September 2025, Release VirtualLab Fusion 2025.2

The New VirtualLab Fusion 2025

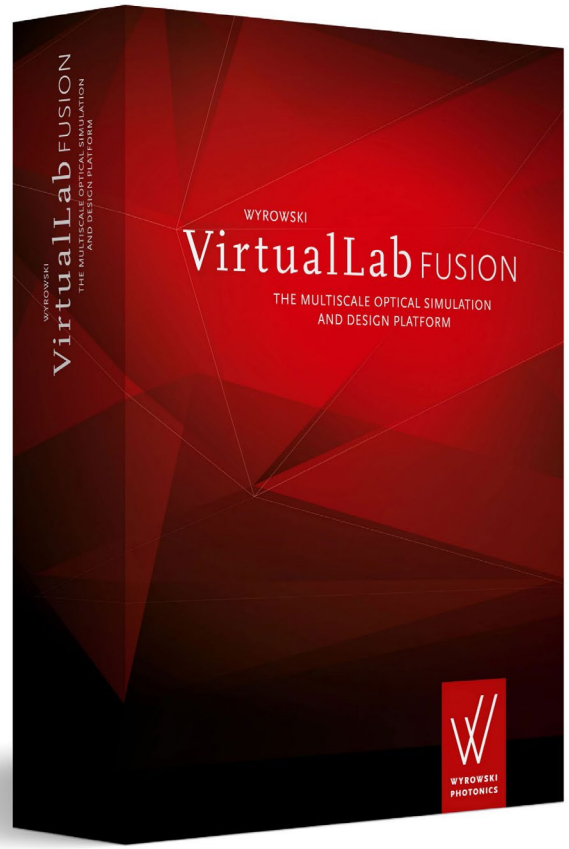
Overview of new features of version 2025.2

General Information

Version	2025.2 (Build 1.118)
Update Service	3rd quarter of 2025 is required.
Install Type	Standalone Installation VirtualLab Fusion 2025.2 is installed in parallel to your existing VirtualLab Fusion installations.

Our Development Focus: Infrastructure vs. Solutions

- VirtualLab Fusion's development has always balanced **infrastructure** advancements with **customer-driven solutions**.
- For version 2025.2, we focused on developments triggered by user requests from customers and developed several new source models and components
- If there's a specific problem or application, you'd like us to address, we'd love to hear from you at **support@lighttrans.com**.

