

# Partial FCC RF Test Report

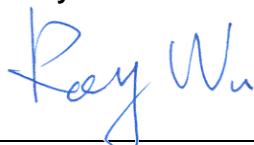
APPLICANT : Franklin Technology  
EQUIPMENT : 4G USB adapter  
BRAND NAME : Franklin  
MODEL NAME : S600W  
FCC ID : XHG-S600W  
STANDARD : 47 CFR Part 2, 27(M)  
CLASSIFICATION : PCS Licensed Transmitter (PCB)  
TX FREQUENCY RANGE : 2496 MHz ~ 2690 MHz  
Rx FREQUENCY RANGE : 2496 MHz ~ 2690 MHz  
MAX. EIRP POWER : 0.25 W (QPSK, BW 5MHz)  
0.22 W (QPSK, BW 10MHz)  
0.26 W (16QAM, BW 5MHz)  
0.22 W (16QAM, BW 10MHz)

This is a partial report which is only valid combined with the integrated the 4G Module (Brand Name: Franklin / Model Name: M600W, FCC ID: XHG-M600W) Report.

The product was received on Mar. 10, 2011 and completely tested on Apr. 01, 2011. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and 47 CFR FCC Part 27 Subpart M and shown compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



Roy Wu / Manager



## SPORTON INTERNATIONAL INC.

No. 52, Hwa Ya 1<sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.



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## REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG131021-01	Rev. 01	Initial issue of report	Apr.12, 2011



### SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§27.50	Equivalent Isotropic Radiated Power	< 2 Watts	PASS	-
3.2	§2.1053 §27.53	Field Strength of Spurious Radiation	$< 55+10\log_{10}(P[\text{Watts}])$	PASS	Under limit 8.89 dB at 7779 MHz

# 1 General Description

## 1.1 Applicant

**Franklin Technology**

906 JEI Platz, 459-11 Gasan-dong, Guncheon-gu, Seoul, Korea

## 1.2 Manufacturer

**U-Media Communications, Inc.**

9F, No. 1, Jin-shan 8th St., Hsinchu 300, Taiwan, R.O.C.

## 1.3 Feature of Equipment Under Test

Product Feature & Specification	
<b>Equipment</b>	4G USB adapter
<b>Brand Name</b>	Franklin
<b>Model Name</b>	S600W
<b>FCC ID</b>	XHG-S600W
<b>Integrated Module</b>	Brand Name : Franklin Model Name : M600W
<b>Tx Frequency</b>	2496 MHz ~ 2690 MHz
<b>Rx Frequency</b>	2496 MHz ~ 2690 MHz
<b>Channel Bandwidth</b>	5MHz / 10MHz
<b>Maximum Output Power to Antenna</b>	21.75 dBm (QPSK, BW 5MHz) 21.23 dBm (QPSK, BW 10MHz) 21.70 dBm (16QAM, BW 5MHz) 21.26 dBm (16QAM, BW 10MHz)
<b>Maximum EIRP</b>	0.25 W (24.03 dBm) (QPSK, BW 5MHz) 0.22 W (23.43 dBm) (QPSK, BW 10MHz) 0.26 W (24.08 dBm) (16QAM, BW 5MHz) 0.22 W (23.49 dBm) (16QAM, BW 10MHz)
<b>Antenna Type</b>	detachable SMA dipole antenna
<b>Type of Modulation</b>	Uplink : OFDMA (QPSK / 16QAM / 64QAM)
<b>EUT Stage</b>	Identical Prototype

**Remark:**

1. For other wireless features of this EUT, the test report will be issued separately.
2. This test report recorded only product characteristics and test results of PCS Licensed Transmitter (PCB).
3. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4 Testing Site

<b>Test Site</b>	SPORTON INTERNATIONAL INC.	
<b>Test Site Location</b>	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978	
<b>Test Site No.</b>	<b>Sporton Site No.</b>	<b>FCC / IC Registration No.</b>
	03CH05-HY	722060/4086B-1

## 1.5 Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR Part 2, 27(M)
- ♦ ANSI C63.4-2003
- ♦ ANSI TIA-603-C-2004

**Remark:**

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B (DoC), recorded in a separate test report.

## 1.6 Ancillary Equipment List

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	System Simulator	Agilent	E6651A	N/A	N/A	Unshielded, 1.8 m

## 2 Test Configuration of Equipment Under Test

### 2.1 Test Mode

Preliminary tests were performed in different data rate to find the worst radiated emission. The data rate shown 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. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range.

Test Modes		
Band	Radiated TCs	Conducted TCs
802.16e (Modulation : OFDMA)	<ul style="list-style-type: none"> <li>■ QPSK, BW 5MHz Link</li> <li>■ QPSK, BW 10MHz Link</li> <li>■ 16QAM, BW 5MHz Link</li> <li>■ 16QAM, BW 10MHz Link</li> </ul>	<ul style="list-style-type: none"> <li>■ QPSK, BW 5MHz Link</li> <li>■ QPSK, BW 10MHz Link</li> <li>■ 16QAM, BW 5MHz Link</li> <li>■ 16QAM, BW 10MHz Link</li> </ul>

