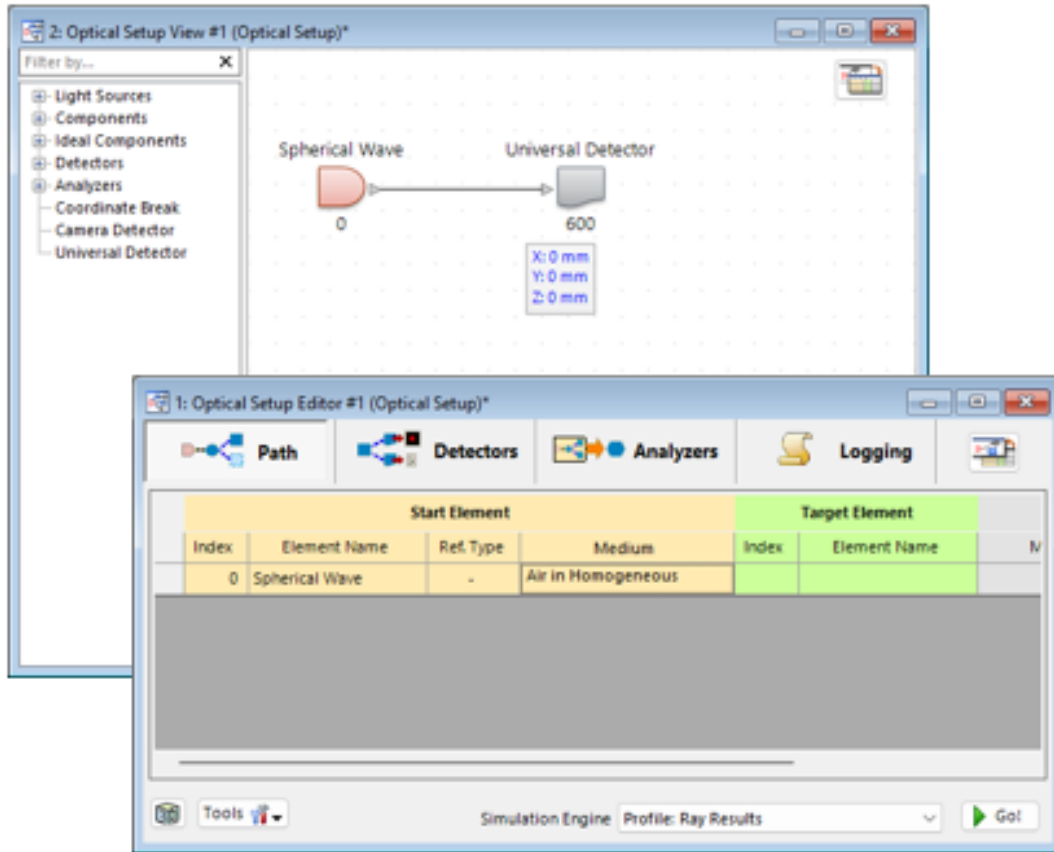# Introduction to the Optical Setup

Abstract

The main purpose of VirtualLab Fusion is to bring the experiments and research from the real world into a virtual one, with the Optical Setup serving as a kind of digital twin to a real-life laboratory. Here, the user can configure sources, components and detectors, control the positions and parameters of all components as well as define the materials that fill the space between them. This use case provides a general introduction to the concept.
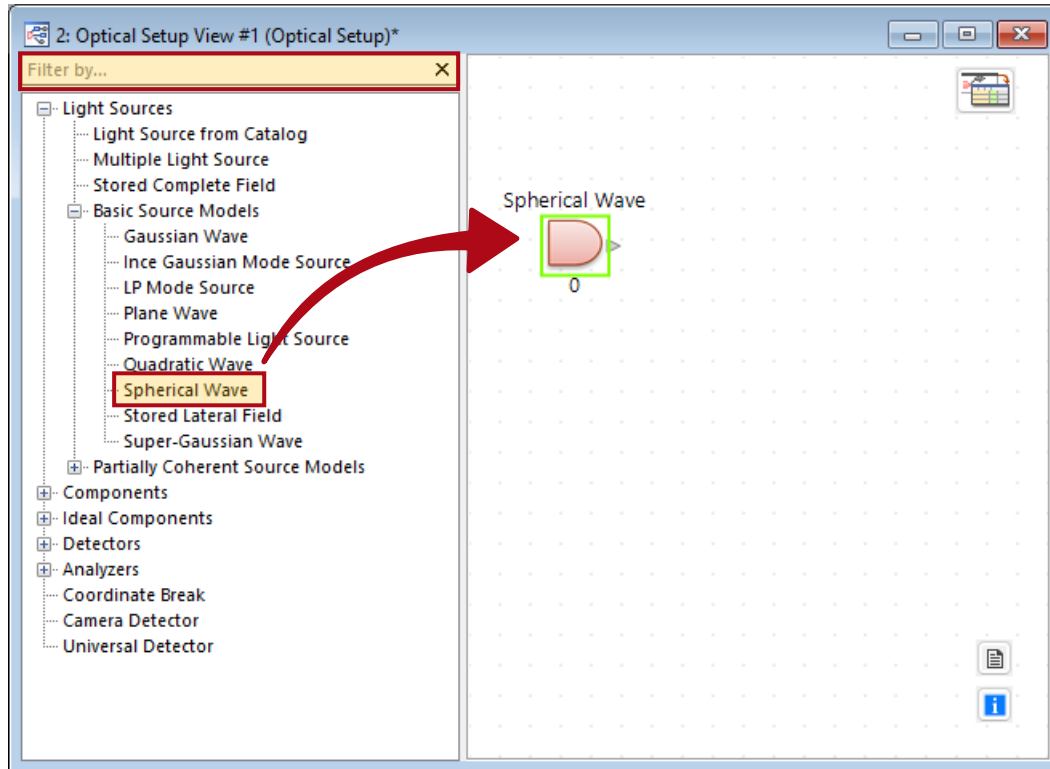
Creating a New Optical Setup
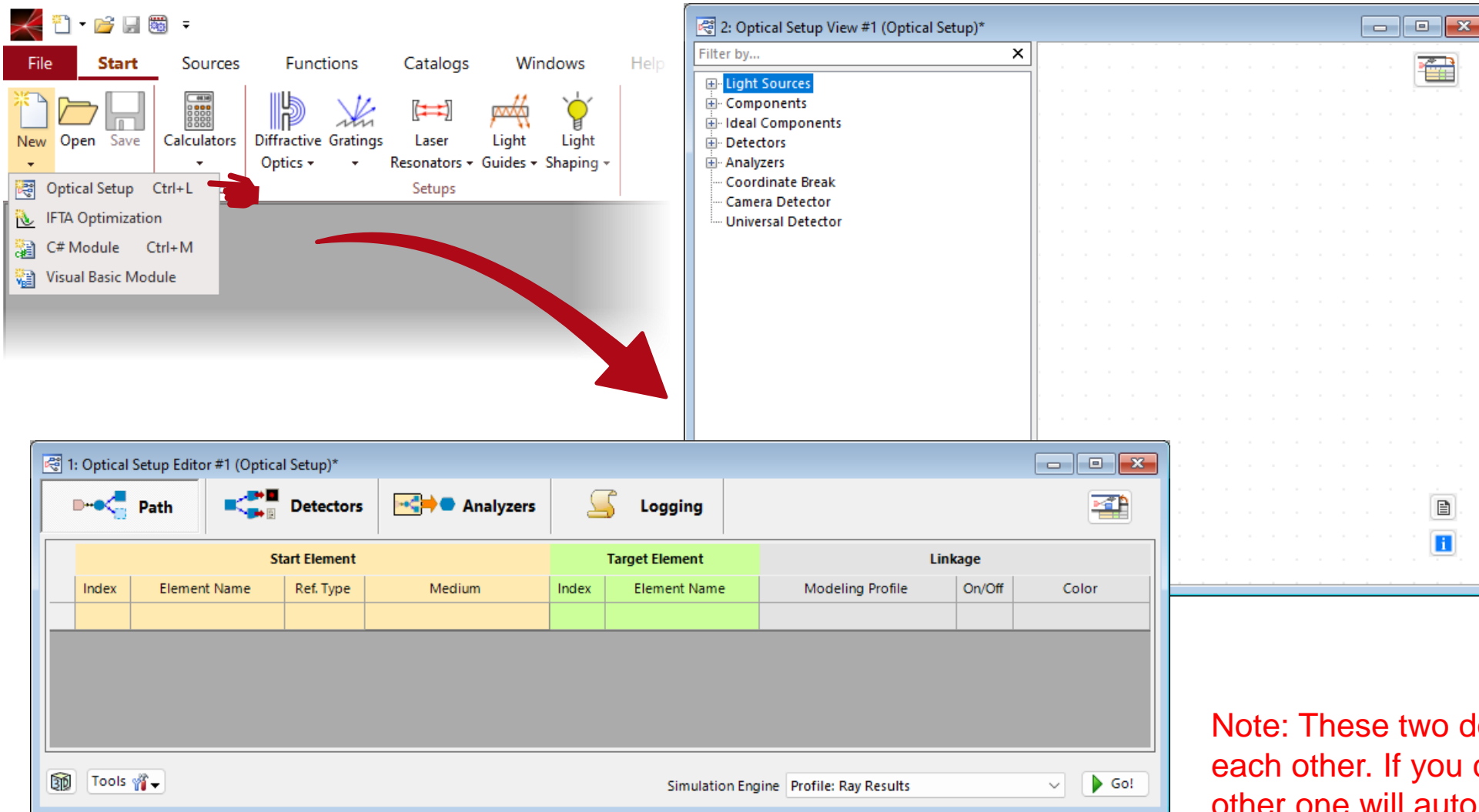
Clicking on *New* and *Optical Setup* in the Start ribbon will automatically generate two empty documents: The *Optical Setup View*, where the overall structure and positioning of your system is visualized, and the *Optical Setup Editor,* that can be used to configure other aspects of the system, like changing the material that fills the space between two elements, for instance.

Note: These two documents are linked to each other. If you close one of them, the other one will automatically close too!
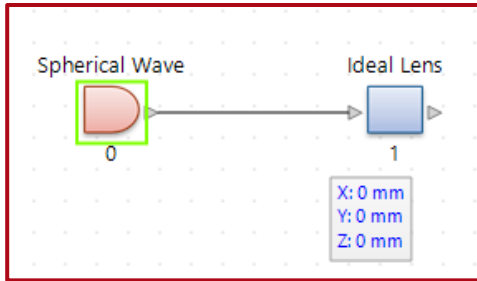
Adding Elements to an Optical Setup

Elements (sources, components, detectors and analyzers) can be added to the system by dragging and dropping them from the list on the left side of the *Optical Setup View* document onto the space on the right. To find a specific element either follow the three-structure or use the search function on the top-left corner.

