



## Test Report

### FCC Part 15, Subpart C, Section 15.247 Industry Canada RSS-210, Issue 8

Report Number: CWD7083-Cert

Model: CWD7083

FCC ID: EROCWD7083  
IC: 5683C-CWD7083

Date: May 11, 2012

Prepared by: Grace Lin  
Grace Lin, Sr. Compliance Engineer

Date: May 11, 2012

Reviewed by: Wayne Owens  
Wayne Owens, Director of Program Management

Date: May 11, 2012



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## **1. General Description**

### **1.1 Product Description**

The equipment under test (EUT) is a Crestron 2.4GHz two-way RF transceiver module, model: CWD7083, serial numbers: CNA7279258 (conducted measurement) and CNA7279265 (radiated measurement).

### **1.2 Test Methodology**

Measurements were performed according to the following procedures and standards:

- 1) ANSI C63.4: 2009
- 2) FCC Procedure, "Guidance for Performing Compliance Measurements on Digital Transmission Systems Operating (DTS) under Section 15.247", January 18, 2012
- 3) Industry Canada RSS-Gen Issue 3
- 4) Industry Canada RSS-210 Issue 8
- 5) Industry Canada ICES-003 Issue 4

All measurements were performed in a 3-meter semi-anechoic chamber and the control room.

### **1.3 Test Facility**

The 3-meter semi-anechoic chamber used to collect conducted and radiated emission data is located at 22 Link Drive, Rockleigh, New Jersey. This test facility has been placed on file with the FCC, Registration Number: 412871, and Industry Canada, Site Number: 5683C-1.



## 1.4 Test Equipment

Description	Model	Serial No.	Frequency Range	Calibration Date
R&S EMI Receiver	ESU40	100076	20 Hz – 40 GHz	Dec. 21, 2011
Teseq Bilog Antenna	CBL 6112D	25231	30 MHz – 2 GHz	Dec. 9, 2011
ETS-Lindgren Double Ridge Horn Antenna	3117	00047560	1 GHz – 18 GHz	Feb. 23, 2012
R&S Preamplifier	TS-PR18	100044	30 MHz – 18 GHz	Nov. 29, 2011
Solar Electronics LISN	9252-50-R-24-N	068545	10 kHz – 50 MHz	Mar. 5, 2012

## 1.5 Evaluation Summary

Rule Section		Description/Parameters	Results
FCC	IC		
§15.203	N/A	Antenna Requirement	Complies
§15.247(a)(2)	§A8.2(a) of RSS-210	6 dB Bandwidth, 500 kHz	Complies
N/A	§4.6.1 of RSS-Gen	99% Occupied Bandwidth	(for reporting purpose)
§15.247(b)(3)	§A8.4(4) of RSS-210	Power Output, conducted, 1 Watt (30dBm)	Complies
§15.247(d)	§2.1, §A8.5 of RSS-210	Band Edge	Complies
§15.247(d)	§A8.5 of RSS-210	Conducted Spurious Emissions, 20 dBc	Complies
§15.247(e)	§A8.2(b) of RSS-210	Power Spectral Density (PSD), 8 dBm in any 3 kHz band.	Complies
§15.205, §15.209, §15.247(d)	§2.2, §2.7, §A8.5 of RSS-210	Unwanted Emissions in the Restricted Bands	Complies
§15.101(b)	§6 of RSS-Gen	Receiver Radiated Emission	Complies
§15.107	§7.2.2 of RSS-Gen	Receiver AC Power Line Conducted Emissions	Complies

**Note:**

The channels selected for test were 11, 18, and 26.

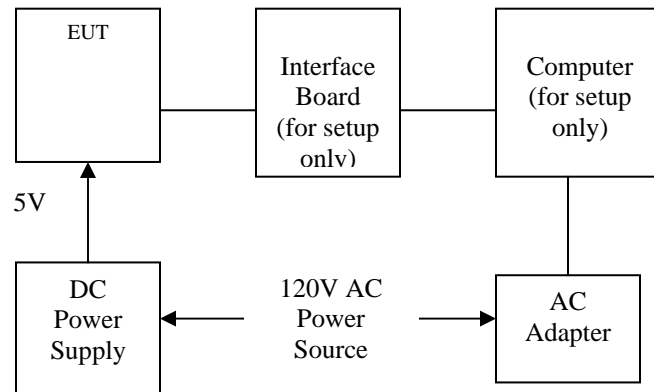
## 2. System Test Configuration

### 2.1 Justification

The EUT was connected to a test board. A DC power supply supplied power to the EUT. A computer supplied test commands through an interface board.

### 2.2 Block Diagram

Block diagram is shown below.



### 2.3 EUT Exercise Software and Mode(s) of Operation

The EUT was configured to transmit continuously. Channels 11 (2405 MHz), 18 (2440 MHz), and 26 (2480 MHz) were selected for test.

### 2.4 Cables

Qty	Description	Length (m)	From - To	Shielded/ Unshielded
1	AWG#18	0.7	EUT – DC Power Supply	Unshielded
1	AWG#18	0.7	EUT – Interface Board	Unshielded
1	DB9 Serial	0.1	Computer – Interface Board	Unshielded



## 2.5 *Special Accessories*

There are no special accessories for compliance of this EUT.

## 2.6 *Support equipment*

No	Description	Manufacturer	Model No	Serial No
1	Laptop Computer	DELL	PP02X	HS5GY61 (Service Tag)
2	AC Adapter	DELL	LA90PS0-00	CN-0DF266-71615-681-134F
3	DC Power Supply	BK Precision	1670	281-2152
4	Interface Board	Crestron	PA06321	MX7801140

## 2.7 *Equipment Modifications*

There were no modifications installed during compliance measurements.



### **3. Evaluation**

#### **3.1 *Antenna Requirements***

This module is validated with a ceramic chip antenna, soldered to the PCB. The antenna gain is 0.5 dBi.

The antennas' connectors are unique in the sense of complying with FCC §15.203, §15.204(b), and §15.204(c).

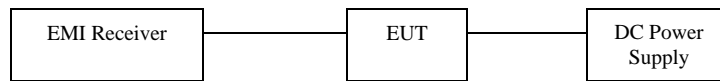


### 3.2 6 dB Bandwidth

**Performance Criterion:** The minimum 6 dB bandwidth shall be at least 500 kHz.

**Test Results:** Complies

**Test Details:** Refers to the following block diagram, data table, and receiver screen captures. The EUT was tested in a continuous transmit mode at the maximum power level.



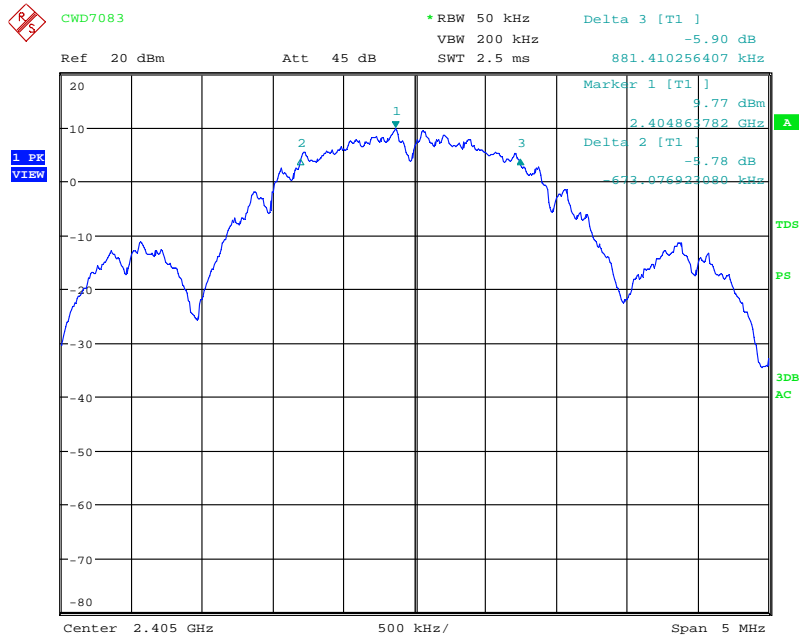
Channel	Frequency (MHz)	6 dB Bandwidth (kHz)
11	2405	1554.5
18	2440	1530.4
26	2480	1530.4

