Aruba AP-503R
Antenna Test Report

Date : Jul. 13, 2022
Prepared by : Rachel Zhao / AK Chen
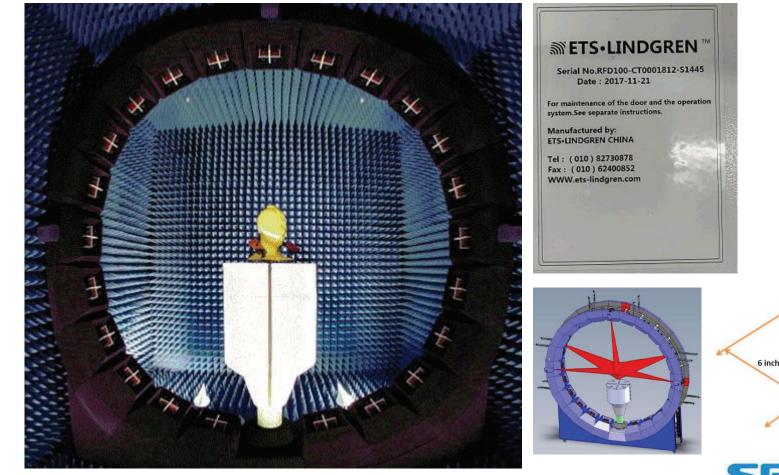
Test Infomation

| Iteam	Description
Brand Name	Aruba
Equipment	Wi-Fi 11ax Dual Band Access Point
Test Location	1F, No. 26, Xinghai Street, Suzhou Industrial Park, Jiangsu, China.
Test Condition	Radiation
Test Engineer	Rachel Zhao, Sercomm
Test Environment	ETS-Lindgren AMS8923
Test Date	Jun. 16, 2022 ~ Jul. 10, 2022

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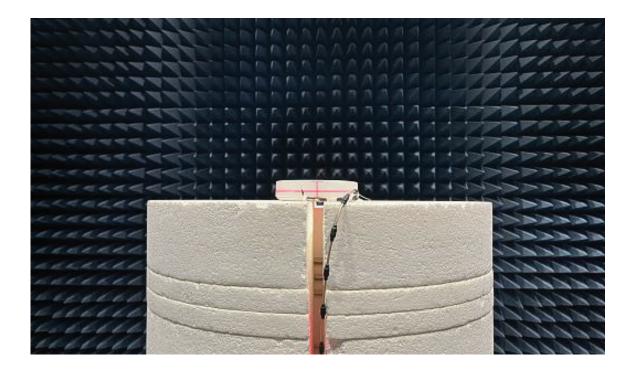
Test Configuration

ETS-Lindgren AMS8923 antenna measurement system with a size of 4.9(L) × 4.9(W) × 4.9(H) m³ is used for antenna performance test. It includes a custom multi-antenna array ring that installs a system of dual-polarized antennas. With a switch control box integrated on the ring, the test system provides fast switching between antennas for high speed testing.

Test Setup & Procedure
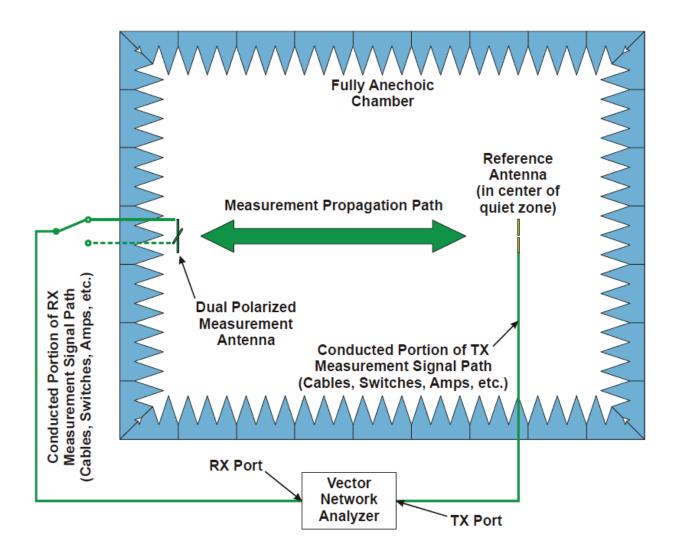
1. Fix the DUT on the dielectric support structure and connect the feeding cable to the antenna used for test

