

## FCC 47 CFR PART 15 SUBPART C

Product Type : RF module  
Applicant : PHIHONG TECHNOLOGY CO LTD  
Address : No. 568, Fu Xing 3rd Rd., GuiShan, Tao Yuan Hsien 33383,  
Taiwan  
Trade Name : PHIHONG  
Model Number : RCA-RFM(BL)  
Test Specification : FCC 47 CFR PART 15 SUBPART C: Oct., 2012  
ANSI C63.4-2009  
Receive Date : Jul. 22, 2013  
Test Period : Sep. 09, 2013  
Issue Date : Oct. 09, 2013

### Issue by

A Test Lab Techno Corp.  
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Taiwan Accreditation Foundation accreditation number: 1330

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**Revision History**

Rev.	Issue Date	Revisions	Revised By
00	Sep. 18, 2013	Initial Issue	
01	Oct. 09, 2013	Revised report information.	Joyce Liao

## Verification of Compliance

Issued Date: 10/09/2013

Product Type : RF module  
Applicant : PHIHONG TECHNOLOGY CO LTD  
Address : No. 568, Fu Xing 3rd Rd., GuiShan, Tao Yuan Hsien 33383,  
Taiwan  
Trade Name : PHIHONG  
Model Number : RCA-RFM(BL)  
FCC ID : 2AARNRCARFMBL  
EUT Rated Voltage : DC 5 ~12V  
Test Voltage : DC 5V  
Applicable Standard : FCC 47 CFR PART 15 SUBPART C: Oct., 2012  
ANSI C63.4-2009  
Test Result : Complied  
Application Purpose : Original  
Performing Lab. : A Test Lab Techno Corp.

No. 140-1, Changan Street, Bade City,  
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<http://www.atl-lab.com.tw/e-index.htm>



The above equipment was tested by A Test Lab Techno Corp. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4: 2009 and the energy emitted by the sample tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247 .

The test results of this report relate only to the tested sample identified in this report.

Approved By : Cran Yang Reviewed By : Fly Lu  
(Manager) (Cran Yang) (Testing Engineer) (Fly Lu)

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## 1 General Information

### 1.1. Summary of Test Result

Standard		Item	Result	Remark
15.249	RSS-GEN			
15.207	7.2.2	AC Power Conducted Emission	N/A	This device's power is supplied by DC source
Standard		Item	Result	Remark
15.249	RSS-210			
15.249(a)	A2.9 (a)	Transmitter Radiated Emissions	PASS	----
15.249(d)	A2.9 (b)	Band Edge Measurement	PASS	----
15.203	-	Antenna Requirement	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

Item	Frequency Range		Uncertainty (dB)
AC Power Conducted Emission	9kHz ~ 30MHz		± 2.020
Radiated Emissions	30MHz ~ 230MHz	Horizontal	± 3.960
		Vertical	± 3.570
	230MHz ~ 1000MHz	Horizontal	± 3.960
		Vertical	± 3.570
	1000MHz ~ 18000MHz	Horizontal	± 3.072
		Vertical	± 3.028
	18000MHz ~ 40000MHz	Horizontal	± 3.622
		Vertical	± 3.506

## 2 EUT Description

Product	RF module
Trade Name	PHIHONG
Model Number	RCA-RFM(BL)
Applicant	PHIHONG TECHNOLOGY CO LTD No. 568, Fu Xing 3rd Rd., GuiShan, Tao Yuan Hsien 33383, Taiwan
Manufacturer	Phihong (Dongguan) Electronics Co., Ltd. Keji Road, Yinhu Ind. Zone, Qingxi Town, Dongguan City, Guangdong, China
FCC ID	2AARNRCARFMBL
Frequency Range	2405 MHz
Modulation Type	FSK
Number of Channel	1 CH
Antenna Type	PCB Antenna
Antenna Gain	10.40 dBi
Field Strength	100.65 dBuV/m

