

FCC TEST REPORT

FCC ID: SY4-B01014

On Behalf of

Shanghai Huace Navigation Technology LTD. Handheld GNSS Data Collector

Model No.: LT700H

Prepared for	:	Shanghai Huace Navigation Technology LTD.
Address	:	599 Gaojing Road, Building D, Shanghai 201702, 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

:	A2102055-C01-R01
:	February 27, 2021
:	February 27-March 25, 2021
:	April 6, 2021
:	V0
	: : :

Contents

1.	Genera	l Information	5
	1.1.	Description of Device (EUT)	5
	1.2.	Accessories of Device (EUT)	6
	1.3.	Ancillary Equipment Details	6
	1.4.	Test Lab Information	6
2.5	Summar	y of test	7
	2.1.	Summary of test result	7
	2.2.	Block Diagram	7
	2.3.	Test mode	7
	2.4.	Test Conditions	7
	2.5.	Measurement Uncertainty (95% confidence levels, k=2)	8
	2.6.	Test Equipment	9
3.0	Occupied	l bandwidth and 20dB Bandwidth	
	3.1.	Limit	10
	3.2.	Test Procedure	10
	3.3.	Test Setup	10
	3.4.	Test Result	10
4. I	Radiated	emissions	11
	4.1.	Limit	11
	4.2.	Block Diagram of Test setup	11
	4.3.	Test Procedure	12
	4.4.	Test Result	13
5.I	requent	cy stability	18
	5.1.	Test limit	18
	5.2.	Test Procedure	18
	5.3.	Test Setup	18
	5.4.	Test Results	18
6.I	Power Li	ine Conducted Emissions	20
	6.1.	Block Diagram of Test Setup	20
	6.2.	Limit	20
	6.3.	Test Procedure	20
	6.4.	Test Result	21
7. A	Antenna	Requirements	23
	7.1.	Limit	23
	7.2.	Antenna Connected Construction	23
	7.3.		
8.7	Fest setu	p photo	
	8.1.	Photos of Radiated emission	24
	8.2.	Photos of Conducted Emission test	
9.I	Photos of	f EUT	26

TEST REPORT DECLARATION

Applicant	:	Shanghai Huace Navigation Technology LTD.	
Address	:	599 Gaojing Road, Building D, Shanghai 201702, China	
Manufacturer	:	Shanghai Huace Navigation Technology LTD.	
Address	:	599 Gaojing Road, Building D, Shanghai 201702, China	
EUT Description	:	Handheld GNSS Data Collector	
		(A) Model No. : LT700H	
		(B) Trademark : CHCNAY	

Measurement Standard Used:

FCC Rules and Regulations Part 15 Subpart C Section 15.225 RSS 210 Issue 10, RSS Gen Issue 5, ANSI C63.10:2013

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).....:

Approved by (name + signature).....:

Lucas Pang **Project Engineer**

Lucas Poung

Simple Guan Project Manager

Date of issue.....:

April 6, 2021

Revision History

Revision	Issue Date	Revisions	Revised By
V0	April 6, 2021	Initial released Issue	Lucas Pang

1. General Information

1.1. Description of Device (EUT)

EUT	: Handheld GNSS Data Collector
Model No. DIFF	: LT700H : /
Trade mark	CHCNAV
Power supply	: DC 3.8V from battery, DC 5V for adapter
NFC	
Operation frequency	: 13.56MHz
Channel No.	: 1 Channel
Modulation	÷ ASK
Antenna Type	: Internal antenna, Antenna gain 20dBi.
Software version	: V1.0
Hardware Version/ FVIN	: V1.0

1.2. Accessories of Device (EUT)

Accessories1	:	AC/DC ADAPTER
Manufacturer	:	Shenzhen Jiuzhou Power Technology Co., LTD
Model	:	JZB110-050200WU
Input	:	AC 100-240V, 50/60Hz, 0.35A
Output	:	DC 5V/2A Max., 10W

1.3. Ancillary Equipment Details

No.	Description	Manufacturer	Model	Serial Number	Certification or SDOC
1.	N/A	N/A	N/A	N/A	N/A

1.4. Test Lab Information

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

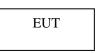
July 15, 2019 Certificated by IC Registration Number: CN0085

2. Summary of test

2.1. Summary of test result

Description of Test Item	Standard	Results
Conducted Emission	15.207(a)	PASS
Radiated emissions	15.209(a)&15.225	PASS
Fundamental field strength limit	15.225(a)	PASS
Frequency stability	15.225(e)	PASS
Band edge compliance	15.225	PASS
Antenna Requirement	15.203	PASS

2.2. Block Diagram



2.3. Test mode

Tested mode, channel, and data rate information				
Mode	Channel	Frequency		
Mode	Channel	(MHz)		
1	CH1	13.56		
Note: According exploratory test, EUT will have maximum output power in those data				
rate. so those data rate were used for all test.				

