



Engineering and Testing for EMC and Safety Compliance

CERTIFICATION APPLICATION REPORT
FCC PART 15.247 PERMISSIVE CHANGE CERTIFICATION & INDUSTRY CANADA CERTIFICATION

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FCC Classification:	DSS – Spread Spectrum Transmitter
FCC Rule Part(s):	Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz ☐ Frequency Hopping System ☒ Direct Sequence System ☐ Hybrid System
Industry Canada Standard:	RSS-139: Low Power License-Exempt Radiocommunication Devices (All Frequency Bands) RSS-139: Section 6.2.2(o): 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

FCC ID:	LDK 102042	MAX. RF OUTPUT POWER:	0.1W
FRN Number:	0004-9689-39.	Frequency Tolerance:	N/A
Equipment Type:	Mini-PCI card	Emission Designator:	N/A
Tx Frequency Range:	2412-2462	Date of Test Report:	July 1, 2002
Rx Frequency Range:	2412-2462	Model(s):	AIR-MPI 352 series

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-139, ANSI C63.4,

Signature: 

Date: July 1, 2002

Typed/Printed Name: Desmond A. Fraser

Position: President
(NVLAP Signatory)

 Accredited by the National Voluntary Accreditation Program for the specific scope of accreditation under Lab Code 200061-0.

Note: This report may not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

TABLE OF CONTENTS

1	GENERAL INFORMATION	4
1.1	SCOPE	4
1.2	TEST FACILITY	4
1.3	RELATED SUBMITTAL (S)/ GRANT(S)	4
1.4	PERMISSIVE CHANGE INFORMATION /OVERVIEW	4
2	EQUIPMENT INFORMATION	5
2.1	APPLICANT AND EQUIPMENT INFORMATION	5
2.2	TEST SYSTEM DETAILS	6
2.3	CONFIGURATION OF TESTED SYSTEM	7
3	COMPLIANCE WITH THE RESTRICTED BAND EDGE - §15.205	8
3.1	TEST PROCEDURE	8
3.2	COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA	8
4	POWER OUTPUT - §15.247(B)	13
4.1	POWER OUTPUT TEST PROCEDURE	13
4.2	TEST EQUIPMENT USED FOR TESTING	13
4.3	POWER OUTPUT TEST DATA	13
5	CONDUCTED LIMITS - § 15.207/15.407(B)6	14
5.1	CONDUCTED EMISSIONS TEST PROCEDURES	14
5.2	CONDUCTED EMISSIONS TEST DATA	15
6	RADIATED EMISSION LIMITS (GENERAL REQUIREMENTS) - §15.209	16
6.1	RADIATED EMISSION LIMITS TEST PROCEDURE	16
6.2	TEST EQUIPMENT USED FOR TESTING	16
6.3	RADIATED EMISSION LIMITS TEST DATA	17

TABLE INDEX

TABLE 2-1:	EQUIPMENT UNDER TEST (EUT)	6
TABLE 2-2:	EXTERNAL COMPONENTS IN TEST CONFIGURATION	6
TABLE 3-1:	COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA AIR-ANT4941	8
TABLE 4-1:	TEST EQUIPMENT USED FOR TESTING (RADIATED RF OUTPUT – EIRP)	13
TABLE 4-2:	POWER OUTPUT TEST DATA	13
TABLE 4-3:	POWER OUTPUT TEST DATA	13
TABLE 5-1:	CONDUCTED EMISSIONS NEUTRAL SIDE (LINE 1)	15
TABLE 5-2:	CONDUCTED EMISSIONS HOT SIDE (LINE 1)	15
TABLE 6-1:	RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT	16
TABLE 6-2:	RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 1) AIR-ANT4941	17
TABLE 6-3:	RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 6) AIR-ANT4941	18
TABLE 6-4:	RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 11) AIR-ANT4941	19

PLOT INDEX

PLOT 3-1:	BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 1	9
PLOT 3-2:	BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 1	10
PLOT 3-3:	BAND EDGE: AVERAGE MEASUREMENT FOR CHANNEL 11	11
PLOT 3-4:	BAND EDGE: PEAK MEASUREMENT FOR CHANNEL 11	12

