MET Laboratories, Inc. *Safety Certification - EMI - Telecom Environmental Simulation*
33439 WESTERN AVENUE ! UNION CITY, CALIFORNIA 94587 ! PHONE (510) 489-6300 ! FAX (510) 489-6372

March 11, 2008

Ubiquiti Networks
495-499 Montague Expressway
Milpitas, CA 95035

Dear Robert Pera,

Enclosed is the EMC test report for compliance testing of the Ubiquiti Networks, NS2 , tested to the requirements of ETSI EN 301 489-1 V1.4.1 (2002-08) with ETSI EN 301 489-17 V1.2.1 (2002-08).

Thank you for using the services of MET Laboratories, Inc. If you have any questions regarding these results or if MET can be of further service to you, please feel free to contact me.

Sincerely yours,
MET LABORATORIES, INC.

Jennifer Sanchez
Documentation Department

Reference: (\Ubiquiti Networks \ EMCS80544A-EN489)

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Electromagnetic Compatibility
Test Report

For the

Ubiquiti Networks
NS2

Tested under

ETSI EN 301 489-1 V1.4.1 (2002-08)
with ETSI EN 301 489-17 V1.2.1 (2002-08)

MET Report: EMCS80544A-EN489

March 11, 2008

Prepared For:

Ubiquiti Networks
495-499 Montague Expressway
Milpitas, CA 95035

Electromagnetic Compatibility Criteria
Test Report

For the

Ubiquiti Networks
NS2

Tested under

ETSI EN 301 489-1 V1.4.1 (2002-08)
with ETSI EN 301 489-17 V1.2.1 (2002-08)

MET Report: EMCS80544A-EN489

Savitha Ramesh, Project Engineer
Electromagnetic Compatibility Lab

Jennifer Sanchez
Documentation Department

Engineering Statement: The measurements shown in this report were made in accordance with the procedures indicated, and the emissions from this equipment were found to be within the limits applicable. I assume full responsibility for the accuracy and completeness of these measurements, and for the qualifications of all persons taking them. It is further stated that upon the basis of the measurements made, the equipment tested is capable of operation in accordance with the requirements of ETSI EN 301 489-1 V1.4.1 (2002-08) with ETSI EN 301 489-17 V1.2.1 (2002-08) under normal use and maintenance.

Tony Permsombut, Lab Manager
Electromagnetic Compatibility Lab

Report Status Sheet

Revision	Report Date	Reason for Revision
∅	March 11, 2008	Initial Issue.

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List of Terms and Abbreviations

AC	**A**lternating **C**urrent
ACF	**A**ntenna **C**orrection **F**actor
Cal	**C**alibration
d	Measurement Distance
dB	Decibels
dBΦA	Decibels above one microamp
dBΦV	Decibels above one microvolt
dBΦA/m	Decibels above one microamp per meter
dBΦV/m	Decibels above one microvolt per meter
DC	**D**irect **C**urrent
E	Electric Field
DSL	**D**igital **S**ubscriber **L**ine
ESD	**E**lectrostatic **D**ischarge
EUT	**E**quipment **U**nder **T**est
f	Frequency
CISPR	**C**omite **I**nternational **S**pecial des **P**erturbations **R**adioelectriques (International Special Committee on Radio Interference)
GRP	**G**round **R**eference **P**lane
H	Magnetic Field
HCP	**H**orizontal **C**oupling **P**lane
Hz	Hertz
IEC	**I**nternational **E**lectrotechnical **C**ommission
kHz	kilohertz
kPa	kilopascal
kV	kilovolt
LISN	**L**ine **I**mpedance **S**tabilization **N**etwork
MHz	Megahertz
ΦH	microhenry
ΦF	microfarad
Φs	micro**s**econds
PRF	**P**ulse **R**epetition **F**requency
RF	**R**adio **F**requency
RMS	**R**oot-**M**ean-**S**quare
TWT	**T**raveling **W**ave **T**ube
V/m	**V**olts per **m**eter
VCP	**V**ertical **C**oupling **P**lane

I. Executive Summary

A. Requirements Summary

The following tests were conducted on a sample of the equipment for the purpose of demonstrating compliance with ETSI EN 301 489-1 V1.4.1 (2002-08).

ETSI EN 301 489-1 V1.4.1 (2002) Section and Test Description	Compliance			Comments
	Yes	No	N/A	
Section 8.2: Enclosure of ancillary equipment intended to be used in other than telecommunication center measured on a stand alone basis	√			Measured emissions below applicable limits.
Section 8.3: DC power input/output ports, conducted emissions of equipment intended to be used in other than telecommunication center			√	Not Applicable
Section 8.4: AC mains power input/output ports, conducted emissions of equipment intended to be used in other than telecommunication center	√			Measured emissions below applicable limits.
Section 8.5: Harmonic current emissions (AC mains input port)	√			Measured emissions below applicable limits.
Section 8.6: Voltage fluctuations and flicker (AC mains input port)	√			
Section 9.2: Radio frequency electromagnetic field (80 MHz to 1000 MHz and 1400 MHz to 2000 MHz)	√			No anomalies observed.
Section 9.3: Electrostatic Discharge	√			No anomalies observed..
Section 9.4: Fast transients, common mode	√			
Section 9.5: Radio frequency, common mode	√			
Section 9.6: Transients and surges in the vehicular environment	√			
Section 9.7: Voltage dips and interruptions	√			
Section 9.8: Surge	√			

Table 1. Summary of EMC ETSI EN 301 489-1 V1.4.1 (2002-08)

II. Equipment Configuration

A. Overview

The purpose of this series of tests was to verify compliance of the Ubiquiti Networks, NS2 with the limits of ETSI EN 301 489-1 V1.4.1 (2002-08).

Model(s) Tested:	NS2
Model(s) Covered:	NS2
EUT Specifications:	Primary Power from laptop: 230V/50Hz
	Secondary Power: N/A
Analysis:	The results obtained relate only to the item(s) tested.
Evaluated by:	Savitha Ramesh

Table 2. EUT Summary Table

B. References

ETSI EN 301 489-1 V1.4.1 (2002-08)	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 1: Common technical requirements, 2002
ETSI EN 301 489-17 V1.2.1 (2002-08)	Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for 2.4GHz wideband transmission systems and 5 GHz high performance RLAN equipment, 2002
EN 55022 (CISPR 22)	Limits and methods of measurement of radio disturbance characteristics of information technology equipment, 1998 w/A1: 2000 & A2: 2003
EN 61000-3-2	Electromagnetic compatibility (EMC) Part 3: Limits — Section 2: Limits for harmonic current Emissions (equipment input current # 16 A per phase), 1995 with A1 & A2: 2000 and A14: 2000
EN 61000-3-3	Electromagnetic compatibility (EMC) Part 3: Limits — Section 3: Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current # 16 A, 1994 with A1: 2001
EN 61000-4-2	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 2: Electrostatic discharge immunity test, 1995 with A1: 1998 and A2: 2001
EN 61000-4-3	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 3: Radiated, radio-frequency, electromagnetic field immunity test, 2002
EN 61000-4-4	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 4: Electrical fast transient/burst immunity test, 1995 w/ A1 & A2: 2001
EN 61000-4-5	Electromagnetic compatibility (EMC) Part 4: Testing and measurement techniques Section 5: Surge immunity test, 1995 with A1: 2001
EN 61000-4-6	Electromagnetic compatibility - Part 4: Testing and measurement techniques Section 6.1: Immunity and conducted disturbances, induced by radio-frequency fields, 1996 with A1: 2001
EN 61000-4-11	Electromagnetic compatibility - Part 4: Testing and measurement techniques Section 11: Voltage Dips, short interruptions and voltage variations immunity tests, 1994 A1: 2001
ISO 7637-1	Road vehicles – Electrical disturbance by conduction and coupling – Part 1: Passenger cars and light commercial vehicles with nominal 12 V supply voltage – Electrical transient conduction along supply lines only, 1990

Table 3. Test References

C. Test Site

All testing was performed at MET Laboratories, Inc., 3162 Belick Street, Santa Clara, CA 95054. All equipment used in making physical determinations is accurate and bears recent traceability to the National Institute of Standards and Technology.

D. Description of Test Sample

The Ubiquiti Networks NS2, is a high performance 802.11 outdoor CPE device specifically designed for optimized performance at 2.4GHZ.

Photograph 1. Ubiquiti Networks NS2

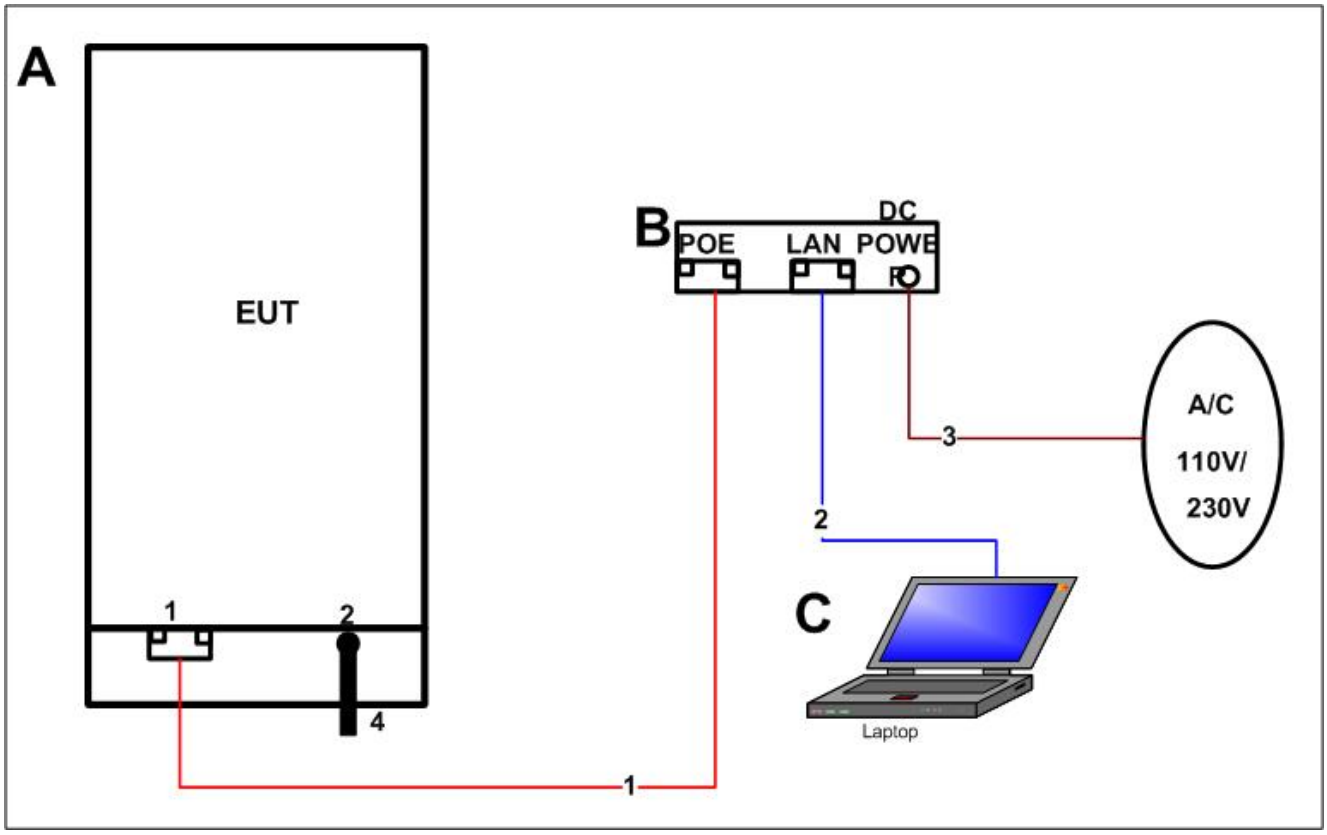


Figure 1. Block Diagram of Test Configurations

E. Equipment Configuration

The EUT was set up as outlined in Figure 1, Block Diagram of Test Setup. All cards, racks, etc., incorporated as part of the EUT is included in the following list.

Ref. ID	Name / Description	Model Number	Serial Number
A	NanoStation 2	NS2	0643 00156DA65660

Table 4. Equipment Configuration

F. Support Equipment

Ubiquiti Networks supplied support equipment necessary for the operation and testing of the NPM-100-2100. All support equipment supplied is listed in the following Support Equipment List.

Ref. ID	Name / Description	Manufacturer	Model Number	*Customer Supplied Calibration Data
B	AC/DC Adaptor	GME Switching	GFP121U-1219B	
C	Laptop	DELL	Inspiron 630m	

Table 5. Support Equipment

* The 'Customer Supplied Calibration Data' column will be marked as either not applicable, not available, or will contain the calibration date supplied by the customer.

G. Ports and Cabling Information

Ref. ID	Port name on EUT	Cable Description or reason for no cable	Qty.	Length (m)	Shielded (Y/N)	Termination Box ID & Port ID
1	A,1	Ethernet	1	2 mts	Y	B, POE
2	B, LAN	Ethernet	1	2 mts	Y	C, Laptop
3	B, DC POWER	Power Cable	1	2 mts	N	230V/110V Power Supply
4	A,2	Terminated with 50 Ohm Load	1	N/A	N/A	N/A

Table 6. Ports and Cabling Information

H. Mode of Operation

The EUT operates in DSSS/OFDM modes.

