



## FCC 47 CFR PART 15 SUBPART C

Product Type : Generic Wireless Audio module  
Applicant : Priferential Accessories Ltd  
Address : The Bluebells Station Road St Albans AL2 3PQ England  
Trade Name : Prif  
Model Number : RFMUNI-11  
Test Specification : FCC 47 CFR PART 15 SUBPART C  
ANSI C63.10:2013

Receive Date : Oct. 15, 2015  
Test Period : Oct. 16, 2015 to Nov. 04, 2015  
Issue Date : Nov. 09, 2015

### Issue by

A Test Lab Techno Corp.  
No. 140-1, Changan Street, Bade City,  
Taoyuan County 334, Taiwan R.O.C.  
Tel : +886-3-2710188 / Fax : +886-3-2710190



Taiwan Accreditation Foundation accreditation number: 1330

**Note:** This report shall not be reproduced except in full, without the written approval of A Test Lab Techno Corp. This document may be altered or revised by A Test Lab Techno Corp. personnel only, and shall be noted in the revision section of the document. The client should not use it to claim product endorsement by TAF, or any government agencies. The test results in the report only apply to the tested sample.



## Revision History

Rev.	Issue Date	Revisions	Revised By
00	Nov. 09, 2015	Initial Issue	



## Verification of Compliance

Issued Date: 11/09/2015

Product Type : Generic Wireless Audio module  
Applicant : Priferential Accessories Ltd  
Address : The Bluebells Station Road St Albans AL2 3PQ England  
Trade Name : Prif  
Model Number : RFMUNI-11  
FCC ID : 2AGZSRFMUNI  
EUT Rated Voltage : DC 5.0V  
Test Voltage : AC 120V/60Hz  
Applicable Standard : FCC 47 CFR PART 15 SUBPART C  
ANSI C63.10:2013  
Test Result : Complied  
Application Purpose : Original  
Performing Lab. : Site1:A Test Lab Techno Corp.  
No. 140-1, Changan Street, Bade City,  
Taoyuan County 334, Taiwan R.O.C.  
Tel : +886-3-2710188 / Fax : +886-3-2710190  
Taiwan Accreditation Foundation accreditation number:  
1330



Testing Laboratory  
1330

Site2:Shenzhen Academy of Metrology and Quality Inspection  
No.4 TongFa Road, Xili Town Nanshan District, Shenzhen,  
China

A Test Lab Techno Corp. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by A Test Lab Techno Corp. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By  
(Manager)

: Fly Lu  
(Fly Lu)

Reviewed By  
(Testing Engineer)

: Eric Ou Yang  
(Eric Ou Yang)

## TABLE OF CONTENTS

<b>1</b>	<b>General Information .....</b>	<b>5</b>
1.1.	Summary of Test Result.....	5
1.2.	Measurement Uncertainty .....	5
<b>2</b>	<b>EUT Description.....</b>	<b>6</b>
<b>3</b>	<b>Test Methodology.....</b>	<b>7</b>
3.1.	Mode of Operation .....	7
3.2.	EUT Exercise Software.....	7
3.3.	Configuration of Test System Details .....	7
3.4.	Test Site Environment.....	8
<b>4</b>	<b>Conducted Emission Measurement.....</b>	<b>9</b>
4.1.	Limit.....	9
4.2.	Test Instruments .....	9
4.3.	Test Setup .....	9
4.4.	Test Procedure.....	10
4.5.	Test Result.....	11
<b>5</b>	<b>Radiated Interference Measurement.....</b>	<b>13</b>
5.1.	Limit.....	13
5.2.	Test Instruments .....	14
5.3.	Setup.....	15
5.4.	Test Procedure.....	16
5.5.	Test Result.....	18
<b>6</b>	<b>Band Edges Measurement.....</b>	<b>22</b>
6.1.	Limit.....	22
6.2.	Test Setup .....	22
6.3.	Test Instruments .....	22
6.4.	Test Procedure.....	23
6.5.	Test Result.....	24
<b>7</b>	<b>20dB RF Bandwidth and 99 % Occupied Bandwidth Measurement.....</b>	<b>26</b>
7.1.	Limit.....	26
7.2.	Test Setup .....	26
7.3.	Test Instruments .....	26
7.4.	Test Procedure.....	26
7.5.	Test Result.....	27
7.6.	Test Graphs .....	28
<b>8</b>	<b>Antenna Measurement.....</b>	<b>29</b>
8.1.	Limit.....	29
8.2.	Antenna Connector Construction.....	29



## 1 General Information

### 1.1. Summary of Test Result

Standard	Item	Result	Remark
15.249			
15.207	AC Power Conducted Emission	PASS	-----
Standard	Item	Result	Remark
15.249			
15.249(a)	Transmitter Radiated Emissions	PASS	-----
15.249(d)	Band Edge Measurement	PASS	-----
15.203	Antenna Requirement	PASS	-----
15.215	20 dB Bandwidth	PASS	-----
RSS-GEN 6.6	99% occupied bandwidth	PASS	-----

The test results of this report relate only to the tested sample(s) identified in this report. Manufacturer or whom it may concern should recognize the pass or fail of the test result.

### 1.2. Measurement Uncertainty

Test Item	Frequency Range	Uncertainty (dB)
Conducted Emission	9kHz ~ 30MHz	± 2.02
Radiated Emission	30MHz ~ 1000MHz	Horizontal ± 3.98
		Vertical ± 3.62
	1000MHz ~ 18000MHz	Horizontal ± 3.11
		Vertical ± 3.07
	18000MHz ~ 40000MHz	Horizontal ± 3.66
		Vertical ± 3.54



## 2 EUT Description

Product	Generic Wireless Audio module
Trade Name	Prif
Model Number	RFMUNI-11
Applicant	Priferential Accessories Ltd The Bluebells Station Road St Albans AL2 3PQ England
Manufacturer	Priferential Accessories Ltd The Bluebells Station Road St Albans AL2 3PQ England
FCC ID	2AGZSRFMUNI
Frequency Range	2402 ~ 2480 MHz
Modulation Type	GFSK
Number of Channel	27 CH
Antenna Type	V Shape Antenna
Antenna Gain	1.0 dBi
Field Strength	99.3 dBuV/m

## 3 Test Methodology

### 3.1. Mode of Operation

Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

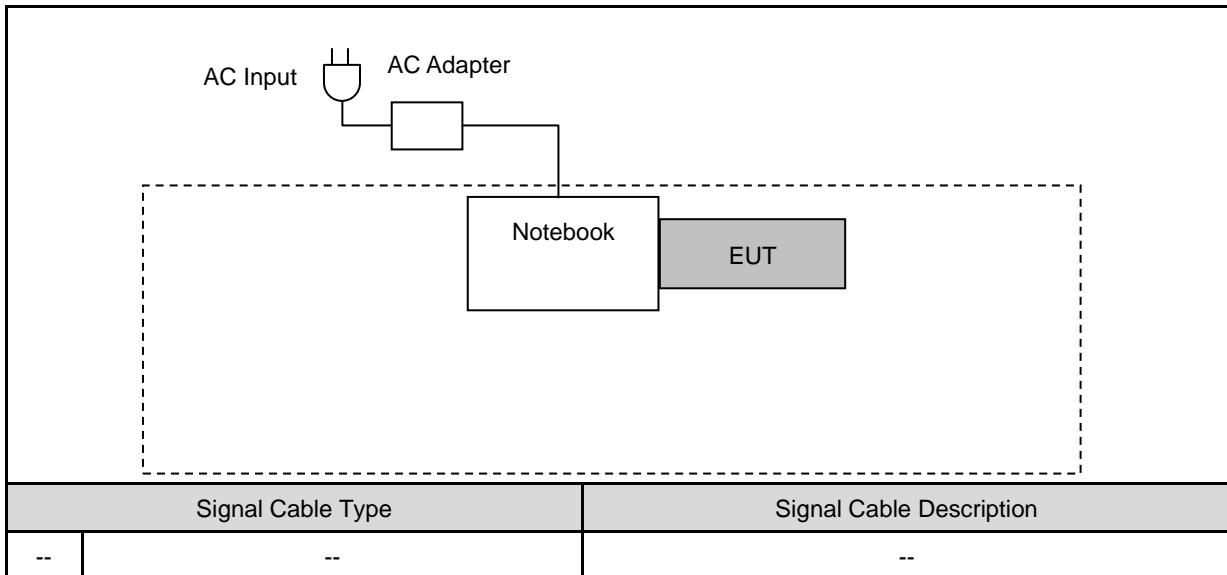
Test Mode
Mode 1: Normal Operation Mode
Mode 2: Transmission Mode

