



**ELECTROMAGNETIC EMISSIONS COMPLIANCE REPORT
INTENTIONAL RADIATOR CERTIFICATION TO
FCC PART 15 SUBPART C REQUIREMENT**

OF

FCC ID: IMK-HARDSAP

DIRECT SEQUENCE SPREAD SPECTRUM 802.11b ACCESS POINT

MODEL NO: 8550

REPORT NO: 00U0438-1

TEST DATE: AUGUST 28, 2000

Prepared for
**PROXIM, INC.
510 DEGUIGUE DRIVE
SUNNYVALE, CA 94086, U.S.A.**

Prepared by
**COMPLIANCE CERTIFICATION SERVICES
a.b.a
COMPLIANCE ENGINEERING SERVICES, INC.
1366 BORDEAUX DRIVE
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	PAGE
1. VERIFICATION OF COMPLIANCE	2
2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	3
3. ANTENNA CONNECTION	4
6. THEORY OF OPERATION	4
7. MPE CALCULATION INFORMATION	4
9. RECEIVER TECHNICAL INFORMATION	4
10. TEST LOCATION	4
11. SUPPORT EQUIPMENT	5
12. TEST EQUIPMENT	5
13. TEST PROCEDURES AND TEST RESULTS	6
Radiated Emissions (General Requirements)	6
Test Requirement: 15.205, 15.209	6
Radiated Emissions	13
Test Requirement: 15.109	13
AC Line Conducted Emissions	15
Test Requirement: 15.207	15
Minimum 6dB Bandwidth for DSSS	17
Test Requirement: 15.247(a)1(i)-(ii)	17
RF Power Output	18
Test Requirement: 15.247(b)	18
Out of Band Measurements	19
Test Requirement: 15.247(c)	19
DSSS Power Density	20
Test Requirement: 15.247(d)	20
Processing Gain of a DSSS	21
Test Requirement : 15.247(e)	21
14. TEST SETUP PHOTOS:	22
ATTACHMENT# 1: EUT PHOTOGRAPHS	26
ATTACHMENT# 2: PROPOSED FCC ID LABEL FORMAT	27
ATTACHMENT# 3: AGENT AUTHORIZATION LETTER	28
ATTACHMENT# 4: REQUEST FOR CONFIDENTIALITY LETTER	29
ATTACHMENT# 5: EUT TECHNICAL DESCRIPTION	30
ATTACHMENT# 6: USER'S GUIDE	31
ATTACHMENT# 7: SCHEMATIC DIAGRAM AND BLOCK DIAGRAM	32

2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)

The product is a DSSS WLAN adapter operating in the 2.4-2.4835GHz band with a nominal TX output power of 16mW. It is a small desktop box with associated wall plug mounted 12V switching DC power supply, integral antenna with dipole elements out from the plastic enclosure and 10 base T port for connection to standard wired LAN. The nominal gain of the integral antenna is 2dBi, which is permanently attached to the PCB. Refer to the manual for MPE statement. This device can be either stand-alone connected to an RJ-45 LAN hub port, or be connected to the RJ-45 port of a computing device.

8550 WLAN	
Actual Frequency Range	2412 – 2462 MHz
Transmit Power	16mW
Modulation Technique	QPSK
Radio Technique	Direct Sequence Spread Spectrum
Channel Bandwidth	22MHz
Number of Channel	11 channels
Antenna Gain, dBi	2.0 dBi
Air Data Rate	11M bps
DC voltage	12 V

PC INTERFACE TYPE	RJ-45
DC voltage	12V
ANTENNA CONNECTOR	PERMANENTLY ATTACHED.
ANTENNA TYPE	HORIZONTAL/VERTICAL DIVERSITY =2.0dBi

3. ANTENNA CONNECTION

The 8550 is equipped with a permanently mounted unique antenna. Please refer to ATTACHMENT#5: **EUT TECHICAL DESCRIPTION** exhibit.

4. THEORY OF OPERATION

Please refer to ATTACHMENT#5: **EUT TECHICAL DESCRIPTION** exhibit.

5. MPE CALCULATION INFORMATION

Please refer to ATTACHMENT#5: **EUT TECHICAL DESCRIPTION** exhibit.

6. RECEIVER TECHNICAL INFORMATION

Please refer to ATTACHMENT#5: **EUT TECHICAL DESCRIPTION** exhibit.

7. TEST LOCATION

All emissions tests were performed at:

Compliance Consulting Services
561F Monterey Road
Morgan Hill, CA 95087

CCS has site descriptions on file with the FCC for 10 and 3 meter site configurations. CCS is a NVLAP accredited facility.

Radiated emissions from the digital portion of the EUT were performed on site A, one of the 10 meter sites.

