APPROVAL SHEET

1.2.1

1.2.2Customer Name: VeriFone

Date: SEP. 03 2024

1.2.2.1 Verifone P/N	
1.2.2.2 DCT P/N	F001G3401911000
Description	ANTENNA, V660C-A WCN
Version	DVT1

Prepared by	Signed by	Approved by Customer
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ME Engineer	Xiwang Cheng	
Reviewed by	Signed by	
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ME Manager	Zijun Chen	
Project Manager	Min Cai	

Project:V660C-A	Author: Chenglong Yan	File Name: V660C-A WCN Antenna Approval sheet
Date: Sep.18.2024		
Language: English	Check: Jiapeng Yan	
Document No.:		
Kunshan Innowave Communication Technology Co., Ltd		

2 Antenna Description

2.1 Picture of the WCN antenna

Top View

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

2.2 Matching Circuit

WCN天線匹配	原始貼片	更改
L3504	10nH	39NH
R3505	3PF	0 Ohm
C3528	NA	
R3510	0 Ohm	
R3511	33PF 勿动	
C3524	33PF 勿动	

2.3 Calibration certificate and darkroom

calibration certificate
Instrument number:M546521029
Calibration Unit: Guangdong Jingheng Testing Technology Co., Ltd
Calibration date: July 10, 2024
Next calibration date: July 9th, 2025
Calibrator: Mai Qifeng

3 Product Specification

3.1 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	2400 MHz to 2500 MHz	5150 MHz to 5850MHz
S11:	-5dB Max	-5dB Max

S-parameter test

3.2 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.

3.3 Antenna radiation measurement

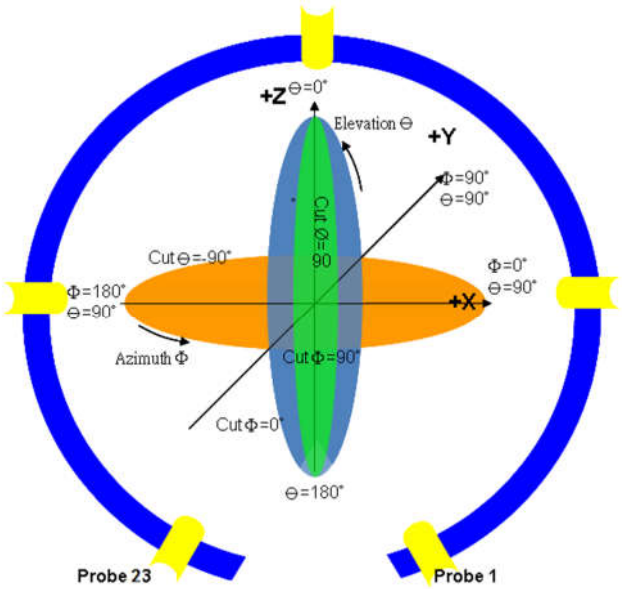
In order to ensure compliance with network carrier specifications, it is required to measure a 3-D gain measurement for WCN Antenna.

