



CERT NO: 2088-01

TEST REPORT #220508

STANDARD: FCC PART 15

SUBPART C--INTENTIONAL RADIATORS

**SECTION 15. 249 OPERATION WITHIN THE BANDS 902-928 MHZ,
2400-2483.5 MHZ, AND 5725-5875 MHZ AND 24.0 TO 24.25 GHZ**

EQUIPMENT TESTED:

PACKET POWER LLC

POWER MONITORING NODE

FCC ID: WCGP2E1C1

MODEL: P2-E1C1

TEST DATE: 22 MAY 2008

1100 Falcon Avenue
Glencoe, MN 55336



CERTIFICATION SERVICES, INC.

Tele: 320-864-4444
Fax: 320-864-6611

Prepared for:

Packet Power LLC
2095 Salem Ct
Orono, MN 55356

Test agent:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336
Tele: 320-864-4444
Fax: 320-864-6611

Test location:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336
Tele: 320-864-4444
Fax: 320-864-6611

Prepared by:

International Certification Services, Inc.
1100 Falcon Avenue
Glencoe, MN 55336

International Certification Services represents to the client that testing is done in accordance with standard procedures applicable and that reported test results are accurate within generally accepted commercial ranges of accuracy.

This report only applies to the specific samples tested under stated test conditions. It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical components. International Certification Services shall have no liability for any deductions, inferences or generalizations drawn by the client or others from this report.

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1.0 TEST SUMMARY

TEST REPORT: #220508

COMPANY: Packet Power, LLC

AGENT: International Certification Services, Inc.

PHONE: 320-864-4444

TEST DATE: 22 May, 2008

EQUIPMENT UNDER TEST: 902 to 928 Mhz Transmitter Power Monitoring Node
Model: P2-E1C1

GENERAL TEST SUMMARY: The testing was performed at International Certification
Services, Inc. at 1100 Falcon Ave, Glencoe, MN 55336

VERIFICATION / CERTIFICATION STATUS: The 902 to 928 Mhz Transmitter Power Monitoring Node
Model: P2-E1C1 was found to be in compliance with the FCC
Part 15 Subpart C, Section 15.249 requirements.

MODIFICATIONS NECESSARY: None

TESTED BY

Duane R. Bagdons

WRITTEN BY

Duane R. Bagdons



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Applicable Standards

47 CFR Ch.1 (10-1-98 Edition)

FCC Part 15 Radio Frequency Devices

Subpart C Intentional Radiators

Section 15.249 Operation within the bands 902-928 Mhz, 2400-2483.5 Mhz, 5725-5875 Mhz and 24.0 to 2425 Ghz..

2.1 Referenced Standards

ANSI C63.4-2003 Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 Khz to 40 Ghz.

2.2 Equipment Units Tested

The equipment tested was a battery powered 902 to 928 Mhz transmitter model: P2-E1C1 Power Monitoring Node product. The antenna is a precise length and shaped wire on the pc board. This device uses a Nordic nRF905 Transceiver chip that produces an output that is GFSK (Gaussian Frequency Shift Keying) modulated (not digitally modulated). It is a frequency hopping circuit that uses 64 channels. This device transmits a burst once every minute. The Burst duration is 6.21 mS maximum in duration. This time is controlled by the internal firmware of the chip. The transmission burst occurs once every 45 seconds by firmware control.

2.3 Equipment and Cable Configuration

See photo of the EUT test configuration setup in Attachment A

2.4 List of Test Equipment

<u>Test Equipment</u>	<u>Model</u>	<u>S/N</u>	<u>Calibration Date</u>
Spectrum Analyzer	Hewlett-Packard 8566B	2421A00458	01/25/08
Preamplifier	MiniCircuits ZKL-2R7	N/A	10/17/07
Biconical Antenna	AH Systems Model SAS-200/540	328	08/30/07
Log Periodic Antenna (200-1000 MHz)	EMCO 3146	9111-3280	08/30/07
Horn Antenna (1-18 Ghz)	EMCO 3115	5697	08/30/07

Measurement cable losses, and antenna correction factors are included in the data sheets. The Resolution BW was set at 1 Mhz and the Video BW was set at 1 Hz with a Span of 0 Hz to perform the correct average detected measurements over 1000 Mhz.

2.5 Units of Measurement.

All measurements were taken in dBuV/m with the antenna located at 2 meters distance from the EUT. Frequency measurements are recorded in Mhz

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2.6 Location of Test Site

The open area test site (OATS) measurement facility used to collect the data was International Certification Services, Inc. at 1100 Falcon Ave in Glencoe, MN 55336. This site has been certified to be in spec of the normalized site attenuation per ANSI C63.4-2003.

2.7 Measurement Procedures

The antenna was placed at a distance of 2 meters from the EUT. The EUT was set on an insulating table in the OATS site and rotated through 360 degrees to determine the worst case EUT orientation. The antenna was then positioned vertical and horizontal to determine which antenna polarity orientation was worst case. Then certification data was recorded at all the transmitter frequencies from the fundamental to the 10th harmonic at an antenna height variation of from 1-4 meters.

