

Antenna specification for approval

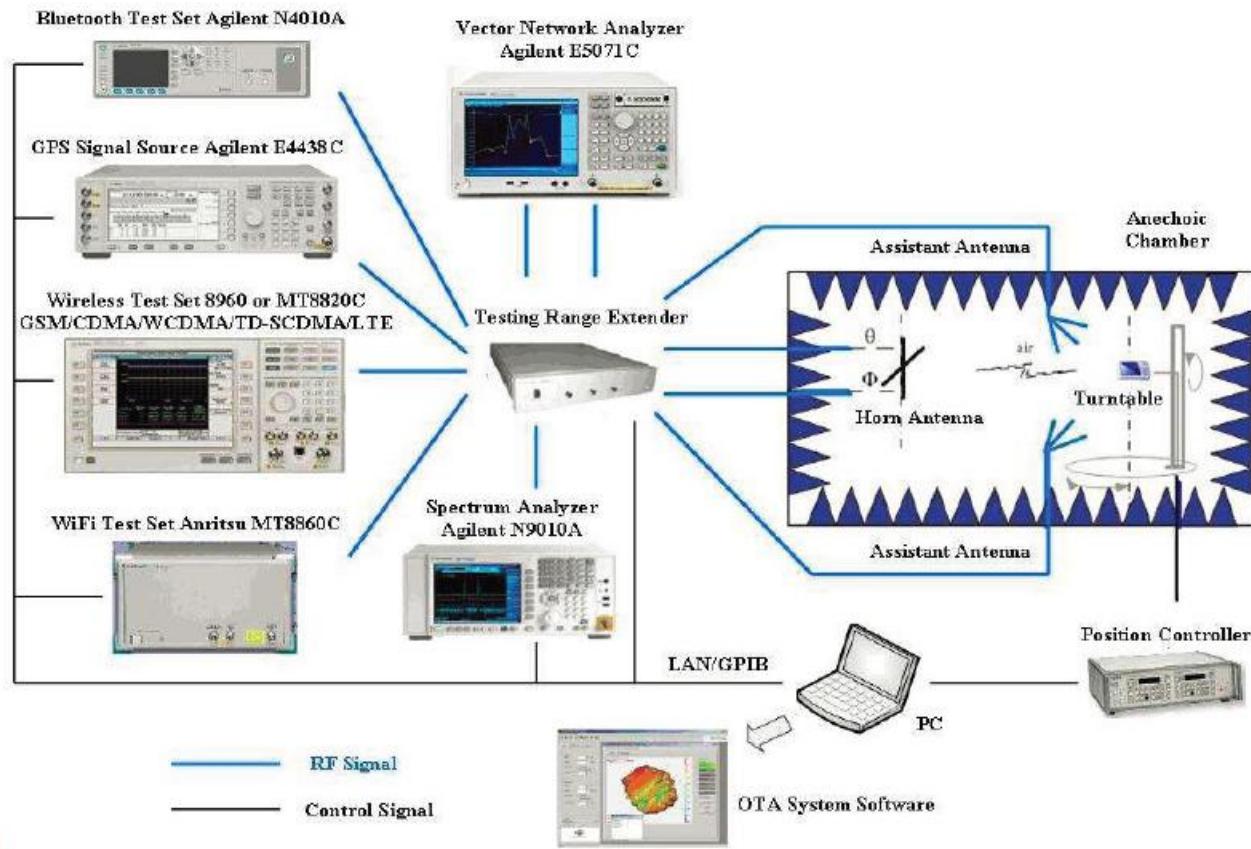
| | | | |
|------------------------------------|--|--------------------------------------|-----------|
| Customer name | Core image | | |
| Model | XX01 3 "Recorder EVA22 motherboard -6221A module | | |
| Antenna frequency | 2.4GHz&5GHz | | |
| Antenna function | WIFI&BT&5Gwifi antenna | | |
| Antenna material | FPC | FPC color | black |
| model | SF2165A-1B2-A | | |
| Material number | SF2165A-1D23B-085-A | | |
| Customer Part Number | | | |
| Ward accepted the signature | | Client acknowledges signature | |
| structure | | Purchase | |
| Document control | | structure | |
| radio frequency | | engineering | |
| To examine | | QC | |
| Responsible | LT | To examine | |
| date 2023. 04. 11 | Seal area | date 2023. 04. 11 | Seal area |

