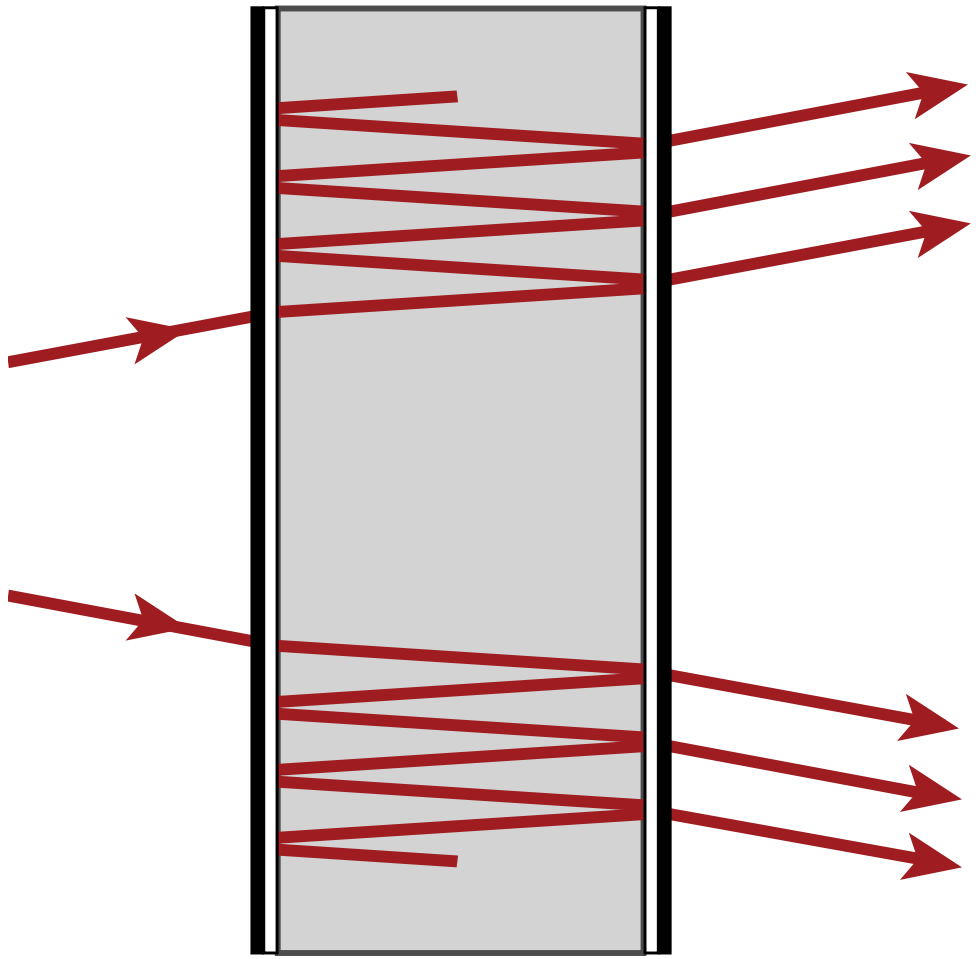
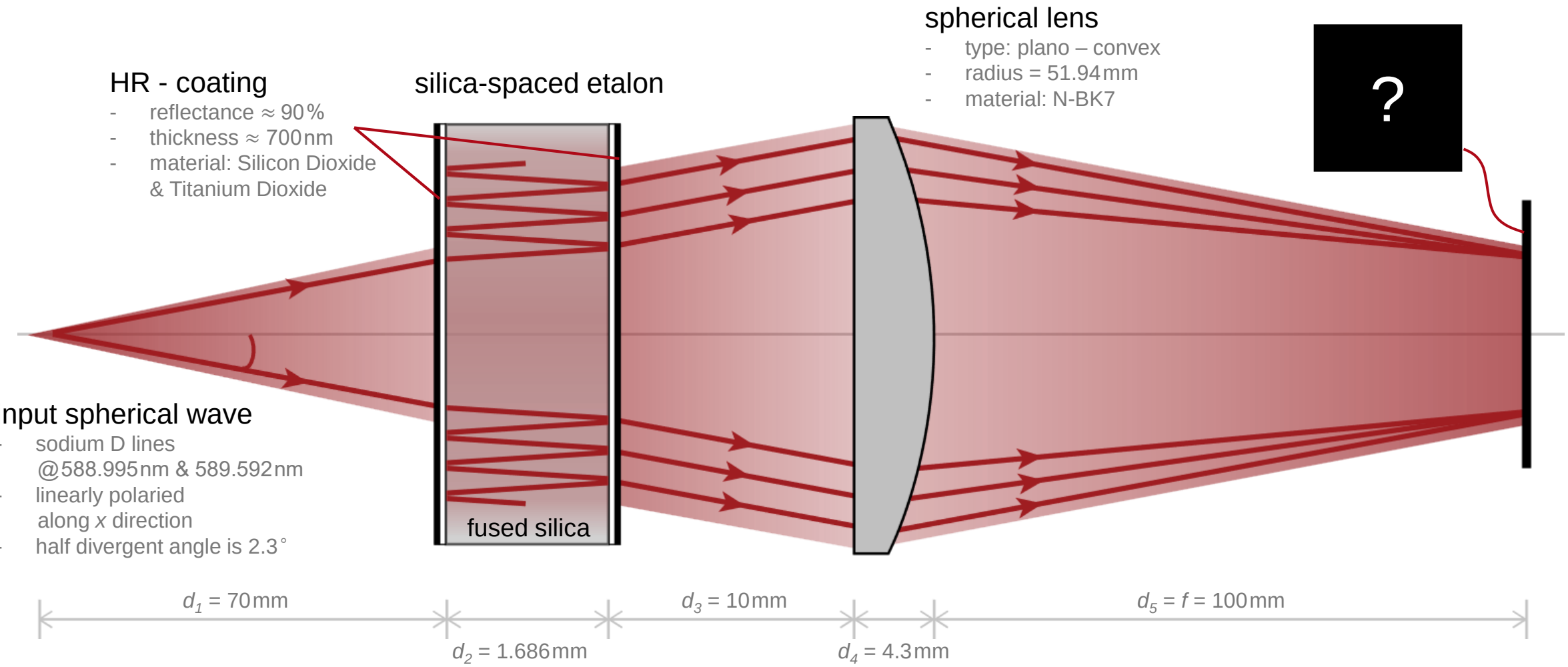
Examination of Sodium D Lines with Fabry-Pérot Etalon