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

AUT orientation

4 Antenna Performance Test

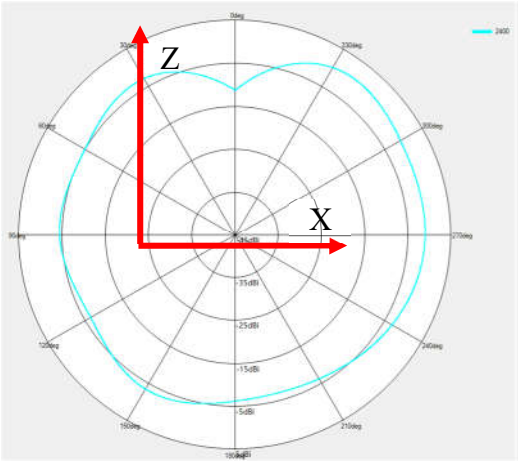
4.1 S11 of WCN Antenna

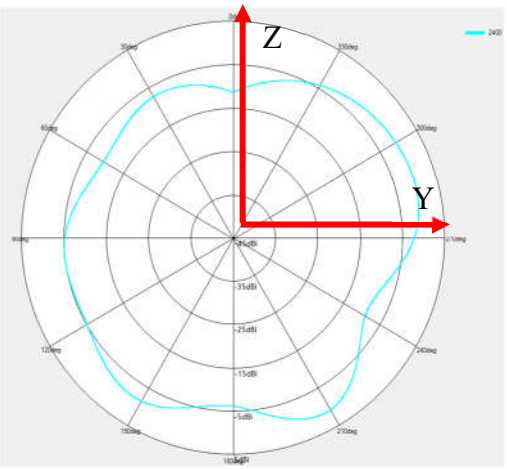
4.2 Antenna Radiated Efficiency

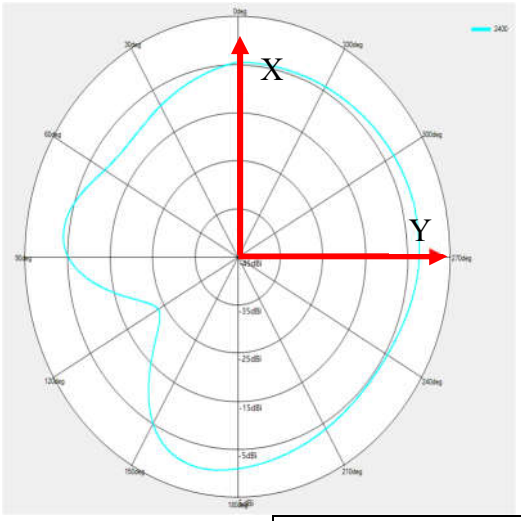
WCN天線				WCN天線			
frequency(MHz)	Efficiency (%)	Efficiency(dB)	Peak gain	frequency(MHz)	Efficiency (%)	Efficiency(dB)	Peak gain
2400	43.85	-3.58	1.15	5150	44.98	-3.47	1.13
2410	45.29	-3.44	1.12	5200	45.39	-3.43	1.12
2420	46.67	-3.31	1.05	5250	46.34	-3.34	1.16
2430	45.19	-3.45	1.06	5300	42.46	-3.72	1.15
2440	48.53	-3.14	0.98	5350	45.29	-3.44	1.17
2450	47.21	-3.26	1.12	5400	45.6	-3.41	1.11
2460	46.34	-3.34	1.09	5450	44.57	-3.51	1.12
2470	44.57	-3.51	1.04	5500	45.19	-3.45	1.17
2480	44.98	-3.47	1.09	5550	38.73	-4.12	1.08
2490	42.36	-3.73	1.13	5600	39.99	-3.98	1.07
2500	43.85	-3.58	1.14	5650	44.87	-3.48	1.13
平均值	45.35	-3.44		5700	38.64	-4.13	1.08
				5750	45.71	-3.4	1.13
				5800	42.07	-3.76	1.18
				5850	43.55	-3.61	1.18
				平均值	43.56	-3.62	

