



VIVOTECH INC. TEST REPORT

FOR THE

13.56 MHz CARD READER, VIVOPAY 3000HF

FCC PART 15 SUBPART C SECTIONS 15.207, 15.209 AND 15.225

COMPLIANCE

DATE OF ISSUE: MAY 11, 2004

PREPARED FOR:

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

W.O. No.: 82157

PREPARED BY:

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CKC Laboratories, Inc.
5473A Clouds Rest
Mariposa, CA 95338

Date of test: May 7-10, 2004

Report No.: FC04-039

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ADMINISTRATIVE INFORMATION

DATE OF TEST: May 7-10, 2004

DATE OF RECEIPT: May 7, 2004

PURPOSE OF TEST: To demonstrate the compliance of the 13.56 MHz Card Reader, Vivopay 3000HF with the requirements for FCC Part 15 Subpart C Sections 15.207, 15.209 and 15.225 devices.

TEST METHOD: ANSI C63.4 (1992)

MANUFACTURER: Plexus (Xiamen) Co., Ltd.
No. 6 Xiangxing 2 Road
Xiangyu Free Trade Zone
Xiamen, Fujian, China (361006)

REPRESENTATIVE: Bruce Moulette

TEST LOCATION: CKC Laboratories, Inc.
5473A Clouds Rest
Mariposa, CA 95338

SUMMARY OF RESULTS

As received, the ViVOtech Inc. 13.56 MHz Card Reader, Vivopay 3000HF was found to be fully compliant with the following standards and specifications:

Canadian Standard	Canadian Section	FCC Standard	FCC Section	Test Description
RSS 210	5.5	47CFR	15.203	Antenna Connector Requirements
RSS 210	6.2.1	47CFR	15.209	General Radiated Emissions Requirement
RSS 210	6.2.2(e)	47CFR	15.225(a)*	Fundamental Requirements
RSS 210	6.2.2(e)	NA	NA	$\pm 150\text{kHz}$ to $\pm 450\text{kHz}$ Emissions Requirement
RSS 210	6.6	47CFR	15.207	AC Mains Conducted Emissions Requirement
	IC 3082-D		784962	Site File No.

* Indicates that FCC Requirements are more stringent than the Canadian Equivalent.

CONDITIONS FOR COMPLIANCE

No modifications to the EUT were necessary to comply.

APPROVALS

Steve Behm, Director of Engineering Services

QUALITY ASSURANCE:



Joyce Walker, Quality Assurance Administrative Manager

TEST PERSONNEL:



Randy Clark, EMC Engineer



Mike Wilkinson, Lab Manager

FCC 15.203 Antenna Requirements

The antenna is an integral part of the EUT and is non-removable; therefore the EUT complies with Section 15.203 of the FCC rules.

FCC 15.33(a) Frequency Ranges Tested

15.207 Conducted: 150 kHz – 30 MHz

15.209 Radiated: 9 kHz – 1000 MHz

FCC SECTION 15.35: ANALYZER BANDWIDTH SETTINGS PER FREQUENCY RANGE			
TEST	BEGINNING FREQUENCY	ENDING FREQUENCY	BANDWIDTH SETTING
CONDUCTED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	9 kHz	150 kHz	200 Hz
RADIATED EMISSIONS	150 kHz	30 MHz	9 kHz
RADIATED EMISSIONS	30 MHz	1000 MHz	120 kHz

Eut Operating Frequency

The EUT was operating at 13.56 MHz

Temperature And Humidity During Testing

The temperature during testing was within +15°C and + 35°C.

The relative humidity was between 20% and 75%.

EQUIPMENT UNDER TEST (EUT) DESCRIPTION

The EUT tested by CKC Laboratories was representative of a production unit.

EQUIPMENT UNDER TEST

13.56 MHz Card Reader

Manuf: ViVOtech Inc.
Model: Vivopay 3000HF
Serial: 101
FCC ID: pending

Power Supply

Manuf: ViVOtech Inc.
Model: 41-9-1000
Serial: NA
FCC ID: NA

PERIPHERAL DEVICES

The EUT was not tested with peripheral devices.

REPORT OF MEASUREMENTS

The following tables report the worst case emissions levels recorded during the tests performed on the EUT. All readings taken were peak readings unless otherwise stated. The data sheets from which the emissions tables were compiled are contained in Appendix C.

Table 1: FCC 15.225 Fundamental									
FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV/m	SPEC LIMIT dBμV/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
13.560	54.4	8.4		0.8	-19.0	44.6	84.0	-39.4	V
13.561	57.9	8.4		0.8	-19.0	48.1	84.0	-35.9	V

Test Method: ANSI C63.4 (1992)
 Spec Limit: FCC Part 15 Subpart C Section 15.225
 Test Distance: 10 Meters

NOTES: V = Vertical Polarization

COMMENTS: EUT is a 13.56MHz Card Reader. EUT is powered via AC power supply. All EUT ports are filled. Frequency range investigated: Carrier. Test distance correction factor used in accordance with 15.31 of 40dB per decade to correct 10m data for comparison to the limit. Temperature: 19°C, Humidity: 38%.

Table 2: FCC 15.207 Six Highest Conducted Emission Levels

FREQUENCY MHz	METER READING dBμV	CORRECTION FACTORS				CORRECTED READING dBμV	SPEC LIMIT dBμV	MARGIN dB	NOTES
		Lisn dB	HPF dB	Cable dB					
0.827750	32.3	0.2	0.3	0.1		32.9	46.0	-13.1	B
0.979072	32.4	0.3	0.2	0.2		33.1	46.0	-12.9	W
0.987578	32.7	0.3	0.2	0.2		33.4	46.0	-12.6	B
13.579440	37.6	0.4	0.1	0.4		38.5	50.0	-11.5	B
27.125400	34.7	0.5	0.2	0.5		35.9	50.0	-14.1	BA
27.128590	41.4	0.4	0.2	0.5		42.5	50.0	-7.5	W

Test Method: ANSI C63.4 (1992)
Spec Limit: FCC Part 15 Subpart C Section 15.207

NOTES: A = Average Reading
B = Black Lead
W = White Lead

COMMENTS: EUT is a 13.56MHz Card Reader. EUT is powered via AC power supply.

