



**FCC CFR47 PART 15 SUBPART C
CERTIFICATION TEST REPORT**

FOR

LOW POWER TRANSMITTER WIRELESS CARD READER

MODEL NUMBER: VIVOPAY VEND

FCC ID: Q55VIVOPAYVEND

REPORT NUMBER: 06U10662-1C

ISSUE DATE: DECEMBER 08, 2006

Prepared for

VIVOTECH

451 EL CAMINO REAL

SANTA CLARA, CA 95050, USA

Prepared by

COMPLIANCE CERTIFICATION SERVICES

561F MONTEREY ROAD

MORGAN HILL, CA 95037, USA

TEL: (408) 463-0885

FAX: (408) 463-0888



Revision History

Rev.	Issue Date	Revisions	Revised By
--	11/15/06	Initial Issue	T.C.
B	11/20/06	Updates from client regarding FCC id and model number.	T.C.
C	12/08/06	Updates page 6 & 7 information	T.C.

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS.....	4
2. TEST METHODOLOGY	5
3. FACILITIES AND ACCREDITATION	5
4. CALIBRATION AND UNCERTAINTY.....	5
4.1. MEASURING INSTRUMENT CALIBRATION.....	5
4.2. MEASUREMENT UNCERTAINTY.....	5
5. EQUIPMENT UNDER TEST.....	6
5.1. DESCRIPTION OF EUT	6
5.2. TEST CONFIGURATION.....	6
5.3. MODE(S) OF OPERATION	6
5.4. MODIFICATIONS.....	7
5.5. DETAILS OF TESTED SYSTEM	7
6. TEST AND MEASUREMENT EQUIPMENT	9
7. LIMITS AND RESULTS	10
7.1. 99% BANDWIDTH.....	10
7.2. RADIATED EMISSIONS.....	12
7.2.1. OPERATION WITHIN THE BAND 13.110 – 14.010 MHz	12
7.2.2. TRANSMITTER RADIATED SPURIOUS EMISSIONS	15
7.3. FREQUENCY STABILITY.....	20
7.4. AC MAINS LINE CONDUCTED EMISSIONS.....	21
8. SETUP PHOTOS	28

1. ATTESTATION OF TEST RESULTS

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

EUT DESCRIPTION: LOW POWER TRANSMITTER WIRELESS CARD READER

MODEL: VIVOPAY VEND

SERIAL NUMBER: 01817

DATE TESTED: OCTOBER 22 to 27, 2006

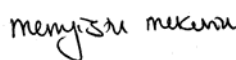
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
FCC PART 15 SUBPART C	NO NON-COMPLIANCE NOTED

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

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

Approved & Released For CCS By:

Tested By:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

MENGISTU MEKURIA
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

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

3. FACILITIES AND ACCREDITATION

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

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

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

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

4.2. MEASUREMENT UNCERTAINTY

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

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

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

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

GENERAL INFORMATION

CHASSIS/ ENCLOSURE MATERIAL	PLASTIC
POWER REQUIREMENTS	7.5 & 9 VDC
POWERLINE FILTER MANUFACTURER AND MODEL	N/A
LIST OF ALL OSCILLATOR FREQUENCIES GREATER THAN OR EQUAL TO 9 kHz	13.56MHz, 10MHz, 32.768MHz, 27.120MHz, 3.6864MHz, 3.5712MHz

5.2. TEST CONFIGURATION

The following configuration was investigated during testing:

EUT Configuration	Description
Typical Configuration	EUT and Modem terminator.

5.3. MODE(S) OF OPERATION

Mode	Description
Normal Mode	Transmit Continuously

5.4. MODIFICATIONS

Add ferrite at I/O cable part # FAIRITE 0443164151 to the DC cable with 2 turns next to the EUT

5.5. DETAILS OF TESTED SYSTEM

SUPPORT EQUIPMENT

No support equipment was used for the operation of the EUT.

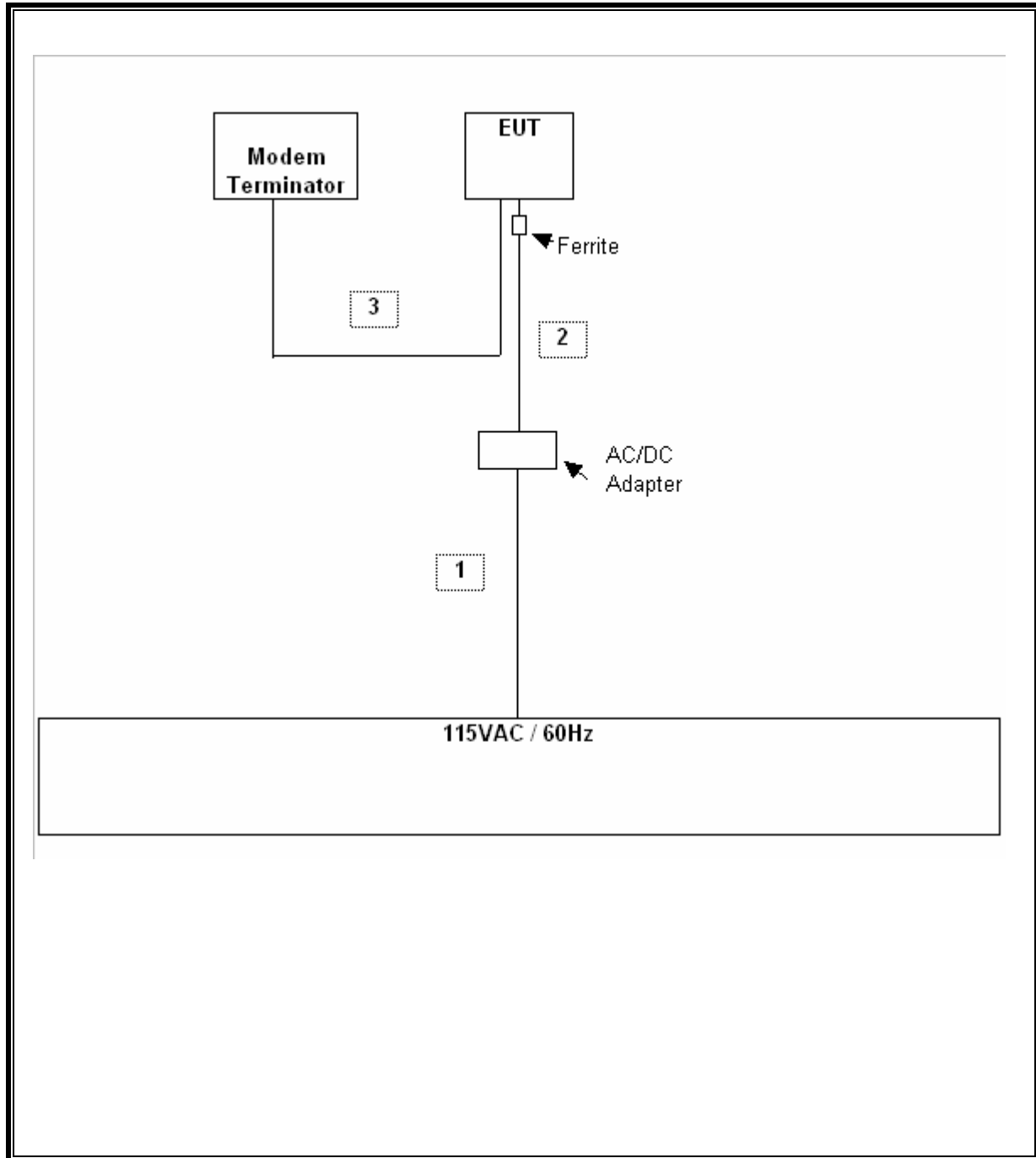
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	Connector Type	Cable Type	Cable Length	Remarks
1	AC	1	US 115V	Un-shielded	2m	N/A
2	DC	1	DC Plug	Un-shielded	1m	Ferite on DC cable
3	Serial	1	DB9	Shielded	3m	Terminator

TEST SETUP

EUT connected to the modem used as the terminator and was continuously transmitting during testing.