I. Method of Monitoring EUT Operation

A Spectrum Analyzer and a Power Meter was use to monitor the EUT's transmitter channel and power output.

J. Modifications

a) Modifications to EUT
No modifications were made to the EUT.

b) Modifications to Test Standard
No modifications were made to the test standard.

K. Disposition of EUT

The test sample including all support equipment submitted to the Electro-Magnetic Compatibility Lab for testing was returned to Ubiquiti Networks upon completion of testing.

III. Electromagnetic Compatibility Emission Criteria

Electromagnetic Compatibility Emission Criteria

Radiated Emission: Test Methods and Limits

Test Requirement(s): **ETSI EN 301 489-1 Clause 8.2, ETSI EN 301 489-17 Clause 7.1, (per EN 55022 Clause 6):** For Radiated Emission in the frequency range 30 MHz - 1000 MHz, the EUT shall meet the requirements as specified in *EN 55022 [6]*. The EUT shall meet the limits shown in Table 7.

Frequency Band (MHz)	Quasi-Peak limits for ancillary equipment intended for use in telecommunication centers only 10 m measurement distance (dBµV/m)	Quasi-Peak limits for ancillary equipment intended for use in other than telecommunication centers 10 m measurement distance (dBµV/m)
30 to 230	40	30
230 to 1000	47	37
Note: radiated emissions from ancillary equipment were measured on a stand alone basis.		

Table 7. Radiated Emissions limits from Clause 6 of EN 55022

Environmental Conditions for Radiated Emission	
Ambient Temperature:	22°C
Relative Humidity:	39 %
Atmospheric Pressure:	102 kPa

Test Procedure: The EUT was placed on a 0.8m-high wooden table inside a semi-anechoic chamber (See Photograph 2). The measurement was performed using normal operation of the equipment. The method of testing, test conditions, and test procedures of *Clause 10* of *EN 55022* were used. The frequencies and amplitudes of field strengths were recorded for reference during final measurements. Final radiated measurements were made in the semi-anechoic chamber. Unless otherwise specified, measurements were made using a quasi-peak detector with a 120 kHz bandwidth.
For pre-scanning, the spectrum analyzer scanned the frequency range from 30 MHz to 1000 MHz to obtain an Emission profile of the EUT. For each point of measurement, the turntable was rotated, the positions of the interface cables were varied, and the antenna height was varied between 1 m and 4 m, in order to find the maximum radiated emissions. Measurements were taken at 10 meter distance using this technique with the antenna in two polarizations: horizontal and vertical.

Test Results: The EUT was found compliant with the requirements of Clause 8.2 of ETSI EN 301 489-1, radiated emissions from ancillary equipment intended for use in other than telecommunication center, measured on a stand-alone basis.

Test Engineer(s): Minh Ly

Test Date(s): November 11, 2007

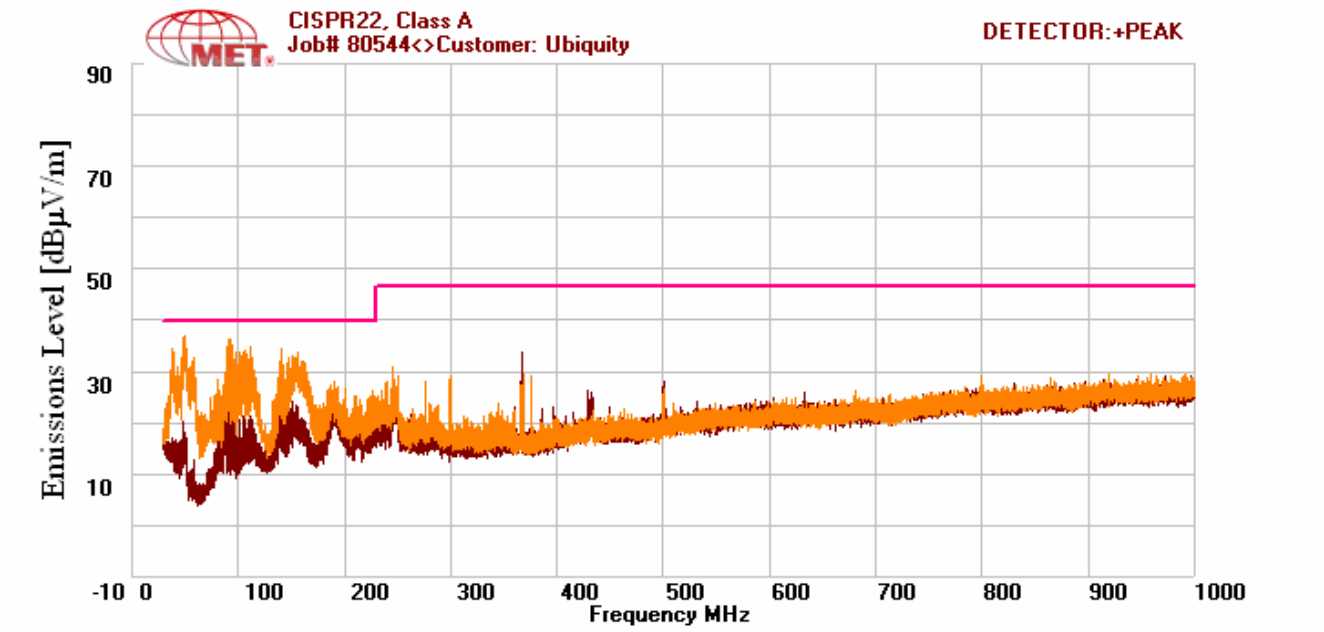
Electromagnetic Compatibility Emission Criteria

Radiated Emission: Test Methods and Limits

Frequency (MHz)	Antenna Polarity (H/V)	EUT Azimuth (Degrees)	Antenna Height (m)	Uncorrected Amplitude QP Detector (dBuV)	Antenna Correction Factor (dB/m) (+)	Cable Loss (dB) (+)	Corrected Amplitude (dBuV/m)	Limit (dBuV/m)	Margin (dB)
37.56	V	207	1	18.40	13.22	1.00	32.62	40.00	-7.38
50.44*	**V**	**61**	**3.14**	**28.90**	**7.61**	**1.16**	**37.67**	**40.00**	**-2.33**
58.72	V	246	2.63	26.05	6.54	1.26	33.85	40.00	-6.15
90.36*	**V**	**177**	**1.52**	**26.90**	**9.17**	**1.58**	**37.64**	**40.00**	**-2.36**
141.2	V	259	1.23	19.42	11.68	2.15	33.25	40.00	-6.75
366.52	H	155	2.42	9.52	15.17	3.30	27.99	47.00	-19.01

Table 8. Radiated Emissions Test Results

Note 1: * - At this frequency, the measured electric-field strength exhibits a margin of compliance that is less than 3 dB below the specification limit. We recommend that every emission measured, have at least a 3 dB margin to allow for deviations in the emission characteristics that may occur during the production process.



Plot 1. Radiated Emissions Test Plot

Electromagnetic Compatibility Emission Criteria

Radiated Emission: Test Methods and Limits

Photograph 2. Radiated Emission, Test Setup

Electromagnetic Compatibility Emission Criteria
Conducted Emission AC Power Interfaces: Test Methods and Limits

Test Requirement(s): **ETSI EN 301 489-1 Clause 8.4, ETSI EN 301 489-17 Clause 7.1 (per EN 55022 Clause 5.1) AC power port:**

Clause 5.1, AC power port: For conducted emission on AC power port in the frequency range 0.15 MHz to 30 MHz, the test method specified in *EN 55022* shall apply.

The EUT shall meet limits shown in Table 9.

Frequency Range (MHz)	Limits for equipment intended to be used in telecommunication centers only (dB:V)		Limits for equipment intended to be used in other than telecommunication centers (dB:V)	
	Quasi-Peak	Average	Quasi- Peak	Average
0.15 - 0.5	79	66	66 to 56	56 to 46
0.5 - 5	73	60	56	46
5 - 30	73	60	60	50
Note: The lower limit shall apply at the transition frequencies. The limits decrease linearly with the logarithm of the frequency in the range of 0.15 MHz to 0.5 MHz.				

Table 9. Mains Terminal Disturbance Voltage Limits from Section 5.1 of EN 55022

Test Procedure: The EUT was placed on a 0.8m-high wooden table above a GRP (See Photograph 3). The measurements were performed using normal operation of the equipment. The method of testing, test conditions, and test procedures of *Clause 9* of *EN 55022* were used. The EMC receiver scanned the frequency range from 0.15 MHz to 30 MHz. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 ohm/50 µH LISN and an EMI Receiver.

Test Results: The EUT was found compliant with the specified requirements of Clause 8.4 of ETSI EN 301 489-1, conducted emissions AC power interfaces of equipment intended to be used in other than telecommunication center..

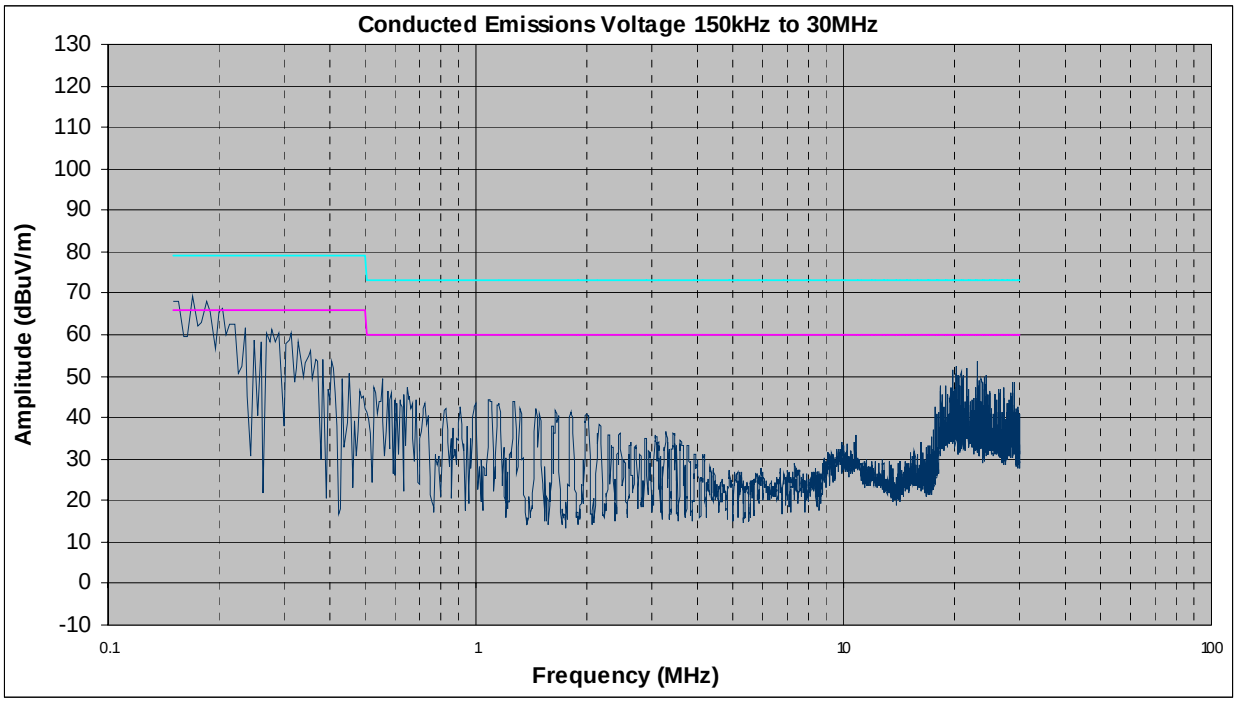
Test Engineer(s): Minh Ly

Test Date(s): November 11, 2007

Electromagnetic Compatibility Emission Criteria
Conducted Emission AC Power Interfaces: Test Methods and Limits

Freq. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.161	57.43	79	PASS	-21.57	48.78	66	PASS	-17.22
20.259	38.57	73	PASS	-34.43	34.71	60	PASS	-25.29
23.128	41.07	73	PASS	-31.93	38.14	60	PASS	-21.86

Table 10. Conducted Emissions - Voltage, Worst Case Emissions, AC Power – Phase Line, 230 VAC/50 Hz

