FCCID: QYPPWR0801

Emissions Test Report

EUT Name: Remote Unit

EUT Model: PWR-08-03

FCC Title 47, Part 15, Subpart C, RSS-210 Issue 6

Prepared for:

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Report/Issue Date: 3 May 2007
Report Number: 30683466.011

Statement of Compliance

Manufacturer:	Polymap WIreless LLC 310 S. Williams Blvd, Suite 346 Tucson, AZ 85711 520-747-1811
Requester / Applicant:	Pierre Landau, Ph.D.
Name of Equipment:	Remote Unit Model No. PWR-08-03
Type of Equipment:	Intentional Radiator
Application of Regulations:	FCC Title 47, Part 15, Subpart C, RSS-210 Issue 6
Test Dates:	18 January 2007 to 01 March 2007

Guidance Documents:

Emissions: FCC 47 CFR Part 15, RSS-210 Issue 6

Test Methods:

Emissions: ANSI C63.4:2005

The electromagnetic compatibility test and documented data described in this report has been performed and recorded by TUV Rheinland, in accordance with the standards and procedures listed herein. As the responsible authorized agent of the EMC laboratory, I hereby declare that a sample of one, of the equipment described above, has been shown to be compliant with the EMC requirements of the stated regulations and standards based on these results. If any special accessories and/or modifications were required for compliance, they are listed in the Executive Summary of this report.

This report must not be used to claim product endorsement by NVLAP or any agency of the U.S. Government. This report contains data that are not covered by NVLAP accreditation. This report shall not be reproduced except in full, without the written authorization of the laboratory.

Mark Ryan 3 May 2007

Test Engineer: Mark Ryan Date

NVLAP 200094-0

FC 90552 and 100881

Industry Canada IC3755

1 Executive Summary

1.1 Scope

This report is intended to document the status of conformance with the requirements of the FCC Title 47, Part 15, Subpart C, RSS-210 Issue 6 based on the results of testing performed on *18 January* 2007 through *01 March* 2007 on the *Remote Unit* Model No. *PWR-08-03* manufactured by Polymap WIreless LLC. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 Summary of Test Results

Table 1 - Summary of Test Results

Test	Test Method(s)	Test Parameters	Measurement	Result
Channel Separation	FCC Part 15.247(a)(1)	≥20 dB bandwidth.	1.004 MHz	**compliant**
Pseudorandom Hopping Algorithm	FCC Part 15.247(a)(1)	Bluetooth DH1		**compliant**
Time of Occupancy	FCC Part 15.247(a)(1)(i)	≤0.4 sec in 31.6 sec.	165.3 ms	**compliant**
20dB Occupied Bandwidth	FCC Part 15.247(a)(1)(i)	=<500kHz	673.3 kHz	**compliant**
99% Power Bandwidth	I.C. RSS-210 Part 5.9.1		865.73 kHz	**compliant**
Peak Output Power	FCC Part 15.247(b)(1)	1 Watt (direct to port)	29.9 dBm	**compliant**
Maximum Permissible Exposure	FCC §15.247(b)(5)	1 mW/cm^2	0.0032 mW/cm^2 @ 0.2m	**compliant**
Spurious Emissions	FCC Part 15.247(d)	Table FCC Part 15.209	38.00 dBuV/m @ 66.84 MHz QP	**compliant**
Frequency Hopping Spread Spectrum Systems	FCC Part 15.247(g)			**compliant**
Incorporation of intelligence	FCC Part 15.247(h)			**compliant**
Frequency Stability	FCC Part 15.215(c)	Containment of 20 dB bandwidth between 2400 and 2483.5 MHz		**compliant**
Radiated Emissions Class B (when not transmitting)	FCC Part 15.109(a)	Table FCC Part 15.109(a)	17.82 dBuV/m QP @ 40.57 MHz	**compliant**
Conducted Emissions	FCC Parts 15.107(a) and 15.207	Table FCC Parts 15.107(a) and 15.207	39.44 dBuV (avg) @ 480kHz	**compliant**

1.4 Special Accessories or Equipment Modifications

No special accessories or modifications were necessary in order to achieve compliance.

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland at the 762 Park Ave., Youngsville, N.C 27596 address is accredited by the commission for performing testing services for the general public on a fee basis. This laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Registration No 90552 and 100881). The laboratory scope of accreditation includes: Title 47 CFR Part 15, 18, and 90. The accreditation is updated every 3 years.

2.1.2 NIST / NVLAP

TUV Rheinland is accredited by the National Voluntary Laboratory Accreditation Program, which is administered under the auspices of the National Institute of Standards and Technology. The laboratory has been assessed and accredited in accordance with ISO Standard 17025:2005 (Lab code 200094-0). The scope of laboratory accreditation includes emission and immunity testing. The accreditation is updated annually.

2.1.3 Canada – Industry Canada

Registration No. IC3755

2.1.4 Japan - VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland at the 762 Park Ave. Youngsville, N.C 27596 address has been assessed and approved in accordance with the Regulations for Voluntary Control Measures. (Registration No. R-1174, R-1679, C-1790 and C-1791).

2.1.5 Acceptance By Mutual Recognition Arrangement

The United States has an established agreement with specific countries under the Asia Pacific Laboratory Accreditation Corporation (APLAC) Mutual Recognition Arrangement. Under this agreement, all TUV Rheinland at the 762 Park Ave. Youngsville, N.C 27596 address test results and test reports within the scope of the laboratory NIST / NVLAP accreditation will be accepted by each member country.

2.2 Test Facilities

All of the test facilities are located at 762 Park Ave., Youngsville, North Carolina 27596, USA.

2.2.1 Emission Test Facility

The Open Area Test Site and AC Line Conducted measurement facility used to collect the radiated and conducted data has been constructed in accordance with ANSI C63.7:1992. The site has been measured in accordance with and verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2003, at a test distance of 3 and 10 meters. This site has been described in reports dated May 12, 1997, submitted to the FCC, and accepted by letter dated June 25, 1997 (31040/SIT 1300F2). The site is listed with the FCC and accredited by NVLAP (code 200094-0). The 5m semi-anechoic chamber used to collect the radiated data has been verified to comply with the theoretical normalized site attenuation requirements of ANSI C63.4:2003, at a test distance of 3 meters. A report detailing this site can be obtained from TUV Rheinland.

2.2.2 Immunity Test Facility

ESD, EFT, Surge, PQF: These tests are performed in an environmentally controlled room with a 3.7m x 3.7m x 3.175mm thick aluminum floor connected to PE ground. For ESD testing, tabletop equipment is placed on a 0.5mm thick insulated mat on a 1.6m x 0.8m x 0.8m high non-conductive table with a 3.175mm aluminum top (Horizontal Coupling Plane). The HCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. The Vertical Coupling Plane consists of an aluminum plate 50cm x 50cm x 3.175mm thick. The VCP is connected to the main ground plane via a low impedance ground strap through two 470 kΩ resistors. For each of the other tests, the HCP is removed.

RF Field Immunity testing is performed in a 7.3m x 3.7m x 3.2m anechoic chamber.

RF Conducted and Magnetic Field Immunity testing is performed on a 4.9m x 3.7m x 3.175mm thick aluminum ground plane which is connected to one end of the anechoic chamber.

All test areas allow a minimum distance of 1 meter from the EUT to walls or conducting objects.

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st addition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

The test system for conducted emissions is defined as the LISN, spectrum analyzer, coaxial cables, and pads. The test system for radiated emissions is defined as the antenna, spectrum analyzer, pre-amplifier, coaxial cables, and pads. The test system for radiated immunity is defined as the antenna, amplifier, cables, signal generator field probe and spectrum analyzer. The test system for conducted immunity is defined as the coupling/decoupling device, amplifier, cables, signal generator and spectrum analyzer. The test system for voltage variations and interruptions immunity is defined as the AC power source and the interruptions generator. The test system for electrical fast transient immunity is defined as the AC power output source and the fast transient generator. The test system for lightning surge immunity is defined as the AC power output source and the lightning surge generator. The test system for electrostatic discharge immunity is defined as the air and contact discharge generators. The test system for power frequency magnetic field immunity is defined as the AC voltage source. The test system for the damped oscillatory wave immunity is defined as the AC power output source and the oscillatory wave generator. The test system for harmonic current and voltage flicker test is defined as the AC power source and the detection devices. The conducted emissions test system has a combined standard uncertainty of ± 1.2 dB. The radiated emissions test system has a combined standard uncertainty of ± 1.6 dB. The radiated immunity test system has a combined standard uncertainty of ± 2.7 dB. The conducted immunity test system has a combined standard uncertainty of ± 1.5 dB. The voltage variations and interruptions immunity test system has a combined standard uncertainty of ± 4.3 dB. The electrical fast transients immunity test system has a combined standard uncertainty of ± 5.8 dB. The lightning surge immunity test system has a combined standard uncertainty of ± 8.0 dB. The electrostatic discharge immunity test system has a combined standard uncertainty of ± 4.1 dB. The power frequency magnetic field immunity test system has a combined standard uncertainty of ± 0.58 dB. The damped oscillatory wave immunity test system has a combined standard uncertainty of ± 8.7 dB. The harmonic current and voltage flicker test system has a combined standard uncertainty of ± 11.6 dB. The expanded uncertainty at a level of 95% confidence is obtained by multiplying the combined standard uncertainty by a coverage factor of 2. Compliance criteria are not based on measurement uncertainty.

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005.

3 Product Information

3.1 Product Description

The information for all equipment used in the tested system, including: descriptions of cables, clock and microprocessor frequencies, EMI critical components, and accessory equipment has been supplied by the manufacturer and is listed in the EMC Test Plan found in Section 6.

The serial number of the product tested is Not Serialized.

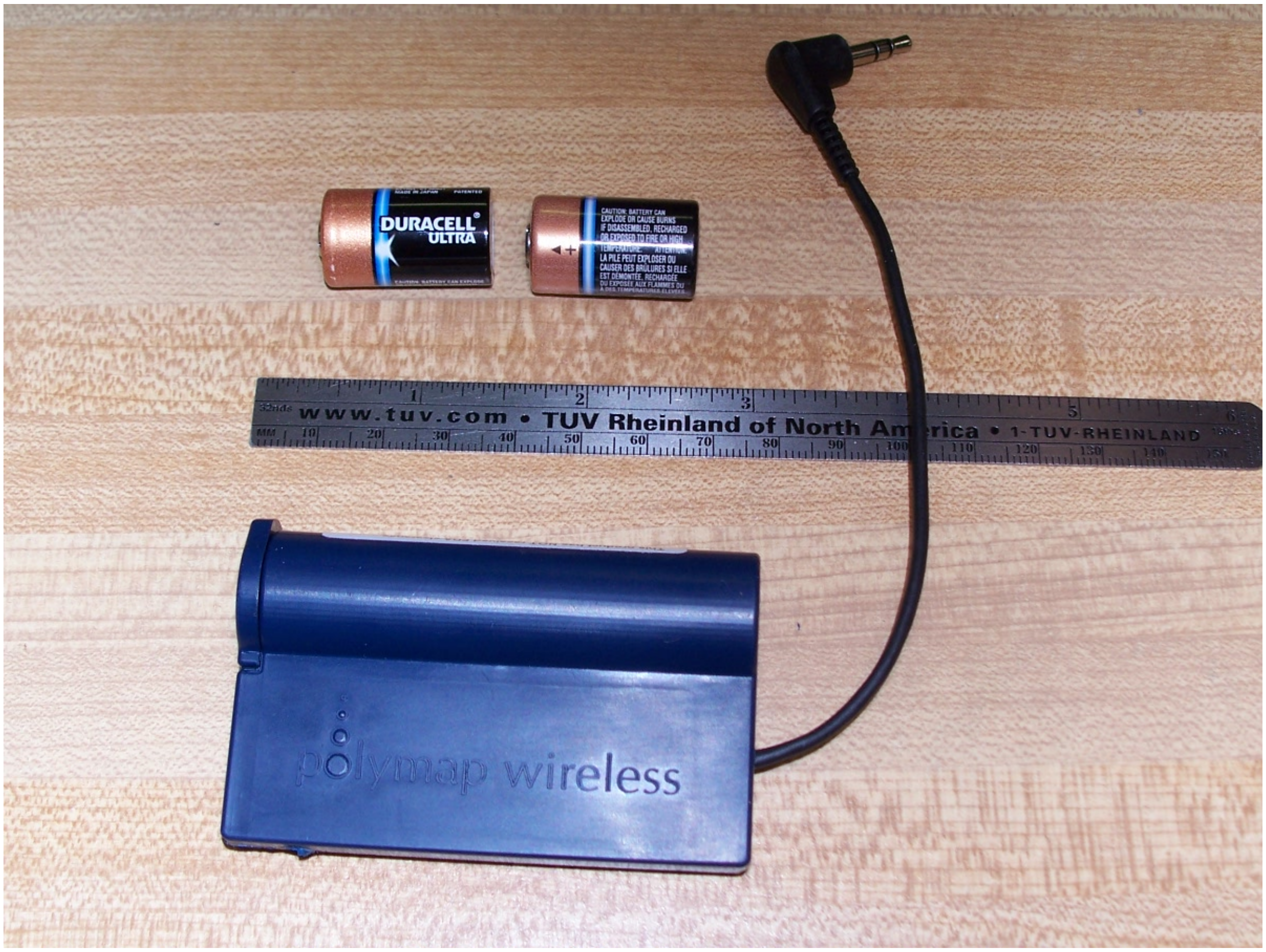


Figure 1 – Photo of EUT

3.2 Equipment Configuration

A description and justification of the equipment configuration is given in the EMC Test Plan. The EUT was tested as described in the EMC Test Plan and was configured and operated in a manner consistent with its intended use. The EUT was connected to rated power and allowed to warm up to normal operating conditions. The placement of the EUT system components was guided by the test standard and selected to represent typical installation conditions.

In the case of an EUT that can operate in more than one configuration, preliminary testing was performed to determine the configuration that produced maximum radiation.

The final configuration was selected to produce worse case radiation and place the EUT in the most susceptible state. There were no deviations from the description of the Equipment Configuration given in the EMC Test Plan.

3.3 Operation Mode

A description and justification of the operation mode is given in the EMC Test Plan.

In the case of an EUT that can operate in more than one state, preliminary testing was performed to determine the operating mode that produced maximum radiation.

The final operating mode was selected to produce worse case radiation and place the EUT in the most susceptible state. There were no deviations from the description of the Operation Mode given in the EMC Test Plan.

4 Emissions

Testing was performed in accordance with 47 CFR Part 15, ANSI C63.4:2005, RSS-210 Issue 6. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.1 Channel Separation Part 15.247(a)(1)

Frequency hopping Systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Note: The FCC has removed the 1MHz 20dB BW restriction in the 2400-2483.5MHz band for Frequency Hopping systems as per FCC public notice 04-165.

20dB Bandwidth = 673.3 kHz worst case
Channel Separation = 1.004 MHz

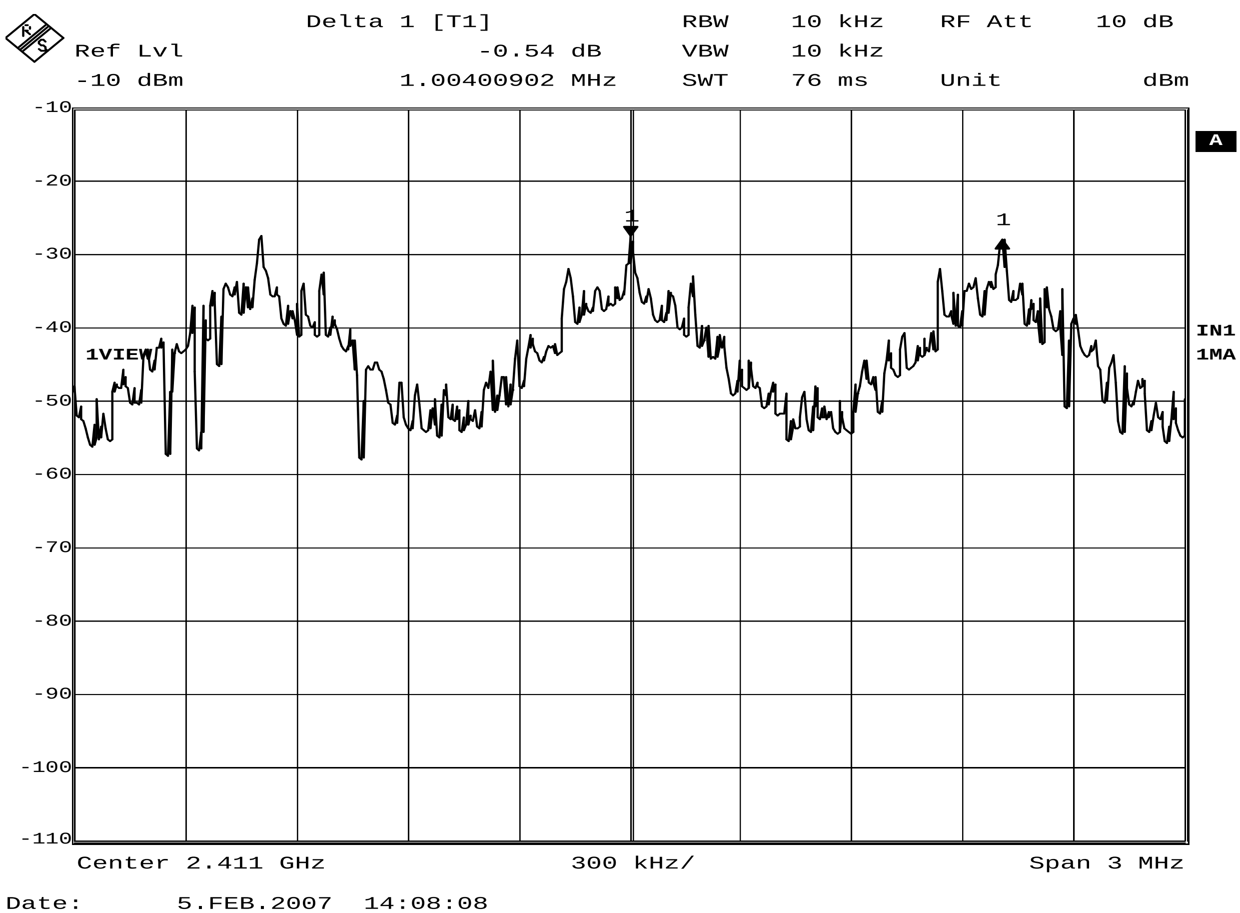


Figure 2 – 1.004 MHz Channel Separation (modulated)

4.2 Pseudorandom Hopping Algorithm FCC Part 15.247(a)(1)

The system shall hop to channel frequencies that are selected from a pseudo-randomly ordered list of hopping frequencies. Each frequency must be used equally on average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their transmitters and shall shift frequencies in synchronization with the transmitted signals.

Table 2 – Time of Occupancy Results

Frequency Band Set	Frequency Range (MHz, inclusive)	Channel Spacing (MHz)	Number of Channels
FCC	2400 – 2483.5	1.004	79

4.2.1 *Pseudo-randomization mode*

The pseudo-random number generator is a function of the approved blue-tooth controller used in the EUT.

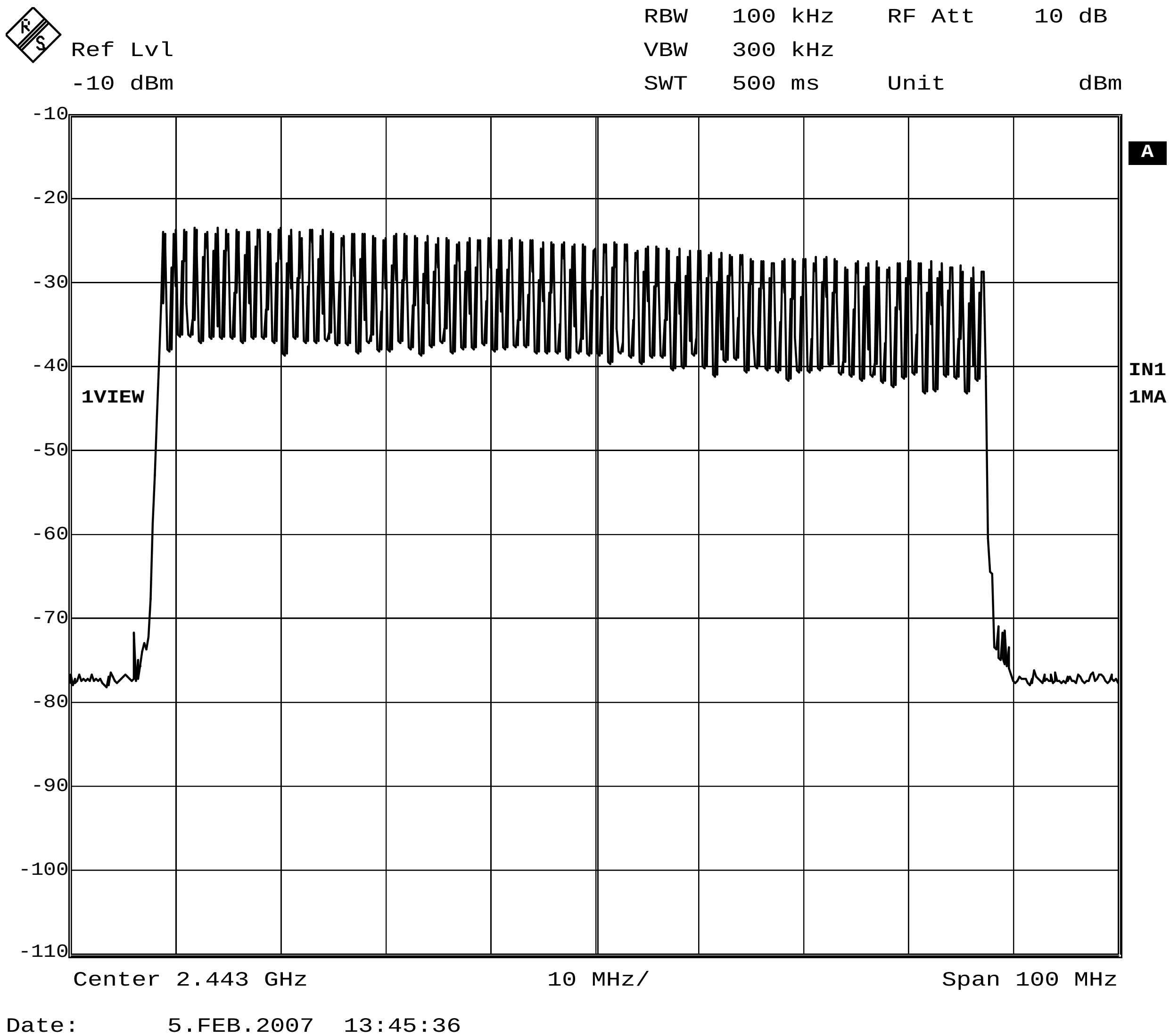


Figure 3 - Plot of EUT's 79 hopping Channels

4.3 Time of Occupancy FCC Part 15.247(a)(1)(iii)

Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels. The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Note: The FCC has removed the 1MHz 20dB BW restriction in the 2400-2483.5MHz band for Frequency Hopping systems as per FCC public notice 04-165.

