



FCC TEST REPORT

On Behalf of

Microboards Technology, LLC (doing business as Afinia)

Afinia 3D Printer

Model No.: H800

FCC ID: O26-H800

Prepared for : Microboards Technology, LLC (doing business as Afinia)

Address : 8150 Mallory Court, Chanhassen, MN 55317, U.S.A.

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.

Address : Building B, East Area of Nanchang Second Industrial Zone,
Gushu 2nd Road, Bao'an District, Shenzhen 518126, P.R. China

Report Number	: T1850384 03
Date of Receipt	: April 23, 2015
Date of Test	: April 23-28, 2015
Date of Report	: April 28, 2015
Version Number	: REV0

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TEST REPORT VERIFICATION

Applicant : Microboards Technology, LLC (doing business as Afinia)
Manufacturer : Delta Micro Factory Corporation
EUT Description : Afinia 3D Printer

(A) Model No. : H800
(B) Trademark : N/A
(C) Ratings Supply : DC 24V
(D) Test Voltage : DC 24V From Adapter with AC 120V/60Hz


Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart B Class B 2013.

The device described above is tested by Shenzhen Alpha Product Testing Co., Ltd. to determine the maximum emission levels emanating from the device and the severe levels of the device can endure and its performance criterion. The test results are contained in this test report and Shenzhen Alpha Product Testing Co., Ltd. is assumed full responsibility for the accuracy and completeness of test. Also, this report shows that the EUT is technically compliant with the FCC Part15 requirements.

This report applies to above tested sample only. This report shall not be reproduced in parts without written approval of Shenzhen Alpha Product Testing Co., Ltd.

Tested by (name + signature).....: Eric Huang
Test Engineer



Approved by (name + signature).....: Simple Guan
Project Manager



Date of issue..... : April 28, 2015

1. SUMMARY OF STANDARDS AND RESULTS

1.1. Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below.

EMISSION			
Description of Test Item	Standard	Limits	Results
Power Line Conducted Emission Test	FCC Part 15:2013 ANSI C63.4:2003	Class B	PASS
Radiated Emission Test	FCC Part 15:2013 ANSI C63.4:2003	Class B	PASS
N/A is an abbreviation for Not Applicable.			

2. GENERAL INFORMATION

2.1. Description of Device (EUT)

Description : Afinia 3D Printer

Model Number : H800

Test Voltage : DC 24V From Adapter with AC 120V/60Hz

AC Adapter : Input: AC100-240V, 50/60Hz, 3A

Output: 24V/9.16A

Model: FSP220-AAAN1

Highest frequency : 480MHz

Version number : Software version: UP 2.1. 4 Hardware version: V38

Trademark : N/A

Applicant : Microboards Technology, LLC (doing business as Afinia)

Address : 8150 Mallory Court, Chanhassen, MN 55317, U.S.A.

Manufacturer : Delta Micro Factory Corporation

Address : No.18 Yanqi Avenue, Yanqi Economic Development Area, Huairou District, Beijing, 101407, P. R. China

Sample Type : Prototype production

2.1. Test mode Description

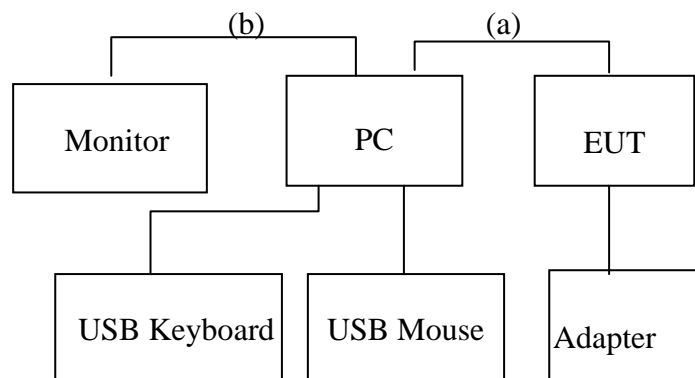
No.	Test Mode
1.	Standby mode
2.	Working
※3.	Exchange data with PC.
Note: ※3. is worst case mode for, so this report only reflected the worst mode.	

2.2. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or DOC
1	Personal Computer	DELL	D11M	CN-0LV772-C0 887-378-H8UR	DOC
2	Monitor	DELL	E2014Hf	CN-011HFV-72 872-397-CHEM	DOC
3	USB Keyboard	ACER	SK-9625	KBUSB1580500 037E0100	DOC
4	USB Mouse	ACER	MS.11200.014	M-UAY-ACR2	DOC

2.3. Block Diagram of connection between EUT and simulators

For EMI Tests



Signal Cable Description of the above Support Units					
No.	Port Name	Cable	Length	Shielded (Yes or No)	Detachable (Yes or No)
(a)	USB Port	USB Cable	150CM	Yes(Shielding and foil shields)	Yes
(b)	VGA Port	VGA Cable	120CM	Yes(Shielding)	Yes

※ EUT: Afinia 3D Printer

2.4. Test Facility

2.4.1. Laboratory Name:

Shenzhen Alpha Product Testing Co., Ltd.

2.4.2. Site Location :

Building B, East Area of Nanchang Second Industrial Zone,
Gushu 2nd Road, Bao'an District, Shenzhen 518126, P.R. China

2.4.3. Test Facility

November11, 2014 File on Federal Communication Commission
Registration Number: 203110

July 18, 2014 Certificated by IC

Registration Number: 12135A

2.5. Measurement Uncertainty

(95% confidence levels, k=2)

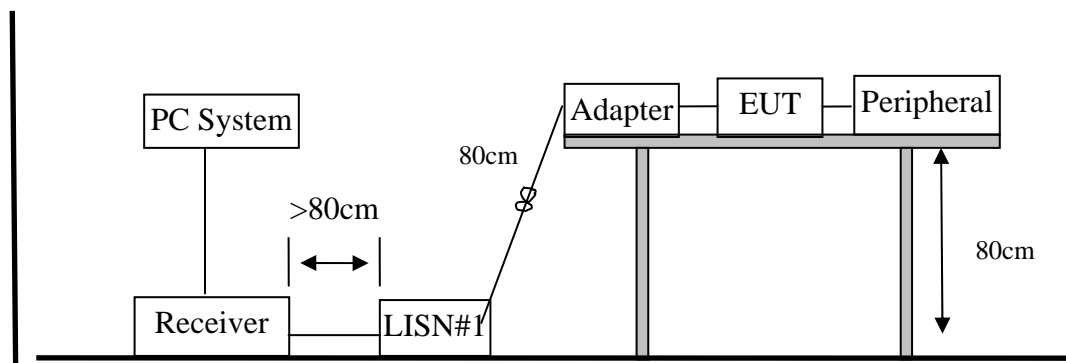
Test Item	Uncertainty
Uncertainty for Conduction emission test	2.70dB
Uncertainty for Radiation Emission test (<1G)	3.90 dB (Distance: 3m Polarize: V)
	3.92 dB (Distance: 3m Polarize: H)
Uncertainty for Radiation Emission test(>1G)	4.26 dB (Distance: 3m Polarize: V)
	4.28 dB (Distance: 3m Polarize: H)

3. POWER LINE CONDUCTED EMISSION TEST

3.1. Test Equipment

Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	101165	2015.01.19	1 Year
2.	L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2015.01.19	1 Year
3.	L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2015.01.19	1 Year
4.	Pulse Limiter	Schwarzbeck	9516F	9618	2015.01.19	1 Year
5	Cable	Resenberger	SUCOFLEX 104	MY6562/4	2015.01.19	1 Year

3.2. Block Diagram of Test Setup



3.3. Power Line Conducted Emission Test Limits

Frequency	Maximum RF Line Voltage	
	Quasi-Peak Level dB(μV)	Average Level dB(μV)
150kHz ~ 500kHz	66 ~ 56*	56 ~ 46*
500kHz ~ 5MHz	56	46
5MHz ~ 30MHz	60	50

Notes: 1. Emission level=Read level+LISN factor-Preamplifier factor+Cable loss

2* Decreasing linearly with logarithm of frequency.

