CYCLE PLOTS	

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 2 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No. : FR210405-01

# **REVISION HISTORY**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR210405-01	Rev. 01	Initial issue of report	Apr. 28, 2022

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 3 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No. : FR210405-01

#### 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	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	Conducted Band Edges and Spurious Emission	≤ 20dBc	Pass	-
3.5	15.247(d)	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 9.07 dB at 4960 MHz
-	15.207	AC Conducted Emission	15.207(a)	Not Required	-
3.6	15.203 & 15.247(b)	Antenna Requirement	15.203 & 15.247(b)	Pass	-

Remark: Not required means after assessing, test items are not necessary to carry out.

#### **Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

#### Comments and Explanations:

The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 4 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

# 1 General Description

# 1.1 Applicant

**Amazon.com Services LLC** 

410 Terry Avenue N Seattle, WA 98109-5210 United States

## 1.2 Product Feature of Equipment Under Test

Product Feature				
<b>Equipment</b> Wireless Remote				
Model Name	G25N8L			
FCC ID	2A4DH-2587			

Report No.: FR210405-01

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

## 1.3 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	Bluetooth LE(1Mbps): 3.13 dBm (0.0021 W)			
Maximum Output Power to Antenna	Bluetooth LE(2Mbps): 3.17 dBm (0.0021 W)			
99% Occupied Bandwidth	Bluetooth LE(1Mbps): 1.035MHz			
39 % Occupied Baildwidth	Bluetooth LE(2Mbps): 2.050MHz			
Antenna Type / Gain	PCB Inv F Antenna with gain 3.17 dBi			
Type of Modulation	Bluetooth LE : GFSK			

#### 1.4 Modification of EUT

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

 Sporton International Inc. (ShenZhen)
 Page Number
 : 5 of 40

 TEL: 86-755-8637-9589
 Report Issued Date
 : Apr. 28, 2022

 FAX: 86-755-8637-9595
 Report Version
 : Rev. 01

FCC ID: 2A4DH-2587 Report Template No.: BU5-FR15CBT4.0 Version 2.0

# 1.5 Testing Location

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Test Firm	Sporton International Inc. (Shenzhen)				
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595				
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.		
	TH01-SZ	CN1256	421272		

Test Firm	Sporton International Inc. (Shenzhen)			
Test Site Location	101, 1st Floor, Block B, Building 1, No. 2, Tengfeng 4th Road, Fenghuang Community, Fuyong Street, Baoan District, Shenzhen City Guangdong Province China 518103 TEL: +86-755-33202398			
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.	
	03CH02-SZ	CN1256	421272	

#### 1.6 Test Software

Item	Site	Manufacturer	Name	Version
1.	03CH02-SZ	AUDIX	E3	6.2009-8-24a
2.	CO01-SZ	AUDIX	E3	6.120613b

# 1.7 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.

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 6 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

# 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	2416	28	2458
	8	2418	29	2460
	9	2420	30	2462
2400-2483.5 MHz	10	2422	31	2464
	11	2424	32	2466
	12	2426	33	2468
	13	2428	34	2470
	14	2430	35	2472
	15	2432	36	2474
	16	2434	37	2476
	17	2436	38	2478
	18	2438	39	2480
	19	2440	-	-
	20	2442	-	-

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 7 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

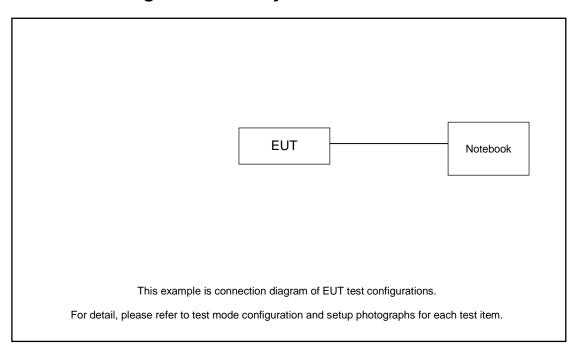
#### 2.2 Test Mode

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 (Z 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					
Test Item	Data Rate / Modulation					
rest item	Bluetooth – LE / GFSK					
Conducted	Mode 1: Bluetooth Tx CH00_2402 MHz					
TCs	Mode 2: Bluetooth Tx CH19_2440 MHz					
108	Mode 3: Bluetooth Tx CH39_2480 MHz					
Radiated	Mode 1: Bluetooth Tx CH00_2402 MHz					
	Mode 2: Bluetooth Tx CH19_2440 MHz					
TCs	Mode 3: Bluetooth Tx CH39_2480 MHz					

### 2.3 Connection Diagram of Test System



Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 8 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

## 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	Notebook	DELL	VOSTRO 1440	Fcc DoC	N/A	AC I/P: Unshielded, 1.8 m DC O/P: Shielded, 1.8 m

### 2.5 EUT Operation Test Setup

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

### 2.6 Measurement Results Explanation Example

#### For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor 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 and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 1.5 dB and 10dB attenuator.

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).  
= 
$$1.5 + 10 = 11.5$$
 (dB)

Report No.: FR210405-01

Report Version : Rev. 01

### 3 Test Result

#### 3.1 6dB and 99% Bandwidth Measurement

#### 3.1.1 Limit of 6dB and 99% Bandwidth

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

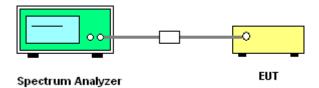
#### 3.1.2 Measuring Instruments

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. For 99% Bandwidth Measurement, the spectrum analyzer's resolution bandwidth (RBW) is set 1% to 5% of the 99% OBW and the VBW is set to 3 times of the RBW.
- 6. Measure and record the results in the test report.

#### 3.1.4 Test Setup



Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 10 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

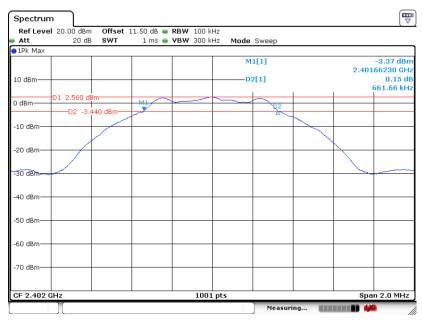
Report No.: FR210405-01

#### 3.1.5 Test Result of 6dB Bandwidth

Please refer to Appendix A.

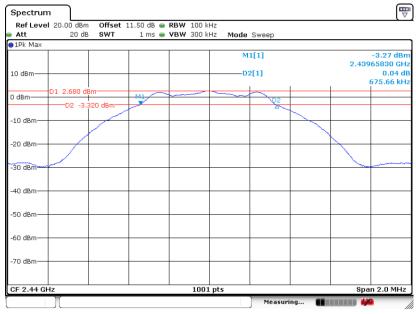
#### **Bluetooth LE 1Mbps**

#### 6 dB Bandwidth Plot on Channel 00



Date: 15.APR.2022 21:59:25

#### 6 dB Bandwidth Plot on Channel 19



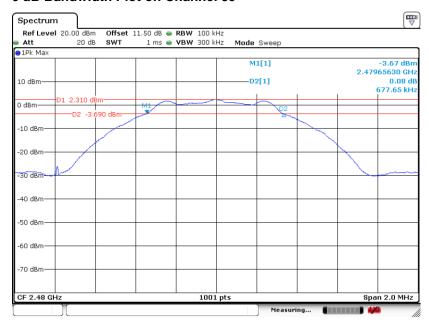
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Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 11 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

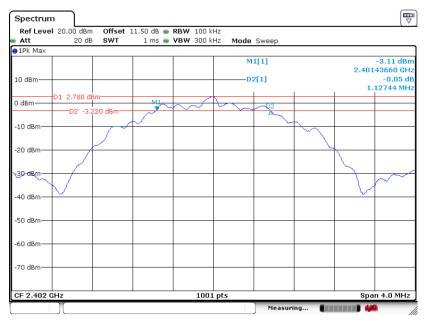
#### 6 dB Bandwidth Plot on Channel 39



Date: 15.APR.2022 22:16:48

#### **Bluetooth LE 2Mbps**

#### 6 dB Bandwidth Plot on Channel 00



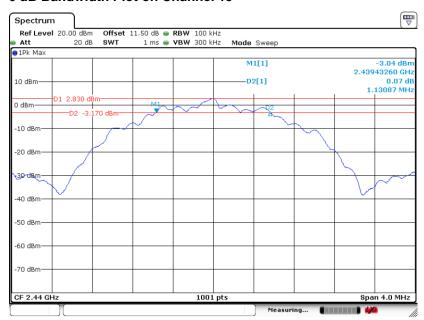
Date: 15.APR.2022 22:20:57

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 12 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

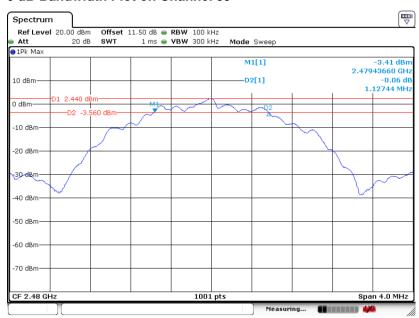
Report No.: FR210405-01

#### 6 dB Bandwidth Plot on Channel 19



Date: 15.APR.2022 22:24:10

#### 6 dB Bandwidth Plot on Channel 39



Date: 15.APR.2022 22:27:29

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 13 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

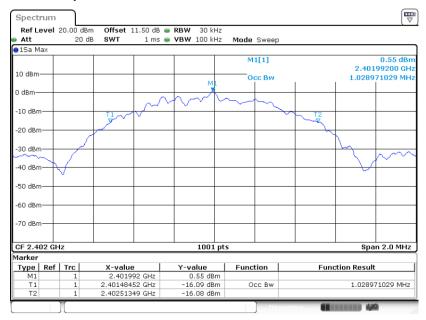
Report No.: FR210405-01

#### 3.1.6 Test Result of 99% Occupied Bandwidth

Please refer to Appendix A.

