FCC CFR47 PART 15 SUBPART C
FCC CFR47 PART 15 SUBPART B
INDUSTRY CANADA RSS-210 ISSUE 7
INDUSTRY CANADA RSS-GEN ISSUE 2

CERTIFICATION TEST REPORT

FOR

PCI-PED v2.1 & ISO/IEC14443 Contactless Reader

MODEL NUMBER: ViVOpay 8100

FCC ID: Q55VIVOPAY8100
IC: 5141A-VP8100

REPORT NUMBER: 10U13108-1, Revision D

ISSUE DATE: AUGUST 09, 2010

Prepared for
ViVOtech, Inc.
451 EL CAMINO REAL
SANTA CLARA, CA 95050, U.S.A.

Prepared by
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	04/06/10	Initial Issue	F. Ibrahim
A	06/14/10	Added testing results for second configuration	F. Ibrahim
B	06/24/10	Revised section 5.2 and section 5.6	F. Ibrahim
C	07/30/10	Revised sections 5.7.1, 5.7.2 and 5.6	F. Ibrahim
D	08/09/10	Revised modification section.	A. Zaffar

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ViVOtech, Inc.
451 EL CAMINO REAL
SANTA CLARA, CA 95050, U.S.A.

EUT DESCRIPTION: PCI-PED v2.1 & ISO/IEC14443 Contactless Reader

MODEL: ViVOpay 8100

SERIAL NUMBER: 02117, MB340

DATE TESTED: February 22 – March 12, 2010
May 17 - June 3, 2010

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Pass
FCC PART 15 SUBPART B	Pass
INDUSTRY CANADA RSS-210 Issue 7, Annex 2	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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 CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For CCS By:

FRANK IBRAHIM
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, 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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

ViVOpay 8100 is a PCI-PED v2.1 & ISO/IEC14443 Contactless Reader. It operates at 13.56 MHz.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum E field as follows:

Configuration	Frequency (MHz)	Mode	Fundamental E field @ 10m distance (dBuV/m)
1st configuration	13.56	Normal TX mode	73.89
2nd configuration	13.56	Normal TX mode	77.72

The transmitter has a maximum E-field at 10m distance as follows:
EIRP = E field at 3m distance – 95.2
E field at 3m distance = E field at 10m distance + 20 = 77.72 + 20 = 97.72 dBuV/m
EIRP = 97.72 -95.2 = **2.52 dBm**

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The 13.56MHz antenna is integrated inside the product, around the LCD area invisible to the user.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was HG2-AR1.2.0.

5.5. WORST-CASE CONFIGURATION AND MODE

FIRST CONFIGURATION:
EUT powered by USB cable from POS unit.

SECOND CONFIGURATION:
EUT powered by AC/DC adapter.

Second configuration was found to be worst-case.

5.6. MODIFICATIONS

The following modifications were implemented in order to pass radiated emissions during the digital device tests:

The following locations and ferrites were used.

1. Serial data cable (ViVO part# 220-2457-00) was inserted in a heat shrinking tube:
a) A ferrite (Fair-rite PN 0443167251) was clipped onto this cable with one-loop of wire through it near the base unit.
b) A ferrite (Fair-rite PN 0443167251) was clipped onto this cable with one-loop of wire through it near the host PC (Dell D630 laptop).

2. USB with power cable:
a) A ferrite (Fair-rite PN 0443167251) was clipped onto the cable with one-loop of wire through it near the base unit.
b) A ferrite (Fair-rite PN 0443167251) was clipped onto this cable with one-loop of wire through it near the host PC (Dell D630 laptop).

3. Desk top PSU by Global Power Corp (ViVO part# 140-2035-01):
a) A ferrite (Fair-rite PN 0443167251) was used with one-loop of wire through it near the base unit.
b) A ferrite (Fair-rite PN 0443167251) was used with one-loop of wire through it near the power supply.

5.7. DESCRIPTION OF TEST SETUP

5.7.1. FIRST CONFIGURATION

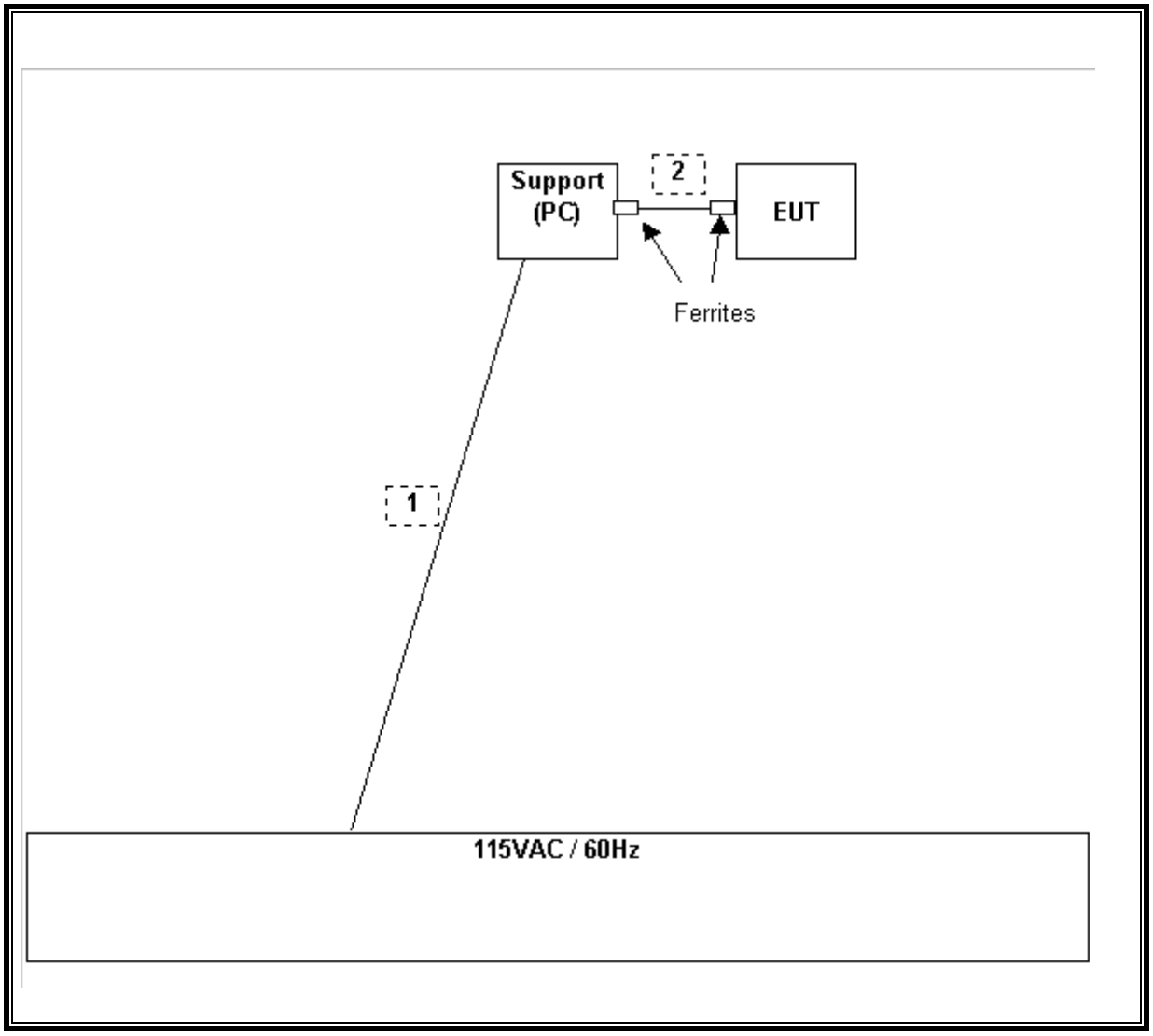
SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
PC	IBM	4840	38700	DoC

