

COMPLIANCE WORLDWIDE INC. TEST REPORT 236-06

In Accordance with the Requirements of

Industry Canada RSS 210, Issue 6, Annex 1
Federal Communications Commission CFR Title 47 Part 15.249, Subpart C
Low Power License-Exempt Radio Communication Devices
Intentional Radiators

Issued to

Sensitech Inc.
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Suite 258X
Beverly, MA 01915
(978) 927-7033

for

TempTale RF
Gateway/Repeater/Signpost 900

FCC ID: SRMT11008340
IC: 6654A-11008340

Report Issued on July 18, 2006

Tested by


Michael A. Desmarais

Reviewed by


Larry K. Stillings

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1 Scope

This test report certifies that the SensiTech Gateway/Repeater/Signpost 900, as tested, meets the RSS 210 Annex 1 Rules and FCC Part 15.249, Subpart C requirements. The scope of this test report is limited to the test sample provided by the client, only in as much as that sample represents other production units. If any significant changes are made to the unit, the changes shall be evaluated and a retest may be required.

2 Product Details

2.1 Manufacturer: SensiTech

2.2 Model Number: Gateway/Repeater/Signpost 900

2.3 Serial Number: 7217060009

2.4 Description: The TempTale RF Gateway is a reader that is attached via an Ethernet connection to the PC controlling the wireless network. The TTRF Gateway chooses a channel within the band (set at shipment at either 915 MHz or 868 MHz) based on the current signal-to-noise ratio measured in each channel.
The TTRF Repeater is used to extend the area that is covered by the network. The Repeater passes signals from the TTRF monitors and other repeaters to the TTRF Gateway. TTRF Repeaters uses the same channel as the TTRF Gateway that it finds when first installed.
The Signpost is used at locations where it is not necessary to read data from the TTRF monitors. TTRF Signposts transmit a location ID that is stored in the monitors. As such, TTRF Signposts are typically used to record the length of time a shipment spends at a specific facility. TTRF Signposts are used in facilities that do not have a TTRF Gateway and TTRF Repeaters.

2.5 Power Source: 12V DC, 120 Volts, 60 Hz

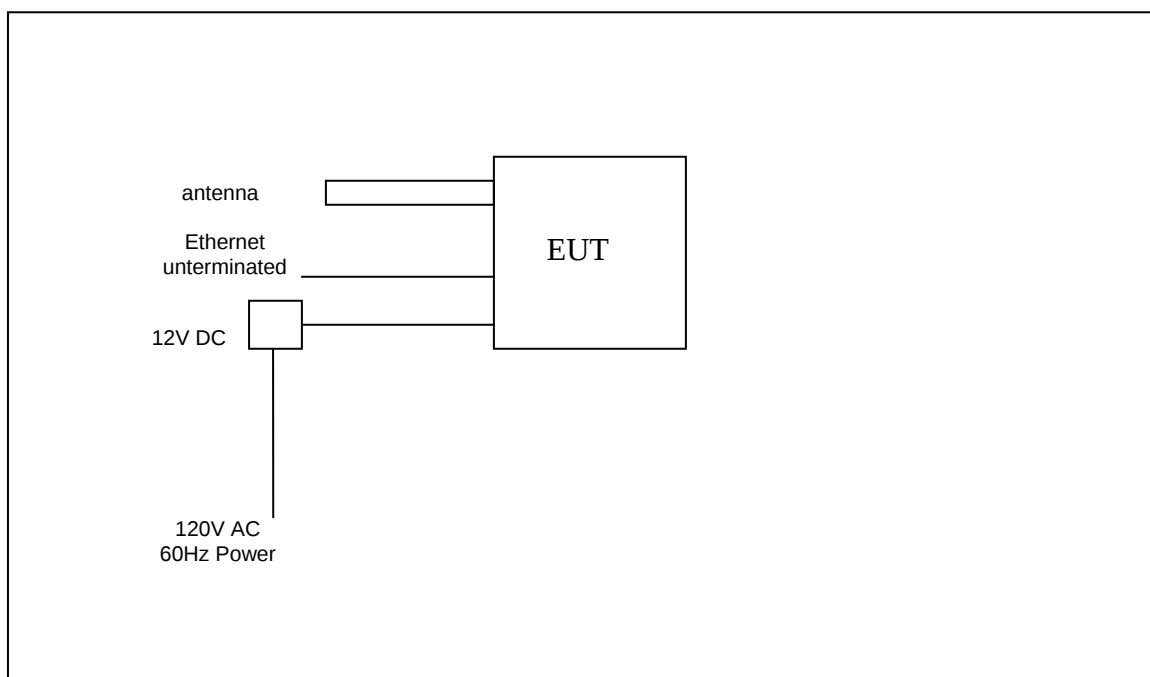
2.6 EMC Modifications: None

3 Product Configuration

3.1 Operational Characteristics & Software

The TempTale RF Gateway/Repeater/Signpost uses Remote Site Server software and TempTale RF monitors, gateways, repeaters, and signposts to capture temperature data and download the data wirelessly to a local computer.

3.2 Block Diagram



4 Measurements Parameters

4.1 Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Last Cal	Cal Due
EMI Receiver	Hewlett Packard	8546A	3650A00360	1/5/2005	1/5/2007
Spectrum Analyzer	Hewlett Packard	8593E	3829A03887	3/13/2006	3/13/2007
Microwave Preamplifier	Hewlett Packard	8449B	3008A01323	8/3/2004	8/3/2006
Biconilog Antenna	Com-Power	AC220	25509	1/31/2006	1/31/2007
Horn Antenna	Electro-Metrics	EM-6961	6337	7/30/2004	7/30/2006

4.2 Measurement & Equipment Setup

Test Date:	7/13/2006
Test Engineer:	Mike Desmarais
Normal Site Temperature (15 - 35°C):	21.6
Extreme Test Temperatures (°C):	0 and +35
Relative Humidity (20 -75%RH):	25
Frequency Range:	914.9 – 922.0 MHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	Depends on measurement
EMI Receiver Avg Bandwidth:	Depends on measurement
Detector Function:	Depends on measurement

4.3 Test Procedure

Test measurements were made in accordance FCC Part 15.249: Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz, 5725 - 5875 MHz, and 24.0 - 24.25 GHz.

