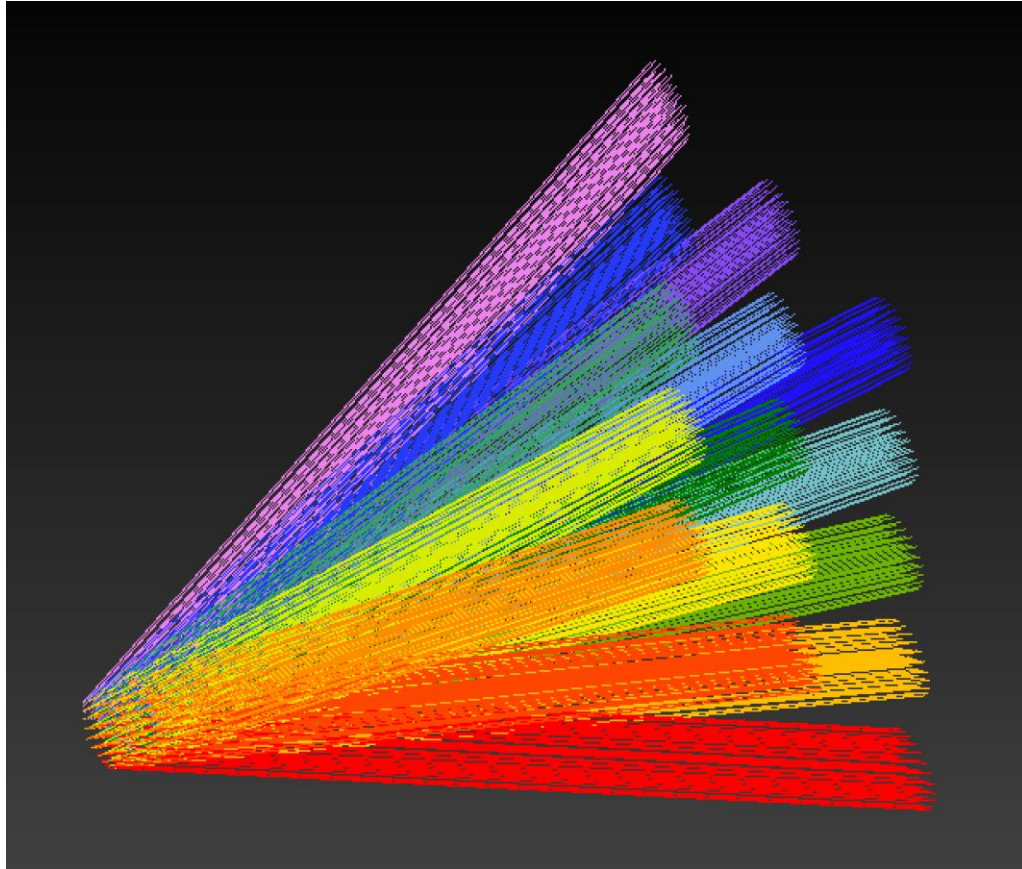# How to Set Up a Scanning Source

Abstract

The *Scanning Source* in VirtualLab Fusion defines a set of ideal planes waves, truncated by an aperture and radiate in different directions. The directions are configured as a raster in the angular space. Such a source finds applications across many different fields: for instance, in a laser scanning system, to analyze the performance of different scanning angles; or in an imaging system to sample the field of view. Together with the Parameter Run, the directions/angles can be scanned in different modes, and it can be flexibly configured for specific applications.

Basic Parameters

The *Basic Parameters* tab defines the aperture shape and size that truncates the ideal plane waves.

- For each scanning angular direction, there is one mode representing the field.

- The aperture shape and size is defined in the plane orthogonal to the mode direction or with the source plane as reference. This can be specified in the tab *Specific Parameters*.

