L.S. Compliance, Inc.
W66 N220 Commerce Court
Cedarburg, WI 53012
Phone: 262.375.4400 Fax: 262.375.4248

Compliance Testing of:

Omni Smart RFID Reader
OS10, OS20, OS30, OS40 and OS45

Prepared For:

Honeywell Access Systems
Attn.: Mr. John Reske
135 West Forest Hill
Oak Creek, WI 53145

Test Report Number:

304225 (TCB Rev. 2)

Test Date(s):

June 7th, 8th, and 9th, 2004

Table of Contents

1. L.S. Compliance in Review

L.S. Compliance - Accreditations and Listing's

As an EMC Testing Laboratory, our Accreditation and Assessments are recognized through the following:

A2LA – American Association for Laboratory Accreditation

Accreditation based on ISO/IEC 17025 : 1999
with Electrical (EMC) Scope of Accreditation
A2LA Certificate Number: **1255.01**

Federal Communications Commission (FCC) – USA

Listing of 3 Meter Semi-Anechoic Chamber based on Title 47 CFR – Part 2.948
FCC Registration Number: **90756**

Listing of 3 and 10 meter OATS based on Title 47CFR – Part 2.948
FCC Registration Number: **90757**

Industry Canada

On file, 3 Meter Semi-Anechoic Chamber based on RSS-212 – Issue 1
File Number: **IC 3088-A**

On file, 3 and 10 Meter OATS based on RSS-212 – Issue 1
File Number: **IC 3088**

U. S. Conformity Assessment Body (CAB) Validation

Validated by the European Commission as a **U. S. Competent Body** operating under the U. S. /EU, Mutual Recognition Agreement (MRA) operating under the European Union Electromagnetic Compatibility –Council Directive 89/336/EEC, Article 10.2.
Date of Validation: **January 16, 2001**

Validated by the European Commission as a **U.S. Notified Body** operating under the U.S./EU, Mutual Recognition Agreement (MRA) operating under the European Union Telecommunication Equipment – Council Directive 99/5/EC, Annex V.

Date of Validation: **November 20, 2002**
Notified Body Identification Number: **1243**

2. A2LA Certificate

THE AMERICAN
ASSOCIATION
FOR LABORATORY
ACCREDITATION

ACCREDITED LABORATORY

A2LA has accredited

L.S. COMPLIANCE, INC.
Cedarburg, WI

for technical competence in the field of

Electrical Testing

The accreditation covers the specific tests and types of tests listed on the agreed scope of accreditation. This laboratory meets the requirements of ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration Laboratories" and any additional program requirements in the identified field of testing. Testing and calibration laboratories that comply with this International Standard also operate in accordance with ISO 9001 or ISO 9002 (1994).

Presented this 26th day of March 2003.

President
For the Accreditation Council
Certificate Number 1255.01
Valid to January 31, 2005

For tests or types of tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

3. A2LA Scope

American Association for Laboratory Accreditation

SCOPE OF ACCREDITATION TO ISO/IEC 17025-1999

L.S. COMPLIANCE, INC.
W66 N220 Commerce Court
Cedarburg, WI 53012
James Blaha Phone: 262 375 4400

ELECTRICAL (EMC)

Valid to: January 31, 2005 Certificate Number: 1255-01

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests:

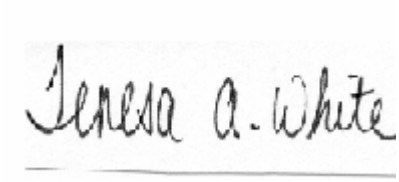
Test	Test Method(s)
Emissions	
Conducted	
Continuous/Discontinuous	Code of Federal Regulations (CFR) 47, FCC Method Parts 15, 18 using ANSI C63.4; EN: 55011, 55022, 50081-1, 50081-2; CISPR: 11, 12, 14-1, 22; CNS 13438
Radiated	Code of Federal Regulations (CFR) 47, FCC Method Parts 15, 18 using ANSI C63.4; EN: 55011, 55022, 50081-1, 50081-2; CISPR: 11, 12, 14-1, 22; CNS 13438
Current Harmonics	IEC 61000-3-2; EN 61000-3-2
Voltage Fluctuations & Flicker	IEC 61000-3-3; EN 61000-3-3
Immunity	EN: 50082-1, 50082-2 EN 61000-6-2 CISPR: 14-2, 24
Conducted Immunity	
Fast Transients/Burst	IEC 61000-4-4; EN 61000-4-4
Surge	IEC: 61000-4-5; ENV 50142; EN 61000-4-5
RF Fields	IEC: 61000-4-6; ENV 50141; EN 61000-4-6
Voltage Dips/Interruptions	IEC 61000-4-11; EN 61000-4-11

Roxanne M. Robinson

(A2LA Cert. No. 1255-01) 05/13/03 Page 1 of 2

5301 Buckeystown Pike, Suite 350 • Frederick, MD 21704-8373 • Phone: 301-644 3248 • Fax: 301-662 2974

4. Signatures

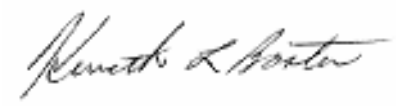


Prepared By: **August 4, 2004**

Teresa A. White, Document Coordinator **Date**

Tested By: **August 4, 2004**

Abtin Spantman, EMC Engineer **Date**



Tested and Approved by: **August 4, 2004**

Kenneth L. Boston, EMC Lab Manager **Date**
PE # 31926 Licensed Professional Engineer
Registered in the State of Wisconsin, United States

5. Product and General Information

Manufacturer:	Honeywell Access Systems					
Date(s) of Test:	June 7th, 8th and 9th, 2004					
Test Engineer(s):		Tom Smith	√	Abtin Spantman	√	Ken Boston
Model #:	OS10, OS20, OS30, OS40 and OS45					
Serial #:	Engineering Units					
Voltage:	5-16 VAC as supplied by a 115VAC wall supply					
Operation Mode:	Active Card-Read					

6. Product Description

Honeywell Access Systems new entry into the reader family is the OmniSmart series. Honeywell offers the OmniSmart family of readers in five models: OS10, OS20, OS30, OS40 and OS45. This family of readers are Contactless Smart Card Readers that offer superb reliability, consistent read range and low power consumption in an easy to install package.

Each of the five models of the Honeywell Card Reader utilizes the same RF circuitry with five separate loop antennas which provides the end user with selectable form factors per their specific applications. All five sizes of the loop antennas were tested and the highest emission data for each are presented in this report.

OmniSmart Readers are “multi-standard” accepting cards that conform to ISO 14443A, 14443B or 15693 making it the reader of choice and reducing obsolescence.

7. Test Requirements

The EUT was tested for Conducted and Radiated Emissions to establish compliance with the limits set forth in Title 47 CFR, Parts 15.207, 15.209 and 15.225, for a low power transmitter.

8. Summary of Test Report

DECLARATION OF CONFORMITY

The OmniSmart Reader was found to **MEET** the requirements as described within the specification of Title 47, CFR FCC, Parts 15.207, 15.209 and 15.225 for a low power transmitter, and Industry Canada RSS-210, Section 6.2.2(e) for an intentional radiator.

The enclosed test results pertain to the sample(s) of the test item listed, and only for the tests performed per the data sheets. Any subsequent modification or changes to the test item could invalidate the data contained herein, and could therefore invalidate the findings of this report.

