DTS EMISSIONS TEST REPORT FOR A LOW POWER TRANSMITTER

I. GENERAL INFORMATION

Requirement:	FCC, IC
Test Requirements:	FCC Part 15, RSS-Gen, RSS-210

Applicant:	Silver Spring Networks 575 Broadway Street Redwood City, CA 94063

FCC ID:	**OWS-NIC714**
IC:	**5975A-NIC714**
Model No.:	NIC414

II. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

The Silver Spring Networks (SSN) model NIC414 is a radio module for electric power meter communications use. The board incorporates a 900 MHz frequency hopping mesh network radio a 2.4 GHz frequency hopping radio, and a 2.4GHz 802.15.4 Zigbee Home Area Network (HAN) radio.

III. TEST DATES AND TEST LOCATION

Testing was performed on various dates between 18 April 2011 and 7 March 2012.

Radiated emissions and AC Line Conducted Emissions:

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538

Radiated emissions and antenna port conducted emissions:

BACL Laboratories
1274 Anvilwood Ave.
Sunnyvale, CA 94089

Antenna port conducted emissions tests were performed at Silver Spring Networks.

T.N. Cokenias 14 June 2012
EMC Consultant/Agent for Silver Spring Networks

15.203 Antenna connector requirement

The EUT uses a custom permanently attached integral antenna, a special sheet metal antenna manufactured by Silver Spring Networks for electric meters. There is also an optional external antenna that can be used with this radio.

Antenna description	Mfr.	Model No.	Gain
Built-in sheet metal electric meter	SSN	n/a	4 dBi at 915 MHz 1 dBi at 2.4 GHz
External monopole antenna (omni)	SSN		3 dBi at 915 MHz 3.6 dBi at 2.4 GHz

TEST PROCEDURES

All tests were performed in accordance with the applicable procedures called out in the following documents, unless otherwise noted:

FCC 47CFR15

RSS-Gen Issue 3: General Requirements and Information for the Certification of Radio Apparatus

KDB 558074 D01 Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating under 15.247

RSS-210 Issue 8: Low power license exempt radio frequency devices
RSS-212: Test Facilities and Test Methods for Radio Equipment

ANSI C63.4 – 2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.

Laboratory Accreditation Information

<u>UL CCS</u>
2.948 FCC: Registration Number: 152170
Industry Canada Test Site: 2324B
Accrediting Body: NVLAP

<u>BACL</u>
2.948 FCC Registration Number: 90464
Industry Canada Test Site Registration Number: 3062A
Accrediting Body: A2LA

Test Equipment

Compliance Certification Services:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07/16/12
PSA Series Spectrum Analyzer	Agilent / HP	E4440A	C01179	04/28/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	07/12/12
Horn Antenna	EMCO	3115	C00945	06/30/12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	11/11/12
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/11/12
LISN, 30 MHz	Solar	8012-50-R-24-BNC	N02481	11/20/12

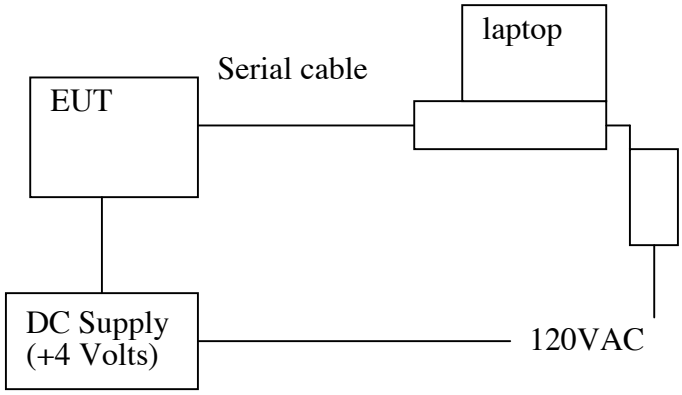
Silver Spring Networks:

Equipment	Mfr	Model	Serial No.	Cal Due
Spectrum analyzer	Agilent	E4405B	MY45113391	01/23/13
Spectrum analyzer	Agilent	N9030A	MY48030147	01/23/13
Spectrum Analyzer	HP	8652B	2712A00113	9/28/12

BACL

Manufacturer	Description	Model No.	Serial No.	Calibration Date
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2012-03-22
Agilent	Spectrum Analyzer	E4440A	MY44303352	2012-05-10
Sunol Science Corp	System Controller	SC99V	122303-1	N/R
Sunol Science Corp	Combination Antenna	JB3	A0020106-3	2011-06-29
EMCO	Horn antenna	3115	9511-4627	2011-10-03
Hewlett Packard	Pre amplifier	8447D	2944A06639	2012-06-09
Mini-Circuits	Pre Amplifier	ZVA-183-S	570400946	2012-05-09

Test Set-up Diagram



Support Equipment

Equipment	Mfr	Model	Asset No.
DC Power Supply	Agilent	E3610A	2844
Laptop PC	Dell	PP01L	TW-0791UH1280-OC9-6558
AC/DC adapter	CUI Inc.	DSA-60W-20	2607HB

2.4 GHz HAN Radio Emissions Test Results

TEST RESULTS
Radiated Test Set-up, 30-25 GHz

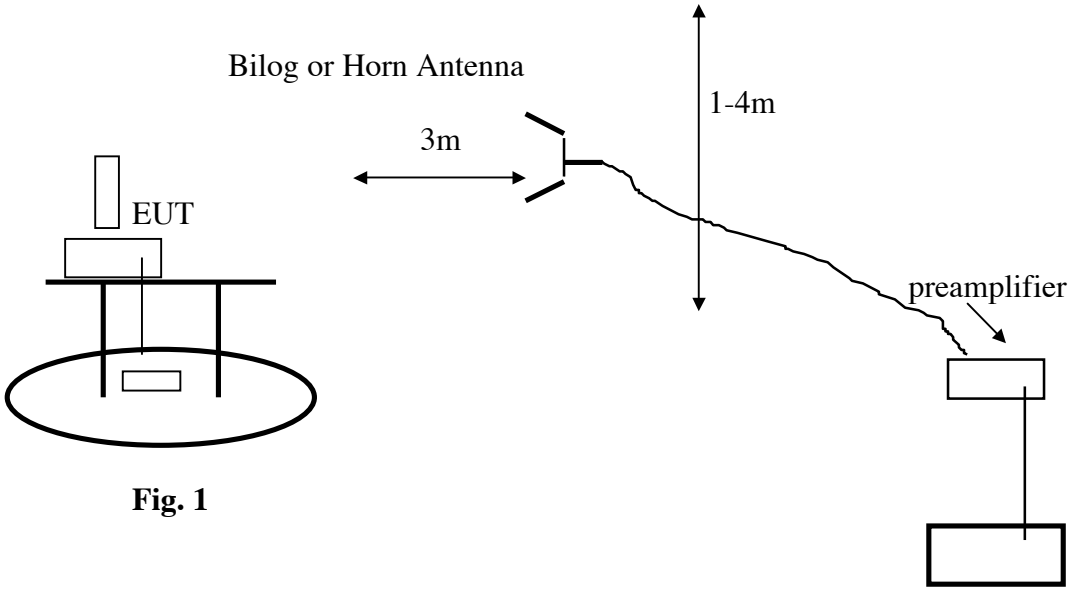


Fig. 1

Test Procedures

Radiated emissions generated by the transmitter portion of the EUT were measured.

