LightTools Illumination Design Software
Design, Analyze, Optimize and Deliver Illumination Optics
LightTools Illumination Design Software Applications

LightTools® is a 3D optical engineering and design software product that supports virtual prototyping, simulation, optimization, and photorealistic renderings of illumination applications. Its complete design and analysis capabilities, combined with ease of use, support for rapid design iterations, and automatic system optimization, help to ensure the delivery of accurate, timely, and cost-effective illumination designs.

Across a broad range of illumination applications, LightTools helps you get high-performance, systems to market faster. View additional LightTools applications at: https://www.synopsys.com/optical-solutions/lighttools/application-gallery.html

**LED DESIGN INCLUDING LED DIES, ARRAYS, AND PACKAGING**

**Key Capabilities**
- Rapid model creation
- Ability to model the embedded phosphor and epoxy covering in an encapsulated LED
- Fully optimizable geometry for designing primary optics
- Sub-micron structures to enhance light extraction efficiency through co-simulation
- Supplied and custom materials for accurate color simulation

**BACKLIT DISPLAYS**

**Key Capabilities**
- Extensible textures to model paint-dot patterns and as-built extraction features
- Functions to automate system setup and facilitate rapid design studies
- Backlight pattern optimization for uniformity and efficiency
- Library of standard brightness-enhancing, diffusing, and reflective films
### DIGITAL PROJECTORS

**Key Capabilities**

- Library of pre-defined LCD, DMD, and LCoS projector models
- Light source definition by geometric and measured sources, including updated standard ray file formats
- Built-in colorimetry analysis features to evaluate color quality and simulated display appearance
- Creation of complex mixing-rod shapes with minimal effort and optimization capabilities that automatically refine the design form
- Rapid and high-accuracy spatial luminance calculations

### LIGHTING AND LUMINAIRES

**Key Capabilities**

- Visualization of how a luminaire is lit and how it lights a room
- Reflector and refractive element construction and automatic pattern-generation tools
- Efficient modeling of a wide range of complex components, from pillow optics to light diffusers for all lighting fixtures
- True-color RGB output
- IES-formatted light sources
- Industry-standard luminaire reports and lighting files

### LIGHT PIPES AND LIGHT GUIDES FOR ILLUMINATION AND LIGHT DISTRIBUTION

**Key Capabilities**

- Interactive construction, parametric editing, and automatic optimization of complex shapes
- Multiple appliqués, dot patterns, fine groove structures, or bump structures for light extraction
- Features to improve speed and accuracy of light pipe simulations
- Volume scattering inside a material to simulate the diffusing characteristics of light guides
**SOLAR COLLECTION AND DAYLIGHTING**

**Key Capabilities**
- Classical and custom solar collection optics
- Tools for modeling solar collection systems using solar insolation data
- Fluorescence to enhance light capture in luminescent solar concentrators
- Photorealistic renderings to show the effects of daylighting enhancements

**VEHICLE INTERIOR LIGHTING**

**Key Capabilities**
- Interactive construction, parametric editing, and automatic optimization of complex shapes
- Multiple appliqués, dot patterns, fine groove structures, or bump structures for light extraction
- Volume scattering inside a material to simulate the diffusing characteristics of light guides
- Visualization of an optical system’s lit and unlit appearance
- Ability to measure luminance at any location in the model space and evaluate display visibility and quality
- Features to optimize task lighting and minimize glare
- Extensible surface scattering to model automotive finishes

**STRAY LIGHT SIMULATION**

**Key Capabilities**
- Ray path analysis that visually identifies stray light issues and summarizes energy flux and total power
- Receiver data filtering for multiple analyses from a single simulation
- Aim areas for efficient analysis of stray light in systems
- CAD import and export to leverage existing data
**MEDICAL IMAGING AND SURGICAL DEVICES**

**Key Capabilities**
- Full suite of volumetric optical effects, including scatter, phosphorescence, and absorption
- Tissue modeling using industry-standard Henyey-Greenstein and Gegenbauer models
- Extensible surface scattering capabilities