2.4. Test Conditions

Temperature range	21-25℃
Humidity range	40-75%
Pressure range	86-106kPa

2.5. Measurement Uncertainty (95% confidence levels, k=2)

Item	Uncertainty
Uncertainty for Power point Conducted Emissions Test	2.74dB
Uncertainty for Radiation Emission test in 3m chamber	2.13 dB(Polarize: V)
(below 30MHz)	2.57dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber	3.77dB(Polarize: V)
(30MHz to 1GHz)	3.80dB(Polarize: H)
Uncertainty for Radiation Emission test in 3m chamber	4.16dB(Polarize: H)
(1GHz to 25GHz)	4.13dB(Polarize: V)
Uncertainty for radio frequency	5.4×10-8
Uncertainty for conducted RF Power	0.37dB
Uncertainty for temperature	0.2°C
Uncertainty for humidity	1%
Uncertainty for DC and low frequency voltages	0.06%

2.6. Test Equipment

Equipment	Manufacture	Model No.	Serial No.	Last cal.	Cal Interval
9*6*6 anechoic chamber	CHENYU	9*6*6	N/A	2019.09.06	3Year
Spectrum analyzer	ROHDE&SCHW ARZ	FSV40-N	102137	2020.09.02	1 Year
Spectrum analyzer	Agilent	N9020A	MY499100060	2020.09.02	1Year
Receiver	ROHDE&SCHW ARZ	ESR	1316.3003K03-10208 2-Wa	2020.09.02	1 Year
Receiver	R&S	ESCI	101165	2020.09.02	1 Year
Bilog Antenna	Schwarzbeck	VULB 9168	VULB9168-438	2020.04.12	2Year
Horn Antenna	SCHWARZBEC K	BBHA 9120 D	BBHA 9120 D(1201)	2020.04.12	2Year
Active Loop Antenna	SCHWARZBEC K	FMZB 1519B	00059	2019.09.07	2Year
Cable	Resenberger	N/A	No.1	2020.09.02	1Year
Cable	Resenberger	N/A	No.2	2020.09.02	1 Year
Cable	Resenberger	N/A	No.3	2020.09.02	1 Year
Pre-amplifier	HP	HP8347A	2834A00455	2020.09.02	1 Year
Pre-amplifier	Agilent	8449B	3008A02664	2020.09.02	1Year
L.I.S.N.#1	Schwarzbeck	NSLK8126	8126466	2020.09.02	1 Year
L.I.S.N.#2	ROHDE&SCHW ARZ	ENV216	101043	2020.09.02	1 Year
20db Attenuator	ICPROBING	IATS1	82347	2020.09.02	1 Year
Horn Antenna	SCHWARZBEC K	BBHA9170	00946	2019.09.07	2 Year
Preamplifier	SKET	LNPA_1840-50	SK2018101801	2020.09.02	1 Year
Power Meter	Agilent	E9300A	MY41496625	2020.09.02	1 Year
Temp. &Humid. Chamber	Weihuang	WHTH-1000-40-8 80	100631	2020.09.02	1 Year
Switching Mode Power Supply	JUNKE	JK12010S	20140927-6	2020.09.02	1 Year

3. Occupied bandwidth and 20dB Bandwidth

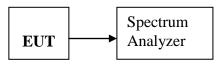
3.1. Limit

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in FCC part 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

3.2. Test Procedure

The transmitter output was directly connected to a spectrum analyzer with a 50 Ω cable. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 3KHz RBW and 10kHz VBW. The 20dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20dB.

3.3. Test Setup



3.4. Test Result

Mode	Freq (MHz)	20dB Bandwidth (KHz)	99% Bandwidth	Limit (kHz)	Conclusion
Tx Mode	13.56	8.635	9.405	/	PASS

Agilent Spectrum Analyzer - Occupied BW W RF 50 ହ ନଦ Ref Value -10.00 dBm	Cent	SENSE:INT ter Freq: 13.560000 MHz Free Run Avg H en: 0 dB	Radio dd: 10/10	8:22 PM Mar 19, 2021 o Std: None o Device: BTS	Trace/Detector
10 dB/div Ref -10.00 dBm Log -20.0 -30.0					Clear Write
-40.0 -50.0 -70.0				·····	Average
-80.0					Max Hold
Center 13.56 MHz #Res BW 3 kHz Occupied Bandwidth		#VBW 10 kHz Total Power	Swe -18.6 dBn	Span 50 kHz eep 5.333 ms n	Min Hold
	9.405 kHz 1.050 kHz 8.635 kHz	OBW Power x dB	99.00 9 -20.00 di		Detector Peak≯ Auto <u>Man</u>
MSG			STATUS		

4. Radiated emissions

4.1. Limit

	Field Stre	ngth	Field Strength Limit a	it at 3m Measurement Dist		
Frequency (MHz)	uV/m	Distance (m)	uV/m	dBuV/m		
0.009 ~ 0.490	2400/F(kHz)	300	10000 * 2400/F(kHz)	$20\log^{(2400/F(kHz))} + 80$		
0.490 ~ 1.705	24000/F(kHz)	30	100 * 24000/F(kHz)	$20\log^{(24000/F(kHz))} + 40$		
$1.705 \sim 30$	30	30	100 * 30	$20\log^{(30)} + 40$		
$30 \sim 88$	100	3	100	20log ⁽¹⁰⁰⁾		
$88 \sim 216$	150	3	150	20log ⁽¹⁵⁰⁾		
$216 \sim 960$	200	3	200	20log ⁽²⁰⁰⁾		
Above 960	500	3	500	20log ⁽⁵⁰⁰⁾		

Note:

a) The tighter limit applies at the band edges.

