



**FCC 47 CFR PART 15 SUBPART C:2008  
AND ANSI C63.4: 2003**

**TEST REPORT**

**For**

**8 Scene Wall Switch**

**Model Number: LCHC-21**

**Brand: AVIN**

**Issued for**

**Avertronics INC.**

No. 10, 19th Road Industrial, Nuntun Dist., Taichung 408, Taiwan

**Issued by**  
**Compliance Certification Services Inc.**  
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**Issued Date: September 02, 2010**



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**REVISION HISTORY**

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		September 02, 2010		Initial Issue	ALL	Selena.Chong



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**1. TEST REPORT CERTIFICATION**

<b>Applicant</b>	Avertronics INC.
<b>Address</b>	No. 10, 19 <sup>th</sup> Road Industrial, Nuntun Dist., Taichung 408, Taiwan.
<b>Manufacture</b>	Avertronics INC.
<b>Address</b>	No. 10, 19 <sup>th</sup> Road Industrial, Nuntun Dist., Taichung 408, Taiwan.
<b>Equipment Under Test</b>	8 Scene Wall Switch
<b>Model Number</b>	LCHC-21
<b>Trade Name</b>	AVIN
<b>Date of Test</b>	March 23, 2010 ~ May 29, 2010

APPLICABLE STANDARD	
STANDARD	TEST RESULT
FCC Part 15 Subpart C : 2008 AND ANSI C63.4 : 2003	No non-compliance noted

Approved by:

**Jeter Wu**

Assistant Manager

Reviewed by:

**Eric Yang**

Senior Engineer



## 2. EUT DESCRIPTION

Product Name	8 Scene Wall Switch			
Model Number	LCHC-21			
Brand Name	AVIN			
Frequency Range	2405MHz~2480MHz			
Transmit Peak Power	CH Low:-4.94dBm (0.32 mW)			
Transmit Data Rate	IEEE 802.15.4 : ≤250 kbps			
Modulation Technique	OQPSK			
Channel Spacing	5MHz			
Channel Number	16 Channels			
	Channel	Frequency	Channel	Frequency
	1	2405MHz	9	2445MHz
	2	2410MHz	10	2450MHz
	3	2415MHz	11	2455MHz
	4	2420MHz	12	2460MHz
	5	2425MHz	13	2465MHz
	6	2430MHz	14	2470MHz
	7	2435MHz	15	2475MHz
	8	2440MHz	16	2480MHz
Antenna Designation	Model: NA Manufacture: Phycomp Type: Chip Antenna Gain : 0 dBi			
Power Source	110Vac/60Hz			
Temperature Range	0 ~ +55°C			

- Remark :** 1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.  
2. This submittal(s) (test report) is intended for FCC ID: **V5ULCHC21201006** filing to comply with Section 15.207,15.209 and 15.247 of the FCC Part 15, Subpart C Rules.



### **3. DESCRIPTION OF TEST MODES**

The EUT is an IEEE 802.15.4 ZigBee transceiver.

The antenna peak gain 0 dBi (highest gain) were chosen for full testing.

#### **IEEE 802.15.4**

The EUT had been tested under operating condition.

There are three channels have been tested as following :

<b>Channel</b>	<b>Frequency (MHz)</b>
Low	2405
Middle	2440
High	2480



## **4. 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 15.247.

## **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 preselectors 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 LISTINGS**

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 I 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	AC Power cable	Unshielded, 1.8m, 1pcs.

**Remark:**

1. All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.



## **6.3 EUT OPERATING CONDITION**

### **RF Setup**

1. Set up all equipments as diagram.
2. RF channels control by hardware in 3 samples.
3. Check sample1 、 sample2 and sample3(CH low 、 mid and high)function.
4. Start test.

### **Normal Link Setup**

1. Set up all equipments as diagram.
2. EUT links to light through ballast
3. Turn on light through EUT.
4. Start test.



## **7. APPLICABLE LIMITS AND TEST RESULTS**

### **7.1 6DB BANDWIDTH**

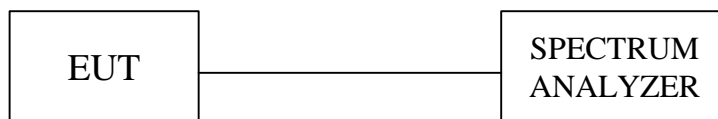
#### **LIMIT**

§ 15.207(a) (2) For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

#### **TEST EQUIPMENTS**

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEK 30	835253/002	JUL. 14, 2011

#### **TEST SETUP**



#### **TEST PROCEDURE**

The transmitter output was connected to a spectrum analyzer. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

**TEST RESULTS**

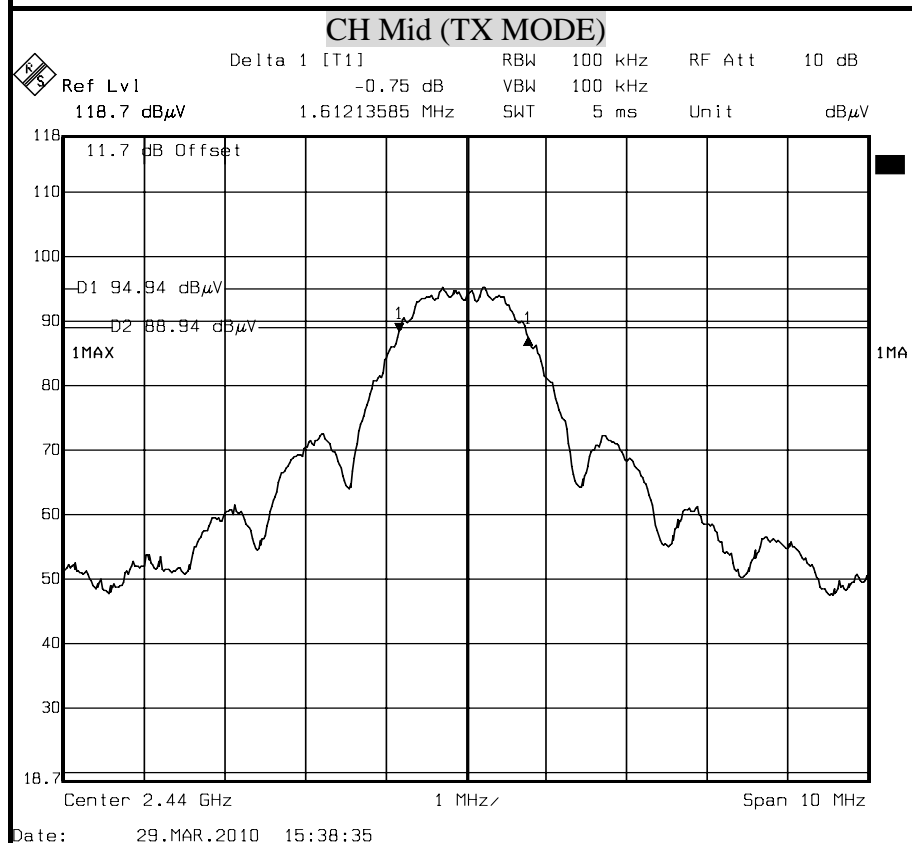
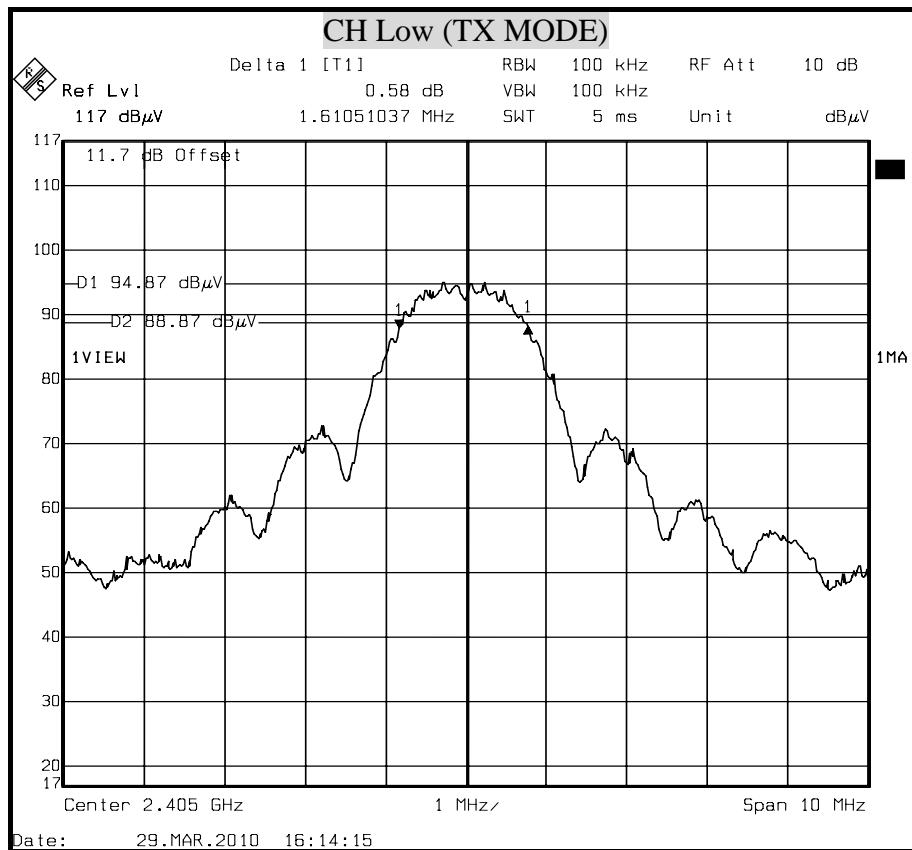
No non-compliance noted

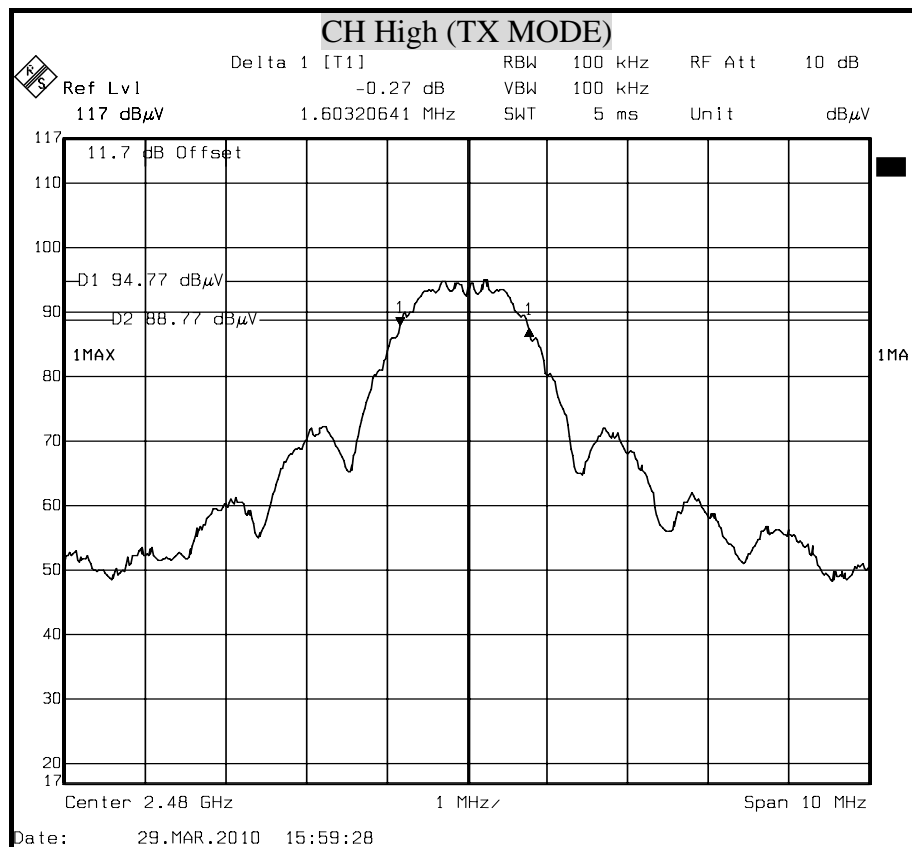
**TX mode**

<b>Channel</b>	<b>Frequency (MHz)</b>	<b>Bandwidth (kHz)</b>	<b>Limit (kHz)</b>	<b>Test Results</b>
Low	2405	1610.5	500	PASS
Middle	2440	1612.1	500	PASS
High	2480	1603.2	500	PASS



**6dB BANDWIDTH (TX MODE)**







## 7.2 MAXIMUM PEAK OUTPUT POWER

### LIMIT

§ 15.247(b) The maximum peak output power of the intentional radiator shall not exceed the following :

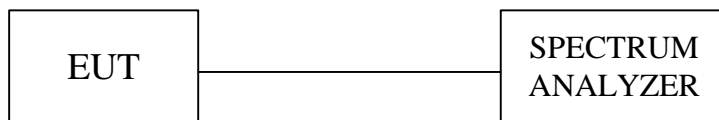
§ 15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands : 1 watt.