TEST SETUP DIAGRAM



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	Cal Due
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	2/4/2007
RF Filter Section	Agilent / HP	85420E	3705A00256	2/4/07
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	8/31/07
Antenna, Loop 9 kHz ~ 30 MHz	EMCO	6502	9202-2722	9/7/07
Temperature / Humidity Chamber	Thermotron	SE 600-10-10	29800	6/12/07
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A6	US42070220	7/29/07
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	9/15/07
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	9/15/07
EMI Test Receiver	R & S	ESHS 20	827129/006	1/27/08

7. LIMITS AND RESULTS

7.1. 99% BANDWIDTH

LIMIT

None; for reporting purposes only.

TEST PROCEDURE

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

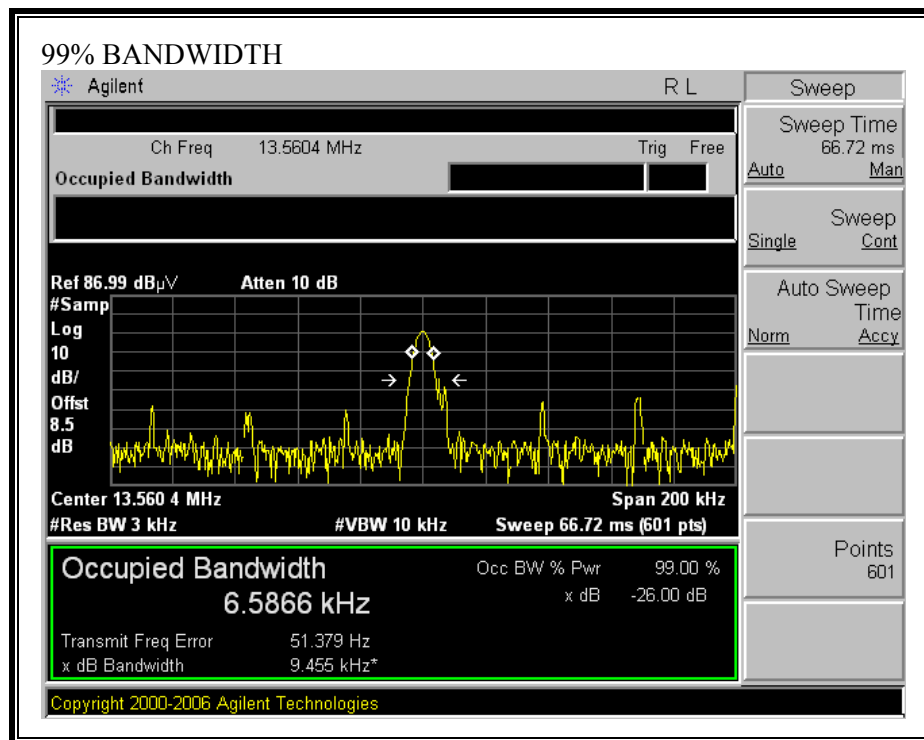
RESULTS

No non-compliance noted:

99% Bandwidth

Frequency (MHz)	99% Bandwidth (KHz)
13.56	6.5866

99% BANDWIDTH



7.2. RADIATED EMISSIONS

7.2.1. OPERATION WITHIN THE BAND 13.110 – 14.010 MHz

TEST PROCEDURE

ANSI C63.4

LIMIT

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

TRANSCIEVER SPURIOUS EMISSIONS BELOW 30MHz

FOR 7.5VDC ADAPTER

FCC Part 15, Subpart B & C

10 Meter Distance Measurement At Open Field

Company: Vivotech

Project #: 06U10662

EUT Description: P.O.S System, 13.56MHz

Model #: VIVOpay Vend_with AC Adapter Model AD-0760DT

Tester: Vien Tran

Date: October 27, 2006

Frequency	PK	QP	AV	AF	Distance	PK Corrected	AV Corrected	QP Limit	AV Limit	PK Margin	AV Margin	Notes
(MHz)	(dBuV)	(dBuV)	(dBuV)	dB/m	Correction (dB)	Reading (dBuV/m)	Reading (dBuV/m)	(dBuV/m)	(dBuV/m)	(dB)	(dB)	
Loop Antenna Face On:												
13.56	51.6			10.56	-19.08	43.07		84.00		-40.9		10m distance
27.12	25.8			9.046	-19.08	15.76		29.54		-13.8		10m distance
Loop Antenna Face Off:												
13.56	33.9			10.56	-19.08	25.37		84.00		-58.6		10m distance
27.12	18.9			9.046	-19.08	8.86		29.54		-20.7		10m distance

Rev. 5.1.6

* 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

FOR 9VDC ADAPTER

FCC Part 15, Subpart B & C												10 Meter Distance Measurement At Open Field
Company: Vivotech Project #: 06U10662 EUT Description: P.O.S System, 13.56MHz Model #: VIVOpay Vend Tester: Vien Tran Date: October 27, 2006												
Frequency (MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	AF dB/m	Distance Correction (dB)	PK Corrected Reading (dBuV/m)	AV Corrected Reading (dBuV/m)	QP Limit (dBuV/m)	AV Limit (dBuV/m)	PK Margin (dB)	AV Margin (dB)	Notes
Loop Antenna Face On:												
13.56	49.7			10.56	-19.08	41.17		84.00		-42.8		10m distance
27.12	24.4			9.046	-19.08	14.36		29.54		-15.2		10m distance
Loop Antenna Face Off:												
13.56	32.6			10.56	-19.08	24.07		84.00		-59.9		10m distance
27.12	18.5			9.046	-19.08	8.46		29.54		-21.1		10m distance
Rev. 5.1.6												
* 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												

7.2.2. TRANSMITTER RADIATED SPURIOUS EMISSIONS

TEST PROCEDURE

ANSI C63.4

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

LIMIT

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

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

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

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

In addition:

