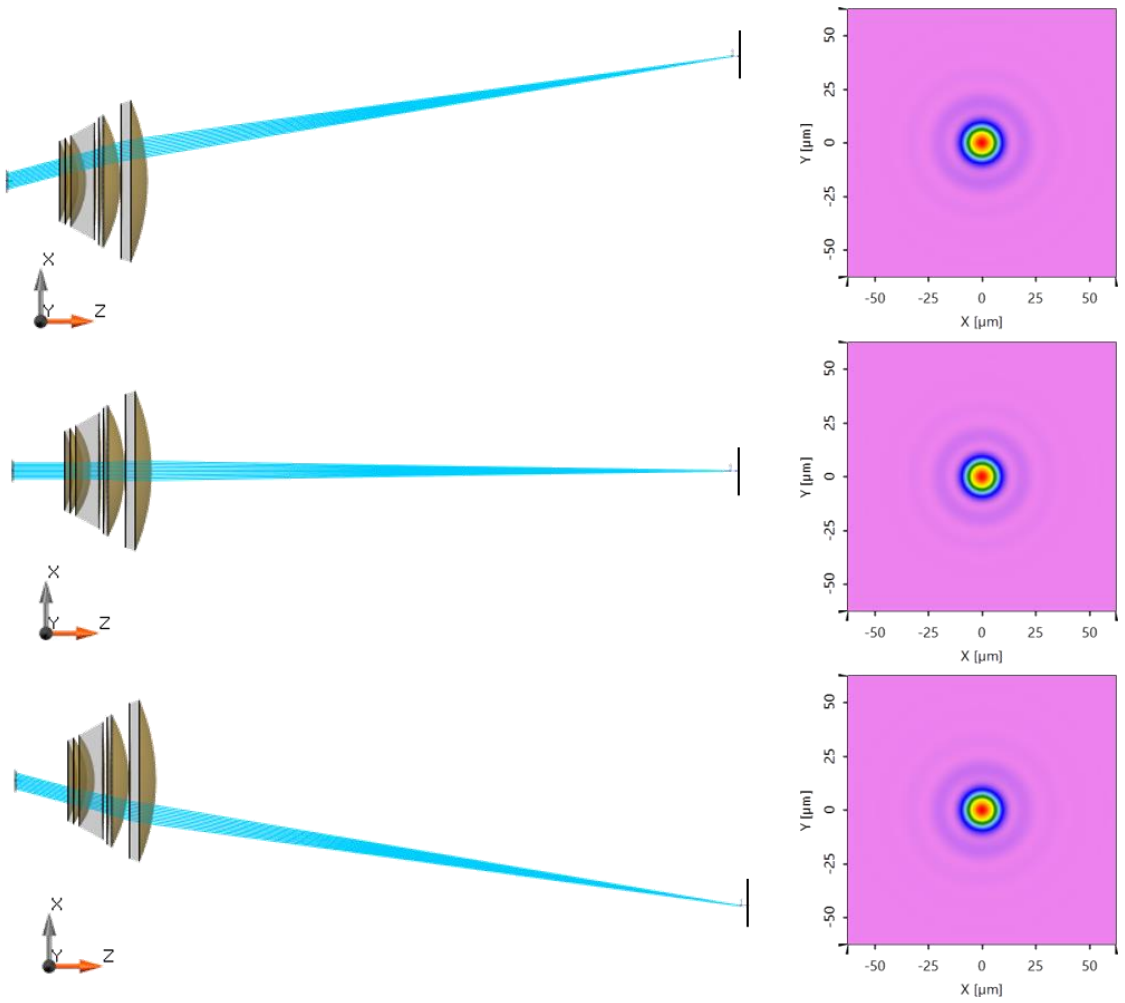
Automatized Detector Positioning by using Parameter Coupling

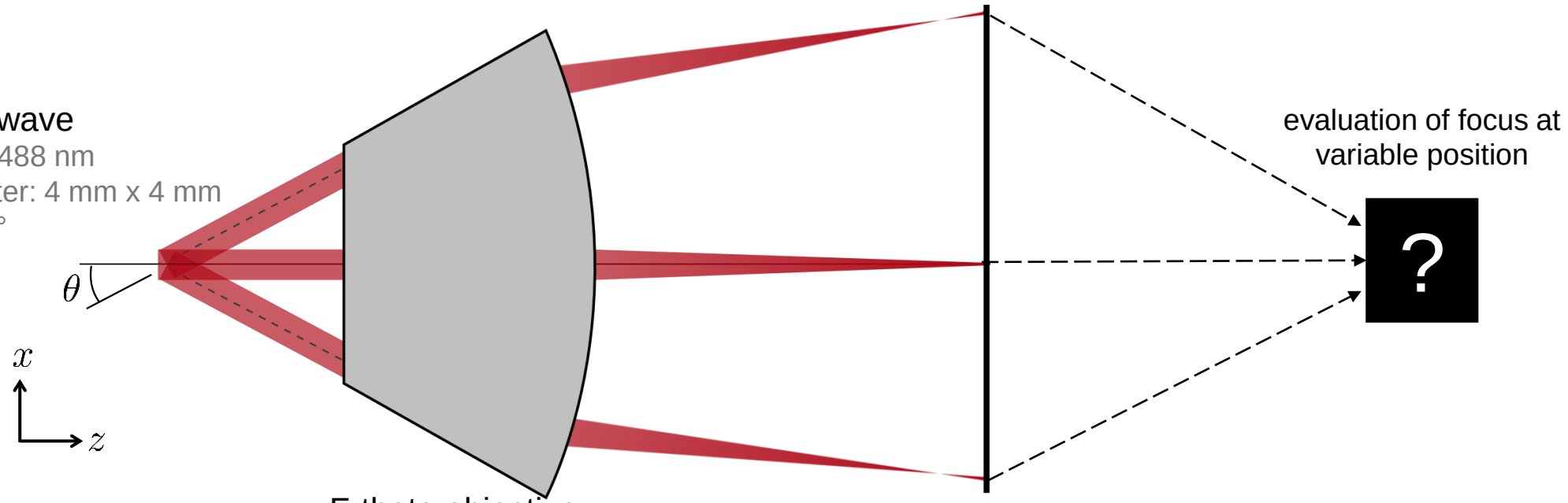
Abstract



In this example, the focus (PSF) of an F-theta objective is investigated for certain angles of incidence. In order to avoid the superfluous computational effort introduced by the shift of the resulting foci with off-axis illumination, the detector position is shifted according to the main propagation direction of the light. VirtualLab's Parameter Coupling tool is applied to automatically handle this adjustment of the detector position.