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that "X axis" position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

### 3.2. EUT Exercise Software

1	Setup the EUT as shown on 3.3.
2	Turn on the power of EUT.

### 3.3. Configuration of Test System Details



#### Tested System Details

The types for all equipments, plus descriptions of all cables used in the tested system (including inserted cards) are:

Product		Manufacturer	Model No.	Serial Number	Power Cord
1.	Notebook	Lenovo	B490	WB12542618	N/A



### 3.4. Test Site Environment

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

## 4 Conducted Emission Measurement

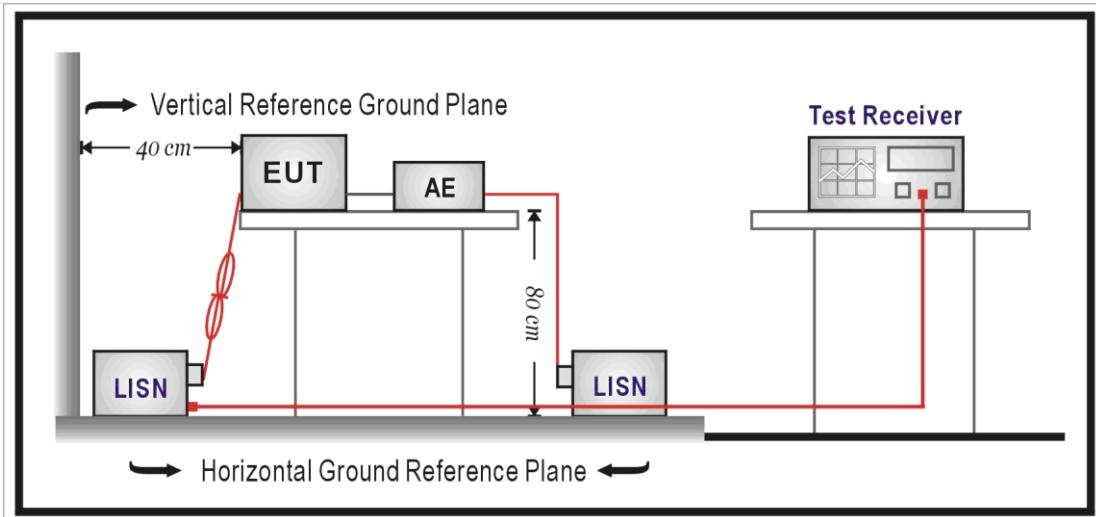
### 4.1. Limit

Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

### 4.2. Test Instruments

Describe	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
SB3319	EMI Test Receiver	Rohde & Schwarz	ESCS30	Jan.20,2015	1 Year
SB4357	AMN	Rohde & Schwarz	ENV216	Jan.20,2015	1 Year