For example: F.S limit at 88MHz is 100uV/m

b) If measurement is made at 3m distance, then F.S Limit at 3m distance is adjusted by using the formula of $L_{d1} = L_{d2} * (d2/d1)^2$.

For example:

F.S Limit at 30m(d2) distance is 30uV/m(Ld2), then F.S Limit at 3m(d1) distance is

 $L_{d1} = 30 uV/m * (30/3)^2 = 100 * 30 uV/m = 69.54 dBuV/m$

(a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.

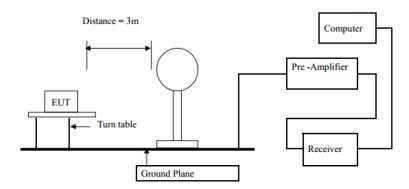
(b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.

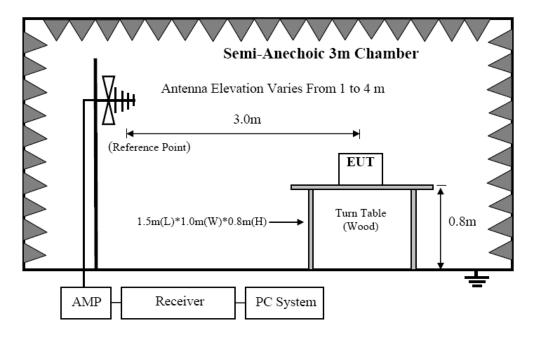
(c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.

(d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

4.2. Block Diagram of Test setup

In 3m Anechoic Chamber Test Setup Diagram for below 30MHz





In 3m Anechoic Chamber Test Setup Diagram for frequency 30MHz-1GHz

4.3. Test Procedure

Procedure of Preliminary Test

The EUT and Support equipment, if needed, were put placed on a non-metallic table, 80cm above the ground plane.

Configuration EUT to simulate typical usage as described in clause 2.4 and test equipment as described in clause 4.2 of this report.

All I/O cables were positioned to simulate typical actual usage as per ANSI C63.10:2013.

Mains cables, telephone lines or other connections to auxiliary equipment located outside the test are shall drape to the floor, be fitted with ferrite clamps or ferrite tubes placed on the floor at the point where the cable reaches the floor and then routed to the place where they leave the turntable. No extension cords shall be used to mains receptacle.

The antenna was placed at 3 meter away from the EUT as stated in ANSI C63.10:2013. The antenna connected to the Spectrum Analyzer via a cable and at times a pre-amplifier would be used.

The Receiver quickly scanned from 9KHz to 30MHz and 30MHz to 1GHz The EUT test program was started. Emissions were scanned and measured rotating the EUT to 360 degrees and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

The test mode(s) described in clause 2.4 were scanned during the preliminary test:

After the preliminary scan, we found the test mode producing the highest emission level. The EUT and cable configuration, antenna position, polarization and turntable position of the above highest emission level were recorded for the final test.

Procedure of Final Test

EUT and support equipment were set up on the turntable as per the configuration with highest emission level in the preliminary test.

The Receiver scanned from9KHz to 30MHz and 30MHz to 1GHz. Emissions were scanned and

measured rotating the EUT to 360 degrees, varying cable placement and positioning the antenna 1 to 4 meters above the ground plane, in both the vertical and the horizontal polarization, to maximize the emission reading level.

Recorded at least the six highest emissions. Emission frequency, amplitude, antenna position, polarization and turntable position were recorded into a computer in which correction factors were used to calculate the emission level and compare reading to the applicable limit and only Q.P. reading is presented.

The test data of the worst-case condition(s) was recorded.

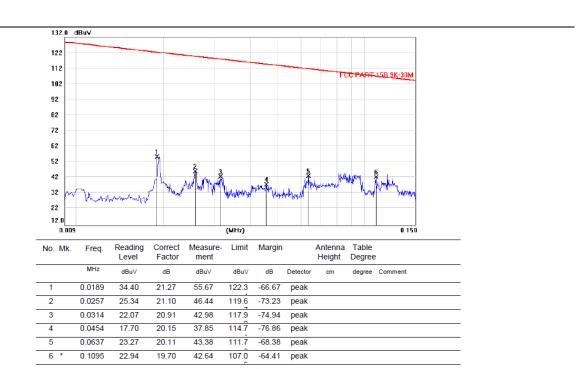
The bandwidth of test receiver is set at 200Hz for 9 KHz to 150 KHz measure, 10 KHz for 150 KHz to 30MHz measure and 120 KHz for 30 MHz to 1GHz measure .

