



# **FCC 47 CFR PART 15 SUBPART C ANSI C63.4: 2003**

## **TEST REPORT**

**For**

**TPM Sensor**

**Model: BX1-009**

**Data Applies To : BX1-001; BX1-002; BX1-004; BX1-005; BX1-013**

**Trade Name: SMP**

Issued to

Standard Motor Products, Inc.  
37-18 Northern Boulevard, Long Island City, New York 11101

Issued by

**Compliance Certification Services Inc.  
Tainan Lab.**

No. 8, Jiu Cheng Ling, Jiaokeng Village, Sinhua  
Township, Tainan Hsien 712, Taiwan R.O.C.

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**Issued Date: October 20, 2010**



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**REVISION HISTORY**

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	October 20, 2010	Initial Issue	ALL	Selena.Chong



## **TABLE OF CONTENTS**

<b>1. TEST RESULT CERTIFICATION.....</b>	<b>4</b>
<b>2. EUT DESCRIPTION .....</b>	<b>5</b>
<b>3. TEST METHODOLOGY .....</b>	<b>6</b>
3.1 EUT CONFIGURATION .....	6
3.2 EUT EXERCISE .....	6
3.3 GENERAL TEST PROCEDURES .....	6
3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS .....	7
3.5 DESCRIPTION OF TEST MODES .....	7
<b>4. INSTRUMENT CALIBRATION.....</b>	<b>8</b>
4.1 MEASURING INSTRUMENT CALIBRATION .....	8
4.2 MEASUREMENT EQUIPMENT USED .....	8
<b>5. FACILITIES AND ACCREDITATIONS .....</b>	<b>9</b>
5.1 FACILITIES .....	9
5.2 EQUIPMENT .....	9
5.3 LABORATORY ACCREDITATIONS AND LISTING .....	9
5.4 TABLE OF ACCREDITATIONS AND LISTINGS .....	10
<b>6. SETUP OF EQUIPMENT UNDER TEST .....</b>	<b>11</b>
6.1 SETUP CONFIGURATION OF EUT .....	11
6.2 SUPPORT EQUIPMENT .....	11
<b>7. FCC PART 15.231 REQUIREMENTS.....</b>	<b>12</b>
7.1 20 DB BANDWIDTH .....	12
7.2 LIMIT OF TRANSMISSION TIME .....	14
7.3 DUTY CYCLE.....	16
7.4 RADIATED EMISSIONS .....	18
7.5 POWERLINE CONDUCTED EMISSIONS .....	28



# 1. TEST RESULT CERTIFICATION

**Product:** TPM Sensor  
**Model:** BX1-009  
**Data Applies To:** BX1-001; BX1-002; BX1-004; BX1-005; BX1-013  
**Brand Name:** SMP  
**Applicant:** Standard Motor Products, Inc.  
 37-18 Northern Boulevard, Long Island City, New York 11101  
**Manufacturer:** Orange Electronic Co., Ltd.  
 No 15, Lane 81, Sec 2, Tanfu Rd., Tanzih, Taichung, Taiwan  
**Tested:** June 29, 2010 ~ October 13, 2010

APPLICABLE STANDARDS	
STANDARD	TEST RESULT
FCC 47 CFR Part 15 Subpart C ANSI C63.4 : 2003	No non-compliance noted

### We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. 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: 2003 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.207, 15.209 and Part 15.231(a).

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

**Approved by:**

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Jeter Wu  
Assistant Manager

**Reviewed by:**

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Eric Huang  
Assistant Section Manager



## 2. EUT DESCRIPTION

<b>Product</b>	TPM Sensor
<b>Model Number</b>	BX1-009
<b>Data Applies To</b>	BX1-001; BX1-002; BX1-004; BX1-005; BX1-013
<b>Brand Name</b>	SMP
<b>Frequency Band</b>	433.77MHz ~ 434.07MHz
<b>Operating Frequency</b>	433.97MHz
<b>Number of Channels</b>	1 Channel
<b>Type of Modulation</b>	ASK+FSK Modulation (Single mode)
<b>Power Supply</b>	Transmitter : Powered by battery 3Vdc
<b>EUT Description</b>	Sensor transmit those data by RF signal to the Receiver
<b>Antenna Type</b>	Monopole Antenna
<b>Temperature Range</b>	0°C ~ +55°C

### Remark:

1. Client consigns only one model sample to test (Model Number: BX1-009). Therefore, the testing Lab. just guarantees the unit, which has been tested.
2. To add a series model is for business necessary. The products are all the same except for different model number.
3. This submittal(s) (test report) is intended for **FCC ID: XVBX1F01** filing to comply with Section 15.207, 15.209 and 15.231(a) of the FCC Part 15, Subpart C Rules.



### **3. TEST METHODOLOGY**

The tests documented in this report were performed in accordance with ANSI C63.4 : 2003 and FCC CFR 47, 15.207, 15.209 and 15.231(a).

#### **3.1 EUT CONFIGURATION**

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

#### **3.2 EUT EXERCISE**

The EUT was operated in the engineering mode to fix the TX frequency that was for the purpose of the measurements.

#### **3.3 GENERAL TEST PROCEDURES**

##### **Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4:2003. Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

##### **Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the maximum emissions, exploratory radiated emission measurements were made according to the requirements in Section 13.1.4.1 of ANSI C63.4:2003.



### 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
<sup>1</sup> 0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 -	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.52525	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	156.7 - 156.9	3260 - 3267	23.6 - 24.0
12.29 - 12.293	162.0125 - 167.17	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	167.72 - 173.2	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	240 - 285	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41	322 - 335.4		

<sup>1</sup> Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

<sup>2</sup> Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

### 3.5 DESCRIPTION OF TEST MODES

The EUT( **Model: BX1-009** ) had been tested under engineering test mode condition and the EUT staying in continuous transmitting mode.



