Technical Information

Applicant		Manufacturer	
Name:	Perimeter Technologies, Inc.	Name:	Perimeter Technologies, Inc.
Address:	730 Hemlock Road	Address:	730 Hemlock Road
City, State, Zip:	Morgantown, PA 19453	City, State, Zip:	Morgantown, PA 19453

Test Specification:

FCC Rules and Regulations Part 15, Subpart C, Para. 15.247

Test Procedure: ANSI C63.4:2003

Test Sample Description

TEST SAMPLE: 2.4 GHz Wireless Base Station Transceiver

BRANDNAME: Perimeter Technologies, Inc.

MODEL: PWF-100

FCC ID: Q8T10000101

TYPE: Chirp Spread Spectrum Transceiver

POWER REQUIREMENTS: 12 VAC, 60 Hz derived from 120 VAC, 60 Hz Adaptor

FREQUENCY OF OPERATION: 2.4 to 2.4835 GHz

Tests Performed

The test methods performed on the 2.4 to 2.4835 GHz Wireless Base Station Transceiver are shown below:

FCC Part 15, Subpart C	Test Method
15.247(a)(2)	Occupied Bandwidth
15.247(b)(3)	Power Output
15.247(d)	Antenna Port, Conducted Emissions
15.247(e)	Antenna Port, Power Density
15.247(d) and 15.205	Spurious Radiated Emissions 30 MHz to 25 GHz
15.247(d) and 15.205	Spurious Radiated Emissions, Band Edge
15.207(b)	Conducted Emissions, Power Leads, 150 kHz to 30 MHz

Certification and Signatures

We certify that this report is a true representation of the results obtained from the tests of the equipment stated. We further certify that the measurements shown in this report were made in accordance with the procedures indicated and vouch for the qualifications of all Retlif Testing Laboratories personnel taking them.

Joseph Maiello
Branch Manager

Richard J. Reitz
Laboratory Manager
iNARTE Certified Engineer ATL-0036-E

Non-Warranty Provision
The testing services have been performed, findings obtained and reports prepared in accordance with generally accepted laboratory principles and practices. This warranty is in lieu of all others, either expressed or implied.

Non-Endorsement
This test report contains only findings and results arrived at after employing the specific test procedures and standards listed herein. It is not intended to constitute a recommendation, endorsement or certification of the product or material tested. This test report must not be used by the client to claim product endorsement by NVLAP or any agency of the U.S. Government.

Requirements and Test Results

Requirement:
FCC Section 15.247(a)(2)
Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz
Systems using digital modulation techniques may operate in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands. The minimum 6 dB bandwidths shall be at least 500 kHz.

- Results:
  The minimum 6 dB bandwidth measured 57,000 kHz which complies with the requirement that the Bandwidth be no less than 500 kHz.

Requirement:
FCC Sections 15.247(b)(3)
Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz
The maximum peak conducted output power of the intentional radiator shall not exceed the following:

For systems using digital modulation in the 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz bands: 1 Watt. As an alternative to a peak power measurement, compliance with the one Watt limit can be based on a measurement of the maximum conducted output power. Maximum Conducted Output Power is defined as the total transmit power delivered to all antenna and antenna elements averaged across all symbols in the signaling alphabet when the transmitter is operating at its maximum power control level. Power must be summed across all antenna and antenna elements. The average must not include any time intervals during which the transmitter is off or is transmitting at a reduced power level. If multiple modes of operation are possible (e.g., alternative modulation methods), the maximum conducted output power is the highest total transmit power occurring in any mode.

- Results:
  The device operates in the 2.4 to 2.4835 GHz band. The maximum peak output power was measured and was found to be 42.21 mWatts, in compliance with the specified limit of 1 watt.

Requirements and Test Results (con't)

Requirement:
FCC Section 15.247(d):
Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz
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 demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a) must also comply with the radiated emissions limits specified in Section 15.209(a) (see Section 15.205(c)).

- Results:
  In any 100 kHz bandwidth outside the frequency band in which the Spread spectrum intentional radiator was operating, the radio frequency power that was produced by the intentional radiator was at least 20 dB below that in the 100 kHz bandwidth within the band that contained the highest level of the desired power. All emissions, which fell within the restricted bands specified in 15.205(a), were measured and found to be in compliance with the limits specified in 15.209(a).

Requirement:
FCC Section 15.247(e):
Operation within the bands 902 - 928 MHz, 2400 - 2483.5 MHz and 5725 - 5850 MHz
For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density shall be determined in accordance with the provisions of paragraph (b) of this section. The same method of determining the conducted output power shall be used to determine the power spectral density.

- Results:
  The power spectral density conducted from the intentional radiator to the antenna was not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission. This power spectral density was determined in accordance with Section 15.247(b)(3), herein. The same method of determining the conducted output power was used to determine the power spectral density.

Requirements and Test Results (con't)

Requirement:
FCC Section 15.209(a) - Radiated Emission Limits, General Requirements
Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in Table 1.

Table 1 - Radiated Emission Limits

Frequency of Emission (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 to 88	100	3
88 to 216	150	3
216 to 960	200	3
Above 960	500	3

- Results:
  The field strength of spurious radiated emissions did not exceed the limits specified in Table 1.

Requirement:
FCC Section 15.207(a) - Conducted Limits
For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits shown in Table 2, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of the paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

Table 2 - Conducted Emission Limits

Frequency of Emission (MHz)	Conducted Limit (dBµV)	
	Quasi-Peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.5 to 5	56	46
5 to 30	60	50
*Decreases due to logarithm of the frequency		

- Results:
  The conducted emissions observed did not exceed the limits specified in Table 2.

Spectrum Analyzer Desensitization Considerations

Due to the nature of the emissions being measured, care was taken to ensure that the resolution bandwidth of the spectrum analyzer was adequate to provide accurate measurements. FCC specified bandwidths of 100 kHz and 1 MHz were utilized below and above 1 GHz, respectively.

General Notes

1. All readings were taken utilizing a peak detector/or average detector function at a test distance of 3 meters.

2. A 10 Hz Video Bandwidth was utilized in order to determine the average value of the emissions.

3. All measurements were made with the device powered by an AC Adapter with an input of 120 VAC, 60 Hz.

4. The frequency range was scanned from 30 MHz to 25 GHz. All emissions not reported were more than 20 dB below the specified limit.

Modifications

No Modifications were made during the course of this testing program in order to demonstrate compliance with the specified requirements.

