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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to Industry Canada RSS-Gen Issue 1 / RSS 210 Issue 7 FCC Part 15, Subpart E on the Redline Communications Transmitter Model: AN-80i (5.4 GHz) PMP

UPN:	4310A-AN80IA
FCC ID:	QC8-AN80IA
GRANTEE:	Redline Communications 675 Campbell Technology Parkway Campbell, CA 95008
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Ave Sunnyvale, CA 94086
REPORT DATE:	June 7, 2007
FINAL TEST DATE:	May 23, 2007
AUTHORIZED SIGNATORY:	Juan Martinez Senior EMC Engineer

ACCREDITED
2016-01

REVISION HISTORY

Revision #	Date	Comments	Modified By
1	June 15, 2007	Initial Release	David Guidotti

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SCOPE

An electromagnetic emissions test has been performed on the Redline Communications model AN-80i (5.4 GHz) PMP pursuant to the following rules:

Industry Canada RSS-Gen Issue 1
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15, Subpart E requirements for UNII Devices

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the Redline Communications model AN-80i (5.4 GHz) PMP and therefore apply only to the tested sample. The sample was selected and prepared by Medhat Fawzy of Redline Communications

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Redline Communications model AN-80i (5.4 GHz) PMP complied with the requirements of the following regulations:

RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15, Subpart E requirements for UNII Devices

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

TEST RESULTS SUMMARY

UNII / LELAN DEVICES

Operation in the 5.47 – 5.725 GHz Band

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.407(a) (2)		26dB Bandwidth	Class II change (adding new antenna)		N/A
15.407(a) (2)	A9.2(2)	Output Power	Class II change (adding new antenna)		N/A
15.407(a) (2))	A9.2(2)	Power Spectral Density	Class II change (adding new antenna)		N/A
	A9.5b	Peak Spectral Density	Class II change (adding new antenna)	Shall not exceed the average value by more than 3dB	N/A
15.407(a) (2))	A9.4	Dynamic frequency selection / Transmit power control	Refer to separate test report		Complies

General requirements for all bands

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
	A9.5a	Modulation	OFDM	Digital modulation is required	Complies
	RSS-GEN	99% bandwidth	Class II change (adding new antenna)		N/A
15.407(b) (2)	A9.3	Spurious Emissions above 1GHz	53.2dBµV/m (457.1µV/m) @ 5375.0MHz		Complies (- 0.8 dB)
15.407(a)(6)	-	Peak Excursion Ratio	Class II change (adding new antenna)	< 13dB	N/A
	A9.5c	Channel Selection	Class II change (adding new antenna)	Device shall be tested on the top, bottom and center channels in each band	N/A
15.407 (c)	A9.5d	Operation in the absence of information to transmit	Class II change (adding new antenna)	Device shall automatically discontinue operation in the absence of information to transmit	N/A
15.407 (g)	A9.5e	Frequency Stability	Class II change (adding new antenna)		N/A
	A9.9g	User Manual information	Class II change (adding new antenna)		N/A

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Class II change (adding new antenna)		Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	48.0dBµV/m (251.2µV/m) @ 1200.0MHz		Complies (- 6.0 dB)
15.207	RSS GEN Table 2	AC Conducted Emissions	Class II change (adding new antenna)		N/A
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11	Refer to OET 65, FCC Part 1 and RSS 102	Complies
	RSP 100 RSS GEN 7.1.5	User Manual	Class II change (adding new antenna)	Statement required regarding non-interference	
	RSP 100 RSS GEN 7.1.5	User Manual	Class II change (adding new antenna)	Statement required regarding detachable antenna	

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	0.015 to 30	± 3.0
Radiated Emissions	30 to 1000	± 3.6
Radiated Emissions	1000 to 40000	± 6.0

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Redline Communications model AN-80i (5.4 GHz) PMP is a Point to Point and/or Point to Multi-Point 5GHz radio operating in the range 5470-5725 GHz that is designed to provide wireless network and internet service. The EUT is normally pole mounted, but the EUT was treated as table-top equipment during testing. The electrical rating of the EUT is 48Vdc Volts , 5 Amps.

The sample was received on May 23, 2007 and tested on May 23, 2007. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Redline	AN-80i	Accesspoint	-	QC8-AN80IA

OTHER EUT DETAILS

List any items from the test log.

ANTENNA SYSTEM

The EUT antenna is a 17.5 dBi sector antenna and a 9dBi OMNI antenna with standard N-Type connectors. Other Family sector antennas with smaller gain 16.6 and 15 dBi will be listed in the report. The radio and antennas will be professionally installed as required per 15.203 for non-standard connectors.

