Software Course: "Introduction to Unified Optical Modeling using LightTrans VirtualLab™"

Tuesday, April 24, 2012 – Friday, April 27, 2012

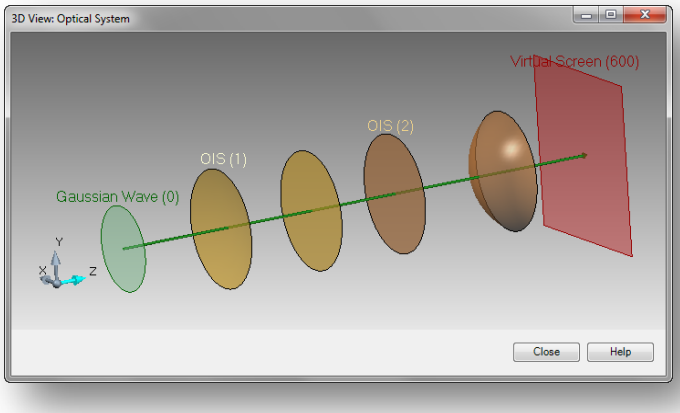
Course Time: 9 am – 5 pm.

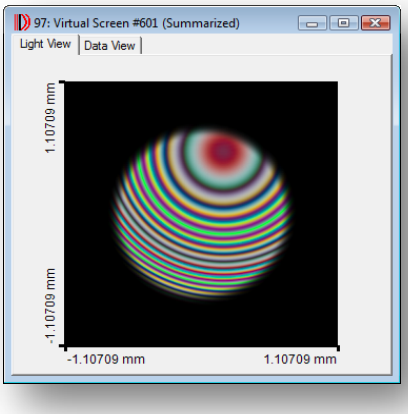
Speaker: Dr. Hagen Schweitzer, LightTrans VirtualLab UG.

Requirements: User without or with low knowledge of VirtualLab™.

Abstract:

The software course gives an introduction into the principles of unified optical modeling and field tracing methods of VirtualLab™. Components of the user interface of VirtualLab™ are introduced and the different types of documents are discussed in detail. Participants will learn step by step about components, sources and detectors of VirtualLab™. The setup and the simulation of optical systems is going to be practiced on various laser systems. Further, the course introduces the parametric optimization and the programming capabilities of VirtualLab™ including snippets and modules. On the final day, an introduction to refractive beam shaping, the analysis of laser resonators and the simulation of ultra short pulses is given.





The figure on the left side shows an optical system – setup and simulation are introduced in the course. The right figure shows an interference pattern – how light is represented in VirtualLab™ is one of the first topics in the course.

Software Course Topics, 1st Day:

- **Introduction to the concepts of field tracing and unified optical modeling for the simulation of light in optical systems**: electromagnetic light model and numerical data storage in VirtualLab™, visualization of light distribution, field tracing concept of modeling of light propagation through free spaces and components using different physical models, evaluation of light distributions using detectors, physical and numerical modeling errors.
- **Introduction to VirtualLab™ documents:** Light Path Diagram, Parameter Run Document, Optimization Documents, Session Editors, VirtualLab™ Explorer and Property Browser.

Software Course Topics, 2nd Day:

- **Simulation of paraxial and non-paraxial lens systems:** aberration analysis, import of lens data from Zemax, modeling of vector propagation effects in lens systems, investigation of focal regions, simulation of PSF and MTF, modeling of imaging systems and space frequency filters, propagation of laser beams through optical systems, analysis of laser beam parameters, analysis of diffraction effects at apertures.
- **Polarization of light**: definition of coherent laser beams having arbitrary uniform polarization, generation of laser beams having varying polarization over the beam diameter, visualization of polarization state over beam diameter, simulation of polarizers and phase retardation plates.
- **Calculation of interferograms and simulation of interferometers:** calculation of interference patterns of two or more light distributions, modeling of interferometers with a coherent light source.

Software Course Topics, 3rd Day:

- **Parametric optimization of laser systems:** introduction to parametric optimization, definition of merit function for optimization, optimization of laser systems including diffraction, interference, polarization and aberrations, optimization of focusing laser systems, optimization of fiber coupling systems, optimization of gratings.
- **Introduction to the programming of snippets and modules**: customized sources, transmission functions and optical interfaces, evaluation of fields and customized parameter run.

Software Course Topics, 4th Day:

- **Refractive beam shaping:** Gaussian to top hat transmission design, session editors for refractive beam shaping for lines and 2D tops hats.
- **Eigenmode analysis of laser resonators:** setup of resonators, Fox-Li and Arnoldi eigenmode algorithms, import of resonators from LASCAD.
- **Simulation of ultra short pulses:** definition of pulses, envelope function and carrier factor, propagation through lens systems.