FCC CFR47 PART 15 SUBPART B
FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 8
INDUSTRY CANADA RSS-GEN ISSUE 3

CERTIFICATION TEST REPORT

FOR

Low Power Transmitter Wireless Card Reader

MODEL NUMBER: ViVOpay 8100e

FCC ID: Q55VP8100N
IC: 5141A-VP8100N

REPORT NUMBER: 11U13850-1

ISSUE DATE: 2011-07-07

REVISED ISSUE DATE: 2011-08-08

Prepared for
ViVOtech, Inc.
451 El Camino Real
Santa Clara
CA, 95050, USA

Prepared by
UNDERWRITERS LABORATORIES INC.
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NVLAP LAB CODE 100255-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	2011-07-07	Initial Issue	M. Antola
1.0	2011-07-28	Revised version of the Firmware that was running on the product at the time of test	M. Antola
1.1	2011-08-08	Added note that 60kHz emission was not from EUT but from support laptop	B. DeLisi

TABLE OF CONTENTS

UNDERWRITERS LABORATORIES INC. FORM NO: CCSUP4701D
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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: ViVOtech, Inc.
451 El Camino Real
Santa Clara, CA, 95050, USA

EUT DESCRIPTION: Low Power Transmitter Wireless Card Reader

MODEL: ViVOpay 8100e

SERIAL NUMBER: 28 /39

DATE TESTED: 2011-06-07 to 2011-06-30

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART C	Pass
INDUSTRY CANADA RSS-210 Issue 8, Annex 2	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

Underwriters Laboratories Inc. calculated the RF Exposure of the above equipment in accordance with the requirements set forth in the above standards, using test results reported in the test report documents referenced below and/or documentation furnished by the applicant. All indications of Pass/Fail in this report are opinions expressed by Underwriters Laboratories Inc. based on interpretations of these calculations. The results show that the equipment 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 by the referenced documents. This document may not be altered or revised in any way unless done so by Underwriters Laboratories Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Underwriters Laboratories Inc. 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 UL By:

Joseph Danisi
Lead Engineering Associate
UL

Tested By:

Bob DeLisi
Sr. Staff Engineer
UL

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 1285 Walt Whitman Rd. Melville, NY 11747, USA.

UL Melville is accredited by NVLAP, Laboratory Code 100255-0. The full scope of accreditation can be viewed at http://ts.nist.gov/standards/scopes/1002550.htm.

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	± 3.3 dB
Radiated Disturbance, 30 to 1000 MHz	± 4.00 dB

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

UNDERWRITERS LABORATORIES INC. FORM NO: CCSUP4701D
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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a PCI-PED v2.1 & ISO/IEC 14443 Contactless Reader. It operates at 13.56MHz.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBuV/m) at 3M
13.56	Transmitting-USB Mode	69.01
13.56	Transmitting-RS232 Mode	69.5

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a loop coil antenna, 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-AR 2.1.0.

The P/N is 540-2901-02, Rev: A.

The test utility software used during testing was EMV POS Simulator, Ver. 1.06E.

5.5. WORST-CASE CONFIGURATION AND MODE

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

SECOND CONFIGURATION:
The EUT powered by AC/DC adapter. Data transferred via RS-232 connection.

5.6. MODIFICATIONS

No modifications were made during testing.

5.7. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	Dell	Latitude D620	PF329 A01	QDS-BRCM1019

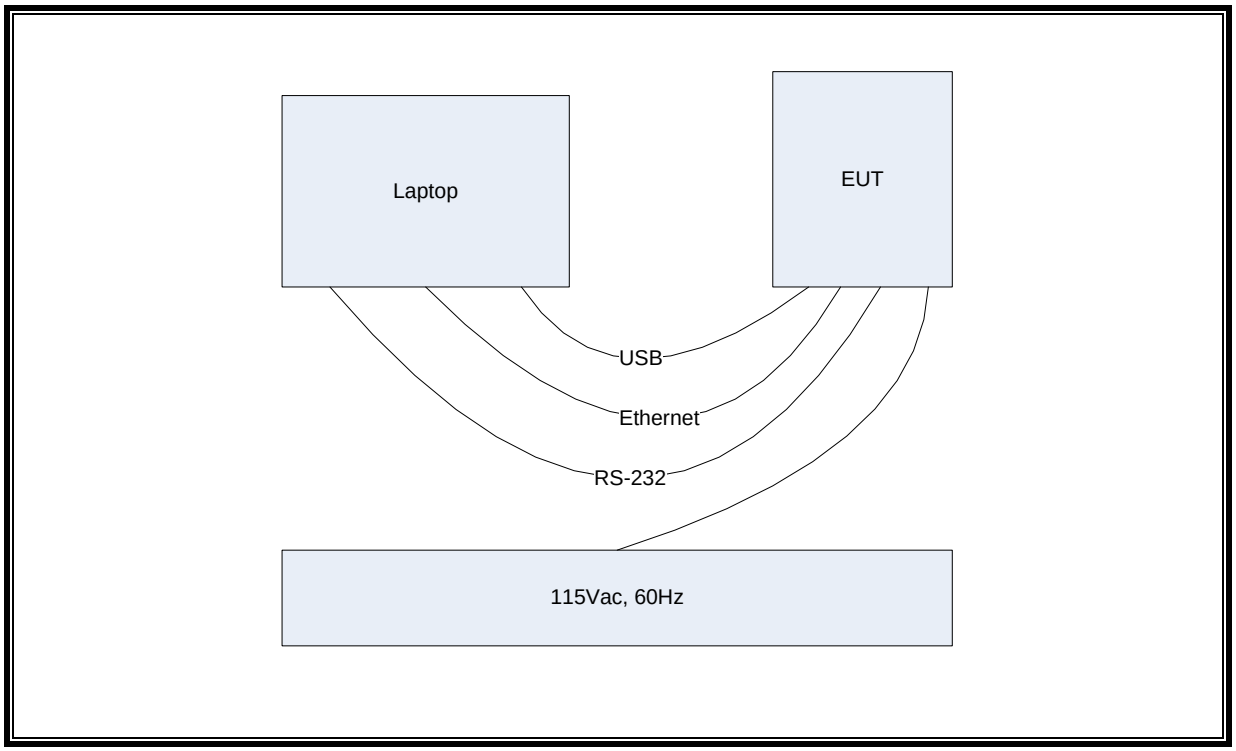
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US 115V	Unshielded	4m	N/A
2	USB	1	USB	Shielded	4m	N/A
3	Serial	1	RS-232	Unshielded	4m	N/A
4	Ethernet	1	RJ-45	Unshielded	>3m	Not supported in production

TEST SETUP

The EUT is connected to a host laptop computer via RS-232 and USB during the tests. Test software exercised the radio card.

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 Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Radiated Emissions - 10 Meter Chamber 9kHz-30MHz					
EMI Receiver	Rohde & Schwarz	ESIB40	34968	2011-03-01	2012-03-01
Active Loop Antenna	EMCO	6507	ME5A-288	2010-10-19	2011-10-19
Switch Driver	HP	11713A	ME7A-627	N/A	N/A
System Controller	Sunol Sciences	SC99V	44396	N/A	N/A
Camera Controller	Panasonic	WV-CU254	44395	N/A	N/A
RF Switch Box	UL	1	44398	N/A	N/A
Measurement Software	UL	Version 9.3	44740	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	87V	64386	2011-02-02	2012-02-29
Radiated Emissions - 10 Meter Chamber 30-1000MHz					
EMI Receiver	Rohde & Schwarz	ESIB40	34968	2011-03-01	2012-03-01
Bicon Antenna	Schaffner	VBA6106A	54	2011-04-05	2012-04-05
Log-P Antenna	Schaffner	UPA6109	44067	2011-04-29	2012-04-29
Switch Driver	HP	11713A	ME7A-627	N/A	N/A
System Controller	Sunol Sciences	SC99V	44396	N/A	N/A
Camera Controller	Panasonic	WV-CU254	44395	N/A	N/A
RF Switch Box	UL	1	44398	N/A	N/A
Measurement Software	UL	Version 9.3	44740	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	87V	64386	2011-02-02	2012-02-29

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Conducted Emissions – GP 1					
EMI Receiver	Rohde & Schwarz	ESIB26	ME5B-081	2011-01-27	2012-01-31
LISN	EMCO	3825/2R	ME5-790	N/A	N/A
LISN	Solar	9252-50-R-24-BNC	ME5A-636	2011-02-04	2012-02-28
Switch Driver	HP	11713A	44397	N/A	N/A
RF Switch Box	UL	4	44404	N/A	N/A
Measurement Software	UL	Version 9.3	44736	N/A	N/A
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43734	2010-03-08	2012-03-08
Multimeter	Fluke	83III	ME5B-305	2011-02-01	2012-02-29

Occupied Bandwidth

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
EMI Receiver	Rohde & Schwarz	ESIB40	34968	2011-03-01	2012-03-01
Dipole Antenna	EMCO	3121C	3359	2010-12-08	2011-12-08
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	4268	2010-12-07	2012-12-07
Multimeter	Fluke	87V	64386	2011-02-02	2012-02-29

Frequency Stability

Test Equipment Used					
Description	Manufacturer	Model	Identifier	Cal Date	Cal Due Date
Spectrum Analyzer	Agilent	E4446A	70728	2011-02-05	2013-02-05
Loop Antenna	Com-Power	--	7A-930	N/A	N/A
Thermal Chamber	Thermotron	SE-1200L	6-302	2011-03-29	2012-03-31
Temp/Humidity/Pressure Meter	Cole Parmer	99760-00	43733	2010-03-08	2012-03-08
Multimeter	Fluke	83V	43443	2011-02-01	2012-02-29

