Epic New Product Release: TIS Pro

Total Integrated Scattered light measurement instrument

Quentin Kuperman

06 September 2022

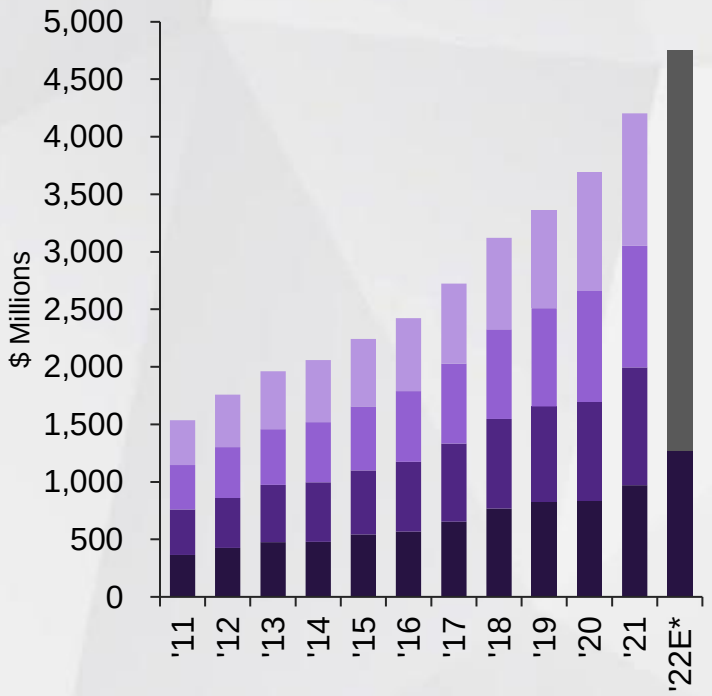
Our Company: Synopsys

FY21 Revenue: ~$4.2B

Employees: 16,360+

Patents: 3,445+

Offices: 125



Market / Region

#1 electronic design automation tools & services

Broadest IP portfolio and **#1** interface, foundation & physical IP

'Leader' in Gartner's Magic Quadrant for application security testing

Optical & Photonic Solutions Locations and Support Around the Globe

Total Employees 200

Offices 15

Upgrade to the Industry Standard

Optical Solutions That Help You Build Better Optical Designs, Faster

CODE V

APPLICATION: IMAGING DESIGN

Lens optimization, analysis, tolerancing and fabrication support

LightTools

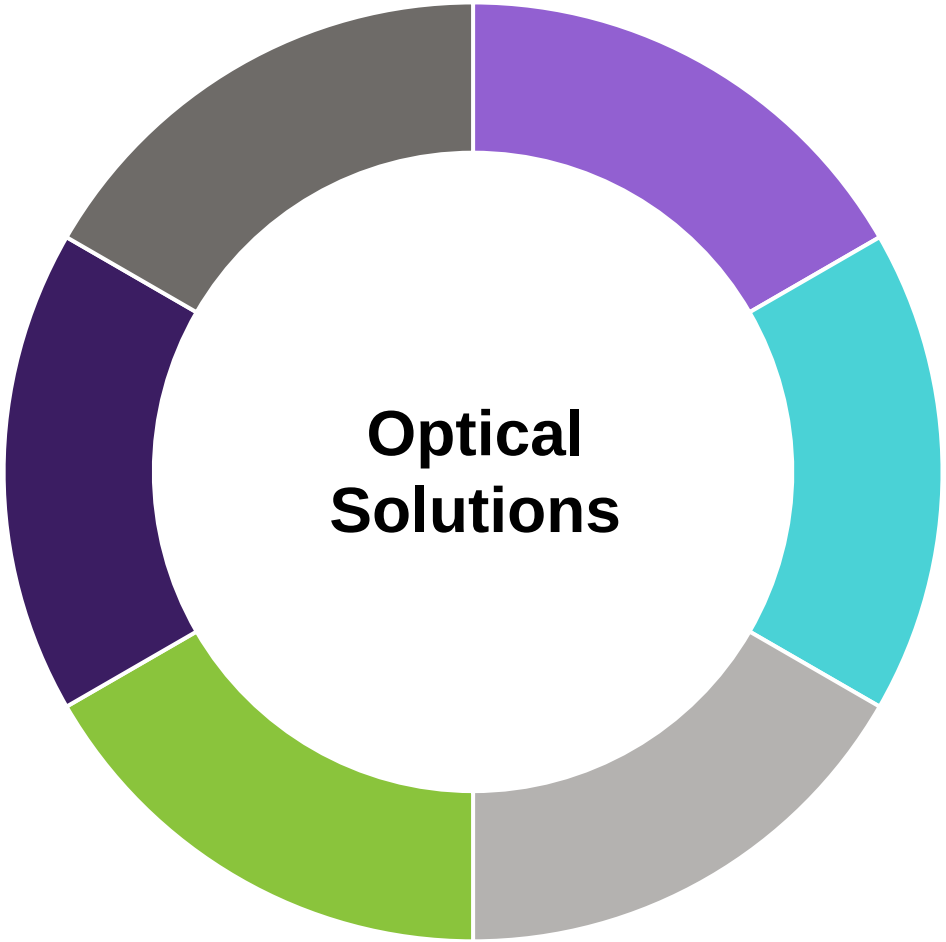
APPLICATION: ILLUMINATION DESIGN

Virtual prototyping, simulation, optimization and visualization of illumination optics