The test methods used to generate the data in this test report is in accordance with 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

5 Measurement Summary

Test Requirement	FCC Rule Requirement	Test Report Section	Result	Comment
Antenna Requirement	15.203	N.A	Compliant	Unit has a reverse polarity sma connector with unique matching external antenna.
Radiated Field Strength of Fundamental	15.249 (a)	6.1	Compliant	
Radiated Field Strength of Harmonics	15.249 (a)	6.2	Compliant	
Occupied Bandwidth		6.3	Compliant	
Band Edge Measurements		6.4	Compliant	
Spurious Radiated Emissions	15.249 (d), 15.209	6.5	Compliant	
Determination of Average Factor		6.7	Compliant	
Conducted Emissions	15.207	N.A	Compliant	

6 Measurement Data

6.1 Radiated Field Strength of Fundamental (15.249, Section (a))

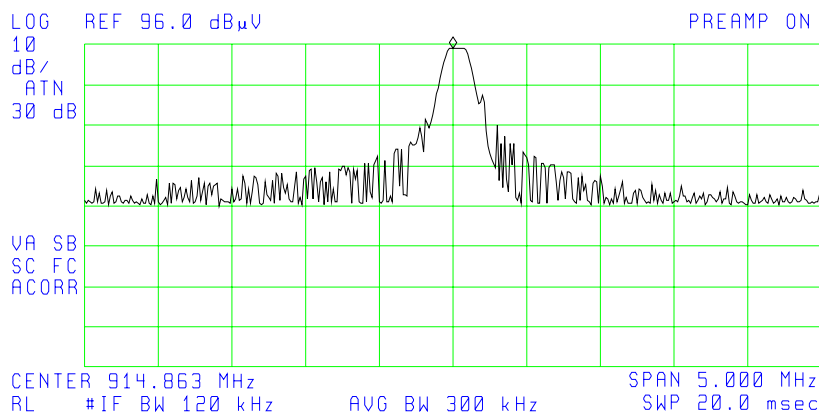
Requirement: The 3 meter field strength of the fundamental emissions from intentional radiators operated within the 902-928 MHz frequency bands shall comply with the following requirement: 50 millivolts/meter (94 dB μ V/m), quasi-peak mode measurement.

6.1.1 Radiated Field Strength of Fundamental – Low Frequency

Frequency (MHz)	Amplitude (dB μ V/m)		Q-Peak Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Q-Peak						
914.9	95.4	92.5	94.0	-1.5	V	114	24	Passed

11:29:23 AUG 07, 2006 CHANNEL 1
SENSITECH GATEWAY/REPEATER/SIGNPOST #236-06

FREQ 914.9 MHz
PEAK 95.4 dB μ V
QP 92.5 dB μ V
AVG NOT SELECTED

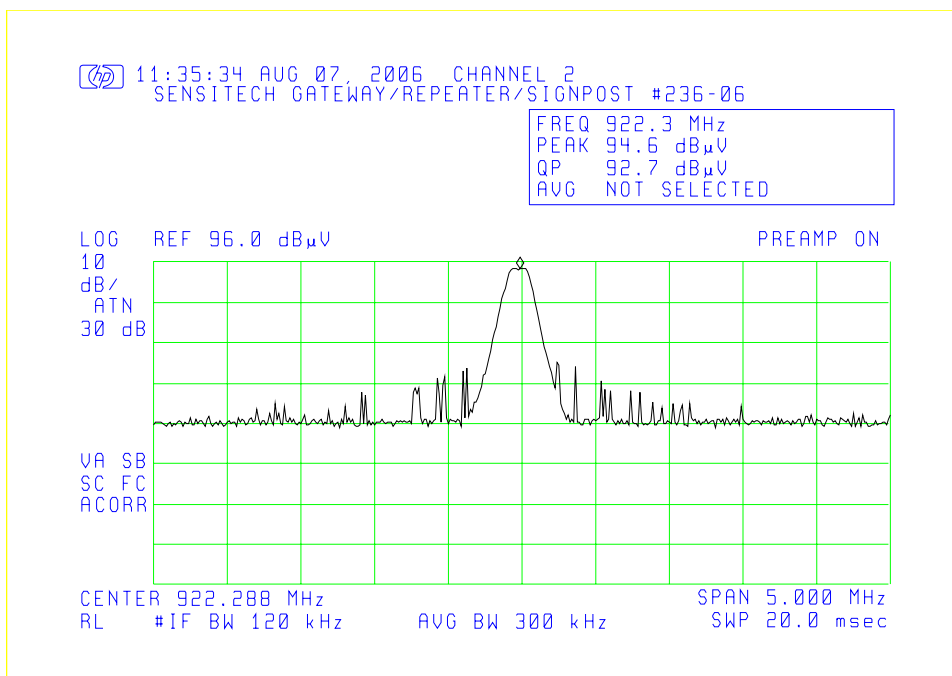


6 Measurement Data (continued)

6.1 Radiated Field Strength of Fundamental (15.249, Section (a)) (continued)

6.1.2 Radiated Field Strength of Fundamental – High Frequency

Frequency (MHz)	Amplitude (dBμV/m)		Q-Peak Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Q-Peak			H/V	cm	Deg	P/F
922.3	94.6	92.7	94.0	-1.3	V	114	24	Passed



6 Measurement Data (continued)

6.2 Radiated Field Strength of Harmonics (15.249, Section (a))

Requirement: The 3 meter field strength of the harmonic emissions from intentional radiators operated within the 902-928 MHz frequency bands shall comply with the following: 500 microvolts/meter (54 dB μ V/m), average mode measurement. Peak field strength may not be greater than 20 dB above the average limit (74 dB μ V/m).

