

HX-A04-2.4G Antenna Specification

Dongguan Hengxin Technology Inc.

Sample Approval Document

**Customer:**

**Product Name:** 2.4G Small SMA Rubber Duck Antenna

**Part No.:** HX-A04-2.4G

**Customer Part No.:**

**Sample Submission Date:**

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Approval Sign-Off

**Customer Approval**

**Supplier**

Engineering

QA Purchasing Approved by

Submitted by

Shougang Zhao

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Company Information

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**RoHS Compliant**

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1. Mechanical Drawing Summary

**Unit:** mm

**Material List:**

- Connector: Zinc Alloy, black plated
- Inner contact: Bronze, black plated
- Housing: PA+ABS, black
- Boot: TPE, black

**Tolerance:**  $\pm 0.5$  mm,  $\pm 1$  mm

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## 2. Reliability Test

| Test Item                     | Procedure                                 | Requirement                                                                                                                |
|-------------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| 1. Visual & Dimensional Check | 5× magnification                          | Conform to drawing                                                                                                         |
| 2. Temperature Cycling        | -40°C (30 min) ↔ 90°C (30 min), 24 cycles | After 2 h recovery: <ul style="list-style-type: none"><li>• No visible damage</li><li>• Freq. Tolerance &lt; ±5%</li></ul> |
| 3. Damp Heat                  | 60°C, 90–95% RH, 24 h                     | After 2 h recovery: <ul style="list-style-type: none"><li>• No visible damage</li><li>• Freq. Tolerance &lt; ±5%</li></ul> |
| 4. High Temp. Endurance       | 90°C, 24 h                                | After 2 h recovery: <ul style="list-style-type: none"><li>• No visible damage</li><li>• Freq. Tolerance &lt; ±5%</li></ul> |

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## 3. Electrical Specification

| Item                  | Specification   |
|-----------------------|-----------------|
| Frequency Range       | 2400 – 2500 MHz |
| VSWR                  | ≤ 2.0           |
| Antenna Gain          | 2 – 3 dBi       |
| Impedance             | 50 Ω            |
| Radiator Material     | Copper (Plated) |
| Connector Type        | R-SMA Reverse   |
| Operating Temperature | -30°C ~ +85°C   |
| Storage Temperature   | -30°C ~ +85°C   |

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## 4. S-Parameter Test Data

### Test Conditions:

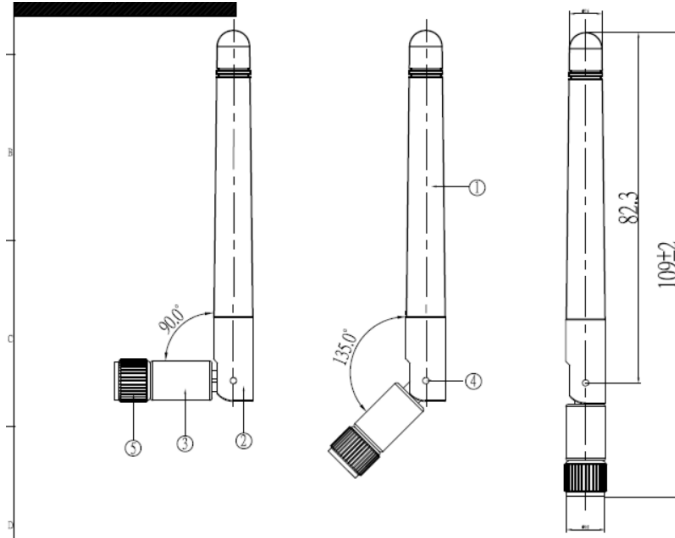
Start: 2 GHz • Stop: 3 GHz • IFBW: 30 kHz

- Tr1: S11 Log Mag, 10.00 dB / Ref 0.000 dB
  - Tr2: S11 Smith Chart (R+j, Scale 1.000)
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## 5. Antenna Radiation Pattern

