



# Lab Manual

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## ***FilmTek Thin Film Measurement System***

(filmtek)

### **1.0 Title**

FilmTek 1500 thin film measurement system

### **2.0 Purpose**

FilmTek™ 1500 is a computerized film thickness measurement and material characterization system. It combines fiber-optic spectrophotometry with material modeling software to enable a simultaneous measurement of film thickness, index of refraction, and extinction coefficient.

### **3.0 Scope**

This manual describes the basic operation of the tool.

### **4.0 Applicable Documents**

[Revision History](#)

The hard copy of the manual is located by the tool. Please check with superuser if needed.

### **5.0 Definitions & Process Terminology**

### **6.0 Safety**

### **7.0 Statistical/Process Data**

### **8.0 Available Process, Gases, Process Notes**

### **9.0 Equipment Operation**

#### **9.1 Overview**

Absolute transmission data is obtained by comparing sample transmission data to the measured transmission of a user supplied sample or air (void). Absolute reflection data is obtained by comparing sample reflection to the measured reflection of a user supplied reference substrate. Using new generalized material models in combination with advanced global optimization algorithms and power spectral density analysis, FilmTek can simultaneously determine:

Multiple layer thickness

Indices of refraction [  $n(\lambda)$  ]

Extinction (absorption) coefficients [  $k(\lambda)$  ]

The parameters that are solved for, along with the layer structure of the sample being measured are stored in recipes. FilmTek is shipped with many commonly used recipes. The user can modify these recipes and create new recipes. The measurement sequence is initiated by clicking a single button in the FilmTek™ Main Window. The spectrophotometer scans the sample over a predefined range of wavelengths. The software generates a corrected spectrum based on a previously stored reference scan, and then performs a regression on the unknown parameters to fit the simulated reflection and power spectral density to their observed values. The resulting thin film parameters along with the measured and modeled spectra are then displayed for the user to examine.

## 9.2 The FilmTek™ Main Window

All basic measurement functions can be controlled from the FilmTek™ main window ([Figure 2](#)). From this window the user can select predefined recipes, perform measurements, and display fitted results. Most interaction with FilmTek™ is accomplished using the mouse.

The **Recipe** list box is used to select a pre-defined measurement program.

The **<Reference>** button is used to initiate a measurement sequence on the reference sample(s).

The **<Measure>** button is used to initiate a measurement sequence on the actual sample

The **<Solve>** button initiates an optimization and reports the final results.

## 9.3 Basic Measurement Procedure

The basic sequence for performing measurements is:

- ▶ Turn on the Halogen light source.
- ▶ Select the desired recipe using the **Recipe** selection box.
- ▶ Fill out all required comment fields.
- ▶ Remove any sample from the stage.
- ▶ Click on the **<Background>** button to measure the background light level for the transmission and reflection signals.
- ▶ Click on the **<Reference>** button to measure the reflection and transmission reference samples.
- ▶ Click on the **<Measure>** button to measure reflection and transmission of the sample.
- ▶ Save the measured data (optional).
- ▶ Turn off the Halogen light after your last measurement

### 9.3.1 Selecting the Recipe

The recipe is selected using the **Recipe** selection box or by selecting the menu item **File | Open Recipe**.

### 9.3.2 Entering Comments

Enter all required fields in the comment tab.

### 9.3.3 Measuring the Background

The background light level should be measured at least once per hour, or upon changing recipes.

Make sure the stage is empty, remove any sample that is on the stage. Click on the **<Background>** button to measure the background noise. Follow the displayed prompt if one comes up.

### 9.3.4 Measuring the Reference

The reference light level should be measured at least once per hour, or upon changing recipes.

Place the reflection reference on the stage. (The most commonly used reference sample is a clean silicon wafer). Click on the **<Reference>** button to measure the reference signal.

### 9.3.5 Measuring the Sample

Place the sample on the stage and move the sample so that the desired area is underneath the spectrophotometer head.

Click on the **<Measure>** button to measure the sample.

If the AutoSolve option is enabled, this step is not needed since a solve automatically follows the measurement. Otherwise, click on the **<Solve>** button to fit the model to the measured data.

The calculated layer thicknesses are displayed in the Main Window under “Final Solution” ([Figure 3](#)).

## 9.4 **Storing the Measured Data**

If desired, the measured data can be stored for future analysis.

- ▶ Click on the **Data | Save Data** menu selection.
- ▶ Enter the desired file name in the dialog box.
- ▶ Click on **Save** to save the measured data.