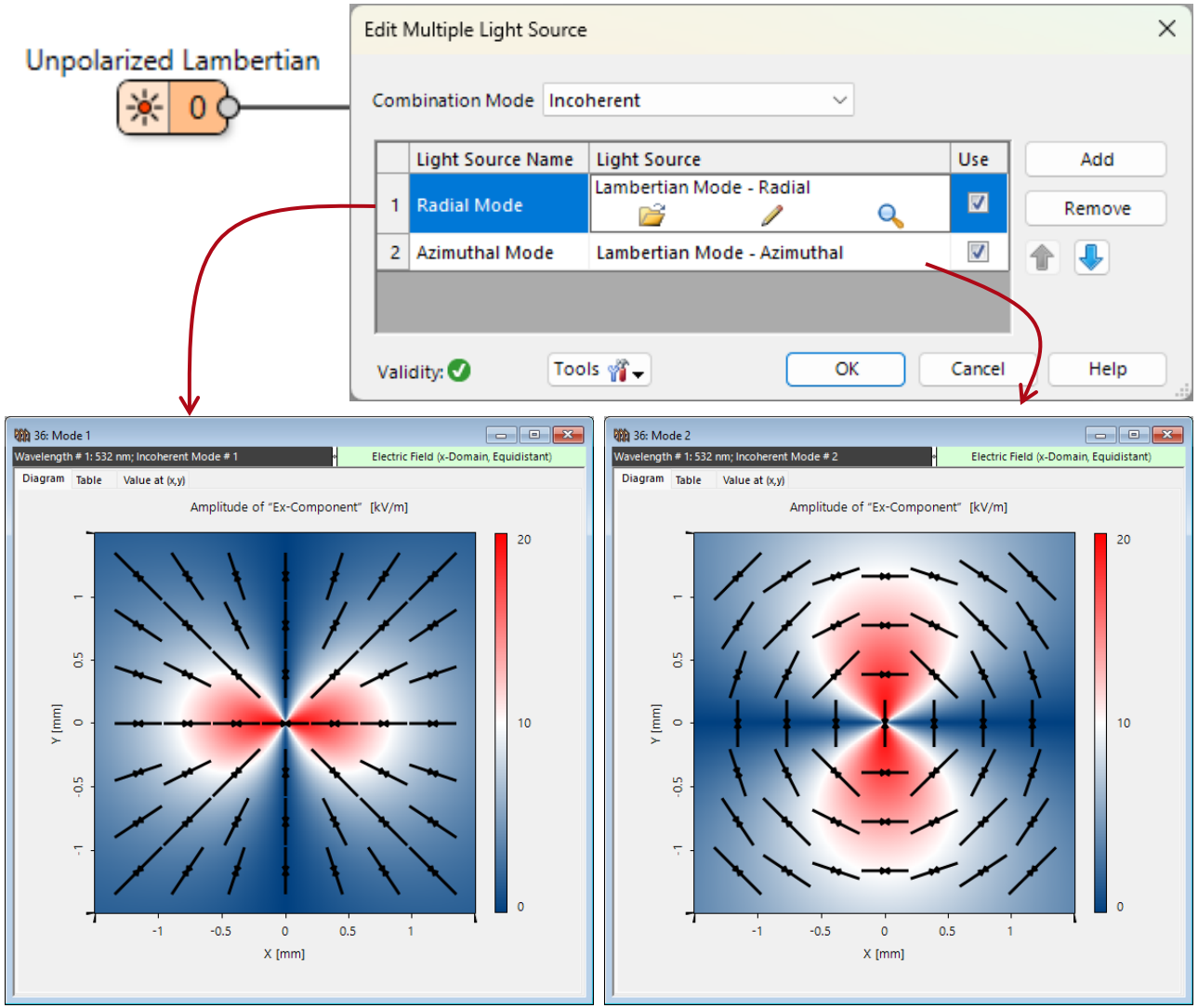


The New VirtualLab Fusion 2025.2

New Source Models

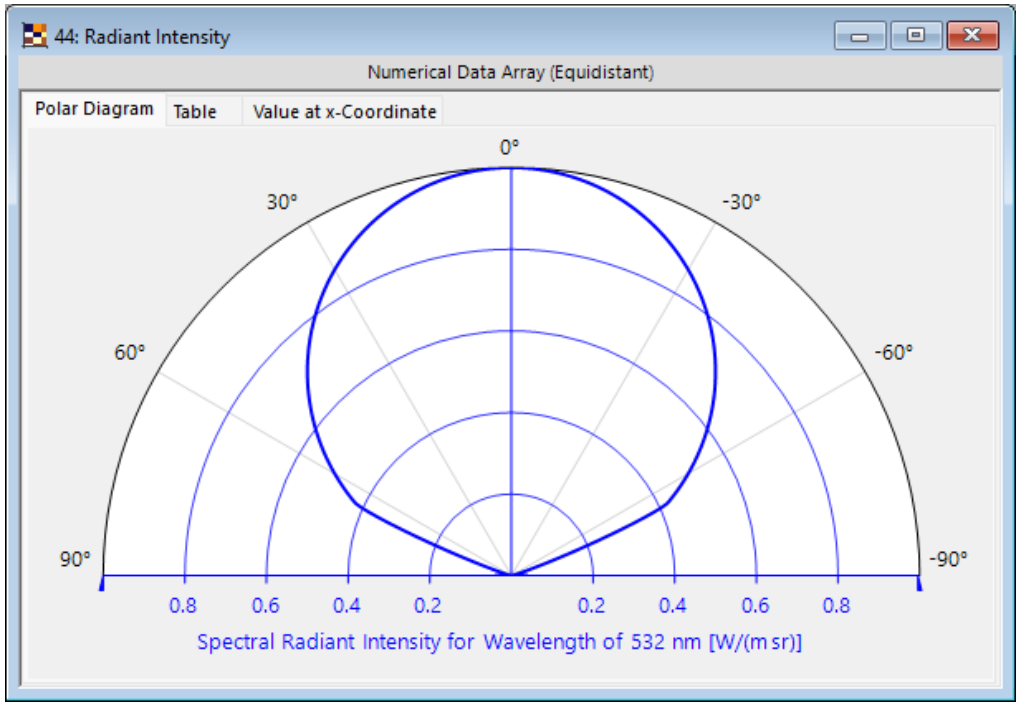
New Source Models: LED-Type Sources

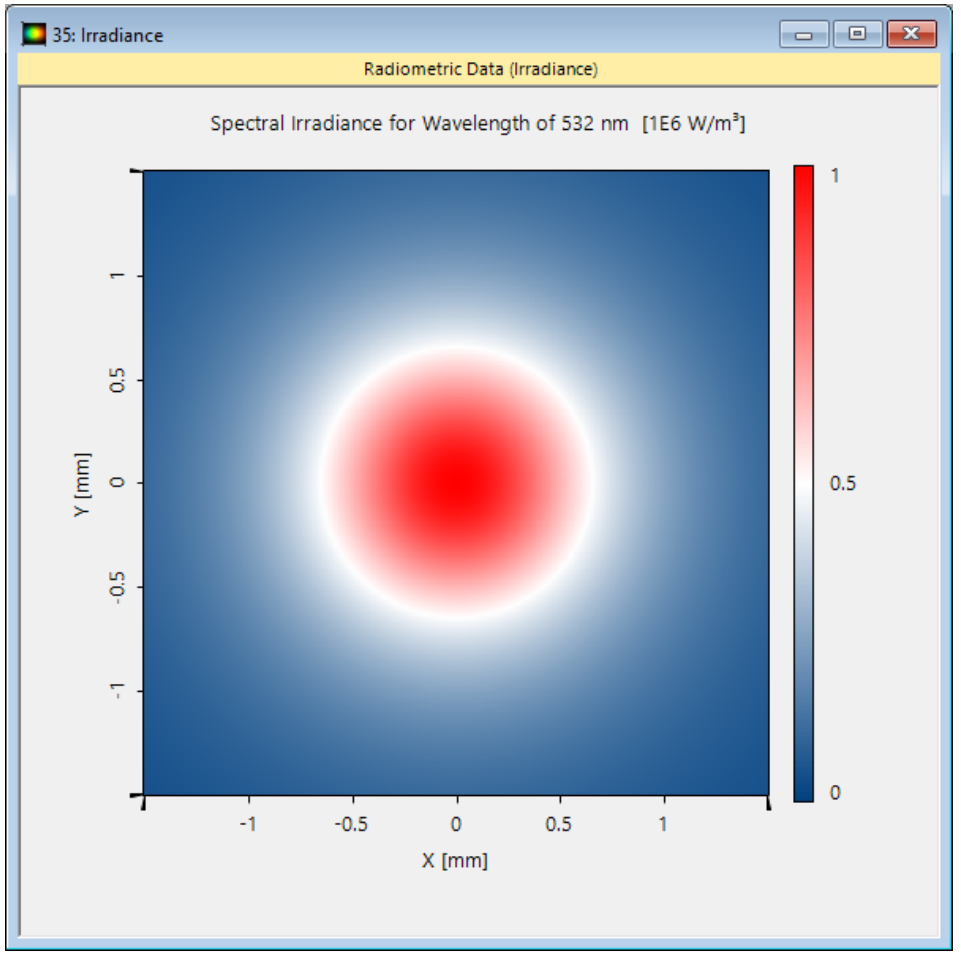
- Enhance the realism of your optical simulations with two new unpolarized source types, specifically designed for LED-like emission characteristics:
  - **Lambertian Radiation Mode**
  - **Cos(θ)^n Radiation Mode**
- Both models intelligently generate orthogonal radial and azimuthal polarization states, providing accurate, unpolarized light output.



Lambertian Radiation Mode: For Realistic LED Simulation

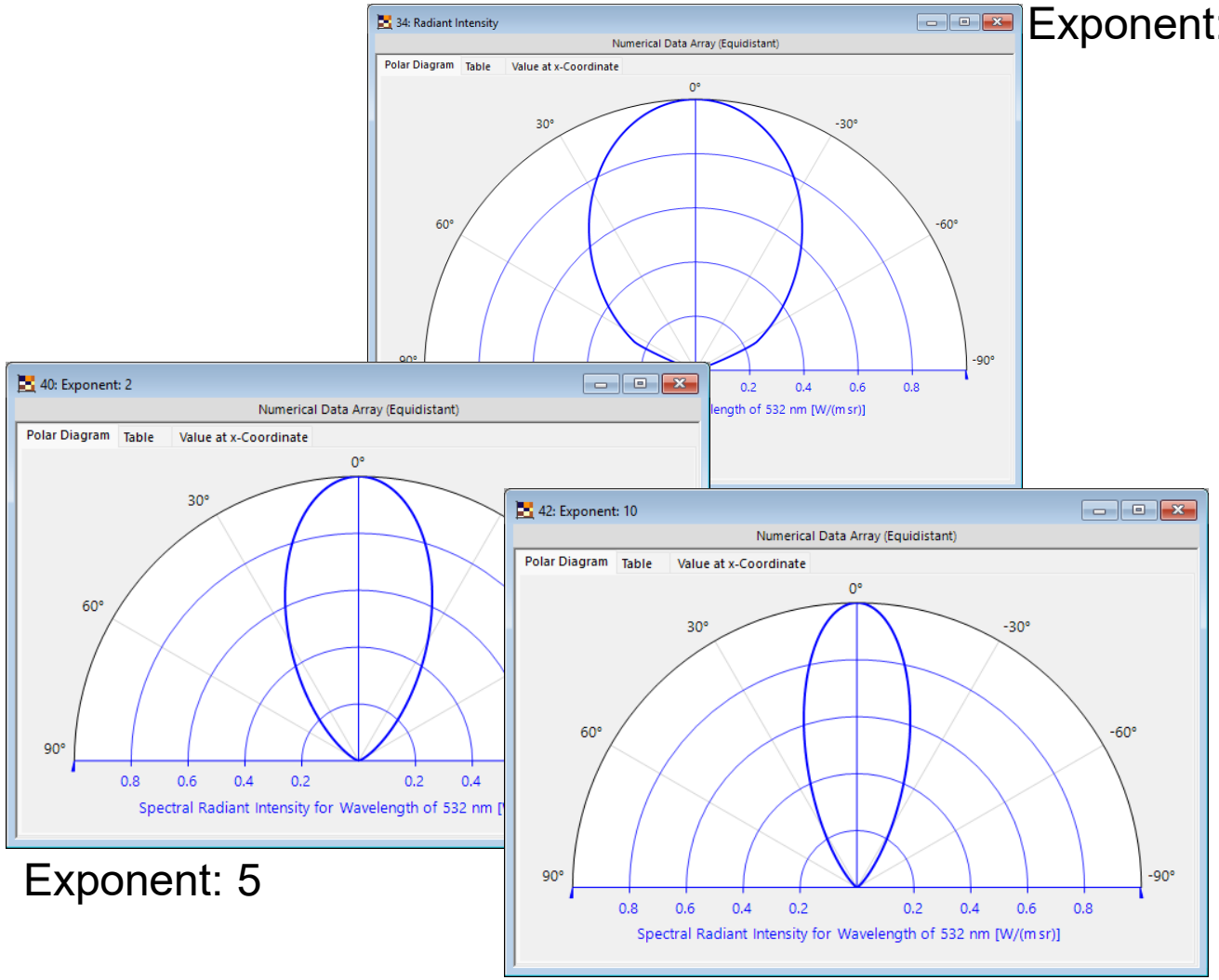
- The ***Lambertian Radiation Mode*** source model follows the well-established cosine emission law, making it ideal for representing commonly available LED-like light distributions.





