SDARS Patch Antenna
TEST REPORT

CUSTOMER: INPAQ

PROJECT: 50*50 mm PCB Ground

PRODUCT: INPAQ 22*22*4 mm

Patch

REVISION: A0

DATE: Sep. 06, 2006

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Approved by : Ken

Summary:

This is a comparative report about performance of the SDARS patch antenna, and each of the characteristic is measured and shown on this document.

I. Measurement Setup:

A. Reflection Coefficient Measurement:

■ **Instrument:** Network Analyzer (Agilent 8753ES, E5071A).

■ **Setup:**

1. Calibrate the Network Analyzer by one port calibration using O.S.L . calibration kits .
2. Connect the antenna under test to the Network Analyzer.
3. Measure the S11(reflection coefficient),Return Loss….

B. Pattern Measurement:

■ **Instruments:** Anechoic Chamber, Network Analyzer, Standard Gain Antenna**.**

■ **Chamber description:**

The INPAQ's anechoic chamber is a far-field measurement system with size of 8m*4m*3.5m. The quiet zone region is 20cm x 20cm x 20cm.

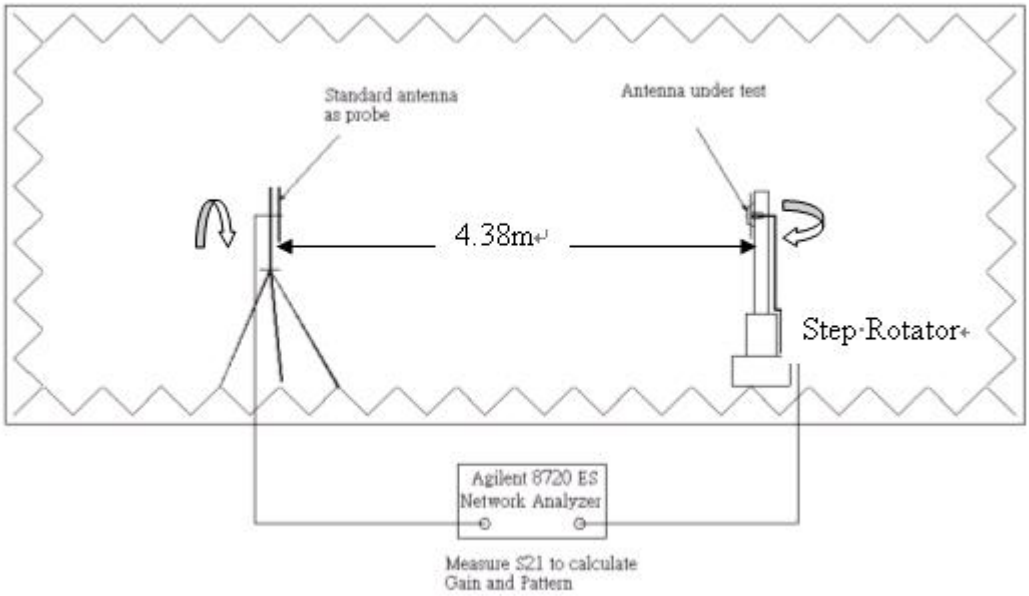

Fig. 1. The interior components of the anechoic chamber.

Fig. 1 shows the interior components of Anechoic chamber and the connection to the network analyzer. The distance between standard antenna as probe and antenna under test (AUT) is 4.38m. The antenna under test is fixed on a step rotator. We can control the rotating angle for accurate or rough measurement.

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The probing antenna is the TDK 900MHz~18 GHz module (9120D horn antenna).

While we measure the radiation patterns by rotating AUT with 360 degrees and repeat again by replacing the AUT with the standard gain antenna under test, we compare both data and using a formula to obtain the gain of AUT. The standard gain antenna is a gain horn (BBHA 9120 LFA 700MHz~6GHZ).

$$G_{AUT} = G_{stand} + P_{AUT} - P_{stand}$$

G_{AUT} : Gain of AUT

G_{stand} : Gain of Standard Gain Antenna

P_{AUT} : Measured Power of AUT

P_{stand} : Measured Power of Standard Gain Antenna

The planes defined in the Fig. 2 which we want to measure are H, and E planes in free space. The vertical or horizontal polarization's power is measured by rotating the antenna probe to 0 degree or to 90 degree shown in Fig. 2, respectively. While we combine both vertical and horizontal power, we obtain total power.

From the total power in these basic planes (H, and E), we can analyze the performance of the antenna is good or not.