LucidShape

APPLICATION: AUTOMOTIVE LIGHTING DESIGN

Design and real-time simulation of automotive forward, rear and signal lighting



RSoft Photonic Device Tools

APPLICATION: PHOTONIC DEVICE DESIGN

Portfolio of simulators and optimizers for passive and active photonic devices

Optical Engineering Services

APPLICATION: CUSTOM OPTICAL DESIGN

Imaging, illumination, and systems engineering services

Optical Scattering Measurements

APPLICATION: PRODUCT QUALITY

Purchase solutions to measure optical samples and import custom data into Synopsys optical software tools

CODE V for Imaging Optics

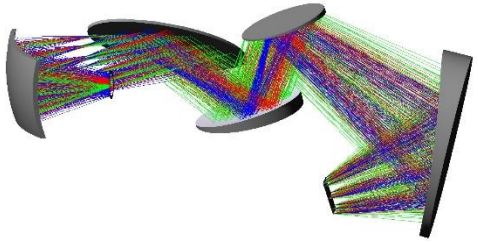
Make Better Optical Designs, Faster

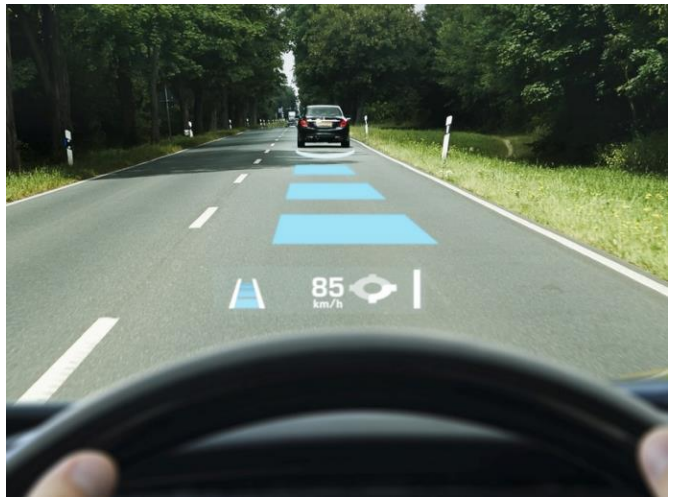
Imaging Applications

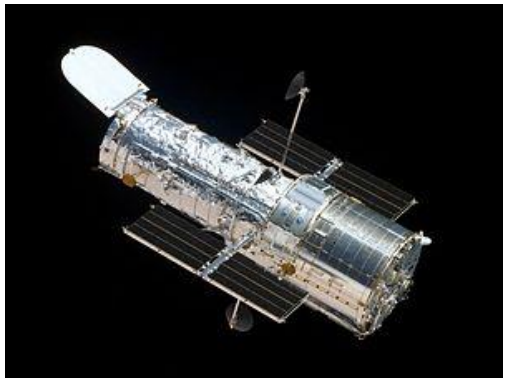
- Digital camera lenses and zoom lenses
- IR & UV systems
- Laser scanning systems
- Microlithographic systems
- Projector systems
- Space-borne systems and telescopes
- LiDAR

