



**Hanyang Antenna Design Co.,Ltd**

# **Antenna Approval Sheet**

|              |                        |
|--------------|------------------------|
| Product name | Internal PCB Antenna   |
| Model name   | F00100000433           |
| Date         | 2024-04-10             |
| Manufacture  | Hanyang Antenna Design |

|      | R&D                                                                                 | Quality                                                                             | Approval                                                                              |
|------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Sign |  |  |  |
| Date | 04/10                                                                               | 04/10                                                                               | 04/10                                                                                 |

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# 1. Document reversion history

| No. | Date       | Detail revision and change                    | Reversion |
|-----|------------|-----------------------------------------------|-----------|
| 1   | 2024-01-24 | Initial release                               | 1.0       |
| 2   | 2024-04-10 | Modify ANT size (17.8 x 10.4mm → 18 x 10.6mm) | 2.0       |
| 3   |            |                                               |           |
| 4   |            |                                               |           |
| 5   |            |                                               |           |
| 6   |            |                                               |           |



## 2. Material certificate

| No. | Part name              | Material     | Color | Quantity | Processing method    | Partner | Remarks |
|-----|------------------------|--------------|-------|----------|----------------------|---------|---------|
| 1   | Φ1.13<br>Coaxial cable | Tinned cable | Black | 1        | Cocentra<br>MHF plug | Shenyu  |         |
| 2   | Antenna                | FR4          | Black | 1        |                      | Yaoxian | 1.0mm   |
| 3   | Double-sided<br>tape   |              | Gray  | 1        | GPL-080GF            | 3M      | 0.8mm   |



### 3. Technical information

#### 3.1 Electrical specifications

|                      |                  |
|----------------------|------------------|
| Frequency            | 5925~7125MHz     |
| VSWR                 | 2.0 :1 blow      |
| Peak gain            | 2.5 dBi          |
| Input impedance      | 50 $\Omega$      |
| Polarization         | Linear           |
| Radiation properties | Omni-directional |
| Maximum power        | 2Watts           |

#### 3.2 Mechanical specifications

|                       |                               |
|-----------------------|-------------------------------|
| Antenna size          | 18.0(mm) x 10.6(mm) x 1.0(mm) |
| Material              | FR4                           |
| Connector type        | COCENTRA ANCZ1131-1B1         |
| Cable length          | 200mm                         |
| Cable color           | Black                         |
| Operating temperature | -40 °C to +80 °C              |
| Operating humidity    | 0 ~ 95%                       |

#### 3.3 Packaging specifications

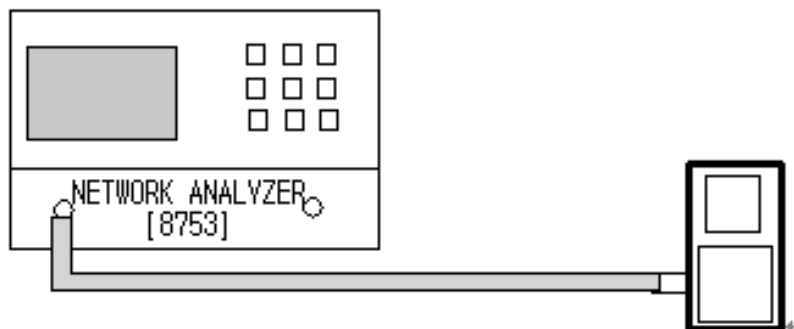
| Part name       | Quantity        | Material  | Remarks   |
|-----------------|-----------------|-----------|-----------|
| Polybag (small) | 1Bag (200pcs)   | PP        | 240x160mm |
| Polybag (large) | 1Bag (1000pcs)  | PP        | 325x220mm |
| Out box         | 1Box (5,000pcs) | K=k paper |           |



