

# FCC Part 15C

## Measurement and Test Report

For

**Shenzhen King Song Sports Equipment Co., Ltd**

**5th Floor, Bld.A, Taiyufeng Industry Park, Queshan Road, Dalang Street,**

**Longhua, Shenzhen**

**FCC ID: 2ADW6KINGSONG-14**

<b>FCC Rule(s):</b>	<u>FCC Part 15.247</u>
<b>Product Description:</b>	<u>Self -balancing Unicycle</u>
<b>Tested Model:</b>	<u>KS</u>
<b>Report No.:</b>	<u>STRD1411031I-2</u>
<b>Tested Date:</b>	<u>2014-11-13 to 2014-12-30</u>
<b>Issued Date:</b>	<u>2014-12-30</u>
<b>Tested By:</b>	<u>Jason Su / Engineer</u>
<b>Reviewed By:</b>	<u>Lahm Peng / EMC Manager</u>
<b>Approved &amp; Authorized By:</b>	<u>Jandy so / PSQ Manager</u>
<b>Prepared By:</b>	

**Shenzhen SEM.Test Technology Co., Ltd.**

1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,  
Bao'an District, Shenzhen, P.R.C. (518101)

Tel.: +86-755-33663308 Fax.: +86-755-33663309 Website: www.semtest.com.cn

Note: This test report is limited to the above client company and the product model only. It may not be duplicated without prior permitted by Shenzhen SEM.Test Technology Co., Ltd.

**TABLE OF CONTENTS**

<b>1. GENERAL INFORMATION.....</b>	<b>3</b>
1.2 TEST STANDARDS.....	4
1.3 TEST METHODOLOGY.....	4
1.4 TEST FACILITY.....	4
1.5 EUT SETUP AND TEST MODE.....	5
<b>2. SUMMARY OF TEST RESULTS .....</b>	<b>6</b>
<b>3. RF EXPOSURE .....</b>	<b>7</b>
3.1 STANDARD APPLICABLE.....	7
3.2 TEST RESULT.....	7
<b>4. ANTENNA REQUIREMENT .....</b>	<b>8</b>
4.1 STANDARD APPLICABLE.....	8
4.2 EVALUATION INFORMATION .....	8
<b>5. POWER SPECTRAL DENSITY .....</b>	<b>9</b>
5.1 STANDARD APPLICABLE.....	9
5.2 TEST EQUIPMENT LIST AND DETAILS .....	9
5.3 TEST PROCEDURE.....	9
5.4 ENVIRONMENTAL CONDITIONS .....	9
5.5 SUMMARY OF TEST RESULTS/PLOTS .....	10
<b>6. 6DB BANDWIDTH .....</b>	<b>13</b>
6.1 STANDARD APPLICABLE.....	13
6.2 TEST EQUIPMENT LIST AND DETAILS .....	13
6.3 TEST PROCEDURE.....	13
6.4 ENVIRONMENTAL CONDITIONS .....	13
6.5 SUMMARY OF TEST RESULTS/PLOTS .....	14
<b>7. RF OUTPUT POWER .....</b>	<b>17</b>
7.1 STANDARD APPLICABLE.....	17
7.2 TEST EQUIPMENT LIST AND DETAILS .....	17
7.3 TEST PROCEDURE.....	17
7.4 ENVIRONMENTAL CONDITIONS .....	17
7.5 SUMMARY OF TEST RESULTS/PLOTS .....	18
<b>8. FIELD STRENGTH OF SPURIOUS EMISSIONS .....</b>	<b>19</b>
8.1 MEASUREMENT UNCERTAINTY .....	19
8.2 STANDARD APPLICABLE.....	19
8.3 TEST EQUIPMENT LIST AND DETAILS .....	19
8.4 TEST PROCEDURE.....	20
8.5 CORRECTED AMPLITUDE & MARGIN CALCULATION.....	20
8.6 ENVIRONMENTAL CONDITIONS .....	21
8.7 SUMMARY OF TEST RESULTS/PLOTS .....	21
<b>9. OUT OF BAND EMISSIONS.....</b>	<b>29</b>
9.1 STANDARD APPLICABLE.....	29
9.2 TEST EQUIPMENT LIST AND DETAILS .....	29
9.3 TEST PROCEDURE.....	29
9.4 ENVIRONMENTAL CONDITIONS .....	30
9.5 SUMMARY OF TEST RESULTS/PLOTS .....	30
<b>10. CONDUCTED EMISSIONS .....</b>	<b>33</b>
10.1 MEASUREMENT UNCERTAINTY .....	33
10.2 TEST EQUIPMENT LIST AND DETAILS .....	33
10.3 TEST PROCEDURE.....	33
10.4 BASIC TEST SETUP BLOCK DIAGRAM.....	33
10.5 ENVIRONMENTAL CONDITIONS .....	34
10.6 TEST RECEIVER SETUP .....	34
10.7 SUMMARY OF TEST RESULTS/PLOTS .....	34
10.8 CONDUCTED EMISSIONS TEST DATA.....	34

## 1. GENERAL INFORMATION

### Client Information

Applicant: Shenzhen King Song Sports Equipment Co., Ltd  
Address of applicant: 5th Floor, Bld.A, Taiyufeng Industry Park, Queshan Road, Dalang Street, Longhua, Shenzhen  
Manufacturer: Shenzhen King Song Sports Equipment Co., Ltd  
Address of manufacturer: 5th Floor, Bld.A, Taiyufeng Industry Park, Queshan Road, Dalang Street, Longhua, Shenzhen

### General Description of EUT

Product Name:	Self -balancing Unicycle
Brand Name:	King Song
Model No.:	KS
Rated Voltage:	Battery :59V; Adapter:DC67.2V charging
Rated Current:	/

*Note: The test data is gathered from a production sample provided by the manufacturer.*

### Technical Characteristics of EUT

Bluetooth Version:	V4.0 (BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	-1.521dBm (Conducted)
Data Rate:	GFSK
Modulation:	25Mbps
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	PCB
Antenna Gain:	0dBi
Lowest Internal Frequency:	26MHz

## 1.2 Test Standards

The following report is prepared on behalf of the Shenzhen King Song Sports Equipment Co., Ltd in accordance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

The objective is to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 of the Federal Communication Commissions rules.

**Maintenance of compliance** is the responsibility of the manufacturer. Any modification of the product, which result in lowering the emission, should be checked to ensure compliance has been maintained.

## 1.3 Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz. The measurement guide KDB 558074 D01 V03r02 for digital transmission systems shall be performed also.

## 1.4 Test Facility

### **FCC – Registration No.: 934118**

Shenzhen SEM.Test Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files and the Registration is 934118.

### **Industry Canada (IC) Registration No.: 11464A**

The 3m Semi-anechoic chamber of Shenzhen SEM.Test Technology Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 11464A.

### **CNAS Registration No.: L4062**

Shenzhen SEM.Test Technology Co., Ltd. is a testing organization accredited by China National Accreditation Service for Conformity Assessment (CNAS) according to ISO/IEC 17025. The accreditation certificate number is L4062. All measurement facilities used to collect the measurement data are located at 1/F, Building A, Hongwei Industrial Park, Liuxian 2<sup>nd</sup> Road, Bao'an District, Shenzhen, P.R.C (518101).

### 1.5 EUT Setup and Test Mode

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements. All testing shall be performed under maximum output power condition, and to measure its highest possible emissions level, more detailed description as follows:

Test Mode List		
Test Mode	Description	Remark
TM1	GFSK(BLE)	2402MHz, 2442MHz, 2480MHz

EUT Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
AC Cable	1.5	Unshielded	Without Ferrite
DC Cable	1.0	Unshielded	Without Ferrite

Special Cable List and Details			
Cable Description	Length (m)	Shielded/Unshielded	With / Without Ferrite
/	/	/	/

Auxiliary Equipment List and Details			
Description	Manufacturer	Model	Serial Number
/	/	/	/

## 2. SUMMARY OF TEST RESULTS

FCC Rules	Description of Test Item	Result
§ 2.1093	RF Exposure	Compliant
§ 15.203; § 15.247(b)(4)(i)	Antenna Requirement	Compliant
§ 15.207(a)	Conducted Emission	Compliant
§ 15.247(e)	Power Spectral Density	Compliant
§ 15.247(a)(2)	6 dB Bandwidth	Compliant
§ 15.247(b)(3)	RF Output Power	Compliant
§ 15.209(a)	Radiated Emission	Compliant
§ 15.247(d)	Band Edge (Out of Band Emissions)	Compliant

N/A: not applicable

### **3. RF Exposure**

---

#### **3.1 Standard Applicable**

According to § 1.1307 and § 2.1093, the portable transmitter must comply the RF exposure requirements.

#### **3.2 Test Result**

This product complied with the requirement of the RF exposure, please see the RF Exposure Report.

## **4. Antenna Requirement**

---

### **4.1 Standard Applicable**

According to FCC Part 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. 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 provisions of this section.

### **4.2 Evaluation Information**

This product has a PCB antenna, fulfill the requirement of this section.