ENCLOSURE

The EUT enclosure is primarily constructed of aluminum. It measures approximately 25cm W by 15cm D by 5cm H.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with emissions specifications.

SUPPORT EQUIPMENT

No local support equipment was used during emissions testing.

The following equipment was used as remote support equipment for emissions testing:

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	PP02X	Laptop	07898349890344	DoC
Cincon	TR60A-POE-L	POE	N/A	N/A

EUT INTERFACE PORTS

The I/O cabling configuration during emissions testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT Ethernet	POE	Cat5	Shielded	30.0
Laptop Ethernet	POE	Cat5	Unshielded	1.0
RF	Antenna	Coaxial	Shielded	0.5

EUT OPERATION

During emissions testing the EUT was transmitting at maximum power on low, middle, and high channels.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on May 23, 2007 at the Elliott Laboratories Open Area Test Site #2 located at 684 West Maude Avenue, Sunnyvale, California. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission.

ANSI C63.4:2003 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4:2003 and RSS 212.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003 and RSS 212. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003 / RSS 212.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.4:2003 and RSS 212 specify that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

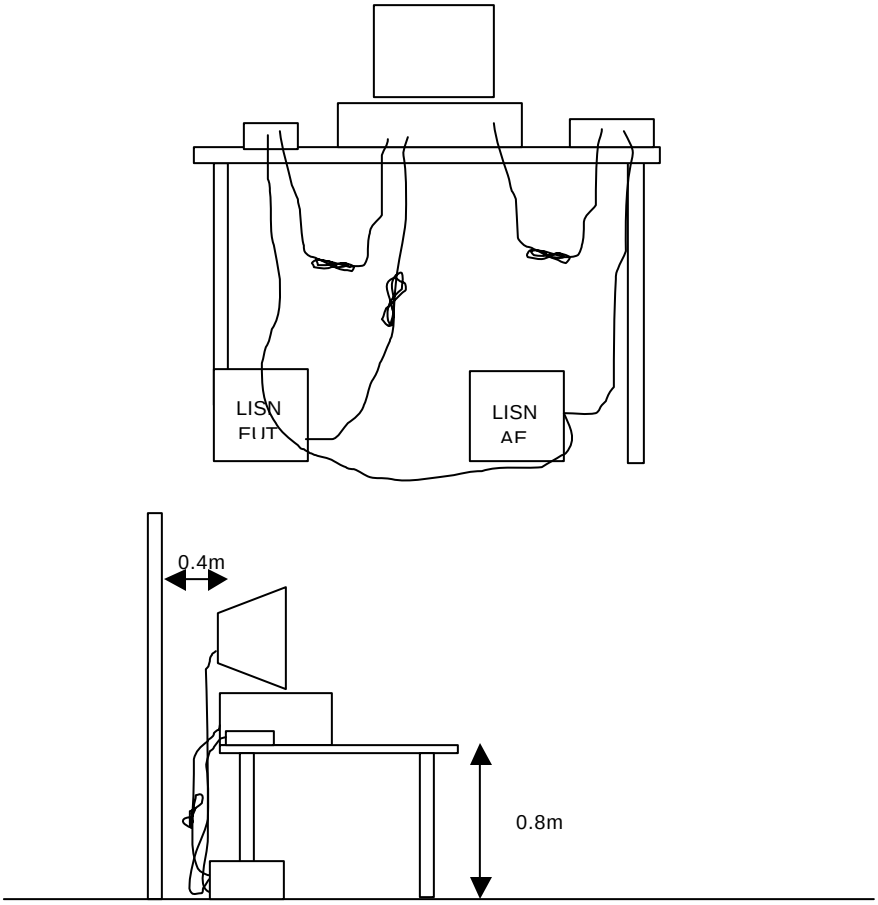
TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4:2003, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.