- Furthermore, the width of a smooth cosine-shaped edge that, for sampling considerations, is applied to the aperture, can be defined in absolute terms or as a percentage of the size of the aperture.
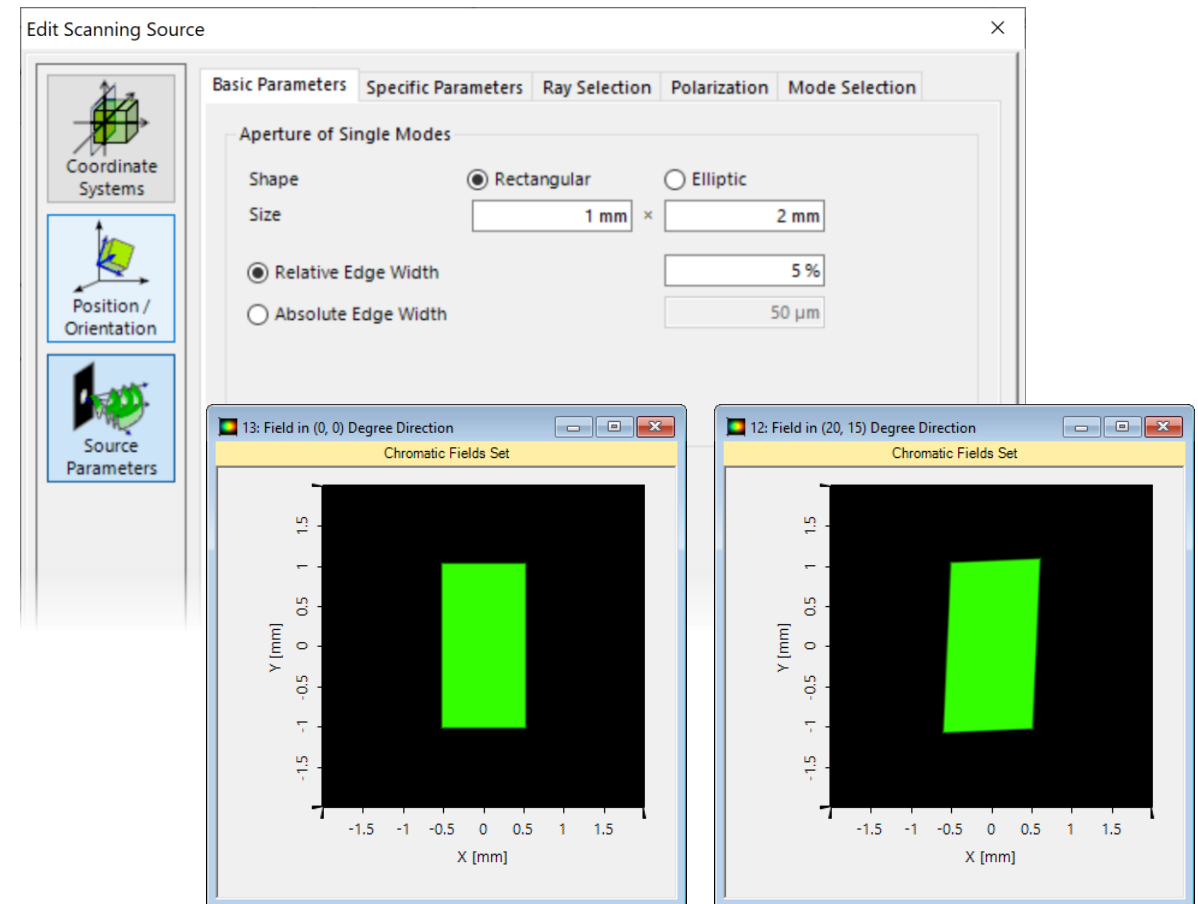

mode in (0°, 0°) direction on the input plane

mode in (20°, 15°) direction on the input plane

Specific Parameters – Intensity

The *Specific Parameters* tab controls the intensity and angular settings of the source.

- The distribution of the intensity over the different angles can be set:
  - according to a desired variation through a pixelated *Chromatic Fields Set* or image file, with the value of each pixel controlling the intensity assigned to each plane-wave mode. In this case, the wavelengths are chosen from the input,
  - or constant over all scanning angles for one wavelength. In this case it is possible to manually set the number of direction samples that will span the selected angular range horizontally and vertically.
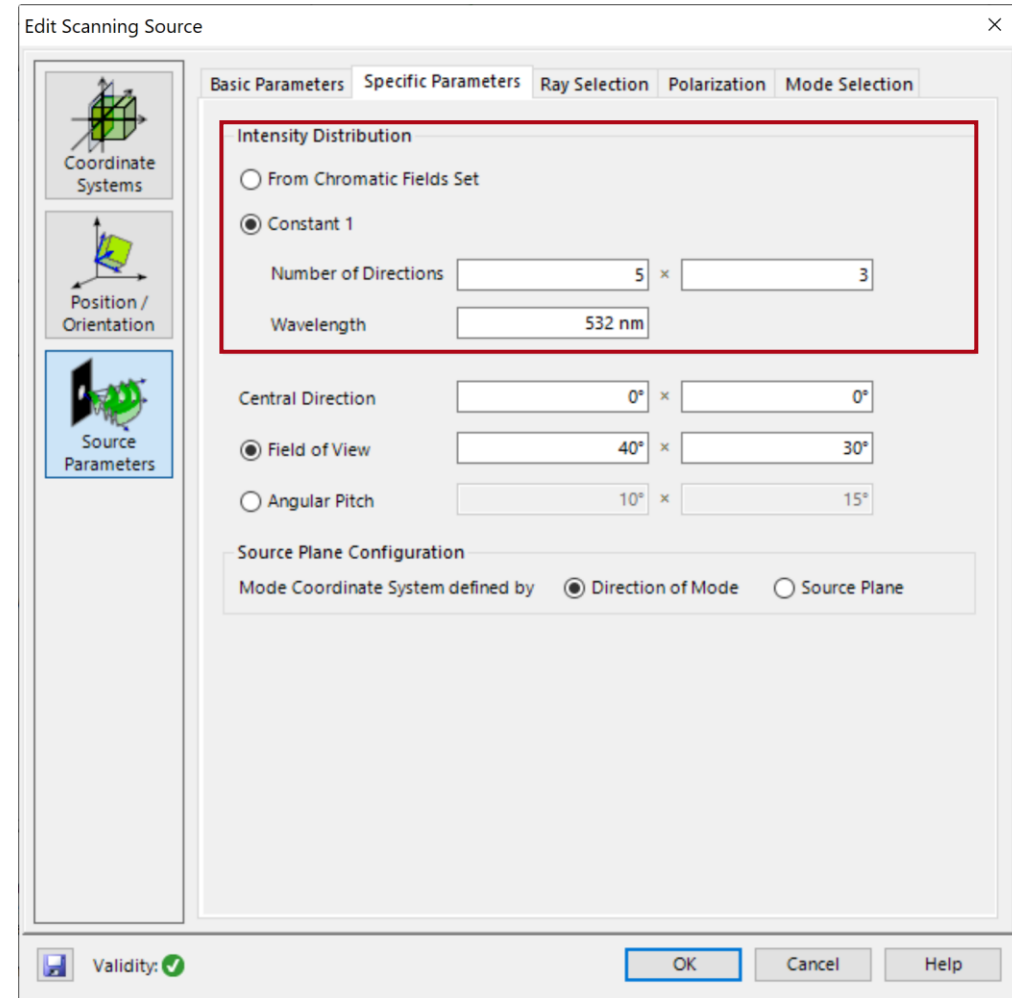
Specific Parameters – Angular Settings

The *Specific Parameters* tab controls the intensity and angular settings of the source.