2. Set measurement parameters such as frequency range and sampling angle

3. Perform test and then get far-field data (radiation pattern, gain, efficiency)

4. Repeat test procedure for other antennas

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Test Equipment & Calibration

Network analyzer and reference antennas are used for calibration. Path loss and cable loss for different frequency bands can be checked and calculated.

Test Equipment & Calibration

Instrument	Brand	Characteristics	Model No.	Serial No.	Calibration Due Date
Precision Sleeve Dipole	ETS-Lindgren	700 MHz ~ 900 MHz	3126-700	00218044	Sep. 26, 2022
Precision Sleeve Dipole	ETS-Lindgren	900 MHz ~ 1000 MHz	3126-900	00218062	Sep. 26, 2022
Precision Sleeve Dipole	ETS-Lindgren	1400 MHz ~ 1700 MHz	3126-1550	00218061	Sep. 26, 2022
Precision Sleeve Dipole	ETS-Lindgren	1700 MHz ~ 2000 MHz	3126-1850	00218064	Sep. 26, 2022
Precision Sleeve Dipole	ETS-Lindgren	2000 MHz ~ 2300 MHz	3126-2150	00218068	Sep. 26, 2022
Precision Sleeve Dipole	ETS-Lindgren	2300 MHz ~ 2700 MHz	3126-2500	00218048	Sep. 26, 2022
Precision Sleeve Dipole	ETS-Lindgren	5000 MHz ~ 6000 MHz	3126-5500	00218065	Sep. 26, 2022
EMQuest Antenna Measurement Software	ETS-Lindgren	Control chamber system	EMQ-100	1596	Non-Calibration Required

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Antenna Details

Ant No.	Operating Band	Type	Material	Feeding	Polarization
WiFi 2G/5G (Ant 0)	2400 MHz ~ 2500 MHz 5150 MHz ~ 5900 MHz	PIFA	Metal	Cable	Hybrid
WiFi 2G/5G (Ant 1)	2400 MHz ~ 2500 MHz 5150 MHz ~ 5900 MHz	PIFA	Metal	Cable	Hybrid

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Result Summary - Gain & Efficiency Table

WiFi 2/5G_ANT0		
Frequency (MHz)	Peak Gain (dBi)	Efficiency (%)
2400	3.65	70
2450	3.94	73
2500	3.70	71
5150	4.80	70
5500	5.11	72
5850	4.52	69
5900	4.29	67

WiFi 2/5G_ANT1		
Frequency (MHz)	Peak Gain (dBi)	Efficiency (%)
2400	3.59	71
2450	3.72	73
2500	3.07	70
5150	4.80	68
5500	4.53	70
5850	4.58	73
5900	4.35	70

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Result Summary - Uncorrelated Gain & Correlated Gain

Frequency (MHz)	Uncorrelated Gain (dBi)	Correlated Gain (dBi)
2400	3.02	6.00
2450	3.14	6.11
2500	3.06	6.06

Frequency (MHz)	Uncorrelated Gain (dBi)	Correlated Gain (dBi)
5150	3.70	6.69
5500	3.45	6.40
5850	3.91	6.92
5900	3.71	6.57

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Calculations (1/2)

Because the antennas are fixed in location within the device the directional antenna gain for MIMO is calculated over a sphere using the raw spatial data taken at 2 degree steps of theta and phi for each antenna using the equations from KDB 662911 D01. The raw antenna data is located in the appendix of this report.

The uncorrelated antenna gain was calculated using KDB 662911 D01, F(2)(d)(ii)

The uncorrelated gain was calculated for each point in the spatial data, and the highest value reported.

