
REPORT ON

EMC Testing of a Electronic Interactive Whiteboard & Student Interaction System
FCC ID : QAM001

Report No OO609685

August 2002

REPORT ON

EMC Testing of a Electronic Interactive Whiteboard & Student
Interaction System. FCC ID : QAM001


Report No OO609685

August 2002

PREPARED FOR

Promethean Limited
TDS House
Lower Philips Road
Blackburn
Lancashire
BB1 5TH

APPROVED BY



C H Gould
Chief Engineer

DATED

12-08-02

DISTRIBUTION

Promethean Limited

Copy 1

TÜV Product Service

Copy 2

Copy No

Total No of Pages 17

**STATUS**

OBJECTIVE	To undertake measurements to determine the Equipment Under Test's (EUT's) compliance with the specification.
MANUFACTURING DESCRIPTION	Electronic Interactive Whiteboard & Student Interaction System
MANUFACTURER	Promethean Limited
SERIAL NUMBER	Not Serialised
TEST SPECIFICATION NUMBER	FCC Part 15 Subpart C; 2000
REGISTRATION NUMBER	Y609685
QUANTITY OF ITEMS TESTED	One
SECURITY CLASSIFICATION OF EUT	Unclassified
INCOMING RELEASE SERIAL NUMBER DATE	Declaration of Build Status Y609685 7 th July 2002
DISPOSAL REFERENCE NUMBER DATE	Held Pending Disposal
ORDER NUMBER DATE	PE 1231 8 th May 2002
START OF TEST FINISH OF TEST	8 th July 2002 19 th July 2002
TEST ENGINEERS	B Bennett A R Hubbard
RELATED DOCUMENTS	ANSI C63.4 1992. Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 10 kHz to 1 GHz.

**SYSTEM CONFIGURATION DURING EMC TESTING**

The EUT together with all associated cabling, was set-up simulating a typical user installation on the Open Field Test Site, then tested in accordance with the specification.

The EUT consisted of a Hand Held Voting Pad and a Whiteboard connected to a Laptop PC. The whiteboard was powered by a dedicated Power Supply Unit.

The EUT was functioning correctly during all testing, and was running the Votetest 3a software which repeatedly caused a 'voting' signal to be transmitted from the Hand Held Voting Pad which was acknowledged by the PC via the Radio pod attached to the Whiteboard.



EMISSION TESTING

Instrumentation used for Emission Testing:

Instrument	Manufacturer	Type No	EMC No Cal Due	
Test Receiver	Rohde & Schwarz	ESVP	1807	16 Jul 03
Turntable & Controller	British Turntables	RH253	1858	TU
Antenna Controller	Emco	1050	1844	TU
Antenna Mast	Emco	1050	1845	TU
Bilog Antenna	Chase	CBL 6111B	2451	17 Oct 02
Low Noise Amplifier (0.5-2GHz)	Avantek	AWT2032	1087	TU
Low Noise Amplifier (1-8GHz)	Miteq	AMF-3D-001080-18-3P	2457	TU
Low Noise Amplifier (8-18GHz)	Miteq	AMF-4E-080180-15-10P	2430	TU
Spectrum Analyser	Hewlett Packard	8562A	2563	06 Aug 02
Horn	EMCO	3115	2662	12 Oct 02
Signal Generator	Rohde & Schwarz	SMT3	2661	20 Aug 02
Test Receiver	Rohde & Schwarz	ESH3	1020	17 June 03
Spectrum Monitor	Rohde & Schwarz	EZM	1416	TU
Plotter	Hewlett Packard	7550A	—	TU
Transient Limiter	Hewlett Packard	11947A	2243	2 Jan 03
Three Phase LISN	Rohde & Schwarz	ESH2-Z5	1584	6 Feb 03
Three Phase LISN	Rohde & Schwarz	ESH2-Z5	1915	15 April 03



RADIATED ELECTRIC FIELD EMISSIONS TEST PROCEDURE

The EUT was set up on a remotely controlled turntable on the Open Field Site. A preliminary profile of the Radiated Electric Field Emissions was obtained by measurements taken at a 3m distance. Measurements of emissions from the EUT were obtained with the Measurement Antenna in both Horizontal and Vertical Polarisations. The profiling produced a list of the worst case emissions together with the EUT azimuth and antenna polarisation.

