PRODUCT PERFORMANCE TEST

(Part # : SS-03-04-005, SS-03-04-006)

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1. Antenna specification

1.1 Electrical Spec.

Frequency Range (GHz)	2.4 – 2.4385(WLAN)	
Position	Left	Right
VSWR	<2.0	<2.0
Peak/Average Gain (dBi)	0.52/-4.90	1.02/-4.64
Impedance	50 ohms	50 ohms
Polarization	Linear	Linear
Radiation Pattern	Omni-Directional	Omni-Directional

1.2 Mechanical Spec.

Antenna Dimensions	Length	Width	Height
	45mm	4mm	4.5mm
Weight (include the cable)	4g		
Operating Temperature	-40°C ~ +70°C		

2. Test Methodology

2.1 Test equipment

The equipment for the antenna measurement we used is as follows.

A. Agilent 8720ES Network Analyzer to measure the VSWR and input impedance.

B. Three-dimensional anechoic chamber to measure the gain (Standard dipole and horn were used to calibrate the chamber)

C. Digital caliper to measure the dimensions.

2.2 Test setup

2.2.1 Frequency Range

2.4GHz ~ 2.484GHz for WLAN

2.2.2 Antenna configuration

The antenna basically has two parts, which one is the stamping and the other is the cable assembly. We use the cable assembly made by Hirose with the part number U.FL-2LP-5016-A-(L).

2.2.3 VSWR

The VSWR characteristics must satisfy the electrical demands.

When the antennas are installed on the laptop, the VSWR must be less than 2.0. The VSWR is measured with Agilent 8720ES network analyzer. All the measurements are performed with the customer provided fixture. Figure 1 shows the schematic diagram for measuring VSWR.

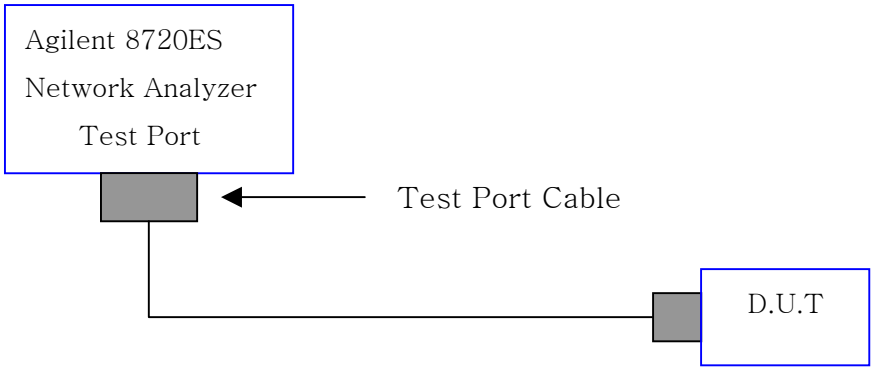


Figure 1. The schematic diagram for measuring VSWR

2.2.4 Radiation Pattern and Gain

The radiation pattern must have the omni-directional characteristic in both positions. The radiation pattern measurements are performed in the three-dimensional anechoic chamber. The chamber provides less than –30dB reflectivity from 800MHz through 6GHz. The chamber is calibrated using both standard dipole and horn antenna. The gain here is expressed as dBi that standardizes the isotropic antenna. The gain measurements are also performed in the same chamber described previously. Figure 2 shows the schematic diagram for measuring radiation pattern and gain.