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US 115V	Un-shielded	4m	N/A
2	USB	1	USB	Shielded	1m	N/A

SETUP DIAGRAM FOR TESTS



5.7.2. SECOND CONFIGURATION

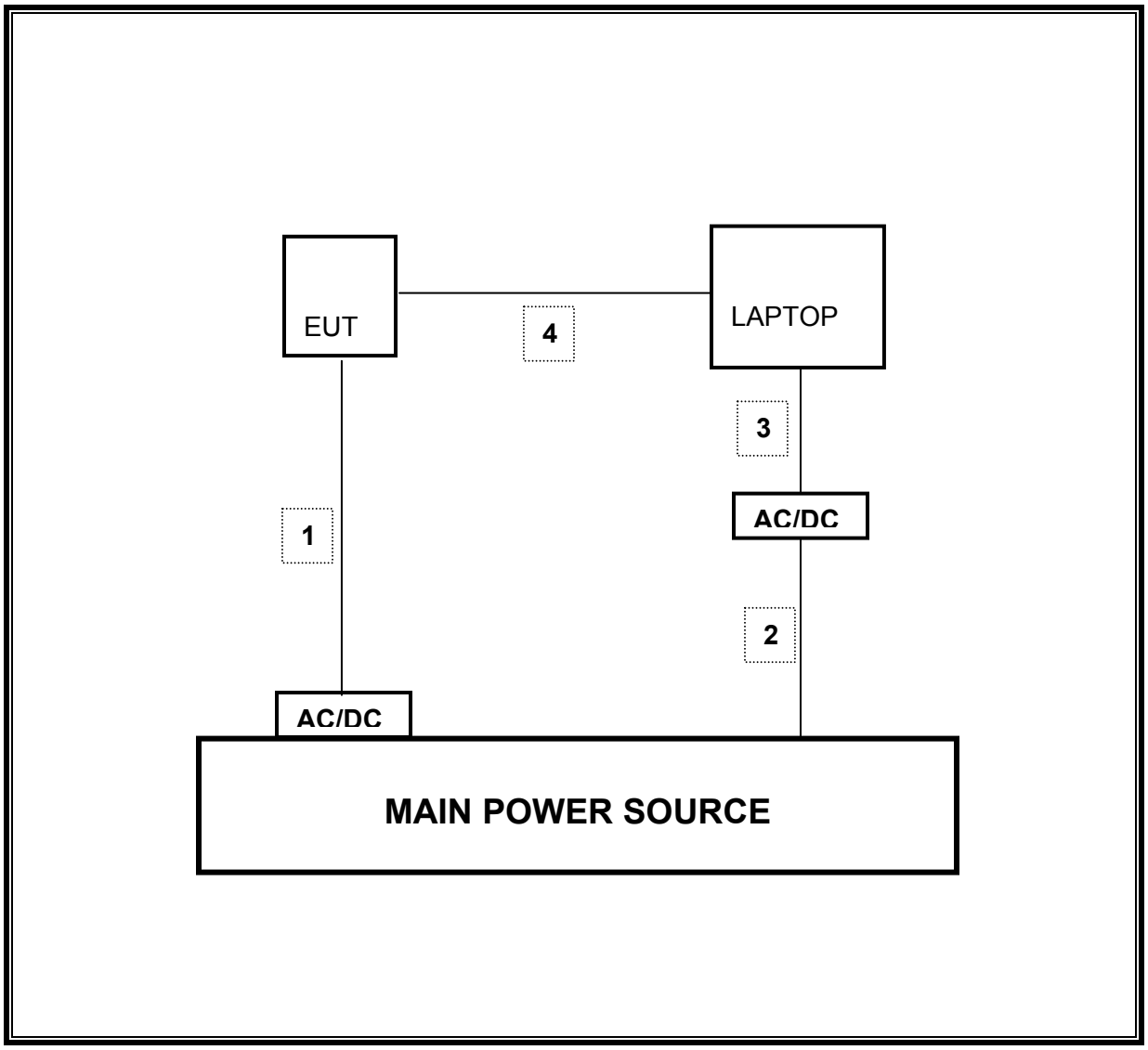
SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC/DC	GLOBAL POWER	3A-161WP09	GPWAC-15-09-VT	N/A
LAPTOP	DELL	Latitude D610	CN-0U8082-48643-5CE-5546	DoC
AC/DC	DELL	HA65NS1-00	CN-0HN662-47890-79I-C03L	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	2m	Ferrite at each end
2	AC	1	AC	Unshielded	1m	N/A
2	DC	1	DC	Unshielded	2m	Ferrite at one end
2	Serial	1	RS232	Unshielded	0.8m	Ferrite at each end

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

First Configuration:

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**S/N**	**Cal Due**
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	11/05/10
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/06/10
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/11
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	C00930	04/11/11
Antenna, Loop, 30 MHz	EMCO	6502	C00593	01/12/12
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	10/29/11
Bilog Antenna	Sunol Science	JB1	A121003	07/14/10
Pre-amplifier	Agilent / HP	8447D	1937A02062	07/06/10

Second Configuration:

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	12/10/09	12/13/10
Preamplifier, 1300 MHz	Agilent / HP	8447D	0	05/09/09	05/09/10
Loop Antenna	EMCO	6502	C00593	10/24/09	10/24/10
Spectrum Analyzer, 40 GHz	Agilent / HP	8564E	C00951	09/05/09	12/05/10
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	N02481	09/15/09	09/15/10
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	08/06/09	05/06/11

7. RADIATED EMISSION TEST RESULTS

7.1. LIMITS AND PROCEDURE

LIMIT

§15.225
IC RSS-210, Section 2.6 (Transmitter)
IC RSS-GEN, Section 6 (Receiver)

(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:

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.

Formula for converting the filed strength from uV/m to dBuV/m is:
Limit (dBuV/m) = 20 log limit (uV/m)

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.

TEST PROCEDURE

ANSI C63.4

The EUT is an intentional radiator that incorporates a digital device, the highest fundamental frequency generated or used in the device is 90 MHz; therefore, the frequency range was investigated from 30 MHz to 1000 MHz.

The EUT has clock frequencies as below:
12MHz, 24 MHz and 13.56MHz.

RESULTS

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

FIRST CONFIGURATION:

FCC Part 15, Subpart B & C **10 Meter Distance Measurement At Open Field**

Company: Vivotech
Project #: 10U13108
Model #: ViVOpay 8100
Tester: Thanh Nguyen
Date: 3/11/2010