6.2.1 Channel (914.9 MHz) (Low)

Frequency (MHz)	Amplitude (dB μ V)		Corr. Fact. (dB)	Amplitude (dB μ V/m)		Average Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg		Peak	Avg			H/V	cm	Deg	
1829.800 ¹	67.63	47.63	-5.55	62.08	42.08	54.00	-11.92	V	170	75	Passed
2744.700 ¹	60.57	40.57	-2.47	58.10	38.10	54.00	-15.90	H	100	350	Passed
3659.600 ¹	47.85	27.85	1.52	49.37	29.37	54.00	-24.63	Noise Floor			Passed
4574.500 ¹	45.43	25.43	2.36	47.79	27.79	54.00	-26.21	Noise Floor			Passed
5489.400	47.11	27.11	5.51	52.62	32.62	54.00	-21.38	Noise Floor			Passed
6404.300	45.64	25.64	7.95	53.59	33.59	54.00	-20.41	Noise Floor			Passed
7319.200 ¹	51.36	31.36	4.37	55.73	35.73	54.00	-18.27	Noise Floor			Passed
8234.100 ¹	51.24	31.24	5.57	56.81	36.81	54.00	-17.19	Noise Floor			Passed
9149.000 ¹	52.79	32.79	6.13	58.92	38.92	54.00	-15.08	Noise Floor			Passed

¹ Frequency falls within the Restricted Bands of Operation. See FCC Part 15, Section 15.205 for additional information.

6.2.2 Channel (922.2 MHz) (High)

Frequency (MHz)	Amplitude (dB μ V)		Corr. Fact. (dB)	Amplitude (dB μ V/m)		Average Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg		Peak	Avg			H/V	cm	Deg	
1844.400 ¹	66.61	46.61	-5.55	61.06	41.06	54.00	-12.94	V	107	80	Passed
2766.600 ¹	59.33	39.33	-3.03	56.30	36.30	54.00	-17.70	H	100	320	Passed
3688.800 ¹	46.51	26.51	0.40	46.91	26.91	54.00	-27.09	Noise Floor			Passed
4611.000 ¹	47.01	27.01	0.34	47.35	27.35	54.00	-26.65	Noise Floor			Passed
5533.200	46.65	26.65	2.79	49.44	29.44	54.00	-24.56	Noise Floor			Passed
6455.400	45.87	25.87	4.18	50.05	30.05	54.00	-23.95	Noise Floor			Passed
7377.600 ¹	50.37	30.37	6.39	56.76	36.76	54.00	-17.24	Noise Floor			Passed
8299.800 ¹	53.21	33.21	8.23	61.44	41.44	54.00	-12.56	Noise Floor			Passed
9222.000	51.92	31.92	8.12	60.04	40.04	54.00	-13.96	Noise Floor			Passed

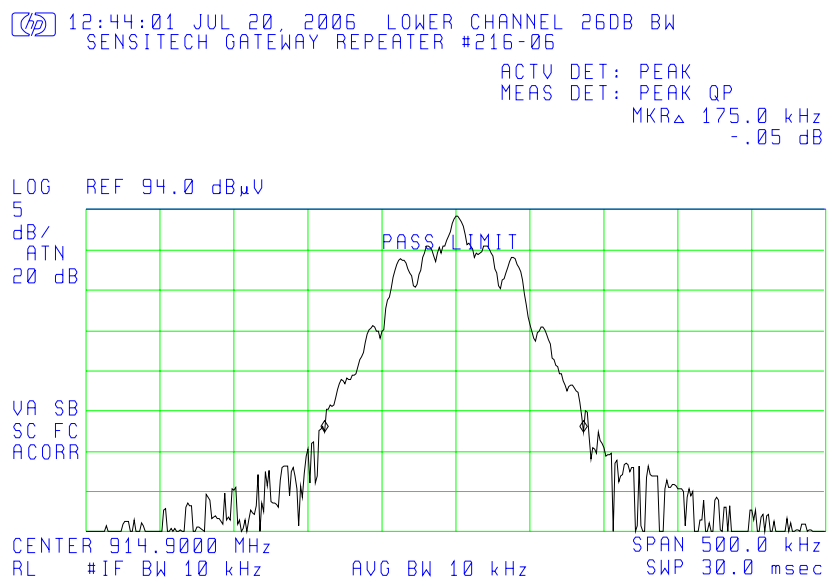
¹ Frequency falls within the Restricted Bands of Operation. See FCC Part 15, Section 15.205 for additional information.