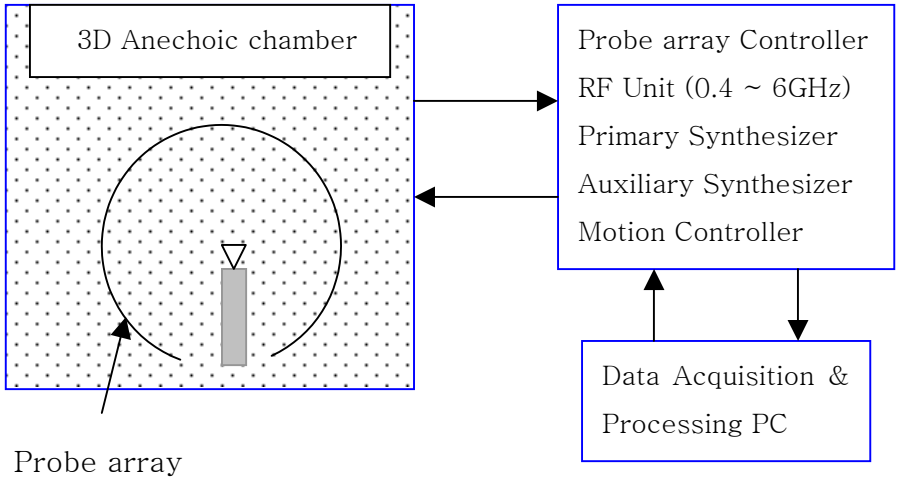
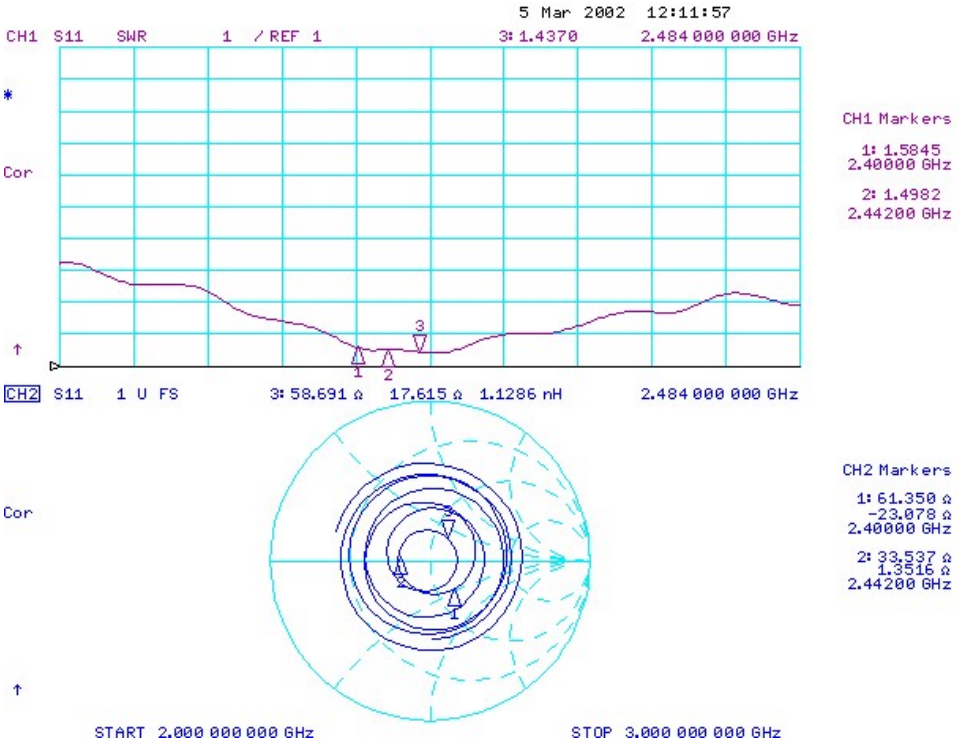


