

# Synopsys TIS Pro

For Accurate Light Reflectance, Transmittance, and Absorption Measurements

## Features at a Glance

- Practical instrument for accurate optical scattering measurements over the entire visible spectrum at multiple angles of incidence
- Provides reflectance, transmittance, and absorption measurements of surfaces and materials used in optical systems
- Designers can import the measurement data into Synopsys optical software tools for high-accuracy product simulations

## Description

Synopsys TIS Pro is an optical scattering instrument for efficient measurements of reflectance, transmittance, and absorption. This fully automated device features an integrated sphere and spectral detector assembled in a housing that controls stray light to ensure fast, accurate measurement results. Synopsys TIS Pro determines the optical properties of surfaces and materials and provides measurements over the entire visible spectrum at various angles of incidence.

Synopsys TIS Pro can be used in conjunction with Synopsys Mini-Diff and REFLET 180S products to provide a complete, end-to-end solution that fully characterizes scattering properties of surfaces and materials, including bi-directional scattering distribution function (BSDF) and total integrated scattering (TIS) data.

Measurement data from Synopsys TIS Pro can be imported into optical design software tools to provide realistic simulations of your as-built product.



Figure 1: Synopsys TIS Pro housing and instrument (prototype pictured does not necessarily represent the final design)

## How Synopsys TIS Pro Works

Once you have placed a surface or material sample in the instrument, use the Synopsys TIS Pro software to specify the angles of incidence to measure and start the measurement. The rotation stages from the source and sample will rotate accordingly. Synopsys TIS Pro will then aim light onto the sample and its spectral detector will collect the signal exiting the integrating sphere for the specified positions.

Using a standard calibration measurement, the Synopsys TIS Pro software will post-process and compute the reflectance, transmittance, and absorption values of the sample. You can display, save, and export this data to optical design software for high-accuracy product simulations.

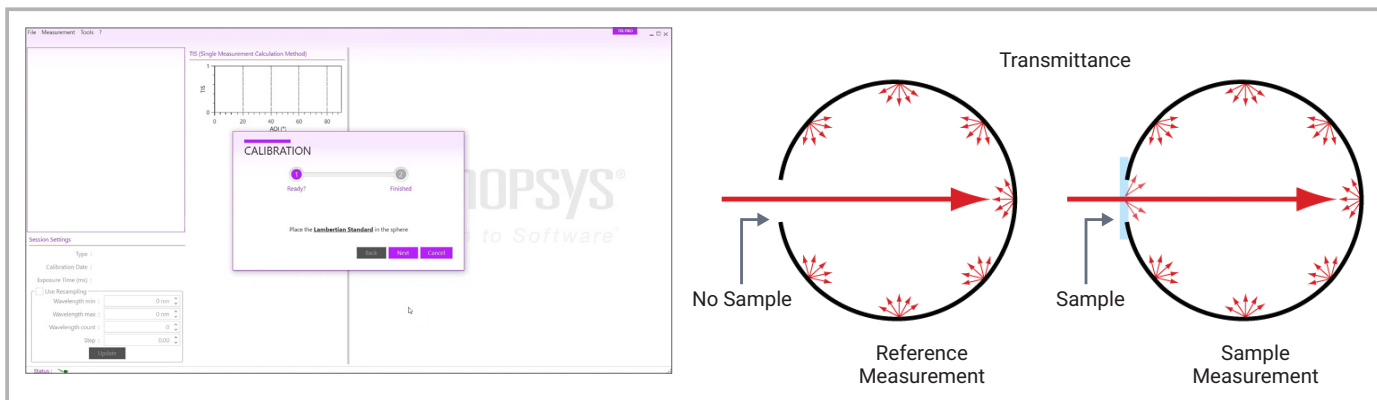


Figure 2: Synopsys TIS Pro software and transmittance measurement principle

## Application Examples

Synopsys TIS Pro is ideal for assessing the effects of surfaces and materials in optical systems.

- Characterize reflector/diffuser materials for automotive design or general lighting systems
- Evaluate quality controls in production
- Analyze stray light suppression from coatings used in aerospace optics
- Measure spectral behavior to incorporate in photorealistic renderings
- Study optical properties of cosmetics
- Characterize materials for many incident angles

Contact us to request a demo of these and other application examples.