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

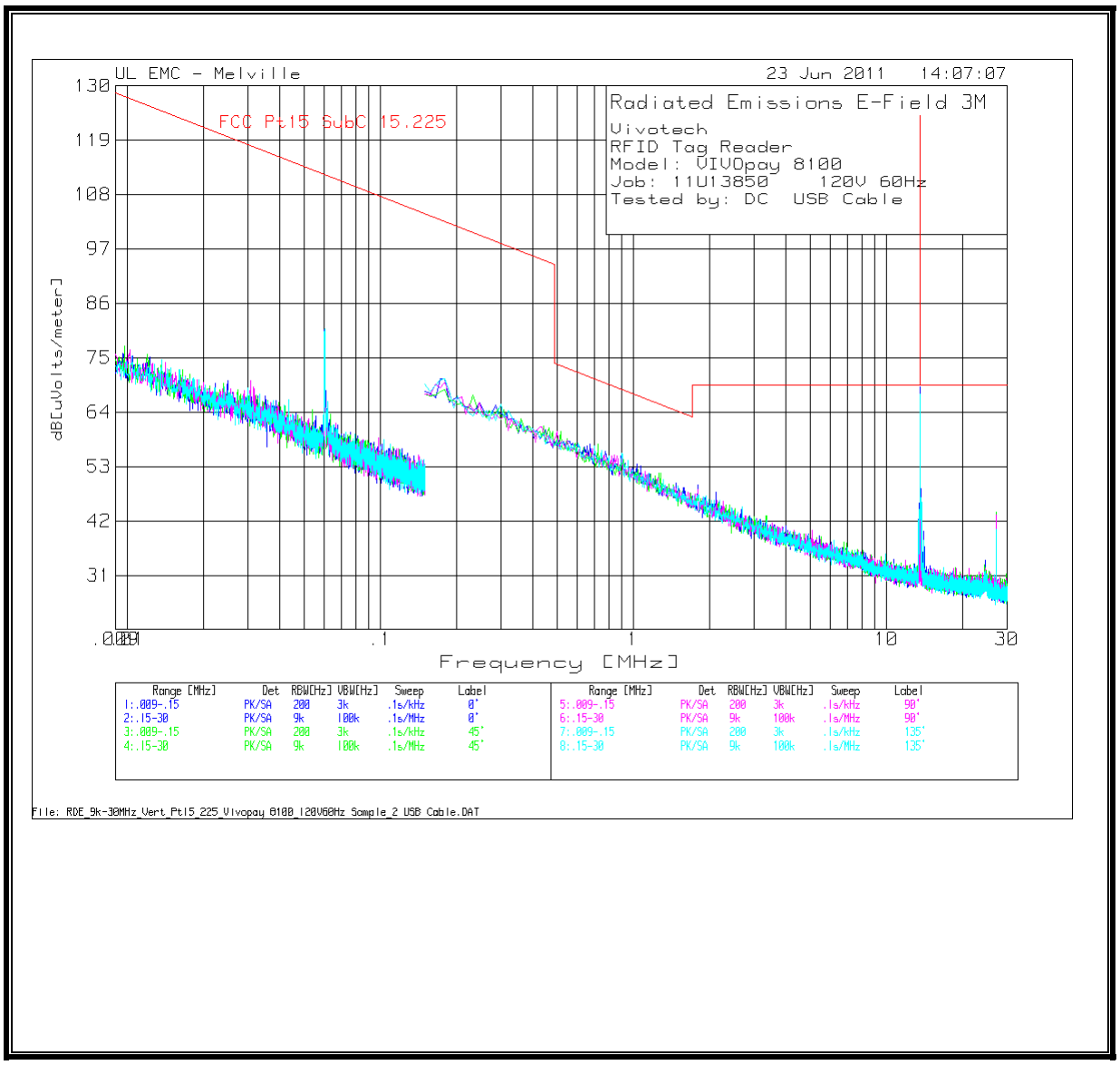
ANSI C63.4

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.

RESULTS

No non-compliance noted:

7.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (9kHz – 30 MHz)-USB Mode



Vivotech
RFID Tag Reader
Model: VIVOpay 8100
Job: 11U13850 120V 60Hz
Tested by: DC USB Cable

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1[dB]	Azimuth [degs]	Height [cm]	Polarity
0° .009 - .15MHz											
1	0.0602	61.86	PK	0.1	18.7	80.66	112	-31.34	291	100	Horz
0° .15 - 30MHz											
2	13.56347	51.11	PK	0.4	17.5	69.01	124	-54.99	53	100	Horz
3	27.12622	17.69	PK	0.6	17.7	35.99	69.5	-33.51	155	100	Horz
45° .009 - .15MHz											
4	0.06023	58.52	PK	0.1	18.7	77.32	112	-34.68	138	120	Horz
45° .15 - 30MHz											
5	13.56347	47.09	PK	0.4	17.5	64.99	124	-59.01	305	120	Horz
6	27.12622	25.39	PK	0.6	17.7	43.69	69.5	-25.81	2	120	Horz
90° .009 - .15MHz											
7	0.06029	58.88	PK	0.1	18.7	77.68	112	-34.32	291	141	Horz
90° .15 - 30MHz											
8	13.56347	40.33	PK	0.4	17.5	58.23	124	-65.77	106	141	Horz
9	27.12622	24.89	PK	0.6	17.7	43.19	69.5	-26.31	282	141	Horz
135° .009 - .15MHz											
10	0.06023	61.43	PK	0.1	18.7	80.23	112	-31.77	206	161	Horz
135° .15 - 30MHz											
11	13.56347	49.82	PK	0.4	17.5	67.72	124	-56.28	13	161	Horz
12	27.12622	21.95	PK	0.6	17.7	40.25	69.5	-29.25	230	161	Horz

LIMIT 1: FCC Pt15 SubC 15.225
LIMIT 2: NONE
LIMIT 3: NONE
LIMIT 4: NONE
LIMIT 5: NONE
LIMIT 6: NONE

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Vivotech
RFID Tag Reader
Model: VIVOpay 8100
Job: 11U13850 120V 60Hz
Tested by: DC USB Cable

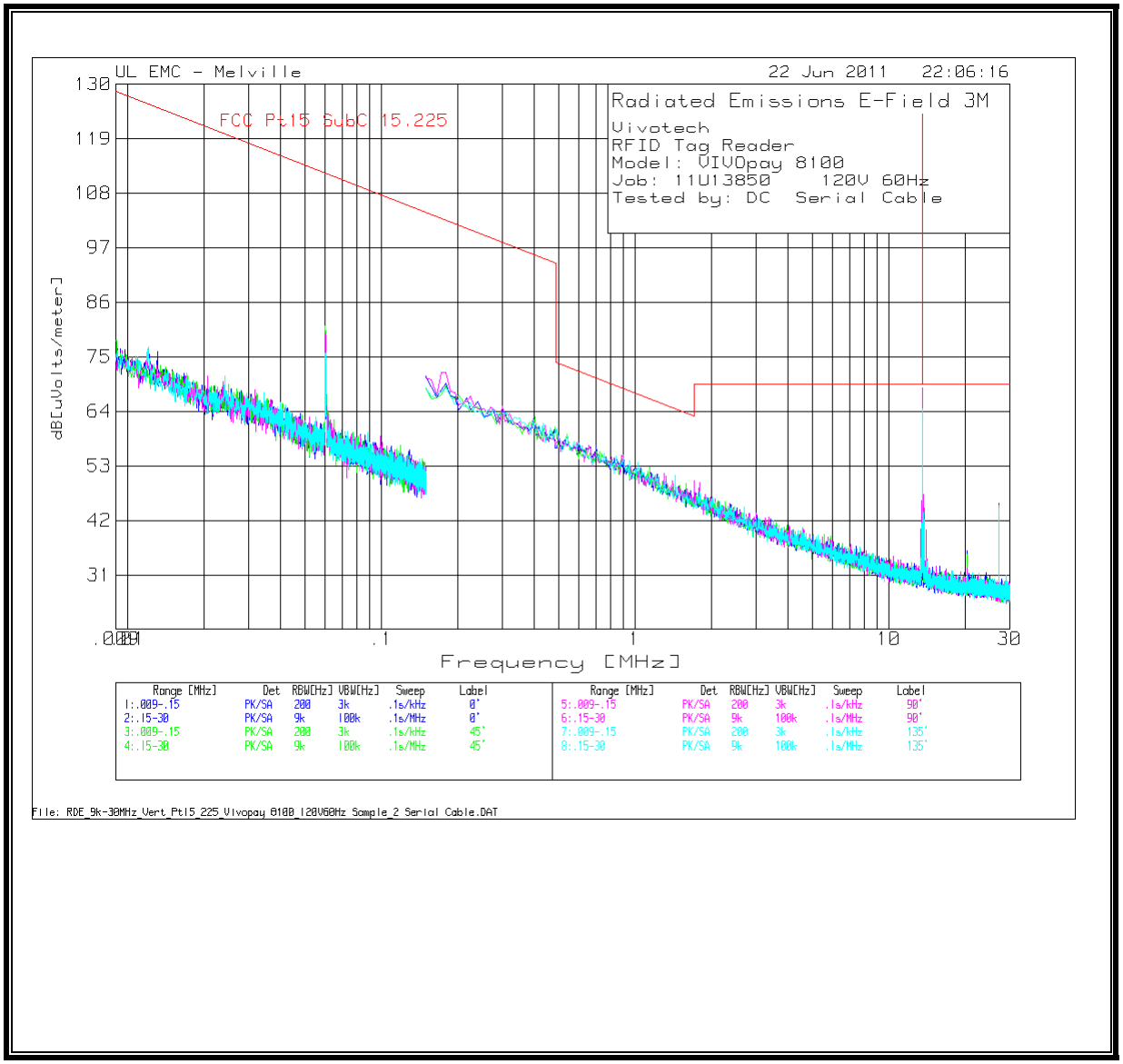
Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1[dB]	Azimuth [degs]	Height [cm]	Polarity
0° .15 - 30MHz										
13.5618	50.65	QP	0.4	17.5	68.55	124	-55.45	62	107	Horz

LIMIT 1: FCC Pt15 SubC 15.225
LIMIT 2: NONE
LIMIT 3: NONE
LIMIT 4: NONE
LIMIT 5: NONE
LIMIT 6: NONE

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Note: emission at 60kHz is an ambient signal from the support laptop computer and not from the equipment under test.

1.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (9kHz – 30 MHz)-RS-232 Mode



Vivotech
RFID Tag Reader
Model: VIVOpay 8100
Job: 11U13850 120V 60Hz
Tested by: DC Serial Cable

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1[dB]	Azimuth [degs]	Height [cm]	Polarity
0° .009 - .15MHz											
1	0.06018	55.69	PK	0.1	18.7	74.49	112	-37.51	290	100	Horz
0° .15 - 30MHz											
5	13.48882	18.5	PK	0.4	17.5	36.4	69.5	-33.1	266	100	Horz
6	13.56347	42.84	PK	0.4	17.5	60.74	124	-63.26	266	100	Horz
7	13.6605	14.21	PK	0.4	17.5	32.11	69.5	-37.39	187	100	Horz
8	27.12622	27.21	PK	0.6	17.7	45.51	69.5	-23.99	26	100	Horz
45° .009 - .15MHz											
2	0.06018	62.44	PK	0.1	18.7	81.24	112	-30.76	207	120	Horz
45° .15 - 30MHz											
9	13.48882	25.37	PK	0.4	17.5	43.27	69.5	-26.23	41	120	Horz
10	13.56347	48.08	PK	0.4	17.5	65.98	124	-58.02	172	120	Horz
11	13.64557	24.79	PK	0.4	17.5	42.69	69.5	-26.81	354	120	Horz
12	27.12622	26.68	PK	0.6	17.7	44.98	69.5	-24.52	207	120	Horz
90° .009 - .15MHz											
3	0.0602	61.14	PK	0.1	18.7	79.94	112	-32.06	290	141	Horz
90° .15 - 30MHz											
13	13.48882	28.02	PK	0.4	17.5	45.92	69.5	-23.58	107	141	Horz
14	13.57093	42.24	PK	0.4	17.5	60.14	69.5	-9.36	319	141	Horz
15	13.63811	28.17	PK	0.4	17.5	46.07	69.5	-23.43	159	141	Horz
16	27.12622	19.08	PK	0.6	17.7	37.38	69.5	-32.12	178	141	Horz
135° .009 - .15MHz											
4	0.06018	56.88	PK	0.1	18.7	75.68	112	-36.32	138	162	Horz
135° .15 - 30MHz											
17	13.56347	46.56	PK	0.4	17.5	64.46	124	-59.54	332	162	Horz
18	13.51868	23.39	PK	0.4	17.5	41.29	69.5	-28.21	354	162	Horz
19	13.63811	25.69	PK	0.4	17.5	43.59	69.5	-25.91	358	162	Horz
20	27.12622	26.28	PK	0.6	17.7	44.58	69.5	-24.92	257	162	Horz

LIMIT 1: FCC Pt15 SubC 15.225

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Vivotech
RFID Tag Reader
Model: VIVOpay 8100
Job: 11U13850 120V 60Hz
Tested by: DC Serial Cable