Cos(θ)^n Radiation Mode: Flexible Angular Distributions

- This source provides a **tunable angular distribution** for unpolarized, LED-like light.
- A customizable **exponent** allows you to model anything from broad Lambertian to narrow, highly directional emission profiles.
- Like all our **unpolarized sources**, it automatically generates the correct orthogonal polarization states for accurate, realistic results out-of-the-box.



Exponent: 2

Exponent: 5

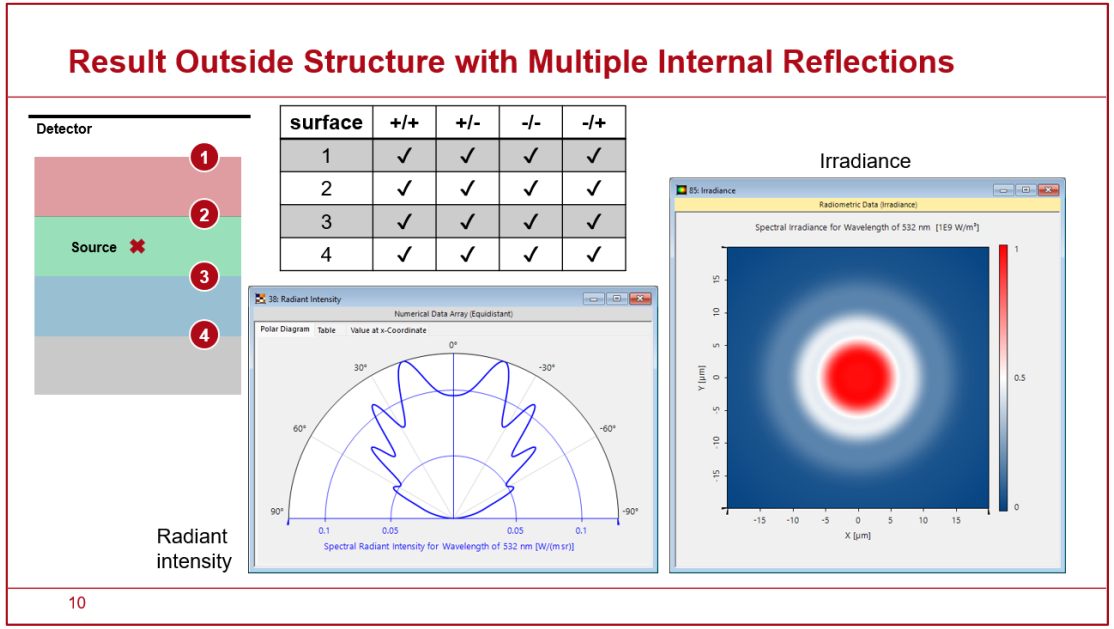
Exponent: 10

Learn More About: OLED Modeling with VirtualLab 2025.2

Use Cases

- Basic structure-based source model for an OLED - Part: I Emitter Source Selection

… more coming soon

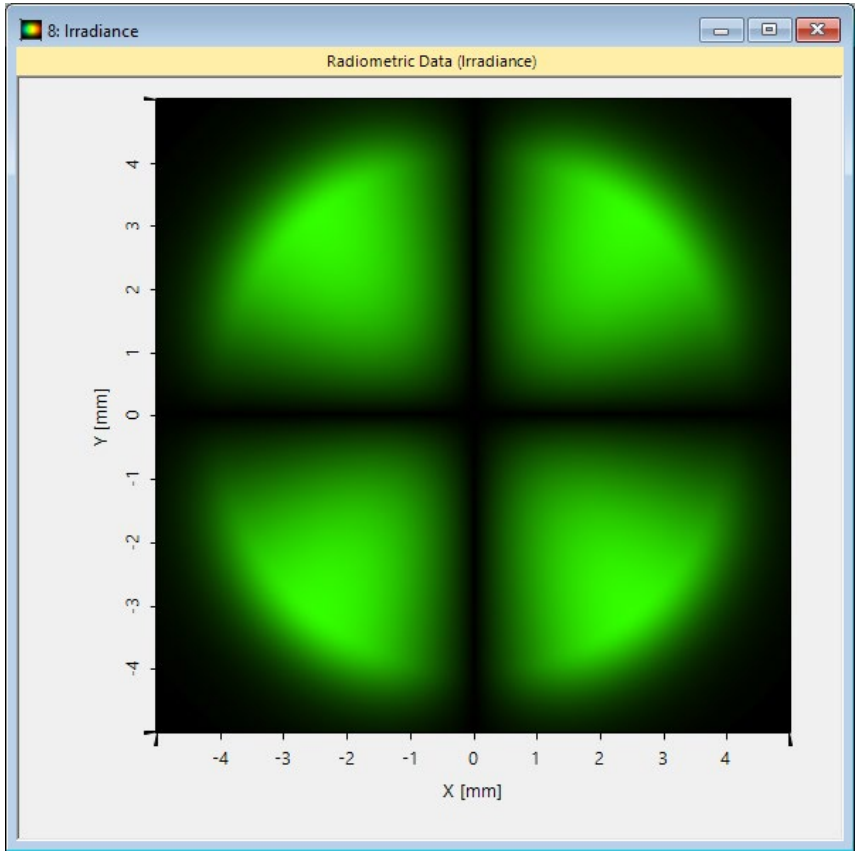


The New VirtualLab Fusion 2025.2

New Components

Linear Polarizer: Beyond the Paraxial Limit

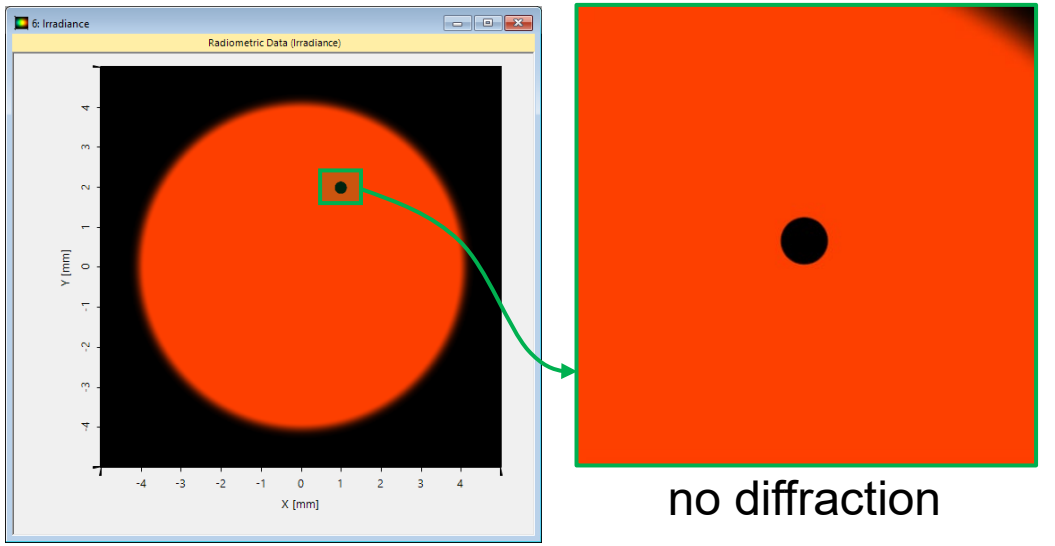
- We introduce **a new functional component** to accurately represent a **linear polarizer.**
- Its **key advantage** over the traditional Jones Matrix-based polarizer is correct performance **under non-paraxial illumination**, such as from an LED.
- This ensures **physically accurate results** for any system, from paraxial to high-angle, high-NA illumination.
- Simply place the component in your system - **no medium or structural properties need to be defined**.

