FCC TEST REPORT

FCC ID	: A7AG2100B
Applicant	: TI Asahi Co., Ltd.
Address	: 4-3-4, Ueno, Iwatsuki-ku, Saitama-shi, Saitama 339-0073 Japan

Equipment Under Test (EUT) :

Product Name	: GNSS
Model No.	: G2100, G2100B, G2100R

Standards	: FCC Part 15 Section 15.109:2010
Date of Test	: Sep. 11 ~ Sep. 14, 2012
Date of Issue	: Sep. 18, 2012
Test Engineer	: Zero zhou / Engineer
Reviewed By	: Philo zhong / Manager

Test Result	**: PASS**

Prepared By:
Waltek Services (Shenzhen) Co., Ltd.
1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District,
Shenzhen 518105, China

Tel :+86-755-83551033
Fax:+86-755-83552400

✧ The sample detailed above has been tested to the requirements of Council Directives ANSI C63.4:2003. The test results have been reviewed against the Directives above and found to meet their essential requirements.

2 Test Summary

Test	Test Requirement	Test Method	Result
Radiated Emission for GNSS (30MHz to 26.5GHz)	FCC Part 15.109:2010	ANSI C63.4: 2003	PASS
Radiated Emission for Charger (30MHz to 1GHz)	FCC Part 15.109:2010	ANSI C63.4: 2003	PASS
Conducted Emission (150KHz to 30MHz)	FCC Part 15.107:2010	ANSI C63.4: 2003	PASS

3 Contents

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4 General Information

4.1 Client Information

Applicant	: TI Asahi Co., Ltd.
Address of Applicant	: 4-3-4, Ueno, Iwatsuki-ku, Saitama-shi, Saitama 339-0073 Japan
Manufacturer	: TI Precision Shanghai Co., Ltd.
Address of Manufacturer	: No.158, Beiyang Road, Songjiang District, Shanghai

4.2 General Description of E.U.T.

Product Name	: GNSS
Model No.	: G2100, G2100B, G2100R
Difference	:The difference of above models is the appearance and the model name. The interfaces,connectors,working frequency bands,functions are the same and contain the same module and module's FCC ID.
Bluetooth Module	:FCC ID:RFR-B2029
Rules	:Part15 Subpart C Section 15.247
Quad-Band GPRS Module	:FCCID: O9EQ24PL001
Rules	:FCC Part 22 and 24.

4.3 Details of E.U.T.

GNSS Technical Data	: 7.4V Li-ion Battery
	12.0VDC by lead-acid battery
	Adapter input: 100-240V AC, 50/60Hz, 1.7A
	Adapter output: 19V DC, 3.16A

4.4 Description of Support Units

The EUT has been tested as an independent unit.

4.5 Standards Applicable for Testing

The standards used were FCC Part15 Subpart B Section 15.107 and Section 15.109.

4.6 Test Facility

The test facility has a test site registered with the following organizations:

- **IC – Registration No.: 7760A**
  Waltek Services(Shenzhen) Co., Ltd. has been registered and fully described in a report filed with the Industry Canada. The acceptance letter from the Industry Canada is maintained in our files. Registration 7760A, July 12, 2012.
- **FCC – Registration No.: 880581**
  Waltek Services(Shenzhen) Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 880581, May 26, 2011.

4.7 Test Location

All the tests were performed at:
Waltek Services(Shenzhen) Co., Ltd. at 1/F, Fukangtai Building, West Baima Rd., Songgang Street, Baoan District, Shenzhen, China

5 Equipment Used during Test

Equipment Name	Manufacturer Model	Equipment No.	Internal No.	Specification	Cal. Date	Due Date	Uncertainty
EMC Analyzer	Agilent/ E7405A	MY45114943	W2008001	9k-26.5GHz	Aug.2, 2012	Aug.1, 2013	±1dB
Trilog Broadband Antenne 30-3000 MHz	SCHWARZBECK MESS-ELEKTROM/ VULB9163	336	W2008002	30-3000 MHz	Aug.2, 2012	Aug.1, 2013	±1dB
Broad-band Horn Antenna 1-18 GHz	SCHWARZBECK MESS-ELEKTROM/ BBHA9120D	667	W2008003	1-18GHz	Aug.2, 2012	Aug.1, 2013	f < 10 GHz : ±1dB 10GHz < f < 18GHz : ±1.5dB
Broadband Preamplifier 0.5-18 GHz	SCHWARZBECK MESS-ELEKTROM/ BBV 9718	9718-148	W2008004	0.5-18GHz	Aug.2, 2012	Aug.1, 2013	±1.2dB
10m Coaxial Cable with N-male Connectors usable up to 18GHz,	SCHWARZBECK MESS-ELEKTROM/AK 9515 H	-	-	-	Aug.2, 2012	Aug.1, 2013	-
10m 50 Ohm Coaxial Cable with N-plug, individual length, usable up to 3(5)GHz, Connector	SCHWARZBECK MESS-ELEKTROM/AK 9513	-	-	-	Aug.2, 2012	Aug.1, 2013	-
Positioning Controller	C&C LAB/ CC-C-IF	-	-	-	N/A	N/A	-
Color Monitor	SUNSPO/ SP-14C	-	-	-	N/A	N/A	-
Test Receiver	ROHDE&SCHWARZ/ ESPI	101155	W2005001	9k-3GHz	Aug.2, 2012	Aug.1, 2013	±1dB
Two-Line V-Network	ROHDE&SCHWARZ/ ENV216	100115	W2005002	50Ω/50μH	Aug.2, 2012	Aug.1, 2013	±10%
V－LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8128	8128-259	9k-30MHz	Aug.2, 2012	Aug.1, 2013	-
PC	Lenovo	T2900D	-	-	Aug.2, 2012	Aug.1, 2013	±1dB
Display	ViewSonic	S27996-1W	-	-	Aug.2, 2012	Aug.1, 2013	±0.5dB
K/B	Dell	L100	-	-	Aug.2, 2012	Aug.1, 2013	±0.5dB
Mouse	Acer	M-UVACR1	-	-	Aug.2, 2012	Aug.1, 2013	±0.5dB

6 Conducted Emission Data

Test Requirement:	FCC Part 15 Section 15.107
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	150kHz to 30MHz
Class:	Class B
Limit:	66-56 dBμV between 0.15MHz & 0.5MHz 56 dBμV between 0.5MHz & 5MHz 60 dBμV between 5MHz & 30MHz
Detector:	Peak for pre-scan (9kHz Resolution Bandwidth) Quasi-Peak & Average if maximised peak within 6dB of Average Limit

6.1 E.U.T. Operation

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 hPa

EUT Operation:

Compliance test was performed in charging mode for charger, communication with PC mode powered by built-in Li-ion battery and DC 12V lead-acid battery respectively for GNSS. The data shown as follow is the worst charging mode.

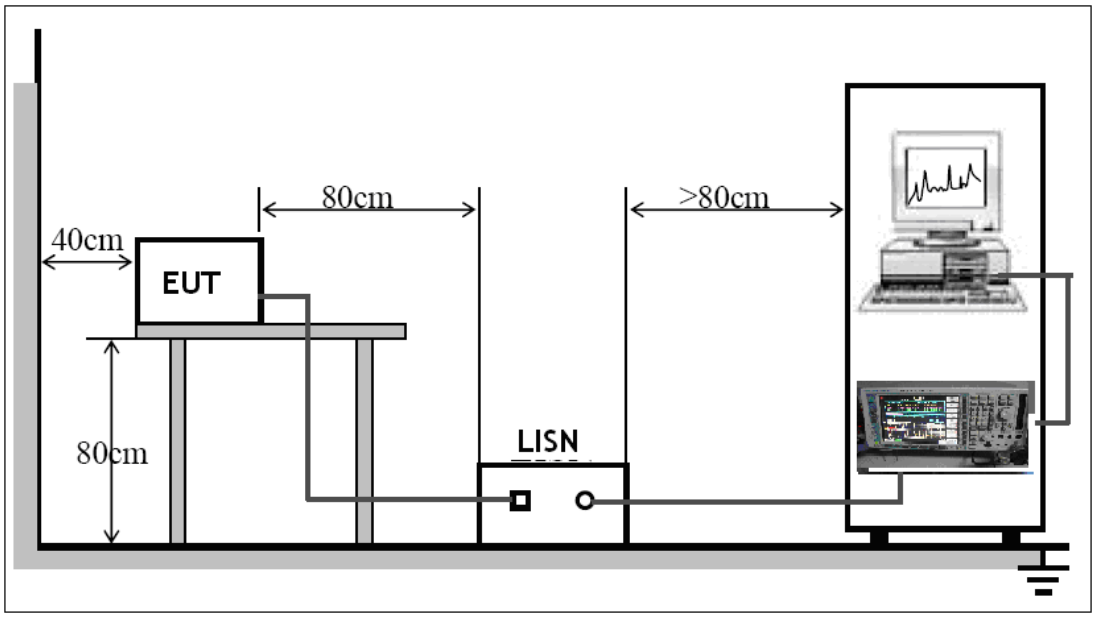
6.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a conducted emissions measurement at Waltek EMC Lab is $\pm$3.64dB.

6.3 EUT Setup

The conducted emission tests were performed using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part15 Subpart B Section 15.107 limits.



The EUT was placed on the test table in shielding room.

6.4 Spectrum Analyzer Setup

According to FCC Part15 Subpart B Rules, the GNSS was tested from 150kHz to 30MHz and the Charger was tested from 150kHz to 30MHz.

Start Frequency .....150 kHz
Stop Frequency..... 30MHz
Scan time..... 10ms
Step.....4kHz
Resolution Bandwidth..... 9kHz

6.5 Test Procedure

1. The EUT was tested according to ANSI C63.4:2003. The frequency spectrum from 150kHz to 30MHz was investigated.
2. The maximised peak emissions from the EUT was scanned and measured for both the Live and Neutral Lines. Quasi-peak & average measurements were performed if peak emissions were within 6dB of the average limit line.Only the worst case is shown in the report.