**Note:**

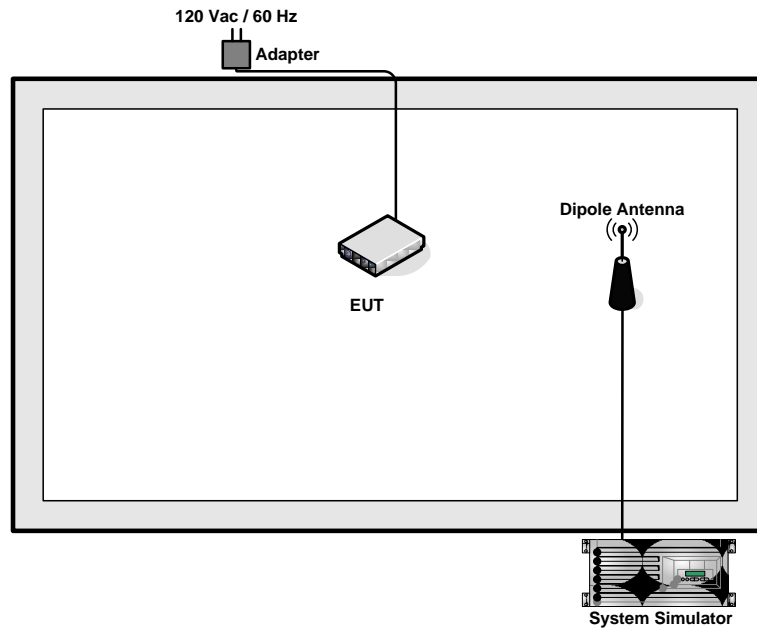
1. The maximum average power levels are on zone type, QPSK and coding rate, 1/2 mode for QPSK, BW 5MHz, QPSK, BW 10MHz, 16QAM, BW 5MHz, and 16QAM, BW 10MHz Link ; only these modes were used for all tests.
2. Only the radiated emission, ERP, and EIRP of the 4G module were performed in this report, and the conducted test cases can be referred to Franklin module report (FCC ID: XHG-M600W).

The conducted power tables are as follows:

Average Conducted Power (*Unit: dBm)							
Channel	Modulation Type	Zone Type	Coding Rate	Main Antenna		Aux. Antenna	
				5MHz Bandwidth	10MHz Bandwidth	5MHz Bandwidth	10MHz Bandwidth
Low	QPSK	PUSC	1/2	21.54	21.03	21.70	21.17
			3/4	21.53	21.02	21.69	21.13
Middle	QPSK	PUSC	1/2	21.66	21.15	21.49	20.99
			3/4	21.65	21.14	21.49	20.98
High	QPSK	PUSC	1/2	21.75	21.23	21.35	20.88
			3/4	21.71	21.20	21.34	20.87
Low	16QAM	PUSC	1/2	21.51	21.05	21.66	21.16
			3/4	21.39	20.90	21.58	21.08
Middle	16QAM	PUSC	1/2	21.62	21.15	21.57	20.96
			3/4	21.54	21.03	21.38	20.83
High	16QAM	PUSC	1/2	21.70	21.26	21.33	20.81
			3/4	21.59	21.15	21.18	20.71

**Note:** PAR = Peak to Average Ratio

## 2.2 Connection Diagram of Test System





### 3 Test Result

#### 3.1 Effective Isotropic Radiated Power Measurement

##### 3.1.1 Test Result of Effective Isotropic Radiated Power

802.16e (QPSK, BW 5MHz) Radiated Power (EIRP)				
Horizontal Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-26.05	42.39	16.34	0.04
Middle	-25.11	43.50	18.39	0.07
High	-26.03	43.78	17.75	0.06
Vertical Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-23.09	44.80	21.71	0.15
Middle	-21.62	45.39	23.77	0.24
High	-21.34	45.37	24.03	0.25

802.16e (QPSK, BW 10MHz) Radiated Power (EIRP)				
Horizontal Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-26.29	42.39	16.10	0.04
Middle	-25.53	43.50	17.97	0.06
High	-25.83	43.78	17.95	0.06
Vertical Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-23.71	44.80	21.09	0.13
Middle	-21.96	45.39	23.43	0.22
High	-22.04	45.37	23.33	0.22



802.16e (16QAM, BW 5MHz) Radiated Power (EIRP)				
Horizontal Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-26.03	42.39	16.36	0.04
Middle	-24.84	43.50	18.66	0.07
High	-25.90	43.78	17.88	0.06
Vertical Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-23.10	44.80	21.70	0.15
Middle	-21.57	45.39	23.82	0.24
High	-21.29	45.37	24.08	0.26

802.16e (16QAM, BW 10MHz) Radiated Power (EIRP)				
Horizontal Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-26.32	42.39	16.07	0.04
Middle	-25.68	43.50	17.82	0.06
High	-25.86	43.78	17.92	0.06
Vertical Polarization				
Channel	LVL (dBm)	Correction Factor (dB)	EIRP (dBm)	EIRP (W)
Low	-23.70	44.80	21.10	0.13
Middle	-21.90	45.39	23.49	0.22
High	-22.11	45.37	23.26	0.21



## **3.2 Radiated Emissions Measurement**

### **3.2.1 Description of Radiated Emissions Measurement**

The power of any emission outside of the authorized operating frequency ranges must be lower than the transmitter power (P) by a factor of mobile digital stations, the attenuation factor shall be not less than  $43 + 10 \log (P)$  dB at the channel edge and  $55 + 10 \log (P)$  dB at 5.5 MHz from the channel edges. It is measured by means of a calibrated spectrum analyzer and scanned from 30 MHz up to a frequency including its 10<sup>th</sup> harmonic.