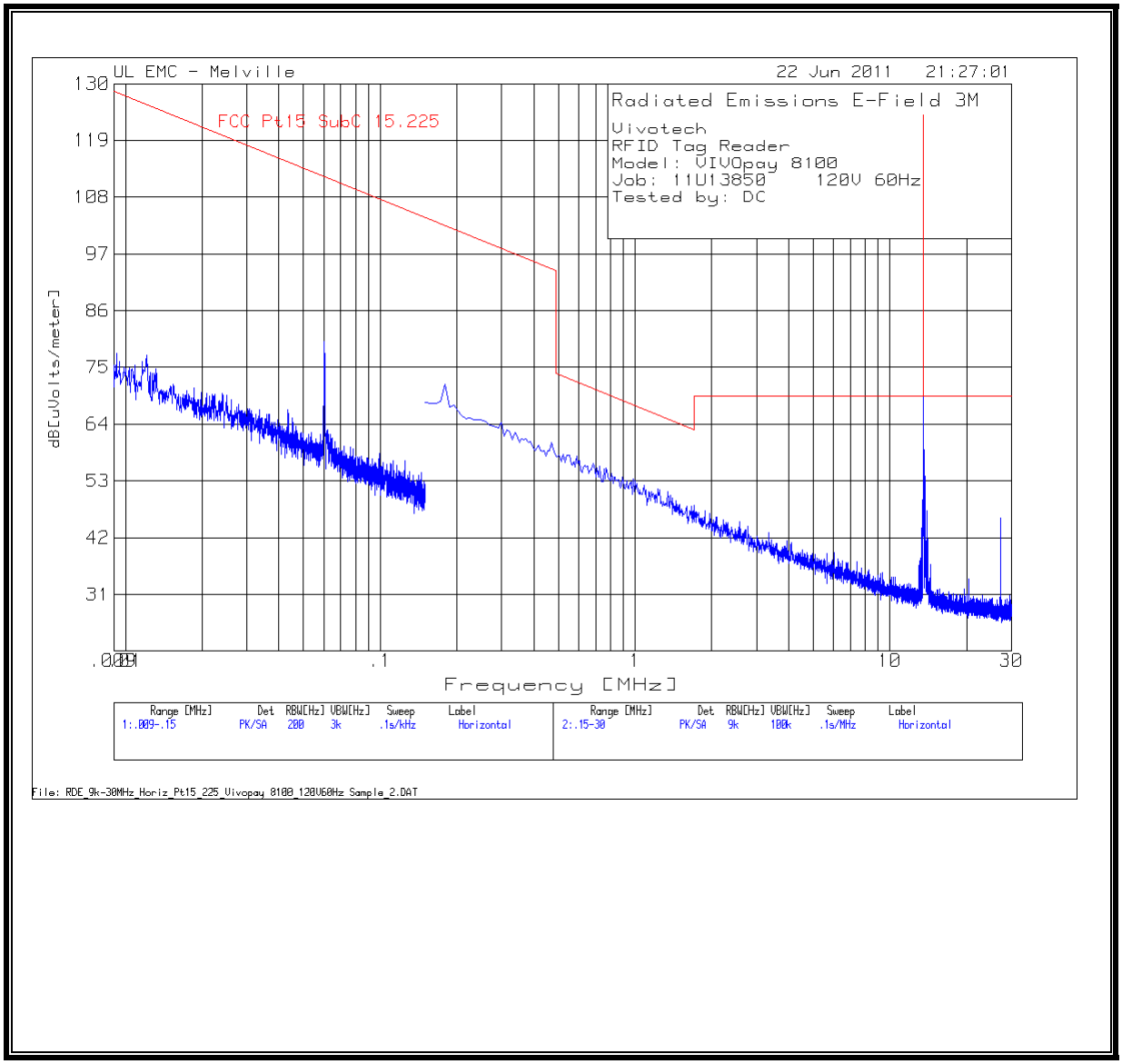
Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1[dB]	Azimuth [degs]	Height [cm]	Polarity
0° .15 - 30MHz										
13.5615	50.31	PK	0.4	17.5	68.21	124	-55.79	43	107	Horz
13.5615	50.6	QP	0.4	17.5	68.5	124	-55.5	43	107	Horz

LIMIT 1: FCC Pt15 SubC 15.225

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Note: emission at 60kHz is an ambient signal from the support laptop computer and not from the equipment under test.

1.1.1. FUNDAMENTAL AND SPURIOUS EMISSIONS (9kHz – 30 MHz)- Horizontal



Vivotech
RFID Tag Reader
Model: VIVOpay 8100
Job: 11U13850 120V 60Hz
Tested by: DC

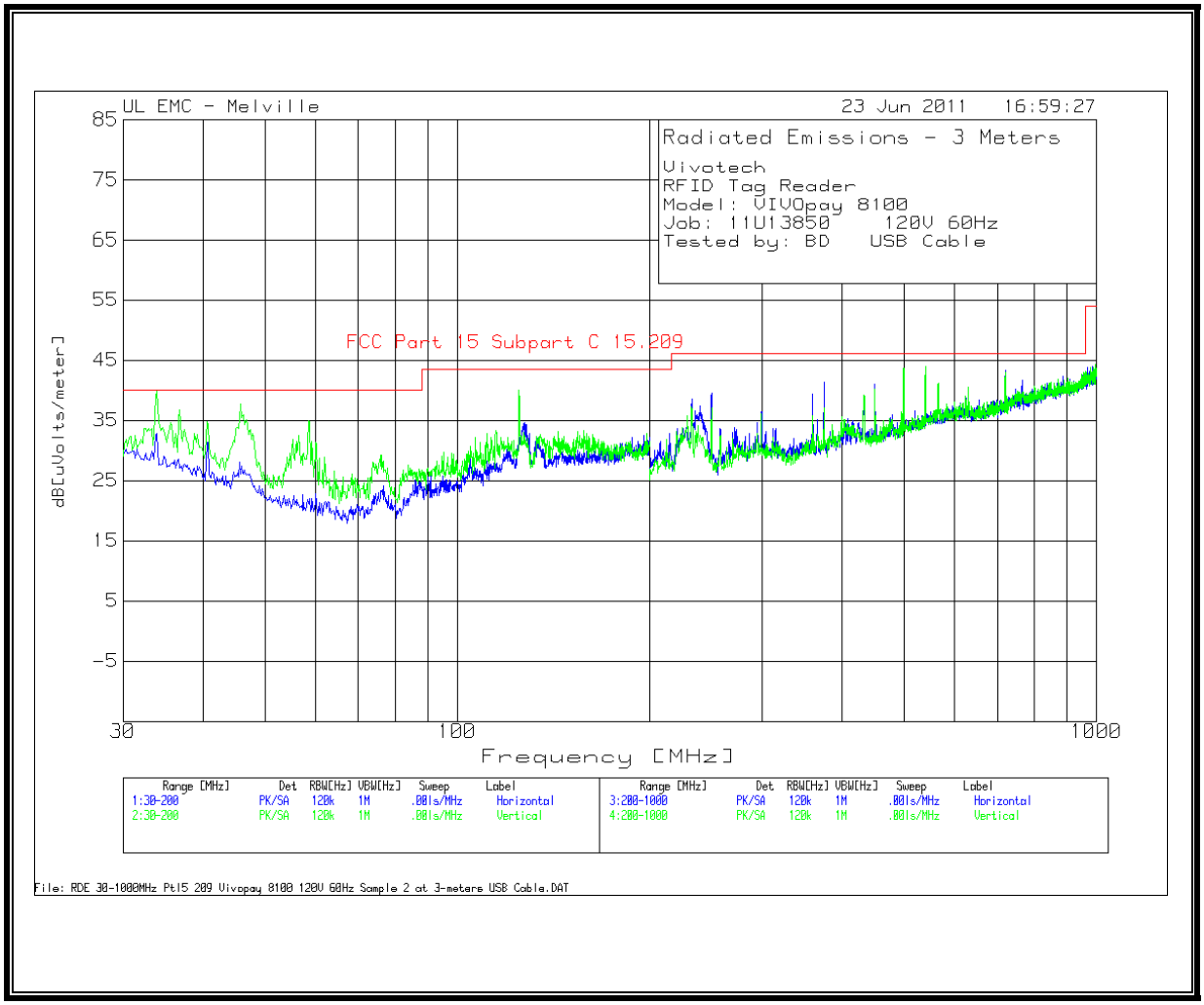
Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1[dB]	Azimuth [degs]
Horizontal .009 - .15MHz									
1	0.06018	61.14	PK	0.1	18.7	79.94	112	-32.06	290
Horizontal .15 - 30MHz									
2	0.17986	54.38	PK	0.1	17.2	71.68	102.5	-30.82	52
3	13.48136	34.47	PK	0.4	17.5	52.37	69.5	-17.13	348
4	13.56347	57.69	PK	0.4	17.5	75.59	124	-48.41	321
5	13.63811	36.54	PK	0.4	17.5	54.44	69.5	-15.06	6
6	27.12622	27.47	PK	0.6	17.7	45.77	69.5	-23.73	231

LIMIT 1: FCC Pt15 SubC 15.225
LIMIT 2: NONE
LIMIT 3: NONE
LIMIT 4: NONE
LIMIT 5: NONE
LIMIT 6: NONE

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Note: emission at 60kHz is an ambient signal from the support laptop computer and not from the equipment under test.

7.1.2. TX SPURIOUS EMISSION 30 TO 1000 MHz (USB Mode)



Vivotech
RFID Tag Reader
Model: VIVOpay 8100
Job: 11U13850 120V 60Hz
Tested by: BD USB Cable

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1[dB]	Azimuth [degs]	Height [cm]	Polarity
Vertical 30 - 200MHz											
1	33.9139	24.07	PK	0.5	15.3	39.87	40	-0.13	357	101	Vert
2	36.8068	21.9	PK	0.6	14.2	36.7	40	-3.3	8	101	Vert
3	40.5506	21.3	PK	0.6	12.8	34.7	40	-5.3	262	101	Vert
4	45.8258	26.23	PK	0.7	10.8	37.73	40	-2.27	197	101	Vert
5	58.5886	27.08	PK	0.7	7.1	34.88	40	-5.12	166	101	Vert
6	124.955	24.82	PK	1.2	14	40.02	43.5	-3.48	8	101	Vert
Horizontal 200 - 1000MHz											
7	250.025	25.14	PK	1.7	12.6	39.44	46	-6.56	52	97	Horz
8	360.08	21.65	PK	2.1	15.6	39.35	46	-6.65	324	97	Horz
9	374.8874	23.39	PK	2.1	15.8	41.29	46	-4.71	18	97	Horz
10	450.1251	21.45	PK	2.3	17.2	40.95	46	-5.05	0	299	Horz
11	500.1501	19.62	PK	2.6	18.3	40.52	46	-5.48	293	199	Horz
12	540.1701	19.34	PK	2.6	19.2	41.14	46	-4.86	122	199	Horz
13	566.1831	17.33	PK	2.7	19.4	39.43	46	-6.57	327	199	Horz
14	720.2601	19.01	PK	3.1	21.1	43.21	46	-2.79	0	97	Horz
15	966.7834	14.67	PK	3.6	24.4	42.67	54	-11.33	289	97	Horz
Vertical 200 - 1000MHz											
16	432.1161	20.4	PK	2.3	16.5	39.2	46	-6.8	356	100	Vert
17	450.1251	21	PK	2.3	16.9	40.2	46	-5.8	356	200	Vert
18	499.7499	22.93	PK	2.6	18.1	43.63	46	-2.37	356	100	Vert
19	540.1701	21.98	PK	2.6	19.4	43.98	46	-2.02	28	100	Vert
20	566.5833	18.63	PK	2.7	19.8	41.13	46	-4.87	62	100	Vert
21	720.2601	18.75	PK	3.1	21.1	42.95	46	-3.05	4	100	Vert
22	961.981	15.32	PK	3.6	24.2	43.12	54	-10.88	119	100	Vert

