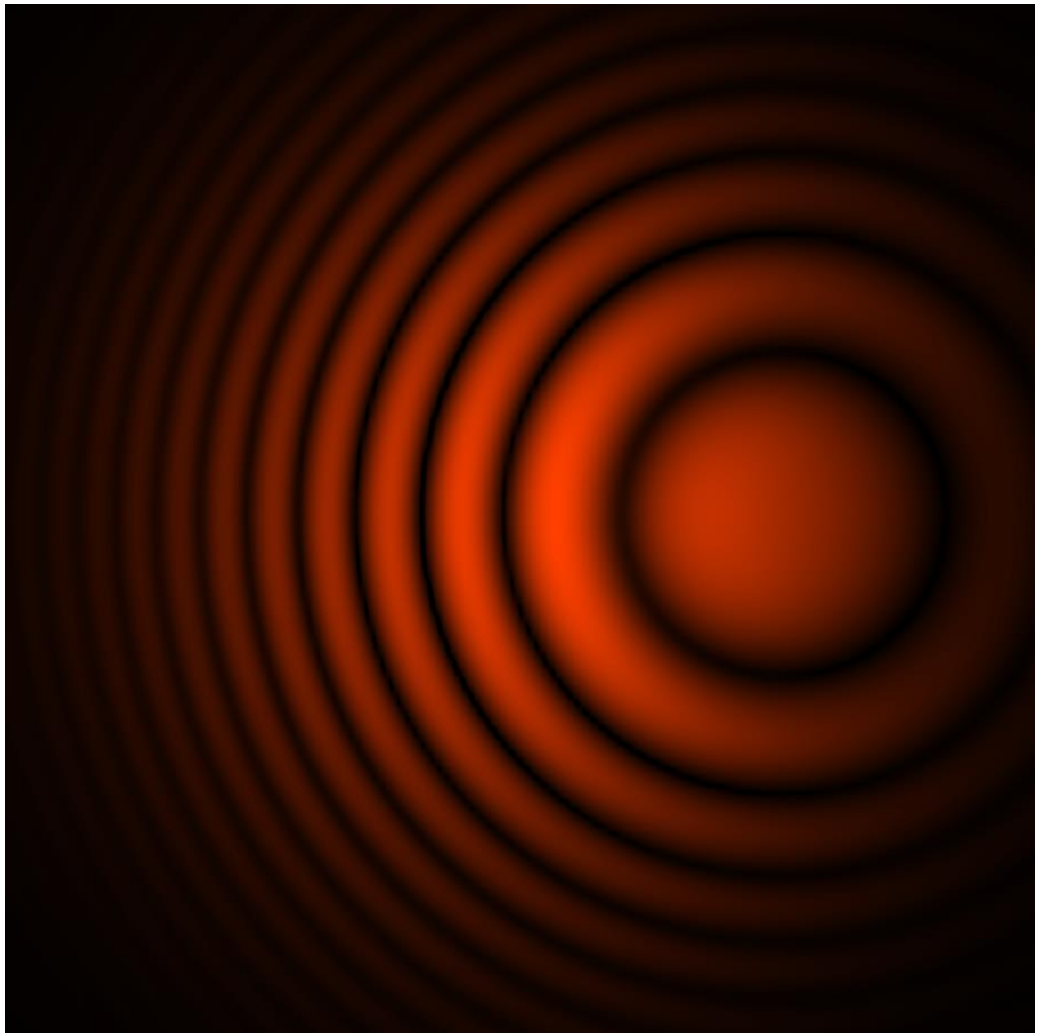