Table 3: FCC 15.209 Radiated Emission Levels: 9 kHz - 30 MHz

FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS				CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Corr dB				
27.121	23.3	4.9		1.1	-20.0	9.3	29.5	-20.2	V
27.121	14.2	4.9		1.1	-20.0	0.2	29.5	-29.3	H
29.999	17.5	4.0		1.2	-20.0	2.7	29.5	-26.8	V

Test Method: ANSI C63.4 (1992)
Spec Limit: FCC Part 15 Subpart C Section 15.209
Test Distance: 10 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization

COMMENTS: EUT is a 13.56MHz Card Reader. EUT is powered via AC power supply. All EUT ports are filled. Frequency range investigated: 9kHz to 30MHz. Test distance correction factor used in accordance with 15.31 of 40dB per decade to correct 10m data for comparison to the limit. Temperature: 19°C, Humidity: 38%. **No emissions detected within 20dB of the limit.**

Table 4: FCC 15.209 Six Highest Radiated Emission Levels: 30-1000 MHz

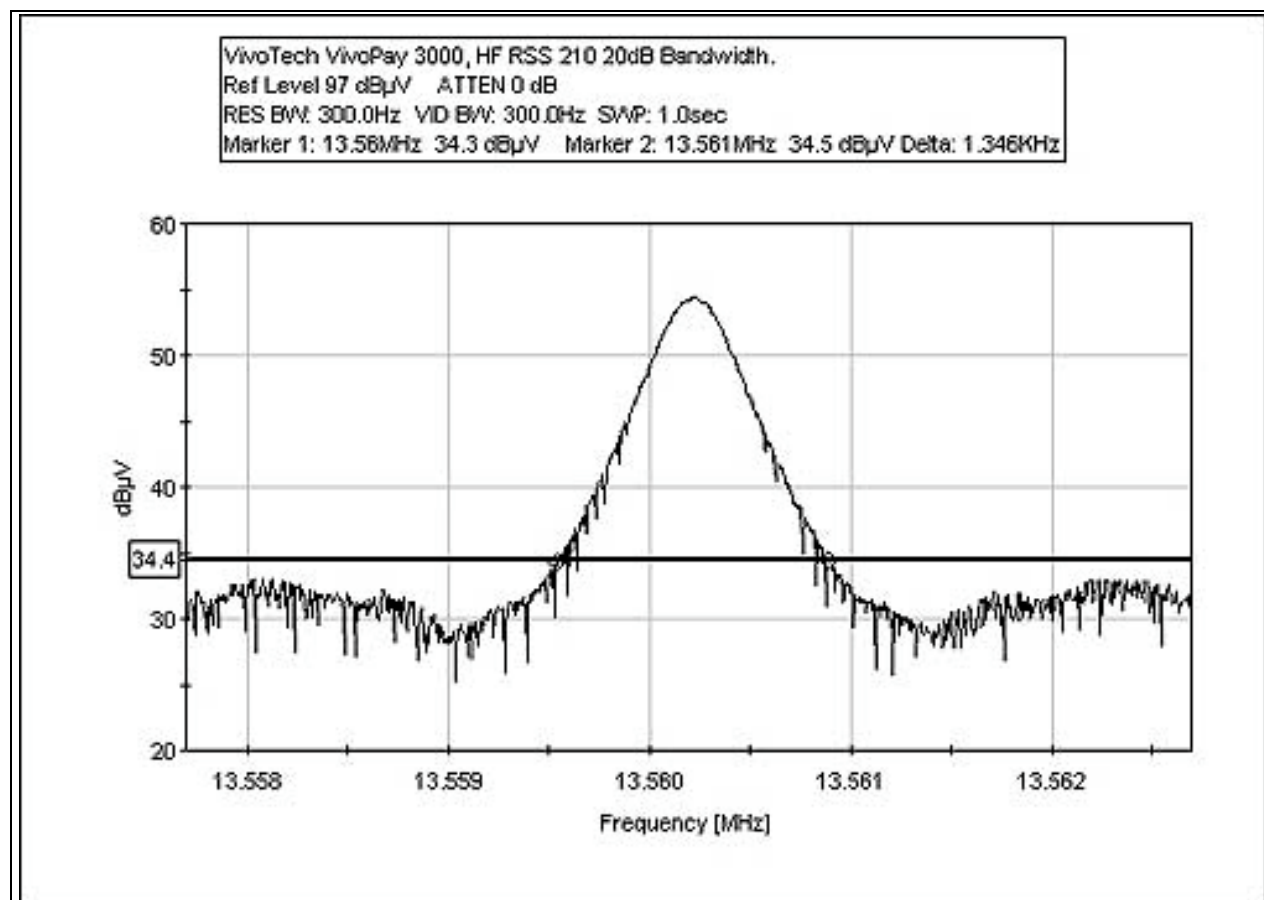
FREQUENCY MHz	METER READING dB μ V	CORRECTION FACTORS				CORRECTED READING dB μ V/m	SPEC LIMIT dB μ V/m	MARGIN dB	NOTES
		Ant dB	Amp dB	Cable dB	Dist dB				
120.087	42.3	10.9	-27.2	2.5	10.0	38.5	43.5	-5.0	VQ
461.117	35.8	16.7	-27.6	5.1	10.0	40.0	46.0	-6.0	H
540.087	35.1	18.1	-27.8	5.9	10.0	41.3	46.0	-4.7	H
540.099	34.7	18.1	-27.8	5.9	10.0	40.9	46.0	-5.1	V
600.099	34.1	19.1	-27.8	5.9	10.0	41.3	46.0	-4.7	H
660.081	32.3	19.8	-28.0	6.5	10.0	40.6	46.0	-5.4	H

Test Method: ANSI C63.4 (1992)
Spec Limit: FCC Part 15 Subpart C Section 15.209
Test Distance: 10 Meters

NOTES: H = Horizontal Polarization
V = Vertical Polarization
Q = Quasi Peak Reading

COMMENTS: EUT is a 13.56MHz Card Reader. EUT is powered via AC power supply. All EUT ports are filled. Frequency range investigated: 30-1000MHz. Test distance correction factor used in accordance with 15.31 of 20dB per decade to correct 10m data for comparison to the limit. Temperature: 19°C, Humidity: 38%.

20dB BANDWIDTH



FREQUENCY STABILITY

Test Conditions: EUT is a 13.56 MHz Card Reader. EUT is powered via 120VAC AC transformer. EUT is located inside of temperature chamber.