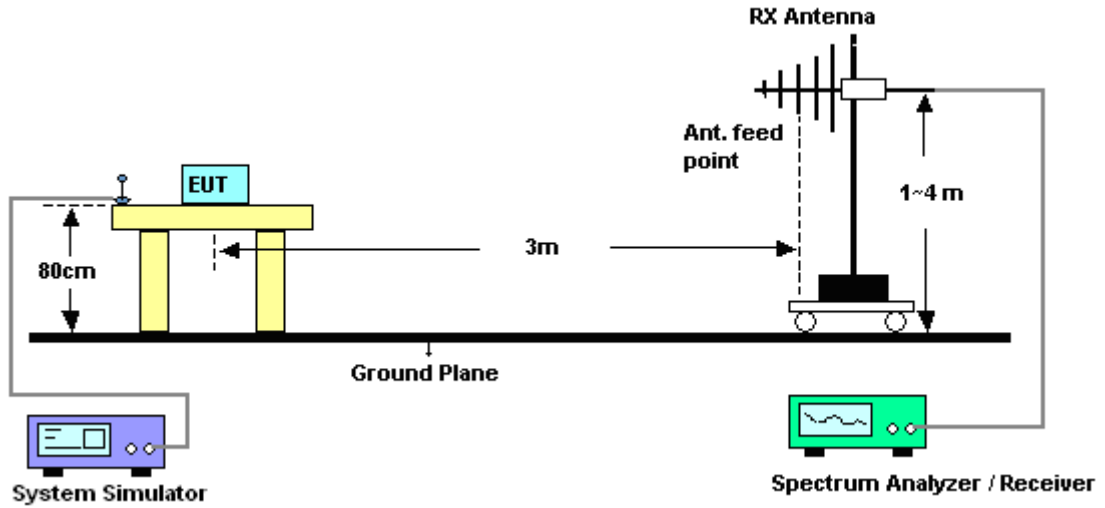
### **3.2.2 Measuring Instruments**

See list of measuring instruments of this test report.

### **3.2.3 Test Procedures**

1. The EUT was placed on a rotatable wooden table with 0.8 meter about ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 1MHz, Sweep = 500ms, Taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. Emission level (dBm) = output power + substitution Gain.