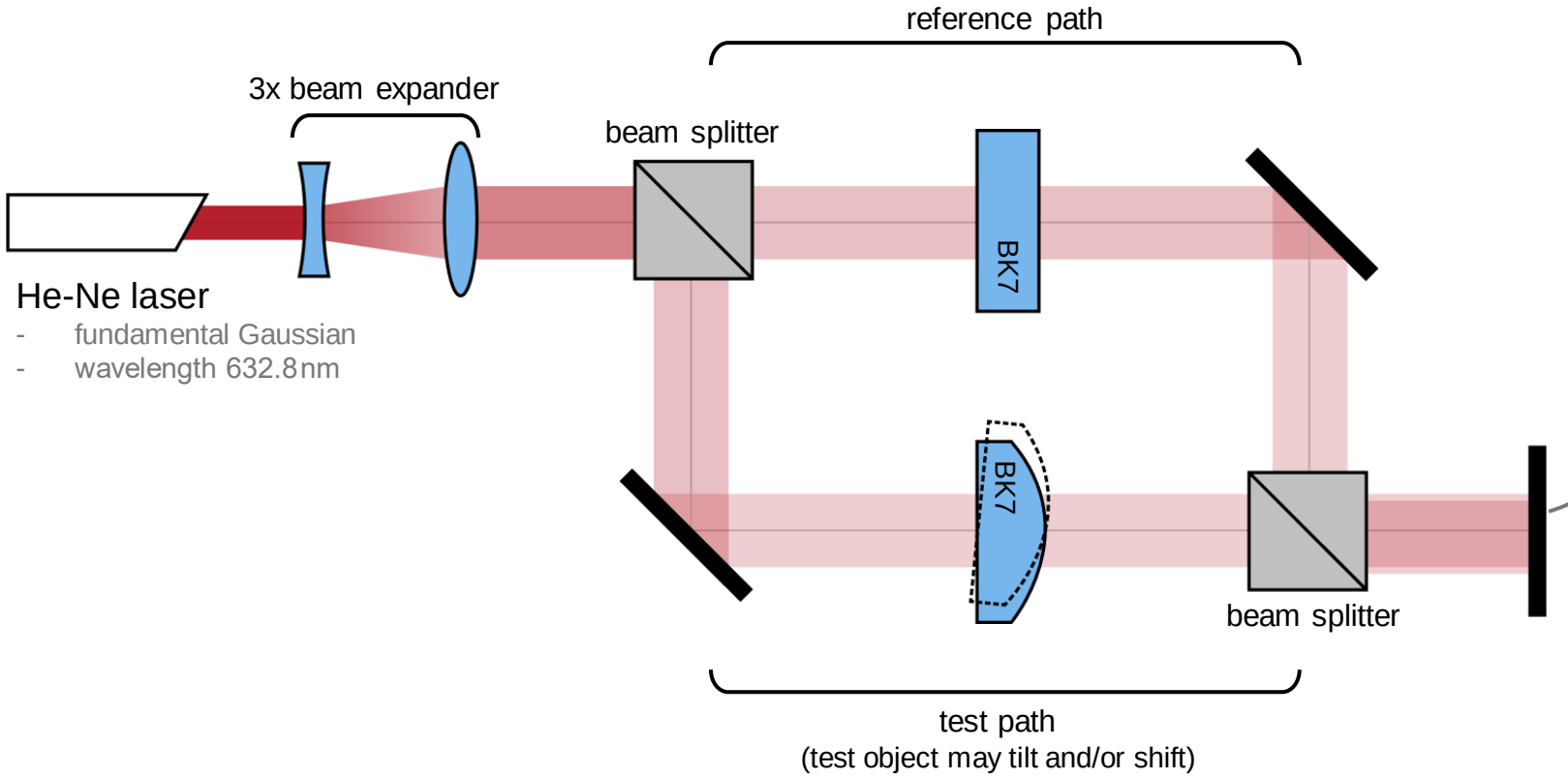
Mach-Zehnder Interferometer

