

DATE: 06 July 2010

I.T.L. (PRODUCT TESTING) LTD.

FCC Radio Test Report

for

Objet Geometries Ltd.

Equipment under test:

3D Rapid Printer

**Alaris™30 V2.0, Alaris™24 Containing:
Motion Controller Rev. 2.0;
Vacuum Panel Rev. 2.0;
Spartan With Lattice FPGA 10K***

* See customer's declaration on page 5.

Written by:



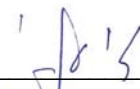
D. Shidlow, Documentation

Approved by:



A. Sharabi, Test Engineer

Approved by:



I. Raz, EMC Laboratory Manager

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This report relates only to items tested.

Measurement/Technical Report for Objet Geometries Ltd.

3D Rapid Printer

Alaris™30 V2.0, Alaris™24 Containing:

Motion Controller Rev. 2.0;

Vacuum Panel Rev. 2.0;

Spartan With Lattice FPGA 10K

FCC ID: YH6-ALARIS

This report concerns: Original Grant: X
Class I Change:
Class II Change:

Equipment type: Low Power Transmitter Below 1705 kHz

Limits used:
47CFR15 Section 15.209

Measurement procedure used is ANSI C63.4-2003.

Application for Certification
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1. General Information

1.1 Administrative Information

Manufacturer:	Objet Geometries Ltd.
Manufacturer's Address:	2 Holtzman St., Scientific Park, P.O.B. 2496, Rehovot, 76124 Israel Tel: +972 8 931 4314 Fax: +972 8 931 4315
Manufacturer's Representative:	Moshik Antebi
Equipment Under Test (E.U.T):	3D Rapid Printer
Equipment Model No.:	Alaris™30 V2.0, Alaris™24 Containing: Motion Controller Rev. 2.0; Vacuum Panel Rev. 2.0; Spartan With Lattice FPGA 10K
Part No.:	7309 (See customer's declaration on following page).
Date of Receipt of E.U.T:	13.12.09
Start of Test:	13.12.09
End of Test:	15.12.09
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15 Subpart C



Date: Tuesday, May 30, 2010

DECLARATION

I HEREBY DECLARE THAT THE

Alaris 24

IS IDENTICAL ELECTRONICALLY, PHYSICALLY, AND MECHANICALLY TO:

Alaris 30 V2.0

THE Alaris 24 DIFFERS FROM THE Alaris 30 V2.0 ONLY BY SOFTWARE.

Please relate to them all (from an EMC point of view) as the same product.

Thank you,

Signature: 

**Printed Name: Moshik Antebi
Electronics Department Manager
Objet Geometries Ltd.**

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Federal Communications Commission (FCC) (U.S.A.), Registration No. 90715.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-1350, R-1285.
5. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025B-1.
6. TUV Product Services, England, ASLLAS No. 97201.
7. Nemko (Norway), Authorization No. ELA 207.

I.T.L. Product Testing Ltd. is accredited by the American Association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

1.3 Product Description

Alaris30 Desktop 3-D Printing System

Print Detailed, True-to-life Models

From the convenience of your office, now you can print high-quality, detailed 3-D models more easily than ever before. The Alaris™30 Desktop 3-D Printer delivers a unique combination of high-quality, finely detailed models in a compact, office friendly system – Just the technology you need to shorten design cycles and propel your business forward.

Based on Objet's proven PolyJet™ Photopolymer Jetting Technology, the Alaris30 creates true-to life parts of any kind with superb accuracy. Create smooth surfaces, complex geometries, small moving elements, fine details, stand-out text and whatever else your design demands. The Alaris30 can build models simply, cost effectively and precisely as you design them.

The Alaris30 Advantage

Printing Your Details

The smallest details create the real design. Just as fine details are crucial to sophisticated product designs, the details are just as vital in the printed part. The Alaris30 printer excels in printing exceptional detail by combining thin 28µ layers with a very small drop size and high resolution of 600 x 600 dpi. The exceptionally smooth and highly detailed printing provided by Alaris30 enables:

- Precise parts for functional, fit and form testing
- Highly accurate model size and shape (typically 0.1– 0.2 mm)
- Complex geometries and small moving elements
- Design verification for a wide range of applications
- Printing of text and other details that stand-out clearly

High Productivity

You can do more, in less time, with the Alaris30.

