



Test Report

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

Report Number: CWD07343-Cert

Model: CWD07343

FCC ID: EROCWD07343
IC: 5683C-CWD07343

Date: March 7, 2014 (Revised March 12, 2014)

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Date: Mar. 7, 2014

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

Date: Mar. 7, 2014



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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: CWD07343, serial number: CNA8262427.

1.2 Test Methodology

Measurements were performed according to the following procedures and standards:

- 1) ANSI C63.4: 2003
- 2) FCC Publication, "Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under §15.247", April 9, 2013
- 3) Industry Canada RSS-Gen Issue 3
- 4) Industry Canada RSS-210 Issue 8

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. 13, 2013
Teseq Bilog Antenna	CBL 6112D	25231	30 MHz – 2 GHz	Dec. 12, 2013
ETS-Lindgren Double Ridge Horn Antenna	3117	00047560	1 GHz – 18 GHz	Oct. 10, 2013
R&S Preamplifier	TS-PR18	100044	30 MHz – 18 GHz	Dec. 18, 2013
ETS-Lindgren Standard Gain Horn Antenna	3160-09	00078911	18 GHz – 26.5 GHz	Mar. 6, 2014*
R&S Preamplifier	TS-PR26	100030	18 GHz – 26.5 GHz	Dec. 18, 2013
Solar Electronics	9252-50-R-24-N	068546	10 kHz – 50 MHz	Apr. 26, 2013

*Mechanical inspection

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, §A8.5 of RSS-210	Radiated Spurious Emissions	Complies
§15.207	§7.2.4 of RSS-Gen	Transmitter AC Power Line Conducted Emissions	Complies

Note:

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



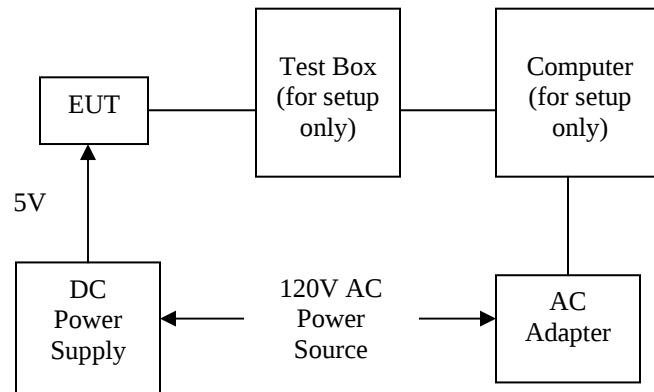
2. System Test Configuration

2.1 Justification

A DC power supply supplied power to the EUT. A computer supplied test commands through a test box.

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	Cat5 (Crossover)	0..6	Computer – Test Box	Unshielded
1	USB	2.0	Computer – Test Box	Unshielded
1	AWG#18	1	DC Power Supply – EUT	Unshielded
1	10-conductor Ribbon Cable	0.3	Test Box – EUT	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	Computer	DELL	Latitude E6520	7HL06Q1 (Service Tag)
2	AC Adapter	DELL	PA-1900-02D	CN-09T215-71615-52N-17B9
3	DC Power Supply	BK Precision	1670	281-2152
4	Test (Red) Box	Ember	ISA3	EM-ISA3-B4A

2.7 *Equipment Modifications*

There were no modifications installed during compliance measurements.



3. Evaluation

3.1 *Antenna Requirements*

This module is validated with a SMD antenna. Antenna gain is 2.1 dBi.

The antenna connector of the SMD antenna is unique in the sense of complying with FCC §15.203, §15.204(b), and §15.204(c).

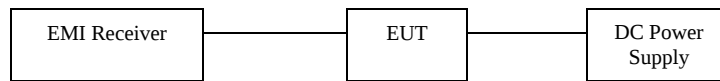


3.2 DTS Bandwidth

Performance Criterion: The minimum DTS 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 at the boost mode.

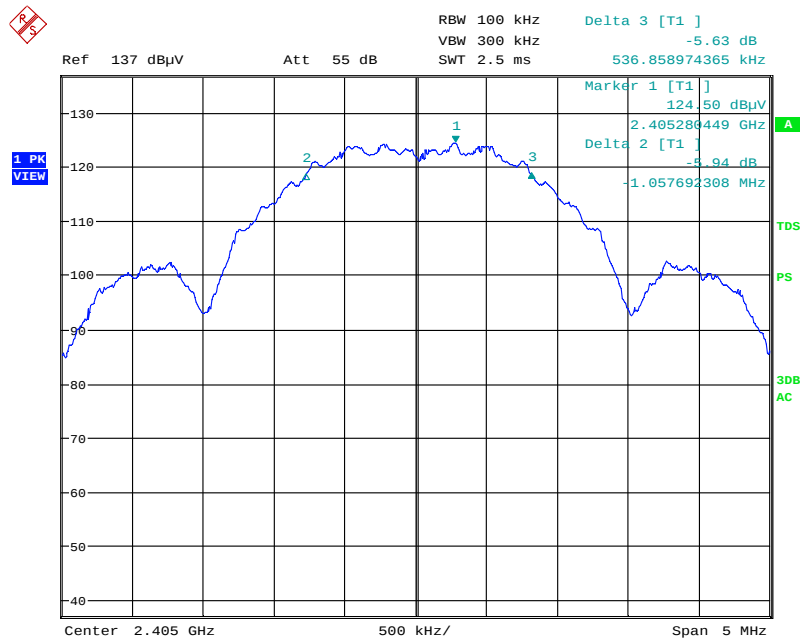


Channel	Frequency (MHz)	6 dB Bandwidth (kHz)
11	2405	1594.6
18	2440	1578.5
26	2480	1586.5

