



## STC Test Report

Date : 2012-11-08

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No. : MH187158

**Applicant (C01494):** Hip Shing Electronics Ltd.  
Units 1, 2 & 3, 20/F., New Treasure Centre, 10., Ng Fong Street, San Po Kong, Kowloon, Hong Kong

**Manufacturer:** Dongguan Zhi Cheng Electronic Products Co., Ltd.  
China, Dongguanshi, Tangxia, Ping San 188 Ind. Zone

**Description of Sample(s):** Product: JLAB Bouncer  
Brand Name: JLAB  
Model Number: JLAB-BTBLACK-DT  
FCC ID: BZAJLABBTBOX

**Date Sample(s) Received:** 2012-08-31

**Date Tested:** 2012-09-03 to 2012-10-31

**Investigation Requested:** Perform ElectroMagnetic Interference measurement in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2011 and ANSI C63.4:2009 for FCC Certification.

**Conclusion(s):** The submitted product COMPLIED with the requirements of Federal Communications Commission [FCC] Rules and Regulations Part 15. The tests were performed in accordance with the standards described above and on Section 2.2 in this Test Report.

**Remark(s):** For additional models details, see page 3.

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Dr. LEE Kam Chuen  
Authorized Signatory  
ElectroMagnetic Compatibility Department  
For and on behalf of  
The Hong Kong Standards and Testing Centre Ltd.

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### **1.0 General Details**

#### **1.1 Test Laboratory**

The Hong Kong Standards and Testing Centre Ltd.  
EMC Laboratory  
10 Dai Wang Street, Taipo Industrial Estate  
New Territories, Hong Kong

#### **1.2 Equipment Under Test [EUT] Description of Sample(s)**

Product: JLAB Bouncer  
Manufacturer: Dongguan Zhi Cheng Electronic Products Co., Ltd.  
Brand Name: JLAB  
Model Number: JLAB-BTBLACK-DT  
Additional Model Number(s): JLAB-BTWHITE-DT  
Input Voltage: 18Vd.c. with Jack  
The AC/DC adapter was provided by the applicant with following details:  
Brand name: GPE; Model no.: GPE365-180200-1; Input: 100-240V a.c. 50/60Hz 1A;  
Output: 18Vd.c. 2000mA 36W.

##### **1.2.1 Description of EUT Operation**

The Equipment Under Test (EUT) is a Hip Shing Electronics Ltd. JLAB Bouncer, it is Audio System, modulation by IC; and type is frequency hopping speed spectrum Modulation.

#### **1.3 Date of Order**

2012-08-31

#### **1.4 Submitted Sample(s):**

1 Sample

#### **1.5 Test Duration**

2012-09-03 to 2012-10-31

#### **1.6 Country of Origin**

China

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### 1.7 RF Module Details

Module Model Number: WI-BT0916  
Module FCC ID:  
Module Transmission Type: Bluetooth V2.1+EDR  
Modulation: FHSS (GFSK /  $\pi/4$ -DQPSK / 8DPSK)  
Data Rates:  
1MBps: GFSK  
2 MBps:  $\pi/4$ -DQPSK  
3 MBps: 8DPSK  
Frequency Range: 2400-2483.5MHz  
Carrier Frequencies: 2402MHz – 2480MHz

Module Specification (specification provided by manufacturer)

### 1.8 Antenna Details

Antenna Type: PCB Layout Inverted F  
Antenna Length: 18x4mm  
Antenna Gain: 1.5dBi

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### **2.0 Technical Details**

#### **2.1 Investigations Requested**

Perform Electromagnetic Interference measurements in accordance with FCC 47CFR [Codes of Federal Regulations] Part 15: 2011 Regulations and ANSI C63.4:2009 for FCC Certification.

#### **2.2 Test Standards and Results Summary Tables**

EMISSION Results Summary						
Test Condition	Test Requirement	Test Method	Class / Severity	Test Result		
				Pass	Fail	N/A
Output Power of Fundamental Emissions	FCC 47CFR 15.247(b)(1)	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
RF Conducted Spurious Emission	FCC 47CFR 15.247(c)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Radiated Spurious Emissions	FCC 47CFR 15.209	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
AC Mains Conducted Emissions	FCC 47CFR 15.207	ANSI C63.4:2009	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Number of Operating Channel	FCC 47CFR 15.247(a)(2)(b)(1)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Band-edge compliance of Conducted Emission	FCC 47CFR 15.247(c)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pseudorandom Hopping Algorithm	FCC 47CFR 15.247(a)(1)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Time of Occupancy	FCC 47CFR 15.247(a)(1)(iii)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20dB Bandwidth	FCC 47CFR 15.247(a)(2)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hopping Channel Separation	FCC 47CFR 15.247(a)(1)	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Antenna requirement	FCC 47CFR 15.203	N/A	N/A	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: N/A – Not Applicable

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### 2.3 Table for Test Modes

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate in the table below is the worst case rate with respect to the specific test item.

Investigation has been done on all the possible configurations for searching the worst cases.

The following table is a list of the test modes shown in this test report.

Test Items	Mode	Data Rate
Max. Conducted Output Power	GFSK / $\pi/4$ -DQPSK / 8DPSK	1MBps / 2MBps / 3MBps
Hopping Channel Separation	8DPSK	3MBps
Number of Hopping Frequency	8DPSK	3MBps
Dwell Time	8DPSK (DH1 / DH3 / DH5)	3MBps
Radiated Emissions Below 1GHz	GFSK	1MBps
Radiated Emission Above 1GHz	GFSK	1MBps
Band Edge Emissions	GFSK / $\pi/4$ -DQPSK / 8DPSK	1MBps / 2MBps / 3MBps

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### **3.0 Test Results**

#### **3.1 Emission**

##### **3.1.1 Maximum Peak Output Power**

Test Requirement:	FCC 47CFR 15.247(b)(1)
Test Method:	N/A
Test Date:	2012-09-05
Mode of Operation:	Bluetooth Communication mode

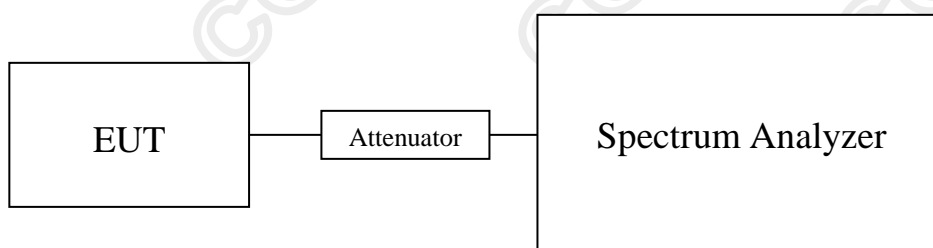
#### **Test Method:**

The RF output of the EUT was connected to the spectrum analyzer. All the attenuation or cable loss will be added to the measured maximum output power. The results are recorded in dBm.

#### **Spectrum Analyzer Setting:**

RBW = 3 MHz, VBW = 3MHz, Sweep = Auto, Span = 10MHz  
Detector = Peak, Trace = Max. hold

#### **Test Setup:**



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### **Limits for Peak Output Power of Fundamental & Harmonics Emissions [FCC 47CFR 15.247]:**

The maximum peak output power shall not exceeded the following limits:  
For frequency hopping systems employing at least 75 hopping channels: 1 Watt  
For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 Watts  
For Digital Transmission systems in 2400-2483.5 MHz Band: 1 Watt

### **Results of Bluetooth Communication mode (GFSK) (Fundamental Power): Pass Maximum conducted output power**

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2402	0.000057

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2441	0.000076

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.000083

### **Results of Bluetooth Communication mode ( $\pi/4$ -DQPSK) (Fundamental Power): Pass Maximum conducted output power**

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2402	0.000046

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2442	0.000048

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.000050

### **Results of Bluetooth Communication mode (8 DPSK) (Fundamental Power): Pass Maximum conducted output power**

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2402	0.000057

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2442	0.000070

Transmitter Frequency (MHz)	Maximum conducted output power (Watt)
2480	0.000084

Limit: 0.125W (125mW)

Calculated measurement uncertainty : 30MHz to 1GHz 1.7dB  
1GHz to 18GHz 1.7dB

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### **3.1.2 Radiated Spurious Emissions**

Test Requirement: FCC 47CFR 15.209  
Test Method: ANSI C63.4:2009  
Test Date: 2012-10-31  
Mode of Operation: Tx mode / Aux in (Connected to iPod) / Bluetooth Communication mode

#### **Test Method:**

The sample was placed 0.8m above the ground plane of semi-anechoic Chamber\*. Measurements in both horizontal and vertical polarities were performed. During the test, each emission was maximized by: having the EUT continuously working, investigated all operating modes, considered typical configuration to obtain worst position, manipulating interconnecting cables, rotating turntable, varying antenna height from 1m to 4m in both horizontal and vertical polarizations. The emissions worst-case are shown in Test Results of the following pages.

\* Semi-anechoic chamber located on the G/F of "The Hong Kong Standards and Testing Centre Ltd." with a metal ground plane filed with the FCC pursuant to section 2.948 of the FCC rules, with Registration Number: 607756.

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### Spectrum Analyzer Setting:

9KHz – 30MHz (Pk & Av)

RBW: 10kHz  
VBW: 30kHz  
Sweep: Auto  
Span: Fully capture the emissions being measured  
Trace: Max. hold

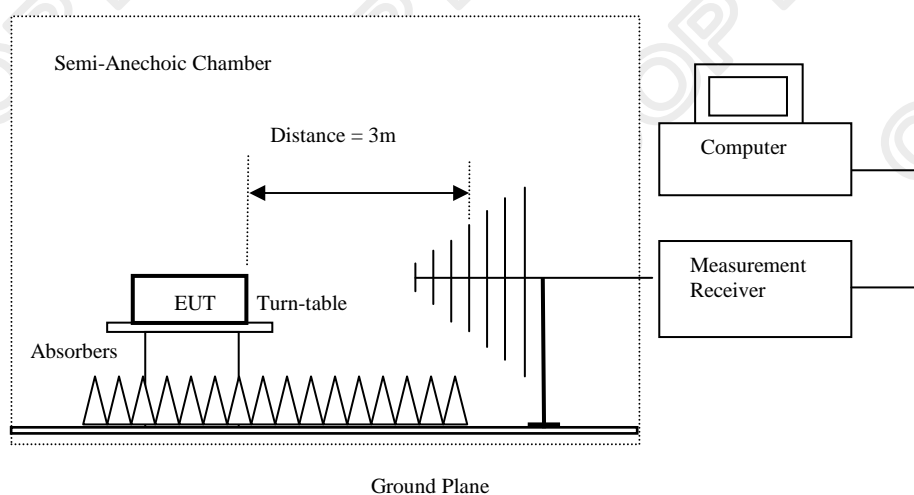
30MHz – 1GHz (QP)

RBW: 120kHz  
VBW: 120kHz  
Sweep: Auto  
Span: Fully capture the emissions being measured  
Trace: Max. hold

Above 1GHz (Pk & Av)

RBW: 3MHz  
VBW: 3MHz  
Sweep: Auto  
Span: Fully capture the emissions being measured  
Trace: Max. hold

### Test Setup:



Absorbers placed on top of the ground plane are for measurements above 1000MHz only.

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### Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

Frequency Range [MHz]	Quasi-Peak Limits [ $\mu\text{V/m}$ ]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Result of Tx mode (2402.0 MHz) (GFSK mode) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu\text{V}$	Correction Factor dB/m	Field Strength dB $\mu\text{V/m}$	Field Strength $\mu\text{V/m}$	Limit $\mu\text{V/m}$	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Result of Tx mode (2402.0 MHz) (GFSK mode) (30MHz – 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu\text{V}$	Correction Factor dB/m	Field Strength dB $\mu\text{V/m}$	Field Strength $\mu\text{V/m}$	Limit $\mu\text{V/m}$	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Result of Tx mode (2402.0 MHz) (GFSK mode) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu\text{V}$	Correction Factor dB/m	Field Strength dB $\mu\text{V/m}$	Limit @3m dB $\mu\text{V/m}$	Margin dB $\mu\text{V/m}$	E-Field Polarity
4804.0	9.1	41.5	50.6	74.0	23.4	Horizontal
4804.0	12.2	41.5	53.7	74.0	20.3	Vertical
7206.0	6.6	48.8	55.4	74.0	18.6	Horizontal
7206.0	4.1	48.8	52.9	74.0	21.1	Vertical

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### Result of Tx mode (2402.0 MHz) (GFSK mode) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4804.0	-1.2	41.5	40.3	54.0	13.7	Horizontal
4804.0	2.2	41.5	43.7	54.0	10.3	Vertical
7206.0	-5.1	48.8	43.7	54.0	10.3	Horizontal
7206.0	-6.1	48.8	42.7	54.0	11.3	Vertical

### Result of Tx mode (2441.0 MHz) (GFSK mode) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
<b>Emissions detected are more than 20 dB below the FCC Limits</b>						

### Results of Tx mode (2441.0 MHz) (GFSK mode) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
<b>Emissions detected are more than 20 dB below the FCC Limits</b>						

### Result of Tx mode (2441.0 MHz) (GFSK mode) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4882.0	13.4	41.4	54.8	74.0	19.2	Horizontal
4882.0	12.0	41.4	53.4	74.0	20.6	Vertical
7323.0	4.9	48.7	53.6	74.0	20.4	Horizontal
7323.0	3.9	48.7	52.6	74.0	21.4	Vertical

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### Result of Tx mode (2441.0 MHz) (GFSK mode) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4882.0	-6.9	41.4	34.5	54.0	19.5	Horizontal
4882.0	-8.3	41.4	33.1	54.0	20.9	Vertical
7323.0	-16.7	48.7	32.0	54.0	22.0	Horizontal
7323.0	-16	48.7	32.7	54.0	21.3	Vertical

### Result of Tx mode (2480.0 MHz) (GFSK mode) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Results of Tx mode (2480.0 MHz) (GFSK mode) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

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### Result of Tx mode (2480.0 MHz) (GFSK mode) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4960.0	13.7	41.4	55.1	74.0	18.9	Horizontal
4960.0	12.9	41.4	54.3	74.0	19.7	Vertical
7440.0	3.3	48.6	51.9	74.0	22.1	Horizontal
7440.0	3.5	48.6	52.1	74.0	21.9	Vertical

### Result of Tx mode (2480.0 MHz) (GFSK mode) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4960.0	-5.0	41.4	36.4	54.0	17.6	Horizontal
4960.0	-7.7	41.4	33.7	54.0	20.3	Vertical
7440.0	-15.0	48.6	33.6	54.0	20.4	Horizontal
7440.0	-15.9	48.6	32.7	54.0	21.3	Vertical

Remarks:

\* Denotes restricted band of operation.

Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty	:	30MHz to 1GHz	4.9dB
		1GHz to 6GHz	4.02dB
		6GHz to 18GHz	4.03dB

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### Result of Tx mode (2402.0 MHz) ( $\pi/4$ -DQPSK mode) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Result of Tx mode (2402.0 MHz) ( $\pi/4$ -DQPSK mode) (30MHz – 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Result of Tx mode (2402.0 MHz) ( $\pi/4$ -DQPSK mode) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4804.0	7.8	41.5	49.3	74.0	24.7	Horizontal
4804.0	11.6	41.5	53.1	74.0	20.9	Vertical
7206.0	5.8	48.8	54.6	74.0	19.4	Horizontal
7206.0	4.5	48.8	53.3	74.0	20.7	Vertical

### Result of Tx mode (2402.0 MHz) ( $\pi/4$ -DQPSK mode) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4804.0	-2.5	41.5	39.0	54.0	15.0	Horizontal
4804.0	1.2	41.5	42.7	54.0	11.3	Vertical
7206.0	-6.2	48.8	42.6	54.0	11.4	Horizontal
7206.0	-7.5	48.8	41.3	54.0	12.7	Vertical

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**Result of Tx mode (2441.0 MHz) ( $\pi/4$ -DQPSK mode) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

**Results of Tx mode (2441.0 MHz) ( $\pi/4$ -DQPSK mode) (30MHz – 1000MHz): PASS**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

**Result of Tx mode (2441.0 MHz) ( $\pi/4$ -DQPSK mode) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4882.0	12.3	41.4	53.7	74.0	20.3	Horizontal
4882.0	11.5	41.4	52.9	74.0	21.1	Vertical
7323.0	3.7	48.7	52.4	74.0	21.6	Horizontal
7323.0	2.9	48.7	51.6	74.0	22.4	Vertical

**Result of Tx mode (2441.0 MHz) ( $\pi/4$ -DQPSK mode) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4882.0	-7.7	41.4	33.7	54.0	20.3	Horizontal
4882.0	-8.5	41.4	32.9	54.0	21.1	Vertical
7323.0	-16.3	48.7	32.4	54.0	21.6	Horizontal
7323.0	-17.1	48.7	31.6	54.0	22.4	Vertical

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**Result of Tx mode (2480.0 MHz) ( $\pi/4$ -DQPSK mode) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
<b>Emissions detected are more than 20 dB below the FCC Limits</b>						

**Results of Tx mode (2480.0 MHz) ( $\pi/4$ -DQPSK mode) (30MHz – 1000MHz): PASS**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
<b>Emissions detected are more than 20 dB below the FCC Limits</b>						

**Result of Tx mode (2480.0 MHz) ( $\pi/4$ -DQPSK mode) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4960.0	14.1	41.4	55.5	74.0	18.5	Horizontal
4960.0	12.4	41.4	53.8	74.0	20.2	Vertical
7440.0	4.1	48.6	52.7	74.0	21.3	Horizontal
7440.0	3.7	48.6	52.3	74.0	21.7	Vertical

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### Result of Tx mode (2480.0 MHz) ( $\pi/4$ -DQPSK mode) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4960.0	-5.9	41.4	35.5	54.0	18.5	Horizontal
4960.0	-9.3	41.4	32.1	54.0	21.9	Vertical
7440.0	-15.1	48.6	33.5	54.0	20.5	Horizontal
7440.0	-16.1	48.6	32.5	54.0	21.5	Vertical

Remarks:

\* Denotes restricted band of operation.

Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 4.9dB  
1GHz to 6GHz 4.02dB  
6GHz to 18GHz 4.03dB

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### Result of Tx mode (2402.0 MHz) (8DPSK) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Result of Tx mode (2402.0 MHz) (8DPSK) (30MHz – 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Result of Tx mode (2402.0 MHz) (8DPSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4804.0	8.8	41.5	50.3	74.0	23.7	Horizontal
4804.0	12.6	41.5	54.1	74.0	19.9	Vertical
7206.0	7.5	48.8	56.3	74.0	17.7	Horizontal
7206.0	4.1	48.8	52.9	74.0	21.1	Vertical

### Result of Tx mode (2402.0 MHz) (8DPSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4804.0	-1.8	41.5	39.7	54.0	14.3	Horizontal
4804.0	1.0	41.5	42.5	54.0	11.5	Vertical
7206.0	-6.2	48.8	42.6	54.0	11.4	Horizontal
7206.0	-4.4	48.8	44.4	54.0	9.6	Vertical

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### Result of Tx mode (2441.0 MHz) (8DPSK) (9kHz – 30MHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Results of Tx mode (2441.0 MHz) (8DPSK) (30MHz – 1000MHz): PASS

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

### Result of Tx mode (2441.0 MHz) (8DPSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4882.0	13.3	41.4	54.7	74.0	19.3	Horizontal
4882.0	11.1	41.4	52.5	74.0	21.5	Vertical
7323.0	4.8	48.7	53.5	54.0	0.5	Horizontal
7323.0	2.9	48.7	51.6	54.0	2.4	Vertical

### Result of Tx mode (2441.0 MHz) (8DPSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4882.0	-6.7	41.4	34.7	54.0	19.3	Horizontal
4882.0	-6.5	41.4	34.9	54.0	19.1	Vertical
7323.0	-16.3	48.7	32.4	54.0	21.6	Horizontal
7323.0	-15.1	48.7	33.6	54.0	20.4	Vertical

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**Result of Tx mode (2480.0 MHz) (8DPSK) (9kHz – 30MHz): Pass**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

**Results of Tx mode (2480.0 MHz) (8DPSK) (30MHz – 1000MHz): PASS**

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Field Strength $\mu$ V/m	Limit $\mu$ V/m	E-Field Polarity
Emissions detected are more than 20 dB below the FCC Limits						

**Result of Tx mode (2480.0 MHz) (8DPSK) (Above 1GHz): Pass**

Field Strength of Spurious Emissions Peak Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4960.0	13.5	41.4	54.9	74.0	19.1	Horizontal
4960.0	13.1	41.4	54.5	74.0	19.5	Vertical
7440.0	5.8	48.6	54.4	74.0	19.6	Horizontal
7440.0	3	48.6	51.6	74.0	22.4	Vertical

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### Result of Tx mode (2480.0 MHz) (8DPSK) (Above 1GHz): Pass

Field Strength of Spurious Emissions Average Value						
Frequency MHz	Measured Level @3m dB $\mu$ V	Correction Factor dB/m	Field Strength dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Margin dB $\mu$ V/m	E-Field Polarity
4960.0	-4.9	41.4	36.5	54.0	17.5	Horizontal
4960.0	-8.3	41.4	33.1	54.0	20.9	Vertical
7440.0	-14.1	48.6	34.5	54.0	19.5	Horizontal
7440.0	-7.1	48.6	41.5	54.0	12.5	Vertical

#### Remarks:

\* Denotes restricted band of operation.

Measurements were made using a peak detector. Any emission less than 1000MHz and falling within the restricted bands of FCC Rules Part 15 Section 15.205 and the limits of FCC Rules Part 15 Section 15.209 were applied.

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 4.9dB  
1GHz to 6GHz 4.02dB  
6GHz to 18GHz 4.03dB

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### Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

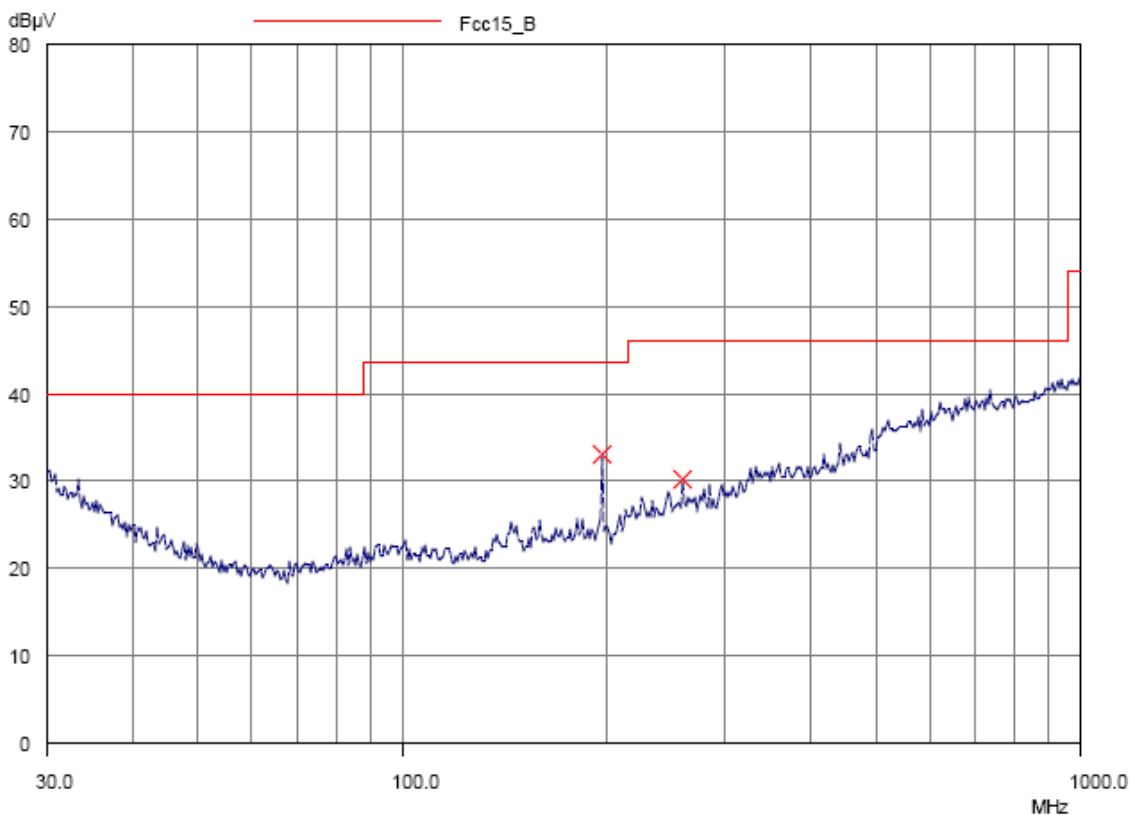
Frequency Range [MHz]	Quasi-Peak Limits [ $\mu\text{V}/\text{m}$ ]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Result of Aux in mode (Connected to iPod) (30MHz – 1GHz): Pass

Please refer to the following table for result details

Horizontal



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### **Result of Aux in mode (Connected to iPod) (30MHz – 1GHz): Pass**

<b>Radiated Emissions Quasi-Peak</b>					
Emission Frequency MHz	E-Field Polarity	Level @3m dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Level @3m $\mu$ V/m	Limit @3m $\mu$ V/m
196.7	Horizontal	33.2	43.5	45.7	150
258.1	Horizontal	30.3	46.0	32.7	200

Remarks:

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty	:	30MHz to 1GHz	4.9dB
		1GHz to 6GHz	4.02dB
		6GHz to 18GHz	4.03dB

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### Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

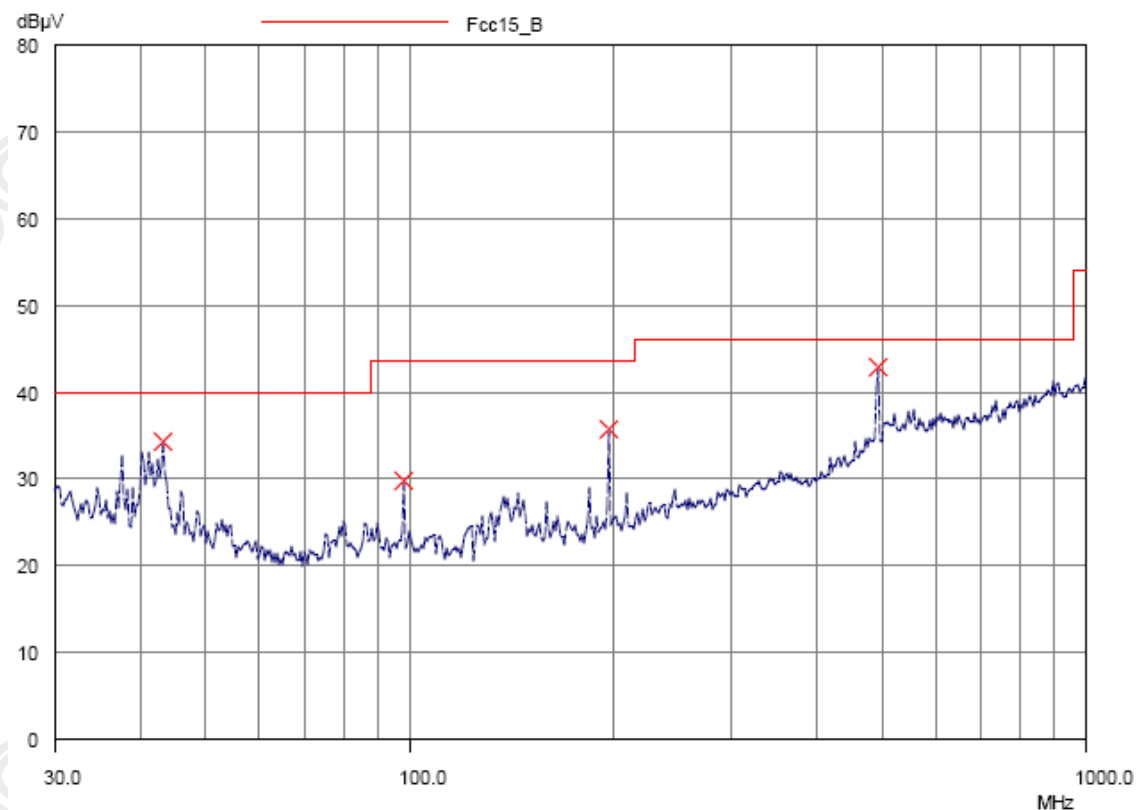
Frequency Range [MHz]	Quasi-Peak Limits [ $\mu\text{V}/\text{m}$ ]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Result of Aux in mode (Connected to iPod) (30MHz – 1GHz): Pass

Please refer to the following table for result details

Vertical



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### Result of Aux in mode (Connected to iPod) (30MHz – 1GHz): Pass

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Level @3m $\mu$ V/m	Limit @3m $\mu$ V/m
43.3	Vertical	34.3	40.0	51.9	100
98.3	Vertical	29.7	43.5	30.5	150
196.6	Vertical	35.9	43.5	62.4	150
491.4	Vertical	42.9	46.0	139.6	200

Remarks:

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty	:	30MHz to 1GHz	4.9dB
		1GHz to 6GHz	4.02dB
		6GHz to 18GHz	4.03dB

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### Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

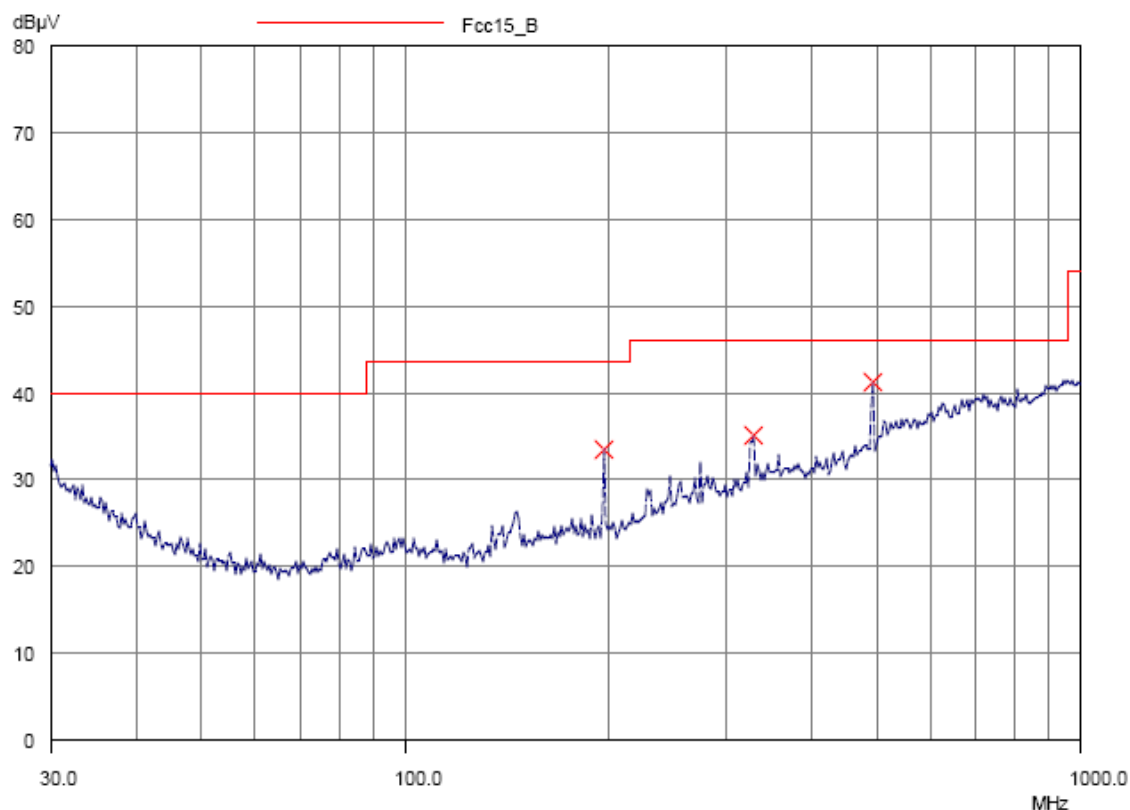
Frequency Range [MHz]	Quasi-Peak Limits [ $\mu\text{V}/\text{m}$ ]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Result of Bluetooth Communication mode (30MHz – 1GHz): Pass

Please refer to the following table for result details

Horizontal



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### **Result of Bluetooth Communication mode (30MHz – 1GHz): Pass**

<b>Radiated Emissions</b>					
<b>Quasi-Peak</b>					
Emission Frequency MHz	E-Field Polarity	Level @3m dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Level @3m $\mu$ V/m	Limit @3m $\mu$ V/m
196.6	Horizontal	33.6	43.5	47.9	150
326.9	Horizontal	35.1	46.0	56.9	200
491.4	Horizontal	42.4	46.0	131.8	200

Remarks:

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty : 30MHz to 1GHz 4.9dB  
1GHz to 6GHz 4.02dB  
6GHz to 18GHz 4.03dB

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### Limits for Radiated Emissions [FCC 47 CFR 15.209 Class B]:

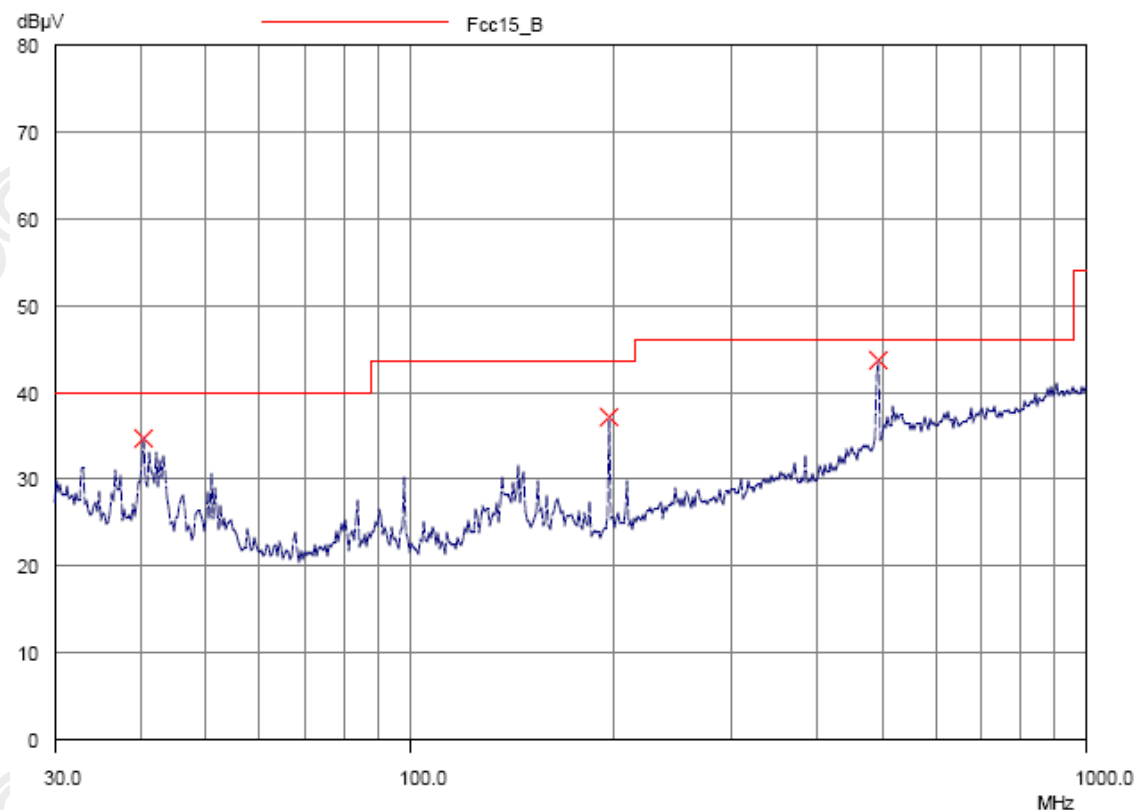
Frequency Range [MHz]	Quasi-Peak Limits [ $\mu\text{V/m}$ ]
0.009-0.490	2400/F (kHz)
0.490-1.705	24000/F (kHz)
1.705-30	30
30-88	100
88-216	150
216-960	200
Above960	500

The emission limits shown in the above table are based on measurement employing a CISPR quasi-peak detector and above 1000MHz are based on measurements employing an average detector.

### Result of Bluetooth Communication mode (30MHz – 1GHz): Pass

Please refer to the following table for result details

Vertical



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### Result of Bluetooth Communication mode (30MHz – 1GHz): Pass

Radiated Emissions Quasi-Peak					
Emission Frequency MHz	E-Field Polarity	Level @3m dB $\mu$ V/m	Limit @3m dB $\mu$ V/m	Level @3m $\mu$ V/m	Limit @3m $\mu$ V/m
40.5	Vertical	34.8	40.0	55.0	100
196.6	Vertical	37.3	43.5	73.3	150
491.5	Vertical	43.8	46.0	154.9	200

Remarks:

Correction Factor included Antenna Factor and Cable Attenuation.

