



Test Report

Standard(s): **FCC Part 15**
 Class B

Model(s): **Ubox Home Internet Server**
 Model 1A001-01

Prepared for: **Ucentric Systems**
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 Maynard, MA 01754

Date(s) of test: **February 8, 2001**

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Insert certificate



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1. Executive Summary

1.1 Scope

This document describes electromagnetic emissions testing performed on the Ubox Home Internet Server Model 1A001-01 on February 8, 2001, pursuant to FCC CFR 47 Part 15. It may be used to demonstrate compliance with the FCC emissions requirements under a Declaration of Conformity (DoC) as well as Canadian emissions requirements regulated by Industry Canada as defined in ICES-003 Issue 2, Revision 1.

1.2 Content

Contained herein are the technical descriptions of the equipment under test (EUT) as well as the test methods and results used to verify compliance with the emissions requirements for Information Technology Equipment (ITE), to the above named standards.

1.3 Conclusions

The Ubox Home Internet Server Model 1A001-01 met the FCC Class B requirements when tested as described herein.
(Refer to Test Descriptions & Results in section 3 for a detailed description).

2. Test Environment

2.1 EUT Description

M/N: Ubox Home Internet Server Model 1A001-01 S/N: FCC Test Sample #10 (Revised)

Description: The Ubox Home Internet Server is a control center for connecting high-speed Internet access with other home appliances, PCs, entertainment devices, and phone services. The unit will typically be installed where other home services (cable, electric, telephone) enter the residence and will use pre-existing wiring in the home.

FCC Test sample #10 - Ubox consisting of:

Test Config: 1A0010-01

Description	Manufacturer	Part Number	Serial Number
Motherboard w/ Intel Celeron 600 MHz	SuperMicro	370SWT	SS102379
Hard Disk Drive 1	Quantum	Fireball Lct15-7.5Gb	SG0285TC1254207M32VP
Hard Disk Drive 2	Seagate	ST310211A	7DB00T3K
TV Tuner/Digitizer	Happauge	WinTV-GO Model 190	1975093
Ethernet - 10/100Base T (2)	Linksys	LNE100Tx	C9B-00866816 C9B-00863231
Video Modulator	Peracom	PC Caster Rev D	Proto #11
Power Supply	Fortron Source	FSP250-60GNA	4882A248
Ucentric ADSL Card	Ucentric Systems LLC	1000070-01	4
Ucentric FM Transmitter	Ucentric Systems	1000080-01	Mike #2-Revised per ECO
Ucentric Telephony Board	Ucentric Systems LLC	AX03	None
Ucentric IR Modulator	Ucentric Systems LLC	1000120-01	1
Ucentric IR Eye	Ucentric Systems LLC	1000360-01	2
Ucentric IR Keyboard	Ucentric Systems LLC	1000150-01	3

2.1.1 System Operation

The video input to the Ubox was exercised by a VCR playing a movie. Video is modulated by the Ubox and sent out via the CATV OUT port to the IR Modulator and then split off to the TV. The Ubox FM modulator is configured to output at 89.7 MHz and is sent out the CATV port to the IR Modulator. The FM is split off at the IR modulator and sent via a cable to an FM Receiver which plays music stored on the Ubox. The Ucentric IR Keyboard is configured to continually output scrolling H's. The WAN connection is connected to the ADSL Simulator and then to the ADSL Computer. The ethernet computer is attached to the Ubox. By pinging this website both the Ethernet (LAN) and ADSL (WAN) connections are exercised during test. The Ubox telephony port is connected to the Telephone Line Simulator. The telephone handset continually calls the Ubox during test. The Ubox USB port is connected to a USB keyboard that continually outputs scrolling H's. The Ubox is running Software Version Rev 11.3.