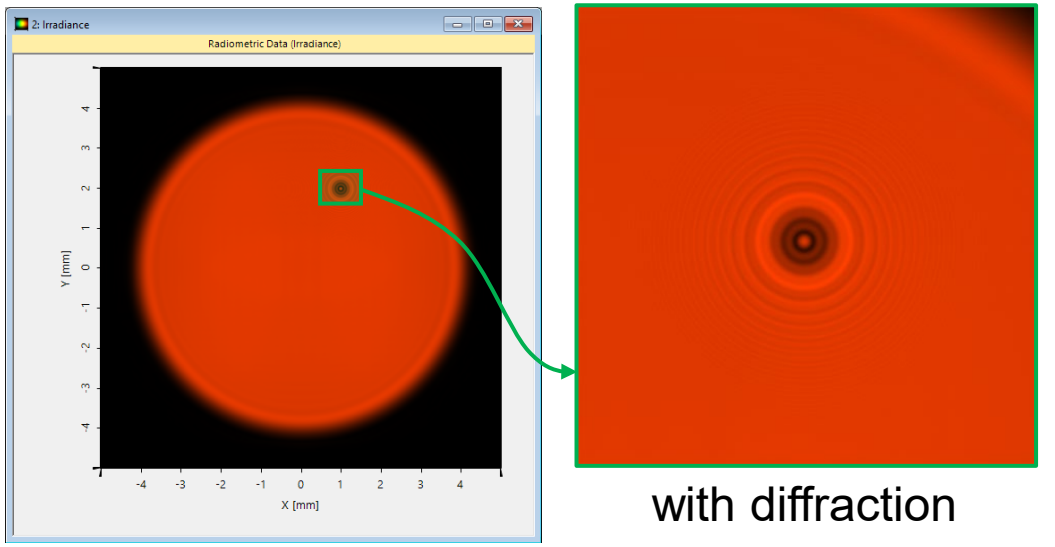


Field after crossed polarizer illuminated by Lambertian source mode

Stop: Accurately Model Diffraction from Tiny Features

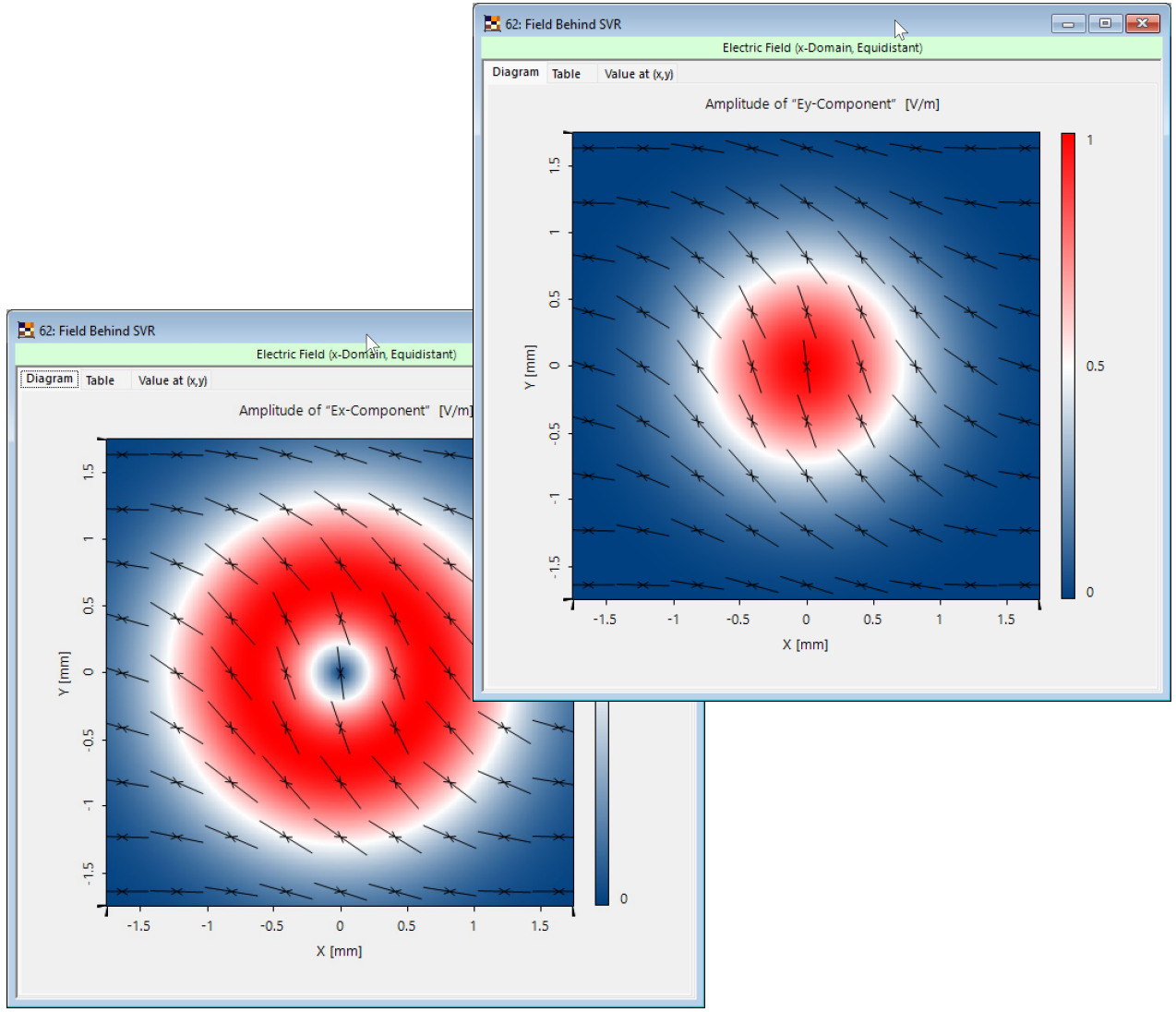
- The new **Stop** component is now the recommended component for defining stops in your system.
- It delivers **faster simulation speeds** for any obstruction size and excels at accurately modeling diffraction from very small stops under larger-field illumination.
- This component **accurately models diffraction effects** from these tiny features, a capability that was challenging with the previous method.
- Provides a flexible framework for analyzing the **impact of small-scale defects on system-level imaging performance.**