Customer: VivoTech
Test Engineer: Randy Clark

Device Model #: VivoPay 3000, HF
Operating Voltage: 120 VAC
Frequency Limit: 0.01 %

Temperature Variations

Channel Frequency:		Channel 1 (MHz)	Dev. (MHz)
		13.56	
Temp (C)	Voltage		
-30	120	N/A	
-20	120	13.56023	0.00023
-10	120	13.56026	0.00025
0	120	13.56024	0.00023
10	120	13.56020	0.00020
20	120	13.56017	0.00017
30	120	13.56017	0.00016
40	120	13.56017	0.00016
50	120	13.56017	0.00016

Voltage Variations ($\pm 15\%$)

20	102.0	13.56017	0.00017
20	120	13.56017	0.00017
20	138.0	13.56017	0.00016

Max Deviation (MHz)	0.00025
Max Deviation (%)	0.00188
PASS	

EUT SETUP

The equipment under test (EUT) was set up in a manner that represented its normal use, as shown in the photographs in Appendix A. Any special conditions required for the EUT to operate normally are identified in the comments that accompany the emissions tables. The corrected data was then compared to the applicable emission limits to determine compliance.

The cables were routed consistent with the typical application by varying the configuration of the test sample. Interface cables were connected to the available I/O ports of the test unit. The effect of varying the position of the cables was investigated to find the configuration that produced maximum emissions. I/O cables were of the type and length specified in the individual requirements. The length of cable that produced maximum emissions was selected.

The radiated and conducted emissions data of the EUT was taken with the HP Spectrum Analyzer. Incorporating the applicable correction factors for distance, antenna, cable loss and amplifier gain, the data was reduced as shown in Table A.

Preliminary and final measurements were taken in order to ensure that all emissions from the EUT were found and maximized.

CORRECTION FACTORS

The basic spectrum analyzer reading was converted using correction factors as shown in the highest emissions readings in the tables. For radiated emissions in dB μ V/m, the spectrum analyzer reading in dB μ V was corrected by using the following formula in Table A. This reading was then compared to the applicable specification limit to determine compliance.

TABLE A: SAMPLE CALCULATIONS		
	Meter reading	(dB μ V)
+	Antenna Factor	(dB)
+	Cable Loss	(dB)
-	Distance Correction	(dB)
-	Preamplifier Gain	(dB)
=	Corrected Reading	(dB μ V/m)

TEST INSTRUMENTATION AND ANALYZER SETTINGS

The test instrumentation and equipment listed in Appendix B were used to collect both the radiated and conducted emissions data. For radiated measurements from 9 kHz to 30 MHz, the magnetic loop antenna was used. For frequencies from 30 to 1000 MHz, the biconilog antenna was used. The horn antenna was used for frequencies above 1000 MHz. Conducted emissions tests required the use of the FCC type LISNs.

The HP spectrum analyzer was used for all measurements. Table B shows the analyzer bandwidth settings that were used in designated frequency bands. For conducted emissions, an appropriate reference level and a vertical scale size of 10 dB per division were used. A 10 dB external attenuator was also used during conducted tests, with internal offset correction in the analyzer. During radiated testing, the measurements were made with 0 dB of attenuation, a reference level of 97 dB μ V, and a vertical scale of 10 dB per division.

SPECTRUM ANALYZER DETECTOR FUNCTIONS

The notes that accompany the measurements contained in the Tables indicate the type of detector function used to obtain the given readings. Unless otherwise noted, all readings were made in the "Peak" mode. Whenever a "Quasi-Peak" or "Average" reading is listed as one of the six highest readings, this is indicated as a "Q" or an "A" in the appropriate table. The following paragraphs describe in more detail the detector functions and when they were used to obtain the emissions data.

Peak

In this mode, the Spectrum Analyzer or test engineer recorded all emissions at their peak value as the frequency band selected was scanned. By combining this function with another feature of the analyzer called "peak hold," the analyzer had the ability to measure transients or low duty cycle transient emission peak levels. In this mode the analyzer made a slow scan across the frequency band selected and measured the peak emission value found at each frequency across the band.

Quasi-Peak

When the true peak values exceeded or were within 2 dB of the specification limit, quasi-peak measurements were taken using the HP Quasi-Peak Adapter for the HP Spectrum Analyzer. The detailed procedure for making quasi peak measurements contained in the HP Quasi-Peak Adapter manual were followed.

Average

For certain frequencies, average measurements may be made using the spectrum analyzer. To make these measurements, the test engineer reduces the video bandwidth on the analyzer until the modulation of the signal is filtered out. At this point the analyzer is set into the linear mode and the scan time is reduced.

EUT TESTING

Mains Conducted Emissions

During conducted emissions testing, the EUT was located on a wooden table measuring approximately 80 cm high, 1 meter deep, and 1.5 meters in length. One wall of the room where the EUT was located has a minimum 2 meter by 2 meter conductive plane. The EUT was mounted on the wooden table 40 cm away from the conductive plane, and 80 cm from any other conductive surface.

The vertical metal plane used for conducted emissions was grounded to the earth. Power to the EUT was provided through a LISN. The LISN was grounded to the ground plane. All other objects were kept a minimum of 80 cm away from the EUT during the conducted test.

The LISNs used were 50 μ H/+50 ohms. Above 150 kHz, a 0.15 μ F series capacitor was added in-line prior to connecting the analyzer to restore the proper impedance for the range. A 30 to 50 second sweep time was used for automated measurements in the frequency bands of 150 kHz to 500 kHz, and 500 kHz to 30 MHz. All readings within 20 dB of the limit were recorded, and those within 6 dB of the limit were examined with additional measurements using a slower sweep time.

Radiated Emissions

The EUT was mounted on a nonconductive, rotating table 80 cm above the conductive grid. The nonconductive table dimensions were 1 meter by 1.5 meters.

During the preliminary radiated scan, the EUT was powered up and operating in its defined FCC test mode. For radiated measurements from 9 kHz to 30 MHz, the magnetic loop antenna was used. The frequency range of 30 MHz to 1000 MHz was scanned with the biconilog antenna located about 1.5 meter above the ground plane in the vertical polarity. During this scan, the turntable was rotated and all peaks at or near the limit were recorded. A scan of the FM band from 88 to 110 MHz was then made using a reduced resolution bandwidth and frequency span. The biconilog antenna was changed to the horizontal polarity and the above steps were repeated. Care was taken to ensure that no frequencies were missed within the FM and TV bands. An analysis was performed to determine if the signals that were at or near the limit were caused by an ambient transmission. If unable to determine by analysis, the equipment was powered down to make the final determination if the EUT was the source of the emission.