9. Introduction

All tests were performed at L.S. Compliance, in Cedarburg, Wisconsin, unless otherwise noted.

On June 2nd, 3rd and 4th, 2004 a series of Conducted and Radiated Emission tests were performed on 5 samples of the OmniSmart Reader, Model Numbers OS10, OS20, OS30, OS40 and OS45, here forth referred to as the "*Equipment Under Test*" or "*EUT*". These tests were performed using the procedures outlined in ANSI C63.4-2001 for intentional radiators, and in accordance with the limits set forth in FCC Parts 15.207, 15.209 and 15.225, as well as Industry Canada RSS-210, Section 6.2.2(e) for a low power transmitter.

The tests were performed by Kenneth L. Boston, EMC Laboratory Lab Manager, and Abtin Spantman, EMC Engineer of L.S. Compliance, and witnessed by John Reske of Honeywell Access Systems.

10. Purpose

The above-mentioned tests were performed in order to determine the compliance of the equipment under test (EUT) with limits contained in Title 47 CFR, FCC Parts 15.207, 15.209 and 15.225. All Radiated Emission tests were performed to measure the emissions in the frequency bands described in this report, and to determine whether said emissions are below the limits established by the above sections.

The tests were performed in accordance with the procedure described in the American National Standard for methods of measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz (ANSI C63.4-2001). Another document used a reference for the EMI Receiver specification is the Comite International Special des Perturbations Radioelectriques (CISPR) Number 16-1, 2002.

11. Radiated Emissions Test

Test Setup

The test setup was assembled in accordance with Title 47 CFR, FCC Part 15 and ANSI C63.4-2001. The EUT was placed on an 80 cm high non-conductive wooden table centered on a flush mounted 2 meter diameter turntable, inside a 3 meter Semi-Anechoic, FCC listed Chamber. The EUT was operated in an active card-read mode, using DC power of 5 volts, supplied by a wall supply. This mode insures that the card readers are transmitting a continuous carrier on 13.560 MHz. Whenever a tag (passive) is brought to within approximately 5 cm of the reader, the 13.56 carrier powers up the tag, which then performs a backscatter modulation to the card reader. This envelope modulation then is picked up by the card reader and de-coded. The limits are extrapolated by a factor of 20 dB/decade, for a reading at 3 meters, taken in the Semi-Anechoic Chamber. The calculations determining these limits are detailed in the following pages of this report. Measurement of the fundamental frequency and the lower harmonics was performed at a distance of 10 meters, using extrapolated limits.

Test Procedure

Final radiation measurements were performed on the EUT in a 3 meter Semi-Anechoic Chamber. A frequency range from 30 MHz to 1000 MHz was scanned, and levels were manually noted at various fixed degree settings of azimuth on the turntable and antenna height. The EUT was placed on a non-conductive wooden table in a 3 meter Semi-Anechoic Chamber, with the antenna mast placed such that the antenna was 3 meters from the test object. The readers were mounted on a vertical fixture, in the orientation that they are to be used during installation.

A Biconical Antenna was used to measure emissions from 30 MHz to 300 MHz, a Log Periodic Antenna was used to measure emissions from 300 MHz to 1000 MHz. The maximum radiated emissions were found by raising and lowering the antenna between 1 and 4 meters in height, using both horizontal and vertical antenna polarities. An active loop antenna was used for measurements below 30 MHz.

The EUT was operated in an active card-read mode during the test. For the fundamental frequency, measurements were repeated on an FCC listed 10 meter Open Area Test Site (OATS). The EUT was scanned for emissions at 13.56 MHz to establish compliance in accordance with FCC Part 15.225 (I.C. RSS-210). A Loop Antenna was used as the sensing antenna. The EUT was positioned on an 80 cm high wooden table, in the center of a flush-mounted 2 meter diameter turntable. The EUT was rotated, and the loop antenna was oriented to obtain a maximum signal level.

Test Equipment Utilized

A complete list of test equipment (including antennas) utilized can be found in Appendix A. The list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals supplied by the manufacturers.
All antenna calibrations were performed at a N.I.S.T. traceable site.

The connecting cables were measured for losses, using a calibrated Signal Generator and an EMI Receiver. The resulting correction and cable loss factors from these calibrations were entered into the EMI Receiver database. As a result, the data taken from the EMI Receiver accounts for the antenna correction factor as well as cable loss or other corrections, and can therefore be entered into the database as a corrected meter reading. The EMI Receiver was operated with a bandwidth of 120 kHz for measurements between 30 MHz and 1000 MHz, and a bandwidth of 9 kHz was used below 30 MHz.

The Quasi-Peak detector function was utilized.

Test Results

The EUT was found to **MEET** the Radiated Emissions requirements of Title 47 CFR, FCC Parts 15.209 and 15.225 for an unintentional radiator (I.C. RSS-210). The frequencies with significant signals were recorded and plotted as shown in the data charts and graphs in this report.

CALCULATION OF RADIATED EMISSIONS LIMITS

The following table depicts the general spurious limits for an low power device. These limits are obtained from Title 47 CFR, Part 15.209(a), for radiated emissions measurements, and were used for spurious signal measurements, in the 3 meter Chamber.

Frequency (MHz)	3 m Limit (μV/m)	3 m Limit (dBμV/m)
30-88	100	40.0
88-216	150	43.5
216-960	200	46.0
960-10,000	500	54.0

Sample conversion from field strength μV/m to dBμV/m:

$dB\mu V/m = 20 \log_{10}$ (3m limit)

from 30-88 MHz for example: $dB\mu V/m = 20 \log_{10} (100)$

$40.0\ dB\mu V/m = 20 \log_{10} (100)$

Note: Limits are rounded to the nearest tenth of a dB.

CALCULATION OF RADIATED EMISSIONS LIMITS (continued)

Calculation of Radiated Emissions limits for FCC Part 15.209; general limits for intentional radiators, plus limits for a 15.225 transmitter.

Field Strength of Transmitter Spurious and Harmonic Frequencies:

For the frequency range of **1705 kHz to 30 MHz**, the spurious signal limit (at 10 meters) is found by:

LIMIT (dBµV/m) = 20 log (30) + 19.08 (except for Table 2 below)

Above 30 MHz, the limits on the previous page apply, at 3 meters.

Where the measurement distance was specified to be 30 meters, a correction factor was applied in order to permit measurement to be performed at a separation distance of 10 meters. In accordance with FCC Part 15.31 (f)(2), the scaling factor used was the 40 dB per decade that is presented in the part.

From 30 meters down to 10 meters: FACTOR (dB) = 40 log (30/10) = 19.08 dB

Table 1: Limits for Readings Taken at 10 Meters; spurious signals

Frequency (MHz)	FCC Limit (µV/m) 15.209	FCC Limit (dBµV/m)	Scaling Factor	Adjusted Limit (dBµV/m)
1.705-30.0	30.00 @ 30 m	29.54	19.08	48.6

Table 2: Limits for Readings Taken at 10 Meters; 15.225 (a,b,c) emission mask

Frequency (MHz)	FCC Limit (µV/m) 15.225	FCC Limit (dBµV/m)	Scaling Factor	Adjusted Limit (dBµV/m)
13.553 – 13.567	15,848 @ 30	84.00	19.08	103.1
13.410 – 13.553 13.567 – 13.710	339 @ 30	50.47	19.08	69.6
13.110 – 13.410 13.710 – 14.010	106 @ 30	40.5	19.08	59.6

Note: Limits are rounded to the nearest tenth of a dB.

