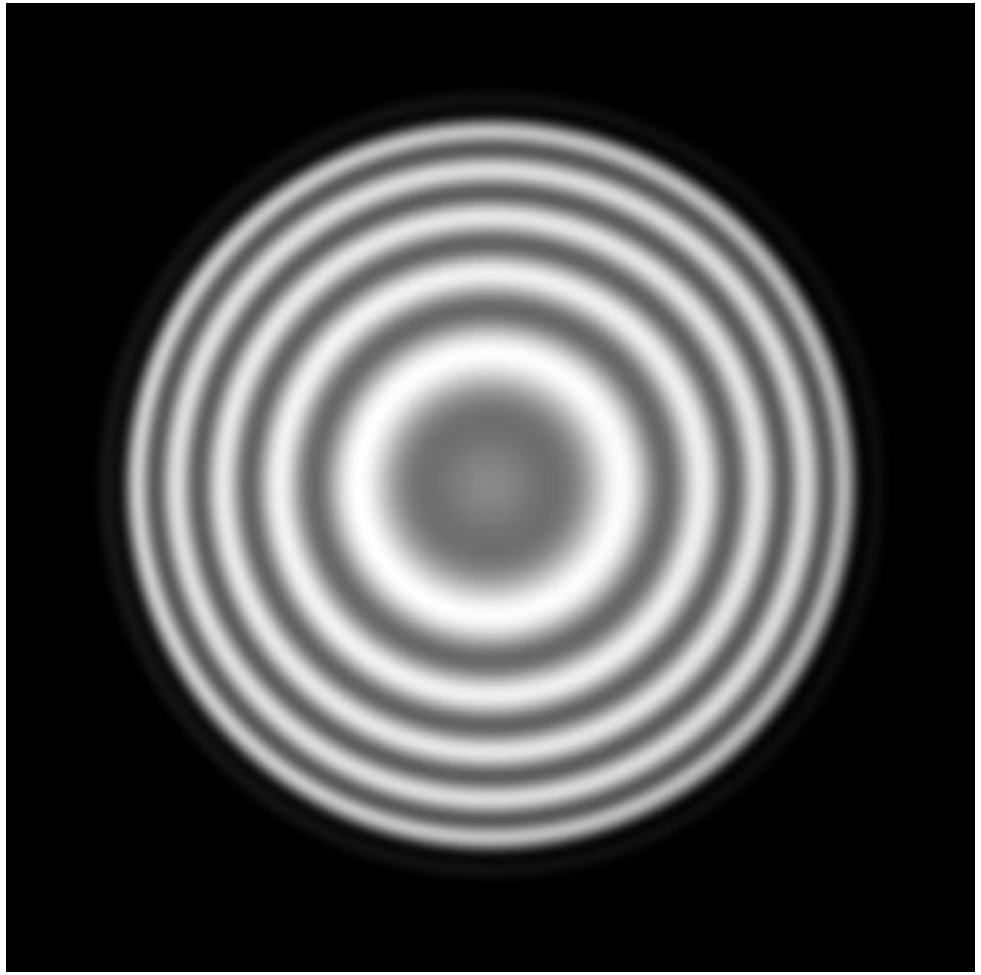
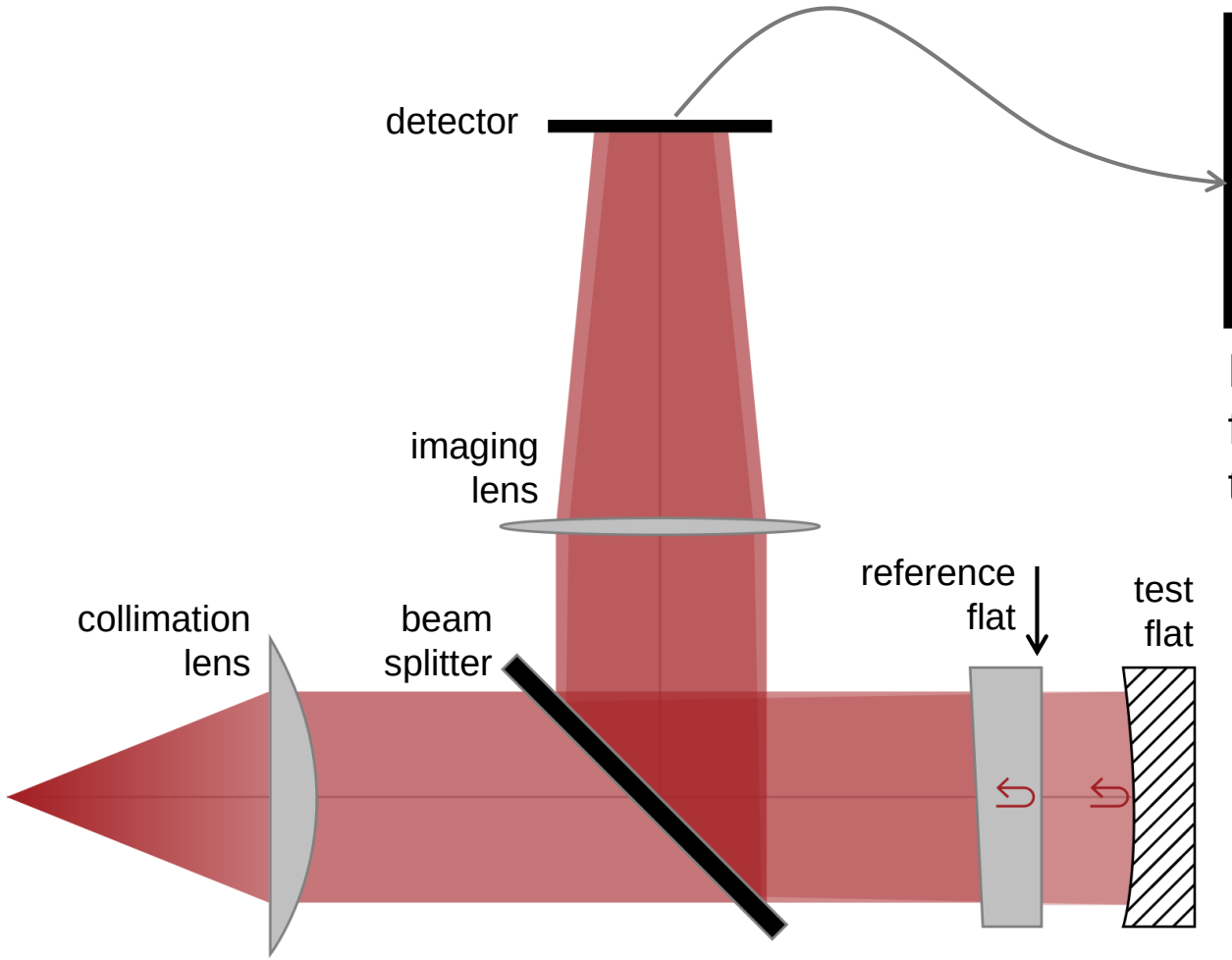
Fizeau Interferometer for Optical Testing

