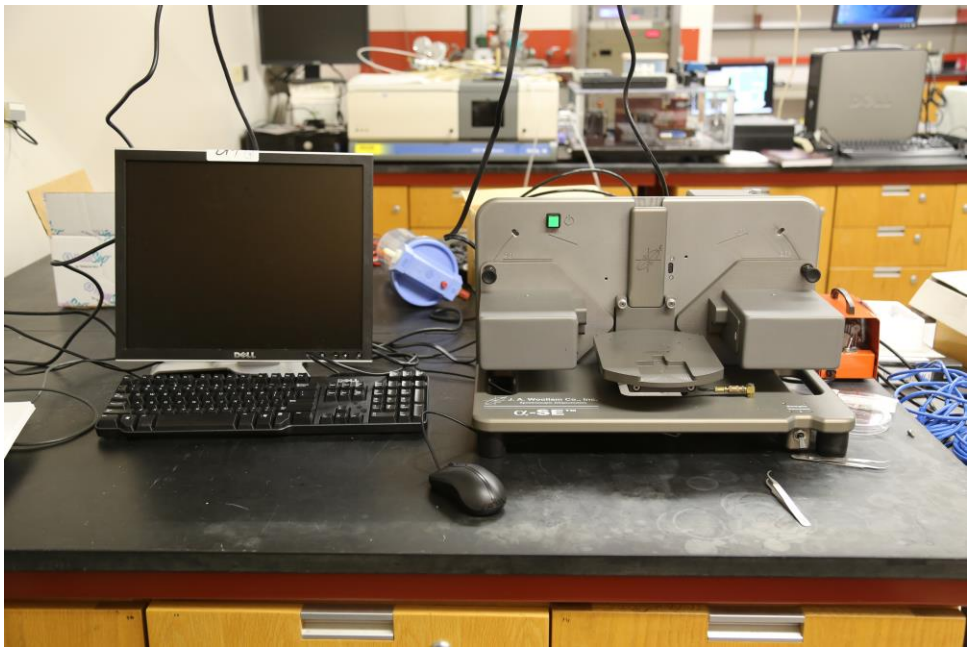
COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK
COLUMBIA NANO INITIATIVE / CENTER FOR INTEGRATED SCIENCE AND ENGINEERING

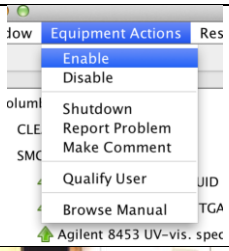
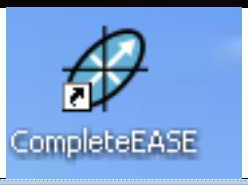
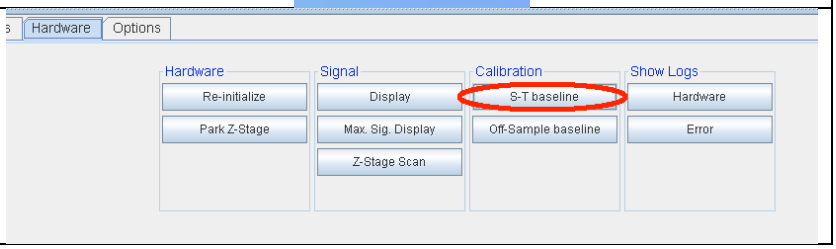
Woollam Ellipsometer Standard Operating Procedure