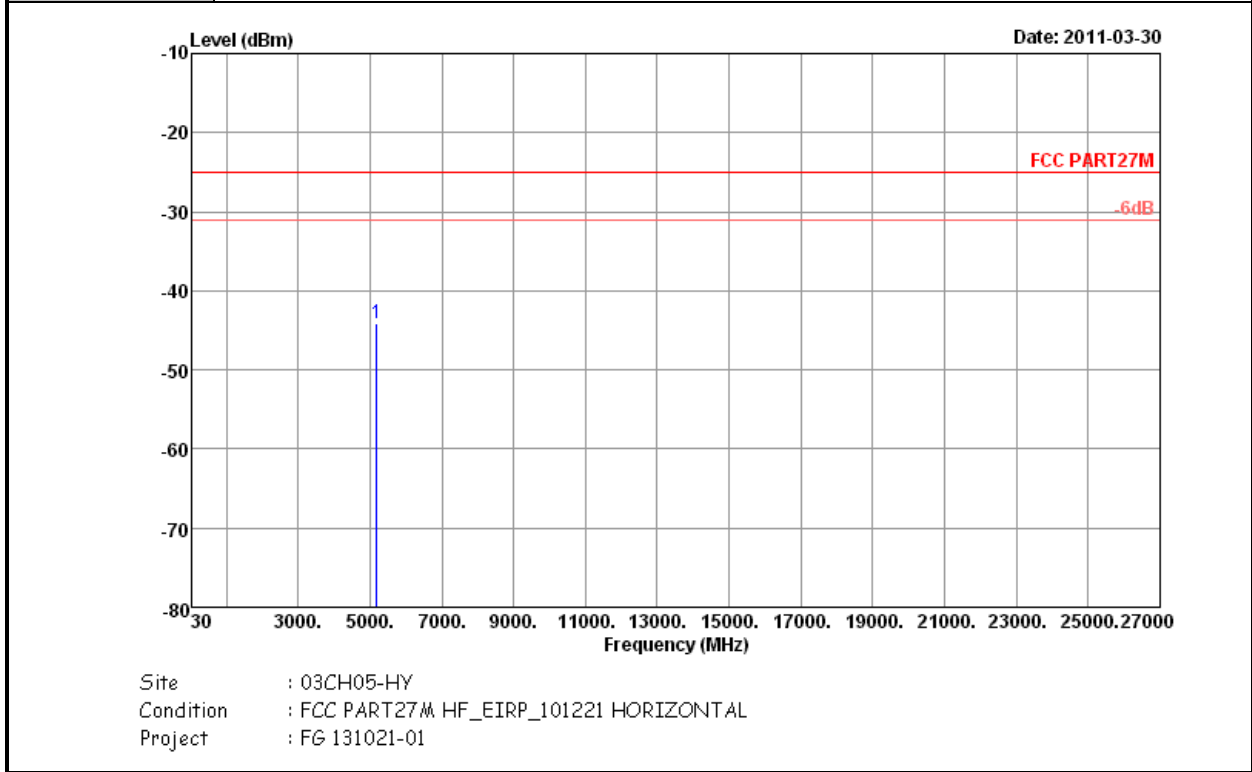
### 3.2.4 Test Setup





3.2.5 Test Result of Radiated Emissions

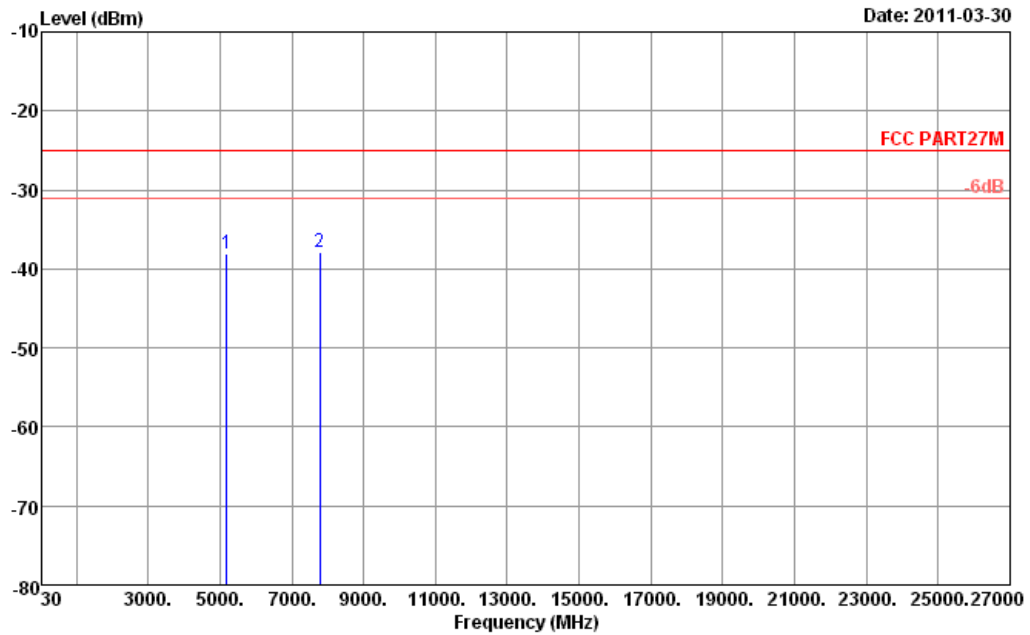
<b>Band :</b>	802.16e	<b>Temperature :</b>	23~24°C
<b>Test Mode :</b>	QPSK, BW 5MHz, Middle Ch (2593MHz)	<b>Relative Humidity :</b>	49~52%
<b>Test Engineer :</b>	Cona Huang	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5186	-44.15	-25	-19.15	-63.15	-53.49	1.27	10.61	H	Pass



<b>Band :</b>	802.16e	<b>Temperature :</b>	23~24°C
<b>Test Mode :</b>	QPSK, BW 5MHz, Middle Ch (2593MHz)	<b>Relative Humidity :</b>	49~52%
<b>Test Engineer :</b>	Cona Huang	<b>Polarization :</b>	Vertical
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		