## 5. Power Spectral Density

### 5.1 Standard Applicable

According to 15.247(a)(1)(iii), For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### 5.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2014-05-28	2015-05-27
Attenuator	ATTEN	ATS100-4-20	/	2014-05-28	2015-05-27

### 5.3 Test Procedure

According to the KDB 558074 D01 V03r02, the test method of power spectral density as below:

- a) Set analyzer center frequency to DTS channel center frequency.
- b) Set the span to 1.5 times the DTS bandwidth.
- c) Set the RBW to:  $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$ .
- d) Set the VBW  $\geq 3 \times \text{RBW}$ .
- e) Detector = peak.
- f) Sweep time = auto couple.
- g) Trace mode = max hold.
- h) Allow trace to fully stabilize.
- i) Use the peak marker function to determine the maximum amplitude level within the RBW.
- j) If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat.

### 5.4 Environmental Conditions

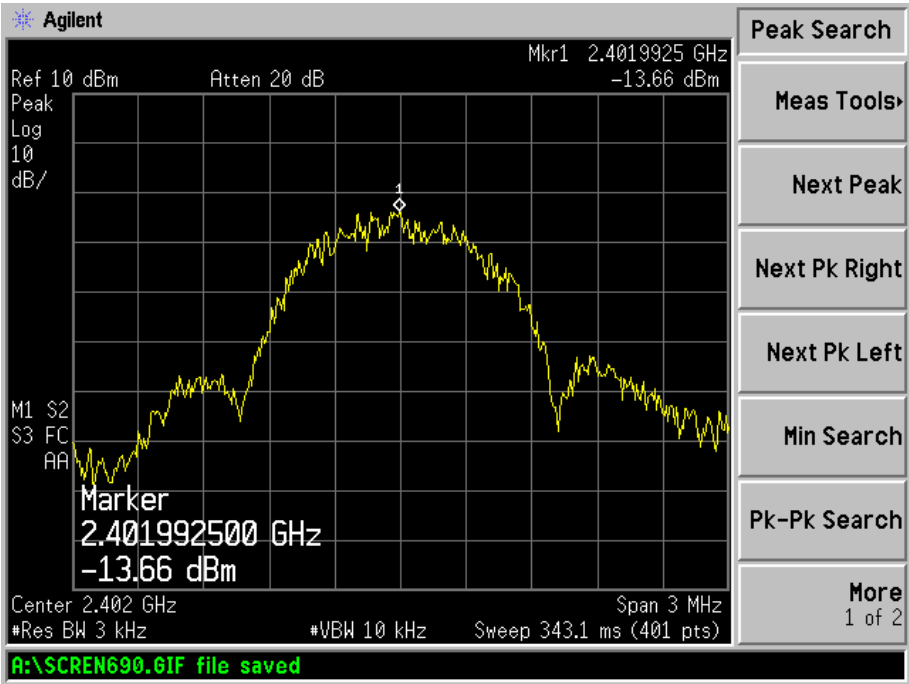
Temperature:	26° C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

5.5 Summary of Test Results/Plots

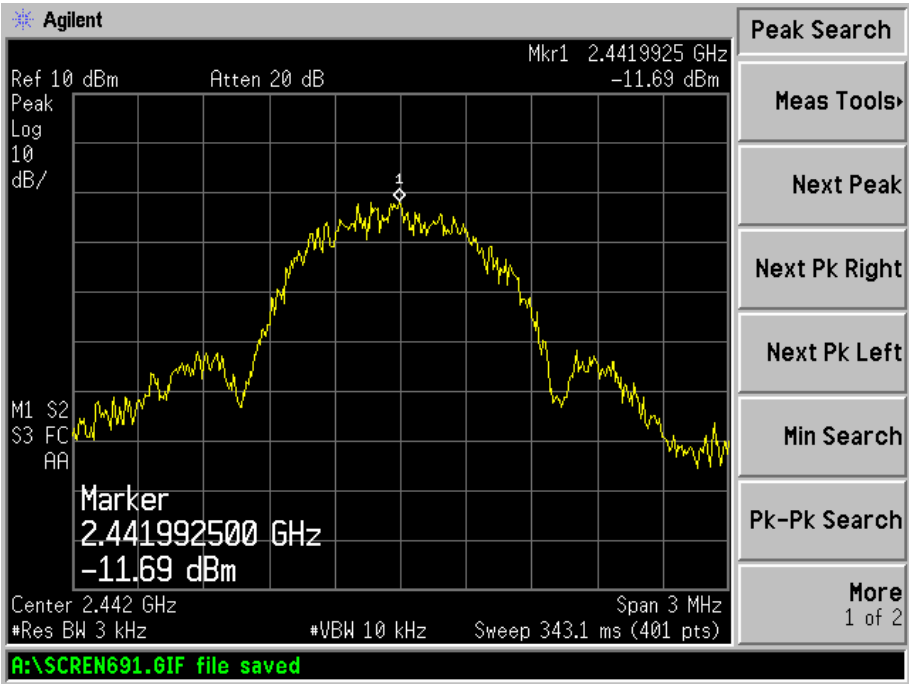
Test Mode	Test Channel MHz	Power Spectral Density dBm/3kHz	Limit dBm/3kHz
GFSK(BLE)	2402	-13.66	8
	2442	-11.69	8
	2480	-11.02	8

Please refer to the following test plots:

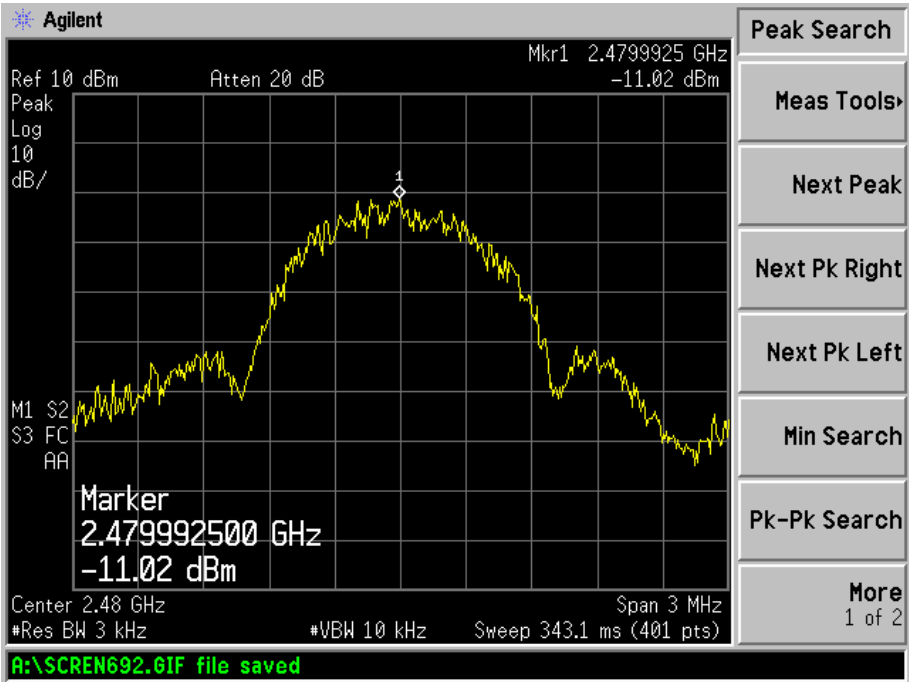
Low Channel



Middle Channel



High Channel



## 6. 6dB Bandwidth

### 6.1 Standard Applicable

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

### 6.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2014-05-28	2015-05-27
Attenuator	ATTEN	ATS100-4-20	/	2014-05-28	2015-05-27

### 6.3 Test Procedure

- Set RBW = 100 kHz.
- Set the video bandwidth (VBW)  $\geq 3 \times$  RBW.
- Detector = Peak.
- Trace mode = max hold.
- Sweep = auto couple.
- Allow the trace to stabilize.
- Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission.

### 6.4 Environmental Conditions

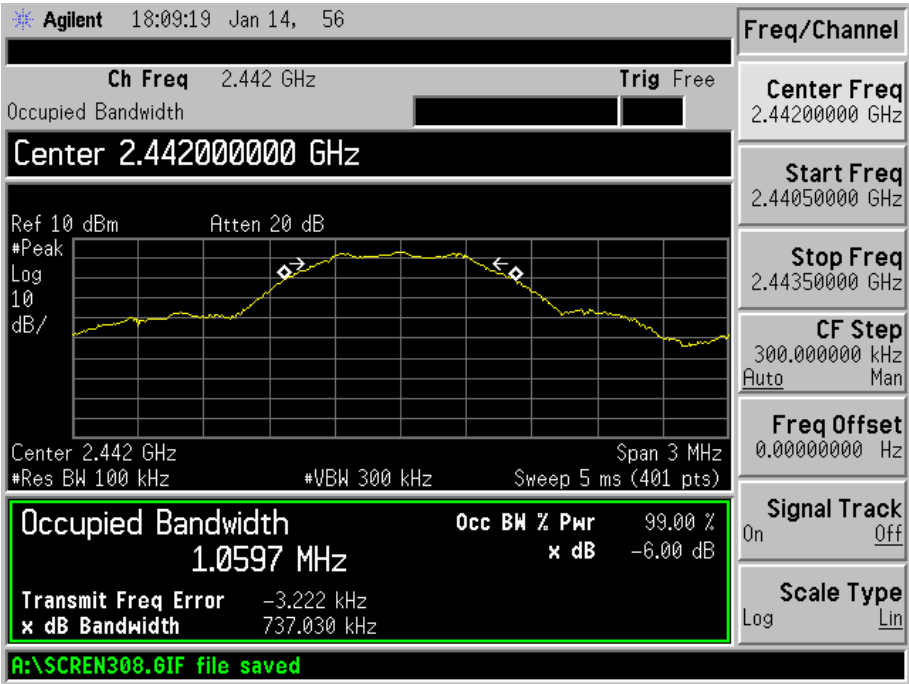
Temperature:	25° C
Relative Humidity:	53%
ATM Pressure:	1018 mbar