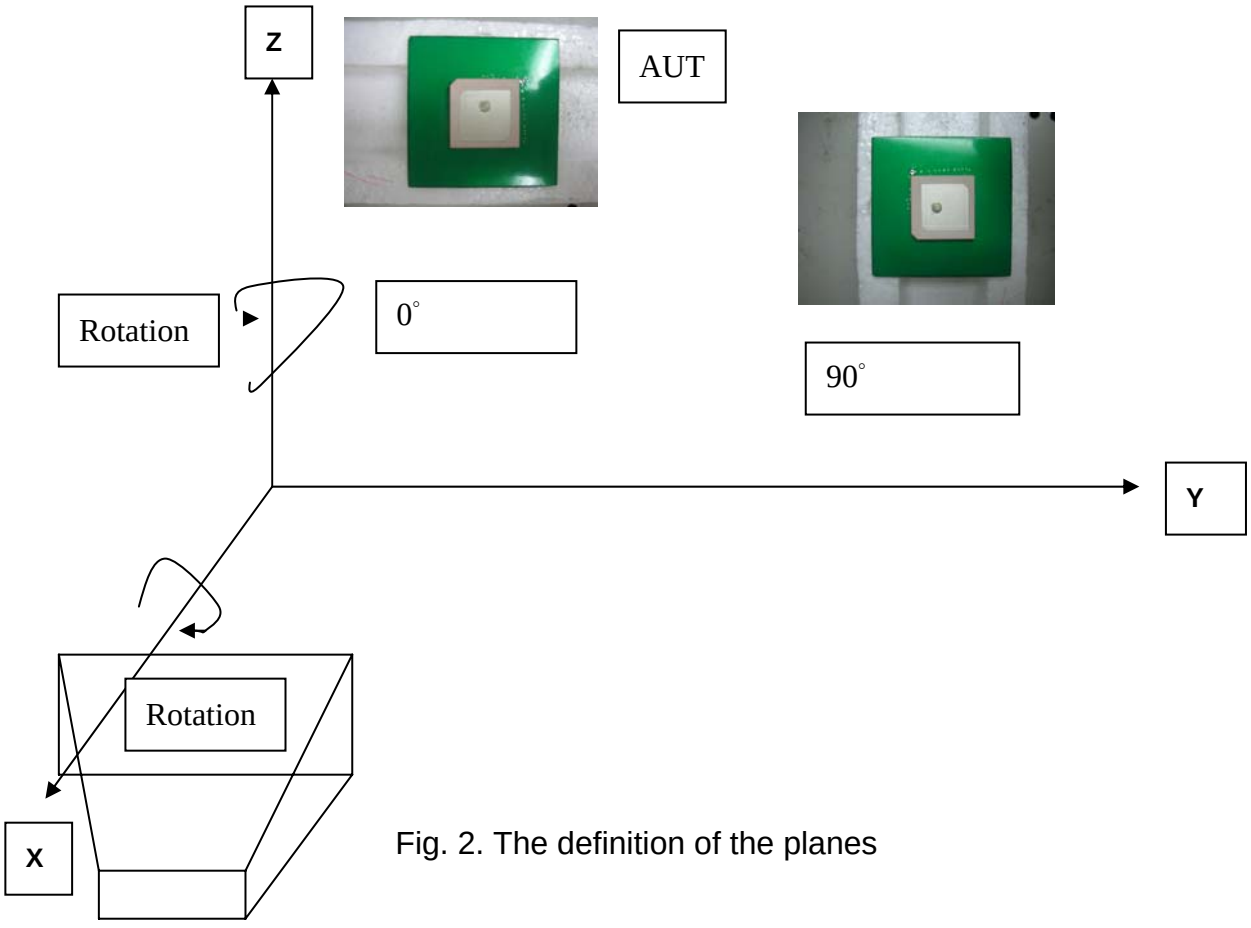

Fig. 2. The definition of the planes

Horn antenna (axial ratio)