3. The lower limit shall apply at the transition frequencies.

3.4. Configuration of EUT on Test

The following equipment are installed on Power Line Conducted Emission Test to meet the commission requirement and operating regulations in a manner which tends to maximize its emission characteristics in a normal application.

3.5. Operating Condition of EUT

3.5.1. Setup the EUT and simulator as shown as Section 3.2.

3.5.2. Turn on the power of all equipment.

3.5.3. Let the EUT work in test mode (Exchange data with PC.) and 15 minutes after taking the test.

3.6. Test Procedure

The EUT was placed on a non-metallic table, 80cm above the ground plane. The EUT Power connected to the power mains through a line impedance stabilization network (L.I.S.N. 1#). This provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N.#2). Both sides of power line were checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.4:2003 on conducted Emission test.

The bandwidth of test receiver (R&S TEST RECEIVER ESCI) is set at 9kHz.

The frequency range from 150kHz to 30MHz is checked. The test result are reported on Section 3.7.

3.7. Conducted Disturbance at Mains Terminals Test Results

PASS.

The test results are listed in next pages.

Note: If the limits for the measurement with the average detector are met when using a receiver with a quasi-peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

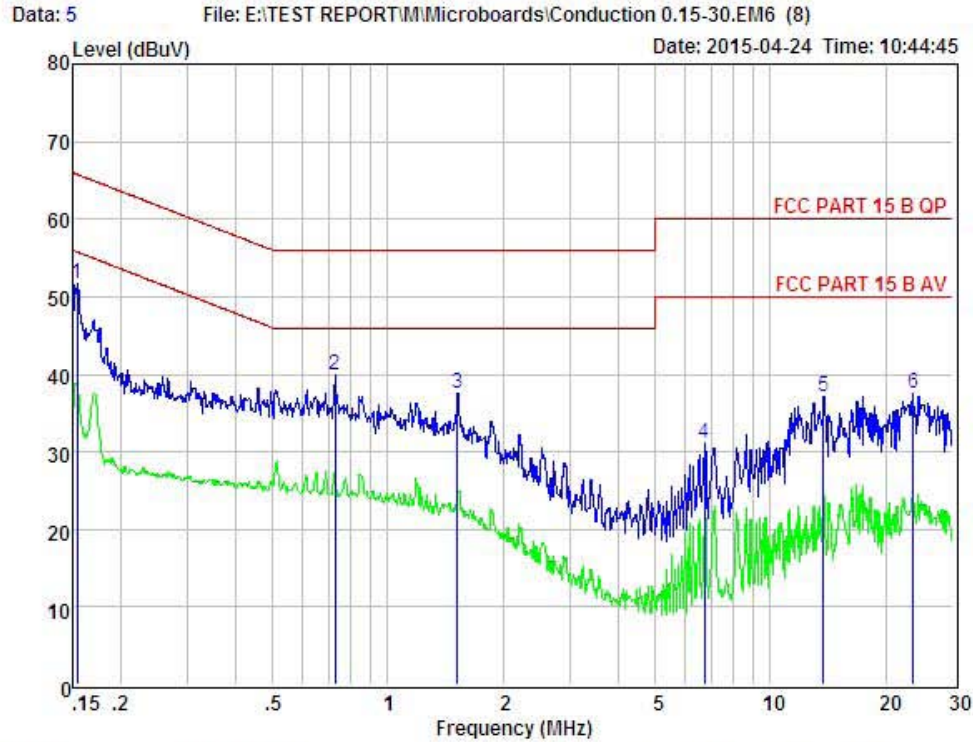
Temperature: 24.7°C Humidity: 51%

The details of test mode is as follows :

No.	Test Mode
1.	Exchange data with PC.
Note: This mode is worst case mode, so this report only reflected the worst mode.	



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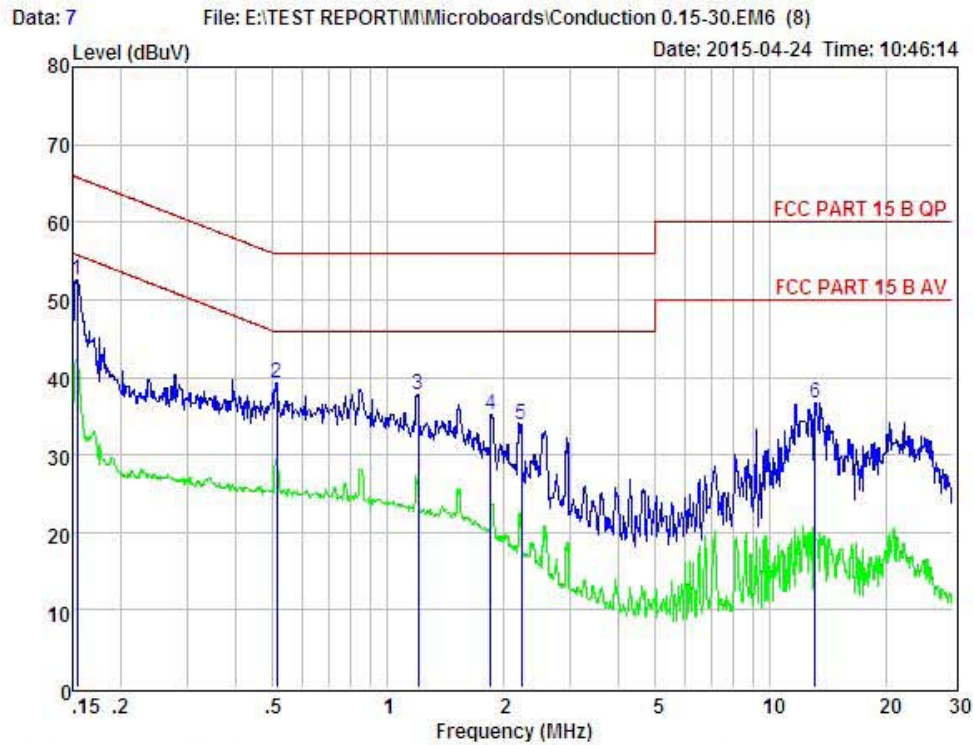
Condition : FCC PART 15 B QP POL: LINE Temp: 24.7 °C Hum: 51 %
 EUT : Afinia 3D Printer
 Model No : H800
 Test Mode : Exchange data with PC
 Power : DC 24V From Adapter AC 120V/60Hz
 Test Engineer: Eric
 Remark :

Item	Freq MHz	Read dBuV	LISN Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	0.154	41.93	0.03	-9.72	0.10	51.78	65.78	-14.00	Peak
2	0.727	30.08	0.04	-9.72	0.10	39.94	56.00	-16.06	Peak
3	1.519	27.70	0.05	-9.71	0.10	37.56	56.00	-18.44	Peak
4	6.733	21.17	0.12	-9.56	0.15	31.00	60.00	-29.00	Peak
5	13.768	27.16	0.23	-9.41	0.23	37.03	60.00	-22.97	Peak
6	23.636	27.21	0.43	-9.56	0.44	37.64	60.00	-22.36	Peak

Remarks: Level = Read + LISN Factor - Preamp Factor + Cable loss



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Condition : FCC PART 15 B QP POL: NEUTRAL Temp:24.7 °C Hum:51 %
 EUT : Afinia 3D Printer
 Model No : H800
 Test Mode : Exchange data with PC
 Power : DC 24V From Adapter AC 120V/60Hz
 Test Engineer: Eric
 Remark :