4.3 Radiation Pattern

WCN antenna: 2400MHz

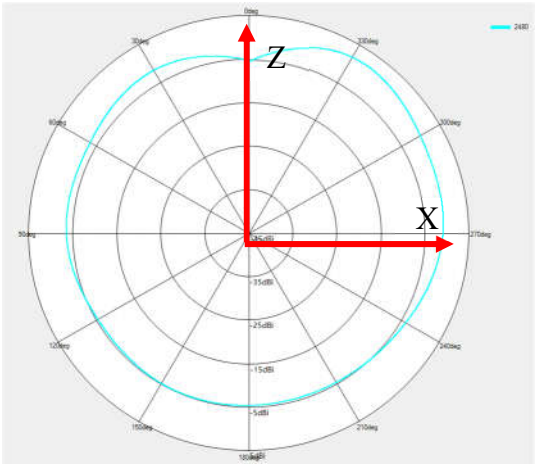


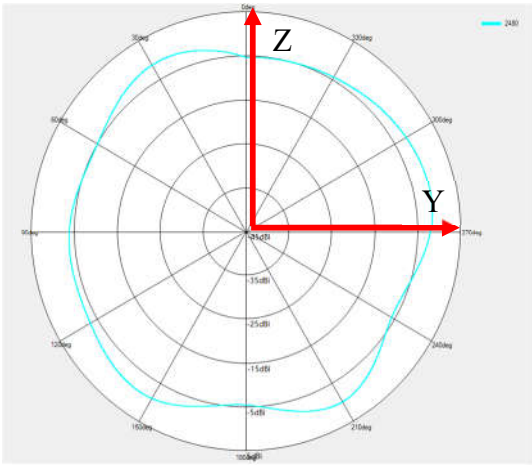


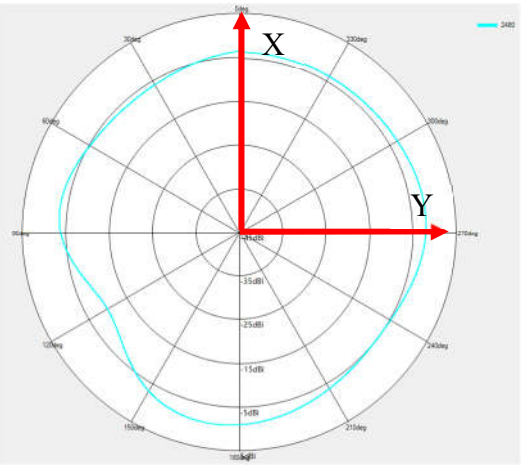


2400MHz		
Phi=0deg Peak (dBi)	-1.03	210 deg
Phi=90deg Peak (dBi)	0.78	150 deg
Theta=90deg Peak(dBi)	-1.05	240 deg

WCN antenna: 2480MHz

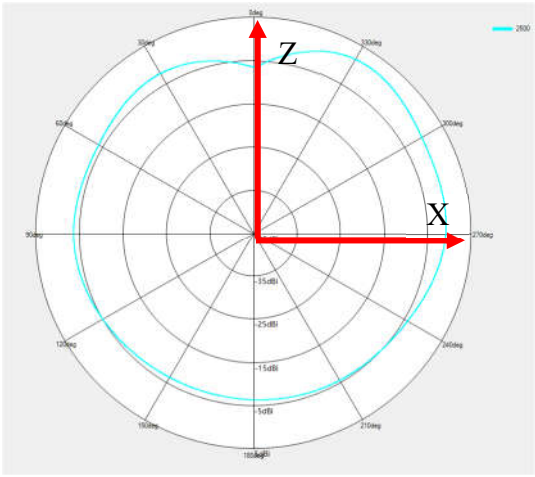


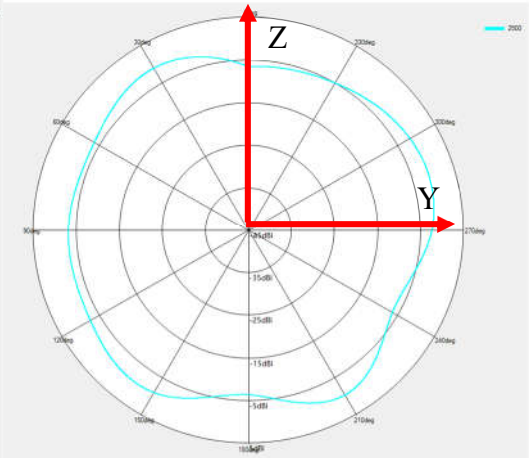


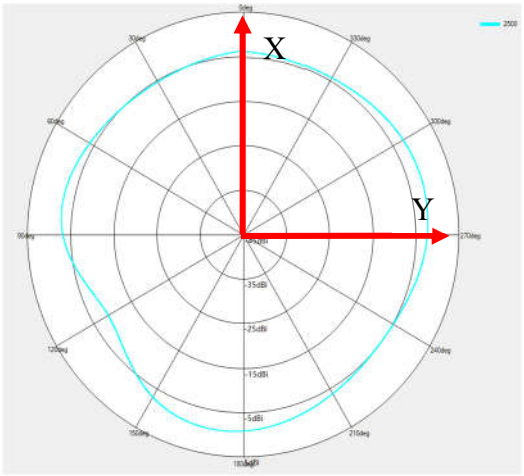


2480MHz		
Phi=0deg Peak (dBi)	1.09	210 deg
Phi=90deg Peak (dBi)	-0.09	150 deg
Theta=90deg Peak(dBi)	-1.03	240 deg

