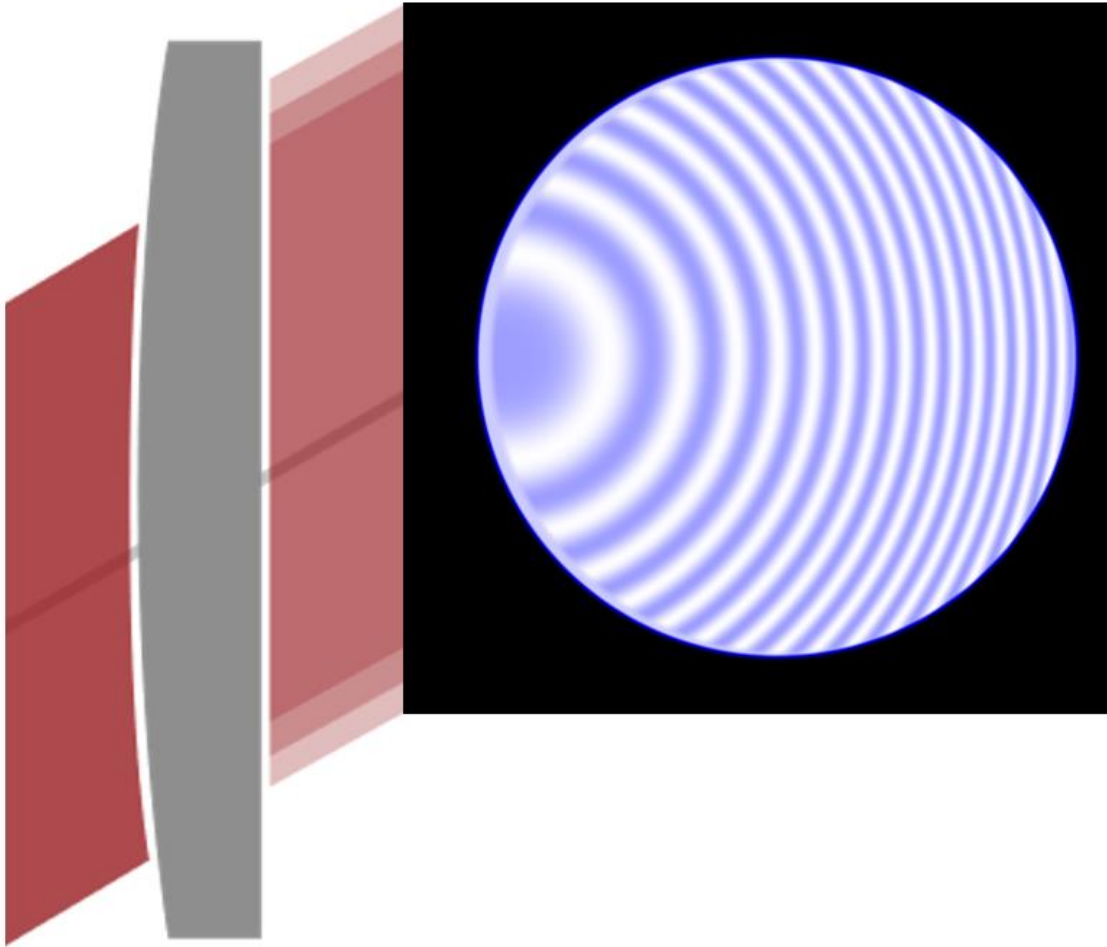


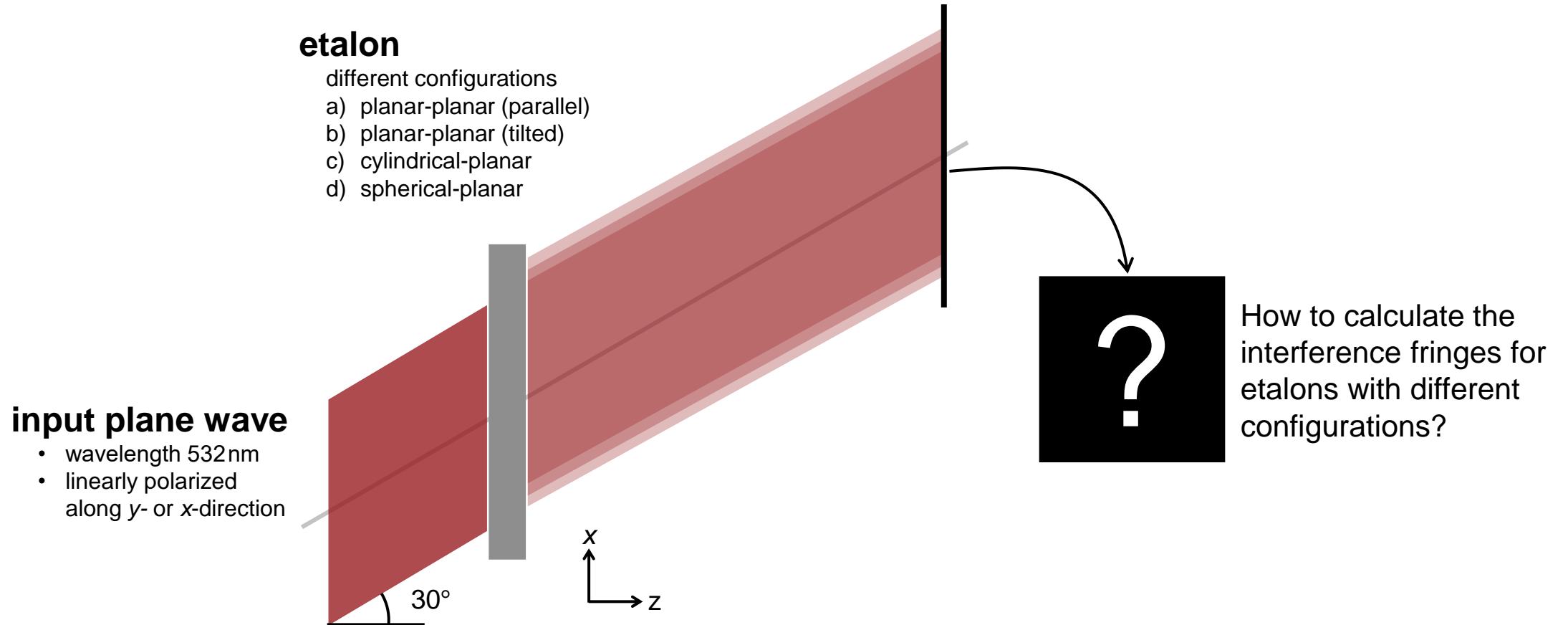
# Modeling of Etalon with Planar and Curved Surfaces

# Abstract

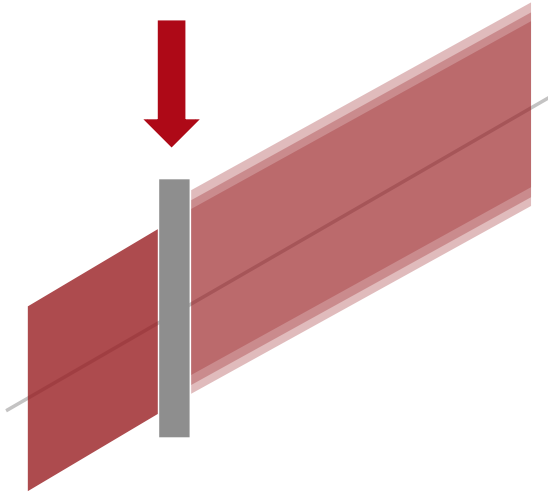


The basic setup of an optical etalon is a transparent plate with parallel surfaces. Such a structure forms a resonator, where transmittance and reflectance vary with the thickness of the etalon. Beside this simple configuration, more complex etalons, with e.g. non-parallel surfaces and curved surfaces, are designed and used for different applications. With the non-sequential field tracing technique of VirtualLab Fusion, several configurations of etalons are analyzed, and the differences in the output interference fringes are investigated including polarization effects.