## 4. Electrical test environment

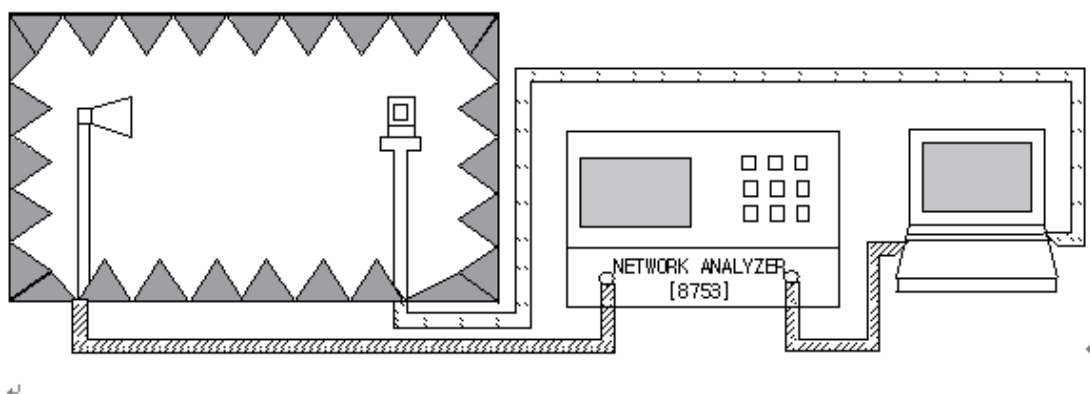
### 4.1 VSWR

- ① Connect the measurement cable to the Network analyzer.
- ② Set and calibrate the Network analyzer to match the measurement frequency.
- ③ Install the antenna and measure the VSWR.



### 4.2 Radiation pattern & Gain

- ① Calibrate the chamber system using the reference antenna, the software for controlling the chamber system is set to the measurement frequency band.
- ② Fit the antenna in chamber.
- ③ Measure the gain, efficiency, and radiation pattern.



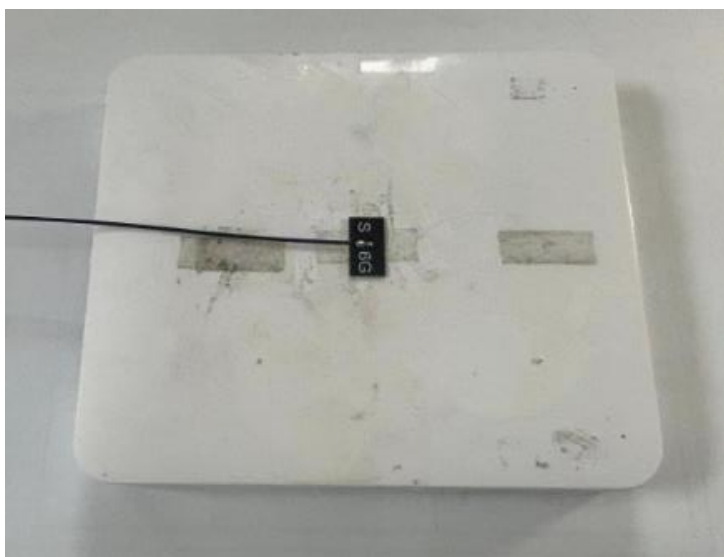
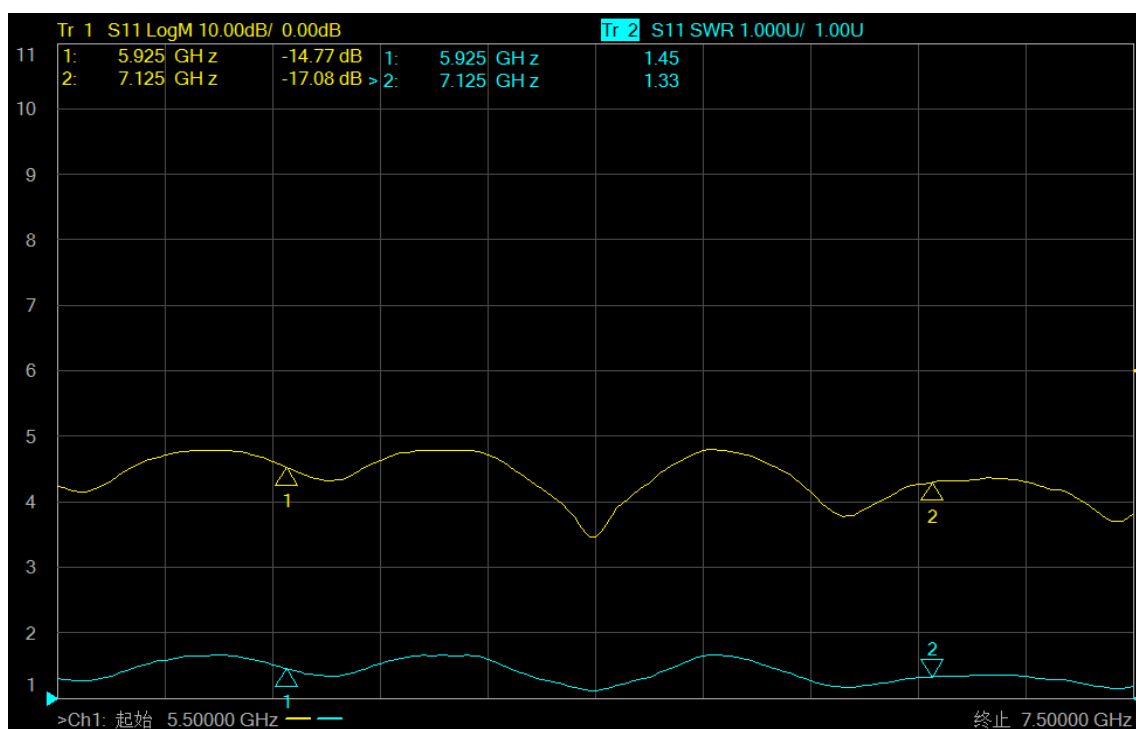