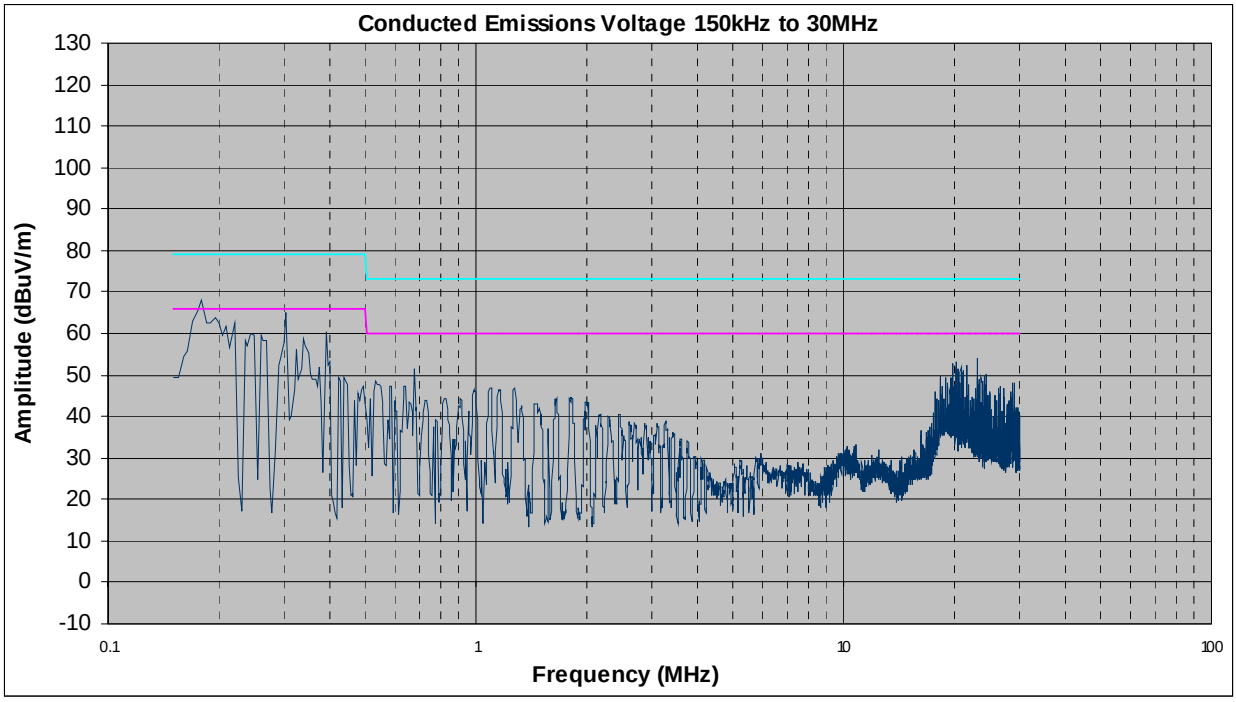


Conducted Emission Limits, Phase Line Plot

Electromagnetic Compatibility Emission Criteria
Conducted Emission AC Power Interfaces: Test Methods and Limits

Freq. (MHz)	Corrected Amplitude (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	Corrected Amplitude (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.163	56.14	79	PASS	-22.86	47.88	66	PASS	-18.12
0.335	43.68	79	PASS	-35.32	40.28	66	PASS	-25.72
23.129	41.57	73	PASS	-31.43	38.91	60	PASS	-21.09

Table 11. Conducted Emissions - Voltage, Worst Case Emissions, AC Power – Neutral Line, 230 VAC/50 Hz



Conducted Emission Limits, Neutral Line Plot

Electromagnetic Compatibility Emission Criteria
Conducted Emission AC Power Interfaces: Test Methods and Limits

Photograph 3. Conducted Emission Mains Interface: Test Method and Limits, Test Setup

L. Limits for Conducted Disturbance at Telecommunication Ports

Test Requirement(s): **ETSI EN 301 489-1, Clause 8.4:**

The EUT shall meet the Conducted Common Mode limits shown in Table 12:

Frequency Range (MHz)	Voltage Limits (dBµV)		Current Limits (dBµA)	
	Quasi-Peak	Average	Quasi- Peak	Average
0.15 - 0.5	97 to 87	84 to 74	53 to 43	40 to 30
5 - 30	87	74	43	30

Note: The limits decrease linearly with the logarithm of the frequency in the range of 0.15 MHz to 0.5 MHz. The current and voltage disturbnace limits are derived for use with an ISN which presents a common mode (asymetric mode) impedance of 150 Σ to the telecommunication port under test (conversion factor is 20 Log_{10} 150/1 = 44 dB).

Table 12. Limits of Conducted Common Mode (Asymmetric Mode) Disturbance at Telecommunication Ports from Clause 5.2 of EN 55022 Class A

Test Procedure: The EUT was located in a shielded enclosure (See Photograph 4). The measurements were performed using normal operation of the equipment. The method of testing, test conditions, and test procedures of *Clause 9* of *EN 55022* were used. The EMC receiver scanned the frequency range from 150 kHz to 30 MHz. The measurements were performed over the frequency range of 0.15 MHz to 30 MHz using a 50 Ω/50 µH LISN as the input transducer to an EMC field intensity meter. The tests were conducted in a RF-shielded enclosure.

Environmental Conditions for Conducted Emission	
Ambient Temperature:	22 °C
Relative Humidity:	48 %

Test Results: The EUT was found to comply with the requirement(s) of this section.

Test Engineer(s): Minh Ly

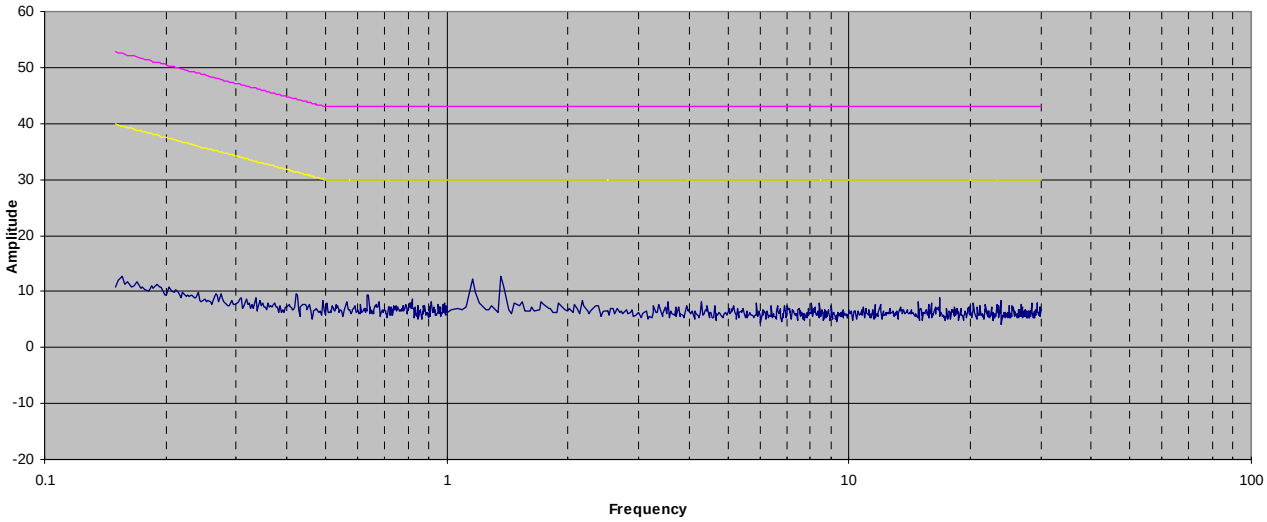
Test Date(s): January 31, 2008

Limits for Conducted Disturbance at Telecommunication Ports

Conducted Emissions - Voltage for Telecommunication Ports, Worst Case Emissions, POE Line

Freq. (MHz)	RAW (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	RAW (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
1.17	10.7	43	PASS	-32.3	7.3	30	PASS	-22.7
1.36	10.4	43	PASS	-32.6	5.85	30	PASS	-24.15
2.18	0.3	43	PASS	-42.7	-6.1	30	PASS	-36.1
4.12	0.1	43	PASS	-42.9	-6.4	30	PASS	-36.4
8.17	-0.5	43	PASS	-43.5	-6.2	30	PASS	-36.2
16.8	-0.6	43	PASS	-43.6	-6.67	30	PASS	-36.67

Table 13. Limits for Conducted Disturbance at Telecommunication Ports Test Results, POE



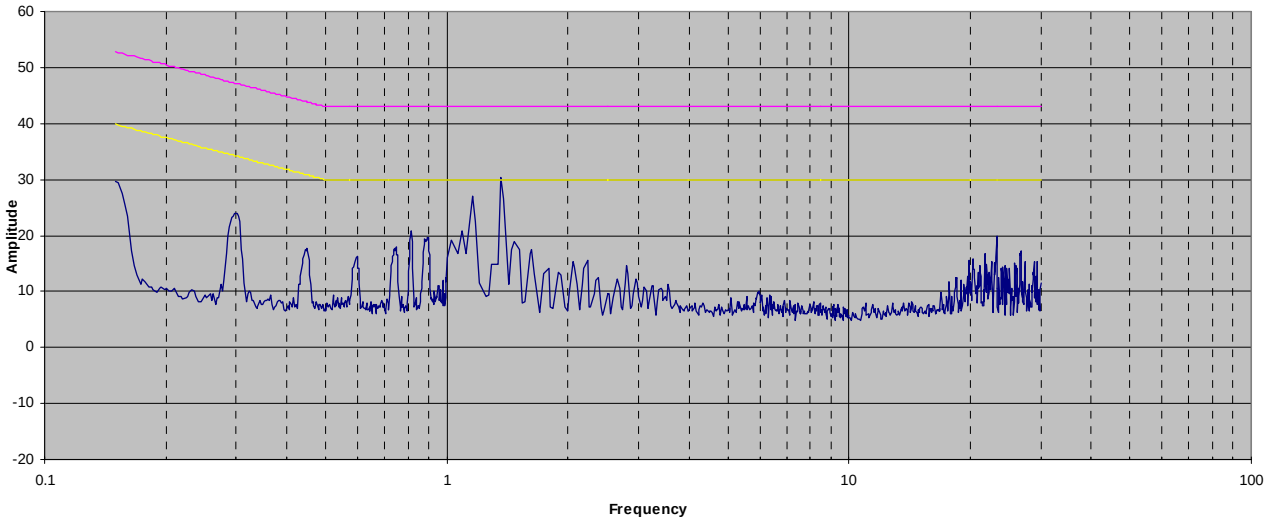
Plot 2. Conducted Emission Limits for Telecommunications Ports, POE Plot

Limits for Conducted Disturbance at Telecommunication Ports

Conducted Emissions - Voltage for Telecommunication Ports, Worst Case Emissions, LAN Line

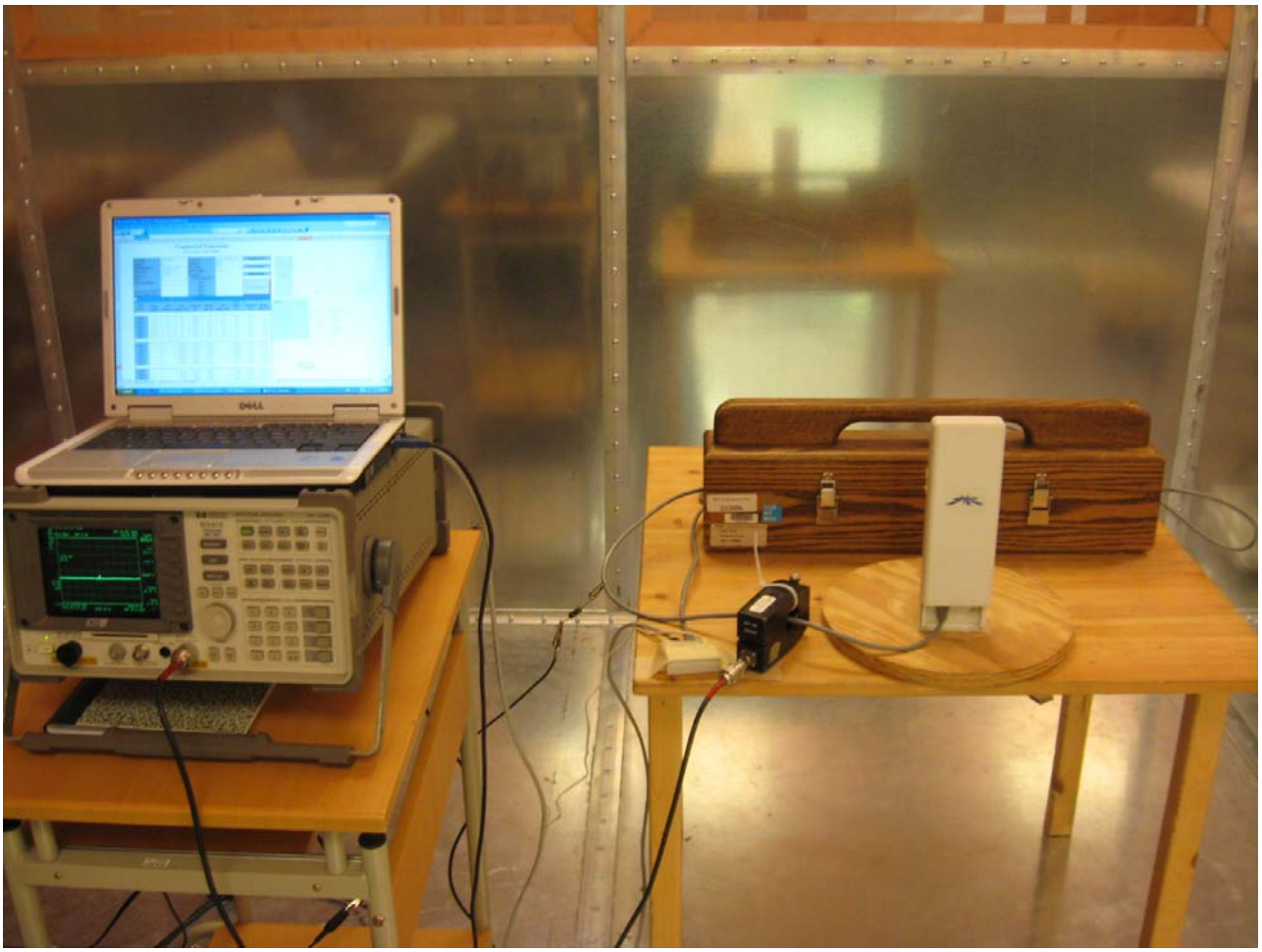
Freq. (MHz)	RAW (dBuV) QP	Limit (dBuV) QP	Results QP	Margin (dB) QP	RAW (dBuV) AVG	Limit (dBuV) AVG	Results AVG	Margin (dB) AVG
0.295	22.58	47.38	PASS	-24.8	22.06	34.38	PASS	-12.32
0.59	12.88	43	PASS	-30.12	10.36	30	PASS	-19.64
1.371	26.86	43	PASS	-16.14	25.9	30	PASS	-4.1
1.141	10.09	43	PASS	-32.91	7.73	30	PASS	-22.27
0.809	16.37	43	PASS	-26.63	13.85	30	PASS	-16.15
0.881	16.73	43	PASS	-26.27	12.26	30	PASS	-17.74

Table 14. Limits for Conducted Disturbance at Telecommunication Ports Test Results, LAN



Plot 3. Conducted Emission Limits for Telecommunications Ports, LAN Plot

Limits for Conducted Disturbance at Telecommunication Ports



Photograph 4. Limits for Conducted Disturbance at Telecommunication Ports

Electromagnetic Compatibility Emission Criteria

8.5 Harmonic Current Emissions

Test Requirement(s): **ETSI EN 301 489-1, Clause 8.5:**

Per *EN 61000-3-2, Clause 8,* the EUT must not produce harmonic currents, which exceed the limits expressed in Table 15.

