

# Material Acknowledgement

Suppliers: 深圳市华信微通信技术有限公司

Model: A91

Product Name: On the antenna assembly

Specification  
s / Models: \_\_\_\_\_

Antenna  
trademark: \_\_\_\_\_

Color: \_\_\_\_\_

Address: \_\_\_\_\_

Contact /  
Phone: \_\_\_\_\_

## Supplier (with official seal)

| Structural<br>Department | R&D<br>Department | Quality<br>Department | Project<br>Department |  |
|--------------------------|-------------------|-----------------------|-----------------------|--|
|                          |                   |                       |                       |  |
|                          |                   |                       |                       |  |

## Customer review

| ID<br>Department | Structural<br>Department /<br>Special<br>Project | Hardware<br>Department | Packaging<br>engineering | Quality<br>Department |
|------------------|--------------------------------------------------|------------------------|--------------------------|-----------------------|
|------------------|--------------------------------------------------|------------------------|--------------------------|-----------------------|

## Confidential Information

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## Specifications

The report mainly provides A91 GSM +LTE,performance parameter test, antenna for built-in antenna:

## 2、Electrical performance

### 2-1Specification Standard

The A91 antenna operates in the LTE700/850/900 1800/1900/2100/2300/2700Mhz/3500Mhz/5000Mhz band, which generates resonances in this ;The following table shows the mass production performance test indicators for the A89 design antenna:

| EGSM+WCDMA+TDSCDMA+LTEAntenna Indicator |                    |             |                    |             |
|-----------------------------------------|--------------------|-------------|--------------------|-------------|
|                                         | Frequency<br>(MHz) | VSWR        | Frequency<br>(MHz) | VSWR        |
| Band                                    | Transmitter        |             | Receiver side      |             |
| GSM850                                  | 824-849            | $\leq 2.86$ | 869-894            | $\leq 2.02$ |
| GSM900                                  | 880-915            | $\leq 2.1$  | 925-960            | $\leq 3.1$  |
| DCS1800                                 | 1710-1785          | $\leq 3.3$  | 1805-1880          | $\leq 3.7$  |
| PCS1900                                 | 1850-1910          | $\leq 2.01$ | 1930-1990          | $\leq 2.12$ |
| TDSCDMF1900                             | 1880-1980          | $\leq 2.0$  | 2110-2170          | $\leq 2.74$ |
| TDSCDMA2100                             | 1920-1980          | $\leq 2.10$ | 2110-2025          | $\leq 2.74$ |
| WCDMA2100                               | 1920-1980          | $\leq 2.10$ | 2110-2090          | $\leq 2.97$ |
| LTE TDD, B38                            | 2570-2620          | $\leq 1.07$ | 2570-2620          | $\leq 2.07$ |
| LTE TDD, B39                            | 1880-1920          | $\leq 3.2$  | 1880-1920          | $\leq 3.7$  |
| LTE TDD, B40                            | 2300-2400          | $\leq 2.17$ | 2300-2400          | $\leq 1.43$ |
| LTE TDD, B41                            | 2496-2690          | $\leq 2.36$ | 2496-2690          | $\leq 2.67$ |
| LTE FDD, B1                             | 1920-1980          | $\leq 2.10$ | 2110-2170          | $\leq 2.74$ |
| LTE FDD, B3                             | 1710-1785          | $\leq 2.01$ | 1805-1880          | $\leq 2.12$ |

## Main antenna

## 3.Standing Wave Ratio(VSWR)test

## 3-1 Test settings

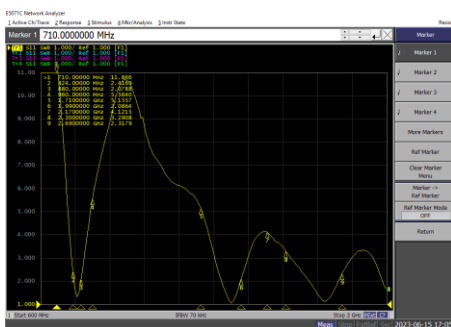
The VSWR test units are connected in turn: E5071B Network Analyzer → 50 ohm coaxial

Cable → 156mm long copper tube /b110> → Test fixtures. Processing of the test fixture: A hard cable is used from the antenna 50 ohm test point on the pcb of the mobile phone to lead out the SMA-J connector, connect it to the copper tube with a choke, and then connect the other devices in turn.