Item	Freq MHz	Read dBuV	LISN Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	0.154	42.79	0.03	-9.72	0.10	52.64	65.78	-13.14	Peak
2	0.513	29.50	0.03	-9.72	0.10	39.35	56.00	-16.65	Peak
3	1.203	27.83	0.04	-9.71	0.10	37.68	56.00	-18.32	Peak
4	1.858	25.38	0.05	-9.70	0.10	35.23	56.00	-20.77	Peak
5	2.237	23.99	0.06	-9.70	0.10	33.85	56.00	-22.15	Peak
6	13.127	26.74	0.23	-9.43	0.22	36.62	60.00	-23.38	Peak

Remarks: Level = Read + LISN Factor - Preamp Factor + Cable loss

4. RADIATED EMISSION TEST

4.1. Test Equipment

4.1.1. For frequency range 30MHz~1000MHz (At Semi Anechoic Chamber)

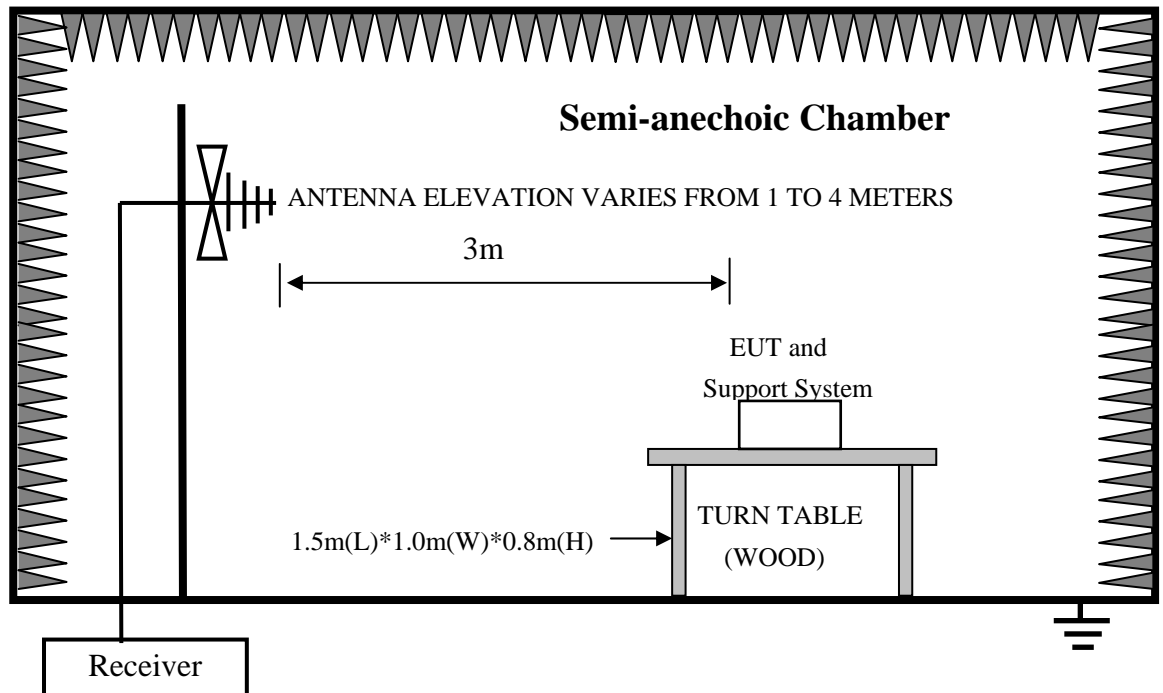
For frequency range 30MHz~1GHz (At Semi Anechoic Chamber)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Test Receiver	Rohde&Schwarz	ESCI	101165	2015.01.19	1 Year
2	Amplifier	QuieTek	AP/0100A	CHM0506005	2014.11.18	1 Year
3	Bilog Antenna	Schwarzbeck	VULB 9168	9168-438	2015.01.22	1 Year
4	Cable	Resenberger	SUCOFLE X 104	309972/4	2015.01.19	1 Year

4.1.2. For frequency range 1GHz~6GHz (At Semi Anechoic Chamber)

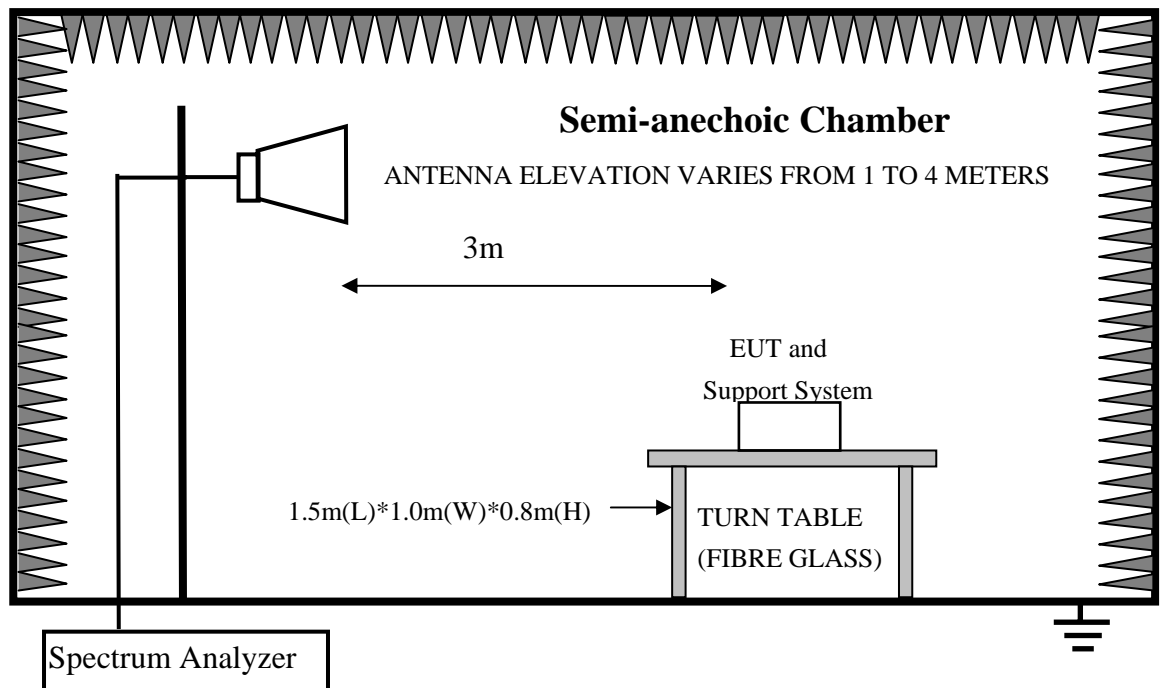
For frequency range 1GHz~5GHz (At Semi Anechoic Chamber)						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum Analyzer	Agilent	E4407B	MY49510055	2015.01.19	1 Year
2	Horn Antenna	Schwarzbeck	BBHA 9120 D	BBHA 9120 D(1201)	2015.01.22	1 Year
3	Amplifier	Quietek	AP-180C	CHM-0602012	2015.01.19	1 Year
4	Cable	Resenberger	SUCOFLEX 104	329112/4	2015.01.19	1 Year

4.2. Block Diagram of Test Setup

4.2.1. In Semi Anechoic Chamber (3m) Test Setup Diagram for 30MHz~1000MHz



4.2.2. In Semi Anechoic Chamber (3m) Test Setup Diagram for 1-6GHz



4.3. Radiated Emission Limit

Frequency MHz	Distance (Meters)	Field Strengths Limits dB(μ V)/m
30 ~ 88	3	40.0
88 ~ 216	3	43.5
216 ~ 960	3	46.0
960 ~ 1000	3	54.0
1000 ~ 5000	3	74(Peak) 54(Average)

Remark: (1) Emission level = Read level+Antenna Factor-Preamp Factor +Cable Loss

(2) The smaller limit shall apply at the cross point between two frequency bands.