1. The EUT was placed on a wooden table resting on a turntable on the test site.
The search antenna was placed 3m from the EUT. The EUT antenna was mounted in the with the EUT TX antenna pointed directly to the search antenna.

2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.

3. Emissions were investigated to the 10^{th} harmonic of the fundamental.

4. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

Test Results: Worst-case results are presented. Refer to data sheets below. Restricted band emissions meet 54 dBuV/m. Other undesired emissions from the transmitter meet the -20 dBc requirement in 15.247(d).

15.205 Restricted Frequency Bands

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

15.209 General Field Strength Limits

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F (kHz)	30
1.705 - 30.0	30	30
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

2.4 GHz HAN Radiated Spurious

Internal antenna

Project number: T120221 and T1202222
Frequency: 2.4GHz
Measurement: Radiated Emissions above 1GHz
Date: 02-22-2012
Tester: Quinn Jiang
Mode: Direct Sequence

Zigbee: internal antenna

Low: chan 11

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna Height (cm)	Test Antenna Polarity (H/V)	Test Antenna Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)	Comments		
Low channel 2405MHz measured at 3 meters													
4810	40.17	352	100	V	32.6	4.56	27.70	49.63	74	-24.37	peak	ats:112=13	internal antenna
4810	38.41	35	100	H	32.6	4.56	27.70	47.87	74	-26.13	peak	ats:112=13	internal antenna
4810	29.49	352	100	V	32.6	4.56	27.70	38.95	54	-15.05	Ave	ats:112=13	internal antenna
4810	27.59	35	100	H	32.6	4.56	27.70	37.05	54	-16.95	Ave	ats:112=13	internal antenna

7210 Mhz: approx 36 dbuv (peak, prescan)

Mid: chan 18

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna Height (cm)	Test Antenna Polarity (H/V)	Test Antenna Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)	Comments		
Mid channel 2440MHz measured at 3 meters													
4880	41.88	341	100	V	32.8	4.56	27.70	51.54	74	-22.46	peak	ats:112=13	internal antenna
4880	39.72	35	100	H	32.8	4.56	27.70	49.38	74	-24.62	peak	ats:112=13	internal antenna
4880	31.07	341	100	V	32.8	4.56	27.70	40.73	54	-13.27	Ave	ats:112=13	internal antenna
4880	28.86	35	100	H	32.8	4.56	27.70	38.52	54	-15.48	Ave	ats:112=13	internal antenna

no 3rd

High: chan 26

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna Height (cm)	Test Antenna Polarity (H/V)	Test Antenna Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)	Comments		
High channel 2480MHz measured at 3 meters													
4960	42.45	254	110	V	33.0	4.56	27.70	52.31	74	-21.69	peak	ats:112=13	internal antenna
4960	40.46	210	110	H	33.0	4.56	27.70	50.32	74	-23.68	peak	ats:112=13	internal antenna
4960	31.9	254	110	V	33.0	4.56	27.70	41.76	54	-12.24	Ave	ats:112=13	internal antenna
4960	29.7	210	110	H	33.0	4.56	27.70	39.56	54	-14.44	Ave	ats:112=13	internal antenna

External antenna

Project number: T120221 and T1202222
Frequency: 2.4GHz
Measurement: Radiated Emissions above 1GHz
Date: 02-22-2012
Tester: Quinn Jiang
Mode: Direct Sequence

Zigbee: external antenna

Low: chan 11

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna Height (cm)	Test Antenna Polarity (H/V)	Test Antenna Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)	Comments		
Low channel 2405MHz measured at 3 meters													
4810	45.69	340	105	V	32.6	4.56	27.70	55.15	74	-18.85	peak	ats:112=13	external ante
4810	37.6	31	103	H	32.6	4.56	27.70	47.06	74	-26.94	peak	ats:112=13	external ante
4801	35.51	340	105	V	32.6	4.56	27.70	44.97	54	-9.03	Ave	ats:112=13	external ante
4810	25.93	31	103	H	32.6	4.56	27.70	35.39	54	-18.61	Ave	ats:112=13	external ante

Mid: chan 18

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna Height (cm)	Test Antenna Polarity (H/V)	Test Antenna Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)	Comments		
Mid channel 2440MHz measured at 3 meters													
4880	41.6	351	102	V	32.8	4.56	27.70	51.26	74	-22.74	peak	ats:112=13	external ante
4880	39.3	204	100	H	32.8	4.56	27.70	48.96	74	-25.04	peak	ats:112=13	external ante
4880	30.96	351	102	V	32.8	4.56	27.70	40.62	54	-13.38	Ave	ats:112=13	external ante
4880	28.45	204	100	H	32.8	4.56	27.70	38.11	54	-15.89	Ave	ats:112=13	external ante
7321	37.53	200	101	V	36.0	5.57	27.90	51.20	74	-22.80	peak	ats:112=13	external ante
7321	34.46	207	101	H	36.0	5.57	27.90	48.13	74	-25.87	peak	ats:112=13	external ante
7321	26.28	200	101	V	36.0	5.57	27.90	39.95	54	-14.05	Ave	ats:112=13	external ante
7321	22.81	207	101	H	36.0	5.57	27.90	36.48	54	-17.52	Ave	ats:112=13	external ante

