

Boulder Optical Design BoulderOpticalDesign.com

Alan Streater, 720-304-3831 (US mountain time)



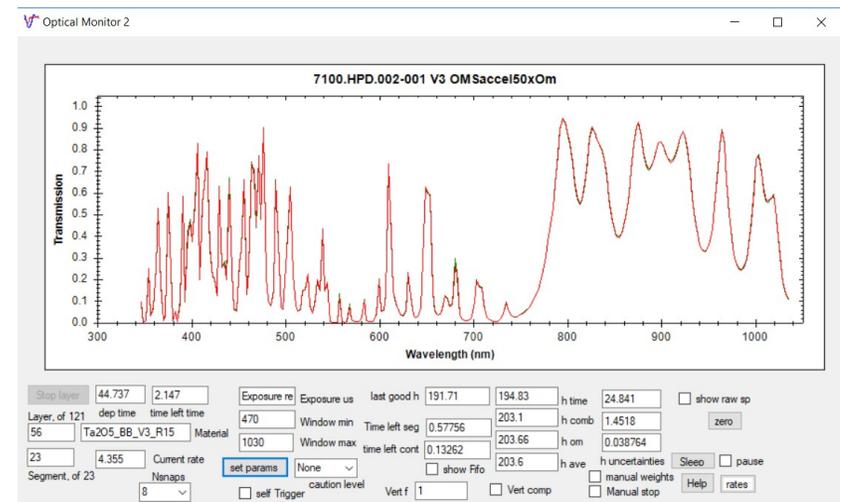
Overview

Boulder Optical Design Inc. is dedicated to serving the optics industry with high-level scientific and technical support in optical physics. Our services include: optical measurement, thin film design, thin film materials, mathematical modeling, optical monitoring of thin film deposition, surface defects, and laser damage.

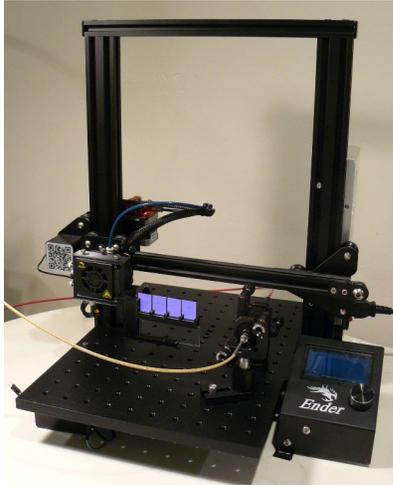
Measurement systems

Many of these measurement systems are for thin film production environments, and also can serve customers of optical components for quality control.

Broadband optical Monitor- Much of the hardware normally sits inside the thin film deposition chamber, and the software is pc-based. The evolving spectrum of a multi-layer thin film is monitored as deposition proceeds. The software analyzes the spectrum, calculates the current layer thickness and predicts the layer stop time. Communication with the chamber controller is by simple signal lines, which enables full automation of a wide variety of chambers. The system is especially well-suited for ion beam sputtering (IBS), but also works with other types of deposition systems as well, under automated control or manual control. For IBS, the resulting layer thickness precision is spectacular.

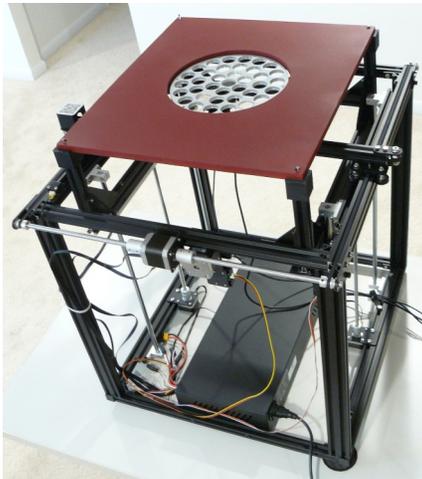


Spectral step-n-measure- This system is for broadband spectral measurements at different spatial positions of an optical element or device. The software is specifically designed to be modular, so it is useful for a wide range of measurement types and applications. Motion is controlled by a text-based g-code file. Simple example matlab/octave scripts are also provided for generating g-code files. A separate application interfaces with the spectrometer, collecting and saving the spectra in an organized way. Example matlab/octave analysis scripts are provided for automated uniformity testing, which is one common application for the system. Other applications include batch or part testing for spectral specifications.

