



Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 15.247 CERTIFICATION & INDUSTRY CANADA CERTIFICATION

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FCC ID:	E2XSWL-2200P	GRANTEE FRN NUMBER:	0006-9029-36
PLAT FORM:	N/A	RTL WORK ORDER NUMBER:	2002057
MODEL(S):	SWL-2200P	RTL QUOTE NUMBER:	QRTL02-413DDF
DATE OF TEST REPORT:	April 15, 2002		
American National Standard Institute:	ANSI/TIA/EIA603, DA000705 for FHSS and fcc97114 for DSSS		
FCC Classification:	DTS – Digital Transmission System		
FCC Rule Part(s):	Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz Direct Sequence System		
Industry Canada Standard:	RSS-210: Low Power License-Exempt Radio Communication Devices (All Frequency Bands)		
Digital Interface Information	Digital Interface was found to be compliant		
Receiver Information	Receiver was found to be compliant		
Frequency Range (MHz)	Output Power (W)	Freq. Tolerance	Emission Designator
2412-2462	0.0457	N/A	N/A

We, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards.

Furthermore, there was no deviation from, additions to, or exclusions from the FCC Part 2, FCC Part 15, Industry Canada RSS-210, ANSI C63.4, ANSI/TIA/EIA603, DA000705 for FHSS and fcc97114 for DSSS.

Signature: 

Date: April 15, 2002

Typed/Printed Name: Desmond A. Fraser

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1 GENERAL INFORMATION

1.1 SCOPE

FCC Rules Part 15.247: Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

IC RSS-210 Section 6.2.2(o): Frequency Hopping, Direct Spread Spectrum and Hybrid Systems that are in operation within the bands of 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz.

A direct sequence (DS) system is a spread spectrum (SS) system in which the carrier has been modulated by a high speed spreading code and an information data stream. The high-speed code sequence dominates the "modulating function" and is the direct cause of the wide spreading of the transmitted signal.

1.2 TEST FACILITY

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4 1992).

1.3 RELATED SUBMITTAL(S)/GRANT(S)

This is an original application for Certification for the WLAN PCI card M/N: SWL-2200P, FCC ID: E2XSWL-2200P. The IF, LO and up to the 2nd LO were investigated and tested.

2 TEST INFORMATION

2.1 TEST JUSTIFICATION

The EUT was tested in all three orthogonal planes in order to determine worst-case emissions. Channel 1 at 2412 MHz, Channel 6 at 2437 MHz and channel 11 at 2462 MHz were tested and investigated from 9 kHz to 24 GHz. Data for all three channels are presented in this report.

The EUT contains an antenna; in order to complete the configuration required, the transmitter was tested with a PCI in a computer with an external antenna. The patch antenna transmits, receives, and is connected to the only antenna port available. The worst-case data taken in this report represents the highest data rate at 11 MBPS. Data rates of 5.5 MBPS, 2 MBPS and 1 MBPS were investigated and found to be in compliance. The change in envelope did not cause the EUT to be non-compliant in any of the aforementioned modes.

2.2 EXERCISING THE EUT

The EUT was provided with the software to continuously transmit during testing. The carrier was also checked to verify that the information was being transmitted.

2.3 TEST RESULT SUMMARY

TABLE 2-1: TEST RESULT SUMMARY WITH FCC RULES AND REGULATIONS

STANADARD	TEST	PASS/FAIL OR N/A
FCC 15.205	Compliance with the restricted Band Edge	Pass
FCC 15.207	Conducted Emissions	Pass
FCC 15.209	Radiated Emissions	Pass
FCC 15.247(a)(2)	Modulated Bandwidth	Pass
FCC 15.247(b)	Power Output	Pass
FCC 15.247(c)	Antenna Conducted Spurious Emissions	Pass
FCC 15.247(d)	Power Spectral Density	Pass

2.4 TEST SYSTEM DETAILS

The FCC Identifiers for all equipment, plus descriptions of all cables used in the tested system are:

