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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart C (15.247) DTS Specifications and Industry Canada RSS 210 Issue 5 for an Intentional Radiator on the Polymap Wireless Model: PWA-07-01

FCC ID:	QYPPWA0701
GRANTEE:	Polymap Wireless 1260 Big Talk Ct. San Jose, CA. 95120
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	July 30, 2003
FINAL TEST DATE:	June 9, June 10, June 11, June 13 and July 25, 2003
AUTHORIZED SIGNATORY:	Mark Briggs Director of Engineering

ACCREDITED

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SCOPE

An electromagnetic emissions test has been performed on the Polymap Wireless model PWA-07-01 pursuant to Subpart C of Part 15 of FCC Rules for intentional radiators and RSS-210 Issue 5 for licence-exempt low power devices. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 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 FCC 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 Polymap Wireless model PWA-07-01 and therefore apply only to the tested sample. The sample was selected and prepared by Pierre Landau of Polymap Wireless

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules and RSS-210 Issue 5 for license-exempt low power devices for the radiated and conducted emissions of intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their 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.

SUMMARY OF RESULTS

Note – remove references in the table below that do not apply to the radio tested

FCC Part 15 Section	RSS 210 Section	Description	Measured Value	Comments	Result
	6.2.2(o)(a)	20dB Bandwidth	1 MHz	The channel spacing shall be greater than the 20dB bandwidth	Complies
	6.2.2(o)(a)	Channel Separation	1.04 MHz		Complies
	6.2.2(o)(a)	Number of Channels	79	2400- 2483.5 MHz: average time of occupancy <0.4 second within a 30 second period.	Complies
	6.2.2(o)(a)	Channel Dwell Time	335ms per 30 seconds		Complies
	6.2.2(o)(a)	Channel Utilization	All channels are used equally	Refer to Theory of Operations BlueTooth compliant hopping algorithm	Complies
15.247 (b) (3)	6.2.2(o)(a)	Output Power, 2400 - 2483.5 MHz	-2.4 dBm (0.0006 Watts) EIRP = 0.0024 W	Multi-point applications: 2400 – 2483.5 MHz Maximum permitted is 1Watt, with EIRP limited to 4 Watts	Complies
15.247(c)	6.2.2(o)(e1)	Spurious Emissions – 30MHz – 25GHz	All spurious emissions < -20dBc	All spurious emissions < -20dBc.	Complies
15.247(c) / 15.209		Radiated Spurious Emissions 30MHz – 25GHz	46.3 dBuV/m @ 7440 MHz (-7.7 dB)	Emissions in restricted bands must meet the radiated emissions limits detailed in 15.207. All others must be < -20dBc	Complies
15.207		AC Conducted Emissions	20dBuV @ 0.474MHz (-36.4dB)		Complies
	6.6	AC Conducted Emissions	All emissions more than 20dB below the limit		Complies
15.247 (b) (5)		RF Exposure Requirements	Output power is below the threshold for SAR evaluation and below the threshold requiring no co-location warnings.	Threshold for SAR for portable devices is 60/f mW. For 2.4Ghz device this threshold is 25mW. The output power is less than 5mW.	Complies
15.203		RF Connector	System uses an integral antenna with 6dBi gain	Integral antenna or specialized connector required	Complies

MEASUREMENT UNCERTAINTIES

ISO Guide 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 NAMAS document NIS 81.

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

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Polymap Wireless model PWA-07-01 is a BlueTooth transmission system, which is designed to allow data to be transferred from a medical device (such as a blood pressure cuff) to a modem via a wireless link. The system is comprised of a BlueTooth module (Remote) that connects to the serial port of the medical device and a modem (Base Station) with integrated BlueTooth transceiver that sends the data through a telephone line to a server.

The Base Station is designed to be used as a tabletop device and is powered from an AC-DC adapter. The remote unit is intended to be powered from an AC-DC adapter or Battery.

The sample was received on June 9, 2003 and tested on June 9, June 10 and July 25, 2003. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	Proposed FCC ID #
Polymap PWA-07-01 Base Station	-	QYPPWA0701

ENCLOSURE

The Base Station enclosure is primarily constructed of plastic. It measures approximately 10 cm wide by 20 cm deep by 5 cm high.

MODIFICATIONS

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

SUPPORT EQUIPMENT

Manufacturer/Model/Description	Serial Number	FCC ID
Winbook / Winbook XL / Laptop	H1106587	DoC

EUT INTERFACE PORTS

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length (m)
RJ11 (x2)	Unterminated			
PC board SV2 connector	Level Shifter	Ribbon Cable	Unshielded	0.5
Level shifter	Laptop Serial	Multiwire	Shielded	1.5

The device would not connect to a PC during normal operation. The PC connection was required during testing to enable control of the transceiver. The PC was located beneath the test table during testing.

EUT OPERATION DURING TESTING

The transmitter was configured to continuously transmit on the selected channel during the test. For occupancy tests the device was set to hop in accordance with the BlueTooth protocol.

ANTENNA REQUIREMENTS

The antenna port is contained within the enclosure of the host system and meets the requirements of 15.203. The gain of the antenna is stated to be 6dBi.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on June 9, June 10 and July 25, 2003 at the Elliott Laboratories Open Area Test Sites # 3 and the 3M lab located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Federal Communications Commission. In accordance with Industry Canada rules detailed in RSS 210 Issue 5 and RSS-212, construction, calibration, and equipment data for the test sites have been filed with the Federal Communications Commission.