WCN antenna: 2500MHz



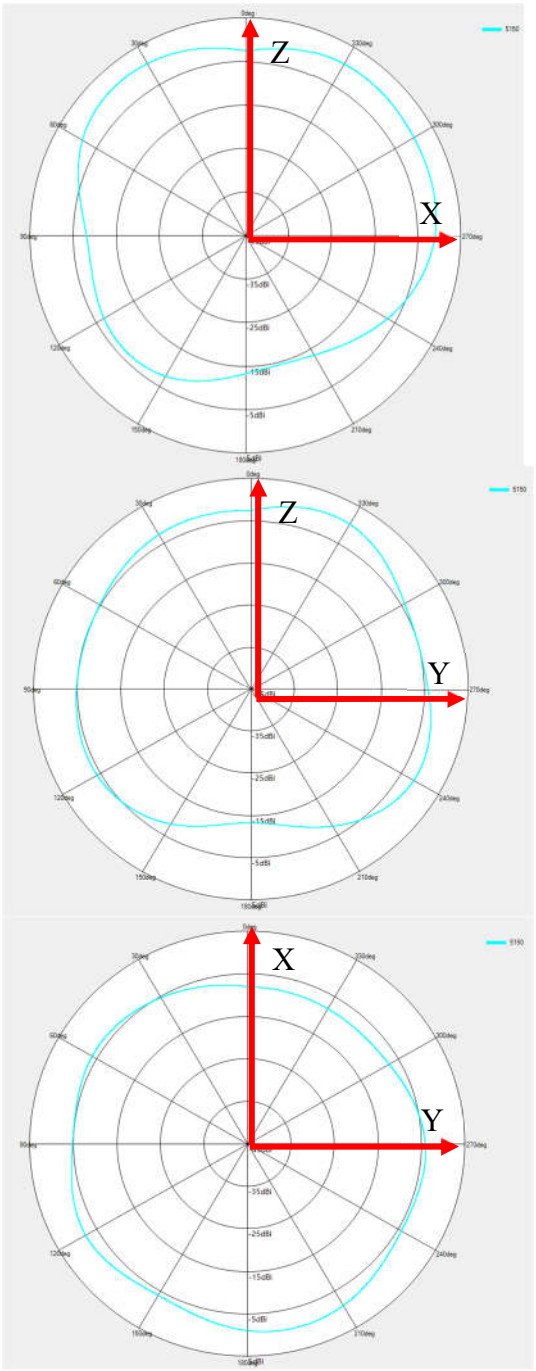




2500MHz		
Phi=0deg Peak (dBi)	1.03	210 deg
Phi=90deg Peak (dBi)	-0.34	150 deg

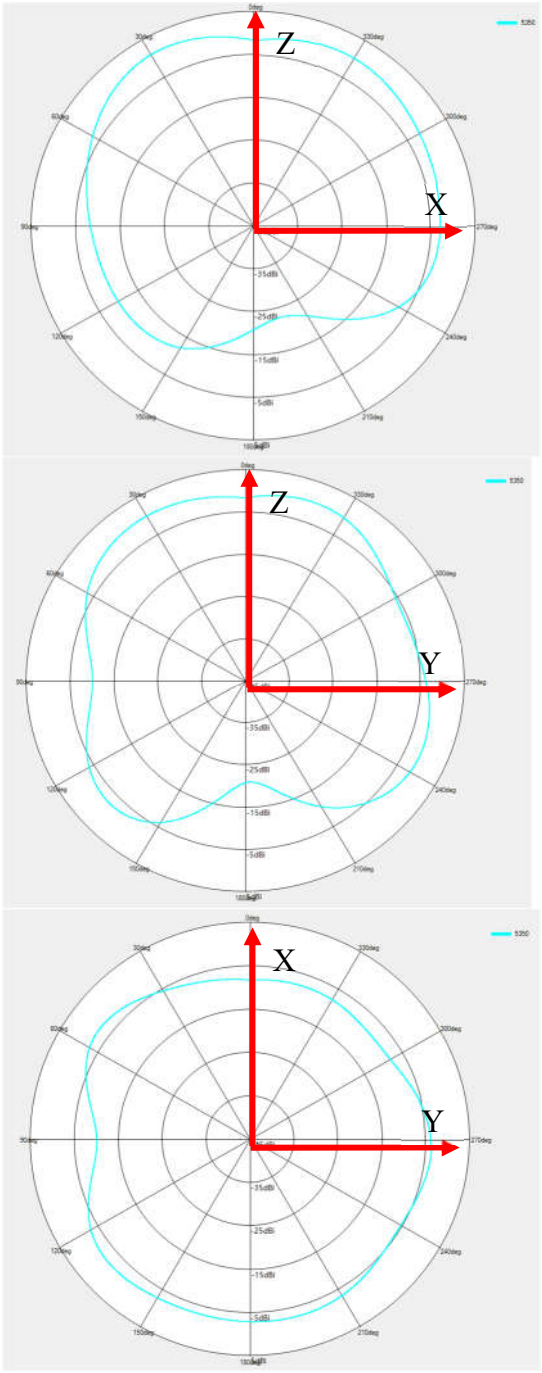