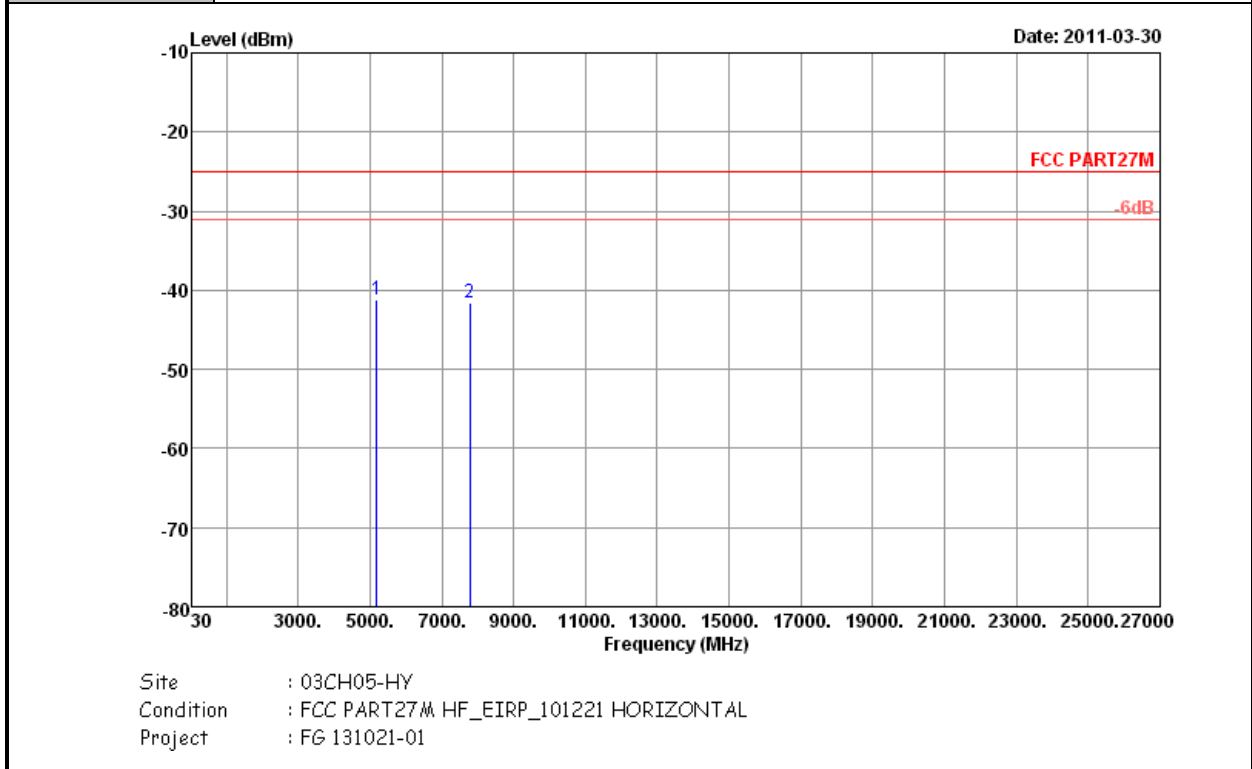


Site : 03CH05-HY  
 Condition : FCC PART27M HF\_EIRP\_101221 VERTICAL  
 Project : FG 131021-01

Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5186	-38.06	-25	-13.06	-57.28	-47.40	1.27	10.61	V	Pass
7779	-37.91	-25	-12.91	-62.23	-48.46	1.65	12.20	V	Pass



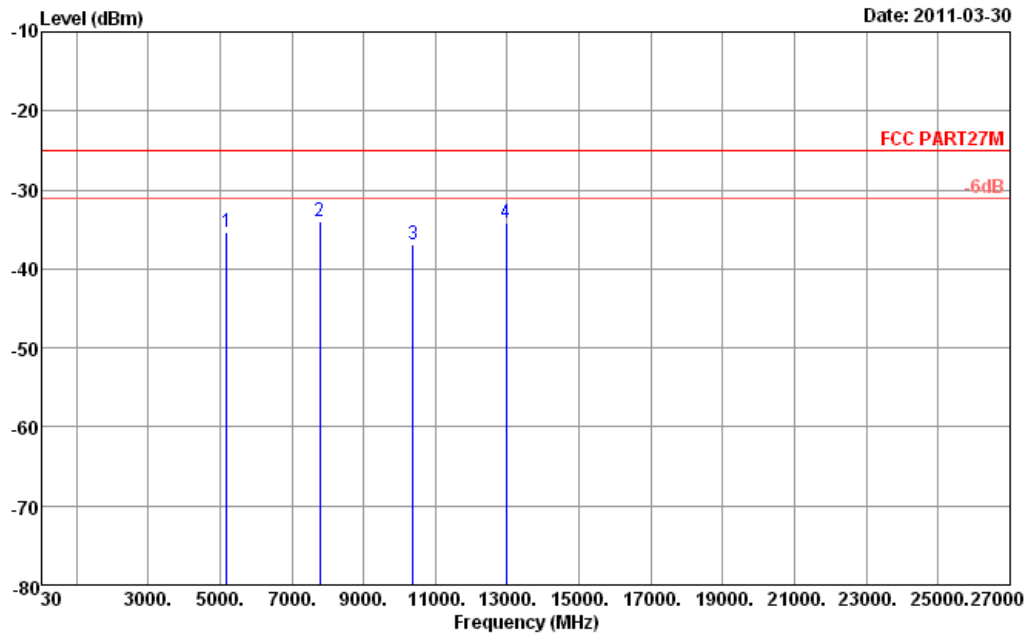
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<b>Test Mode :</b>	QPSK, BW 10MHz, Middle Ch (2593MHz)	<b>Relative Humidity :</b>	49~52%
<b>Test Engineer :</b>	Cona Huang	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5184	-41.27	-25	-16.27	-59.49	-50.61	1.27	10.61	H	Pass
7779	-41.53	-25	-16.53	-64.85	-52.08	1.65	12.20	H	Pass



<b>Band :</b>	802.16e	<b>Temperature :</b>	23~24°C
<b>Test Mode :</b>	QPSK, BW 10MHz, Middle Ch (2593MHz)	<b>Relative Humidity :</b>	49~52%
<b>Test Engineer :</b>	Cona Huang	<b>Polarization :</b>	Vertical
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