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

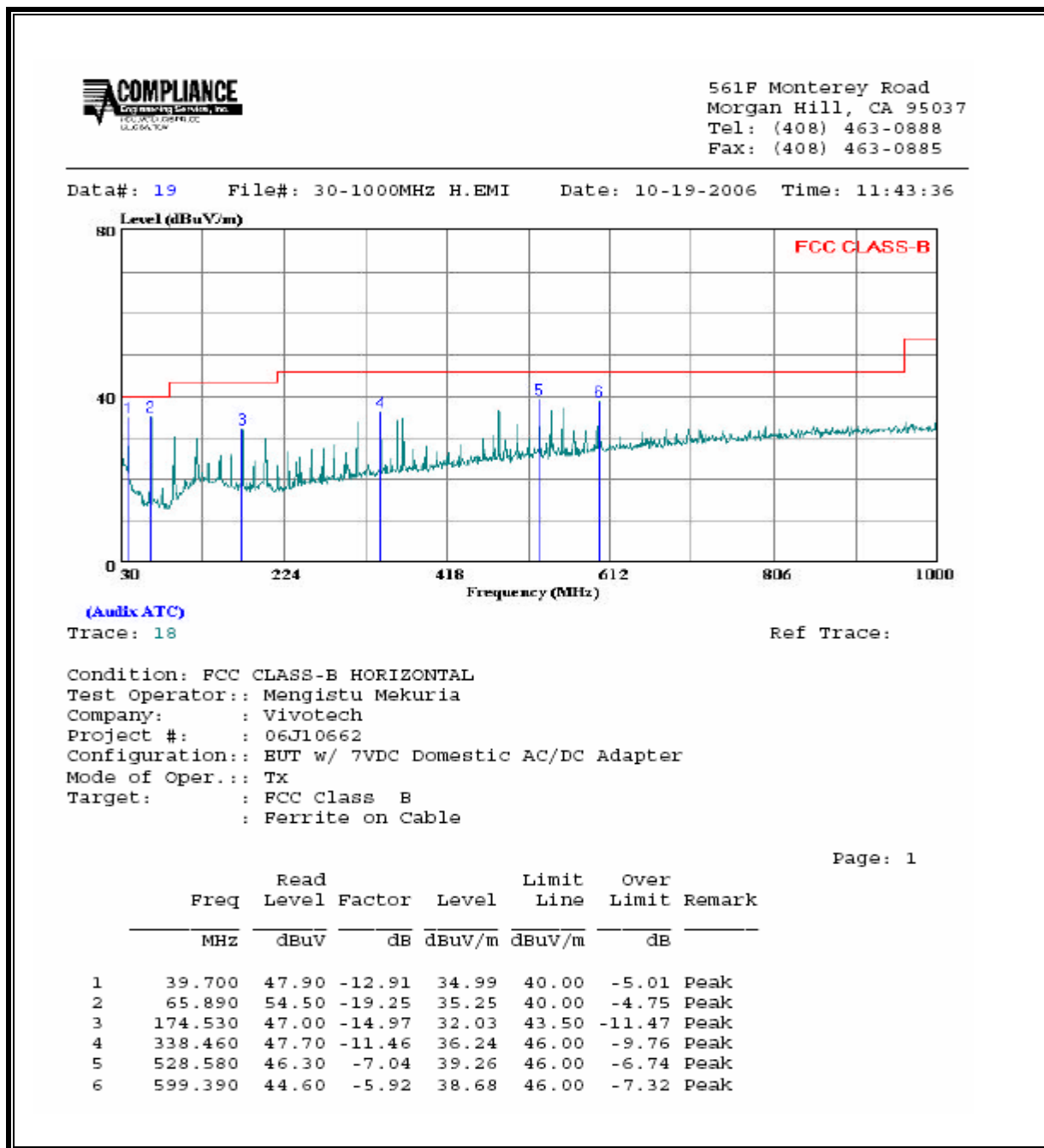
§15.209 (d) The provisions in §§ 15.225, measuring emissions at distances other than the distances specified in the above table, determining the frequency range over which radiated emissions are to be measured, and limiting peak emissions apply to all devices operated under this part.

RESULTS

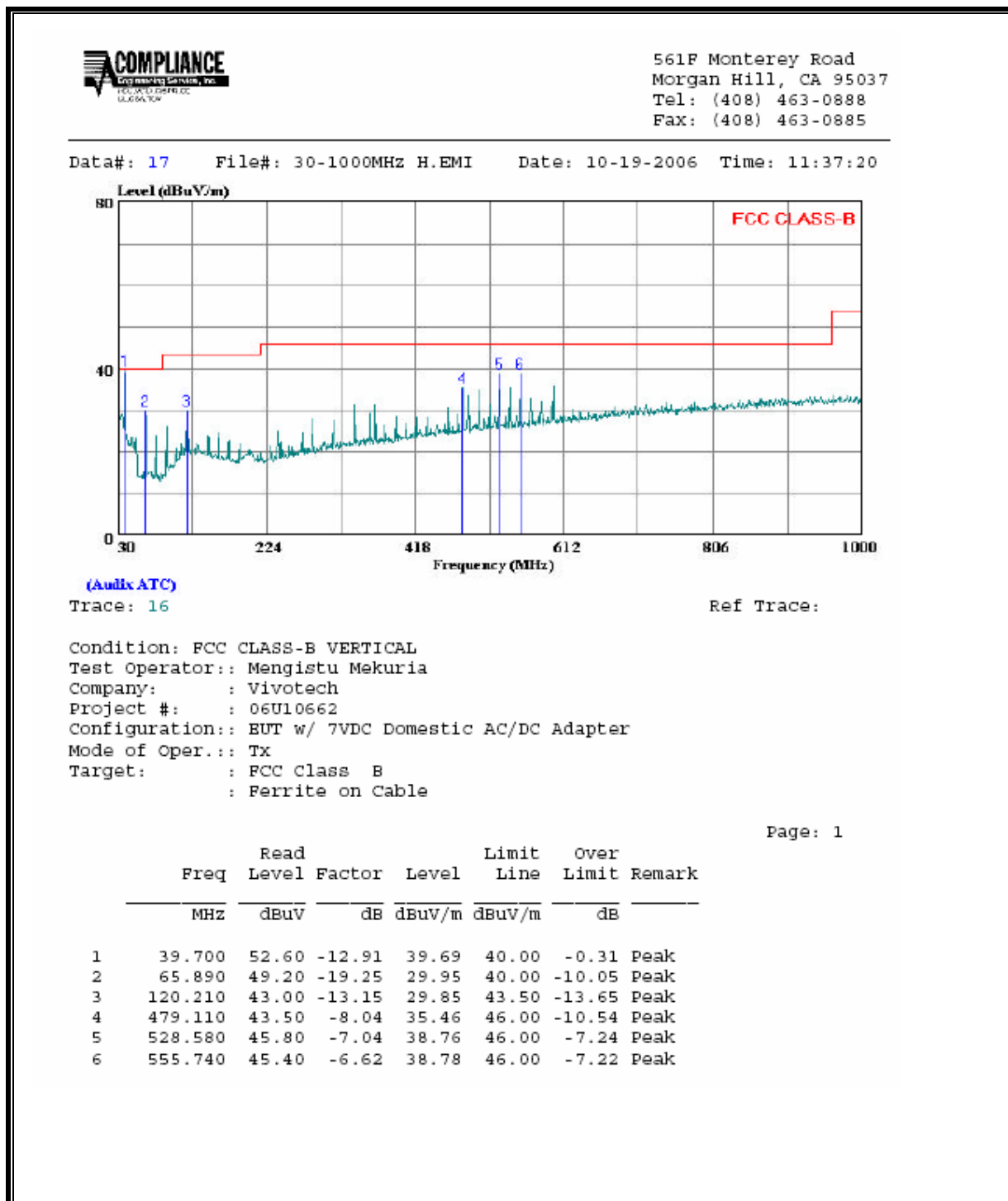
No non-compliance noted:

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

For 7.5VDC Adapter

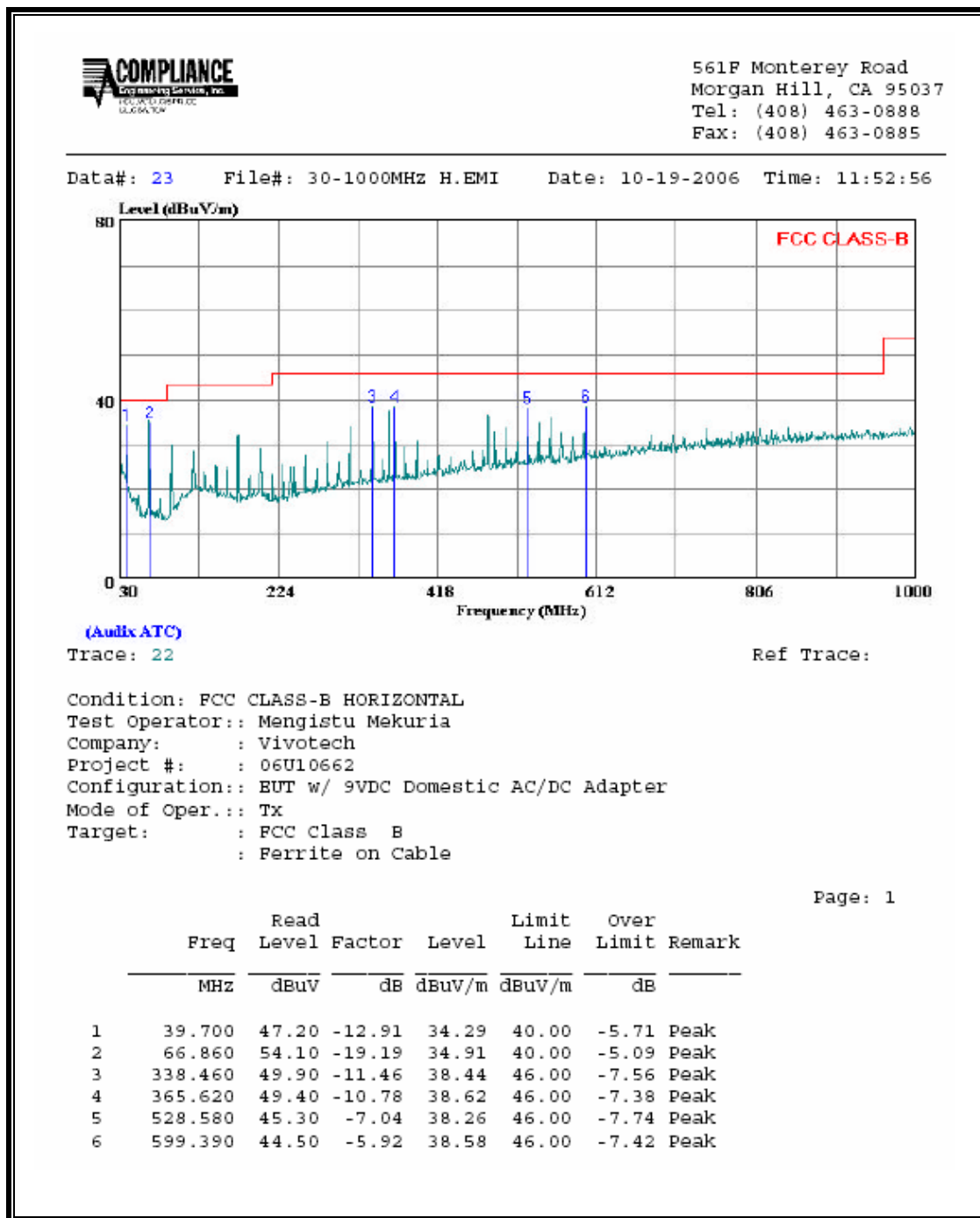


SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

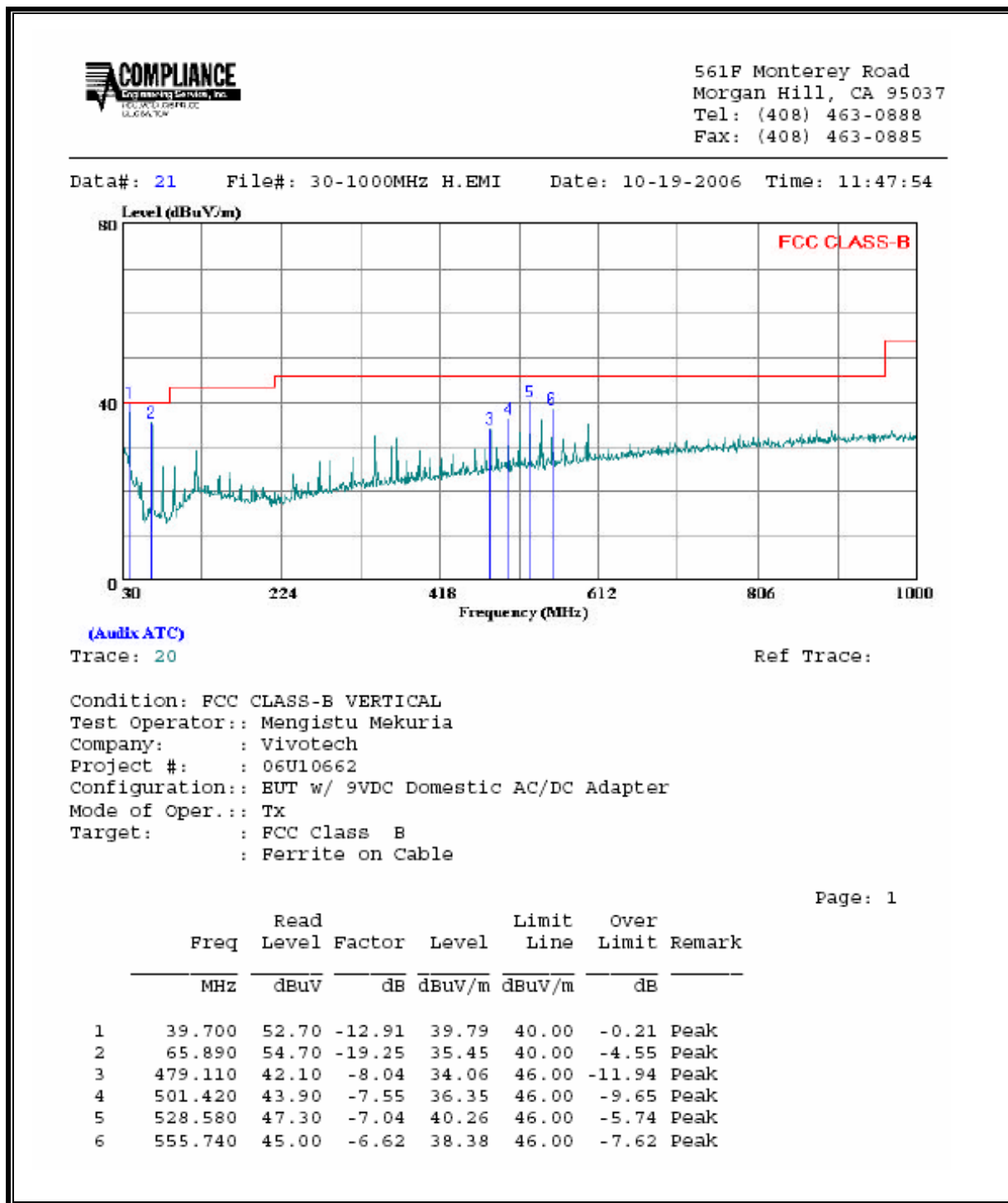


SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

For 9VDC Adapter



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



7.3. FREQUENCY STABILITY

LIMIT

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

TEST PROCEDURE

ANSI / TIA / EIA 603 Clause 2.3.1 and 2.3.2

RESULTS

No non-compliance noted.

Reference Frequency: EUT Channel 13.56MHz @ 20°C				
Limit: ± 100 ppm = 135.603 KHz				
Power Supply (Vdc)	Environment Temperature (*C)	Frequency Deviation Measured with Time Elapse		
		(MHz)	Delta (ppm)	Limit (ppm)
9.00	50	13.56033	-0.004	± 100
9.00	40	13.56031	0.016	± 100
9.00	30	13.56035	-0.019	± 100
9.00	20	13.56033	0.000	± 100
9.00	10	13.56033	-0.002	± 100
9.00	0	13.56037	-0.032	± 100
9.00	-10	13.56042	-0.072	± 100
9.00	-20	13.56048	-0.110	± 100