Calculated measurement uncertainty	:	30MHz to 1GHz	4.9dB
		1GHz to 6GHz	4.02dB
		6GHz to 18GHz	4.03dB

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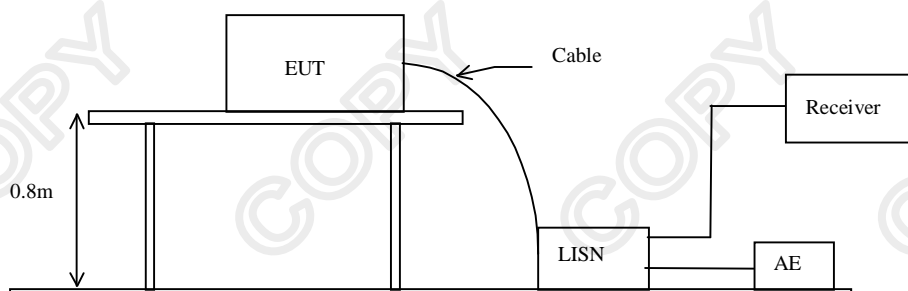
### 3.1.3 Conducted Emissions (0.15MHz to 30MHz)

Test Requirement: FCC 47CFR 15.207  
Test Method: ANSI C63.4:2009  
Test Date: 2012-09-04  
Mode of Operation: Aux in mode / Bluetooth Communication mode  
Test Voltage: 117Va.c., 60Hz

#### Test Method:

The test was performed in accordance with ANSI C63.4: 2009, with the following: an initial measurement was performed in peak and average detection mode on the live line, any emissions recorded within 30dB of the relevant limit line were re-measured using quasi-peak and average detection on the live and neutral lines with the worst case recorded in the table of results.

#### Test Setup:



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### Limit for Conducted Emissions (FCC 47 CFR 15.207):

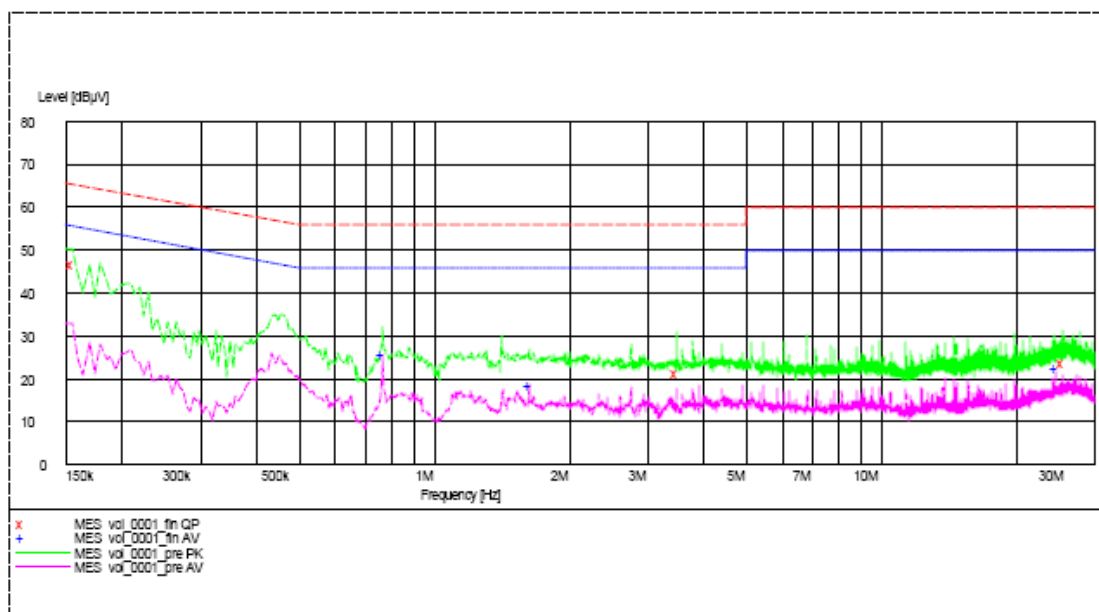
Frequency Range [MHz]	Quasi-Peak Limits [dB $\mu$ V]	Average [dB $\mu$ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

\* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

### Results of Aux in mode (Aux in Connected to iPod, USB Port Connected to Resistive load) (L): PASS

Please refer to the following diagram for individual results.



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**Results of Aux in mode (Aux in Connected to iPod, USB Port Connected to Resistive load) (L):**  
**PASS**

Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dB $\mu$ V	Limit dB $\mu$ V	Level dB $\mu$ V	Limit dB $\mu$ V
Live	0.155	46.7	66.0	-*-	-*-
Live	3.500	21.4	56.0	-*-	-*-
Live	25.600	23.7	60.0	-*-	-*-
Live	0.770	-*-	-*-	25.8	46.0
Live	1.635	-*-	-*-	18.5	46.0
Live	24.575	-*-	-*-	22.5	56.0

Remarks:

Calculated measurement uncertainty : 3.25dB

-\*- Emission(s) that is far below the corresponding limit line.

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### Limit for Conducted Emissions (FCC 47 CFR 15.207):

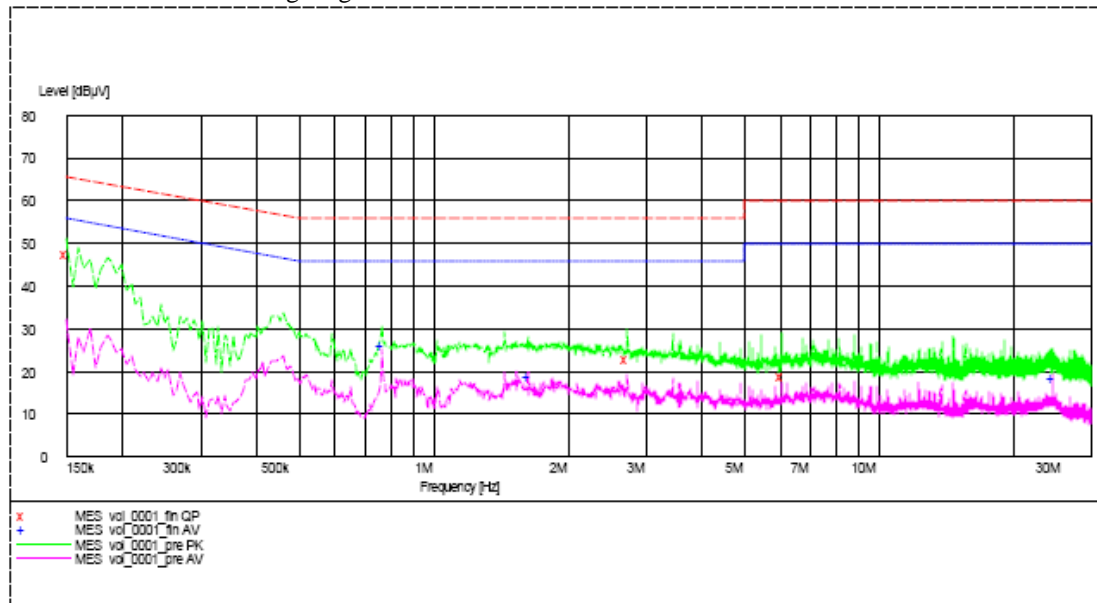
Frequency Range [MHz]	Quasi-Peak Limits [dB $\mu$ V]	Average [dB $\mu$ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

\* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

### Results of Aux in mode (Aux in Connected to iPod, USB Port Connected to Resistive load) (N): PASS

Please refer to the following diagram for individual results.



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**Results of Aux in mode (Aux in Connected to iPod, USB Port Connected to Resistive load) (N):**  
**PASS**

Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dB $\mu$ V	Limit dB $\mu$ V	Level dB $\mu$ V	Limit dB $\mu$ V
Neutral	0.150	47.8	56.0	*-	*-
Neutral	2.730	23.2	56.0	*-	*-
Neutral	6.065	19.1	60.0	*-	*-
Neutral	0.770	*-	*-	26.3	46.0
Neutral	1.635	*-	*-	19.0	46.0
Neutral	24.575	*-	*-	18.7	50.0

Remarks:

Calculated measurement uncertainty : 3.25dB

\*- Emission(s) that is far below the corresponding limit line.

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### Limit for Conducted Emissions (FCC 47 CFR 15.207):

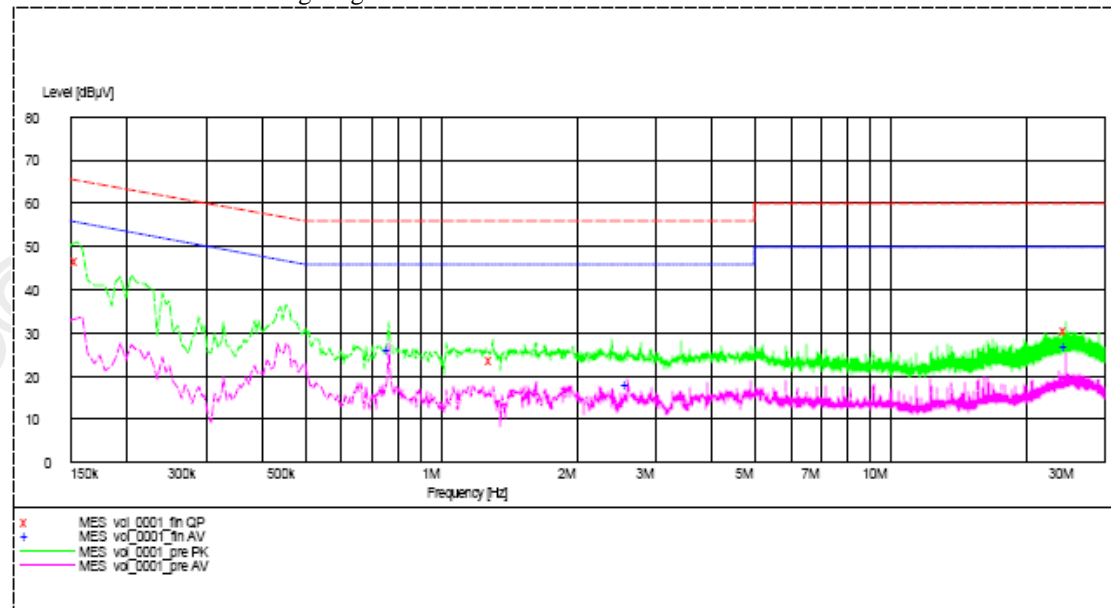
Frequency Range [MHz]	Quasi-Peak Limits [dB $\mu$ V]	Average [dB $\mu$ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

\* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

### Results of Bluetooth mode (BT paired with Mobile phone, USB Port connected to resistive load) (L): PASS

Please refer to the following diagram for individual results.



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### Results of Bluetooth mode (BT paired with Mobile phone, USB Port connected to resistive load)

(L): PASS

Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dB $\mu$ V	Limit dB $\mu$ V	Level dB $\mu$ V	Limit dB $\mu$ V
Live	0.155	46.9	66.0	-*-	-*-
Live	1.305	23.8	56.0	-*-	-*-
Live	24.575	30.7	60.0	-*-	-*-
Live	0.770	-*-	-*-	26.4	46.0
Live	2.615	-*-	-*-	18.4	46.0
Live	24.575	-*-	-*-	27.0	50.0

Remarks:

Calculated measurement uncertainty : 3.25dB

-\*- Emission(s) that is far below the corresponding limit line.

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### Limit for Conducted Emissions (FCC 47 CFR 15.207):

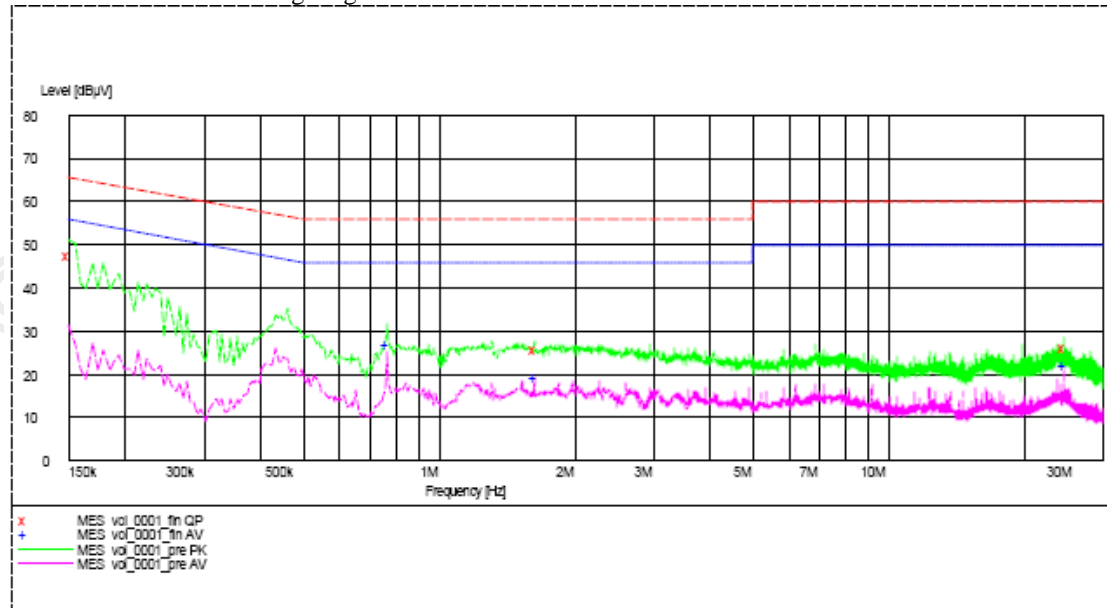
Frequency Range [MHz]	Quasi-Peak Limits [dB $\mu$ V]	Average [dB $\mu$ V]
0.15-0.5	66 to 56*	56 to 46*
0.5-5.0	56	46
5.0-30.0	60	50

\* Decreases with the logarithm of the frequency.

Limits for Conducted Emissions Test, please refer to limit lines (Quasi-Peak and Average) in the following diagram.

### Results of Bluetooth mode (BT paired with Mobile phone, USB Port connected to resistive load) (N): PASS

Please refer to the following diagram for individual results.



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### Results of Bluetooth mode (BT paired with Mobile phone, USB Port connected to resistive load)

(N): PASS

Conductor Live or Neutral	Frequency MHz	Quasi-peak		Average	
		Level dB $\mu$ V	Limit dB $\mu$ V	Level dB $\mu$ V	Limit dB $\mu$ V
Neutral	0.150	47.6	66.0	-*-	-*-
Neutral	1.635	26.0	56.0	-*-	-*-
Neutral	24.575	26.3	60.0	-*-	-*-
Neutral	0.770	-*-	-*-	27.2	46.0
Neutral	1.635	-*-	-*-	19.5	46.0
Neutral	24.575	-*-	-*-	22.3	50.0

#### Remarks:

Calculated measurement uncertainty : 3.25dB

-\*- Emission(s) that is far below the corresponding limit line.

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### **3.1.4 20dB Bandwidth Measurement**

Test Requirement: FCC 47CFR 15.247(a)(1)  
Test Method: ANSI C63.4:2009  
Test Date: 2012-09-04  
Mode of Operation: Communication mode

#### **Remark:**

The result has been done on all the possible configurations for searching the worst cases.

#### **Test Method:**

The bandwidth is measured at an amplitude level reduced from the reference level by a specified ratio. The reference level is the level of the highest amplitude signal observed from the transmitter at the fundamental frequency. Once the reference level is established, the equipment is conditioned with typical modulating signal to produce the worst-case (i.e. the widest) bandwidth.

#### **Test Setup:**

As Test Setup of clause 3.1.1 in this test report.

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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.120	Within 2400-2483.5

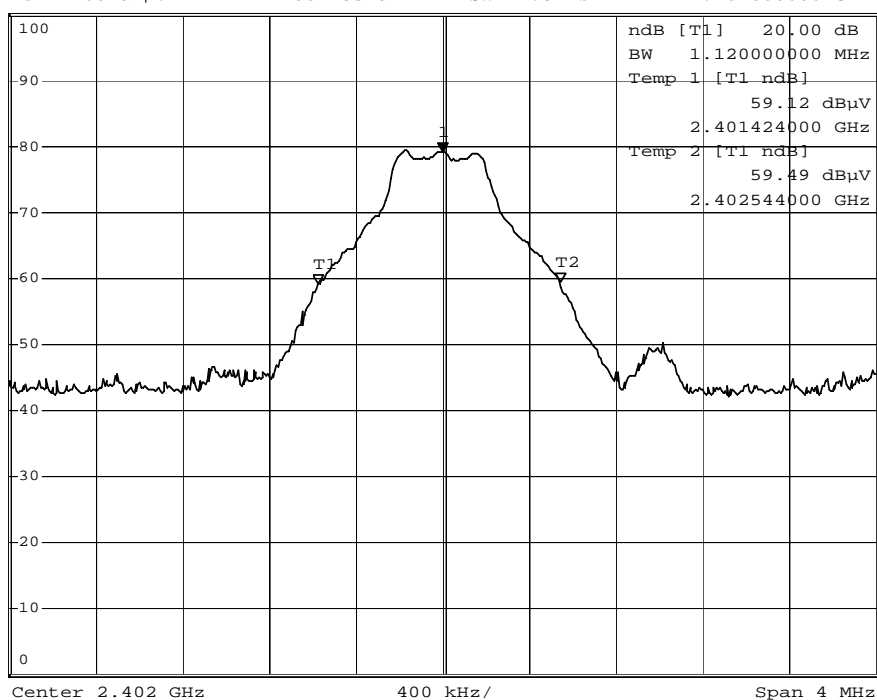
### (Lowest Operating Frequency)- (GFSK)



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 79.18 dB $\mu$ V  
SWT 2.5 ms 2.40200000 GHz