(3) Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.

4.4. EUT Configuration on Test

The following equipment are installed on Radiated Emission Test to meet the commission requirements and operating regulations in a manner that tends to maximize its emission characteristics in normal application.

4.4.1. Support Equipments : As Tested Supporting System Detail, in Section 2.2.

4.5. Operating Condition of EUT

4.5.1. Setup the EUT as shown in Section 4.2.

4.5.2. Turn on the power of all equipment.

4.5.3. Let the EUT work in test mode (Exchange data with PC.) and 15 minutes after taking the test.

4.6. Test Procedure

The EUT was placed on a non-metallic table, 80 cm above the ground plane inside a semi-anechoic chamber. An antenna was located 3m from the EUT on an adjustable mast. A pre-scan was first performed in order to find prominent radiated emissions. For final emissions measurements at each frequency of interest, the EUT were rotated and the antenna height was varied between 1m and 4m in order to maximize the emission. Measurements in both horizontal and vertical polarities were made and the data was recorded. In order to find the maximum emission, the relative positions of equipments and all of the interface cables were changed according to ANSI C63.4:2003 on Radiated Emission test.

The bandwidth setting on the test receiver (ROHDE&SCHWARZ TEST RECEIVER ESCI) is 120 kHz.

The resolution bandwidth of the Agilent Spectrum Analyzer E4407B was set at 1MHz. (For above 1GHz)

The frequency range from 30MHz to 1000MHz was pre-scanned with a peak detector and all final readings of measurement from Test Receiver are Quasi-Peak values.

The frequency range from 1GHz to 6GHz was checked with peak and average detector, measurement distance is 3m in 3m chamber.

Finally, selected operating situations at Anechoic Chamber measurement, all the test results are listed in section 4.7.

4.7. Radiated Disturbance Test Results

PASS.

For frequency range 30MHz~1000MHz

The test results are listed in next pages.

Temperature: 25.2℃ Humidity: 56%

The details of test mode is as follows :

No.	Test Mode
1.	Exchange data with PC.
Note: This mode is worst case mode, so this report only reflected the worst mode.	

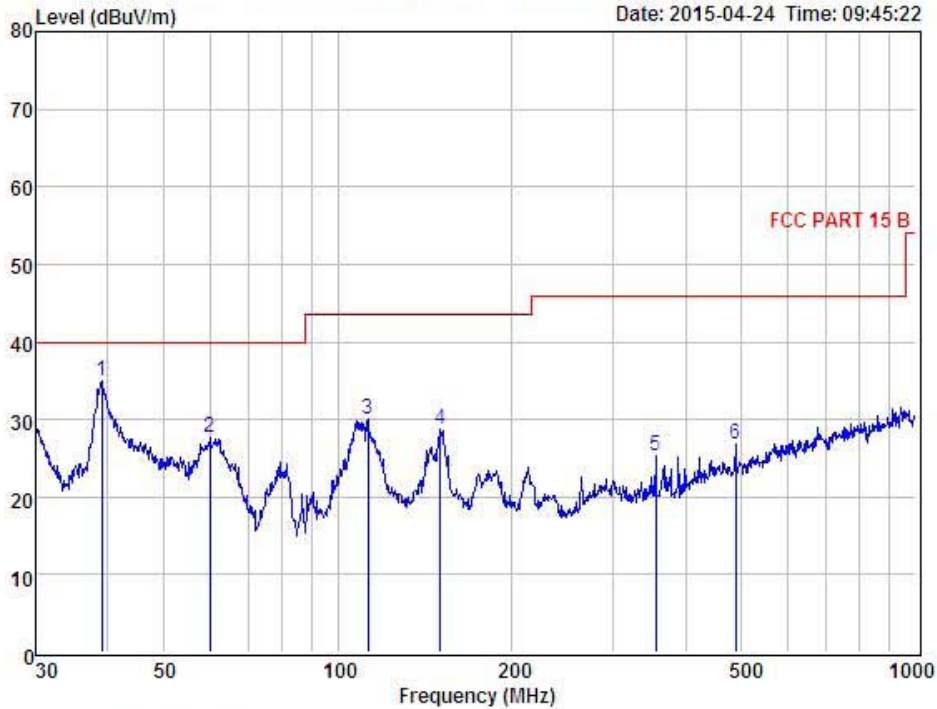


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Data: 3

File: E:\REPORT DATA\MMicroboards\H800.EM6 (8)

Date: 2015-04-24 Time: 09:45:22



Condition : FCC PART 15 B 3m POL: VERTICAL
 EUT : Afinia 3D Printer
 Model No : H800
 Test Mode : Exchange data with PC
 Power : DC 24V From Adapter AC 120V/60Hz
 Test Engineer : Eric
 Remark :
 Temp : 25.2°C
 Hum : 56%

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	39.02	52.58	14.07	31.89	0.13	34.89	40.00	-5.11	Peak
2	60.07	46.44	12.75	31.75	0.24	27.68	40.00	-12.32	Peak
3	112.92	49.45	11.50	31.33	0.47	30.09	43.50	-13.41	Peak
4	150.54	45.45	14.16	31.19	0.39	28.81	43.50	-14.69	Peak
5	355.43	41.34	13.91	30.47	0.63	25.41	46.00	-20.59	Peak
6	487.32	39.18	16.35	29.66	0.94	26.81	46.00	-19.19	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

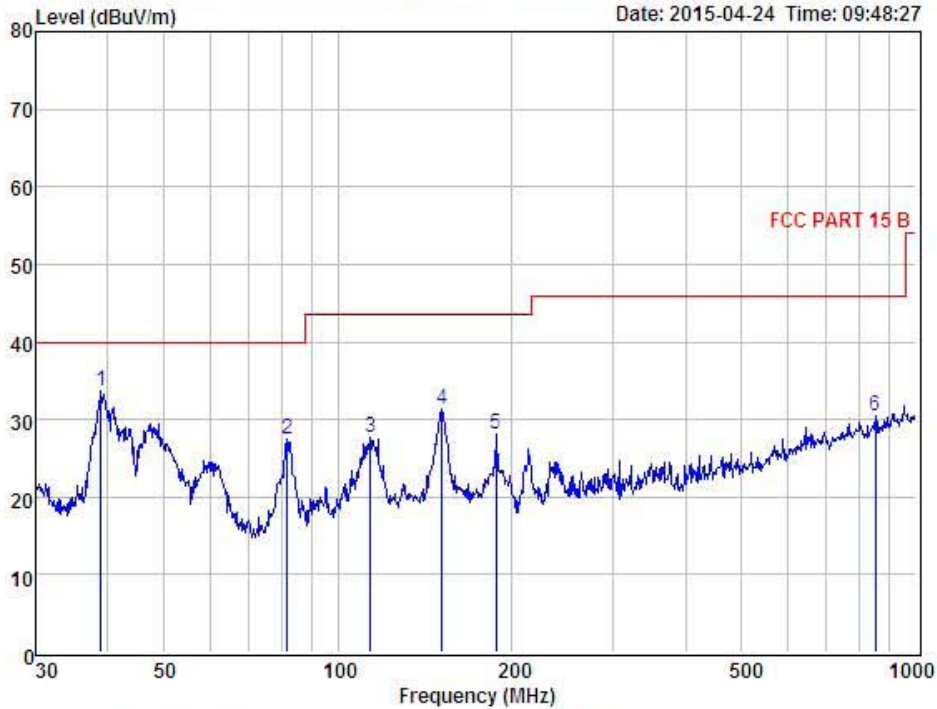


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Data: 4

File: E:\REPORT DATA\MMicroboards\H800.EM6 (8)

Date: 2015-04-24 Time: 09:48:27



Condition : FCC PART 15 B 3m POL: HORIZONTAL
 EUT : Afinia 3D Printer
 Model No : H800
 Test Mode : Exchange data with PC
 Power : DC 24V From Adapter AC 120V/60Hz
 Test Engineer : Eric
 Remark :
 Temp : 25.2°C
 Hum : 56%

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	38.89	51.34	14.07	31.89	0.13	33.65	40.00	-6.35	Peak
2	81.78	49.50	9.32	31.58	0.17	27.41	40.00	-12.59	Peak
3	113.71	47.01	11.50	31.33	0.44	27.62	43.50	-15.88	Peak
4	151.60	47.82	14.16	31.18	0.42	31.22	43.50	-12.28	Peak
5	187.75	47.78	10.71	30.99	0.55	28.05	43.50	-15.45	Peak
6	851.04	36.98	21.06	29.14	1.55	30.45	46.00	-15.55	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

For frequency range 1GHz~6GHz

The test results are listed in next pages.