§ 15.247(b) (4) Except as shown in paragraphs (c) of this section , if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section , as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEK 30	835253/002	JUL. 14, 2011

### TEST SETUP



### TEST RESULTS

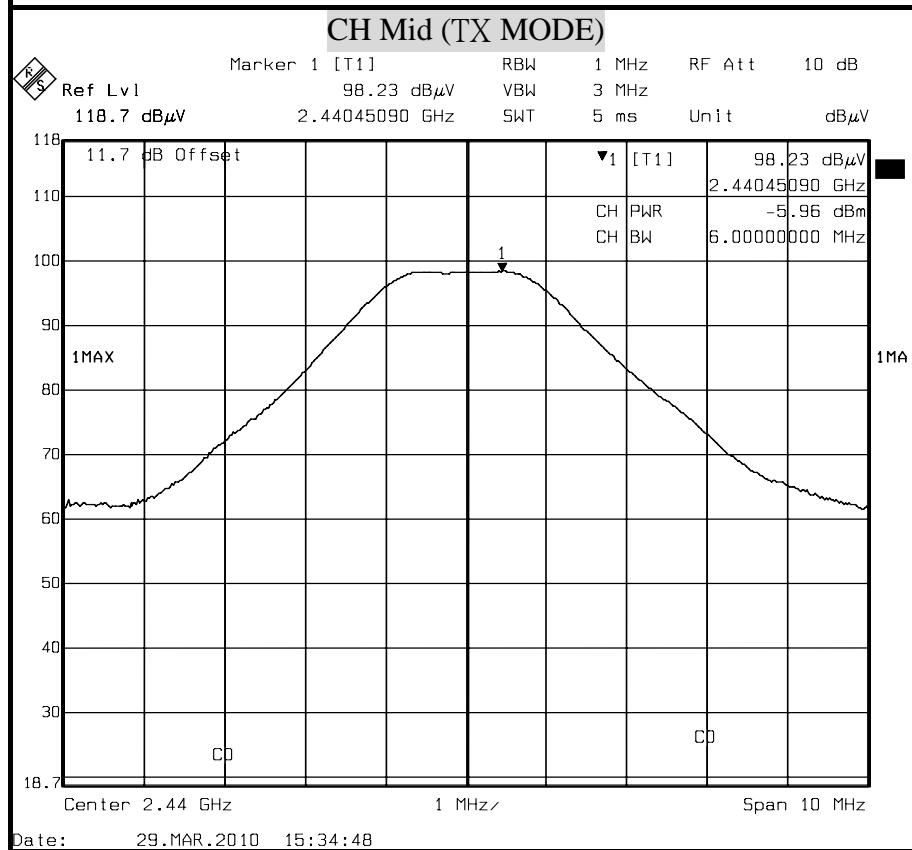
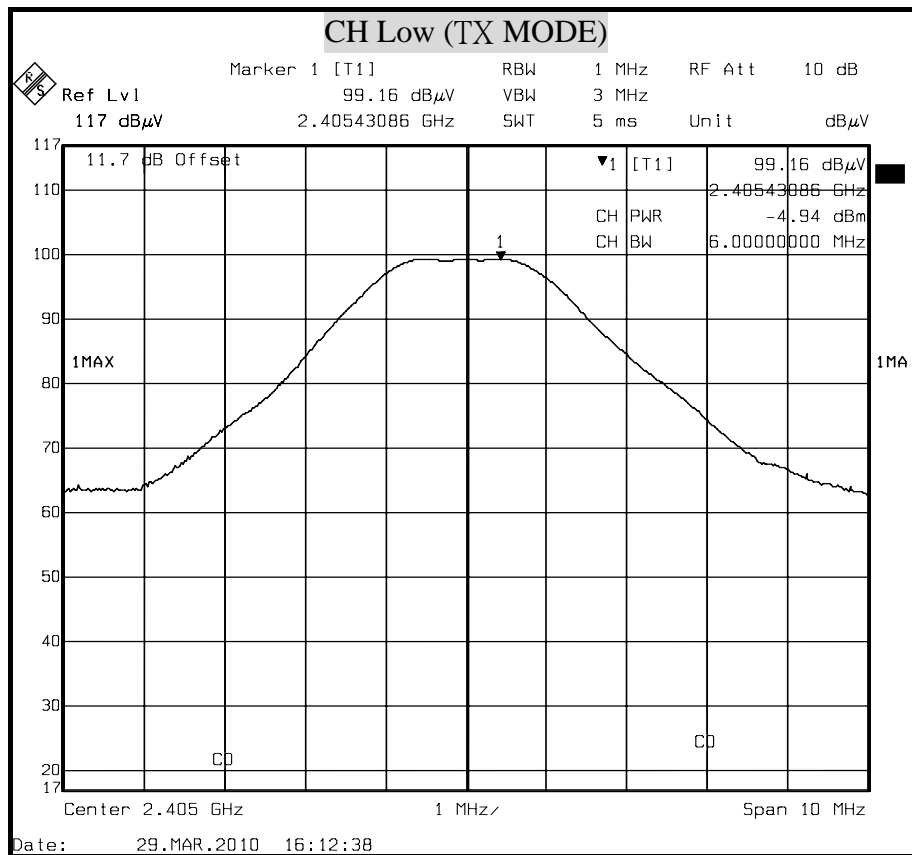
No non-compliance noted

Total peak power calculation formula:

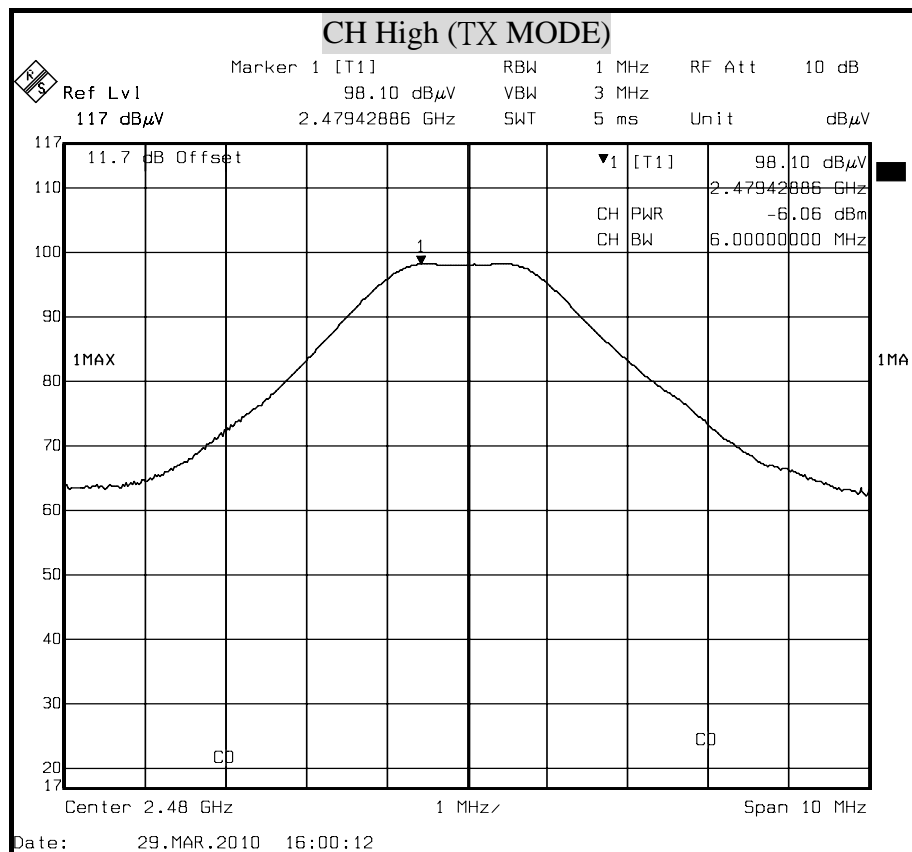
#### TX mode

Channel	Frequency (MHz)	Output Power Chain0 (dBm)	Limit (dBm)	Margin (dB)	Result
Low	2405	-4.94	30.00	-34.94	PASS
Middle	2440	-5.96	30.00	-35.96	PASS
High	2480	-6.06	30.00	-36.06	PASS

Note : 1. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

**MAXIMUM PEAK OUTPUT POWER (TX MODE)**







## 7.3 POWER SPECTRAL DENSITY

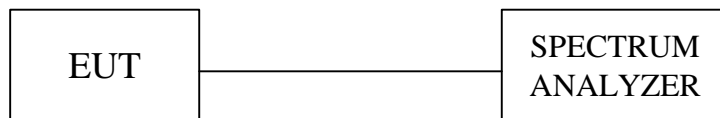
### LIMIT

§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

### TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEK 30	835253/002	JUL. 14, 2011

### TEST SETUP



### TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=3KHz and VBW $\geq$ RBW, set sweep time=span / 3KHz.

The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span / 3KHz for a full response of the mixer in the spectrum analyzer.