Once an element has been dropped on the right side, it also will automatically appear as an entry in the *Optical Setup Editor*.
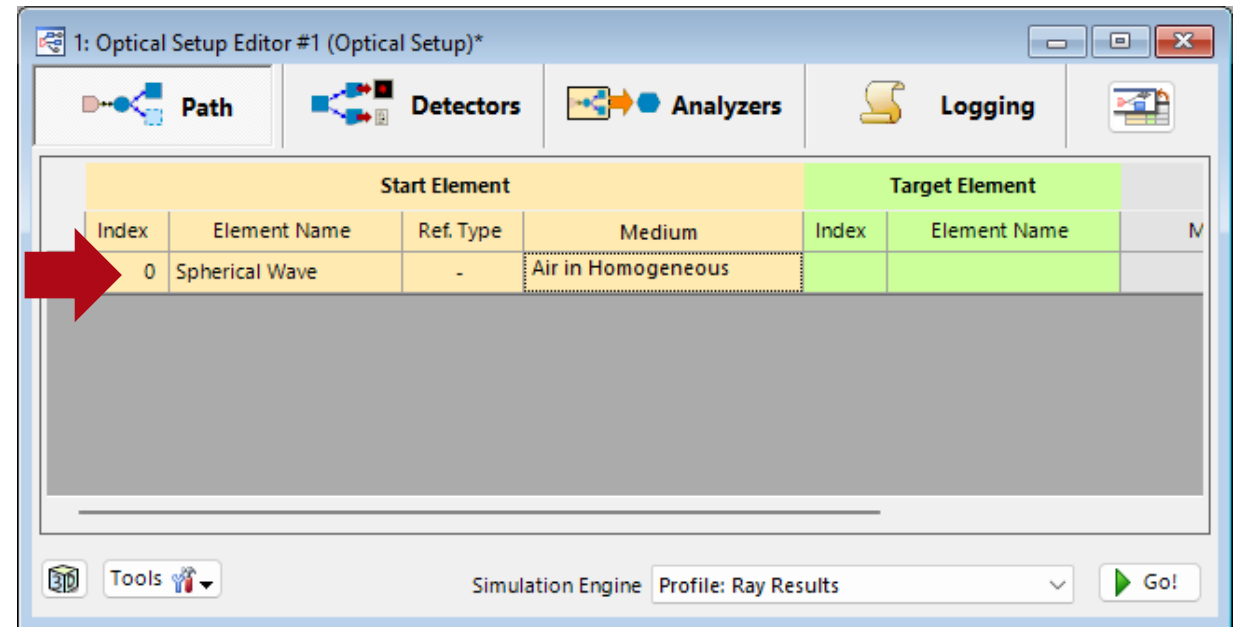
Connecting Elements to Each Other

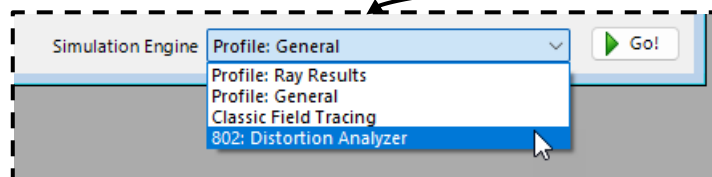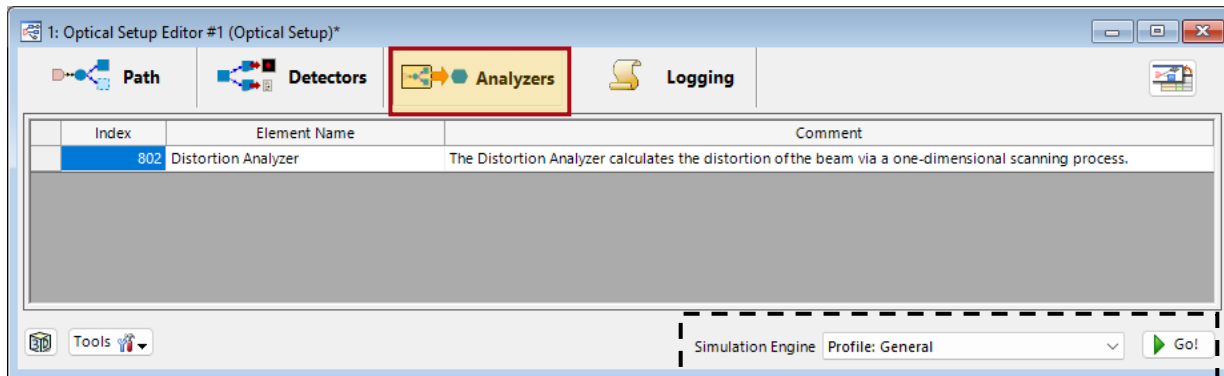To connect an element to another, simply drag and drop a line between them.