Ref 100 dB $\mu$ V

\*Att 35 dB



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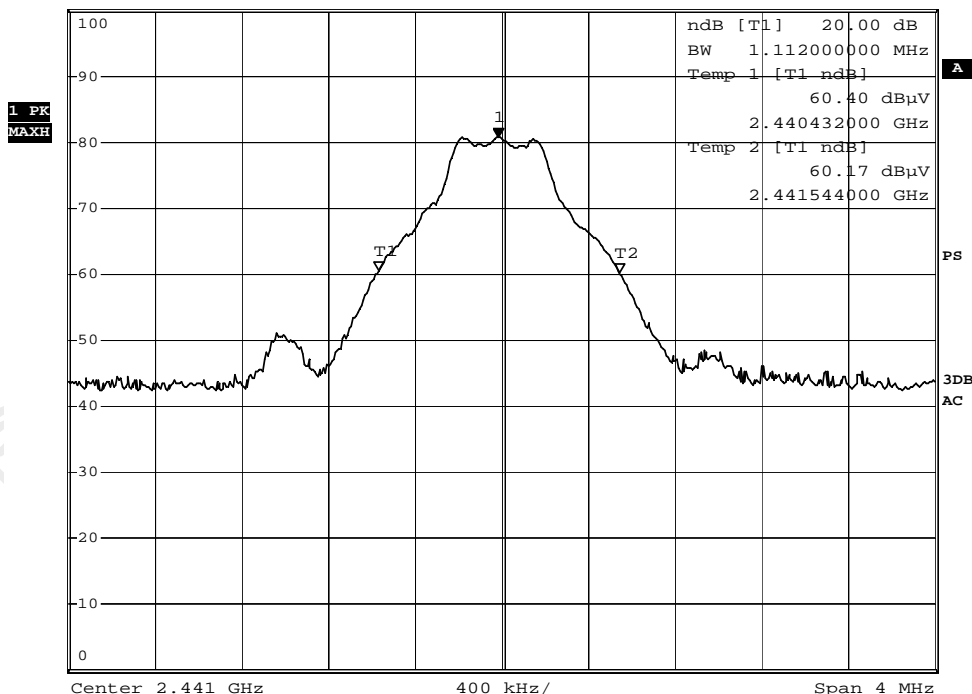
No. : MH187158

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.112	Within 2400-2483.5

## (Middle Operating Frequency)- (GFSK)



\*RBW 100 kHz    Marker 1 [T1 ]  
 \*VBW 300 kHz    80.69 dBμV  
 Ref 100 dBμV    \*Att 35 dB    SWT 2.5 ms    2.440984000 GHz



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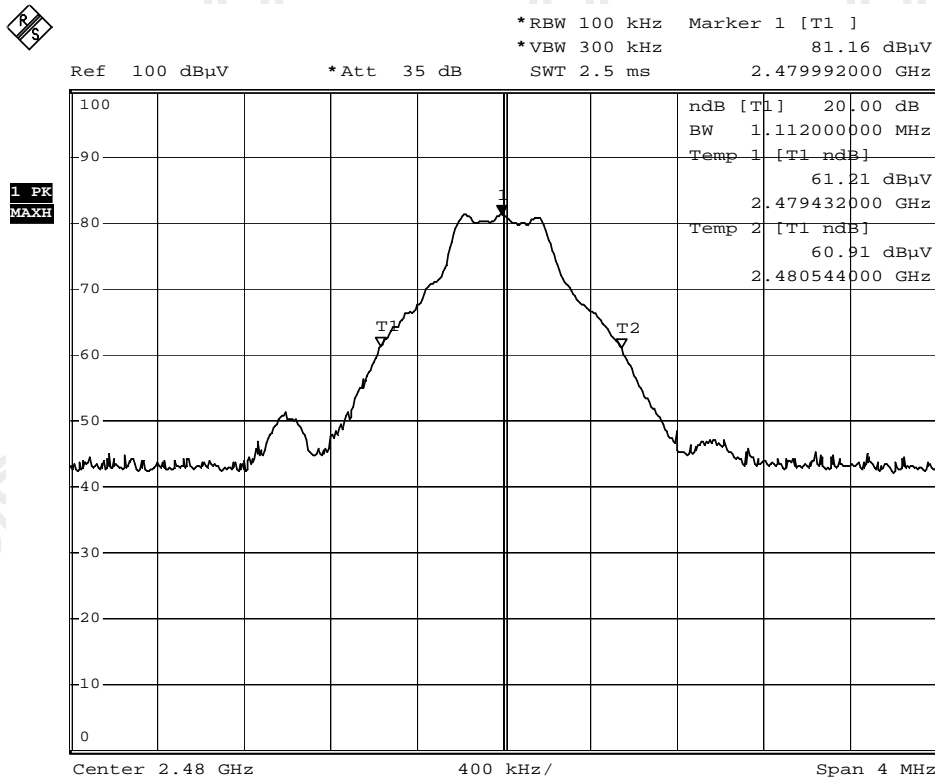
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.112	Within 2400-2483.5

### (Highest Operating Frequency)- (GFSK)



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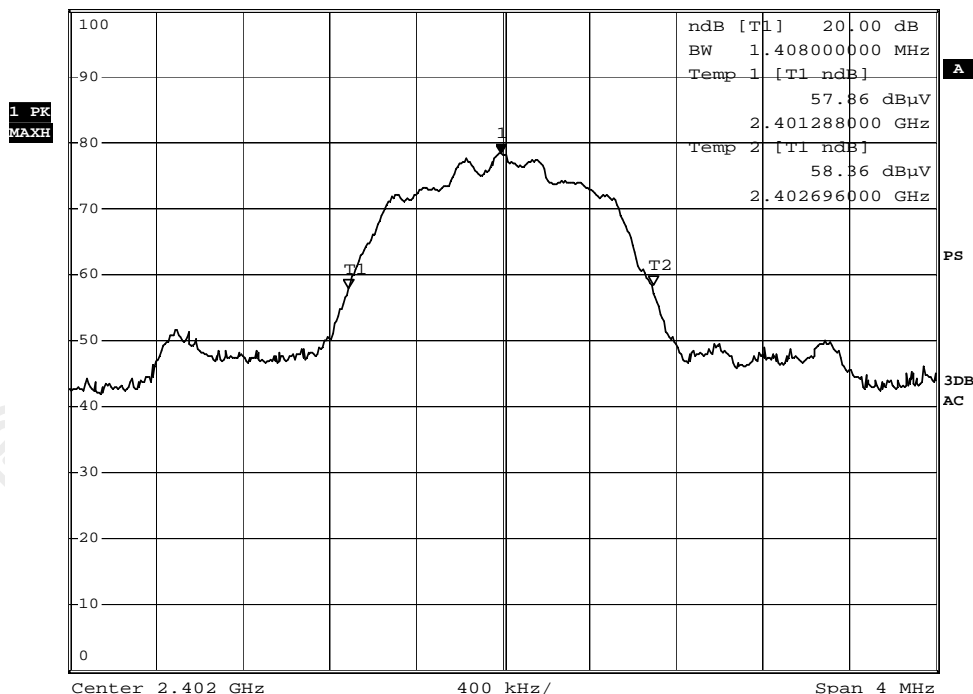
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.408	Within 2400-2483.5

(Lowest Operating Frequency)- ( $\pi/4$  DQPSK)



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 78.25 dB $\mu$ V  
Ref 100 dB $\mu$ V \*Att 35 dB SWT 2.5 ms 2.401992000 GHz



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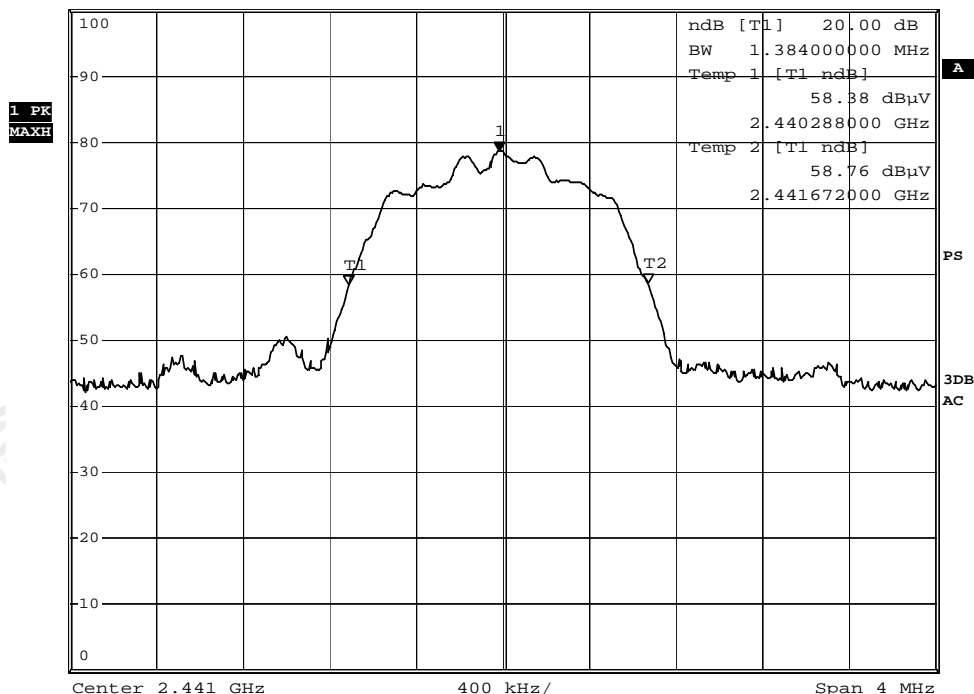
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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.384	Within 2400-2483.5

## (Middle Operating Frequency)- ( $\pi/4$ DQPSK)



\*RBW 100 kHz    Marker 1 [T1 ]  
 \*VBW 300 kHz    78.55 dB $\mu$ V  
 Ref 100 dB $\mu$ V    \*Att 35 dB    SWT 2.5 ms    2.440984000 GHz



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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.376	Within 2400-2483.5

## (Highest Operating Frequency)- ( $\pi/4$ DQPSK)

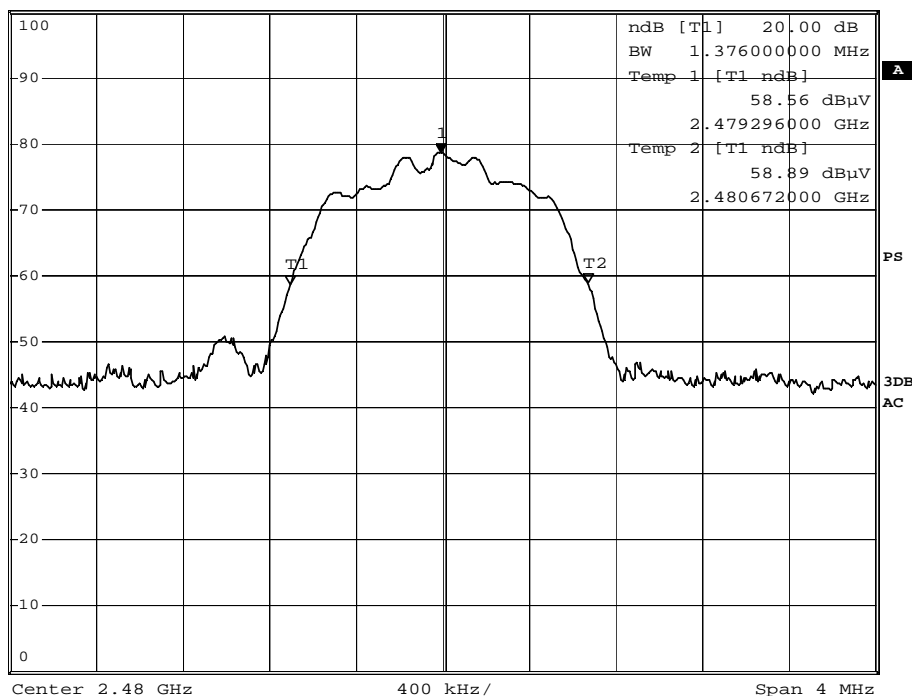


\*RBW 100 kHz Marker 1 [T1 ]  
 \*VBW 300 kHz 78.73 dB $\mu$ V  
 SWT 2.5 ms 2.479992000 GHz

Ref 100 dB $\mu$ V

\*Att 35 dB

2.479992000 GHz



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Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2402	1.360	Within 2400-2483.5

### (Lowest Operating Frequency)- (8DPSK)

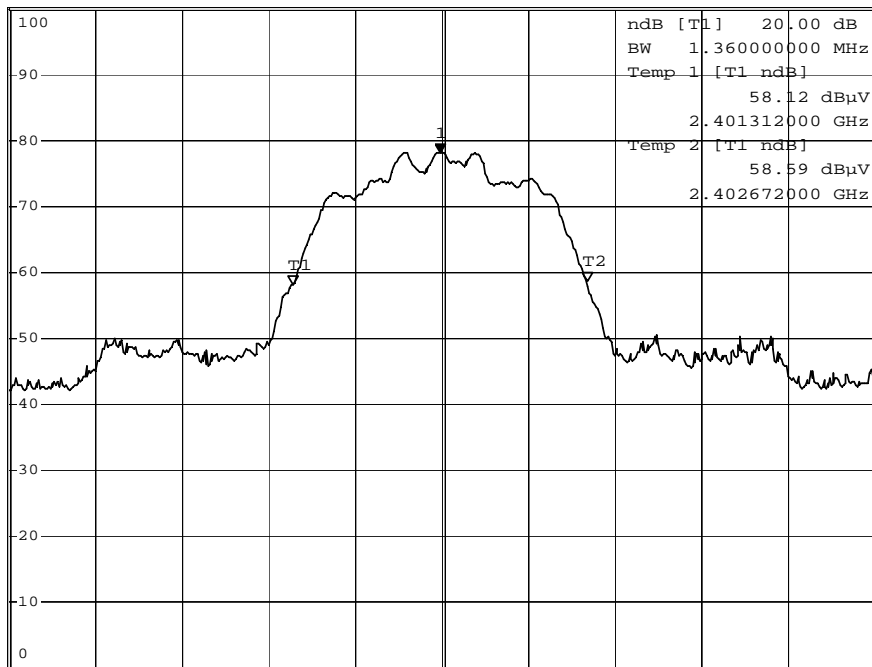


\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 78.21 dB $\mu$ V  
SWT 2.5 ms 2.401992000 GHz

Ref 100 dB $\mu$ V

\*Att 35 dB

2.401992000 GHz



Center 2.402 GHz

400 kHz/

Span 4 MHz

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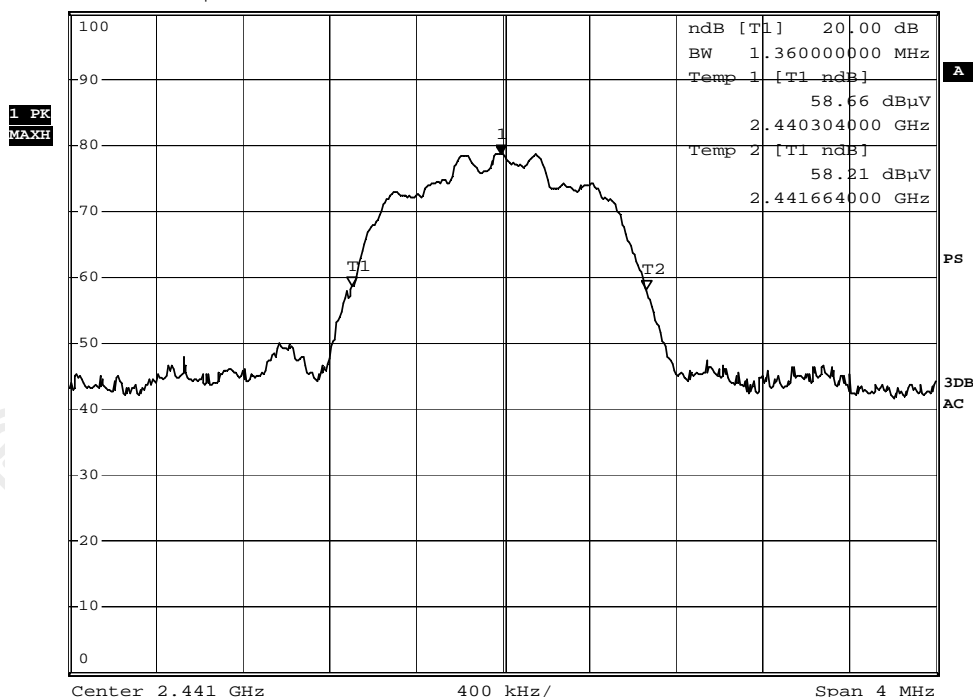
No. : MH187158

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2441	1.360	Within 2400-2483.5

### (Middle Operating Frequency)- (8DPSK)



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 78.69 dB $\mu$ V  
Ref 100 dB $\mu$ V \*Att 35 dB SWT 2.5 ms 2.440992000 GHz



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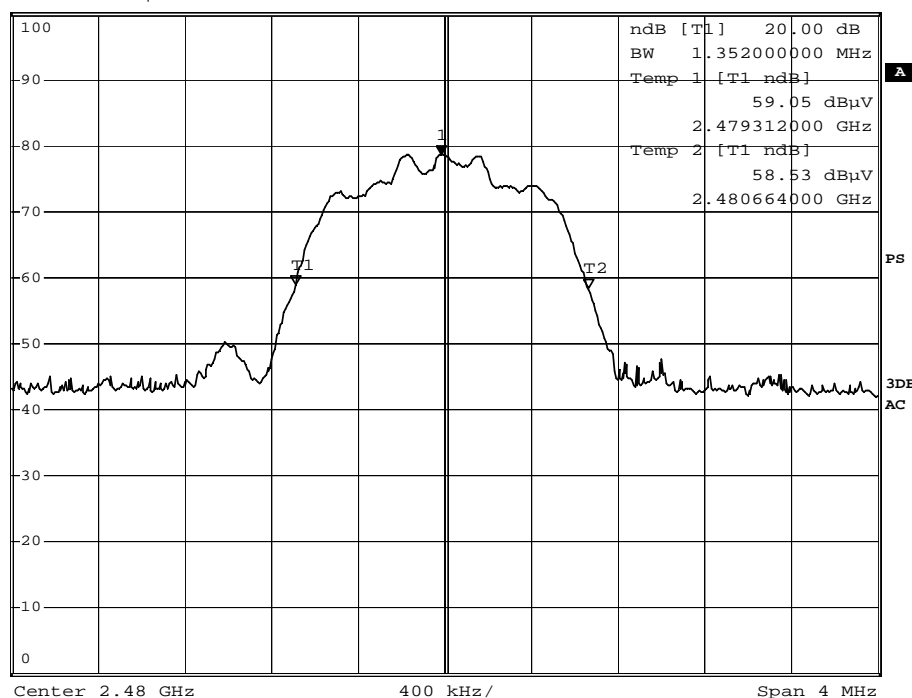
No. : MH187158

Fundamental Frequency [MHz]	20dB Bandwidth [MHz]	FCC Limits [MHz]
2480	1.352	Within 2400-2483.5

### (Highest Operating Frequency)- (8DPSK)



Ref 100 dB $\mu$ V \*Att 35 dB \*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 78.72 dB $\mu$ V  
SWT 2.5 ms 2.479984000 GHz



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### **Channel Centre Frequency**

#### **Requirements:**

Frequency hopping system in the 2400-2483.5MHz band shall use at least 79 (Channel 0 to 78) non-overlapping channels.

