EMC Emissions Testing Report

Research Machines* PC 330 μATX Mini Tower

Quasi-Stationary Current Harmonics
(as per BS EN61000-3-2: 2006)

Voltage Fluctuation and Flicker
(as per BS EN61000-3-3: 1995 + A2: 2005)
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<table>
<thead>
<tr>
<th>Test</th>
<th>Tested By</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quasi-Stationary Current Harmonics</td>
<td>Giuseppe Deliso</td>
<td></td>
</tr>
<tr>
<td><em>(as per BS EN61000-3-2: 2006)</em></td>
<td>14 October 2013</td>
<td></td>
</tr>
<tr>
<td>Voltage Fluctuation and Flicker</td>
<td>Giuseppe Deliso</td>
<td></td>
</tr>
<tr>
<td><em>(as per BS EN61000-3-3: 1995 + A2: 2005)</em></td>
<td>14 October 2013</td>
<td></td>
</tr>
</tbody>
</table>

Approved

Anna Mancari

31 October 2013
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1. Introduction

1.1 Introduction
This report presents the results of the EMC Emissions tests on the Research Machines* PC 330 µATX Mini Tower – Lab. Ref. Resea4977 to the following Standards

- **Quasi-Stationary Current Harmonics** *(as per BS EN61000-3-2:2006)*
- **Voltage Fluctuation and Flicker** *(as per BS EN61000-3-3:1995 + A2: 2005)*

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

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** Quasi-Stationary Current Harmonics testing.
- From the results it can be seen that the EUT **passed** Voltage Fluctuation and Flicker testing.
2. Equipment Under Test (EUT)

2.1 EUT

![Research Machines* PC 330 µATX Mini Tower](image)

Figure 2-1  Research Machines* PC 330 µATX Mini Tower

2.2 EUT Configuration

<table>
<thead>
<tr>
<th>Component</th>
<th>Qty</th>
<th>Manufacturer</th>
<th>Model</th>
<th>AA/Serial Number</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>System</td>
<td>1</td>
<td>RM*</td>
<td>PC 330 Tower</td>
<td>T093182301</td>
<td>µATX Mini Tower System</td>
<td>N/A</td>
</tr>
<tr>
<td>Chassis</td>
<td>1</td>
<td>Chenbro*</td>
<td>PC31176-H02*13246</td>
<td>Not Known</td>
<td>µATX Mini Tower Chassis</td>
<td>N/A</td>
</tr>
<tr>
<td>Power Supply</td>
<td>1</td>
<td>AcBel*</td>
<td>PCB029</td>
<td>PCB02913250000102A</td>
<td>iPower 85 400 ATX12V 350W Power Supply Unit.</td>
<td>Top rear of chassis</td>
</tr>
<tr>
<td>Motherboard</td>
<td>1</td>
<td>FUJITSU*</td>
<td>D3222-B1</td>
<td>42204493</td>
<td>µATX Desktop Motherboard with Intel® Q87 Chipset</td>
<td>N/A</td>
</tr>
<tr>
<td>Processor</td>
<td>1</td>
<td>Intel®</td>
<td>CM8064601464303</td>
<td>N/A</td>
<td>Intel® Core™ i7-4770 Processor (8M Cache, up to 3.90 GHz)</td>
<td>LGA1150 socket</td>
</tr>
<tr>
<td>Integrated Graphics</td>
<td>1</td>
<td>Intel®</td>
<td>Intel® HD Graphics 4600</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>SSD</td>
<td>1</td>
<td>Samsung*</td>
<td>SSD 840</td>
<td>S14GNEACC31555L</td>
<td>2.5” 840, 250 GB Solid State Drive</td>
<td>Side mounted bay</td>
</tr>
<tr>
<td>HDD</td>
<td>1</td>
<td>Toshiba*</td>
<td>DT01ACA1</td>
<td>83OHJENS</td>
<td>3.5” 1000 GB, 7200 RPM Hard Disk Drive</td>
<td>Lower 3.5” bay</td>
</tr>
<tr>
<td>Optical Drive</td>
<td>2</td>
<td>TSSTcorp*</td>
<td>SH-224DB</td>
<td>R93E6YCD4071MZ</td>
<td>Optical Media Drive CD/DVD Super Filemaster</td>
<td>5.25” bays</td>
</tr>
<tr>
<td>Memory</td>
<td>4</td>
<td>Elixir*</td>
<td>M2X8G64CB8HCSN-DG</td>
<td>7722123F/D815123E</td>
<td>DIMM, DDR3, 8192 MB, 1600 MHz</td>
<td>DIMM A1/A3, DIMM B2/B4</td>
</tr>
</tbody>
</table>