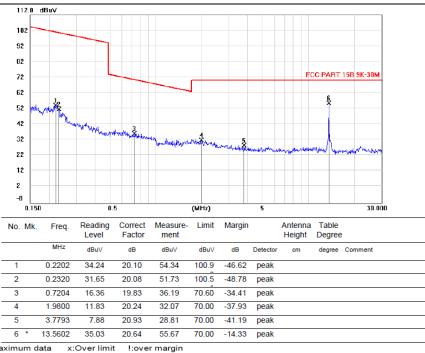
4.4. Test Result

PASS. (See below detailed test result) Detailed information please see the following page.

Frequen	cy Range : 9KHz~30MHz					
Test Mo	de : TX: 13.56MHz					
Test Res	sults : PASS					
Note:	1. The test results are listed in next pages.					
	2. This mode is worst case mode, so this report only reflected the worst mode.					
	3. 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					
	quasi-peak detector need not be carried out.					

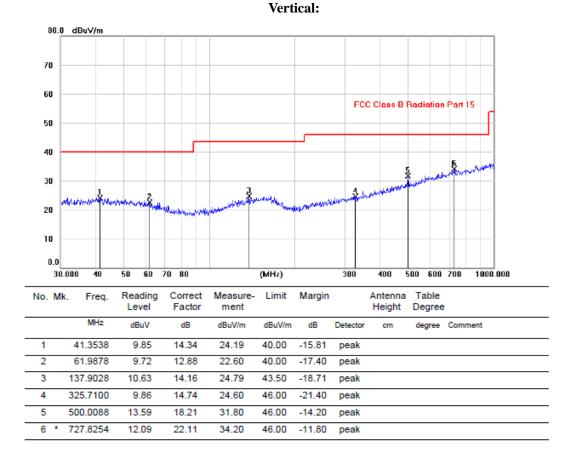
From 9KHz to 30MHz: Conclusion: PASS







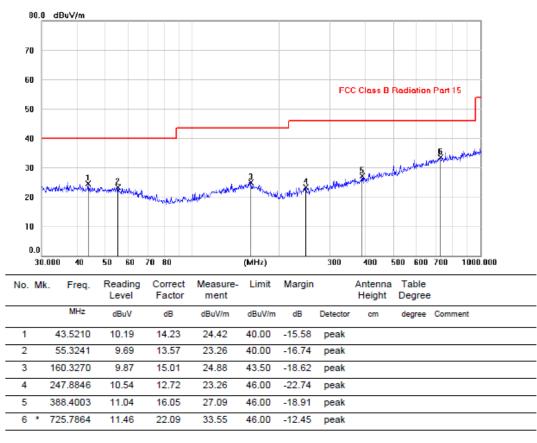
Note: Measurement=Reading Level+Correc Factor. Factor=(LISN or ISN or PLC or Current Probe)Factor+Cable



From 30MHz to 1GHz: Conclusion: PASS

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

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



Horizontal:

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

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

Temperatur	emperature 24°C Relative Humi		umidity	56%					
Pressure		960hPa	a		Distance		3m	3m	
Test Mode		TX							
Freq. (MHz)		ition /V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limits 3m (dBuV/m)	Margin (dBuV/m)	
13.560		Н	Peak	56.87	-13.94	42.93	124	-81.07	
13.560		Н	AV	49.49	-13.94	35.55	104	-68.45	
13.110		Н	Peak	50.32	-13.94	36.38	80.5	-44.12	
13.410		Н	Peak	49.84	-13.94	35.90	90.5	-54.60	
13.553		Н	Peak	49.15	-13.94	35.21	90.5	-55.29	
13.567		Н	Peak	47.28	-13.93	33.35	90.5	-57.15	
13.710		Н	Peak	43.24	-13.93	29.31	80.5	-51.19	
14.010		Н	Peak	43.52	-13.93	29.59	80.5	-50.91	
Freq. (MHz)		ition /V	Detector Mode (PK/QP)	Reading (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limits 3m (dBuV/m)	Margin (dBuV/m)	
13.560		V	Peak	58.65	-13.94	44.71	124	-79.29	
13.560		V	AV	50.96	-13.94	37.02	104	-66.98	
13.110		V	Peak	51.32	-13.94	37.38	80.5	-43.12	
13.410		V	Peak	50.08	-13.94	36.14	90.5	-54.36	
13.553		V	Peak	47.92	-13.94	33.98	90.5	-56.52	
13.567		V	Peak	46.32	-13.93	32.39	90.5	-58.11	
13.710		V	Peak	44.61	-13.93	30.68	80.5	-49.82	
14.010		V	Peak	45.15	-13.93	31.22	80.5	-49.28	

Field Strength Emissions Result

Note:

1: 30m to 3m correction factor calculation:

40*Log(30m/3m)=40

2: --Means other frequency and mode comply with standard requirements and at least have 20dB margin.

3: Correct Factor=Cable Loss+ Antenna Factor- Amplifier Gain

Measurement Result=Reading + Correct Factor

Margin=Measurement Result-Limit

5. Frequency stability

5.1. Test limit

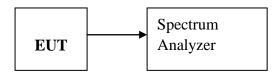
Please refer section RSS-Gen & 15.225e.