Frequency (MHz)	PK (dBu/V)	QP (dBu/V)	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)	Notes
Loop Antenna Face On:											
13.56	63.33		N/A	10.56	-19.08	54.81	N/A	84.00	N/A	-29.2	Fundamental @10m Dist
13.41	34.92		N/A	10.54	-19.08	26.38	N/A	50.47	N/A	-24.1	Spurious @10m Dist
13.553	25.83		N/A	10.56	-19.08	17.31	N/A	50.47	N/A	-33.2	Spurious @10m Dist
13.567	58.3		N/A	10.56	-19.08	49.78	N/A	50.47	N/A	-0.7	Spurious @10m Dist
13.66	34.67		N/A	10.57	-19.08	26.16	N/A	50.47	N/A	-24.3	Spurious @10m Dist
13.186	27.5		N/A	10.52	-19.08	18.94	N/A	40.51	N/A	-21.6	Spurious @10m Dist
13.426	35.83		N/A	10.54	-19.08	27.29	N/A	50.47	N/A	-23.2	Spurious @10m Dist
13.636	38.33		N/A	10.56	-19.08	29.81	N/A	50.47	N/A	-20.7	Spurious @10m Dist
13.673	40.67		N/A	10.57	-19.08	32.16	N/A	50.47	N/A	-18.3	Spurious @10m Dist
13.853	40.33		N/A	10.59	-19.08	31.84	N/A	40.51	N/A	-8.7	Spurious @10m Dist
14.283	36.67		N/A	10.63	-19.08	28.22	N/A	29.54	N/A	-1.3	Spurious @10m Dist
27.12	20.67		N/A	9.046	-19.08	10.64	N/A	29.54	N/A	-18.9	Spurious @10m Dist
Loop Antenna Face Off:											
13.56	62.67		N/A	10.56	-19.08	54.15	N/A	84.00	N/A	-29.9	Fundamental @10m Dist
13.41	35.83		N/A	10.54	-19.08	27.29	N/A	50.47	N/A	-23.2	Spurious @10m Dist
13.553	48.5		N/A	10.56	-19.08	39.98	N/A	50.47	N/A	-10.5	Spurious @10m Dist
13.567	50.33		N/A	10.56	-19.08	41.81	N/A	50.47	N/A	-8.7	Spurious @10m Dist
13.66	39.5		N/A	10.57	-19.08	30.99	N/A	50.47	N/A	-19.5	Spurious @10m Dist
13.186	37.5		N/A	10.52	-19.08	28.94	N/A	40.51	N/A	-11.6	Spurious @10m Dist
13.85	28		N/A	10.59	-19.08	19.51	N/A	40.51	N/A	-21.0	Spurious @10m Dist
27.12	18.83		N/A	9.046	-19.08	8.80	N/A	29.54	N/A	-20.7	Spurious @10m Dist

* 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 kHz 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 Readings
A.F. = Antenna factor

SECOND CONFIGURATION:

FCC Part 15, Subpart B & C **10 Meter Distance Measurement At Open Field**

Company: Vivotech
Project #: 10U13212
Mode of operation: TX ON
Tester: Thanh Nguyen
Date: 05-28-10

Frequency (MHz)	PK (dBuV)	QP (dBuV)	AF dB/m	Distance Correction (dB)	PK/QK Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	PK/QK Margin (dB)	Notes
Loop Antenna Face On:								
13.56	67.16	60.81	10.556	-19.08	52.29	84.00	-31.7	Fundamental @10m Dist
13.553	59.3	58.09	10.5553	-19.08	49.57	50.47	-0.9	Spurious @ 10m Dist
13.567	60.84	57.59	10.5567	-19.08	49.07	50.47	-1.4	Spurious @ 10m Dist
13.41	43.33	37.65	10.541	-19.08	29.11	40.51	-11.4	Spurious @ 10m Dist
13.71	48.53	41.89	10.571	-19.08	33.38	40.51	-7.1	Spurious @ 10m Dist
27.12	20.72		9.0456	-19.08	10.69	29.54	-18.9	Spurious @ 10m Dist
Loop Antenna Face Off:								
13.56	58.55	57.58	10.556	-19.08	49.06	84.00	-34.9	Fundamental @ 10m Dist
13.553	56.13	54.92	10.5553	-19.08	46.40	50.47	-4.1	Spurious @ 10m Dist
13.567	58.78	55.7	10.5567	-19.08	47.18	50.47	-3.3	Spurious @ 10m Dist
13.41	38.16	34.03	10.541	-19.08	25.49	40.51	-15.0	Spurious @ 10m Dist
13.71	39.84	36.22	10.571	-19.08	27.71	40.51	-12.8	Spurious @ 10m Dist
27.12	24.4		9.0456	-19.08	14.37	29.54	-15.2	Spurious @ 10m Dist

* No more emissions were found up to 30MHz

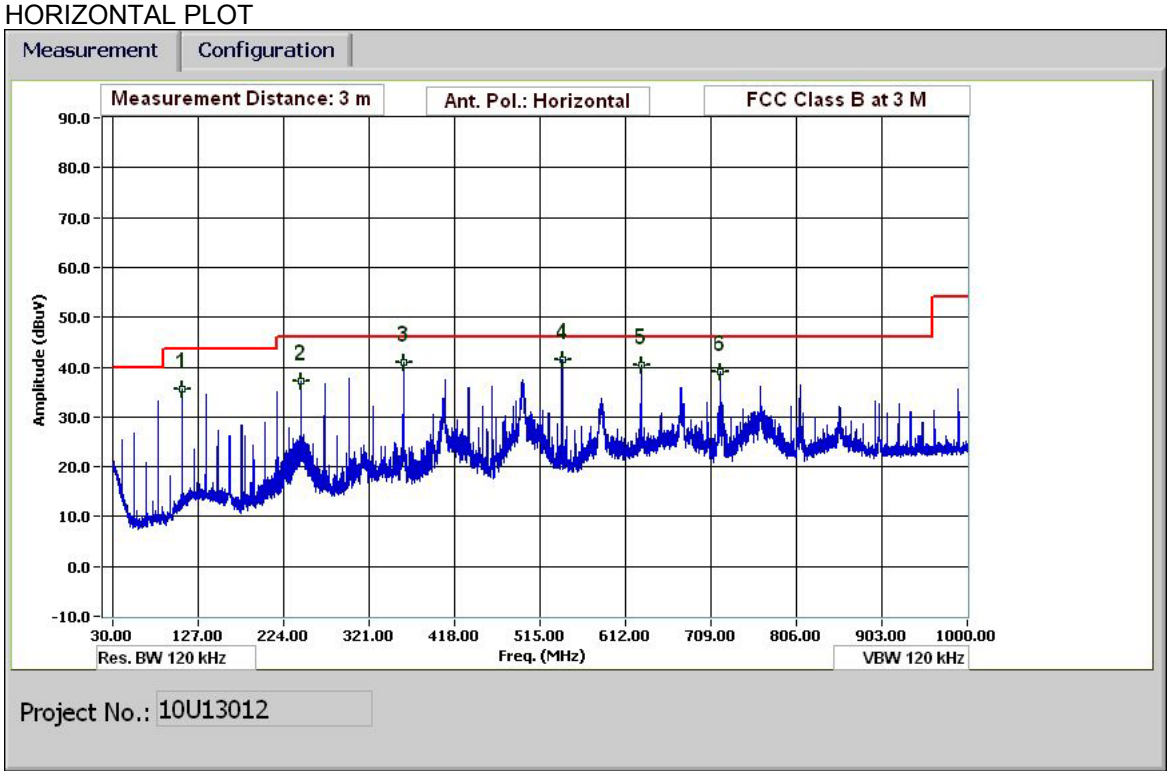
Note: The emission limits are based on measurements employing a CISPR quasi-peak detector except for the frequency bands 9–90 kHz, 110–490 kH and above 10000Mhz. Radiated emission limits in these three bands are based on measurements employing an average detector.