Abstract

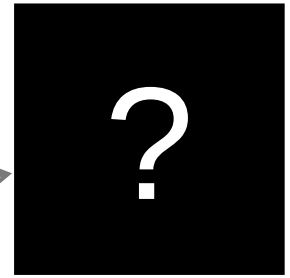


Interferometry is an important technology for optical metrology. It is widely used for the measurements of e.g. surface profile, defects, mechanical and thermal distortion with high precision. As a typical example, a Mach-Zehnder interferometer with coherent laser source is build up in VirtualLab Fusion, with the help of non-sequential field tracing. It is demonstrated that how the tilt and shift of an optical elements may affect the interference fringe pattern.

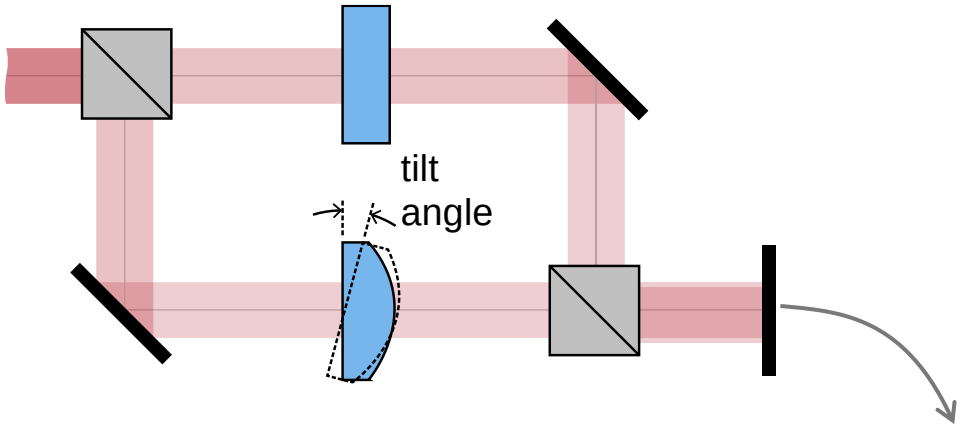
Modeling Task

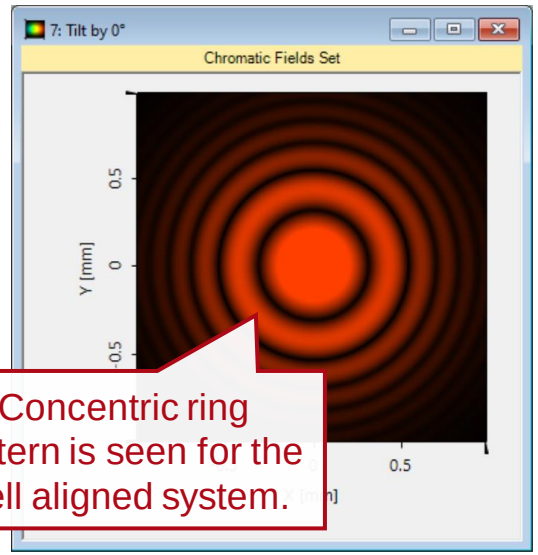


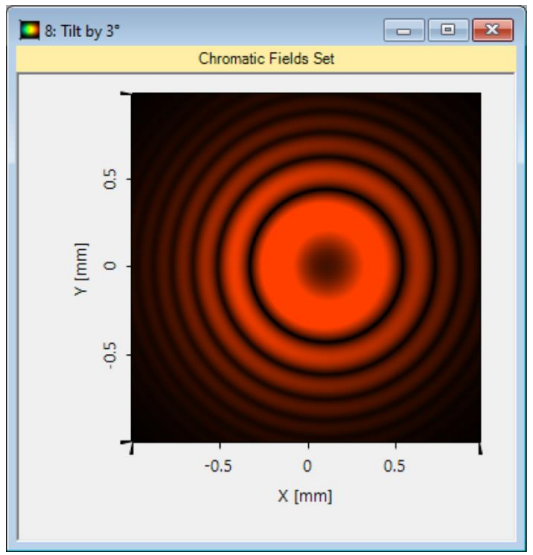
How to calculate interference fringe with the possible shift and tilt of components considered?