LIMIT 1: FCC Part 15 Subpart C 15.209

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection

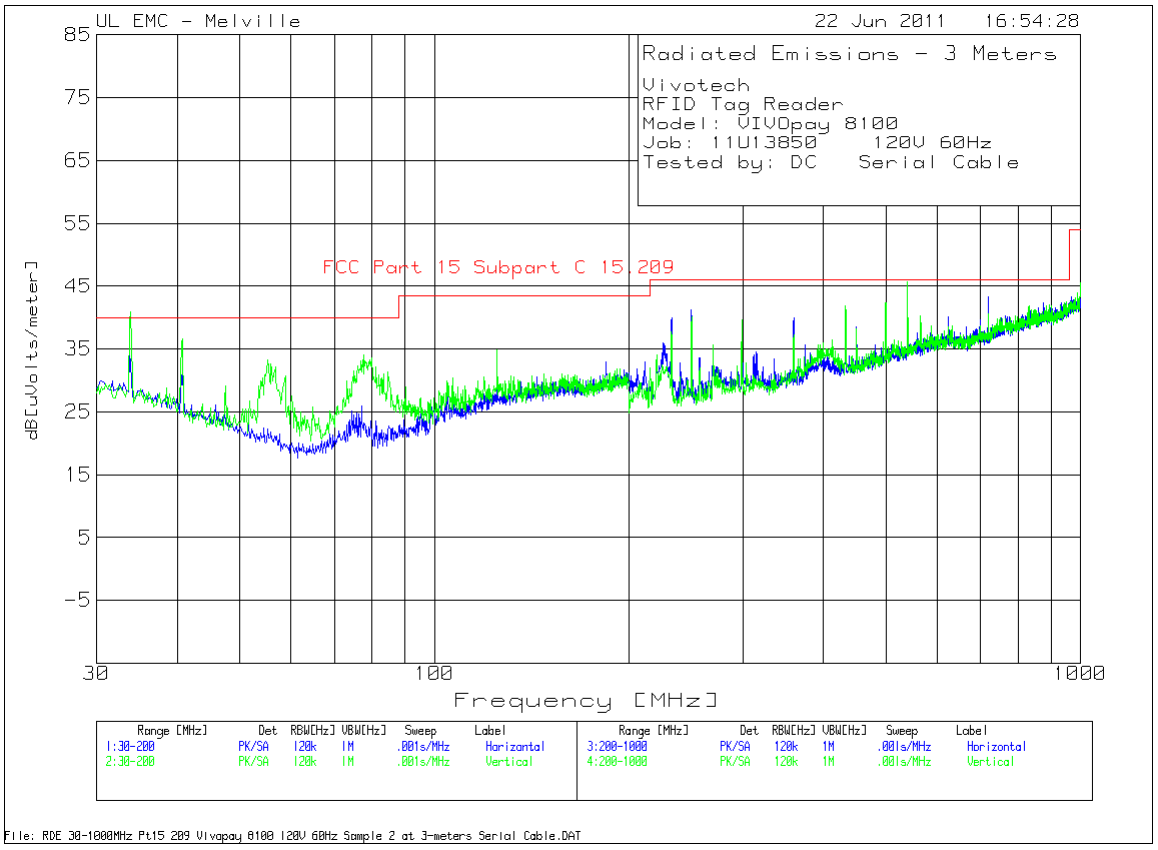
Vivotech
RFID Tag Reader
Model: VIVOpay 8100
Job: 11U13850 120V 60Hz
Tested by: BD USB Cable

Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1[dB]	Azimuth [degs]	Height [cm]	Polarity
Vertical 30 - 200MHz										
33.9066	23.23	QP	0.5	15.3	39.03	40	-0.97	270	105	Vert
36.8331	20	QP	0.6	14.2	34.8	40	-5.2	252	104	Vert
40.6817	22.28	QP	0.7	12.7	35.68	40	-4.32	298	102	Vert
45.6036	22.6	QP	0.6	10.9	34.1	40	-5.9	49	105	Vert
58.7341	26.02	QP	0.7	7.1	33.82	40	-6.18	91	108	Vert
125.0132	25.34	QP	1.2	14	40.54	43.5	-2.96	54	101	Vert
Horizontal 200 - 1000MHz										
249.9912	26.65	QP	1.7	12.6	40.95	46	-5.05	250	129	Horz
360.0056	23.42	QP	2.1	15.6	41.12	46	-4.88	87	100	Horz
374.9936	24.52	QP	2.1	15.8	42.42	46	-3.58	23	104	Horz
450.032	25.34	QP	2.3	17.2	44.84	46	-1.16	98	224	Horz
500.0724	18.92	QP	2.6	18.3	39.82	46	-6.18	44	186	Horz
540.0688	19.55	QP	2.6	19.2	41.35	46	-4.65	100	179	Horz
566.1228	18.41	QP	2.7	19.4	40.51	46	-5.49	275	188	Horz
720.3553	18.41	QP	3.1	21.1	42.61	46	-3.39	29	130	Horz
966.6846	19.7	QP	3.6	24.4	47.7	54	-6.3	6	110	Horz
Vertical 200 - 1000MHz										
432.0342	18.75	QP	2.3	16.5	37.55	46	-8.45	189	129	Vert
450.0209	24.08	QP	2.3	16.9	43.28	46	-2.72	26	141	Vert
499.7169	22.05	QP	2.6	18.1	42.75	46	-3.25	192	108	Vert
540.1029	18.06	QP	2.6	19.4	40.06	46	-5.94	189	110	Vert
566.6187	20.14	QP	2.7	19.8	42.64	46	-3.36	159	110	Vert
720.3379	18.24	QP	3.1	21.1	42.44	46	-3.56	135	105	Vert
961.9002	19.7	QP	3.6	24.2	47.5	54	-6.5	5	111	Vert

LIMIT 1: FCC Part 15 Subpart C 15.209

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

7.1.3. TX SPURIOUS EMISSION 30 TO 1000 MHz (RS-232 Mode)



Vivotech
RFID Tag Reader
Model: VIVOpay 8100
Job: 11U13850 120V 60Hz
Tested by: DC Serial Cable

Marker Number	Test Frequency [MHz]	Meter Reading [dB(uV)]	Detector Type	Gain/Loss Factor [dB]	Transducer Factor [dB]	Level dB[uVolts/meter]	Limit 1	Margin 1[dB]	Azimuth [degs]	Height [cm]	Polarity
Horizontal 30 - 200MHz											
1	33.7437	16.92	PK	0.5	16.9	34.32	40	-5.68	154	100	Horz
Vertical 30 - 200MHz											
2	33.9139	25.18	PK	0.5	15.3	40.98	40	0.98	85	100	Vert
3	40.7207	23.16	PK	0.7	12.7	36.56	40	-3.44	357	100	Vert
4	55.1852	24.54	PK	0.7	8	33.24	40	-6.76	268	100	Vert
5	77.8178	25.9	PK	0.9	7.2	34	40	-6	22	100	Vert
Horizontal 200 - 1000MHz											
6	232.8164	26.29	PK	1.6	12.1	39.99	46	-6.01	325	100	Horz
7	249.6248	26.93	PK	1.7	12.6	41.23	46	-4.77	188	100	Horz
8	360.08	22.21	PK	2.1	15.6	39.91	46	-6.09	17	100	Horz
9	625.0125	17.07	PK	2.8	20.3	40.17	46	-5.83	299	100	Horz
10	719.8599	18.7	PK	3.1	21.1	42.9	46	-3.1	198	100	Horz
11	875.1376	15.61	PK	3.4	23.3	42.31	46	-3.69	188	100	Horz
18	498.9495	21.51	PK	2.6	18.3	42.41	46	-3.59	330	100	Horz
19	540.1701	18.77	PK	2.6	19.2	40.57	46	-5.43	96	200	Horz
20	432.9165	19.91	PK	2.3	17.1	39.31	46	-6.69	296	200	Horz
Vertical 200 - 1000MHz											
12	232.4162	24.35	PK	1.6	11.7	37.65	46	-8.35	18	200	Vert
13	250.025	25.78	PK	1.7	12.6	40.08	46	-5.92	120	100	Vert
14	298.8494	24.26	PK	1.9	13.4	39.56	46	-6.44	223	200	Vert
15	360.08	19.77	PK	2.1	15.4	37.27	46	-8.73	292	200	Vert
16	432.9165	23.04	PK	2.3	16.6	41.94	46	-4.06	7	100	Vert
17	499.7499	21.72	PK	2.6	18.1	42.42	46	-3.58	359	100	Vert
21	540.1701	23.66	PK	2.6	19.4	45.66	46	-0.34	122	100	Vert
22	565.3827	17.73	PK	2.7	19.8	40.23	46	-5.77	122	100	Vert
23	720.2601	16.39	PK	3.1	21.1	40.59	46	-5.41	334	100	Vert
24	949.975	14.64	PK	3.6	24.2	42.44	46	-3.56	155	300	Vert

LIMIT 1: FCC Part 15 Subpart C 15.209

PK - Peak detector
QP - Quasi-Peak detector
LnAv - Linear Average detector
LgAv - Log Average detector
Av - Average detector
CAV - CISPR Average detector
RMS - RMS detection
CRMS - CISPR RMS detection

Vivotech										
RFID Tag Reader										
Model: VIVOpay 8100										
Job: 11U13850 120V 60Hz										
Tested by: DC Serial Cable										
Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Azimuth [degs]	Height [cm]	Polarity
Frequency	Reading	Type	Factor	Factor	dB[uVolts/meter]					
[MHz]	[dB(uV)]		[dB]	[dB]						
Horizontal 30 - 200MHz										
33.9023	9.04	QP	0.5	16.8	26.34	40	-13.66	86	103	Horz
Vertical 30 - 200MHz										
33.907	19.67	QP	0.5	15.3	35.47	40	-4.53	285	279	Vert
40.6873	21.77	QP	0.7	12.7	35.17	40	-4.83	107	100	Vert
77.8003	21.85	QP	0.9	7.2	29.95	40	-10.05	284	101	Vert
Horizontal 200 - 1000MHz										
232.7724	24.13	QP	1.6	12.1	37.83	46	-8.17	283	113	Horz
249.9989	25.73	QP	1.7	12.6	40.03	46	-5.97	313	123	Horz
360.0097	22.01	QP	2.1	15.6	39.71	46	-6.29	169	128	Horz
624.9903	16.5	QP	2.8	20.3	39.6	46	-6.4	225	131	Horz
720.012	17.69	QP	3.1	21.1	41.89	46	-4.11	320	108	Horz
875.1376	8.57	QP	3.4	23.3	35.27	46	-10.73	175	320	Horz
498.7125	16.37	QP	2.6	18.3	37.27	46	-8.73	321	197	Horz
540.0118	21.24	QP	2.6	19.2	43.04	46	-2.96	125	223	Horz
Vertical 200 - 1000MHz										
540.0073	20.07	QP	2.6	19.4	42.07	46	-3.93	182	111	Vert
250.0001	27.95	QP	1.7	12.6	42.25	46	-3.75	168	100	Vert
432.2318	21.48	QP	2.3	16.5	40.28	46	-5.72	193	134	Vert
499.9817	19.26	QP	2.6	18.1	39.96	46	-6.04	188	102	Vert
565.2428	12.9	QP	2.7	19.8	35.4	46	-10.6	244	103	Vert
720.0226	17.82	QP	3.1	21.1	42.02	46	-3.98	194	164	Vert
949.8514	8.89	QP	3.6	24.2	36.69	46	-9.31	157	249	Vert
LIMIT 1: FCC Part 15 Subpart C 15.209										
PK - Peak detector										
QP - Quasi-Peak detector										
LnAv - Linear Average detector										
LgAv - Log Average detector										
Av - Average detector										
CAV - CISPR Average detector										
RMS - RMS detection										
CRMS - CISPR RMS detection										

