Test Report

FCC Part 15, Subpart C, Section 15.247
Industry Canada RSS-210, Issue 7

Report Number: TX3-Cert

Model: MTX-3, PTX3

FCC ID: EROTX3
IC: 5683C-TX3

Date: September 29, 2010

Prepared by: *Grace Lin* Date: Sep. 29, 2010

Grace Lin, Sr. Compliance Engineer

Reviewed by: *Wayne Owens* Date: Sep. 29, 2010

Wayne Owens, Director of Program Management

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1. General Description

1.1 Product Description

The equipment under test (EUT) is a 2.8" Handheld Touchpanel, models: MTX-3 (with J3 installed) and PTX3 (with J3 uninstalled) is a wireless controller for home theater, home automation, and AV presentation.

1.2 Test Methodology

Measurements were performed according to the following procedures and standards:

1) ANSI C63.4: 2003
2) FCC Procedure, "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005
3) Industry Canada RSS-Gen Issue 2
4) Industry Canada RSS-210 Issue 7
5) Industry Canada ICES-003 Issue 4

All measurements were performed in a 3-meter semi-anechoic chamber and the control room. Prescan was performed on both the MTX-3 and the PTX3. The worst-case data was reported/recorded.

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. 22, 2009
Teseq Bilog Antenna	CBL 6112D	25231	30 MHz – 2 GHz	Jan. 28, 2010
ETS-Lindgren Double Ridge Horn Antenna	3117	00047560	1 GHz – 18 GHz	Jan. 27, 2010
R&S Preamplifier	TS-PR18	100044	30 MHz – 18 GHz	Feb. 9, 2010
ETS-Lindgren Standard Gain Horn Antenna	3160-09	00078911	18 GHz – 26.5 GHz	May 10, 2010*
R&S Preamplifier	TS-PR26	100030	18 GHz – 26.5 GHz	Feb. 23, 2010
Solar Electronics LISN	9252-50-R-24-N	068546	10 kHz – 50 MHz	Feb. 3, 2010

* Visual 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, §2.7, §A8.5 of RSS-210	Radiated Spurious Emissions	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.

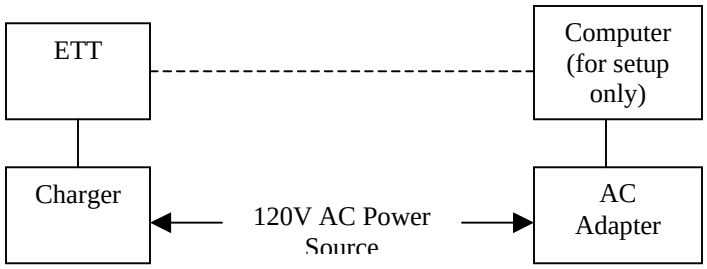
2. System Test Configuration

2.1 Justification

EUT was powered through a charger. A computer supplied test commands to the EUT through an USB port.

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	USB	1.5	Computer – EUT	Shielded

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	PP02X	38707541497
2	AC Power Adapter	DELL	LA90PS0-00	CN-0DF266-71615-681-134F
3	DC Power Supply	BK Precision	1670	281-2152

2.7 Equipment Modifications

There were no modifications installed during compliance measurements.

3. Evaluation

3.1 Antenna Requirements

This device is validated with a ceramic chip antenna. Antenna gain of the ceramic chip antenna is 2.95 dBi ± 0.25dB.

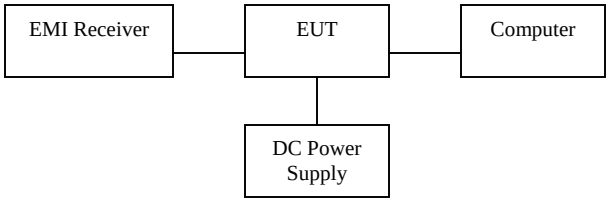
The soldering pads of the ceramic chip antenna is unique in connector in the sense of complying with FCC §15.203, §15.204(b), and §15.204(c).

3.2 6 dB Bandwidth

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

Test Results: Complies

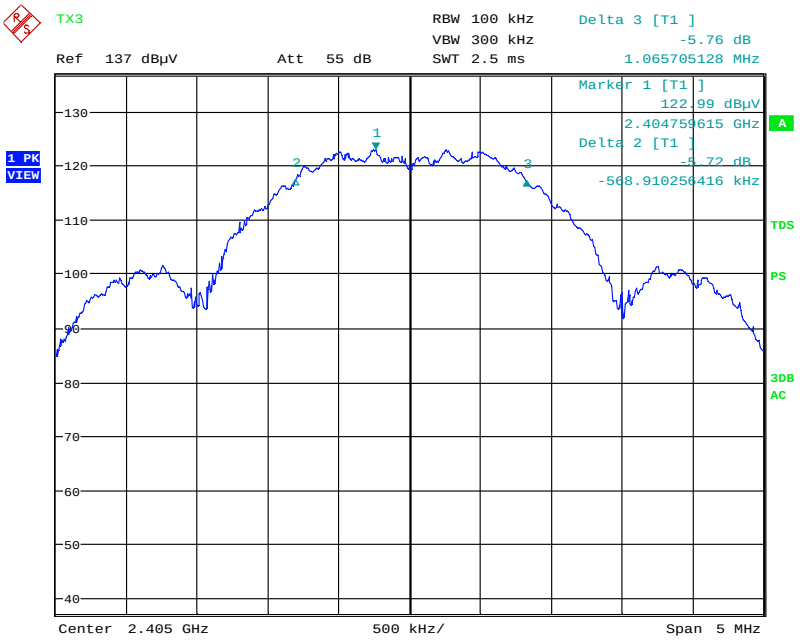
Test Details: Refers to the following block diagram, data table, and receiver screen captures. The EUT was tested in a continuous transmit mode with maximum power levels at boost mode.



