

**COMPLIANCE WORLDWIDE INC.
TEST REPORT 286-06R2**

In Accordance with the Requirements of

**FCC PART 15, SUBPART C
INDUSTRY CANADA RSS 210, ISSUE 6**
Low Power License-Exempt Radio Communication Devices
Intentional Radiators

Issued to

**Philips Medical Systems
3000 Minuteman Drive
Andover, MA 01810
978-659-2800**

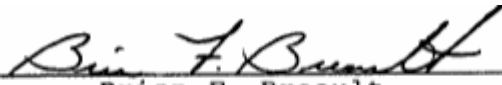
for

**MDL4851 ITS Module
with the Radiall/Larsen model SPDA17RP2400 and
M8100-66490 Tri-band antenna**

**FCC ID: PQC-MDL4851
IC: 3549B-MDL4851**

Report Issued on March 26, 2007

Tested by


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Reviewed by


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1. Scope

This test report certifies that the Philips MDL4851 2.4 GHz ROW ITS Radio Module with the either of the two antennas outlined in Section 5, Note 1, as tested, meets the FCC Part 15, Subpart C and Industry Canada RSS 210 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. This report replaces in full CW Test Report #286-06R1 to add the Tri-Band antenna data.

2. Product Details

2.1. Manufacturer: Philips Medical Systems

2.2. Model Number: MDL4851 ITS Module / ROW PP2

2.3. Serial Number: US42300566

2.4. Description: The MDL4851 ROW ITS Module with either the External Antenna or alternative Tri-band antenna is a radio module which transmits patient physiological ECG and SpO2 data and waveforms in the 2.4 GHz ISM bands to the M4852A 2.4 GHz ROW Access Point. The EUT has no display or method to monitor itself. The monitoring will be done on the IntelliVue Information Center and also on the MP50 bedside patient monitor.

2.5. Power Source: DC 12 volts – Provided by the MP50 bedside patient monitor

2.6. EMC Modifications: None

3. Product Configuration

3.1. Operational Characteristics & Software

The MDL4851 2.4 GHz Instrument Telemetry System radio module is based on the M4841-65708 1.4 GHz Philips Telemetry II System's 1.4 GHz radio module. The MDL4851 2.4 GHz module combines a 2.4 GHz radio module with the M8090-66491 PCA, which is the interface for data and power from the Patient Monitor to which it connects, is a single housing, M8003-45201. It can be connected to the MPXX series of monitors through a short pigtail "Y" cable. The pigtail cable has a round DIN connector which plugs into the 12V/LAN/Serial port on the MPXX monitor. On the ITS end, the cable has an RJ45 plug for data and a 5 mm coaxial power connector for the 12 V DC power input. For the Radiated Emissions testing, the connections to the ITS for power and data are made through the custom cable, Item E in the System Configuration Block Diagram in Section 3.5.

An MP50 Patient Bedside Monitor will be connected to the MDL4851 ITS module. The MP50 will have ECG and SpO2 simulators connected to generate the patient physiological data signals.

The MDL4851 will also be qualified with an alternative Tri-band antenna, Model #M8100-66490.

3. Product Configuration (continued)

3.2. Support Equipment

Blk #	Mfgr	Model / Part #	Opt	HW Rev.	FW Rev.	SW Rev.	Serial # (if available)	Nom. Voltage	Description
2	Philips	MP50	N/A	N/A	N/A	N/A	DE44010453	100-240 V	Bedside Patient Monitor
3	Bio-Tek	Lionheart 2	N/A	N/A	N/A	N/A	203926	9 V DC	Multi-parameter patient simulator Recall #125005
4	Philips	M4852A/862232/ NA	N/A	LP1	Z.00.02	N/A	SB-4503530893	48 V DC	2.4 GHz ROW Access Point
5	Philips	M4844A/862114/ NA	ABA	Prd	N/A	N/A	US42200068	100-240 V	Philips Telemetry II Synchronization box
6	Power-D-Sine	M4845A/862152/ NA	N/A	NA	NA	NA	MO4386809557276003	100-240 V	Power Over Ethernet Hub 6 Port
7	Cisco	2950 Catalyst	N/A	NA	NA	NA	F0C0816X105	120 VAC	10/100 Base-T switch
8	Philips	M3171A/862117	N/A	NA	NA	NA	756005AG-34500040	100-240 V	Access Point Controller
9	Philips	M3167-60003	N/A	NA	NA	G.	U303KN8XA393	100-240 V	IntelliVue Information Center- HP PC
11	HP	109B20/14N	N/A	N/A	N/A	N/A	68929480	120 VAC	Display for IntelliVue Information Center
12	HP	6236B	N/A	N/A	N/A	N/A	214A10689	104-127 V	Power Supply for ITS Radio Module

3.3. EUT Cables

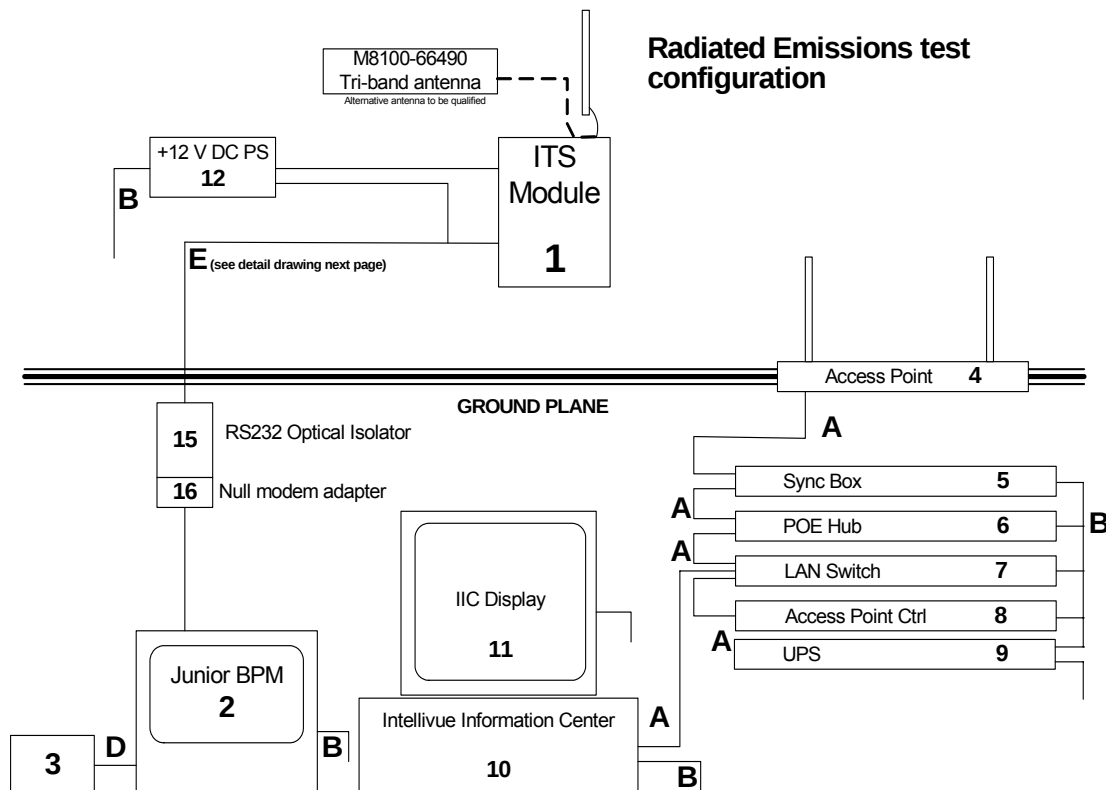
Blk Item	Part #	Shielded Y or N	Length	No. of Conductors (if avail.)	Port Tested (Y/N)	Termination	Function / Description
N/A	M8058-61001	N	0.1 m	6	N/A	N/A	6 conductor ribbon cable-internal
C		N	0.3 m		N/A	N/A	Data/power pigtail cable from Bedside monitor to the radio module
E	N/A	N	0.9 m		N/A	N/A	Data/power assembly-provided by PMD R&D- custom cable connecting Optical isolator DB9 to the ITS through a "Y" cable with additional leads from the ITS to the +12 V DC supply

3.4. Support Cables

Blk Item	Part #	Shielded Y or N	Length	No. of Conductors (if avail.)	Port Tested (Y/N)	Termination	Function / Description
A	N/A	N	10 m	8	N	N/A	Category 5 UTP cable, various lengths
B	392 925	N	1 m	2	N	N/A	AC power cords
D	Philips	N	2 m	2	N	N/A	ECG leadset

3 Product Configuration (continued)

3.5 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	3/14/2007	3/14/2008
Spectrum Analyzer	Hewlett Packard	8593E	3829A03887	3/16/2006	3/16/2007
Microwave Preamp	Hewlett Packard	8449B	3008A01323	9/22/2006	9/22/2008
Bilog Antenna	Com-Power	AC220	25509	7/31/2006	7/31/2007
Horn Antenna	Electro-Metrics	EM-6961	6337	8/25/2006	8/25/2008

4. Measurements Parameters (continued)

4.2. Measurement & Equipment Setup

Test Date:	March 20, 2007
Test Engineer:	Brian Breault
Normal Site Temperature (15 – 35°C):	21.0
Relative Humidity (20 –75%RH):	30%
Frequency Range of DUT:	>2.4 GHz & <2.4835 GHz
Measurement Distance:	3 Meters
EMI Receiver IF Bandwidth:	
EMI Receiver Avg Bandwidth:	In accordance with FCC Part 15, Section 15.35
Detector Function:	

4.3. Test Procedure

Test measurements were made in accordance FCC Part 15.247, IC RSS-210 Annex VIII: Operation within the bands 902 – 928 MHz, 2400 – 2483.5 MHz, 5725 – 5875 MHz, and 24.0 – 24.25 GHz.

Radiated emissions testing is based on the requirements detailed in FCC 15.209: Radiated emission limits, general requirements.

The product under test complies with the definition for digital modulation outlined in FCC 15.403(f). The operating frequencies of the product under test were selected according to the requirements outlined in FCC 15.31(m).

The test methods used to generate the data in this test report are 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.

The reference level offset in all of the plots included in this document has been adjusted to include correction factors.

In accordance with ANSI C63.4-2003, section 13.1.4.1, c), the device under test was rotated through three orthogonal axes to determine which attitude produced the highest emission relative to the limit. The attitude that produced the highest emission relative to the limit was used for all radiated emission measurements.