### 3 Test Methodology

#### 3.1. Mode of Operation

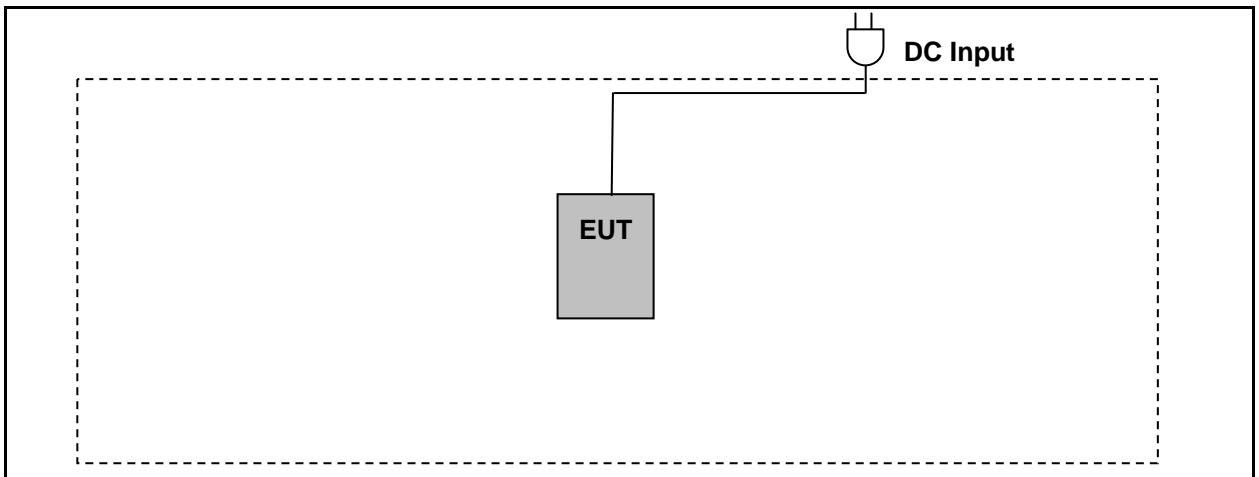
Decision of Test ATL has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation, which was shown in this test report and defined as:

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

#### 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



#### 3.4. Test Site Environment

Items	Required (IEC 68-1)	Actual
Temperature (°C)	15-35	26
Humidity (%RH)	25-75	60
Barometric pressure (mbar)	860-1060	950

## 4 Radiated Interference Measurement

### 4.1. Limit

Frequency (MHz)	Field Strength ( $\mu\text{V/m}$ 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 dB $\mu\text{V/m}$  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 (dB $\mu\text{V/m}$ )=20log Emission level ( $\mu\text{V/m}$ ).

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

Frequency (MHz)	Class A (dB $\mu\text{V/m}$ ) (at 3m)		Class B (dB $\mu\text{V/m}$ ) (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 (dB $\mu\text{V/m}$ )=20log Emission level ( $\mu\text{V/m}$ ).

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

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



## 4.2. Test Instruments

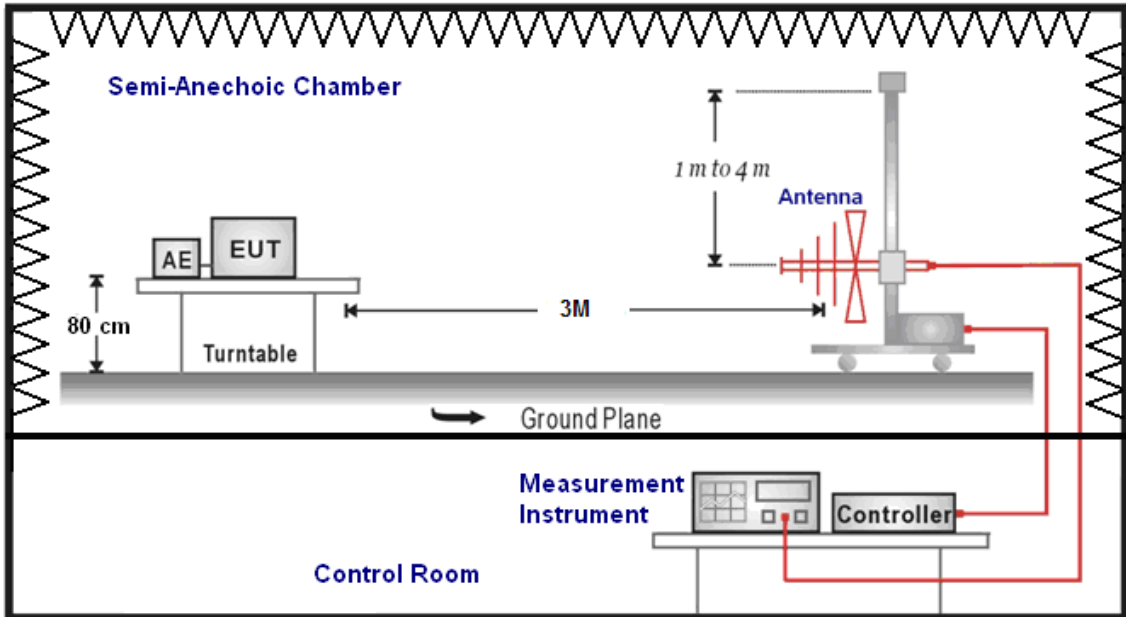
3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/21/2013	(2)
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/21/2013	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/21/2013	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/21/2013	(1)
Broadband Antenna (30MHz~1GHz)	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	9163-270	07/01/2013	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/10/2013	(1)
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	06/13/2013	(1)
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	08/14/2012	(3)
Test Site	ATL	TE01	888001	08/27/2013	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