High: chan 26

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna Height (cm)	Test Antenna Polarity (H/V)	Test Antenna Factor (dB/m)	Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC Limit (dBµV/m)	FCC Margin (dB)	Comments		
High channel 2480MHz measured at 3 meters													
4960	43.08	160	101	V	33.0	4.56	27.70	52.94	74	-21.06	peak	ats:112=13	external ante
4960	40.43	210	101	H	33.0	4.56	27.70	50.29	74	-23.71	peak	ats:112=13	external ante
4960	32.48	160	101	V	33.0	4.56	27.70	42.34	54	-11.66	Ave	ats:112=13	external ante
4960	29.88	210	101	H	33.0	4.56	27.70	39.74	54	-14.26	Ave	ats:112=13	external ante

no 3rd

Radiated Bandedge Emissions

Internal antenna and External antenna

Company: Silver Spring Network
Project number: T1112194
Frequency: 2.4GHz
measurement: Radiated Restrcited Bandedge
Date: 12-19-2011
Tester: Quinn Jiang
Mode: Direct Sequence

Zigbee: internal antenna

Low: chan 11

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments		
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)			
Low channel 2405 MHz measured at 3 meters													
2390	32.87	332	133	V	28.1	3.12	0.0	64.09	74	-9.91	peak	ats:112=13	internal anten
2390	34.84	360	133	H	28.1	3.12	0.0	66.06	74	-7.94	peak	ats:112=13	internal anten
2390	20.90	332	133	V	28.1	3.12	0.0	52.12	54	-1.88	Ave	ats:112=13	internal anten
2390	22.52	360	133	H	28.1	3.12	0.0	53.74	54	-0.26	Ave	ats:112=13	internal anten

High: chan 26

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments		
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)			
High channel 2480 MHz measured at 3 meters													
2483.5	30.18	37	133	V	28.4	3.25	0.0	61.83	74	-12.17	peak	ats:112=6	internal anten
2483.5	32.18	354	127	H	28.4	3.25	0.0	63.83	74	-10.17	peak	ats:112=6	internal anten
2483.5	19.56	37	133	V	28.4	3.25	0.0	51.21	54	-2.79	Ave	ats:112=6	internal anten
2483.5	22.04	354	127	H	28.4	3.25	0.0	53.69	54	-0.31	Ave	ats:112=6	internal anten

Zigbee: external antenna

Low: chan 11

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments		
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)			
Low channel 2405 MHz measured at 3 meters													
2390	34.10	29	129	V	28.1	3.12	0.0	65.32	74	-8.68	peak	ats:112=10	external anter
2390	26.45	130	154	H	28.1	3.12	0.0	57.67	74	-16.33	peak	ats:112=10	external anter
2390	21.56	29	129	V	28.1	3.12	0.0	52.78	54	-1.22	Ave	ats:112=10	external anter
2390	13.78	130	154	H	28.1	3.12	0.0	45.00	54	-9.00	Ave	ats:112=10	external anter

High: chan 26

Frequency (MHz)	S.A. Reading (dBµV)	Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC		Comments		
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)			
High channel 2480 MHz measured at 3 meters													
2483.5	31.59	31	126	V	28.4	3.25	0.0	63.24	74	-10.76	peak	ats:112=4	external anter
2483.5	26.18	127	125	H	28.4	3.25	0.0	57.83	74	-16.17	peak	ats:112=4	external anter
2483.5	21.42	31	126	V	28.4	3.25	0.0	53.07	54	-0.93	Ave	ats:112=4	external anter
2483.5	13.52	127	125	H	28.4	3.25	0.0	45.17	54	-8.83	Ave	ats:112=4	external anter

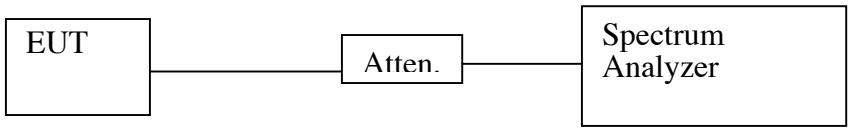
Radiated Emissions 30-1000 MHz

Internal antenna and External antenna

All transmitter emissions were at least 20 dB below limits

6dB Bandwidth for DTS
Test Requirement: FCC: 15.247 (a) 2
IC: RSS-210 Sec. 6.2.2(o)(iv)
99% Occupied Bandwidth
Test Requirement: None, information only

Test Set-up



Test Procedures

The transmitter output is connected to a spectrum analyzer via coaxial cable with appropriate attenuation.

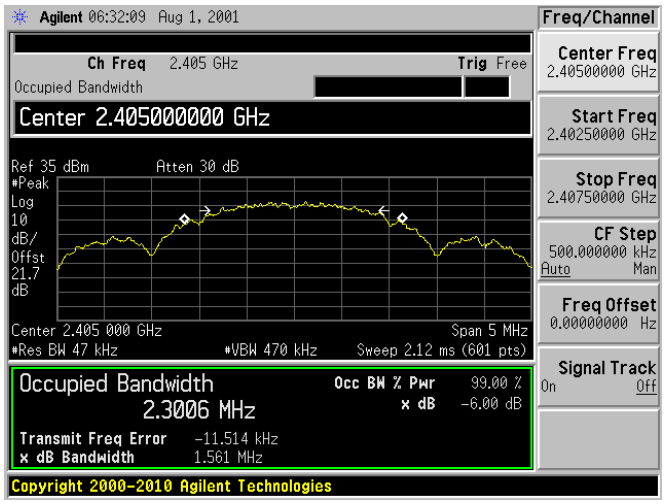
RBW = 1- 5% EBW
VBW> 3xRBW
Detector: PEAK

Test Results. No non-compliance noted. Refer to data sheets below.

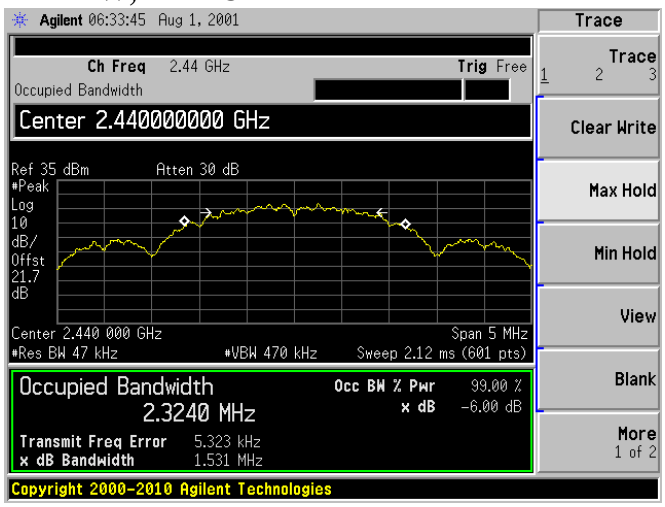
Minimum 6 dB BW: 1.531 MHz
Minimum Required: 500 kHz