### 4.3. Test Setup





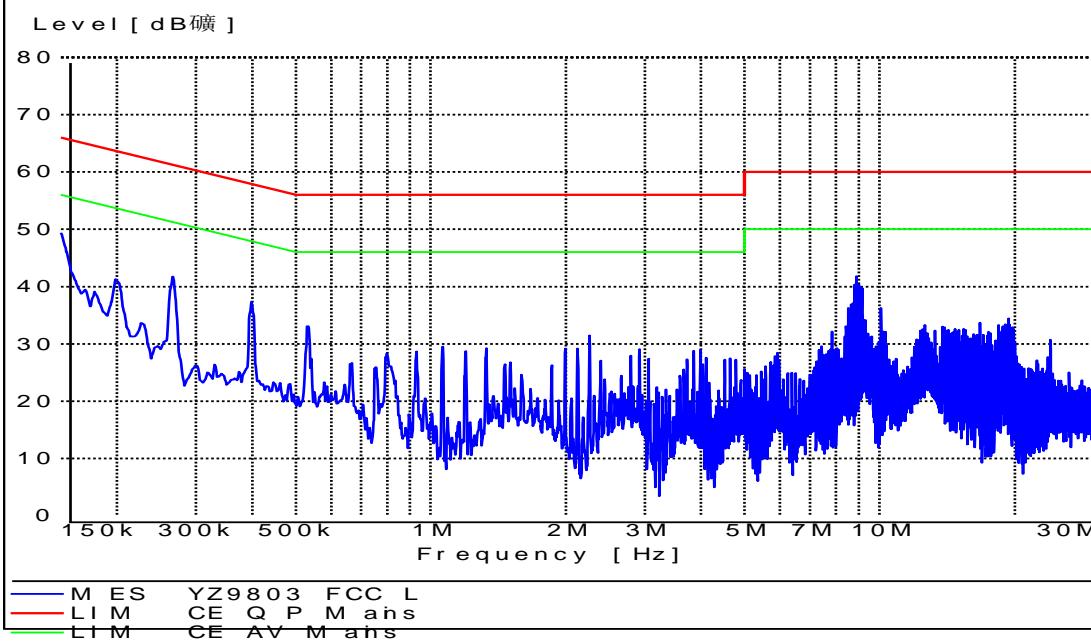
## 4.4. Test Procedure

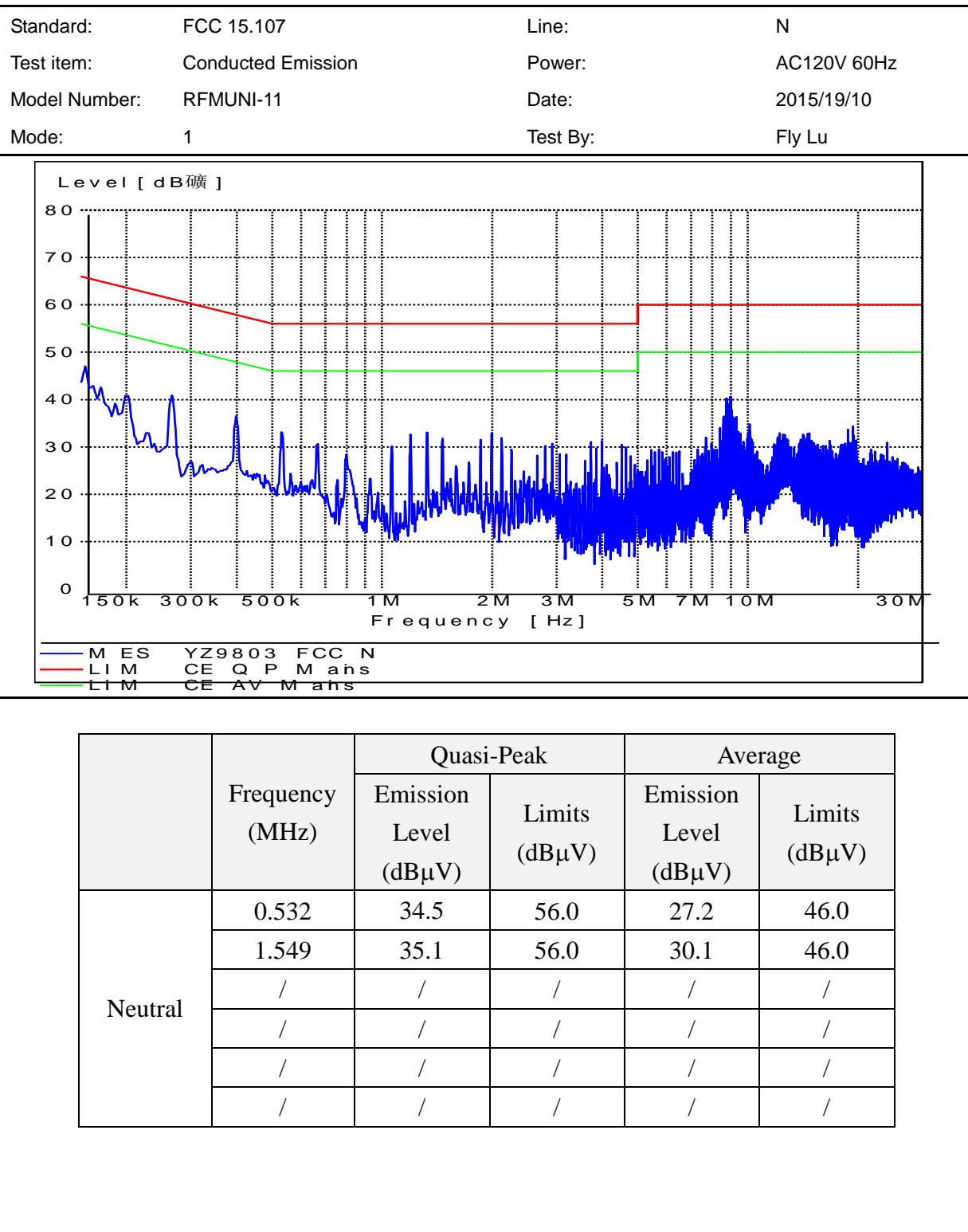
The power line conducted emission measurements were performed in a shielded enclosure. The EUT was assembled on a wooden table which is 80 centimeters high, was placed 40 centimeters from the back wall and at least 1 meter from the sidewall.

Power was fed to the EUT from the public utility power grid through a line filter and EMCO Model 3162/2 SH Line Impedance Stabilization Networks (LISN). The LISN housing, measuring instrumentation case, ground plane, etc., were electrically bonded together at the same RF potential. The Spectrum analyzer was connected to the AC line through an isolation transformer. The 50-ohm output of the LISN was connected to the spectrum analyzer directly. Conducted emission levels were in the CISPR quasi-peak detection mode. The analyzer's 6 dB bandwidth was set to 9 KHz. No post-detector video filter was used.

The spectrum was scanned from 150 KHz to 30 MHz. The physical arrangement of the test system and associated cabling was varied (within the scope of arrangements likely to be encountered in actual use) to determine the effect on the unit's emanations in amplitude and frequency. All spurious emission frequencies were observed. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in paragraph 4.1.

## 4.5. Test Result

Standard:	FCC 15.107	Line:	L																																							
Test item:	Conducted Emission	Power:	AC120V 60Hz																																							
Model Number:	RFMUNI-11	Date:	2015/19/10																																							
Mode:	1	Test By:																																								
 <p>Level [ dB ]</p> <p>Frequency [ Hz ]</p> <p>— M ES YZ9803 FCC L — LIM CE Q P M ains — LIM CE AV M ains</p>																																										
<table border="1"> <thead> <tr> <th rowspan="2">Frequency (MHz)</th> <th colspan="2">Quasi-Peak</th> <th colspan="2">Average</th> </tr> <tr> <th>Emission Level (dB<math>\mu</math>V)</th> <th>Limits (dB<math>\mu</math>V)</th> <th>Emission Level (dB<math>\mu</math>V)</th> <th>Limits (dB<math>\mu</math>V)</th> </tr> </thead> <tbody> <tr> <td>0.543</td><td>33.2</td><td>56.0</td><td>26.3</td><td>46.0</td></tr> <tr> <td>2.190</td><td>31.2</td><td>56.0</td><td>24.9</td><td>46.0</td></tr> <tr> <td>/</td><td>/</td><td>/</td><td>/</td><td>/</td></tr> <tr> <td>/</td><td>/</td><td>/</td><td>/</td><td>/</td></tr> <tr> <td>/</td><td>/</td><td>/</td><td>/</td><td>/</td></tr> <tr> <td>/</td><td>/</td><td>/</td><td>/</td><td>/</td></tr> </tbody> </table>				Frequency (MHz)	Quasi-Peak		Average		Emission Level (dB $\mu$ V)	Limits (dB $\mu$ V)	Emission Level (dB $\mu$ V)	Limits (dB $\mu$ V)	0.543	33.2	56.0	26.3	46.0	2.190	31.2	56.0	24.9	46.0	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
Frequency (MHz)	Quasi-Peak		Average																																							
	Emission Level (dB $\mu$ V)	Limits (dB $\mu$ V)	Emission Level (dB $\mu$ V)	Limits (dB $\mu$ V)																																						
0.543	33.2	56.0	26.3	46.0																																						
2.190	31.2	56.0	24.9	46.0																																						
/	/	/	/	/																																						
/	/	/	/	/																																						
/	/	/	/	/																																						
/	/	/	/	/																																						





## 5 Radiated Interference Measurement

### 5.1. Limit

Frequency (MHz)	Field Strength ( $\mu$ V/m at meter)	Measurement Distance (meter)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 - 88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

Harmonic emissions limits comply with below 54 dBuV/m at 3m. Other emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or comply with the radiated emissions limits specified in section 15.209(a) limit in the table below has to be followed.

Note: (1) The tighter limit applies at the band edges.

(2) Emission level (dBuV/m)=20log Emission level (uV/m).

#### Limits of Radiated Emission Measurement (FCC 15.209)

Frequency (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	Peak	AVG	Peak	AVG
0.009 – 0.490	80	60	74	54

Notes: (1) The limit for radiated test was performed according to FCC PART 15C.

(2) The tighter limit applies at the band edges.

(3) Emission level (dBuV/m)=20log Emission level (uV/m).

