



**FCC CFR47 PART 15 SUBPART C  
INDUSTRY CANADA RSS-210 ISSUE 7  
INDUSTRY CANADA RSS-GEN ISSUE 2  
CERTIFICATION TEST REPORT**

**FOR**

**LOW POWER TRANSMITTER WIRELESS CARD READER**

**MODEL NUMBER: ViVOpay 5000m**

**FCC ID: Q55VP5KAM**

**IC: 5141A-030VP5M**

**REPORT NUMBER: 07U11478-1, REVISION B1**

**ISSUE DATE: JANUARY 18, 2008**

*Prepared for*

**VIVOTECH  
451 EL CAMINO REAL  
SANTA CLARA, CA 95050, USA**

*Prepared by*

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**NVLAP LAB CODE 200065-0**

Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/29/07	Initial Issue	F. Ibrahim
A	01/10/08	Revised model name and EUT description Added EUT photo to section 5.1 Revised the S/N	F. Ibrahim
B	01/15/08	Added reference to IC rules	F. Ibrahim
B1	01/18/08	Revised FCC ID and IC #	T. Hong

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## 1. ATTESTATION OF TEST RESULTS

**COMPANY NAME:** VIVOTECH  
451 EL CAMINO REAL  
SANTA CLARA, CA 95050, USA

**EUT DESCRIPTION:** It is an ISO/IEC14443 Contactless Proximity Coupling Device with Application (PCDA) and also known as Embedded in a stand-alone intelligent Contactless card reader with magnetic stripe module.

**MODEL:** ViVOpay 5000m

**SERIAL NUMBER:** CA0752A332

**DATE TESTED:** 11/15 – 11/20/2007

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	No Non-Compliance Noted
RSS-210 Issue 7 and RSS-GEN Issue 2	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.

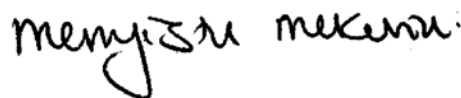
**Note:** The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by Compliance Certification Services and all revisions are duly noted in the revisions 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:



FRANK IBRAHIM  
EMC SUPERVISOR  
COMPLIANCE CERTIFICATION SERVICES

Tested By:



MENGISTU MEKURIA  
EMC ENGINEER  
COMPLIANCE CERTIFICATION SERVICES

## 2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 2, and RSS-210 Issue 7.

## 3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

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

It is an ISO/IEC14443 Contactless Proximity Coupling Device with Application (PCDA) and also known as Embedded in a stand-alone intelligent contactless card reader with magnetic stripe module.



## **5.2. DESCRIPTION OF AVAILABLE ANTENNAS**

The radio utilizes an integral ungrounded loop antenna, the Antenna manufacturer is Vivotech.

## **5.3. SOFTWARE AND FIRMWARE**

The firmware installed in the EUT during testing was called production firmware version  
EB7-GR 1.0.0