Equipment List

Occupied Bandwidth

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
8357	10.0 dB Attenuator	Narda	DC - 11 GHz, 20 W	768-10	6/4/2009	6/4/2010
R603	Spectrum Analyzer	Agilent	100 kHz - 26.5 GHz	E7405A;B	5/12/2009	5/12/2010

Power Output

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
8357	10.0 dB Attenuator	Narda	DC - 11 GHz, 20 W	768-10	6/4/2009	6/4/2010
R603	Spectrum Analyzer	Agilent	100 kHz - 26.5 GHz	E7405A;B	5/12/2009	5/12/2010

Antenna Port, Conducted Emissions

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
R603	Spectrum Analyzer	Agilent	100 kHz - 26.5 GHz	E7405A;B	5/12/2009	5/12/2010

Antenna Port, Power Density

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
8357	10.0 dB Attenuator	Narda	DC - 11 GHz, 20 W	768-10	6/4/2009	6/4/2010
R603	Spectrum Analyzer	Agilent	100 kHz - 26.5 GHz	E7405A;B	5/12/2009	5/12/2010

Spurious Radiated Emissions

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
8071	Spectrum Analyzer	Hewlett Packard	100Hz-2.5 GHz/2-22GH	8566B	12/27/2007	6/27/2009
8072	Spectrum Analyzer Display	Hewlett Packard		85662A	12/27/2007	6/27/2009
8080	Receiver	Rohde & Schwarz	20-1300 MHz	ESVP	5/20/2009	5/20/2010
8300	OATS Site NSA	RSI	3/10 Meter Site		8/15/2008	8/15/2009
8300B	OATS Cable				9/10/2008	9/10/2009
8365	Biconilog	EMCO	26 MHz - 3 GHz	3142C	9/12/2007	9/12/2009
8411	Preamplifier	Sonoma Instrument	9 kHz - 1 GHz	310N	9/23/2008	9/23/2009
R603	Spectrum Analyzer	Agilent	100 kHz - 26.5 GHz	E7405A;B	5/12/2009	5/12/2010

Spurious Radiated Emissions, Band Edge

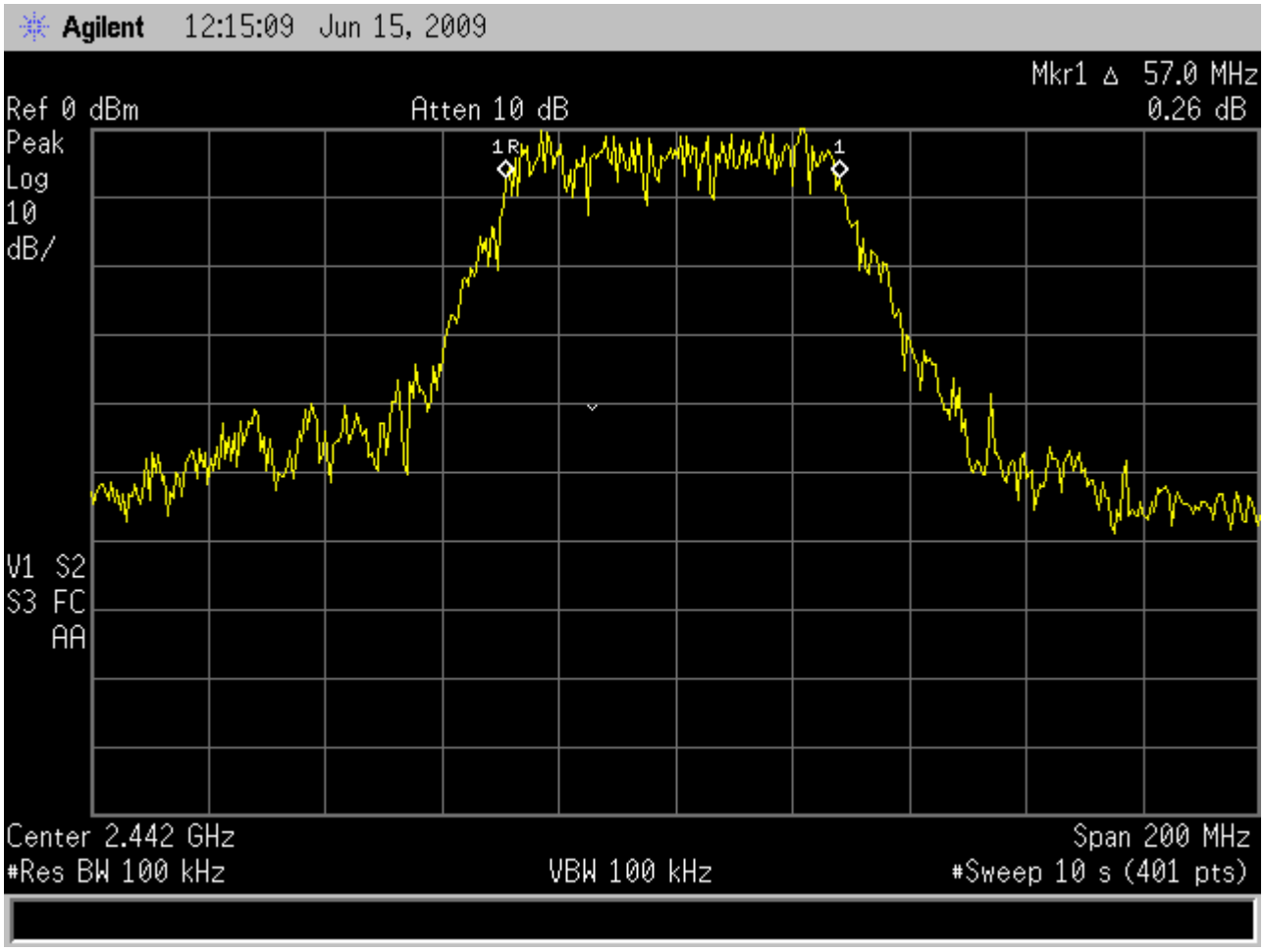
EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
8017	Double Ridge Guide	EMCO	1 - 18 GHz	3115	8/6/2007	8/6/2009
8060A	Cable	Retlif	10 kHz - 18 GHz	25' Type N	8/14/2008	8/14/2009
8061A	Cable	Retlif	10 kHz - 18 GHz	25' Type N	1/26/2009	1/26/2010
8300	OATS Site NSA	RSI	3/10 Meter Site		8/15/2008	8/15/2009
8317	Preamplifier	Agilent	1-26.5 GHz, 30 dB	8449B	6/3/2009	6/3/2010
R603	Spectrum Analyzer	Agilent	100 kHz - 26.5 GHz	E7405A;B	5/12/2009	5/12/2010

Equipment List (con't)