| Serial number | Certification number | Material type | Date of issue | Remarks |
|---------------|----------------------|--------------------|---------------|----------|
| 1 | A2220186128101ER1 | Tinned copper wire | 2022-05-17 | One year |
| 2 | CANEC2227657302 | halogen | 2022-12-28 | One year |
| 3 | CANEC2227657303 | Adhesive | 2022-12-28 | One year |
| 4 | SHAEC23000346911 | FEP sheath | 2023-01-13 | One year |
| 5 | SHAEC22004639301 | FEP insulation | 2022-12-15 | One year |
| 6 | SZxEC2203054804 | Tin wire | 2022-09-19 | One year |
| 7 | SZxEC2203054808 | Tin | 2022-09-19 | One year |
| 8 | ETR22300684 | Printing ink | 2022-08-09 | One year |
| 9 | EKR22501369 | Substrate | 2022-05-27 | One year |
| 10 | CANEC2227574118 | EVA foam | 2023-01-03 | One year |
| 11 | SZxEC2202709609 | Conductive cloth | 2022-08-16 | One year |
| 12 | CANEC2218227002 | Gold plating | 2022-08-30 | One year |

table of Contents

| | |
|--|---|
| 一:Device Support & Testable Antenna Type..... | 1 |
| 二:Overview..... | 2 |
| 三:Matching circuit diagram & machine picture & antenna picture | 3 |
| 四:Antenna standing wave ratio & Antenna Efficiency... | 4 |
| 五:Environmental treatment..... | 5 |
| 六:Signal strength..... | 6 |
| 七:3D pattern..... | 7 |
| 八:Structural drawing..... | 8 |

—:Device Support & Testable Antenna Type



| Antenna function | Frequency Range | test instrument | test method | standard test |
|--|--|---|--|---|
| 2G antenna (GSM) | 824MHz-960MHz, 1710MHz-1990MHz | 5071B、8960 OTA darkroom | Active test, passive test | Soward standards, customer requirements |
| 3G antenna (WCDMA/TDSCDMA/CDMA-EVDO/2000) | 824MHz-960MHz, 1710MHz-2170MHz | 5071B、8960 OTA darkroom | Active test, passive test | Soward standards, customer requirements |
| 4G antenna (LTE-FDD/LTE-TDD) | | 5071B、CMW500、 SP8011、OTA darkroom | Active test, passive test | Soward standards, customer requirements |
| WIFI antenna | 2.4GHz-2.48GHz, 5.15GHz-5.35GHz, 5.725GHz-5.825GHz | 5071B、CMW500、OTA darkroom、router、 PC | Active test, passive test, APK actual test, throughput test | Soward standards, customer requirements |
| BT antenna | 2.4GHz-2.48GHz, | 5071B、OTA darkroom 、Bluetooth Speaker | Passive test, actual test | Soward standards, customer requirements |
| Positioning antenna (GPS, GLONASS, Beidou, Galileo) | 1.575.42MHz \pm 10MHz 1602MHz \pm 0.5625MHz 1561MHz \pm 2.046MHz | 5071B、OTA darkroom 、APK | Passive test, actual test | Soward standards, customer requirements |
| NFC antenna | 13.56MHz | 5071B、Dedicated test fixture、OTA darkroom、APK | Passive test, actual test | Soward standards, customer requirements |
| Remote control antenna | 433MHz | 5071B、OTA darkroom | Passive test, actual test | Soward standards, customer requirements |