## **5.4. WORST-CASE CONFIGURATION**

The natural position of the EUT considered as a worst-case configuration

## 5.5. DESCRIPTION OF TEST SETUP

### SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
AC/DC ADAPTER	GLOBAL POWER	3A-161WP09	GPWAC-15-09-2-VT	N/A

### I/O CABLES

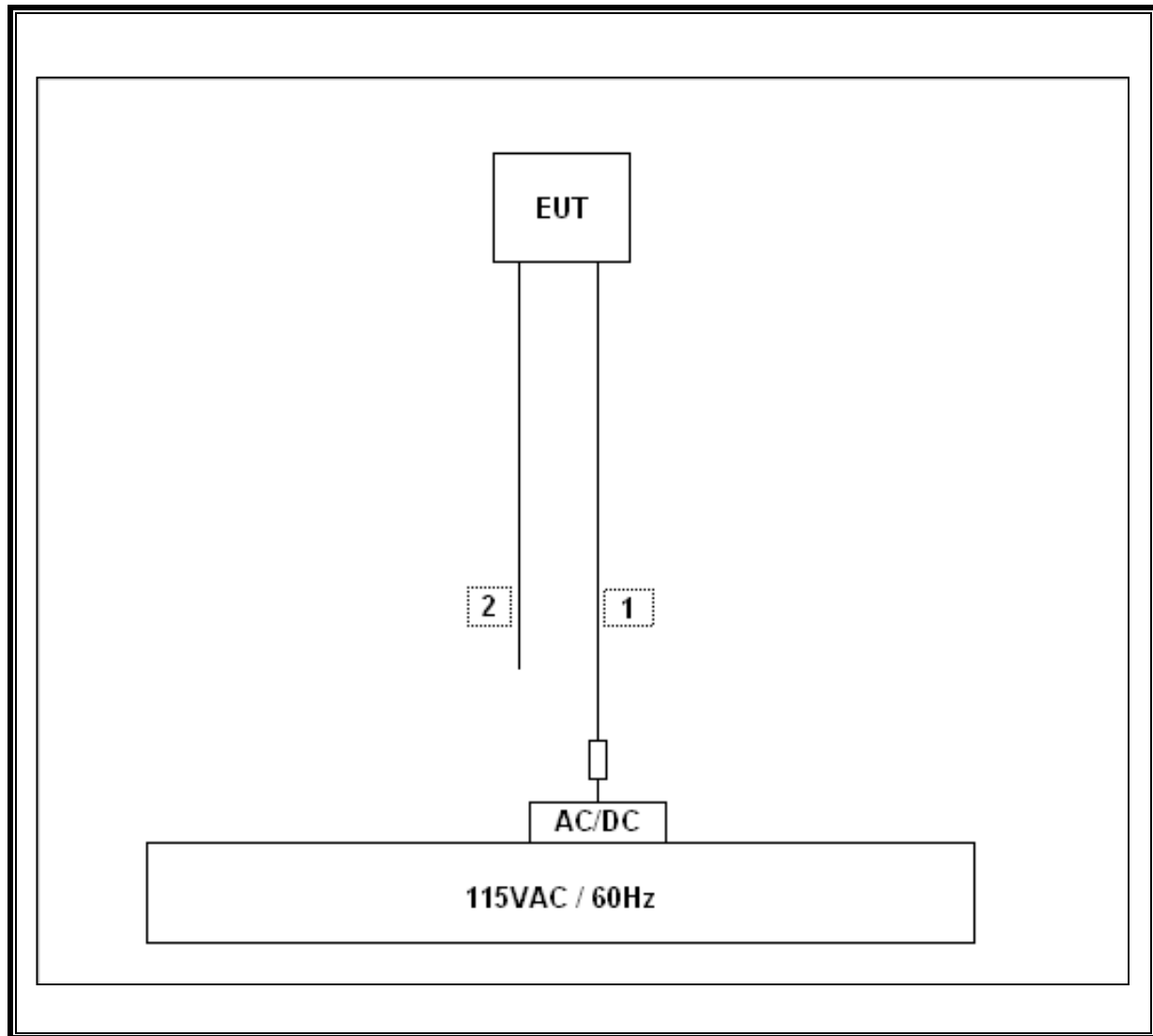
I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	DC	1	DC	Unshielded	2.0 m	Ferrite at one end
2	ETHERNET	1	RJ45	Unshielded	3.0m	N/A

### TEST SETUP

The EUT is a stand-alone device; the firmware that the EUT has makes the radio unit works.



**SETUP DIAGRAM FOR TESTS**



## 6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
RF Filter Section	HP	85420E	3705A00256	06/12/08
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/25/08
EMI Test Receiver	R & S	ESHS 20	827129/006	01/27/08
EMI Receiver, 9 kHz ~ 2.9 GHz	HP	8542E	3942A00286	06/12/08
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent	E4446A	US42070220	11/26/07
Preamplifier	HP	8447D	1937A02062	05/09/08
Antenna, Bilog 30MHz ~ 2Ghz	Sunol Sciences	JB1	A0022704	09/28/08
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	10/25/08
Antenna, Loop, 30 MHz	EMCO	6502	C00593	10/24/08
Environmental Chamber	Thermotron	SE 600-10-10	C00930	04/16/08

## 7. APPLICABLE LIMITS AND TEST RESULTS

### 7.1. RADIATED 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 0.15 MHz to 1000 MHz.

#### LIMIT

FCC §15.225:

- (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 as follows:

§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:

IC, A2.6 13.110-14.010 MHz:

The field strength of any emission shall not exceed the following limits:

- (a) 15.848 millivolts/m (84 dB $\mu$ V/m) at 30 m, within the band 13.553-13.567 MHz.
- (b) 334 microvolts/m (50.5 dB $\mu$ V/m) at 30 m, within the bands 13.410-13.553 MHz and 13.567-13.710MHz.
- (c) 106 microvolts/m (40.5 dB $\mu$ V/m) at 30 m, within the bands 13.110-13.410 MHz and 13.710-14.010MHz.
- (d) 30 microvolts/m (29.5 dB $\mu$ V/m) at 30 m, outside the band 13.110-14.010 MHz.