6.5 Summary of Test Results/Plots

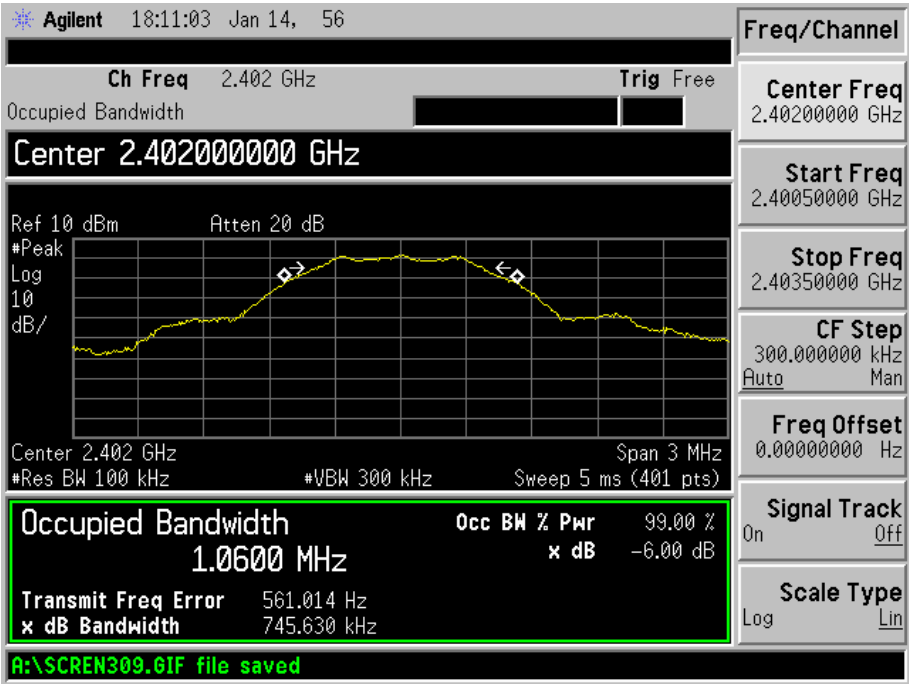
Test Mode	Test Channel MHz	6 dB Bandwidth kHz	99% Bandwidth kHz	Limit kHz
GFSK(BLE)	2402	737.030	10597	>500
	2442	745.630	10600	>500
	2480	747.536	10706	>500

Please refer to the following test plots:

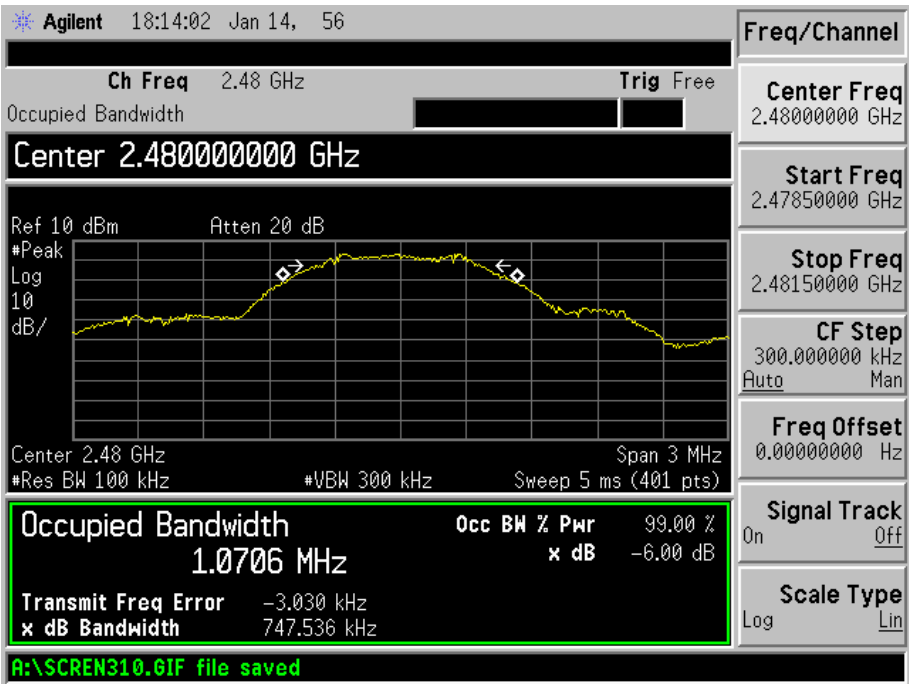
For BLE  
Low Channel:



Middle Channel:



High Channel:





## 7. RF Output Power

### 7.1 Standard Applicable

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

### 7.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	Agilent	E4402B	US41192821	2014-05-28	2015-05-27
Attenuator	ATTEN	ATS100-4-20	/	2014-05-28	2015-05-27

### 7.3 Test Procedure

According to section 15.247(b)-power output of the KDB-558074 D01 V03r02, 8.1.2 Option 2 (channel integration method) this procedure should only be used when the maximum available RBW of the spectrum/signal analyzer is less than the DTS bandwidth.

- a) Set the  $RBW \geq DTS$  bandwidth.
- b) Set  $VBW \geq 3 \times RBW$ .
- c) Set span  $\geq 3 \times RBW$
- d) Sweep time = auto couple.
- e) Detector = peak.
- f) Trace mode = max hold.
- g) Allow trace to fully stabilize.
- h) Use peak marker function to determine the peak amplitude level.

### 7.4 Environmental Conditions

Temperature:	26° C
Relative Humidity:	57%
ATM Pressure:	1011 mbar

**7.5 Summary of Test Results/Plots**

Test Mode	Frequency MHz	Reading dBm	Output Power mW	Limit mW
GFSK(BLE)	2402	-1.521	0.7045	1000
	2442	-2.123	0.6133	1000
	2480	-2.236	0.5976	1000

*Note: the antenna gain of 0dBi less than 6dBi maximum permission antenna gain value based on 1 watt peak output power limit.*

## 8. Field Strength of Spurious Emissions

### 8.1 Measurement Uncertainty

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement is  $\pm 5.10$  dB.

### 8.2 Standard Applicable

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

The emission limit in this paragraph is based on measurement instrumentation employing an average detector. The provisions in §15.35 for limiting peak emissions apply. Spurious Radiated Emissions measurements starting below or at the lowest crystal frequency.

### 8.3 Test Equipment List and Details

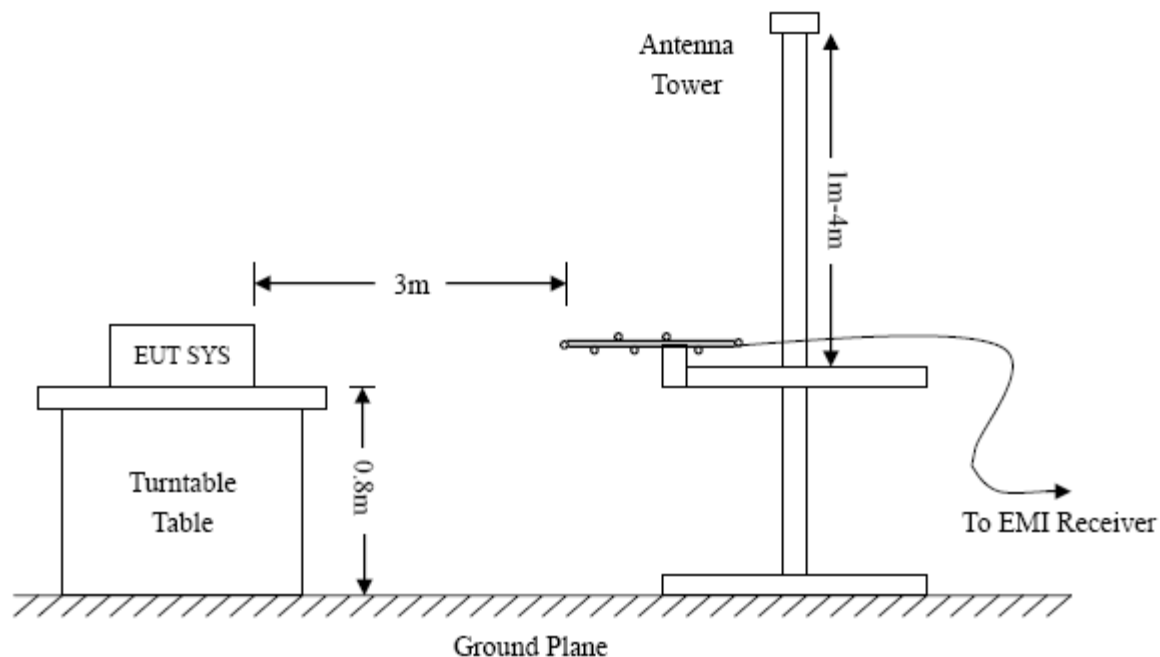
Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2014-05-28	2015-05-27
EMI Test Receiver	R&S	ESVB	825471/005	2014-05-28	2015-05-27
Pre-amplifier	Agilent	8447F	3113A06717	2014-05-28	2015-05-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2014-05-28	2015-05-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2014-05-24	2015-05-23
Horn Antenna	ETS	3117	00086197	2014-05-24	2015-05-23
Horn Antenna	ETS	3116B	00088203	2014-05-24	2015-05-23
Loop Antenna	SCHWARZECK	HFRA 5165	9365	2014-05-24	2015-05-23

## 8.4 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.205 15.247(a) and FCC Part 15.209 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.