## Test Equipment

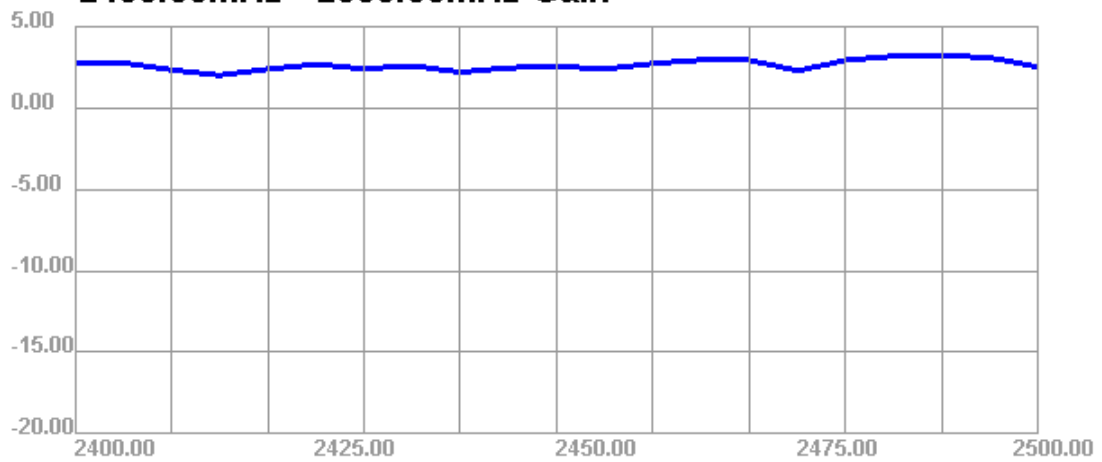
- Anechoic Chamber: 8 m × 4 m × 4 m
- Quiet Zone: 600 mm @ 1 GHz
- Isolation: > 100 dB @ 1 MHz – 10 GHz
- Instrument: Agilent 5071B
- Receive Antenna: 0.7 – 6.0 GHz (gain calibration)
- Antenna Type: Double Ridged Horn Antenna
- Test Setup: DUT ↔ Standard Gain Antenna ↔ Turntable ↔ Port1 / Port2



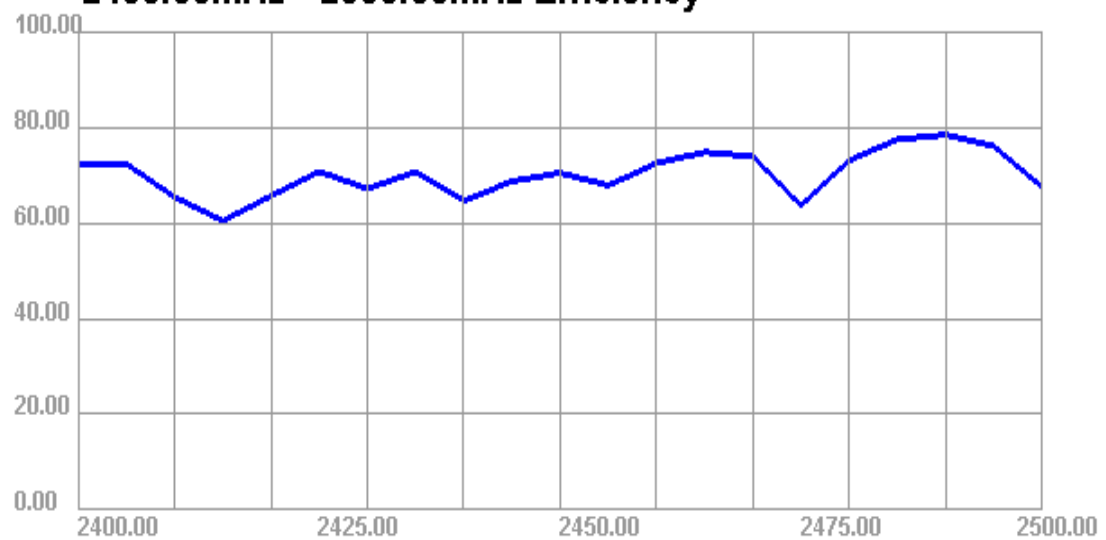
| Passive Test For 2400–2500 |             |              |               |               |            |            |             |             |                      |                    |              |              |
|----------------------------|-------------|--------------|---------------|---------------|------------|------------|-------------|-------------|----------------------|--------------------|--------------|--------------|
| Freq<br>(MHz)              | Effi<br>(%) | Effi<br>(dB) | Gain<br>(dBi) | Gain<br>(dBd) | UHS<br>(%) | DHS<br>(%) | Max<br>(dB) | Min<br>(dB) | Directivity<br>(dBi) | Beamwidth<br>(3dB) | AttH<br>(dB) | AttV<br>(dB) |
| 2400                       | 72.53       | -1.39        | 2.8           | 0.65          | 46.546     | 25.983     | 2.8         | -22.62      | 4.2                  | 30                 | 45.1         | 45.07        |
| 2405                       | 72.39       | -1.4         | 2.77          | 0.62          | 47.006     | 25.384     | 2.77        | -22.75      | 4.18                 | 30                 | 45.06        | 45.11        |
| 2410                       | 65.48       | -1.84        | 2.33          | 0.18          | 43.125     | 22.353     | 2.33        | -23.47      | 4.17                 | 30                 | 44.88        | 44.83        |
| 2415                       | 60.46       | -2.18        | 2.01          | -0.14         | 40.2       | 20.265     | 2.01        | -23.49      | 4.19                 | 30                 | 44.54        | 44.42        |
| 2420                       | 65.65       | -1.83        | 2.38          | 0.23          | 43.893     | 21.76      | 2.38        | -22.66      | 4.21                 | 30                 | 44.83        | 44.71        |
| 2425                       | 70.78       | -1.5         | 2.68          | 0.53          | 47.584     | 23.197     | 2.68        | -22.03      | 4.18                 | 30                 | 45.16        | 44.97        |