6 Measurement Data (continued)

6.3 Occupied Bandwidth

6.3.1 Occupied Bandwidth Lower Channel

26 Bandwidth = 175.0 kHz

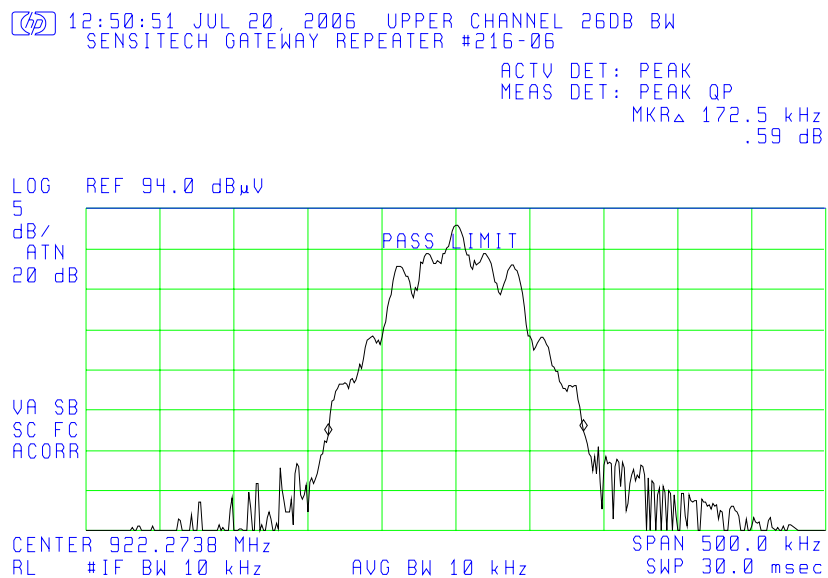


6 Measurement Data (continued)

6.3 Occupied Bandwidth (continued)

6.3.1 Occupied Bandwidth Upper Channel

26 Bandwidth = 172.5 kHz



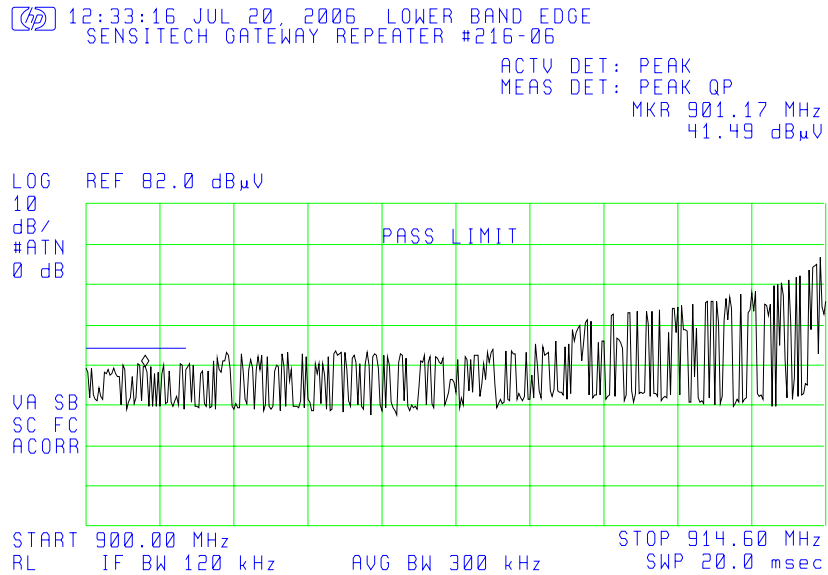
Test Number: 236-06

Issue Date: 7/18/2006

6 Measurement Data (continued)

6.4 Band Edge Measurements

6.4.1 Measurement Results – Lower Band Edge



Test Number: 236-06

Issue Date: 7/18/2006

6 Measurement Data (continued)

6.4 Band Edge Measurements (continued)

6.4.2 Measurement Results – Upper Band Edge

12:57:16 JUL 20, 2006 UPPER CHANNEL BAND EDGE
SENSITECH GATEWAY REPEATER #216-06

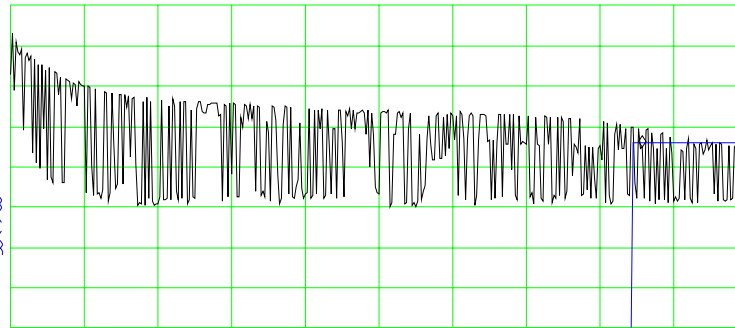
FREQ 928.1 MHz
PEAK 49.8 dBμV
QP 24.1 dBμV
AVG NOT SELECTED

LOG REF 80.0 dBμV

10
dB/
#ATTN
0 dB

MA SB
SC FC
ACORR

START 922.500 MHz STOP 929.000 MHz
#IF BW 120 kHz AVG BW 300 kHz SWP 20.0 msec



6.5 Spurious Radiated Emissions, 30 MHz to 1 GHz (15.249, Section (d))

Requirement: Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.

6.5.1 Spurious Radiated Emissions, 30 MHz to 1 GHz Test Setup

6.5.1.1. Regulatory Limit: FCC Part 209, Quasi-Peak

Frequency Range (MHz)	Distance (Meters)	Limit (dBμV/m)
30 to 88	3	40.0
88 to 216	3	43.5
216 to 960	3	46.0
960 to 1000	3	54.0

6.5.1.2 Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Cal Due
EMI Receiver	Hewlett Packard	8546A	3650A00360	1/5/2007
Biconilog Antenna	Com-Power	AC220	25509	1/31/2007

6.5.1.3 Measurement & Equipment Setup

Test Date:	06/14/2006
Test Engineer:	Michael Desmarais
Site Temperature (°C):	21.0
Relative Humidity (%RH):	36
Frequency Range:	30 MHz to 1 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	120 kHz
EMI Receiver Avg Bandwidth:	300 kHz
Detector Functions:	Peak and Quasi-Peak.
Antenna Height:	1 to 4 meters

