



**Report on the
EMC Emissions
Testing of the
Enlight* EN-7280 ATX Mid Tower Chassis
With the Intel D845GERG2 Motherboard**

Lab. Ref. PVCS1566

**Power Line Conduction
Radiated Emissions (E-Field)**

**(as per BS EN55022 (1995))
(as per BS EN55022 (1995))**



EMC Emission tests of the
Enlight EN-7280 ATX Mid Tower Chassis
with the Intel D845GERG2 Motherboard
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Report Date
25 November 2002

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Power Line Conduction (as per BS
EN55022 (1995))

Alan McHale 25 November 2002



Radiated Emissions (E-Field) (as per BS
EN55022 (1995))

Alan McHale 30 October 2002



APPROVED BY & DATE

SIGNATURE

Donna Fraser 25 November 2002





**EMC Emission tests of the
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1. INTRODUCTION

1.1. Introduction

This report presents the results of the EMC Emissions tests on the Enlight EN -7280 ATX Mid Tower Chassis with the Intel D845GERG2 Motherboard – Lab. Ref. PVCS1566 to the following Standards

- Power Line Conduction (as per BS EN55022 (1995))
- Radiated Emissions (E-Field) (as per BS EN55022 (1995))

The testing was carried out by INTEL CORPORATION (UK) LTD at their Engineering test facilities located at

Intel Corporation (UK) Ltd Pipers Way Swindon Wiltshire England SN3 1RJ	and	Intel Corporation (UK) Ltd Sheppards Farm Chiseldon Swindon Wiltshire England
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This report also details the configuration of the equipment under test, the test methods used, and any relevant modifications where appropriate.

1.2. Summary of Issues

A summary of Action Items for hardware related issues are given below.

An Action Item (AI) means that the particular test is not meeting the relevant specification and could prevent correct operation of the named EUT.

Other items in this report may be marked as FYI. These are recommendations or observations that may be of interest to the system designer.

1.2.1. Action Items

- None.

1.2.2. FYI Items

- From the results it can be seen that the EUT passed the Class B limit.

2. EQUIPMENT UNDER TEST (EUT)

2.1. EUT.



Figure 2-1 Enlightenment EN-7280 ATX Mid Tower Chassis

2.2. EUT Configuration.

Supplier	Description	Model/Part Number	Serial Number	Location
Enlight	ATX Mid Tower Chassis	EN-7280	None	N/A
Enlight	ATX12V Power Supply	HPC-420-302 DF	00000010	Top back of chassis
Intel	uATX Motherboard D845GERG2	AA C14003-101	AZRG23527880	N/A
Intel	Pentium® 4 Processor (With Hyper threading)	3.06GHz / 533MHz FSB	Not Known	CPU Socket
Kingston*	256MB 333MHz PC2700 DDR DIMM	KVR333X64C25/256	N/A	DIMM0 & 1 Slot
NVIDIA*	128MB AGP Graphics Card	GeForce4 MX440	P70-A03-083	AGP Slot
IBM*	Deskstar™ 76.8GB IDE Hard Drive	DTLA -307075 07N3935	YSFDX554	HDD 3.5" internal bay
Sony*	1.44 MB Floppy Drive	MPF920-E	21468808	Bottom external 3.5" floppy bay
Sony	24x10x40 CD-RW Drive	CRX175E2	88BA1106514	Top external 5.25" bay
Toshiba*	4x DVD-ROM Drive	SD-M1402	054B002514	Bottom external 5.25" bay

Table 2-1

2.3. Support Equipment

2.3.1. Anechoic Chamber 3 meter

Supplier	Description	Model/Part Number
Cherry*	Keyboard	PS/2
Logitech*	Mouse	PS/2
NEC*	Monitor	Multisync* FE750
Intel Corporation	Serial Emulator	C12573
Intel Corporation	Parallel Emulator	C12574
Intel Corporation	USB Camera	680942-002
Pioneer*	Headphones	SE-M350
Creative Labs*	Microphone	None
Logitech	USB Joystick	863167-0000

