

UltraOne Incorporated

Ultra 510 Laboratory Analyzer EMC Test Report



Percept Technology Labs

PRODUCT TEST AND COMPLIANCE EXPERTS

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Revision History:

Version	Date	Comments	Contributors
1.0	08/16/2002	Initial Release	C. Smith

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1.0 Introduction

1.1 Overview

This test Report covers the EMC (Electromagnetic Compatibility) compliance requirements and test methods needed for product certification of the Ultra 510 Laboratory Analyzer, hereafter known as the Equipment Under Test (EUT), to internal and external regulatory requirements as stated in the references.

1.2 Qualifications

The EUT(s) supplied by Ultras Inc. are representative of product produced in their volume manufacturing process.

The EUT have not been further modified except as noted in this report.

1.3 Client

Ultras Incorporated
11223 Elm Street
Boulder, CO 80301
800-123-4567

1.4 Company Restricted Information

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1.5 Reference Documents

- 1) EN61326, Electrical equipment for measurement, control, and laboratory use – EMC requirements, 1998, (Implements EN61326, 1997 + A1, 1998)

2.0 EMC Test Summary

The EUT was received on 11 August 2002 and was functional and in good condition.

The EUT was tested from 12 August 2002 to 14 August 2002.

The following test results apply only to the device tested under the conditions specified in this report.

Table 1: Electromagnetic Compatibility Test Results

Test Name	Test Specification	Required Performance	Actual Performance	Pass / Fail
Emissions Limits for Class A Equipment per EN61326, Table 3				
Radiated Electromagnetic Emissions	EN55011	Group1, Class A	Group1, Class A	PASS
Conducted Electromagnetic Emissions				
Minimum Immunity Test Requirements per EN61326, Table 1				
Electrostatic Discharge Immunity	EN61000-4-2	Criteria B: 4kV contact, 8kV air	Criteria B: 4kV contact, 8kV air	PASS
Radiated Electromagnetic Immunity	EN61000-4-3	Criteria A: 3 V/m, 80 MHz to 1 GHz	Criteria A: 3 V/m, 80 MHz to 1 GHz	PASS
		Criteria A: 10 V/m, 1 GHz to 2.5 GHz	Criteria A: 10 V/m, 1 GHz to 2.5 GHz	PASS
Electrical Fast Transient / Burst Immunity	EN61000-4-4	Criteria B: 500V I/O lines 1.0kV AC	Criteria A: 500V I/O lines 1.0kV AC	PASS
Electrical Surge Immunity	EN61000-4-5	Criteria B: 500V differential 1.0kV common	Criteria B: 500V differential 1.0kV common	PASS
Conducted Electromagnetic Immunity	EN61000-4-6	Criteria A: 3 V, 0.15 MHz to 80 MHz	Criteria A: 3 V, 0.15 MHz to 80 MHz	PASS
AC Voltage Variations Immunity	EN61000-4-11	Criteria B: 95% reduction for 1 cycle	Criteria A: 95% reduction for 1 cycle	PASS

3.0 Product Description

3.1 Intended Use

Continuous real-time monitoring of Analyzer levels present in test laboratories. The EUT is designed for use in the general laboratory environment.

3.2 General

Trade Mark:	Ultra 510		
Part / Model No.:	G510-34		
Rated Input Voltage:	90 – 264 VAC	Frequency:	47 – 63 Hz
Rated Current / Power:	1.3 Amps max		
Supply Connection:	Detachable power cord		
Construction:	Aluminum housing		
Length x Width x Height:	1.3m x 0.2m x 0.6m		
Weight:	10kg		

3.3 Grounding and Bonding

Grounding is achieved through the Earth conductor in the AC line cord

3.4 Power Supplies

Manufacturer	Model	Output and Type	Safety	EMC
Power Source	PS233-12	12Vdc, 1.3A	UL File# E2345	EN55022 Class B EN55024

3.5 Interface Ports and Cables

Label	Type	Cable Max Length (m)	Function
RS232	RS232	N/A	Service port only – not connected during test
Ethernet	Ethernet	3 - 30	Communications via Ethernet
4-20 mA	4-20 mA	4	Communications via 4-20 mA current loop

3.6 Software / Firmware

- Description: Factory installed firmware
- Revision Level: 4.5.6

3.7 Oscillator and Switching Frequencies

Frequency	Derived	Description of Use
24 MHz	10 MHz	Microprocessor operating frequency
225 MHz	N/A	Analyzer sample clock
10 kHz	N/A	Internal switching regulator

3.8 Support Equipment

Support equipment is supplied to enable or monitor the performance of the equipment, and where practical, shall not be subject to the test conditions or requirements.

