# FCC TEST REPORT

FCC ID : VMFRVC3000

**Applicant** : **DongGuan Protronics Electronics Ltd.** 

Protronic Industrial Park, Xiangxi Village, Shipai Town, Dongguan,

Guangdong, China

**Equipment Under Test (EUT):** 

Product description : Wireless Back-up Camera System

Model No. : RVC3000

**Standards**: FCC 15 Paragraph 15.249

**Date of Test** : Sep.19, 2007

Test Engineer : Tiger Su

Reviewed By : Thelo 2hous

PERPARED BY: Waltek Services (Shenzhen) Co., Ltd.

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## DongGuan Protronic Electronics Ltd.

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# **3** Test Summary

Test	Test Requirement	Test Method	Class / Severity	Result
Radiated Emission (30MHz to 25GHz)	FCC PART 15: 2003	ANSI C63.4: 2003	Class B	PASS
Conducted Emission (150KHz to 30MHz)	FCC PART 15: 2003	ANSI C63.4: 2003	Class B	N/A

### 4 General Information

#### 4.1 Client Information

Applicant: **DongGuan Protronic Electronics Ltd.** 

Address of Applicant: Protronic Industrial Park, Xiangxi Village, Shipai Town,

Dongguan, Guangdong, China

Manufacturer: **DongGuan Protronic Electronics Ltd.** 

Address: Protronic Industrial Park, Xiangxi Village, Shipai Town,

Dongguan, Guangdong, China

#### 4.2 General Description of E.U.T.

Product description: Wireless Back-up Camera System

Model No.: RVC3000

#### 4.3 Details of E.U.T.

Power Supply: DC 12V

#### 4.4 Description of Support Units

The EUT has been tested as an independent unit.

#### 4.5 Standards Applicable for Testing

The customer requested FCC tests for a Wireless Back-up Camera System. The standards used were FCC 15 Paragraph 15.249, Paragraph 15.207, Paragraph 15.209, Paragraph 15.31, Paragraph 15.33, Paragraph 15.35.

#### 4.6 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

#### • FCC – Registration No.: 556682

SGS-CSTC Standards Technical Services Co., Ltd ShenZhen Branch EMC Lab, EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 556682, August 04, 2005.

#### 4.7 Test Location

All Emissions tests were performed at:-

No.1 Workshop,M-10,Middle Section, Science & Technology Park,ShenZhen,China 518057.

# **5** Equipment Used during Test

Equipment	Brand Name	Model	Cal. Int Months	Last Cal. Date
3m Anechoic chamber				
EMC Analyzer	Agilent	E7402A	12	2007-08
EMI Test Receiver	R&S	ESS	12	2007-08
Pre Amplifier	Anritsu	MH648A	12	2007-08
Bilog Antenna	SCHAFFNER	CBL6111C	12	2007-08
Loop Antenna	R&S	6108	12	2007-08
Horn Antenna	ETS.LINDGERN	GH14-H052	12	2007-08
AM/FM Stereo Signal Generator	Panasonic	VP-8122A	12	2007-08
Signal Generator	R&S	SMG	12	2007-08
RF Selector	TOYO	NS4901A	-	-
Turn Disc	HD	DS4150S	-	_
Antenna Mast	HD	MA2400	-	-
EMI Shielded Room				
Spectrum analyzer	ADVANTEST	R3261C	12	2007-08
EMI Test Receiver	R&S	ESS	12	2007-08
Pre Amplifier	Anritsu	MH648A	12	2007-08
LISN	Kyoritsu	KNW-403D	12	2007-08
Absorbing Clamp	R&S	MDS-21	12	2007-08
Distortion Meter	MEGURO	MAK-6578A	12	2007-08
AM/FM Stereo Signal Generator	Panasonic	VP-8122A	12	2007-08
Oscilloscope	LEADER	LS1020	12	2007-08
Function Generator	National	VP-7422A	12	2007-08
Signal Generator	R&S	SMG	12	2007-08
RF Selector	TOYO	NS4000	-	-
Remote Controller	ТОҮО	MAC	-	-

