

A wide-angle photograph of a large, modern conference hall. The room has a high ceiling with a grid of recessed lights. The floor is polished and reflects the lights. In the foreground, there are several rows of red and black equipment, likely laser components, arranged in a U-shape. In the background, more equipment and a large open space are visible.

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IFIN-HH/ELI-NP Training and Conference Center
Sydney Benjamin Galès / main conference hall

The Things We Thought We Knew About Optics and Coatings

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Laser optics are often considered as commodities: a wavelength, a reflectivity value, a flatness figure and an LIDT number copied from the previous purchase order and online shops. Yet laser optics optimized for high-power and high-energy laser systems are frequently what limits the power, efficiency and lifetime of a laser system. This workshop takes one typical request for quotation as a case and examines it line by line, explaining the meaning of each specification typical for laser optics.

The first part reviews general optics specifications: substrate materials from UV and IR fused silica to sapphire and CaF_2 , surface-defect standards (MIL-PRF-13830B vs ISO 10110-7), clear versus coated aperture, and the often-confused family of flatness, power, irregularity and wavefront error. We show how coating stress bends substrates and how a selective flatness specification can cut cost without compromising performance and feasibility.

The second part tests common myths against data from international laser damage competitions and OPTOMAN's own measurements. This chapter covers damage mechanisms under different irradiance conditions, LIDT testing conditions and how they differ, LIDT scaling laws, the origins and significance of (sub)surface defects, linear and nonlinear absorption, and E-field optimization within the structure of the coating stack.

Participants will leave speaking some of the coating engineers' language, and knowing how to specify what their application truly needs.

Keywords: laser optics specification • IBS coatings • LIDT • surface form • absorption • E-field optimization • laser-induced contamination.