A thorough scan of all frequencies was made manually using a small frequency span, rotating the turntable as needed. The test engineer maximized the readings with respect to the table rotation, antenna height, and configuration of EUT. Maximizing of the EUT was achieved by monitoring the spectrum analyzer on a closed circuit television monitor.

APPENDIX A

TEST SETUP PHOTOGRAPHS

PHOTOGRAPH SHOWING RADIATED EMISSIONS



Radiated Emissions - Front View

PHOTOGRAPH SHOWING RADIATED EMISSIONS



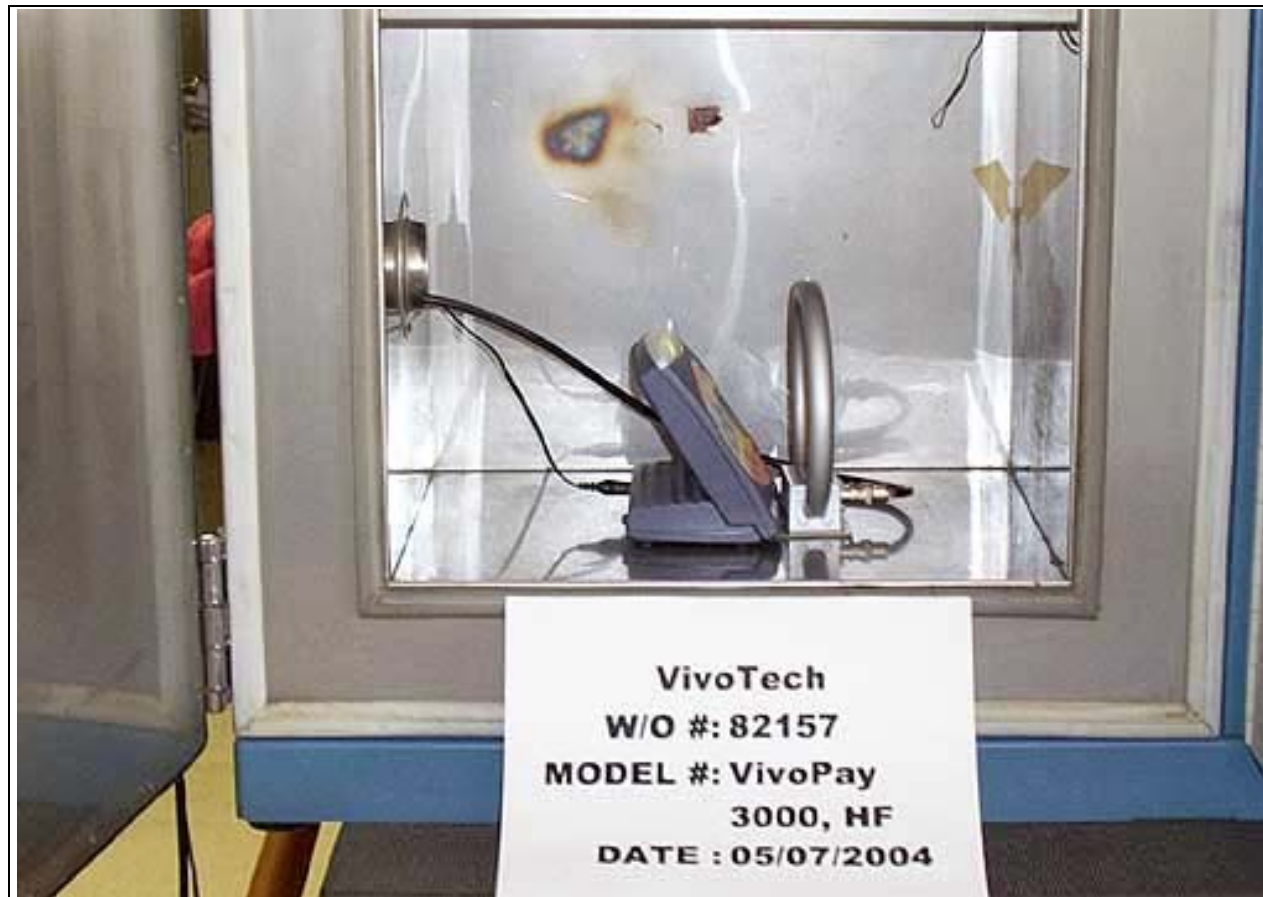
Radiated Emissions - Back View

PHOTOGRAPH SHOWING MAINS CONDUCTED EMISSIONS



Mains Conducted Emissions - Front View

PHOTOGRAPH SHOWING TEMPERATURE TESTING



APPENDIX B

TEST EQUIPMENT LIST

15.225(a)

Function	S/N	Calibration Date	Cal Due Date	Asset #
HP 8566B SA	2209A01404	02/26/2003	02/26/2005	00490
HP 8566B SA Display	2403A08241	02/26/2003	02/26/2005	00489
HP 85650A QPA	2811A01267	02/26/2003	02/26/2005	00478
EMCO Loop Antenna	1074	05/21/2003	05/21/2005	00226

15.207

Function	S/N	Calibration Date	Cal Due Date	Asset #
HP 8566B SA	2209A01404	02/26/2003	02/26/2005	00490
HP 8566B SA Display	2403A08241	02/26/2003	02/26/2005	00489
HP 85650A QPA	2811A01267	02/26/2003	02/26/2005	00478
LISN Model 8028-50-TS-24-BNC	8379276 & 8379280	06/05/2003	06/05/2005	00330

15.209

Function	S/N	Calibration Date	Cal Due Date	Asset #
HP 8566B SA	2209A01404	02/26/2003	02/26/2005	00490
HP 8566B SA Display	2403A08241	02/26/2003	02/26/2005	00489
HP 85650A QPA	2811A01267	02/26/2003	02/26/2005	00478
HP 8447D Preamp	1937A02604	03/07/2003	03/07/2005	00099
Chase CBL6111C Bilog	2456	12/13/2002	12/13/2004	1991
EMCO Loop Antenna	1074	05/21/2003	05/21/2005	00226

Temperature Testing

Function	S/N	Calibration Date	Cal Due Date	Asset #
Antenna, Loop Sensor 7334-1	170	12/09/02	12/8/2004	00170
Digital Multimeter 22-183	NA		NCR	01241
Power Stat 126	N/A	5/1/03	4/30/2005	02037
Spectrum Analyzer 8596E	3346A00225	6/24/02	6/23/2004	00783
Temp Chamber S-1.2 MiniMax	11899	1/31/03	1/30/2005	01879
Thermometer HH-26K	T-202884	8/15/03	8/14/2005	02242