8.65	25	13.56032	0.009	± 100
10.35	25	13.56038	-0.039	± 100

7.4. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

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

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

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/50 ohms line impedance stabilization network (LISN).

Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

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

RESULTS

No non-compliance noted:

6 WORST EMISSIONS

EUT with radio board for 7.5 VDC Power Supply.

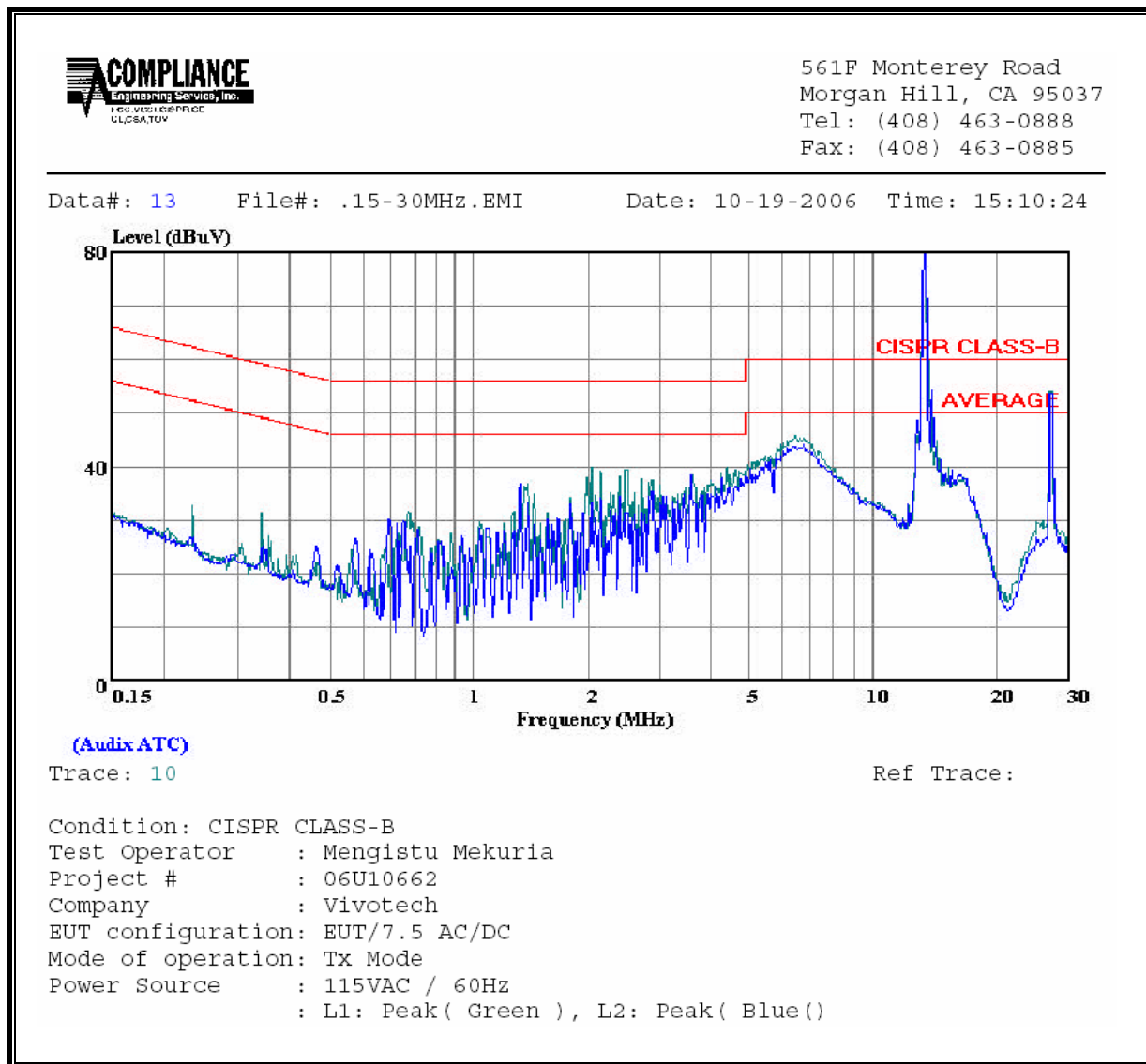
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
2.12	39.80	--	--	0.00	56.00	46.00	-16.20	-6.20	L1
6.59	45.60	--	--	0.00	60.00	50.00	-14.40	-4.40	L1
27.27	54.10	--	--	0.00	60.00	50.00	-5.90	4.10	L1
3.68	38.43	--	--	0.00	56.00	46.00	-17.57	-7.57	L2
6.88	44.01	--	--	0.00	60.00	50.00	-15.99	-5.99	L2
27.27	53.73	--	--	0.00	60.00	50.00	-6.27	3.73	L2
6 Worst Data									

EUT with radio board for 9 VDC Power Supply.