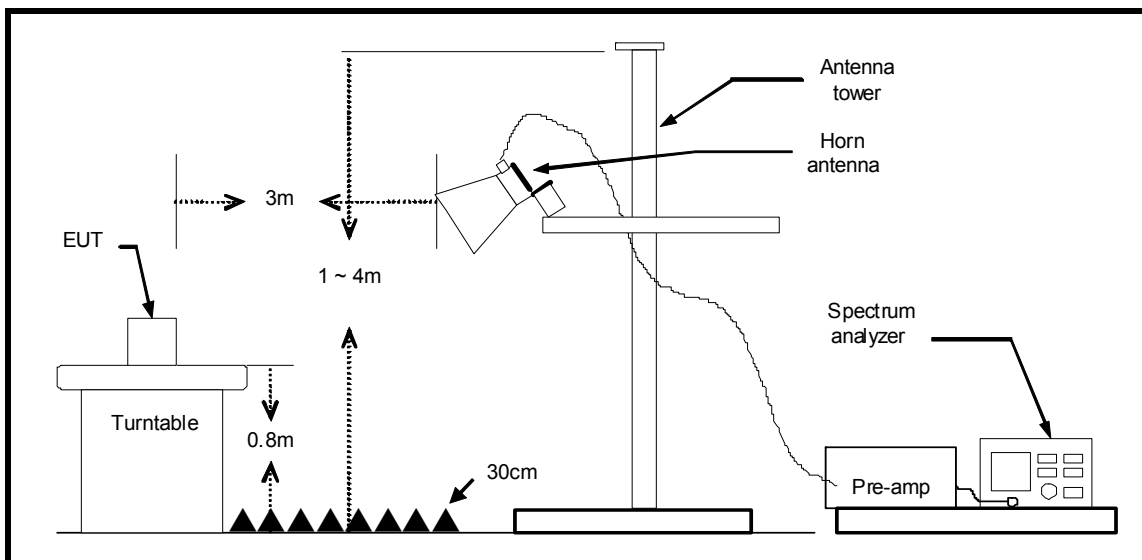
Note: N.C.R. = No Calibration Request.

### 4.3. Setup

Below 1GHz



Above 1GHz



#### 4.4. 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 0.8 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 three 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 volts per meter (dBuV/m).

The actual field intensity in referenced to 1 microvolt per meter (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:

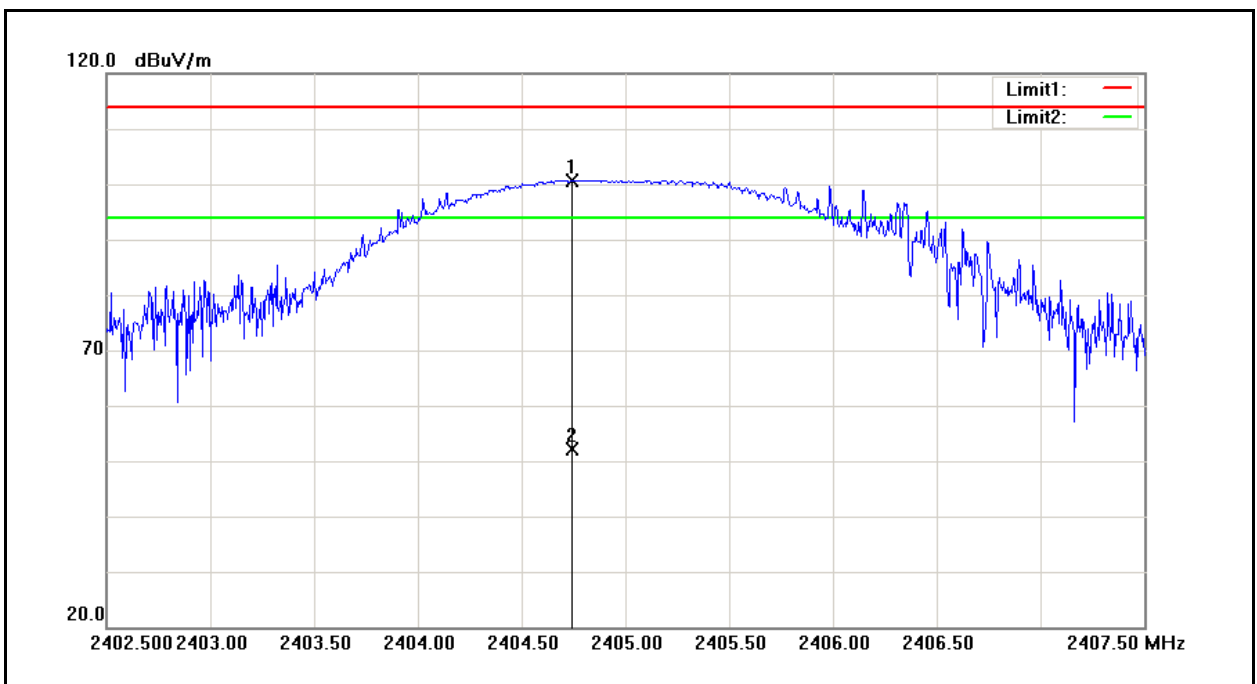
(a) For fundamental frequency : Transmitter Output < +30dBm

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

#### 4.5. Test Result

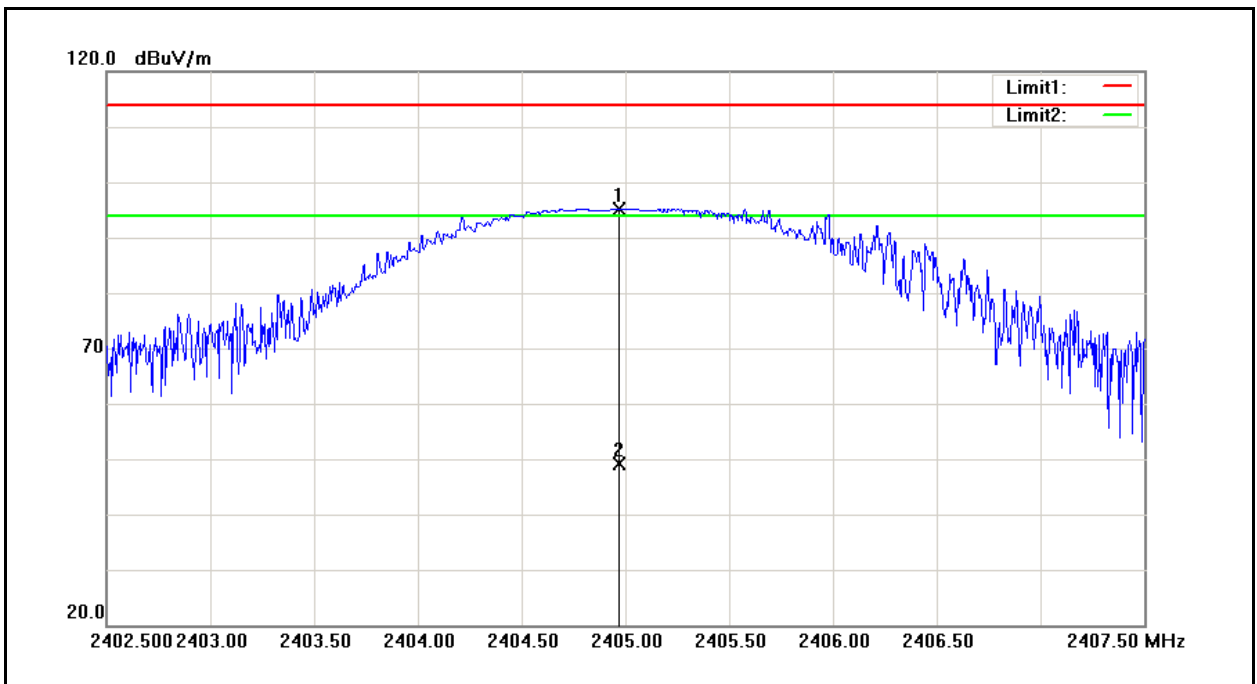
Fundamental Test Result:

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5V
Model Number:	RCA-RFM(BL)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Test Mode:	2	Date:	09/09/2013
Frequency:	2405 MHz	Test By:	Fly Lu
Ant.Polar.:	Horizontal		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2404.745	96.67	3.98	100.65	114.00	-13.35	Peak
2	2404.745	48.24	3.98	52.22	94.00	-41.78	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5V
Model Number:	RCA-RFM(BL)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Test Mode:	2	Date:	09/09/2013
Frequency:	2405 MHz	Test By:	Fly Lu
Ant.Polar.:	Vertical		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2404.970	91.10	3.98	95.08	114.00	-18.92	Peak
2	2404.970	45.16	3.98	49.14	94.00	-44.86	AVG

## Below 1GHz

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5V
Model Number:	RCA-RFM(BL)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	1	Date:	09/09/2013
		Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark	Ant.Pola H / V
108.0000	26.76	-14.26	12.50	43.50	-31.00	QP	H
259.0000	25.45	-11.97	13.48	46.00	-32.52	QP	H
401.5000	26.97	-8.58	18.39	46.00	-27.61	QP	H
611.0000	27.00	-4.82	22.18	46.00	-23.82	QP	H
754.0000	27.27	-2.39	24.88	46.00	-21.12	QP	H
904.0000	26.60	0.47	27.07	46.00	-18.93	QP	H
73.0000	31.52	-16.95	14.57	40.00	-25.43	QP	V
269.5000	26.78	-11.59	15.19	46.00	-30.81	QP	V
388.5000	27.88	-8.63	19.25	46.00	-26.75	QP	V
519.0000	27.08	-6.69	20.39	46.00	-25.61	QP	V
640.0000	27.83	-4.23	23.60	46.00	-22.40	QP	V
879.5000	27.03	-0.21	26.82	46.00	-19.18	QP	V

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

Above 1GHz

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5V
Model Number:	RCA-RFM(BL)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Mode:	2	Date:	09/09/2013
Frequency:	2405MHz	Test By:	Fly Lu

Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remar	Ant. Polar. H / V
3002.000	37.60	5.91	43.51	74.00	-30.49	peak	H
4810.000	42.58	11.68	54.26	74.00	-19.74	peak	H
4810.000	28.78	11.68	40.46	54.00	-13.54	AVG	H
6418.000	32.76	17.16	49.92	74.00	-24.08	peak	H
3058.000	38.07	6.04	44.11	74.00	-29.89	peak	V
4810.000	46.46	11.67	58.13	74.00	-15.87	peak	V
4810.000	30.70	11.67	42.37	54.00	-11.63	AVG	V
6425.000	32.91	17.18	50.09	74.00	-23.91	Peak	V