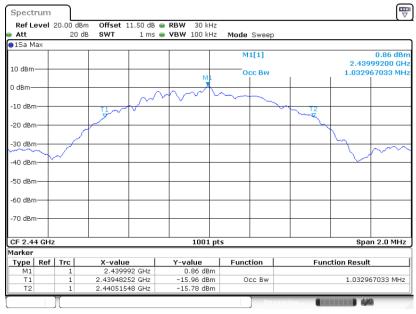
#### **Bluetooth LE 1Mbps**

#### 99% Occupied Bandwidth Plot on Channel 00



Date: 15.APR.2022 22:00:55

#### 99% Occupied Bandwidth Plot on Channel 19



Date: 15.APR.2022 22:14:43

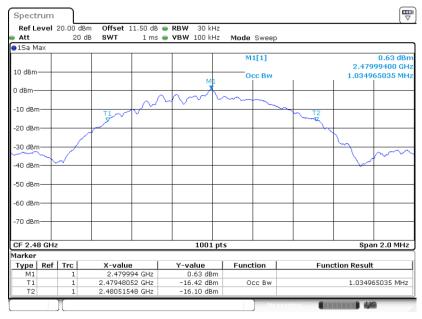
Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 14 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

# CC RF Test Report No.: FR210405-01

#### 99% Occupied Bandwidth Plot on Channel 39

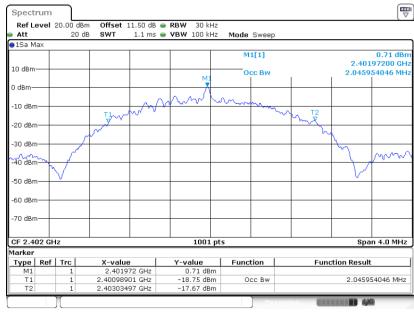


Date: 15.APR.2022 22:19:21

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

#### **Bluetooth LE 2Mbps**

#### 99% Occupied Bandwidth Plot on Channel 00

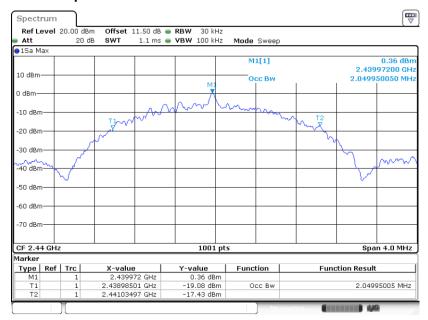


Date: 15.APR.2022 22:23:01

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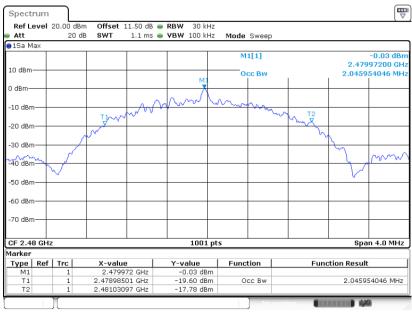
TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 15 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

#### 99% Occupied Bandwidth Plot on Channel 19



Date: 15.APR.2022 22:26:10

#### 99% Occupied Bandwidth Plot on Channel 39



Date: 15.APR.2022 22:29:36

Note: The occupied channel bandwidth is maintained within the band of operation for all of the modulations.

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 16 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

Report Version : Rev. 01
Report Template No.: BU5-FR15CBT4.0 Version 2.0

### 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.

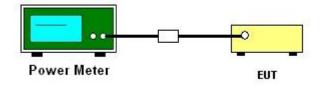
#### 3.2.2 Measuring Instruments

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
- 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.

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 17 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

### 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.

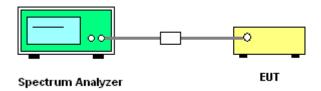
#### 3.3.2 Measuring Instruments

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.

Sporton International Inc. (ShenZhen)

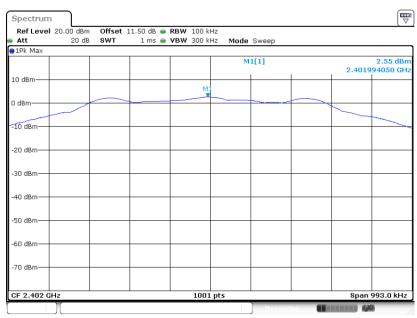
TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 18 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

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

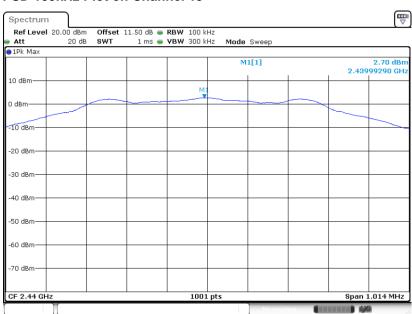
#### **Bluetooth LE 1Mbps**

#### PSD 100kHz Plot on Channel 00



Date: 15.APR.2022 21:59:55

#### PSD 100kHz Plot on Channel 19



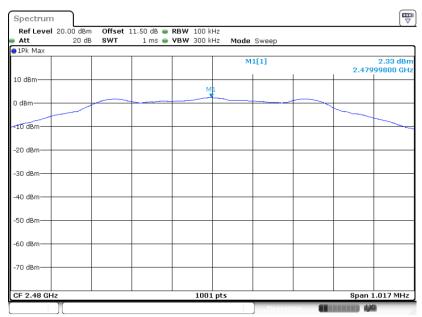
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Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 19 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

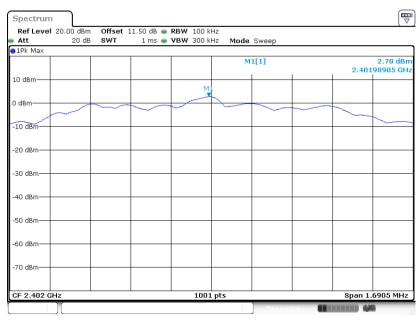
#### PSD 100kHz Plot on Channel 39



Date: 15.APR.2022 22:17:34

#### **Bluetooth LE 2Mbps**

#### PSD 100kHz Plot on Channel 00



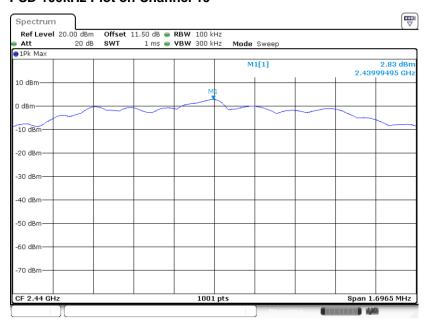
Date: 15.APR.2022 22:21:47

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 20 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

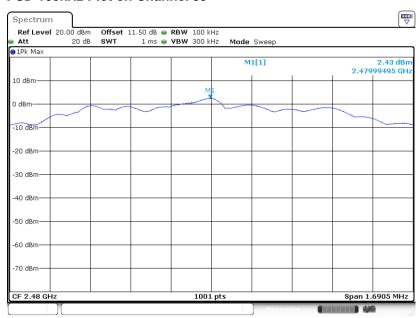
Report No.: FR210405-01

#### **PSD 100kHz Plot on Channel 19**



Date: 15.APR.2022 22:25:03

#### PSD 100kHz Plot on Channel 39



Date: 15.APR.2022 22:28:13

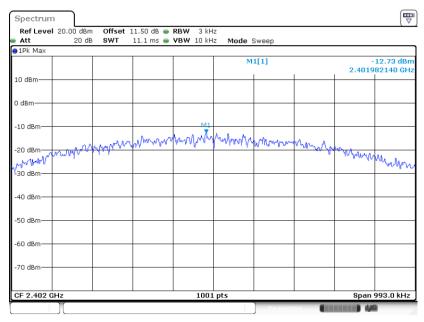
TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 21 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