11. SUPPORT EQUIPMENT

DEVICE TYPE	MANUFACTURER	MODEL NAME	SERIAL NO	FCC ID
HOST PC	Dell Computer	MMS	8028F	E2KHANNIBAD

12. TEST EQUIPMENT

EQUIPMENT TYPE	MANUFAC./ MODEL NAME	SERIAL NO	CAL DUE:
SPECTRUM ANALYZER	HP / 8593EM	3710A00205	5/25/01
SPECTRUM ANALYZER	HP / 8566B	2140A01296	12/17/00
RF PRE-SELECTOR	HP / 85685A	2817A00756	11/18/00
PRE-AMP	HP / 8449B	3008A00369	4/12/01
HORN ANTENNA	EMCO / 3115	2238	9/24/00
HORN ANTENNA	ARA / MWH-1826/B	1013	7/26/01
BILOG ANTENNA	CHASE EMC / CBL6112	2049	11/23/00

13. TEST PROCEDURES AND TEST RESULTS

Radiated Emissions (General Requirements)

Test Requirement: 15.205, 15.209

Measurement Equipment Used:

HP 8593EM Spectrum Analyzer

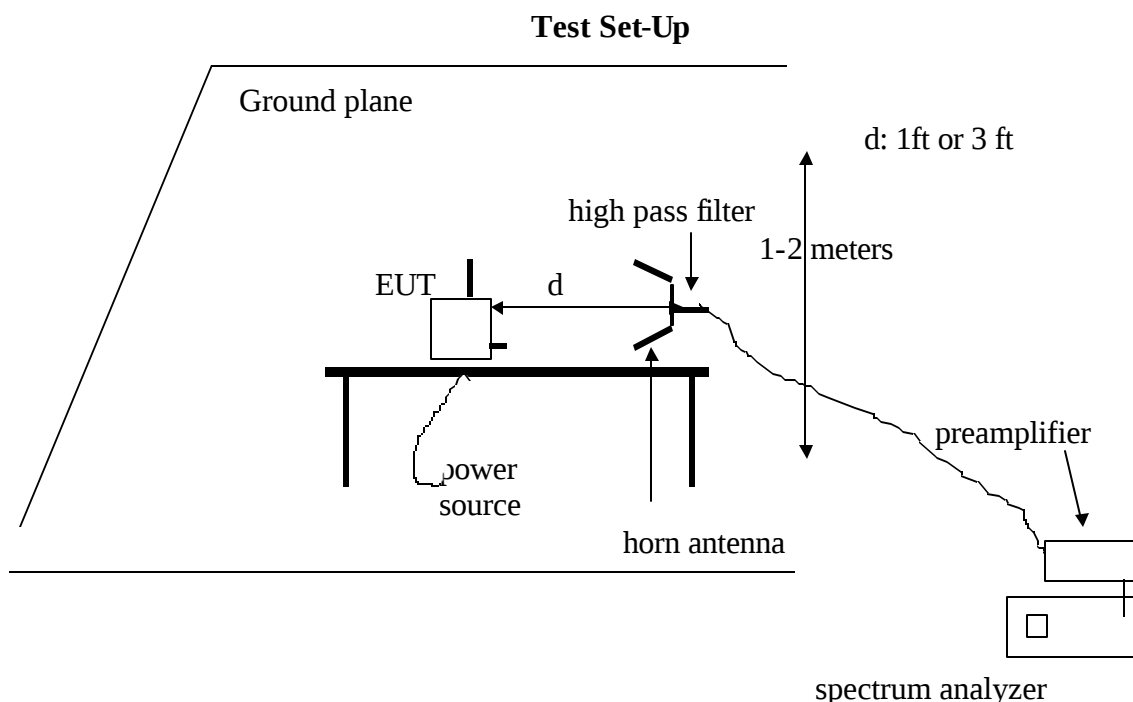
HP 8449B Preamplifier, 1-26 GHz

EMCO 3115 Horn Antenna, 1-18 GHz

ARA MWH1826/B Antenna, 18-26 GHz

FLEXCO Cables, 17ft (loss: 0.85 dB/ft@ 26 GHz)

FYS Microwave: High Pass Filter 4.57 GHz & 7.6 GHz



Test Procedures

1. The EUT was placed on a wooden table on the outdoor ground plane. The search antenna was placed 3 ft and 1 ft from the EUT. Measurement distance is chosen so that the noise floor of the measurement system is at least 6dB below the specification limits. The EUT was set to transmit at its lowest channel first.
2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.

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

4. Steps 1 to 3 were repeated for the middle and high channel

Test Results:

Refer to attached spreadsheets.

COMPLIANCE CERTIFICATION SERVICES, INC.