2.8 Reporting Measurement Data

See data sheets and plots in Attachment B.

2.9 Radiated Emissions Data

The frequency and amplitude of the tuned frequency of the EUT along with the frequencies and amplitudes of the harmonics up to the 10th harmonic are reported in the data sheets in Attachment B. This information is plotted against the limit of section 15.249 of FCC Part 15 subpart C. Both Horizontal and Vertical antenna polarities as well as antenna heights of 1 to 4 meters were observed but all maximum signal strengths occurred in the Horizontal antenna polarity and at 1 meter antenna height.

The Final Level, expressed in dBuV/m, is arrived at by taking the reading from the spectrum analyzer (Level dBuV) and adding the antenna correction factor and cable loss factor (Factor dB) and subtracting the preamp gain. This result then has the FCC limit subtracted from it to provide the margin which gives the tabular data as shown in the data sheets in Attachment B.

Example:

<u>Frequency</u> <u>(MHz)</u>	<u>Level</u> <u>(dBuV)</u>	+	<u>Factor</u> <u>(dB)</u>	=	<u>Corr Data</u> <u>(dBuV/m)</u>	-	<u>FCC Limit</u> <u>(dBuV/m)</u>	=	<u>Margin</u> <u>(dB)</u>
100.0	20.6	+	11.0	=	31.6	-	43.5	=	-11.9

2.10 Operating Frequency Data for Intentional Radiators

All operating frequencies and harmonic frequencies and ambient temperature at which all data was taken at is recorded in the data sheets in Attachment B.

2.11 Occupied Bandwidth Data for Intentional Radiators

The occupied BW data for the EUT is listed in the data sheets in Attachment B.

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2.12 Summary of Results

The EUT passed the requirements of FCC Part 15 Subpart C, Section 15.249 with a maximum output power of 34.20 uWatts at the fundamental frequency of 902.433 Mhz against a limit of 1.0 Watt. No modifications were necessary to accomplish this compliance.

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ATTACHMENT A

RADIATED MEASUREMENT

TEST SET UP

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**Packet Power LLC
Power Monitoring Node
Model: P2-E1C1
Radiated Emissions
Test Configuration**



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ATTACHMENT B

DETAILED TEST DATA SHEETS

Each radiated emissions plot indicates the receiving antenna measurement distance in meters and the emission amplitudes with respect to their applicable limits. The associated tabulation for each radiated plot lists the emission frequency, the final emission level, and the margin from the limit.

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Packet Power, LLC
Power Monitoring Node
Model: P2-E1C1
Temperature: 50 Deg F.
Humidity: 69 % R.H.

Test Technician: Duane R. Bagdons

Center Frequency: 902.43 Mhz (low channel)
914.83 Mhz (mid channel)
927.63 Mhz (high channel)

Preliminary testing was done to determine what antenna polarity and antenna height generated the highest signal levels. Tests were performed at this test configuration and then each frequency was maximized to 0-360 degrees orientation and antenna height of 1-4 meters.

FCC 15.249 (a)

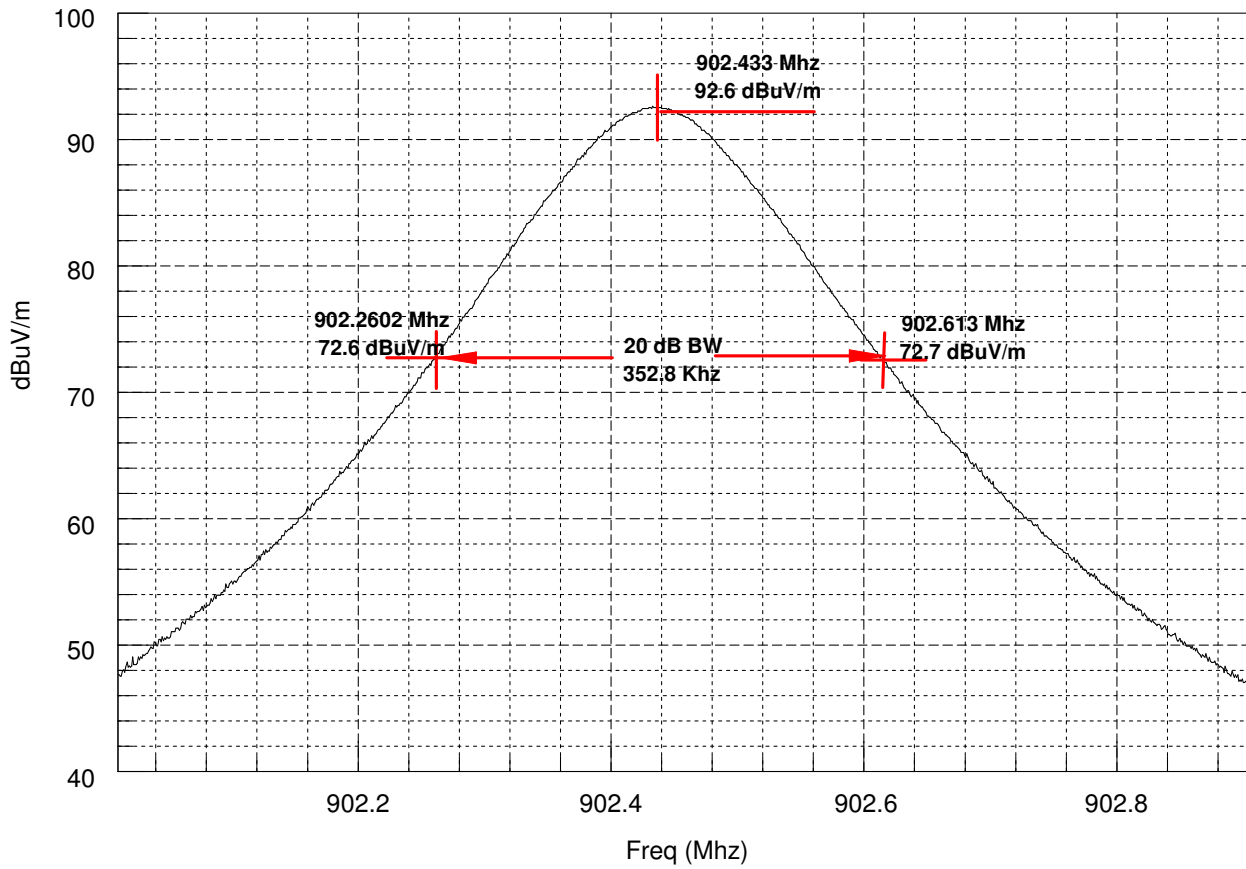
Channel	Frequency (Mhz)	Amplitude (dBuV/m)	FCC 15.249 Limit (dBuV/m)	Margin (dB)
Low Channel	902.2602	72.6	93.979	-21.379
	902.433	92.6	93.979	-1.379
	902.613	72.7	93.979	-21.279
Mid Channel	914.6569	71.6	93.979	-22.379
	914.8333	91.5	93.979	-2.479
	915.0178	71.59	93.979	-22.389
High Channel	927.463	60.25	93.979	-33.729
	927.639	80.347	93.979	-13.632
	927.816	60.44	93.979	-33.539