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
2.24	39.05	--	--	0.00	56.00	46.00	-16.95	-6.95	L1
6.73	46.49	--	--	0.00	60.00	50.00	-13.51	-3.51	L1
26.98	52.59	--	--	0.00	60.00	50.00	-7.41	2.59	L1
0.78	40.77	--	--	0.00	56.00	46.00	-15.23	-5.23	L2
6.70	44.49	--	--	0.00	60.00	50.00	-15.51	-5.51	L2
27.27	52.98	--	--	0.00	60.00	50.00	-7.02	2.98	L2
6 Worst Data									

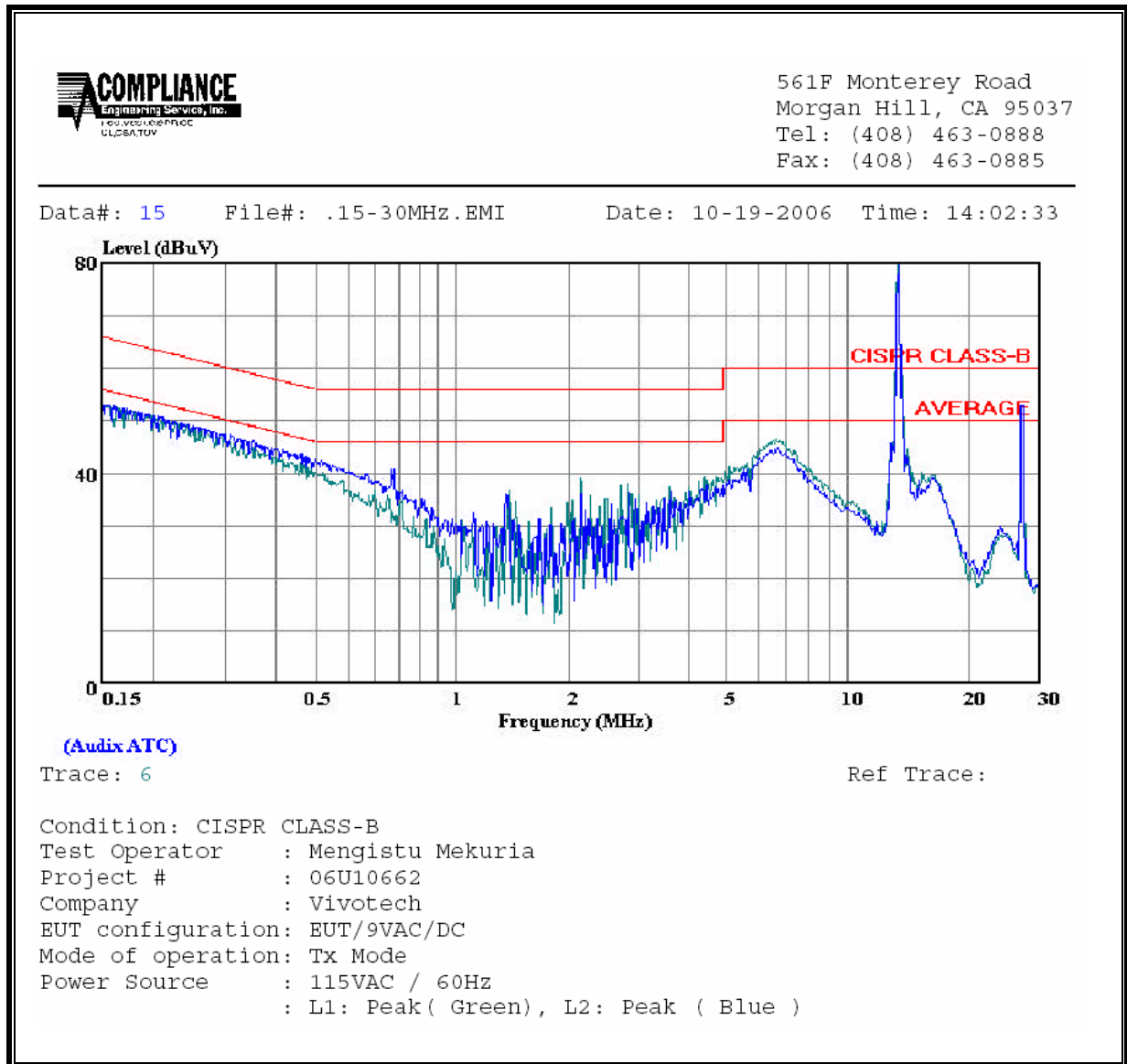
LINE 1 AND 2 RESULTS - EUT AT NORMAL TRANSMITTER MODE WITH ANTENNA

7.5 VDC Power Supply



LINE 1 AND 2 RESULTS - EUT AT NORMAL TRANSMITTER MODE WITH ANTENNA

9 VDC Power Supply



6 WORST EMISSIONS

EUT with Antenna Port Termination for 7.5 VDC Power Supply.

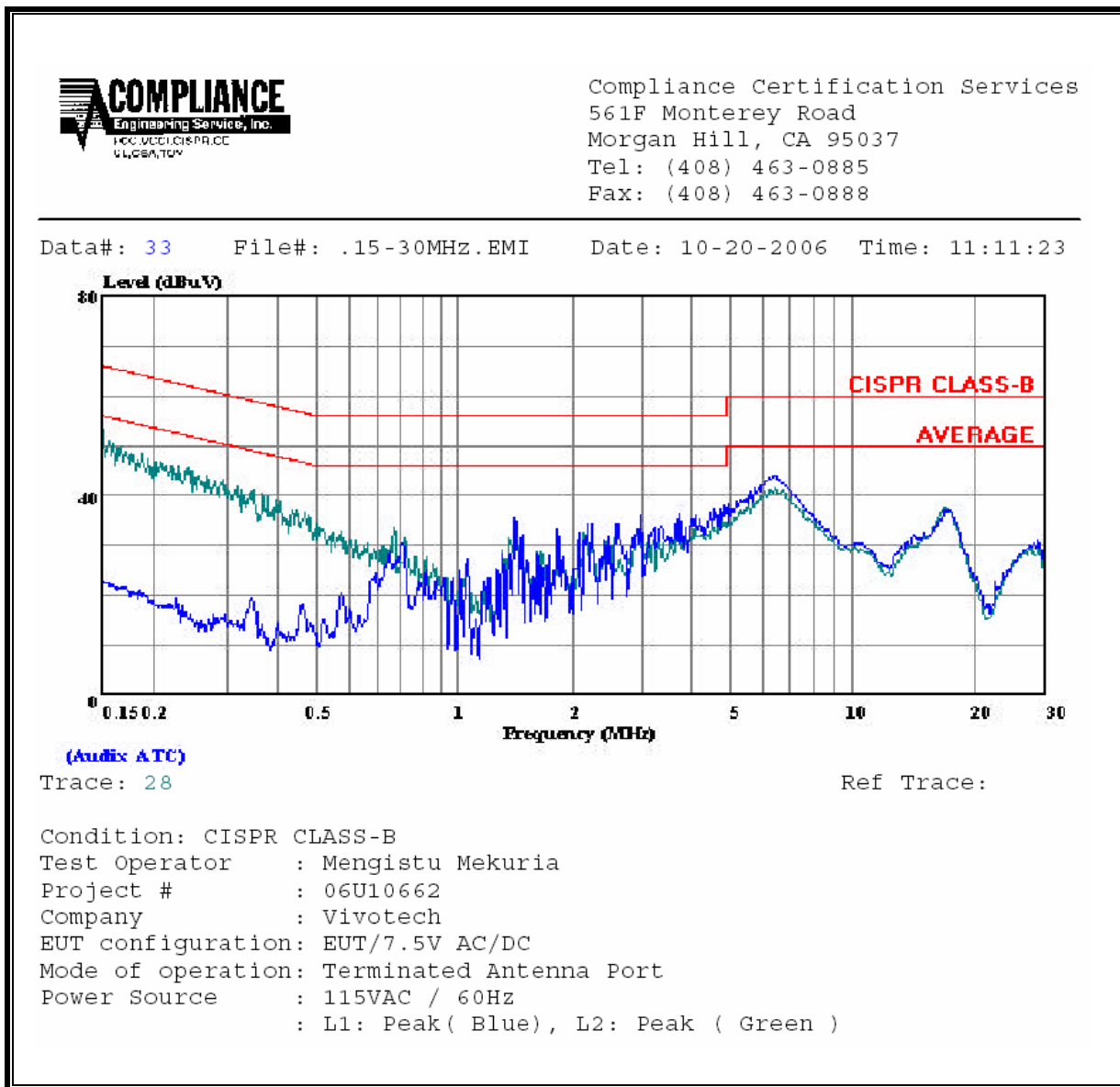
CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
3.09	35.90	--	--	0.00	56.00	46.00	-20.10	-10.10	L1
6.59	44.14	--	--	0.00	60.00	50.00	-15.86	-5.86	L1
17.57	37.07	--	--	0.00	60.00	50.00	-22.93	-12.93	L1
3.40	33.28	--	--	0.00	56.00	46.00	-22.72	-12.72	L2
6.52	41.54	--	--	0.00	60.00	50.00	-18.46	-8.46	L2
16.93	37.73	--	--	0.00	60.00	50.00	-22.27	-12.27	L2
6 Worst Data									