#### Limits of Radiated Emission Measurement (FCC Part 15.249)

Frequency Range (MHz)	Limit
2400-2483.5	Field strength of fundamental 50000 $\mu$ V/m (94 dB $\mu$ V/m) @ 3 m
Above 2483.5	Field strength of harmonics 500 $\mu$ V/m (54 dB $\mu$ V/m) @ 3 m

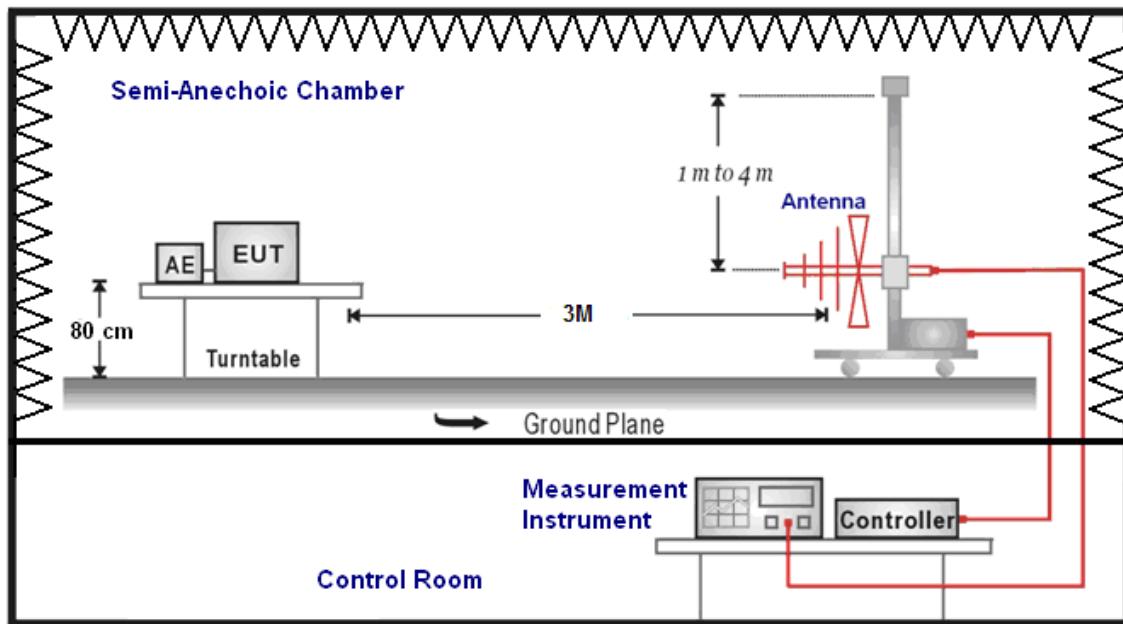


## 5.2. Test Instruments

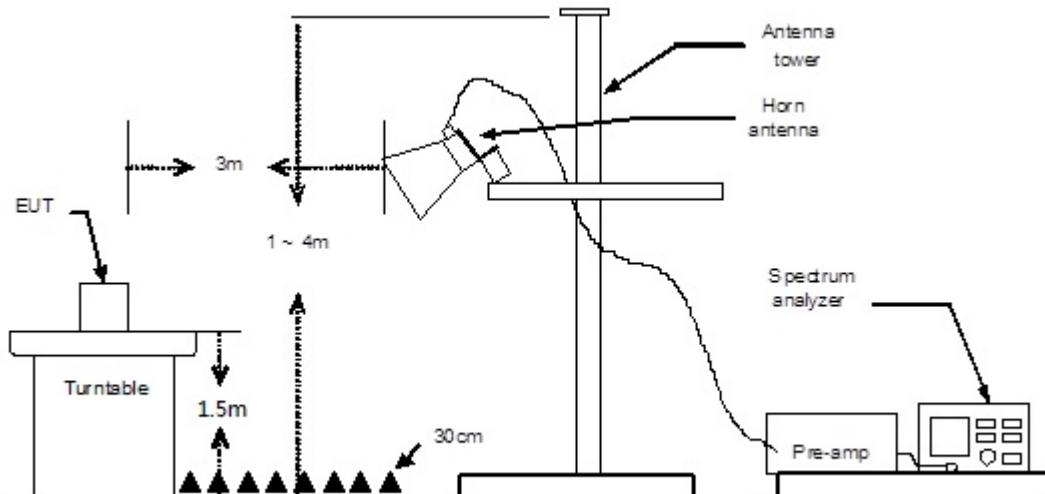
3 Meter Chamber					
Model No.	Equipment	Manufacturer	Serial Number	Cal. Date	Remark
ESU40	EMI Test Receiver	R&S	SB8501/09	May.16, 2015	1 Year
VULB9163	Bilog Antenna	Schwarzbeck	SB8501/04	Jan.20, 2015	1 Year
HF906	Horn Antenna	R&S	SB3435	Jan.20, 2015	1 Year
--	Amplifier(1-18GHz)	R&S	SB3435/01	Jan.20, 2015	1 Year
--	Amplifier(18-40GHz)	R&S	SB3435/02	May.16, 2015	1 Year
AT4560	Horn Antenna	Amplifier Research	SB5392/02	May.16, 2015	1 Year
9X6X6	3m Semi-anechoic chamber	Albatross Projects	SB3450/01	Oct.12, 2014	2 Years
ESI26	EMI Test Receiver	Rohde & Schwarz	SB3436	Jan.20,2015	1 Year
VULB9163	Broadband antenna	SCHWARZBECK	SB3955	Jan.20,2015	1 Year
HF907	Horn Antenna	R&S	SB8501/01	Aug.15,2015	1 Year
Spectrum Analyzer	Agilent	N9039A	MY46520256	Jan.10, 2015	2 Years

### 5.3. Setup

Below 1GHz



Above 1GHz



## 5.4. Test Procedure

Final radiation measurements were made on a three-meter, Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 1.5 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 250 MHz to 2.5 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously & Measurements spectrum range from 30 MHz to 26.5 GHz is investigated.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on tree orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

SCHWARZBECK MESS-ELEKTRONIK Biconilog Antenna (mode VULB9163) at 3 Meter and the SCHWARZBECK Double Ridged Guide Antenna (model BBHA9120D&9170) was used in frequencies 1 – 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20dB/decade).

For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in micro volts pre meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in micro colts per meter (dBuV/m).

The actual field intensity in dBuV/m is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

$$(1) \text{ Amplitude (dBuV/m)} = \text{FI (dBuV)} + \text{AF (dBuV)} + \text{CL (dBuV)} - \text{Gain (dB)}$$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

$$(2) \text{ Actual Amplitude (dBuV/m)} = \text{Amplitude (dBuV)} - \text{Dis(dB)}$$

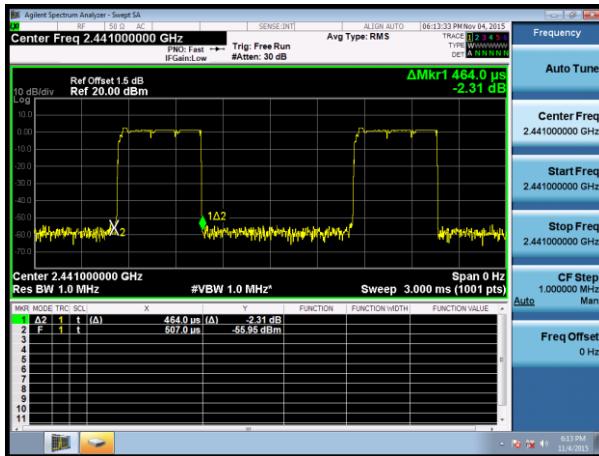
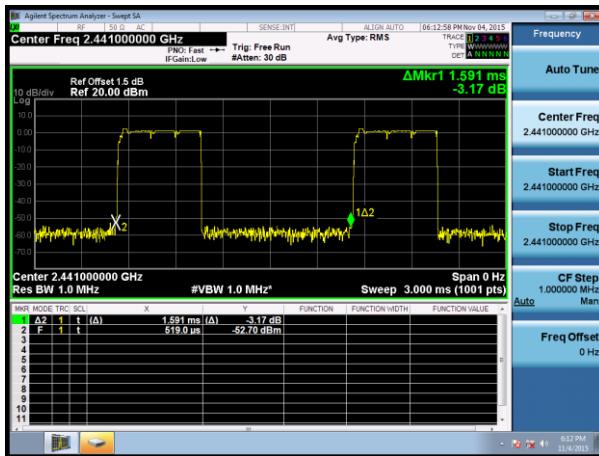
The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30dBm