Modeling Task

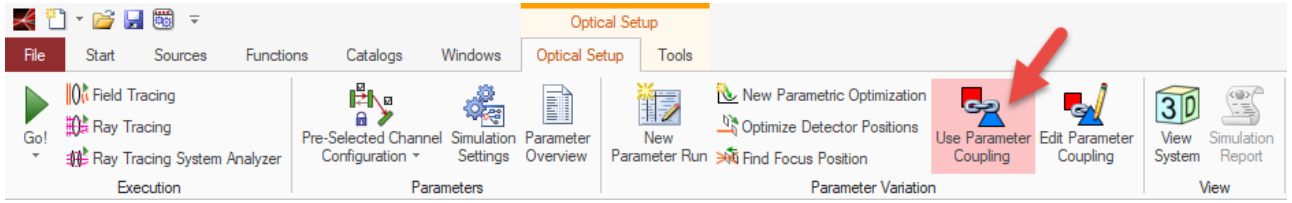
source: plane wave
- wavelength: 488 nm
- beam diameter: 4 mm x 4 mm
- theta: 0, ±15°

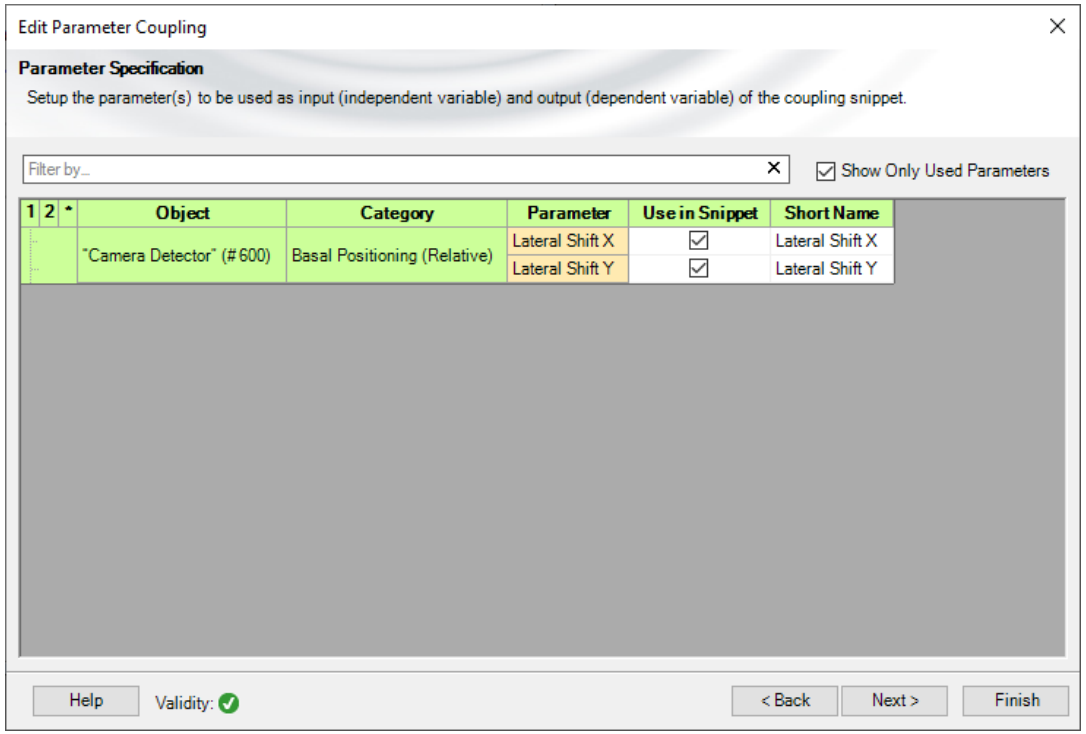


evaluation of focus at variable position

F-theta objective
- effective focal length $f_{eff} = 100.18\,mm$
- from patent USP 4436383

Automatic Detector Positioning via Parameter Coupling





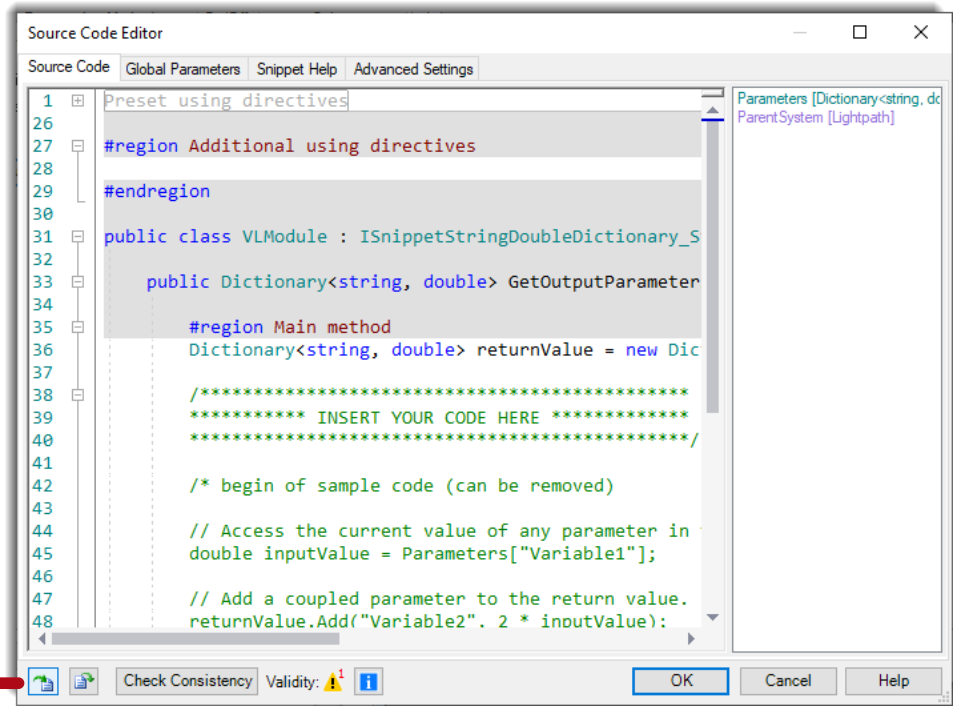
Parameter Coupling allows the user to define the variation of the desired system parameters through a small script “snippet”.