EUT with Antenna Port Termination for 9 VDC Power Supply.

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
3.04	37.40	--	--	0.00	56.00	46.00	-18.60	-8.60	L1
6.12	45.31	--	--	0.00	60.00	50.00	-14.69	-4.69	L1
16.75	40.75	--	--	0.00	60.00	50.00	-19.25	-9.25	L1
3.12	38.65	--	--	0.00	56.00	46.00	-17.35	-7.35	L2
6.25	45.93	--	--	0.00	60.00	50.00	-14.07	-4.07	L2
17.38	41.52	--	--	0.00	60.00	50.00	-18.48	-8.48	L2
6 Worst Data									

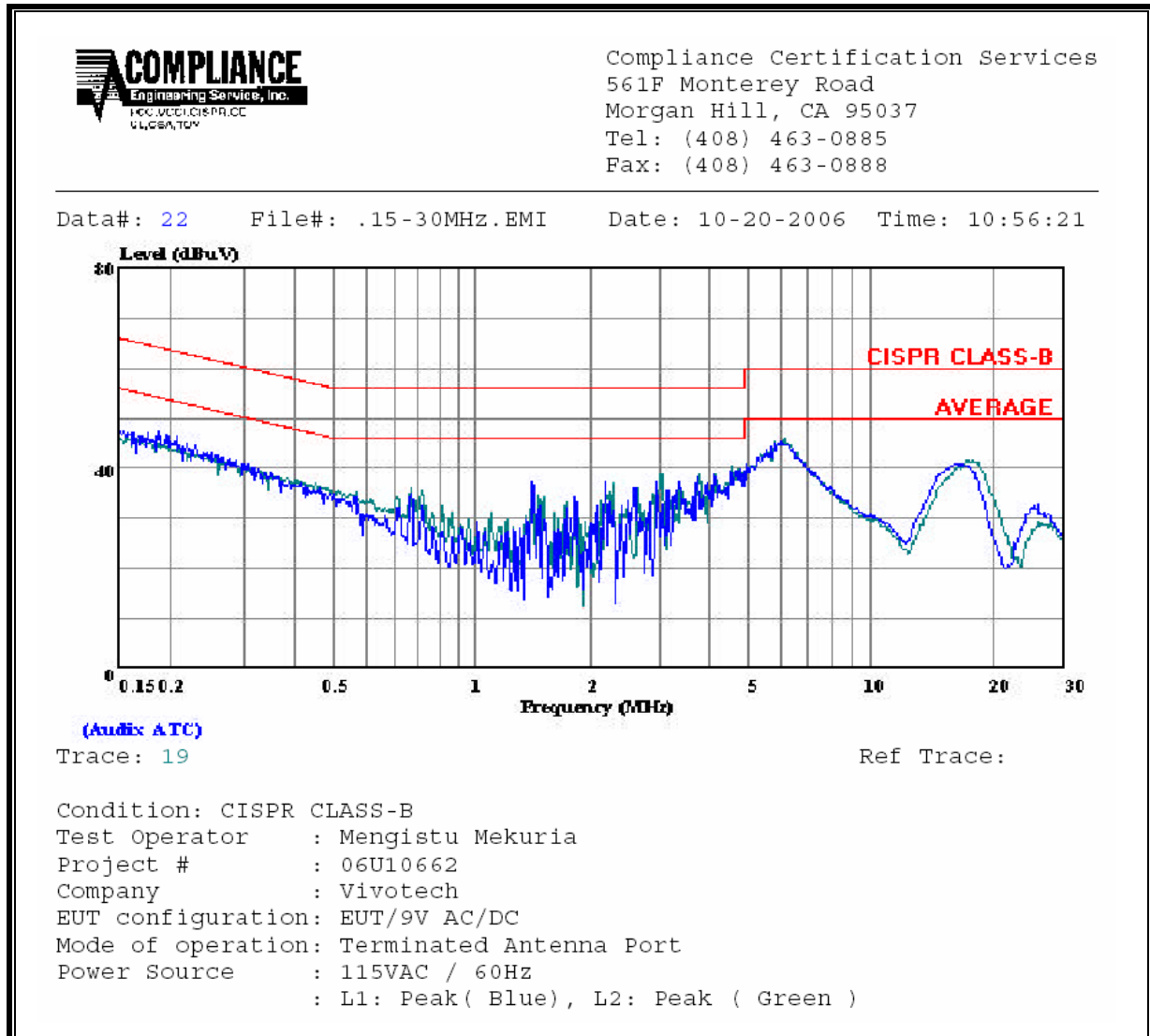
LINE 1 AND LINE 2 RESULTS - EUT WITH TERMINATED ANTENNA PORT .