| 2430                       | 67.22       | -1.73        | 2.4           | 0.25          | 45.462     | 21.756     | 2.4         | -22         | 4.13                 | 30                 | 45.16        | 44.88        |
| 2435                       | 70.7        | -1.51        | 2.58          | 0.43          | 47.848     | 22.851     | 2.58        | -21.33      | 4.09                 | 30                 | 45.46        | 45.22        |
| 2440                       | 64.68       | -1.89        | 2.19          | 0.04          | 43.459     | 21.219     | 2.19        | -21         | 4.08                 | 30                 | 45.17        | 44.94        |
| 2445                       | 68.72       | -1.63        | 2.46          | 0.31          | 45.856     | 22.862     | 2.46        | -20.57      | 4.09                 | 30                 | 45.58        | 45.21        |
| 2450                       | 70.51       | -1.52        | 2.55          | 0.4           | 46.874     | 23.632     | 2.55        | -20.15      | 4.07                 | 30                 | 45.89        | 45.33        |
| 2455                       | 67.89       | -1.68        | 2.38          | 0.23          | 45.004     | 22.885     | 2.38        | -20         | 4.07                 | 30                 | 45.81        | 45.29        |
| 2460                       | 72.5        | -1.4         | 2.72          | 0.57          | 47.973     | 24.526     | 2.72        | -19.75      | 4.12                 | 30                 | 45.86        | 45.53        |
| 2465                       | 74.85       | -1.26        | 2.94          | 0.79          | 49.636     | 25.21      | 2.94        | -19.52      | 4.2                  | 30                 | 45.81        | 45.56        |
| 2470                       | 73.91       | -1.31        | 2.94          | 0.79          | 49.379     | 24.528     | 2.94        | -19.43      | 4.25                 | 30                 | 45.69        | 45.39        |
| 2475                       | 63.68       | -1.96        | 2.28          | 0.13          | 43.03      | 20.652     | 2.28        | -19.71      | 4.24                 | 30                 | 45.15        | 44.84        |

