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Adaptive X-Ray Optics

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Editors

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Contents

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1 Synchrotron Adaptive X-ray Optics I
Ali M. Khounsary, Argonne National Laboratory (United States)
Kevin L. Baker, Lawrence Livermore National Laboratory (United States)

2 Synchrotron Adaptive X-ray Optics II
Kazuto Yamauchi, Osaka University (Japan)
Raymond Barrett, European Synchrotron Radiation Facility (France)

3 Adaptive Normal-Incidence Telescopes I
Stephen L. O'Dell, NASA Marshall Space Flight Center (United States)
Paul A. Bierden, Boston Micromachines Corporation (United States)

4 Adaptive Normal-Incidence Telescopes II
Stuart B. Shaklan, Jet Propulsion Laboratory (United States)
Mourad Idir, Synchrotron SOLEIL (France)

5 Active Grazing-Incidence Telescopes I
Sergio R. Restaino, U.S. Naval Research Laboratory (United States)
Daniel Lopez, Argonne National Laboratory (United States)

6 Active Grazing-Incidence Telescopes II
Michael Hart, The University of Arizona
Simon G. Alcock, Diamond Light Source Ltd. (United Kingdom)

Introduction

Adaptive optics is a rapidly evolving field with a broad range of applications, from ophthalmology to optical communications to astronomy. Specific applications include laser beam forming and correction, laser materials processing, confocal microscopes, scanning optical systems, optical probes, micro-optic couplings, and in-vivo retinal mapping. Technical advances—including manufacturing developments such as Micro-Electro-Mechanical Systems (MEMS) combined with batch processing—and ensuing cost reductions are likely to effect an even broader range of applications.

Developed originally for correcting atmospherically induced wave-front errors, most adaptive optics operate in the IR and visible spectral bands. However, there is no fundamental reason why they cannot be extended beyond—including in the X-ray band. On the other hand, some specific technical issues of active optics for grazing-incidence mirrors differ from those for normal-incidence mirrors.

This is the inaugural conference in a biennial series planned for SPIE Optics + Photonics. It serves as a forum for reporting and reviewing developments in "traditional" adaptive optics, for examining their extension and application to X-ray optic, and for reporting progress in what we broadly (and loosely) term "Adaptive X-ray Optics".

Two main objectives guide and drive this endeavor. One is to provide capabilities for dynamic or quasi-static adjustment of otherwise static optical systems, thus improving imaging quality and increasing the versatility of X-ray optical systems. The other objective, somewhat related to the first, is to provide real-time corrections to X-ray optical systems.

This Conference comprised six sessions. The first two sessions concentrated on the burgeoning efforts to apply adaptive techniques to X-ray synchrotron optics. The third and fourth sessions focused on normal-incidence telescopes—drawing lessons on progress in deformable traditional optics in sensing, actuation, and correction. The last two sessions centered on grazing-incidence telescopes, where the need for remotely (in-space) adjustable optics is being examined primarily for figure correction of highly nested, lightweight X-ray telescopes.

We thank the speakers and session chairs for contributing to a timely and useful conference. We are grateful to the Conference co-chairs (Drs. Stuart B. Shaklan, John Wellman, and Kazuto Yamauchi) and other members of the Program Committee for their assistance in organizing the Conference. Finally, we appreciate the help of the SPIE staff.

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Sergio R. Restaino