Abstract



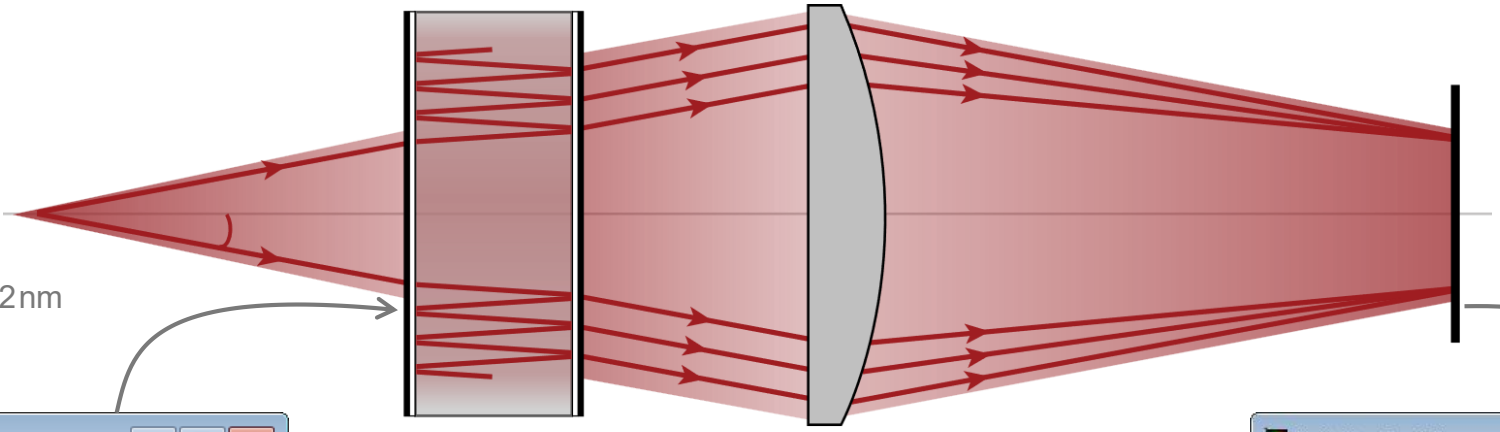
Fabry-Pérot etalons are widely used in laser resonators and spectroscopy for wavelength selection. Typically they are composed of two high-reflection (HR) coated surfaces with air or glass in between. In this example, an optical metrology system with a silica spaced etalon is set up to measure the sodium D lines in VirtualLab Fusion. With the non-sequential field tracing technique, the interference due to multiple reflections in the etalon is fully considered, and the influence from the coating reflectance on the fringe contrast is investigated.