(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

$$\text{Duty cycle(ms)} = \text{Ton}/\text{T} = 0.398/0.650 * 100\% = 29.16\%$$

$$\text{Duty cycle factor} = 20 \log (1/\text{duty cycle}) = 10.70$$



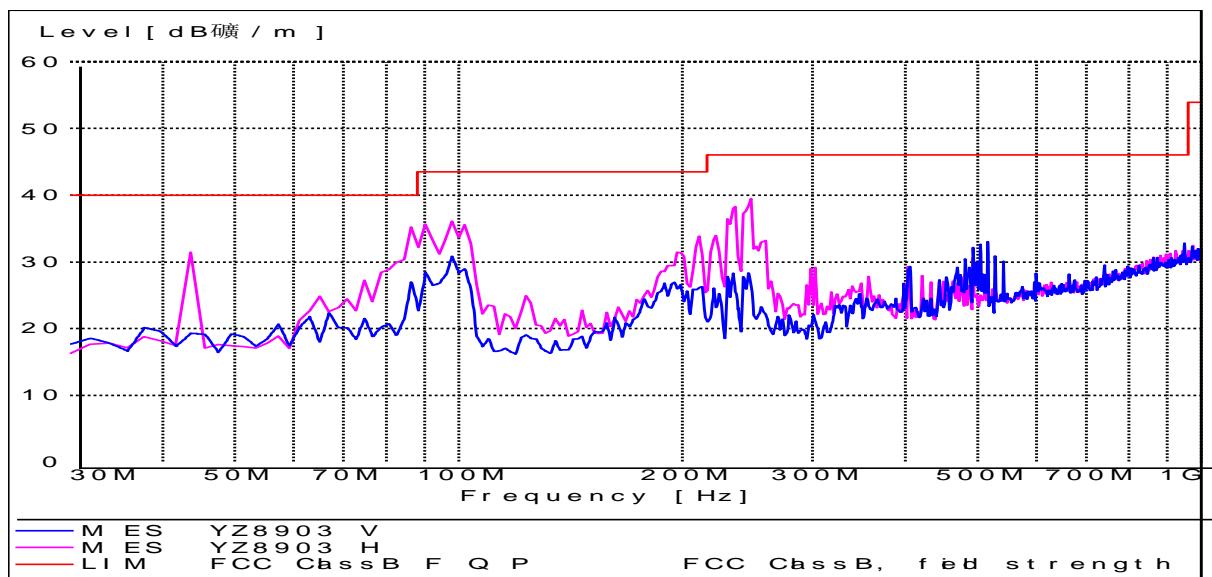
## 5.5. Test Result

### Below 1GHz

Standard:	FCC Part 15C			Test Distance:	3m		
Test item:	Radiated Emission			Power:	AC 120V/60HZ		
Model Number:	RFMUNI-11			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 1			Date:	2015/10/21		
Test By:							Fly Lu
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar. H / V
43.21	1.72	8.17	30.11	40.0	26.60	QP	H
98.03	2.06	5.19	36.25	43.5	23.78	QP	H
191.52	3.91	5.72	33.87	43.5	23.81	QP	H
247.71	4.05	3.00	38.95	46.0	26.29	QP	H
251.35	4.08	2.66	39.26	46.0	22.03	QP	H
531.69	4.35	7.24	34.41	46.0	19.24	QP	H
43.21	1.72	18.5	19.78	40.0	14.16	QP	V
98.03	2.06	13.92	27.52	43.5	22.49	QP	V
191.52	3.91	12.91	26.68	43.5	24.78	QP	V
247.71	4.05	13.17	28.78	46.0	22.90	QP	V
251.35	4.08	12.91	29.01	46.0	23.57	QP	V
531.69	4.35	16.10	25.55	46.0	25.90	QP	V

Note: No emission found between lowest internal used/generated frequencies to 30MHz (9 kHz~30MHz).

Horizontal& Vertical

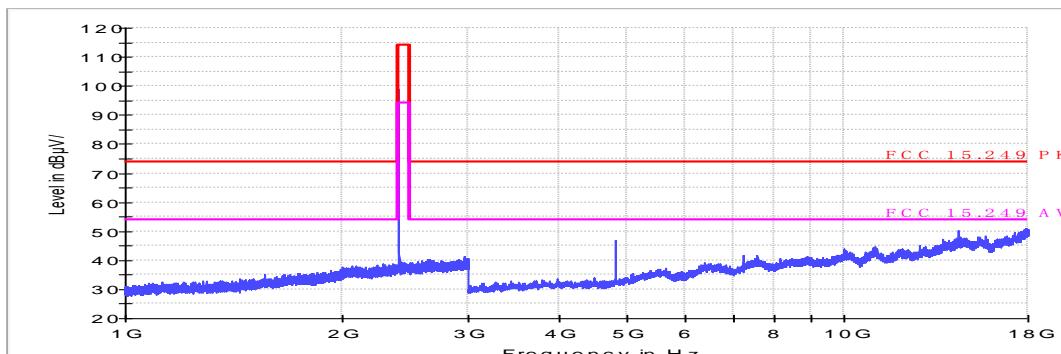


## Above 1GHz

Standard:	FCC Part 15C		Test Distance:	3m			
Test item:	Radiated Emission			Power:	AC 120V/60HZ		
Model Number:	RFMUNI-11			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 2			Date:	2015/10/21		
Frequency:	2402 MHz			Test By:	Fly Lu		
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar.
2404	96.0	3.2	99.20	114.0	14.8	peak	H
2404	85.3	3.2	88.50	94.0	5.5	Average	H
4808	41.5	5.9	47.40	74.0	26.6	peak	H
2404	91.9	3.2	95.10	114.0	18.9	peak	V
2404	81.2	3.2	84.40	94.0	9.6	Average	V
4808	41.2	5.9	47.10	74.0	26.9	peak	

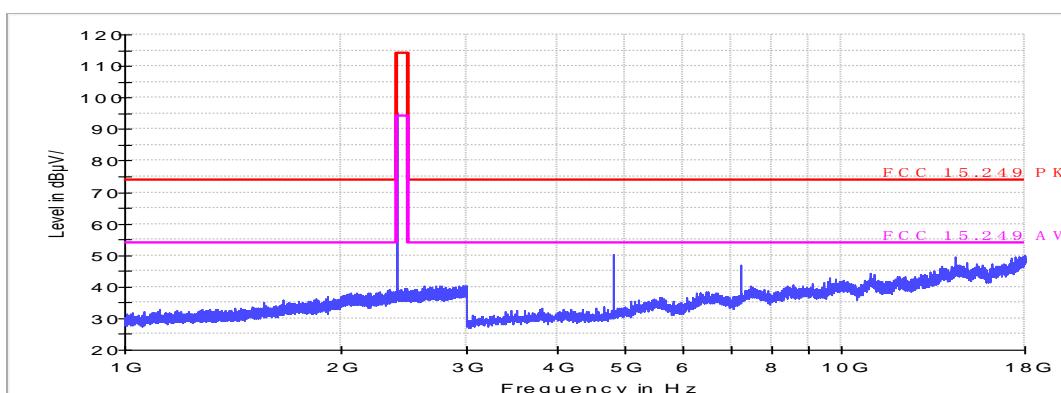
Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Vertical

