

VisionSym — Visualization System Simulator

Create Virtual Optical Prototypes with Precision and Speed

Optical illumination systems are used to achieve a specific visual appearance or illumination, which are affected by characteristics of the optical model, target scene, and observer. With the complexity of today's optical components, it's cost prohibitive to manufacture multiple physical prototypes to verify the lit appearance of these systems.

VisionSym solves this challenge by providing physics-based photorealistic simulations so that both qualitative and quantitative metrics can be assessed virtually. VisionSym also utilizes the latest advances in GPU technology to dramatically speed up the calculations required to create lit and unlit visualizations of your system.

Features at a Glance

- Physics-based photorealistic simulations that provide highly realistic and quantitatively correct representations for virtual prototyping during product development
- Robust optical model configuration provided by LucidShape, LucidShape CAA V5 Based, and LightTools
- Interactive camera placement with progressive visualization updates
- Accelerated GPU-Based Visualization

Robust Optical Model Configuration

Configure your optical model within the LightTools, LucidShape, or LucidShape CAA V5 Based environment for subsequent visualization in VisionSym. This includes:

- Creating the geometries with optical properties and materials and the light sources to be included in the rendering.

Supported optical properties and materials depend upon the parent application but can range from ideal materials to standard optical definitions such as Lambertian and Gaussian to properties provided by real world measurements from the SmartStart Library.

- Defining how VisionSym connects to the parent application by adding a VisionSym simulation in LucidShape and LucidShape CAA V5 Based or a Luminance Camera in LightTools.



Figure 1. VisionSym rendering of combined lit and unlit appearance

Interactive Light Simulations

You can launch VisionSym in interactive mode from the parent application and observe progressive updates to the ray trace until the image reaches the fidelity that you need. This capability is useful when trying to determine potential lit/unlit appearance issues. You can interactively move the VisionSym Camera to easily determine camera views or positions that should be evaluated in more detail.

After defining all your settings in the interactive mode, you can also launch VisionSym in background mode to render all the defined camera positions while you continue with other work.

With VisionSym, you can:

- Visualize physics-based, photorealistic renderings of your system launched from the parent application with dramatically enhanced speed
- Inspect intermediate results
- Modify camera settings
- Modify simulation settings
- Modify post-processing settings
- Modify scene settings

Quantitative Physics-Based Simulations

VisionSym includes the Advanced Analysis tool to streamline analysis steps, provide access to a wide range of analysis tools, and simplify interactive design analysis and troubleshooting.

As you run a VisionSym simulation, you can save results in EXR or PNG formats and use them as input to Advanced Analysis to assess quantitative values associated with the rendering such as luminance, color, and uniformity.

In VisionSym, results can be evaluated directly using Advanced Analysis tools.

- Cross-check appearance against luminance, uniformity, and regulatory targets
- Maintain traceability between visual results and photometric compliance
- Supports unified styling and engineering workflows

