

Gaertner Ellipsometer User Instructions

For the Micro-Electronics Laboratory

At

University of Notre Dame

Department of Electrical Engineering

For problems, clarification of procedures, or general information pertaining to this machine please contact send email to **staff-ndnf-list@nd.edu**

Operation:

Use Figures #1 - #5 during this procedure.

Gaertner Modeling program works very closely to these instructions as well.

2nd mode of operation is the 2Angle mode which is very similar as well.

2Angle mode is for multiorder films and 3,000 to 30,000Å films.

1. Enable system in iLab
2. Turn the "Power on/off Keyswitch" until the "Power" light on the front illuminates.
3. Start the "GEMP" (Gartner Ellipsometer Measurement Program) program on the computer.
4. Set sample wafer on top of table.
5. Pull to open the "Shutter".
6. Looking thru eyepiece adjust the two "Tilt knobs" on the bottom of the table until the "+" and the "X" are overlapping. See Figures # 3 and #4 on Page # 4.
7. In the "GEMP" program:
 - a. Click on the "Ellipsometer" menu.
 - b. Click on the "Measurement and Calculation" option.
 - c. Load or create a setup.
 - i. "Phi" is "Angle of Incidence".
 - ii. Enter each layers "Thickness", "N", and "K". Chart is listed in back of this booklet.
 - iii. Enter Substrate information.
 - iv. Choose a calculation mode.
 - v. Save setup or perform measurement.
 - d. Depress the button "Table Height Adjustment".
 - i. Adjust the black "Table Height Knob" on the bottom of the table until you reach the maximum power available.
 - ii. When 10 is reached the display wraps back down to 5 to allow for more adjustment.
 - iii. Small Bar on the right of the diagram shows the Max Power you have reached therefore making it easy to see when you have maximized the power.
 - e. Depress "Measure and Calculate"
 - i. Read Results.
8. Remove your sample.
9. Repeat steps #5 thru #8 for as many samples or points you have to measure.
10. Close the "GEMP" program.
11. Push to close the "Shutter".
12. Turn off the "Power on/off Keyswitch".
13. Disable system in iLab

To change Angle of Incidence:

1. Loosen black "lock screw".
2. While holding the arm of the side you are using, Pull out the "release" knob and change the Angle of incidence of the arm.

3. After setting the new Angle of Incidence tighten the black “Lock Screw”.
4. Repeat steps 2 and 3 for the other arm. Both arms should read the same angle.

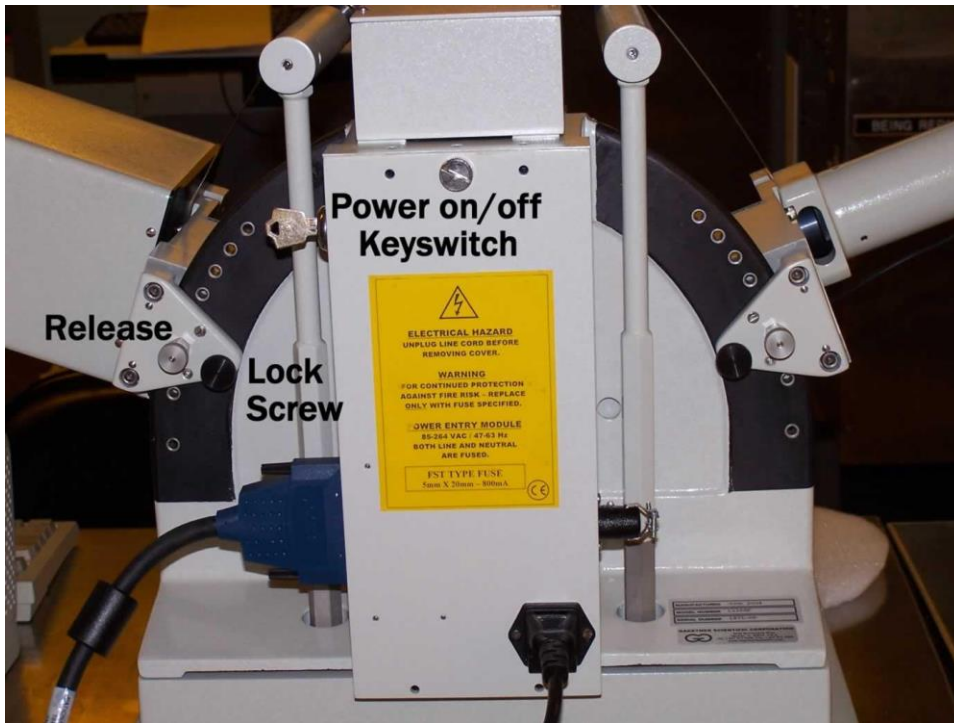


Figure #1: View of the rear of machine.