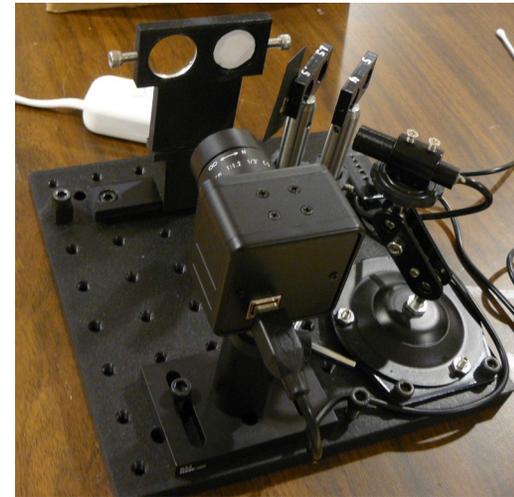


Spectral step-n-measure system

Automated optical surface Inspection- This system is for measuring surface quality, typically referred to scratch/dig. Dark field images are collected, covering a region of interest. The images are analyzed and defects are characterized and counted. Histograms of ISO ISO 10110-7 size bins are shown. The software also puts results into a spreadsheet for final display of results, which can produce fancy customized certifications. Most importantly for thin film deposition labs, the system is designed for drop-in loading of whole deposition planets, which can save much time and cost.

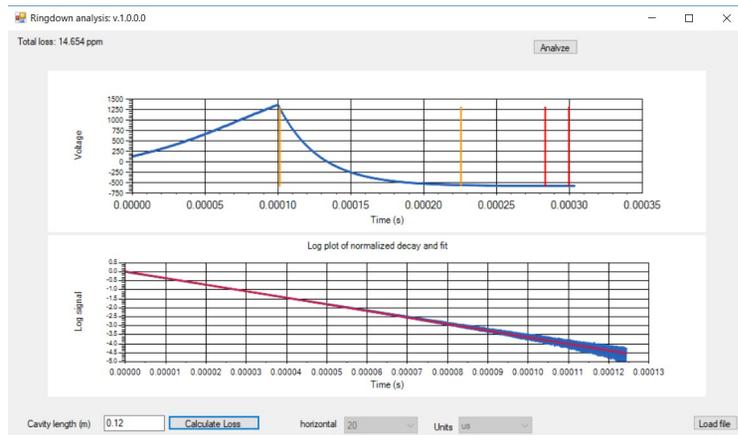


Surface Scattering measurement- In addition to defects that are large enough for direct measurement and counting, an optical surface typically has a roughness or large number of very small scattering sites, that collectively cause a small amount of scattered light. The measurement of this scattering typically involves a laser beam coming in at an angle, and measuring reflected light at non-specular angles with a camera. The analysis compares this scattered light with a reference surface. This is a very simple measurement and is low in cost. It is basically a quantitative version of the common practice of holding a part up to a bright light to check for excess scattering!



Surface Scattering measurement system

Ringdown measurement systems- I have developed ringdown measurement systems for environmental monitoring, and also for production testing of low-loss mirrors that go into ringdown systems. The various applications almost put this into the category of a consulting service, but we typically set up a complete system, and the software is usually similar or the same.



Example ringdown measurement data

Consulting Services

High-level scientific support leads to faster and better solutions, and this is where we can save you money. We combine a deep understanding of the interaction of light and matter with strong scientific discipline and long experience in the optics industry. Here are a few examples of support that we provide.

- Determine optical parameters for a coating material, based on spectrophotometer scans and other data. Extrapolate to other wavelengths where possible.
- Create or review thin film designs and/or specifications for a complex optical system. For thin film designs, we specialize in out-of-the box solutions for problems that are especially difficult!
- Optimize coating designs for improved manufacturability, especially for systems using broadband optical monitoring.
- Design and develop a system for environmental gas monitoring, using ringdown, direct absorption, or other spectroscopic methods.
- We have supported a lot of work on particle counting systems, so we have considerable expertise in this area.

About Alan Streater

Alan D. Streater, president of Boulder Optical Design Inc., has a Ph.D. in physics (JILA/NIST, U. of CO). After postdoctoral work (Leiden University), he was in academics for 11 years, specializing in the interaction of light and matter (Lehigh University Physics Department, tenured 1995) He has since worked in the optics industry. He has over 40 publications and patents.

Dr. Streater has the clarity of a teacher, the depth of a researcher, and a practical approach that is essential in industry. His expertise includes light propagation, optical materials, thin film optical design, thin film deposition, and optical measurements. Other important skills include mathematical modeling, scientific communication and writing, product development, programming, and other general laboratory skills.

Non-disclosure policy and integrity Statement

I will not disclose results, data, or techniques that are privately held by other companies or by your company. I will use and suggest solutions and techniques that are my own, or that are in the open literature, or that are standard in the optics industry. I can provide a list of references who can attest to my high standards of integrity, my scientific abilities, skills, and effectiveness.

Contact information

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