Abstract



Fizeau interferometers are a common type of optical metrology devices in the industry, and they are often used to test the quality of optical surfaces with high precision. With the help of non-sequential tracing in VirtualLab Fusion, we build up a Fizeau interferometer, and use it for testing different optical surfaces e.g. cylindrical and spherical ones. It can be shown that the resulting interference fringes are sensitive to the surface profile.

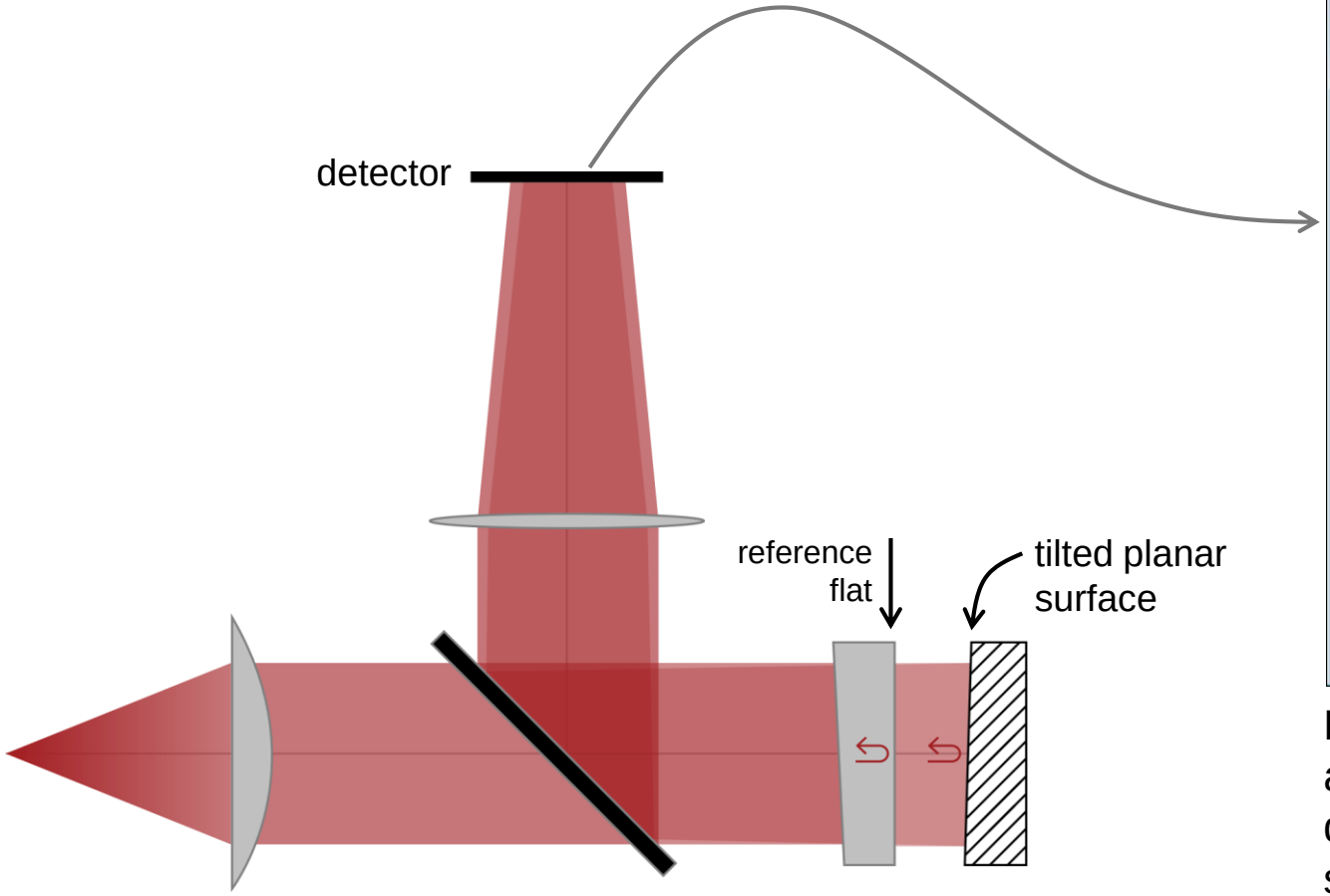
Modeling Task

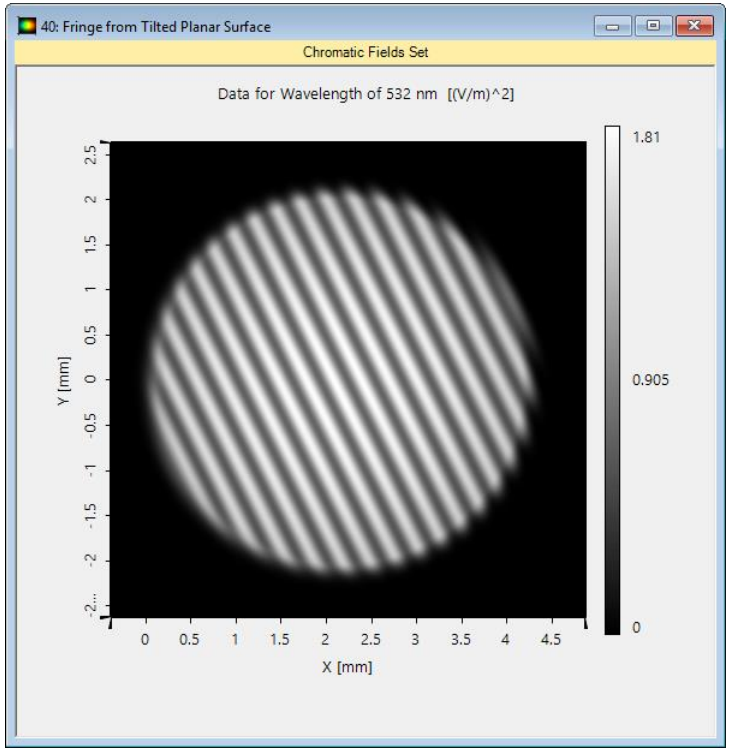


How does the interference fringe change for different test flats?

