



# PRECISION OPTICS AND ASSEMBLIES

For more than 50 years, Harris has provided high-performance optical components and assemblies for the world's most sophisticated Earth and space observation systems. Today we are the fabricator of choice for large, high-precision products that meet our customers' most rigorous requirements.

## HIGH-PERFORMANCE, RELIABLE OPTICS FOR EARTH AND SPACE OBSERVATION

### BENEFITS

Meets the most demanding requirements for spatial frequency errors, mounting needs, and application-specific issues

Fabricated cost-effectively with Harris' end-to-end in-plant capabilities

Provides a surface finish of less than 2 angstroms on glass and glass ceramic materials

### SPECIALIZING IN CUSTOM, LARGE-SCALE OPTICS

Harris provides opto-mechanical design, optical fabrication, test, and assembly services for precision optics products and systems. We specialize in the custom fabrication of large flat optics (2.5 meters and larger) in quantity. We have been fabricating large optical surfaces – both mirrors and windows – in any shape, with low surface roughness and figure, for over 50 years. This experience, along with our rigorous metrology and testing program and our state-of-the-art in-house facilities, enable us to meet demanding quality and delivery requirements.

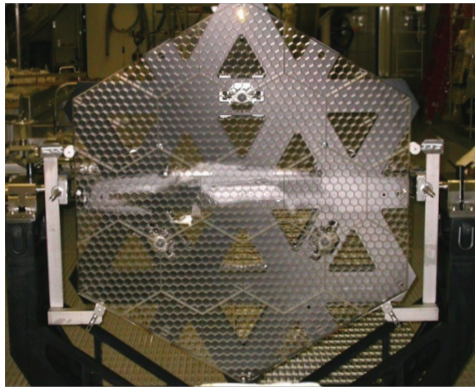
### Our products are used in a variety of high-performance systems, including:

- Telescopes
- High-Energy Laser Optics
- Test Optics
- Observation Windows
- Gauging Systems
- Relay Mirrors
- Large Vacuum Compatible Viewing Windows
- Grating Substrates
- Inspection Instruments
- Solid Plano Optics
- Interferometers
- Microlithography Systems

NASA's Chandra X-ray Observatory and James Webb Space Telescope

University of Rochester Lab for Laser Energetics

DigitalGlobe's IKONOS, Quickbird, GeoEye-1, and WorldView-1, -2, -3, -4



Lightweighted primary mirror segment.

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## KEY CAPABILITIES

- Polish plano configurations in glass, glass ceramic, and crystalline materials in 10- to 50-inch (0.25m to 1.25m) diameter optics with a figure accuracy better than 0.02 wave RMS (0.01 microns RMS)
- Achieve surface finishes of less than 2 angstroms on glass and glass ceramic materials
- Meet demanding requirements for spatial frequency errors, mounting needs and other application-specific issues
- Shape and grind plano surfaces on optics up to 100 inches (2.5m) in diameter - both solid and lightweight configurations. Complex part geometries can be machined with our computer numerical control (CNC) waterjet cutter or CNC milling systems
- Incorporate state-of-the-art computer controlled figuring systems, such as small-tool polishing and ion figuring

## SPECIALIZED TEST SYSTEMS

- Ritchey-Common test facility for full aperture testing of optics up to 72 inches (1.8m) in diameter
- 35-inch (0.9m) aperture Fizeau interferometer system
- Capability phase measuring interferometers up to 24-inch (0.6m) aperture



Harris provides precision optics for some of the world's most prestigious observatories and telescopes.

## TECHNOLOGIES AND PROCESSES

**Small Tool Polishing** – Process surfaces to the correct optical figure within a few microns using the latest deterministic control algorithms.

**Magneto-Rheological Finishing** – Provide deterministic finishing and figuring to meet the most stringent requirements.

**Ion Beam Figuring** – Remove material at the atomic level to converge the optical figure to specification. Provide deterministic, competitively priced production and exceptional edge-of aperture control for segmented systems.

**Specialized Coatings** – Apply various solutions, including low-stress, high-reflectance silver coatings.

**Testing and Metrology** – Accommodate optics as large as 3.5 meters with ASC 9100 / ISO 9001:2008 certified accuracy to less than 0.01µm RMS.

**Simulation of Space Environments** – Compensate for gravity and vacuum from 300° K to 30° K.

**Assembly** – Assemble in certified integration areas using experienced assembly professionals.

## About Harris Corporation

Harris Corporation is a leading technology innovator that creates mission-critical solutions that connect, inform and protect the world. The company's advanced technology provides information and insight to customers operating in demanding environments from ocean to orbit and everywhere in between. Harris has approximately \$8 billion in annual revenue and supports customers in 125 countries through four customer-focused business segments: Communication Systems, Space and Intelligence Systems, Electronic Systems, and Critical Networks.

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