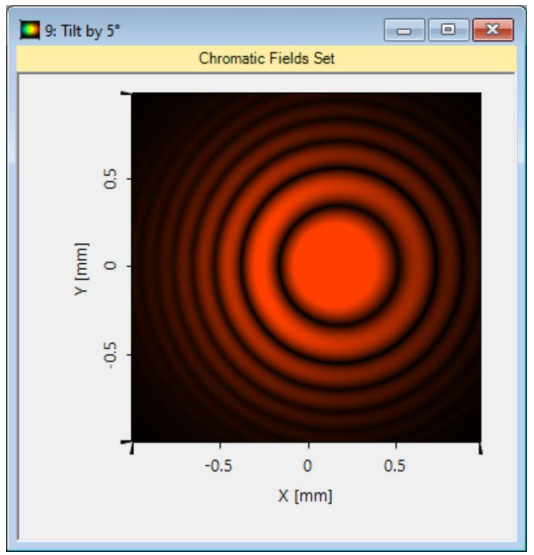


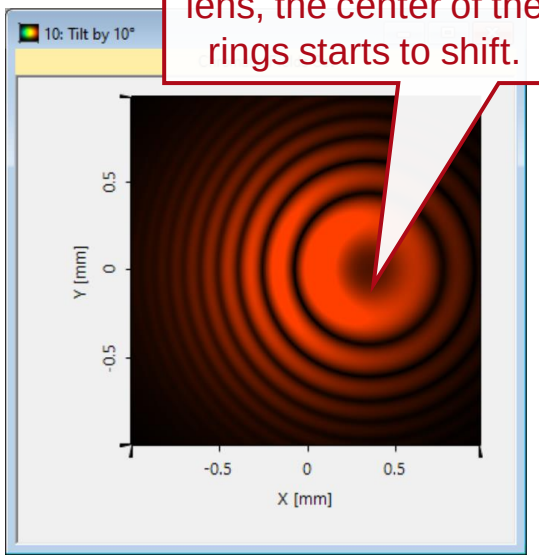
Interference Fringe Due to Component Tilt