spherical wave
- wavelength 532 nm
- half-opening angle 26.6°

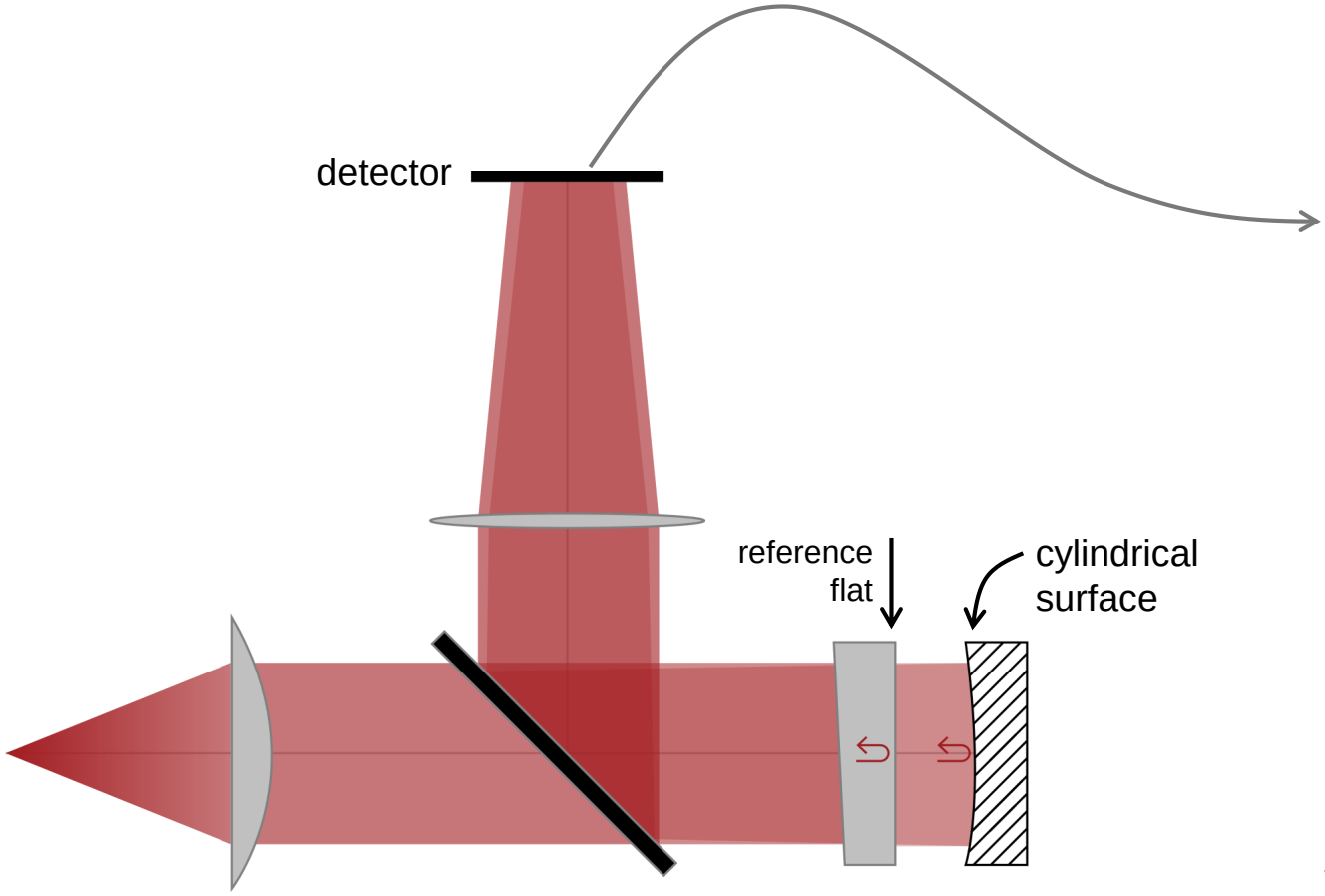
Tilted Planar Surface under Observation

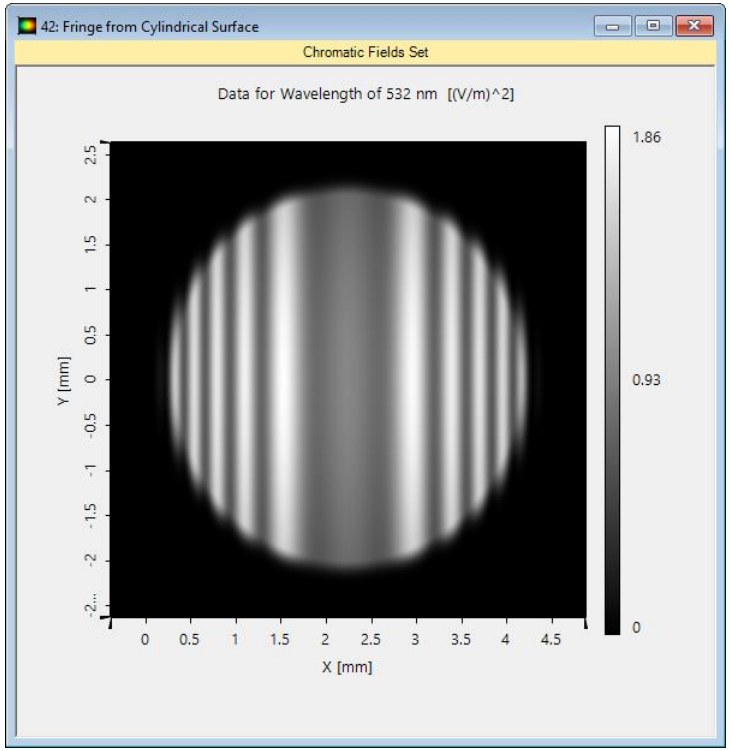




Reflection from the test planar surface remain as plane waves, but only with slightly different direction, and therefore leading to parallel striped fringes.