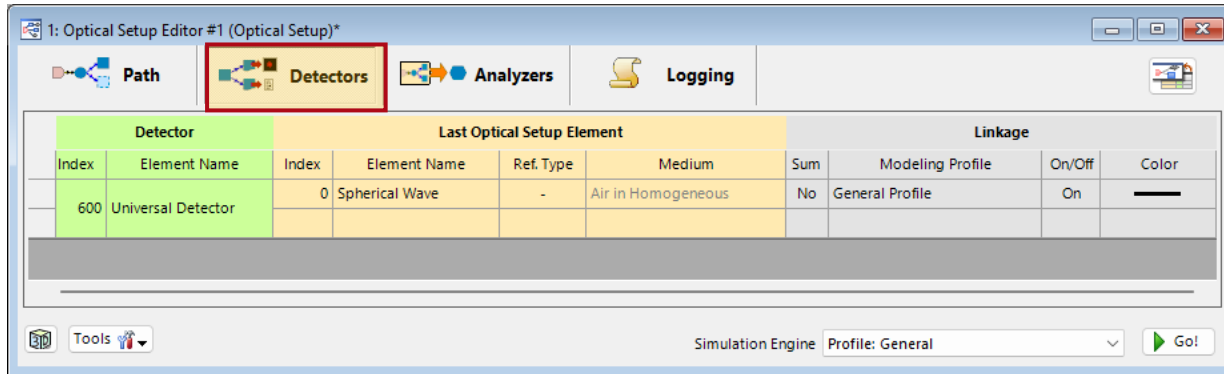The connection will then automatically appear in the Optical Setup Editor, including information about:

1 Name and index (automatically assigned number) of the *Start Element* for each connection.

2 The Reference Type: R stands for *Reflection*, T for *Transmission.*

3 The homogeneous medium that fills the space between the two elements.

4 Name and index of the *Target Element.*

5 The modeling profile used (see: *Configuring Your Simulation in VirtualLab Fusion*)

Detectors & Analyzers

Detectors and *Analyzers* have their own tab in the *Optical Setup Editor*. As *Detectors* work similarly to other components (meaning they need to be connected to an active path to function), their page looks identical to the one for sources and components. *Analyzers* on the other hand are not connected to the system and function more as their own simulation engine, often with a "bird's eye" view of the entire system. Hence, their page mostly includes information about the purpose of the analyzer.
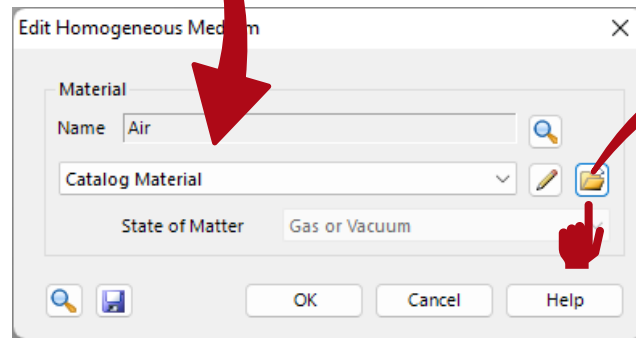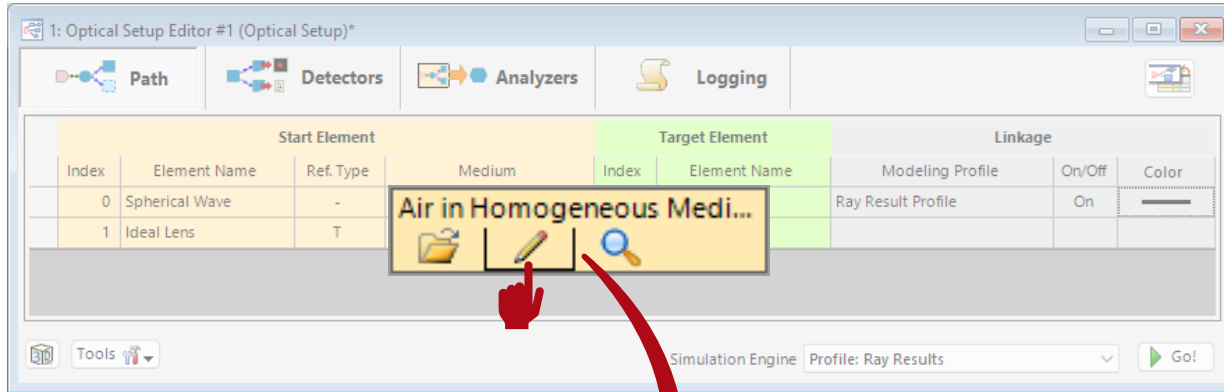
Note: Because of their special nature, analyzers need to be setup as the current Simulation Engine to be run. This can only be done in the Optical Setup Editor.
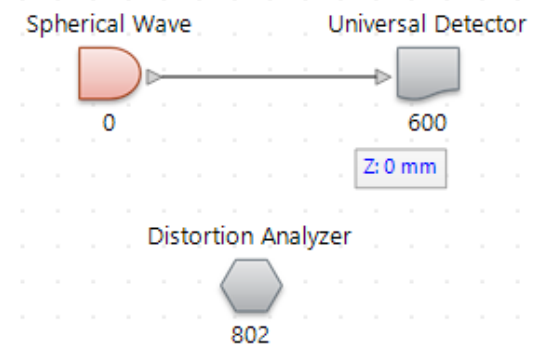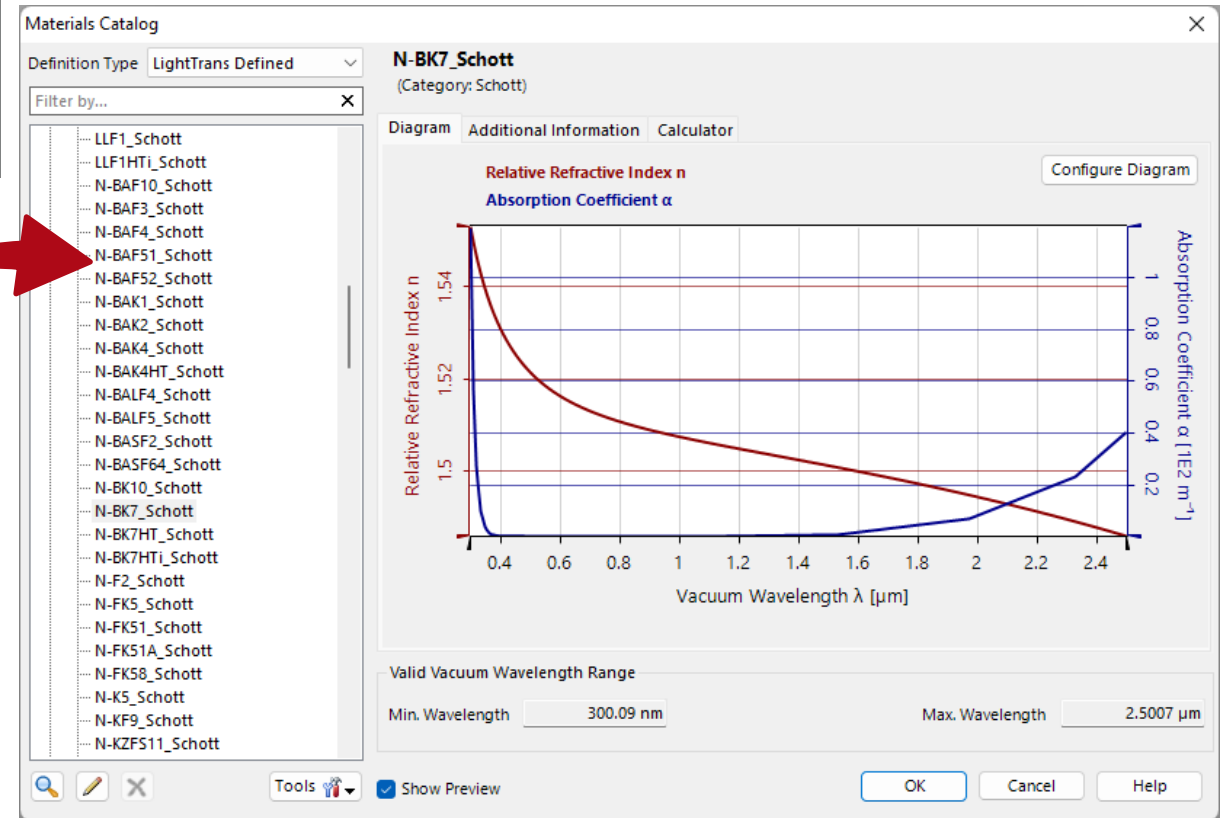
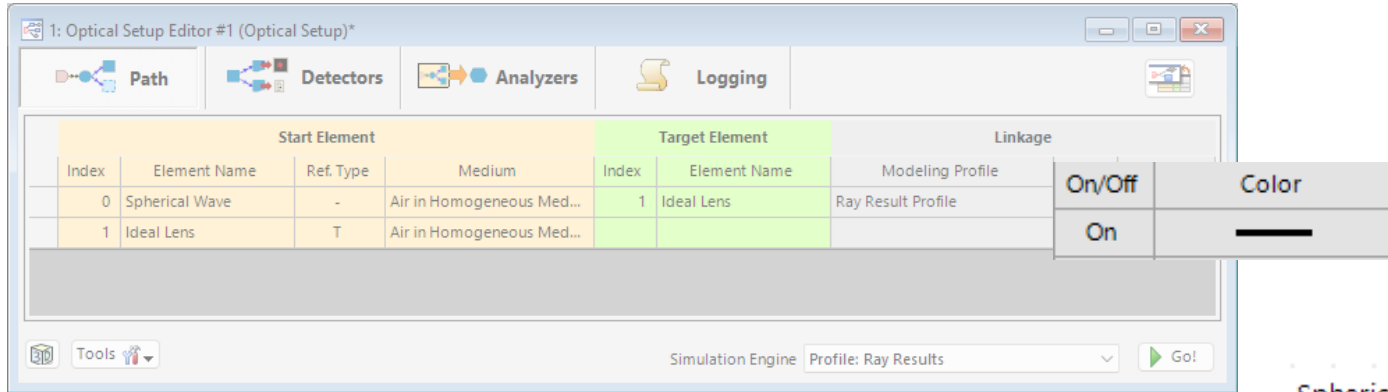# Defining the Medium and Material between Components

Inside the *Optical Setup Editor*, users can define the material that fills the space between two elements in the system.

In VirtualLab Fusion, *Medium* is used to speak of the spatial dependence of the refractive index (e.g. a homogeneous medium), while *Material* refers to dispersion.

Linkages

Note: Double-clicking any linkage in the Optical Setup View *will also activate or deactivate it.*
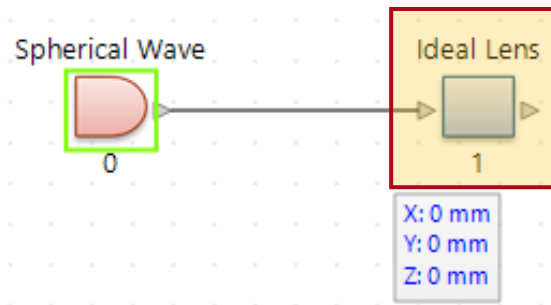
The rightmost column of the *Optical Setup Editor* can be used to customize the linkages between the components. Users can quickly deactivate certain linkages (indicated in the *Optical Setup View* by dashed lines) and even customize the color of any linkage.