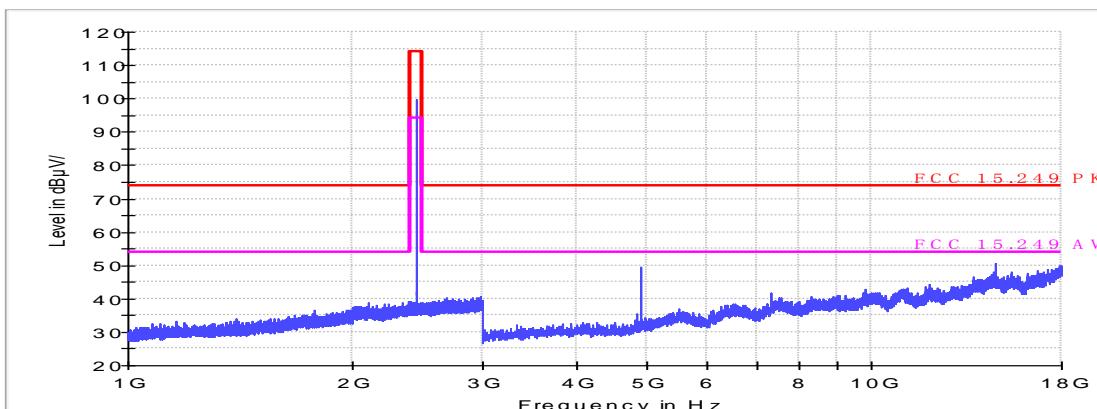
FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Standard:	FCC Part 15C		Test Distance:	3m			
Test item:	Radiated Emission			Power:	AC 120V/60HZ		
Model Number:	RFMUNI-11			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 2			Date:	2015/10/21		
Frequency:	2441 MHz		Test By:	Fly Lu			
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar.
2441	96.0	3.3	99.30	114.0	14.7	peak	H
2441	85.3	3.3	88.60	94.0	5.4	Average	H
4882	38.7	6.2	44.90	74.0	29.1	peak	H
2441	93.1	3.3	96.40	114.0	17.6	peak	V
2441	82.4	3.3	85.70	94.0	8.3	Average	V
4882	38.6	6.2	44.80	74.0	29.2	peak	V

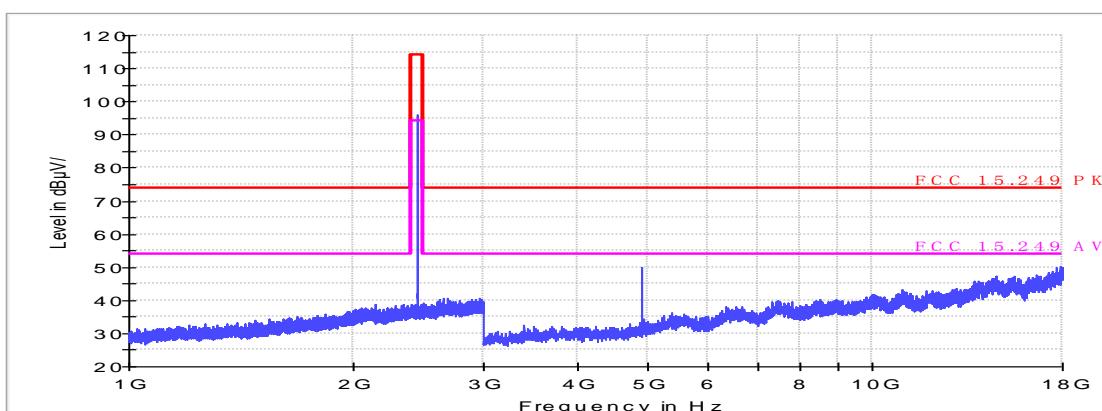
### Horizontal

FCC Electric Field Strength 1-18GHz operate on 2.4GHz



### Vertical

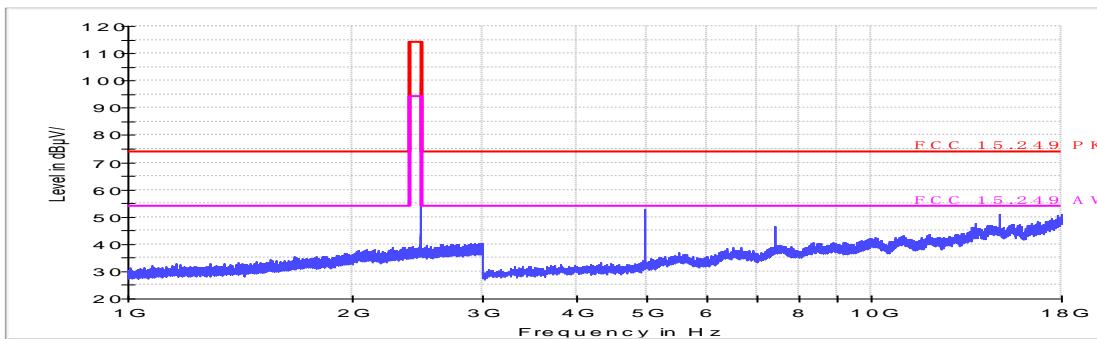
FCC Electric Field Strength 1-18GHz operate on 2.4GHz



Standard:	FCC Part 15C		Test Distance:	3m			
Test item:	Radiated Emission			Power:	AC 120V/60HZ		
Model Number:	RFMUNI-11			Temp.(°C)/Hum.(%RH):	26(°C)/60%RH		
Mode:	Mode 2			Date:	2015/10/21		
Frequency:	2478 MHz		Test By:	Fly Lu			
Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Polar.
2478	94.8	3.8	98.60	114.0	15.4	peak	H
2478	84.1	3.8	87.90	94.0	6.1	Average	H
4956	46.6	6.5	53.10	74.0	20.9	peak	H
2478	93.8	3.8	97.60	114.0	16.4	peak	V
2478	83.1	3.8	86.90	94.0	7.1	Average	V
4956	44.4	6.5	50.90	74.0	23.1	peak	V