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Packet Power, LLC
Power Monitoring Node Model: P2-E1C1
FCC 15.249 Signal Bandwidth (20 dB)
Low Channel (902.4 Mhz)



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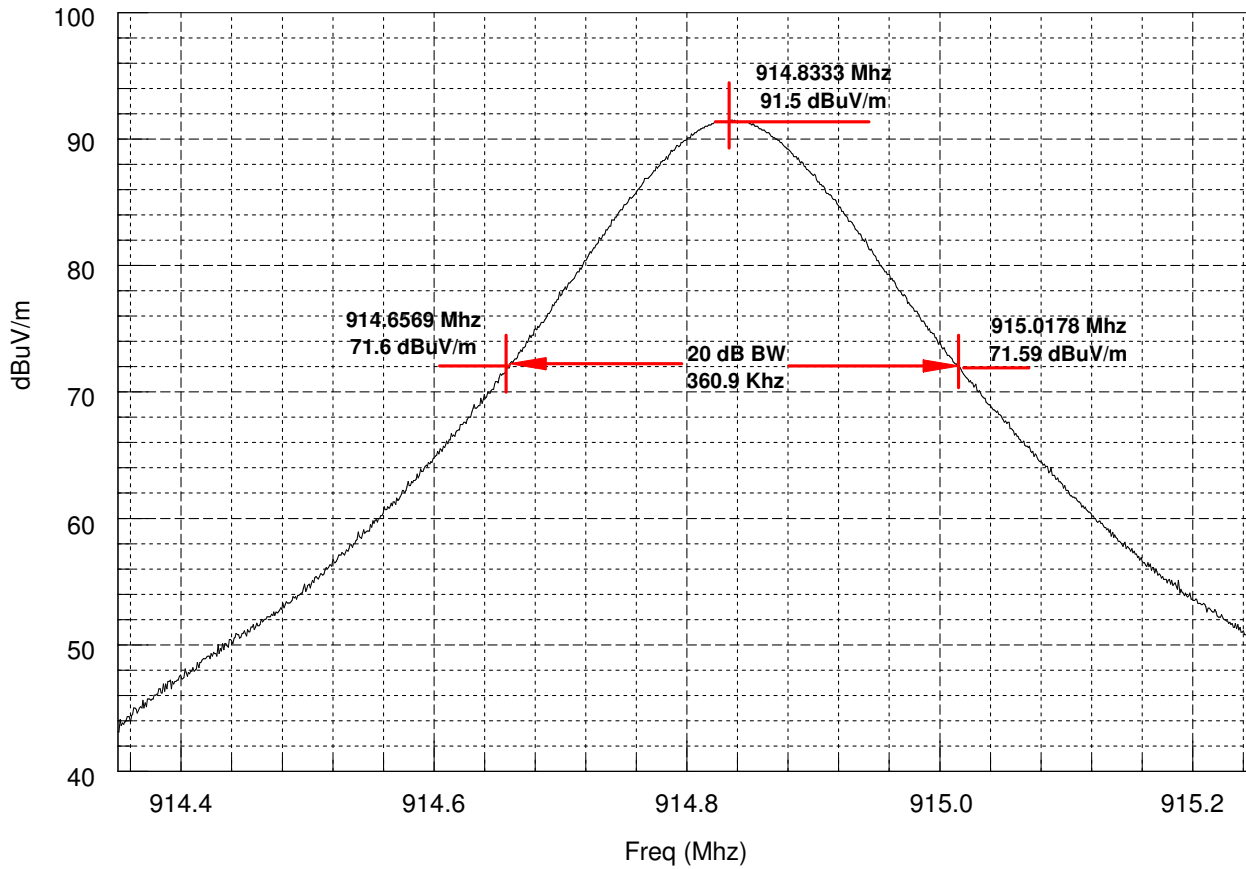
May 19, 2008