|      |       |       |      |      |        |        |      |        |      |    |       |       |
|------|-------|-------|------|------|--------|--------|------|--------|------|----|-------|-------|
| 2480 | 73.13 | -1.36 | 2.91 | 0.76 | 49.929 | 23.205 | 2.91 | -18.64 | 4.27 | 30 | 45.73 | 45.51 |
| 2485 | 77.51 | -1.11 | 3.18 | 1.03 | 53.473 | 24.033 | 3.18 | -18.13 | 4.29 | 30 | 45.91 | 45.78 |
| 2490 | 78.49 | -1.05 | 3.23 | 1.08 | 54.76  | 23.73  | 3.23 | -18.01 | 4.28 | 30 | 45.96 | 45.84 |
| 2495 | 76.06 | -1.19 | 3.08 | 0.93 | 53.567 | 22.492 | 3.08 | -17.98 | 4.27 | 30 | 45.85 | 45.72 |
| 2500 | 67.53 | -1.71 | 2.51 | 0.36 | 47.912 | 19.618 | 2.51 | -18.25 | 4.22 | 30 | 45.47 | 45.3  |

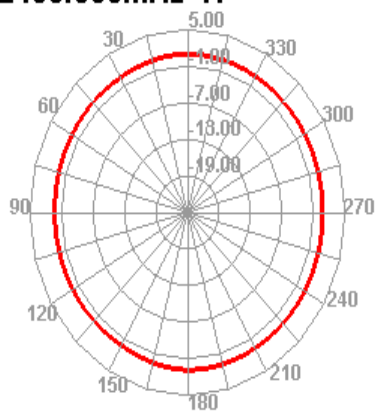
**2400.00MHz - 2500.00MHz Gain**



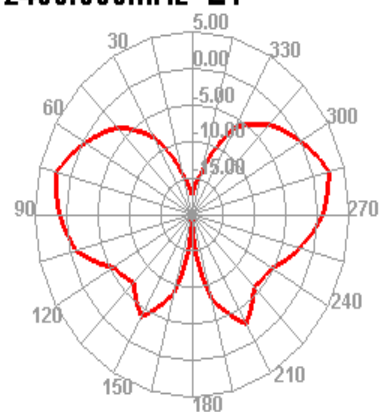
**2400.00MHz - 2500.00MHz Efficiency**



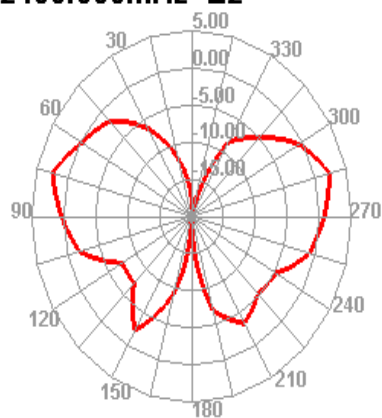
**2400.000MHz H**



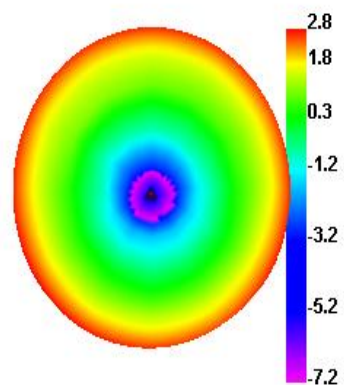
**2400.000MHz E1**



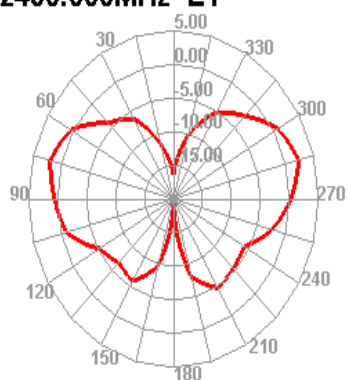
2400.000MHz E2



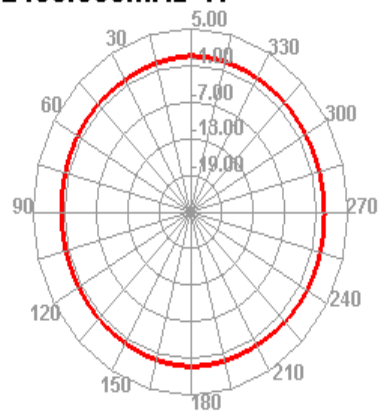
2400.000MHz



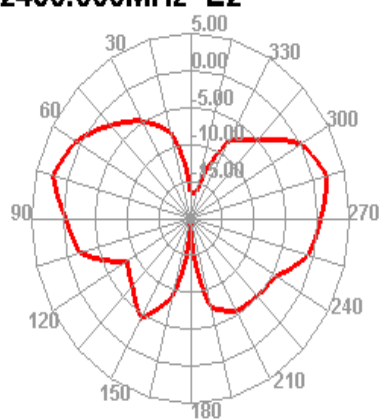
2450.000MHz E1



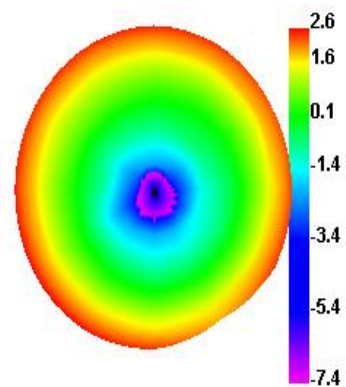
2450.000MHz H



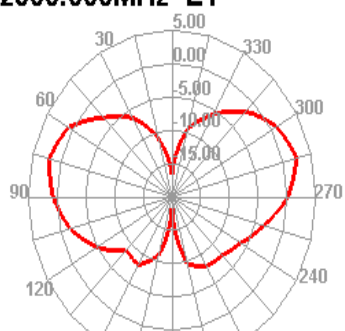
2450.000MHz E2



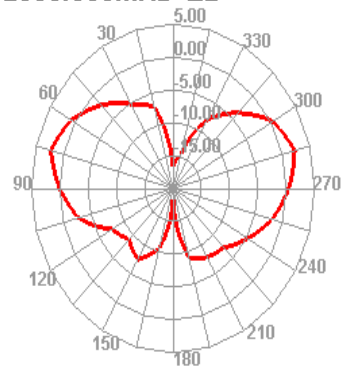
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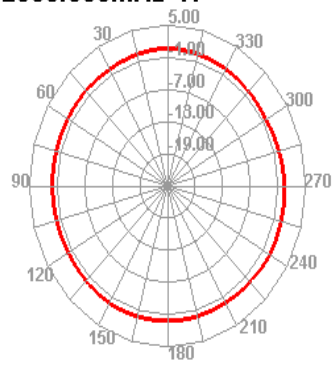
2500.000MHz E1