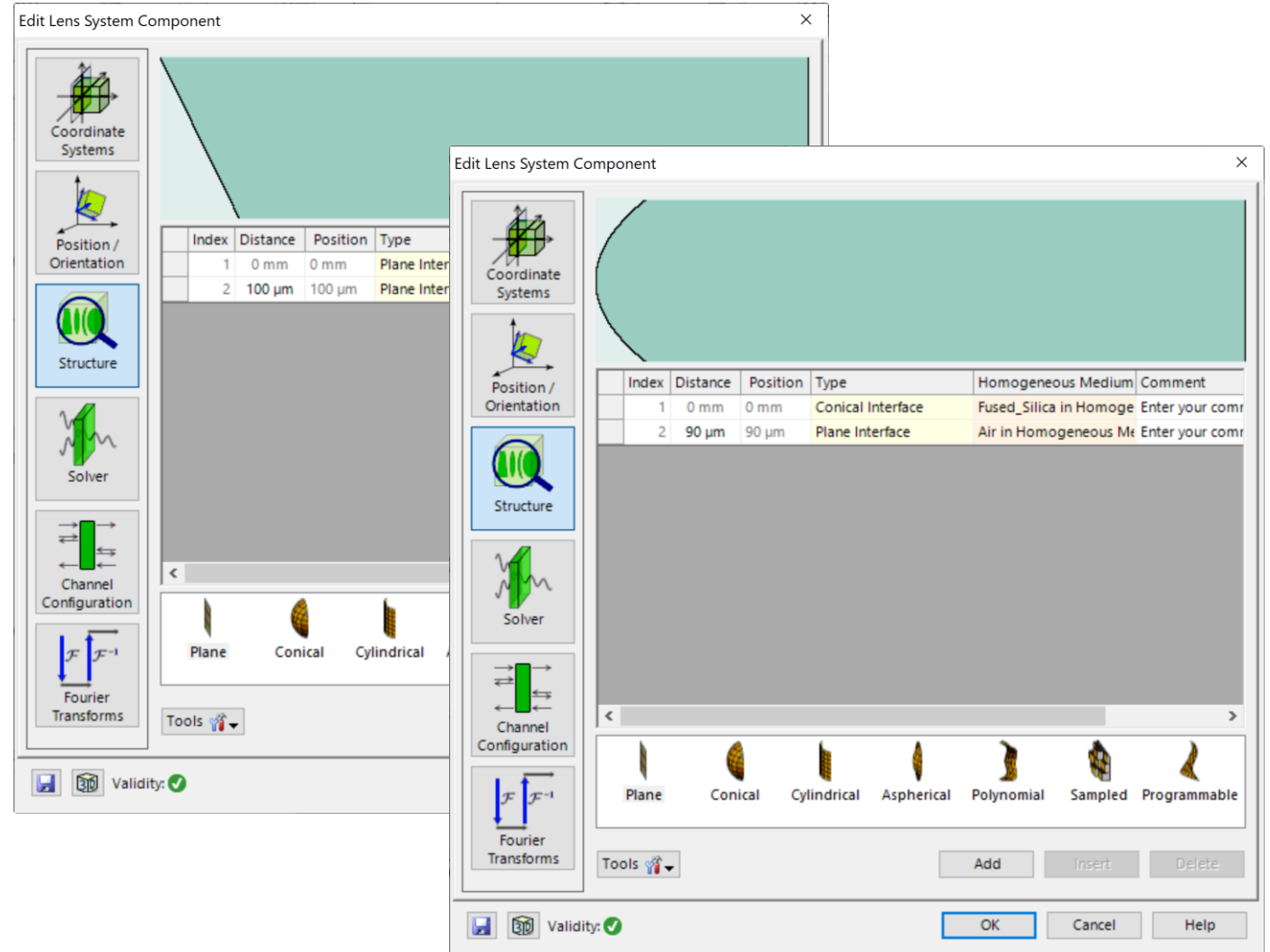
# Modeling Task



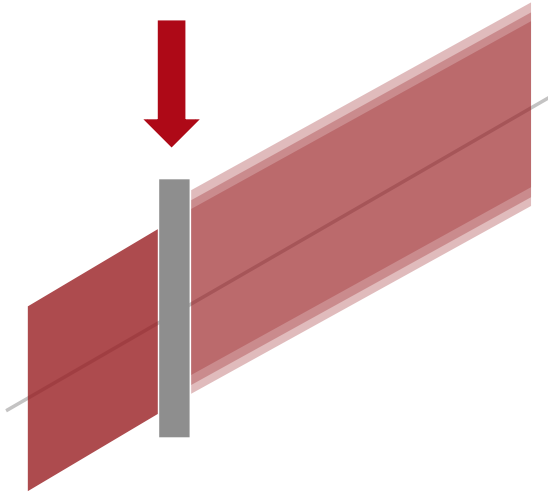
# Etalon



The *Lens System Component* allows for an easy definition of a component consisting of various interfaces. Among other types of surfaces, it is possible to include planar, spherical and cylindrical interfaces as well as to define the media between them.



# Channel System for Nonsequential Modeling



In the *Manual Channel Configuration* mode, the user can control which light paths should be considered during the simulation. The detailed configuration can be found on the *Channel Configuration* page. Further information can be found here:

[!\[\]\(bd1a142de767a21e5362c595f844a4ff\_img.jpg\) Channel Configuration For Surfaces and Grating Regions](#)

Edit Lens System Component

Surface	+/+	+/-	-/-	-/+
All Surfaces	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Surface #1 (Plane Interface)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Surface #2 (Plane Interface)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Note: Geometry parameters of the system have been adjusted for illustration purposes.