二: Overview

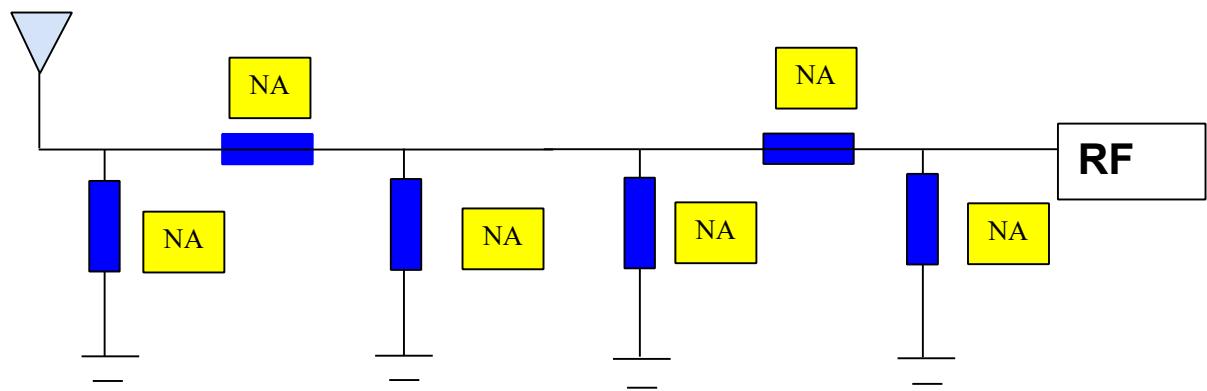
(1) Antenna performance

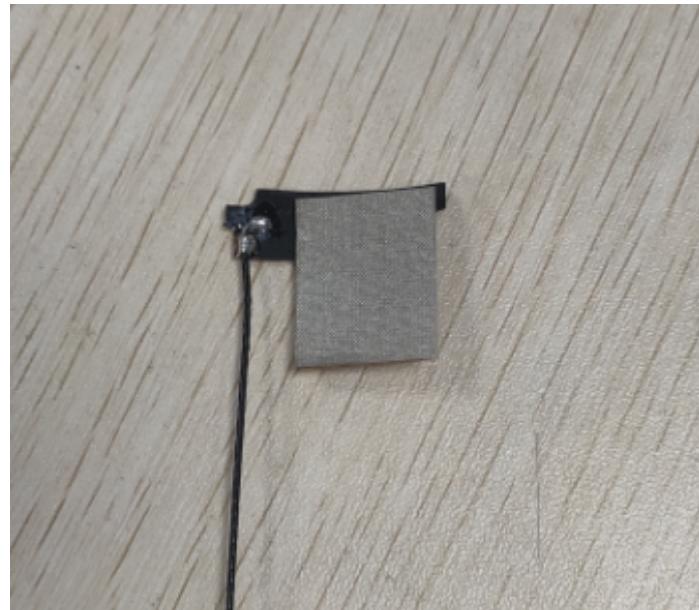
1. This approval sheet supports for MID project. FPC antennas include in this project. This report is for the performance of WIFI&BT antenna.
2. Antenna shape size: Meet the requirement of MID
3. Antenna band: 2.4GHz~5GHz
4. Antenna material: Antenna material meet the requirement of MID
5. Adhesive performance: Adhesive performance meet the requirement of MID
6. Antenna performance meet the spec below:

| Description | 2.4GHz~5GHz | Units |
|------------------------|---------------------------|-------|
| VSWR | ≤2.0 | |
| Average Antenna Gain | ≥-4.5 | dB |
| Antenna Efficiency | ≥40 | % |
| Feed Impedance | 50 ohms | |
| Operating Temperature | -40 to +85 deg C | |
| Polarization / Azimuth | Linear / Omni-directional | |

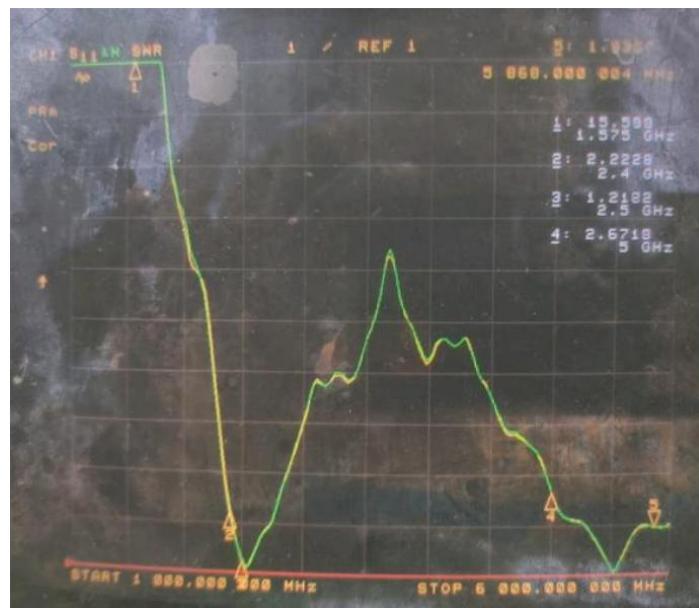
(2) Mechanical Information

| Mechanical Dimension | |
|-----------------------|--------------------|
| Cable Length | 085mm/BLACK |
| Description | WIFI&BT antenna |
| Material | FPC |
| Coaxial Cable | 500hm/0. D. 0.81mm |
| Environmental | |
| Operation Temperature | -40 to +85 deg C |
| Storage Temperature | -40 to +85 deg C |