**Note:** The RF level in the plots is relative and is not the indication of RF output power.



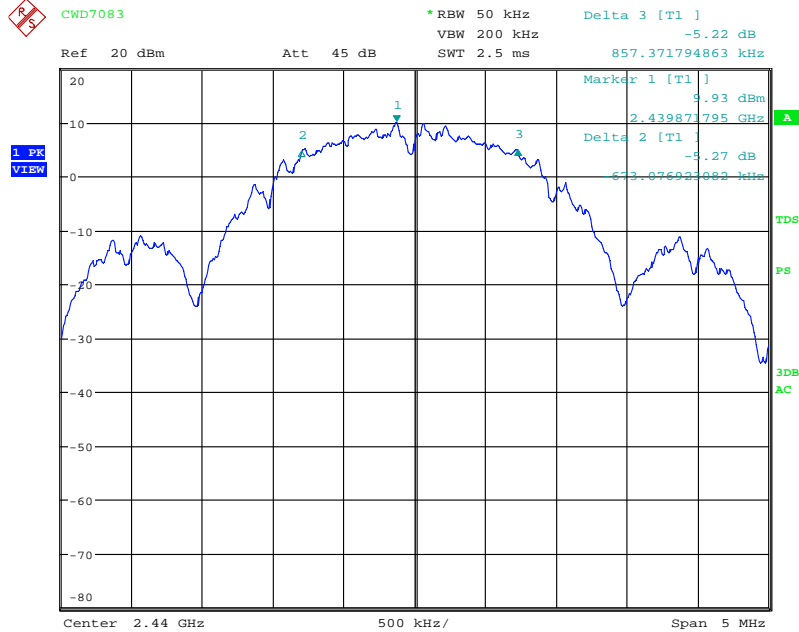


**6 dB Bandwidth, Channel 11:**



Date: 19.APR.2012 22:58:57

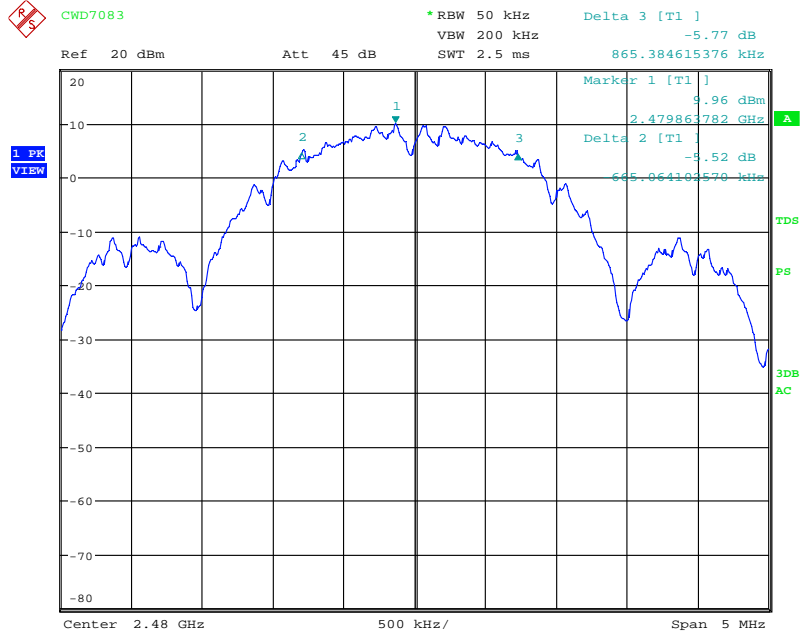
**6 dB Bandwidth, Channel 18:**



Date: 19.APR.2012 23:04:05



### 6 dB Bandwidth, Channel 26:



Date: 19.APR.2012 23:08:13



### 3.3 99% Bandwidth

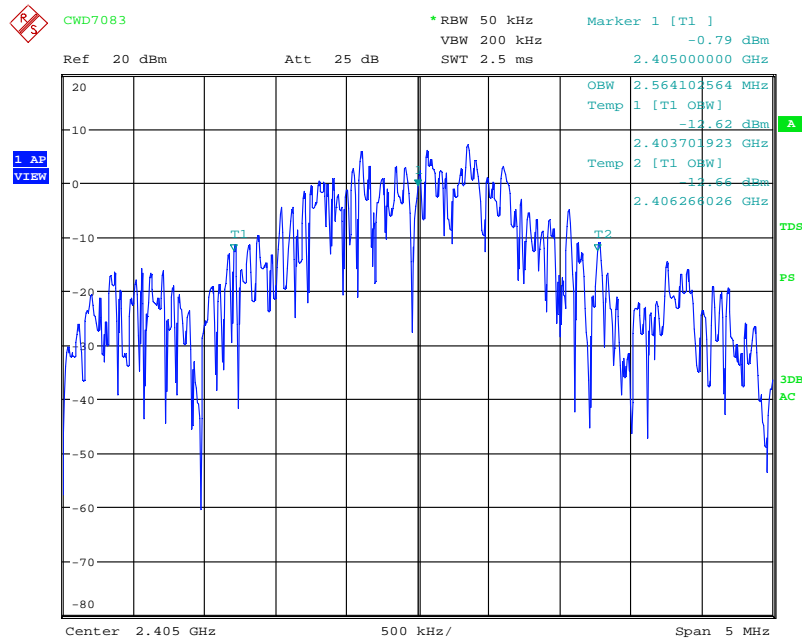
**Test Details:** Refers to the following block diagram, data table, and receiver screen captures. The EUT was tested in a continuous transmit mode at the maximum power level.



Channel	Frequency (MHz)	99% Bandwidth (MHz)
11	2405	2.564
18	2440	2.548
26	2480	2.564

**Note:** The RF level in the plots is relative and is not the indication of RF output power.

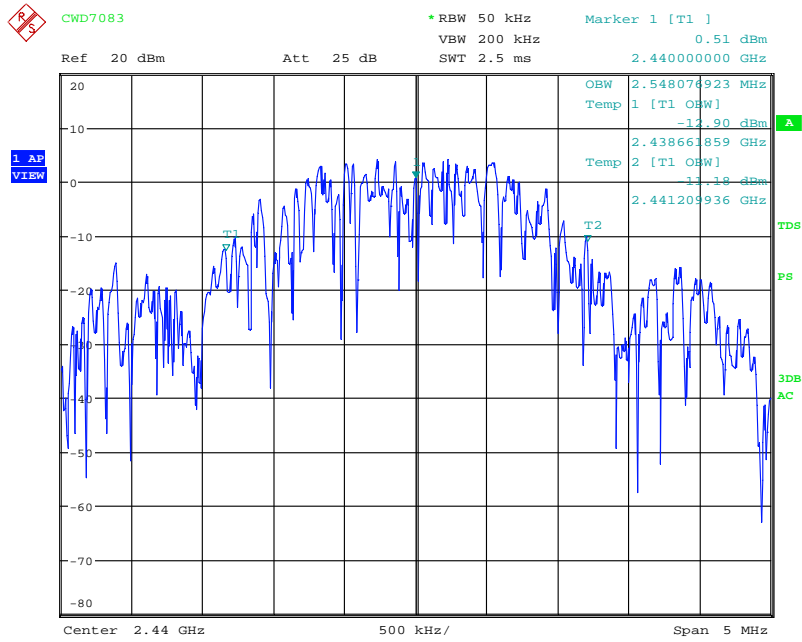
#### 99% Bandwidth Channel 11:



Date: 19.APR.2012 23:40:55

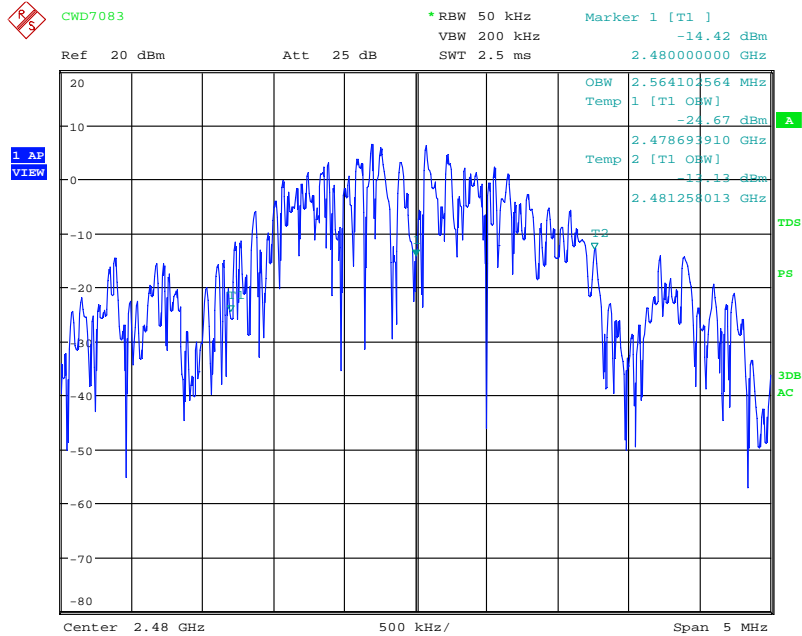


### 99% Bandwidth Channel 18:



Date: 19.APR.2012 23:38:27

### 99% Bandwidth Channel 26:



Date: 19.APR.2012 23:34:28



### 3.4 Power Output

**Performance Criterion:** The maximum peak conducted output power shall not exceed 1 Watt.

**Test Results:** Complies

**Test Details:** The EUT was tested in a continuous transmit mode with maximum power levels. Refers to the following block diagram, data table, and receiver screen captures.

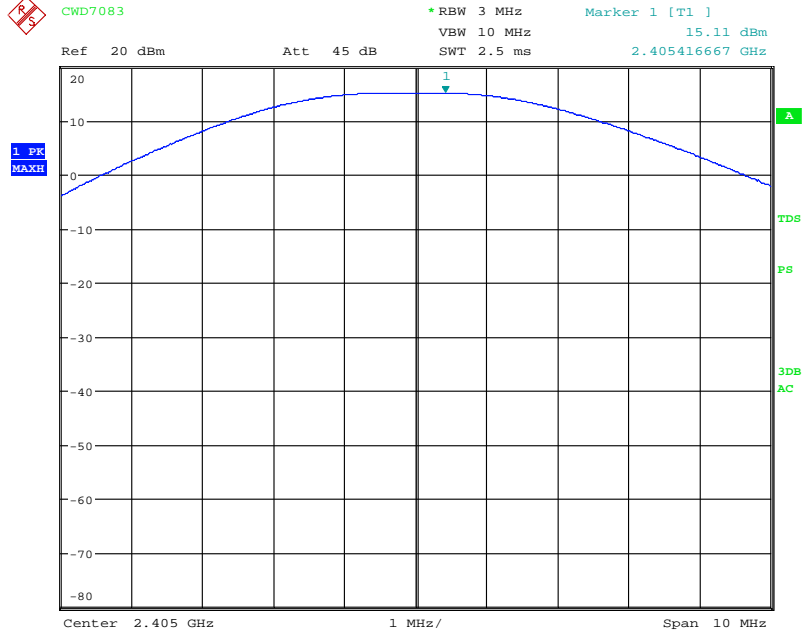


Channel	Frequency (MHz)	Power Level	Power	
			dBm	mW
11	2405	-1	15.11	32.43
18	2440	-1	15.28	33.73
26	2480	-17	2.56	1.803

**Note:** The insertion loss was compensated for in the receiver.

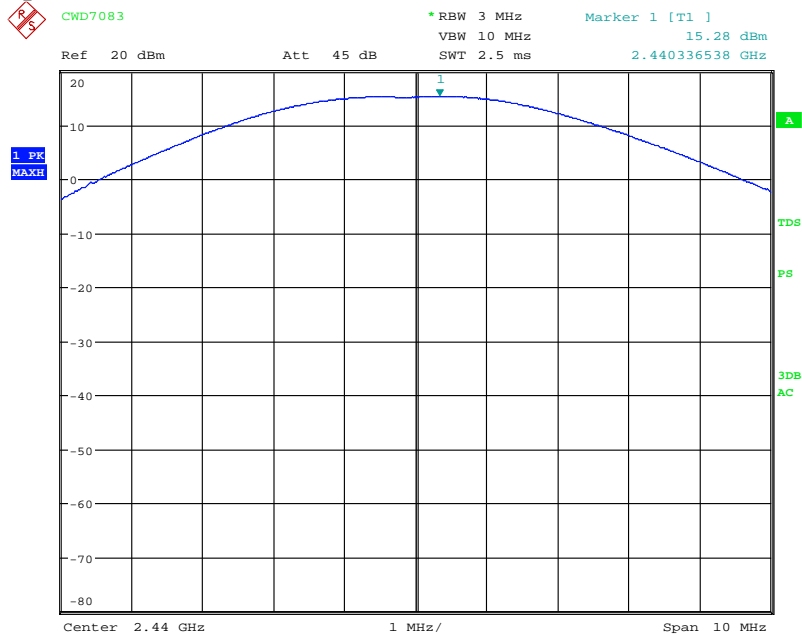


### Power Output, Channel 11:



Date: 7.MAY.2012 08:27:09

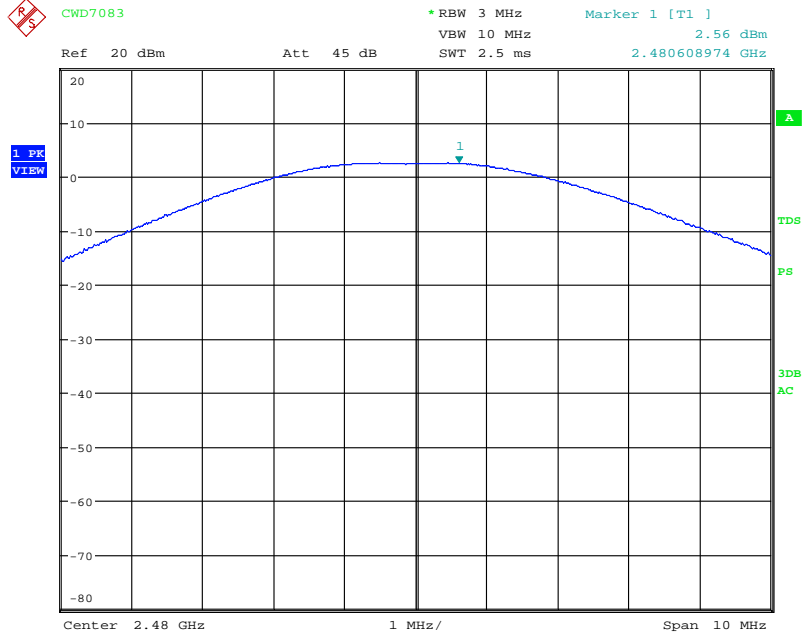
### Power Output, Channel 18:



Date: 7.MAY.2012 08:28:28



**Power Output, Channel 26:**



Date: 11.MAY.2012 08:46:49



### 3.5 *Band Edge*

**Performance Criterion:** In any 100 kHz bandwidth outside the frequency band, the RF power shall be at least 20 dB below that in the 100 kHz bandwidth within the band.