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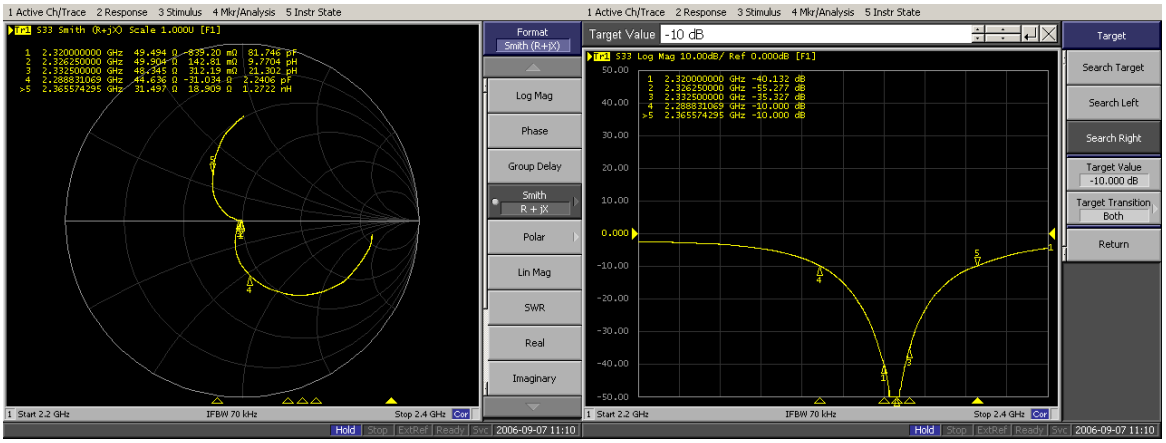
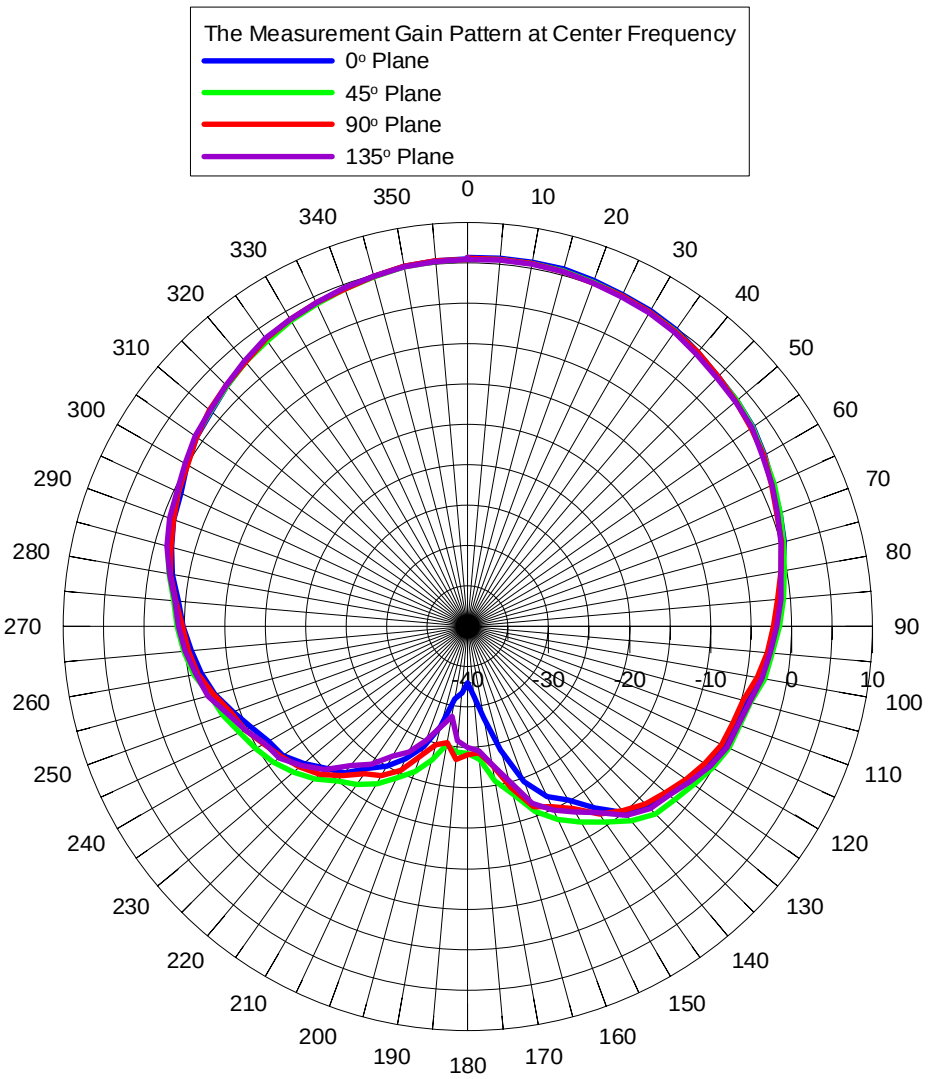
II. Experimental Results:

1. Return Loss/Impedance



INPAQ SDARS SIRIUS Patch on 50*50 mm PCB Ground

2. Pattern:



III. Data Analysis:

1. Impedance/Return Loss

	Return Loss	Impedance	Gain **0°H-plane**(dBic)
INPAQ			
2320MHz	-40.13	49.49-j0.84	5.8
2326.25MHz	-55.28	49.9+j0.14	5.66
2332.5MHz	-35.33	48.35+j0.31	5.75