三: Matching circuit diagram & machine picture & antenna picture**(1) Matching circuit****(2) Machine picture & antenna picture**



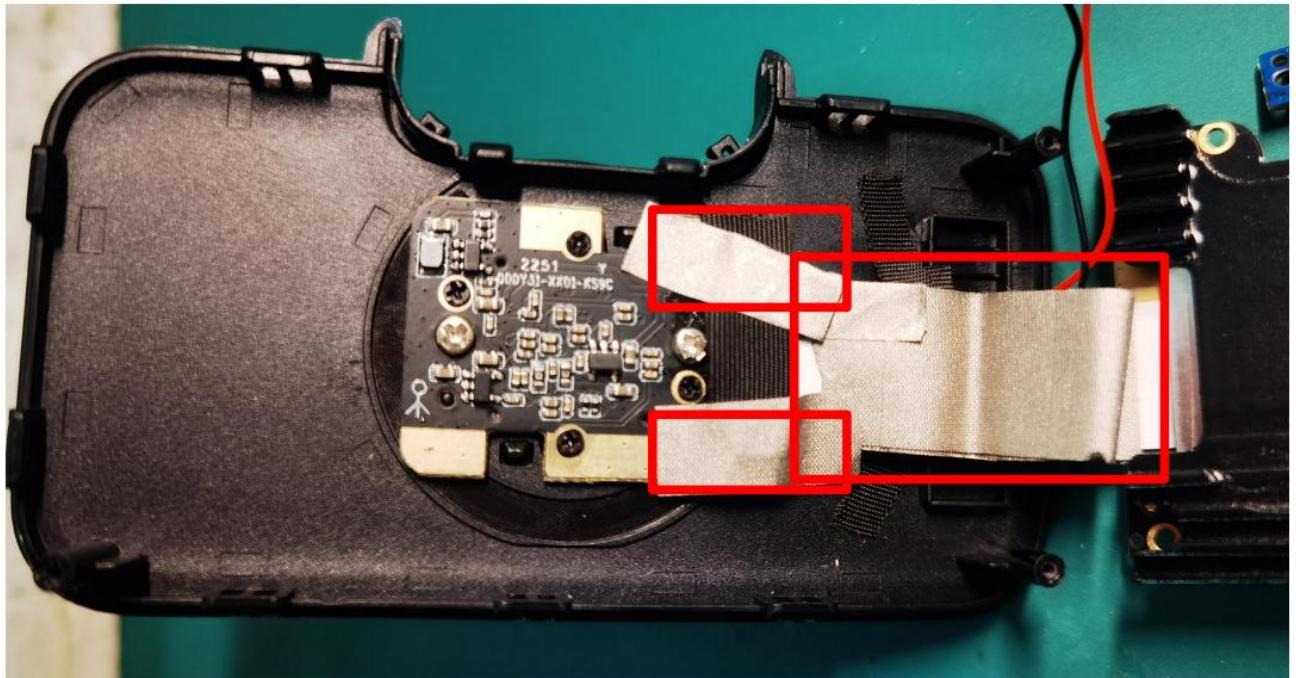
四:Antenna standing wave ratio & Antenna Efficiency