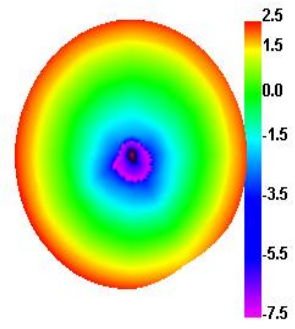
2500.000MHz E2



2500.000MHz H



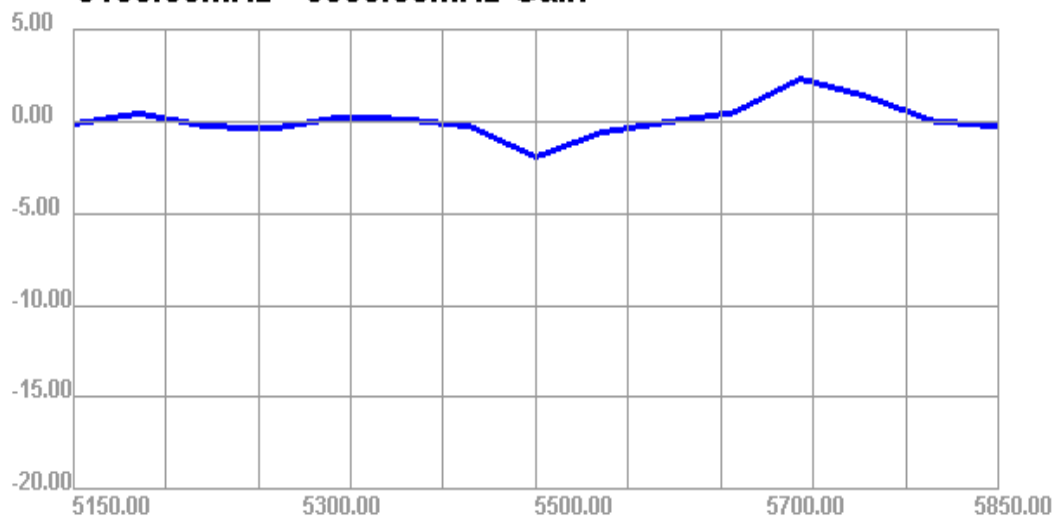
2500.000MHz



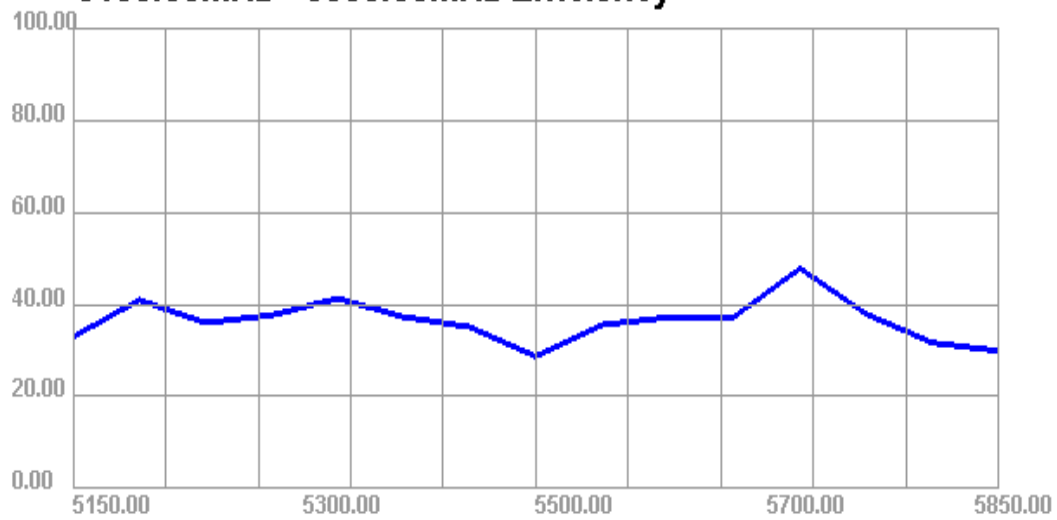
| Application Information |              |
|-------------------------|--------------|
| 04Version               | 5.243.347    |
| TotalTime               | 7m 59s 653ms |
| AdditionalInfor         | NULL         |

