FCC CFR47 PART 15 SUBPART C
CERTIFICATION TEST REPORT

FOR

LOW POWER TRANSMITTER WIRELESS CARD READER

MODEL NUMBER: Vivopay 5000

FCC ID: Q55VP5KA

REPORT NUMBER: 06U10074-1B

ISSUE DATE: FEBRUARY 17, 2006

Prepared for
VIVOTECH
451 EL CAMINO REAL
SANTA CLARA, CA 95050, USA

Prepared by
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LAB CODE:200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
A	2/09/06	Initial Issue based on 05U3831-2 IC Report	Thu
B	2/17/06	Revised & Added 7.2.1 Section For Operation within the Band 13.110 – 14.010 MHz	Thu

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	VIVOTECH 451 EL CAMINO REAL SANTA CLARA, CA 95050, USA
EUT DESCRIPTION:	LOW POWER TRANSMITTER WIRELESS CARD READER
MODEL:	Vivopay 5000
SERIAL NUMBER:	01638
DATE TESTED:	NOVEMBER 22 to 29, 2005

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

THANH NGUYEN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

EUT is a low power transmitter wireless card reader, and its fundamental frequency is 13.56MHz.

GENERAL INFORMATION

CHASSIS/ ENCLOSURE MATERIAL	PLASTIC
POWER REQUIREMENTS	7 VDC
POWERLINE FILTER MANUFACTURER AND MODEL	GATRON CORP
LIST OF ALL OSCILLATOR FREQUENCIES GREATER THAN OR EQUAL TO 9 kHz	13.56MHz, 10MHz, 32.768MHz, 27.120MHz, 3.6864MHz, 3.5712MHz

5.2. TEST CONFIGURATION

The following configuration was investigated during testing:

EUT Configuration	Description
Typical Configuration	EUT stand alone

5.3. MODE(S) OF OPERATION

Mode	Description
Normal Mode	Transmit Continuously

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was EB7X3A220TEST.

5.5. MODIFICATIONS

No modifications were made during testing.

5.6. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT

N/A; no support equipment were used for the operation of the EUT.