Frequency, MHz	6 dB BW, MHz
2405 (Low)	1.561
2440 (Mid)	1.531
2480 (High)	1.677

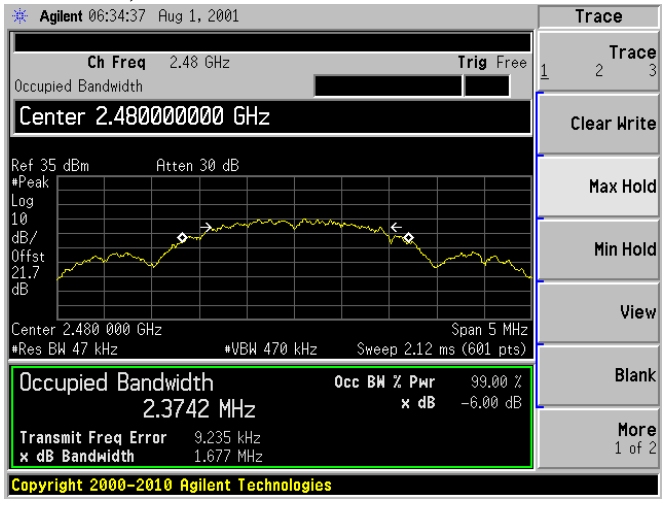
6dB Bandwidth LOW Channel



6 dB BW, MID Channel



6 dB BW, HIGH Channel



99% Occupied Bandwidth

Test Procedures

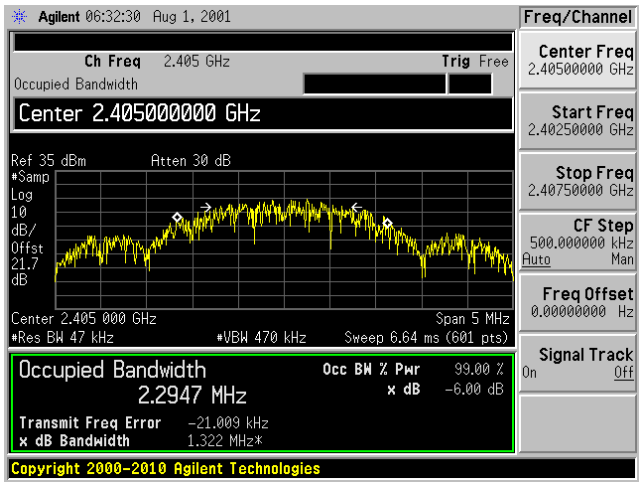
The transmitter output is connected to a spectrum analyzer via coaxial cable with appropriate attenuation.

RBW = 1- 5% EBW
VBW> 3xRBW
Detector: SAMPLE

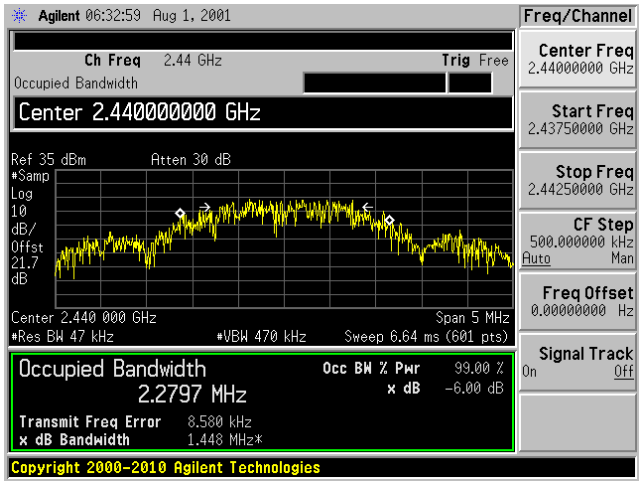
Test Results. No non-compliance noted. Refer to data sheets below.

Frequency, MHz	99% BW, MHz
2405 (Low)	2.29
2440 (Mid)	2.28
2480 (High)	2.32

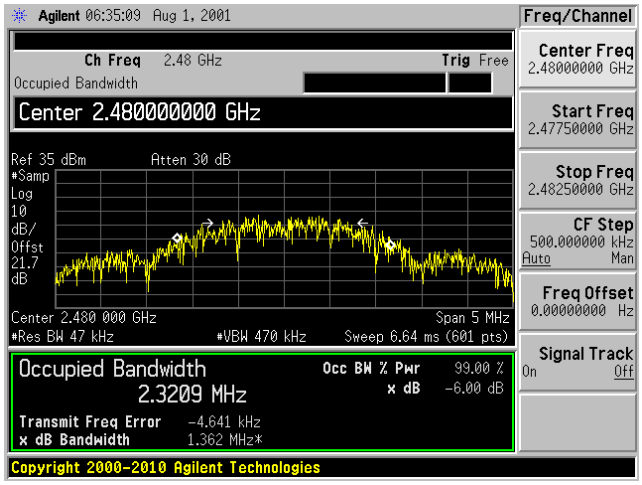
99% BW LOW Channel



99% BW MID Channel

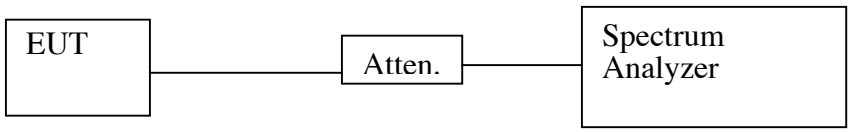


99% BW HIGH Channel



RF Power Output
Test Requirement: FCC: 15.247(b)
IC: RSS-210 Sec. 6.2.2(o)(iv)

Test Setup



Test Procedures

Measurement Procedure PK1:

RBW ≥ EBW.
VBW ≥ 3 x RBW.
SPAN = zero.
Sweep time = auto couple.
Detector = peak.
Trace mode = max hold.
Allow trace to fully stabilize.

Use peak marker function to determine the peak amplitude level within the fundamental emission.