### 4. INSTRUMENT CALIBRATION

#### 4.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

#### 4.2 MEASUREMENT EQUIPMENT USED

##### Equipment Used for Emissions Measurement

Open Area Test Site # 6				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TYPE N COAXIAL CABLE	SUHNER	CHA9513	6	AUG. 31, 2011
BI-LOG Antenna	Sunol	JB1	A070506-2	NOV. 12, 2010
LOOP ANTENNA	EMCO	6502	8905-2356	JUN. 10, 2011
Pre-Amplifier	HP	8447F	2944A03817	AUG. 31, 2011
EMI Receiver	R&S	ESVS10	833206/012	MAY 10, 2011
RF Cable	SUHNER	SUCOFLEX104PEA	20520/4PEA	NOV. 10, 2010
Horn Antenna	Com-Power	AH-118	071032	DEC. 29, 2010
Spectrum Analyzer	R&S	FSEK 30	835253/002	JUL. 14, 2011
Pre-Amplifier	MITEQ	AFS44-00108650-42-10P-44	1205908	NOV. 10, 2010
Turn Table	Yo Chen	001	-----	N.C.R.
Antenna Tower	AR	TP1000A	309874	N.C.R.
Controller	CT	SC101	-----	N.C.R.
RF Swicth	E-INSTRUMENT TELH LTD	ERS-180A	EC1204141	N.C.R
Test S/W	e-3 (5.04303e)			

Remark: Each piece of equipment is scheduled for calibration once a year.





## **5. FACILITIES AND ACCREDITATIONS**

### **5.1 FACILITIES**

All measurement facilities used to collect the measurement data are located at

No. 8, Jiu Cheng Ling, Jiaokeng Village, Sinhua Township, Tainan Hsien 712, Taiwan R.O.C.

The sites are constructed in conformance with the requirements of ANSI C63.7:1992, ANSI C63.4 : 2003 and CISPR Publication 22.

### **5.2 EQUIPMENT**

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.






All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

### **5.3 LABORATORY ACCREDITATIONS AND LISTING**

The test facilities used to perform radiated and conducted emissions tests are accredited by Taiwan Accreditation Foundation for the specific scope of accreditation under Lab Code: 1109 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by TAF or any agency of the Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: TW-1037).



**5.4 TABLE OF ACCREDITATIONS AND LISTINGS**

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	 TW-1037
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	 C-2882 R-2635
Taiwan	TAF	CISPR 11, FCC METHOD-47 CFR Part 18, EN 55011, EN 60601-1-2, CISPR 22, CNS 13438, EN 55022, EN 55024, AS/NZS CISPR 22 CISPR 14, EN 55014-1, EN 55014-2, CNS 13783-1, CISPR 22, CNS 13439, EN 55013, FCC Method-47 CFR Part 15 Subpart B, IC ICES-003, VCCI V-3 & V-4 FCC Method-47 CFR Part 15 Subpart C and ANSI C63.4, LP 0002 EN / IEC 61000-4-2 / -3 / -4 / -5 / -6 / -8 / -11 EN 61000-3-2, EN 61000-3-3 EN 61000-6-3, EN 61000-6-1, AS/NZS 4251.1, EN 61000-6-4, EN 61000-6-2, AS/NZS 4251.2, EN 61204-3, EN 50130-4, EN 62040-2, EN 50371, EN 50385, AS/NZS 4268, ETSI EN 300 386 ETSI EN 300 328, ETSI EN 301 489-1/-3/-9/-17 ETSI EN 301 893, ETSI EN 300 220-2/-1 ETSI EN 300 440-2/-1 ETSI EN 301 357-2/-1 RSS-310, RSS-210 Issue 7, RSS-Gen Issue 2	
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS13439	 SL2-IN-E-0039 SL2-R1/R2-0039 SL2-A1-E-0039
Canada	Industry Canada	RSS210, Issue 7	

\* No part of this report may be used to claim or imply product endorsement by TAF or any agency of the US Government.



## 6. SETUP OF EQUIPMENT UNDER TEST

### 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

### 6.2 SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	N/A	-----	-----	-----	-----

No.	Signal cable description	
A	N/A	-----

**Remark:**

- 1. All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
- 2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*



## 7. FCC PART 15.231 REQUIREMENTS

### 7.1 20 DB BANDWIDTH

#### LIMIT

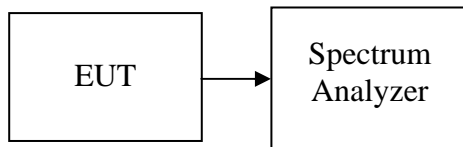
The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz. For devices operating above 900 MHz, the emission shall be no wider than 0.5% of the center frequency. Bandwidth is determined at the points 20 dB down from the modulated carrier.

#### MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	R&S	FSEK 30	835253/002	JAN. 03, 2011

*Remark: Each piece of equipment is scheduled for calibration once a year.*

#### Test Configuration



#### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The spectrum analyzer center frequency is set to the transmitter frequency. The RBW is set to 10 kHz and VBW is set 30kHz.