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

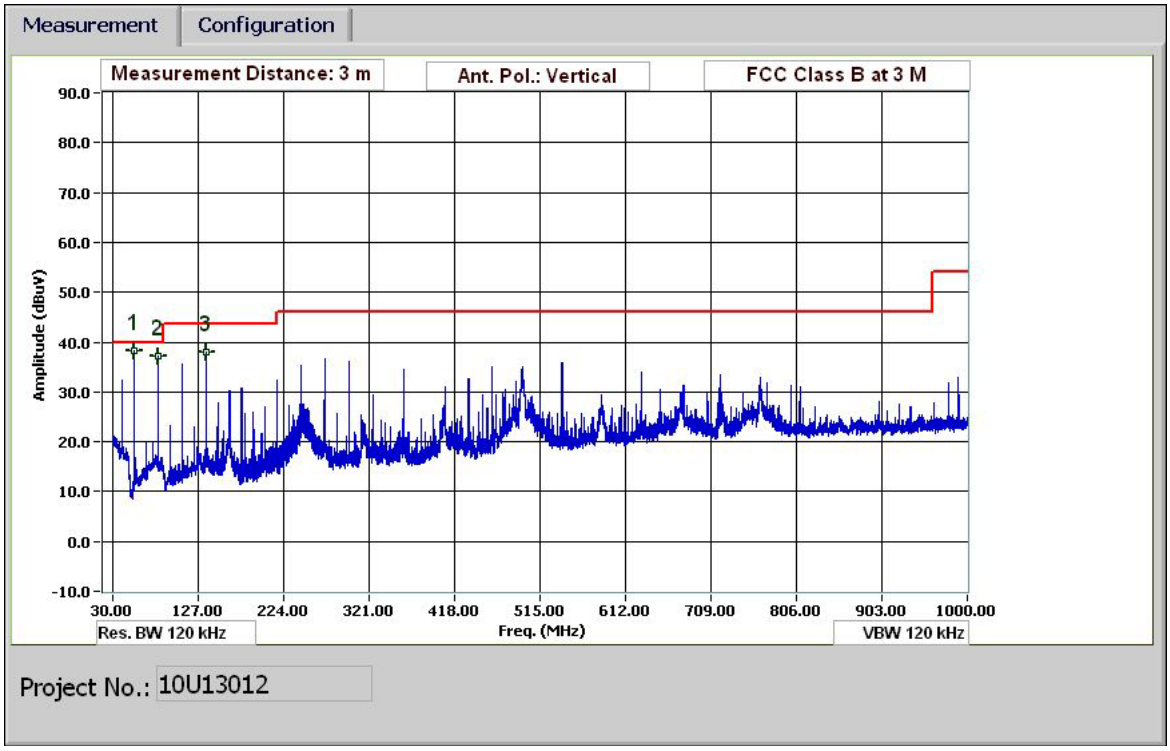
7.1.2. TX/RX SPURIOUS EMISSION 30 TO 1000 MHz

FIRST CONFIGURATION:

HORIZONTAL PLOT



VERTICAL PLOT



HORIZONTAL AND VERTICAL DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen
Date: 02/22/10
Project #: 10U13108
Company: Vivotech
EUT Description: Wireless Card Reader 13.56MHz
EUT M/N: ViVoPay 8100
Test Target: FCC Part 15.225
Mode Oper: Normal

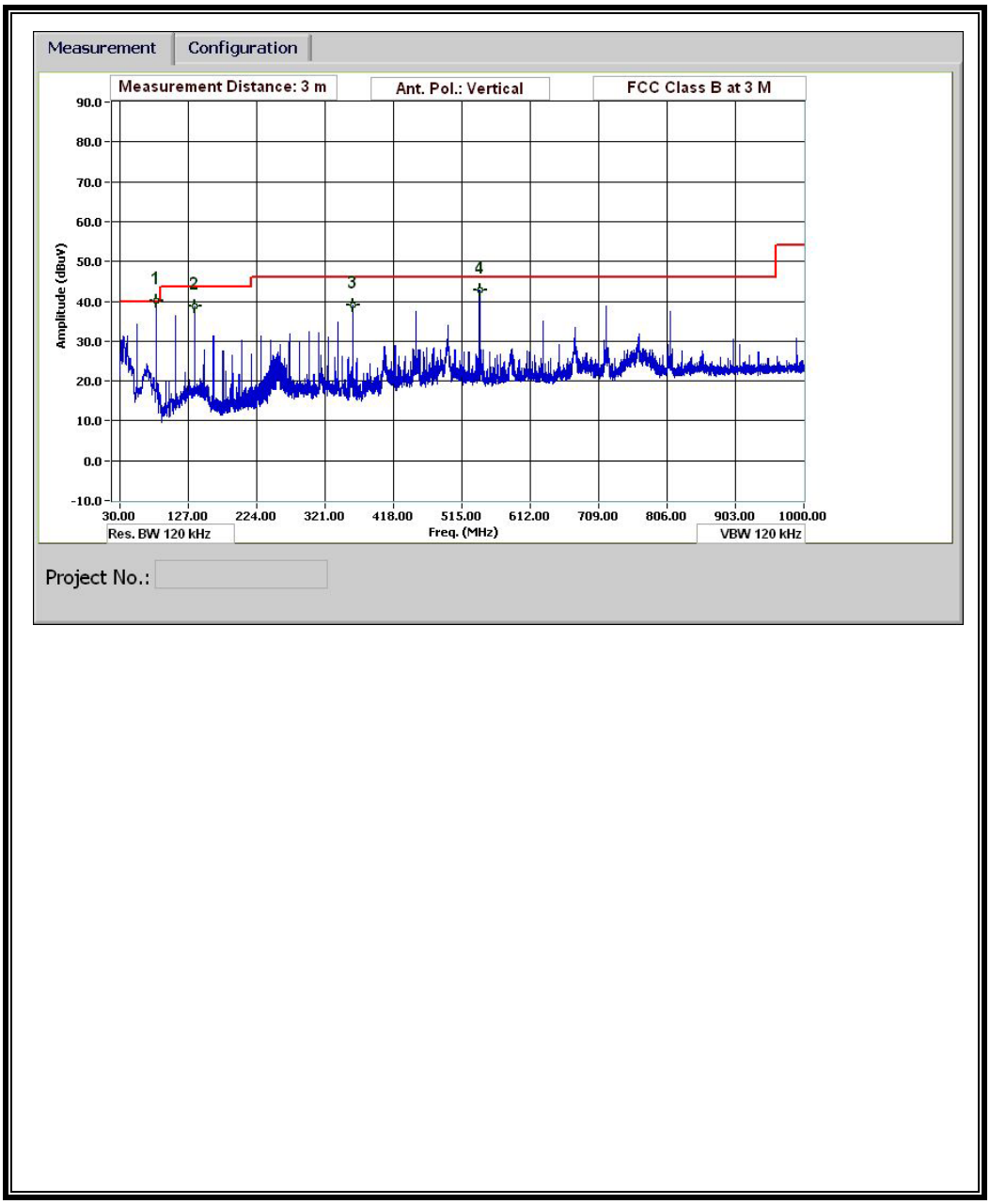
f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