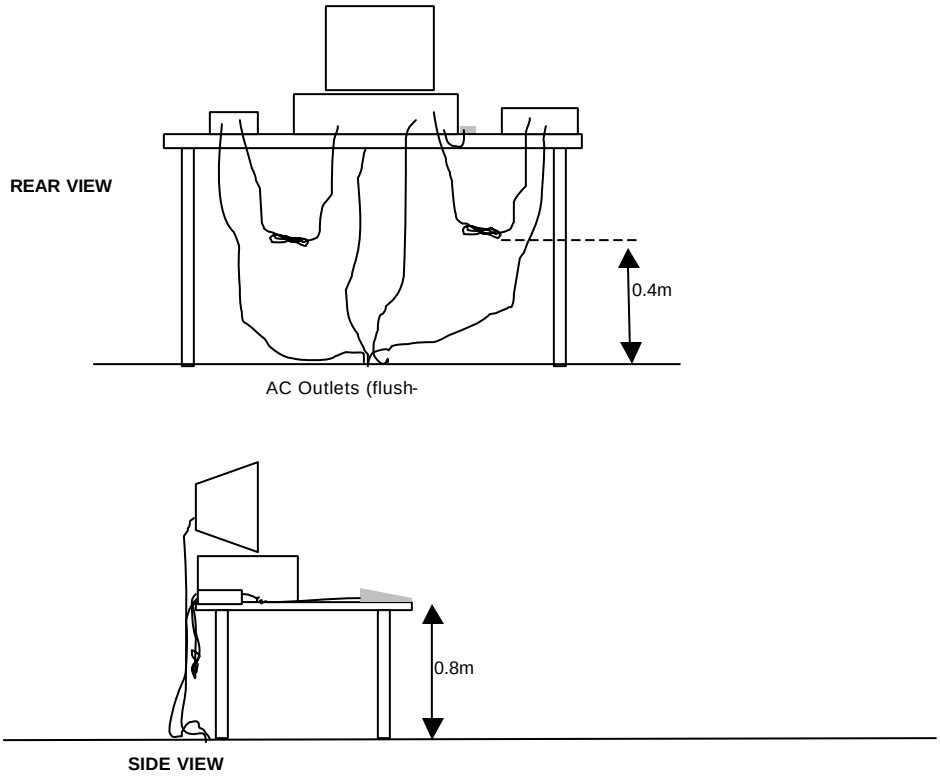
RADIATED EMISSIONS

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



Typical Test Configuration for Radiated Field Strength Measurements

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

FCC 15.407 (a) OUTPUT POWER LIMITS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
5150 - 5250	50mW (17 dBm)	4 dBm/MHz
5250 - 5350	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

For system using antennas with gains exceeding 6dBi, the output power and power spectral density limits are reduced by 1dB for every dB the antenna gain exceeds 6dBi.
Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

[1] The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

OUTPUT POWER AND SPURIOUS LIMITS –UNII DEVICES

The table below shows the limits for output power and output power density defined by FCC Part 15 Subpart E. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
5150 - 5250	50mW (17 dBm)	10 dBm/MHz
5250 - 5350	250 mW (24 dBm)	11 dBm/MHz
5470 - 5725	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

The peak excursion envelope is limited to 13dB.

For system using antennas with gains exceeding 6dBi, the output power and power spectral density limits are reduced by 1dB for every dB the antenna gain exceeds 6dBi.
Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_C = R_r + F_d$$

and

$$M = R_C - L_S$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_C = Corrected Reading in dBuV/m

L_S = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \text{ v } 30\ P}{3} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

1 Page

EXHIBIT 2: Test Measurement Data

17 Pages

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	Test-Log Number:	T68072
		Project Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Emissions Spec:	FCC 15.247, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Redline Communications

Model

AN-80i (5.4 GHz) PMP

Date of Last Test: 5/23/2007

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	Test-Log Number:	T68072
		Project Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Emissions Spec:	FCC 15.247, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

EUT INFORMATION

The following information was collected during the test sessions(s).

General Description

The EUT is a Point to Point and/or Point to Multi-Point 5GHz radio operating in the range 5470-5725 GHz that is designed to provide wireless network and internet service. The EUT is normally pole mounted, but the EUT was treated as table-top equipment during testing. The electrical rating of the EUT is 48Vdc Volts , 5 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Redline	AN-80i	Accesspoint	-	QC8-AN80IA

Other EUT Details

None

EUT Antenna (Intentional Radiators Only)

The EUT antenna is a 17.5 dBi sector antenna and a 9dBi OMNI antenna with standard N-Type connectors. Other Family sector antennas with smaller gain 16.6 and 15 dBi will be listed in the report. The radio and antennas will be professionally installed as required per 15.203 for non-standard connectors.

EUT Enclosure

The EUT enclosure is primarily constructed of aluminum. It measures approximately 25cm W by 15cm D by 5cm H.

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Project Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Emissions Spec:	FCC 15.247, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

Test Configuration #1

The following information was collected during the test sessions(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	-	-	-	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	PP02X	Laptop	07898349890344	DoC
Cincon	TR60A-POE-L	POE	N/A	N/A

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT Ethernet	POE	Cat5	Shielded	30.0
Laptop Ethernet	POE	Cat5	Unshielded	1.0
RF	Antenna	Coaxial	Shielded	0.5

EUT Operation During Emissions Tests

During emissions testing the EUT was transmitting at maximum power on low, middle, and high channels .