Measurement of Electromagnetic Radiated Emissions

Upon a 10 meter FCC listed Site and in the 3 meter FCC listed Chamber

Test Standard: Title 47 CFR, FCC Parts 15.209 and 15.225

Frequency Range Inspected: 30 MHz to 1000 MHz

Manufacturer:	Honeywell Access Systems					
Date(s) of Test:	June 3rd and 4th, 2004					
Test Engineer(s):		Tom Smith		Abtin Spantman	√	Ken Boston
Model #:	OS10, OS20, OS30, OS40 and OS45					
Serial #:	Engineering units					
Voltage:	5 VDC, supplied by a wall supply at 115 VAC					
Operation Mode:	Active Card-Read					
Distance:	√	3 Meters	√	10 Meters		
Configuration:	0.8 m height					
Detectors Used:		Peak	√	Quasi-Peak		Average

Environmental Conditions in the Lab:
Temperature: 20 – 25°C
Relative Humidity: 30 – 60 %

Test Equipment Used:
EMI Measurement Instrument: HP8546A and Agilent E4407B
Log Periodic Antenna: EMCO #93146
Biconical Antenna: EMCO #3115
Loop Antenna: EMCO 6502

OATS: Level of significant radiated emissions found at 10 meters, frequencies below 30 MHz

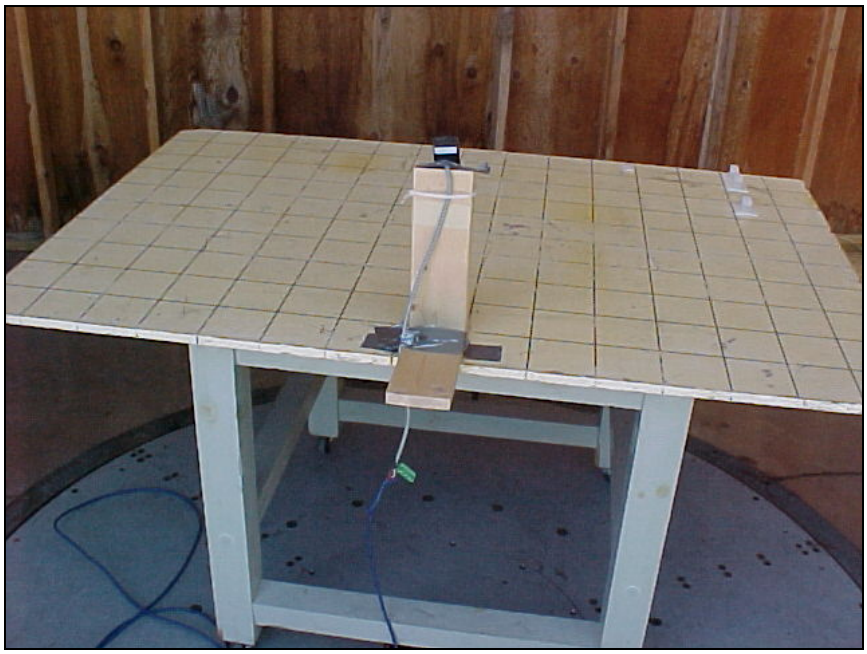
Frequency (MHz)	Antenna Polarity	Model	Height (meters)	Azimuth (0° - 360 °)	EMI Meter Reading (dBµV/m)	15.209; 15.225 Limit (dBµV/m)	Margin (dB)
13.56	Note 2	OS10	1.0	-	43.0	103.1	60.1
13.56	Note 2	OS20	1.0	-	49.4	103.1	53.7
13.56	Note 2	OS30	1.0	-	50.4	103.1	52.7
13.56	Note 2	OS40	1.0	-	55.7	103.1	47.4
13.56	Note 2	OS45	1.0	-	53.1	103.1	50.0
27.12	Note 2	OS40	1.0	-	20.3	48.6	28.3

Chamber: Level of significant radiated emissions found at 3 meters, frequencies above 30 MHz

Frequency (MHz)	Antenna Polarity	Model	Height (meters)	Azimuth (0° - 360 °)	EMI Meter Reading (dBµV/m)	15.209 Limit (dBµV/m)	Margin (dB)
40.7	V	OS20	1.0	50	37.0 (Note 3)	40.0	3.0
40.7	V	OS40	1.0	90	36.1	40.0	3.9
67.8	V	OS30	1.0	15	35.7	40.0	4.3
67.8	V	OS45	1.0	30	36.0	40.0	4.0
217.0	V	OS40	1.9	320	34.5	43.5	9.0

Note: A Quasi-peak Detector was used in measurements below 1 GHz. All other emissions seen, other than the noise floor, were greater than 20 dB below the limits.
Note 2: Readings taken with Loop Antenna oriented for maximum readings.
Note 3: Reading scaled to a 3 meter reading, from a reading taken with the Biconical antenna at 10 meters.
Note 4: Signal levels in the 15.225 b & c emission mask bands were greater than 20 dB below those limits.

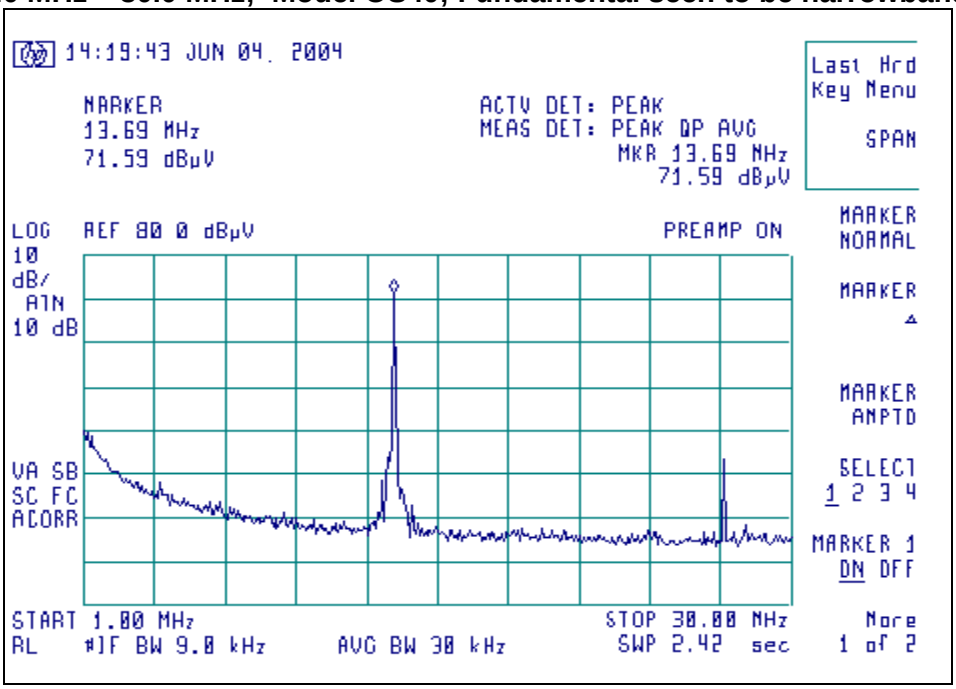
Photo(s) of Setup for Radiated Emissions Test