#### TEST RESULTS

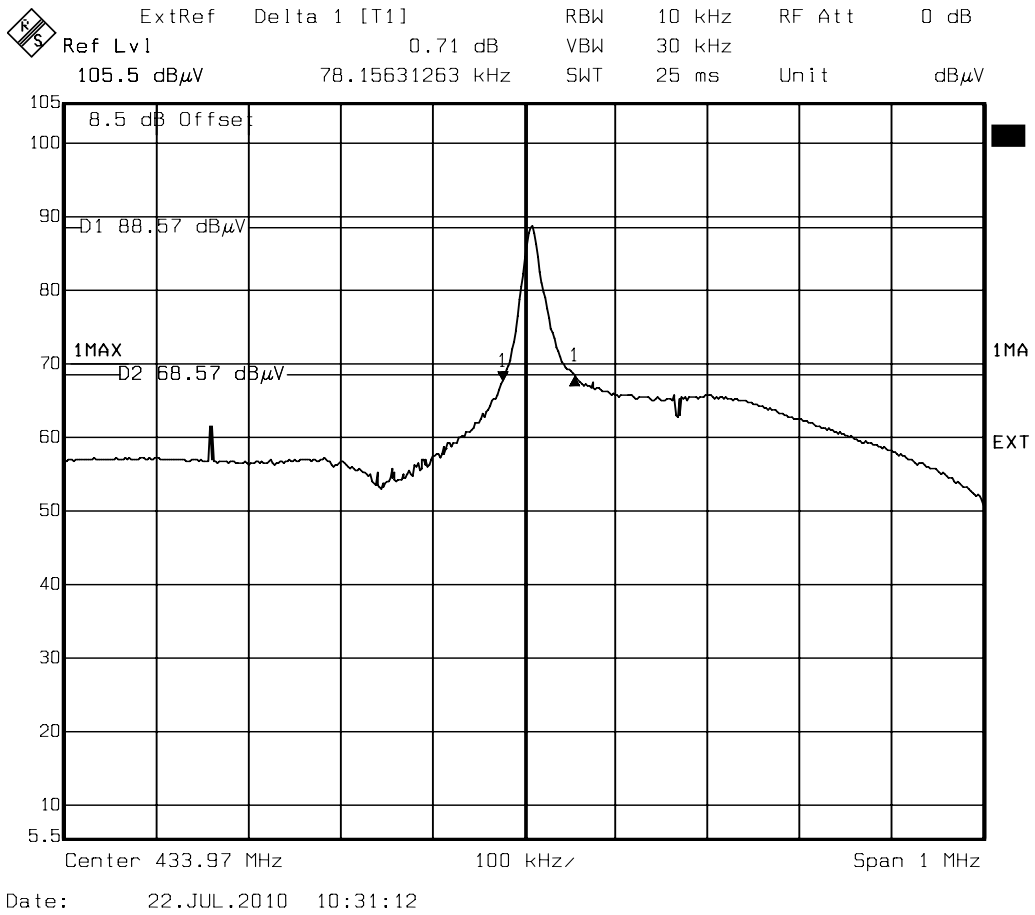
*No non-compliance noted.*

#### Test Data

Frequency (MHz)	20dB Bandwidth (KHz)	Limit (KHz)	Result
433.97	78.156	1084.925	PASS



Test Plot





## 7.2 LIMIT OF TRANSMISSION TIME

### LIMIT

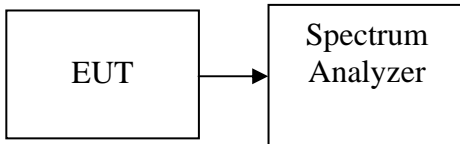
According to 15.231 (a)(2), A transmitter activated automatically shall cease transmission within 5 seconds after activation.

### MEASUREMENT EQUIPMENT USED

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
SPECTRUM ANALYZER	R&S	FSEK 30	835253/002	JAN. 03, 2011

*Remark: Each piece of equipment is scheduled for calibration once a year.*

### Test Configuration



### TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The spectrum analyzer center frequency is set to the transmitter frequency. The RBW = 100kHz and VBW = 100kHz.