As a result, any change of the value of the independent input parameter will simultaneously result in a change of the dependent (coupled) parameter.

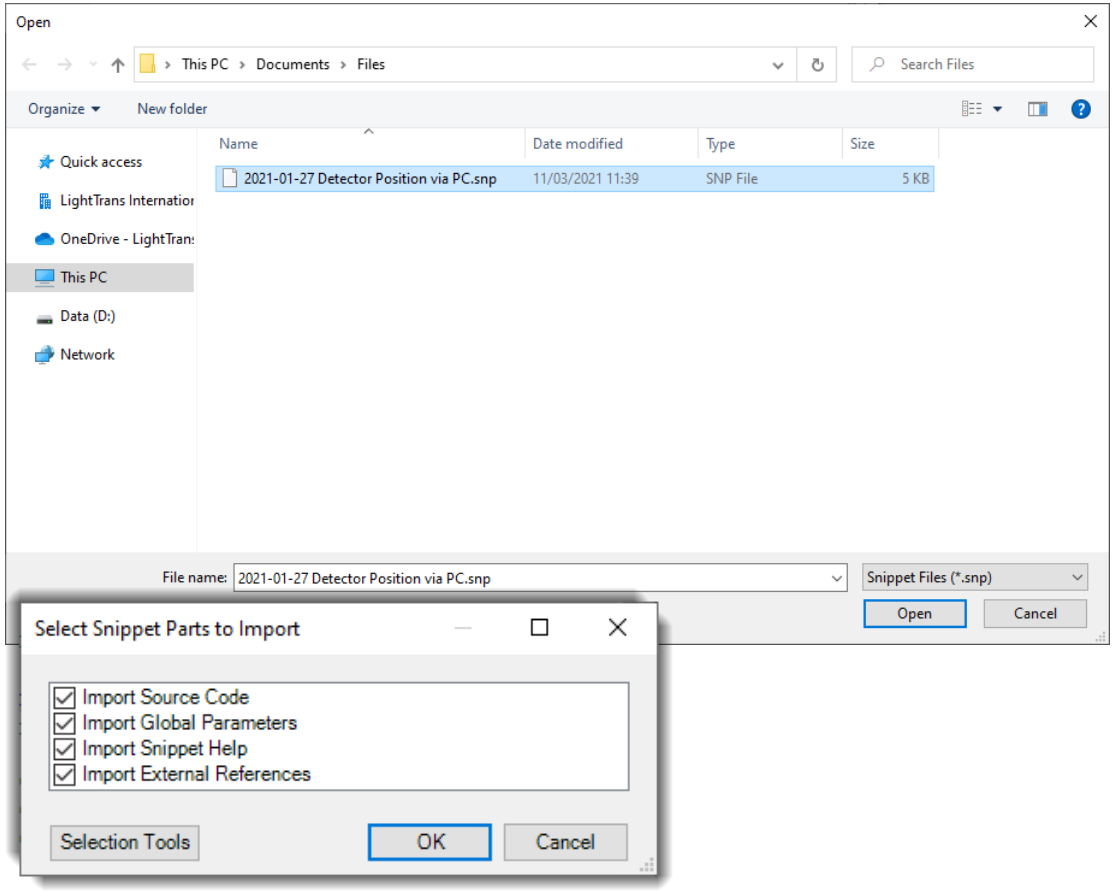
In this example, we couple the lateral position of the desired detector to coincide with the position of chief ray.

Parameter Coupling Procedure

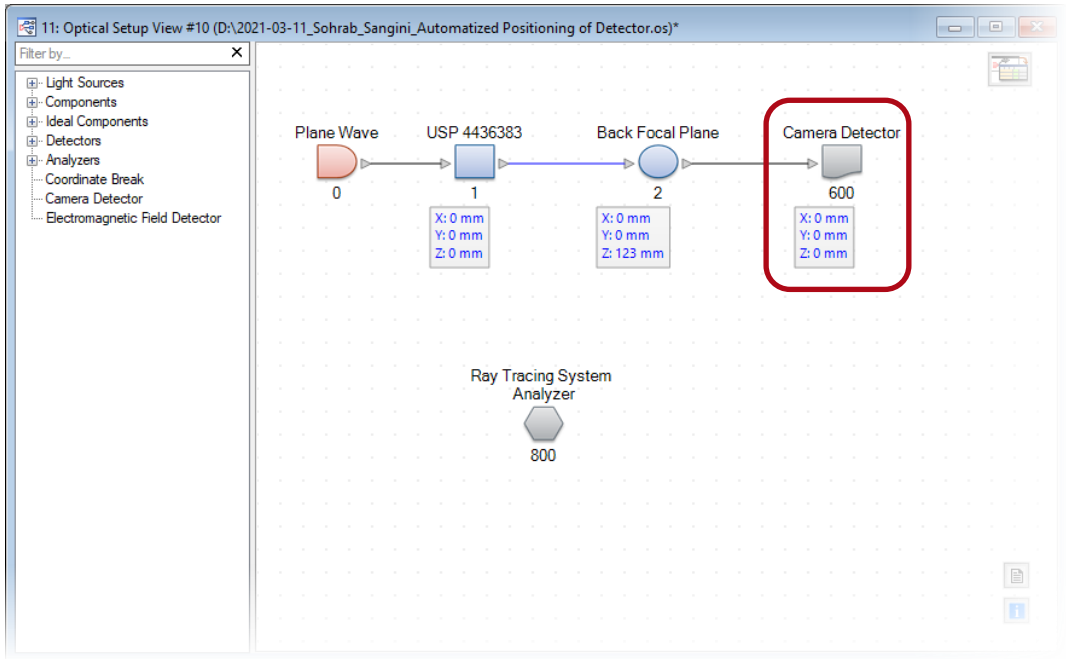
In order to find the appropriate lateral position of the detector, an additional ray tracing step is performed by the applied Parameter Coupling snippet. This particular snippet can be imported:

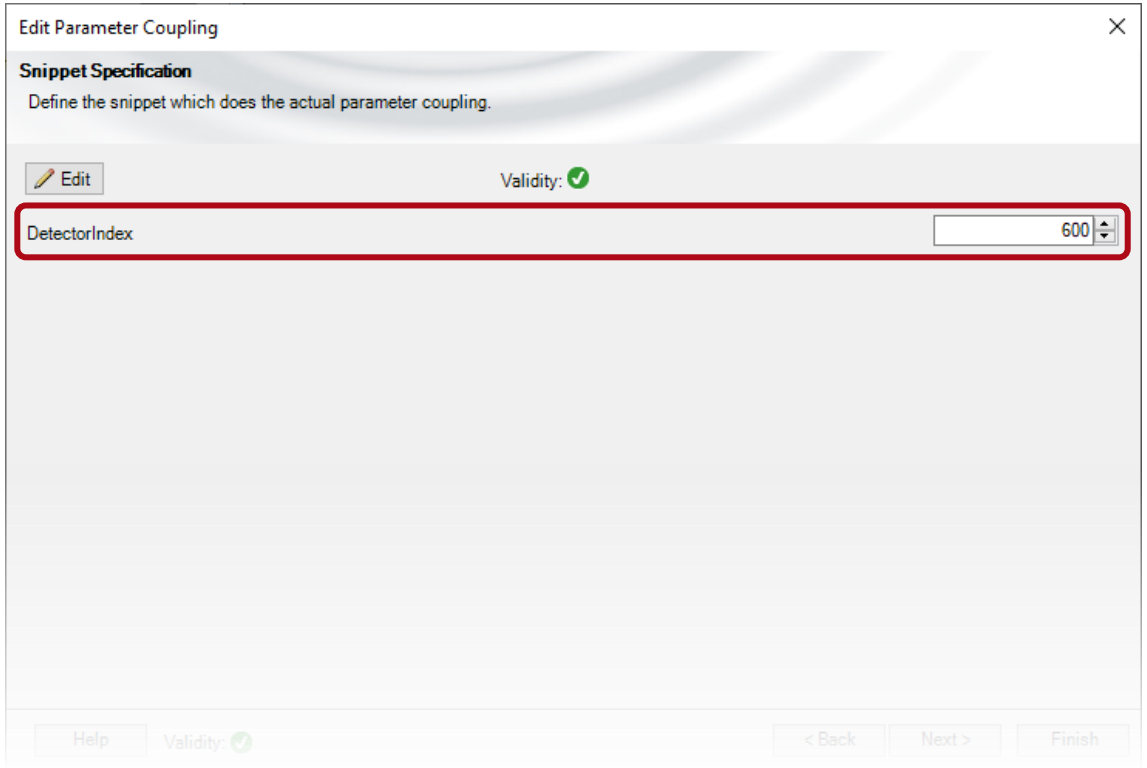


import snippet



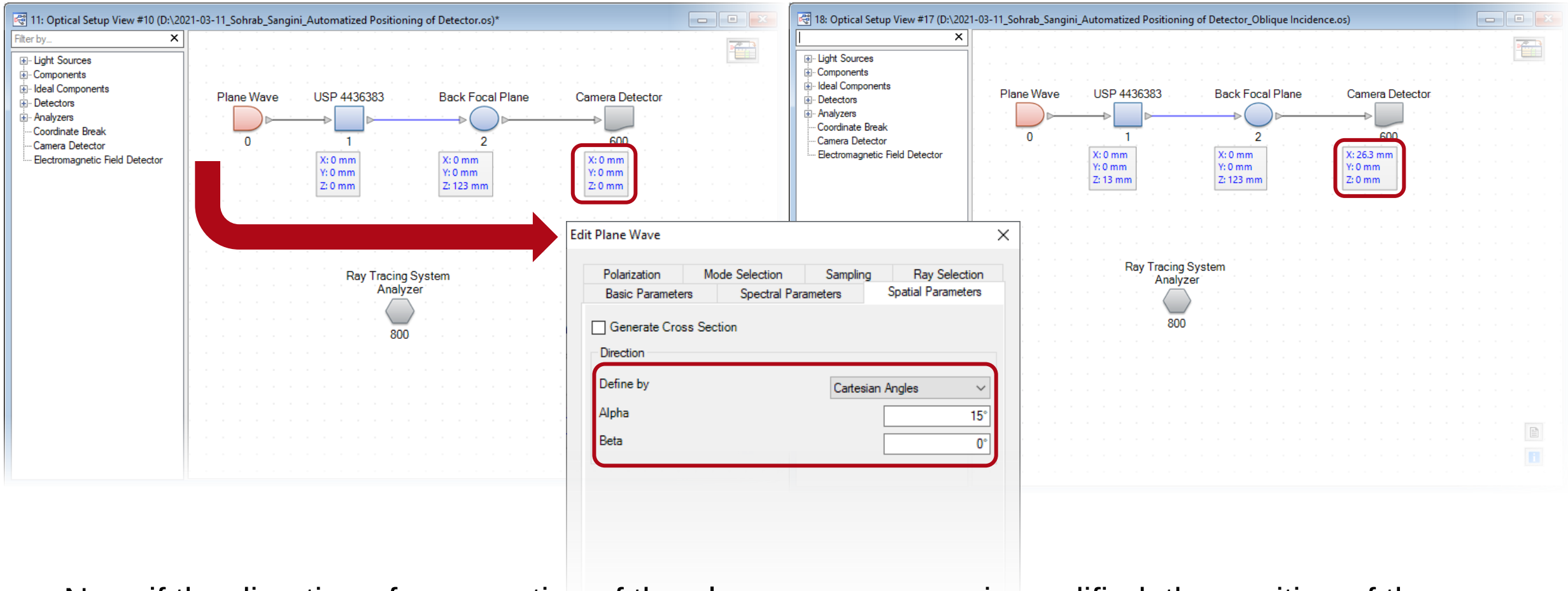
Detector Index Selection