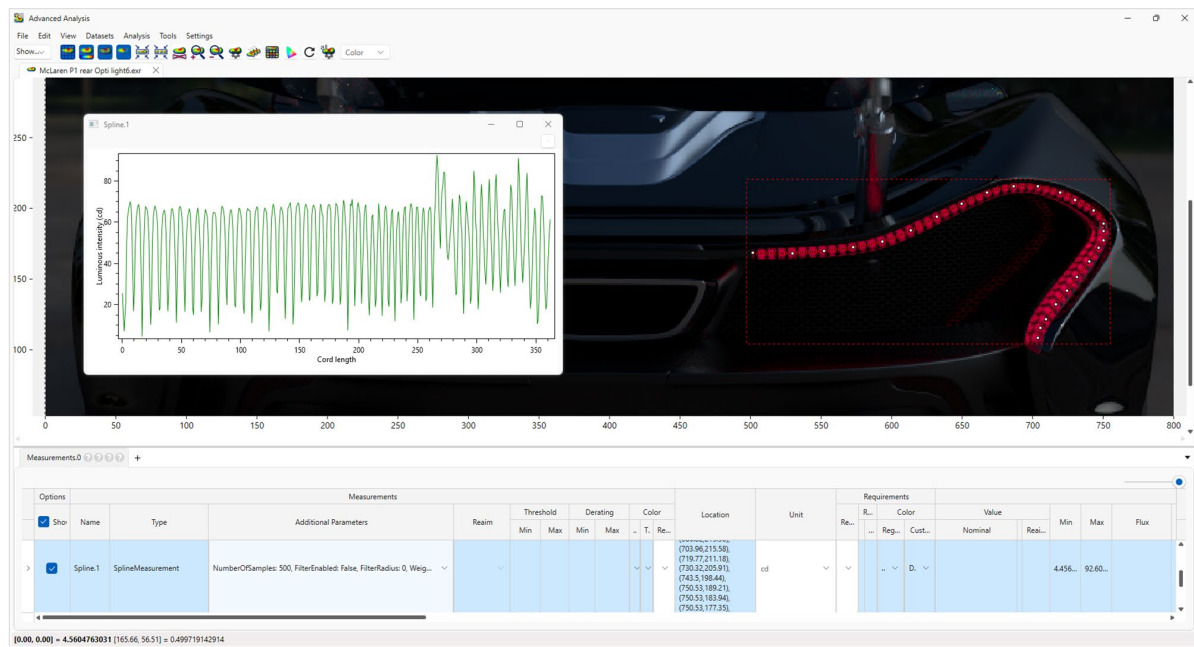


Figure 1. Advanced Analysis with VisionSym data evaluation

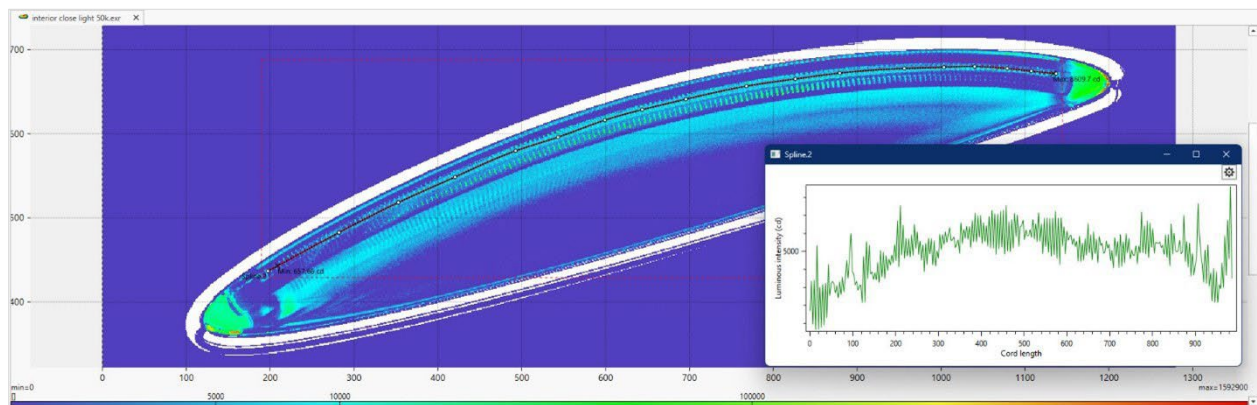


Figure 2. Advanced Analysis false color plot to visualize luminance distribution levels

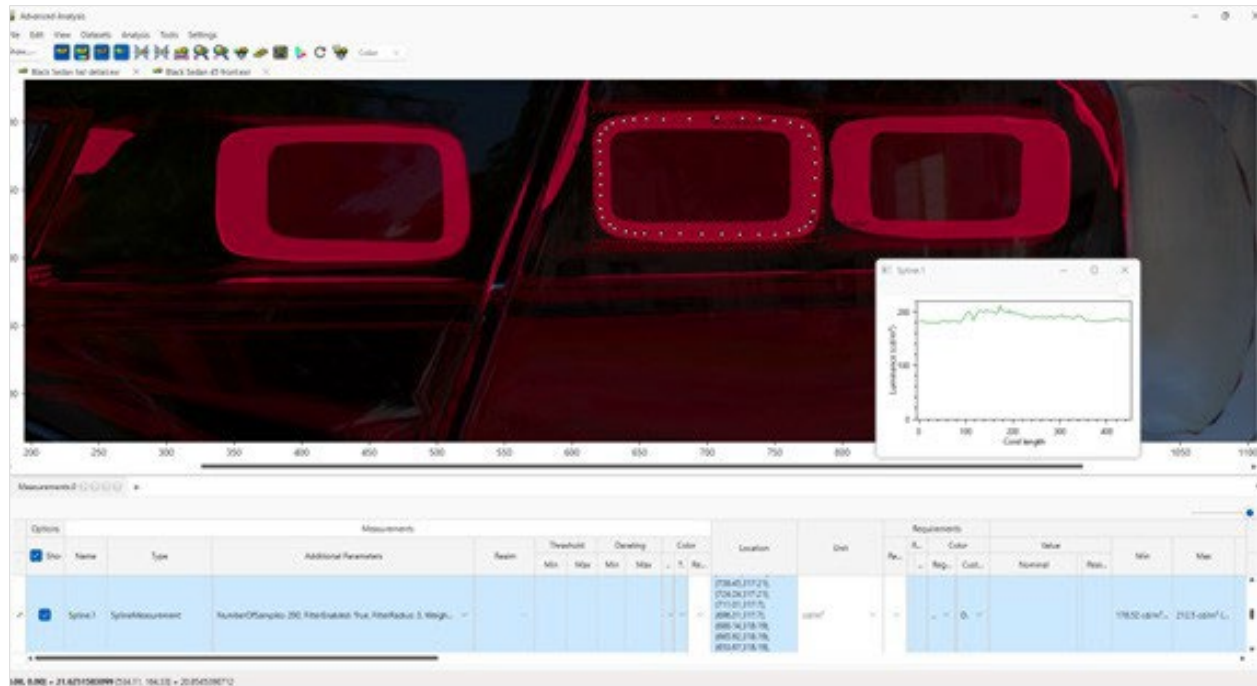


Figure 3. VisionSym results in Advanced Analysis for uniformity assessment

In LightTools, you can also use standard LightTools analysis features associated with the luminance camera without accessing the Advanced Analysis tool – to examine luminance values, for example.