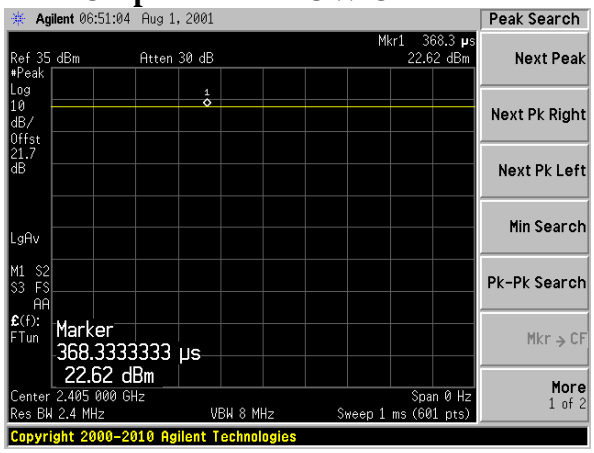
Test Results

Refer to spectrum analyzer graphs. Reference level offset corrects for external attenuation and cable loss.

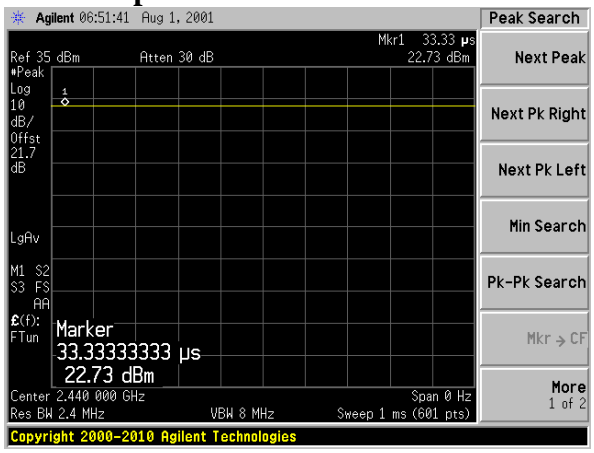
Channel	**Frequency, MHz**	**Output Power, dBm**
Low	2405	22.62 (ats112=12)
Mid	2440	22.73 (ats112=12)
High	2480	10.39 (ats112=6)

Note: High channel power is limited by restricted band emissions requirement at 2483.5-2500 MHz. Firmware power settings are listed beside each channel.

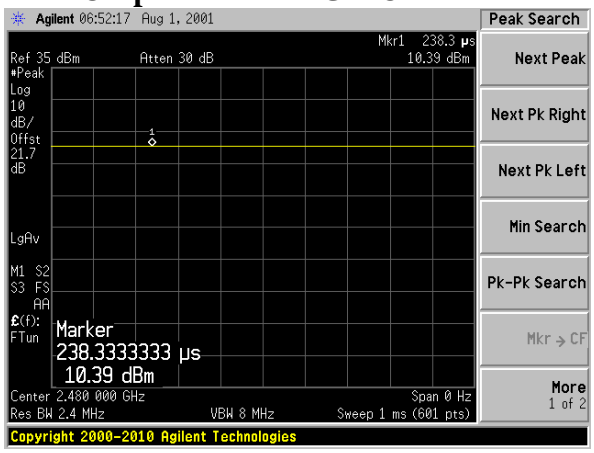
Peak Output Power LOW Channel



Peak Output Power MID Channel

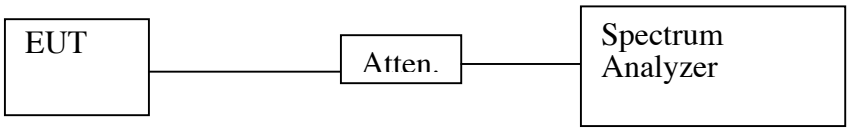


Peak Output Power HIGH Channel



Spurious Emissions, Conducted
Test Requirement: FCC: 15.247(d)
IC: RSS-210 Sec. 6.2.2(o)(e1)

Test Setup



Test Procedure

1. The EUT was configured on a test bench. The cable was connected between the EUT antenna port and the spectrum analyzer input port.

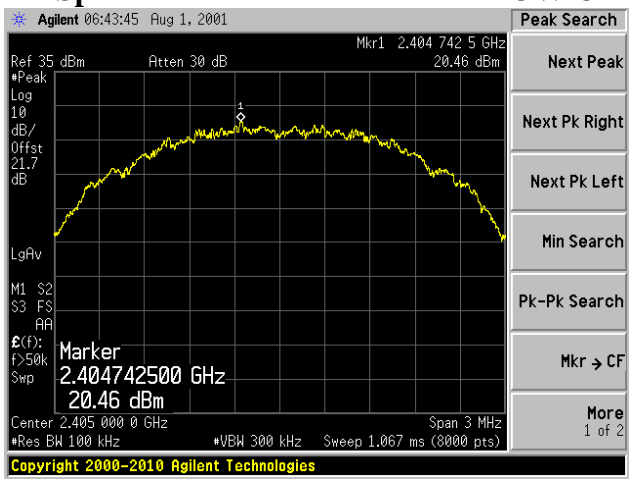
Spectrum analyzer RES BW was set to 100 kHz. While the transmitter broadcast a steady stream of digital data, the analyzer MAX HOLD function was used to capture the envelope of the transmission.

Readings were taken out to 10fo.

Test Results

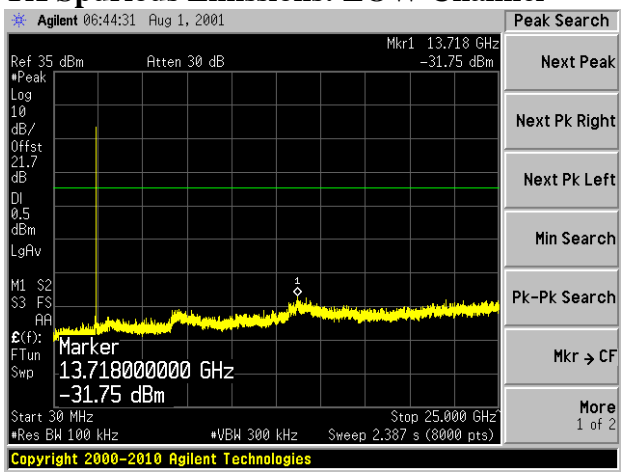
Refer to spectrum analyzer plots. Data shows out of band emissions are suppressed well below the -20 dBc minimum required by the Rules.