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Packet Power, LLC
Power Monitoring Node Model: P2-E1C1
FCC 15.249 Signal Bandwidth (20 dB)
Middle Channel (914.8333 Mhz)



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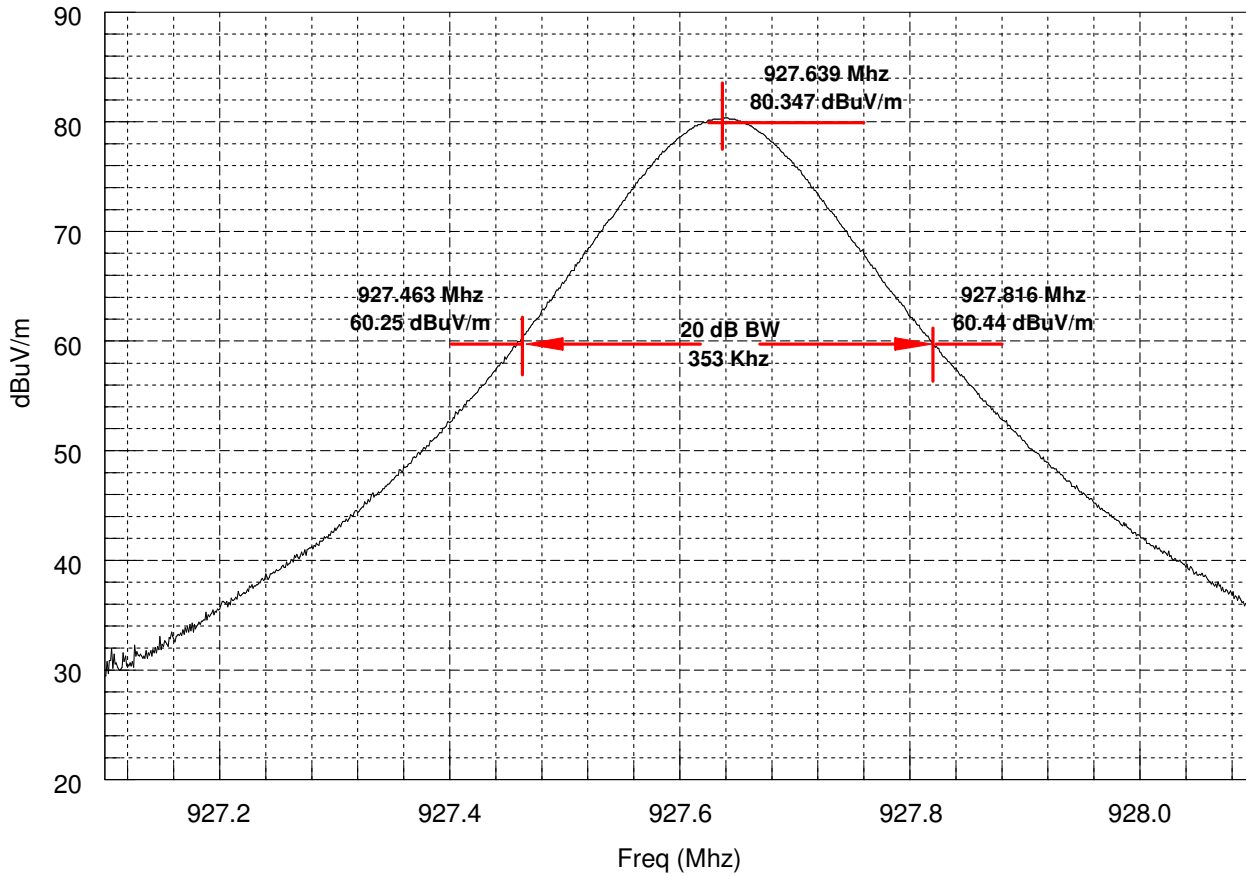
May 19, 2008

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Packet Power, LLC
Power Monitoring Node Model: P2-E1C1
FCC 15.249 Signal Bandwidth (20 dB)
High Channel (927.639 Mhz)