Note: If the limits for the measurement with the average detector are met when using a receiver with a peak detector, the test unit shall be deemed to meet both limits and the measurement with the average detector need not be carried out.

Temperature: 25.2°C Humidity: 56%

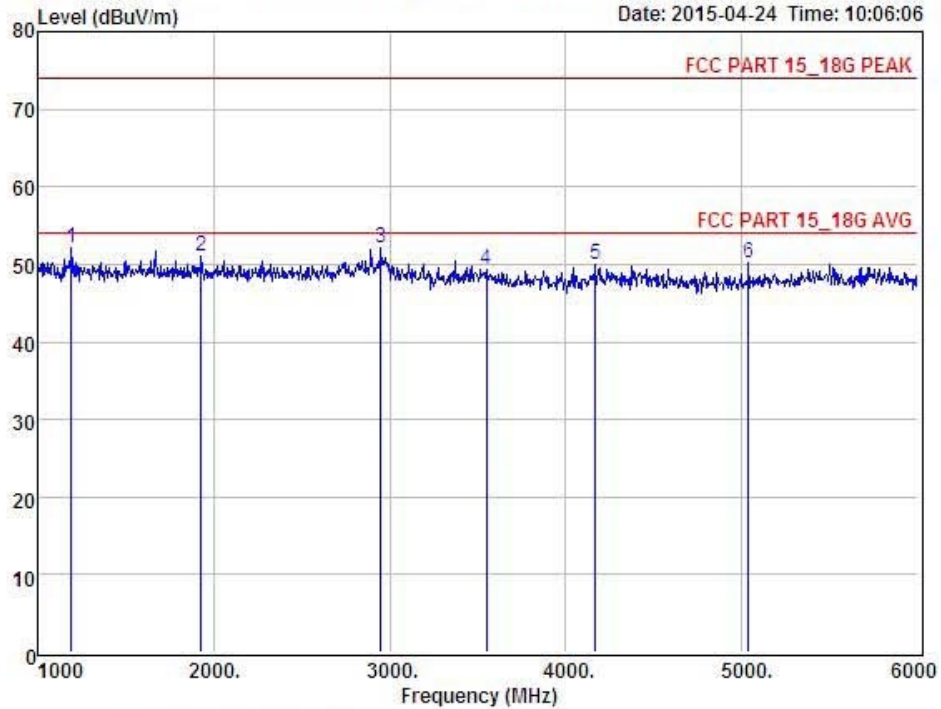
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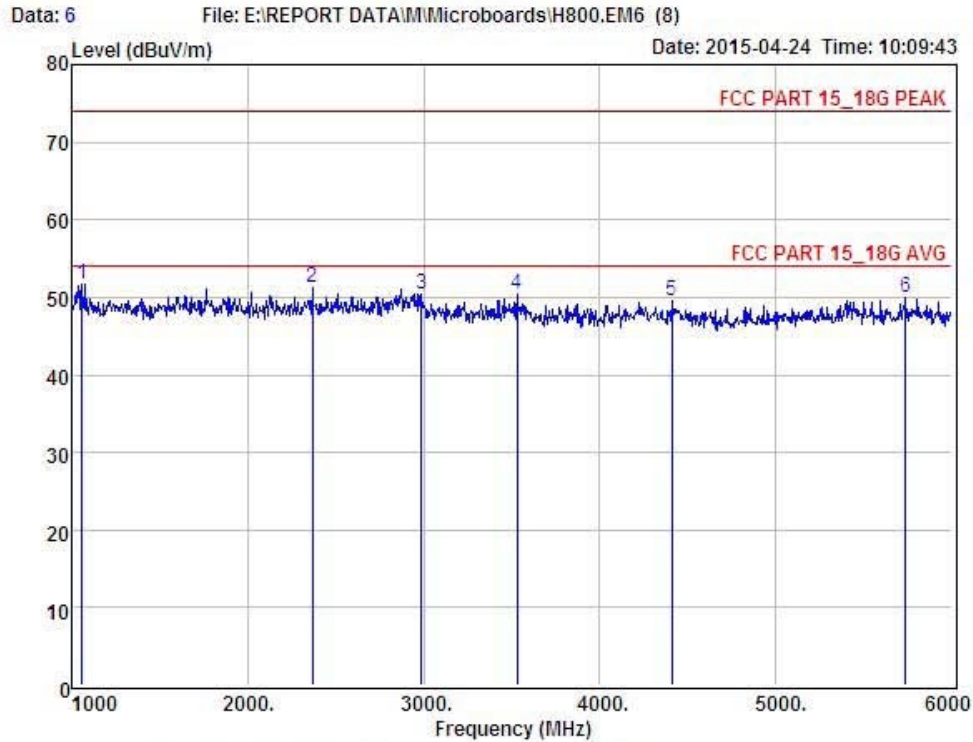
Condition : FCC PART 15_18G PEAK 3m POL: VERTICAL
 EUT : Afinia 3D Printer
 Model No : H800
 Test Mode : Exchange data with PC
 Power : DC 24V From Adapter AC 120V/60Hz
 Test Engineer : Eric
 Remark :
 Temp : 25.2°C
 Hum : 56%

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	1190.00	60.10	24.71	34.90	2.31	52.22	74.00	-21.78	Peak
2	1930.00	56.18	26.17	34.91	3.55	50.99	74.00	-23.01	Peak
3	2950.00	54.54	28.09	34.98	4.38	52.03	74.00	-21.97	Peak
4	3550.00	50.66	28.72	34.90	4.89	49.37	74.00	-24.63	Peak
5	4170.00	49.22	30.04	34.62	5.29	49.93	74.00	-24.07	Peak
6	5040.00	46.65	31.63	33.99	5.85	50.14	74.00	-23.86	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss



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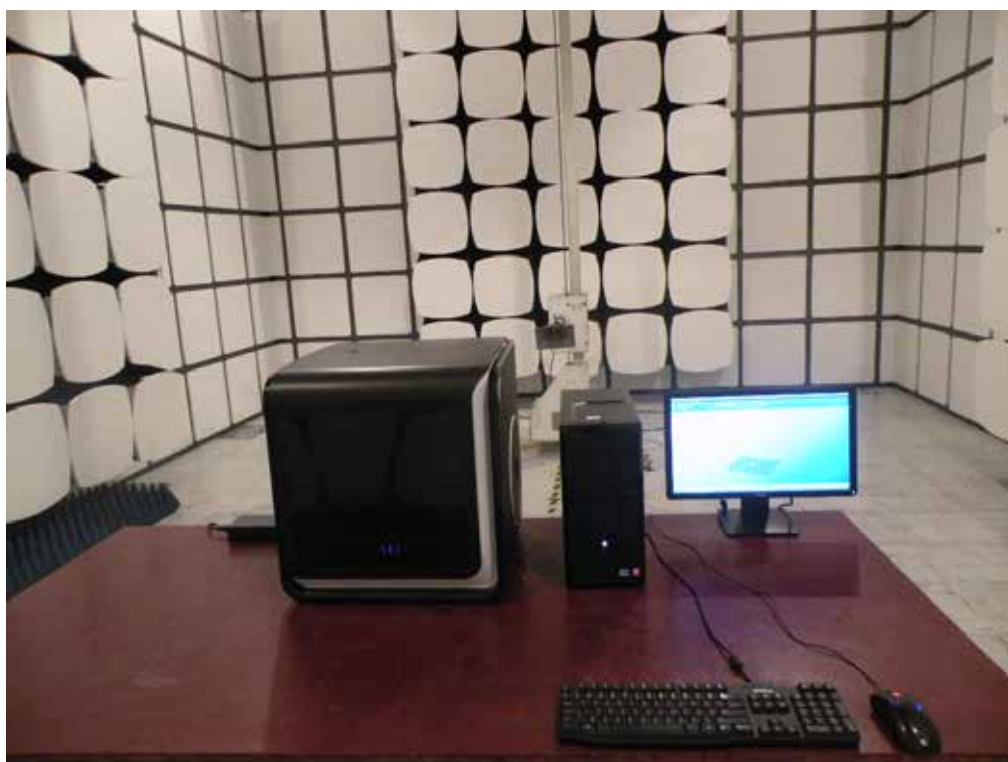
Condition : FCC PART 15_18G PEAK 3m POL: HORIZONTAL
 EUT : Afinia 3D Printer
 Model No : H800
 Test Mode : Exchange data with PC
 Power : DC 24V From Adapter AC 120V/60Hz
 Test Engineer : Eric
 Remark :
 Temp : 25.2°C
 Hum : 56%

Item	Freq MHz	Read Level dBuV	Antenna Factor dB	Preamp Factor dB	Cable Loss dB	Level dBuV	Limit dBuV	Margin dBuV	Remark
1	1060.00	49.86	34.70	34.86	2.04	51.74	74.00	-22.26	Peak
2	2370.00	47.69	34.57	34.97	3.91	51.20	74.00	-22.80	Peak
3	2985.00	46.49	34.50	34.98	4.41	50.42	74.00	-23.58	Peak
4	3530.00	45.95	34.44	34.90	4.87	50.36	74.00	-23.64	Peak
5	4410.00	44.45	34.19	34.49	5.45	49.60	74.00	-24.40	Peak
6	5740.00	43.56	33.63	33.59	6.27	49.87	74.00	-24.13	Peak

Remark: Level = Read Level + Antenna Factor - Preamp Factor + Cable Loss

5. PHOTOGRAPH

5.1.Photos of Radiated Emission Test (In Anechoic Chamber)