2.4GHz uncorrelated calculation:
Maximum uncorrelated gain: 3.14dBi
$= 10*\log(((10^{(G0/10)})+(10^{(G1/10)}))/2)$
$= 10*\log(((10^{(3.88/10)})+(10^{(2.24/10)}))/2)$

This occurs at: 2450MHz, phi 180/theta 60

5GHz uncorrelated calculation:
Maximum uncorrelated gain: 3.91dBi
$= 10*\log(((10^{(G0/10)})+(10^{(G1/10)}))/2)$
$= 10*\log(((10^{(4.21/10)})+(10^{(3.59/10)}))/2)$

This occurs at: 5850MHz, phi 140/theta -60

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Calculations (2/2)

Because the antennas are fixed in location within the device the directional antenna gain for MIMO is calculated over a sphere using the raw spatial data taken at 2 degree steps of theta and phi for each antenna using the equations from KDB 662911 D01. The raw antenna data is located in the appendix of this report.

The correlated antenna gain was calculated using KDB 662911 D01, F(2)(d)(i)

The correlated gain was calculated for each point in the spatial data, and the highest value reported.

2.4GHz correlated calculation:
Maximum correlated gain: 6.11dBi
$= 10*log(((10^{(G0/20)})+(10^{(G1/20)}))^2)/2)$
$= 10*log(((10^{(3.88/20)})+(10^{(2.24/20)}))^2)/2)$

This occurs at: 2450MHz, phi 180/theta 60

5GHz correlated calculation:
Maximum correlated gain: 6.92dBi
$= 10*log(((10^{(G0/20)})+(10^{(G1/20)}))^2)/2)$
$= 10*log(((10^{(4.21/20)})+(10^{(3.59/20)}))^2)/2)$