APPENDIX INDEX

APPENDIX A:	MPE EVALUATION REPORT-FCC PART 1.1307, 1.1310, 2.1091, & 2.1093	20
APPENDIX B:	TEST SET UP PHOTOGRAPHS	21
APPENDIX C:	EUT PHOTOGRAPHS	25
APPENDIX D:	ANTENNA SPECIFICATIONS	30

PHOTOGRAPH INDEX

PHOTOGRAPH 1:	CONDUCTED EMISSIONS – FRONT VIEW	21
PHOTOGRAPH 2:	CONDUCTED EMISSIONS REAR VIEW	22
PHOTOGRAPH 3:	RADIATED EMISSIONS FRONT VIEW	23
PHOTOGRAPH 4:	RADIATED EMISSIONS REAR VIEW	24
PHOTOGRAPH 5:	AP1200 WITH 2.4GHZ AND 5 GHZ TX MODULES	25
PHOTOGRAPH 6:	5GHZ ANTENNA INSTALLED IN AP1200	26
PHOTOGRAPH 7:	2.4GHZ ANTENNA	27
PHOTOGRAPH 8:	5GHZ TX MODULE WITH INTEGRAL ANTENNA	28
PHOTOGRAPH 9:	AP1200 MOTHER BOARD WITH 2.4GHZ TX MODULE INSTALLED	29

FIGURE INDEX

FIGURE 2-1:	WORST CASE CONFIGURATION OF SYSTEM UNDER TEST	7
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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-139 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 application is for a Class II Permissive Change for the Mini-PCI card FCC ID: LDK102042 installed on Cisco's AP1200 Access Point as a module with Cisco's 5 GHz UNII device (FCC ID: LDK102045) with integrated antenna. There is also a new 2.4GHz 2.2 dBi antenna, AIR-ANT4941.

1.4 PERMISSIVE CHANGE INFORMATION /OVERVIEW

This Permissive Change Application is MPE evaluation on RF safe distance/ transmitter co-location between this modular approved Mini-PCI Card (FCC ID: LDK102042) with the antennas listed table 2.2 of this report and the 5GHz UNII transmitter (FCC ID: LDK102045) and its integral antenna currently at the commission. The MPE evaluation report is an attachment to this report.

2 EQUIPMENT INFORMATION

2.1 APPLICANT AND EQUIPMENT INFORMATION

FCC Classification:	DSS – Spread Spectrum Transmitter
FCC Rule Part(s):	Part 15.247: Operation within the bands 920-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz ☐ Frequency Hopping System ☒ Direct Sequence System ☐ Hybrid System
Industry Canada Standard:	RSS-139: Low Power License-Exempt Radiocommunication Devices (All Frequency Bands) RSS-139: Section 6.2.2(o): 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

FCC ID:	LDK 102042	MAX. RF OUTPUT POWER:	0.1W
FRN Number:	0004-9689-39.	Frequency Tolerance:	N/A
Equipment Type:	Mini-PCI card	Emission Designator:	N/A
Tx Frequency Range:	2412-2462	Date of Test Report:	July 1, 2002
Rx Frequency Range:	2412-2462	Model(s):	AIR-MPI-350 series

2.2 TEST SYSTEM DETAILS

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

TABLE 2-1: EQUIPMENT UNDER TEST (EUT)

PART	MANUFACTURER	MODEL	SERIAL NUMBER	FCC ID	CABLE DESCRIPTION	RTL BAR CODE
2.4 GHZ MINI-PCI WLAN	CISCO	VENUS	N/A	LDK 102042	N/A	N/A
ACCESS POINT	CISCO	AP1200	AKN0000409	DoC	N/A	N/A
5 GHZ UNII	CISCO	OSPREY	VEN 06152907	LDK102045	N/A	N/A

TABLE 2-2: EXTERNAL COMPONENTS IN TEST CONFIGURATION

MANUFACTURER	ANTENNA TYPE	EIRP, DBM	ANTENNA GAIN, DBI	ENVIRONMENT
Cisco	AIR-ANT 1949	30.1	13.5	Outdoors
Cisco	AIR-ANT 4121	24.2	12.0	Outdoors
Cisco	AIR-ANT 2506	20.4	5.1	Outdoors
Cisco	AIR-ANT 3549	23.1	8.5	Indoors/ Outdoors
Cisco	AIR-ANT 2012	23.9	6.5	Indoors/ Outdoors
Cisco	AIR-ANT1729	23.2	6.0	Indoors/ Outdoors
Cisco	AIR-ANT 3213	20.7	5.0	Indoors/ Outdoors
Cisco	AIR-ANT 1728	20.7	5.0	Indoors/ Outdoors
Cisco	AIR-ANT 5959	17.4	2.0	Indoors/ Outdoors
¹ Cisco	AIR-ANT-4941	20.5	2.2	Indoors/ Outdoors

¹ This antenna is added to the existing antennas under the class II application change.