5.2.Photos of Power Line Conducted Emission Test



6. PHOTOS OF THE EUT



EUT View



EUT View



EUT View



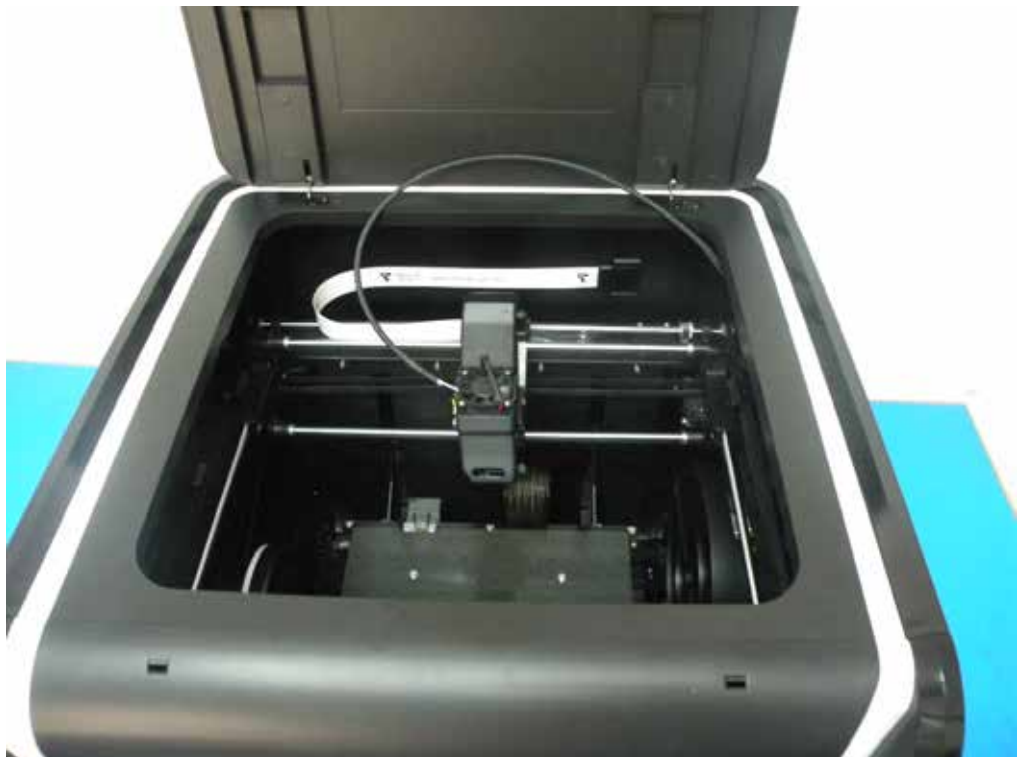
EUT View



EUT View



EUT View

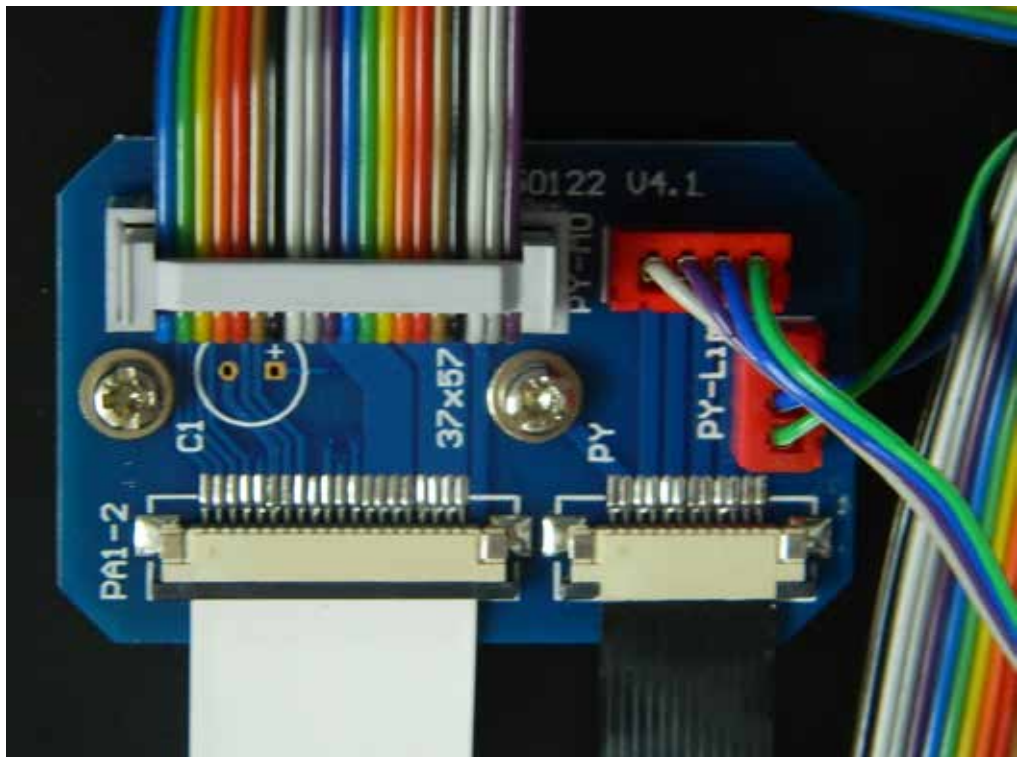
**EUT View****EUT View**

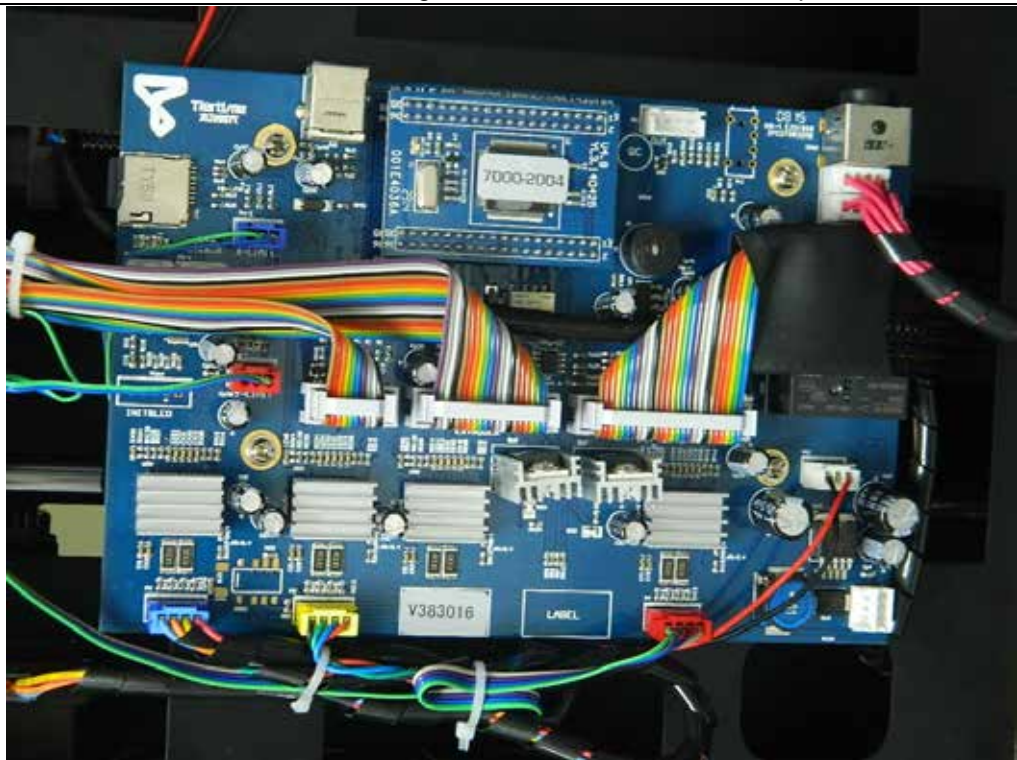
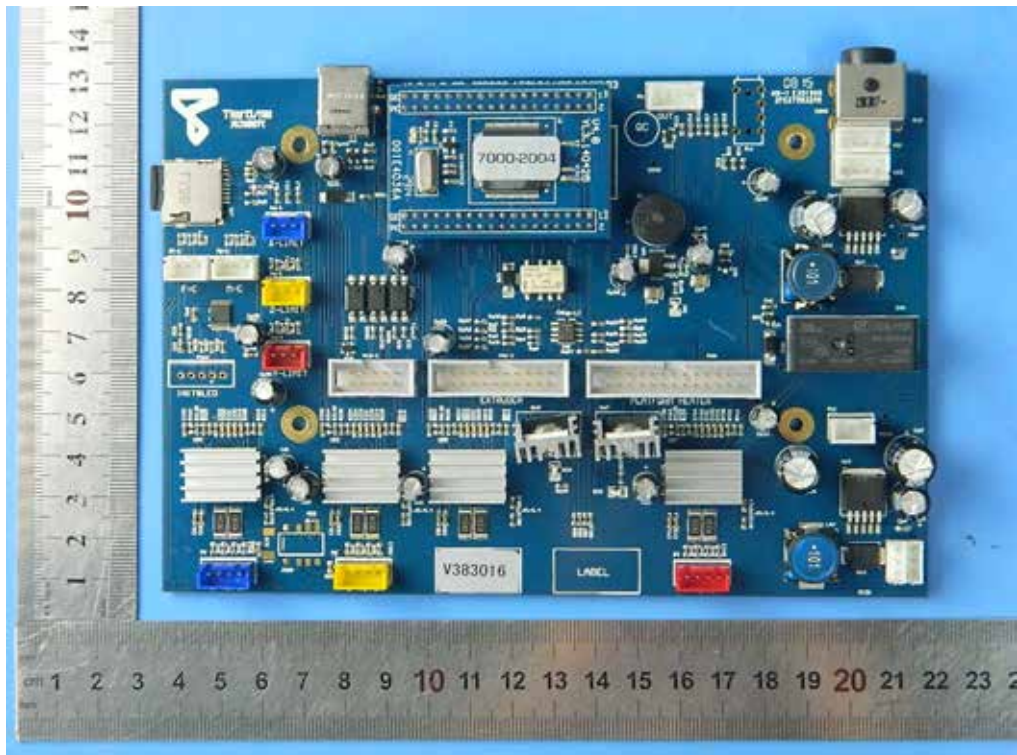