Regulation 15.225(e) The frequency tolerance of the carrier signal shall be maintained within $\pm -0.01\%(\pm 100 \text{ ppm})$ of the operating frequency over a temperature variation of -20 degrees to ± 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

5.2. Test Procedure

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

5.3. Test Setup



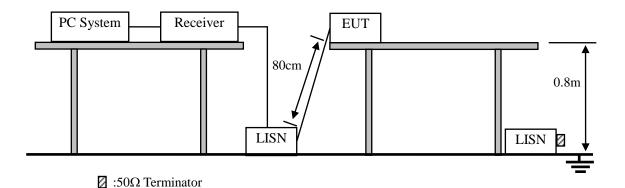
5.4. Test Results

PASS.

Detailed information please see the following page.

Assigned Frequency(MHz): 13.56MHz						
Voltage	TemperatureMeasured Frequency (MHz)Frequency stability		Limit			
Low DC 3.42V	+20°C	13.560789	0.000789			
	-10°C	13.560423	0.000423			
	-5℃	13.560583	0.000583			
	0°C	13.560493	0.000493			
	+10°C	13.560087	0.000087			
Normal DC 3.8V	+20°C	13.560166	0.000166	±100 ppm ±0.001356MHz		
200101	+30°C	13.560717	0.000717			
	+40°C	13.560178	0.000178			
	+50°C	13.560668	0.000668			
	+60°C	13.560378	0.000378]		
High DC 4.18V	+20°C	13.560365	0.000365			

6. Power Line Conducted Emissions



6.1. Block Diagram of Test Setup

6.2. Limit

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

Notes: 1. * Decreasing linearly with logarithm of frequency.

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

6.3. Test Procedure

(1) The EUT was placed on a non-metallic table, 80cm above the ground plane.

(2) Setup the EUT and simulator as shown in 10.1

(3) The EUT Power connected to the power mains through a power adapter and a line impedance stabilization network (L.I.S.N1). The other peripheral devices power cord connected to the power mains through a line impedance stabilization network (L.I.S.N1), this provided a 50-ohm coupling impedance for the EUT (Please refer to the block diagram of the test setup and photographs). 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 C64.10:2013 on conducted Emission test.

(4) The bandwidth of test receiver is set at 10KHz.

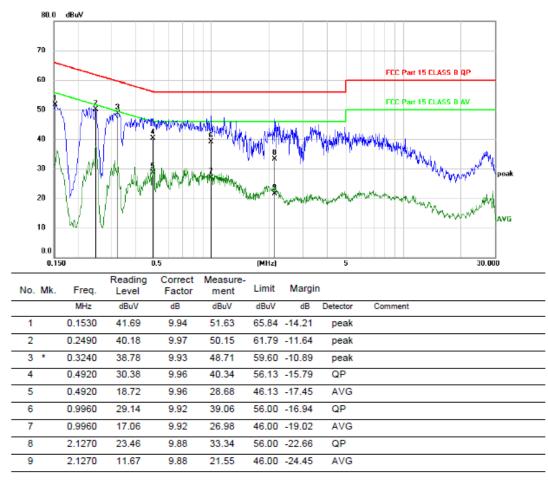
(5) The frequency range from 150 KHz to 30MHz is checked.

6.4. Test Result

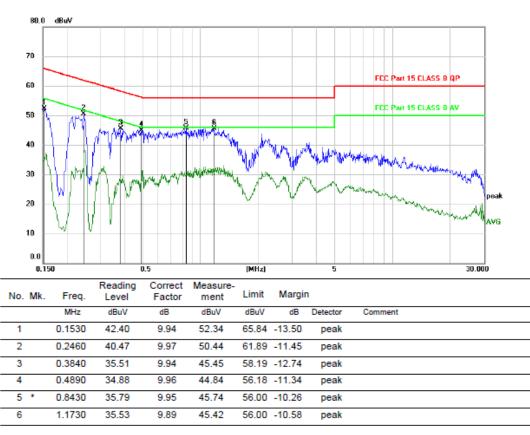
PASS. (See below detailed test data)

Note: If peak Result comply with AV limit, QP and AV Result is deemed to comply with AV limit

Line:



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



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

Neutral:

7. Antenna Requirements

7.1. Limit

For intentional device, according to RSS-Gen Section 6.8 and FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. And according to FCC 47 CFR Section 15.209, if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

7.2. Antenna Connected Construction

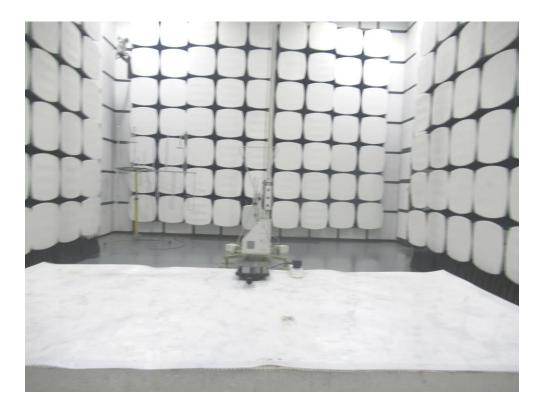
The antenna is internal antenna and no consideration of replacement. Please see EUT photo for details.