### TEST RESULTS

Total peak power calculation formula:

No non-compliance noted

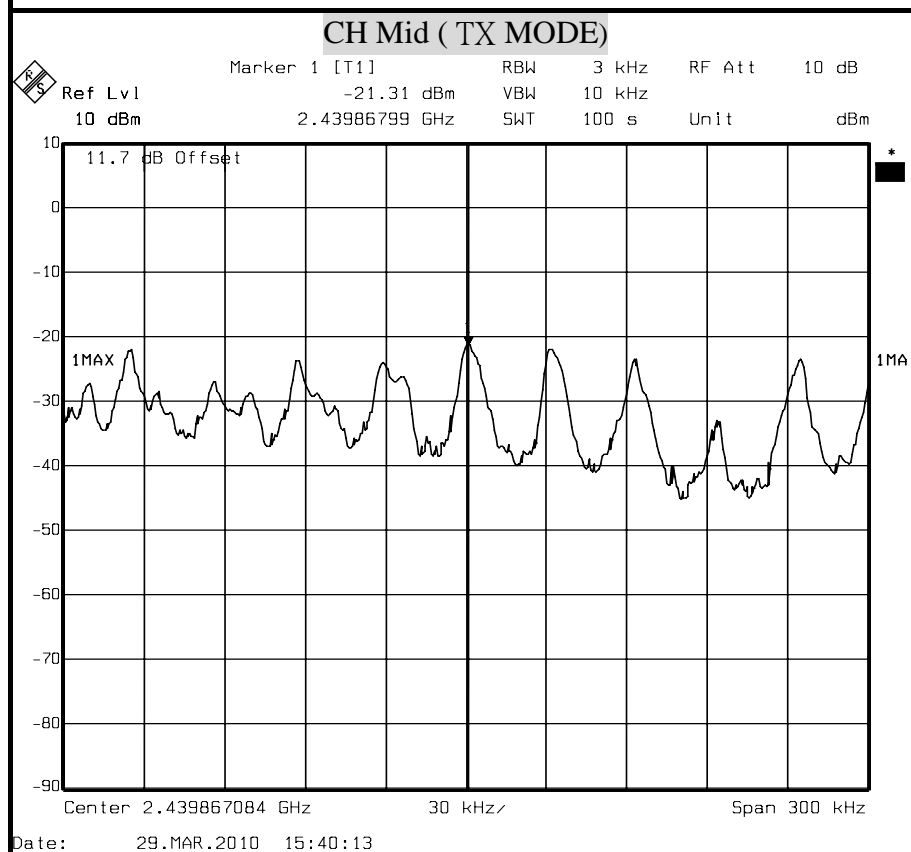
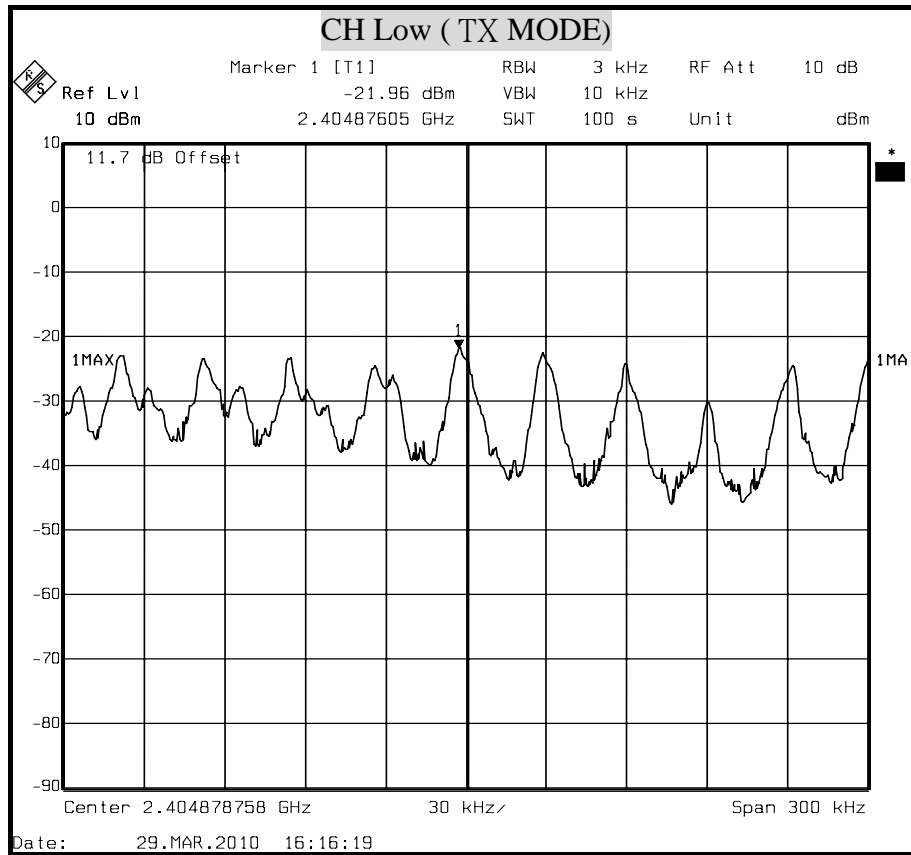
#### **TX mode**

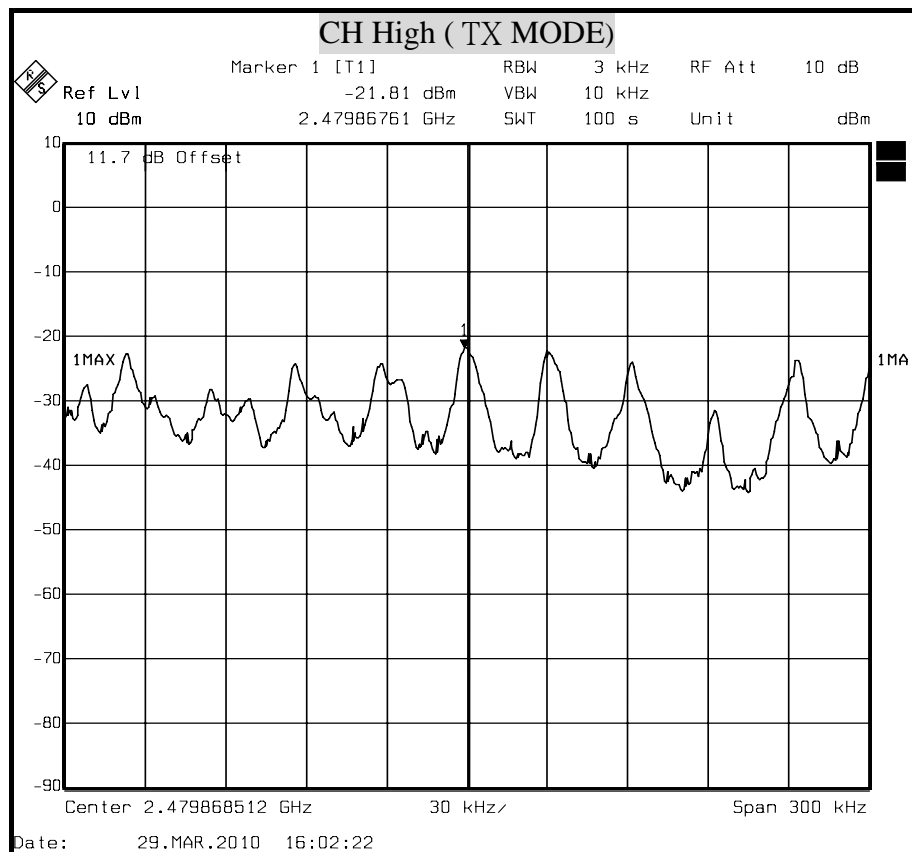
Channel	Frequency (MHz)	PPSD Chain0 (dBm)	Limit (dBm)	Margin (dB)	Result
Low	2405	-21.96	8.00	-29.96	PASS
Middle	2440	-21.31	8.00	-29.31	PASS
High	2480	-21.81	8.00	-29.81	PASS

Note : 1. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.



**POWER SPECTRAL DENSITY (TX MODE)**







## **7.4 CONDUCTED SPURIOUS EMISSION**

### **LIMITS**

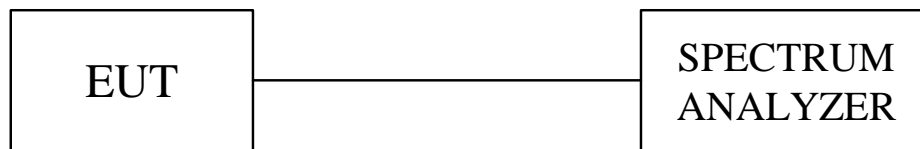
§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

### **TEST PROCEDURE**

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 100 kHz.

The spectrum from 30 MHz to 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

### **TEST SETUP**



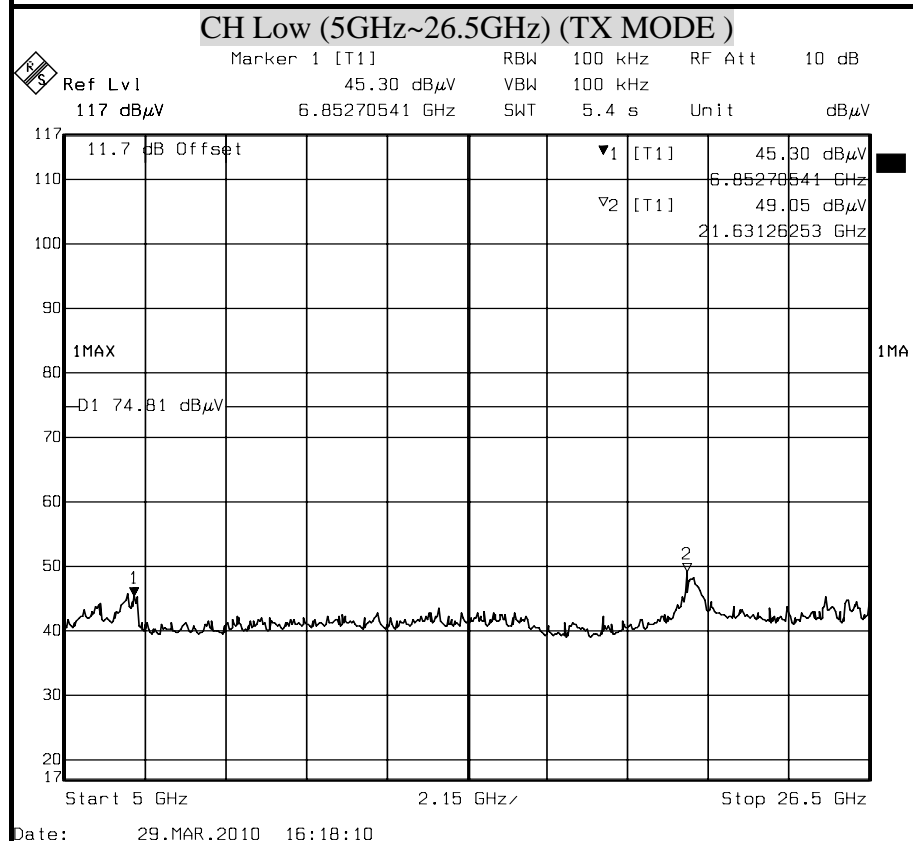
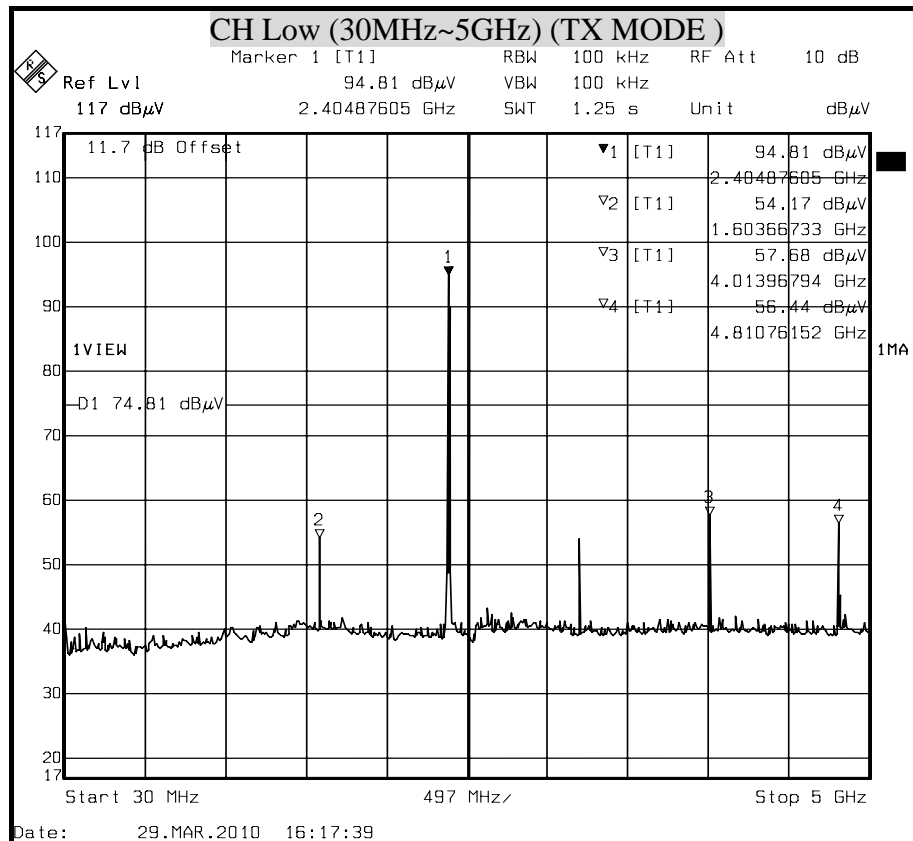
### **TEST RESULTS**