6.5.1.4 Test Procedure

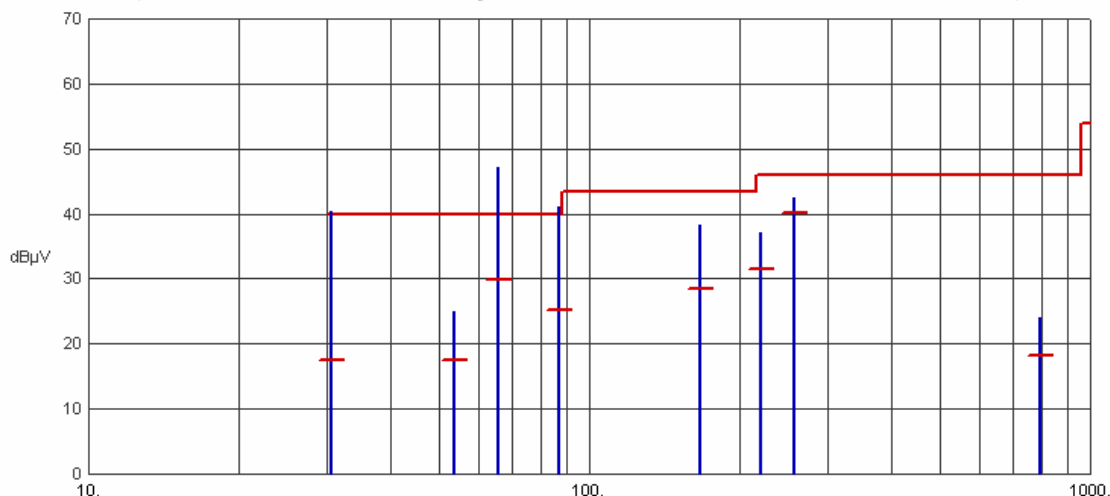
Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

6.5 Spurious Radiated Emissions (30 MHz to 1 GHz) Test Results (continued)

6.5.2 Horizontal Polarity

Test No.: 236-06, Radiated Emissions - Horizontal Polarity

FCC, Class B



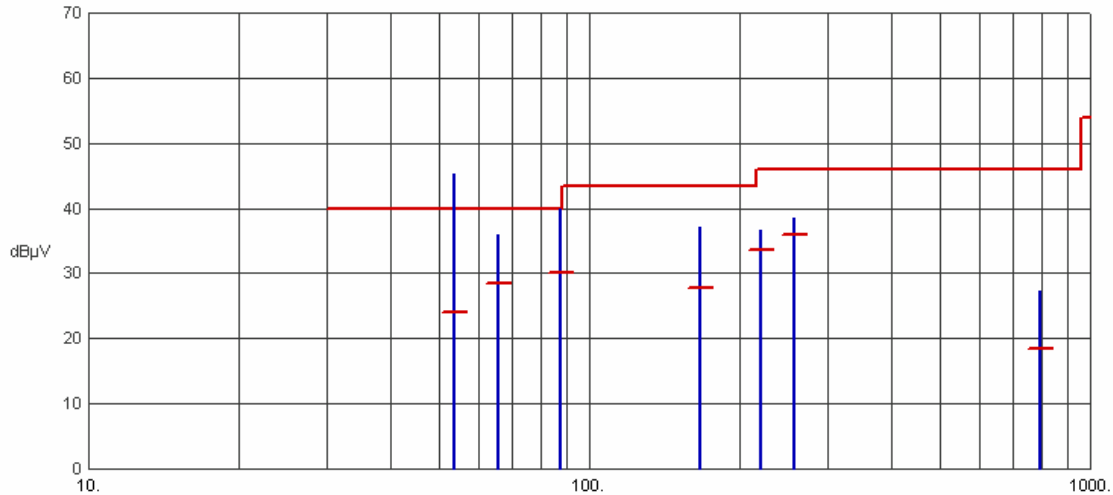
Frequency (MHz)	Pk Amp (dBμV/m)	QP Amp (dBμV/m)	QP Limit (dBμV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
30.5169	40.30	17.58	40.00	-22.42	N/A	N/A	
53.9243	24.92	17.52	40.00	-22.48	N/A	N/A	
65.9660	47.16	29.79	40.00	-10.21	N/A	N/A	
87.2510	41.01	25.24	40.00	-14.76	N/A	N/A	
166.6619	38.18	28.56	43.50	-14.94	N/A	N/A	
220.0176	37.14	31.51	46.00	-14.49	N/A	N/A	
255.9061	42.37	40.24	46.00	-5.76	N/A	N/A	
792.1777	24.06	18.11	46.00	-27.89	N/A	N/A	

6.5 Spurious Radiated Emissions (30 MHz to 1 GHz) Test Results (continued)

6.5.3 Vertical Polarity

Test No.: 236-06, Radiated Emissions - Vertical Polarity

FCC, Class B



Frequency (MHz)	Pk Amp (dBμV/m)	QP Amp (dBμV/m)	QP Limit (dBμV/m)	Margin (dB)	Ant Ht (cm)	Table (Deg)	Comments
53.7443	45.25	24.12	40.00	-15.88	N/A	N/A	
65.8610	35.82	28.58	40.00	-11.42	N/A	N/A	
87.3074	39.91	30.16	40.00	-9.84	N/A	N/A	
166.6835	37.21	27.70	43.50	-15.80	N/A	N/A	
220.0350	36.64	33.58	46.00	-12.42	N/A	N/A	
255.8723	38.57	35.91	46.00	-10.09	N/A	N/A	
792.1429	27.37	18.32	46.00	-27.68	N/A	N/A	

6.6 Spurious Radiated Emissions (1 – 9.2 GHz) Test Results

There were no spurious emissions above 1 GHz other than the harmonics previously reported.