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

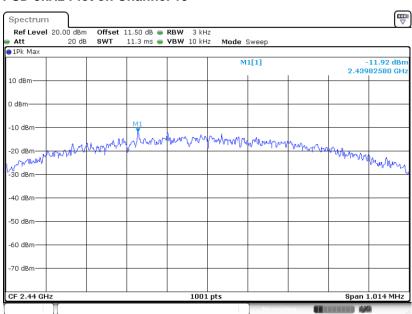
#### **Bluetooth LE 1Mbps**

#### PSD 3kHz Plot on Channel 00



Date: 15.APR.2022 21:59:40

#### PSD 3kHz Plot on Channel 19



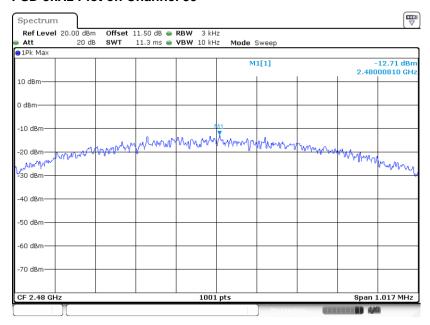
Date: 15.APR.2022 22:13:33

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 22 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

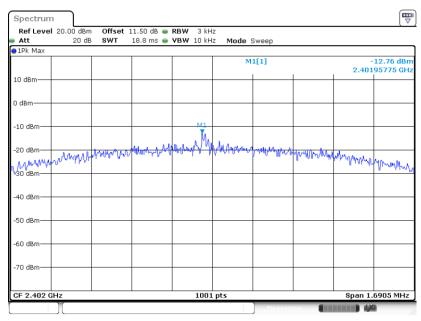
#### **PSD 3kHz Plot on Channel 39**



Date: 15.APR.2022 22:17:06

#### **Bluetooth LE 2Mbps**

#### PSD 3kHz Plot on Channel 00



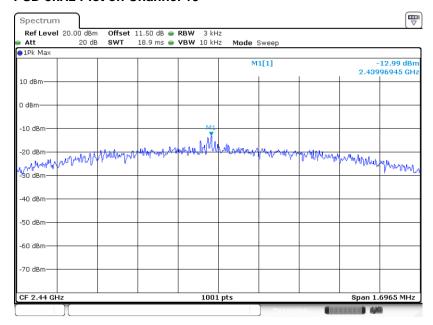
Date: 15.APR.2022 22:21:34

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 23 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

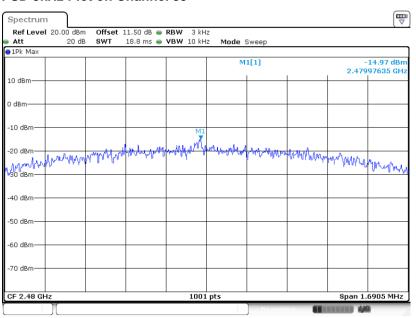
Report No.: FR210405-01

#### **PSD 3kHz Plot on Channel 19**



Date: 15.APR.2022 22:24:40

#### PSD 3kHz Plot on Channel 39



Date: 15.APR.2022 22:27:49

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 24 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

### 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.

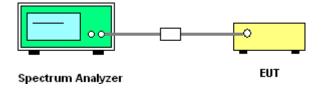
#### 3.4.2 Measuring Instruments

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



**Sporton International Inc. (ShenZhen)** TEL: 86-755-8637-9589

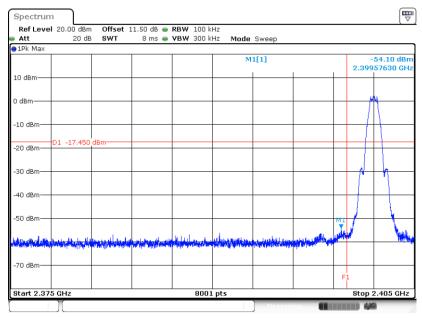
FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 25 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

### 3.4.5 Test Result of Conducted Band Edges Plots

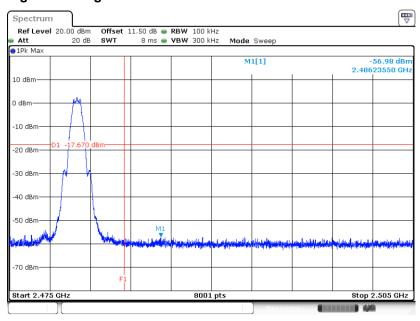
#### **Bluetooth LE 1Mbps**

#### Low Band Edge Plot on Channel 00



Date: 15.APR.2022 22:00:16

#### **High Band Edge Plot on Channel 39**



Date: 15.APR.2022 22:18:18

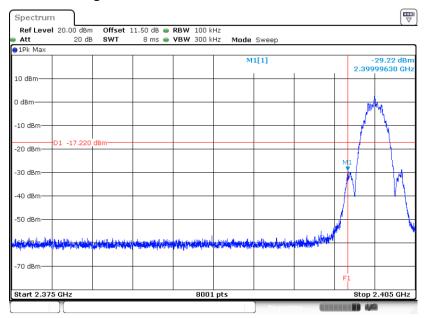
Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 26 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

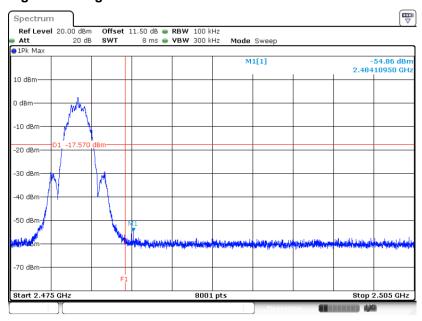
#### **Bluetooth LE 2Mbps**

#### Low Band Edge Plot on Channel 00



Date: 15.APR.2022 22:22:22

#### **High Band Edge Plot on Channel 39**



Date: 15.APR.2022 22:33:03

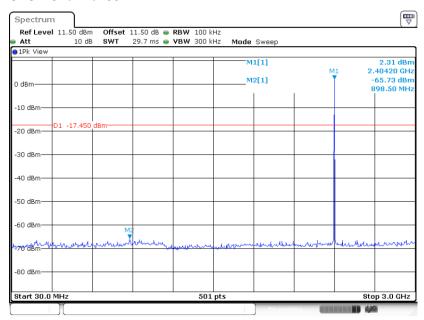
TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 27 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

### 3.4.6 Test Result of Conducted Spurious Emission Plots

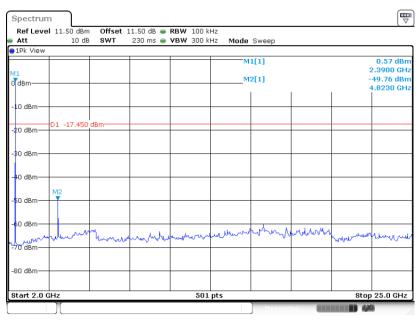
#### **Bluetooth LE 1Mbps**

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



Date: 15.APR.2022 22:00:28

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



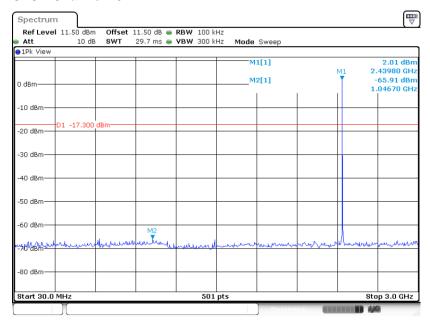
Date: 15.APR.2022 22:00:39

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 28 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

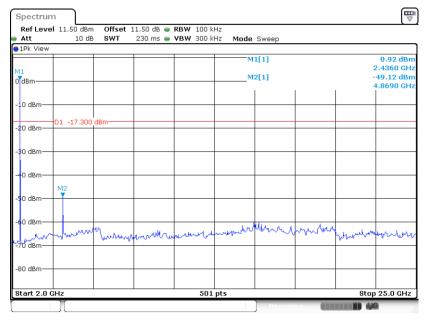
Report No.: FR210405-01

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



Date: 15.APR.2022 22:14:16

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



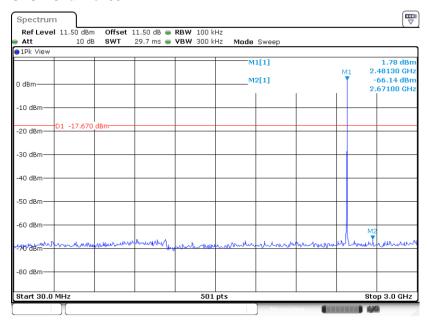
Date: 15.APR.2022 22:14:26

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 29 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