Modeling Task

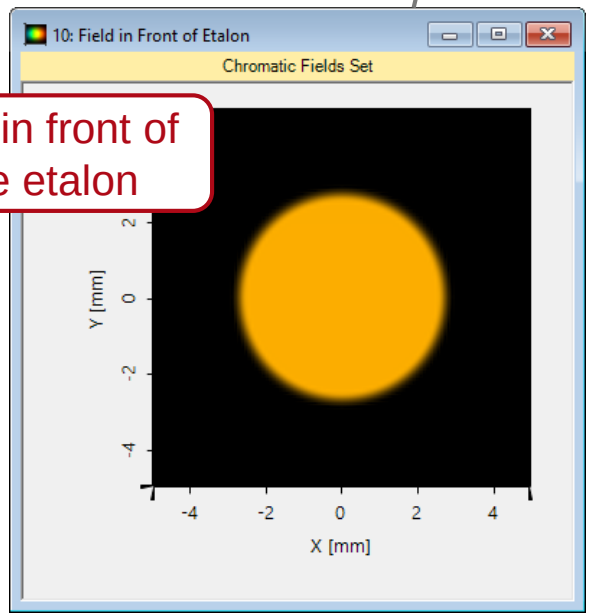


Visualization of Both Spectrum Lines

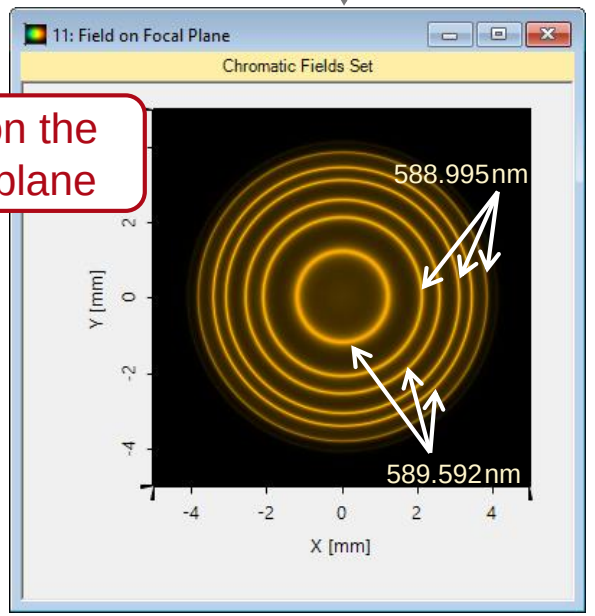
input spherical wave
- sodium D lines
  @588.995nm & 589.592nm