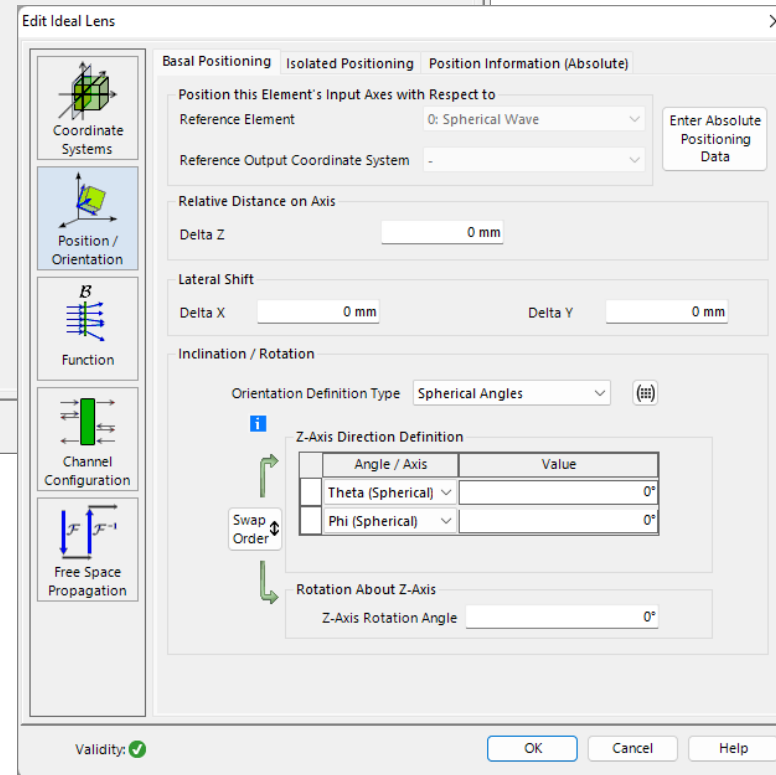Deactivated linkages will not be considered for the simulation, but the connected components will keep their relative positions.
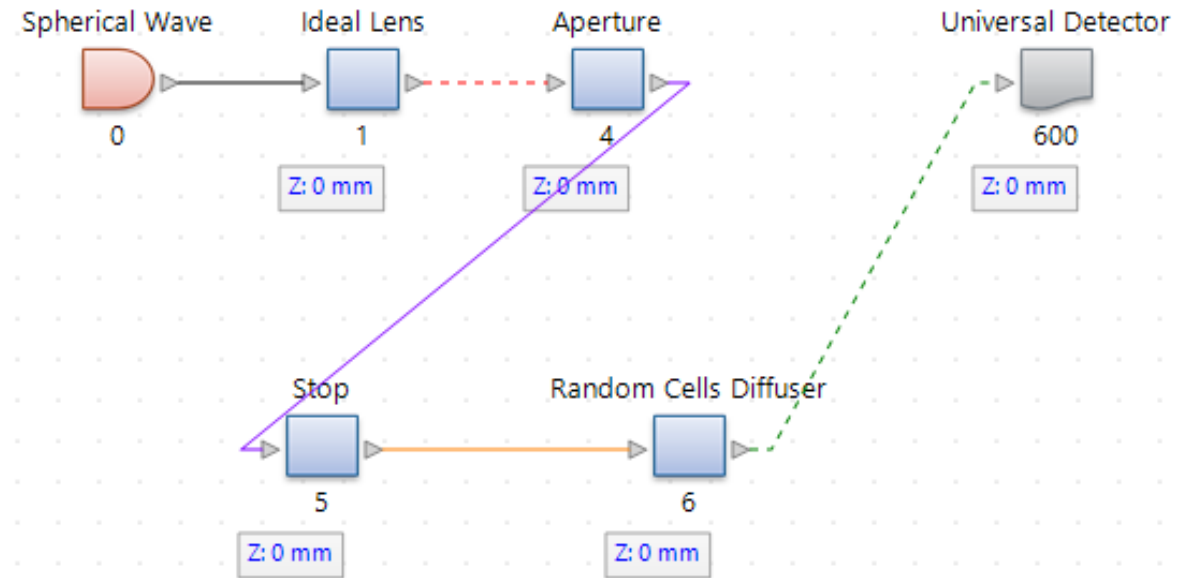