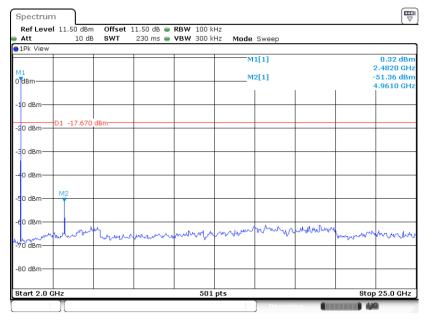
Report No.: FR210405-01

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



Date: 15.APR.2022 22:18:38

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



Date: 15.APR.2022 22:18:50

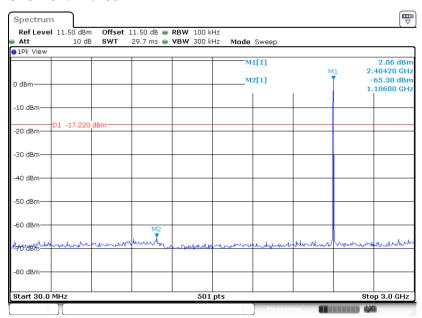
Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 30 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

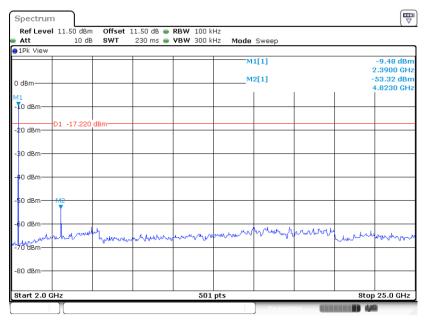
#### **Bluetooth LE 2Mbps**

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



Date: 15.APR.2022 22:22:35

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



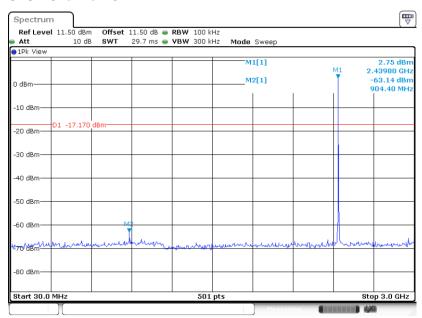
Date: 15.APR.2022 22:22:47

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 31 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

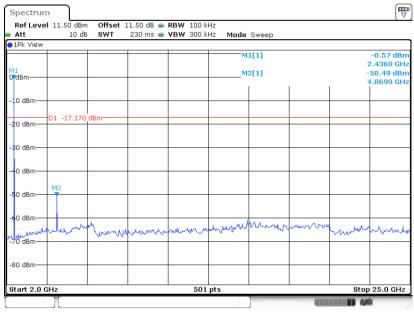
Report No.: FR210405-01

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



Date: 15.APR.2022 22:25:26

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



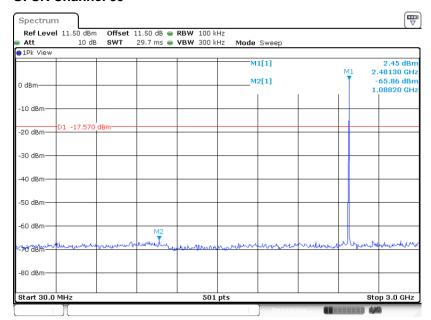
Date: 15.APR.2022 22:25:42

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 32 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

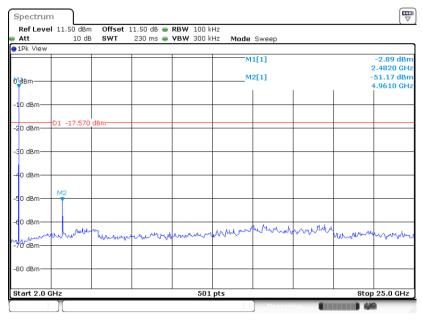
Report No.: FR210405-01

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



Date: 15.APR.2022 22:28:37

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



Date: 15.APR.2022 22:28:49

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 33 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

### 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.

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 34 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

#### 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.

Report No.: FR210405-01

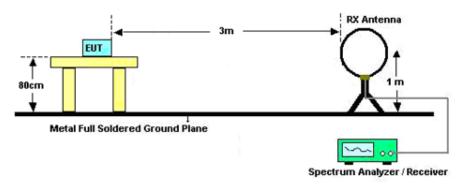
- The EUT was placed on a turntable with 0.8 meter for frequency below 1GHz and 1.5 meter for frequency above 1GHz respectively above ground.
- 4. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
- 5. Corrected Reading: 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.
- 7. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than 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.

Sporton International Inc. (ShenZhen)Page Number: 35 of 40TEL: 86-755-8637-9589Report Issued Date: Apr. 28, 2022

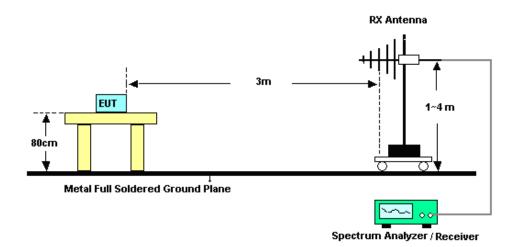
FAX : 86-755-8637-9595 Report Version : Rev. 01
FCC ID: 2A4DH-2587 Report Template No.: BU5-FR15CBT4.0 Version 2.0

### 3.5.4 Test Setup

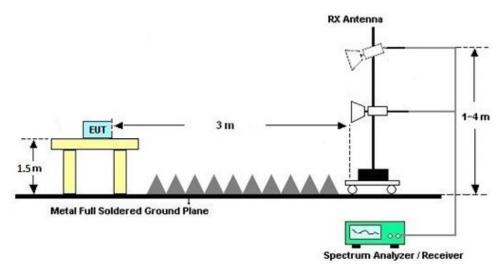
#### For radiated emissions below 30MHz



#### For radiated emissions from 30MHz to 1GHz



#### For radiated emissions above 1GHz



Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 36 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

### 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.

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&C.

### 3.5.7 Duty Cycle

Please refer to Appendix D.

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

Please refer to Appendix B&C.

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 37 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

Report Template No.: BU5-FR15CBT4.0 Version 2.0

### 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.

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 38 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report Template No.: BU5-FR15CBT4.0 Version 2.0

## 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	R&S	FSV40	101078	10Hz~40GHz	Apr. 07, 2022	Apr. 15, 2022	Apr. 06, 2023	Conducted (TH01-SZ)
Pulse Power Senor	Anritsu	MA2411B	1339473	30MHz~40GHz	Dec. 28, 2021	Apr. 15, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
Power Meter	Anritsu	ML2495A	1542004	50MHz Bandwidth	Dec. 28, 2021	Apr. 15, 2022	Dec. 27, 2022	Conducted (TH01-SZ)
EXA Spectrum Analyzer	KEYSIGHT	N9010A	MY551502 13	10Hz~44GHz	Jul. 13, 2021	Apr. 13, 2022~ Apr. 14, 2022	Jul. 13, 2022	Radiation (03CH02-SZ)
Loop Antenna	R&S	HFH2-Z2	100354	9kHz~30MHz	Jun. 22, 2020	Apr. 13, 2022~ Apr. 14, 2022	Jun. 21, 2022	Radiation (03CH02-SZ)
Bilog Antenna	TeseQ	CBL6112D	35407	30MHz-2GHz	Jul. 15, 2021	Apr. 13, 2022~ Apr. 14, 2022	Jul. 14, 2022	Radiation (03CH02-SZ)
Double Ridge Horn Antenna	ETS-Lindgren	3117	00119436	1GHz~18GHz	Jul. 25, 2021	Apr. 13, 2022~ Apr. 14, 2022	Jul. 24, 2022	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	TTA1840-35- HG	1871923	18GHz~40GHz	Jul. 13, 2021	Apr. 13, 2022~ Apr. 14, 2022	Jul. 13, 2022	Radiation (03CH02-SZ)
SHF-EHF Horn	com-power	AH-840	101071	18Ghz-40GHz	Apr. 10, 2022	Apr. 13, 2022~ Apr. 14, 2022	Apr. 09, 2023	Radiation (03CH02-SZ)
LF Amplifier	Burgeon	BPA-530	102211	0.01~3000Mhz	Oct. 22, 2021	Apr. 13, 2022~ Apr. 14, 2022	Oct. 21, 2022	Radiation (03CH02-SZ)
HF Amplifier	MITEQ	AMF-7D-0010 1800-30-10P- R	1943528	1GHz~18GHz	Oct. 22, 2021	Apr. 13, 2022~ Apr. 14, 2022	Oct. 21, 2022	Radiation (03CH02-SZ)
HF Amplifier	KEYSIGHT	83017A	MY532701 05	0.5GHz~26.5Gh z	Oct. 22, 2021	Apr. 13, 2022~ Apr. 14, 2022	Oct. 21, 2022	Radiation (03CH02-SZ)
AC Power Source	Chroma	61601	616010002 470	N/A	NCR	Apr. 13, 2022~ Apr. 14, 2022	NCR	Radiation (03CH02-SZ)
Turn Table	Chaintek	T-200	N/A	0~360 degree	NCR	Apr. 13, 2022~ Apr. 14, 2022	NCR	Radiation (03CH02-SZ)
Antenna Mast	Chaintek	MBS-400	N/A	1 m~4 m	NCR	Apr. 13, 2022~ Apr. 14, 2022	NCR	Radiation (03CH02-SZ)