5. Measurement Summary

Test Requirement	FCC Part 15 Reference	Test Report Section	Result	Comment
Antenna Requirement	15.203	N/A	Compliant	See Note 1 below.
Minimum 6 dB Bandwidth	15.247 (a) (2)	6.1	Compliant	
99% Bandwidth	IC RSS-GEN	6.1	Compliant	For reference only
Maximum Peak Conducted Output Power	15.247 (b) (3) & (b) (4)	6.2	Compliant	
Conducted Spurious Emissions	15.247 (d)	6.3	Compliant	
Lower and Upper Band Edge Measurements		6.4	Compliant	
Power Spectral Density	15.247 (e)	6.5	Compliant	
Public Exposure to Radio Frequency Energy Levels	1.1307 (b) (1)	6.6	Compliant	Calculated from field strength measurement and antenna gain.
Radiated Field Strength of Harmonics in Restricted Bands	15.247 (d) 15.209	6.7	Compliant	
Conducted Emissions	15.207	6.8	Compliant	-0.16 dB margin, neutral
Determination of Averaging Factor	15.35	6.9	Compliant	

Note: 1. Two antennas were supplied for test and individually tested:

1. Radial/Larsen model SPDA17RP2400 right angle whip (external). This external antenna utilizes a reverse polarity TNC configuration for connection.
2. An alternative Tri-band antenna, Model #M8100-66490.

6. Measurement Data

6.1. Minimum 6 dB Bandwidth (15.247 (a) (2)) (RSS 210 A8.2(1))

Requirement: Systems using digital modulation techniques may operate in the 902 – 928 MHz, 2400 – 2483.5 MHz, and 5725 – 5850 MHz bands. The minimum 6 dB bandwidth shall be at least 500 kHz.

Resolution Bandwidth: 100 kHz

Video Bandwidth: 300 kHz

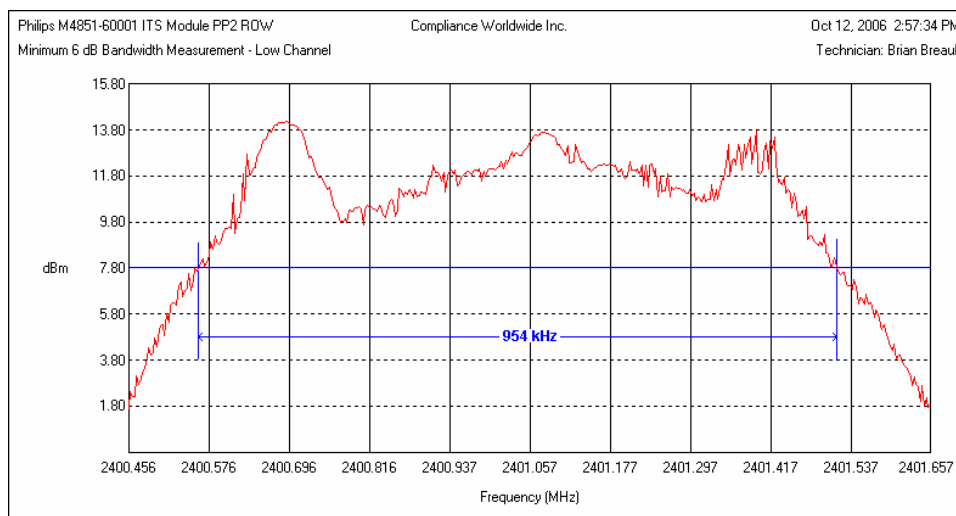
Sweep Time: 100 mS

6.1.1. Measurement Results

Channel	Frequency	-6 dB Bandwidth (kHz)	Required -6 dB Bandwidth (kHz)	Result
Low	2401.056	954	≥ 500	Compliant
Middle	2439.072	951	≥ 500	Compliant
High	2482.272	948	≥ 500	Compliant

6.1.2. 6 dB Bandwidth Measurement Plots

Low Channel

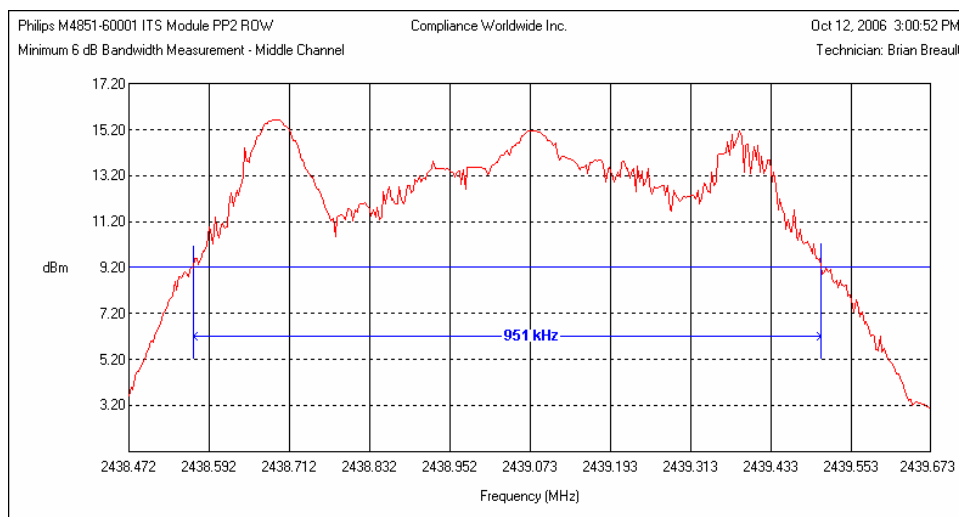


6. Measurement Data (continued)

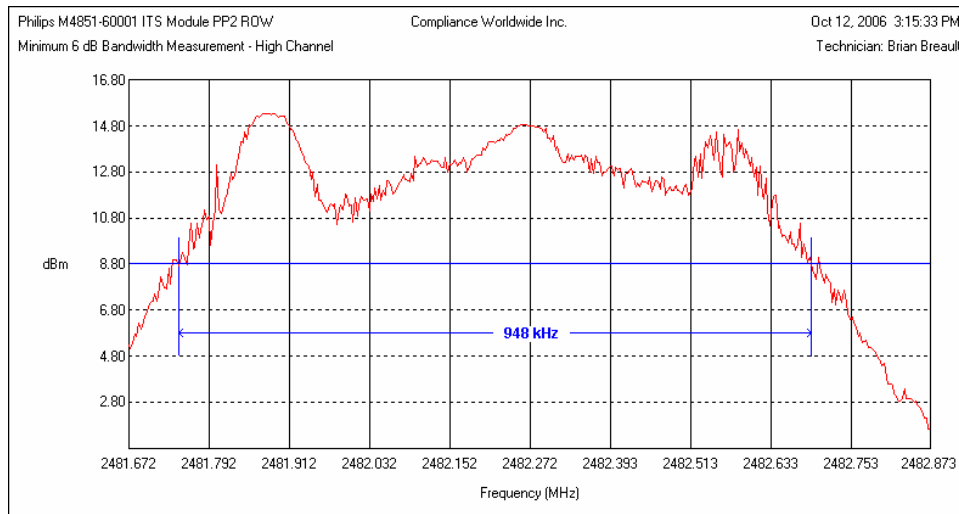
6.1. Minimum 6 dB Bandwidth (15.247 (a) (2)) (RSS 210 A8.2(1)) (continued)

6.1.2. 6 dB Bandwidth Measurement Plots (continued)

Middle Channel



High Channel

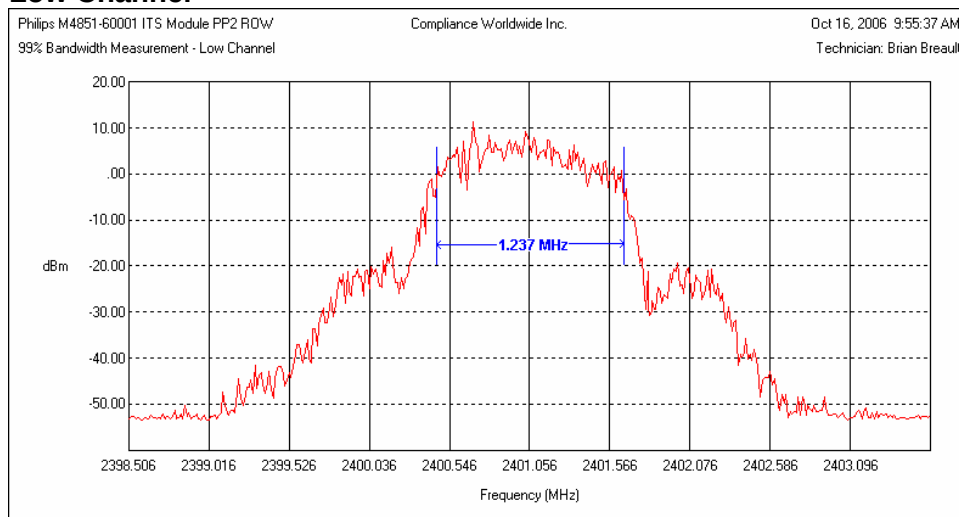


6. Measurement Data (continued)

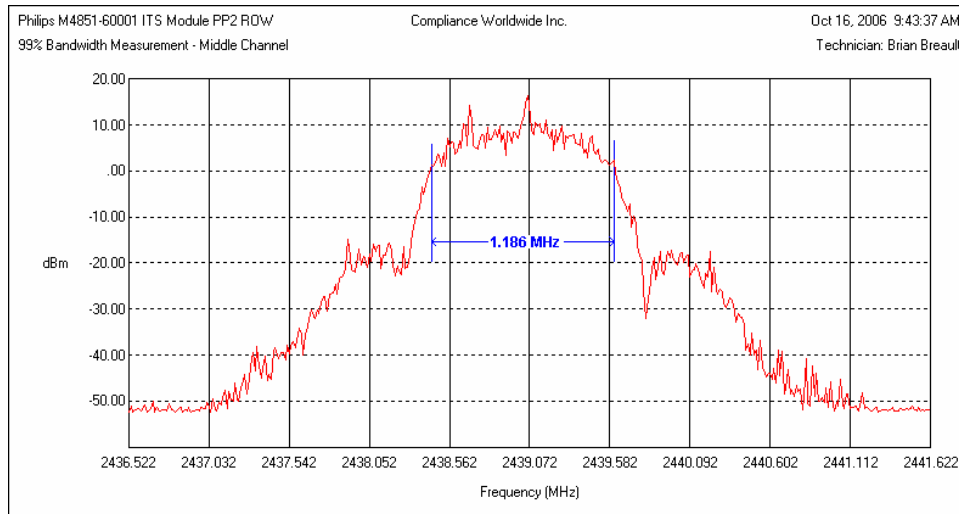
6.1. 99% Bandwidth

6.1.3. 99% dB Bandwidth Measurement Plots

Low Channel



Middle Channel

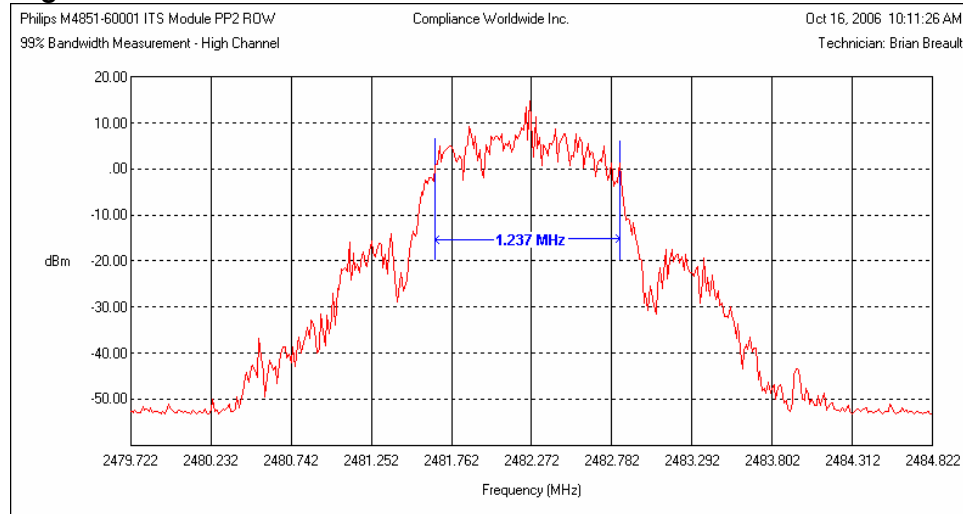


6. Measurement Data (continued)

6.1. 99% Bandwidth

6.1.3. 99% dB Bandwidth Measurement Plots (continued)