Channel	Frequency (MHz)	6 dB Bandwidth (kHz)
11	2405	1634.6
18	2440	1570.5
26	2480	1562.5

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

6 dB Bandwidth, Channel 11:



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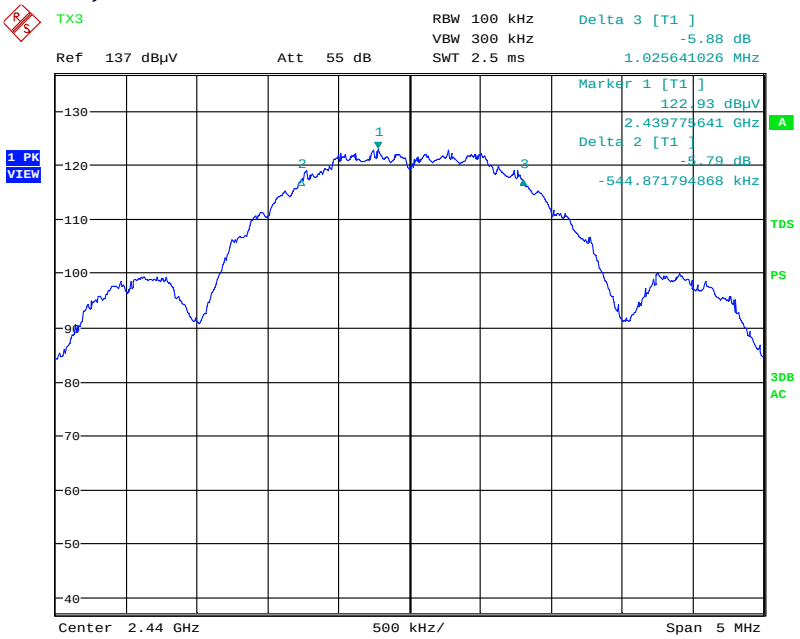
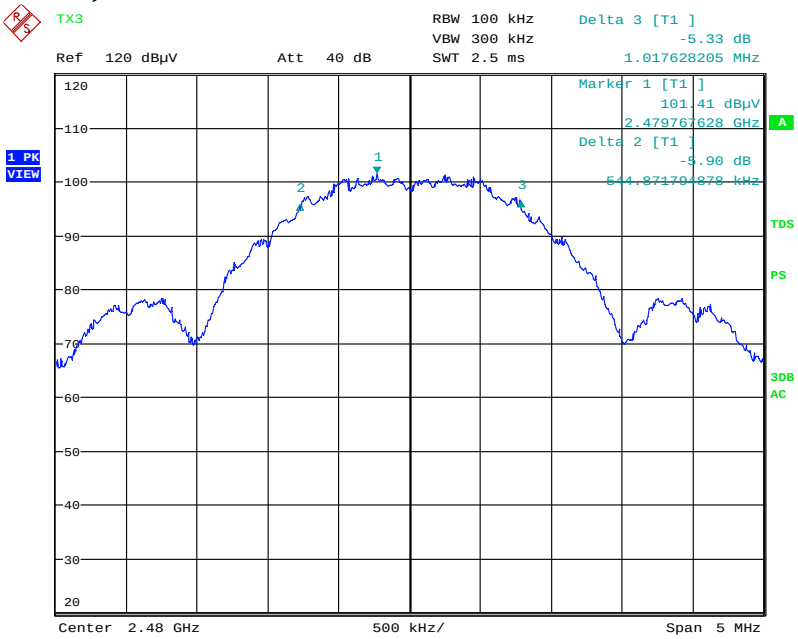
6 dB Bandwidth, Channel 18:



Date: 24.SEP.2010 09:47:04

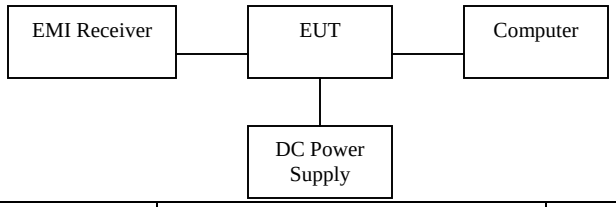
6 dB Bandwidth, Channel 26:



Date: 24.SEP.2010 09:51:13

3.3 99% Bandwidth

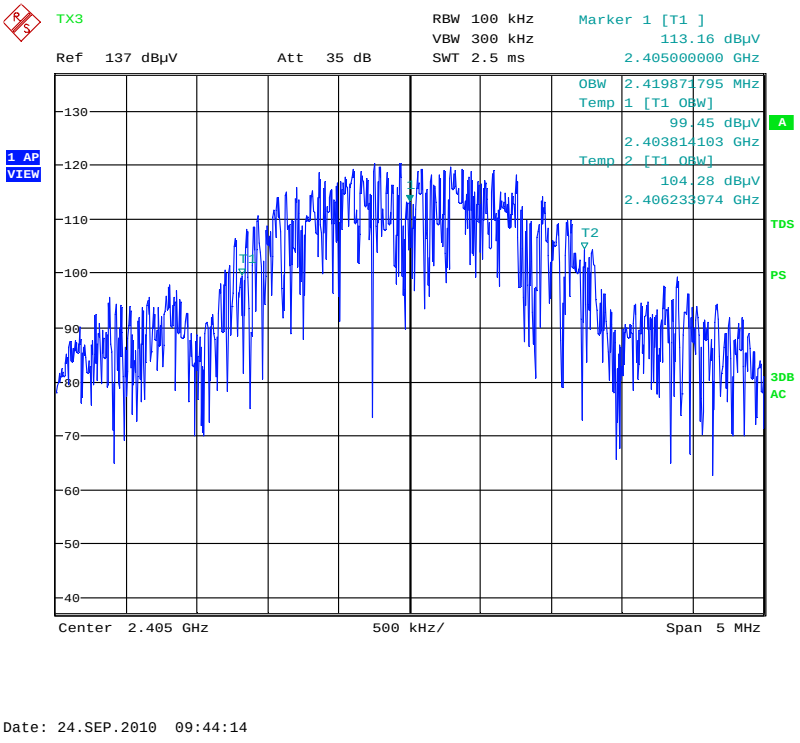
Test Details: Refers to the following block diagram, data table, and receiver screen captures. The EUT was tested in a continuous transmit mode with maximum power levels at boost mode.



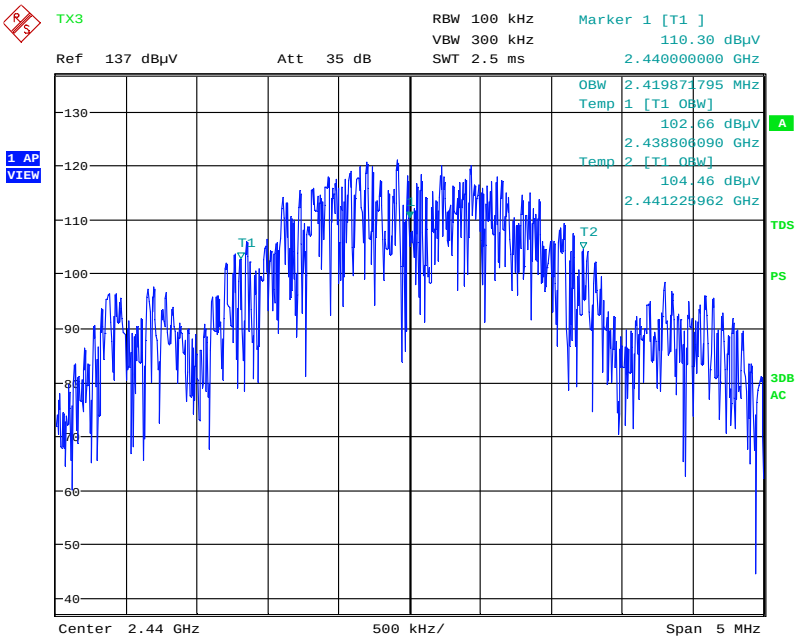
Channel	Frequency (MHz)	99% Bandwidth (MHz)
11	2405	2.4198
18	2440	2.4198
26	2480	2.4359