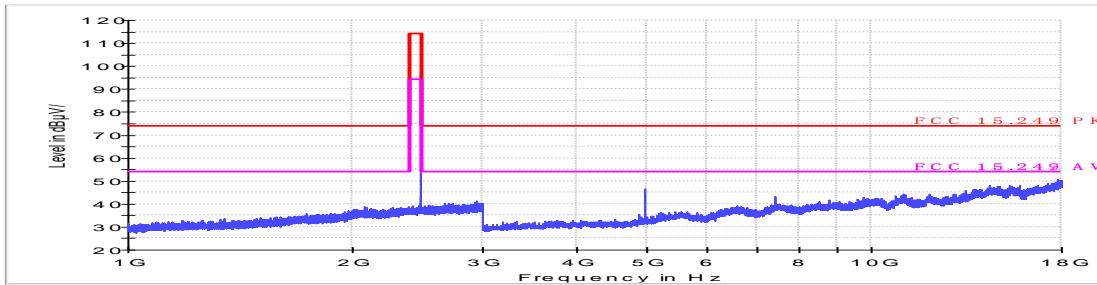
### Horizontal

FCC Electric Field Strength 1-18 GHz operate on 2.4 GHz



### Vertical

FCC Electric Field Strength 1-18 GHz operate on 2.4 GHz

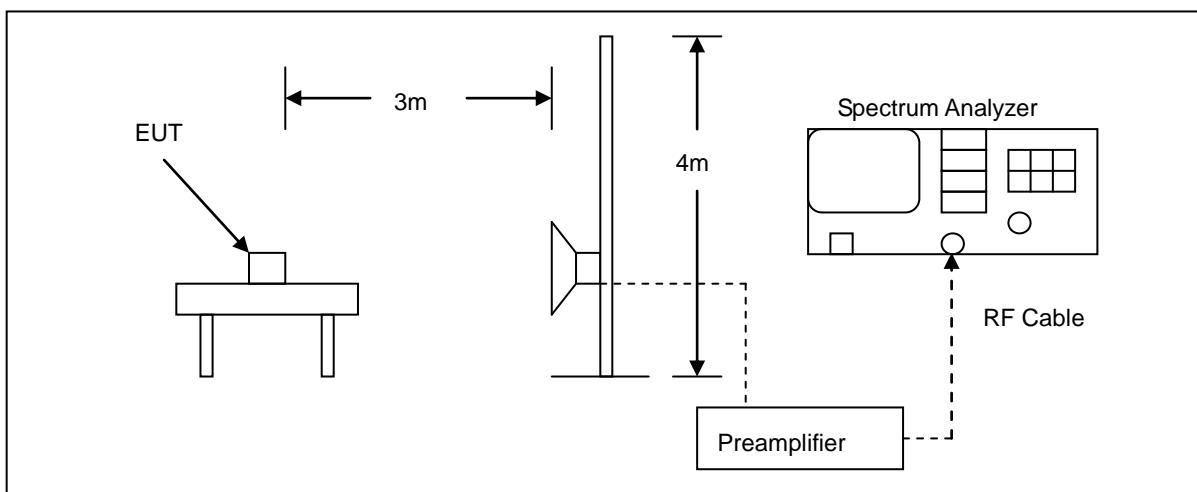


## 6 Band Edges Measurement

### 6.1. Limit

In any 100 kHz bandwidth outside the frequency band, the radio frequency power is at least 50dB below that in the 100 kHz bandwidth within the band that contains the highest lever of the desired power.

### 6.2. Test Setup



### 6.3. Test Instruments

3 Meter Chamber					
Model No.	Equipment	Manufacturer	Serial Number	Cal. Date	Remark
ESU40	EMI Test Receiver	R&S	SB8501/09	Jan.20,2015	1 Year
VULB9163	Bilog Antenna	Schwarzbeck	SB8501/04	Jan.20, 2015	1 Year
HF906	Horn Antenna	R&S	SB3435	Jan.20, 2015	1 Year
--	Amplifier(1-18GHz)	R&S	SB3435/01	Jan.20, 2015	1 Year
--	Amplifier(18-40GHz)	R&S	SB3435/02	Jan.20,2015	1 Year
AT4560	Horn Antenna	Amplifier Research	SB5392/02	Jan.20,2015	1 Year
9X6X6	3m Semi-anechoic chamber	Albatross Projects	SB3450/01	Oct.12, 2014	2 Years
ESI26	EMI Test Receiver	Rohde & Schwarz	SB3436	Jan.20,2015	1 Year
VULB9163	Broadband antenna	SCHWARZBECK	SB3955	Jan.20,2015	1 Year
HF907	Horn Antenna	R&S	SB8501/01	Aug.15,2015	1 Year
Spectrum Analyzer	Agilent	N9039A	MY46520256	Jan.10, 2015	2 Years



## 6.4. Test Procedure

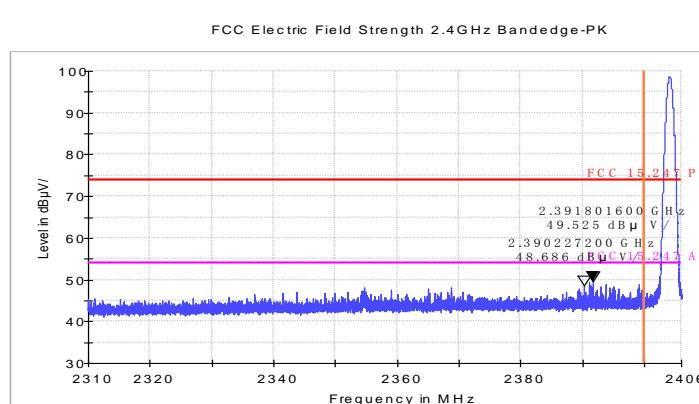
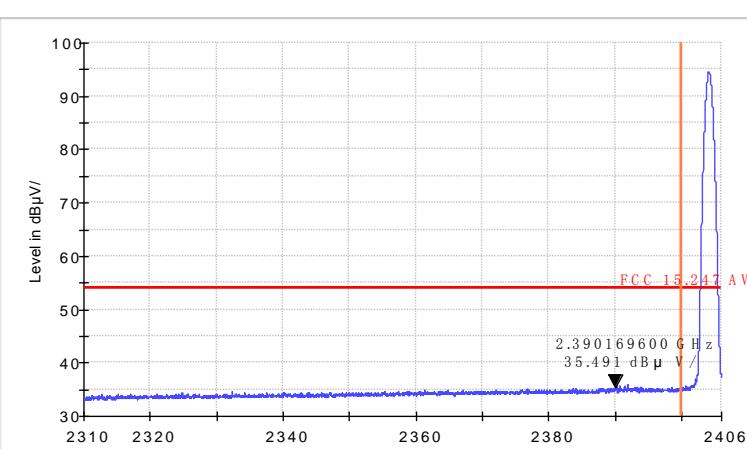
The emissions on the harmonics frequencies, the limits, and the margin of compliance are presented. These tests were made when the transmitter was in full radiated power. The additional test was performed to show compliance with the requirement at the band-edge frequency 2483.5 MHz and up to 2500 MHz and at 2390.0 MHz.

The transmitter was configured with the worst case antenna and setup to transmit at the highest channel. Then the field strength was measured at 2483.5 MHz.

The transmitter was then configured with the worst case antenna and setup to transmit at the lowest channel. Then the field strength was measured at 2390.0 MHz. These tests were performed at 4 different bit rates.

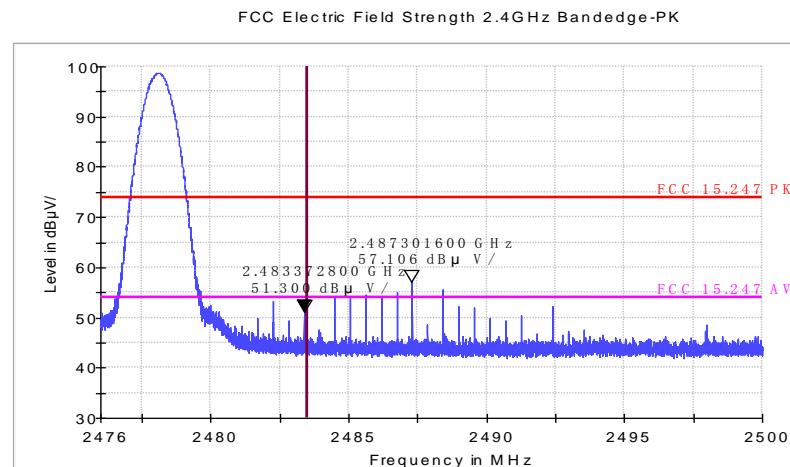
For measurements the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