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	Radio

Receiver Radiated Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 5/23/2007
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 48Vdc

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing.

The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measuremen

Ambient Conditions:

Temperature: 17 °C
Rel. Humidity: 67 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 1000 - 18000 MHz, Maximized Emissions	RSS-210	Pass	45.9dBµV/m @ 1200.0MHz (-8.1dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

EMC Test Data

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	Radio

Run #1: Maximized Readings, 1000 - 18000 MHz
Center Channel, Rx mode

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000 - 18000 MHz	3	3	0.0

Frequency	Level	Pol	RSS-210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1200.020	45.9	V	54.0	-8.1	AVG	263	1.0	
1200.020	48.9	V	74.0	-25.1	PK	263	1.0	
1350.190	33.5	V	54.0	-20.5	AVG	282	1.0	
1350.190	48.1	V	74.0	-25.9	PK	282	1.0	
1557.020	43.0	V	54.0	-11.0	AVG	35	1.0	
1557.020	54.0	V	74.0	-20.0	PK	35	1.0	
11189.040	34.6	V	54.0	-19.4	AVG	259	1.0	
11189.040	44.8	V	74.0	-29.2	PK	259	1.0	
16785.590	38.3	V	54.0	-15.7	AVG	112	1.0	
16785.590	48.7	V	74.0	-25.3	PK	112	1.0	
11190.040	34.7	H	54.0	-19.3	AVG	319	1.0	
11190.040	45.9	H	74.0	-28.1	PK	319	1.0	

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	Radio

Receiver Radiated Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 5/23/2007
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 48Vdc

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing.

The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Ambient Conditions:

Temperature: 17 °C
Rel. Humidity: 67 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 1000 - 18000 MHz, Maximized Emissions	RSS-210	Pass	48.0dBµV/m (251.2µV/m) @ 1200.0MHz (-6.0dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	Radio

Run #1: Maximized Readings, 1000 - 18000 MHz
Center channel, Rx mode

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000 - 18000 MHz	3	3	0.0

Frequency	Level	Pol	RSS-210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1199.970	48.0	V	54.0	-6.0	AVG	292	1.0	
1199.970	50.8	V	74.0	-23.2	PK	292	1.0	
11190.240	35.0	H	54.0	-19.0	AVG	8	1.0	
11190.240	45.5	H	74.0	-28.5	PK	8	1.0	
16785.290	38.5	H	54.0	-15.5	AVG	53	1.0	
16785.290	49.2	H	74.0	-24.8	PK	53	1.0	
11188.950	34.6	V	54.0	-19.4	AVG	346	1.0	
11188.950	45.1	V	74.0	-28.9	PK	346	1.0	
16785.290	38.3	V	54.0	-15.7	AVG	202	1.0	
16785.290	48.6	V	74.0	-25.4	PK	202	1.0	
1350.410	34.6	V	54.0	-19.4	AVG	251	1.0	
1350.410	47.5	V	74.0	-26.5	PK	251	1.0	
1557.530	41.9	V	54.0	-12.1	AVG	302	1.0	
1557.530	55.1	V	74.0	-18.9	PK	302	1.0	

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	N/A

Radiated Emissions (17dBi antenna)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 5/23/2007 12:04
Test Engineer: Juan Martinez
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 48Vdc

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 17 °C
Rel. Humidity: 67 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1a - c	RE, 1000 - 40,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.407	Pass	53.2dBµV/m (457.1µV/m) @ 5375.0MHz (-0.8dB)

Modifications Made During Testing:

No modifications were made to the EUT during testing

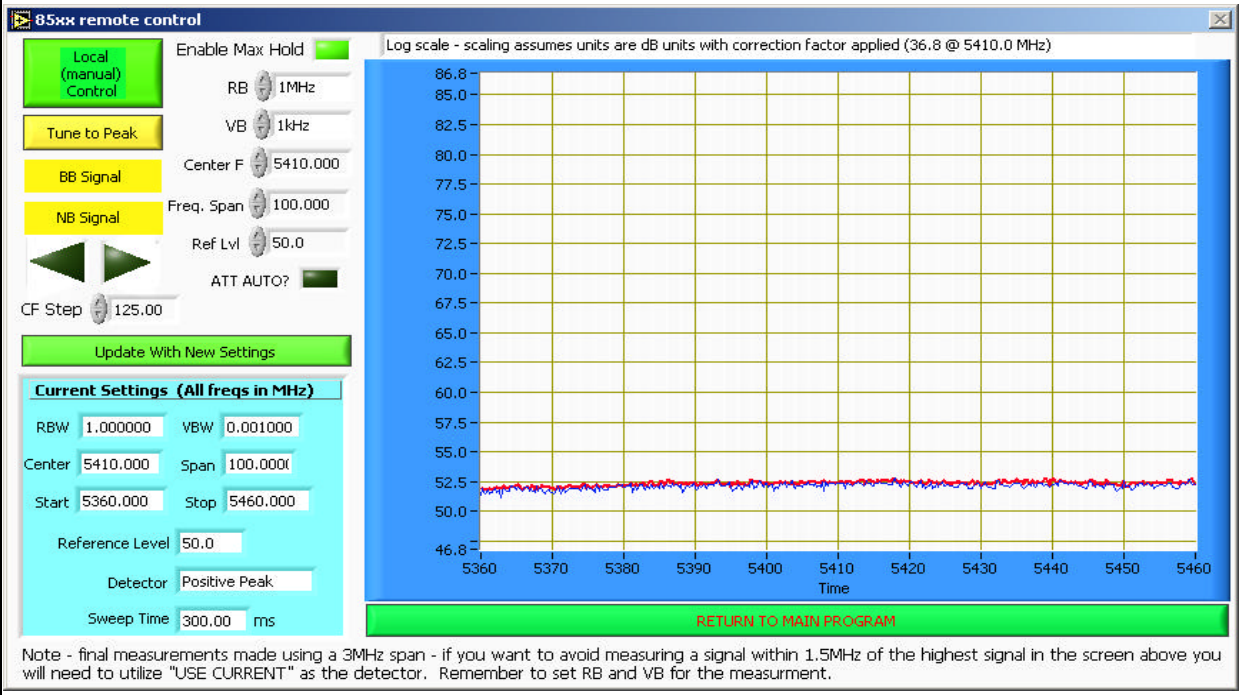
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 1000 - 40,000 MHz. Low Channel @ 5480 MHz, Power setting -4

