



ANSYS SPEOS PRO

Design optical systems and simulate visible light from discrete and ambient sources using photometric and colorimetric virtual sensors.

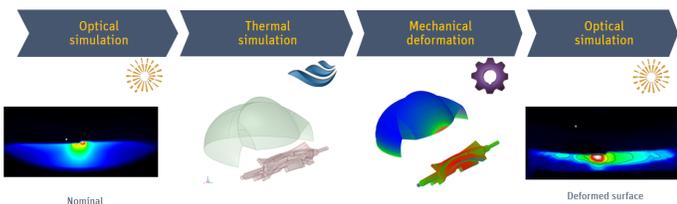
The ANSYS SPEOS Pro package contains all the core functionalities to simulate the photometric performance – intensity, illuminance and luminance – of lighting systems.

User-centered design

ANSYS SPEOS offers intuitive 3D modeling capabilities in a comprehensive user interface. Making it accessible to any optical designers, both CAD users and non-CAD users. The simplified user interface which is based on direct modeling, makes it easy and quick to create, experience, optimize and validate any optical system., in just a few clicks and in a very rapid iterative process.

Connection with multiphysics simulations

ANSYS SPEOS PRO integrates with other ANSYS multiphysics solutions. On top of an optical simulation, you are able to perform the related thermal and mechanical simulations. Check the impact of heat and deformations on the optical performances to certify in usage context the compliance of your system. ANSYS SPEOS includes meshed geometry support which enables mesh data import from the multiphysics workflow



Light Sources

- SPEOS Pro simulates light from a wide range of sources:
- Discrete light sources: LED, halogen, HID, surface source – from a model or a ray file.
 - Ambient sources: Uniform and high dynamic range images (HDRIs).

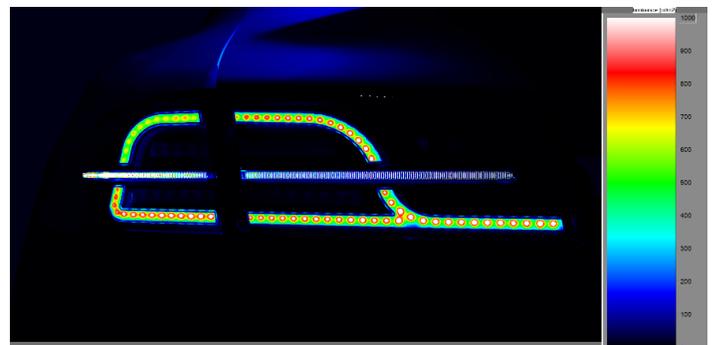
Materials

SPEOS Pro is able to simulate light interaction with advanced materials like retro-reflecting, matte and semi-matte colors RAL, iridescent paint, holographic films, automotive leathers, aluminum mirrors, aluminum scattering reflectors, aluminum anisotropic scattering reflectors, human skin and transparent or diffusive plastic for light guide applications.

Illuminance, Luminance and Intensity

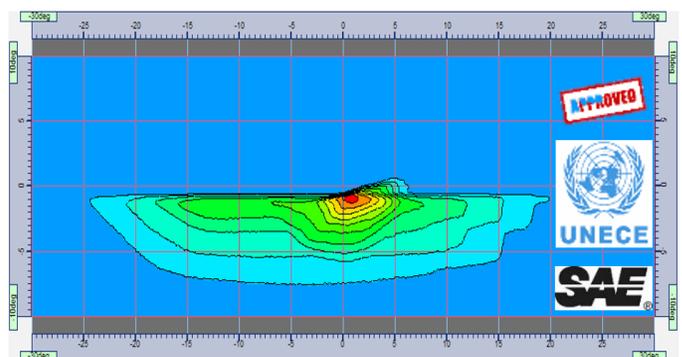
With SPEOS Pro, users can create any optical model by applying optical properties to all surfaces, materials and light sources. They can simulate and virtually analyze the photometric performance of lighting systems before making a physical prototype. SPEOS Pro quantifies illuminance (lux, foot-candle), luminance (cd/m², foot lambert) and intensity (candela) of light.

By quantifying the luminance, users can render a high-resolution, photorealistic aspect of virtual prototypes with a unique physics-based approach to light. SPEOS Pro offers reliable and accurate rendering of virtual products, including the lit appearance of any system, as well as luminance information in any point or area.



Regulation check

The simulation results – photometry maps, cross sections, point measurements – ensure compliance with international standards and specifications.