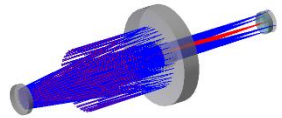
Automotive Applications

- Projection headlamps
- Positional awareness and 360-degree cameras
- HUDs









LightTools for Illumination Optics

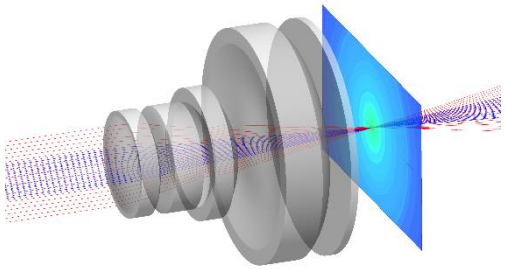
More Accuracy and More Capabilities

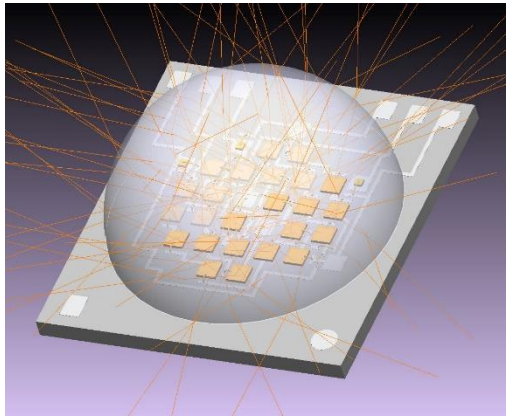
Illumination Applications

- AR/VR
- Projectors
- Flat panel display backlighting
- Stray light analysis
- Luminaire design
- LED sources and packaging
- Lightpipes
- Machine vision
- Medical devices
- LiDAR

Automotive Applications

- Instrument clusters
- Interior lights
- Switches, controls





LucidShape for Automotive Lighting

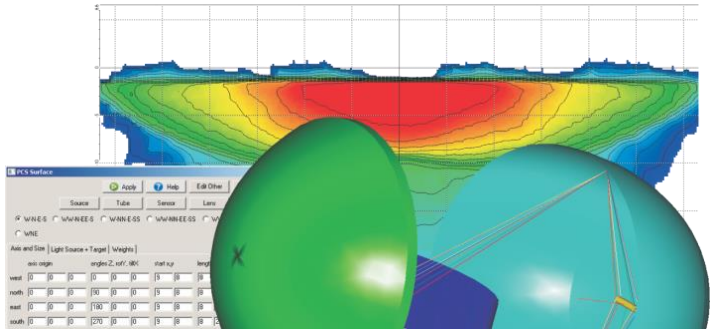
Better, Smarter Lighting Development

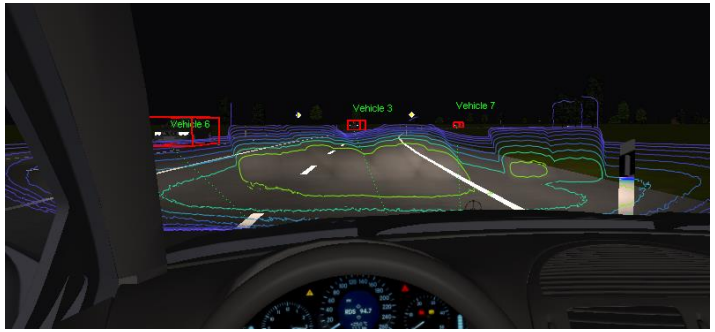
Automotive Lighting Applications

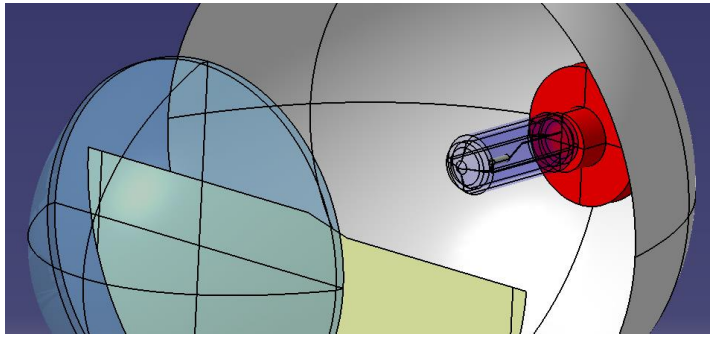
- Forward lighting
- Signal and tail lights
- Interior lighting
- Courtesy and license plate lights
- Virtual beam pattern analysis

Key Capabilities

- Interactive tools for **design and simulation** of automotive lighting products
- Complete design and visualization workflow **integrated into the CATIA V5 environment**
- Flexible **display**, **analysis** and **manipulation** of light data
- **Night driving simulation** to dynamically evaluate beam patterns of vehicle headlights