#### **6** Conducted Emission Test

Product Name: Wireless Back-up Camera System

Test Requirement: FCC Part15 Paragraph 15.207

Test Method: Based on FCC Part15 Paragraph 15.207

Test Date:

Frequency Range: 150 kHz to 30MHz

Class B

Detector: Peak for pre-scan (9 kHz Resolution Bandwidth)

Quasi-Peak & Average if maximised peak within 6dB of

Average Limit

#### **6.1** Test Equipment

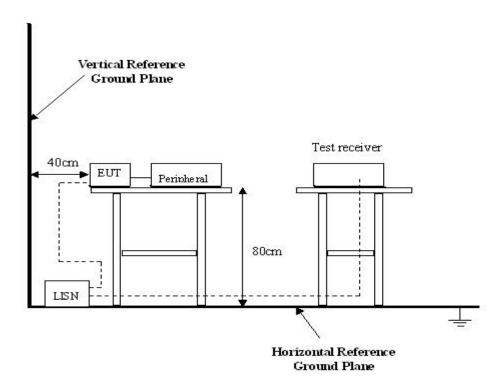
Please refer to Section 5 this report.

#### **6.2** Test Procedure

- 1. The EUT was tested according to ANSI C63.4: 2003. The frequency spectrum from 150kHz to 30MHz was investigated.
- 2. The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.

#### 6.3 Conducted Test Setup

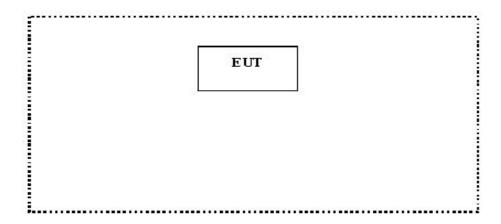
The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Paragraph 15.207 limits.



#### **6.4 EUT Operating Condition**

Operating condition is according to ANSI C63.4: 2003.

- A. Setup the EUT and simulators as shown on follow.
- B. Enable RF signal and confirm EUT active.
- C. Modulate output capacity of EUT up to specification.



#### **6.5** Conducted Emission Limits

 $66\text{-}56~dB\mu V/m$  between 0.15MHz~&~0.5MHz

 $56 \ dB\mu V/m$  between  $0.5MHz \ \& \ 5MHz$ 

 $60~dB\mu V/m$  between 5MHz & 30MHz

**Note**: In the above limits, the tighter limit applies at the band edges.

#### 6.6 Conducted Emission Test Result

Owing to the DC operation of EUT, this test is not performed.

#### 7 Radiation Emission Test

Product Name: Wireless Back-up Camera System

Test Requirement: FCC Part15 Paragraph 15.249

Test Method: Based on FCC Part15 Paragraph 15.31 and Paragraph 15.33

Test Date: Sep. 19, 2007

Frequency Range: 30MHz to 25GHz

Measurement Distance: 3m

Detector: Peak for pre-scan (120kHz resolution bandwidth)

Quasi-Peak if maximised peak within 6dB of limit

#### 7.1 Test Equipment

Please refer to Section 5 this report.

#### 7.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase centre variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

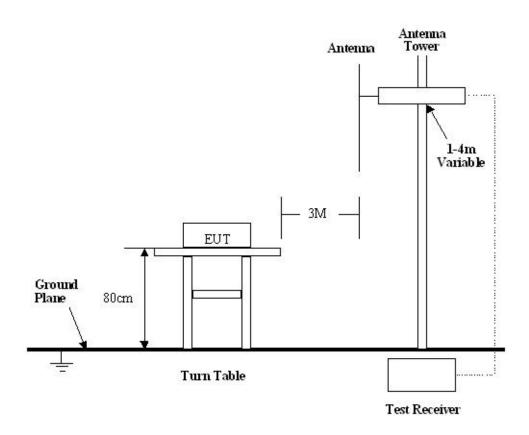
Based on ANSI C63.4: 2003, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at SGS EMC Lab is +4.0 dB.