## 10.0 Troubleshooting Guidelines

## 11.0 Figures & Schematics

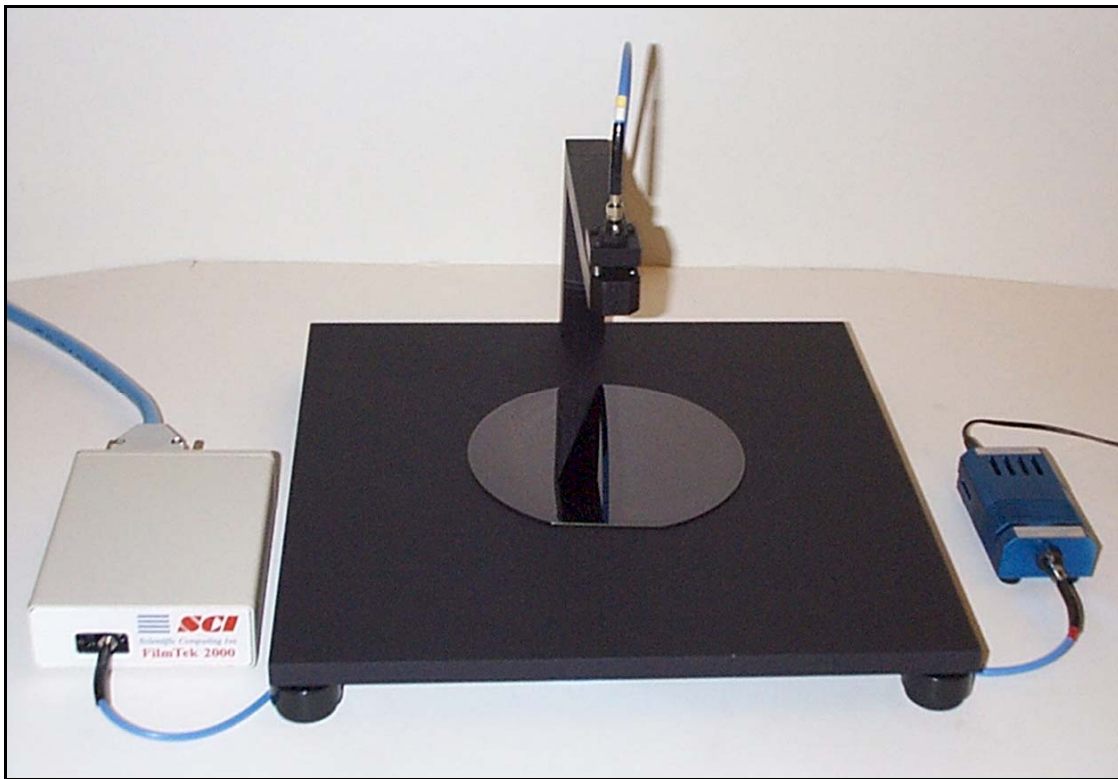


Figure 1 - FilmTek Stage

