



Report No:
File reference No:

TW2011042-04E
January 16, 2021

Applicant: Quectel Wireless Solutions Co., Ltd

Product: LTE Module

Model No: EC25-AF, EC25-AF-MINIPCIE

Brand Name: Quectel

Test Standards: FCC Part 2 and Part 24E

Test result: It is herewith confirmed and found to comply with the requirements set up by ANSI C63.10, FCC Part 2 and Part 24E for the evaluation of electromagnetic compatibility

Approved By

Jack Chung

Jack Chung

Manager

Dated: January 16, 2021

Results appearing herein relate only to the sample tested
The technical reports is issued errors and omissions exempt and is subject to withdrawal at

SHENZHEN TIMEWAY TESTING LABORATORIES

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Special Statement:

The testing quality ability of our laboratory meet with “Quality Law of People’s Republic of China” Clause 19.

The testing quality system of our laboratory meet with ISO/IEC-17025 requirements, which is approved by CNAL. This approval result is accepted by MRA of APLAC.

Our test facility is recognized, certified, or accredited by the following organizations:

CNAL-LAB Code: L2292

The EMC Laboratory has been assessed and in compliance with CNAL/AC01:2002 accreditation criteria for testing Laboratories (identical to ISO/IEC 17025:2005 General Requirements) for the Competence of testing Laboratories.

FCC-Registration No.: 744189

The 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 No.: 744189.

Industry Canada (IC) —Registration No.:5205A

The EMC Laboratory has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 5205A.

A2LA (Certification Number:5013.01)

The EMC Laboratory has been accredited by the American Association for Laboratory Accreditation (A2LA). Certification Number:5013.01

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Test Report Conclusion

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1.0 General Details

1.1 Test Lab Details

Name : SHENZHEN TIMEWAY TESTING LABORATORIES.
Address: Room 512-519,5/F., East Tower,Building 4, Anhua Industrial Zone, Futian District,Shenzhen, Guangdong China
Telephone: (755) 83448688
Fax: (755) 83442996

1.2 Applicant Details

Applicant: Quectel Wireless Solutions Co., Ltd
Address: 7th Floor, Hongye Building, No.1801 Hongmei Road, Cuhui District, Shanghai 200233, China
Telephone: --
Fax: --

1.3 Description of EUT

Product: LTE Module
Manufacturer: Quectel Wireless Solutions Co., Ltd
Address: 7th Floor, Hongye Building, No.1801 Hongmei Road, Cuhui District, Shanghai 200233, China
Brand Name: Quectel
Model Number: EC25-AF, EC25-AF-MINIPCIE
IMEI: EC25=AF: 866834040000767
EC25-AF MINIPCIE: 8668340400002375
Hardware Version: R1.0
Software Version: EC25AFFAR07A02M4G
Rating: EUT installed in a Body Worn Camera that powered by a DC3.8V 3200mAh Li-ion battery.
Antenna: FPC Antenna with maximum gain 3.2dBi
Test modes: LTE Band 2
Moddulation: LTE: QPSK, 16QAM
LTE Category: 4
Maximum LTE Band 2: 24.93dBm
E.I.R.P/E.R.P
Frequency range Mode Tx (MHz) Rx (MHz)
LTE Band 4: 1850-1910 1930-1990

Note:1. the information of the EUT is declared by the manufacturer

2. EUT used in a a Body Worn Camera, whose model name is BioAX and that is manufactured by Audax Global Solutions Ltd.

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1.4 Submitted Sample: 2 Samples

1.5 Test Duration: 2020-11-03 ~ 2021-01-15

1.6 Test Uncertainty

Spurious Radiated Emissions below 1GHz Uncertainty =4.7dB

Spurious Radiated Emissions above 1GHz Uncertainty =6.0dB

Note: The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.

1.7 Test Engineer

Terry Tang

The sample tested by

Print Name: Terry Tang

2.0 Test Equipment

Instrument Type	Manufacturer	Model	Serial No.	Date of Cal.	Due Date
ESPI Test Receiver	R&S	ESPI 3	100379	2020-06-23	2021-06-22
LISN	R&S	EZH3-Z5	100294	2020-06-23	2021-06-22
LISN	R&S	EZH3-Z5	100253	2020-06-23	2021-06-22
Impuls-Begrenzer	R&S	ESH3-Z2	100281	2020-06-23	2021-06-22
Loop Antenna	EMCO	6507	00078608	2018-06-25	2021-06-24
Spectrum	R&S	FSIQ26	100292	2020-06-23	2021-06-22
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2020-06-23	2021-06-22
Horn Antenna	R&S	BBHA 9120D	9120D-631	2018-07-09	2021-07-08
Power meter	Anritsu	ML2487A	6K00003613	2020-06-23	2021-06-22
Power sensor	Anritsu	MA2491A	32263	2020-06-23	2021-06-22
Bilog Antenna	Schwarebeck	VULB9163	9163/340	2018-07-04	2021-07-03
9*6*6 Anechoic	--	--	N/A	2020-07-06	2021-07-05
EMI Test Receiver	RS	ESVB	826156/011	2020-06-23	2021-06-22
EMI Test Receiver	RS	ESH3	860904/006	2020-06-23	2021-06-22
Spectrum	HP/Agilent	ESA-L1500A	US37451154	2020-06-23	2021-06-22
Spectrum	HP/Agilent	E4407B	MY50441392	2020-06-23	2021-06-22
Spectrum	RS	FSP	1164.4391.38	2020-01-16	2021-01-15
RF Cable	Zhengdi	ZT26-NJ-NJ-8 M/FA	--	2020-06-23	2021-06-22
RF Cable	Zhengdi	7m	--	2020-06-23	2021-06-22

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RF Switch	EM	EMSW18	060391	2020-06-23	2021-06-22
Pre-Amplifier	Schwarebeck	BBV9743	#218	2020-06-23	2021-06-22
Pre-Amplifier	HP/Agilent	8449B	3008A00160	2020-06-23	2021-06-22
LISN	SCHAFFNER	NNB42	00012	2021-01-06	2022-01-05
Wideband Radio Communication Test Set	ROHDE&SCHW ARZ	CMW500	147376	2020-06-23	2021-06-22
Horn Antenna	A-INFO	LB-180400-KF	J211060660	2018-07-09	2021-07-08

2.1 Test Summary

Test Item	Section in CFR 47	Result
RF Exposure (SAR)	Part 1.1307 Part 2.1093	Pass* (Please refer to SAR Report)
Effective Isotropic Radiated Power	Part 24.232(c)	Pass
Field Strength of Spurious Radiation	Part 2.1053 Part 24.238(a)	Pass

Note: This is a C2PC test report based on original FCC ID: XMR201808EC25AF. In the new applicaiton, a FPC antenna is used, while a dipole antenna was used in the original application. And also, the WCDMA Band II and IV and LTE Band 14 is not enable by the software.

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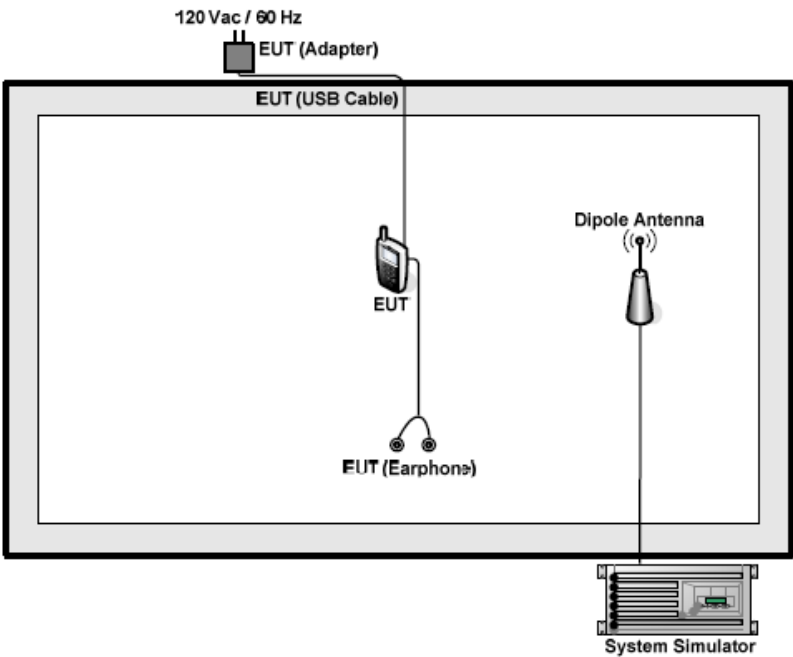
3 System test configuration

3.1 Test mode

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range, and EUT is rotated on three test planes to find out the worst emission.