False Color Visualization

False color rendering modes provide enhanced visual interpretation of photometric behavior.

- Highlights intensity distributions and non-uniformity
- Supports visual verification prior to numerical analysis

Accelerated GPU-Based Visualization

VisionSym is a GPU-accelerated Monte Carlo rendering engine designed to deliver fast, photometrically accurate visualization for optical and automotive lighting development. It enables high-fidelity HDR renderings while maintaining direct interoperability with Advanced Analysis for unified appearance and quantitative workflows.

GPU-Accelerated Progressive Rendering

- VisionSym uses progressive Monte Carlo rendering on the GPU to generate physically based lighting results with rapid visual feedback.
- Reduces time to assess optical concepts compared to CPU-based rendering
- Enables continuous refinement of image quality during computation
- Supports rapid iteration during concept development and styling evaluation

HDR Output and Quantitative Visualization

VisionSym produces high dynamic range renderings suitable for both qualitative review and quantitative assessment.

- EXR output preserves luminance detail across wide dynamic ranges
- Enables evaluation of glare, contrast, and luminance distribution
- Results can be used directly in downstream analysis workflows

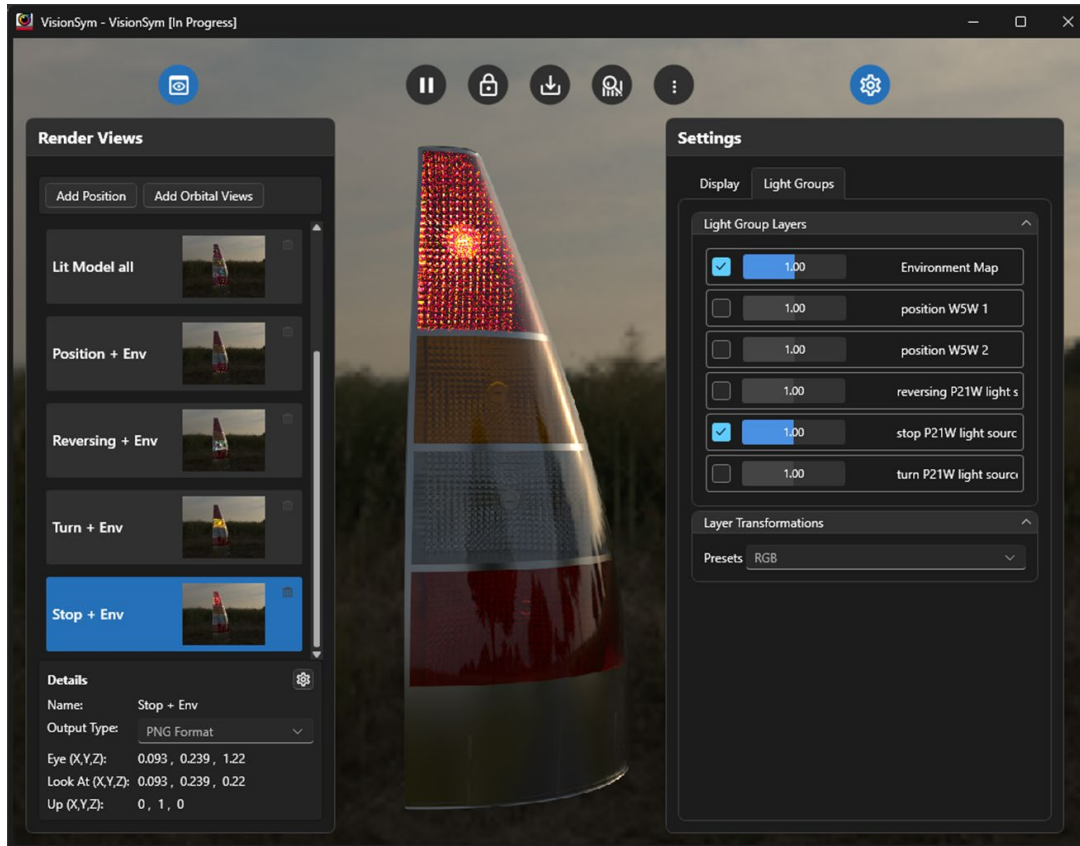


Figure 4. VisionSym viewer with camera position (Render Views) layout and light group controls

Multi-View Appearance Inspection

Multiple camera views can be defined to render all of them in a batch in the background mode.

- Simplifies inspection of beam patterns and functional lighting behavior
- Helps identify artifacts and optical noise earlier in the design cycle
- Improves communication across optical, mechanical, and styling teams

In LightTools, you can also use the Parameter Analyzer utility to create “movies” of multiple camera views.

Interactive Light Group Control

VisionSym supports isolation and dimming of light groups for targeted appearance evaluation.

- Simplifies debugging of complex multi-emitter systems
- Helps identify stray light, ghost images, and artifacts
- Enables A/B comparison of lighting concepts