Manufacturer	Part Number	Description	Function
Computers R US	CRU678	Control computer	Monitors EUT over Ethernet connection
Ultras	Monitor Net	Monitor Net Software Version: 2.9.3	Used to monitor EUT condition and Analyzer levels during testing

4.0 EMC Compliance Plan

4.1 Operating Modes and Configurations for EMC Testing

4.1.1 Operating Modes

Normal operating mode is monitoring Analyzer levels connected to computer running Monitor Net Software. A 1.5 second sample rate was used.

The external Analyzer input nozzle was covered with scotch tape to force noise floor measurement and maximum gain. This also allowed the EUT to function normally without Analyzer flow into the device.

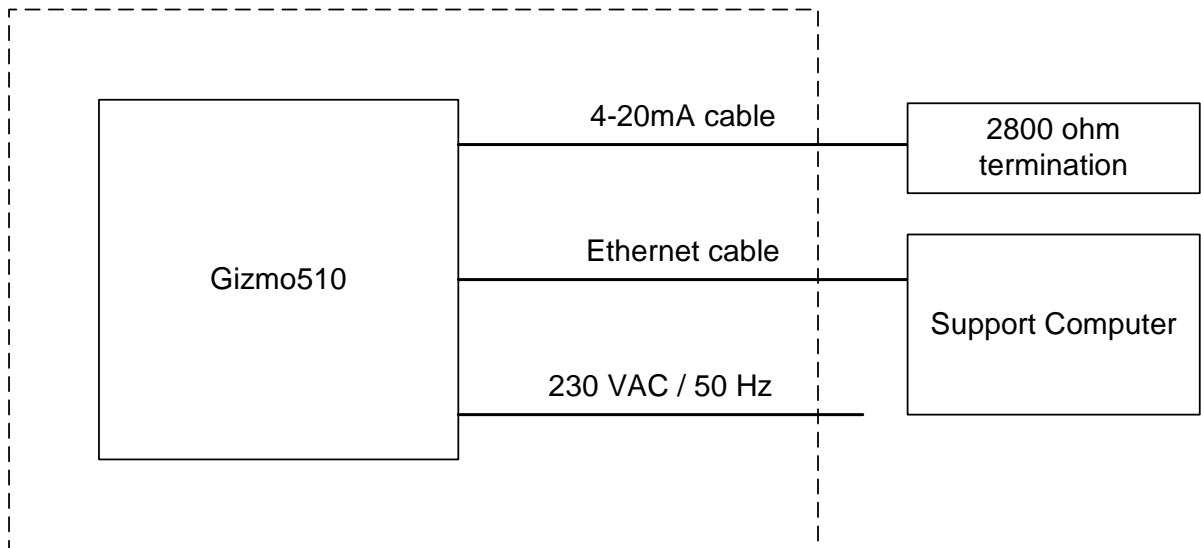
4.1.2 Configurations

The configuration is as shown in the EMC block diagram.

4.2 EMC Block Diagram

All equipment exposed to the conditions of the tests are enclosed in the dotted lined box.

Figure 1: Block Diagram for EMC Testing



4.3 Test Locations

- **EMC Testing Inc.**

6757 Oak Street, Boulder, CO 80301

800-456-7890

Project Reference # ETI3456

4.4 Electromagnetic Emissions

Objective:

To verify that the electromagnetic emissions generated by the product under normal use and in the product's intended environment are below a level as specified by national and international standards.

4.4.1 Radiated Electromagnetic Emissions

Test Date:

12 August 2002

Responsible Engineer:

B. Jones

Test Method:

EN55011, Industrial, Scientific, and Medical (ISM) Radio-Frequency Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement, 1998

Deviations from Test Method:

Per EN61326, emissions testing shall be performed at a distance of 10m rather than 30m as specified in EN55011 Class A.