- Build tray size of 300 x 200 x 150mm (11.81 x 7.87 x 5.9in) enables big parts or many small parts to be printed simultaneously
- Four-cartridge loading delivers up to 36 hours unattended printing

Office Convenience

Small and lightweight, the Alaris30 is a desktop 3-D printer that is perfect for any office, anywhere.

- Fits on a desk or dedicated stand
- Requires no special electricity
- Network-enabled to support multiple designers

Ease of Use

The Alaris30 is designed to be easy to use, with simple printer management and operation.

- Turn any 3D CAD file into a part with just a few mouse clicks – Intuitive Objet Studio™ software ensures easy operation
- Fast and easy support removal – Just minutes from printing to finished parts
- Easy, error-free loading of Model and Support materials

Objet's patented PolyJet Inkjet Technology works by jetting photopolymer materials in thin layers (28μ / 0.0011in) onto a tray, building parts layer by layer. Each photopolymer layer is cured with UV light immediately after it is jetted, producing fully cured models that can be handled and used without post-curing. The gel-like support material, which is specially designed for complex geometries, is easily removed with a water-jet or by hand.

PolyJet Technology Advantages

- High quality – 28μ (0.0011in) layers deliver smooth, accurate, highly detailed models
- High accuracy – Precise jetting and advanced material properties produce parts with fine details and thin walls down to 0.6mm
- Fast – High-speed build at full width enables simultaneous building of multiple items in the same print run.
- Clean – Suitable for an office environment, with sealed cartridge loading/unloading and easy support material removal.

Applications

Fit & Form

High-accuracy printing enables models with multiple assembled parts. This allows validation that all elements fit properly and that moving parts interact correctly. Electronic components can be inserted for emulation of final products.



Functionality

Alaris30 prints with high accuracy and produces fine details, as well as thin walls, enabling models with moving parts of any size. This makes it easy to confirm that all parts – even small ones – interact and move correctly.



Painting

Super-thin build layers create exceptionally smooth surfaces that can be painted to produce a close representation of the look and feel of the final product – Ideal for internal and external marketing presentations.



Rapid Tooling

Durable models with outstanding feature detail and excellent surface characteristics provide direct tools for creating and duplicating real silicone parts.



Vacuum Forming

Smooth surfaces and the strong model material create models that are ideal for vacuum forming, enabling reduced-weight models, packaging and economical production of tools.



The Alaris 24 V.02 is identical to the Alaris 34 V.02 except for software.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2003. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

The radiated emissions tests were performed at I.T.L.'s testing facility at Kfar Bin-Nun, Israel. This site is a FCC listed test laboratory (FCC Registration No. 90715, date of listing September 03, 2009). I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01.

1.6 Measurement Uncertainty

Conducted Emission

The uncertainty for this test is ± 2 dB.

Radiated Emission

The Open Site complies with the ± 4 dB Normalized Site Attenuation requirements of ANSI C63.4-2003. In accordance with Paragraph 5.4.6.1 of this standard, this tolerance includes instrumentation calibration errors, measurement technique errors, and errors due to site anomalies.

2. System Test Configuration

2.1 *Justification*

The operation of the RFID Transceiver, is done automatically, when the antenna senses the tag that is located on each one of the material container.

When the Transceiver senses the tag, it starts reading the tag content, the last information that was written to it.

During the Radio test, a normal printer operation was simulated. The 4 material containers were in place, and the Transceiver wrote & read from the tags.

2.2 *EUT Exercise Software*

The EUT exercise program used during radiated and conducted testing is part of the printer operating SW and was designed to exercise the various system components as are in a typical use.

The program sequentially exercises each tag component in turn. The sequence used is:

- 1) Reads the header tag,
- 2) Every 10sec of working pumps, writes the time into the tag

2.3 *Special Accessories*

No special accessories were needed to achieve compliance.

2.4 *Equipment Modifications*

No modifications were needed in order to achieve compliance.