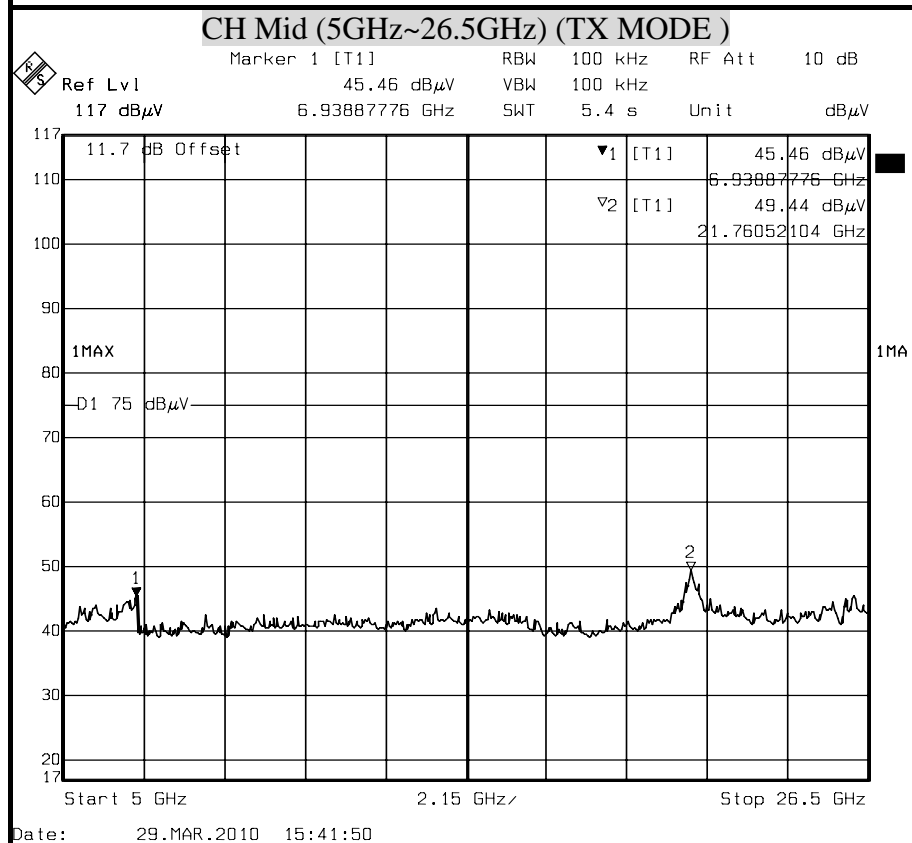
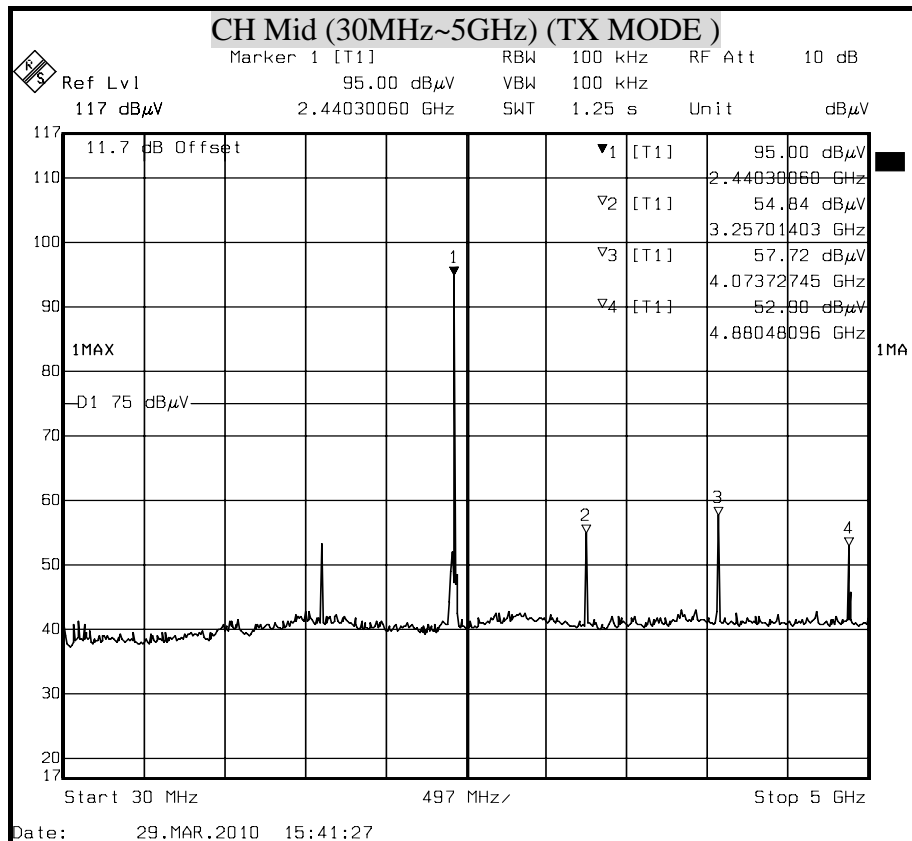
No non-compliance noted

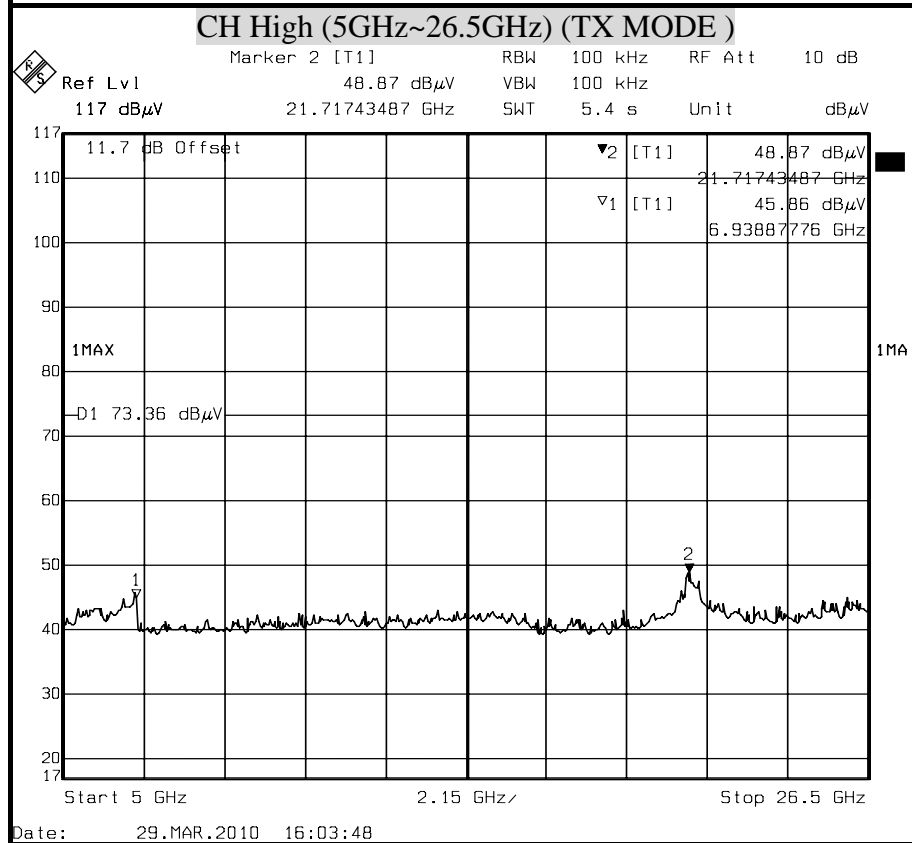
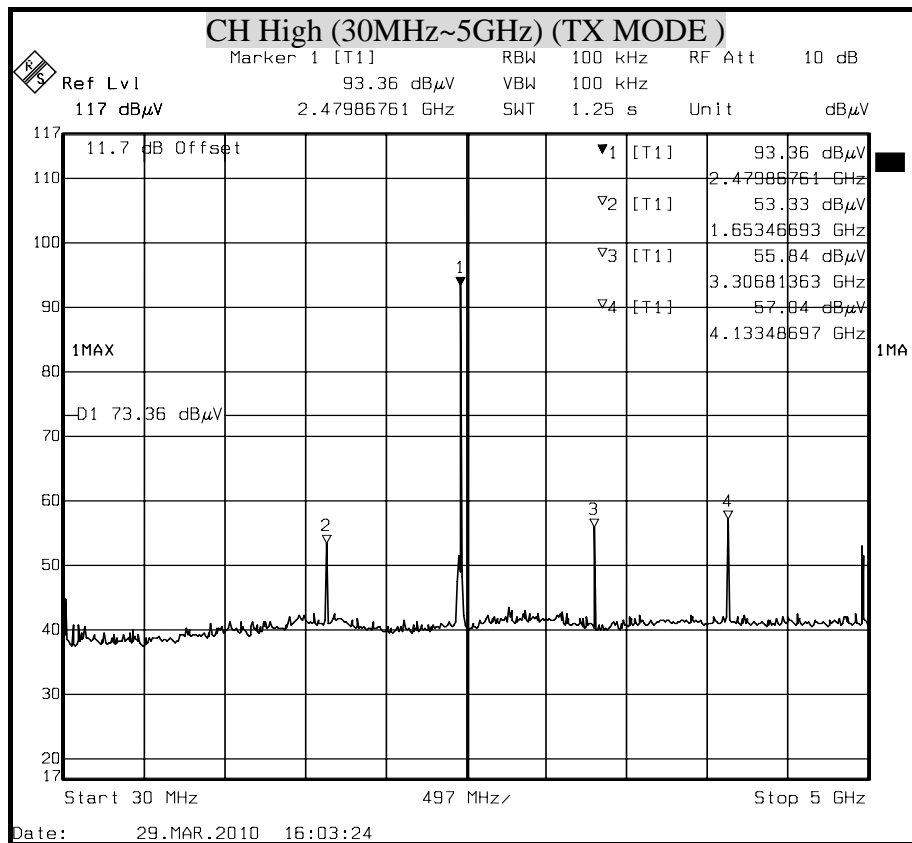


## OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

(TX MODE)











## 7.5 RADIATED EMISSIONS

### 7.5.1 TRANSMITTER RADIATED SUPURIOUS EMSSIONS

#### LIMITS

§ 15.205 (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 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	( <sup>2</sup> )
13.36 - 13.41			

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

<sup>2</sup> Above 38.6

§ 15.205 (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.