The Device supports only Bluetooth DH1 packets.

Limit for Time of Occupancy is 0.4 seconds in [0.4 * (seconds)*79(hopping channels)]
or 0.4 seconds in 31.6 seconds.

Hops per second is 1 (hop) / 98.2mS (Period) = 10.18 (hops per second)
Number of hops in 31.6 seconds is 10.18 (hops per second) * 31.6 (Seconds) = 321 hops
Total time on channel = 321 (hops) * 0.515 mS (time of single hop) = 165.3 mS

Table 3 – Time of Occupancy Results

Frequency Band (MHz)	Number of Hopping Channels	Time of Occupancy	Limit	Margin to Limit
2400-2483.5	79	165.3 mS	400mS	**-234.7 mS**

The spectrum analyzer was set as follows:
RBW=500 kHz
VBW=500 kHz
Span=0Hz
LOG dB/div.= 10dB

Sweep = 1 mS and 1S

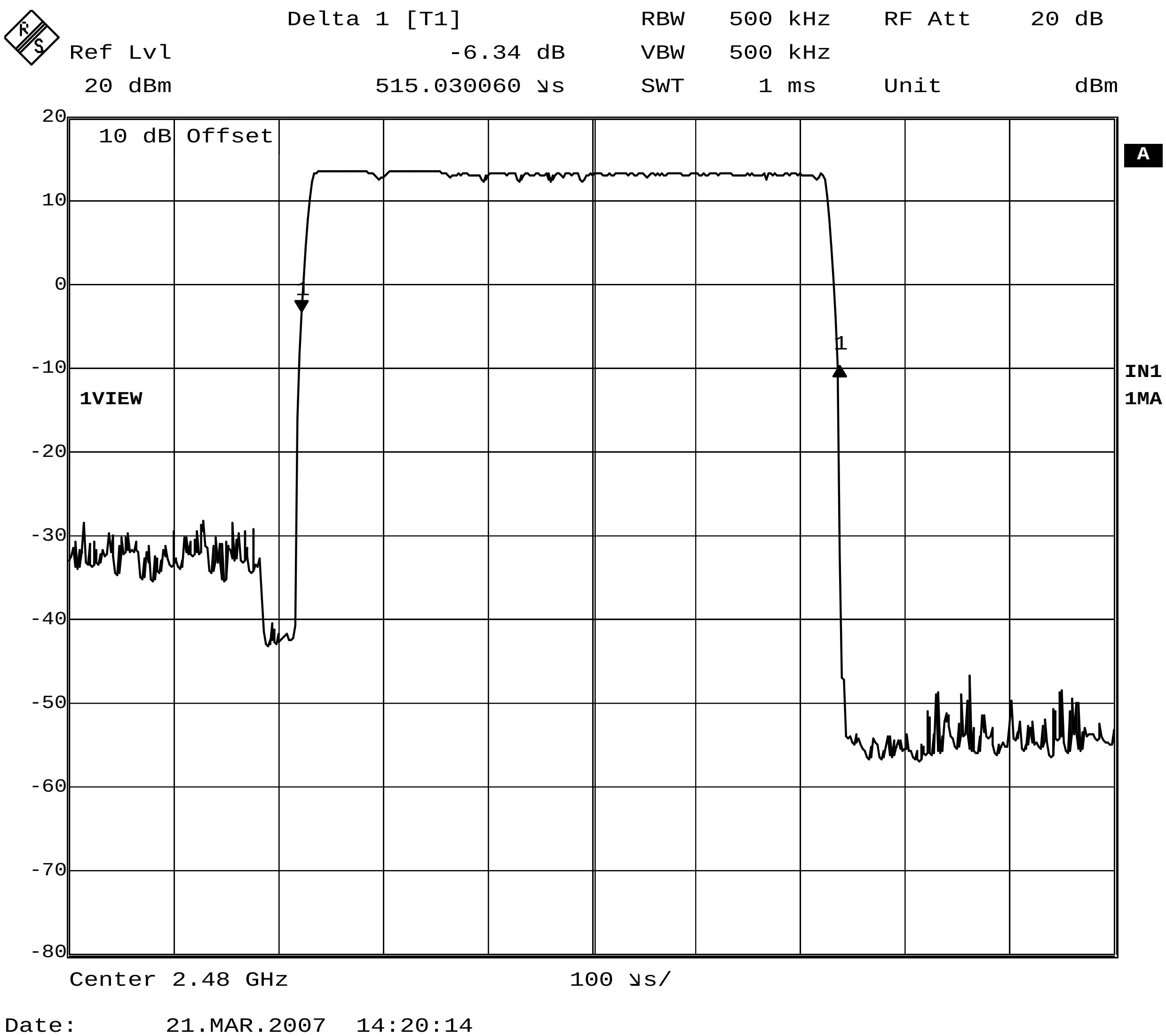


Figure 4 - Plot of EUT's Time on channel for one hop = 515µS

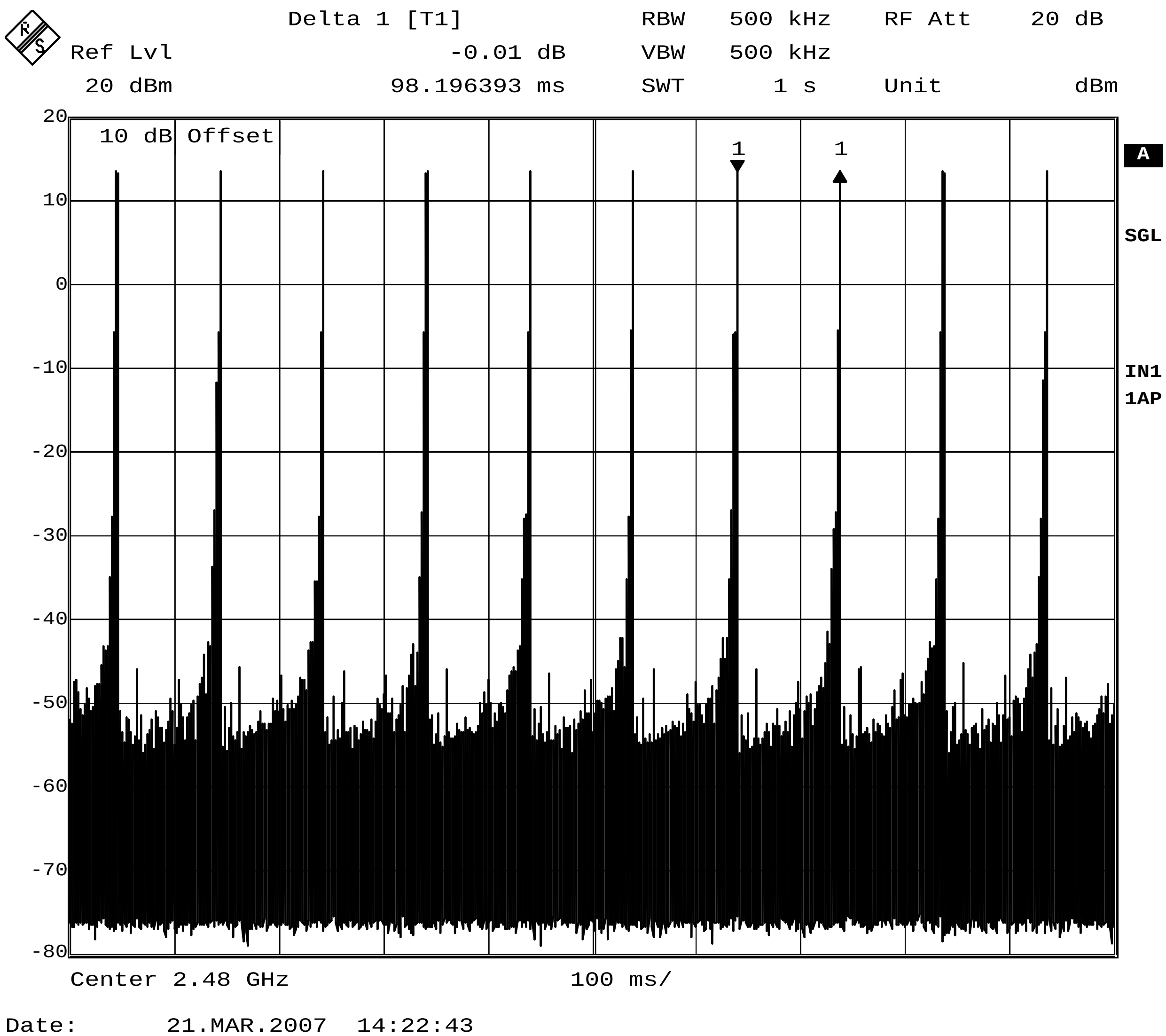


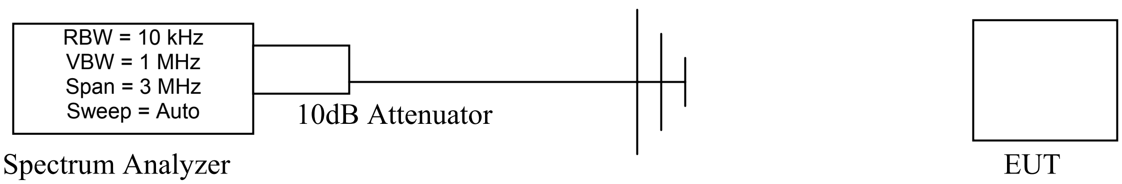
Figure 5 - Plot of EUT's Time between hops (period) = 98.2mS

4.4 20dB Bandwidth; §15.247(a)(1)

The bandwidths are measured with a spectrum analyzer connected directly to the antenna termination, while the EUT is operating in transmission mode at the appropriate center frequency.

The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz

Note: The FCC has removed the 1MHz 20dB BW restriction in the 2400-2483.5MHz band for Frequency Hopping systems as per FCC public notice 04-165.



Measurement Test set up

Table 4 – Table of Results

Center Frequency (MHz)	20dB Bandwidth (kHz)
2402 - low	673.3
2441 - mid	606
2480 - high	606

Note: Emissions shown in red are worst case, see plots below

.

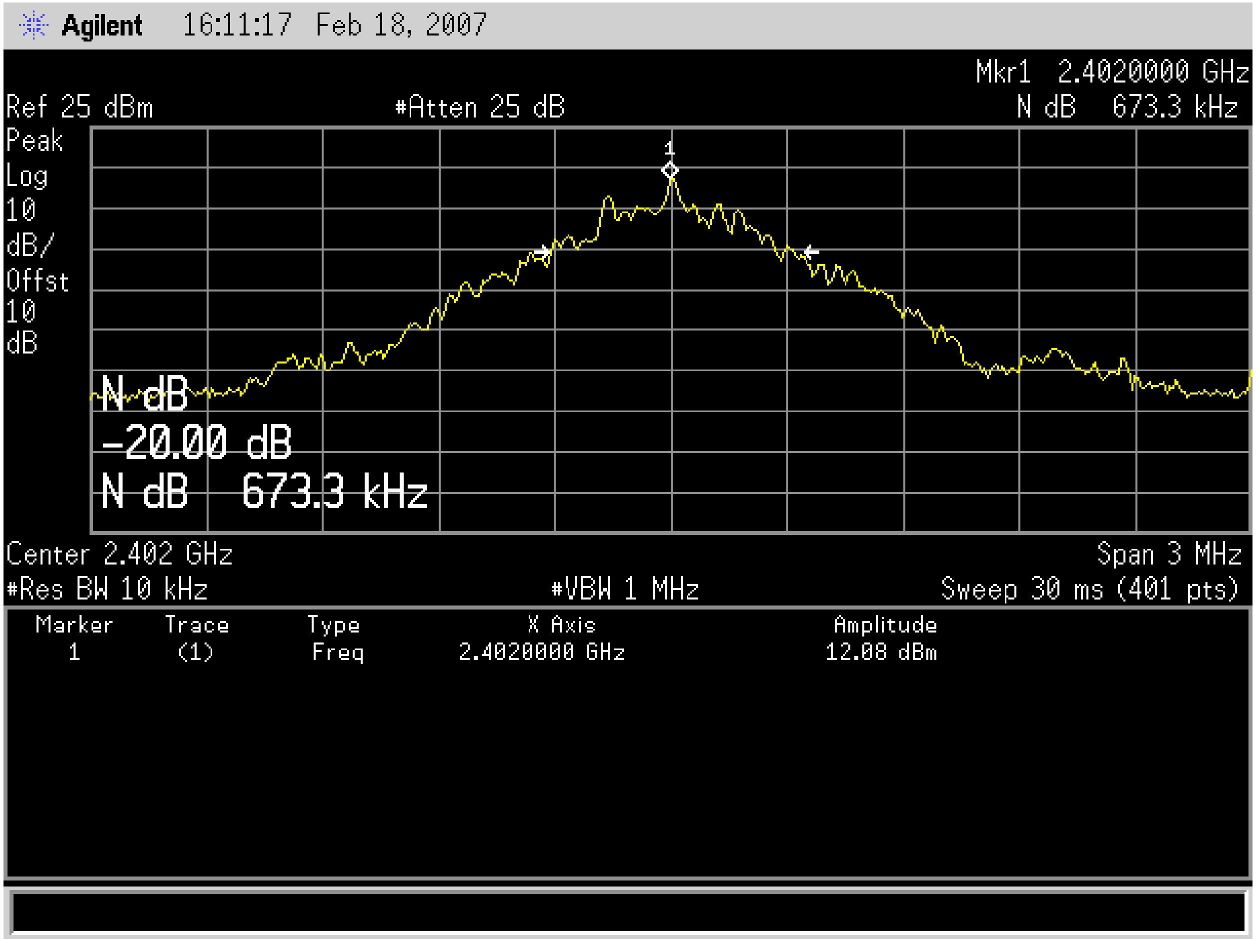
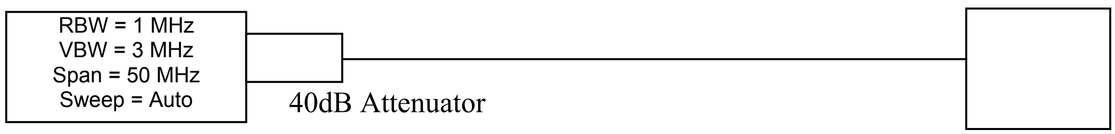


Figure 6 – Worst Case 20dB signal bandwidth at low band (2402MHz)

4.5 99% Power Bandwidth; RSS-210 §5.9.1

The bandwidths are measured with a spectrum analyzer connected directly to the antenna termination, while the EUT is operating in transmission mode at the appropriate center frequency.



Spectrum Analyzer   RF Output connection

Measurement Test set up

Table 5 – Table of Results

Center Frequency (GHz)	99% Power Bandwidth (kHz)
2402 - low	**865.73**
2441 - mid	**859.72**
2480 - high	**859.72**