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

99% Bandwidth, Channel 11:



99% Bandwidth, Channel 18:



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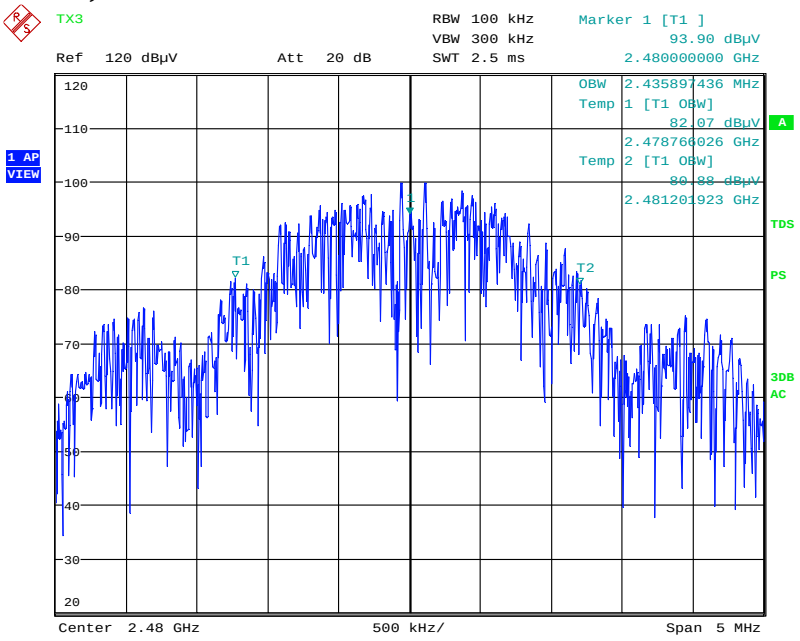
99% Bandwidth, Channel 26:



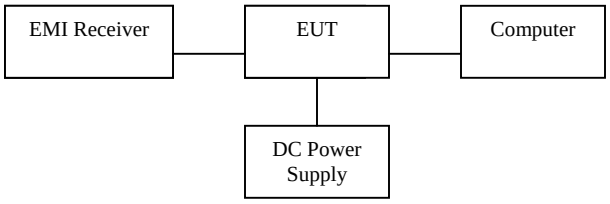
Date: 24.SEP.2010 09:52:01

3.4 Power Output

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

Test Results: Complies

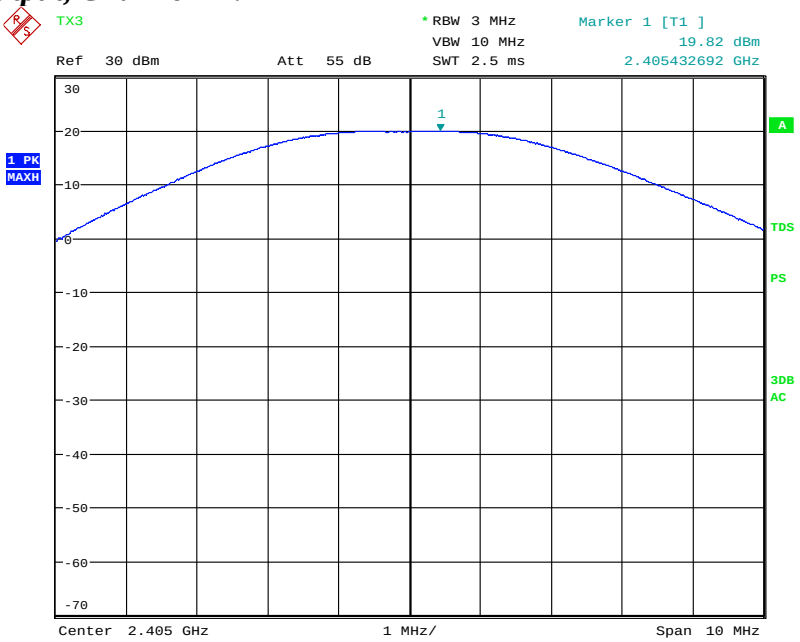
Test Details: The EUT was tested in a continuous transmit mode with maximum power levels at boost mode. Refers to the following block diagram, data table, and receiver screen captures.



Channel	Frequency (MHz)	Power Level	Power	
			dBm	mW
11	2405	0	19.82	95.94
18	2440	253	19.32	85.51
26	2480	230	-2.13	0.61

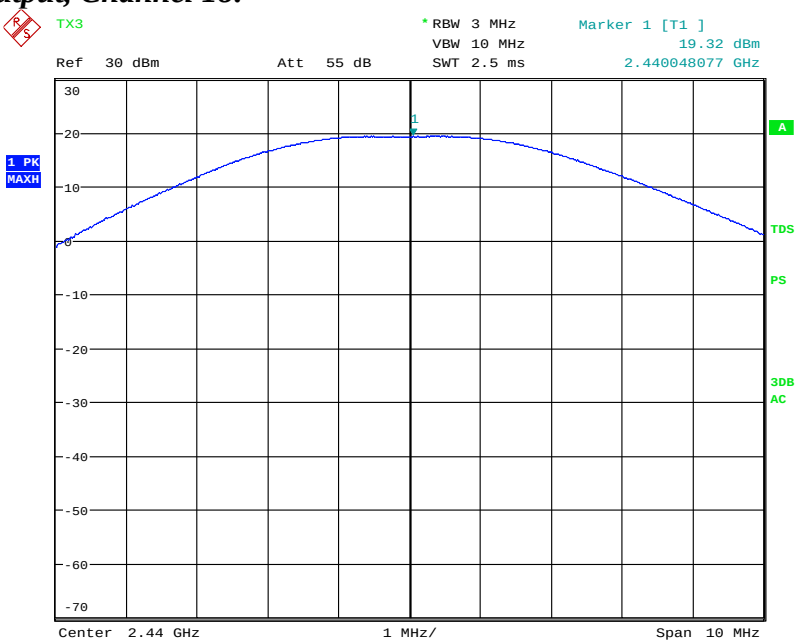
Note: The insertion loss was compensated for in the receiver.