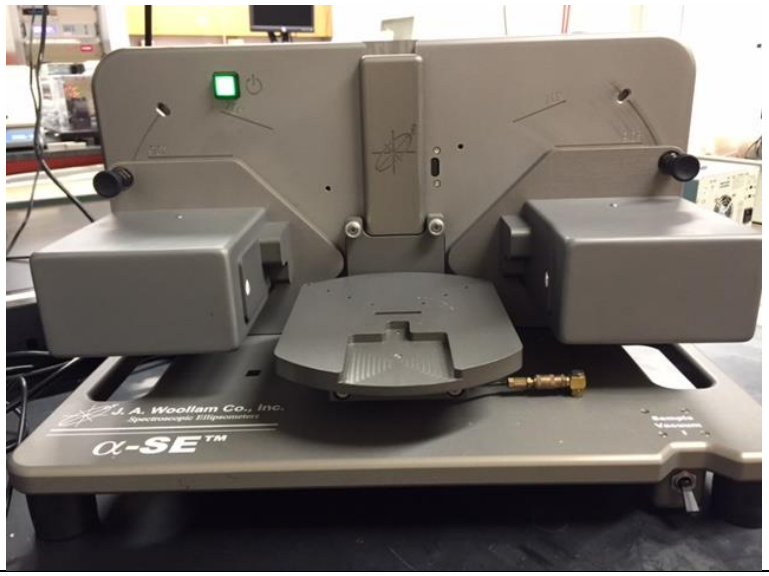
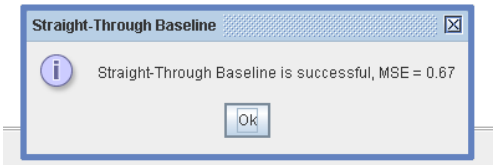
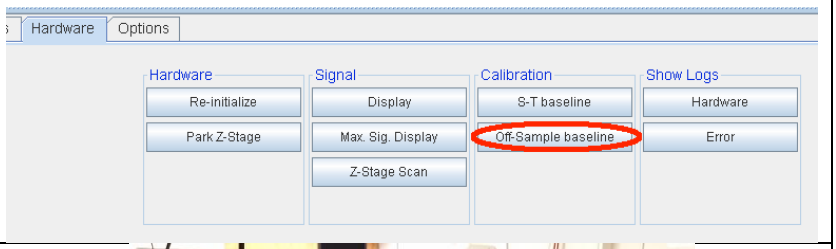
These instructions are intended for reference only, and will *not* replace the thorough training required for proper system operation. Contact a superuser/staff member with questions or to report a system problem.

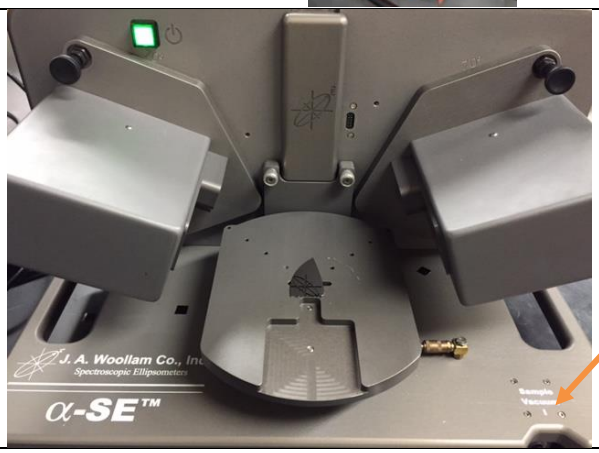
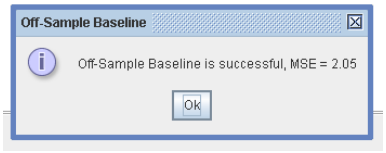