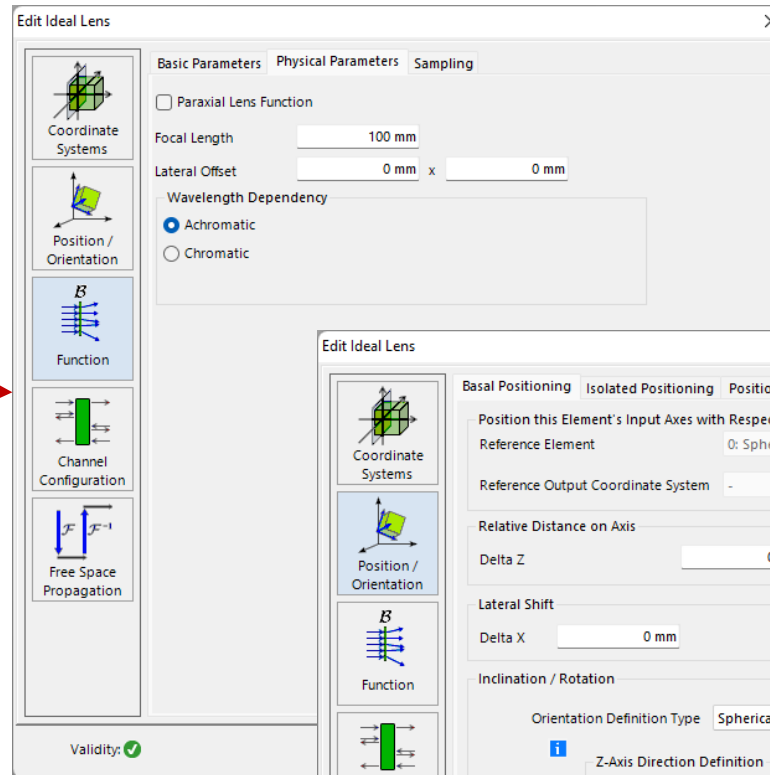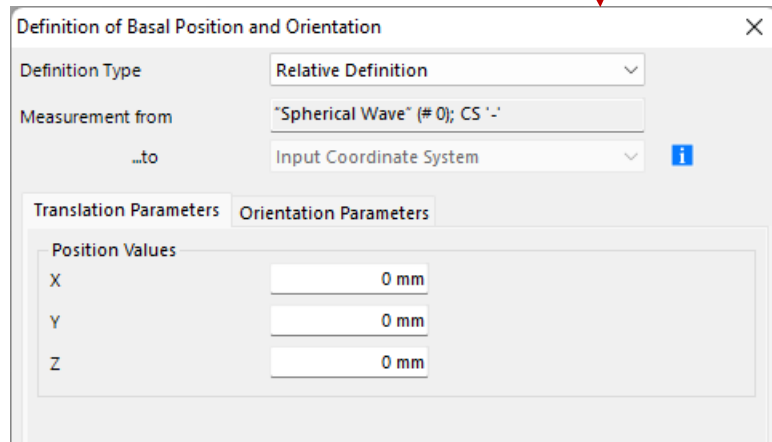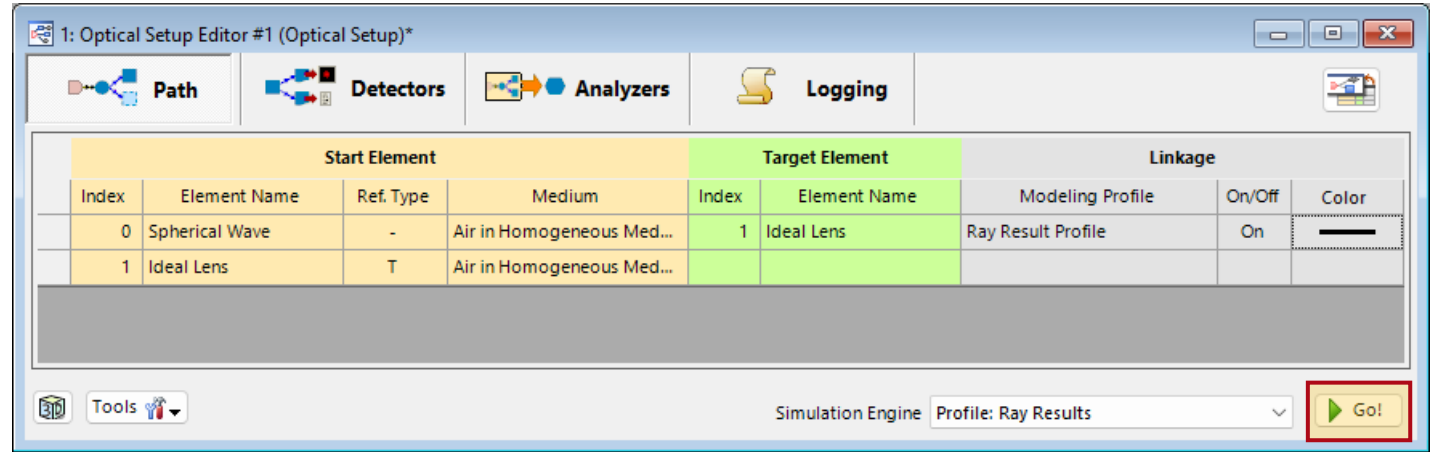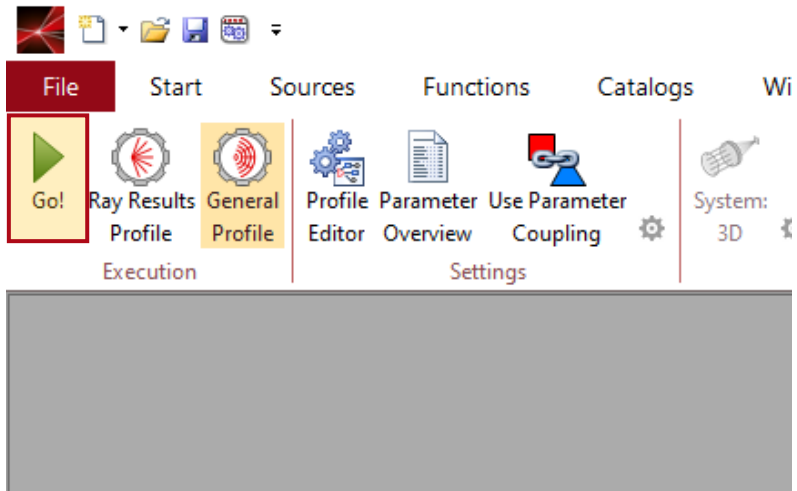
Specifying Position and Parameters of Components