High Channel



6. Measurement Data (continued)

6.2 Maximum Peak Conducted Output Power (15.247 (b) (1)) (RSS 210 A8.4.1)

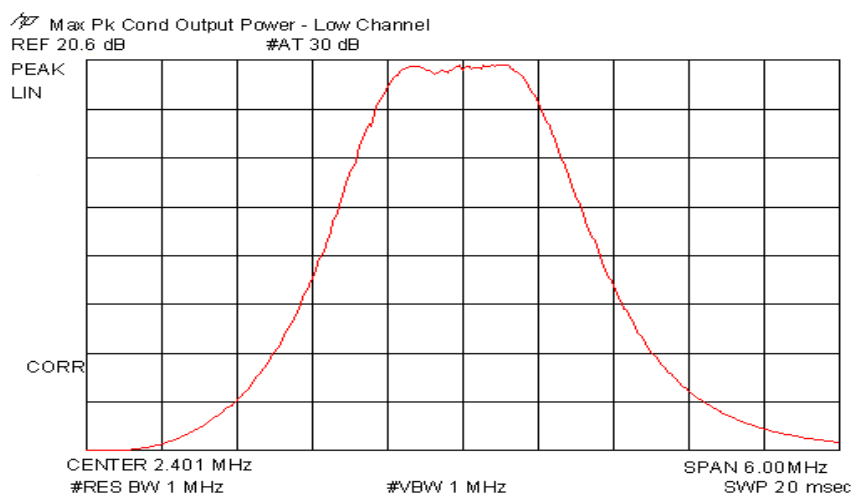
Requirement: For systems using digital modulation in the 2400-2483.5 MHz band: 1 watt. Compliance with the one watt limit can be based on a measurement of the maximum conducted output power.

6.2.1 Measurement Results

Channel	Frequency	Conducted Output Power (dBm)	Conducted Output Power (W)	Conducted Output Power Limit (W)	Result
Low	2401.056	20.60	.1148	1	Compliant
Middle	2439.072	22.20	.1659	1	Compliant
High	2482.272	21.80	.1514	1	Compliant

6.2.2 Measurement Plots

Low Channel

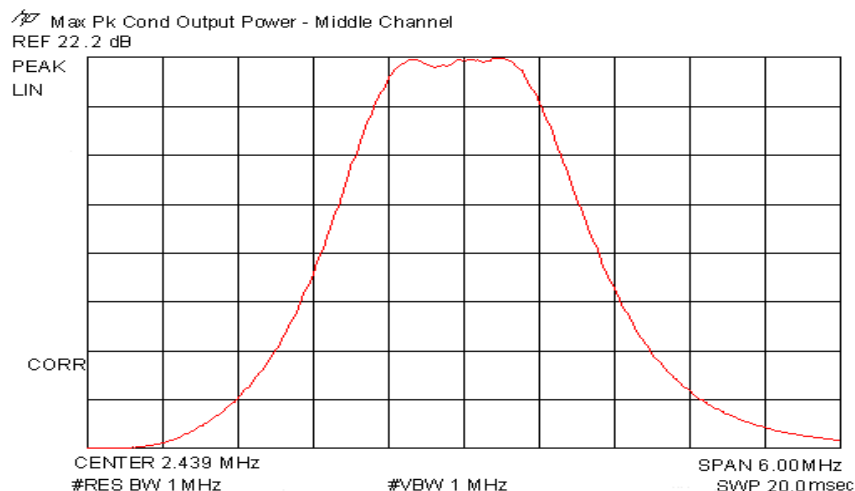


6. Measurement Data (continued)

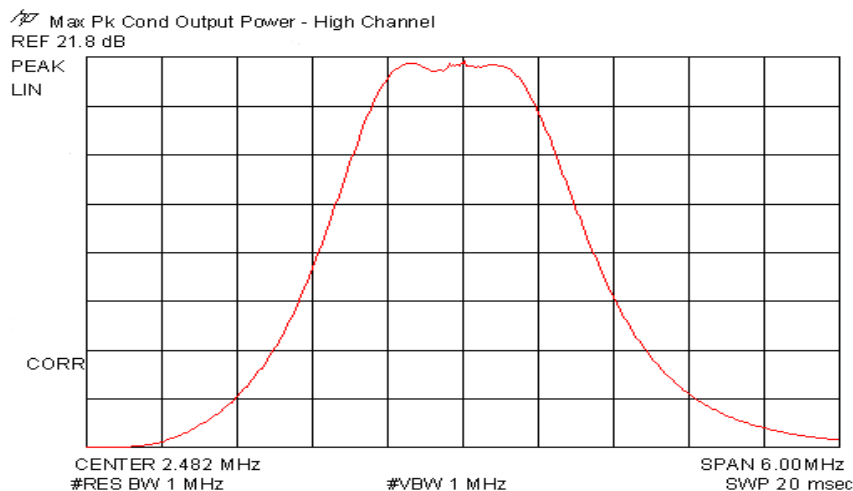
6.2. Maximum Peak Conducted Output Power (15.247 (b) (1)) (continued)

6.2.2 Measurement Plots (continued)

Middle Channel



High Channel

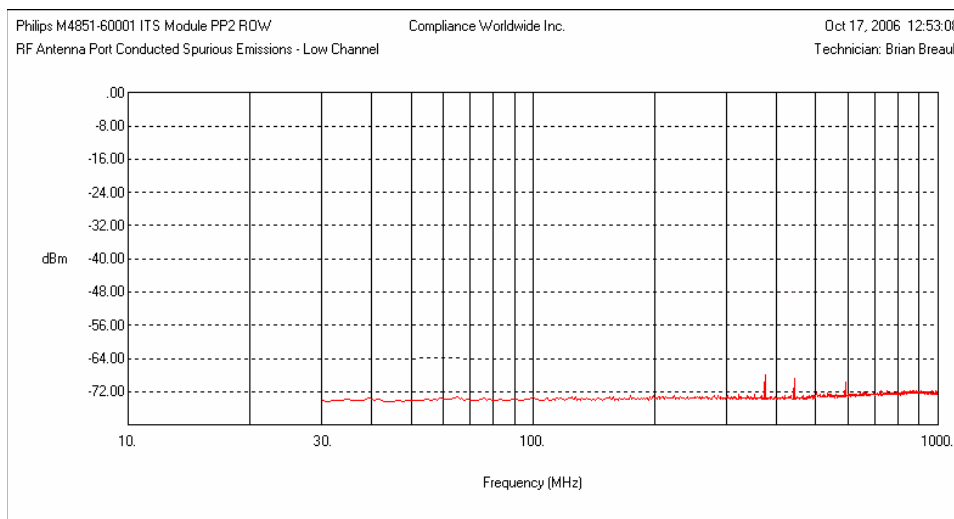


6. Measurement Data (continued)

6.3. Conducted Spurious Emissions (15.247 (d)) (RSS 210 A8.5)

Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

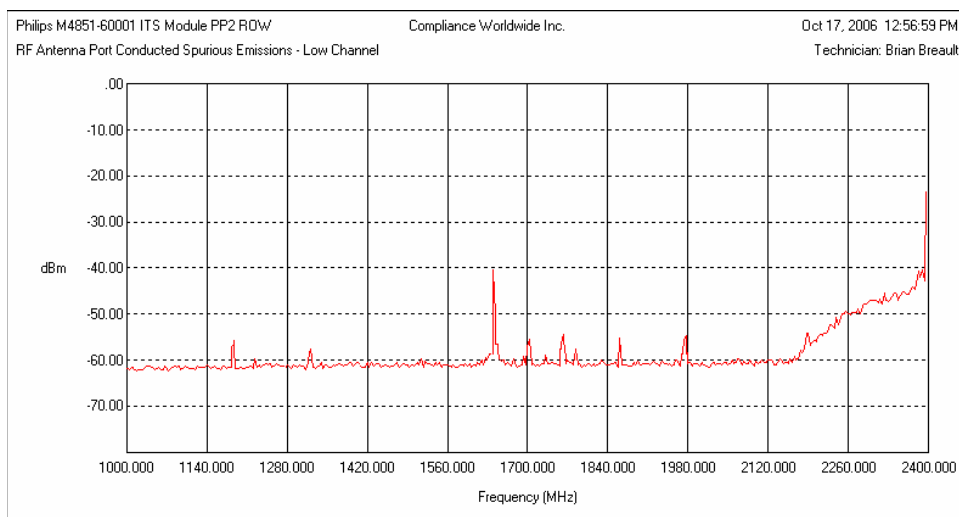
6.3.1. RF Antenna Port Conducted Spurious Emissions Low Channel Active – Plot 1 of 3



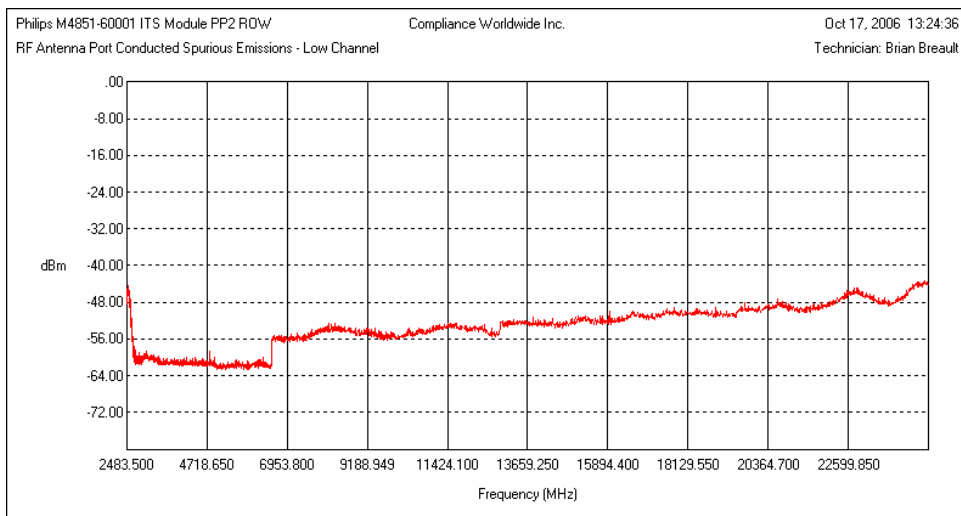
6. Measurement Data (continued)