7.3. Results

The EUT antenna is Internal Antenna. It complies with the standard requirement.

8. Test setup photo

8.1. Photos of Radiated emission

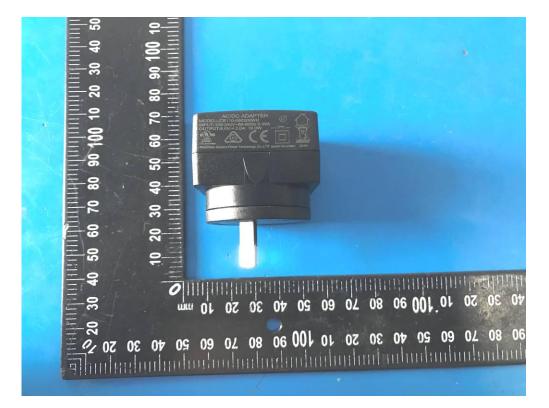




8.2. Photos of Conducted Emission test

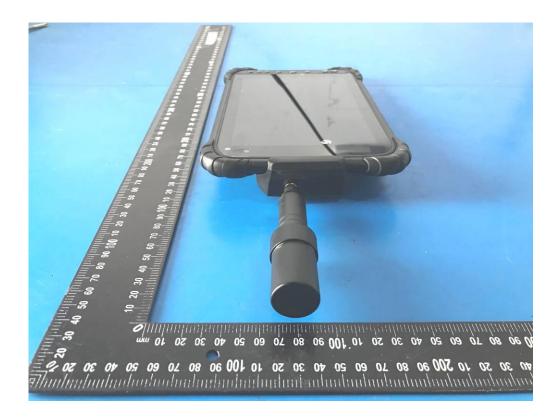
9. Photos of EUT

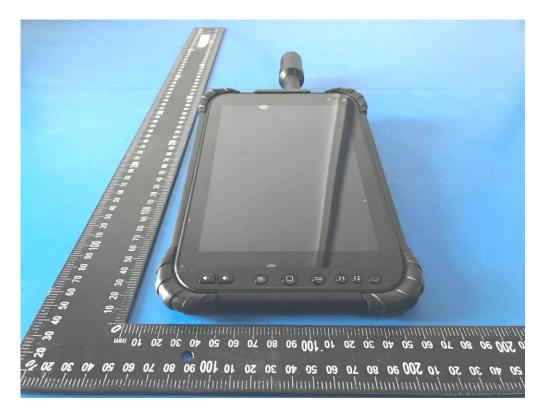