Harmonic Order	Maximum Permissible Harmonic Current (in Amperes)
Odd Harmonics	
3	2.30
5	1.14
7	0.77
9	0.40
11	0.33
13	0.21
15 < n < 39	0.15 - 15/n
Harmonic Order	**Maximum Permissible Harmonic Current (in Amperes)**
Even Harmonics	
2	1.08
4	0.43
6	0.30
8< n <40	0.23 - 8/n

Table 15. Harmonic Current Emission Limits from Section 7 of EN 61000-3-2

Test Procedure: The EUT was placed on a 0.8m-high wooden table above a GRP (See Photograph 1). The measurement was performed using normal operation of the equipment. The method of testing, test conditions, and test procedures of *EN 61000-3-2.*

ITE is tested with the equipment configured to its rated current. In this case, the equipment, if necessary, may be configured with its power supplies loaded with additional load (resistive) boards to simulate rated current conditions. For ITE systems designed for use with a manufacturer-supplied power distribution system, e.g. transformers, UPS, power conditioner, etc., compliance with the limits of this standard shall be met at the input to the power distribution system.

Test Results: The EUT was found compliant with the specified requirements of Clause 8.5.

Test Engineer(s): Savitha Ramesh

Test Date(s): January 25, 2008

Electromagnetic Compatibility Emission Criteria, Harmonic Current Emissions

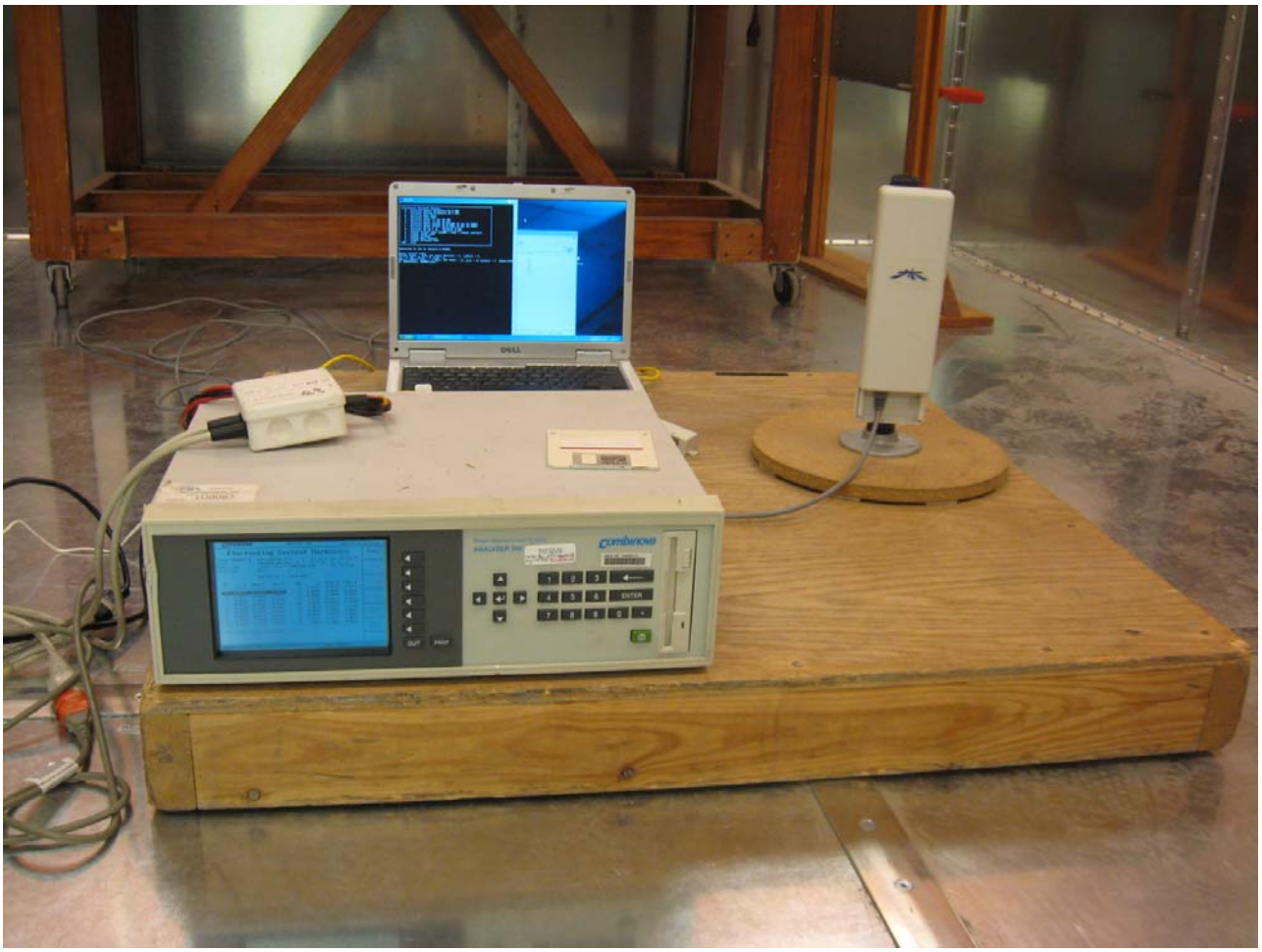
Class (A, B, C, D)	Voltage (V)	Current (I)	Frequency (Hz)	Total Harmonic Distortion (%)
A	229.95V	61.6mA	50.00Hz	269.34%

Harmonic #	Measured (Amps)	Limit (Amps)	Results
2	0.0002	1.080	Pass
3	0.0215	2.300	Pass
4	0.0002	0.430	Pass
5	0.0210	1.140	Pass
6	0.0002	0.300	Pass
7	0.0203	0.770	Pass
8	0.0002	0.230	Pass
9	0.0194	0.400	Pass
10	0.0002	0.184	Pass
11	0.0183	0.330	Pass
12	0.0002	0.153	Pass
13	0.0170	0.210	Pass
14	0.0002	0.131	Pass
15	0.0157	0.150	Pass
16	0.0002	0.115	Pass
17	0.0142	0.132	Pass
18	0.0001	0.102	Pass
19	0.0127	0.118	Pass
20	0.0001	0.092	Pass
21	0.0115	0.107	Pass
22	0.0001	0.084	Pass
23	0.0100	0.098	Pass
24	0.0001	0.077	Pass
25	0.0085	0.090	Pass
26	0.0001	0.071	Pass
27	0.0071	0.083	Pass
28	0.0001	0.066	Pass
29	0.0057	0.078	Pass
30	0.0001	0.061	Pass
31	0.0045	0.073	Pass
32	0.0001	0.058	Pass
33	0.0034	0.068	Pass
34	0.0001	0.054	Pass
35	0.0024	0.064	Pass
36	0.0001	0.051	Pass
37	0.0016	0.061	Pass
38	0.0001	0.048	Pass
39	0.0010	0.058	Pass
40	0.0000	0.046	Pass

Table 16. Harmonic Current Emissions Test Results

Electromagnetic Compatibility Emission Criteria

8.5 Harmonic Current Emissions



Photograph 1. 8.5 Harmonic Current Emissions, Test Setup

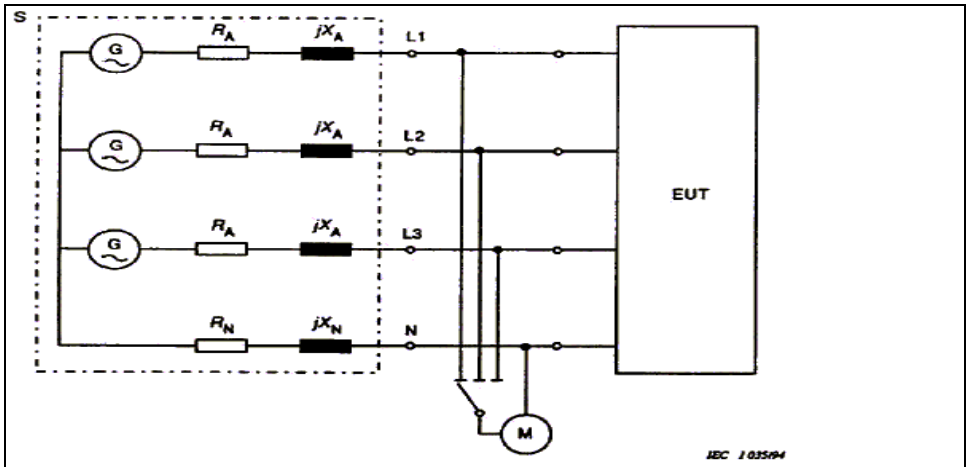
Electromagnetic Compatibility Emission Criteri

8.6 Voltage Fluctuations (Flicker)

Test Requirement(s): **ETSI EN 301 489-1, Clause 8.6:**

The EUT must not produce voltage fluctuations and/or flicker at the supply terminals as measured or calculated according to clause 4, according to limits expressed in *Clause 5*, under test conditions described in *Clause 6* and *Annex A* of *EN 61000-3-3*.

Test Procedure: The EUT was placed on a 0.8m-high wooden table above a GRP (See Photograph 2). The EUT was situated such that the sides of the EUT were no closer than 2.0 m from the walls. The EUT was operated with an AC main source at 220 V. Tests to prove the compliance of the EUT with the limits of *EN 61000-3-3, Section 5* were made using the test circuit provided in Figure 2 of *EN 61000-3-3*. The test circuit consisted of the test power supply, the reference impedance, the EUT, and a flickermeter. The test supply voltage (open-circuit voltage) was the rated voltage of the equipment. 2% ofThe test voltage was maintained within the nominal value. The frequency was 50 0.5%.Hz The total harmonic distortion of the supply voltage was less than 3%. The limits applicable to voltage fluctuations and flicker at the supply terminals of the EUT were automatically measured with the analyzer.



EUT equipment under test

M measuring equipment

S supply source consisting of the supply voltage generator G and reference impedance Z with the elements:

R_A = 0,24 Ω; jX_A = 0,15 Ω at 50 Hz;

R_N = 0,16 Ω; jX_N = 0,10 Ω at 50 Hz.

The elements include the actual generator impedance.

When the source impedance is not well defined, see 6.2.

G voltage source in accordance with 6.3.

NOTE – In general, three-phase loads are balanced, and R_N and X_N can be neglected, as there is no current in the neutral wire.

Figure 2. Test Circuit for EN 61000-3-3

Electromagnetic Compatibility Emission Criteria

8.6 Voltage Fluctuations (Flicker)

Test Results: The EUT was found compliant with the specified requirements of Clause 8.6.