## 5. Electrical characteristic

### 5.1 VSWR

The VSWR characteristics must satisfy the following electrical demands. It was tested with 0.8mm thick double-sided adhesive tape and mounted on a 160x130mm plastic case.

|           |              |
|-----------|--------------|
| Frequency | 5925~7125MHz |
| VSWR      | 2.0 :1 blow  |





## 5.2 Gain & Efficiency

The unit of gain is “dBi” and it must satisfy the following specifications.

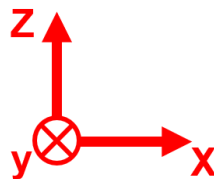
|           |              |
|-----------|--------------|
| Frequency | 5925~7125MHz |
| Peak gain | 2.5 dBi      |

Mobile Station Over the Air Passive Performance

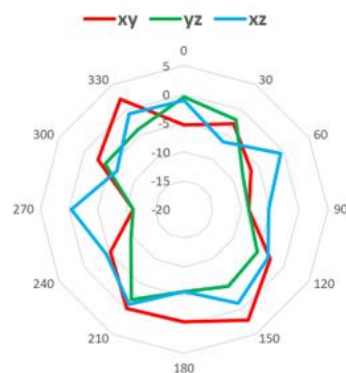
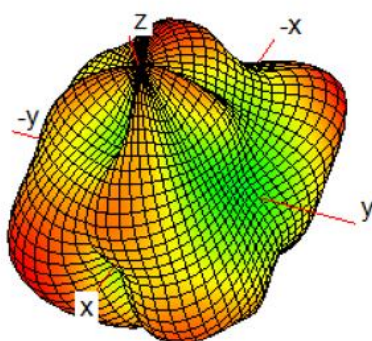
|                             |                          |        |         |        |        |        |        |        |        |        |        |        |        |  |  |  |  |
|-----------------------------|--------------------------|--------|---------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--|--|--|--|
| EUT                         |                          |        |         |        |        |        |        |        |        |        |        |        |        |  |  |  |  |
| Test Date                   | Tue 23/Jan/2024 16:31:22 |        |         |        |        |        |        |        |        |        |        |        |        |  |  |  |  |
| Event Status                |                          |        |         |        |        |        |        |        |        |        |        |        |        |  |  |  |  |
| Serial Number               |                          |        |         |        |        |        |        |        |        |        |        |        |        |  |  |  |  |
| Hardware Version            |                          |        |         |        |        |        |        |        |        |        |        |        |        |  |  |  |  |
|                             | 1                        | 2      | 3       | 4      | 5      | 6      | 7      | 8      | 9      | 10     | 11     | 12     | 13     |  |  |  |  |
| Frequency [MHz]             | 5925                     | 6025   | 6125    | 6225   | 6325   | 6425   | 6525   | 6625   | 6725   | 6825   | 6925   | 7025   | 7125   |  |  |  |  |
| Efficiency [dB]             | -2.65                    | -2.56  | -2.54   | -2.61  | -2.54  | -2.71  | -2.39  | -2.36  | -2.66  | -2.74  | -3.20  | -3.06  | -3.13  |  |  |  |  |
| Efficiency [%]              | 54.29                    | 55.43  | 55.76   | 54.78  | 55.76  | 53.61  | 57.72  | 58.08  | 54.22  | 53.17  | 47.83  | 49.46  | 48.63  |  |  |  |  |
| TRG [dB]                    | -2.65                    | -2.56  | -2.54   | -2.61  | -2.54  | -2.71  | -2.39  | -2.36  | -2.66  | -2.74  | -3.20  | -3.06  | -3.13  |  |  |  |  |
| TRG <sub>0</sub> [dB]       | -8.71                    | -8.39  | -8.67   | -8.74  | -8.91  | -9.24  | -8.71  | -8.36  | -8.52  | -8.64  | -8.99  | -8.67  | -8.27  |  |  |  |  |
