# **FCC RF Test Report**

APPLICANT : Noodoe Corp.
EQUIPMENT : BLE wristband

BRAND NAME : Noodoe

MODEL NAME : Noodoe Watch

FCC ID : 2AD3D-IV2

STANDARD : FCC Part 15 Subpart C §15.247

CLASSIFICATION : (DTS) Digital Transmission System

The product was received on Jan. 08, 2015 and testing was completed on Jan. 28, 2015. We, SPORTON INTERNATIONAL INC., 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., the test report shall not be reproduced except in full.

Reviewed by: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

#### SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 1 of 36 Report Issued Date : Mar. 05, 2015

**Report No.: FR510843** 

Report Template No.: BU5-FR15CBT4.0 Version 1.0

: Rev. 01

Report Version

# **TABLE OF CONTENTS**

SU	MMA	RY OF TEST RESULT	4
1	GEN	IERAL DESCRIPTION	5
	1.1	Applicant	5
	1.2	Manufacturer	5
	1.3	Product Feature of Equipment Under Test	5
	1.4	Product Specification subjective to this standard	5
	1.5	Modification of EUT	6
	1.6	Testing Location	6
	1.7	Applicable Standards	6
2	TES	T CONFIGURATION OF EQUIPMENT UNDER TEST	7
	2.1	Descriptions of Test Mode	7
	2.2	Test Mode	7
	2.3	Connection Diagram of Test System	8
	2.4	Support Unit used in test configuration and system	8
	2.5	EUT Operation Test Setup	8
	2.6	Measurement Results Explanation Example	9
3	TES	T RESULT	10
	3.1	6dB Bandwidth Measurement	10
	3.2	Peak Output Power Measurement	13
	3.3	Power Spectral Density Measurement	15
	3.4	Conducted Band Edges and Spurious Emission Measurement	21
	3.5	Radiated Band Edges and Spurious Emission Measurement	30
	3.6	Antenna Requirements	34
4	LIST	OF MEASURING EQUIPMENT	35
5	UNC	ERTAINTY OF EVALUATION	36
ΑP	PEND	DIX A. RADIATED SPURIOUS EMISSION	
ΑP	PEND	DIX B. SETUP PHOTOGRAPHS	

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 2 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

# **REVISION HISTORY**

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FR510843	Rev. 01	Initial issue of report	Mar. 05, 2015

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 3 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

# **SUMMARY OF TEST RESULT**

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.247(a)(2)	RSS-210 A8.2(a)	6dB Bandwidth	≥ 0.5MHz	Pass	-
3.2	15.247(b)(1)	RSS-210 A8.1(b)	Peak Output Power	≤ 30dBm	Pass	-
3.3	15.247(e)	RSS-210 A8.2(b)	Power Spectral Density	≤ 8dBm/3kHz	Pass	-
3.4	15.247(d)	RSS-210 A8.5	Conducted Band Edges and Spurious Emission	≤ 20dBc	Pass	-
3.5	15.247(d)	RSS-210 A8.5	Radiated Band Edges and Spurious Emission	15.209(a) & 15.247(d)	Pass	Under limit 6.79 dB at 2497.280 MHz
3.6	15.203 & 15.247(b)	RSS-210 A8.4	Antenna Requirement	N/A	Pass	-

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 4 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

# 1 General Description

# 1.1 Applicant

Noodoe Corp.

15F., No.19-13, Sanchong Rd., Nangang Dist., Taipei City 115, Taiwan (R.O.C.)

## 1.2 Manufacturer

**FIH Mobile Limited** 

No. 4, Mingsheng St., Tu-Cheng Dist., New Taipei City 23679, Taiwan

# 1.3 Product Feature of Equipment Under Test

Product Feature				
Equipment	BLE wristband			
Brand Name	Noodoe			
Model Name	Noodoe Watch			
FCC ID	2AD3D-IV2			
EUT supports Radios application	Bluetooth v4.0 LE			
EUT Stage	Identical Prototype			

**Report No.: FR510843** 

**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 subjective to this standard

Product Specification subjective to this standard				
Tx/Rx Frequency Range	2402 MHz ~ 2480 MHz			
Number of Channels	40			
Carrier Frequency of Each Channel	40 Channel(37 hopping + 3 advertising channel)			
<b>Maximum Output Power to Antenna</b>	4.17 dBm (0.0026 W)			
Antenna Type	MULTILAYER CERAMIC Antenna Type with gain -1.77 dBi			
Type of Modulation	Bluetooth LE : GFSK			