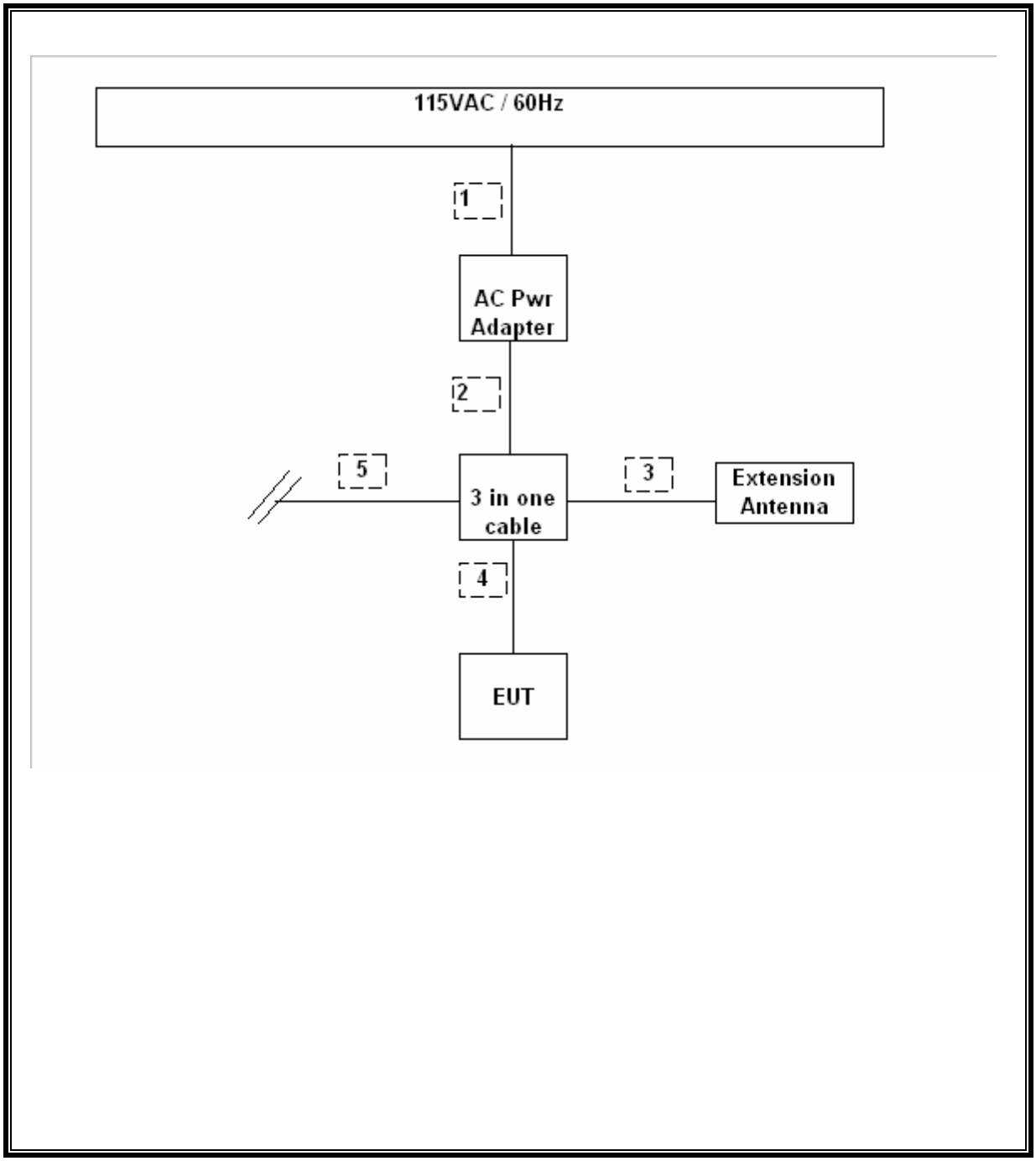
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC Power	1	AC Power	Unshielded	2m	N/A
2	DC power	1	DC Power	Unshielded	2m	N/A
3	RF	1	Mini Din	Shielded	1m	N/A
4	3 in One	1	3 in One	Shielded	1m	N/A
5	Ethernet	1	RJ45	Unshielded	2m	Terminated

TEST SETUP

EUT was standing alone and continuously transmitting during testing.

TEST SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST

Name of Equipment	Manufacturer	Model No.	Serial No.	Due Date
SA Display Section 3	HP	85662A	2314A04793	1/15/2006
SA RF Section, 1.5 GHz	HP	85680A	2314A02604	1/15/2006
Site C Preamplifier, 1300MHz	HP	8447D	2944A06550	8/26/2006
Antenna, Biconical	Eaton	94455-1	1214	3/3/2006
Antenna, Log Periodic 200 ~ 1000 MHz	EMCO	3146	9107-3163	3/3/2006
Quasi-Peak Adaptor	HP	85650A	2521A01038	1/15/2006
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	3/29/2006
RF Filter Section	HP	85420E	3705A00256	3/29/2006
Antenna, Bilog 30MHz ~ 2Ghz	Sunol Sciences	JB1	A121003	3/3/2006
Antenna, Loop 9 kHz ~ 30 MHz	EMCO	6502	9202-2722	9/7/2006
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2006
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	10/21/2006
Line Filter	Lindgren	LMF-3489	497	CNR
EMI Test Receiver	R & S	ESHS 20	827129/006	6/3/2006
AC Power Source, 10 kVA	ACS	AFC-10K-AFC-2	J1568	CNR