Test modes		
Band	Radiated	Conducted
LTE Band 2	QPSK and 16QAM link	QPSK and 16QAM link

3.2 Configuration of Tested System



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4.0 Effective Isotropic Radiated Power

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Methods of Measurement

The testing follows FCC KDB 971168 v03r01 Section 5.8 and ANSI/TIA-603-E (2016).

- Connect the equipment as illustrated. Mount the equipment with the manufacturer specified antenna in a vertical orientation on a manufacturer specified mounting surface located on a non-conducting rotating platform of a RF anechoic chamber (preferred) or a standard radiation site.
- Key the transmitter, then rotate the EUT 360° azimuthally and record spectrum analyzer power level (LVL) measurements at angular increments that are sufficiently small to permit resolution of all peaks. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading at each angular increment. (Note: several batteries may be needed to offset the effect of battery voltage droop, which should not exceed 5% of the manufactured specified battery voltage during transmission).
- Replace the transmitter under test with a vertically polarized half-wave dipole (or an antenna whose gain is known relative to an ideal half-wave dipole). The center of the antenna should be at the same location as the center of the antenna under test.
- Connect the antenna to a signal generator with a known output power and record the path loss (in dB) as LOSS. If a standard radiation test site is used, raise and lower the test antenna to obtain a maximum reading. $LOSS = \text{Generator Output Power (dBm)} - \text{Analyzer reading (dBm)}$
- Determine the effective radiated output power at each angular position from the readings in steps b) and d) using the following equation: $ERP \text{ (dBm)} = LVL \text{ (dBm)} + LOSS \text{ (dB)}$
- The maximum ERP is the maximum value determined in the preceding step.
- When calculating ERP, in addition to knowing the antenna radiation and matching characteristics, it is necessary to know the loss values of all elements (e.g.transmission line attenuation, mismatches, filters, combiners) interposed between the point where transmitter output power is measured, and the point where power is applied to the antenna. ERP can then be calculated as follows:
 $EIRP \text{ (dBm)} = \text{Output Power (dBm)} - \text{Losses (dB)} + \text{Antenna Gain (dBd)}$
where: dBd refers to gain relative to an ideal dipole.
 $EIRP \text{ (dBm)} = ERP \text{ (dBm)} + 2.15 \text{ (dB.)}$

Using the maximum output power configuration.

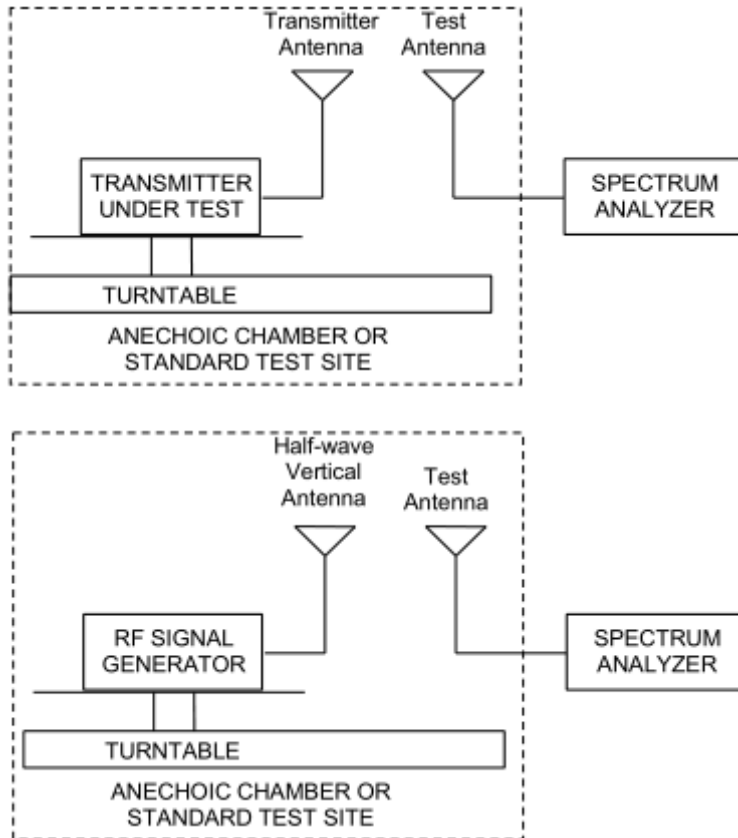
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Test setup



The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in stand-up position (Z axis) and the worst case was recorded.

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Limits

Rule Part 24.232(c) Mobile and portable stations are limited to 2 watts EIRP.

Rule Part 24.232(e) Peak transmit power must be measured over any interval of continuous transmission using instrumentation calibrated in terms of an rms-equivalent voltage.

Limit	$\leq 2 \text{ W (33 dBm)}$
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = 2$, $U = 1.19 \text{ dB}$

Test Results:

The measurement is performed for both of horizontal and vertical antenna Polarization, and only the data of worst mode is recorded in this report.

LTE Band 2						
bandwidth	Channel	Frequency (MHz)	Polarization	EIRP (dBm)	Limit (dBm)	Conclusion
1.4 MHz (QPSK)	Low	1850.7	Horizontal	24.67	33	Pass
	Mid	1880	Horizontal	24.50	33	Pass
	High	1909.3	Horizontal	24.93	33	Pass
3 MHz (QPSK)	Low	1851.5	Horizontal	23.55	33	Pass
	Mid	1880	Horizontal	23.51	33	Pass
	High	1908.5	Horizontal	23.59	33	Pass
5 MHz (QPSK)	Low	1852.5	Horizontal	23.32	33	Pass
	Mid	1880	Horizontal	23.46	33	Pass
	High	1907.5	Horizontal	23.52	33	Pass
10 MHz (QPSK)	Low	1855	Horizontal	24.61	33	Pass
	Mid	1880	Horizontal	24.66	33	Pass
	High	1905	Horizontal	24.79	33	Pass
15 MHz (QPSK)	Low	1857.5	Horizontal	24.43	33	Pass
	Mid	1880	Horizontal	24.36	33	Pass

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	High	1902.5	Horizontal	24.80	33	Pass
20 MHz (QPSK)	Low	1860	Horizontal	23.97	33	Pass
	Mid	1880	Horizontal	23.51	33	Pass
	High	1900	Horizontal	23.32	33	Pass
1.4 MHz (16QAM)	Low	1850.7	Horizontal	24.19	33	Pass
	Mid	1880	Horizontal	23.85	33	Pass
	High	1909.3	Horizontal	24.47	33	Pass
3 MHz (16QAM)	Low	1851.5	Horizontal	23.32	33	Pass
	Mid	1880	Horizontal	23.15	33	Pass
	High	1908.5	Horizontal	23.50	33	Pass
5 MHz (16QAM)	Low	1852.5	Horizontal	22.71	33	Pass
	Mid	1880	Horizontal	23.08	33	Pass
	High	1907.5	Horizontal	23.12	33	Pass
10 MHz (16QAM)	Low	1855	Horizontal	24.35	33	Pass
	Mid	1880	Horizontal	24.25	33	Pass
	High	1905	Horizontal	24.52	33	Pass
15 MHz (16QAM)	Low	1857.5	Horizontal	24.06	33	Pass
	Mid	1880	Horizontal	24.23	33	Pass
	High	1902.5	Horizontal	24.58	33	Pass
20 MHz (16QAM)	Low	1860	Horizontal	23.67	33	Pass
	Mid	1880	Horizontal	23.22	33	Pass
	High	1900	Horizontal	23.16	33	Pass