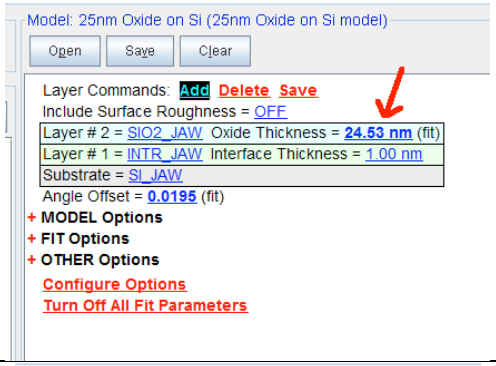
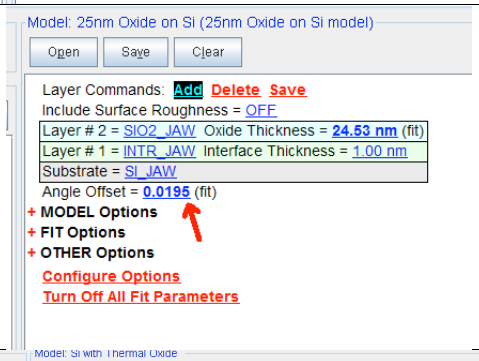
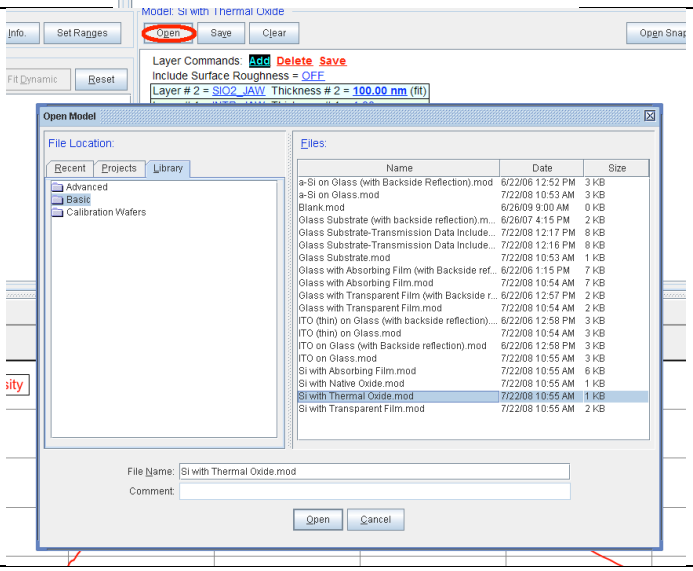
Written by Dr. Dan Paley
Updated by Dr. Manju Rajeswaran

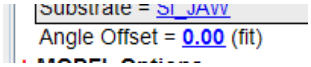
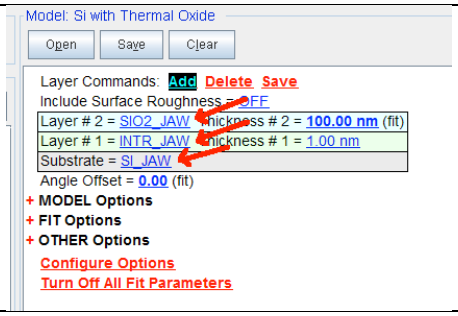
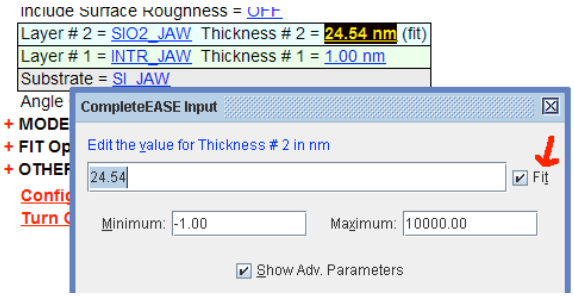
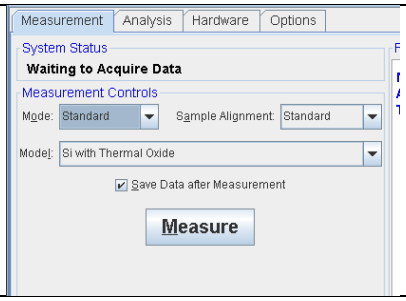
COLUMBIA | NANO INITIATIVE

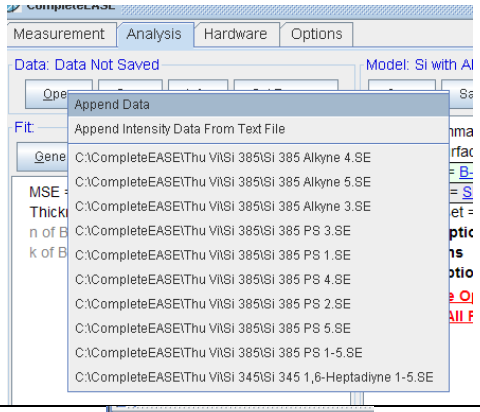
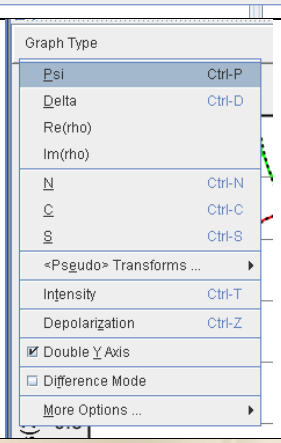
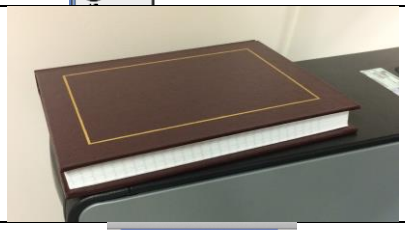
1	Enable the tool in BADGER	
2	Turn on instrument by pressing the green button (button should light up).	
3	Open Complete Ease software on computer. Ellipsometer will start checking the stage by moving the stage up and down. Wait for this process to complete.	
4	In Hardware tab, under Calibration Section, click on "S-T Calibration".	