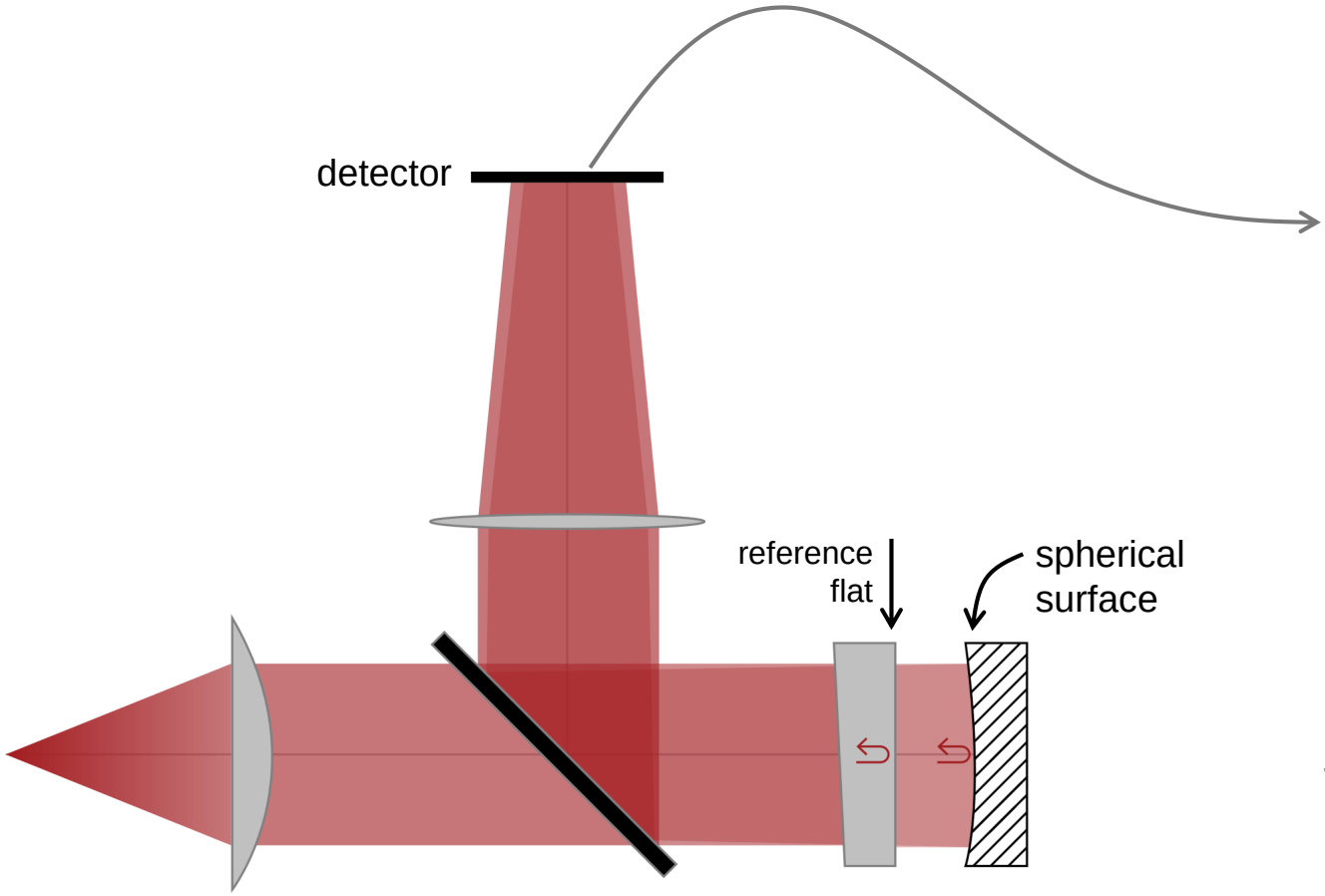
Cylindrical Surface under Observation

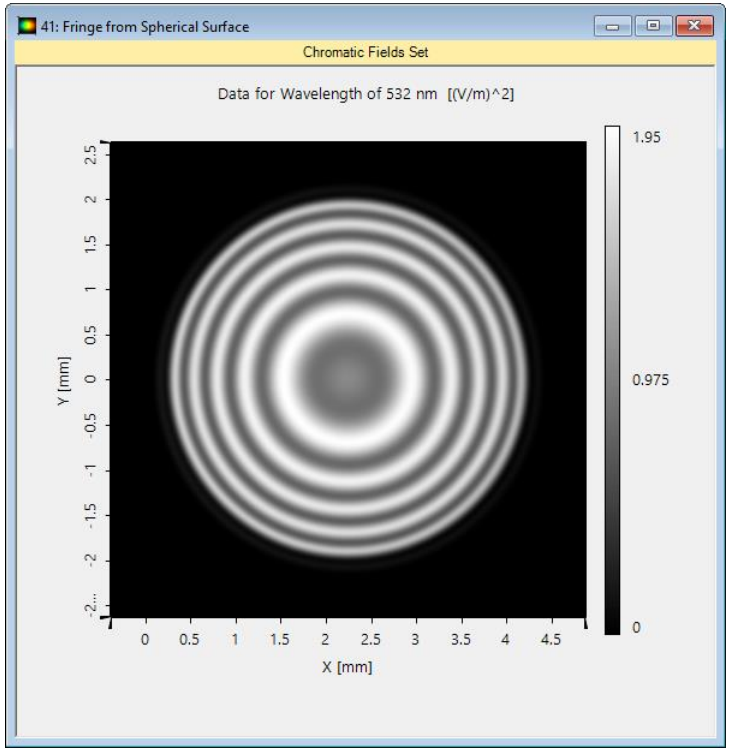




Reflected wavefront from the test cylindrical surface gets curved in one direction, therefore leading to parallel striped fringes but with varying pitch.