The EUT operates in according with the Bluetooth system specification within the 2400 - 2483.5 MHz frequency band.

RF channels for Bluetooth systems are spaced 1 MHz and are ordered in channel number k. In order to comply with out-of-band regulations, a lower frequency guard band of 2.0 MHz and a higher frequency guard band of 3.5MHz is used.

The operating frequencies of each channel are as follows:

First RF channel start from 2400MHz + 2MHz guard band = 2402MHz

Frequency of RF Channel = 2402+k MHz, k = 0,...,78 (Channel separation = 1MHz)

### **Hopping Channel Separation**

#### **Requirements:**

Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

#### **Limit:**

The measured minimum bandwidth \* 2/3 = 1.112MHz \* 2/3 = 741kHz

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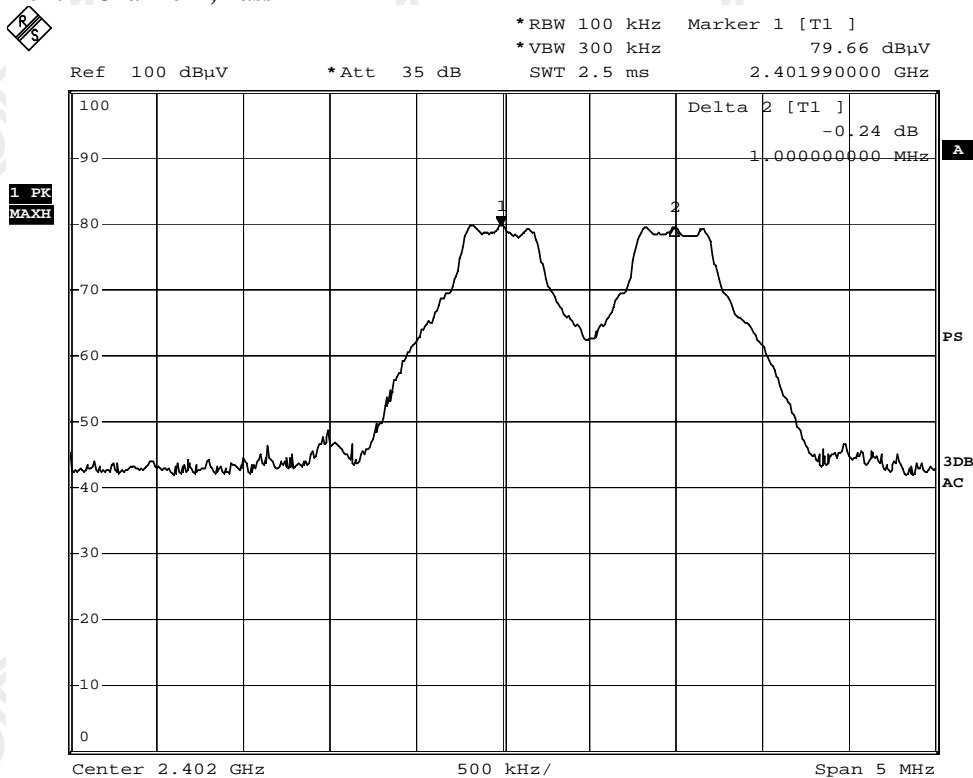
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Channel separation = 1MHz (>741kHz) (GFSK)

Channel 0 – Channel 1, Pass



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### Channel 39 – Channel 40, Pass

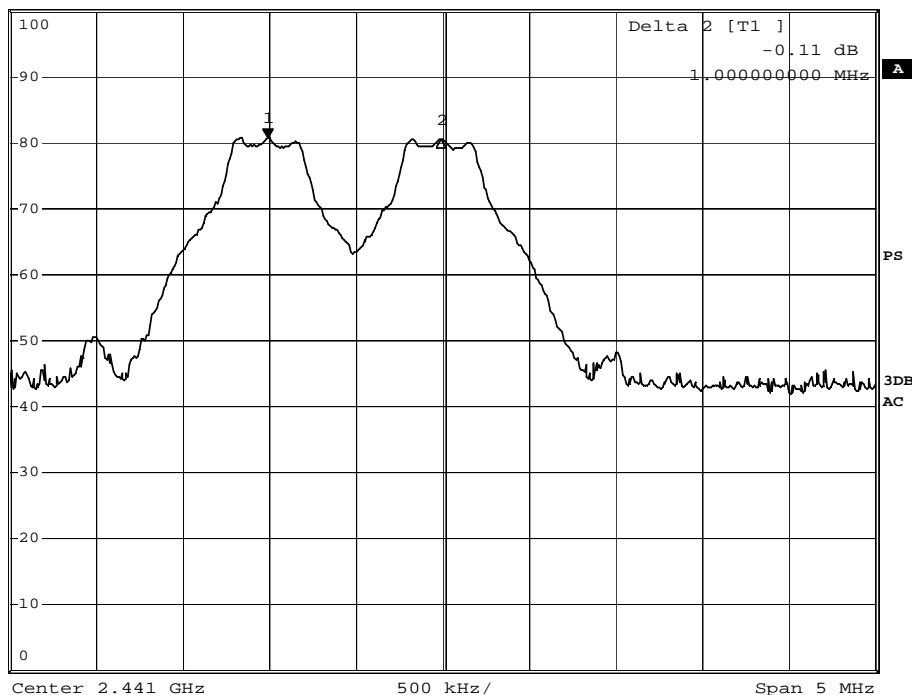


\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 80.64 dB $\mu$ V  
SWT 2.5 ms 2.439990000 GHz

Ref 100 dB $\mu$ V

\*Att 35 dB

2.439990000 GHz



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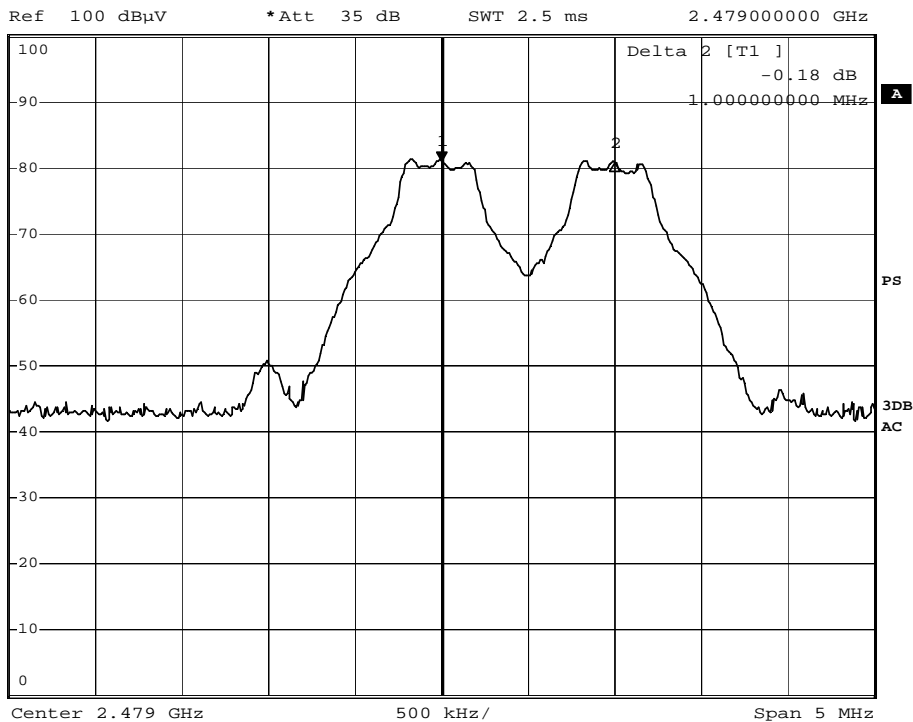
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## Channel 78 – Channel 79, Pass



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 81.00 dBμV  
SWT 2.5 ms 2.479000000 GHz



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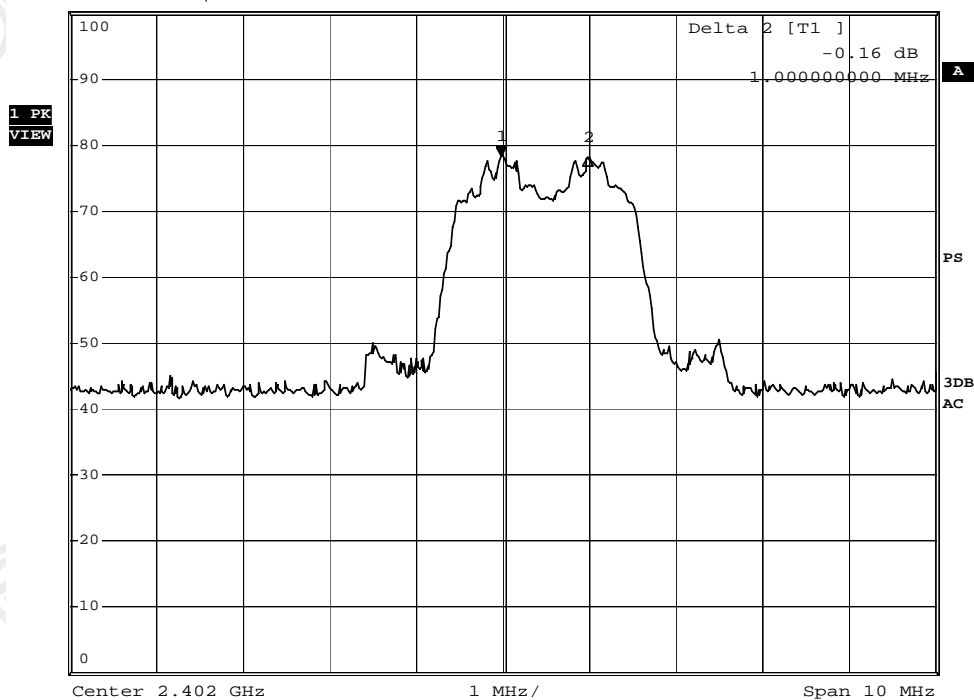
Channel separation = 1MHz (>741kHz) ( $\pi/4$  DQPSK)

Channel 0 – Channel 1, Pass



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 78.28 dB $\mu$ V

Ref 100 dB $\mu$ V \*Att 35 dB SWT 2.5 ms 2.401980000 GHz



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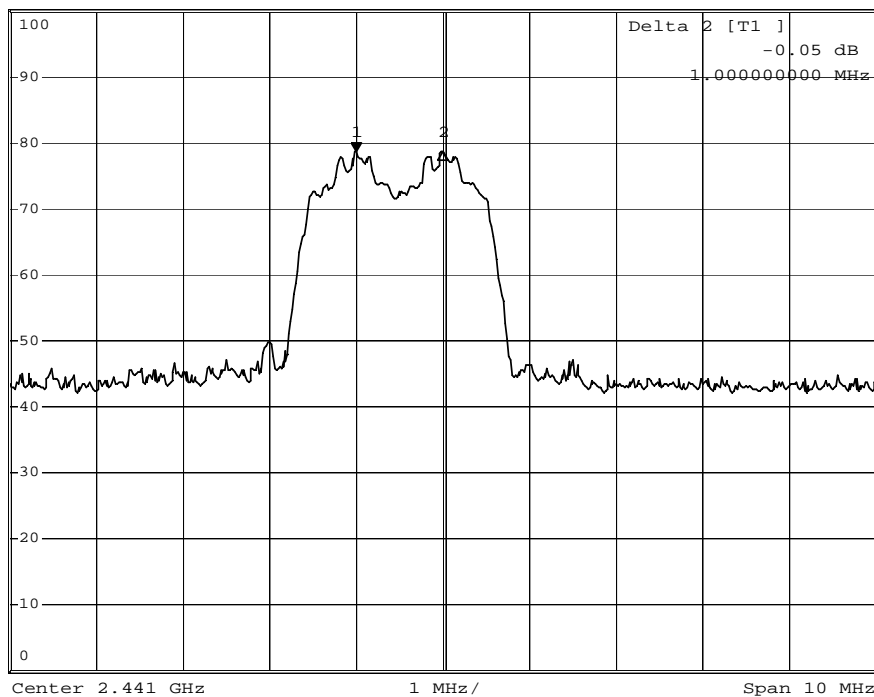
### Channel 39 – Channel 40, Pass



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 78.66 dBμV  
SWT 2.5 ms 2.44000000 GHz

Ref 100 dBμV

\*Att 35 dB



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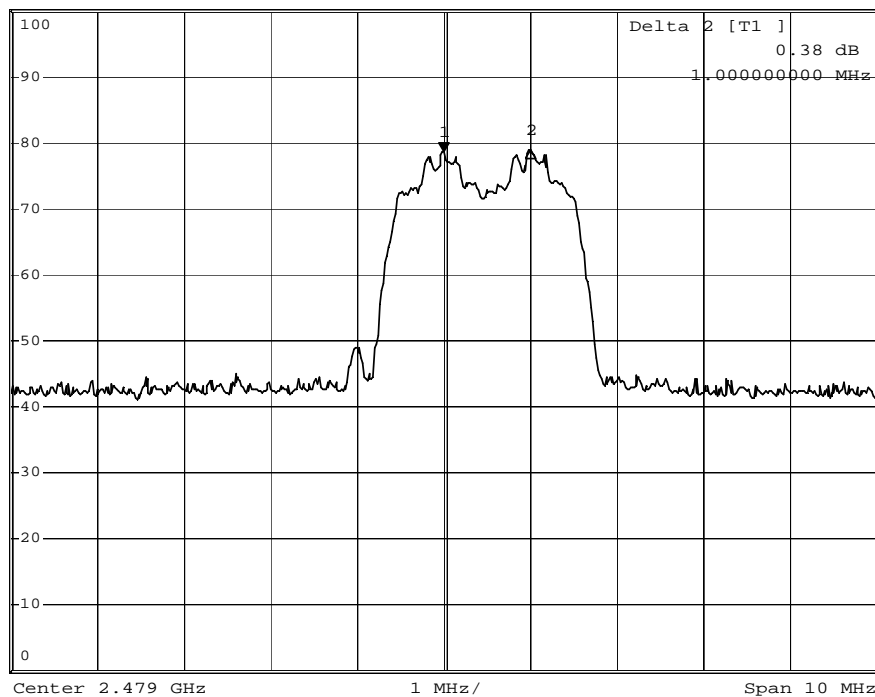
### Channel 78 – Channel 79, Pass



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 78.51 dBμV  
SWT 2.5 ms 2.479000000 GHz

Ref 100 dBμV

\*Att 35 dB



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Channel separation = 1MHz (>741kHz) (8DPSK)

Channel 0 – Channel 1, Pass

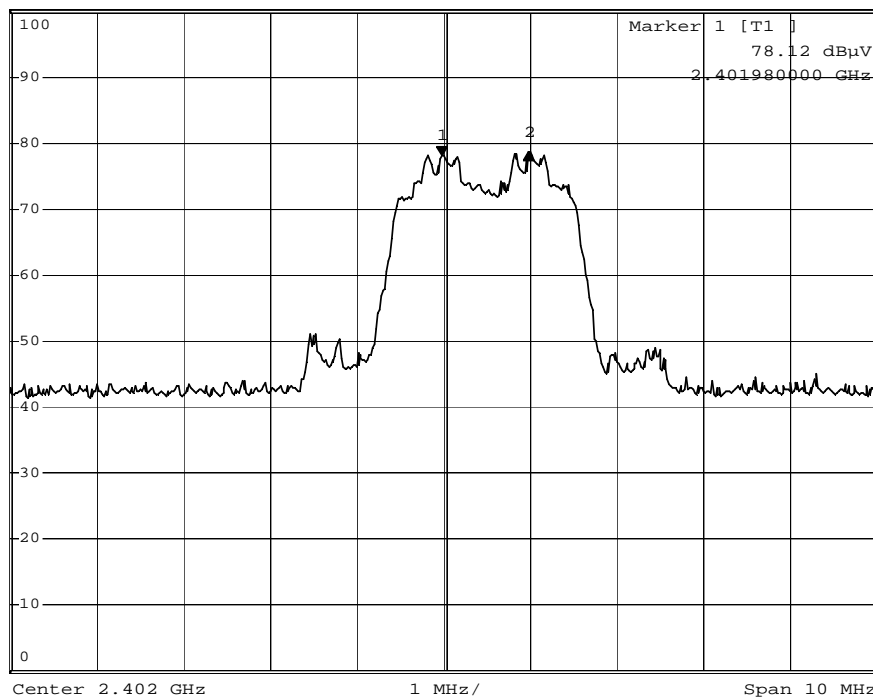


\*RBW 100 kHz Delta 2 [T1 ]  
\*VBW 300 kHz 0.39 dB  
SWT 2.5 ms 1.000000000 MHz

Ref 100 dBuV

\*Att 35 dB

1.000000000 MHz



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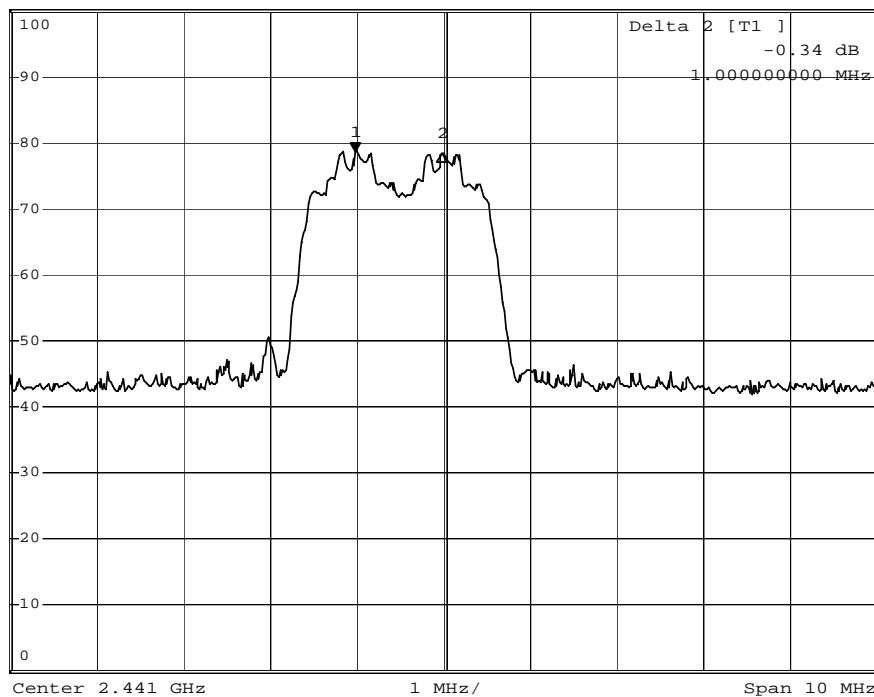
### Channel 39 – Channel 40, Pass