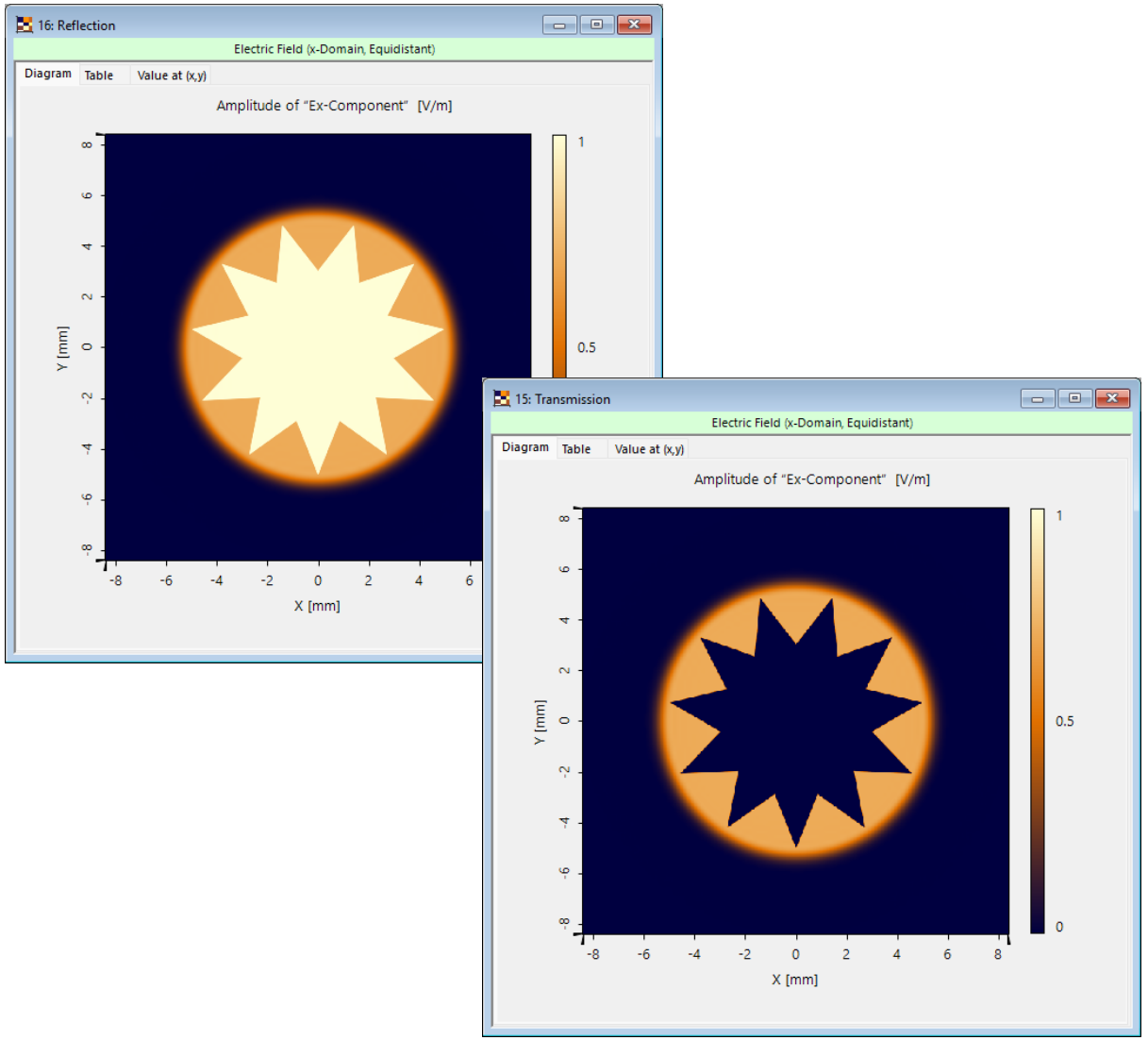
Laterally-Varying Retarder (Orientation): Polarization Control

- A brand-new functional component for **advanced polarization control**, allowing the phase delay between polarization components to **vary as a function of position across the field**.
- Enables **tailored polarization shaping**, moving beyond the uniform retardation of standard waveplates.
- Unlocks new possibilities for **sophisticated beam shaping applications** that depend on modulated polarization.



Laterally-Varying Beam Splitter Cube: Control of Reflection

- Introducing a new functional component for **defining macroscopic spatial patterns of reflection and transmission** on a beam splitting surface.
- **Load an arbitrary 2D region** to act as a distinct optical zone, such as a central mirror or hole.
- **Assign unique reflectance and transmittance values** for points inside the loaded region versus the surrounding substrate.
- Model complex components like **beam splitters with a central obscuration**, **a reflective patch, or an off-axis aperture** directly and efficiently.

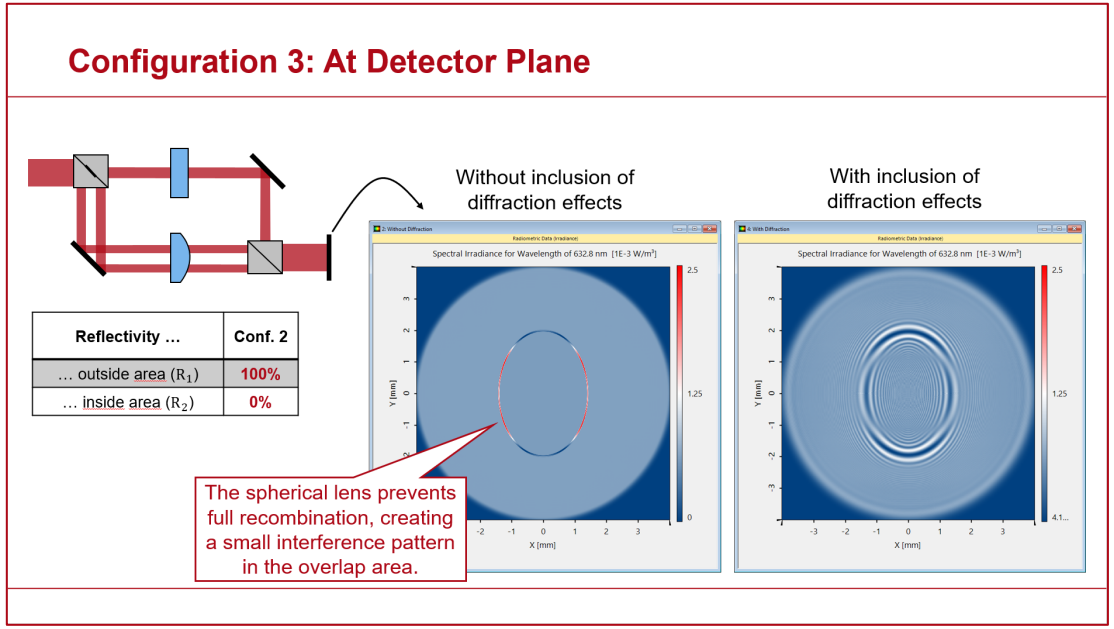


Learn More About: New Components in VirtualLab 2025.2

Use Cases

- Mach-Zehnder Interferometer with Small Obstructions
- Laterally-Varying Retarder
- Mach-Zehnder Interferometer with Laterally-Varying Beam Splitter Cube