### TEST RESULTS

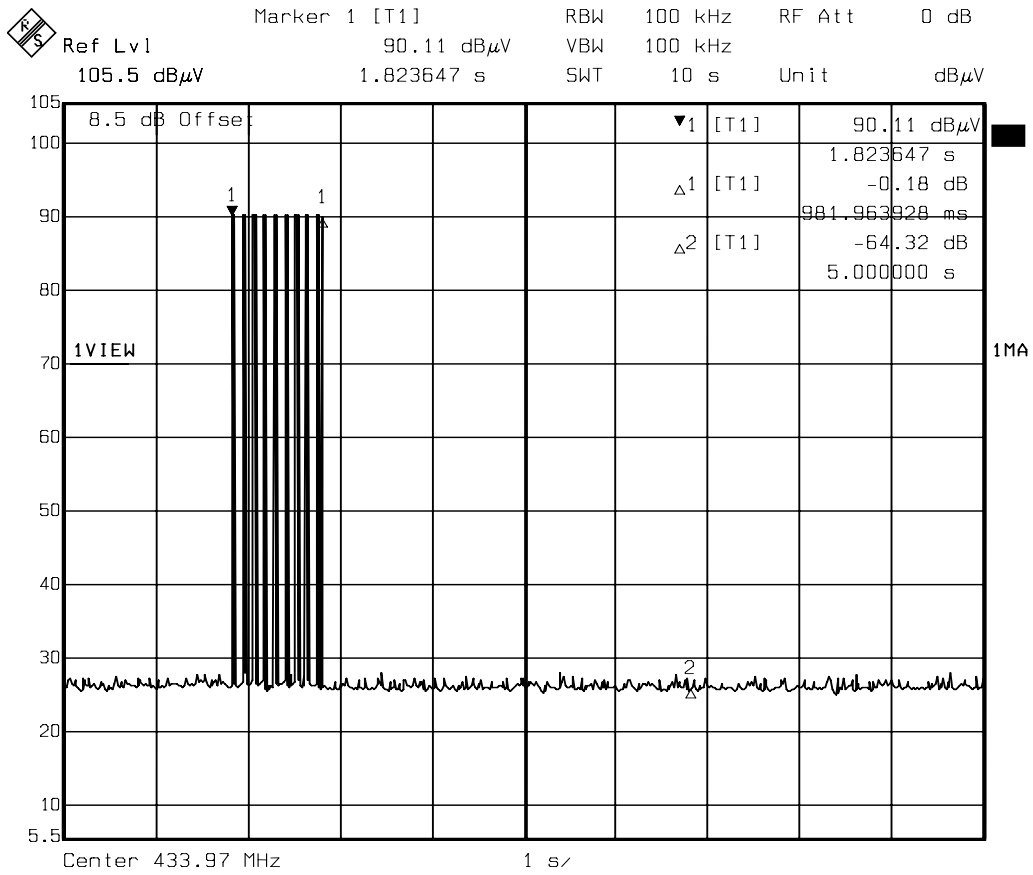
*No non-compliance noted*

### Test Data

Frequency (MHz)	Transmission Time (s)	Limit (Second)	Result
433.97	1.8236	5	PASS



Test Plot



Date: 13.OCT.2010 10:07:37



### **7.3 DUTY CYCLE**

#### **LIMIT**

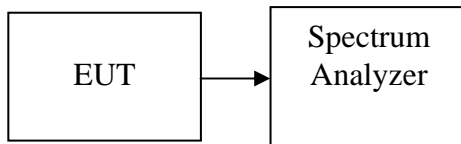
Nil (No dedicated limit specified in the Rules)

#### **MEASUREMENT EQUIPMENT USED**

<b>Name of Equipment</b>	<b>Manufacturer</b>	<b>Model</b>	<b>Serial Number</b>	<b>Calibration Due</b>
SPECTRUM ANALYZER	R&S	FSEK 30	835253/002	JAN. 03, 2011

**REMARK:** Each piece of equipment is scheduled for calibration once a year.

#### **TEST CONFIGURATION**



#### **TEST PROCEDURE**

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=100KHz, Span = 0Hz, Adjust Sweep = 100s.
5. Repeat above procedures until all frequency measured were complete.

#### **TEST RESULTS**

No non-compliance noted

#### **TEST DATA**

$T_p = 104.208\text{ms}$

$T_{on} = 13.627\text{ (ms)}$

$\text{Factor} = 20 * \log(T_{on} / T_p) = 20 * \log(13.627/100) = -17.312\text{dB}$

$\text{Factor} = -20\text{dB}$

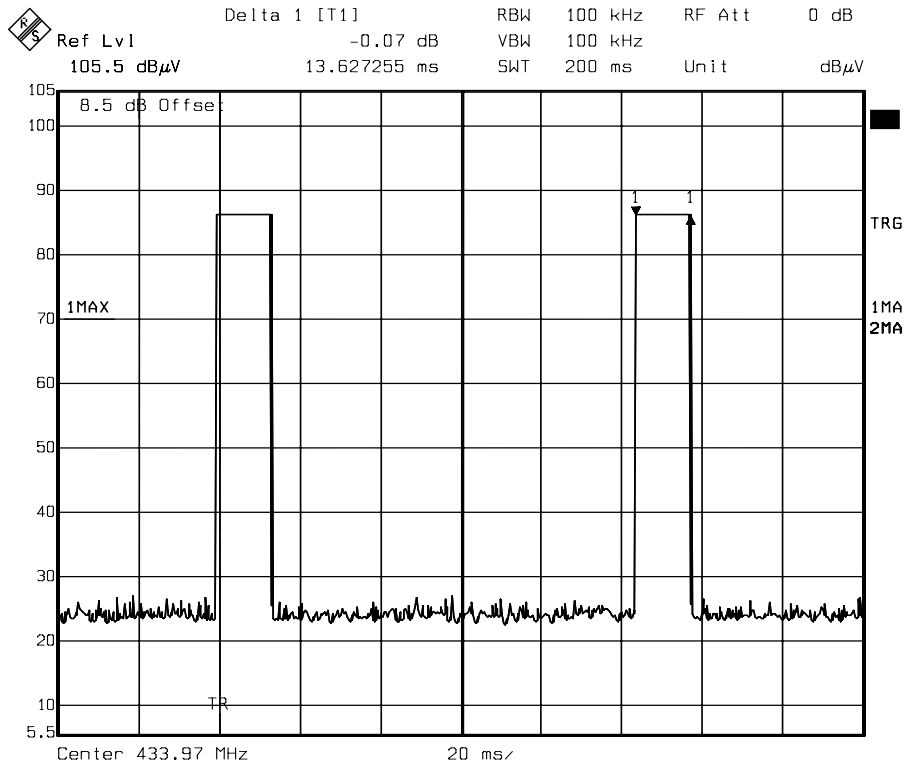
Remark:  $T_p > 100\text{ms}$ . Use 100ms for calculation.