Frequency :9kHz-30MHz

RBW=10KHz,

VBW =30KHz

Sweep time= Auto

Trace = max hold

Detector function = peak

Frequency :30MHz-1GHz

RBW=120KHz,

VBW=300KHz

Sweep time= Auto

Trace = max hold

Detector function = peak, QP

Frequency :Above 1GHz

RBW=1MHz,

VBW=3MHz(Peak), 10Hz(AV)

Sweep time= Auto

Trace = max hold

Detector function = peak, AV

## 8.5 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

$$\text{Corr. Ampl.} = \text{Indicated Reading} + \text{Ant. Factor} + \text{Cable Loss} - \text{Ampl. Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -6dBμV means the emission is 6dBμV below the maximum limit for Class B. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corr. Ampl.} - \text{FCC Part 15 Limit}$$

## 8.6 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

## 8.7 Summary of Test Results/Plots

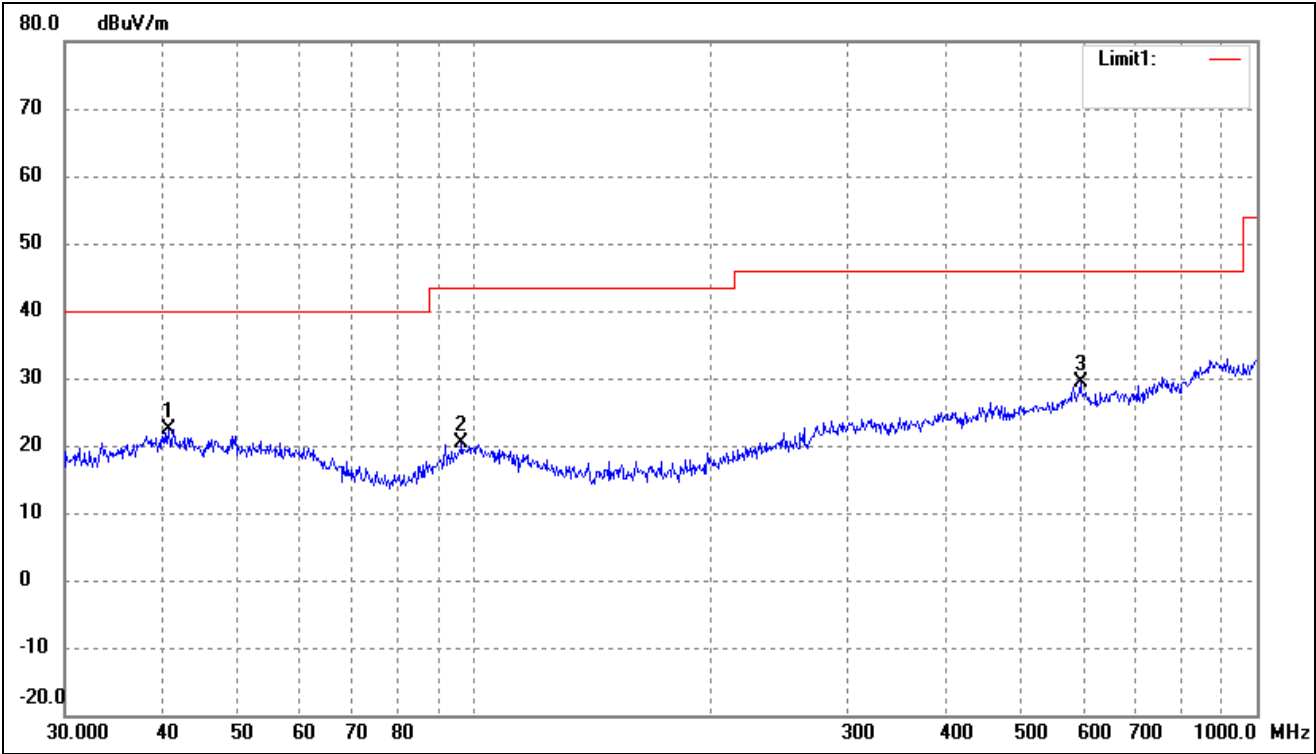
According to the data below, the FCC Part 15.205, 15.209 and 15.247 standards, and had the worst cases:

*Note: this EUT was tested in 3 orthogonal positions and the worst case position data was reported.*

From 30 MHz to 1 GHz

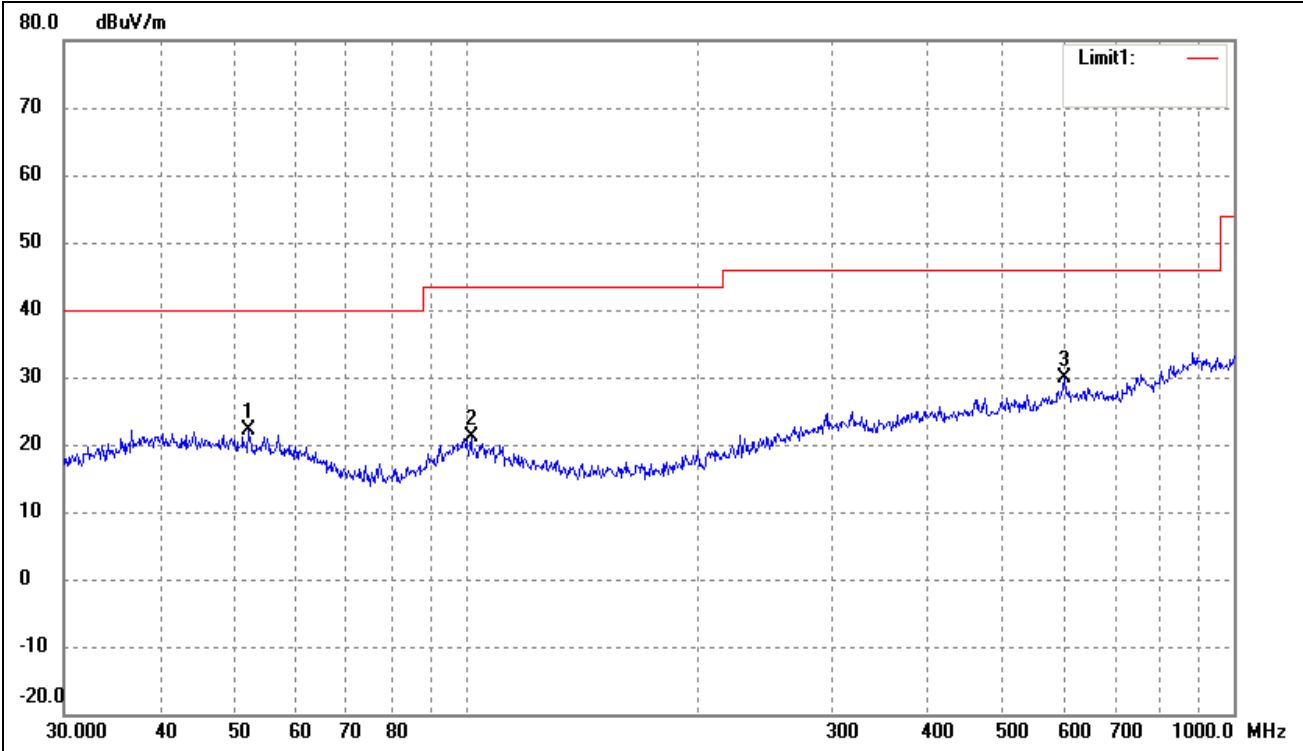
Test Mode: Transmitting-Low channel (2402MHz)

