

face. A laser beam, which can be injected from a small bore hole in the wall of the cylinder, will be able to make many low-loss bounces around the ring, creating a large optical path length.

The reflecting ring operates on the same principle as the Herriott cell. The difference exists in the mirror that doesn't have to be optically aligned, and which has a relatively large, internal surface area that lends itself to either open air or evacuated spectroscopic measurements. This solid, spherical ring mirror removes the possi-

bility of mirror misalignment caused by thermal expansion or vibrations, because there is only a single, solid reflecting surface. Benefits of the reflecting ring come into play when size constraints reduce the size of the system, especially for space missions in which mass is at a premium.

This work was done by David C. Scott, Kelly Rickey, Alexander Ksendzov, Warren P. George, and Abdullah S. Aljabri of Caltech; and Joel M. Steinkraus of Cal Poly for NASA's Jet Propulsion Laboratory. Further information is contained in a TSP (see page 1).

In accordance with Public Law 96-517, the contractor has elected to retain title to this invention. Inquiries concerning rights for its commercial use should be addressed to:

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Next-Generation Microshutter Arrays for Large-Format Imaging and Spectroscopy

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A next-generation microshutter array, Large Microshutter Array (LAMA), was developed as a multi-object field selector. LAMA consists of small-scaled microshutter arrays that can be combined to form large-scale microshutter array mosaics. Microshutter actuation is accomplished via electrostatic attraction between the shutter and a counter electrode, and 2D addressing can be accomplished by applying an electrostatic potential between a row of shutters and a column, orthogonal to the row, of counter electrodes. Microelectromechanical system (MEMS) technology is used to fabricate the microshutter arrays.

The main feature of the microshutter device is to use a set of standard surface micromachining processes for device fabrication. Electrostatic actuation is

used to eliminate the need for macro-mechanical magnet actuating components. A simplified electrostatic actuation with no macro components (e.g. moving magnets) required for actuation and latching of the shutters will make the microshutter arrays robust and less prone to mechanical failure. Smaller-size individual arrays will help to increase the yield and thus reduce the cost and improve robustness of the fabrication process. Reducing the size of the individual shutter array to about one square inch and building the large-scale mosaics by tiling these smaller-size arrays would further help to reduce the cost of the device due to the higher yield of smaller devices.

The LAMA development is based on prior experience acquired while devel-

oping microshutter arrays for the James Webb Space Telescope (JWST), but it will have different features. The LAMA modular design permits large-format mosaicking to cover a field of view at least 50 times larger than JWST MSA. The LAMA electrostatic, instead of magnetic, actuation enables operation cycles at least 100 times faster and a mass significantly smaller compared to JWST MSA. Also, standard surface micromachining technology will simplify the fabrication process, increasing yield and reducing cost.

This work was done by Samuel Moseley, Alexander Kutyrav, Ari Brown, and Mary Li of Goddard Space Flight Center. Further information is contained in a TSP (see page 1). GSC-16000-1