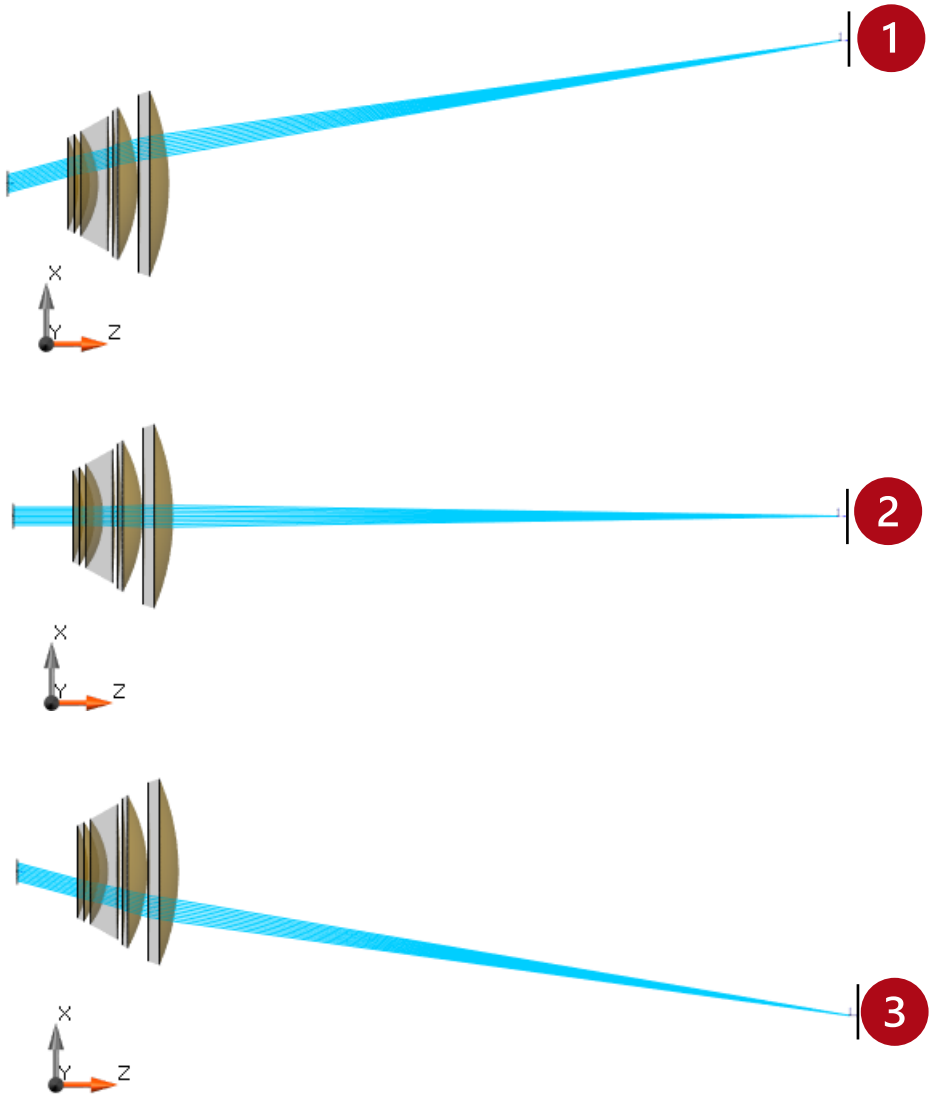
The unique index of the detector has to be specified in the specification tab of the snippet.