#### 7.3 Test Procedure

- 1. Maximizing procedure was performed on the six (6) highest emissions to ensure EUT is compliant with all installation combinations.
- 2. All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB $\mu$ V of specification limits), and are distinguished with a "Qp" in the data table.
- 3. The EUT was under normal mode during the final qualification test and the configuration was used to represent the worst case results.

## 7.4 Radiated Test Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4: 2003, The specification used in this report was the FCC Part15 Paragraph 15.249 and Paragraph 15.209 limits.



#### 7.5 Spectrum Analyzer Setup

According to FCC Part15 Paragraph 15.249 Rules, the system was tested to 25000 MHz.

Start Frequency	.30 MHz
Stop Frequency	. 25000 MHz
Sweep Speed Auto	
IF Bandwidth	. 100 kHz
Video Bandwidth	.1 MHz
Quasi-Peak Adapter Bandwidth	. 120 kHz
Quasi-Peak Adapter Mode	. Normal
Resolution Bandwidth	.1MHz

#### 7.6 Corrected Amplitude & Margin Calculation

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

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "Margin" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of  $-7dB\mu V$  means the emission is  $7dB\mu V$  below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

#### 7.7 Summary of Test Results

According to the data in section 7.10, the EUT complied with the FCC Part15 Paragraph 15.249 standards.

#### 7.8 EUT Operating Condition

Same as section 6.4 of this report.

#### 7.9 Radiated Emissions Limit

#### A. FCC Part 15 subpart C Paragraph 15.249 Limit

Fundamental Frequency		Strength of lamental	Field Strength of Harmonics		
r undumentar r requency	mV/m	dBuV/m	uV/m	dBuV/m	
902-928MHz	50	94	500	54	
2400-2483.5 MHz	50	94	500	54	
5725-5875 MHz	50	94	500	54	
24.0-24.25GHz	250	108	2500	68	

Note:

- (1) RF Voltage(dBuV)=20 log RF Voltage(uV)
- (2) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (3)The emission limit in this paragraph is based on measurement instrumentation employing an average detector. Measurement using instrumentation with a peak detector function, corresponding to 20dB above the maximum permitted average limit.
- (4) Above 1GHz,do a Peak and average measurements for all emissions,Limit for peak is 94dBuvV/m,According to Part15.35(b) and average is 54BuvV/m.

#### B. Frequencies in restricted band are complied to limit on Paragraph 15.209

Frequency(MHZ)	Distance(m)	Field strength(dBuV/m)
30-88	3	40.0
88-216	3	43.5
216-960	3	46.0
Above 960	3	54.0

Note:

- (1) RF Voltage(dBuV)=20 log RF Voltage(uV)
- (2) In the Above Table, the tighter limit applies at the band edges.
- (3) Distance refers to the distance in meters between the measuring instrument antenna.

#### 7.10 Radiated Emissions Test Result

Formula of conversion factors: the field strength at 3m was established by adding The meter reading of the spectrum analyzer (which is set to read in units of dBuV) To the antenna correction factor supplied by the antenna manufacturer. The antenna Correction factors are stared in terms of dB. The gain of the pressletor was accounted For in the spectrum analyser meter reading.

Example:

Freq(MHz) Meter Reading +ACF=FS

33 20dBuV+10.36dB=30.36dBuV/m @3m

#### **Radiated Emission Test Data**

Test Voltage: DC 12V
Test Mode: TX On
Temperature: 24 °C
Humidity: 52%RH
Test Result: PASS

Remarks: 30-1000MHz radiation test no significant emissions above the equipment noise floor were detected.