5	A window will open requesting to move the stage to S-T position. Hold and pull out black knobs to move stage to 90 Degrees configuration, then click OK. Wait for the S-T calibration to finish.	
6	Once the S-T calibration is completed, a window will open showing the status of the calibration. The window should say "Straight Through Calibration Successful. MSE = …". The MSE (Measurement System Error) should be between 0 and 5.	
7	In Hardware tab, under Calibration Section, click on "Off-Sample Calibration".	
8	A window will open requesting to move the stage to Off Sample position. Hold and pull out black knobs to move stage to 70° configuration. The knobs must snap into the locking holes. Press OK.	

9	Another window will open requesting to place a calibration wafer. Locate the calibration piece (250 Å) in the second drawer from top under the instrument.	
10	Switch on Unicon vacuum pump	
10	Place calibration piece on the stage and turn on the chuck vacuum. Click OK. Calibration takes about 30 seconds.	
11	Once the calibration is completed, a window will open showing the status of the calibration. The MSE should be between 0 and 2. Remove calibration wafer piece, **store the piece face down (shiny side down) in container and put back in the right drawer.**	

12	Click on Analysis tab, and check the measured Silicon Oxide thickness. The thickness should be 25 nm +/- 10%. **If the thickness is outside that range, stop and notify Super User.**	
13	Write down the Angle Offset.	
14	Still in Analysis Tab, click Open under Model. Choose desired Model (most used models are in Basics folder under Library tab). Refer to Complete Ease Manual or contact Super User for model selection if unsure.	
15	Model selection suggestions:	
	* For oxide or layers with thickness less than 10 nm on wafer: Use "Si with Native Oxide" model. * For oxide thickness more than 10 nm on wafer: Use "Si with Thermal Oxide" model. * For layer with thichness larger than 10nm on wafer: Use either "Si with Transparent Thin Film" or "Si with Absorbing Film"	

	model, depending on the transparency of the film.	
16	Enter Angle Offset (if applicable) by clicking on the number of the Angle Offset. Enter value for the Angle Offset then click OK.	
17	If no model is available for your sample: You can add, delete and modify individual layers, selecting sub-models for the layers by clicking on their names.	
18	Any thickness or angle offset value with "(fit)" at the end is a refined parameter. To fix any value (a.k.a. don't want to measure this value), right click on the value to remove "(fit)" at the end (or click on the value and uncheck the Fit box). User can also enter desired thickness for each layer by clicking on the value and enter the number wanted.	
19	After choosing model and layer thickness to be measured, click on Measurement tab and click Measure. Notes: The MSE given here can be very high, depending on the condition of the sample's surface or the accuracy of the model. The higher the MSE, the higher the +/- value.	
20	To open old data, first choose the right model and layer thickness in Model window, then click Open in Data Window. Choose the file and click Open. Then click Fit to retrieve the data wanted.	

21	To combine multiple data and find the best fit, first open one data value (see step 20). Then **right-click** on Open in Data window and choose Append Data. Click on all wanted data files and click Append. Then click Fit to get the best fit from all the data with the chosen model. Click Save to save the data.	
22	Click "Graph Type" in Graph window to see plot of different measurement value.	
23	Once done, turn off instrument and close Complete Ease. Fill out log book.	
24	Disable the instrument on BADGER.