9: Ray Distribution 3D

3D View

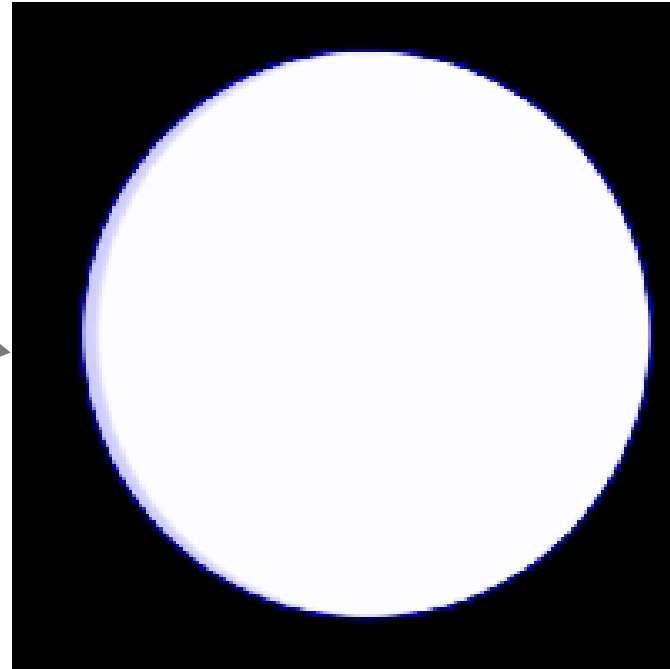
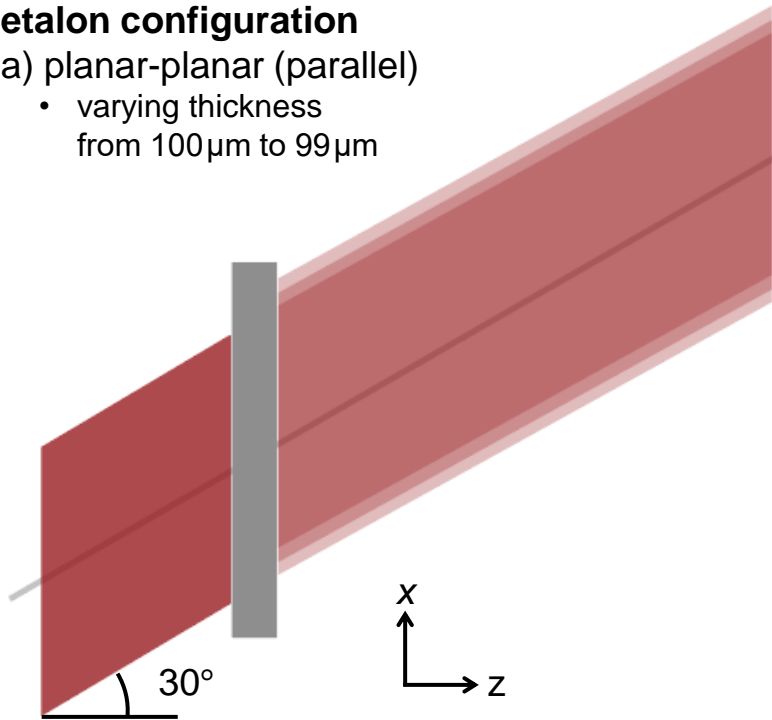
The 3D view shows a coordinate system with X, Y, and Z axes. Green lines represent light rays. A red arrow labeled "from front" points towards the right, with a red arrow labeled "+/+ " pointing in the same direction. A red arrow labeled "from back" points towards the left, with a red arrow labeled "-/- " pointing in the same direction. A scale bar at the bottom right indicates 400 μm.