| Passive Test For 5 |             |              |               |               |            |            |             |             |                      |                    |              |              |
|--------------------|-------------|--------------|---------------|---------------|------------|------------|-------------|-------------|----------------------|--------------------|--------------|--------------|
| Freq<br>(MHz)      | Effi<br>(%) | Effi<br>(dB) | Gain<br>(dBi) | Gain<br>(dBd) | UHS<br>(%) | DHS<br>(%) | Max<br>(dB) | Min<br>(dB) | Directivity<br>(dBi) | Beamwidth<br>(3dB) | AttH<br>(dB) | AttV<br>(dB) |
| 5150               | 32.97       | -4.82        | -0.15         | -2.3          | 22.751     | 10.217     | -0.15       | -13.31      | 4.67                 | 15                 | 57.23        | 57.91        |
| 5200               | 40.98       | -3.87        | 0.43          | -1.72         | 27.542     | 13.441     | 0.43        | -15.8       | 4.3                  | 15                 | 55.42        | 55.3         |
| 5250               | 36.03       | -4.43        | -0.26         | -2.41         | 22.807     | 13.228     | -0.26       | -17.71      | 4.18                 | 15                 | 54.15        | 53.97        |
| 5300               | 37.64       | -4.24        | -0.41         | -2.56         | 22.56      | 15.078     | -0.41       | -21.84      | 3.83                 | 15                 | 53.82        | 53.7         |
| 5350               | 41.34       | -3.84        | 0.2           | -1.95         | 24.208     | 17.132     | 0.2         | -21.79      | 4.03                 | 0                  | 53.14        | 53.38        |
| 5400               | 37.31       | -4.28        | 0.12          | -2.03         | 21.837     | 15.47      | 0.12        | -26.23      | 4.41                 | 0                  | 52.63        | 53.03        |
| 5450               | 35.11       | -4.55        | -0.27         | -2.42         | 20.438     | 14.674     | -0.27       | -22.69      | 4.27                 | 0                  | 52.38        | 52.78        |
| 5500               | 28.72       | -5.42        | -1.94         | -4.09         | 16.569     | 12.153     | -1.94       | -19.2       | 3.48                 | 0                  | 51.95        | 52.78        |
| 5550               | 35.55       | -4.49        | -0.6          | -2.75         | 20.653     | 14.901     | -0.6        | -20.16      | 3.89                 | 0                  | 53.27        | 53.95        |
| 5600               | 37.21       | -4.29        | -0.03         | -2.18         | 21.904     | 15.304     | -0.03       | -33.12      | 4.26                 | 0                  | 53.12        | 53.77        |
| 5650               | 37.35       | -4.28        | 0.48          | -1.67         | 22.343     | 15.009     | 0.48        | -23.84      | 4.76                 | 0                  | 53.21        | 53.94        |
| 5700               | 47.85       | -3.2         | 2.31          | 0.16          | 28.836     | 19.013     | 2.31        | -20.91      | 5.51                 | 0                  | 54.71        | 55.69        |
| 5750               | 37.91       | -4.21        | 1.36          | -0.79         | 22.494     | 15.418     | 1.36        | -21.1       | 5.57                 | 0                  | 54.11        | 55.14        |
| 5800               | 31.69       | -4.99        | 0.03          | -2.12         | 17.949     | 13.746     | 0.03        | -18.12      | 5.02                 | 0                  | 54.19        | 54.94        |
| 5850               | 29.91       | -5.24        | -0.28         | -2.43         | 15.992     | 13.922     | -0.28       | -18.13      | 4.96                 | 0                  | 54.47        | 55.21        |

