

# ANSYS SPEOS Premium

Conduct advanced analysis of the performance and appearance of lighting systems, taking materials into account and extending light range to radiometry from ultraviolet to near-infrared.

The ANSYS SPEOS Premium package contains the functionalities of the ANSYS SPEOS Pro package, including one solver and four built-in high-performance computing (HPC) tasks. It has additional advanced analytics for photometry and radiometry, spectral intensity, illuminance and luminance.

## / Sky

This SPEOS Premium feature models sky and natural environments, including sun and atmospheric conditions, which adhere to International Commission on Illumination (CIE) standards. Daylight models provide an advanced level of realism. Users may reproduce the sky spectral luminance for any location, at any time of day, to perform photometric simulation and visual ergonomics studies. Even the amount of sunshine and sunset conditions may be simulated.

## / Display Source

With SPEOS Premium, users can model the light emission of any displays. This feature utilizes screen brightness, the spectrum of each RGB dye and an emitted image.

## / 3D Textures

SPEOS Premium helps model and optimize the backlighting unit of display devices such as LCD and DLP. It offers functionalities to create microtexture on a lighting part by adding an unlimited number of micromotifs to it, directly from the digital mock-up. This feature has been developed, tested and used by specialists in backlighting to reach a high level of luminance uniformity. A fully automated, texture generator embeds built-in functionalities for creating regular patterns as rectangular, spherical or hexagonal patterns. In less than two minutes, it will generate and manage thousands of parametrized microlenses in instances where the CAD/CAM-created microlenses are too heavy — without the need for additional manual operations.

## / Polarization

The SPEOS Premium package includes polarization modeling capabilities that extend to a quarter-wave plate, retarder and polarizer. Custom models of polarized materials can be defined using light incidence and wavelength dependencies.

Polarization effects are displayed in the results, allowing users to assess performance and ergonomic criteria against specifications. Advanced users will be able to analyze the polarization state (Stokes parameters) for evaluating the degree of polarization, depolarization or extinction ratio.

This SPEOS feature is useful for comparing the performances of different electronic displays such as LCD, OLED and HUD display systems, and validating their compliance with specifications.



## / Fluorescence

This software model provides fluorescent material to model light emission from excited parts. It allows users to create specific materials used in green lighting, LED and medical applications. The model considers the absorption of light energy by a particle, the transition from ground state to the excited state, the partial loss of heat energy to the surroundings, and the return to the ground state involving emission of light energy (with the wavelength longer than the exciting light). To support this capability, libraries of fluorescent dyes supplied by market leaders such as BASF, MERCK and INTEMATIX are available. Typically, this functionality is dedicated to the development of LED, OLED sources and laser sources, as well as for analytical applications based on fluorescence.

## / Inverse Monte Carlo Simulation

This is a dedicated algorithm to propagate rays backward from sensor to source. Stopping criteria for this simulation are based on the number of passes launched, simulation time and/or confidence level value. This algorithm is required for unlit appearances using an ambient source or for camera systems for straylight analysis.

## / Spectral Analysis

ANSYS SPEOS Premium allows users to layer a simulation result by wavelength for future post-processing analysis. The spectrum in any point of this simulation result can be displayed. Due to this spectral layered simulation result, the source spectrum can be changed as a post-processing operation to evaluate impact of different LED colors. By selecting a wavelength, users are able to display the result for the selected wavelength only.

## / Texture

ANSYS SPEOS Premium enables users to apply textures on faces, surfaces or bodies for better material appearance. The texture feature facilitates the application of normal maps for bump mapping and images for textures like wood and stickers. Users can layer different textures to combine effects as multiple masks and precisely model wood, leather, brushed metal, grained plastic, Mold-Tech materials and carbon fiber.



## / Virtual Lighting Controller

Users can control the energy ratio of different light sources during post-processing, and display simulation results of brightness, intensity or illumination without requiring a new simulation. Configurations (day, night, light configuration scenario) can be saved for future review.

## / Face and Source Filtering

This feature is used to analyze the contribution of each source or face. Results of the simulation are split by layers to ease analysis. Users will be able to accomplish a precise surface-by-surface analysis to understand exactly how each surface/source contributes to the light propagation. It allows for tracking the system's light path, showing how and where the light travels, quantifying each face's contribution in the system in the final results and removing stray light and dark spots. Users save time and cost by detecting failures earlier and gaining a better understanding of the system, and reducing iterations and the number of prototypes during the design process.

## / Stray Light Analysis

ANSYS SPEOS Premium provides analysis of sequences by energy, allowing users to solve straylight issues. This multiprobe feature qualifies the impact of each light sequence inside the optical system and enables detection and avoidance of stray light issues using baffles. With the interactive preview of the light path and sequence filtering, identification of the stray light is easy and fast.