- You can set the *Central Direction*, i.e. the direction around which the selected range will be centered. This direction will be assigned to a mode when the *Number of Directions* is odd.

- The scanning range can be configured either through the total desired *Field of View* or through the *Angular Pitch* separating the individual plane-wave modes.
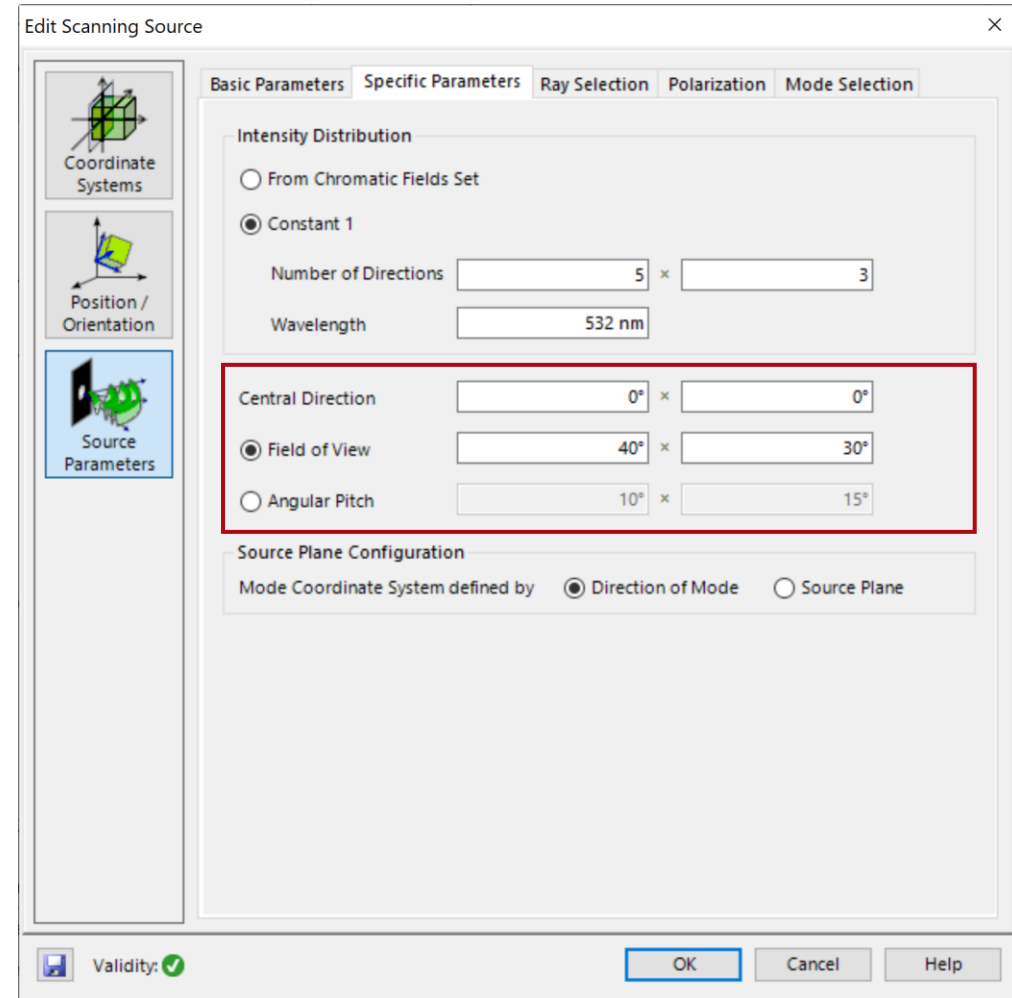
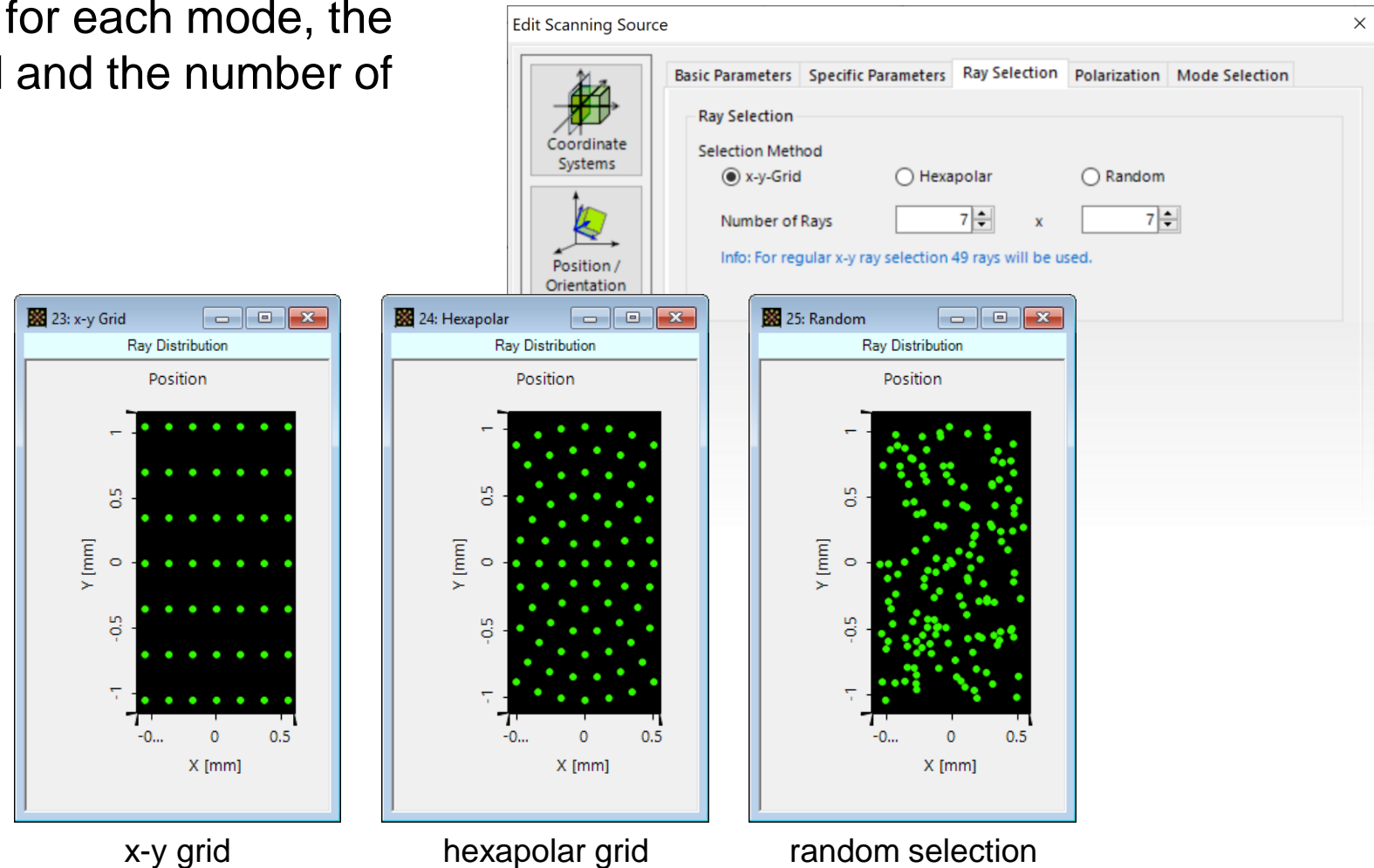# Specific Parameters – Coordinate System