**Test Results:** Complies

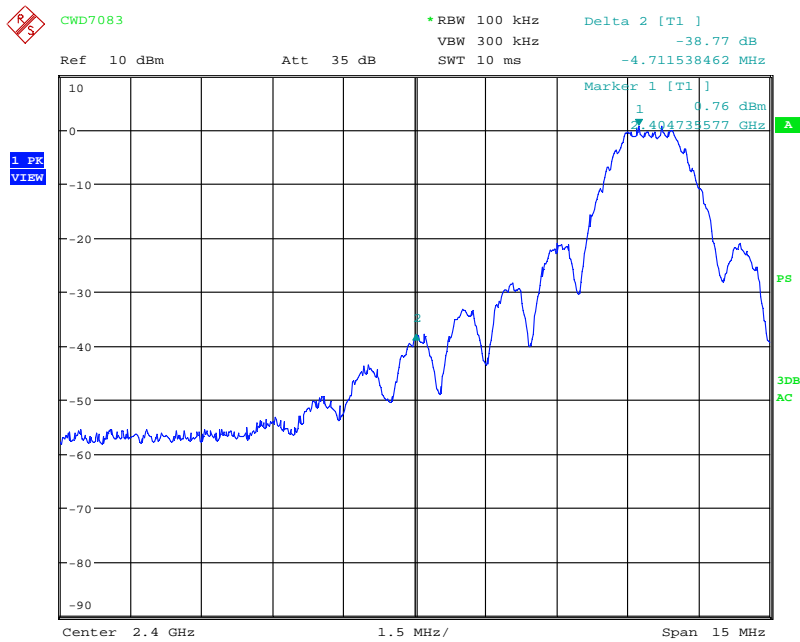
**Test Details:** Refers to the following block diagram and receiver screen captures







**Band Edge:**



Date: 20.APR.2012 02:17:51



Date: 16.JUN.2011 13:37:45



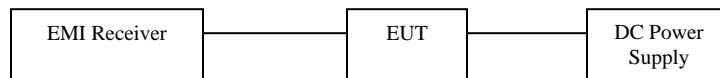
### 3.6 *Conducted Spurious Emissions*

**Performance Criterion:** In any 100 kHz bandwidth outside the frequency band, the radio frequency power shall be at least 20 dB below that in the 100 kHz bandwidth within the band.

**Test Results:** Complies

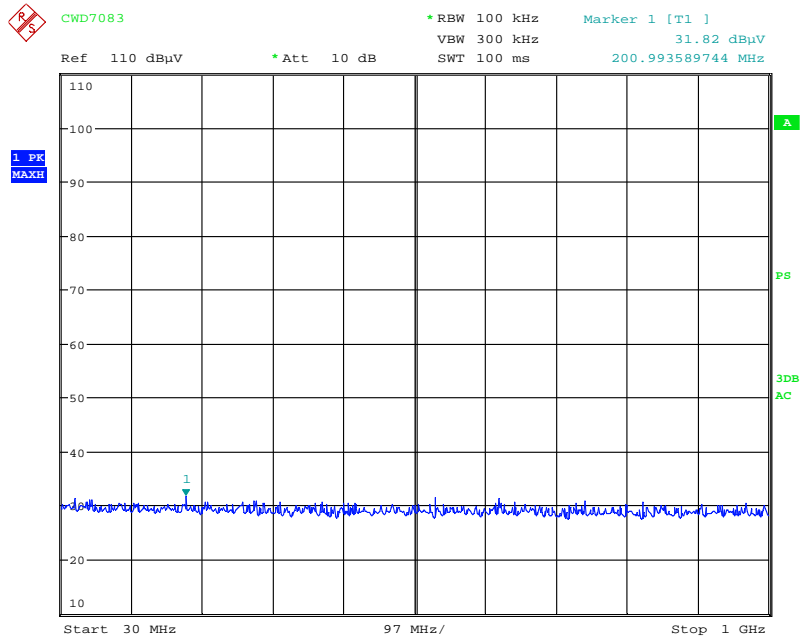
**Test Details:** Refers to the following block diagram and receiver screen captures

**Note:** The EUT was tested in a continuous transmit mode at the maximum power level of -1. The RF level in the screen captures is relative and is not the indication of RF output power.