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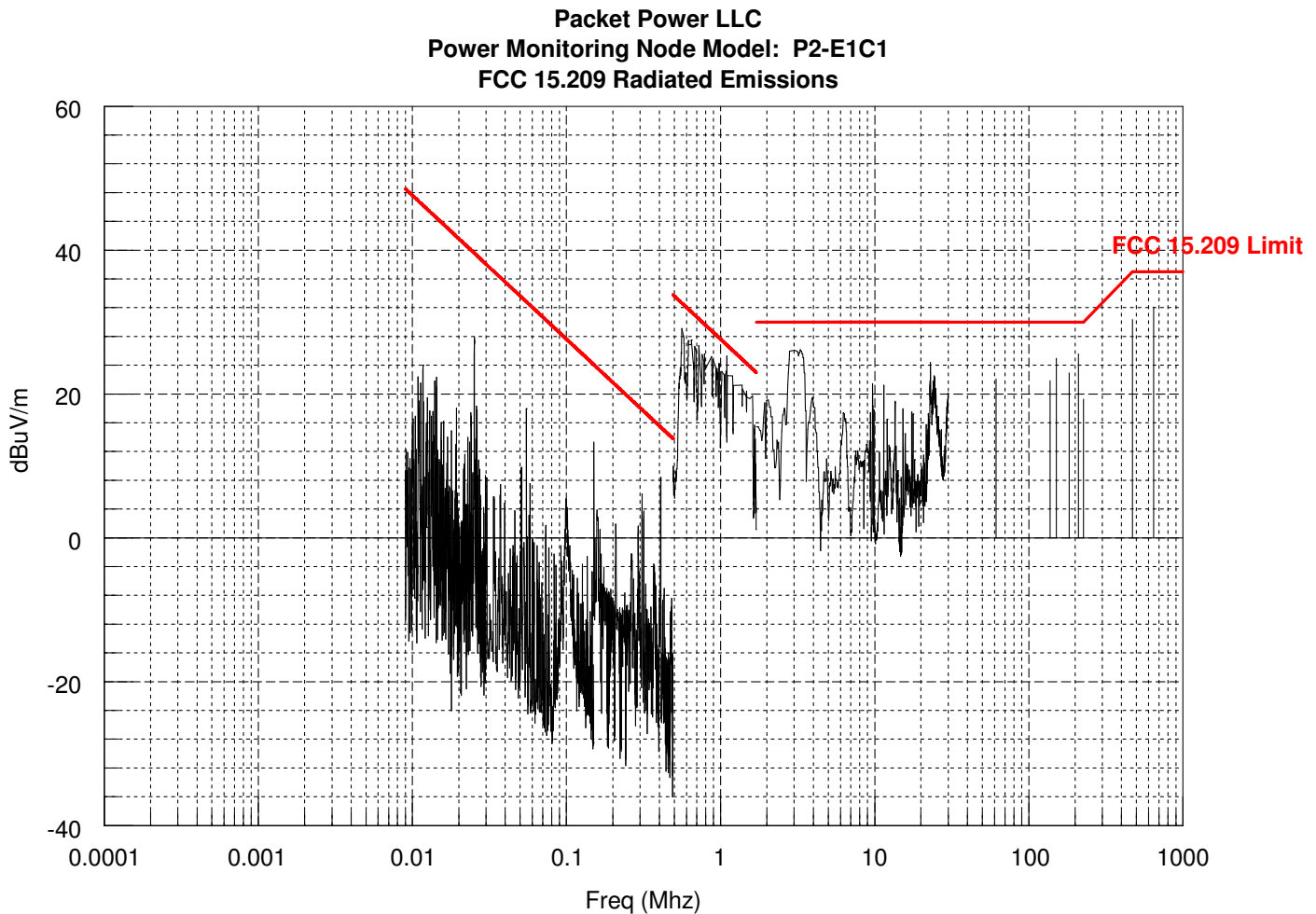


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FCC 15.249 (b): N/A

FCC 15.249 (c) All radiated Emissions tests were performed at an antenna distance of 3 meters.

FCC 15.249 (d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in Section 15.209, whichever is the lesser attenuation.



International Certification Services, Inc.

