



FCC TEST REPORT

On Behalf of

Shanghai e-Compass Science & Technology Co., Ltd

GNSS RECEIVER

Model No.: E600

Prepared for : Shanghai e-Compass Science & Technology Co., Ltd
Address : No.651 Wanfang Rd, Pujiang Town, Minhang District,
Shanghai, China

Prepared By : Shenzhen Alpha Product Testing Co., Ltd.
Address : Building i, No.2, Lixin Road, Fuyong Street, Bao'an District,
518103, Shenzhen, Guangdong, China

Report Number : T1881806 12
Date of Receipt : November 16, 2018
Date of Test : November 16-19, 2018
Date of Report : November 20, 2018
Version Number : REV0

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TEST REPORT DECLARATION

Applicant : Shanghai e-Compass Science & Technology Co., Ltd
 Address : No.651 Wanfang Rd, Pujiang Town, Minhang District, Shanghai, China
 Manufacturer : Guangzhou Geo Electron Science & Technology Company Limited
 Address : No. 702, 704, 7/F, Building C, No.7, Cai Pin Road, Science
 City, Luogang District, Guangzhou, China
 EUT Description : GNSS RECEIVER
 (A) Model No. : E600
 (B) Trademark : eSurvey

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart B Class B 2017, ANSI C63.4:2014

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).....: Anne Qiu
Project Engineer

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

Date of issue.....: November 20, 2018



Revision History

Revision	Issue Date	Revisions	Revised By
REV0	November 20, 2018	Initial released Issue	Anne Qiu

1. General Information

1.1. Description of Device (EUT)

Product Name : GNSS RECEIVER

Model Number : E600

Diff : N/A

Test Voltage : DC 7.4V From Battery

EUT Information : Input: DC 7.4V, DC 12-36V

Highest Frequency : More than 108MHz

Trademark : eSurvey

Software version : N/A

Hardware version : N/A

1.2. Accessories of Device (EUT)

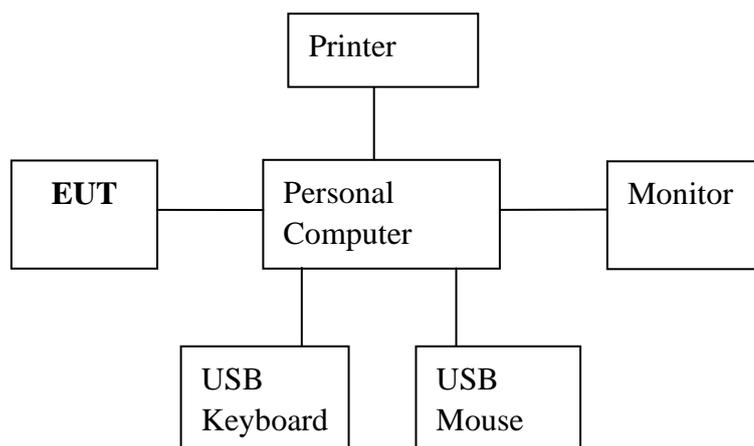
Power Source : N/A

1.3. Tested Supporting System Details

No.	Description	Manufacturer	Model	Serial Number	Certification or DOC
1.	Personal Computer	ACER	ASPIRE M1830	PTSF90C00305005 CAC3000	DOC
2.	Monitor	ACER	G205HV	SNID:10306738385	DOC
3.	USB Keyboard	ACER	SK-9625	KBUSB158050003 7E0100	DOC
4.	USB Mouse	ACER	MS.11200.014	M-UAY-ACR2	DOC
5.	Printer	HP	HP1020	CNCJ410726	DOC

1.4. Block Diagram of connection between EUT and simulators

For Test



Signal Cable Description of the above Support Units					
No.	Port Name	Cable	Length	Shielded (Yes or No)	Detachable (Yes or No)
(a)	N/A	N/A	N/A	N/A	N/A

EUT: GNSS RECEIVER

2. Summary Of Standards And Results

2.1. 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 15:2017 ANSI C63.4:2014	Class B	P
Radiated Emission Test	FCC Part 15:2017 ANSI C63.4:2014	Class B	P
Note: 1. P is an abbreviation for Pass. 2. F is an abbreviation for Fail. 3. N/A is an abbreviation for Not Applicable.			

2.2. Test Mode Description

For Test		
Mode No.	Test Mode	Test Voltage
※1.	Data Transmitting	DC 7.4V from Battery
2.	Working	DC 7.4V from Battery
Note: ※ is worst case mode tests, so this report only reflected the worst mode in each part.		

2.3. Test Equipment List

For Power Line Conducted Emission Test Equipment:						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1.	Test Receiver	Rohde & Schwarz	ESCI	101165	2018.09.21	1 Year
2.	L.I.S.N.#1	Schwarz beck	NSLK8126	8126466	2018.09.21	1 Year
3.	L.I.S.N.#2	ROHDE&SCHWARZ	ENV216	101043	2018.09.21	1 Year
4.	Pulse Limiter	Schwarz beck	9516F	9618	2018.09.21	1 Year

For Frequency Range 30MHz~1GHz Radiated Emission Test Equipment:						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Test Receiver	Rohde&Schwarz	ESR	1316.3003K03-102082-Wa	2018.09.21	1 Year
3	Bilog Antenna	Schwarz beck	VULB 9168	9168-627	2018.04.13	2 Year

For Frequency Range above 1GHz Radiated Emission Test Equipment:						
Item	Equipment	Manufacturer	Model No.	Serial No.	Last Cal.	Cal. Interval
1	Spectrum analyzer	ROHDE&SCHWARZ	FSU	1166.1660.26	2018.09.21	1 Year
2	Horn Antenna	Schwarz beck	BBHA 9120 D	BBHA 9120 D(1201)	2018.04.13	2 Year
3	Amplifier	Agilent	8449B	3008A02664	2018.09.21	1 Year

2.4. Test Facility

Shenzhen Alpha Product Testing Co., Ltd.

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103,
Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission

Registration Number: 293961

Designation Number: CN1236

2.5. Measurement Uncertainty

Test Item	Uncertainty
Uncertainty for Conduction emission test	2.74dB
Uncertainty for Radiation Emission test (<1G)	3.77 dB (Distance: 3m Polarize: V)
	3.80 dB (Distance: 3m Polarize: H)
Uncertainty for Radiation Emission test (>1G)	4.13 dB (Distance: 3m Polarize: V)
	4.16 dB (Distance: 3m Polarize: H)
(95% confidence levels, k=2)	

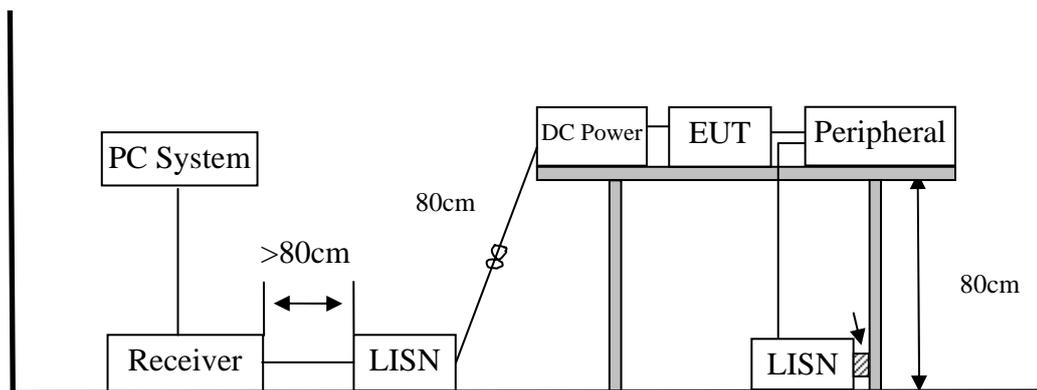
3. Power Line Conducted Emission Test

3.1. Test Limits

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

- Notes:
1. Emission level=Read level + LISN factor-Preamp factor + Cable loss
 2. * Decreasing linearly with logarithm of frequency.
 3. The lower limit shall apply at the transition frequencies.

3.2. Block Diagram of Test Setup



3.3. 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.