7. LIMITS AND RESULTS

7.1. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

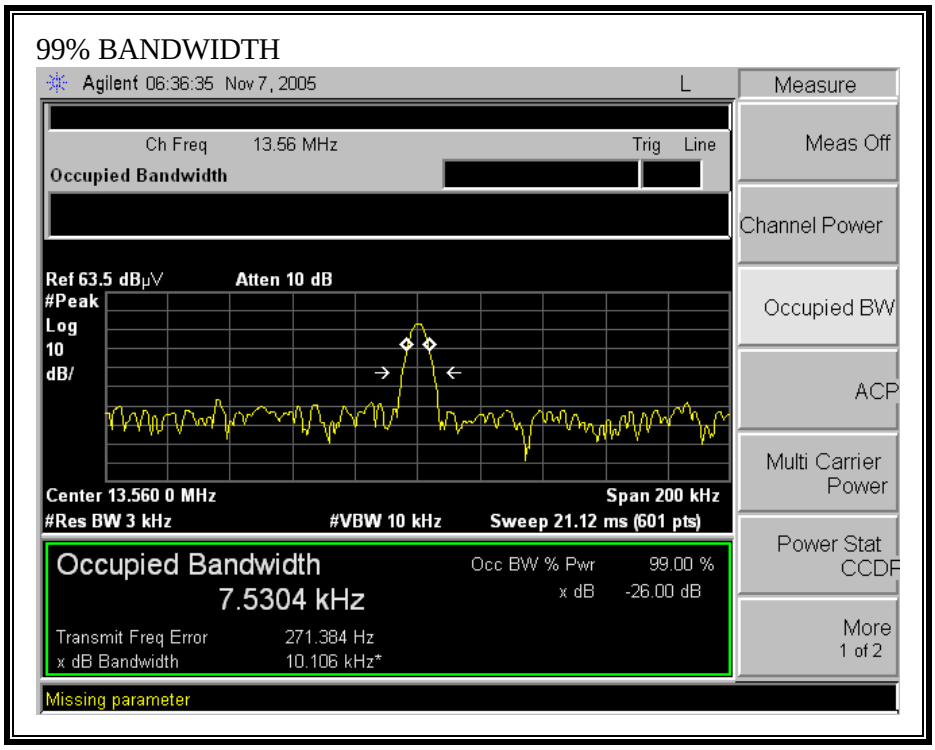
RESULTS

No non-compliance noted:

99% Bandwidth

Frequency (MHz)	99% Bandwidth (KHz)
13.56	7.5304

99% BANDWIDTH



7.2. RADIATED EMISSIONS

7.2.1. OPERATION WITHIN THE BAND 13.110 – 14.010 MHz

TEST PROCEDURE

ANSI C63.4

LIMIT

(a) The field strength of any emissions within the band 13.553–13.567 MHz shall not exceed 15,848 microvolts/ meter at 30 meters.
(b) Within the bands 13.410–13.553 MHz and 13.567–13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
(c) Within the bands 13.110–13.410 MHz and 13.710–14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
(d) The field strength of any emissions appearing outside of the 13.110– 14.010 MHz and shall not exceed the general radiated emission limits in § 15.209.

TRANSCEIVER SPURIOUS EMISSIONS BELOW 30MHz

RSS 210 10 Meter Distance Measurement At Open Field

Test Engr: Thanh Nguyen
Project #: 05U3831
Company: VIVOTECH
EUT Descrip.: POSSystem,13.56MHz.
EUT M/N: VIVOpay 5000
Test Target: RSS 210
Mode Oper: Transceiving