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:

## 7.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (0.15 – 30 MHz)

### EMISSIONS IN THE FREQUENCY RANGE OF 13.11-14.01 MHz

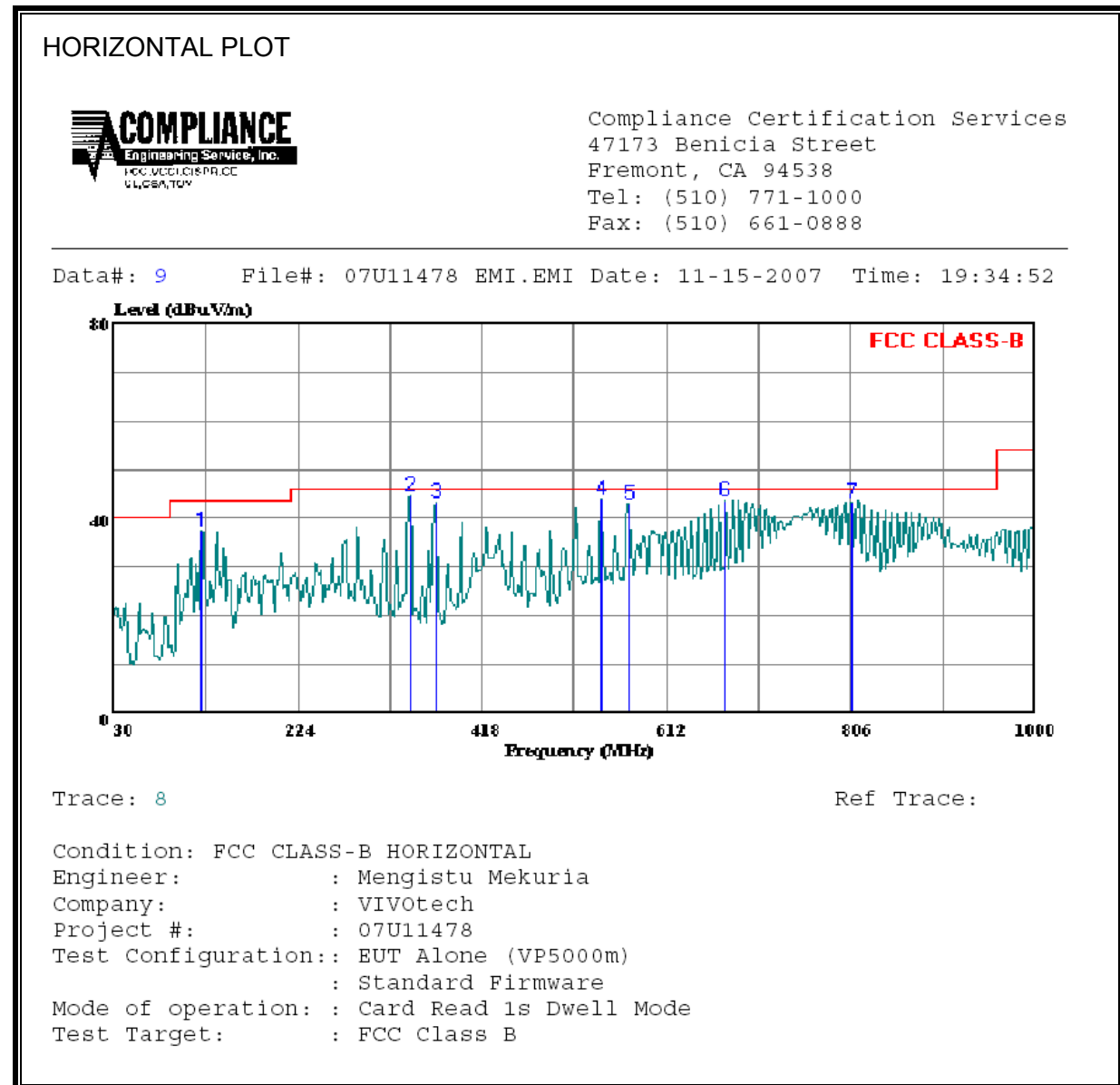
FCC Part 15, Subpart B & C												10 Meter Distance Measurement At Open Field
Company: Vivotech Project #: 07U11478 Model #: Vivopay 5000m Tester: Doug Anderson Date: 11/19/07												
Frequency (MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	AF (dB/m)	Distance Correction (dB)	PK Corrected Reading (dBuV/m)	AV Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	PK Margin (dB)	AV Margin (dB)	Notes
<b>Loop Antenna Face On:</b>												
13.56	40.9	40.2	N/A	10.56	-19.08	31.67	N/A	84.00	N/A	-52.3	N/A	Fundamental @ 10m Dist
13.41	12.44	6.9	N/A	10.54	-19.08	-1.64	N/A	50.48	N/A	-52.1	N/A	13.41-13.553MHz Spurious @ 10m
13.553	29.51	26.4	N/A	10.56	-19.08	17.87	N/A	50.48	N/A	-32.6	N/A	13.41-13.553MHz Spurious @ 10m
13.567	29.00	26.3	N/A	10.56	-19.08	17.77	N/A	50.48	N/A	-32.7	N/A	13.567-13.710MHz Spurious @ 10m
13.71	14.9	6.6	N/A	10.57	-19.08	-1.91	N/A	50.48	N/A	-52.4	N/A	13.567-13.710MHz Spurious @ 10m
13.11	14.8	11.6	N/A	10.51	-19.08	3.03	N/A	40.51	N/A	-37.5	N/A	13.110-13.410MHz Spurious @ 10m
13.41	12.44	6.9	N/A	10.54	-19.08	-1.64	N/A	40.51	N/A	-42.2	N/A	13.110-13.410MHz Spurious @ 10m
13.71	14.9	6.6	N/A	10.57	-19.08	-1.91	N/A	40.51	N/A	-42.4	N/A	13.710-14.010MHz Spurious @ 10m
14.01	11.2	5.8	N/A	10.6	-19.08	-2.68	N/A	40.51	N/A	-43.2	N/A	13.710-14.010MHz Spurious @ 10m
<b>Loop Antenna Face Off:</b>												
13.56	53.3	52.8	N/A	10.56	-19.08	44.27	N/A	84.00	N/A	-39.7	N/A	Fundamental @ 10m Dist
13.41	29.6	21.9	N/A	10.54	-19.08	13.36	N/A	50.48	N/A	-37.1	N/A	13.41-13.553MHz Spurious @ 10m
13.553	47.1	46.3	N/A	10.56	-19.08	37.77	N/A	50.48	N/A	-12.7	N/A	13.41-13.553MHz Spurious @ 10m
13.567	49.00	48.2	N/A	10.56	-19.08	39.67	N/A	50.48	N/A	-10.8	N/A	13.567-13.710MHz Spurious @ 10m
13.71	30.2	20.00	N/A	10.57	-19.08	11.49	N/A	50.48	N/A	-39.0	N/A	13.567-13.710MHz Spurious @ 10m
13.11	15.9	9.7	N/A	10.51	-19.08	1.13	N/A	40.51	N/A	-39.4	N/A	13.110-13.410MHz Spurious @ 10m
13.41	29.6	21.9	N/A	10.54	-19.08	13.36	N/A	40.51	N/A	-27.2	N/A	13.110-13.410MHz Spurious @ 10m
13.71	30.2	20.00	N/A	10.57	-19.08	11.49	N/A	40.51	N/A	-29.0	N/A	13.710-14.010MHz Spurious @ 10m
14.01	15.3	10.9	N/A	10.6	-19.08	2.42	N/A	40.51	N/A	-38.1	N/A	13.710-14.010MHz Spurious @ 10m
* No more emissions were found between 13.110 – 14.010 MHz band.  <b>Note:</b> The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 1000MHz. 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												