| Gain <sub>0 Peak</sub> [dB] | -1.44                    | -0.64  | -0.37   | -0.63  | -0.37  | -0.65  | -0.36  | 0.54   | -0.28  | 0.34   | -0.30  | 0.07   | 0.26   |  |  |  |  |
| Gain <sub>0 Min</sub> [dB]  | -23.98                   | -33.03 | -24.69  | -26.71 | -33.66 | -24.07 | -26.58 | -26.67 | -23.49 | -24.28 | -27.77 | -30.61 | -33.48 |  |  |  |  |
| TRG <sub>0</sub> [dB]       | -3.89                    | -3.88  | -3.75   | -3.83  | -3.67  | -3.80  | -3.54  | -3.62  | -3.96  | -4.04  | -4.53  | -4.45  | -4.72  |  |  |  |  |
| Gain <sub>0 Peak</sub> [dB] | 2.09                     | 2.01   | 1.78    | 1.94   | 2.10   | 1.86   | 2.11   | 1.92   | 1.89   | 1.86   | 1.82   | 1.88   | 1.98   |  |  |  |  |
| Gain <sub>0 Min</sub> [dB]  | -20.50                   | -22.06 | -20.95  | -22.47 | -28.81 | -21.54 | -21.20 | -22.91 | -32.44 | -43.54 | -43.31 | -23.62 | -25.01 |  |  |  |  |
| UHRG [dB]                   | -5.97                    | -5.92  | -5.90   | -6.10  | -6.06  | -6.35  | -6.06  | -6.00  | -6.31  | -6.29  | -6.76  | -6.57  | -6.65  |  |  |  |  |
| UHRG/TRG [%]                | 46.62                    | 46.21  | 46.12   | 44.84  | 44.39  | 43.18  | 42.95  | 43.25  | 43.18  | 44.19  | 44.07  | 44.51  | 44.45  |  |  |  |  |
| H-Plane                     | -12.97                   | -12.98 | -13.49  | -14.02 | -14.26 | -13.87 | -12.88 | -11.49 | -10.99 | -10.85 | -11.42 | -11.14 | -10.52 |  |  |  |  |
| E1-Plane, AVG [dB]          | -9.81                    | -9.70  | -10.49  | -10.91 | -11.63 | -11.72 | -11.06 | -11.37 | -11.25 | -11.61 | -11.78 | -9.53  | -9.52  |  |  |  |  |
| E2-Plane, AVG [dB]          | -6.42                    | -5.97  | -6.19   | -6.16  | -6.35  | -6.84  | -6.58  | -6.38  | -6.54  | -6.13  | -6.37  | -6.15  | -6.11  |  |  |  |  |
| Peak Gain [dB]              | 2.17                     | 2.07   | 1.87    | 2.04   | 2.18   | 1.95   | 2.22   | 2.00   | 1.95   | 1.95   | 1.90   | 1.97   | 2.09   |  |  |  |  |
| Directivity [dB]            | 4.00                     | 3.73   | 3.35    | 3.72   | 3.91   | 3.64   | 3.85   | 3.44   | 3.60   | 3.67   | 3.97   | 3.98   | 4.30   |  |  |  |  |
| Minimum Gain [dB]           | -11.22                   | -10.55 | -12.56  | -13.96 | -14.18 | -13.10 | -13.70 | -16.01 | -16.72 | -13.97 | -13.72 | -13.38 | -10.56 |  |  |  |  |
| Test Condition              | FS                       |        |         |        |        |        |        |        |        |        |        |        |        |  |  |  |  |
| Antenna Type                |                          |        |         |        |        |        |        |        |        |        |        |        |        |  |  |  |  |
| Average Efficiency          | -2.70 dB                 |        | 53.75 % |        |        |        |        |        |        |        |        |        |        |  |  |  |  |