TX Spurious Emissions: Reference LOW Channel

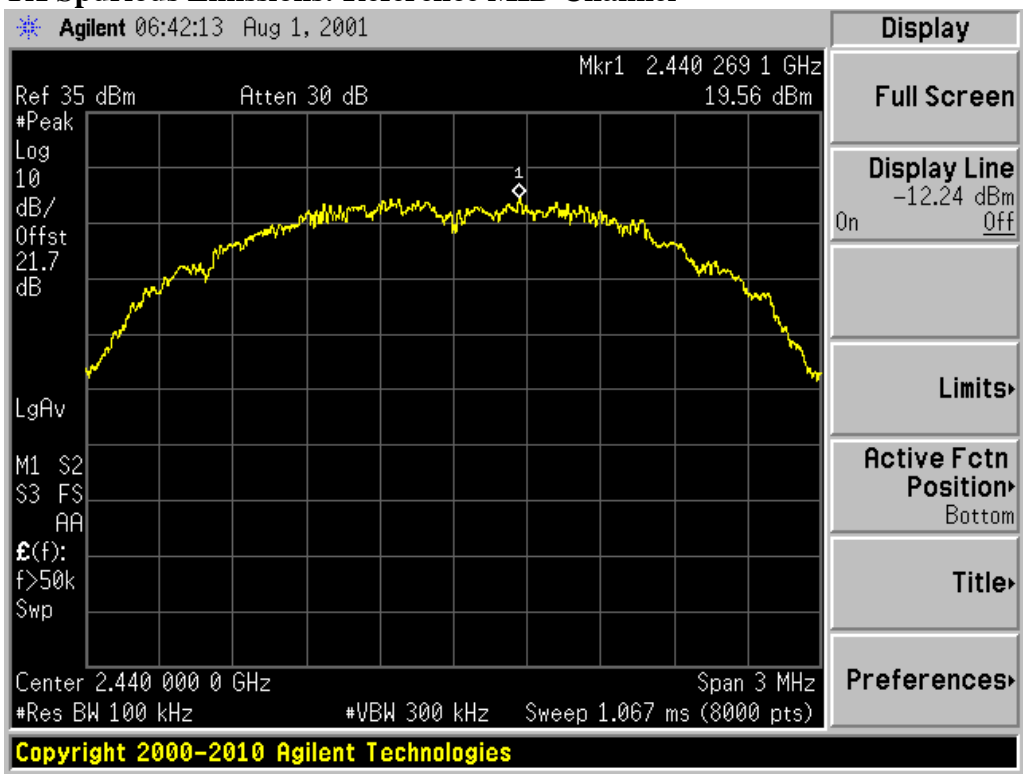


TX Spurious Emissions: LOW Channel Bandedge

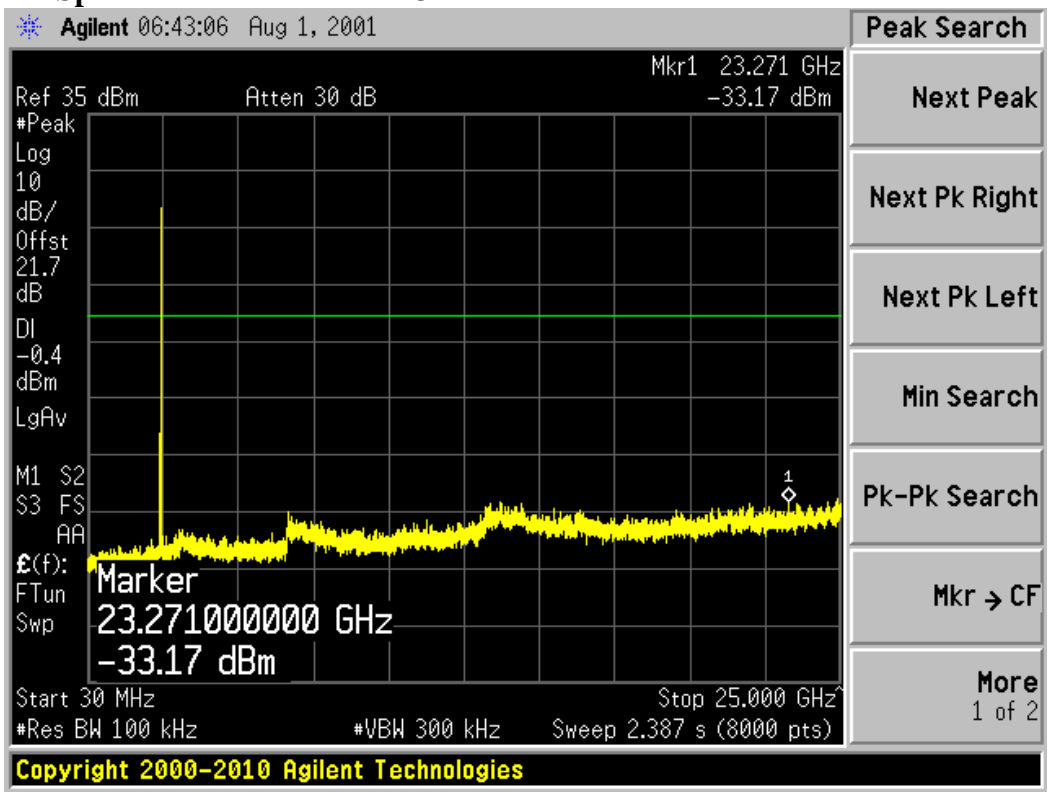
TX Spurious Emissions: LOW Channel



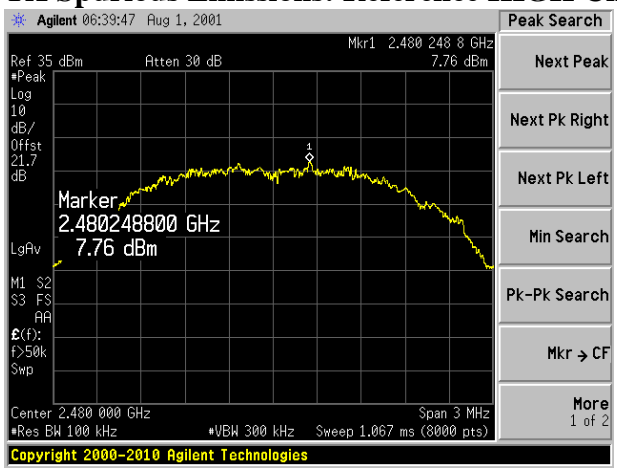
TX Spurious Emissions: Reference MID Channel