Table 2-2

2.3.2. Open Area Test Site (OATS 2) 10 meter

Supplier	Description	Model/Part Number
Cherry	Keyboard	PS/2
Logitech	Mouse	PS/2
NEC	Monitor	Multisync FE750
Intel Corporation	Serial Emulator	C12573
Intel Corporation	Parallel Emulator	C12574
Intel Corporation	USB Camera	680942-002
Vivanco*	Headphones	SR250
Creative Labs	Microphone	None
Logitech	USB Joystick	863167-0000

Table 2-3

2.3.3. Screened Chamber

Supplier	Description	Model/Part Number
Cherry	Keyboard	PS/2
Logitech	Mouse	PS/2
NEC	Monitor	Multisync E500
Intel Corporation	Serial Emulator	C12573
Intel Corporation	Parallel Emulator	C12574
Intel Corporation	USB Camera	680942-002
Vivanco	Headphones	SR650
Creative Labs	Microphone	None
Quickshot*	Joystick	QS-201

Table 2-4

2.4. EUT Deviations and Comments

EUT tested with one 3.06GHz module, Intel Pentium® 4 Processor with active heatsink and fan.
 The Intel Independent I/O shield was fitted in the chassis.
 Two Everflow* 80mm 12Vdc fans fitted to rear panel of chassis.
 Ferrite coil fitted to front panel power & LED cables.
 BIOS version RG84510A.86A.0004.D

2.5. Software

The program used to exercise the EUT was the EMC test software version 2.2 which was running under Microsoft[®] XP. Video resolution was set at 800x600.

The EMC test software version 2.2 is designed to exercise the various EUT components in a manner similar to typical use. The software was installed on the hard disk drive and starts automatically on EUT power up. Once started the software exercises each of the following EUT components:

CDROM drive	Reads data from the CD-ROM. The directory tree is scanned and data is read until a given number of bytes (1.5M) have been read.
Hard disk drive	Writes, read and verifies 64K bytes of data on each drive.
Floppy drive	Writes, read and verifies one sector for each working drive.
Keyboard	Performs a keyboard confidence test.
Monitor	Either inverts the colour of every pixel on the screen or continually outputs 'H' characters.
Mouse	Uses the driver to do a mouse confidence test.
Parallel port	Either 256 (with loopback connector) or 54 (without) characters (A-z, a-z) are written (and with loopback connector, also read back).
Serial port	The line is configured, if a loopback connector is present a non-blocking read is issued, (baudrate/20, max 6000) characters (streams of 0-9) are written, and the same number of characters must be read back (only if a loopback connector is present).
USB	Reads device descriptor from each device attached. On subsequent reads it verifies that the data is correct.
Network	Writes a file to a specified directory then reads it back.

3. Power Line Conduction (as per BS EN55022 (1995))

3.1. Test Setup

The EUT was placed on top of a fixed wooden table.

3.2. Test Equipment

3.2.1. Powerline Conduction

Supplier	Description	Model/Part Number	Serial Number	Cal. Due date
Rohde & Schwarz	LISN	ESH3-Z5	839135/022	22 nd Jan 2003
Rohde & Schwarz	EMI Test Receiver	ESHS 10	839698/002	22 nd Jan 2003

Table 3-1

3.3. EUT

See section 2.1

3.4. Support Equipment Deviations

None

3.5. Test Method

The EUT was powered up via the LISN and the EUT exercising software was invoked to exercise all sub systems of the EUT. The RF conducted emissions from the EUT were measured using the R&S ESHS 10 via the LISN under computer control. Using R&S ES-K1 version 1.4x software the "Average" and "Peak" levels were measured at the same time for all frequencies in the range 150kHz to 30 MHz. Any frequency over the Av or QP limit respectively constituted a failure.