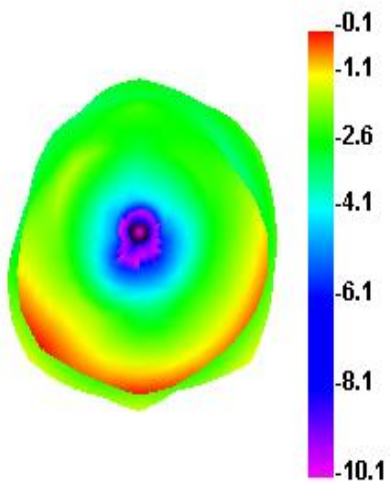
**5150.00MHz - 5850.00MHz Gain**



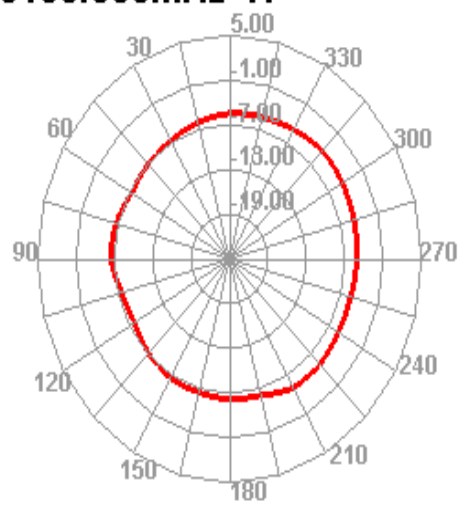
**5150.00MHz - 5850.00MHz Efficiency**



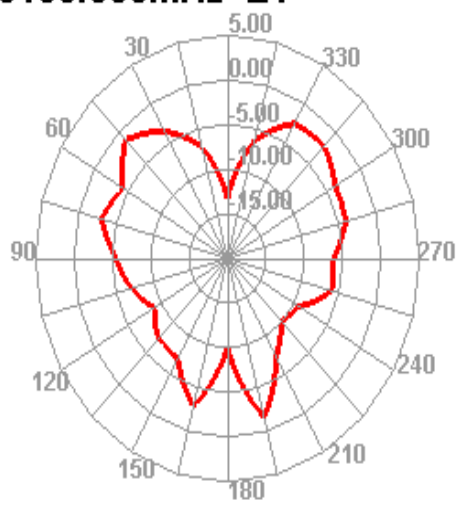
**5150.000MHz**



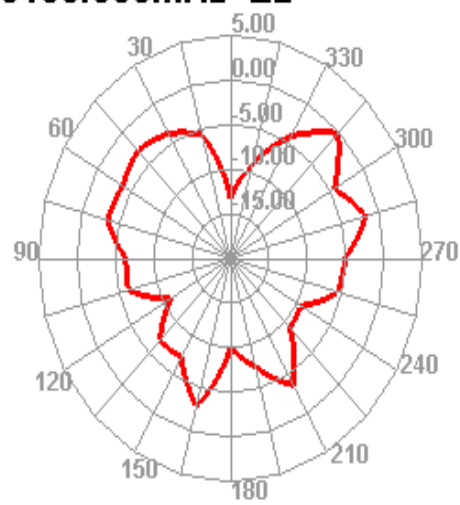
**5150.000MHz H**



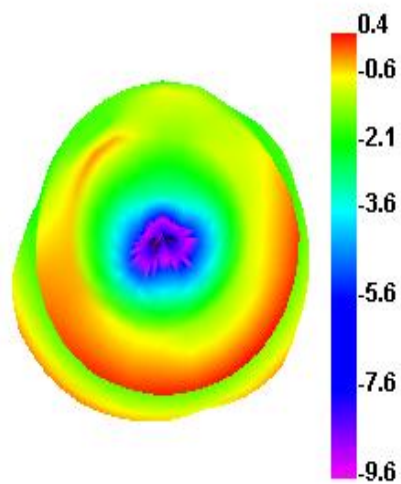
**5150.000MHz E1**



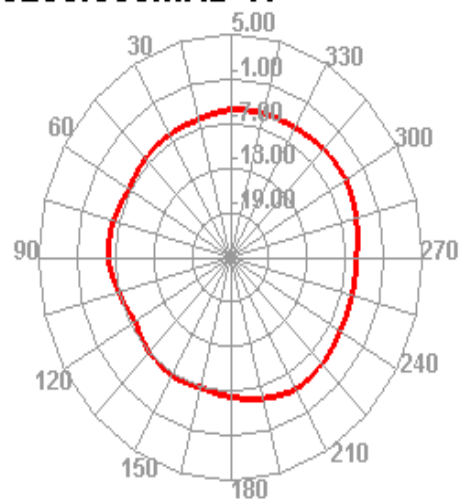
**5150.000MHz E2**



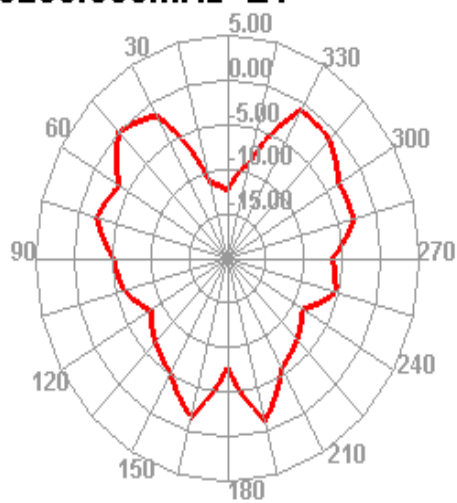
**5200.000MHz**



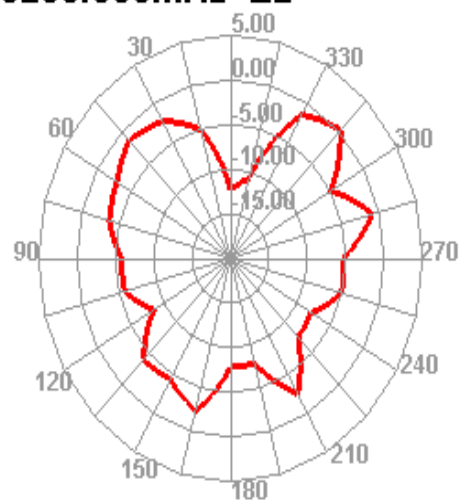