The FCC 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 FCC requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4-1992. 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. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

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.

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.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde and 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.

POWER METER

A power meter and peak power sensor are used for all direct output power measurements from transmitters as they provide a broadband indication of the power output.

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 biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers.

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.

ANSI C63.4 specifies 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 FCC requires 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, 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

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

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. 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. Emissions which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

Measurement bandwidths (video and resolution) are set in accordance with FCC procedures for the type of radio being tested.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions from the AC power port are given in units of microvolts, the limits for radiated electric field emissions are given in units of microvolts per meter at a specified test distance and the output power limits are given in temrs of Watts, milliwatts or dBm. 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.

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp) the following formula is used to determine the field strength limit in terms of microvolts per meter 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)

For reference, converting the voltage and electric field strength specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. Conversion of power specification limits from linear units (in milliwatts) to decibel form (in dBm) is accomplished by taking the base ten logarithm, then multiplying by 10.

FCC 15.407 (a)and RSS 210 (o) 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)	Number Of Channels	Output Power
2400 – 2483.5	>= 75	1 W (30 dBm)
2400 – 2483.5	>= 75	0.125 W (21 dBm)

RSS 210 (o) AND FCC 15.247 SPURIOUS RADIATED EMISSIONS LIMITS

T limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands detailed in Part 15.205 and for all spurious emissions from the receiver are:

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level.

FCC AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in FCC Part 15.207.

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

RSS-210 SECTION 6.6 AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in Industry Canada RSS-210 section 6.6.

Frequency Range (MHz)	Limit (uV)	Limit (dBuV)
0.450 to 30.000	250	48

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_r - B = C$$

and

$$C - S = M$$

where:

R_r = Receiver Reading in dBuV

B = Broadband Correction Factor*

C = Corrected Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

* Broadband Level - Per ANSI C63.4, 13 dB may be subtracted from the quasi-peak level if it is determined that the emission is broadband in nature. If the signal level in the average mode is six dB or more below the signal level in the peak mode, the emission is classified as broadband.

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, 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

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

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 30 - 1000 MHz, 09-Jun-03
Engineer: Rafael

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	12	5/13/2003	5/13/2004
EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	12	9/12/2002	9/12/2003
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	12	12/27/2002	12/27/2003

Conducted Emissions, 09-Jun-03
Engineer: volivas

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	1398	12	1/10/2003	1/10/2004
Rohde & Schwarz	Test Receiver, 9kHz-2750MHz	ESCS 30	1337	12	12/27/2002	12/27/2003
Solar Electronics Co	LISN	8028-50-TS-24-BNC	904	12	6/19/2002	6/19/2003

Radiated Emissions, 1 - 6.5 GHz, 10-Jun-03
Engineer: jcadigal

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	1242	12	10/9/2002	10/9/2003
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 6.5GHz	8595EM	780	12	2/20/2003	2/20/2004
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	12	8/14/2002	8/14/2003
Narda West	High Pass Filter 4.0 GHz,	60583 HXF370	247	12	4/17/2003	4/17/2004

Radiated Emissions, 1 - 25GHz, 13-Jun-03
Engineer: Chris

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Hewlett Packard	High Pass filter, 3.5GHz	84300-80038	1157	18	3/1/2002	9/1/2003
EMCO	Horn antenna, D. Ridge 1-18GHz (SA40 system antenna)	3115	1142	12	3/27/2003	3/27/2004
Hewlett Packard	Microwave EMI test system (SA40, 9kHz - 40GHz)	84125C	1149	12	3/12/2003	3/12/2004
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	12	8/14/2002	8/14/2003
Hewlett Packard	Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	12	11/19/2002	11/19/2003

Conducted Emissions, 25-Jul-03
Engineer: mfaustino

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Elliott Laboratories	FCC / CISPR LISN	LISN-3, OATS	304	12	6/5/2002	7/30/2003
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	1398	12	1/10/2003	1/10/2004
Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	1316	12	12/6/2002	12/6/2003

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T50394 23 Pages

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EMC Test Data

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Proj Eng:	Mark Briggs
Contact:	Pierre Landau		
Emissions Spec:	15.247/FCC B/EN 301 489-17	Class:	-
Immunity Spec:	EN 301 489-17/EN 301 489-01	Environment:	-

EMC Test Data

For The

Polymap Wireless

Model

PWR-07-01 and PWA-07-01

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Proj Eng:	Mark Briggs
Contact:	Pierre Landau		
Emissions Spec:	15.247/FCC B/EN 301 489-17	Class:	-
Immunity Spec:	EN 301 489-17/EN 301 489-01	Environment:	-

EUT INFORMATION

General Description

The EUT is a BlueTooth transmission system which is designed to allow data to be transferred from a medical device (such as a blood pressure cuff) to a modem via a wireless link. The system is comprised of a BlueTooth module (Remote) that connects to the serial port of the medical device and a modem (Access Point) with integrated BlueTooth transceiver that sends the data through a telephone line to a server.

The Access Point is designed to be used as a table-top device and is powered from an AC-DC adapter. The remote unit is intended to be powered from an AC-DC adapter or from a host device.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Polymap	PWR-07-01	Remote	Prototype	QYPPWR0701
Polymap	PWA-07-01	Base Station	Prototype	QYPPWA0701
Coby	CA-44	Access Point AC adpater	-	-
Coby	CA-11	Remote AC adpater	-	-

Other EUT Details

The Remote is to be certified as a module for use in the US and Canada. The antenna for the remote is integral to the device (surface mount antenna, connected directly to the circuit board).