6.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

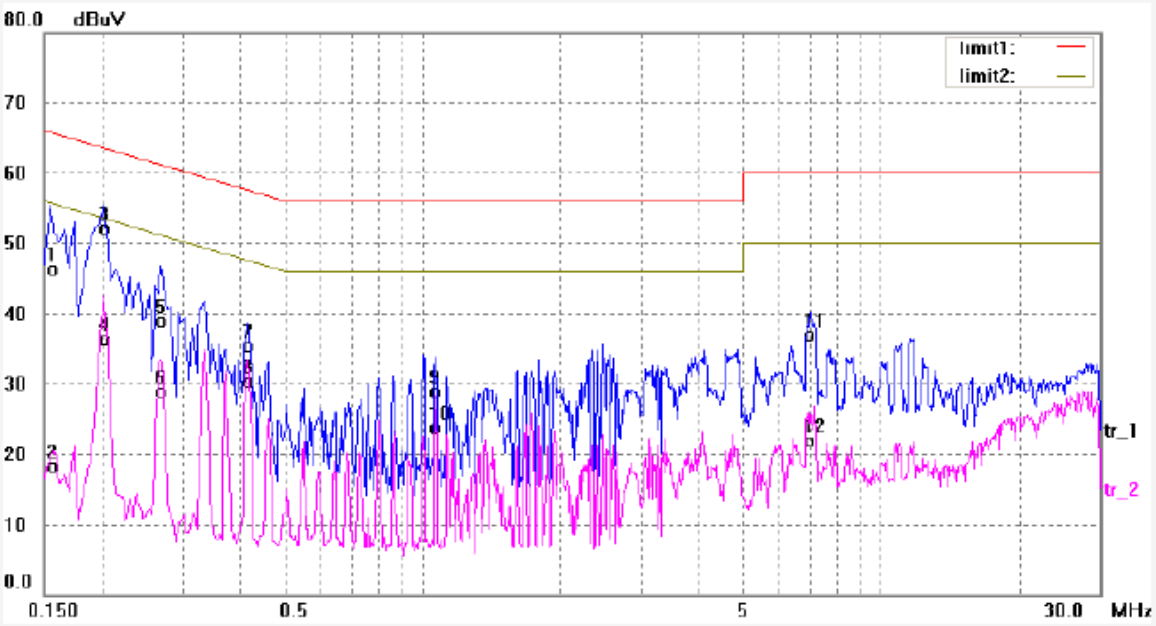
6.7 Summary of Test Results

An initial pre-scan was performed on the live and neutral lines.

Refer to the spectrum analyzer data chart on the following pages.

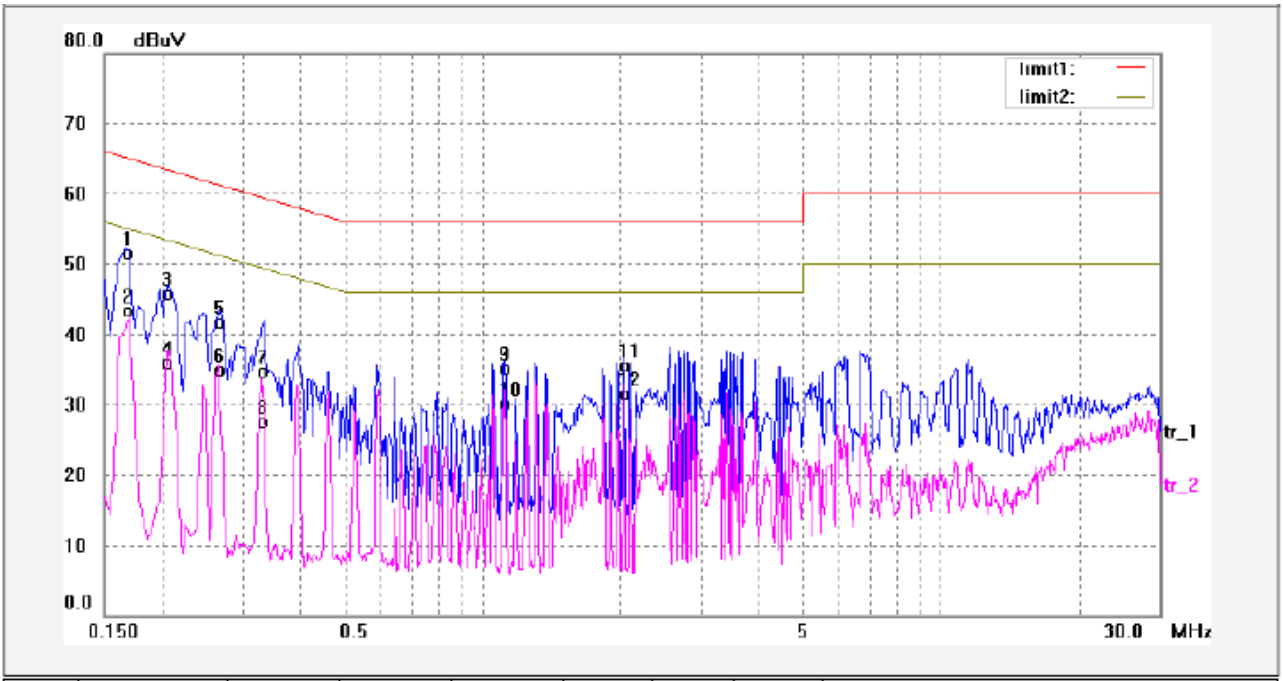
Charging mode:

Live line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1539	35.11	10.35	45.46	65.78	-20.32	QP	
2	0.1539	7.24	10.35	17.59	55.78	-38.19	AVG	
3	0.2020	40.97	10.35	51.32	63.52	-12.20	QP	
4	0.2020	25.08	10.35	35.43	53.52	-18.09	AVG	
5	0.2700	27.80	10.35	38.15	61.12	-22.97	QP	
6	0.2700	17.83	10.35	28.18	51.12	-22.94	AVG	
7	0.4180	24.11	10.35	34.46	57.49	-23.03	QP	
8	0.4180	19.09	10.35	29.44	47.49	-18.05	AVG	
9	1.0700	17.65	10.36	28.01	56.00	-27.99	QP	
10	1.0700	12.49	10.36	22.85	46.00	-23.15	AVG	
11	7.0500	25.77	10.43	36.20	60.00	-23.80	QP	
12	7.0500	10.64	10.43	21.07	50.00	-28.93	AVG	

Neutral line:



No.	Freq. (MHz)	Reading (dBuV)	Factor (dB)	Result (dBuV)	Limit dBuV	Margin (dB)	Detector	Remark
1	0.1660	40.28	10.35	50.63	65.15	-14.52	QP	
2	0.1660	32.25	10.35	42.60	55.15	-12.55	AVG	
3	0.2060	34.58	10.35	44.93	63.36	-18.43	QP	
4	0.2060	24.75	10.35	35.10	53.36	-18.26	AVG	
5	0.2660	30.58	10.35	40.93	61.24	-20.31	QP	
6	0.2660	23.72	10.35	34.07	51.24	-17.17	AVG	
7	0.3339	23.56	10.35	33.91	59.35	-25.44	QP	
8	0.3339	16.31	10.35	26.66	49.35	-22.69	AVG	
9	1.1180	23.94	10.36	34.30	56.00	-21.70	QP	
10	1.1180	18.94	10.36	29.30	46.00	-16.70	AVG	
11	2.0420	24.37	10.37	34.74	56.00	-21.26	QP	
12	2.0420	20.41	10.37	30.78	46.00	-15.22	AVG	

6.8 Photograph – Conducted Emission Test Setup

7 Radiated Emission Data

Test Requirement:	FCC Part 15 Subpart B Section 15.109
Test Method:	ANSI C63.4:2003
Test Result:	PASS
Frequency Range:	30MHz to 26.5GHz
Measurement Distance:	3m
Limit:	40.0 dBμV/m between 30MHz & 88MHz
	43.5 dBμV/m between 88MHz & 216MHz
	46.0 dBμV/m between 216MHz & 960MHz
	54.0 dBμV/m above 960MHz
	74.0 dBμV/m between 1GHz ~ 2GHz for peak
	54.0 dBμV/m between 1GHz ~ 2GHz for AVG
Detector:	Peak for pre-scan (120kHz resolution bandwidth)

7.1 E.U.T Operation:

Operating Environment:

Temperature: 25.5 °C

Humidity: 51 % RH

Atmospheric Pressure: 1012 hPa

EUT Operation:

Compliance test was performed in charging mode for charger, communication with PC mode powered by built-in Li-ion battery and DC 12V lead-acid battery respectively for GNSS. The worst mode is communication with PC mode powered by 12V lead-acid cell and shown as follow.

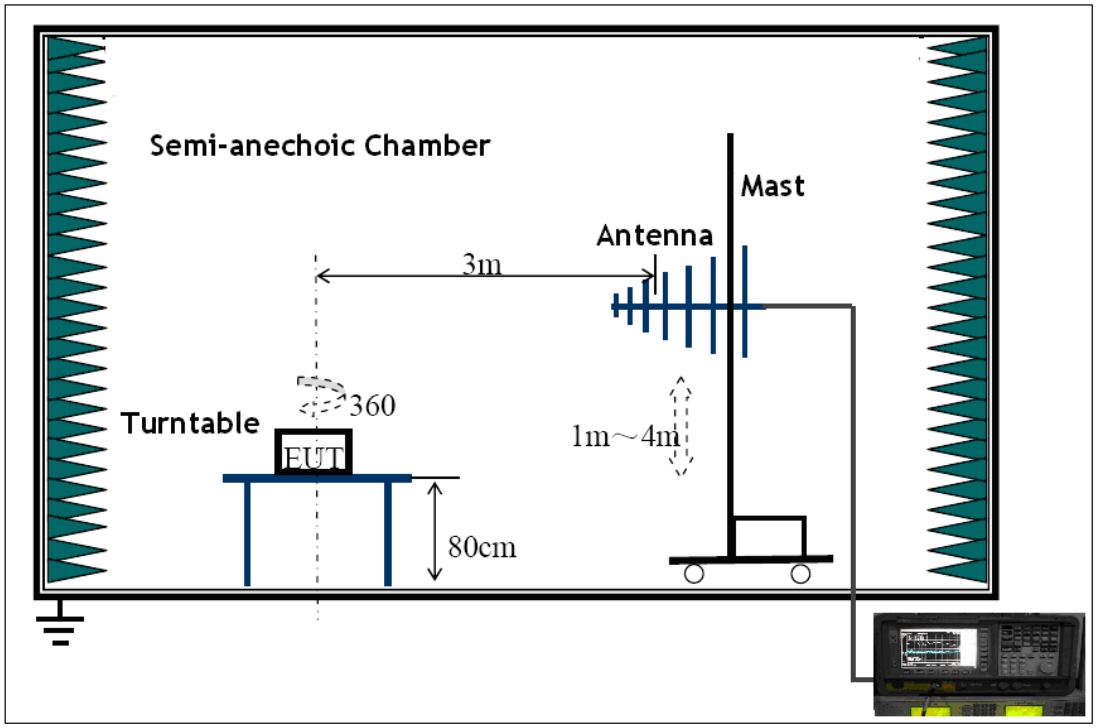
7.2 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Waltek EMC Lab is ±5.03dB.

7.3 EUT Setup

The radiated emission tests were performed in the 3m Semi- Anechoic Chamber test site, using the setup accordance with the ANSI C63.4:2003, The specification used in this report was the FCC Part 15 Subpart B Section 15.109limits.



The EUT was placed on the test table in shielding room.