2.5 Configuration of Tested System

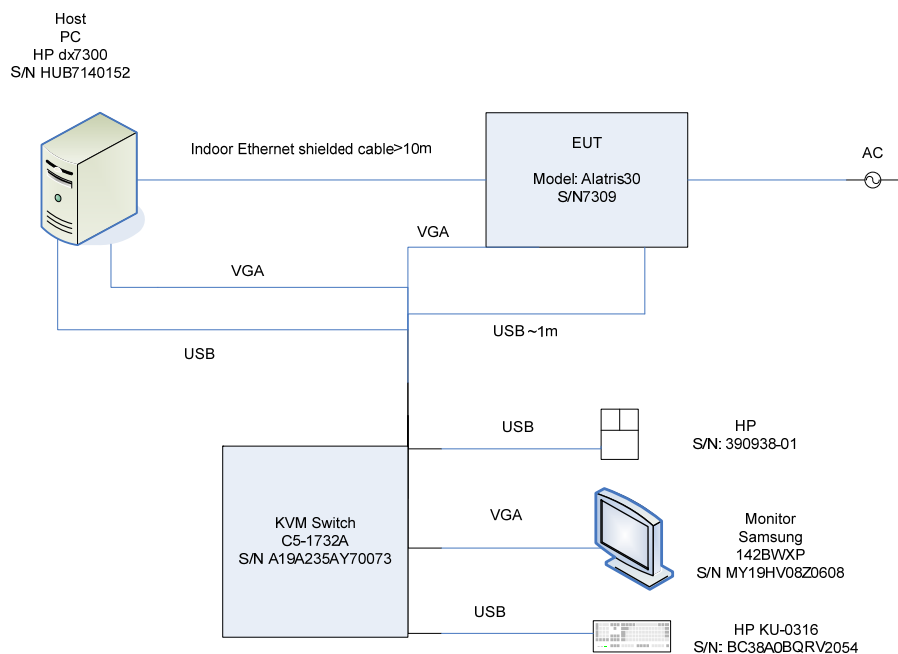


Figure 1. Configuration of Tested System

3. Test Setup Photographs



Figure 2. Conducted Emission Test Setup



Figure 3. Radiated Emission Test Setup

4. Conducted Emission Data

4.1 Test Specification

F.C.C., Part 15, Subpart C

4.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 3.1. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room, with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall.

The E.U.T was powered from 115 V AC / 60 Hz via a 50 Ohm / 50 μ Hn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

4.3 Measured Data

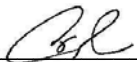
JUDGEMENT: Passed by 5.6 dB

The margin between the emission levels and the specification limit is, in the worst case, 5.6 dB for the phase line at 0.16 MHz and 7.1 dB at 0.43 MHz for the neutral line.

The EUT met the F.C.C. Part 15, Subpart C specification requirements.

The details of the highest emissions are given in *Figure 4* to *Figure 7*.

TEST PERSONNEL:

Tester Signature:  Date: 07.07.10

Typed/Printed Name: A. Sharabi

Conducted Emission

E.U.T Description 3D Rapid Printer
 Type Alaris™30 V2.0, Alaris™24 Containing:
 Motion Controller Rev. 2.0;
 Vacuum Panel Rev. 2.0;
 Spartan With Lattice FPGA 10K
 Serial Number: 7309

Specification: F.C.C., Part 15, Subpart C
 Lead: Phase
 Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.164081	51.1	50.2	-15.1	49.7	-5.6	0.0
2	0.277903	46.4	42.6	-18.3	35.2	-15.8	0.0
3	0.419256	51.9	48.0	-9.6	38.8	-8.7	0.0
4	0.555463	45.9	41.8	-14.2	32.6	-13.4	0.0
5	6.774066	25.1	25.5	-34.5	12.1	-37.9	0.0
6	19.124976	46.3	45.1	-14.9	42.3	-7.7	0.0

Figure 4. Detectors: Peak, Quasi-peak, AVERAGE .

Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description 3D Rapid Printer
 Type Alaris™30 V2.0, Alaris™24 Containing:
 Motion Controller Rev. 2.0;
 Vacuum Panel Rev. 2.0;
 Spartan With Lattice FPGA 10K
 Serial Number: 7309

Specification: F.C.C., Part 15, Subpart C
 Lead: Phase
 Detectors: Peak, Quasi-peak, Average

 11:07:06 MAY 05, 2010

ACTV DET: PEAK
 MEAS DET: PEAK QP AVG
 MKR 430 kHz
 51.89 dBμV

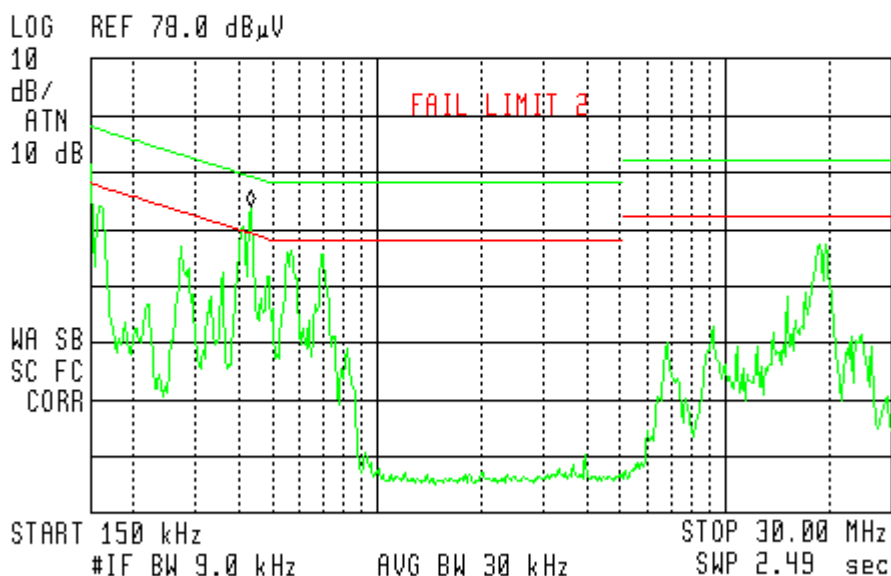


Figure 5. Detectors: Peak, Quasi-peak, Average

Note: Fail indication on the spectral plot results from peak
 detector level reading above the limit. This indication is for
 information only and it should not be interpreted as a test
 failure.

Conducted Emission

E.U.T Description 3D Rapid Printer
 Type Alaris™30 V2.0, Alaris™24 Containing:
 Motion Controller Rev. 2.0;
 Vacuum Panel Rev. 2.0;
 Spartan With Lattice FPGA 10K
 Serial Number: 7309

Specification: F.C.C., Part 15, Subpart C
 Lead: Neutral
 Detectors: Peak, Quasi-peak, Average

Signal Number	Frequency (MHz)	Peak (dBuV)	QP (dBuV)	QP Delta L 1 (dB)	Avg (dBuV)	Av Delta L 2 (dB)	Corr (dB)
1	0.221879	40.3	39.0	-23.8	38.3	-14.5	0.0
2	0.433999	51.9	48.7	-8.5	40.1	-7.1	0.0
3	0.555128	47.3	42.2	-13.9	32.8	-13.2	0.0
4	0.694453	43.8	39.2	-16.8	29.3	-16.7	0.0
5	6.710590	45.1	35.0	-25.0	5.8	-44.2	0.0
6	19.124475	46.0	43.1	-16.9	41.8	-8.2	0.0

Figure 6. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta refer to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

Conducted Emission

E.U.T Description 3D Rapid Printer
Type Alaris™30 V2.0, Alaris™24 Containing:
Motion Controller Rev. 2.0;
Vacuum Panel Rev. 2.0;
Spartan With Lattice FPGA 10K
Serial Number: 7309

Specification: F.C.C., Part 15, Subpart C
Lead: Neutral
Detectors: Peak, Quasi-peak, Average

 10:54:28 MAY 05, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKA 430 kHz
48.32 dBμV