APPENDIX C:
MEASUREMENT DATA SHEETS

Test Location: CKC Laboratories • 5473A Clouds Rest • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Vivo Tech**
 Specification: **FCC 15.225(a) (30 Meters)**
 Work Order #: **82157**
 Test Type: **Maximized Emissions**
 Equipment: **13.56 MHz Card Reader**
 Manufacturer: **VivoTech**
 Model: **VivoPay 3000, HF**
 S/N: **101**

Date: 05/07/2004
 Time: 12:11:01
 Sequence#: 4
 Tested By: Randal Clark

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
13.56 MHz Card Reader*	VivoTech	VivoPay 3000, HF	101
Power Supply	VivoTech	41-9-1000	na

Support Devices:

Function	Manufacturer	Model #	S/N
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Test Conditions / Notes:

EUT is a 13.56MHz Card Reader. EUT is powered via AC power supply. All EUT ports are filled. Frequency range investigated: Carrier. Test distance correction factor used in accordance with 15.31 of 40dB per decade to correct 10m data for comparison to the limit. Temperature: 19°C, Humidity: 38%.

Transducer Legend:

T1=Cable - 10 Meter	T2=Mag Loop - Site B - AN 00226 - 9kHz-30M
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Measurement Data: Reading listed by margin.

Test Distance: 10 Meters

#	Freq MHz	Rdng dB μ V	T1 dB	T2 dB	Dist dB	Corr dB μ V/m	Spec dB μ V/m	Margin dB	Polar Ant
1	13.561M	57.9	+0.8	+8.4	-19.0 93	48.1	84.0	-35.9	Vert 100
2	13.560M	54.4	+0.8	+8.4	-19.0 356	44.6	84.0	-39.4	Vert 100

Test Location: CKC Laboratories • 5473A Clouds Rest • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Vivo Tech**

Specification: **FCC 15.207 - AVE**

Work Order #: **82157**

Test Type: **Conducted Emissions**

Equipment: **13.56 MHz Card Reader**

Manufacturer: **VivoTech**

Model: **VivoPay 3000, HF**

S/N: **101**

Date: 05/07/2004

Time: 08:51:40

Sequence#: 1

Tested By: Randal Clark

120V 60Hz

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
13.56 MHz Card Reader*	VivoTech	VivoPay 3000, HF	101
Power Supply	VivoTech	41-9-1000	na

Support Devices:

Function	Manufacturer	Model #	S/N
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Test Conditions / Notes:

EUT is a 13.56MHz Card Reader. EUT is powered via AC power supply.

Transducer Legend:

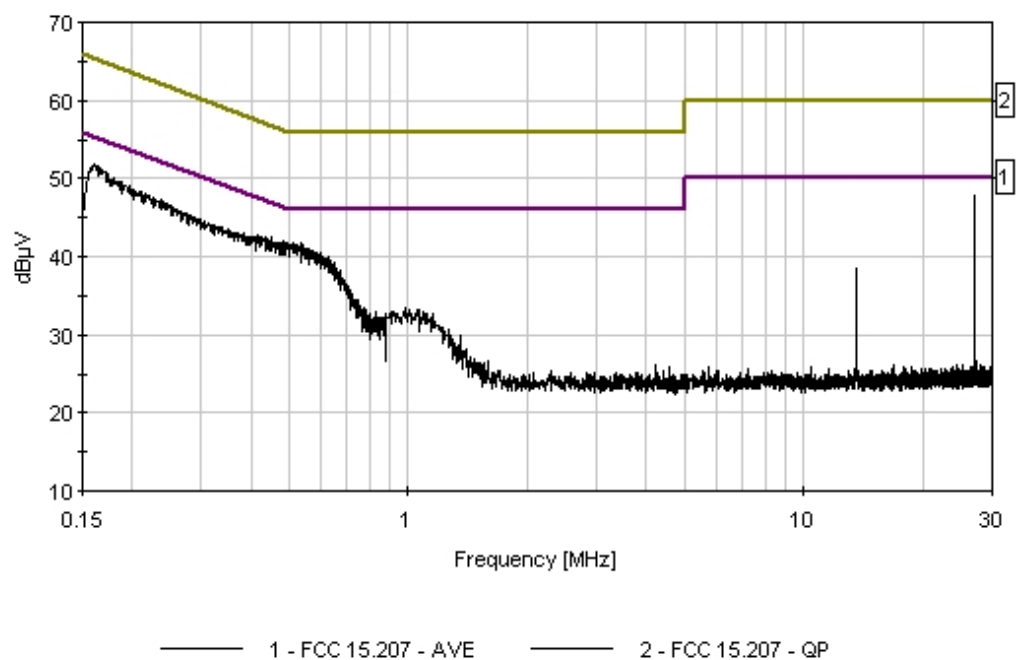
T1=Cable - Internal + cab	T2=LISN Insertion Loss s/n280
T3=HP Filter AN02608	

Measurement Data: Reading listed by margin.

Test Lead: Black

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	13.579M	37.6	+0.4	+0.4	+0.1		+0.0	38.5	50.0	-11.5	Black
2	987.578k	32.7	+0.2	+0.3	+0.2		+0.0	33.4	46.0	-12.6	Black
3	827.750k	32.3	+0.1	+0.2	+0.3		+0.0	32.9	46.0	-13.1	Black
4	27.125M	34.7	+0.5	+0.5	+0.2		+0.0	35.9	50.0	-14.1	Black
Ave	27.122M	46.6	+0.5	+0.5	+0.2		+0.0	47.8	50.0	-2.2	Black
^	27.125M	46.5	+0.5	+0.5	+0.2		+0.0	47.7	50.0	-2.3	Black
7	4.207M	25.3	+0.3	+0.4	+0.1		+0.0	26.1	46.0	-19.9	Black
8	16.886M	25.3	+0.4	+0.4	+0.1		+0.0	26.2	50.0	-23.8	Black
9	160.908k	14.4	+0.1	+0.3	+1.7		+0.0	16.5	55.4	-38.9	Black
Ave	160.908k	49.8	+0.1	+0.3	+1.7		+0.0	51.9	55.4	-3.5	Black
^	160.908k	49.8	+0.1	+0.3	+1.7		+0.0	51.9	55.4	-3.5	Black

CKC Laboratories Date: 05/07/2004 Time: 08:51:40 Vivo Tech WVO#: 82157
 FCC 15.207 - AVE Test Lead: Black 120V 60Hz Sequence#: 1
 VivoTech M/N VivoPay 3000, HF



Test Location: CKC Laboratories • 5473A Clouds Rest • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Vivo Tech**

Specification: **FCC 15.207 - AVE**

Work Order #: **82157**

Test Type: **Conducted Emissions**

Equipment: **13.56 MHz Card Reader**

Manufacturer: **VivoTech**

Model: **VivoPay 3000, HF**

S/N: **101**

Date: 05/07/2004

Time: 09:00:53

Sequence#: 2

Tested By: Randal Clark

120V 60Hz

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
13.56 MHz Card Reader*	VivoTech	VivoPay 3000, HF	101
Power Supply	VivoTech	41-9-1000	na

Support Devices:

Function	Manufacturer	Model #	S/N
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Test Conditions / Notes:

EUT is a 13.56MHz Card Reader. EUT is powered via AC power supply.

