HIGH-TEK HARNESS ENTERPRISE

Antenna Testing Report

CLEVO 5600

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Approved by *David Su*

General Information

- ***Measurement Resume***

Date	*Engineer*	*2.4~2.5 GHz*	*5.15~5.35 GHz*	*5.47~5.725 GHz*	*5.725~5,825 GHz*
91/03/22	*Charles Teng*	•			

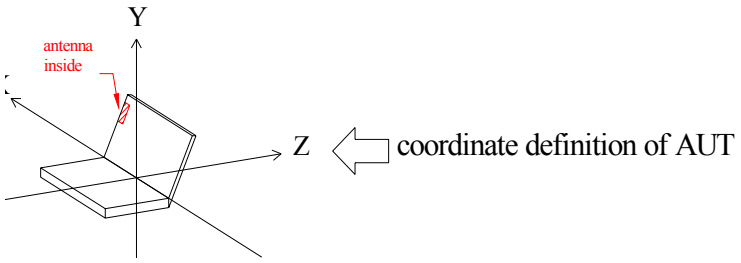
- ***Antenna specifications:*** maximum size, unit: mm

DIPOLE Type	*Length*	*Width*	*Height*	*Cable length*
Right Side	*64.0*	*5.8*	*4.5*	*536*
Left Side	*64.0*	*5.8*	*4.5*	*709*

- ***Measurement Setup & Environment***

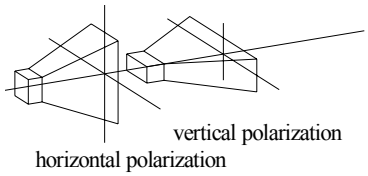
Temp.	*Humidity*	*Instrument*	*System*	*Entry*
20	*50%*	*VNA HP8753ES, 7x4x4 m anechoic chamber*	*NSI antenna measurement system*	*VSWR, Return, Radiation pattern*