2.1.2 Support Equipment:

Description	Manufacturer	Model Number	Serial Number	FCC ID
Television	White Westinghouse	WTV 1332	GT01CG3117	None
VCR	Samtron	SV-D91	6VBKC05531R/XAA	None
Hub	Netgear	DS104	DS14D04224825	None
ADSL Simulator	Veritas DSL	ADS-006002002	006207	None
ADSL Computer	No Name	None	None	None
Telephone Line Simulator	Teltone	TLS-5C-01	102230	None
Tel. Handset	Radio Shack	43-877	ET-296	None
FM Receiver	Bose	Wave Radio	None	None

Cables

Qty	Description	Cable (Loopback/Open Ended/Connected?)	Unshielded/Shielded Type (Braided/Foil)	Shield Termination (360°/Drain)	Length (Meters)
1	Power Cable	Connected	Unshielded	NA	1.5
1	Ethernet Cable	Connected	Unshielded	NA	7.5
1	Ethernet Cable	Connected	Unshielded	NA	23
2	Telephone/ADSL	Connected	UnShielded	NA	7.5
2	TV in/out	Connected	Shielded	360°	7.5
1	IR Mod In	Connected	Shielded	360°	3
1	FM out	Connected	Shielded	360°	3
1	USB Keyboard	Connected	Shielded	360°	1.5
1	IR Eye	Connected	Unshielded	NA	3

2.2 Test Facility Description

The test facility is located on the premises of Integrity Design & Test Services, Inc. at 37-7 Ayer Road, Littleton, MA 01460. All testing is performed in an Open Area Test Site conforming to the site attenuation characteristics defined by ANSI C63.4 1992. Test methods and facilities have been audited and accredited by the National Voluntary Lab Accreditation Program (NVLAP).

2.3 Test Equipment

All equipment used in the testing process have up to date calibrations traceable to the National Institute of Standards and Technology (NIST). Refer to Table 2.3-1 for a complete list of equipment used during the testing.

2.4 Product Disposition

All items received for testing undergo an inspection to ensure proper working condition upon reception and before return shipment. The unit under test passed the incoming inspection when received for testing on February 8, 2001. The unit was returned to the client's facility at the completion of testing after passing the final inspection.

Table 2.3-1: Test Equipment

Description	Model Number	Serial Number	Last Calibration	Due Calibration	EMI #
Spectrum Analyzer (9 KHz to 22 GHz)	HP8593E	3543A01976	7/31/00	7/31/01	145-1
LISN: 50Ω/50μH	91221-1	0386	3/23/01	3/23/02	145-2
Preamplifier (150 KHz to 1.3 GHz)	HP 8447D	2443A04077	4/20/00	4/20/01	145-3
LISN: 50Ω/50μH	Solar 9252-50-R-24- BNC	941725	5/16/00	5/16/01	145-5
BiLog Antenna (30 MHz to 2 GHz)	Chase CBL6112A	2284	7/12/00	7/12/01	145-6
BiLog Antenna (30 MHz to 2 GHz)	Chase CBL6112A	2173	8/10/00	8/10/01	145-7
LISN: 50Ω/50μH	Solar 9252-50-R-24- BNC	971601	6/8/00	6/8/01	145-8
LISN: 50Ω/50μH	Solar 9252-50-R-24- BNC	941724	8/31/00	8/31/01	145-9
Guided Ridged Horn (1 GHz to 18 GHz)	A.H. Systems SAS-200/571	163	10/31/00	10/31/01	145-10
Preamplifier (150 KHz to 1.3 GHz)	HP 8447D	2944A07027	4/20/00	4/20/01	145-13
Preamplifier (1 GHz to 26.5 GHz)	HP 8449B	3008A00232	8/8/00	8/8/01	145-14
LISN: 50Ω/50μH	Solar 9252-50-R-24- BNC	971617	6/21/00	6/21/01	145-15
LISN: 50Ω/50μH	91221-1	0335-04304	3/23/01	3/23/02	145-16
LISN: 50Ω/50μH	3850/2	9606-1052	7/6/00	7/6/01	145-17
LISN: 50Ω/50μH	91221-1	0385	3/23/01	3/23/02	145-18
Preamplifier (1 GHz to 26.5 GHz)	HP 8449B	3008A00948	8/24/00	8/24/01	145-20
Spectrum Analyzer (9 KHz to 26 GHz)	HP 8593EM	3412A00102	12/28/00	12/28/01	145-21
Guided Ridged Horn (1 GHz to 18 GHz)	EMCO 3115	5520	12/7/00	12/7/01	145-29
LISN: 50Ω/50μH	Solar 9233-50-TS-50-N	981960	10/31/00	10/31/01	145-31
Monopole Antenna	AM-541	11008	2/28/00	Out of service	145-32
Preamplifier (150 KHz to 1.3 GHz)	HP 8447D	2944A08408	2/14/01	2/14/02	145-33

Description	Model Number	Serial Number	Last Calibration	Due Calibration	EMI #
BiLog Antenna (30 MHz to 1GHz)	Chase CBL6111C	2564	5/30/00	5/30/01	145-34
Digital Multi Meter	75 Series II	55400267	6/2/00	6/2/01	145-42
LISN: 50Ω/50μH	9857-50-BP-24- BNC	001139	6/19/00	6/19/01	145-58

All equipment used for testing has been calibrated according to methods and procedures defined by the National Institute of Standards and Technology (NIST).