TABLE 2-2: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
WLAN PCI CARD	SAMSUNG ELECTRO-MECHANICS Co., LTD	SWL-2200Pp	N/A	E2XSWL-2200P	N/A	014241

TABLE 2-3: EXTERNAL COMPONENTS IN TEST CONFIGURATION

Part	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
CD-ROM DRIVE	PHILIPS BUSINESS ELECTRONICS	CDD4201/81 CDR/W	4VO1947DG02397	N/A	INTERNAL	012274
FLOPPY DRIVE	MITSUMI	D353M3	N/A	N/A	INTERNAL	012114
SYSTEM	GATEWAY COMPANIES, INC.	ATXSTF	N/A	N/A	N/A	012332
VIDEO CARD	VISIONTEK	NV996.0 REV.D (RIVA TNT 2)	0223655	N/A	N/A	012900
MOUSE	MICROSOFT CORPORATION	INTELLIMOUSE USB	X05-22941	N/A	SHIELDED WITH FERRITE CONNECTOR END I/O	012301
POWER SUPPLY	EOS	ZVC60NT12AD	00000-94-5797	N/A	UNSHIELDED	014274
KEYBOARD	MAXI-SWITCH	G9900H	2000022106	N/A	SHIELDED I/O	011754
MODEM	USROBOTICS	0413	000839032B26M4PN	N/A	SHIELDED I/O UNSHIELDED POWER	900407
MONITOR	LG	EVF720	N/A	N/A	SHIELDED I/O UNSHIELDED POWER	011929
PRINTER	HEWLETT PACKARD	C3941A	USCB233387	N/A	SHIELDED I/O UNSHIELDED POWER	900293