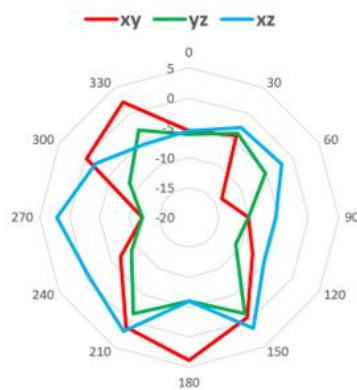
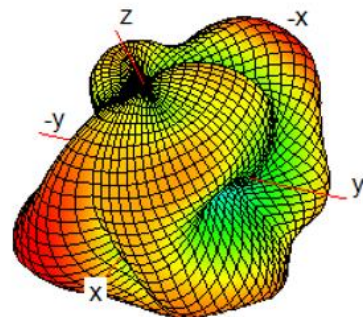
## 5.3 Radiation pattern



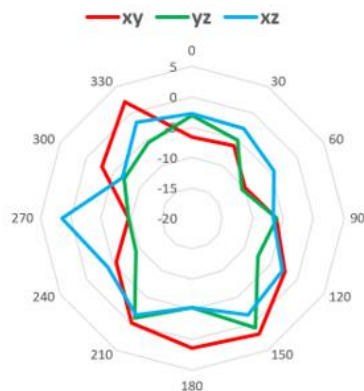
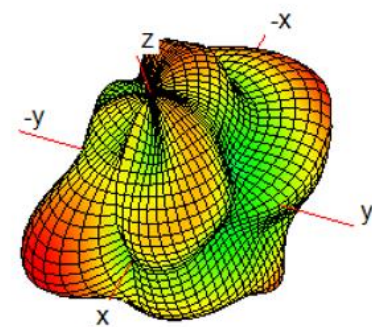
5925MHz



6525MHz



7125MHz





## 6. Environmental reliability test

| Test item                     | Test method                                                                                                                                                                                                                                                                                                                                                                       | Test Standard                                                                                                                                                                                                                                            | Test result | Number of samples |
|-------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------------------|
| High temperature and Humidity | <ol style="list-style-type: none"><li>1. Check the test surface to keep it clean and dry without bubbles and scratches.</li><li>2. T=60±2°C, RH=93±3%, test time 48 hours. After 48 hours, recover at room temperature for 2 hours, take out the product and inspect the appearance of the sample, check the mechanical properties, and test the electrical properties.</li></ol> | <ul style="list-style-type: none"><li>- No cracks, obvious deformation, falling off, RF test pass is qualified;</li><li>- When the tape is peeled off, the coating cannot be peeled off, otherwise it is judged NG.</li></ul>                            | Pass        | 10pcs             |
| High temperature storage      | <ol style="list-style-type: none"><li>1. Check the test surface to keep it clean and dry without bubbles and scratches.</li><li>2. The sample was placed in a precision constant temperature and humidity test chamber, and stored at 70°C±2°C for 72h. After the test, it was placed in room temperature for 2h to check the appearance of the product.</li></ol>                | <ul style="list-style-type: none"><li>- Parts without cracks, obvious deformation, falling off, paint adhesion test OK, RF test qualified;</li><li>- When the tape is peeled off, the coating cannot be peeled off, otherwise it is judged NG.</li></ul> | Pass        | 10pcs             |
| Low temperature storage       | <ol style="list-style-type: none"><li>1. Check the test surface to keep it clean and dry without bubbles and scratches.</li><li>2. The sample was placed in a precision constant temperature and humidity test chamber and stored at -40°C±2°C for 72h. After the test, it was placed in room temperature for 2 hours to check the appearance of the product.</li></ol>           | <ul style="list-style-type: none"><li>- Parts without cracks, obvious deformation, falling off, paint adhesion test OK, RF test qualified;</li><li>- When the tape is peeled off, the coating cannot be peeled off, otherwise it is judged NG.</li></ul> | Pass        | 10pcs             |
|                               |                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                          |             |                   |



|                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                       |      |       |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|
| Salt spray tester | <ol style="list-style-type: none"><li>1. Put the test sample into the salt spray tester.</li><li>2. Close the test chamber door and set the spray parameters. At <math>35^{\circ}\text{C}\pm 2^{\circ}\text{C}</math>, humidity <math>&gt;85\%</math>, pH value in the range of 6.5-7.2, with <math>5\%\pm 1\%</math> NaCl solution continuously sprayed 48h salt water,</li><li>3. After the above cycle, take out the product, rinse it with tap water, dry it at room temperature, and test the test surface.</li></ol> | - Inspect the surface of the specimen without any cracks, corrosion, foaming, obvious deformation, discoloration, wrinkling or poor overall shedding. | Pass | 10pcs |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|------|-------|