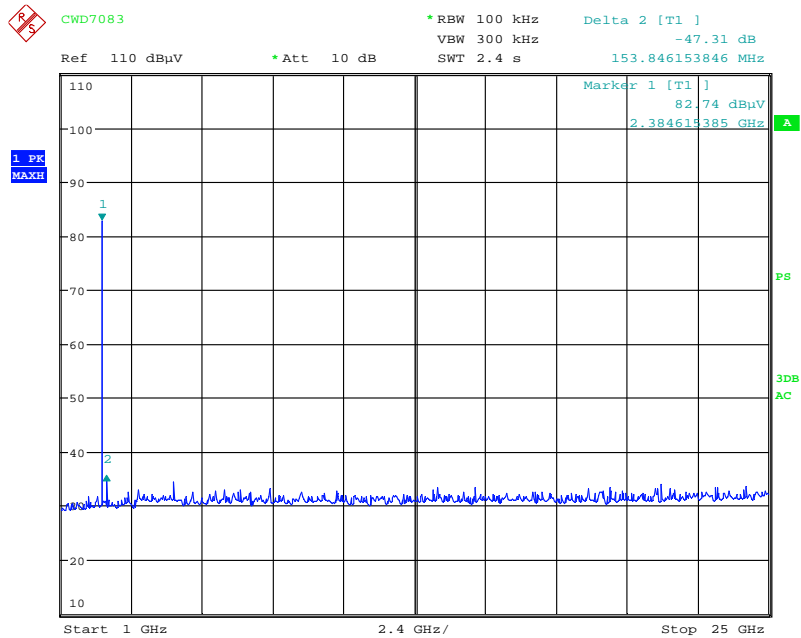




### Conducted Spurious Emission – Channel 11



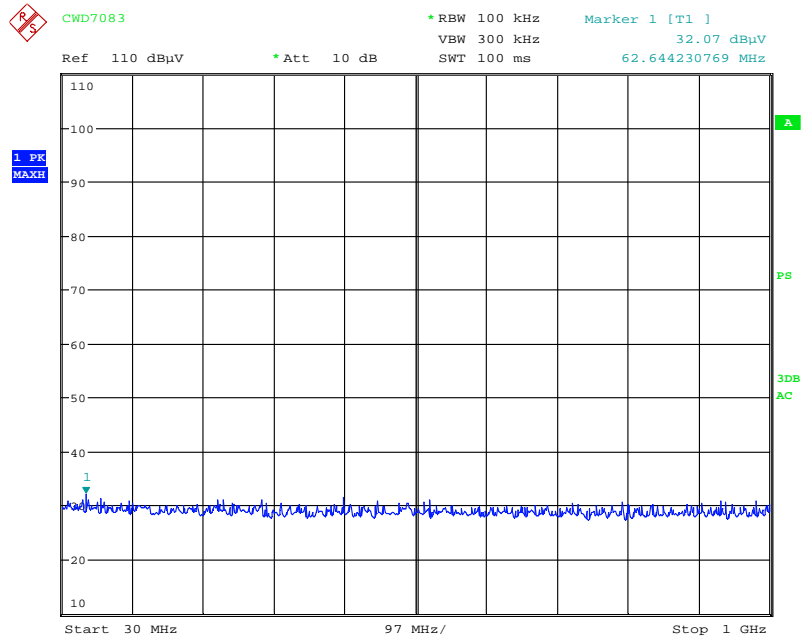
Date: 30.APR.2012 22:09:49



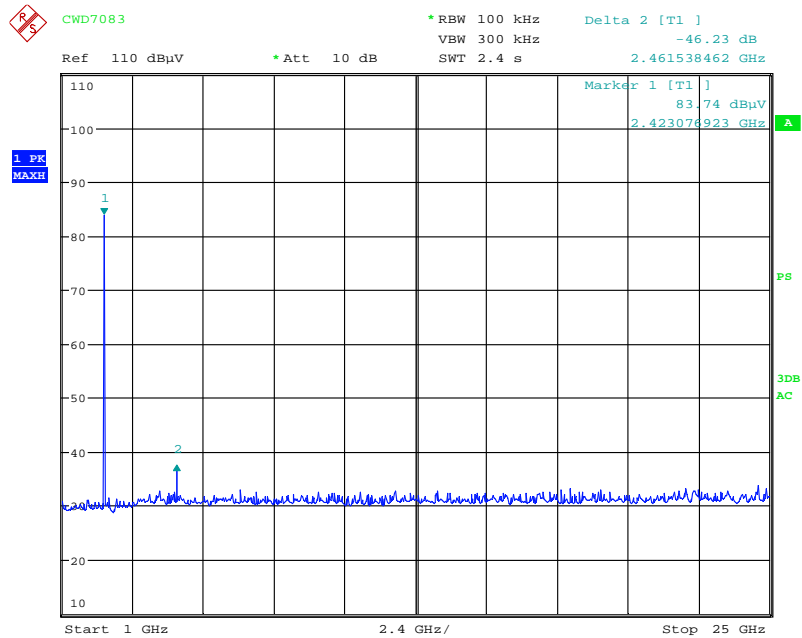
Date: 30.APR.2012 22:11:03



### Conducted Spurious Emission – Channel 18



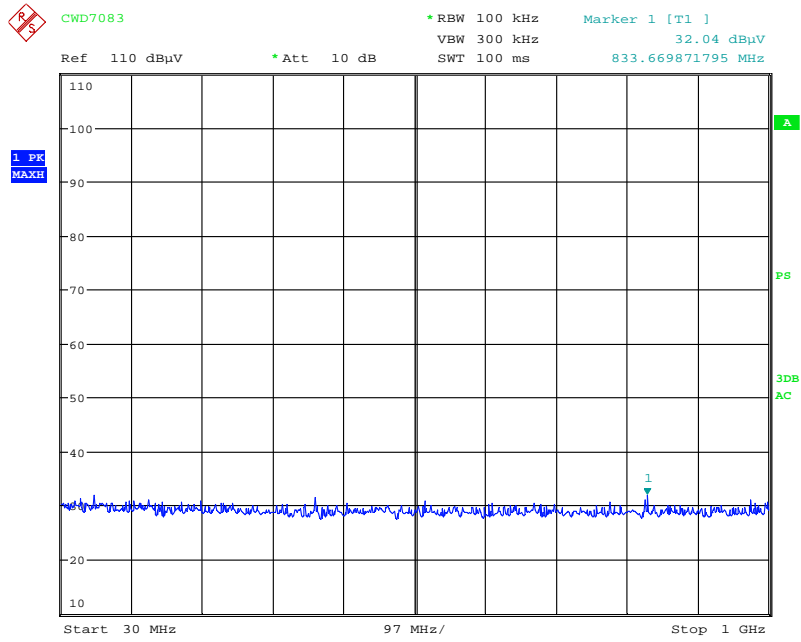
Date: 30.APR.2012 22:13:04



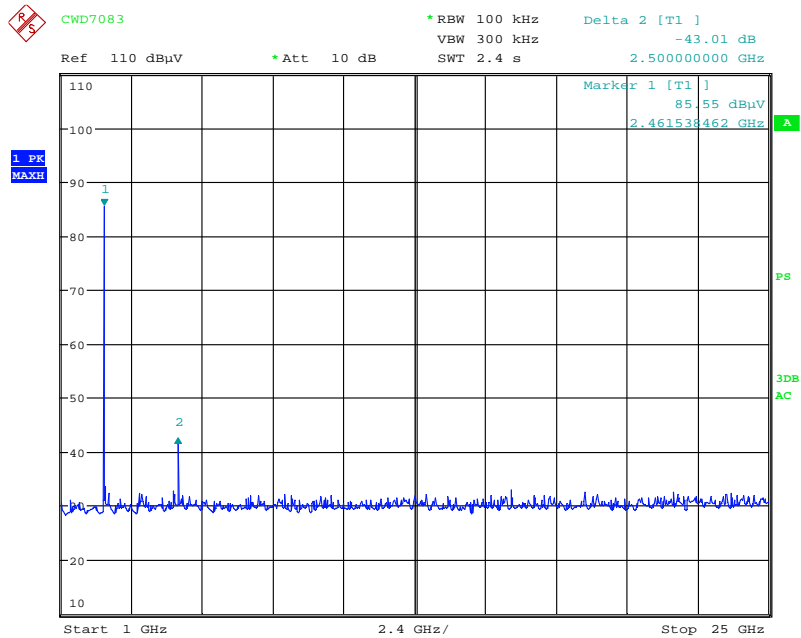
Date: 30.APR.2012 22:12:30



### Conducted Spurious Emission – Channel 26



Date: 30.APR.2012 22:14:06



Date: 30.APR.2012 22:15:07



### 3.7 Power Spectral Density

**Performance Criterion:** The power spectral density shall not be greater than 8 dBm in any 3 kHz band.

**Test Results:** Complies

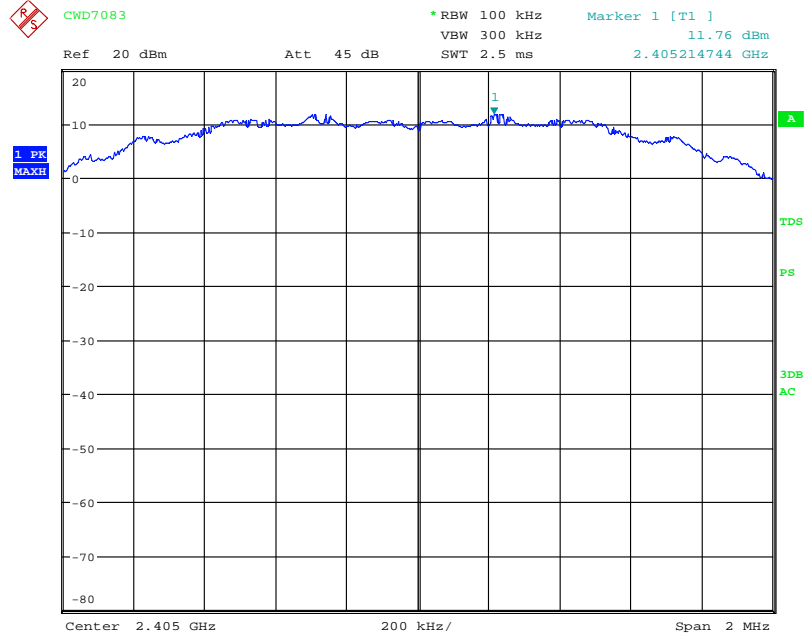
**Test Details:** The EUT was tested in a continuous transmit mode with maximum power levels. Refers to the following table and receiver screen captures. The insertion loss was compensated for in the receiver. Bandwidth correction factor applies.



Channel	Frequency (MHz)	Power Spectral Density (dBm)
11	2405	-3.44
18	2440	-3.19
26	2480	-16.33