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5.0 Radiates Spurious Emission

Ambient condition

Temperature	Relative humidity	Pressure
23°C ~25°C	45%~50%	101.5kPa

Method of Measurement

1. The testing follows FCC KDB 971168 v03r01 Section 5.8 and ANSI/TIA-603-E (2016).
 2. The EUT is placed on a turntable 0.8 meters above the ground in the chamber, 3 meter away from the antenna. The maximal emission value is acquired by adjusting the antenna height, polarization and turntable azimuth. Normally, the height range of antenna is 1 m to 4 m, the azimuth range of turntable is 0° to 360°, and the receive antenna has two polarizations Vertical (V) and Horizontal (H).
 3. A log-periodic antenna or double-ridged waveguide horn antenna shall be substituted in place of the EUT. The log-periodic antenna will be driven by a signal generator and the level will be adjusted till the same power value on the spectrum analyzer or receiver. The level of the spurious emissions can be calculated through the level of the signal generator, cable loss, the gain of the substitution antenna and the reading of the spectrum analyzer or receiver.
 4. The EUT is then put into continuously transmitting mode at its maximum power level during the test. Set Test Receiver or Spectrum RBW=1MHz, VBW=3MHz, And the maximum value of the receiver should be recorded as (Pr).
 5. The EUT shall be replaced by a substitution antenna. In the chamber, an substitution antenna for the frequency band of interest is placed at the reference point of the chamber. An RF Signal source for the frequency band of interest is connected to the substitution antenna with a cable that has been constructed to not interfere with the radiation pattern of the antenna. A power (PMea) is applied to the input of the substitution antenna, and adjust the level of the signal generator output until the value of the receiver reach the previously recorded (Pr). The power of signal source (PMea) is recorded. The test should be performed by rotating the test item and adjusting the receiving antenna polarization.
 6. A amplifier should be connected to the Signal Source output port. And the cable should be connect between the Amplifier and the Substitution Antenna. The cable loss (Pcl) ,the Substitution Antenna Gain (Ga) and the Amplifier Gain (PAg) should be recorded after test.
 7. The measurement results are obtained as described below:
$$\text{Power(EIRP)} = \text{PMea} - \text{PAg} - \text{Pcl} + \text{Ga}$$

The measurement results are amend as described below:
$$\text{Power(EIRP)} = \text{PMea} - \text{Pcl} + \text{Ga}$$
 8. This value is EIRP since the measurement is calibrated using an antenna of known gain (2.15 dBi) and known input power. ERP can be calculated from EIRP by subtracting the gain of the dipole, $\text{ERP} = \text{EIRP} - 2.15\text{dBi}$.
- The modulation mode and RB allocation refer to section 5.1, using the maximum output power

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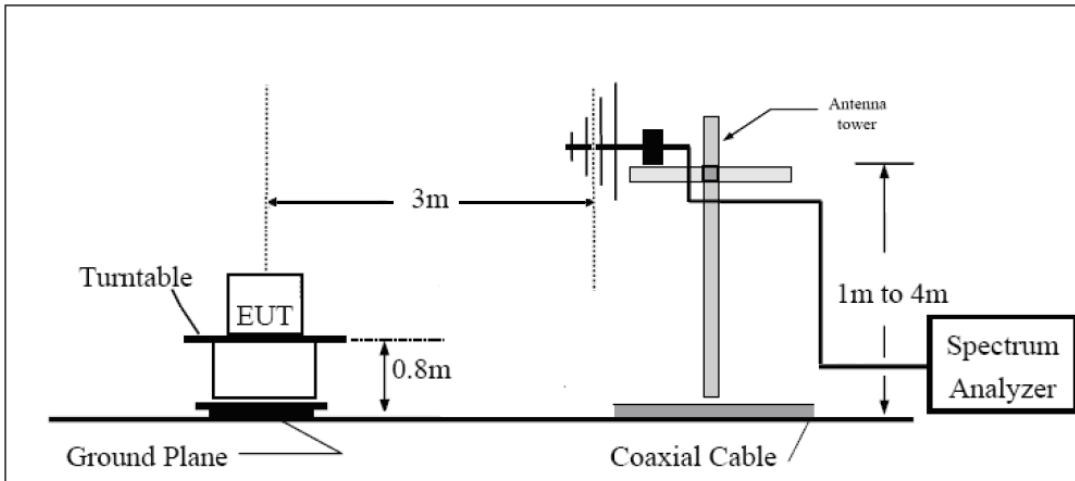
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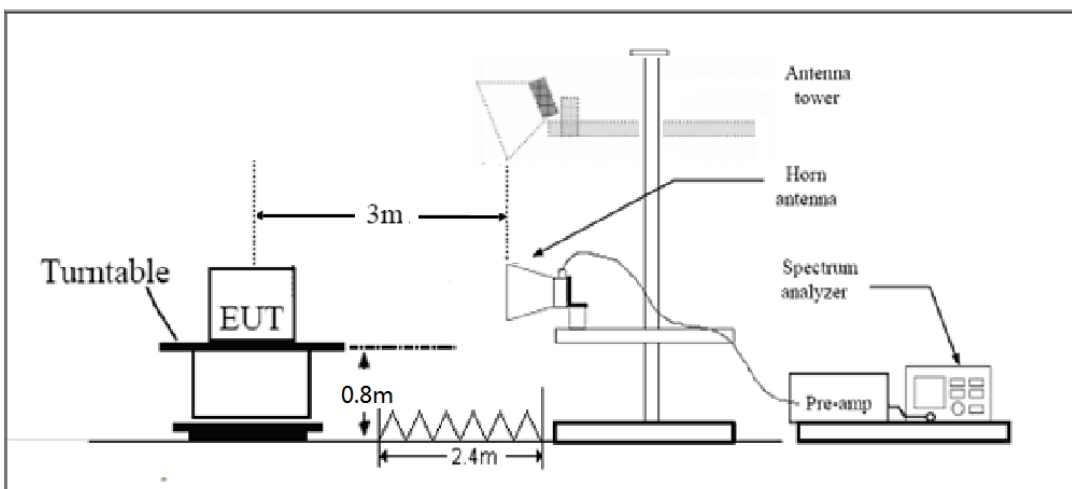
configuration.

Test setup

30MHz~~~ 1GHz



Above 1GHz



The radiated emission was measured in the following position: EUT stand-up position (Z axis), lie-down position (X, Y axis). The worst emission was found in lie-down position (X axis) and the worst case was recorded.

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Limits

Rule Part 24.238(a) specifies that “on any frequency outside a licensee's frequency block, the power of any emission shall be attenuated below the transmitter power (P) by at least $43 + 10 \log_{10} (P)$ dB.”

Limit	-13 dBm
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Measurement Uncertainty

The assessed measurement uncertainty to ensure 95% confidence level for the normal distribution is with the coverage factor $k = \pm 1.96$, $U = \pm 3.55$ dB.

Test Result

Sweep the whole frequency band through the range from 30MHz to the 10th harmonic of the carrier, the emissions below the noise floor will not be recorded in the report.

