ESSENT OPTICS

Spectrophotometers For Coaters
Optical Monitoring Systems
Thin Film Calculation Software

LINZA 150 LENS MEASUREMENT SPECTROPHOTOMER

APPLICATION NOTES

Measurement of Short-Throw Mini Objectives

Using The LINZA 150 Lens Measurement Spectrophotometer

Introduction

Modern optical devices consist of lenses having different and often extreme specifications. Lenses are designed in a wide range of sizes and optical characteristics which bring about a set of characterization challenges. Measurement of the optical characteristics of each lens is not possible in most cases. So traditionally witness samples are used as a reference instead. Coating engineers place them on the calotte in the vacuum chamber together with the coated lenses. Measurement of the lens objectives is even a more challenging task.

This Application Note illustrates the practical example of transmittance measurement of the short-throw mini objectives using the LINZA 150 Lens Measurement Spectrophotometer.

Project Description

For one of our customers it was necessary to measure transmittance of three objectives with the following characteristics:

- Focal length: 12mm
- Clear aperture: 9 mm
- Overall length of objective: 22 mm
- Number of objectives: 3 pcs.

LINZA 150 spectrophotometers allow measuring transmittance and reflectance on lenses. The instrument can generate transmittance and reflectance data for a wide range of focal lengths (from -20 mm to ∞ and from +20 mm to ∞) and clear apertures of lenses (starting from 8 mm). However, the present case is a special one because the extremely small focal length and clear aperture of the objective lead to inability to guide all transmitted illumination to the detector inside the measurement channel of the instrument.

Solution

The experts at EssentOptics came up with an idea to measure objectives in pairs. However, the paired objectives shall be arranged in the spectrophotometer as an afocal system (Fig. 1):

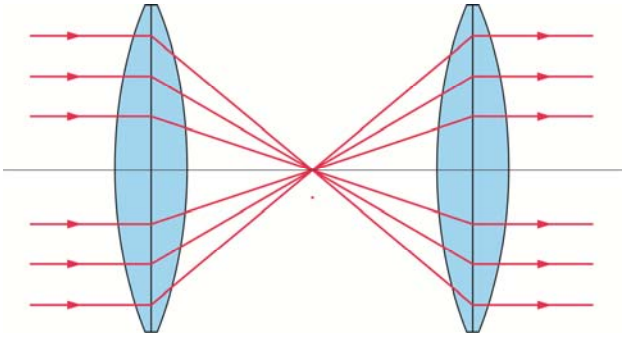

Fig. 1. Afocal optical system

This solution ensures that all illumination transmitted through paired objectives will be collimated and will also enter the detector without losses. Based on the available design specifications of the objectives we determined the required distance between objectives. Next, three transmittance measurements of three pairs of the objectives were taken: T(1-2), T(2-3) and T(1-3). The measurement results are shown below.

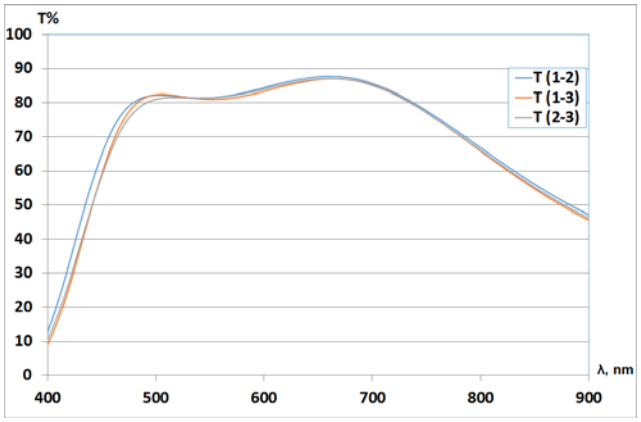

Fig.2. Spectral transmittance of three pairs of mini objectives

The obtained measurements of the paired objectives represent the classical system of three equations with three unknowns. The solution of this system of the equations does not present any problem and allows to accurately determine the transmittance of each separate objective (Fig.3):

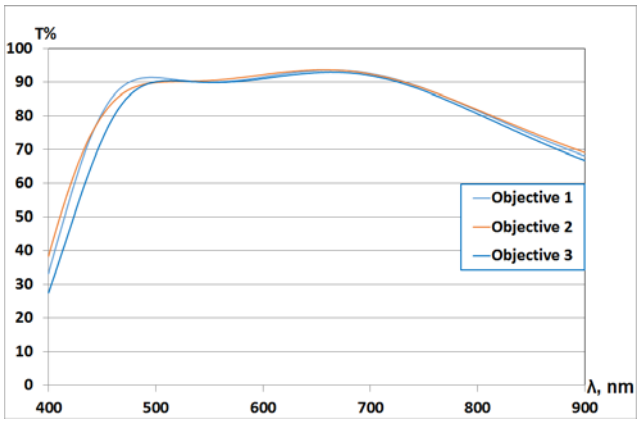

Fig.3. Actual spectral transmittance of individual short-throw mini-objectives.

Conclusion

We demonstrated a possibility to measure spectral transmittance of the short-through mini-objectives using the LINZA 150 Lens Measurement Spectrophotometers. The obtained measurement results allow to precisely determine the optical characteristics of each objective and compare the data with the initial product specifications.

About EssentOptics

EssentOptics Ltd is a leading producer of the test and measurement instrumentation for optics and photonics industry. Our products are widely used by coating experts and cover the following applications:

- PHOTON RT UV-VIS-MWIR spectrophotometer for measurement of the transmittance and absolute specular reflectance of the planar optical components at variable angles of incidence and polarizations;

- LINZA 150 UV-VIS-SWIR Lens Measurement Spectrophotometer for transmittance and reflectance measurement of the spherical optics and lens objectives;

- IRIS and AKRA broadband optical monitoring systems for accurate supervision of thin film deposition processes.

Find out more about EssentOptics:
www.essentoptics.com