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

No non-compliance noted:

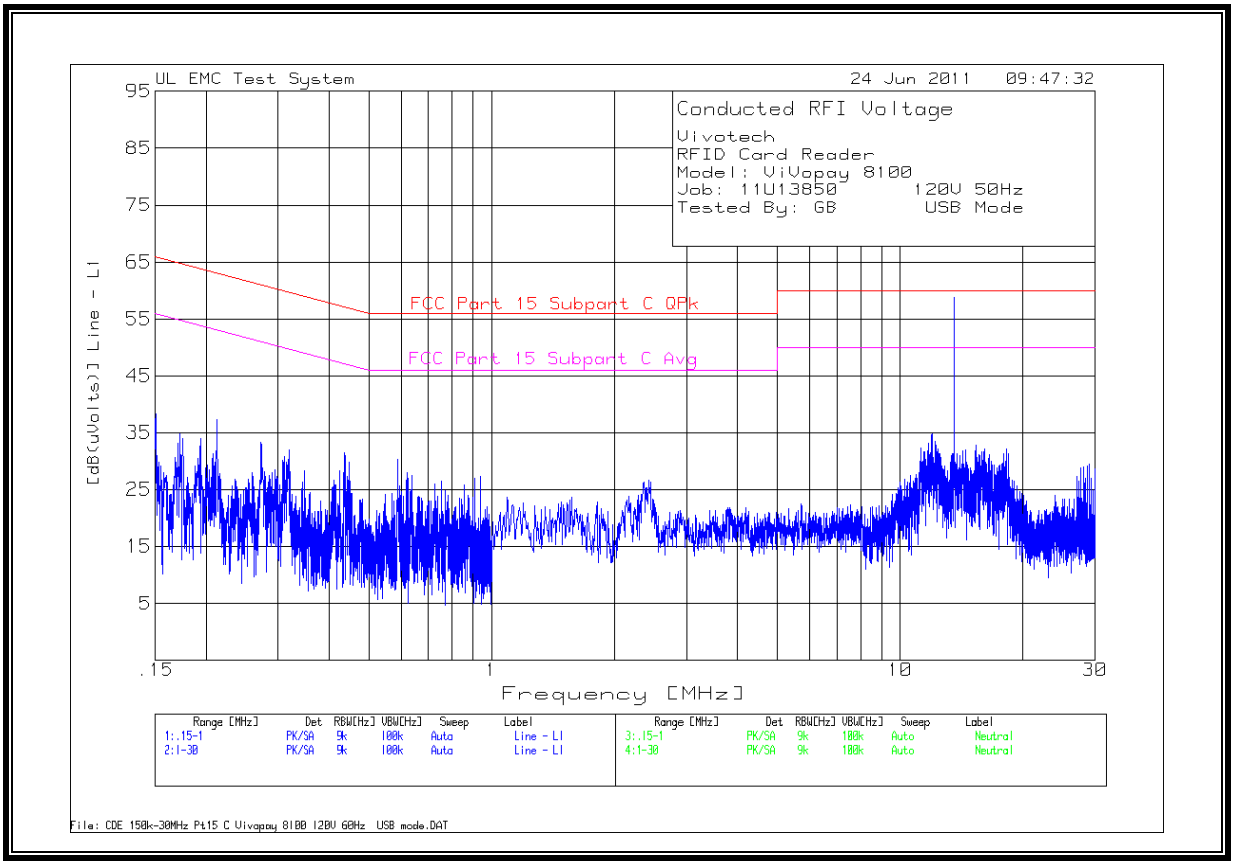
Note: Failing data obtained at fundamental frequency with permanently attached antenna connected. Per KDB Publication number 174176, test was repeated with suitable dummy load connected to verify emissions within the transmitter's fundamental band comply with the limits of Section 15.207.

6 WORST EMISSIONS – USB Mode with Internal Antenna Connected

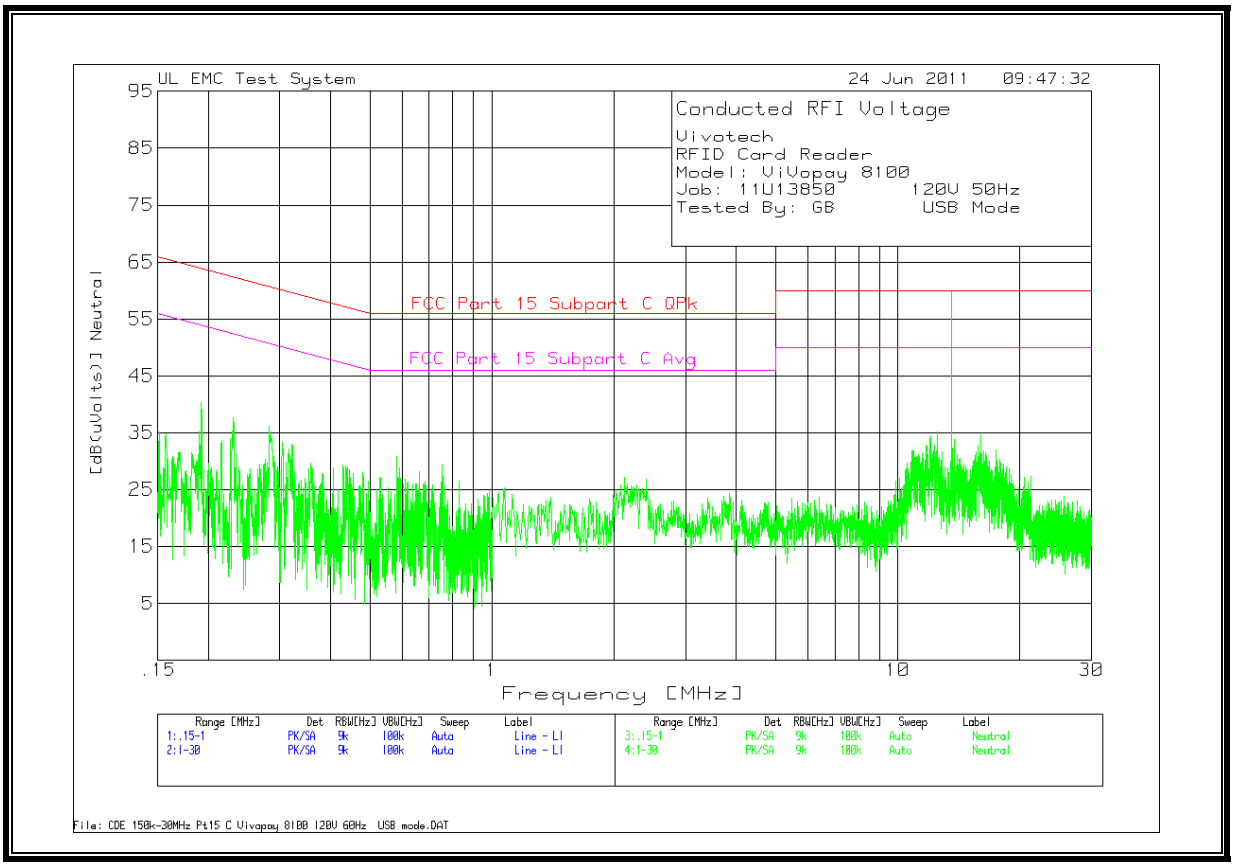
Vivotech										
RFID Card Reader										
Model: ViVopay 8100										
Job: 11U13850 120V 50Hz										
Tested By: GB USB Mode										
Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]
Number	Frequency	Reading	Type	Factor	Factor	[dB(uVolts)]				
	[MHz]	[dB(uV)]		[dB]	[dB]					
Line - L1 .15 - 1MHz										
1	0.15034	26.77	PK	11.6	0	38.37	66	-27.63	56	-17.63
2	0.1721	23.51	PK	11.3	0	34.81	64.9	-30.09	54.9	-20.09
3	0.2124	26.25	PK	11	0	37.25	63.1	-25.85	53.1	-15.85
4	0.27242	22.42	PK	10.8	0	33.22	61	-27.78	51	-17.78
Line - L1 1 - 30MHz										
5	11.95259	24.1	PK	10.6	0	34.7	60	-25.3	50	-15.3
6	13.56531	48.21	PK	10.6	0	58.81	60	-1.19	50	8.81
Neutral .15 - 1MHz										
7	0.1568	23.33	PK	11.5	0	34.83	65.6	-30.77	55.6	-20.77
8	0.192	29.16	PK	11.2	0	40.36	63.9	-23.54	53.9	-13.54
9	0.22975	26.58	PK	11	0	37.58	62.5	-24.92	52.5	-14.92
10	0.28229	25.27	PK	10.8	0	36.07	60.7	-24.63	50.7	-14.63
Neutral 1 - 30MHz										
11	12.4863	24.43	PK	10.7	0	35.13	60	-24.87	50	-14.87
12	13.56531	49.08	PK	10.7	0	59.78	60	-0.22	50	9.78
LIMIT 1: FCC Part 15 Subpart C QPk										
LIMIT 2: FCC Part 15 Subpart C Avg										
PK - Peak detector										
QP - Quasi-Peak detector										
LnAv - Linear Average detector										
LgAv - Log Average detector										
Av - Average detector										
CAV - CISPR Average detector										
RMS - RMS detection										
CRMS - CISPR RMS detection										

Vivotech									
RFID Card Reader									
Model: ViVopay 8100									
Job: 11U13850 120V 50Hz									
Tested By: GB USB Mode									
Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]
Frequency	Reading	Type	Factor	Factor	[dB(uVolts)]				
[MHz]	[dB(uV)]		[dB]	[dB]					
Line - L1 1 - 30MHz									
13.56445	46.98	QP	10.6	0	57.58	60	-2.42	50	7.58
Neutral 1 - 30MHz									
13.56443	47.35	QP	10.7	0	58.05	60	-1.95	50	8.05
Line - L1 1 - 30MHz									
13.56445	45.13	Av	10.6	0	55.73+	60	-4.27	50	5.73
Neutral 1 - 30MHz									
13.56443	45.36	Av	10.7	0	56.06+	60	-3.94	50	6.06
NOTE: "+" - Indicates an emission level in excess of the									
applicable limit (s).									
PK - Peak detector									
QP - Quasi-Peak detector									
LnAv - Linear Average detector									
LgAv - Log Average detection									
Av - average detection									
CAV - CISPR average detection									
RMS - RMS detection									
CRMS - CISPR RMS detection									
LIMIT 1: FCC Part 15 Subpart C QPk									
LIMIT 2: FCC Part 15 Subpart C Avg									