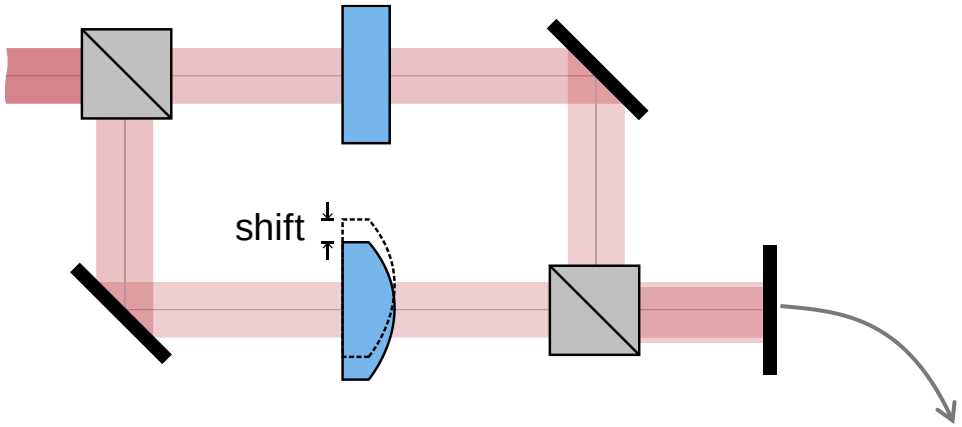




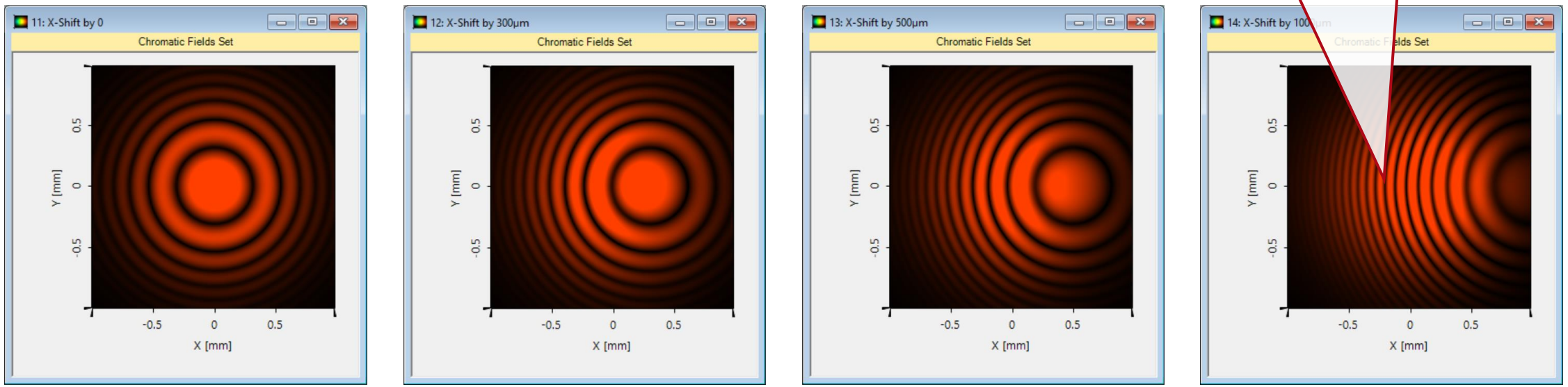
Concentric ring pattern is seen for the well aligned system.

Due to the tilt of the lens, the center of the rings starts to shift.