Double-clicking on an element in the *Optical Setup View* will open its *Edit* menu, including options for positioning and its physical parameters.

Note: Double-click on the position control panel below the component to adjust its position.

Performing the Simulation

To actually perform the simulation, simply click on the *Go!* button either in the *Optical Setup Editor* or in the *Profile Editing & Run* menu tab. VirtualLab Fusion will then automatically start the simulation using the active *Simulation Profile*. For more information on how to configure your simulation, take a look at the following documentation:

Configuring Your Simulation in VirtualLab Fusion

Logging
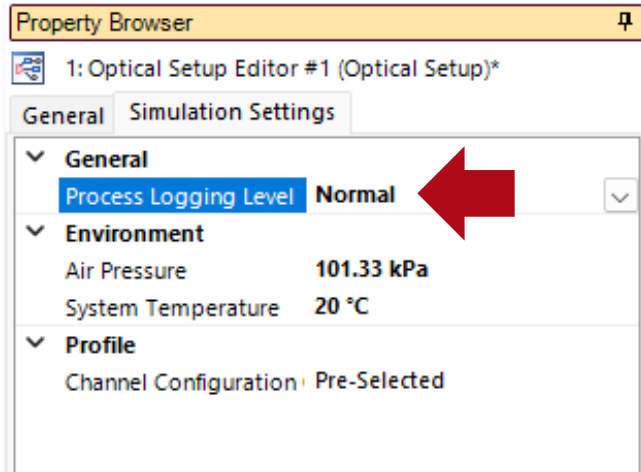
To see the current status of the simulation or to get more information about the internal processes (like which Fourier Transforms was used), *Logging* can be activated in the *Simulation Settings* of the *Property Browser*.
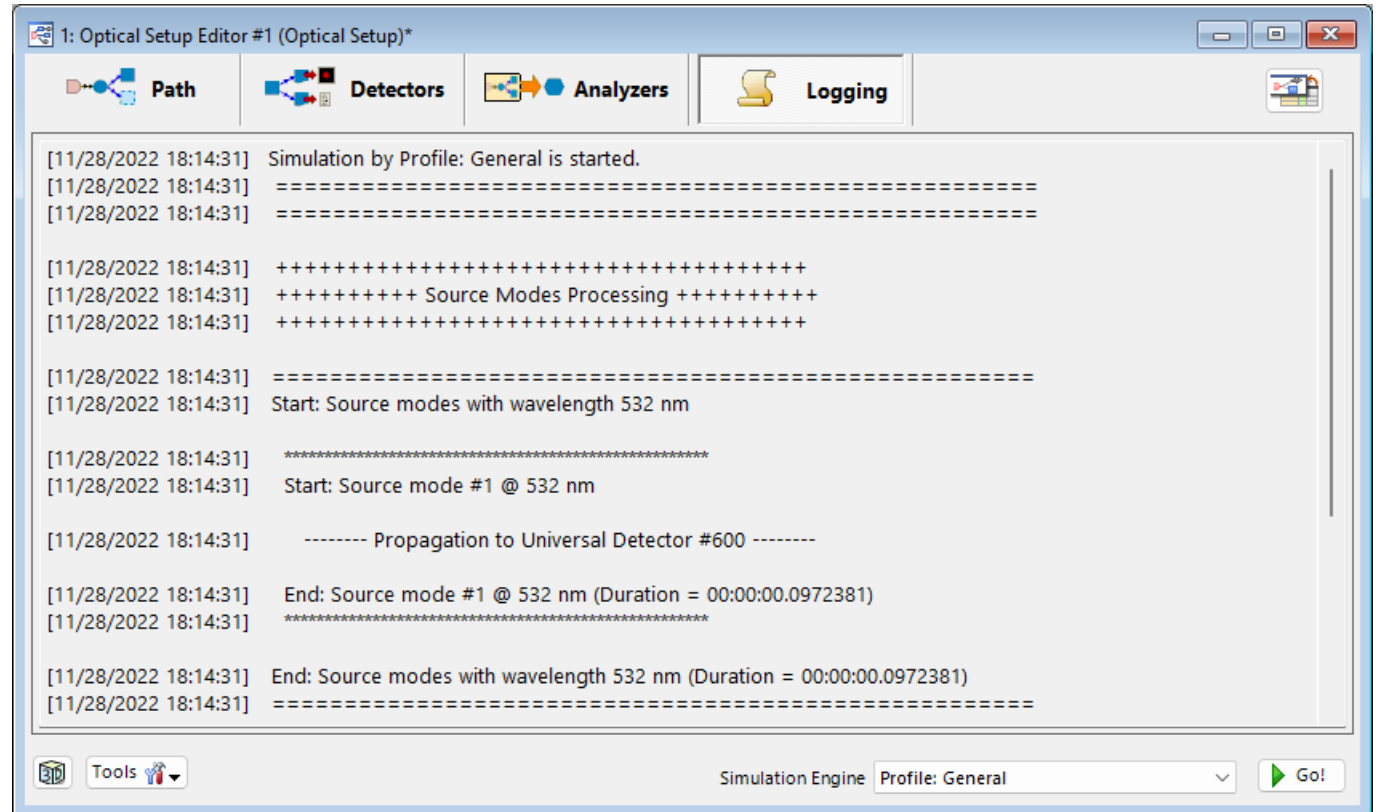
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