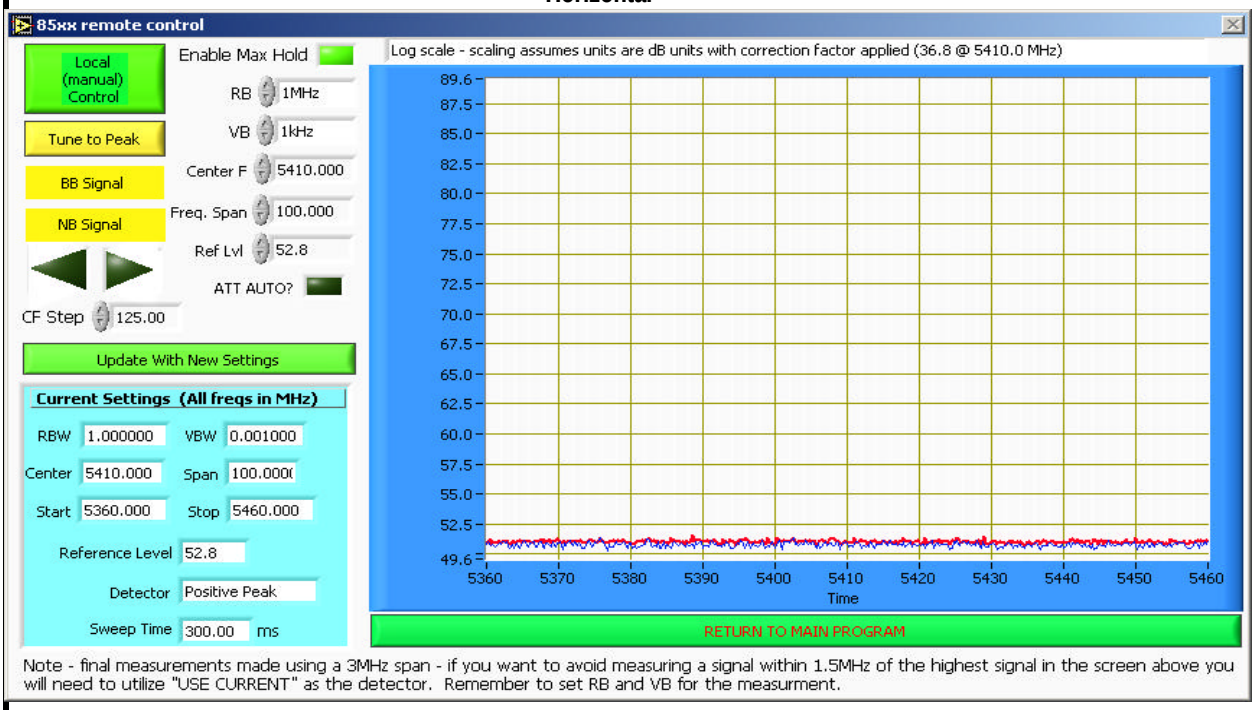
Vertical



Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	N/A

Run #1a: Continued

Horizontal



Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5375.000	53.2	V	54.0	-0.8	AVG	360	1.0	Power setting -4
5375.000	63.6	V	74.0	-10.4	PK	360	1.0	Power setting -4
5448.200	52.0	H	54.0	-2.0	AVG	0	1.0	
5448.200	63.2	H	74.0	-10.8	PK	0	1.0	

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	N/A

Run #1a: Continued

Other Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
10959.790	34.4	V	54.0	-19.6	AVG	343	1.0	
10959.790	44.7	V	74.0	-29.3	PK	343	1.0	
16440.590	36.4	V	54.0	-17.6	AVG	269	1.0	
16440.590	47.4	V	74.0	-26.6	PK	269	1.0	
10958.820	34.7	H	54.0	-19.3	AVG	327	1.0	
10958.820	45.5	H	74.0	-28.5	PK	327	1.0	
16439.270	36.5	H	54.0	-17.5	AVG	25	1.0	
16439.270	46.7	H	74.0	-27.3	PK	25	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm/MHz (~68dBuV/m).
Note 2:	Band-edge measurement calculated from the fundamental field strength (peak or average) minus the band edge delta marker measurement.

Run #1b: Radiated Spurious Emissions, 1000 - 40,000 MHz. Center Channel @ 5595 MHz, Power setting of 1

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
11190.310	35.1	H	54.0	-18.9	AVG	353	1.0	
11190.310	46.5	H	74.0	-27.5	PK	353	1.0	
16785.460	38.6	H	54.0	-15.4	AVG	15	1.0	
16785.460	48.8	H	74.0	-25.2	PK	15	1.0	
11191.040	35.0	V	54.0	-19.0	AVG	67	1.0	
11191.040	46.4	V	74.0	-27.6	PK	67	1.0	
16786.300	38.6	V	54.0	-15.4	AVG	327	1.0	
16786.300	49.5	V	74.0	-24.5	PK	327	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm/MHz (~68dBuV/m).

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 1000 - 40,000 MHz. High Channel @ 5715 MHz, Power setting of 1

Other Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
11429.830	35.9	V	54.0	-18.1	AVG	278	1.0	
11429.830	47.1	V	74.0	-26.9	PK	278	1.0	
17143.610	40.6	V	54.0	-13.4	AVG	360	1.0	
17143.610	50.7	V	74.0	-23.3	PK	360	1.0	
11429.290	35.6	H	54.0	-18.4	AVG	28	1.0	
11429.290	46.3	H	74.0	-27.7	PK	28	1.0	
17145.020	40.5	H	54.0	-13.5	AVG	282	1.0	
17145.020	52.5	H	74.0	-21.5	PK	282	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm/MHz (~68dBuV/m).
Note 2:	Band-edge measurement calculated from the fundamental field strength (peak or average) minus the band edge delta marker measurement.

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	N/A

Radiated Emissions (9dBi antenna)

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 5/23/2007 12:04
Test Engineer: Juan Martinez
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 48Vdc

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

Ambient Conditions:

Temperature: 17 °C
Rel. Humidity: 67 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1a - c	RE, 1000 - 40,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.407	Pass	52.1103.6 @ 5437.85MHz (-1.9dB)

Modifications Made During Testing:

No modifications were made to the EUT during testing

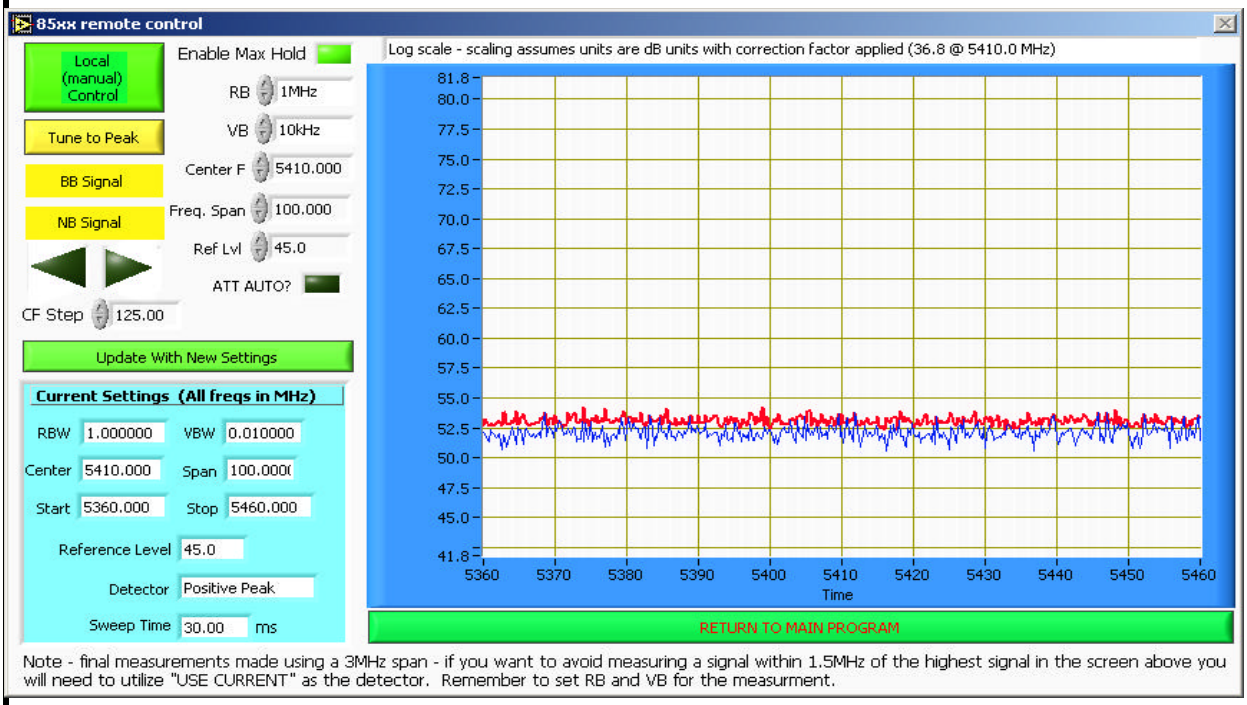
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 1000 - 40,000 MHz. Low Channel @ 5480 MHz, Power setting 10