Figure 2. The schematic diagram for measuring radiation pattern and gain

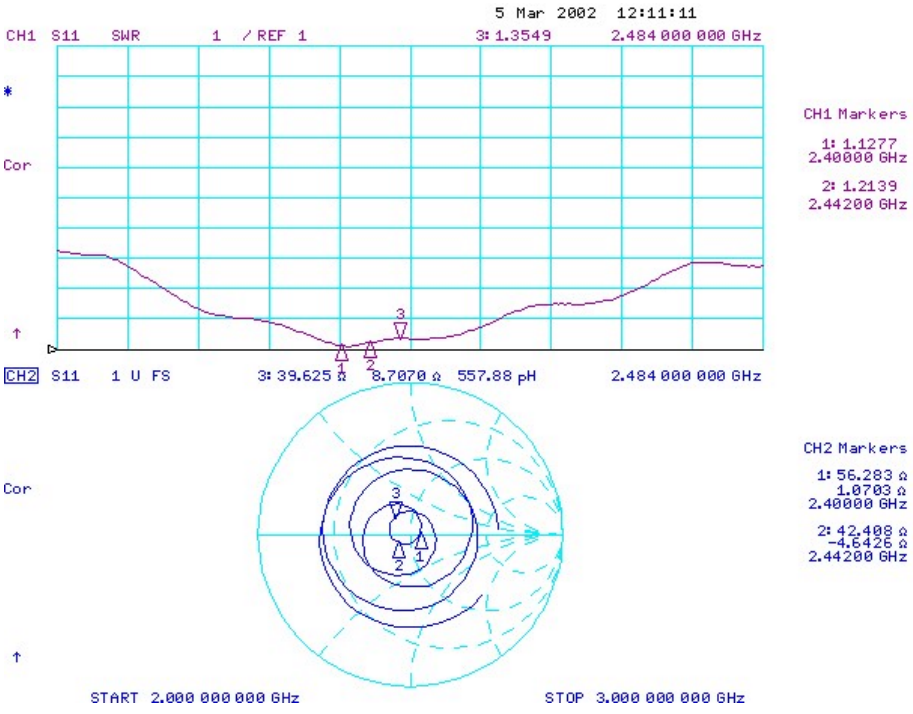
3. Performance Data

3.1 VSWR

3.1.1 Left

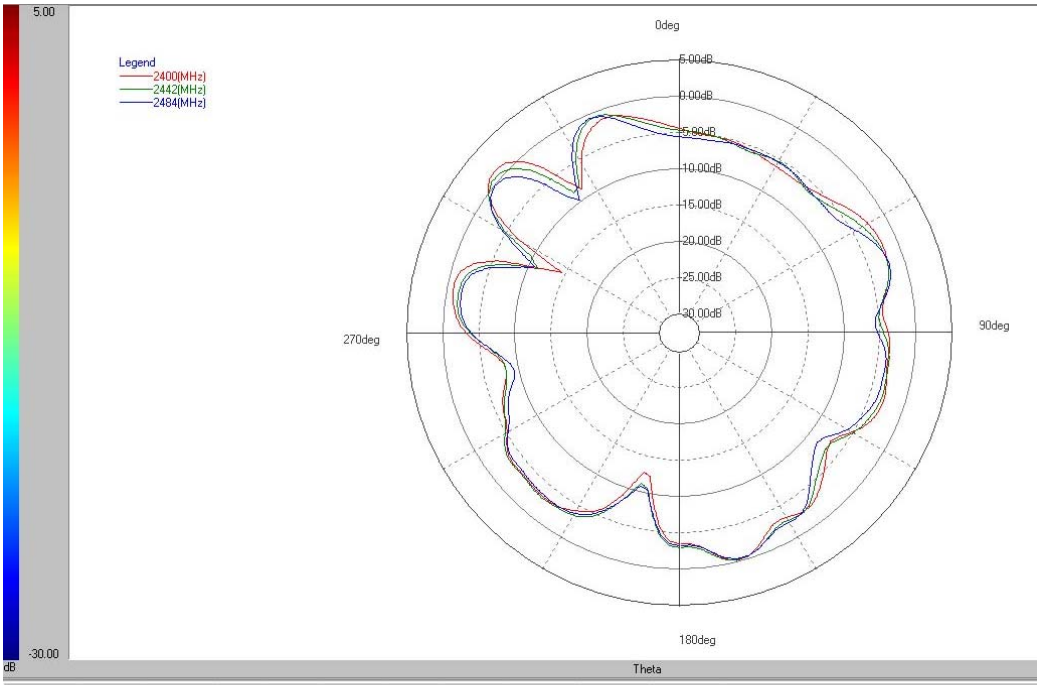


3.1.2 Right



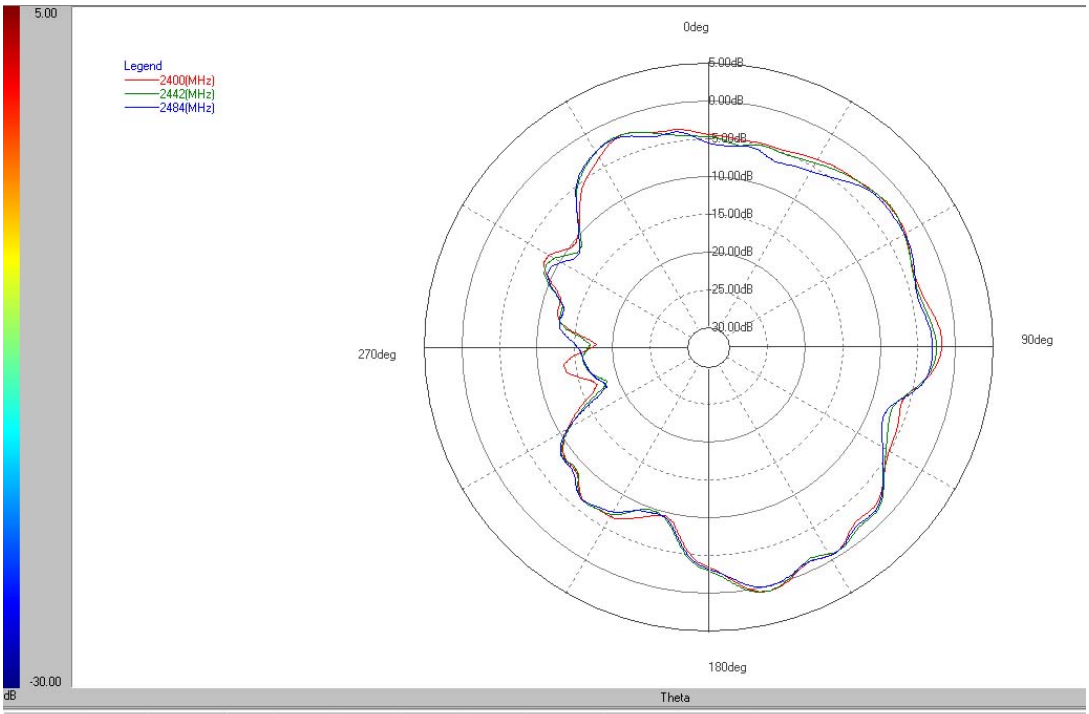
3.2 Radiation pattern and gain

3.2.1 Left E1-Plane



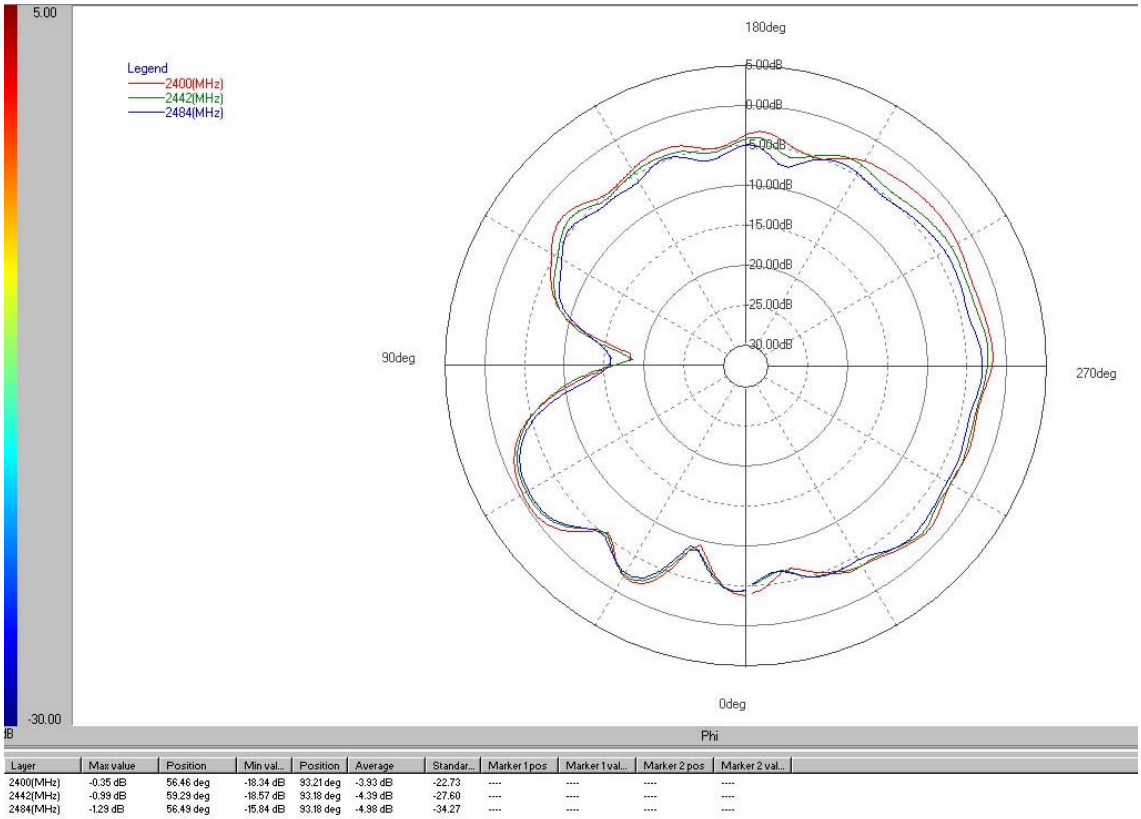
Layer	Max value	Position	Min val...	Position	Average	Standar...	Marker 1 pos	Marker 1 val...	Marker 2 pos	Marker 2 val...
2400(MHz)	1.22 dB	-48.57 deg	-14.63 dB	-62.85 d...	-3.98 dB	-23.22	----	----	----	----
2442(MHz)	0.50 dB	-51.42 deg	-11.30 dB	-65.72 d...	-4.05 dB	-23.94	----	----	----	----
2484(MHz)	-0.14 dB	-51.42 deg	-10.90 dB	-165.71 ...	-4.43 dB	-27.97	----	----	----	----

