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PHOTONICS spectra

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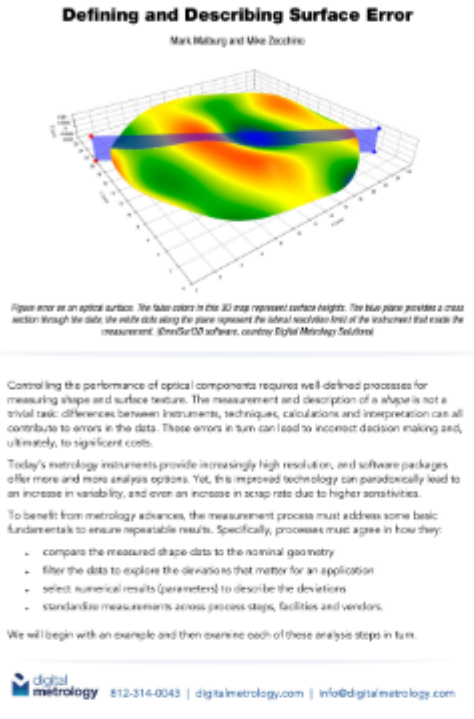
Defining and Describing Surface Error

Mark Malburg and Mike Zecchino

Figure error on an optical surface. The false colors in this 3D map represent surface heights. The blue plane provides a cross section through the data; the white dots along the plane represent the lateral resolution limit of the instrument that made the measurement. (OmniSurf3D software, courtesy Digital Metrology Solutions)

Controlling the performance of optical components requires well-defined processes for measuring shape and surface texture. The measurement and description of a shape is not a trivial task: differences between instruments, techniques, calculations and interpretation can all contribute to errors in the data. These errors in turn can lead to incorrect decision making and, ultimately, to significant costs.

Today's metrology instruments provide increasingly high resolution, and software packages offer more and more analysis options. Yet, this improved technology can paradoxically lead to an increase in variability, and even an increase in scrap rate due to higher sensitivities.

To benefit from metrology advances, the measurement process must address some basic fundamentals to ensure repeatable results. Specifically, processes must agree in how they:

- compare the measured shape data to the nominal geometry
- filter the data to explore the deviations that matter for an application
- select numerical results (parameters) to describe the deviations
- standardize measurements across process steps, facilities and vendors.

We will begin with an example and then examine each of these analysis steps in turn.

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Defining and Describing Surface Error

Controlling optical component performance requires well-defined measurement processes. Analysis software can help by guiding users through the steps of the measurement process (geometry fitting, filtering, and defining parameters) and by making it simple to visualize the impact of analysis options. Highly visual, interactive software makes it possible for designers, technicians, and inspectors to interact with the same 3D data, providing consistency and broad dissemination of process information.

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