Radiated Emissions
15.205

08/28/00
Kerwin Corpuz
A-site (1.0 Meter)

PROXIM

2412 - 2462MHz DSSS WIRELESS LAN ACCESS POINT (M/N: 8550); FCC ID: IMK-HARDSAP

 $f_0 = 2412$ MHz (LOW, CH.1)

F(MHz)	READING (dBuV)		AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	HPF (dB)	TOTAL (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dB)		REMARK
	Pk	Avg						Pk	Avg	Pk	Avg	Pk	Avg	
4824V	43.1	32.4	34	5.1	-31.25	-9.5	1	42.45	31.75	74	54	-31.6	-22.3	(A)
4824H	46.5	35.1	34	5.1	-31.25	-9.5	1	45.85	34.45	74	54	-28.2	-19.6	(B)
7236*	47.4	36.3	37.2	6.23	-31.25	-9.5	1	51.08	39.98	74	54	-22.9	-14	
9648*	46.9	36.2	38.1	7.84	-31.25	-9.5	1	53.09	42.39	74	54	-20.9	-11.6	
12060*	47.1	36.9	39.3	8.5	-31.25	-9.5	1	55.15	44.95	74	54	-18.9	-9.05	
14472*	49.3	38.4	41	9.54	-31.25	-20	1	49.59	38.69	74	54	-24.4	-15.3	
16884*	50.3	39.6	41.6	10.71	-31.25	-20	1	52.36	41.66	74	54	-21.6	-12.3	
19296*	50.1	39.3	32	11.9	-31.25	-20	1	43.75	32.95	74	54	-30.3	-21.1	
21708*	51.9	41.6	32.4	13.43	-31.25	-20	1	47.48	37.18	74	54	-26.5	-16.8	
24120*	53.1	42.1	32.9	14.28	-31.25	-20	1	50.03	39.03	74	54	-24	-15	

REMARK: (A)-EUT's antenna worse case @ vertical position. (B)-EUT's antenna worse case @ horizontal position
* Measured noise floor (worse case vertical)

NOTE: MEASURED HORIZONTAL (H) AND VERTICAL (V)
DIST: Correction to extrapolate reading to 3m specification distance
1.0M measurement distance= **-9.5dB**; 0.3M= **-20dB**
AF: Antenna Factor

ANTENNA: EMCO, 3115, S/N:2238 & ARA, MWH-1826/B, S/N:1013

AMP: Pre-amp gain

PRE-AMP: HP 8449B, S/N:3710A00205

CL: Cable loss (17ft)

HPF: FSY High pass filter insertion loss (4.57GHz; S/N:003) and (7.6GHz; S/N:001)

ANALYZER SETTINGS

<u>Res bw</u>	<u>Avg. bw</u>
PEAK(Pk): 1MHz	1MHz
AVERAGE(Avg): 1MHz	10Hz

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PAGE NO: 8

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Radiated Emissions
15.205

08/28/00
Kerwin Corpuz
A-site (1.0 Meter)

PROXIM

2412 - 2462MHz DSSS WIRELESS LAN ACCESS POINT (M/N: 8550); FCC ID: IMK-HARDSAP

fo= 2437 MHz (MID, CH.6)

F(MHz)	READING (dBuV)		AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	HPF (dB)	TOTAL (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dB)		REMARK
	Pk	Avg						Pk	Avg	Pk	Avg	Pk	Avg	
4874V	44.5	33.3	34	5.1	-31.25	-9.5	1	43.85	32.65	74	54	-30.2	-21.4	(A)
4874H	47.7	35.3	34	5.1	-31.25	-9.5	1	47.05	34.65	74	54	-27	-19.4	(B)
7311*	47.4	36.3	37.2	6.23	-31.25	-9.5	1	51.08	39.98	74	54	-22.9	-14	
9748*	46.9	36.2	38.1	7.84	-31.25	-9.5	1	53.09	42.39	74	54	-20.9	-11.6	
12185*	47.1	36.9	39.3	8.5	-31.25	-9.5	1	55.15	44.95	74	54	-18.9	-9.05	
14622*	49.3	38.4	41	9.54	-31.25	-20	1	49.59	38.69	74	54	-24.4	-15.3	
17059*	50.3	39.6	41.6	10.71	-31.25	-20	1	52.36	41.66	74	54	-21.6	-12.3	
19496*	50.1	39.3	32	11.9	-31.25	-20	1	43.75	32.95	74	54	-30.3	-21.1	
21933*	51.9	41.6	32.4	13.43	-31.25	-20	1	47.48	37.18	74	54	-26.5	-16.8	
24370*	53.1	42.1	32.9	14.28	-31.25	-20	1	50.03	39.03	74	54	-24	-15	

REMARK: (A)-EUT's antenna worse case @ vertical position. (B)-EUT's antenna worse case @ horizontal posit
* Measured noise floor (worse case vertical)

NOTE: MEASURED HORIZONTAL (H) AND VERTICAL (V)

DIST: Correction to extrapolate reading to 3m specification distance
1.0M measurement distance= **-9.5dB**; 0.3M= **-20dB**

AF: Antenna Factor

ANTENNA: EMCO, 3115, S/N:2238 & ARA, MWH-1826/B, S/N:1013

AMP: Pre-amp gain

PRE-AMP: HP 8449B, S/N:3710A00205

CL: Cable loss (17ft)

HPF: FSY High pass filter insertion loss (4.57GHz; S/N:003) and (7.6GHz; S/N:001)

ANALYZER SETTINGS

Res bw	Avg. bw
PEAK(Pk): 1MHz	1MHz
AVERAGE(Avg): 1MHz	10Hz

COMPLIANCE CERTIFICATION SERVICES, INC.