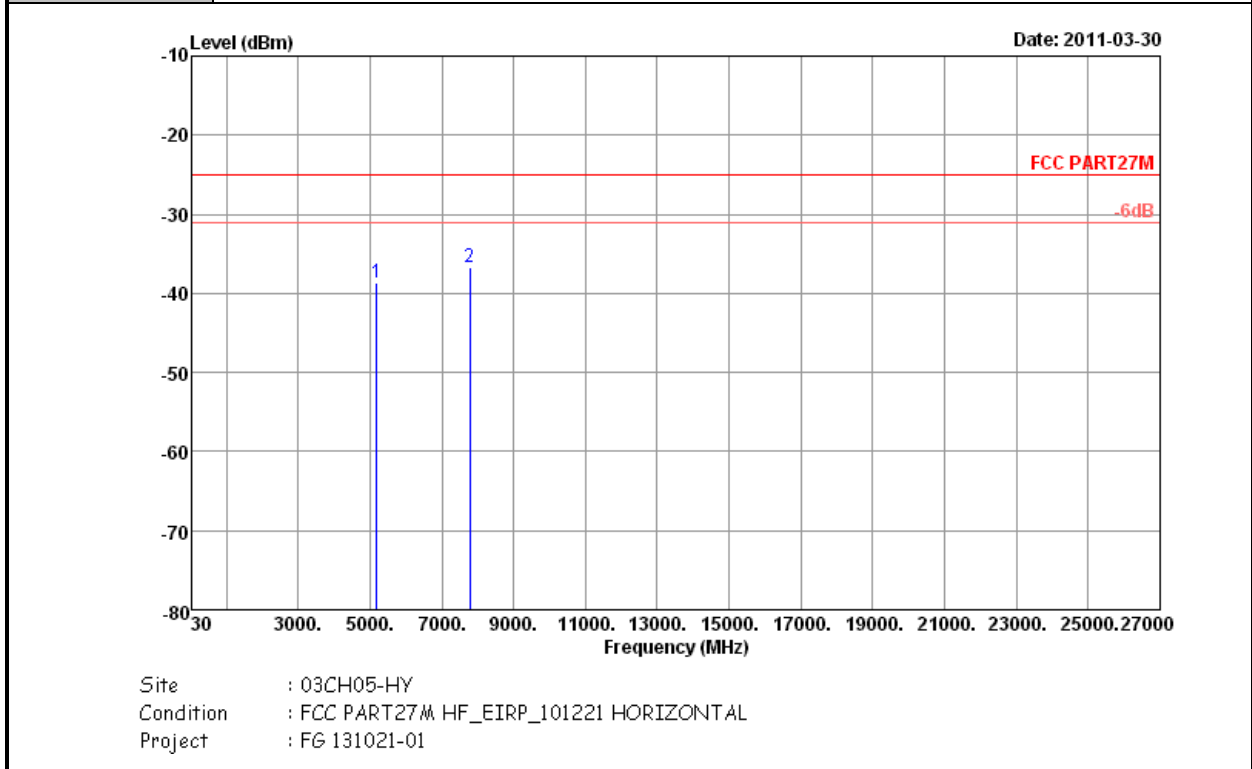
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 Condition : FCC PART27M HF\_EIRP\_101221 VERTICAL  
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Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5186	-35.27	-25	-10.27	-53.49	-44.61	1.27	10.61	V	Pass
7779	-33.91	-25	-8.91	-57.23	-44.46	1.65	12.20	V	Pass
10372	-36.93	-25	-11.93	-64.28	-47.49	2.61	13.17	V	Pass
12965	-34.27	-25	-9.27	-64.64	-44.33	3.13	13.19	V	Pass





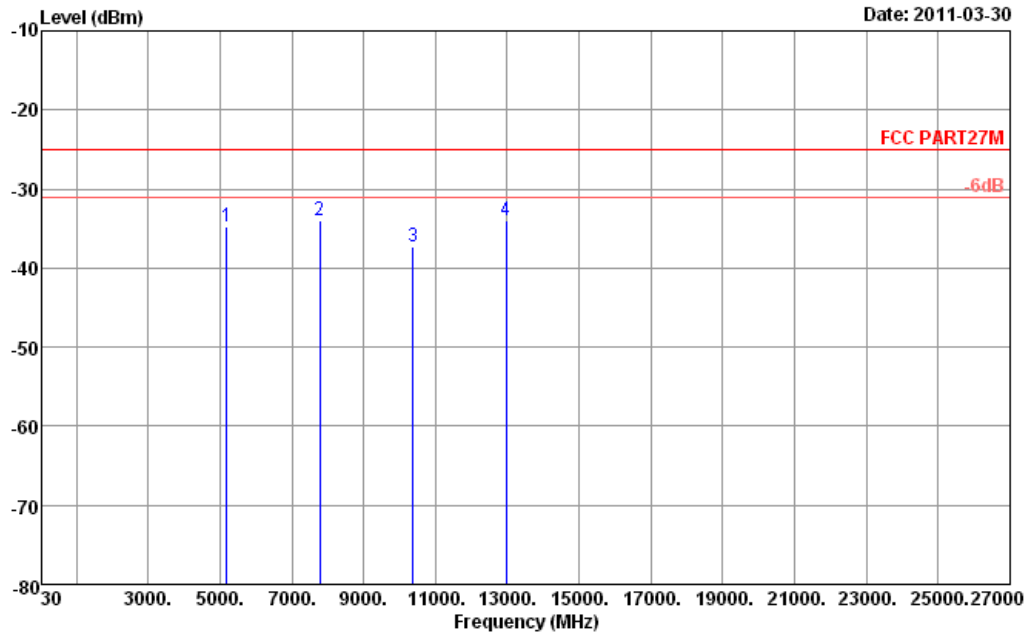
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<b>Test Engineer :</b>	Cona Huang	<b>Polarization :</b>	Horizontal
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5186	-38.60	-25	-13.60	-56.82	-47.94	1.27	10.61	H	Pass
7779	-36.79	-25	-11.79	-60.11	-47.34	1.65	12.20	H	Pass