7.5 VDC Power Supply



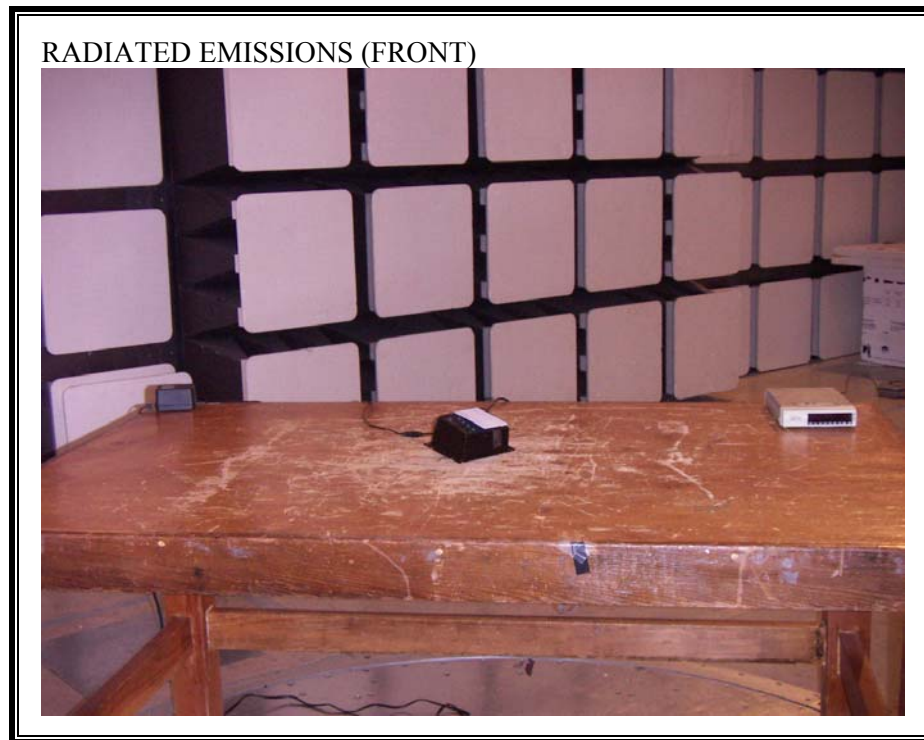
LINE 1 AND LINE 2 RESULTS - EUT WITH TERMINATED ANTENNA PORT.

9 VDC Power Supply



8. SETUP PHOTOS

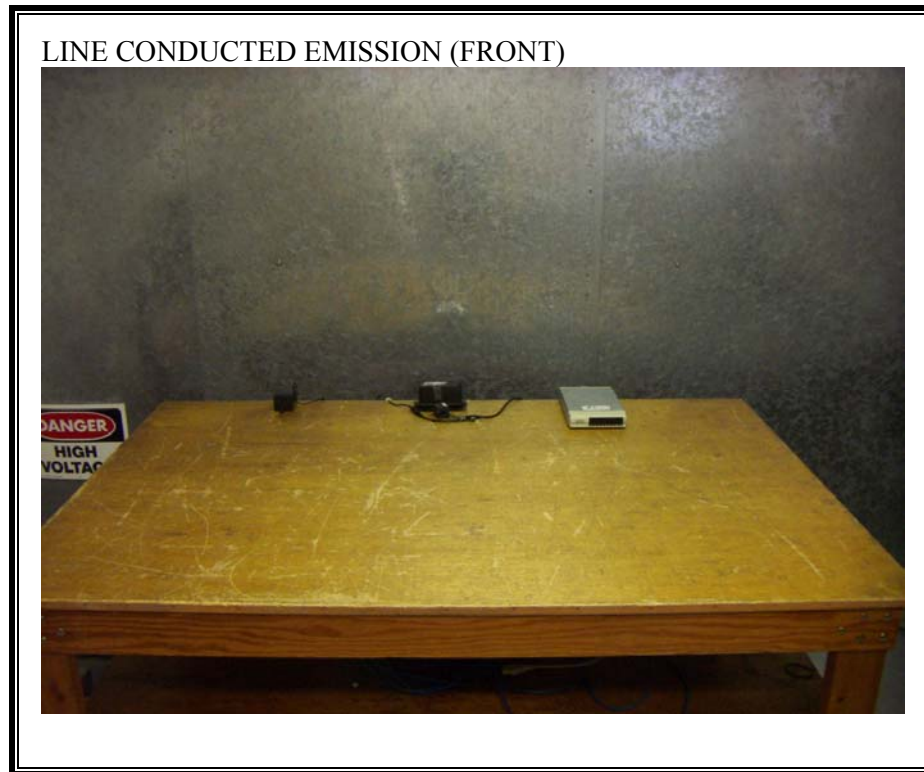
RADIATED EMISSION (30-1000 MHz)



RADIATED EMISSIONS (BACK)



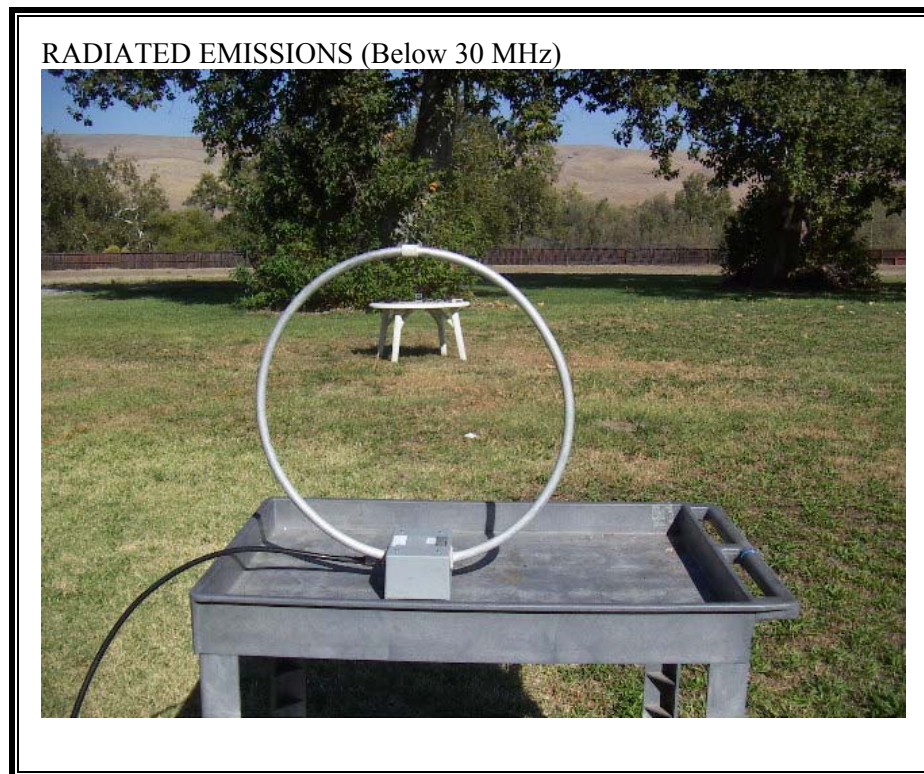
AC MAINS LINE CONDUCTED EMISSION (0.15-30 MHz)



LINE CONDUCTED EMISSION (BACK)



RADIATED EMISSIONS (0.009-30 MHz)



FREQUENCY STABILITY



END OF REPORT