3. Test Description/Results

3.1 Radiated Emissions

3.1.1 Object

The purpose of this test is to measure the radiated electromagnetic emissions generated by the equipment under test (EUT), pursuant to FCC part 15 Class B requirements. (See Table 3.1.1-1 for the Class B radiated limits).

3.1.2 Procedure

Testing is performed in an Open Area Test Site. The EUT is placed on a wooden turntable 80 cm in height. The EUT is centered laterally on the turntable and flush with the rear of the table. Peripheral equipment is placed on either side of the EUT with a minimum of 10 cm spacing. (When testing a personal computer system, monitors shall be placed on top of the PC, and the keyboard and mouse shall be placed in front of the PC towards the front edge of the turntable.) Excess interface cables are draped over the back edge of the table no closer than 40 cm to the ground plane.

The EUT shall be set into operation such that all parts of the system are exercised. This may require the use of test software designed to exercise the various parts of the system. With the EUT set into operation, the turntable is rotated over 360 degrees and interface cables are manipulated to maximize the emissions. The peripherals are not moved during the test. The receiving antenna is placed at a test distance of 3 or 10 meters from the closest point on the EUT. The antenna height is varied from 1 to 4 meters, and the polarity of the antenna is switched between vertical and horizontal such that the received signal is maximized.

3.1.3 Deviations from Test Method

None

3.1.4 Measurement Uncertainty

A minimum of a 2 dB margin of compliance is recommended for radiated emissions data to verify passing results. This is recommended to compensate for the measurement uncertainties involved.

3.1.5 Results

The Ubox Home Internet Server Model 1A001-01 met the FCC Class B radiated emissions requirements when tested as described below. (See Appendix A for a complete listing of data points).

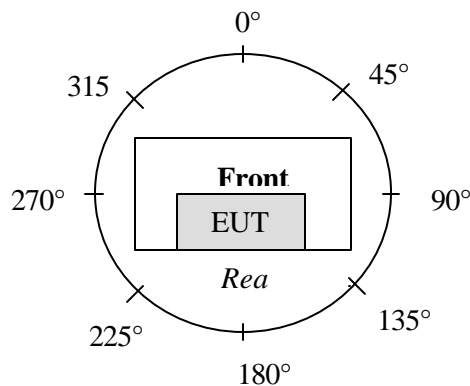
Worst case emissions measured:

Modifications	FCC Class B Radiated Emissions
See Note (1)	Passed: - 5.3 dB at 599.6 MHz Line Voltage: 120 VAC, 60 Hz See Table: A1 Azimuth Angle (see diagram below): 315° Antenna Height: 1 Meter Polarity: Horizontal

Notes

- (1) Final scan. No modifications installed.

Azimuth Angle Diagram



The above results pertain only to the specific item submitted for testing, identified by the product's model and serial numbers.

3.1.6 Radiated Emissions Terms and Calculation

The following is a description of terms and a sample calculation, as appears in the radiated emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading: This is the reading obtained on the spectrum analyzer in dBμV. Any external preamplifiers used are taken into account through internal analyzer settings.

A.F.: This is the antenna factor for the receiving antenna. It is a conversion factor, which converts electric fields strengths to voltages, which can be measured directly on the spectrum analyzer. It is treated as a loss in dB. Cable losses have been included with the A.F. to simplify the calculations. The antenna factor is used in calculations as follows:

$$\text{Reading on Analyzer (dBmV)} + \text{A.F. (dB)} = \text{Net field strength (dBmV/m)}$$

Net: This is the net field strength measurement (as shown above).