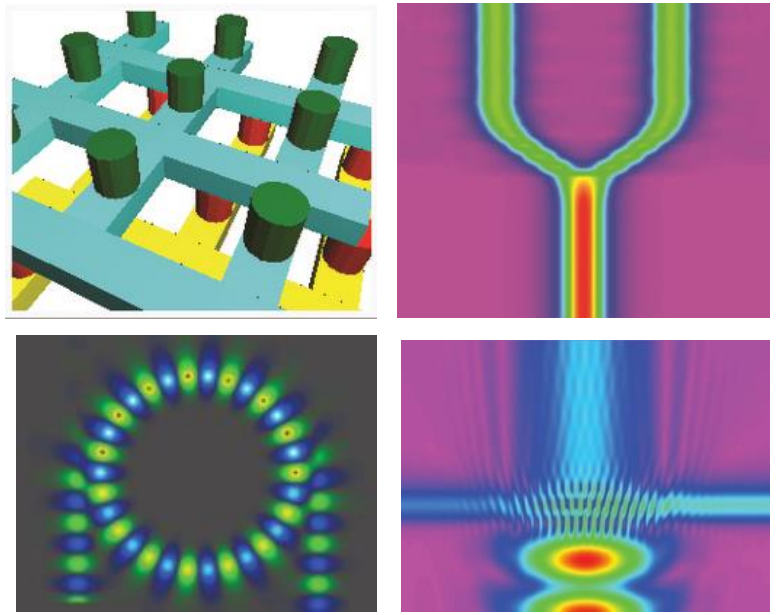


RSoft Photonic Device Tools

The Industry's Widest Portfolio of Physical Simulators and Optimizers

Integrated with the Synopsys CODE V, LightTools, and Sentaurus TCAD tools for streamlined, multi-domain co-simulations

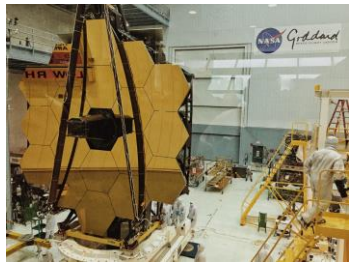
- **BeamPROP BPM** — BPM-based, fiber and waveguide devices
- **FullWAVE FDTD** — FDTD-based, photonic nanostructures
- **BandSOLVE PWE** — PWE-based, photonic crystal devices
- **GratingMOD CMT** — CMT-based, grating structures
- **FemSIM FEM** — FEM-based, waveguide/cavity modes
- **ModePROP EME** — EME-segmented structures, phase sensitive
- **DiffractMOD RCWA** — RCWA-based, diffractive grating structures
- **MOST** — Multivariable Optimizer and Scanner Tool
- **LaserMOD** — MQW semiconductor lasers
- **Utilities** — Multi-Physics, LED, Solar Cell, Tapered Laser, BSDF, AWG



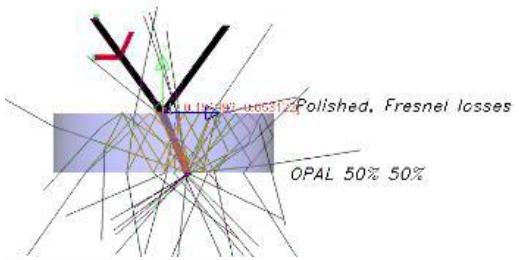
Scattering Measurements for Optical Simulations

On demand service to characterize any surface or sample in our laboratory:

- 2D and 3D reflection and transmission measurements
- Spectral measurements
- For all surface and sample types
- TIR measurements
- High resolution measurements
- Volume scattering measurements
- TIS measurements with our sphere
- Refractive index measurements