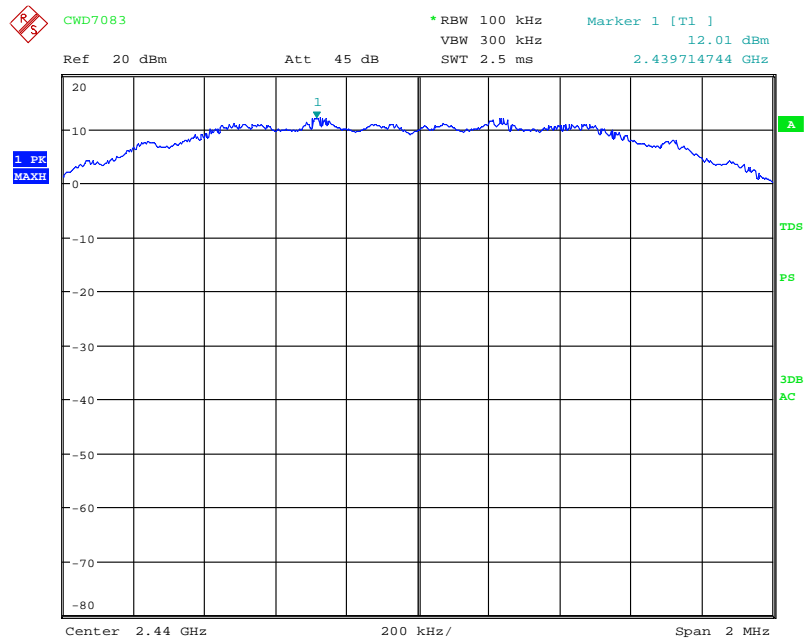


### Power Spectral Density, Channel 11:



Date: 7.MAY.2012 08:37:35

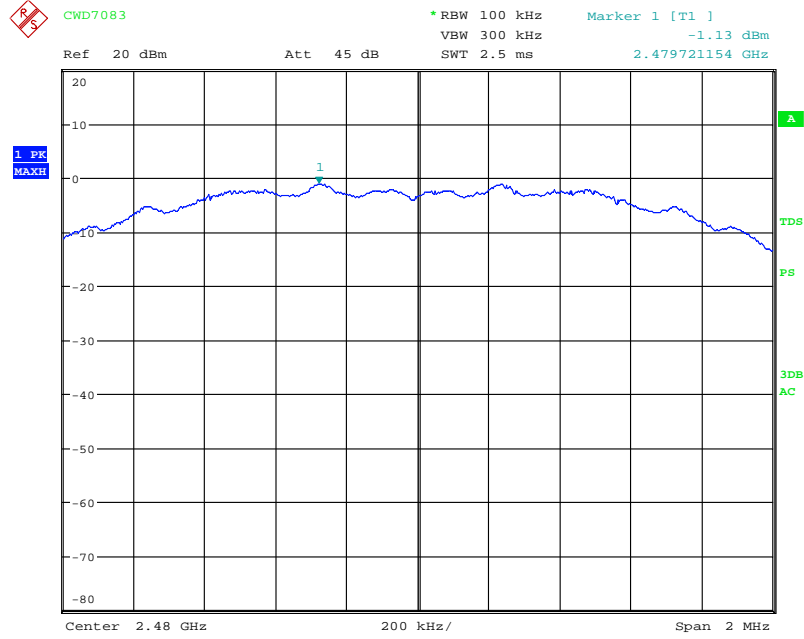
### Power Spectral Density, Channel 18:



Date: 7.MAY.2012 08:36:29



Power Spectral Density, Channel 26:



Date: 11.MAY.2012 08:51:58





### 3.8 *Unwanted Emissions in the Restricted Bands*

**Performance Criterion:** Unwanted emissions in the restricted bands must comply with the radiated emission limits specified in FCC § 15.209(a) and Table 2 of IC RSS-210.

**Test Results:** Complies

**Test Details:** Antenna-port conducted measurements were performed by following the procedure in Sections 5.4.2.2.2.1 and 5.4.2.2.3 of the “Guidance for Performing Compliance Measurements on Digital Transmission Systems Operating (DTS) under Section 15.247”, dated January 18, 2012.

Refers to the following block diagram and data table for test data. Calculation of duty cycle correction factor is included in the Theory of Operation.





**CWD7083 Unwanted Emissions in the Restricted Bands**

Frequency (MHz)	Channel No.	Power Setting (Level)	Measured Data (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	Measured Data (dBm eirp)	Duty Cycle Correction Factor (dB)	Corrected Data (dBm eirp)	Limit (dBm eirp)	Margin (dB)	Detector
2405	11	-1	12.47	0.53	2.00	15.00	-	-	-	-	RMS
2405	11	-1	14.61	0.53	2.00	17.14	-	-	-	-	PK
4810	11	-1	-44.27	0.74	2.00	-41.53	13.9	-55.43	-41.2	14.23	RMS
4810	11	-1	-39.54	0.74	2.00	-36.80	0	-36.80	-21.2	15.60	PK
12025	11	-1	-59.33	1.20	2.00	-56.13	13.9	-70.03	-41.2	28.83	RMS
12025	11	-1	-49.96	1.20	2.00	-46.76	0	-46.76	-21.2	25.56	PK
19240 (NF)	11	-1	-80.14	1.45	2.00	-76.69	13.9	-90.59	-41.2	49.39	RMS
19240 (NF)	11	-1	-69.73	1.45	2.00	-66.28	0	-66.28	-21.2	45.08	PK
2440	18	-1	12.57	0.53	2.00	15.10	-	-	-	-	RMS
2440	18	-1	14.80	0.53	2.00	17.33	-	-	-	-	PK
4880	18	-1	-42.32	0.75	2.00	-39.58	13.9	-53.48	-41.2	12.28	RMS
4880	18	-1	-37.04	0.75	2.00	-34.30	0	-34.30	-21.2	13.10	PK
7320	18	-1	-51.23	0.93	2.00	-48.30	13.9	-62.20	-41.2	21.00	RMS
7320	18	-1	-44.74	0.93	2.00	-41.81	0	-41.81	-21.2	20.61	PK
12200	18	-1	-55.41	1.20	2.00	-52.21	13.9	-66.11	-41.2	24.91	RMS
12200	18	-1	-46.85	1.20	2.00	-43.65	0	-43.65	-21.2	22.45	PK
19520 (NF)	18	-1	-80.35	1.45	2.00	-76.90	13.9	-90.80	-41.2	49.60	RMS
19520 (NF)	18	-1	-69.55	1.45	2.00	-66.10	0	-66.10	-21.2	44.90	PK
2480	26	-17	-0.69	0.54	2.00	1.85	-	-	-	-	RMS
2480	26	-17	1.80	0.54	2.00	4.34	-	-	-	-	PK
2483.5	26	-17	-31.29	0.54	2.00	-28.75	13.9	-42.65	-41.2	1.45	RMS
2483.5	26	-17	-25.71	0.54	2.00	-23.17	0	-23.17	-21.2	1.97	PK
4960	26	-17	-63.82	0.75	2.00	-61.07	13.9	-74.97	-41.2	33.77	RMS
4960	26	-17	-52.27	0.75	2.00	-49.52	0	-49.52	-21.2	28.32	PK
7440 (NF)	26	-17	-66.71	0.93	2.00	-63.78	13.9	-77.68	-41.2	36.48	RMS
7440 (NF)	26	-17	-56.56	0.93	2.00	-53.63	0	-53.63	-21.2	32.43	PK
12400 (NF)	26	-17	-66.53	1.20	2.00	-63.33	13.9	-77.23	-41.2	36.03	RMS
12400 (NF)	26	-17	-56.39	1.20	2.00	-53.19	0	-53.19	-21.2	31.99	PK
19840 (NF)	26	-17	-81.12	1.45	2.00	-77.67	13.9	-91.57	-41.2	50.37	RMS
19840 (NF)	26	-17	-70.62	1.45	2.00	-67.17	0	-67.17	-21.2	45.97	PK
22320 (NF)	26	-17	-79.98	1.70	2.00	-76.28	13.9	-90.18	-41.2	48.98	RMS
22320 (NF)	26	-17	-69.61	1.70	2.00	-65.91	0	-65.91	-21.2	44.71	PK

NF: Noise Floor

Tested: May 9-11, 2012

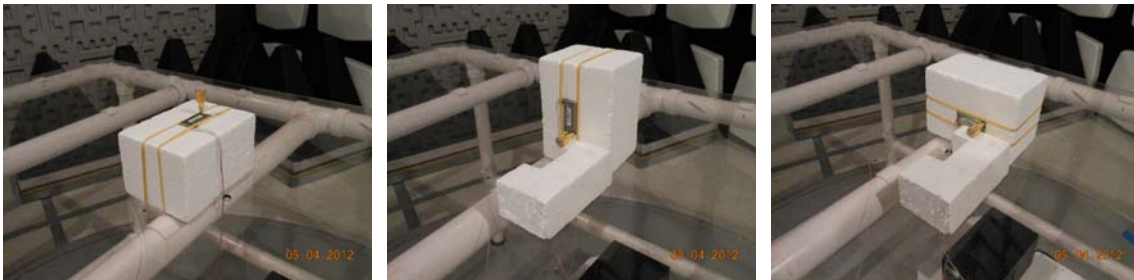
Tested by: Grace Lin

In addition, radiated measurement for cabinet/case emissions was performed with the antenna port terminated with a resistive load. Radiated emission was performed from 30 MHz to the tenth harmonics of the carrier. For each scan of radiated emission measurement, the procedures for maximizing emissions were followed. The EUT was rotated and antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. All radiated emission measurements, up to 18 GHz, were performed at 3-meter distance between an antenna and the EUT. All radiated emission measurements, above 18 GHz, were performed at 0.3-meter distance between an antenna and the EUT.