EUT Enclosure

The Access Point enclosure is primarily constructed of plastic. It measures approximately 10 cm wide by 20 cm deep by 5 cm high.

The Remote may be provided with a plastic enclosure or without an enclosure when it is to be installed within the enclosure of a host system. The remote has integral shielding to meet the requirements for modular approval as specified by the FCC and Industry Canada.

Modification History

Mod. #	Test	Date	Modification
1			
2			
3			

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Proj Eng:	Mark Briggs
Contact:	Pierre Landau		
Emissions Spec:	15.247/FCC B/EN 301 489-17	Class:	-
Immunity Spec:	EN 301 489-17/EN 301 489-01	Environment:	-

Test Configuration #1-For Digital Device Testing

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
none				

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
none				

Interface Cabling and Ports

		Cable(s)		
Port	Connected To	Description	Shielded or Unshielded	Length(m)
Base Station phone in	Unterminated	RJ11 cable	unshielded	3
Base Station phone out	Unterminated	RJ11 cable	unshielded	3

EUT Operation During Emissions

For Digital Device testing, the EUT was powered on.

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Proj Eng:	Mark Briggs
Contact:	Pierre Landau		
Emissions Spec:	15.247/FCC B/EN 301 489-17	Class:	-
Immunity Spec:	EN 301 489-17/EN 301 489-01	Environment:	-

Test Configuration #3 - For Radio Testing

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Winbook	Winbook XL	Laptop	H1106587	DoC

Remote Support Equipment

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

Access Point Interface Cabling and Ports

		Cable(s)		
Port	Connected To	Description	Shielded or Unshielded	Length(m)
RJ11 (x2)	Unterminated			
PC board SV2 connector	Level Shifter	RibbonCable	Unshielded	0.5
Level shifter	Laptop Serial	Multiwire	Shielded	1.5

EUT Operation During Emissions

The device was configured to continuously transmit on a single channel for power and radiated spurious emissions measurements. For occupancy measurements the device was configured to hop in accordance with the BlueTooth algorithm with maximum dwell time on each frequency.

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	-

Conducted Emissions - Power Ports

Test Specifics

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: 6/9/2003
Test Engineer: Victor Olivas
Test Location: SVOATS #1
Config. Used: 1
Config Change: none
EUT Voltage: 120V/60Hz

General Test Configuration

For tabletop equipment, the EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN.

Ambient Conditions:

Temperature: 18 °C
Rel. Humidity: 60 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	EN55022 B	Pass	-36.4dB @ 0.474MHz

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.

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EMC Test Data

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.474	20.0	Line	56.4	-36.4	QP	
0.474	10.0	Line	46.4	-36.4	Average	
0.158	27.7	Line	65.6	-37.9	QP	
0.197	25.7	Line	63.7	-38.0	QP	
0.201	25.1	Neutral	63.6	-38.5	QP	
0.185	25.7	Neutral	64.3	-38.6	QP	
0.263	21.8	Neutral	61.3	-39.5	QP	
0.263	9.7	Neutral	51.3	-41.6	Average	
0.201	9.8	Neutral	53.6	-43.8	Average	
0.197	9.8	Line	53.7	-43.9	Average	
0.185	9.8	Neutral	54.3	-44.5	Average	
0.158	10.0	Line	55.6	-45.6	Average	

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Radiated Emissions

Test Specifics

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: 6/10/2003
Test Engineer: Joseph Cadigal
Test Location: SVOATS #3

Config. Used: 3
Config Change: none
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.
For radiated emissions testing the measurement antenna was located 3 meters from the EUT.
Unless stated otherwise the EUT was operating such that it constantly transmitted on either the low, center or high channels.

Ambient Conditions:

Temperature: 20.6 °C
Rel. Humidity: 52 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 1 - 2500 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	-7.7dB @ 7440 MHz

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:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Run #1a: Radiated Spurious Emissions, 1 - 2500 MHz. Low Channel @ 2402 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2402.000	95.9	v	-	-	Pk	296	1.0	
2402.000	92.0	v	-	-	Avg	296	1.0	
4804.000	55.6	v	74.0	-18.4	Pk	290	1.0	
4804.000	43.1	v	54.0	-10.9	Avg	290	1.0	
7206.000	58.0	v	75.9	-17.9	Pk	153	1.0	
2402.000	90.5	h	-	-	Pk	280	2.4	
2402.000	87.0	h	-	-	Avg	280	2.4	
4804.000	56.4	h	74.0	-17.6	Pk	300	2.0	
4804.000	43.0	h	54.0	-11.0	Avg	300	2.0	
7206.000	53.6	h	75.9	-22.3	Pk	262	1.0	
Band edge measurements								
2390.000	39.9	v	74.0	-34.1	Pk	296	1.0	
2390.000	36.0	v	54.0	-18.0	Avg	296	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	No spurious emissions visible above the noise floor beyond 8 GHz
Note 3:	Band edge measurement - calculated by applying band edge delta measurement (-56dBc) to peak and average measurements of the fundamental signal.