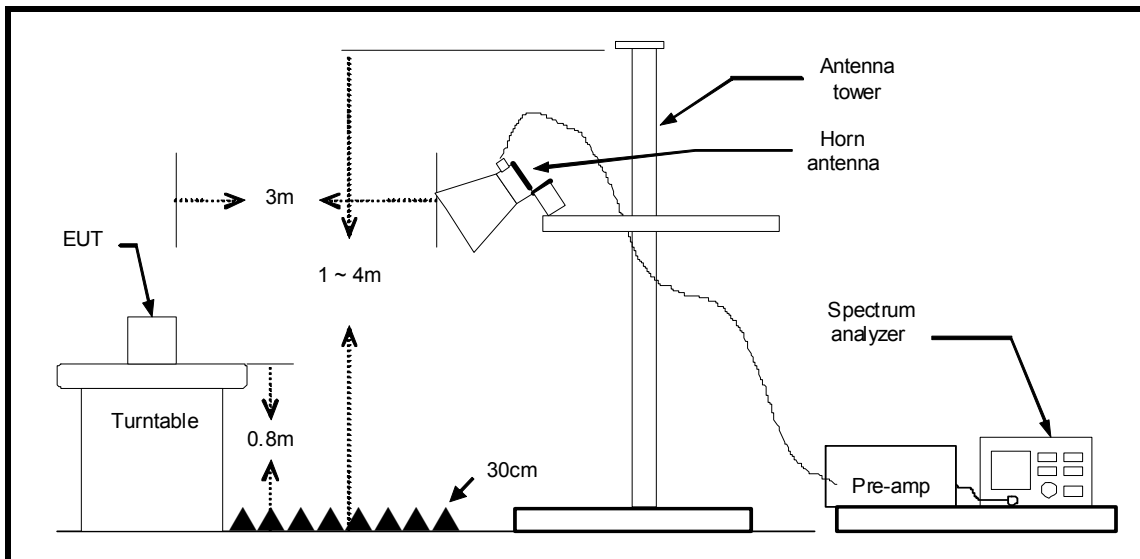


## 5 Band Edges Measurement

### 5.1. 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 level of the desired power.

### 5.2. Test Setup



### 5.3. Test Instruments

3 Meter Chamber					
Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Remark
RF Pre-selector	Agilent	N9039A	MY46520256	01/21/2013	(2)
Spectrum Analyzer	Agilent	E4446A	MY46180578	01/21/2013	(1)
Pre Amplifier	Agilent	8449B	3008A02237	02/21/2013	(1)
Pre Amplifier	Agilent	8447D	2944A10961	02/21/2013	(1)
Horn Antenna (1~18GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9120D	9120D-550	06/10/2013	(1)
Horn Antenna (18~40GHz)	SCHWARZBECK MESS-ELEKTRONIK	BBHA9170	9170-320	06/13/2013	(1)
Loop Antenna	COM-POWER CORPORATION	AL-130	121014	08/14/2012	(3)
Test Site	ATL	TE01	888001	08/27/2013	(1)

Remark: (1) Calibration period 1 year. (2) Calibration period 2 years. (3) Calibration period 3 years.

Note: N.C.R. = No Calibration Request.

#### **5.4. 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.

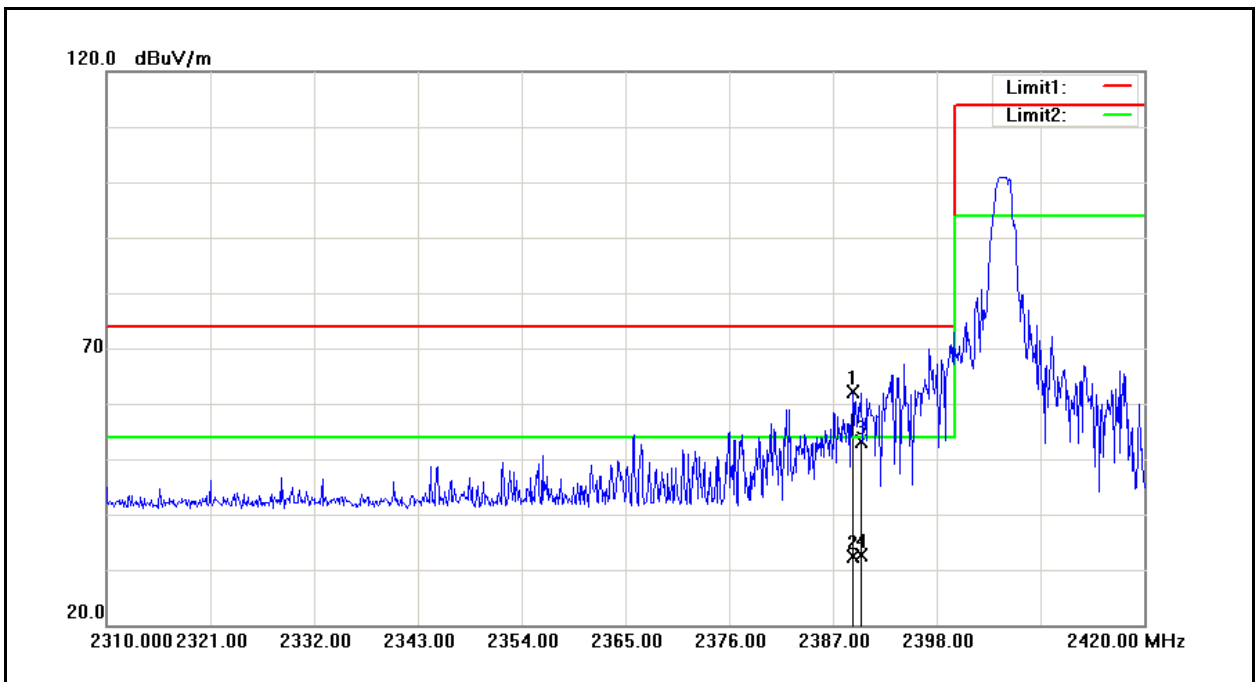
The transmitter was configured with the worst case antenna and setup to transmit at the highest channel. Then the field strength was measured at 2483.5 MHz.