## a) Parallel Planar-Planar Surfaces

### etalon configuration

#### a) planar-planar (parallel)

- varying thickness from  $100\mu\text{m}$  to  $99\mu\text{m}$



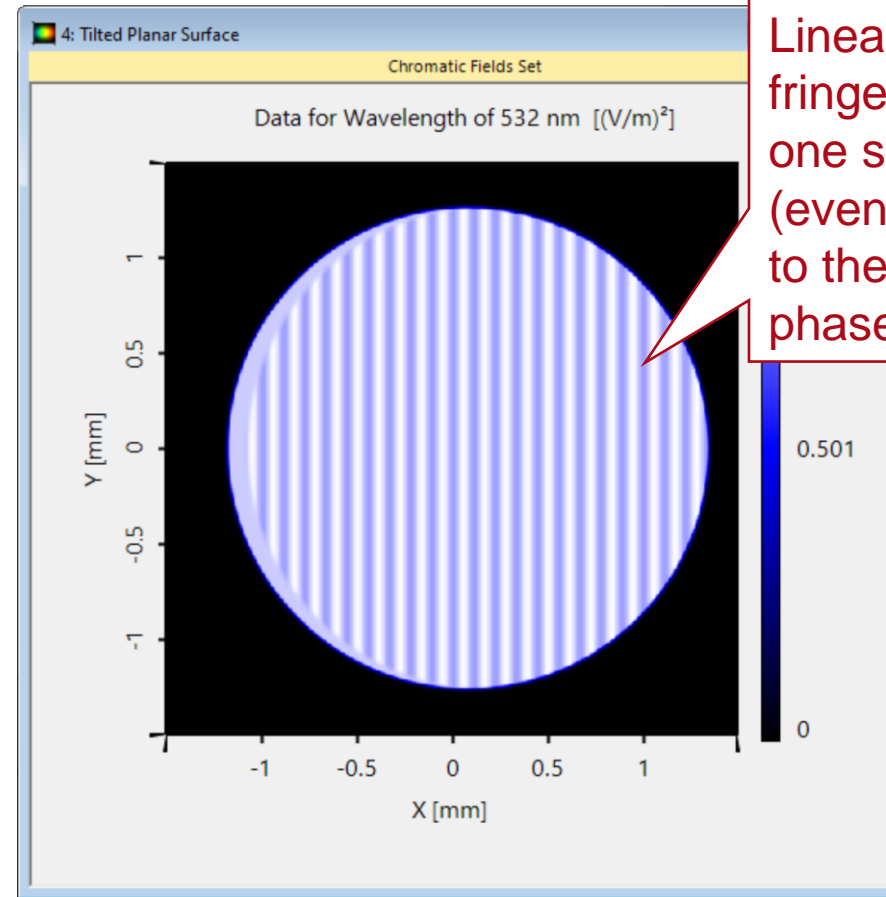
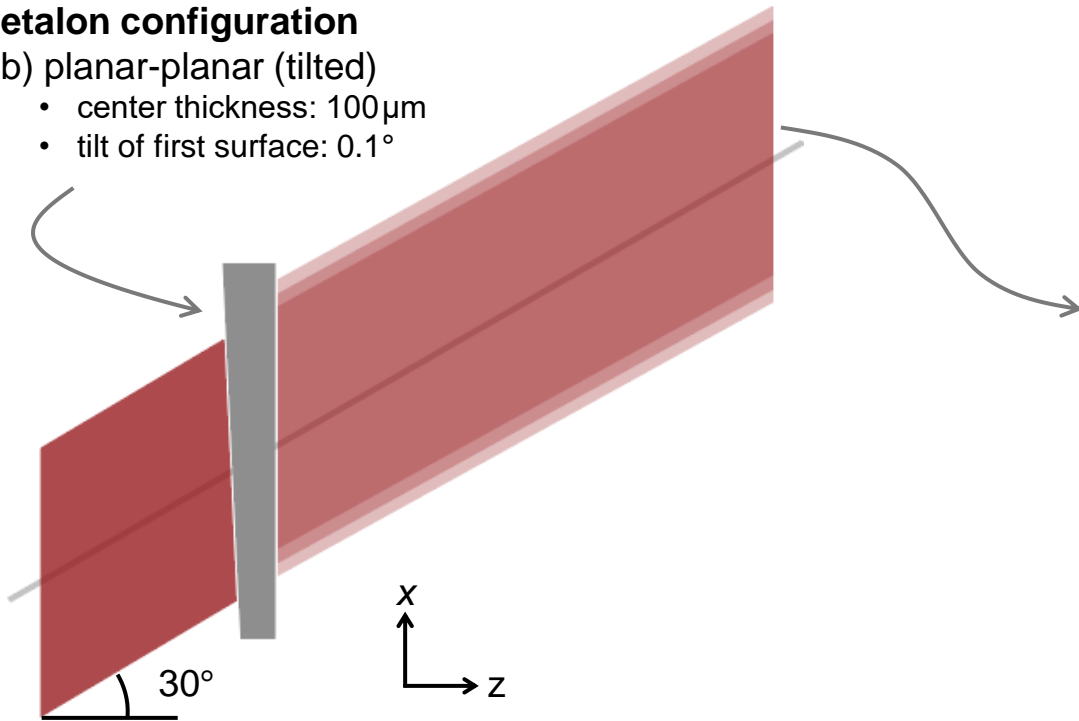
Constructive and destructive interference are alternating as the thickness of the etalon varies. Due to