2.5 CONFIGURATION OF TESTED SYSTEM

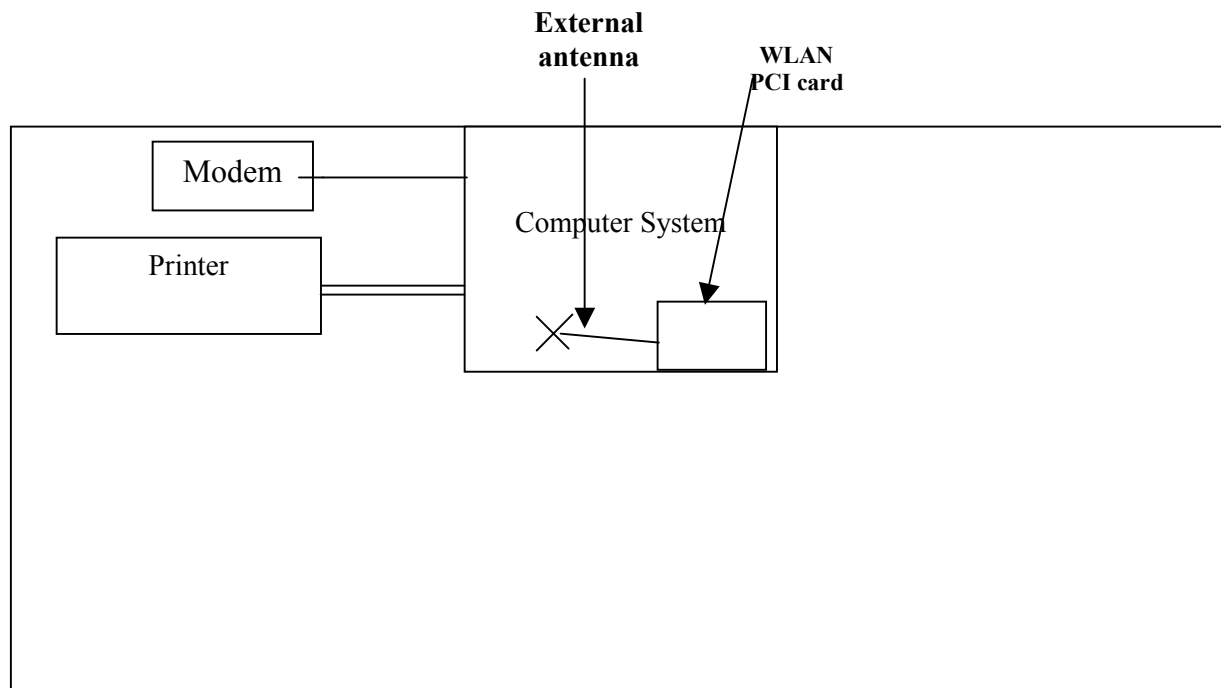


FIGURE 1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

3 COMPLIANCE WITH THE RESTRICTED BAND EDGE - §15.205

3.1 TEST PROCEDURE

Compliance with the band edges was performed using the FCC's "Radiated Measurement at a Band Edge" guidance document. The final data derived below were from radiated measurements only. The data taken in this report represents the worst case at 11 MBPS. Data rates of 5.5MBPS, 2 MBPS and 1 MBPS were investigated and found to be in compliance.

3.2 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

Operating Frequency (MHz): 2412-2462
Channel: 1 & 11
Distance: 3 meter
Limit: 54 dBuV/m

TABLE 3-1: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

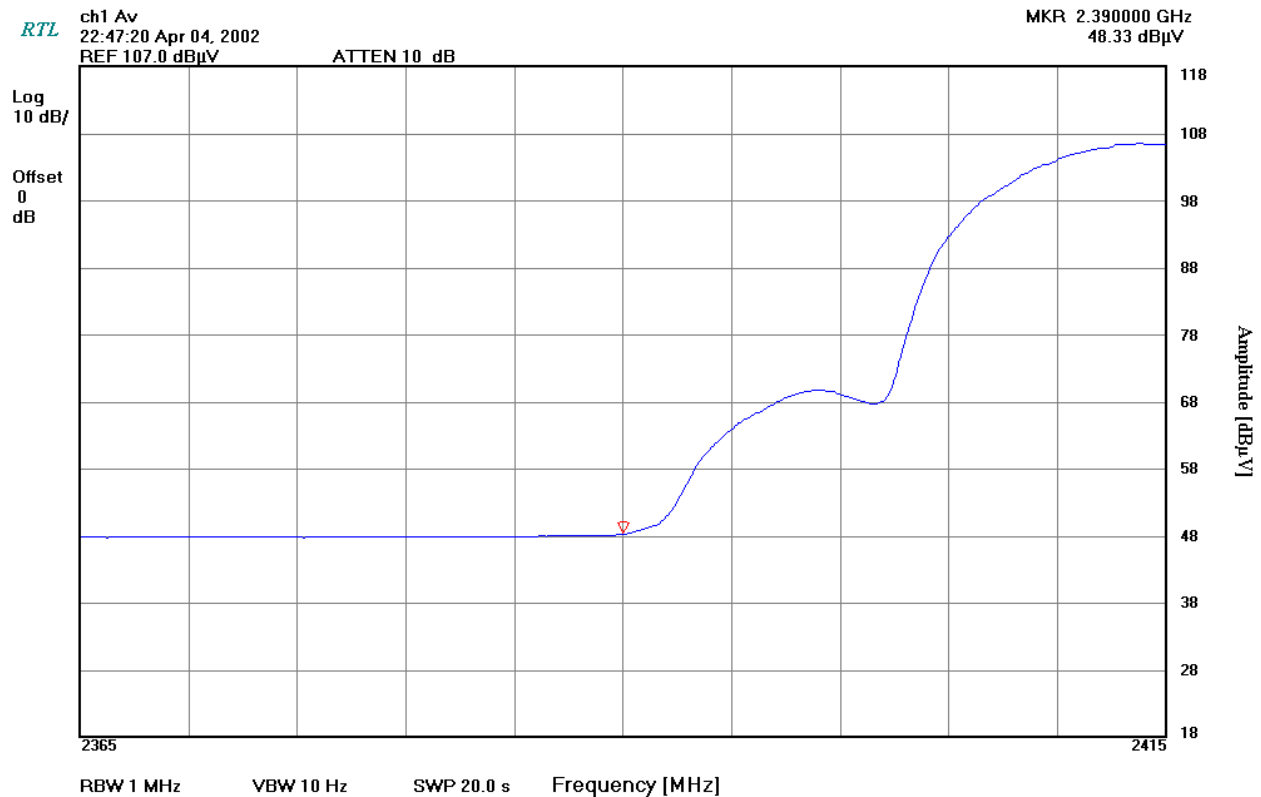
Channel Set to	Frequency tested MHz	Detector	Field Strength Level (dBμV/m)	Level Corrected (dBμV/m)	FCC Limit (dBμV/m)	FCC Margin (dB)
1	2390.0	Absolute measurement	37.3	48.3	54.0	-5.7
11	2483.5	Absolute measurement	39.2	50.2	54.0	-3.8