**5200.000MHz H**



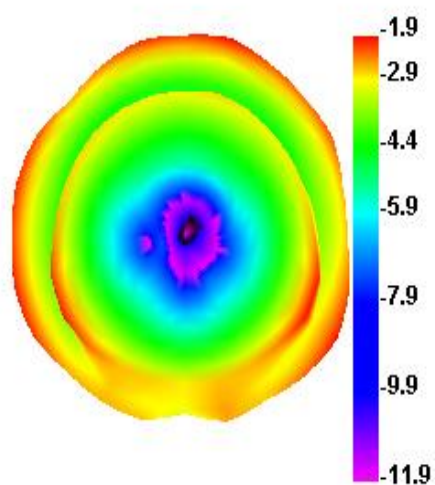
**5200.000MHz E1**



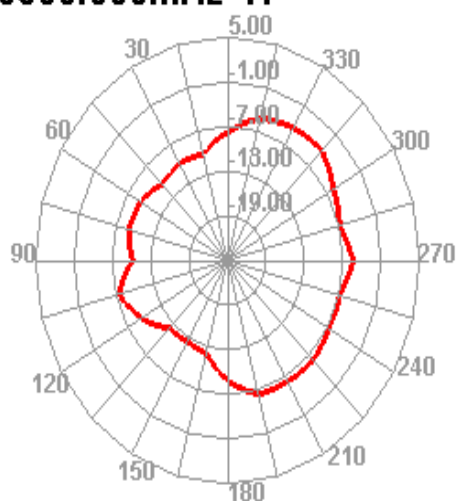
**5200.000MHz E2**



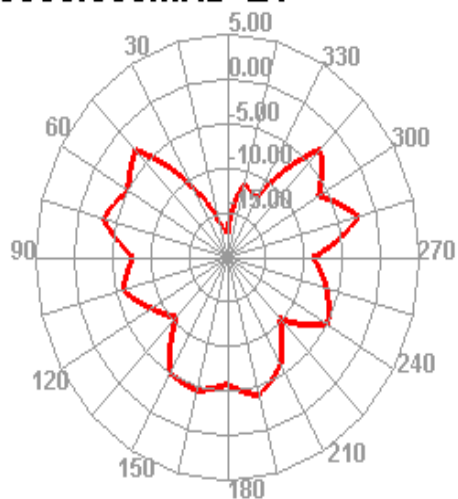
5500.000MHz



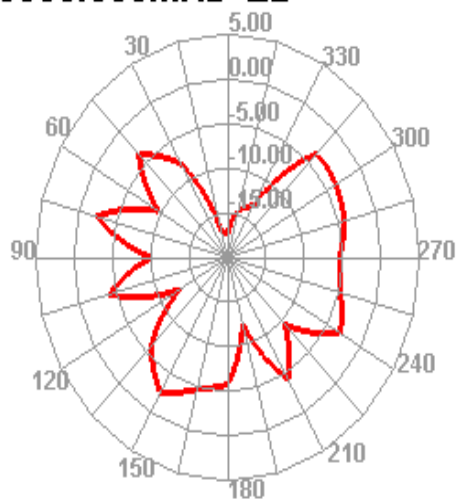
5500.000MHz H



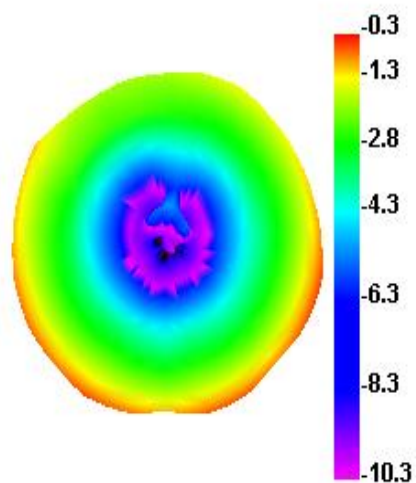
5500.000MHz E1



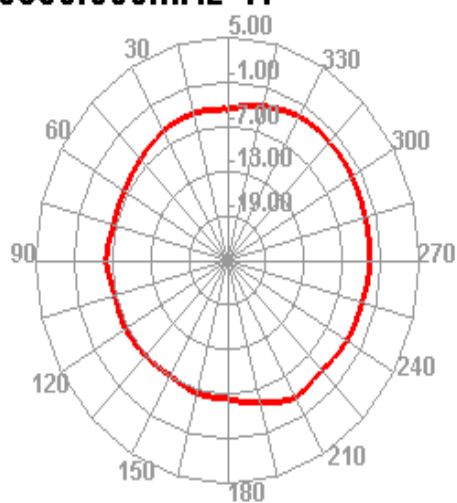
5500.000MHz E2



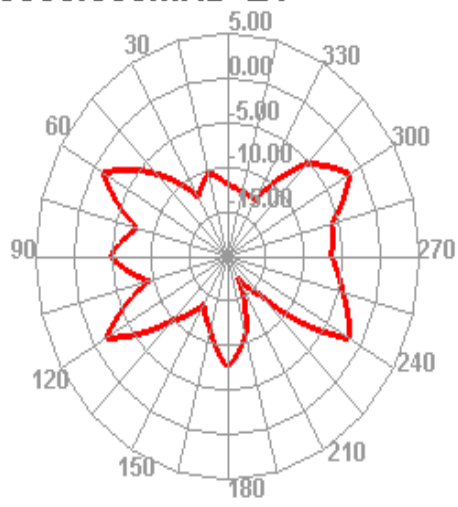
5850.000MHz



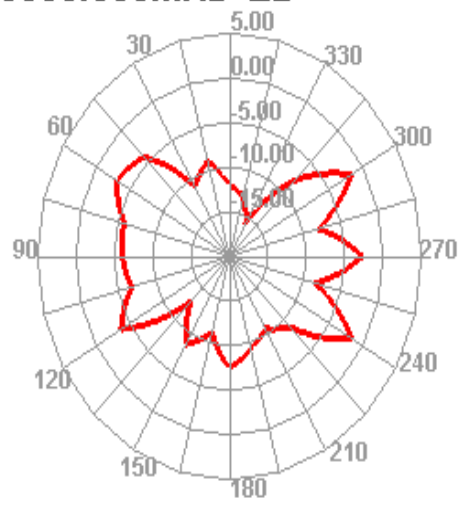
5850.000MHz H



**5850.000MHz E1**



**5850.000MHz E2**



-END-