Transducer Legend:

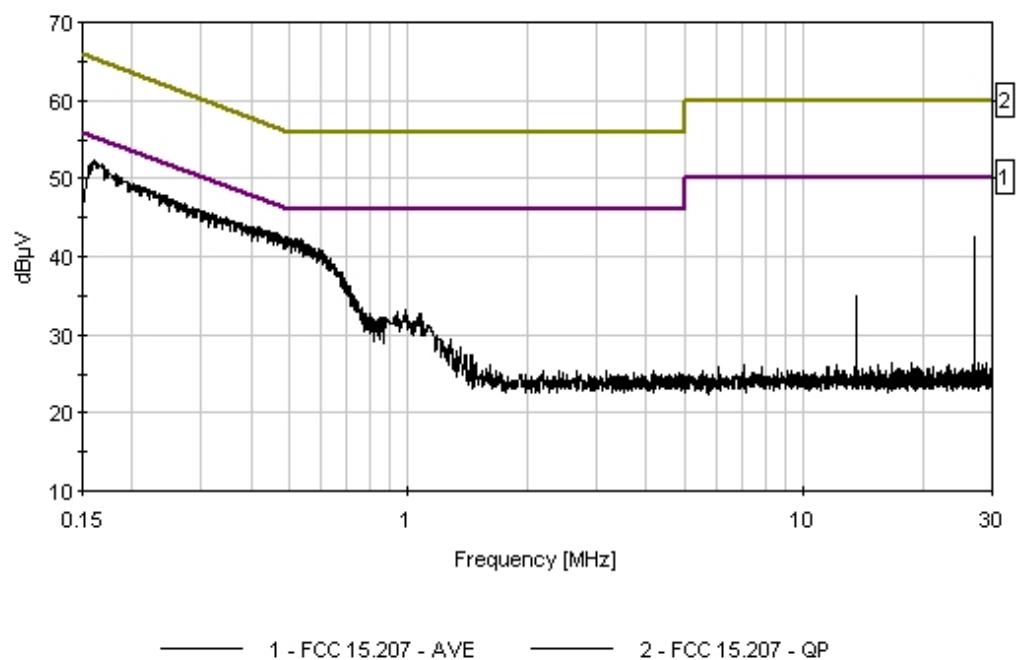
T1=Cable - Internal + cab	T2=LISN Insertion Loss s/n276
T3=HP Filter AN02608	

Measurement Data: Reading listed by margin.

Test Lead: White

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	dB	Dist Table	Corr dBμV	Spec dBμV	Margin dB	Polar Ant
1	27.129M	41.4	+0.5	+0.4	+0.2		+0.0	42.5	50.0	-7.5	White
2	979.072k	32.4	+0.2	+0.3	+0.2		+0.0	33.1	46.0	-12.9	White
3	13.570M	34.0	+0.4	+0.5	+0.1		+0.0	35.0	50.0	-15.0	White
4	1.353M	27.6	+0.2	+0.3	+0.2		+0.0	28.3	46.0	-17.7	White
5	16.760M	25.6	+0.4	+0.4	+0.1		+0.0	26.5	50.0	-23.5	White
6	16.624M	25.4	+0.4	+0.4	+0.1		+0.0	26.3	50.0	-23.7	White
7	160.180k	14.7	+0.1	+0.4	+1.8		+0.0	17.0	55.5	-38.5	White
Ave											
^	160.181k	50.0	+0.1	+0.4	+1.8		+0.0	52.3	55.5	-3.2	White

CKC Laboratories Date: 05/07/2004 Time: 09:00:53 Vivo Tech WVO#: 82157
 FCC 15.207 - AVE Test Lead: White 120V 60Hz Sequence#: 2
 VivoTech M/N VivoPay 3000, HF



Test Location: CKC Laboratories • 5473A Clouds Rest • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Vivo Tech**

Specification: **FCC 15.209**

Work Order #: **82157**

Date: 05/07/2004

Test Type: **Maximized Emissions**

Time: 13:45:01

Equipment: **13.56 MHz Card Reader**

Sequence#: 5

Manufacturer: VivoTech

Tested By: Randal Clark

Model: VivoPay 3000, HF

S/N: 101

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
13.56 MHz Card Reader*	VivoTech	VivoPay 3000, HF	101
Power Supply	VivoTech	41-9-1000	na

Support Devices:

Function	Manufacturer	Model #	S/N
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Test Conditions / Notes:

EUT is a 13.56MHz Card Reader. EUT is powered via AC power supply. All EUT ports are filled. Frequency range investigated: 9kHz to 30MHz. Test distance correction factor used in accordance with 15.31 of 40dB per decade to correct 10m data for comparison to the limit. Temperature: 19°C, Humidity: 38%. **No emissions detected within 20dB of the limit.**

Transducer Legend:

T1=Cable - 10 Meter	T2=Mag Loop - Site B - AN 00226 - 9kHz-30M
T3=15.31 10m 40dB/Dec Correction	

Measurement Data:

Reading listed by margin.