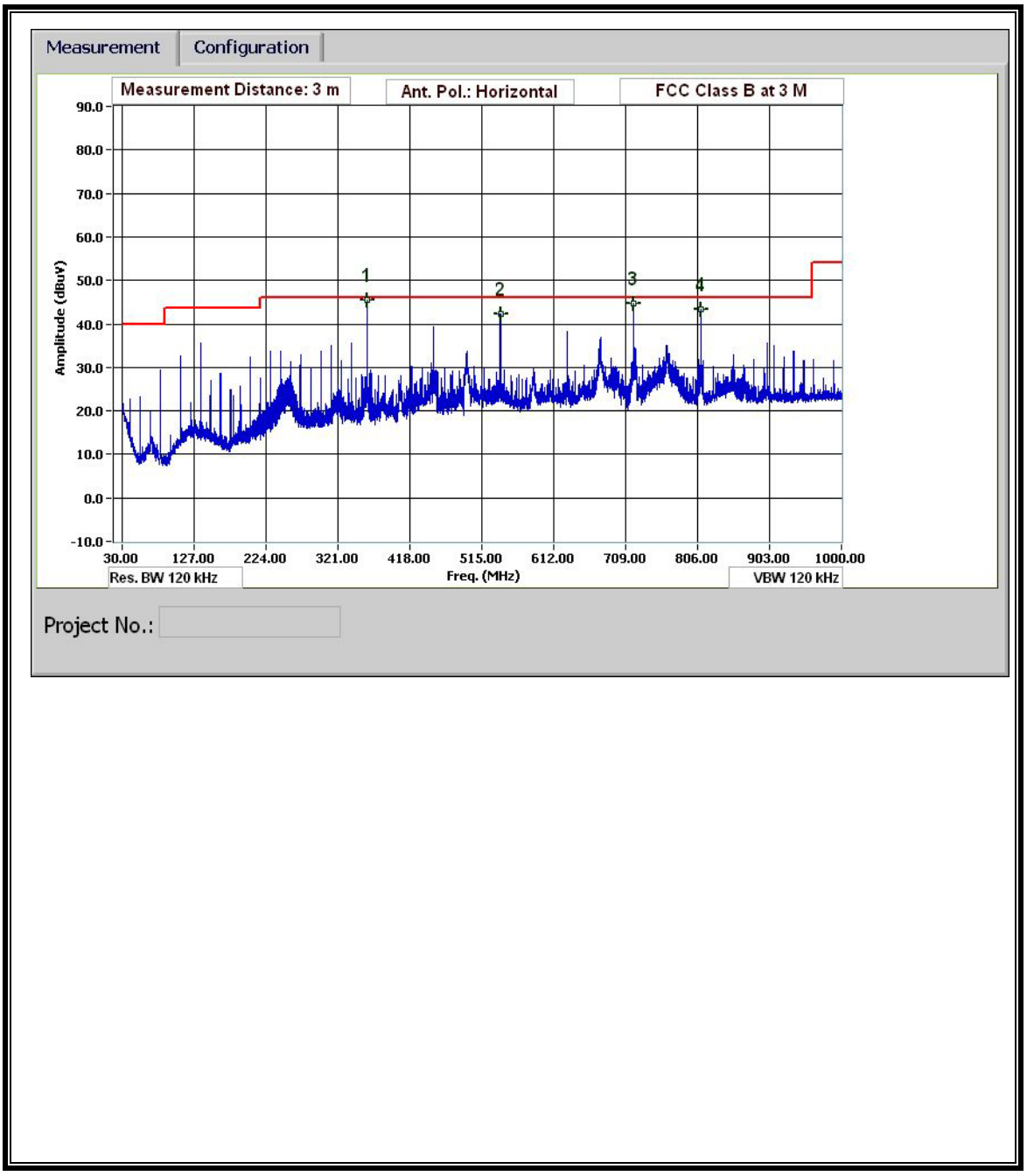
f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
Common choke and caps															Full scan
54.241	3.0	57.8	8.2	0.7	28.4	0.0	0.0	38.3	40.0	-1.7	V	P	100.0	0 - 360	
81.362	3.0	57.4	7.3	0.8	28.3	0.0	0.0	37.2	40.0	-2.8	V	P	100.0	0 - 360	
135.604	3.0	51.9	13.4	1.1	28.3	0.0	0.0	38.1	43.5	-5.4	V	P	100.0	0 - 360	
108.483	3.0	51.4	11.5	1.0	28.3	0.0	0.0	35.5	43.5	-8.0	H	P	100.0	0 - 360	
244.089	3.0	52.3	11.8	1.3	28.2	0.0	0.0	37.2	46.0	-8.8	H	P	100.0	0 - 360	
360.014	3.0	53.1	14.3	1.7	28.1	0.0	0.0	41.0	46.0	-5.0	H	P	100.0	0 - 360	
540.021	3.0	49.6	17.4	2.1	27.7	0.0	0.0	41.5	46.0	-4.5	H	P	100.0	0 - 360	
630.025	3.0	46.8	18.8	2.3	27.4	0.0	0.0	40.5	46.0	-5.5	H	P	100.0	0 - 360	
720.028	3.0	44.0	19.9	2.5	27.2	0.0	0.0	39.1	46.0	-6.9	H	P	100.0	0 - 360	

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

SECOND CONFIGURATION:

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





SPURIOUS EMISSIONS 30 TO 1000 MHz

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Thanh Nguyen
Date: 06/03/10
Project #: 10U13212
Company: VIVOtech
EUT Description: Contactless Reader
EUT M/N: ViVOpay 8100
Test Target: FCC Class B
Mode Oper: Data stimulated program

f	Measurement Frequency	Amp	Preamp Gain	Margin	Margin vs. Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		
Read	Analyzer Reading	Filter	Filter Insert Loss		
AF	Antenna Factor	Corr.	Calculated Field Strength		
CL	Cable Loss	Limit	Field Strength Limit		

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filter dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Ant. High cm	Table Angle Degree	Notes
81.362	3.0	59.9	7.3	0.8	28.3	0.0	0.0	39.8	40.0	-0.2	V	QP	100.0	0 - 360	Full Scan
135.604	3.0	52.7	13.4	1.1	28.3	0.0	0.0	38.8	43.5	-4.7	V	P	100.0	0 - 360	
360.014	3.0	51.1	14.3	1.7	28.1	0.0	0.0	39.0	46.0	-7.0	V	P	100.0	0 - 360	
540.021	3.0	51.0	17.4	2.1	27.7	0.0	0.0	42.8	46.0	-3.2	V	P	100.0	0 - 360	
360.014	3.0	57.5	14.3	1.7	28.1	0.0	0.0	45.4	46.0	-0.6	H	QP	100.0	0 - 360	
540.021	3.0	50.6	17.4	2.1	27.7	0.0	0.0	42.4	46.0	-3.6	H	P	100.0	0 - 360	
720.028	3.0	49.7	19.9	2.5	27.2	0.0	0.0	44.8	46.0	-1.2	H	P	100.0	0 - 360	
810.032	3.0	47.2	21.1	2.7	27.5	0.0	0.0	43.4	46.0	-2.6	H	P	100.0	0 - 360	

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

8. AC MAINS LINE CONDUCTED EMISSIONS

LIMITS

§15.207
IC RSS-GEN, Section 7.2.2

(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 50μH/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 (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
Notes: 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.		

TEST PROCEDURE

ANSI C63.4

RESULTS

FIRST CONFIGURATION:

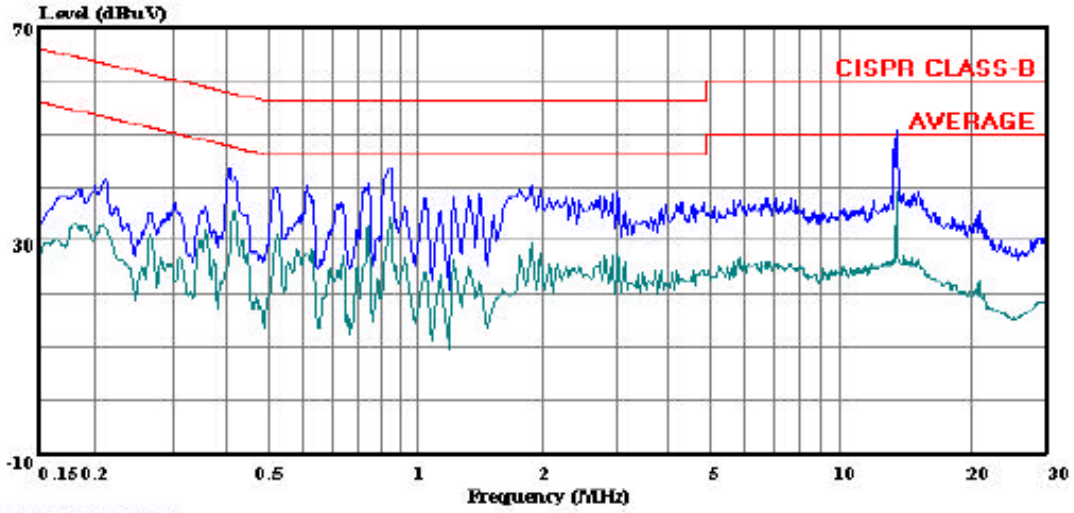
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit		Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.41	43.77	--	35.50		57.73	47.73	-13.96	-12.23	L1
0.95	43.73	--	34.36		56.00	46.00	-12.27	-11.64	L1
13.55	50.62	--	39.03		60.00	50.00	-9.38	-10.97	L1
0.31	41.30	--	32.72		60.05	50.05	-18.75	-17.33	L2
1.03	41.81	--	31.40		56.00	46.00	-14.19	-14.60	L2
13.55	50.26	--	38.79		60.00	50.00	-9.74	-11.21	L2
6 Worst Data									