TEST PERSONNEL:

Franck Schuppius		4/05/2002
Test Technician/Engineer	Signature	Date Of Test

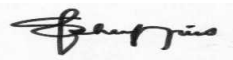
Channel Number: 1
Frequency: 2412MHz
Resolution Bandwidth: 1MHz
Video Bandwidth: 10Hz
Sweep Time: 20.0s

PLOT 3-1: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1



TEST PERSONNEL:

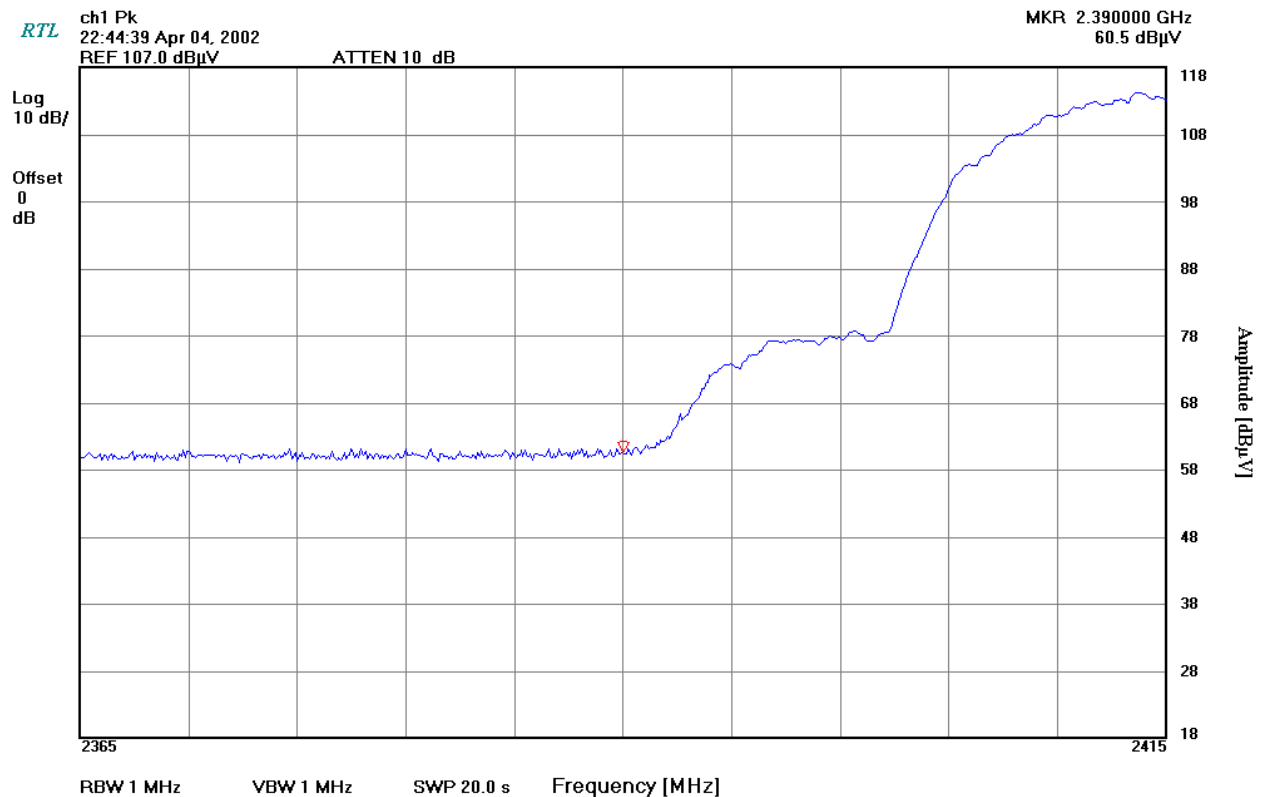
Franck Schuppius
Test Technician/Engineer


