Fast Steering Mirrors

Precision Sensing, Measurement and Controls

ATA has developed a broad range of custom fast steering mirrors, bringing new meaning to the word "fast," that enable real time corrections in adaptive optics for directed energy systems, long range dynamic laser communications, and telescopes. We can build designs using any mirror technology from metal and glass to silicon carbide to meet your specific program requirements. ATA's custom mirrors have ranged from 1-inch high performance laser communications mirrors to proven 5-inch 1 kHz designs to new 12-inch custom designs operating at 1 kHz and higher for directed energy systems.

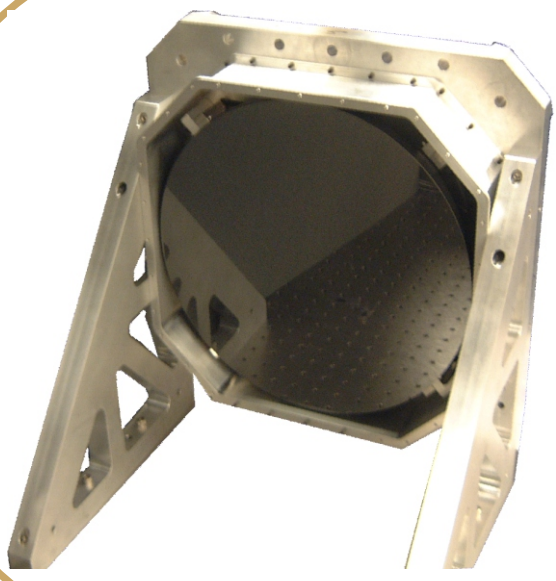
What makes ATA beam steering capabilities exceed the performance of fast steering mirrors from other companies?

ATA develops and manufactures sensors, actuators, flexures and controls. ATA produces the highest efficiency actuators available, including space-qualified actuators with redundant core windings. New ATA-designed non-contact linear displacement sensors are capable of the lowest noise floors and sub-nanometer resolution over 1mm and longer travel, and beveled edges to match mirror rotations. ATA makes the finest angular rate sensors available anywhere, with angular motion measurement capabilities below 40 nano-radians, 1 to 1000 Hz. Combine these capabilities with our 30-year history of excellence in real-time control system development for precision sensing, measurement and control and you have a product line that simply beats the competition.

ATA develops and manufactures stabilized platforms and inertial reference units which can be combined with fast steering mirrors to meet the most stringent system requirements.

The ATA FSM team is composed of world-class, multi-disciplined engineers. Our core FSM competencies are:

- **Inertial and Line-of-Sight Stabilization**
- **Laser Optics Beam Steering**
- **Automatic Control Systems Engineering and Design**
- **High-Speed Digital and Analog Electronics**
- **Opto-Mechanical Engineering**



ATA's 12" FSM

13M0865

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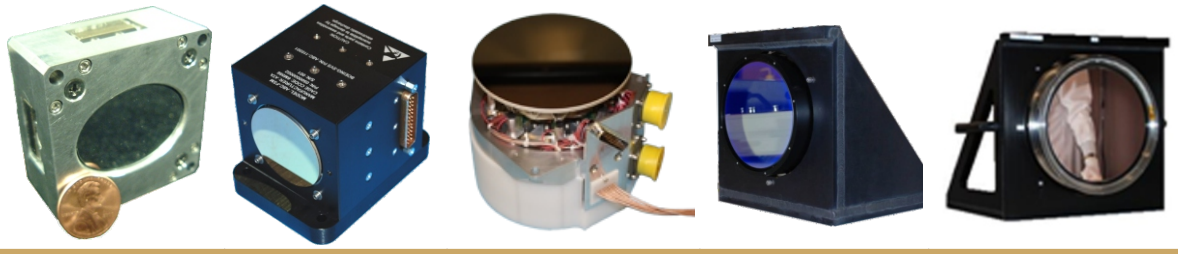
ATA's State-of-the-Art Fast Steering Mirrors

- ATA offers proven and innovative designs in reactionless mirror systems
- Mirror systems use the highest performance components built by ATA
- High efficiency actuators
- High-sensitivity angular rate sensors
- Low noise linear displacement sensors
- Optimized flexures and custom control systems



Name	1" FSM	2" FSM	5" FSM	7" FSM	12" FSM
Mirror Size	1" x 1.4" Elliptical	2" Circular	5" Circular	7.25" Circular	12" Circular
Mechanism Size	2" x 2" x 1"	3" x 3.3" x 4"	6" x 6" x 8"	10"x 10" x 5"	15" x 15" x 11.4"
Mass	320 g (0.7 lb)	< 900 g (2 lbs)	3.4 kg (7.5 lbs)	6.8 kg (15 lbs)	43 kg (95 lbs)
Substrate Material	Aluminum	Silicon Carbide	Silicon Carbide	Silicon Carbide	Silicon Carbide
Optical Properties	λ/4 P-V Single Point Diamond Turned Aluminum	λ/10 P-V Flatness Protected Silver Coating	λ/20 RMS Flatness Protected Silver Coating	λ/20 RMS Flatness High reflectivity dielectric coating	λ/30 RMS Flatness @ ambient conditions High reflectivity dielectric coating
Angular Travel	± 2 degrees	±1.5 degrees	±2 degrees	± 5 mrad	± 1 mrad Capable of ± 8 mrad
Acceleration	> 7000 radians/sec²	> 500 radians/sec²	> 1000 radians/sec²	> 160 radians/sec²	> 300 radians/sec²
Bandwidth	> 1 kHz	> 1 kHz optical > 200 Hz position	> 1 kHz optical > 500 Hz position	500 Hz position	800 Hz optical 500 Hz position
Reactionless	No	No	Yes	No	Yes
Position Resolution	----	< 1 µrad	< 1 µrad	< 50 nrad	< 150 nrad 50 Hz to 1 kHz
Controller Type	Analog	Analog	Digital (xPC)	Digital (FPGA)	Digital (xPC)

Cutting Edge Technology in Sensing and Controls

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