3.4. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 3.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

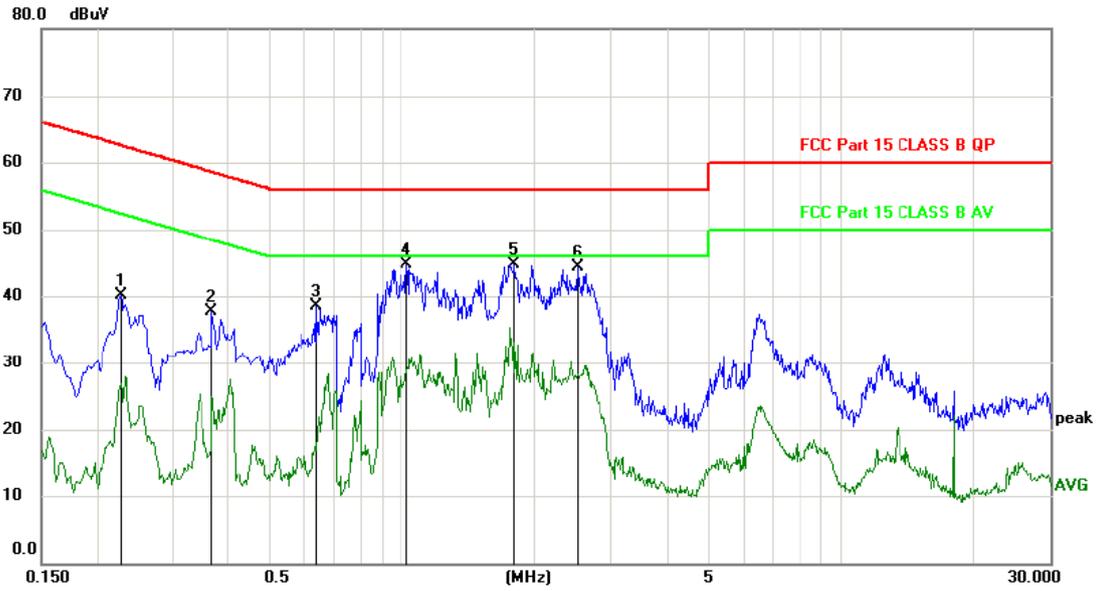
3.5. Test Procedure

- (1) 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 C63.4:2014 on conducted Emission test.
- (2) The frequency range from 150kHz to 30MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESCI) is set at 9kHz.

3.6. Test Results

Test Date : 2018.11.19	Temperature : 21.7°C
Test Engineer : Anne Qiu	Humidity : 49%
Test Mode : Data Transmitting	
Test Results : PASS	
Note: 1. The test results are listed in next pages. 2. 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 and quasi-peak detector need not be carried out. 3. 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.	

Antenna polarity: L

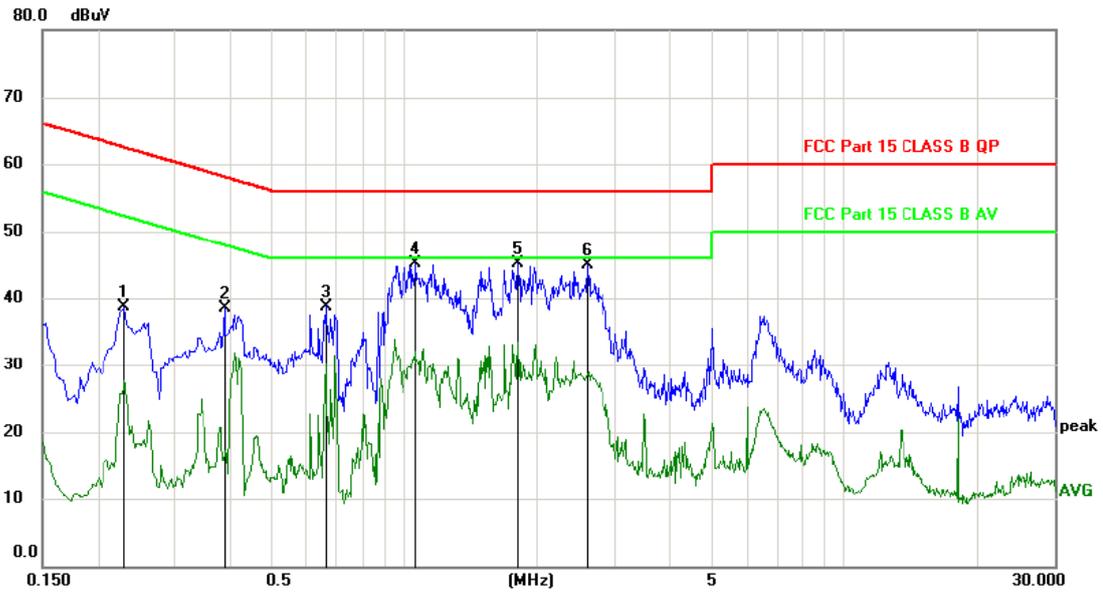


No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.2280	40.14	0.00	40.14	62.52	-22.38	peak	
2	0.3690	37.73	0.00	37.73	58.52	-20.79	peak	
3	0.6360	38.54	0.00	38.54	56.00	-17.46	peak	
4	1.0230	44.70	0.00	44.70	56.00	-11.30	peak	
5 *	1.8030	44.74	0.00	44.74	56.00	-11.26	peak	
6	2.5110	44.27	0.00	44.27	56.00	-11.73	peak	

*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

Antenna polarity: N



No. Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measurement dBuV	Limit dBuV	Margin dB	Detector	Comment
1	0.2310	38.74	0.00	38.74	62.41	-23.67	peak	
2	0.3899	38.50	0.00	38.50	58.07	-19.57	peak	
3	0.6630	38.80	0.00	38.80	56.00	-17.20	peak	
4	1.0619	45.05	0.00	45.05	56.00	-10.95	peak	
5 *	1.8149	45.07	0.00	45.07	56.00	-10.93	peak	
6	2.6009	44.93	0.00	44.93	56.00	-11.07	peak	

*:Maximum data x:Over limit !:over margin

Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable

4. RADIATED EMISSION TEST

4.1. Test Limit

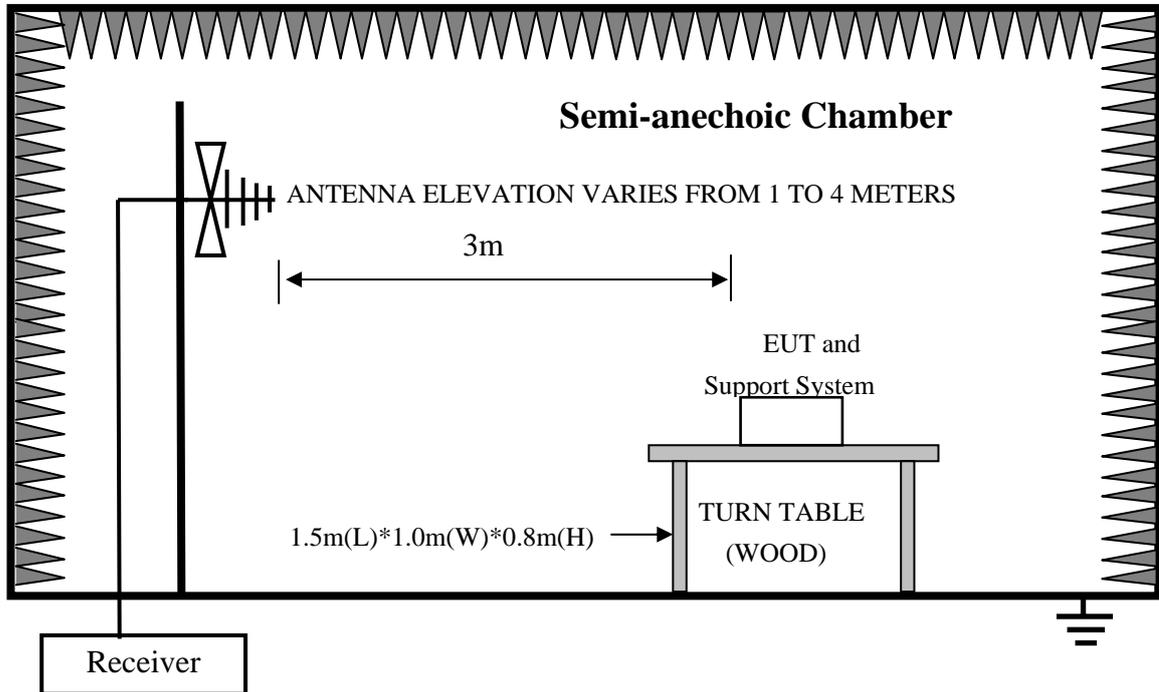
Frequency MHz			Distance (Meters)	Distance (Meters)
30	~	88	3	40.0
88	~	216	3	43.5
216	~	960	3	46.0
960	~	1000	3	54.0
Above 1GHz			3	74(Peak) 54(Average)

- Notes:
1. The smaller limit shall apply at the cross point between two frequency bands.
 2. Distance is the distance in meters between the measuring instrument, antenna and the closest point of any part of the device or system.
 3. Frequency range of radiated measurements:

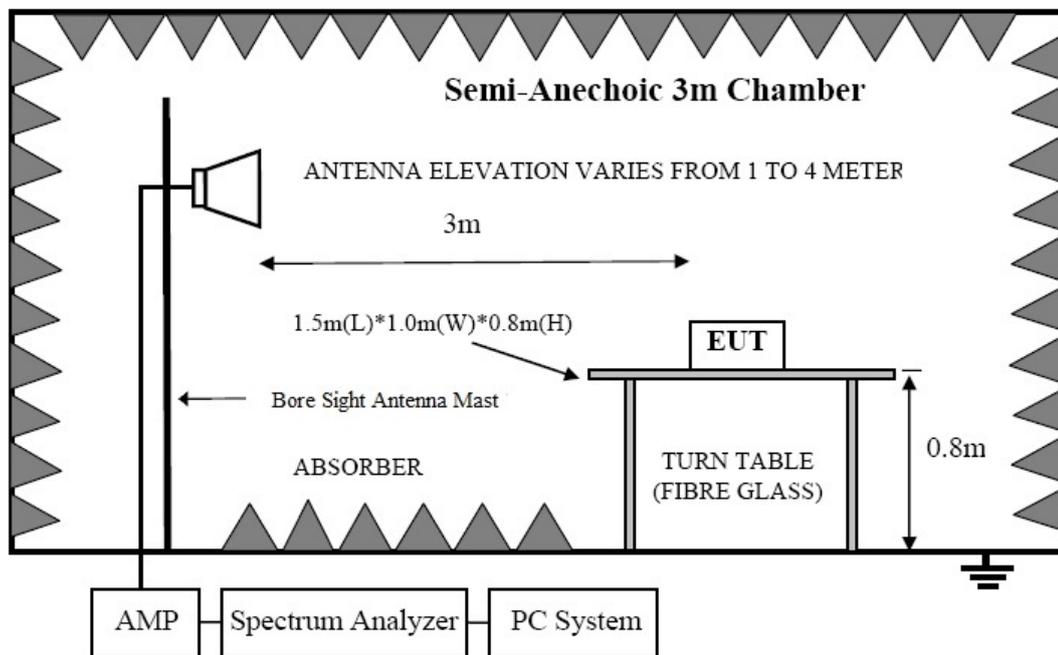
Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-108	1000
108-500	2000
500-1000	5000
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

4.2. Block Diagram of Test Setup

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



In Semi Anechoic Chamber (3m) Test Setup Diagram for Above 1GHz



4.3. Configuration of EUT 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. Operating Condition of EUT

- (1) Setup the EUT as shown as Section 4.2.
- (2) Turn on the power of all equipment.
- (3) Let the EUT work in test mode and 15 minutes before taking the test.

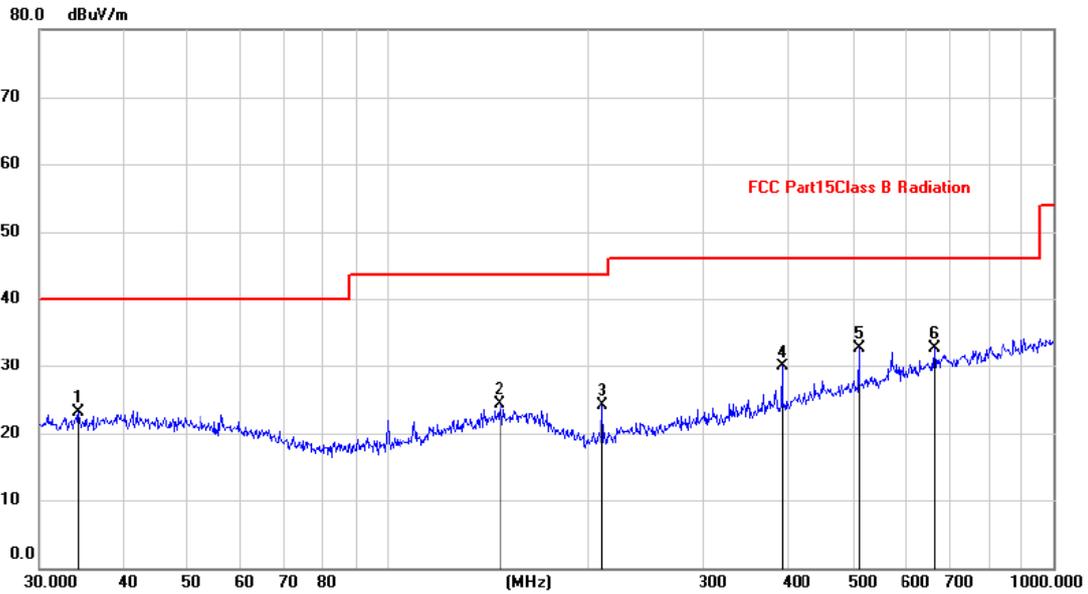
4.5. Test Procedure

- (1) 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 C63.4:2014 on Radiated Emission test.
- (2) For the radiated emission test above 1GHz:
Place the measurement antenna away from each area of the EUT determined to be a source of emissions at the specified measurement distance, while keeping the measurement antenna aimed at the source of emissions at each frequency of significant emissions, with polarization oriented for maximum response. The measurement antenna may have to be higher or lower than the EUT, depending on the radiation pattern of the emission and staying aimed at the emission source for receiving the maximum signal. The final measurement antenna elevation shall be that which maximizes the emissions. The measurement antenna elevation for maximum emissions shall be restricted to a range of heights of from 1 m to 4 m above the ground or reference ground plane.
- (3) The frequency range from 30MHz to 1000MHz is checked, the bandwidth of test receiver (R&S TEST RECEIVER ESR) is set at 120kHz.
- (4) The frequency range from above 1GHz is checked, the bandwidth of spectrum analyzer (Spectrum Analyzer FSU) is set at 1MHz.
- (5) 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 pre-scanned with a peak detector and all final readings of measurement from Spectrum Analyzer are peak and average values checked, all measurement distance is 3m in 3m semi anechoic chamber.
- (6) The test results are reported on Section 4.7.

4.6. Test Results

Frequency Range : 30MHz~1000MHz	
Test Date : 2018.11.19	Temperature : 24.0°C
Test Engineer : Anne Qiu	Humidity : 49%
Test Mode : Data Transmitting	
Test Results : PASS	
Note: 1. The test results are listed in next pages. 2. If the limits for the measurement with the quasi-peak 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 quasi-peak detector need not be carried out.	

Antenna polarity: Horizontal

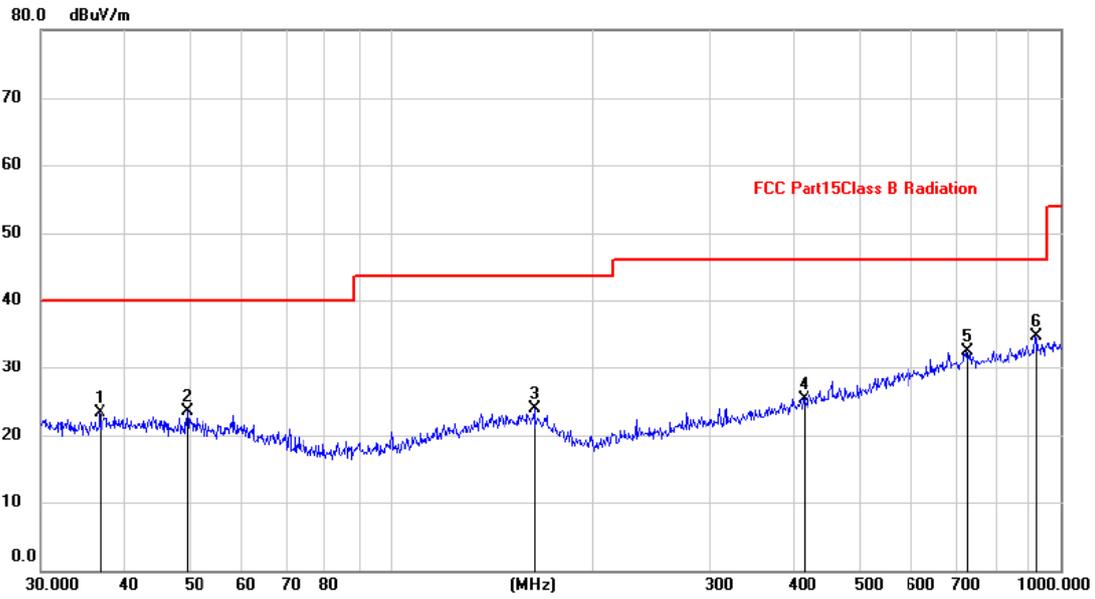


No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		34.2760	9.63	13.47	23.10	40.00	-16.90	peak		
2		147.4036	9.92	14.36	24.28	43.50	-19.22	peak		
3		210.0482	13.36	10.69	24.05	43.50	-19.45	peak		
4		392.0951	14.56	15.40	29.96	46.00	-16.04	peak		
5		510.0436	15.37	17.36	32.73	46.00	-13.27	peak		
6	*	665.8035	12.44	20.36	32.80	46.00	-13.20	peak		

Note: 1. *: Maximum data; x: Over limit; !: over margin.