The *Specific Parameters* tab controls the intensity and angular settings of the source.

- The coordinate system can be defined commonly for all modes, with *x* and *y* contained in the source plane and *z* pointing forward into the rest of the system, or it can be defined individually for each mode, with *z* pointing along the direction of the mode and *x* and *y* perpendicular to it.

- This will have an effect on how the aperture configured in *Basic Parameters* is applied (as shown below), as well as on the coordinate system with respect to which the polarization state of each mode configured in the *Polarization* tab is defined.

Direction of Mode   Source Plane
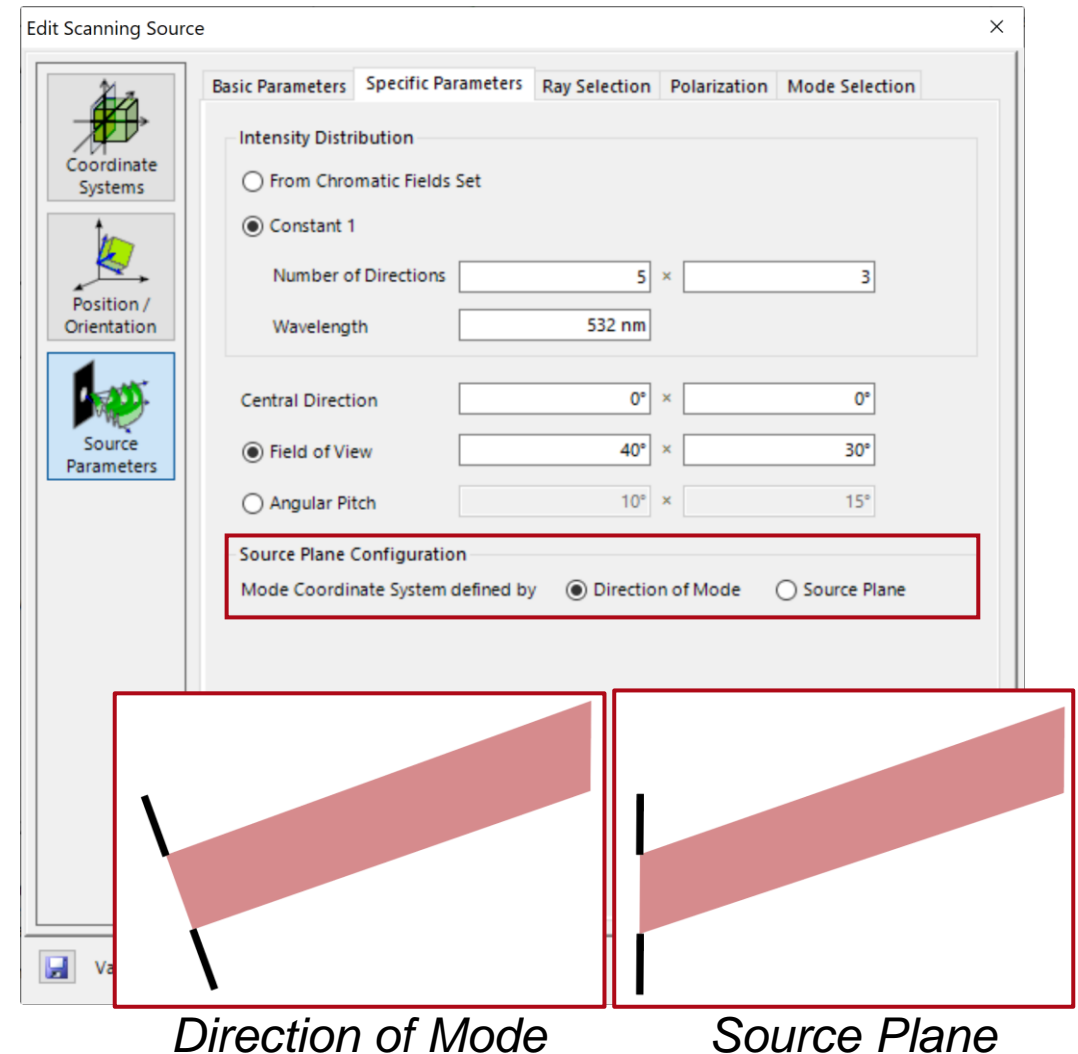
Ray Selection