2.3 CONFIGURATION OF TESTED SYSTEM

2.4 GHz External Antennas

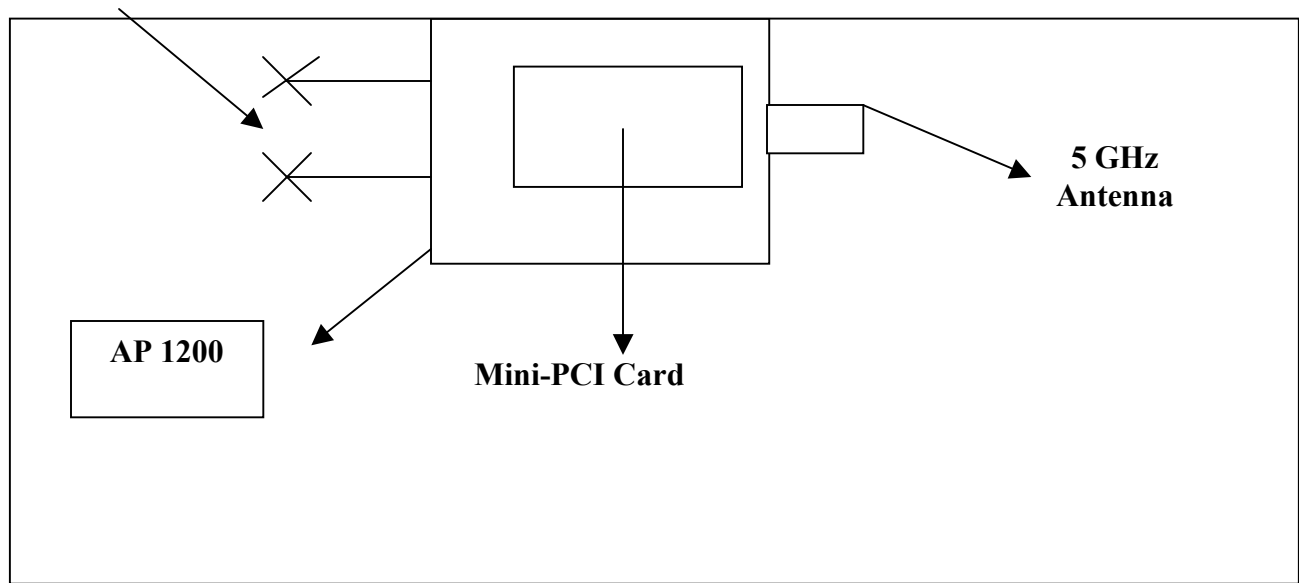


FIGURE 2-1: WORST CASE CONFIGURATION OF SYSTEM UNDER TEST

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 results for the EUT at channels 1 and 11 with 11 MBPS data rate. Data rates of 5.5MBPS, 2 MBPS and 1 MBPS were investigated and found to be in compliance.