The peak level of radiated emissions above 1 GHz was measured with a resolution bandwidth (RBW) of 1 MHz and a video bandwidth (VBW) of 3 MHz.

For harmonics/spurs that fall in the restricted band, the radiated spurious emissions above 1 GHz were measured with RBW of 1 MHz, VBW of 10 Hz, and Sweep of Auto. The unit was configured for continuous operation.

EUT was tested in three orthogonal orientations (XY, YZ, and ZX planes).

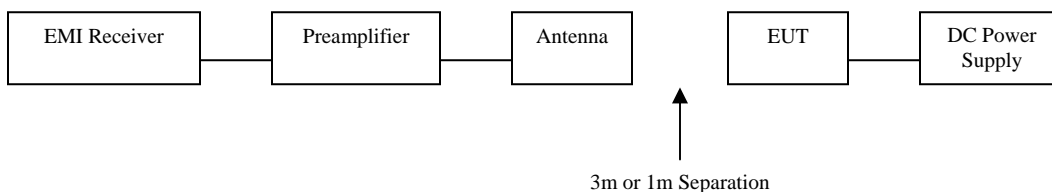


EUT = XY

EUT = YZ

EUT = ZX

Refers to the following block diagram and data table for test data. Antenna factor, cable loss, and preamplifier gain were compensated for in the receiver. A factor of 20 dB/decade applies to measurements made at a closer distance than the limit distance before comparing to the limits. Calculation of duty cycle correction factor is included in the Theory of Operation.





***Radiated Measurement Data for Cabinet/Case Emissions:***

Radiated Emissions, TX									
Antenna Polarization	Frequency (MHz)	Measured Data (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Turntable Degree	Detector	EUT Orientation	Ch
H	7213.43	49.2	54	4.8	169.0	166.5	AV	ZX	11
H	7213.43	57.2	74	16.8	169.0	166.5	PK	ZX	11
H	9621.83	47.5	54	6.5	157.9	166.5	AV	ZX	11
H	9621.83	56.3	74	17.7	157.9	166.5	PK	ZX	11
H	7321.25	48.0	54	6.0	147.0	170.9	AV	ZX	18
H	7321.25	56.2	74	17.8	147.0	170.9	PK	ZX	18
V	9761.83	48.6	54	5.4	104.9	172.7	AV	ZX	18
V	9761.83	57.0	74	17.1	104.9	172.7	PK	ZX	18
H	7438.50	45.9	54	8.1	175.3	172.9	AV	ZX	26
H	7438.50	54.6	74	19.4	175.3	172.9	PK	ZX	26
V	9921.83	46.8	54	7.3	100.0	173.7	AV	ZX	26
V	9921.83	54.7	74	19.3	100.0	173.7	PK	ZX	26

Tested by: Grace Lin Date of Test: May 4, 2012

### 3.9 Receiver Radiated Emissions

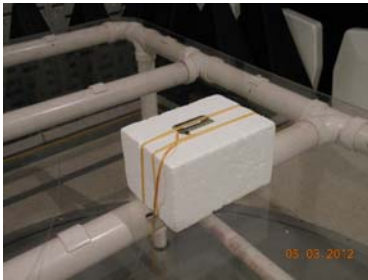
**Performance Criterion:** Receiver radiated emissions must meet the requirements of Table 1 of IC RSS-Gen. Receivers operating above 960 MHz or below 30 MHz are exempt from complying with the technical provisions of FCC Part 15 Subpart B.

**Test Results:** Complies

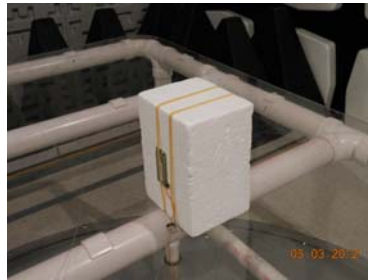
**Test Details:** Radiated emission was performed from 30 MHz to the fifth harmonics of the carrier. For each scan of radiated emission measurement, the procedures for maximizing emissions were followed. The EUT was rotated and antenna height was varied between 1 m and 4 m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. All radiated emission measurements, up to 18 GHz, were performed at 3-meter distance between an antenna and the EUT.

For the measurement of radiated emission at the frequency range 30-1000MHz, measurement was made by using a quasi-peak detector with a 120 kHz bandwidth. For the frequency range above 1 GHz, measurement was made using an average detector with a 1 MHz bandwidth.

EUT was tested in three orthogonal orientations (XY, YZ, and ZX planes).



EUT = XY

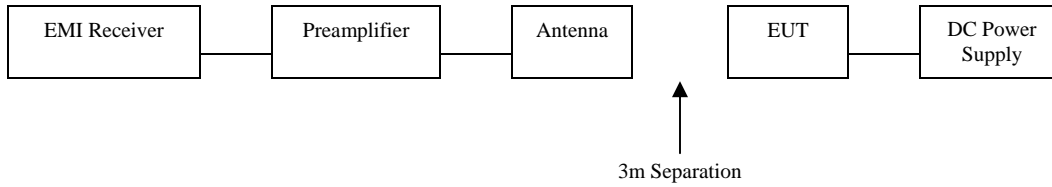


EUT = YZ



EUT = ZX

Refers to the following block diagram, data table, and receiver screen captures for test data. Antenna factor, cable loss, and preamplifier gain were compensated for in the receiver.



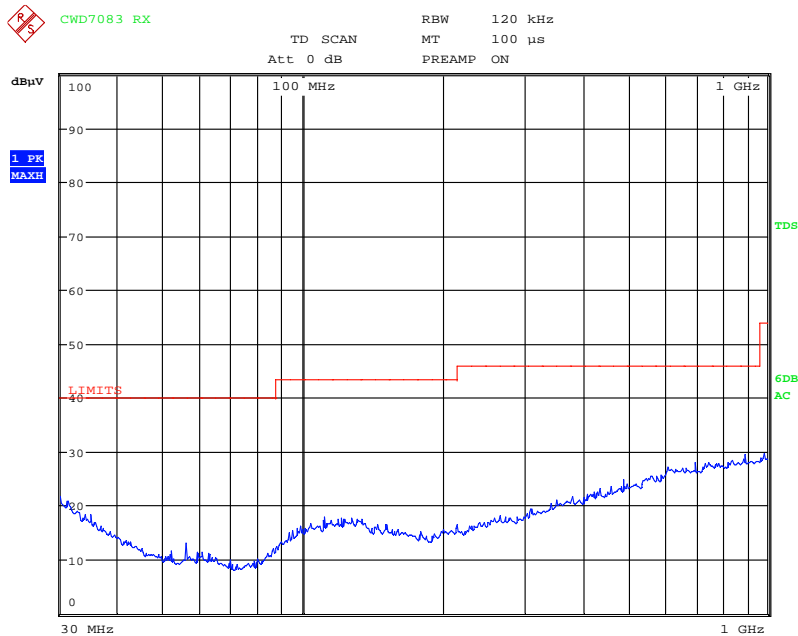
**Radiated Emissions, RX**

Antenna Polarization	Frequency (MHz)	Measured Data (dBuV/m)	FCC Class B Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Turntable Degree	Detector	EUT Orientation
H	4877.24	41.0	54	13.0	153.2	146.6	AV	ZX
H	4877.24	47.0	74	27.0	153.2	146.6	PK	ZX