TX Spurious Emissions:MID Channel

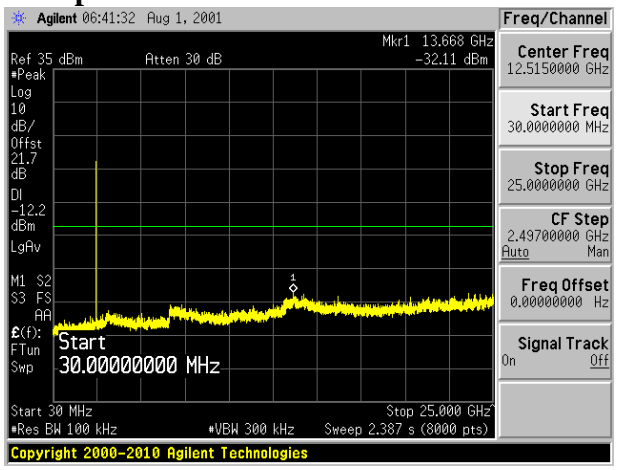


TX Spurious Emissions: Reference HIGH Channel



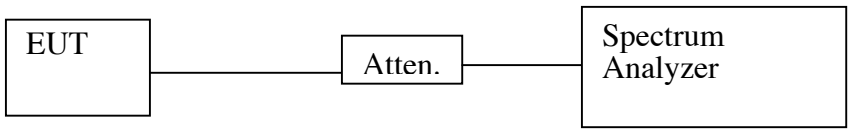
TX Spurious Emissions: HIGH Channel Bandedge

TX Spurious Emissions: HIGH Channel



Power Spectral Density
Test Requirement: 15.247(e)
RSS-210 Sec. 6.2.2(o)(iv)

Test Setup



Test Procedure
Measurement Procedure PKPSD:

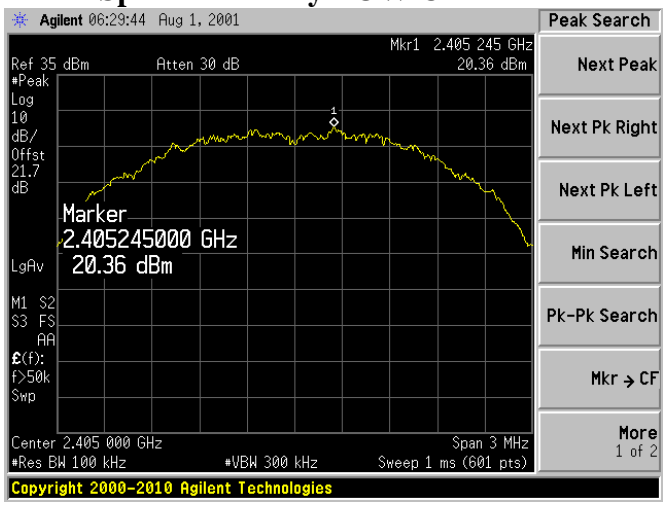
1. Use this procedure when the maximum peak conducted output power in the fundamental emission is used to demonstrate compliance.
2. Set the RBW = 100 kHz.
3. Set the VBW ≥ 300 kHz.
4. Set the span to 5-30 % greater than the EBW.
5. Detector = peak.
6. Sweep time = auto couple.
7. Trace mode = max hold.
8. Allow trace to fully stabilize.
9. Use the peak marker function to determine the maximum power level in any 100 kHz band segment within the fundamental EBW.
10. Scale the observed power level to an equivalent value in 3 kHz by adjusting (reducing) the measured power by a bandwidth correction factor (BWCF) where BWCF = 10log (3 kHz/100 kHz = -15.2 dB).
11. The resulting peak PSD level must be ≤ 8 dBm.

Test Results

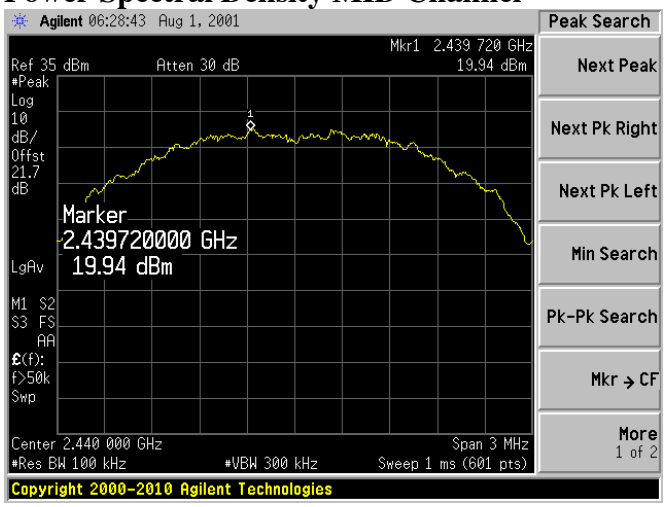
Maximum PSD is for LOW channel: (20.26 -15.2) dBm = 5.06 dBm.

Refer to attached spectrum analyzer plots.