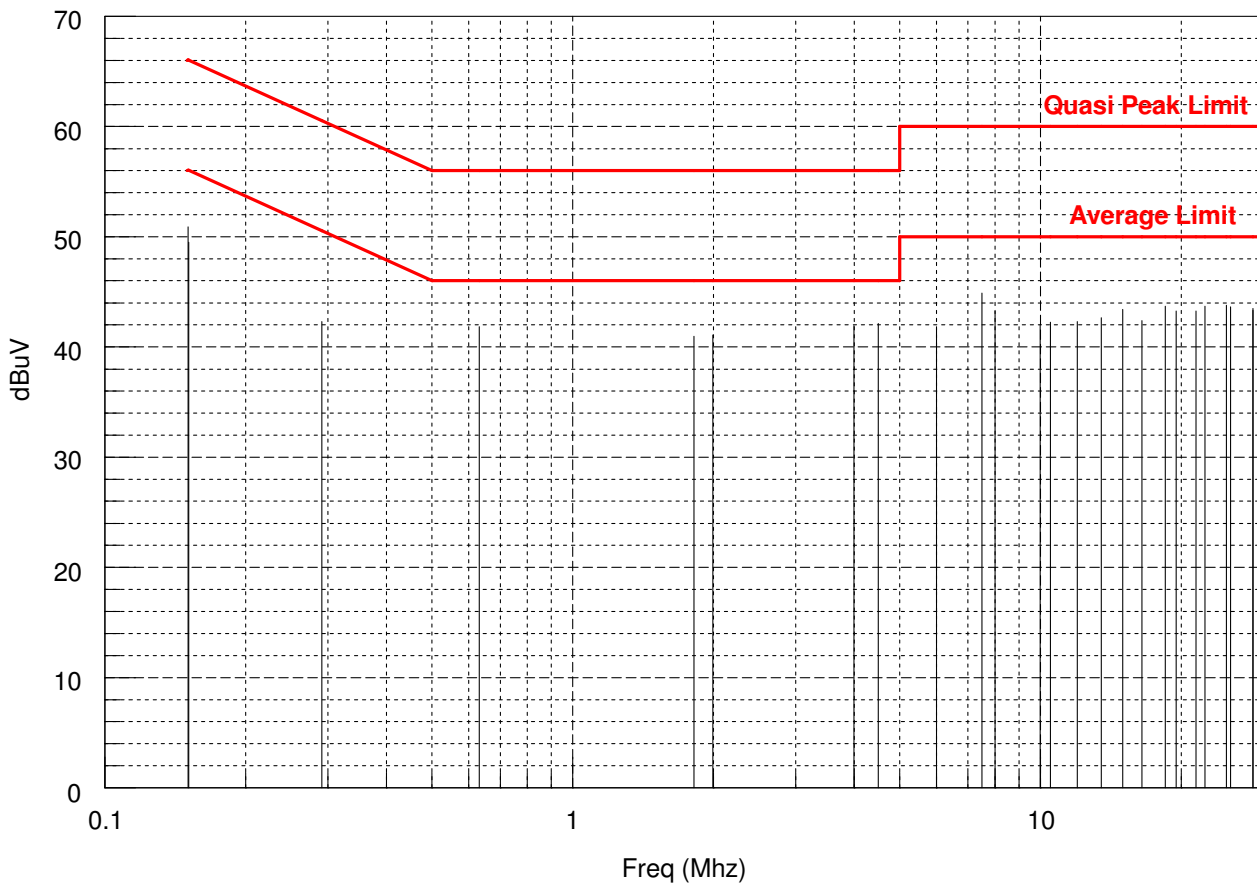
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Packet Power LLC
Power Monitoring Node Model: P2-E1C1
FCC 15.207 Conducted Emissions (120 VAC, 60 Hz)



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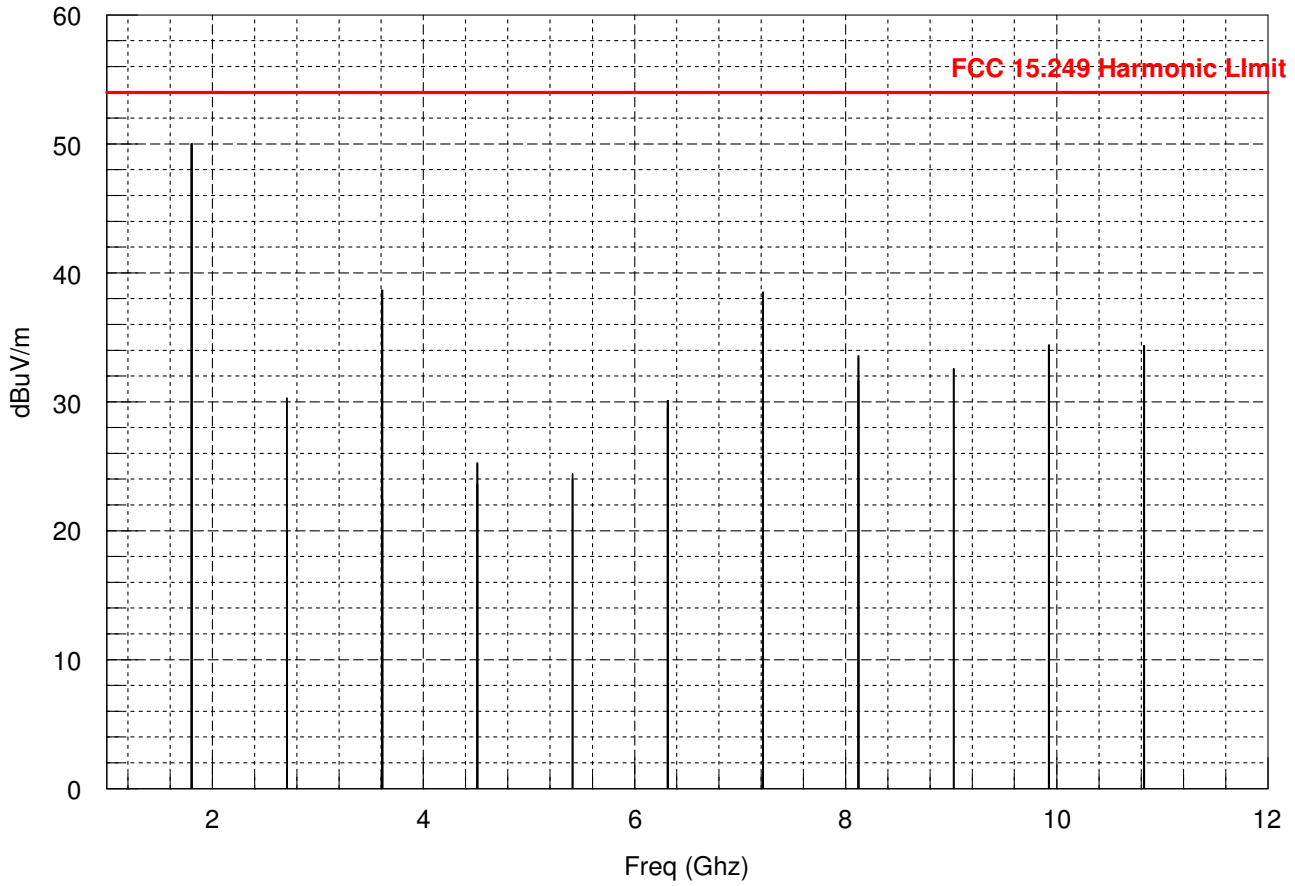
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Packet Power, LLC
Model: Power Monitoring Node
FCC 15.249 Harmonic Amplitudes
Low Channel (902.4 Mhz)