This occurs at: 5850MHz, phi 140/theta -60
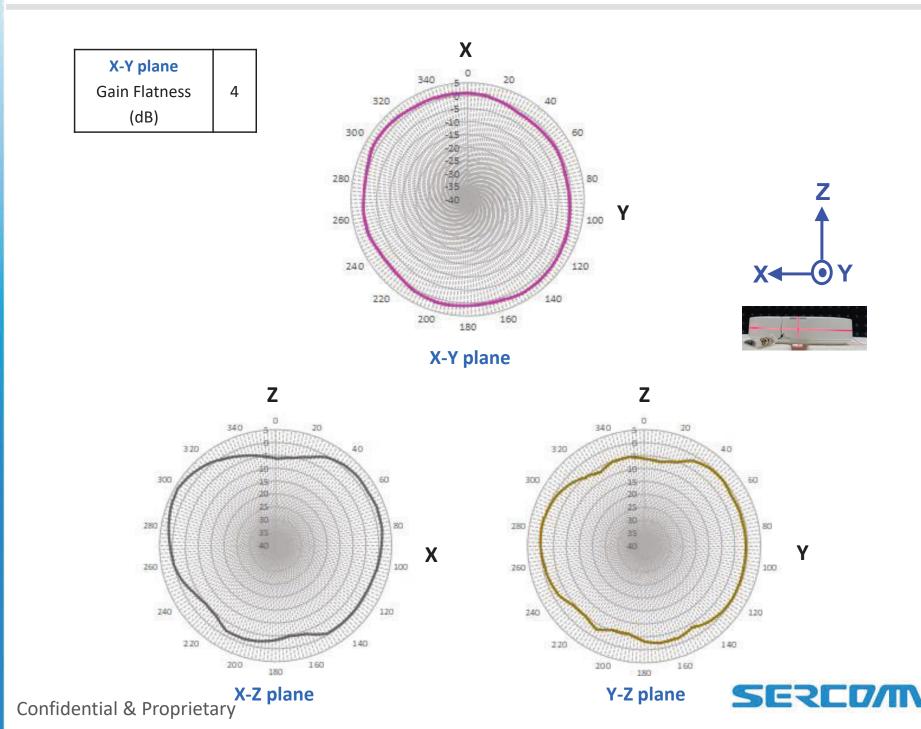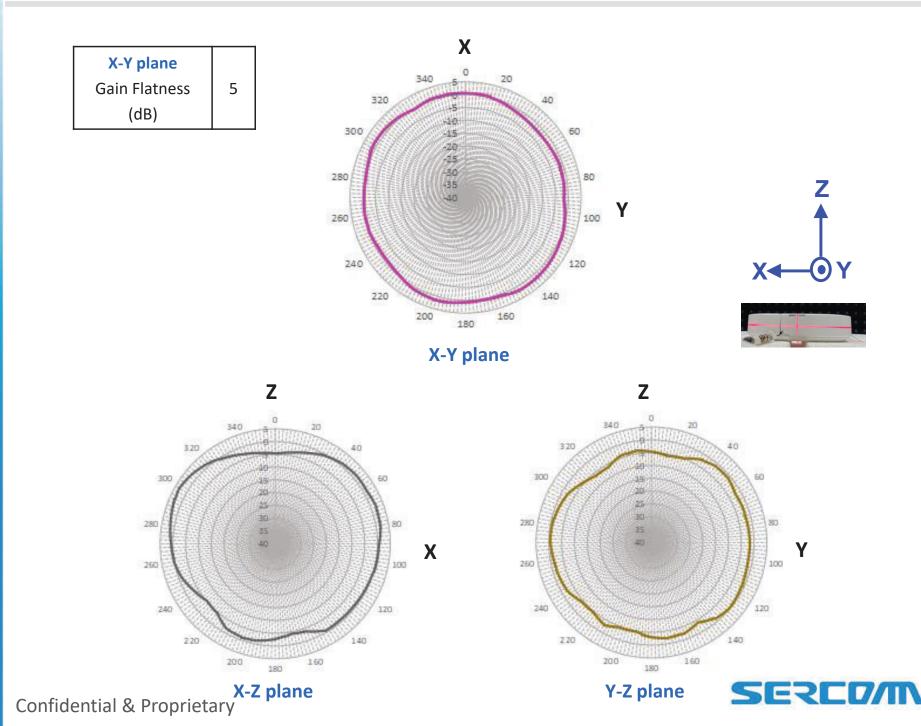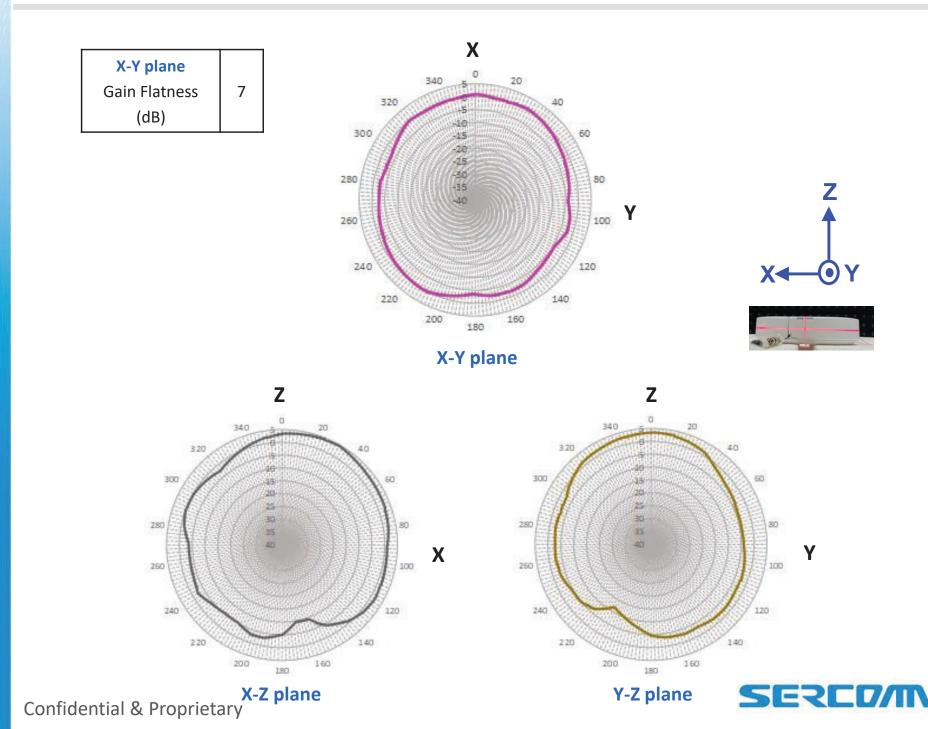
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Appendix