Horizontal



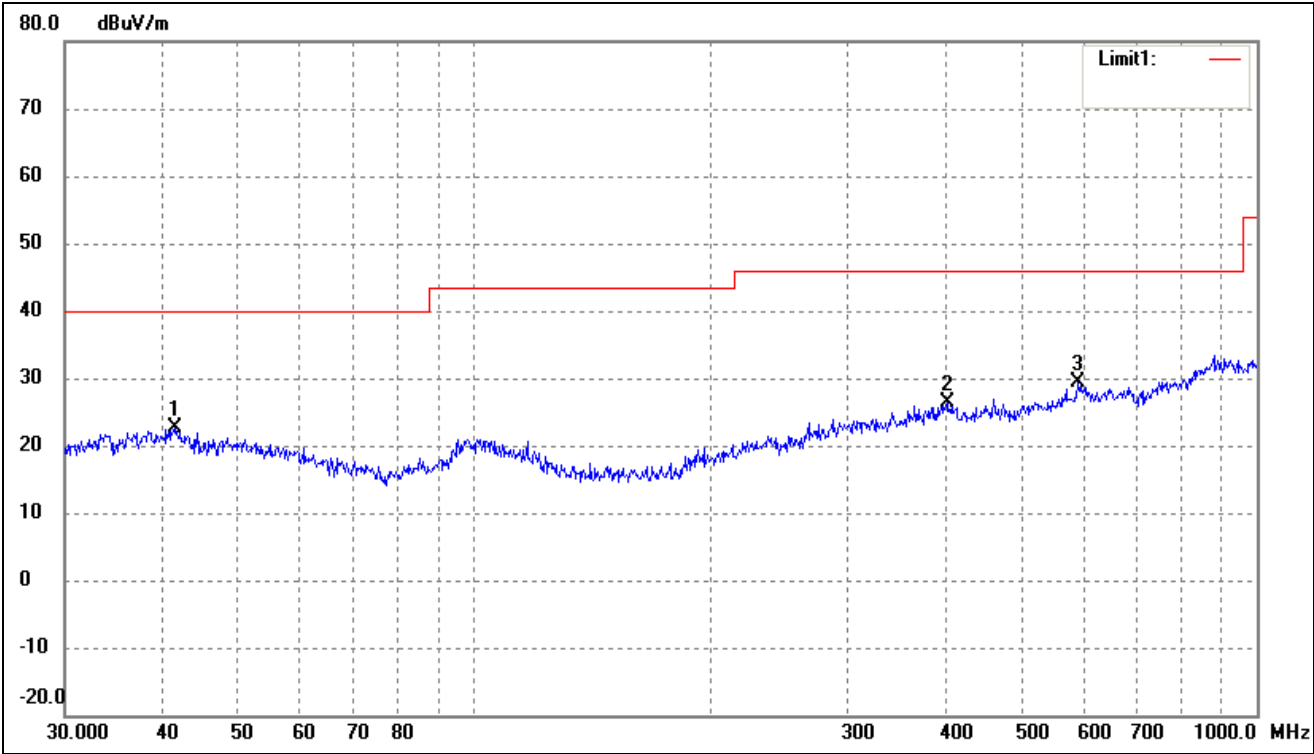
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( ° )	(cm)	
1	40.7016	15.28	7.18	22.46	40.00	-17.54	125	100	peak
2	96.4362	15.09	5.24	20.33	43.50	-23.17	36	100	peak
3	595.1329	16.14	13.14	29.28	46.00	-16.72	310	100	peak

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( ° )	(cm)	
1	52.2079	16.08	6.07	22.15	40.00	-17.85	156	100	peak
2	101.6443	15.16	5.95	21.11	43.50	-22.39	214	100	peak
3	601.4265	16.56	13.22	29.78	46.00	-16.22	96	100	peak

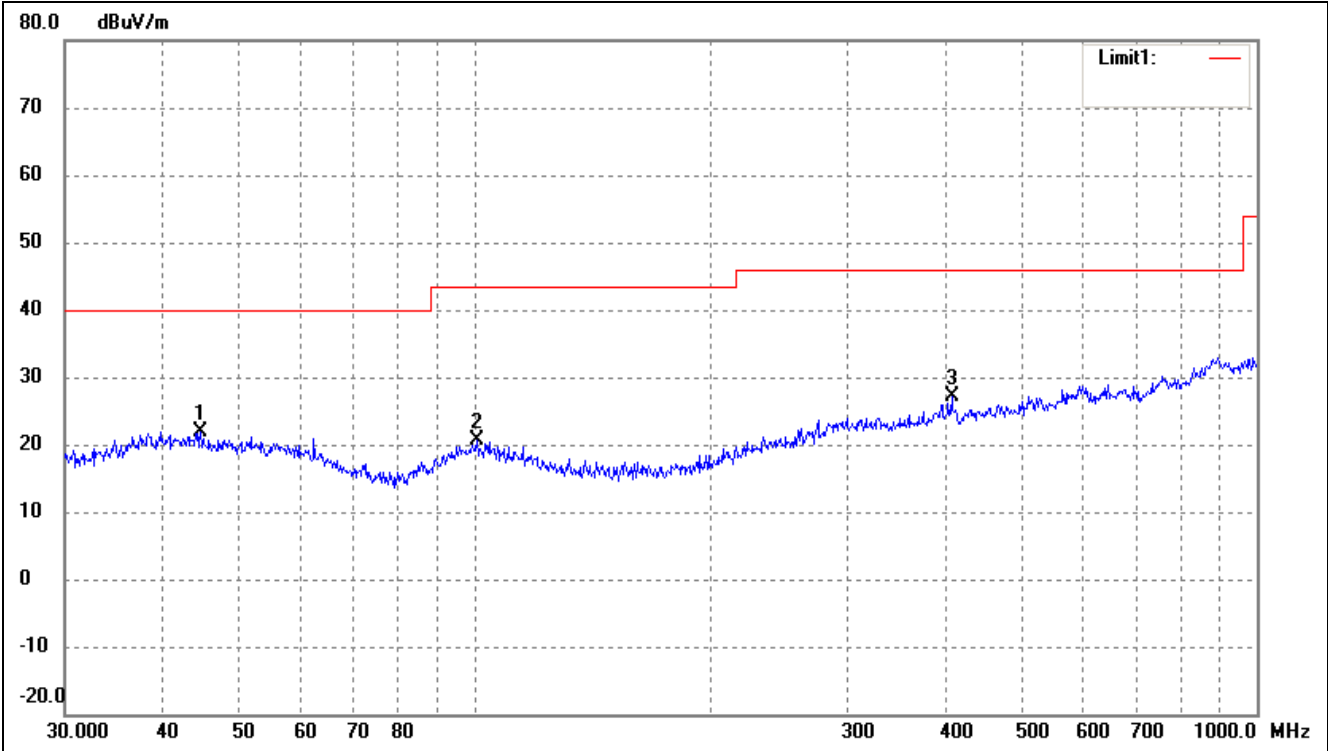
From 30 MHz to 1 GHz  
Test Mode: Transmitting-Middle channel (2442MHz)  
Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( ° )	(cm)	
1	41.5670	15.52	7.09	22.61	40.00	-17.39	154	100	peak
2	401.8385	16.43	10.06	26.49	46.00	-19.51	328	100	peak
3	590.9737	16.30	12.97	29.27	46.00	-16.73	45	100	peak

