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

- **input spherical wave**
  - sodium D lines @ 588.9950nm & 589.5924nm
  - half divergent angle is 2.3°

- **coatings**
  - varying reflectance
  - material: Silicon Dioxide & Titanium Dioxide

- **spherical lens**
  - plano – convex
  - effective focal length 100mm

- **silica-spaced etalon**

- **fused silica**
Visualization of Both Spectrum Lines

wavelengths 588.9950 nm & 589.5924 nm

coating reflectance ≈ 82%

in front of the etalon

on the Fourier plane of the lens
Finesse vs. Coating Reflectance

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

coatings
- varying reflectance: 82%, 65%, 37%

single wavelength 589.9950nm
Finesse vs. Coating Reflectance

the higher the reflectance, the higher the finesse

1D measurements along the radial direction
peek into virtuallab fusion

flexible configuration of channels

ray tracing analysis and visualization of the optical system

visualization of interference
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 Configuration for Surfaces and Grating Regions [Use Case]
VirtualLab Fusion Technologies

- Prisms, plates, cubes, ...
- Lenses & freeforms
- Gratings
diffractive,
Fresnel, meta lenses
- HOE, CGH,
DOE
- Micro lens &
freeform arrays
- SLM &
adaptive components
- Diffractive,
beam splitters
- Waveguides &
fibers
- Scatterer
- Diffusers
- Crystals &
anisotropic components
- Nonlinear components
- Free space
- Apertures & boundaries
- Lenses &
freeforms
- Diffractive,
Fresnel, meta lenses

Field Solver
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| further reading | - [Modeling of Etalon with Planar or Curved Surfaces](#)  
- [Coherence Measurement Using Michelson Interferometer and Fourier Transform Spectroscopy](#) |