Note: Emission shown in red are worst case, see plots below

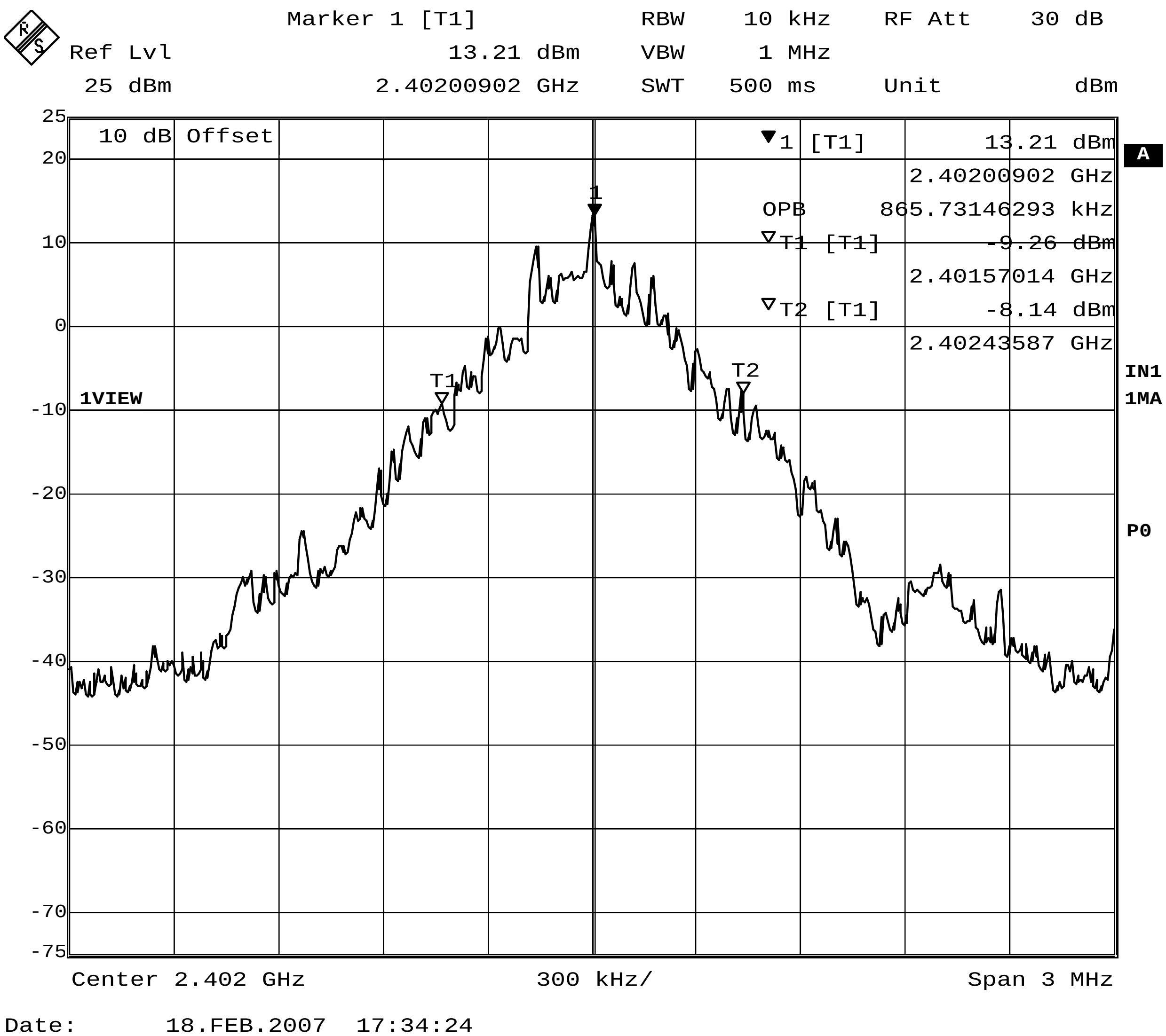


Figure 7 – Low-band 99% Occupied Power Bandwidth

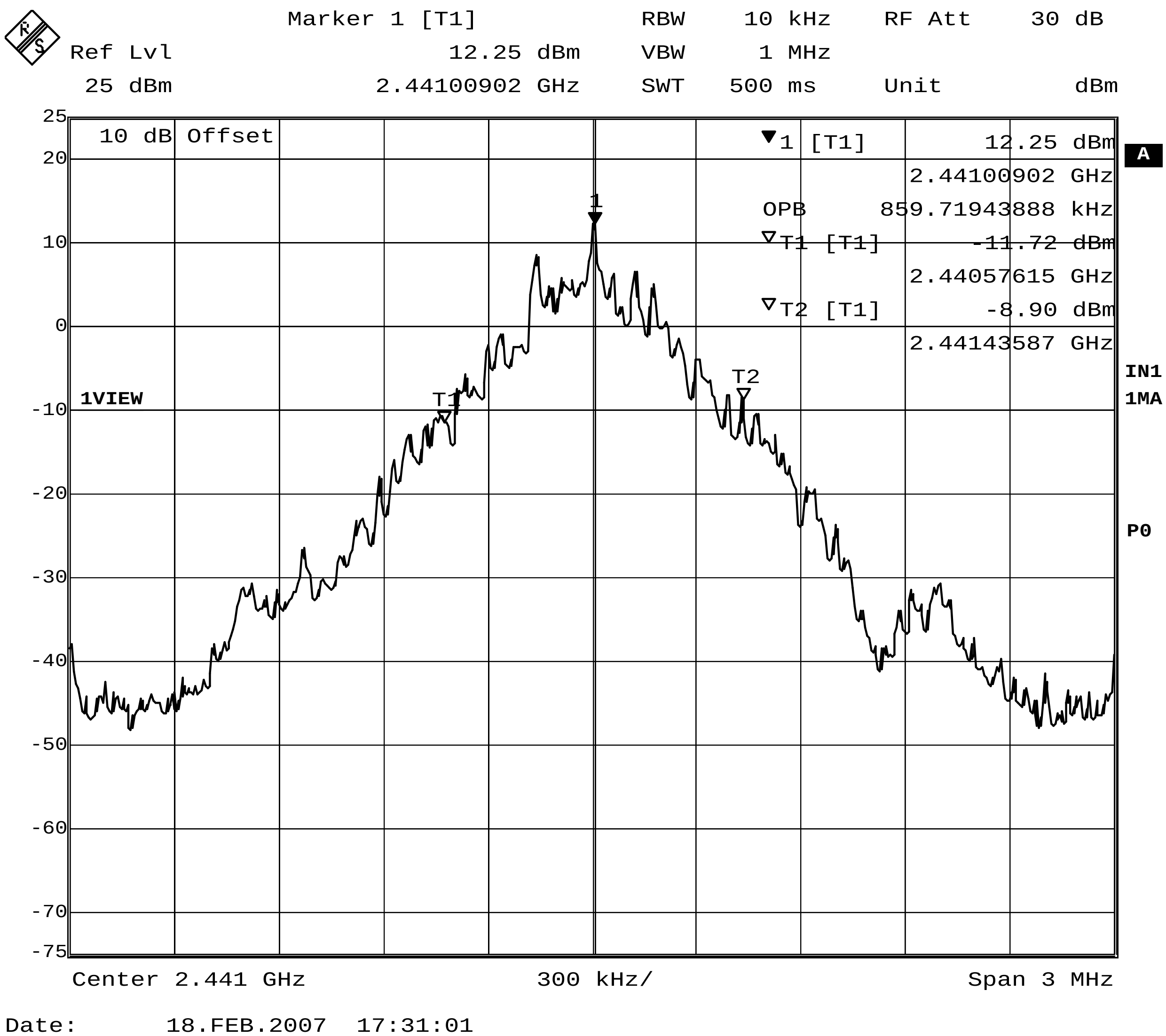


Figure 8 – Mid-band 99% Occupied Power Bandwidth

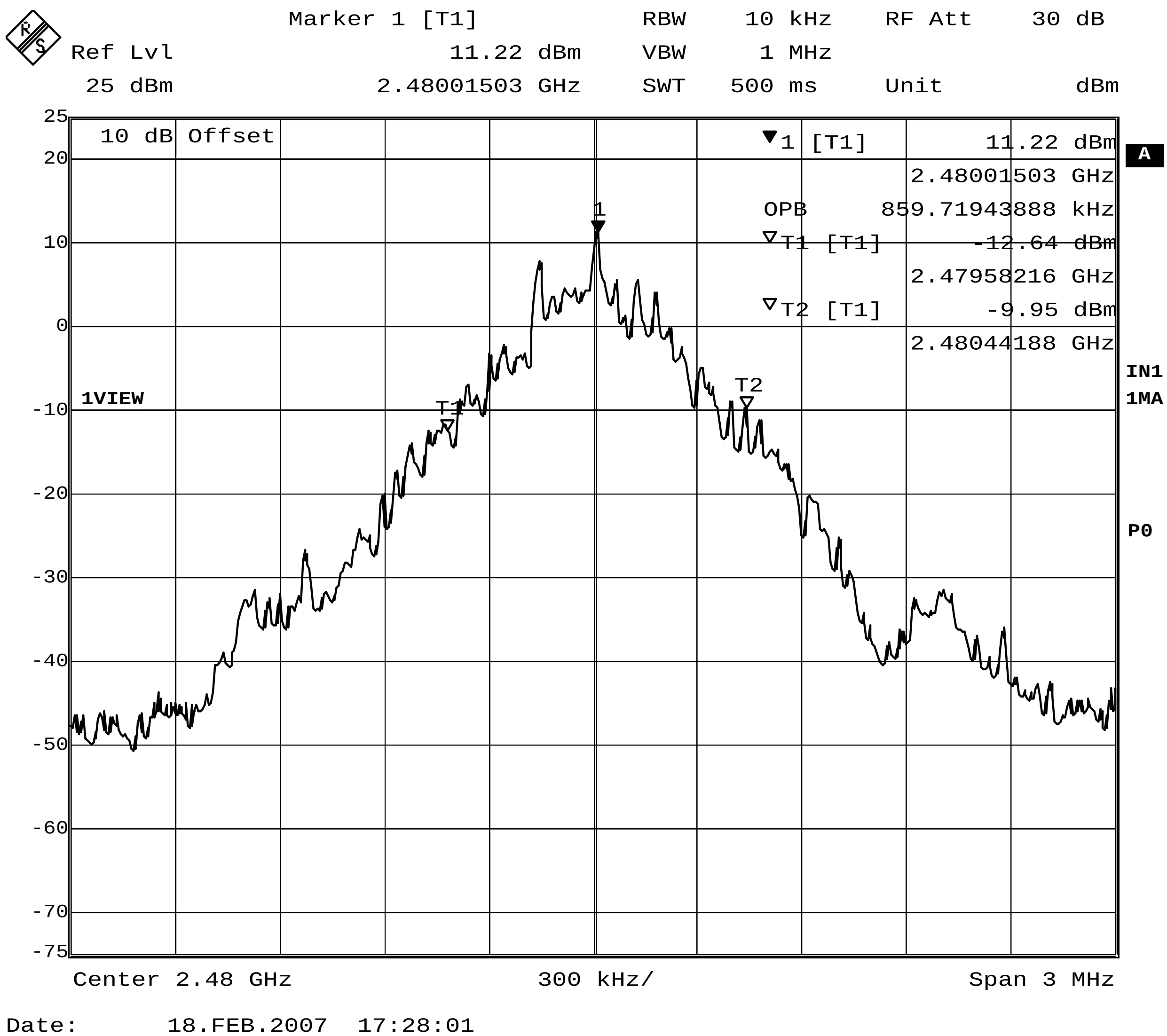


Figure 9 – High-band 99% Occupied Power Bandwidth

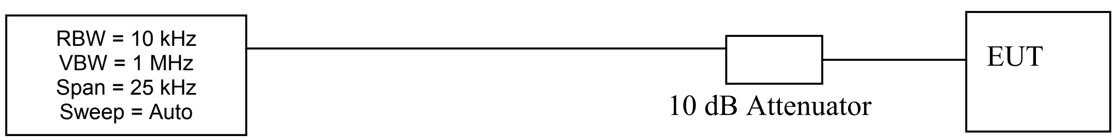
4.6 Peak Output Power FCC Part 15.247(b)(1)

For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels shall be: 1Watt (30dBm). The EUT was set to transmit an un-modulated carrier (CW), for maximum power measurement.

The peak output power was measured at low-band, mid-band, and at high-band. The measurement was made using a direct connection between the RF output of the EUT and the spectrum analyzer. The cable loss and the attenuator factors were added to the measurements. The spectrum analyzer's resolution bandwidth was greater than the 20dB bandwidth of the modulated carrier and the video bandwidth was equal to the resolution bandwidth.

The Conducted Peak Power was compared to the peak radiated power (see graphs in section 4.4) to calculate the gain of the antenna.

Conducted Test Setup:



Spectrum Analyzer

RF Output connection

4.6.1 Antenna Gain

The gain of the antenna and loss of the transmissions line will be included in the initial setup. This setup is performed by the manufacturer, and is not accessible to the end user of the device. For this test a 0dB gain antenna was assumed, however if an antenna has greater gain than 6dBi, then the output will be reduced as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6dBi.

4.6.1.1 Results as tested

Table 6 – Direct measured Carrier Power Results

Frequency MHz	Measured Power in dBm	Limit dBm (Watts)	Margin to Limit (dBm)
2402	14.87	30 (1)	**-15.13**
2441	13.80	30 (1)	**-16.20**
2480	12.98	30 (1)	**-17.02**

Table 7 – Radiated Carrier Power Results (internal antenna)

Frequency MHz	Radiated Power (dBm)	Minus Direct measured power (dBm)	Calculated Antenna Gain (dBi)
2402	11.82	14.87	-3.05

Table 8 – Radiated Carrier Power Results (patch - antenna)

Frequency MHz	Radiated Power (dBm)	Minus Direct measured power (dBm)	Calculated Antenna Gain (dBi)
2402	12.01	14.87	-2.86

Note: When the Patch antenna was evaluated, it had less loss than the built-in antenna. Although the patch antenna had a slightly lower loss than the internal antenna, both antennas exhibited less than unity gain. All subsequent radiated measurements will be made only with the patch-antenna.

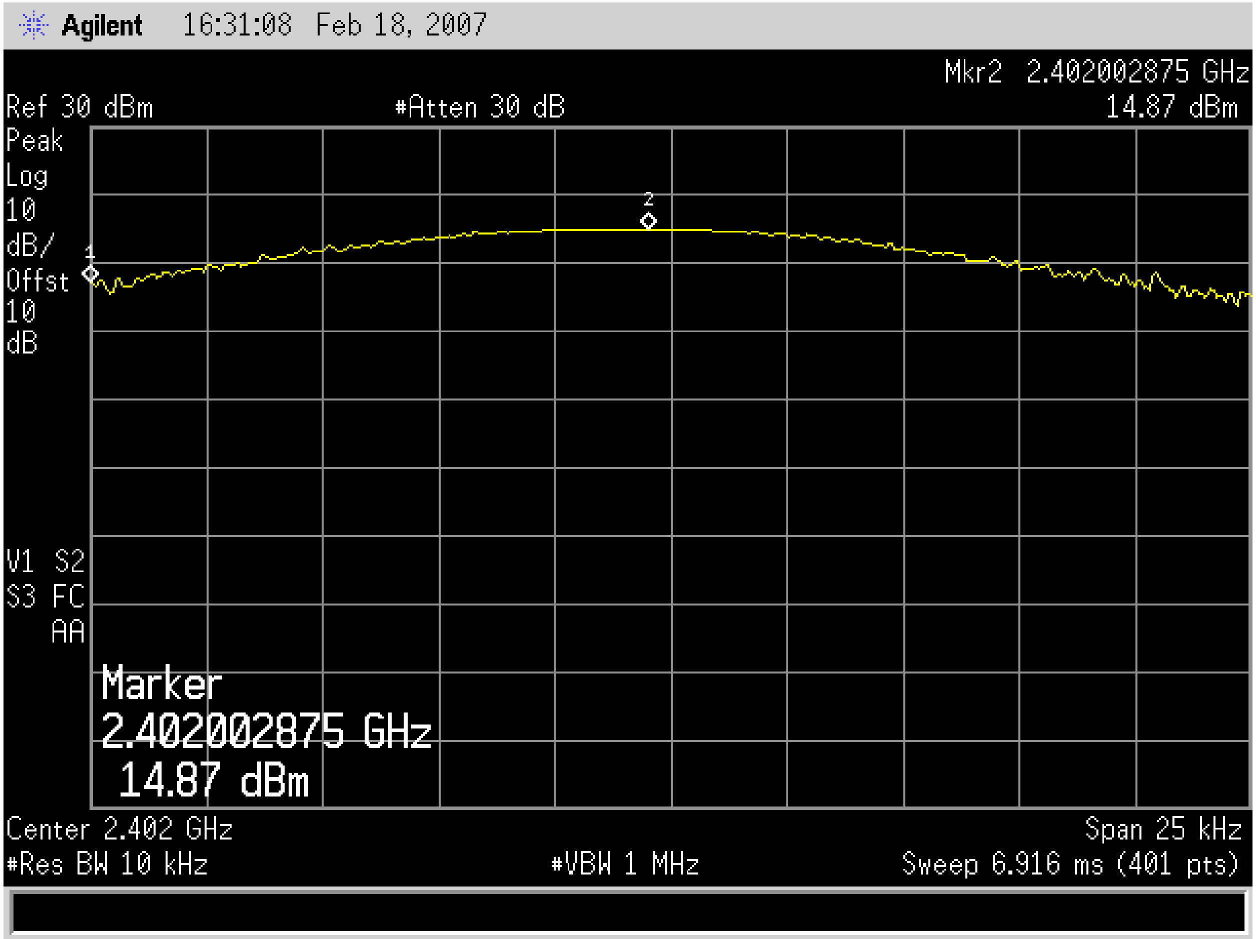


Figure 10 – Un-modulated Peak Power Output at low-band (worst case)

4.7 Maximum Permissible Exposure; FCC §15.247(b)(5), RSS-210 §14

4.7.1 Maximum Permissible Exposure Limits

The EUT shall be operated in a manner that ensures that the public is not exposed to radio frequency levels in excess of the FCC guidelines, per FCC §1.1307(b)(1).

For frequencies above 1500MHz, the Maximum Permissible Exposure (MPE) Limit for General Population / Uncontrolled exposure is S = 1 mW/cm^2 for no more than 30 minutes exposure from Table 1 of FCC §1.1310. The manufacturer specifies a separation distance of 20cm from the antenna.

4.7.2 Calculations for Maximum Permissible Exposure Levels

Given:

$$E = \sqrt{(30 * P)} / D, \quad E = \sqrt{(30 * 0.016)} / 0.2 \quad = 3.46 \text{ V/m}$$

And
$S = E^2 / 3770$ = 0.0032 mW/cm^2

Where:

E = calculated field strength in volts/meter
P = Maximum output power (adjusted to include antenna loss)
14.97dBm – 2.86dBi = 12.11dBm (0.016W)
D = 0.2m separation distance (recommended 20cm distance)
S = calculated power density limit in mW/cm^2

In the 2400 to 2483.5 MHz band:
S = Power Density Limit = 1. 0 mW/cm^2 (from Table 1 of FCC §1.1310).

1.1.1.1 Results

The calculated power density at 20cm is 0.0032 mW/cm^2.

Using the above equations, the EUT would have to be 3.6 cm distance to reach the 1 mW/cm^2 Exposure limit.

Table 9 – Power Density calculation results

Frequency	Maximum adjusted Output Power (Watts)	Power Density Limit (mW/cm^2)	Power Density in mW/cm^2 at 20cm	Margin to Limit (mW/cm^2)	Distance required for 1 mW/cm^2 limit (cm)
2402 MHz	0.016	1.0	**0.0032**	-0.9968	**3.6**

4.8 Band-Edge Measurement FCC §15.247(d), RSS-210 §6.2.2(o)(e1)

4.8.1 Test Procedure

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrated compliance with the peak conducted power limits. In addition, radiated emissions which fall in the restricted bands, as defined in part 15.205(a), must also comply with the radiated emission limits specified in part 15.209(a).

The radiated measurement was used for the High band-edge measurement because of the proximity to the restricted band starting at 2483.5.

Since the nearest restricted band-edge to 2402MHz is at 2390MHz (10MHz below the 2400-2483.5MHz band), the requirements of part 15.205 does not apply for the low frequency, and the conducted measurement was used.

Spectrum Analyzer EUT

Measurement Test set up for radiated measurement

Table 10 – Band-Edge Results

Center Frequency (MHz)	Restricted Band Edge Frequency (MHz)	-20dB Frequency (MHz)	Amplitude at Band edge (dBµV)	Restricted band edge limit (dBµV)	band edge frequency (MHz)	-20dB Margin (MHz)	Margin (dB)
2402	2390.00	2401.64	N/A	N/A	2400	**1.655**	**N/A**
2480	2483.5	2480.345	25.13 pk	54	2483.5	**-3.155**	**-28.87**

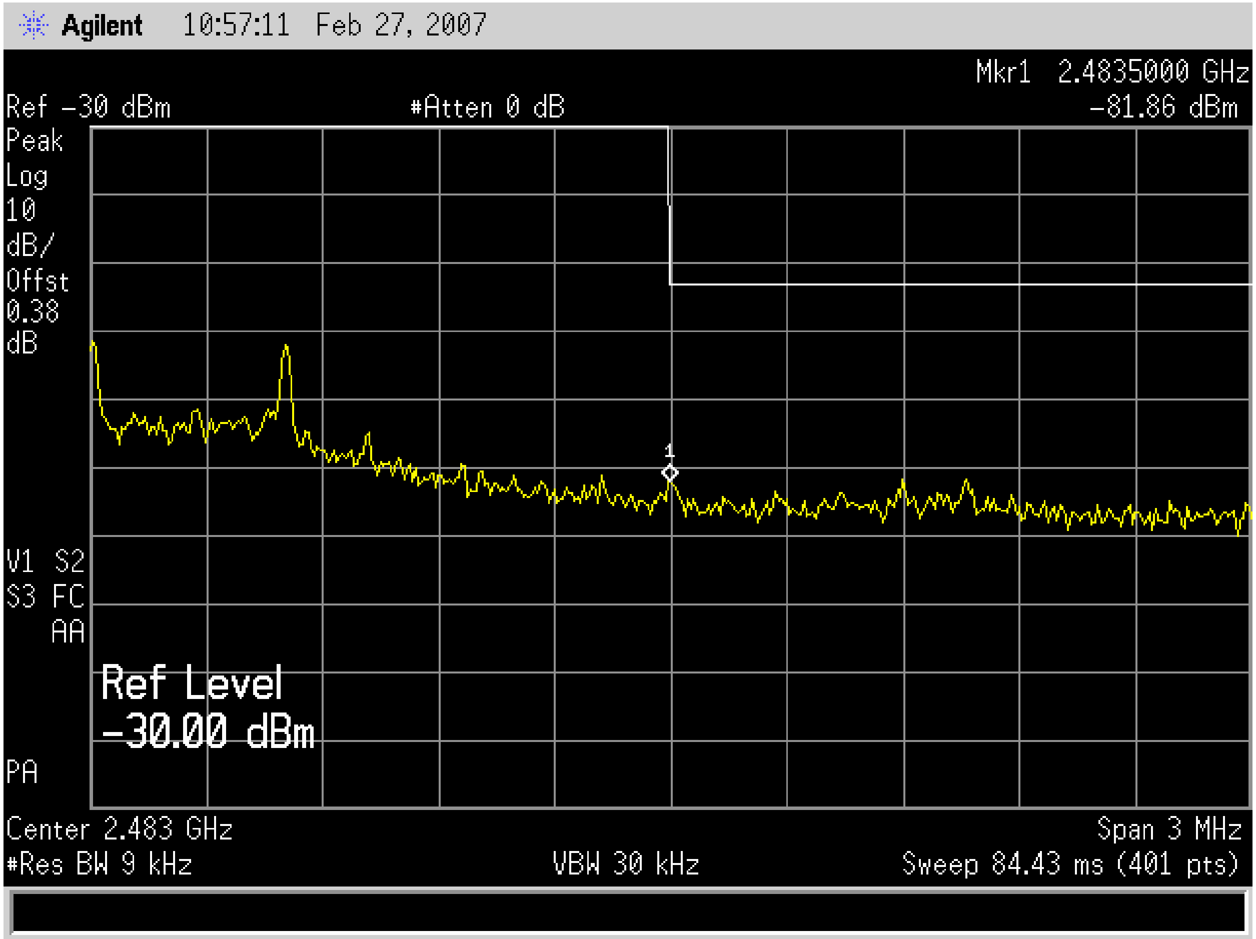


Figure 11 – Radiated Emissions (w/ correction factors) at high band edge.

Note: -81.86 dBm = 25.13 dBµV

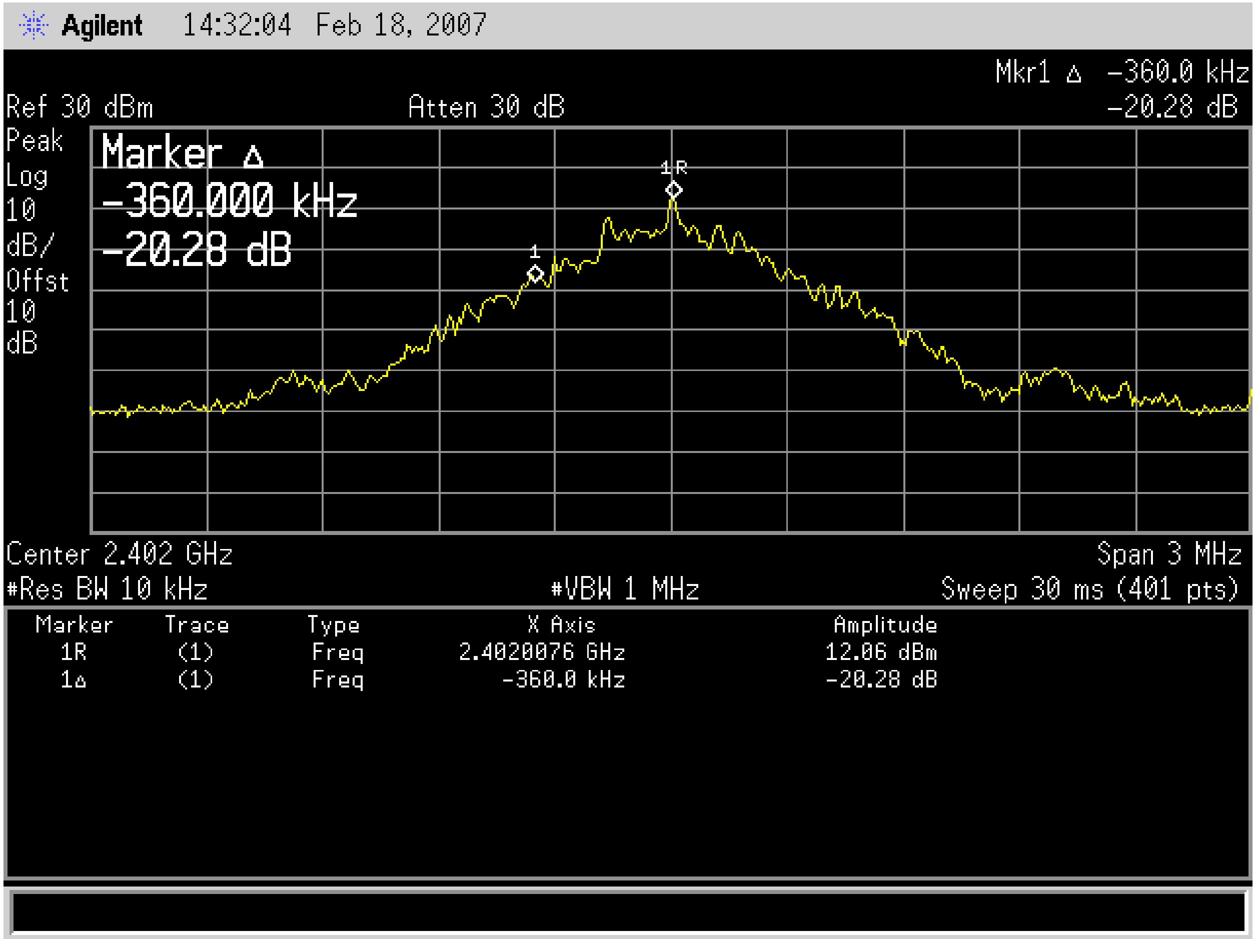


Figure 12 – 20dB down – low-band edge frequency (2402.000MHz - .360MHz = 2401.64 MHz).