Using the information from the preliminary profiling of the EUT, a search was made in the frequency range 30MHz to 10000MHz. The list of worst case emissions was then confirmed or updated under Open Site conditions. Emission levels were maximised by adjusting the antenna height, antenna polarisation and turntable azimuth. Emissions levels were then formally measured using a Quasi-Peak Detector which met the CISPR requirements. The details of the worst case emissions were then recorded and are presented in Table 1.

The EUT was connected to a 110V 60Hz supply.

The Radiated Electric Field Emissions measurements were made using a Rohde & Schwarz ESVP Receiver and a Hewlett Packard 8562A Spectrum Analyser.

The test was performed in accordance with ANSI C63.4.



RADIATED ELECTRIC FIELD TEST RESULTS

Equipment Designation : Intentional Radiator.

The EUT met the requirements of FCC Part 15 Subpart C clause 15.209 for Radiated Electric Field Emissions.

The emissions were measured at 3m.

Open Field Site Results : The levels of the 7 highest emissions measured in accordance with the specification are presented in Table 1 below :-

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dBμV/m	μV/m	dBμV/m	μV/m
44.240	V	101	354	25.8	19.5	40.0	100.0
47.925	V	101	0	25.3	18.4	40.0	100.0
58.987	V	101	0	26.8	21.9	40.0	100.0
92.167	V	104	62	29.1	28.5	43.5	150.0
99.536	V	101	332	32.1	40.3	43.5	150.0
106.900	V	101	167	32.9	44.2	43.5	150.0
114.300	V	101	5	32.3	41.2	43.5	150.0

Table 1

The margin between the specification requirements and all other emissions was 15dB or more below the specification limit.

ABBREVIATIONS FOR ABOVE TABLE

H Horizontal Polarisation
Pol Polarisation
deg degree

V Vertical Polarisation
Hgt Height
Azm Azimuth

Procedure Test Performed in accordance with ANSI C63.4.

Performed by B Bennett, EMC Engineer.



RADIATED ELECTRIC FIELD TEST RESULTS

Equipment Designation : Intentional Radiator.

The EUT met the requirements of FCC Part 15 Subpart C clause 15.249 for Field Strength of emissions from intentional radiators operating within the 902MHz to 928MHz frequency band.

The emissions were measured at 3m.

Open Field Site Results : The levels of the fundamental and highest harmonic emissions measured in accordance with the specification are presented in Table 2 and 3 below :-

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dB μ V/m	mV/m	dB μ V/m	mV/m
916.000	V	327	354	89.6	30.2	94.0	50.0

Table 2 – EUT Fundamental

Emission Frequency	Pol	Hgt	Azm	Field Strength at 3m		Specification Limit	
MHz	H/V	cm	deg	dB μ V/m	μ V/m	dB μ V/m	μ V/m
1823.000	V	307	0	50.0	316.2	54.0	500.0
2748.000	V	259	0	51.3	367.3	54.0	500.0

Table 3 – EUT Harmonics

No other harmonic emissions were detected above the noise floor of the measuring system

ABBREVIATIONS FOR ABOVE TABLE

H Horizontal Polarisation
Pol Polarisation
deg degree

V Vertical Polarisation
Hgt Height
Azm Azimuth

Procedure Test Performed in accordance with ANSI C63.4.

Performed by B Bennett, EMC Engineer.

**CONDUCTED EMISSIONS ON POWER LINES (TERMINAL VOLTAGES) TEST PROCEDURE**

All Conducted Emission Measurements were undertaken within the Characterisation Chamber. Emissions were measured on the Live and Neutral Lines.

Emissions were then formally measured using a Quasi-Peak Detector which meets the CISPR requirements. The details of the worst case emissions were then recorded in the Job Log Book. Details of the worst case emissions for the Live and Neutral Lines are presented in Tables 4 and 5 respectively.

The EUT was connected to a 110V 60Hz supply.

The Conducted Emission measurements were made using a Rohde & Schwarz ESH-3 Test Receiver and EZM Spectrum Monitor.

The test was performed in accordance with ANSI C63.4.



CONDUCTED EMISSION (TERMINAL VOLTAGES) RESULTS

Equipment Designation : Intentional Radiator. Live Line.

The EUT met the requirements of FCC Part 15 Subpart C, clause 15.207 for Conducted Emissions on the Live Line.