field in front of the etalon

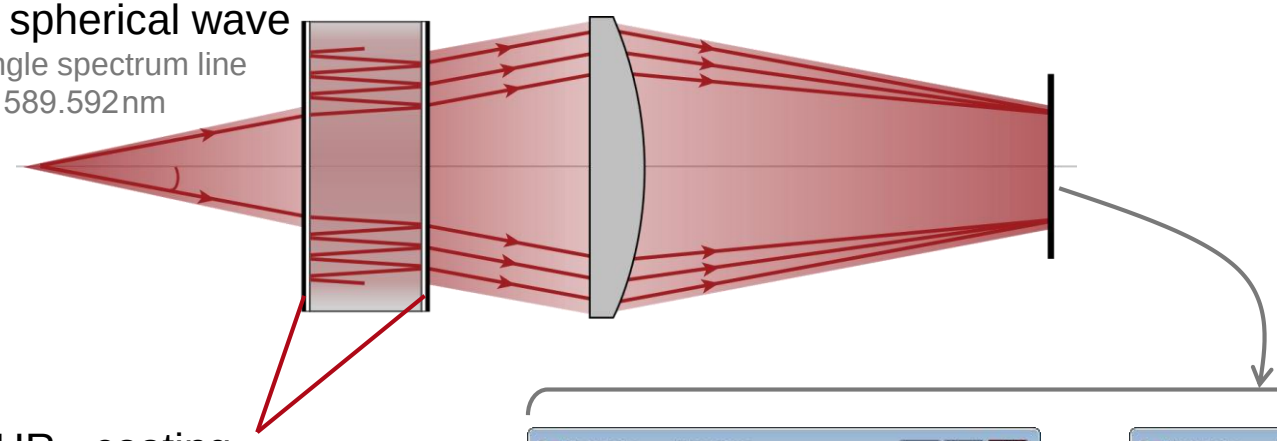


field on the focal plane



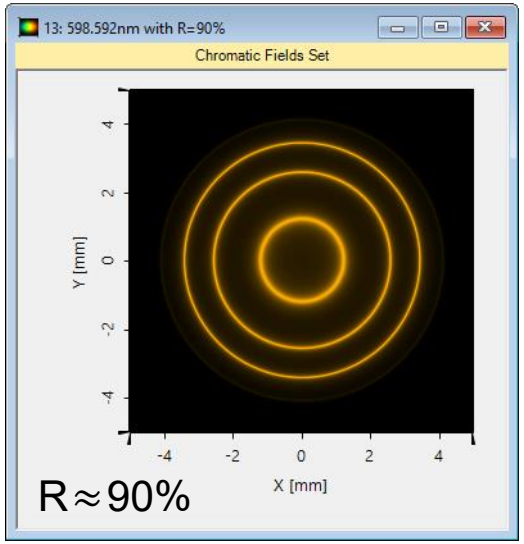
Finesse vs. Coating Reflectance

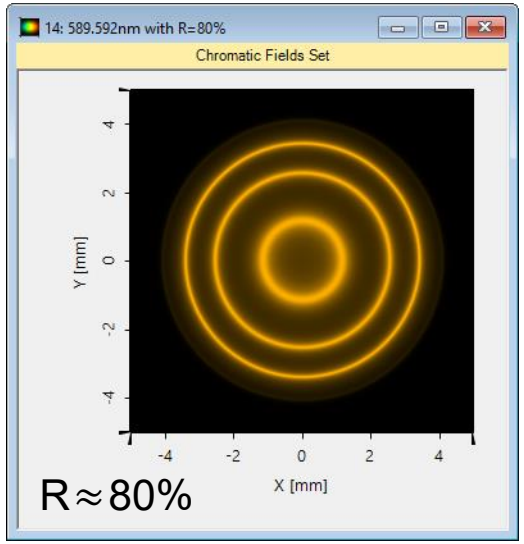
input spherical wave
- single spectrum line @589.592nm