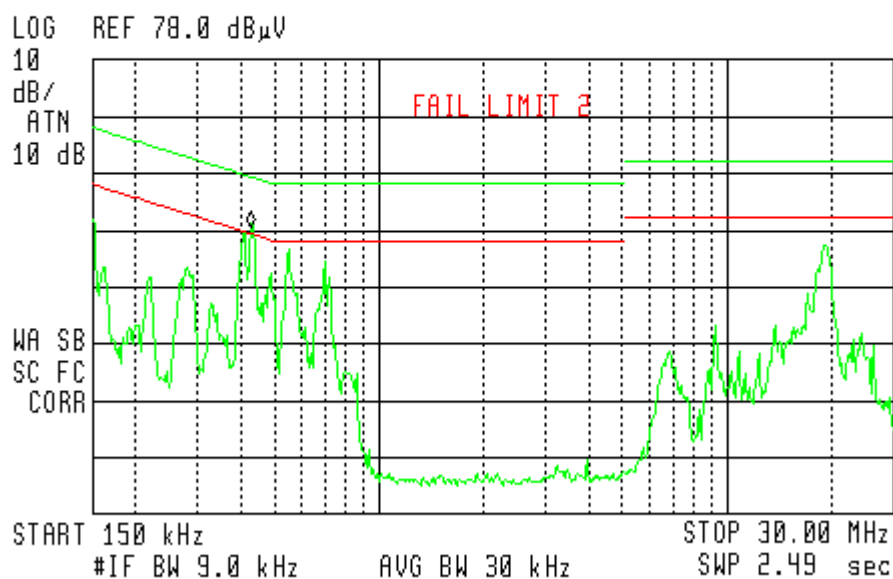


Figure 7 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

Note: Fail indication on the spectral plot results from peak detector level reading above the limit. This indication is for information only and it should not be interpreted as a test failure.

4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-2A	127	March 3, 2010	1 Year
LISN	Fischer	FCC-LISN-2A	128	March 3, 2010	1 Year
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 Year
RF Filter Section	HP	85420E	3705A00248	November 10, 2009	1 Year
Printer	HP	LaserJet 2200	JPKG19982	N/A	N/A

5. Field Strength of Fundamental

5.1 Test Specification

F.C.C., Part 15, Subpart C, Section 15.209

5.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.

The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.

The EMI receiver was set to the E.U.T. Fundamental Frequency (125 kHz) and Peak Detection.

The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna were adjusted for maximum level reading on the EMI receiver. The loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

5.3 Measured Data

JUDGEMENT: Passed by 25.38 dB

The EUT met the FCC Part 15, Subpart C, Section 15.209 specification requirements.

The details of the highest emissions are given in Figure 8.

TEST PERSONNEL:


Tester Signature: 

Date: 07.07.10

Typed/Printed Name: A. Sharabi

Field Strength of Fundamental

E.U.T Description 3D Rapid Printer
 Type Alaris™30 V2.0, Alaris™24 Containing:
 Motion Controller Rev. 2.0;
 Vacuum Panel Rev. 2.0;
 Spartan With Lattice FPGA 10K
 Serial Number: 7309

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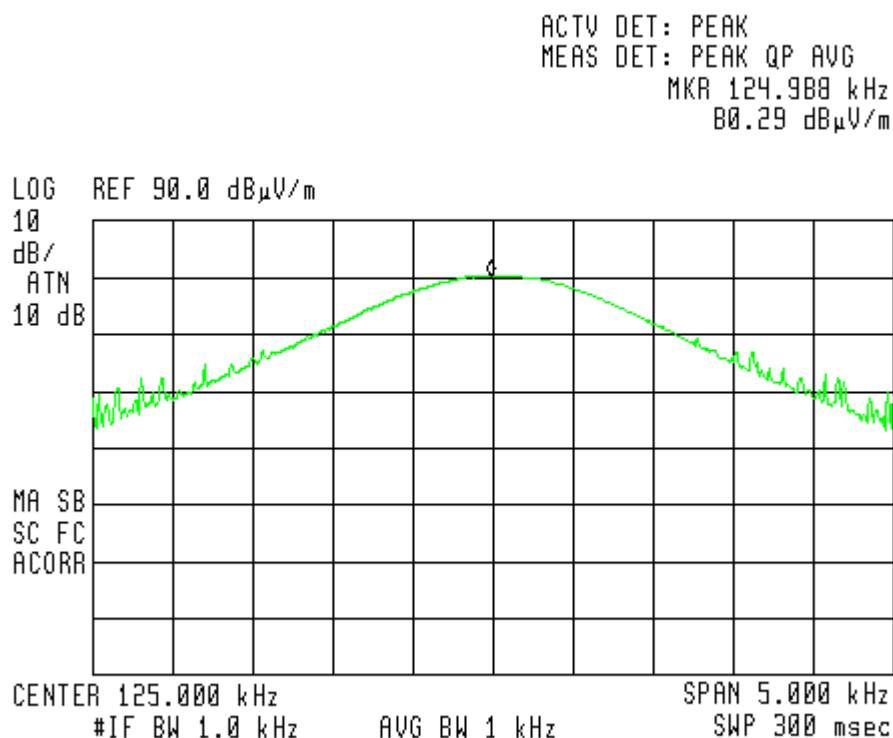