2. Measurement = Reading Level + Correct Factor; Correct Factor = Antenna Factor + Cable Loss.

Antenna polarity: Vertical



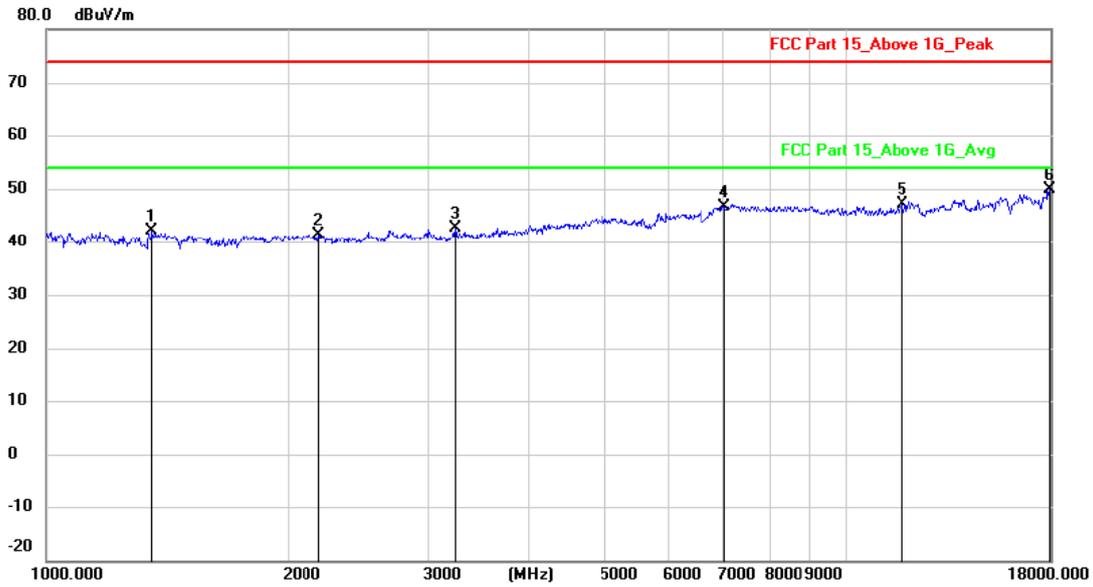
No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment
1		36.7662	9.46	13.75	23.21	40.00	-16.79			peak
2		49.5328	9.76	13.68	23.44	40.00	-16.56			peak
3		163.7550	9.55	14.28	23.83	43.50	-19.67			peak
4		414.7223	9.41	15.98	25.39	46.00	-20.61			peak
5		724.2611	11.33	21.25	32.58	46.00	-13.42			peak
6	*	919.2866	11.07	23.59	34.66	46.00	-11.34			peak

Note: 1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Frequency Range	: Above 1GHz		
Test Date	: 2018.11.19	Temperature	: 2.0°C
Test Engineer	: Anne Qiu	Humidity	: 49%
Test Mode	: Data Transmitting		
Test Results	: PASS		
Note:	1. The test results are listed in next pages. 2. If the limits for the measurement with the quasi-peak 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 quasi-peak detector need not be carried out.		

Antenna polarity: Horizontal

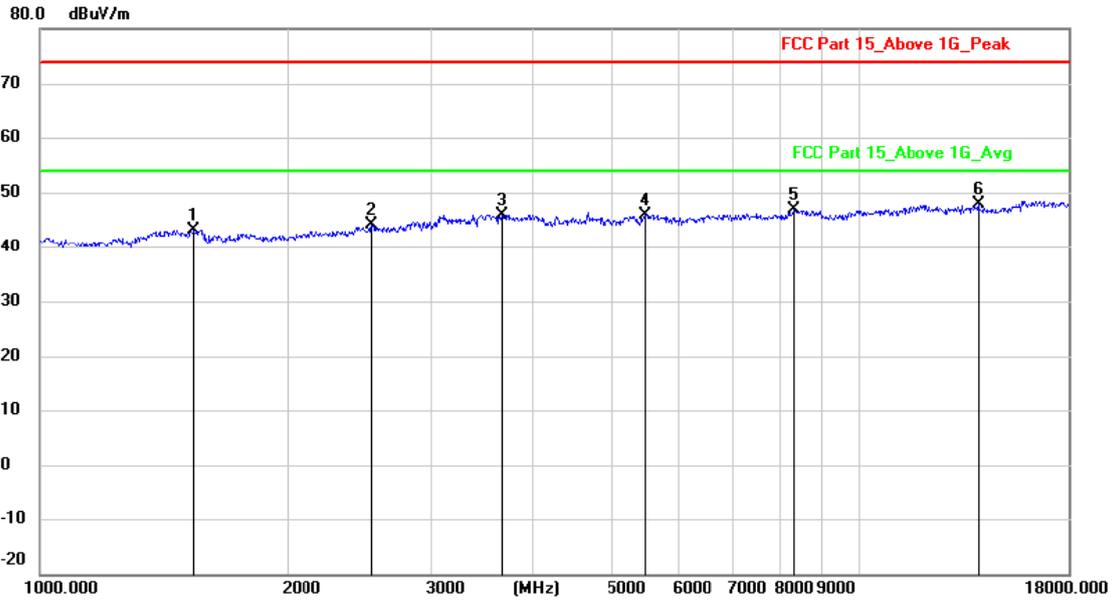


No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Antenna Height cm	Table Degree degree	Comment
1		1354.577	49.25	-7.15	42.10	74.00	-31.90			peak
2		2188.663	44.92	-3.43	41.49	74.00	-32.51			peak
3		3242.619	45.01	-2.28	42.73	74.00	-31.27			peak
4		7035.726	43.99	2.67	46.66	74.00	-27.34			peak
5		11735.24	41.35	5.67	47.02	74.00	-26.98			peak
6	*	17948.04	37.35	12.56	49.91	74.00	-24.09			peak

Note: 1. *: Maximum data; x: Over limit; !: over margin.

2. Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

Antenna polarity: Vertical



No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Margin	Antenna Height	Table Degree
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree
1		1538.281	50.18	-6.94	43.24	74.00	-30.76		
2		2536.283	47.45	-3.29	44.16	74.00	-29.84		
3		3650.582	52.01	-6.01	46.00	74.00	-28.00		
4		5487.260	47.74	-1.75	45.99	74.00	-28.01		
5		8295.823	43.46	3.35	46.81	74.00	-27.19		
6	*	13957.52	41.03	6.93	47.96	74.00	-26.04		

Note:1. *:Maximum data; x:Over limit; !:over margin.

2.Measurement=Reading Level+Correct Factor; Correct Factor=Antenna Factor+Cable Loss.