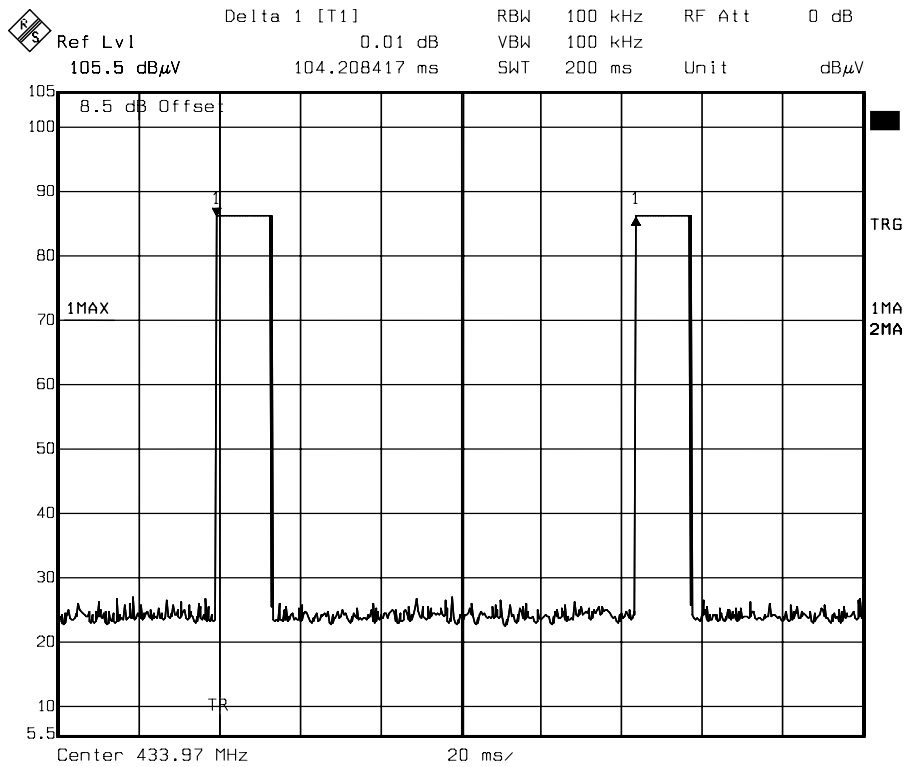
**Test Plot**

**Ton**



Date: 25.AUG.2010 17:08:39

**Tp**



Date: 25.AUG.2010 17:08:22



## 7.4 RADIATED EMISSIONS

### LIMIT

1. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (mV/m)	Field Strength (dBµV/m at 3-meter)	Measurement Distance (m)
30-88	100*	40	3
88-216	150*	43.5	3
216-960	200*	46	3
Above 960	500	54	3

*Remark: Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231(a) and 15.241.*

2. For intentional device, according to § 15.231(b), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the following table.

Fundamental Frequency (MHz)	Field Strength of Fundamental (µV/M)	Field Strength of Spurious Emission (µV/M)
40.66-40.70	2250	225
70-130	1250	125
130-174	1250 to 3750**	125 to 375**
174-260	3750	375
260-470	3750 to 12500**	375 to 1250**
Above 470	12500	1250

Note :

1. “ ※※ ” linear interpolations.
2. Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 56.81818(F) - 6136.3636; for the band 260-470 MHz, uV/m at 3 meters = 41.6667(F) - 7083.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.



3. Except the field strength table in §15.231(b) is replaced by the following:

Fundamental Frequency (MHz)	Field Strength of Fundamental (µV/M)	Field Strength of Spurious Emission (µV/M)
40.66-40.70	1000	100
70-130	500	50
130-174	500 to 1500**	50 to 150**
174-260	1500	150
260-470	1500 to 5000**	150 to 500**
Above 470	5000	500

Note :

1. “ \*\* ” linear interpolations.
2. Where F is the frequency in MHz, the formulas for calculating the maximum permitted fundamental field strengths are as follows: for the band 130-174 MHz, uV/m at 3 meters = 22.72727(F) – 2454.545; for the band 260-470 MHz, uV/m at 3 meters = 16.6667(F) - 2833.3333. The maximum permitted unwanted emission level is 20 dB below the maximum permitted fundamental level.

**MEASUREMENT EQUIPMENT USED**

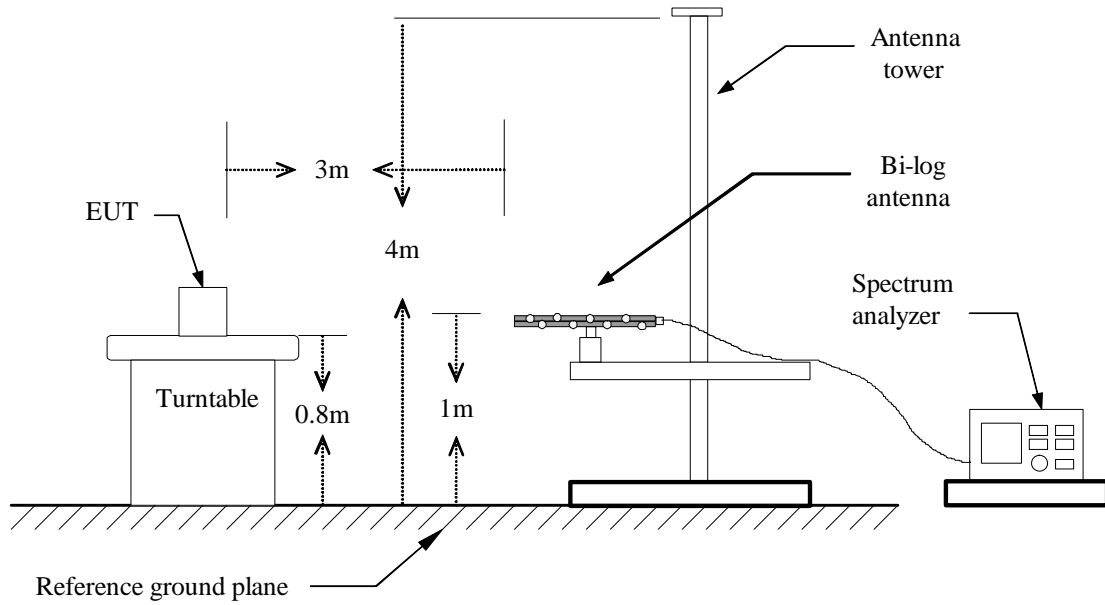
Open Area Test Site # 6				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TYPE N COAXIAL CABLE	SUHNER	CHA9513	6	AUG. 31, 2011
BI-LOG Antenna	Sunol	JB1	A070506-2	NOV. 12, 2010
LOOP ANTENNA	EMCO	6502	8905-2356	JUN. 10, 2011
Pre-Amplifier	HP	8447F	2944A03817	AUG. 31, 2011
EMI Receiver	R&S	ESVS10	833206/012	MAY 10, 2011
RF Cable	SUHNER	SUCOFLEX104PEA	20520/4PEA	NOV. 10, 2010
Horn Antenna	Com-Power	AH-118	071032	DEC. 29, 2010
Spectrum Analyzer	R&S	FSEK 30	835253/002	JUL. 14, 2011
Pre-Amplifier	MITEQ	AFS44-00108650-42-10P-44	1205908	NOV. 10, 2010
Turn Table	Yo Chen	001	-----	N.C.R.
Antenna Tower	AR	TP1000A	309874	N.C.R.
Controller	CT	SC101	-----	N.C.R.
RF Swicth	E-INSTRUMENT TELH LTD	ERS-180A	EC1204141	N.C.R
Test S/W	e-3 (5.04303e)			