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Run #1b: Radiated Spurious Emissions, 1 - 2500MHz. Center Channel @ 2441 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2441.000	94.7	v	-	-	Pk	292	1.0	
2441.000	91.6	v	-	-	Avg	292	1.0	
4804.000	58.7	v	74.0	-15.3	Pk	0	1.0	
4804.000	44.6	v	54.0	-9.4	Avg	0	1.0	
7323.000	57.1	v	74.0	-16.9	Pk	219	1.0	
7323.000	47.9	v	54.0	-6.1	Avg	219	1.0	
2441.000	91.4	h	-	-	Pk	140	2.4	
2441.000	87.4	h	-	-	Avg	140	2.4	
4882.000	56.9	h	74.0	-17.1	Pk	360	2.0	
4882.000	44.6	h	54.0	-9.4	Avg	360	2.0	
7323.000	53.1	v	74.0	-20.9	Pk	209	1.0	
7323.000	43.4	v	54.0	-10.7	Avg	209	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	No spurious emissions visible above the noise floor beyond 8 GHz

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EMC Test Data

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Run #1c: Radiated Spurious Emissions, 1 - 2500 MHz. High Channel @ 2480MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.000	93.3	v	-	-	Pk	300	1.0	
2480.000	89.4	v	-	-	Avg	300	1.0	
4960.000	48.4	v	74.0	-25.6	Pk	0	1.0	2nd harmonic
4960.000	36.0	v	54.0	-18.0	Avg	0	1.0	2nd harmonic
7440.000	55.0	v	74.0	-19.0	Pk	353	1.0	
7440.000	46.3	v	54.0	-7.7	Avg	353	1.0	
2480.000	89.4	h	-	-	Pk	262	2.6	
2480.000	85.4	h	-	-	Avg	262	2.6	
4960.000	57.0	h	74.0	-17.0	Pk	250	2.3	2nd harmonic
4960.000	44.6	h	54.0	-9.4	Avg	250	2.3	2nd harmonic
7440.000	50.4	v	74.0	-23.6	Pk	309	1.0	
7440.000	40.1	v	54.0	-13.9	Avg	309	1.0	
Band edge measurements								
2483.500	51.3	v	74.0	-22.7	Pk	300	1.0	
2483.500	47.4	v	54.0	-6.6	Avg	300	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	No spurious emissions visible above the noise floor beyond 8 GHz
Note 3:	Band edge measurement - calculated by applying band edge delta measurement (-42dBc) to peak and average measurements of the fundamental signal.

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Antenna Port Conducted Emissions

Test Specifics

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: 6/10/2003
Test Engineer: Chris Byleckie
Test Location: 3m Lab
Config. Used: 3
Config Change: None
EUT Voltage: 120V/60Hz

General Test Configuration

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.
Unless stated otherwise the EUT was operating such that it constantly transmitted on either the low, center or high channels.

Summary of Results

Run #	Test Performed	Limit	Result	Comments
1	20dB Bandwidth	15.247(a)	Pass	1.0MHz
2	Output Power	15.247(b)	Pass	-2.4 dBm
3	Channel Occupancy	15.247(a)	Pass	335mS
3	Channel Separation	15.247(a)	Pass	1.035MHz
3	Number of Channels	15.247(a)	Pass	79
4	Out-of-Band Spurious	15.247(a)	Pass	All emisisons < -20dBc
4	Band Edge levels	15.247(a)	N/A	Refer to run

Modifications Made During Testing:

No modifications were made to the EUT during testing

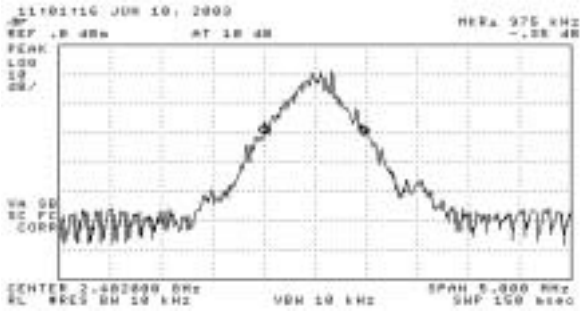
Deviations From The Standard

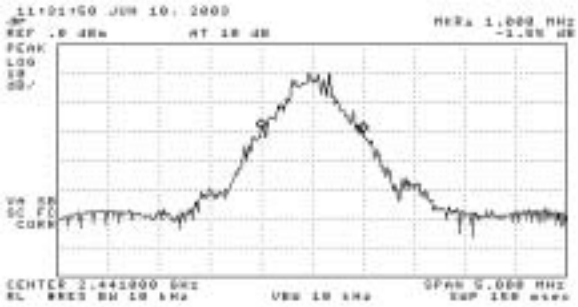
No deviations were made from the requirements of the standard.

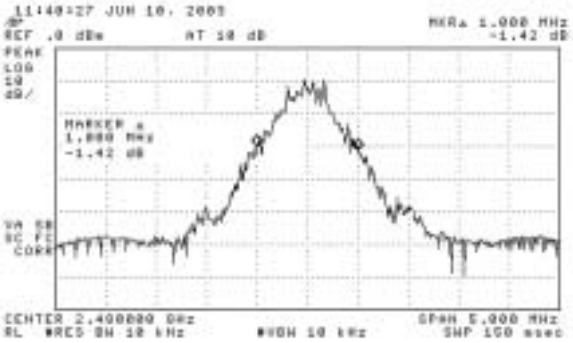
Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Run #1: Signal Bandwidth

Channel	Frequency (MHz)	Resolution Bandwidth (kHz)	20dB Signal Bandwidth
Low	2402	10	.975 MHz
Mid	2441	10	1.0 MHz
High	2480	10	1.0 MHz