the perfect parallel and planar surfaces no fringes appear.

## b) Tilted Planar-Planar Surfaces

### etalon configuration

#### b) planar-planar (tilted)

- center thickness:  $100\mu\text{m}$
- tilt of first surface:  $0.1^\circ$



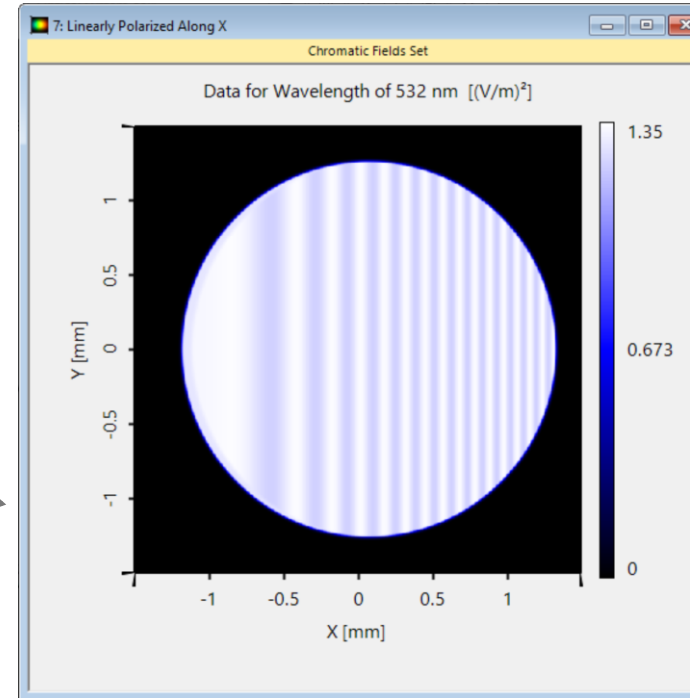
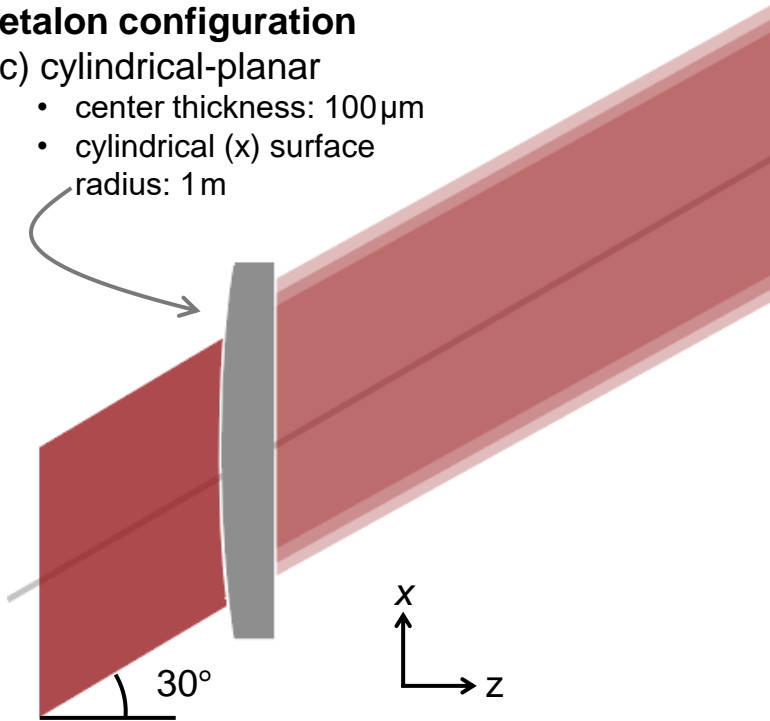
first surface tilt by  $0.1^\circ$