Conducted Emissions, Power Leads, 150 kHz to 30 MHz

EN	Type	Manufacturer	Description	Model No.	Cal Date	Due Date
713	EMI Test Receiver	Rohde & Schwarz	20 Hz - 26.5 GHz	ESIB26	8/23/2008	8/23/2009
8194	LISN	Solar Electronics	10 kHz - 30 MHz	8028-50-TS-24-B	11/17/2007	11/17/2009
8195	LISN	Solar Electronics	10 kHz - 30 MHz	8028-50-TS-24-B	11/17/2007	11/17/2009
8356	10.0 dB Attenuator	Narda	DC - 11 GHz, 20 W	768-10	9/11/2008	9/11/2009
8366A	Cable 20' BNC	Retlif	10 kHz - 1 GHz	n/a	10/30/2008	10/30/2009

Occupied Bandwidth
FCC Part 15, Subpart C, Section 15.247(a)(2)
Test Data



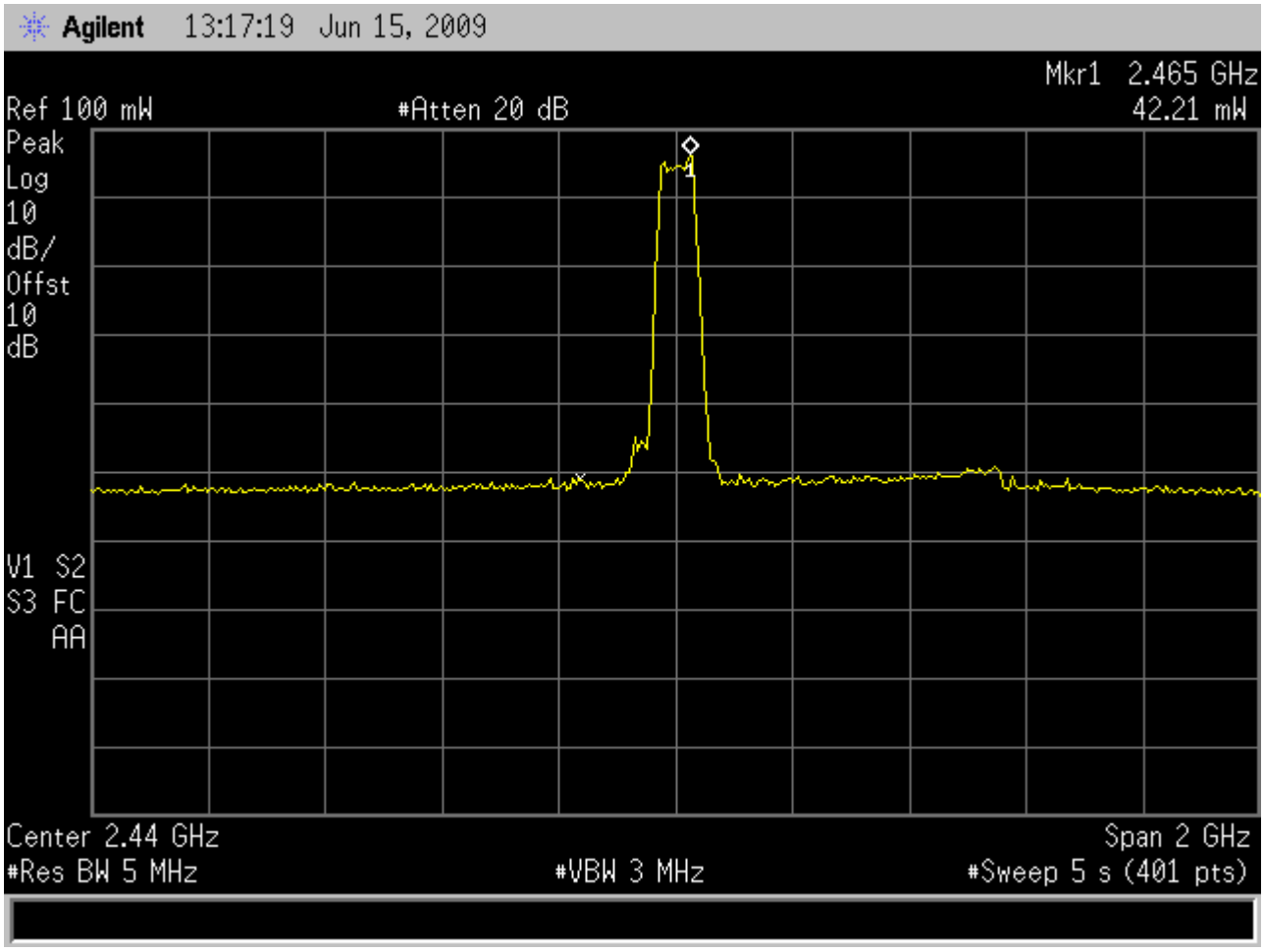
Customer	Perimeter Technologies.		
Test Sample	2.4 GHz Wireless Base Station Transceiver		
Model / S/N	10000101 / 00000266		
Date 6-15-09		Tech:.RW	Sheet 1 of 1

Conducted Emissions, Power Output
FCC Part 15, Subpart C, Section 15.247(b)(3)
Test Data

Test Method:	FCC Part 15, Subpart C, Section 15.247 (b)(3), RF Power Output		
Customer:	Perimeter Technologies	**Job No.**	R-1379P-1
Test Sample:	2.4 GHz Wireless Base Station Transceiver		
Model / S/N:	10000101 / 00000266	**FCC ID:**	Q8T10000101
Operating Mode:	Continuously Transmitting / Receiving a pulsed 2.4 GHz Signal		
Technician:	R. Wilson	**Date:**	6/15/09