 SPORTON INTERNATIONAL INC.
 Page Number
 : 5 of 36

 TEL: 886-3-327-3456
 Report Issued Date
 : Mar. 05, 2015

 FAX: 886-3-328-4978
 Report Version
 : Rev. 01

FCC ID: 2AD3D-IV2 Report Template No.: BU5-FR15CBT4.0 Version 1.0

#### 1.5 Modification of EUT

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

# 1.6 Testing Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

**Report No.: FR510843** 

: 6 of 36

Test Site	SPORTON INTERNATIONAL INC.				
	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park,				
Toot Site Legation	Kwei-Shan District, Tao Yuan City, Taiwan, R.O.C.				
Test Site Location	TEL: +886-3-327-3456				
	FAX: +886-3-328-4978				
Took Site No		Sporton Site No.			
Test Site No.	TH02-HY	CO05-HY	03CH05-HY		

**Note:** The test site complies with ANSI C63.4 2009 requirement.

# 1.7 Applicable Standards

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

- FCC Part 15 Subpart C §15.247
- FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02
- ANSI C63.10-2013

#### Remark:

- All test items were verified and recorded according to the standards and without any deviation during the test.
- FCC permits the use of the 1.5 meter table as an alternative in C63.10-2013 through inquiry 2. tracking number 961829.

SPORTON INTERNATIONAL INC. Page Number TEL: 886-3-327-3456 Report Issued Date: Mar. 05, 2015

FAX: 886-3-328-4978 Report Version : Rev. 01 FCC ID: 2AD3D-IV2 Report Template No.: BU5-FR15CBT4.0 Version 1.0

# 2 Test Configuration of Equipment Under Test

# 2.1 Descriptions of Test Mode

The RF output power was recorded in the following table:

		Bluetooth 4.0 – LE RF Output Power	
Channal		Data Rate / Modulation	
Channel	Frequency	GFSK	
		1Mbps	
Ch00	2402MHz	3.96 dBm	
Ch19	2440MHz	<b>4.17</b> dBm	
Ch39	2480MHz	4.03 dBm	

- 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: conduction (150 kHz to 30 MHz), radiation (9 kHz to the 10th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower). Pre-scanned tests, X, Y, Z in three orthogonal panels to determine the final configuration (Z plane as worst plane) from all possible combinations.
- b. AC power line Conducted Emission was tested under maximum output power.

#### 2.2 Test Mode

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 4.0 – LE / GFSK				
Conducted	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps				
	Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps				
TCs	Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps				
Dedicted	Mode 1: Bluetooth Tx CH00_2402 MHz_1Mbps				
Radiated	Mode 2: Bluetooth Tx CH19_2440 MHz_1Mbps				
TCs	Mode 3: Bluetooth Tx CH39_2480 MHz_1Mbps				

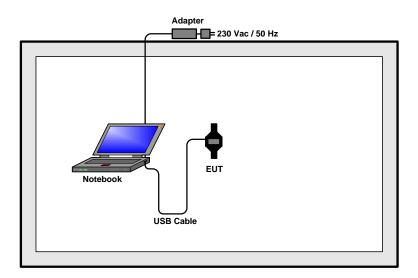
SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 7 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No.: FR510843** 

# 2.3 Connection Diagram of Test System

<Bluetooth 4.0 - LE Tx Mode>



# 2.4 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
	Notebook	Lenovo T	TP00053A	FCC DoC	Unshielded 1.8m	AC I/P:
						Unshielded, 1.2 m
'-						DC O/P:
						Shielded, 1.8 m

# 2.5 EUT Operation Test Setup

For Bluetooth function, the RF utility, "nrfgostudio" was installed in EUT which was programmed in order to make the EUT get into the engineering modes to contact with Bluetooth base station for continuous transmitting and receiving signals.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 8 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

# 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 4.2 dB and 10dB attenuator.

$$Offset(dB) = RF \ cable \ loss(dB) + attenuator \ factor(dB).$$
  
= 4.2 + 10 = 14.2 (dB)

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 9 of 36

Report Issued Date : Mar. 05, 2015

Report Version : Rev. 01

**Report No. : FR510843** 

## 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.

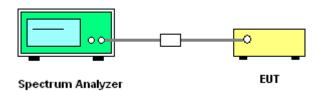
## 3.1.2 Measuring Instruments

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 FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
- 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



SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 10 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

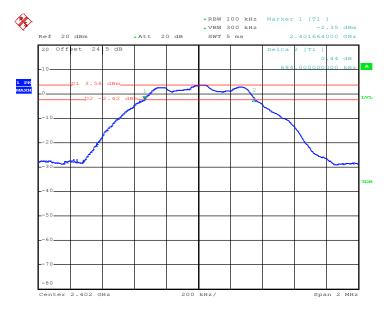
**Report No.: FR510843** 

## 3.1.5 Test Result of 6dB Bandwidth

Test Mode :	Bluetooth 4.0 - LE	Temperature :	<b>22~25</b> ℃
Test Engineer :	AC Chang	Relative Humidity :	51~55%

Channel	Frequency (MHz)	6dB Bandwidth (MHz)	6dB Bandwidth Min. Limit (MHz)	Pass/Fail
00	2402	0.684	0.5	Pass
19	2440	0.676	0.5	Pass
39	2480	0.680	0.5	Pass

#### 6 dB Bandwidth Plot on Channel 00



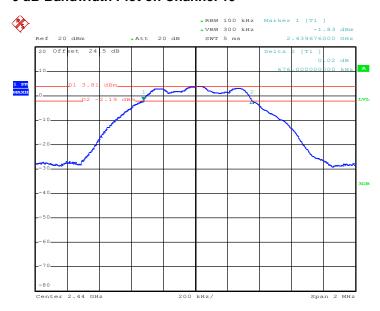
Date: 22.JAN.2015 09:57:37

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 11 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

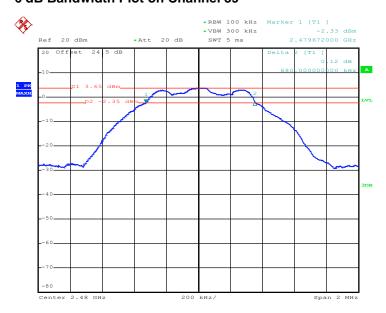
**Report No. : FR510843** 

#### 6 dB Bandwidth Plot on Channel 19



Date: 22.JAN.2015 10:19:29

#### 6 dB Bandwidth Plot on Channel 39



Date: 22.JAN.2015 10:28:17

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 12 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

# 3.2 Peak Output Power Measurement

## 3.2.1 Limit of Peak 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.

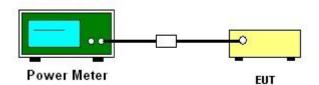
#### 3.2.2 Measuring Instruments

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 FCC KDB No. 558074 DTS D01 Meas.
   Guidance v03r02.
- 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



TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 13 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

Report No. : FR510843

# 3.2.5 Test Result of Peak Output Power

Test Mode :	Bluetooth 4.0 - LE	Temperature :	<b>22~25</b> ℃
Test Engineer :	AC Chang	Relative Humidity :	51~55%

		R	F Power (dBm)		
Channel	Frequency (MHz)	GFSK	Max. Limits	Dece/Feil	
	(IVITIZ)	1 Mbps	(dBm)	Pass/Fail	
00	2402	3.96	30.00	Pass	
19	2440	4.17	30.00	Pass	
39	2480	4.03	30.00	Pass	

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 14 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

## 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 10.2 Method PKPSD of FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02
- 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



SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 15 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

Report No.: FR510843

# 3.3.5 Test Result of Power Spectral Density

Test Mode :	Bluetooth 4.0 - LE	Temperature :	<b>22~25</b> ℃
Test Engineer :	AC Chang	Relative Humidity :	51~55%

Channal	Frequency	Power	Max. Limits	Dece/Feil	
Channel	(MHz)	PSD/100kHz (dBm)	PSD/3kHz (dBm)	(dBm/3kHz)	Pass/Fail
00	2402	3.570	-8.340	8	Pass
19	2440	3.810	-7.580	8	Pass
39	2480	3.630	-8.340	8	Pass

#### Note:

- 1. Measured power density (dBm) has offset with cable loss.
- 2. The Measured power density (dBm)/ 100kHz is reference level and used as 20dBc down for Conducted Band Edges and Conducted Spurious Emission limit line.