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.

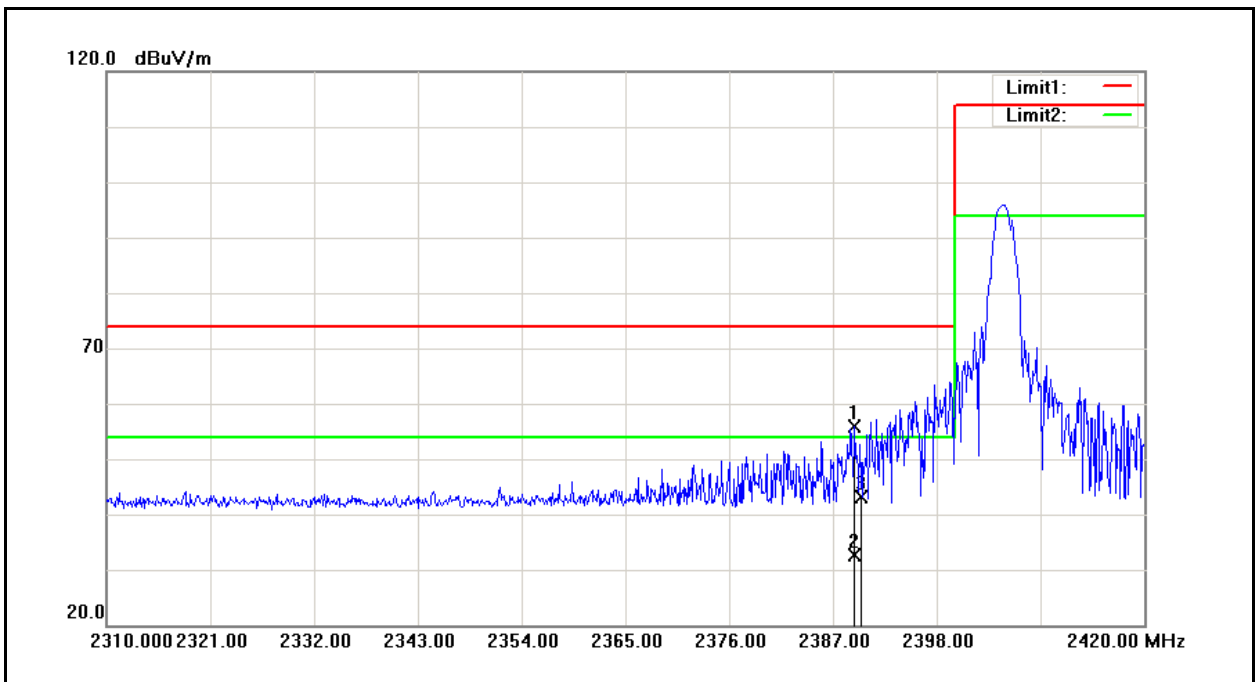
### 5.5. Test Result

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5V
Model Number:	RCA-RFM(BL)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Test Mode:	2	Date:	09/09/2013
Frequency:	2405 MHz	Test By:	Fly Lu
Ant.Polar.:	Horizontal		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.090	58.13	3.88	62.01	74.00	-11.99	peak
2	2389.090	28.56	3.88	32.44	54.00	-21.56	AVG
3	2390.000	49.31	3.88	53.19	74.00	-20.81	peak
4	2390.000	28.64	3.88	32.52	54.00	-21.48	AVG

Standard:	FCC Part 15C	Test Distance:	3m
Test item:	Radiated Emission	Power:	DC 5V
Model Number:	RCA-RFM(BL)	Temp.(°C)/Hum.(%RH):	26(°C)/60%RH
Test Mode:	2	Date:	09/09/2013
Frequency:	2405 MHz	Test By:	Fly Lu
Ant.Polar.:	Vertical		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	2389.310	52.02	3.88	55.90	74.00	-18.10	peak
2	2389.310	28.76	3.88	32.64	54.00	-21.36	AVG
3	2390.000	39.35	3.88	43.23	74.00	-30.77	peak

## **6 Antenna Measurement**

### **6.1. 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.

### **6.2. Antenna Connector Construction**

The antenna used in this product is PCB Antenna. And the maximum Gain of this antenna is 10.40 dBi.