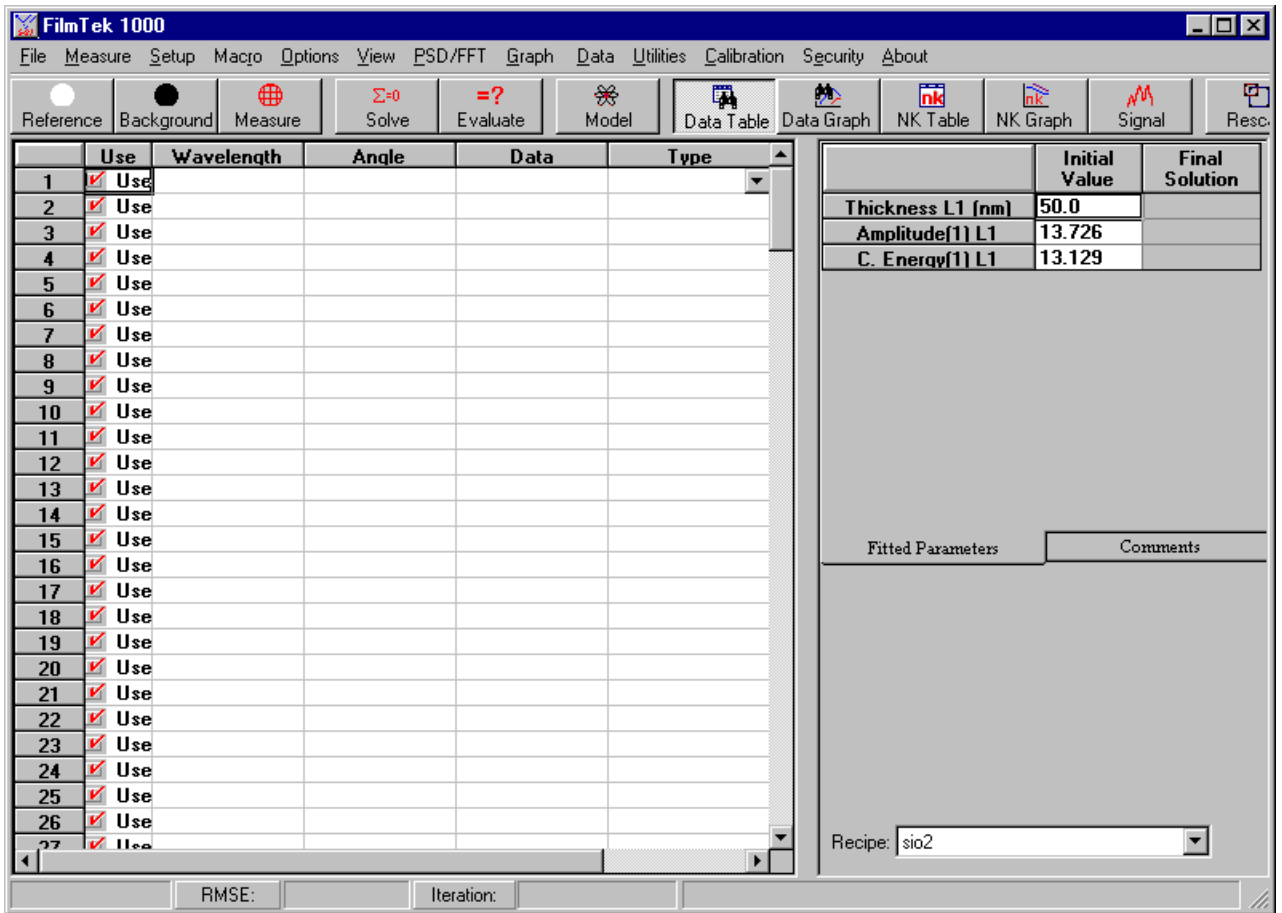


Figure 2 - FilmTek Main Window

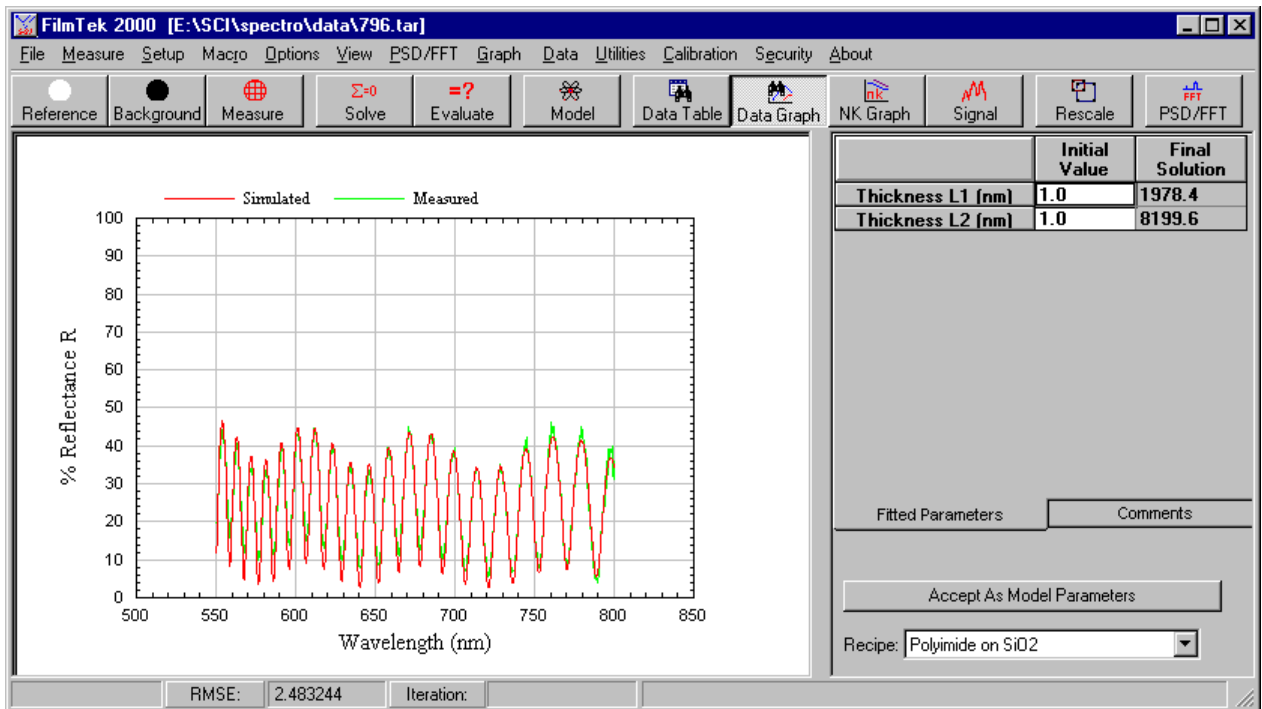


Figure 3