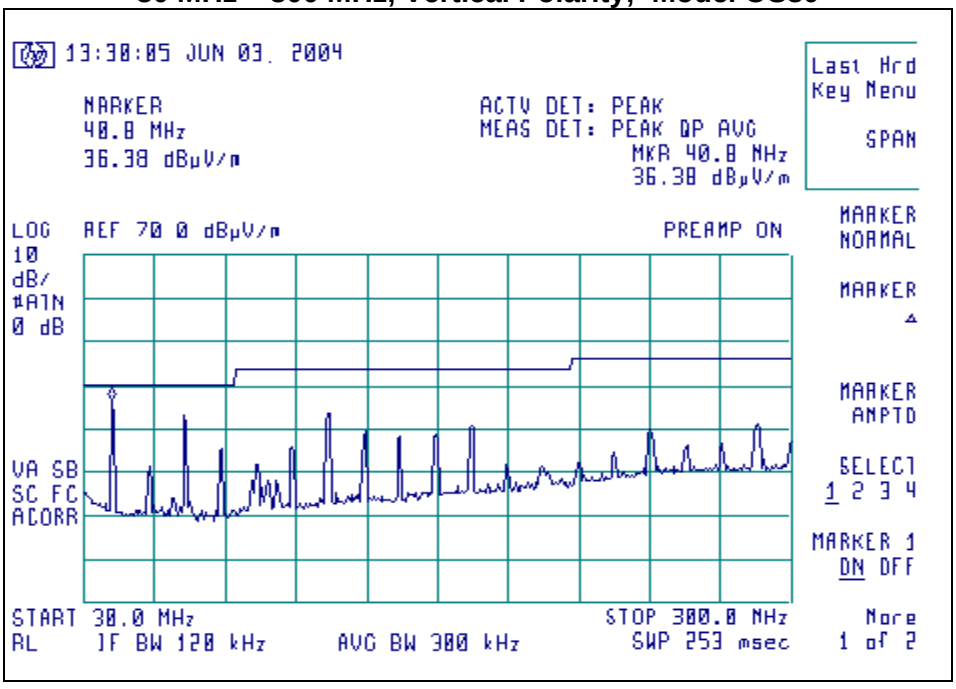
Views of the EUT during Radiated Emissions testing on the 10 Meter FCC listed OATS.

Graphs made during Radiated Emissions Testing

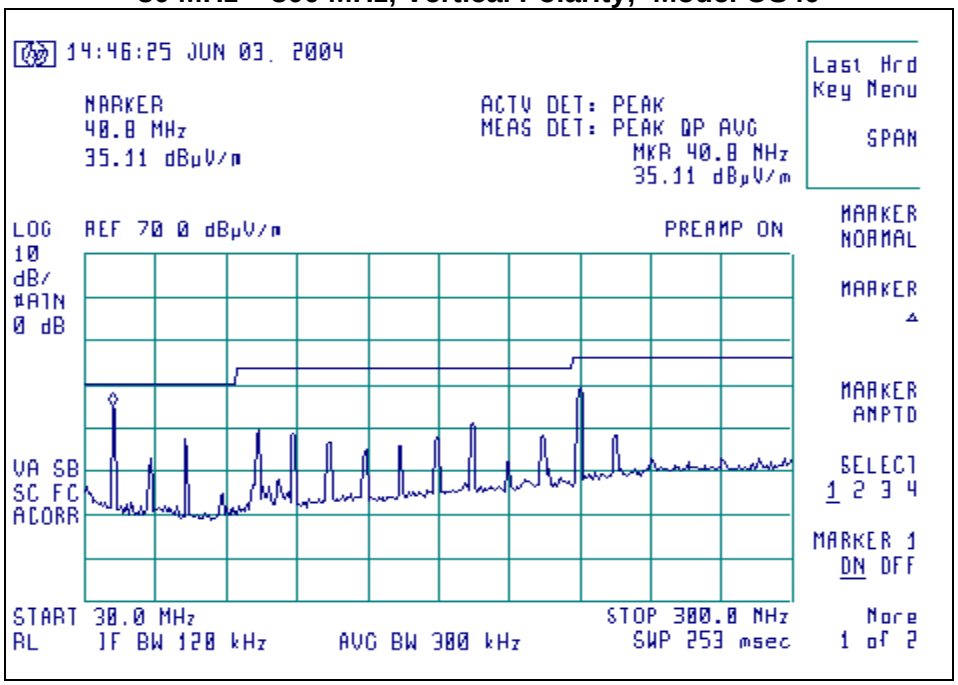
Signature Scan of Radiated Emissions at 3 meters
1.0 MHz – 30.0 MHz; Model OS40; Fundamental seen to be narrowband.



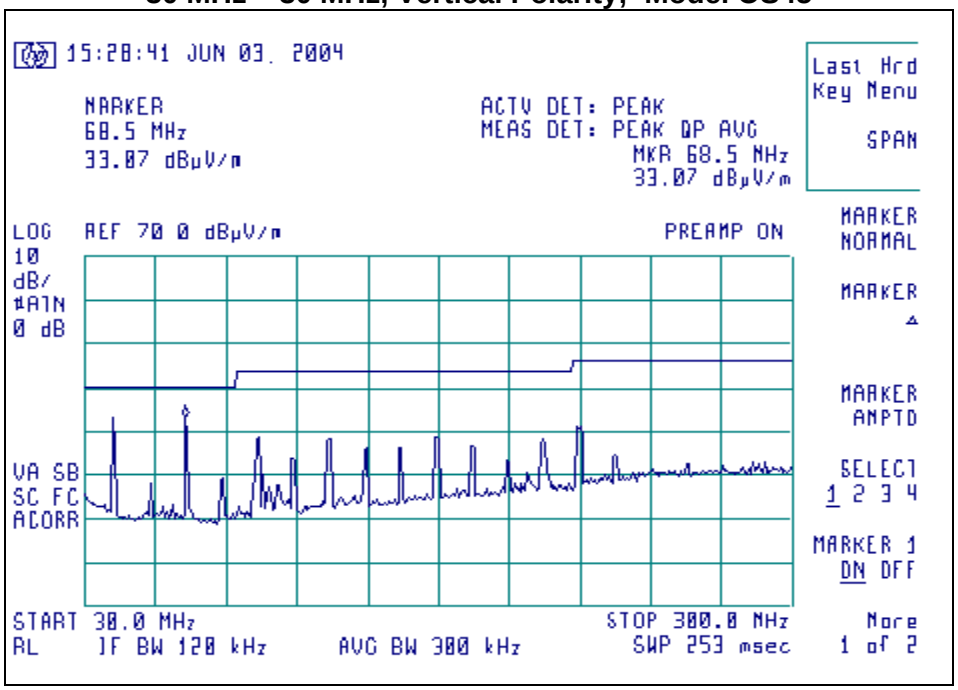
Signature Scan of Radiated Emissions at 3 meters
30 MHz – 300 MHz, Vertical Polarity; Model OS30