3.6. Test Results

Environmental Status

24.5°C Temperature, 37% Humidity and 991mB Barometric Pressure

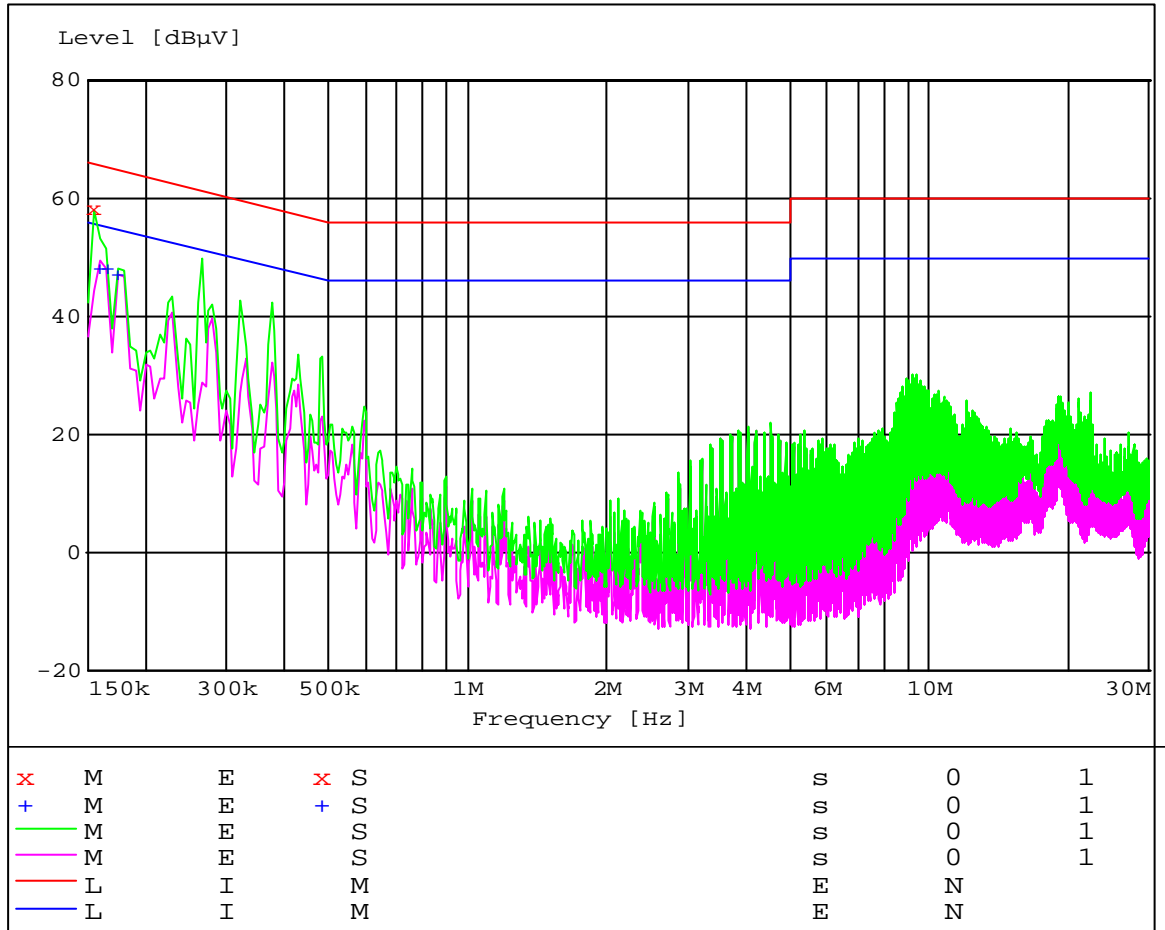


Figure 3-1

Frequency MHz	AV Level dBuV	AV Limit dBuV	AV Delta dB	Phase	PE
0.16	48.07	55.46	7.39	N	GND
0.165	48.34	55.21	6.87	N	GND
0.175	47.17	54.72	7.55	L1	GND

Table 3-2

Frequency MHz	QP Level dBuV	QP Limit dBuV	QP Delta dB	Phase	PE
0.155	58.42	65.73	7.3	N	GND

Table 3-3

No frequencies were determined to be over the Av or QP limits.