Figure 8. Field Strength of Fundamental
Detector: Peak

$$\begin{aligned}
 L_{im300m} &= 25.67 \text{ dB}\mu\text{V/m} \\
 L_{im3m} &= 25.67 \text{ dB}\mu\text{V/m} + 80.0 \text{ dB}\mu\text{V/m} = 105.67 \text{ dB}\mu\text{V/m}
 \end{aligned}$$

5.4 Test Instrumentation Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3411A00102	November 10, 2010	1 year
EMI Receiver Filter Section	HP	85420E	3427A00103	November 10, 2010	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2009	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A

6. Radiated Emission, 9 kHz – 30 MHz

6.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209

6.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 2.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions. The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying to CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was operated at the frequency of 125 kHz. This frequency was measured using a peak detector.

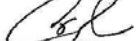
6.3 Measured Data

JUDGEMENT: Passed by 25.4 dB

The EUT met the requirements of the F.C.C. Part 15, Subpart C, Section 209 specification.

The margin between the emission levels and the specification limit is 25.4 dB.

TEST PERSONNEL:

Tester Signature: 

Date: 07.07.10

Typed/Printed Name: A. Sharabi

Radiated Emission 9 kHz – 30 MHz

E.U.T Description 3D Rapid Printer
 Type Alaris™30 V2.0, Alaris™24 Containing:
 Motion Controller Rev. 2.0;
 Vacuum Panel Rev. 2.0;
 Spartan With Lattice FPGA 10K
 Serial Number: 7309

Specification: FCC, Part 15, Subpart C

Test Distance: 3 meters

Frequency range: 9 kHz to 30.0 GHz

Operation Frequency: 125 kHz

Detector: Peak

Frequency (MHz)	Peak Amp (dBμV/m)	Average Factor (dB)	Average Result (dBμV/m)	Average Specification (dBμV/m)	Margin (dB)
0.125	80.3	0	80.3	105.67	-25.37
0.375	58.3	0	58.3	96.12	-37.82
0.875	43.0	0	43.0	68.75	-25.75

Figure 9. Radiated Emission

Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.

“Peak Amp” includes correction factor.

* “Correction Factor” = Antenna Factor + Cable Loss

Average Factor = $20\log(22.798/100) = -12.84$ dB

15:16:59 MAY 05, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 115.00 msec
.02 dB