6.3. Conducted Spurious Emissions (15.247 (d)) (RSS 210 A8.5) (continued)

6.3.1. RF Antenna Port Conducted Spurious Emissions (continued) Low Channel Active – Plot 2 of 3



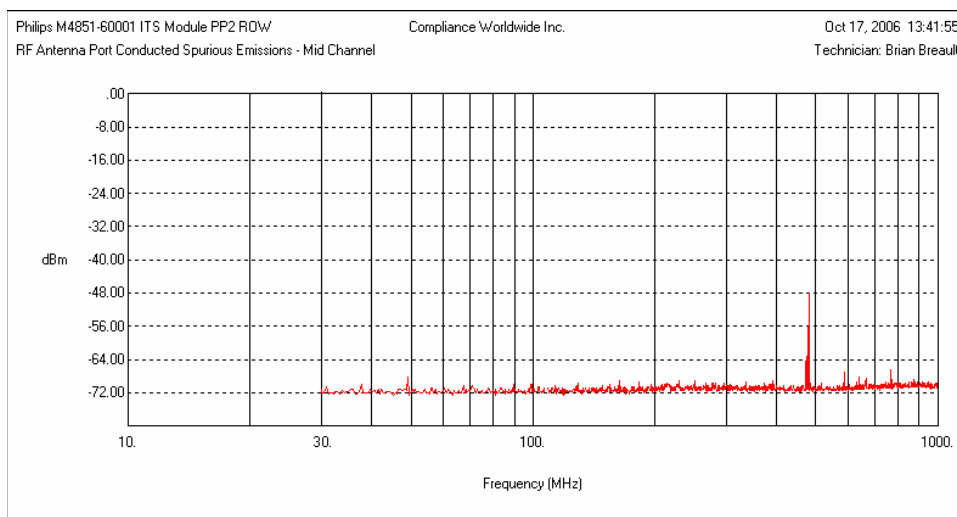
Low Channel Active – Plot 3 of 3



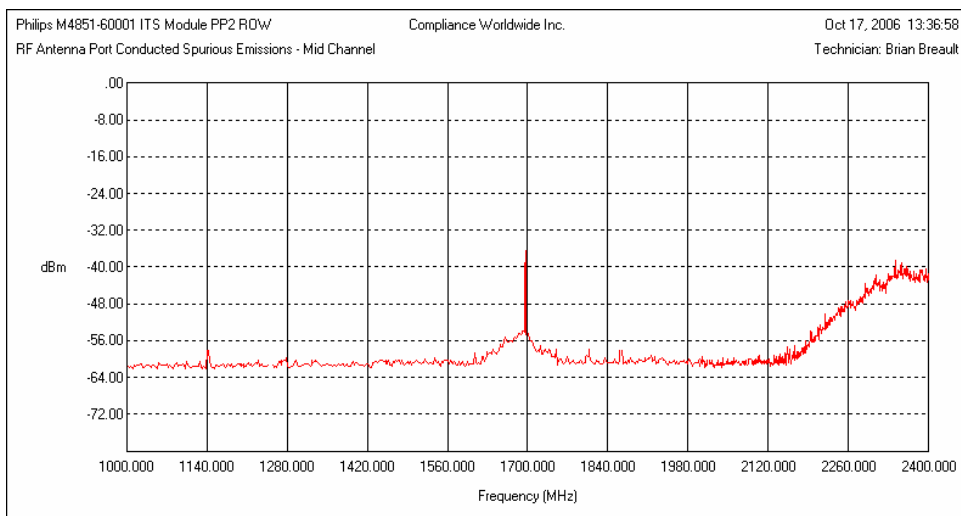
6. Measurement Data (continued)

6.3. Conducted Spurious Emissions (15.247 (d)) (continued)

6.3.1. RF Antenna Port Conducted Spurious Emissions (continued) Middle Channel Active – Plot 1 of 3



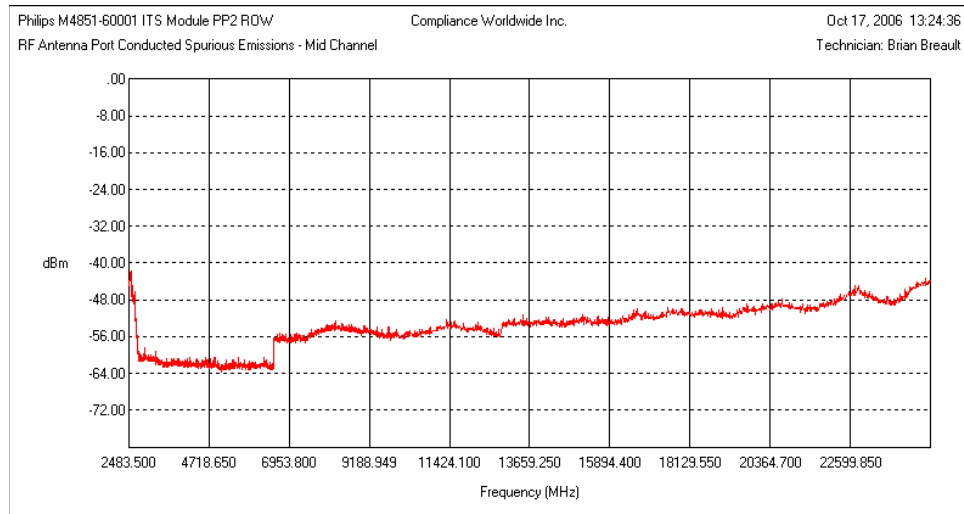
Middle Channel Active – Plot 2 of 3



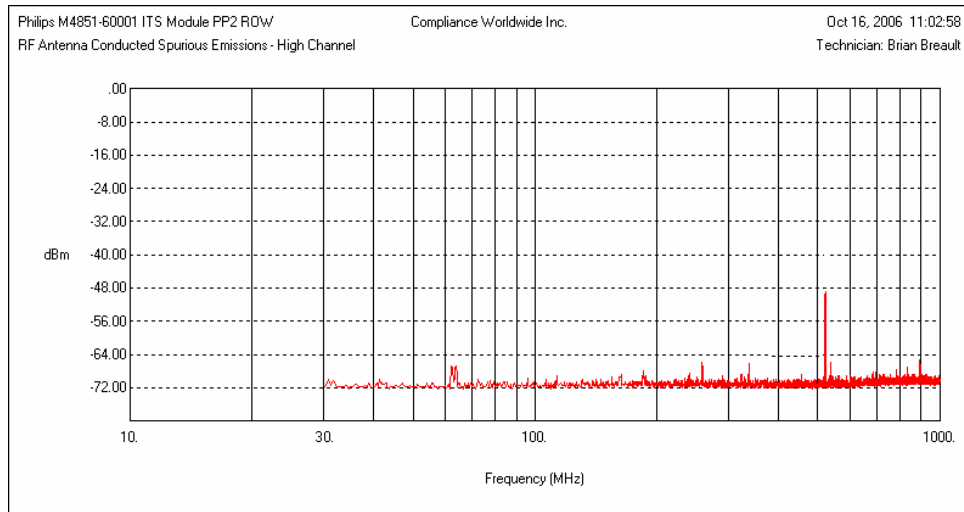
6. Measurement Data (continued)

6.3. Conducted Spurious Emissions (15.247 (d)) (RSS 210 A8.5) (continued)

6.3.1. RF Antenna Port Conducted Spurious Emissions (continued) Middle Channel Active – Plot 3 of 3



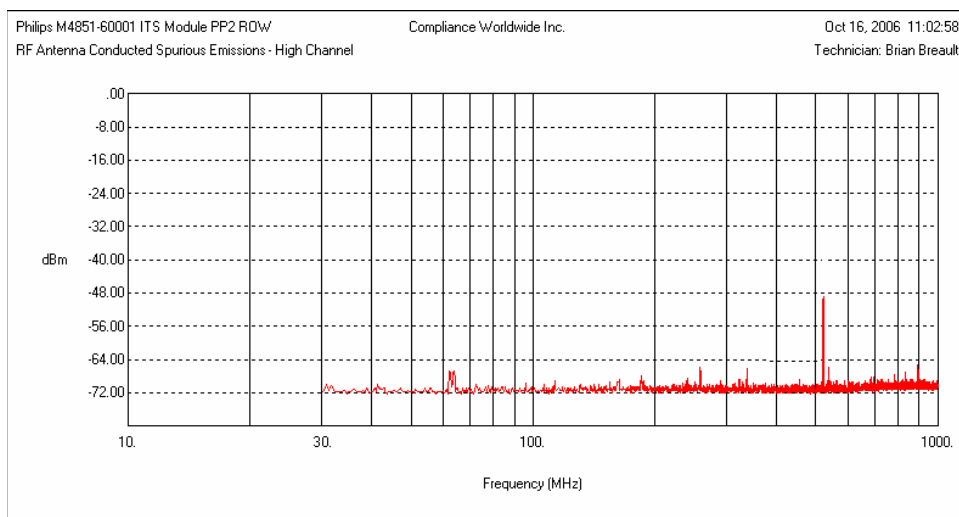
High Channel Active – Plot 1 of 3



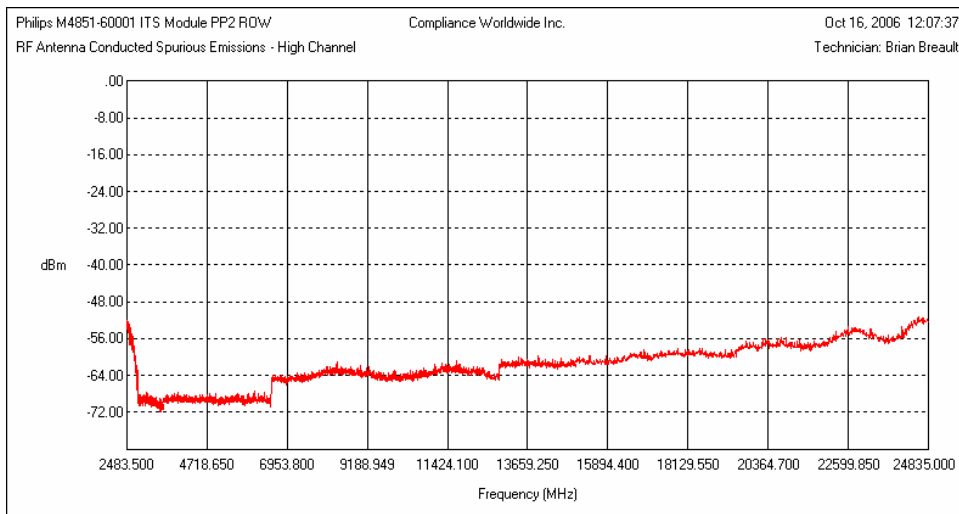
6. Measurement Data (continued)

