

NASA SBIR/STTR Technologies

Contract No. NNX13CG30P – Advanced Optical Metrology for XRAY Replication Mandrels and Mirrors

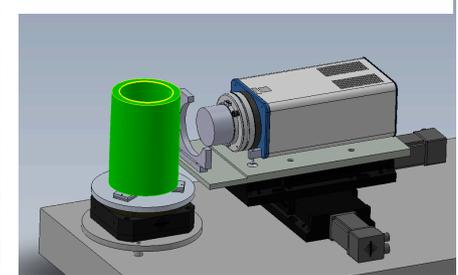
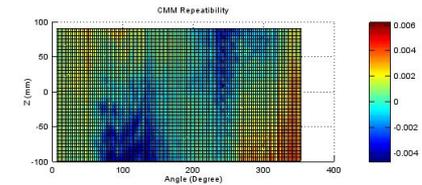
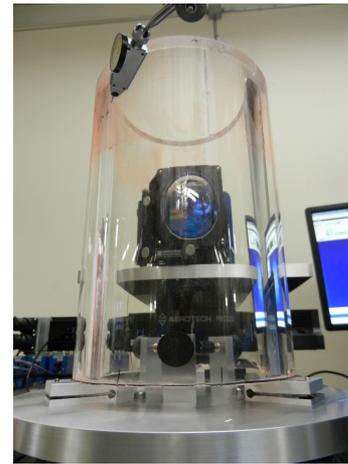


PI: Kai Xin PhD : Aperture Optical Sciences Inc. – Durham, CT

Identification and Significance of Innovation

Advanced x-ray observatories such as IXO and GenX will require thousands of thin shell mirror segments produced by replication using convex mandrels. Quality and cost effective manufacturing of these segments is dependent on the speed and effectiveness of the metrology we use in manufacturing and the ability to use accurate measurements to enable deterministic fabrication. AOS proposes development of an efficient and accurate metrology system to enable the manufacturing of segments with performance of 0.5 arc-second or better. A current method to test such mandrels is to stitch multiple meridional profiles acquired using a large aperture plano interferometer and an air-bearing actuated partholder. AOS will advance this method, by building an automated platform, driven by custom developed software, and implementing improvements that will enhance both the accuracy and efficiency of the test.

Expected TRL Range at the end of Contract (1-9): 3-4



Technical Objectives

1. Produce an automated metrology system that can demonstrate precision of measurement of high resolution line scans with uncertainty < 0.2 arc-seconds
2. Measure low frequency form error using a coordinate measuring machine (CMM).
3. Stitch low frequency CMM data with overlaid high resolution line scans. Cone angle variation angle should be < 0.1 arc-seconds. Resulting map should be in a form that may be used as a input for corrective finishing.

Work Plan

1. Acquire parts and build test platform
2. Calibrate Optical and Mechanical Measurements
3. Develop software to control the mechanical system for optical alignment
4. Make measurements of NASA provided mandrels

NASA and Non-NASA Applications

IXO Replication Mandrels
GenX mandrels and optics
Precision Cylindrical Optics
Large Format Aspheres
Low Mid-Spatial Period Optical Surfaces
Deterministic Low Cost Fabrication

Firm Contacts

Mr. Flemming Tinker, Aperture Optical Sciences Inc. (860) 316-2589

Dr. Kai Xin, PI, Aperture Optical Sciences Inc. (860) 316-2589

NON-PROPRIETARY DATA