4. Radiated Emissions (E-Field) (as per BS EN55022 (1995))

4.1. Test Setup



Figure 4-1 Generic test set-up for the Enlightenment EN-7280 ATX Mid Tower Chassis

1. Equipment Under Test
2. Monitor
3. Peripheral Emulators (Parallel & Serial)
4. Headphones
5. Microphone
6. USB Camera
7. PS/2 UK Keyboard
8. PS/2 Mouse
9. Joystick

4.2. Test Equipment

4.2.1. Radiated Emissions (E-FIELD)

Supplier	Description	Model/Part Number	Serial Number	Cal Date Due
Chase	Bilog Antenna	CBL6112B	2556	03 rd May 2003
Chase	Bilog Antenna	CBL6112A	2204	22 nd Jan 2003
Rohde & Schwarz	EMI Test Receiver (OATS 2)	ESVS 10	843744/013	31 st Oct 2003
Rohde & Schwarz	EMI Test Receiver	ESVS 10	842122/008	13 th June 2003
N/A	10m OATS	SF2	N/A	27 th Oct 2003

Table 4-1

4.3. EUT

See section 2.1

4.4. Support Equipment Deviations

None.

4.5. Test Method

EUT is first tested in 3 meter Anechoic Chamber as outlined below and if any frequencies are determined to be over or within 7dB of limit then the EUT is further tested at the Open Area Test Site (OATS) also outlined below.

Test Method in 3 meter Anechoic Chamber

The EUT was placed on or beside (if floor standing) a table. The top of the table was 0.8 meters above the ground plane and 3 meters from the antenna. The antenna was positioned 1.5 meters up from the ground plane. From 30MHz to 1000MHz a BiLog antenna was used. The receiver was equipment reference 4 and the antenna used was equipment reference 1. The test was run automatically under computer control using R&S ESK1 version 1.4. The algorithm used was as follows:

Five scans of the EUT were performed using the peak detector and the resulting graphs superimposed. Up to Thirty frequencies on the resultant graph with amplitude within 10dB of the quasi peak limit detected between 30MHz to 1GHz were selected. With the receiver set to each of the selected frequencies the EUT was rotated, the antenna raised and lowered from 2 meters to 1 meter and the antenna polarisation was changed from the vertical to the horizontal and the maximum Quasi-Peak (QP) signal strength noted.

Test Method in 10 meter Open Area Test Site (OATS)

The EUT was tested on OATS equipment reference 5 where it was placed on or beside a table 0.8 meters above the ground plane and 10 meters from the antenna. The EUT was powered on and ran the referenced EUT exercising software (see section 2). The antenna was mounted on a mast permitting movement from 1.0 meter to 4.0 meters above the ground plane in horizontal or vertical polarisation. From 30MHz to 1000MHz a BiLog antenna equipment reference 2 was used. The receiver was a Rohde and Schwarz ESVS equipment reference 3. All frequencies found to be over or within 7dB of the quasi peak limit when tested in the 3 meter Anechoic Chamber were measured. The EUT was rotated and the antenna raised and lowered from 1 meter to 4 meters and the antenna was also changed from the vertical polarisation to the horizontal polarisation and the maximum Quasi Peak (QP) signal strength noted.