6.7 Determination of Average Factor

Total Duration of 1 cycle: 168 ms

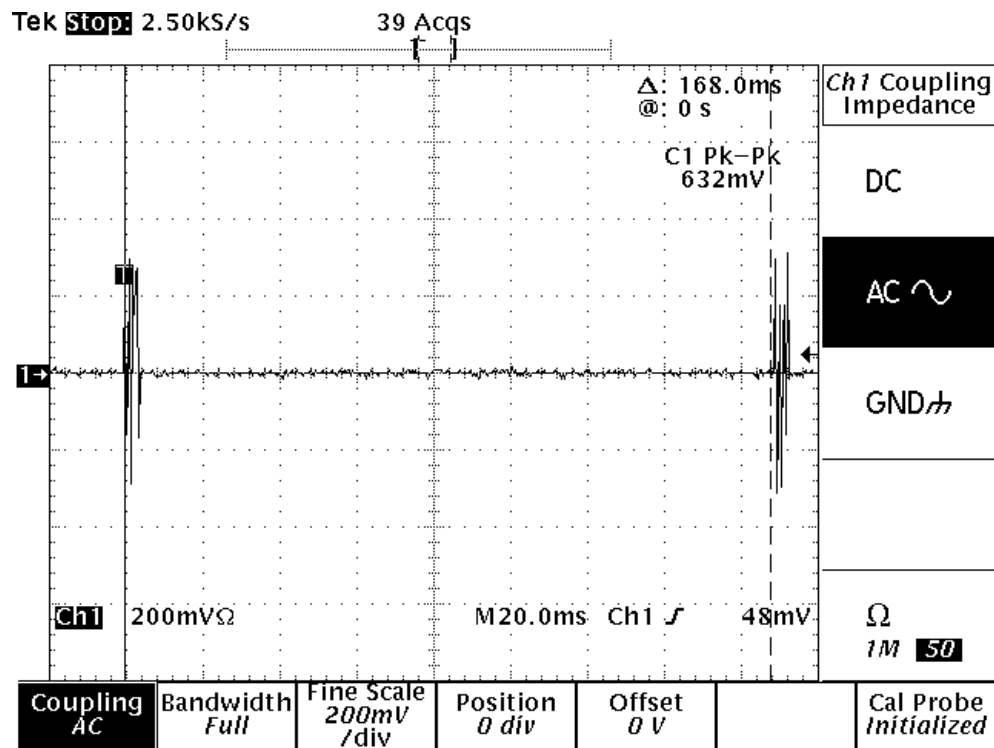
Total On-Time in 1 cycle: 3.83 ms

On-Time divided by cycle: $3.83 \text{ ms} / 168 \text{ ms} = 0.02279$

Average Factor: $20 \cdot \log(0.02279) = -32.8 \text{ dB}$

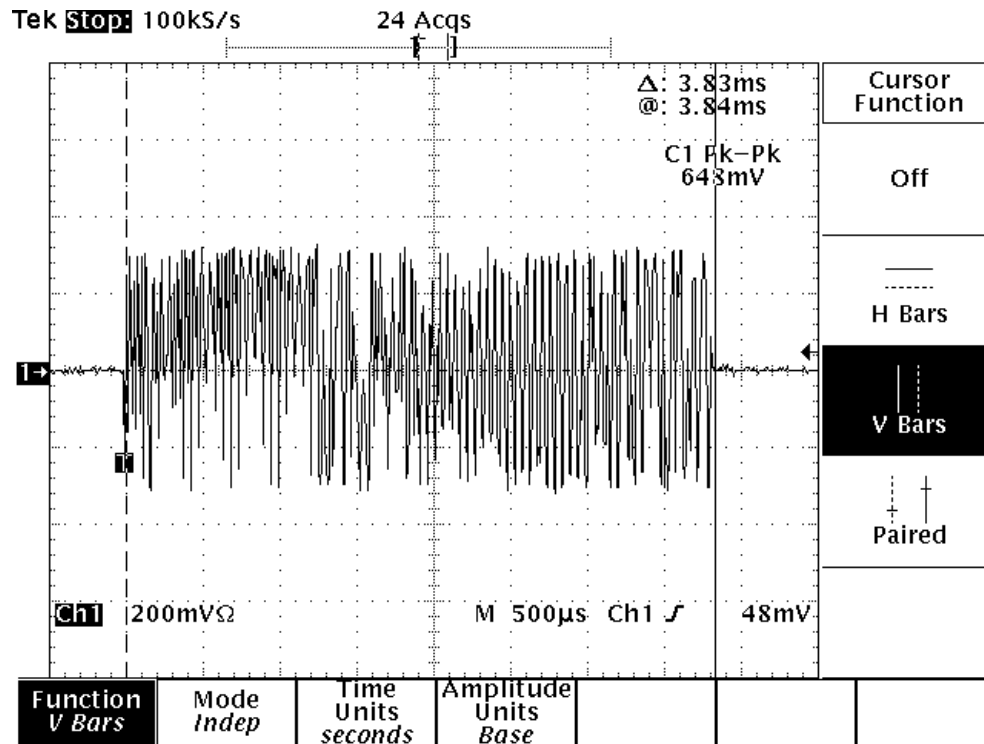
FCC and IC maximum allowed average factor is -20 dB .

6.7.1 Plot showing total duration of pulse train



6.7 Determination of Average Factor, continued

6.7.2 Plot showing individual pulse:



7. Conducted Emissions Test Setup

7.1. Regulatory Limit: 15.207

Frequency Range (MHz)	Limits (dBμV)	
	Quasi-Peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5.0	56	46
5.0 to 30.0	60	50

* Decreases with the logarithm of the frequency.