Power Output, Channel 11:



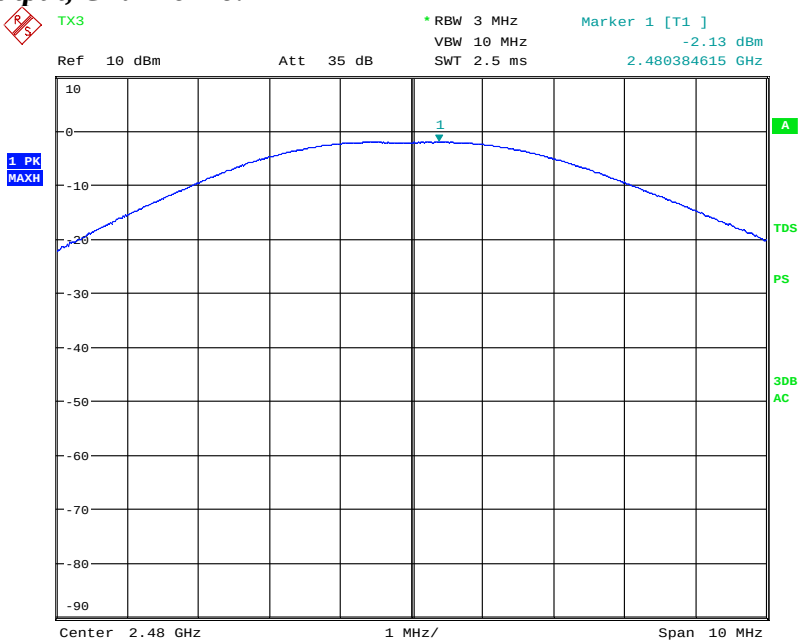
Date: 24.SEP.2010 09:58:49

Power Output, Channel 18:



Date: 24.SEP.2010 09:57:07

Power Output, Channel 26:

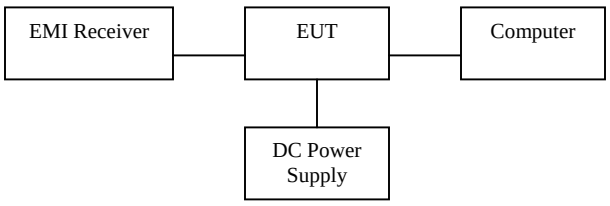


3.5 Band Edge

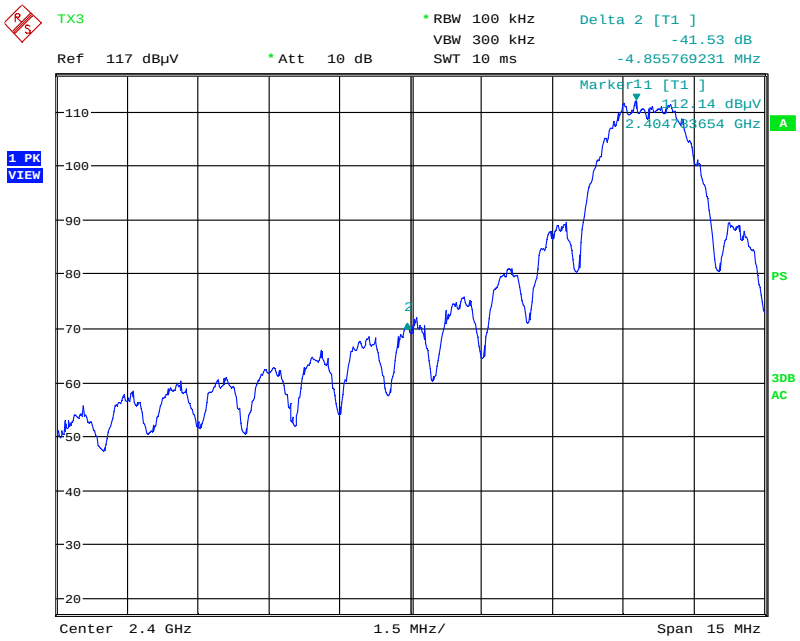
Performance Criterion: In any 100 kHz bandwidth outside the frequency band, the RF power shall be at least 20 dB below that in the 100 kHz bandwidth within the band.

Test Results: Complies

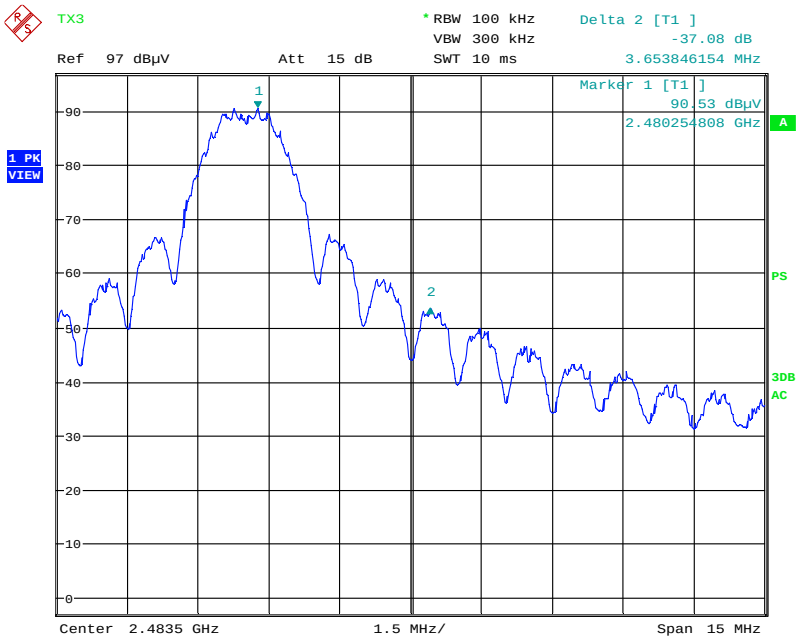
Test Details: Refers to the following block diagram and receiver screen captures



Band Edge:



Date: 24.SEP.2010 10:13:35



Date: 24.SEP.2010 10:04:08

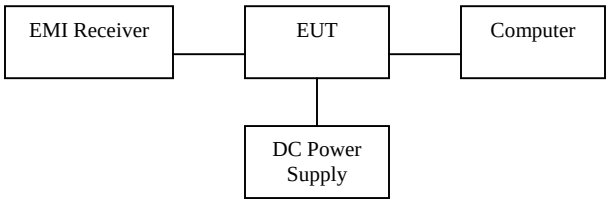
3.6 Conducted Spurious Emissions

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.