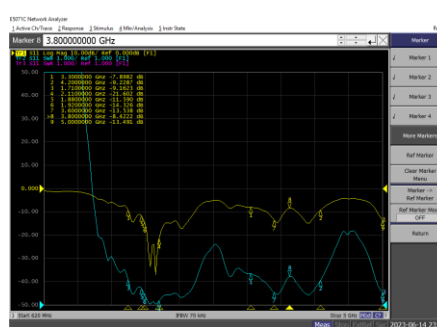
## 3-2 VWR test

The following table shows the value of the standing wave ratio of the edge frequency point of the GSM+LTE antenna operating band, , the return loss, VSWR, and the relevant waveform plot is shown in the annex:

A91 ANT1 VSWR/Return Loss

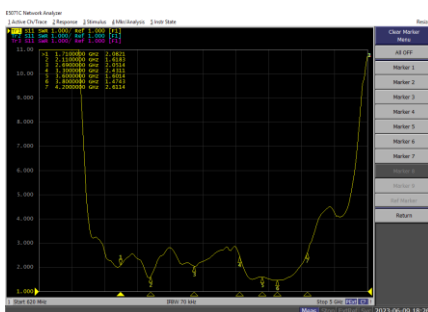


A91 ANT2 VSWR/Return Loss

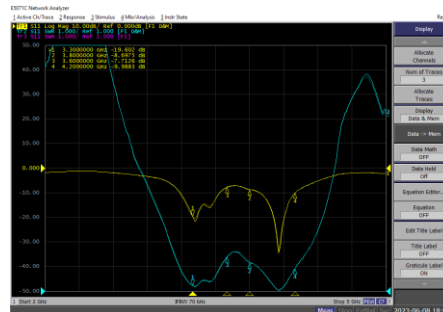


## 3-3 test results

A91 ANT3 VSWR/Return Loss

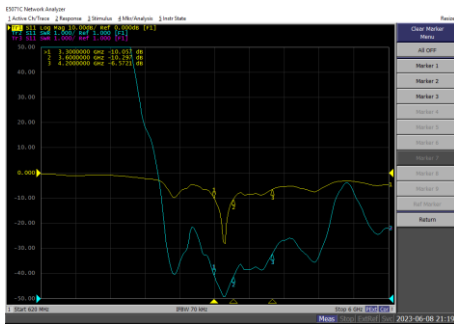


A91 ANT4 VSWR/Return Loss

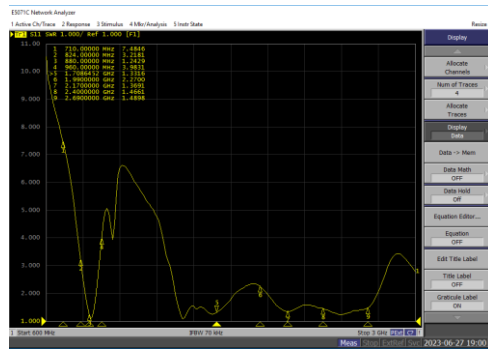


A91 ANT5 VSWR/Return Loss

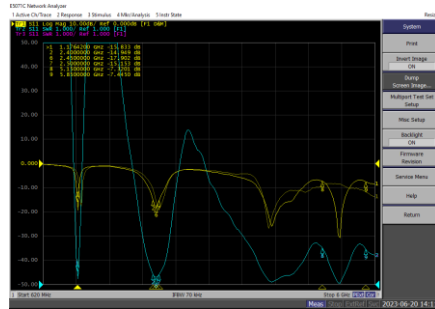
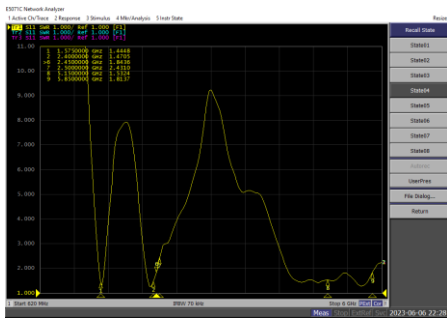
A91 ANT0 VSWR/Return Loss



A91 WIFI 1 VSWR/Return Loss



A91 WIFI 2 VSWR/Return Loss



## 3-4 gain test

### ANT0 Gain

|     |      |      |      |      |      |
|-----|------|------|------|------|------|
| 700 | -2.8 | 1400 | -4.2 | 2120 | -2.8 |
| 710 | -2.7 | 1420 | -4.1 | 2140 | -2.7 |
| 720 | -2.5 | 1440 | -3.9 | 2160 | -2.8 |
| 730 | -2.5 | 1460 | -3.7 | 2180 | -2.9 |
| 740 | -2.6 | 1480 | -3.8 | 2300 | -3.6 |