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

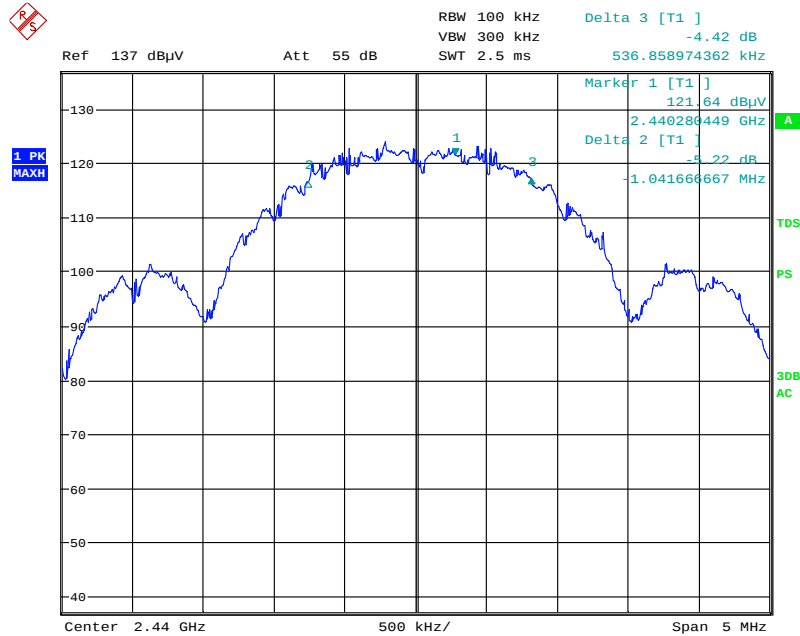


DTS Bandwidth, Channel 11:



Date: 6.MAR.2014 15:22:52

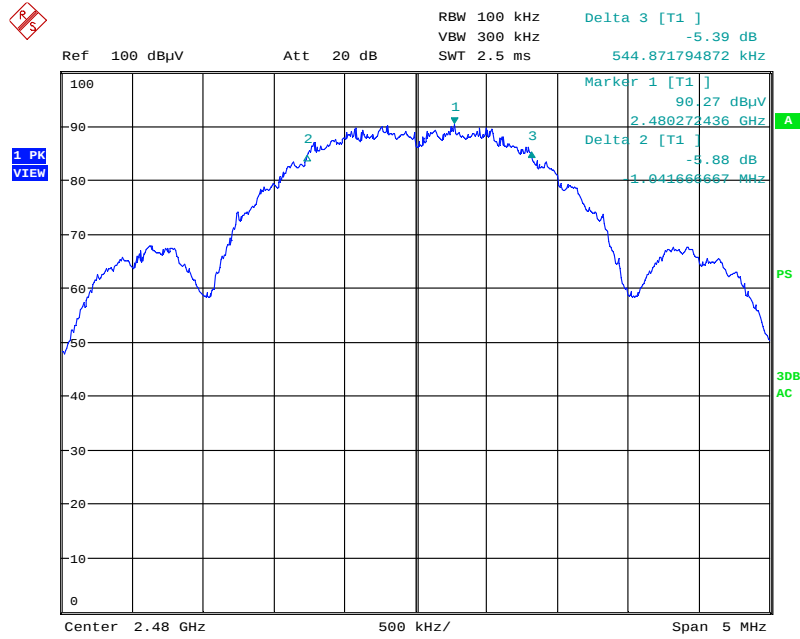
DTS Bandwidth, Channel 18:



Date: 6.MAR.2014 15:19:53



DTS Bandwidth, Channel 26:



Date: 6.MAR.2014 15:33:24



3.3 99% Bandwidth

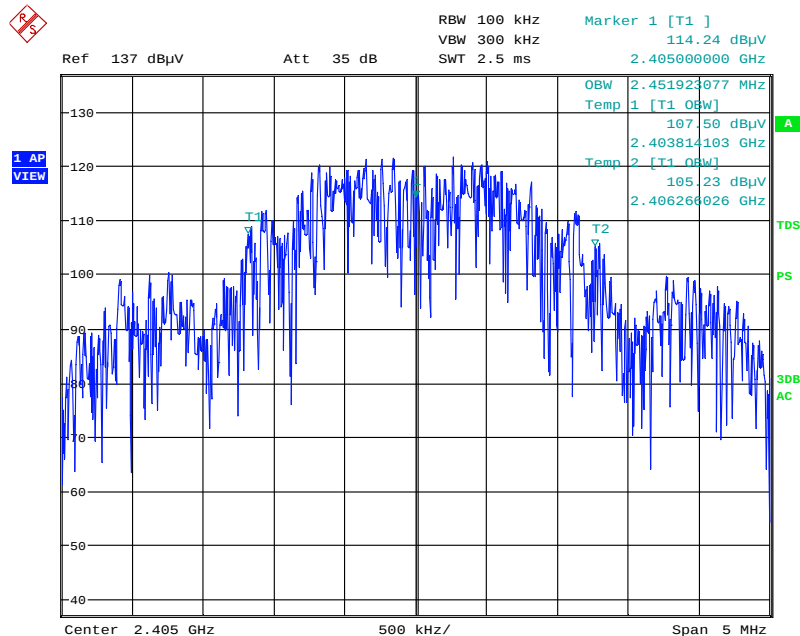
Test Details: Refers to the following block diagram, data table, and receiver screen captures. The EUT was tested in a continuous transmit mode at the maximum power level at the boost mode.



Channel	Frequency (MHz)	99% Bandwidth (MHz)
11	2405	2.452
18	2440	2.452
26	2480	2.476

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

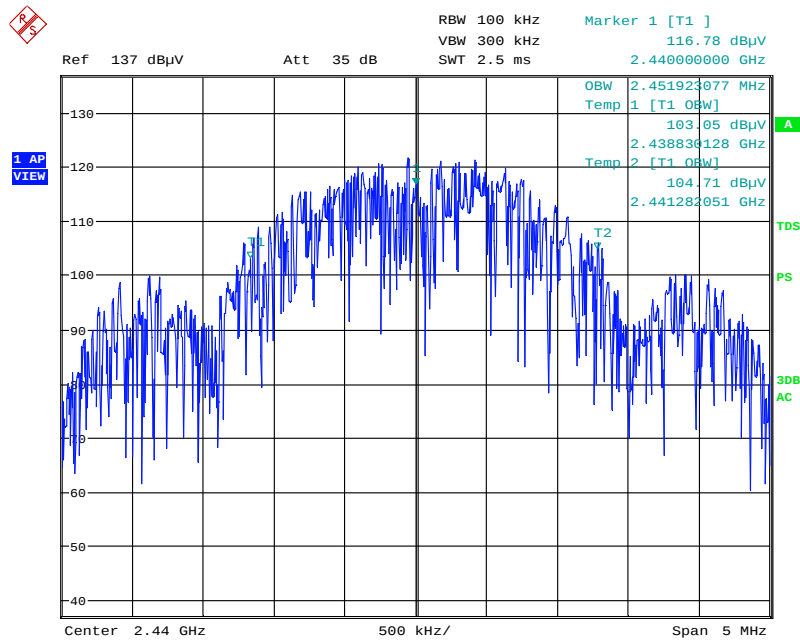
99% Bandwidth, Channel 11:



Date: 6.MAR.2014 15:23:44

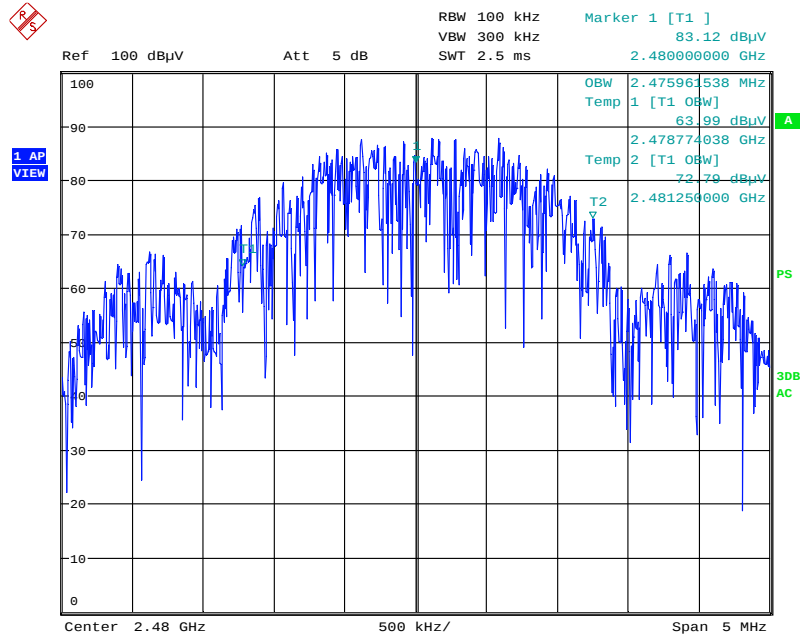


99% Bandwidth, Channel 18:



Date: 6.MAR.2014 15:20:47

99% Bandwidth, Channel 26:



Date: 6.MAR.2014 15:39:53



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 at the boost mode. Refers to the following block diagram, data table, and receiver screen captures.

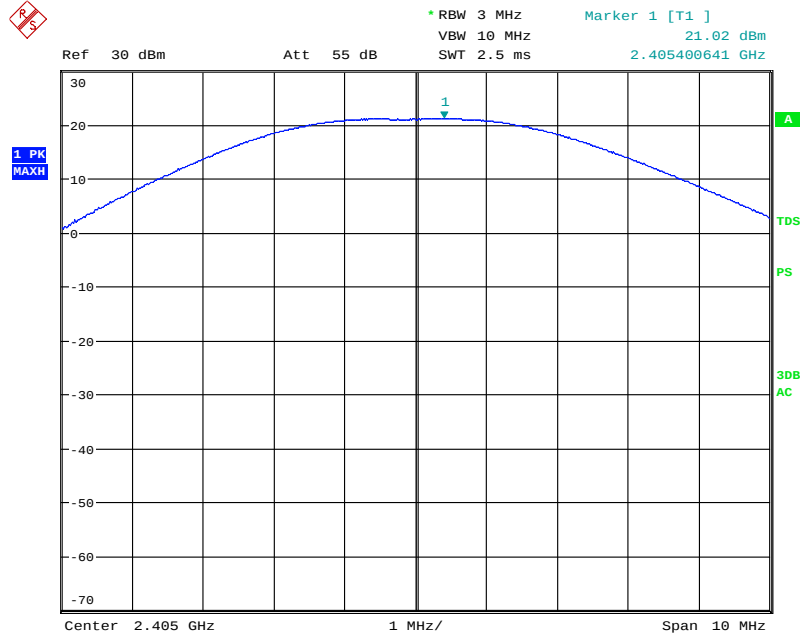


Channel	Frequency (MHz)	Power Level	Power	
			dBm	mW
11	2405	0	21.02	126.4736
18	2440	0	20.71	117.7606
26	2480	230	-2.33	0.5848

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

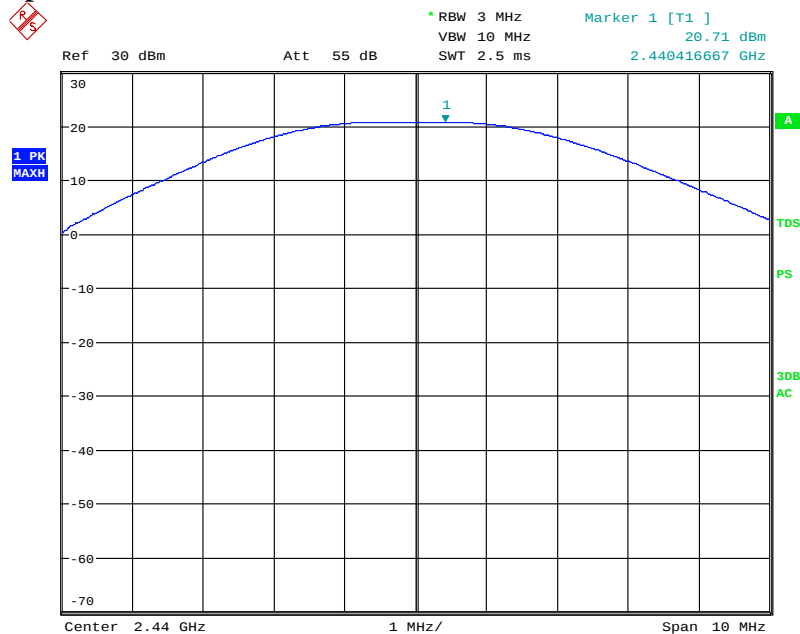


Power Output, Channel 11:



Date: 6.MAR.2014 15:46:47

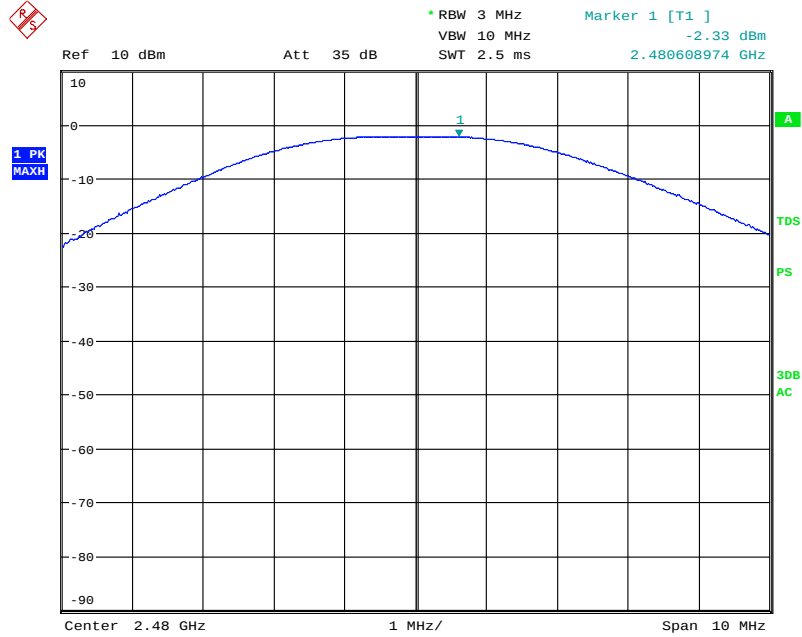
Power Output, Channel 18:



Date: 6.MAR.2014 15:45:24



Power Output, Channel 26:



Date: 6.MAR.2014 15:48:03



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.

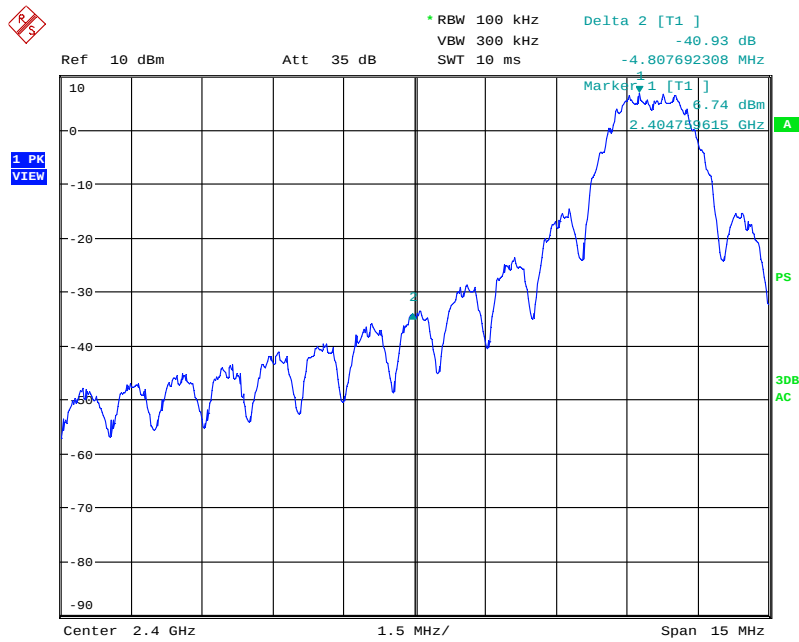
Test Results: Complies

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

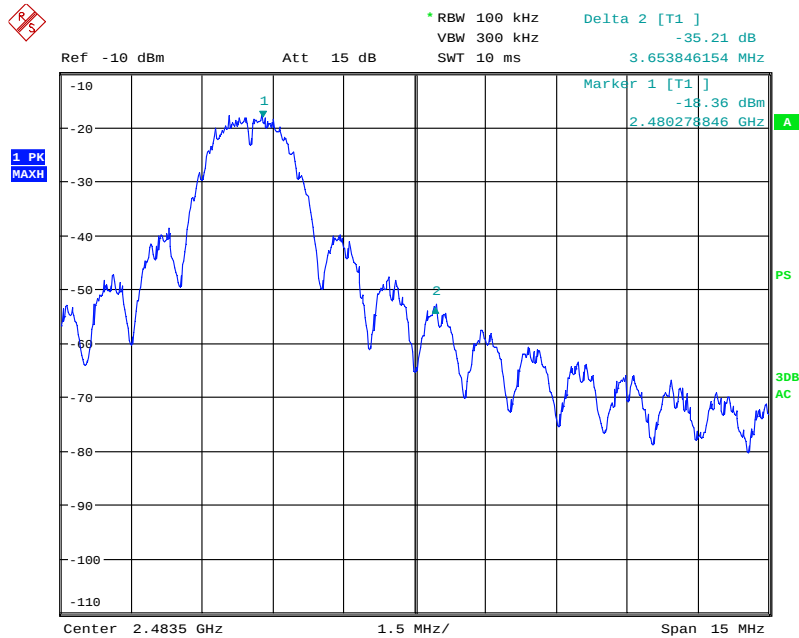




Band Edge:



Date: 6.MAR.2014 16:22:14



Date: 6.MAR.2014 16:24:55



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

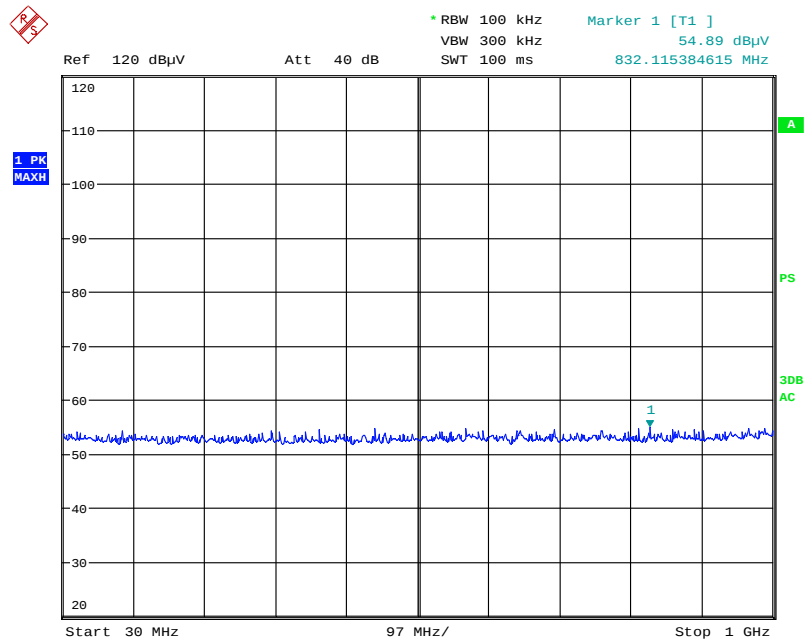
Test Details: Refers to the following block diagram and receiver screen captures