**Remark:** Each piece of equipment is scheduled for calibration once a year.

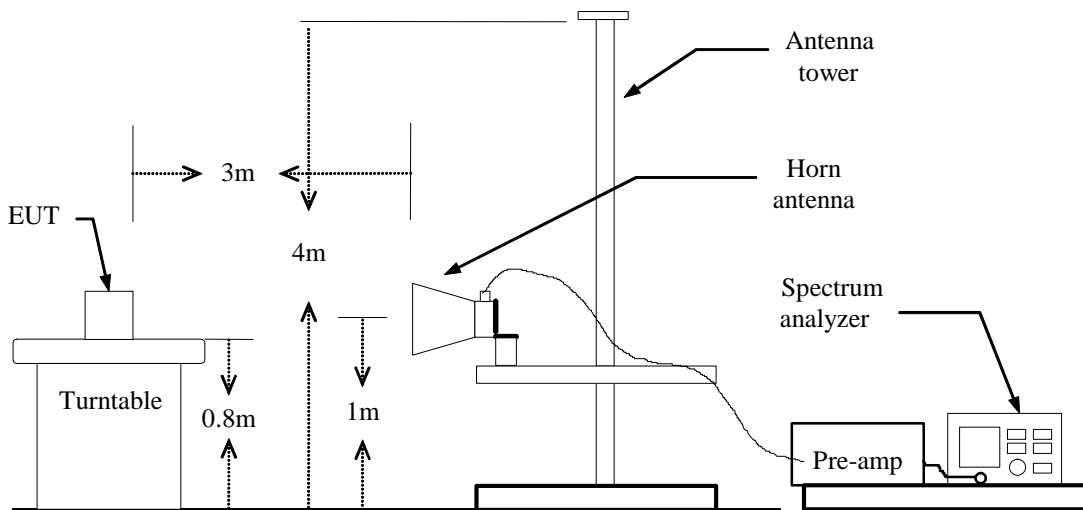


**Test Configuration**

**Below 1 GHz**



**Above 1 GHz**





## **TEST PROCEDURE**

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:  
Below 1GHz:  
 $RBW=100kHz / VBW=300kHz / Sweep=AUTO$   
Above 1GHz:  
(a) PEAK:  $RBW=VBW=1MHz / Sweep=AUTO$   
(b) AVERAGE=Peak Value + Duty Factor
7. Repeat above procedures until the measurements for all frequencies are complete.



**TEST RESULTS**

**Below 1 GHz**

**Operation Mode:** TX / X Mode                      **Test Date:** June 29, 2010  
**Temperature:** 28.3°C                              **Tested by:** Eric Yang  
**Humidity:** 47 % RH                                **Polarity:** Ver. / Hor.

Freq- Uency	Antenna Factor	Cable Loss	Meter Reading at 3 m(dB μ V)		Limits	Duty Cycle Factor	Emission Level at 3 m(dB μ V/m)		Margin		Detector Mode
			Horizontal	Vertical			Horizontal	Vertical	Horizontal	Vertical	
433.95	16.96	2.83	51.46	41.52	100.83	-	71.24	61.30	-29.58	-39.52	PK
433.95	16.96	2.83	N/A	N/A	80.83	-17.31	53.93	43.99	-26.90	-36.84	AVG
867.98	22.59	4.39	23.98	22.54	80.83	-	50.96	49.52	-29.86	-31.30	PK
867.98	22.59	4.39	N/A	N/A	60.83	-17.31	33.65	32.21	-27.18	-28.62	AVG
N/A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

**Notes:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.
5. Remark “\*” means the Restricted band.
6. Peak level(PK)=Meter Reading +Antenna Factor +Cable Loss
7. Average level(AVG)=Peak level(Emission Level) +Duty factor.



**Operation Mode:** TX / Y Mode                      **Test Date:** June 29, 2010  
**Temperature:** 28.3°C                                **Tested by:** Eric Yang  
**Humidity:** 47 % RH                                 **Polarity:** Ver. / Hor.

Freq- Uency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading at 3 m(dB μ V)		Limits (dBμV/M)	Duty Cycle Factor (dB)	Emission Level at 3 m(dB μ V/m)		Margin		Detector Mode
			Horizontal	Vertical			Horizontal	Vertical	Horizontal	Vertical	
433.95	16.96	2.83	52.64	43.55	100.83	-	72.42	63.33	-28.40	-37.49	PK
433.95	16.96	2.83	N/A	N/A	80.83	-17.31	55.11	46.02	-25.72	-34.81	AVG
867.98	22.59	4.39	27.84	25.11	80.83	-	54.82	52.09	-26.00	-28.73	PK
867.98	22.59	4.39	N/A	N/A	60.83	-17.31	37.51	34.78	-23.32	-26.05	AVG
N/A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

**Notes:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.
5. Remark “\*” means the Restricted band.
6. Peak level(PK)=Meter Reading +Antenna Factor +Cable Loss
7. Average level(AVG)=Peak level(Emission Level) +Duty factor.