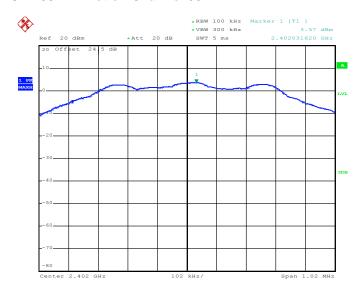
SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 16 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

Report No.: FR510843

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

#### PSD 100kHz Plot on Channel 00

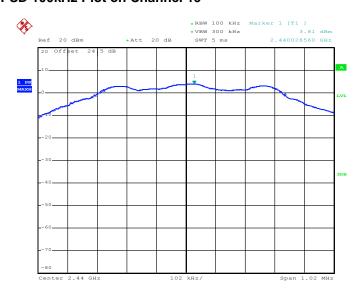


Date: 22.JAN.2015 10:02:44

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 17 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

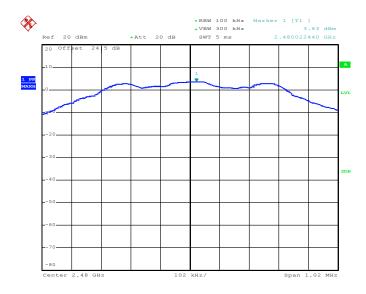
**Report No. : FR510843** 

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



Date: 22.JAN.2015 10:20:52

#### PSD 100kHz Plot on Channel 39



Date: 22.JAN.2015 10:29:52

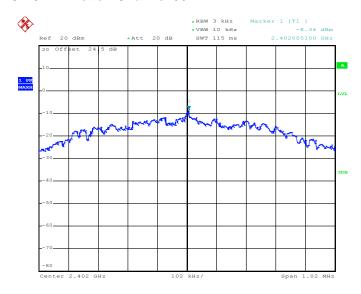
SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 18 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

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

#### **PSD 3kHz Plot on Channel 00**

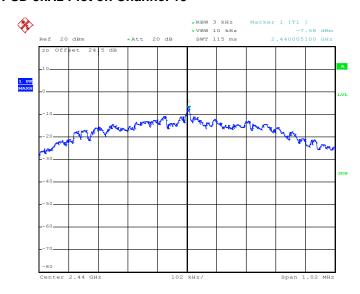


Date: 22.JAN.2015 10:02:15

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 19 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

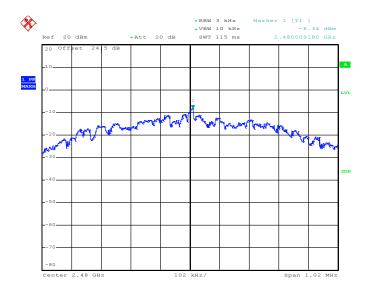
**Report No. : FR510843** 

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



Date: 22.JAN.2015 10:20:14

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



Date: 22.JAN.2015 10:29:20

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 20 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

## 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.

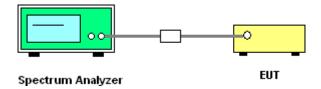
#### 3.4.2 Measuring Instruments

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 FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
- 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 per 15.247(d).
- 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.

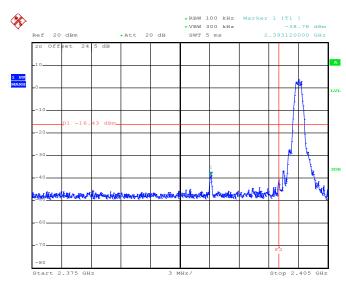
TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 21 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

Report No.: FR510843

# 3.4.5 Test Result of Conducted Band Edges

Test Mode :	Bluetooth 4.0 - LE	Temperature :	<b>22~25</b> ℃
Test Channel :	00 and 39	Relative Humidity :	51~55%
		Test Engineer :	AC Chang

#### Low Band Edge Plot on Channel 00

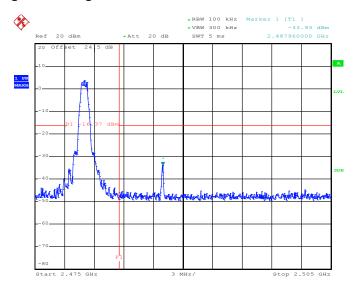


Date: 22.JAN.2015 10:04:13

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 22 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