LINE 1 RESULTS



LINE 2 RESULTS

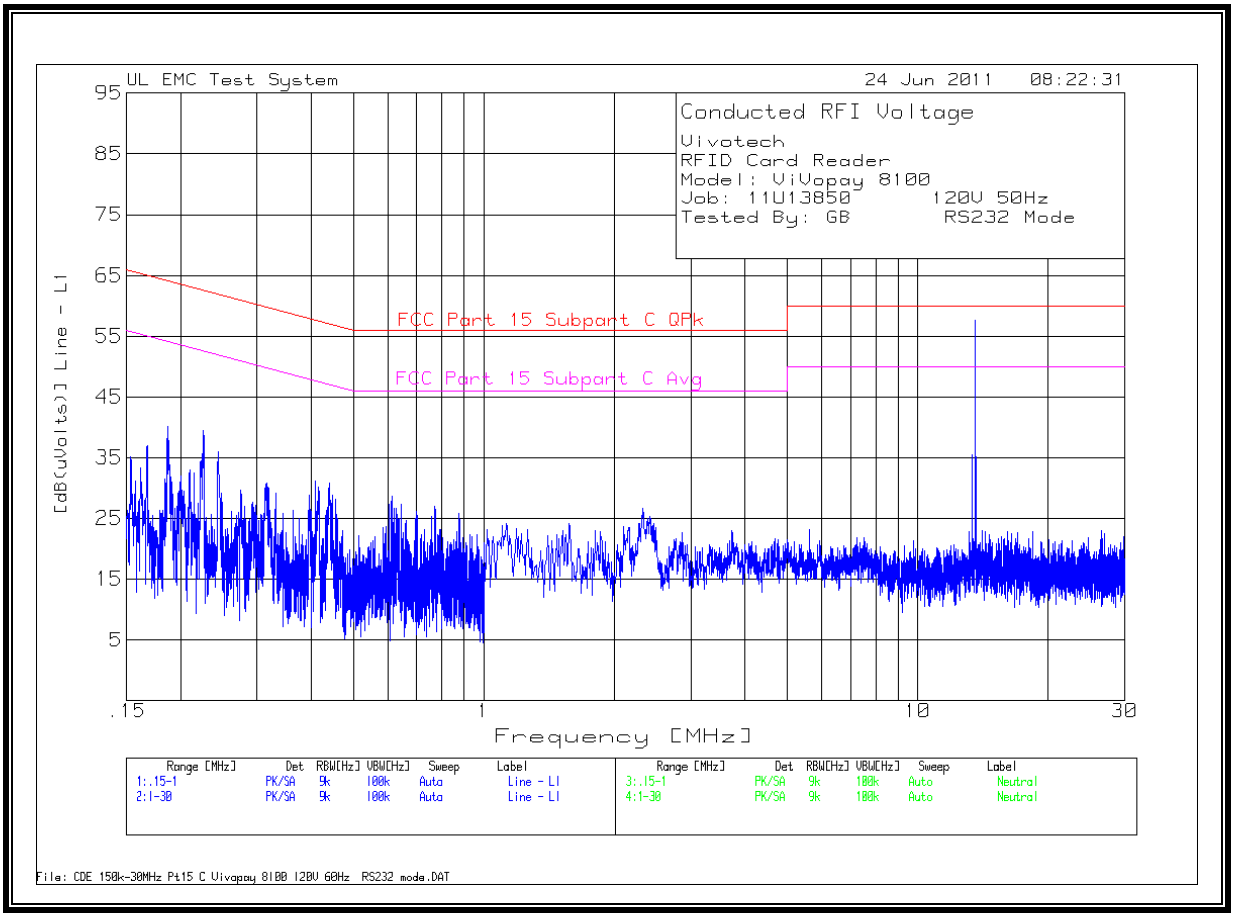


6 WORST EMISSIONS – RS-232 Mode with Internal Antenna Connected

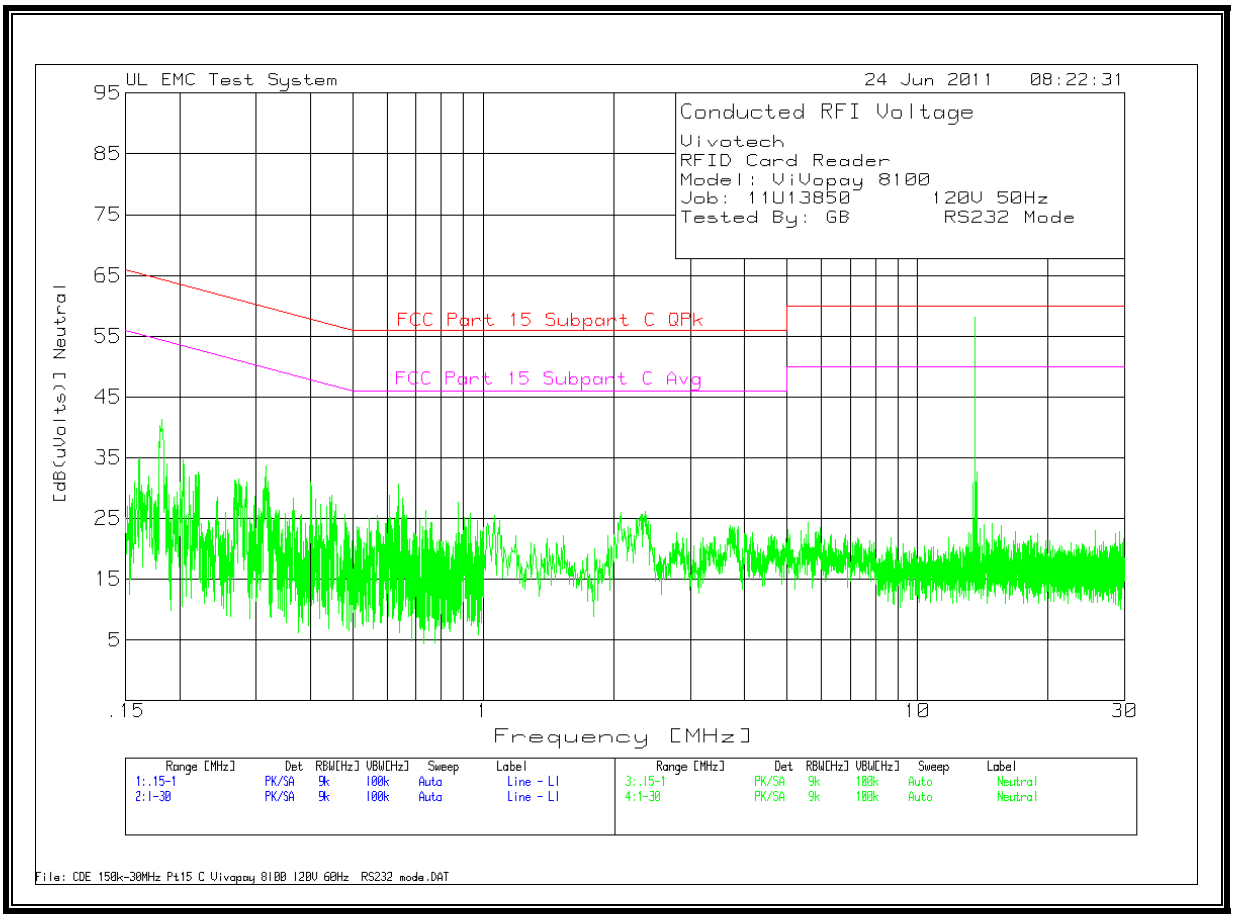
Vivotech										
RFID Card Reader										
Model: ViVopay 8100										
Job: 11U13850 120V 50Hz										
Tested By: GB RS232 Mode										
Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]
Number	Frequency	Reading	Type	Factor	Factor	[dB(uVolts)]				
	[MHz]	[dB(uV)]		[dB]	[dB]					
Line - L1 .15 - 1MHz										
1	0.16734	25.52	PK	11.4	0	36.92	65.1	-28.18	55.1	-18.18
2	0.18656	28.96	PK	11.2	0	40.16	64.2	-24.04	54.2	-14.04
3	0.22567	28.41	PK	11	0	39.41	62.6	-23.19	52.6	-13.19
4	0.2442	25.14	PK	10.9	0	36.04	62	-25.96	52	-15.96
Line - L1 1 - 30MHz										
5	13.35647	24.94	PK	10.6	0	35.54	60	-24.46	50	-14.46
6	13.56531	46.97	PK	10.6	0	57.57	60	-2.43	50	7.57
Neutral .15 - 1MHz										
7	0.16131	23.62	PK	11.5	0	35.12	65.4	-30.28	55.4	-20.28
8	0.1818	29.96	PK	11.3	0	41.26	64.4	-23.14	54.4	-13.14
9	0.2039	23.59	PK	11.1	0	34.69	63.5	-28.81	53.5	-18.81
10	0.3151	22.88	PK	10.7	0	33.58	59.8	-26.22	49.8	-16.22
Neutral 1 - 30MHz										
11	13.56531	47.34	PK	10.7	0	58.04	60	-1.96	50	8.04
12	13.67554	21.94	PK	10.7	0	32.64	60	-27.36	50	-17.36
LIMIT 1: FCC Part 15 Subpart C QPk										
LIMIT 2: FCC Part 15 Subpart C Avg										
PK - Peak detector										
QP - Quasi-Peak detector										
LnAv - Linear Average detector										
LgAv - Log Average detector										
Av - Average detector										
CAV - CISPR Average detector										
RMS - RMS detection										
CRMS - CISPR RMS detection										

Vivotech									
RFID Card Reader									
Model: ViVopay 8100									
Job: 11U13850 120V 50Hz									
Tested By: GB RS232 Mode									
Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]
Frequency	Reading	Type	Factor	Factor	[dB(uVolts)]				
[MHz]	[dB(uV)]		[dB]	[dB]					
Line - L1 1 - 30MHz									
13.56453	47.12	QP	10.6	0	57.72	60	-2.28	50	7.72
Neutral 1 - 30MHz									
13.56448	47.45	QP	10.7	0	58.15	60	-1.85	50	8.15
Line - L1 1 - 30MHz									
13.56453	45.02	Av	10.6	0	55.62+	60	-4.38	50	5.62
Neutral 1 - 30MHz									
13.56448	45.26	Av	10.7	0	55.96+	60	-4.04	50	5.96
NOTE: "+" - Indicates an emission level in excess of the									
applicable limit (s).									
PK - Peak detector									
QP - Quasi-Peak detector									
LnAv - Linear Average detector									
LgAv - Log Average detection									
Av - average detection									
CAV - CISPR average detection									
RMS - RMS detection									
CRMS - CISPR RMS detection									
LIMIT 1: FCC Part 15 Subpart C QPk									
LIMIT 2: FCC Part 15 Subpart C Avg									