4.9 Spurious Emissions; FCC §15.247(c), RSS-210 §6.2.2(q1)

4.9.1 Test Procedure

4.9.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 300 kHz and provide a reading at each frequency for each 6° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarization's.

Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

4.9.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation.

Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs. The range of the test was from 30MHz to 10GHz to include the 10^{th} harmonic of the fundamental frequency.

The Quasi-Peak (QP) detector was used for frequencies at or less than 1000 MHz. Above 1000 MHz, the Average (Av) detector was used, and per part 15.35(b), the Peak limit is 20dB above the average limit.

4.9.1.3 Deviations

There were no deviations from this test methodology.

4.9.2 Test Results

All harmonic emissions are more than 20dB below the fundamental frequencies. All emissions including emissions in all restricted bands, other than the fundamental frequencies and their harmonics, are below the 15.209 limits. As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.9.2.1 Radiated Emissions outside the Frequency Band

In any 100kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of desired power, based on radiated measurements.

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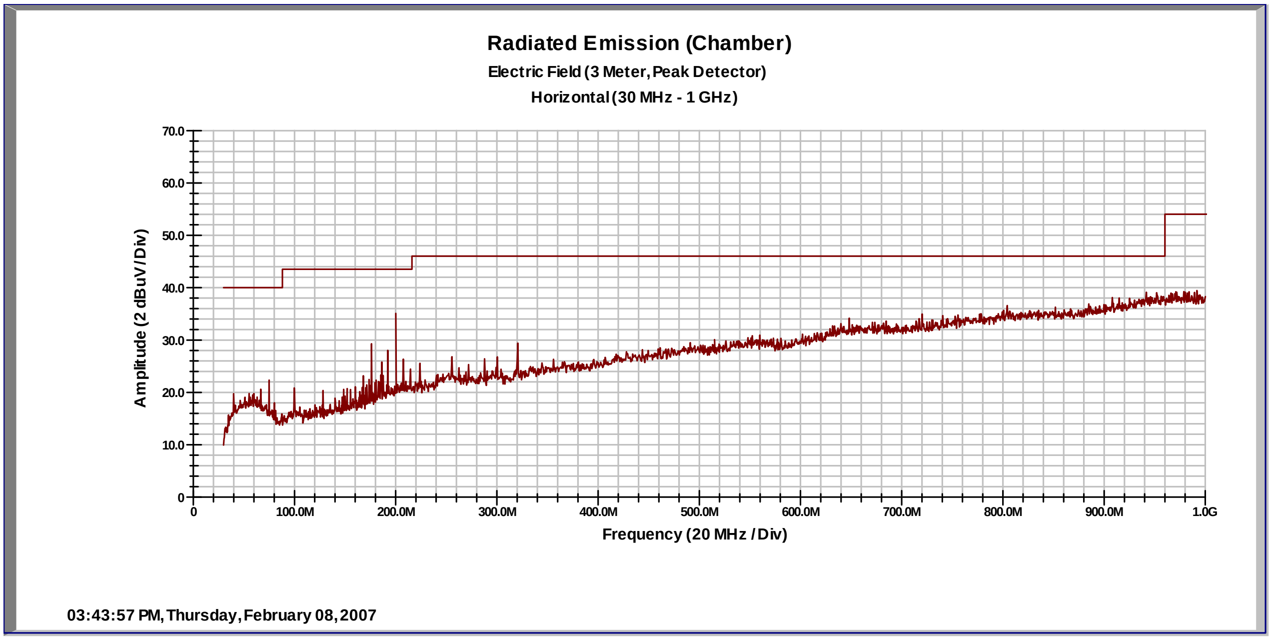
EUT Name	Remote Unit	**Date**	22 May 2006
EUT Model	PWR-08-03	**Temp / Hum in**	N/A
EUT Serial	Not Serialized	**Temp / Hum out**	74ºF
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	38%rh
Deg/sweep	12	**RBW / VBW**	120kHz / 300kHz
Dist/Ant Used	3m / 3142_1007	**Performed by**	Mark Ryan
Configuration	Mid-band (2441 MHz) channel transmit, worst case w/ internal antenna.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	QP FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
208.00	H	1.2	112	19.55	0.00	2.04	10.56	32.15	43.50	-11.35
320.80	H	1.4	141	10.27	0.00	2.55	13.53	26.35	46.00	-19.65

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All peak emissions were below the limits of part 15.209.

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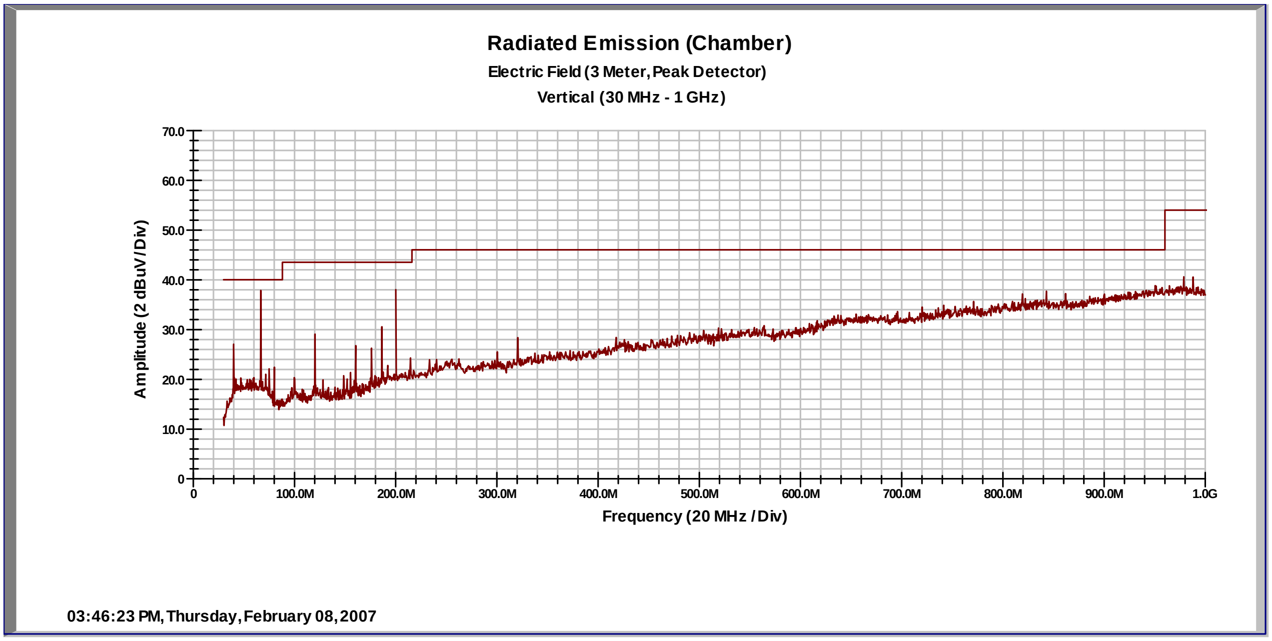
EUT Name	Remote Unit	**Date**	08 February 2007
EUT Model	PWR-08-03	**Temp / Hum in**	32º C / 23% rh
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	Battery Operated
Deg/sweep	12	**RBW / VBW**	120kHz / 300kHz
Dist/Ant Used	3m / 3142_1007	**Performed by**	Mark Ryan
Configuration	Mid-band (2441 MHz) channel transmit, worst case w/ Internal Antenna.		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	QP FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
66.84	V	1	242	28.15	0.00	1.12	8.73	38.00	40.00	-2.00
89.08	V	1	151	33.44	0.00	1.29	6.57	41.30	43.50	-2.20
120.28	V	1	215	18.20	0.00	1.53	7.51	27.23	43.50	-16.27
200.48	V	1	16	8.80	0.00	1.99	10.30	21.09	43.50	-22.41
320.00	V	1.5	147	4.34	0.00	2.55	14.60	21.49	46.00	-24.51

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: The large peak is the output of the transmitter.

All peak emissions were below the limits of part 15.209.

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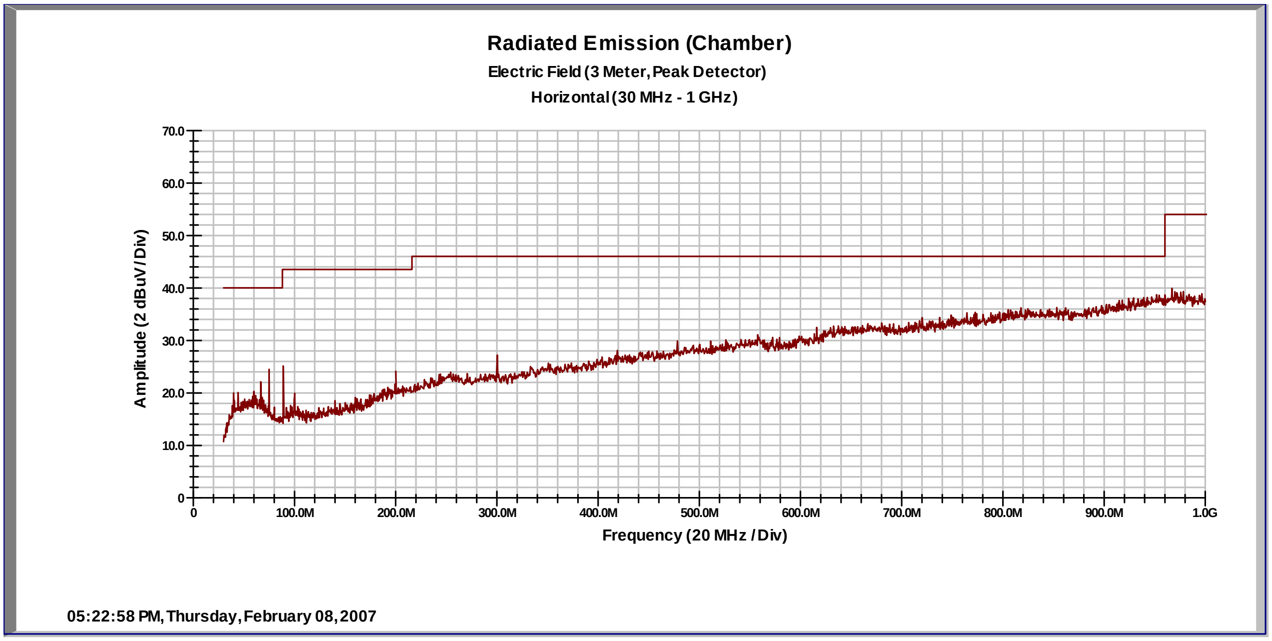
EUT Name	Remote Unit	**Date**	22 May 2006
EUT Model	PWR-08-03	**Temp / Hum in**	N/A
EUT Serial	Not Serialized	**Temp / Hum out**	74ºF
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	38%rh
Deg/sweep	12	**RBW / VBW**	120kHz / 300kHz
Dist/Ant Used	3m / 3142_1007	**Performed by**	Mark Ryan
Configuration	Patch-Antenna; Mid-band (2441 MHz) channel transmit, worst orientation		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	QP FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
208.00	H	1.2	112	13.00	0.00	2.04	10.56	25.60	43.50	-17.90
320.80	H	1.4	141	2.10	0.00	2.55	13.53	18.18	46.00	-27.82

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All peak emissions were below the limits of part 15.209.

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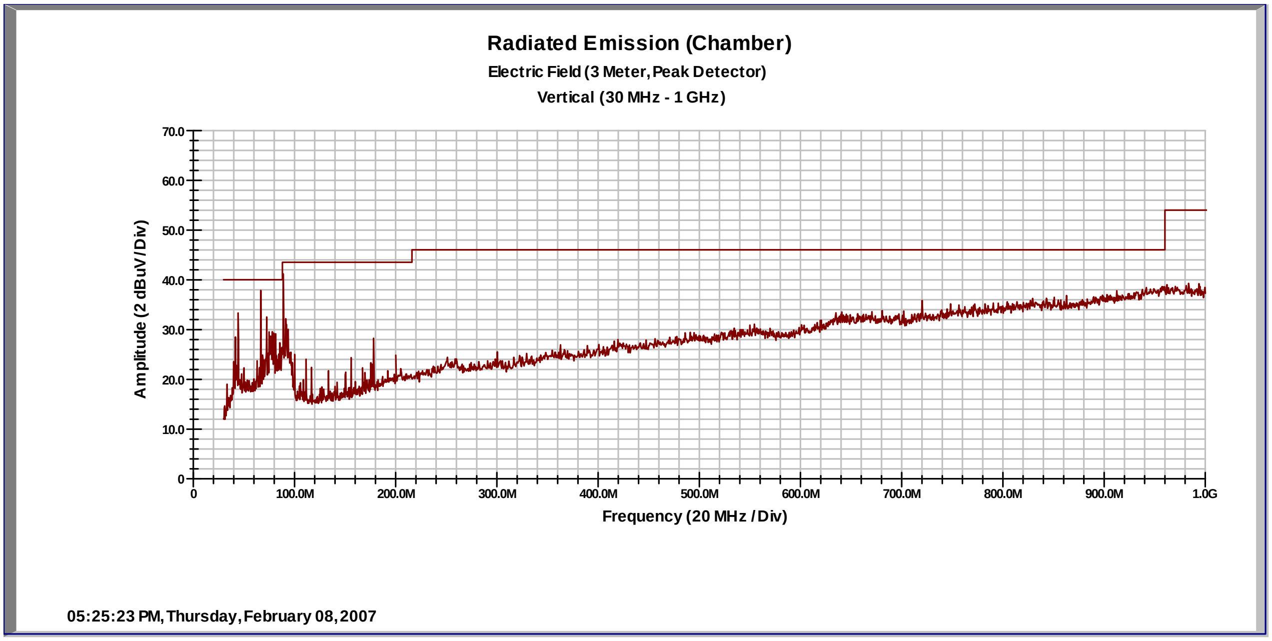
EUT Name	Remote Unit	**Date**	08 February 2007
EUT Model	PWR-08-03	**Temp / Hum in**	32º C / 23% rh
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	Battery Operated
Deg/sweep	12	**RBW / VBW**	120kHz / 300kHz
Dist/Ant Used	3m / 3142_1007	**Performed by**	Mark Ryan
Configuration	Patch-Antenna; Mid-band (2441 MHz) channel transmit, worst orientation		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	QP FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
44.60	V	1	229	20.01	0.00	0.90	9.06	29.97	40.00	-10.03
66.84	V	1	197	27.21	0.00	1.12	8.73	37.06	40.00	-2.94
91.56	V	1	246	17.76	0.00	1.32	6.62	25.71	43.50	-17.79

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: All peak emissions were below the limits of part 15.209.

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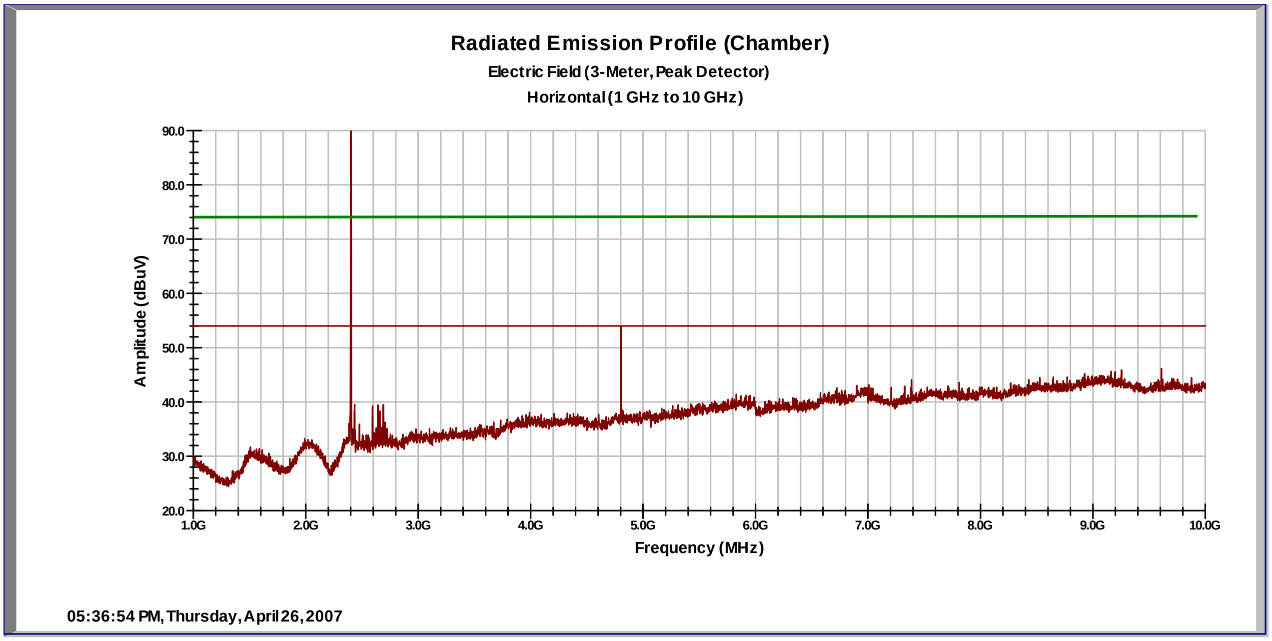
EUT Name	Remote Unit	**Date**	26 April 2007
EUT Model	PWR-08-03	**Temp / Hum in**	22°C / 40%rh
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	Battery Operated
Deg/sweep	6	**RBW / VBW**	1MHz / 3MHz
Dist/Ant Used	3m / 3115_2236	**Performed by**	Mark Ryan
Configuration	Single channel transmit, modulated Low band (2402 GHz) w/ internal antenna (worst case)		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: The red limit line is for the frequencies that lie within restricted band(s) using the average detector, the green line is using the peak detector.

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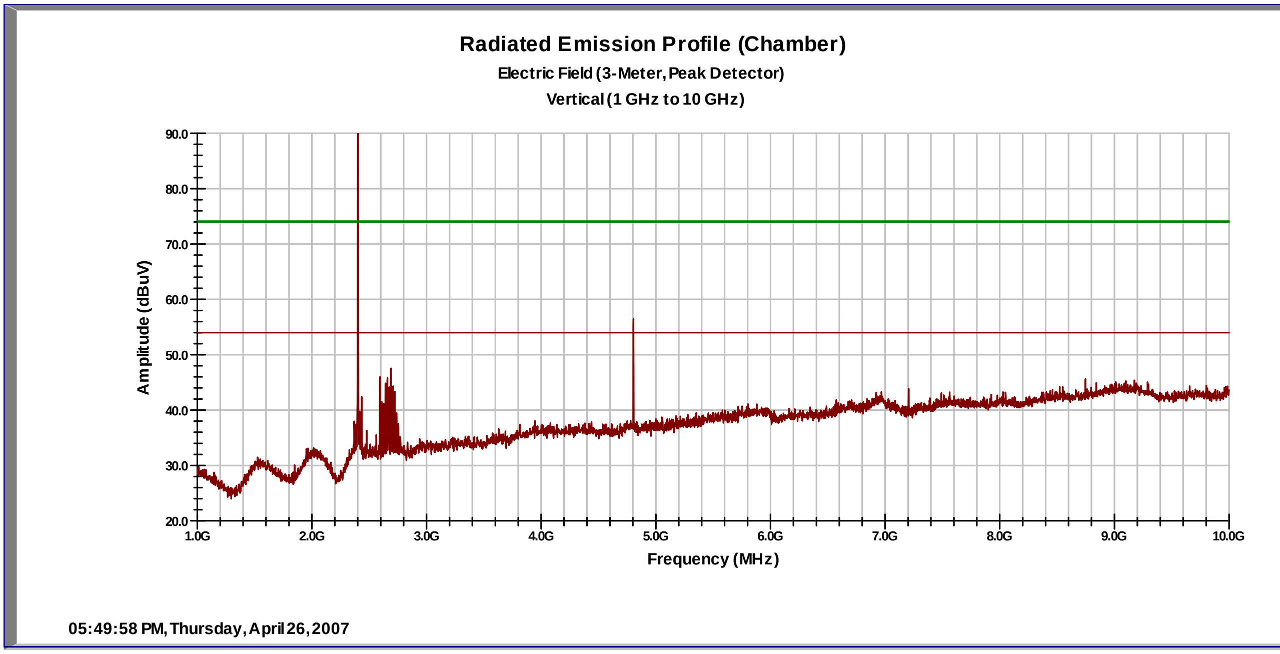
EUT Name	Remote Unit	**Date**	26 April 2007
EUT Model	PWR-08-03	**Temp / Hum in**	22°C / 40%rh
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	Battery Operated
Deg/sweep	6	**RBW / VBW**	1MHz / 3MHz
Dist/Ant Used	3m / 3115_2236	**Performed by**	Mark Ryan
Configuration	Single channel transmit, modulated Low band (2402 GHz) w/ internal antenna (worst case)		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
4804.00	V	1.2	213	27.56	35.18	10.10	33.15	35.63	54.00	-18.37
4804.00	V	1.2	213	50.00	35.18	10.10	33.15	58.07	74.00	-15.93

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Harmonic emissions. Green – Average, Blue – peak

The peak value was 12.01dBm = 119.4 dBμV, the limits of harmonics is 20dB below peak of fundamental (119 – 20 = 99.4 dBuV)

The red limit line is for the frequencies that lie within restricted band(s) using the average detector; the green line is using the peak detector. The 2nd harmonic at 4804MHz is inside a restricted band.

All other emissions outside the band (spurious) were indistinguishable from the noise floor.