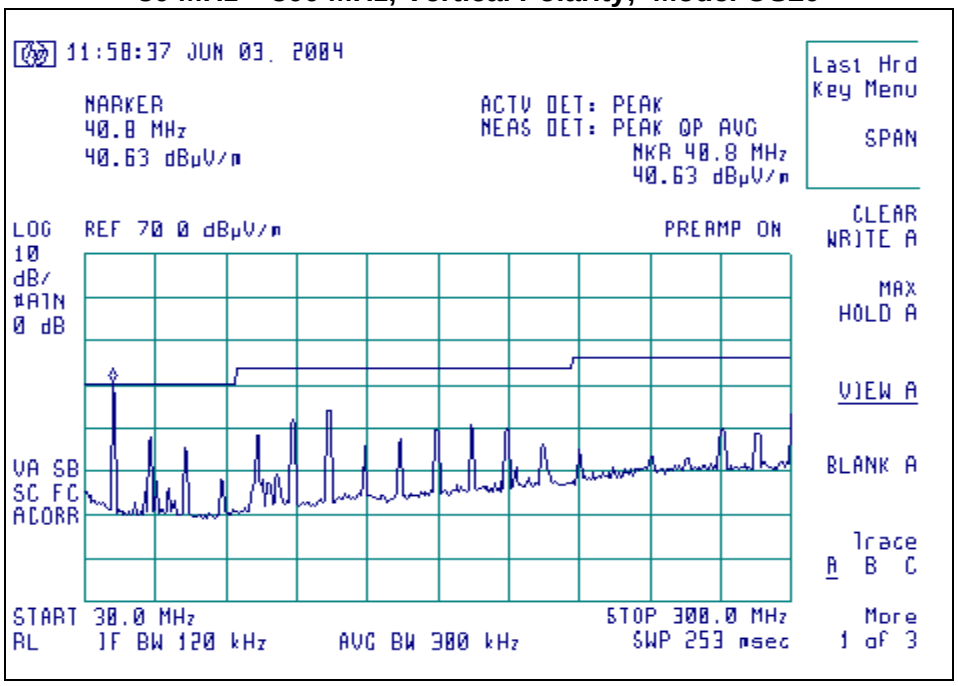
Signature Scan of Radiated Emissions
30 MHz – 300 MHz, Vertical Polarity; Model OS40



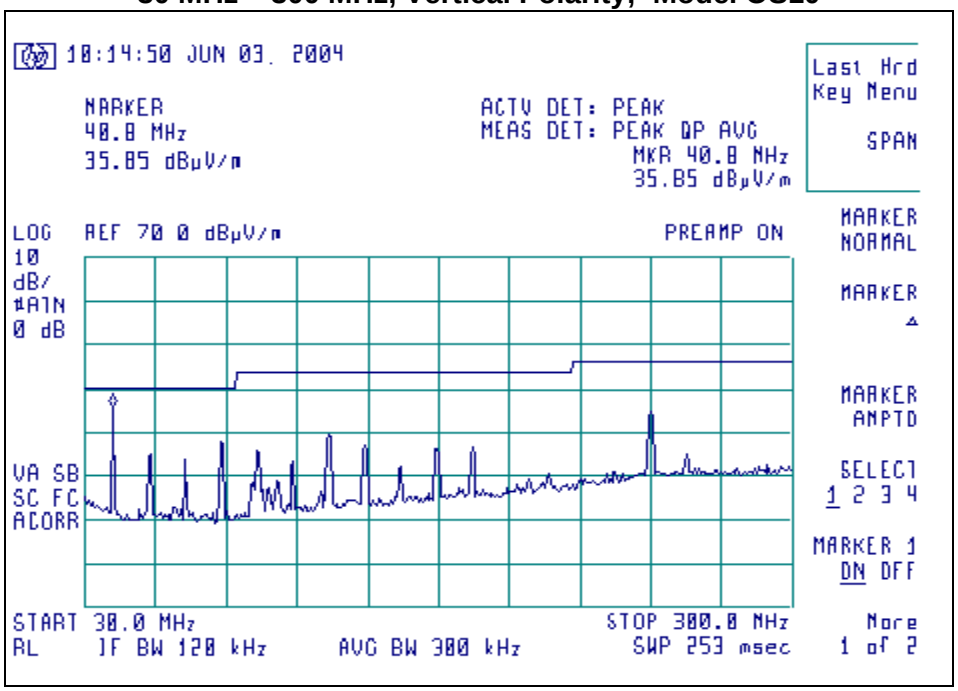
Signature Scan of Radiated Emissions
30 MHz – 30 MHz, Vertical Polarity; Model OS45



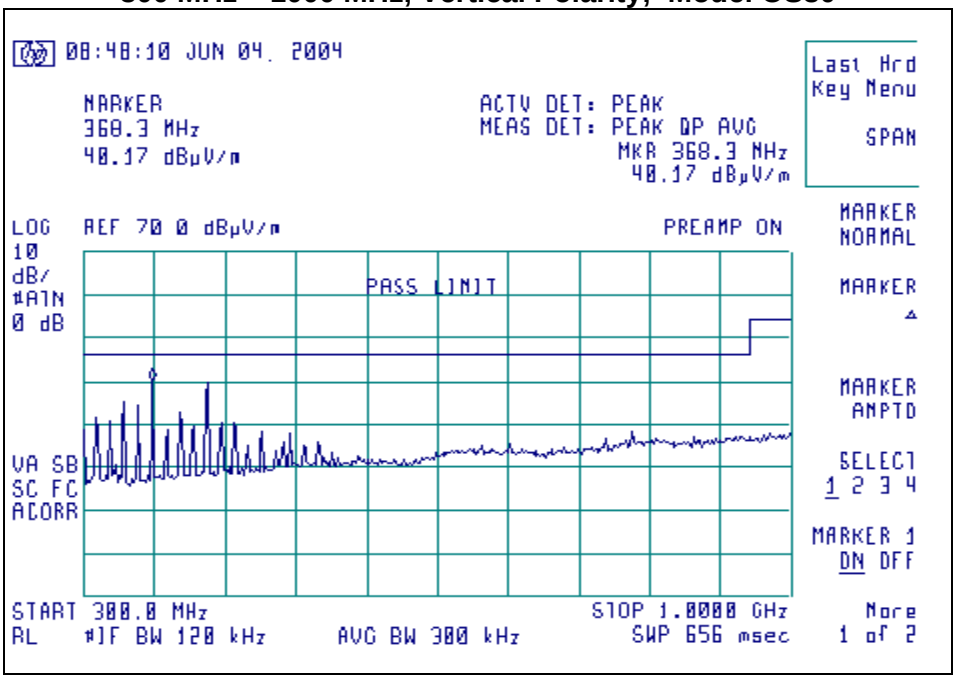
Signature Scan of Radiated Emissions
30 MHz – 300 MHz, Vertical Polarity; Model OS20