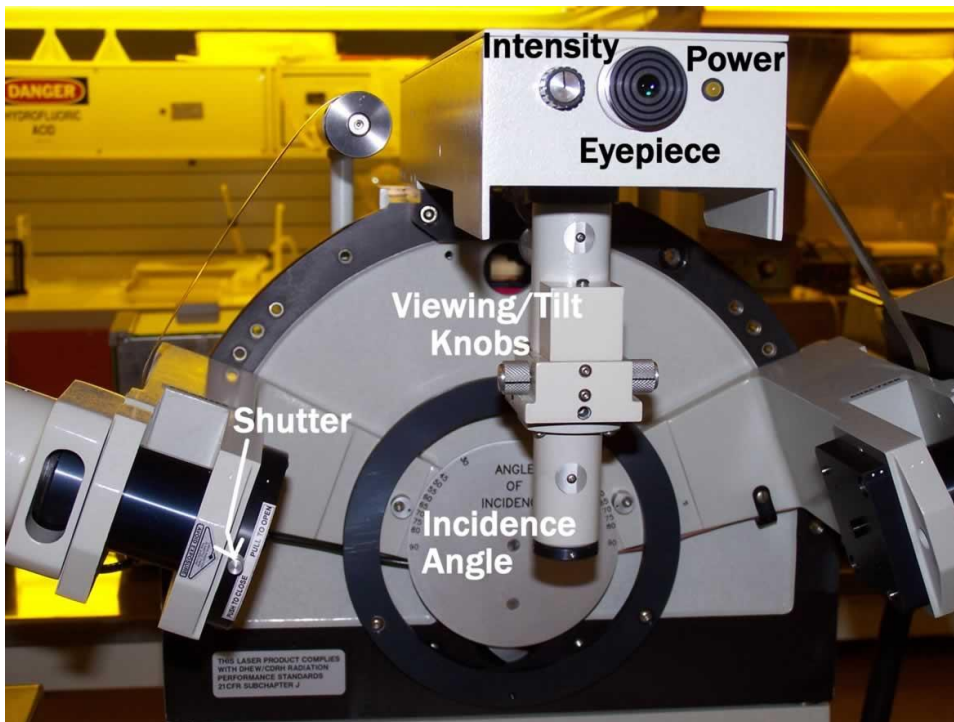


Figure #2: View of front of the machine.

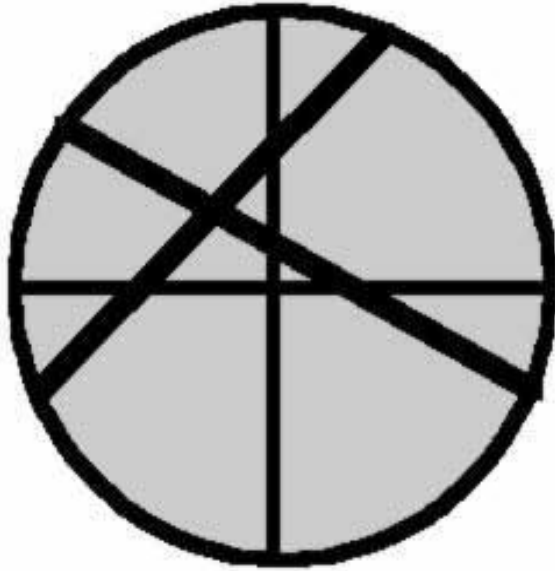


Figure #3: Looking thru view port before table is aligned.

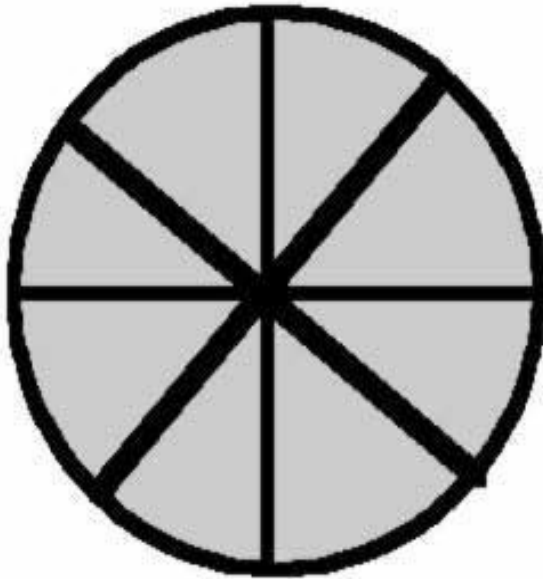


Figure #4: Looking through the view port onto an aligned table.

