

# EMC Emissions Testing Report

---

Research Machines\* PC 330  $\mu$ ATX Mini Tower

Resea4977

## **Quasi-Stationary Current Harmonics**

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

## **Voltage Fluctuation and Flicker**

*(as per BS EN61000-3-3: 1995 + A2: 2005)*



**In making any use of this test report you are expressly agreeing to the disclaimers and notices below:**

THIS TEST REPORT IS PROVIDED "AS IS" WITH NO WARRANTY WHATSOEVER, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING BUT NOT LIMITED TO THOSE FOR NON-INFRINGEMENT OF INTELLECTUAL PROPERTY, MERCHANTABILITY OR SATISFACTORY QUALITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, SPECIFICATION OR SAMPLE.

INTEL ASSUMES NO RESPONSIBILITY FOR ANY ERRORS WHICH MAY APPEAR IN THIS DOCUMENT.

THIS INFORMATION IS FOR REFERENCE USE BY PC INTEGRATORS ONLY. PC INTEGRATORS ARE NOT AUTHORISED TO REFER TO INTEL'S TESTING OR REPORTING ACTIVITIES IN ADVERTISING OR ANY OTHER MANNER.

Information in this document is provided solely in connection with and to enable the use of Intel products. Intel assumes no liability whatsoever, including infringement of any patent or copyright, for sale and use of Intel products except as provided in Intel's Terms and Conditions of Sale for such products. Intel retain the right to make changes to its test specifications and Intel Products at any time, without notice nor does Intel make a commitment to update the information contained herein. The hardware vendor remains solely responsible for the design, sale and functionality of its product, including any liability arising from product infringement or product warranty. Intel accepts no liability for the quality of third party suppliers, and cannot guarantee that third party products are compatible with Intel products or that third party suppliers will not change parts so that they are no longer compliant.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by the sale of Intel products.

Intel products are not intended for use in medical, life saving, or life sustaining applications.

IN NO EVENT WILL INTEL BE LIABLE FOR ANY LOSS OF PROFITS, LOSS OF USE, BUSINESS INTERRUPTIONS, INCIDENTAL, INDIRECT, SPECULATIVE CONSEQUENTIAL OR SPECIAL DAMAGES, IRRESPECTIVE OF WHETHER INTEL HAS ADVANCE NOTICE OF THE POSSIBILITY OF SUCH DAMAGES.

IN NO EVENT WILL INTEL'S TOTAL LIABILITY TO BUYER UNDER THIS AGREEMENT EXCEED THE VALUE OF THE INTEL PRODUCT THAT CAUSES SUCH LOSS OR DAMAGE.

IN NO EVENT WILL INTEL BE LIABLE IN INDEMNITY.

THE LIMITATIONS AND DISCLAIMERS SET OUT IN THIS AGREEMENT WERE AN ESSENTIAL ELEMENT IN INTEL AGREEING TO SUPPLY THIS TEST REPORT FREE OF CHARGE.

**This Report may only be duplicated in its entirety. The results of this test pertain only to the sample tested.**

© 2013 Intel Corporation

\* Other brands and names are the trademarks of their respective owners



<b>Test</b>	<b>Tested By</b>	<b>Signature</b>
<b>Quasi-Stationary Current Harmonics</b> <i>(as per BS EN61000-3-2: 2006)</i>	Giuseppe Deliso 14 October 2013	
<b>Voltage Fluctuation and Flicker</b> <i>(as per BS EN61000-3-3: 1995 + A2: 2005)</i>	Giuseppe Deliso 14 October 2013	

**Approved****Signature**

Anna Mancari

31 October 2013





## Contents

1.	Introduction .....	5
1.1	Introduction .....	5
1.2	Summary of Issues .....	5
1.2.1.	Action Items .....	5
1.2.2.	FYI Items .....	5
2.	Equipment Under Test (EUT) .....	6
2.1	EUT .....	6
2.2	EUT Configuration .....	6
2.3	Support Equipment .....	7
2.3.1	Screened Room .....	7
2.4	EUT Deviations and Comments .....	7
2.5	Software .....	7
3.	Quasi-Stationary Current Harmonics .....	8
3.1	Test Setup .....	8
3.2	Test Equipment .....	8
3.3	EUT .....	8
3.4	Support Equipment Deviations .....	8
3.5	Test Method .....	8
3.6	Harmonics Test Conditions .....	8
3.7	Test Results .....	9
3.8	Test Results – Continued .....	10
4.	Voltage Fluctuation and Flicker .....	11
4.1	Test Setup .....	11
4.2	Test Equipment .....	11
4.3	EUT .....	11
4.4	Support Equipment Deviations .....	11
4.5	Test Method .....	11
4.6	Test Results .....	12