Interference Fringe Due to Component Shift

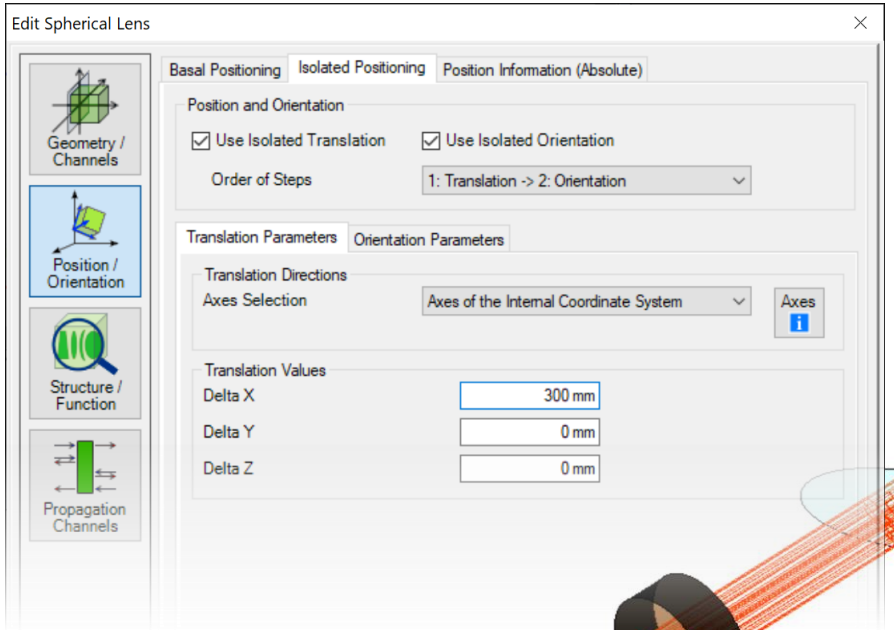


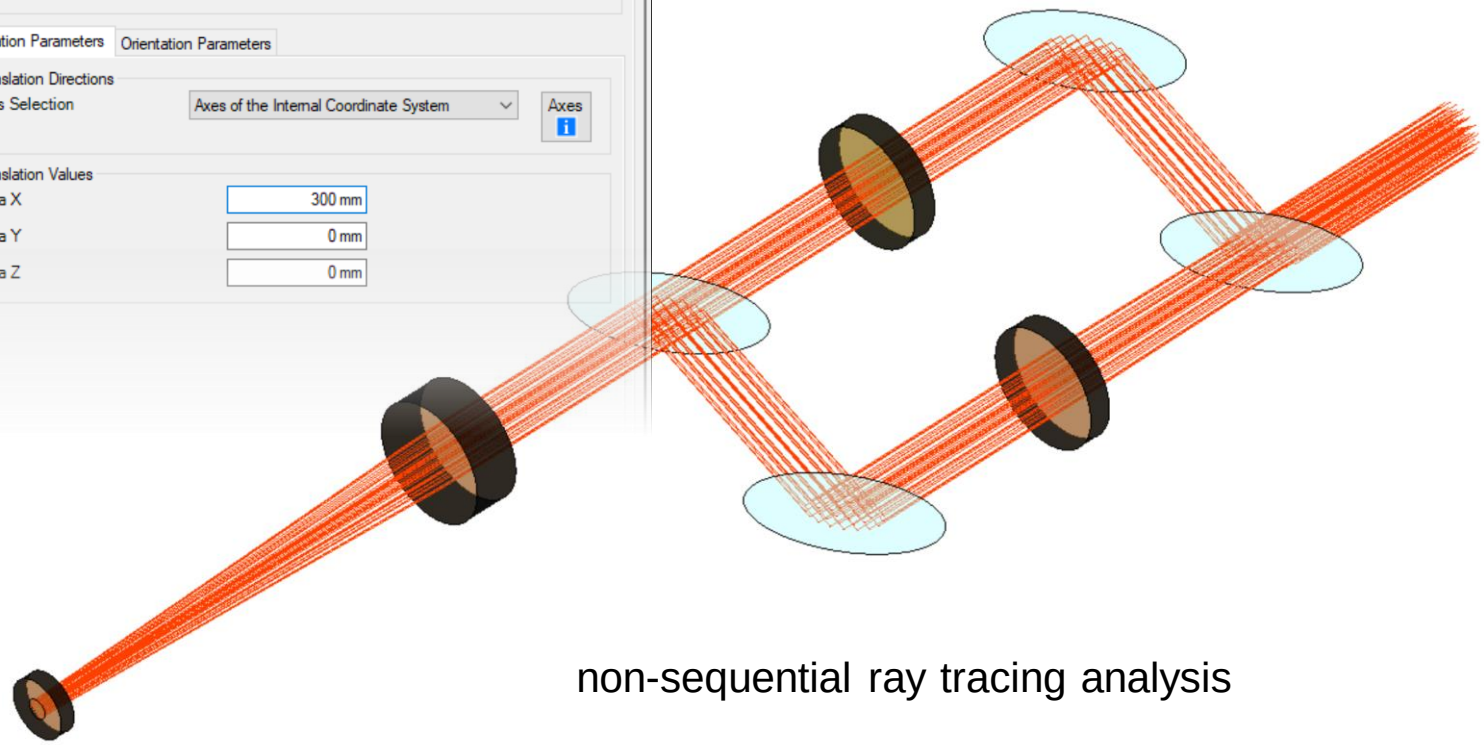
With large shift distance, only the part of the lens contribute to the interference and the fringes tend to become linear.