**MACHINE VISION AND LASER SCANNING COMPONENTS**

**Key Capabilities**
- Extensive material modeling and a full complement of geometric laser propagation capabilities
- Accurate modeling of both illumination and detection optics across the electromagnetic spectrum
- Evaluation of illuminator and detection optics from the detector's point of view
- Modeling light-field and dark-field illumination with polarization effects
- Construction of dynamic, time-based models

**AEROSPACE, DEFENSE, AND SPACE-BORNE SYSTEMS**

**Key Capabilities**
- Stray light and off-axis rejection analysis
- Easy identification of ghosts and flare
- Blackbody source spectrum
- CAD import for optical mounts and assemblies
- Multiple variance reduction methods for efficient simulations
- Model scattering for surface and cleanliness defects
**LIDAR AND REMOTE SENSING**

<table>
<thead>
<tr>
<th>Key Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Time of flight measurements</td>
</tr>
<tr>
<td>• Detection of low signal reflections</td>
</tr>
<tr>
<td>• Design feature for hyperspectral instruments</td>
</tr>
</tbody>
</table>

**AR/MR/VR AND CO-SIMULATION WITH RSOFT PRODUCTS**

<table>
<thead>
<tr>
<th>Key Capabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Integration of sub-micron structures in designs</td>
</tr>
<tr>
<td>• Exploration of image fusion for AR systems, such as automotive heads-up-displays</td>
</tr>
<tr>
<td>• Evaluation of glare effects as experienced by the human eye</td>
</tr>
<tr>
<td>• Contrast reduction analysis for ambient lighting environments</td>
</tr>
</tbody>
</table>

---

**Configure LightTools to Meet Your Needs**

LightTools has multiple modules that can be licensed in configurations to meet your specific application needs. The Core Module is a prerequisite for all other modules, which include the Illumination Module, Optimization Module, Advanced Design Module, Advanced Physics Module, SOLIDWORKS Link Module, Data Exchange Modules, and Imaging Path Module. These modules work together seamlessly to provide a complete design and analysis solution for illumination systems.
**Core Module**

The LightTools Core Module provides graphical 3D solid modeling functionality and interactive optical ray tracing for creating and visualizing optical and opto-mechanical systems, including the capability to specific properties for materials and optical surfaces.

Productivity-enhancing features include an intuitive user interface, libraries of task-and-application-specific utilities and example systems, programming extensions for automating workflow, and photorealistic renderings of mechanical models.

All other LightTools modules are fully integrated with the Core Module. For more information about LightTools modules, visit https://www.synopsys.com/optical-solutions.html

---

**Illumination Module**

Enables designers to simulate and analyze light as it traverses the optical and mechanical components in a model. Includes state-of-the-art Monte Carlo ray tracing for accurate predictions of intensity, luminance, and illuminance throughout the model, as well as powerful illumination analysis capabilities.

---

**Optimization Module**

Automatically improves the performance of virtually any type of illumination system. Full integration with the LightTools 3D solid modeling environment ensures practical, realistic solutions in a fraction of the time it would take to accomplish manually.

---

**Advanced Design Module**

Provides a set of specialized tools to enable fast, robust modeling of reflective and refractive freeform optics in both single-surface and segmented configurations for a diverse set of illumination applications.

---

**Advanced Physics Module**

Extends optical modeling capabilities in LightTools for custom optical parts and advanced illumination subsystems. Includes modeling of phosphors, user-defined optical properties, and gradient index materials.

---

**SOLIDWORKS Link Module**

Dynamically links SOLIDWORKS mechanical models to LightTools, where you can assign optical properties, optimize, and directly update your SOLIDWORKS design.

---

**Data Exchange Modules**

Provide import and export capabilities for industry-standard CAD file formats, including IGES, STEP, SAT, CATIA V4 and V5, and Parasolid formats.

---

**Imaging Path Module**

Defines an imaging path based on sequential optical surfaces and performs lens analyses. The Imaging Path capability can be used directly in LightTools or in conjunction with CODE V.

---

**To Learn More**

For more information on LightTools and to request a demo, please contact the Synopsys Optical Solutions Group at (626) 795-9101 between 8:00 a.m.–5:00 p.m. PST, visit https://www.synopsys.com/optical-solutions.html or send an email to optics@synopsys.com