Conducted Emissions Live Line : A search was made in the frequency range 450kHz to 30MHz. The levels of the 6 highest emissions were measured in accordance with the specification and are presented in Table 4 below :-

Emission Frequency	Measured Level	Absolute Level		Spec Limit	
MHz	dBμV	dBμV	μV	dBμV	μV
0.605	22.5	32.7	43.2	48.0	250.0
0.909	23.9	34.2	51.3	48.0	250.0
0.984	23.3	33.6	47.9	48.0	250.0
1.286	23.6	33.9	49.6	48.0	250.0
1.363	22.4	32.7	43.2	48.0	250.0
7.029	24.8	35.2	57.5	48.0	250.0

Table 4

The margin between the specification requirements and all other emissions was 15dB or more below the specified limit.

Procedure Test performed in accordance with ANSI C63.4.

Performed by A R Hubbard, EMC Engineer.



CONDUCTED EMISSION (TERMINAL VOLTAGES) RESULTS

Equipment Designation : Intentional Radiator. Neutral Line.

The EUT met the requirements of FCC Part 15 Subpart C, clause 15.207 for Conducted Emissions on the Neutral Line.

Conducted Emissions Neutral Line : A search was made in the frequency range 450kHz to 30MHz. The levels of the 6 highest emissions were measured in accordance with the specification and are presented in Table 5 below :-

Emission Frequency	Measured Level	Absolute Level		Spec Limit	
MHz	dB μ V	dB μ V	μ V	dB μ V	μ V
0.605	22.5	32.7	43.2	48.0	250.0
0.681	22.3	32.5	42.2	48.0	250.0
0.983	23.4	33.7	48.4	48.0	250.0
1.288	23.4	33.7	48.4	48.0	250.0
1.363	22.3	32.6	42.7	48.0	250.0
1.666	21.5	31.9	39.4	48.0	250.0

Table 5

The margin between the specification requirements and all other emissions was 16dB or more below the specified limit.

Procedure Test performed in accordance with ANSI C63.4.

Performed by A R Hubbard, EMC Engineer.

PHOTOGRAPHS OF EUT



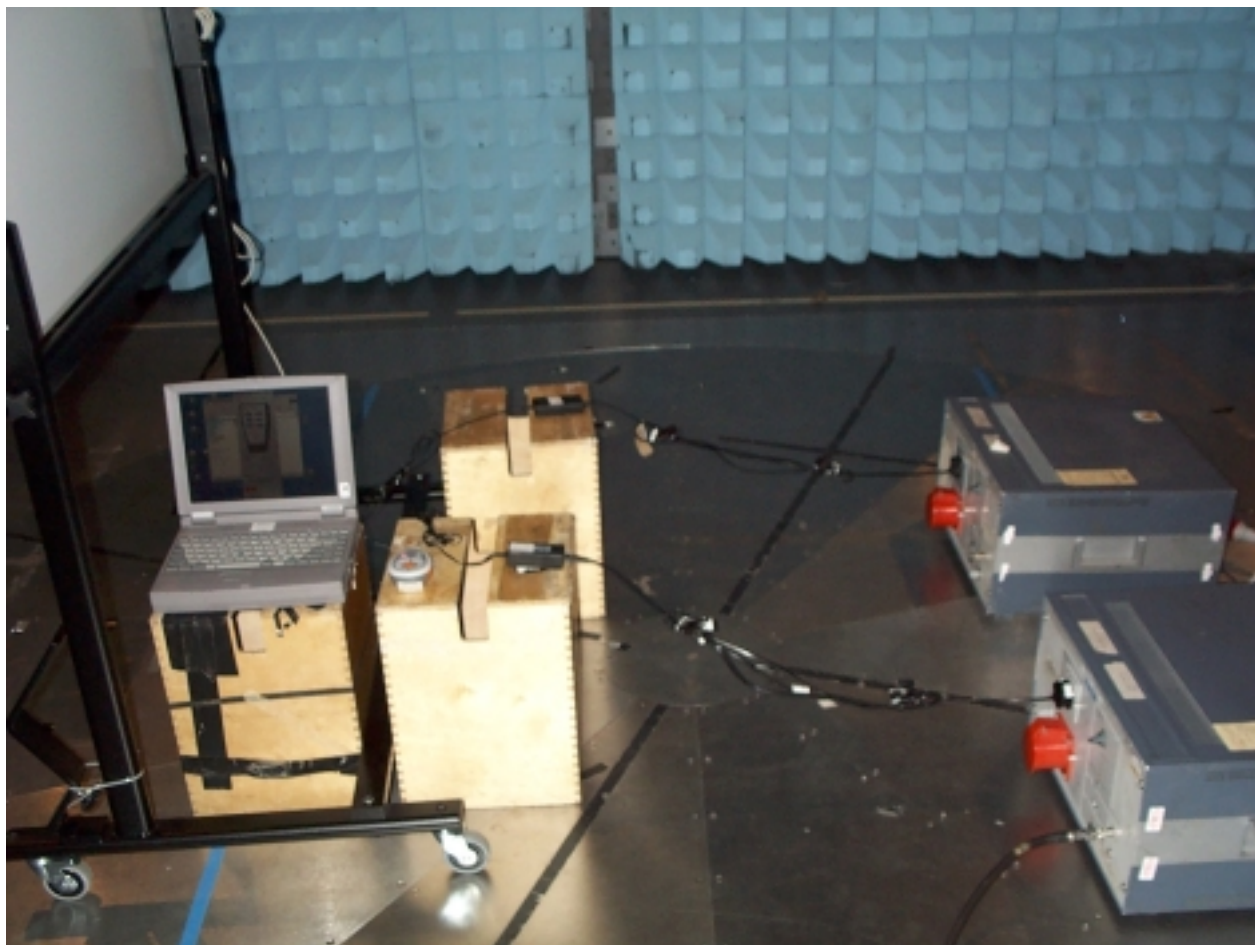
Photograph 1 – Front view showing EUT configuration for Radiated Emissions