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



Date: 22.JAN.2015 10:30:34

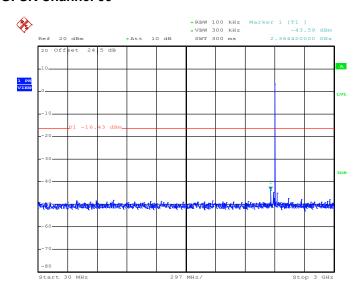
TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 23 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

# 3.4.6 Test Result of Conducted Spurious Emission

Test Mode :	Bluetooth 4.0 - LE	Temperature :	<b>22~25</b> ℃
Test Channel :	00	Relative Humidity :	51~55%
		Test Engineer :	AC Chang

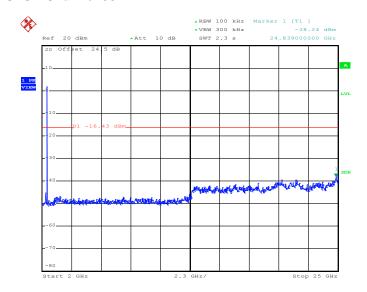
# Conducted Spurious Emission Plot on Bluetooth LE 1Mbps GFSK Channel 00



Date: 22.JAN.2015 10:16:58

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 24 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

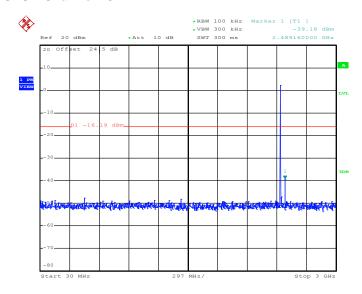


Date: 22.JAN.2015 10:17:16

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 25 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

Test Mode :	Bluetooth 4.0 - LE	Temperature :	<b>22~25</b> ℃
Test Channel :	19	Relative Humidity :	51~55%
		Test Engineer :	AC Chang

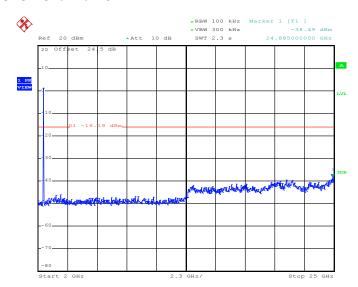


Date: 22.JAN.2015 10:25:20

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 26 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

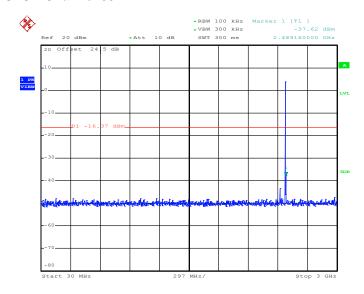


Date: 22.JAN.2015 10:25:38

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 27 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

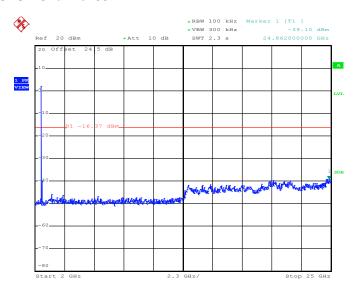
Test Mode :	Bluetooth 4.0 - LE	Temperature :	<b>22~25</b> ℃
Test Channel :	39	Relative Humidity :	51~55%
		Test Engineer :	AC Chang



Date: 22.JAN.2015 10:39:20

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 28 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 



Date: 22.JAN.2015 10:39:38

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 29 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

## 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 FCC section 15.209 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.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 30 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

#### 3.5.3 Test Procedures

- 1. The testing follows FCC KDB Publication No. 558074 D01 DTS Meas. Guidance v03r02.
- 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.: FR510843

- 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.
- 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 measurement below 1GHz, If the emission level of the EUT measured by the peak detector is 3 dB lower than the applicable limit, the peak emission level will be reported. Otherwise, the emission measurement will be repeated using the quasi-peak detector and reported.
- 7. 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.