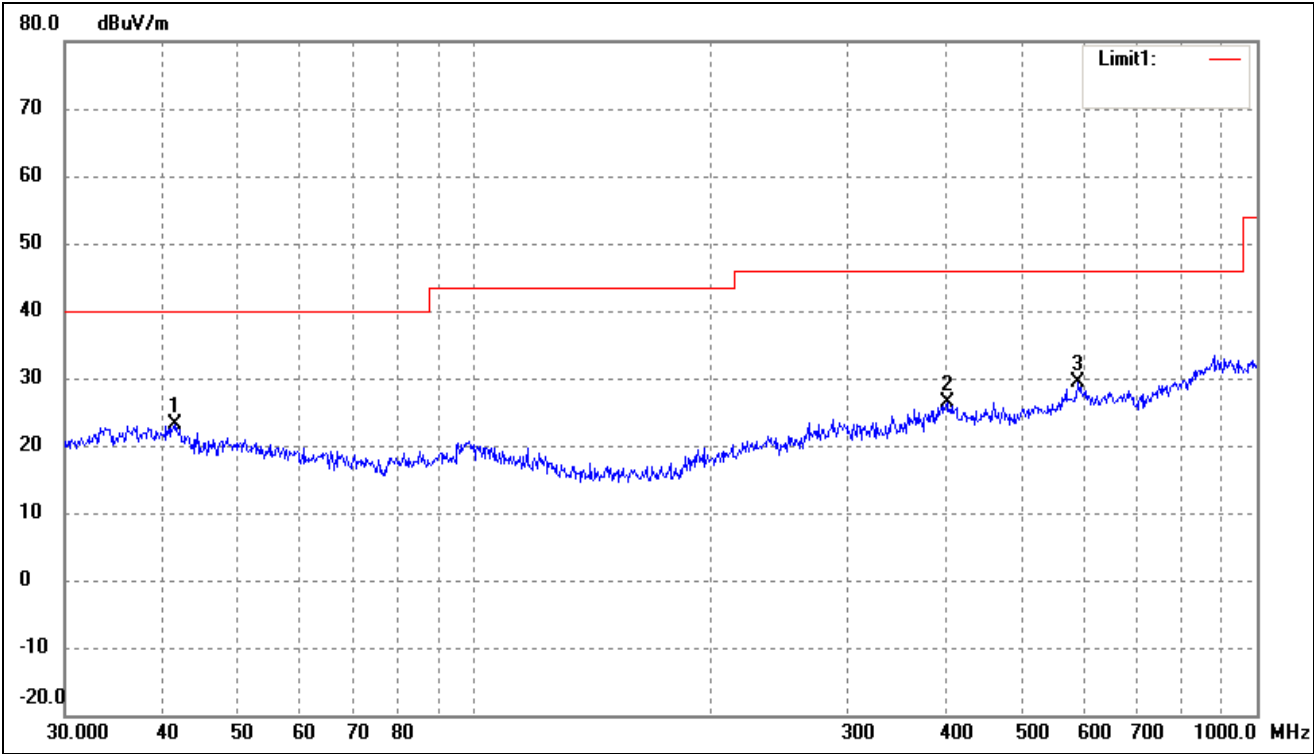


Vertical



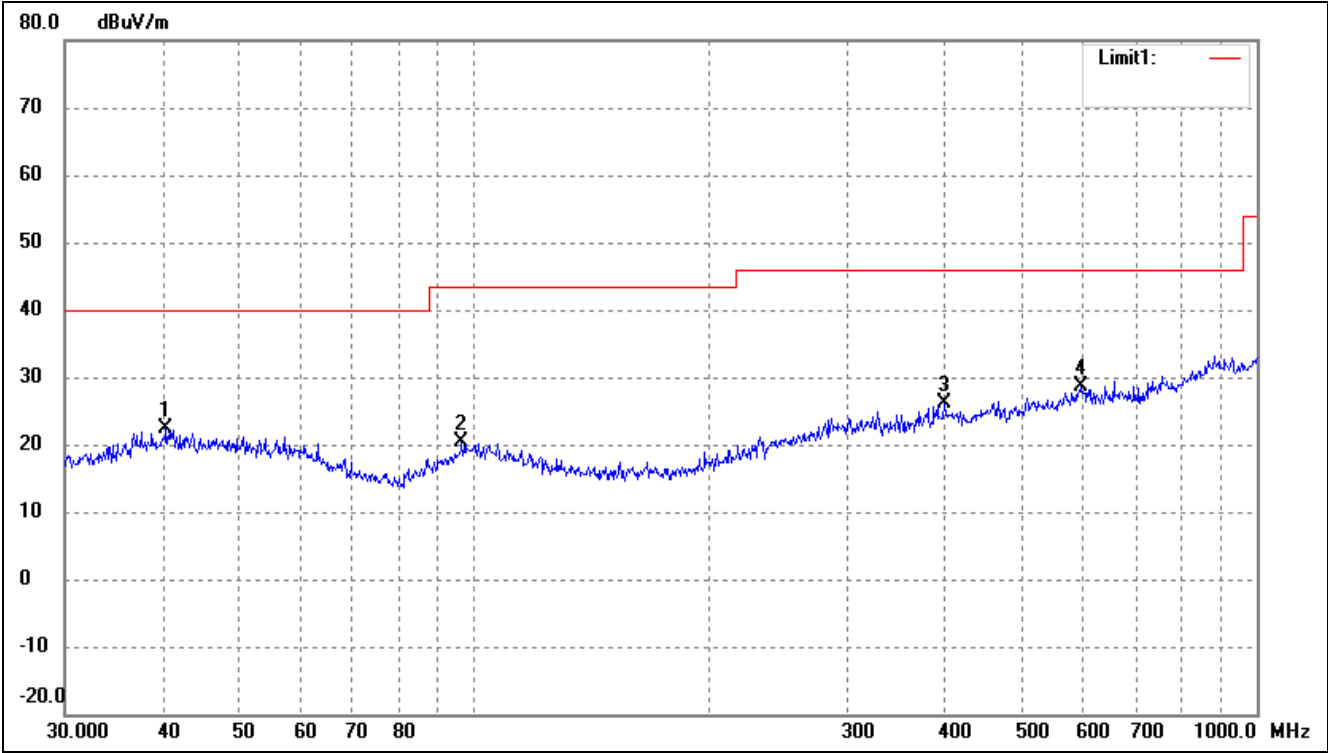
No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( ° )	(cm)	
1	44.7434	13.95	7.84	21.79	40.00	-18.21	94	100	peak
2	100.9340	14.54	6.03	20.57	43.50	-22.93	135	100	peak
3	407.5145	17.19	9.85	27.04	46.00	-18.96	156	100	peak

From 30 MHz to 1 GHz  
Test Mode: Transmitting-High channel (2480MHz)  
Horizontal



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( ° )	(cm)	
1	41.5670	16.02	7.09	23.11	40.00	-16.89	312	100	peak
2	401.8385	16.43	10.06	26.49	46.00	-19.51	56	100	peak
3	590.9737	16.30	12.97	29.27	46.00	-16.73	98	100	peak

Vertical



No.	Frequency	Reading	Correct	Result	Limit	Margin	Degree	Height	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	( ° )	(cm)	
1	40.4172	13.30	9.12	22.42	40.00	-17.58	54	100	peak
2	96.4362	15.21	5.24	20.45	43.50	-23.05	156	100	peak
3	399.0302	15.95	10.09	26.04	46.00	-19.96	212	100	peak
4	597.2234	15.41	13.21	28.62	46.00	-17.38	114	100	peak

*Spurious Emissions Above 1GHz**Transmitting: BLE mode:*

Frequency	Reading	Correct	Result	Limit	Margin	Polar	Detector
(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	H/V	
Low Channel-2402MHz							
4804	61.42	-3.59	57.83	74	-16.17	H	PK
4804	50.22	-3.59	46.63	54	-7.37	H	AV
7206	59.25	-0.52	58.73	74	-15.27	H	PK
7206	44.24	-0.52	43.72	54	-10.28	H	AV
4804	59.15	-3.59	55.56	74	-18.44	V	PK
4804	48.12	-3.59	44.53	54	-9.47	V	AV
7206	60.10	-0.52	59.58	74	-14.42	V	PK
7206	44.14	-0.52	43.62	54	-10.38	V	AV
Middle Channel-2442MHz							
4884	58.24	-3.49	54.75	74	-19.25	H	PK
4884	47.14	-3.49	43.65	54	-10.35	H	AV
7326	58.25	-0.47	57.78	74	-16.22	H	PK
7326	43.14	-0.47	42.67	54	-11.33	H	AV
4884	60.24	-3.49	56.75	74	-17.25	V	PK
4884	49.13	-3.49	45.64	54	-8.36	V	AV
7326	60.12	-0.47	59.65	74	-14.35	V	PK
7326	45.15	-0.47	44.68	54	-9.32	V	AV
High Channel-2480MHz							
4960	64.27	-3.41	60.86	74	-13.14	H	PK
4960	49.55	-3.41	46.14	54	-7.86	H	AV
7440	53.45	-0.42	53.03	74	-20.97	H	PK
7440	44.16	-0.42	43.74	54	-10.26	H	AV
4960	57.68	-3.41	54.27	74	-19.73	V	PK
4960	44.52	-3.41	41.11	54	-12.89	V	AV
7440	59.11	-0.42	58.69	74	-15.31	V	PK
7440	43.95	-0.42	43.53	54	-10.47	V	AV

*Note: Testing is carried out with frequency rang 9kHz to the tenth harmonics, which above 3<sup>th</sup> Harmonics are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

*The measurements greater than 20dB below the limit from 9kHz to 30MHz..*

## 9. Out of Band Emissions

### 9.1 Standard Applicable

According to §15.247 (d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a).

### 9.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
Spectrum Analyzer	R&S	FSP	836079/035	2014-05-28	2015-05-27
EMI Test Receiver	R&S	ESVB	825471/005	2014-05-28	2015-05-27
Pre-amplifier	Agilent	8447F	3113A06717	2014-05-28	2015-05-27
Pre-amplifier	Compliance Direction	PAP-0118	24002	2014-05-28	2015-05-27
Trilog Broadband Antenna	SCHWARZBECK	VULB9163	9163-333	2014-05-24	2015-05-23
Horn Antenna	ETS	3117	00086197	2014-05-24	2015-05-23

### 9.3 Test Procedure

According to the KDB 558074 D01 v03r02, the band-edge radiated test method as follows:

Set span = wide enough to capture the peak level of the emission operating on the channel closest to the bandedge, as well as any modulation products which fall outside of the authorized band of operation (2310MHz to 2420MHz for low bandedge, 2460MHz to 2500MHz for the high bandedge)

RBW = 1MHz, VBW = 1MHz for peak value measured

RBW = 1MHz, VBW = 10Hz for average value measured

Sweep = auto; Detector function = peak/average; Trace = max hold

All the trace to stabilize, set the marker on the emission at the bandedge, or on the highest modulation product outside of the band, if this level is greater than that at the bandedge. Enable the marker-delta function, then use the marker-to-peak function to move the marker to the peak of the in-band emission. Those emission must comply with the 15.209 limit for fall in the restricted bands listed in section 15.205. Note that the method of measurement KDB publication number: 913591 may be used for the radiated bandedge measurements.

According to the KDB 558074 D01 V03r02, the conducted spurious emissions test method as follows:

1. Set start frequency to DTS channel edge frequency.
2. Set stop frequency so as to encompass the spectrum to be examined.
3. Set RBW = 100 kHz.
4. Set VBW  $\geq$  300 kHz.
5. Detector = peak.
6. Trace Mode = max hold.
7. Sweep = auto couple.
8. Allow the trace to stabilize (this may take some time, depending on the extent of the span).
9. Use peak marker function to determine maximum amplitude of all unwanted emissions within any 100 kHz bandwidth.

Ensure that the amplitude of all unwanted emissions outside of the authorized frequency band (excluding restricted frequency bands) are attenuated by at least the minimum requirements specified in section 8.1. Report the three highest emissions relative to the limit.