§ 15.209 (a) 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 (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

\*\* 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 and 15.241.

§ 15.209 (b) In the emission table above, the tighter limit applies at the band edges.

### **TEST EQUIPMENTS**

The following test equipments are utilized in making the measurements contained in this report.

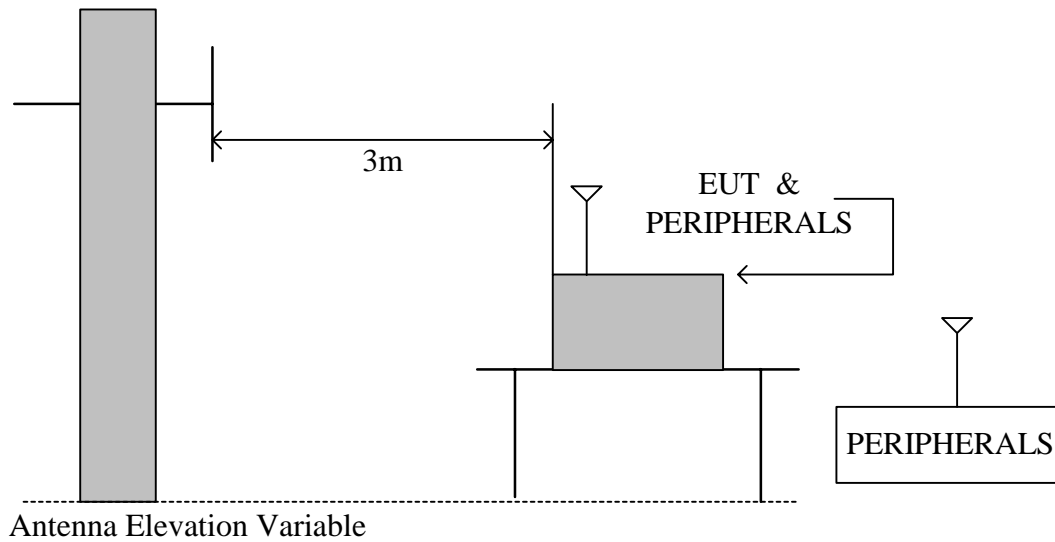
Open Area Test Site # 6				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
TYPE N COAXIAL CABLE	SUHNER	CHA9513	6	AUG. 31, 2010
BI-LOG Antenna	Sunol	JB1	A070506-2	NOV. 12, 2010
LOOP ANTENNA	EMCO	6502	8905-2356	JUN. 10, 2011
Pre-Amplifier	HP	8447F	2944A03817	AUG. 31, 2010
EMI Receiver	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	JAN. 03, 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

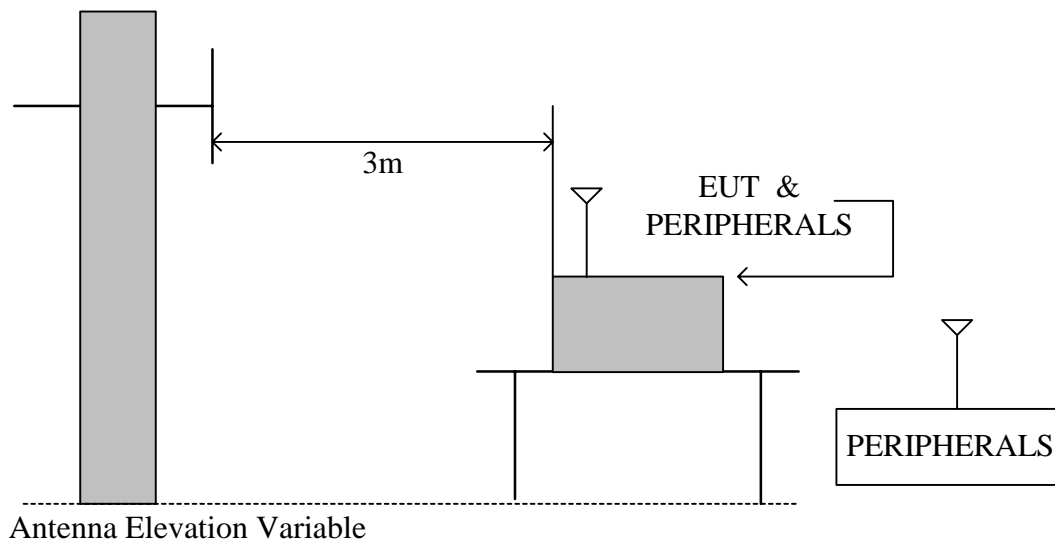


### **TEST SETUP**

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 to 1GHz.



The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.





## **TEST PROCEDURE**

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. While measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. While measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

### **Note:**

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

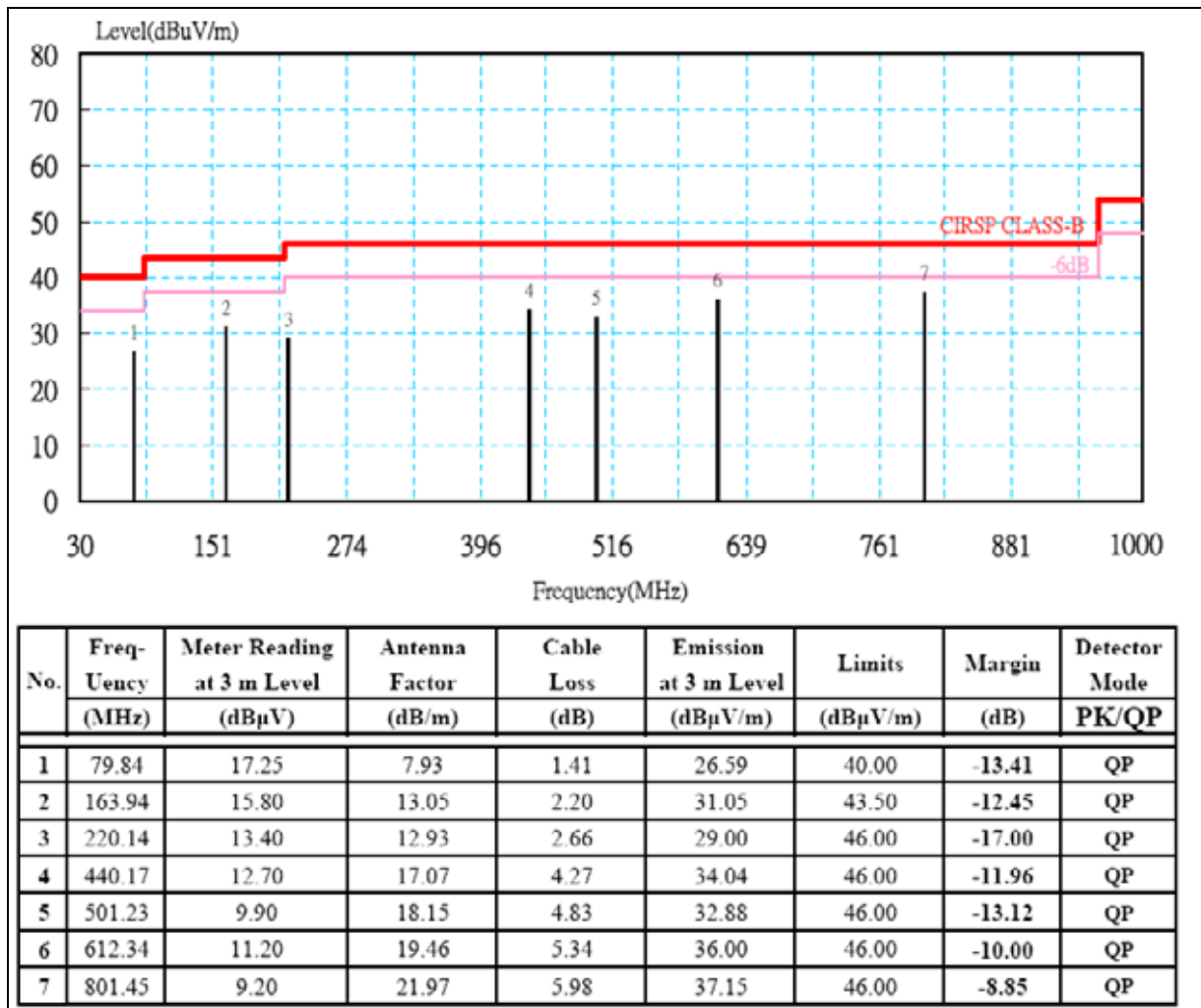
## **TEST RESULTS**

No non-compliance noted



## 7.5.2 WORST-CASE RADIATED EMISSION BELOW 1 GHz

Product Name	8 Scene Wall Switch	Test Date	2010/03/30
Model	LCHC-21	Test By	Eric Yang
Test Mode	Normal operating (worst case)	Temp& Humidity	28.7°C, 51%
Polarity	Vertical		

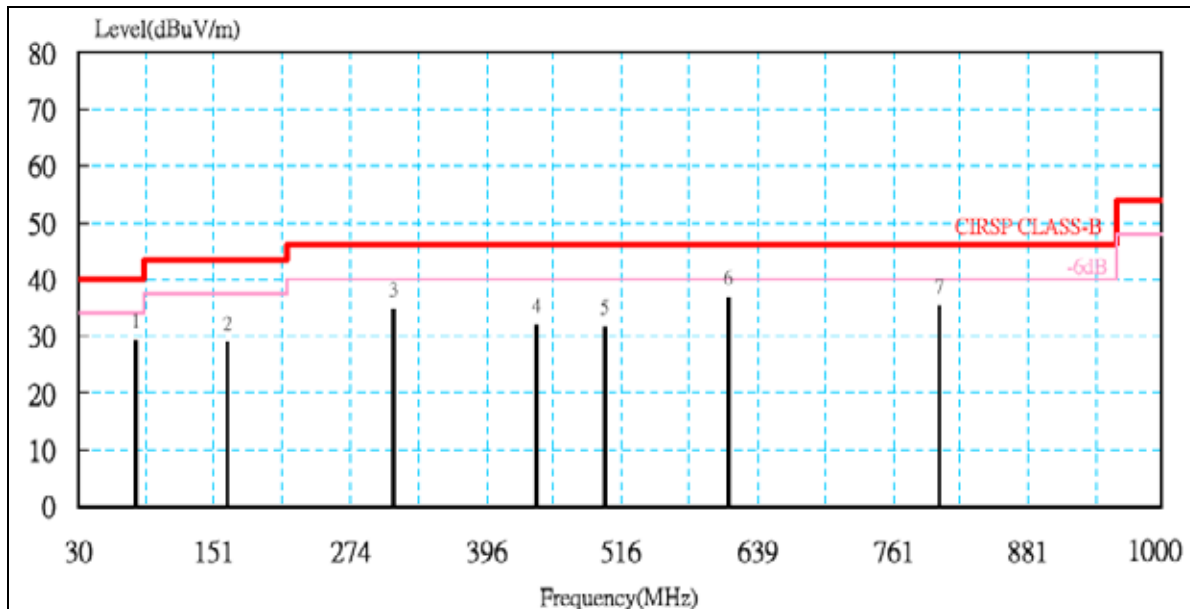


### Remark:

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
2. Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, 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.
5. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).