LINE 1 RESULTS



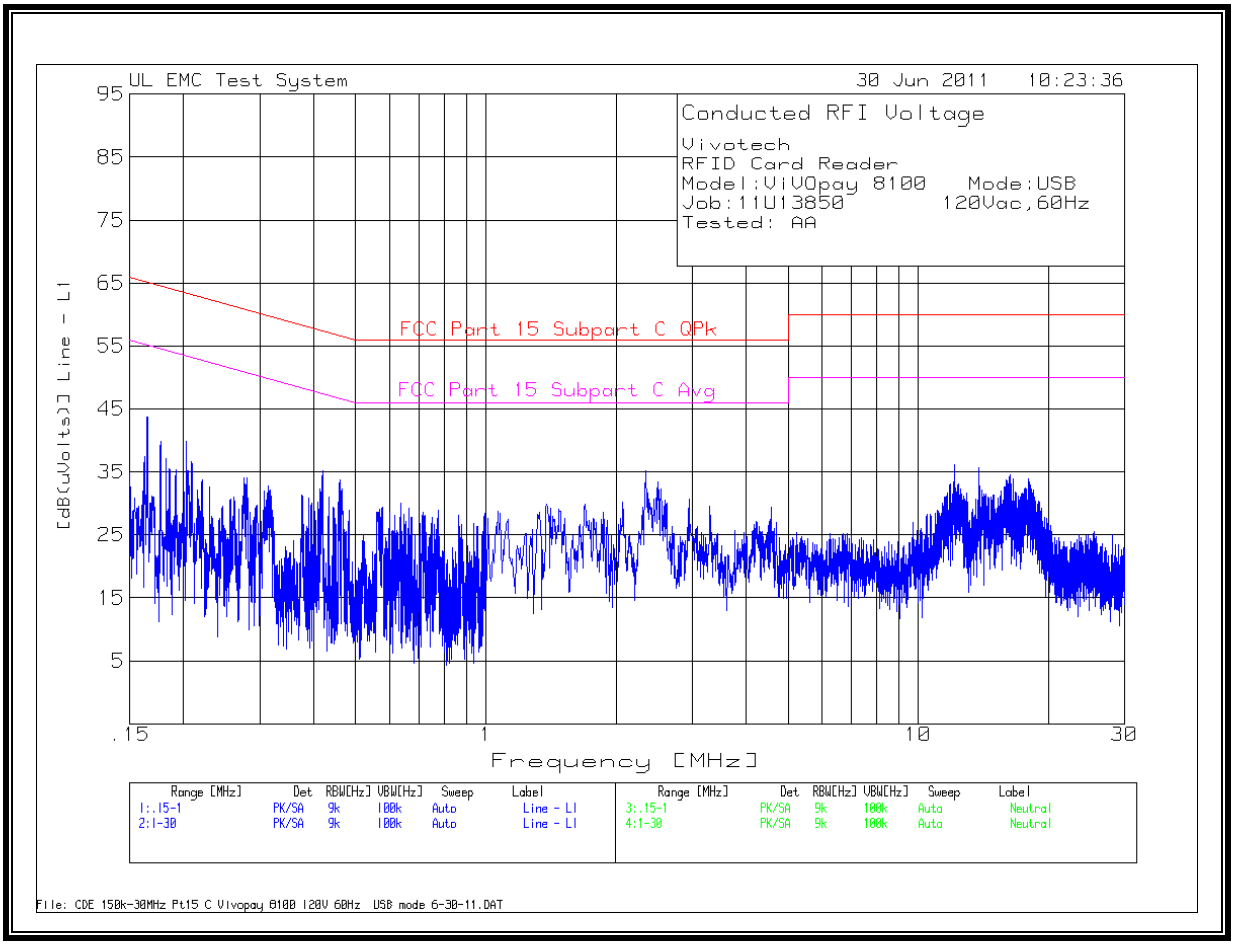
LINE 2 RESULTS



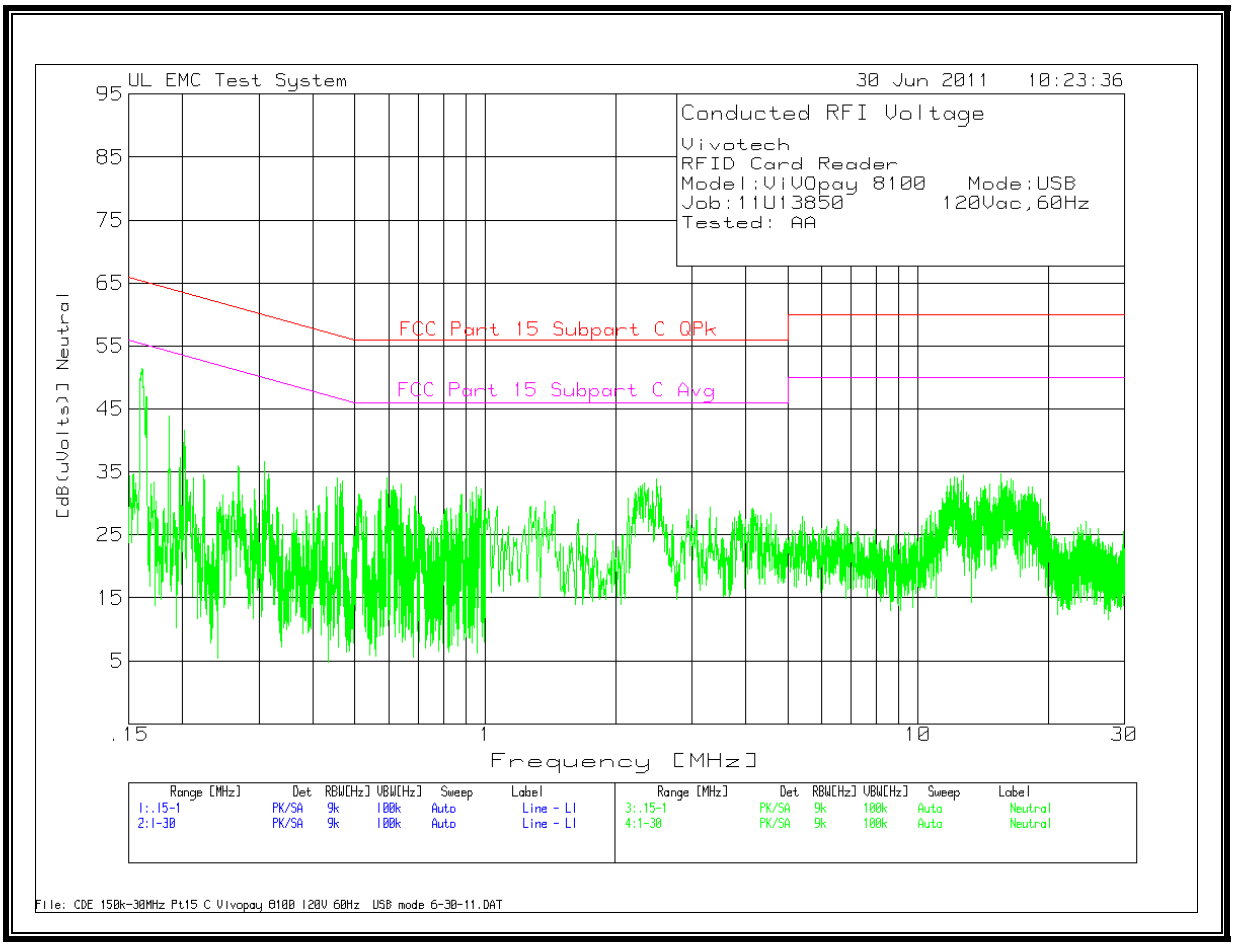
6 WORST EMISSIONS – USB Mode with Dummy Antenna Connected

Vivotech										
RFID Card Reader										
Model:ViVOpay 8100 Mode:USB										
Job:11U13850 120Vac,60Hz										
Tested: AA										
Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]
Number	Frequency	Reading	Type	Factor	Factor	[dB(uVolts)]				
	[MHz]	[dB(uV)]		[dB]	[dB]					
Line - L1 .15 - 1MHz										
1	0.16462	32.39	PK	11.4	0	43.79	65.2	-21.41	55.2	-11.41
2	0.20271	28.8	PK	11.1	0	39.9	63.5	-23.6	53.5	-13.6
3	0.41899	24.56	PK	10.6	0	35.16	57.5	-22.34	47.5	-12.34
Line - L1 1 - 30MHz										
4	2.34587	24.81	PK	10.4	0	35.21	56	-20.79	46	-10.79
5	12.10342	25.51	PK	10.6	0	36.11	60	-23.89	50	-13.89
6	13.83217	25.06	PK	10.6	0	35.66	60	-24.34	50	-14.34
Neutral .15 - 1MHz										
7	0.16122	39.9	PK	11.5	0	51.4	65.4	-14	55.4	-4
8	0.18605	32.67	PK	11.2	0	43.87	64.2	-20.33	54.2	-10.33
9	0.30864	25.97	PK	10.7	0	36.67	60	-23.33	50	-13.33
Neutral 1 - 30MHz										
10	2.4909	23.48	PK	10.4	0	33.88	56	-22.12	46	-12.12
11	12.74155	23.87	PK	10.7	0	34.57	60	-25.43	50	-15.43
12	15.53771	24.07	PK	10.7	0	34.77	60	-25.23	50	-15.23
Vivotech										
RFID Card Reader										
Model:ViVOpay 8100 Mode:USB										
Job:11U13850 120Vac,60Hz										
Tested: AA										
Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]	
Frequency	Reading	Type	Factor	Factor	[dB(uVolts)]					
[MHz]	[dB(uV)]		[dB]	[dB]						
Neutral .15 - 1MHz										
0.16045	20.65	Av	11.5	0	32.15	65.4	-33.25	55.4	-23.25	
NOTE: "+" - Indicates an emission level in excess of the										
applicable limit (s).										
PK - Peak detector										
QP - Quasi-Peak detector										
LnAv - Linear Average detector										
LgAv - Log Average detection										
Av - average detection										
CAV - CISPR average detection										
RMS - RMS detection										
CRMS - CISPR RMS detection										
LIMIT 1: FCC Part 15 Subpart C QPk										
LIMIT 2: FCC Part 15 Subpart C Avg										