# 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



Figure 2-1 Research Machines\* PC 330  $\mu$ ATX Mini Tower

### 2.2 EUT Configuration

Component	Qty	Manufacturer	Model	AA/Serial Number	Description	Location
System	1	RM*	PC 330 Tower	T093182301	$\mu$ ATX Mini Tower System	N/A
Chassis	1	Chenbro*	PC31176-H02*13246	Not Known	$\mu$ ATX Mini Tower Chassis	N/A
Power Supply	1	AcBel*	PCB029	PCB02913250000102A	iPower 85 400 ATX12V 350W Power Supply Unit.	Top rear of chassis
Motherboard	1	FUJITSU*	D3222-B1	42204493	$\mu$ ATX Desktop Motherboard with Intel® Q87 Chipset	N/A
Processor	1	Intel®	CM8064601464303	N/A	Intel® Core™ i7-4770 Processor (8M Cache, up to 3.90 GHz)	LGA1150 socket
Integrated Graphics	1	Intel®	Intel® HD Graphics 4600	N/A	N/A	N/A
SSD	1	Samsung*	SSD 840	S14GNEACC31555L	2.5" 840, 250 GB Solid State Drive	Side mounted bay
HDD	1	Toshiba*	DT01ACA1	830H4JENS	3.5" 1000 GB, 7200 RPM Hard Disk Drive	Lower 3.5" bay
Optical Drive	2	TSSTcorp*	SH-224DB	R93E6YCD4071MZ R93E6YCD4071MY	Optical Media Drive CD/DVD Super Filemaster	5.25" bays
Memory	4	Elixir*	M2X8G64CB8HC5N-DG	7722123F/D815123E C11C123E/8B11123D	DIMM, DDR3, 8192 MB, 1600 MHz	DIMM A1/A3 DIMM B2/B4

Table 2-1



## 2.3 Support Equipment

### 2.3.1 Screened Room

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

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:

<b>Optical drives</b>	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.
<b>External Hard disk drive</b>	Writes, read and verifies 64K bytes of data on each drive.
<b>Keyboard</b>	Performs a keyboard confidence test.
<b>Monitor</b>	Either inverts the colour of every pixel on the screen or continually outputs 'H' characters.
<b>Mouse</b>	Uses the driver to do a mouse confidence test.
<b>Parallel port</b>	Either 256 (with loopback connector) or 54 (without) characters (A-z, a-z) are written (and with loopback connector, also read back).
<b>Serial port</b>	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).
<b>USB</b>	Reads device descriptor from each device attached. On subsequent reads it verifies that the data is correct.
<b>Network</b>	Writes a file to a specified directory then reads it back.

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

Supplier	Description	Model/Part Number
EM Test*	Harmonic test system	HFS500
EM Test	Harmonics control system	DPA503