Signature

4/05/2002
Date Of Test

Channel Number: 1
Frequency: 2412MHz
Bandwidth Resolution: 1MHz
Video Bandwidth: 1MHz
Sweep Time: 20.0s

PLOT 3-2: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1



TEST PERSONNEL:

Franck Schuppiss
Test Technician/Engineer


Signature

4/05/2002
Date Of Test

Channel Number: 11
Frequency: 2462MHz
Resolution Bandwidth: 1MHz
Video Bandwidth: 10Hz
Sweep Time: 20.0s

PLOT 3-3: BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11



TEST PERSONNEL:

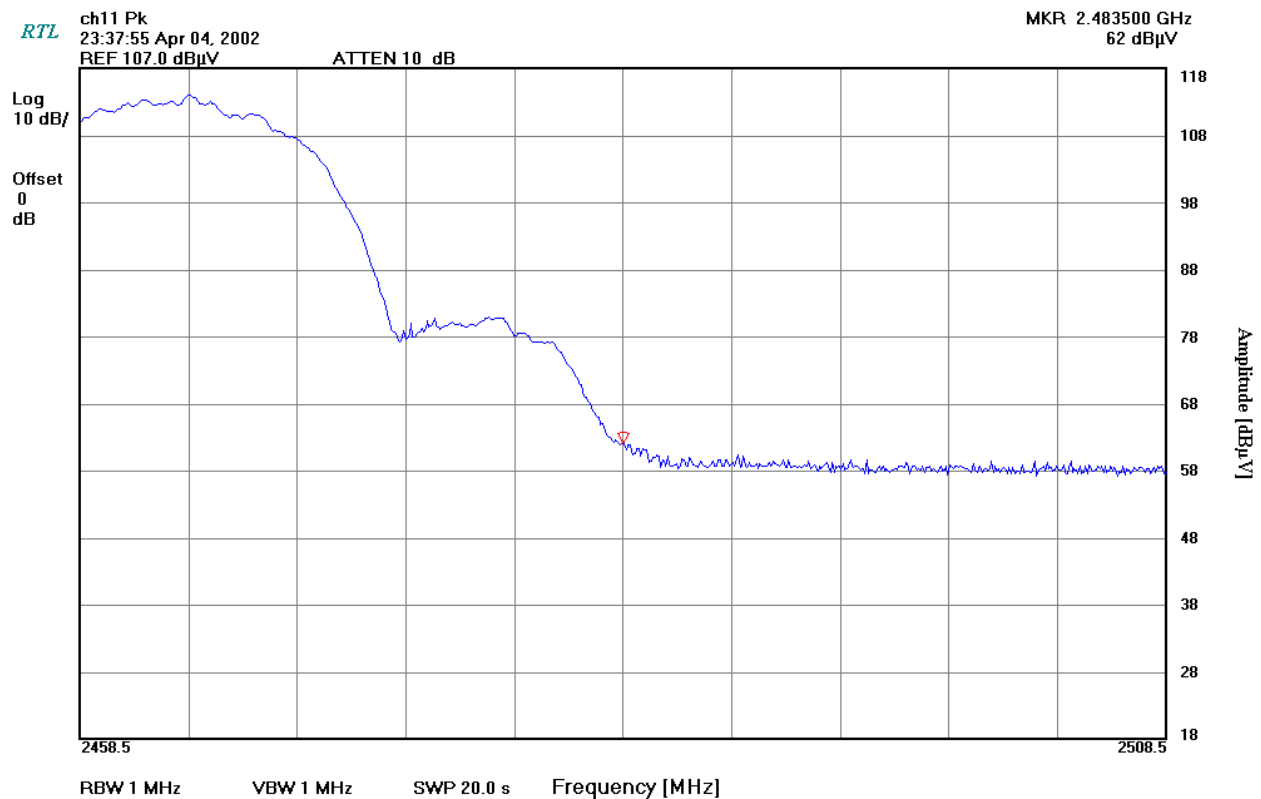
Franck Schuppis
Test Technician/Engineer