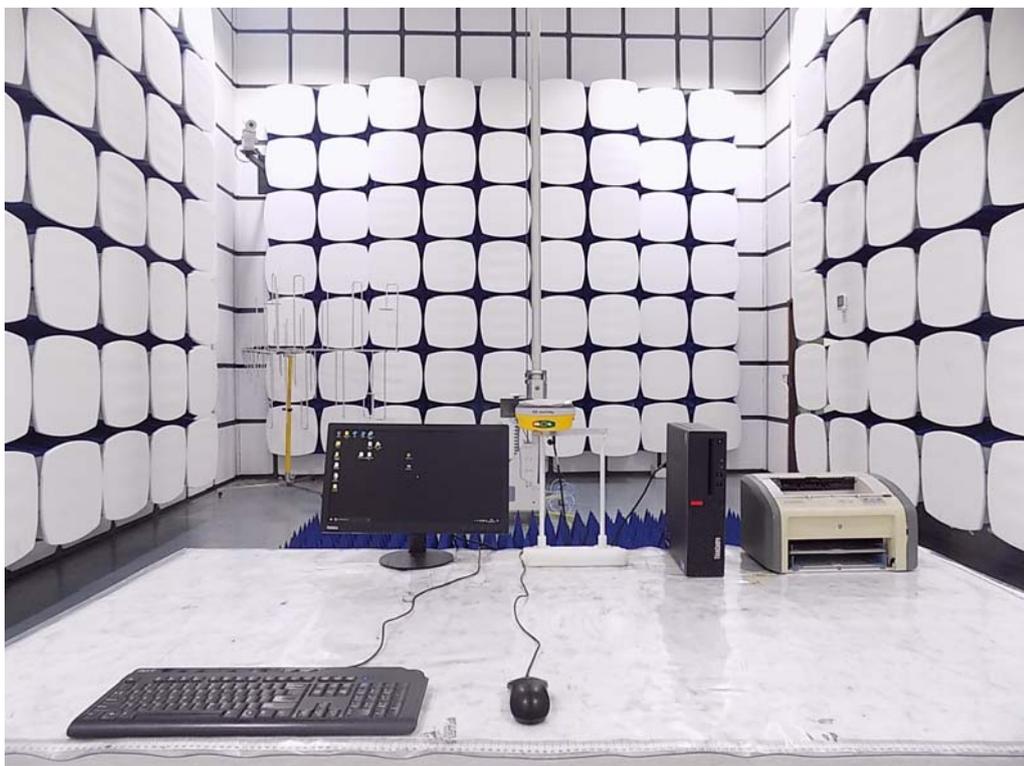
5. PHOTOGRAPH

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

30M-1000MHz



Above 1GHz



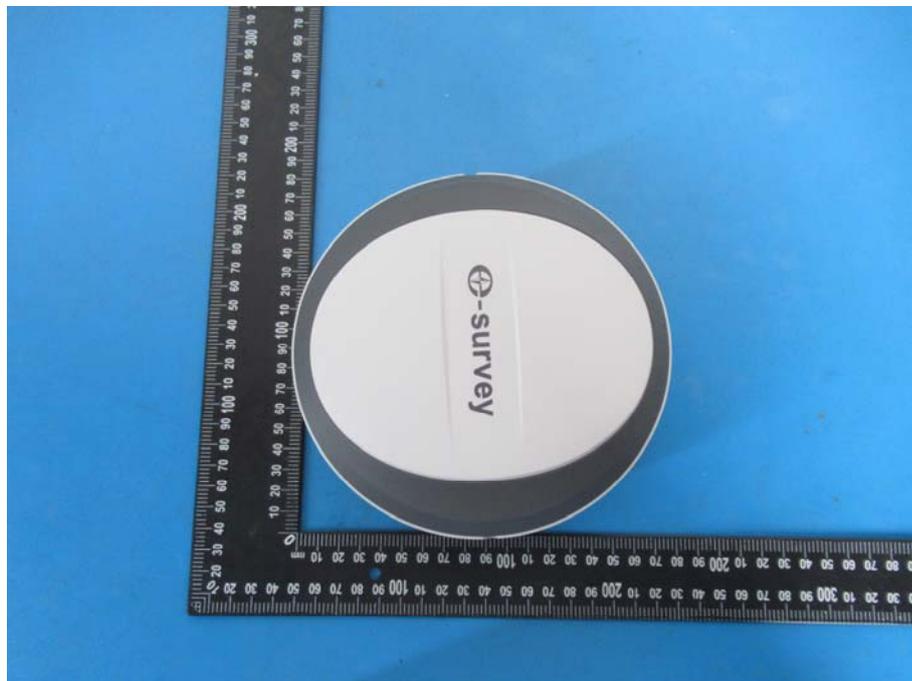
5.2.Photos of Conducted disturbance at mains terminals test