Table 3-1

## 3.3 EUT

See section 2.1

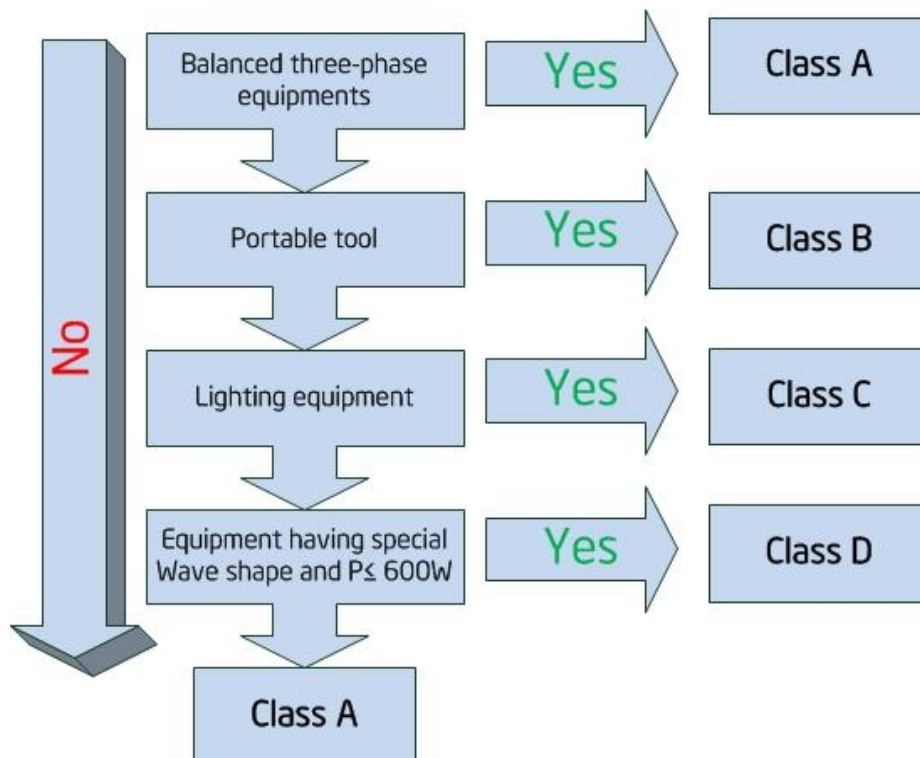
## 3.4 Support Equipment Deviations

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

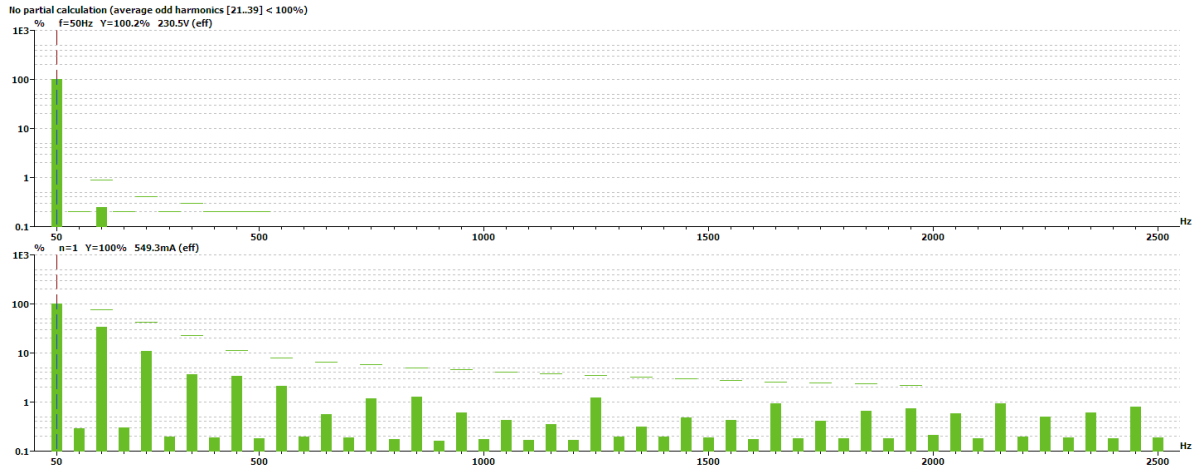


Figure 3-1

### 3.8 Test Results – Continued

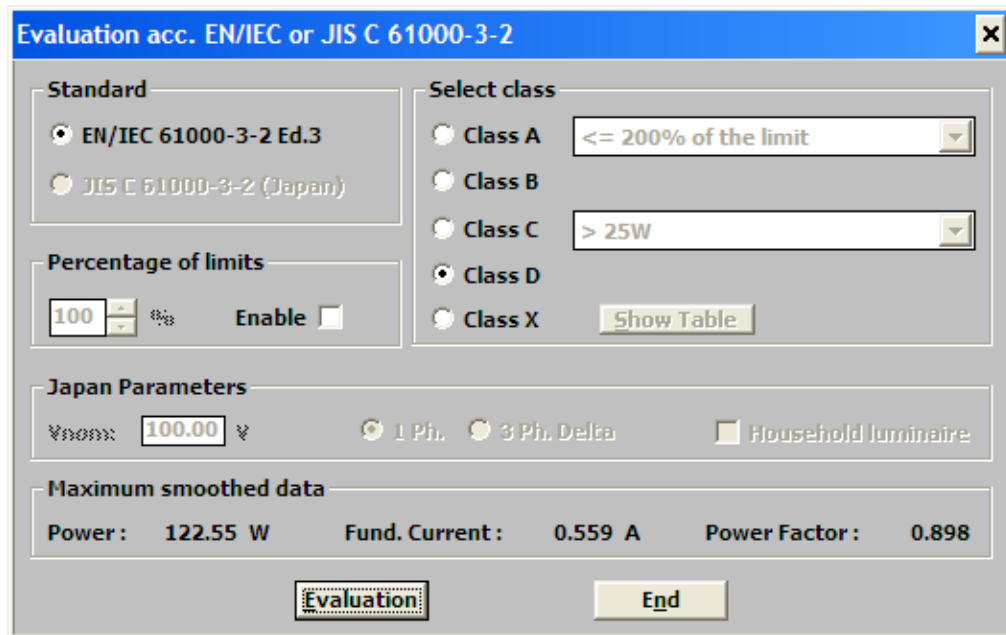


Figure 3-2

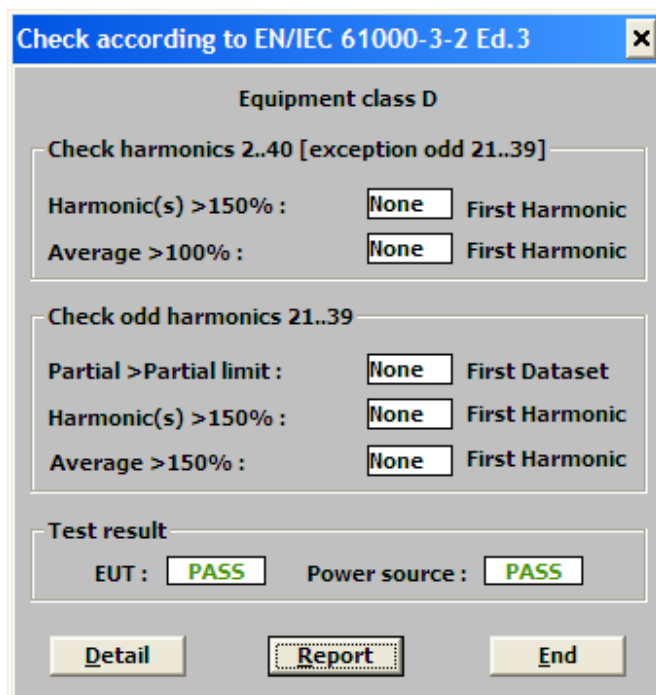


Figure 3-3

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

Supplier	Description	Model/Part Number
EM Test	Harmonic test system	HFS500
EM Test	Harmonics control system	DPA503

Table 4-1

### 4.3 EUT

See section 2.1

### 4.4 Support Equipment Deviations

None

### 4.5 Test Method

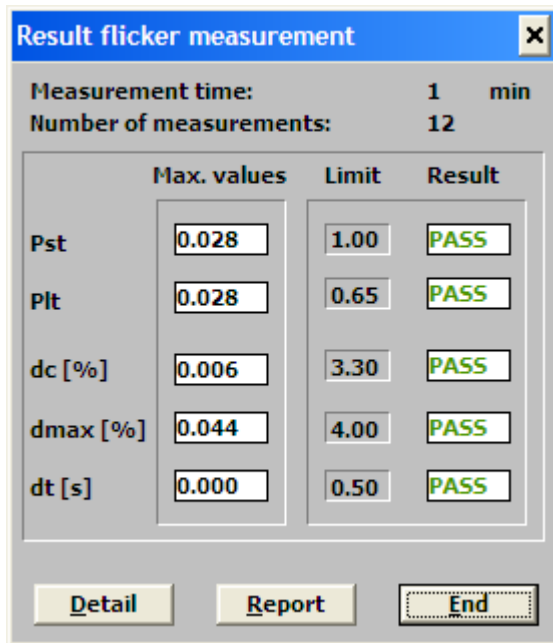
This test measures the voltage fluctuations and flicker impressed on the AC mains by the EUT. It is applicable to electrical and electronic equipment having an input current up to and including 16A per phase, and intended to be connected to public low-voltage distribution systems of between 220V and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



	Max. values	Limit	Result
Pst	0.028	1.00	PASS
Plt	0.028	0.65	PASS
dc [%]	0.006	3.30	PASS
dmax [%]	0.044	4.00	PASS
dt [s]	0.000	0.50	PASS

Measurement time: 1 min  
Number of measurements: 12

Buttons: Detail, Report, End

Figure 4-1

The following limits apply:

The value of Pst shall not be greater than 1,0

The relative steady state voltage change dc, shall not exceed 3%

The maximum relative voltage change dmax, shall not exceed 4%

The value of d(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.