6.3. Conducted Spurious Emissions (15.247 (d)) (RSS 210 A8.5) (continued)

6.3.1. RF Antenna Port Conducted Spurious Emissions (continued) High Channel Active – Plot 2 of 3



High Channel Active – Plot 3 of 3

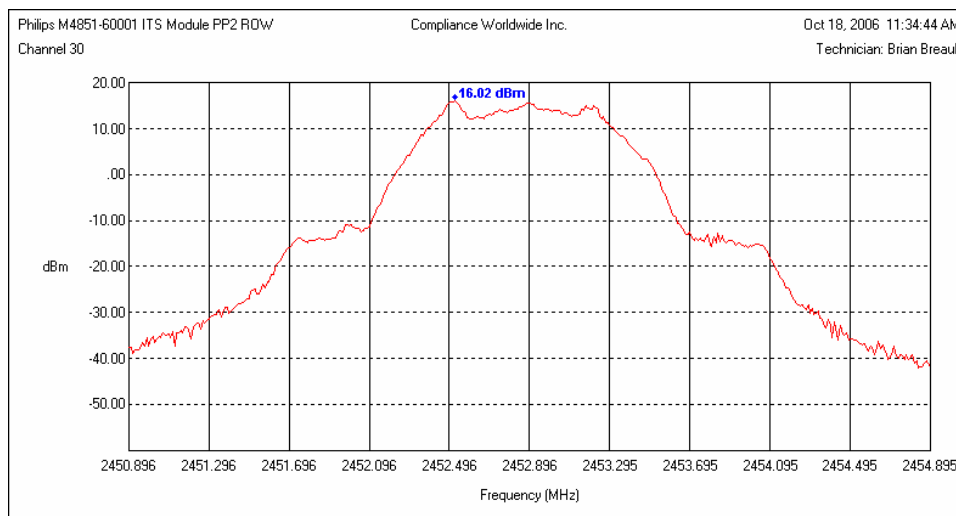


6. Measurement Data (continued)

6.4 Lower and Upper Band Edge Measurements (15.247 (d)) (RSS 210 A8.5)

Requirement: In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

6.4.1 Highest Level of Desired Power Within the Band

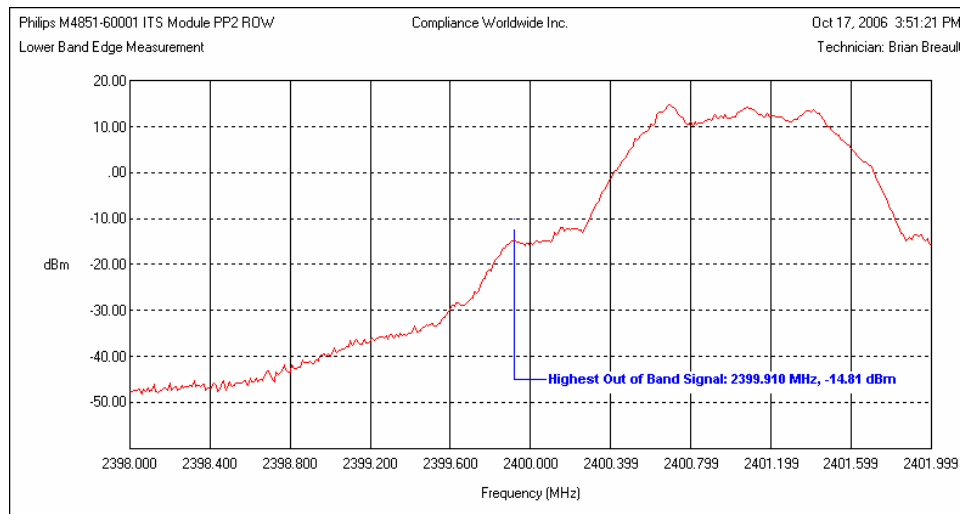


6. Measurement Data (continued)

6.4 Lower and Upper Band Edge Measurements (15.247 (d)) (RSS 210 A8.5) (cont'd)

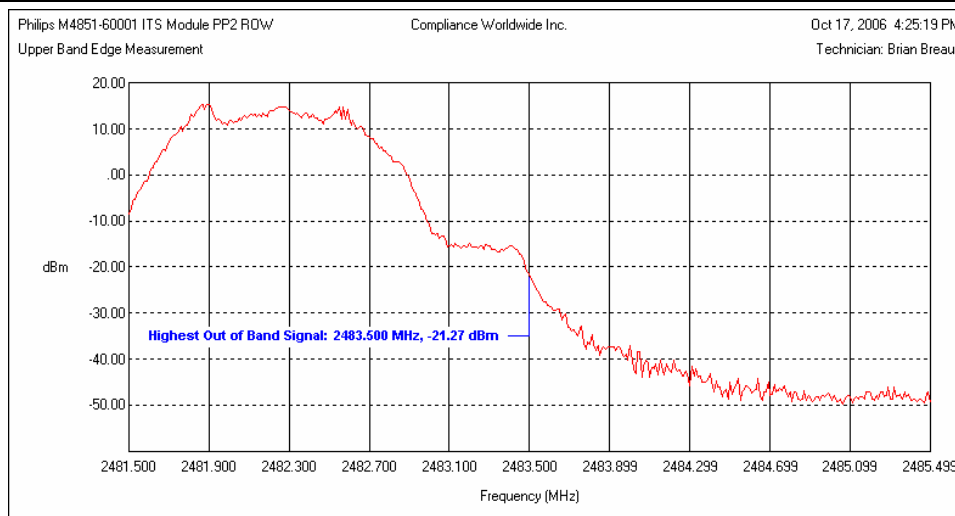
6.4.2. Measurement Results – Lower Band Edge

Lowest Channel (MHz)	Highest Level Within the Band (dBm)		Band Edge Frequency (MHz)	Highest Level Outside the Band (dBm)		Margin (dB)		Result
	Freq.	Peak		Freq.	Peak	Required	Actual	
2401.056	2452.896	+16.02	2400.000	2399.910	-14.81	>30 dB	30.83 dB	Compliant



6.4.3. Measurement Results – Upper Band Edge

Highest Channel (MHz)	Highest Level Within the Band (dBm)		Band Edge Frequency (MHz)	Highest Level Outside the Band (dBm)		Margin (dB)		Result
	Freq.	Peak		Freq.	Peak	Required	Actual	
2482.272	2452.896	+16.02	2483.500	2483.500	-21.27	>30 dB	37.29	Compliant



6. Measurement Data (continued)

6.5. Power Spectral Density (15.247 (e)) (RSS 210 A8.2(2))

Requirement: For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

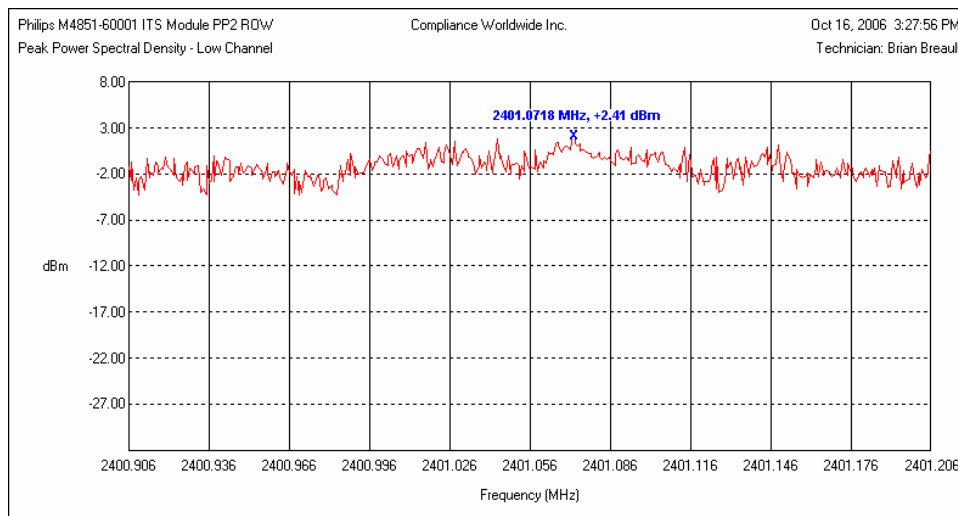
Frequency Span: 300 kHz
Resolution Bandwidth: 3 kHz
Video Bandwidth: 10 kHz
Sweep Time: 100 Seconds

6.5.1 Measurement Results

Channel	Frequency	Power Spectral Density (dBm)	Limit (dBm)	Result
Low	2401.056	2.41	8	Compliant
Middle	2439.072	4.44	8	Compliant
High	2482.272	3.38	8	Compliant

6.5.2 Measurement Plots

Low Channel

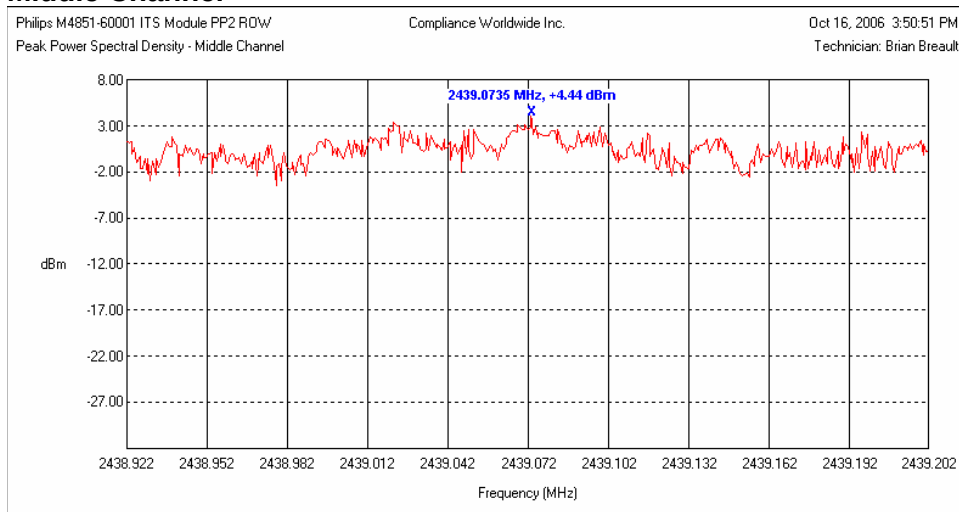


6. Measurement Data (continued)

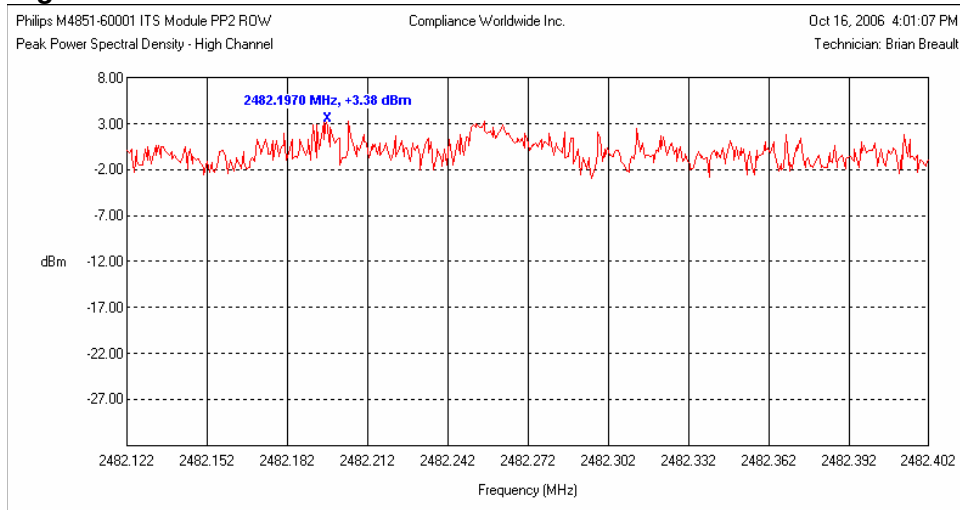
6.5. Power Spectral Density (15.247 (e)) (continued)

6.5.2 Measurement Plots (continued)

Middle Channel



High Channel



6. Measurement Data (continued)

6.6. Public Exposure to Radio Frequency Energy Levels (15.247(i) (1.1307 (b)(1)) RSS-GEN 5.5, RSS 102

MPE Distance (cm)	DUT Output Power (dBm)	DUT Antenna Gain (dBi)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
(1)	(2)	(3)	(4)	(5)	
20 cm	22.2	+2.0	.052	1.0	Compliant
20 cm	22.2	+1.2	.044	1.0	Compliant

First Calculation is based upon the external antenna. Second calculation is based upon the internal multi-band antenna.