6. PHOTOS OF THE EUT



EUT View



EUT View



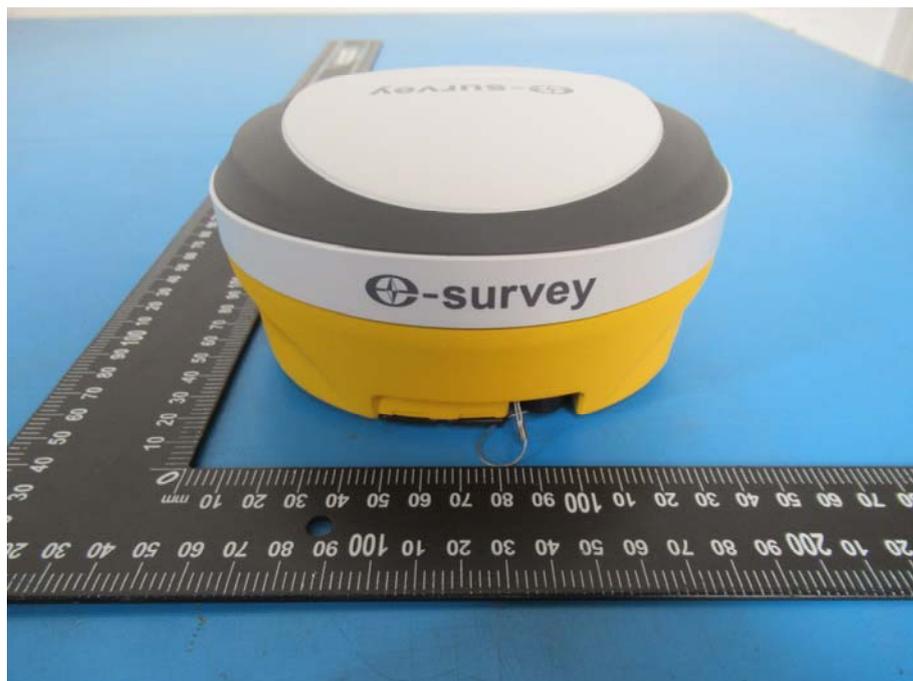
EUT View



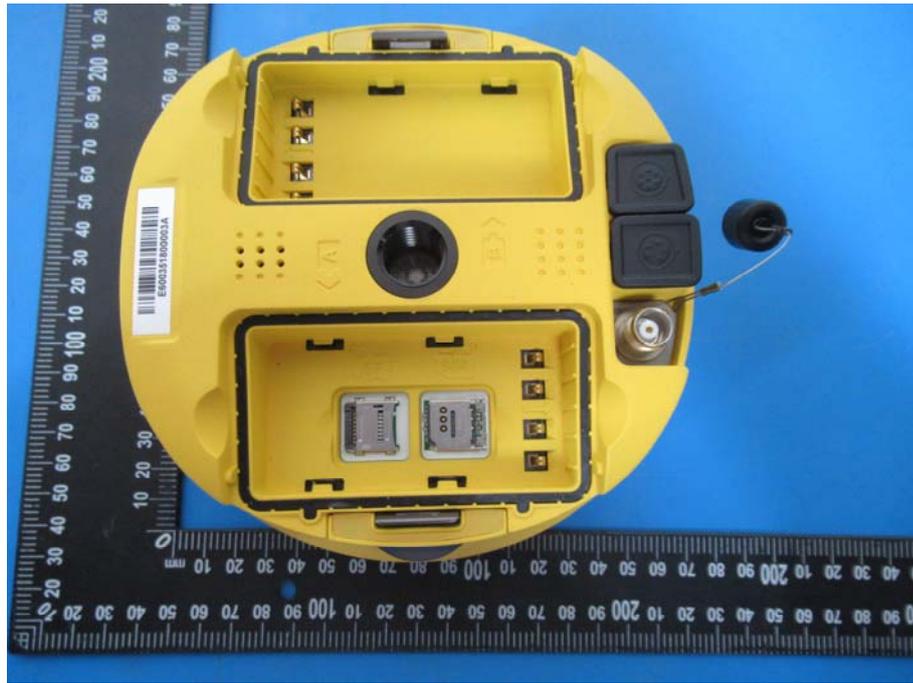
EUT View



EUT View



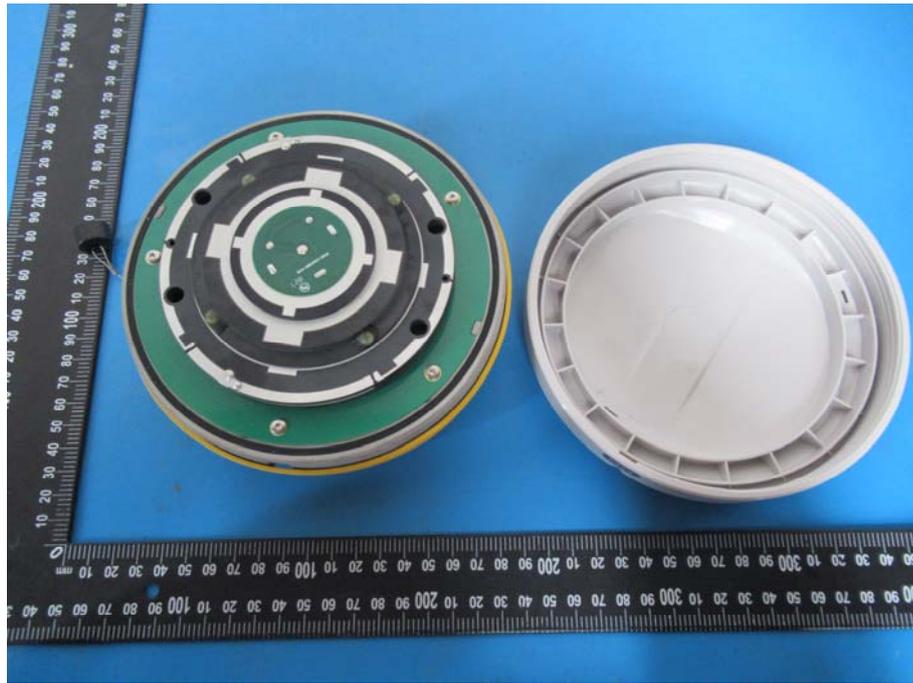
EUT View



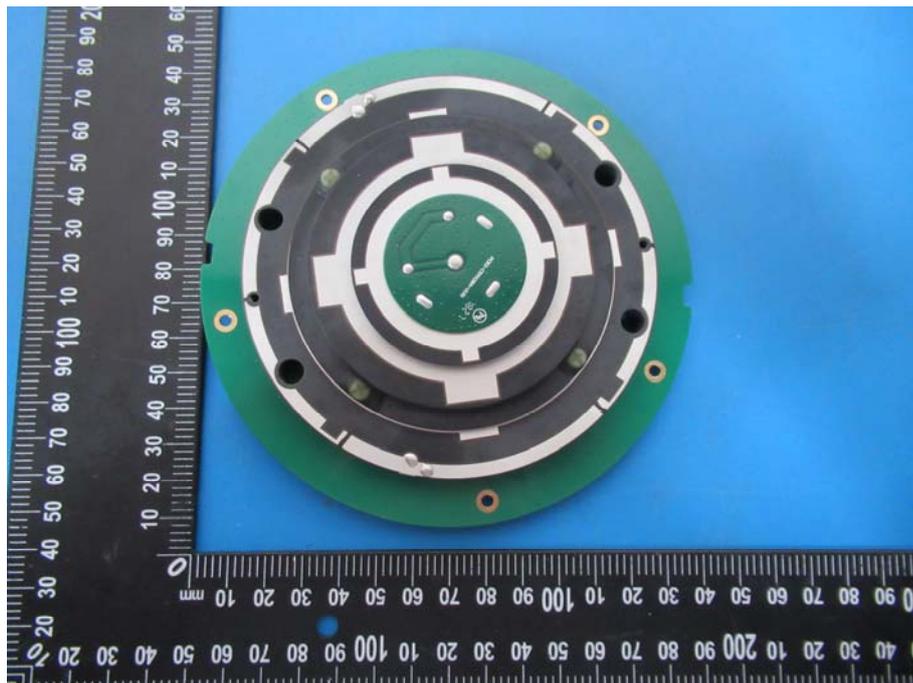
EUT View



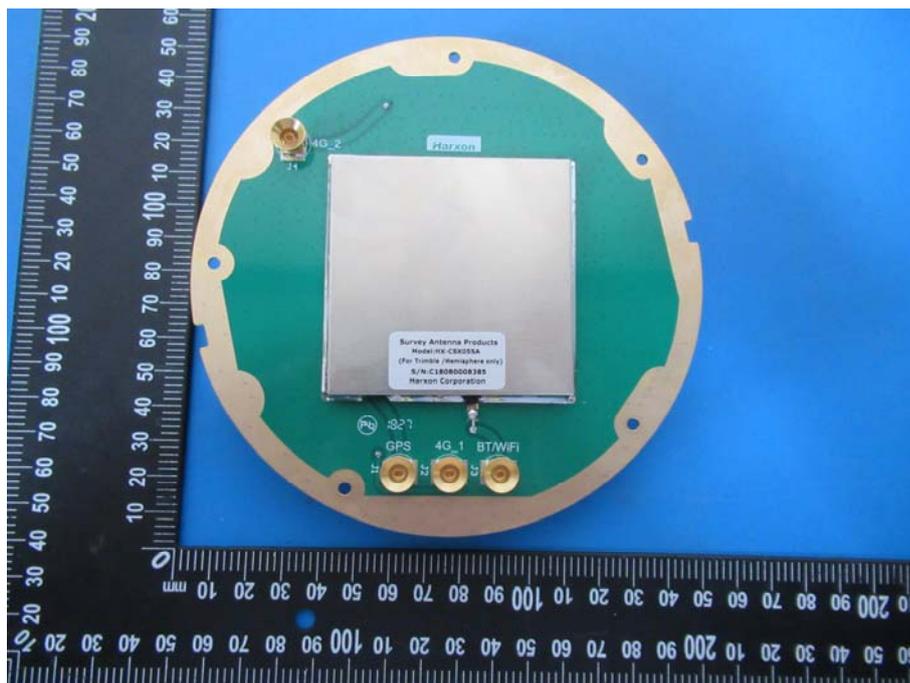
EUT View



EUT View



EUT View



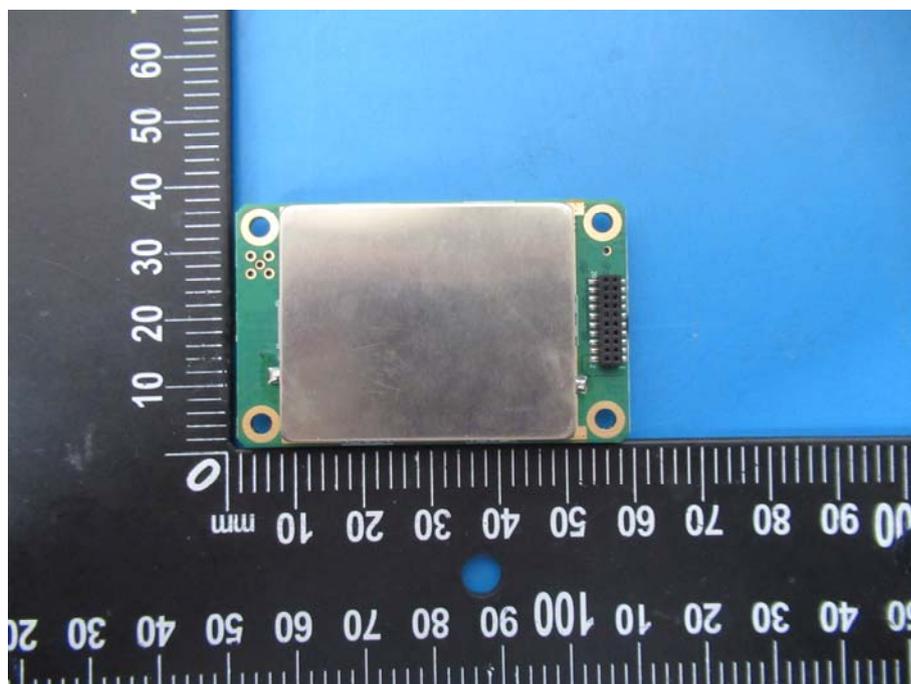
EUT View



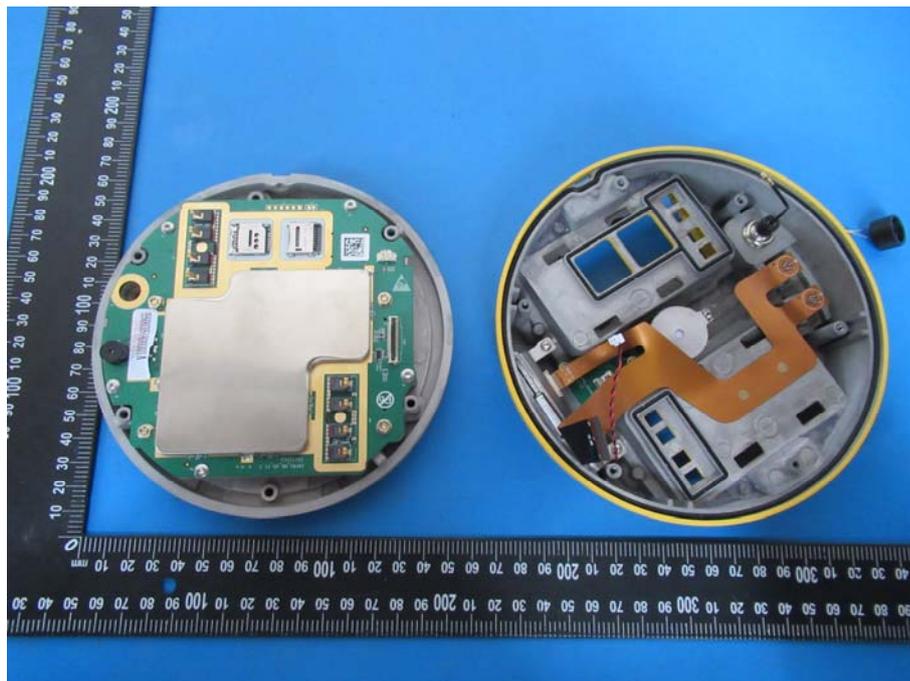