3.2.2 Left E2-Plane



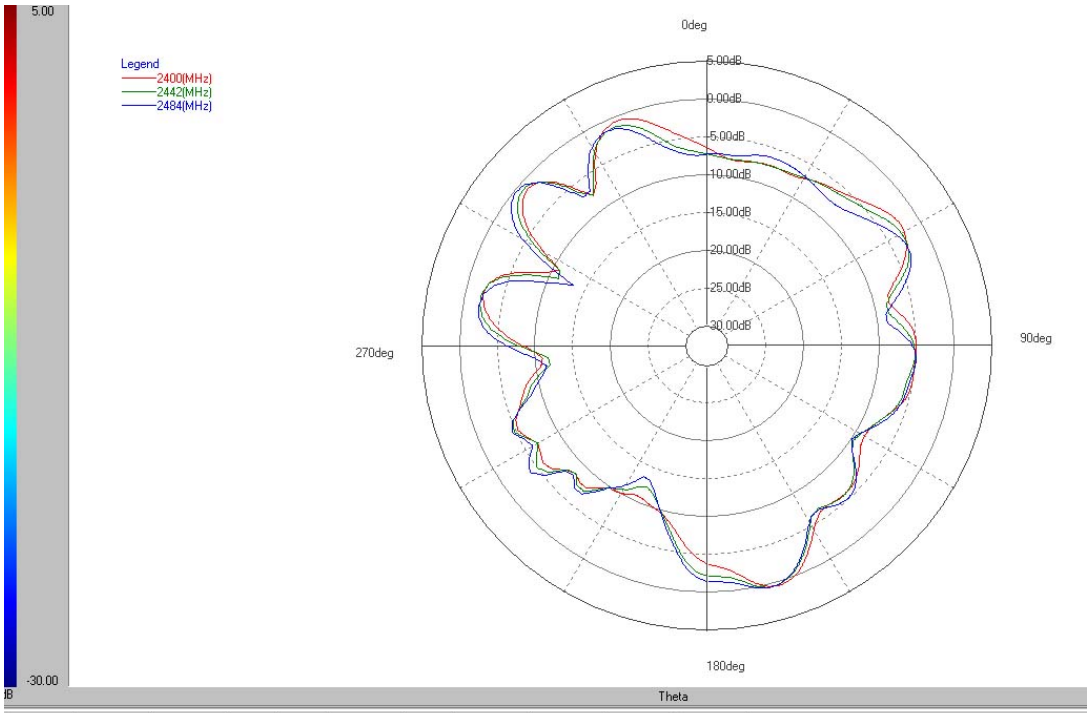
Layer	Max value	Position	Min val...	Position	Average	Standar...	Marker 1 pos	Marker 1 val...	Marker 2 pos	Marker 2 val...
2400(MHz)	0.62 dB	165.71 deg	-17.96 dB	-88.57 d...	-5.14 dB	-35.41	----	----	----	----
2442(MHz)	0.58 dB	165.71 deg	-18.58 dB	-108.56 ...	-5.27 dB	-36.92	----	----	----	----
2484(MHz)	-0.03 dB	165.71 deg	-18.27 dB	-111.42 d...	-5.52 dB	-40.20	----	----	----	----