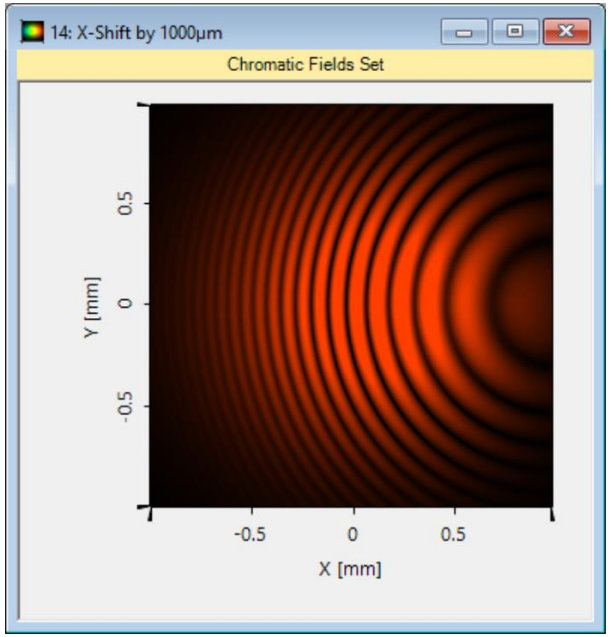
Peek into VirtualLab Fusion

flexible position and orientation settings





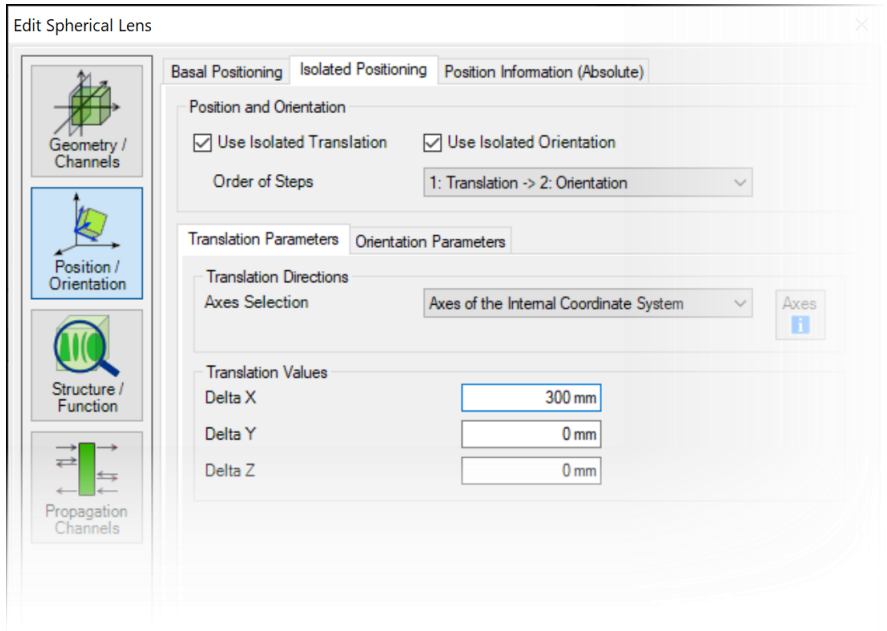
non-sequential ray tracing analysis



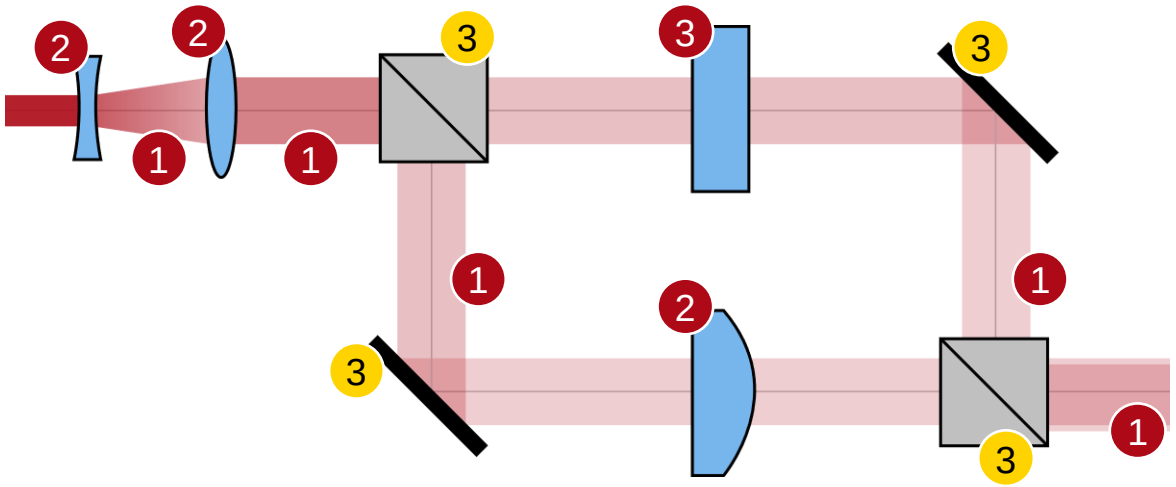
direct observation of interference fringes