International Certification Services, Inc.

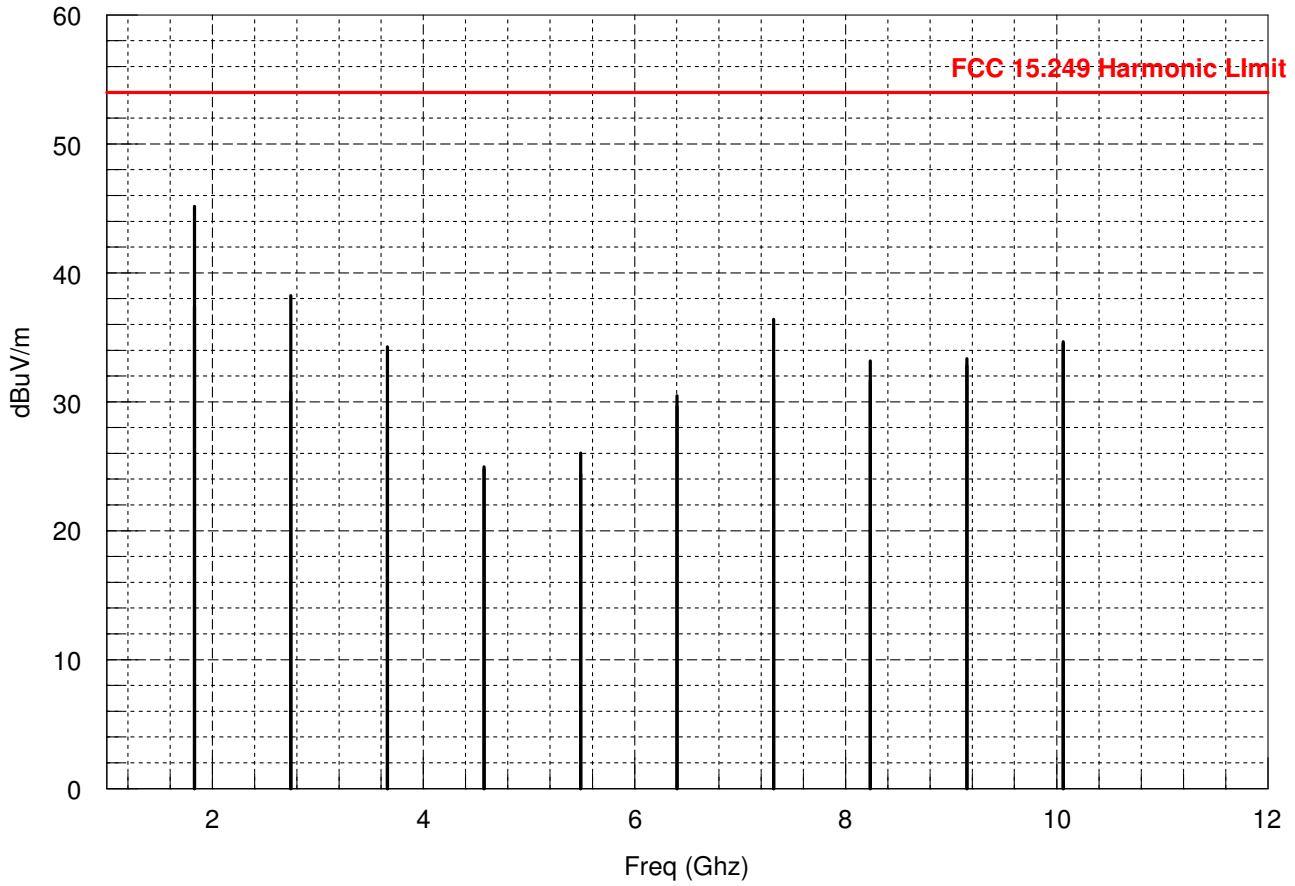
May 22, 2008

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CERTIFICATION SERVICES, INC.

