Modeling of Etalon with Planar or Curved Surfaces
Abstract

The simplest form of an optical etalon is a transparent plate with parallel surfaces. Such a structure forms a resonator, and the transmittance and reflectance vary with the thickness of etalon. Beside the simplest structure, etalons with other configurations, with e.g. non-parallel surfaces and curved surfaces, are designed and used for different applications. With the non-sequential field tracing technique, several configurations of etalons are analyzed, and the differences in the output interference fringes are investigated.
Modeling Task

input plane wave
- wavelength 532 nm
- linearly polarized along y or x direction

etalon
different configurations
a) planar-planar (parallel)
b) planar-planar (tilted)
c) cylindrical-planar
d) spherical-planar

How to calculate the interference fringes for etalons with different configurations?
Parallel Planar-Planar Surfaces

Constructive and destructive interference alternatively shows up when the thickness of etalon varies.

etalon configuration
a) planar-planar (parallel)
- varying thickness from 100 to 99 µm
Tilted Planar-Planar Surfaces

etalon configuration
b) planar-planar (tilted)
- center thickness 100 µm
- tilt of first surface 0.1°

Linear interference fringes appear due to linear change of etalon thickness.
Cylindrical-Planar Surfaces

Polarization-dependent effect on the interference is considered in the simulation.
Spherical-Planar Surfaces

etalon configuration
d) spherical-planar
- center thickness 100µm
- spherical (x&y) surface radius 1 m

Non-sequential field tracing simulation of etalons allows the consideration of arbitrary surface types.
Peek into VirtualLab Fusion

flexible channel settings

3D system analysis with non-sequential ray tracing

Interference from multiple reflections between arbitrary surface types
Workflow in VirtualLab Fusion

• Construct component using interfaces
  - Catalogs II: Interfaces Catalog [Tutorial Video]

• Set up component position and orientation
  - LPD II: Position and Orientation [Tutorial Video]

• Adjust channels for surfaces
  - Channel Configuration for Surfaces and Grating Regions
    [Use Case]
VirtualLab Fusion Technologies

Field Solver

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

30°
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<td>- <a href="#">Examination of Sodium D Lines with Etalon</a></td>
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