

# APPROVAL SHEET

Customer Name: VeriFone

Date: Jun. 28 2024

|              |                      |
|--------------|----------------------|
| Verifone P/N |                      |
| DCT P/N      | F-2A-XZ-0381-000-K0  |
| Description  | ANTENNA, V660P-A WCN |
| Version      | DVT1                 |

| Prepared by     | Signed by      | Approved by<br>Customer |
|-----------------|----------------|-------------------------|
| RF Engineer     | Chun Yin       |                         |
| ME Engineer     | Heqing He      |                         |
| Reviewed by     | Signed by      |                         |
| RF Manager      | Xiangxiang Sun |                         |
| ME Manager      | Jun Wang       |                         |
| Project Manager | Wei Wei        |                         |

|                                            |                       |                                                     |
|--------------------------------------------|-----------------------|-----------------------------------------------------|
| Project:V660P-A                            | Author:Chun Yin       | File Name:<br>V660P-A WCN Antenna Approval<br>sheet |
| Date: APR.11.2024                          |                       |                                                     |
| Language: English                          | Check: Xiangxiang Sun |                                                     |
| Document No.:                              |                       |                                                     |
| Huizhou Speed Wireless Technology Co., Ltd |                       |                                                     |

# 1 Antenna Description

Top View

| WCN Antenna Structure                                          |
|----------------------------------------------------------------|
| 1. FPC with SPRING ; Fixed Internal Antenna (Monopole antenna) |

## 1.1 Matching Circuit

| WCN天線匹配 | 原始貼片    | 更改   | SAR SENSOR | 原始貼片        | 更改    |
|---------|---------|------|------------|-------------|-------|
| L3504   | 39nH    | 10NH | L3503      | 100NH (可更改) | 22NH  |
| R3505   | 0 ohm   | 3PF  | L3513      | 0ohm (可更改)  | 100NH |
| C3528   | NA      |      | R3504      | 33PF 勿动     |       |
| R3510   | 0 Ohm   |      | L3502      | 100nH 勿动    |       |
| C3553   | NA      |      | R3506      | 18PF 勿动     |       |
| R3511   | 33PF 勿动 | NA   |            |             |       |
| C3524   | 33PF 勿动 | NA   |            |             |       |
| 弹片3501  | 贴片      | NA   |            |             |       |
| 弹片3502  | 贴片      | NA   |            |             |       |
|         |         |      |            |             |       |

# 2 Product Specification

## 2.1 S11 (Return Loss)

The S11 over the frequencies stated in Table 1 below shall be measured at the connector end of the cable for each antenna assembly. The S11 are measured with the antennas installed on platform. The S11 shall be 100% tested in production.

| Test Parameter | 698 MHz to 960 MHz | 1710 MHz to 2690 MHz |
|----------------|--------------------|----------------------|
| S11:           | -5dB Max           | -5dB Max             |

## 2.2 Test environment

The radiation pattern and antenna gain shall be tested either with a conventional far field anechoic chamber or a near field anechoic chamber such as a Satimo SG24-L.

For a far field anechoic chamber, the gain measurements shall be made within an RF anechoic chamber with at least 3-meter separation from the receive antenna to the antenna under test

(AUT). The RF anechoic chamber must be lined with absorptive material rated as a minimum frequency range from 400MHz to 10GHz. The notebook with the antenna assemblies installed shall be placed on a non-conductive structure at a sufficient height to be in the ‘quiet zone’ of the chamber. All test equipment including horn antennas, adapters, cables, network analyzers, and receivers shall be calibrated per manufacturer’s minimum calibration requirements. For a near field anechoic chamber, the AUT test must be place in the center (and within the admissible offset) of the probe array elements. The RF anechoic chamber must be lined with absorptive material rated as a minimum frequency range from 400MHz to 10GHz. The notebook with the antenna assemblies installed shall be placed on a non-conductive structure.

## 2.3 Antenna radiation measurement

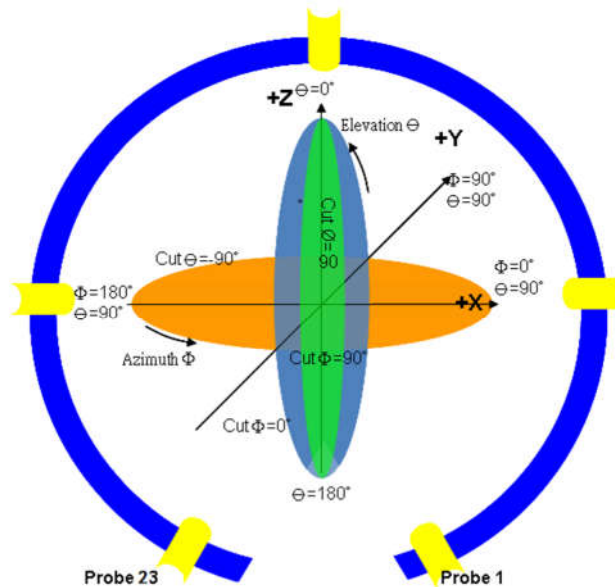
In order to ensure compliance with network carrier specifications, it is required to measure a 3-D gain measurement for WCN Antenna.

Table below specifies the details of the 3-D gain measurement points

|                      |                    |
|----------------------|--------------------|
| Theta Start: 0°      | Phi Start: 0°      |
| Theta Stop: 150°     | Phi Stop: 330°     |
| Theta increment: 30° | Phi Increment: 30° |

The table above specifies the minimum 23 measurement points (x2 polarizations) for each measurement frequency.

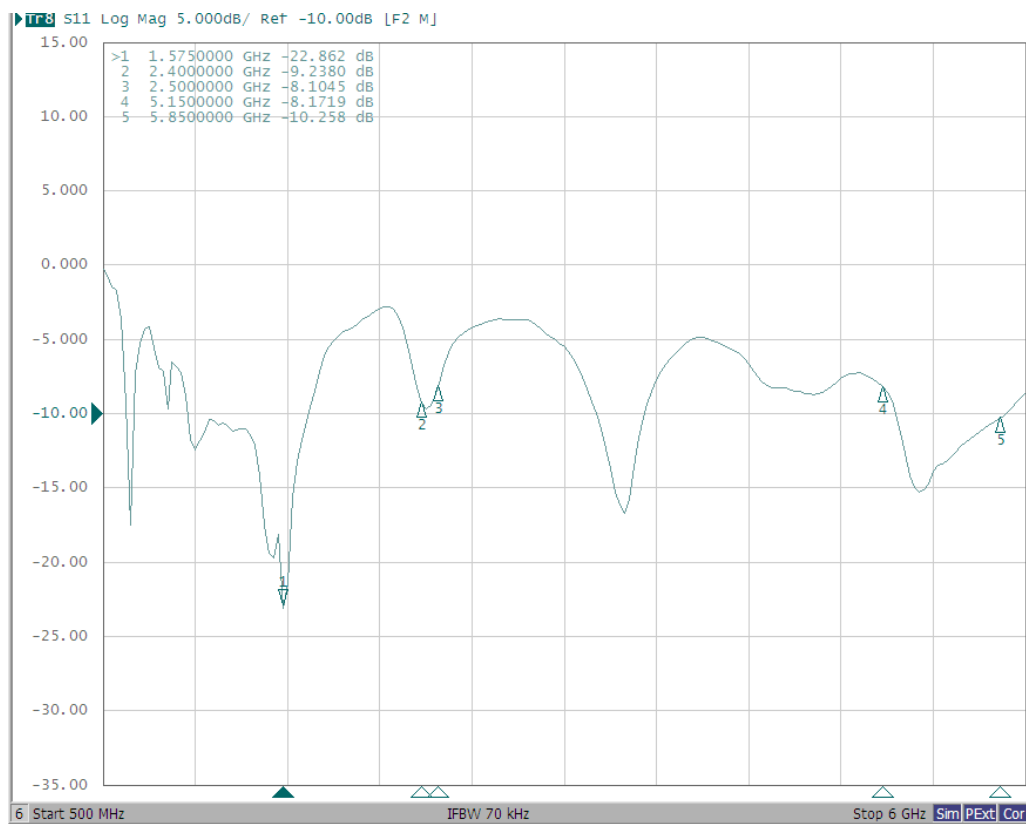
The axis and AUT orientation for gain measurements are outlined in below Figures.



**The axis definition**

### 3 Antenna Performance Test

#### 3.1 S11 of WCN Antenna

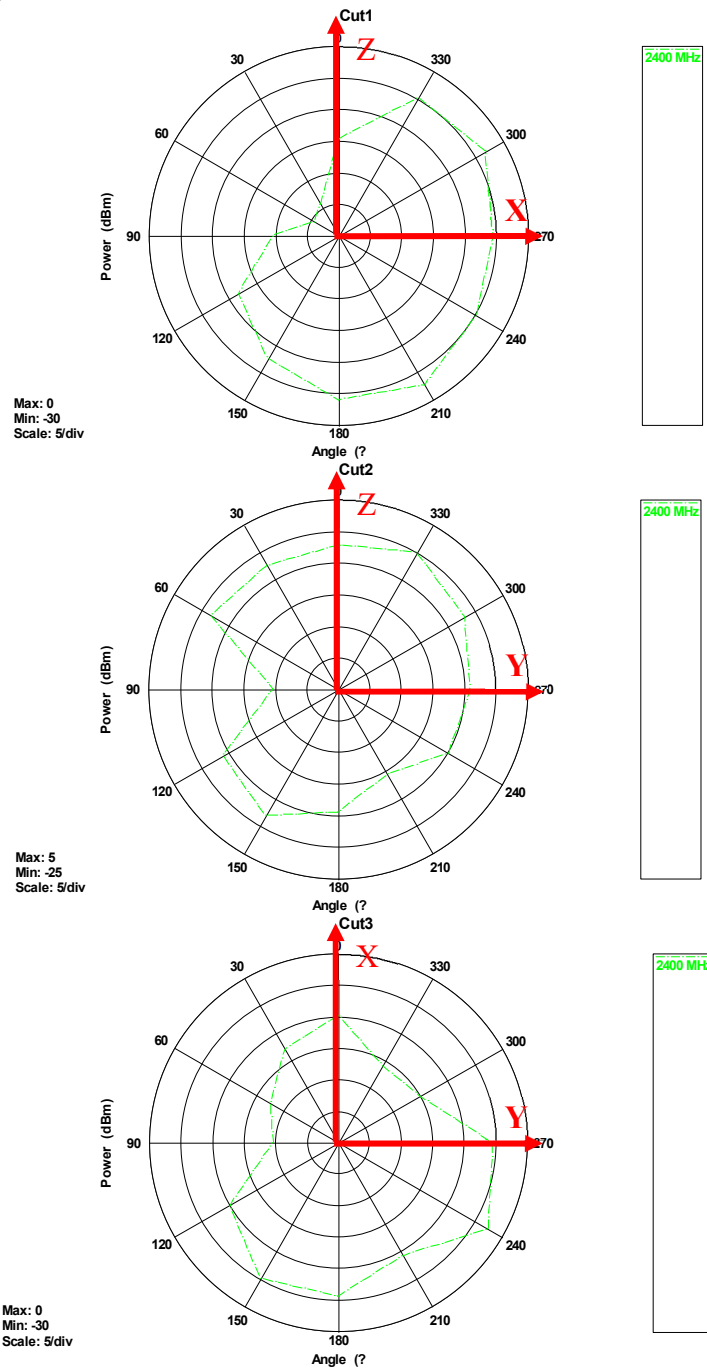


#### 3.2 Antenna Radiated Efficiency

| Frequency(MHz) | Efficiency | Efficiency(dB) | Peak Gain | Frequency(MHz) | Efficiency | Efficiency(dB) | Peak Gain | Frequency(MHz) | Efficiency | Efficiency(dB) | Peak Gain |
|----------------|------------|----------------|-----------|----------------|------------|----------------|-----------|----------------|------------|----------------|-----------|
| 1560           | 46.7       | -3.3           | 0.8       | 2400           | 49.8       | -3             | 1         | 5150           | 46.8       | -3.3           | 1.6       |
| 1565           | 47.1       | -3.3           | 0.8       | 2410           | 50.6       | -3             | 1.2       | 5200           | 41.1       | -3.9           | 1.4       |
| 1570           | 47.1       | -3.3           | 0.7       | 2420           | 51.6       | -2.9           | 1.4       | 5250           | 41         | -3.9           | 1.3       |
| 1575           | 47.3       | -3.3           | 0.6       | 2430           | 52.3       | -2.8           | 1.6       | 5300           | 42.2       | -3.7           | 1.6       |
| 1580           | 47.8       | -3.2           | 0.6       | 2440           | 53.2       | -2.7           | 1.6       | 5350           | 40.2       | -4             | 1.6       |
| 1585           | 48.5       | -3.1           | 0.5       | 2450           | 53.7       | -2.7           | 1.6       | 5400           | 35.7       | -4.5           | 0.5       |
| 1590           | 49         | -3.1           | 0.4       | 2460           | 54.8       | -2.6           | 1.6       | 5450           | 35.8       | -4.5           | 0.3       |
| 1595           | 50         | -3             | 0.4       | 2470           | 55.4       | -2.6           | 1.6       | 5500           | 36.4       | -4.4           | 0.3       |
| 1600           | 50.6       | -3             | 0.3       | 2480           | 55.1       | -2.6           | 1.6       | 5550           | 35.6       | -4.5           | 0.3       |
| 1605           | 50.8       | -2.9           | 0.4       | 2490           | 54.4       | -2.6           | 1.5       | 5600           | 34.8       | -4.6           | 0.2       |
| 1610           | 51.4       | -2.9           | 0.5       | 2500           | 53.4       | -2.7           | 1.5       | 5650           | 32.9       | -4.8           | -0.2      |
| 平均值            | 48.7       | -3.1           | 0.3       | 平均值            | 53.1       | -2.7           | 1.47      | 5700           | 32.8       | -4.8           | -0.3      |
|                |            |                |           |                |            |                |           | 5750           | 36.5       | -4.4           | -0.3      |
|                |            |                |           |                |            |                |           | 5800           | 36.4       | -4.4           | -0.3      |
|                |            |                |           |                |            |                |           | 5850           | 36.7       | -4.4           | -0.3      |
|                |            |                |           |                |            |                |           | 平均值            | 37.4       | -4.3           | 0.51      |

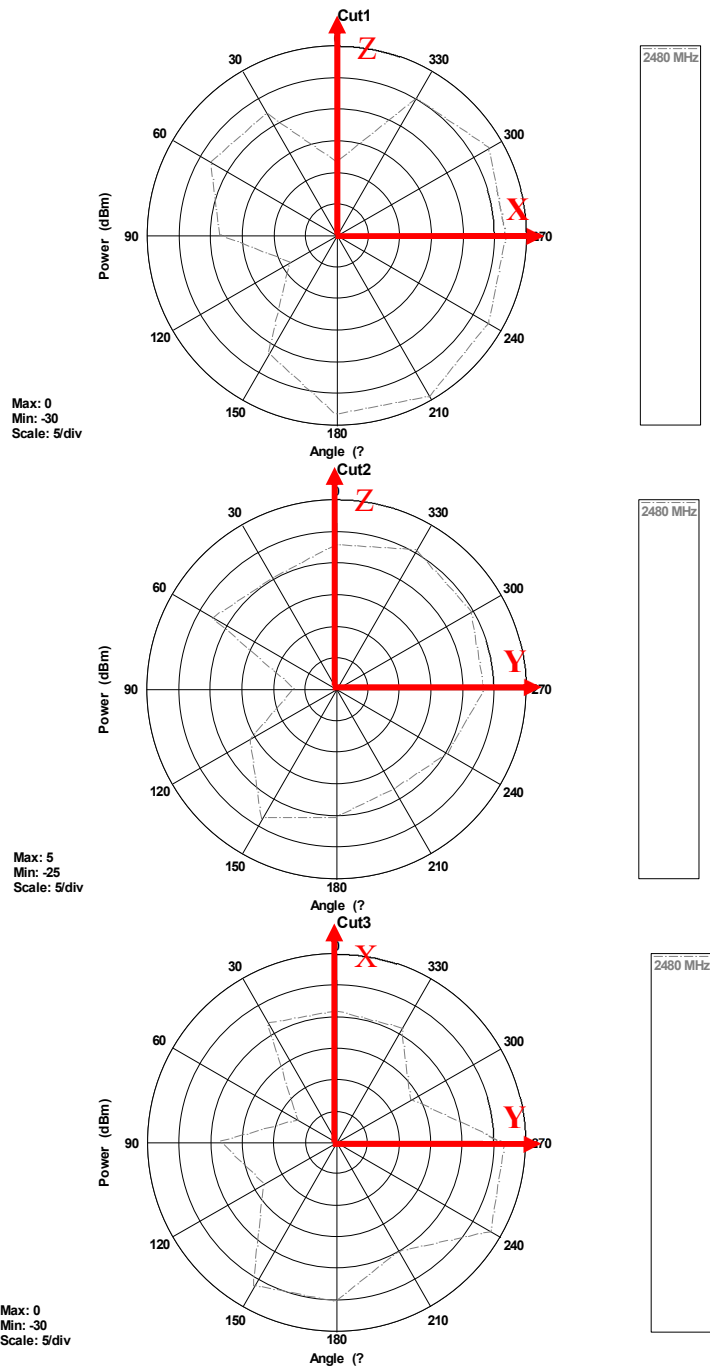
### 3.3 Radiation Pattern

WCN antenna: 2400MHz



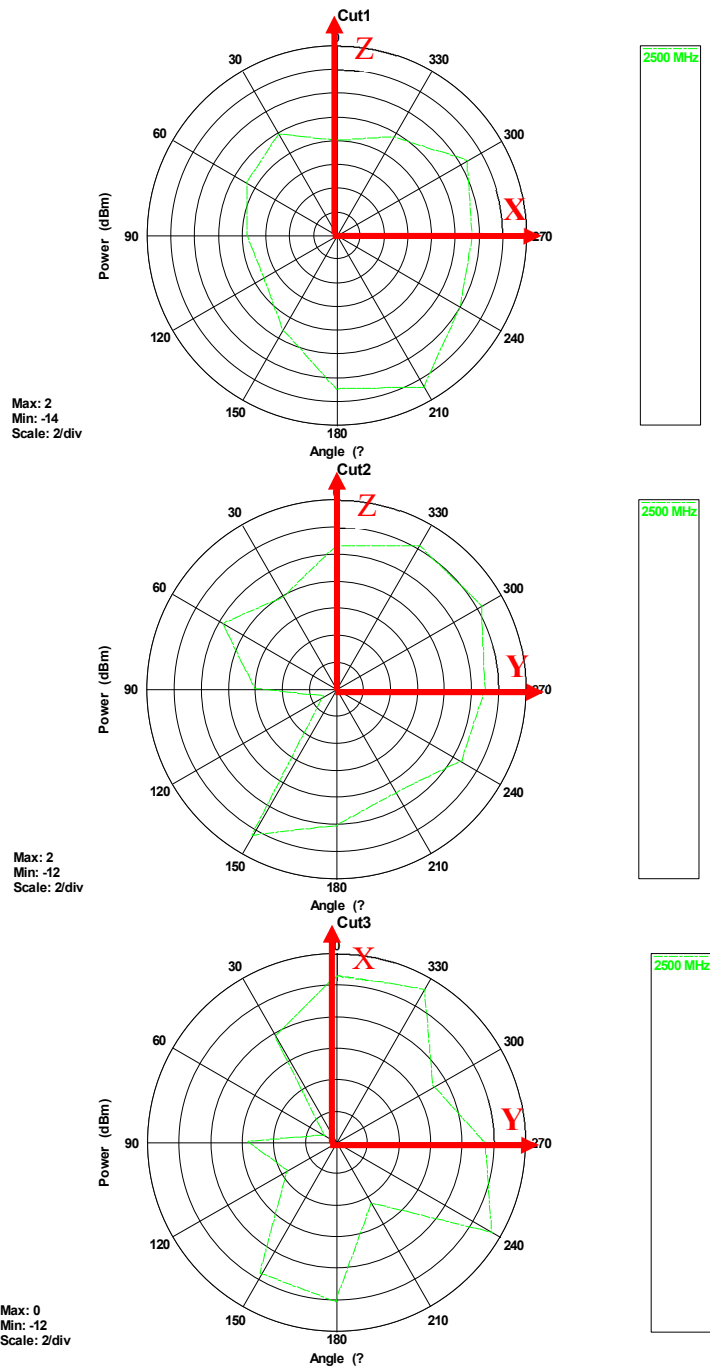
| 2400MHz               |       |         |
|-----------------------|-------|---------|
| Phi=0deg Peak (dBi)   | -1.24 | 210 deg |
| Phi=90deg Peak (dBi)  | 0.12  | 150 deg |
| Theta=90deg Peak(dBi) | -1.39 | 240 deg |

WCN antenna: 2480MHz



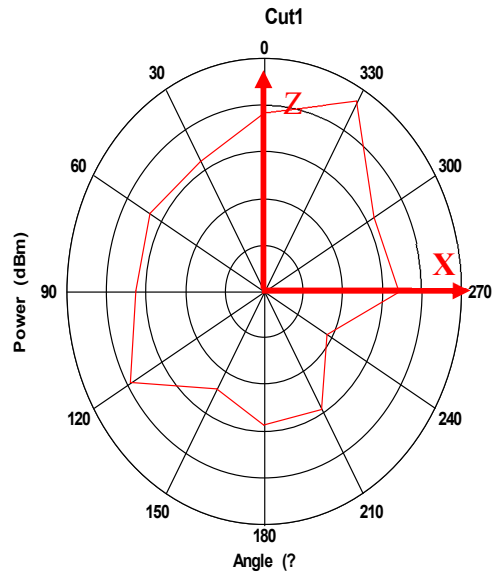
| 2480MHz               |       |         |
|-----------------------|-------|---------|
| Phi=0deg Peak (dBi)   | 0.66  | 210 deg |
| Phi=90deg Peak (dBi)  | 0.71  | 150 deg |
| Theta=90deg Peak(dBi) | -0.22 | 240 deg |

WCN antenna: 2500MHz

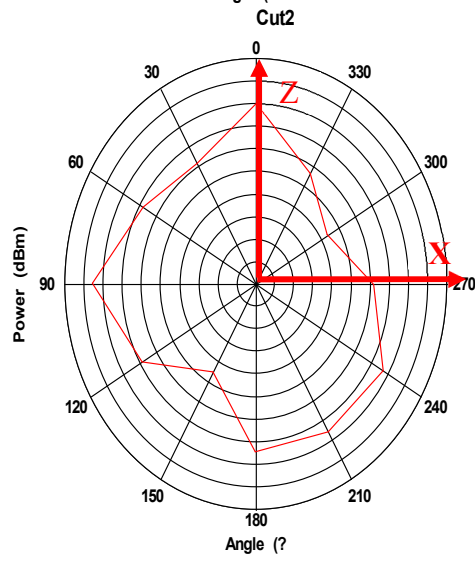


| 2500MHz               |       |         |
|-----------------------|-------|---------|
| Phi=0deg Peak (dBi)   | 0.69  | 210 deg |
| Phi=90deg Peak (dBi)  | 0.44  | 150 deg |
| Theta=90deg Peak(dBi) | -0.61 | 240 deg |

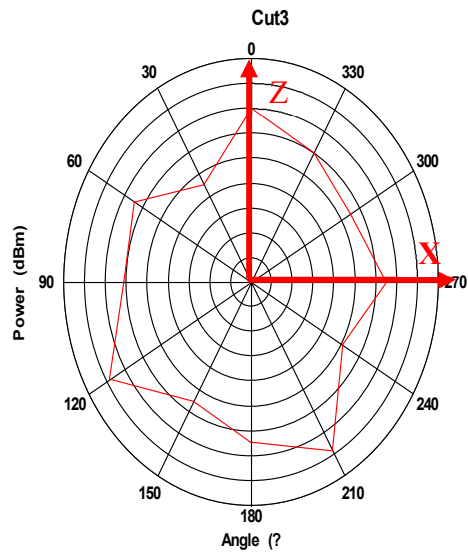
WCN antenna: 5150MHz



5150 MHz



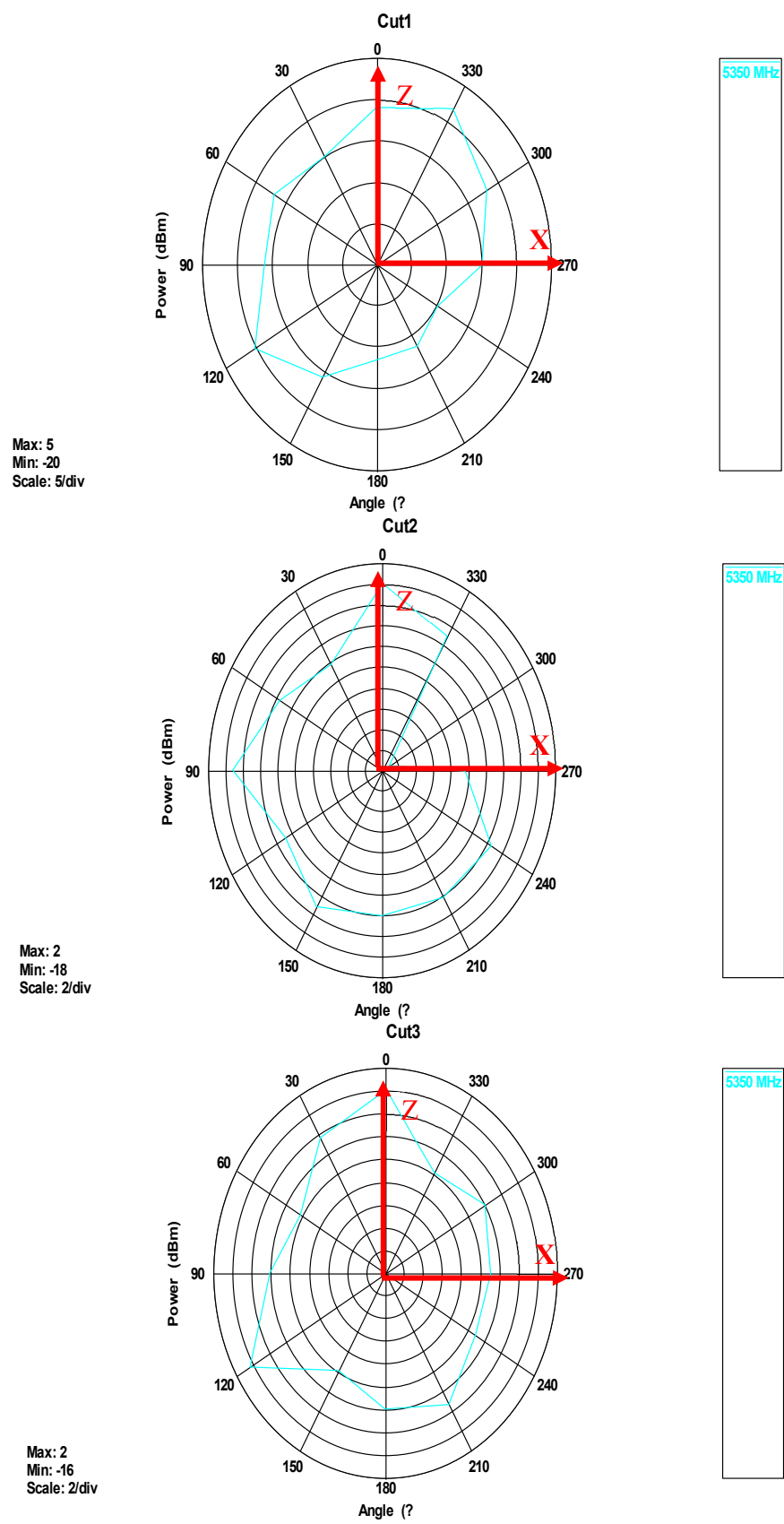
5150 MHz



5150 MHz

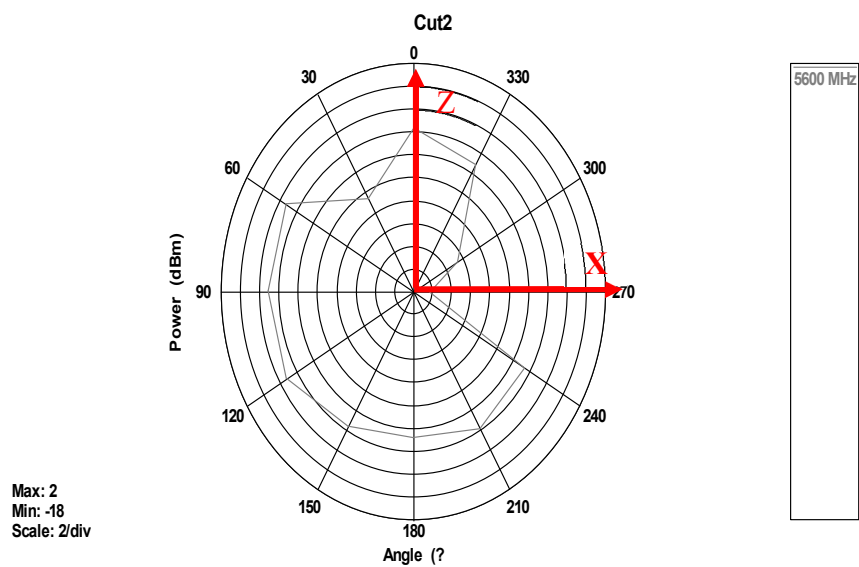
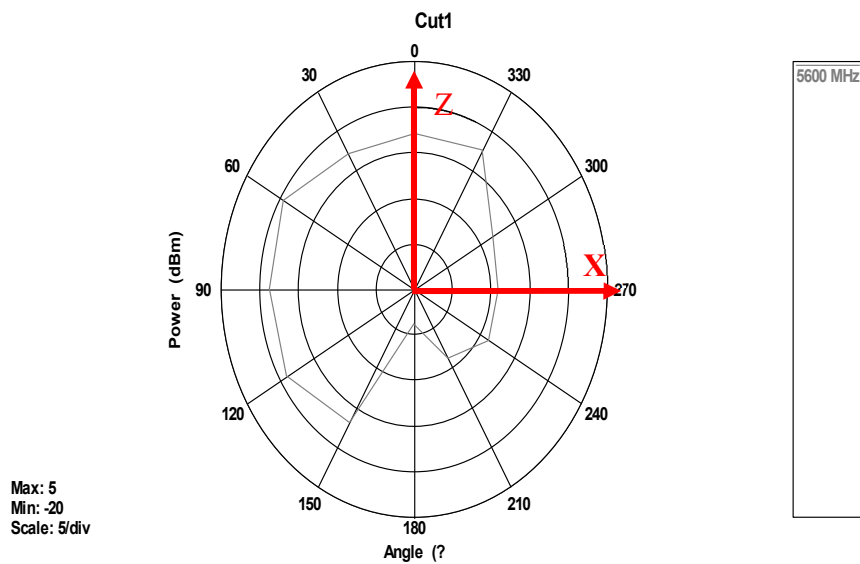
| 5150MHz               |       |         |
|-----------------------|-------|---------|
| Phi=0deg Peak (dBi)   | -0.37 | 210 deg |
| Phi=90deg Peak (dBi)  | -0.59 | 120 deg |
| Theta=90deg Peak(dBi) | -1    | 90 deg  |