### 1GHz-25GHz Radiated Emission Data

# **Low Frequency**

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
2414.00		Vertical	66.30	94.00	27.70	1.5	90
2414.00		Horizontal	64.29	94.00	29.71	1.5	120
4828.00	AV	Vertical	41.21	54.00	12.79	1.5	45
7242.00	AV	Vertical	42.19	54.00	11.81	1.5	90
9656.00	AV	Vertical	45.62	54.00	8.38	1.5	90
12170.00	AV	Vertical	44.22	54.00	9.78	1.5	120
14484.00	AV	Vertical	45.73	54.00	8.27	1.5	45
16898.00	AV	Vertical	46.20	54.00	7.80	1.5	120
19312.00	AV	Vertical	46.66	54.00	7.34	1.5	180
21726.00	AV	Vertical	46.27	54.00	7.73	1.5	90
24140.00	AV	Vertical	45.18	54.00	8.82	1.5	60
4828.00	AV	Horizontal	40.13	54.00	13.87	1.5	180
7242.00	AV	Horizontal	41.95	54.00	12.05	1.5	45
9656.00	AV	Horizontal	43.68	54.00	10.02	1.5	45
12170.00	AV	Horizontal	43.39	54.00	10.61	1.5	180
14484.00	AV	Horizontal	44.22	54.00	9.78	1.5	45
16898.00	AV	Horizontal	45.51	54.00	8.49	1.5	60
19312.00	AV	Horizontal	46.11	54.00	7.89	1.5	120
21726.00	AV	Horizontal	45.82	54.00	8.18	1.5	90
24140.00	AV	Horizontal	45.11	54.00	8.89	1.5	90
4828.00	PK	Vertical	53.52	74.00	20.48	1.5	120
7242.00	PK	Vertical	54.56	74.00	19.44	1.5	120
9656.00	PK	Vertical	55.29	74.00	18.71	1.5	90
12170.00	PK	Vertical	56.68	74.00	17.32	1.5	90
14484.00	PK	Vertical	56.79	74.00	17.21	1.5	45
16898.00	PK	Vertical	57.38	74.00	16.62	1.5	60
19312.00	PK	Vertical	60.21	74.00	13.79	1.5	60
21726.00	PK	Vertical	59.96	74.00	14.04	1.5	100
24140.00	PK	Vertical	62.24	74.00	11.76	1.5	120
4828.00	PK	Horizontal	51.08	74.00	22.92	1.5	45

7242.00	PK	Horizontal	52.11	74.00	21.89	1.5	90
9656.00	PK	Horizontal	53.13	74.00	20.87	1.5	180
12170.00	PK	Horizontal	55.42	74.00	18.58	1.5	120
14484.00	PK	Horizontal	56.15	74.00	17.85	1.5	45
16898.00	PK	Horizontal	56.96	74.00	17.04	1.5	180
19312.00	PK	Horizontal	59.93	74.00	14.07	1.5	120
21726.00	PK	Horizontal	58.88	74.00	15.12	1.5	90
24140.00	PK	Horizontal	61.19	74.00	12.81	1.5	90

# Middle Frequency

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
2432.00		Vertical	70.30	94.00	23.70	1.5	45
2432.00		Horizontal	68.82	94.00	25.18	1.5	180
4864.00	AV	Vertical	44.29	54.00	9.71	1.5	90
7296.00	AV	Vertical	45.71	54.00	8.29	1.5	120
9728.00	AV	Vertical	46.62	54.00	7.38	1.5	60
12160.00	AV	Vertical	45.72	54.00	8.28	1.5	45
14592.00	AV	Vertical	46.58	54.00	7.42	1.5	120
17024.00	AV	Vertical	46.77	54.00	7.23	1.5	180
19456.00	AV	Vertical	47.22	54.00	6.78	1.5	120
21888.00	AV	Vertical	47.10	54.00	6.90	1.5	90
24320.00	AV	Vertical	46.96	54.00	7.04	1.5	60
4864.00	AV	Horizontal	43.15	54.00	10.85	1.5	120
7296.00	AV	Horizontal	44.23	54.00	9.77	1.5	120
9728.00	AV	Horizontal	43.26	54.00	10.74	1.5	90
12160.00	AV	Horizontal	44.82	54.00	9.18	1.5	60
14592.00	AV	Horizontal	45.38	54.00	8.62	1.5	120
17024.00	AV	Horizontal	45.68	54.00	8.14	1.5	100
19456.00	AV	Horizontal	46.74	54.00	7.26	1.5	45
21888.00	AV	Horizontal	46.95	54.00	7.05	1.5	60
24320.00	AV	Horizontal	46.27	54.00	7.73	1.5	180
4864.00	PK	Vertical	57.71	74.00	16.29	1.5	45
7296.00	PK	Vertical	56.82	74.00	17.18	1.5	60
9728.00	PK	Vertical	55.69	74.00	18.31	1.5	90
12160.00	PK	Vertical	56.85	74.00	17.15	1.5	180
14592.00	PK	Vertical	57.72	74.00	16.28	1.5	120
17024.00	PK	Vertical	60.62	74.00	13.38	1.5	120
19456.00	PK	Vertical	61.52	74.00	12.48	1.5	90
21888.00	PK	Vertical	60.26	74.00	13.74	1.5	60
24320.00	PK	Vertical	61.71	74.00	12.29	1.5	100
4864.00	PK	Horizontal	54.24	74.00	19.76	1.5	60
7296.00	PK	Horizontal	53.29	74.00	20.71	1.5	100
9728.00	PK	Horizontal	52.42	74.00	21.58	1.5	180