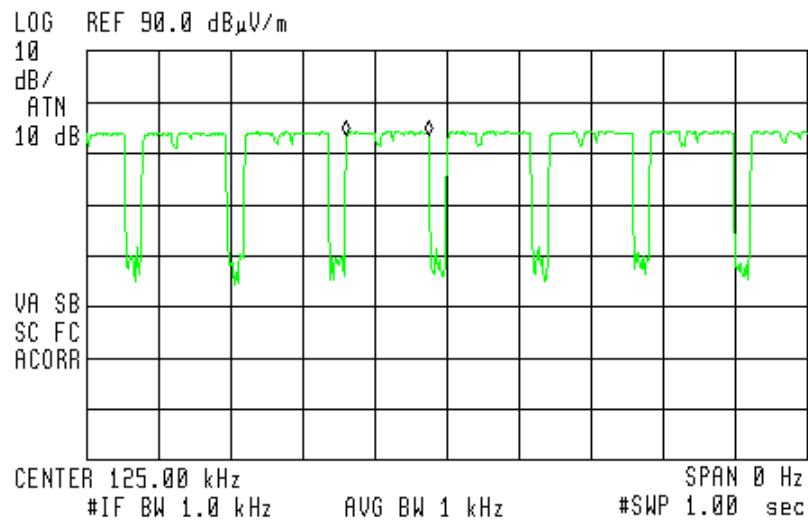


Figure 10. Transmitter “On” Time During 115 milliseconds

15:18:00 MAY 05, 2010

ACTV DET: PEAK
MEAS DET: PEAK QP AVG
MKRΔ 27.500 msec
.05 dB

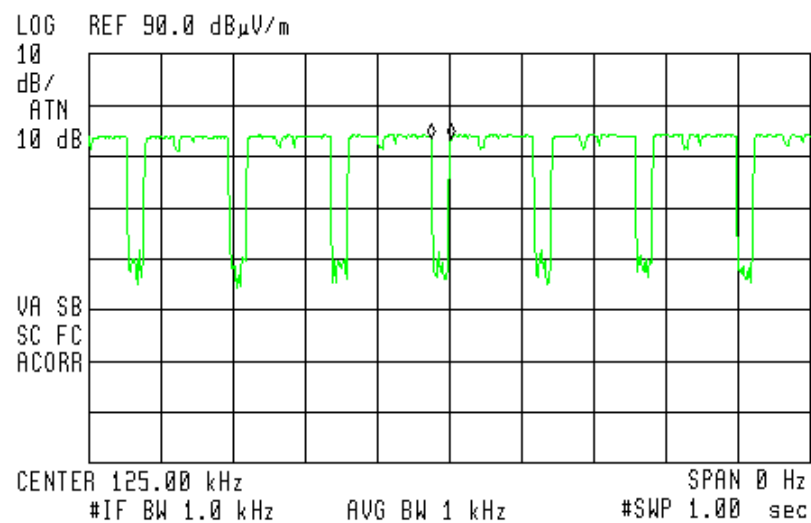


Figure 11. Transmitter “OFF” Time During 115 milliseconds

6.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	November 10, 2009	1 year
RF Section	HP	85420E	3705A00248	November 10, 2009	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 19, 2009	1 year
Antenna Mast	ARA	AAM-4A	1001	N/A	N/A
Turntable	ARA	ART-1001/4	1001	N/A	N/A
Mast & Table Controller	ARA	ACU-2/5	1001	N/A	N/A
Printer	HP	LaserJet 2200	JPKGC19982	N/A	N/A

6.5 Field Strength Calculation

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

$$FS = RA + AF + CF$$

FS: Field Strength [dB μ v/m]
 RA: Receiver Amplitude [dB μ v]
 AF: Receiving Antenna Correction Factor [dB/m]
 CF: Cable Attenuation Factor [dB]

Example: FS = 30.7 dB μ V (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dB μ V

No external pre-amplifiers are used.

7. APPENDIX B - CORRECTION FACTORS

7.1 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3	1200.0	7.3
20.0	0.6	1400.0	7.8
30.0	0.8	1600.0	8.4
40.0	0.9	1800.0	9.1
50.0	1.1	2000.0	9.9
60.0	1.2	2300.0	11.2
70.0	1.3	2600.0	12.2
80.0	1.4	2900.0	13.0
90.0	1.6		
100.0	1.7		
150.0	2.0		
200.0	2.3		
250.0	2.7		
300.0	3.1		
350.0	3.4		
400.0	3.7		
450.0	4.0		
500.0	4.3		
600.0	4.7		
700.0	5.3		
800.0	5.9		
900.0	6.3		
1000.0	6.7		

NOTES:

1. The cable type is RG-214.
2. The overall length of the cable is 27 meters.
3. The above data is located in file 27MO3MO.CBL on the disk marked "Radiated Emission Tests EMI Receiver".

7.2 Correction factors for CABLE

from EMI receiver
to test antenna
at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.
2. The overall length of the cable is 10 meters.

7.3 Correction factors for ACTIVE LOOP ANTENNA
Model 6502
S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2