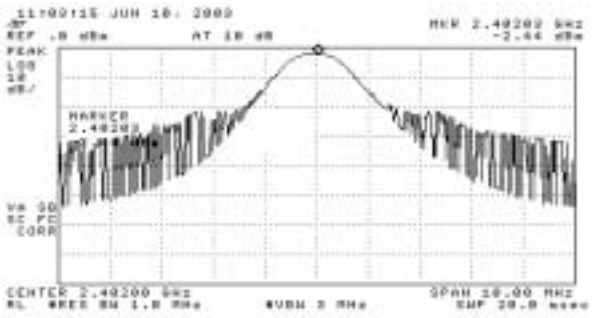


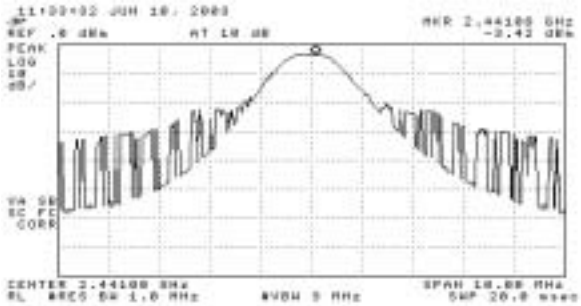


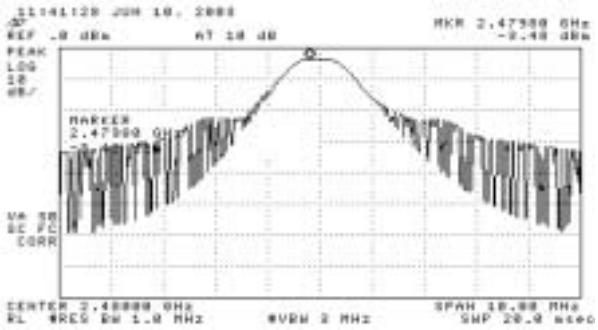
Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Run #2: Output Power

Channel	Frequency MHz	Output Power		Notes
		dBm	mW	
Low	2402	-2.4	0.5754	level = b9
Mid	2441	-3.4	0.4571	level = b9
High	2480	-3.5	0.4467	level = b9







Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Run #3: Channel Occupancy And Spacing

The channel occupancy was measured with the radio transmitting normally (i.e. In hopping mode)

The channel spacing was: 1.035 MHz

Channel spacing was wider than the 20dB bandiwdth as per the requirements of FCC 15.247 / RSS 210

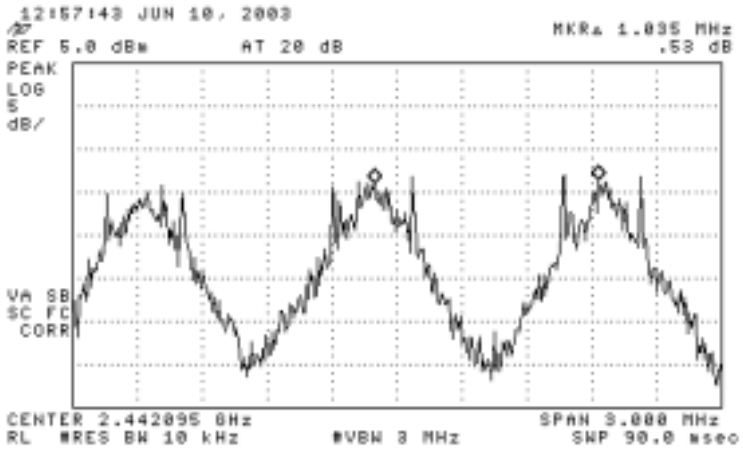
The transmit time on the channel was: 0.525 ms

The time between hops on the same channel was: 0.047 seconds

The number of channels was: 79

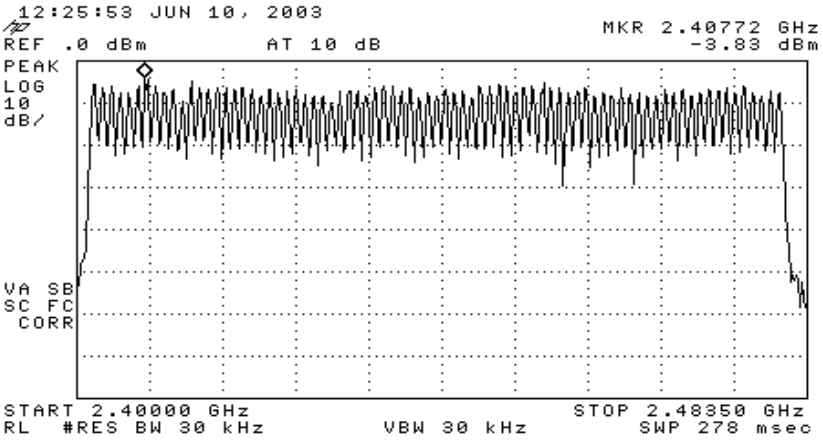
Number of times per 30 seconds a channel is used: 638.2979