PART	MODEL	GAIN DBi
AIR-ANT4941	OMNI-DIRECTECTIONAL	2.2

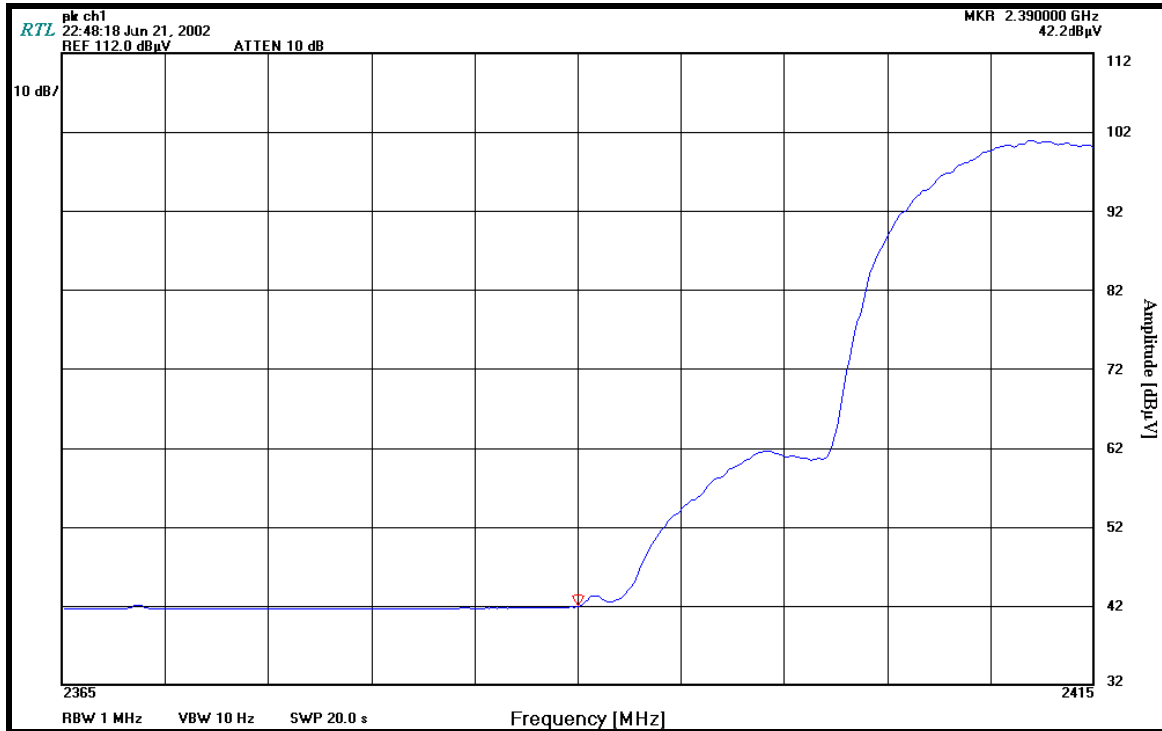
3.2 COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA

TABLE 3-1: COMPLIANCE WITH THE RESTRICTED BAND EDGE TEST DATA AIR-ANT4941

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	36.2	42.2	54.0	-11.8
11	2483.5	ABSOLUTE MEASUREMENT	38.7	44.3	54.0	-9.7

CHANNEL: 1
CHANNEL FREQUENCY: 2412
RESOLUTION BANDWIDTH (MHZ): 1
VIDEO BANDWIDTH (HZ): 10
SWEEP TIME (S): 20.0

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



TEST PERSONNEL:

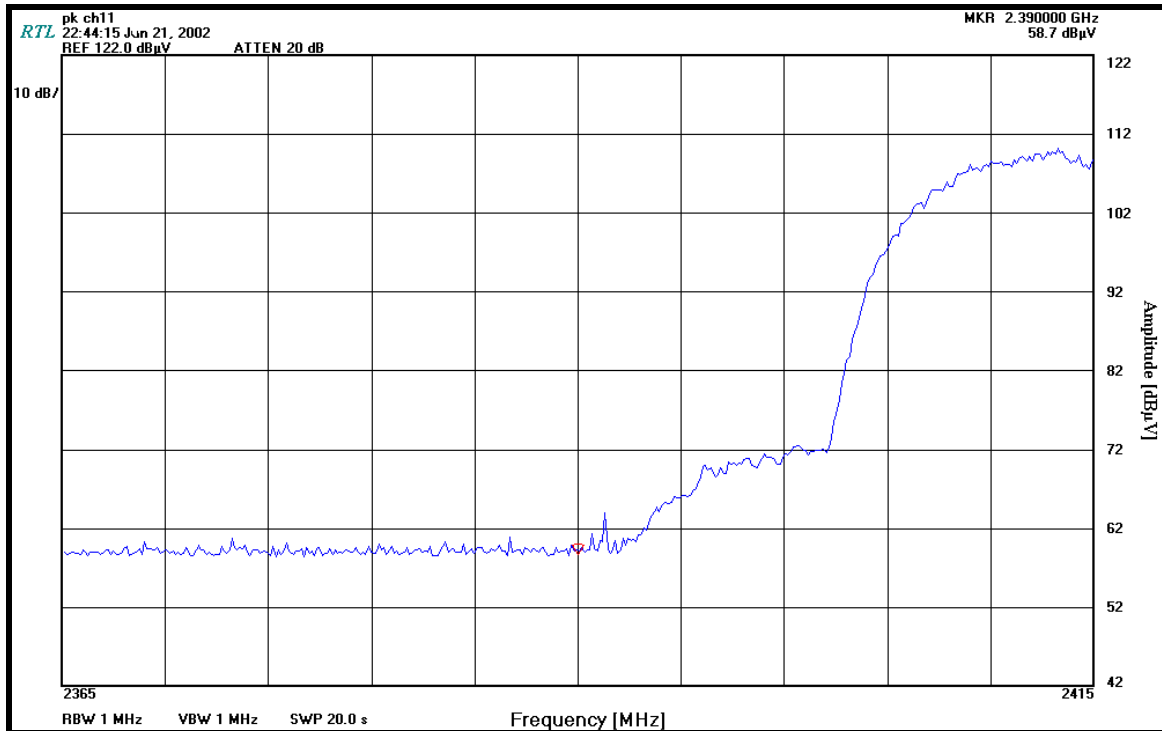
RACHID SEHB
TEST TECHNICIAN/ENGINEER


SIGNATURE

06/21/2002
DATE OF TEST

CHANNEL NUMBER: 1
CHANNEL FREQUENCY: 2412
RESOLUTION :BANDWIDTH (MHZ): 1
VIDEO BANDWIDTH (MHZ): 1
SWEEP TIME (S): 20.0

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



TEST PERSONNEL:

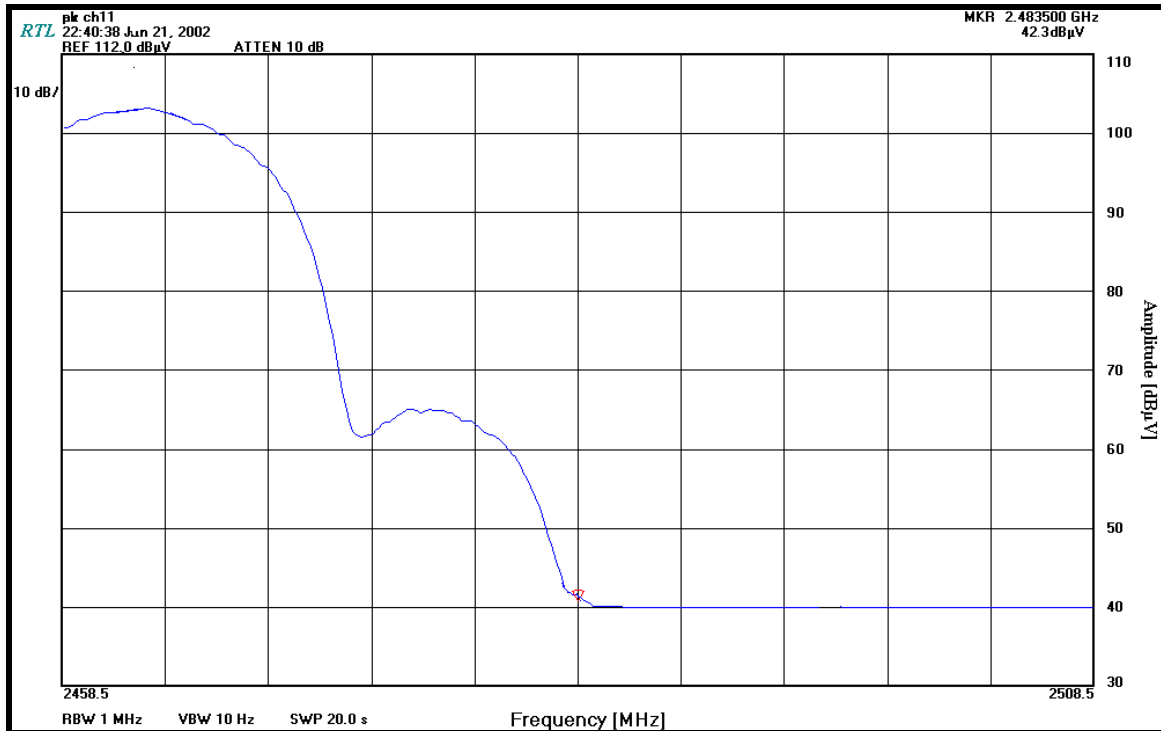
Rachid Sehb
Test Technician/Engineer


Signature

06/21/2002
Date Of Test

CHANNEL NUMBER: 11
CHANNEL FREQUENCY: 2462
RESOLUTION :BANDWIDTH (MHZ): 1
VIDEO BANDWIDTH (HZ): 10
SWEEP TIME (S): 20.0

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



TEST PERSONNEL:

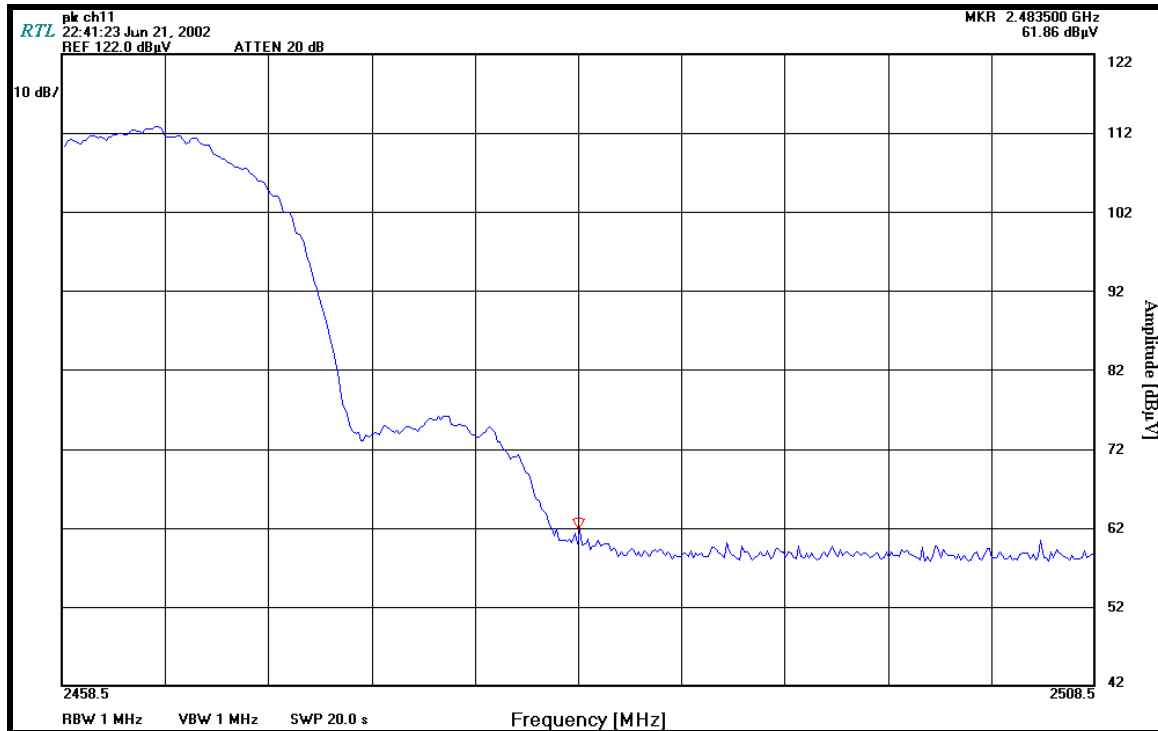
Rachid Sehb
Test Technician/Engineer


Signature

06/21/2002
Date Of Test

CHANNEL NUMBER: 11
CHANNEL FREQUENCY: 2462
RESOLUTION :BANDWIDTH (MHZ): 1
VIDEO BANDWIDTH (MHZ): 1
SWEEP TIME (S): 20.0

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



TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

06/21/2002
Date Of Test

4 POWER OUTPUT - §15.247(B)

4.1 POWER OUTPUT TEST PROCEDURE

The power output per FCC 15.247(b) was measured on the EUT using an HP peak power meter. EIRP measurement was performed as a radiated test using the substitution method.