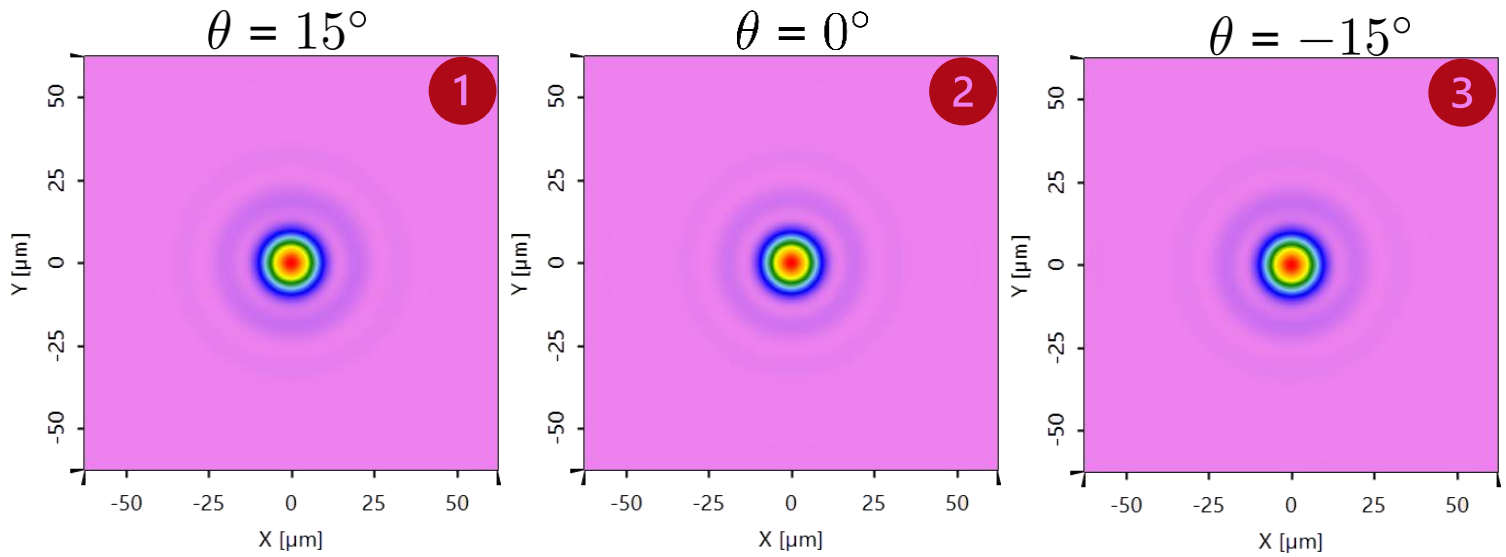
Oblique Incidence



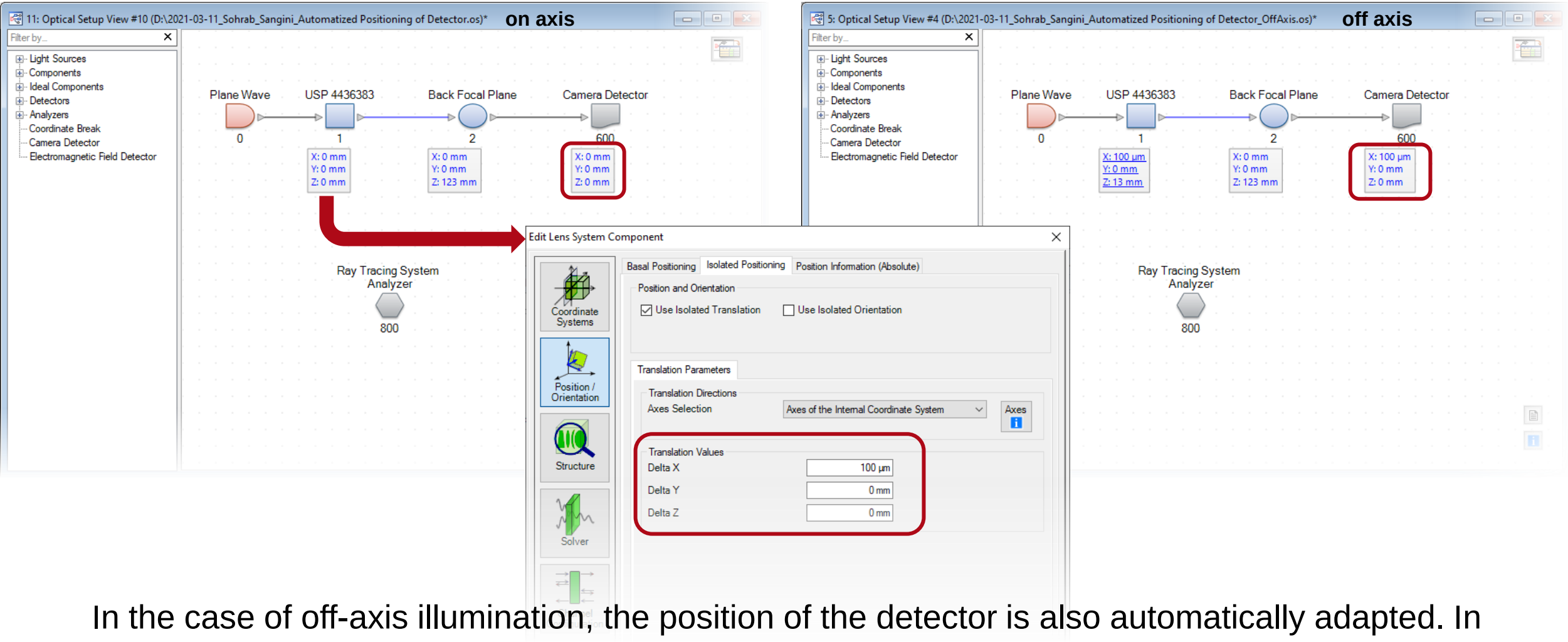
Now, if the direction of propagation of the plane-wave source is modified, the position of the detector is automatically adapted. In this example, an angle of 15° will lead to a shift of 26.3 mm in x direction.