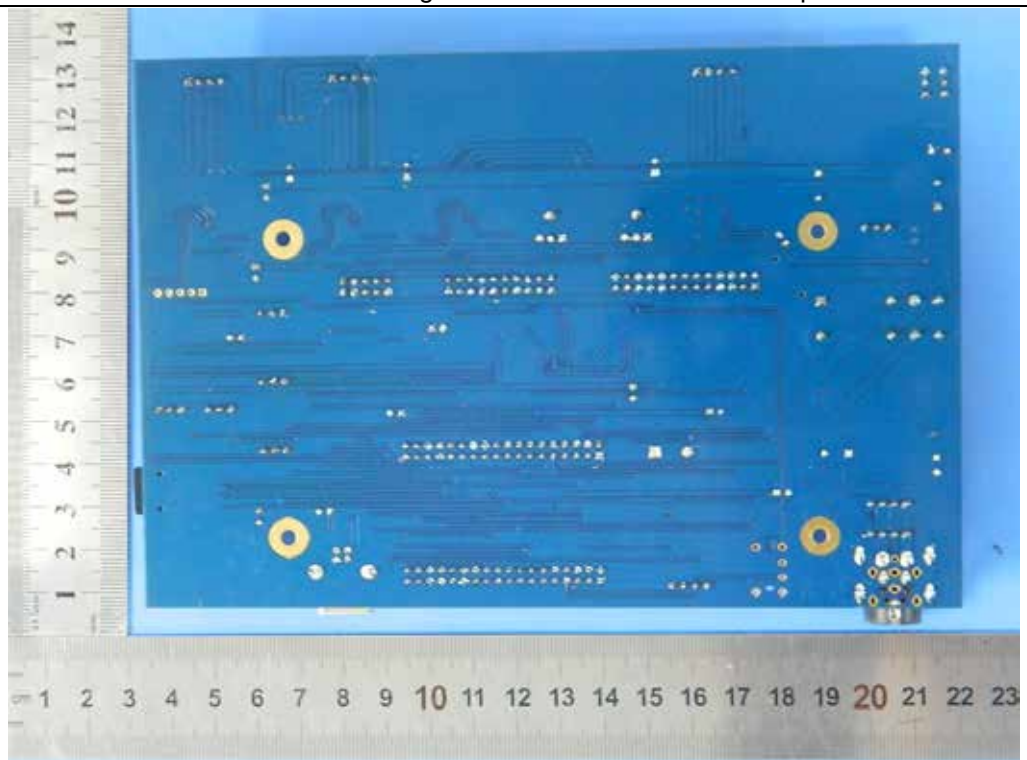
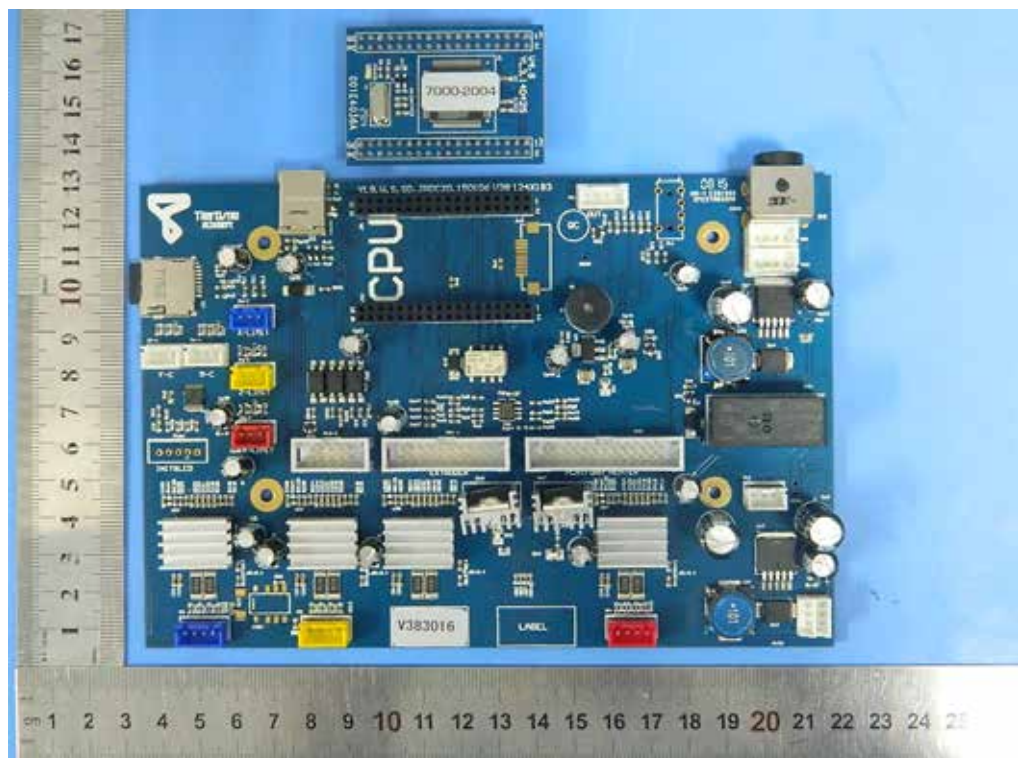
EUT View



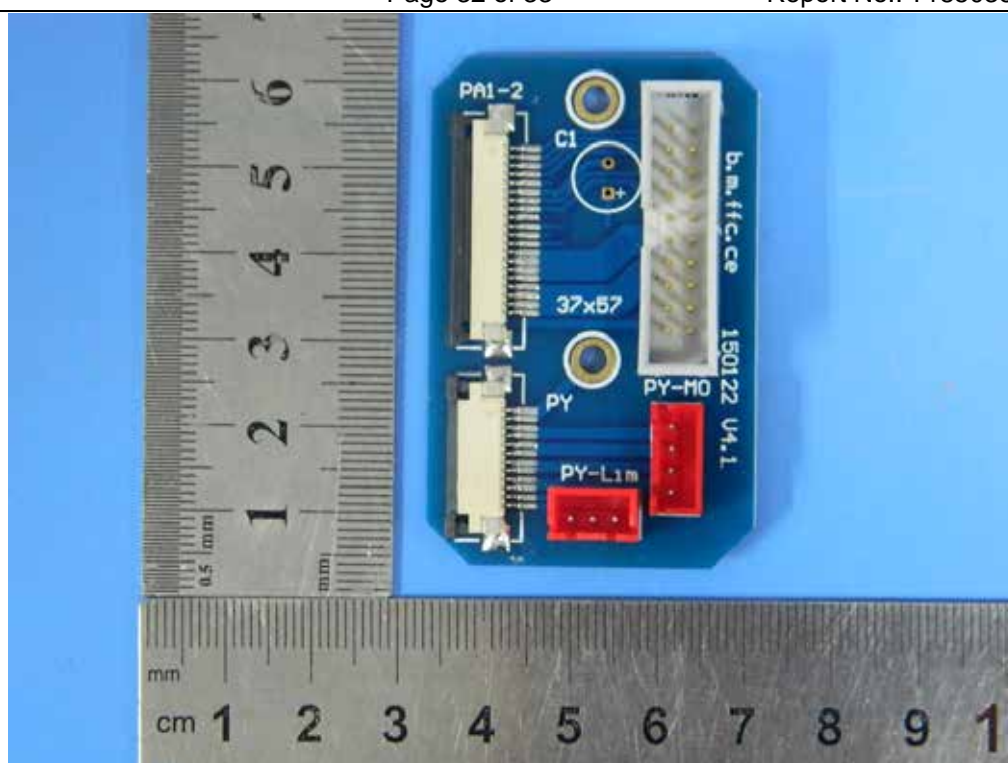
EUT View

**EUT View****EUT View**

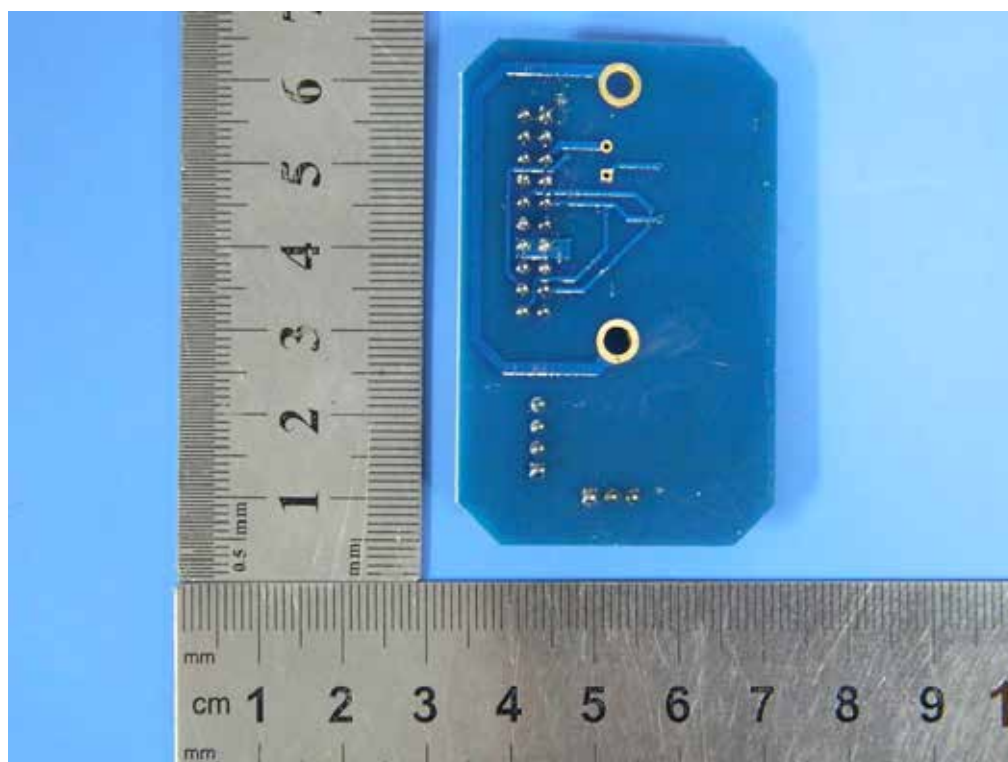
**EUT View****EUT View**

**EUT View****EUT View**





EUT View



EUT View



EUT View



EUT View

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