4.2 TEST EQUIPMENT USED FOR TESTING

TABLE 4-1: TEST EQUIPMENT USED FOR TESTING (RADIATED RF OUTPUT – EIRP)

RTL Asset #	Manufacturer	Model	Part Type	Serial Number
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771
901186	Agilent Technologies	E9323A (50MHz-6GHz)	Peak & Avg. Power Sensor	US40410380
901184	Agilent Technologies	E4416A	EPM-P Power Meter, single channel	GB41050573
900772	EMCO	3161-02	Horn ANTENNA (2-4 GHz)	900772
900723	Miteq	NA	AMP 100M Hz-26GHz	NA
900814	Electro-Metrics	RGA-60	Double Ridges Guide Antenna (1-18 GHz)	2310

4.3 POWER OUTPUT TEST DATA

TABLE 4-2: POWER OUTPUT TEST DATA

Operating Frequency (MHz): 2412MHz, 2436MHz, 2462MHz
 Channel: 1, 6 & 11
 Measured Cond. Pwr. (dBm): 19.4, 20.4 & 18.4

TABLE 4-3: POWER OUTPUT TEST DATA

CHANNEL	EIRP (dBm)* AIR-ANT 4941	POWER CONDUCTED OUTPUT (dBm)
1	19.0	19.4
6	20.3	20.4
11	20.8	18.4

*Measurement accuracy is +/- 1.5 dB

TEST PERSONNEL:

Rachid Sehb
 Test Technician/Engineer


 Signature

6/21/2002
 Date Of Test

5 CONDUCTED LIMITS - § 15.207/15.407(B)6

5.1 CONDUCTED EMISSIONS TEST PROCEDURES

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 worst-case emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

5.2 CONDUCTED EMISSIONS TEST DATA

All channels were investigated. Channel 1 represents the worst-case data.

TABLE 5-1: CONDUCTED EMISSIONS NEUTRAL SIDE (LINE 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B Limit (dBuV)	FCC B Margin (dB)
11.655	Pk	48.0	-3.0	45.0	48.0	-3.0
14.830	Pk	47.5	-3.3	44.2	48.0	-3.8
20.450	Pk	48.3	-3.9	44.4	48.0	-3.6
29.355	Pk	46.6	-4.5	42.1	48.0	-5.9

TABLE 5-2: CONDUCTED EMISSIONS HOT SIDE (LINE 1)

Emission Frequency (MHz)	Test Detector	Analyzer Reading (dBuV)	Site Correction Factor (dB)	Emission Level (dBuV)	FCC B Limit (dBuV)	FCC B Margin (dB)
11.655	Pk	47.4	-3.0	44.4	48.0	-3.6
20.135	Pk	48.2	-3.9	44.3	48.0	-3.7
26.375	Pk	43.0	-4.3	38.7	48.0	-9.3
29.400	Pk	44.9	-4.5	40.4	48.0	-7.6

Pk=Peak

TEST PERSONNEL:

 Rachid Sehb Test Technician/Engineer	Signature	06/20/2002 Date Of Test
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6 RADIATED EMISSION LIMITS (GENERAL REQUIREMENTS) - §15.209

6.1 RADIATED EMISSION LIMITS TEST PROCEDURE

Radiated Spurious Emissions applies to harmonics and spurious emissions that fall in the restricted and non-restricted bands. The restricted bands are listed in Part 15.205. The maximum permitted average field strength for the restricted band is listed in Part 15.209. The EUT was tested in the X-Y, X-Z and Y-Z orthogonal plane.

6.2 TEST EQUIPMENT USED FOR TESTING

TABLE 6-1: RADIATED SPURIOUS EMISSIONS TEST EQUIPMENT

RTL ASSET #	MANUFACTURER	MODEL	PART TYPE	SERIAL NUMBER
900931	HP	8566B	Spectrum Analyzer (100Hz – 22 GHz)	3138A07771
900772	EMCO	3161-02	Horn ANTENNA (2-4 GHz)	900772
900321	EMCO	3161-03	Horn Antennas (4-8,2GHz)	9508-1020
900323	EMCO	3160-7	Horn Antennas (8,2-12,4 GHz)	9605-1054
900325	EMCO	3160-9	Horn Antennas (18 - 26.5 GHz)	9605-1051
900723	Miteq	NA	AMP 100MHz-26GHz	NA
900791	Schaffner - Chase	CBL6112	Antenna (25 MHz - 2 GHz)	2099

6.3 RADIATED EMISSION LIMITS TEST DATA

Operating Frequency (MHz): 2412
Channel: 1
Antenna: AIR-ANT4941
Measured Cond. Pwr. (dBm): 19.4