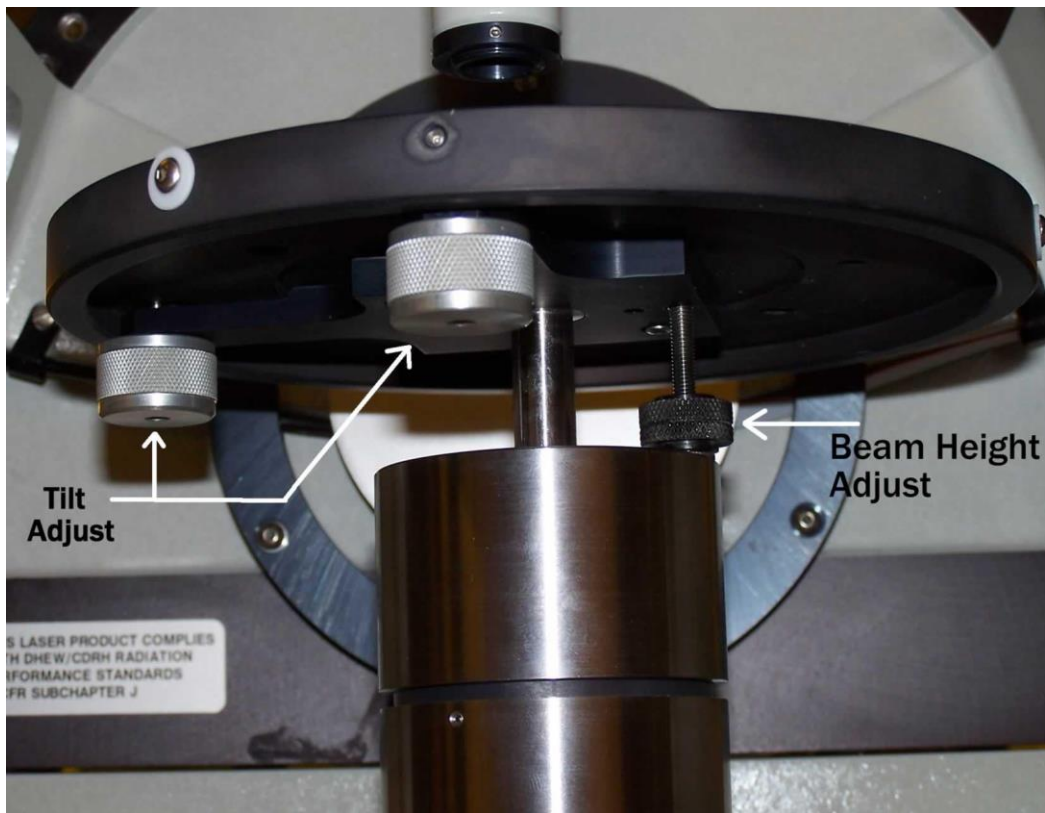


Figure #5: Bottom of table.

Material	Symbol	N	K	Brewster Angle
Aluminum	Al	1.43	7.28	
Aluminium Nitride	AlN	2.1496		
Aluminum Oxide	Al ₂ O ₃	1.7		60.4
Benzocyclobutene polymer	BCB	1.56		
Carbon	C	2.705	.04 - .512	67.4
Chrome	Cr	3.4	4.4	
Cobalt	Co	3.1		
Copper, Evaporated	Cu	.9-.28	2.76-3.39	
Gallium Arsenide	GaAs	3.8-4	.3-.653	73.6
Gallium Nitride	GaN	2.385		67.3
Gallium Phosphide	GaP	3.313		
Germanium	Ge	4.7	1.52	
Glass, Borosilicate		1.51		
Gold, Evaporated	Au	0.155	3.2	72.1
Gold, Sputtered	Au	0.25	3.46	
Hafnium Oxide	HfO ₂	2		62.4
Nickel	Ni	1.89	3.55	
Nickel Oxide	NiO	2.18		
Oil		1.36		
Paraffin		1.433		

Photoresist		1.64		
Photoresist, SPR700		1.641		
Platinum	Pt	2.22	4.67	
Platinum, Electrol		2.48	3.37	
Polymide		1.6		
Polysilicon		4.06	0.012	
Polysilicon, amorphous		4.06 - 4.535	.012 - .236	75.8
Polysilicon, P doped		3.823	0.028	
Quartz		1.457		
Sapphire	Al ₂ O ₃	1.785		
Scandium Oxide	Sc ₂ O ₃	1.88		
Silicon	Si	3.882	0.019	75.5
Silicon (Amorphous)	a-Si	4.1	0.213	
Silicon Carbide	SiC	2.5 - 2.7		69.2
Silicon Dioxide, Crystalline	SiO ₂	1.522		
Silicon Dioxide, Deposited		1.43 - 1.45		57.0
Silicon Dioxide, Grown		1.455-1.46		
Silicon Monoxide	SiO	1.969	0.012	
Silicon Nitride	Si ₃ N ₄	2.022		63.5
Silicon Oxide	Si ₂ O ₃	1.55		68.0
SION (Chemistry?)	SION	1.53		
SION	SION	1.481		
Silver	Ag	0.066	4.02	75.9
Tantalum	Ta	2.1	2.33	
Titanium	Ti	3	3.62	74.6
Titanium Nitride	TiN	1.5	2	69.6
Titanium Oxide	TiO	2.2		
Tungsten	W	3.27	3.5	
Vanadium	Va	3.5		