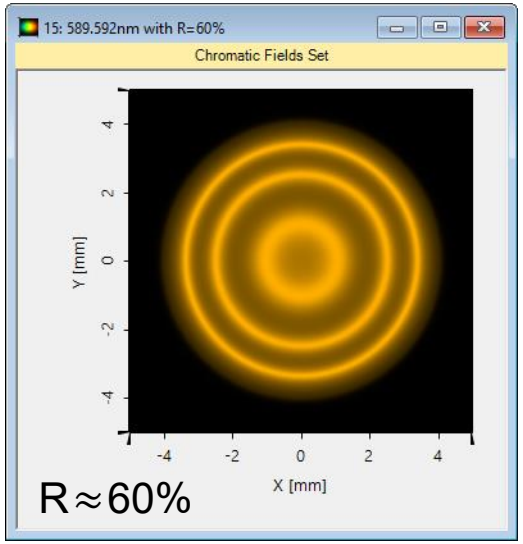


HR - coating
- reflectance ≈90%, 80%, 60%

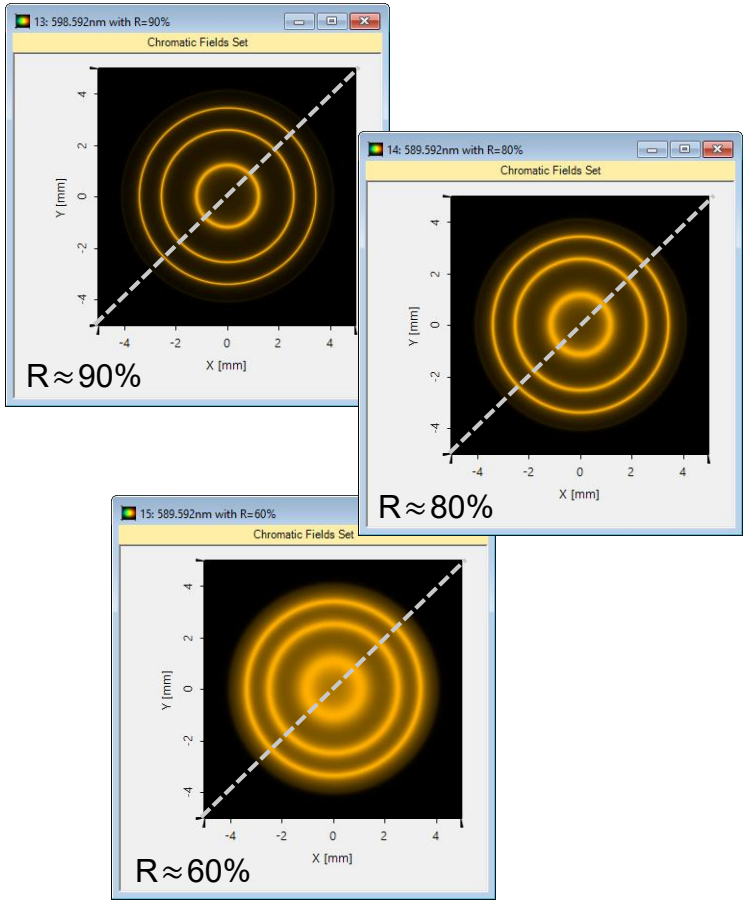
Sharpness of the interference fringes depends on the reflectance of the coatings on the etalon.