TABLE 6-2: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 1) AIR-ANT4941

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
2340.00	Av	V	10	1.1	30.0	5.6	35.6	54
2340.54	Pk	V	10	1.1	40.3	5.6	45.9	
2419.45	Av	V	20	1.1	88.0	5.6	93.6	Fundamental
2419.78	Pk	V	20	1.1	98.5	5.6	104.1	Fundamental
2485.40	Av	V	20	1.1	29.0	5.6	34.6	54
2486.29	Pk	V	20	1.1	39.6	5.6	45.2	
2543.90	Av	V	40	1.1	26.1	5.6	31.7	54
2543.90	Pk	V	40	1.1	38.0	5.6	43.6	
4822.72	Av	V	10	1.1	<20 dB			54
7234.40	Av	V	10	1.1	<20 dB			54
9645	Av	V	10	1.1	<20 dB			54
12055	Av	V	10	1.1	<20 dB			54
14438	Av	V	10	1.1	<20 dB			54
16890	Av	V	10	1.1	<20 dB			54
19290	Av	V	10	1.1	<20 dB			54
21722	Av	V	10	1.1	<20 dB			54
24133	Av	V	10	1.1	<20 dB			54

PEAK: RES. =1 MHz, VID= 1MHz; AVERAGE: RES. =1 MHz, VID= 10Hz; NF = NOISE FLOOR

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

06/20/2002
Date Of Test

Operating Frequency (MHz): 2437
Channel: 6
Antenna: AIR-ANT4941
Measured Cond. Pwr. (dBm): 20.4

TABLE 6-3: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 6) AIR-ANT4941

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
2350.75	Av	V	20	1.2	27.6	5.6	33.2	54
2351.21	Pk	V	20	1.2	41.6	5.6	47.2	
2381.00	Av	V	20	1.2	30.0	5.6	35.6	54
2381.00	Pk	V	20	1.2	40.4	5.6	46.0	
2434.41	Av	V	10	1.2	90.0	5.6	95.6	Fundamental
2434.97	Pk	V	10	1.2	98.4	5.6	104.0	Fundamental
2514.00	Av	V	30	1.2	26.3	5.6	31.9	54
2514.00	Pk	V	30	1.2	39.6	5.6	45.2	
4871.21	Av	V	10	1.2	<20 dB			54
7312.21	Av	V	20	1.2	<20 dB			54
9744	Av	V	10	1.1	<20 dB			54
12186	Av	V	10	1.1	<20 dB			54
14628	Av	V	10	1.1	<20 dB			54
17050	Av	V	10	1.1	<20 dB			54
19494	Av	V	10	1.1	<20 dB			54
21938	Av	V	10	1.1	<20 dB			54
24375	Av	V	10	1.1	<20 dB			54

PEAK: RES. =1 MHz, VID= 1MHz; AVERAGE: RES. =1 MHz, VID= 10Hz; NF = NOISE FLOOR

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer



Signature

06/20/2002
Date Of Test

Operating Frequency (MHz): 2462
Channel: 11
Antenna: AIR-ANT4941
Measured Cond. Power (dBm): 18.4

TABLE 6-4: RADIATED EMISSIONS HARMONICS/SPURIOUS (CHANNEL 11) AIR-ANT4941

Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)
2468.11	Av	V	30	1.1	87.4	5.6	93.0	Fundamental
2468.95	Pk	V	30	1.1	95.6	5.6	101.2	Fundamental
2480.42	Av	V	20	1.1	31.3	5.6	36.9	54
2480.54	Pk	V	20	1.1	40.2	5.6	45.8	
2497.50	Av	V	30	1.1	35.4	5.6	41.0	54
2495.77	Pk	V	30	1.1	42.0	5.6	47.6	
4925.00	Av	V	10	1.1	<20 dB			54
7390.31	Av	V	10	1.1	<20 dB			54
9848.98	Av	V	10	1.1	<20 dB			54
12310.77	Av	V	10	1.1	<20 dB			54
14772.65	Av	V	10	1.1	<20 dB			54
17233.00	Av	V	10	1.1	<20 dB			54
19695.55	Av	V	10	1.1	<20 dB			54
22157.55	Av	V	10	1.1	<20 dB			54
24622.24	Av	V	10	1.1	<20 dB			54

PEAK: RES. =1 MHz, VID= 1MHz; AVERAGE: RES. =1 MHz, VID= 10Hz; NF = NOISE FLOOR

TEST PERSONNEL:

Rachid Sehb
Test Technician/Engineer


Signature

06/20/2002
Date Of Test