<b>Product Name</b>	8 Scene Wall Switch	<b>Test Date</b>	2010/03/30
<b>Model</b>	LCHC-21	<b>Test By</b>	Eric Yang
<b>Test Mode</b>	Normal operating (worst case)	<b>Temp&amp; Humidity</b>	28.7°C, 51%
<b>Polarity</b>	Horizontal		



No.	Freq- Uency (MHz)	Meter Reading at 3 m Level (dBμV)	Antenna Factor (dB/m)	Cable Loss (dB)	Emission at 3 m Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector Mode PK/QP
1	81.54	19.80	8.01	1.43	29.24	40.00	-10.76	QP
2	163.95	13.50	13.05	2.20	28.75	43.50	-14.75	QP
3	312.54	16.70	14.44	3.42	34.56	46.00	-11.44	QP
4	440.18	10.50	17.07	4.27	31.84	46.00	-14.16	QP
5	501.24	8.50	18.15	4.83	31.48	46.00	-14.52	QP
6	612.35	11.90	19.46	5.34	36.70	46.00	-9.30	QP
7	801.47	7.30	21.97	5.98	35.25	46.00	-10.75	QP

**Remark:**

1. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).
2. Radiated emissions measured were made with an instrument using peak/quasi-peak detector mode.
3. Quasi-peak test would be performed if the peak result were greater than the quasi-peak limit or as required by the applicant.
4. Measurements above show only up to 6 maximum emissions noted, or would be lesser, with "N/A" remark, 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.
5. Margin (dB) = Remark result (dBuV/m) – Quasi-peak limit (dBuV/m).

**7.5.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHz**

<b>Product Name</b>	8 Scene Wall Switch	<b>Test Date</b>	2010/03/23
<b>Model</b>	LCHC-21	<b>Test By</b>	Eric Yang
<b>Test Mode</b>	TX (CH Low)	<b>Temp&amp; Humidity</b>	27.5°C, 47%

**Horizontal**

TX mode / CH Low					Measurement Distance at 3m Horizontal polarity					
Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark	
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)	
3206.58	50.41	30.14	2.99	41.18	1.27	43.63	74.00	-30.37	P	
3206.58	42.10	30.14	2.99	41.18	1.27	35.32	54.00	-18.68	A	
* 4809.40	54.93	33.13	3.73	42.37	0.69	50.10	74.00	-23.90	P	
* 4809.40	46.44	33.13	3.73	42.37	0.69	41.61	54.00	-12.39	A	
7213.57	57.08	38.54	4.66	41.88	1.39	59.79	74.00	-14.21	P	
7213.57	48.04	38.54	4.66	41.88	1.39	50.75	54.00	-3.25	A	
N/A	-----	-----	-----	-----	-----	-----	-----	-----	P	
N/A	-----	-----	-----	-----	-----	-----	-----	-----	A	

**Remark:**

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:  
Level = Reading + AF + Cable – Preamp + Filter, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.



<b>Product Name</b>	8 Scene Wall Switch	<b>Test Date</b>	2010/03/23
<b>Model</b>	LCHC-21	<b>Test By</b>	Eric Yang
<b>Test Mode</b>	TX (CH Low)	<b>Temp&amp; Humidity</b>	27.5°C, 47%

## Vertical

TX mode / CH Low				Measurement Distance at 3m Vertical polarity					
Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
3206.57	52.01	30.14	2.99	41.18	1.27	45.23	74.00	-28.77	P
3206.57	46.78	30.14	2.99	41.18	1.27	40.00	54.00	-14.00	A
* 4809.49	54.69	33.13	3.73	42.37	0.69	49.86	74.00	-24.14	P
* 4809.49	45.13	33.13	3.73	42.37	0.69	40.30	54.00	-13.70	A
7213.41	51.96	38.54	4.66	41.88	1.39	54.67	74.00	-19.33	P
7213.41	42.10	38.54	4.66	41.88	1.39	44.81	54.00	-9.19	A
N/A	-----	-----	-----	-----	-----	-----	-----	-----	P
N/A	-----	-----	-----	-----	-----	-----	-----	-----	A

**Remark:**

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:  
Level = Reading + AF + Cable – Preamp + Filter, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.





<b>Product Name</b>	8 Scene Wall Switch	<b>Test Date</b>	2010/03/23
<b>Model</b>	LCHC-21	<b>Test By</b>	Eric Yang
<b>Test Mode</b>	TX (CH Mid)	<b>Temp&amp; Humidity</b>	27.5°C, 47%

## Horizontal

TX mode / CH Mid					Measurement Distance at 3m Horizontal polarity					
Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark	
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)	
3253.24	50.62	30.15	3.03	41.20	1.21	43.81	74.00	-30.19	P	
3253.24	43.52	30.15	3.03	41.20	1.21	36.71	54.00	-17.29	A	
* 4880.08	53.36	33.34	3.75	42.44	0.71	48.72	74.00	-25.28	P	
* 4880.08	43.78	33.34	3.75	42.44	0.71	39.14	54.00	-14.86	A	
* 7320.46	51.42	38.86	4.71	41.71	1.62	54.90	74.00	-19.10	P	
* 7320.46	43.22	38.86	4.71	41.71	1.62	46.70	54.00	-7.30	A	
N/A	-----	-----	-----	-----	-----	-----	-----	-----	P	
N/A	-----	-----	-----	-----	-----	-----	-----	-----	A	

**Remark:**

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:  
Level = Reading + AF + Cable – Preamp + Filter, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.



<b>Product Name</b>	8 Scene Wall Switch	<b>Test Date</b>	2010/03/23
<b>Model</b>	LCHC-21	<b>Test By</b>	Eric Yang
<b>Test Mode</b>	TX (CH Mid)	<b>Temp&amp; Humidity</b>	27.5°C, 47%

## Vertical

TX mode / CH Mid				Measurement Distance at 3m Vertical polarity					
Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
3253.19	51.42	30.15	3.03	41.20	1.21	44.61	74.00	-29.39	P
3253.19	43.98	30.15	3.03	41.20	1.21	37.17	54.00	-16.83	A
* 4880.11	53.62	33.34	3.75	42.44	0.71	48.98	74.00	-25.02	P
* 4880.11	42.87	33.34	3.75	42.44	0.71	38.23	54.00	-15.77	A
* 7320.29	51.16	38.86	4.71	41.71	1.62	54.64	74.00	-19.36	P
* 7320.29	42.11	38.86	4.71	41.71	1.62	45.59	54.00	-8.41	A
N/A	-----	-----	-----	-----	-----	-----	-----	-----	P
N/A	-----	-----	-----	-----	-----	-----	-----	-----	A

**Remark:**

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:  
Level = Reading + AF + Cable – Preamp + Filter, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.



<b>Product Name</b>	8 Scene Wall Switch	<b>Test Date</b>	2010/03/23
<b>Model</b>	LCHC-21	<b>Test By</b>	Eric Yang
<b>Test Mode</b>	TX (CH High)	<b>Temp&amp; Humidity</b>	27.5°C, 47%

## Horizontal

TX mode / CH High					Measurement Distance at 3m Horizontal polarity					
Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark	
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)	
3306.51	52.14	30.16	3.07	41.22	1.14	45.29	74.00	-28.71	P	
3306.51	46.87	30.16	3.07	41.22	1.14	40.02	54.00	-13.98	A	
* 4959.08	53.44	33.58	3.77	42.52	0.74	49.01	74.00	-24.99	P	
* 4959.08	46.59	33.58	3.77	42.52	0.74	42.16	54.00	-11.84	A	
* 7438.96	54.55	39.22	4.77	41.53	1.87	58.88	74.00	-15.12	P	
* 7438.96	43.16	39.22	4.77	41.53	1.87	47.49	54.00	-6.51	A	
N/A	-----	-----	-----	-----	-----	-----	-----	-----	P	
N/A	-----	-----	-----	-----	-----	-----	-----	-----	A	

**Remark:**

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:  
Level = Reading + AF + Cable – Preamp + Filter, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.



<b>Product Name</b>	8 Scene Wall Switch	<b>Test Date</b>	2010/03/23
<b>Model</b>	LCHC-21	<b>Test By</b>	Eric Yang
<b>Test Mode</b>	TX (CH High)	<b>Temp&amp; Humidity</b>	27.5°C, 47%

## Vertical

TX mode / CH High				Measurement Distance at 3m Vertical polarity					
Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
3306.49	53.30	30.16	3.07	41.22	1.14	46.45	74.00	-27.55	P
3306.49	48.71	30.16	3.07	41.22	1.14	41.86	54.00	-12.14	A
* 4959.01	55.62	33.58	3.77	42.52	0.74	51.19	74.00	-22.81	P
* 4959.01	47.80	33.58	3.77	42.52	0.74	43.37	54.00	-10.63	A
* 7438.97	53.24	39.22	4.77	41.53	1.87	57.57	74.00	-16.43	P
* 7438.97	42.88	39.22	4.77	41.53	1.87	47.21	54.00	-6.79	A
N/A	-----	-----	-----	-----	-----	-----	-----	-----	P
N/A	-----	-----	-----	-----	-----	-----	-----	-----	A

**Remark:**

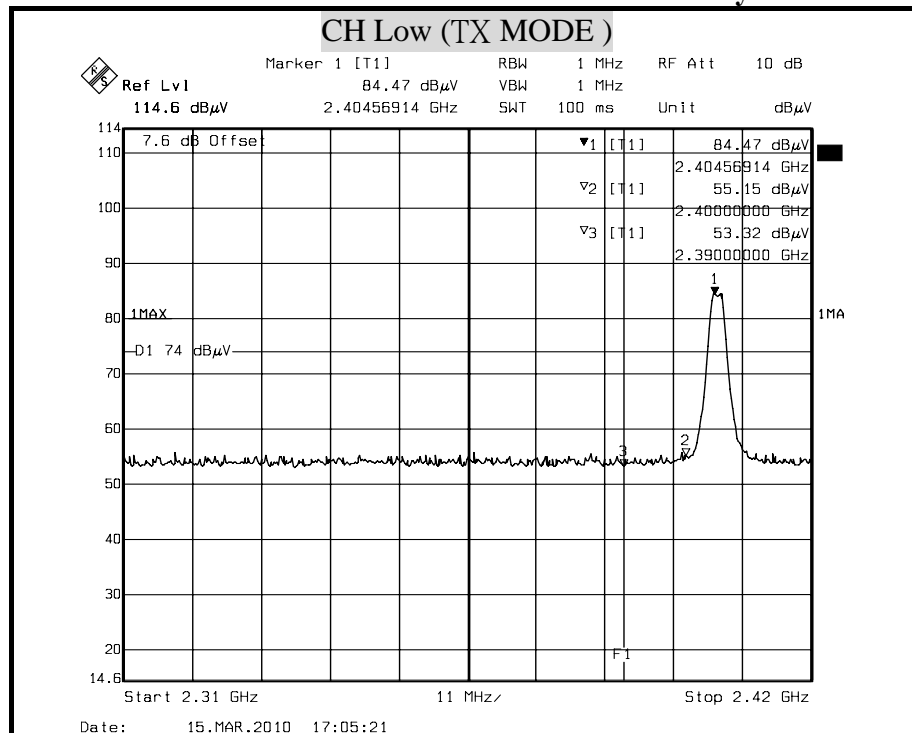
1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:  
Level = Reading + AF + Cable – Preamp + Filter, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.