12160.00	PK	Horizontal	54.45	74.00	19.55	1.5	120
14592.00	PK	Horizontal	55.59	74.00	18.41	1.5	90
17024.00	PK	Horizontal	58.61	74.00	15.39	1.5	60
19456.00	PK	Horizontal	59.28	74.00	14.72	1.5	180
21888.00	PK	Horizontal	59.95	74.00	14.05	1.5	90
24320.00	PK	Horizontal	60.18	74.00	13.82	1.5	90

# **High Frequency**

Frequency (MHz)	Detector	Antenna Polarization	Emission Level (dBuV/m)	FCC 15 Subpart C Limit (dBuV/m)	Margin (dB)	Antenna Height (m)	Turntable Angle (°)
2468.00		Vertical	71.12	94.00	22.88	1.5	180
2468.00		Horizontal	69.41	94.00	24.59	1.5	120
4936.00	AV	Vertical	46.12	54.00	7.88	1.5	90
7404.00	AV	Vertical	45.55	54.00	8.45	1.5	180
9872.00	AV	Vertical	44.23	54.00	9.77	1.5	180
12340.00	AV	Vertical	45.52	54.00	8.48	1.5	120
14808.00	AV	Vertical	46.61	54.00	7.39	1.5	100
17276.00	AV	Vertical	46.78	54.00	7.22	1.5	60
19744.00	AV	Vertical	46.90	54.00	7.10	1.5	90
22212.00	AV	Vertical	47.25	54.00	6.75	1.5	120
24680.00	AV	Vertical	47.22	54.00	6.78	1.5	180
4936.00	AV	Horizontal	45.58	54.00	8.42	1.5	120
7404.00	AV	Horizontal	44.91	54.00	9.09	1.5	60
9872.00	AV	Horizontal	43.38	54.00	10.62	1.5	90
12340.00	AV	Horizontal	45.11	54.00	8.89	1.5	45
14808.00	AV	Horizontal	45.95	54.00	8.05	1.5	60
17276.00	AV	Horizontal	46.28	54.00	7.72	1.5	120
19744.00	AV	Horizontal	46.17	54.00	7.83	1.5	180
22212.00	AV	Horizontal	46.77	54.00	7.23	1.5	100
24680.00	AV	Horizontal	46.68	54.00	7.32	1.5	90
4936.00	PK	Vertical	58.86	74.00	15.14	1.5	180
7404.00	PK	Vertical	58.22	74.00	15.78	1.5	90
9872.00	PK	Vertical	57.64	74.00	16.36	1.5	45
12340.00	PK	Vertical	58.83	74.00	15.17	1.5	45
14808.00	PK	Vertical	59.99	74.00	14.01	1.5	60
17276.00	PK	Vertical	60.17	74.00	13.83	1.5	120
19744.00	PK	Vertical	61.26	74.00	12.74	1.5	100
22212.00	PK	Vertical	62.23	74.00	11.77	1.5	180
24680.00	PK	Vertical	63.01	74.00	10.99	1.5	90
4936.00	PK	Horizontal	58.45	74.00	15.55	1.5	60
7404.00	PK	Horizontal	57.75	74.00	16.25	1.5	90
9872.00	PK	Horizontal	56.33	74.00	17.67	1.5	120