Voltage (V)	Current (I)	Frequency (Hz)	Total Harmonic Distortion (%)
240.2V	66.1mA	49.996Hz	269.34%

Average (Is) relative voltage Drop	**d(t)**	0.004%
Relative voltage fluctuation (3s)	**dpp**	0.001%
d(t) at steady - state level	**Yes /No**	Yes
Last relative steady - state level change	**dc**	0.000
Last transition swing	**dmax**	-----
Normalized peak flicker (3s)	**Pp**	0.00

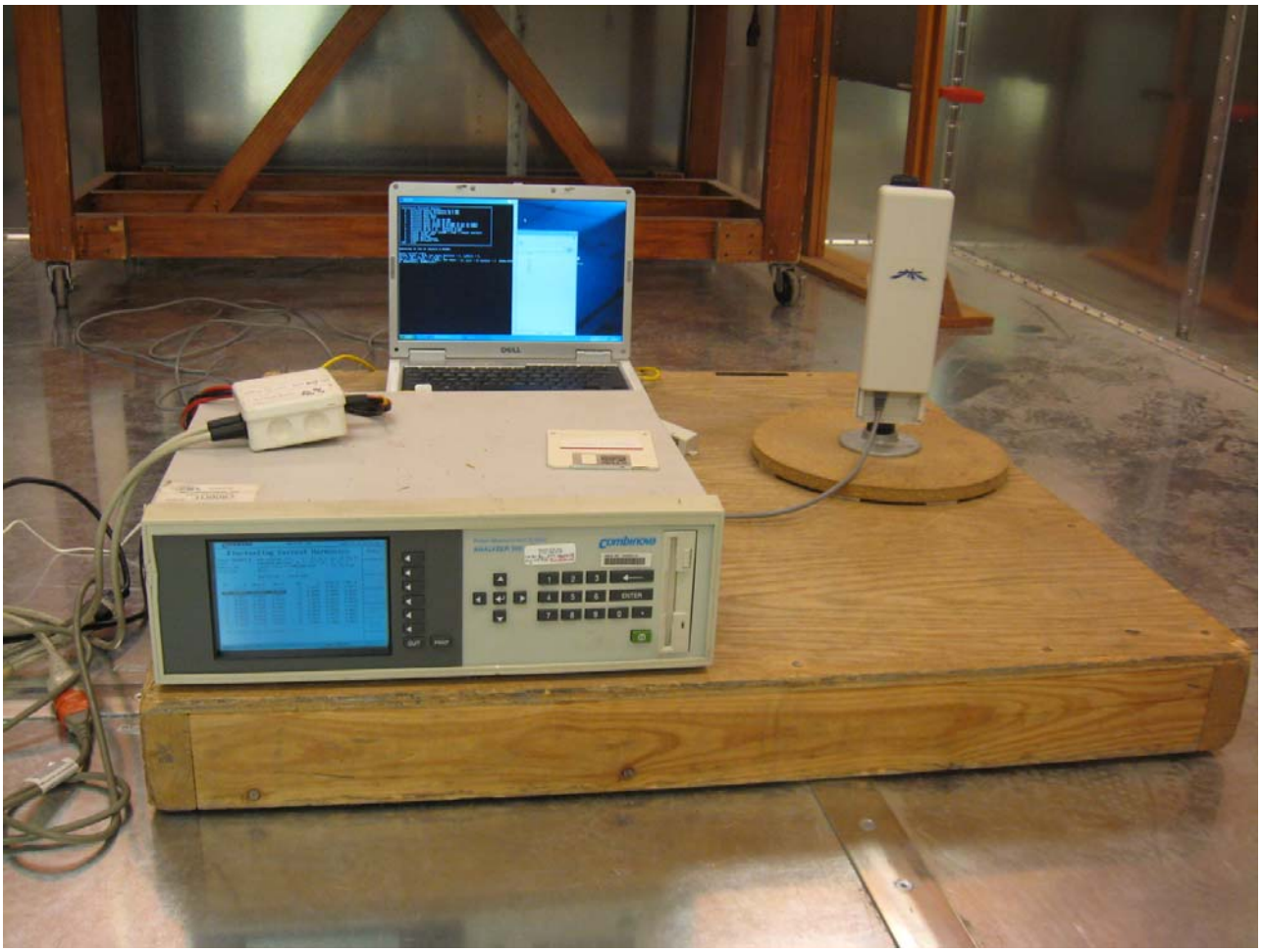
Parameter		Observation Period		Limit
		Short	Long	
Observation Time	**Tp**	10 min	120 min	
Maximum relative voltage change	**dmax**	0.00%	0.00%	4
Max rel. steady-state voltage change	**dc**	0.00%	0.00%	3
Duration of d(t) > 3 %	**t**	0.00s	0.00s	0.2
Short term flicker severity	**Pst**	0.00	0.00	1.00
Long term flicker severity	**Plt**	0.00	0.00	0.65

Test Engineer(s): Savitha Ramesh

Test Date(s): January 25, 2008

Electromagnetic Compatibility Emission Criteria

8.6 Voltage Fluctuations (Flicker)



Photograph 2. 8.6 Voltage Fluctuations (Flicker), Test Setup

III. Electromagnetic Compatibility Immunity Criteria

Electromagnetic Compatibility Immunity Criteria

Radio Frequency Electromagnetic Field

Test Requirement(s): **ETSI EN 301 489-1 Clause 9.2, ETSI EN 301 489-4 17 Clause 7.2:**

The test method shall be in accordance with *EN 61000-4-3 [9]*.

The EUT must not be susceptible to a radiated electromagnetic field 80% amplitude modulated with 1 kHz in the frequency range of 80 MHz to 1000 MHz and 1400 MHz to 2000 MHz at 3 V/m. If the wanted signal is modulated at 1000 Hz, then an audio signal of 400 Hz shall be used. Performance Criterion ETSI 301 489-17 Clause 6.3 and 6.5 apply.

Test Procedure: The EUT was placed on a 0.8m-high wooden table in the center of an anechoic chamber, and the radiating antenna was placed 3 m in front of the EUT (See Photograph 5 and Photograph 6). Support equipment for the EUT was located outside of the test room. The EUT was exposed to the required immunity fields. The amplitude and frequency of the radiated interference was set by an automated, computer controlled system.

Environmental Conditions for Radio Frequency Electromagnetic Field	
Ambient Temperature:	21°C
Relative Humidity:	35%

The chamber and signal generation/amplification system is calibrated to insure a uniform RF field with no EUT present. The recorded signal is played back by the controlling computer with the EUT placed in the area of uniform field. The signal source was stepped through the applicable frequency range at a rate no faster than 1% of the fundamental, as recommended in *EN 61000- 4-3*. The amplitude of the signal was modulated 80% with frequency of 1 kHz over the frequency range of 80 MHz to 1000 MHz and 1400 MHz to 2000 MHz at 3 V/m. Field presence was monitored during testing via a field probe placed in close proximity to the EUT. Throughout testing, the EUT was closely monitored for signs of susceptibility. The test was performed with the antenna oriented in both a horizontal and vertical polarization.

Test Results: The EUT was found compliant with the specified Radio Frequency Electromagnetic Field Immunity limits of *ETSI EN 301 489-1 Clause 9.2*.

Test Engineer(s): Savitha Ramesh

Test Date(s): January 23, 2008

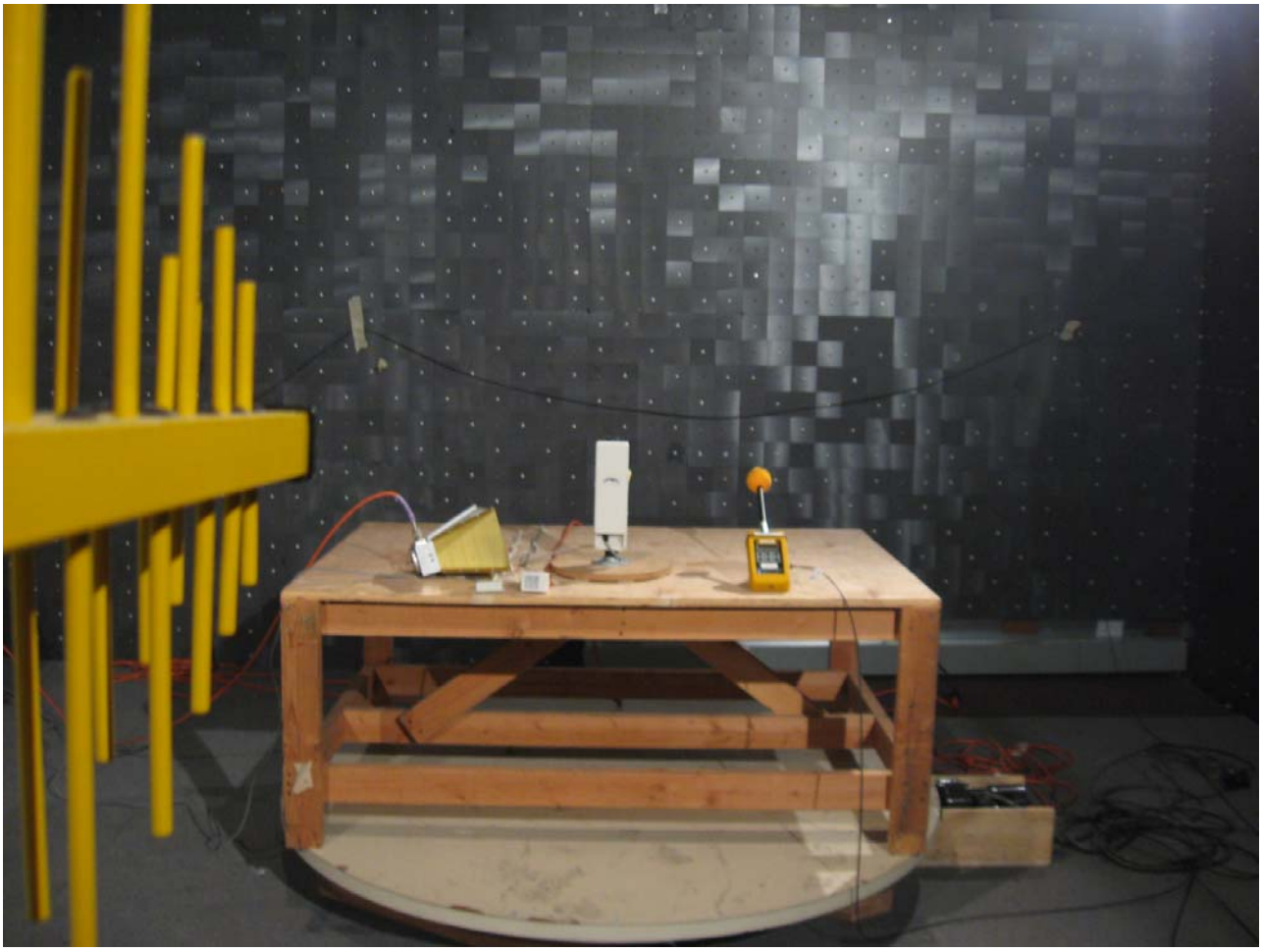
Electromagnetic Compatibility Immunity Criteria

Radio Frequency Electromagnetic Field

Severity (V/m)	Polarity (H/V)	Start Frequency (MHz)	Stop frequency (MHz)	Modulation (Freq & Type)	Results			
					Front	Back	Right	Left
3	V	80	1000	1 KHz AM 80%	Pass	Pass	Pass	Pass
3	H	80	1000	1 KHz AM 80%	Pass	Pass	Pass	Pass
3	V	1400	2000	1 KHz AM 80%	Pass	Pass	Pass	Pass
3	H	1400	2000	1 KHz AM 80%	Pass	Pass	Pass	Pass

Table 17. Radiated Immunity Test Results

Radio Frequency Electromagnetic Field – Test Setup Photograph



Photograph 5. Radio Frequency Electromagnetic Field (Below 1 GHz), Test Setup

Electromagnetic Compatibility Immunity Criteria

Radio Frequency Electromagnetic Field

Photograph 6. Radio Frequency Electromagnetic Field (Above 1 GHz), Test Setup

Electromagnetic Compatibility Immunity Criteria

9.3 Electrostatic Discharge

Test Requirement(s): **ETSI EN 300 489-1 Clause 9.3:**

Per *EN 61000-4-2*, the EUT was tested with 8 kV, applied to non-conductive surfaces, and to air discharges of up to ± contact discharges of up to ± 4 kV, applied to conductive surfaces of the EUT and the VCP. Performance Criterion B applies.

The EUT was placed on a 0.8m-high wooden table located above a ground reference plane (GRP) (See Photograph 3), with a thickness of at least 0.25 mm, thus satisfying the requirements of *IEC 61000-4-2*:

> It [the GRP] shall be a metallic sheet (copper or aluminum) of 0.25 mm minimum thickness.... The minimum size of the reference plane is 1 m2, the exact size depending on the dimensions of the EUT. It shall project beyond the EUT or coupling plane by at least 0.5 m on all sides....

A horizontal coupling plane (HCP), 1.6 m x 0.8 m, shall be placed on the table. The EUT and cables shall be isolated from the coupling plane by an insulating support 0.5 mm thick.

A copper vertical coupling plane (VCP) measuring 0.5 m X 0.5 m was placed 0.1 m from the EUT. The VCP was connected to the GRP through two series 470 k Ω resistors. The GRP was connected to safety ground. The EUT was connected to the grounding system through its power cable only, in accordance with *EN 61000-4-2, Section 7.1*, *paragraph 4*:

> The EUT shall be connected to the grounding system in accordance with its installation specifications. No additional grounding connections are allowed.

Ambient Temperature:	22°C
Relative Humidity:	38%
Atmospheric Pressure:	102.03kPa

Environmental Conditions during EN 61000-4-2 Testing

Test Procedure: 8kV were applied to non-conductive Air discharges of up to ± surfaces. ± Contact discharges of up to 4 kV were applied to conductive surfaces of the EUT. 4 kV were applied to Contact discharges of ± the VCP. Negative and positive discharges were applied at least ten times to each selected discharge point. The functionality of the EUT was determined during and after each discharge in accordance with Performance Criterion B.