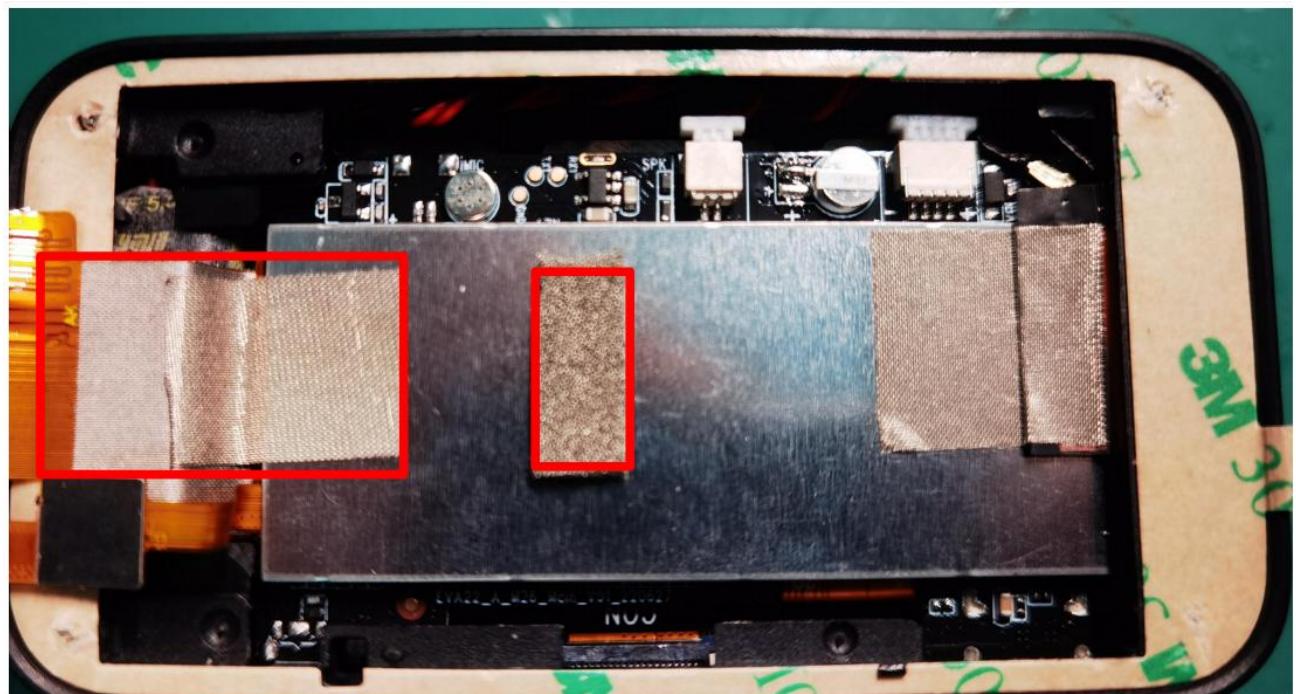
| Passive Test For 2.4G | | | | | | | | | | | | |
|-----------------------|-------------|--------------|---------------|---------------|-------------|-------------|-------------|-------------|----------------------|--------------------|--------------|--------------|
| Freq (MHz) | Effi (%) | Effi (dB) | Gain (dBi) | Gain (dBd) | UHIS (%) | DHIS (%) | Max (dB) | Min (dB) | Directivity (dBi) | Beamwidth (3dB) | AttH (dB) | AttV (dB) |
| 2400 | 41.55 | -3.81 | 3.43 | 1.28 | 17.022 | 24.533 | 3.43 | -10.59 | 7.24 | 0 | 46.77 | 47.04 |
| 2410 | 38.81 | -4.11 | 3.11 | 0.96 | 16.035 | 22.772 | 3.11 | -10.49 | 7.22 | 0 | 46.94 | 47.16 |
| 2420 | 44.71 | -3.5 | 3.71 | 1.56 | 18.702 | 26.007 | 3.71 | -9.69 | 7.21 | 0 | 47.02 | 47.39 |
| 2430 | 48.84 | -3.11 | 4.08 | 1.93 | 20.771 | 28.065 | 4.08 | -9.12 | 7.2 | 0 | 47.31 | 47.67 |
| 2440 | 52.82 | -2.77 | 4.38 | 2.23 | 22.949 | 29.87 | 4.38 | -9.31 | 7.15 | 0 | 47.68 | 47.91 |
| 2450 | 56.37 | -2.49 | 4.66 | 2.51 | 24.737 | 31.636 | 4.66 | -9.31 | 7.15 | 0 | 47.98 | 48.27 |
| 2460 | 51.93 | -2.85 | 4.4 | 2.25 | 22.892 | 29.042 | 4.4 | -9.95 | 7.25 | 0 | 47.79 | 48.02 |
| 2470 | 47.24 | -3.26 | 4.04 | 1.89 | 20.819 | 26.424 | 4.04 | -10.28 | 7.3 | 0 | 47.6 | 47.7 |
| 2480 | 46.52 | -3.32 | 3.94 | 1.79 | 20.566 | 25.959 | 3.94 | -10.14 | 7.26 | 0 | 47.93 | 48.05 |
| 2490 | 52.22 | -2.82 | 4.36 | 2.21 | 23.231 | 28.985 | 4.36 | -8.93 | 7.18 | 0 | 48.1 | 47.95 |
| 2500 | 56.2 | -2.5 | 4.59 | 2.44 | 25.034 | 31.163 | 4.59 | -8.8 | 7.09 | 0 | 48.13 | 48.09 |