In the *Ray Selection* tab, for each mode, the desired selection method and the number of rays can be specified.

x-y grid   hexapolar grid   random selection
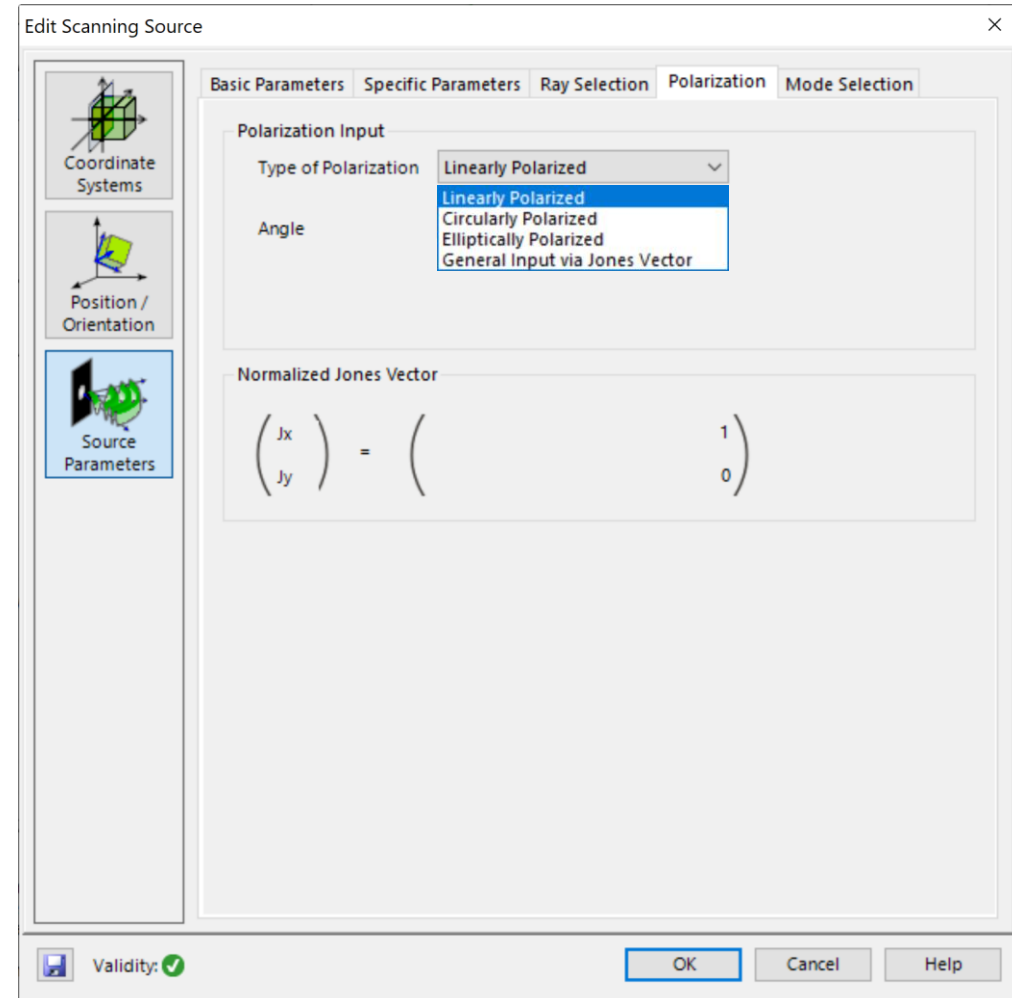
Polarization Settings

The *Polarization* tab provides the polarization options for all scanning directions.