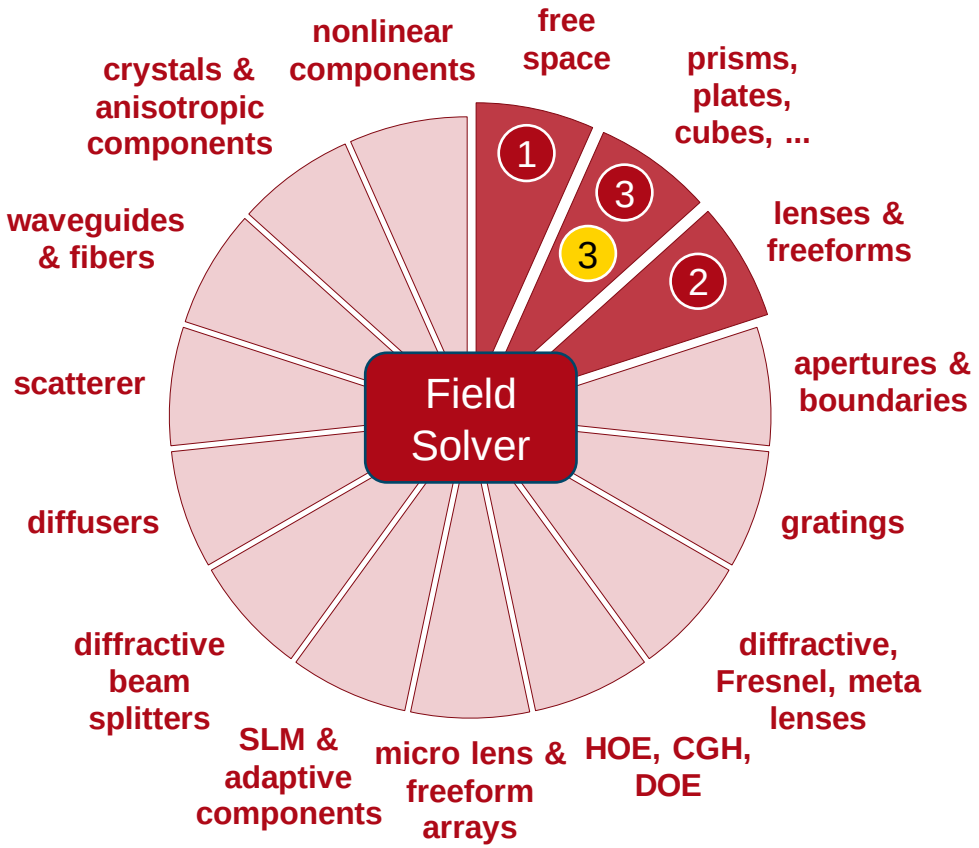
Workflow in VirtualLab Fusion

- Set up input Gaussian field
  - Basic Source Models [Tutorial Video]
- Set the position and orientation of components
  - LPD II: Position and Orientation [Tutorial Video]
- Set the non-sequential channels of components
  - Channel Setting for Non-Sequential Tracing [Use Case]



VirtualLab Fusion Technologies





idealized component

Document Information

title	Mach-Zehnder Interferometer
document code	IFO.0005
version	1.2
toolbox(es)	Starter Toolbox (Non-Sequential Extension)
VL version used for simulations	VirtualLab Fusion Summer Release 2019 (7.6.1.18)
category	Application Use Case
further reading	- Laser-Based Michelson Interferometer and Interference Fringe Exploration - Fizeau Interferometer for Optical Testing