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DATE: 25 November 2013

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

FCC Radio Test Report

for

Stratasys Ltd.

Equipment under test:

3D Desktop Printer

Objet30 V3.0
125 kHz Transmitter

Written by: _____
R. Pinchuck, Documentation

Approved by: _____
I. Siboni, Test Engineer

Approved by: _____
I. Raz, EMC Laboratory Manager

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Measurement/Technical Report for
Stratasys Ltd.

3D Desktop Printer

Objet30 V3.0

FCC ID: YH6-ALARIS

25 November 2013

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

Equipment type: Part 15 Low Power Transmitter Below 1705 kHz

Limits used: 47CFR15 Section 15.209

Measurement procedure used is KDB 558074 D01 April 9, 2013 and ANSI C63.4: 2003.

Application for Certification
prepared by:
Ishaishou Raz
ITL (Product Testing) Ltd.
Kfar Bin Nun
D.N. Shimshon 99780
Israel
e-mail Sraz@itl.co.il

Applicant for this device:
(different from "prepared by")
Idan Glass
2 Holtzman St.,
Rehovot 7670402
Israel
Tel: +972-8-931-4285
Fax: +972-8-931-4315
e-mail: Idan.Glass@stratasys.com

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1. General Information

1.1 Administrative Information

Manufacturer:	Stratasys Ltd.
Manufacturer's Address:	2 Holtzman St., Rehovot, 7670402 Israel Tel: +972-8-931-4285 Fax: +972-8-931-4315
Manufacturer's Representative:	Idan Glass
Equipment Under Test (E.U.T):	3D Desktop Printer
Equipment Model No.:	Objet30 V3.0
Equipment Serial No.:	Not Designated
Date of Receipt of E.U.T:	09.09.13
Start of Test:	13.10.13
End of Test:	13.10.13
Test Laboratory Location:	I.T.L (Product Testing) Ltd. Kfar Bin Nun, ISRAEL 99780
Test Specifications:	FCC Part 15, Subpart C

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.

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

The Objet30 Pro combines the accuracy and versatility of a high-end rapid prototyping machine with the small footprint of a desktop 3D printer. Powered by PolyJet technology, it offers seven different 3D printing materials, among them clear and high-temperature, and features the industry's highest level print resolution so you get smooth surfaces, small moving parts and thin walls. With a roomy tray size of 300 × 200 × 150 mm (11.81 × 7.87 × 5.9 in.), Objet30 Pro is ideal for prototyping consumer goods, consumer electronics, medical devices and more. The Objet30 Pro gives you the power to create realistic models in-house – quickly and easily.

1.4 Test Methodology

Radiated testing was performed according to the procedures in KDB 558074 D01 April 9, 2013 and ANSI 63-4: 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 November 21, 2012).
I.T.L.'s EMC Laboratory is also accredited by A2LA, certificate No. 1152.01

1.6 Measurement Uncertainty

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site 30-1000MHz:

Expanded Uncertainty (95% Confidence, K=2):

± 5.2 dB

Note: See ITL Procedure No. PM 198.

2. System Test Configuration

2.1 Justification

The FCC issued a Grant for the product on July, 12, 2010.

The Class II Permissive Changes to the original product are as follows:

Lotus control board (BRD-34324) changed at the RFID section:

1) BOM change: MAX4534 changed to MAX4524EUB
2) Layout improvements:
    i. RFID 5V regulator footprint corrected
    ii. A few nets improvements (PCB layout)

Due to the above changes an application for a C2PC with the FCC is being submitted.

2.2 EUT Exercise Software

No exercise software was used.

2.3 Special Accessories

No special accessories were needed to achieve compliance.

2.4 Equipment Modifications

No modifications were necessary in order to achieve compliance.

