

## **On-site Workshop Description**

### **Roughness, waviness and mid-spatial frequency ripple on optical surfaces**

#### **Description:**

The surface texture of a polished optical surface is an important, if misunderstood, surface property. Until recently, surface texture could be safely described by a single number, RMS roughness, following MIL-STD-10A, since most polished optical surfaces were manufactured using the same slurry-pitch process that had existed for decades. In the past 30 years, however, new manufacturing technologies have evolved using molding, diamond turning, synthetic lap polishing and deterministic figuring which have dramatically altered the surface finish of optics. In order to control the resultant surface texture errors, new specifications like gradients, correlation values, PSDs and MSF ripple specifications have been introduced. Most users do not completely understand these new notations however, and the meaning of even a simple RMS roughness specification has become obscure, or even meaningless.

This course begins with the origins and evolution of surface texture specifications in optics, and defines the terms and parameters used to control surface texture in the modern optical manufacturing world. The national and international standards are introduced, and the derivation of meaningful specification for texture and waviness for common applications is discussed. Finally, the identification, measurement and reduction of these manufacturing errors is treated.

#### **Learning outcomes:**

This course was designed to bring photonics personnel up to an immediate working knowledge on surface texture specifications and the impact surface roughness and waviness can have on an optical system.

This course will enable you to:

- describe the surface texture of a polished optical surface
- identify the sources of surface texture errors in modern manufacturing processes
- understand the meaning of the most common surface texture and ripple specifications
- compose a meaningful surface texture specification using MIL, ASME and ISO standards
- understand the impact of mid-spatial frequency ripple and roughness
- identify these surface errors in measurement data
- quantify the requirements for surface texture using a variety of notations

#### **Intended audience:**

This course is intended for optical design, manufacturing and quality control and assurance engineers and managers. **Maximum of 20 attendees per workshop.**

#### **Course level:**

Intermediate; some understanding of algebra is beneficial.

#### **Course Length:**

Half day (4.5 hours) with a 15 minute coffee break.

#### **Instructor:**

Dave Aikens has been writing on the subject of surface texture and ripple for more than 20 years and is one of the foremost experts on optics mid-spatial frequency ripple today.

Dave is President and founder of Savvy Optics Corp., is the head of the American delegation to ISO TC 172 SC1, and is chairman of the American Standards Committee for Optics, ASC/OP. He is also the project manager for ISO surface texture notation standards for optics.

#### **Notes:**

The course price includes presentation handouts for all attendees, a copy of the ASME surface texture standard B46.1-2002, and ISO 10110 Part 8 (surface texture notations for optics).