**EMISSIONS OUTSIDE THE FREQUENCY RANGE OF 13.11-14.01 MHz (0.15-30 MHz)**

<b>FCC Part 15, Subpart B &amp; C                      10 Meter Distance Measurement At Open Field</b>												
<b>Company:</b> Vivotech <b>Project #:</b> 07U11478 <b>Model #:</b> Vivopay 5000m <b>Tester:</b> Doug Anderson <b>Date:</b> 11/19/07												
Frequency (MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	AF dB/m	Distance Correction (dB)	PK Corrected Reading (dBuV/m)	AV Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	PK Margin (dB)	AV Margin (dB)	Notes
<b>Loop Antenna Face On:</b>												
27.12	29.9	28.6	N/A	9.046	-19.08	18.56	N/A	29.54	N/A	-11.0	N/A	0.15-30MHz Spurious @ 3m
<b>Loop Antenna Face Off:</b>												
27.12	14.3	11.1	N/A	9.046	-19.08	1.06	N/A	29.54	N/A	-28.5	N/A	0.15-30MHz Spurious @ 3m
<p>* No more emissions were found up to 30MHz</p> <p><u>Note:</u> The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kHz and above 10000Mhz. Radiated emission limits in these three bands are based on measurements employing an average detector.</p> <p>P.K. = Peak            Q.P. = Quasi Peak Reading            A.F. = Antenna factor</p>												

## 7.1.2. SPURIOUS EMISSIONS (30 - 1000 MHz)

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



# HORIZONTAL DATA

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV/m	dB	dBuV/m	dB	
1	121.180	53.94	37.29	-16.66	43.50	-6.22	Peak
2	342.340	59.59	44.69	-14.90	46.00	-1.31	Peak
3	368.530	57.36	43.29	-14.07	46.00	-2.71	Peak
4	543.130	54.49	43.94	-10.55	46.00	-2.06	Peak
5	572.230	53.21	43.01	-10.20	46.00	-2.99	Peak
6	674.080	52.39	43.51	-8.88	46.00	-2.49	Peak
7	807.940	50.12	43.30	-6.82	46.00	-2.70	Peak