12340.00	PK	Horizontal	58.19	74.00	15.81	1.5	90
14808.00	PK	Horizontal	59.27	74.00	14.73	1.5	60
17276.00	PK	Horizontal	59.46	74.00	14.54	1.5	120
19744.00	PK	Horizontal	60.57	74.00	13.43	1.5	100
22212.00	PK	Horizontal	62.22	74.00	11.78	1.5	45
24680.00	PK	Horizontal	62.94	74.00	11.06	1.5	60

**Note**: Above 1GHz,do a Peak and average measurements for all emissions,Limit for peak is 94dBuvV/m,According to Part15.35(b) and average is 54BuvV/m.

# 8 Band Edge

#### 8.1 Test Equipment

Please refer to Section 5 this report.

#### **8.2** Test Procedure

- 1. The EUT, peripherals were put on the turntable which table size is 1mX1.5m, table high 0.8m. All set up is according to ANSI C63.4: 2003.
- 2. The bandwidth of the fundamental frequency was measure by spectrum analyser with 100kHz RBW and 100kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power 20dB.

#### 8.3 Band Edge

Requirements: FCC 15.249(d), the emission power at the START and STOP frequencies shall be at least 50dB below the level of the fundamental or to the general radiated emission limits in FCC 15.209.

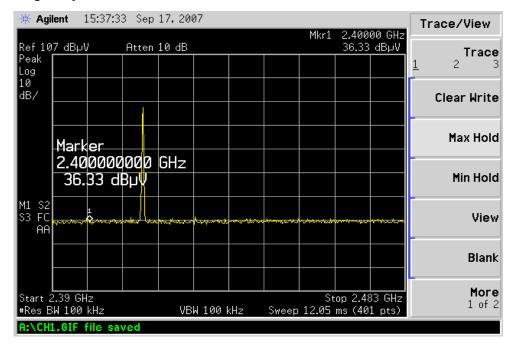
#### 8.4 Band Edge Test Result

Product Name: Wireless Back-up Camera System

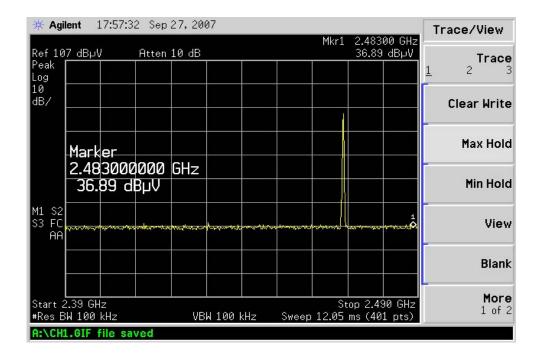
Test Item: Band Edge Test

Test Voltage: DC 12V
Test Mode: TX On
Temperature: 24 °C
Humidity: 52%RH

#### **Low Frequency**



#### **High Frequency**



**Note:** (1) The field strength of any emissions which appear outside of this band shall not exceed the general radiated emission limits in Section 15.249.

(2) This device does meet the FCC requirement.