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X-Y plane	
Gain Flatness (dB)	4

X-Y plane

X-Z plane

Y-Z plane

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X-Y plane	
Gain Flatness (dB)	4

X-Y plane

X-Z plane

Y-Z plane

X-Y plane	
Gain Flatness (dB)	5

X-Y plane

X-Z plane

Y-Z plane

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2D Radiation Pattern – WiFi 2/5G_ANT0 @5.15GHz

X-Y plane	
Gain Flatness (dB)	7

X-Y plane

X-Z plane

Y-Z plane

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X-Y plane	
Gain Flatness (dB)	6

X-Y plane

X-Z plane

Y-Z plane

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2D Radiation Pattern – WiFi 2/5G_ANT0 @5.85GHz

X-Y plane	
Gain Flatness (dB)	5

X-Y plane

X-Z plane

Y-Z plane

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2D Radiation Pattern – WiFi 2/5G_ANT0 @5.9GHz

X-Y plane	
Gain Flatness (dB)	5

X-Y plane

X-Z plane

Y-Z plane

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X-Y plane	
Gain Flatness (dB)	7

X-Y plane

X-Z plane

Y-Z plane

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X-Y plane	
Gain Flatness (dB)	5

X-Y plane

X-Z plane

Y-Z plane

X-Y plane	
Gain Flatness (dB)	7

X-Y plane

X-Z plane

Y-Z plane

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X-Y plane	
Gain Flatness (dB)	7

X-Y plane

X-Z plane

Y-Z plane

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X-Y plane	
Gain Flatness (dB)	7