LINE 1 RESULTS



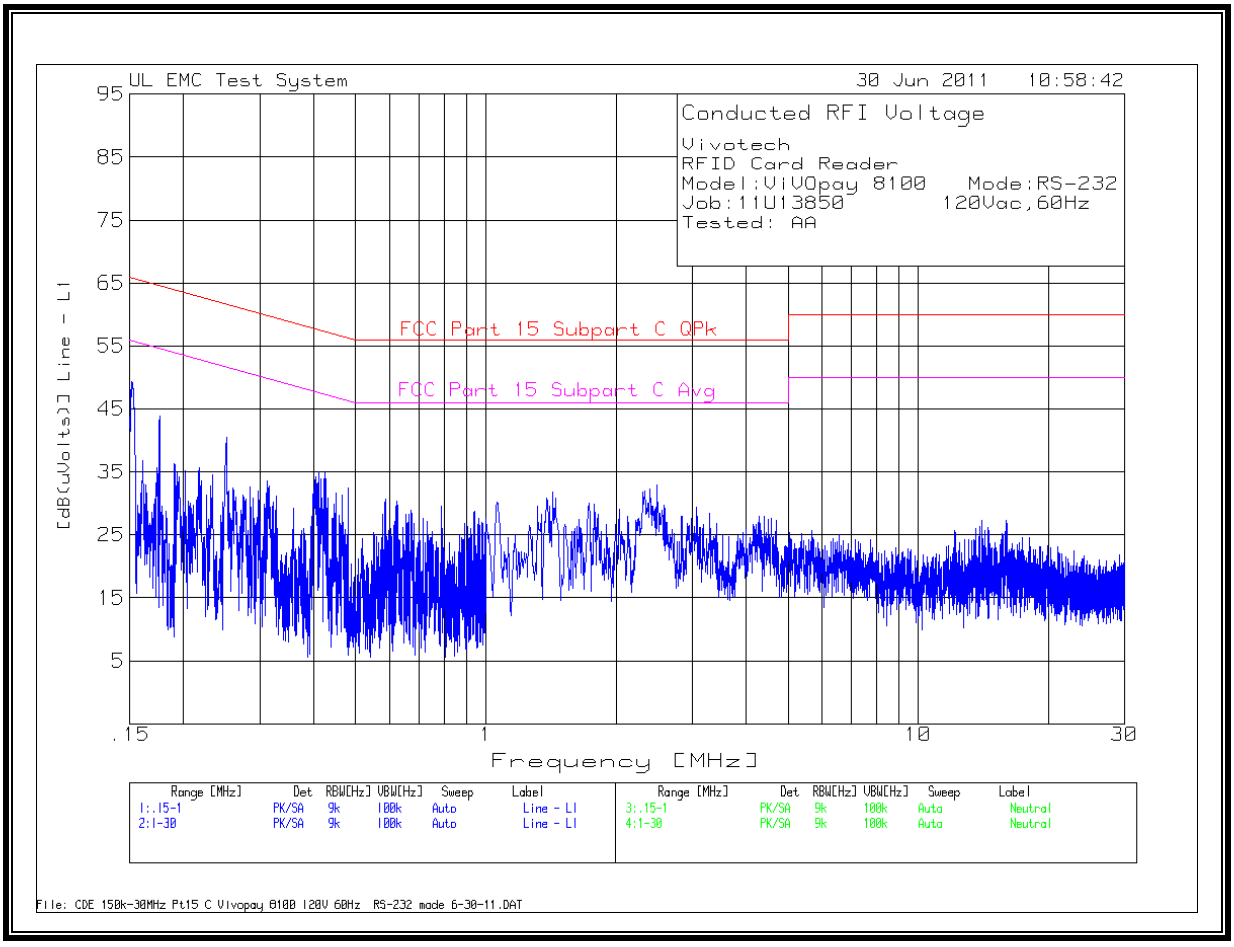
LINE 2 RESULTS



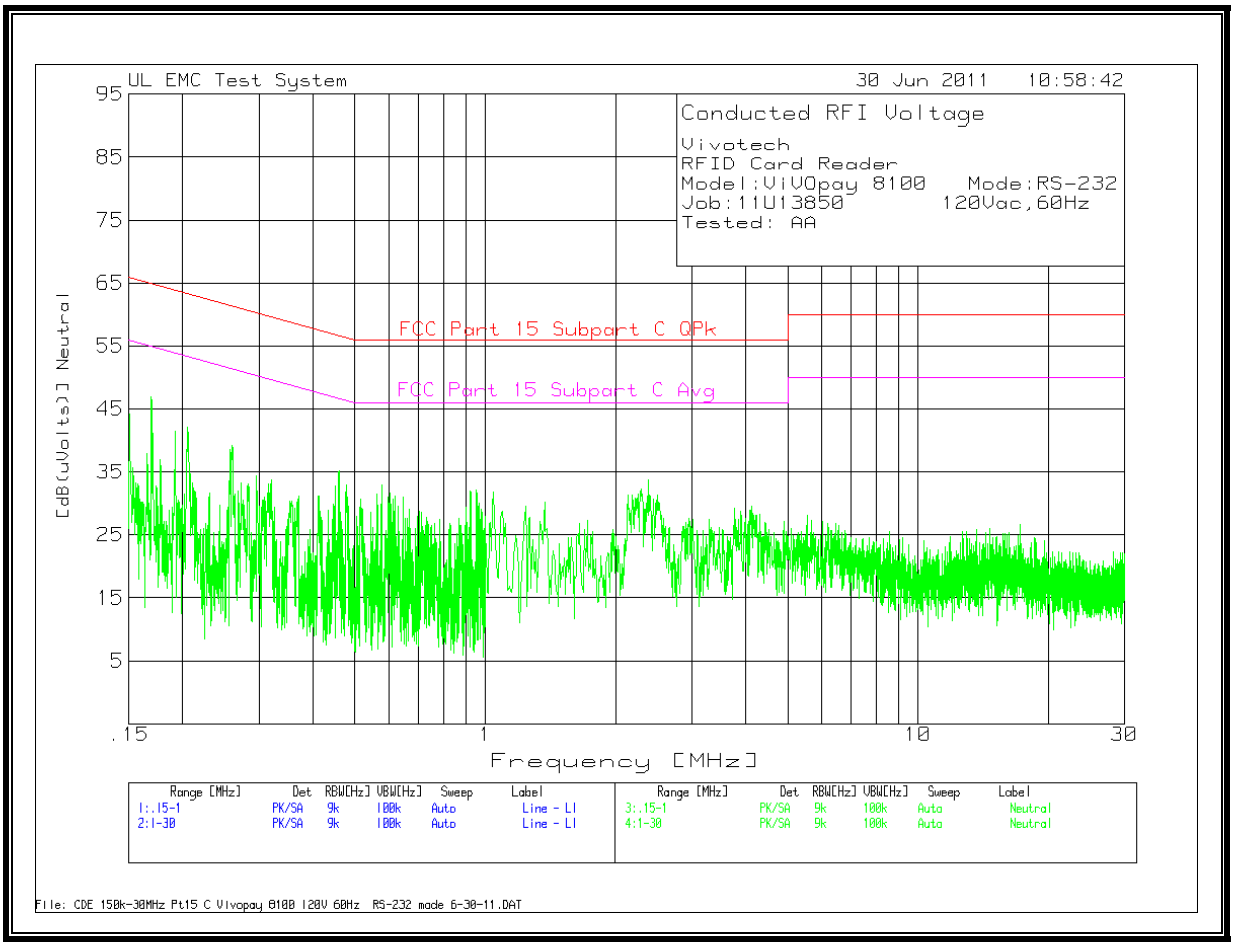
6 WORST EMISSIONS – RS-232 Mode with Dummy Antenna Connected

Vivotech										
RFID Card Reader										
Model:ViVOpay 8100 Mode:RS-232										
Job:11U13850 120Vac,60Hz										
Tested: AA										
Marker	Test	Meter	Detector	Gain/Loss	Transducer	Level	Limit 1	Margin 1[dB]	Limit 2	Margin 2[dB]
Number	Frequency	Reading	Type	Factor	Factor	[dB(uVolts)]				
	[MHz]	[dB(uV)]		[dB]	[dB]					
Line - L1 .15 - 1MHz										
1	0.1517	37.81	PK	11.6	0	49.41	65.9	-16.49	55.9	-6.49
2	0.17585	32.54	PK	11.3	0	43.84	64.7	-20.86	54.7	-10.86
3	0.25151	29.53	PK	10.9	0	40.43	61.7	-21.27	51.7	-11.27
4	0.4161	23.27	PK	10.6	0	33.87	57.5	-23.63	47.5	-13.63
Line - L1 1 - 30MHz										
5	1.42929	21.37	PK	10.4	0	31.77	56	-24.23	46	-14.23
6	2.4851	22.54	PK	10.4	0	32.94	56	-23.06	46	-13.06
Neutral .15 - 1MHz										
7	0.16921	35.47	PK	11.4	0	46.87	65	-18.13	55	-8.13
8	0.19217	30.24	PK	11.2	0	41.44	63.9	-22.46	53.9	-12.46
9	0.20509	31	PK	11.1	0	42.1	63.4	-21.3	53.4	-11.3
10	0.2595	28.47	PK	10.8	0	39.27	61.4	-22.13	51.4	-12.13
Neutral 1 - 30MHz										
11	1.04641	21.4	PK	10.4	0	31.8	56	-24.2	46	-14.2
12	2.37488	23.4	PK	10.4	0	33.8	56	-22.2	46	-12.2
LIMIT 1: FCC Part 15 Subpart C QPk										
LIMIT 2: FCC Part 15 Subpart C Avg										
LIMIT 3: NONE										
LIMIT 4: NONE										
LIMIT 5: NONE										
LIMIT 6: NONE										
PK - Peak detector										
QP - Quasi-Peak detector										
LnAv - Linear Average detector										
LgAv - Log Average detector										
Av - Average detector										
CAV - CISPR Average detector										
RMS - RMS detection										
CRMS - CISPR RMS detection										

LINE 1 RESULTS



LINE 2 RESULTS



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 / TIA / EIA 603 Clause 2.3.1 and 2.3.2

RESULTS

No non-compliance noted.

Reference Frequency: EUT Channel 13.56 MHz @ 20ºC **Limit: ± 100 ppm = 135.616 kHz**				
Power Supply	**Environment**	**Frequency Deviation Measureed with Time Elapse**		
(Vac)	**Temperature (ºC)**	**(MHz)**	**Delta (ppm)**	**Limit (ppm)**
115.00	50	13.5615600	0.015	± 100
115.00	40	13.5615770	0.002	± 100
115.00	30	13.5615740	0.004	± 100
115.00	***20***	***13.5615800***	***0.000***	***± 100***
115.00	10	13.5615800	0.000	± 100
115.00	0	13.5615740	0.004	± 100
115.00	-10	13.5615970	-0.013	± 100
115.00	-20	13.5615740	0.004	± 100
97.15	20	13.5615540	0.019	± 100
132.25	20	13.5615570	0.017	± 100

10. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

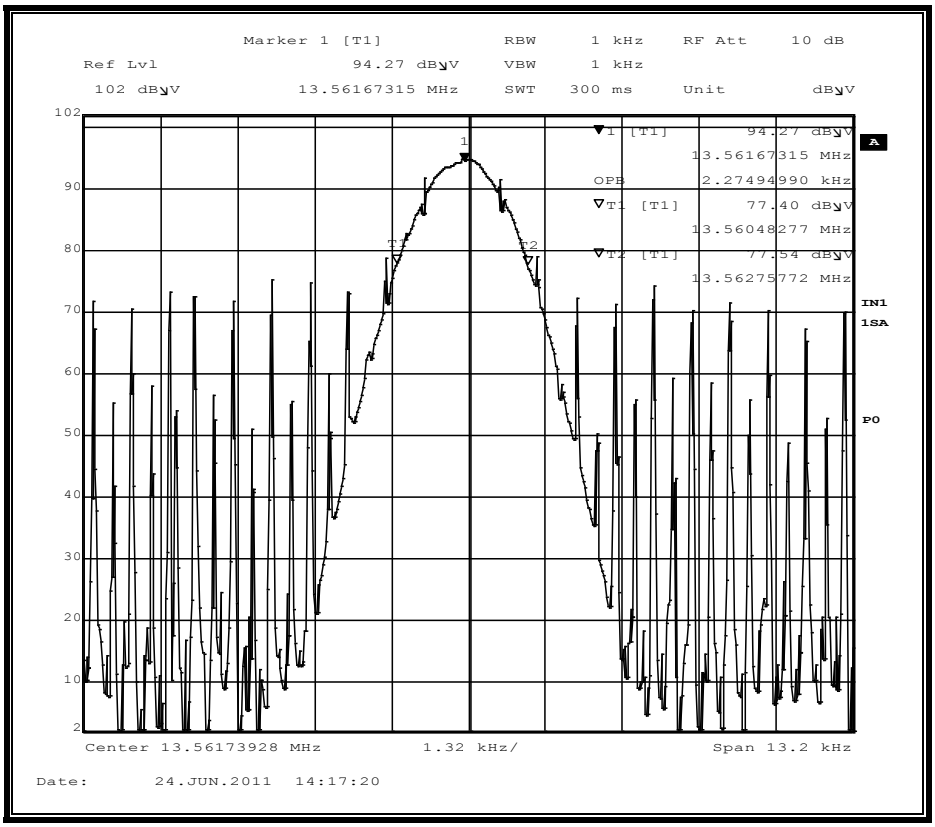
TEST PROCEDURE

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

Frequency (MHz)	99% Bandwidth (KHz)	20dB Bandwidth (KHz)
13.56	2.27	3.33

99% BANDWIDTH



20dB BANDWIDTH