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LTE Band 2 1.4MHz CH-Low

Harmonic	Frequency (MHz)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)
2	3700.1	Horizontal	-43.68	-13.00
3	5550.7	Horizontal	-45.87	-13.00
4	7167.0	Horizontal	-45.65	-13.00
5	9253.5	Horizontal	-45.71	-13.00
6	11104.2	Horizontal	-42.29	-13.00
7	12954.9	Horizontal	-43.07	-13.00
8	14805.6	Horizontal	-41.64	-13.00
9	16656.3	Horizontal	-40.65	-13.00
10	18507.0	Horizontal	-57.91	-13.00

LTE Band 2 1.4MHz CH-Middle

Harmonic	Frequency (MHz)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)
2	3759.0	Horizontal	-42.13	-13.00
3	5638.9	Horizontal	-46.57	-13.00
4	7520.0	Horizontal	-48.15	-13.00
5	9400.0	Horizontal	-48.66	-13.00
6	11280.0	Horizontal	-42.46	-13.00
7	13160.0	Horizontal	-41.74	-13.00
8	15040.0	Horizontal	-41.09	-13.00
9	16920.0	Horizontal	-40.53	-13.00
10	18800.0	Horizontal	-58.82	-13.00

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LTE Band 2 1.4MHz CH-High

Harmonic	Frequency (MHz)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)
2	3817.5	Horizontal	-47.95	-13.00
3	5726.6	Horizontal	-42.31	-13.00
4	7637.2	Horizontal	-46.73	-13.00
5	9546.5	Horizontal	-45.89	-13.00
6	11455.8	Horizontal	-44.05	-13.00
7	13365.1	Horizontal	-42.65	-13.00
8	15274.4	Horizontal	-41.30	-13.00
9	17183.7	Horizontal	-40.49	-13.00
10	19093.0	Horizontal	-58.77	-13.00

LTE Band 2 5MHz CH-Low

Harmonic	Frequency (MHz)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)
2	3700.5	Horizontal	-43.67	-13.00
3	5551.5	Horizontal	-43.86	-13.00
4	7410.0	Horizontal	-47.73	-13.00
5	9262.5	Horizontal	-46.59	-13.00
6	11115.0	Horizontal	-44.21	-13.00
7	12967.5	Horizontal	-42.09	-13.00
8	14820.0	Horizontal	-41.36	-13.00
9	16672.5	Horizontal	-40.84	-13.00
10	18525.0	Horizontal	-58.17	-13.00

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LTE Band 2 5MHz CH-Middle

Harmonic	Frequency (MHz)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)
2	3755.6	Horizontal	-46.72	-13.00
3	5633.6	Horizontal	-45.19	-13.00
4	7520.0	Horizontal	-47.06	-13.00
5	9400.0	Horizontal	-45.81	-13.00
6	11280.0	Horizontal	-43.75	-13.00
7	13160.0	Horizontal	-42.91	-13.00
8	15040.0	Horizontal	-41.43	-13.00
9	16920.0	Horizontal	-40.05	-13.00
10	18800.0	Horizontal	-57.56	-13.00

LTE Band 2 5MHz CH-High

Harmonic	Frequency (MHz)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)
2	3810.8	Horizontal	-48.63	-13.00
3	5716.1	Horizontal	-41.27	-13.00
4	7621.5	Horizontal	-49.33	-13.00
5	9537.5	Horizontal	-48.12	-13.00
6	11445.0	Horizontal	-44.09	-13.00
7	13352.5	Horizontal	-42.57	-13.00
8	15260.0	Horizontal	-41.28	-13.00
9	17167.5	Horizontal	-40.39	-13.00
10	19075.0	Horizontal	-59.06	-13.00

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LTE Band 2 20MHz CH-Low

Harmonic	Frequency (MHz)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)
2	3702.0	Horizontal	-42.30	-13.00
3	5553.4	Horizontal	-42.95	-13.00
4	7440.0	Horizontal	-50.13	-13.00
5	9300.0	Horizontal	-47.17	-13.00
6	11160.0	Horizontal	-43.93	-13.00
7	13020.0	Horizontal	-41.26	-13.00
8	14880.0	Horizontal	-43.14	-13.00
9	16740.0	Horizontal	-40.98	-13.00
10	18600.0	Horizontal	-58.56	-13.00

LTE Band 2 20MHz CH-Middle

Harmonic	Frequency (MHz)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)
2	3742.1	Horizontal	-45.86	-13.00
3	5613.4	Horizontal	-45.18	-13.00
4	7484.6	Horizontal	-46.92	-13.00
5	9400.0	Horizontal	-44.53	-13.00
6	11280.0	Horizontal	-43.37	-13.00
7	13160.0	Horizontal	-42.03	-13.00
8	15040.0	Horizontal	-41.21	-13.00
9	16920.0	Horizontal	-40.13	-13.00
10	18800.0	Horizontal	-58.63	-13.00

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LTE Band 2 20MHz CH-High

Harmonic	Frequency (MHz)	Antenna Polarization	EIRP Level (dBm)	Limit (dBm)
2	3781.9	Horizontal	-45.63	-13.00
3	5673.8	Horizontal	-44.08	-13.00
4	7564.1	Horizontal	-48.37	-13.00
5	9500.0	Horizontal	-46.28	-13.00
6	11400.0	Horizontal	-43.65	-13.00
7	13300.0	Horizontal	-41.87	-13.00
8	15200.0	Horizontal	-41.35	-13.00
9	17100.0	Horizontal	-40.22	-13.00
10	19000.0	Horizontal	-59.36	-13.00

Note: 1.The other Spurious RF Radiated emissions level is no more than noise floor.
2. The worst emission was found in the antenna is Horizontal position.

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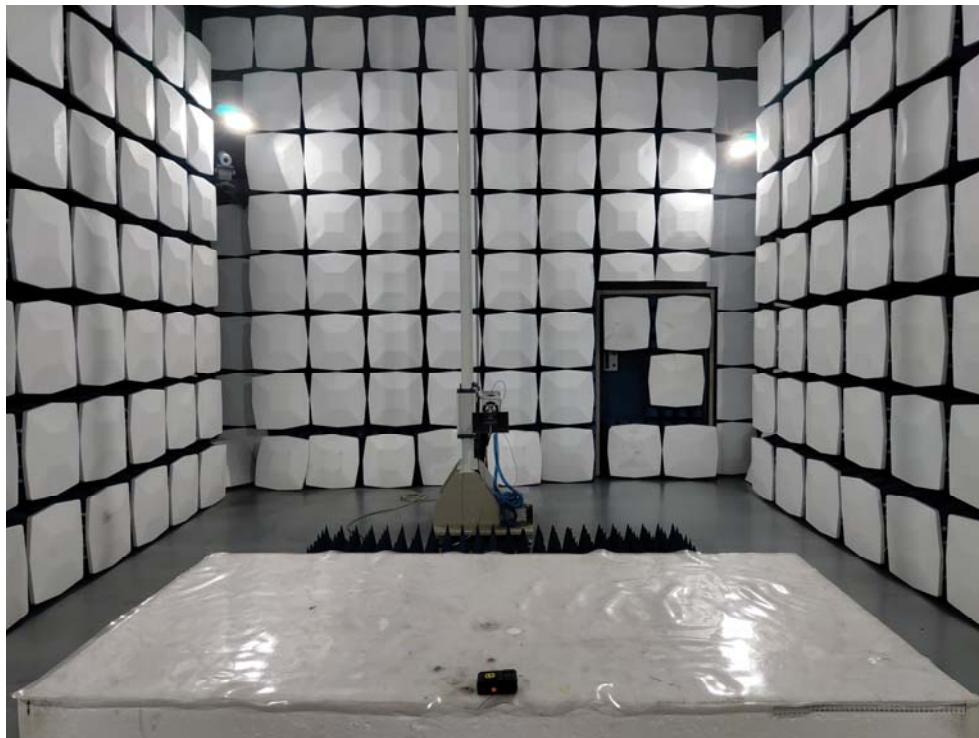
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6.0 Test Setup Photos

Spurious Radiated Emission:



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7.0 EUT Photos

Outside View



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Outside View



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Outside View



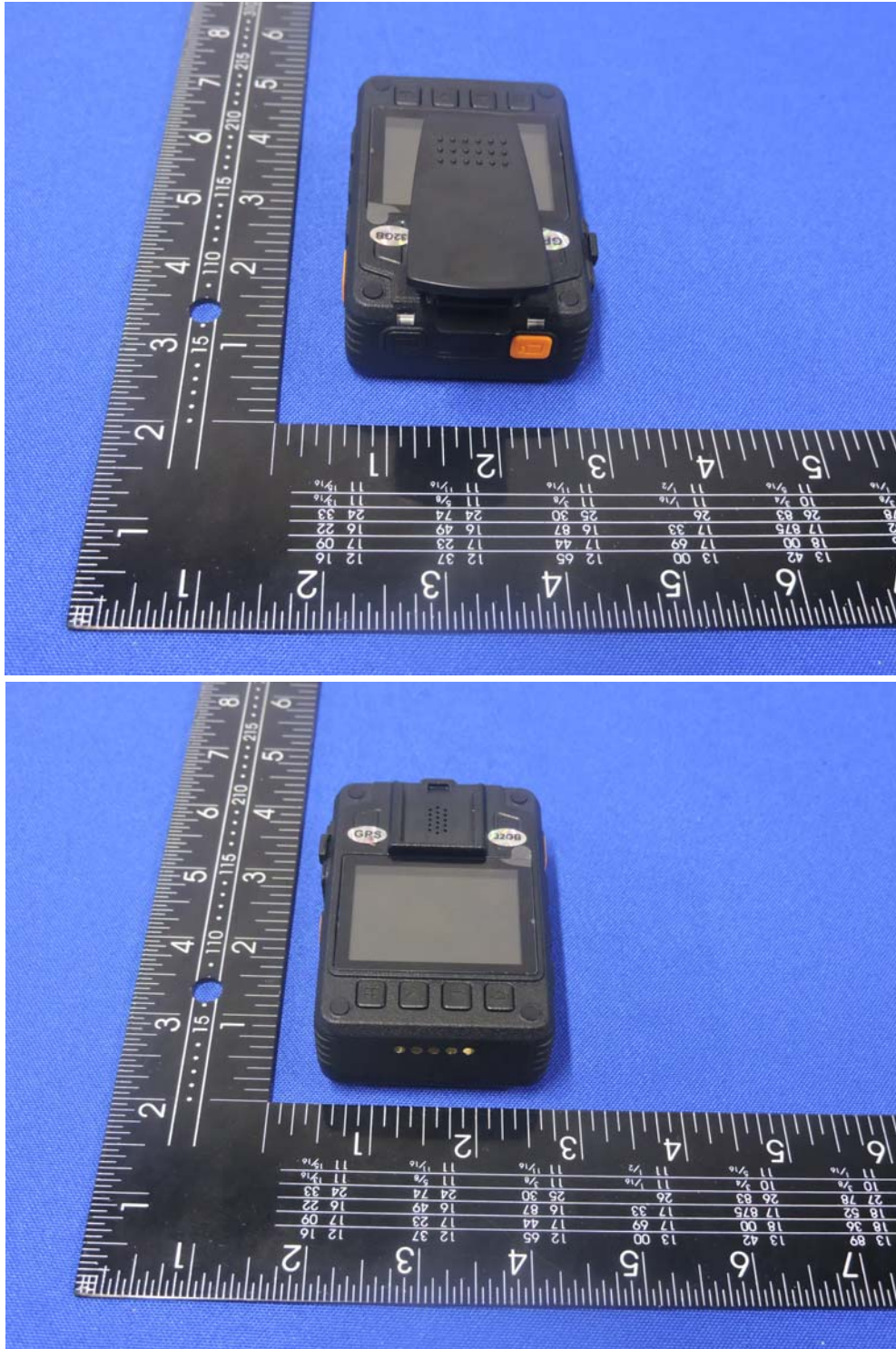
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Outside View



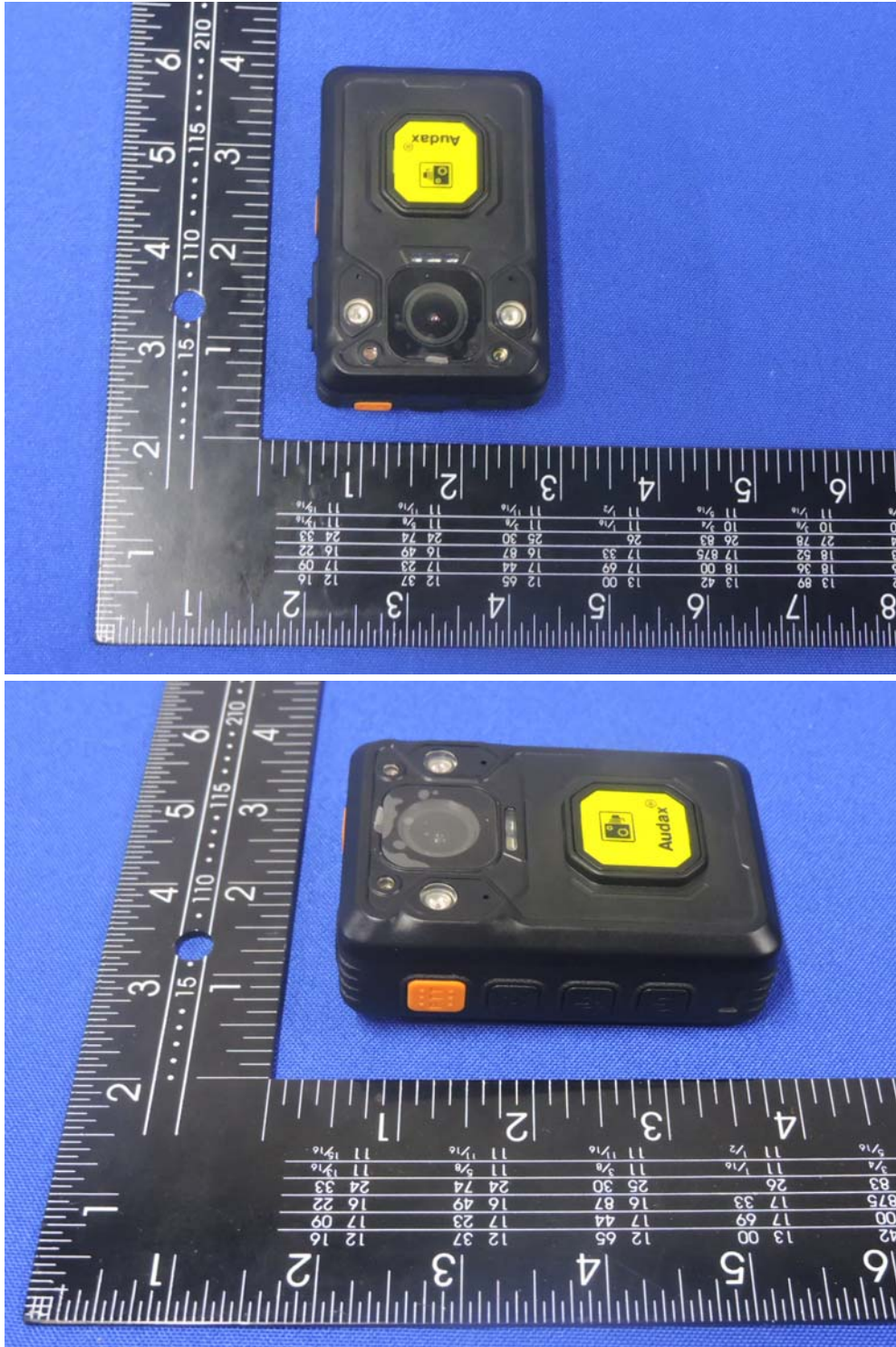
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Outside View