Test Results: The EUT as tested was found compliant with the requirements of Clause 9.3

Test Engineer(s): Savitha Ramesh

Test Date(s): January 25, 2008

Electromagnetic Compatibility Immunity Criteria

9.3 Electrostatic Discharge

	Volts (+/-)	Surface/Location	Results	Anomalies
Vertical Coupling Plane	2 kV	Front	Pass	No anomalies observed
	2 kV	Back	Pass	No anomalies observed
	2 kV	Right	Pass	No anomalies observed
	2 kV	Left	Pass	No anomalies observed
	4 kV	Front	Pass	No anomalies observed
	4 kV	Back	Pass	No anomalies observed
	4 kV	Right	Pass	No anomalies observed
	4 kV	Left	Pass	No anomalies observed
HCP (for Table Top)	2 kV	Front	Pass	No anomalies observed
	2 kV	Back	Pass	No anomalies observed
	2 kV	Right	Pass	No anomalies observed
	2 kV	Left	Pass	No anomalies observed
	4 kV	Front	Pass	No anomalies observed
	4 kV	Back	Pass	No anomalies observed
	4 kV	Right	Pass	No anomalies observed
	4 kV	Left	Pass	No anomalies observed
Contact Discharge	2 kV	Front	Pass	No anomalies observed
	2 kV	Back	Pass	No anomalies observed
	2 kV	Right	Pass	No anomalies observed
	2 kV	Left	Pass	No anomalies observed
	4 kV	Front	Pass	No anomalies observed
	4 kV	Back	Pass	No anomalies observed
	4 kV	Right	Pass	No anomalies observed
	4 kV	Left	Pass	No anomalies observed
Air Discharge	2 kV	Front	Pass	No anomalies observed
	2 kV	Back	Pass	No anomalies observed
	2 kV	Right	Pass	No anomalies observed
	2 kV	Left	Pass	No anomalies observed
	4 kV	Front	Pass	No anomalies observed
	4 kV	Back	Pass	No anomalies observed
	4 kV	Right	Pass	No anomalies observed
	4 kV	Left	Pass	No anomalies observed
	8 kV	Front	Pass	No anomalies observed
	8 kV	Back	Pass	No anomalies observed
	8 kV	Right	Pass	No anomalies observed
	8 kV	Left	Pass	No anomalies observed

Table 18. ESD Test Results

Electromagnetic Compatibility Immunity Criteria

9.3 Electrostatic Discharge

Photograph 3. 9.3 Electrostatic Discharge, Test Setup

Electromagnetic Compatibility Immunity Criteria

9.4 Fast Transient, Common Mode

Test Requirement(s): **ETSI EN 300 489-1, Clause 9.4:**

Per *EN 61000-4-4*, The EUT was tested with the electrical fast transients shown in Figure 3, having an amplitude of ± 1 kV applied to the AC power cables (plug type); ± 0.5 kV applied to I/O and data lines. Only cables that could potentially exceed 3 m in length in real-world application of the EUT need be tested. Performance criterion B applies for all tests.

Test Procedure: The EUT was placed on a 0.8m-high wooden table above a GRP extending at least 1 m beyond all sides of the EUT (See Photograph 4). The Electrical Fast Transient/Burst (EFT/B) generator and the coupling clamp were mounted to the ground plane. For application of the fast transients to the power lines, power was supplied to the EUT through the EFT/B generator. For application of the fast transients to I/O, data and control lines, the cables were individually placed in the coupling clamp, which was also connected to the EFT/B generator.

The EFT/B generator was operated to couple the required transient bursts to each line of the power input in common mode. Transient bursts were applied for a period not less than one minute with both positive transients and negative transients.

The EUT was then powered from an isolated circuit, and selected I/O, data and control cables were placed one at a time in the capacitive coupling clamp. The EFT/B generator was operated to inject the required bursts onto each selected cable via the coupling clamp.

Throughout testing, the EUT was monitored closely for signs of susceptibility.

Electromagnetic Compatibility Immunity Criteria

9.4 Fast Transient, Common Mode

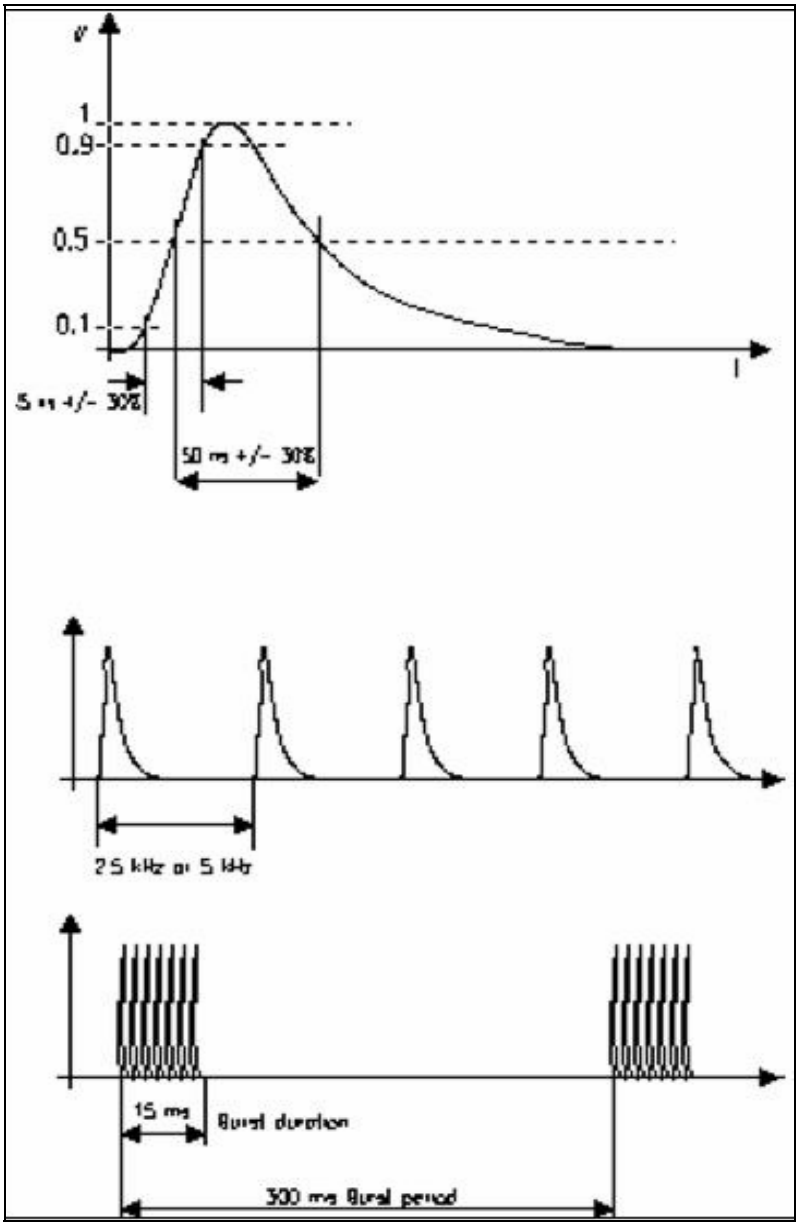


Figure 3. EN 61000-4-4 Test Waveform

Electromagnetic Compatibility Immunity Criteria

9.4 Fast Transient, Common Mode

Test Results: The EUT as tested was found compliant with the requirements of Clause 9.4.

Port Name	Slot/EUT Side	Test Level	Results	Anomalies
AC Power / Differential Mode				
Phase	Back	±1.0 kV	Pass	No Anomalies Observed
Phase to Neutral	Back	±1.0 kV	Pass	No Anomalies Observed
AC Power / Common Mode				
Phase to Ground	Back	±1.0 kV		Not Applicable
I/O & DC Power				
Ethernet	Back	±500 V	Pass	No Anomalies Observed

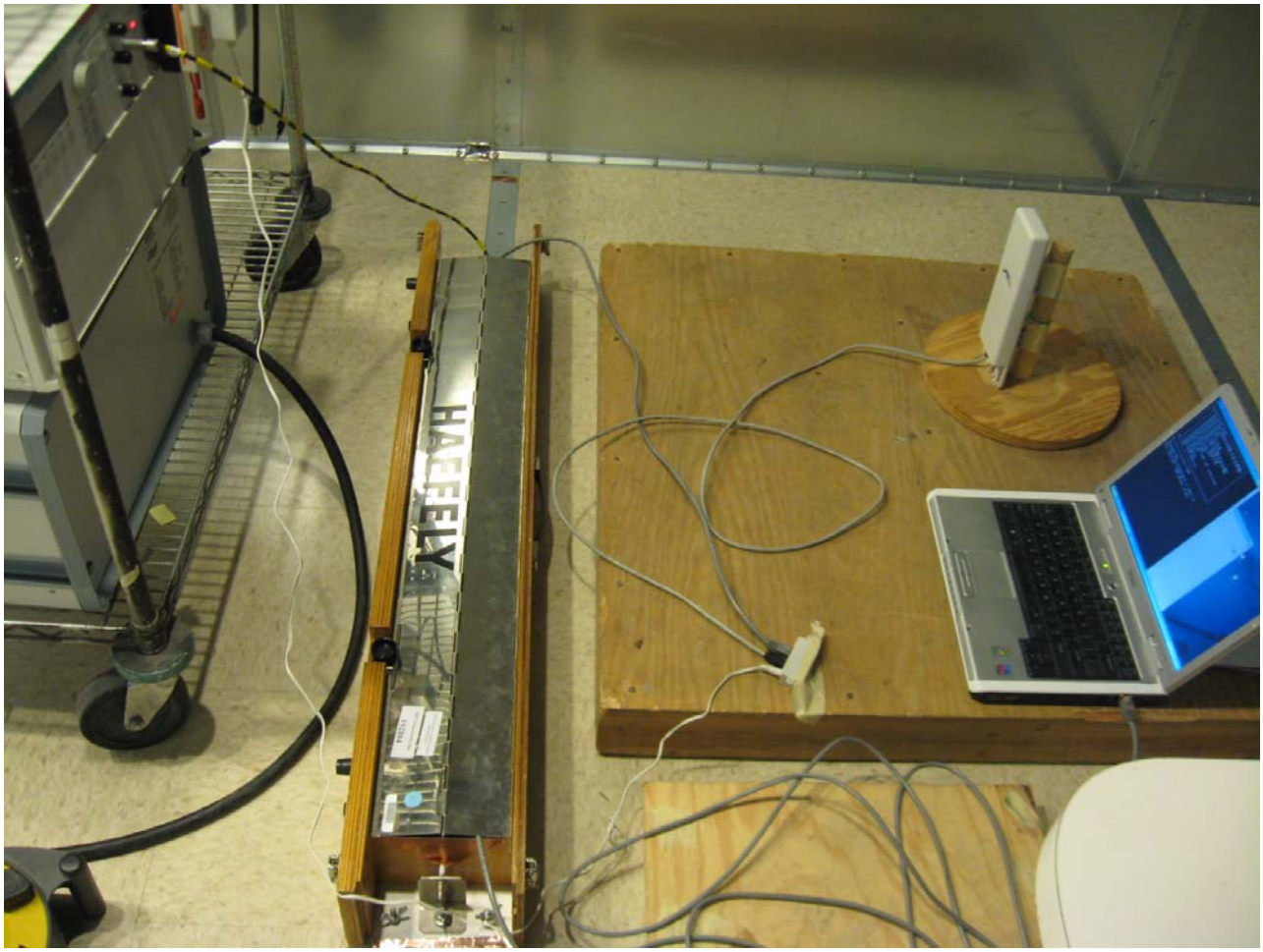
Table 19. EFT Test Results

Test Engineer(s): Savitha Ramesh

Test Date(s): January 30, 2008

Electromagnetic Compatibility Immunity Criteria

9.4 Fast Transient, Common Mode



Photograph 4. 9.4 Fast Transient, Common Mode, Test Setup

Electromagnetic Compatibility Immunity Criteria

9.5 Radio Frequency, Common Mode

Test Requirement(s): **ETSI EN 300 489-1, Clause 9.5:**

Per *EN 61000-4-6*, all interconnecting cables on the EUT including AC power lines, data and control lines shall be tested for immunity to conducted radio frequencies in the range 0.15 MHz - 80 MHz. Using the bulk current injection method, I/O and data cables must be tested to a level of 3 Vrms. The injection voltage shall be amplitude modulated at 80% by a 1 kHz tone. Performance Criterion A applies for all tests.

Test Procedure: The EUT was placed on a 0.8m-high wooden table above a GRP extending at least 1 m beyond all sides of the EUT (See Photograph 5). For power line cables, a Coupling Decoupling Network (CDN) was used. The CDN was initially calibrated in a calibration jig with a 50 Ω RF load and a 100 Ω matching resistor on one side, and a 100 Ω matching resistor and the receiver (spectrum analyzer) on the other. The injection voltage level was adjusted to maintain a monitored voltage of 3 Vrms across the frequency range (0.15 MHz to 80 MHz).

For cables other than the power line in the frequency range 0.15 MHz - 80 MHz, the BCI was initially calibrated in a calibration jig with a 50 Ω RF load and a 100 Ω matching resistor on one side, and a 100 Ω matching resistor and the receiver (spectrum analyzer) on the other. The injection voltage level was adjusted to maintain a monitored voltage of 3 Vrms across the frequency range (0.15 MHz to 80 MHz). The BCI was clamped around the cable under test at a distance of 0.1 to 0.3 m from the EUT.

Test Results: The EUT as tested was found compliant with the requirements of Clause 9.5.