Direct Monte Carlo Simulation

This simulation uses a dedicated algorithm to propagate rays forward from source to sensor.

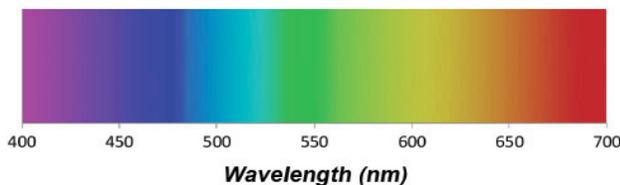
The algorithm is required for lit appearance or photometric analysis of intensity distribution.

Stopping criteria for the simulation are based on the number of rays launched or simulation time.

SPEOS Pro considers spectral transmission (transparent materials), spectral reflection (mirrors) and spectral diffusion (plaster) to calculate the real appearance of a system in a given lighting environment.

Wavelength Range: Visible Light (360nm - 830nm)

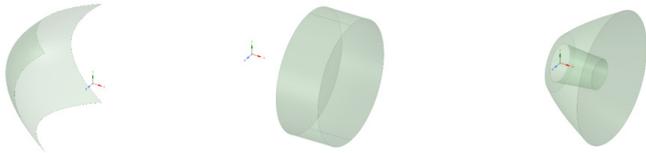
SPEOS Pro simulates the spectral contribution of light within the visible range of 360nm - 830nm.



Elementary Surfaces

Design optical surface (parabolic, elliptical) to collimate light.

- Projection lens: Design aspheric lens from polynomial or automatic definition (for compact LED projector modules, Fresnel lens, etc.).
- TIR lens: Design total internal reflection lens.



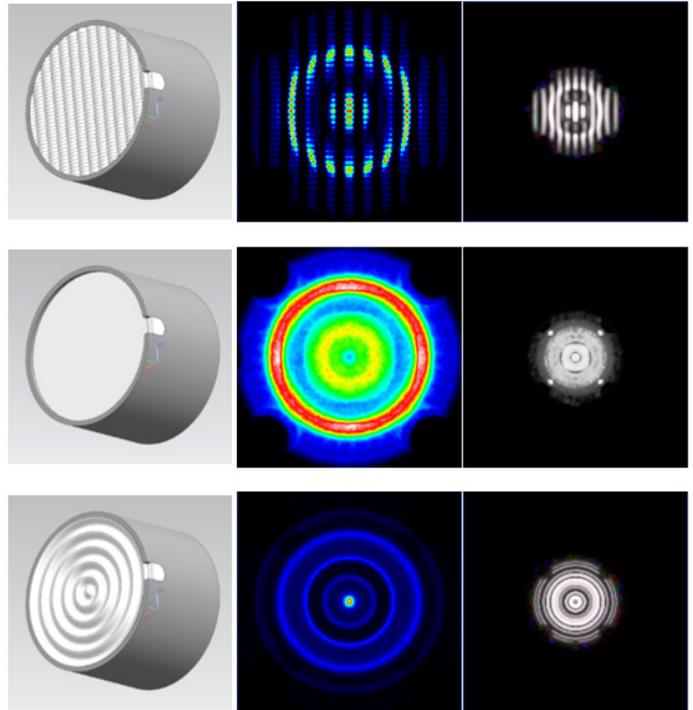
Design of Experiments (DOE)

SPEOS Pro provides and automates the numerical certification of the digital mock-up for any design variant of the product. It offers the capability to evaluate any lighting distribution from a custom specification or official regulations available from the ANSYS optical library. The impact of any design change can be seen directly as the pass/failed criteria is displayed in the photometric viewer, the construction tree and the simulation report.

SPEOS Pro allows users to perform DOE to evaluate the influence of several parameter values. Using a design table for sensor or simulation definitions, it enables tolerance studies for different points of view and configurations of light sources. Additionally, it facilitates the automatization of tasks for results post-processing. These analyses can feed design optimization.

SPEOS Pro also offers a confidence level for any measurement that is an index of design compliance with a specification.

This feature allows users to balance the number of rays (and the associated time required) and the level of confidence for the result. Piloting the precision of the result from the start, users can optimize their design without compromising quality and specification target.



Design optimization through automatic parametric analysis

The integration of ANSYS DesignXplorer within ANSYS SPEOS enables to optimize the performance of any optical design, using both optical and mechanical parameters, achieving an optical target in less iterations.