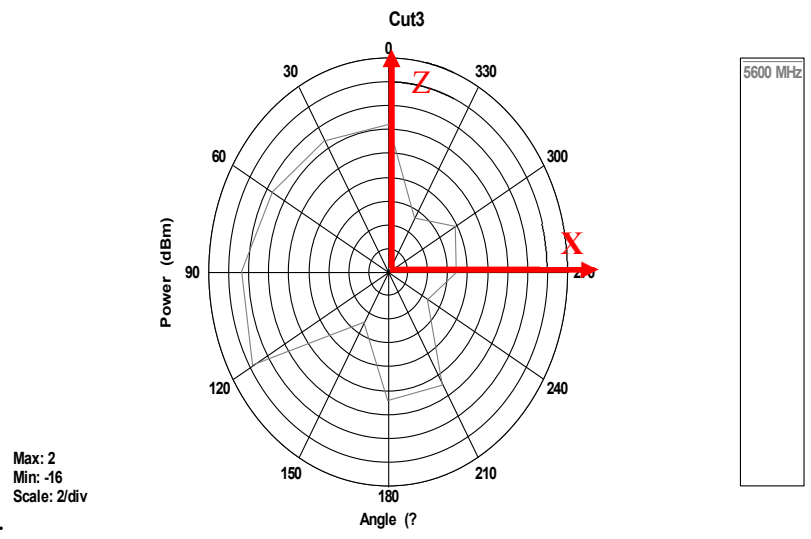
WCN antenna: 5350MHz



| 5350MHz               |      |         |
|-----------------------|------|---------|
| Phi=0deg Peak (dBi)   | 0.36 | 120 deg |
| Phi=90deg Peak (dBi)  | 1.72 | 330 deg |
| Theta=90deg Peak(dBi) | 0.05 | 0 deg   |

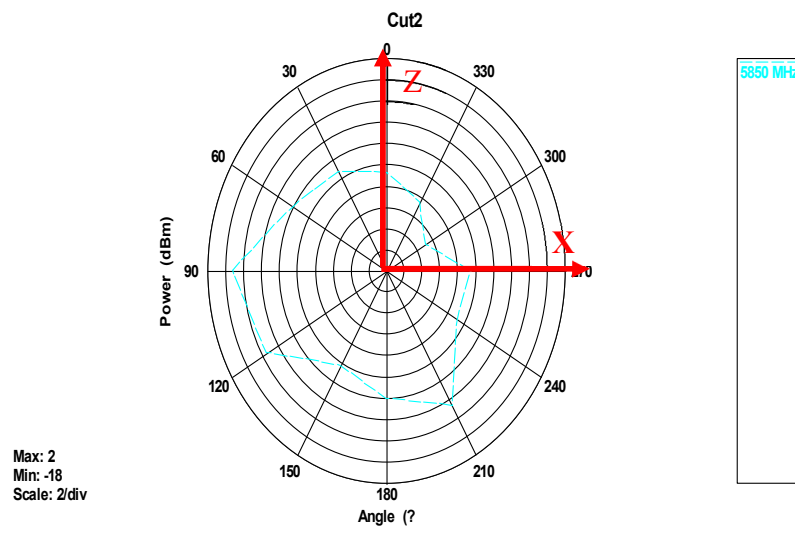
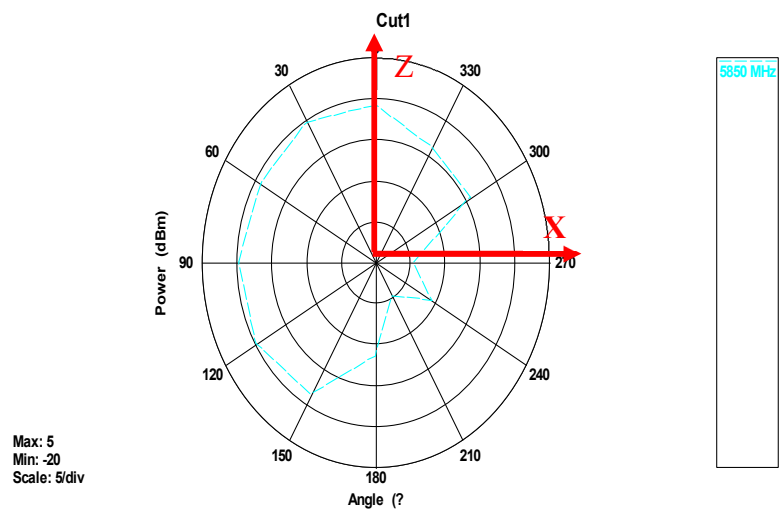
WCN antenna: 5600MHz