Signature

4/05/2002
Date Of Test

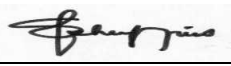
Channel Number: 11
Frequency: 2462MHz
Resolution Bandwidth: 1MHz
Video Bandwidth: 1MHz
Sweep Time: 20.0s

PLOT 3-4: BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11



TEST PERSONNEL:

Franck Schuppis
Test Technician/Engineer


Signature

4/05/2002
Date Of Test

4 CONDUCTED LIMITS - §15.207

4.1 TEST METHODOLOGY FOR CONDUCTED EMISSIONS MEASUREMENTS

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50 ohm / 50 microhenry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar 400 kHz high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 400 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from (150/450) kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

Note: Rhein Tech Laboratories, Inc. has implemented procedures to minimize errors that occur from test instruments, calibration, procedures, and test setups. Test instrument and calibration errors are documented from the manufacturer or calibration lab. Other errors have been defined and calculated within the Rhein Tech quality manual, section 6.1. Rhein Tech implements the following procedures to minimize errors that may occur: yearly as well as daily calibration methods, technician training, and emphasis to employees on avoiding error.

4.2 CONDUCTED EMISSION TEST

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. If the conducted emissions exceed the limit with the instrument set to the quasi-peak mode, then measurements are made in the average mode. If the quasi-peak measurement is at least 6dB higher than the amplitude in the average mode, the level measured in the quasi-peak mode may be reduced by 13dB before comparing it to the limit.

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 450 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE.

TABLE 4-1: CONDUCTED SPURIOUS EMISSIONS TEST EQUIPMENT

RTL Asset #	Manufacturer	Model	Part Type	Serial Number
900931	HP	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771
900070	Solar		LISN	

4.3 CONDUCTED EMISSION TEST DATA

TABLE 4-2: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 1

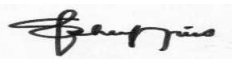
Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
4.431	Pk	36.1	1.5	37.6	48.0	-10.4
9.500	Pk	38.3	2.1	40.4	48.0	-7.6
10.850	Pk	41.6	2.2	43.8	48.0	-4.2
11.300	Pk	39.4	2.3	41.7	48.0	-6.3
12.220	Pk	39.1	2.5	41.6	48.0	-6.4
12.670	Pk	36.1	2.5	38.6	48.0	-9.4
23.090	Pk	33.6	3.2	36.8	48.0	-11.2

TABLE 4-3: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 1

Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
3.617	Pk	30.2	1.4	31.6	48.0	-16.4
9.500	Pk	37.4	1.7	39.1	48.0	-8.9
10.850	Pk	41.4	2.2	43.6	48.0	-4.4
11.090	Pk	34.6	2.3	36.9	48.0	-11.1
11.320	Pk	39.7	2.4	42.1	48.0	-5.9
12.220	Pk	39.0	2.5	41.5	48.0	-6.5
23.090	Pk	34.5	3.3	37.8	48.0	-10.2