3.2.3 Left H-Plane



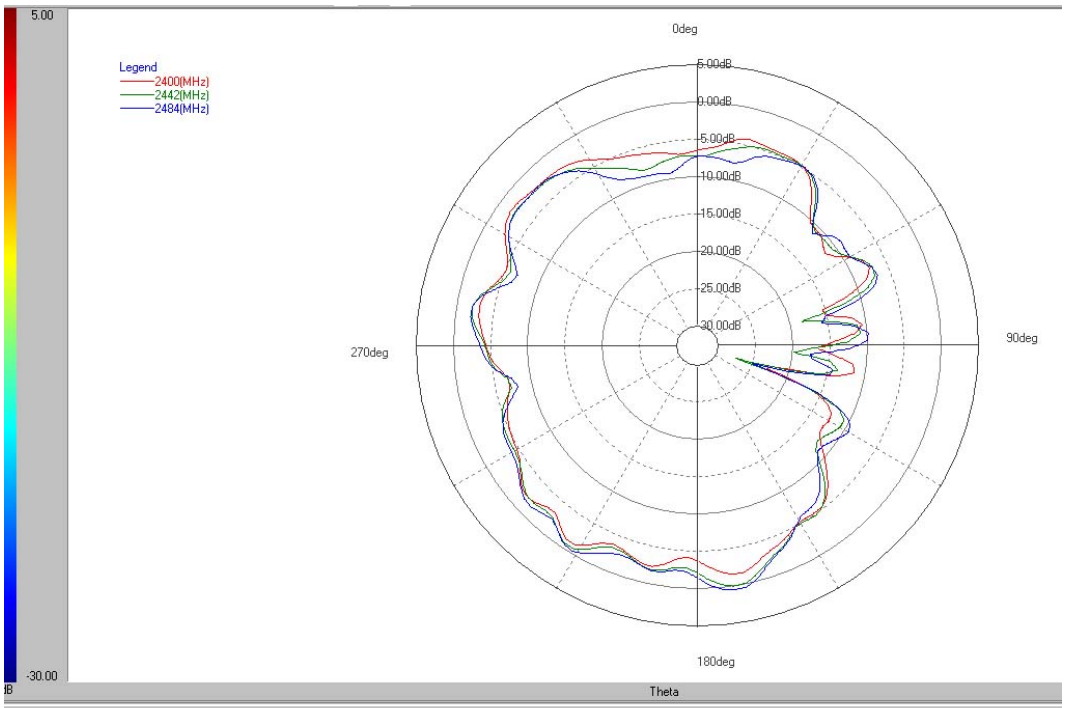
Frequency (MHz)	E1 (peak/avg.)	E2 (peak/avg.)	H (peak/avg.)
2400	1.22/-3.98	0.62/-5.14	-0.35/-3.93
2442	0.50/-4.05	0.58/-5.27	-0.99/-4.39
2484	-0.14/-4.43	-0.03/-5.52	-1.29/-4.98