X-Y plane

X-Z plane

Y-Z plane

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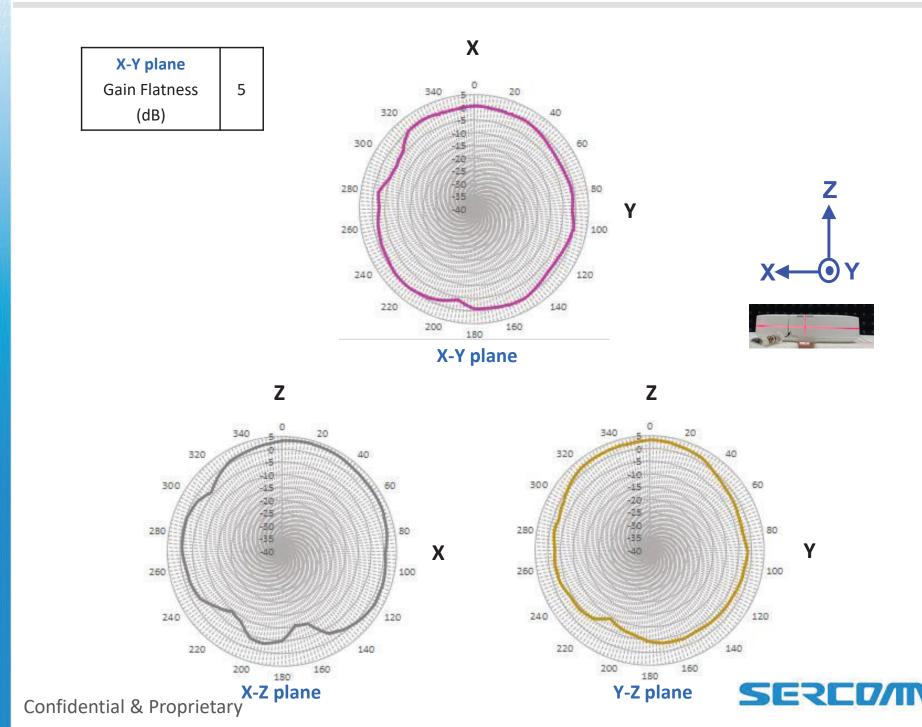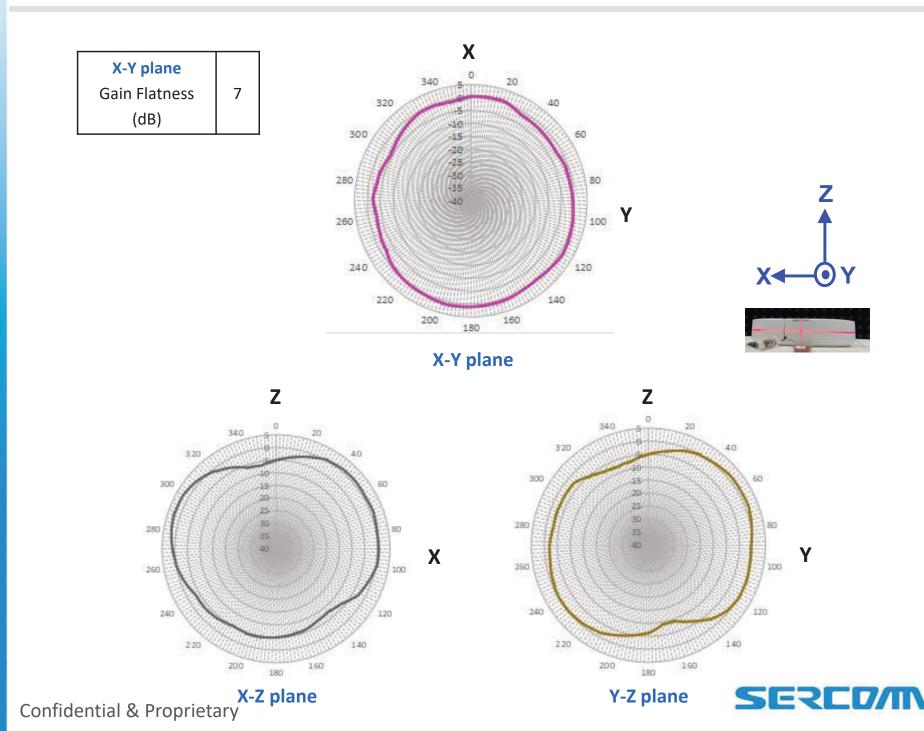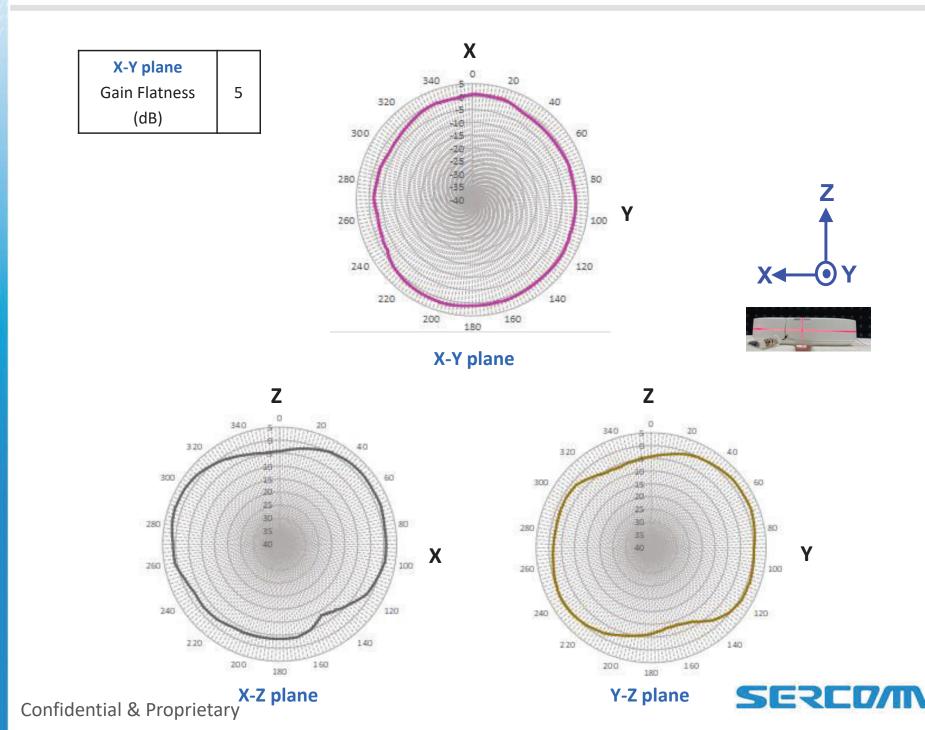