NCR: No Calibration Required

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 39 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

Report Template No.: BU5-FR15CBT4.0 Version 2.0

## 5 Uncertainty of Evaluation

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**

Test Item	Uncertainty				
Conducted Power	±1.34 dB				
Conducted Emissions	±1.34 dB				
Occupied Channel Bandwidth	±0.13 %				
Conducted Power Spectral Density	±1.32 dB				

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

Measuring Uncertainty for a Level of Confidence	5.0dB
of 95% (U = 2Uc(y))	J.00B

#### Uncertainty of Radiated Emission Measurement (1000 MHz ~ 18000 MHz)

Measuring Uncertainty for a Level of Confidence	5.1dB
of 95% (U = 2Uc(y))	3.1ub

#### Uncertainty of Radiated Emission Measurement (18000 MHz ~ 40000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	5.1dB
---	-------

----- THE END -----

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : 40 of 40
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report No.: FR210405-01

Report Template No.: BU5-FR15CBT4.0 Version 2.0

## **Appendix A. Conducted Test Results**

Sporton International Inc. (ShenZhen)

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number : A1 of A1
Report Issued Date : Apr. 28, 2022
Report Version : Rev. 01

Report Number : FR210405-01

### **Bluetooth LE 1Mbps**

Test Engineer:	Tang ZhaoYang	Temperature:	21~25	°C
Test Date:	2022/4/15	Relative Humidity:	51~54	%

# 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	1.029	0.662	0.50	Pass
BLE	1Mbps	1	19	2440	1.033	0.676	0.50	Pass
BLE	1Mbps	1	39	2480	1.035	0.678	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	3.12	30.00	3.17	6.29	36.00	Pass
BLE	1Mbps	1	19	2440	3.13	30.00	3.17	6.30	36.00	Pass
BLE	1Mbps	1	39	2480	2.77	30.00	3.17	5.94	36.00	Pass

### 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
Ī	BLE	1Mbps	1	0	2402	2.55	-12.73	3.17	8.00	Pass
Ī	BLE	1Mbps	1	19	2440	2.70	-11.92	3.17	8.00	Pass
Ī	BLE	1Mbps	1	39	2480	2.33	-12.71	3.17	8.00	Pass

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

Report Number : FR210405-01

### **Bluetooth LE 2Mbps**

Test Engineer:	Tang ZhaoYang	Temperature:	21~25	°C
Test Date:	2022/4/15	Relative Humidity:	51~54	%

### 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	2.046	1.127	0.50	Pass
BLE	2Mbps	1	19	2440	2.050	1.131	0.50	Pass
BLE	2Mbps	1	39	2480	2.046	1.127	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	3.11	30.00	3.17	6.28	36.00	Pass
BLE	2Mbps	1	19	2440	3.17	30.00	3.17	6.34	36.00	Pass
BLE	2Mbps	1	39	2480	2.79	30.00	3.17	5.96	36.00	Pass

### 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	2.78	-12.76	3.17	8.00	Pass
BLE	2Mbps	1	19	2440	2.83	-12.99	3.17	8.00	Pass
BLE	2Mbps	1	39	2480	2.43	-14.97	3.17	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

Toot Engineer		Temperature :	24~25°C
Test Engineer :	Eason/ Shun Ping You	Relative Humidity :	48~49%

### **Bluetooth LE 1Mbps**

### 2.4GHz 2400~2483.5MHz BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	( dBµV/m )	(dB)	(dBµV/m)	(dB <sub>µ</sub> V)	( dB/m )	( dB )	( dB )	( cm )	(deg)	(P/A)	(H/V)
		2364.39	51.38	-22.62	74	46.42	31.7	5.51	32.25	114	222	Р	Н
		2376.36	41.03	-12.97	54	36.05	31.7	5.53	32.25	114	222	Α	Н
BLE	*	2402	97.72	-	-	92.71	31.7	5.55	32.24	114	222	Р	Н
CH 00	*	2402	95.91	-	-	90.9	31.7	5.55	32.24	114	222	Α	Н
2402MHz		2378.25	51.54	-22.46	74	46.56	31.7	5.53	32.25	100	287	Р	V
2402141112		2384.235	41.06	-12.94	54	36.08	31.7	5.53	32.25	100	287	Α	V
	*	2402	97.28	-	-	92.27	31.7	5.55	32.24	100	287	Р	V
	*	2402	95.53	-	-	90.52	31.7	5.55	32.24	100	287	Α	V
		2384.2	51.77	-22.23	74	46.79	31.7	5.53	32.25	237	301	Р	Н
		2385.32	41.04	-12.96	54	36.06	31.7	5.53	32.25	237	301	Α	Н
	*	2440	97.55	-	-	92.08	32	5.61	32.14	237	301	Р	Н
	*	2440	95.81	-	-	90.34	32	5.61	32.14	237	301	Α	Н
		2487.82	51.68	-22.32	74	45.85	32.1	5.68	31.95	237	301	Р	Н
BLE		2490.76	41.93	-12.07	54	36.1	32.1	5.68	31.95	237	301	Α	Н
CH 19 2440MHz		2323.58	51.28	-22.72	74	46.45	31.63	5.47	32.27	100	5	Р	V
244UIVII112		2368.8	41.27	-12.73	54	36.29	31.7	5.53	32.25	100	5	Α	V
	*	2440	97.35	-	-	91.88	32	5.61	32.14	100	5	Р	V
	*	2440	95.52	-	-	90.05	32	5.61	32.14	100	5	Α	V
		2497.2	51.79	-22.21	74	45.86	32.1	5.68	31.85	100	5	Р	٧
		2491.67	42.1	-11.9	54	36.27	32.1	5.68	31.95	100	5	Α	V

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### FCC RF Test Report

	*	2480	99.59	-	-	93.81	32.07	5.66	31.95	100	133	Р	Н
	*	2480	97.82	-	-	92.04	32.07	5.66	31.95	100	133	Α	Н
		2483.76	54.1	-19.9	74	48.32	32.07	5.66	31.95	100	133	Р	Н
BLE		2484.44	42	-12	54	36.22	32.07	5.66	31.95	100	133	Α	Н
CH 39 2480MHz	*	2480	100.67	-	-	94.89	32.07	5.66	31.95	296	76	Р	V
240UNITZ	*	2480	99.93	-	-	94.15	32.07	5.66	31.95	296	76	Α	V
		2483.52	55.79	-18.21	74	50.01	32.07	5.66	31.95	296	76	Р	V
		2483.68	41.95	-12.05	54	36.17	32.07	5.66	31.95	296	76	Α	V
Remark	1. No	o other spurio	us found.			1	I		I	I			

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587

Page Number

: B2 of B9

<sup>2.</sup> All results are PASS against Peak and Average limit line.

### 2.4GHz 2400~2483.5MHz

### BLE (Harmonic @ 3m)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		( MHz )	( dBµV/m )	( dB )	Line ( dBµV/m )	Level ( dBµV )	Factor ( dB/m )	Loss (dB)	Factor ( dB )	Pos ( cm )	Pos ( deg )	Avg. (P/A)	
BLE		4804	49.88	-24.12	74	65.3	33.8	8.68	57.9	-	-	Р	Н
CH 00 2402MHz		4804	50.24	-23.76	74	65.66	33.8	8.68	57.9	-	-	Р	V
		4880	51.22	-22.78	74	66.6	33.73	8.79	57.9	275	286	Р	Н
D. F.		4880	43.08	-10.92	54	58.46	33.73	8.79	57.9	275	286	Α	Н
BLE		7320	46.49	-27.51	74	59.19	35.73	11.09	59.52	-	-	Р	Н
CH 19 2440MHz		4880	51.71	-22.29	74	67.09	33.73	8.79	57.9	100	263	Р	V
2440WII IZ		4880	43.59	-10.41	54	58.97	33.73	8.79	57.9	100	263	Α	V
		7320	46.7	-27.3	74	59.4	35.73	11.09	59.52	ı	ı	Р	V
		4960	51.02	-22.98	74	66.21	33.73	8.98	57.9	265	285	Р	Н
DI E		4960	44.83	-9.17	54	60.02	33.73	8.98	57.9	265	285	Α	Н
BLE		7440	46.26	-27.74	74	59.22	35.78	11.12	59.86	ı	ı	Р	Н
CH 39 2480MHz		4960	51.5	-22.5	74	66.69	33.73	8.98	57.9	100	260	Р	V
2400111112		4960	44.93	-9.07	54	60.12	33.73	8.98	57.9	100	260	Α	V
		7440	45.96	-28.04	74	58.92	35.78	11.12	59.86	-	-	Р	V

#### Remark

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587

<sup>1.</sup> No other spurious found.