EUT View



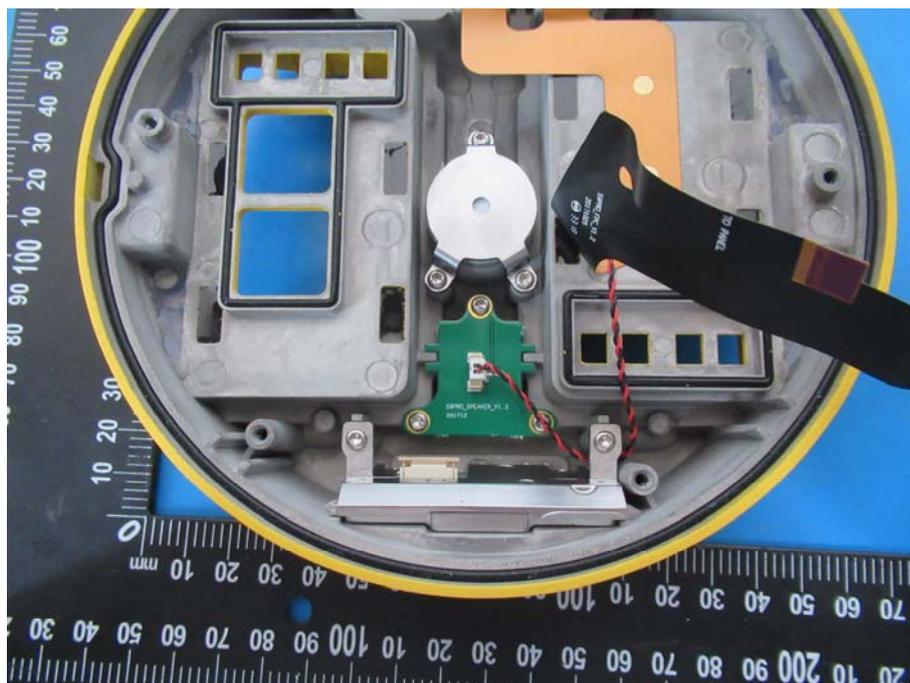
EUT View



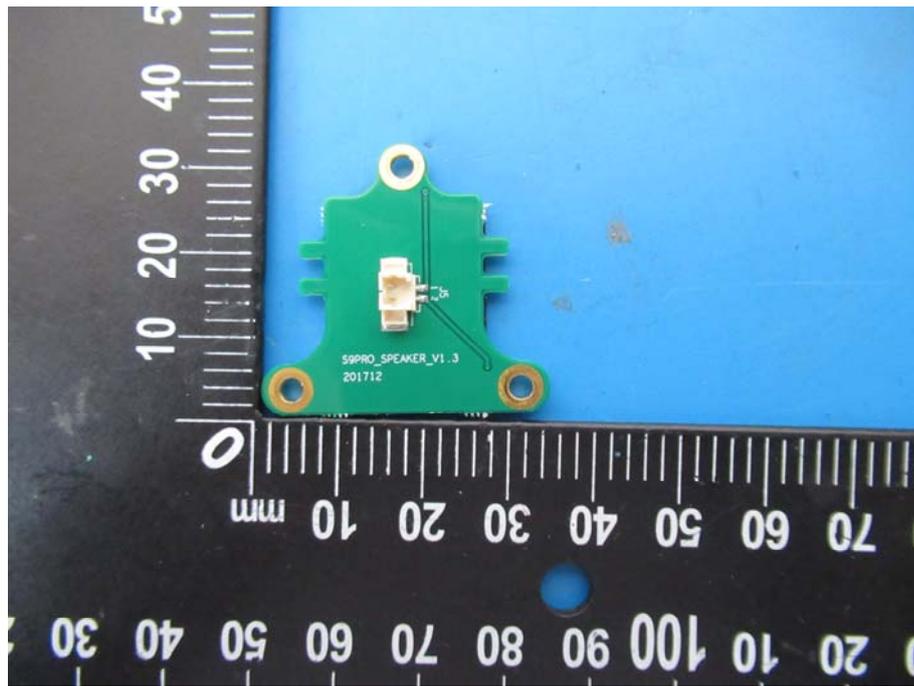
EUT View



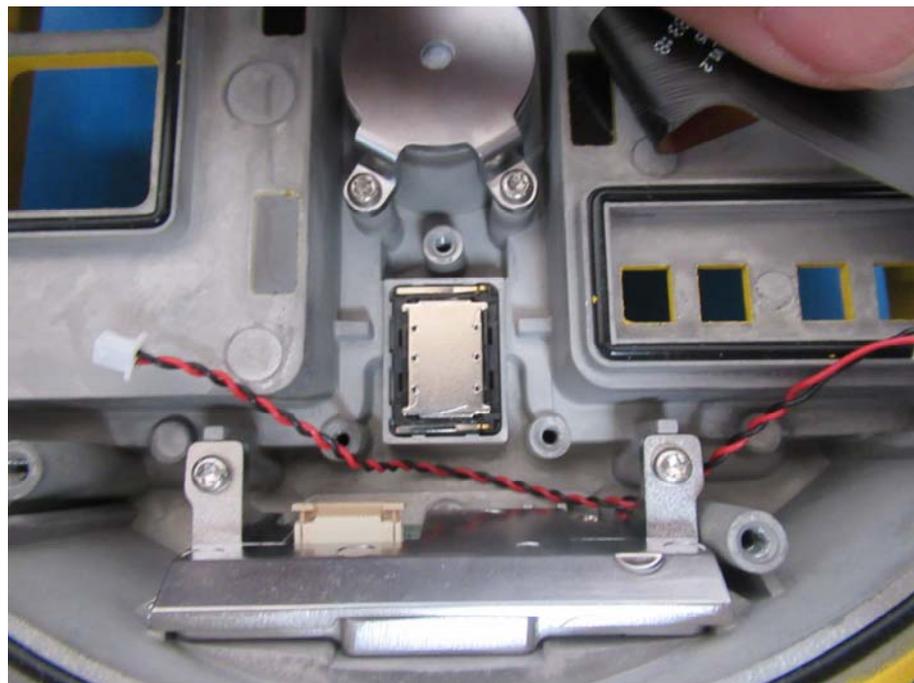
EUT View



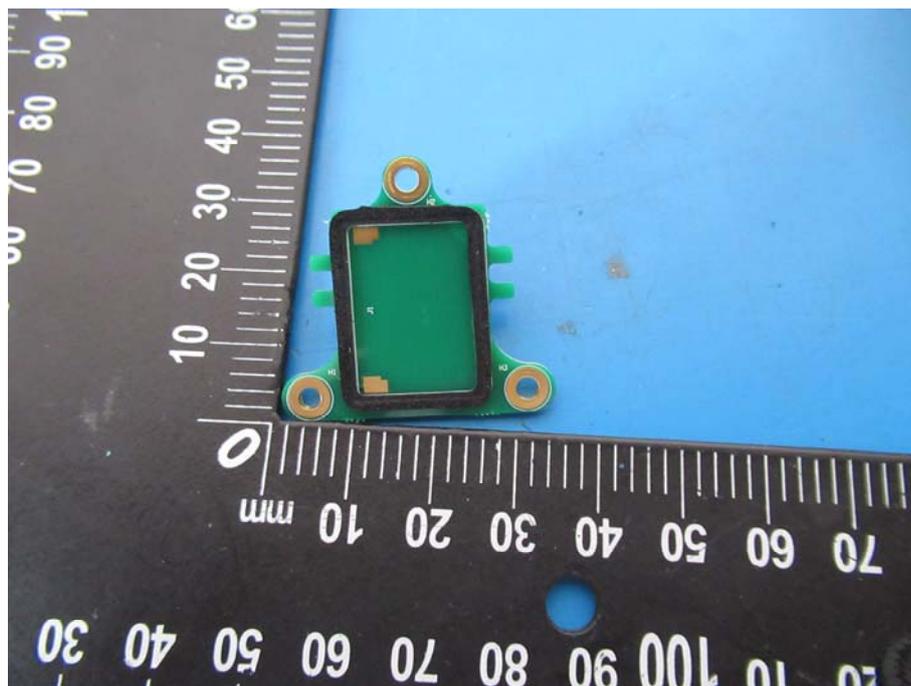
EUT View



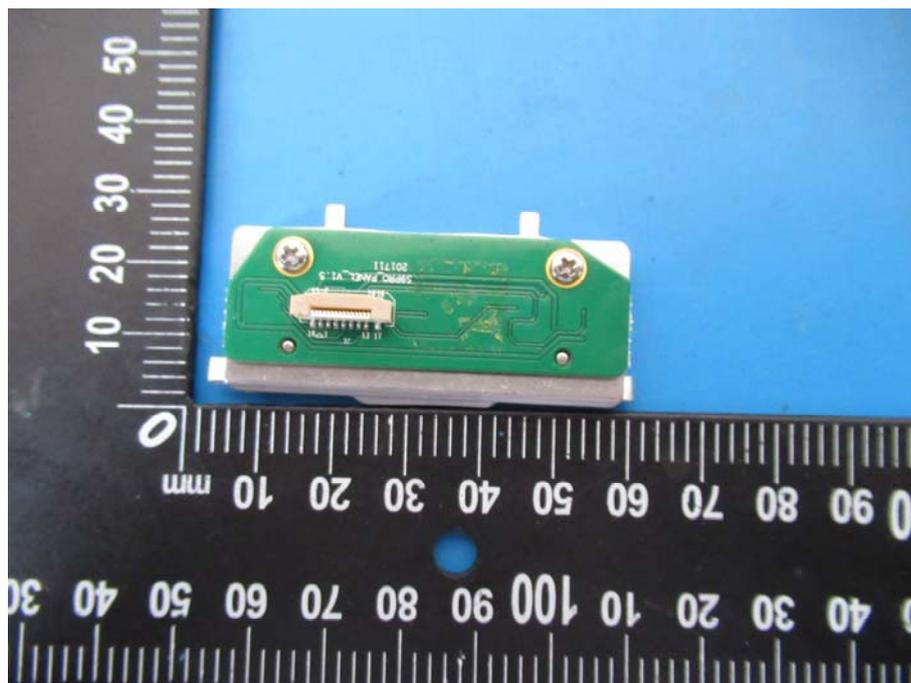
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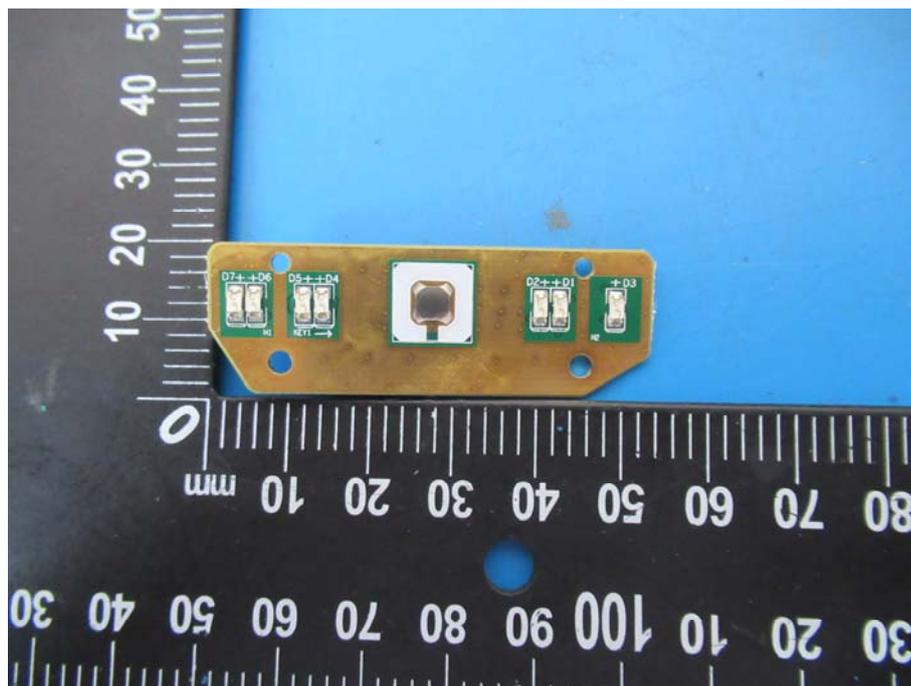
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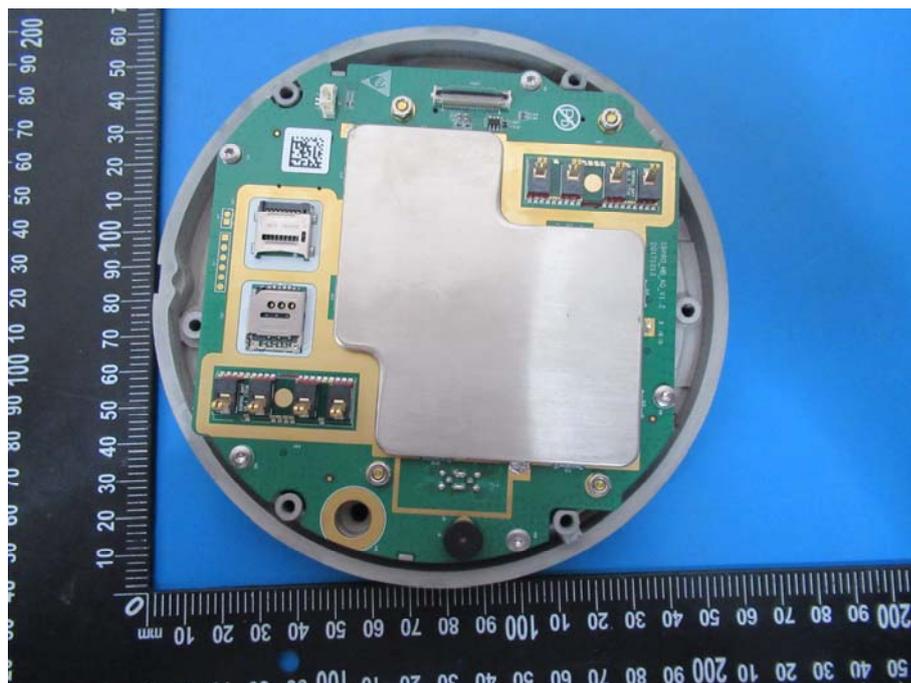