Frequency (MHz)	PK (dBuV)	QP (dBuV)	AF dB/m	Distance Correction (dB)	PK Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	PK Margin (dB)	Notes
Loop Antenna Face On:								
13.56	35.6		10.556	-19.08	27.07	84.00	-56.9	Fundamental @ 10m Dist
13.41	23		10.541	-19.08	14.46	40.51	-26.1	13.110-13.410MHz Spurious @ 10m
14.01	15.5		10.601	-19.08	7.02	40.51	-33.5	13.710-14.010MHz Spurious @ 10m
27.16	12.5		9.0408	-19.08	2.46	29.54	-27.1	14.010-30MHz Spurious @ 10m
Loop Antenna Face Off:								
13.56	26		10.556	-19.08	17.47	84.00	-66.5	Fundamental @ 10m Dist
13.41	18.5		10.541	-19.08	9.96	40.51	-30.6	13.110-13.410MHz Spurious @ 10m
13.71	16.5		10.571	-19.08	7.99	40.51	-32.5	13.710-14.010MHz Spurious @ 10m
14.01	14.5		10.601	-19.08	6.02	40.51	-34.5	13.710-14.010MHz Spurious @ 10m
27.12	12.5		9.0456	-19.08	2.46	29.54	-27.1	14.010-30MHz Spurious @ 10m

* No more emissions were found up to 30MHz

Note: The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kH and above 10000Mhz. Radiated emission limits in these three bands are based on measurements employing an average detector.

P.K. = Peak
Q.P. = Quasi Peak Reading
A.F. = Antenna factor

7.2.2. TRANSMITTER RADIATED SPURIOUS EMISSIONS

TEST PROCEDURE

ANSI C63.4

The highest clock frequency generated or used in the EUT is 13.56 MHz, therefore the frequency range was investigated from 9 kHz to 1000 MHz.

LIMIT

§15.209 (a) Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

In addition:

§15.209 (d) The emission limits shown the above table are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9-90 kHz, 110-490 kHz and above 1000 MHz. Radiated emissions limits in these three bands are based on measurements employing an average detector.

§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

RESULTS

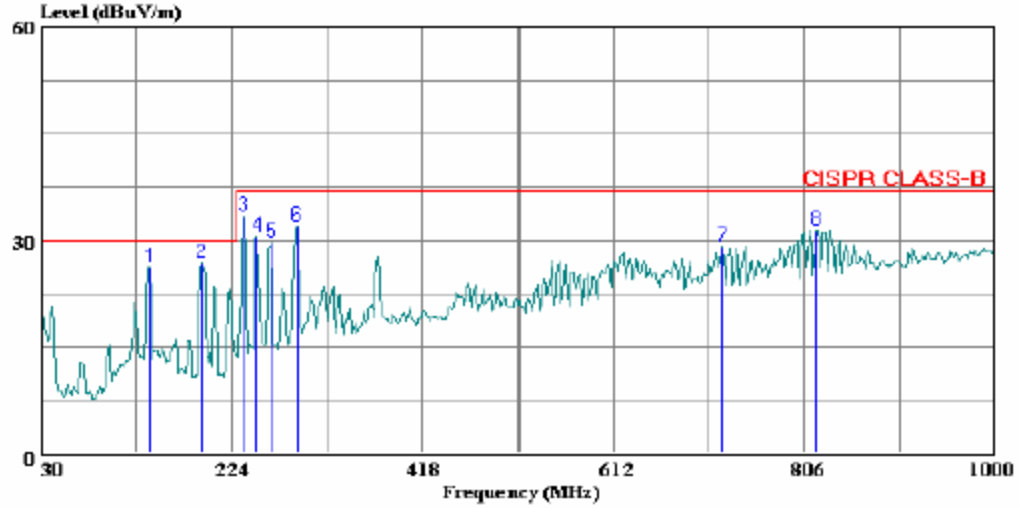
No non-compliance noted:

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 8 File#: 30-1GHz.EMI Date: 11-22-2005 Time: 11:35:36



(Audix ATC)

Trace: 7 Ref Trace:

Condition: CISPR CLASS-B HORIZONTAL
Test Operator: : Thanh Nguyen
Project #: : 05U3831
Company: : VIVOTECH
EUT: : POS System, 13.56 MHz, One antenna, AC Adapter
Model No. : VIVOPay 5000
Configuration : EUT , support equipment
Target of Test : CISPR Class B
Mode of Operation: Transceiver 13.56MHz