Table 2-1
2.3 Support Equipment

2.3.1 Screened Room

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Description</th>
<th>Model/Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Logitech*</td>
<td>PS/2 Classic Keyboard</td>
<td>868017-0120</td>
</tr>
<tr>
<td>Logitech*</td>
<td>PS/2 Mouse</td>
<td>810-000361</td>
</tr>
<tr>
<td>Western Digital*</td>
<td>1TB USB/FireWire/eSATA External HDD</td>
<td>WD1000HCS-00</td>
</tr>
<tr>
<td>Asus*</td>
<td>24” Widescreen LCD Monitor</td>
<td>VS247</td>
</tr>
<tr>
<td>Intel Corporation</td>
<td>Serial Emulator</td>
<td>C12573</td>
</tr>
<tr>
<td>Intel Corporation</td>
<td>Parallel Emulator</td>
<td>C12574</td>
</tr>
<tr>
<td>Logitech</td>
<td>USB Camera</td>
<td>E3500</td>
</tr>
<tr>
<td>Sony*</td>
<td>Headphones</td>
<td>MDR-XD200</td>
</tr>
<tr>
<td>Logitech</td>
<td>Microphone</td>
<td>Desktop Microphone</td>
</tr>
</tbody>
</table>

Table 2-2  (NB: Not all equipment may be used; this is dependent on EUT configuration)

2.4 EUT Deviations and Comments

EUT was tested with one Intel® Core™ i7-4770 Processor (8M Cache, up to 3.90 GHz) with EKL* DC12V Processor Fan [DFR922512CM-010].

Other parts fitted in chassis: Top Motor* 80mm Chassis Fan [DF128025SL-3]

BIOS Version: FUJITSU // American Megatrends Inc.* V4.6.5.4 R1.10.0, dated, 09/16/2013.

2.5 Software

The program used to exercise the EUT was the EMC Exercizer 2.0.2 software in conjunction with Intel Power Thermal Utility. The system was running Microsoft* Windows® 7 Professional 64-bit (Service Pack 1).

Video Resolution was 1920 by 1080 pixels.

The software used to exercise the EUT 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:

<table>
<thead>
<tr>
<th>Optical drives</th>
<th>Reads data from the optical drive. The directory tree is scanned and data is read until a given number of bytes (1.5M) have been read.</th>
</tr>
</thead>
<tbody>
<tr>
<td>External Hard disk drive</td>
<td>Writes, read and verifies 64K bytes of data on each drive.</td>
</tr>
<tr>
<td>Keyboard</td>
<td>Performs a keyboard confidence test.</td>
</tr>
<tr>
<td>Monitor</td>
<td>Either inverts the colour of every pixel on the screen or continually outputs ‘H’ characters.</td>
</tr>
<tr>
<td>Mouse</td>
<td>Uses the driver to do a mouse confidence test.</td>
</tr>
<tr>
<td>Parallel port</td>
<td>Either 256 (with loopback connector) or 54 (without) characters (A-z, a-z) are written (and with loopback connector, also read back).</td>
</tr>
<tr>
<td>Serial port</td>
<td>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).</td>
</tr>
<tr>
<td>USB</td>
<td>Reads device descriptor from each device attached. On subsequent reads it verifies that the data is correct.</td>
</tr>
<tr>
<td>Network</td>
<td>Writes a file to a specified directory then reads it back.</td>
</tr>
</tbody>
</table>

Table 2-3
3. Quasi-Stationary Current Harmonics

(as per BS EN61000-3-2:2006)

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

3.2 Test Equipment

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Description</th>
<th>Model/Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM Test</td>
<td>Harmonic test system</td>
<td>HFS500</td>
</tr>
<tr>
<td>EM Test</td>
<td>Harmonics control system</td>
<td>DPA503</td>
</tr>
</tbody>
</table>

Table 3-1

3.3 EUT
See section 2.1

3.4 Support Equipment Deviations
None

3.5 Test Method
This test measures the harmonic currents injected into the AC mains from the EUT. It is applicable to electrical and electronic equipment having an input current up to and including 16A per phase, and intended to be connected to public low-voltage distribution systems of between 220V and 250V at 50Hz line to neutral.

3.6 Harmonics Test Conditions
3.7 Test Results

Environmental Status
26°C, 32% Humidity, 992mB Barometric Pressure

![Figure 3-1](image-url)
3.8 Test Results – Continued

As can be seen from the results above, the EUT passed Class D testing.
4. Voltage Fluctuation and Flicker

(as per BS EN61000:1995 + A2:2005)

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

4.2 Test Equipment

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Description</th>
<th>Model/Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>EM Test</td>
<td>Harmonic test system</td>
<td>HFS500</td>
</tr>
<tr>
<td>EM Test</td>
<td>Harmonics control system</td>
<td>DPA503</td>
</tr>
</tbody>
</table>

Table 4-1

4.3 EUT
See section 2.1

4.4 Support Equipment Deviations
None

4.5 Test Method
This test measures the voltage fluctuations and flicker impressed on the AC mains by the EUT. It is applicable to electrical and electronic equipment having an input current up to and including 16A per phase, and intended to be connected to public low-voltage distribution systems of between 220V and 250V at 50Hz line to neutral.

The test is conducted using frequency domain instrumentation described in the spec. All types of voltage fluctuations are assessed at the supply terminals of the EUT by direct measurement using a flickermeter.
4.6 Test Results

Environmental Status
25.5°C, 32% Humidity, 993mB Barometric Pressure

Figure 4-1

The following limits apply:
The value of $P_{st}$ shall not be greater than 1.0
The relative steady state voltage change $\Delta V_{dc}$, shall not exceed 3%
The maximum relative voltage change $\Delta V_{max}$, shall not exceed 4%
The value of $\Delta V(t)$ during a voltage change shall not exceed 3% for more than 200ms.

As can be seen from the results above, the EUT passed flicker testing.