



# 深圳市亿铭远科技有限公司

Shenzhen Yimingyuan Technology Co., Ltd

Industry leading manufacturer of one-stop  
communication RF antenna solutions

## Antenna Debugging Report

customer: thermodynamic

Project Name: Hakushu (OnboardPCB ANT)

RF Engineer: Xu Long

cell-phone number: 15915343126

Report Version: 2024.04.24

Antenna Manufacturer Company: Heatmoving

Comapny Address: NO 28 Jingyuling Rd Dongcheng Dongguan Guangdong China

行业领先的一站式通信射频天线解决方案制造商

One stop communication RF antenna solution manufacturer



# catalogue

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# Introduction to Project Debugging

## Introduction to Project Debugging

|                  |                  |                |                         |                |              |             |               |
|------------------|------------------|----------------|-------------------------|----------------|--------------|-------------|---------------|
| Plate type       | complete machine |                |                         |                |              |             |               |
| Antenna Overview | Main antenna     | Frequency band |                         | Antenna status | Antenna form | Design Area | Match changes |
|                  |                  | 2G             | N/A                     | sample         | PIFA         |             | nothing       |
|                  |                  | 3G             |                         |                |              |             |               |
|                  |                  | 4G             | N/A                     |                |              |             |               |
|                  |                  | 5G             | N/A                     |                |              |             |               |
|                  | Other antennas   | BT/WIFI        | 2.4G                    |                | Onboard      |             | nothing       |
|                  |                  | GPS            | N/A                     |                |              |             | nothing       |
|                  |                  | diversity      | N/A                     |                |              |             | nothing       |
| Prototype status | HaKushu          |                | Environmental treatment | nothing        |              |             |               |

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# Summary of Report Version

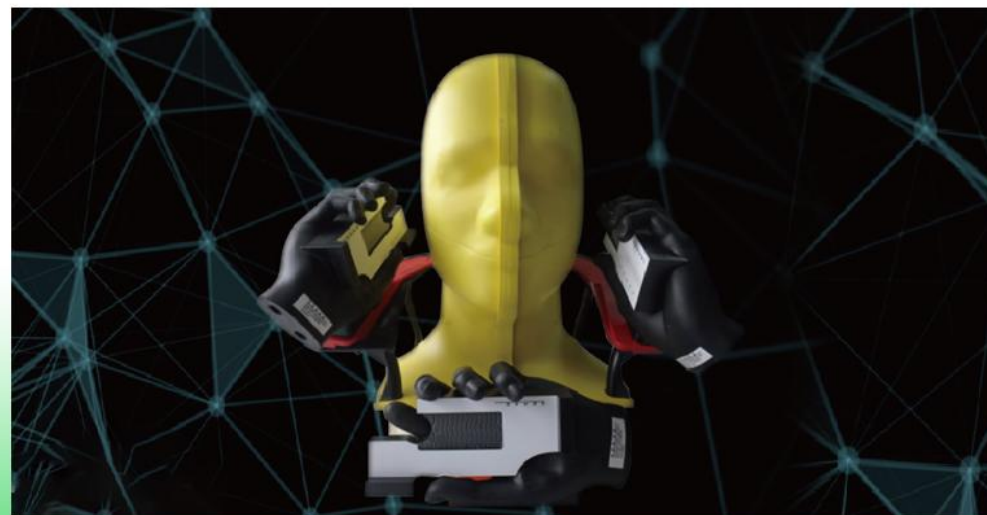
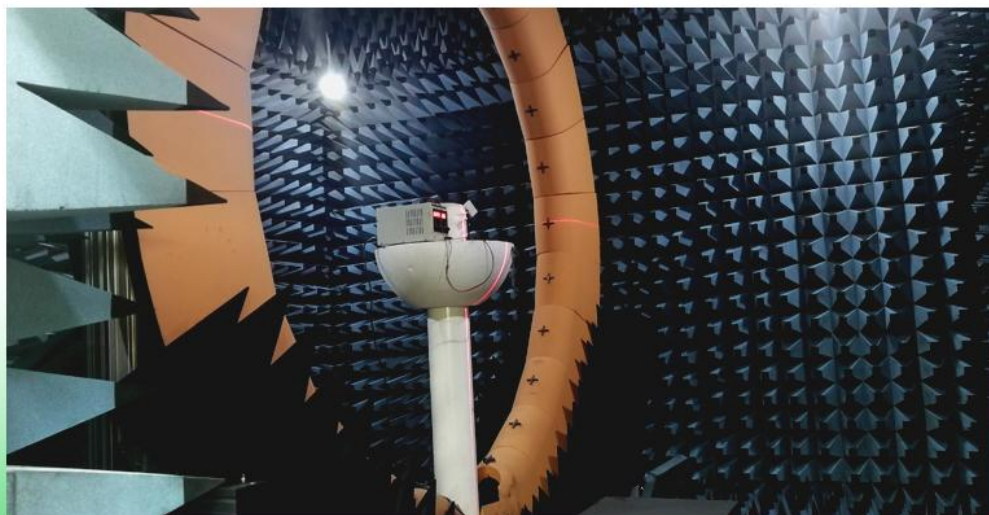
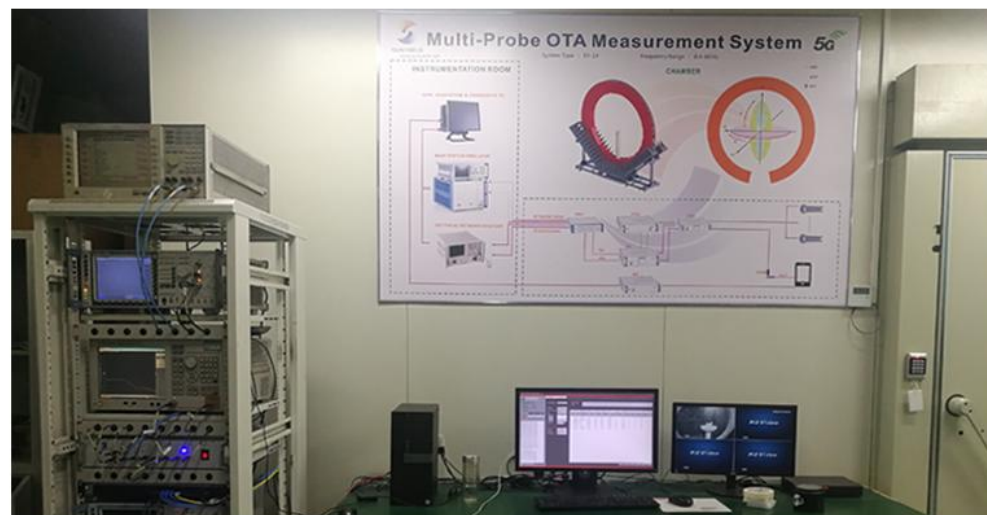
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| edition | date     | Content Overview            |
|---------|----------|-----------------------------|
| Hakushu | 20240424 | Onboard antenna test report |
|         |          |                             |
|         |          |                             |
|         |          |                             |
|         |          |                             |
|         |          |                             |
|         |          |                             |
|         |          |                             |
|         |          |                             |



Yimingyuan Technology

Project development environment



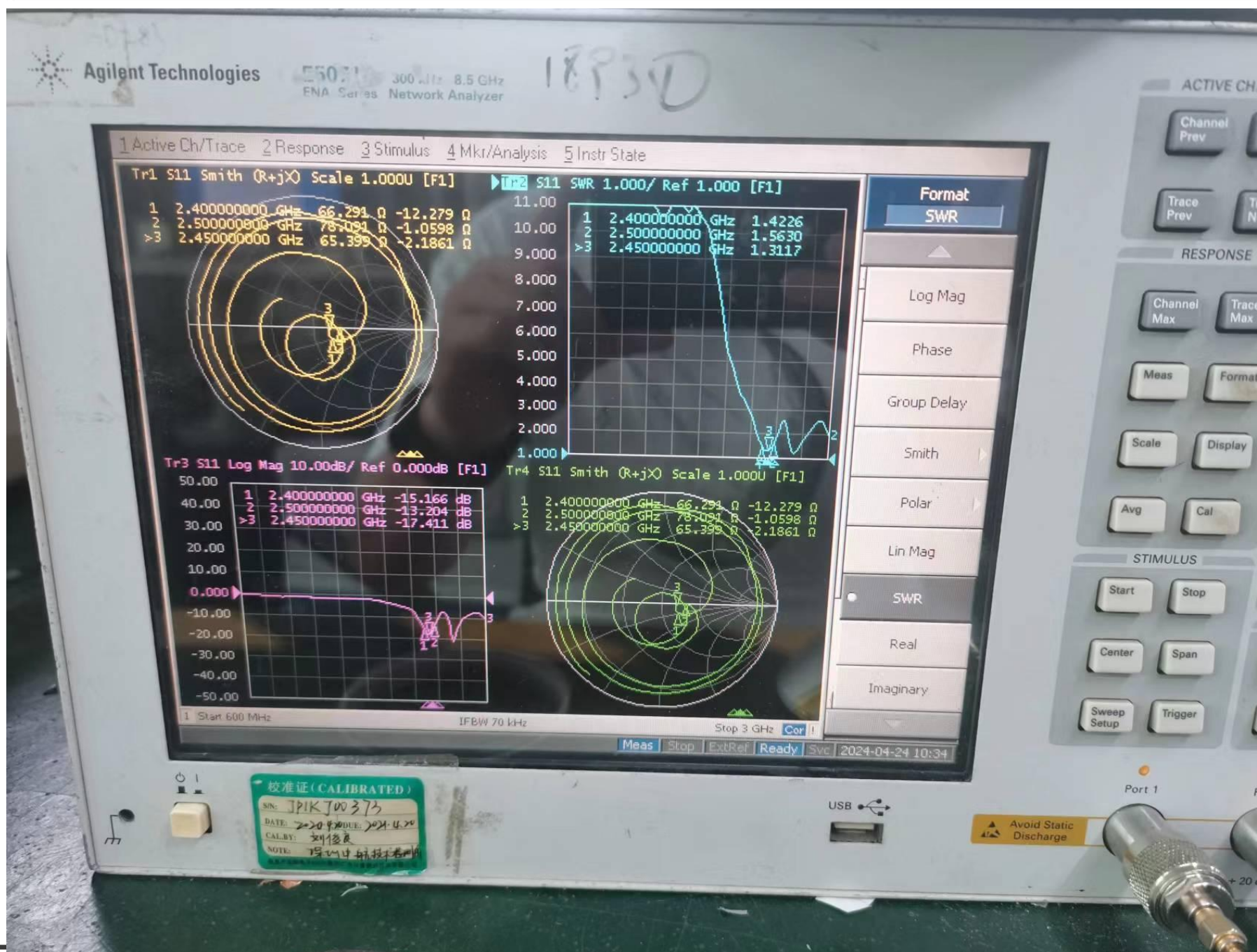
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“质量第一，服务至上”是亿铭远一直以来的发展宗旨