Exit Criteria:

The EUT shall meet the following emissions limits:

Frequency Band (MHz)	Group1, Class A Equipment 10m Measurement Distance (dBuV/m)
30 – 230	40
230 – 1000	47

Product Tested:

Serial#: 31299

Results:

The Ultra510 met the requirements for Radiated Electromagnetic Emissions with a margin of 8.1 dB with respect to the EN55011 Class A limit.

Figure 2: Radiated Emissions Test Setup



4.4.2 Conducted Electromagnetic Emissions

Test Date:

12 August 2002

Responsible Engineer:

B. Jones

Test Method:

EN55011, Industrial, Scientific, and Medical (ISM) Radio-Frequency Equipment – Radio Disturbance Characteristics – Limits and Methods of Measurement, 1998

Deviations from Test Method:

None

Exit Criteria:

The EUT must meet the following emissions limits:

Frequency Band (MHz)	Group1, Class A Equipment	
	Quasi-Peak Measurement (dBuV)	Average Measurement (dBuV)
0.15 – 0.5	79	66
0.5 – 30	73	60

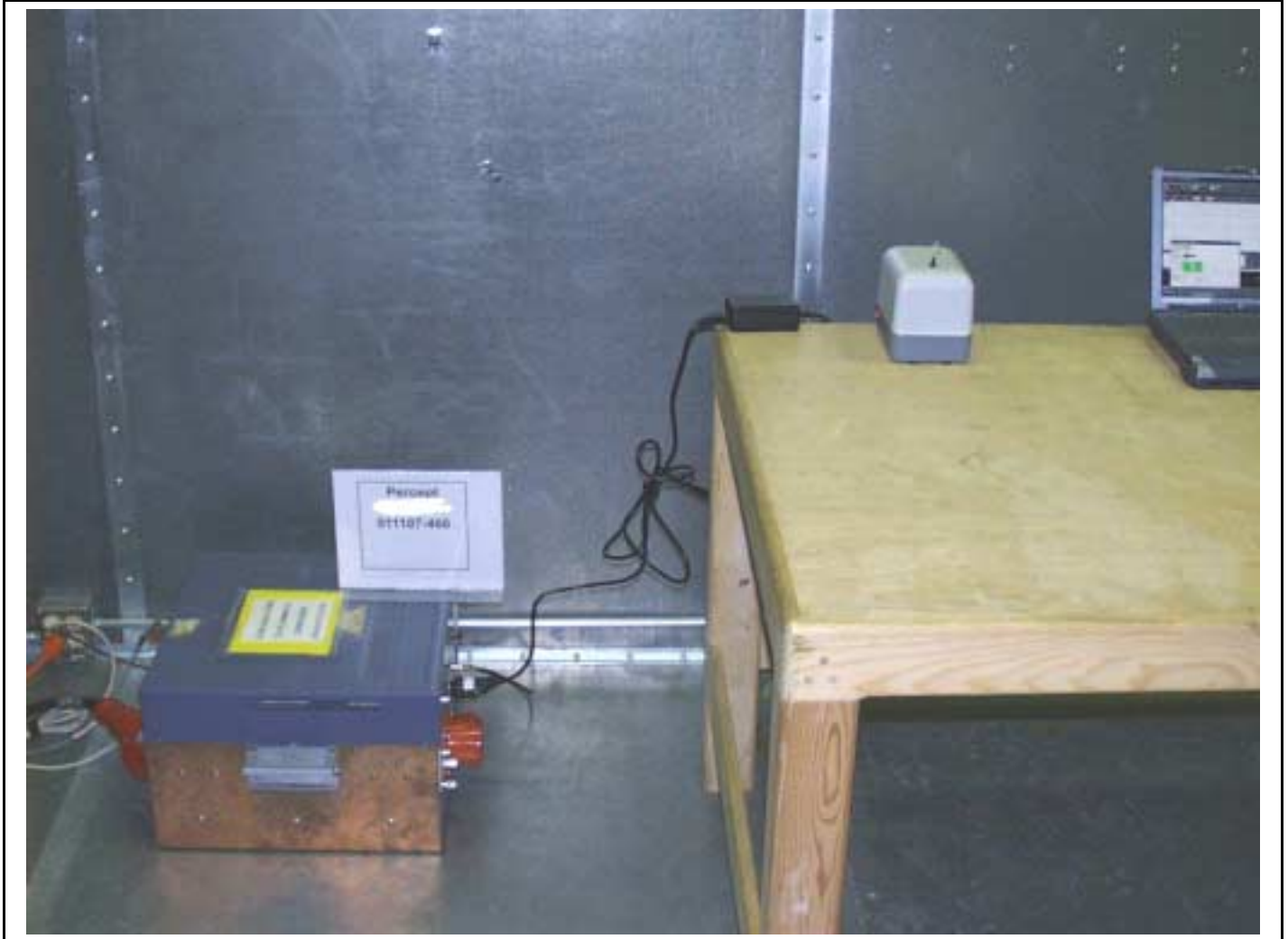
Product Tested:

Serial#: 31299

Results:

The ULTRA 510 met the requirements for Conducted Electromagnetic Emissions with a margin of 10.9dB with respect to the EN55011 Class A limit.

Figure 3: Conducted Emissions Test Setup



4.4.3 Electromagnetic Immunity

Objective:

To verify that the product performs as intended when exposed to different types of electromagnetic energies that may be encountered under normal use in the product's intended environment.

4.4.4 Immunity Compliance Criteria

Criteria A: During testing, normal performance as specified by the manufacturer:

1. The displayed Analyzer level shall be less than 100 per minute. A level greater than this indicates potential susceptibility. All susceptibility conditions shall be easily repeatable and not random phenomenon.
2. The device shall not experience the following errors:
 - Flow Error – Indicates interrupted flow through the device
 - Analyzer Error – Indicates malfunction of the measuring module
 - TCP / IP Failure – Indicates loss of communications with the control computer

Criteria B: During Testing, temporary degradation or loss of function or performance (as described in Criteria A) is allowed provided the unit is able to return to its normal operating condition without user intervention.

Criteria C: During testing, temporary degradation or loss of function or performance (as described in Criteria A) which requires operator intervention or system reset:

4.4.5 Electrostatic Discharge Immunity

Test Date:

14 August 2002

Responsible Engineer:

B. Jones

Test Method:

EN61000-4-2, Electrostatic Discharge Immunity Test, 1995

Test Levels:

Test Location	Discharge Voltage +/- (kV)
Indirect Contact: HCP	2, 4
Indirect Contact: VCP	2, 4
Direct Contact to Metallic Surfaces	2, 4
Air Discharges to Insulated Surfaces	2, 4, 8
<ul style="list-style-type: none">• 10 discharges shall be applied for each voltage and polarity at each test point.	

Deviations from Test Method:

The test level for the Air Discharge Mode was increased in severity from 4kV to 8kV per client request.

Exit Criteria:

Criteria B

Product Tested:

Serial#: 31299

Results:

The ULTRA 510 met criteria B requirements for Electrostatic Discharge Immunity.

Figure 4: Electrostatic Discharge Immunity Test Setup



4.4.6 Radiated Electromagnetic Immunity

Test Date:

13 August 2002

Responsible Engineer:

B. Jones

Test Method:

EN61000-4-3, Radiated, Radio-Frequency, Electromagnetic Field Immunity Test, 1995

Test Levels:

Frequency Range (MHz)	Test Level (V/m)	Modulation / Sweep
80.0 to 1000.0	3	80% AM at 1.0kHz 1% steps with 2s dwell
Clock Frequencies: 160	3	80% AM at 1.0kHz 2s dwell
ISM Frequencies: 433.92, 915.00	3	80% AM at 1.0kHz 2s dwell
Cellular & Mobile: 890 - 915 1450 - 1550 1710 - 1785 1800 - 1980 2010 - 2025 2350 - 2450	10	80% AM at 1.0kHz 1.0 MHz steps with 2s dwell

Deviations from Test Method:

Additional testing was performed in the frequency range of 1.0 GHz to 2.5 GHz for selected frequency bands per customer request.