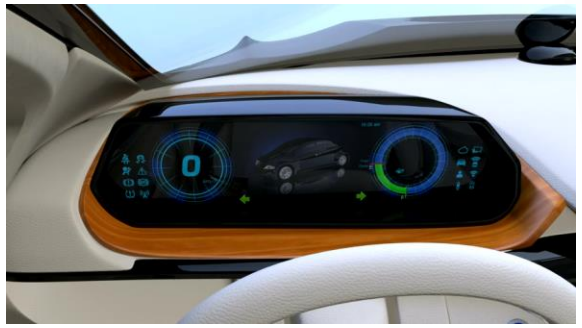


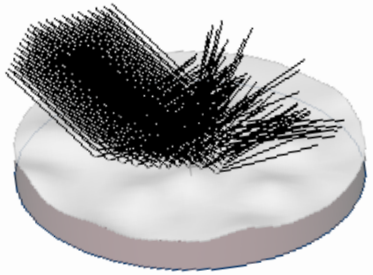
Credit: NASA/Goddard/Rebecca Roth

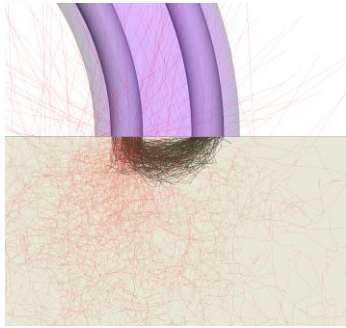


Applications

- General Lighting: diffusive films / reflectors
- Automotive: diffusive films / reflectors / paint
- Display: diffusive films / paints / VDI
- Aerospace: mirrors / black scatterers
- Others: phosphors



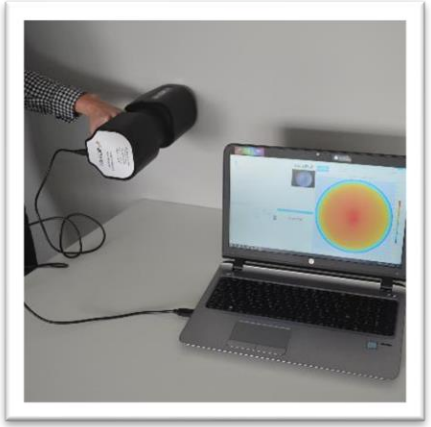


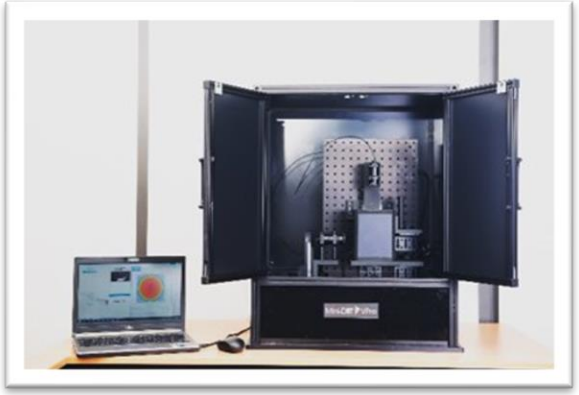


Scattering Instruments for Optical Simulations

Synopsys offers high-end scattering measurement instruments for your lab:

- **Mini-Diff V2:** Portable and affordable instrument for BRDF and BTDF measurement. Camera-based sensor and export measurement for simulation software.
  - AOI: 0°/20°/40°/60°; Dynamic range 10^5; Angular accuracy: 1°
- **Mini-Diff VPro:** Laboratory version of the Mini-Diff V2 with a dark box included and AOI from 0° to 60°.
  - AOI: tunable from 0° to 60°; Dynamic range: 10^6; Angular accuracy: 0.5°
- **Reflet 180S:** Unique stand-alone instrument goniophometer.
  - AOI: tunable 0° to 90°; Dynamic range: 10^9; Angular accuracy: 0.1°





New instrument: TIS Pro

Accurate Light **Reflectance, Transmittance and Absorption** **Measurements**

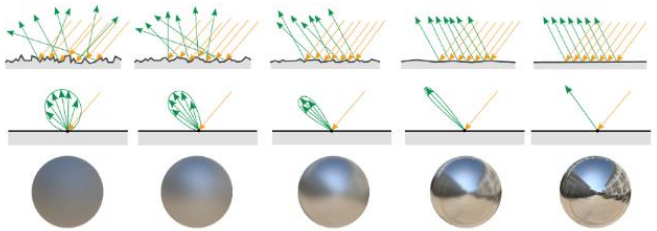
Need:

- Optical designers need **accurate optical properties** for ray tracing **simulations**
- **R&D** department need to **design the right material** with given optical properties
- **Quality** check in **manufacturing process** must be perfectly **controlled**

Solutions:

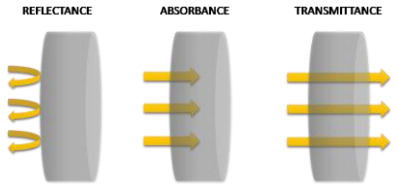
- Angular optical scattering
  - ➢ Bidirectionnal Scattering Distribution Function