| 750 | -2.7 | 1500 | -3.9 | 2320 | -3.5 |
| 760 | -2.8 | 1700 | -3.5 | 2340 | -3.4 |
| 770 | -2.8 | 1720 | -3.4 | 2360 | -3.3 |
| 780 | -2.9 | 1740 | -3.4 | 2380 | -3.5 |
| 790 | -3.1 | 1760 | -3.3 | 2400 | -3.5 |
| 800 | -2.8 | 1780 | -3.3 | 2420 | -3.6 |
| 810 | -2.6 | 1800 | -3.2 | 2440 | -3.7 |
| 820 | -2.4 | 1820 | -3.2 | 2460 | -3.8 |
| 830 | -2.3 | 1840 | -3.1 | 2480 | -3.9 |
| 840 | -2.2 | 1860 | -2.9 | 2500 | -4.1 |
| 850 | -2.1 | 1880 | -2.9 | 2520 | -4.2 |
| 860 | -2.2 | 1900 | -2.8 | 2540 | -4.1 |
| 870 | -2.3 | 1920 | -2.8 | 2560 | -3.9 |
| 880 | -2.5 | 1940 | -2.7 | 2580 | -3.8 |
| 890 | -2.5 | 1960 | -2.7 | 2600 | -3.6 |
| 900 | -2.4 | 1980 | -2.9 | 2620 | -3.7 |

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|-----|------|------|------|------|------|
| 910 | -2.4 | 2000 | -2.8 | 2640 | -3.8 |
| 920 | -2.3 | 2020 | -2.9 | 2660 | -3.9 |
| 930 | -2.3 | 2040 | -3.1 | 2680 | -3.9 |
| 940 | -2.4 | 2060 | -3.1 | 2700 | -4.1 |
| 950 | -2.4 | 2080 | -2.9 |      |      |
| 960 | -2.5 | 2100 | -2.9 |      |      |
|     |      |      |      |      |      |