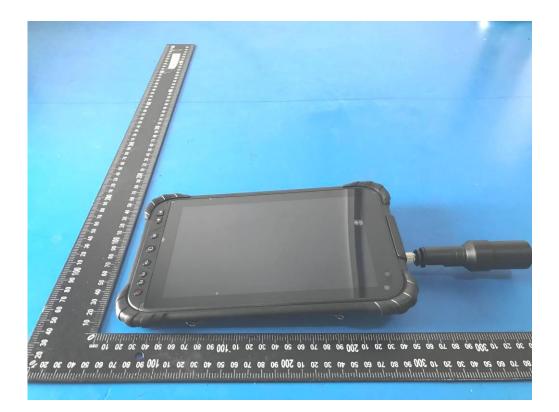


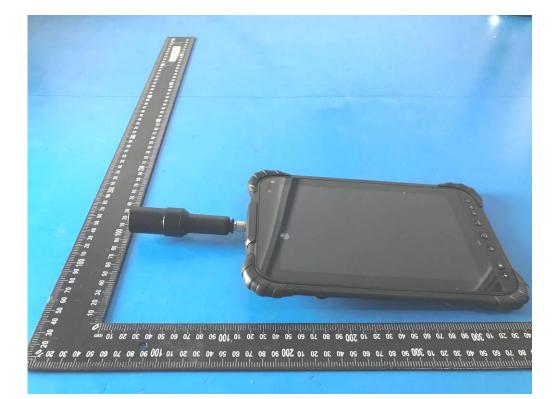


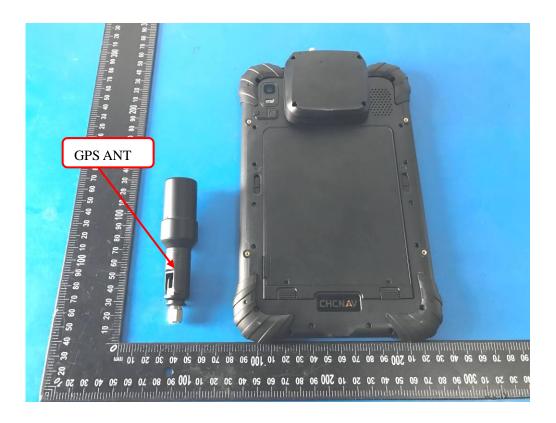










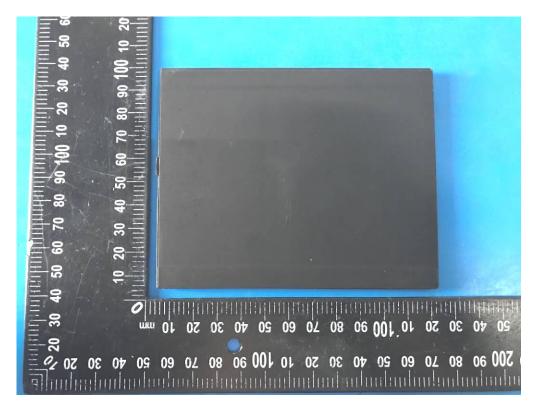






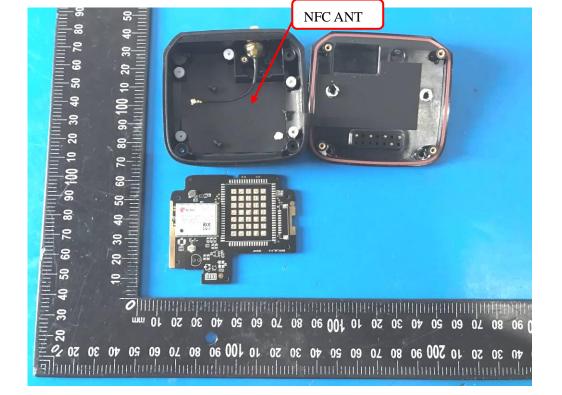




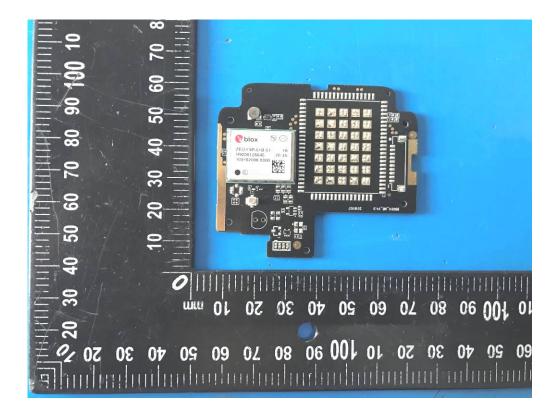


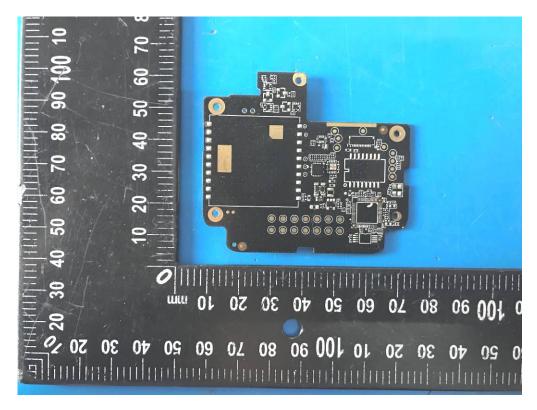


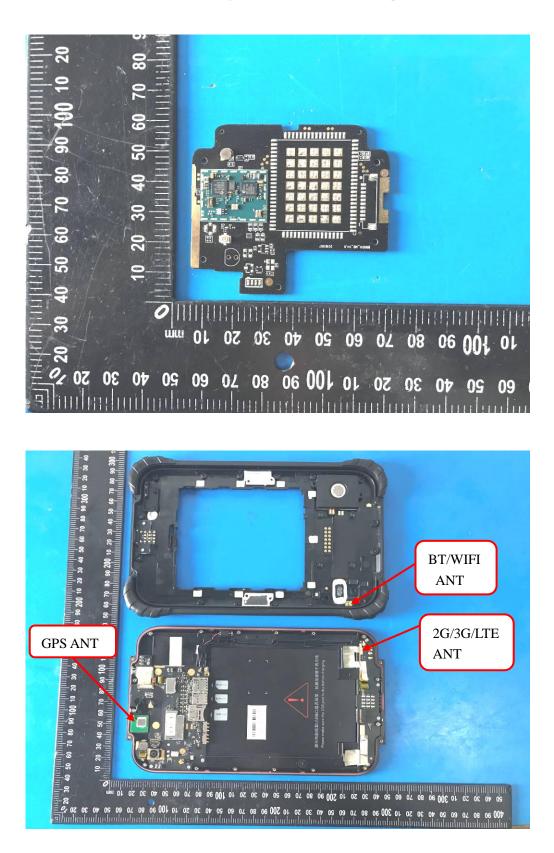