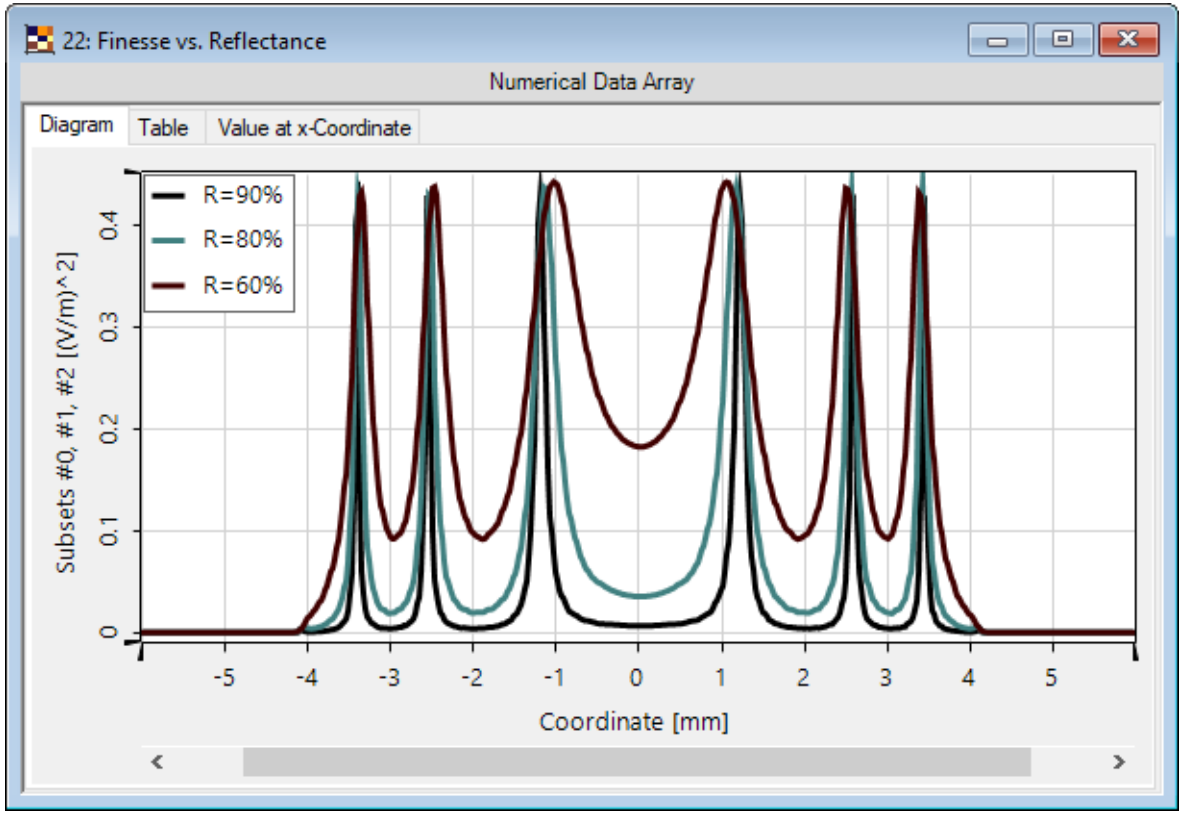


Finesse vs. Coating Reflectance



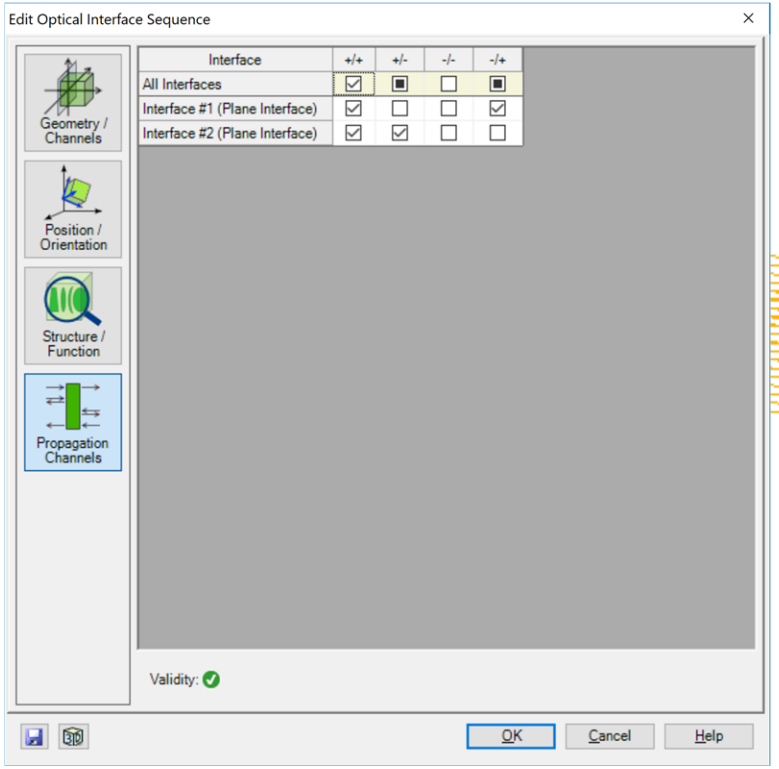
extracting 1D data along the diagonal direction

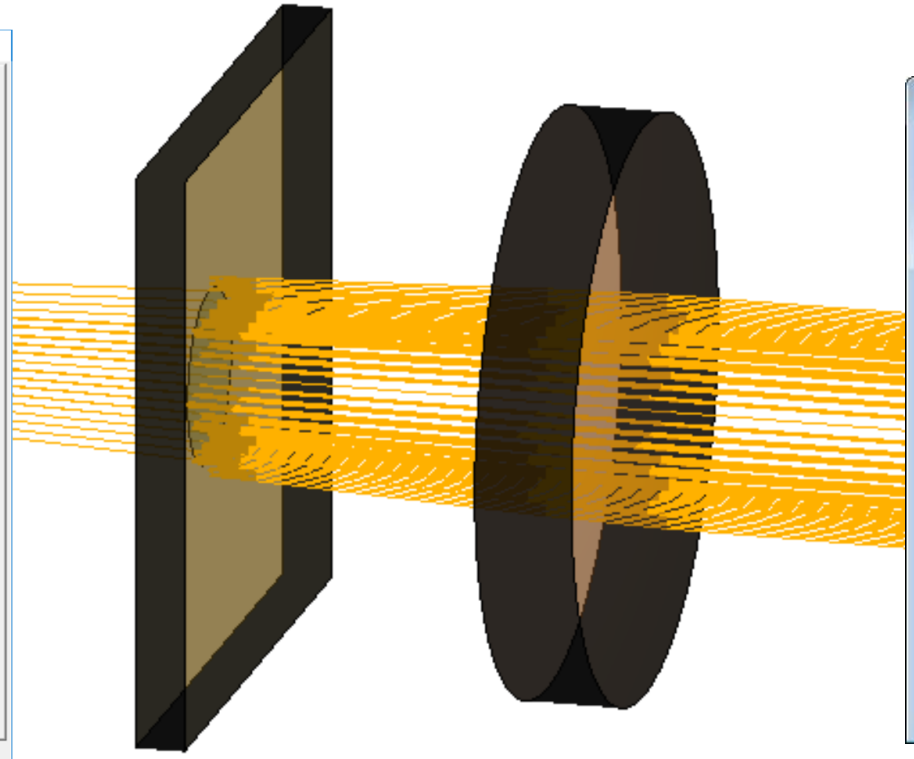
the higher reflectance, the higher finesse