Spherical Surface under Observation

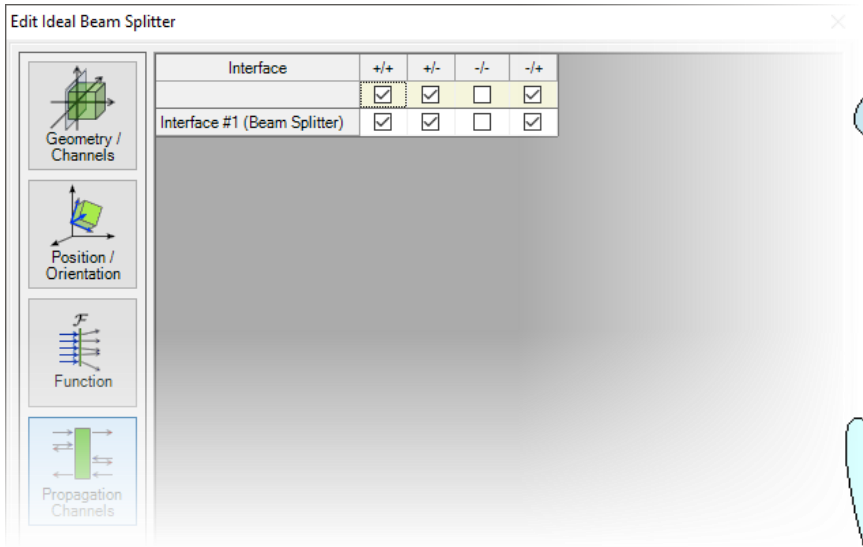


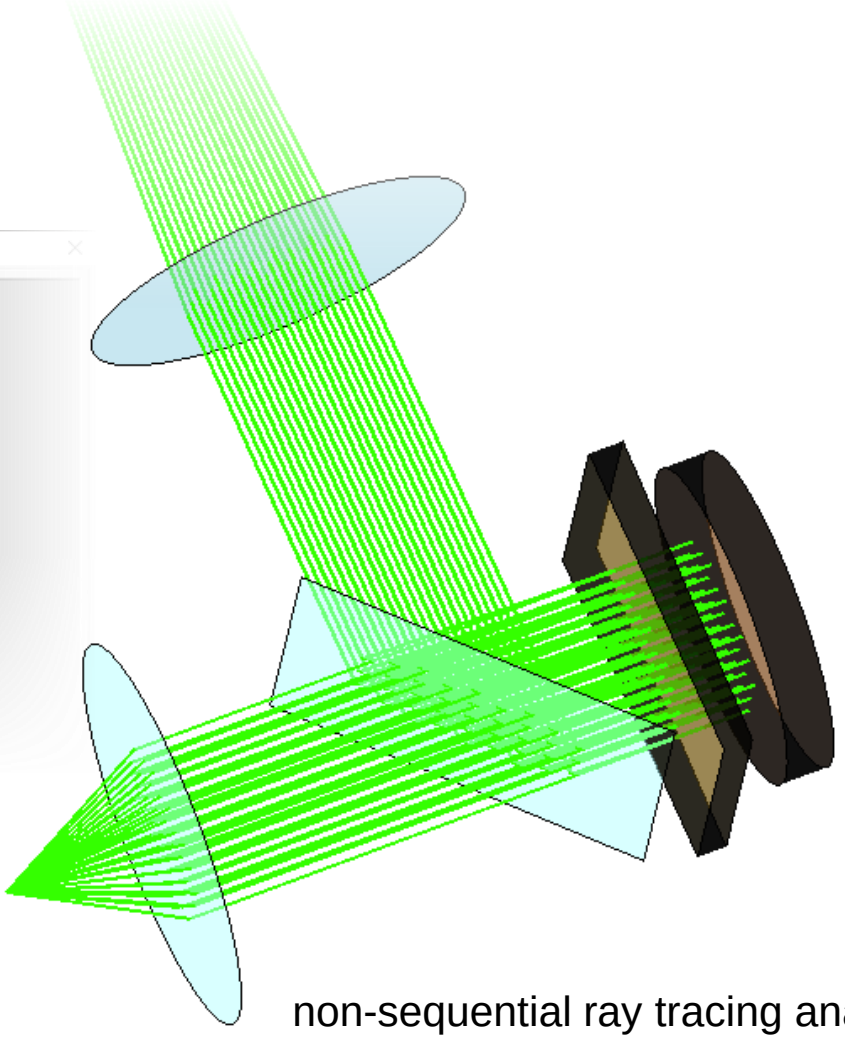


Spherical surface changes the reflected wavefront in radial direction, thus the interference fringes appears as concentric rings.

