Filmetrics F20 Operating Procedure

1. Turn the power on to the light source by flipping the front panel switch on the F20 spectrophotometer.

NOTE: THE LIGHT SOURCE SHOULD BE ALLOWED TO STABILIZE AT LEAST 10 MINUTES BEFORE TAKING THE MEASUREMENTS.

2. Use the mouse to double click on the "FILMeasure" icon.

3. Select the film structure from the "Structure:" selection box on the main screen by clicking on the arrow next to the dialog box and pulling down with the mouse. If the structure to be measured is not listed go directly to step 4.

4. Click on the "Edit Structure" box below the "Structure:" selection box.

4.1. Select the type of material to be measured from the "Layer #1" selection box or leave unchanged if the material you are measuring is already in the box. To select, click on the arrow on the right side of dialog box to bring up the material menu. If the material to be measured is not present in the pop-up material menu, there are three possible approaches:

4.1.1. Choose a material in the list which is similar.

4.1.2. If the material is transparent, select "Enter Refractive Index Value" from the material list and enter a value for the refractive index.

4.1.3. In the Edit Menu select "Edit Material Library" to create a new material.

4.2. All measurements require initial estimates for thickness. Change the thickness estimation value by entering it in the dialog box below "Thickness, d(A)".

4.3. Select the values to be measured. If you are just measuring the thickness, select "d" by clicking in the box next to it under the "Measure:" category.

If you are measuring any of the optical constants select "d, n, k", and "r" because they must all be simultaneously measured.

NOTE: AS WITH ANY MEASUREMENT, THE ACCURACY OF THE MEASURED DATA DECREASES AS THE NUMBER OF MEASURED VALUES INCREASES.

4.4. Select the substrate from the "Substrate" selection box. For whatever substrate you are choosing you must provide a pure wafer of the material for the baseline measurement, which is required for all measurements.

5. Take a Baseline measurement by first clicking on the Baseline button on the main screen. On the "Take Baseline" dialog box, make certain the "Autoscale Integration Time" option is selected, and choose the Baseline Sample that will be used.

6. Put the Baseline sample on the measurement stage and click on "Take Baseline".

NOTE: THE BASELINE SHOULD BE PERIODICALLY RETAKEN EVERY 20-30 MINUTES.

7. To take dark measurement pick up sample with tweezers and tilt sample making sure the light source is being reflected away from the optical fibers that receive input. You can tilt the sample until you can see the light reflected on to the table next to the platform to be sure that there is no reflection being picked up by the receivers. Then click on the box to take the dark measurement.

8. Make the measurement by placing your sample on the stage and click on the "Measure" button. If the measurement was successful. The minima and the maxima of the calculated reflectance (the red line on the graph) will coincide in wavelength with the minima and the maxima of the measured reflectance (the blue line on the graph). In most cases that will not overlap, but will be separated in amplitude. See Fig. 1. If the red and blue minima and maxima do not coincide, then the measurement was not successful.

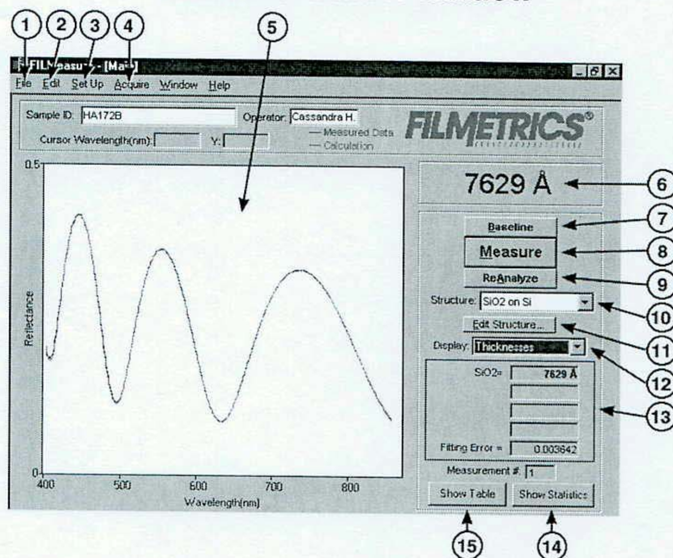
NOTE: THE USUAL CAUSE FOR THE ERROR IS IN THE BASELINE MEASUREMENT SO FIRST RETAKE THE BASELINE MEASUREMENT. THE NEXT ERROR MAY BE IN THE INITIAL ESTIMATIONS IN "EDIT STRUCTURE".

9. The value of the thickness will appear in the upper right hand corner. See Fig. 1. If you were measuring any of the optical constants change the "Display:" selection to view the desired values. They will appear in the lines below "Display:". See Fig.1.