Packet Power, LLC
Model: Power Monitoring Node
FCC 15.249 Harmonic Amplitudes
Middle Channel (914.8 Mhz)



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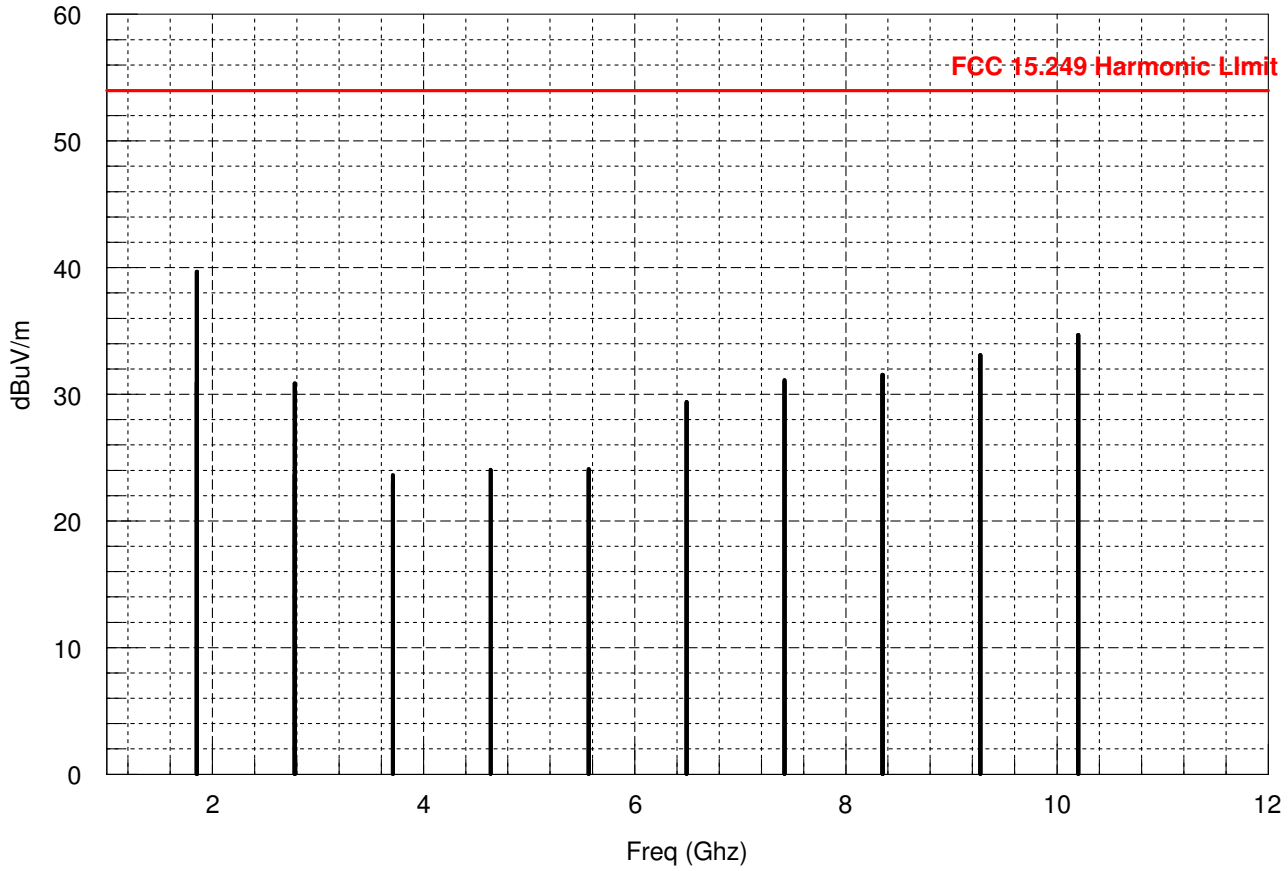
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CERTIFICATION SERVICES, INC.

Packet Power, LLC
Model: Power Monitoring Node
FCC 15.249 Harmonic Amplitudes
High Channel (927.6 Mhz)



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ATTACHMENT C

**PRODUCT DATA SHEET OR PRODUCT INFORMATION FORM AS SUPPLIED
BY THE CUSTOMER**

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CERTIFICATION SERVICES, INC.

COMPANY NAME: Packet Power, LLC

CUSTOMER REPRESENTATIVE: International Certification Services, Inc.

EQUIPMENT DESCRIPTION: Power Monitoring Node (902-928 Mhz Transmitter)

MODEL NUMBER: P2-E1C1

SERIAL NUMBER: 1002

TYPE OF TEST: ☐ Development
☐ Initial Design Verification
☐ Design Change (Please describe exact changes below)
☒ Production Sample (Audit Test)
Changes made: NONE

OSCILLATOR FREQUENCIES:

32.768 Khz, 16 Mhz

PRODUCT SHIELDING PROVISION:

Plastic enclosure

SOFTWARE AND / OR OPERATING MODES:

Packet Power Host Software, V 1.0

I/O CABLES: NONE

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