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 78.58 dBμV  
SWT 2.5 ms 2.439980000 GHz

Ref 100 dBμV

\*Att 35 dB



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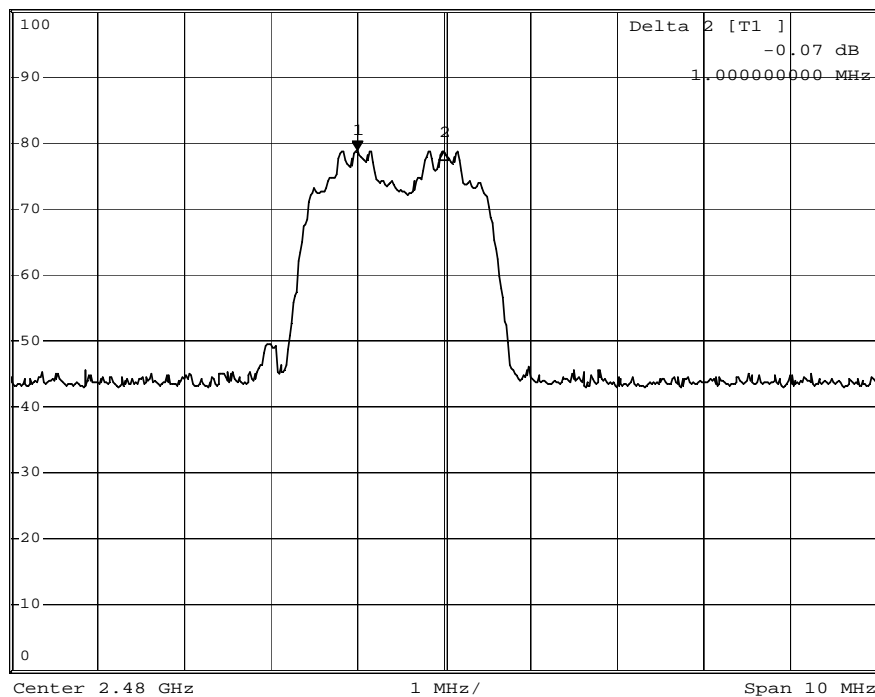
### Channel 78 – Channel 79, Pass



\*RBW 100 kHz Marker 1 [T1 ]  
\*VBW 300 kHz 78.76 dBμV  
SWT 2.5 ms 2.479000000 GHz

Ref 100 dBμV

\*Att 35 dB



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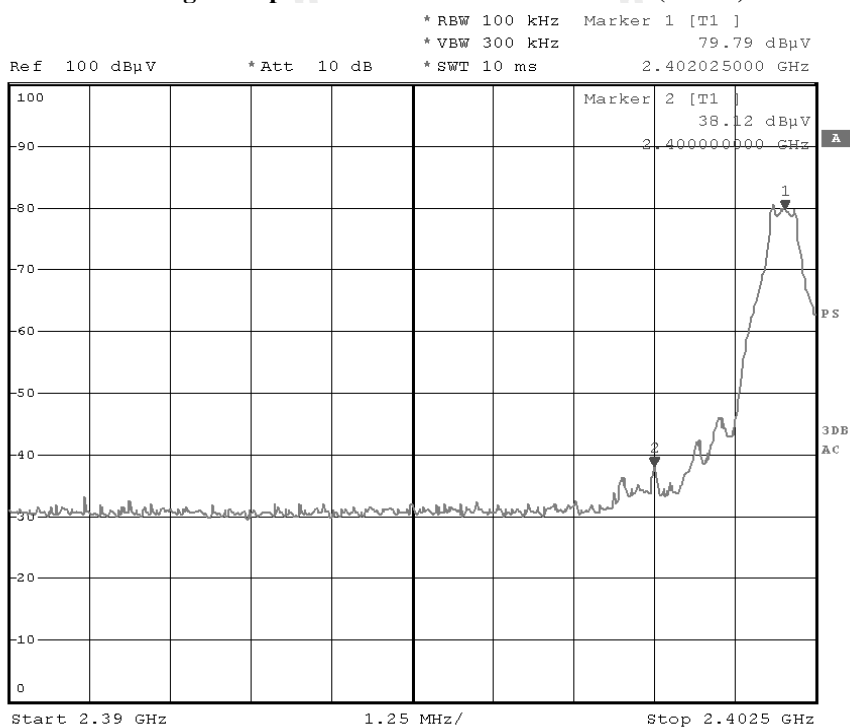
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### Band-edge Compliance of RF Emissions – Lowest (GFSK)



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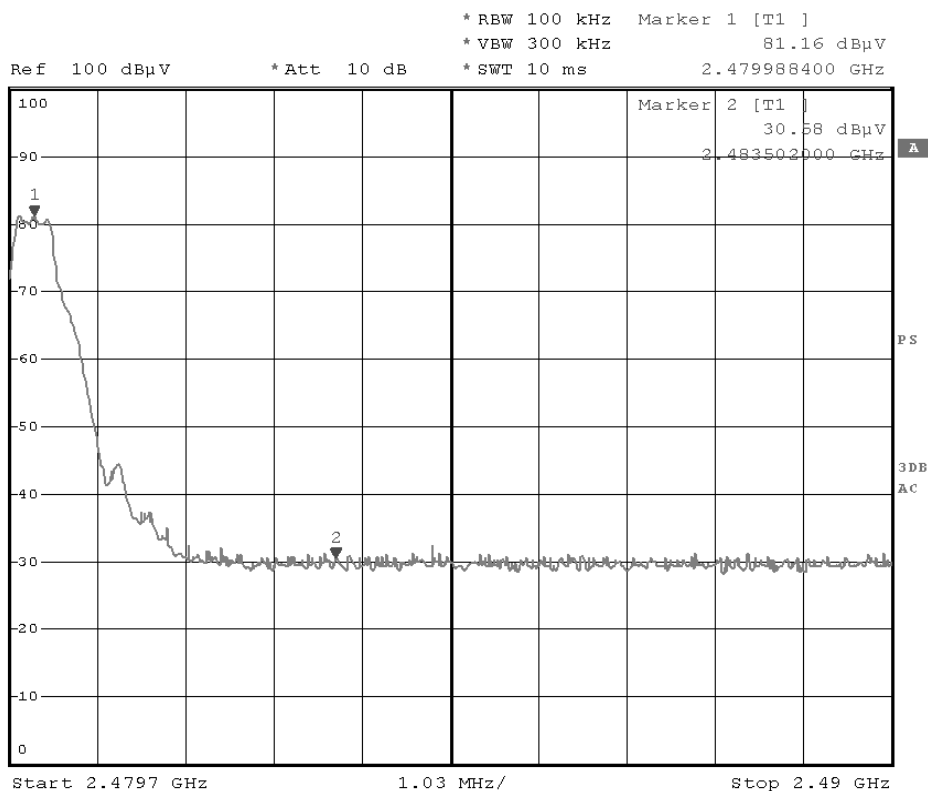
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### Band-edge Compliance of RF Emissions – Highest (GFSK)



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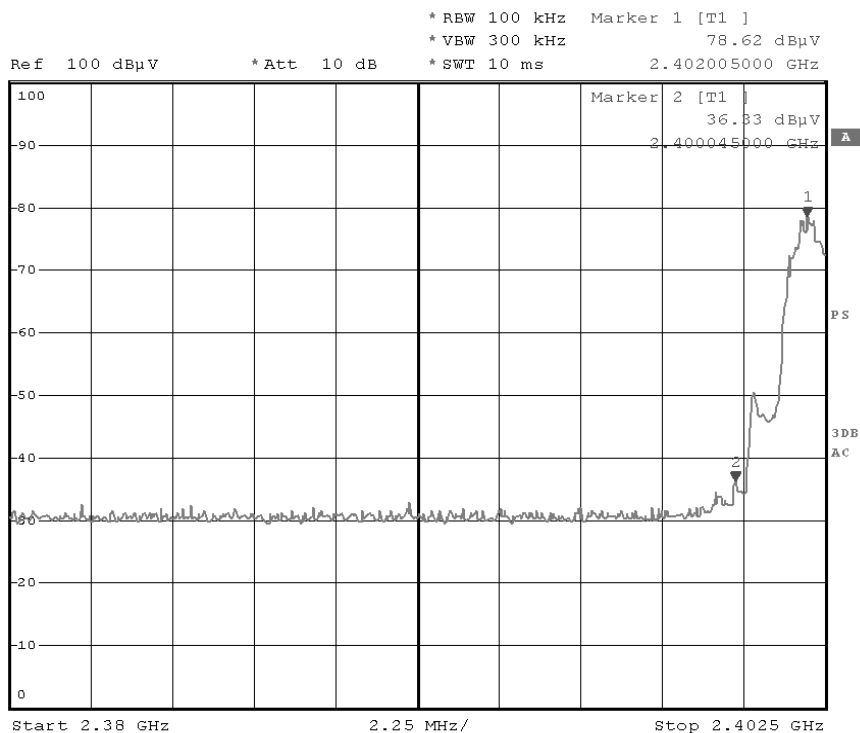
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### Band-edge Compliance of RF Emissions – Lowest ( $\pi/4$ DQPSK)



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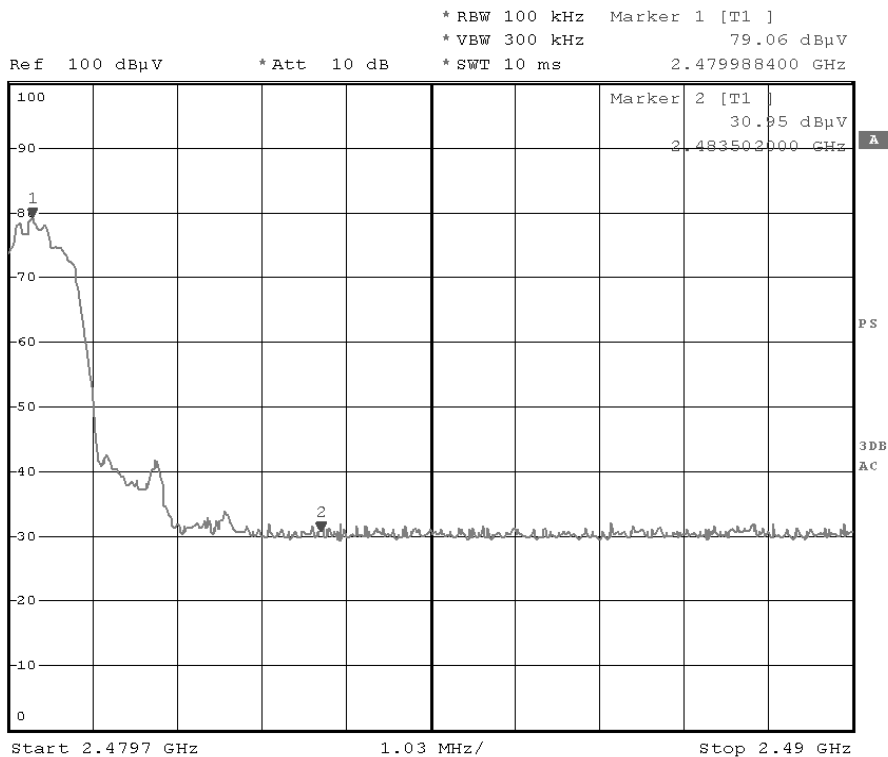
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### Band-edge Compliance of RF Emissions – Highest ( $\pi/4$ DQPSK)



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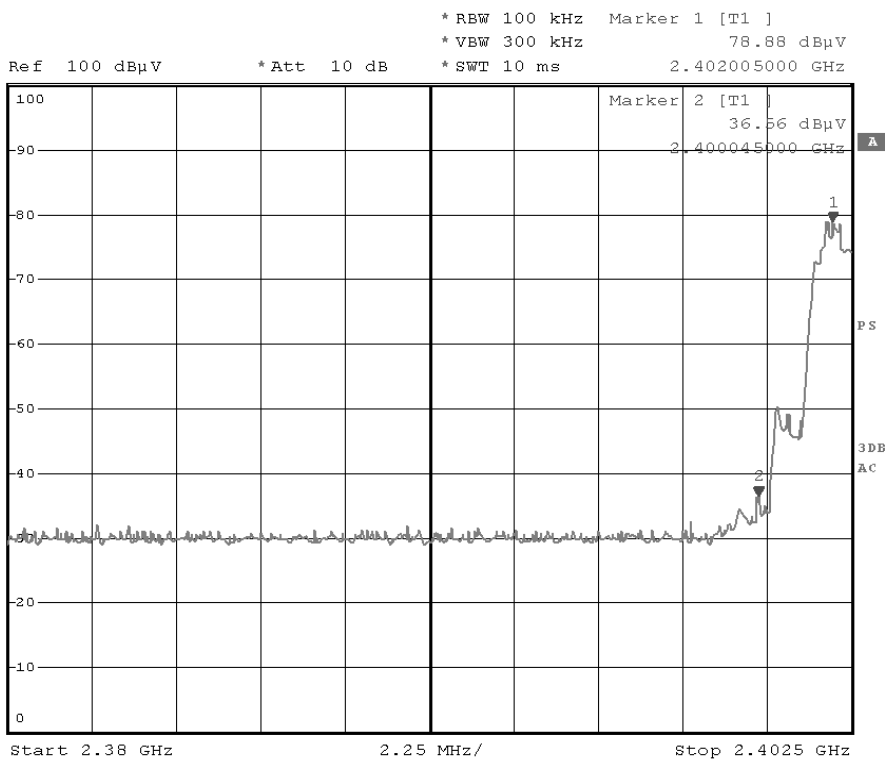
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### Band-edge Compliance of RF Emissions – Lowest (8DPSK)



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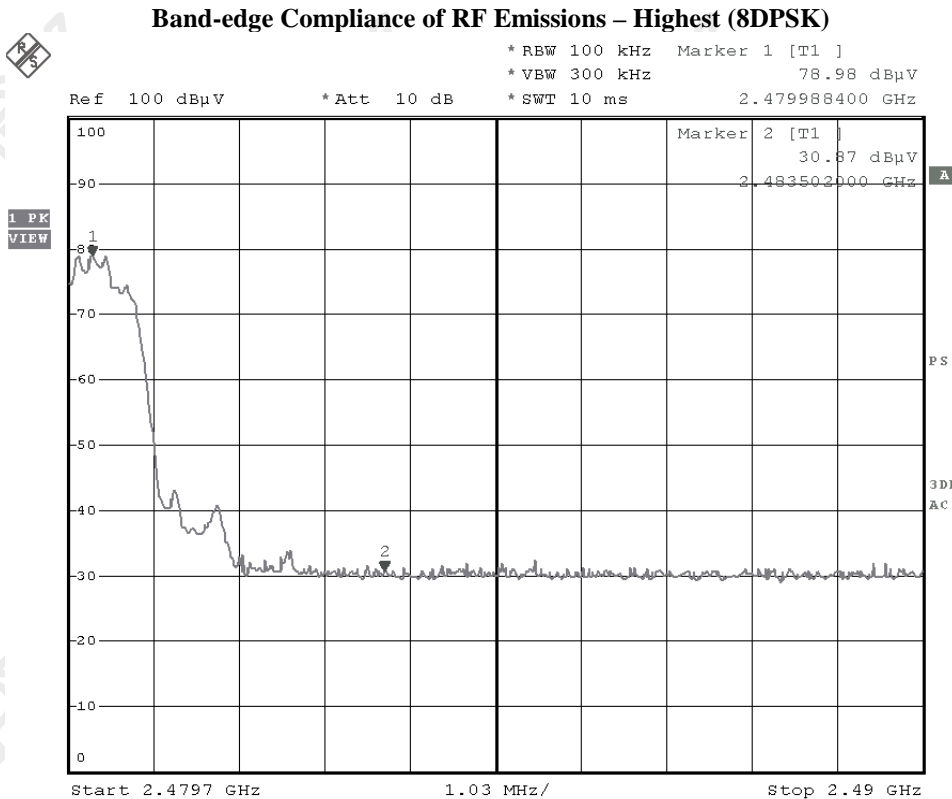
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### Band-edge Compliance of RF Emissions – Highest (8DPSK)



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### **Antenna Requirement**

#### **Test Requirements: § 15.203**

#### **Test Specification:**

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. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

#### **Test Results:**

The EUT has 1 [Inverted-F Antenna (PCB layout)] which is permanently attached to the main unit and attached on PCB board, the antenna gain = 1.5dBi. All component install on inside of EUT. User unable to remove or changed the Antenna.

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### **Pseudorandom Hopping Algorithm**

#### **Requirements:**

The channel frequencies shall be selected from a pseudorandom ordered list of hopping frequencies. Each frequency must be used equally by the transmitter.

### **EUT Pseudorandom Hopping Algorithm**

The EUT is a Bluetooth device, the Pseudo-random hopping pattern; hopping characteristics and algorithm are based on the Bluetooth specification.