2. Gain Pattern Data: (Unit:dBic)

	INPAQ(2320MHz)			
angle	**0**	**45**	**90**	**135**
-90°	-4.44	-4.13	-4.81	-3.92
-75°	-1.78	-1.57	-1.85	-1.13
-60°	0.32	0.37	0.22	0.76
-45°	2.36	2.25	2.57	2.69
-30°	4.01	3.82	4.14	4.27
-15°	5.05	4.82	5.08	5.21
0°	5.80	5.59	5.73	5.85
15°	5.98	5.61	5.66	5.82
30°	5.37	5.07	5.18	5.22
45°	4.03	3.83	4.06	4.05
60°	2.58	2.43	2.53	2.63
75°	0.63	0.48	0.47	0.58
90°	-1.62	-1.46	-2.07	-1.31

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	INPAQ(2326.25MHz)			
angle	**0**	**45**	**90**	**135**
-90°	-4.82	-4.11	-4.76	-4.27
-75°	-2.15	-1.64	-2.02	-1.58
-60°	-0.03	0.20	-0.04	0.30
-45°	2.06	2.05	2.22	2.19
-30°	3.76	3.72	3.87	3.89
-15°	4.82	4.74	4.87	4.83
0°	5.66	5.52	5.56	5.44
15°	5.77	5.53	5.45	5.44
30°	5.16	4.98	4.92	4.80
45°	3.77	3.71	3.75	3.50
60°	2.34	2.30	2.23	2.08
75°	0.46	0.43	0.16	0.03
90°	-1.73	-1.46	-2.26	-1.78

	INPAQ(2332.5MHz)			
angle	**0**	**45**	**90**	**135**
-90°	-4.78	-3.90	-4.41	-4.13
-75°	-1.99	-1.49	-1.87	-1.51
-60°	0.09	0.28	0.05	0.36
-45°	2.13	2.11	2.22	2.26
-30°	3.86	3.79	3.96	3.99
-15°	4.93	4.83	4.97	4.92
0°	5.75	5.61	5.64	5.60
15°	5.85	5.64	5.56	5.57
30°	5.30	5.05	4.99	4.95
45°	3.86	3.77	3.71	3.52
60°	2.43	2.33	2.18	2.06
75°	0.58	0.47	0.20	0.03
90°	-1.48	-1.24	-2.16	-1.73

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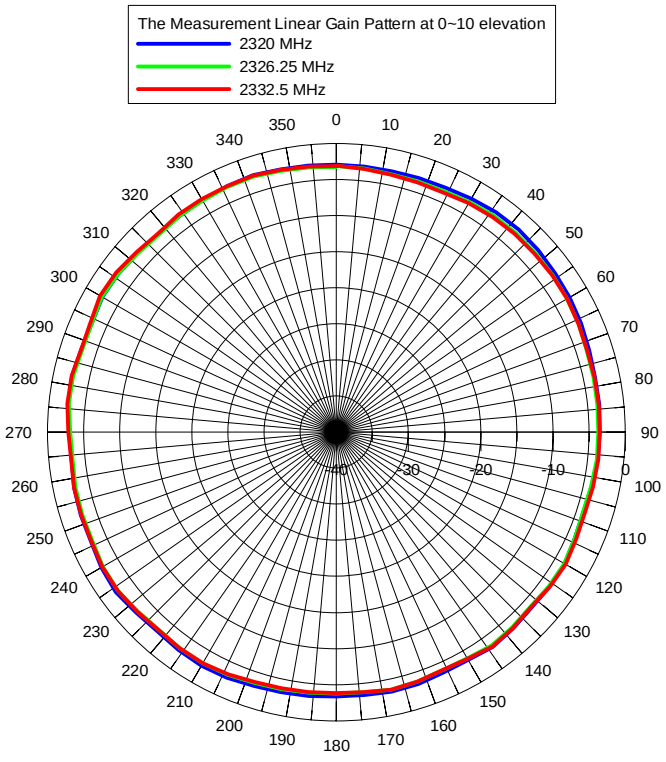
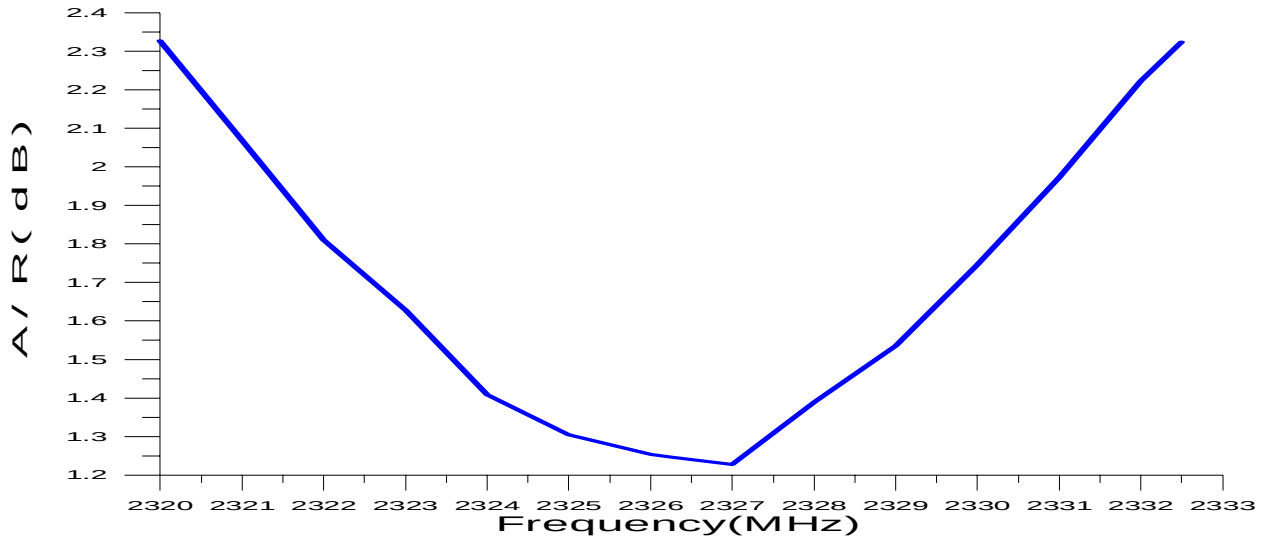
3. Axial Ratio Data (Unit : dB)