Limit: This is the FCC Class B radiated emission limit (in units of dBμV/m). The FCC limits are given in units of μV/m. The following formula is used to convert the units of μV/m to dBμV/m:

$$\text{Limit (dBmV/m)} = 20 * \log(\mu\text{V/m})$$

Margin: This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example for an emission measuring 20.5 dBμV on the spectrum analyzer at 592 MHz:
(Note: This shows a passing result (i.e. a negative margin))

Example only:

<u>Reading</u>		<u>A.F.</u>		<u>Net Reading</u>		<u>Net Reading</u>		<u>FCC limit</u>		<u>Margin</u>
20.5dBμV	+	25 dB	=	45.5 dBμV/m	:	45.5 dBμV/m	-	57 dBμV/m	=	-11.5 dB

3.2 Conducted Emissions

3.2.1 Object

The purpose of this test is to measure the conducted electromagnetic emissions on the AC power lines, pursuant to FCC part 15 Class B requirements. (See Table 3.2.1-1 for the Class B conducted limits).

3.2.2 Procedure

Testing is performed in an Open Area Test Site. Equipment is arranged on the table as described in section 3.1.2. Each individual current-carrying power lead shall be individually connected through a 50 Ω /50 μ H Line Impedance Stabilization Network (LISN). A 2-meter x 2-meter vertical coupling plane is placed 40 cm to the rear of the EUT. The EUT is set into operation such that all parts of the system are exercised, while the RF voltages across the 50 Ω measuring port of the LISN are recorded. The test is repeated for each current-carrying power line of the EUT.

3.2.3 Deviations from Test Method

None

3.2.4 Measurement Uncertainty

A minimum of a 1 dB margin of compliance is recommended for conducted emissions data to verify passing results. This is recommended to compensate for the measurement uncertainties involved.

3.2.5 Results

The Ubox Home Internet Server Model 1A001-01 met the FCC Class B conducted emissions requirements when tested as described below. (See Appendix A for a complete listing of data points).

Worst case emissions measured:

Modifications	FCC Class B Conducted Emissions
See Note (1)	Passed: - 8.6 dB at 521 MHz Line Voltage: 120 VAC, 60 Hz Table: A2

Notes

- (1) Final scan. No modifications installed.

The above results pertain only to the specific item submitted for testing, identified by the product's model and serial numbers.

3.2.6 Conducted Emissions Terms and Calculation

The following is a description of terms and a sample calculation, as appears in the conducted emissions data table. The numbers used in the calculation are for example only. There is no direct correlation to the specific data taken for the product described in this document:

Reading: This is the reading obtained on the spectrum analyzer in dBμV. Any external attenuators used are taken into account through internal analyzer settings.

Limit: This is the FCC Class B conducted emission limit (in units of dBμV).
The FCC limits are given in units of μVolts. The following formula is used to convert the units of μVolts to dBμVolts:

$$Limit (dB\mu V) = 20 * \log (\mu V)$$

Margin: This is the margin of compliance below the FCC limit. The units are given in dB. A negative margin indicates the emission was below the limit. A positive margin indicates that the emission exceeds the limit.

Example for an emission measuring 55 dBμV on the spectrum analyzer at 5.4 MHz.
(Note: This shows a passing result (i.e. a negative margin))

Example only:

<u>Reading</u>		<u>FCC limit</u>		<u>Margin</u>
55 dBμV	-	60 dBμV	=	-5 dB

Table 3.1.1-1: FCC Class B Radiated Emissions Limit

Frequency (MHz)	FCC Class B Quasi-Peak (dBmV/m)	
	3m	10m
30 to 88	40	30
88 to 216	44	33
216 to 230	46	36
230 to 960	46	36
960 to 1000	54	44
Above 1000	*54	*44

* Average detector used.