Radiated Emissions
15.205

08/28/00
Kerwin Corpuz

A-site (1.0 Meter)

PROXIM

2412 - 2462MHz DSSS WIRELESS LAN ACCESS POINT (M/N: 8550); FCC ID: IMK-HARDSAP

fo= 2462 MHz (HIGH, CH.11)

F(MHz)	READING (dBuV)		AF (dB)	CL (dB)	AMP (dB)	DIST (dB)	HPF (dB)	TOTAL (dBuV/m)		LIMIT (dBuV/m)		MARGIN (dB)		REMARK
	Pk	Avg						Pk	Avg	Pk	Avg	Pk	Avg	
4924V	43	32.7	34	5.1	-31.25	-9.5	1	42.35	32.05	74	54	-31.7	-22	(A)
4924H	45.5	33.6	34	5.1	-31.25	-9.5	1	44.85	32.95	74	54	-29.2	-21.1	(B)
7386*	47.4	36.3	37.2	6.23	-31.25	-9.5	1	51.08	39.98	74	54	-22.9	-14	
9848*	46.9	36.2	38.1	7.84	-31.25	-9.5	1	53.09	42.39	74	54	-20.9	-11.6	
12310*	47.1	36.9	39.3	8.5	-31.25	-9.5	1	55.15	44.95	74	54	-18.9	-9.05	
14772*	49.3	38.4	41	9.54	-31.25	-20	1	49.59	38.69	74	54	-24.4	-15.3	
17234*	50.3	39.6	41.6	10.71	-31.25	-20	1	52.36	41.66	74	54	-21.6	-12.3	
19696*	50.1	39.3	32	11.9	-31.25	-20	1	43.75	32.95	74	54	-30.3	-21.1	
22158*	51.9	41.6	32.4	13.43	-31.25	-20	1	47.48	37.18	74	54	-26.5	-16.8	
24620*	53.1	42.1	32.9	14.28	-31.25	-20	1	50.03	39.03	74	54	-24	-15	

REMARK: (A)-EUT's antenna worse case @ vertical position. (B)-EUT's antenna worse case @ horizontal posit

* Measured noise floor (worse case vertical)

NOTE: MEASURED HORIZONTAL (H) AND VERTICAL (V)

DIST: Correction to extrapolate reading to 3m specification distance

1.0M measurement distance= -9.5dB; 0.3M= -20dB

AF: Antenna Factor

ANTENNA: EMCO, 3115, S/N:2238 & ARA, MWH-1826/B, S/N:1013

AMP: Pre-amp gain

PRE-AMP: HP 8449B, S/N:3710A00205

CL: Cable loss (17ft)

HPF: FSJ High pass filter insertion loss (4.57GHz; S/N:003) and (7.6GHz; S/N:001)

ANALYZER SETTINGSRes bwAvg. bw

PEAK(Pk):

1MHz

1MHz

AVERAGE(Avg):

1MHz

10Hz

Conducted measurement of Restricted Band Emission (2483.5-2500 MHz)

Test Requirement : 15.205

Measurement Equipment Used:

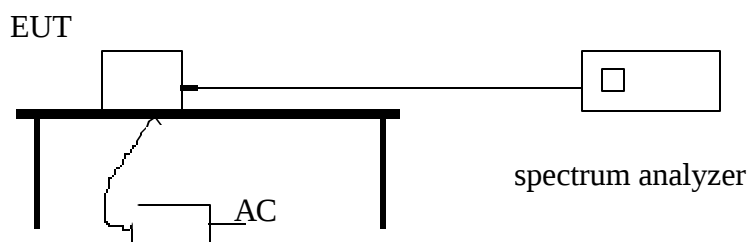
HP 8593EM Spectrum Analyzer

MCL (BW-S10W2) 10dB, 2W pad

PAGE NO: 10

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Test Set-up**Test Procedure:**

To do conducted measurements a coaxial cable with a 50-ohm impedance match was used and soldered where the permanent antennas were located.

