



Press Release: High-Power Plate Deformable Mirrors

MZA Associates Corporation in collaboration with Active Optical Systems, LLC, has developed a new capability for manufacturing deformable mirrors (DMs) that are capable of handling high laser power without significant thermally induced distortion or damage. Since beginning manufacturing of high-power deformable mirrors in 2006, MZA has dramatically increased the power handling capability of their DM technology through a focused development over the last two years. The result of this development is a DM capable of using the highest quality optical coatings without significant stress-induced distortion that has affected other vendor's deformable mirrors. Tests done on MZA's DM coatings at an independent testing facility found only 0.4 parts per million (ppm) absorption in the coating.

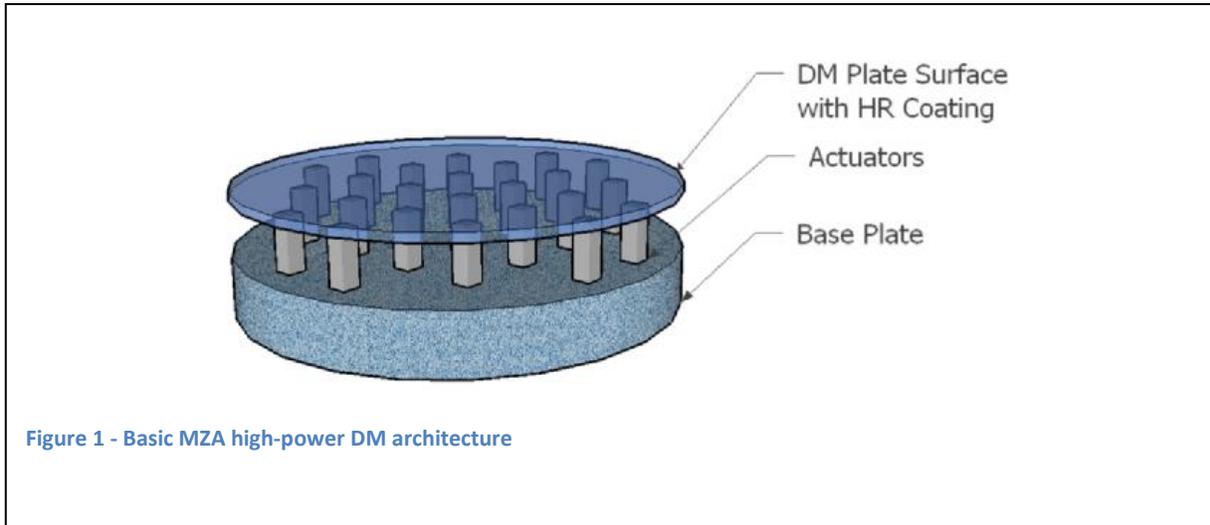
Throughout this effort, MZA focused on developing a detailed quality control process in which every component of the DM is tested and inspected prior to integration to eliminate any defective components. MZA's deformable mirrors have been manufactured with as few as 21 and as many as 95 actuators with actuator spacing ranging from 9 to 6 mm. During high power testing, the mirrors have been subjected to a 1-micron wavelength 100 kW average power laser radiation for up to 5 seconds over a 6 cm² beam area. During this test the mirror surface heated less than 1-degree Celsius. The mirrors also performed well during short pulse 250 kW exposure tests. MZA's DMs have been used in a developmental high-power laser for the last six months and with no sign of damage under repeated exposure to high-power flux. Tests performed on another vendor's deformable mirror in the same laser system under less power showed significant heating and surface damage.