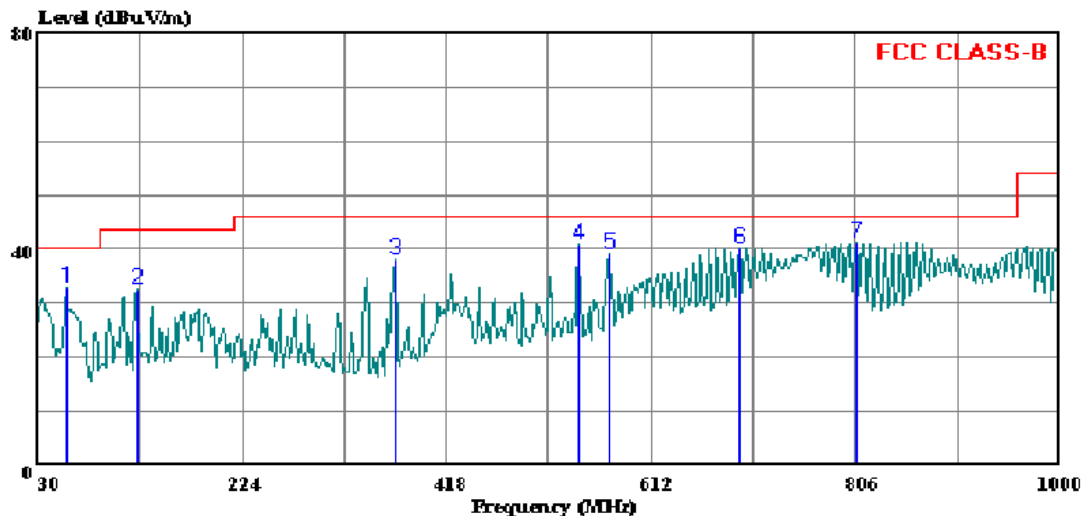
**SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)**

**VERTICAL PLOT**



Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538  
Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 11 File#: 07U11478 EMI.EMI Date: 11-15-2007 Time: 19:45:34



Trace: 10

Ref Trace:

Condition: FCC CLASS-B VERTICAL  
Engineer: : Mengistu Mekuria  
Company: : VIVotech  
Project #: : 07U11478  
Test Configuration: : EUT Alone (VP5000m)  
: Standard Firmware  
Mode of operation: : Card Read is Dwell Mode  
Test Target: : FCC Class B

VERTICAL DATA

	Freq	Read Level	Level	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV/m	dB	dBuV/m	dB	
1	56.190	55.82	32.88	-22.94	40.00	-7.12	Peak
2	124.090	49.20	32.68	-16.52	43.50	-10.82	Peak
3	368.530	52.26	38.19	-14.07	46.00	-7.81	Peak
4	543.130	51.35	40.80	-10.55	46.00	-5.20	Peak
5	572.230	49.41	39.21	-10.20	46.00	-6.79	Peak
6	696.390	48.85	40.31	-8.54	46.00	-5.69	Peak
7	807.940	48.05	41.23	-6.82	46.00	-4.77	Peak

## 7.2. AC MAINS LINE CONDUCTED EMISSIONS

### TEST PROCEDURE

ANSI C63.4

### 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 to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 $\mu$ H/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 band edges.

Frequency range (MHz)	Limits (dB $\mu$ V)	
	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
<b>Notes:</b> 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

### RESULTS:

# **6 WORST EMISSIONS**

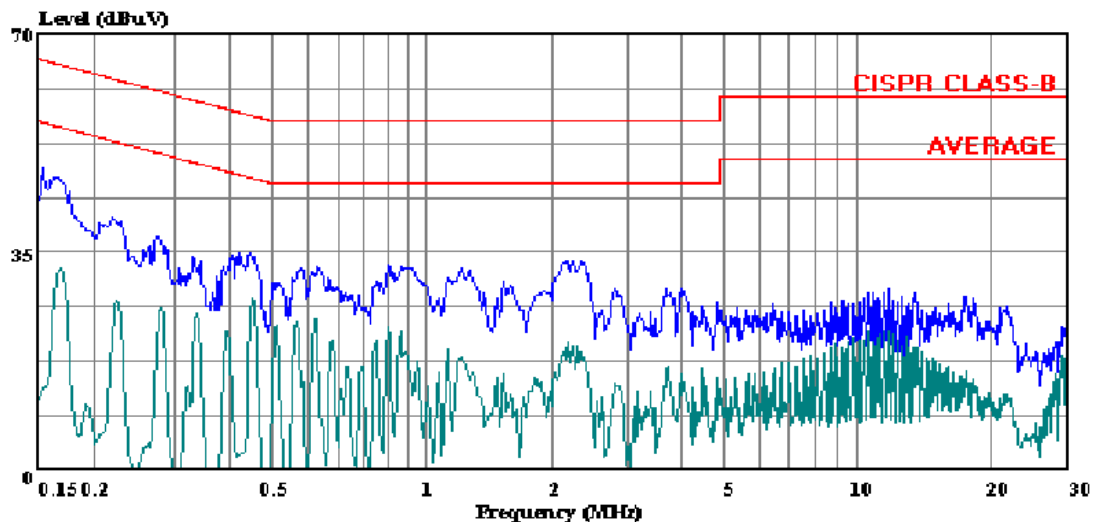
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.16	48.40	--	--	0.00	65.73	55.73	-17.33	-7.33	L1
0.42	34.78	--	--	0.00	57.47	47.47	-22.69	-12.69	L1
2.33	33.56	--	--	0.00	56.00	46.00	-22.44	-12.44	L1
0.16	48.10	--	--	0.00	65.73	55.73	-17.63	-7.63	L2
0.40	37.32	--	--	0.00	57.85	47.85	-20.53	-10.53	L2
2.51	33.56	--	--	0.00	56.00	46.00	-22.44	-12.44	L2
6 Worst Data									