4.6. Test Results

4.6.1. Preliminary Scan in 3 meter Anechoic Chamber

Environmental Status

24°C Temperature, 39% Humidity and 1027mB Barometric Pressure

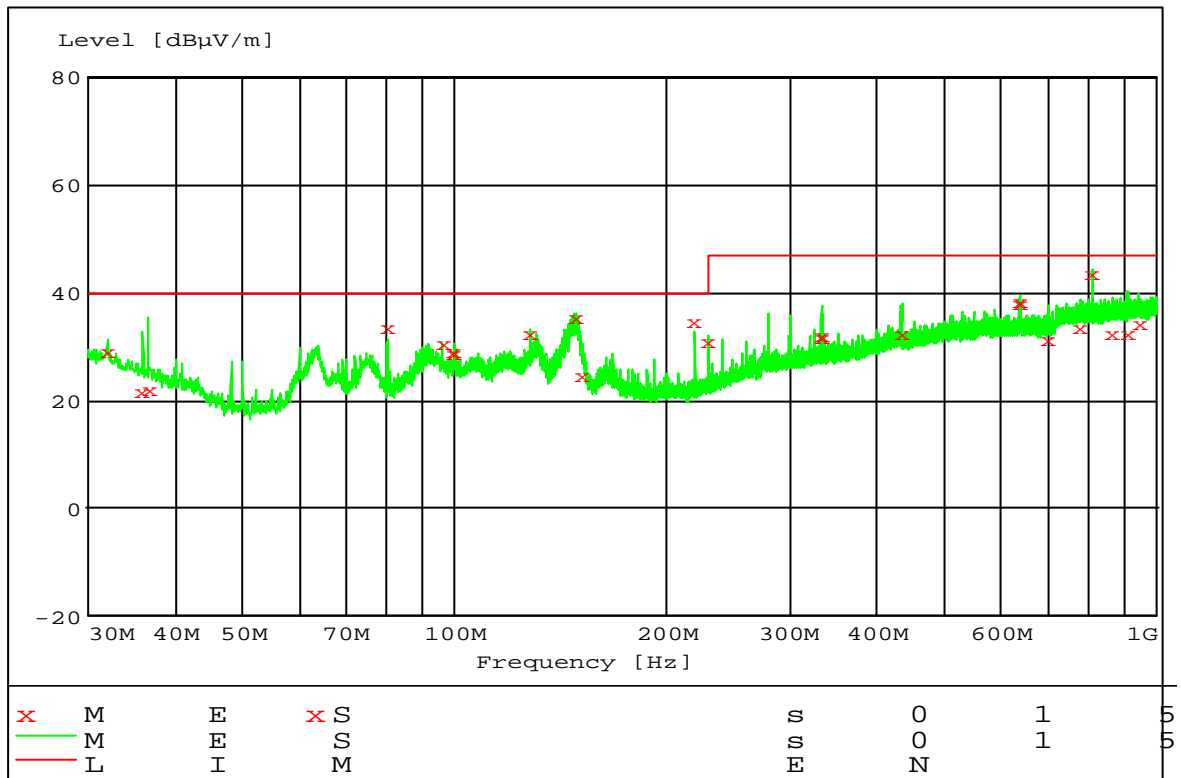


Figure 4-2

<u>Frequency MHz</u>	<u>OP Level dBuV/M</u>	<u>Class B Limit dBuV/M</u>	<u>Delta dB</u>	<u>Rotation °</u>	<u>Height</u>	<u>Orientation</u>
80.16	33.62	40	6.38	266	197	Horizontal
96.18	30.68	40	9.32	266	118	Vertical
128.26	32.82	40	7.18	260	229	Horizontal
148.78	35.65	40	4.35	183	100	Vertical
220	34.72	40	5.28	359	117	Vertical
229.96	31.05	40	8.95	125	100	Vertical
637.66	38.14	47	8.86	286	144	Horizontal
638.74	38.65	47	8.35	235	197	Horizontal
810.04	43.59	47	3.41	359	197	Vertical

Table 4-2 Results from maximizing frequencies in the 3M chamber

Four frequencies were determined to be over or within 7dB of limit so further testing at 10 meter Open Area Test Site was required.



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4.6.2. Results from testing at the 10M OATS

Environmental Status

10°C Temperature, 89% Humidity and 938mB Barometric Pressure

<u>Frequency MHz</u>	<u>QP Level dBuV/M</u>	<u>Class B Limit dBuV/M</u>	<u>Delta dB</u>	<u>Rotation °</u>	<u>Height</u>	<u>Orientation</u>
80.16	19.90	30	10.10	90	350	Vertical
148.78	19.10	30	10.90	0	150	Vertical
220.00	Ambient - No Signal Detected From EUT					
810.04	34.70	37	2.30	310	150	Vertical

Table 4-3 Results from testing at the 10M OATS

As can be seen from the results in Table 4-3, no frequencies were determined to be over the limit.