| Passive Test For 5G-WIFI | | | | | | | | | | | | |
|--------------------------|-------------|--------------|---------------|---------------|-------------|-------------|-------------|-------------|----------------------|--------------------|--------------|--------------|
| Freq (MHz) | Effi (%) | Effi (dB) | Gain (dBi) | Gain (dBd) | UHIS (%) | DHIS (%) | Max (dB) | Min (dB) | Directivity (dBi) | Beamwidth (3dB) | AttH (dB) | AttV (dB) |
| 5000 | 32.03 | -4.94 | 0.19 | -1.96 | 13.124 | 18.91 | 0.19 | -16.23 | 5.13 | 0 | 57.34 | 57.35 |
| 5100 | 39.76 | -4.01 | 1.22 | -0.93 | 17.246 | 22.514 | 1.22 | -16.65 | 5.22 | 0 | 57.81 | 57.76 |
| 5200 | 37.3 | -4.28 | 1.09 | -1.06 | 15.775 | 21.529 | 1.09 | -30.16 | 5.37 | 0 | 56.99 | 56.81 |
| 5300 | 48.35 | -3.16 | 2.44 | 0.29 | 19.644 | 28.709 | 2.44 | -16.05 | 5.6 | 0 | 56.76 | 56.86 |
| 5400 | 35.9 | -4.45 | 1.13 | -1.02 | 15.052 | 20.851 | 1.13 | -16.36 | 5.57 | 0 | 56.69 | 56.95 |
| 5500 | 37.87 | -4.22 | 2.15 | 0 | 15.221 | 22.648 | 2.15 | -15.39 | 6.36 | 0 | 57.35 | 58.31 |
| 5600 | 35.08 | -4.55 | 1.49 | -0.66 | 13.592 | 21.485 | 1.49 | -18.75 | 6.04 | 0 | 58.6 | 59.56 |
| 5700 | 42.51 | -3.71 | 2.32 | 0.17 | 16.736 | 25.777 | 2.32 | -22.74 | 6.04 | 0 | 59.11 | 59.81 |
| 5800 | 44.52 | -3.51 | 2.56 | 0.41 | 18.117 | 26.402 | 2.56 | -16.47 | 6.07 | 0 | 59.62 | 60.26 |
| 5900 | 42.91 | -3.67 | 2.06 | -0.09 | 18.198 | 24.711 | 2.06 | -11.91 | 5.73 | 0 | 60.04 | 61.12 |
| 6000 | 54.41 | -2.64 | 2.55 | 0.4 | 24.598 | 29.814 | 2.55 | -8.48 | 5.19 | 0 | 61.72 | 62.72 |

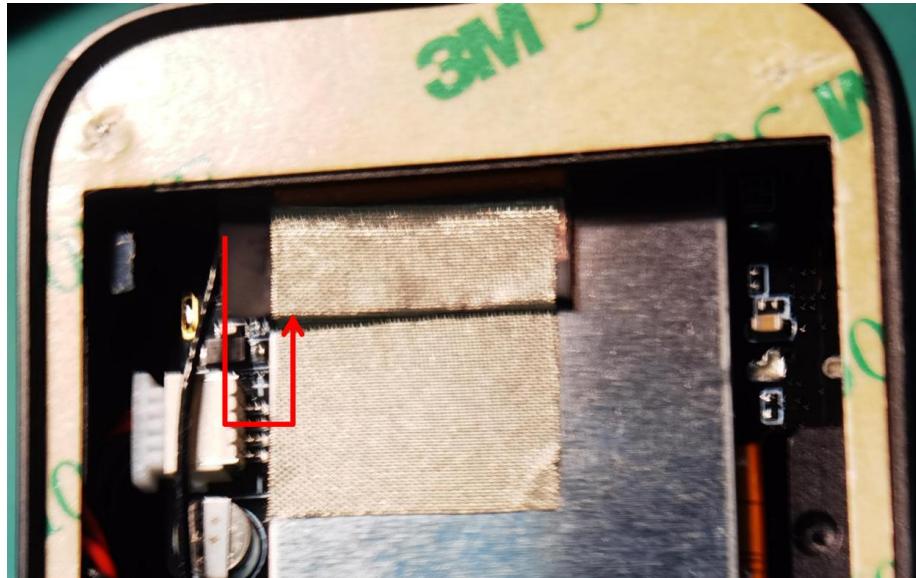
五: Environmental treatment



1. The camera cable should be wrapped with conductive cloth and grounded with the camera module; Can improve the spirit Sensitive)