HORIZONTAL DATA

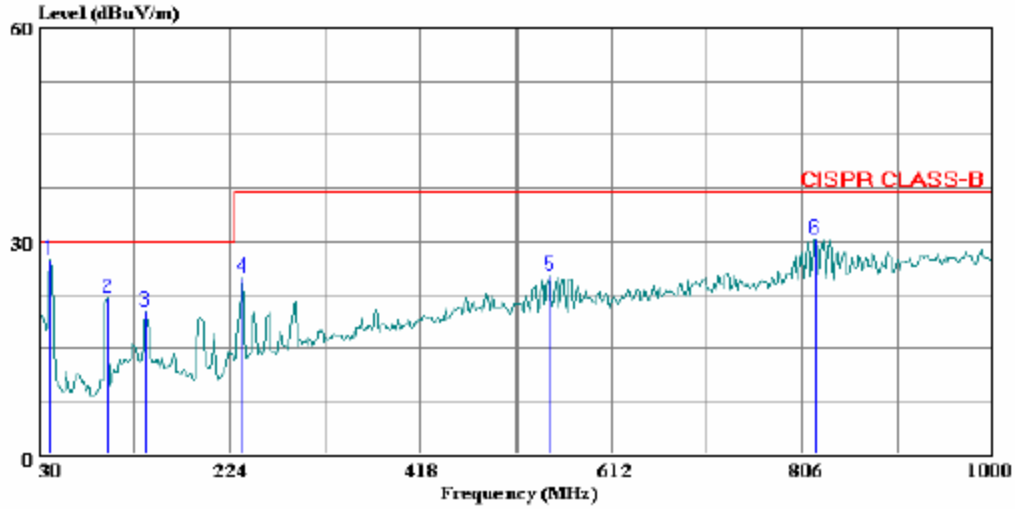
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	140.580	11.34	14.77	26.11	30.00	-3.89	Peak
2	193.930	13.26	13.56	26.82	30.00	-3.18	Peak
3	237.580	19.95	13.39	33.34	37.00	-3.66	Peak
4	250.190	16.53	13.90	30.43	37.00	-6.57	Peak
5	264.740	15.22	14.39	29.61	37.00	-7.39	Peak
6	290.930	16.61	15.33	31.94	37.00	-5.06	Peak
7	722.580	5.55	23.50	29.05	37.00	-7.95	Peak
8	817.640	6.46	24.83	31.29	37.00	-5.71	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 10 File#: 30-1GHz.EMI Date: 11-22-2005 Time: 11:40:10



(Audix ATC)

Trace: 9 Ref Trace:

Condition: CISPR CLASS-B VERTICAL
Test Operator: : Thanh Nguyen
Project #: : 05U3831
Company: : VIVOTECH
EUT: : POS System, 13.56 MHz, One Antenna, AC Adapter
Model No. : VIVOPay 5000
Configuration : EUT , support equipment
Target of Test : CISPR Class B
Mode of Operation: Transceiver 13.56MHz

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	41.640	12.61	14.90	27.51	30.00	-2.49	Peak
2	99.840	10.58	11.38	21.96	30.00	-8.04	Peak
3	138.640	5.17	14.89	20.06	30.00	-9.94	Peak
4	237.580	11.43	13.39	24.82	37.00	-12.18	Peak
5	547.980	4.31	20.86	25.17	37.00	-11.83	Peak
6	818.610	5.47	24.83	30.30	37.00	-6.70	Peak

7.3. FREQUENCY STABILITY

LIMIT

15.225 (e) The frequency tolerance of the carrier signal shall be maintained within +/- 0.01% over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C.

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.3.1 and 2.3.2

RESULTS

No non-compliance noted.