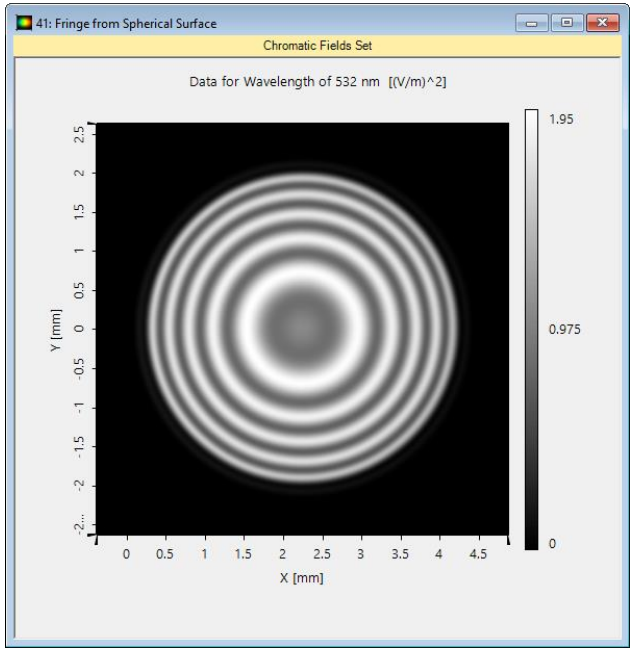
Peek into VirtualLab Fusion

flexible channel settings





non-sequential ray tracing analysis

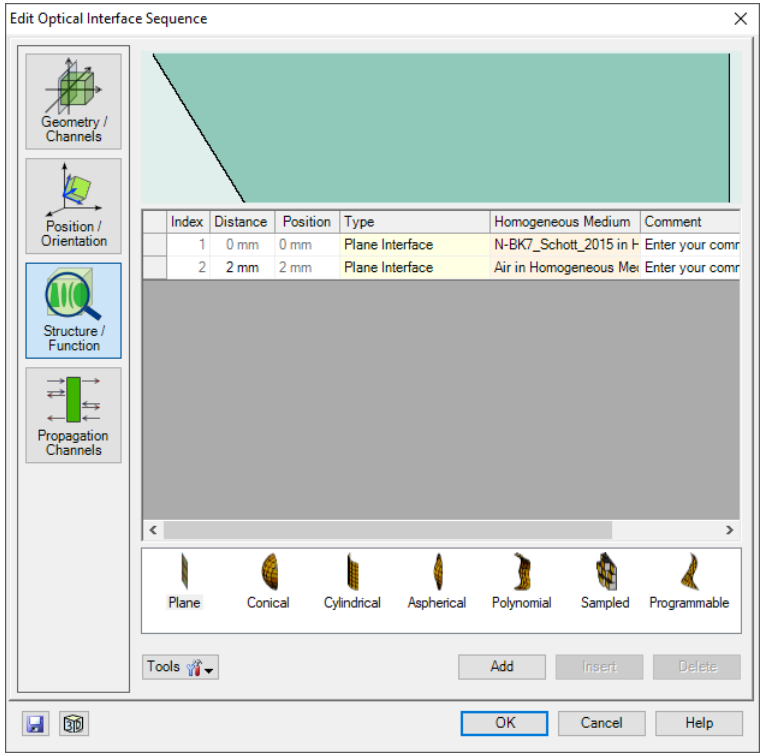


visualization and analysis of interference fringe

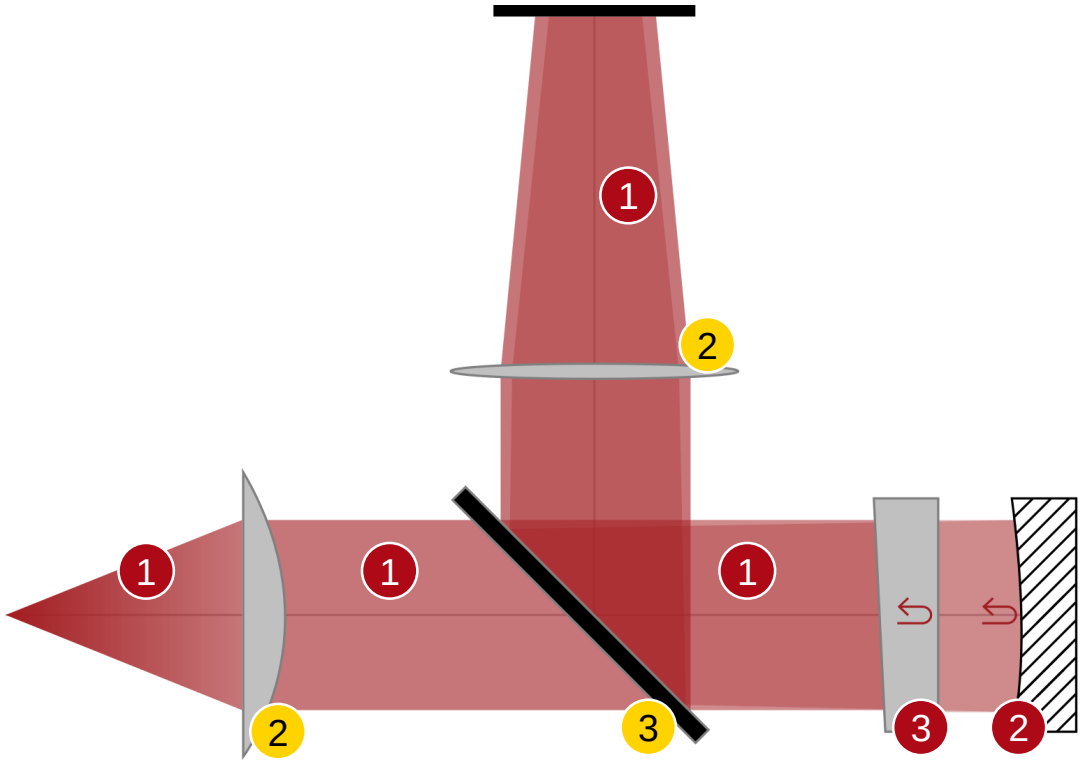
Workflow in VirtualLab Fusion

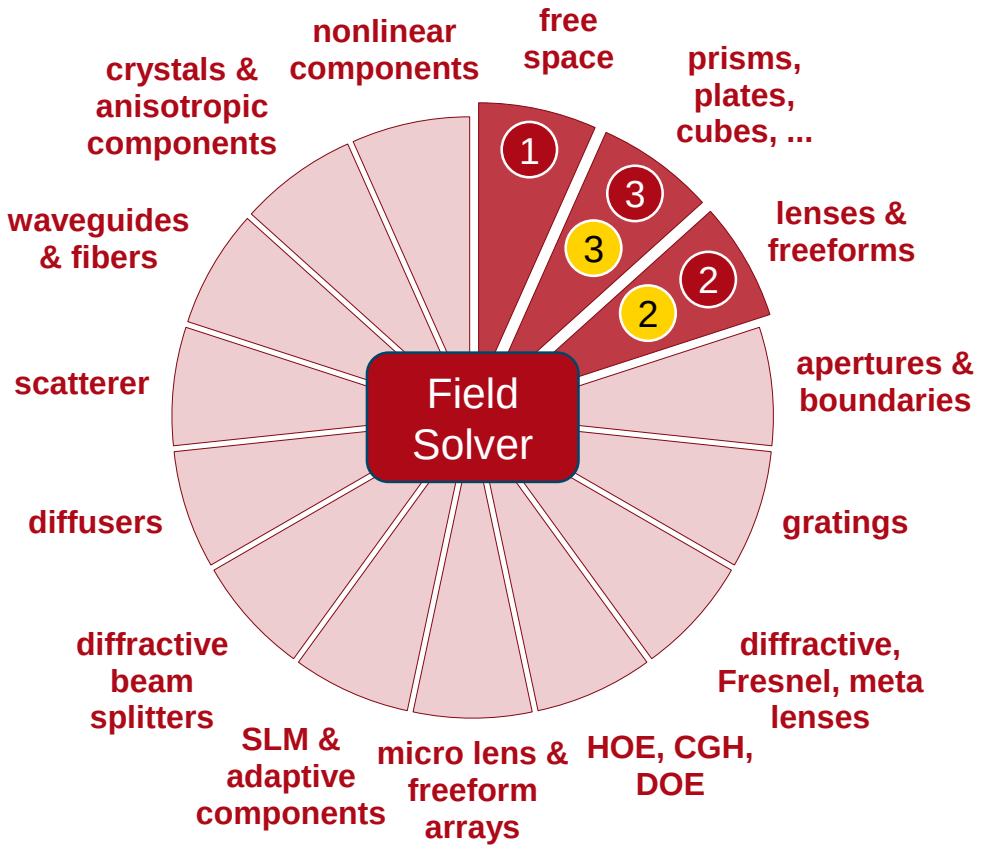
- Set up input field
  - Basic Source Models [Tutorial Video]
- Construct real components using surfaces

- Define position and orientation of components
  - LPD II: Position and Orientation [Tutorial Video]
- Set channels properly for non-sequential tracing
  - Channel Setting for Non-Sequential Tracing [Use Case]



VirtualLab Fusion Technologies





idealized component

Document Information

title	Fizeau Interferometer for Optical Testing
document code	IFO.0009
version	1.0
toolbox(es)	Starter Toolbox (Non-Sequential Extension)
VL version used for simulations	7.4.0.49
category	Application Use Case
further reading	- Laser-Based Michelson Interferometer and Interference Fringe Exploration - Mach-Zehnder Interferometer