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

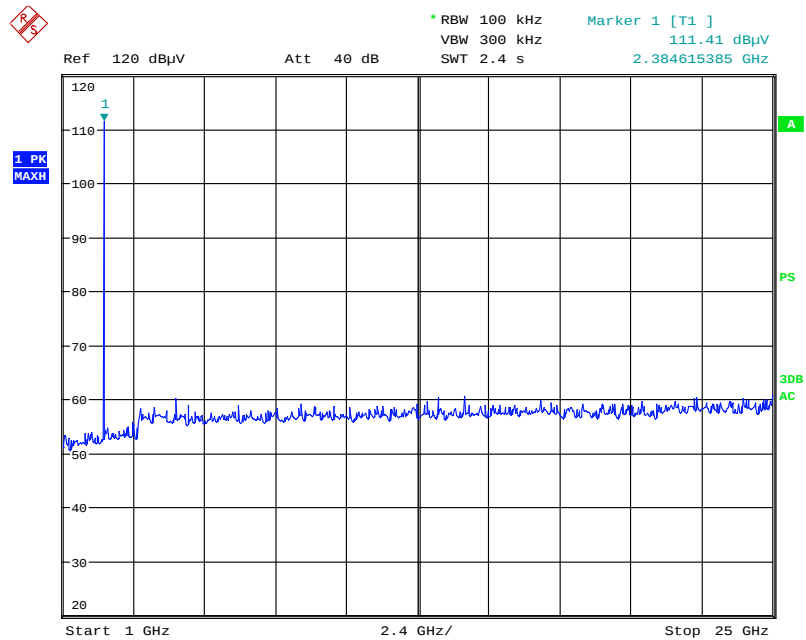




Conducted Spurious Emission – Channel 11



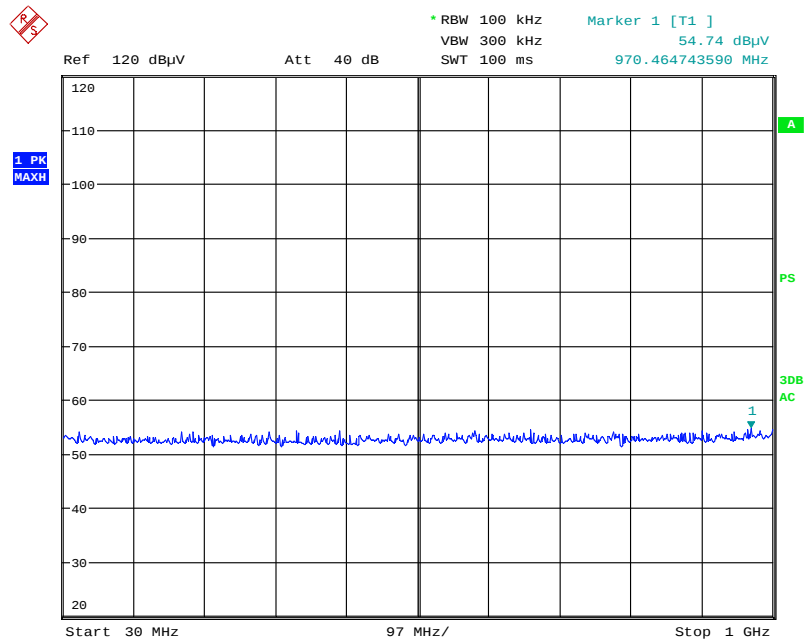
Date: 6.MAR.2014 19:25:23



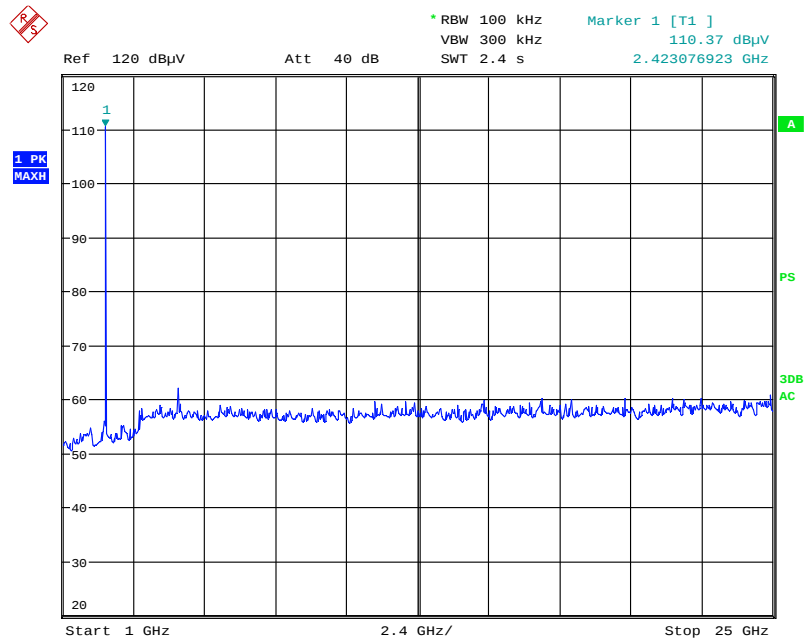
Date: 6.MAR.2014 19:22:51



Conducted Spurious Emission – Channel 18



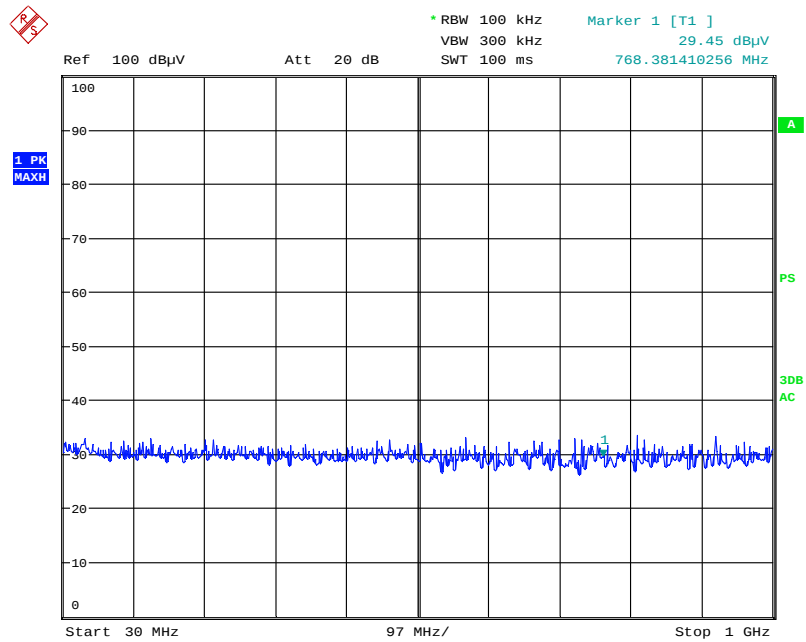
Date: 6.MAR.2014 19:28:00



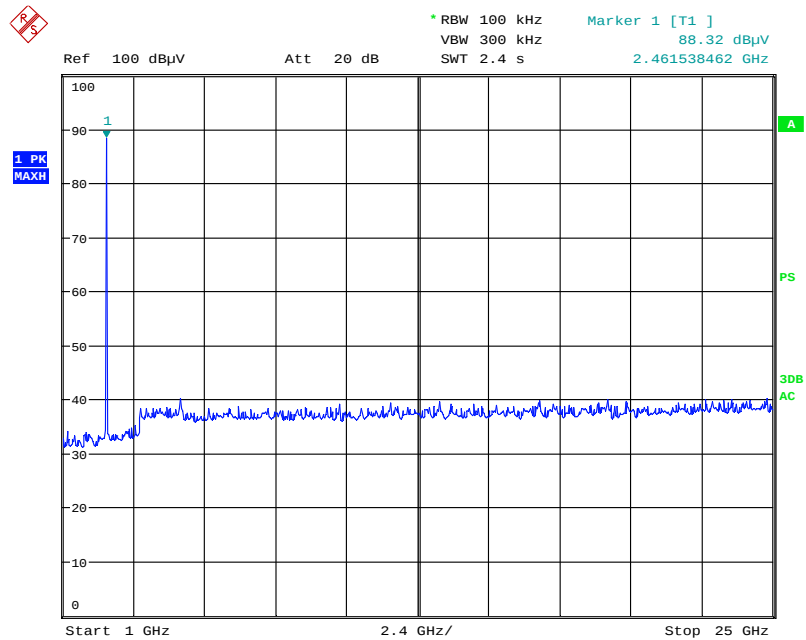
Date: 6.MAR.2014 19:26:30



Conducted Spurious Emission – Channel 26