Reference Frequency: EUT Channel 13.56MHz @ 20?C				
		Limit: ± 100 ppm =	**135.605**	**KHz**
Power Supply	**Environment**	**Frequency Deviation Measureed with Time Elapse**		
(Vdc)	**Temperature (?C)**	**(MHz)**	**Delta (ppm)**	**Limit (ppm)**
5.00	50	13.56041	0.031	± 100
5.00	40	13.56044	0.010	± 100
5.00	30	13.56048	-0.017	± 100
5.00	***20***	***13.56046***	***0.000***	***± 100***
5.00	10	13.56040	0.039	± 100
5.00	0	13.56041	0.037	± 100
5.00	-10	13.56043	0.022	± 100
5.00	-20	13.56042	0.026	± 100
4.25	25	13.56045	0.004	± 100
5.75	25	13.56050	-0.033	± 100

7.4. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

According to Section 13.1.3.1 of ANSI C63.4-2003, AC Line Conducted measurements on a 13.56 MHz transmitter were acceptable to be performed with a dummy load under the following conditions:

1) First, perform the AC line conducted tests with the antenna attached to make sure the device complies with the 15.207 limits outside the transmitter's fundamental emission band;
2) Second, retest with a dummy load to make sure the device complies with the 15.207 limits inside the transmitter's fundamental emission band. Only the fundamental TX emission band needs to be retested.

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, 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 to30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN).

Compliance with the provisions of this 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.

Frequency range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
* Decreases with the logarithm of the frequency.		

RESULTS

No non-compliance noted:

6 WORST EMISSIONS

EUT with a dummy load (75 Ω termination at antenna port)

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.23	48.43	--	--	0.00	62.52	52.52	-14.09	-4.09	L1
0.46	43.00	--	--	0.00	56.77	46.77	-13.77	-3.77	L1
0.69	41.70	--	--	0.00	56.00	46.00	-14.30	-4.30	L1
0.23	50.24	--	--	0.00	62.52	52.52	-12.28	-2.28	L2
0.46	43.42	--	--	0.00	56.77	46.77	-13.35	-3.35	L2
0.69	41.38	--	--	0.00	56.00	46.00	-14.62	-4.62	L2
6 Worst Data									

LINE 1 RESULTS - EUT at normal transmitter mode with antenna

Compliance Certification Services
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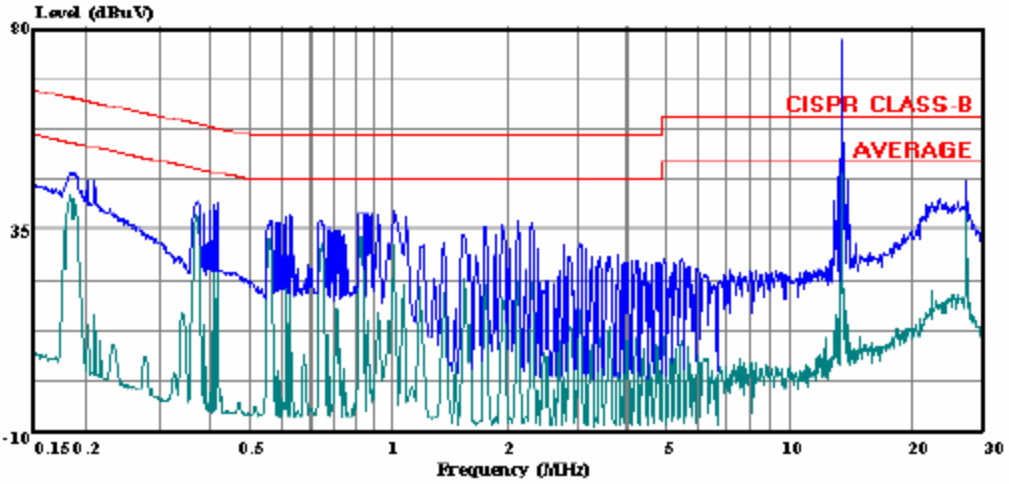
Fax: (408) 463-0888