2.5 Configuration of Tested System

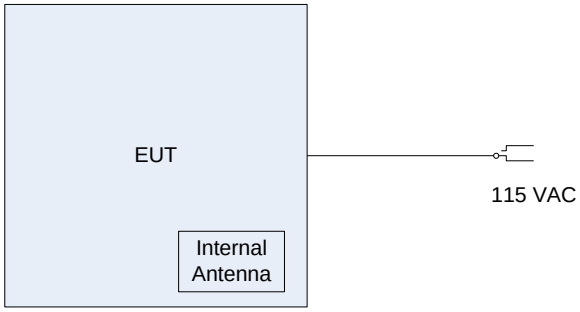

Figure 1. Configuration of Tested System

3. Radiated Measurement Test Set-up Photo

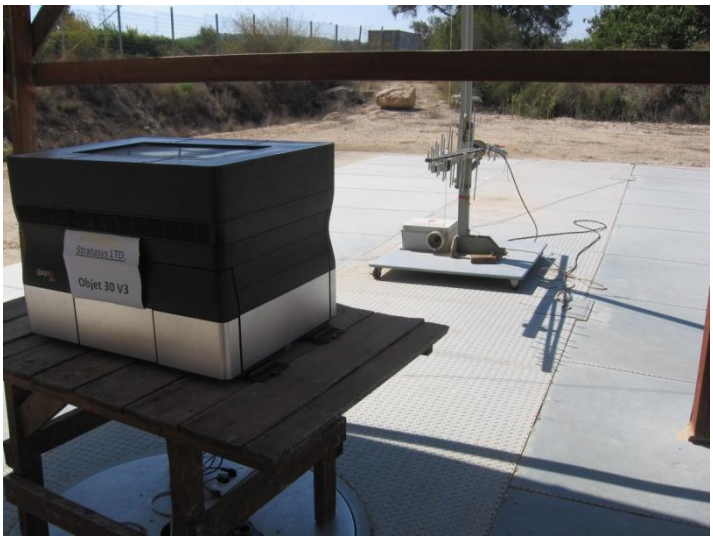

Figure 2. Radiated Emission Test

Figure 3. Radiated Emission Test

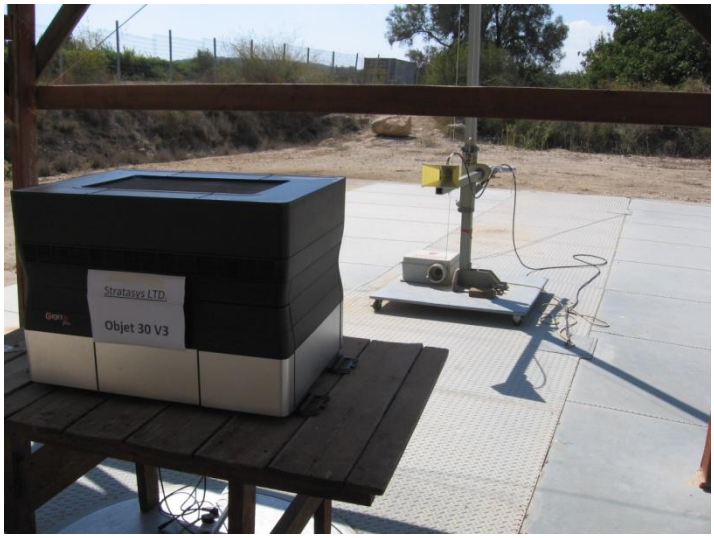

Figure 4. Radiated Emission Test

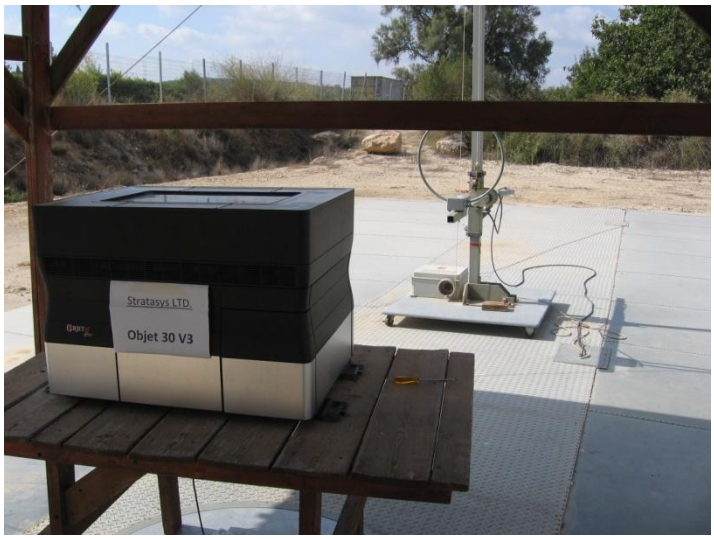

Figure 5. Radiated Emission Test

4. Field Strength of Fundamental 125 kHz Transmitter

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.

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.

The average result is:

Peak Level(dBµV/m) + Average Factor (dB)

4.3 Measured Data

JUDGEMENT: Passed by 22.17 dB

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

The details of the highest emissions are given in *Figure 6*.

TEST PERSONNEL:

Tester Signature: _____ Date: 01.12.2013

Typed/Printed Name: I. Siboni

Field Strength of Fundamental

E.U.T Description	3D Desktop Printer
Type	Objet30 V3.0
Serial Number:	Not Designated