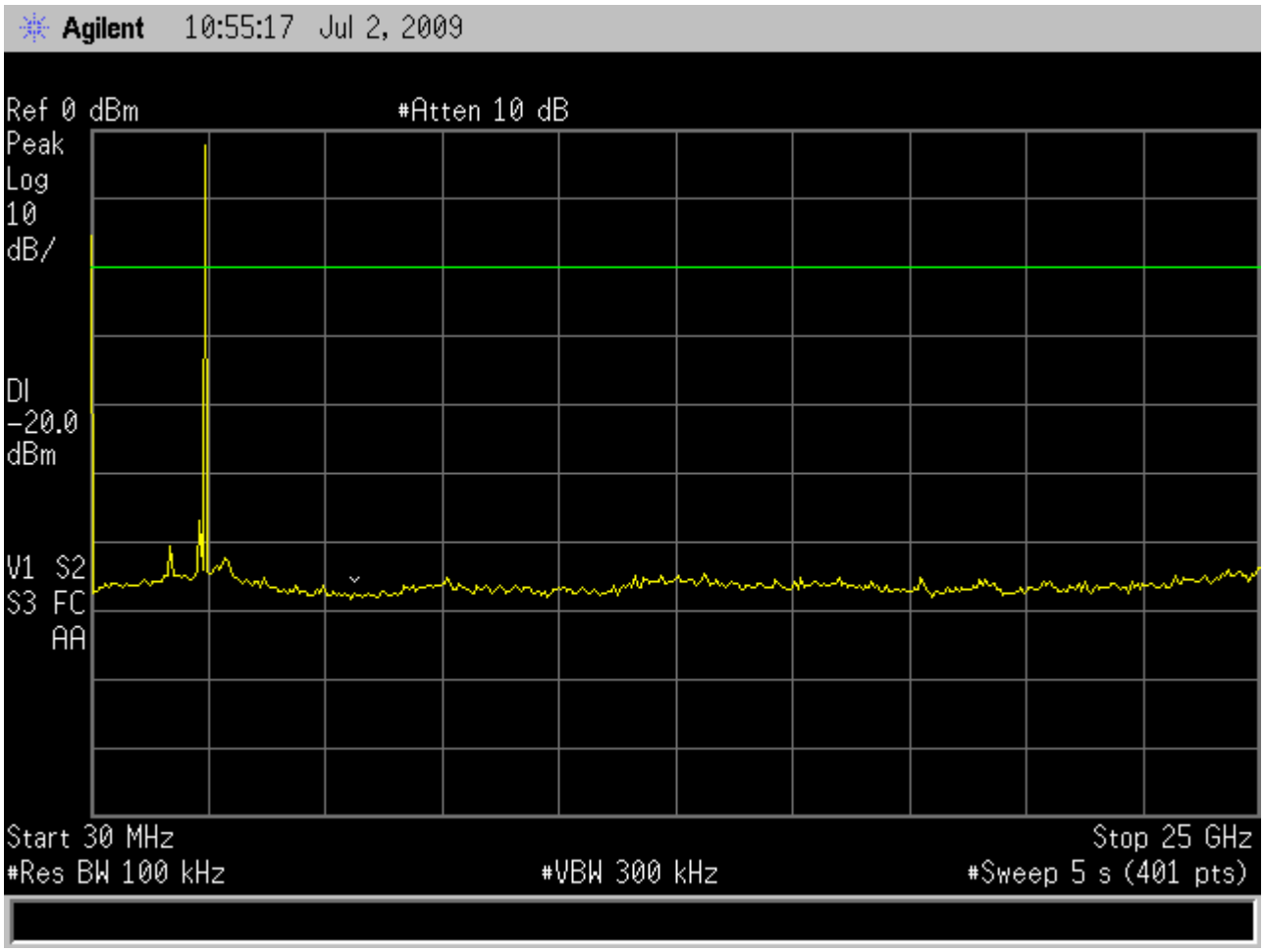
Notes:	Reference Level:	100mW	Resolution BW:	5MHz
	Video Bandwidth:	3MHz	Sweep Time:	5sec
	RF Attenuation:	20dB	Span:	200MHz
	External Attenuation:	10dB		

Frequency		Power Output		Limit			
GHz		mW		mW			
2.4		42.21		1000			



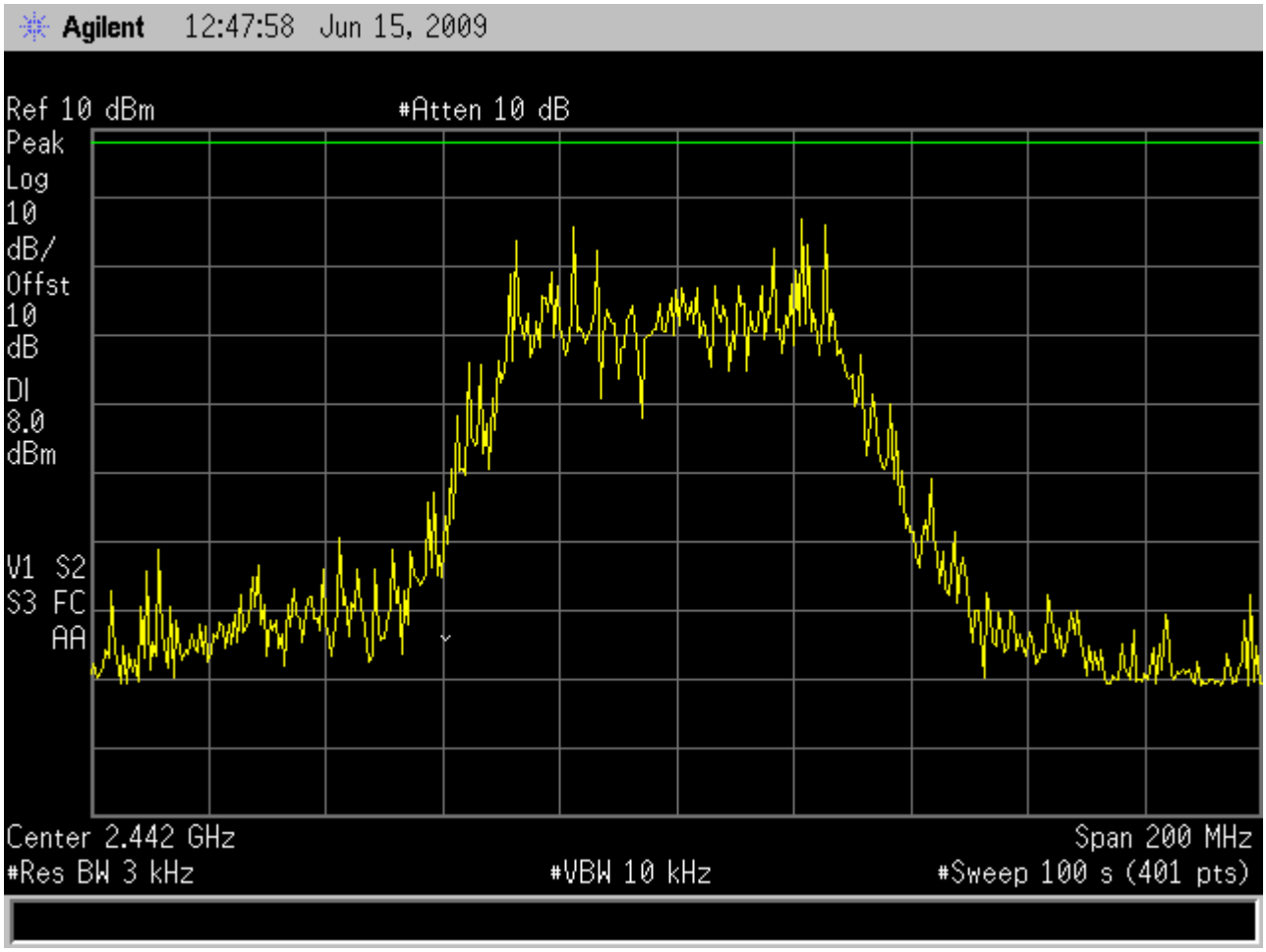
Customer	Perimeter Technologies		
Test Sample	2.4 GHz Wireless Base Station Transceiver		
Model / S/N	10000101 / 00000266		
Date 7-2-09		Tech:.RW	Sheet 1 of 1