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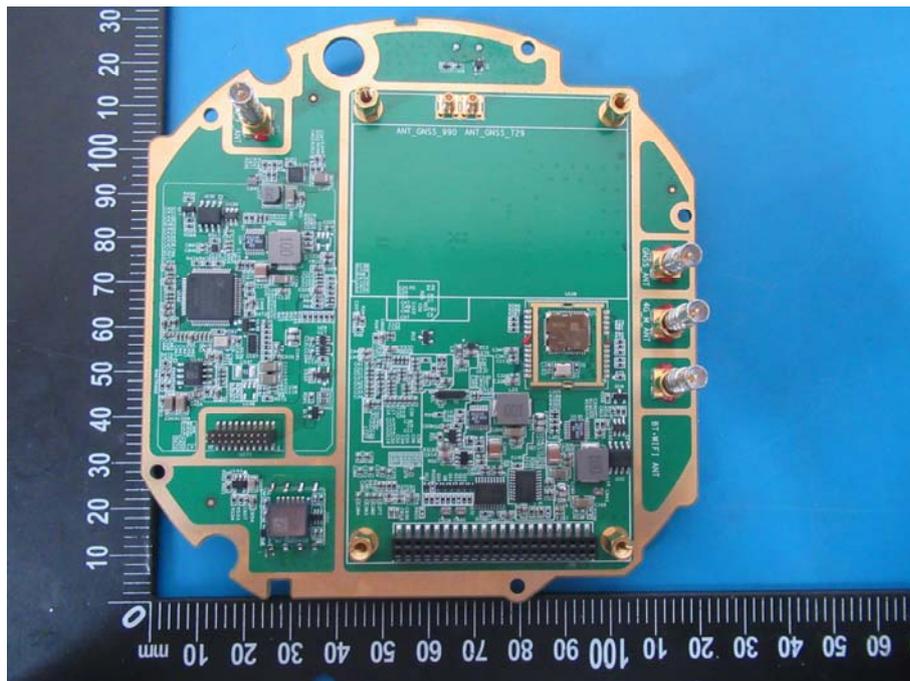
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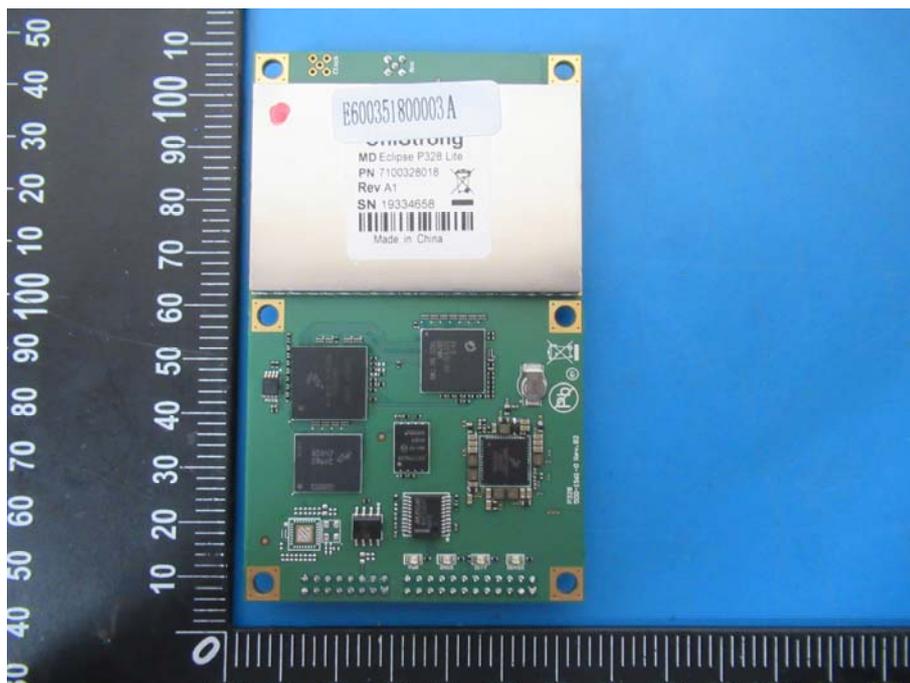
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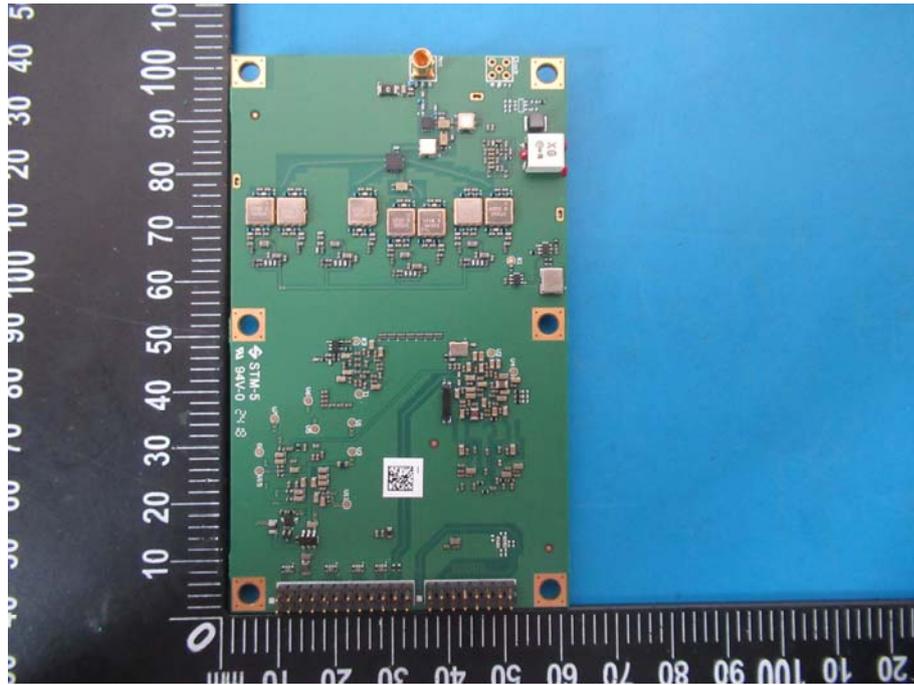
EUT View



EUT View



EUT View



EUT View

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