ANT1 Gain

| Freq | Gain | Freq | Gain | Freq | Gain |
|------|------|------|------|------|------|
| 700  | -3.8 | 950  | -4.2 | 2160 | -1.7 |
| 710  | -3.7 | 960  | -4.2 | 2180 | -1.9 |
| 720  | -3.6 | 1700 | -2.1 | 2300 | -2.5 |
| 730  | -3.6 | 1720 | -2.1 | 2320 | -2.3 |
| 740  | -3.7 | 1740 | -1.9 | 2340 | -2.2 |
| 750  | -3.8 | 1760 | -1.9 | 2360 | -2.3 |
| 760  | -3.9 | 1780 | -2.2 | 2380 | -2.4 |
| 770  | -3.9 | 1800 | -2.1 | 2400 | -2.5 |
| 780  | -4.1 | 1820 | -1.9 | 2420 | -2.6 |
| 790  | -4.1 | 1840 | -1.8 | 2440 | -2.6 |
| 800  | -4.2 | 1860 | -1.9 | 2460 | -2.7 |
| 810  | -4.2 | 1880 | -1.8 | 2480 | -2.6 |
| 820  | -4.1 | 1900 | -1.8 | 2500 | -2.6 |
| 830  | -3.9 | 1920 | -1.8 | 2520 | -2.5 |
| 840  | -3.9 | 1940 | -1.9 | 2540 | -2.5 |
| 850  | -4.1 | 1960 | -1.9 | 2560 | -2.4 |
| 860  | -4.1 | 1980 | -1.8 | 2580 | -2.4 |
| 870  | -4.2 | 2000 | -1.8 | 2600 | -2.3 |
| 880  | -4.1 | 2020 | -1.7 | 2620 | -2.3 |
| 890  | -3.9 | 2040 | -1.7 | 2640 | -2.5 |
| 900  | -3.9 | 2060 | -1.6 | 2660 | -2.5 |
| 910  | -3.8 | 2080 | -1.6 | 2680 | -2.6 |
| 920  | -3.8 | 2100 | -1.5 | 2700 | -2.6 |
| 930  | -3.9 | 2120 | -1.5 |      |      |
| 940  | -4.1 | 2140 | -1.5 |      |      |

ANT2 Gain

| Freq | Gain | Freq | Gain | Freq | Gain | Freq | Gain |
|------|------|------|------|------|------|------|------|
| 1700 | -2.1 | 2500 | -2.3 | 3300 | -1.7 | 3760 | -1.9 |
| 1720 | -2.1 | 2520 | -2.2 | 3320 | -1.9 | 3780 | -1.9 |
| 1740 | -1.9 | 2540 | -2.6 | 3340 | -2.5 | 3800 | -2.2 |

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|      |      |      |      |      |      |      |      |
|------|------|------|------|------|------|------|------|
| 1760 | -1.9 | 2560 | -2.3 | 3360 | -2.3 | 3820 | -2.1 |
| 1780 | -2.2 | 2580 | -2.3 | 3380 | -2.2 | 3840 | -1.9 |
| 1800 | -2.1 | 2600 | -2.2 | 3400 | -2.3 | 3860 | -1.8 |
| 1820 | -1.9 | 2620 | -2.4 | 3420 | -2.4 | 3880 | -1.9 |
| 1840 | -1.8 | 2640 | -2.3 | 3440 | -2.5 | 3900 | -1.8 |
| 1860 | -1.9 | 2660 | -2.4 | 3460 | -2.6 | 3920 | -1.8 |
| 1880 | -1.8 | 2680 | -2.5 | 3480 | -2.6 | 3940 | -1.8 |
| 1900 | -1.8 | 2700 | -2.5 | 3500 | -2.7 | 3960 | -1.9 |
| 1920 | -1.8 |      |      | 3520 | -2.6 | 3980 | -1.9 |
| 1940 | -1.9 |      |      | 3540 | -2.6 | 4000 | -1.8 |
| 1960 | -1.9 |      |      | 3560 | -2.5 | 4020 | -1.8 |
| 1980 | -1.8 |      |      | 3580 | -2.5 | 4040 | -1.7 |
| 2000 | -1.8 |      |      | 3600 | -2.4 | 4060 | -1.7 |
| 2020 | -1.7 |      |      | 3620 | -2.4 | 4080 | -1.6 |
| 2040 | -1.7 |      |      | 3640 | -2.3 | 4100 | -1.6 |
| 2060 | -1.6 |      |      | 3660 | -2.3 | 4120 | -1.5 |
| 2080 | -1.6 |      |      | 3680 | -2.5 | 4140 | -1.5 |
| 2100 | -1.5 |      |      | 3700 | -2.5 | 4160 | -1.5 |
| 2120 | -1.5 |      |      | 3720 | -2.6 | 4180 | -1.9 |
| 2140 | -1.5 |      |      | 3740 | -2.6 | 4200 | -1.9 |
| 2160 | -1.8 |      |      |      |      |      |      |
| 2180 | -1.9 |      |      |      |      |      |      |