The transmit time per channel per 30 seconds is, therefore: 335.1 ms

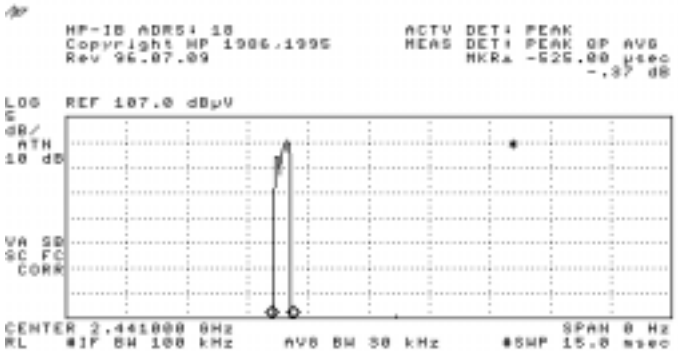


Plot showing 1.035MHz channel spacing

Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

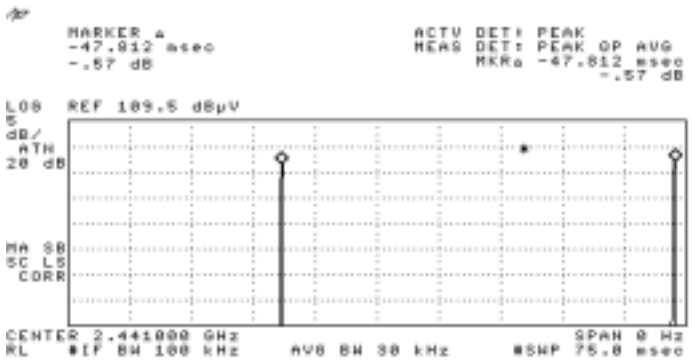


Plot showing all 79 channels



Plot showing transmit time on a channel (.53ms)

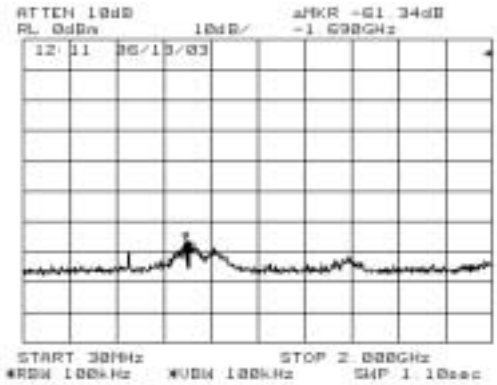
Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

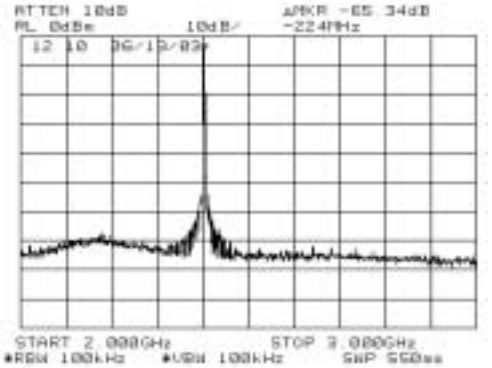


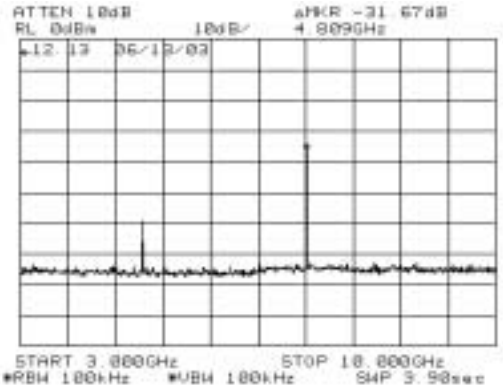
Plot showing time spacing between successive transmissions on the same channel (47ms)

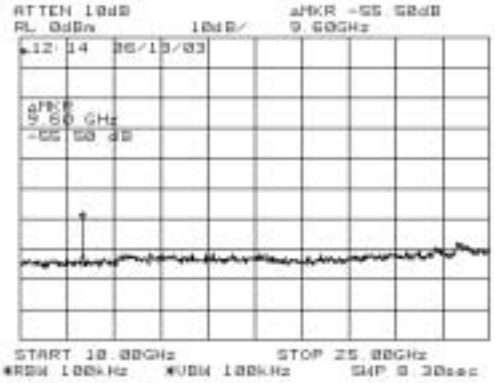
Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Run #4: Out of Band Spurious Emissions
Run #4a: Low Channel









Plot showing out of band spurious - low channel

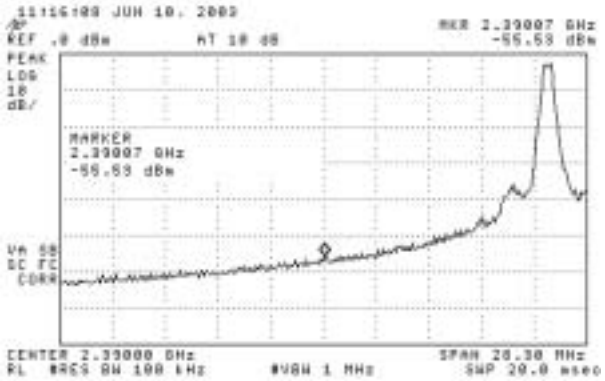
Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Band-Edge Measurements - Plots for use with radiated measurements of the fundamental

Level of fundamental: -2.9dBm (RBW=100kHz, VBW=1MHz)

Level at 2390MHz band edge: -55.5dBm (RBW=100kHz, VBW=1MHz)