TEST PERSONNEL:

Franck Schuppius
Test Technician/Engineer



Signature

4/04/2002
Date Of Test

TABLE 4-4: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 6

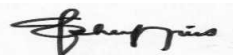
Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
3.617	Pk	29.8	1.4	31.2	48.0	-16.8
9.500	Pk	36.3	2.1	38.4	48.0	-9.6
10.870	Pk	41.9	2.2	44.1	48.0	-3.9
11.090	Pk	34.4	2.2	36.6	48.0	-11.4
11.320	Pk	40.1	2.3	42.4	48.0	-5.6
12.220	Pk	39.4	2.5	41.9	48.0	-6.1
12.670	Pk	36.5	2.5	39.0	48.0	-9.0
23.100	Pk	34.1	3.2	37.3	48.0	-10.7

TABLE 4-5: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 6

Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
2.088	Pk	33.6	1.2	34.8	48.0	-13.2
9.500	Pk	37.4	1.7	39.1	48.0	-8.9
10.870	Pk	41.9	2.2	44.1	48.0	-3.9
11.090	Pk	34.0	2.3	36.3	48.0	-11.7
11.320	Pk	40.3	2.4	42.7	48.0	-5.3
12.220	Pk	39.7	2.5	42.2	48.0	-5.8
23.100	Pk	36.3	3.3	39.6	48.0	-8.4

TEST PERSONNEL:

Franck Schuppius
Test Technician/Engineer



Signature

4/04/2002
Date Of Test

TABLE 4-6: CONDUCTED EMISSIONS (NEUTRAL SIDE) TRANSMITTING CH 11

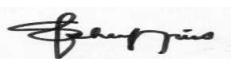
Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
4.431	Pk	31.5	1.5	33.0	48.0	-15.0
9.500	Pk	37.2	2.1	39.3	48.0	-8.7
10.870	Pk	42.1	2.2	44.3	48.0	-3.7
11.320	Pk	40.2	2.3	42.5	48.0	-5.5
12.220	Pk	39.5	2.5	42.0	48.0	-6.0
12.460	Pk	32.0	2.5	34.5	48.0	-13.5
12.670	Pk	36.9	2.5	39.4	48.0	-8.6
23.100	Pk	34.6	3.2	37.8	48.0	-10.2

TABLE 4-7: CONDUCTED EMISSIONS (PHASE SIDE) TRANSMITTING CH 11

Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
4.977	Pk	30.1	1.7	31.8	48.0	-16.2
9.500	Pk	36.8	1.7	38.5	48.0	-9.5
10.870	Pk	41.4	2.2	43.6	48.0	-4.4
11.090	Pk	34.5	2.3	36.8	48.0	-11.2
11.320	Pk	39.3	2.4	41.7	48.0	-6.3
12.220	Pk	39.2	2.5	41.7	48.0	-6.3
12.670	Pk	36.1	2.5	38.6	48.0	-9.4
23.100	Pk	37.2	3.3	40.5	48.0	-7.5

TEST PERSONNEL:

Franck Schuppius
Test Technician/Engineer



Signature

4/04/2002
Date Of Test

TABLE 4-8: CONDUCTED EMISSIONS (PHASE SIDE) RECEIVING CH 1

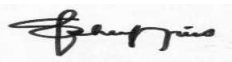
Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
2.093	Pk	32.0	1.2	33.2	48.0	-14.8
9.500	Pk	37.1	2.1	39.2	48.0	-8.8
10.870	Pk	41.6	2.2	43.8	48.0	-4.2
11.320	Pk	39.5	2.3	41.8	48.0	-6.2
12.220	Pk	39.3	2.5	41.8	48.0	-6.2
12.680	Pk	36.5	2.5	39.0	48.0	-9.0
23.100	Pk	35.2	3.2	38.4	48.0	-9.6