Date: 6.MAR.2014 19:30:03



Date: 6.MAR.2014 19:29:22



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

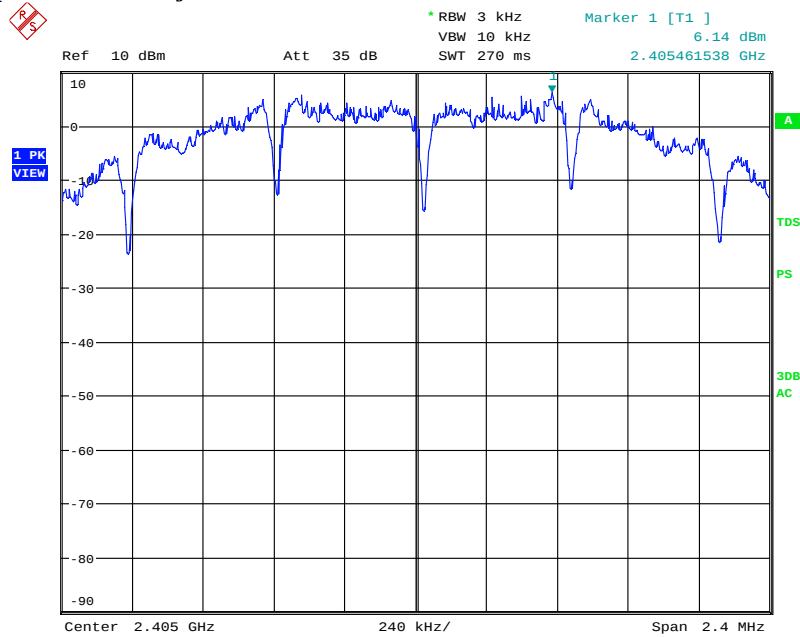
Test Details: The EUT was tested in a continuous transmit mode with maximum power levels. Refers to the following table and receiver screen captures. The insertion loss was compensated for in the receiver.



Channel	Frequency (MHz)	Power Spectral Density (dBm)
11	2405	6.14
18	2440	5.61
26	2480	-17.87

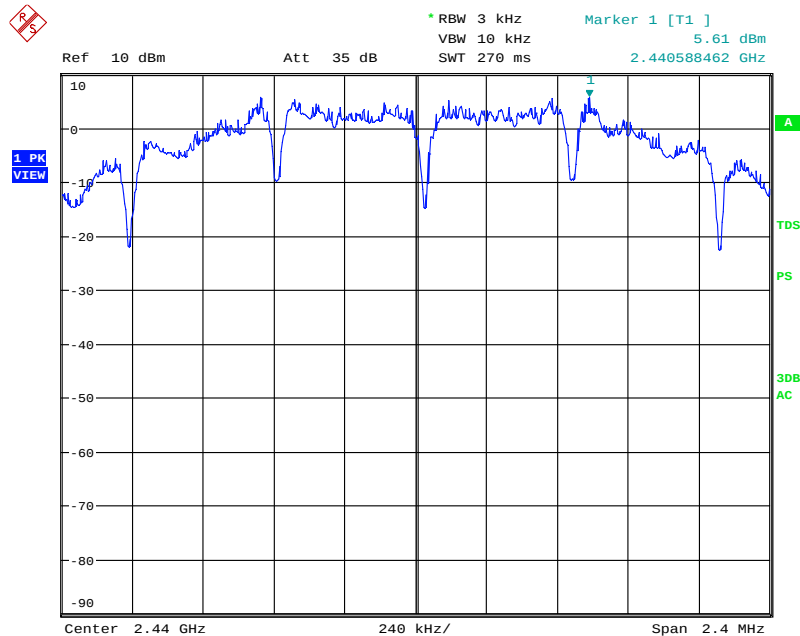


Power Spectral Density, Channel 11:



Date: 6.MAR.2014 17:27:35

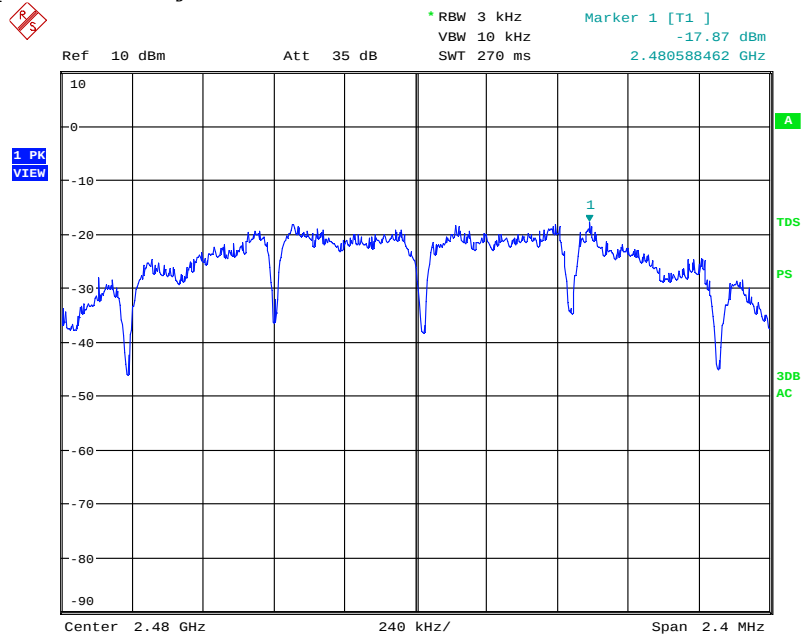
Power Spectral Density, Channel 18:



Date: 6.MAR.2014 17:29:01



Power Spectral Density, Channel 26:



Date: 6.MAR.2014 17:31:01

3.8 Radiated Spurious Emissions

Performance Criterion: Radiated spurious emissions which fall in the restricted bands must comply with the radiated emission limits specified in FCC § 15.209(a) and Table 2 of IC RSS-Gen.

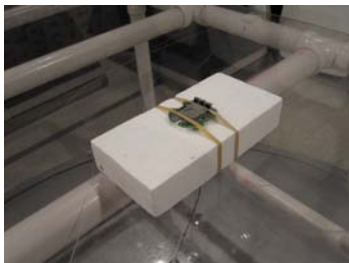
Test Results: Complies

Test Details: Radiated spurious 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.

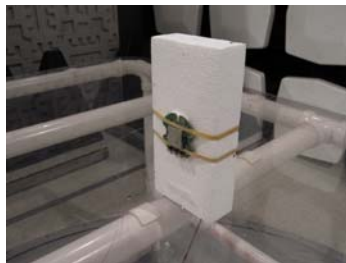
The peak level of radiated emissions above 1 GHz was measured with a resolution bandwidth (RBW) of 1 MHz and a video bandwidth (VBW) of 3 MHz.

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.

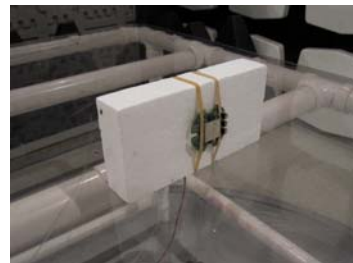
EUT was tested in three orthogonal orientations (XY, YZ, and ZX planes).



EUT = XY

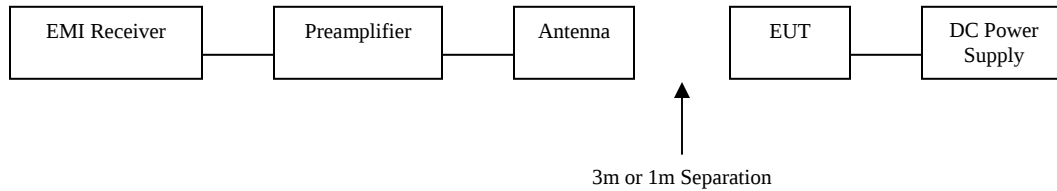


EUT = YZ



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.