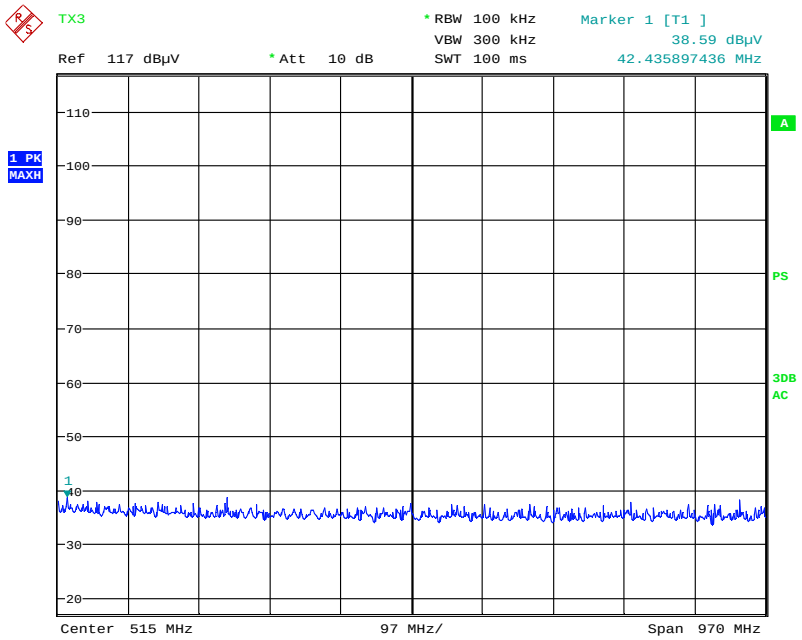
Test Results: Complies

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

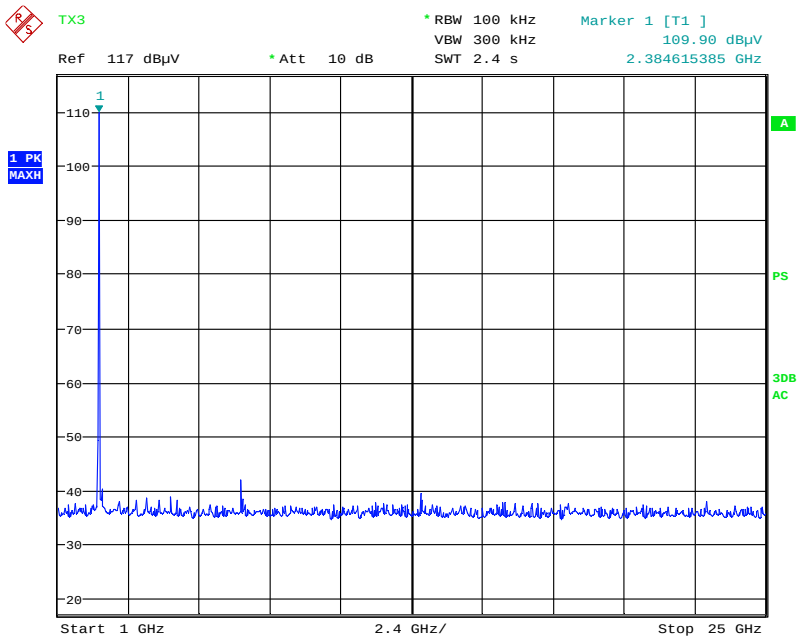
Note: The EUT was tested in a continuous transmit mode with maximum power levels at boost mode. The RF level in the screen captures is relative and is not the indication of RF output power.