<sup>2.</sup> All results are PASS against Peak and Average limit line.

### **Bluetooth LE 2Mbps**

### 2.4GHz 2400~2483.5MHz

### BLE (Band Edge @ 3m)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	( dBµV/m )	(dB)	( dBµV/m )	(dB <sub>µ</sub> V)	( dB/m )	( dB )	( dB )	( cm )	( deg )	(P/A)	(H/V)
		2319.03	51.15	-22.85	74	46.32	31.63	5.47	32.27	151	225	Р	Н
		2365.65	40.8	-13.2	54	35.84	31.7	5.51	32.25	151	225	Α	Н
BLE	*	2402	97.02	-	-	92.01	31.7	5.55	32.24	151	225	Р	Н
CH 00	*	2402	95.8	-	-	90.79	31.7	5.55	32.24	151	225	Α	Н
2402MHz		2320.71	51.08	-22.92	74	46.25	31.63	5.47	32.27	102	290	Р	V
2402111112		2372.58	40.69	-13.31	54	35.71	31.7	5.53	32.25	102	290	Α	V
	*	2402	97.78	-	-	92.77	31.7	5.55	32.24	102	290	Р	V
	*	2402	95.24	-	-	90.23	31.7	5.55	32.24	102	290	Α	V
		2370.76	50.86	-23.14	74	45.88	31.7	5.53	32.25	180	226	Р	Н
		2323.58	40.7	-13.3	54	35.87	31.63	5.47	32.27	180	226	Α	Н
	*	2440	97.79	-	-	92.32	32	5.61	32.14	180	226	Р	Н
	*	2440	95.8	-	-	90.33	32	5.61	32.14	180	226	Α	Н
		2487.96	51.69	-22.31	74	45.86	32.1	5.68	31.95	180	226	Р	Н
BLE		2496.71	41.74	-12.26	54	35.81	32.1	5.68	31.85	180	226	Α	Н
CH 19 2440MHz		2386.3	51.47	-22.53	74	46.47	31.7	5.55	32.25	100	286	Р	V
2440WITI2		2359.42	40.71	-13.29	54	35.76	31.7	5.51	32.26	100	286	Α	V
	*	2440	97.73	-	-	92.26	32	5.61	32.14	100	286	Р	V
	*	2440	95.56	-	-	90.09	32	5.61	32.14	100	286	Α	٧
		2488.24	51.7	-22.3	74	45.87	32.1	5.68	31.95	100	286	Р	٧
		2483.97	41.86	-12.14	54	36.08	32.07	5.66	31.95	100	286	Α	٧

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### FCC RF Test Report

	*	2480	99.5	-	-	93.72	32.07	5.66	31.95	120	225	Р	Н
	*	2480	97.47	-	-	91.69	32.07	5.66	31.95	120	225	Α	Н
		2483.72	56.34	-17.66	74	50.56	32.07	5.66	31.95	120	225	Р	Н
BLE		2483.52	43.02	-10.98	54	37.24	32.07	5.66	31.95	120	225	Α	Н
CH 39 2480MHz	*	2480	100.02	-	-	94.24	32.07	5.66	31.95	101	290	Р	V
240UIVITI2	*	2480	98	-	-	92.22	32.07	5.66	31.95	101	290	Α	V
		2483.6	57.74	-16.26	74	51.96	32.07	5.66	31.95	101	290	Р	V
		2483.52	43.44	-10.56	54	37.66	32.07	5.66	31.95	101	290	Α	V
	1 N	2483.52 o other spurio		-10.56	54	37.66	32.07	5.66	31.95	101	290	Α	_

Remark 2.

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587

All results are PASS against Peak and Average limit line.

#### 2.4GHz 2400~2483.5MHz

### BLE (Harmonic @ 3m)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
		(MHz)	( dBµV/m )	( dB )	Line ( dBµV/m )	Level ( dBµV )	Factor ( dB/m )	Loss (dB)	Factor (dB)	Pos ( cm )	Pos ( deg )	Avg. (P/A)	
BLE		4804	49.2	-24.8	74	64.62	33.8	8.68	57.9	-	-	Р	Н
CH 00 2402MHz		4804	49.1	-24.9	74	64.52	33.8	8.68	57.9	-	-	Р	V
		4880	51.71	-22.29	74	67.09	33.73	8.79	57.9	286	228	Р	Н
D. F.		4880	43.49	-10.51	54	58.87	33.73	8.79	57.9	286	228	Α	Н
BLE		7320	46.34	-27.66	74	59.04	35.73	11.09	59.52	-	-	Р	Н
CH 19 2440MHz		4880	51.19	-22.81	74	66.57	33.73	8.79	57.9	100	286	Р	V
244UIVIITZ		4880	43.38	-10.62	54	58.76	33.73	8.79	57.9	100	286	Α	V
		7320	46.52	-27.48	74	59.22	35.73	11.09	59.52	-	-	Р	V
		4960	51.49	-22.51	74	66.68	33.73	8.98	57.9	251	242	Р	Н
D. E		4960	43.79	-10.21	54	58.98	33.73	8.98	57.9	251	242	Α	Н
BLE		7440	46.07	-27.93	74	59.03	35.78	11.12	59.86	-	-	Р	Н
CH 39		4960	51.36	-22.64	74	66.55	33.73	8.98	57.9	103	248	Р	V
2480MHz		4960	43.59	-10.41	54	58.78	33.73	8.98	57.9	103	248	Α	V
		7440	46.44	-27.56	74	59.4	35.78	11.12	59.86	-	-	Р	V

#### Remark

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TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number

: B6 of B9

<sup>1.</sup> No other spurious found.

<sup>2.</sup> All results are PASS against Peak and Average limit line.

## **Emission below 1GHz**

### 2.4GHz BLE (LF)

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	( dBµV/m )	(dB)	( $dB\mu V/m$ )	(dBµV)	( dB/m )	( dB )	(dB)	( cm )	(deg)	(P/A)	(H/V)
		44.55	18.11	-21.89	40	30.87	20.19	2.1	35.05	-	-	Р	Н
		166.77	17.14	-26.36	43.5	30.38	19.24	2.62	35.1	-	-	Р	Н
		404.42	21.76	-24.24	46	31.08	22.16	3.31	34.79	-	-	Р	Н
		635.28	25.37	-20.63	46	29.78	26.2	3.89	34.5	-	-	Р	Н
0.4011		761.38	26.92	-19.08	46	29.44	27.96	3.9	34.38	-	-	Р	Н
2.4GHz BLE		993.21	28.66	-25.34	54	28.42	30.17	4.18	34.11	-	-	Р	Η
LF		51.34	18.3	-21.7	40	30.94	20.25	2.21	35.1	-	-	Р	V
"		162.89	16.88	-26.62	43.5	30.07	19.31	2.6	35.1	-	-	Р	٧
		304.51	19.49	-26.51	46	31.37	19.83	3.19	34.9	-	-	Р	٧
		600.36	24.71	-21.29	46	29.54	25.78	3.89	34.5	-	-	Р	٧
		753.62	26.96	-19.04	46	29.55	27.91	3.89	34.39	-	-	Р	7
		921.43	28.83	-17.17	46	29.44	29.47	4.18	34.26	-	-	Р	٧
Remark		o other spurio I results are P		st limit li	ne.								

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587

Page Number

: B7 of B9

All results are PASS against limit line.