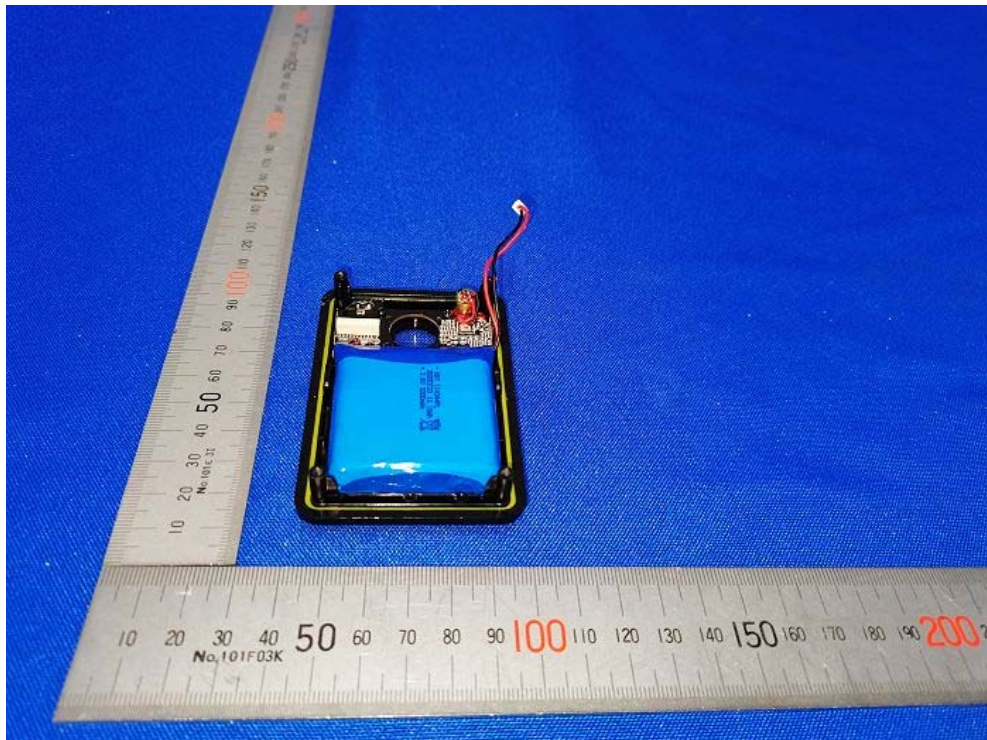
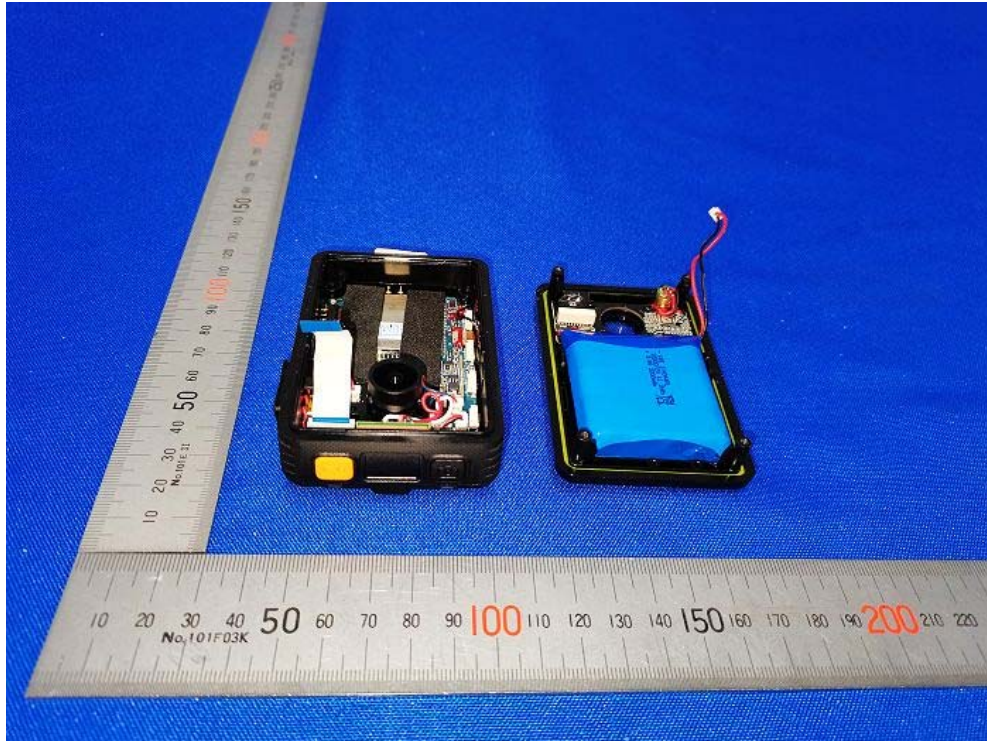
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Inside view



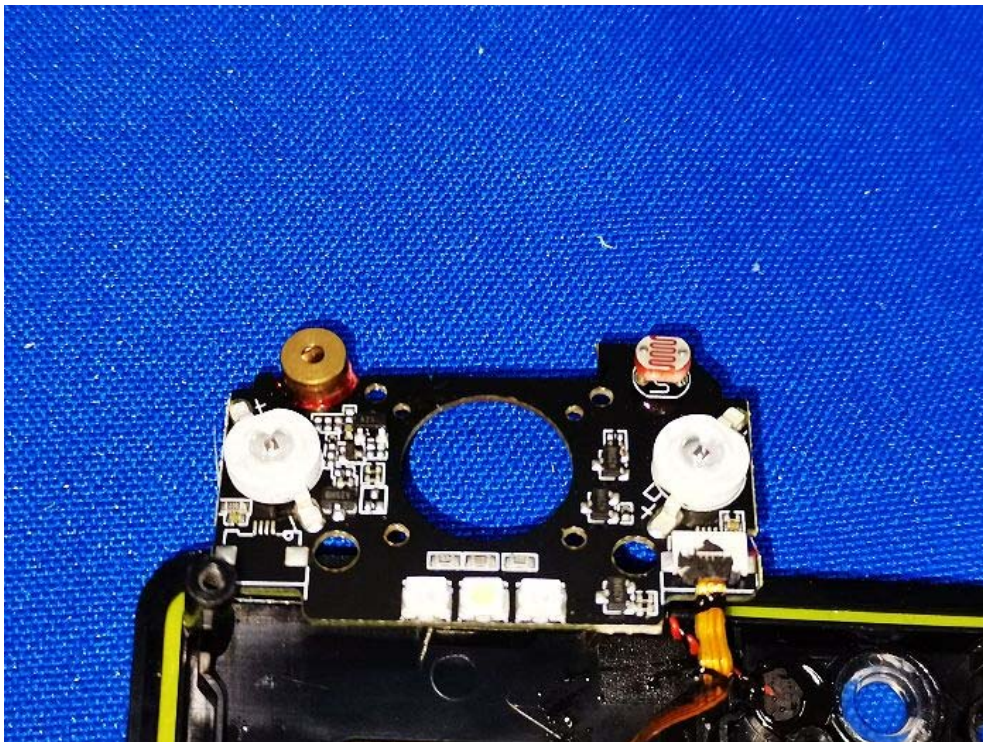
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Inside view