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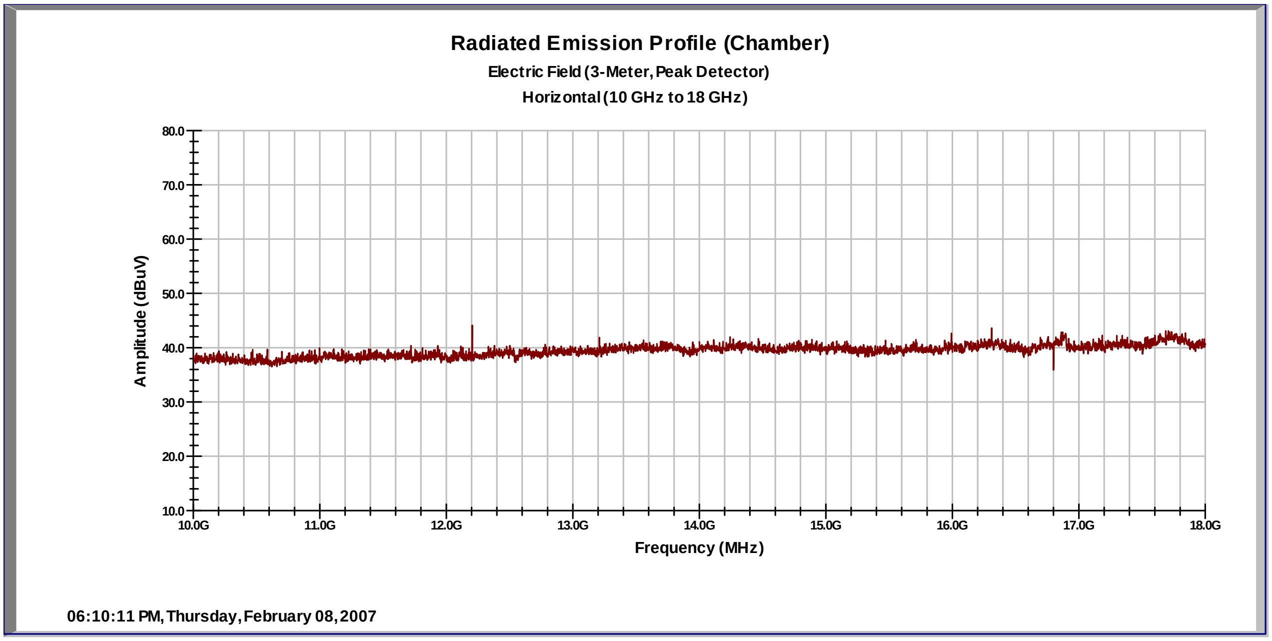
EUT Name	Remote Unit	**Date**	06 February 2007
EUT Model	PWR-08-03	**Temp / Hum in**	22°C / 23%rh
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	Battery Operated
Deg/sweep	6	**RBW / VBW**	1MHz / 3MHz
Dist/Ant Used	3m / 3115_2236	**Performed by**	Mark Ryan
Configuration	Single channel transmit, modulated		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Any emission is indistinguishable from the receiver noise floor.

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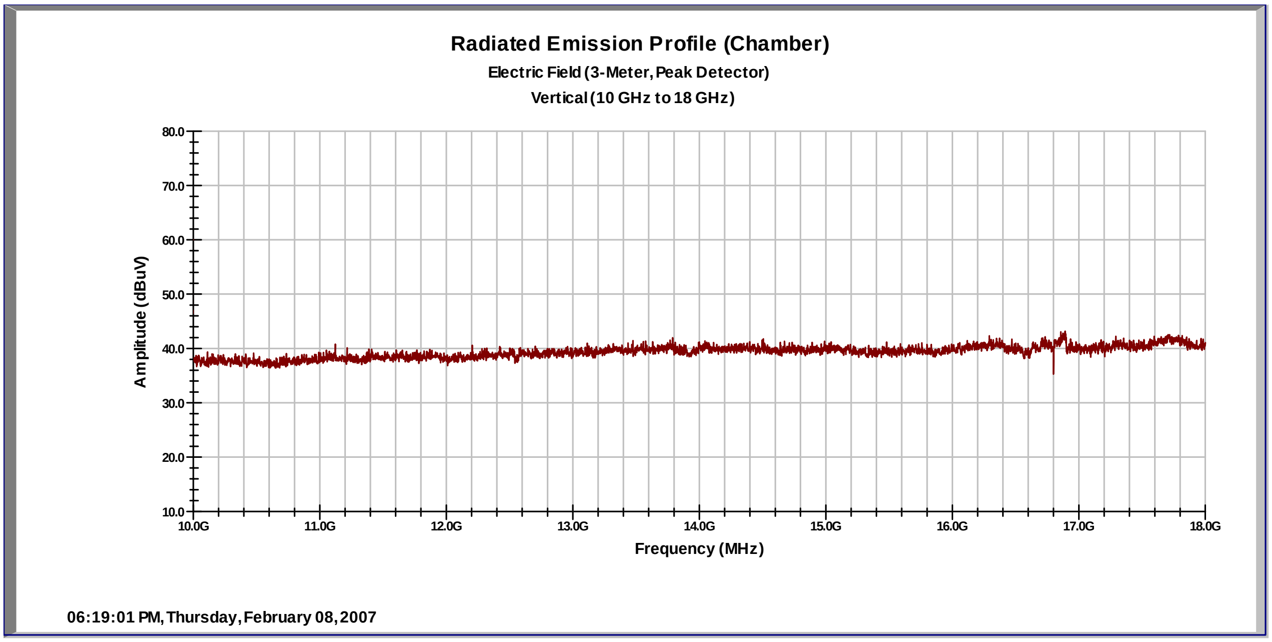
EUT Name	Remote Unit	**Date**	06 February 2007
EUT Model	PWR-08-03	**Temp / Hum in**	22°C / 23%rh
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	Battery Operated
Deg/sweep	6	**RBW / VBW**	1MHz / 3MHz
Dist/Ant Used	3m / 3115_2236	**Performed by**	Mark Ryan
Configuration	Single channel transmit, modulated		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Any emission is indistinguishable from the receiver noise floor.

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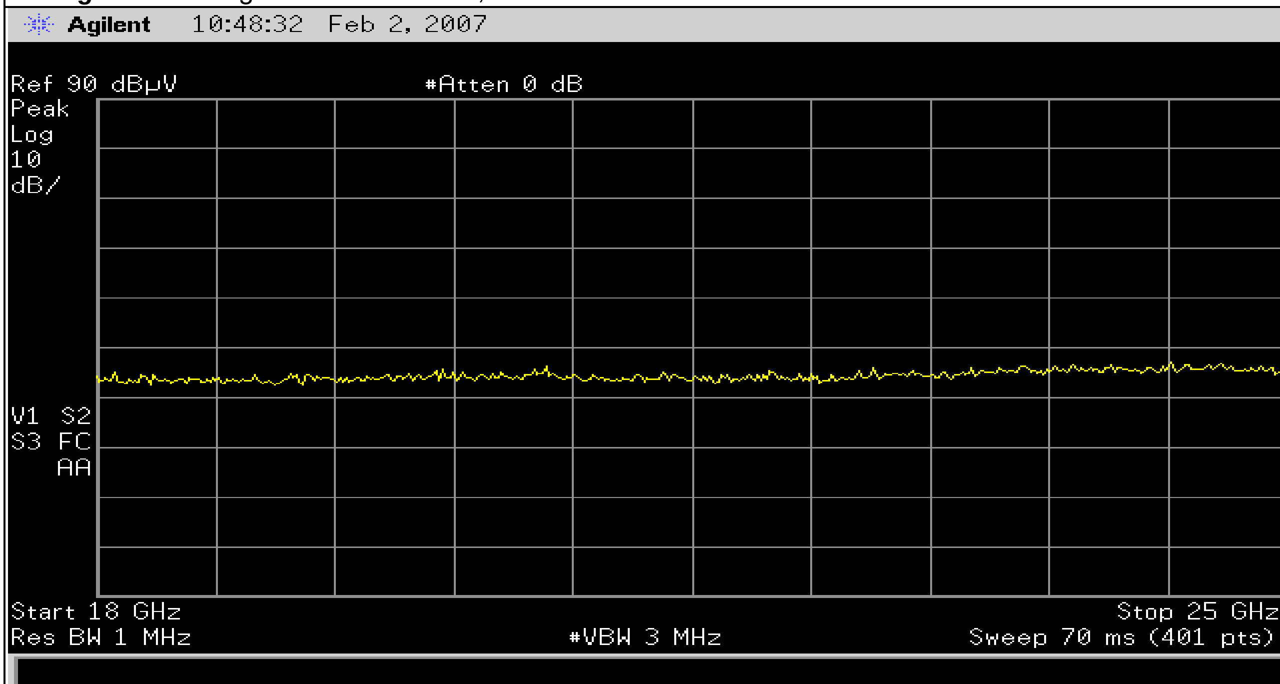
EUT Name	Remote Unit	**Date**	08 February 2007
EUT Model	PWR-08-03	**Temp / Hum in**	32º C / 23% rh
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	Battery Operated
Deg/sweep	6	**RBW / VBW**	1MHz / 3MHz
Dist/Ant Used	1m / 42-442-6/CAL	**Performed by**	Mark Ryan
Configuration	Single channel transmit, modulated		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Any emission is indistinguishable from the receiver noise floor.

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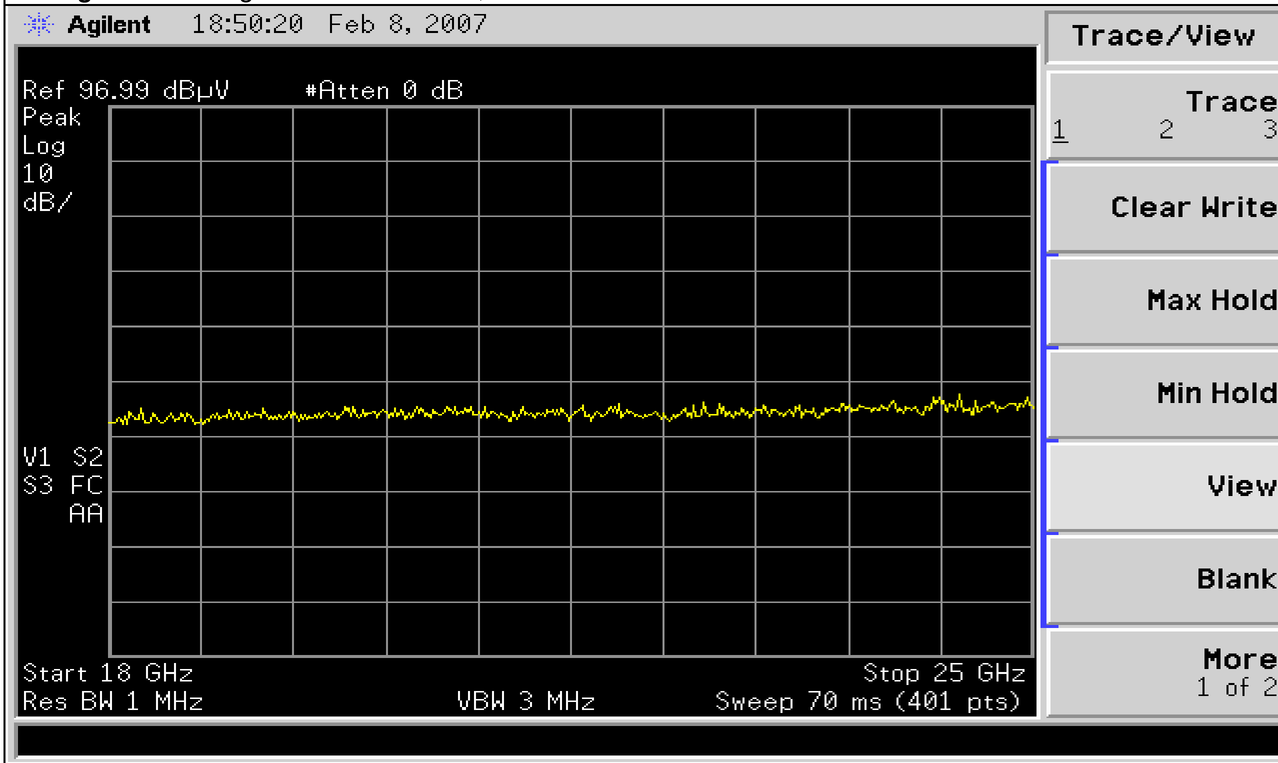
EUT Name	Remote Unit	**Date**	08 February 2007
EUT Model	PWR-08-03	**Temp / Hum in**	32º C / 23% rh
EUT Serial	Not Serialized	**Temp / Hum out**	N/A
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	Battery Operated
Deg/sweep	6	**RBW / VBW**	1MHz / 3MHz
Dist/Ant Used	1m / 42-442-6/CAL	**Performed by**	Mark Ryan
Configuration	Single channel transmit, modulated		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: Any emission is indistinguishable from the receiver noise floor.

4.10 Frequency Hopping Spread Spectrum Systems FCC Part 15.247(g)

Frequency hopping spread spectrum systems are not required to employ all available hopping channels during each transmission. However, the system, consisting of both the transmitter and the receiver, must be designed to comply with all of the regulations in this section should the transmitter be presented with a continuous data (or information) stream. In addition, a system employing short transmission bur4sts must comply with the definition of a frequency hopping system and must distribute its transmissions over the minimum number of hopping channels specified in this section.

When the EUT is presented with a continuous data stream, each packet transmitted by the device will be sent on the next channel in the pseudo-random list. When a continuous data stream is presented, the EUT adheres to the 0.4 second dwell time limit for each 20 second window requirement. The EUT is programmed using a pseudo-random shuffle mode that will, utilize all the channels equally. The entire frequency channel list is shuffled using a pseudo-random number generator. The frequencies in the shuffled list are then used in sequence; when the last frequency has been used, the list is reshuffled. No frequency is ever repeated until the entire list has been used.

In compliance with FCC Part 15 regulations, the reader never stays on one frequency for more than 400 ms. There are several mechanisms at work to enforce the 400 ms cutoff. First, as the reader performs tag inventories, from time to time it will check to see how much time is remaining from the 400 ms allotment for a given frequency. If there is less than 100 ms remaining, the reader will hop to the next frequency. Second, in some cases, if more than one antenna is in use, the reader will change frequencies when an antenna change is performed; these antenna changes typically occur many times within any 400 ms time period. Finally, a hardware timer in the reader is dedicated to tracking the 400ms dwell time. Should a frequency continue to be used for 400 ms, because none of the above conditions caused it to be changed, the timer will force a frequency change at the 400 ms mark.

For more information, refer to section 6 of this report.

4.11 Incorporation of Intelligence FCC Part 15.247(h)

The incorporation of intelligence within a frequency hopping spread spectrum system that permits the system to recognize other users within the spectrum band so that it individually and independently chooses and adapts its hop-sets to avoid hopping on occupied channels is permitted. The coordination of frequency hopping systems in any other manner for the express purpose of avoiding the simultaneous occupancy of individual hopping frequencies by multiple transmitters is not permitted.

The EUT does not attempt to recognize other users or interferers within this spectrum band.

4.12 Frequency Stability FCC Part 15.215(c)

The requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage.

4.12.1 Containment of the Emission during Variations in Temperature

The EUT was placed in an environmental temperature test chamber, supplied with the normal DC voltage by means of an external variable power supply, and a spectrum analyzer with attenuator was attached to the output port.

The temperature inside the chamber is then raised to the highest temperature specified and allowed sufficient time for the temperature of the chamber to stabilize. While maintaining a constant temperature inside the environmental chamber, the carrier signal was then measured 40 min after temperature stabilization. Then the above process is repeated for the lowest temperature specified and 10 degree Centigrade increments between the extremes thereafter.

4.12.1.1 Results

The EUT is intended to be used in a temperature controlled indoor environment such as a hospital or Doctor's office. The EUT was placed in a temperature chamber that was increased in 10º steps from the extremes of equipment operation (0ºC to +30ºC). Only minor changes in frequencies were observed during this test.

The equipment complied with the specification.

Table 11 – Temperature Stability

Temperature ˚ C	Low channel frequency (2402MHz)		High channel frequency (2480MHz)		Results
	-20dB freq.	ΔBE (MHz)	-20dB freq.	ΔBE (MHz)	
0	2401.643125	**1.643125**	2480.397875	3.102125	**Pass**
10	2401.637175	**1.63715**	2480.3915	3.1085	**Pass**
20	2401.632	**1.632**	2480.390125	3.109875	**Pass**
30	2401.62375	**1.62375**	2480.378875	3.121125	**Pass**

Note: Low Band Edge (BE) = 2400MHz, High BE =2483.5MHz

Spectrum Analyzer Parameters:

RBW=10kHz
VBW=30kHz
Span=50kHz
LOG dB/div.= 10dB
Sweep = Auto

4.12.2 Containment of the Emission during Variations in Voltage

The setup was identical section 4.10.1. The variation in voltage tests were made simultaneously with the variations in temperature tests. A reference was taken at the nominal voltage, and then the Voltage was varied from 85% to 115% of the nominal voltage.

The EUT is normally battery operated, but due to long transmits times required for testing, a DC power supply was used in place of the battery. Therefore the tables below will simulate a fresh battery and a discharged battery.

4.12.2.1 Results

The DC supply voltage was varied between 85% and 115% of the nominal rated supply voltage. No change in fundamental frequency was observed during the variation. The equipment was found to be compliant.

Table 12 – Voltage Stability w/ varible power supply

Voltage	Low channel frequency (2402MHz)		High channel frequency (2480MHz)		Results
	-20dB freq.	∆BE (MHz)	-20dB freq.	∆BE (MHz)	
5.1	2401.6175	1.6175	2480.3895	3.1105	**Pass**
6.0	2401.6476	1.6475	2480.3825	3.1175	**Pass**
6.9	2401.6776	1.6775	2480.3525	3.1475	**Pass**

Note: Low Band Edge (BE) = 2400MHz, High BE =2483.5MHz

Spectrum Analyzer Parameters:

RBW=10kHz
VBW=30kHz
Span=50kHz
LOG dB/div.= 10dB
Sweep = Auto

4.13 Radiated Emissions when not transmitting FCC Part 15.109(a)

Testing was performed in accordance with FCC part 15.109(a). These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.13.1 Test Methodology

4.13.1.1 Preliminary Test

A test program that controls instrumentation and data logging was used to automate the preliminary RF emission test procedure. The frequency range of interest was divided into sub-ranges to yield a frequency resolution of approximately 300 kHz and provide a reading at each frequency for no more than 12° of turntable rotation. For each frequency sub-range the turntable was rotated 360° while peak emission data was recorded and plotted over the frequency range of interest in horizontal and vertical antenna polarizations. Preliminary emission profile testing was performed inside the anechoic chamber. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the floor. The EUT was positioned as shown in the setup photographs. The receiving antenna was placed at a distance of 3m at a fixed height of 1m. Measurement equipment was located outside of the chamber. A video camera was placed inside the chamber to view the EUT.

4.13.1.2 Final Test

For each frequency measured, the peak emission was maximized by manipulating the receiving antenna from 1 to 4 meters above the ground plane and placing it at the position that produced the maximum signal strength reading. The turntable was then rotated through 360° while observing the peak signal and placing the EUT at the position that produced maximum radiation. The six highest emissions relative to the limit were measured unless such emissions were more than 20 dB below the limit. If less than six emissions are within 20 dB of the limit, than the noise level of the receiver is measured at frequencies where emissions are expected. Multiples of all oscillator and microprocessor frequencies were also checked. Final testing was performed on an NSA compliant test site. The EUT was placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane. The placement of EUT and cables were the same as for preliminary testing and is shown in the setup photographs.

4.13.1.3 Deviations

There were no deviations from this test methodology.