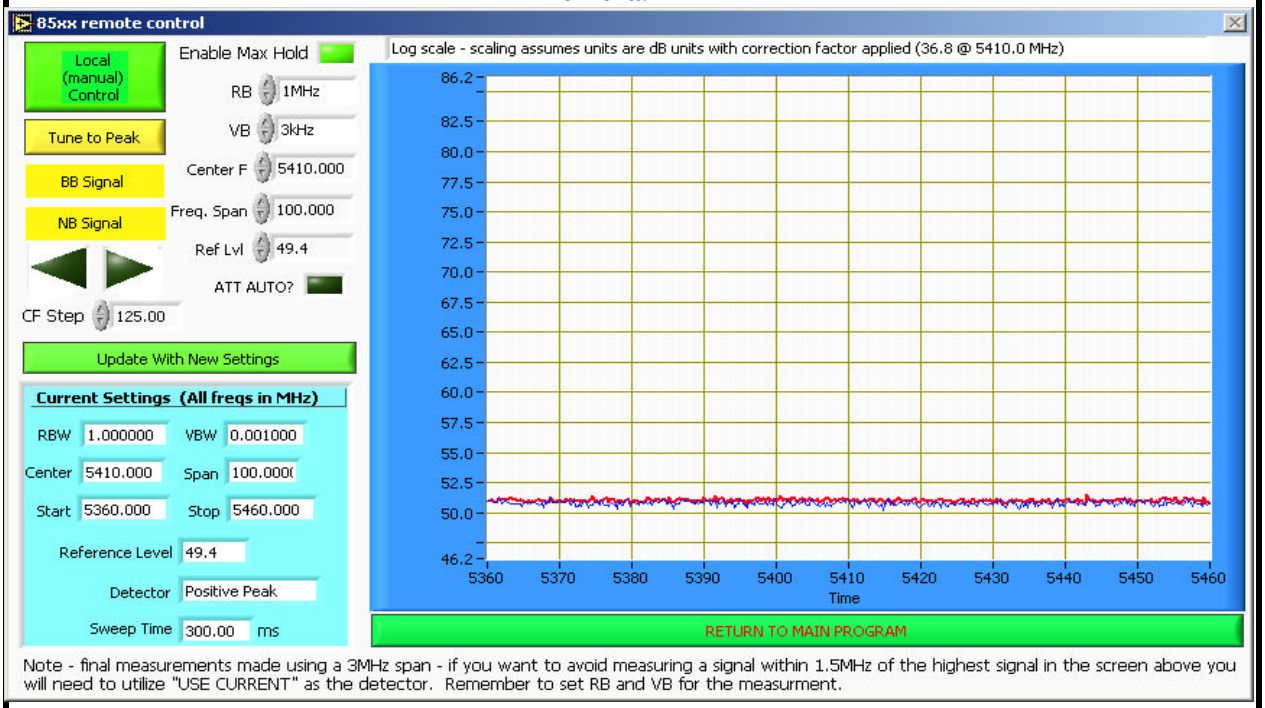
Vertical



Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	N/A

Run #1a: Continued

Horizontal



Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5499.050	95.1	V	54.0	41.1	AVG	171	0.0	Fundamental
5499.050	103.6	V	74.0	29.6	PK	171	0.0	Fundamental
5437.800	52.1	V	54.0	-1.9	AVG	360	1.0	5480 MHz Bandedge
5437.800	63.3	V	74.0	-10.7	PK	360	1.0	5480 MHz Bandedge
5486.250	80.5	H	54.0	26.5	AVG	230	0.0	Fundamental
5486.250	89.4	H	74.0	15.4	PK	230	0.0	Fundamental
5395.700	52.0	H	54.0	-2.0	AVG	180	1.0	5480 MHz Bandedge
5395.700	63.3	H	74.0	-10.7	PK	180	1.0	5480 MHz Bandedge

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	N/A

Run #1a: Continued

Other Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
10959.800	35.1	V	54.0	-18.9	AVG	259	1.0	
10959.800	45.4	V	74.0	-28.6	PK	259	1.0	
16438.940	36.8	V	54.0	-17.2	AVG	179	1.0	
16438.940	47.6	V	74.0	-26.4	PK	179	1.0	
10960.860	34.3	H	54.0	-19.7	AVG	47	1.0	
10960.860	45.5	H	74.0	-28.5	PK	47	1.0	
16441.070	36.3	H	54.0	-17.7	AVG	162	1.0	
16441.070	46.5	H	74.0	-27.5	PK	162	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm/MHz (~68dBuV/m).
Note 2:	Band-edge measurement calculated from the fundamental field strength (peak or average) minus the band edge delta marker measurement.

Run #1b: Radiated Spurious Emissions, 1000 - 40,000 MHz. Center Channel @ 5595 MHz, Power setting 10

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
11191.250	34.7	H	54.0	-19.3	AVG	360	1.0	
11191.250	45.1	H	74.0	-28.9	PK	360	1.0	
16783.660	38.3	H	54.0	-15.7	AVG	287	1.0	
16783.660	48.8	H	74.0	-25.2	PK	287	1.0	
11189.800	36.4	V	54.0	-17.6	AVG	291	1.0	
11189.800	47.1	V	74.0	-26.9	PK	291	1.0	
16784.970	38.2	V	54.0	-15.8	AVG	185	1.0	
16784.970	48.9	V	74.0	-25.1	PK	185	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm/MHz (~68dBuV/m).

Client:	Redline Communications	Job Number:	J68022
Model:	AN-80i (5.4 GHz) PMP	T-Log Number:	T68072
		Account Manager:	Dean Eriksen
Contact:	Medhat Fawzy		
Standard:	FCC 15.247, RSS-210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 1000 - 40,000 MHz. High Channel @ 5715 MHz, Power setting 10

Other Spurious Radiated Emissions:

Frequency	Level	Pol	15.209 / 15E		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
11429.970	46.9	V	54.0	-7.1	AVG	272	1.6	
11429.970	59.4	V	74.0	-14.6	PK	272	1.6	
17146.110	40.3	V	54.0	-13.7	AVG	277	1.0	
17146.110	50.9	V	74.0	-23.1	PK	277	1.0	
11429.830	37.0	H	54.0	-17.0	AVG	337	2.0	
11429.830	48.4	H	74.0	-25.6	PK	337	2.0	
17145.650	40.2	H	54.0	-13.8	AVG	96	1.0	
17145.650	51.0	H	74.0	-23.0	PK	96	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set to -27dBm/MHz (~68dBuV/m).
Note 2:	Band-edge measurement calculated from the fundamental field strength (peak or average) minus the band edge delta marker measurement.

EXHIBIT 3: Photographs of Test Configurations

4 Pages