The EUT is configured on a test bench as shown above. The EUT's transmission is continuous at the High Channel (2462MHz). Spectrum analyzer set START FREQ to 2483.5 MHz and STOP FREQ to 2500 MHz. RES BW=1 MHz, VID BW = 10 Hz to measure average. DISPLAY LINE was set to 37.5nW.

$$\text{calculation: } P = \frac{(E d)^2}{30 G}$$

where, P is power
d is distance
E is in volts (average limit at 3 meter)
(54dBuV=0.0005V)
G is antenna gain (dBi)

$$P = \frac{\{(0.0005)(3)\}^2}{30(2)}$$

$$P = 37.5 \text{ nW}$$

Test Result : Please refer to attach spectrum plot.

CHANNEL	Measured (average)	LIMIT(nW)
2462MHz	30.19nW	37.5

Conducted measurement of Restricted Band Emission (2483.5-2500 MHz) Plot

Radiated Emissions

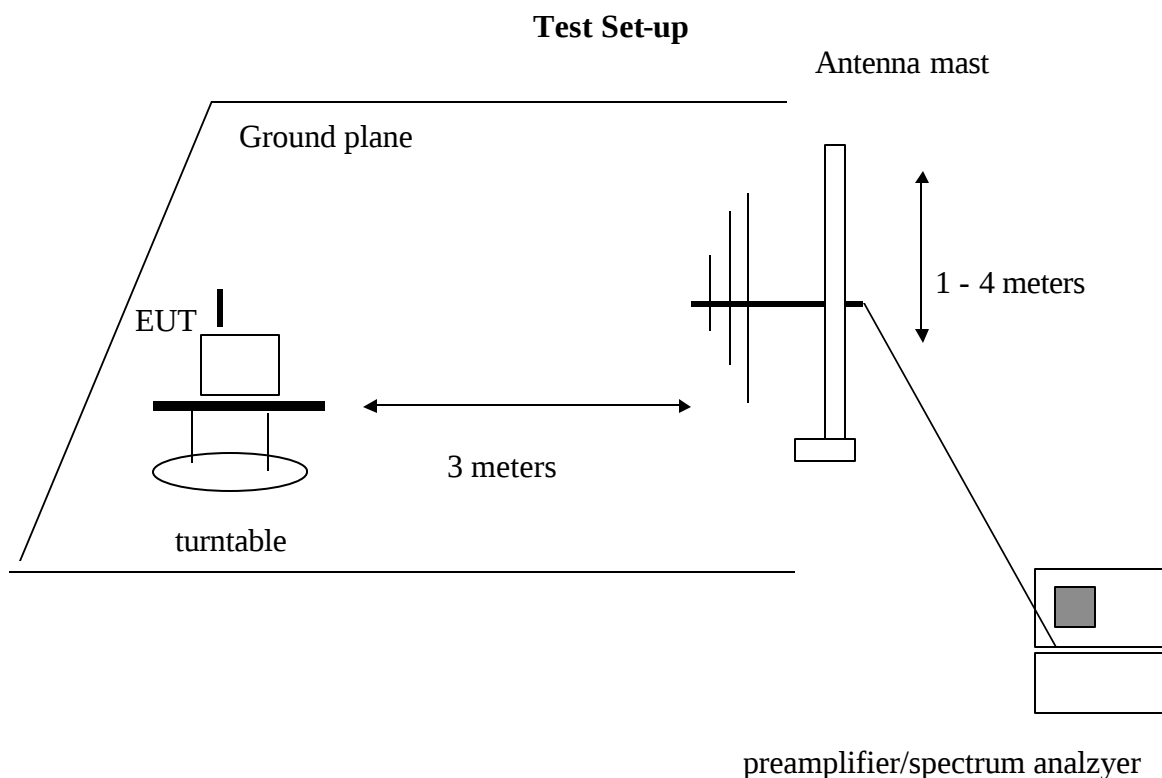
Test Requirement: 15.109

Measurement Equipment Used:

HP 8566B Spectrum Analyzer

HP 85685A RF Preselector

CHASE EMC CBL6112 Bilog Antenna, 30 - 2000 MHz



TEST PROCEDURE:

The EUT was placed on a turntable at a distance of 3 meters from a bilog search antenna. The EUT was set to transmit. The antenna was raised and lowered, the EUT rotated on the turntable, until the EUT azimuth, antenna elevation, and antenna polarity were found which yielded maximum received emission levels on the spectrum analyzer.

Test Result:

Refer to attached tabular data sheet.