4.13.2 Test Results

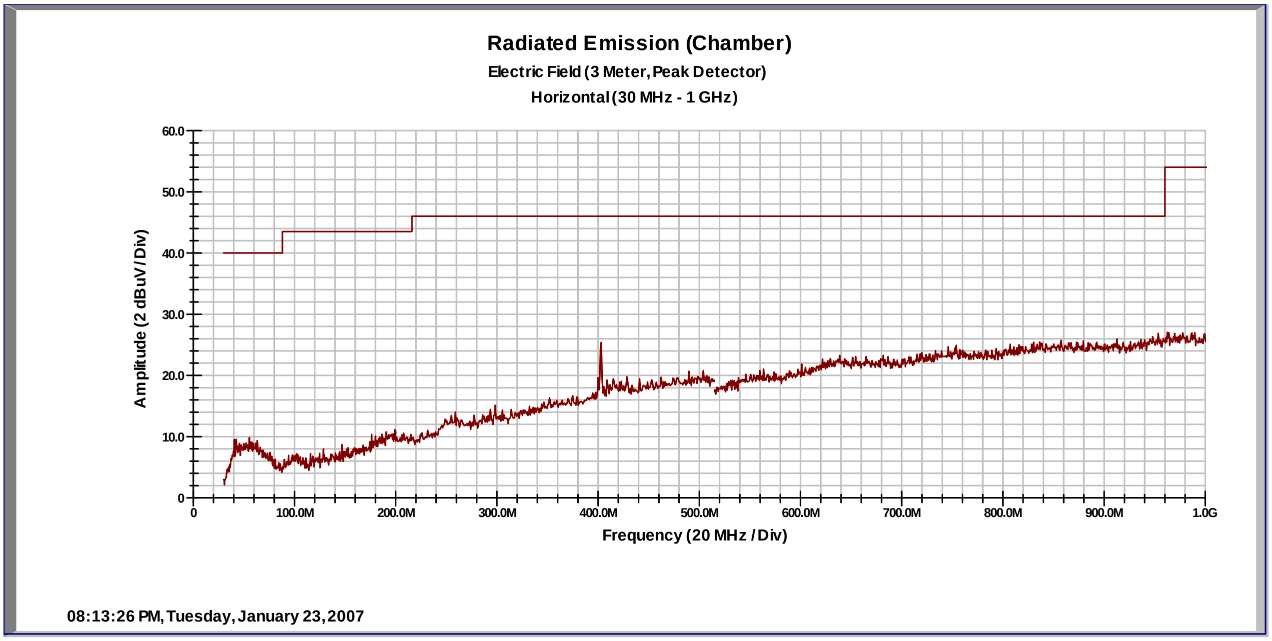
Section 4.13.2.1 lists the final measurement data under the worst case operating modes, configurations, and/or cable positions. As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.13.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

SOP 1 Radiated Emissions   Tracking # 30683466.011 Page 1 of 4

EUT Name	Remote Unit	**Date**	23 January 2007
EUT Model	PWR-08-03	**Temp / Hum in**	N/A
EUT Serial	Not Serialized	**Temp / Hum out**	20 ºC
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	27 %rh
Deg/sweep	12	**RBW / VBW**	120kHz / 300kHz
Dist/Ant Used	3m / 6140	**Performed by**	Mark Ryan
Configuration	Not Transmitting		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	QP FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
403.10	H	1.2	275	5.40	0.00	2.25	15.44	23.09	46.00	-22.91

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

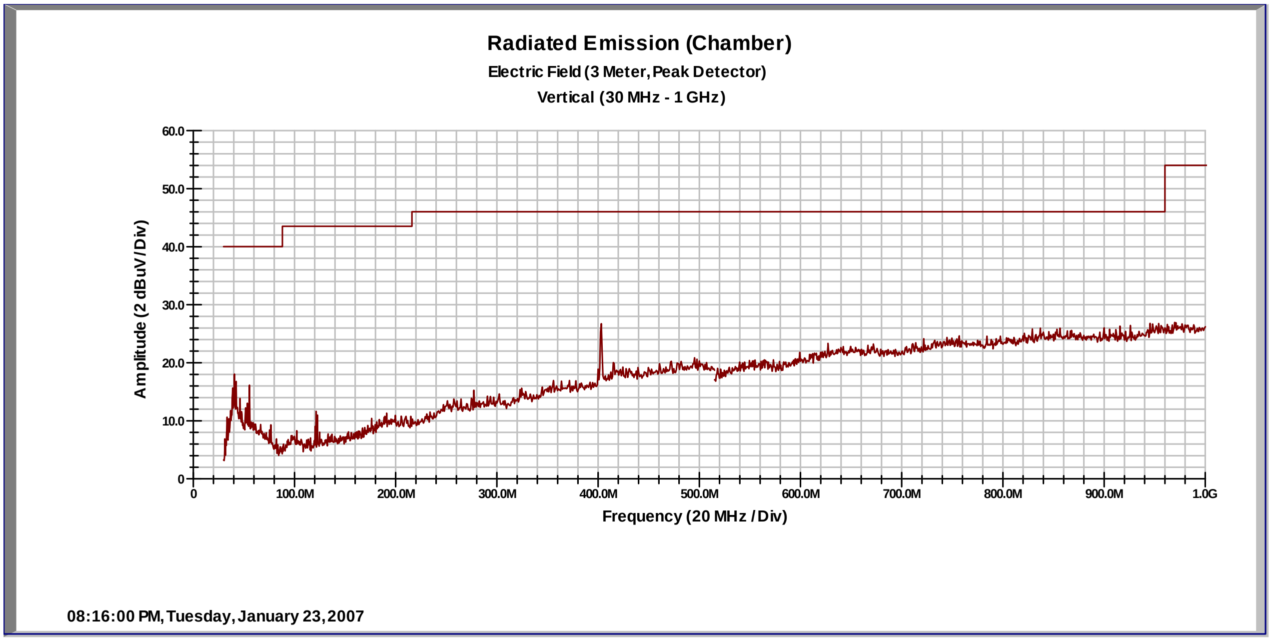
Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB   Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 1 Radiated Emissions

Tracking # 30683466.011 Page 2 of 4

EUT Name	Remote Unit	**Date**	23 January 2007
EUT Model	PWR-08-03	**Temp / Hum in**	N/A
EUT Serial	Not Serialized	**Temp / Hum out**	20 ºC
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	27 %rh
Deg/sweep	12	**RBW / VBW**	120kHz / 300kHz
Dist/Ant Used	3m / 6140	**Performed by**	Mark Ryan
Configuration	Not Transmitting		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	QP FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
40.57	V	1	254	8.47	0.00	0.69	8.66	17.82	40.00	-22.18
55.30	V	1	186	5.25	0.00	0.81	9.02	15.08	40.00	-24.92
121.10	V	1.2	17	2.35	0.00	1.19	7.52	11.07	43.50	-32.43
403.10	V	1.6	92	5.50	0.00	2.25	15.48	23.23	46.00	-22.77
756.60	V	1.8	12	1.20	0.00	3.11	21.07	25.38	46.00	-20.62
979.37	V	1.5	0	1.21	0.00	3.54	23.99	28.74	54.00	-25.26

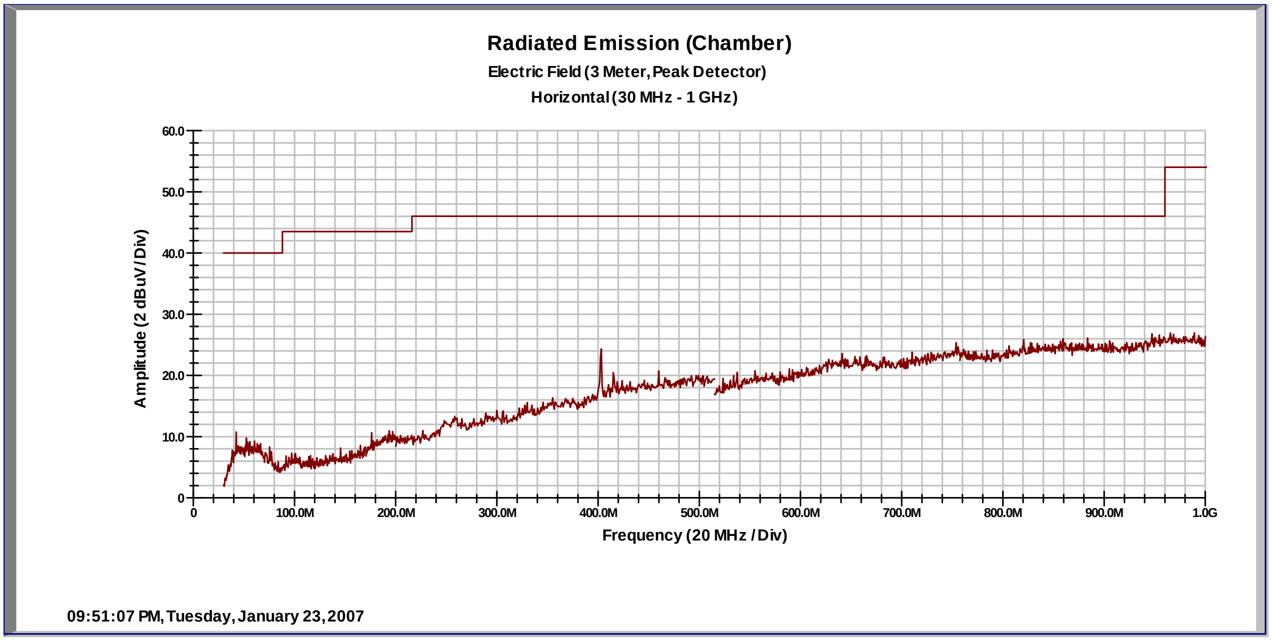
Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: The emission shown in RED is the worst case emission.

SOP 1 Radiated Emissions — Tracking # 30683466.011 Page 3 of 4

EUT Name	Remote Unit	**Date**	23 January 2007
EUT Model	PWR-08-03	**Temp / Hum in**	N/A
EUT Serial	Not Serialized	**Temp / Hum out**	20 ºC
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	27 %rh
Deg/sweep	12	**RBW / VBW**	120kHz / 300kHz
Dist/Ant Used	3m / 6140	**Performed by**	Mark Ryan
Configuration	Not Transmitting w/ Patch Antenna		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	QP FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
403.10	H	1.2	275	5.51	0.00	2.25	15.44	23.20	46.00	-22.80

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

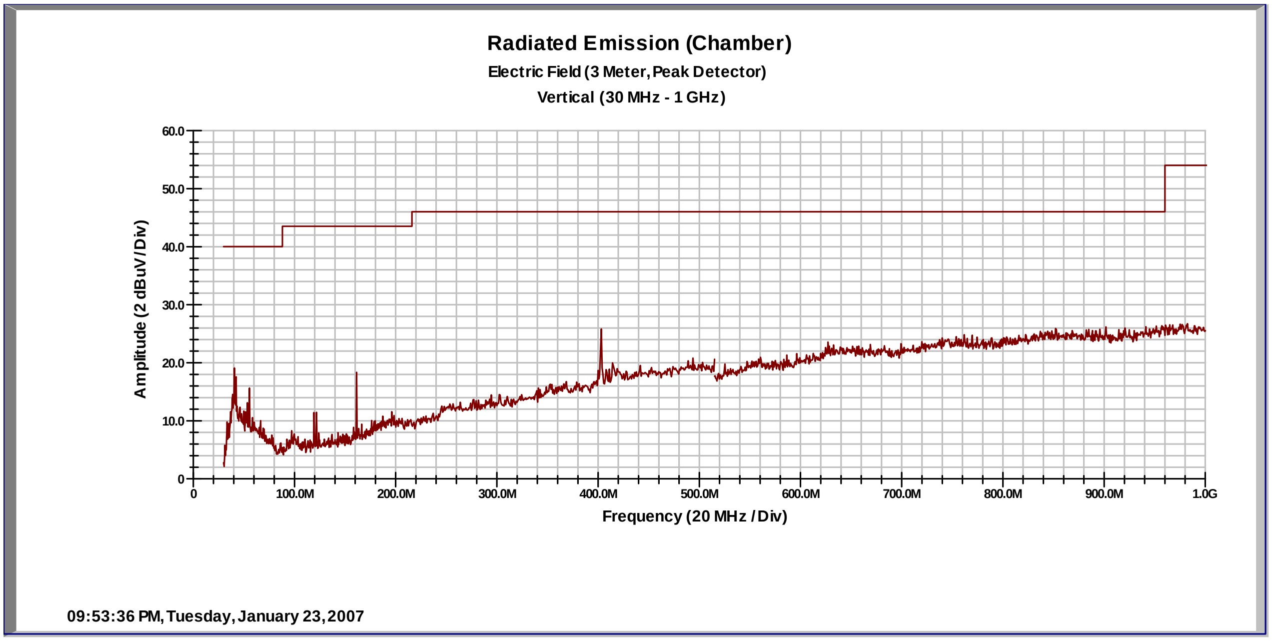
Combined Standard Uncertainty $u_c(y)$ = ± 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

SOP 1 Radiated Emissions

Tracking # 30683466.011 Page 4 of 4

EUT Name	Remote Unit	**Date**	23 January 2007
EUT Model	PWR-08-03	**Temp / Hum in**	N/A
EUT Serial	Not Serialized	**Temp / Hum out**	20 ºC
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC / Freq.**	27 %rh
Deg/sweep	12	**RBW / VBW**	120kHz / 300kHz
Dist/Ant Used	3m / 6140	**Performed by**	Mark Ryan
Configuration	Not Transmitting w/ Patch Antenna		



Emission Freq (MHz)	ANT Polar (H/V)	ANT Pos (m)	Table Pos (deg)	QP FIM Value (dBuV)	Amp Gain (dB)	Cable Loss (dB)	ANT Factor (dB/m)	E-Field Value (dBuV/m)	Spec Limit (dBuV/m)	Spec Margin (dB)
40.57	V	1	254	8.53	0.00	0.69	8.66	17.88	40.00	-22.12
55.30	V	1	186	5.55	0.00	0.81	9.02	15.38	40.00	-24.62
161.10	V	2.1	17	4.29	0.00	1.38	8.60	14.27	43.50	-29.23
403.10	V	1.6	92	5.77	0.00	2.25	15.48	23.50	46.00	-22.50
756.60	V	1.8	12	1.52	0.00	3.11	21.07	25.70	46.00	-20.30
979.37	V	1.5	0	1.83	0.00	3.54	23.99	29.36	54.00	-24.64

Spec Margin = E-Field Value - Limit, E-Field Value = FIM Value - Amp Gain + Cable Loss + ANT Factor ± Uncertainty

Combined Standard Uncertainty $u_c(y) = \pm$ 1.6dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes: The emission shown in RED is the worst case emission.

4.13.3 Sample Calculation

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBµV/m) = FIM - AMP + CBL + ACF

Where: FIM = Field Intensity Meter (dBµV)
AMP = Amplifier Gain (dB)
CBL = Cable Loss (dB)
ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

4.14 Conducted Emissions FCC Part 15.107(a) and 15.207

Testing was performed in accordance with FCC Part 15.107(a), and 15.207. These test methods are listed under the laboratory's NVLAP Scope of Accreditation. This test measures the levels emanating from the EUT, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

4.14.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. For each frequency sub-range, each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50μH / 50Ω LISNs. Testing is either performed in the anechoic chamber or on PLC Site 2. The setup photographs clearly identify which site was used. The vertical ground plane used in the anechoic chamber is a 2m x 2m wooden frame that is covered with ¼ inch hardware cloth and is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN. Floor-standing equipment is placed directly on the ground plane.

4.14.1.1 Deviations

There were no deviations from this test methodology.

4.14.2 Test Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

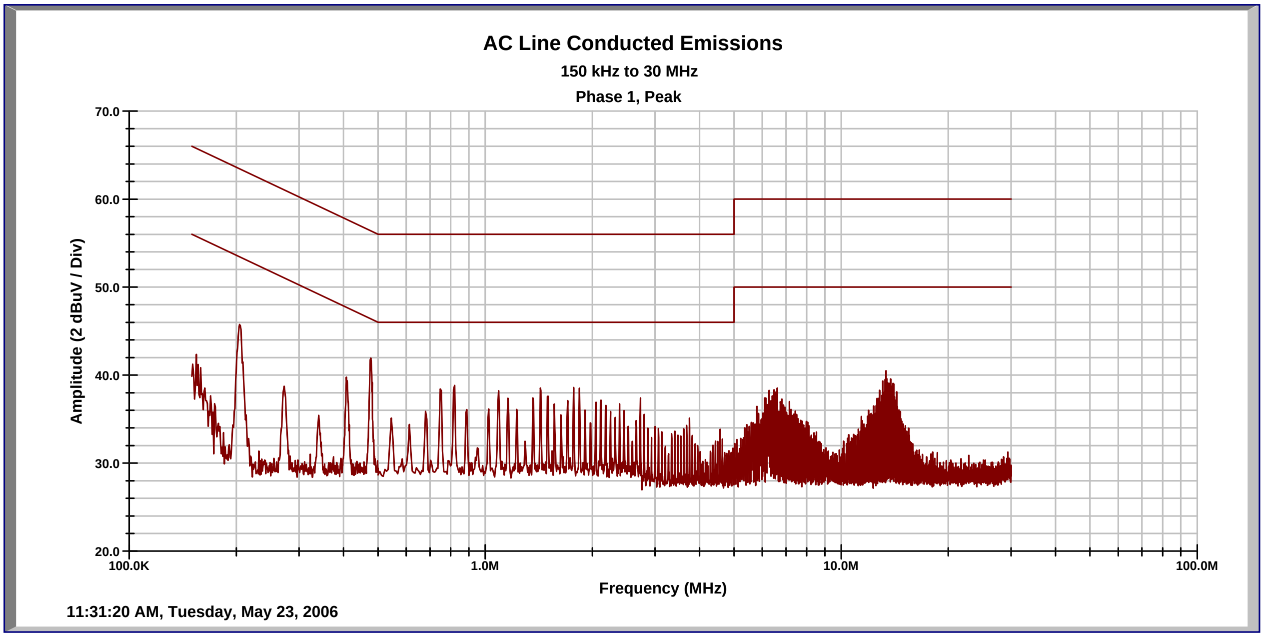
Plots of the EUT's AC Line Conducted emissions are contained in the following sections. The plots show peak and/or average emissions and the corresponding peak and/or average limits. If the peak emissions are below the average limit, then the EUT is considered to pass and no average measurements are made. If the peak emissions are below the quasi-peak limit and the average emissions are below the average limit, then the EUT is considered to pass and no further measurements are made. Otherwise, individual frequencies are measured and compared to the corresponding limit for the detector used (quasi-peak or average).

4.14.2.1 Final Data

The data recorded in this section contains the final results under the worst-case conditions and with any modifications or special accessories implemented as the manufacturer intends.

SOP 2 Conducted Emissions Tracking # 30683466.011 Page 1 of 4

EUT Name	Remote Unit	**Date**	23 May 2006
EUT Model	PWR-08-03	**Temperature**	70ºF
EUT Serial	**Not Serialized**	**Humidity**	43%rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC /Freq**	120VAC / 60Hz
LISNs Used	1	**Performed by**	Mark Ryan
Configuration	Receive mode - no transmit for FCC 15.107(a)		

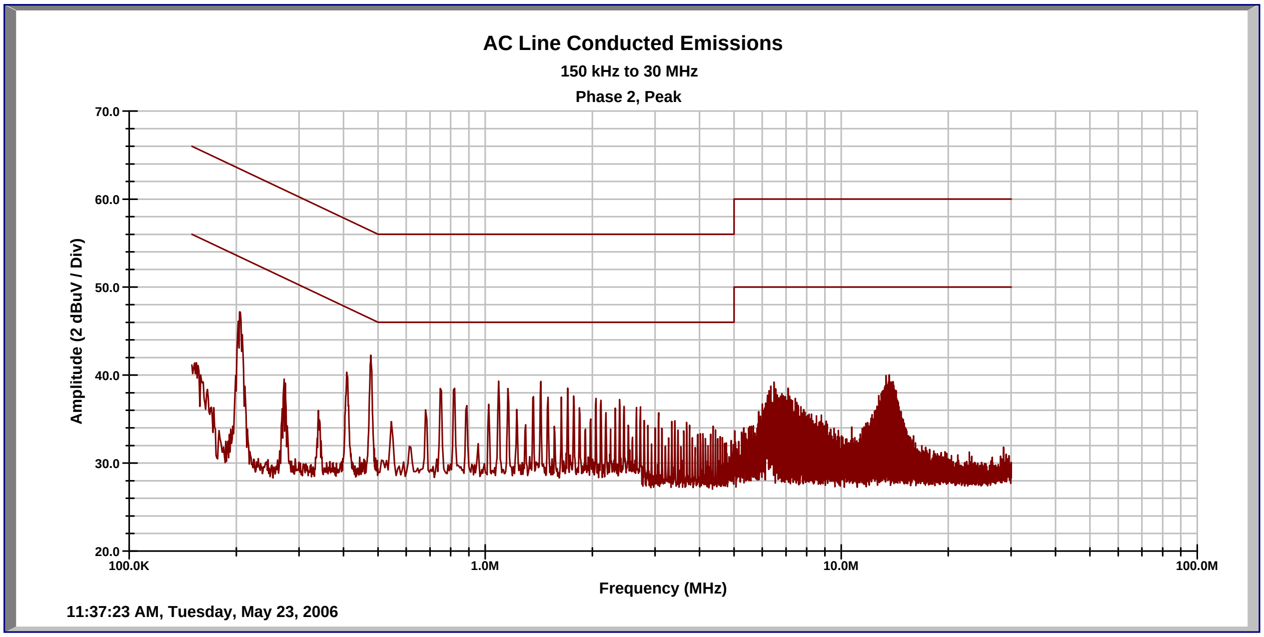


Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.20	1	34.21	26.80	0.00	10.02	63.61	53.61	-19.38	-16.79
0.48	1	29.77	29.39	0.02	10.03	56.34	46.34	-16.52	-6.90
0.82	1	24.33	24.80	0.03	10.04	56.00	46.00	-21.60	-11.13
1.43	1	25.34	24.33	0.04	10.05	56.00	46.00	-20.57	-11.58
6.48	1	26.37	23.53	0.08	10.24	60.00	50.00	-23.31	-16.15

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty
Combined Standard Uncertainty $u_c(y) = \pm 1.2$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes: The emission in RED is the worst case.