Slot/EUT Side	Port Name	Results	Anomalies
AC Power Line/ AC/DC Adaptor	Power	Pass	No Anomalies observed
Ethernet (POE)/ EUT/Under	Ethernet Port	Pass	No Anomalies observed
Ethernet/AC/DC Adaptor	Ethernet Port	Pass	No Anomalies observed

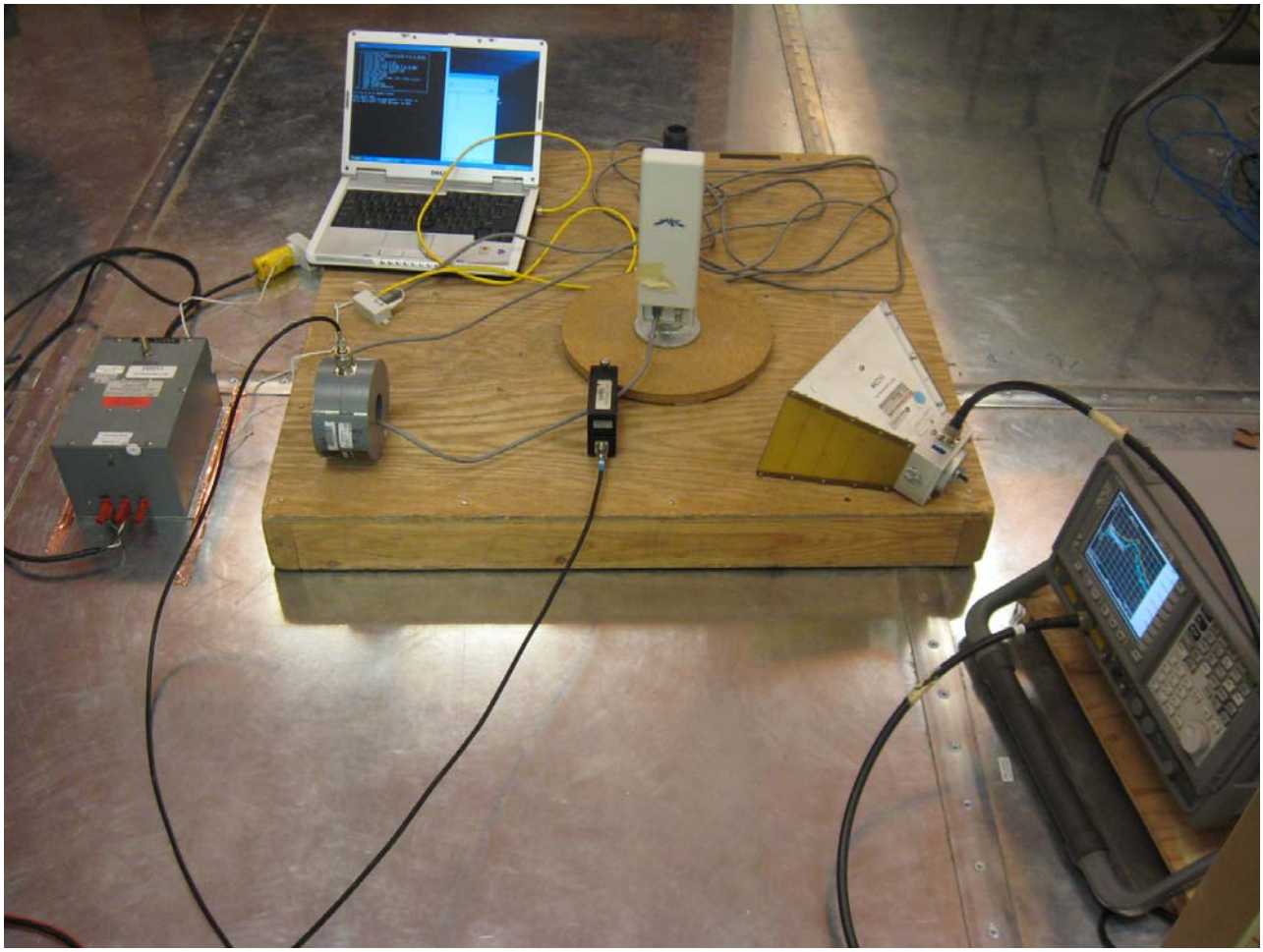
Table 20. Conducted Immunity Test Results

Test Engineer(s): Savitha Ramesh

Test Date(s): January 25, 2008

Electromagnetic Compatibility Immunity Criteria

9.5 Radio Frequency, Common Mode



Photograph 5. 9.5 Radio Frequency, Common Mode, Test Setup

Electromagnetic Compatibility Immunity Criteria

9.7 Voltage Dips and Short Interruptions

Test Requirement(s): **ETSI EN 300 489-1, Clause 9.7:**

Per *EN 61000-4-11*, the EUT shall be tested for the following voltage dips, interruptions and variations:

5.2.4.4 Voltage Dips and Short Interruptions		
Unit	**Test level and Characteristic**	**Performance Criterion**
Voltage reduction % Duration ms	30 10	B
Voltage reduction % Duration ms	60 100	C
Voltage reduction % Duration ms	>95 5000	C

Table 21. Voltage Dips and Short Interruptions Limits

Test Procedure: The EUT was placed on a 0.8m-high wooden table and situated in the center of a GRP. The EUT was provided with AC power via the programmable power supply (See Photograph 6). The power supply was programmed to perform the applicable set of voltage dips, interruptions and variations. Each sequence was repeated three times to verify the results.

Results: The EUT as tested was found compliant with the requirements of Clause 9.6.

Test Type	Parameters	No of Repetitions	Results	Anomalies
Voltage Dips	30% drop for 10 ms	3	Pass	No anomalies observed
Voltage Dips	60% drop for 100 ms	3	Pass	No anomalies observed
Short Interrupts	> 95% drop for 5000 ms	3	Pass	No anomalies observed

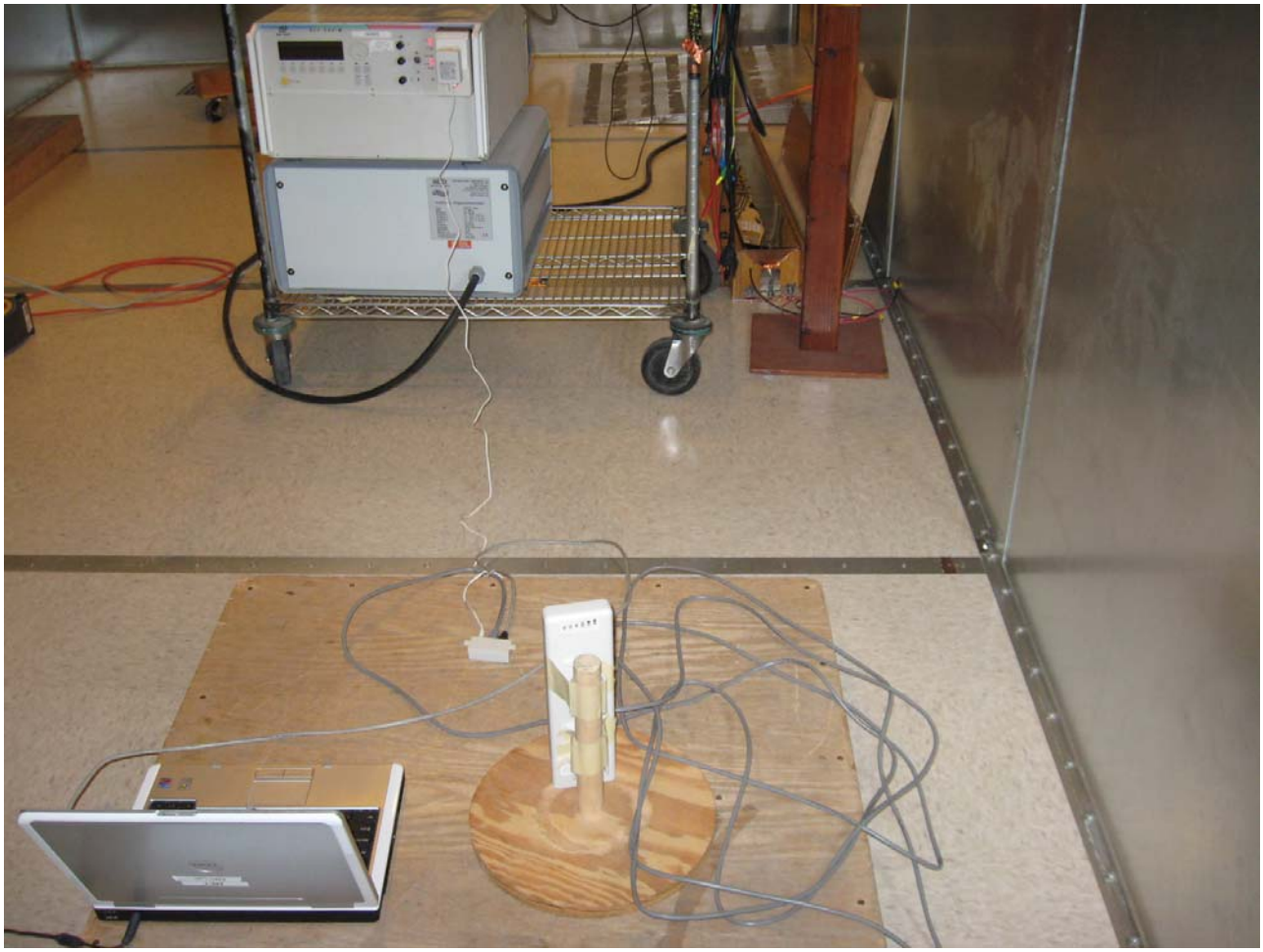
Table 22. VDI Test Results

Test Engineer: Savitha Ramesh

Test Date: January 29, 2008

Electromagnetic Compatibility Immunity Criteria

9.7 Voltage Dips and Short Interruptions



Photograph 6. 9.7 Voltage Dips and Short Interruptions, Test Setup

Electromagnetic Compatibility Immunity Criteria

9.8 Surges

Test Requirement(s): **ETSI EN 301 489-1, Clause 9.8:**

The EUT was tested with the surge waveforms shown on the following page, having an open ± 0.5 kV applied to the I/O interconnection cables.circuit amplitude of Performance criterion B applies for I/O cables.

The EUT was tested with the surge waveforms shown on the following page, having an open circuit amplitude of ± 0.5 kV (differential mode), and ±1 kV (common mode) applied to the AC power cables. Performance Criterion B applies for AC power cables.

Test Procedure: The EUT was placed on a 0.8m-high wooden table above a GRP extending at least 1 m beyond all sides of the EUT (See Photograph 7). For I/O port surges, For application of the fast transients to I/O, data and control lines, the cables were individually placed in the coupling clamp, which was also connected to the EFT/B generator. These three tests were performed with positive surges and negative surges.

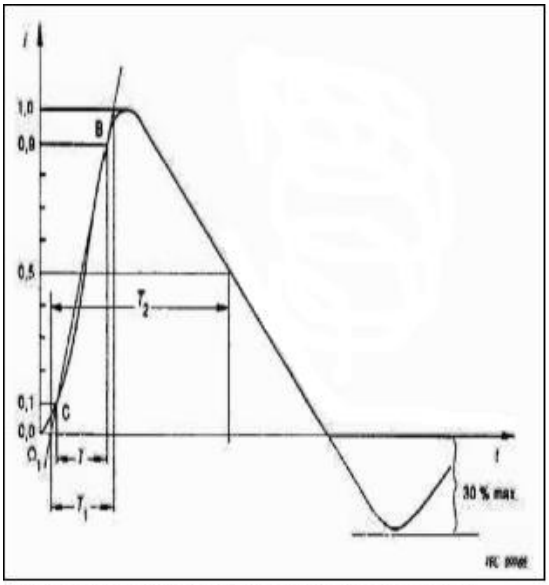
AC power [where applicable] was supplied to the EUT through the Combination Wave Generator. The combination wave generator was configured to produce the following output:

Open Circuit Voltage:	Front Time = 1.2 Φs Time to Half = 50 Φs
Short Circuit Current:	Front Time = 8 Φs Time to Half = 20 Φs
Telecom wave parameters:	Front Time = 10 Φs Time to Half = 700 Φs

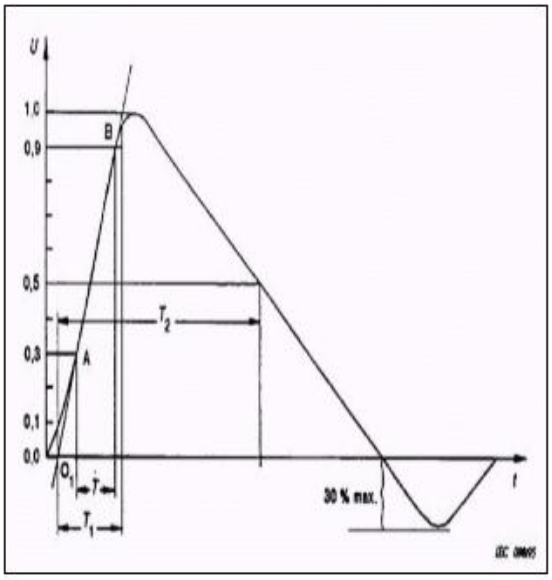
Table 23. Combination Wave Generator Test Parameters for EN 61000-4-5

Electromagnetic Compatibility Immunity Criteria

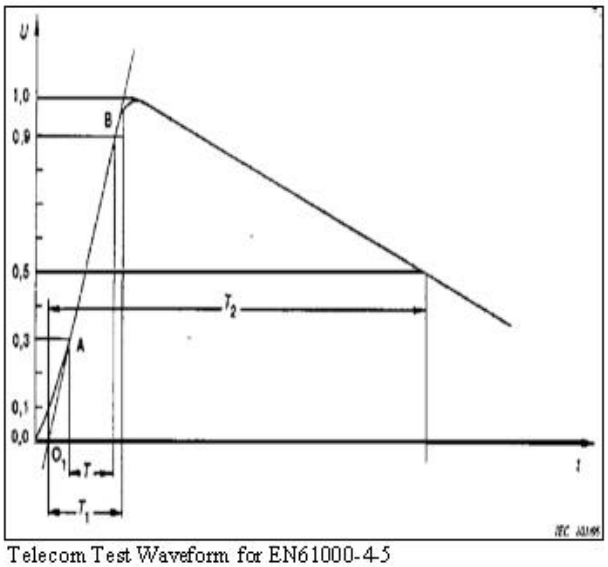
9.8 Surges



Short Circuit Current Waveform for EN 61000-4-5



Open Circuit Voltage Waveform for EN 61000-4-5



Telecom Test Waveform for EN61000-4-5

Figure 4. EN 61000-4-5 Surge Test Waveforms

Electromagnetic Compatibility Immunity Criteria

9.8 Surges

Test Procedure (Continued): For AC power lines, the Combination Wave Generator was operated to couple the required surges between each EUT input power phase and ground, and from line to line. These three tests were performed with positive surges and negative surges, synchronized with the power input phase at 0E, 90E, and 270E. Throughout testing, the EUT was monitored closely for signs of susceptibility. For I/O port surges, surge waveforms were applied via a CDN, in accordance with *Section 7 of EN 61000-4-5*.