Table 3.2.1-1: FCC Class B Conducted Emissions Limit

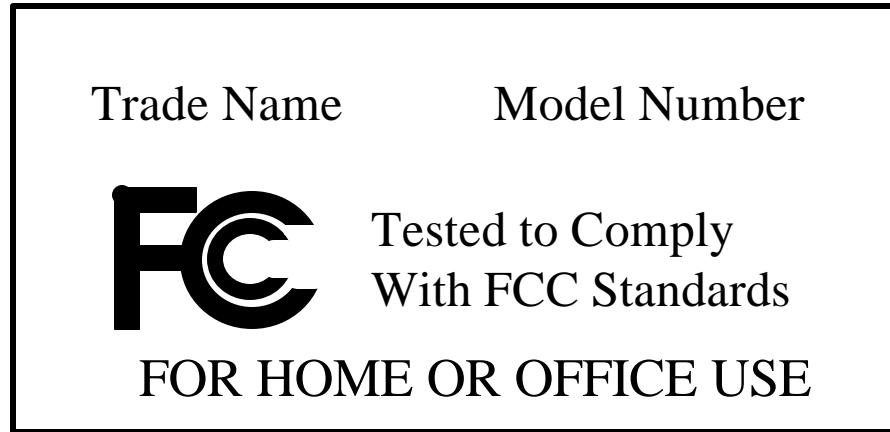
Frequency	Quasi-Peak Limit
.450 MHz to 30 MHz	48 dBμV

(Note: For each table shown above, the stricter limit applies at the frequency transition points.)

3.3 Labeling Requirements

3.3.1 FCC Labeling (taken from FCC CFR 47 section 15.19)

The label shown below must be applied to all products authorized under a DoC, replacing the FCC identifier and compliance statement required for FCC certifications. Please note that a separate label is used for devices, which are assembled from authorized components.



A DoC compliance statement must also be prepared and supplied with the product containing the following information:

- Name and model number of product
- A statement that the product complies with Part 15 of the regulations (Similar to the statement shown in Section 15.19(a)(3))
- Name, address and telephone number of the responsible party (Either the manufacturer, the assembler if applicable, or the importer if applicable)

Information to user (taken from FCC CFR 47 section 15.105)

For a Class B digital device or peripheral, the instructions furnished the user shall include the following or similar statement, placed in a prominent location in the text of the manual.

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- *Reorient or relocate the receiving antenna.*
- *Increase the separation between the equipment and receiver.*
- *Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.*
- *Consult the dealer or an experienced radio/TV technician for help.*

In addition to the above statement, the users manual shall caution the user that changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. (Taken from FCC CFR 47 section 15.21).

3.3.2 Industry Canada Labeling (pursuant to ICES-003 Issue 2, Revision 1)

The following is the suggested text for the Canadian product label for ITE equipment. Although the wording may be combined with the FCC label, it must clearly state the equipment meets the Canadian Interference-Causing Equipment Regulations. (Ref. EMCAB-3 Issue 2)

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

OR

Cet appareil numérique de la classe B respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Please note that Industry Canada requirements state that the label must be in French or English, (the two official languages of Canada).

Appendix A – Test Data

Table A1: FCC Class B Radiated Emissions.

Company: Ucentric Systems
 Test Engineer: Kevin Squires
 M/N: Ubox Home Internet Server Model 1A001-01
 Test Date: February 8, 2001
 OATS #: 2
 Test Configuration: Final Scan (120 VAC, 60Hz)

Polarity (V or H)	Frequency (MHz)	Q.P. Reading (dBμV)	A.F. (dB)	Net (dBμV/m)	FCC Class B Limit @ 3m (dBμV/m)	FCC Margin (dB)
V	49.2	24	9.5	33.5	40	-6.5
V	73.7	16	8	24	40	-16
V	86	12.3	10	22.3	40	-17.7
V	98.3	24.5	12	36.5	44	-7.5
V	184.3	4	12	16	44	-28
V	200.4	10.5	12	22.5	44	-21.5
H	208.9	2.8	12	14.8	44	-29.2
H	383.1	19.3	18	37.3	46	-8.7
V	502.6	19.8	20.5	40.3	46	-5.7
H	532.9	6.4	22	28.4	46	-17.6
V	599.6	17.7	23	40.7	46	-5.3
H	804.1	3.1	24.5	27.6	46	-18.4

Table A2: FCC Class B Conducted Emissions.