7.4 Spectrum Analyzer Setup

According to FCC Part15 Subpart B Rules, the GNSS was tested from 30MHz to 26.5GHz and the Charger was tested from 30MHz to 1000MHz.

Below 1GHz

Start Frequency ..... 30 MHz
Stop Frequency..... 1000MHz
Sweep Speed ..... Auto
IF Bandwidth 120 KHz
Video Bandwidth..... 100KHz
Quasi-Peak Adapter Bandwidth ..... 120 KHz
Quasi-Peak Adapter Mode ..... Normal
Resolution Bandwidth..... 100KHz

Above 1GHz

Start Frequency ..... 1000 MHz
Stop Frequency..... 26.5GHz
Sweep Speed ..... Auto
IF Bandwidth 120 KHz
Video Bandwidth..... 3MHz
Quasi-Peak Adapter Bandwidth ..... 120 KHz
Quasi-Peak Adapter Mode ..... Normal
Resolution Bandwidth..... 1MHz

7.5 Test Procedure

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is moved from 1m to 4m to find out the maximum emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.
7. The radiation measurements are performed in X, Y, Z axis positioning. Only the worst case is shown in the report.

7.6 Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. – Class B Limit

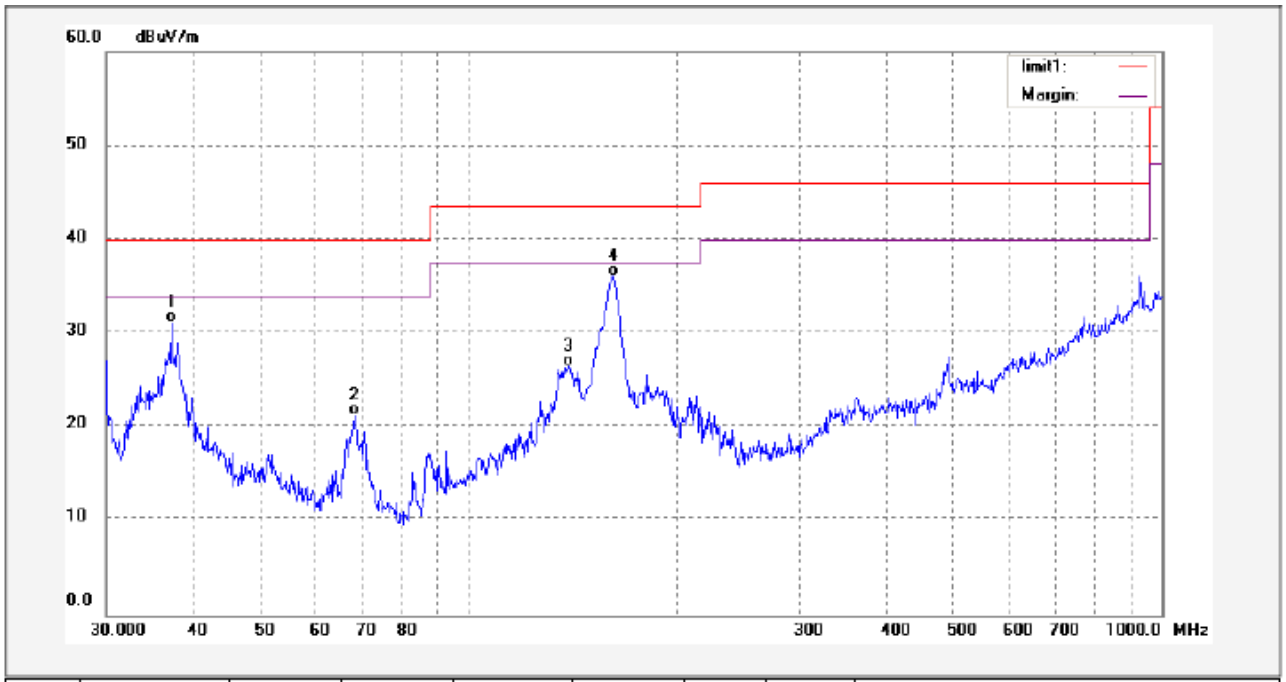
7.7 Summary of Test Results

According to the data in this section, the EUT complied with the FCC Part15 Subpart B Section 15.109 Rules.

Test Mode: Communicating with PC and powered by 12V lead-acid cell

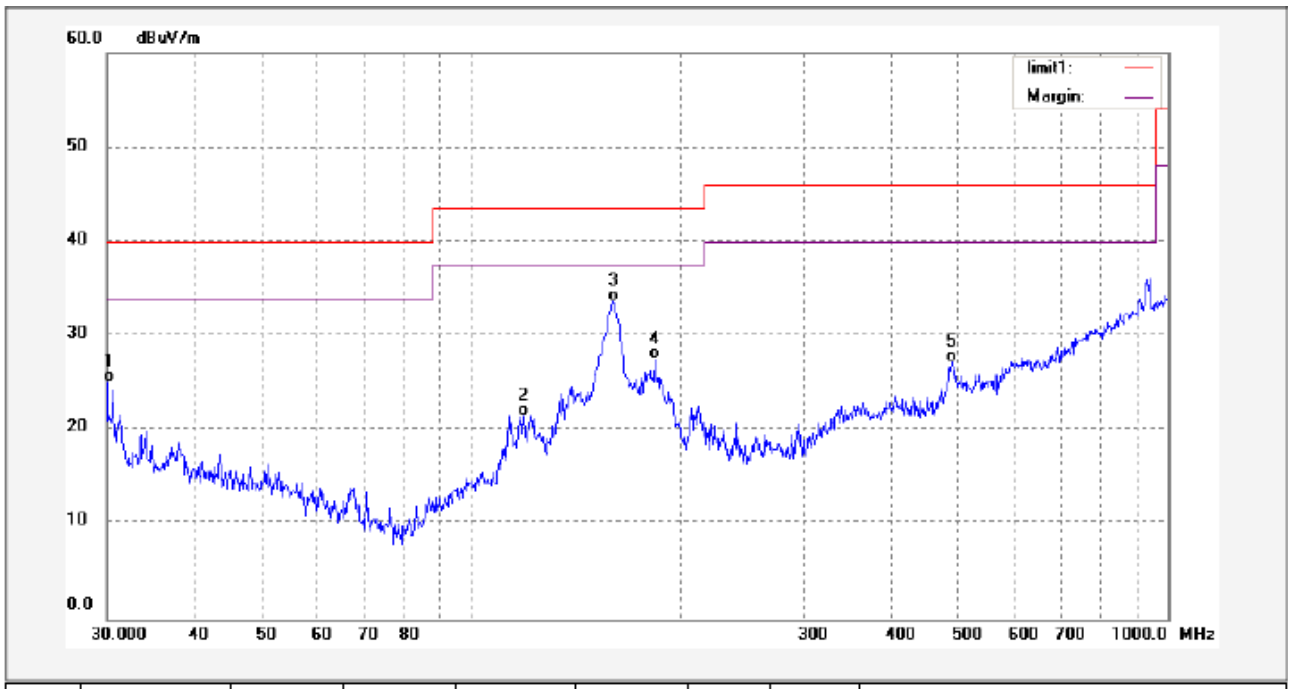
Frequency Range: 30MHz ~ 1GHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	37.3017	14.54	16.56	31.10	40.00	-8.90	QP	
2	68.5038	10.93	10.25	21.18	40.00	-18.82	QP	
3	139.3005	14.72	11.72	26.44	43.50	-17.06	QP	
4	162.0197	24.58	11.55	36.13	43.50	-7.37	QP	

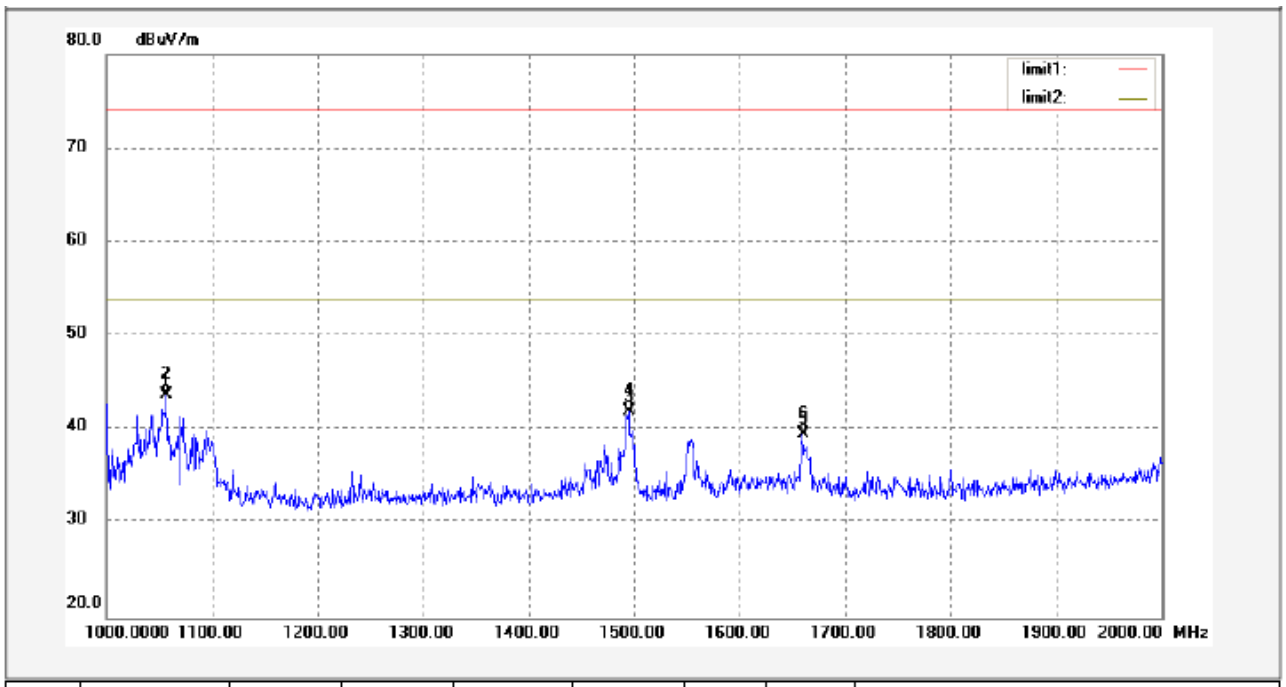
Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	30.0000	9.00	16.15	25.15	40.00	-14.85	QP	
2	118.9285	9.48	12.07	21.55	43.50	-21.95	QP	
3	159.7586	22.43	11.27	33.70	43.50	-9.80	QP	
4	183.2211	13.75	13.72	27.47	43.50	-16.03	QP	
5	490.0451	1.41	25.75	27.16	46.00	-18.84	QP	