ANSYS DesignXplorer leverages parametric analyses to efficiently explore, understand and optimize your design. DesignXplorer includes correlation, design of experiments, response surface creation and analysis, optimization and six sigma analysis.

ANSYS SPEOS can also be connected to ANSYS OptisLang to optimize a significantly higher number of variables.

Colorimetry: Colorimetric Analysis

SPEOS Pro enables colorimetric analysis in true color of any photometric and image result. When a user places the cursor on a result (illuminance, intensity or luminance), the software returns the corresponding color coordinates in the trichromatic graph of the CIE 1931 or CIE 1964 standard.

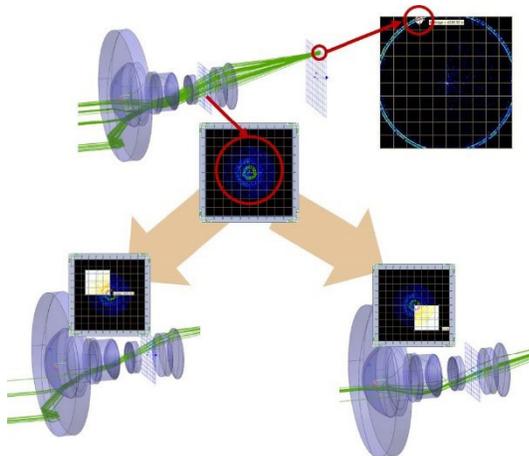
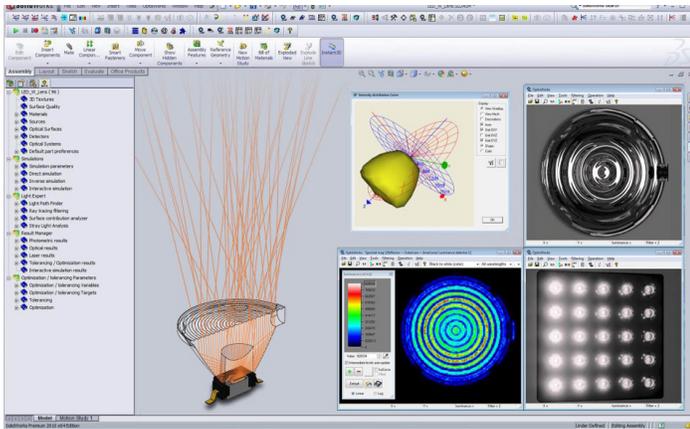
Light Expert

SPEOS Pro shows rays in the 3D view to identify specific light paths in a specific target area. This is useful to understand and solve light leakage and hotspots.

The feature allows users to perfectly understand the behavior of lighting systems, including how and where the light travels and how each part of a 3D system influences light propagation.

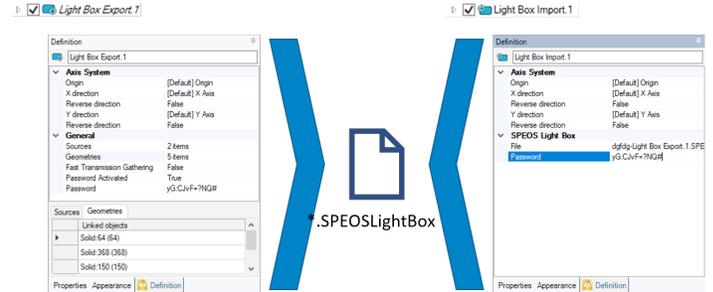
With SPEOS Pro, users can select an area in a simulation result (a photometric map) and see the complete light path from the source to that area. With just a few clicks, users benefit from a real understanding of light behavior in a system. Users will then be able to identify the surfaces involved in the propagation and modify them to meet requested specifications.

SPEOS Pro displays an interactive ray tracing in the 3D view of rays hitting a specific area on the detector (a surface in an XMP map). The rays are exportable as CAD geometry to allow modifications on a design.



Intellectual Property

SPEOS light box allows to share optical systems among business partners while preserving the Intellectual Property. SPEOS light box encapsulates all the geometries of an optical system with all their properties and dependencies in a black box. This black box is saved as a single AES-256 encrypted file, only decrypting by SPEOS software.



Simulation Capability

SPEOS Pro includes one solver for ANSYS SPEOS simulation and four built-in high-performance computing (HPC) tasks. SPEOS HPC is compatible with ANSYS Remote Solve Manager (RSM), which acts as a simplified job spooler.

Applications

Automotive:

Headlamps, tail lamps, signal lamps, interior vehicle lighting, mirrors, windshields, interior perceived quality, paint effects, dashboards, displays.