**Operation Mode:** TX / Z Mode                      **Test Date:** June 29, 2010  
**Temperature:** 28.3°C                              **Tested by:** Eric Yang  
**Humidity:** 47 % RH                                **Polarity:** Ver. / Hor.

Freq- Uency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading at 3 m(dB μ V)		Limits (dBμV/M)	Duty Cycle Factor (dB)	Emission Level at 3 m(dB μ V/m)		Margin		Detector Mode
			Horizontal	Vertical			Horizontal	Vertical	Horizontal	Vertical	
433.95	16.96	2.83	40.55	52.54	100.83	-	60.33	72.32	-40.49	-28.50	PK
433.95	16.96	2.83	N/A	N/A	80.83	-17.31	43.02	55.01	-37.81	-25.82	AVG
867.98	22.59	4.39	27.11	29.87	80.83	-	54.09	56.85	-26.73	-23.97	PK
867.98	22.59	4.39	N/A	N/A	60.83	-17.31	36.78	39.54	-24.05	-21.29	AVG
N/A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

**Notes:**

1. Measuring frequencies from 30 MHz to the 1GHz.
2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.
3. Data of measurement within this frequency range shown “ --- ” in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.
4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.
5. Remark “\*” means the Restricted band.
6. Peak level(PK)=Meter Reading +Antenna Factor +Cable Loss
7. Average level(AVG)=Peak level(Emission Level) +Duty factor.





**Above 1 GHz**

**Operation Mode:** TX / X Mode                      **Test Date:** June 29, 2010  
**Temperature:** 28.3°C                                **Tested by:** Eric Yang  
**Humidity:** 47 % RH                                 **Polarity:** Ver. / Hor.

Freq- Uency (MHz)	Antenna	Cable	Meter Reading		Limits (dBμV/M)	Duty Cycle Factor (dB)	Emission Level		Margin		Detector Mode
	Factor (dB/m)	Loss (dB)	at 3 m(dB μ V)				at 3 m(dB μ V/m)		Horizontal	Vertical	
* 1301.89	25.77	2.11	27.84	25.87	74.00	-	55.72	53.75	-18.28	-20.25	PK
* 1301.89	25.77	2.11	N/A	N/A	54.00	-17.31	38.41	36.44	-15.59	-17.56	AVG
1735.83	28.39	2.29	26.98	24.96	80.83	-	57.66	55.64	-23.16	-25.18	PK
1735.83	28.39	2.29	N/A	N/A	60.83	-17.31	40.35	38.33	-20.47	-22.49	AVG
2169.82	30.16	2.51	28.11	27.11	80.83	-	60.78	59.78	-20.05	-21.05	PK
2169.82	30.16	2.51	N/A	N/A	60.83	-17.31	43.47	42.47	-17.36	-18.36	AVG
2603.69	29.78	2.70	27.89	26.35	80.83	-	60.37	58.83	-20.46	-22.00	PK
2603.69	29.78	2.70	N/A	N/A	60.83	-17.31	43.06	41.52	-17.77	-19.31	AVG
3037.22	30.11	2.86	28.50	26.53	80.83	-	61.47	59.50	-19.36	-21.33	PK
3037.22	30.11	2.86	N/A	N/A	60.83	-17.31	44.15	42.18	-16.67	-18.64	AVG
3472.28	30.19	3.20	28.74	26.87	80.83	-	62.13	60.26	-18.69	-20.56	PK
3472.28	30.19	3.20	N/A	N/A	60.83	-17.31	44.82	42.95	-16.01	-17.88	AVG
* 3906.43	30.85	3.38	25.87	27.54	74.00	-	60.10	61.77	-13.90	-12.23	PK
* 3906.43	30.85	3.38	N/A	N/A	54.00	-17.31	42.79	44.46	-11.21	-9.54	AVG
* 4339.84	31.82	3.57	25.36	26.33	74.00	-	60.75	61.72	-13.25	-12.28	PK
* 4339.84	31.82	3.57	N/A	N/A	54.00	-17.31	43.43	44.40	-10.57	-9.60	AVG
N/A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Remark “\*” means the Restricted band.
5. Spectrum setting:
  - a. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = auto.
  - b. Average level=Peak level +Duty factor.
6. Peak level(PK)=Meter Reading +Antenna Factor +Cable Loss
7. Average level(AVG)=Peak level(Emission Level) +Duty factor.



**Operation Mode:** TX / Y Mode      **Test Date:** June 29, 2010  
**Temperature:** 28.3°C      **Tested by:** Eric Yang  
**Humidity:** 47 % RH      **Polarity:** Ver. / Hor.