Data#: 7 File#: VivoTech (IC).EMIDate: 11-29-2005 Time: 14:03:47



Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 05U3831
Company : VIVO TECH
EUT Description: POS System, 13.56 MHz, Antenna, Adapter
Model : VIVOPay 5000
EUT Config : EUT Stand alone
Mode Of Oper : Transmitting
Target : RSS 210
Power Source: : 115VAC, 60 Hz
: Line 1: Peak(Black), Average(Green)
: EUT without 75 Ohm termination
: at Antenna Port

LINE 2 RESULTS - EUT at normal transmitter mode with antenna

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

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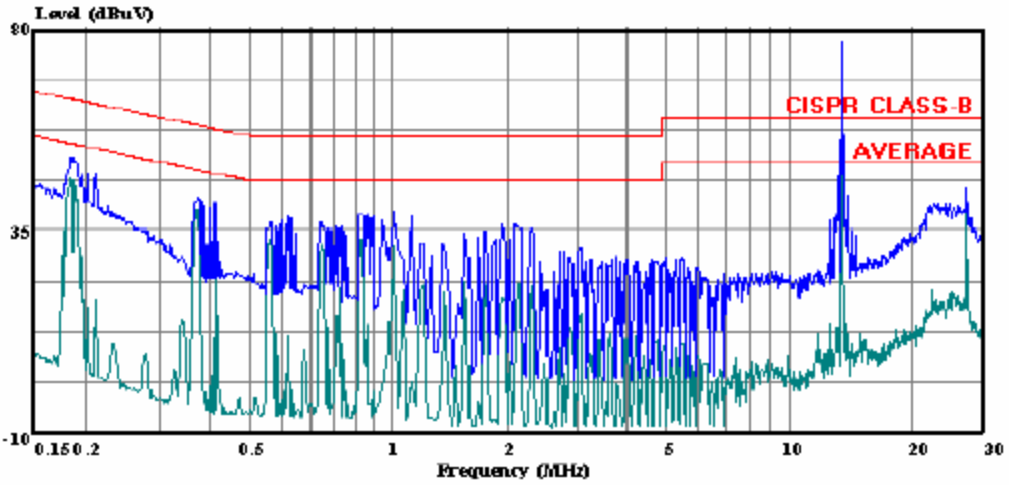

Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 05U3831
Company : VIVO TECH
EUT Description: POS System, 13.56 MHz, Antenna, Adapter
Model : VIVOPay 5000
EUT Config : EUT Stand alone
Mode Of Oper : Transmitting
Target : RSS 210
Power Source: : 115VAC, 60 Hz
: Line 2: Peak(Black), Average(Green)
: EUT without 75 Ohm termination
: at Antenna Port

LINE 1 RESULTS - EUT with termination at antenna port

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

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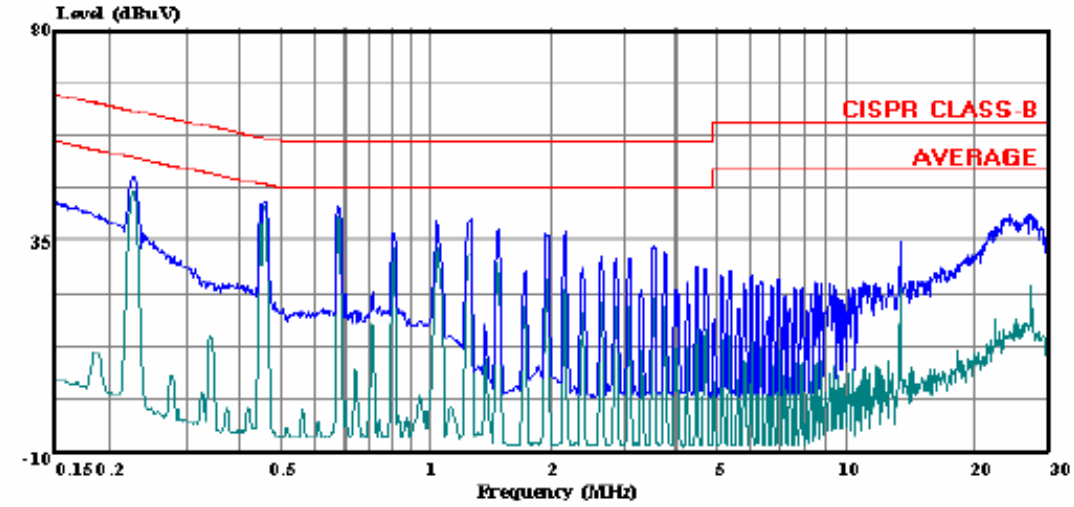

Trace: 26 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 05U3831
Company : VIVO TECH
EUT Description: POS System, 13.56 MHz, Antenna, Adapter
Model : VIVOPay 5000
EUT Config : EUT Stand alone
Mode Of Oper : Transmitting
Target : RSS 210
Power Source: : 115VAC, 60 Hz
: Line 1: Peak(Black), Average(Green)
: EUT with 75 Ohm termination
: at Antenna Port

LINE 2 RESULTS - EUT with termination at antenna port

Compliance Certification Services
561F Monterey Road
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Tel: (408) 463-0885
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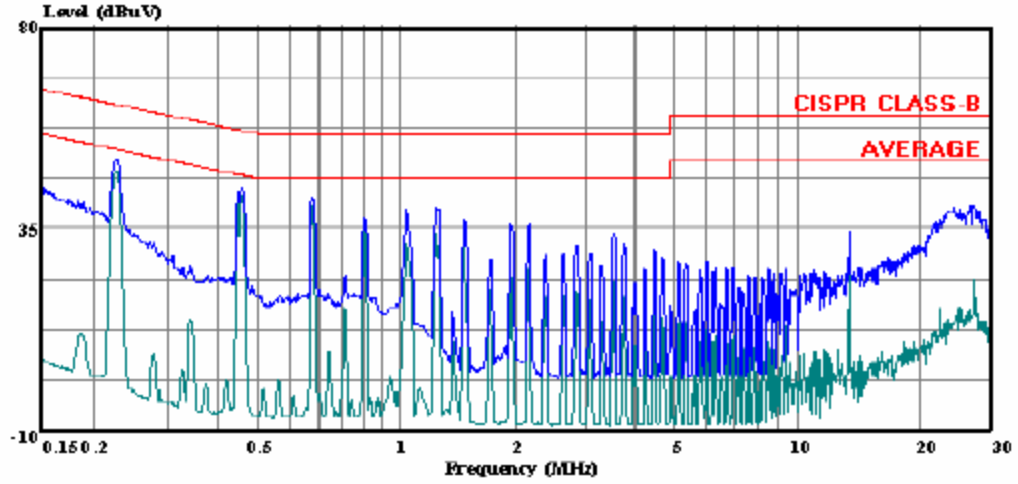

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Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 05U3831
Company : VIVO TECH
EUT Description: POS System, 13.56 MHz, Antenna, Adapter
Model : VIVOPay 5000
EUT Config : EUT Stand alone
Mode Of Oper : Transmitting
Target : RSS 210
Power Source: : 115VAC, 60 Hz
: Line 2: Peak(Black), Average(Green)
: EUT with 75 Ohm termination
: at Antenna Port

8. SETUP PHOTOS

RADIATED EMISSION (30-1000 MHz)

RADIATED EMISSIONS (FRONT)

RADIATED EMISSIONS (BACK)

AC MAINS LINE CONDUCTED EMISSION (0.15-30 MHz)

LINE CONDUCTED EMISSION (FRONT)

LINE CONDUCTED EMISSION (BACK)

RADIATED EMISSIONS (0.009-30 MHz)

RADIATED EMISSIONS (Below 30 MHz)

FREQUENCY STABILITY

TEMPERATURE CHAMBER

END OF REPORT