Test Results: The EUT as tested was found compliant with the requirements of Clause 9.8.

Port Name	Phase	Test Level	Results	Anomalies
AC, Differential Mode				
Phase to Neutral	0	±1.0 kV	Pass	No anomalies observed
	90	±1.0 kV	Pass	No anomalies observed
	270	±1.0 kV	Pass	No anomalies observed

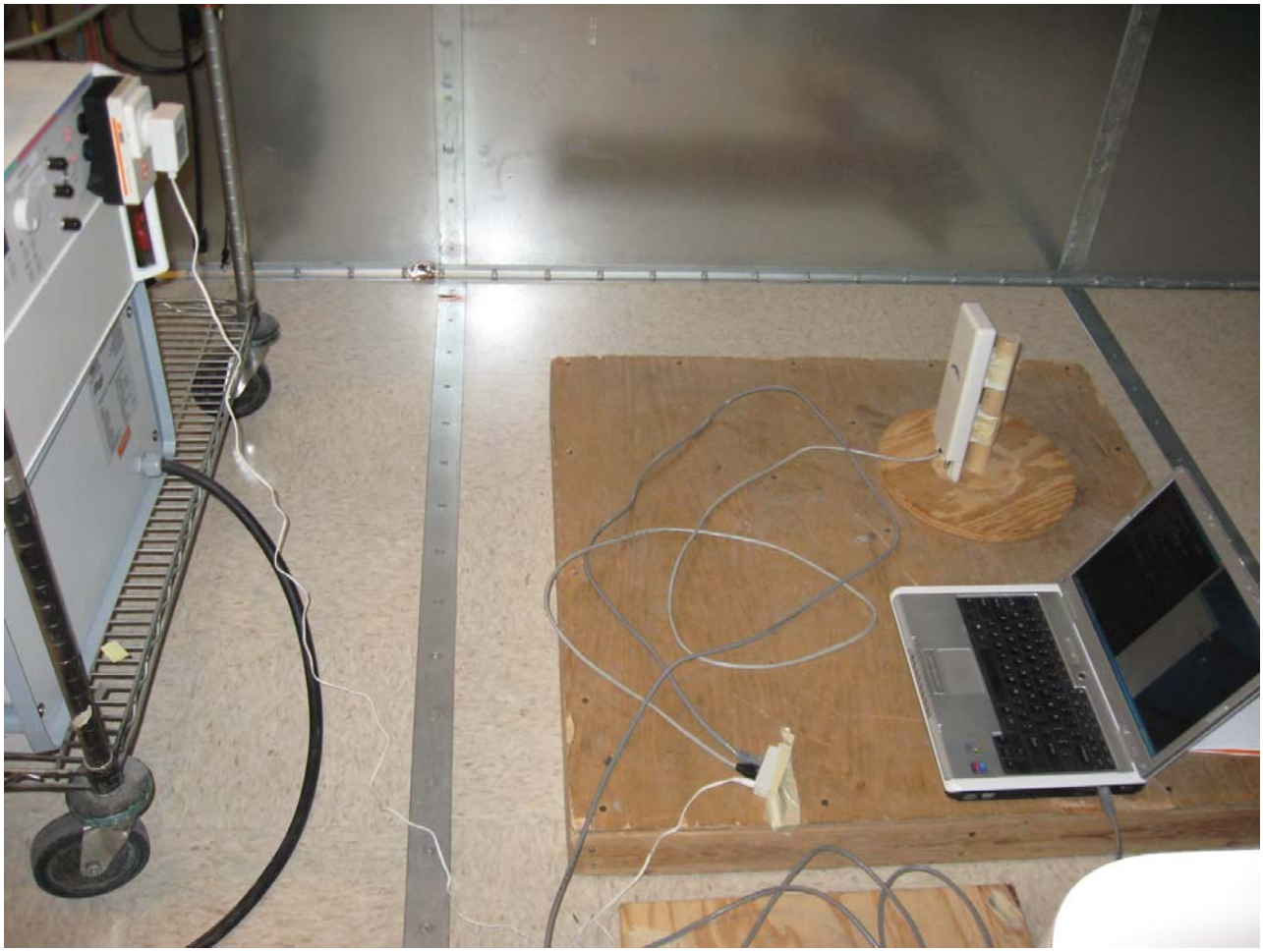
Table 24. Surge Test Results

Test Engineer(s): Savitha Ramesh

Test Date(s): January 23, 2008

Electromagnetic Compatibility Immunity Criteria

9.8 Surges



Photograph 7. 9.8 Surges, Test Setup

IV. Test Equipment

Test Equipment

Calibrated test equipment utilized during testing was maintained in a current state of calibration per the requirements of ANSI/NCSL Z540-1-1994 and ANSI/ISO/IEC 17025:2000.

Test Name: **AC Conducted Emissions Voltage**			Test Date(s): **November 11, 2007**		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2108	EMI Receiver (RF Section)	HP	85460A	09/22/2006	09/22/2007
1S2109	EMI Receiver (Receiver Section)	HP	85462A	09/22/2006	09/22/2007
1S2263	10 Meter Chamber	Rantec	N2-14	08/15/2006	08/15/2007
1S2464	A/C LISN	Solar Electronics	9252-50-R24-BNC	9/1/2006	9/1/2007
1S2336	Custom 100A DC LISN	FCC	100A DC	03/03/2006	03/03/2007
1S2337	Custom 100A AC LISN	FCC	100A AC	03/03/2006	03/03/2007
1S2372	Custom 50A A/C LISN	FCC	50A A/C	03/03/2006	03/03/2007
1S2108	EMI Receiver (RF Section)	HP	85460A	09/22/2006	09/22/2007
Test Name: **Conducted Emissions I/O Ports**			Test Date(s): **January 25, 2008**		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2406	Spectrum Analyzer	HP	8591E	10/1/2007	10/1/2008
1S2488	Screen Room	Universal	N/A	1/23/2008	1/22/2009
1S2096	EM Injection clamp	FCC	F-2031	See Note	
1U0029	RF Current Probe	Solar Electronics	6741-1	8/17/2007	8/17/2008
Test Name: **Radiated Emissions**			Test Date(s): **November 11, 2007**		
1S2184	Antenna Bilog Chase Model CBL6112A	Chase	CBL6112A	1/3/2007	1/3/2008
1S2263	10 Meter chamber	Rantec	N2-14	8/15/2006	8/15/2007
1S2466	Digital Hygrometer/Thermometer	Fisher Scientific	11-661-13	7/27/2006	7/27/2008
1S2421	EMI Test Receiver (20Hz to 7 GHz)	Rohde & Schware	ESIB 7	3/27/2007	3/27/2008
Test Name: **EN 61000-3-2 Harmonic Current Emissions, EN 61000-3-3 Voltage Fluctuations (Flicker)**			Test Date(s): **January 25, 2008**		
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1U0087	Power measurement unit	Combinova	Analyzer 300	1/2/2008	1/2/2009
1S2468	Digital Hygrometer/Thermometer	Fisher Scientific	11-661-13	7/27/2006	7/26/2008
1S2488	Screen Room	Universal	N/A	10/23/2008	10/23/2009

Table 25. Emissions Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

Test Name: **EN 61000-4-2 Electrostatic Discharge Immunity**				Test Date(s): **January 25, 2008**	
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2470	ESD Simulator; Mini Zap Gun	Schaffner	NSG-435	6/16/2007	6/16/2008
1S2467	Digital Hygrometer/Thermometer	Fisher Scientific	11-661-13	7/27/2006	7/26/2008
1S2488	Screen room	Universal	N/A	1/23/2008	1/22/2009
Test Name: **EN 61000-4-3 Radiated Electromagnetic Field**				Test Date(s): **January 23, 2008**	
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2153	Amplifier (broadband and wide band)	Amplifier Research	100W/100M1A	See Note	
1S2198	Horn Antenna	EMCO	3115	8/31/2007	8/30/2008
1S2208	Horn Antenna (TX only)	EMCO	3115	See Note	
1S2401	Bilog Antenna (20 MHz-2 GHz)	Schaffner-Chase	CBL6140A	See Note	
1S2409	Synthesized RF Signal Generator	Gigatronics	6062A	10/9/2007	10/9/2008
1S2410	Electric Field Probe	Wandel & Goltermann	EMC-20	2/19/2007	2/19/2008
1S2467	Digital Hygrometer/Thermometer	Fisher Scientific	11-661-13	7/27/2006	7/26/2008
1S2264	3 Meter chamber	Lindgren	none	12/17/2007	12/17/2008
1S2460	1-26GHz Spectrum analyzer	Agilent	E4407B	3/20/2007	3/20/2008
1S2478	TWT Amplifier (1-2.5GHz)	Communications and Power Industries	VZL6943J2	See Note	
Test Name: **EN 61000-4-4 Fast Transients**				Test Date(s): **January 30, 2008**	
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2467	Digital Hygrometer/Thermometer	Fisher Scientific	11-661-13	7/27/2006	7/26/2008
1S2486	5m Control Room	PanaSheild	N/A	1/23/2008	1/22/2009
1S2423	Ultra Compact Simulator	Amplifier Research	UCS 500-M/6A	1/25/2007	2/24/2008
1S2104	Capacitive Coupling Clamp	Haefely	N/A	See Note	
Test Name: **EN 61000-4-5 Surges**				Test Date(s): **January 23, 2008**	
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2486	5m Control Room	PanaSheild	5m Control room	1/23/2008	1/22/2009
1S2423	Ultra Compact Simulator	Amplifier Research	UCS 500-M/6A	1/25/2007	2/24/2008
1S2467	Digital Hygrometer/Thermometer	Fisher Scientific	11-661-13	7/27/2006	7/26/2008
Test Name: **EN 61000-4-6 Radio Frequency, Conducted Continuous**				Test Date(s): **January 25, 2008**	
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2020	Wideband Amplifier (.01 – 1000 MHz)	IFI	M5500	See Note	
1S2079	Probe RF Current injection	FCC	F-120-9B	See Note	
1S2093	Coupling Decoupling NET (150 kHz – 230 MHz)	FCC	801-M3-25	11/28/2006	11/28/2007
1S2488	Screen Room	Universal	N/A	1/23/2007	1/23/2008
1S2390	Synthesized RF Signal Generator	Gigatronics	6061A	5/4/2007	5/4/2008
1S2467	Digital Hygrometer/Thermometer	Fisher Scientific	11-661-13	7/27/2006	7/26/2008
1S2406	Spectrum Analyzer	HP	8591E	10/1/2007	10/1/2008
1S2092	Coupling Decoupling NET (150 kHz – 230 MHz)	FCC	801-M3-25	10/31/2007	10/30/2008
1S2400	RF Current Probe	Solar Electronics	6741-1	1/5/2007	1/25/2008
1S2079	Probe RF Current injection	FCC	F-120-9B	10/31/2007	10/30/2008
1S2208	Horn Antenna	EMCO	3115	See Note	
Test Name: **EN 61000-4-11 Voltage Dips and Short Interruptions**				Test Date(s): **January 29, 2008**	
MET Asset #	**Equipment**	**Manufacturer**	**Model**	**Last Cal Date**	**Cal Due Date**
1S2467	Digital Hygrometer/Thermometer	Fisher Scientific	11-661-13	7/27/2006	7/26/2008
1S2486	5m Control Room	PanaSheild	N/A	1/23/2008	1/22/2009
1S2423	Ultra Compact Simulator	Amplifier Research	UCS 500-M/6A	1/25/2007	2/24/2008

Table 26. Immunity Test Equipment List

Note: Functionally tested equipment is verified using calibrated instrumentation at the time of testing.

End of Report