LINE 1 RESULTS

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

Data#: 14 File#: 10U13108 LC.EMI Date: 03-11-2010 Time: 09:46:25



(Line Conduction)

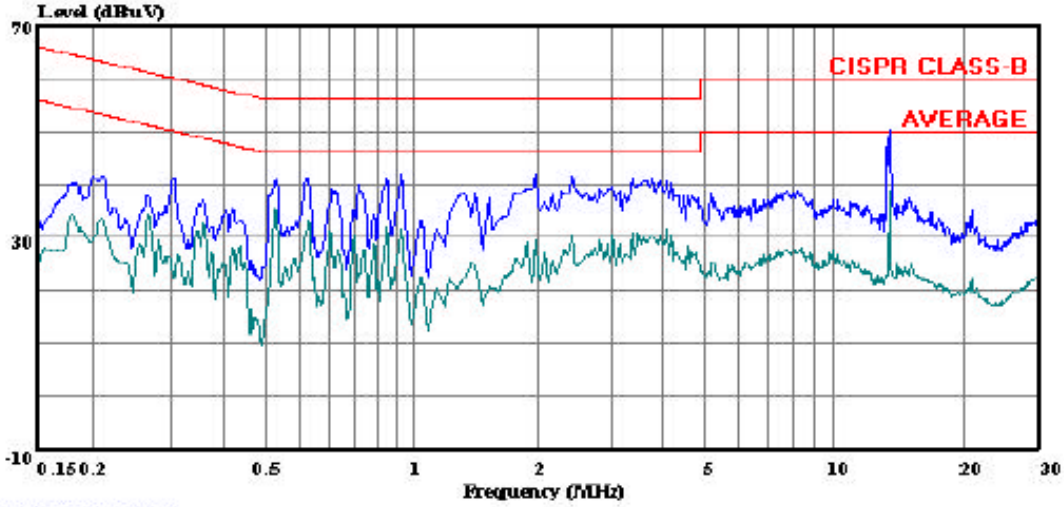
Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Thanh Nguyen
Project #: : 10U13108
Company: : VivoTech
EUT Description:: Wireless Card Reader 13.56MHz
: ViVOpay 8100
Mode: : Normal
Target: : CISPR Class B
Voltage: : 115VAC/ 60Hz
: L1: Peak(Blue); Average (Green)

LINE 2 RESULTS

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

Data#: 21 File#: 10U13108 LC.EMI Date: 03-11-2010 Time: 10:03:10



(Line Conduction)

Trace: 19 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Thanh Nguyen
Project #: : 10U13108
Company: : VivoTech
EUT Description:: Wireless Card Reader 13.56MHz
: ViVOpay 8100
Mode: : Normal
Target: : CISPR Class B
Voltage: : 115VAC/ 60Hz
: L2: Peak(Blue); Average (Green)

SECOND CONFIGURATION:

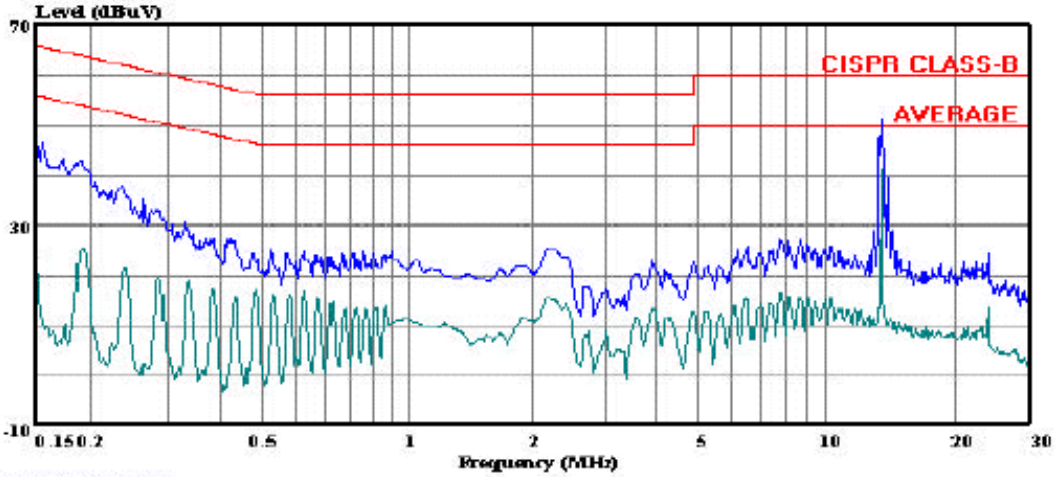
6 WORST EMISSIONS

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	46.37	--	--	0.00	65.73	55.73	-19.36	-9.36	L1
2.35	25.55	--	--	0.00	56.00	46.00	-30.45	-20.45	L1
13.70	51.36	--	41.33	0.00	60.00	50.00	-8.64	-8.67	L1
0.15	45.65	--	--	0.00	66.00	56.00	-20.35	-10.35	L2
7.98	28.38	--	--	0.00	60.00	50.00	-31.62	-21.62	L2
13.70	50.60	--	41.19	0.00	60.00	50.00	-9.40	-8.81	L2
6 Worst Data									

LINE 1 RESULTS

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

Data#: 7 File#: 10U13212Vivotech_LC.EMI
Date: 05-28-2010 Time: 16:50:57



(Line Conduction)

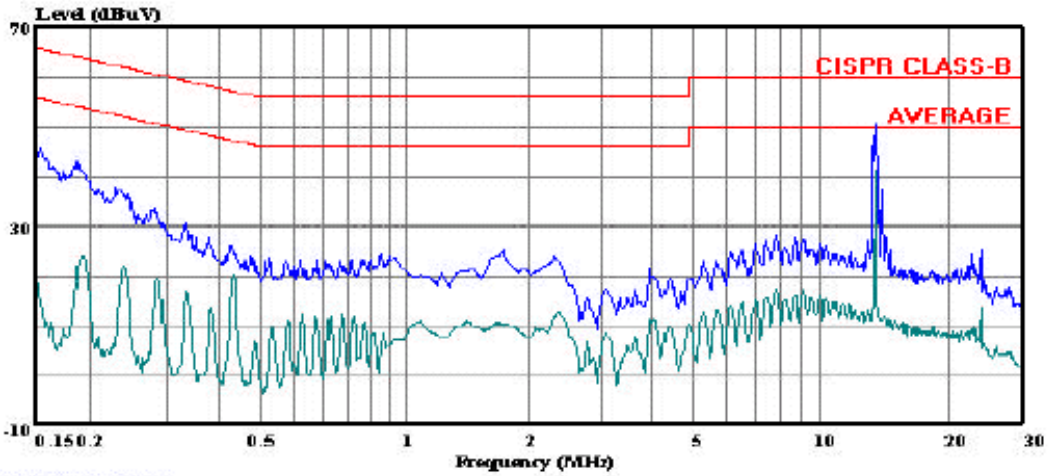
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Thanh Nguyen
Project #: : 10U13212
Company: : VIVOtech
EUT Description: : PCI-PED v2.1 & ISO/IEC 14443 Contactless
: Reader
Configuration: : EUT StandAlone
Mode: : Normal Tx and Rx.
Target: : FCC Class B
Voltage: : 115V / 60Hz
: L1: Peak (Blue); Average (Green)

LINE 2 RESULTS

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

Data#: 14 File#: 10U13212Vivotech_LC.EMI
Date: 05-28-2010 Time: 17:06:02



(Line Conduction)

Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: : Thanh Nguyen
Project #: : 10U13212
Company: : VIVOtech
EUT Description:: PCI-PED v2.1 & ISO/IEC 14443 Contactless
: Reader
Configuration: : EUT StandAlone
Mode: : Normal Tx and Rx.
Target: : FCC Class B
Voltage: : 115V / 60Hz
: L2: Peak (Blue); Average (Green)

9. FREQUENCY STABILITY

LIMIT

§15.225 (e) The frequency tolerance of the carrier signal shall be maintained within ±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.