Test Distance: 10 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB	Dist dB	Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	27.121M	23.3	+1.1	+4.9	-20.0	+0.0	154	9.3	29.5	-20.2	Vert 100
2	29.999M	17.5	+1.2	+4.0	-20.0	+0.0	5	2.7	29.5	-26.8	Vert 100
3	27.121M	14.2	+1.1	+4.9	-20.0	+0.0		0.2	29.5	-29.3	Horiz 100

Test Location: CKC Laboratories • 5473A Clouds Rest • Mariposa, CA 95338 • 1-800-500-4EMC (4362)

Customer: **Vivo Tech**
 Specification: **FCC 15.209**
 Work Order #: **82157**
 Test Type: **Maximized Emissions**
 Equipment: **13.56 MHz Card Reader**
 Manufacturer: **VivoTech**
 Model: **VivoPay 3000, HF**
 S/N: **101**

Date: 05/07/2004
 Time: 11:46:31
 Sequence#: 3
 Tested By: Randal Clark

Equipment Under Test (* = EUT):

Function	Manufacturer	Model #	S/N
13.56 MHz Card Reader*	VivoTech	VivoPay 3000, HF	101
Power Supply	VivoTech	41-9-1000	na

Support Devices:

Function	Manufacturer	Model #	S/N
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Test Conditions / Notes:

EUT is a 13.56MHz Card Reader. EUT is powered via AC power supply. All EUT ports are filled. Frequency range investigated: 30-1000MHz. Test distance correction factor used in accordance with 15.31 of 20dB per decade to correct 10m data for comparison to the limit. Temperature: 19°C, Humidity: 38%.

Transducer Legend:

T1=Amp - S/N 604	T2=Bilog Site B
T3=Cable - 10 Meter	

Measurement Data:

Reading listed by margin.

Test Distance: 10 Meters

#	Freq MHz	Rdng dBμV	T1 dB	T2 dB	T3 dB		Dist Table	Corr dBμV/m	Spec dBμV/m	Margin dB	Polar Ant
1	600.099M	34.1	-27.8	+19.1	+5.9		+10.0 6	41.3	46.0	-4.7	Horiz 142
2	540.087M	35.1	-27.8	+18.1	+5.9		+10.0 360	41.3	46.0	-4.7	Horiz 111
3	120.087M QP	42.3	-27.2	+10.9	+2.5		+10.0 178	38.5	43.5	-5.0	Vert 355
^	120.055M	44.3	-27.2	+10.9	+2.5		+10.0 178	40.5	43.5	-3.0	Vert 355
5	540.099M	34.7	-27.8	+18.1	+5.9		+10.0	40.9	46.0	-5.1	Vert 107
6	660.081M	32.3	-28.0	+19.8	+6.5		+10.0 -2	40.6	46.0	-5.4	Horiz 100
7	461.117M	35.8	-27.6	+16.7	+5.1		+10.0	40.0	46.0	-6.0	Horiz 198
8	40.086M QP	37.4	-27.3	+12.4	+1.4		+10.0 360	33.9	40.0	-6.1	Vert 107
^	40.060M	45.5	-27.3	+12.4	+1.4		+10.0 360	42.0	40.0	+2.0	Vert 107
10	569.598M	33.0	-27.8	+18.6	+6.0		+10.0 6	39.8	46.0	-6.2	Horiz 138
11	433.992M	36.1	-27.4	+16.1	+5.0		+10.0 110	39.8	46.0	-6.2	Vert 107

12	678.078M	30.7	-27.9	+20.1	+6.6	+10.0 5	39.5	46.0	-6.5	Horiz 149
13	433.991M	35.1	-27.4	+16.1	+5.0	+10.0 80	38.8	46.0	-7.2	Vert 156
14	660.098M	30.5	-28.0	+19.8	+6.5	+10.0	38.8	46.0	-7.2	Vert 142
15	406.893M QP	35.3	-27.2	+15.6	+5.1	+10.0 117	38.8	46.0	-7.2	Vert 107
^	406.888M	39.5	-27.2	+15.6	+5.1	+10.0 117	43.0	46.0	-3.0	Vert 107
17	542.492M	32.2	-27.8	+18.2	+5.9	+10.0 5	38.5	46.0	-7.5	Horiz 162
18	447.575M	34.3	-27.5	+16.4	+5.0	+10.0 365	38.2	46.0	-7.8	Horiz 198
19	461.124M QP	33.9	-27.6	+16.7	+5.1	+10.0 109	38.1	46.0	-7.9	Vert 107
^	461.120M	38.6	-27.6	+16.7	+5.1	+10.0 274	42.8	46.0	-3.2	Vert 107
21	420.448M	34.5	-27.3	+15.8	+5.1	+10.0 182	38.1	46.0	-7.9	Vert 107
22	460.133M	33.8	-27.6	+16.7	+5.1	+10.0 383	38.0	46.0	-8.0	Horiz 180
23	596.720M	30.9	-27.8	+19.0	+5.9	+10.0 6	38.0	46.0	-8.0	Vert 107
24	556.022M	31.3	-27.8	+18.4	+6.0	+10.0 353	37.9	46.0	-8.1	Horiz 138
25	406.883M	34.4	-27.2	+15.6	+5.1	+10.0 2	37.9	46.0	-8.1	Horiz 212
26	393.309M	34.4	-27.1	+15.2	+5.0	+10.0 104	37.5	46.0	-8.5	Vert 107
27	420.443M	33.7	-27.3	+15.8	+5.1	+10.0 361	37.3	46.0	-8.7	Horiz 212
28	515.366M	31.6	-27.8	+17.7	+5.7	+10.0 118	37.2	46.0	-8.8	Horiz 162
29	480.074M	32.5	-27.7	+17.0	+5.3	+10.0 250	37.1	46.0	-8.9	Horiz 149
30	569.600M	30.3	-27.8	+18.6	+6.0	+10.0 2	37.1	46.0	-8.9	Vert 107
31	542.480M	30.8	-27.8	+18.2	+5.9	+10.0 5	37.1	46.0	-8.9	Vert 107
32	500.067M	31.8	-27.8	+17.4	+5.5	+10.0 98	36.9	46.0	-9.1	Horiz 111
33	488.249M	31.9	-27.7	+17.2	+5.4	+10.0 138	36.8	46.0	-9.2	Horiz 202
34	474.692M	32.1	-27.7	+16.9	+5.3	+10.0 360	36.6	46.0	-9.4	Horiz 198
35	447.560M	32.7	-27.5	+16.4	+5.0	+10.0 344	36.6	46.0	-9.4	Vert 107
36	379.774M	33.8	-27.0	+14.9	+4.9	+10.0 211	36.6	46.0	-9.4	Vert 107