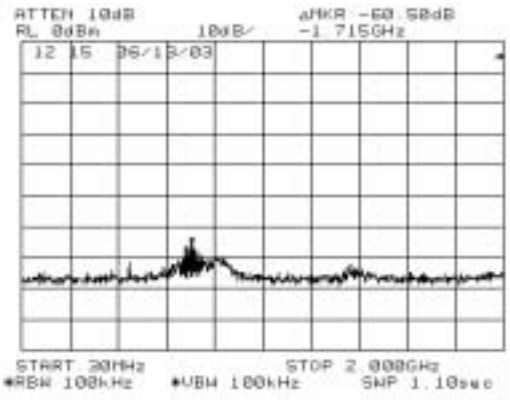
Band edge level is **-56dBc (peak)**

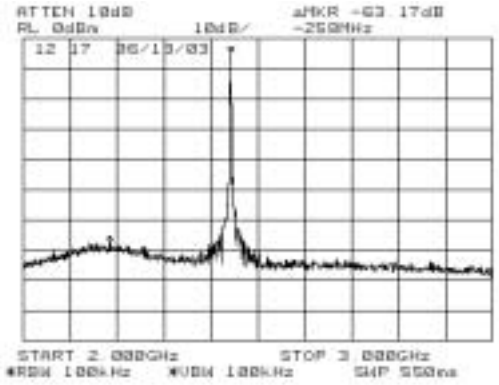


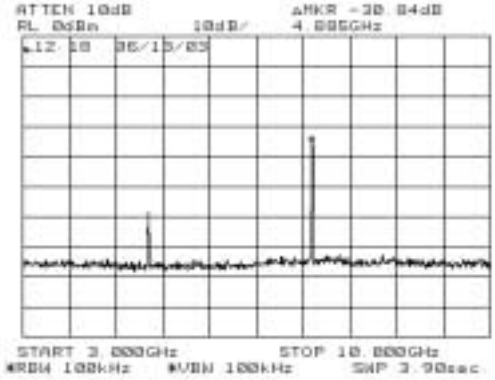
Plot of lower band edge relative to low channel signal

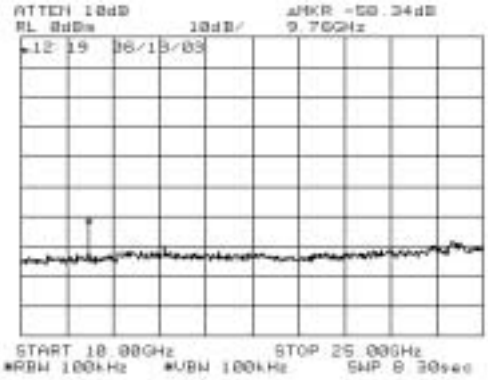
Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Run #4b: Middle Channel





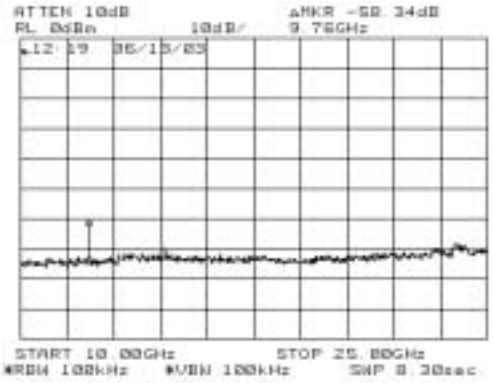


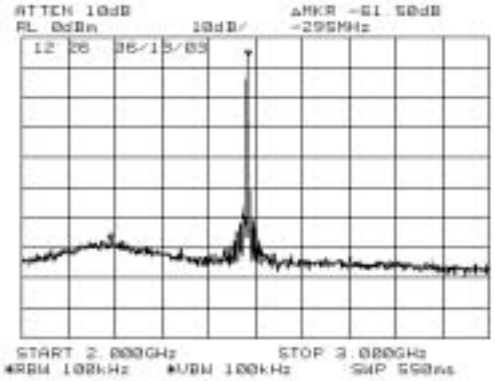


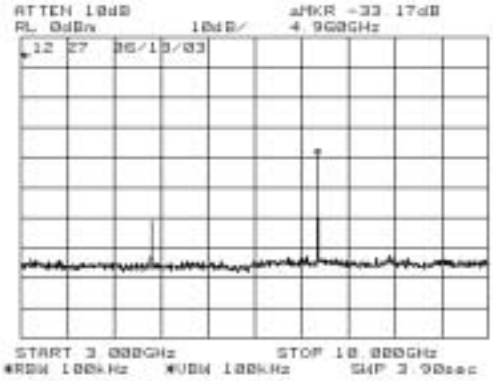
Plot showing out of band spurious - mid channel

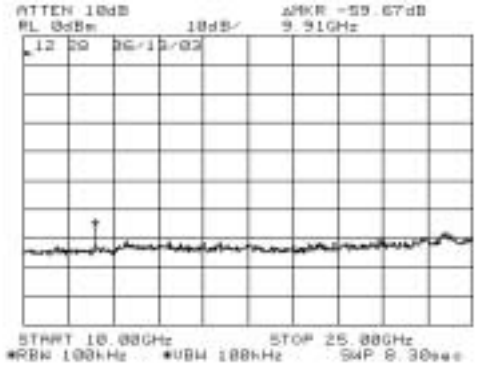
Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Run #4c: High Channel