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### Occupancy Time (Dwell time)

#### Requirements:

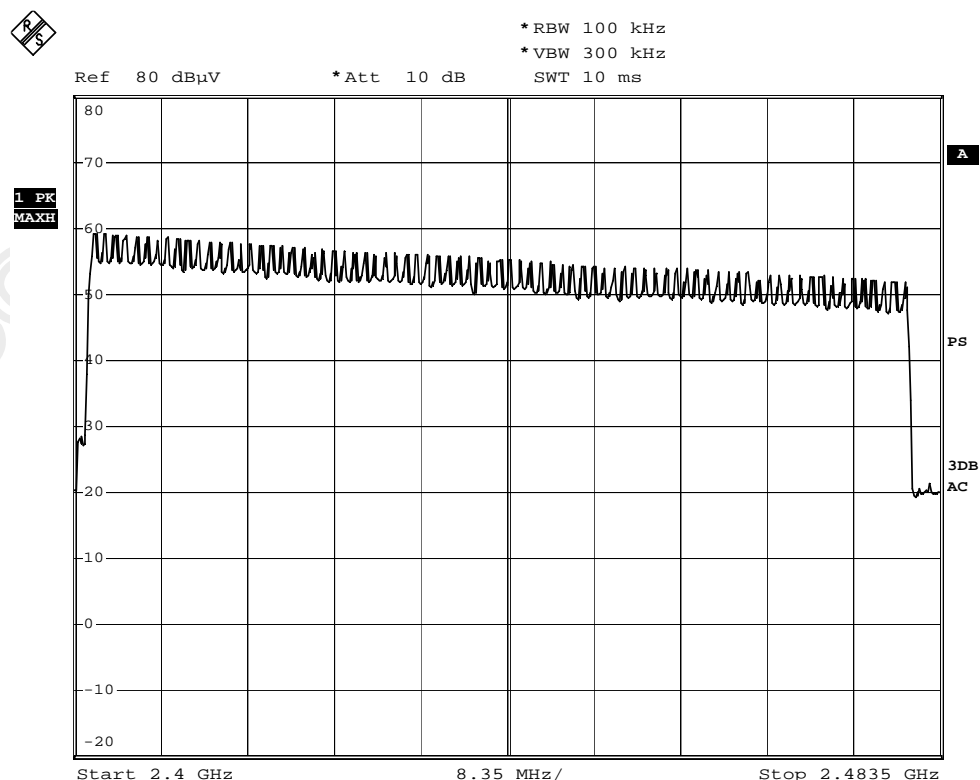
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channel employed.  
No requirements for Digital Transmission System.

**Dwell Time = Pulse Duration \* hop rate / number of channel \* observation duration**

**Observed duration: 0.4s x79 = 31.6s**

#### Measurement Data:

**Channel Occupied in 8DPSK: 79 of 79 Channels**



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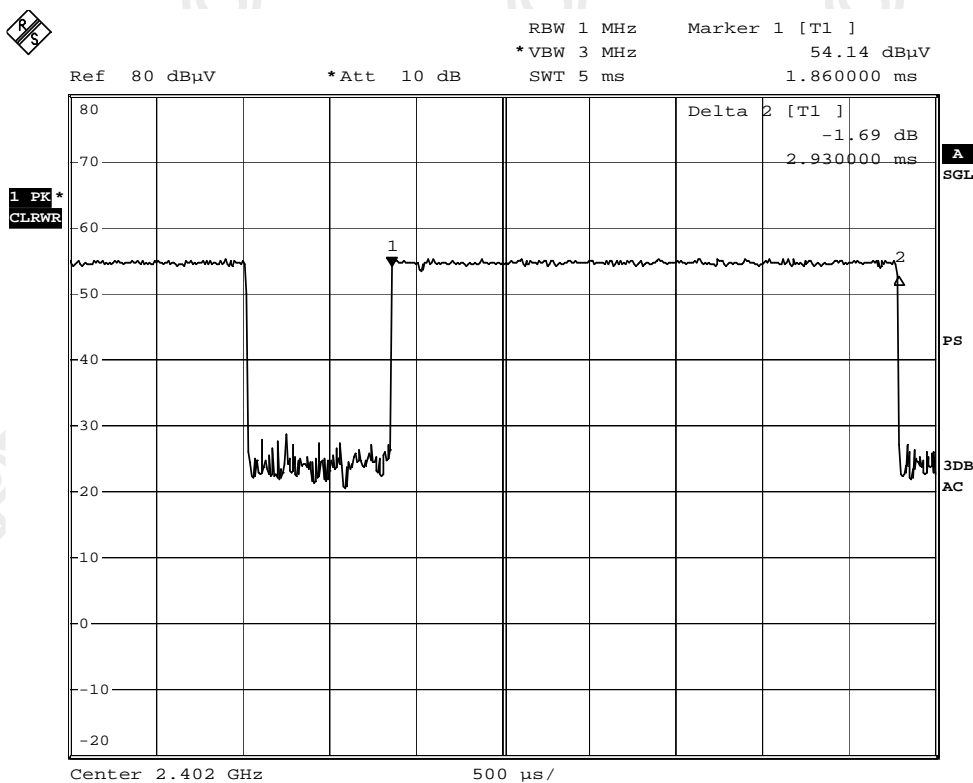
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### DH5 Packet:

DH5 Packet permit maximum  $1600/79/6 = 3.37$  hops per second in each channel (5 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times  $3.37 \times 31.6 = 106.6$  within 31.6 seconds

**Fig. A**  
**[Pulse duration of Lowest Channel]**



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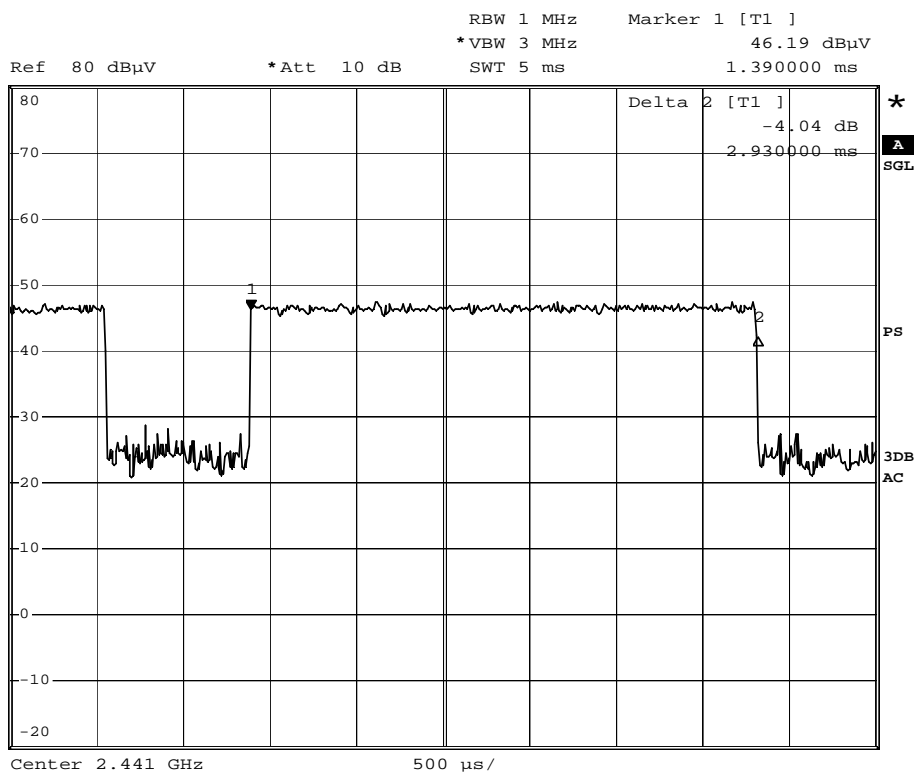
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**Fig. B**  
**[Pulse duration of Middle Channel]**



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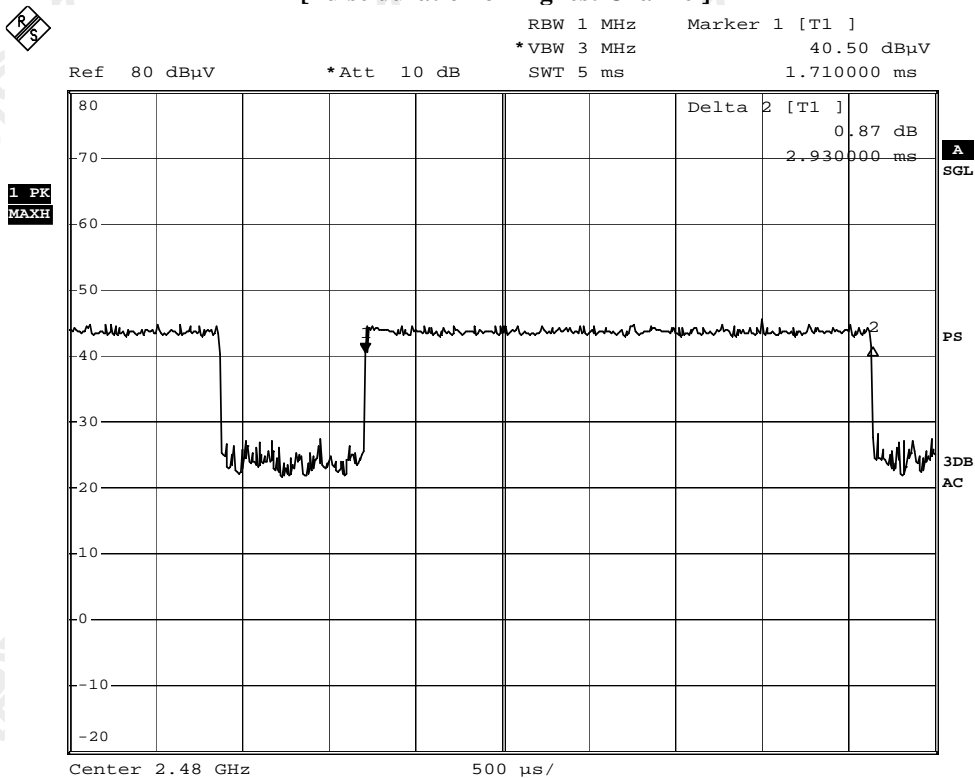
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**Fig. C**  
**[Pulse duration of Highest Channel]**



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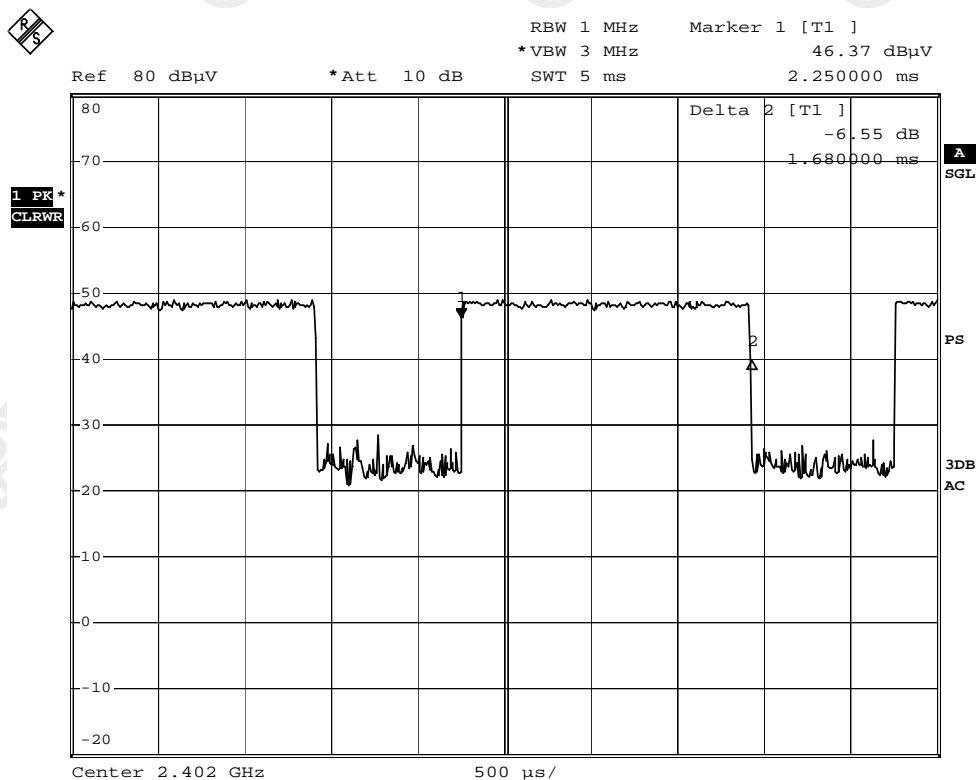
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### DH3 Packet:

DH3 Packet permit maximum  $1600/79/4 = 5.06$  hops per second in each channel (3 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times  $5.06 \times 31.6 = 160$  within 31.6 seconds

**Fig. D**  
**[Pulse duration of Lowest Channel]**



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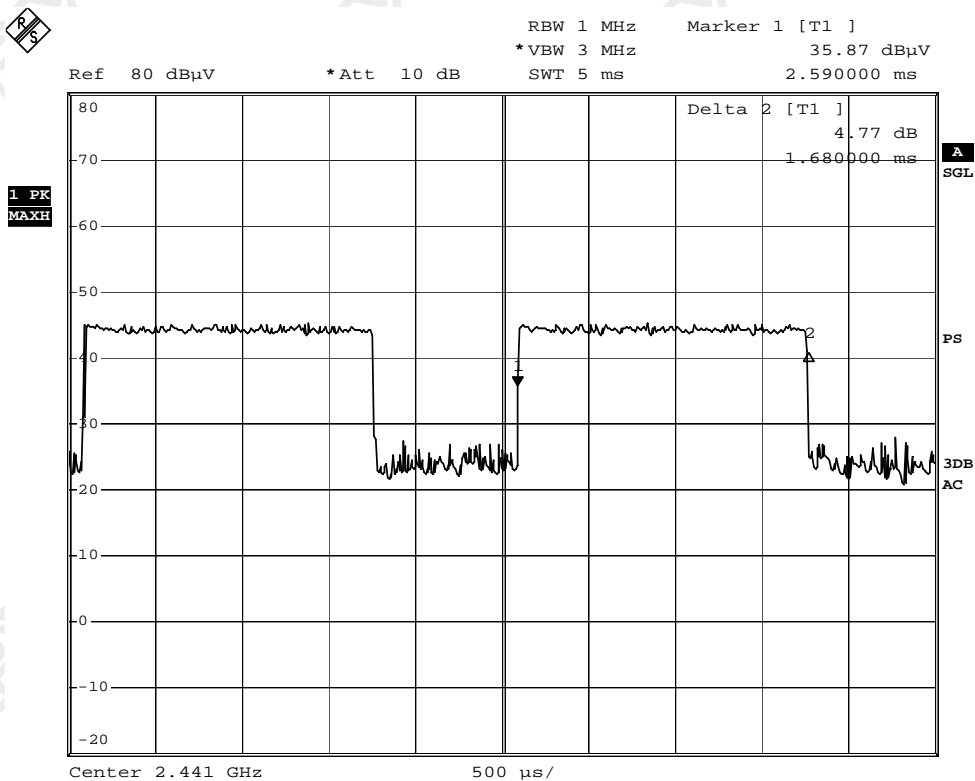
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**Fig. E**  
**[Pulse duration of Middle Channel]**



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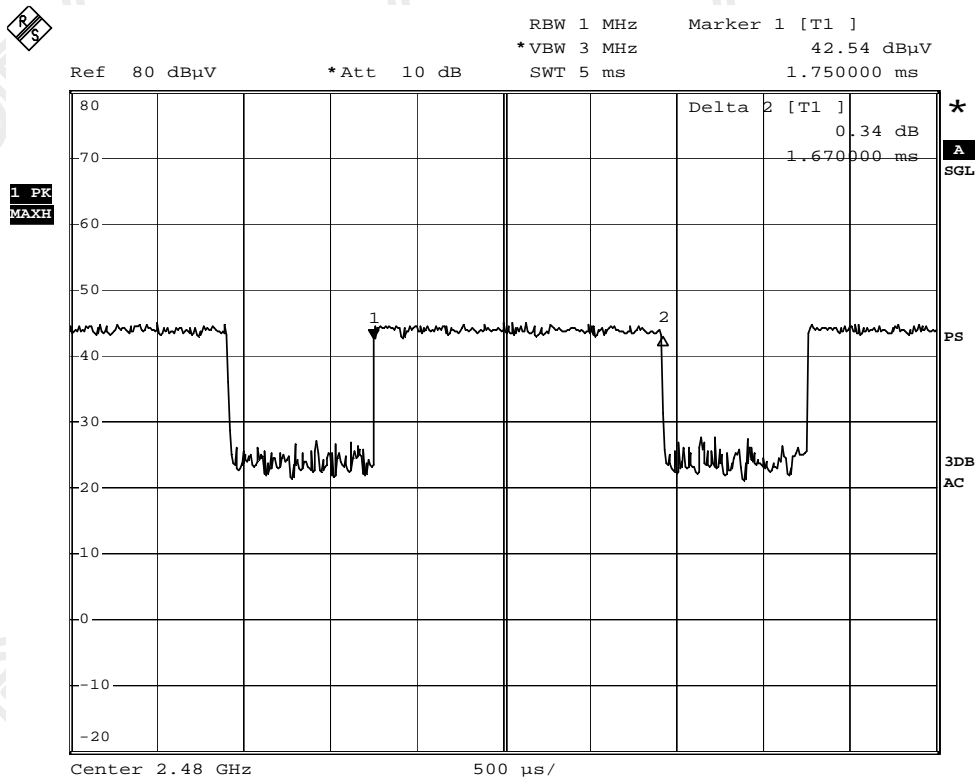
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**Fig. F**  
**[Pulse duration of Highest Channel]**



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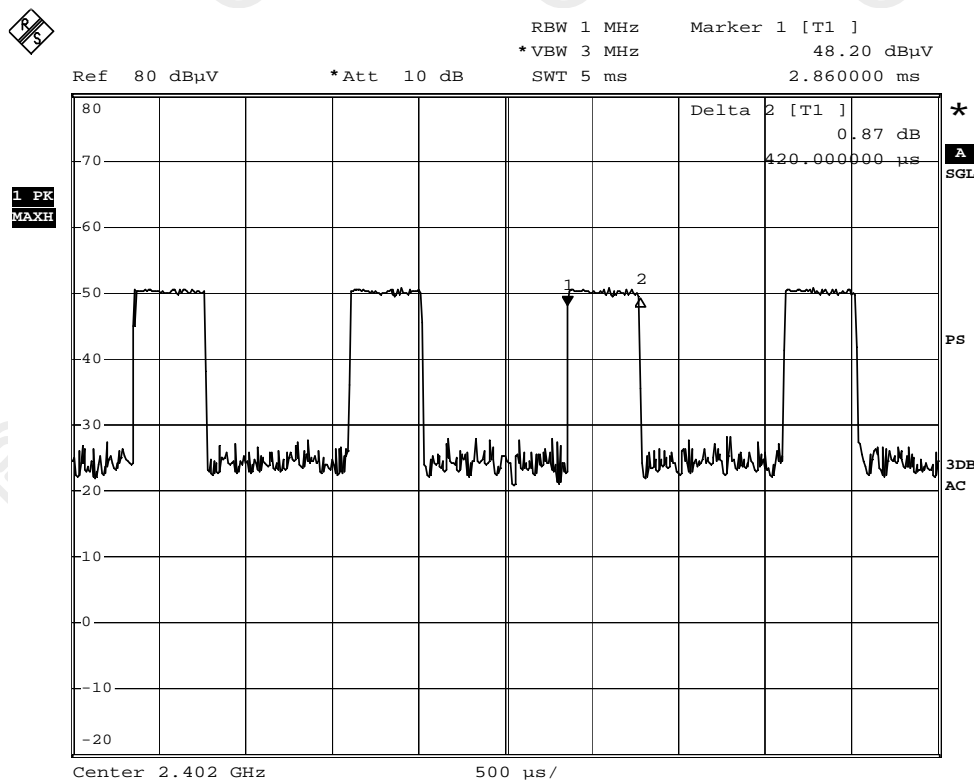
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### DH1 Packet:

DH1 Packet permit maximum  $1600/79/2 = 10.12$  hops per second in each channel (3 time slots RX, 1 time slot TX). The Dwell time is the time duration of the pulse times  $10.12 \times 31.6 = 320$  within 31.6 seconds

**Fig. G**  
**[Pulse duration of Lowest Channel]**



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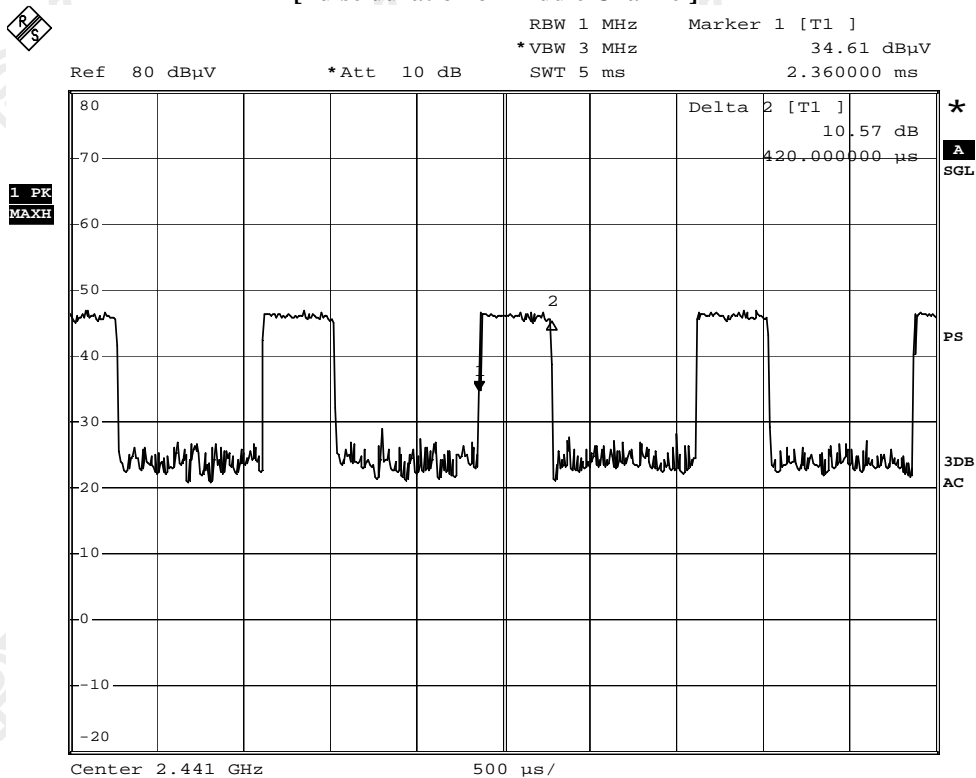
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**Fig. H**  
**[Pulse duration of Middle Channel]**



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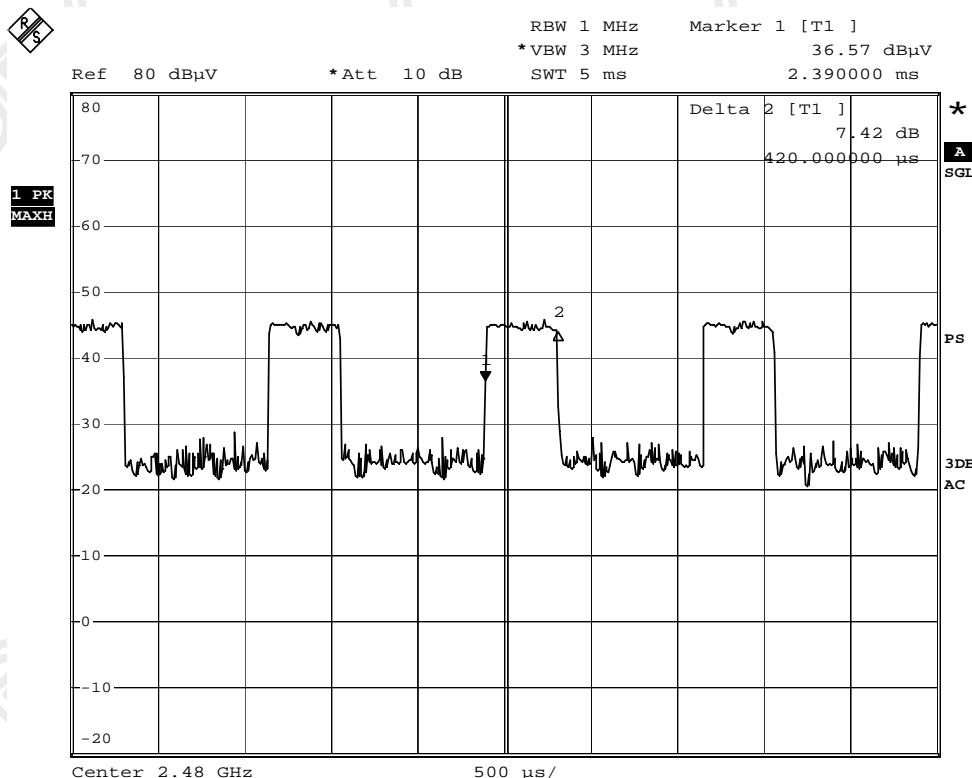
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**Fig. I**  
**[Pulse duration of Highest Channel]**



**Time of occupancy (Dwell Time):**

Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)	Test Results
DH5	2402	2.930	0.312	0.400	Complies
DH5	2441	2.930	0.312	0.400	Complies
DH5	2480	2.930	0.312	0.400	Complies
DH3	2402	1.680	0.269	0.400	Complies
DH3	2442	1.680	0.269	0.400	Complies
DH3	2480	1.670	0.267	0.400	Complies
DH1	2402	0.420	0.134	0.400	Complies
DH1	2442	0.420	0.134	0.400	Complies
DH1	2480	0.420	0.134	0.400	Complies

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### Appendix A

#### List of Measurement Equipment

##### Radiated Emission

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM215	MULTIDEVICE CONTROLLER	EMCO	2090	00024676	N/A	N/A
EM216	MINI MAST SYSTEM	EMCO	2075	00026842	N/A	N/A
EM217	ELECTRIC POWERED TURNTABLE	EMCO	2088	00029144	N/A	N/A
EM218	ANECHOIC CHAMBER	ETS-LINDGREN	FACT-3	--	2012/10/25	2013/10/25
EM219	BICONILOG ANTENNA	EMCO	3142C	00029071	2011/03/01	2013/03/01
EM229	EMI TEST RECEIVER	R&S	ESIB40	100248	2012/05/03	2013/05/03
EM299	DOUBLE-RIDGED WAVEGUIDE HORN ANTENNA	ETS-LINDGREN	3115	00114120	2012/01/25	2014/01/25
EM022	LOOP ANTENNA	EMCO	6502	1189-2424	2011/09/14	2013/09/14
EM293	MXA SIGNAL ANALYZER	AGILENT TECHNOLOGIES	MY50510152	N/A	2011/11/10	2012/11/10

##### Line Conducted

EQP NO.	DESCRIPTION	MANUFACTURER	MODEL NO.	SERIAL NO.	LAST CAL	DUE CAL
EM197	LISN	EMCO	4825/2	1193	2012/05/16	2013/05/16
EM181	EMI TEST RECEIVER	ROHDE & SCHWARZ	ESIB7	100072	2012/05/03	2013/05/03
EM179	IMPULSE LIMITER	ROHDE & SCHWARZ	ESH3-Z2	357-8810.52/54	2012/01/27	2013/01/27
EM154	SHIELDING ROOM	SIEMENS MATSUSHITA COMPONENTS	N/A	803-740-057-99A	2012/01/27	2013/01/27

Remarks:-

CM Corrective Maintenance  
N/A Not Applicable or Not Available  
TBD To Be Determined

### Appendix B

#### Ancillary Equipment

ITEM NO.	DESCRIPTION	MODEL NO.	FCC ID	REMARK
1	iPod Touch	A1367	BCG-E2407	N/A

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### Appendix C

#### Photographs of EUT

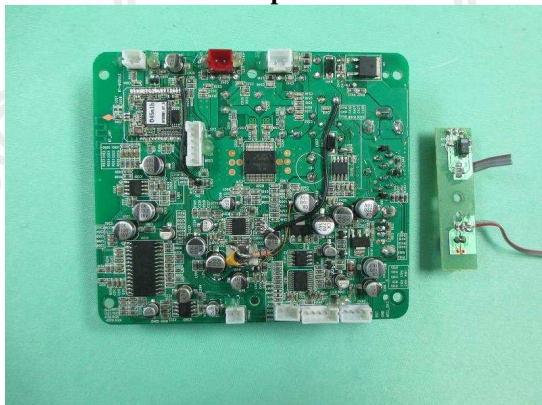
**Front View of the product**



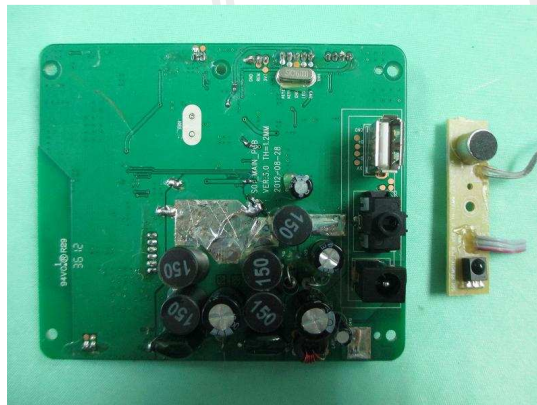
**Rear View of the product**



**Inner Circuit Top View- All PCBs**



**Inner Circuit Bottom View- All PCBs**



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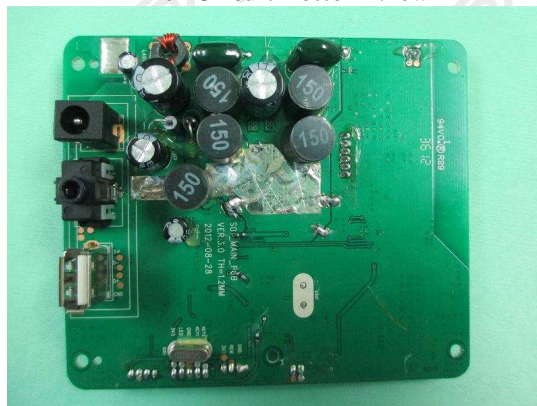
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### Photographs of EUT

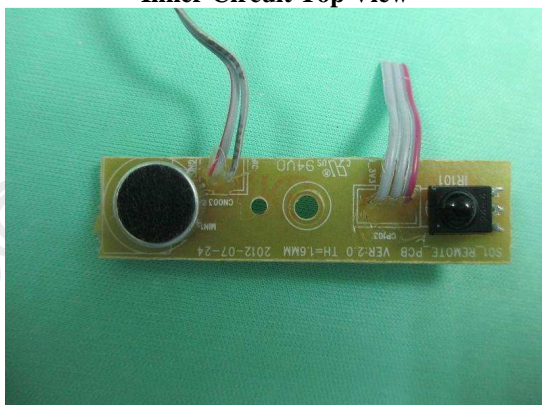
**Inner Circuit Top View**



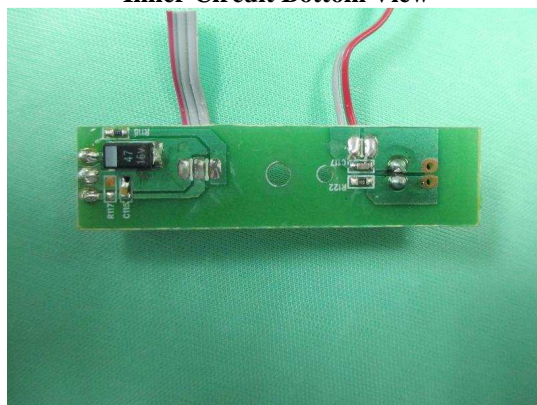
**Inner Circuit Bottom View**



**Inner Circuit Top View**



**Inner Circuit Bottom View**



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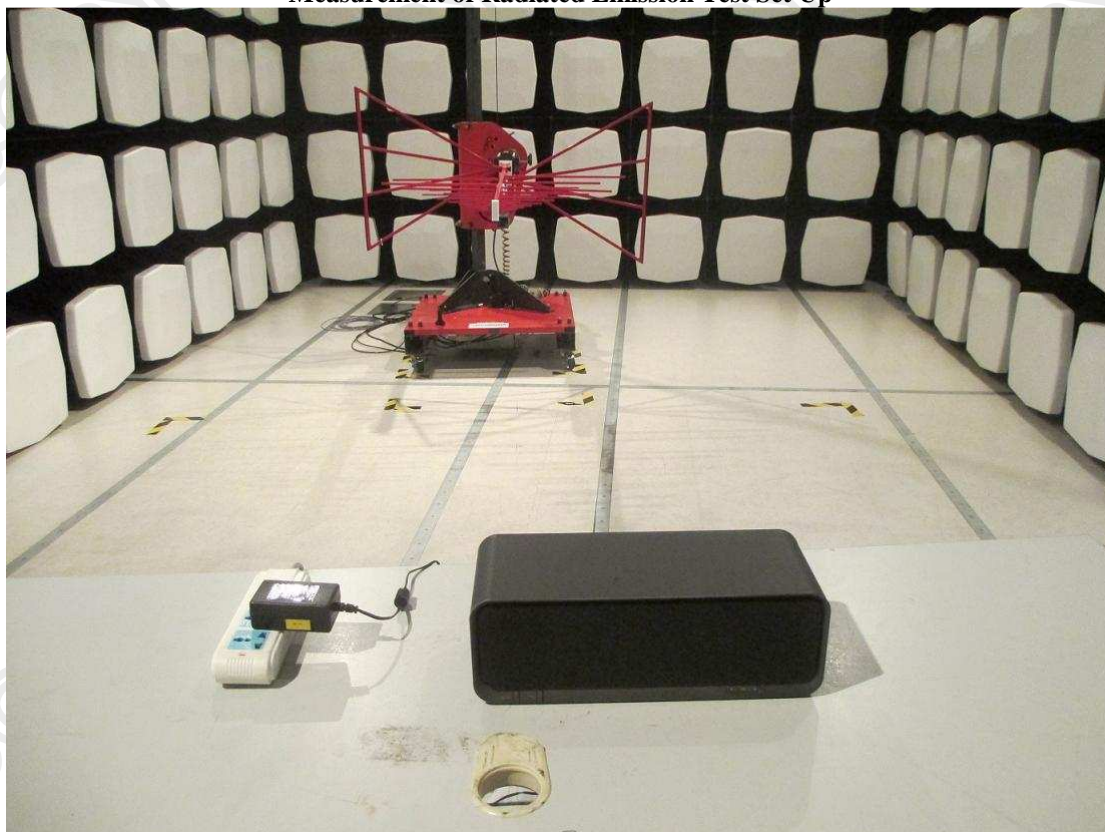
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### Photographs of EUT

Measurement of Radiated Emission Test Set Up



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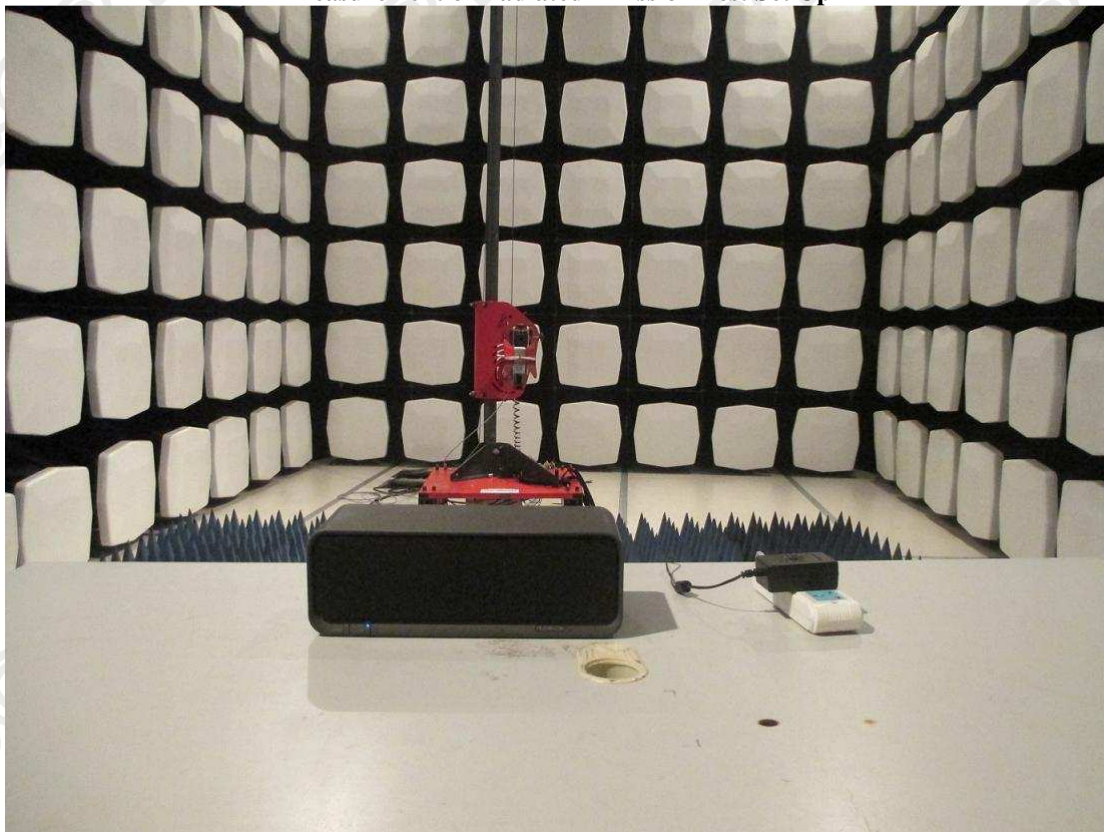
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### Photographs of EUT

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### Photographs of EUT

Measurement of Conducted Emission Test Set Up



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

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