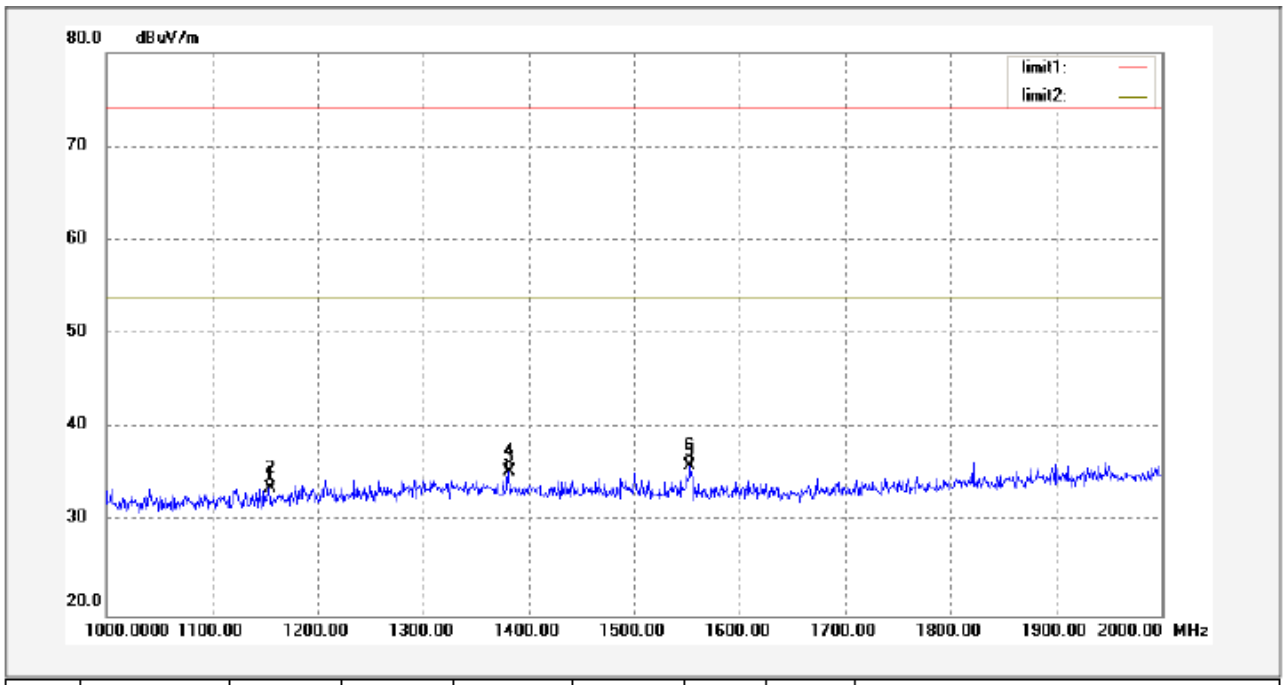
Frequency Range: 1GHz ~ 2GHz

Antenna polarization: Vertical



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1057.114	59.07	-15.26	43.81	74.00	-30.19	peak	
2	1057.114	59.07	-15.26	43.81	54.00	-10.19	AVG	
3	1494.990	55.90	-13.97	41.93	74.00	-32.07	peak	
4	1494.990	55.90	-13.97	41.93	54.00	-12.07	AVG	
5	1659.319	53.59	-14.03	39.56	74.00	-34.44	peak	
6	1659.319	53.59	-14.03	39.56	54.00	-14.44	AVG	

Antenna polarization: Horizontal



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Remark
1	1154.309	48.40	-14.83	33.57	74.00	-40.43	peak	
2	1154.309	48.40	-14.83	33.57	54.00	-20.43	AVG	
3	1380.762	49.16	-13.78	35.38	74.00	-38.62	peak	
4	1380.762	49.16	-13.78	35.38	54.00	-18.62	AVG	
5	1553.106	49.92	-14.00	35.92	74.00	-38.08	peak	
6	1553.106	49.92	-14.00	35.92	54.00	-18.08	AVG	

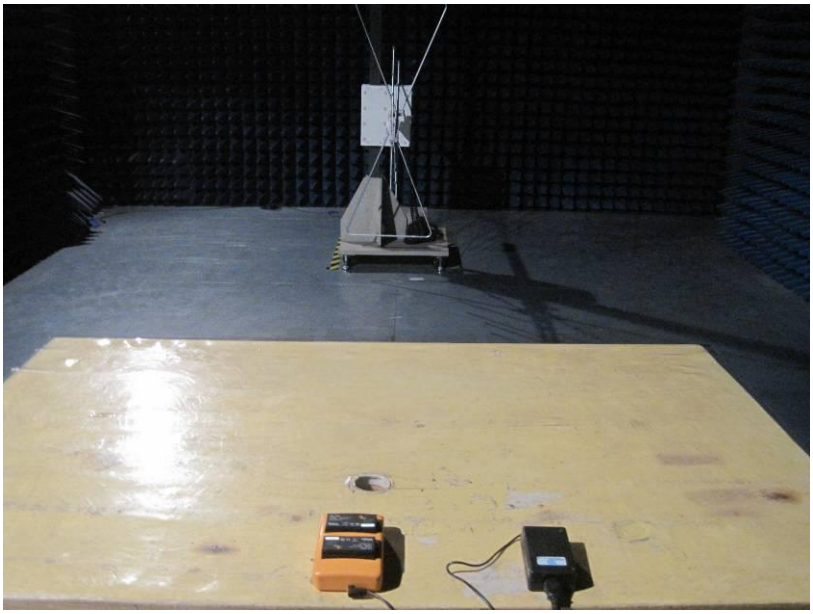
Remark: the frequency above 2GHz to 26.5GHz,the signal is lower than the nosie level of the spectrum,so the data won't showing in the test report.