TEST PROCEDURE

ANSI C63.4:2003
Clause 13.1.5

RESULTS

FIRST CONFIGURATIOIN:

		Limit =	1.356	kHz
Power Supply (Vac)	Environment Temperature (ºC)	Frequency Deviation Measureed with Time Elapse (MHz)	Delta (kHz)	Margin (kHz)
115.00	50	13.5605220	0.009	-1.347
115.00	40	13.5605016	-0.012	-1.344
115.00	30	13.5605113	-0.002	-1.354
115.00	***20***	***13.5605134***	0.000	-1.356
115.00	10	13.5605290	0.016	-1.340
115.00	0	13.5605361	0.023	-1.333
115.00	-10	13.5605486	0.035	-1.321
115.00	-20	13.5605673	0.054	-1.302
97.15	20	13.5605589	0.046	-1.311
132.25	20	13.5605467	0.033	-1.323

SECOND CONFIGURATIOIN:

		Limit:	1.356034173	kHz
Power Supply (Vdc)	Environment Temperature (ºC)	Frequency Deviation Measured with Time Elapse (MHz)	Delta (kHz)	Margin (kHz)
9.00	50	13.560275256	-0.066469000	-1.289565172
9.00	40	13.560274451	-0.067274000	-1.288760172
9.00	30	13.560294706	-0.047019000	-1.309015172
9.00	***20***	***13.560341725***	***0.000000000***	***-1.356034173***
9.00	10	13.560364350	0.022625000	-1.333409173
9.00	0	13.560387468	0.045743000	-1.310291173
9.00	-10	13.560376811	0.035086000	-1.320948173
9.00	-20	13.560403309	0.061584000	-1.294450173
7.63	20	13.5603328	-0.008948000	-1.347086172
10.35	20	13.5603322	-0.009565000	-1.346469172

10. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

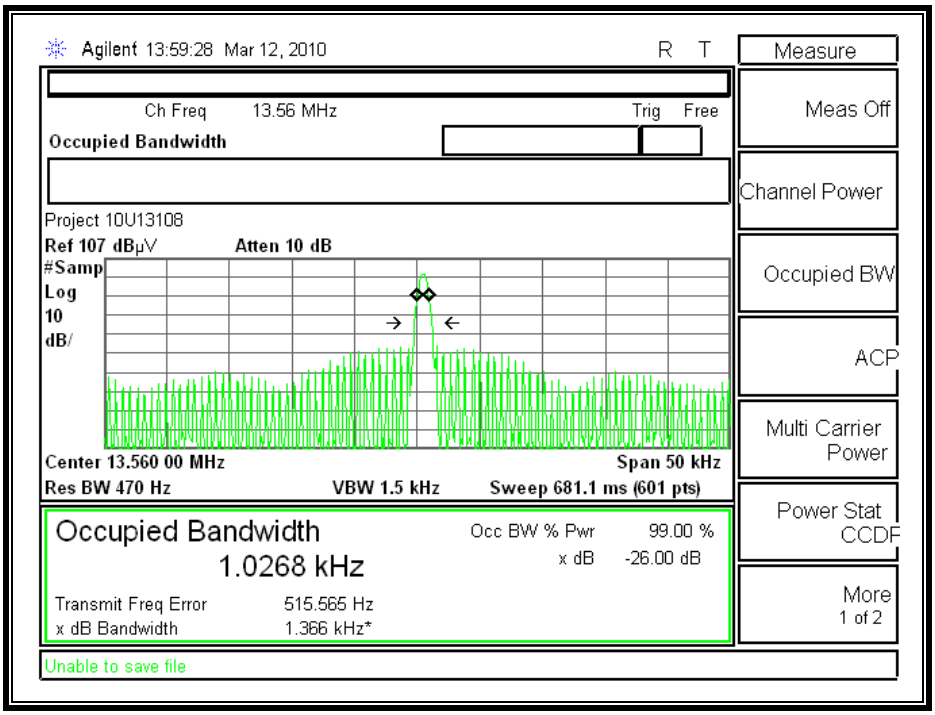
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

RESULTS

FIRST CONFIGURATION:

Frequency (MHz)	99% Bandwidth kHz
13.56	1.0268

99% BANDWIDTH

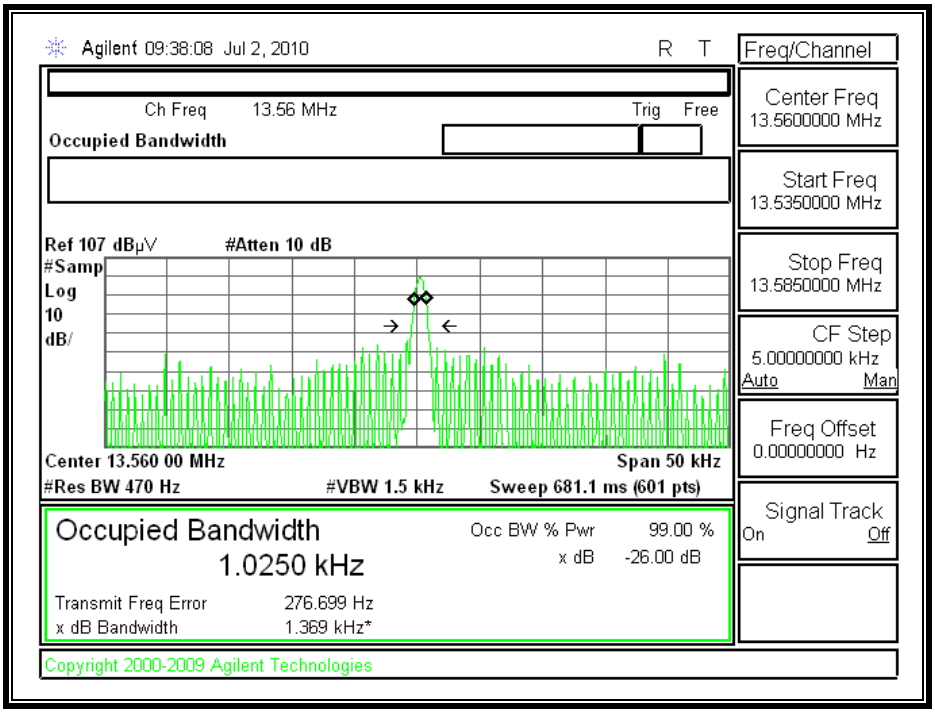


SECOND CONFIGURATION:

RESULTS

Frequency (MHz)	99% Bandwidth kHz
13.56	1.025

99% BANDWIDTH



11. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m^2)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f, is in MHz.
2. A power density of 10 W/m^2 is equivalent to 1 mW/cm^2.
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

EQUATIONS

Power density is given by:

S = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

Power density in units of W/m^2 is converted to units of mWc/m^2 by dividing by 10.

Distance is given by:

D = SQRT (EIRP / (4 * Pi * S))

where

D = Separation distance in m
EIRP = Equivalent Isotropic Radiated Power in W
S = Power density in W/m^2

For multiple colocated transmitters operating simultaneously in frequency bands where the limit is identical, the total power density is calculated using the total EIRP obtained by summing the Power * Gain product (in linear units) of each transmitter.