1. Reference CFR 2.1093(b): For purposes of this section, a portable device is defined as a transmitting device designed to be used so that the radiating structure(s) of the device is/are within 20 centimeters of the body of the user.
2. Table 6.2.1 of this test report. The value used for this assessment is the highest of the 3 measured channels.
3. Data supplied by the client.
4. Calculated from field strength measurement and antenna gain.
5. Reference CFR 1.1310, Table 1: Limits for Maximum Permissible Exposure (MPE), Section (B): Limits for General Population/Uncontrolled Exposure.

6. Measurement Data (continued)

6.7 Radiated Field Strength of Harmonics (15.247, Section (d))

6.7.1. Radiall/Larsen model SPDA17RP2400

Requirement: The 3 meter field strength of the harmonic emissions that fall within the restricted bands of operate per 15.205 from intentional radiators operated within the 2400-2483.5 MHz frequency bands shall comply with the following: 500 microvolts/meter (54 dB μ V/m), average mode measurement

Note: The peak field strength of any emission shall not exceed the maximum permitted average limits specified by more than 20 dB under any condition of modulation.

6.7.1.1 Lower Channel (2401.056 MHz)

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	
4802.112 ¹	56.04	36.04	0.89	56.93	36.93	54	-17.07	H	103	270	Passed
7203.168	48.01	28.01	4.77	52.78	32.78	54	-21.22	V	159	225	Passed
9604.224	51.89	31.89	8.28	60.17	40.17	54	-13.83	V	137	45	Passed
12005.280 ¹	44.91	24.91	11.75	56.66	36.66	54	-17.34	V	185	137	Passed
14406.336	45.27	25.27	18.27	63.54	43.54	54	-10.46	H	154	10	Passed
16807.392	45.65	25.65	20.52	66.17	46.17	54	-7.83	V	107	245	Passed
19208.448 ¹	45.30	25.30	9.81	55.11	35.11	54	-18.89	Noise Floor			Passed
21609.504	48.84	28.84	10.81	59.65	39.65	54	-14.35	Noise Floor			Passed
24010.560	49.93	29.93	13.51	63.44	43.44	54	-10.56	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)

6.7 Radiated Field Strength of Harmonics (15.247, Section (d)) (continued)

6.7. 1. Radiall/Larsen model SPDA17RP2400

6.7.1.2 Middle Channel (2439.072 MHz)

Frequency (MHz)	Amplitude (dBμV)		Corr. Fact. (dB)	Amplitude (dBμV/m)		Average Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg		Peak	Avg			H/V	cm	Deg	
4878.144 ¹	58.18	38.18	1.02	59.20	39.20	54	-14.80	V	136	185	Passed
7317.216 ¹	52.31	32.31	5.05	57.36	37.36	54	-16.64	V	109	170	Passed
9756.288	54.15	34.15	8.82	62.97	42.97	54	-11.03	V	100	170	Passed
12195.360 ¹	44.60	24.60	11.99	56.59	36.59	54	-17.41	V	145	80	Passed
14634.432	45.00	25.00	17.94	62.94	42.94	54	-11.06	V	100	170	Passed
17073.504	45.29	25.29	23.92	69.21	49.21	54	-4.79	H	150	180	Passed
19512.576 ¹	48.02	28.02	9.96	57.98	37.98	54	-16.02	Noise Floor			Passed
21951.648	48.33	28.33	11.32	59.65	39.65	54	-14.35	Noise Floor			Passed
24390.720	52.65	32.65	13.36	66.01	46.01	54	-7.99	Noise Floor			Passed

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

6.7.1.3 Upper Channel (2482.272 MHz)

Frequency (MHz)	Amplitude (dBμV)		Corr. Fact. (dB)	Amplitude (dBμV/m)		Average Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg		Peak	Avg			H/V	cm	Deg	
4964.544 ¹	62.34	42.34	1.45	63.79	43.79	54	-10.21	V	102	225	Passed
7446.816 ¹	54.20	34.20	5.66	59.86	39.86	54	-14.14	V	111	100	Passed
9929.088	50.28	30.28	9.00	59.28	39.28	54	-14.72	V	131	270	Passed
12411.360 ¹	46.59	26.59	12.17	58.76	38.76	54	-15.24	V	121	160	Passed
14893.632	45.57	25.57	16.37	61.94	41.94	54	-12.06	V	122	0	Passed
17375.904	45.48	25.48	26.73	72.21	52.21	54	-1.79	V	130	270	Passed
19858.176 ¹	48.61	28.61	9.06	57.67	37.67	54	-16.33	Noise Floor			Passed
22340.448	49.21	29.21	13.14	62.35	42.35	54	-11.65	Noise Floor			Passed
24822.720	52.56	32.56	13.84	66.40	46.40	54	-7.60	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)

6.7 Radiated Field Strength of Harmonics (15.247, Section (d))

6.7.2. Alternative Tri-band antenna, Model #M8100-66490

6.7.2.1 Lower Channel (2401.056 MHz)

Frequency (MHz)	Amplitude (dBμV)		Corr. Fact. (dB)	Amplitude (dBμV/m)		Average Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg		Peak	Avg			H/V	cm	Deg	
4802.112 ¹	57.37	37.37	-0.56	56.81	36.81	54	-17.19	V	107	80	Passed
7203.168	57.76	37.76	3.82	61.58	41.58	54	-12.42	V	174	355	Passed
9604.224	60.64	40.64	5.07	65.71	45.71	54	-8.29	V	160	355	Passed
12005.280 ¹	54.86	34.86	7.40	62.26	42.26	54	-11.74	V	137	0	Passed
14406.336	51.76	31.76	11.80	63.56	43.56	54	-10.44	V	160	280	Passed
16807.392	49.58	29.58	17.59	67.17	47.17	54	-6.83	V	160	355	Passed
19208.448 ¹	51.40	31.40	9.81	61.21	41.21	54	-12.79	Noise Floor			Passed
21609.504	51.16	31.16	10.81	61.97	41.97	54	-12.03	Noise Floor			Passed
24010.560	51.94	31.94	13.51	65.45	45.45	54	-8.55	Noise Floor			Passed

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

6.7.2.2. Middle Channel (2439.072 MHz)

Frequency (MHz)	Amplitude (dBμV)		Corr. Fact. (dB)	Amplitude (dBμV/m)		Average Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg		Peak	Avg			H/V	cm	Deg	
4878.144 ¹	60.72	40.72	-0.41	60.31	40.31	54	-13.69	V	165	0	Passed
7317.216 ¹	58.04	38.04	3.61	61.65	41.65	54	-12.35	V	169	0	Passed
9756.288	57.01	37.01	5.35	62.36	42.36	54	-11.64	V	145	260	Passed
12195.360 ¹	49.98	29.98	7.67	57.65	37.65	54	-16.35	V	132	355	Passed
14634.432	48.22	28.22	12.23	60.45	40.45	54	-13.55	V	136	0	Passed
17073.504	49.40	29.40	18.71	68.11	48.11	54	-5.89	V	131	0	Passed
19512.576 ¹	50.97	30.97	9.96	60.93	40.93	54	-13.07	Noise Floor			Passed
21951.648	51.59	31.59	11.32	62.91	42.91	54	-11.09	Noise Floor			Passed
24390.720	52.18	32.18	13.36	65.54	45.54	54	-8.46	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)

6.7 Radiated Field Strength of Harmonics (15.247, Section (d)) (continued)

6.7.2. Alternative Tri-band antenna, Model #M8100-66490

6.7.2.3. Upper Channel (2482.272 MHz)

Frequency (MHz)	Amplitude (dBμV)		Corr. Fact. (dB)	Amplitude (dBμV/m)		Average Limit	Margin (dB)	Ant Pol	Ant Ht	TT Pos	Result
	Peak	Avg		Peak	Avg			H/V	cm	Deg	
4964.544 ¹	63.10	43.10	-0.24	62.86	42.86	54	-11.14	V	231	358	Passed
7446.816 ¹	57.68	37.68	3.85	61.53	41.53	54	-12.47	V	191	355	Passed
9929.088	55.63	35.63	6.17	61.80	41.80	54	-12.20	V	148	95	Passed
12411.360 ¹	54.10	34.10	7.92	62.02	42.02	54	-11.98	V	137	260	Passed
14893.632	49.93	29.93	12.53	62.46	42.46	54	-11.54	V	199	90	Passed
17375.904	49.41	29.41	28.65	78.06	58.06	54	4.06	V	163	350	Passed
19858.176 ¹	51.21	31.21	9.06	60.27	40.27	54	-13.73	Noise Floor			Passed
22340.448	51.45	31.45	13.14	64.59	44.59	54	-9.41	Noise Floor			Passed
24822.720	51.71	31.71	13.84	65.55	45.55	54	-8.45	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)