## c) Cylindrical-Planar Surfaces

### etalon configuration

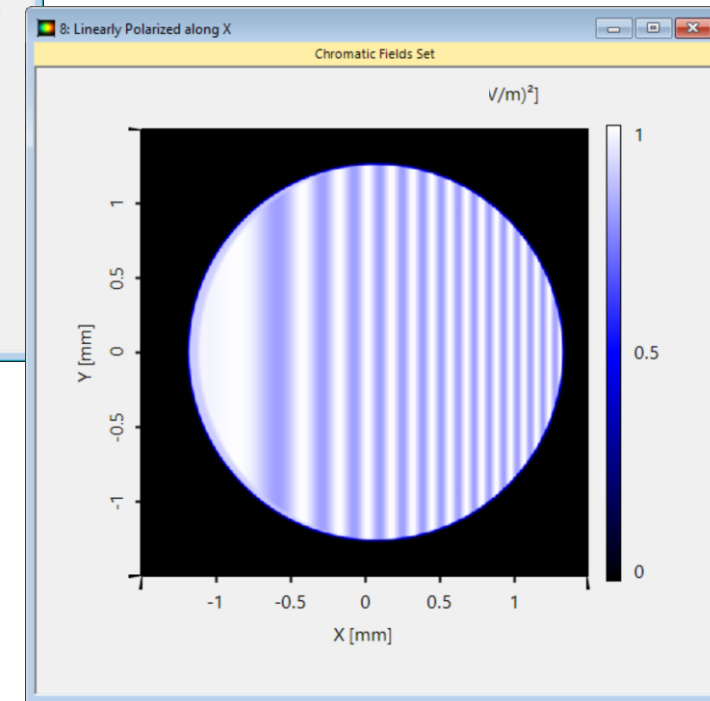
#### c) cylindrical-planar

- center thickness:  $100\mu\text{m}$
- cylindrical (x) surface radius:  $1\text{m}$



input polarization along x

Polarization-dependent effects on the interference are considered in the simulation.



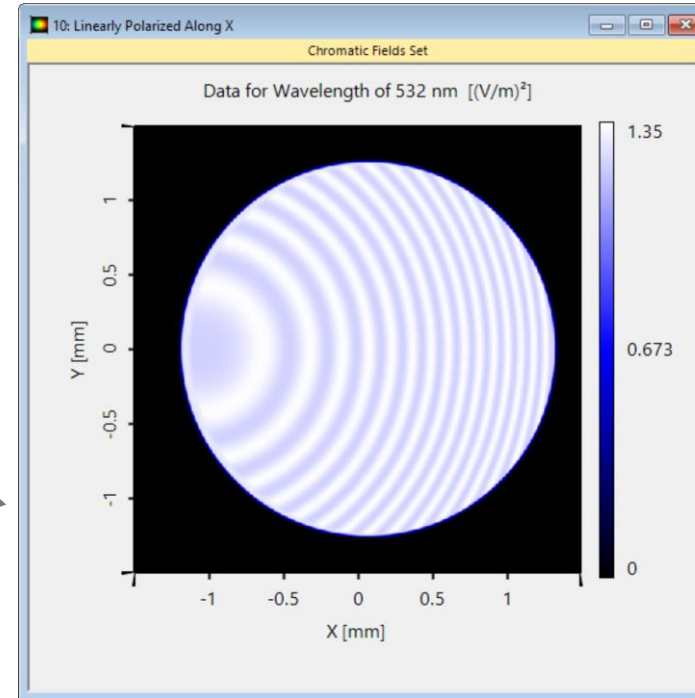
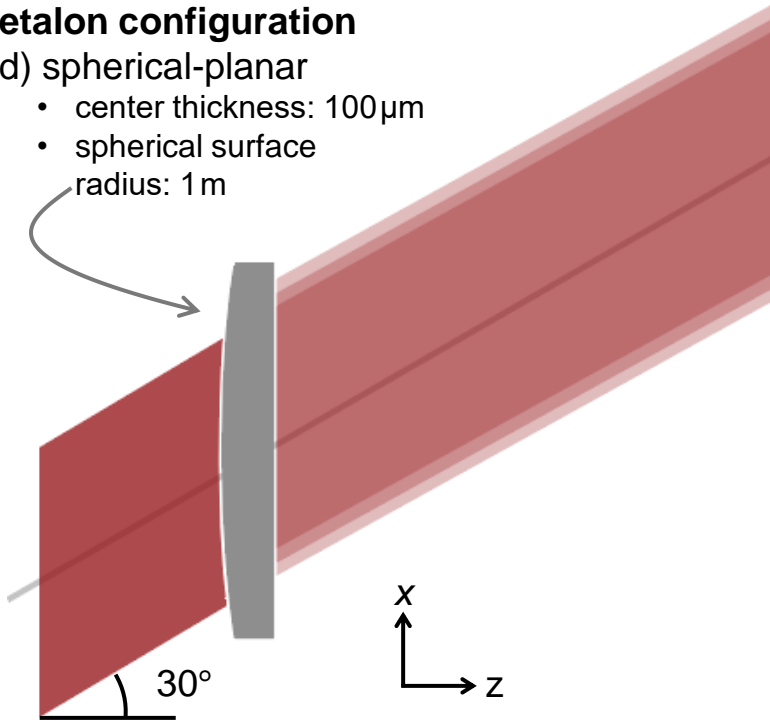
input polarization along y