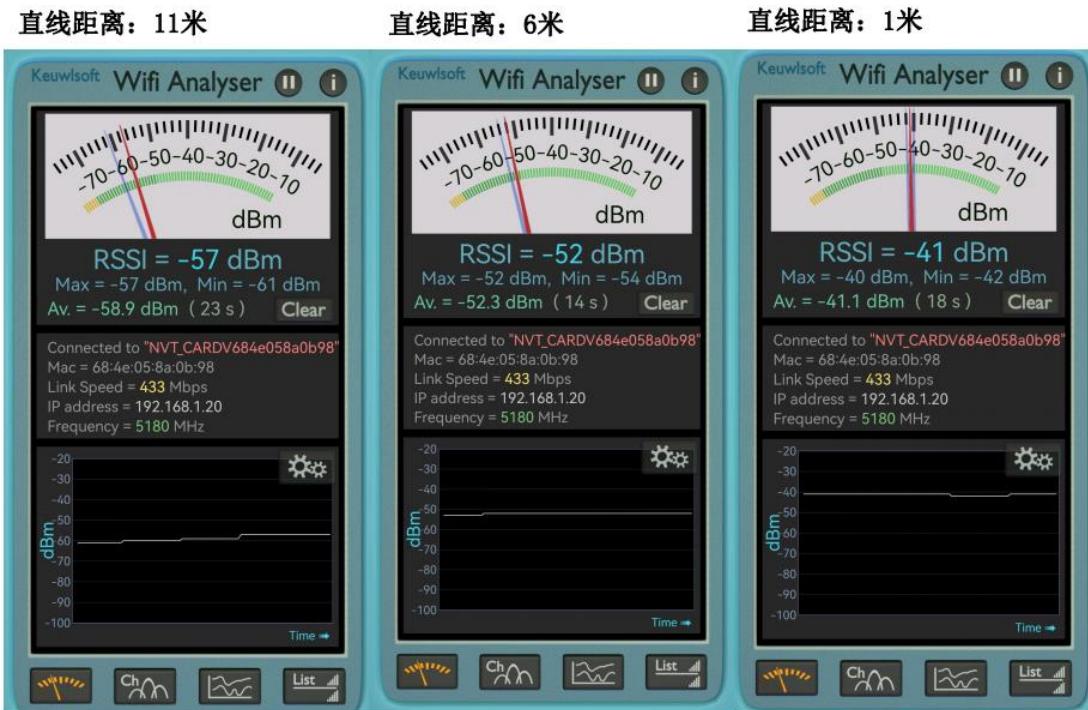
2. The screen bar is wrapped with conductive cloth and grounded with the motherboard shield cover;
3. The motherboard shield cover pasted conductive sponge and screen grounding treatment;
4. Capacitance line and horn line made into twisted pair, reduce coupling interference;