Antenna Port, Conducted Emissions
FCC Part 15, Subpart C, Section 15.247(d)
Test Data

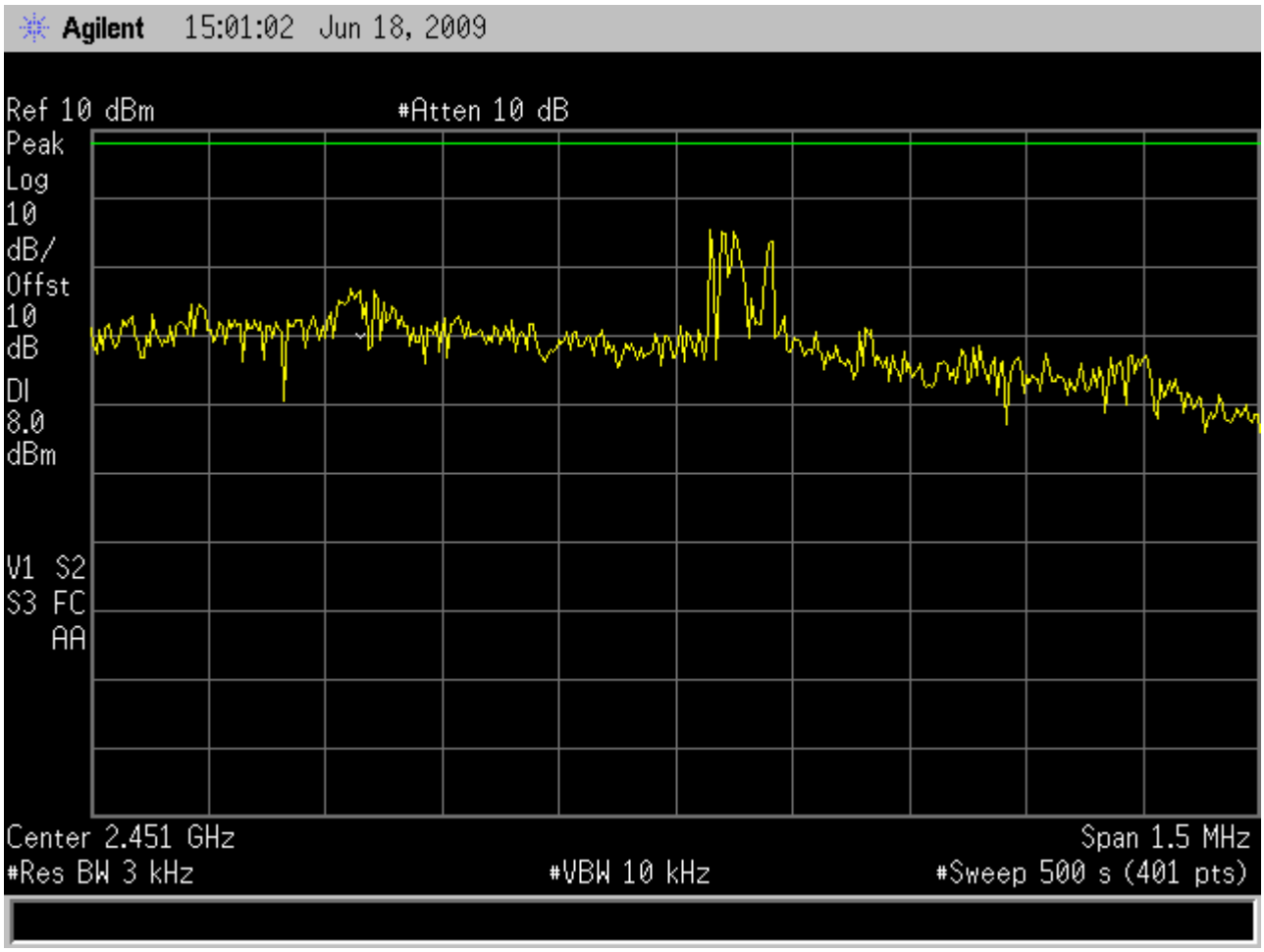


Customer	Perimeter Technologies		
Test Sample	2.4 GHz Wireless Base Station Transceiver		
Model / S/N	10000101 / 00000266		
Date 7-2-09		Tech:.RW	Sheet 1 of 1

Antenna Port, Power Density
FCC Part 15, Subpart C, Section 15.247(e)
Test Data



Customer	Perimeter Technologies	
Test Sample	2.4 GHz Wireless Base Station Transceiver	
Model / S/N	10000101 / 00000266	
Date 6-15-09	Tech:.RW	Sheet 1 of 2



Customer	Perimeter Technologies		
Test Sample	2.4 GHz Wireless Base Station Transceiver		
Model / S/N	10000101 / 00000266		
Date 6-15-09		Tech:.RW	Sheet 2 of 2

Spurious Radiated Emissions, 30 MHz to 25 GHz
FCC Part 15, Subpart B, Section 15.209(a)
Test Data

Test Method:	**FCC Part 15 Subpart C, Spurious Radiated Emissions, Paragraph 15.247(d)**		
Customer:	Perimeter Technologies	**Job No.:**	R-1379P-1
Test Sample:	2.4 GHz Wireless Base Station Transceiver		
Model No.:	10000101	**S/N:**	00000266
Operating Mode:	Continuously transmitting / receiving a pulsed 2.4GHz signal		
Technician:	R. Wilson	**Date:**	6-16-09

Notes: Test Distance: 3 Meters Temp: 23°C RH: 52%
Detector: Quasi-Peak from 30 MHz to 1 GHz, Peak above 1 GHz