Electronics:

Light guides, backlighting units, projection systems, LEDs, cold cathode fluorescent lamps (CCFLs) and other sources, switches, etc.

Lighting:

Reflectors, luminaires, lamps, bulbs, fiber optics, luminaire lenses, etc.

Consumer goods:

Smartphones, keypads, luminous toys, jewels, precious stones (reflective analysis), appliance displays, panels and switches, etc.

ANSYS SPEOS Packages:

- Pro
- Premium
- Enterprise

See chart on next page.

ANSYS SPEOS	PrepPost / Solver Bundle Packages			Add-Ons				
	Pro	Premium	Enterprise	Optical Part Design	Optical Sensor Test	HUD Design & Analysis	Far Infrared Extension	Optical Design Optimizer
General Solver Capabilities								
Monte-Carlo Forward Ray Tracing	●	●	●					
Monte-Carlo Backward Ray Tracing		●	●					
Deterministic Simulation	▲	●	●					
Spectral Propagation	●	●	●					
Polarization propagation	●	●	●					
Dispersion	●	●	●					
Surface Diffusion	●	●	●					
Volumic Diffusion	●	●	●					
Ambiant Material	●	●	●					
SPEOS Live Preview (GPU acceleration)		● (2)	● (2)					
Virtual BSDF			● (1)					
Photometry								
Intensity	●	●	●					
Illuminance	●	●	●					
3D Illuminance	●	●	●					
Luminance	▲	●	●					
3D Energy Density		●	●					
360° View - Observer		●	●					
360° View - Immersive		●	●					
Human Vision								
Dynamic Adaptation			●					
Glare Simulation			●					
High Dynamic Range Screen support			●					
Wavelength Range								
Visible (360nm - 830nm)	●	●	●					
UV (50nm-360 nm)		●	●					
Near IR (830nm - 2.5µm)		●	●					
Far Infra-Red (2.5µm - 100µm)							●	
Optical Design								
Parabolic Surface	●	●	●					
TIR Lens	●	●	●					
Projection Lens	●	●	●					
Optical Lens				●				
Optical Surface				●				
Light Guide				●				
Sharp Cut-Off Reflector				●				
Poly-Ellipsoidal Surface				● (1)				
Micro Optical Stripes				● (1)				
Honeycomb lens				● (1)				

● Fully Support ▲ Limited Capability □ Requires more than 1 product

(1) Not available for ANSYS SPEOS (2) Only for ANSYS SPEOS

ANSYS SPEOS	PrePost / Solver Bundle Packages			Add-Ons				
	Pro	Premium	Enterprise	Optical Part Design	Optical Sensor Test	HUD Design & Analysis	Far Infrared Extension	Optical Design Optimizer
Optical Sensors								
Field of View					●			
Export Sensor Grid as Geometry					● (1)			
Camera Sensor					●			
LiDAR Sensor					●			
Camera Sensor Post Processing					●			
Head-up Display								
HUD Optical Analysis					●			
HUD Optical Design					●			
HUD Visualization					●			
HPC - SPEOS								
Default Number of Cores	4	4	4					
Parallel Solving on Local PC	●	●	●					
Parallel Solving on Cluster	●	●	●					
ANSYS RSM compatibility	●	●	●					
Simulation Preparation								
Source Group	● (1)	● (1)	● (1)					
Geometry Group	● (1)	● (1)	● (1)					
Local Meshing	● (1)	● (1)	● (1)					
3D Textures	●	●	●					
Polarization Plate		● (1)	● (1)					
Fluorescent Converter		●	●					
Texture Mapping (bump, multi-layer)		● (1)	● (1)					
Sky		●	●					
Thermic Source							●	
Earth Atmosphere model							□	
Post Processing								
Virtual Lighting Controller		●	●					
Photometric Numerical Certification	●	●	●					
Colorimetric Analysis	●	●	●					
Spectral Analysis		●	●					
Light Expert	●	●	●					
Layer by Source		●	●					
Layer by Face		●	●					
Layer by Sequence		●	●					
Stray Light Analysis		●	●					
Layer by Polarization		●	●					
Visibility & Legibility			●					
Night Vision Goggle							●	
Script Automation	●	●	●					
Optimization								
Parameters	●	●	●					
Design of Experiment	●	●	●					
Design Optimization (1)								●
ANSYS DesignXplorer (2)	●	●	●					
ANSYS optiSLang interface (2)	□	□	□					

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