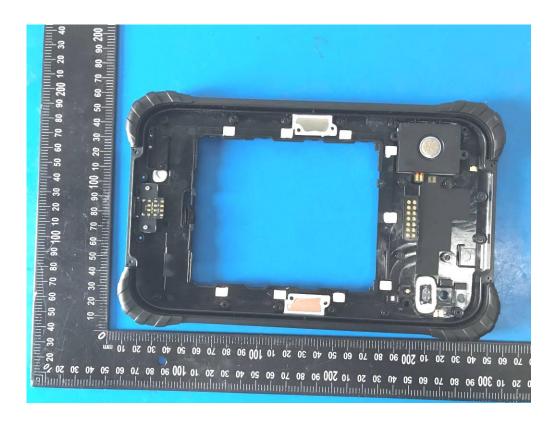


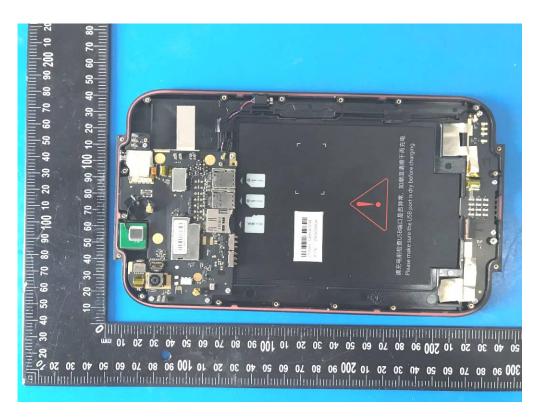


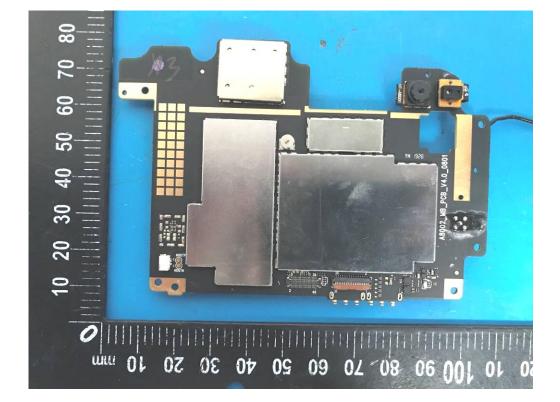


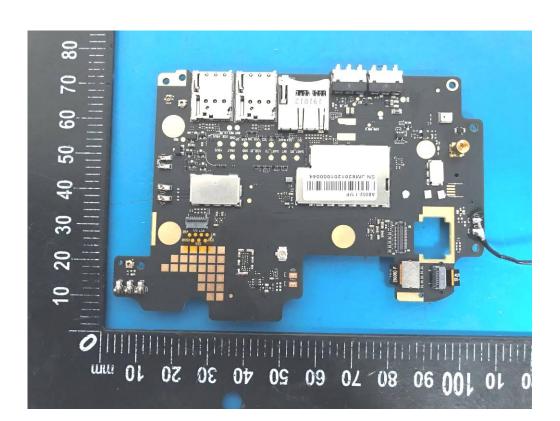


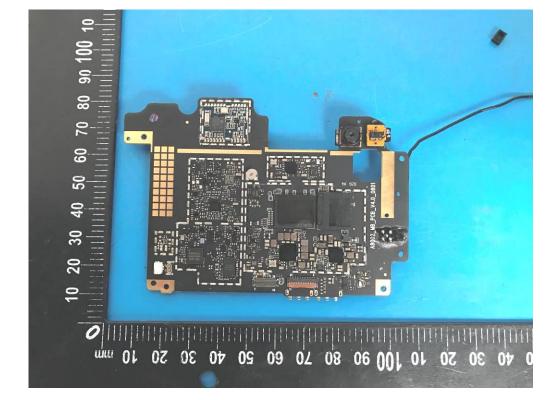


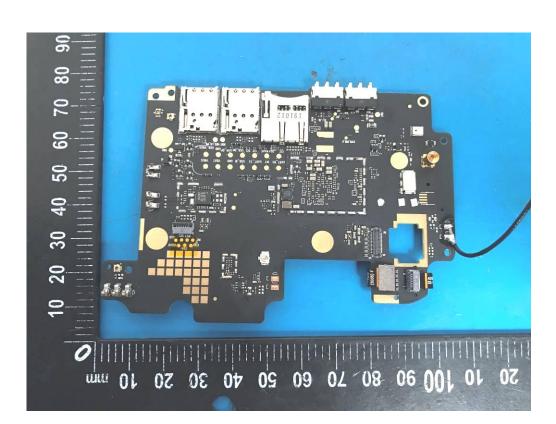


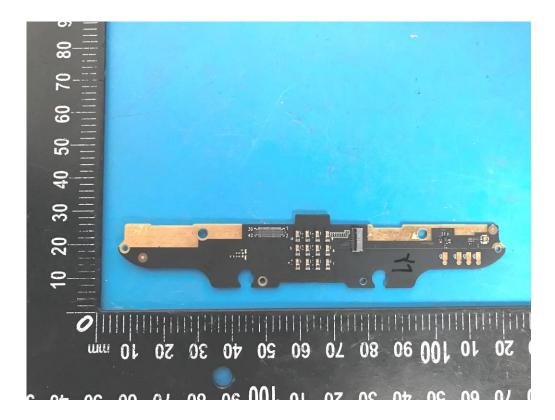














----- END OF REPORT------