Band	Duty Cycle(%)	T(µs)	1/T(kHz)	VBW Setting
Bluetooth 4.0 - LE	68.15	424	2.36	3kHz

 SPORTON INTERNATIONAL INC.
 Page Number
 : 31 of 36

 TEL: 886-3-327-3456
 Report Issued Date
 : Mar. 05, 2015

 FAX: 886-3-328-4978
 Report Version
 : Rev. 01

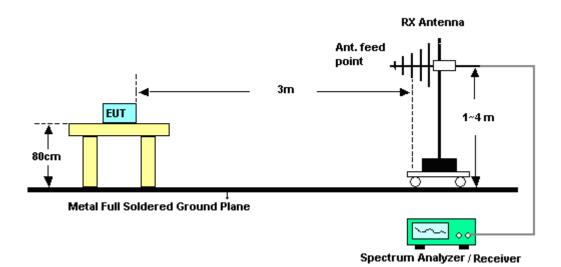
FCC ID: 2AD3D-IV2 Report Template No.: BU5-FR15CBT4.0 Version 1.0

## 3.5.4 Test Setup

#### For radiated emissions below 30MHz



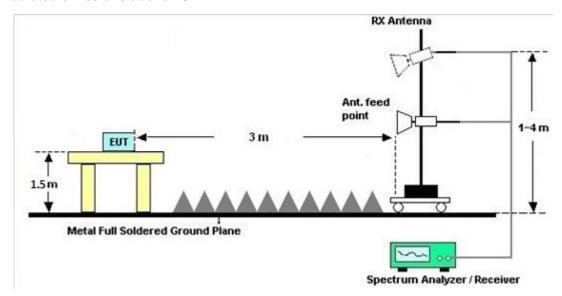
#### For radiated emissions from 30MHz to 1GHz



TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 32 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

Report No.: FR510843

#### For radiated emissions above 1GHz



## 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 per 15.31(o) was not reported.

## 3.5.6 Test Result of Radiated Spurious at Band Edges

Please refer to Appendix A.

# 3.5.7 Test Result of Radiated Spurious Emission (30MHz ~ 10<sup>th</sup> Harmonic)

Please refer to Appendix A.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 33 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

# 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 FCC 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.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 34 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

# 4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
Spectrum Analyzer	Rohde & Schwarz	FSP40	100055	9kHz~40GHz	Jun. 09, 2014	Jan. 28, 2015	Jun. 08, 2015	Radiation (03CH05-HY)
Bilog Antenna	Schaffner	CBL6111C	2725	30MHz~1GHz	Sep. 27, 2014	Jan. 28, 2015	Sep. 26, 2015	Radiation (03CH05-HY)
Double Ridged Guide Horn Antenna	SCHWARZBE CK	BBHA 9120 D	9120D-124 1	1GHz~18GHz	Apr. 16, 2014	Jan. 28, 2015	Apr. 15, 2015	Radiation (03CH05-HY)
SHF-EHF Horn Antenna	SCHWARZBE CK	BBHA 9170	BBHA9170 251	18GHz~40GHz	Oct. 02, 2014	Jan. 28, 2015	Oct. 01, 2015	Radiation (03CH05-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	100kHz~18GHz	Jul. 07, 2014	Jan. 28, 2015	Jul. 06, 2015	Radiation (03CH05-HY)
Preamplifier	EMCI	EMC011830	980148	DC~18GHz	Jun. 23, 2014	Jan. 28, 2015	Jun. 22, 2015	Radiation (03CH05-HY)
Preamplifier	COM-POWER	PA-103	161075	9kHz~30MHz	Apr. 15, 2014	Jan. 28, 2015	Apr. 14, 2015	Radiation (03CH05-HY)
Preamplifier	Miteq	TTA0204	1872107	18GHz~40GHz	May 23, 2014	Jan. 28, 2015	May 22, 2015	Radiation (03CH05-HY)
Turn Table	HD	HD100	420/611	0 - 360 degree	N/A	Jan. 28, 2015	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	HD100	240/666	1 m - 4 m	N/A	Jan. 28, 2015	N/A	Radiation (03CH05-HY)
Loop Antenna	R&S	HFH2-Z2	100315	9 kHz~30 MHz	Jul. 28, 2014	Jan. 28, 2015	Jul. 27, 2015	Radiation (03CH05-HY)

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 35 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

# 5 Uncertainty of Evaluation

#### **Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)**

Measuring Uncertainty for a Level of Confidence	2.26
of 95% (U = 2Uc(y))	2.20

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

Measuring Uncertainty for a Level of Confidence	5.10
of 95% (U = 2Uc(y))	0.10

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : 36 of 36
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843** 

SPORTON INTERNATIONAL INC.

TEL: 886-3-327-3456 FAX: 886-3-328-4978 FCC ID: 2AD3D-IV2 Page Number : A1 of A1
Report Issued Date : Mar. 05, 2015
Report Version : Rev. 01

**Report No. : FR510843**