## d) Spherical-Planar Surfaces

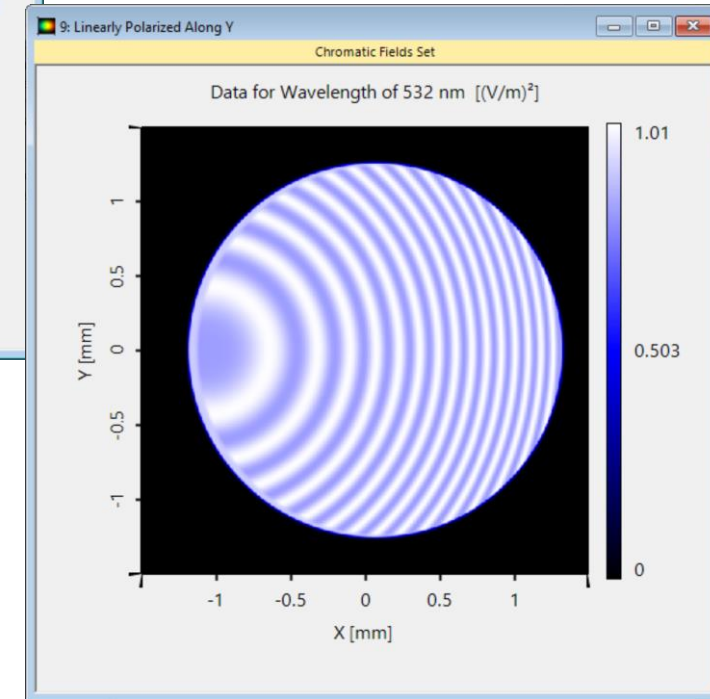
### etalon configuration

#### d) spherical-planar

- center thickness:  $100\mu\text{m}$
- spherical surface radius:  $1\text{ m}$

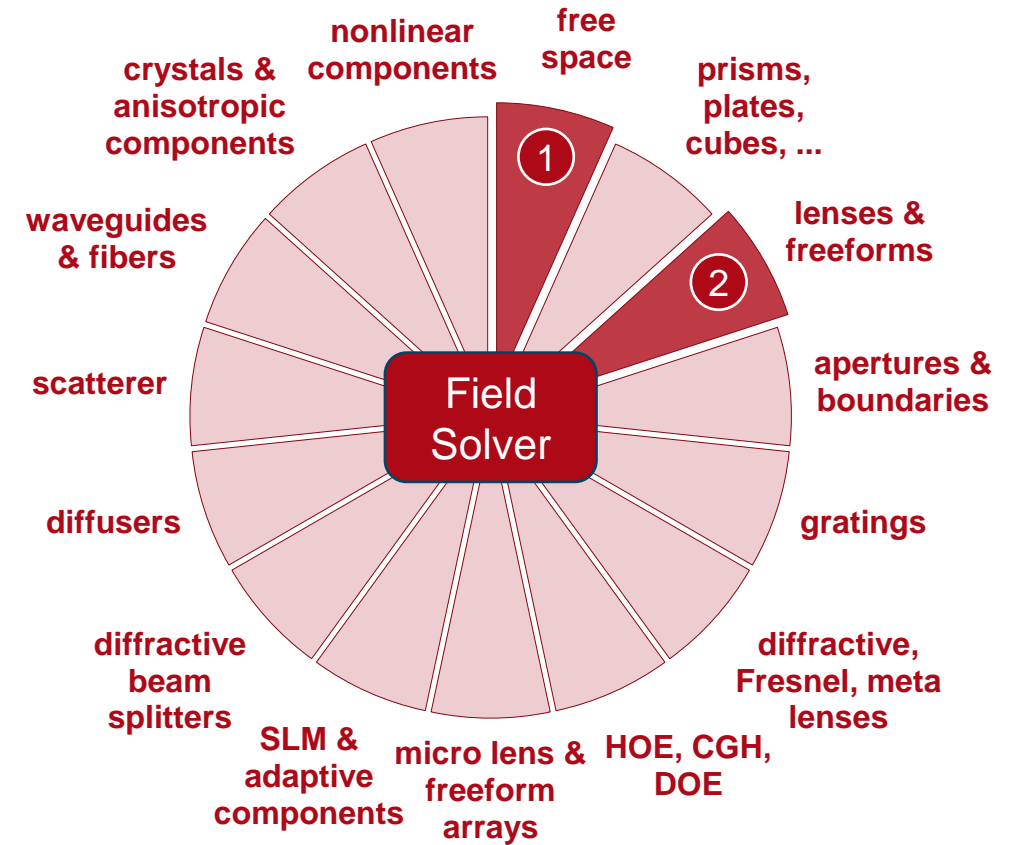
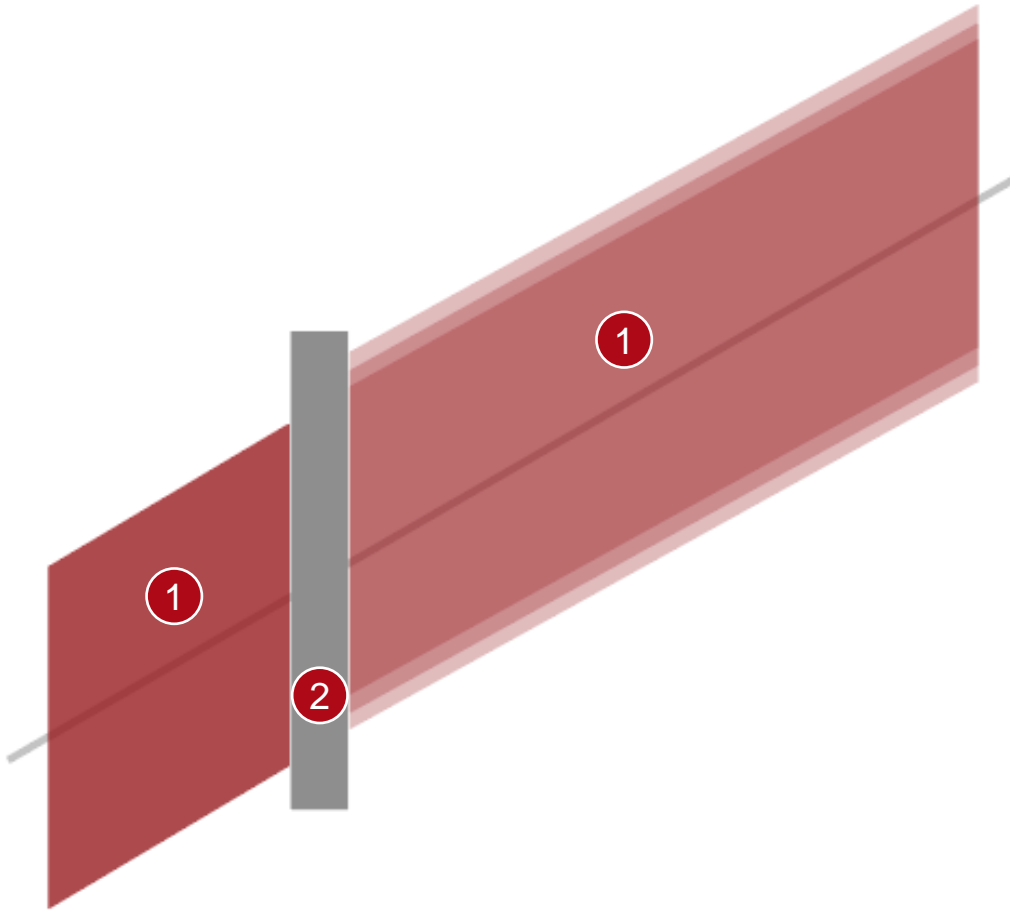


input polarization along x



input polarization along y

# VirtualLab Fusion Technologies



# Document Information

title	Modeling of Etalon with Planar or Curved Surfaces
document code	IFO.0011
document version	1.3
software edition	VirtualLab Fusion Basic
software version	2021.1 (Build 1.180)
category	Application Use Case
further reading	<ul style="list-style-type: none"><li>- <a href="#"><u>Examination of Sodium D Lines with Etalon</u></a></li><li>- <a href="#"><u>Coherence Measurement Using Michelson Interferometer and Fourier Transform Spectroscopy</u></a></li><li>- <a href="#"><u>Channel Configuration For Surfaces and Grating Regions</u></a></li></ul>