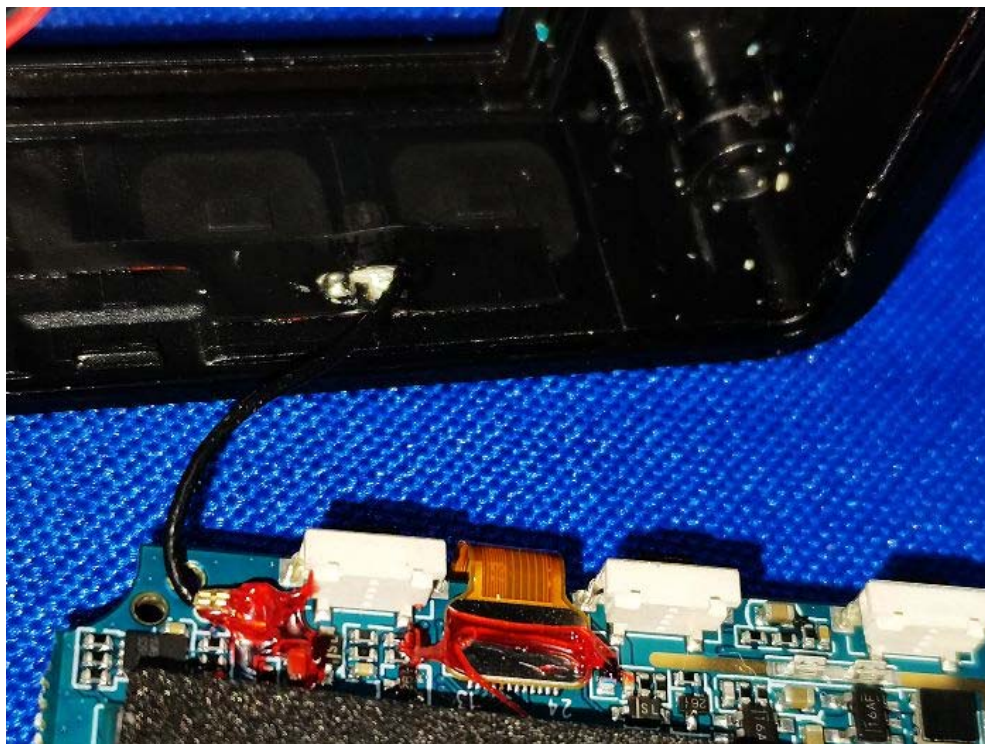
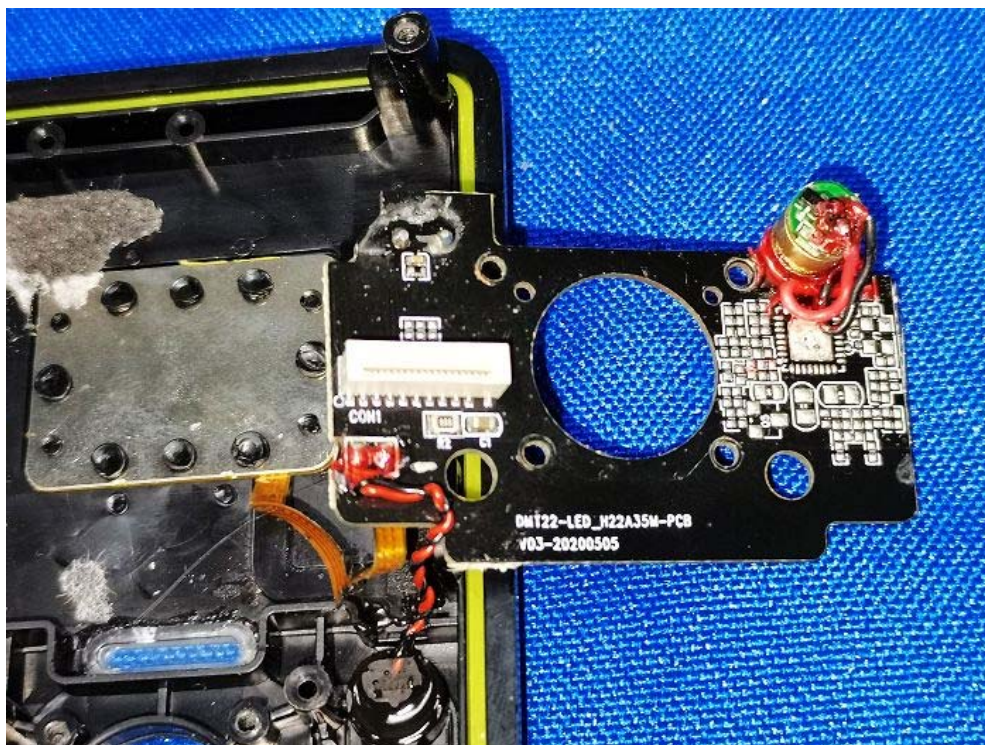
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Inside view



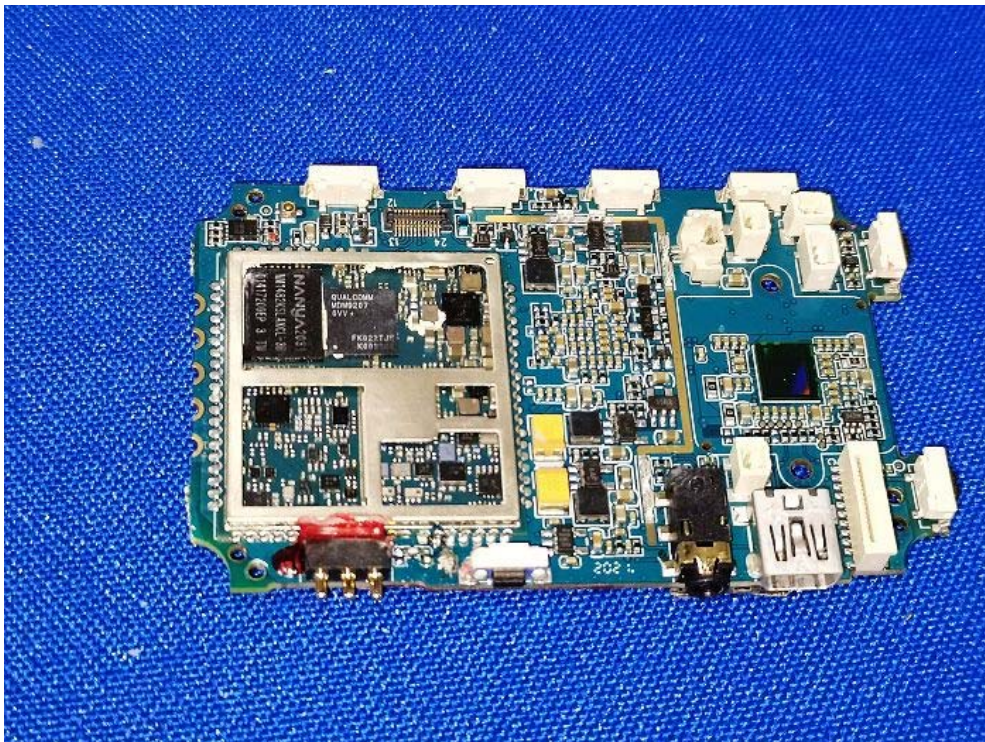
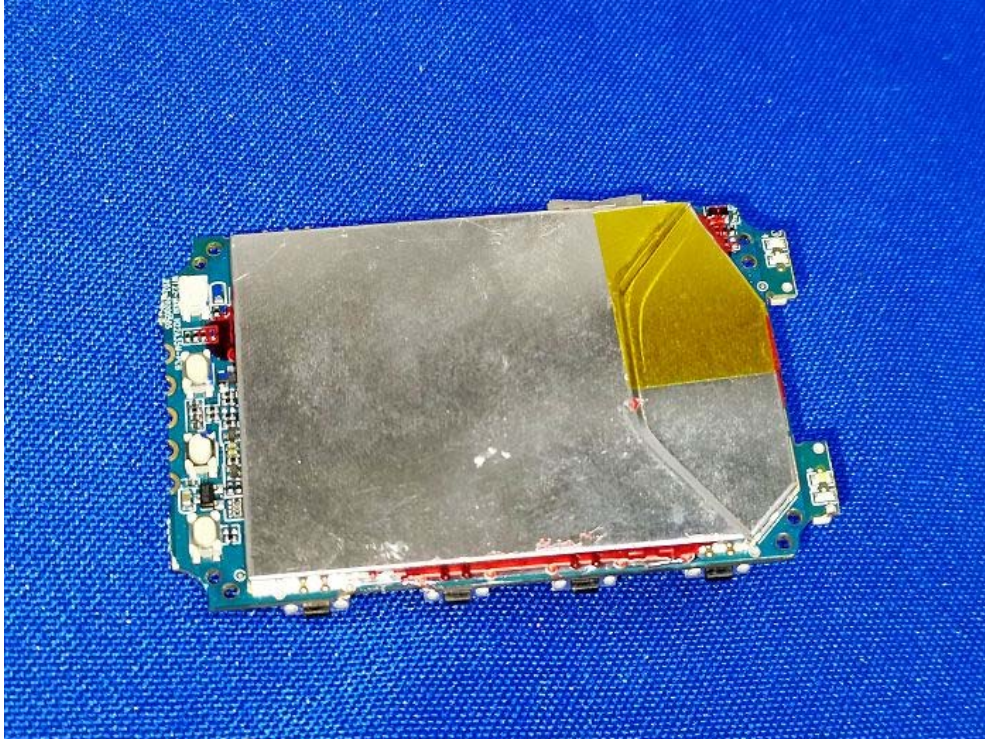
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Inside view