7.8 Photograph – Radiated Emission Test Setup

Below 1GHz

Above 1GHz

Test Setup for Charger



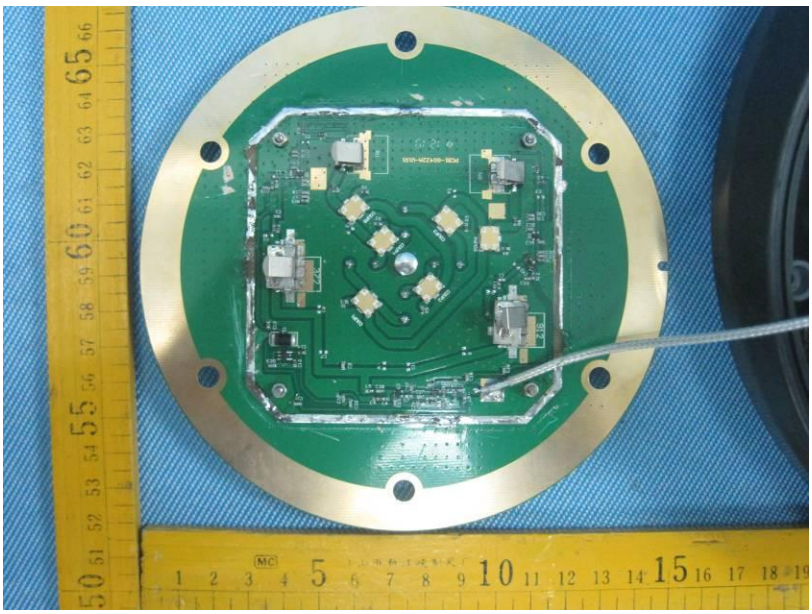
8 Photographs - Constructional Details

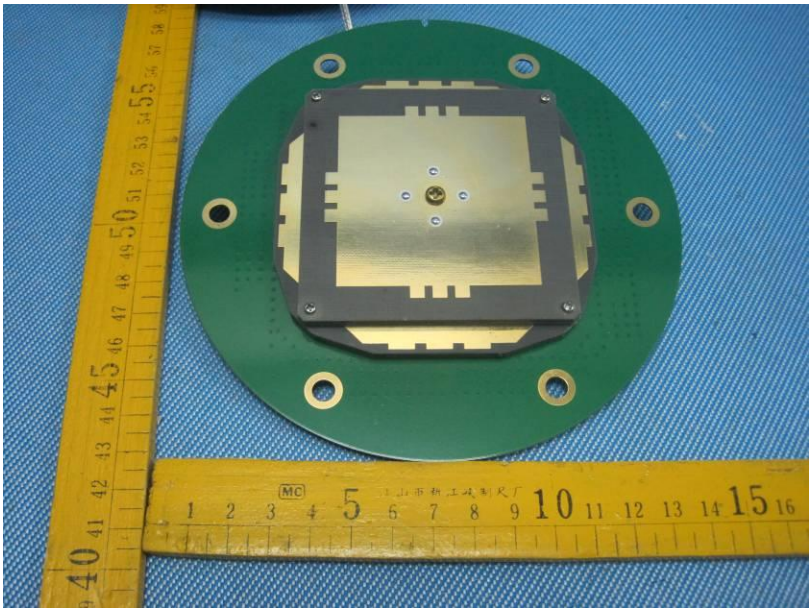
8.1 EUT-Component View

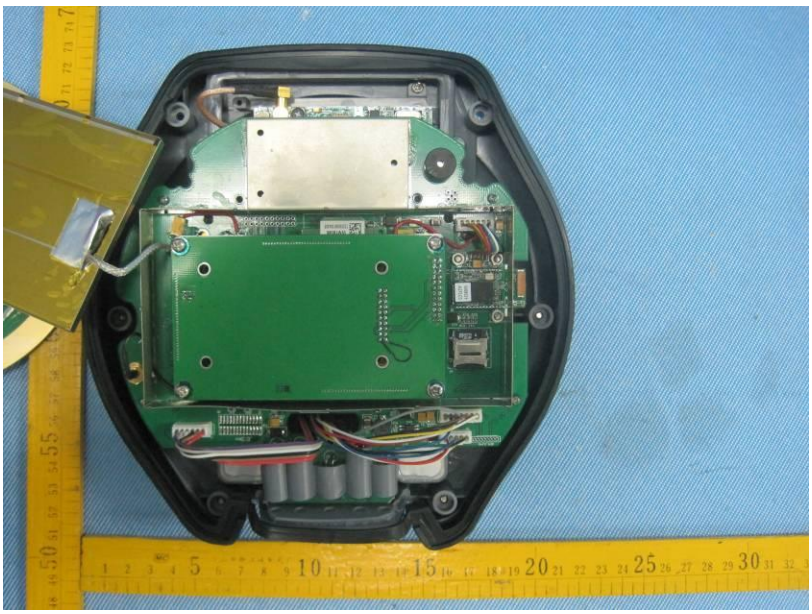
8.2 EUT1-Appearance View

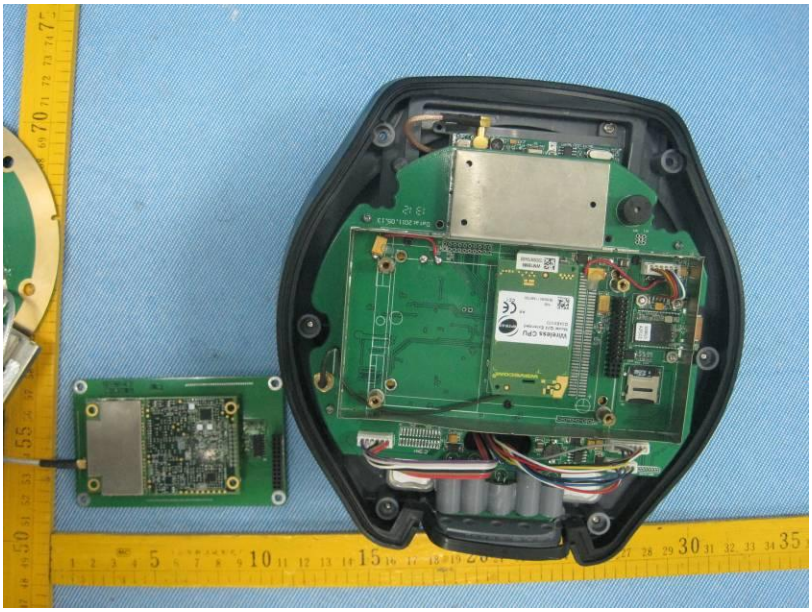
8.3 EUT1-Open View

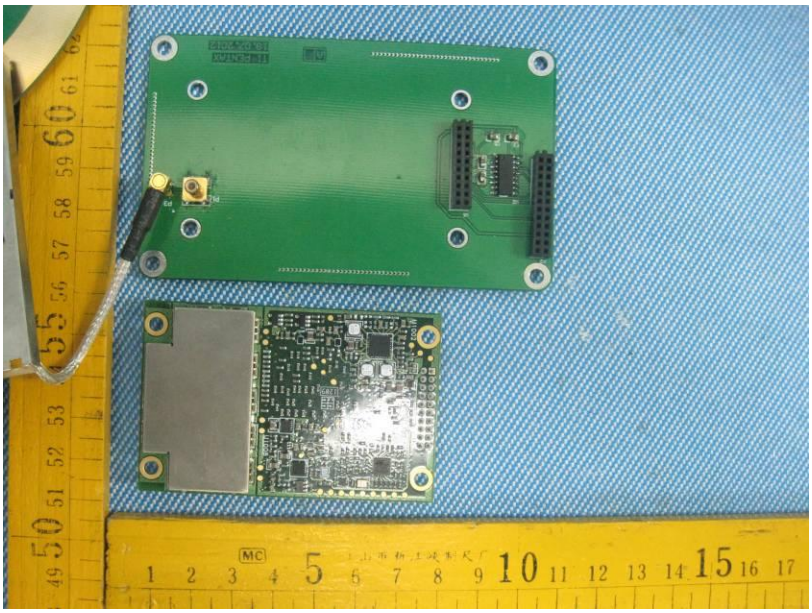
8.4 EUT1 PCB View

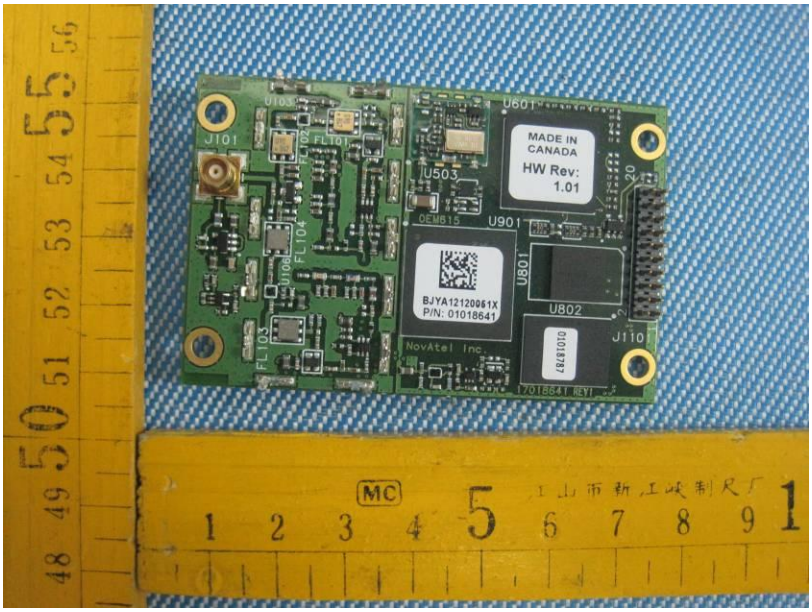








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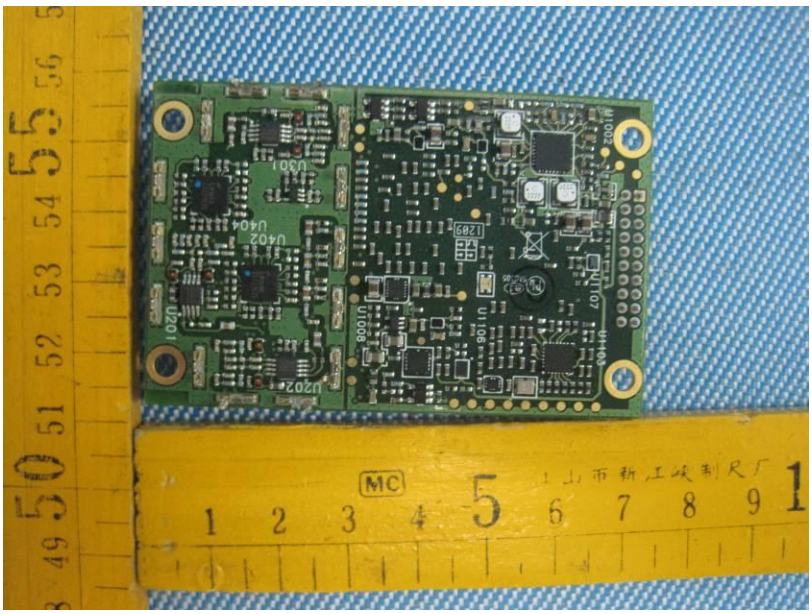
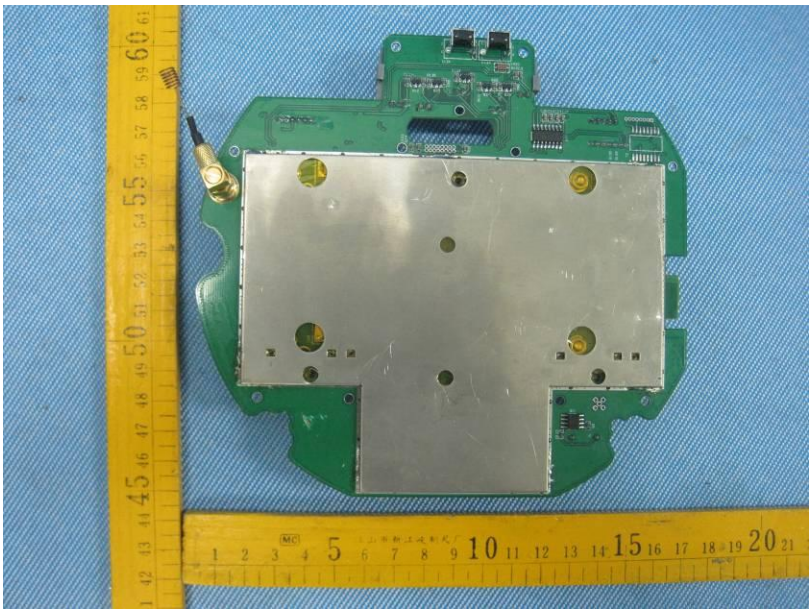
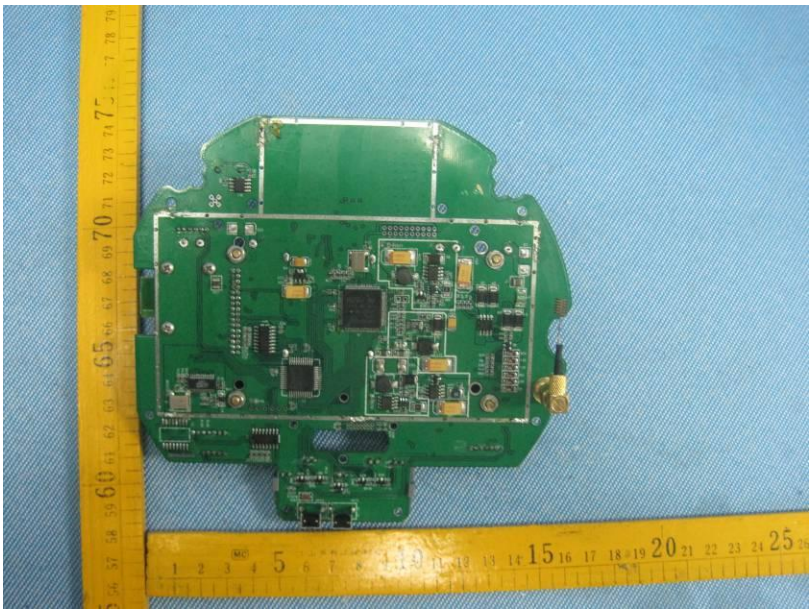
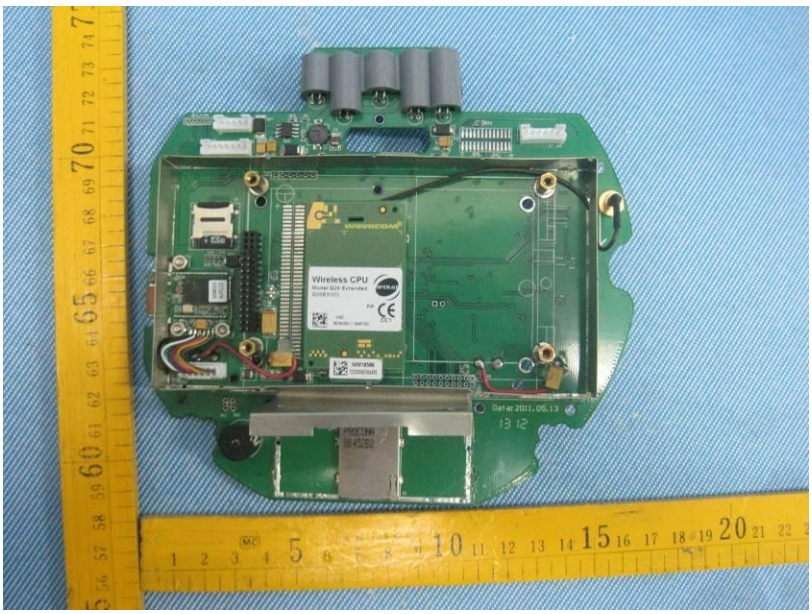
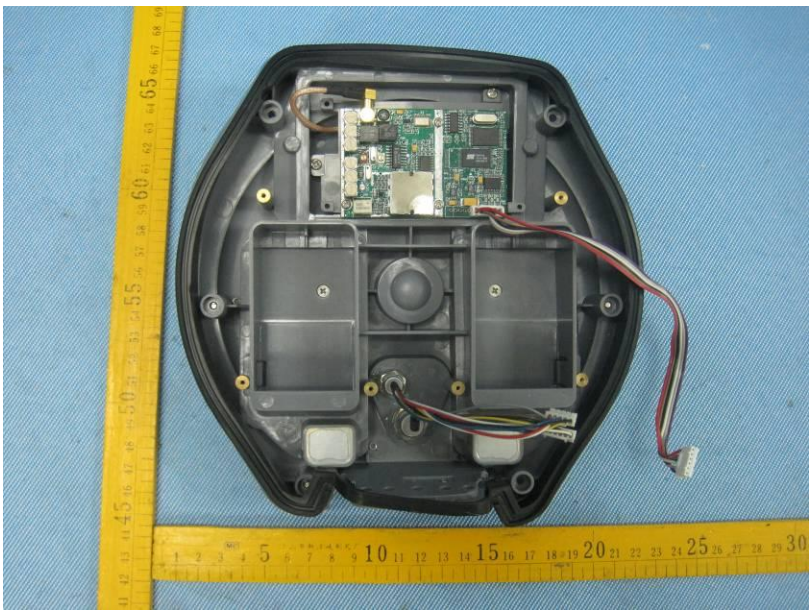
HW Rev: 1.01
U503
U901
U802
J101
J110
NovAtel Inc.