Company: Ucentric Systems
 Test Engineer: Kevin Squires
 M/N: Ubox Home Internet Server Model 1A001-01
 Test Date: February 8, 2001
 OATS # 2
 Test Configuration: Final Scan (120 VAC, 60Hz)

Frequency (MHz)	Phase Reading (dBμV)	FCC Class B Quasi-Peak Limit (dBμV)	Margin (dB)
0.521	39.4	48.0	-8.6
1.1	33.5	48.0	-14.5
3.6	31.5	48.0	-16.5
6.4	29.7	48.0	-18.3
19.7	37	48.0	-11.0
23.1	36	48.0	-12.0
Frequency (MHz)	Neutral Reading (dBμV)	FCC Class B Quasi-Peak Limit (dBμV)	Margin (dB)
0.719	36.6	48.0	-11.4
1	31	48.0	-17.0
3.5	30.2	48.0	-17.8
6.1	32.9	48.0	-15.1
18.2	38.6	48.0	-9.4
23.1	35.5	48.0	-12.5

Configuration Photographs

Configuration Photograph

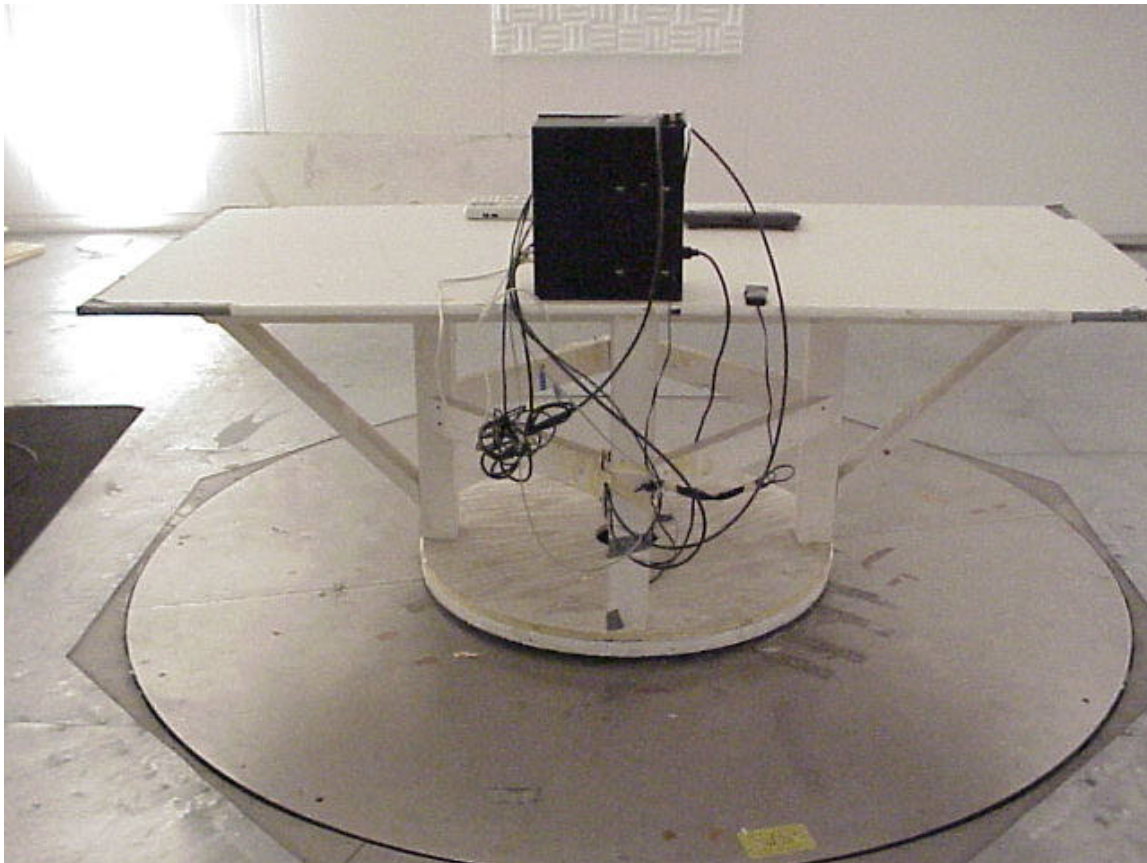
Company: Ucentric Systems
Model: Ubox Home Internet Server Model 1A001-01



Worst Case Radiated Emissions Test Configuration

Configuration Photograph

Company: Ucentric Systems
Model: Ubox Home Internet Server Model 1A001-01



Worst Case Radiated Emissions Test Configuration

Configuration Photograph

Company: Ucentric Systems
Model: Ubox Home Internet Server Model 1A001-
01



Worst Case Conducted Emissions Test
Configuration

Configuration Photograph

Company: Ucentric Systems
Model: Ubox Home Internet Server Model 1A001-01



Worst Case Conducted Emissions Test
Configuration