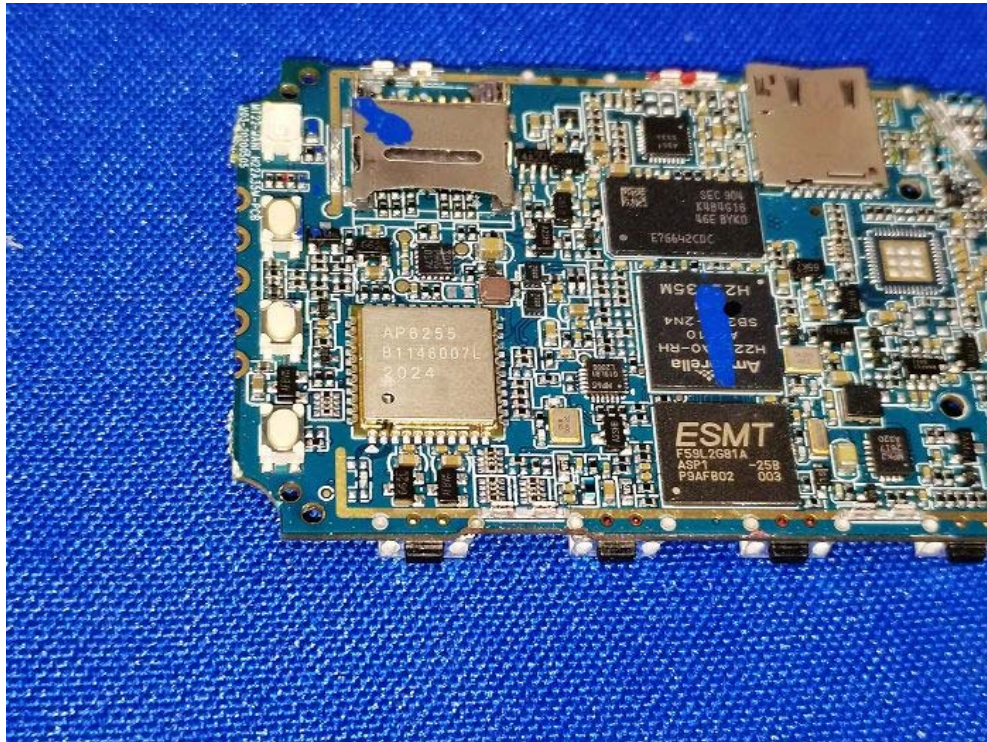
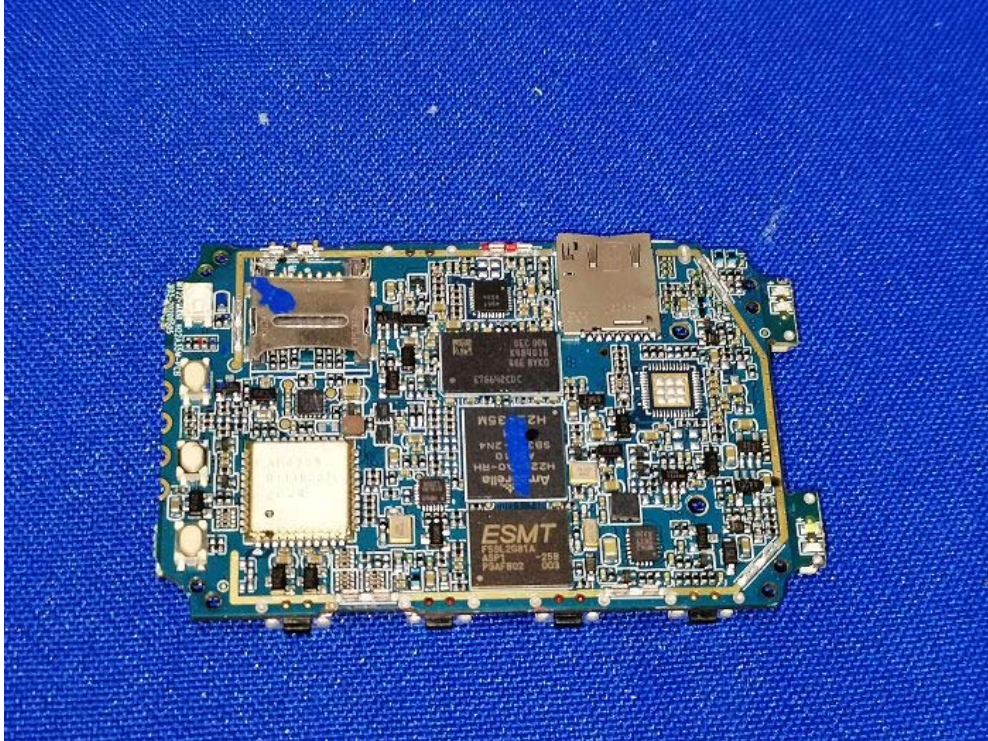
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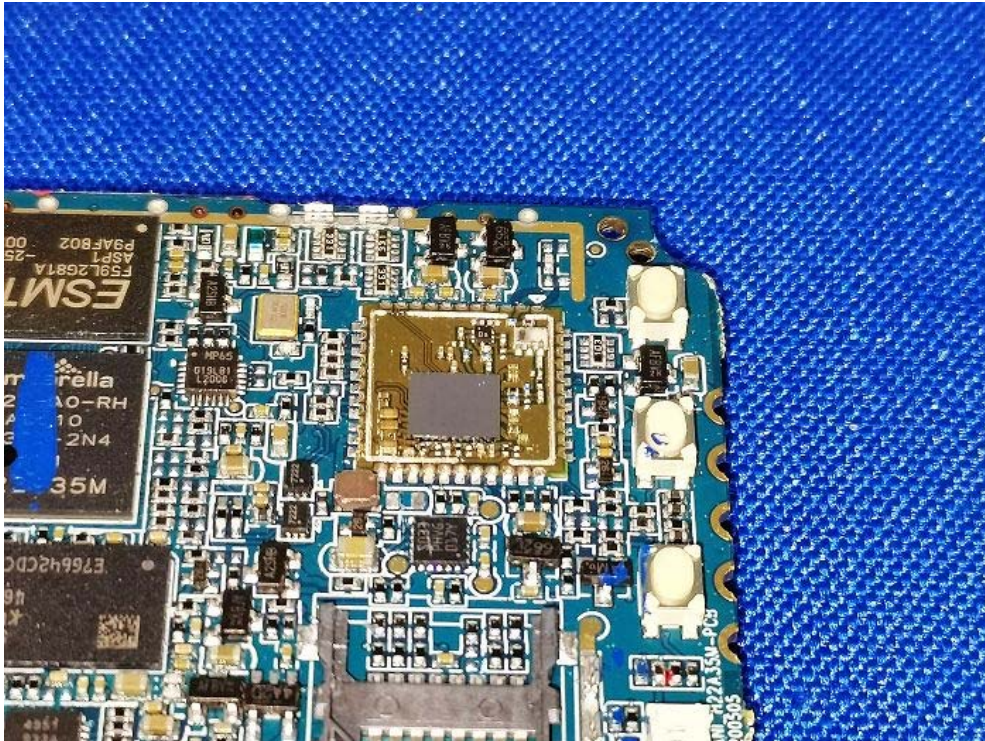
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Inside view



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