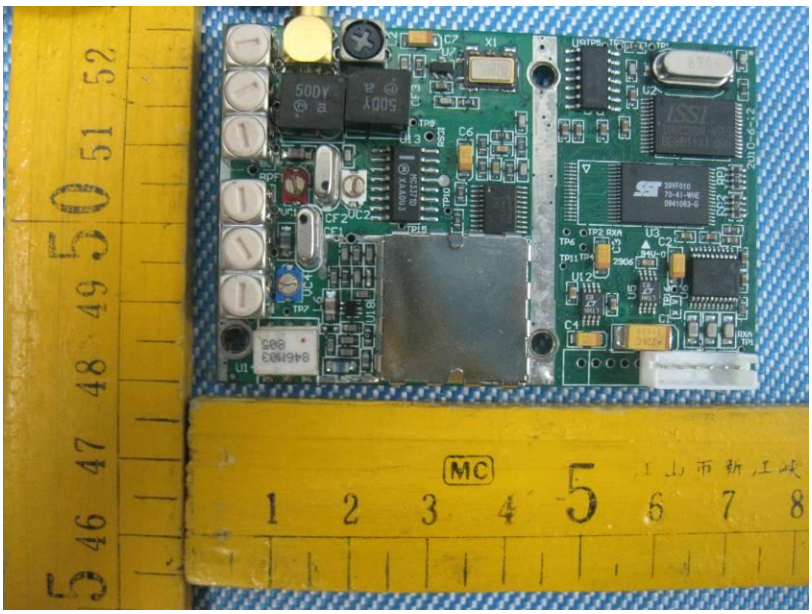


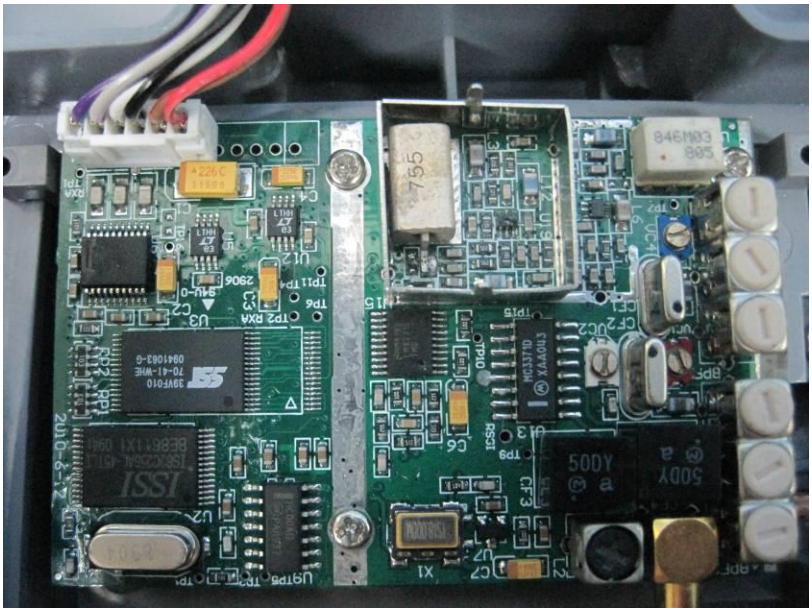


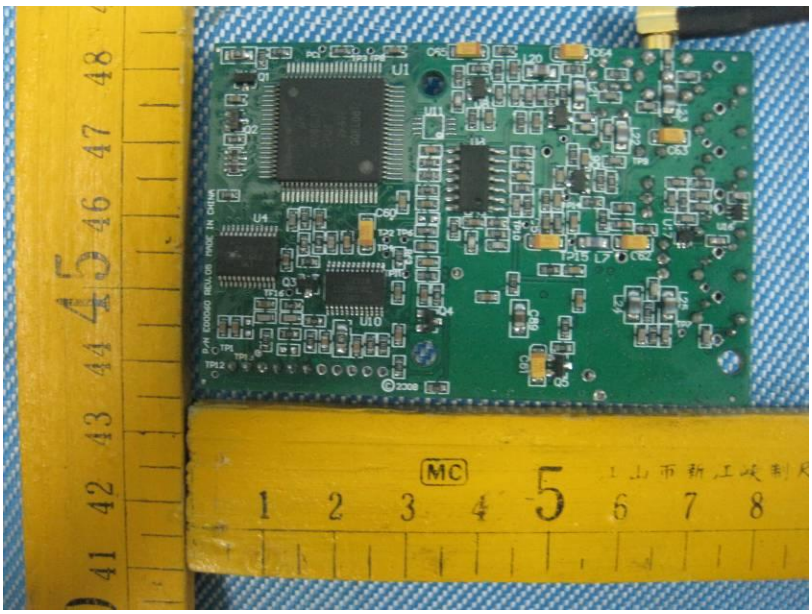


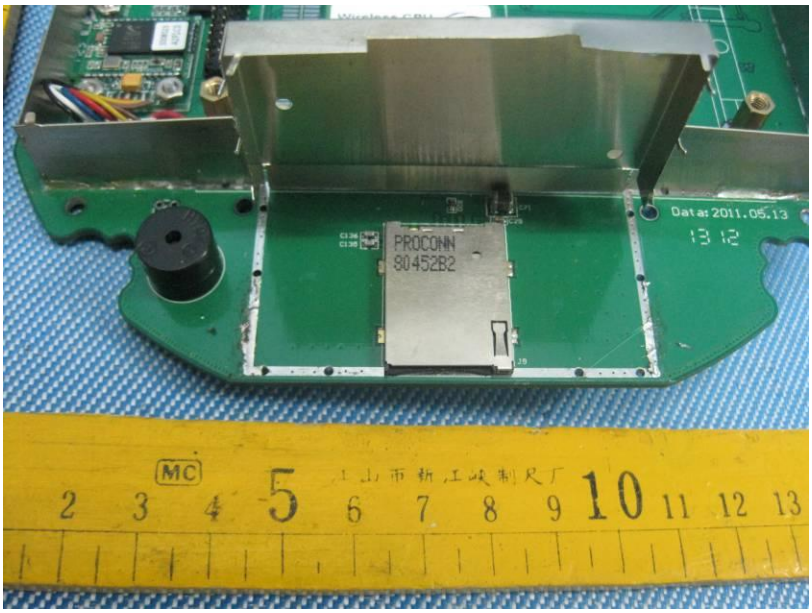


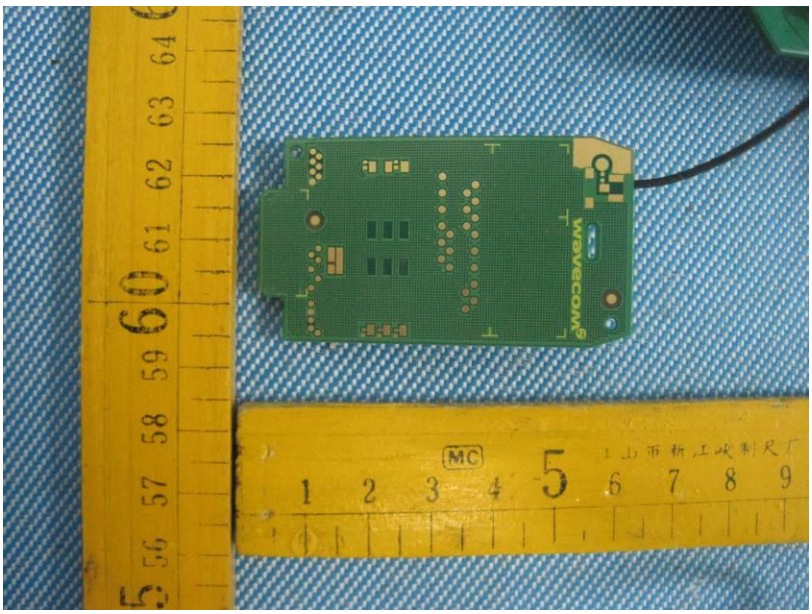


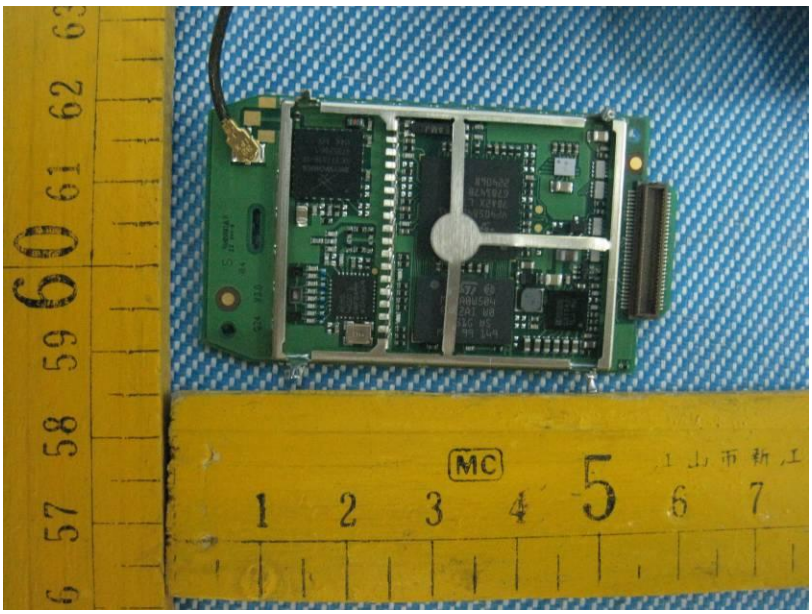


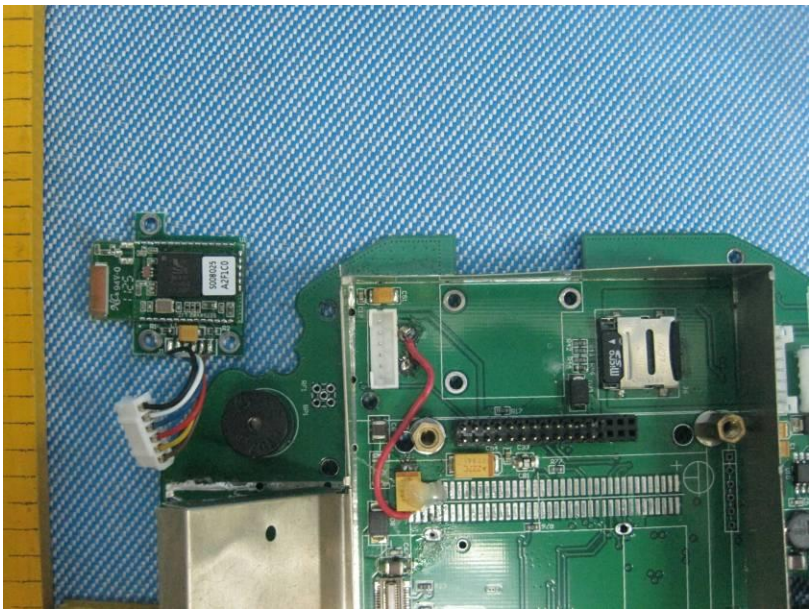


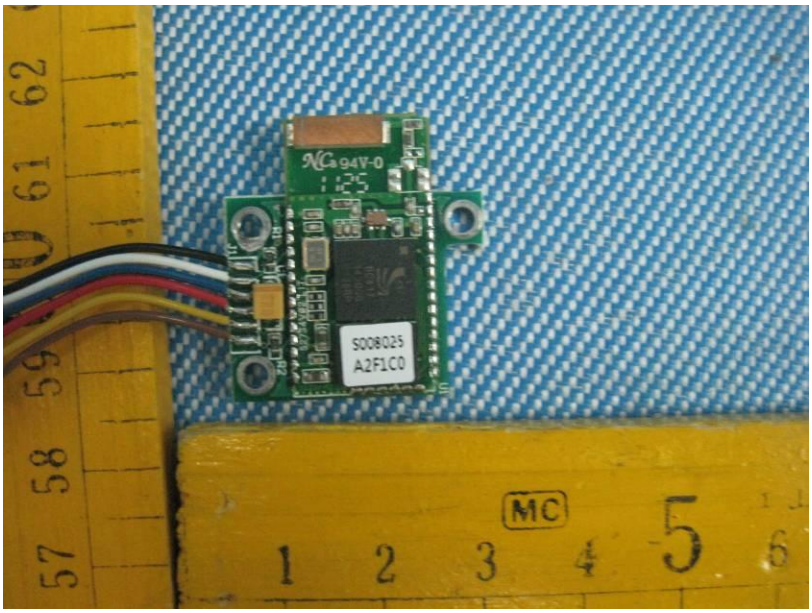


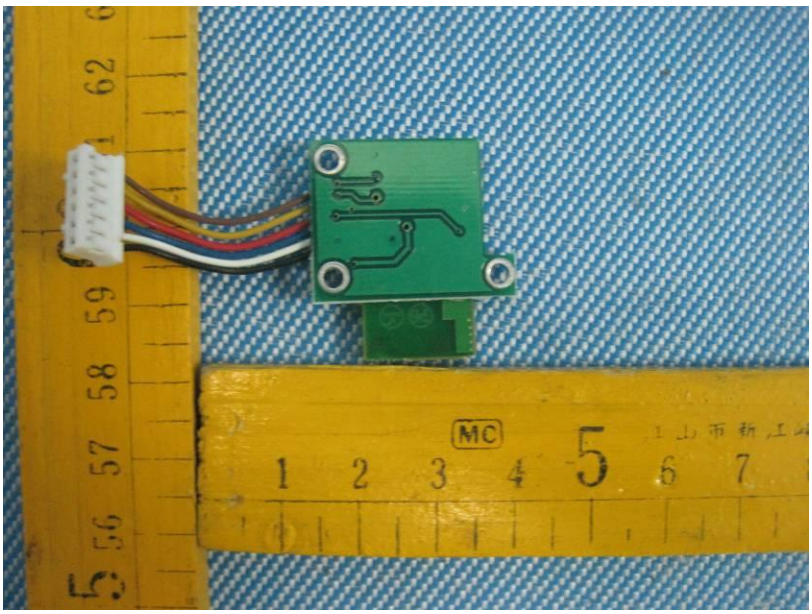






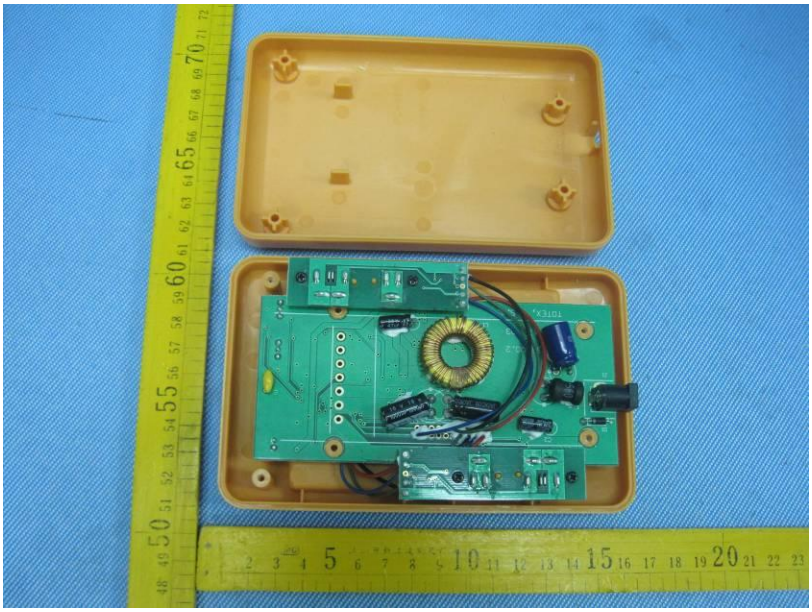




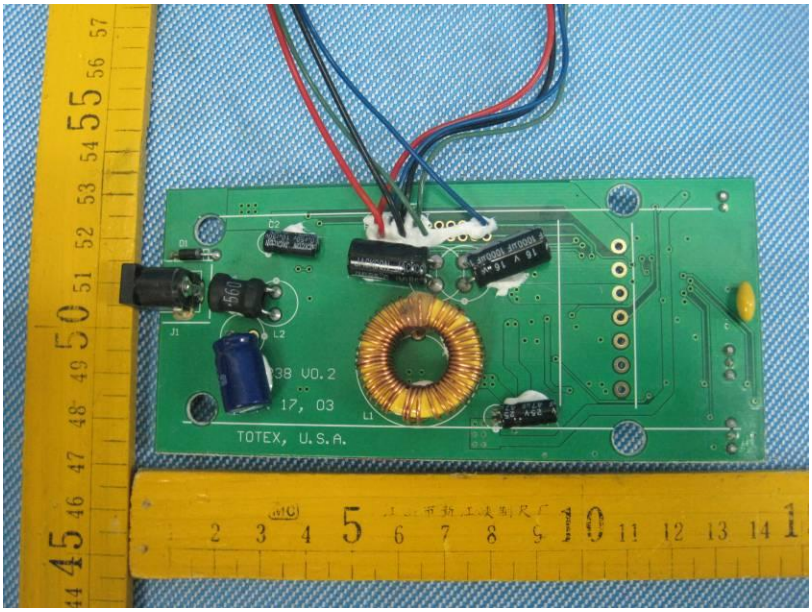