Frequency	Antenna Position	EUT Orientation	Meter Readings	Correction Factor	Corrected Reading	Converted Reading	Limit
MHz	(V/H) / Meters	Degrees	dBuV	dB	dBuV/m	uV/m	uV/m
30.00							100
*33.00	H / 1.0	180.0	1.4	16.9	18.3	8.22	
88.00							100
88.00							150
*115.00	H / 1.0	180.0	4.1	9.6	13.7	4.84	
*185.00	H / 1.0	180.0	0.5	11.1	11.6	3.80	
*200.00	H / 1.0	180.0	0.3	11.4	11.7	3.85	
216.00							150
216.00							200
*605.00	H / 1.0	180.0	1.8	22.1	23.9	15.67	
960.0							200
960.0							500
*995.00	H / 1.0	180.0	3.3	27.0	30.3	32.73	
1000.00							500
25000.00							500

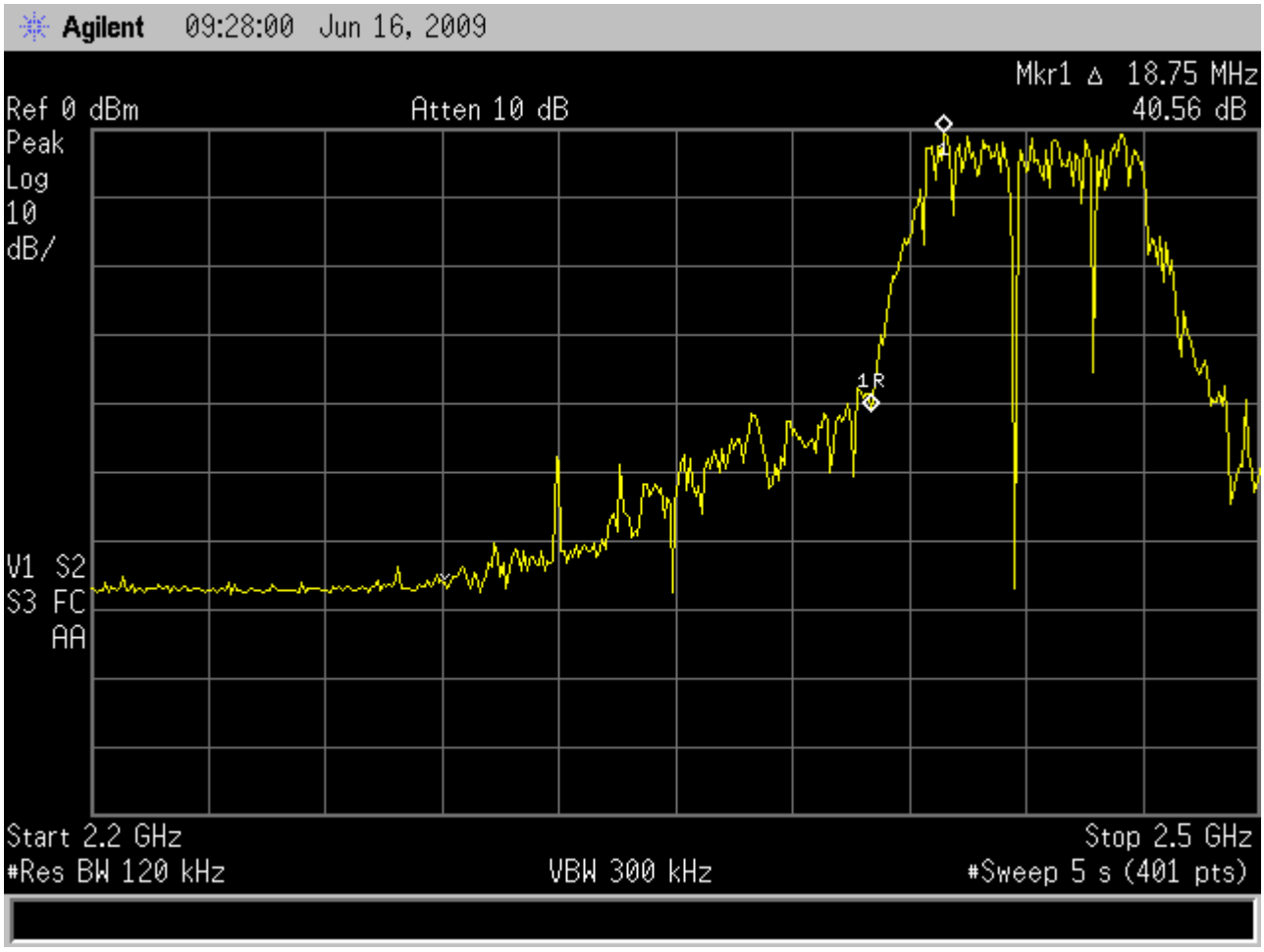
The frequency range was scanned from 30 MHz to 25 GHz.
The emissions observed from the EUT do not exceed the specified limits.
Emissions not recorded were more than 20dB under the specified limit.
* This measurement represents minimum sensitivity of the measurement system

Spurious Radiated Emissions, Band Edge
FCC Part 15, Subpart C, Section 15.247(d)
Test Data

Test Method:	**FCC Part 15, Subpart C, Section 15.247 Band Edge 2.4 & 2.4835 GHz**		
Customer:	Perimeter Technologies	**Job No.:**	R-1379P-1
Test Sample:	2.4 GHz Wireless Base Station Transceiver		
Model No.:	10000101	**Serial No.:**	00000266
Operating Mode:	Continuously Transmitting / Receiving a pulsed 2.4GHz Signal		
Technician:	R. Wilson	**Date:**	6-19-09