The polarization state will be applied per mode according to the coordinate system configured under the tab *Specific Parameters*.

The polarization state can be:

- linear,
- circular,
- elliptical,
- general input via Jones matrix.

Mode Selection

In the *Mode Selection* tab there are different options provided. It is possible to activate all or a given subset of the modes previously configured for subsequent simulations:
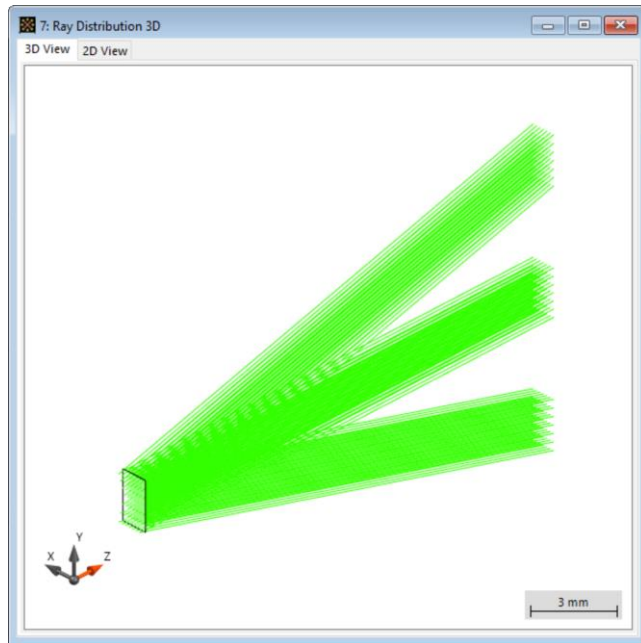
- The wavelengths can be selected individually or all together.

- The scanning direction can be chosen within a specified column or row of angles or can be chosen as a single direction. It is also possible to choose all directions at once.
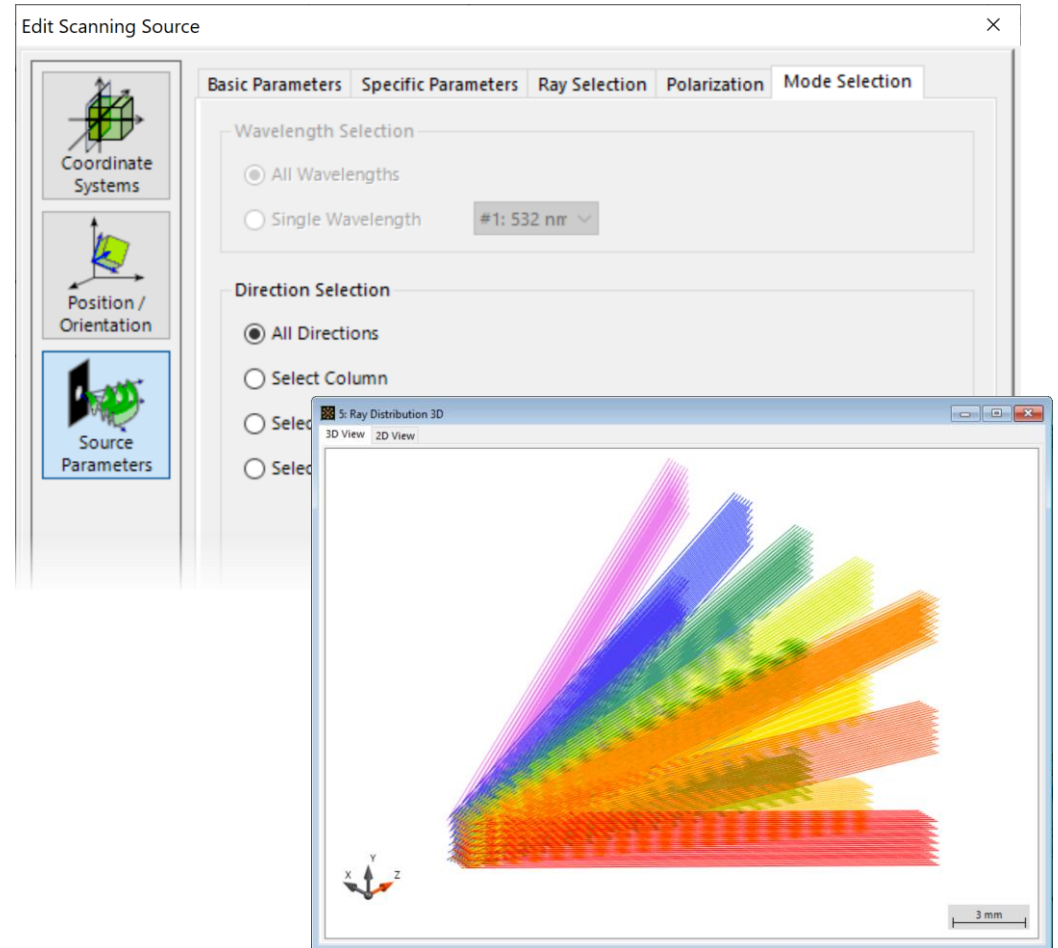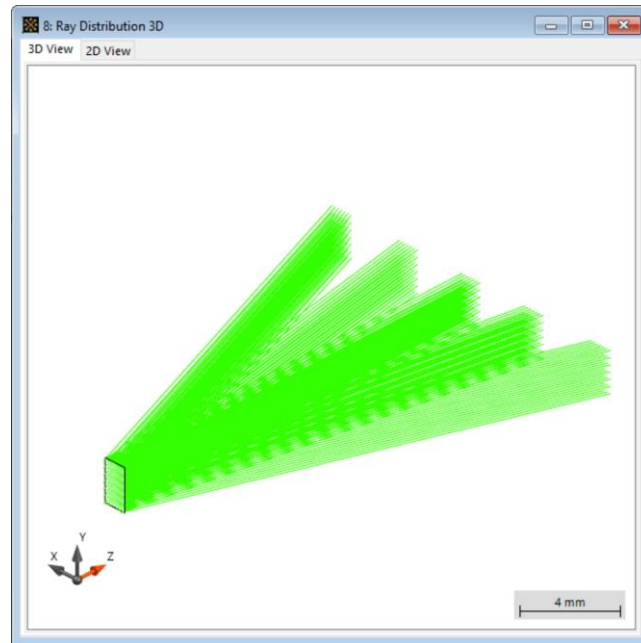