  Existing measurement instruments:
  Mini-Diff V2 / Mini-Diff VPro / REFLET 180S



- Amount of light propagation
  - ➢ R/T/A ratios

  New instrument:
  TIS Pro



Available solutions on the market with only R or T, and single Angle of incidence
TIS Pro is meant to address TIS ratios measurements with **spectral and angular dependency**

TIS Pro Features

Calibrated standard

&

Guided procedure

Accuracy & Precision

Custom sample holders designed by our engineering team

Reflectance & Transmittance measurements

Automated and controlled source

Custom angle of incidence

Spectro-photometer detection

Spectral dependency

High dynamic measuremnts

Wide range of applications

Highly polished mirrors for Space industry

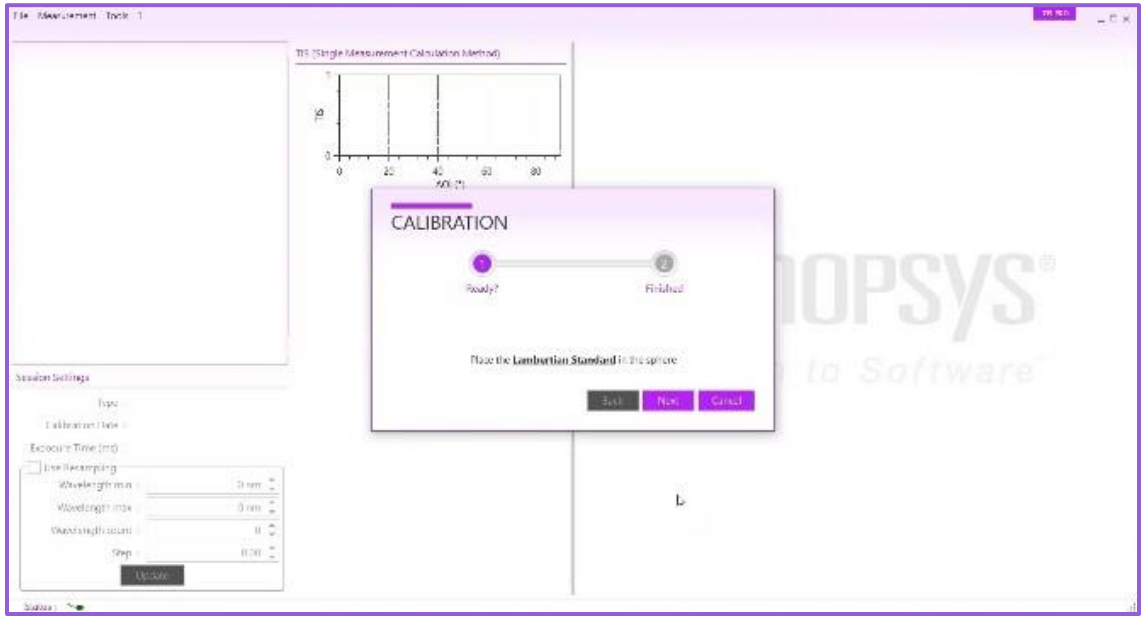
Stray Light UltraBlack surfaces

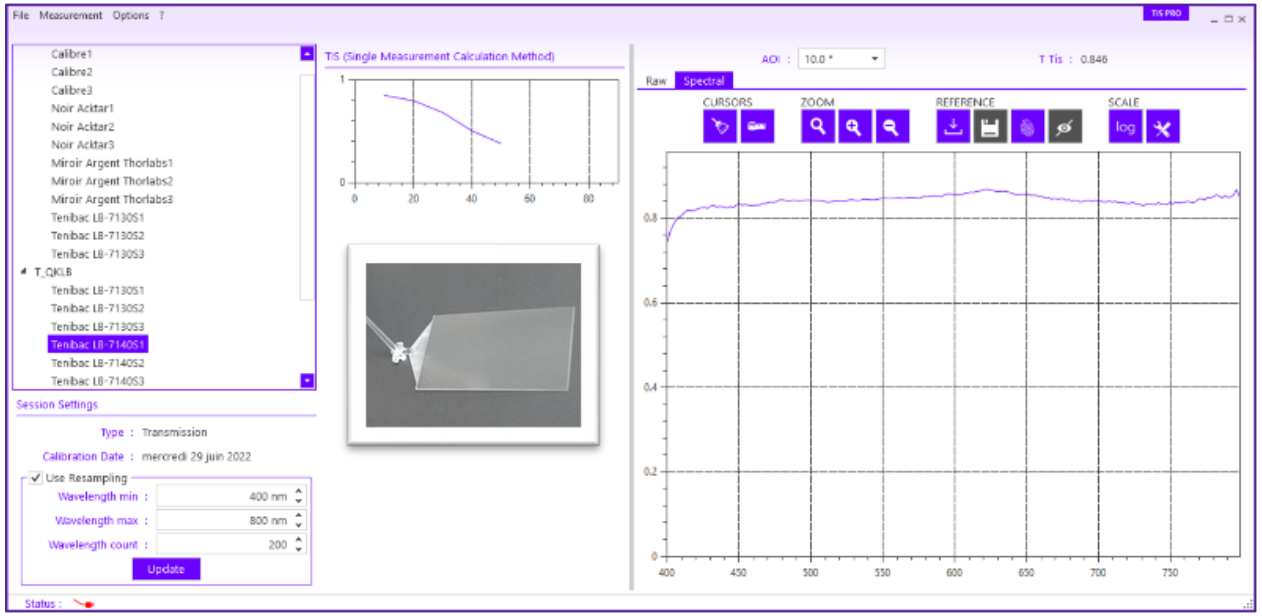
General lighting aluminum or white films

TIS Pro UI & Measurement Process

TIS Pro measurement process:

- Controls for detector parameters adjustment
- Session creation with angle of incidence selection