**LINE 1 RESULTS**



Compliance Certification Services  
47173 Benicia Street  
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Data#: 14 File#: 07U11478 LC.EMI Date: 11-15-2007 Time: 23:11:47



(Line Conduction)

Trace: 12

Ref Trace:

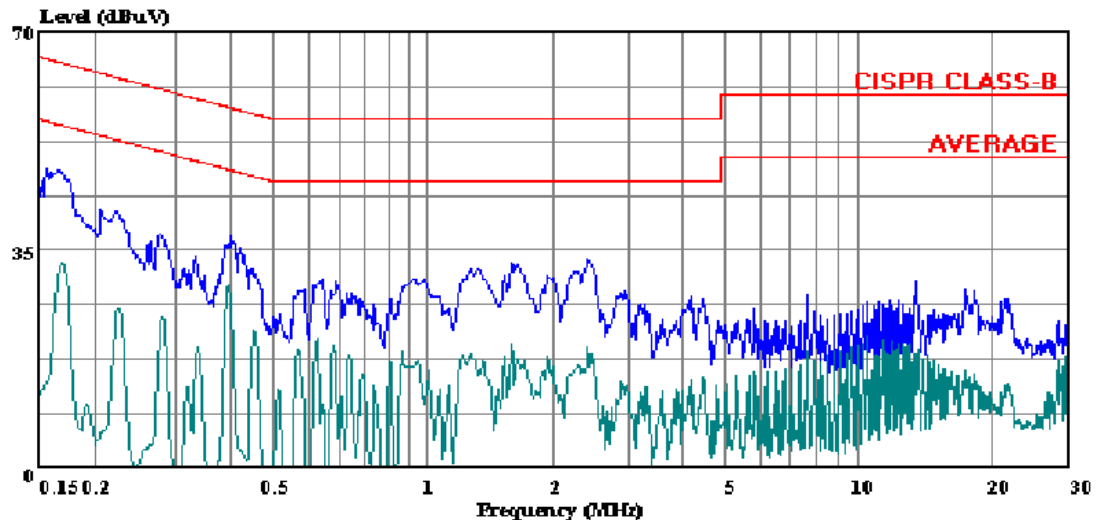
Condition: CISPR CLASS-B  
Test Operator:: Mengistu Mekuuria  
Project #: : 07U11478  
Company: : VIVotech  
Configuration: EUT Alone (VIVotech VP5000m)  
Mode: : GR firmware Normal Operation  
Target: : FCC Class B  
Voltage: : 115VAC/60Hz  
: L1: Peak (Blue); Green (Average)

**LINE 2 RESULTS**



Compliance Certification Services  
47173 Benicia Street  
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Tel: (510) 771-1000  
Fax: (510) 661-0888

Data#: 7 File#: 07U11478 LC.EMI Date: 11-15-2007 Time: 23:02:28



(Line Conduction)

Trace: 5

Ref Trace:

Condition: CISPR CLASS-B  
Test Operator:: Mengistu Mekuuria  
Project #: : 07U11478  
Company: : VIVotech  
Configuration: BUT Alone (VIVotech VP5000m)  
Mode: : GR firmware Normal Operation  
Target: : FCC Class B  
Voltage: : 115VAC/60Hz  
: L2: Peak (Blue); Green (Average)

### **7.3. FREQUENCY STABILITY**

#### **LIMIT**

FCC §15.225 (e) The frequency tolerance of the carrier signal shall be maintained within  $\pm 0.01\%$  of the operating frequency, 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. For battery operated equipment, the equipment tests shall be performed using a new battery.

IC, A2.6 13.110-14.010 MHz:

Carrier frequency stability shall be maintained to  $\pm 0.01\%$  ( $\pm 100$  ppm).

#### **TEST PROCEDURE**

ANSI / TIA / EIA 603 Clauses 2.3.1 and 2.3.2

#### **RESULTS**

No non-compliance noted.

Reference Frequency: EUT Channel 13.56MHz @ 20°C Limit: $\pm 100$ ppm = 135.603 KHz				
Power Supply (Vdc)	Environment Temperature (°C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
9.30	50	13.5602920	0.018	$\pm 100$
9.30	40	13.5602960	0.015	$\pm 100$
9.30	30	13.5603070	0.007	$\pm 100$
<b>9.30</b>	<b>20</b>	<b>13.5603170</b>	<b>0.000</b>	<b><math>\pm 100</math></b>
9.30	10	13.5603650	-0.035	$\pm 100$
9.30	0	13.5604020	-0.063	$\pm 100$
9.30	-10	13.5604120	-0.070	$\pm 100$
9.30	-20	13.5604130	-0.071	$\pm 100$
7.90	20	13.5603160	0.001	$\pm 100$
10.7	20	13.5603140	0.002	$\pm 100$



## 7.4. 99% BANDWIDTH

### LIMITS

None; for reporting purposes only.