### Note symbol

*	Fundamental Frequency which can be ignored. However, the level of any
	unwanted emissions shall not exceed the level of the fundamental frequency.
!	Test result is Margin line.
P/A	Peak or Average
H/V	Horizontal or Vertical

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TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number

: B8 of B9

### A calculation example for radiated spurious emission is shown as below:

BLE	Note	Frequency	Level	Margin	Limit	Read	Antenna	Path	Preamp	Ant	Table	Peak	Pol.
					Line	Level	Factor	Loss	Factor	Pos	Pos	Avg.	
		(MHz)	(dBµV/m)	(dB)	(dBµV/m)	(dBµV)	( dB/m )	( dB )	( dB )	( cm )	(deg)	(P/A)	(H/V)
BLE		2390	55.45	-18.55	74	54.51	32.22	4.58	35.86	103	308	Р	Н
CH 00													
2402MHz		2390	43.54	-10.46	54	42.6	32.22	4.58	35.86	103	308	Α	Н

- 1. Path Loss(dB) = Cable loss(dB) + Filter loss(dB) + Attenuator loss(dB)
- 2. Level( $dB\mu V/m$ ) =

Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBµV) - Preamp Factor(dB)

3. Margin (dB) = Level(dB $\mu$ V/m) – Limit Line(dB $\mu$ V/m)

#### For Peak Limit @ 2390MHz:

- 1. Level(dBµV/m)
- = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dBµV) Preamp Factor(dB)
- $= 32.22(dB/m) + 4.58(dB) + 54.51(dB\mu V) 35.86 (dB)$
- $= 55.45 (dB\mu V/m)$
- 2. Margin (dB)
- = Level(dBµV/m) Limit Line(dBµV/m)
- $= 55.45(dB\mu V/m) 74(dB\mu V/m)$
- = -18.55(dB)

#### For Average Limit @ 2390MHz:

- 1. Level(dBµV/m)
- = Antenna Factor(dB/m) + Path Loss(dB) + Read Level(dB $\mu$ V) Preamp Factor(dB)
- $= 32.22(dB/m) + 4.58(dB) + 42.6(dB\mu V) 35.86 (dB)$
- $= 43.54 (dB\mu V/m)$
- 2. Margin (dB)
- = Level( $dB\mu V/m$ ) Limit Line( $dB\mu V/m$ )
- $= 43.54(dB\mu V/m) 54(dB\mu V/m)$
- = -10.46(dB)

Both peak and average measured complies with the limit line, so test result is "PASS".

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## Appendix C. Radiated Spurious Emission Plots

## Note symbol

-L	Low channel location
-R	High channel location

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TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587 Page Number

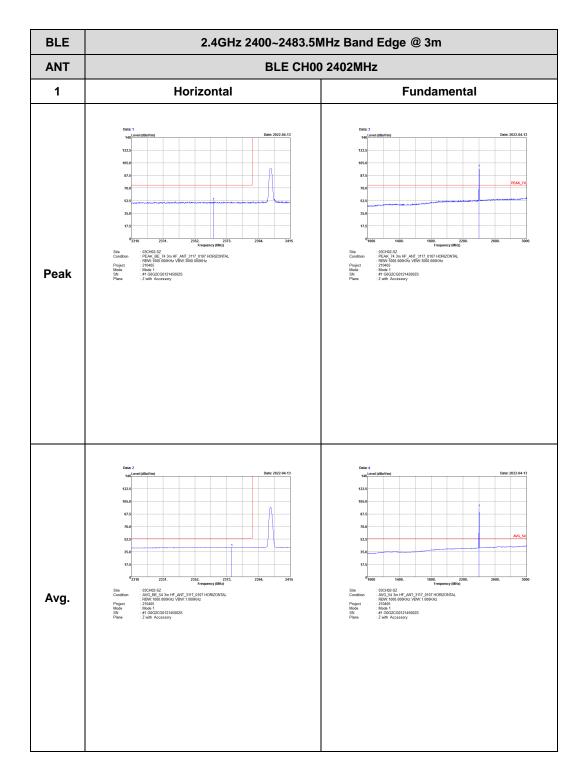
: C1 of C24



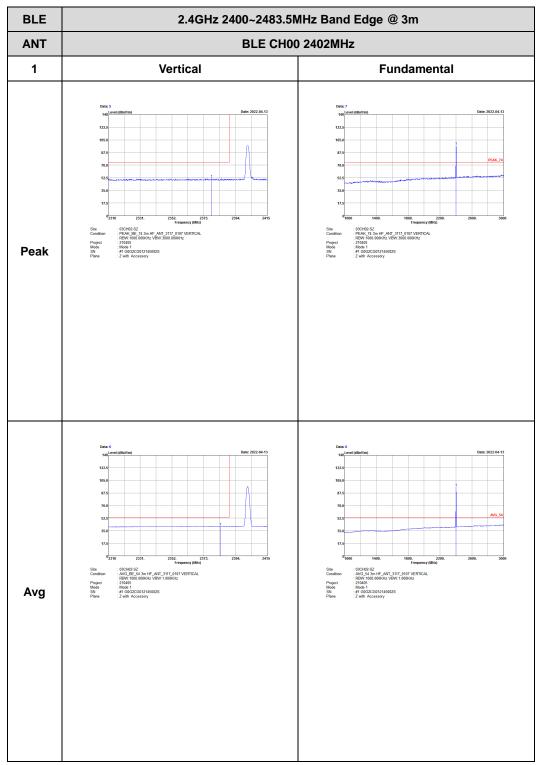
### **Bluetooth LE 1Mbps**

## 2.4GHz 2400~2483.5MHz

### BLE (Band Edge @ 3m)



TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587



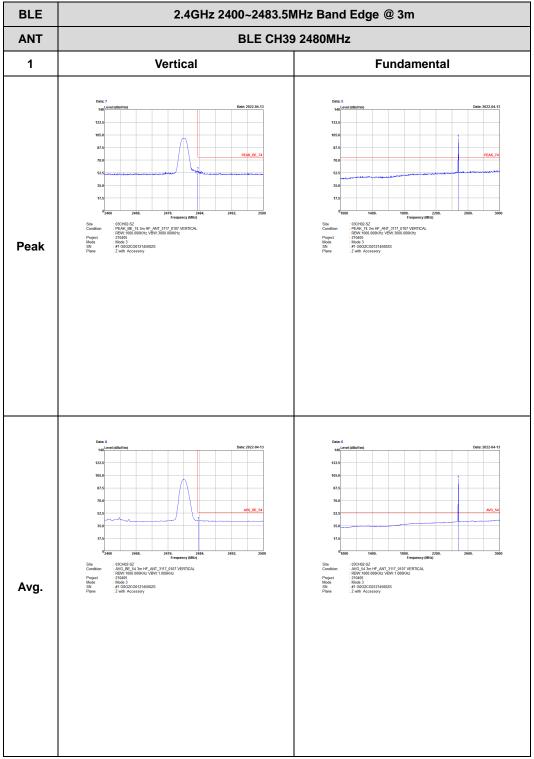
BLE 2.4GHz 2400~2483.5MHz Band Edge @ 3m ANT BLE CH19 2440MHz - L 1 Horizontal **Fundamental** . 03CH02-SZ .PEAK\_BE\_74 3m HF\_ANT\_3117\_0107 HORIZONTAL .RBW1-1000 0006Hz V5W-3000 0000Hz .210405 .R10002C2012145002S .#1 0002C2012145002S Peak Avg.

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m				
ANT	BLE CH19 2440MHz - R				
1	Horizontal	Fundamental			
Peak	Date: 2022-04-13  100.00  172.50  100.00  173.50  174.50  175.	Left blank			
Avg.	Date: 61  100  101  102.25  105.6  107.5  105.6  107.5  105.6  107.5  105.6  107.5  105.6  107.5  105.6  107.5  105.6  107.5  105.6  107.5  105.6  107.5  105.6  107.5  105.6  107.5  105.6  107.5  105.6  10	Left blank			

BLE 2.4GHz 2400~2483.5MHz Band Edge @ 3m ANT BLE CH19 2440MHz - L 1 Vertical **Fundamental** Peak Avg.

BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m				
ANT	BLE CH19 2440MHz - R				
1	Vertical	Fundamental			
Peak	Date: 11  100	Left blank			
Avg.	Date: 17 100; evel (dBM/m) 172.0 185.0 187.5 188.0 187.5 188.0 187.5 188.0 188	Left blank			

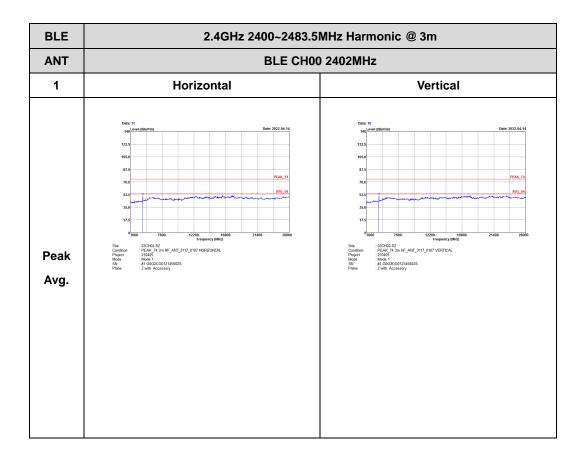
BLE 2.4GHz 2400~2483.5MHz Band Edge @ 3m ANT **BLE CH39 2480MHz** 1 Horizontal **Fundamental** 03CH02-SZ PEAK, BE, 74 3m HF\_ANT\_3117\_0107 HORIZONTAL RBW-1000 000KHz VBW-3000.000KHz 210405 1M066 3 81 G062C0012145002S 7 wth Accessory Peak Avg.