Additionally, the analysis allows users to evaluate the energetic contribution of each stray light sequence, enabling refine analysis and quantification of the image deterioration contributor. Technical experts can directly identify major drawbacks and imagine innovative solutions.

The feature provides a genuine representation of stray light by synchronizing light paths in 3D view and sequencing the selected measure. This association is a major asset for quickly evaluating the feasibility of some remediation action and promoting a technical solution that can be shared by multiple groups of developers.

The SPEOS platform integration considers any design change and avoids painstaking updates. SPEOS Premium offers a collaborative tool for sharing compliance tests, inside the daily working platform. It is typically used for understanding the origins of stray light, defining the remediation action and evaluating impact of the opto-mechanical part redesign. By providing visual and quantitative support on cross-disciplinary issues, it facilitates communication between collaborators and suppliers or OEMs.

## / 3D Energy

SPEOS Premium enables users to analyze the light density in a 3D sensor. Typical applications are hotspots, leaks, localization inside or outside of lighting system (as in a light guide), control of absorption and emission in medical devices.

It displays volumetric light propagation inside a body. Within the SPEOS Platform environment, this feature provides an intuitive visualization for analyzing the energy distribution on the emissive volume of the body.

## / Application Examples:

- Observe the light density in a light guide based on the shape of the prisms extracting the light
- Find a better focus of an assembly of a source and reflector
- Optimize the light distribution of a spot in a real swimming pool
- Analyze the flux spread (depending on the distance)
- Determine where light doesn't go, in cases where complex geometries exist, in order to place the fixing points and injection core without impacting the appearance lit

## / Virtual Reality

SPEOS Premium provides a 360-degree view of the product in development. It brings interactivity to both visualization and analysis of simulation results. SPEOS Premium enables users to easily display 360-degree immersive results and observer results (succession of point of views turning around a target). It also supports standard VR capabilities (stereo) and technologies (multiscreen displays, tracking devices). In addition, it aids in design review, allowing a project team to virtually assess appearance, perceived quality and unlit or lit effects of a product in any environment.

## / UV-NIR (100 nm-2.5 $\mu\text{m}$ ) / Radiometric Analysis

SPEOS Premium allows users to address the development of systems based on UV and NIR or lidar simulation. Sensor type can be defined as radiometric, which offers access to irradiance ( $\text{watt}/\text{m}^2$ ), radiance ( $\text{watt}/(\text{m}^2.\text{sr})$ ) and radiant intensity ( $\text{watt}/\text{sr}$ ). This enables modeling of all optical sensors used in medical, consumer electronics, defense, aerospace or automotive applications. Propagation considers optical properties for surfaces, skin, human tissues, materials and source emission (Vis, UV, gamma ray, X-ray). It permits users to simulate, analyze and optimize the photometric and radiometric efficiency of their optical systems for medical applications and to model the human body as integrated in a radiative analysis chain, which includes illuminating systems and vision systems.

## / ANSYS SPEOS Packages:

- Pro
- Premium
- Enterprise

See chart below.

| FEATURES                           | PRO | PREMIUM | ENTERPRISE |
|------------------------------------|-----|---------|------------|
| Intensity, Illuminance & Luminance | •   | •       | •          |
| Regulation Check                   | •   | •       | •          |
| Light Sources                      | •   | •       | •          |
| Ambient Source                     | •   | •       | •          |
| Materials                          | •   | •       | •          |
| Visible (360 nm-830 m)             | •   | •       | •          |
| Basic Surface                      | •   | •       | •          |
| Projection Lens                    | •   | •       | •          |
| TIR Lens                           | •   | •       | •          |
| Design of Experiments              | •   | •       | •          |
| Colorimetry: Colorimetric Analysis | •   | •       | •          |
| Ray Tracing Filtering              | •   | •       | •          |
| Luminance Inverse Simulation       |     | •       | •          |
| Display source                     |     | •       | •          |
| Spectral analysis                  |     | •       | •          |
| Texture                            |     | •       | •          |
| Colorimetry: Spectral Analysis     |     | •       | •          |
| Virtual Lighting Controller        |     | •       | •          |
| Analysis and Source Filtering      |     | •       | •          |
| Stray Light Analysis               |     | •       | •          |
| 3D Textures                        |     | •       | •          |
| 3D Energy                          |     | •       | •          |
| Polarization                       |     | •       | •          |
| Fluorescence                       |     | •       | •          |
| Virtual Reality                    |     | •       | •          |
| Sky                                |     | •       | •          |
| UV-NIR (100 nm-2.5 μm)             |     | •       | •          |
| Human Vision                       |     |         | •          |
| Visibility & Legibility            |     |         | •          |
| High Dynamic Range                 |     |         | •          |
| Virtual BSDF Bench                 |     |         | •          |

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