SAOT Summer Academy 2020 - Course B

ZEMAX OpticStudio

Lectures and exercises: Dr. Volker Türck (www.tuerck-ing.de)

Topics: Optical Materials and Systems and Computational Optics

Snells law describes how light changes its direction of travel due to of refraction. Although its mathematical form is very simple, it is hardly possible to describe in a closed mathematical form the quality of an image that is formed by several lenses. Optical design is rather the inverse of this task, that is, to determine the best combination of lenses to create a well-focused image of a given object. It cannot be done analytically, either. Only by using a computer and appropriate software allows finding solutions for this task. Today there are a number of programs for optical design on the market. In this course the participants will learn some fundamentals of optical design using the program OpticStudio from Zemax. With practical examples and exercises, the participants will understand the essential concepts and will be introduced to strategies for the design of optical systems according to a given specification.

During the four days of the course there will be two on-line sessions each day. Between the sessions the participants will have time to work on exercises for themselves. The first day is dedicated to the foundations. Starting from the law of refraction, the most important terms and concepts of geometrical ray optics will be covered and basic working steps in the use of OpticStudio will be explained. On the second day, the focus is on how to describe the quality of optical images and which aberrations influence them. We will show how optical systems can be optimized with OpticStudio to achieve a good image quality. On the third day, the very central topic of automatic optimization will be further explored. Finally, on day four, the focus is on how OpticStudio can take into account the wave properties of light and the resulting effects of diffraction. Finally, an outlook will be given on which steps are necessary on the way from the concept to a finished product and how modern design software can support the designer.

Note for participants: In order to make it easy to follow the instructions while working with the Optic Studio software, it is highly recommended to either use a computer with two screens or two distinct computers, one for the webinar and one for OpticStudio.

Time Table

- Monday, 10:00 – 11:30 and 15:00 – 16:15

  Key concepts for the simulation of optical imaging systems, fundamentals of OpticStudio, building simple systems with paraxial lenses, imaging systems with real lenses

- Tuesday, 10:00 – 11:30 and 15:00 – 16:15

  Properties of optical glass, description and quantification of aberrations, analyses of optical systems, fundamentals of automatic optimization

- Wednesday, 10:00 – 11:30 and 15:00 – 16:15

  Automatic optimization of optical systems in OpticStudio, local and global optimization, optimizing glass selection

- Thursday, 10:00 – 11:30 and 15:00 – 16:15

  Beyond ray optics: diffraction and how it is handled in OpticStudio, typical steps in the design of an optical system: from concept to manufacture