## 7.5.4 RESTRICTED BAND EDGES

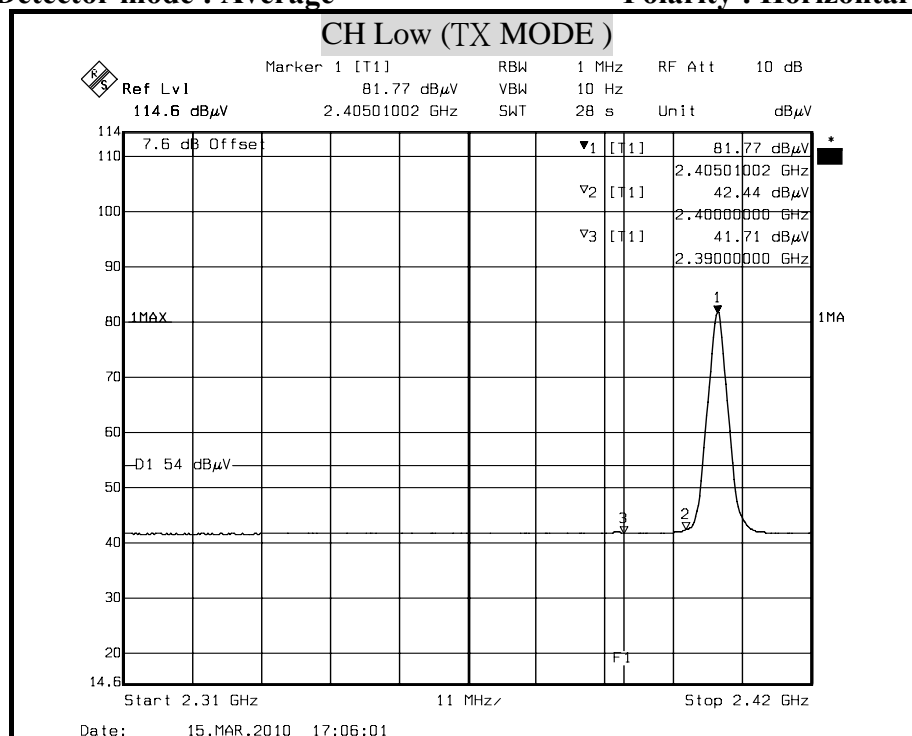
Detector mode : Peak

Polarity : Horizontal



Detector mode : Average

Polarity : Horizontal



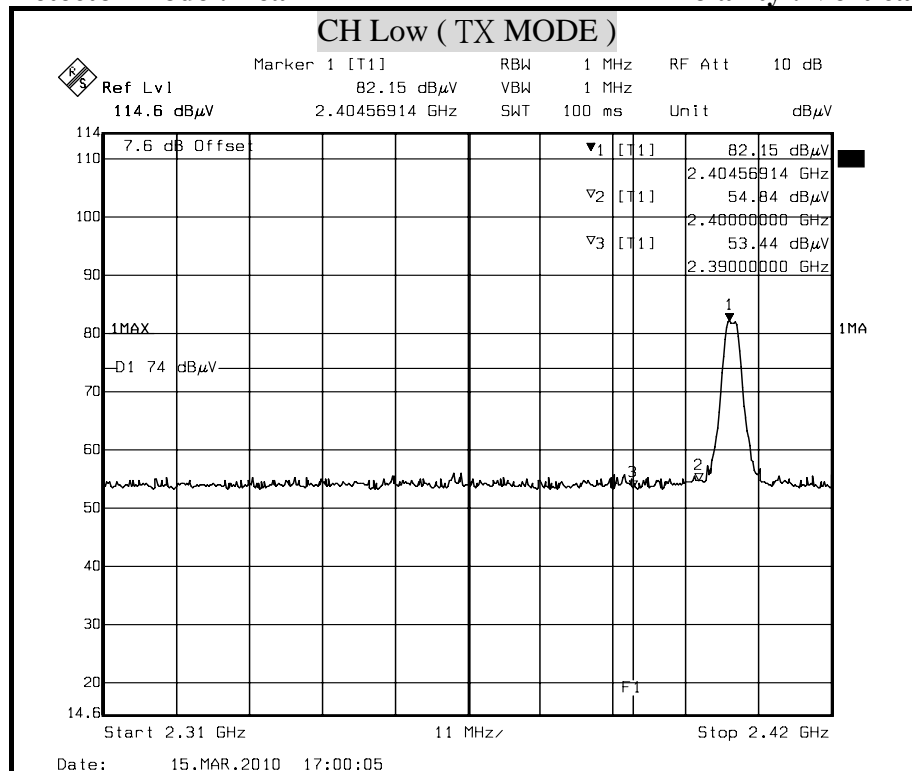
### Remark:

1. Display Line = 54/74 dB  $\mu$  V/m.
2. 2390MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.4(dB)
3. 2483.5MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.41(dB)



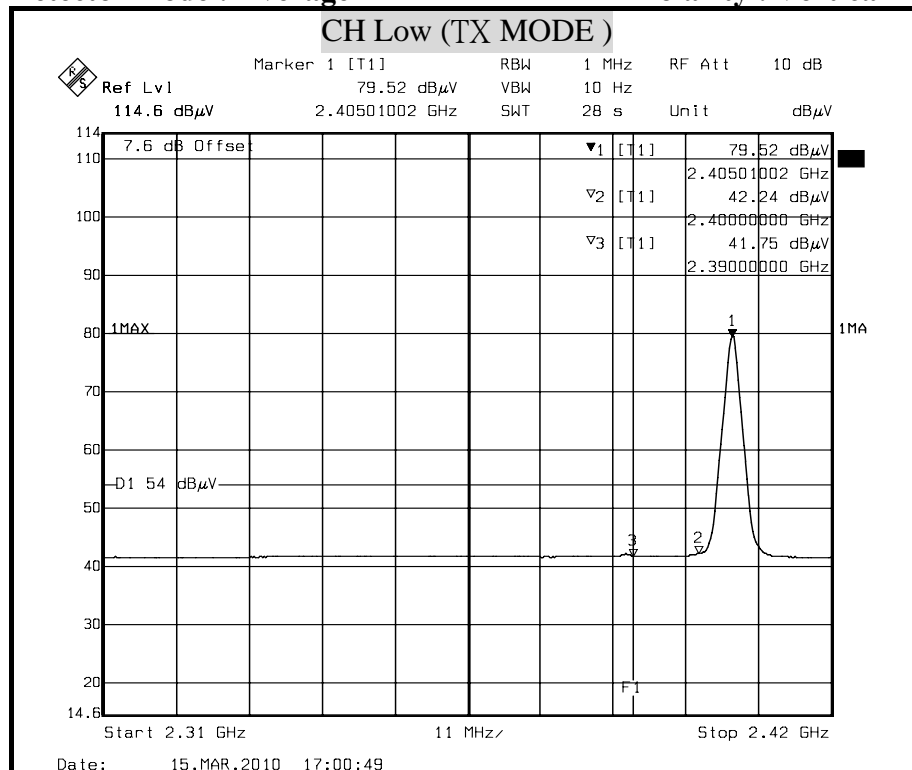
Detector mode : Peak

Polarity : Vertical



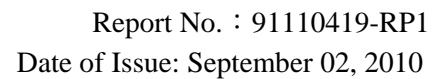
Detector mode : Average

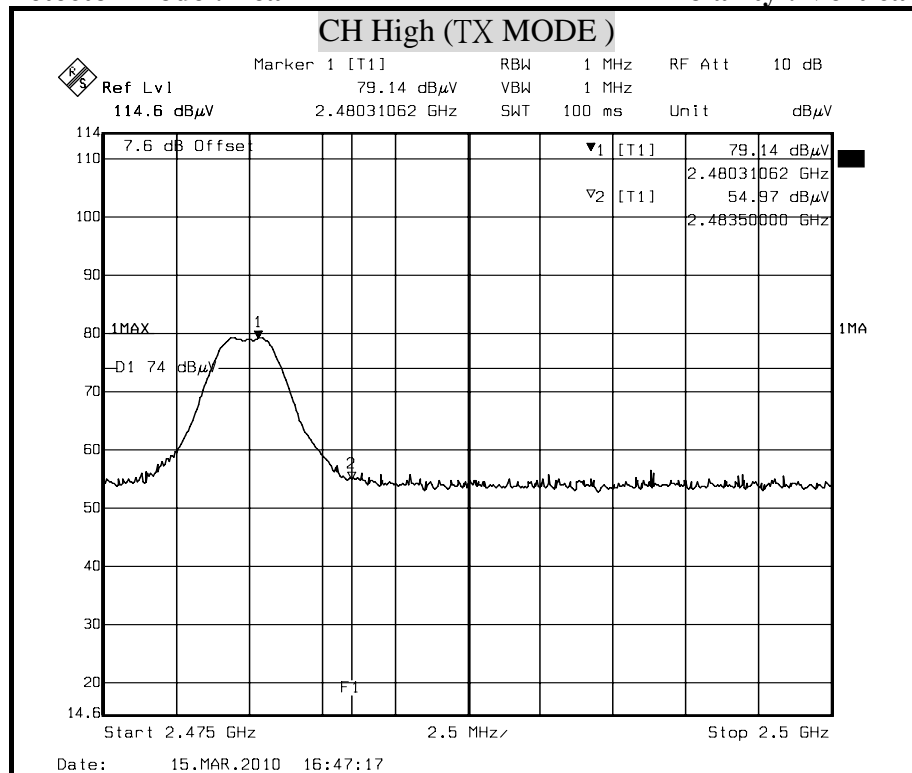
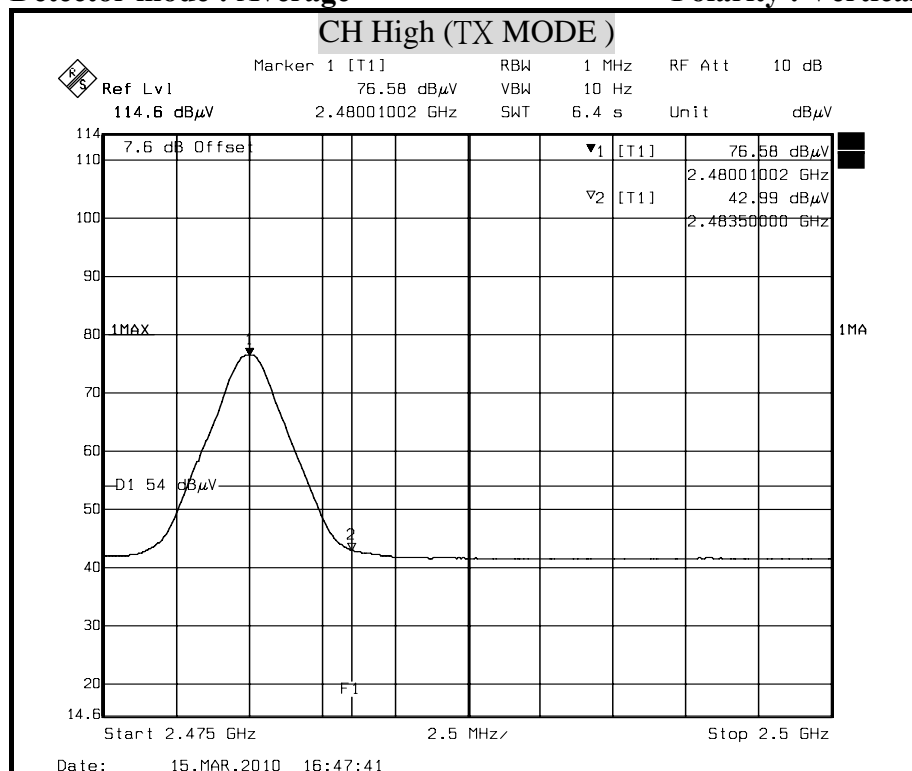
Polarity : Vertical