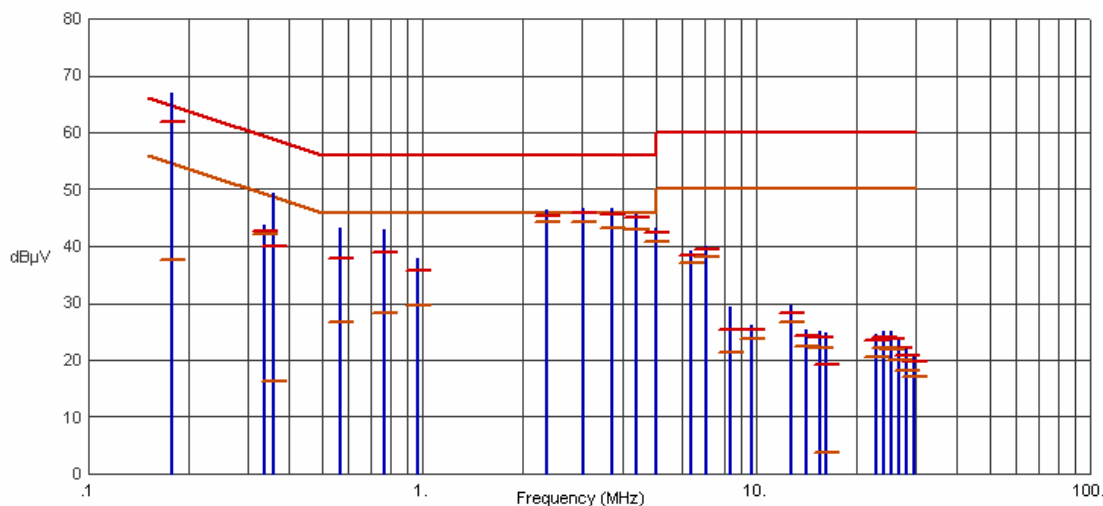
6.8 Line Conducted Emissions (15.207)

6.8. 1. Radial/Larsen model SPDA17RP2400

6.8.1.1. 120 Volts, 60 Hz Phase

Test No.: 286-05, 120 Volts, 60 Hz Phase

EN55022, 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
.1774	66.83	61.77	64.61	-2.84	37.52	54.61	-17.09	
.3355	43.64	42.64	59.31	-16.67	42.08	49.31	-7.23	
.3604	49.28	40.13	58.72	-18.59	16.33	48.72	-32.39	
.5711	43.09	37.84	56.00	-18.16	26.54	46.00	-19.46	
.7698	42.90	39.05	56.00	-16.95	28.40	46.00	-17.60	
.9645	38.00	35.74	56.00	-20.26	29.72	46.00	-16.28	
2.3508	46.27	45.39	56.00	-10.61	44.33	46.00	-1.67	
3.0217	46.76	45.78	56.00	-10.22	44.21	46.00	-1.79	
3.6945	46.72	45.64	56.00	-10.36	43.15	46.00	-2.85	
4.3645	45.58	44.96	56.00	-11.04	42.82	46.00	-3.18	
5.0379	43.24	42.51	60.00	-17.49	40.78	50.00	-9.22	
6.3795	39.07	38.44	60.00	-21.56	37.09	50.00	-12.91	
7.0507	40.03	39.43	60.00	-20.57	38.18	50.00	-11.82	
8.3991	29.34	25.25	60.00	-34.75	21.31	50.00	-28.69	
9.7378	26.20	25.45	60.00	-34.55	23.84	50.00	-26.16	
12.7572	29.52	28.37	60.00	-31.63	26.66	50.00	-23.34	
14.1005	25.30	24.19	60.00	-35.81	22.41	50.00	-27.59	
15.4427	25.16	23.98	60.00	-36.02	22.22	50.00	-27.78	
16.1261	24.79	19.21	60.00	-40.79	3.72	50.00	-46.28	
22.8290	24.55	23.50	60.00	-36.50	20.65	50.00	-29.35	
24.1689	25.07	24.04	60.00	-35.96	22.06	50.00	-27.94	
25.5122	24.94	23.78	60.00	-36.22	21.81	50.00	-28.19	
26.8551	23.37	22.03	60.00	-37.97	19.87	50.00	-30.13	
28.1997	22.07	20.70	60.00	-39.30	18.21	50.00	-31.79	
29.5463	20.91	19.65	60.00	-40.35	17.09	50.00	-32.91	

6. Measurement Data (continued)

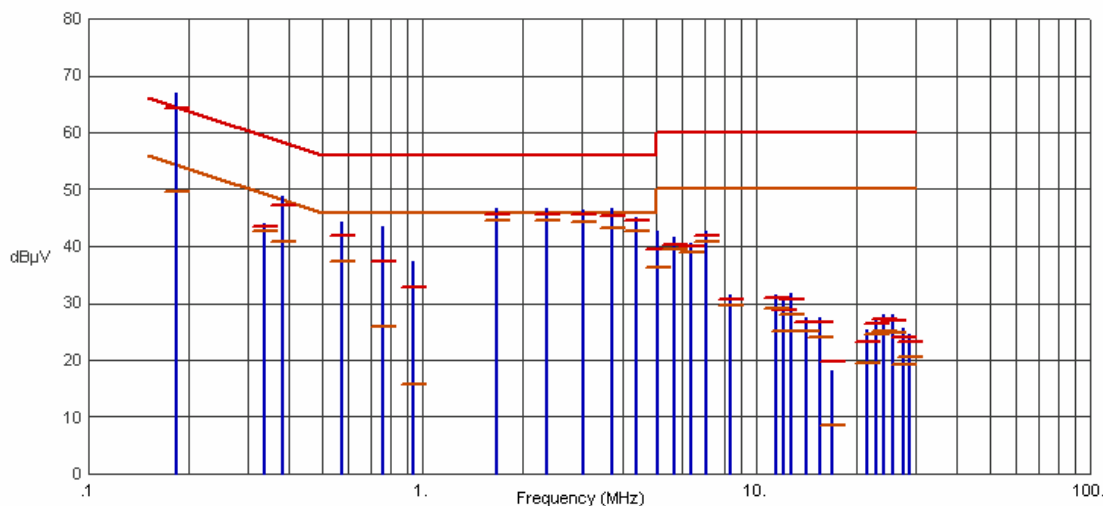
6.8 Line Conducted Emissions (15.207) (continued)

6.8. 1. Radial/Larsen model SPDA17RP2400 (continued)

6.8.1.2. 120 Volts, 60 Hz Neutral

Test No.: 286-05, 120 Volts, 60 Hz Neutral

EN55022, 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
.1826	66.84	64.21	64.37	-1.16	49.58	54.37	-4.79	
.3364	44.11	43.37	59.29	-15.92	42.65	49.29	-6.64	
.3829	48.91	47.18	58.22	-11.04	40.70	48.22	-7.52	
.5753	44.15	41.85	56.00	-14.15	37.23	46.00	-8.77	
.7617	43.34	37.34	56.00	-18.66	25.89	46.00	-20.11	
.9410	37.25	32.88	56.00	-23.12	15.71	46.00	-30.29	
1.6780	46.76	45.67	56.00	-10.33	44.65	46.00	-1.35	
2.3501	46.60	45.70	56.00	-10.30	44.65	46.00	-1.35	
3.0219	46.34	45.71	56.00	-10.29	44.31	46.00	-1.69	
3.6944	46.58	45.45	56.00	-10.55	43.24	46.00	-2.76	
4.3670	44.98	44.43	56.00	-11.57	42.63	46.00	-3.37	
5.0426	42.78	39.45	60.00	-20.55	36.33	50.00	-13.67	
5.7098	41.60	40.38	60.00	-19.62	39.39	50.00	-10.61	
6.3826	40.61	40.08	60.00	-19.92	38.93	50.00	-11.07	
7.0545	42.58	41.78	60.00	-18.22	40.84	50.00	-9.16	
8.4004	31.51	30.64	60.00	-29.36	29.57	50.00	-20.43	
11.4264	31.53	30.85	60.00	-29.15	29.17	50.00	-20.83	
12.0948	30.92	28.90	60.00	-31.10	25.13	50.00	-24.87	
12.7655	31.73	30.76	60.00	-29.24	28.01	50.00	-21.99	
14.1154	27.37	26.65	60.00	-33.35	25.19	50.00	-24.81	
15.4628	27.38	26.55	60.00	-33.45	24.04	50.00	-25.96	
16.8155	18.26	19.64	60.00	-40.36	8.64	50.00	-41.36	
21.5159	25.26	23.19	60.00	-36.81	19.44	50.00	-30.56	
22.8567	27.44	26.35	60.00	-33.65	24.48	50.00	-25.52	
24.2041	27.92	27.10	60.00	-32.90	25.09	50.00	-24.91	
25.5519	27.90	26.91	60.00	-33.09	24.68	50.00	-25.32	
27.5665	25.61	24.02	60.00	-35.98	19.23	50.00	-30.77	
28.9190	24.43	23.26	60.00	-36.74	20.50	50.00	-29.50	

6. Measurement Data (continued)

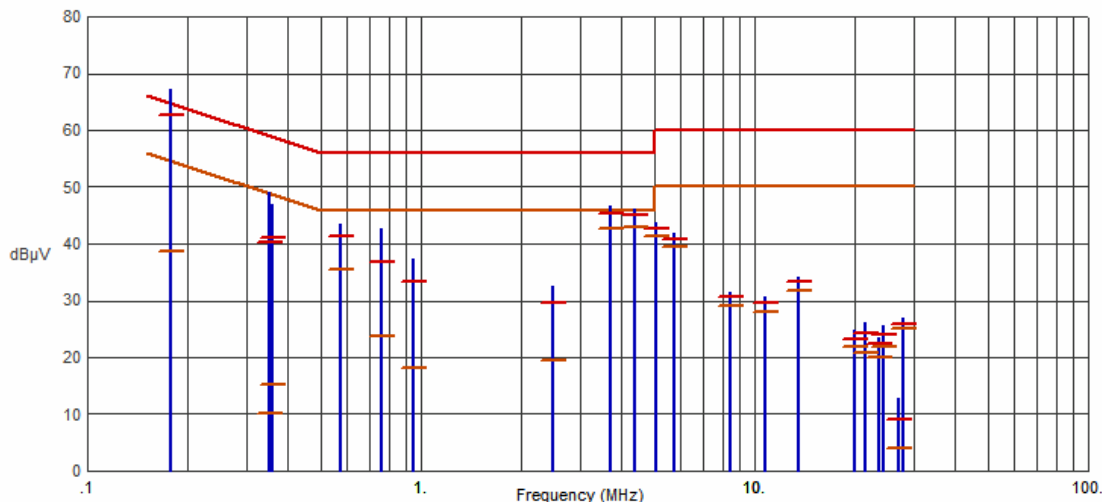
6.8 Line Conducted Emissions (15.207) (continued)