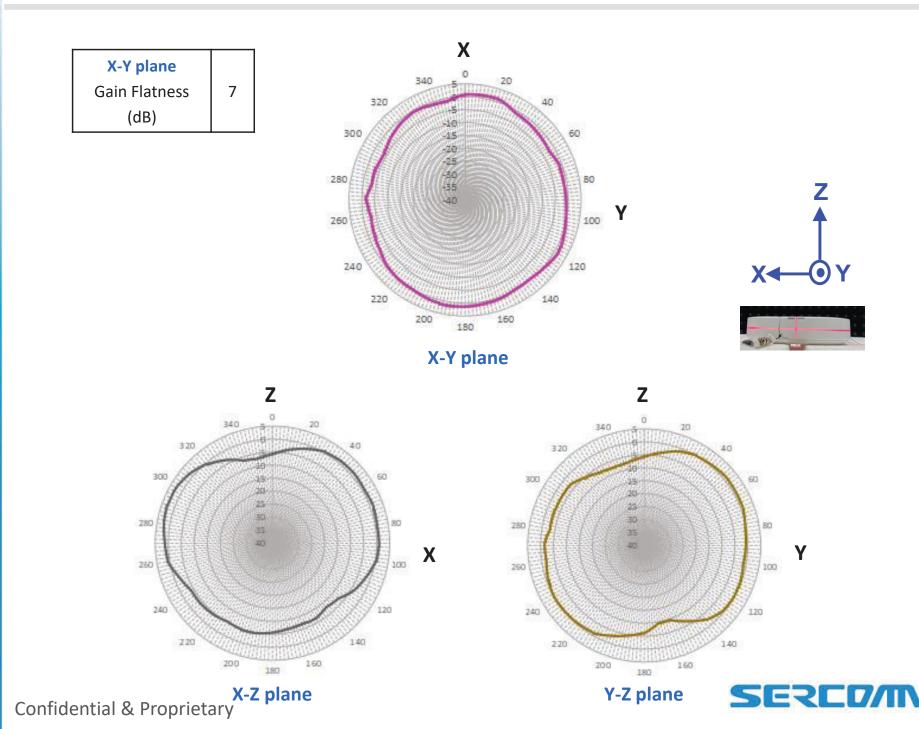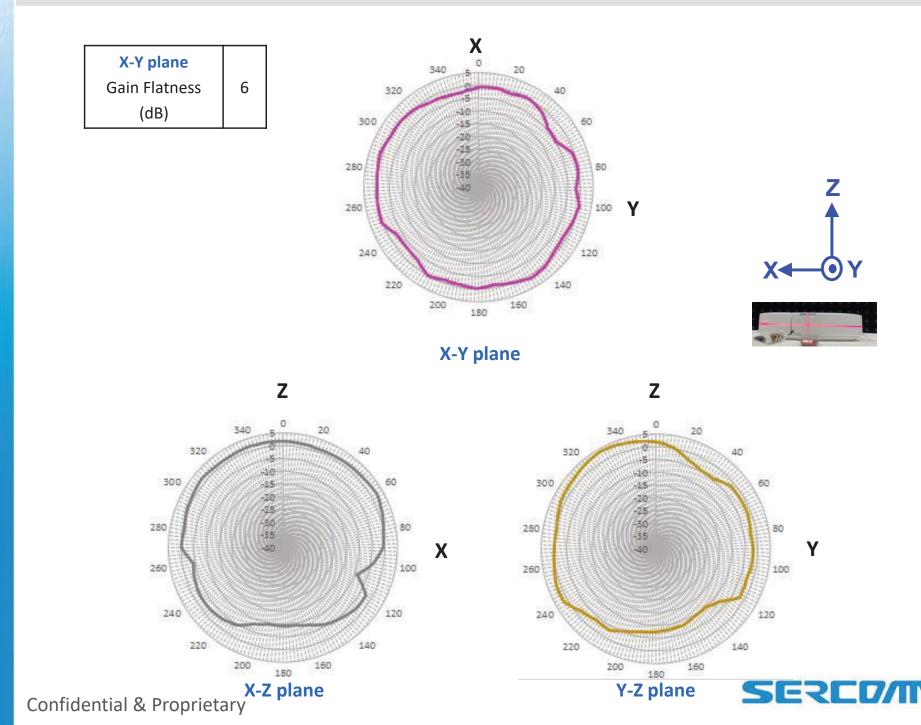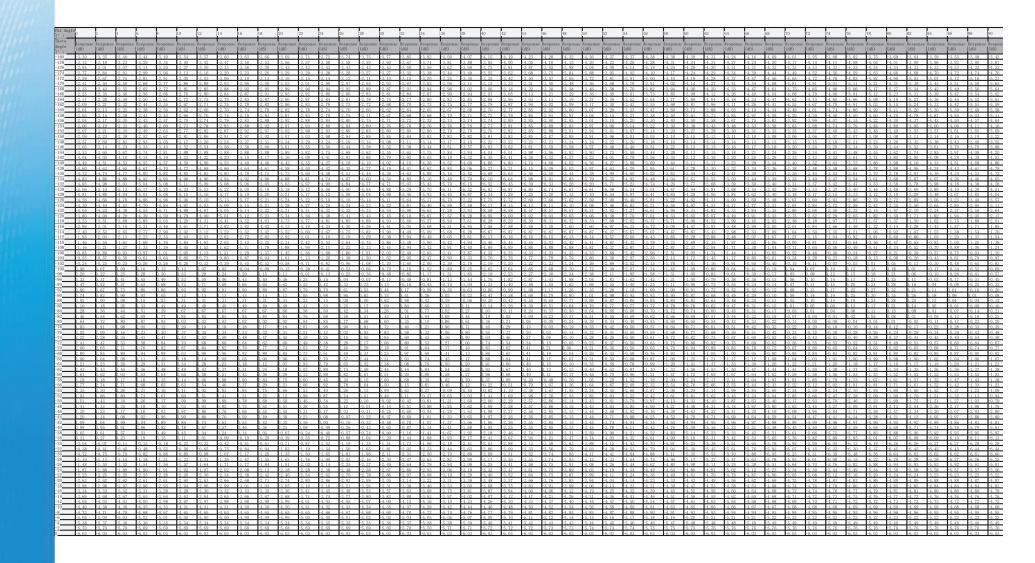
2D Radiation Pattern – WiFi 2/5G_ANT1 @5.85GHz

X-Y plane	
Gain Flatness (dB)	6

X-Y plane

X-Z plane

Y-Z plane

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X-Y plane	
Gain Flatness (dB)	6

X-Y plane

X-Z plane

Y-Z plane

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