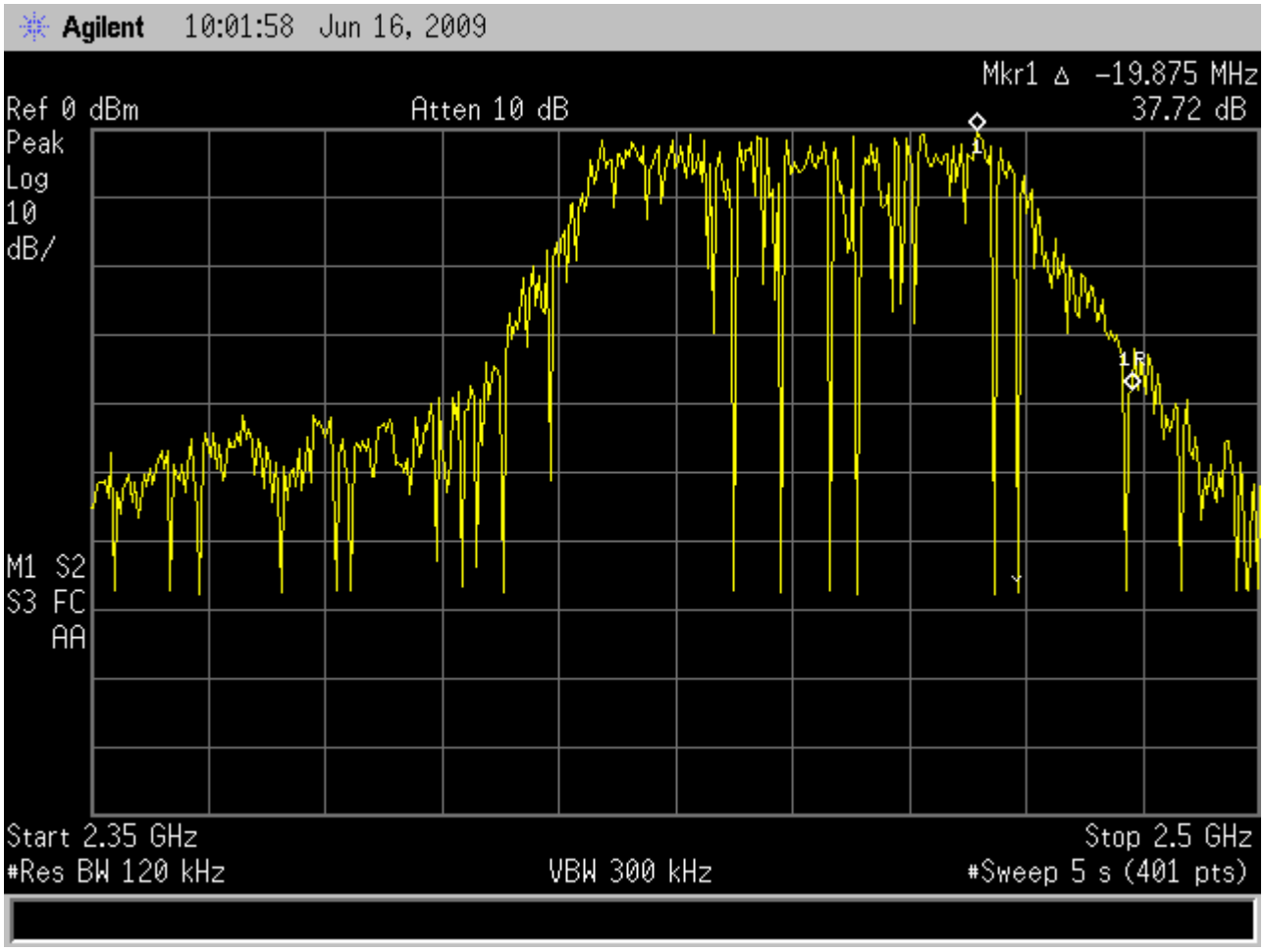
Notes: Test Distance: 3 Meters Temp: 23°C Humidity: 68%
Detector: Quasi-Peak Below 1 GHz, Peak above 1 GHz

Frequency	Antenna Position	EUT Orientation	Meter Readings	Correction Factor	Corrected Reading	Converted Reading	Limit
GHz	(V/H) / Meters	Degrees	dBuV	dB	dBuV/m	uV/m	uV/m
2.348	V / 1.0	190.0	45.57	-2.9	42.67	136.0	500
2.3544	H / 1.5	293.0	49.32	-2.9	46.42	209.4	500
2.4953	V / 1.0	301.0	49.59	-2.9	46.69	216.0	500
2.4849	H / 1.0	66.0	36.45	-2.9	33.55	47.6	500



2.4 GHz

Customer	Perimeter Technologies	
Test Sample	2.4 GHz Wireless Base Station Transceiver	
Model / S/N	10000101 / 00000266	
Date 6-16-09	Tech:RW	Sheet 1 of 2



2.4835 GHz

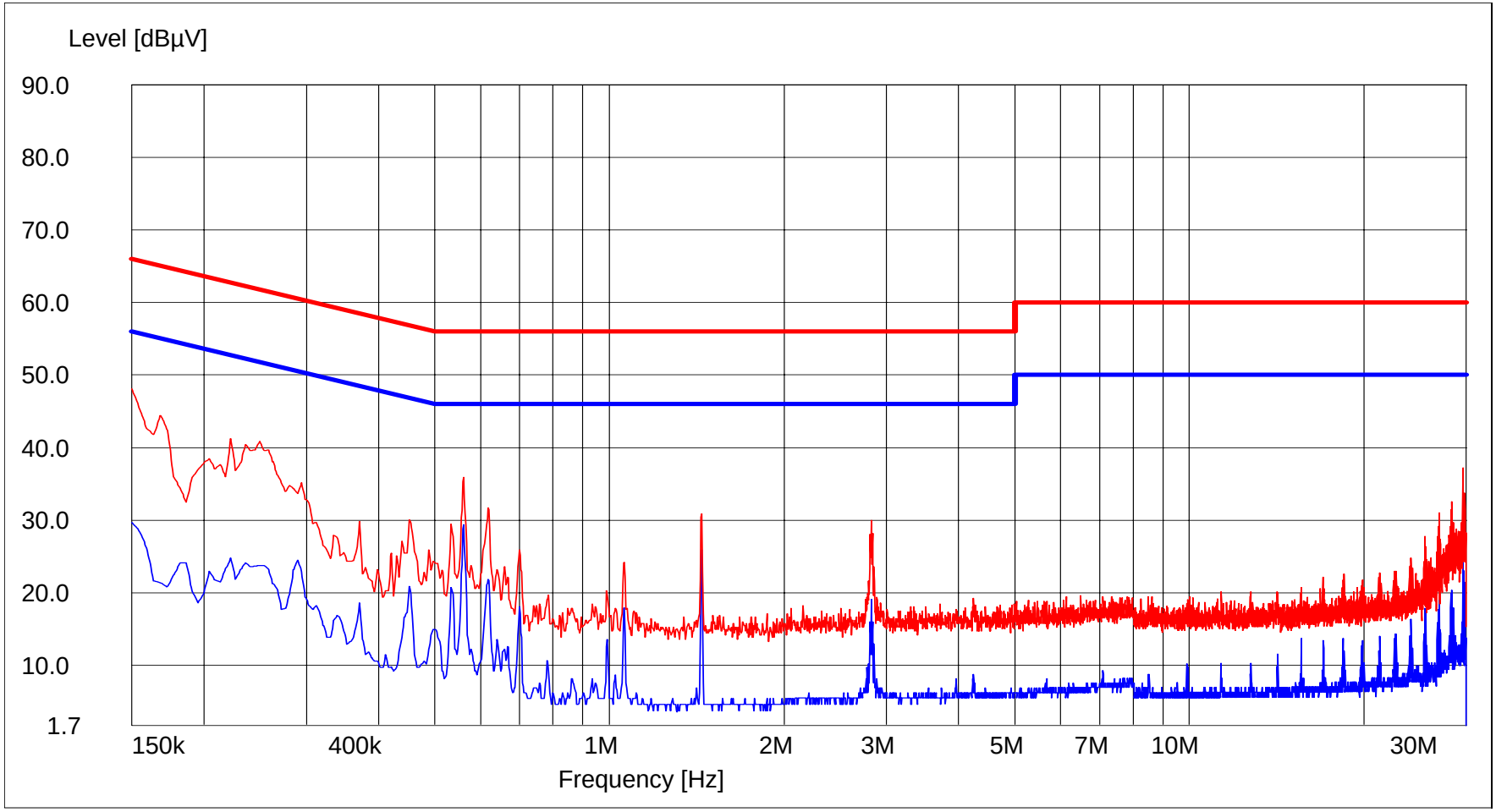
Customer	Perimeter Technologies	
Test Sample	2.4 GHz Wireless Base Station Transceiver	
Model / S/N	10000101 / 00000266	
Date 6-16-09	Tech:RW	Sheet 2 of 2