6.8.2. Alternative Tri-band antenna, Model #M8100-66490

6.8.2.1. 120 Volts, 60 Hz Phase

Test No.: 286-06, 120 Volts, 60 Hz Phase

EN55022, 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
.1772	67.20	62.65	64.62	-1.97	38.54	54.62	-16.08	
.3512	49.06	40.26	58.93	-18.67	10.21	48.93	-38.72	
.3577	46.98	40.98	58.78	-17.80	15.29	48.78	-33.49	
.5741	43.44	41.41	56.00	-14.59	35.43	46.00	-10.57	
.7610	42.58	36.69	56.00	-19.31	23.71	46.00	-22.29	
.9472	37.20	33.36	56.00	-22.64	18.25	46.00	-27.75	
2.4926	32.61	29.51	56.00	-26.49	19.56	46.00	-26.44	
3.7047	46.56	45.42	56.00	-10.58	42.79	46.00	-3.21	
4.3786	46.18	45.18	56.00	-10.82	42.87	46.00	-3.13	
5.0525	43.63	42.77	60.00	-17.23	41.31	50.00	-8.69	
5.7269	41.90	40.84	60.00	-19.16	39.43	50.00	-10.57	
8.4221	31.55	30.55	60.00	-29.45	29.09	50.00	-20.91	
10.7797	30.57	29.64	60.00	-30.36	27.97	50.00	-22.03	
13.4756	34.12	33.27	60.00	-26.73	31.73	50.00	-18.27	
20.0002	24.91	23.22	60.00	-36.78	21.89	50.00	-28.11	
21.5576	26.13	24.19	60.00	-35.81	20.67	50.00	-29.33	
23.5847	23.48	22.42	60.00	-37.58	20.04	50.00	-29.96	
24.2577	25.51	23.99	60.00	-36.01	21.88	50.00	-28.12	
26.9134	12.71	9.01	60.00	-50.99	3.88	50.00	-46.12	
28.0003	26.90	25.80	60.00	-34.20	24.95	50.00	-25.05	

6. Measurement Data (continued)

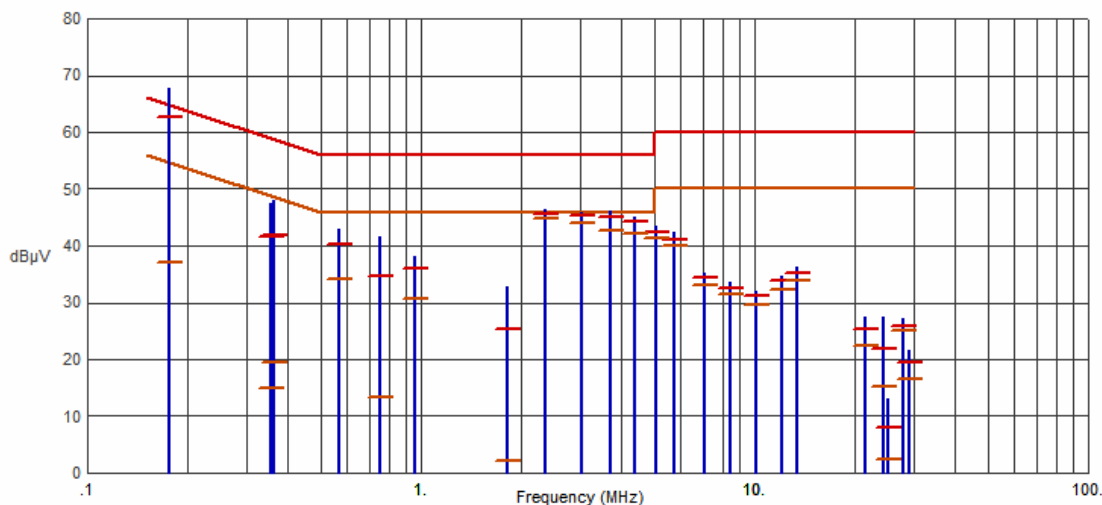
6.8 Line Conducted Emissions (15.207) (continued)

6.8.2. Alternative Tri-band antenna, Model #M8100-66490

6.8.2.2. 120 Volts, 60 Hz Neutral

Test No.: 286-06, 120 Volts, 60 Hz Neutral

EN55022, 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
.1755	67.79	62.67	64.70	-2.03	37.06	54.70	-17.64	
.3564	47.46	41.69	58.81	-17.12	14.94	48.81	-33.87	
.3611	48.00	41.83	58.70	-16.87	19.34	48.70	-29.36	
.5706	43.06	40.21	56.00	-15.79	34.04	46.00	-11.96	
.7503	41.47	34.57	56.00	-21.43	13.43	46.00	-32.57	
.9580	38.26	35.95	56.00	-20.05	30.57	46.00	-15.43	
1.8207	32.71	25.30	56.00	-30.70	2.16	46.00	-43.84	
2.3580	46.35	45.69	56.00	-10.31	44.74	46.00	-1.26	
3.0309	45.91	45.32	56.00	-10.68	43.96	46.00	-2.04	
3.7056	46.09	45.05	56.00	-10.95	42.80	46.00	-3.20	
4.3799	45.05	44.38	56.00	-11.62	42.07	46.00	-3.93	
5.0526	43.35	42.48	60.00	-17.52	41.21	50.00	-8.79	
5.7278	42.31	41.13	60.00	-18.87	40.08	50.00	-9.92	
7.0749	35.27	34.33	60.00	-25.67	33.12	50.00	-16.88	
8.4209	33.57	32.52	60.00	-27.48	31.42	50.00	-18.58	
10.1057	32.02	31.21	60.00	-28.79	29.69	50.00	-20.31	
12.1256	34.70	33.96	60.00	-26.04	32.35	50.00	-17.65	
13.4730	36.23	35.31	60.00	-24.69	33.85	50.00	-16.15	
21.5550	27.36	25.30	60.00	-34.70	22.41	50.00	-27.59	
24.2444	27.53	21.79	60.00	-38.21	15.18	50.00	-34.82	
25.0704	13.16	8.03	60.00	-51.97	2.52	50.00	-47.48	
28.0005	27.07	25.92	60.00	-34.08	24.97	50.00	-25.03	
28.9706	21.57	19.40	60.00	-40.60	16.48	50.00	-33.52	

6. Measurement Data (continued)

6.9 Determination of Average Factor

Total Duration of 1 cycle: 26.6 mS
Total On-Time in 1 cycle: 412 μ S
On-Time divided by cycle: 0.0154
Average Factor: $20 \times \log_{10}(0.0154) = -36.2\text{dB}$
FCC and IC maximum allowed average factor is -20dB .

7. 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 3023A-1**).

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.

8. Test Setup Photographs

8.1. Radiall/Larsen model SPDA17RP2400

8.1.1. Radiated Emissions, Front



8. Test Setup Photographs (Continued)

8.1. Radiall/Larsen model SPDA17RP2400 (continued)

8.1.2. Radiated Emissions, Back



8. Test Setup Photographs (Continued)

8.1. Radiall/Larsen model SPDA17RP2400 (continued)

8.1.3. Conducted Emissions, Front



8. Test Setup Photographs (Continued)

8.1. Radiall/Larsen model SPDA17RP2400 (continued)

8.1.4. Conducted Emissions, Back



8. Test Setup Photographs (Continued)

8.2. Alternative Tri-band Antenna, Model #M8100-66490 (continued)

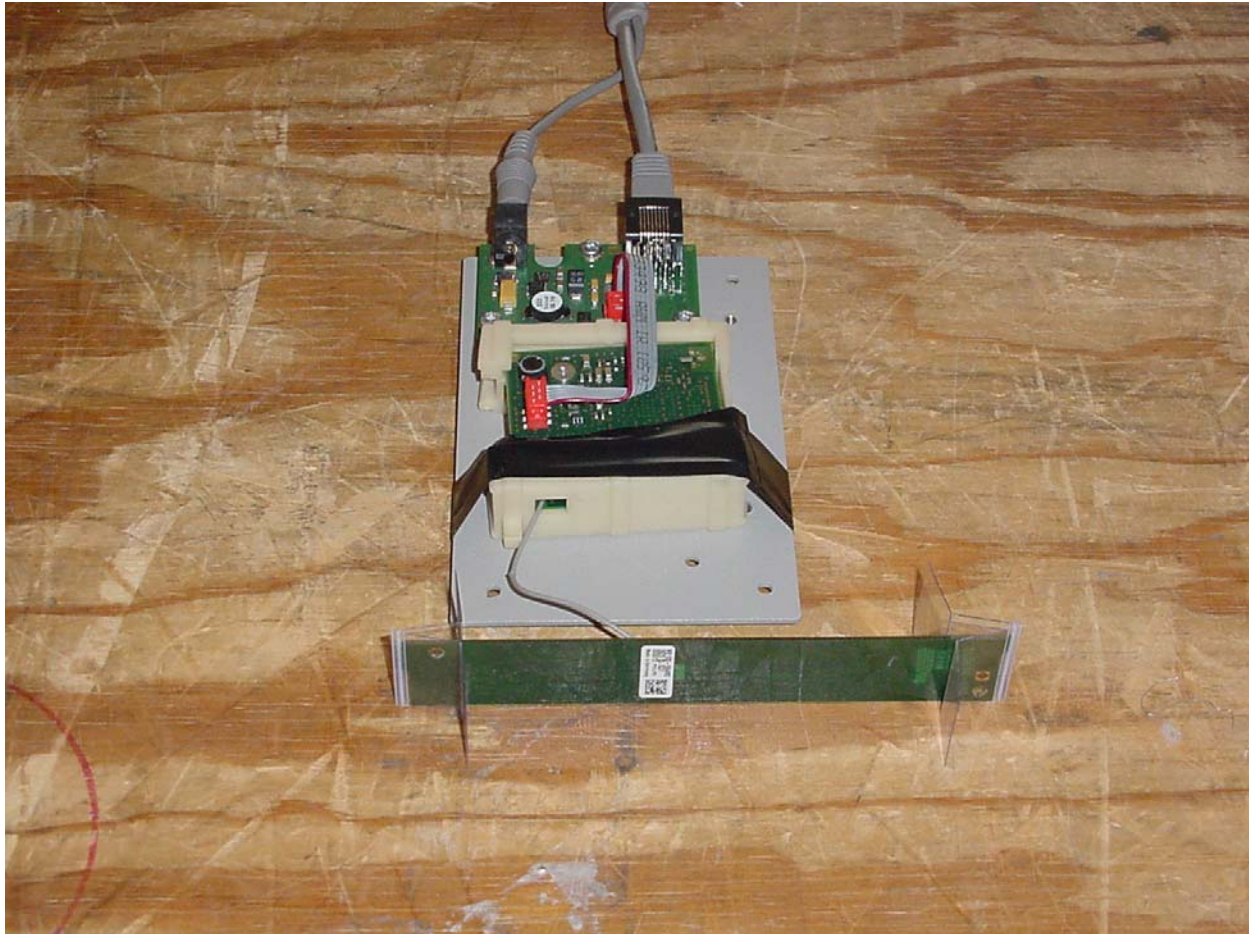
8.2.1-A Radiated Emissions, Front



8. Test Setup Photographs (Continued)

8.2. Alternative Tri-band Antenna, Model #M8100-66490 (continued)

8.2.1-B Radiated Emissions, Front, Close-up



Note: Non-metallic holders were used to maintain an orientation of the antenna circuit board that was perpendicular to the table. This attitude produced the highest emission relative to the limit. See Section 4.3, paragraph 6 for additional information.

8. Test Setup Photographs (Continued)

8.2. Alternative Tri-band Antenna, Model #M8100-66490 (continued)

8.2.2. Radiated Emissions, Back



8. Test Setup Photographs (Continued)

8.2. Alternative Tri-band Antenna, Model #M8100-66490 (continued)

8.2.3. Conducted Emissions, Front



8. Test Setup Photographs (Continued)

8.2. Alternative Tri-band Antenna, Model #M8100-66490 (continued)

8.2.4. Conducted Emissions, Back