### 2.4GHz 2400~2483.5MHz

### BLE (Harmonic @ 3m)



BLE 2.4GHz 2400~2483.5MHz Harmonic @ 3m

ANT BLE CH19 2440MHz

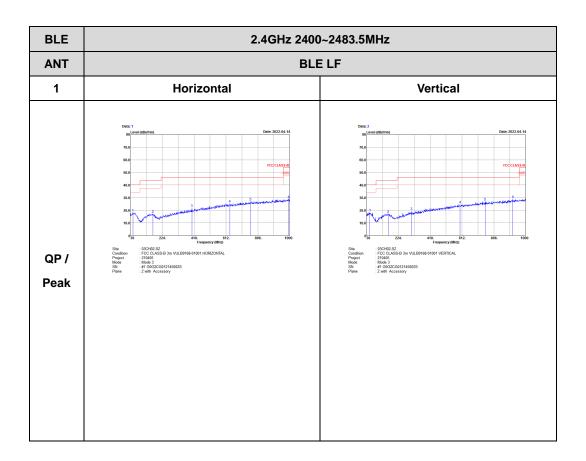
1 Horizontal Vertical

ONE 21

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587



## Emission below 1GHz 2.4GHz BLE (LF)

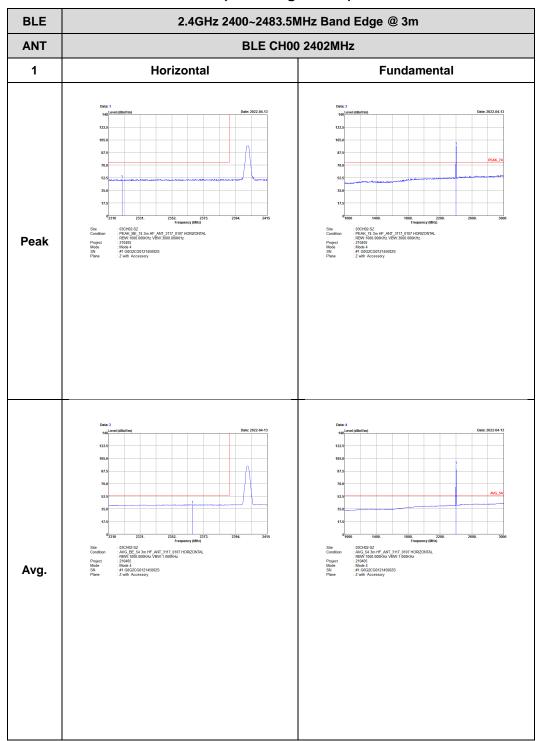




### **Bluetooth LE 2Mbps**

### 2.4GHz 2400~2483.5MHz

### BLE (Band Edge @ 3m)



TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587

BLE 2.4GHz 2400~2483.5MHz Band Edge @ 3m ANT BLE CH00 2402MHz 1 Vertical **Fundamental** Peak Avg

BLE 2.4GHz 2400~2483.5MHz Band Edge @ 3m ANT BLE CH19 2440MHz - L 1 Horizontal **Fundamental** . 03CH02-SZ .PEAK\_BE\_74 3m HF\_ANT\_3117\_0107 HORIZONTAL .RBW1-1000 0006Hz V5W-3000 0000Hz .210405 .R1 0002C0012145002S .2 wth Accessory Peak Avg.

TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587

BLE 2.4GHz 2400~2483.5MHz Band Edge @ 3m ANT BLE CH19 2440MHz - R 1 Horizontal **Fundamental** Peak Left blank Left blank Avg.

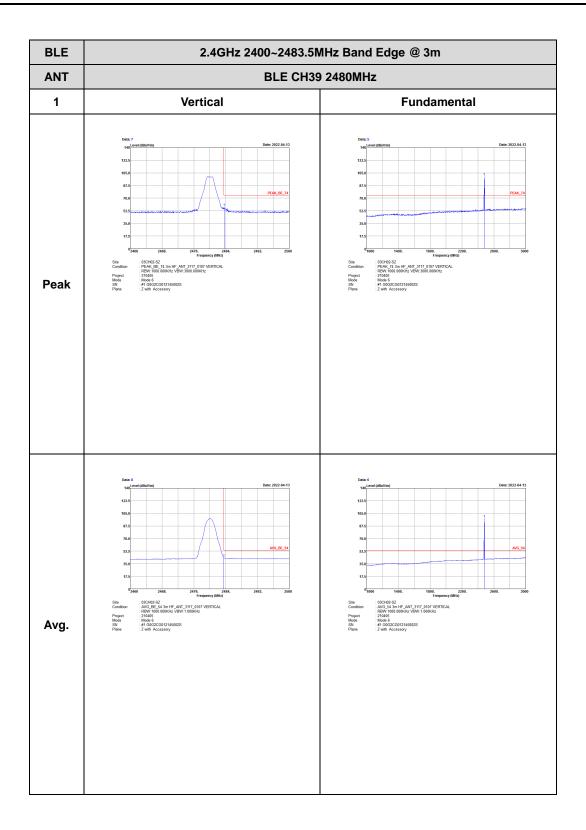
TEL: 86-755-8637-9589 FAX: 86-755-8637-9595 FCC ID: 2A4DH-2587

BLE 2.4GHz 2400~2483.5MHz Band Edge @ 3m ANT BLE CH19 2440MHz - L 1 Vertical **Fundamental** Peak Avg.

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BLE	2.4GHz 2400~2483.5MHz Band Edge @ 3m				
ANT	BLE CH19 2440MHz - R				
1	Vertical	Fundamental			
Peak	Date: 11  106: end (dilbution)  122.2  106.0  107.0  108.0  109.0	Left blank			
Avg.	Date 12 1446 evet (ellbul/ter) 1522 166.0 87.5 170.0 187.5 188.5 189.5 199.5 1	Left blank			

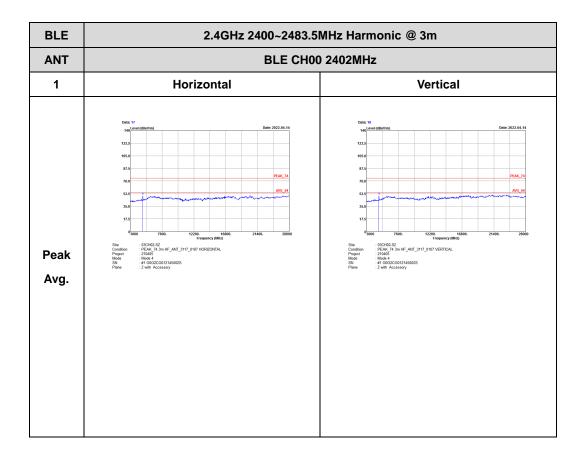
BLE 2.4GHz 2400~2483.5MHz Band Edge @ 3m ANT **BLE CH39 2480MHz** 1 Horizontal **Fundamental** 03CH02-SZ PEAK, BE, 74 3m HF\_ANT\_3117\_0107 HORIZONTAL RBW-1000 000KHz VBW-3000.000KHz 210405 1Mode 6 141 G0G2C012145002S 7 wth Accessory Peak Avg.





### 2.4GHz 2400~2483.5MHz

### BLE (Harmonic @ 3m)



BLE 2.4GHz 2400~2483.5MHz Harmonic @ 3m

ANT BLE CH19 2440MHz

1 Horizontal Vertical

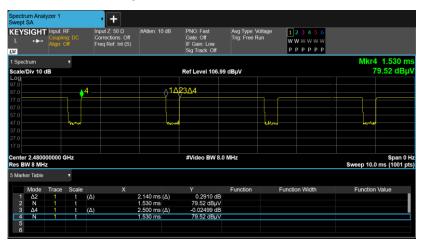
ONE 21

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## Appendix D. Duty Cycle Plots

Band	Duty Cycle(%)	T(ms)	1/T(kHz)	VBW Setting
Bluetooth -LE 1Mbps	85.60	2.140	0.467	1kHz
Bluetooth -LE 2Mbps	58,24	1.095	0.913	1kHz

#### Bluetooth - LE 1Mbps



#### Bluetooth - LE 2Mbps