- 2 steps calibration (on provided white calibrated standard)
- Sample set up (in Reflectance or Transmittance configuration)



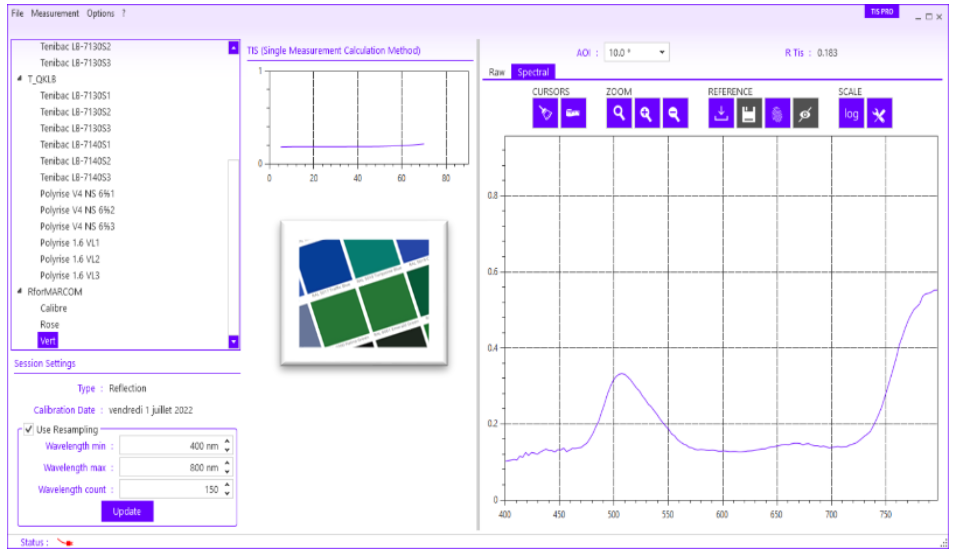


TIS Pro results and performances

TIS Pro offers:

- Accurate Reflectance/Transmittance/Absorption measurement
- Fully automated measurements
- Spectral TIS ratios measurements
- Direct export to optical simulation ray tracing software

Specifications	Detail
Source	Halogen 150W - 3200°K
Detector	340nm-850nm spectrophotometer
Integrating sphere	8” diameter sphere
Angle of incidence	Custom 0.1° pitch from 0° to 70°
Calibration time (for 1 AOI)	1s (maximum exposure)
Measurement time (for 1 AOI)	1s (maximum exposure)
Results: Dynamic Minimum TIS detection Accuracy Gage Repeatability & Reproducibility	 12bit detector (adjustable exposure time) 0.01% in reflectance +/-0.1% on white reference standard <1%
Data exchange	Text tabular data / LightTools format
Dimensions, weight	40*70*50cm (H*L*D), 15kg



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Silicon to Software™

Thank You