CWD7343 Radiated Spurious Emissions, Boost Mode, Internal Antenna												
Antenna Polarization	Frequency (MHz)	Channel No.	Power Setting (Level)	EUT Orientation	Measured Data (dBuV/m)	Duty Cycle Correction Factor (dB)	Corrected Data	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Turntable Degree	Detector
H	2405	11	0	YZ	113.84	-	-	-	-	230.5	8.7	AVE
H	2405	11	0	YZ	116.36	-	-	-	-	230.5	8.7	PK
H	2390	11	0	YZ	48.99	15.45	33.54	54	20.46	230.5	8.7	AVE
H	2390	11	0	YZ	59.41	0	59.41	74	14.59	230.5	8.7	PK
H	4810	11	0	YZ	61.94	15.45	46.49	54	7.51	144.6	193.5	AVE
H	4810	11	0	YZ	70.26	0	70.26	74	3.74	144.6	193.5	PK
H	12025	11	0	YZ	44.37	15.45	28.92	54	25.08	160.8	221.7	AVE
H	12025	11	0	YZ	56.47	0	56.47	74	17.53	160.8	221.7	PK
H	19240*	11	0	YZ	36.17	15.45	20.72	54	33.28	-	-	AVE
H	19240*	11	0	YZ	45.63	0	45.63	74	28.37	-	-	PK
H	2440	18	0	YZ	114.87	-	-	-	-	204.9	9.3	AVE
H	2440	18	0	YZ	117.59	-	-	-	-	204.9	9.3	PK
H	4880	18	0	YZ	55.72	15.45	40.27	54	13.73	132.4	194.4	AVE
H	4880	18	0	YZ	64.45	0	64.45	74	9.55	132.4	194.4	PK
H	7320	18	0	YZ	61.88	15.45	46.43	54	7.57	100.0	80.4	AVE
H	7320	18	0	YZ	73.79	0	73.79	74	0.21	100.0	80.4	PK
H	12200	18	0	YZ	41.86	15.45	26.41	54	27.59	186.9	0.0	AVE
H	12200	18	0	YZ	54.38	0	54.38	74	19.62	186.9	0.0	PK
H	19520*	18	0	YZ	33.06	15.45	17.61	54	36.39	100.0	0.0	AVE
H	19520*	18	0	YZ	43.86	0	43.86	74	30.14	100.0	0.0	90.0
H	2480	26	230	YZ	97.47	-	-	-	-	222.6	359.9	AVE
H	2480	26	230	YZ	100.01	-	-	-	-	222.6	359.9	PK
H	2483.5	26	230	YZ	62.96	15.45	47.51	54	6.49	222.6	359.9	AVE
H	2483.5	26	230	YZ	73.47	0	73.47	74	0.53	222.6	359.9	PK
H	2483.5	25	247	YZ	61.21	15.45	45.76	54	8.24	222.6	359.9	AVE
H	2483.5	25	247	YZ	72.00	0	72.00	74	2	222.6	359.9	PK
H	2483.5	24	0	YZ	59.73	15.45	44.28	54	9.72	222.6	359.9	AVE
H	2483.5	24	0	YZ	72.31	0	72.31	74	1.69	222.6	359.9	PK
H	4960	26	230	YZ	30.60	15.45	15.15	54	38.85	111.7	191.8	AVE
H	4960	26	230	YZ	44.16	0	44.16	74	29.84	111.7	191.8	PK
H	7440 (NF)	26	230	YZ	31.74	15.45	16.29	54	37.71	-	-	AVE
H	7440 (NF)	26	230	YZ	45.32	0	45.32	74	28.68	-	-	PK
H	12400 (NF)	26	230	YZ	35.36	15.45	19.91	54	34.09	-	-	AVE
H	12400 (NF)	26	230	YZ	47.69	0	47.69	74	26.31	-	-	PK
H	19840 (NF)*	26	230	YZ	18.53	15.45	3.08	54	50.92	-	-	AVE
H	19840 (NF)*	26	230	YZ	30.03	0	30.03	74	43.97	-	-	PK
H	22320 (NF)*	26	230	YZ	20.07	15.45	4.62	54	49.38	-	-	AVE
H	22320 (NF)*	26	230	YZ	32.82	0	32.82	74	41.18	-	-	PK
NF: Noise Floor											Tested: March 5-6, 2014	
*: Tested at 1m											Tested by: Grace Lin	

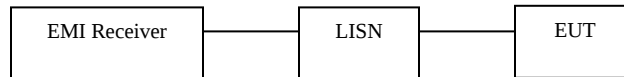


3.9 Transmitter AC Power Line Conducted Emissions

Performance Criterion: AC power line conducted emissions shall not exceed the limits specified in FCC § 15.207 and Table 4 of IC RSS-Gen.

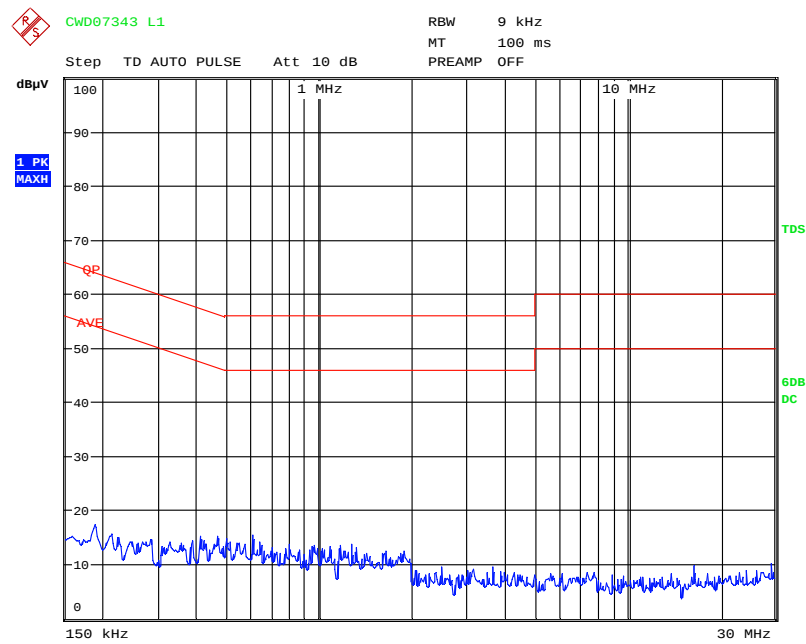
Test Results: Complies.

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.



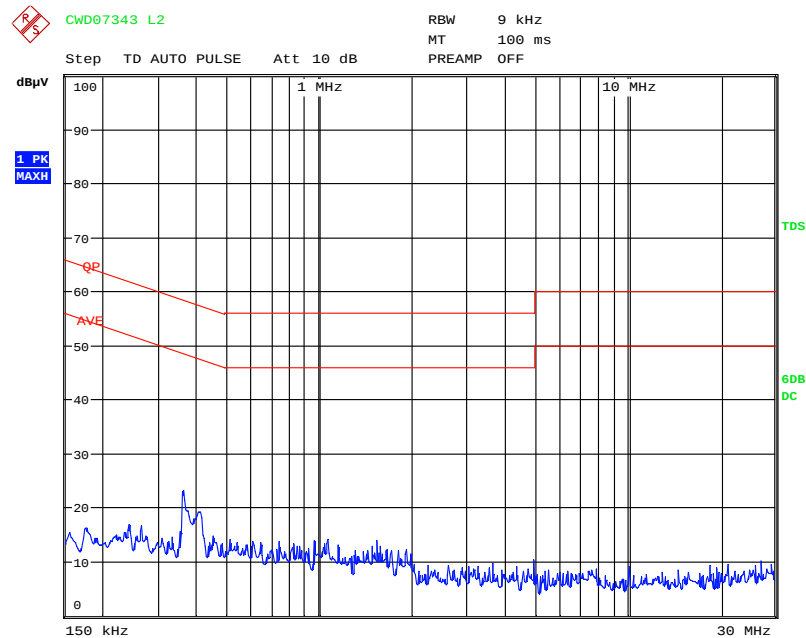


Line L1:



Date: 6.MAR.2014 21:00:22

Line L2:



Date: 6.MAR.2014 21:01:44