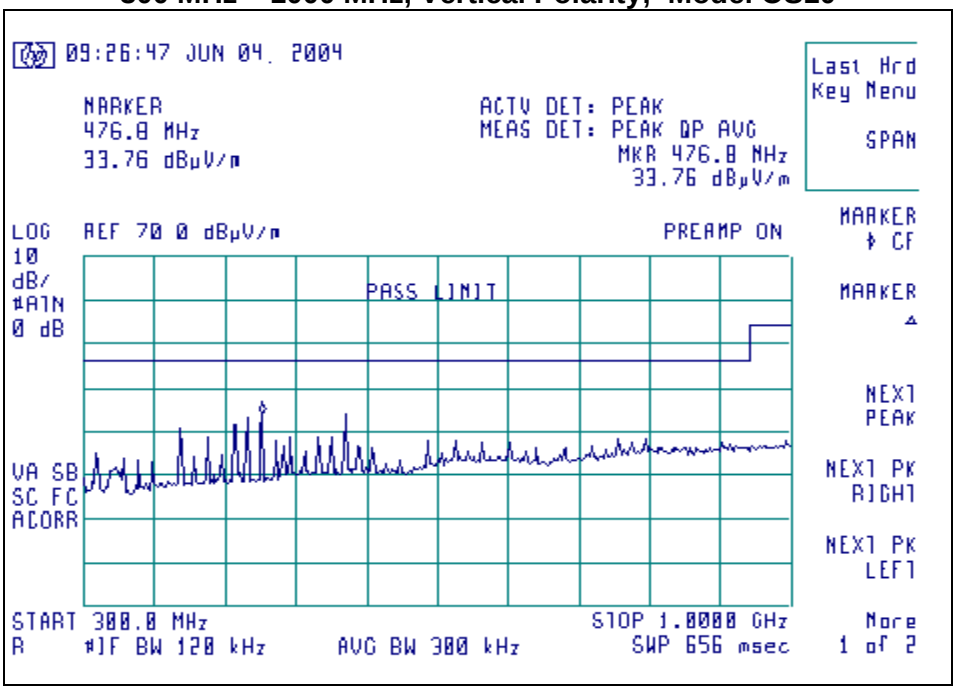
Signature Scan of Radiated Emissions
30 MHz – 300 MHz, Vertical Polarity; Model OS10



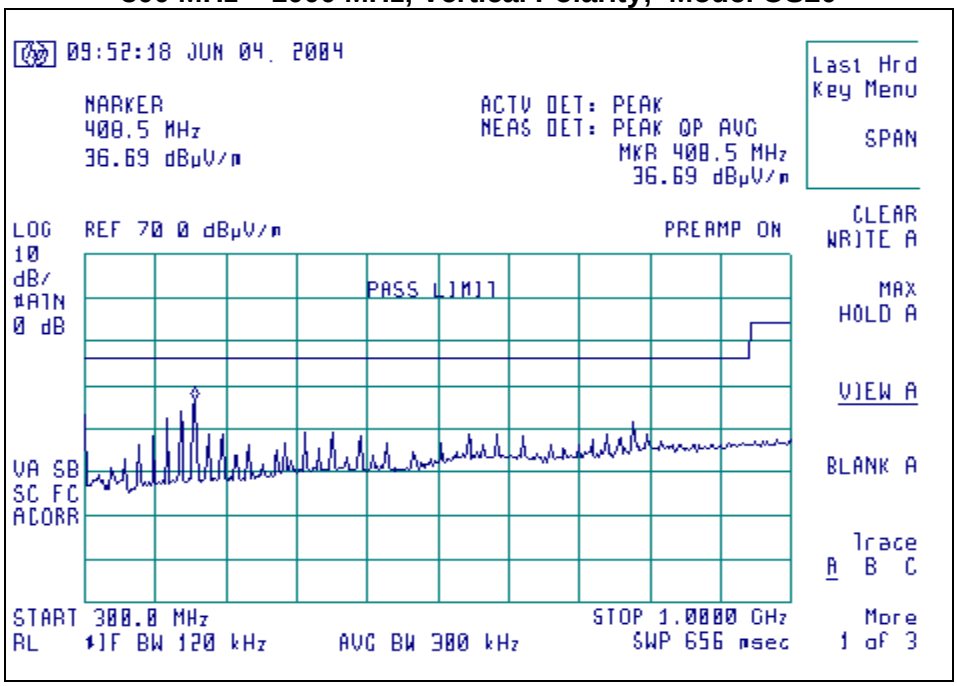
Signature Scan of Radiated Emissions at 3 meters
300 MHz – 1000 MHz, Vertical Polarity; Model OS30



Signature Scan of Radiated Emissions at 3 meters
300 MHz – 1000 MHz, Vertical Polarity; Model OS10



Signature Scan of Radiated Emissions
300 MHz – 1000 MHz, Vertical Polarity; Model OS20



12. Conducted Emissions Test (at AC Mains)

Test Setup

The Conducted Emissions tests were performed within a Shielded Room. The EUT was placed on a non-conductive wooden table, with a height of 80 cm above the reference ground plane. The EUT wall type transformer power supply was plugged into a 50Ω (ohm), 50/250 µH Line Impedance Stabilization Network (LISN). The test area and setup are in accordance with ANSI C63.4-2001 and IEC CISPR 22 (EN 55022). The AC power source to the LISN was connected to inside the Shielded Room via an appropriate broadband EMI filter.

Test Procedure

After the EUT was setup in the Shielded Room and connected to the LISN, the RF sampling port of the LISN was connected to a 10 dB Attenuator-Limiter, and then to the EMI Receiver. The LISN used has the ability to terminate the unused port with a 50Ω load, when switched to either L1 (line) or L2 (neutral). The appropriate frequency range and bandwidths were entered into the EMI Receiver, and measurements were recorded. The bandwidth used for these measurements is 9 kHz, as specified in CISPR 16-1 (2001), Section 1, Table 1 for Quasi-Peak and Average detectors in the frequency range of 150 kHz to 30 MHz. Readings were then taken and recorded.

The limits for Conducted Emissions can be found in Title 47 CFR, FCC Part 15.207, and have been listed in this test report.

Test Equipment Utilized

A complete list of test equipment can be found in Appendix A. This list includes calibration information and equipment descriptions. All equipment is calibrated and used according to the operation manuals provided by the manufacturers. Calibrations of the LISN and Limiter are traceable to a N.I.S.T. site. All cables are calibrated and checked periodically for conformance. The emissions are measured on the EMI Receiver, which has automatic correction for all factors stored in memory, and allows direct readings to be taken.

Test Results

The EUT was found to **MEET** the Conducted Emissions AC Mains requirements of FCC Part 15.207 for an intentional radiator. Tests of the highest emitting sample were repeated with a resistor substituted for the loop antenna, in order to show compliance to the limits at the fundamental frequency. Detailed test results can be found in the data charts and graphs of this report.

CALCULATION OF CONDUCTED EMISSIONS LIMITS

The following table depicts the general emission limits for an intentional radiator. These limits are obtained from Title 47 CFR, FCC Part 15.207, for radiated emissions measurements.

Frequency (MHz)	Quasi-Peak Limit (dBμV)	Average Limit (dBμV)
0.15 – 0.5	66 to 56 *	56 to 46 *
0.5 – 5.0	56	46
5.0 - 30	60	50

* Decreases with logarithm of the frequency.

Sample conversion in the 0.15 MHz to 0.5 MHz range:

$$Limit\big|_F = \left[-19.12\left(\frac{dB}{Hz}\right)x\left(\log\frac{freq(MHz)}{0.15}\right)\right] + 66$$

For 200 kHz for example (F=0.20 MHz):

$$Limit\big|_{F=200kHz} = \left[-19.12\left(\frac{dB}{Hz}\right)x\left(\log\frac{0.20}{0.15}\right)\right] + 66$$

$$Limit\big|_{F=200kHz} = 63.61\left(dB\mu V\right)$$

Note: Limits are rounded to the nearest whole number.