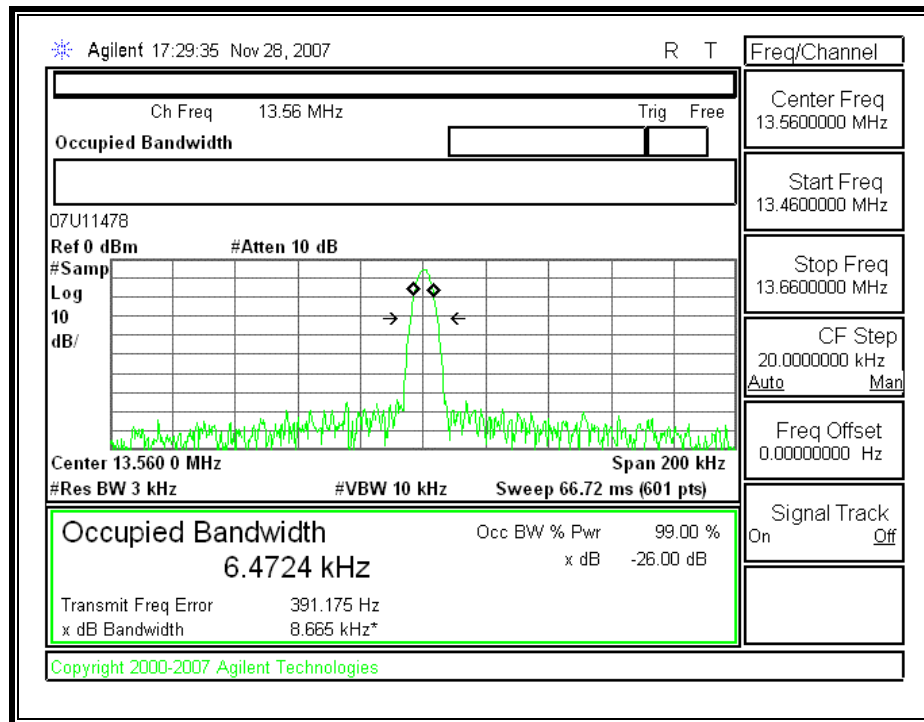
### TEST PROCEDURE

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

Frequency (MHz)	99% Bandwidth (kHz)
13.56	6.4724

**99% BANDWIDTH**



## 8. SETUP PHOTOS

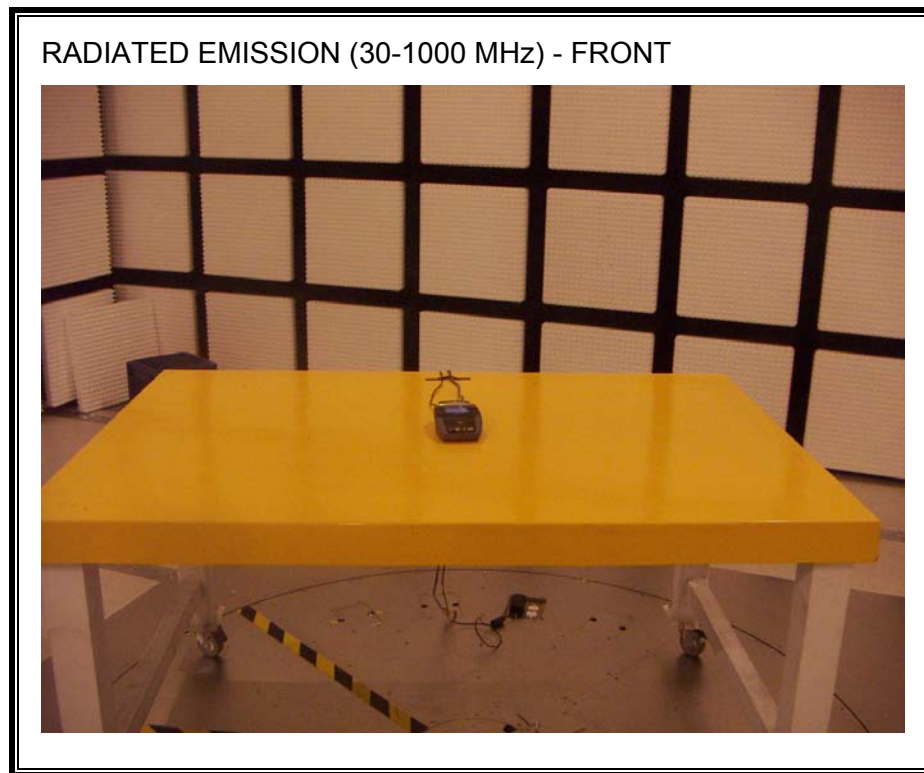
### RADIATED EMISSION (0.15-30 MHz)