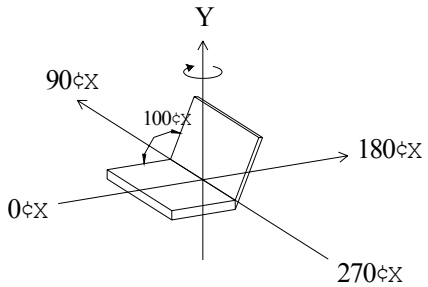
Coordinate Definition



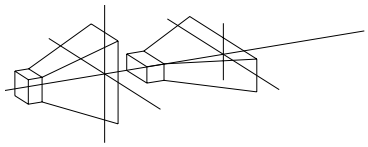
coordinate definition of AUT

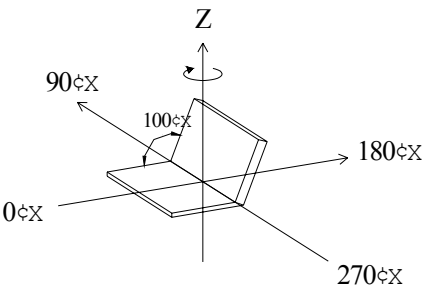
IORN ANTENNA





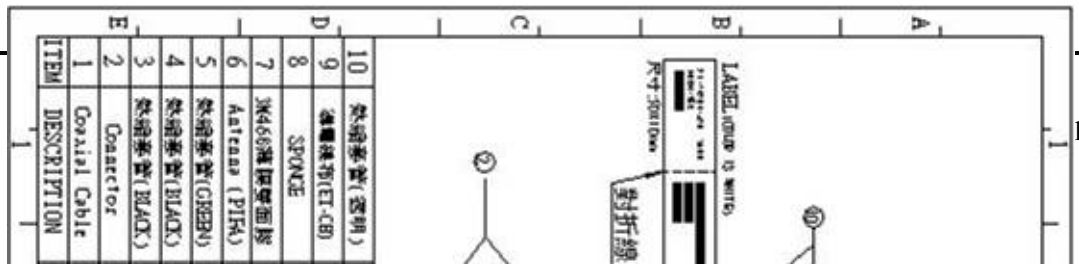
X - Z Plane



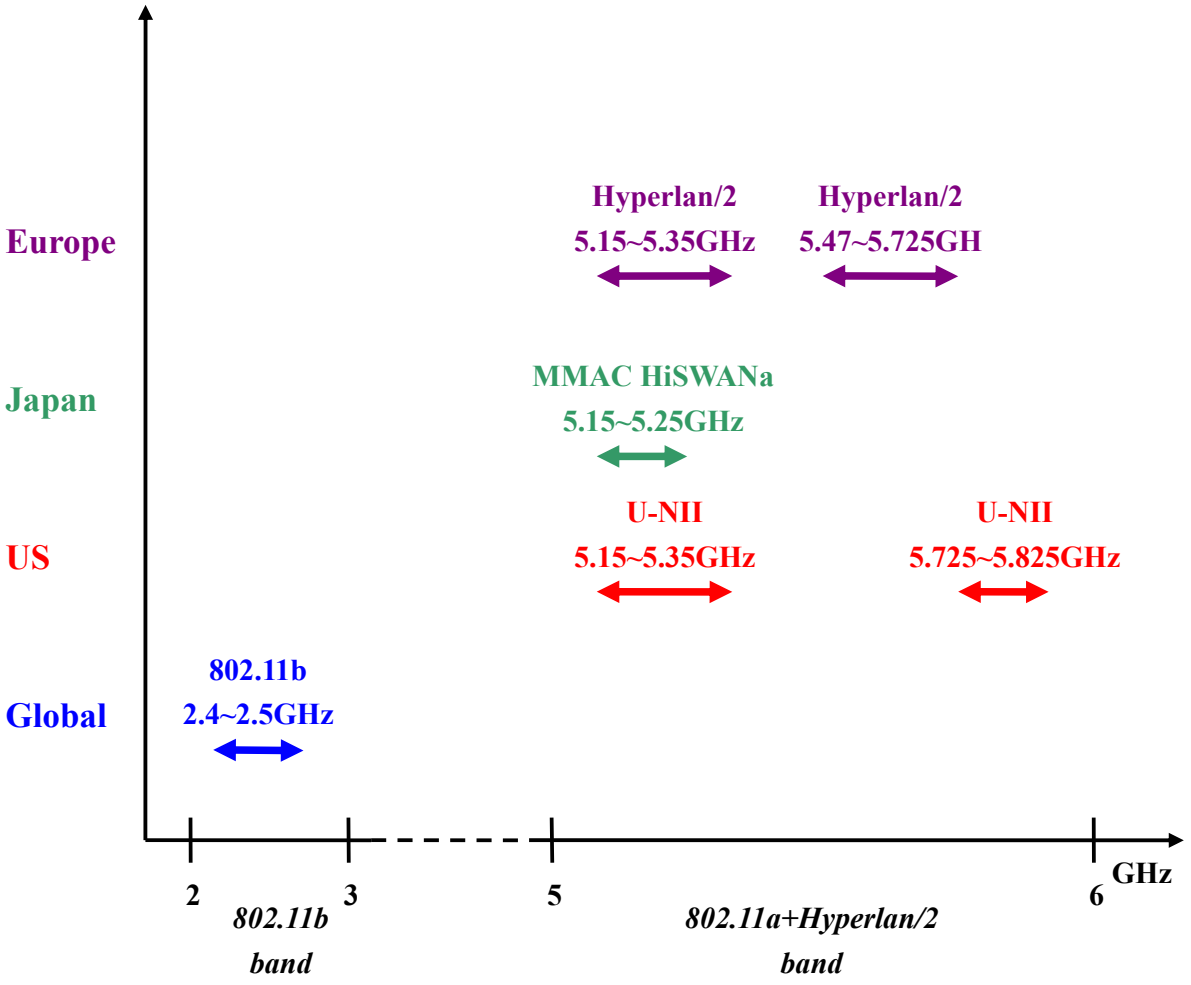


X - Y Plane

Antenna Drawing



Spectrum Allocation in worldwide WLAN



Typical Performance of Antenna

I. Typical Performance Table

	2.4~2.5GHz	5.15~5.25GHz	5.15~5.35GHz	5.47~5.825GHz
VSWR	**1.80**			
Peak Gain	**-0.45 dBi**			
Average Gain	**-4.32 dBi**			

II. Antenna Type

Position	Main Antenna (Right-side Antenna)	Aux Antenna (Left-side Antenna)
Antenna Type	PIFA	PIFA
Material	METAL SHEET	METAL SHEET