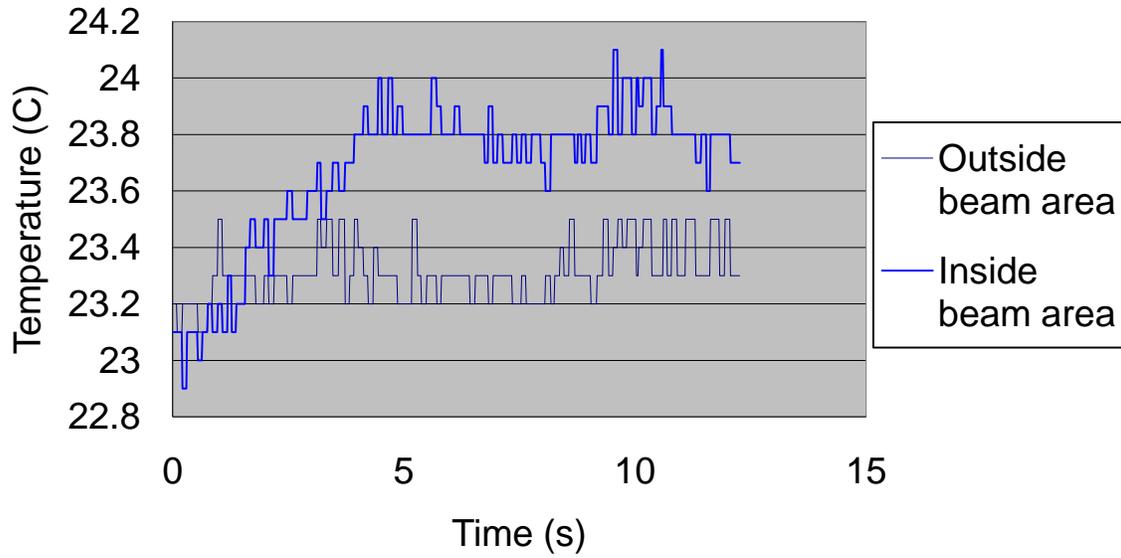
For DM control, MZA also provides high-speed computer-interfaced drive electronics package and low-cost Shack-Hartmann wavefront sensors through its partner company, Active Optical Systems, LLC (www.aos-llc.com). The drive electronics package is currently used at up to 2,000 mirror commands per second, but the system is designed to be capable of commanding a DM more than 100,000 times per second. A 96-channel version of these electronics has been packaged in a 2U (3.5") x full width (17") x half-depth (8") rack-mount box.

Below are figures that illustrate the MZA DM capabilities. Figure 1 shows the basic architecture of the MZA deformable mirrors. Figure 2 shows a 3D rendering of the CAD model of a 95-actuator DM. All the MZA DMs are design in great detail in CAD before any device is manufactured. Figure 3 shows a photograph of a completed deformable mirror that matches the CAD rendering exactly. Figure 4 shows the thermal imaging results before and after 100 kW average power laser radiation and the corresponding temperature increase.

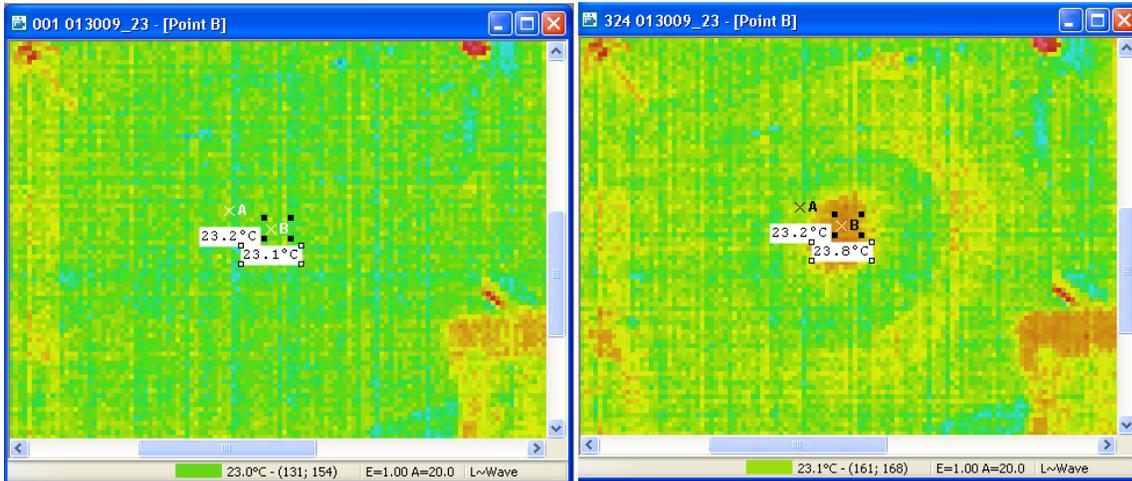


MZA is currently continuing the development of their high-power mirrors to further improve the mirror technology to better meet the challenges of high power laser wavefront control. For more information on MZA's deformable mirror technology, contact Justin Mansell (505-245-9970, www.mza.com).





(a)



(b)

(c)

Figure 4 - (a) Temperature Data from the 5-second 100 kW average power test of a 42-actuator DM. (b) Thermal camera picture before the test. (c) Thermal camera picture after the test was completed showing the laser-induced heating.