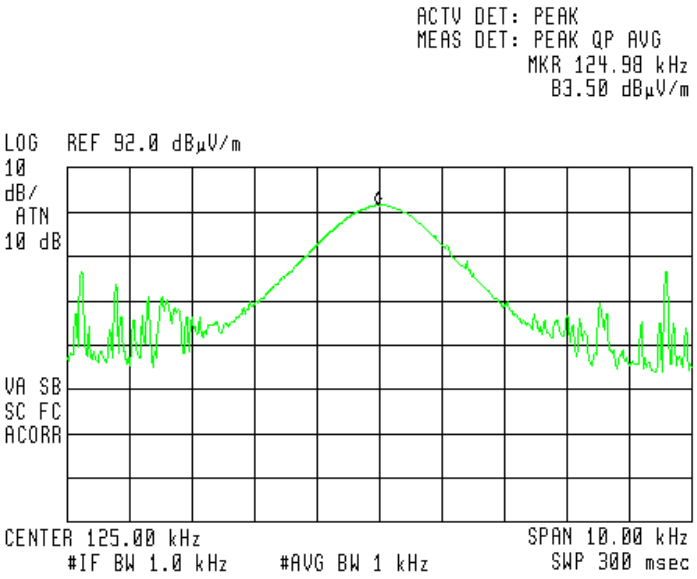

Figure 6. Field Strength of Fundamental.
Detector: Peak

Average Limit = 105.67dBµV/m

4.4 Test Instrumentation Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1 year
RF Section	HP	85420E	3705A00248	February 26, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 21, 2012	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

5. Spurious Radiated Emission, 9 kHz – 30 MHz, 125 kHz Transmitter

5.1 Test Specification

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

5.2 Test Procedure

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

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 with 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 10 meters.

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

5.3 Measured Data

JUDGEMENT: PASSED

The EUT was tested and it met the requirements of the FCC Part 15, Subpart C, specification.

TEST PERSONNEL:

Tester Signature: _____ Date: 01.12.13

Typed/Printed Name: I. Siboni

Radiated Emission 9 kHz – 30 MHz

E.U.T Description	3D Desktop Printer
Type	Objet30 V3.0
Serial Number:	Not Designated

Specification: FCC, Part 15, Subpart C

Test Distance: 3 meters
Operation Frequency: 125 kHz

Frequency range: 9 kHz to 30.0 GHz
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
0.450	28.5	0	28.5	94.50	-66.0
0.800	25.9	0	25.9	69.5	-43.6

Figure 7. 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

5.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1 year
RF Section	HP	85420E	3705A00248	February 26, 2013	1 year
Active Loop Antenna	EMCO	6502	9506-2950	October 21, 2012	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

5.5 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 [dBµv/m]
RA: Receiver Amplitude [dBµv]
AF: Receiving Antenna Correction Factor [dB/m]
CF: Cable Attenuation Factor [dB]

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

No external pre-amplifiers are used.

6. Spurious Radiated Emission 30-1000 MHz, 125 kHz transmitter

6.1 Test Specification

30 - 1000 MHz, F.C.C., Part 15, Subpart C

6.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 3.
See Section 3.1 Justification of the System Test Configuration concerning the E.U.T. orientation for this test.
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 2*. The signals from the list of the highest emissions were verified and the list was updated accordingly.
The levels of the emissions within the frequency ranges of the restricted bands (Section 15.205 of FCC Part 15) were compared to the limits of the table in Section 15.209 (a), General Requirements.

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

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization. Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The emissions were measured at a distance of 3 meters.

6.3 Test Data

JUDGEMENT: PASSED

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

No signals were detected in the frequency range of 30 -1000 MHz.

TEST PERSONNEL:

Tester Signature: _____ Date: 01.12.13

Typed/Printed Name: I. Siboni

6.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	HP	85422E	3906A00276	February 26, 2013	1 year
RF Section	HP	85420E	3705A00248	February 26, 2013	1 year
Antenna Biconical	EMCO	3104	2606	August 30, 2013	1 year
Antenna Log Periodic	ARA	LPD-2010/A	1038	April 2, 2013	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

7. APPENDIX A - CORRECTION FACTORS

7.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.3
20.0	0.6
30.0	0.8
40.0	0.9
50.0	1.1
60.0	1.2
70.0	1.3
80.0	1.4
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

FREQUENCY (MHz)	CORRECTION FACTOR (dB)
1200.0	7.3
1400.0	7.8
1600.0	8.4
1800.0	9.1
2000.0	9.9
2300.0	11.2
2600.0	12.2
2900.0	13.0

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 BICONICAL ANTENNA

Type BCD-235/B, at 3 meter range

FREQUENCY (MHz)	AFE (dB/m)
20.0	19.4
30.0	14.8
40.0	11.9
50.0	10.2
60.0	9.1
70.0	8.5
80.0	8.9
90.0	9.6
100.0	10.3
110.0	11.0
120.0	11.5
130.0	11.7
140.0	12.1
150.0	12.6
160.0	12.8
170.0	13.0
180.0	13.5
190.0	14.0
200.0	14.8
210.0	15.3
220.0	15.8
230.0	16.2
240.0	16.6
250.0	17.6
260.0	18.2
270.0	18.4
280.0	18.7
290.0	19.2
300.0	19.9
310	20.7
320	21.9
330	23.4
340	25.1
350	27.0

NOTES:

1. Antenna serial number is 1041.

2. The above list is located in file 19BC10M1.ANT on the disk marked "Radiated Emissions Tests EMI Receiver".

7.3 Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY (MHz)	Magnetic Antenna Factor (dB)	Electric Antenna Factor (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