Total EIRP = (P1 * G1) + (P2 * G2) + ... + (Pn * Pn)

where

Px = Power of transmitter x
Gx = Numeric gain of antenna x

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

RESULTS

EIRP = E field at 3m distance – 95.2
E field at 3m distance = E field at 10m distance + 20 = 77.72 + 20 = 97.72 dBuV/m
EIRP = 97.72 -95.2 = **2.52 dBm = 0.00179 W,** this is less than 2.5 W based on section 2.2 of RSS210 therefore this test is N/A.

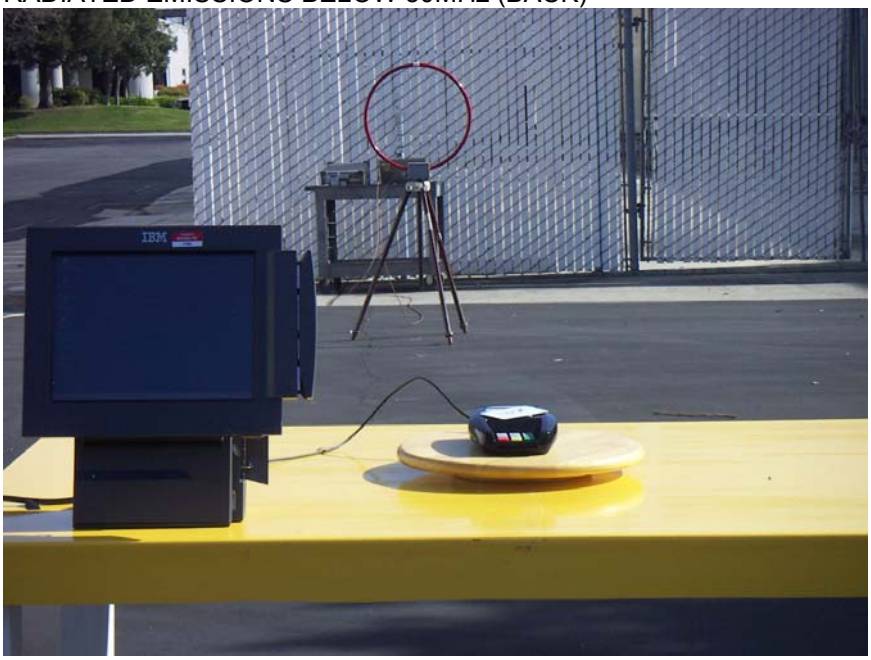
12. SETUP PHOTOS

FIRST CONFIGURATION:

RADIATED EMISSION BELOW 30 MHz

RADIATED EMISSIONS BELOW 30MHz (FRONT)

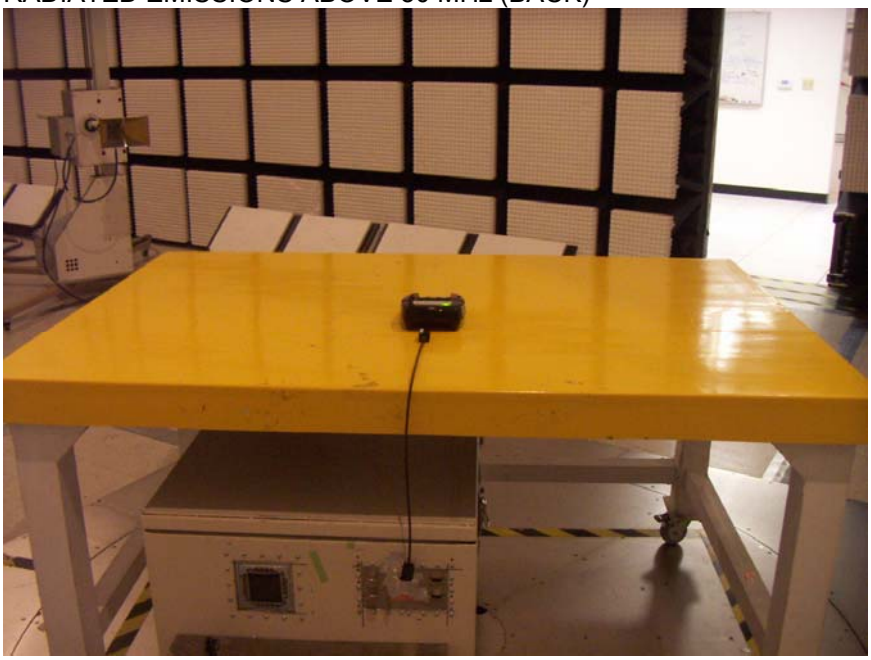
RADIATED EMISSIONS BELOW 30MHz (BACK)



RADIATED EMISSION ABOVE 30 MHz

RADIATED EMISSIONS ABOVE 30 MHz (FRONT)

RADIATED EMISSIONS ABOVE 30 MHz (BACK)



AC MAINS LINE CONDUCTED EMISSION

LINE CONDUCTED EMISSION (FRONT)

LINE CONDUCTED EMISSION (BACK)

FREQUENCY TOLERANCE OVER EXTREME CONDITIONS

FREQUENCY TOLERANCE OVER EXTREME CONDITIONS

SECOND CONFIGURATION:

RADIATED EMISSION (0.15-30 MHz)

RADIATED EMISSION (0.15-30 MHz) FACE ON

RADIATED EMISSION (0.15-30 MHz) FACE OFF

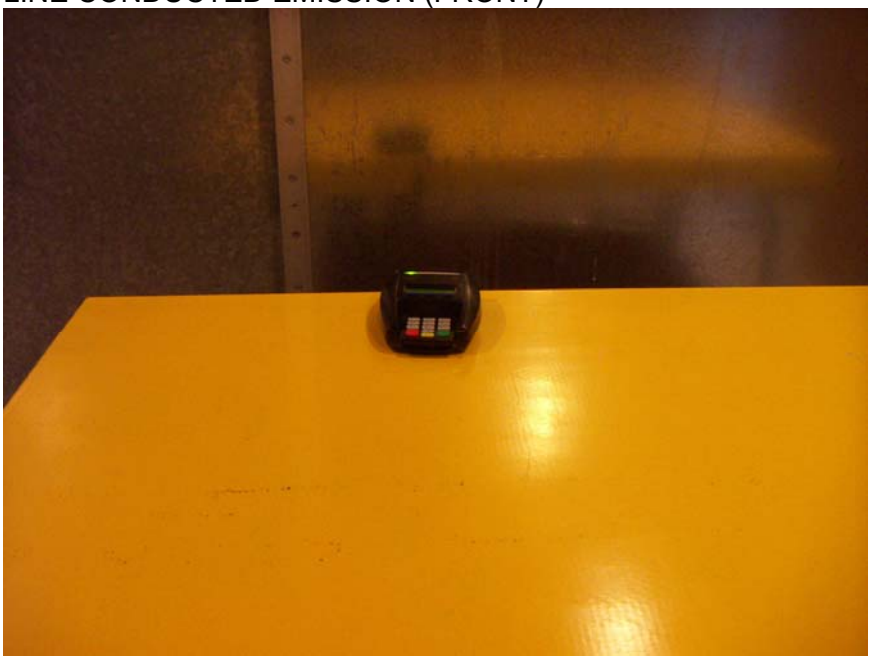
RADIATED EMISSION (30-1000 MHz)

RADIATED EMISSION (30-1000 MHz) - FRONT

RADIATED EMISSION (30-1000 MHz) - BACK

AC MAINS LINE CONDUCTED EMISSION

LINE CONDUCTED EMISSION (FRONT)



LINE CONDUCTED EMISSION (BACK)

FREQUENCY TOLERANCE OVER EXTREME CONDITIONS

FREQUENCY TOLERANCE OVER EXTREME CONDITIONS

END OF REPORT