III. VSWR

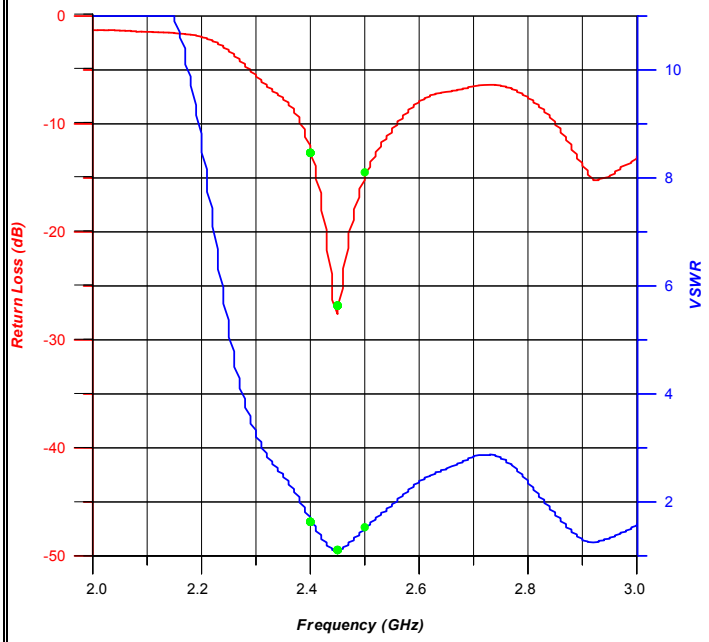
	2.4GHz ISM 2.4~2.5GHz			JAPAN 5.15~5.25GHz		U-NII,Hyperlan/2 5.150~5.35GHz			U-NII+HiperLAN/2 5.47~5.825GHz		
Freq (GHz)	2.40	2.45	2.50	5.15	5.25	5.15	5.25	5.35	5.47	5.6	5.825
MAIN	1.63	1.11	1.53								
AUX	1.80	1.04	1.62								

IV. Peak Gain and Average Gain

Freq (GHz) / Gain (dBi)		2.4GHz ISM 2.4~2.5GHz			JAPAN 5.15~5.25GHz		U-NII,Hyperlan/2 5.150~5.350GHz			U-NII+HiperLAN/2 5.470~5.825GHz		
		2.40	2.45	2.50	5.15	5.25	5.15	5.25	5.35	5.47	5.6	5.825
MAIN	Peak	**-0.86**	**0**	**1.51**								
	Avg	**-4.34**	**-4.32**	**-3.45**								
AUX	Peak	**-3.73**	**-3.16**	**-1.58**								
	Avg	**-6.89**	**-6.51**	**-5.52**								

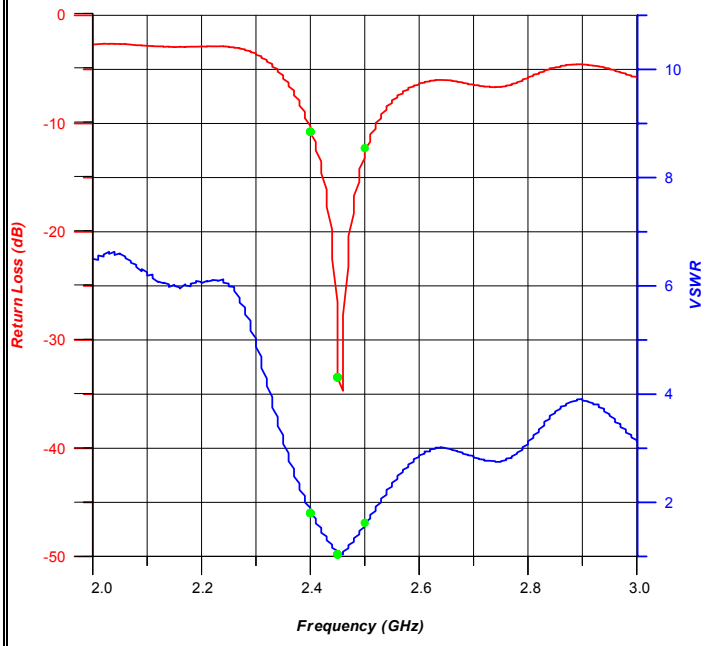
Return Loss & VSWR

L-Antenna



2.4~2.5 GHz Center freq.		2450
Beam Width @MHz		120
freq.	Return Loss(dB)	VSWR
2.4 GHz	-12.8	1.63
2.45 GHz	-26.9	1.11
2.5 GHz	-14.6	1.53