携手共进 共创未来



## Antenna Smith Circle Diagram and S11 Parameters





# Antenna efficiency

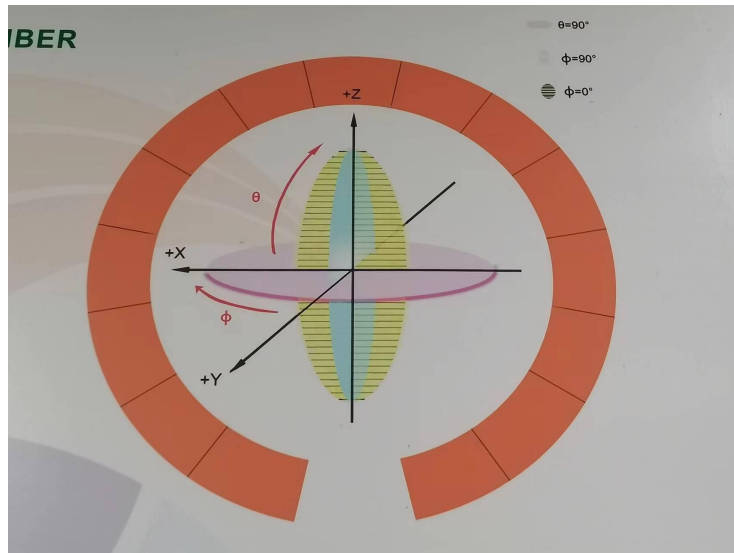
| Gain&Efficiency&PhaseCenter<br>增益、效率和相位中心 |                 |                      |                     |
|-------------------------------------------|-----------------|----------------------|---------------------|
| frequency<br>频率(MHz)                      | gain<br>增益(dBi) | efficiency<br>效率(dB) | efficiency<br>效率(%) |
| 2402                                      | 3.9             | -3.71                | 42.52               |
| 2410                                      | 3.85            | -3.49                | 44.75               |
| 2416                                      | 4.34            | -3.17                | 48.19               |
| 2422                                      | 4.57            | -3.13                | 48.68               |
| 2428                                      | 4.49            | -3.41                | 45.56               |
| 2434                                      | 4.43            | -3.49                | 44.82               |
| 2440                                      | 4.29            | -3.47                | 45.03               |
| 2446                                      | 4.18            | -3.57                | 43.94               |
| 2454                                      | 4.35            | -3.61                | 43.59               |
| 2460                                      | 4.48            | -3.63                | 43.39               |
| 2466                                      | 4.08            | -3.91                | 40.6                |
| 2472                                      | 3.91            | -3.94                | 40.33               |
| 2480                                      | 3.85            | -3.96                | 40.17               |

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# Z、X、Y Physical picture

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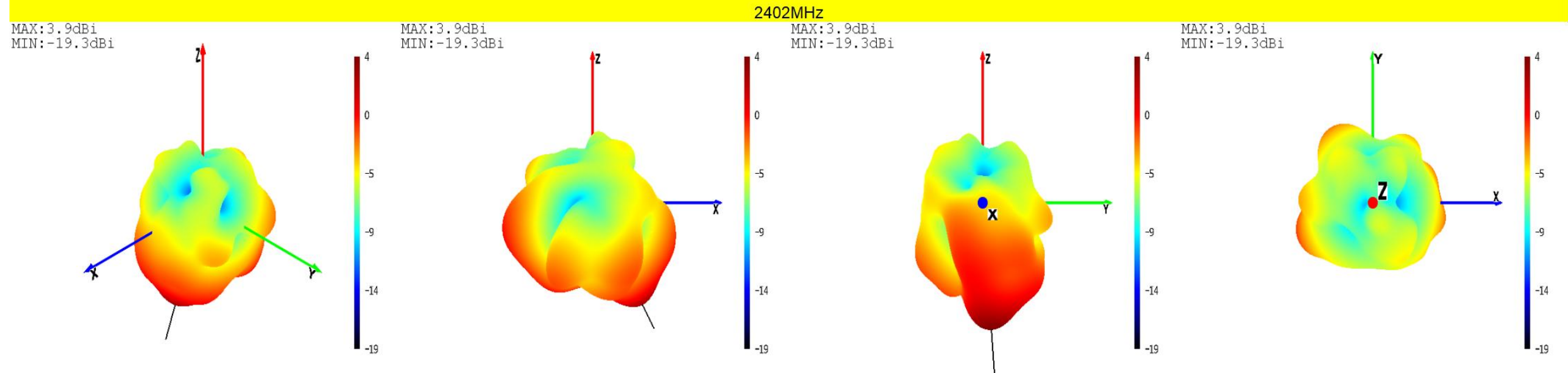


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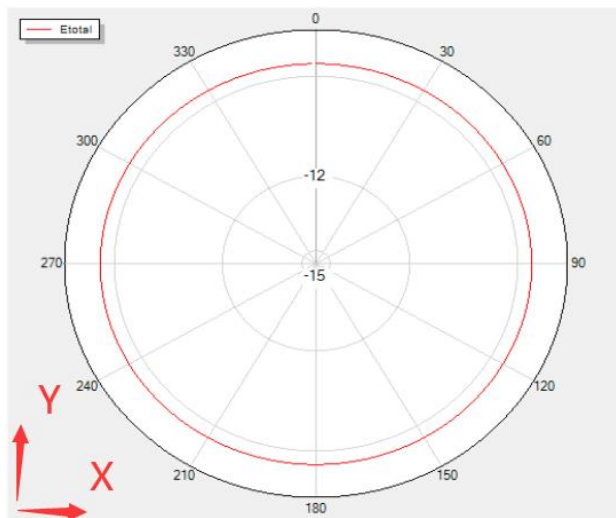
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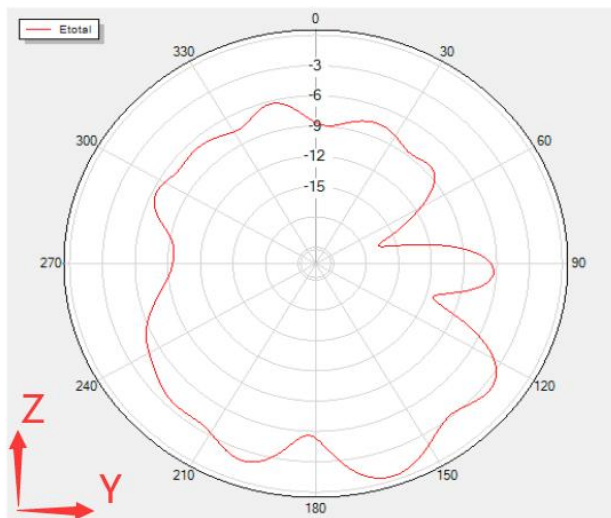
# Antenna apple diagram and directional diagram



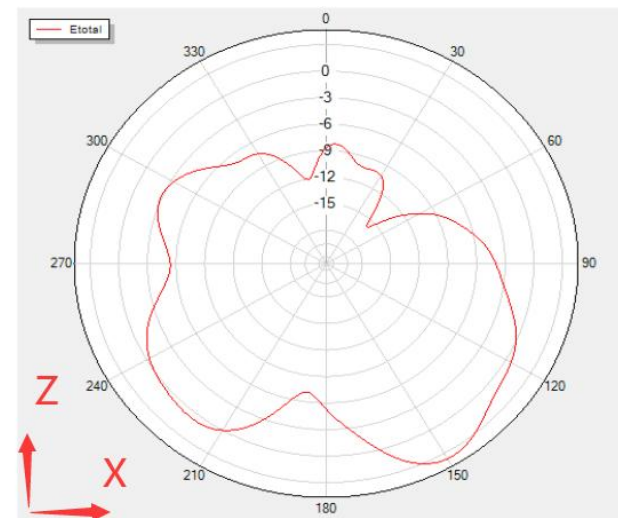
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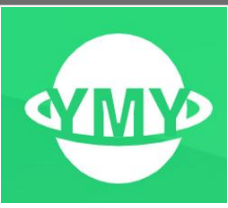
Phi=90 Freq=2402MHz



Phi=0 Freq=2402MHz



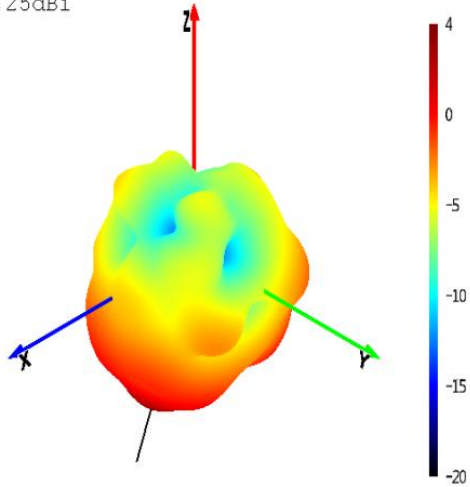
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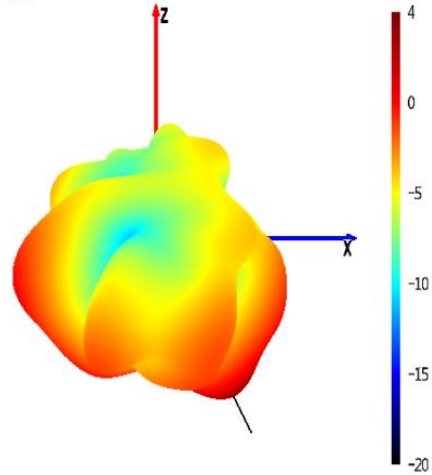
# Antenna apple diagram and directional diagram

2410MHz

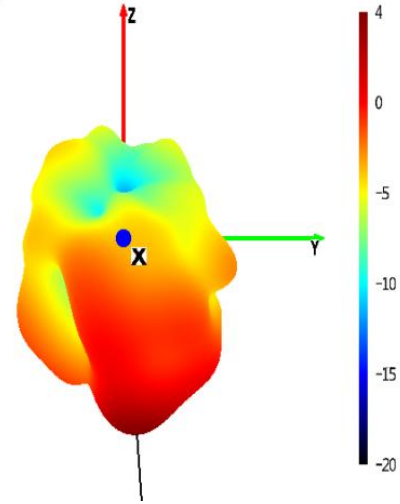
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MIN:-20.25dBi



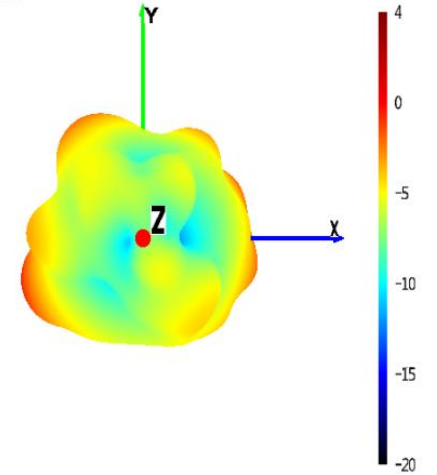
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MIN:-20.25dBi



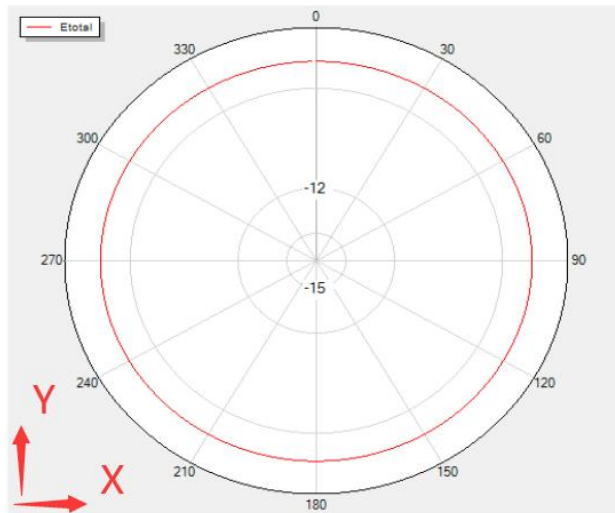
MAX:3.85dBi  
MIN:-20.25dBi



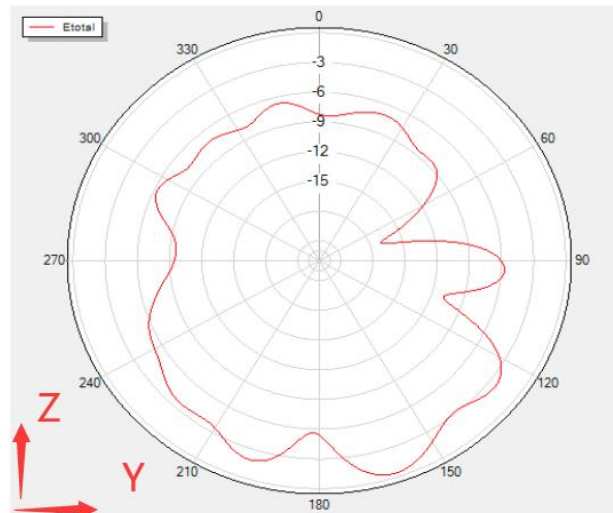
MAX:3.85dBi  
MIN:-20.25dBi



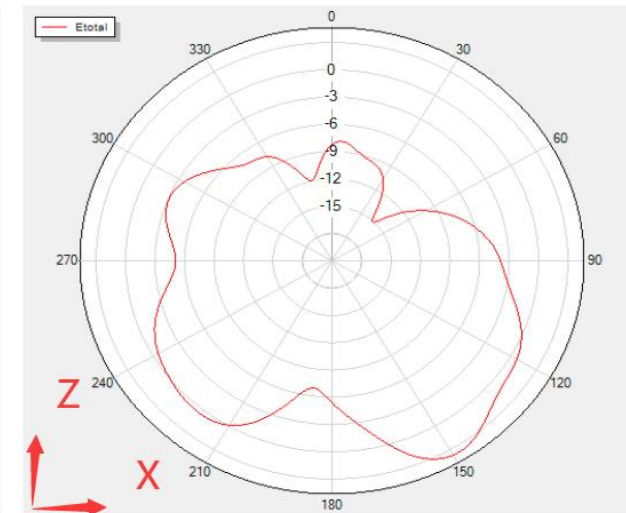
Theta=0 Freq=2410MHz



Phi=90 Freq=2410MHz



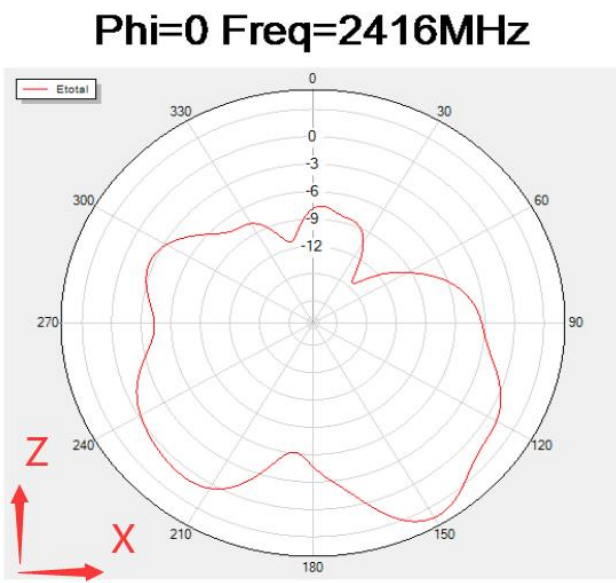
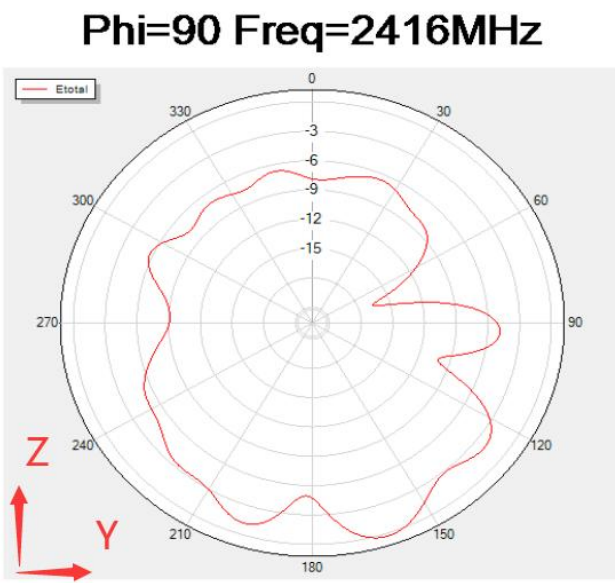
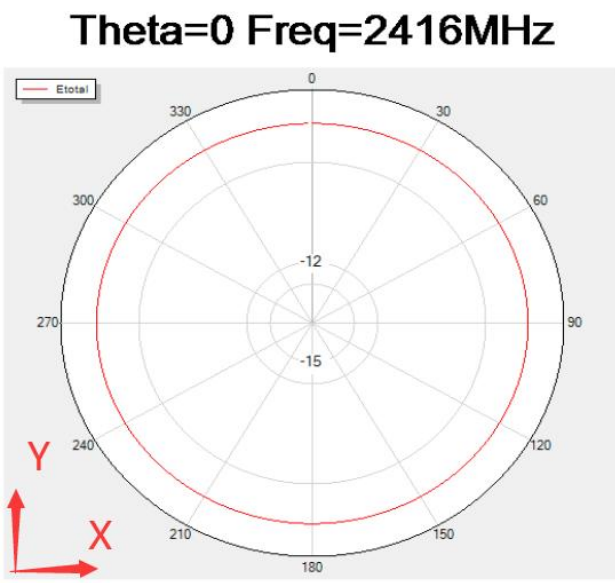
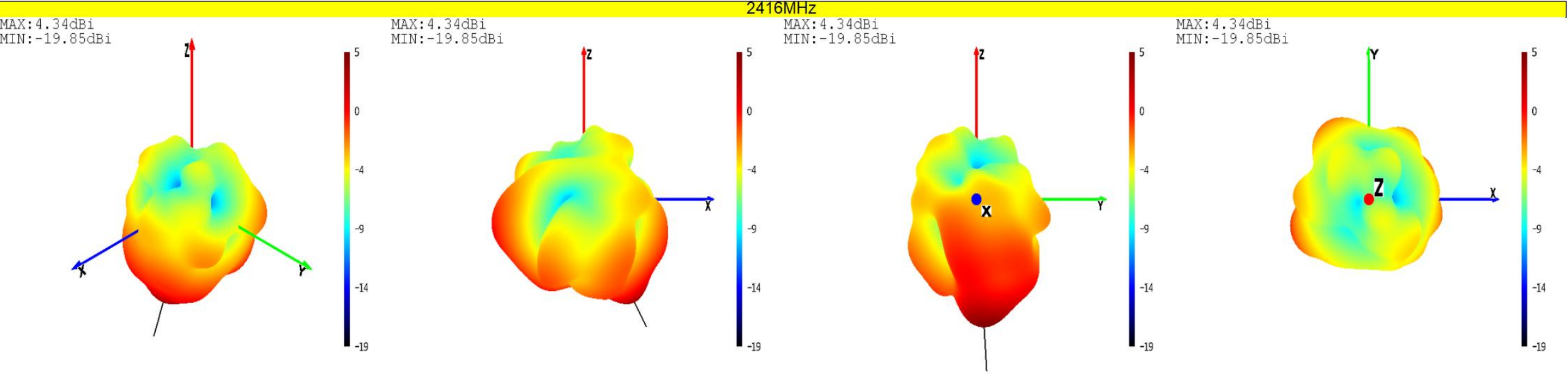
Phi=0 Freq=2410MHz



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# Antenna apple diagram and directional diagram



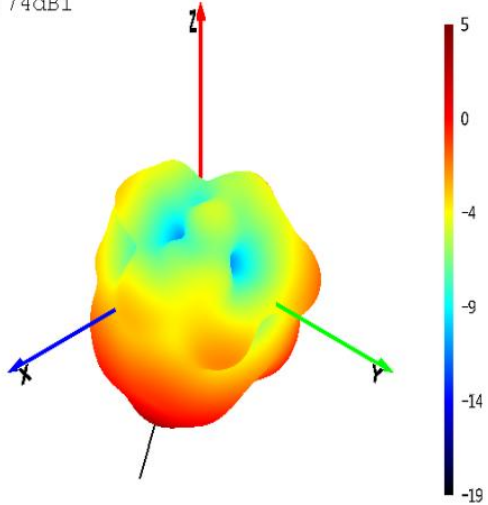
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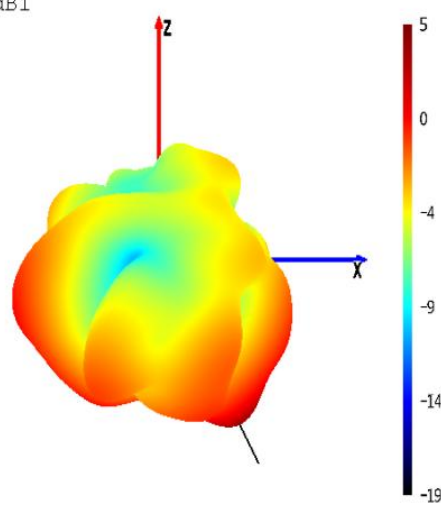
# Antenna apple diagram and directional diagram

2422MHz

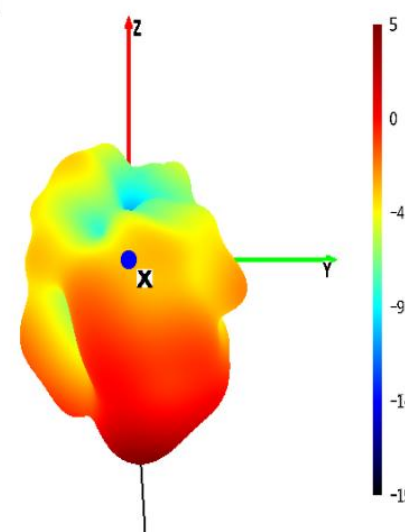
MAX: 4.57dBi  
MIN: -19.74dBi



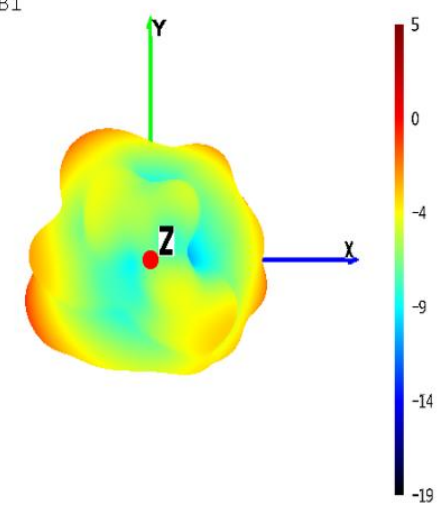
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MIN: -19.74dBi



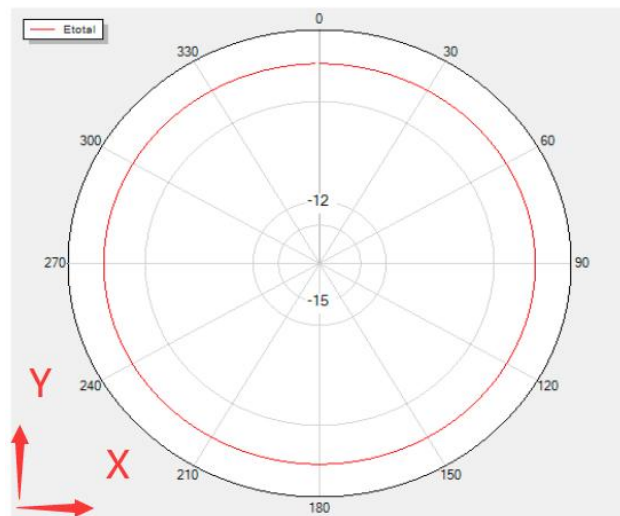
MAX: 4.57dBi  
MIN: -19.74dBi



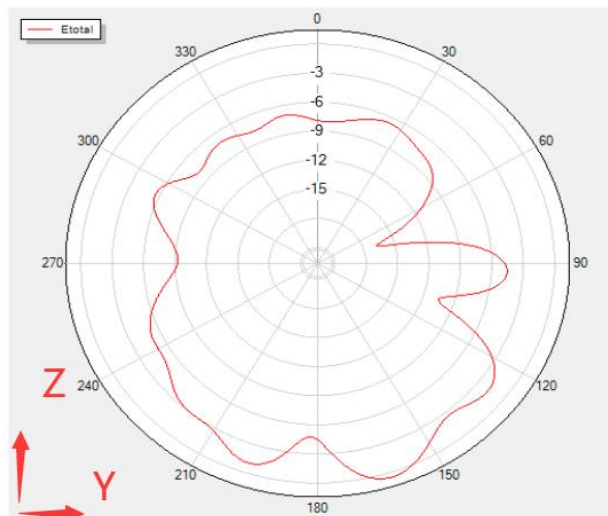
MAX: 4.57dBi  
MIN: -19.74dBi



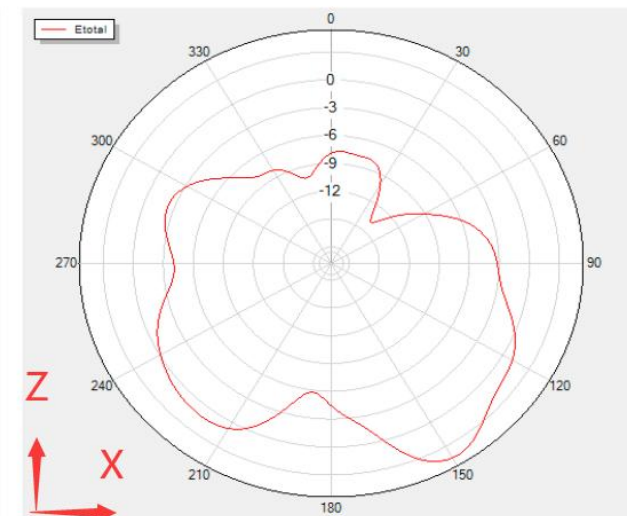
Theta=0 Freq=2422MHz



Phi=90 Freq=2422MHz



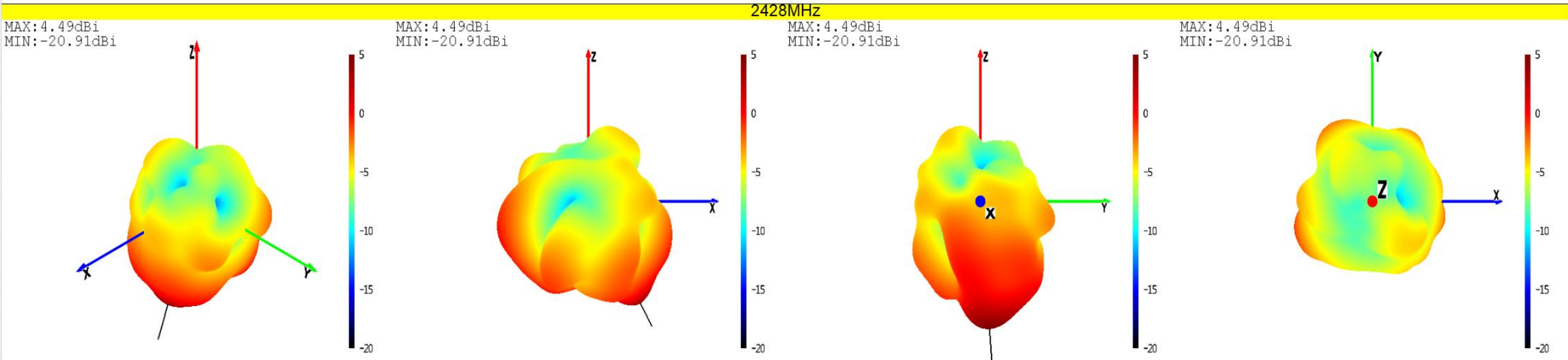
Phi=0 Freq=2422MHz



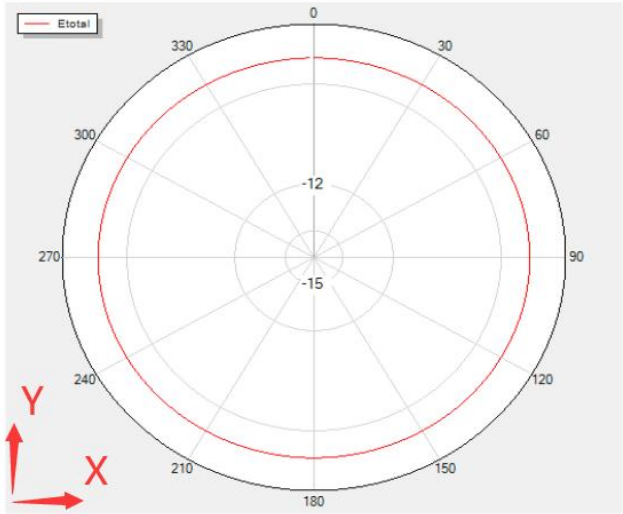
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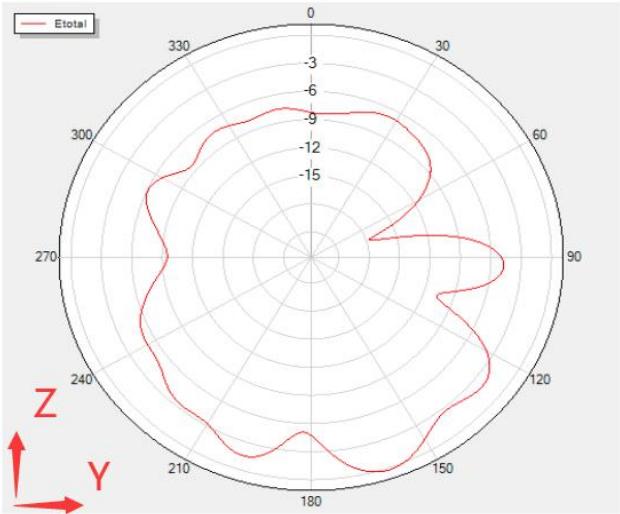
# Antenna apple diagram and directional diagram



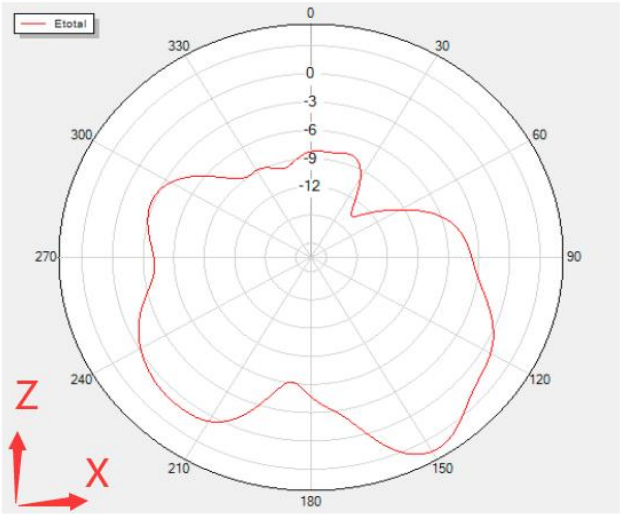
Theta=0 Freq=2428MHz



Phi=90 Freq=2428MHz



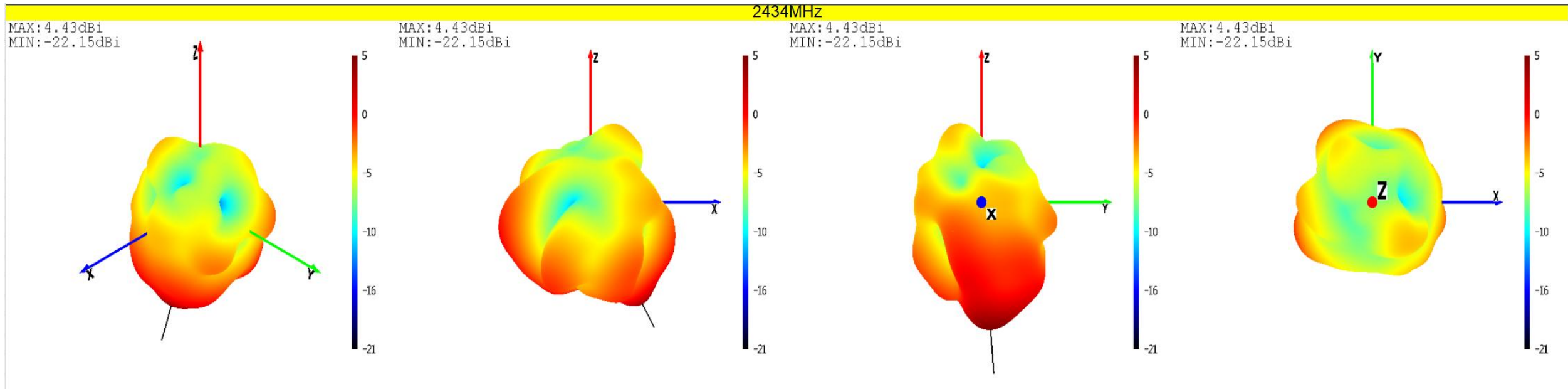
Phi=0 Freq=2428MHz



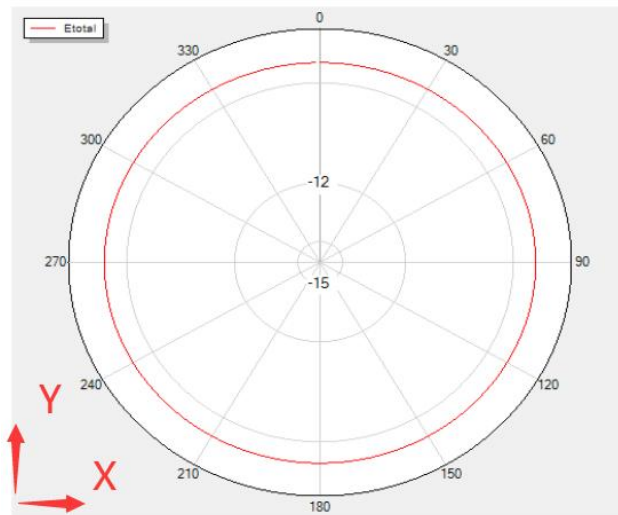
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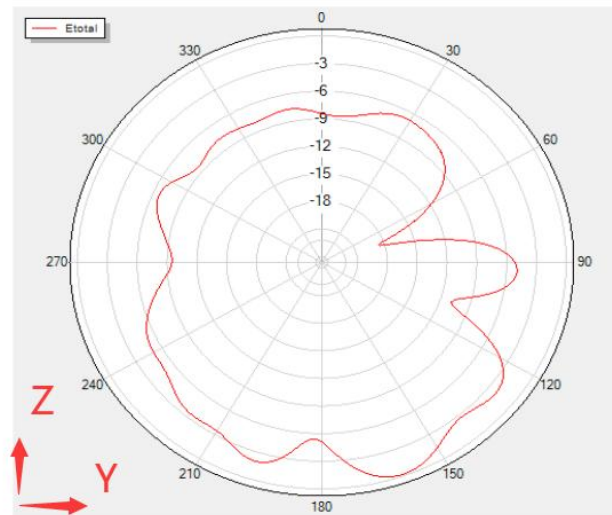
# Antenna apple diagram and directional diagram



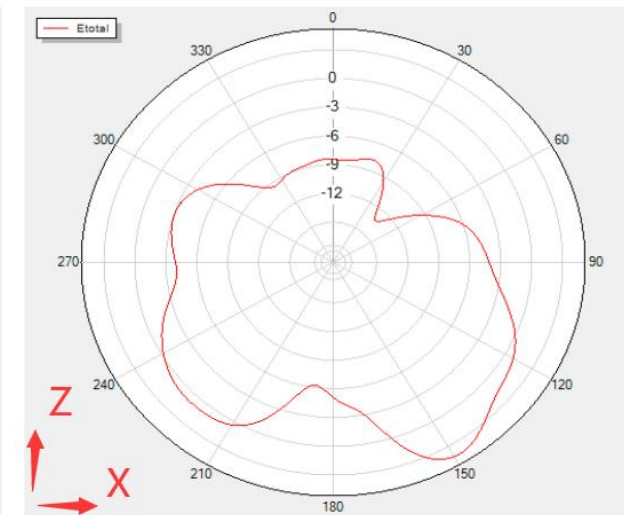
Theta=0 Freq=2434MHz



Phi=90 Freq=2434MHz



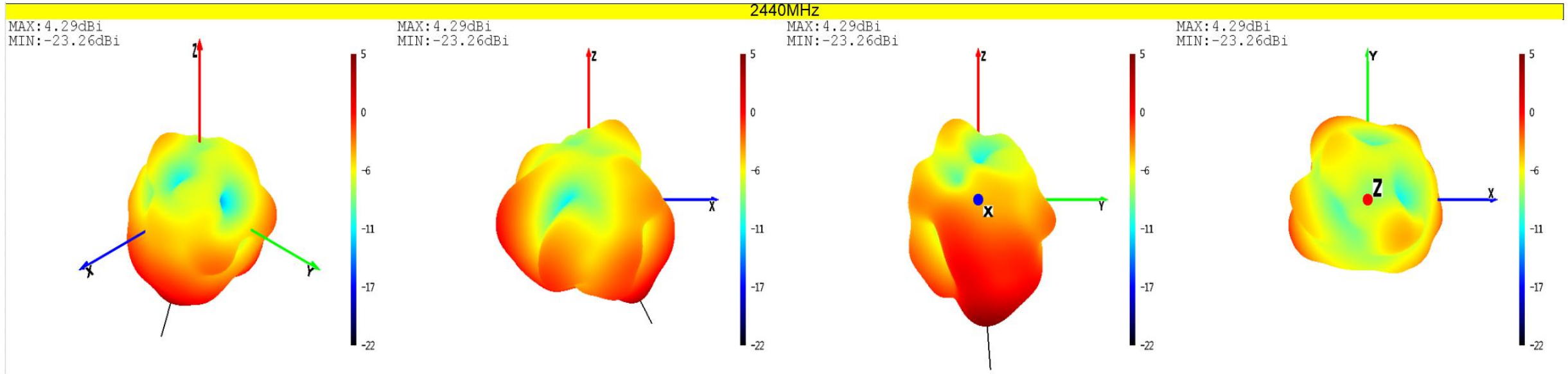
Phi=0 Freq=2434MHz



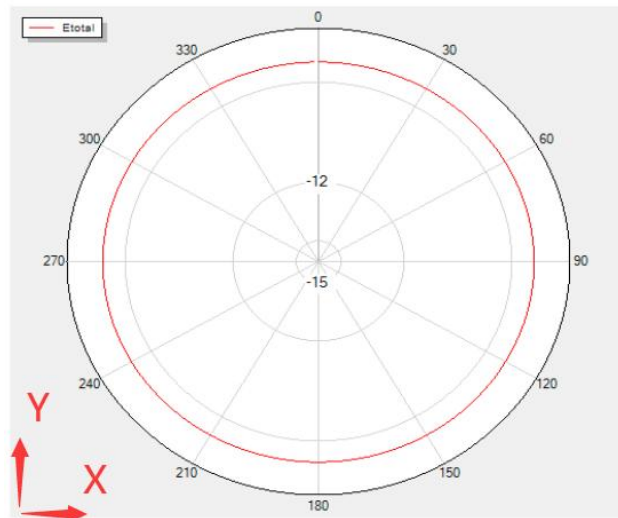
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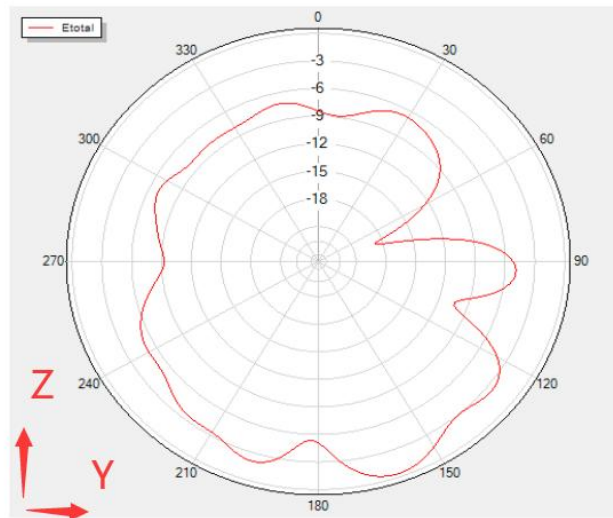
# Antenna apple diagram and directional diagram



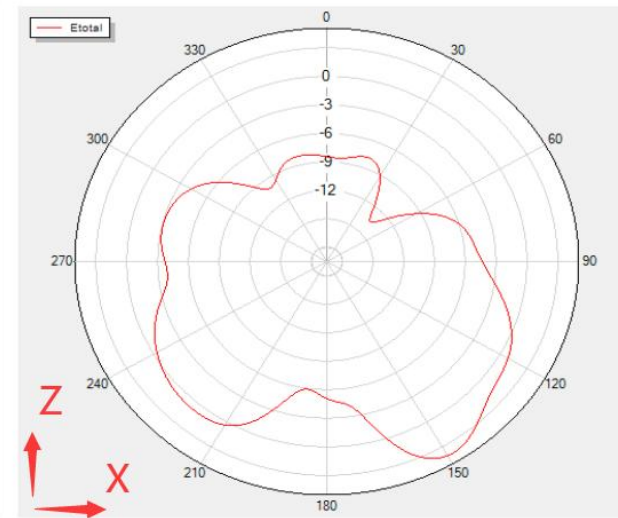
Theta=0 Freq=2440MHz



Phi=90 Freq=2440MHz



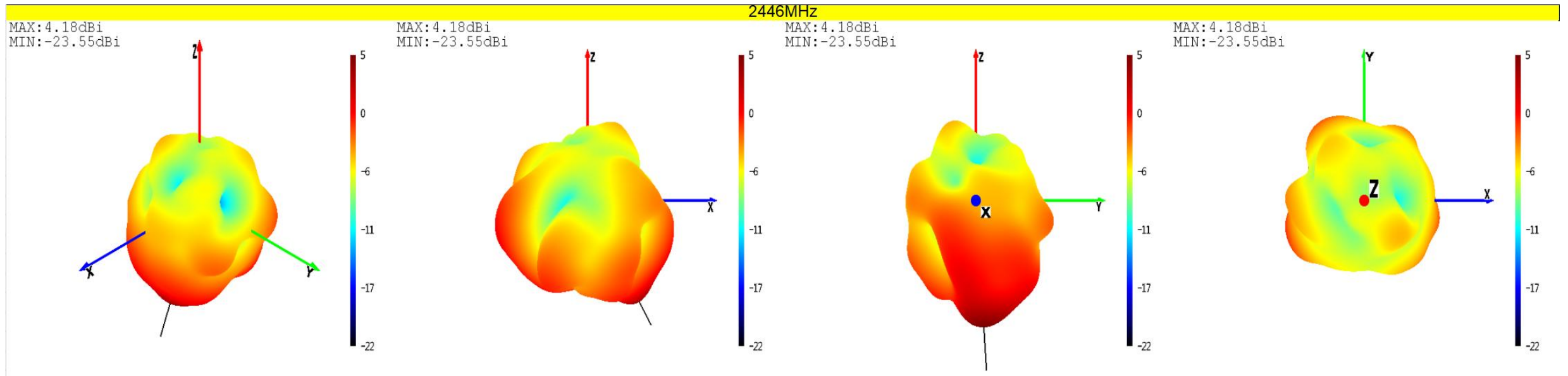
Phi=0 Freq=2440MHz



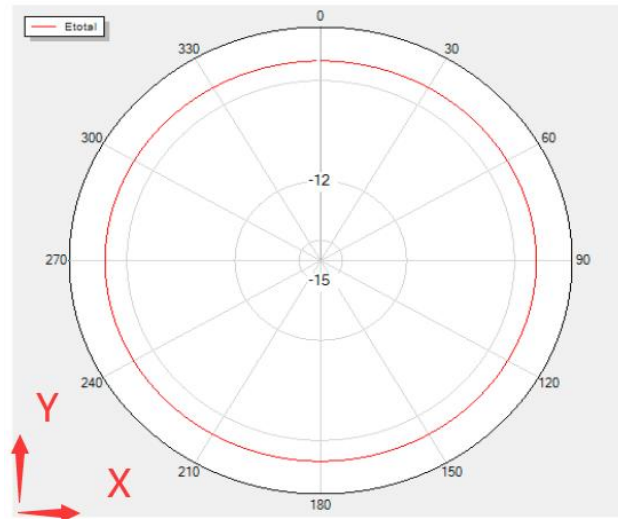
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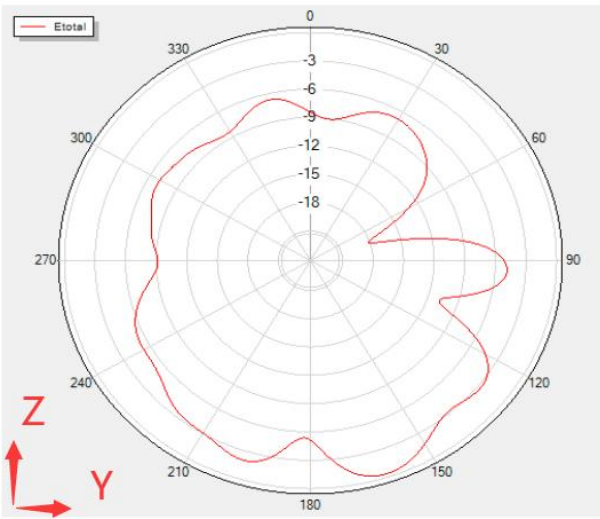
# Antenna apple diagram and directional diagram



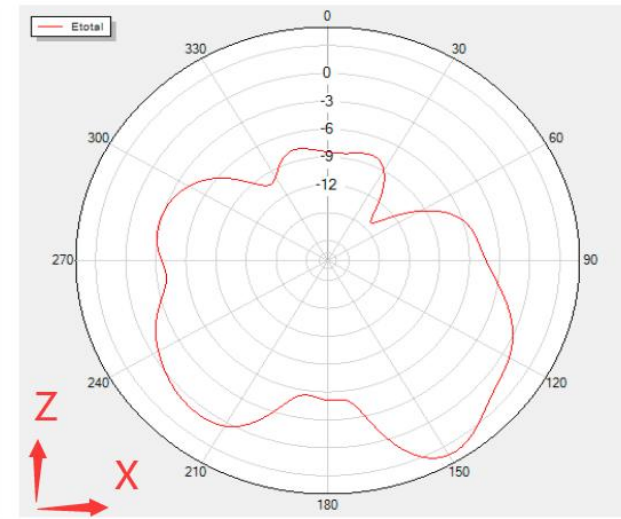
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Phi=90 Freq=2446MHz



Phi=0 Freq=2446MHz



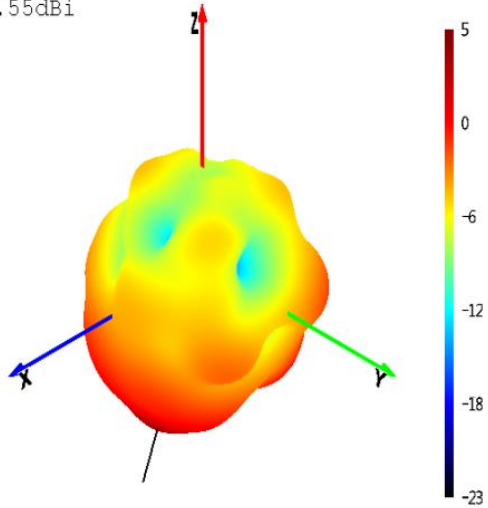
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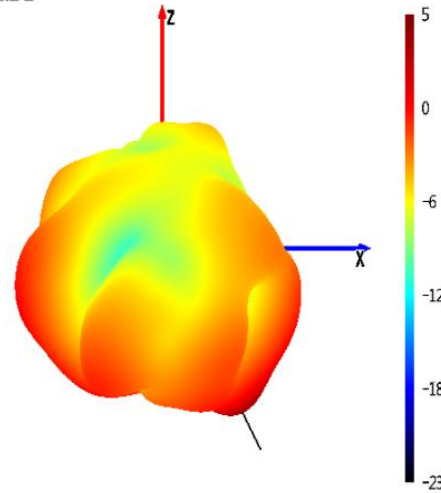
# Antenna apple diagram and directional diagram

2454MHz

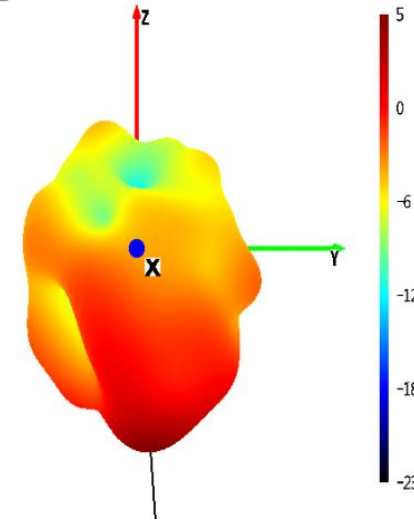
MAX: 4.35dBi  
MIN: -24.55dBi



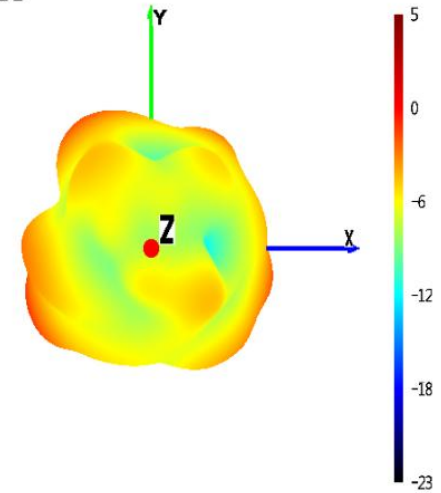
MAX: 4.35dBi  
MIN: -24.55dBi



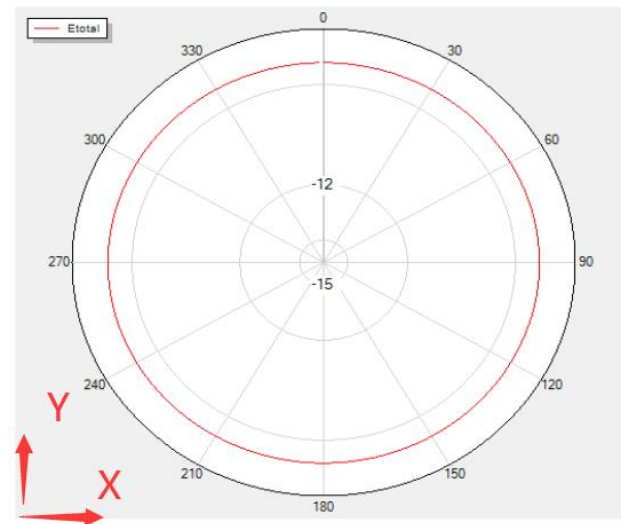
MAX: 4.35dBi  
MIN: -24.55dBi



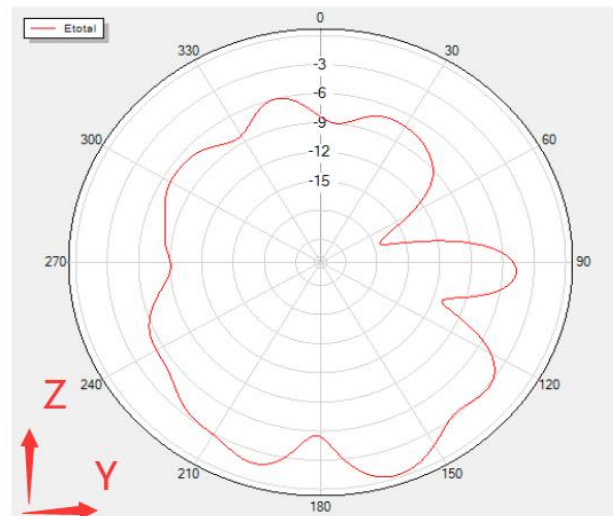
MAX: 4.35dBi  
MIN: -24.55dBi



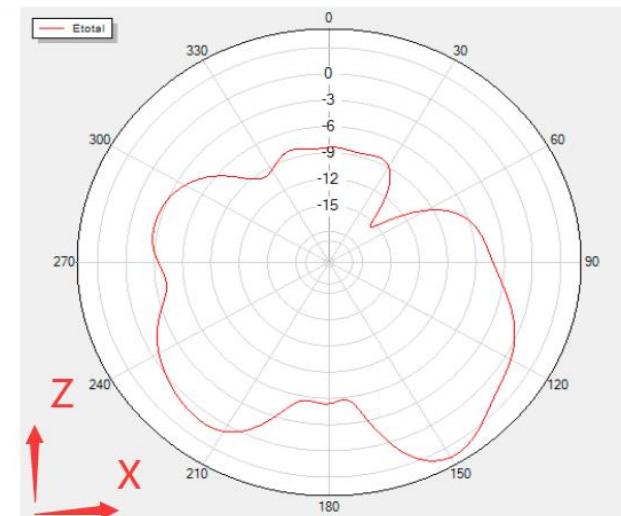
Theta=0 Freq=2454MHz



Phi=90 Freq=2454MHz



Phi=0 Freq=2454MHz



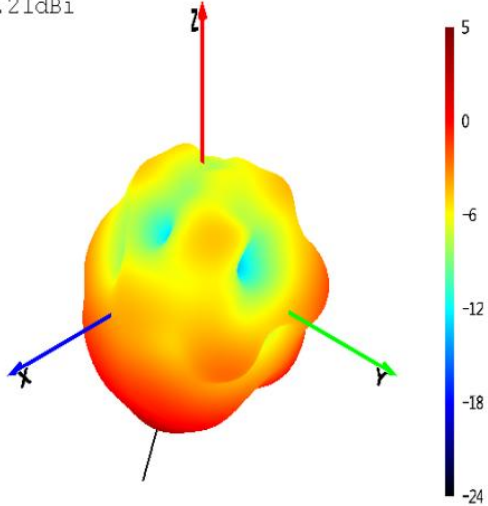
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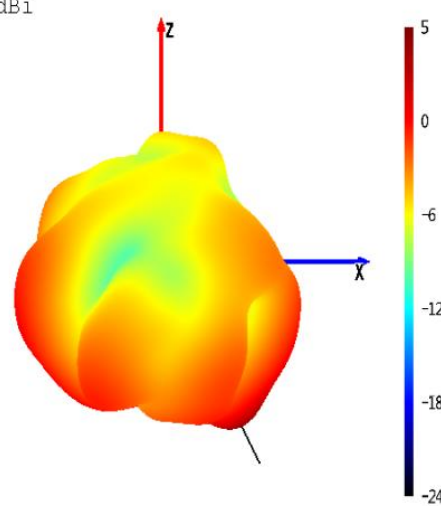
# Antenna apple diagram and directional diagram

2460MHz

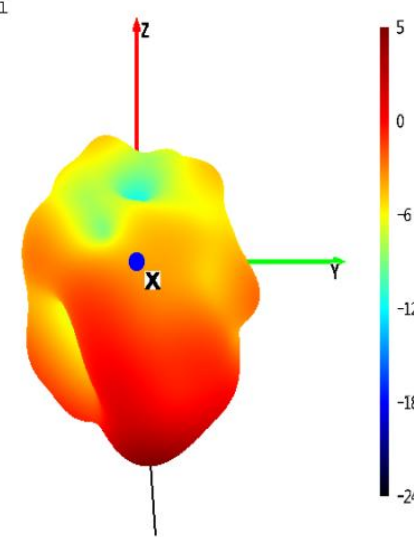
MAX: 4.48dBi  
MIN: -25.21dBi



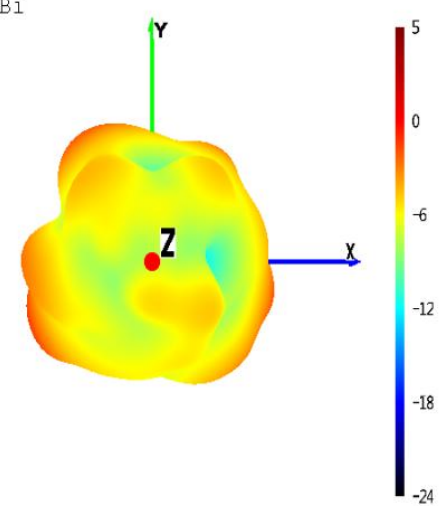
MAX: 4.48dBi  
MIN: -25.21dBi



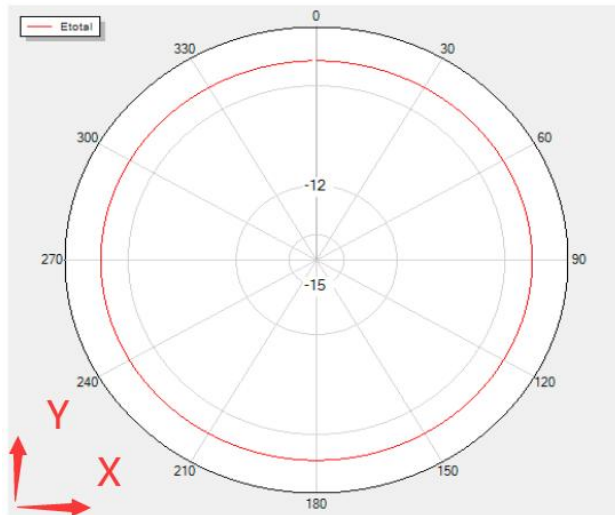
MAX: 4.48dBi  
MIN: -25.21dBi



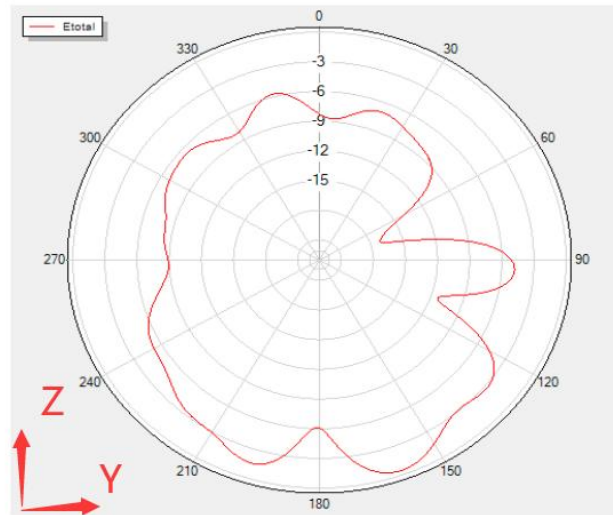
MAX: 4.48dBi  
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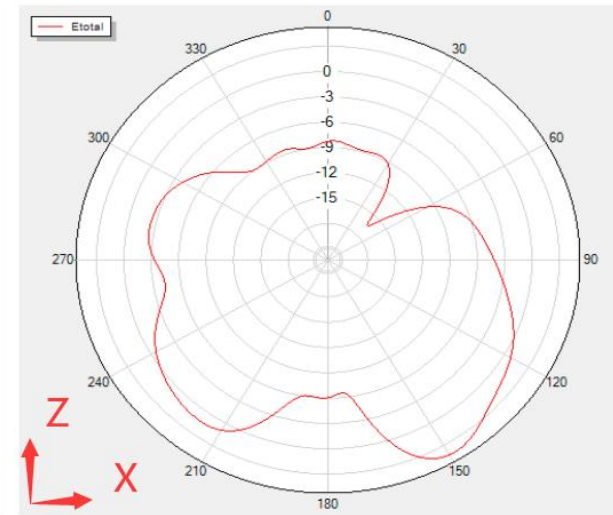
Theta=0 Freq=2460MHz



Phi=90 Freq=2460MHz



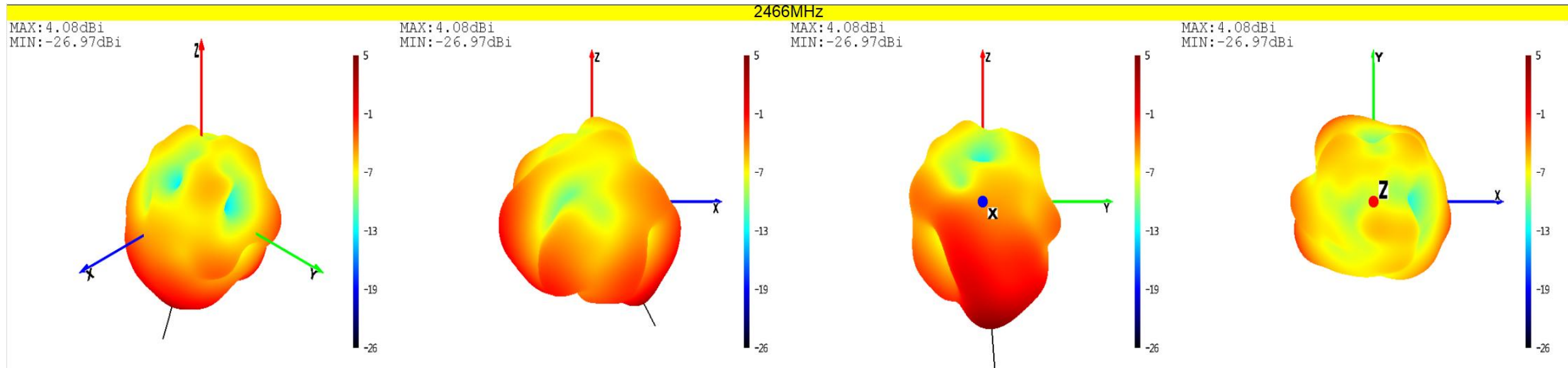
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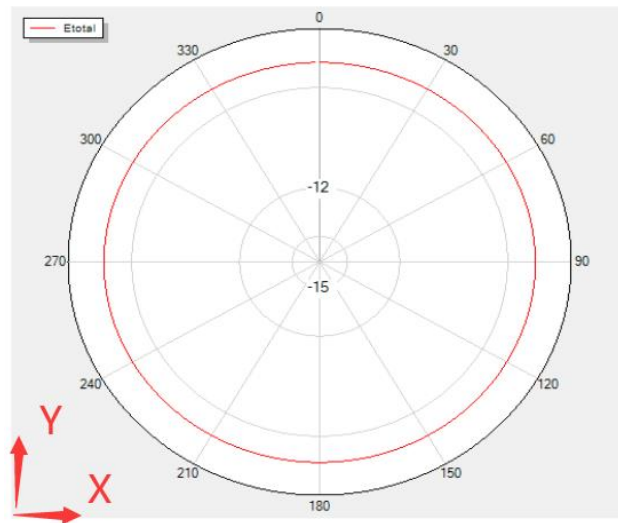
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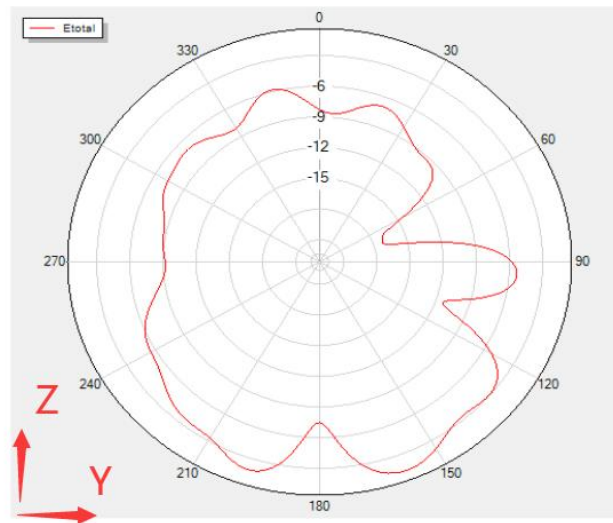
# Antenna apple diagram and directional diagram



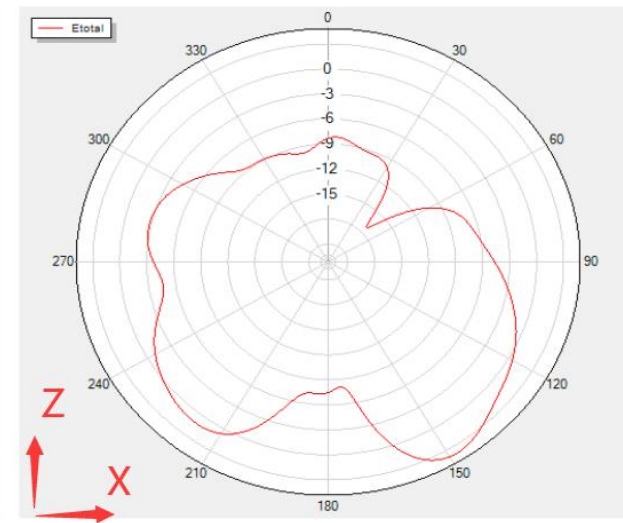
Theta=0 Freq=2466MHz



Phi=90 Freq=2466MHz



Phi=0 Freq=2466MHz



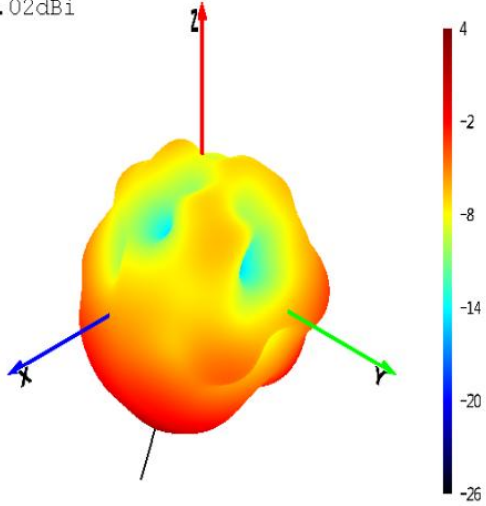
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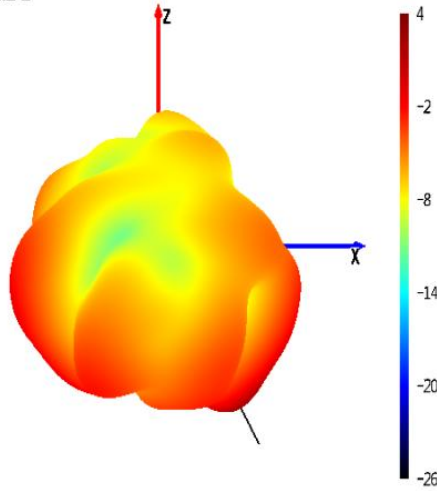
# Antenna apple diagram and directional diagram

2472MHz

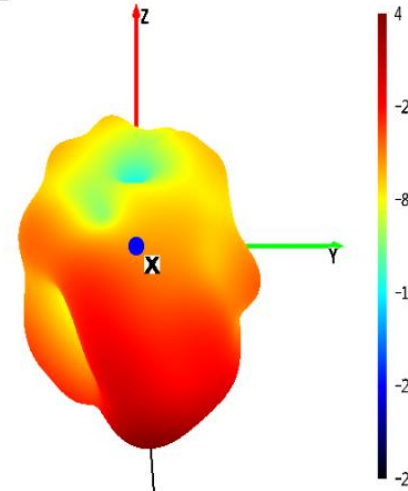
MAX:3.91dBi  
MIN:-27.02dBi



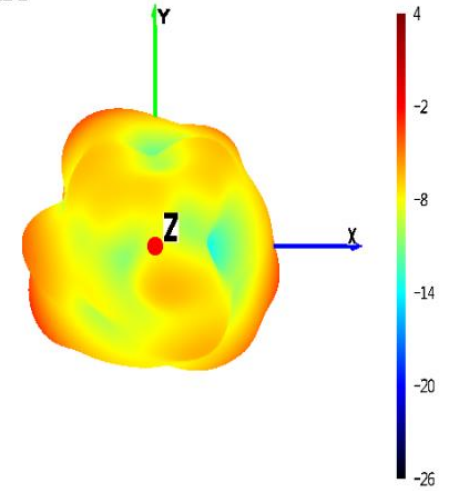
MAX:3.91dBi  
MIN:-27.02dBi



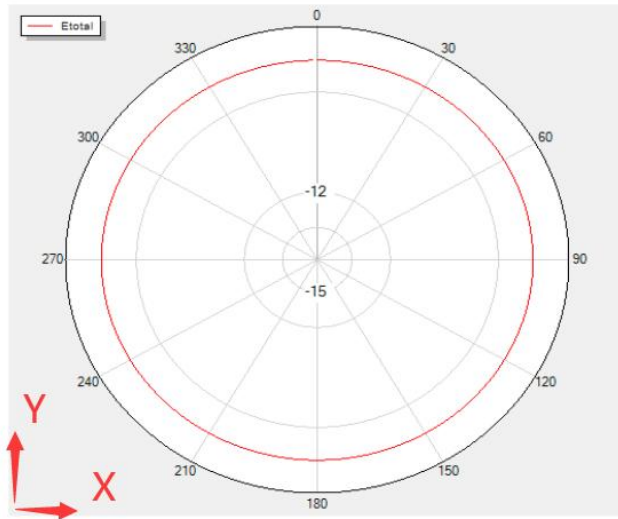
MAX:3.91dBi  
MIN:-27.02dBi



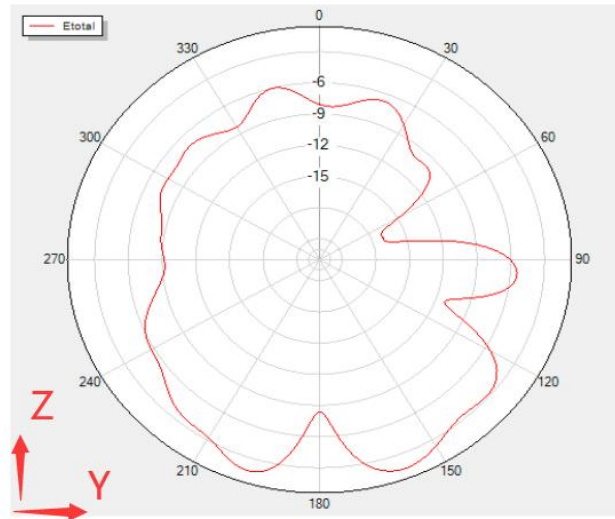
MAX:3.91dBi  
MIN:-27.02dBi



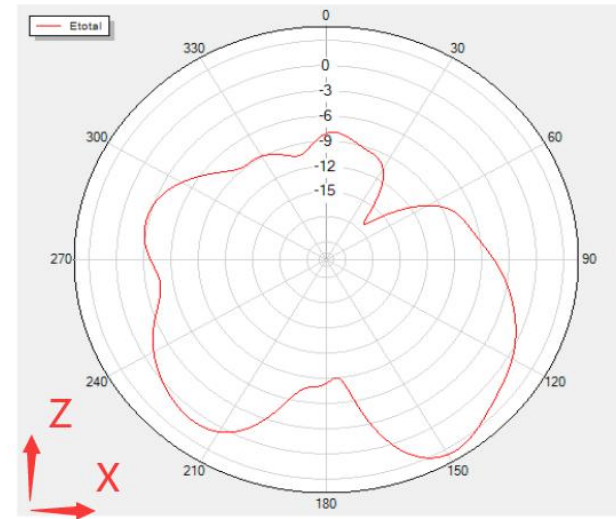
Theta=0 Freq=2472MHz



Phi=90 Freq=2472MHz



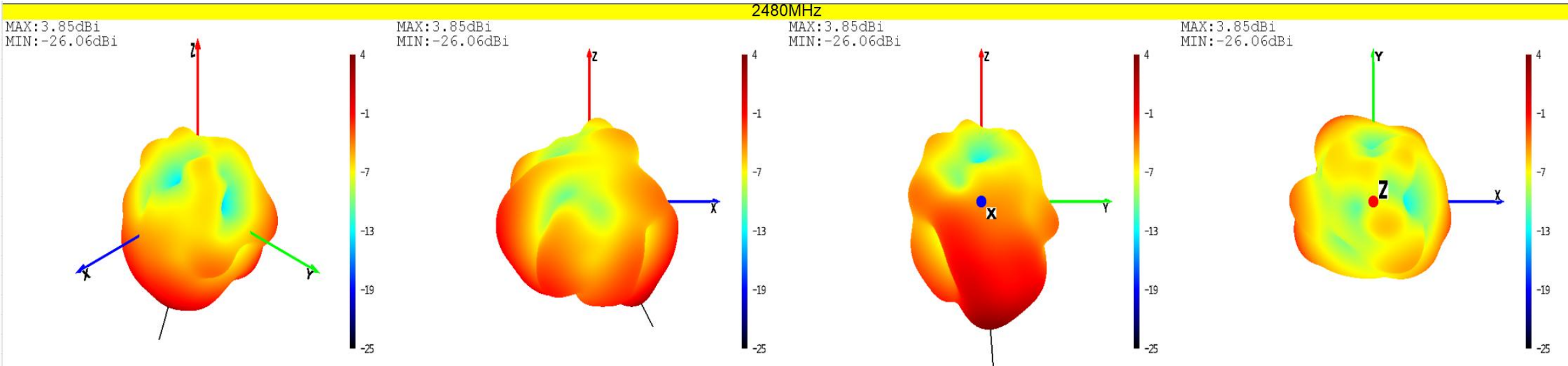
Phi=0 Freq=2472MHz



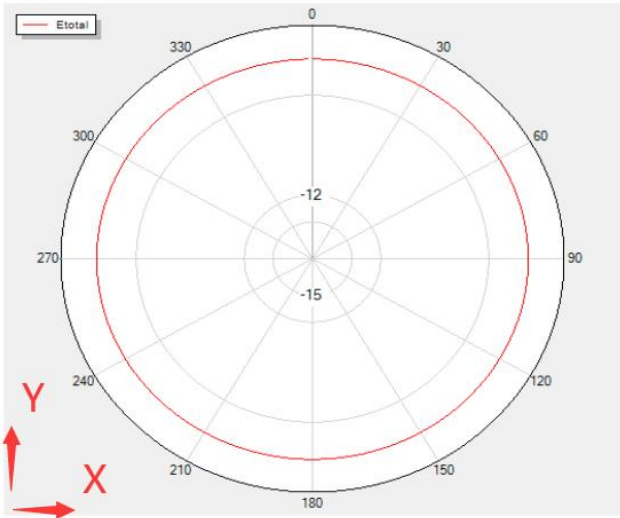
Join hands and create a better future together



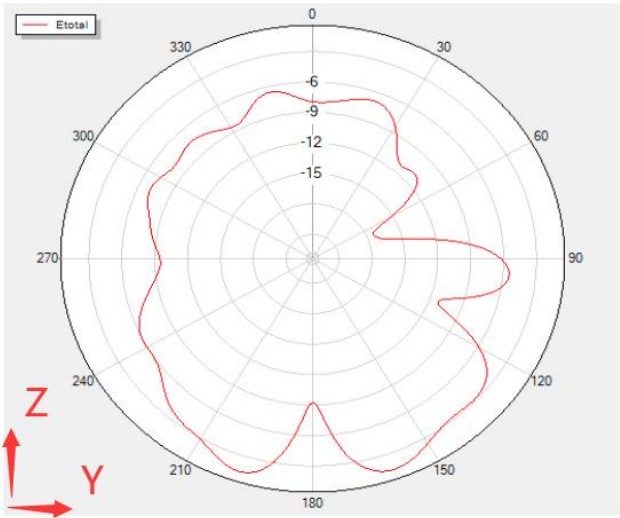
# Antenna apple diagram and directional diagram



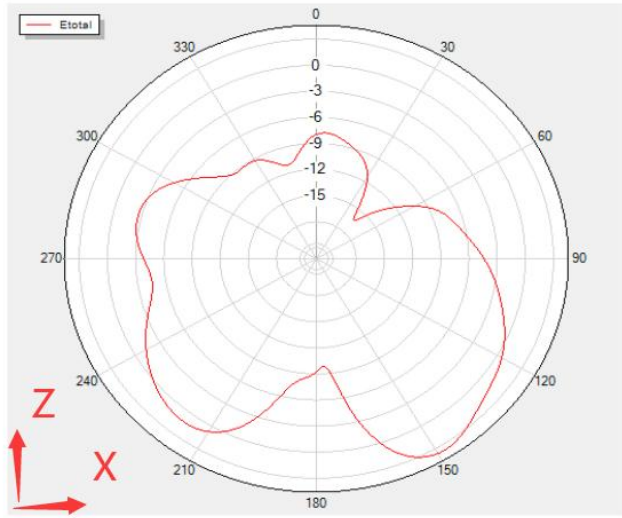
Theta=0 Freq=2480MHz



Phi=90 Freq=2480MHz



Phi=0 Freq=2480MHz



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## Additional explanation

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- 📶 Please carefully confirm whether the matching circuit mentioned in the report has been modified and whether the environmental treatment has been imported, as this will directly affect the antenna performance.
- 📶 The parameters provided in this report are only the parameters provided by the customer to our company for testing the prototype, and do not represent the final mass production status of your company's final project.
- 📶 If your company has the latest prototype for trial production or updated status (replacement of materials, software, environmental treatment, etc.), please submit it to our company for verification as soon as possible to confirm whether the antenna performance is affected.
- 📶 If your company needs to send the machine for third-party retesting or customer testing, please be sure to hand it over to our company for testing and confirmation, as factors such as motherboard consistency, assembly consistency, and differences in antenna assembly may lead to deviations in antenna parameters.



# 深圳市亿铭远科技有限公司

Shenzhen Yimingyuan Technology Co., Ltd

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## The End

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**携手共进 共创未来**

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