37	420.067M	32.9	-27.3	+15.8	+5.1	+10.0 383	36.5	46.0	-9.5	Horiz 195
38	67.866M	40.0	-27.2	+5.8	+1.9	+10.0 1	30.5	40.0	-9.5	Vert 107
39	311.956M	35.4	-26.6	+13.2	+4.2	+10.0 104	36.2	46.0	-9.8	Vert 107
40	528.915M	30.3	-27.8	+17.9	+5.8	+10.0 369	36.2	46.0	-9.8	Horiz 162
41	80.055M	38.3	-27.2	+6.7	+2.0	+10.0 321	29.8	40.0	-10.2	Vert 107
42	440.092M	31.8	-27.4	+16.3	+5.0	+10.0 5	35.7	46.0	-10.3	Vert 107
43	108.566M	37.9	-27.2	+10.1	+2.4	+10.0	33.2	43.5	-10.3	Vert 107
44	189.891M	38.3	-26.7	+8.3	+3.2	+10.0	33.1	43.5	-10.4	Vert 107
45	488.240M	30.6	-27.7	+17.2	+5.4	+10.0	35.5	46.0	-10.5	Vert 107
46	284.855M	35.3	-26.5	+12.6	+3.9	+10.0 73	35.3	46.0	-10.7	Vert 136
47	320.060M	34.1	-26.6	+13.4	+4.3	+10.0 84	35.2	46.0	-10.8	Horiz 220
48	300.084M	34.7	-26.5	+12.8	+4.1	+10.0 362	35.1	46.0	-10.9	Horiz 220
49	203.470M	37.0	-26.7	+8.6	+3.3	+10.0 143	32.2	43.5	-11.3	Vert 107
50	81.426M	36.9	-27.2	+6.9	+2.0	+10.0 365	28.6	40.0	-11.4	Vert 107
51	400.069M	31.1	-27.2	+15.4	+5.1	+10.0 1	34.4	46.0	-11.6	Vert 107
52	203.481M	36.7	-26.7	+8.6	+3.3	+10.0 255	31.9	43.5	-11.6	Horiz 361
53	393.321M	31.0	-27.1	+15.2	+5.0	+10.0 365	34.1	46.0	-11.9	Horiz 386
54	230.601M	36.2	-26.5	+10.7	+3.4	+10.0 130	33.8	46.0	-12.2	Horiz 361
55	440.088M	29.6	-27.4	+16.3	+5.0	+10.0 5	33.5	46.0	-12.5	Horiz 180
56	311.961M	32.5	-26.6	+13.2	+4.2	+10.0 360	33.3	46.0	-12.7	Horiz 386
57	325.500M	31.9	-26.7	+13.5	+4.3	+10.0 229	33.0	46.0	-13.0	Vert 107
58	325.500M	31.9	-26.7	+13.5	+4.3	+10.0 231	33.0	46.0	-13.0	Vert 107
59	360.063M	30.8	-26.9	+14.4	+4.6	+10.0 308	32.9	46.0	-13.1	Horiz 239
60	352.636M	30.8	-26.8	+14.3	+4.5	+10.0 253	32.8	46.0	-13.2	Vert 107
61	339.080M	31.2	-26.7	+13.9	+4.4	+10.0 229	32.8	46.0	-13.2	Vert 107

62	379.761M	29.9	-27.0	+14.9	+4.9	+10.0 2	32.7	46.0	-13.3	Horiz 386
63	122.098M	33.9	-27.2	+11.0	+2.5	+10.0 362	30.2	43.5	-13.3	Vert 107
64	230.614M	35.0	-26.5	+10.7	+3.4	+10.0 162	32.6	46.0	-13.4	Vert 107
65	284.841M	32.4	-26.5	+12.6	+3.9	+10.0 360	32.4	46.0	-13.6	Horiz 343
66	135.677M	33.2	-27.1	+11.0	+2.6	+10.0 3	29.7	43.5	-13.8	Vert 107
67	217.041M	35.6	-26.6	+9.7	+3.4	+10.0 102	32.1	46.0	-13.9	Horiz 361
68	366.196M	29.6	-26.9	+14.6	+4.7	+10.0 47	32.0	46.0	-14.0	Vert 107
69	67.864M	35.4	-27.2	+5.8	+1.9	+10.0	25.9	40.0	-14.1	Horiz 400
70	240.090M	33.4	-26.5	+11.3	+3.5	+10.0 2	31.7	46.0	-14.3	Horiz 220
71	257.721M	32.4	-26.5	+12.1	+3.7	+10.0 3	31.7	46.0	-14.3	Horiz 361
72	176.350M	34.6	-26.8	+8.4	+3.0	+10.0 363	29.2	43.5	-14.3	Vert 107
73	120.060M	32.9	-27.2	+10.9	+2.5	+10.0 361	29.1	43.5	-14.4	Horiz 250
74	339.081M	29.3	-26.7	+13.9	+4.4	+10.0 2	30.9	46.0	-15.1	Horiz 386
75	108.551M	33.1	-27.2	+10.1	+2.4	+10.0 308	28.4	43.5	-15.1	Horiz 400
76	271.281M	31.1	-26.5	+12.4	+3.8	+10.0 249	30.8	46.0	-15.2	Horiz 363
77	298.401M	30.2	-26.5	+12.8	+4.1	+10.0 3	30.6	46.0	-15.4	Horiz 386
78	240.069M	32.1	-26.5	+11.3	+3.5	+10.0	30.4	46.0	-15.6	Vert 355
79	149.236M	31.6	-27.0	+10.4	+2.8	+10.0 383	27.8	43.5	-15.7	Horiz 400
80	244.160M	31.4	-26.5	+11.6	+3.6	+10.0 360	30.1	46.0	-15.9	Horiz 361
81	298.380M	29.6	-26.5	+12.8	+4.1	+10.0 383	30.0	46.0	-16.0	Vert 107
82	217.032M	33.5	-26.6	+9.7	+3.4	+10.0 217	30.0	46.0	-16.0	Vert 107
83	135.674M	30.8	-27.1	+11.0	+2.6	+10.0 77	27.3	43.5	-16.2	Horiz 400

84	200.055M	32.1	-26.7	+8.3	+3.3	+10.0 365	27.0	43.5	-16.5	Vert 355
85	280.084M	29.5	-26.5	+12.5	+3.9	+10.0 6	29.4	46.0	-16.6	Horiz 220
86	260.084M	29.9	-26.5	+12.2	+3.7	+10.0 237	29.3	46.0	-16.7	Horiz 220
87	149.230M	30.5	-27.0	+10.4	+2.8	+10.0 360	26.7	43.5	-16.8	Vert 107
88	244.174M	30.1	-26.5	+11.6	+3.6	+10.0 312	28.8	46.0	-17.2	Vert 107