Remark:

1. Display Line = 54/74 dB μ V/m.
2. 2390MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.4(dB)
3. 2483.5MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.41(dB)



**Detector mode : Peak****Polarity : Vertical****Detector mode : Average****Polarity : Vertical****Remark:**

1. Display Line = 54/74 dB  $\mu$  V/m.
2. 2390MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.4(dB)
3. 2483.5MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.41(dB)





## 7.6 POWERLINE CONDUCTED EMISSIONS

### LIMITS

§ 15.207 (a) Except as shown in paragraph (b) and (c) this section, for an intentional radiator that 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 the limits in the following table, as measured using a 50  $\mu$ H/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

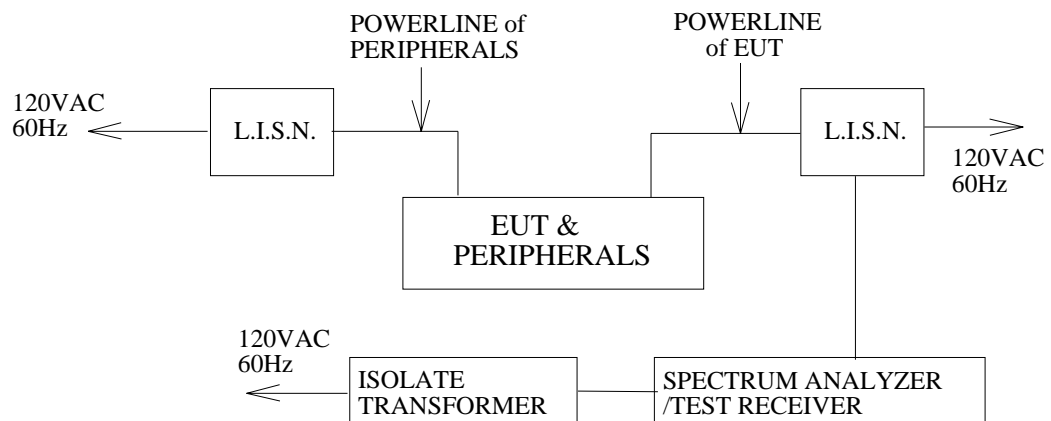
The lower limit applies at the boundary between the frequency ranges.

Frequency of Emission (MHz)	Conducted limit (dB $\mu$ v)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50

### TEST EQUIPMENTS

The following test equipments are used during the conducted powerline tests:

Conducted Emission room #1				
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, 2010
Test S/W	e-3 (5.04211c) R&S (2.27)			

**TEST SETUP****TEST PROCEDURE**

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80cm above the horizontal ground plane. The EUT IS CONFIGURED IN ACCORDANCE WITH ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both quasi-peak detection and average detection measurements.

Line conducted data is recorded for both NEUTRAL and LINE.

**TEST RESULTS**

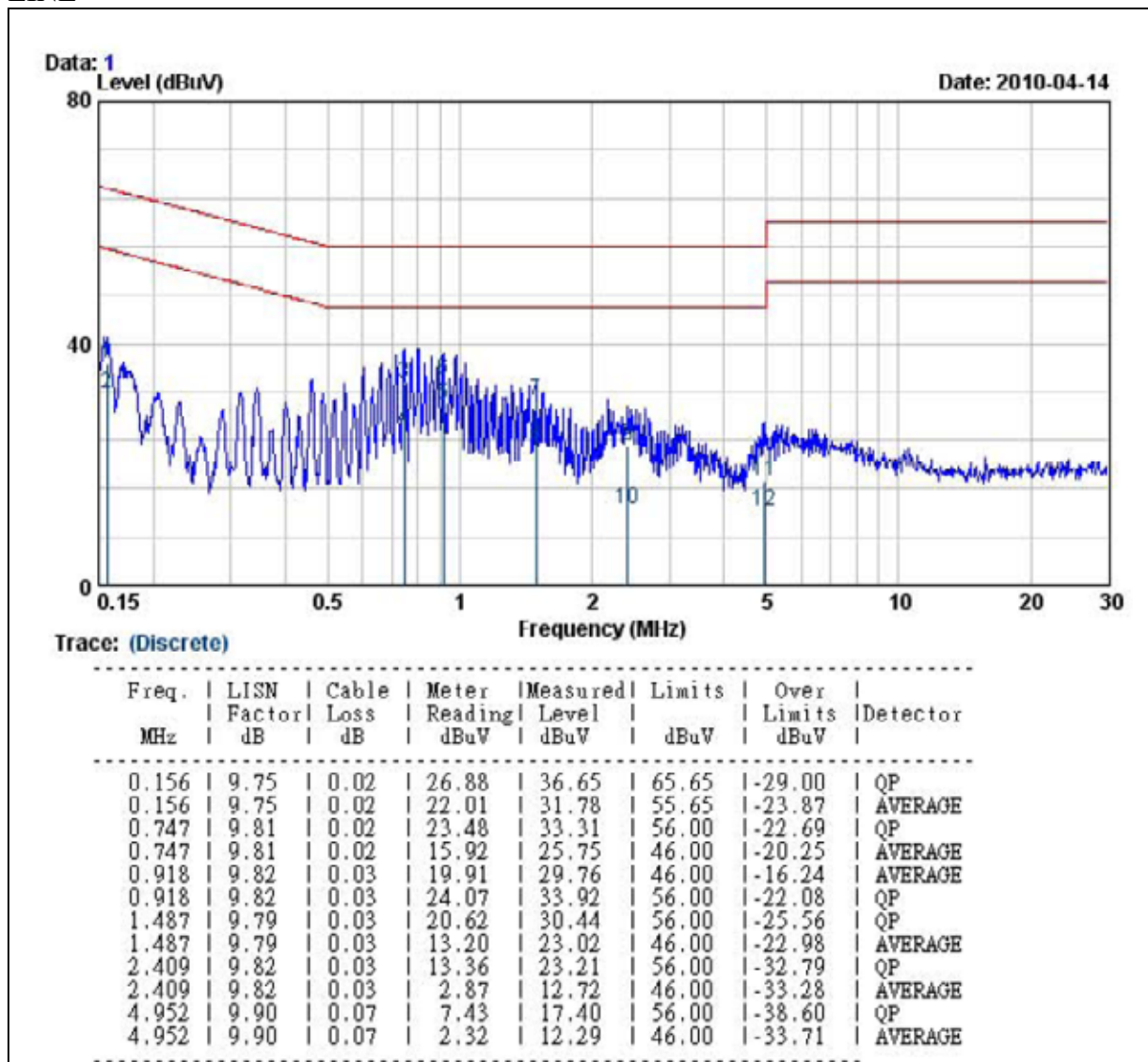
No non-compliance noted



## CONDUCTED RF VOLTAGE MEASUREMENT

Product Name	8 Scene Wall Switch	Test Date	2010/04/14
Model	LCHC-21	Test By	Hong Tsai
Test Mode	Normal operating (worst case)	Temp& Humidity	25.1 °C, 53%

LINE



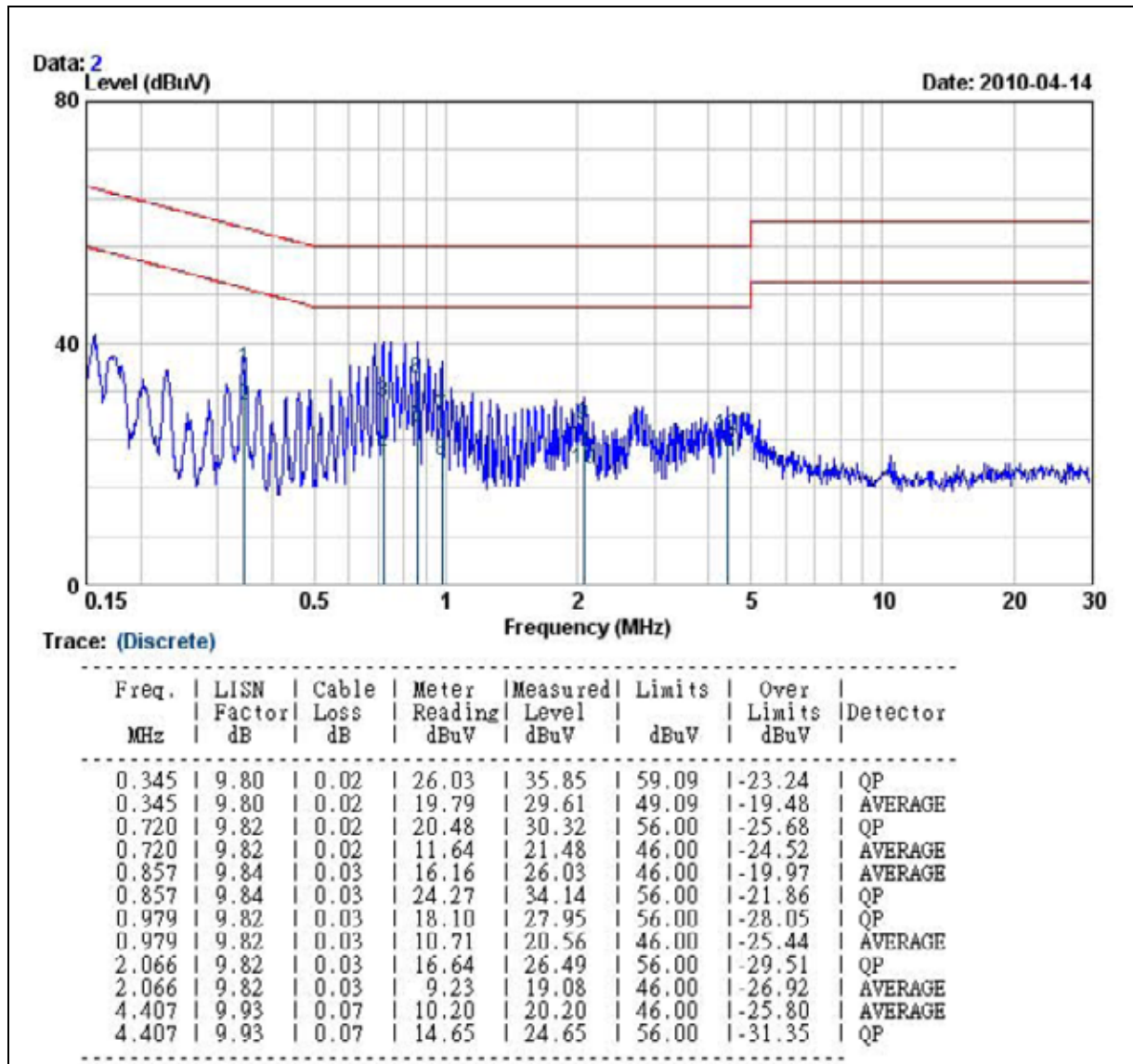
### Remark:

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value



Product Name	8 Scene Wall Switch	Test Date	2010/04/14
Model	LCHC-21	Test By	Hong Tsai
Test Mode	Normal operating (worst case)	Temp& Humidity	25.1°C, 53%

NEUTRAL

**Remark:**

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value



## **8. ANTENNA REQUIREMENT**

### **8.1 STANDARD APPLICABLE**

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 0dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 0dBi.

### **8.2 ANTENNA CONNECTED CONSTRUCTION**

The antenna used for this product is one chip antenna. The peak Gain of these antennas is 0 dBi at 2.4GHz.