SOP 2 Conducted Emissions		Tracking # 30683466.011 Page 2 of 4	
EUT Name	Remote Unit	**Date**	23 May 2006
EUT Model	PWR-08-03	**Temperature**	70ºF
EUT Serial	**Not Serialized**	**Humidity**	43%rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC /Freq**	120VAC / 60Hz
LISNs Used	2	**Performed by**	Mark Ryan
Configuration	Receive mode - no transmit for FCC 15.107(a)		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.20	2	36.08	30.76	0.00	10.11	63.61	53.61	-17.42	-12.74
0.48	2	29.63	29.22	0.02	10.09	56.34	46.34	-16.60	-7.01
0.82	2	25.78	25.22	0.03	10.06	56.00	46.00	-20.13	-10.69
1.43	2	26.90	25.46	0.04	10.05	56.00	46.00	-19.01	-10.45
6.60	2	25.96	24.74	0.08	10.25	60.00	50.00	-23.71	-14.93
13.69	2	26.62	24.99	0.13	10.45	60.00	50.00	-22.80	-14.43

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

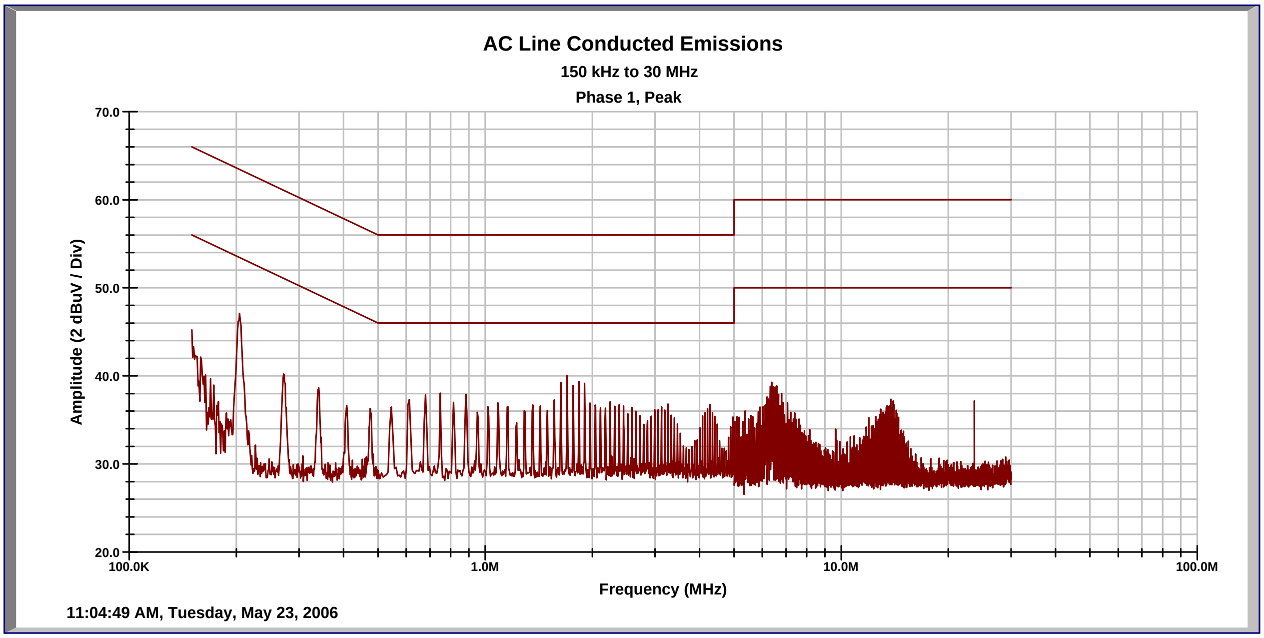
Combined Standard Uncertainty $u_c(y) = \pm 1.2$dB   Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes:

SOP 2 Conducted Emissions — Tracking # 30683466.011 Page 3 of 4

EUT Name	Remote Unit	**Date**	23 May 2006
EUT Model	PWR-08-03	**Temperature**	70ºF
EUT Serial	**Not Serialized**	**Humidity**	43%rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC /Freq**	120VAC / 60Hz
LISNs Used	1	**Performed by**	Mark Ryan

Configuration Typical transmit mode - transmitter on – modulated on single channel, for FCC 15.207

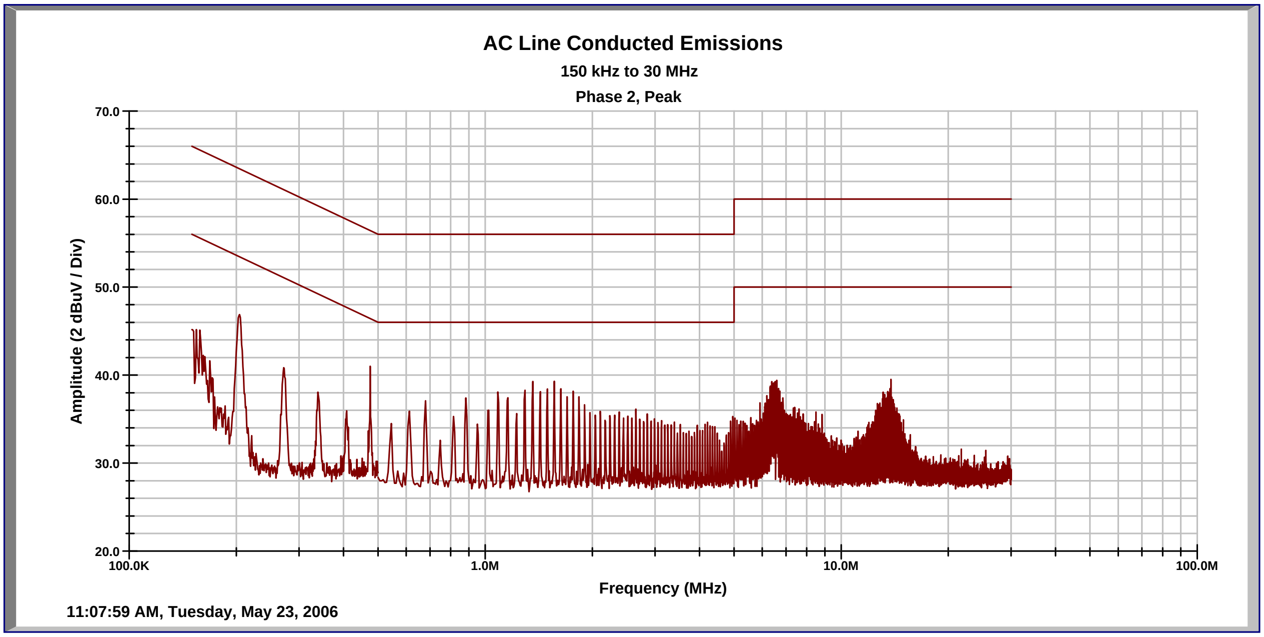


Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.20	1	35.19	24.64	0.00	10.02	63.61	53.61	-18.40	-18.95
0.48	**1**	24.52	**21.93**	0.02	10.03	56.34	46.34	-21.77	**-14.36**
1.70	1	27.58	20.27	0.03	10.06	56.00	46.00	-18.33	-15.64
3.13	1	22.57	17.42	0.05	10.10	56.00	46.00	-23.28	-18.43
6.33	1	26.21	21.74	0.08	10.23	60.00	50.00	-23.48	-17.95
13.75	1	23.45	18.72	0.13	10.45	60.00	50.00	-25.97	-20.70

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty
Combined Standard Uncertainty $u_c(y) = \pm 1.2$dB Expanded Uncertainty $U = ku_c(y)$ $k = 2$ for 95% confidence

Notes: The emission in **BLUE** is the worst case while transmitting.

SOP 2 Conducted Emissions		Tracking # 30683466.011 Page 4 of 4	
EUT Name	Remote Unit	**Date**	23 May 2006
EUT Model	PWR-08-03	**Temperature**	70ºF
EUT Serial	**Not Serialized**	**Humidity**	43%rh
Standard	FCC 47 CFR Part 15, RSS-210 Issue 6	**Line AC /Freq**	120VAC / 60Hz
LISNs Used	2	**Performed by**	Mark Ryan
Configuration	Typical transmit mode - transmitter on – modulated on single channel, for FCC 15.207		



Emission Freq (MHz)	Line ID (1,2,3,N)	FIM Quasi (dBuV)	FIM Ave (dBuV)	Cable Loss (dB)	LISN + T Limiter (dB)	Quasi Limit (dBuV)	Ave Limit (dBuV)	Quasi Spec Margin (dB)	Ave Spec Margin (dB)
0.20	2	34.71	24.71	0.00	10.11	63.61	53.61	-18.79	-18.79
0.48	2	23.46	18.53	0.02	10.09	56.34	46.34	-22.77	-17.70
1.63	2	27.04	23.44	0.03	10.06	56.00	46.00	-18.87	-12.47
2.79	2	22.59	19.55	0.05	10.09	56.00	46.00	-23.27	-16.31
6.39	2	27.43	23.06	0.07	10.24	60.00	50.00	-22.26	-16.63
13.82	2	22.34	15.96	0.13	10.45	60.00	50.00	-27.08	-23.46

Quasi Spec Margin = Quasi FIM + Cable Loss + LISN CF - Quasi Limit ± Uncertainty
Ave Spec Margin = Ave FIM + Cable Loss + LISN CF - Ave Limit ± Uncertainty

Combined Standard Uncertainty $u_c(y)$ = ± 1.2dB Expanded Uncertainty $U = ku_c(y)$ k = 2 for 95% confidence

Notes:

5 Test Equipment Use List

5.1 Test Equipment used

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal dd/mm/yy	Next Cal dd/mm/yy
SOP 1 - Radiated Emissions (5 Meter Chamber)					
Ant. BiconiLog	Chase	CBL6140A	1108	16-May-06	16-May-07
Antenna Horn 1-18GHz	EMCO	3115	5770	28-Apr-06	28-Apr-07
Amplifier, preamp	Agilent Technologies	8449B	3008A01480	25-Sep-06	25-Sep-07
Cable, Coax	Andrew	FSJ1-50A	03	12-Sep-06	12-Sep -07
Cable, Coax	Andrew	FSJ1-50A	30	12-Sep-06	12-Sep -07
Cable, Coax	Andrew	FSJ1-50A	45	12-Sep-06	12-Sep -07
Chamber, Semi-Anechoic	Braden Shielding	5 meter	A67631	10-Jan-2007	10-Jan-08
Receiver, EMI	Rohde & Schwarz	ESIB40	100043	22-Jan-07	22-Jan-08
Spectrum Analyzer	Agilent Tec.	E7405A	US39440161	27-Feb-06	27-Feb-07

General Laboratory Equipment					
Meter, Multi	Fluke	79-3	69200606	13-Aug-06	13-Aug-07
Meter, Temp/Humid/Barom	Fisher	02-400	01	25-Jan-07	25-Jan-08

* Calibration of equipment past due for re-calibration will be performed expeditiously. If any equipment is found to be out of tolerance at that time, affected customers will be notified accordingly.

6 EMC Test Plan

1.2 EMC Test Plan

The attached EMC test plan has been generated by the manufacturer and implemented as recorded in this test report.

1.3 Introduction

This manufacturer-supplied document provides a description of the Equipment Under Test (EUT), configuration(s), operating condition(s), and performance acceptance criteria. It is intended to provide the test laboratory with the essential information needed to perform the requested testing.

1.4 Customer

The information in the following tables is required, as it should appear in the final test report.

Table 13 – Customer Information

Company Name	polymap wireless
Web Site	www.polymapwireless.com
Address 1	310 S. Williams Blvd. Ste. 346
Address:	Tucson, AZ 85711
Phone	520-747-1811
Fax	520-747-9408

Table 14 – Technical Contact Information

Name	Pierre Landau, PhD
E-mail	pierre@polymap.net
Phone	520-747-1811
Fax	520-747-9408

1.5 *Equipment Under Test (EUT)*

The information provided in the following table should be listed as it should appear in the final report. For those products that have only a model name, list the model number as *non-applicable* and vice-versa.

Table 15 – EUT Designation

Product Name	Polytel® Monitoring System
System Name	Polytel
Model Number	PWR-08-03 (Remote Unit)
Product Description	Bluetooth accessory for LifeScan One Touch Ultra glucose monitor, and access point allowing data to be forwarded over a regular telephone line to a remote site.

1.5.1 Product Specifications

The information provided in the following table should be listed as it should appear in the final report.

Table 16 – EUT Specifications

<table>
<tr><td>Size (in inches)</td><td colspan="6">1 1/8"H 3 7/8 "W 5 ¾ D</td></tr>
<tr><td>Weight (in pounds)</td><td colspan="6">0.3Lbs.</td></tr>
<tr><td rowspan="5">Power Supply
(check all that apply)</td><td colspan="6">Voltage Type ☐ DC ☒ AC</td></tr>
<tr><td colspan="6">Operating Voltage 120 Operating Frequency 60
Operating Voltage 240 Operating Frequency 50</td></tr>
<tr><td colspan="6">Multiple Feeds ☐ Yes and how many ☒ No</td></tr>
<tr><td colspan="6">Current (Max) 1 (A)</td></tr>
<tr><td colspan="6">Power Consumption (Max loaded) 5 (W)</td></tr>
<tr><td rowspan="5">Clock Oscillator Switching Power Supply Operating Frequencies:</td><td>Type</td><td>Frequency</td><td>Module</td><td>Type</td><td>Frequency</td><td>Module</td></tr>
<tr><td>Crystal</td><td>10MHz</td><td>Access Point</td><td>Crystal</td><td>12MHz</td><td>Remote</td></tr>
<tr><td>Crystal</td><td>12MHz</td><td>Access Point</td><td>Crystal</td><td>32.768kHz</td><td>Remote</td></tr>
<tr><td>Crystal</td><td>32.768KHz</td><td>Access Point</td><td></td><td></td><td></td></tr>
<tr><td>Crystal</td><td>28.224MHz</td><td>Access Point</td><td></td><td></td><td></td></tr>
<tr><td>Is the EUT a frame or a shelf product?
(Note: shelf = 36" or less)</td><td colspan="6">☒ Table Top ☐ Rack mount ☐ Floor standing cabinet
☐ Other describe</td></tr>
</table>

1.5.2 Interface Specifications

The information provided in the following table should be listed as it should appear in the final report.

Table 17 – Interface Specifications

Interface Design/ Port Name	Number of this type Interfaces	Cabled with what type of cable?	Is the cable shielded?	What is the maximum potential length of the cable?	Metallic (M), Coax (C) or Fiber (F)?
RJ-11 from AP	2	Regular telephone cord	☐Yes ☒No	20ft	☒M ☐C ☐F
Coax connector to remote	1	Coax	☐Yes ☒No	6”	☒M ☐C ☐F

1.5.3 Technical Description

The System in composed of a central unit (“Access Point”), and one or more accessories (“Remote Units”) which connect to the Access Point over a Bluetooth link.

The Remote units are designed to be attached (either internally, in the case of the PWR-08-01 and -02 or externally (in the case of the PWR-08-03) to medical devices generating episodic information (such as BP cuffs, scales, glucose meters, etc.). The remote units retrieve the newly acquired data from the host medical device, store it in local flash memory, then attempt to locate the access point. When the AP is located, data is transferred over the Bluetooth link.

The Access Point is provided with a v.90 modem and software to run TCP/IP (over PPP) over the modem link. When it receives data from a remote unit, it connects to the Internet using its stored dialing number and login information, then transfers the data to the data center.

Thus the system is essentially a store-and-forward mechanism for delivering data collected on medical instruments in the home to a central monitoring station.

1.5.4 Configuration(s)

The AP (PWA-08-01) only exists in one configuration. It is connected to the various remotes over a Bluetooth link. The remotes (PWR-08-01, PWR-08-02, PWR-08-03) are three different configurations of the same radio, each intended to communicate with the Access Point over a Bluetooth link. Specifically, they are:

PWR-08-01: Class 1 Bluetooth radio with optional level shifter and onboard antenna

PWR-08-02: Class 1 Bluetooth radio with optional level shifter and external antenna

PWR-08-03: Class 1 Bluetooth radio with an onboard antenna and special circuitry for connection to a glucose meter.

The radio sections of all three PWR-08-0x modules are identical; the PWR-08-03 incorporates additional CMOS switches to disconnect the serial line from the host when the board is powered down, as the host pulls up both RXD and TXD.

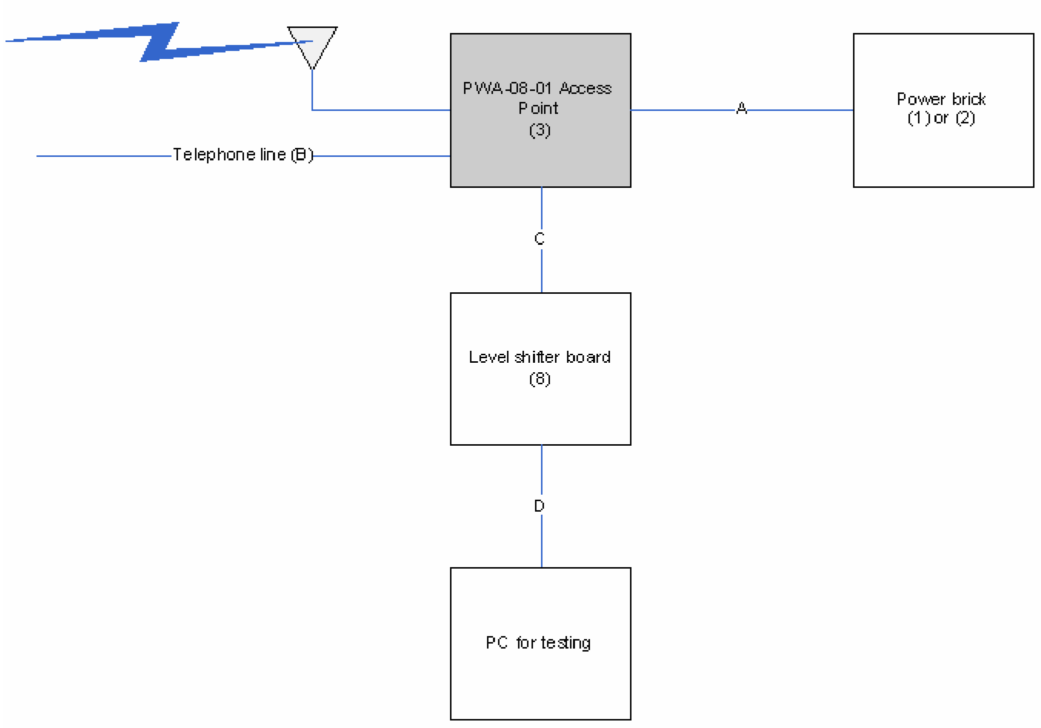


Figure 13 – Block diagram for testing EMC and modem on PWA-08-01

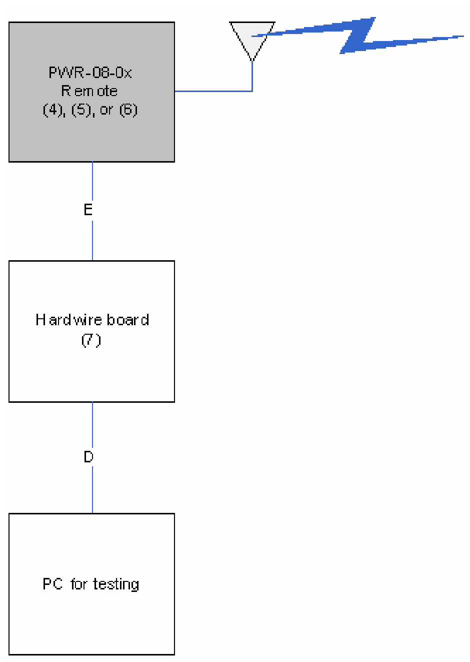


Figure 2 – Block diagram for testing EMC on PWR-08-0x

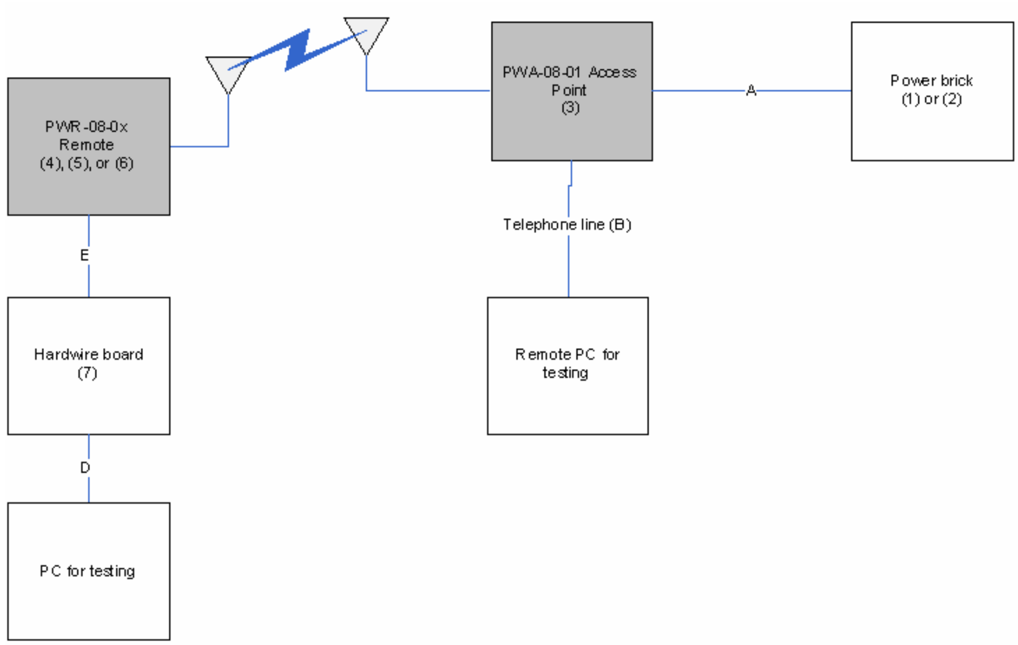


Figure 3 – Block diagram for testing immunity

Table 18 – Equipment Chassis Shown in Block Diagram

Des.	Manufacturer	Model No.	Revision	Description
1	Simex	HM4806UA P01		120V Adapter
2	Simex	HM4106V AP02		230V Adapter
3	Polymap Wireless	PWA-08-01	1.0	Access Point
4	Polymap Wireless	PWR-08-01	1.2	Remote with onboard antenna
5	Polymap Wireless	PWR-08-02	1.1	Remote with external antenna
6	Polymap Wireless	PWR-08-03	1.1	Glucose meter accessory (remote with extra circuit on serial line), onboard antenna
7	Polymap Wireless	PWH-08-01	1.1	Hardwire board (used for testing only)
8	Polymap Wireless	Level shifter board	1.0	Level shifter board (used for testing only)

The cable length will determine whether particular immunity tests are applicable. The length recorded must be the length provided to the lab for testing. The cable provided should be the longest one provided to the end user or the longest one available for purchase. In the event that the manufacturer of the EUT does not provide the cables, "representative" cables must be provided. *Any ferrites on the cables need to be shown in the block diagram.*

Table 19 – Cables Shown in Block Diagram

Des.	Cable Name
A	Power cord (5V)
B	Telephone cord
C	Level shifter ribbon
D	Null modem RS-232
E	Hardwire cable

1.5.5 Operating Conditions

As detailed in Document 8-5110 "Regulatory Testing for 08 devices", these units typically operate for only a few minutes every day. This is due to the fact that a congestive heart failure patient (one of the target populations) will typically check their weight and BP once a day; a diabetic might test their glucose as many as six times a day. In each case, the wireless connection time is typically under five seconds, with the telephone connection time being as long as two minutes in cases where the modem is slow to connect.

We have chosen to test the units by constructing a pass-through piece of software, that builds a continuous bidirectional serial connection between a device connected to the remote, across the Bluetooth link, through the modem and telephone lines to a remote modem and receiving terminal emulator. This, in our opinion, represents a good approximation of worst-case emissions.

1.5.5.1 Software

Please see Document 8-5110 "Regulatory Testing for 08 devices" for details

1.5.5.2 Mode(s)

Please see Document 8-5110 "Regulatory Testing for 08 devices" for details

1.5.6 Performance Criteria (Required for Immunity Testing Only)

The units shall continue to be able to operate despite interference. More specifically, either the radio or the modem connection can be dropped, and reestablished by hand during the testing, but neither device should transmit incorrect data nor should they be left in a state where a connection is not easily reestablished.

The production software, which is not usable for the immunity testing, uses a store-and-forward approach to delivering a small amount of data. It assumes there could be multiple failures in each communication link, and schedules retries to allow reliable delivery of information. Thus, the only risk is if something in the environment causes the equipment to lock up and be unable to execute software.

1.5.6.1 Generic Performance Criteria "A"

The apparatus shall continue to operate as intended. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. If the minimum performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

1.5.6.2 Generic Performance Criteria "B"

The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level specified by the manufacturer, when the apparatus is used as intended. The performance level may be replaced by a permissible loss of performance. During the test, degradation of performance is however allowed. No change of actual operating state or stored data is allowed. If the minimum performance loss is not specified by the manufacturer then either of these may be derived from the product description and documentation and what the user may reasonably expect from the apparatus if used as intended.

