ASC OPI 2005: Call for White Paper Concerning Performance Based Optical Surface Imperfection Standard

Requirements of Zygo Corporation with respect to surface imperfection standards

At the request of OEOSC, this note is being written to describe the need of the optics industry for future surface imperfection standards, from one company's perspective.

Most optical systems fall into two major catagories; incoherent (e.g. white light) systems, and coherent (e.g. laser) systems. Both catagories are futher segregated into amplitude-sensitive systems (e.g. interferometers) and intensity sensitive systems (e.g. imagers) Zygo is concerned mainly with the performance-based defects on coherent and incoherent systems which are amplitude sensitive. The performance parameter is the inaccuracy in the phase detection during measurement with an interferometer. The phase errors arise due to the change in phase by the coherent summation of the primary wavefront and the wavefront projection after interacting with the material/surface defects.

Optical noise arising due to these defects has a much greater impact in coherent illumination compared to incoherent illumination. The defects that are cosmetic under incoherent illumination affect the performance under coherent illumination.

Hence, performance based effect of material defects (like index homogeneity, bubbles, inclusions etc.) and surface defects (like scratch, dig, pits, coating voids etc.) on interferometers and phase measuring systems under coherent illumination is the key requirement of Zygo Corporation. Our current use of ISO 10110, MIL-PRF-13830, and OP1.002 is adequate for all but these types of imperfections.