Conducted Spurious Emission – Channel 11

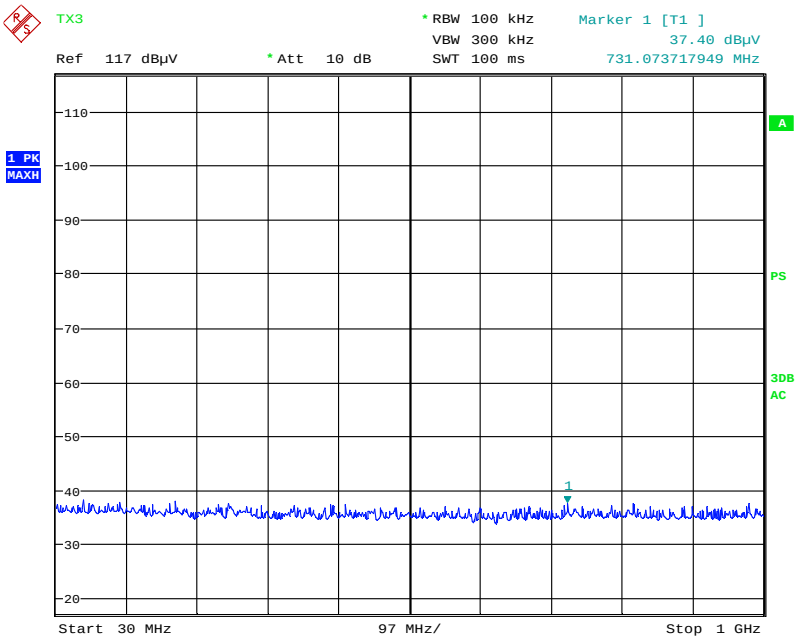


Date: 24.SEP.2010 10:11:17

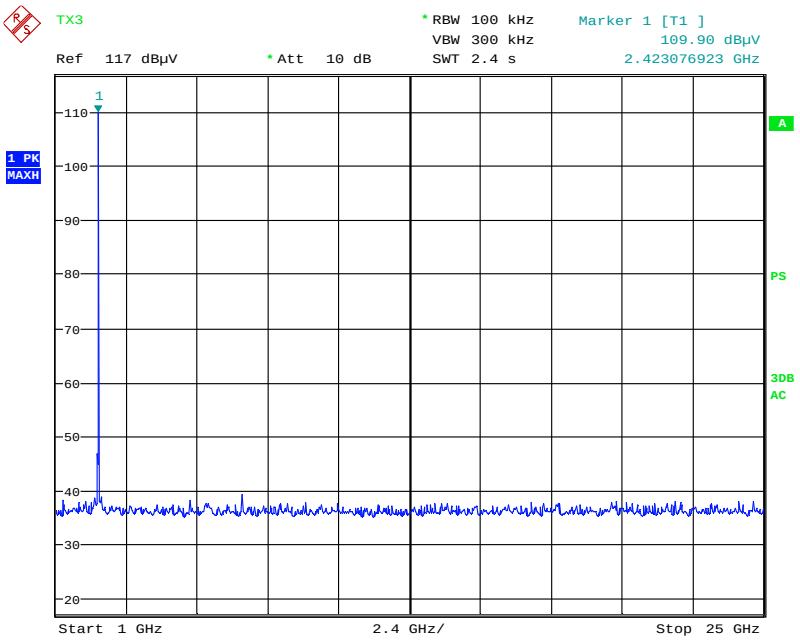


Date: 24.SEP.2010 10:11:53

Conducted Spurious Emission – Channel 18

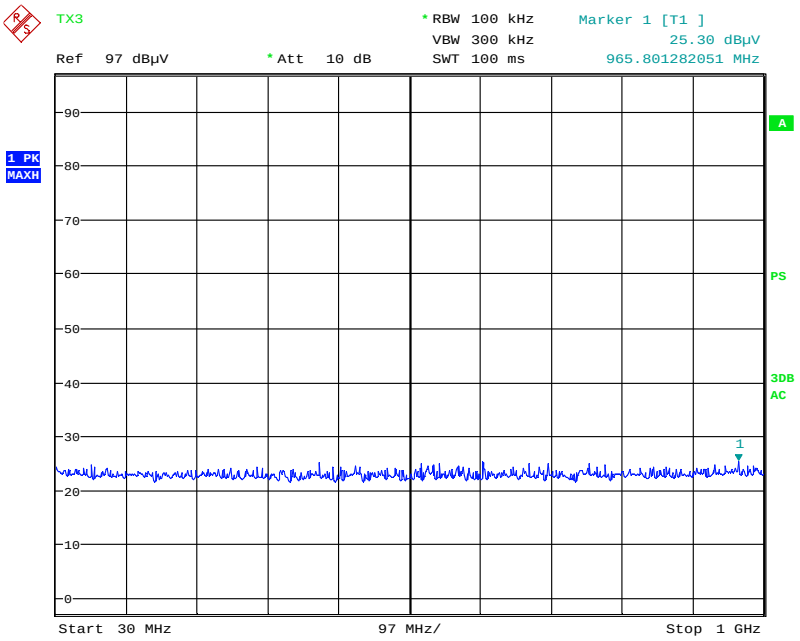


Date: 24.SEP.2010 10:09:33

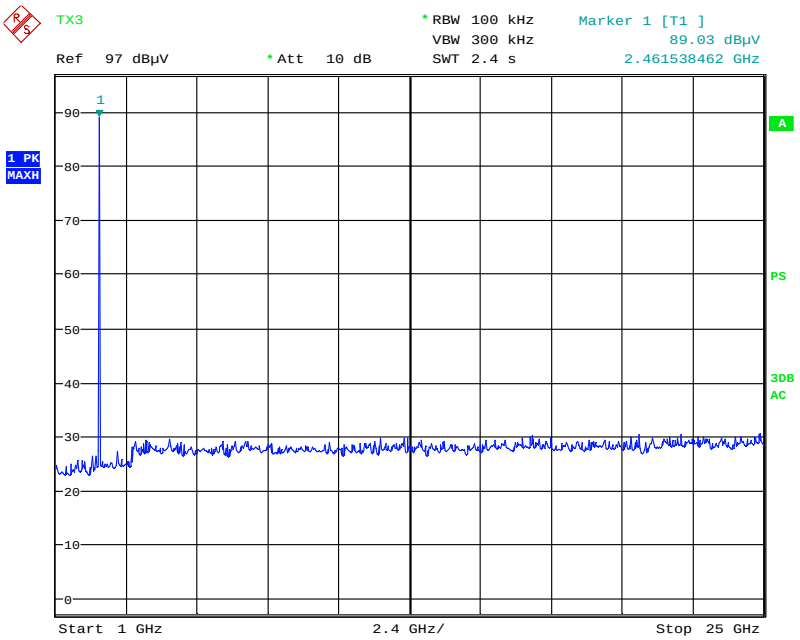


Date: 24.SEP.2010 10:08:59

Conducted Spurious Emission – Channel 26



Date: 24.SEP.2010 10:05:38



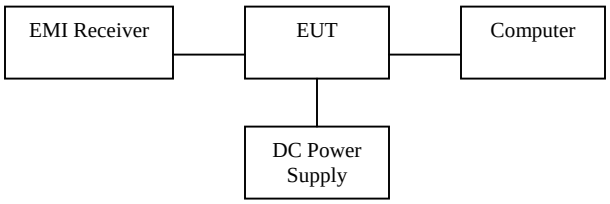
Date: 24.SEP.2010 10:06:40

3.7 Power Spectral Density

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

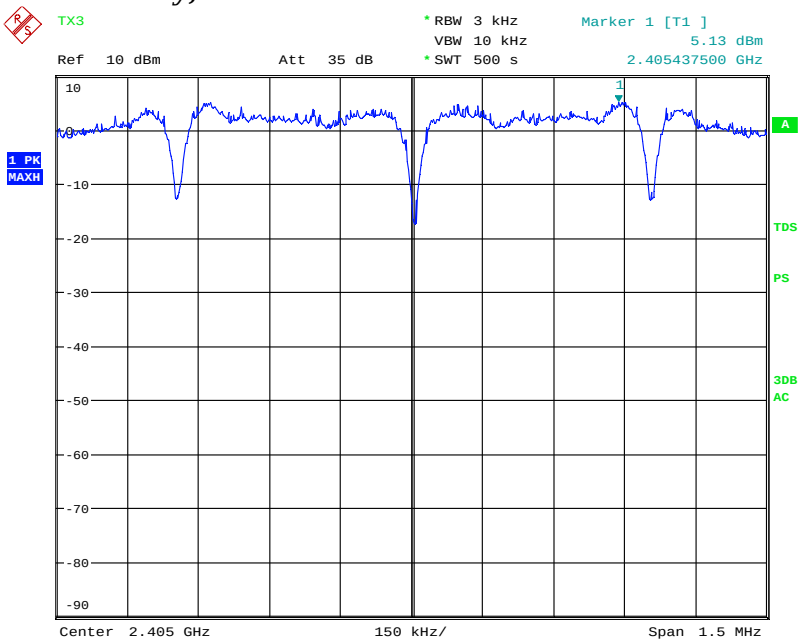
Test Results: Complies

Test Details: The EUT was tested in a continuous transmit mode with maximum power levels of 0 (channels 11 and 18) and 230 (channel 26) at boost mode. Refers to the following table and receiver screen captures. The insertion loss was compensated for in the receiver.