1.6 Equivalent Models

	Manufacturer	Model No.	Revision	Description
1	Polymap Wireless	PWR-08-01	1.2	Remote with onboard antenna
2	Polymap Wireless	PWR-08-02	1.1	Remote with external antenna
3	Polymap Wireless	PWR-08-03 (Device tested)	1.1	Glucose meter accessory (remote with extra circuit on serial line), onboard antenna

1.6.1.1 Manufacturer's Letter of Attestation

See section 1.5.4 of this test plan for

1.7 Test Specifications

Table 20 – EUT Designation

Emissions	
Standard	Requirement
ETSI EN 300 328	All
61000-3-2	Class A
61000-3-3	
Immunity	
ETSI EN 300 328	All

7 Regulatory Testing Instructions

Testing instructions for the “08” series devices.

Introduction

The purpose of this document is to provide guidance to personnel responsible for regulatory compliance testing on the PWR-08-03 remote unit and PWA-08-01 access points

Device description

For testing, the two devices are provided along with two interface boards allowing them to be connected to PCs. Note: reflashing the firmware requires that the PC have a parallel port and the BlueSuite set of software installed.

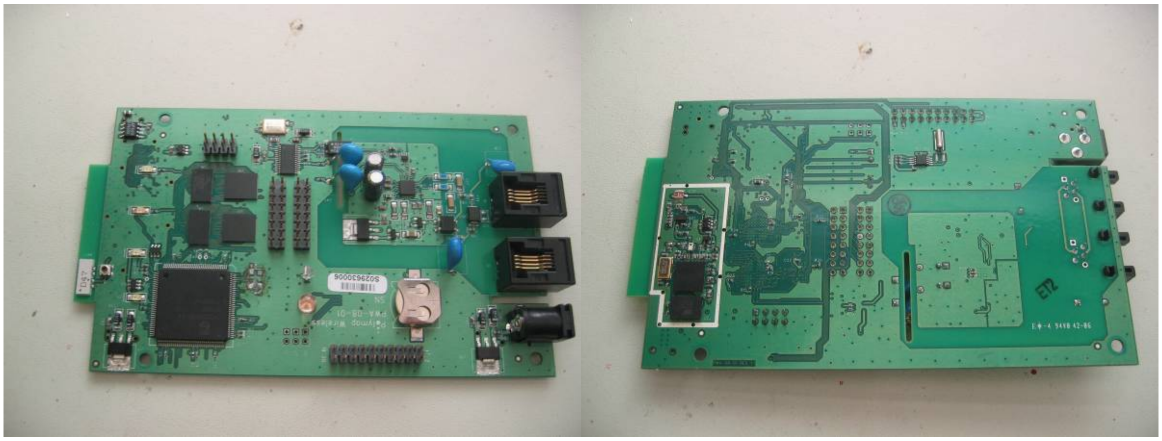
PWR-08-03 remote unit

The remote unit consists of a single circuit board, with a single 15-pin edge connector. It has an RF shield; radio testing may indicate that this shield is superfluous. Inline with the antenna is a test connector, which disconnects the antenna when the test plug is inserted.

PWR-08-03, top and bottom views. Connector is at right edge of board. Battery provides a backup for a real-time clock.

PWA-08-01 access point (AP)

The access point consists of a single circuit board with several connectors, allowing access for programming, as well as direct connection to the UARTs of the different devices. The RF section may be protected by a shield if RF testing indicates this is necessary.



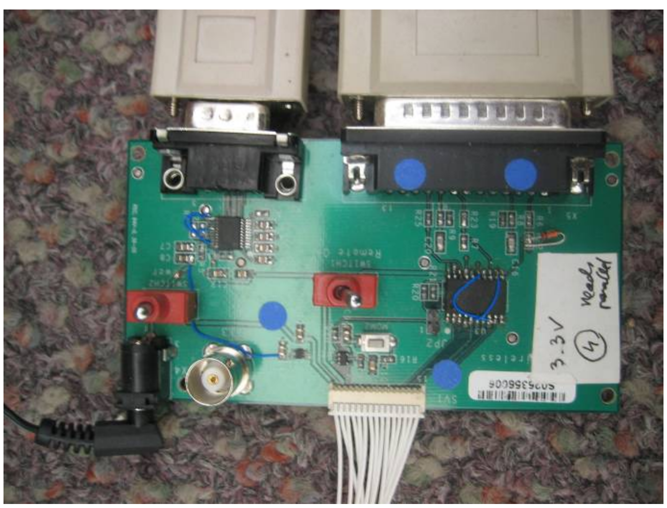
PWA-08-01, top and bottom views. Modem section is located to the right of the board. Battery provides a backup for a real-time clock.

PWH-08-01 hardwire board

The hardwire board consists of a level shifter for the serial line and a buffer to protect the SPI bus. It should be connected to a PC using both a serial and a parallel port. Note that the parallel port is only necessary for loading new firmware on the radio. A **null modem cable** should be used to connect to the computer.

The PWH-08-01 board is used for:

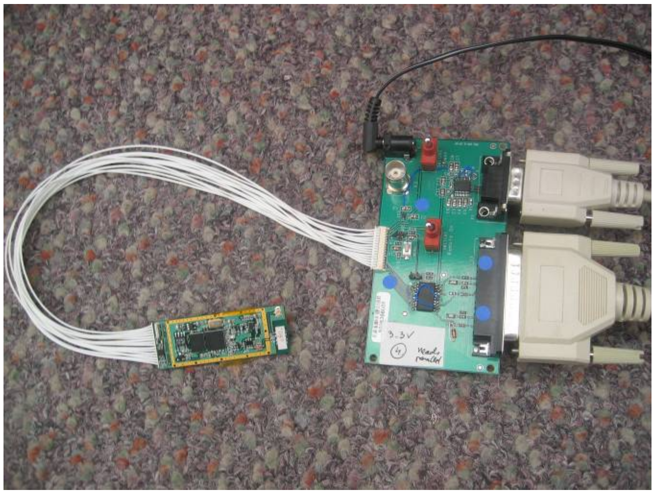
- Loading the software on a PWR-08-03
- Testing a PWR-08-03
- Loading the radio software on a PWA-08-01



PWH-08-01 “hardwire” board. SWITCH2 = Power, SWITCH1 = Remote On. For use, both of these should be in the position shown. White cable goes to unit being programmed or tested.

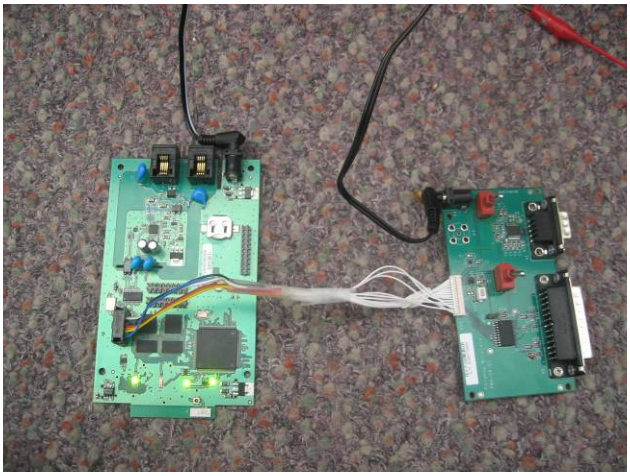
Connecting to a PWR-08-03

To program and test a PWR-08-03 unit, connect a straight cable between the hardwire board and the unit:



Connecting to the programming port of a PWA-08-01

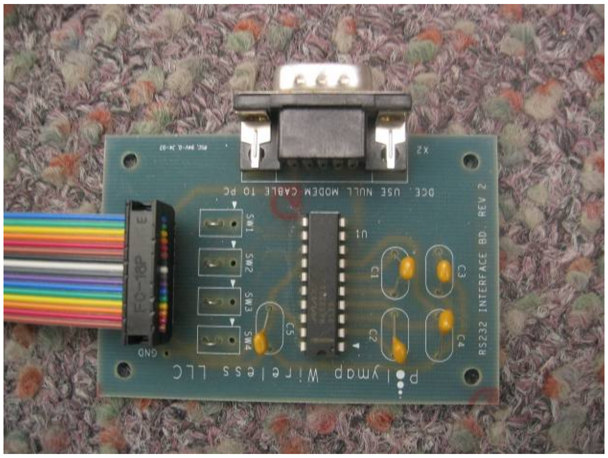
To program the radio on a PWA-08-01, connect the special cable between the hardwire board and connector J9 on the access point board. Please note – cable connector has 10 pins, board has 8 pins. Please make sure Pin 1's are matched



Hardwire board connected to access point board to reflash program. Note that each board must be provided with power. Note also that ribbon connector has extra pins; please make sure to match Pin 1 of cable with Pin 1 of connector J9.

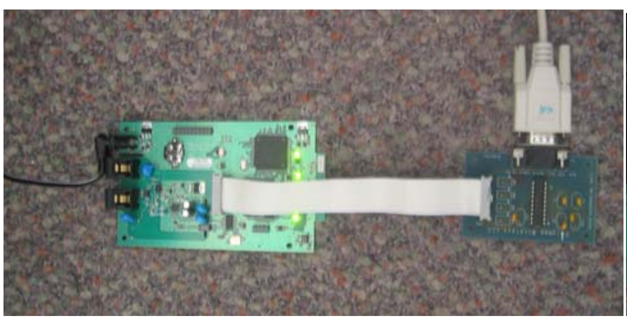
RS232 Interface Bd. Rev 2

This board includes only an RS232 level shifter. It is powered from the access point, and allows a connection through a **null modem cable** to the COM port of a computer.



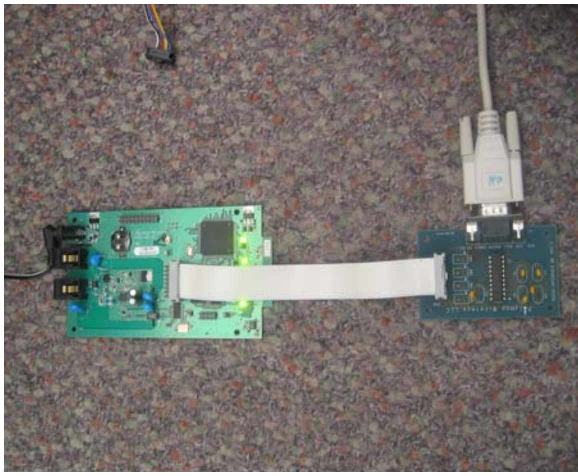
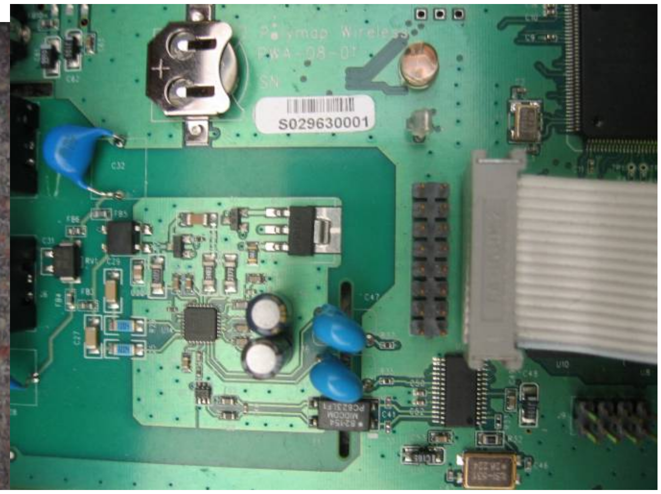
Connecting to the modem section of PWA-08-01

For testing the modem section, it is important to be able to communicate directly with the v.92 modem on the board. Connect the level shifter board to J1 as shown:




Connecting to the radio section of PWA-08-01

For testing the radio section, it is useful to be able to communicate directly with the UART of the radio. Connect the level shifter board to J3 as shown:

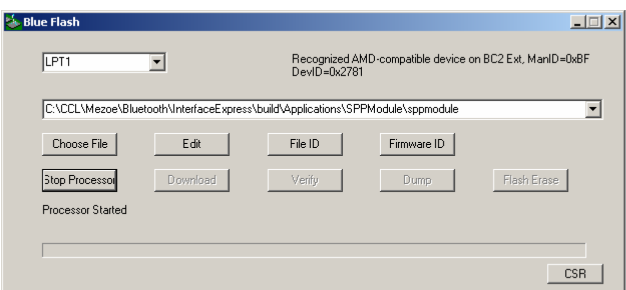



Installing the BlueSuite tools on the PC

For the purpose of reloading the firmware on a board, a PC with a "real" parallel port is required. A laptop with a USB-type parallel port cannot be used. The Cambridge Silicon Radio BlueSuite set of tools (provided on a disk) should be installed, and the system rebooted to ensure that the updated parallel port drivers are installed.

Loading firmware on the PWR-08-03 remote unit

- Please ensure that the device is connected as in section 2.3.1, and that the parallel port is connected to the PC.
- From the Start menu, select Programs….All Programs…CSR BlueSuite…BlueFlash
- When the BlueFlash program starts, it will show the window below:



- Press "Stop Processor"
- Press "choose file" and select the appropriate image file (see below for filenames to use)
- Press "Download"
- Press "Start Processor"

NOTE: the directory contains paired files, with ".XPV" and ".XDV" extensions. Both must be present for the download to work correctly.

Firmware for radio testing

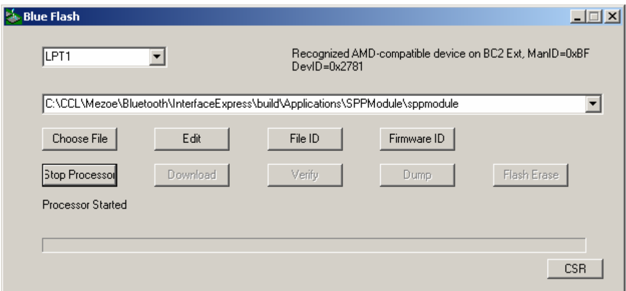
The firmware that should be used for radio testing is entitled "NewDevTest.xpv".

Firmware for immunity testing

The firmware that should be loaded on the PWR-08-03 for immunity testing is entitled "SPPModule_client_verbose.xpv"

Loading firmware on the PWA-08-01 access point

- Please ensure that the device is connected as in section 2.3.2, and that the parallel port is connected to the PC.
- From the Start menu, select Programs….All Programs…CSR BlueSuite…BlueFlash
- When the BlueFlash program starts, it will show the window below:



- Press "Stop Processor"
- Press "choose file" and select the appropriate image file (see below for filenames to use)
- Press "Download"
- Press "Start Processor"

NOTE: the directory contains paired files, with ".XPV" and ".XDV" extensions. Both must be present for the download to work correctly.

Firmware for radio testing

The firmware that should be used for radio testing is entitled "NewDevTest.xpv"

Firmware for immunity testing

The firmware that should be loaded on the PWA-08-01 for immunity testing is entitled "SPPModule_AP_Silent.xpv"

Radio testing

Setup

PWR-08-03

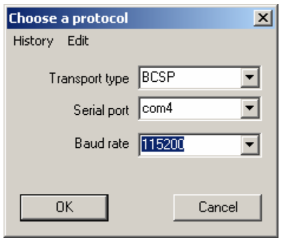
- Select a remote that has radio testing firmware loaded
- Connect the hardwire board to the remote as shown in section 2.3.1

PWA-08-01

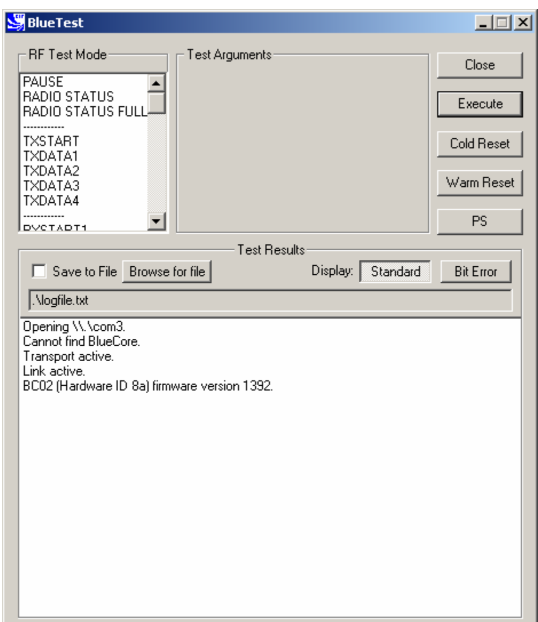
- Select an access point that has radio testing firmware loaded
- Connect the hardwire board to the access point as shown in section 2.3.2

Transmitting on a fixed frequency

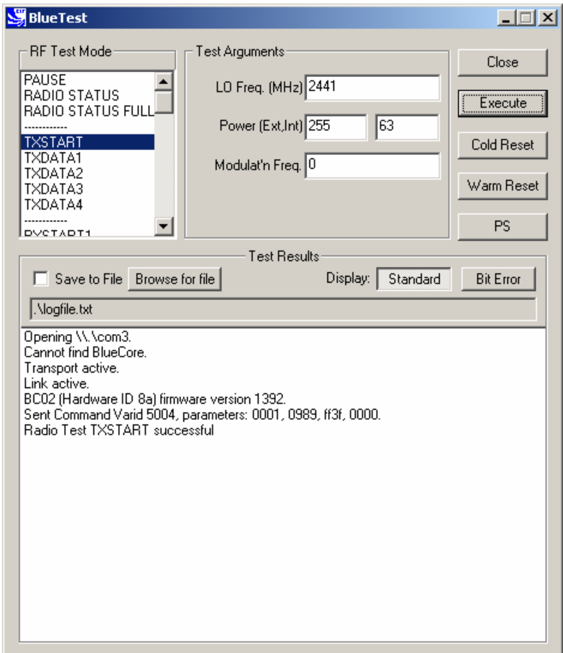
- From the Start menu, select All Programs…CSR BlueSuite…BlueTest
- Select "BCSP", the number of the COM port you are using, and 115200 as the speed



- This will result in the following window. Note particularly the "Link Active" line. If it is not present, check that correct firmware is loaded and serial port is connected correctly.



- Select TXSTART. This will bring up the selection of frequency and power. Frequency is expressed in Megahertz. Power should be set to "internal: 255", and "external: 63" for the maximum output power. Please change the value on "external" to throttle back the power, and leave "internal" always set to 255.



Modem testing

Setup

- Connect an access point as described in section 2.4.1 above.
- On the PC, start Hyperterminal or equivalent program, connected to the COM port
- Verify correct operation: type "ATZ" followed by a carriage return, and the modem should reply "OK"

Generating modem test tones

Using the Hyperterminal window, you can initiate any of a series of test tones on the modem.

AT%TT - PTT Test Command

This command facilitates PTT testing of signal levels by providing continuous signals regardless of whether or not the modem is connected to the line. The signal transmitted is in accordance with the parameter provided.

A range of commands allows the user to initiate a series of signals required to obtain PTT approval. The signals emitted include answer tone, modulation, carriers, and other pertinent signals. A test is initiated upon receipt of an AT%TTn (the second T is a password and n is a test number), and the test is aborted when any keyboard character is entered. The modem will continuously transmit the tone or carrier according to the parameter supplied.

Syntax

AT%TT0x x corresponds to the desired DTMF dial digit:

0 Dial digit 0

1 Dial digit 1

2 Dial digit 2

3 Dial digit 3

4 Dial digit 4

5 Dial digit 5

6 Dial digit 6

7 Dial digit 7

8 Dial digit 8

9 Dial digit 9

A Dial digit *

B Dial digit #

C Dial digit A

D Dial digit B

E Dial digit C

F Dial digit D

AT%TT3x x corresponds to the selected MISC function:

0 Silence

1 V.25 answer tone (2100 Hz)

2 Guard tone (1800 Hz)

3 V.25 originate tone (1300 Hz)

4 Fax originate tone (1100 Hz)

5 Bell answer tone (2225 Hz)

6-F Reserved

Immunity testing

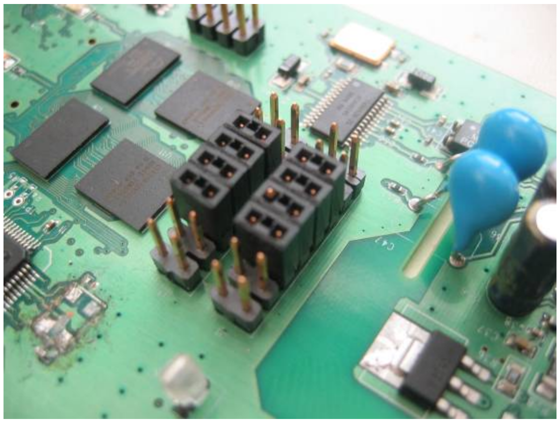
Setup

PWR-08-03

- Connect the PWR-08-03 as in Section 2.3.1
- Connect its serial line to the COM port on a PC
- Start Hyperterminal or equivalent program on the PC
-

PWA-08-01

- please insert jumpers in the four center sets of pins of both J1 and J3 (a total of 8 jumpers).



Jumper pins installed on J1 and J3 of PWA-08-01 as in normal operation.

Telephone line

- Connect an outside telephone line to either of the telephone ports on the unit

Receiving modem

- A receiving modem needs to be set up to listen to and answer calls from the test unit. If you have one locally available, that can be used; otherwise please contact Polymap Wireless at (520) 747-1811 for the telephone number of a modem in our office that can be used as the receiving modem for testing purposes

Starting the test

- Ensure that the receiving modem is set up and ready to answer. Also make sure the receiving modem is connected to a terminal window such as Hyperterm.
- Initiate the telephone call by typing a "dial" command into the terminal window. For example:

ATDT8294055

This will dial the telephone number of the remote modem. When it answers, you will get a "CONNECTED" message followed by the connection speed.

- Confirm that characters can by typed back and forth between the sending and receiving terminal windows.
- Using the terminal program, initiate a ZMODEM file transfer of a large file. The progress can be followed on both the sending and receiving screens.
-

Restarting the test in case of failure

If the connection is broken, you may need to restart the test. For the purposes of the test software (which is of course simplistic), the easiest is to power-cycle the access point, then press the "RESET" button on the hardwire board connected to the PWR-08-03. Wait ten seconds.