7.2. Measurement Equipment Used to Perform Test

Device	Manufacturer	Model No.	Serial No.	Last Cal	Cal Due
EMI Receiver	Hewlett Packard	8546A	3650A00360	1/5/2006	1/5/2007
LISN	EMCO	EM3825/2	9109-1860	12/15/2005	12/15/2006

7.3. Measurement & Equipment Setup

Test Date:	07/12/2006
Test Engineer:	Mike Desmarais
Site Temperature (°C):	21.3
Relative Humidity (%RH):	33
Frequency Range:	0.15 MHz to 30 MHz
EMI Receiver IF Bandwidth:	9 kHz
EMI Receiver Avg Bandwidth:	30 kHz
Detector Functions:	Peak, Quasi-Peak. & Average

7.4. Test Procedure

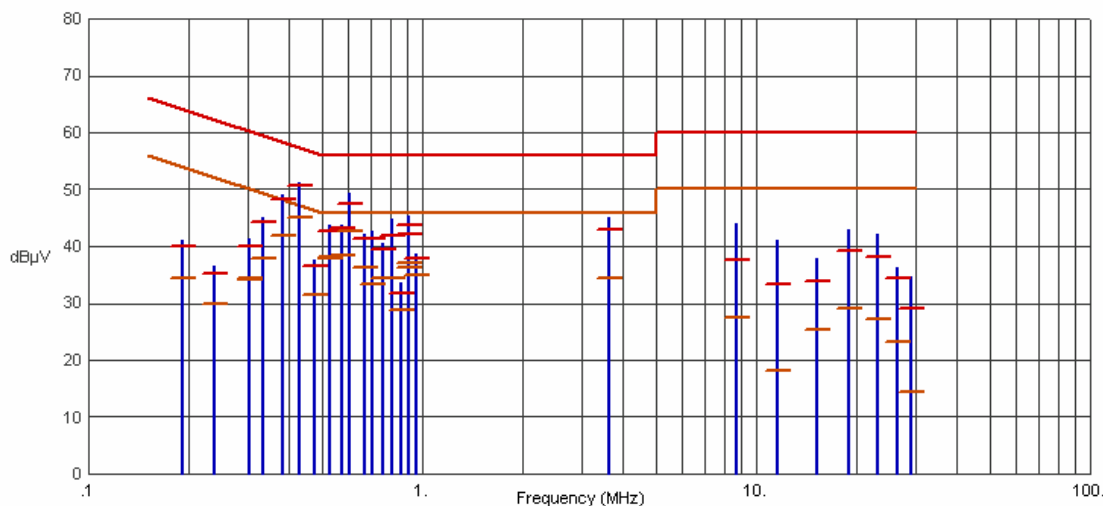
Test measurements were made in accordance with ANSI C63.4-2003, Standard Methods of Measurement of Radio Noise Emissions from Low-Voltage Electrical and Electronics Equipment in the Range of 9 kHz to 40 GHz.

8. Conducted Emissions Test Results

8.1. 120 Volts, 60 Hz Phase

Test No.: 236-06, 120 Volts, 60 Hz Phase

FCC, Class B



Frequency (MHz)	Pk Amp (dBμV)	QP Amp (dBμV)	QP Limit (dBμV)	QP Margin (dB)	Avg Amp (dBμV)	Avg Limit (dBμV)	Avg Margin (dB)	Comments
.1911	41.15	39.89	63.99	-24.10	34.48	53.99	-19.51	
.2387	36.64	35.31	62.14	-26.83	29.96	52.14	-22.18	
.3037	41.25	40.03	60.14	-20.11	34.49	50.14	-15.65	
.3043	41.24	39.90	60.12	-20.22	34.23	50.12	-15.89	
.3346	44.97	44.16	59.34	-15.18	37.83	49.34	-11.51	
.3828	49.09	48.39	58.22	-9.83	41.93	48.22	-6.29	
.3831	49.03	48.34	58.21	-9.87	41.86	48.21	-6.35	
.4304	51.28	50.72	57.24	-6.52	45.15	47.24	-2.09	
.4773	37.52	36.51	56.39	-19.88	31.43	46.39	-14.96	
.5255	43.71	42.77	56.00	-13.23	37.99	46.00	-8.01	
.5257	43.44	42.78	56.00	-13.22	38.01	46.00	-7.99	
.5731	43.76	43.18	56.00	-12.82	38.35	46.00	-7.65	
.6072	49.32	47.48	56.00	-8.52	42.65	46.00	-3.35	
.6698	42.17	41.29	56.00	-14.71	36.31	46.00	-9.69	
.7088	42.70	41.39	56.00	-14.61	33.24	46.00	-12.76	
.7645	40.47	39.40	56.00	-16.60	34.39	46.00	-11.61	
.8110	44.90	41.92	56.00	-14.08	34.27	46.00	-11.73	
.8614	33.60	31.68	56.00	-24.32	28.78	46.00	-17.22	
.9093	45.46	43.73	56.00	-12.27	37.10	46.00	-8.90	
.9119	44.29	42.10	56.00	-13.90	36.21	46.00	-9.79	
.9553	38.79	37.99	56.00	-18.01	34.92	46.00	-11.08	
3.6340	45.07	42.83	56.00	-13.17	34.48	46.00	-11.52	
8.7042	43.87	37.71	60.00	-22.29	27.34	50.00	-22.66	
11.5357	40.96	33.27	60.00	-26.73	18.13	50.00	-31.87	
15.2566	37.83	33.85	60.00	-26.15	25.23	50.00	-24.77	
18.8924	42.95	39.13	60.00	-20.87	29.13	50.00	-20.87	
23.0547	42.14	38.03	60.00	-21.97	27.18	50.00	-22.82	
26.4018	36.23	34.36	60.00	-25.64	23.14	50.00	-26.86	
29.1578	34.60	29.03	60.00	-30.97	14.28	50.00	-35.72	