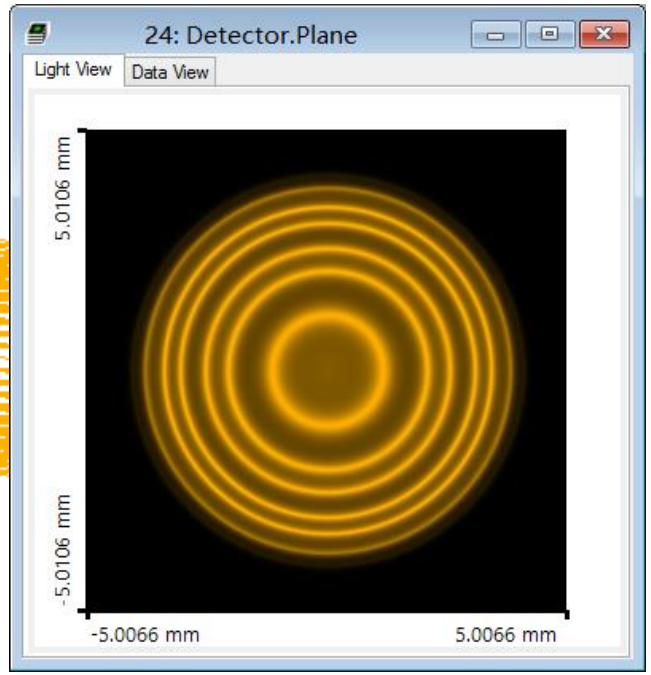
Peek into VirtualLab Fusion

flexible setting of channels for non-sequential tracing





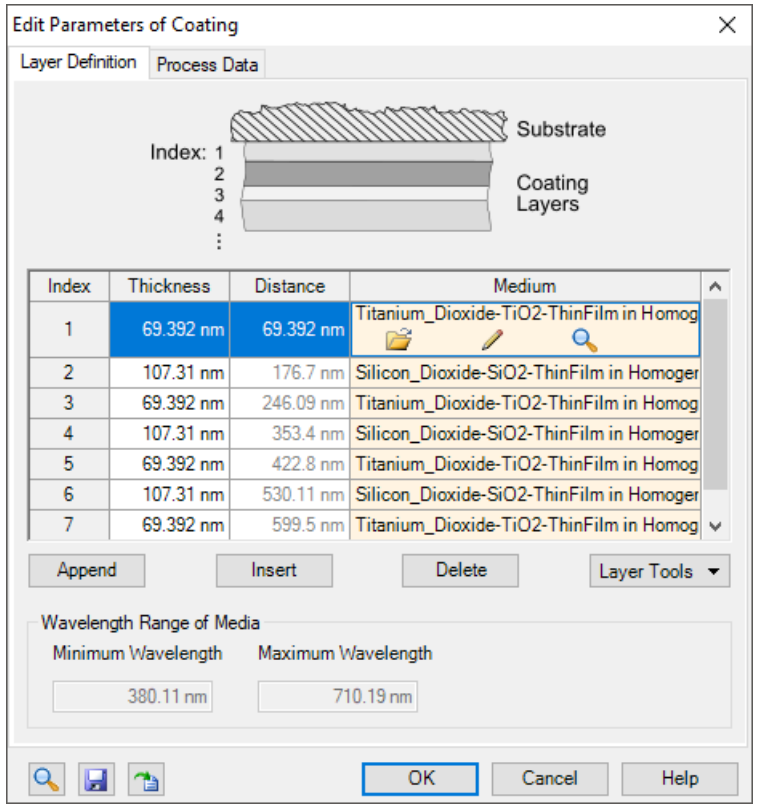
visualization of interference



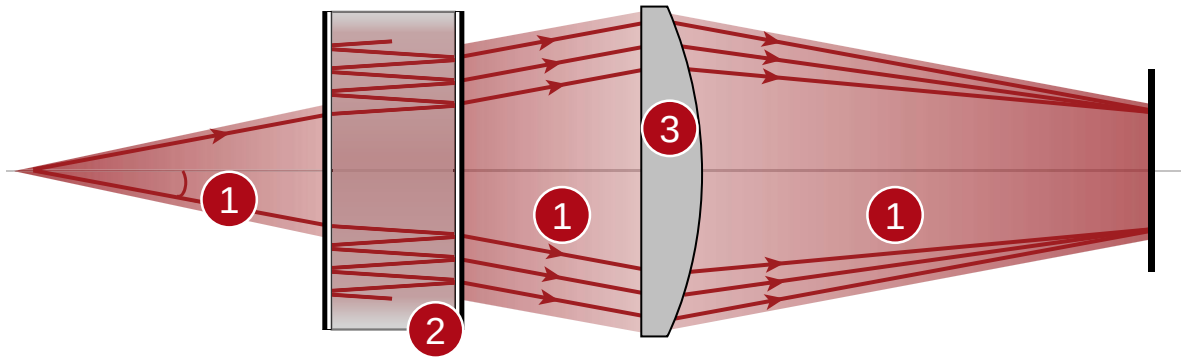
non-sequential ray tracing analysis of the optical system

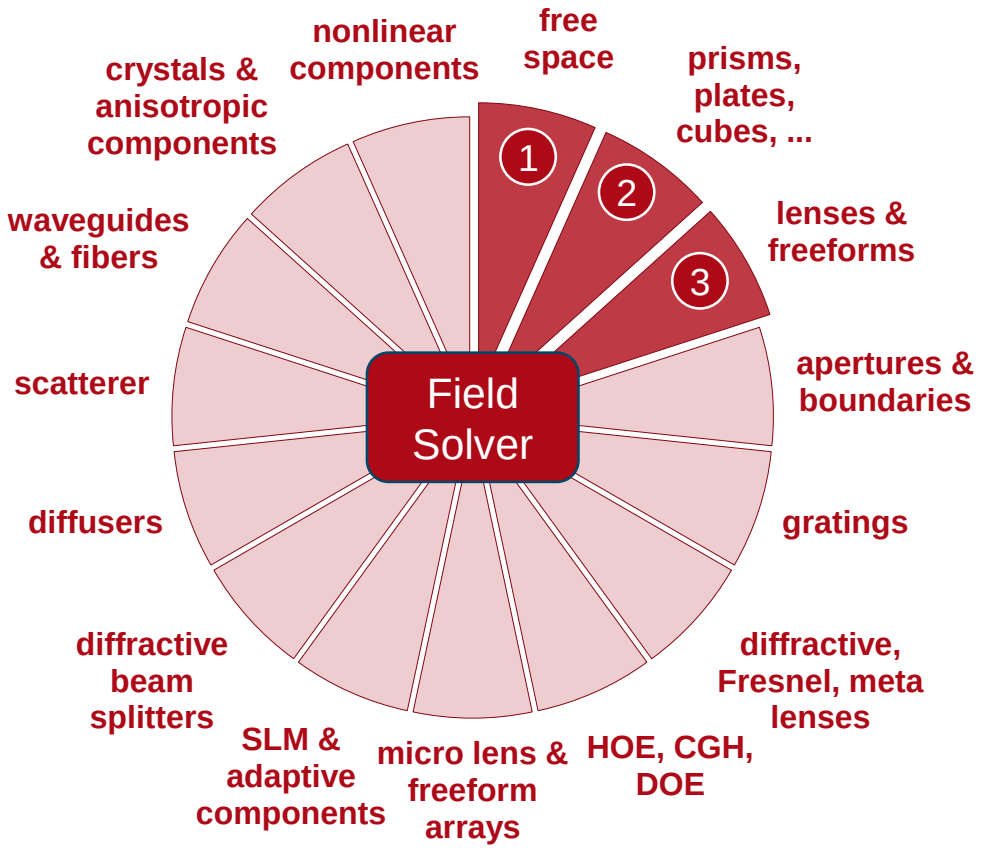
Workflow in VirtualLab Fusion

- 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 HR coating
  - Catalogs III: Coatings Catalog [Tutorial Video]
- Set the non-sequential channels of components
  - Channel Setting for Non-Sequential Tracing [Use Case]



VirtualLab Fusion Technologies





Document Information

title	Examination of Sodium D Lines with Etalon
document code	IFO.0012
version	2.0
toolbox(es)	Starter Toolbox (Non-Sequential Extension)
VL version used for simulations	7.4.0.49
category	Application Use Case
further reading	- Modeling of Etalon with Planar or Curved Surfaces - Coherence Measurement Using Michelson Interferometer and Fourier Transform Spectroscopy