Tested by: Grace Lin

Date of Test: May 3, 2012

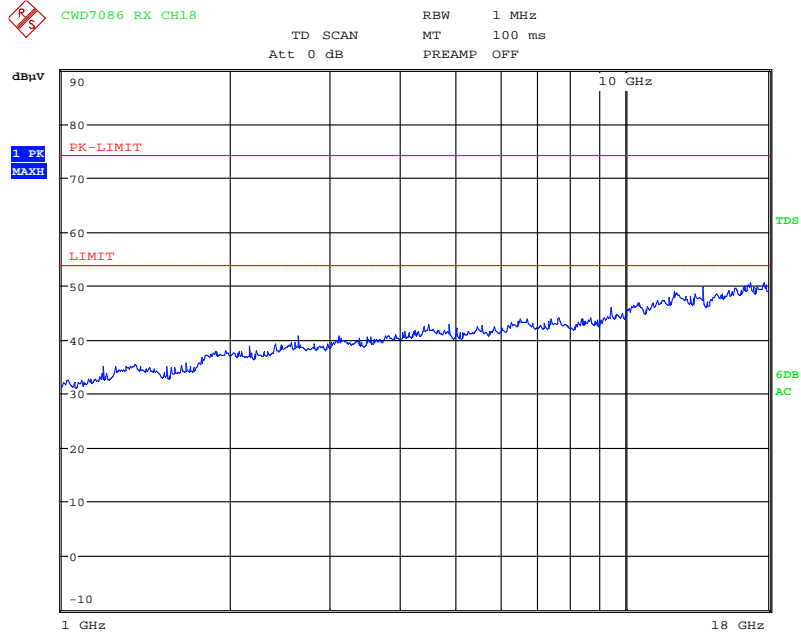
**Receiver Radiated Emission, 30MHz – 1 GHz:**



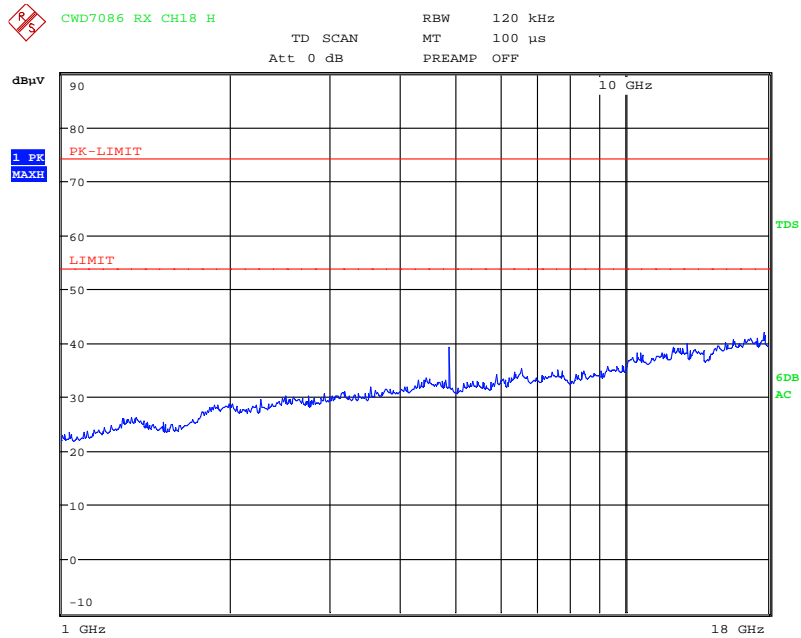
Date: 4.MAY.2012 13:41:49



### Receiver Radiated Emission, above 1 GHz:



Date: 3.MAY.2012 13:31:04



Date: 3.MAY.2012 14:05:02

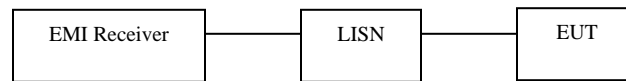


### 3.10 Receiver AC Power Line Conducted Emissions

**Performance Criterion:** AC power line conducted emissions shall not exceed the limits specified in FCC § 15.107 and Table 2 of IC RSS-Gen.

**Test Results:** Complies.

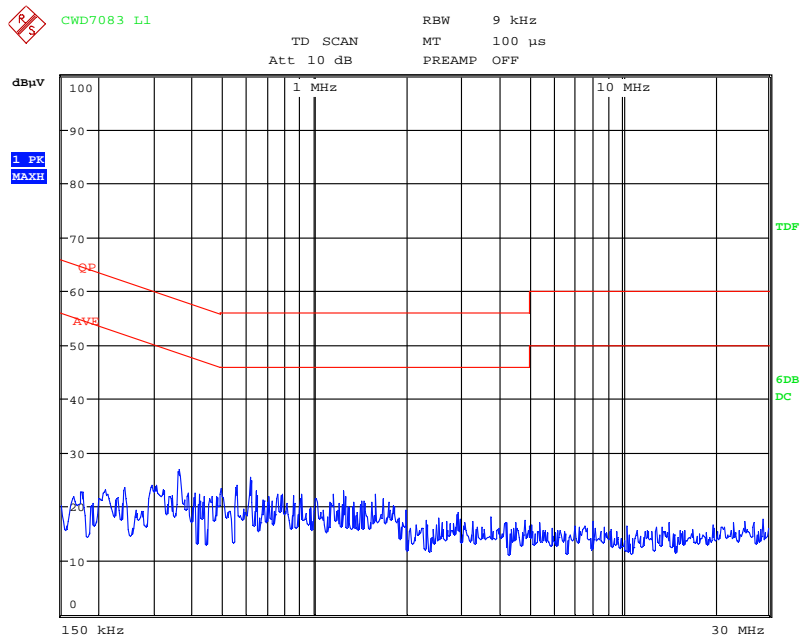
**Test Details:** AC power line conducted emissions were performed from 150 kHz to 30 MHz and measured with a resolution bandwidth of 9 kHz. EUT was set in the receiving mode. Refers to the following screen captures (using a peak detector) and block diagram.





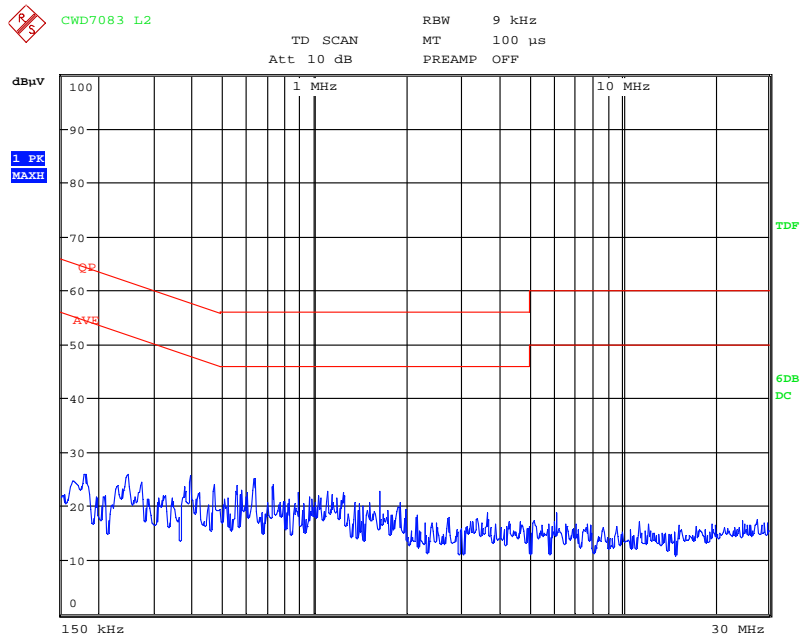


Line 1:



Date: 4.MAY.2012 14:16:27

Line 2:



Date: 4.MAY.2012 14:17:26