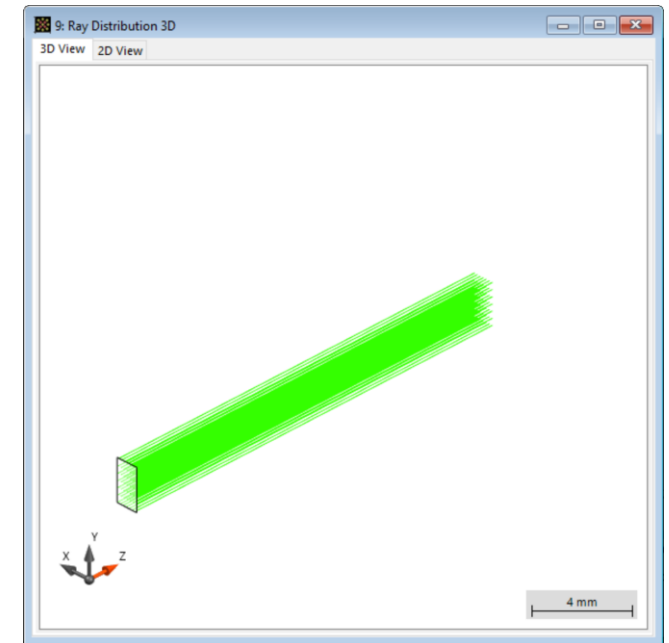with all scanning directions

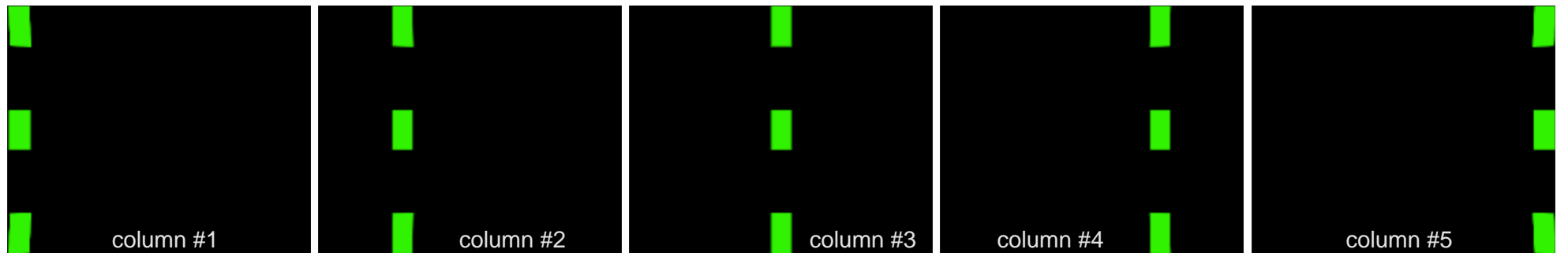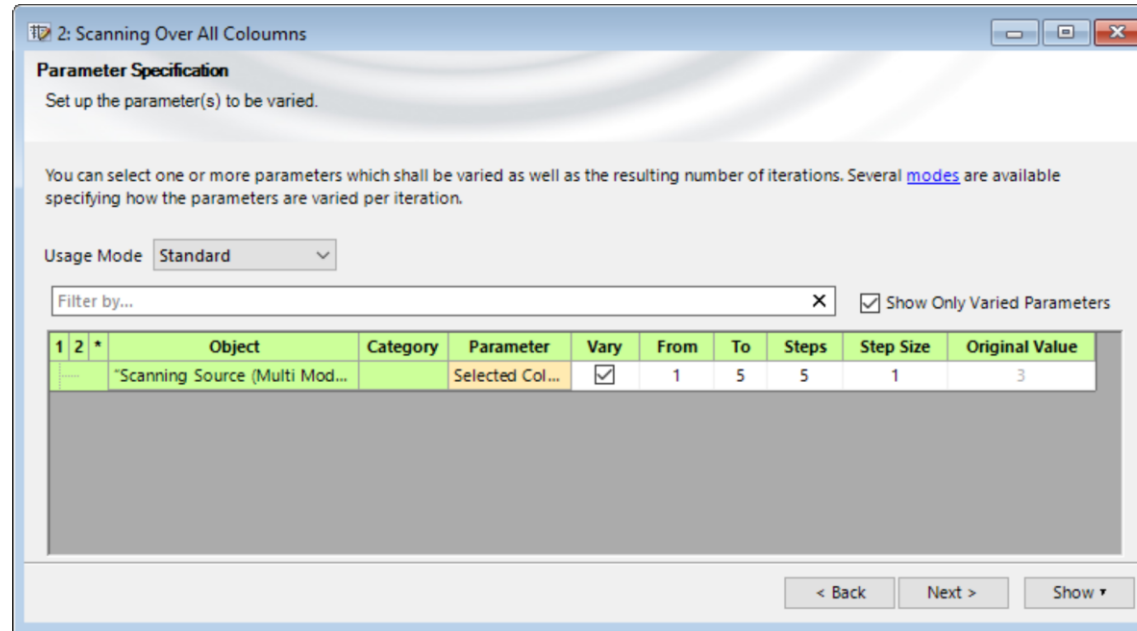# Mode Selection