Plot showing out of band spurious - high channel

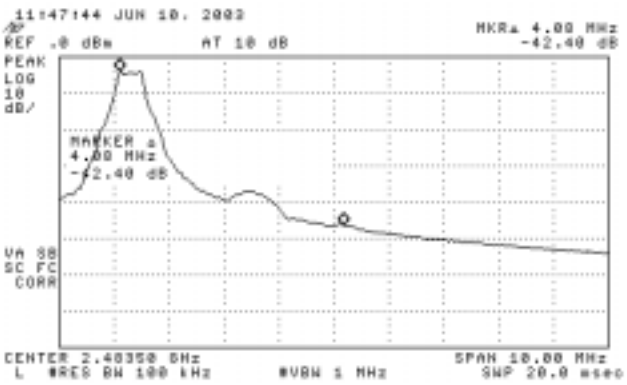
Client:	Polymap Wireless	Job Number:	J50350
Model:	PWR-07-01 and PWA-07-01	T-Log Number:	T50394
		Account Manager:	Mark Briggs
Contact:	Pierre Landau		
Spec:	15.247/FCC B/EN 301 489-17	Class:	N/A

Band-Edge Measurements - Plots for use with radiated measurements of the fundamental

Level of fundamental: -3.9dBm (RBW=100kHz, VBW=1MHz)

Level at 2491.75MHz (highest signal in Restricted band): -46.3dBm (RBW=100kHz, VBW=1MHz)

Band edge level is **-42dBc (peak)**

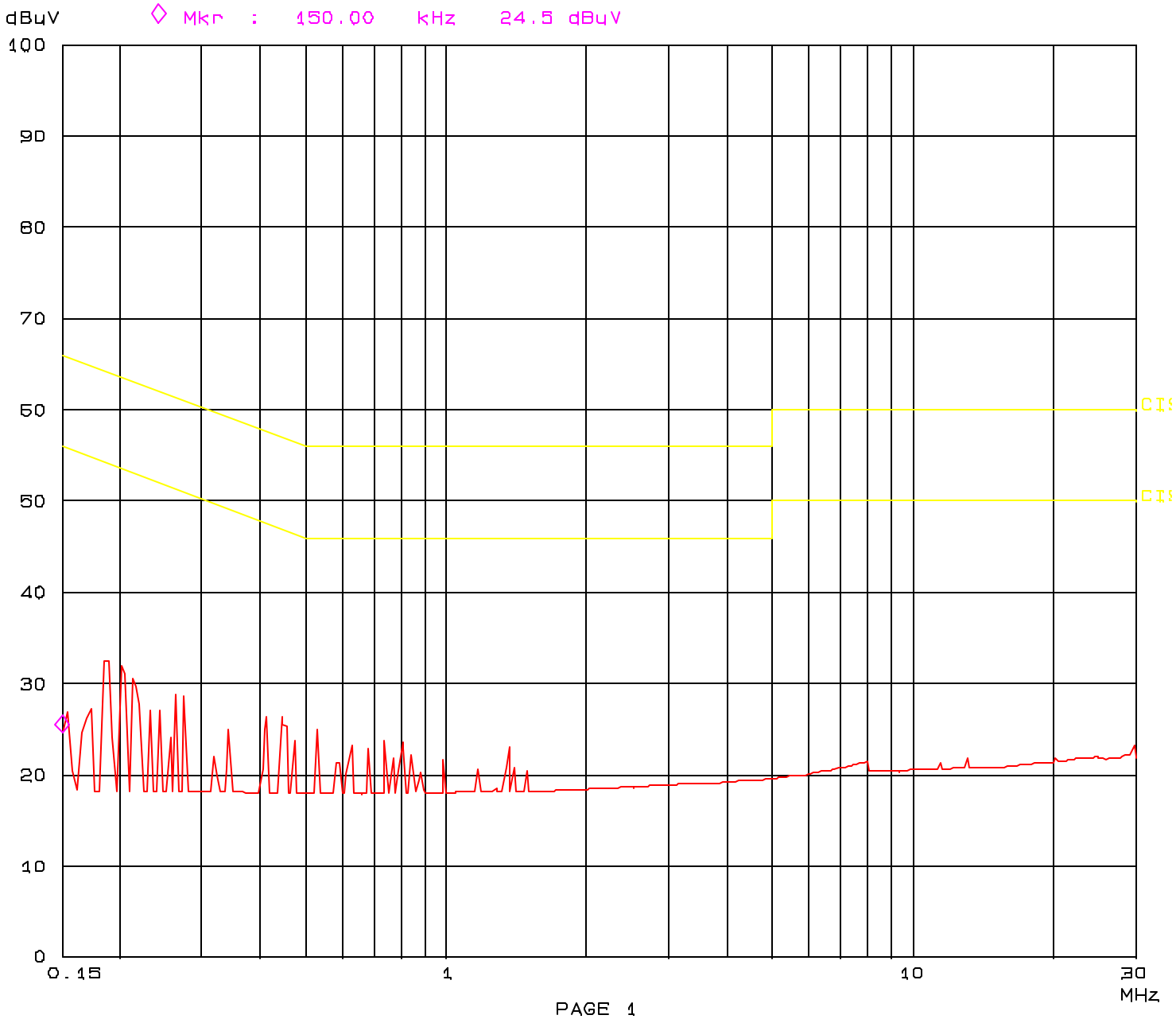


Plot of upper band edge relative to high channel signal

Elliott Laboratories
Conducted Emissions DC

09. Jun 03 23:20

EUT:	Remote and Base Station
Manuf:	Polymap Wireless
Op Cond:	120V
Operator:	Victor M. Olivas Jr
Test Spec:	EN55022 B
Comment:	J50350 / T50394
	Neutral



Elliott Laboratories
Conducted Emissions DC

09. Jun 03 23:07

EUT:	Remote and Base Station
Manuf:	Polymap Wireless
Op Cond:	120V
Operator:	Victor M. Olivas Jr
Test Spec:	EN55022 B
Comment:	J50350 / T50394
	Line