Close-up view of the test sample with resistor load substitution.

Measurement of Electromagnetic Conducted Emission

Frequency Range Inspected: 0.15 MHz – 30.0 MHz

Test Requirements: CISPR 22 (EN 55022) Title 47CFR FCC Part 15.107

Manufacturer:	Honeywell Access Systems							
Date(s) of Test:	June 7th, 8th, 9th and July 28, 2004							
Test Engineer:		Tom Smith		Abtin Spantman	√	Ken Boston		
Model #:	OS10, OS20, OS30, OS40 and OS45							
Serial #:	Engineering Units							
Voltage:	5 VDC, from a wall supply at 115 VAC							
Operation Mode:	Active Card-Read							
Test Location:	√	Shielded Room						Chamber
EUT Placed On:	√	40cm from Vertical Ground Plane						10cm Spacers
	√	80cm above Ground Plane						Other:
Measurements:		Pre-Compliance		Preliminary				Final
Detectors Used:		Peak	√	Quasi-Peak	√			Average

Environmental Conditions in the Lab:
Temperature: 20 – 25° C
Atmospheric Pressure: 86 kPa – 106 kPa
Relative Humidity: 30 – 60%

Test Equipment Utilized:
EMI Receiver: HP 8546A
LISN: EMCO 3816/2NM
Transient Limiter: HP 119474A

			QUASI-PEAK			AVERAGE		
Frequency (MHz)	Model	Line	Q-Peak Reading (dBμV/m)	Q-Peak Limit (dBμ V/m)	Quasi-Peak Margin (dB)	Average Reading (dBμV/m)	Average Limit (dBμ V/m)	Average Margin (dB)
13.56	OS10	L2	50.5	60	9.5	50.4	50	*0.4* *
13.56	OS30	L1	59.8	60	1.2	59.6	50	*9.6* *
13.56	OS40	L1	60.1	60	*.1* *	60.0	50	*10.0* *
13.56	OS45	L1	57.9	60	2.1	57.8	50	*7.8* *
27.12	OS20	L1	89.8	60	20.2	39.7	50	10.3
27.12	OS40	L1	36.8	60	23.2	36.7	50	13.3
13.56	OS40	L1	44.4	60	15.6 **	44.0	50	6.0 **

* Note: Samples tested with Loop Antenna present.

** Note: OS40 sample re-tested with resistive dummy load substituted for Loop Antenna.

Photo of Setup for Conducted Emissions (AC Mains)Test, OS20

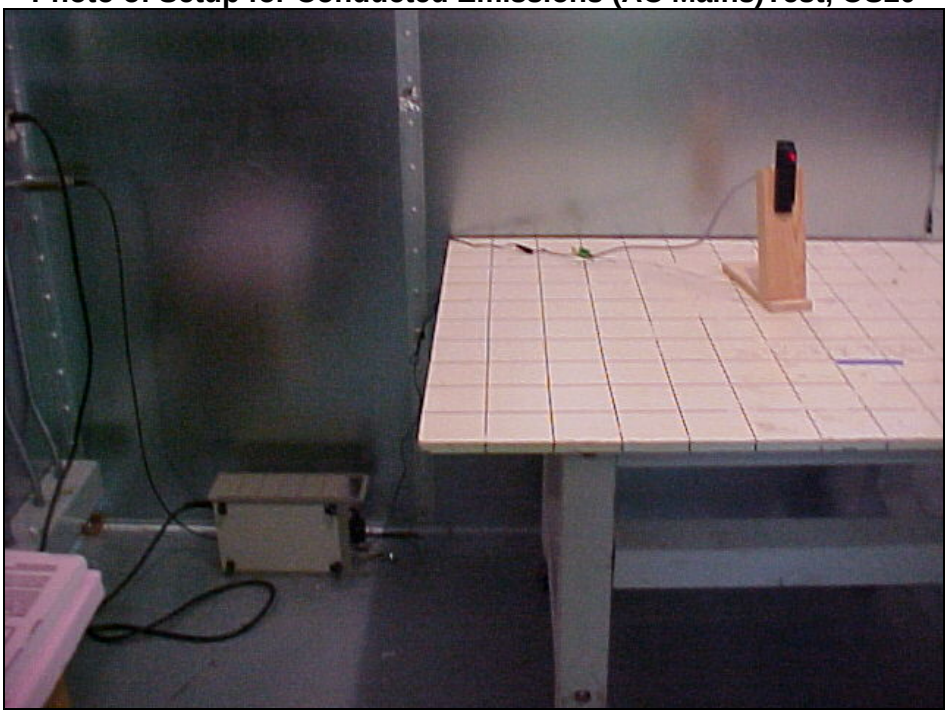
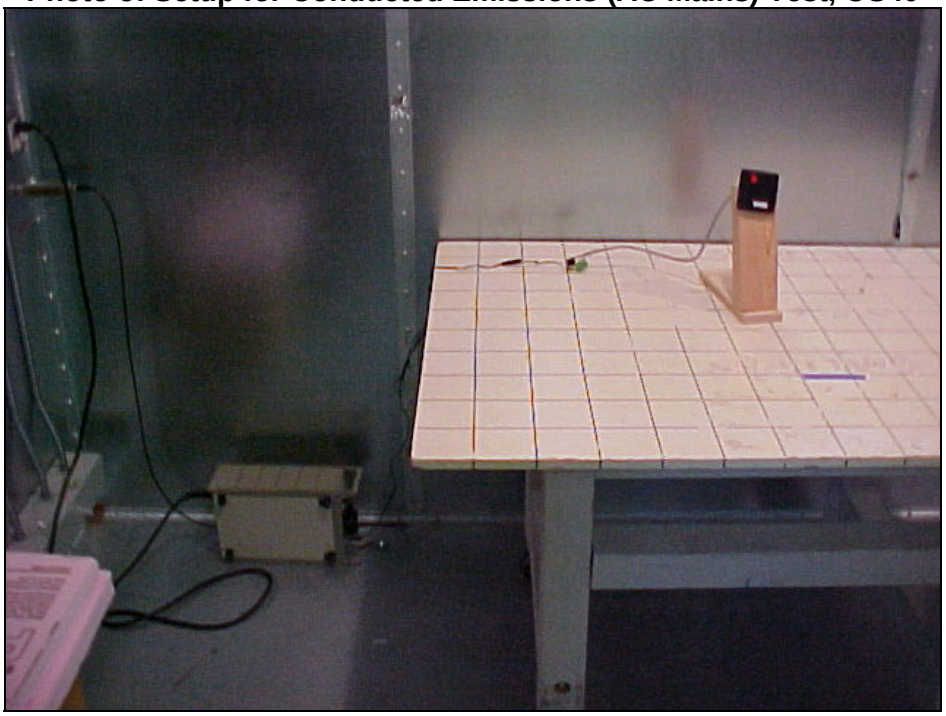
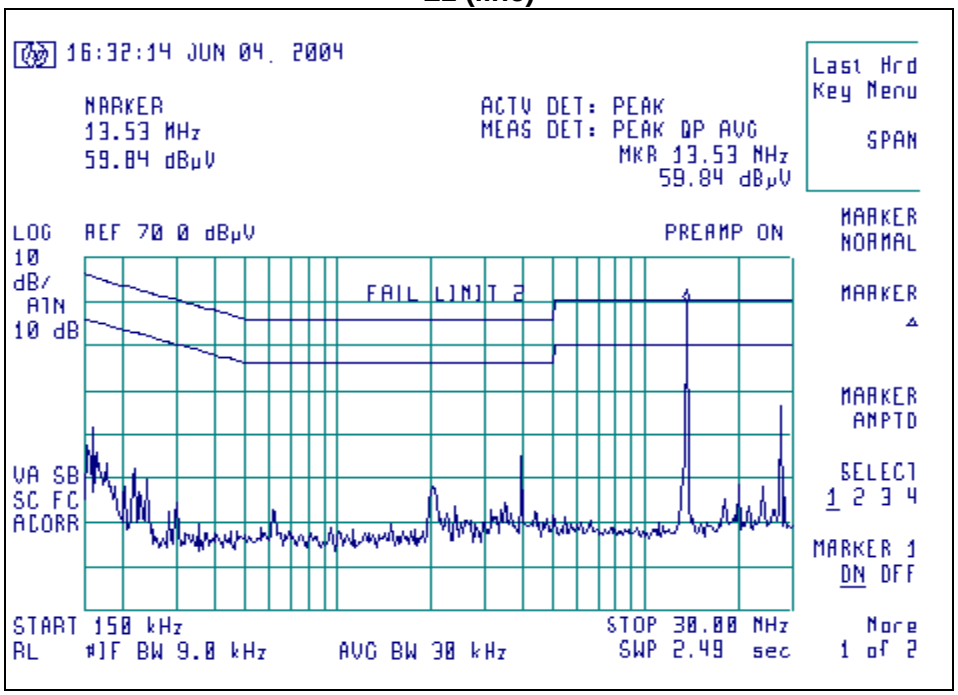