Exit Criteria:

Criteria A

Product Tested:

Serial#: 31299

Results:

The ULTRA 510 met Criteria A requirements for Radiated Electromagnetic Immunity

Figure 5: Radiated Electromagnetic Immunity Test Setup



4.4.7 Electrical Fast Transient / Burst Immunity

Test Date:

13 August 2002

Responsible Engineer:

B. Jones

Test Method:

EN61000-4-4, Electrical Fast Transient / Burst Immunity Test, 1995

Test Levels:

Coupling Mode	Test Voltage +/- kV	Test Time Seconds
AC Line Cord	1	60
Ethernet Cable	0.5	60
4-20mA Cable	0.5	60

Deviations from Test Method:

None

Exit Criteria:

Criteria B

Product Tested:

Serial#: 31299

Results:

The ULTRA 510 met Criteria B requirements for Electrical Fast Transient / Burst Immunity.

Figure 6: Electrical Fast Transient / Burst Immunity Test Setup



4.4.8 Electrical Surge Immunity

Test Date:

13 August 2002

Responsible Engineer:

B. Jones

Test Method:

EN61000-4-5, Surge Immunity Test, 1995

Test Levels:

Coupling Mode	Test Voltage +/- kV
Differential Mode	0.5
Common Mode	0.5, 1.0
<ul style="list-style-type: none">• Surges shall be coupled at phase angles of 0°, 90°, & 270°• The delay time between consecutive surges shall be 60 seconds• 5 surges of each voltage, polarity, phase angle & coupling path shall be applied.	

Deviations from Test Method:

None

Exit Criteria:

Criteria B

Product Tested:

Serial#: 31299

Results:

The ULTRA 510 met Criteria B requirements for Electrical Surge Immunity

Figure 7: Electrical Surge Immunity Test Setup



4.4.9 Conducted Electromagnetic Immunity

Test Date:

13 May 2002

Responsible Engineer:

B. Jones

Test Method:

EN61000-4-6, Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields, 1996

Test Levels:

Test Point / Coupling Method	Frequency Range (MHz)	Test Level (V/m)	Modulation / Sweep
AC Line Cord / M3 CDN	0.150 to 80.0	3	80% AM at 1.0kHz 1% steps with 2s dwell
	Clock Frequencies: 20	3	80% AM at 1.0kHz 2s dwell
	ISM Frequencies: 6.78, 13.56, 27.12, 40.68	3	80% AM at 1.0kHz 2s dwell
Ethernet Cable / RF Clamp	0.150 to 80.0	3	80% AM at 1.0kHz 1% steps with 2s dwell
	Clock Frequencies: 20	3	80% AM at 1.0kHz 2s dwell
	ISM Frequencies: 6.78, 13.56, 27.12, 40.68	3	80% AM at 1.0kHz 2s dwell
4-20mA Cable / RF Clamp	0.150 to 80.0	3	80% AM at 1.0kHz 1% steps with 2s dwell
	Clock Frequencies: 20	3	80% AM at 1.0kHz 2s dwell
	ISM Frequencies: 6.78, 13.56, 27.12, 40.68	3	80% AM at 1.0kHz 2s dwell

Deviations from Test Method:

None

Exit Criteria:

Criteria A

Product Tested:

Serial#: 31299

Results:

The ULTRA 510 met Criteria A requirements for Conducted Electromagnetic Immunity

Figure 8: Conducted Electromagnetic Immunity Test Setup



4.4.10 AC Voltage Variations Immunity

Test Date:

14 June 2002

Responsible Engineer:

B. Jones

Test Method:

EN61000-4-11, Voltage Dips, Short Interruptions and Voltage Variations Immunity Tests, 1994

Test Levels:

Voltage Dip (% Ut)	Duration (periods)
> 95	1 cycle
<ul style="list-style-type: none">• Each Voltage Dip condition is repeated 5 times at a phase angle of 0°.	

Deviations from Test Method:

None

Exit Criteria:

Criteria B

Product Tested:

Serial#: 31299

Results:

The ULTRA 510 met Criteria B requirements for AC Voltage Variations Immunity

Figure 9: AC Voltage Variations Immunity Test Setup