RADIATION EMISSION DATA

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Line Conducted Emissions

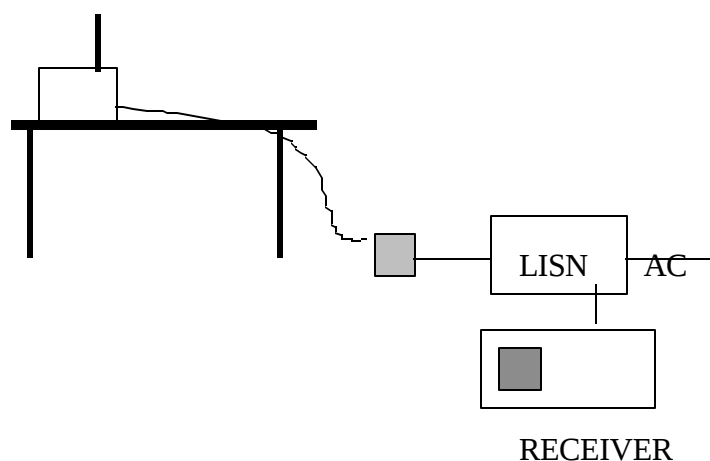
Test Requirement: 15.207

Measurement Equipment Used:

Rhode & Schwarz EMI Receiver ESHS-20

Fischer Custom Communication LISN, FCC-LISN-50/250-25-2

Test Set-up

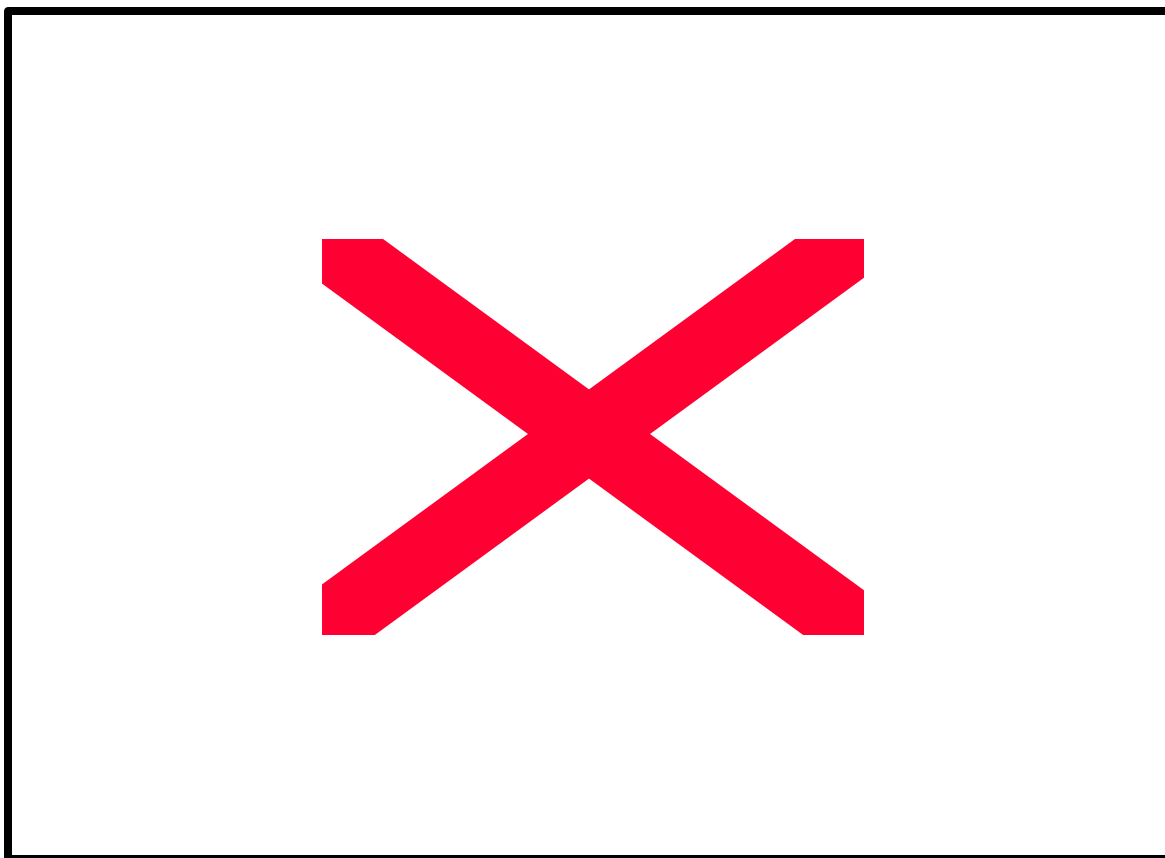


Test Procedure

1. The EUT was placed on a wooden table 40 cm from a vertical ground plane and approximately 80 cm above the horizontal ground plane on the floor. The EUT was set to transmit in a normal mode.
2. Line conducted data was recorded for both NEUTRAL and HOT lines.

Test Results

Refer to attached graph.



Peak Mode: L1 (Green), L2 (Black)

Voltage Used: 115Vac, 60 Hz

Eut mode: Transmit

Note: Four different power supplies will be available with this product. Data is included for all four power supplies.