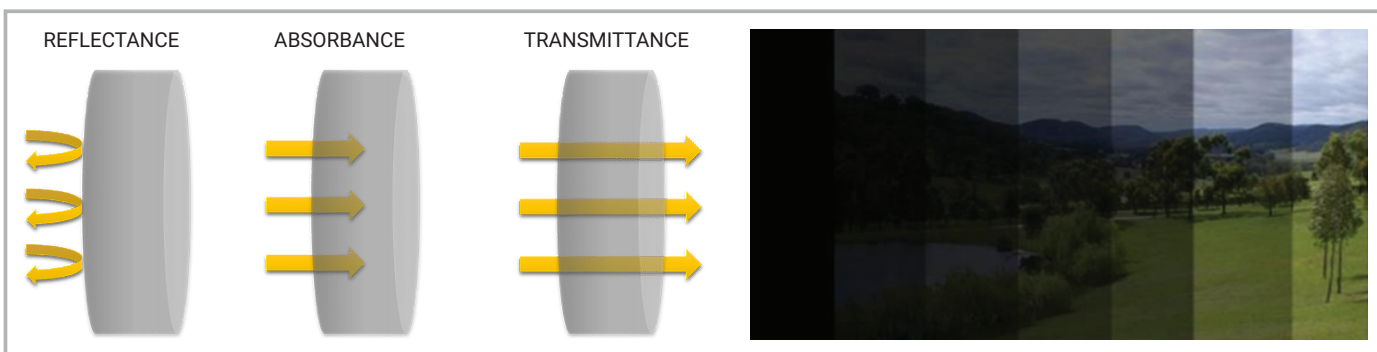


Figure 3: TIS ratio grade example

## Spectral Measurements

Synopsys TIS Pro uses a halogen source and a spectral detection for both reflectance and transmittance. It allows a full wavelength-dependent measurement. Results are displayed in a 2D plot within the software (TIS values against wavelength for different angles of incidence).

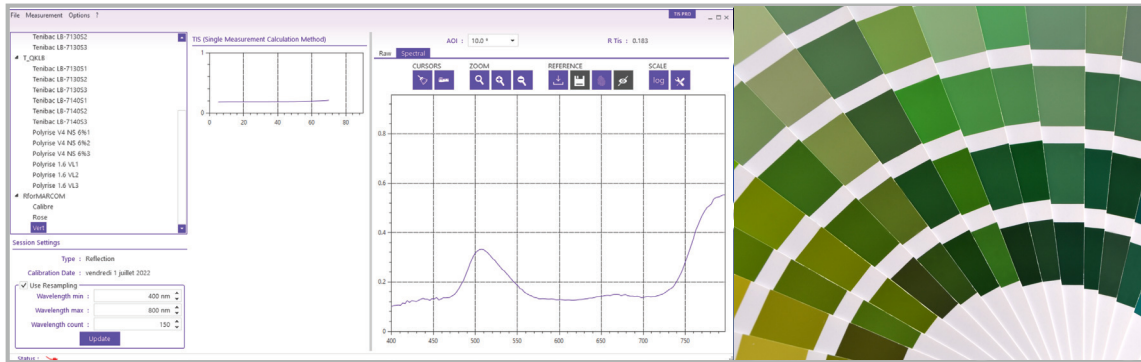


Figure 4: Example of green sample spectral reflectance

## Reflective Materials

Synopsys TIS Pro provides TIS measurements including reflectance for several incident angles over the entire visible spectral range.

- After a two-step calibration (one step for dark signal to offset stray light and one step with a known reference standard to calibrate the response of the spectrophotometer), it is possible to measure:
  - Reflectors, such as aluminum for general lighting
  - Paints for automotive or cosmetic applications
  - Diffusing material sockets
  - Optical mounts and more, including space optics
- The measured reflectance values can be saved as text files
  - TIS comparison can be made directly from the software for comparison between samples
  - Synopsys TIS Pro software also accounts for anisotropic material measurement

### Example: Black Coating

Reflector materials can have complex behavior depending on the incident plane. The Synopsys TIS Pro allows you to capture reflective properties for various angles of incidence.