### ANT3 Gain

| Freq | Gain  | Freq | Gain | Freq | Gain | Freq | Gain |
|------|-------|------|------|------|------|------|------|
| 1700 | -2.24 | 2500 | -2.3 | 3300 | -1.7 | 3760 | -1.9 |
| 1720 | -2.54 | 2520 | -2.2 | 3320 | -1.9 | 3780 | -1.9 |
| 1740 | -1.88 | 2540 | -2.6 | 3340 | -2.5 | 3800 | -2.2 |
| 1760 | -1.64 | 2560 | -2.3 | 3360 | -2.3 | 3820 | -2.1 |
| 1780 | -1.55 | 2580 | -2.3 | 3380 | -2.2 | 3840 | -1.9 |
| 1800 | -1.9  | 2600 | -2.2 | 3400 | -2.3 | 3860 | -1.8 |
| 1820 | -1.87 | 2620 | -2.4 | 3420 | -2.4 | 3880 | -1.9 |
| 1840 | -1.67 | 2640 | -2.3 | 3440 | -2.5 | 3900 | -1.8 |
| 1860 | -1.87 | 2660 | -2.4 | 3460 | -2.6 | 3920 | -1.8 |
| 1880 | -1.67 | 2680 | -2.5 | 3480 | -2.6 | 3940 | -1.8 |
| 1900 | -1.78 | 2700 | -2.5 | 3500 | -2.7 | 3960 | -1.9 |
| 1920 | -1.8  |      |      | 3520 | -2.6 | 3980 | -1.9 |
| 1940 | -1.84 |      |      | 3540 | -2.6 | 4000 | -1.8 |
| 1960 | -1.89 |      |      | 3560 | -2.5 | 4020 | -1.8 |
| 1980 | -1.77 |      |      | 3580 | -2.5 | 4040 | -1.7 |
| 2000 | -1.88 |      |      | 3600 | -2.4 | 4060 | -1.7 |

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|      |       |  |  |      |      |      |      |
|------|-------|--|--|------|------|------|------|
| 2020 | -1.78 |  |  | 3620 | -2.4 | 4080 | -1.6 |
| 2040 | -1.78 |  |  | 3640 | -2.3 | 4100 | -1.6 |
| 2060 | -1.78 |  |  | 3660 | -2.3 | 4120 | -1.5 |
| 2080 | -1.78 |  |  | 3680 | -2.5 | 4140 | -1.5 |
| 2100 | -1.78 |  |  | 3700 | -2.5 | 4160 | -1.5 |
| 2120 | -1.67 |  |  | 3720 | -2.6 | 4180 | -1.9 |
| 2140 | -1.78 |  |  | 3740 | -2.6 | 4200 | -1.9 |
| 2160 | -1.64 |  |  |      |      |      |      |
| 2180 | -1.87 |  |  |      |      |      |      |