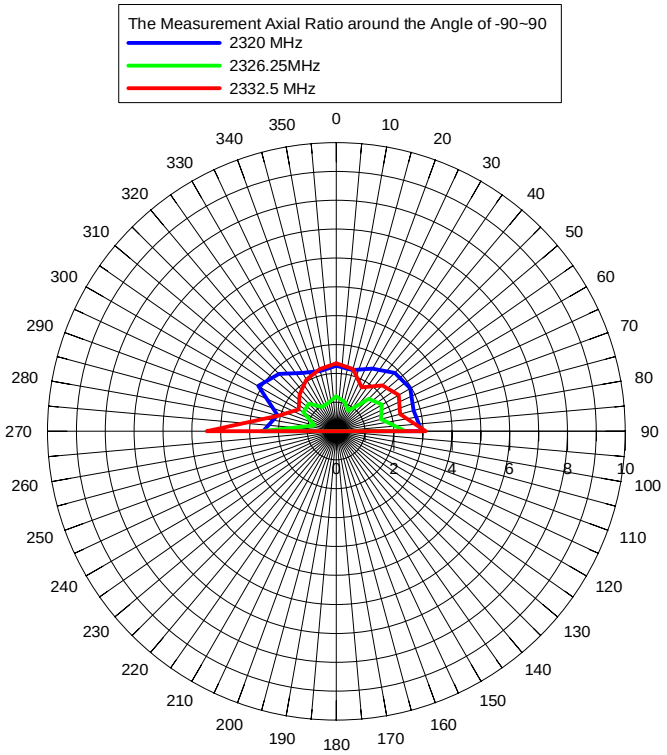
	INPAQ		
Frequency	**MAX**	**MIN**	**A/R**
2320	-52.191	-54.518	2.327
2321	-52.61	-54.678	2.068
2322	-53.024	-54.834	1.81
2323	-53.332	-54.959	1.627
2324	-53.5	-54.909	1.409
2325	-53.445	-54.75	1.305
2326	-53.243	-54.497	1.254
2326.25	-53.175	-54.422	1.247
2327	-52.89	-54.118	1.228
2328	-52.529	-53.919	1.39
2329	-52.239	-53.775	1.536
2330	-52.111	-53.856	1.745
2331	-52.138	-54.111	1.973
2332	-52.279	-54.502	2.223
2332.5	-52.357	-54.681	2.324

4. The Linear Gain Pattern at 0°~10° Elevation (Unit : dBi)



The linear gain pattern at 0°~10° elevation	Max (dBi)	Min (dBi)	Average (dBi)
2320	-2.29	-4.03	-3.00
2326.25	-2.56	-4.06	-3.26
2332.5	-2.25	-3.94	-3.18





The Measurement Axial Ratio around the Angle of -90°~90°

IV. Patch Assembly Location Diagram