Minimum 6dB Bandwidth for DSSS

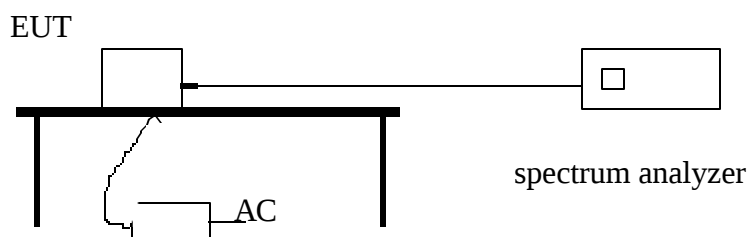
Test Requirement: 15.247(a)1(i)(i-ii)

Measurement Equipment Used:

HP 8593EM Spectrum Analyzer

MCL (BW-S10W2) 10dB, 2W pad

Test Set-up



Test Procedure:

To do conducted measurements a coaxial cable with a 50-ohm impedance match was used and soldered where the permanent antennas were located.

The EUT is configured on a test bench as shown above. The EUT'S transmission is continuous at the Low Channel (2.412GHz). Spectrum analyzer CENTER FREQUENCY set to 2412 MHz. SPAN set to 50 MHz. Used a Resolution BW: 100 kHz and Video BW: 100 kHz to measure the 6dB bandwidth.

While the transmitter broadcasts a steady stream of digital data, the analyzer MAX HOLD function is used to capture the envelope of the transmission occupied bandwidth.

Repeated for Mid Channel (2.437GHz) and High Channel (2.462GHz)

Test Results: Refer to attached spectrum analyzer data chart and plots.

Frequency	Measured	Limit	Result
2.41250 GHz	11.63MHz	>500kHz	PASSED
2.43700 GHz	11.38MHz	>500kHz	PASSED
2.46200 GHz	11.38MHz	>500kHz	PASSED

RF Power Output

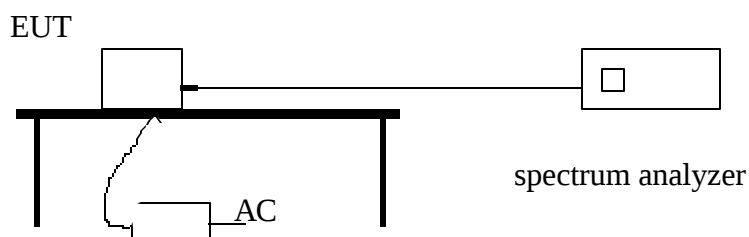
Test Requirement: 15.247(b)

Measurement Equipment Used:

HP 8593EM Spectrum Analyzer

MCL (BW-S10W2) 10dB, 2W pad

Test Set-up



Test Procedure

To do conducted measurements a coaxial cable with a 50-ohm impedance match was used and soldered where the permanent antennas were located.

The EUT is configured on a test bench as shown above. The EUT's transmission is continuous at the Low Channel (2412MHz). Spectrum analyzer CENTER FREQUENCY set to Low Channel(2412MHz). SPAN set to 20 MHz. RES BW=3 MHz, VID BW = 3 MHz. Repeated above steps for MID Channel (2437MHz) and HIGH Channel (2462MHz).

CHANNEL	Watts	dBm	LIMIT(dBm)
2412MHz	.030	14.74	30
2437MHz	.038	15.76	30
2462MHz	.028	14.42	30

Test Results:

Refer to attached spectrum plots.

Out of Band Measurements

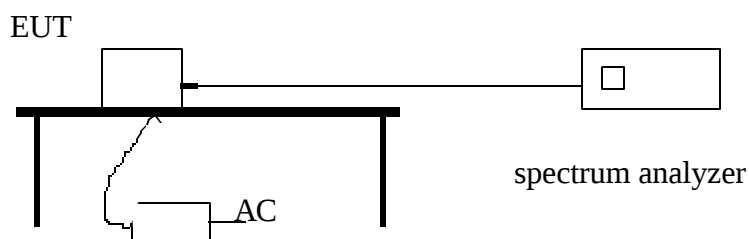
Test Requirement: 15.247(c)

Measurement Equipment Used:

HP 8593EM Spectrum Analyzer

MCL (BW-S10W2) 10dB, 2W pad

Test Set-up



Test Procedure:

To do conducted measurements a coaxial cable with a 50-ohm impedance match was used and soldered where the permanent antennas were located.

The EUT is configured on a test bench as shown above. The EUT's transmission is continuous at the Low Channel (2.412 GHz). Spectrum analyzer CENTER FREQUENCY set to 2412 MHz. Used a Resolution BW: 100 kHz and Video BW: 100 kHz to measure conducted emissions. Set the spectrum analyzer to START: 30 MHz and STOP: 2.9 GHz for the first scan. The second scan was set to START: 2.9 GHz and STOP: 12 GHz. The third scan was set to START: 12 GHz and STOP: 25 GHz. All emissions were compared to the 20-dB attenuation requirement.