### ANT4 Gain

| Freq | Gain | Freq | Gain |
|------|------|------|------|
| 3300 | -1.7 | 3760 | -1.9 |
| 3320 | -1.9 | 3780 | -1.9 |
| 3340 | -2.5 | 3800 | -2.2 |
| 3360 | -2.3 | 3820 | -2.1 |
| 3380 | -2.2 | 3840 | -1.9 |
| 3400 | -2.3 | 3860 | -1.8 |
| 3420 | -2.4 | 3880 | -1.9 |
| 3440 | -2.5 | 3900 | -1.8 |
| 3460 | -2.6 | 3920 | -1.8 |
| 3480 | -2.6 | 3940 | -1.8 |
| 3500 | -2.7 | 3960 | -1.9 |
| 3520 | -2.6 | 3980 | -1.9 |
| 3540 | -2.6 | 4000 | -1.8 |
| 3560 | -2.5 | 4020 | -1.8 |
| 3580 | -2.5 | 4040 | -1.7 |
| 3600 | -2.4 | 4060 | -1.7 |
| 3620 | -2.4 | 4080 | -1.6 |
| 3640 | -2.3 | 4100 | -1.6 |
| 3660 | -2.3 | 4120 | -1.5 |
| 3680 | -2.5 | 4140 | -1.5 |
| 3700 | -2.5 | 4160 | -1.5 |
| 3720 | -2.6 | 4180 | -1.9 |
| 3740 | -2.6 | 4200 | -1.9 |

### ANT5 Gain

| Freq | Gain | Freq | Gain |
|------|------|------|------|
| 3300 | -1.7 | 3760 | -1.9 |
| 3320 | -1.9 | 3780 | -1.9 |

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|      |      |      |      |
|------|------|------|------|
| 3340 | -2.5 | 3800 | -2.2 |
| 3360 | -2.3 | 3820 | -2.1 |
| 3380 | -2.2 | 3840 | -1.9 |
| 3400 | -2.3 | 3860 | -1.8 |
| 3420 | -2.4 | 3880 | -1.9 |
| 3440 | -2.5 | 3900 | -1.8 |
| 3460 | -2.6 | 3920 | -1.8 |
| 3480 | -2.6 | 3940 | -1.8 |
| 3500 | -2.7 | 3960 | -1.9 |
| 3520 | -2.6 | 3980 | -1.9 |
| 3540 | -2.6 | 4000 | -1.8 |
| 3560 | -2.5 | 4020 | -1.8 |
| 3580 | -2.5 | 4040 | -1.7 |
| 3600 | -2.4 | 4060 | -1.7 |
| 3620 | -2.4 | 4080 | -1.6 |
| 3640 | -2.3 | 4100 | -1.6 |
| 3660 | -2.3 | 4120 | -1.5 |
| 3680 | -2.5 | 4140 | -1.5 |
| 3700 | -2.5 | 4160 | -1.5 |
| 3720 | -2.6 | 4180 | -1.9 |
| 3740 | -2.6 | 4200 | -1.9 |

**GPS/WIFI/BT L1**

| Freq | Gain | Freq | Gain | Freq | Gain |
|------|------|------|------|------|------|
| 1560 | -1.3 | 2400 | -1.4 | 5100 | 1.1  |
| 1570 | -1.2 | 2420 | -1.3 | 5200 | 1.2  |
| 1580 | -1.2 | 2440 | -1.2 | 5300 | 1.0  |
| 1590 | -1.3 | 2460 | -1.2 | 5400 | 1.2  |
|      |      | 2480 | -1.2 | 5500 | 1.2  |
|      |      | 2500 | -1.3 | 5600 | 1.1  |
|      |      |      |      | 5700 | 1.0  |
|      |      |      |      | 5800 | 1.1  |

**GPS/WIFI/BT L2**

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| Freq | Gain  | Freq | Gain | Freq | Gain |
|------|-------|------|------|------|------|
| 1160 | -1.64 | 2400 | -0.6 | 5100 | 0.87 |
| 1170 | -1.65 | 2420 | -0.7 | 5200 | 0.72 |
| 1180 | -1.54 | 2440 | -0.7 | 5300 | 1.0  |
|      |       | 2460 | -0.6 | 5400 | 1.1  |
|      |       | 2480 | -0.7 | 5500 | 1.14 |
|      |       | 2500 | -0.8 | 5600 | 1.24 |
|      |       |      |      | 5700 | 1.2  |
|      |       |      |      | 5800 | 1.13 |