Performance Evaluation – Oblique Incidence



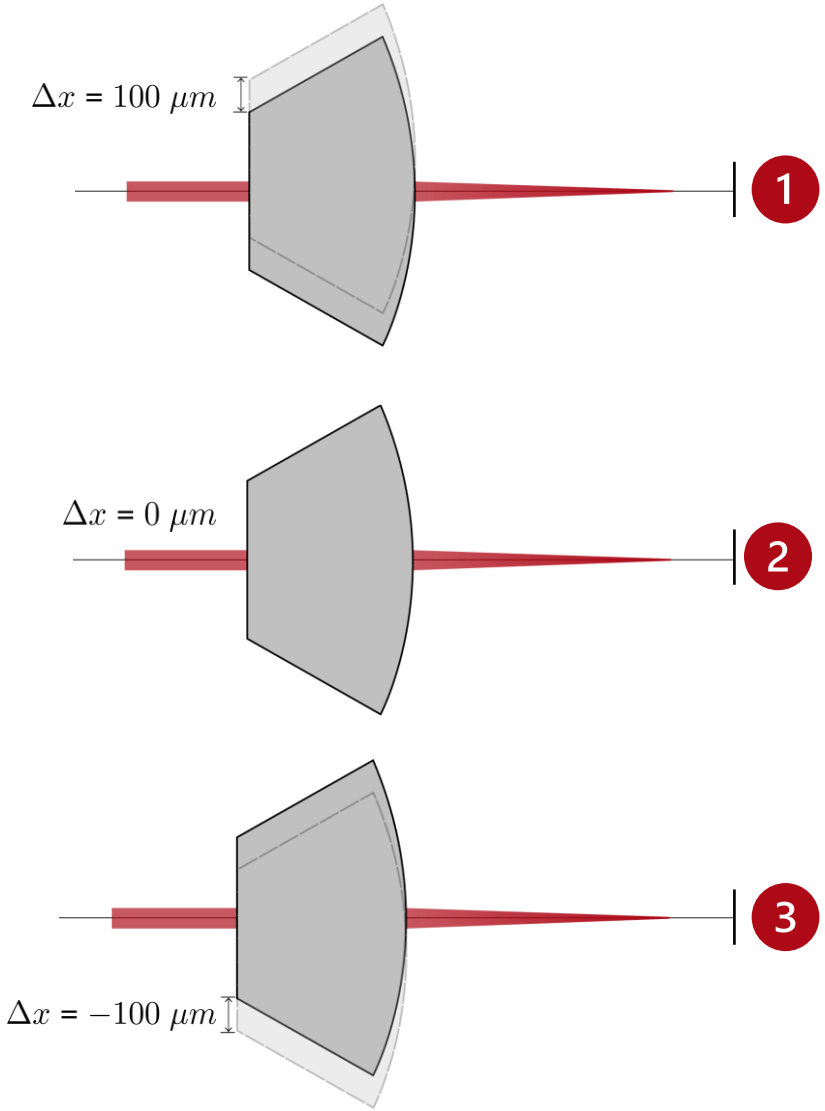


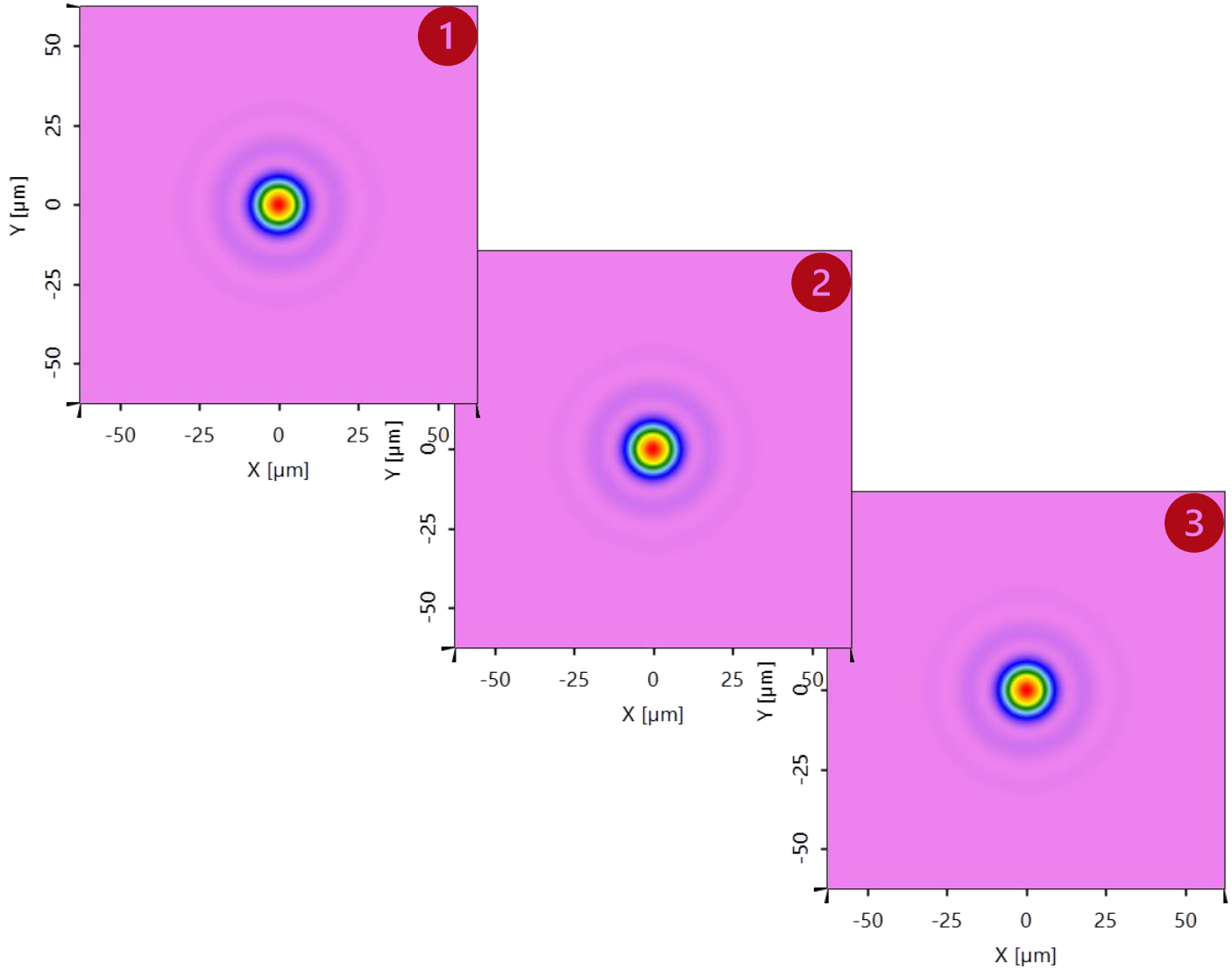
On- & Off-Axis Illumination



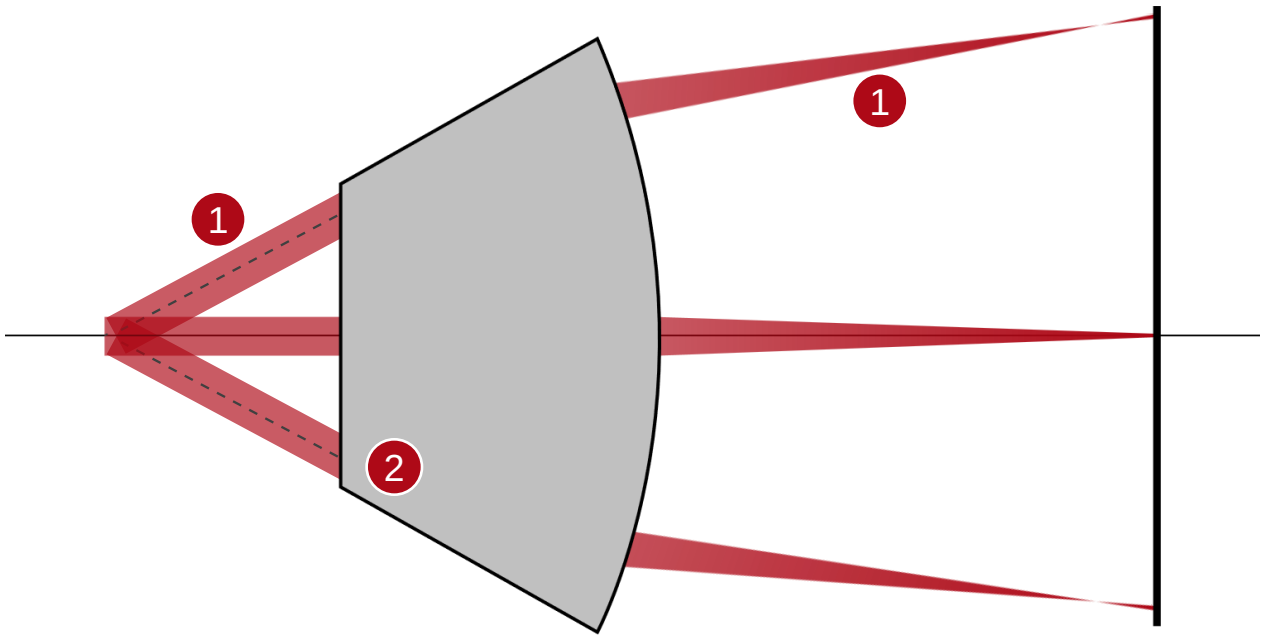
In the case of off-axis illumination, the position of the detector is also automatically adapted. In this example, a shift of 100 µm is automatically considered by the Parameter Coupling.

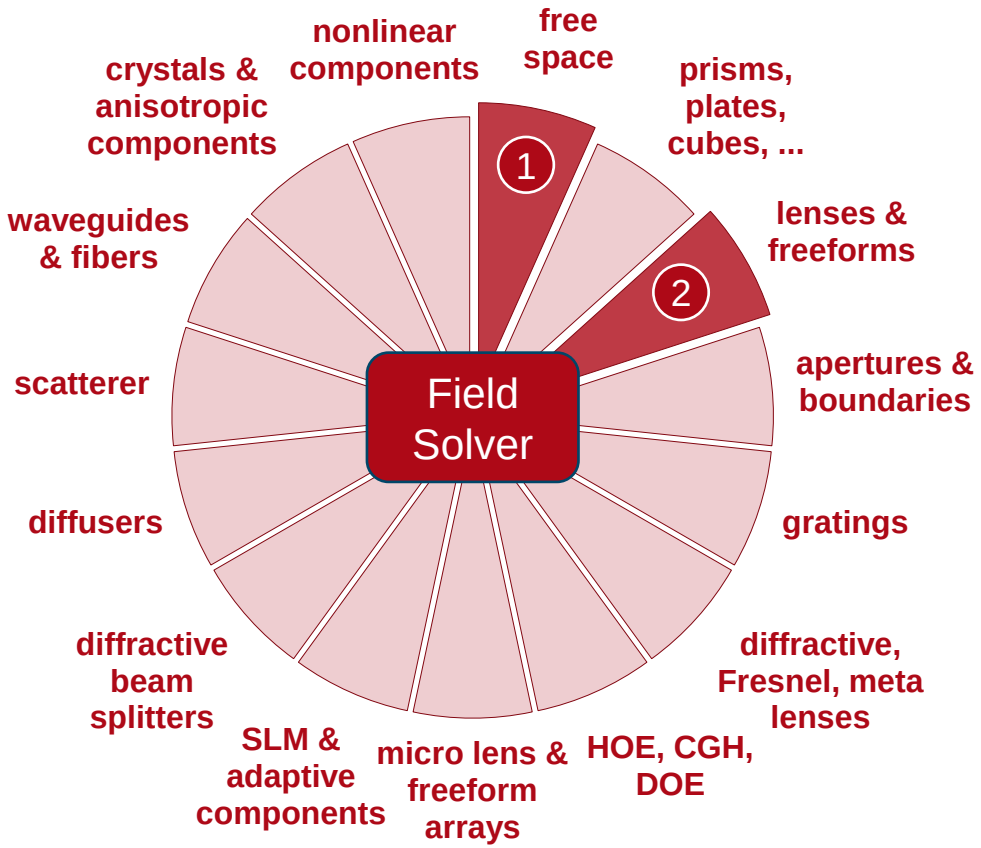
Performance Evaluation – Off-Axis Illumination





VirtualLab Fusion Technologies





Document Information

title	Automatized Detector Positioning by using Parameter Coupling
document code	SWF.0039
document version	1.1
software version	2023.1 (Build 1.556)
software edition	VirtualLab Fusion Basic
category	Feature Use Case
further reading	• Performance Analysis of Laser Scanning System • Coupling of Parameters in VirtualLab Fusion