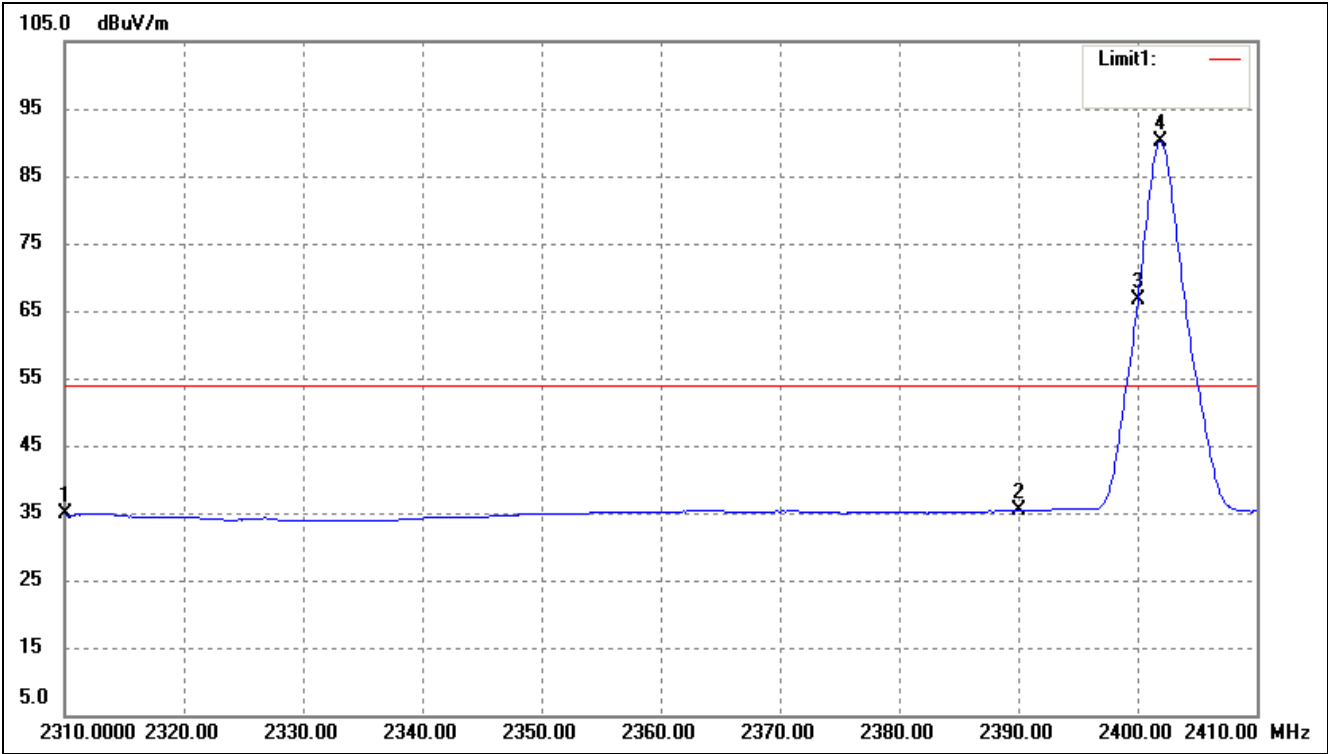
#### 9.4 Environmental Conditions

Temperature:	23°C
Relative Humidity:	54%
ATM Pressure:	1011 mbar

#### 9.5 Summary of Test Results/Plots

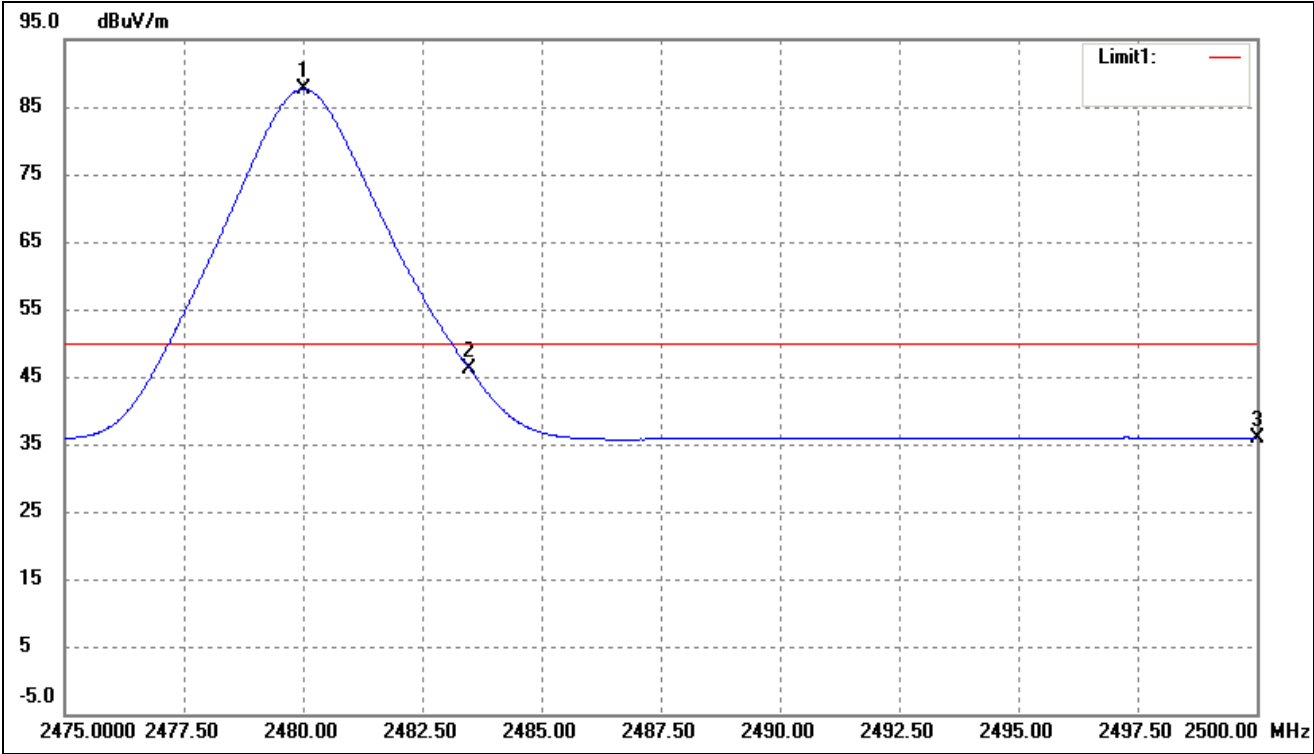
Please refer to the test plots as below.

Bandedge (Radiated)  
Lowest Bandedge-BLE  
Horizontal (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2310.000	18.43	16.34	34.77	54.00	-19.23	Average Detector
	2310.000	30.21	16.34	46.55	74.00	-27.45	Peak Detector
2	2390.000	18.29	17.03	35.32	54.00	-18.68	Average Detector
	2390.000	31.10	17.03	48.13	74.00	-25.87	Peak Detector
3	2400.000	49.54	17.11	66.65	Delta =23.47 dBc		Average Detector
4	2401.945	73.00	17.12	90.12			Average Detector

Highest Bandedge-BLE  
Horizontal (Worst case)



No.	Frequency	Reading	Correct	Result	Limit	Margin	Remark
	(MHz)	(dBuV/m)	dB/m	(dBuV/m)	(dBuV/m)	(dB)	
1	2480.000	70.00	17.71	87.71	/	/	Average Detector
	2480.000	73.81	17.71	91.52	/	/	Peak Detector
2	2483.500	Delta = 55.14 dBc		32.57	54.00	-21.43	Average Detector
	2483.500			36.38	74.00	-37.62	Peak Detector
3	2500.000	17.99	17.86	35.85	50.00	-14.15	Average Detector
	2500.000	31.13	17.86	48.99	74.00	-25.01	Peak Detector



## 10. Conducted Emissions

### 10.1 Measurement Uncertainty

Base on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement is  $\pm 2.88$  dB.

### 10.2 Test Equipment List and Details

Description	Manufacturer	Model	Serial Number	Cal. Date	Due. Date
EMI Test Receiver	Rohde & Schwarz	ESPI	101611	2014-05-28	2015-05-27
L.I.S.N	Schwarz beck	NSLK8126	8126-224	2014-05-28	2015-05-27
Pulse Limiter	Rohde & Schwarz	ESH3-Z2	100911	2014-05-28	2015-05-27

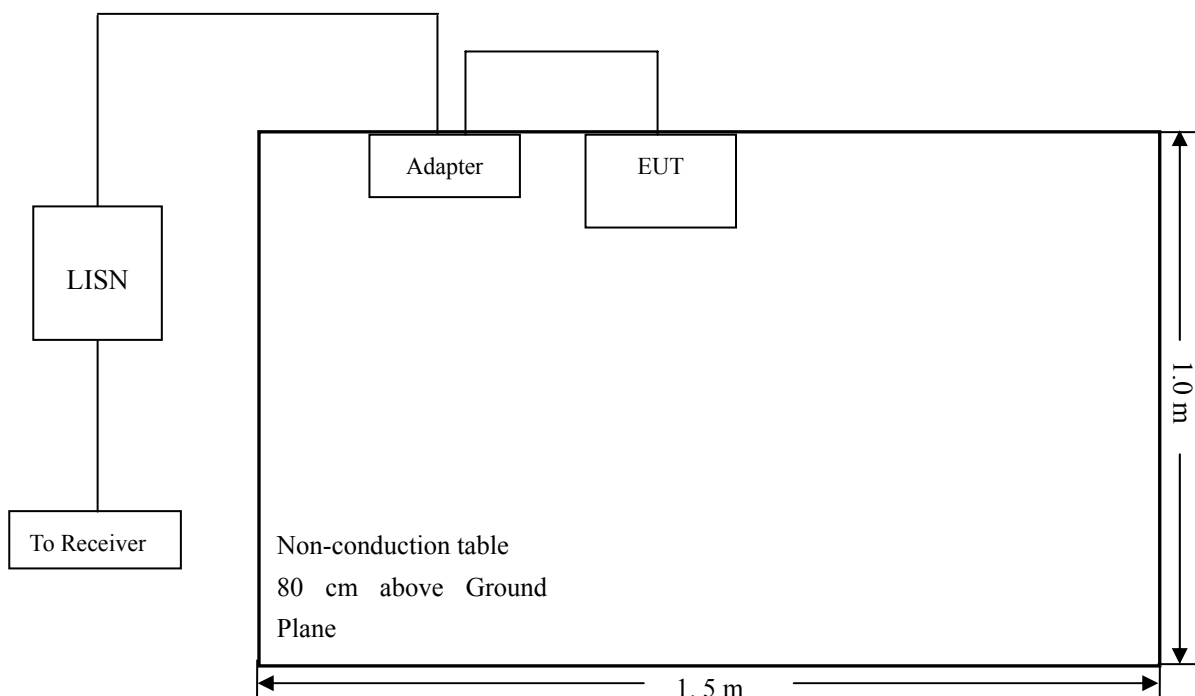
### 10.3 Test Procedure

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15.207 Limit.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