# 9 Photographs of Testing

# 9.1 Radiation Emission Test View For 30MHz-1000MHz



# 9.2 Radiation Emission Test View For 1GHz-25GHz



# 10 Photographs - Constructional Details

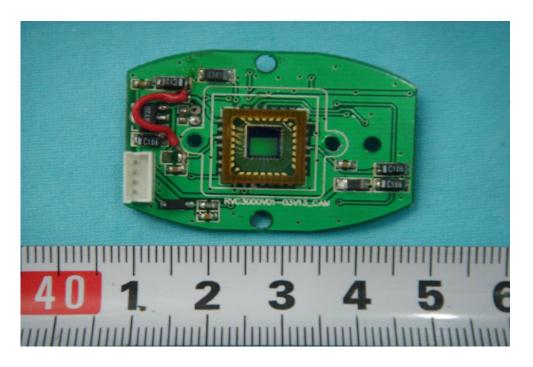
# 10.1 EUT - Front View



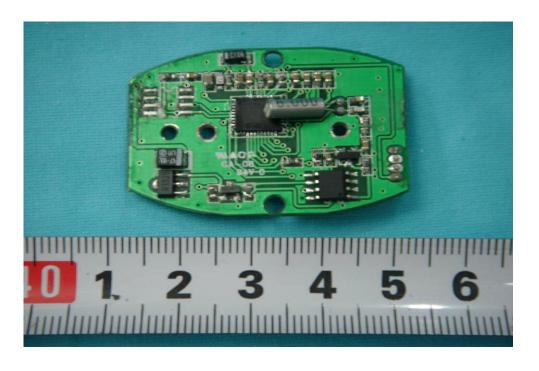
## 10.2 EUT - Back View



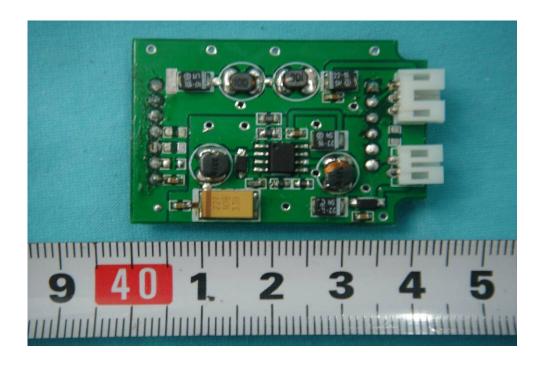
# 10.3 PCB1 - Front View



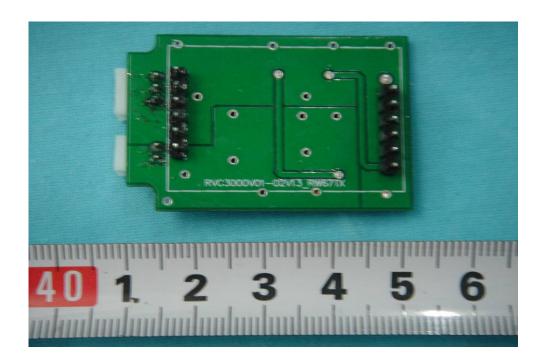
# 10.4 PCB1 - Back View



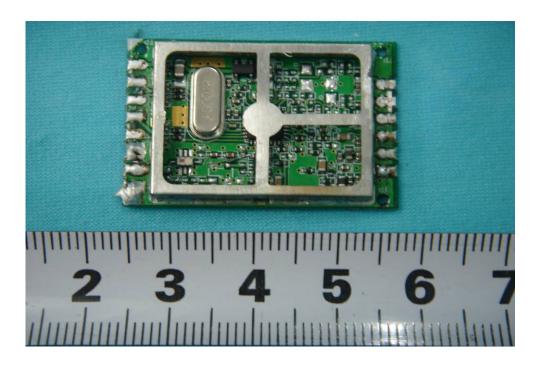
# 10.5 PCB2 - Front View



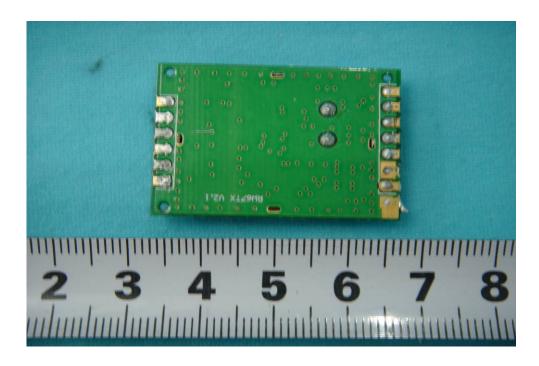
## 10.6 PCB2 - Back View



# 10.7 PCB3 - Front View



## 10.8 PCB3 - Back View



## 11 FCC ID Label

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT
EUT Bottom View/proposed FCC Mark Location