… more coming soon

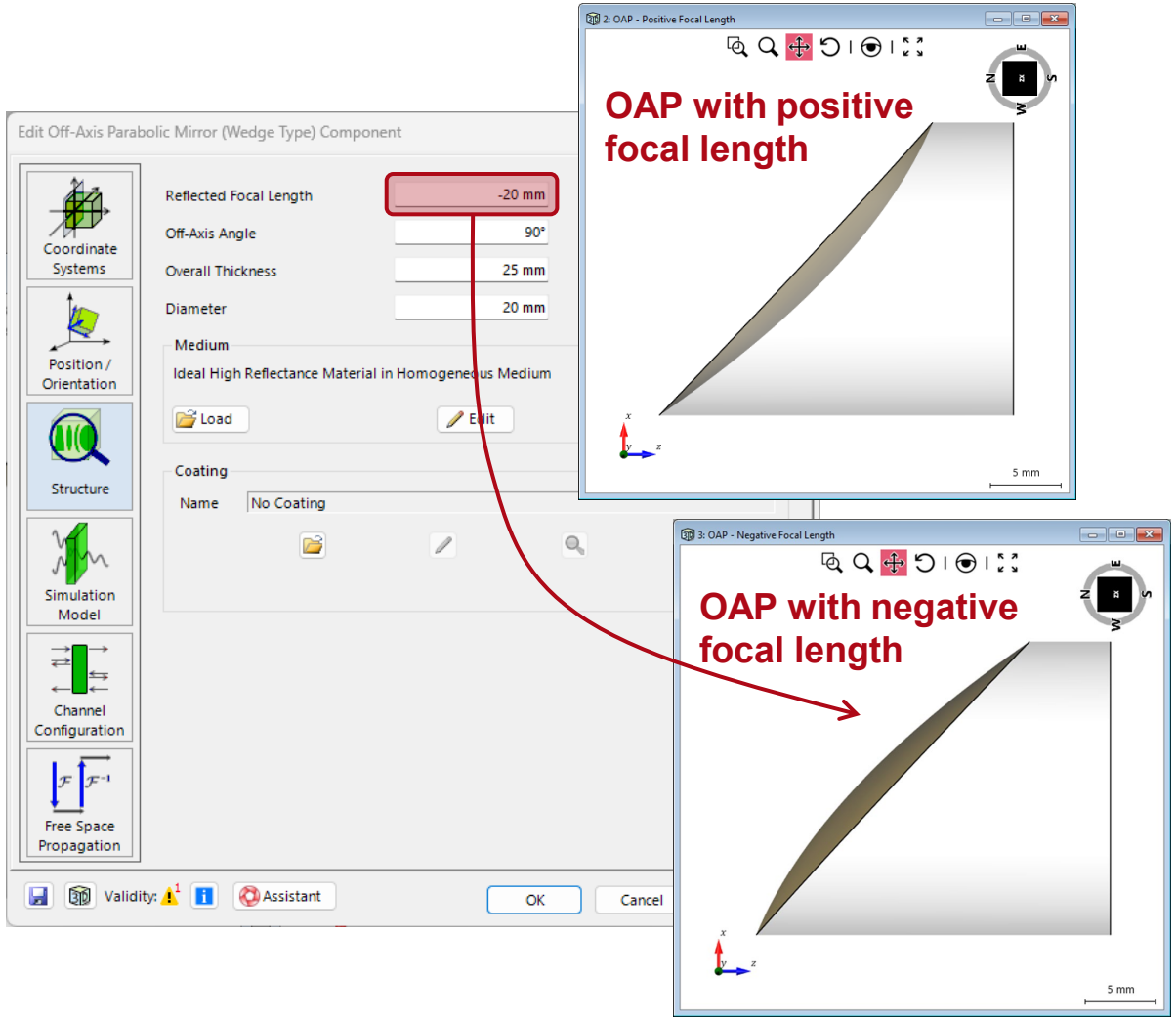


The New VirtualLab Fusion 2025.2

Improved Simulation Capabilities

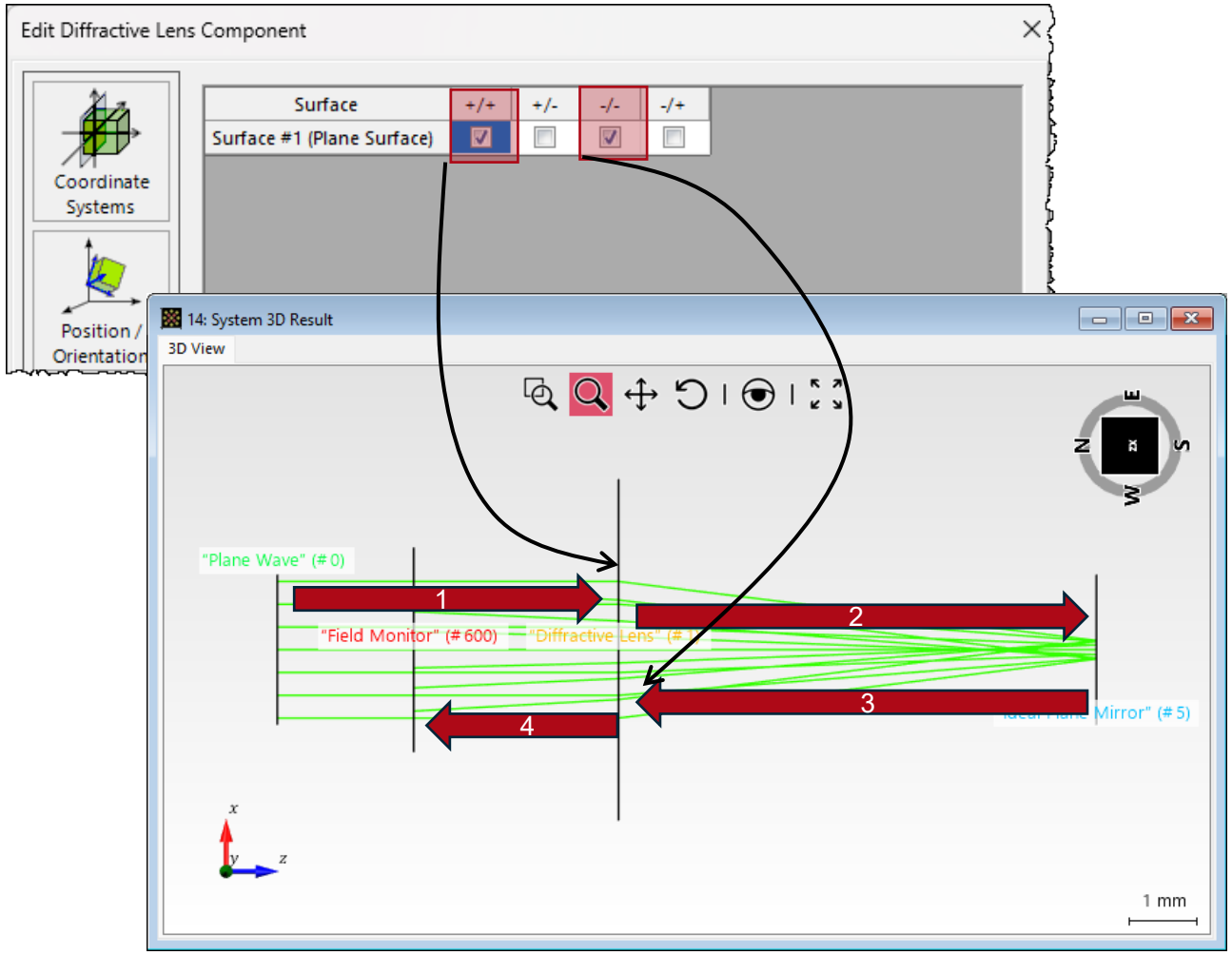
Enhancements for Off-Axis Parabolic Mirror (Wedge Type)

- **Improvements for Off-Axis Parabolic Mirror (Wedge Type):**
  - The component now supports the definition of **negative focal lengths**.
  - This enables the straightforward configuration of both **concave and convex off-axis parabolic mirrors** for a more versatile modeling experience.