### 10.4 Basic Test Setup Block Diagram



## 10.5 Environmental Conditions

Temperature:	25 °C
Relative Humidity:	52%
ATM Pressure:	1012 mbar

## 10.6 Test Receiver Setup

During the conducted emission test, the test receiver was set with the following configurations:

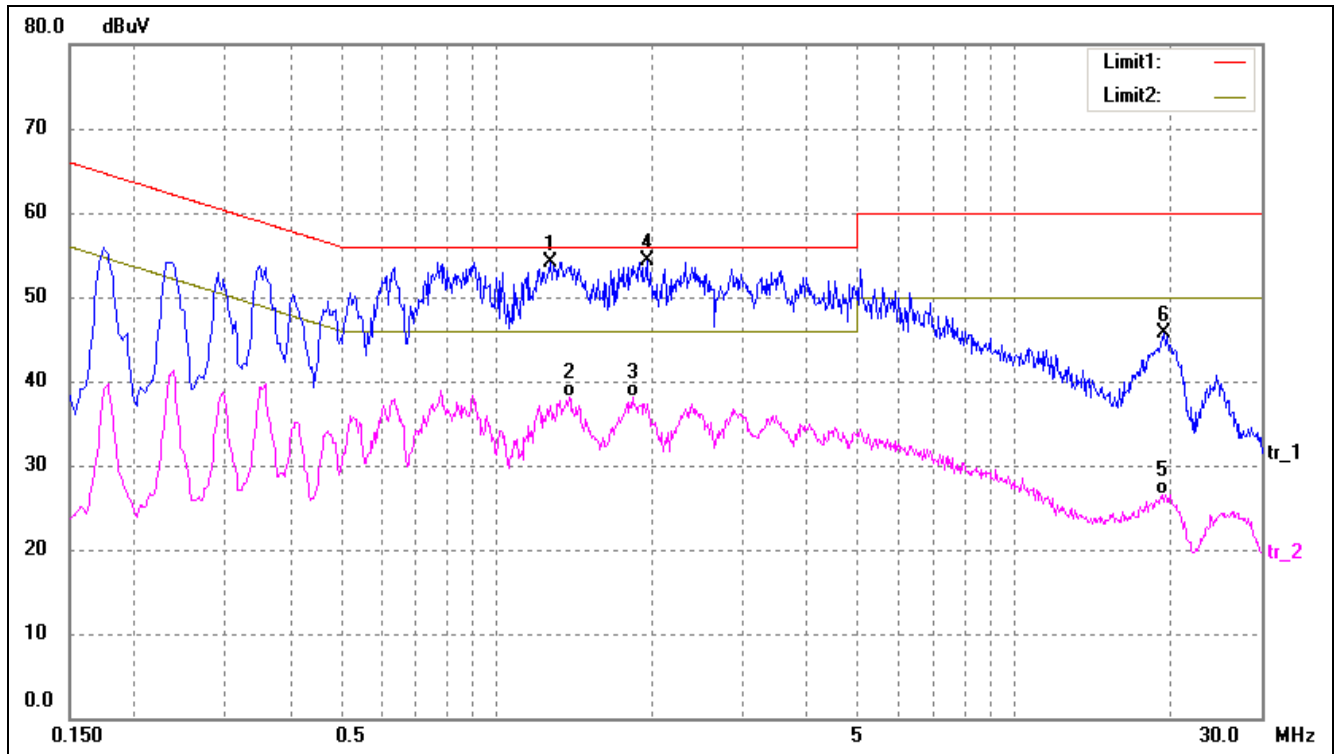
Start Frequency ..... 150 kHz  
Stop Frequency..... 30 MHz  
Sweep Speed ..... Auto  
IF Bandwidth..... 10 kHz  
Quasi-Peak Adapter Bandwidth ..... 9 kHz  
Quasi-Peak Adapter Mode ..... Normal

## 10.7 Summary of Test Results/Plots

According to the data in section 9.8, the EUT complied with the FCC Part 15.207 Conducted margin for a Class B device, with the *worst* margin reading of:

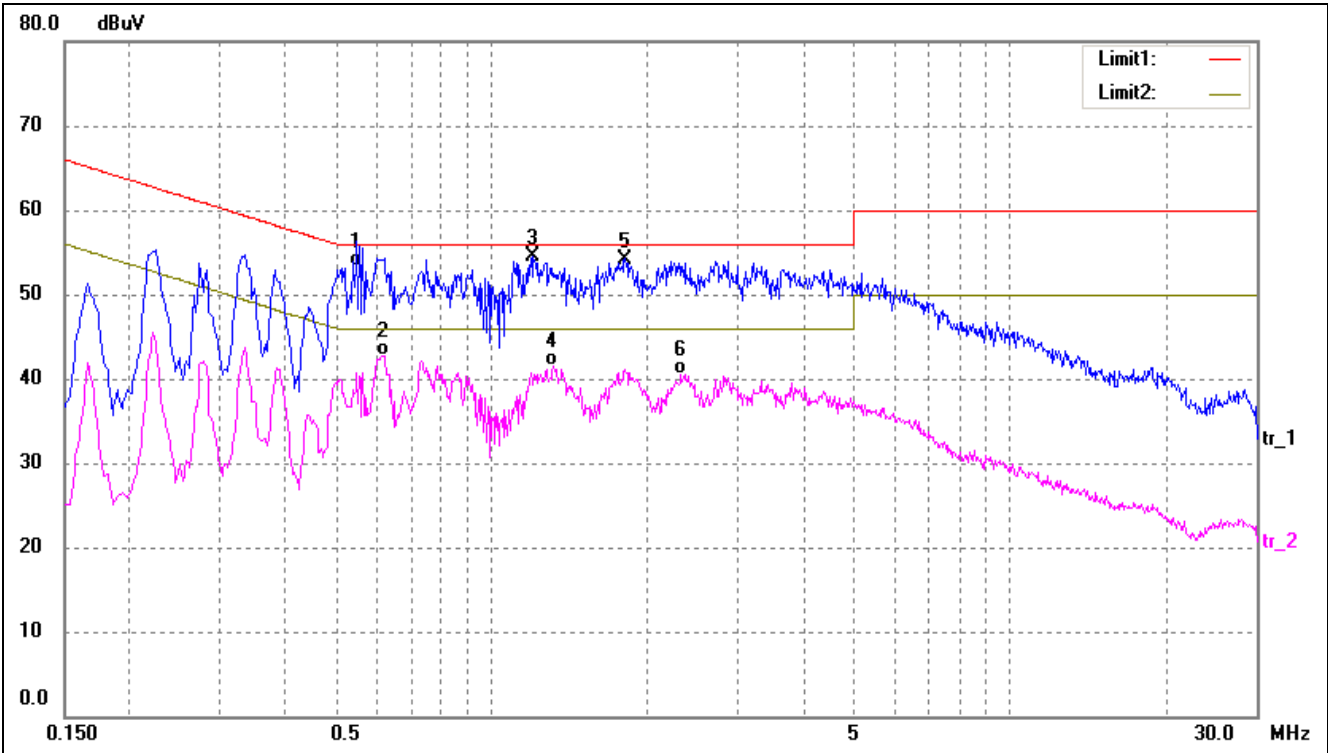
**-1.58 dB at 1.2059 MHz in the Line mode, peak detector, 0.15-30MHz**

## 10.8 Conducted Emissions Test Data

**Plot of Conducted Emissions Test Data**EUT: *Self-balancing Unicycle*Tested Model: *KS*Operating Condition: *BT Transmitting & charging*Comment: *Adapter:DC67.2V*Test Specification: *Neutral*

No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	1.2700	44.17	10.00	54.17	56.00	-1.83	peak
2	1.3860	28.12	10.00	38.12	46.00	-7.88	AVG
3	1.8340	28.12	10.00	38.12	46.00	-7.88	AVG
4	1.9580	44.24	10.00	54.24	56.00	-1.76	peak
5	19.4020	14.66	11.88	26.54	50.00	-23.46	AVG
6	19.5100	33.73	11.90	45.63	60.00	-14.37	peak

Test Specification: Line



No.	Frequency	Reading	Correct	Result	Limit	Margin	Detector
	(MHz)	(dBuV)	(dB/m)	(dBuV)	(dBuV)	(dB)	
1	0.5500	43.83	9.55	53.38	56.00	-2.62	QP
2	0.6140	33.19	9.61	42.80	46.00	-3.20	AVG
3	1.2059	44.42	10.00	54.42	56.00	-1.58	peak
4	1.3180	31.47	10.00	41.47	46.00	-4.53	AVG
5	1.8100	44.20	10.00	54.20	56.00	-1.80	peak
6	2.3220	30.59	10.00	40.59	46.00	-5.41	AVG

\*\*\*\*\* END OF REPORT \*\*\*\*\*