Conducted Emissions, Power Leads, 150 kHz to 30 MHz
FCC Part 15, Subpart B, Section 15.207(a)
Test Data

Retlif Testing Laboratories, R-1379P-1

Conducted Emissions, 150kHz to 30 MHz

Customer: Perimeter Technologies Inc.
Test Sample: 2.4 GHz Wireless Base Station Transceiver
Model/Serial Number: 10000101/SN: 00000266
Test Specification: FCC Part 15 Subpart C, Section 15.207(a) Conducted Emissions
Mode of Operation: Continuously transmitting / receiving a pulsed 2.4 GHz signal
Technician/Date: B.Mortimer, 6/23/09
Lead Tested: 120VAC, 60Hz, HOT
Notes:



Sheet 1 of 2

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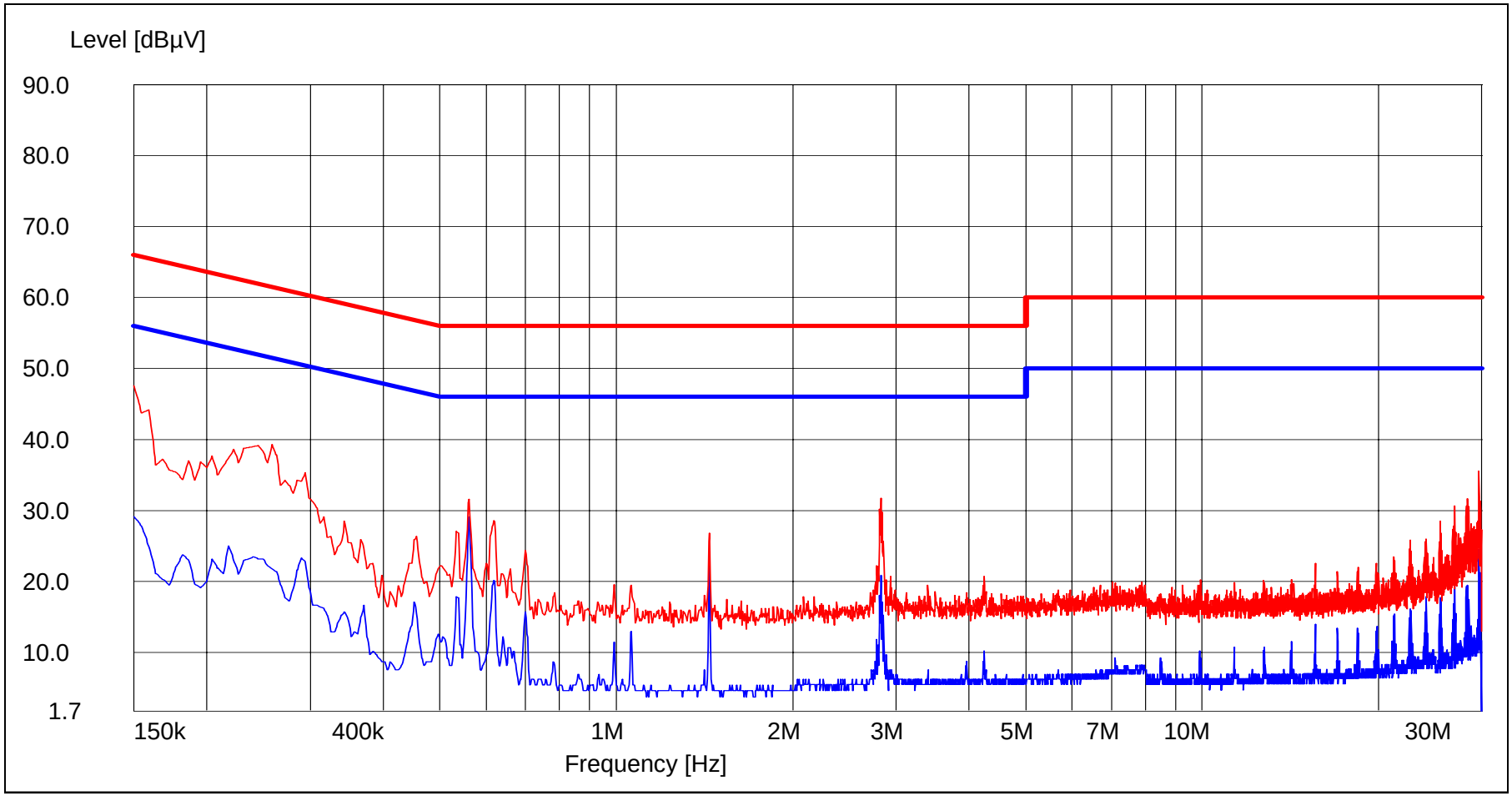
Conducted Emissions, 150kHz to 30 MHz

Customer: Perimeter Technologies Inc.
Test Sample: 2.4 GHz Wireless Base Station Transceiver
Model/Serial Number: 10000101/SN: 00000266
Test Specification: FCC Part 15 Subpart C, Section 15.207(a) Conducted Emissions
Mode of Operation: Continuously transmitting / receiving a pulsed 2.4 GHz signal
Technician/Date: B.Mortimer, 6/23/09
Lead Tested: 120VAC, 60Hz, NEUTRAL
Notes: