

# Antenna Test report

Model Name: A9-A

Date: 18th OCT, 2023

ANWEI communication Technology Co., Ltd.

[www.aw168.cn](http://www.aw168.cn)

# Catalogue

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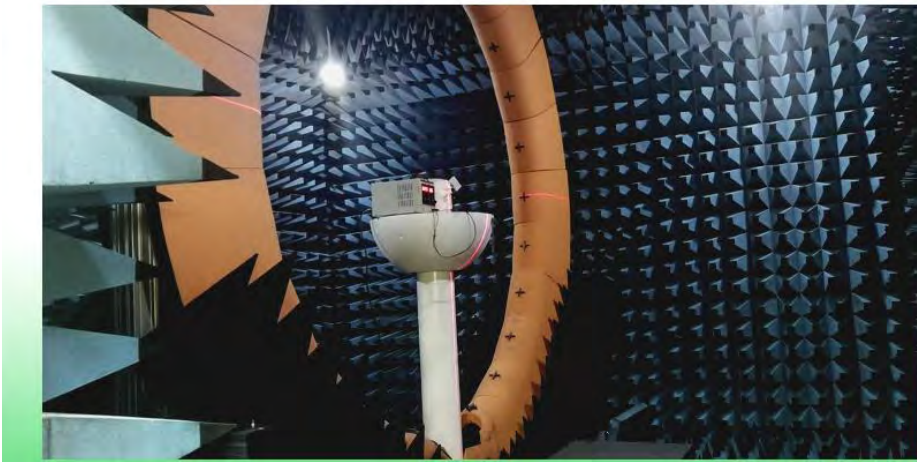
# 01.Project Introducation and Photoes-Project Introducation

|                          |                                                                                 |                |                  |
|--------------------------|---------------------------------------------------------------------------------|----------------|------------------|
| RF Engineer              | Engineer lei                                                                    | Email          |                  |
|                          |                                                                                 | Mobile         | 15986728949      |
| Antenna Overview         |                                                                                 |                |                  |
| Status of Sample machine | Whole machine                                                                   | Project Name   | A9-A             |
| Antenna Type             | PIFA                                                                            | Structure mode | FPC+coaxial line |
| Main Antenna             | 4G B1/2/3/4/5/7/8/12/17/20/28/66/38/40/41 2G(850/900/1800/1900)<br>3G 1/2/4/5/8 |                |                  |
| Other Antenna            | Diversity Three-in-one antenna                                                  |                |                  |

# 02.Report Versions

| Version | Report Time | Commissioning Overview |
|---------|-------------|------------------------|
| A0      | 2023.10.18  | Antenna Test Report    |
| A1      |             |                        |
| A2      |             |                        |
| A3      |             |                        |
| A4      |             |                        |
| A5      |             |                        |
| A6      |             |                        |
| A7      |             |                        |
| A8      |             |                        |
| A9      |             |                        |
| A10     |             |                        |

## 04.Introduction of Company and Test Environment-Test Environment



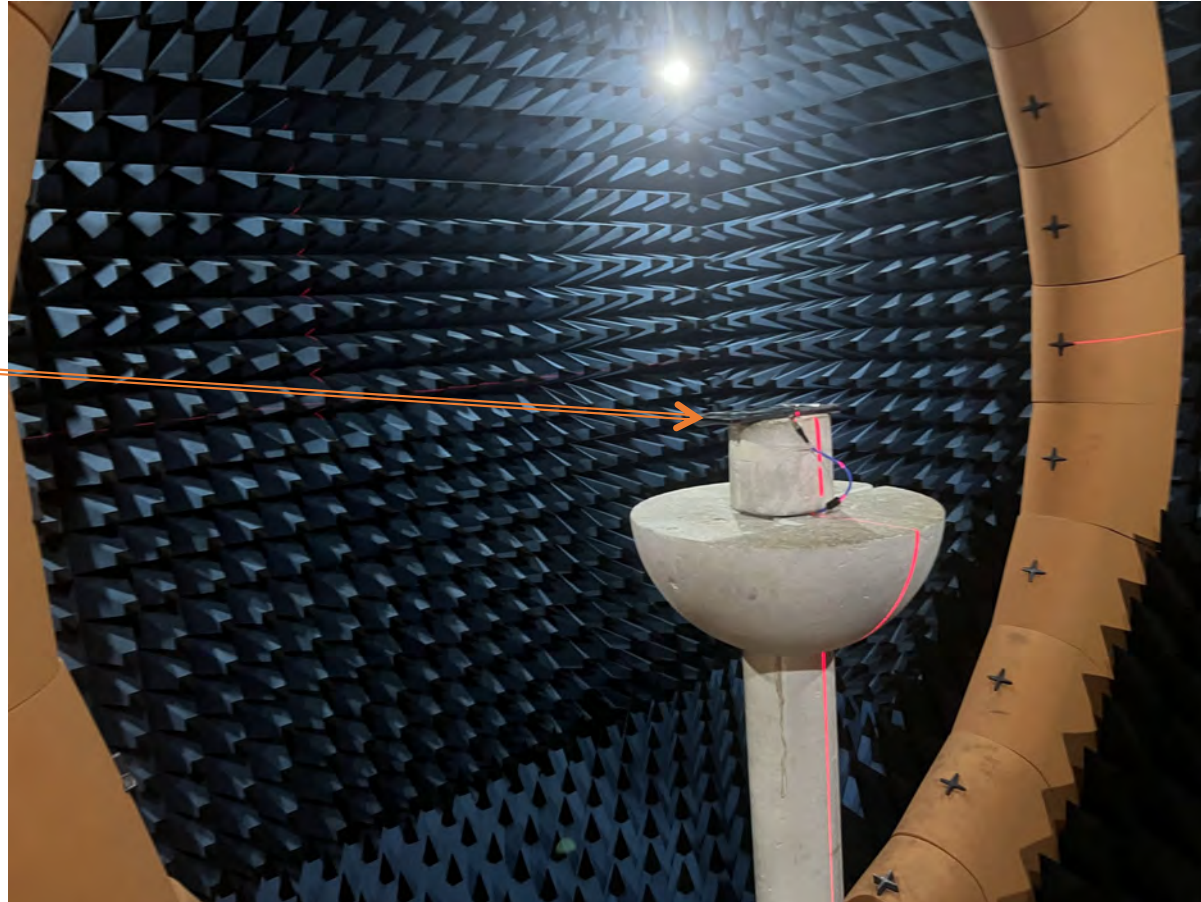
**The company owns several OTA darkrooms whose frequency bands covers from 400mhz to 8.5ghz.**

- ✎ Providing OTA test for whole machine which include but not be limited to 5G NSA, SA(trp/tis), WiFi active test (supporting 11b/11g/11n/11ax mode), bluetooth/GPS active test

- ✎ Providing antenna gain and efficiency
- ✎ Providing 2D pattern / Apple chart analysis
- ✎ Providing upper and lower hemisphere efficiency
- ✎ Providing mutual interference correlation coefficient test items.

## 05.Environment Test

Location of  
Tested  
Machine



## 06.Antenna correlation data

### Main antenna active data

|         | Channel | TRP ( dBm) | TIS ( dBm) |          |        | Channel | TRP ( dBm) | TIS ( dBm) |       |       | Channel | TRP ( dBm) | TIS ( dBm) |
|---------|---------|------------|------------|----------|--------|---------|------------|------------|-------|-------|---------|------------|------------|
| FDD B1  | 18050   | 17.8       |            | FDD B17  | 23780  | 11.2    |            | TDD 38     | 2580  | 16.89 |         |            |            |
|         | 18300   | 17.35      |            |          | 23790  | 11.4    |            |            | 2595  | 17.23 |         |            |            |
|         | 18550   | 17.79      | -93.87     |          | 23800  | 11.5    | -85.67     |            | 2610  | 16.96 | -90.11  |            |            |
| FDD B2  | 18650   | 16.21      |            | FDD B20  | 24200  | 15.24   |            | TDD 40     | 38750 | 16.88 |         |            |            |
|         | 18900   | 16.88      |            |          | 24300  | 15.89   |            |            | 39150 | 15.87 |         |            |            |
|         | 19150   | 16.62      | -93.06     |          | 24400  | 15.82   | -87.17     |            | 39550 | 15.85 | -88.23  |            |            |
| FDD B3  | 19250   | 16.24      |            | FDD B28A | 27260  | 11.5    |            | TDD 41     |       | 16.6  |         |            |            |
|         | 19575   | 16.52      |            |          | 27370  | 11.8    |            |            | 40620 | 16.54 |         |            |            |
|         | 19900   | 16.86      | -92.98     |          | 27469  | 12.3    | -87.25     |            |       | 16.21 | -88.22  |            |            |
| FDD B4  | 20000   | 16.86      |            | FDD B28B | 27410  | 12.2    |            |            |       |       |         |            |            |
|         | 20175   | 16.49      |            |          | 27510  | 12.6    |            |            |       |       |         |            |            |
|         | 20350   | 16.27      | -91.46     |          | 27600  | 13.5    | -86.87     |            |       |       |         |            |            |
| FDD B5  | 20450   | 16.34      |            | FDD B66  | 132022 | 16.3    |            |            |       |       |         |            |            |
|         | 20525   | 15.85      |            |          | 132322 | 16.4    |            |            |       |       |         |            |            |
|         | 20600   | 15.54      | -88.36     |          | 132622 | 16.6    | -91.0      |            |       |       |         |            |            |
| FDD B7  | 20800   | 14.29      |            |          |        |         |            |            |       |       |         |            |            |
|         | 21100   | 15.27      |            |          |        |         |            |            |       |       |         |            |            |
|         | 21400   | 16.2       | -91.68     |          |        |         |            |            |       |       |         |            |            |
| FDD B8  | 21500   | 16.86      |            |          |        |         |            |            |       |       |         |            |            |
|         | 21625   | 15.97      |            |          |        |         |            |            |       |       |         |            |            |
|         | 21750   | 15.11      | -90.19     |          |        |         |            |            |       |       |         |            |            |
| FDD B12 | 23060   | 10.4       |            |          |        |         |            |            |       |       |         |            |            |
|         | 23095   | 11.7       |            |          |        |         |            |            |       |       |         |            |            |
|         | 23130   | 11.8       | -85.79     |          |        |         |            |            |       |       |         |            |            |

## 06. Antenna correlation data

## Main antenna active data

|          | Channel | TRP ( dBm) | TIS ( dBm) |
|----------|---------|------------|------------|
| GSM 850  | 128     | 25.26      |            |
|          | 190     | 25.02      |            |
|          | 251     | 25.22      | -101.5     |
| GSM 900  | 1       | 24.57      |            |
|          | 62      | 24.07      |            |
|          | 124     | 23.55      | -100.17    |
| DCS 1800 | 512     | 23.19      |            |
|          | 698     | 23.09      |            |
|          | 885     | 22.9       | -101.94    |
| PCS 1900 | 512     | 22.91      |            |
|          | 661     | 23.11      |            |
|          | 810     | 22.48      | -101.5     |
|          |         |            |            |
|          |         |            |            |
|          |         |            |            |
|          |         |            |            |

|  | Channel | TRP ( dBm) | TIS ( dBm) |
|--|---------|------------|------------|
|  |         |            |            |
|  |         |            |            |
|  |         |            |            |
|  |         |            |            |
|  |         |            |            |
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|  |         |            |            |
|  |         |            |            |
|  |         |            |            |
|  |         |            |            |
|  |         |            |            |

|     | Channel | TRP (dBm) | TIS (dBm) |
|-----|---------|-----------|-----------|
| W 1 | 9612    | 17.92     |           |
|     | 9750    | 17.64     |           |
|     | 9888    | 17.38     | -104.48   |
| W 2 | 9262    | 16.48     |           |
|     | 9400    | 16.73     |           |
|     | 9538    | 16.94     | -101.32   |
| W 4 | 1312    | 17.35     |           |
|     | 1413    | 17.25     |           |
|     | 1513    | 17.87     | -103.5    |
| W 5 | 4132    | 16.69     |           |
|     | 4183    | 16.9      |           |
|     | 4233    | 16.55     | -102.6    |
| W 8 | 2712    | 15.35     |           |
|     | 2787    | 15.15     |           |
|     | 2863    | 14.55     | -100.8    |
|     |         |           |           |

## 08. WIFI active data

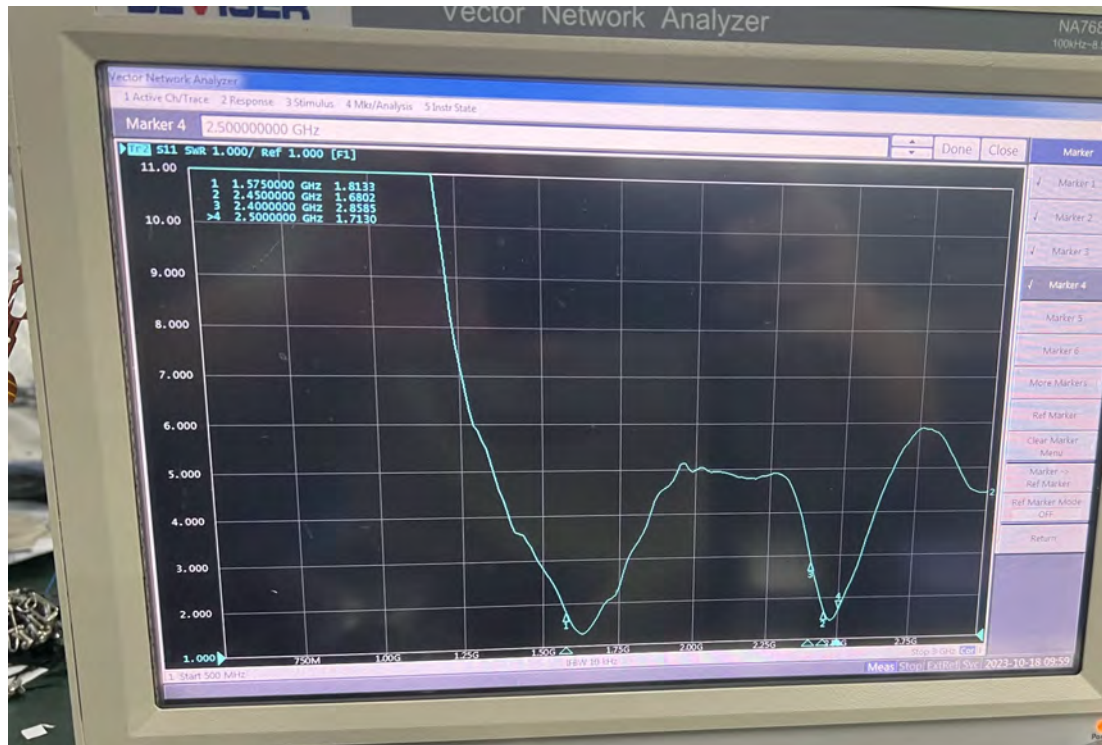
| BAND       | 2.4GWIFI |        |       | 5.8WIFI |        |       |
|------------|----------|--------|-------|---------|--------|-------|
| CHANNEL    | low      | medium | high  | low     | medium | high  |
| TRP (dBm)  | 12.6     | 12.3   | 12.7  | 9.2     | 9.7    | 10.3  |
| TIS ( dBm) | -79.7    | -79.5  | -78.7 | -69.6   | -70.0  | -70.5 |

## Main antenna gain

## 09. Antenna passive data

| Gain&Efficiency |        |         |            |            | Gain&Efficiency |         |         |            |            | frequency | gain    | mingain | efficiency | efficiency |
|-----------------|--------|---------|------------|------------|-----------------|---------|---------|------------|------------|-----------|---------|---------|------------|------------|
| frequency       | gain   | mingain | efficiency | efficiency | frequency       | gain    | mingain | efficiency | efficiency | 频率(MHz)   | 增益(dBi) | 最小增益    | 效率(dBi)    | 效率(%)      |
| 频率(MHz)         | 增益(dB) | 最小增益    | 效率(dB)     | 效率(%)      | 频率(MHz)         | 增益(dBi) | 最小增益    | 效率(dBi)    | 效率(%)      |           |         |         |            |            |
| 690             | -5.92  | -29.73  | -9.41      | 15.46%     | 820             | -1.58   | -19.56  | -6.07      | 24.71      | 1700      | -0.83   | -23.25  | -6.12      | 24.46      |
| 700             | -5.12  | -31.06  | -8.66      | 15.61%     | 840             | -1.26   | -20.28  | -5.74      | 26.68      | 1720      | -0.91   | -23.05  | -5.94      | 25.48      |
| 710             | -4.79  | -32.92  | -8.22      | 15.08%     | 860             | -0.91   | -23.05  | -5.94      | 25.48      | 1740      | -2.46   | -14.31  | -5.79      | 26.38      |
| 720             | -4.4   | -36.33  | -7.92      | 16.15%     | 880             | -0.83   | -23.25  | -6.12      | 24.46      | 1760      | -1.57   | -14.37  | -5.32      | 29.36      |
| 730             | -4.21  | -38.37  | -7.77      | 16.72%     | 900             | -0.62   | -28.83  | -6.18      | 24.09      | 1780      | -2      | -14.64  | -5.7       | 26.91      |
| 740             | -3.91  | -33.24  | -7.63      | 17.28%     | 920             | -0.64   | -20.88  | -6.18      | 24.09      | 1800      | 0.82    | -21.31  | -5.41      | 28.74      |
| 750             | -3.41  | -30.59  | -7.42      | 18.10%     | 940             | -0.82   | -20.95  | -6.44      | 22.71      | 1820      | 0.53    | -18.33  | -5.8       | 26.30      |
| 760             | -2.95  | -29.01  | -7.22      | 18.97%     | 960             | -0.55   | -19.36  | -6.29      | 23.47      | 1840      | 0.43    | -18.61  | -5.87      | 25.88      |
| 770             | -2.91  | -28.51  | -7.26      | 18.79%     |                 |         |         |            |            | 1860      | 1.61    | -19.31  | -5.37      | 29.06      |
| 780             | -2.53  | -25.14  | -7.04      | 19.75%     |                 |         |         |            |            | 1880      | 2.8     | -19.54  | -4.83      | 32.89      |
| 790             | -2.48  | -24.75  | -7.17      | 19.19%     |                 |         |         |            |            | 1900      | -1.1    | -14.99  | -5.06      | 31.20      |
| 800             | -2.36  | -24.6   | -7.03      | 19.80%     |                 |         |         |            |            | 1920      | -1.06   | -14.95  | -5.03      | 31.37      |
|                 |        |         |            |            |                 |         |         |            |            | 1940      | -0.76   | -15.62  | -5.01      | 31.55      |
|                 |        |         |            |            |                 |         |         |            |            | 1960      | -0.82   | -16.36  | -5.15      | 30.55      |
|                 |        |         |            |            |                 |         |         |            |            | 1980      | -0.65   | -17.27  | -5.01      | 31.57      |
|                 |        |         |            |            |                 |         |         |            |            | 2000      | -0.65   | -16.54  | -5.02      | 31.51      |
|                 |        |         |            |            |                 |         |         |            |            | 2020      | -0.75   | -18.48  | -5.19      | 30.24      |
|                 |        |         |            |            |                 |         |         |            |            | 2040      | -0.33   | -21.02  | -4.83      | 32.85      |
|                 |        |         |            |            |                 |         |         |            |            | 2060      | -0.7    | -20.7   | -4.95      | 32.01      |
|                 |        |         |            |            |                 |         |         |            |            | 2080      | -0.46   | -16.67  | -4.65      | 34.31      |
|                 |        |         |            |            |                 |         |         |            |            | 2100      | -0.23   | -15.71  | -4.55      | 35.11      |
|                 |        |         |            |            |                 |         |         |            |            | 2120      | -0.75   | -15.24  | -4.76      | 33.43      |
|                 |        |         |            |            |                 |         |         |            |            | 2240      | 0.42    | -18.69  | -5.67      | 27.10      |
|                 |        |         |            |            |                 |         |         |            |            | 2260      | 0.39    | -19.62  | -5.71      | 26.84      |
|                 |        |         |            |            |                 |         |         |            |            | 2280      | 0.48    | -21.02  | -5.81      | 26.23      |
|                 |        |         |            |            |                 |         |         |            |            | 2300      | 1.21    | -16.13  | -4.79      | 33.16      |
|                 |        |         |            |            |                 |         |         |            |            | 2320      | 1.03    | -15.86  | -4.8       | 33.10      |
|                 |        |         |            |            |                 |         |         |            |            | 2340      | -0.04   | -16.57  | -5.4       | 28.86      |
|                 |        |         |            |            |                 |         |         |            |            | 2360      | 0.5     | -16.91  | -5.24      | 29.93      |
|                 |        |         |            |            |                 |         |         |            |            | 2380      | -0.17   | -15.75  | -5.98      | 25.25      |
|                 |        |         |            |            |                 |         |         |            |            | 2400      | 0.45    | -17.34  | -5.29      | 29.59      |
|                 |        |         |            |            |                 |         |         |            |            | 2420      | -0.33   | -19.88  | -6.04      | 24.90      |
|                 |        |         |            |            |                 |         |         |            |            | 2440      | -0.77   | -18.62  | -6.07      | 24.72      |
|                 |        |         |            |            |                 |         |         |            |            | 2460      | -1.11   | -20.62  | -6.44      | 22.72      |
|                 |        |         |            |            |                 |         |         |            |            | 2480      | -0.91   | -23.61  | -6.14      | 24.32      |
|                 |        |         |            |            |                 |         |         |            |            | 2500      | -1.2    | -23.79  | -6.34      | 23.23      |
|                 |        |         |            |            |                 |         |         |            |            | 2520      | 0.45    | -19.55  | -5.07      | 31.09      |
|                 |        |         |            |            |                 |         |         |            |            | 2540      | -0.35   | -23.37  | -5.76      | 26.54      |
|                 |        |         |            |            |                 |         |         |            |            | 2560      | 0.24    | -22.17  | -5.11      | 30.81      |
|                 |        |         |            |            |                 |         |         |            |            | 2580      | 0.35    | -23.43  | -5.18      | 30.32      |
|                 |        |         |            |            |                 |         |         |            |            | 2600      | 0.64    | -22.43  | -5.09      | 30.95      |
|                 |        |         |            |            |                 |         |         |            |            | 2620      | 0.2     | -20.13  | -5.8       | 26.28      |
|                 |        |         |            |            |                 |         |         |            |            | 2640      | 1.45    | -20.28  | -4.62      | 34.52      |
|                 |        |         |            |            |                 |         |         |            |            | 2660      | 0.88    | -22.09  | -5.33      | 29.30      |
|                 |        |         |            |            |                 |         |         |            |            | 2680      | 0.88    | -23.79  | -5.21      | 30.15      |

# 09.GPS/WIFI/BT Antenna VSWR/S11

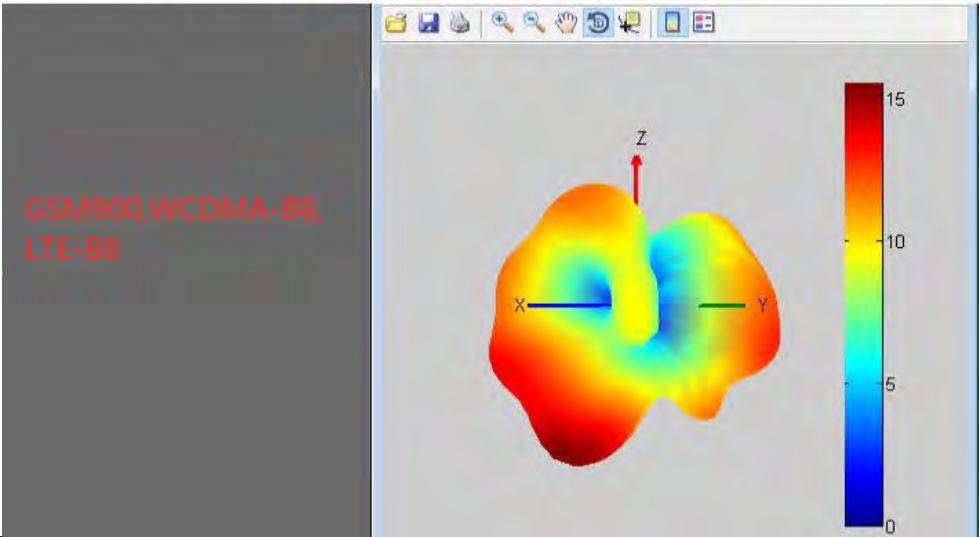
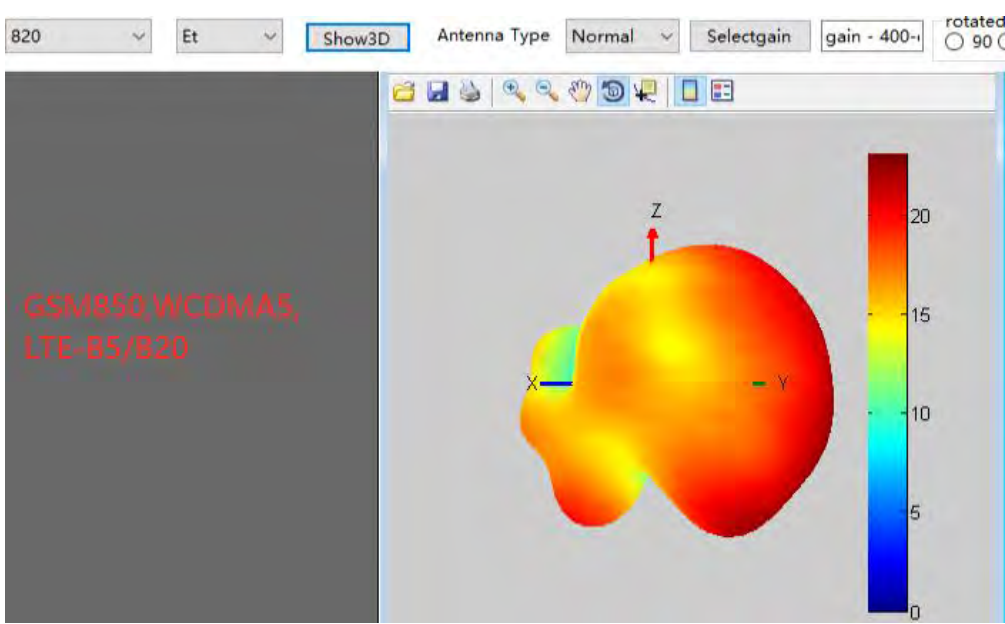
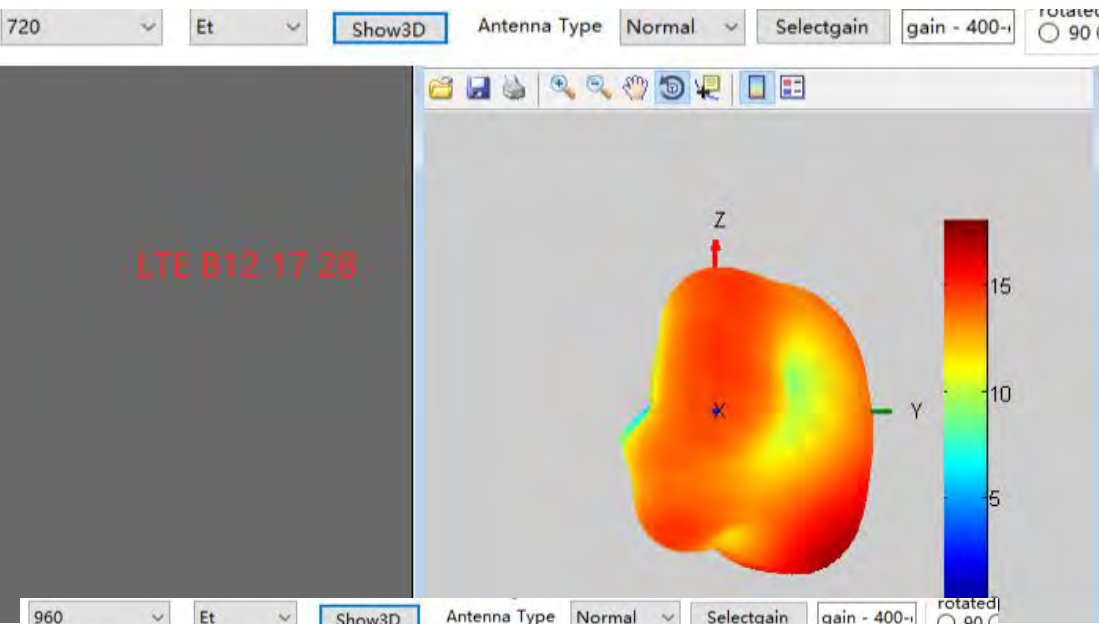


# 10. MAIN Antenna VSWR/S11



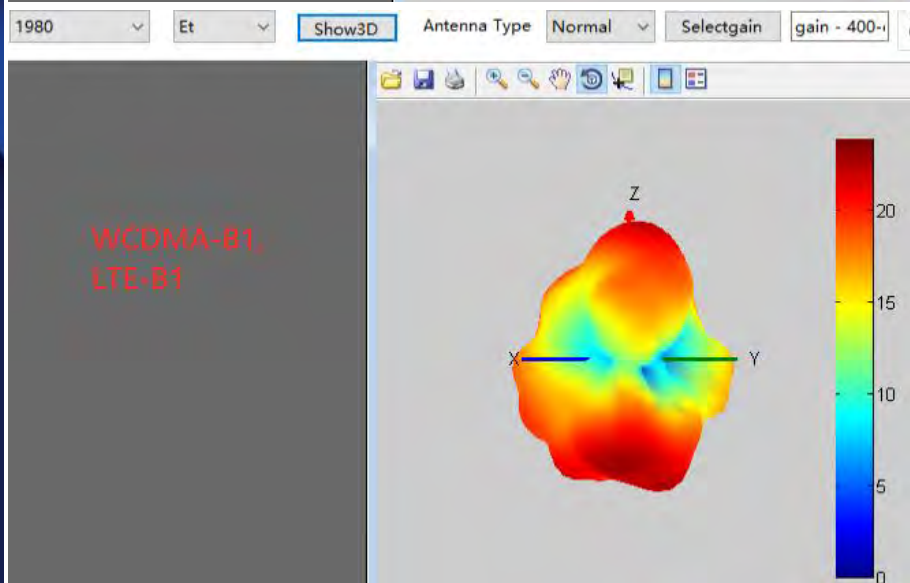
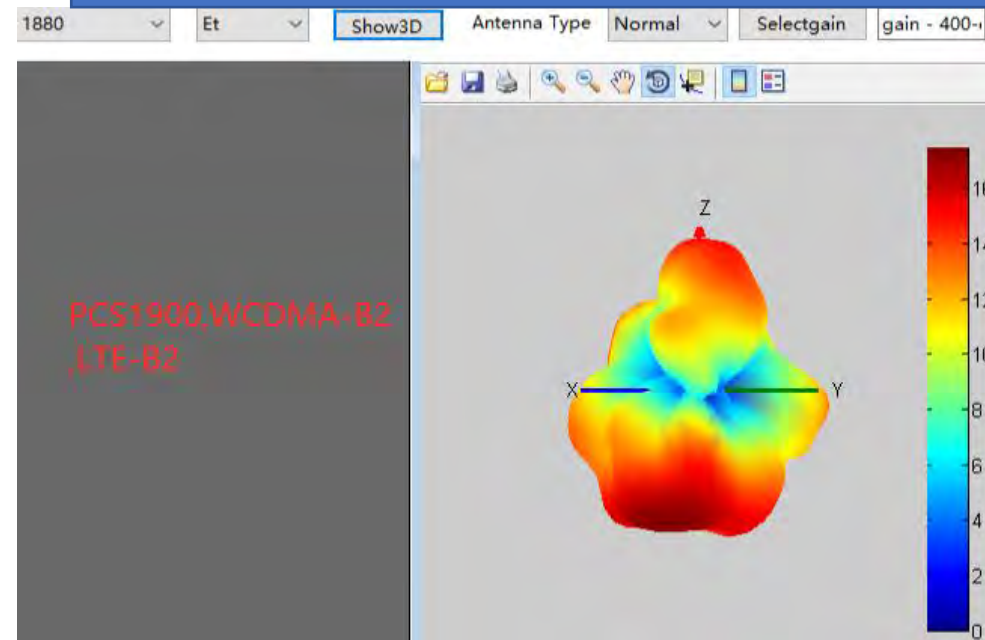
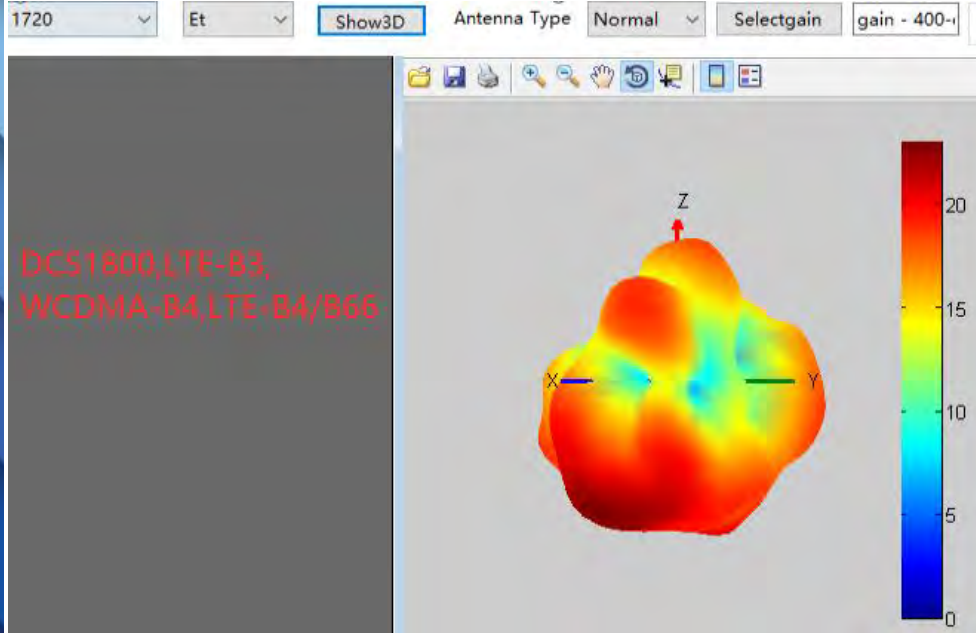
# 10. Antenna correlation data

Main antenna apple pattern and directional pattern



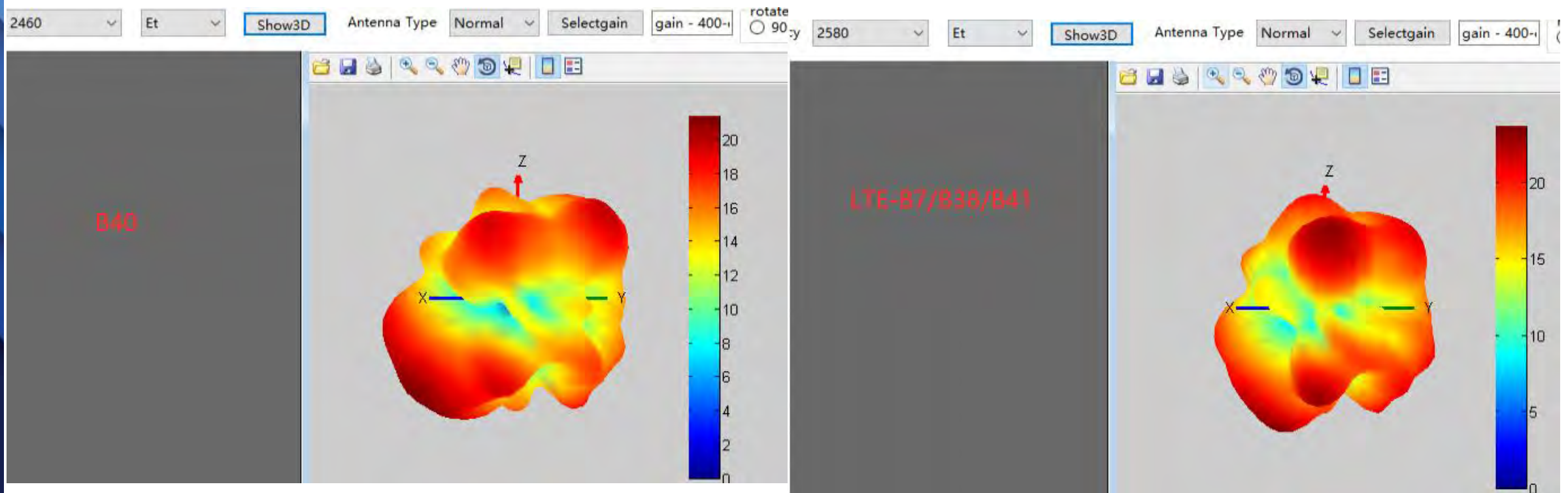
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Main antenna apple pattern and directional pattern



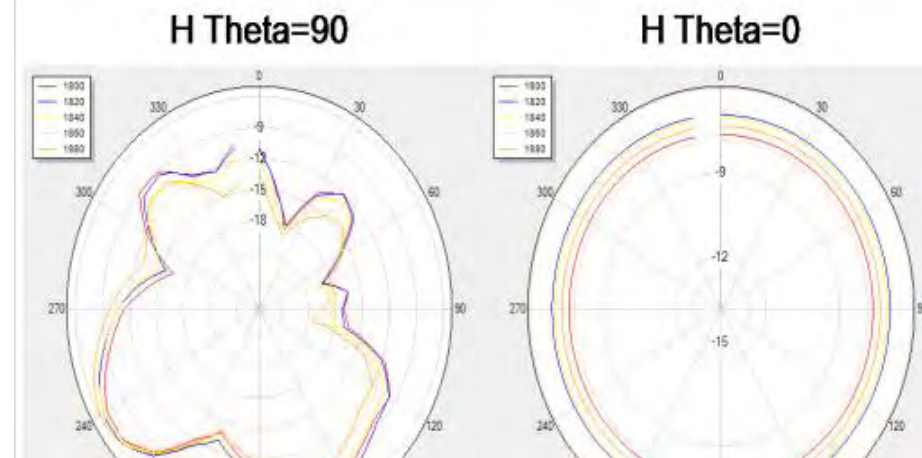
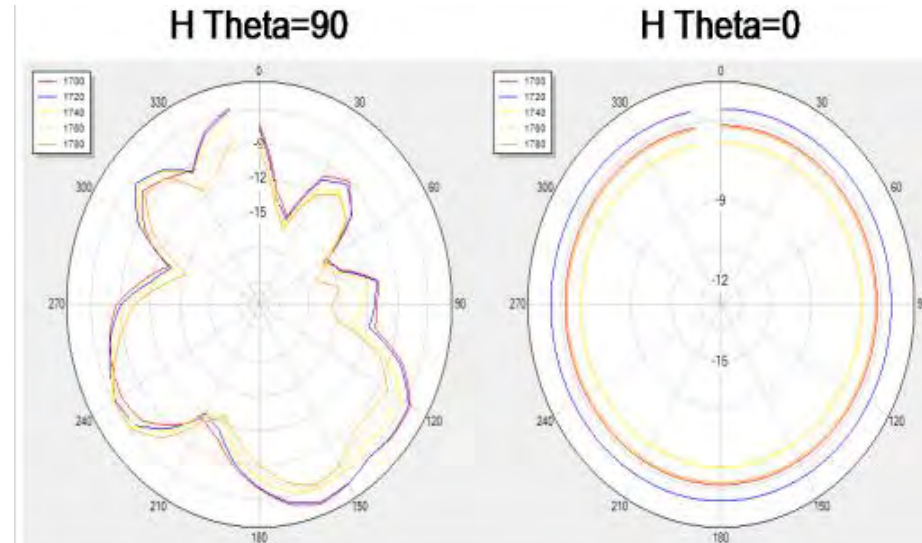
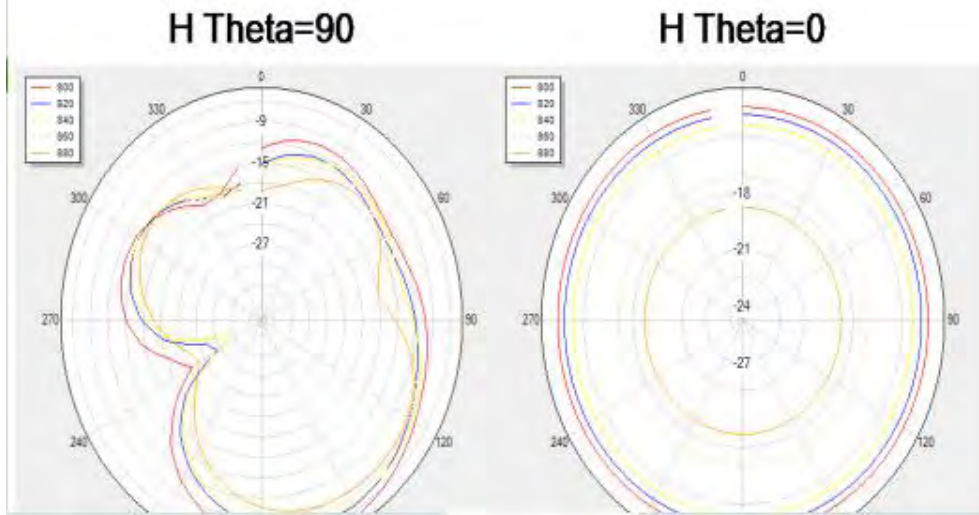
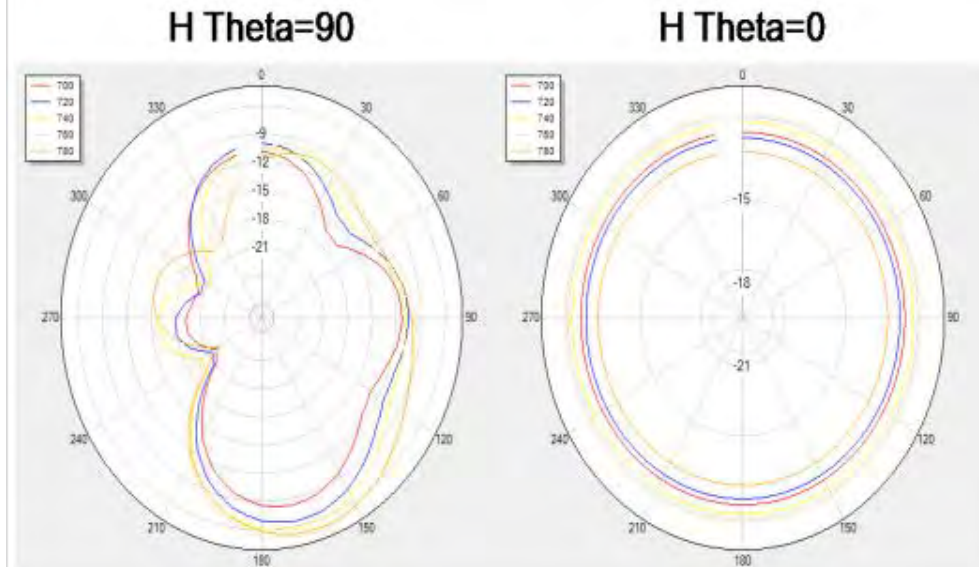
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Main antenna apple pattern and directional pattern



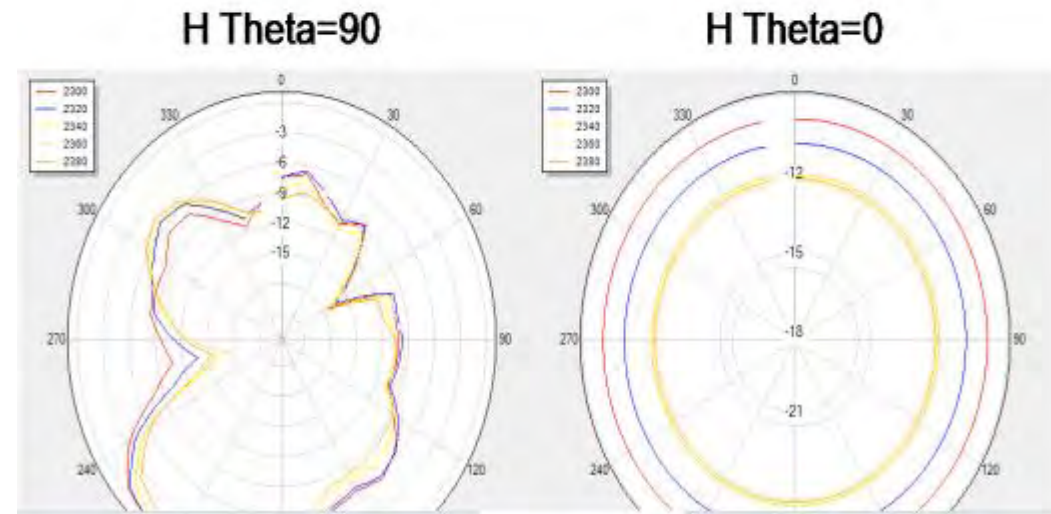
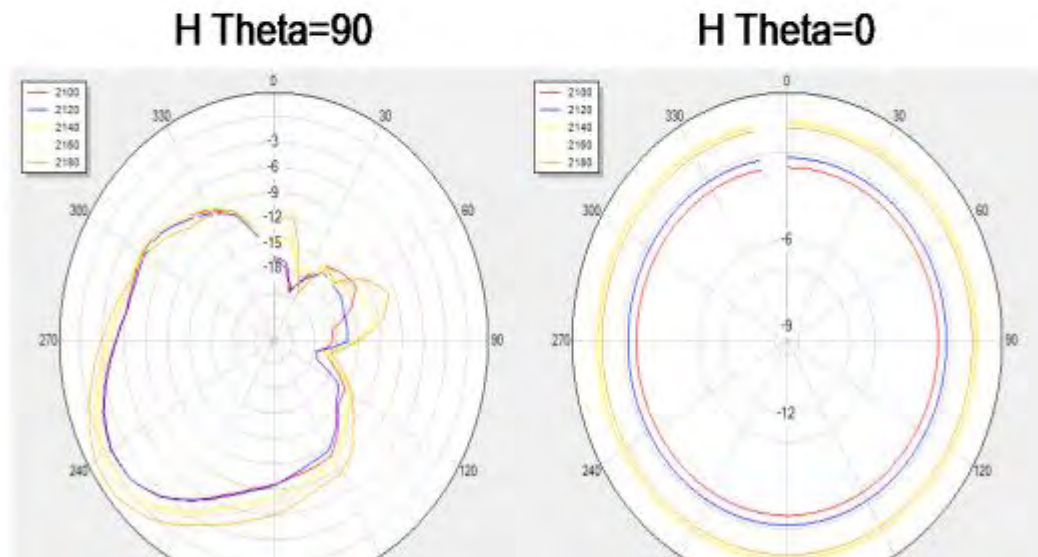
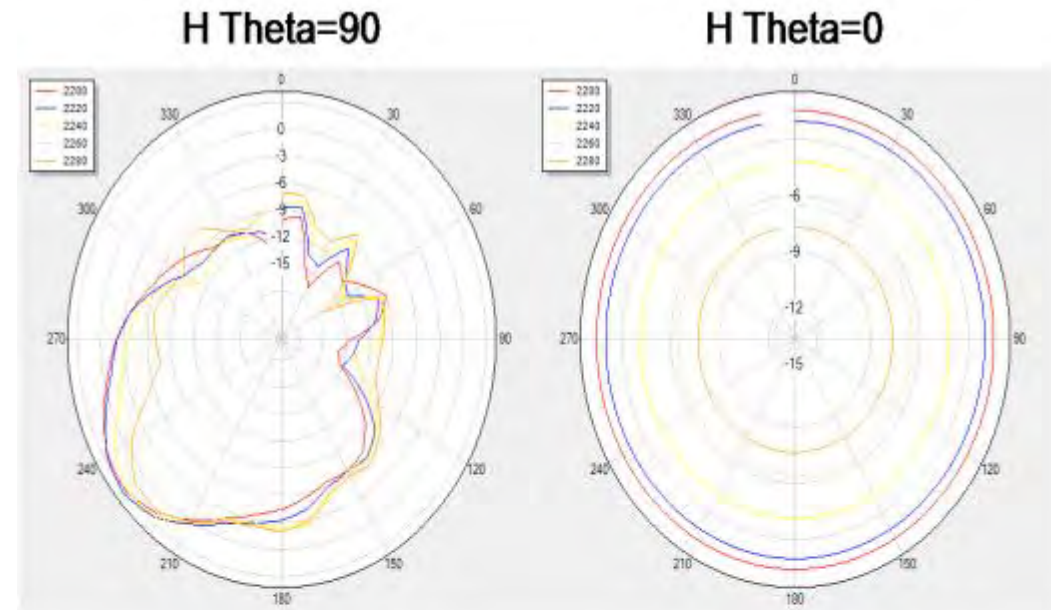
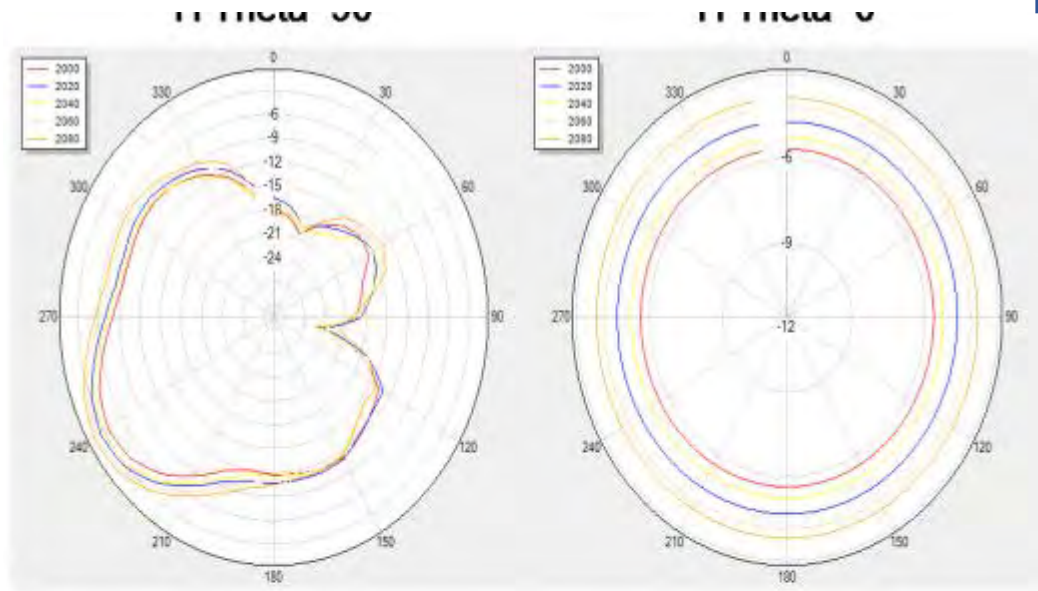
## 10. Antenna correlation data

Main antenna apple pattern and directional pattern

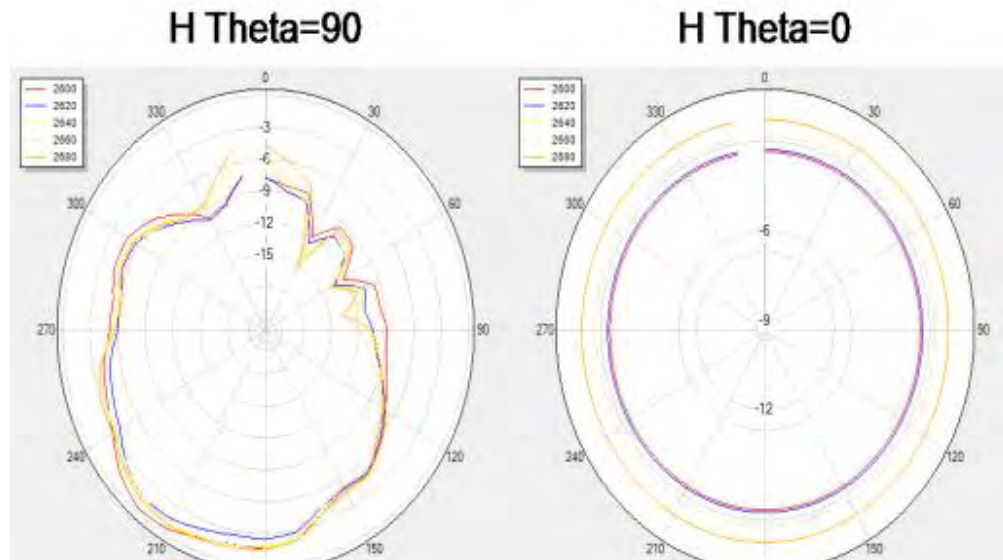
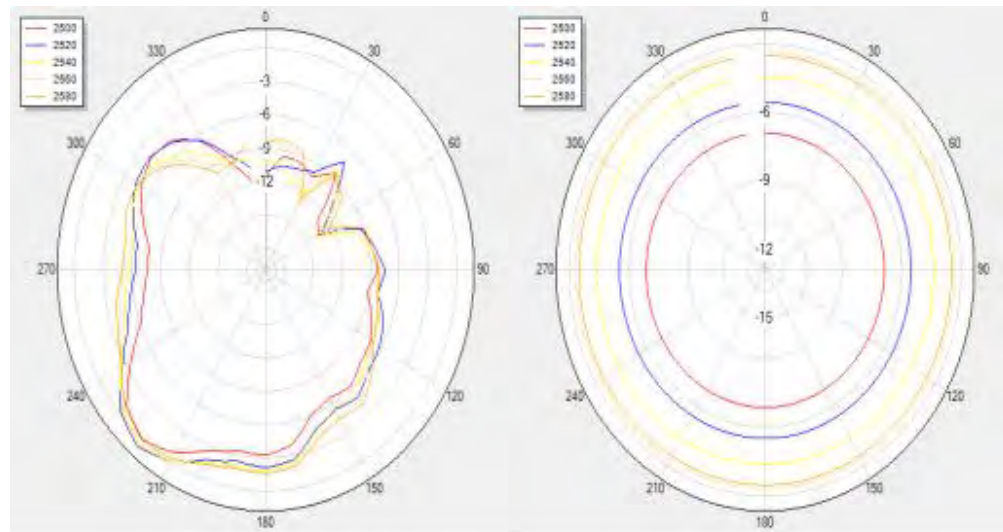


## 10. Antenna correlation data

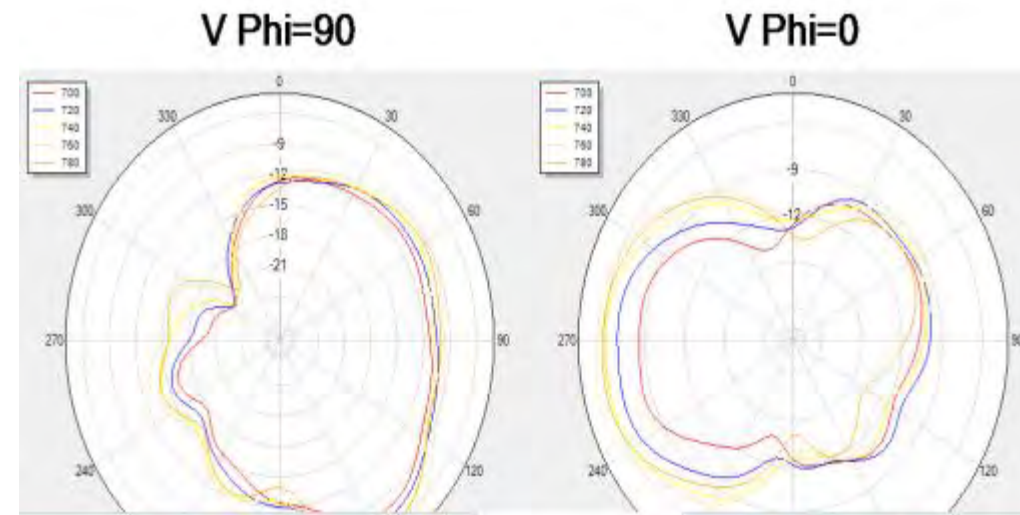
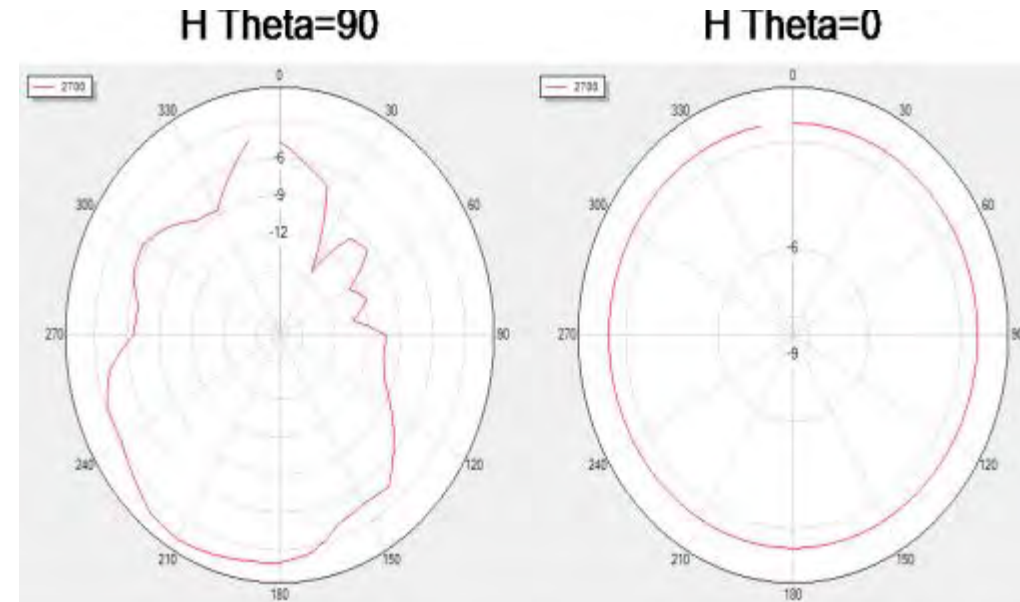
Main antenna apple pattern and directional pattern



## 10. Antenna correlation data



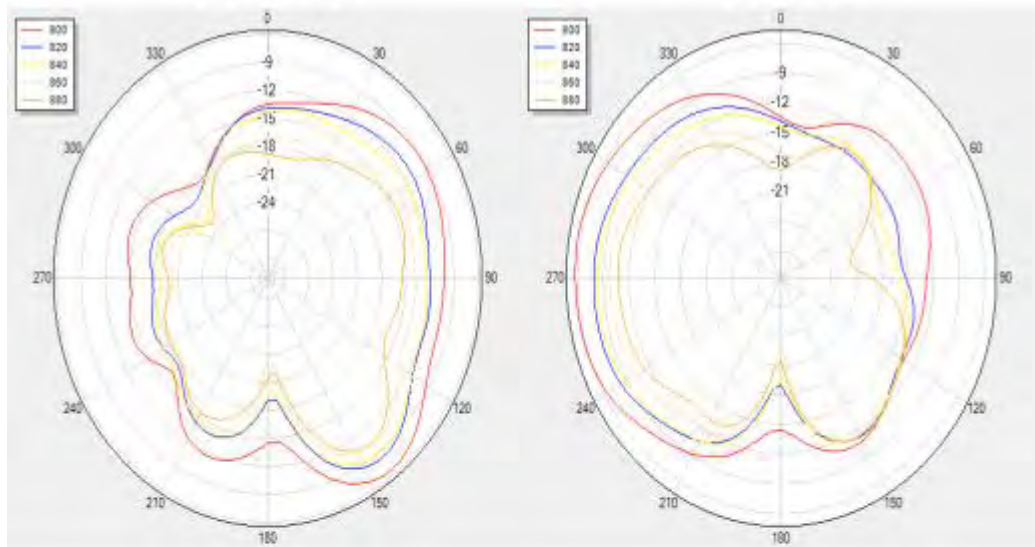
Main antenna apple pattern and directional pattern



## 10. Antenna correlation data

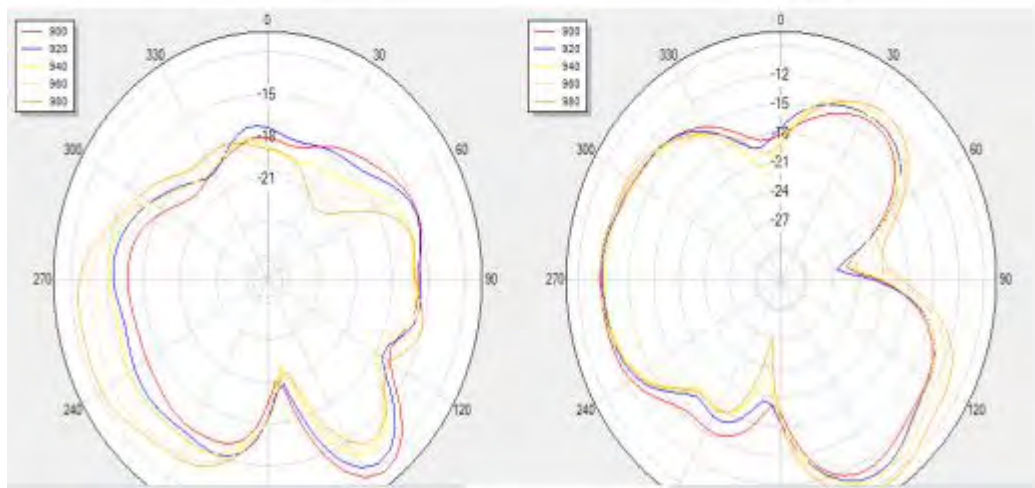
V Phi=90

V Phi=0



V Phi=90

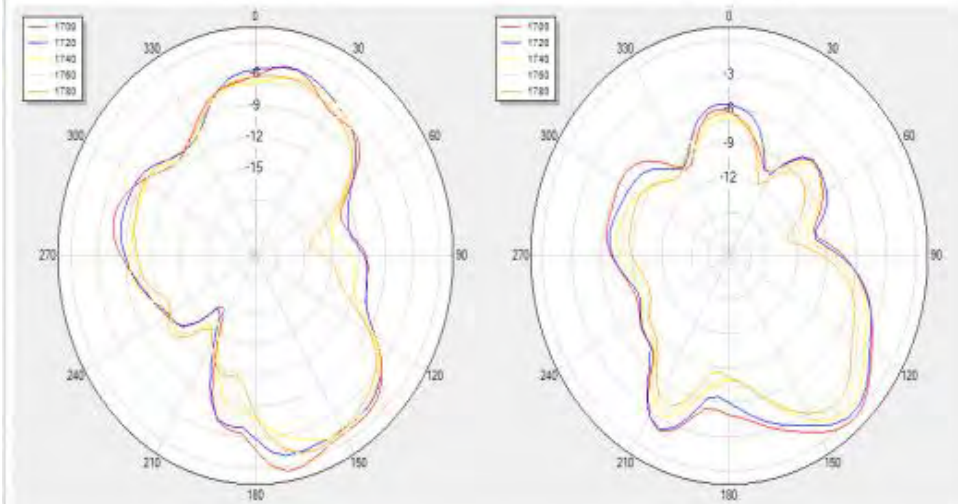
V Phi=0



Main antenna apple pattern and directional pattern

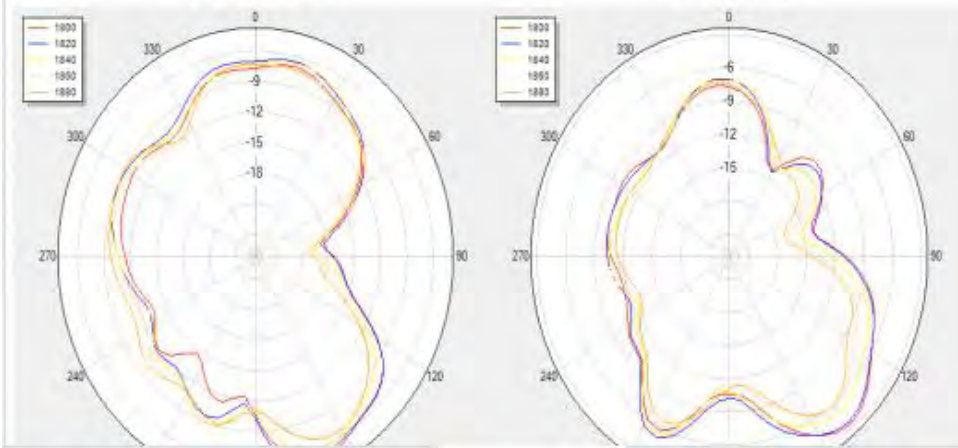
V Phi=90

V Phi=0



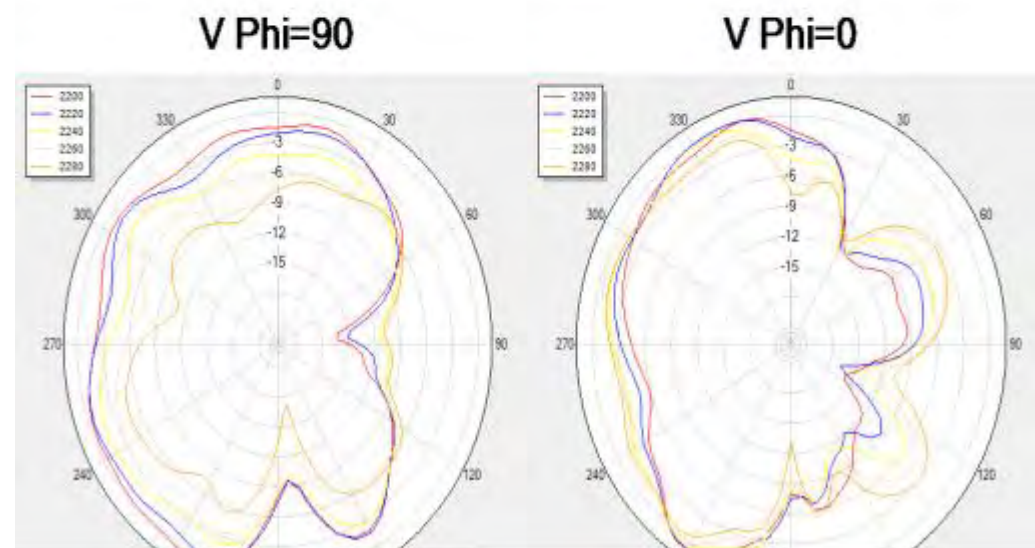
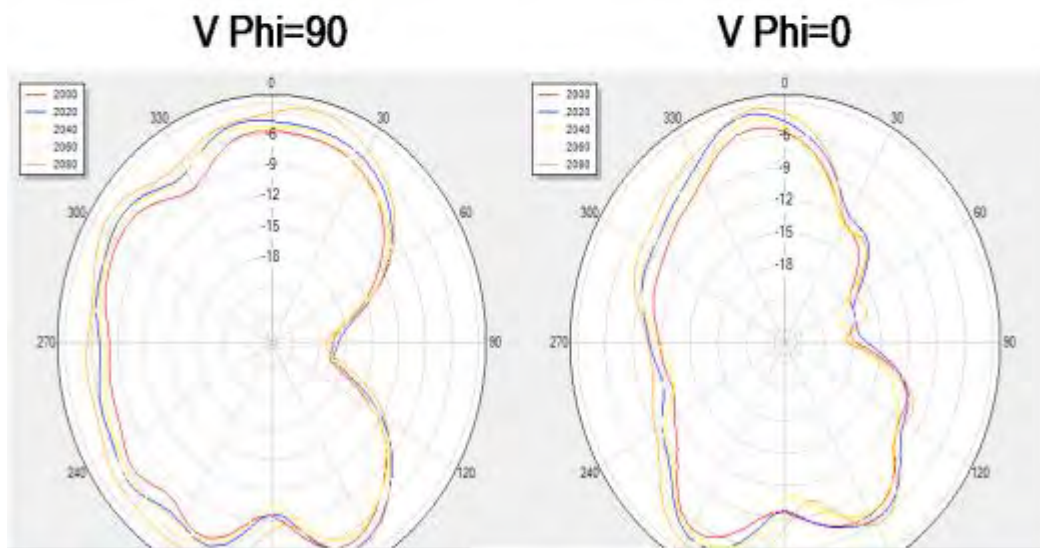
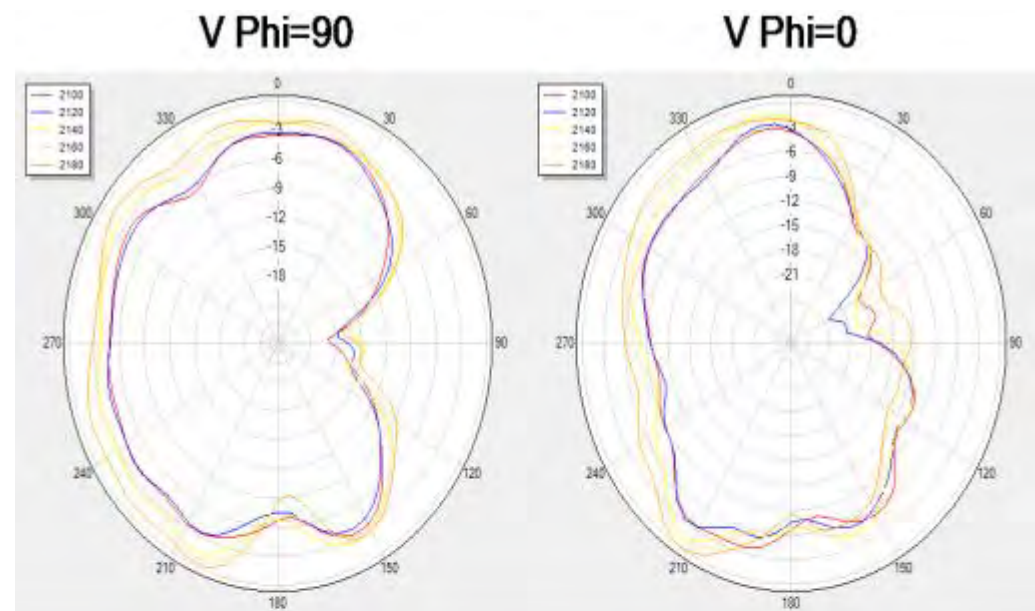
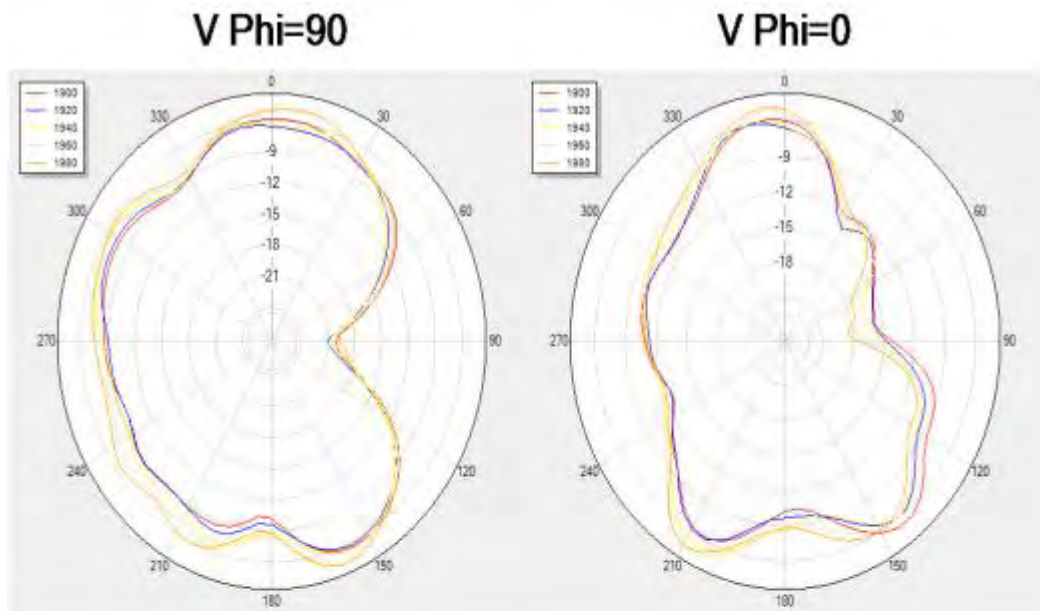
V Phi=90

V Phi=0



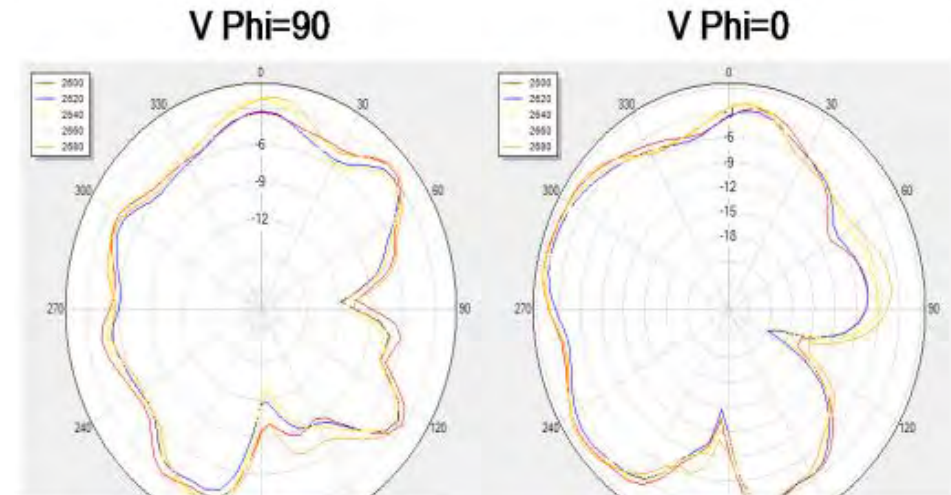
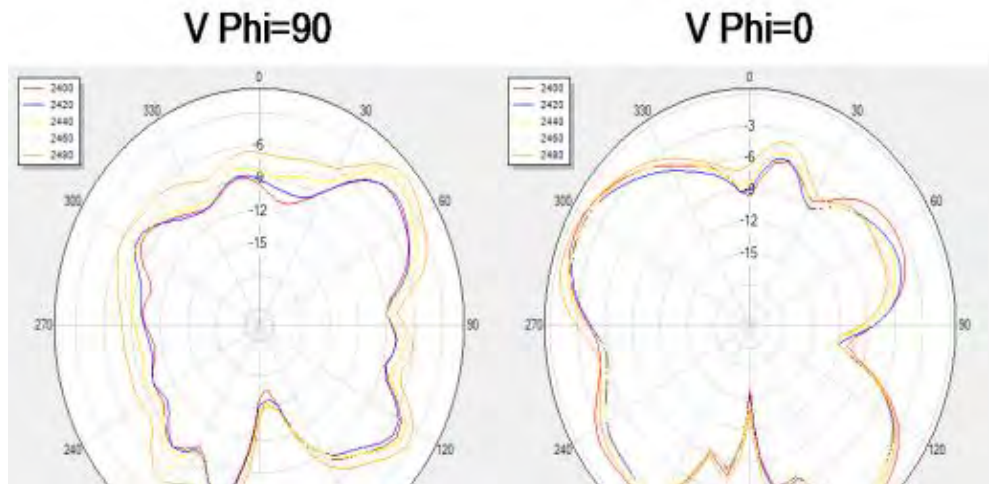
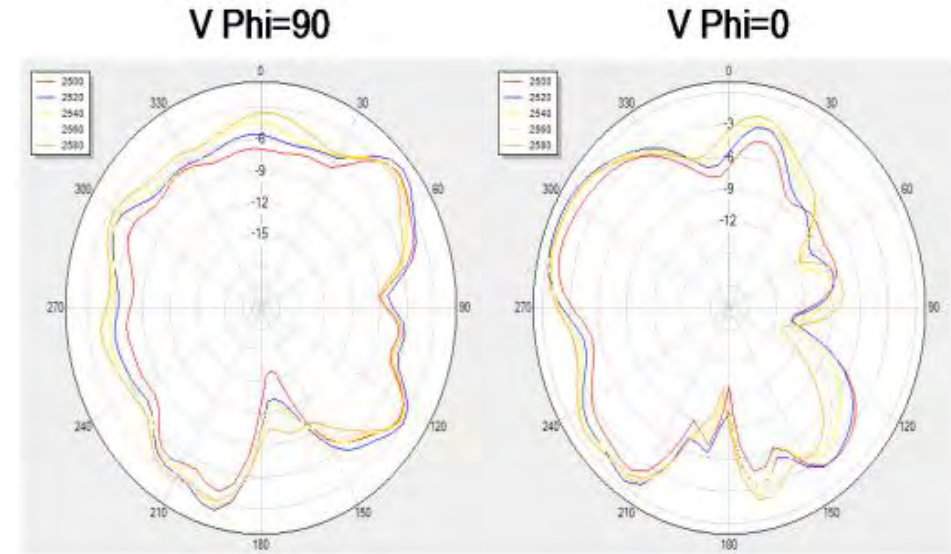
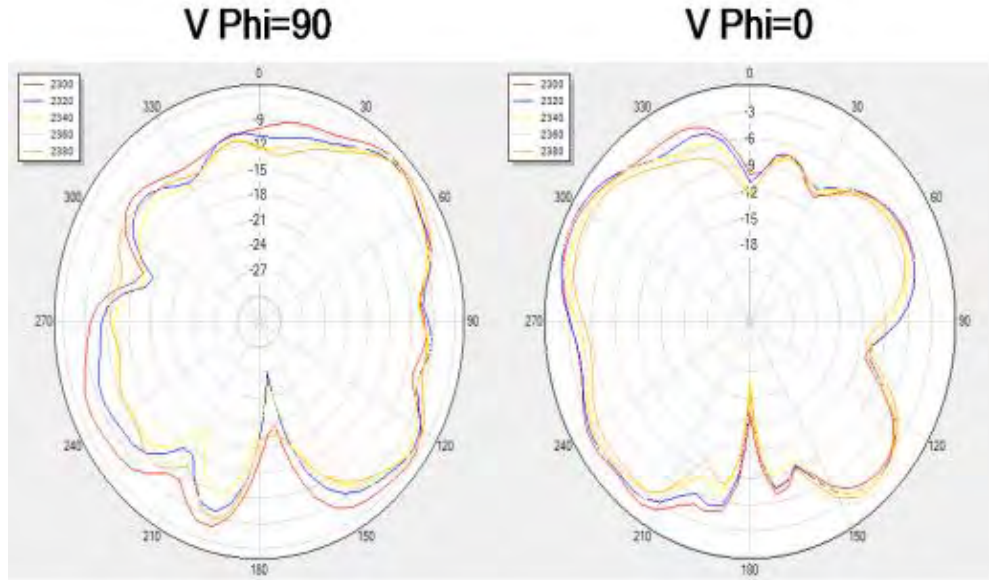
## 10. Antenna correlation data

Main antenna apple pattern and directional pattern



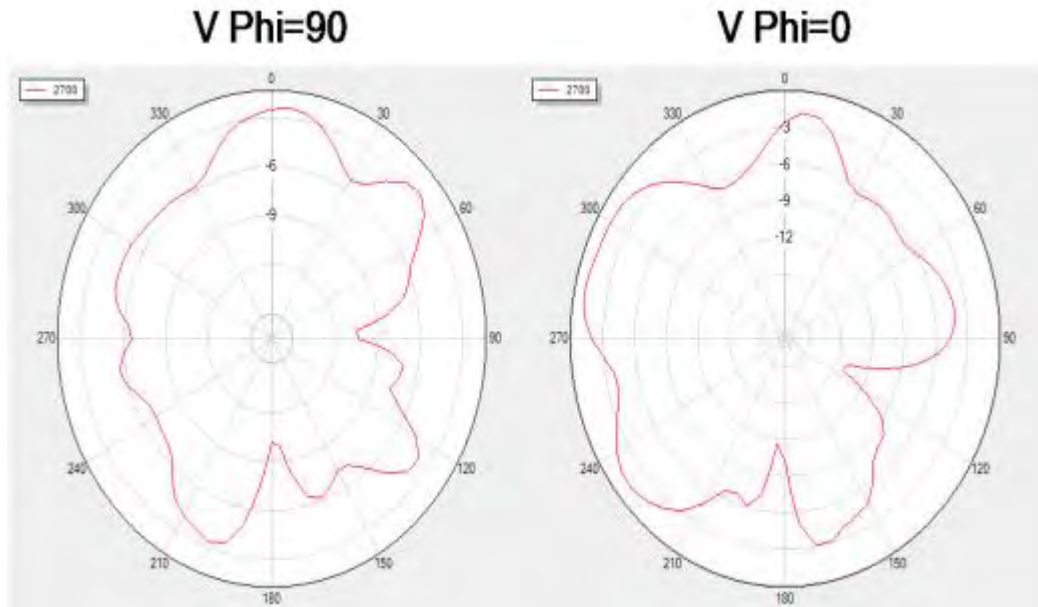
## 10. Antenna correlation data

Main antenna apple pattern and directional pattern



## 10. Antenna correlation data

Main antenna apple pattern and directional pattern



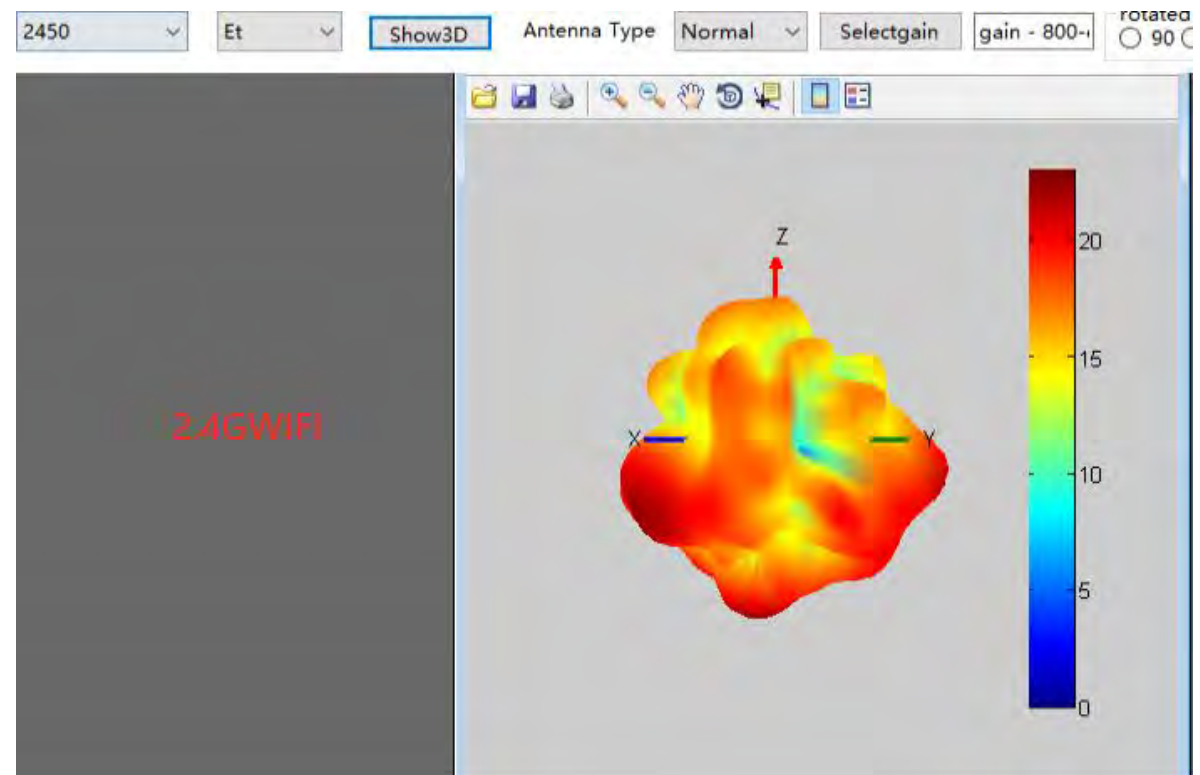
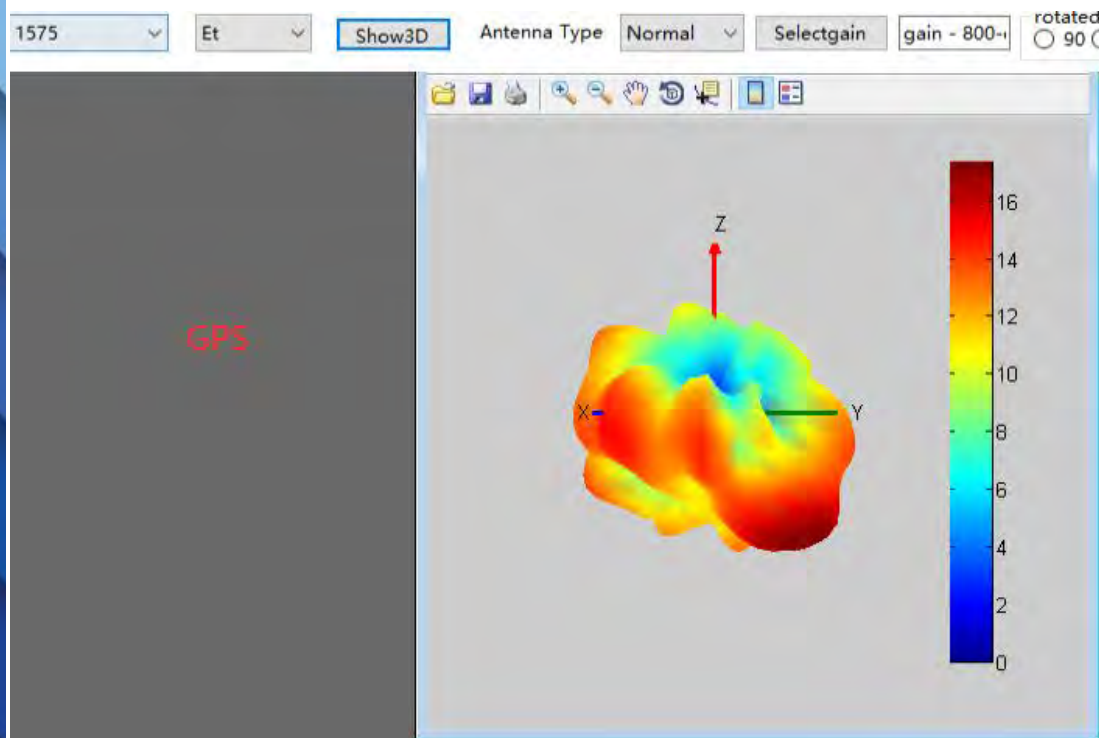
## 11. Antenna passive data

## Three in one antenna gain

| Gain&Efficiency      |                 |                 |                       |                     | Gain&Efficiency      |                 |                 |                       |                     | Gain&Efficiency      |                 |                 |                       |                     |       |
|----------------------|-----------------|-----------------|-----------------------|---------------------|----------------------|-----------------|-----------------|-----------------------|---------------------|----------------------|-----------------|-----------------|-----------------------|---------------------|-------|
| frequency<br>频率(MHz) | gain<br>增益(dBi) | mingain<br>最小增益 | efficiency<br>效率(dBi) | efficiency<br>效率(%) | frequency<br>频率(MHz) | gain<br>增益(dBi) | mingain<br>最小增益 | efficiency<br>效率(dBi) | efficiency<br>效率(%) | frequency<br>频率(MHz) | gain<br>增益(dBi) | mingain<br>最小增益 | efficiency<br>效率(dBi) | efficiency<br>效率(%) |       |
| 1570                 | 0.08            | -12.34          | -4.87                 | 32.59               | 2400                 | -1.45           | -21.79          | -5.79                 | 26.38               | 5100                 | -1.69           | -21.26          | -6.86                 | 20.61               |       |
| 1572                 | -0.03           | -12.29          | -4.94                 | 32.05               |                      | 2420            | -1.34           | -24.13                | -5.67               | 27.12                | 5200            | -0.7            | -27.81                | -6.4                | 22.89 |
| 1573                 | -0.05           | -12.3           | -4.93                 | 32.17               |                      | 2440            | -1.71           | -24.09                | -5.95               | 25.41                | 5300            | -0.78           | -18.6                 | -6.1                | 24.53 |
| 1574                 | -0.03           | -12.32          | -4.88                 | 32.53               |                      | 2460            | -1.29           | -28.35                | -5.79               | 26.36                | 5400            | -1.25           | -21.16                | -6.56               | 22.08 |
| 1575                 | 0               | -12.28          | -4.79                 | 33.16               |                      | 2480            | -0.91           | -33.15                | -5.54               | 27.94                | 5500            | -1.81           | -19.73                | -6.52               | 22.27 |
| 1576                 | 0.02            | -12.23          | -4.75                 | 33.47               |                      | 2500            | -1.15           | -25.54                | -5.66               | 27.14                | 5600            | -1.68           | -20.62                | -6.15               | 24.25 |
| 1578                 | 0.06            | -11.91          | -4.66                 | 34.19               |                      |                 |                 |                       |                     | 5700                 | -1.39           | -27.05          | -6.2                  | 23.98               |       |
| 1579                 | 0.08            | -11.69          | -4.62                 | 34.54               |                      |                 |                 |                       |                     | 5800                 | -0.7            | -21.69          | -6.18                 | 24.09               |       |
| 1580                 | 0.1             | -11.72          | -4.58                 | 34.83               |                      |                 |                 |                       |                     |                      |                 |                 |                       |                     |       |

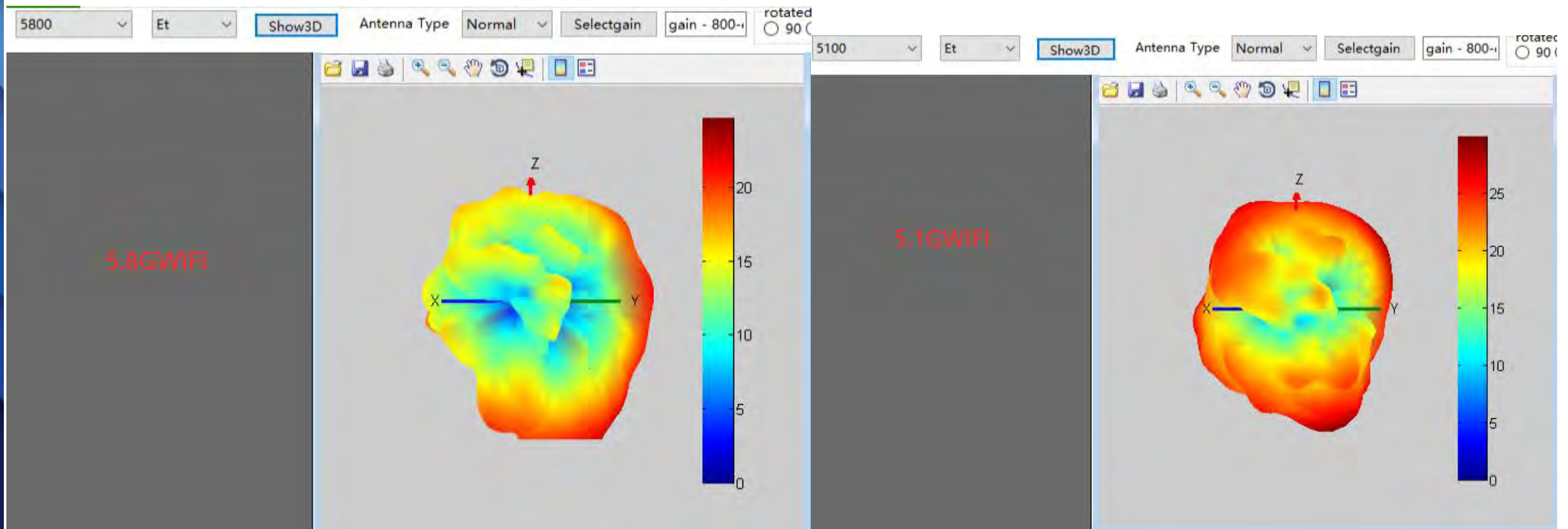
## 12. Antenna correlation data

Three in one antenna apple pattern and directional pattern



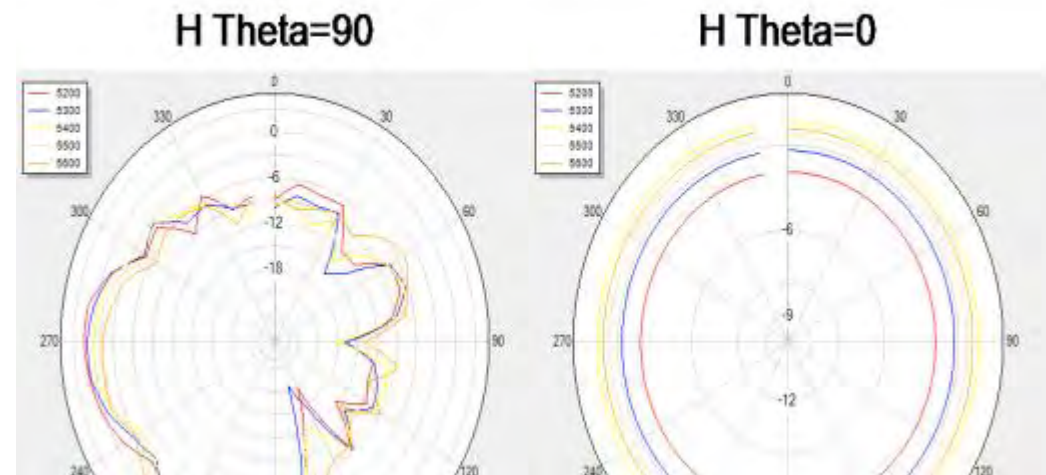
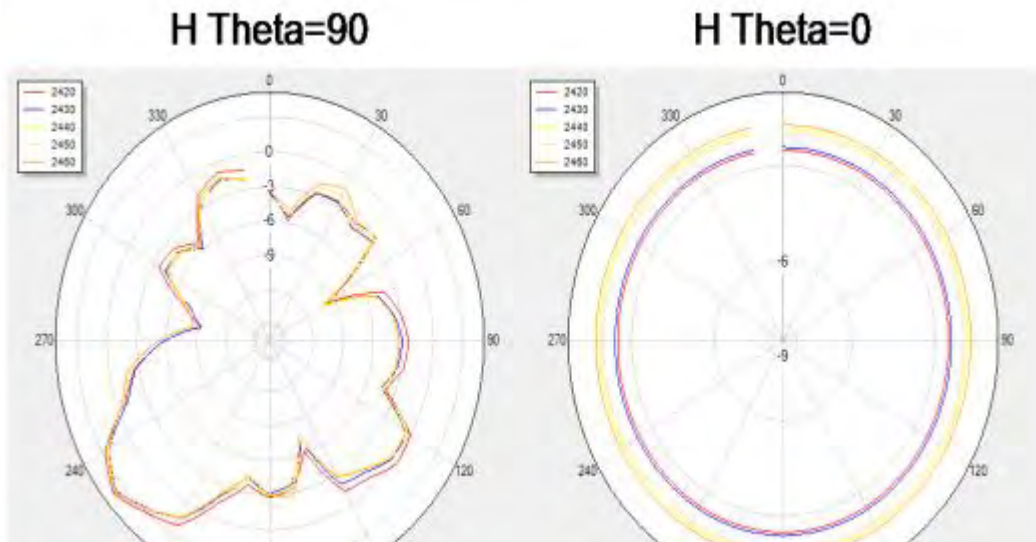
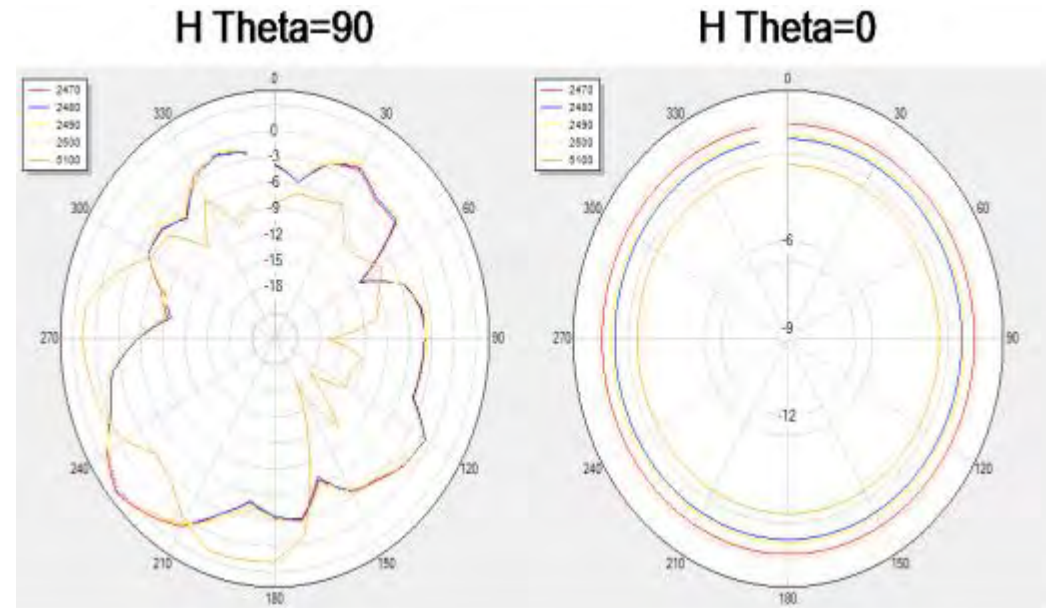
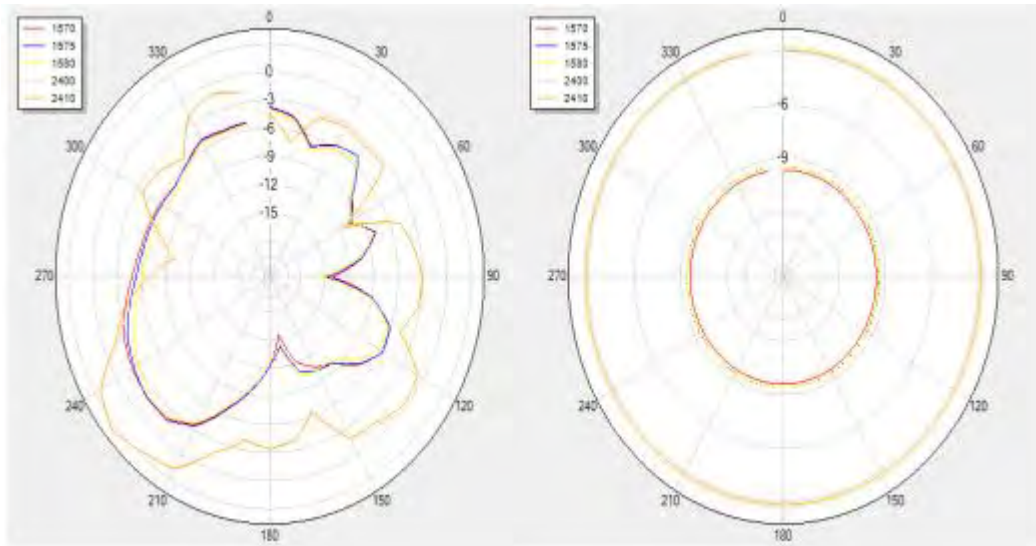
## 12. Antenna correlation data

Three in one antenna apple pattern and directional pattern



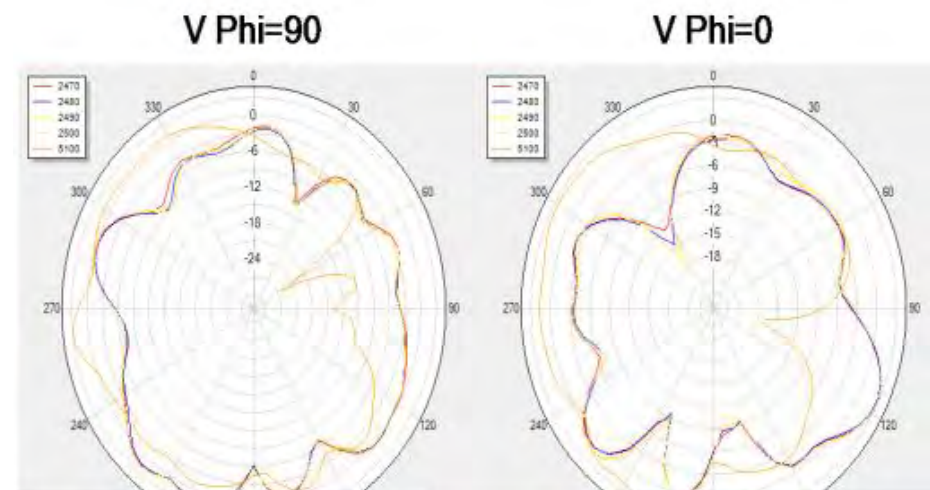
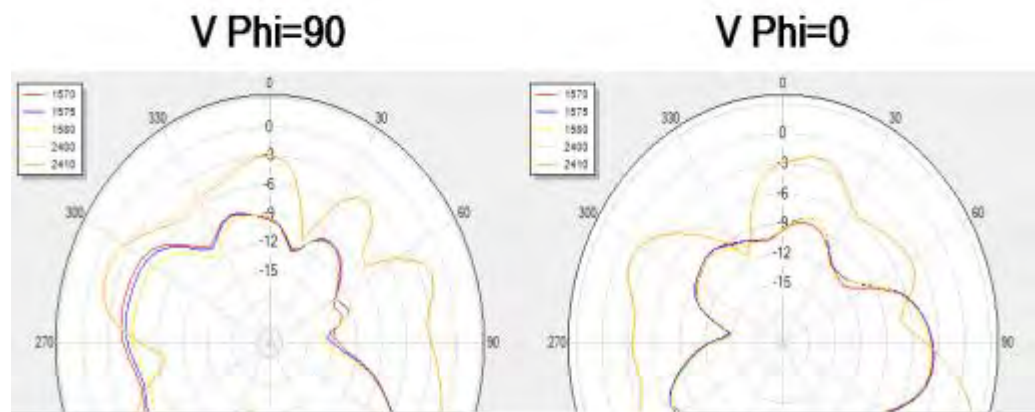
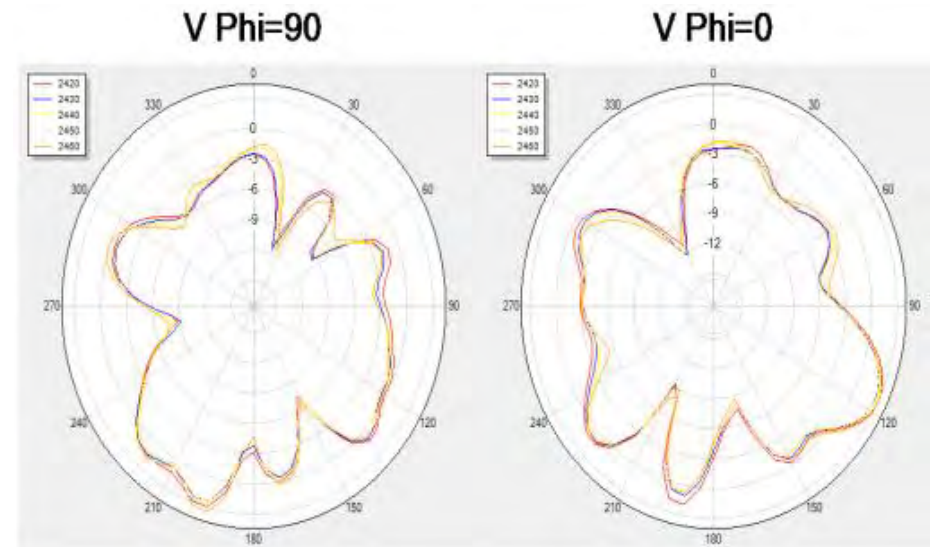
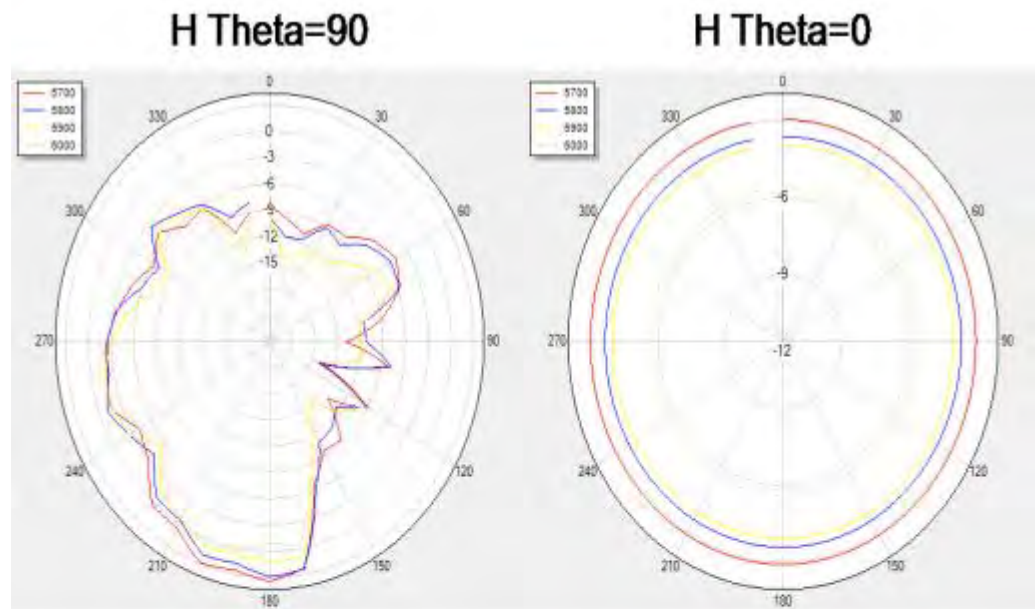
## 12. Antenna correlation data

Three in one antenna apple pattern and directional pattern



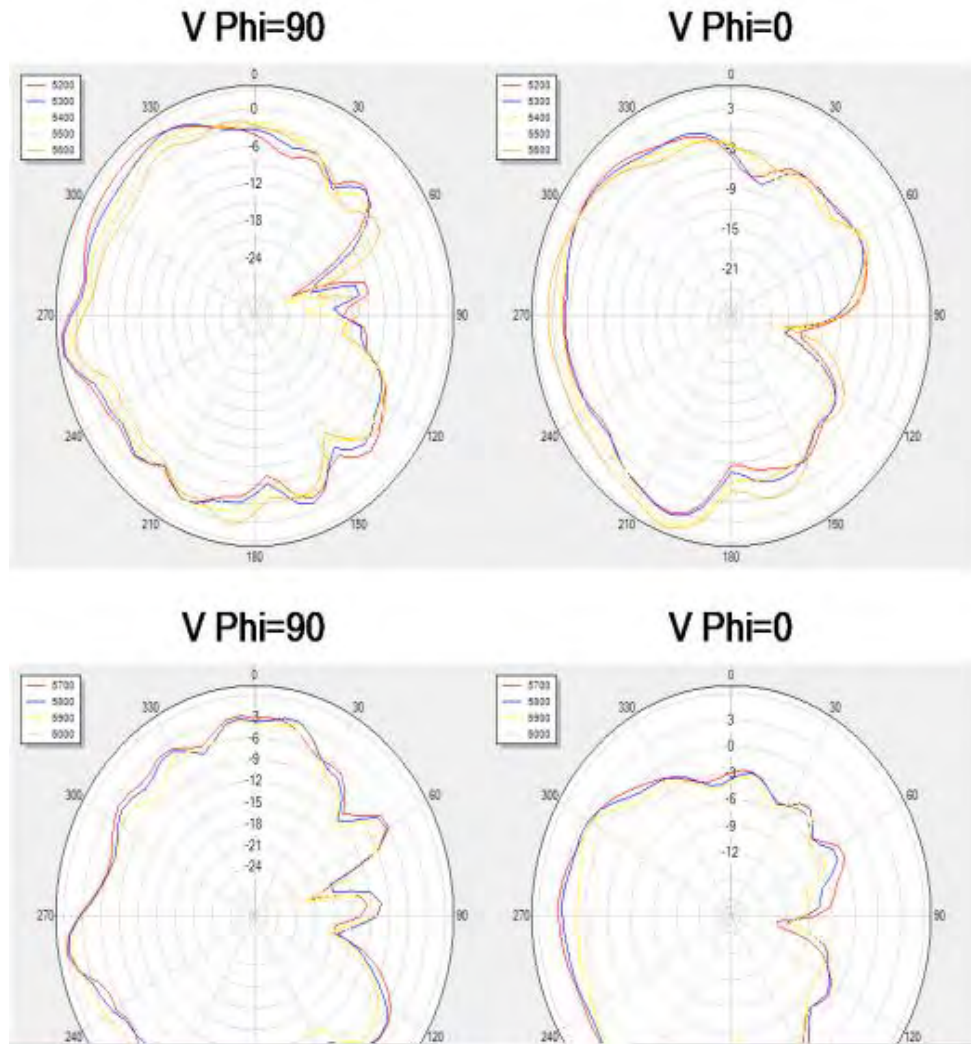
## 12. Antenna correlation data

Three in one antenna apple pattern and directional pattern

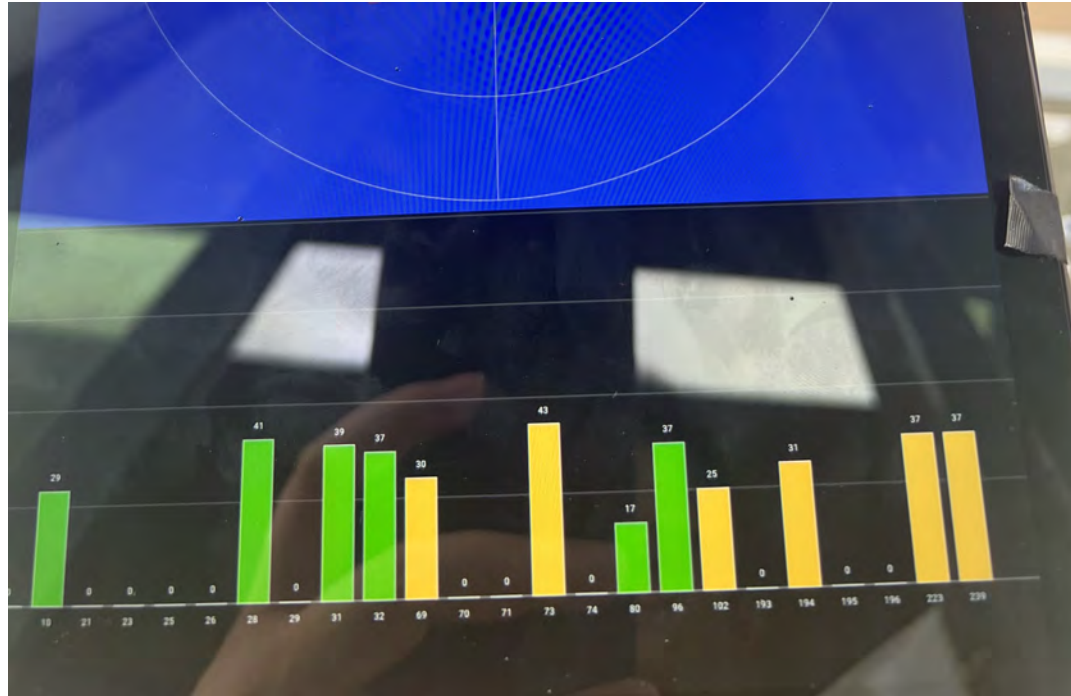


## 12. Antenna correlation data

Three in one antenna apple pattern and directional pattern

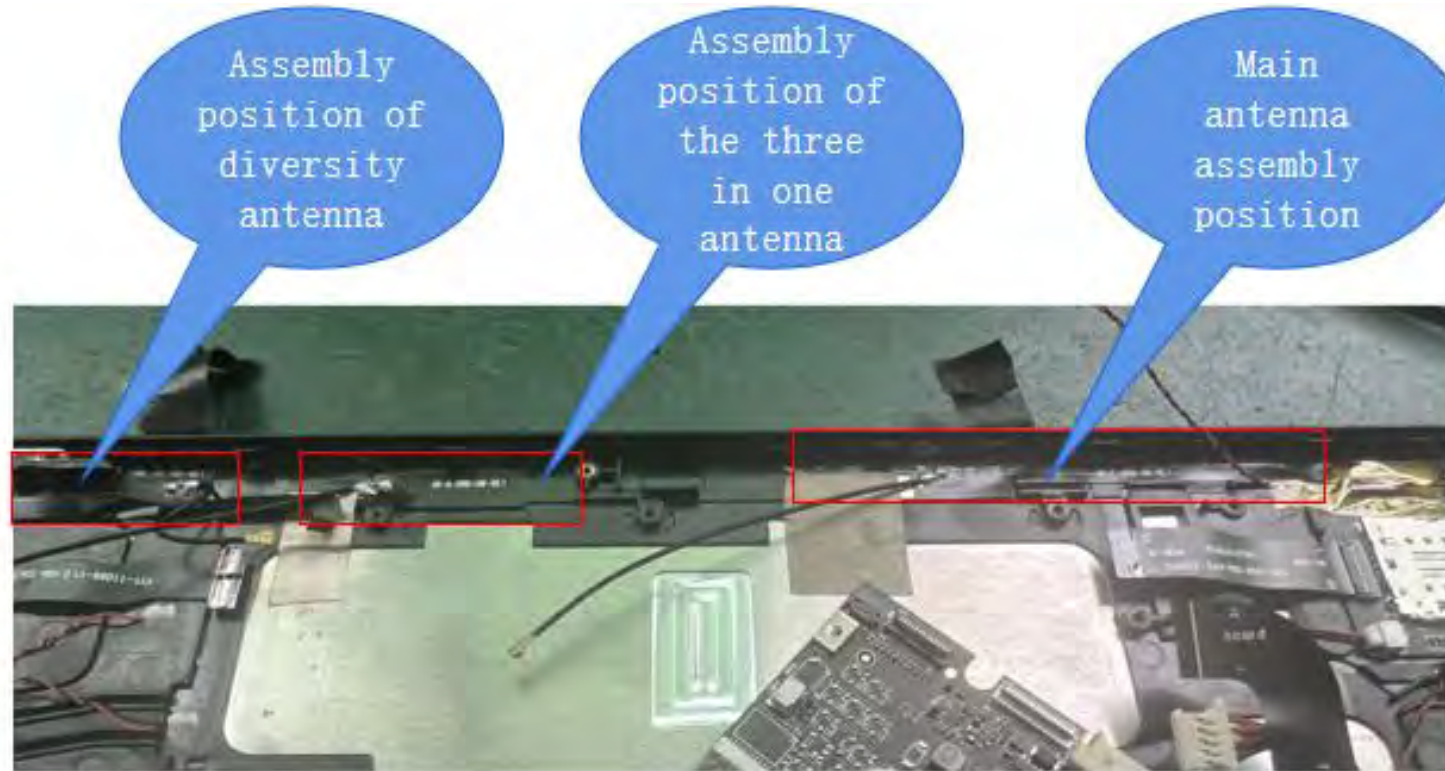


## 13.GPS/BT/ measured data



GPS cold start positioning for 65 seconds, C/N value of 42, Bluetooth 13 meters, no noise

## 14. Antenna location diagram

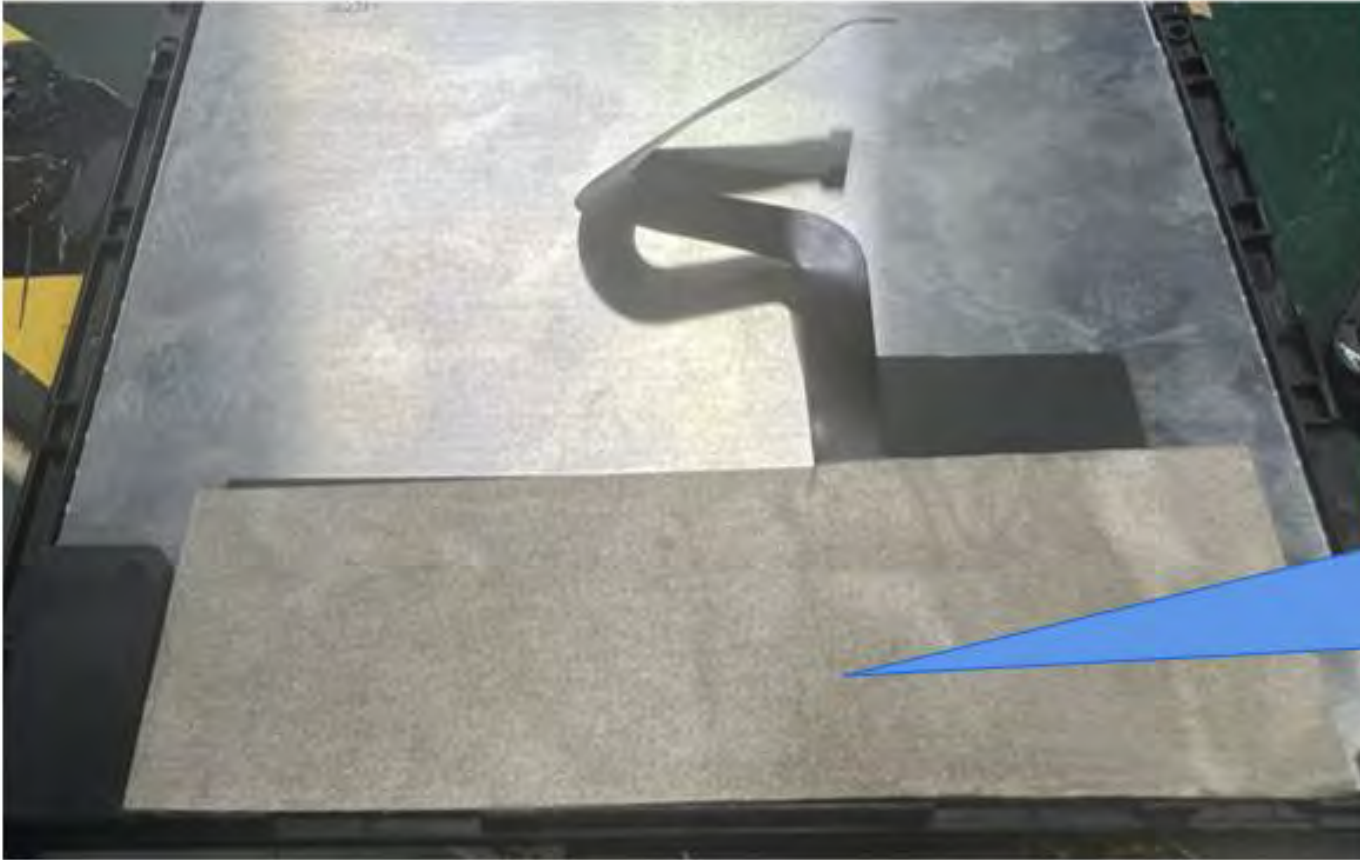


## 15. Environmental treatment



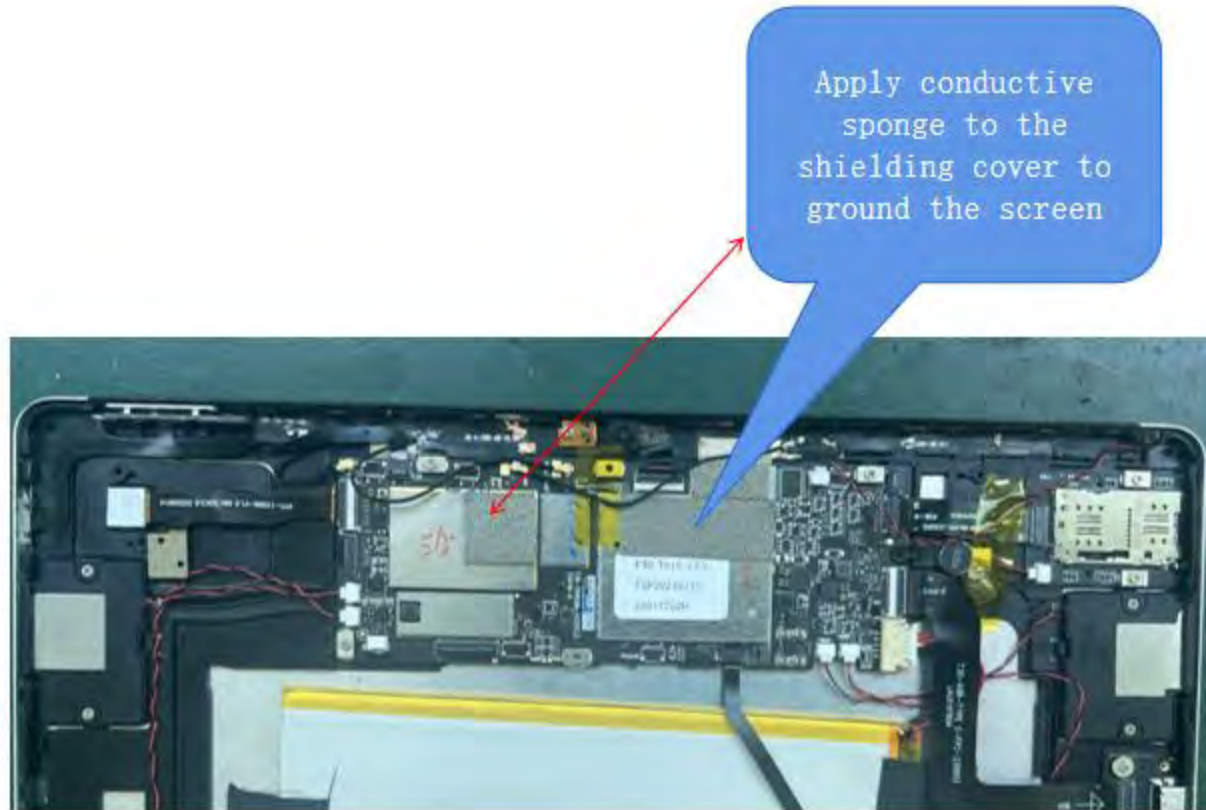
MIC wires  
should be  
placed below  
and away from  
the antenna

## 16. Environmental treatment

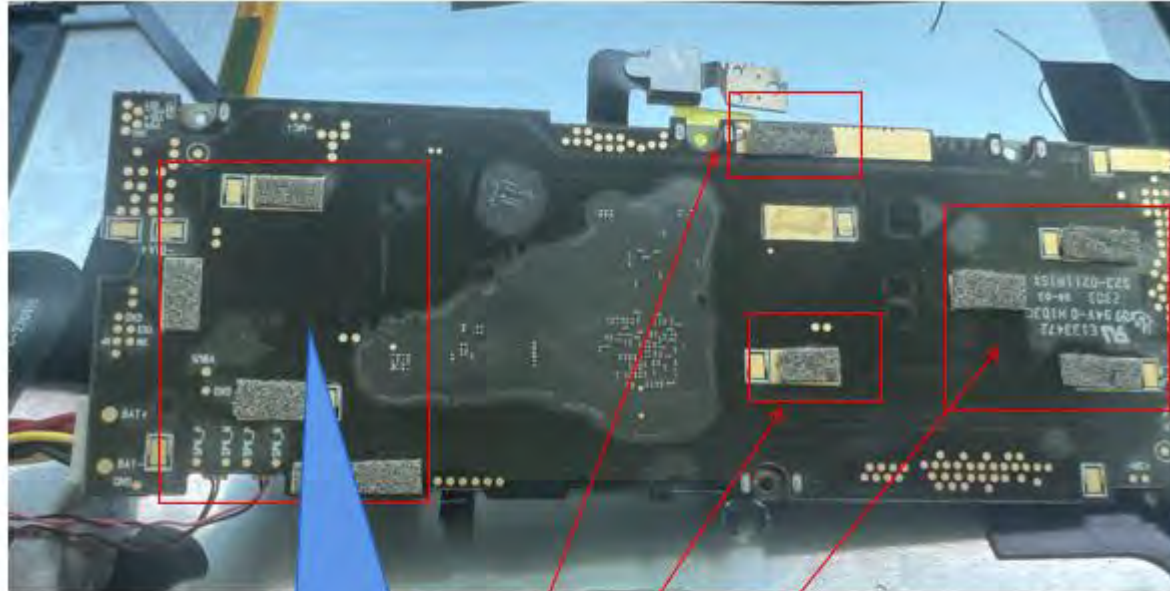


The flat wires of the screen are wrapped in conductive cloth and grounded

## 16. Environmental treatment



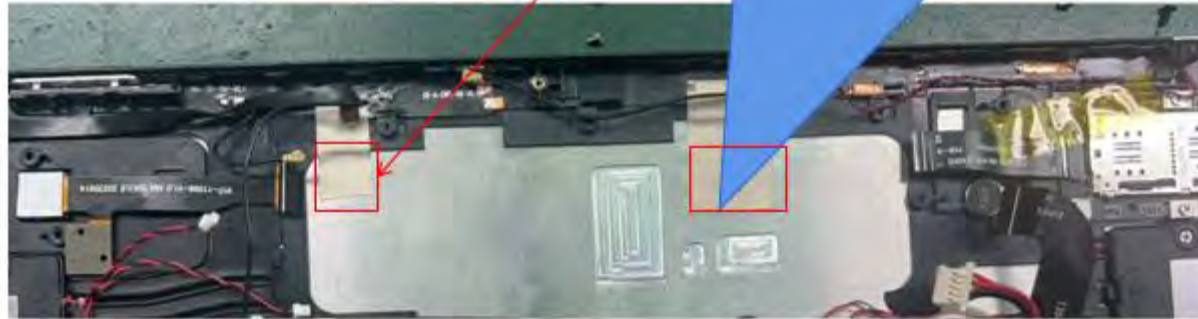
## 16. Environmental treatment



Connect conductive sponge to ground the copper leakage points on the motherboard

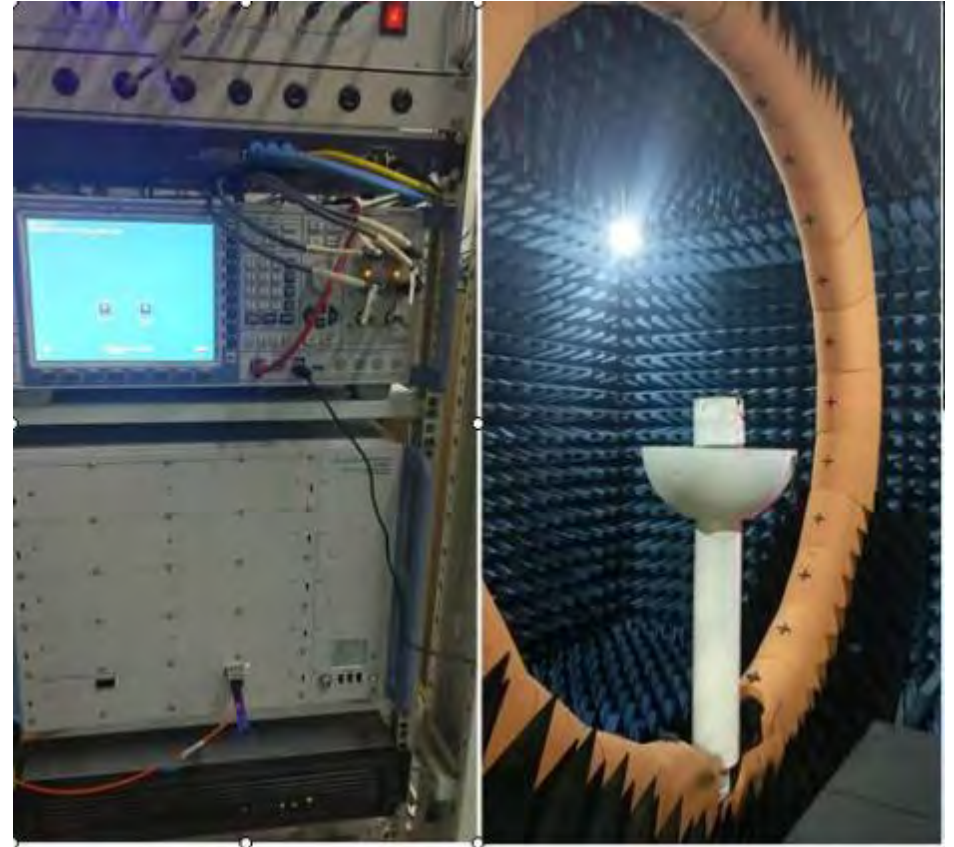
## 16. Environmental treatment

Apply conductive cloth to the copper leakage area of FPC and ground it to the bottom shell, with laser engraving in the red area

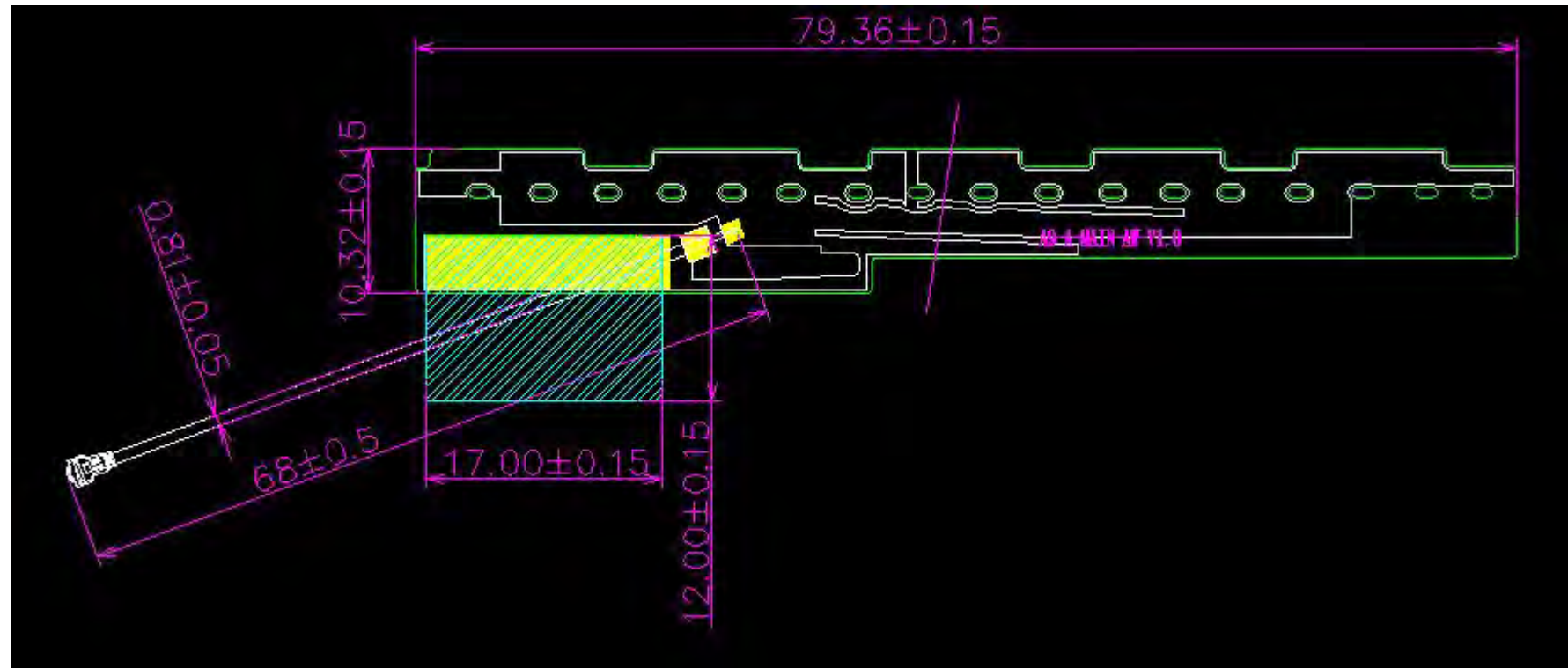


## 17.Conclusion

**The software and hardware of batch production should be the same as the sample machine.**



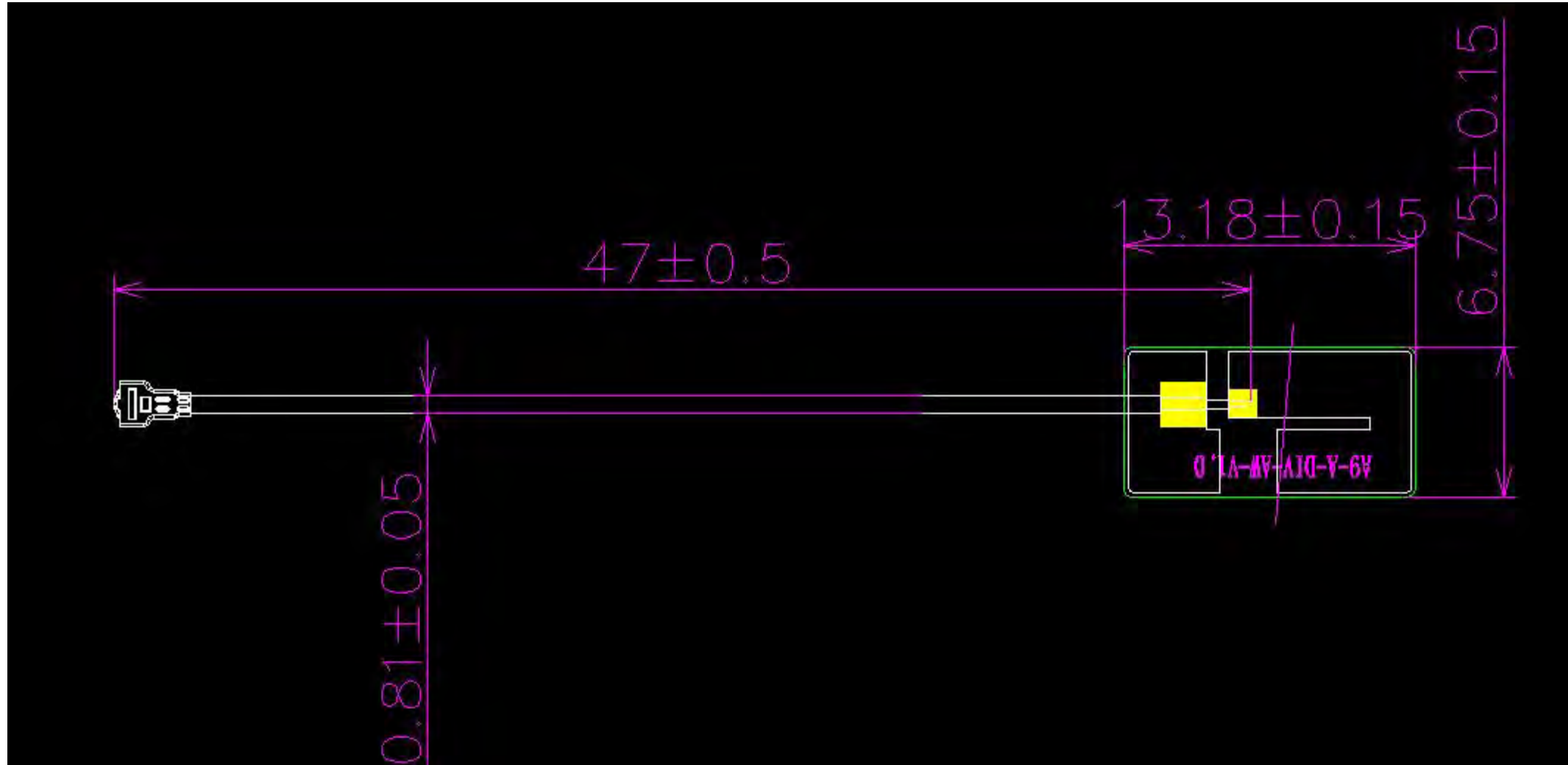
## Main antenna size



## Three in one antenna size



## Diversity antenna size



The background is a dark blue gradient with abstract, layered geometric shapes in various shades of blue and light blue, creating a sense of depth and movement. These shapes are primarily located in the top-left and bottom-right corners, framing the central text.

# THANKS!

ANWEI communication Technology Co., Ltd.