<b>Band :</b>	802.16e	<b>Temperature :</b>	23~24°C
<b>Test Mode :</b>	16QAM, BW 5MHz, Middle Ch (2593MHz)	<b>Relative Humidity :</b>	49~52%
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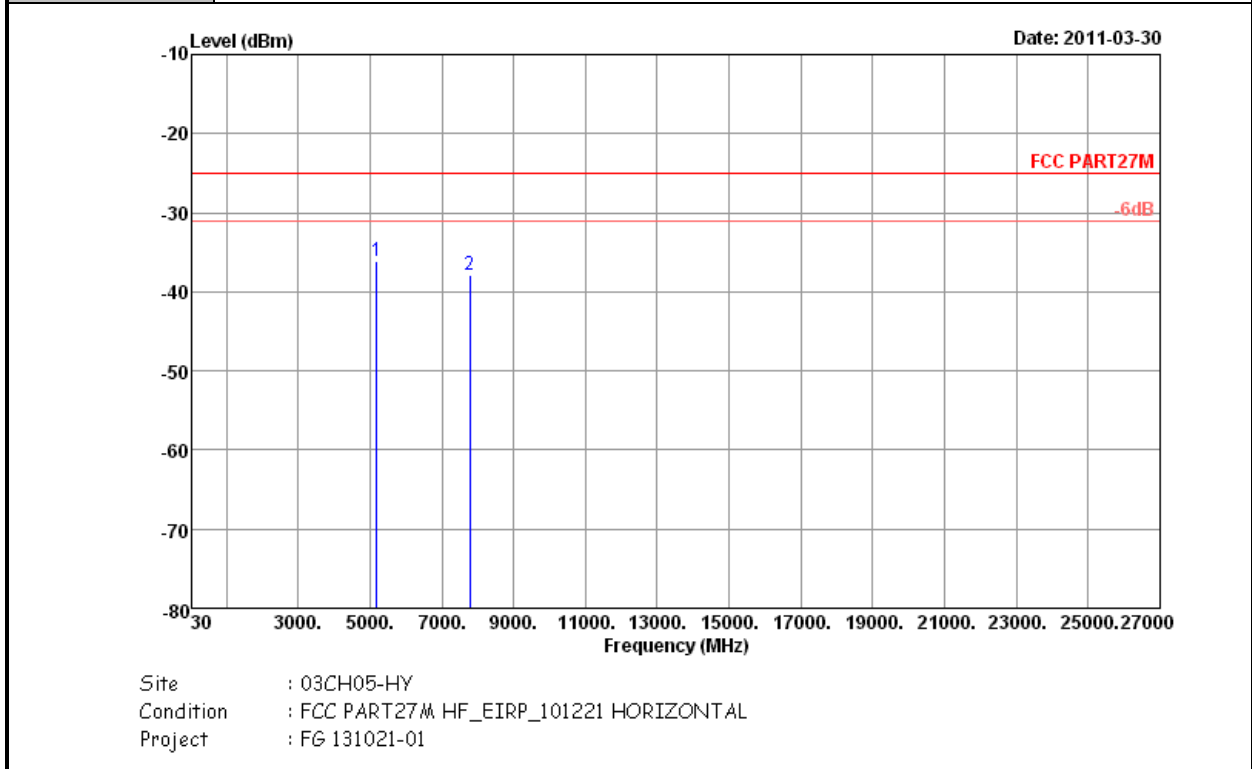


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Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5186	-34.84	-25	-9.84	-53.09	-44.18	1.27	10.61	V	Pass
7779	-33.89	-25	-8.89	-57.21	-44.44	1.65	12.20	V	Pass
10372	-37.29	-25	-12.29	-64.64	-47.85	2.61	13.17	V	Pass
12965	-34.07	-25	-9.07	-64.44	-44.13	3.13	13.19	V	Pass



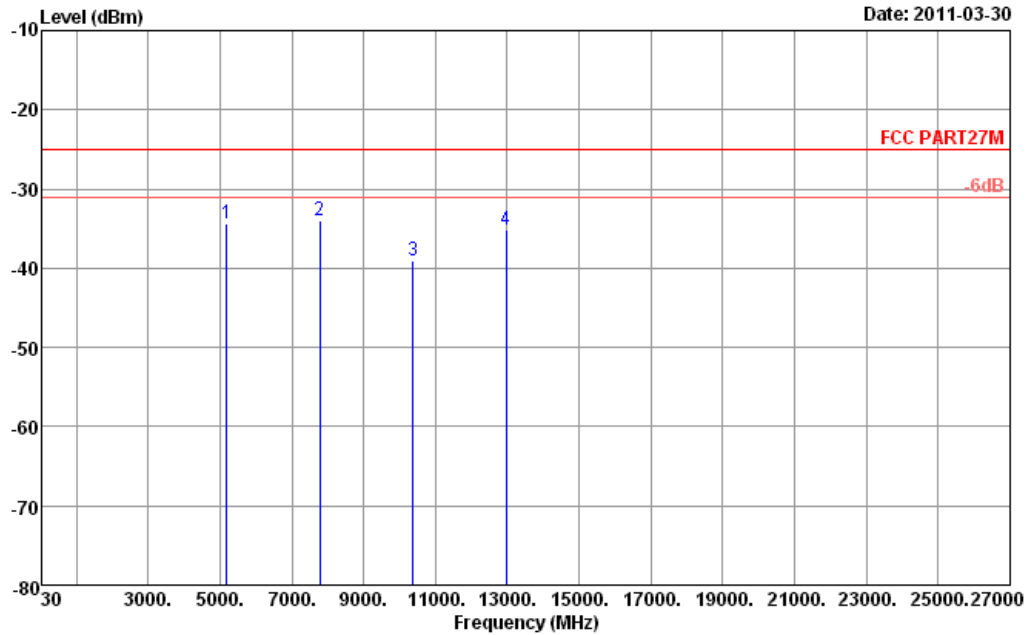
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<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Frequency ( MHz )	EIRP ( dBm )	Limit ( dBm )	Over Limit ( dB )	SPA Reading ( dBm )	S.G. Power ( dBm )	TX Cable loss ( dB )	TX Antenna Gain ( dBi )	Polarization ( H/V )	Result
5186	-36.17	-25	-11.17	-54.39	-45.51	1.27	10.61	H	Pass
7779	-37.90	-25	-12.90	-61.22	-48.45	1.65	12.20	H	Pass