PHOTOGRAPHS OF EUT (continued)



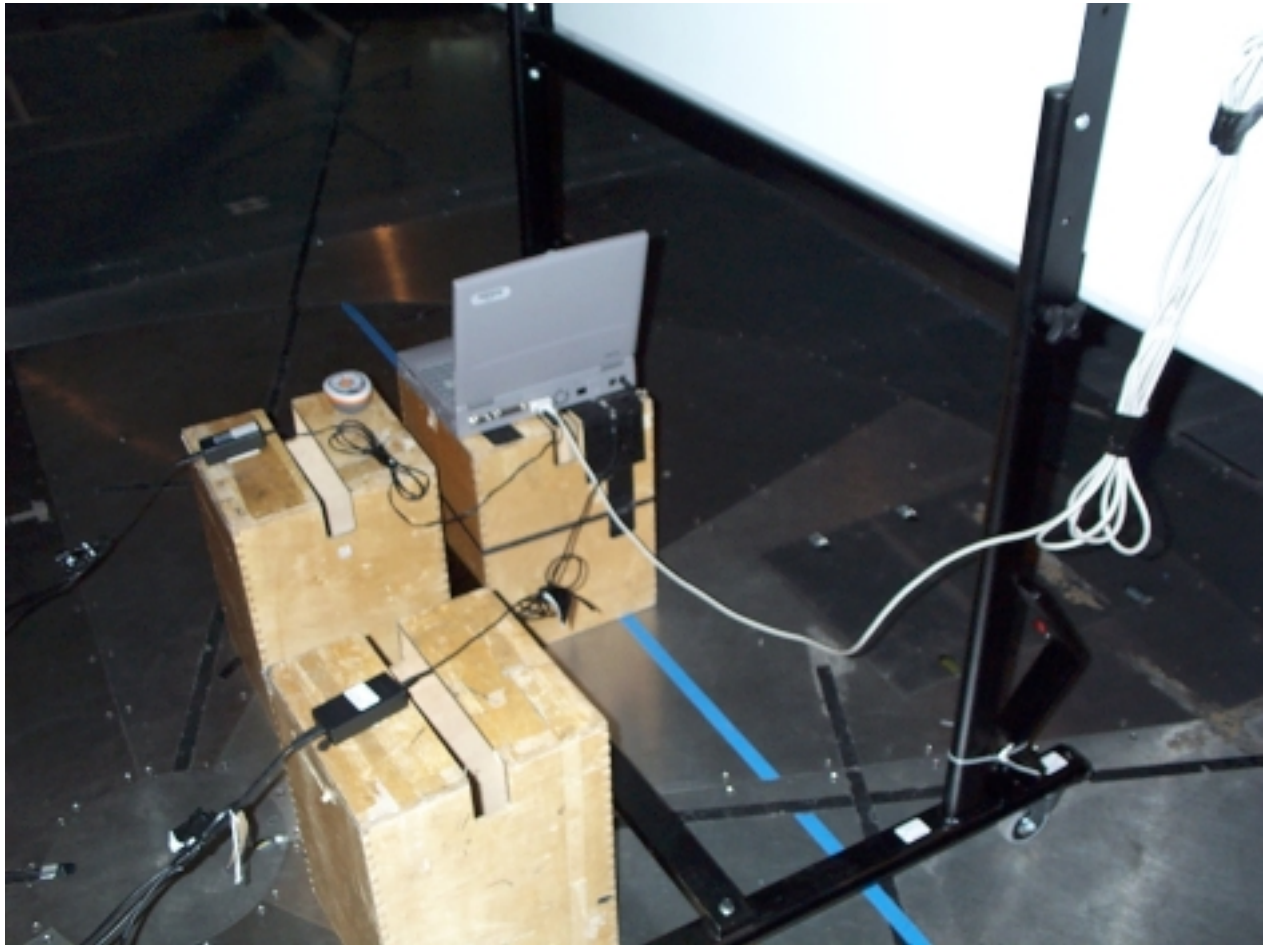
Photograph 2 – Rear view showing EUT configuration for Radiated Emissions