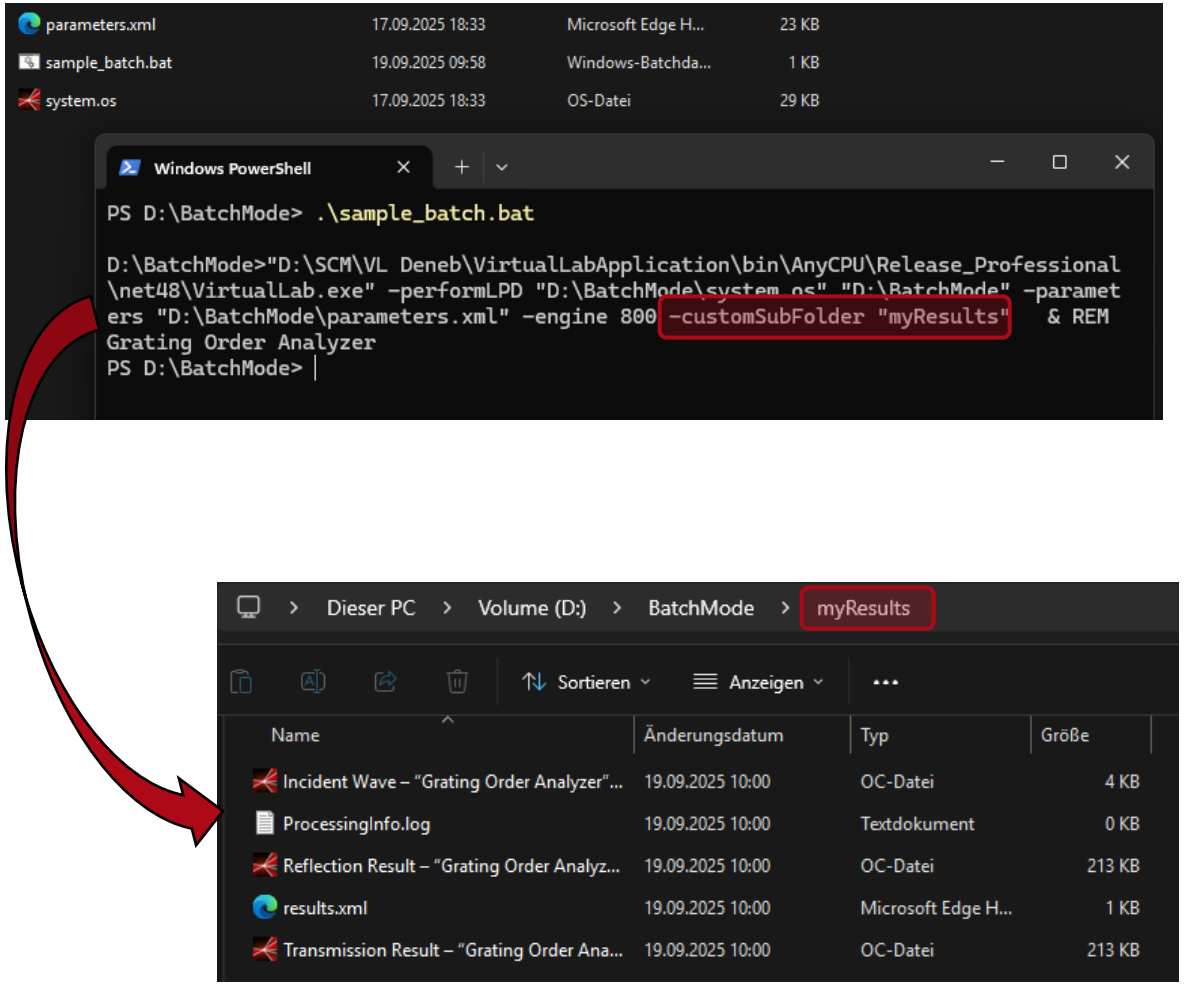
New Surface Channels for Diffractive Lens & Functional Meta Lens

- **Expanded Surface Channels for Diffractive Lenses & More:**
  - The **Diffractive Lens** component now supports all four surface channels (++, +-, -+, --).
  - This enables full **non-sequential** usage of the component, allowing for more complex and versatile system modeling.
  - This capability has been extended to the **Holographic Optical Element**, **Function Meta Lens**, and **Functional Modulated Metasurface** components.



Improvements for Batch Mode Support

- **Enhanced Batch Mode Control and Logging:**
  - Introduced the new command option `-customSubfolder`, allowing users to specify a **custom directory** for storing simulation results, enabling better organization of automated workflows.
  - Implemented a **clear separation of log files**: preparation steps are now logged separately from errors and warnings generated during processing. This simplifies debugging and analysis of batch runs.

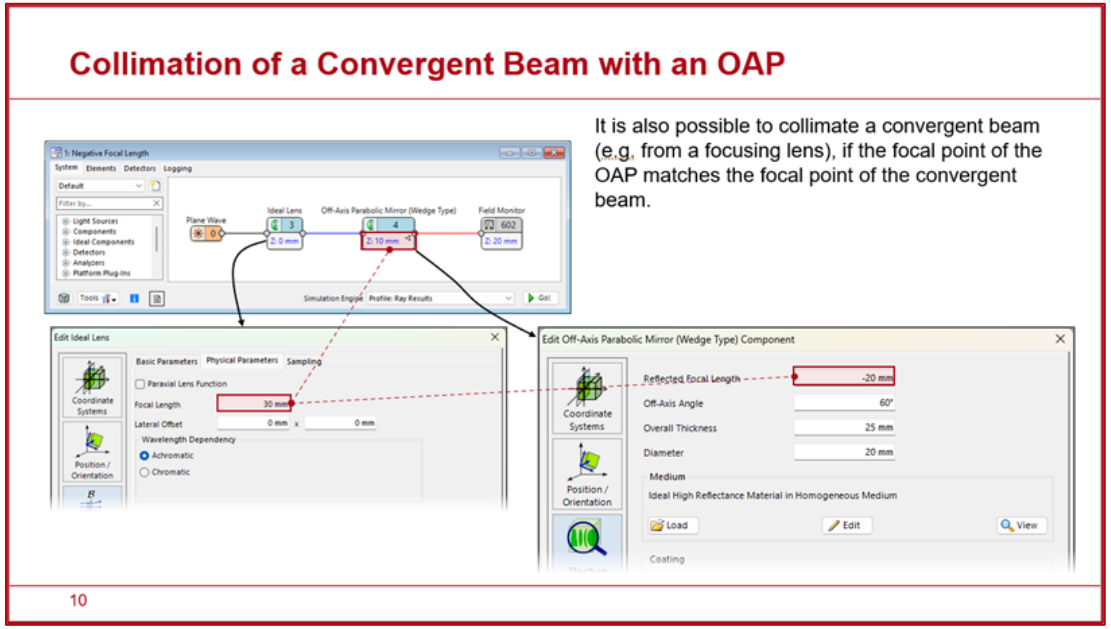


Learn More About: Improved Simulation Capabilities

Use Cases

- Collimation of a Spherical Wave by an Off-Axis Parabolic Mirror
- Off-Axis Parabolic Mirror (Tutorial)
- Design of a CGH for Null-Testing