<b>Band :</b>	802.16e	<b>Temperature :</b>	23~24°C
<b>Test Mode :</b>	16QAM, BW 10MHz, Middle Ch (2593MHz)	<b>Relative Humidity :</b>	49~52%
<b>Test Engineer :</b>	Cona Huang	<b>Polarization :</b>	Vertical
<b>Remark :</b>	Spurious emissions within 30-1000MHz were found more than 20dB below limit line.		



Site : 03CH05-HY  
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Frequency (MHz)	EIRP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
5186	-34.45	-25	-9.45	-52.67	-43.79	1.27	10.61	V	Pass
7779	-33.97	-25	-8.97	-57.29	-44.52	1.65	12.20	V	Pass
10372	-39.12	-25	-14.12	-66.47	-49.68	2.61	13.17	V	Pass
12965	-35.14	-25	-10.14	-65.51	-45.20	3.13	13.19	V	Pass

## 4 List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
System Simulator	R&S	CMU200	117995	N/A	Jun. 08, 2009	Jun. 07, 2011	Conducted (TH02-HY)
Spectrum Analyzer	R&S	FSP40	100055	9kHz~40GHz	Jun. 11, 2010	Jun. 10, 2011	Conducted (TH02-HY)
Power Meter	Anritsu	ML2495A	0932001	N/A	Sep. 13, 2010	Sep. 12, 2011	Conducted (TH02-HY)
Power Sensor	Anritsu	MA2411B	0846202	N/A	Sep. 14, 2010	Sep. 13, 2011	Conducted (TH02-HY)
Thermal Chamber	Ten Billion	TTH-D35P	TBN-930701	N/A	Jul. 30,2010	Jul. 29, 2011	Conducted (TH02-HY)
Spectrum Analyzer	R&S	FSP30	101352	9KHz-40GHz	Nov. 03, 2010	Nov. 02, 2011	Radiation (03CH05-HY)
Amplifier	COM-POWER	PA-103	161075	1KHz - 1GHz	Mar. 29, 2011	Mar. 28, 2012	Radiation (03CH05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2725	30MHz ~ 1GHz	Nov. 06, 2010	Nov. 05, 2011	Radiation (03CH05-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA917025 1	15GHz- 40GHz	Oct. 18, 2010	Oct. 17, 2011	Radiation (03CH05-HY)
Pre Amplifier	Agilent	8449B	3008A01917	1GHz- 26.5GHz	Apr. 15, 2010	Apr. 14, 2011	Radiation (03CH05-HY)
Turn Table	HD	Deis HD 2000	420/611	0 - 360 degree	N/A	N/A	Radiation (03CH05-HY)
Antenna Mast	HD	MA 240	240/666	1 m - 4 m	N/A	N/A	Radiation (03CH05-HY)
Horn Antenna	ESCO	3117	00066584	1GHz ~ 18GHz	Aug. 05, 2010	Aug. 04, 2011	Radiation (03CH05-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9 kHz~30 MHz	Jul. 29, 2010	Jul. 28, 2011	Radiation (03CH05-HY)
WiMAX Base Station (System Simulator)	Agilent	E6651A	N/A	N/A	N/A	N/A	Radiation (03CH05-HY)

## 5 Uncertainty of Evaluation

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Contribution	Uncertainty of $X_i$		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
<b>Combined Standard Uncertainty <math>Uc(y)</math></b>	<b>1.27</b>		
<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2Uc(y)</math>)</b>	<b>2.54</b>		

### Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Contribution	Uncertainty of $X_i$		$u(X_i)$	$C_i$	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	$\pm 0.10$	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	$\pm 1.70$	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	$\pm 0.50$	Normal (k=2)	0.25	1	0.25
Receiver Correction	$\pm 2.00$	Rectangular	1.15	1	1.15
Antenna Factor Directional	$\pm 1.50$	Rectangular	0.87	1	0.87
Site Imperfection	$\pm 2.80$	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\text{Log}(1-\Gamma_1*\Gamma_2)$	+0.34 / -0.35	U-Shape	0.244	1	0.244
<b>Combined Standard Uncertainty <math>Uc(y)</math></b>	<b>2.36</b>				
<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2Uc(y)</math>)</b>	<b>4.72</b>				



## **Appendix A. Photographs of EUT**

Please refer to Sporton report number EP131021-01 as below.