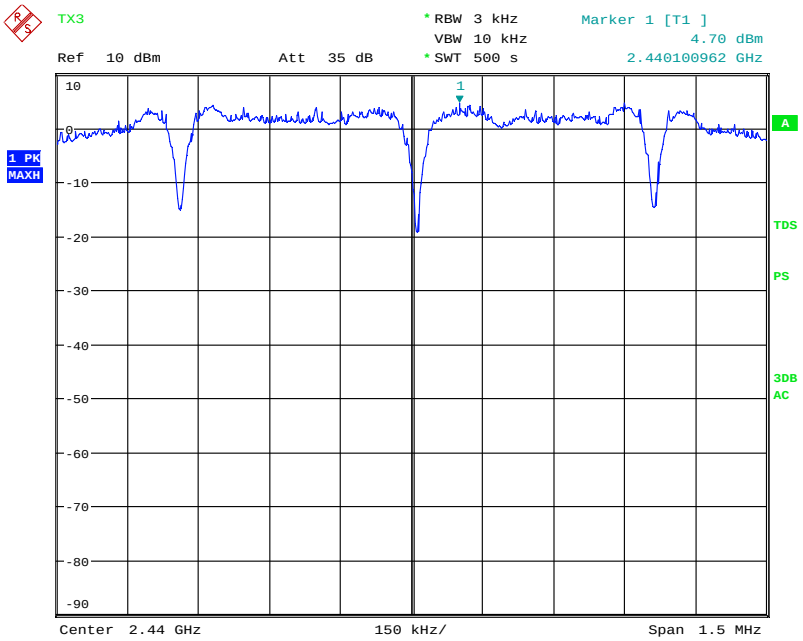
Channel	Frequency (MHz)	Power Spectral Density (dBm)
11	2405	5.13
18	2440	4.70
26	2480	-16.79

Power Spectral Density, Channel 11:



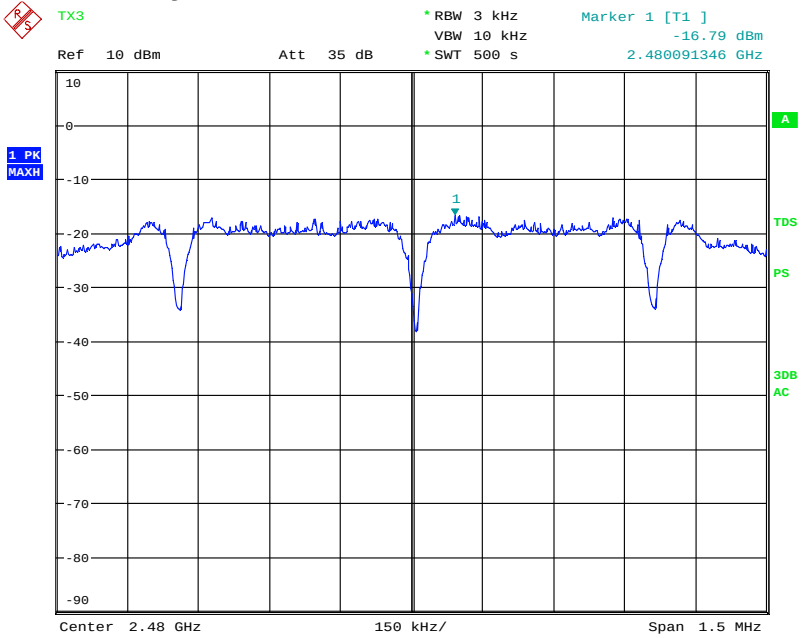
Date: 24.SEP.2010 10:27:28

Power Spectral Density, Channel 18:



Date: 24.SEP.2010 10:37:56

Power Spectral Density, Channel 26:



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-210.

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 1-meter distance between an antenna and the EUT.

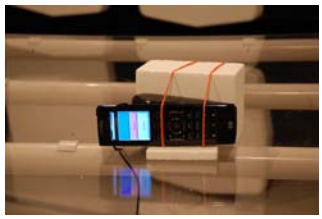
The peak level of radiated emissions above 1 GHz was measured with a resolution bandwidth (RBW) of 1 MHz and a video bandwidth (VBW) of 3 MHz.

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

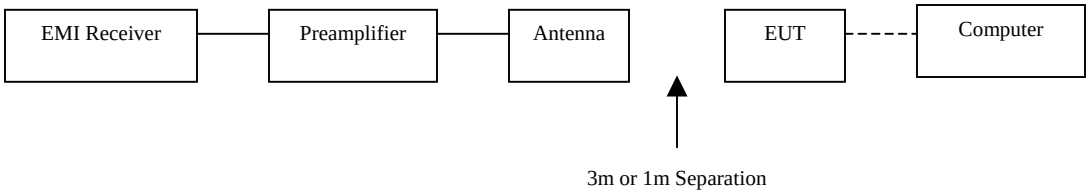
EUT = YZ



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.

Duty cycle calculation and screen shots are included in the Theory of Operation.



TX3, Radiated Spurious Emissions

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	XY	119.39	-	-	-	-	200.4	171.3	AVE
H	2405	11	0	XY	121.89	-	-	-	-	200.4	171.3	PK
H	2390	11	0	XY	58.27	20	38.27	54	15.73	200.4	171.3	AVE
H	2390	11	0	XY	68.63	0	68.63	74	5.37	200.4	171.3	PK
H	4810	11	0	XY	61.58	20	41.58	54	12.42	157.8	310.6	AVE
H	4810	11	0	XY	70.36	0	70.36	74	3.64	157.8	310.6	PK
H	12025	11	0	XY	60.65	20	40.65	54	13.35	168.2	317.2	AVE
H	12025	11	0	XY	72.80	0	72.80	74	1.20	168.2	317.2	PK
H	19240*	11	0	XY	54.09	20	34.09	54	19.91	100.0	0.0	AVE
H	19240*	11	0	XY	65.91	0	65.91	74	8.09	100.0	0.0	PK
H	2440	18	253	XY	118.27	-	-	-	-	195.3	173.1	AVE
H	2440	18	253	XY	120.73	-	-	-	-	195.3	173.1	PK
H	4880	18	253	XY	65.06	20	45.06	54	8.94	141.7	119.3	AVE
H	4880	18	253	XY	73.21	0	73.21	74	0.79	141.7	119.3	PK
H	7320	18	253	XY	59.79	20	39.79	54	14.21	132.4	344.6	AVE
H	7320	18	253	XY	71.57	0	71.57	74	2.43	132.4	344.6	PK
H	12200	18	253	XY	54.19	20	34.19	54	19.81	165.3	315.2	AVE
H	12200	18	253	XY	66.08	0	66.08	74	7.92	165.3	315.2	PK
H	19520*	18	253	XY	46.24	20	26.24	54	27.76	100.0	0.0	AVE
H	19520*	18	253	XY	57.56	0	57.56	74	16.44	100.0	0.0	PK
H	2480	26	230	XY	95.90	-	-	-	-	190.1	178.4	AVE
H	2480	26	230	XY	98.25	-	-	-	-	190.1	178.4	PK
H	2483.5	26	230	XY	61.22	20	41.22	54	12.78	190.1	178.4	AVE
H	2483.5	26	230	XY	72.19	0	72.19	74	1.81	190.1	178.4	PK
H	4960	26	230	XY	42.22	20	22.22	54	31.78	149.7	320.6	AVE
H	4960	26	230	XY	54.59	0	54.59	74	19.41	149.7	320.6	PK
H	7440 (NF)	26	230	XY	33.92	20	13.92	54	40.08	-	-	AVE
H	7440 (NF)	26	230	XY	47.02	0	47.02	74	26.98	-	-	PK
H	12400 (NF)	26	230	XY	39.54	20	19.54	54	34.46	-	-	AVE
H	12400 (NF)	26	230	XY	52.47	0	52.47	74	21.53	-	-	PK
H	19840 (NF)*	26	230	XY	33.75	20	13.75	54	40.25	-	-	AVE
H	19840 (NF)*	26	230	XY	47.13	0	47.13	74	26.87	-	-	PK
H	22320 (NF)*	26	230	XY	34.74	20	14.74	54	39.26	-	-	AVE
H	22320 (NF)*	26	230	XY	47.19	0	47.19	74	26.81	-	-	PK

