# Ansys Optics for Automotive

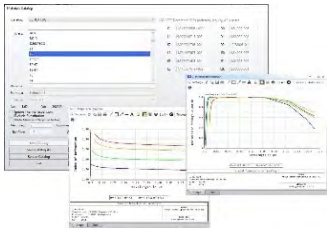

## What is Ansys Optics?

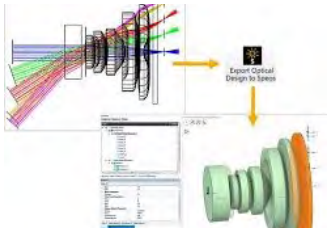
The Ansys Optics product suite is a popular choice for automotive lighting design due to its comprehensive simulation capabilities, high-fidelity human vision modeling, integrated multiphysics, virtual prototyping, industry-specific applications, improved efficiency, cost savings, and enhanced collaboration among engineering teams. The suite of tools includes ray tracing, photometry, human vision, legibility, high-performance computing (HPC), GPU, visibility analysis, wave optics, thermal and structural analysis, material libraries, and surface modeling. It also supports virtual prototyping, design optimization, and performance prediction.

This comprehensive platform helps automotive engineers design and optimize advanced optical systems efficiently.

## Why Ansys?

For more than 50 years, Ansys engineering simulation software has enabled innovators across a multitude of industries and applications to push boundaries using the predictive power of simulation through virtual prototyping. Global electronic manufacturers have chosen Ansys to meet evolving consumer preferences and market demands.





## Key Features

### Human Vision Simulation

**Camera and Sensor Systems:** Ansys Optics products assist in field-of-view analysis, sensor fusion, and performance testing under different conditions.

**Virtual Reality and Augmented Reality (VR):** Ansys Optics integrates VR and AR technologies for interactive prototyping and design review.

**Perceptual Rendering:** Ansys Speos® software can simulate how lighting and displays are perceived by the human eye, which is crucial for designing user-friendly and safe lighting systems.

**Visibility and Comfort Analysis:** Ansys Optics' suite of products simulates and assesses driver visibility and comfort under different lighting conditions.

### Optimization and Automation

**Customer Material Libraries:** Ansys Optics provides extensive material libraries for automotive optics, including optical properties like refractive indices and absorption coefficients. These libraries enable accurate modeling of complex optical behaviors and support many material models through a user-friendly interface.

**Automation Tools:** Ansys Optics tools offer automation features for automotive engineers, enabling design exploration, parametric modeling, scripting, batch processing, integration with CAD and PLM systems, optimization algorithms, virtual prototyping, and performance analysis.

**Lighting Systems Design:** Ansys Optics enables the design and simulation of automotive lighting systems, including headlights, taillights, and interior lighting. It enables accurate light distribution simulation, beam pattern optimization, and thermal management analysis.

### High-performance Computing

**Accelerating Simulations:** HPC clusters enable large-scale optical simulations, reducing simulation time for automotive manufacturers. GPUs optimize parallel processing and enable tasks like ray tracing and rendering. Tools like Ansys Speos software provide near-real-time design feedback.

**Scalability and Efficiency:** HPC resources enable simulation scaling for complex scenarios, while GPU acceleration enhances efficiency, especially for iterative design processes requiring quick turnaround times.

**Integration with Automotive Workflows:** Ansys Optics tools integrate with HPC and GPU resources for virtual prototyping, which saves time and costs. Cloud-based HPC solutions facilitate collaborative work across global teams.

### Thermal and Structural Analysis

**Thermal Mapping in Speos Software:** Speos software enables the integration of thermal results from Ansys Fluent® software to assess the impact of temperature changes on optical performance. This includes understanding how heat affects lens material properties and light transmission.

**Material Properties:** Ansys Optics includes detailed libraries of material properties that change with temperature. This helps in accurately predicting how thermal variations impact optical performance.

**Multiphysics Simulations:** Ansys Optics tools support multi-physics simulations in which thermal and structural analyses are performed simultaneously.

## Key Benefits

- **Comprehensive Simulation Capabilities:** Provides precise modeling of light behavior, including reflection, refraction, scattering, and diffraction
- **Ray Tracing and Wave Optics:** Combines ray tracing for macroscopic optical designs with wave optics for analyzing diffraction and interference effects
- **Integrated Design Workflow:** Streamlines the design process, which reduces development time
- **Enhanced Visualization and Analysis:** Offers high-quality rendering capabilities for real-world visualization and comprehensive analysis tools
- **Design for Manufacturability:** Performs tolerance analysis to assess the impact of manufacturing variations on optical performance
- **Advanced Features for Automotive Applications:** Supports the design of adaptive lighting systems and head-up displays (HUDs)
- **Efficiency and Cost Savings:** Reduces prototyping costs and enables early problem detection
- **Compliance and Standards:** Ensures designs meet automotive industry standards and regulations
- **User-friendly Interface:** Features an intuitive interface for both novice and experienced users
- **Customizable Workflows:** Enables users to customize workflows to suit their specific needs

## Key Applications

- **Headlights:** Advanced headlight systems use LED and laser technology for improved visibility and energy efficiency. Adaptive headlights adjust the light beam based on driving conditions and oncoming traffic to prevent glare.
- **Displays:** Displays are enhancing safety, comfort, and the driving experience by integrating with optical technologies, with further innovations pushing the boundaries of vehicle display technology.
- **Taillights and Signal Lights:** LEDs are commonly used for their brightness, longevity, and lower energy consumption. They also enable innovative design possibilities.
- **Interior Lighting:** Ambient lighting enhances the aesthetic appeal and can improve driver alertness. LEDs and fiber optics are often used for customizable interior lighting.
- **Lidar (Light Detection and Ranging):** Used in autonomous vehicles for mapping the environment and detecting obstacles. Lidar systems emit laser pulses and measure the time it takes for the pulses to return after hitting an object.
- **Cameras:** Optical cameras are used for many purposes, including parking assistance, lane departure warning, and autonomous driving systems. High-resolution and infrared cameras provide better image quality and functionality in different lighting conditions.
- **Head-up Displays (HUDs):** HUDs project critical driving information onto the windshield, which encourages drivers to keep their eyes on the road. HUDs use optical projection systems to ensure the display is clear and readable across different lighting conditions.
- **Instrument Panels and Infotainment Systems:** LCD and OLED screens are used for dashboards and entertainment systems, providing clear and customizable displays.

**Learn more about Ansys Optics**