Theta=90deg Peak(dBi)	0.95	240 deg

WCN antenna: 5150MHz



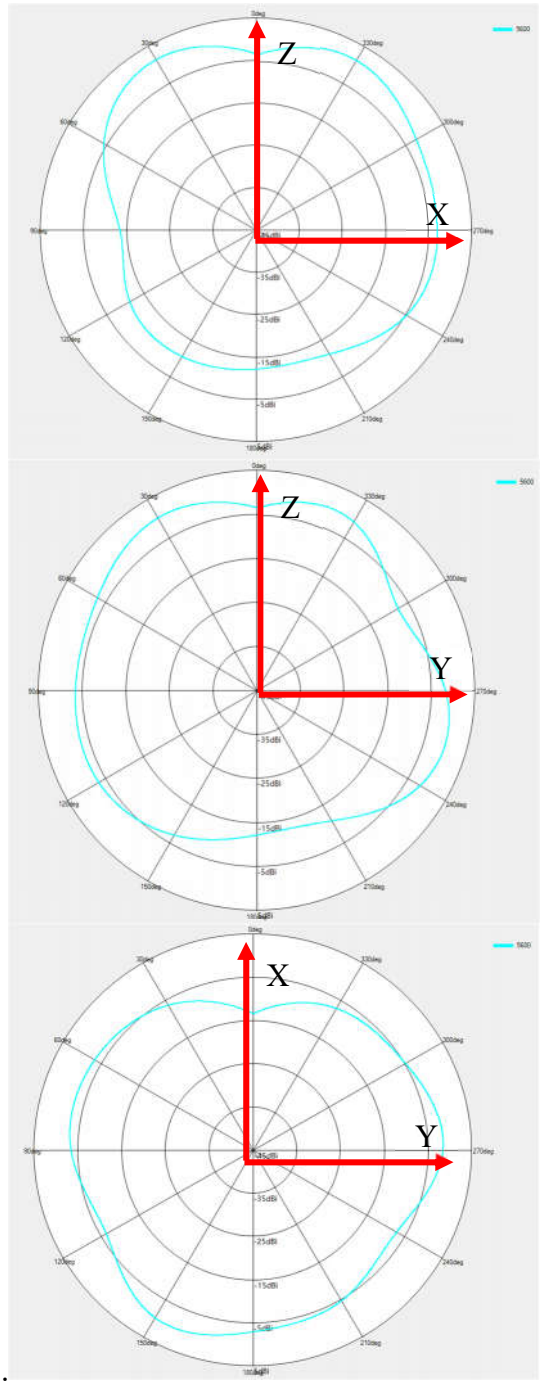
5150MHz		
Phi=0deg Peak (dBi)	-1.09	210 deg
Phi=90deg Peak (dBi)	-0.05	120 deg
Theta=90deg Peak(dBi)	-0.75	90 deg