Shutdown

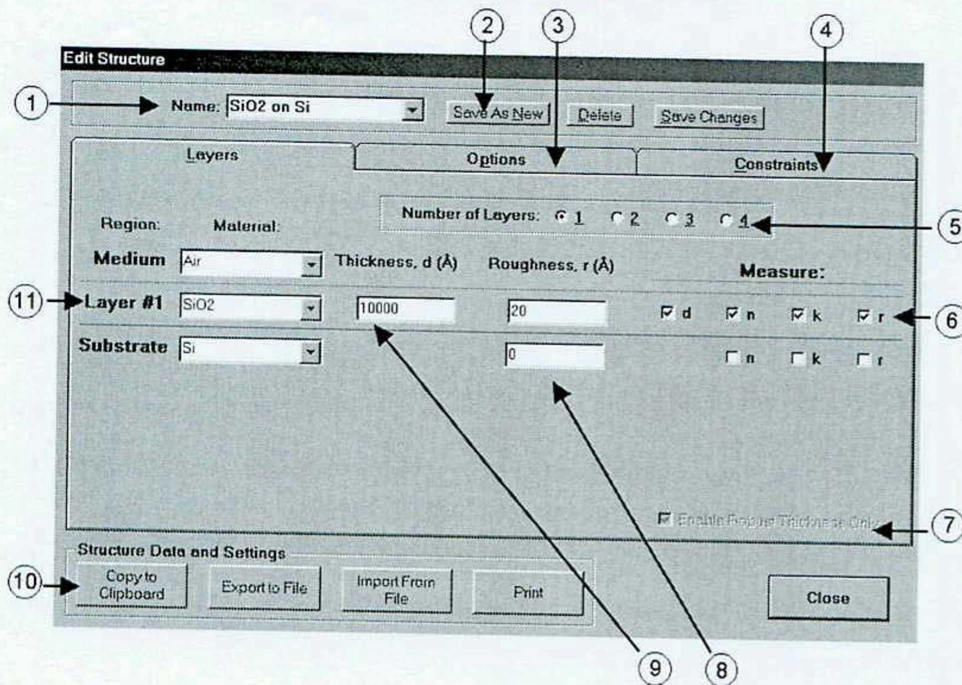
10. When you are finished with all measurements exit program by going to the "File" menu and then select "Exit". Then turn off the light source by flipping the switch on the front panel.

FILMeasure Main Window



1. Standard Windows File menu for saving and retrieving data, printing, etc.
2. The Edit menu is used for copying measured spectra and measurement results, as well as selecting thickness units and editing the material library.
3. Used to setup reflectance acquisition parameters and the graphic display.
4. For starting and stopping continuous reflectance acquisition. Convenient for setting up hardware.
5. Graphical display for measured and calculated reflectance, as well as measured optical constants. Change display limits by double-clicking in the display area. A click of the right mouse button while the curser is within the graphical display activates a blue line (one click for measured curve) and red line (2 clicks for calculated curve) for easy reading of cursor values in the Main Window. Keyboard up/down and right/left arrows move the line to a desired location.
6. The measured film thickness is displayed here.
7. The baseline measurement sequence, which is required before measurements are made, is initiated by pressing the Baseline button.
8. This button causes a reflectance spectrum to be acquired and then analyzed in one step.
9. Analysis only on the displayed reflectance spectrum. Usually used when trying different analysis settings on a previously acquired spectrum.
10. Used to select the film structure that is to be measured.
11. This is where the selected film structure is described, and the analysis parameters are set.
12. Used to select the information displayed in the Results Box below.
13. The Results Box summarizes the most recent measurement results.
14. Statistical tabulation of all measurement results are accessed by pushing this button.
15. Complete results of the most recent measurement are accessed by pushing this button.

Edit Structure Window



A structure defines the film to be measured, the substrate and any underlying films, the approximate thickness of the film, and the quantities to be measured:

1. The name of the film structure is listed/edited here.
2. The structure can be saved as a new structure, deleted, or changes can be saved.
3. Advanced measurement parameters can be accessed by clicking on the Options tab.
4. Constraints on the possible measured values are selected here.
5. The number of film layers is chosen here.
6. The values to be measured are selected by checking the appropriate boxes.
7. A very robust thickness measurement routine is enabled by selecting this box.
8. Known film roughness for films not being measured, and the initial guess for the film(s) being measured are entered in this column.
9. Known film thicknesses for films not being measured, and the initial guess for the film(s) being measured are entered here.
10. All of the Edit Structure parameters can be copied, printed, imported or exported. This is convenient for remembering temporary setups, setting up multiple F20s, or sending measurement parameters to Filmetrics for troubleshooting.
11. The film layers are listed here. Common films can be selected from the pull-down menus.