Test Number: 236-06

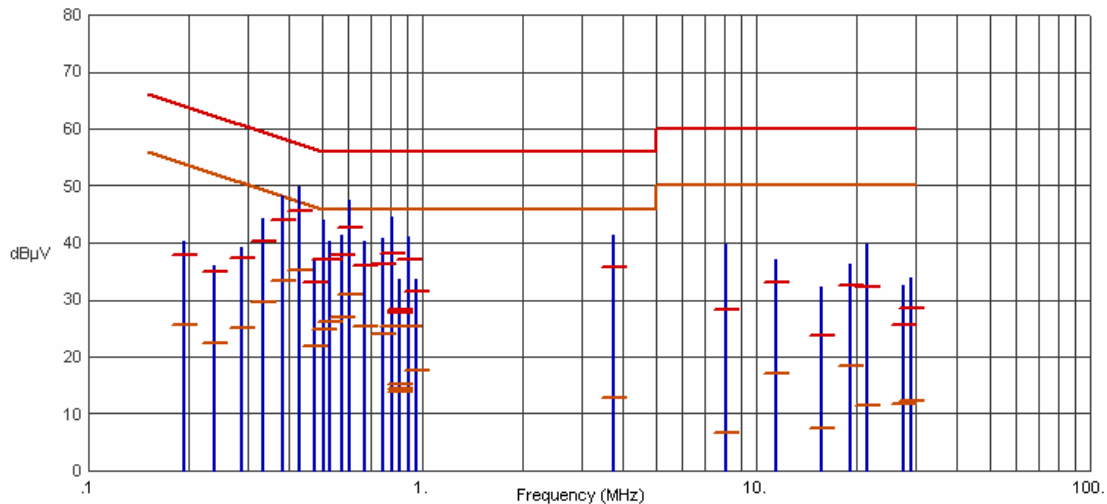
Issue Date: 7/18/2006

8. Conducted Emissions Test Results (continued)

8.2. 120 Volts, 60 Hz Neutral

Test No.: 236-06, 120 Volts, 60 Hz Neutral

FCC, Class B



Frequency (MHz)	Pk Amp (dBμV)	QP Amp (dBμV)	QP Limit (dBμV)	QP Margin (dB)	Avg Amp (dBμV)	Avg Limit (dBμV)	Avg Margin (dB)	Comments
.1927	40.29	37.76	63.92	-26.16	25.73	53.92	-28.19	
.2390	35.98	35.05	62.13	-27.08	22.31	52.13	-29.82	
.2865	39.27	37.46	60.63	-23.17	25.03	50.63	-25.60	
.3343	44.39	40.39	59.34	-18.95	29.55	49.34	-19.79	
.3826	48.31	43.98	58.22	-14.24	33.27	48.22	-14.95	
.4299	49.88	45.47	57.25	-11.78	35.07	47.25	-12.18	
.4771	37.11	33.11	56.39	-23.28	21.74	46.39	-24.65	
.5052	43.88	37.19	56.00	-18.81	24.80	46.00	-21.20	
.5262	40.25	37.02	56.00	-18.98	26.01	46.00	-19.99	
.5731	41.23	37.79	56.00	-18.21	26.90	46.00	-19.10	
.6068	47.55	42.72	56.00	-13.28	31.04	46.00	-14.96	
.6687	40.19	35.93	56.00	-20.07	25.27	46.00	-20.73	
.7631	40.79	36.15	56.00	-19.85	24.01	46.00	-21.99	
.7632	40.82	36.25	56.00	-19.75	24.08	46.00	-21.92	
.8097	44.54	38.25	56.00	-17.75	25.38	46.00	-20.62	
.8579	33.23	27.83	56.00	-28.17	13.98	46.00	-32.02	
.8586	33.22	27.91	56.00	-28.09	14.48	46.00	-31.52	
.8590	33.56	28.24	56.00	-27.76	15.30	46.00	-30.70	
.9078	41.02	37.15	56.00	-18.85	25.46	46.00	-20.54	
.9560	33.48	31.56	56.00	-24.44	17.60	46.00	-28.40	
3.7238	41.23	35.73	56.00	-20.27	12.81	46.00	-33.19	
8.0966	39.76	28.24	60.00	-31.76	6.64	50.00	-43.36	
11.5093	37.15	33.10	60.00	-26.90	17.02	50.00	-32.98	
15.7502	32.17	23.83	60.00	-36.17	7.42	50.00	-42.58	
19.2255	36.15	32.52	60.00	-27.48	18.31	50.00	-31.69	
21.4495	39.74	32.30	60.00	-27.70	11.47	50.00	-38.53	
27.5605	32.47	25.58	60.00	-34.42	11.84	50.00	-38.16	
29.1768	33.99	28.61	60.00	-31.39	12.24	50.00	-37.76	

9. Test Site Description

Compliance Worldwide is located at 357 Main Street in Sandown, New Hampshire. The test sites at Compliance Worldwide are used for conducted and radiated emissions testing in accordance with Federal Communications Commission (FCC) and Industry Canada standards. A description of the test sites is on file with the FCC (registration number **96392**) and Industry Canada (file number **IC 3023**).

The radiated emissions test site is a 3 and 10 meter enclosed open area test site (OATS). Personnel, support equipment and test equipment are located in the basement beneath the OATS ground plane.

The conducted emissions site is part of a 16' x 20' x 12' ferrite tile chamber and uses one of the walls for the vertical ground plane required by EN 55022.

Both sites are designed to test products or systems 1.5 meter W x 1.5 meter L x 2.0 meter H, floor standing or table top.