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Introduction

The conference, *Optics for EUV, X-Ray, and Gamma-Ray Astronomy VIII* met 8–10 August, in San Diego, California, as part of the **SPIE Optics + Photonics 2017** international symposium, ***Optical Engineering + Applications***. This conference provides a forum for discussion of recent progress in imaging and spectroscopic optics for high-energy astronomy. As with previous biennial conferences in this series, the conference was well-attended by international researchers, including graduate-student and post-doctoral scientists, and featured approximately 65 oral or poster papers.

The success of the conference reflects the vitality of the high-energy astronomy community working in optics and imaging telescopes. The current environment is particularly positive, as facility-class x-ray and gamma-ray observatories have recently been approved for implementation or for advanced study. These include the large space-based x-ray observatories *ATHENA* (selected by ESA as the L2 mission of the Cosmic Visions program) and Lynx (being studied by NASA for consideration during the next US Decadal Survey, as a worthy successor to the *Chandra X-ray Observatory*), as well as the ground-based Cherenkov Telescope Array (CTA) gamma-ray observatory, being implemented by a large international consortium. In parallel, other smaller x-ray missions (*SRG*, *IXPE*, *XARM*, *eXTP*, and *Einstein Probe*) are at various stages of implementation or study.

Session 1 was devoted to ground-based Cherenkov Telescopes for gamma-ray astronomy in the TeV domain. Imaging Atmospheric Cherenkov Telescopes (IACTs) are arrays of moderate-angular-resolution, normal-incidence mirrors that provide stereoscopic imaging of Cherenkov light emitted in upper-atmosphere showers, initiated by interaction of cosmic gamma rays with the atmosphere. The presentations addressed technological efforts for realization of low-cost telescopes of different size classes and designs for the upcoming CTA (Cherenkov Telescope Array) project. In this context, an interesting review discussed analogies between dual-mirror telescopes for IACT applications and for grazing-incidence Wolter-like x-ray telescopes. In each case, the configurations have been inspired by the work of Karl Schwarzschild on the design of aplanatic telescopes.

Session 2 concerned design and development of various X-Ray Telescopes, e.g., the *Imaging X-ray Polarimetry Explorer* (*IXPE*, recently selected by NASA as a SMEX mission), *STAR-X* (a wide-field x-ray telescope using thin monocrystalline-silicon segmented mirrors), the small-optics systems *MiXO* (Miniature Lightweight X-ray Optics), and *CubeX* (CubeSat x-ray telescope) for solar-system exploration.

Session 3 reported development and implementation of the ATHENA Telescope, which ESA has selected as the second large-class (L2) mission in its Cosmic Vision program. The requirements of 2 m^2 effective area and 5″ angular resolution are enabled by innovative x-ray optics based upon silicon-pore mirror technology. Presented papers reported the status of the *ATHENA* telescope and optics, as well as detailed descriptions by industrial and scientific partners of aspects related to manufacturing, integration, testing, and calibration.

Session 4 addressed the design and analyses aspects of various x-ray missions. These included *ATHENA*, *STAR-X*, and the two future Chinese missions (*eXTP* and *Einstein Probe*) with international participation.

Session 5 dealt with the metrology and testing of astronomical x-ray optics. Some papers addressed the *ATHENA* optics, in particular, how to perform a reliable metrology and calibration program for silicon-pore-optics modules. Other papers reported on calibrations of mirror modules for the *Hitomi* mission.

Sessions 6 and 7 reported methods for direct fabrication of light-weight, high-angular-resolution, high-throughput x-ray mirrors. For the monocrystalline-silicon optics, the fabrication process slices a thin mirror from a figured block of single-crystal silicon, which is ideally free of internal stress. For the thin fused-silica optics, the fabrication process directly figures and polishes the thin substrate. These approaches aim to maintain *Chandra*'s sub-arcsecond resolution while providing 10-30 greater throughput. Each shows promising Initial results and anticipates ion-beam figuring to correct residual low-frequency errors.

Session 8 concerned slumped optics. Reports on hot slumping of thin glass substrates, such as used for the *NuSTAR* hard x-ray mission and considered for the *IXO* optics, focused primarily on fabrication of substrates for deformable x-ray mirrors. In contrast, the session also discussed cold slumping of thin glass substrates for high-throughput x-ray mirrors.

Session 9 described recent developments in spectrometer and polarimeter optical components for x-ray astronomy. The report on critical-angle transmission (CAT) gratings pointed to high-resolution-spectroscopy applications for medium (*ARCUS*) and for large (*Lynx*) x-ray astronomy missions. Papers on a proposed soft x-ray spectroscopy polarimeter (*REDSoX*) described using CAT gratings in combination with laterally graded multilayers working near the Brewster angle.

Session 10 and Session 11 reported, respectively, on recent developments and applications for multilayer coatings and on the related issue of coating stress. While high-reflectance coatings enhance and extend to high energies the effective area, internal stress caused by the coating itself can distort the thin mirrors envisioned for light-weight x-ray optics.

Session 12 addressed erosion/deposition figuring techniques aimed at producing precise profiles for thin substrates. These post-fabrication methods include ion figuring, differential deposition (additive machining), and ion implantation to manipulate stress in thin substrates. As a novel extrapolation of additive machining, two papers reported on a UK research effort toward utilizing 3D printing for fabricating x-ray optics.

Session 13 concerned adjustable optics, one of the new frontiers for implementing future x-ray telescopes (e.g., *Lynx*) of large effective area and excellent imaging quality. Papers in this session reported progress in piezoelectric and magnetostrictive actuators

Session 14 reported other imaging technologies for x-ray astronomy. These included lobster-eye optics for large-field-of-view monitoring and an interesting approach to boosting imaging resolution of a moderate-resolution focusing telescope using a rotating collimator.

We are grateful to the Program Committee, session chairs, authors, and SPIE staff for their contributions to this successful conference.

Finally, we sadly note the passing of our dear friend and colleague Mikhail (Misha) Gubarev in early 2017. As a talented optical physicist at NASA Marshall Space Flight Center, Misha made numerous contributions to metrology and fabrication of x-ray and neutron optics.

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