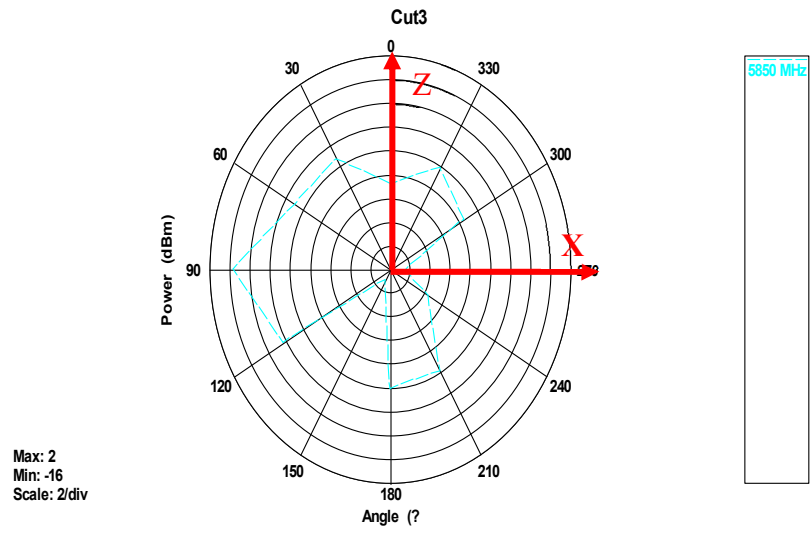




| 5600MHz               |       |         |
|-----------------------|-------|---------|
| Phi=0deg Peak (dBi)   | -0.39 | 120 deg |
| Phi=90deg Peak (dBi)  | -0.52 | 60 deg  |
| Theta=90deg Peak(dBi) | -2.8  | 60 deg  |

WCN antenna: 5850MHz

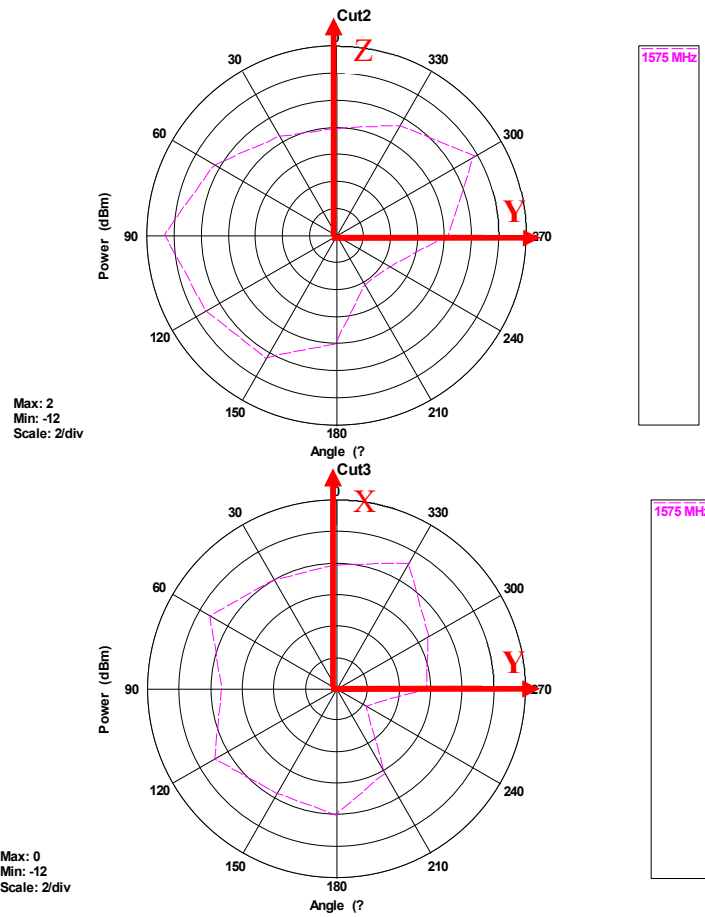




| 5850MHz               |       |        |
|-----------------------|-------|--------|
| Phi=0deg Peak (dBi)   | -0.42 | 90 deg |
| Phi=90deg Peak (dBi)  | -0.42 | 90 deg |
| Theta=90deg Peak(dBi) | -0.92 | 90 deg |

WCN antenna: 1575MHz





| 1575MHz               |      |        |
|-----------------------|------|--------|
| Phi=0deg Peak (dBi)   | 0.65 | 0 deg  |
| Phi=90deg Peak (dBi)  | 0.65 | 90 deg |
| Theta=90deg Peak(dBi) | -2.8 | 60 deg |

NFC: 13.56MHz  
Type: Loop Antenna