3.2.4 Right E1-Plane



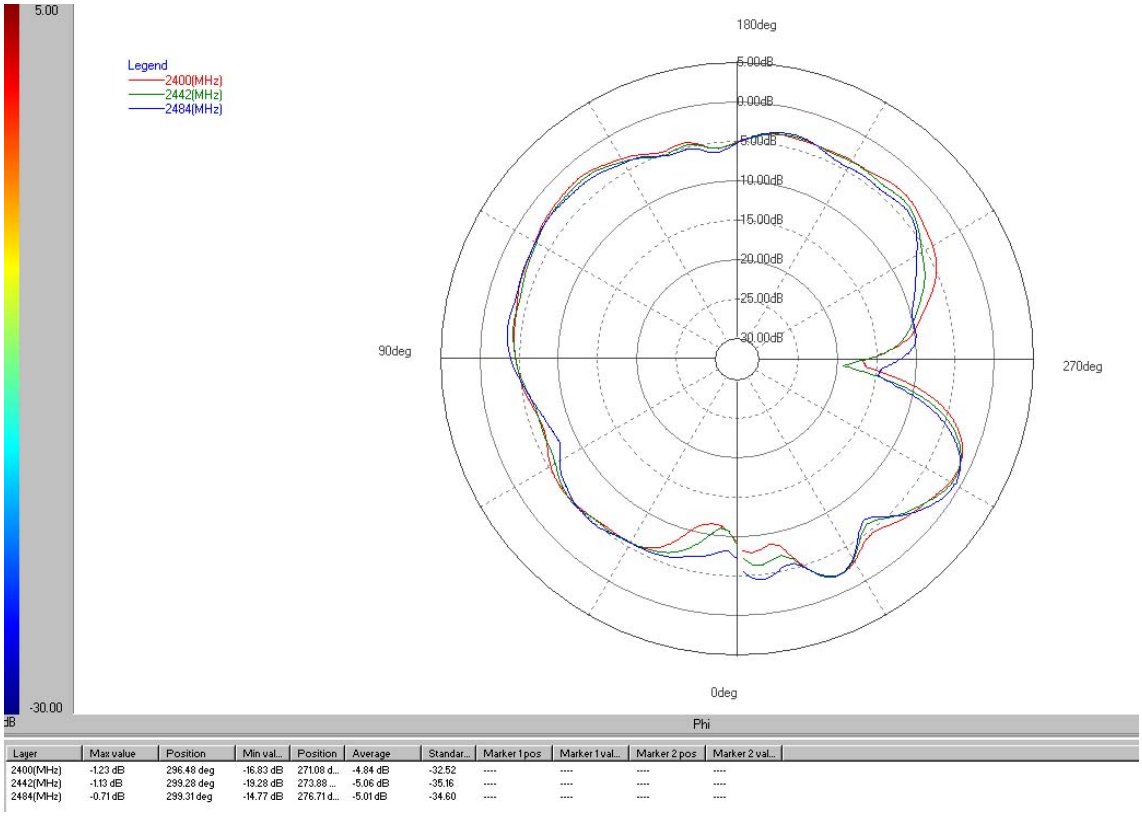
Layer	Max value	Position	Min val...	Position	Average	Standar...	Marker 1 pos	Marker 1 val...	Marker 2 pos	Marker 2 val...
2400(MHz)	0.45 dB	162.84 deg	-10.95 dB	-94.29 d...	-5.39 dB	-38.92	----	----	----	----
2442(MHz)	0.33 dB	165.70 deg	-12.45 dB	-157.15 ...	-5.49 dB	-40.24	----	----	----	----
2484(MHz)	0.38 dB	165.71 deg	-13.49 dB	-154.23 ...	-5.38 dB	-38.77	----	----	----	----

3.2.5 Right E2-Plane



Layer	Max value	Position	Min val...	Position	Average	Standar...	Marker 1 pos	Marker 1 val...	Marker 2 pos	Marker 2 val...
2400(MHz)	-1.37 dB	-148.55 deg	-22.93 d...	108.56 d...	-5.59 dB	-41.37	----	----	----	----
2442(MHz)	-0.08 dB	171.42 deg	-27.61 dB	108.56 d...	-5.49 dB	-39.83	----	----	----	----
2484(MHz)	0.43 dB	171.42 deg	-25.34 d...	108.56 d...	-5.45 dB	-39.20	----	----	----	----

3.2.6 Right H-Plane



Frequency (MHz)	E1 (peak/avg.)	E2 (peak/avg.)	H (peak/avg.)
2400	0.45/-5.39	-1.37/-5.59	-1.23/-4.84
2442	0.33/-5.49	-0.08/-5.49	-1.13/-5.06
2484	0.38/-5.38	0.43/-5.45	-0.71/-5.01