PHOTOGRAPHS OF EUT (continued)



Photograph 3 – View showing EUT configuration for Conducted Emissions

PHOTOGRAPHS OF EUT (continued)



Photograph 4 – View showing EUT configuration for Conducted Emissions



FCC SITE COMPLIANCE LETTER

FEDERAL COMMUNICATIONS COMMISSION
Laboratory Division
7435 Oakland Mills Road
Columbia, MD. 21046

September 08, 2000

Registration Number: 90986

BABT Product Service
Snitterfield Road
Bearley, Stratford-upon-Avon
Warwickshire CV37 0EX
United Kingdom
Attention: Jensen Adams

Re: Measurement facility located at Bearley
3 & 10 meter site
Date of Listing: September 08, 2000

Gentlemen:

Your submission of the description of the subject measurement facility has been reviewed and found to be in compliance with the requirements of Section 2.948 of the FCC Rules. The description has, therefore, been placed on file and the name of your organization added to the Commission's list of facilities whose measurement data will be accepted in conjunction with applications for Certification under Parts 15 or 18 of the Commission's Rules. Please note that this filing must be updated for any changes made to the facility, and at least every three years from the date of listing the data on file must be certified as current.

If requested, the above mentioned facility has been added to our list of those who perform these measurement services for the public on a fee basis. An up-to-date list of such public test facilities is available on the Internet on the FCC Website at WWW.FCC.GOV, E-Filing, OET Equipment Authorization Electronic Filing.

Sincerely,

A handwritten signature in black ink, appearing to read 'Thomas W. Phillips', written in a cursive style.

Thomas W Phillips
Electronics Engineer

**SYSTEM MEASUREMENT UNCERTAINTY**

For a 95% confidence level, the measurement uncertainties for defined systems are :-

For Radiated Emissions, Quasi-Peak Measurements taken in Zero Span using the Hewlett Packard Spectrum Analyser, Preselector and Quasi-Peak Adaptor:-

Frequency	$\pm 2 \times 10^{-7} \times \text{Centre Frequency}$
Amplitude	<+4.45dB (30-200MHz; 3m Measurements) <-4.42dB (30-200MHz; 3m Measurements) <+4.80dB (200-1000MHz; 3m Measurements) <-3.81dB (200-1000MHz; 3m Measurements)

For Conducted Emissions, Quasi-Peak measurements using a Rohde & Schwarz ESH-3 Test Receiver and EZM Spectrum Monitor:-

Frequency	15ppm + 50kHz
Amplitude	$\pm 2.7\text{dB}$



UKAS Accreditations do not cover opinions and interpretations and any expressed herein are outside the scope of any UKAS Accreditation.

Results of tests not yet included in our UKAS Accreditation Schedule are marked NUA
(Not UKAS Accredited).

© 2002 TÜV Product Service Limited

This report must not be reproduced without the written permission of TÜV Product Service Limited