## 6.5. Test Result

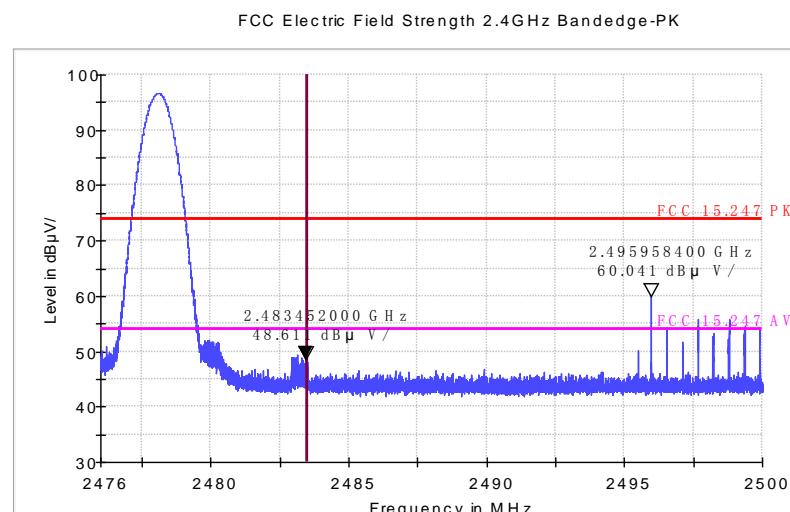
Mode 2						
2402/H						
2402/V						
	Frequency (MHz)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna	Remark
	2391.8	49.52	74	24.48	H	Peak
	--	--	--	--	--	Average
	2390.1	35.49	74	38.51	V	Peak
	--	--	--	--	--	Average

Mode 2

2480/H



2480/V



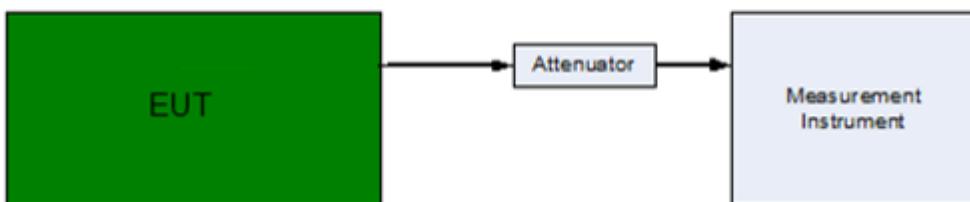
Frequency (MHz)	Result (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Antenna	Remark
2483.3	51.3	74	22.7	H	Peak
2487.3	57.1	74	16.9	H	Peak
2487.3	46.4	54	7.6	H	Average
2483.4	48.6	74	25.4	V	Peak
2495.9	60.0	74	14.0	V	Peak
2495.9	49.3	54	4.7	V	Average

## 7 20dB RF Bandwidth and 99 % Occupied Bandwidth Measurement

### 7.1. Limit

N/A

### 7.2. Test Setup



### 7.3. Test Instruments

Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
Spectrum Analyzer	Agilent	N9020A	MY53420615	05/12/2015	(1)
Test Site	ATL	TE02	TE02	N.C.R.	-----
RF cable	WOKEN	---	C.10-07-02	10/24/2015	(1)
RF cable	WOKEN	---	C.10-07-03	10/24/2015	(1)
Temporary antenna connector	---	---	A01-224	05/24/2015	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years.

NOTE: N.C.R. = No Calibration Request. All the RF cables apply to 9 KHz to 40GHz.

### 7.4. Test Procedure

#### 20dB RF Bandwidth

Testing must be done according to this procedure. This is the only method recognized by the FCC. The RF output port of the Equipment-Under-Test is directly coupled to the input of the EMC analyzer through a specialized RF connector and a 10dB passive attenuator. A fully charged battery was used for the supply voltage. The Bluetooth frequency hopping function of the EUT was enabled. The spectrum analyzer used the following settings:

1. Span = approx. 2 to 3 times the 20dB bandwidth, centered on a hopping frequency
2. RBW  $\geq 1\%$  of the 20dB span, VBW  $\geq$  RBW
4. Sweep = auto
5. Detector function = peak
6. Trace = max hold

The trace was allowed to stabilize. The EUT was transmitting at its maximum data rate. The marker-to-peak function was used to set the marker to the peak of the emission. The marker-delta function was used to measure 20dB down one side of the emission. The marker-delta function and marker was moved to the other side of the



emission until it was even with the reference marker. The marker-delta reading at this point was the 20dB bandwidth of the emission.

### 99 % Occupied Bandwidth

The transmitter shall be operated at its maximum carrier power measured under normal test conditions.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts.

The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%.

The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where

practical, a sampling detector shall be used since a peak or, peak hold, may produce a wider bandwidth than actual.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded.

Note: We tests were performed in different modulation to find the worst case. And show the worst-case here.

## 7.5. Test Result

Model Number	RFMUNI-11		
Test Item	20dB RF Bandwidth and 99 % Occupied Bandwidth		
Test Mode	Mode 2		
Date of Test	2015/11/24	Test Site	TE02
Frequency (MHz)	20dB RF Bandwidth (MHz)	99 % Occupied Bandwidth (MHz)	Limit (MHz)
2404	2.402	2.3101	-----
2441	2.491	2.4272	-----
2478	2.332	2.1855	-----

## 7.6. Test Graphs

Mode 2: GFSK Link Mode

2404	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.404000000 GHz</p> <p>Center Freq: 2.404000000 GHz</p> <p>RF: 130.0 GHz SENSE:INTI</p> <p>Align Auto</p> <p>04:59:08 PM Nov 04, 2015</p> <p>Trig: Free Run</p> <p>Avg/Hold: 10/10</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>#IFGain:Low</p> <p>#Atten: 20 dB</p> <p>Frequency</p> <p>Center Freq 2.404000000 GHz</p> <p>CF Step 300.000 kHz</p> <p>Auto</p> <p>Freq Offset 0 Hz</p> <p>Occupied Bandwidth 2.3101 MHz</p> <p>Total Power -17.1 dBm</p> <p>Transmit Freq Error 82.815 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 2.402 MHz</p> <p>x dB -20.00 dB</p>
2441	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.441000000 GHz</p> <p>Center Freq: 2.441000000 GHz</p> <p>RF: 130.0 GHz SENSE:INTI</p> <p>Align Auto</p> <p>04:59:42 PM Nov 04, 2015</p> <p>Trig: Free Run</p> <p>Avg/Hold: 10/10</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>#IFGain:Low</p> <p>#Atten: 20 dB</p> <p>Frequency</p> <p>Center Freq 2.441000000 GHz</p> <p>CF Step 300.000 kHz</p> <p>Auto</p> <p>Freq Offset 0 Hz</p> <p>Occupied Bandwidth 2.4272 MHz</p> <p>Total Power -16.0 dBm</p> <p>Transmit Freq Error 252.90 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 2.491 MHz</p> <p>x dB -20.00 dB</p>
2478	<p>Agilent Spectrum Analyzer - Occupied BW</p> <p>Center Freq 2.478000000 GHz</p> <p>Center Freq: 2.478000000 GHz</p> <p>RF: 130.0 GHz SENSE:INTI</p> <p>Align Auto</p> <p>04:59:59 PM Nov 04, 2015</p> <p>Trig: Free Run</p> <p>Avg/Hold: 10/10</p> <p>Radio Std: None</p> <p>Radio Device: BTS</p> <p>#IFGain:Low</p> <p>#Atten: 20 dB</p> <p>Frequency</p> <p>Center Freq 2.478000000 GHz</p> <p>CF Step 300.000 kHz</p> <p>Auto</p> <p>Freq Offset 0 Hz</p> <p>Occupied Bandwidth 2.1855 MHz</p> <p>Total Power -15.5 dBm</p> <p>Transmit Freq Error 149.59 kHz</p> <p>OBW Power 99.00 %</p> <p>x dB Bandwidth 2.332 MHz</p> <p>x dB -20.00 dB</p>



## 8 Antenna Measurement

### 8.1. Limit

For intentional device, according to 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.

And According to 15.247 (b), if transmitting antennas of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### 8.2. Antenna Connector Construction

The antenna used in this product is V Shape Antenna. And the maximum Gain of this antenna is only 1.0 dBi.