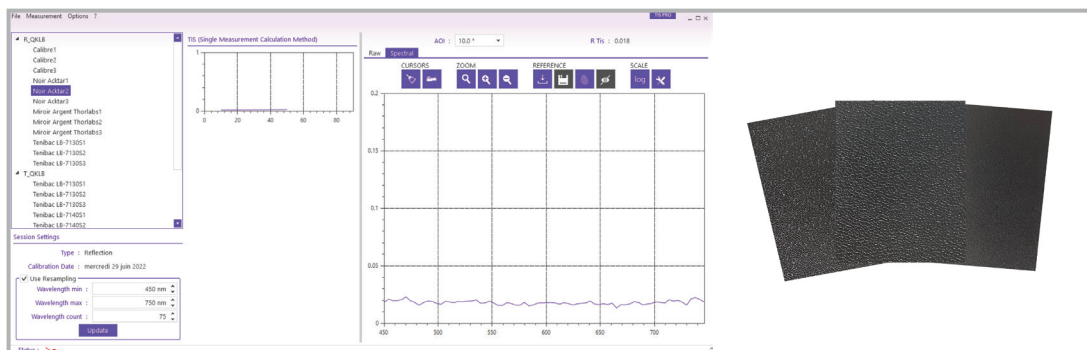


Figure 5: Example of black sample reflectance spectrum

## Transmissive Materials

Synopsys TIS Pro provides TIS measurements including transmittance for several incident angles over the entire visible spectral range.

- The same source is used for transmittance and reflectance measurements
- After a two-step calibration (one step for dark signal to offset stray light and one step with no sample to calibrate the response of the spectrophotometer), it is possible to measure diffusing materials such as:
  - Dichroic filters
  - Colored diffusing plastics
  - Opal glass

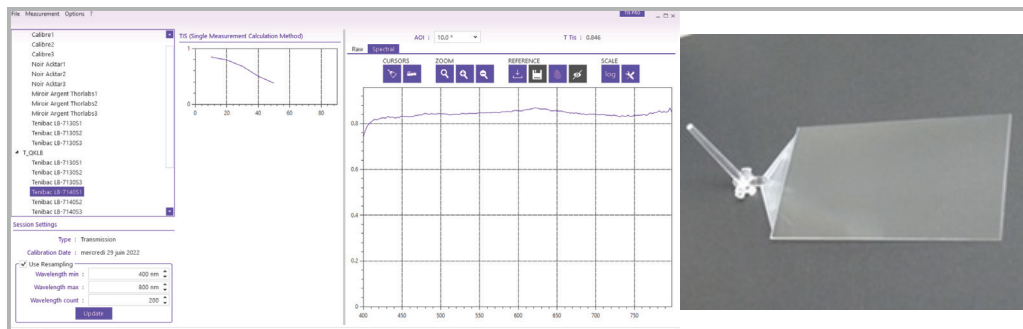


Figure 6: Example of transmissive materials measurement

## Reflective and Transmissive Materials

Synopsys TIS Pro provides absorption measurements on diffusers and can create a ready-to-use reflectance and transmittance (RT) file for use in illumination design software and photorealistic simulations.



Figure 7: Synopsys TIS Pro data can be used to enhance photorealistic renderings of your product designs

## Components

Synopsys TIS Pro includes:

- One calibration sample
- Integrated software
- High-precision spectrophotometer
- Barium sulfate coated sphere
- Stray light reduction housing

## Technical Specification

Synopsys TIS Pro Technical Specifications	
Source	Halogen 150W - 3200°K
Detector	340 nm-850 nm spectrophotometer
Integrating sphere	8-inch diameter sphere
Angle of incidence	Custom 0.1° pitch from 0° to 70° in R and T
Calibration time (for 1 AOI)	1 second
Measurement time (for 1 AOI)	1 second
Results: <ul style="list-style-type: none"><li>• Dynamic</li><li>• Minimum TIS detection</li><li>• Accuracy</li><li>• Repeatability</li></ul>	<ul style="list-style-type: none"><li>• 12-bit detector (adjustable exposure time)</li><li>• 0.01% in reflectance</li><li>• +/-0.1% on white reference standard</li><li>• &lt;1%</li></ul>
Data exchange	Text tabular data/LightTools format
Dimensions, weight	40*70*50 cm (H*L*D), 15 kg

For more information about Synopsys Optical Solutions, visit [synopsys.com/optical-solutions.html](https://www.synopsys.com/optical-solutions.html) or send an email to [optics@synopsys.com](mailto:optics@synopsys.com).