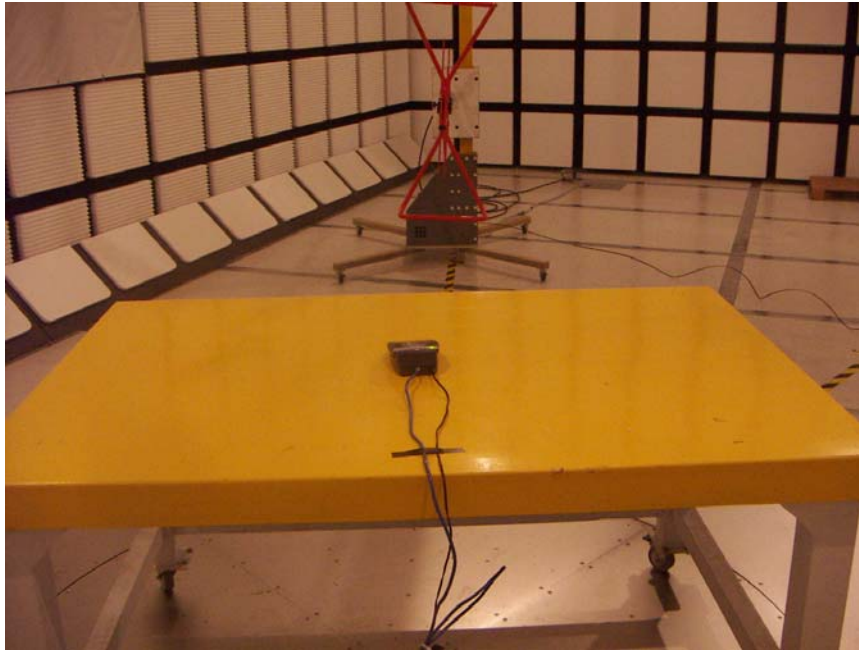
RADIATED EMISSION (0.15-30 MHz) – FACE OFF



**RADIATED EMISSION (30-1000 MHz)**



RADIATED EMISSION (30-1000 MHz) - BACK



**AC MAINS LINE CONDUCTED EMISSION**

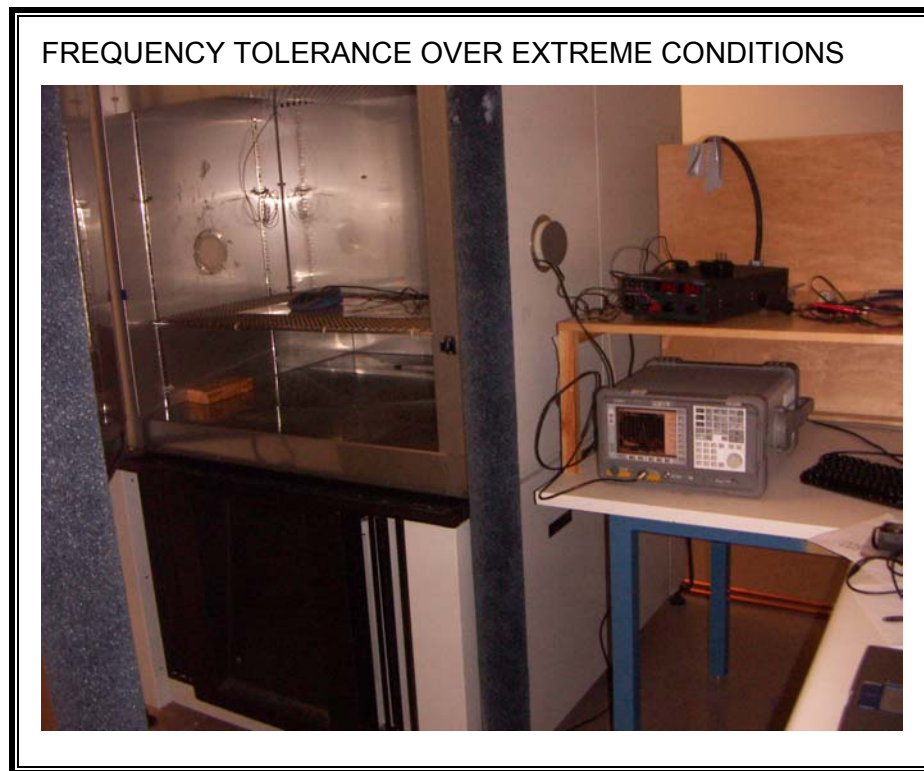


LINE CONDUCTED EMISSION (BACK)





**FREQUENCY TOLERANCE OVER EXTREME CONDITIONS**



**END OF REPORT**