WCN antenna: 5350MHz



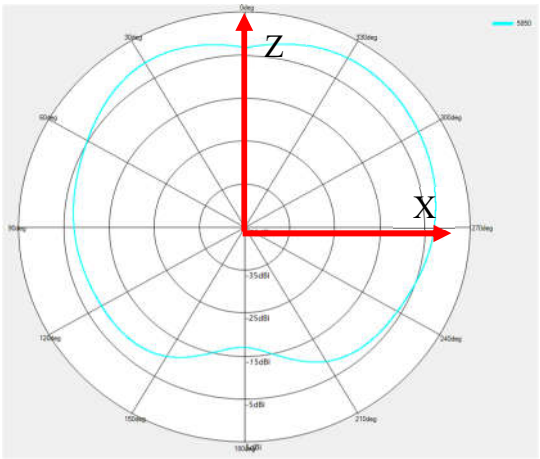
5350MHz		
Phi=0deg Peak (dBi)	1.0	120 deg
Phi=90deg Peak (dBi)	-0.29	330 deg
Theta=90deg Peak(dBi)	-1.08	0 deg

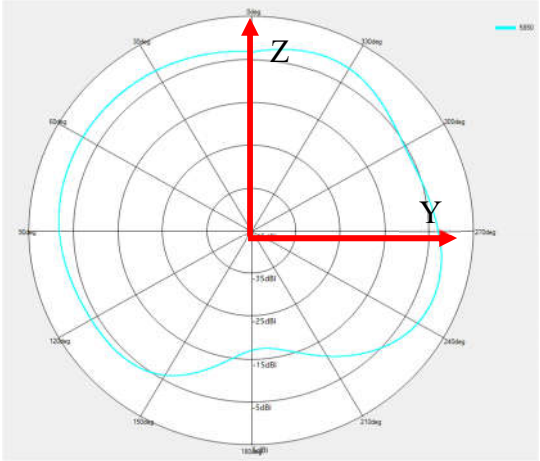
WCN antenna: 5600MHz

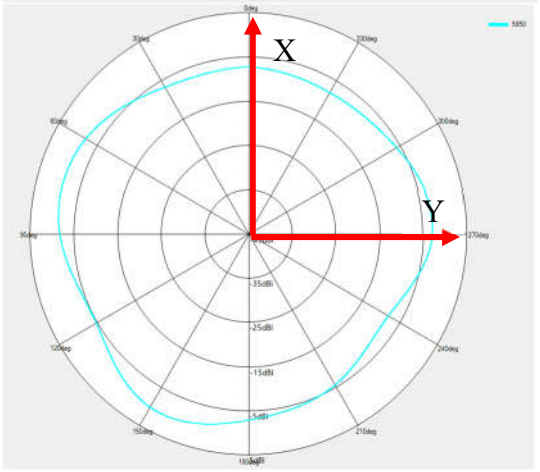


5600MHz		
Phi=0deg Peak (dBi)	1.08	120 deg
Phi=90deg Peak (dBi)	-0.42	60 deg
Theta=90deg Peak(dBi)	-1.01	60 deg

WCN antenna: 5850MHz







5850MHz		
Phi=0deg Peak (dBi)	-0.15	90 deg
Phi=90deg Peak (dBi)	-1.07	90 deg
Theta=90deg Peak(dBi)	-1.04	90 deg

NFC Antenna

NFC Frequency Band : 13.553 - 13.567 MHz

Modulation Type : ASK

Supported Card Type : A / B

NFC Antenna Type : Loop Antenna

NFC Antenna size : 70.70*62.46*2.5mm

NFC Antenna location : the front area of terminal