Freq- Uency	Antenna Factor	Cable Loss	Meter Reading		Limits	Duty Cycle Factor	Emission Level		Margin		Detector Mode
			at 3 m(dB μ V)				at 3 m(dB μ V/m)		Horizontal	Vertical	
(MHz)	(dB/m)	(dB)	Horizontal	Vertical	(dBμV/M)	(dB)	Horizontal	Vertical	Horizontal	Vertical	
* 1301.89	25.77	2.11	28.54	26.57	74.00	-	56.42	54.45	-17.58	-19.55	PK
* 1301.89	25.77	2.11	N/A	N/A	54.00	-17.31	39.11	37.14	-14.89	-16.86	AVG
1735.93	28.39	2.29	27.36	25.98	80.83	-	58.05	56.67	-22.78	-24.16	PK
1735.93	28.39	2.29	N/A	N/A	60.83	-17.31	40.73	39.35	-20.09	-21.47	AVG
2170.16	30.16	2.51	28.54	26.73	80.83	-	61.21	59.40	-19.62	-21.43	PK
2170.16	30.16	2.51	N/A	N/A	60.83	-17.31	43.90	42.09	-16.93	-18.74	AVG
2603.78	29.78	2.70	29.33	27.45	80.83	-	61.81	59.93	-19.02	-20.90	PK
2603.78	29.78	2.70	N/A	N/A	60.83	-17.31	44.50	42.62	-16.33	-18.21	AVG
3038.25	30.11	2.86	28.54	26.35	80.83	-	61.51	59.32	-19.32	-21.51	PK
3038.25	30.11	2.86	N/A	N/A	60.83	-17.31	44.20	42.01	-16.63	-18.82	AVG
3472.41	30.19	3.20	27.65	26.11	80.83	-	61.05	59.50	-19.78	-21.32	PK
3472.41	30.19	3.20	N/A	25.14	60.83	-17.31	43.73	42.19	-17.09	-18.64	AVG
* 3906.46	30.85	3.38	28.33	26.98	74.00	-	62.56	61.21	-11.44	-12.79	PK
* 3906.46	30.85	3.38	N/A	25.14	54.00	-17.31	45.25	43.90	-8.75	-10.10	AVG
* 4339.86	31.82	3.57	28.50	26.78	74.00	-	63.89	62.17	-10.11	-11.83	PK
* 4339.86	31.82	3.57	N/A	N/A	54.00	-17.31	46.57	44.85	-7.43	-9.15	AVG
N/A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Remark “\*” means the Restricted band.
5. Spectrum setting:
  - a. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = auto.
  - b. Average level=Peak level +Duty factor.
6. Peak level(PK)=Meter Reading +Antenna Factor +Cable Loss
7. Average level(AVG)=Peak level(Emission Level) +Duty factor.



**Operation Mode:** TX / Z Mode                      **Test Date:** June 29, 2010  
**Temperature:** 28.3°C                                **Tested by:** Eric Yang  
**Humidity:** 47 % RH                                 **Polarity:** Ver. / Hor.

Freq- Uency	Antenna Factor	Cable Loss	Meter Reading at 3 m(dB μ V)		Limits (dBμV/M)	Duty Cycle Factor (dB)	Emission Level at 3 m(dB μ V/m)		Margin		Detector Mode
			Horizontal	Vertical			Horizontal	Vertical	Horizontal	Vertical	
* 1302.19	25.77	2.11	26.35	28.67	74.00	-	54.23	56.55	-19.77	-17.45	PK
* 1302.19	25.77	2.11	N/A	N/A	54.00	-17.31	36.92	39.24	-17.08	-14.76	AVG
1735.96	28.39	2.29	27.14	29.11	80.83	-	57.83	59.80	-23.00	-21.03	PK
1735.96	28.39	2.29	N/A	N/A	60.83	-17.31	40.51	42.48	-20.31	-18.34	AVG
2170.14	30.16	2.51	26.35	28.65	80.83	-	59.02	61.32	-21.81	-19.51	PK
2170.14	30.16	2.51	N/A	N/A	60.83	-17.31	41.71	44.01	-19.12	-16.82	AVG
2604.19	29.78	2.70	25.42	27.48	80.83	-	57.90	59.96	-22.93	-20.87	PK
2604.19	29.78	2.70	N/A	N/A	60.83	-17.31	40.59	42.65	-20.24	-18.18	AVG
3038.45	30.11	2.86	24.98	26.98	80.83	-	57.95	59.95	-22.88	-20.88	PK
3038.45	30.11	2.86	N/A	N/A	60.83	-17.31	40.64	42.64	-20.19	-18.19	AVG
3472.26	30.19	3.20	25.33	27.84	80.83	-	58.72	61.23	-22.10	-19.59	PK
3472.26	30.19	3.20	N/A	N/A	60.83	-17.31	41.41	43.92	-19.42	-16.91	AVG
* 3906.42	30.85	3.38	26.87	28.33	74.00	-	61.10	62.56	-12.90	-11.44	PK
* 3906.42	30.85	3.38	N/A	N/A	54.00	-17.31	43.79	45.25	-10.21	-8.75	AVG
* 4340.38	31.82	3.57	26.75	27.54	74.00	-	62.14	62.93	-11.86	-11.07	PK
* 4340.38	31.82	3.57	N/A	N/A	54.00	-17.31	44.82	45.61	-9.18	-8.39	AVG
N/A	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

**Notes:**

1. Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.
2. Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.
3. Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.
4. Remark “\*” means the Restricted band.
5. Spectrum setting:
  - a. Spectrum Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = auto.
  - b. Average level=Peak level +Duty factor.
6. Peak level(PK)=Meter Reading +Antenna Factor +Cable Loss
7. Average level(AVG)=Peak level(Emission Level) +Duty factor.



## 7.5 POWERLINE CONDUCTED EMISSIONS

### LIMIT

For an intentional radiator which is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

Frequency Range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

### MEASUREMENT EQUIPMENT USED

Conducted Emission room				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
L.I.S.N.	SCHWARZBECK	NNLK 8121	8121-308	MAR. 09, 2011
	Rohde & Schwarz	ESH 3-Z5	840062/021	NOV. 29, 2010
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	JUL. 13, 2011
BNC COAXIAL CABLE	CCS	BNC50	11	AUG. 26, 2011
Test S/W	e-3 (5.04211c)    R&S (2.27)			

*Remark: Each piece of equipment is scheduled for calibration once a year.*

### Test results

Since this EUT is battery powered, this test item is not applicable.