NF: Noise Floor
*: Tested at 1m

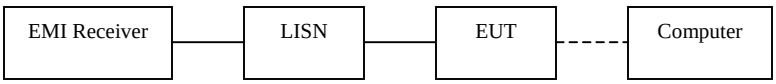
Tested: September 16-17 and 23, 2010
Tested by: Grace Lin

3.9 Transmitter AC Power Line Conducted Emissions

Performance Criterion: AC power line conducted emissions shall not exceed the limits specified in FCC § 15.107 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.



TX, Line 1:

Frequency (MHz)	Measured Level (dBuV)		Limit (dBuV)		Margin (dB)
	Quasi-Peak	Average	Quasi-Peak	Average	
0.234	43.0	36.1	62.3	52.3	16.2
0.410	42.8	36.4	57.7	47.7	11.2
0.585	45.0	37.4	56.0	46.0	8.6
1.112	41.1	33.9	56.0	46.0	12.2
2.166	33.3	28.8	56.0	46.0	17.3
2.875	2.9	35.1	56.0	46.0	10.9

Tested by: Grace Lin Date of Test: September 21, 2010

TX, Line 2:

Frequency (MHz)	Measured Level (dBuV)		Limit (dBuV)		Margin (dB)
	Quasi-Peak	Average	Quasi-Peak	Average	
0.468	40.6	31.3	58.3	48.3	17.7
0.525	41.8	36.1	56.0	46.0	14.3
0.584	44.9	36.8	56.0	46.0	11.1
0.760	41.0	32.2	56.0	46.0	15.0
1.226	39.7	33.4	56.0	46.0	16.3
1.342	36.3	28.2	56.0	46.0	17.8

Tested by: Grace Lin Date of Test: September 21, 2010

3.10 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

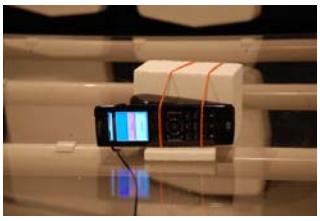
Test Details: Radiated emission was performed from 30 MHz to the fifth harmonics of the carrier. For each scan of radiated emission measurement, the procedures for maximizing emissions were followed. The EUT was rotated and antenna height was varied between 1 m and 4 m in order to maximize the emission. 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).

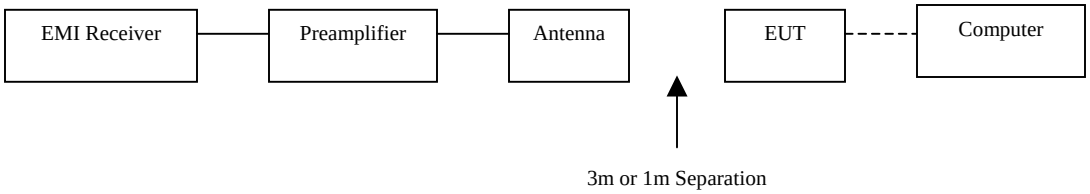
EUT = XY

EUT = YZ



EUT = ZX

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



TX3, Receiver

Antenna Polarization	Frequency (MHz)	Channel No.	EUT Orientation	Measured Data (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Antenna Height (cm)	Turntable Degree	Detector
V	180.0	18	YZ	37.1	43.5	6.4	100.0	44.8	QP
V	192.1	18	YZ	37.6	43.5	5.9	100.0	55.9	QP
H	329.3	11	XY	33.1	46	12.9	100.0	310.6	QP
V	540.0	18	YZ	35.4	46	10.6	100.0	46.4	QP
V	1560.0	18	ZX	34.1	54	19.9	100.0	47.1	AVE
V	4872.0	18	ZX	41.9	54	12.1	135.7	292.6	AVE

Tested by: Grace Lin

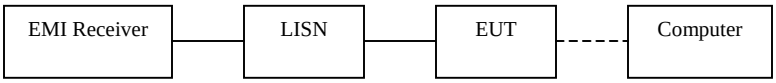
Dates of Test: September 20 and 23, 2010

3.11 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.



RX, Line 1:

Frequency (MHz)	Measured Level (dBuV)		Limit (dBuV)		Margin (dB)
	Quasi-Peak	Average	Quasi-Peak	Average	
0.292	42.3	35.5	60.5	50.5	15.0
0.583	45.8	38.4	56.0	46.0	7.6
0.642	43.3	35.3	56.0	46.0	10.7
1.284	44.4	36.2	56.0	46.0	9.8
2.335	38.8	30.3	56.0	46.0	15.7
2.627	40.3	33.1	56.0	46.0	12.9

Tested by: Grace Lin Date of Test: September 21, 2010

RX, Line 2:

Frequency (MHz)	Measured Level (dBuV)		Limit (dBuV)		Margin (dB)
	Quasi-Peak	Average	Quasi-Peak	Average	
0.584	43.7	37.4	58.3	48.3	14.6
0.642	45.8	37.5	56.0	46.0	10.2
0.758	43.2	35.7	56.0	46.0	12.8
0.817	41.6	30.5	56.0	46.0	14.4
1.284	39.4	33.2	56.0	46.0	16.6
2.101	38.6	30.0	56.0	46.0	16.0

Tested by: Grace Lin Date of Test: September 21, 2010