Single column

Single row

Single direction
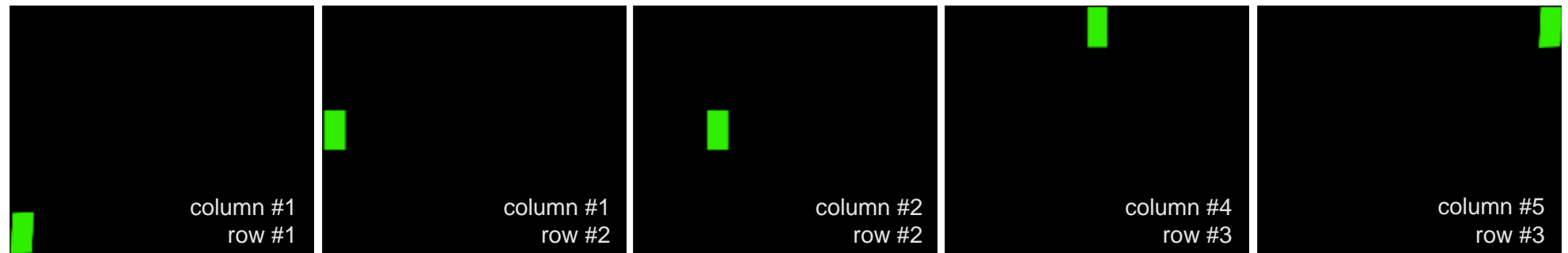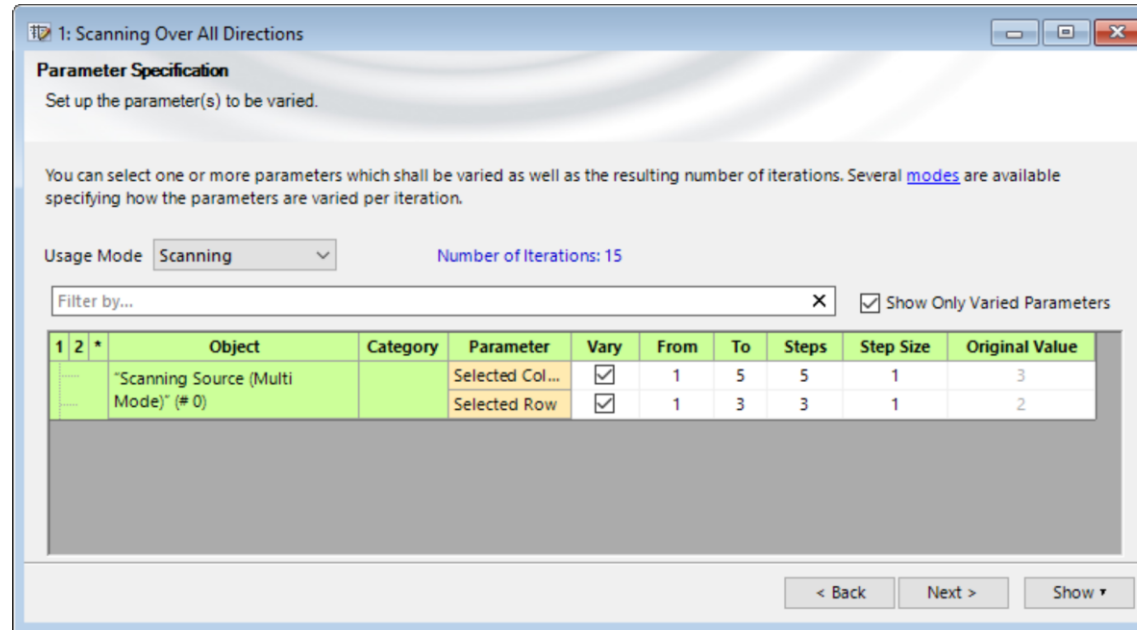
ParameterRun – Scanning over Columns/Rows

- In the *Mode Selection* tab, check select column.
- Start *Parameter Run* and scan over selected column index.
- In a similar way, one can also scan over rows.

scanning from column 1 to 5

ParameterRun – Scanning over Each Single Direction

- In the *Mode Selection* tab, check select direction.

- Start *Parameter Run* and switch to scanning mode. Then scan over selected column and row indices.

scanning over all directions, with selected indices

Document Information

title	How to Set Up a Scanning Source
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document version	1.2
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further reading	- Performance Evaluation of an F-Theta Scanning Lens - How to Set Up a Panel-Type Source - Modeling of a HoloLens 1 - Type Layout with Light Guide Component