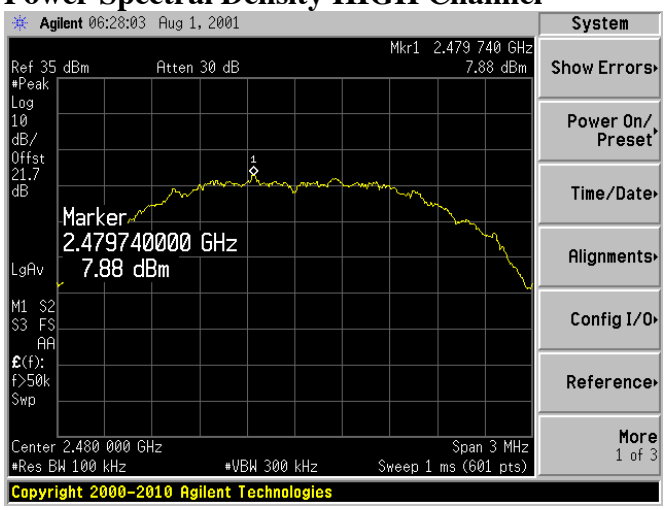
Power Spectral Density LOW Channel



Power Spectral Density MID Channel



Power Spectral Density HIGH Channel



RF Exposure (MPE) Calculations

Silver Spring Networks										
FCC ID: OWS-NIC714										
IC: 5975A- NIC714										
Dual 900 MHz FHSS/2.4 GHz DTS radio module						**Calculate mW/cm2 here. Enter frequency in MHz:**				
RF Hazard Distance Calculation						Calculation of Limits from 1.1310 Table 1				
									Controlled	Uncontrolled
									Ave 6 min	Ave 30 min
mW/cm2 from Table1:		1.00	(E: 61 V/m)			F(MHz)	**Actual F, MHz**		Occ, mW/c2	Gen, mW/cm2
						0.3-3	0.5		100.0	100.0
Max RF Power	TX Antenna	MPE distance	S, mW/cm@	Comment		*3.0 - 30.0*	*5*		*180.0*	*36.0*
P, dBm	G, dBi	cm	at 20 cm			**30.0-300**	**55**		**1.0**	**0.2**
						300-1500	*902*		*3.0*	*0.60*
22.6	**3.6**	**5.8**	**0.08**	ext. ant		1500-100000	5555		5.0	1.0
						Enter P(mW)	Equivalent dBm	**Enter dBm**	Equivalent Watts	
Basis of Calculations:						***64***	**18.1**	***18.1***	64.6	
E^2/3770 = S, mW/cm2										
E, V/m = (Pwatts*Ggain*30)^.5/d, meters										
d = ((Pwatts*G*30)/3770*S))^0.5			Pwatts*Ggain = 10^(PdBm-30+GdBi)/10)							
S@20cm = 20 log (MPE dist/20cm)										
NOTE: For mobile or fixed location transmitters, minimum separation distance is for FCC compliance is 20 cm,										
even if calculations indicate MPE distance is less										

4.4 POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of 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 μH/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 (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm 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 peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

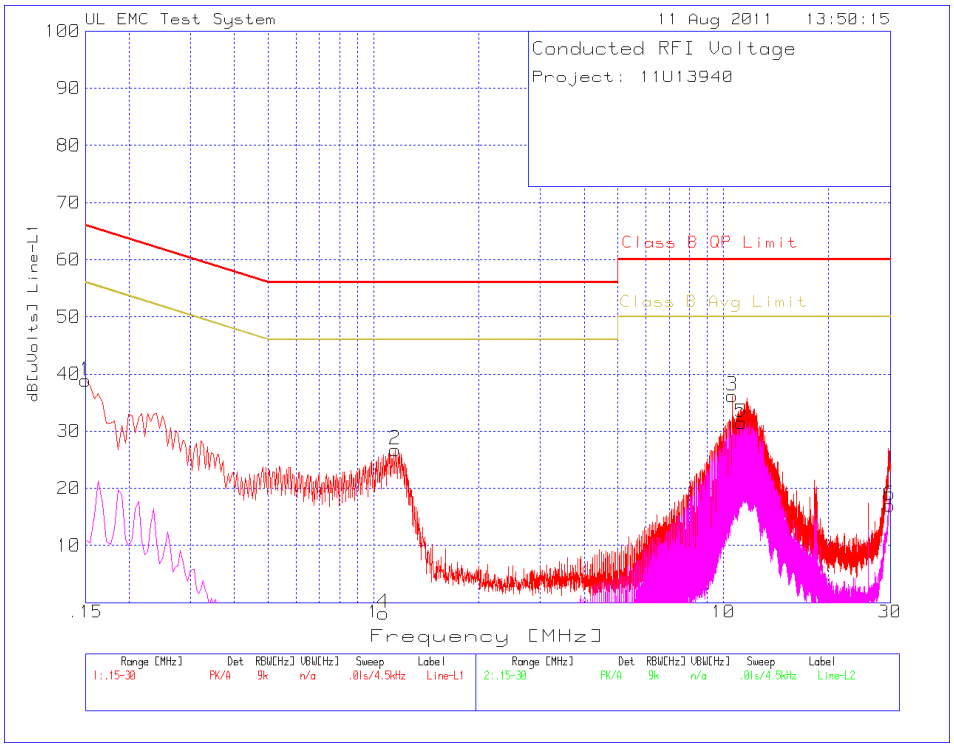
The transmitter was configured to simultaneously transmit FHSS mode in the 902 MHz and 2.4 GHz bands simultaneously, since this is the worst case operation (maximum output power) for simultaneous operation.

Line conducted data is recorded for both NEUTRAL and HOT lines.

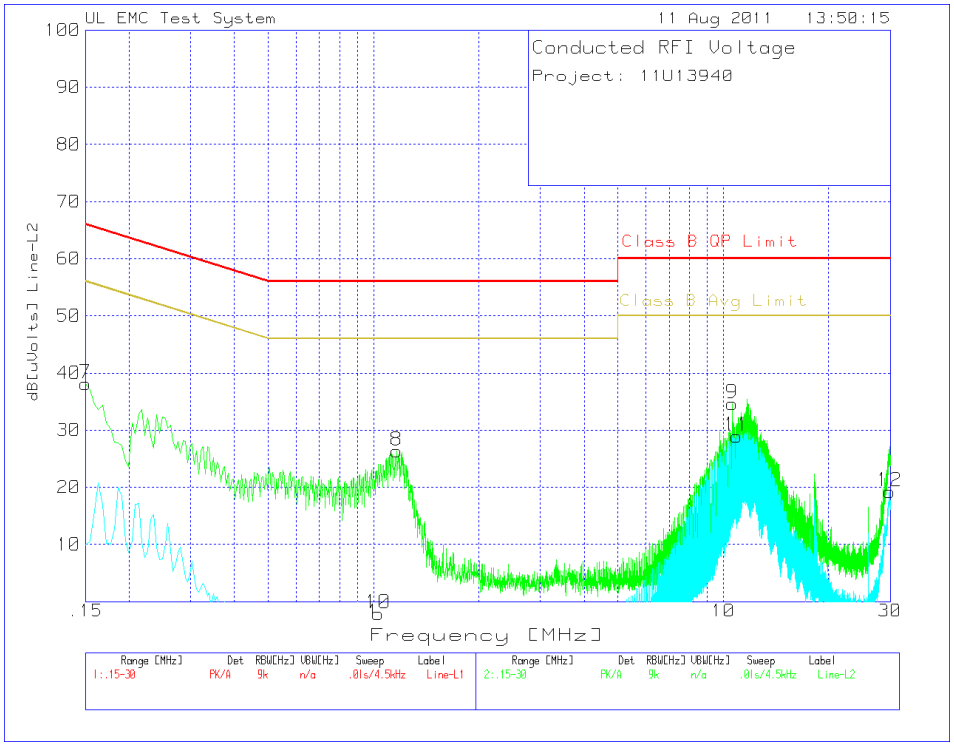
RESULTS

No non-compliance noted:

LINE 1 RESULTS



LINE 2 RESULTS



END OF REPORT

Report Revision History

Revision No.	Revision Description	Pages Revised	Revised by	Date
-	Original issue		T. Cokenias	13 June 2012
1	Add band edge conducted spurious plots for L, H channels	21,23	T. Cokenias	14 June 2012