R-Antenna



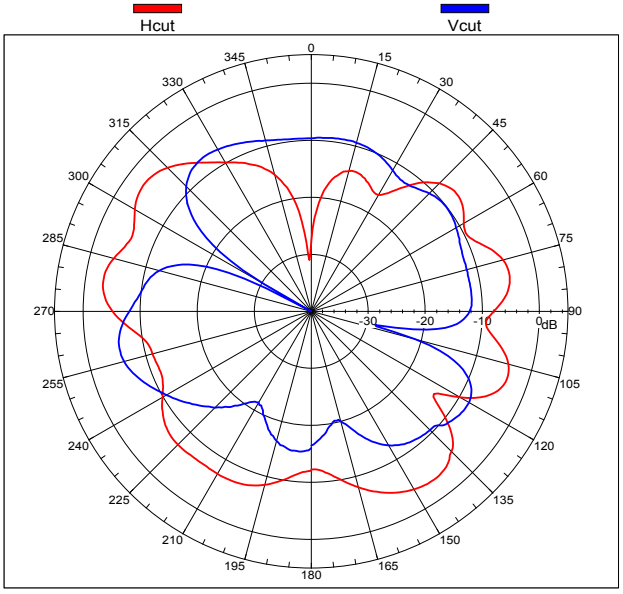
2.4~2.5 GHz Center freq.		2450
Beam Width @MHz		120
freq.	Return Loss(dB)	VSWR
2.4 GHz	-10.9	1.80
2.45 GHz	-33.5	1.04
2.5 GHz	-12.4	1.62

Radiation Pattern I

R-antenna(2.4~2.5 GHz)

Note: horizontal polarization plots in the red line and vertical polarization in the blue one

Far-field amplitude of YZ-2.45 H&V

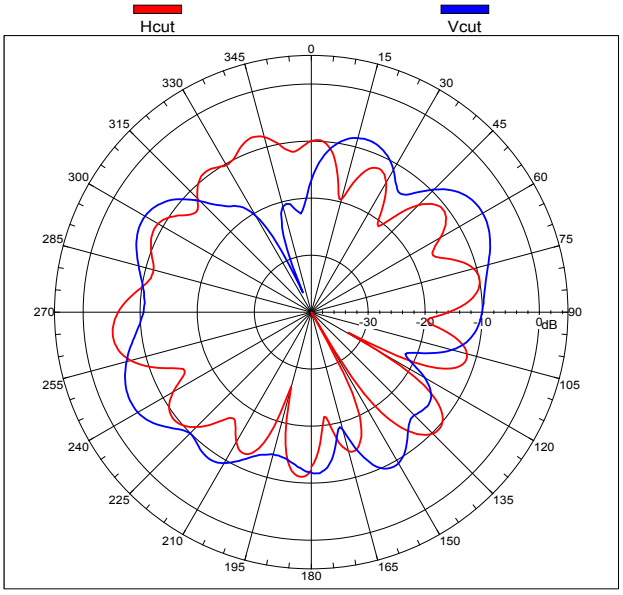


Average Gain And Peak Gain (On Azimuth Plane)

Y-Z Plane

Avg. Gain (dBi)	*-5.98*
Avg. Gain (dBi)	*-9.20*
Peak Gain (dBi)	*-1.58*

Far-field amplitude of XZ-2.45 H&V



Average Gain And Peak Gain (On Azimuth Plane)