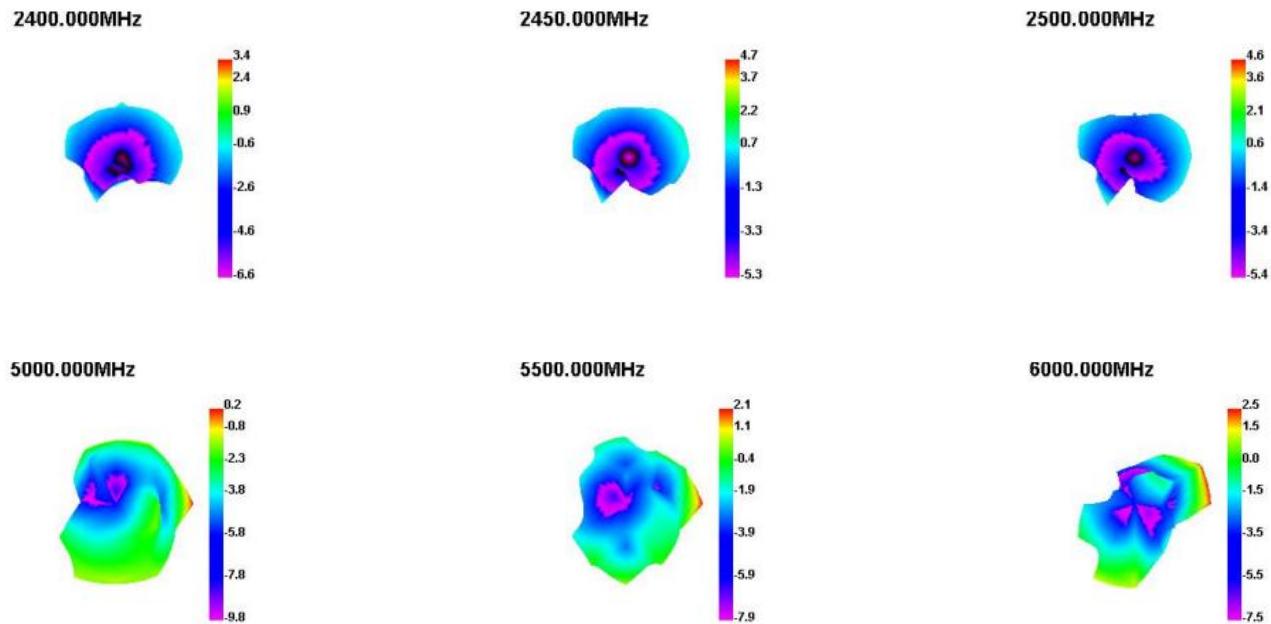


5. The grounding mode of the conductive cloth of the wifi antenna is shown in the figure. Fold the FPC marking position in half and then guide the antenna up
 The electric cloth is attached to the shield cover, so that the antenna is directly connected with the main board;

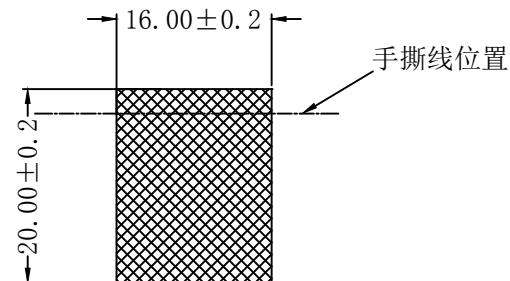
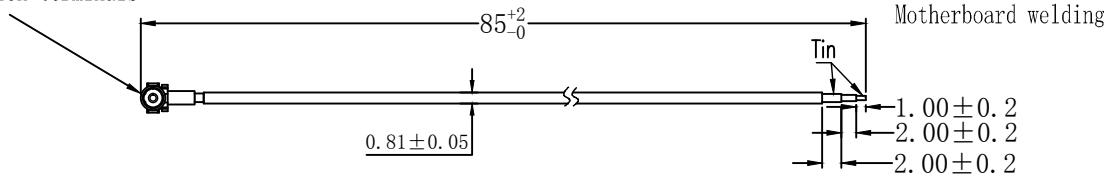
Note: Please optimize the specific environment treatment according to the test report

六: Signal strength

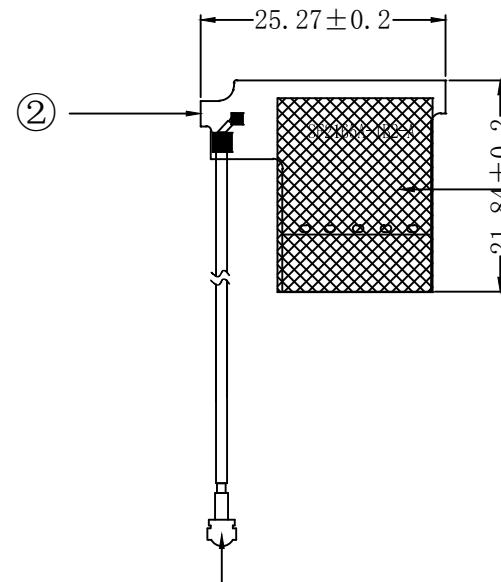


七:3D pattern**八:Structural drawing**

The 3 generation terminals



Conductive cloth



③ The conductive cloth is placed in the reverse center at the copper leakage position of the FPC

technical requirements:

- * for critical dimensions;
- Size conform to the requirements of the drawings;
- No virtual welding welding point, false welding. Require full welding points.
- Network test pass.
- No marked tolerance according to SJ/T 10628 1995 6classes;

| | | | | | | | | | |
|---|------------------|-------|----------|----------------|------------|------|------------|------------|------|
| 5 | | | | | | | | | |
| 4 | | | | | | | | | |
| 3 | Conductive cloth | gray | 1 | 16*20mm | signatures | date | mass | signatures | date |
| 2 | FPC | black | 1 | SF2165A-1B2-A | RD | YWD | 2023.04.11 | QC | |
| 1 | coaxial line | black | 1 | Ø=0.81 | RF | | | | |
| | name | color | quantity | specifications | audits | | approval | | |

SWARD

ShenZhen SWARD Communication
Technology Co.Ltd

SF2165A-1D23B-085-A

ROHS