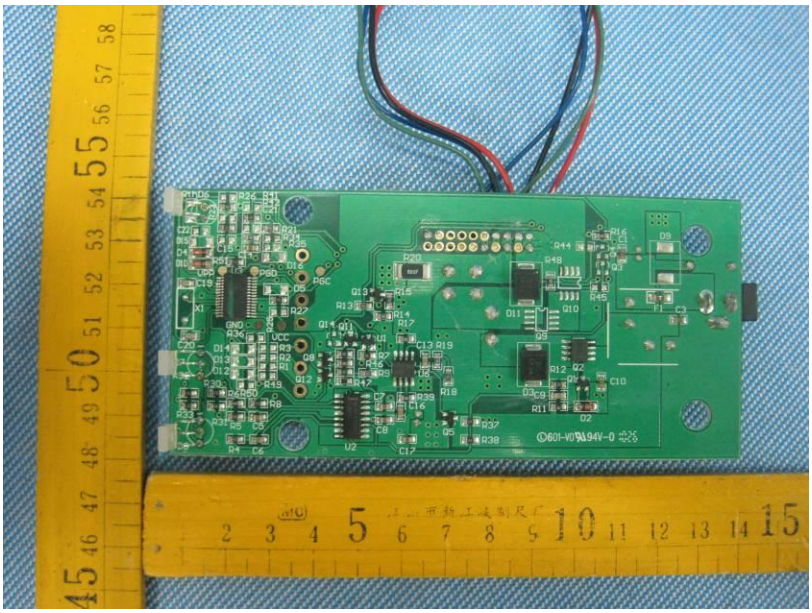
8.5 EUT2-Appearance View

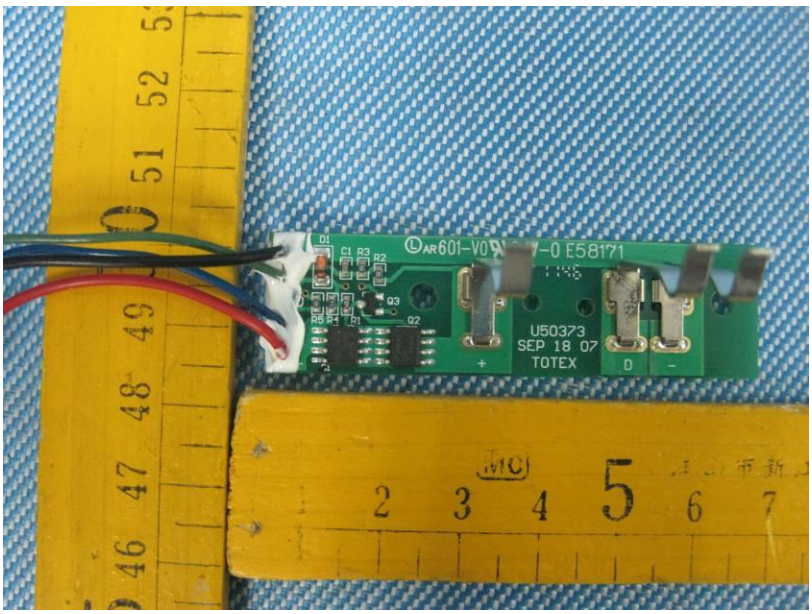
8.6 EUT2-Open View

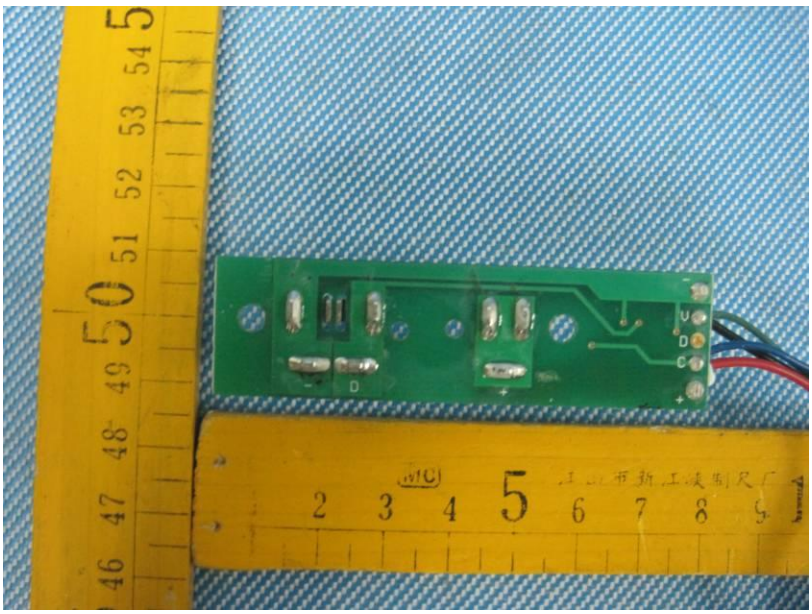


8.7 EUT2 PCB View

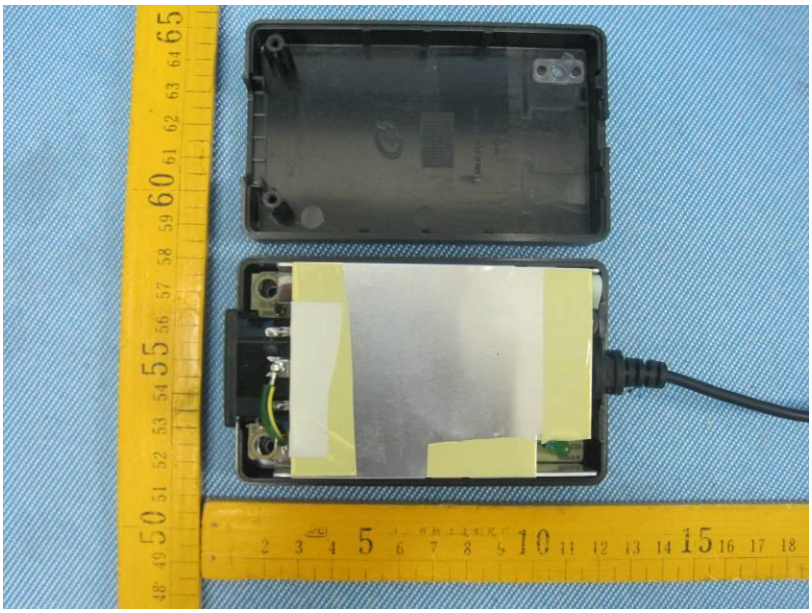


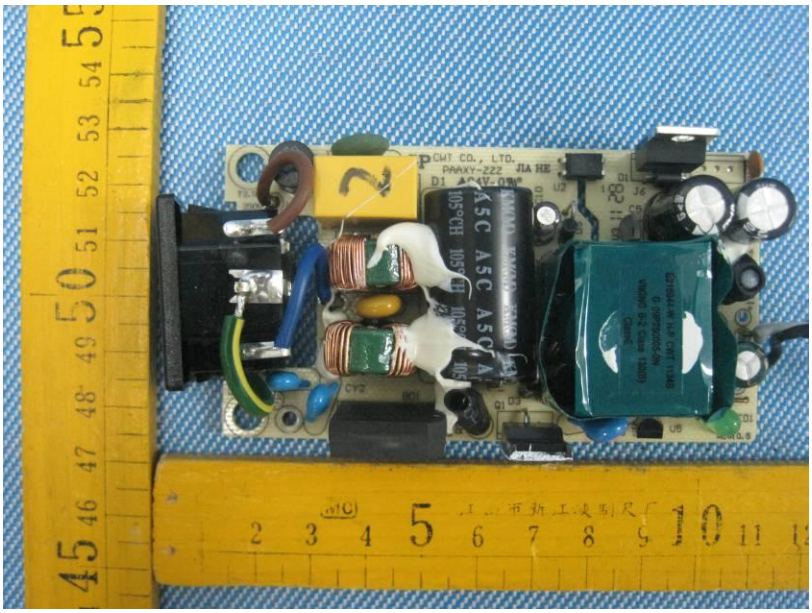


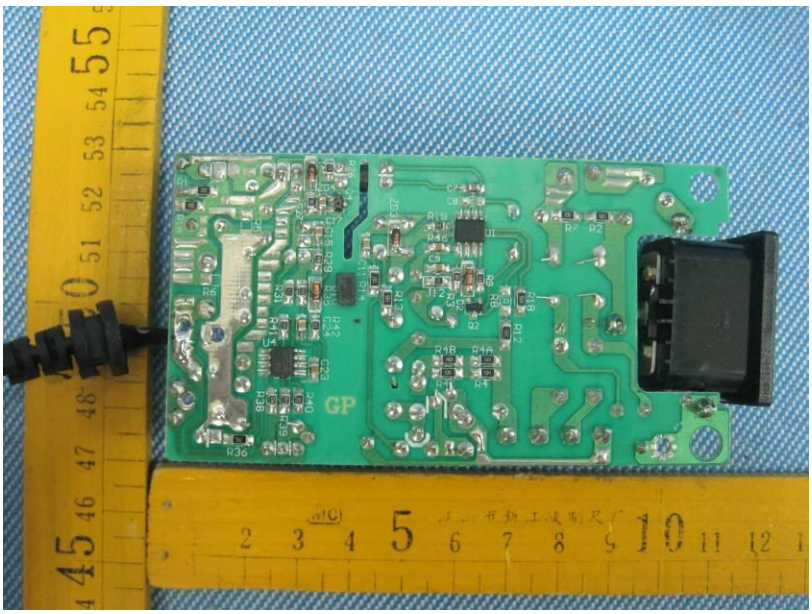




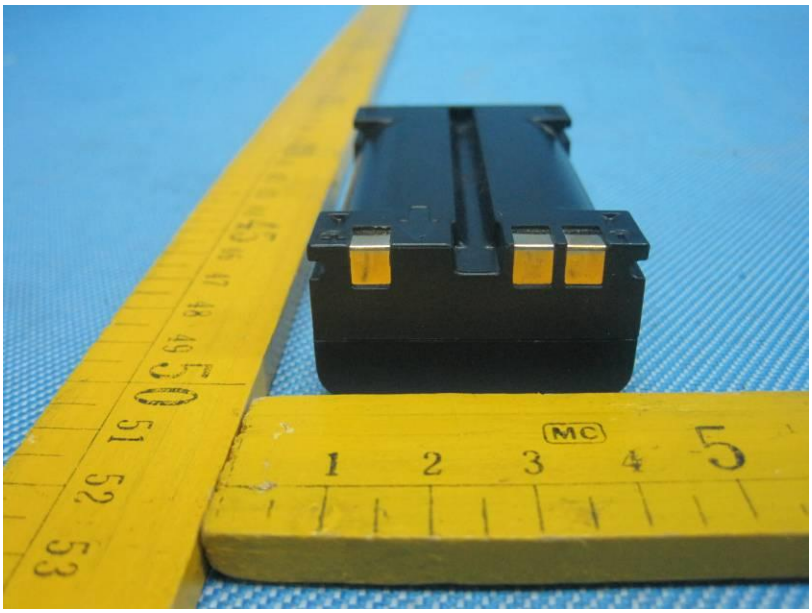
8.8 AC Adapter View

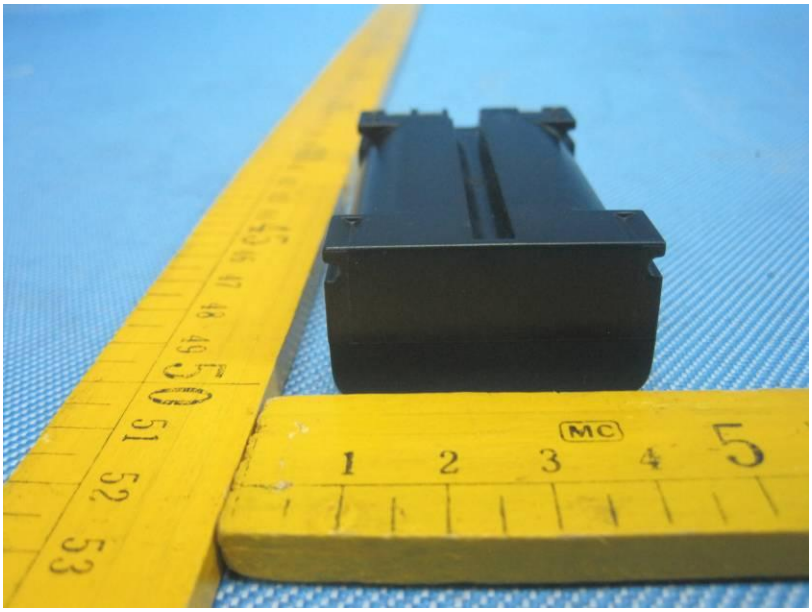






8.9 Battery View





9 FCC Label

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:(1)this device may not cause harmful interference,and (2) this device must accept any interference received, including interference that may cause undesired operation

The Label must not be a stick-on paper. The Label on these products must be permanently affixed to the product and readily visible at the time of purchase and must last the expected lifetime of the equipment not be readily detachable.

Proposed Label Location on EUT

EUT Top View/proposed FCC Label Location