Z-X Plane

Avg. Gain (dBi)	*-10.76*
Avg. Gain (dBi)	*-9.78*
Peak Gain (dBi)	*-4.44*

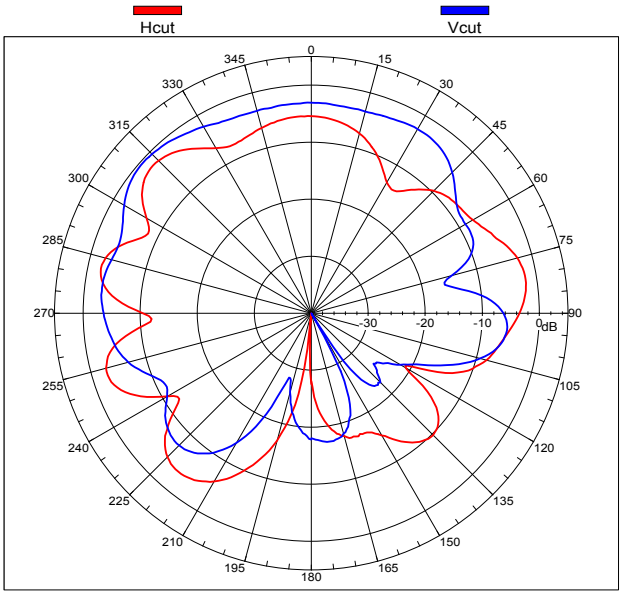
Radiation Pattern II

L-antenna(2.4~2.5 GHz)

Note: horizontal polarization plots in the red line

and vertical polarization in the blue one

Far-field amplitude of YZ-2.45 H&V

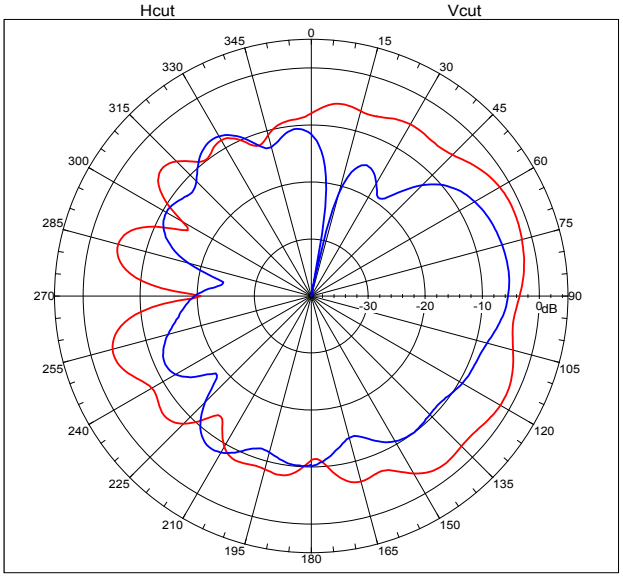


Average Gain And Peak Gain (On Azimuth Plane)

Y-Z Plane

Avg. Gain (dBi)	*-6.62*
Avg. Gain (dBi)	*-5.70*
Peak Gain (dBi)	*0*

Far-field amplitude of XZ-2.45 H&V



Average Gain And Peak Gain (On Azimuth Plane)

Z-X Plane

Avg. Gain (dBi)	*-5.42*
Avg. Gain (dBi)	*-10.26*
Peak Gain (dBi)	*-1.49*

Appendix

VSWR : *Voltage standing wave ratio on a transmission line in an antenna system. The ratio of the forward to reflected voltage on the line, and not a power ratio. A VSWR of 1:1 occurs when all parts of the antenna system are*

matched correctly.

Return Loss : When the load is mismatched, then, not all of the available power from the generator is delivered to the load. This 'loss 'is called return loss(RL).

Radiation pattern : The radiation characteristics of an antenna as a function of spatial coordinates. Normally, the pattern is measured in the far-field region and is represented graphically.

Polarization : The sense of the wave radiated by an antenna. This can be horizontal, vertical, elliptical , or circular (left or right hand circularity), depending on the design and application. The polarization of the antenna is based on the orientation of the electric or E field component. The polarization must be matched between two antennas to receive the maximum field intensity. Dependent on the antenna type, it is possible to radiate linear, elliptical and circular polarizations.

Gain value : The increase in effective radiated power in the desired direction of the major lobe.

Peak gain : The highest gain value in 360 degrees, which means the antenna efficiency at this angle is the best.

Cable loss : When RF signal transmitting in the coaxial cable, due to the material of the cable, the power may dissipate into to the air in the form of heat. So when we try to measure the gain of an antenna, we have to offset the cable loss. The power loss of coaxial cable(Φ=1.13 mm) at 2.4~2.5 GHz is 3dB per 1000 mm . In this case, the cable length of the right antenna is about 536 mm , so the cable loss when RF signal transmitting at 2.4~2.5 GHz is about 1.61 dB .For the same reason , the cable length of the left antenna is about 709 mm , so the cable loss when RF signal transmitting at 2.4~2.5 GHz is about 2.13 dB . Which means we have to offset the cable loss to the gain value that we measure from the radiation pattern and that is the true antenna gain (G_a) we want .