TABLE 4-9: CONDUCTED EMISSIONS (NEUTRAL SIDE) RECEIVING CH 1

Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
3.617	Pk	30.9	1.4	32.3	48.0	-15.7
9.500	Pk	37.6	1.7	39.3	48.0	-8.7
10.870	Pk	41.5	2.2	43.7	48.0	-4.3
11.320	Pk	39.7	2.4	42.1	48.0	-5.9
12.220	Pk	39.3	2.5	41.8	48.0	-6.2
12.680	Pk	36.9	2.5	39.4	48.0	-8.6
23.110	Pk	36.5	3.3	39.8	48.0	-8.2

TEST PERSONNEL:

Franck Schuppis
Test Technician/Engineer



Signature

4/04/2002
Date Of Test

TABLE 4-10: CONDUCTED EMISSIONS (PHASE SIDE) RECEIVING CH 6

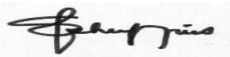
Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.455	Pk	37.6	0.8	38.4	48.0	-9.6
9.500	Pk	36.9	2.1	39.0	48.0	-9.0
10.870	Pk	41.7	2.2	43.9	48.0	-4.1
11.320	Pk	39.6	2.3	41.9	48.0	-6.1
12.220	Pk	39.1	2.5	41.6	48.0	-6.4
12.670	Pk	35.9	2.5	38.4	48.0	-9.6
14.030	Pk	32.1	2.6	34.7	48.0	-13.3
23.110	Pk	35.6	3.2	38.8	48.0	-9.2

TABLE 4-11: CONDUCTED EMISSIONS (NEUTRAL SIDE) RECEIVING CH 6

Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
0.455	Pk	31.3	0.8	32.1	48.0	-15.9
9.500	Pk	36.2	1.7	37.9	48.0	-10.1
10.870	Pk	41.2	2.2	43.4	48.0	-4.6
11.320	Pk	39.6	2.4	42.0	48.0	-6.0
12.230	Pk	38.8	2.5	41.3	48.0	-6.7
12.680	Pk	36.3	2.5	38.8	48.0	-9.2
23.110	Pk	36.7	3.3	40.0	48.0	-8.0

TEST PERSONNEL:

Franck Schuppilus
Test Technician/Engineer



Signature

4/04/2002
Date Of Test

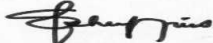
TABLE 4-12: CONDUCTED EMISSIONS (PHASE SIDE) RECEIVING CH 11

Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
4.977	Pk	30.8	1.6	32.4	48.0	-15.6
9.500	Pk	36.4	2.1	38.5	48.0	-9.5
10.420	Pk	35.0	2.1	37.1	48.0	-10.9
10.870	Pk	41.6	2.2	43.8	48.0	-4.2
11.320	Pk	39.6	2.3	41.9	48.0	-6.1
12.220	Pk	38.9	2.5	41.4	48.0	-6.6
23.110	Pk	35.5	3.2	38.7	48.0	-9.3

TABLE 4-13: CONDUCTED EMISSIONS (NEUTRAL SIDE) RECEIVING CH 11

Temperature: 74°F Humidity: 45%						
Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B QP Limit (dBuV)	FCC B QP Margin (dBuV)
4.982	Pk	29.9	1.7	31.6	48.0	-16.4
9.500	Pk	37.7	1.7	39.4	48.0	-8.6
10.870	Pk	41.6	2.2	43.8	48.0	-4.2
11.320	Pk	39.3	2.4	41.7	48.0	-6.3
12.220	Pk	39.0	2.5	41.5	48.0	-6.5
12.680	Pk	36.2	2.5	38.7	48.0	-9.3
23.100	Pk	36.6	3.3	39.9	48.0	-8.1

TEST PERSONNEL:

Franck Schuppis		4/04/2002
Test Technician/Engineer	Signature	Date Of Test