… more coming soon

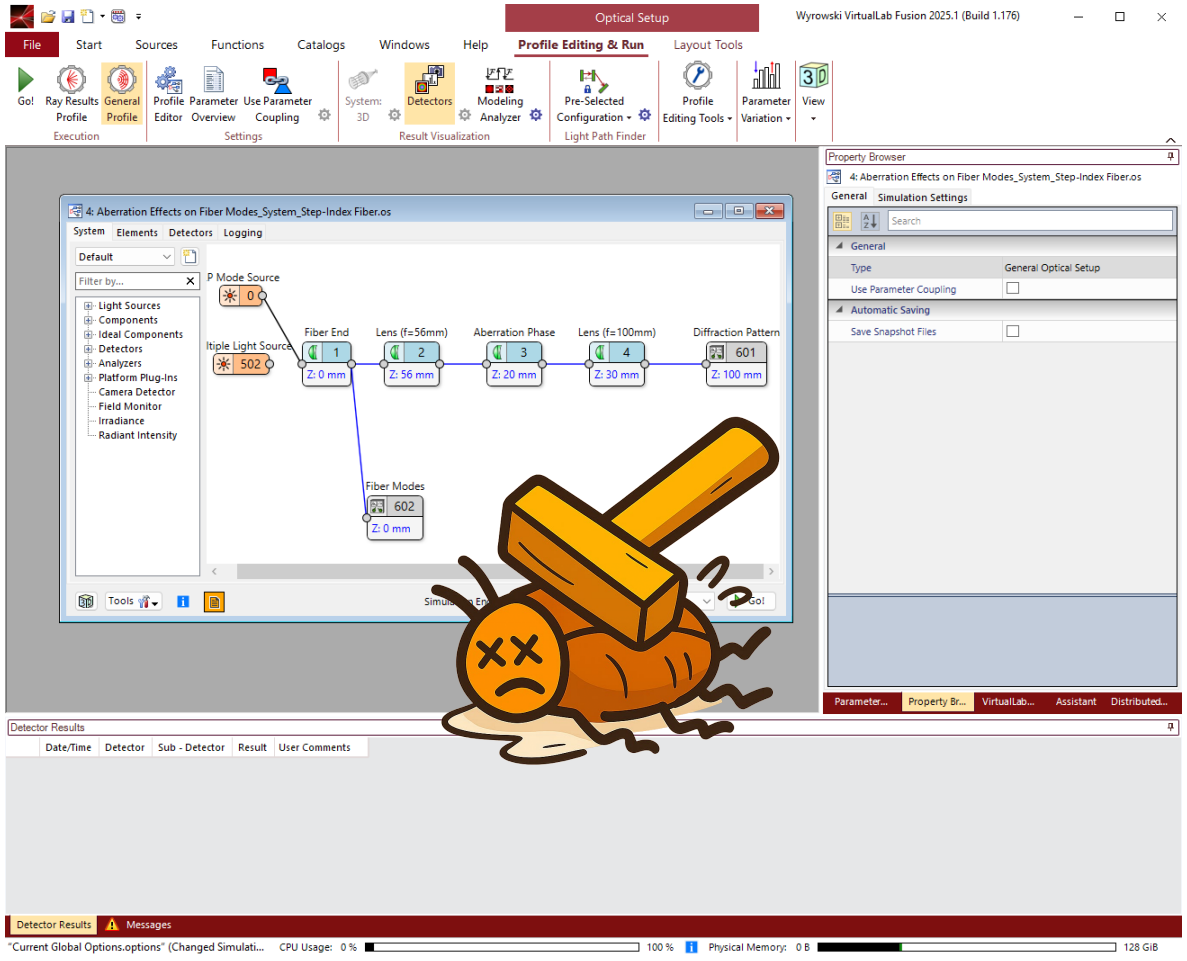


The New VirtualLab Fusion 2025.2

Bug Fixes

Bug Fixing - Overview

- As part of our ongoing commitment to quality and stability, we have addressed numerous issues reported by our users and identified by our development team.
- In VirtualLab Fusion 2025.2, we have resolved **over 30 bugs** across the platform, including fixes in:
  - Visualization of data arrays and results.
  - Configuration options for material data.
  - Merit function evaluation within the IFTA.
  - …among other general stability and performance improvements.
- Thank to all our users who submitted reports and helped make this release more robust.

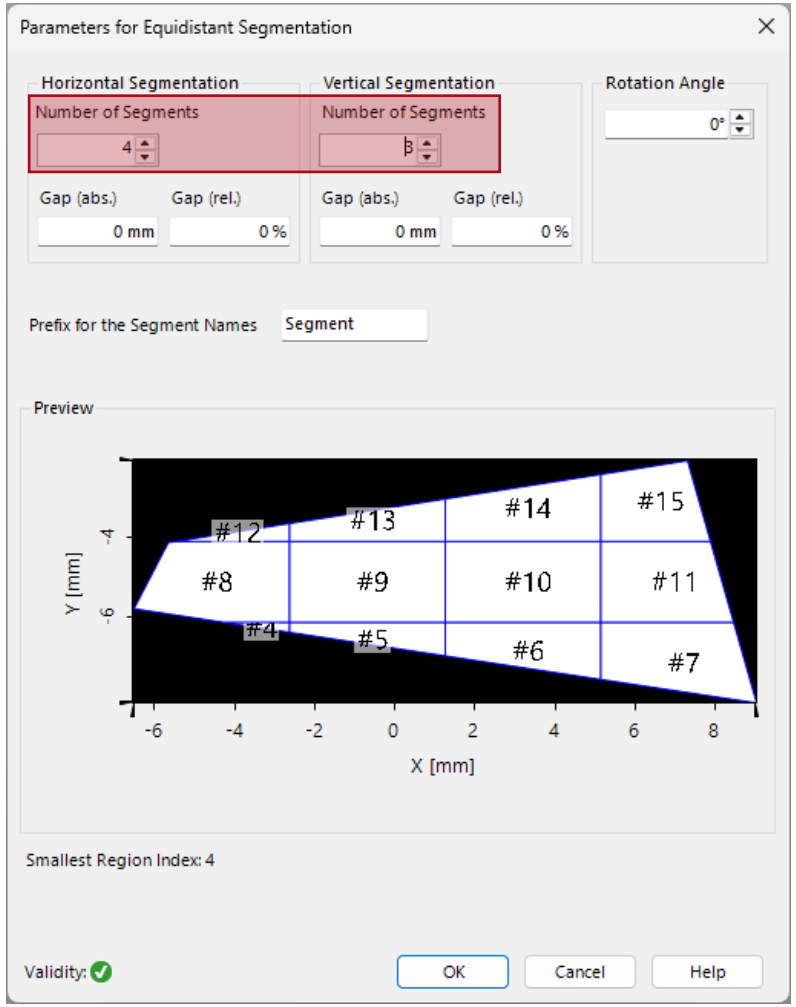


Major Bug Fixes I

1. **Critical Stability Fix for Uncontrolled Crashes:**
   - In version 2025.1, an update to the underlying **NMath** numerical library inadvertently introduced instability on certain PC configurations, leading to uncontrolled crashes related to its internal use of the Intel MKL.
   - We have thoroughly addressed this conflict in VirtualLab Fusion 2025.2. The software now remains stable and reliable across all supported system environments.
2. **Fixed Isolated Positioning Update Bug:**
   - Code optimizations in version 2025.1 inadvertently broke the update mechanism for **Isolated Positioning**.
   - This meant changes to elements or the setup might not reflect correctly in simulations until the user manually forced an update.
   - This has been resolved; the update chain now works correctly for all positioning types, ensuring reliable simulation results.

Major Bug Fixes II

3. **Gridded Segmentation Tool for Light Guides Enhanced**
   - **Fixed:** Resolved an issue from version 2025.1 where the gridded segmentation tool was not functioning correctly.
   - **Enhanced:** Dramatically increased the maximum number of segments in both the x- and y-direction from **100 to 10,000**, enabling much more flexible and complex light guide designs.



VirtualLab Fusion 2025.2 Release Highlights

- We are excited to present VirtualLab Fusion 2025.2, packed with new features and enhancements designed to accelerate your innovation:
  - **New Source Models:** Create more realistic systems with expanded light source options.
  - **New Components:** Build and simulate a wider range of innovative optical setups.
  - **Improved Simulation Capabilities:** Get results faster with performance boosts and enjoy greater flexibility with new non-sequential and automation tools.
- **Experience a faster, more powerful, and more versatile simulation environment.**