While the transmitter broadcasts a steady stream of digital data, the analyzer MAX HOLD function is used to capture the emissions.

Repeated for Mid Channel (2.437GHz) and High Channel (2.462GHz)

Test Result:

Please refer to attach plots.

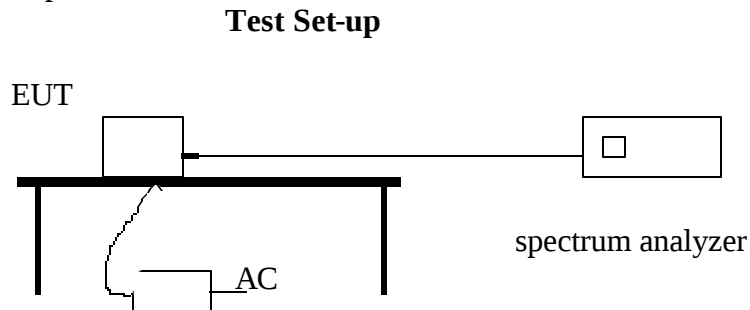
DSSS Power Density

Test Requirement: 15.247(d)

Measurement Equipment Used:

HP 8593EM Spectrum Analyzer

MCL (BW-S10W2) 10dB, 2W pad



Test Procedure:

To do conducted measurements a coaxial cable with a 50-ohm impedance match was used and soldered where the permanent antennas were located.

The EUT is configured on a test bench as shown above. The EUT's transmission is continuous at the Low Channel (2412MHz). Spectrum analyzer CENTER FREQUENCY set to Low Channel(2412MHz). SPAN set to 300 kHz. RES BW=3 kHz, VID BW = 3 kHz, and SWP set to 100 sec. Repeated above steps for MID Channel (2437MHz) and HIGH Channel (2462MHz).

Test Result :

Please refer to attached spectrum plot.

Processing Gain

Test Requirement: 15.247(e)

Test Setup and Result:

Processing gain was performed by the manufacturer. Please refer to the attached processing gain information provided by the manufacturer.

14. TEST SETUP PHOTOS:

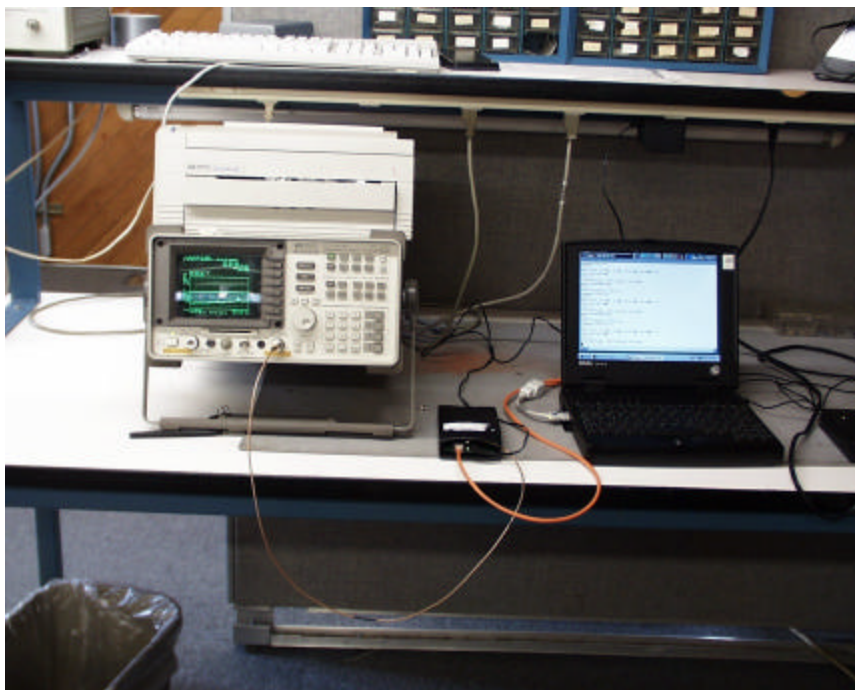
15.109 Radiated Setup



15.207 AC Conducted Emissions (worse power supply)



Conducted Emissions Test-Setup



ATTACHMENT# 1: EUT PHOTOGRAPHS

ATTACHMENT# 2: PROPOSED FCC ID LABEL FORMAT

ATTACHMENT# 3: AGENT AUTHORIZATION LETTER

ATTACHMENT# 4: REQUEST FOR CONFIDENTIALITY LETTER

ATTACHMENT# 5: EUT TECHNICAL DESCRIPTION

ATTACHMENT# 6: USER'S GUIDE

ATTACHMENT# 7: SCHEMATIC DIAGRAM AND BLOCK DIAGRAM