Photo of Setup for Conducted Emissions (AC Mains) Test, OS40

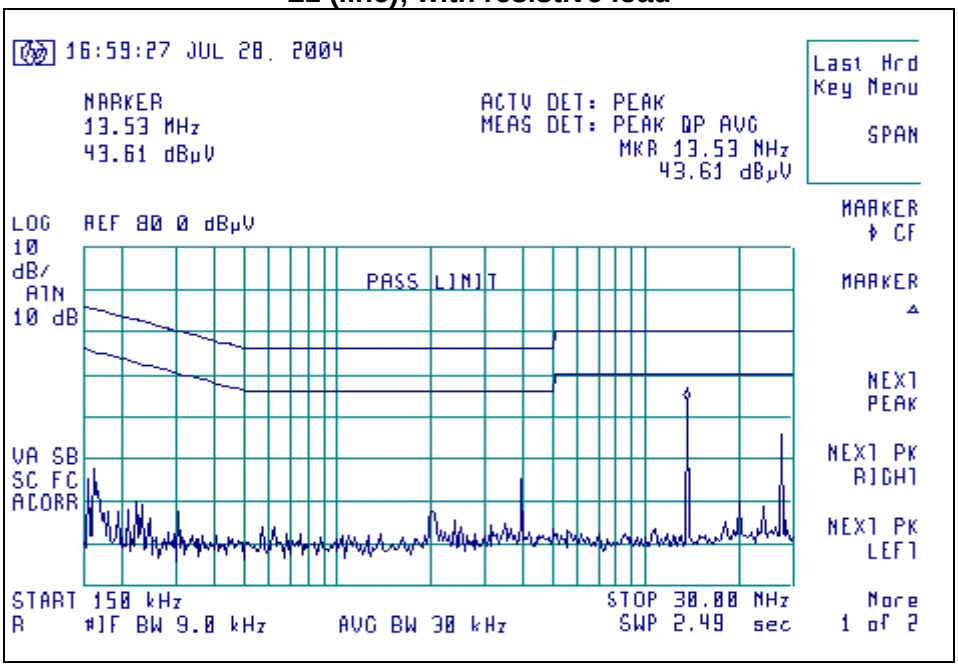


Graphs made during Conducted Emissions (AC Mains) Testing

Signature Scan of Conducted Emissions (AC Mains), OS40
L1 (line)



Signature Scan of Conducted Emissions (AC Mains), OS40
L1 (line); with resistive load



13. Frequency Stability (Title 47 CFR, FCC Parts 15.225(e) and 15.31(e))

The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency (1.356 kHz) 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 tests shall be performed using a new battery. The DC supply voltage was varied over the widest range, as DC power can be supplied by a variety of suppliers.

The OS10 (smallest) and OS45 (largest) samples were tested, with the largest deviation seen on the OS10; for which the following results are presented. Maximum deviation seen was 0.3 kHz, which is within the specification of ±1.356 kHz.

Temperature (°C)	Frequency (MHz)	Frequency Delta (kHz)
- 20	13.5612	+ 0.3
+ 20	13.5609	(reference)
+ 50	13.5609	0.0
Voltage		
4.25 (85% of 5 V)	13.5609	0.0
5.4	13.5609	(reference)
18.4 (115% of 16V)	13.5609	0.0

APPENDIX A

Test Equipment List

Asset #	Manufacturer	Model #	Serial #	Description	Date	Due
AA 960006	EMCO	6502	9205 2753	Loop Antenna	9/03/03	9/04/05
AA960008	EMCO	3816/2NM	9701-1057	Line Impedance Stabilization Network	9/03/03	9/03/04
AA960031	HP	119474A	3107A01708	Transient Limiter	Note 1	Note 1
AA960077	EMCO	93110B	9702-2918	Biconical Antenna	9/02/03	9/02/04
AA960078	EMCO	93146	9701-4855	Log-Periodic Antenna	9/02/03	9/02/04
AA960081	EMCO	3115	6907	Double Ridge Horn Antenna	11/14/03	11/14/04
CC00221C	Agilent	E4407B	US39160256	Spectrum Analyzer	11/04/03	11/04/04
EE960004	EMCO	2090	9607-1164	Device Controller	N/A	N/A
EE960013	HP	8546A	3617A00320	Receiver RF Section	9/04/03	9/04/04
EE960014	HP	85460A	3448A00296	Receiver Pre-Selector	9/04/03	9/04/04
N/A	LSC	Cable	0011	3 Meter ½" Armored Cable	6/29/04	6/29/05
N/A	LSC	Cable	0038	1 Meter RG 214 Cable	6/29/04	6/29/05
N/A	LSC	Cable	0067	10 Meter Semflex	6/29/04	6/29/05
N/A	Pasternack	Attenuator	N/A	10 dB Attenuator	Note 1	Note 1

Note 1 - Equipment calibrated within a traceable system.

Table of Expanded Uncertainty Values, (K=2) for Specified Measurements

Measurement Type	Particular Configuration	Uncertainty Values
Radiated Emissions	3 – Meter chamber, Biconical Antenna	4.24 dB
Radiated Emissions	3-Meter Chamber, Log Periodic Antenna	4.8 dB
Radiated Emissions	10-Meter OATS, Biconical Antenna	4.18 dB
Radiated Emissions	10-Meter OATS, Log Periodic Antenna	3.92 dB
Conducted Emissions	Shielded Room/EMCO LISN	1.60 dB
Radiated Immunity	3 Volts/Meter in 3-Meter Chamber	1.128 Volts/Meter
Conducted Immunity	3 Volts level	1.0 V