

# 2009 Award Winner

## COMPACT ALIGNMENT FOR DIAGNOSTIC LASER BEAMS

The Livermore-developed laser beam centering and pointing system (LBCAPS) is a compact, reliable, and cost-effective system that images both centering and pointing information onto one camera, cutting the cost of beam alignment in half.

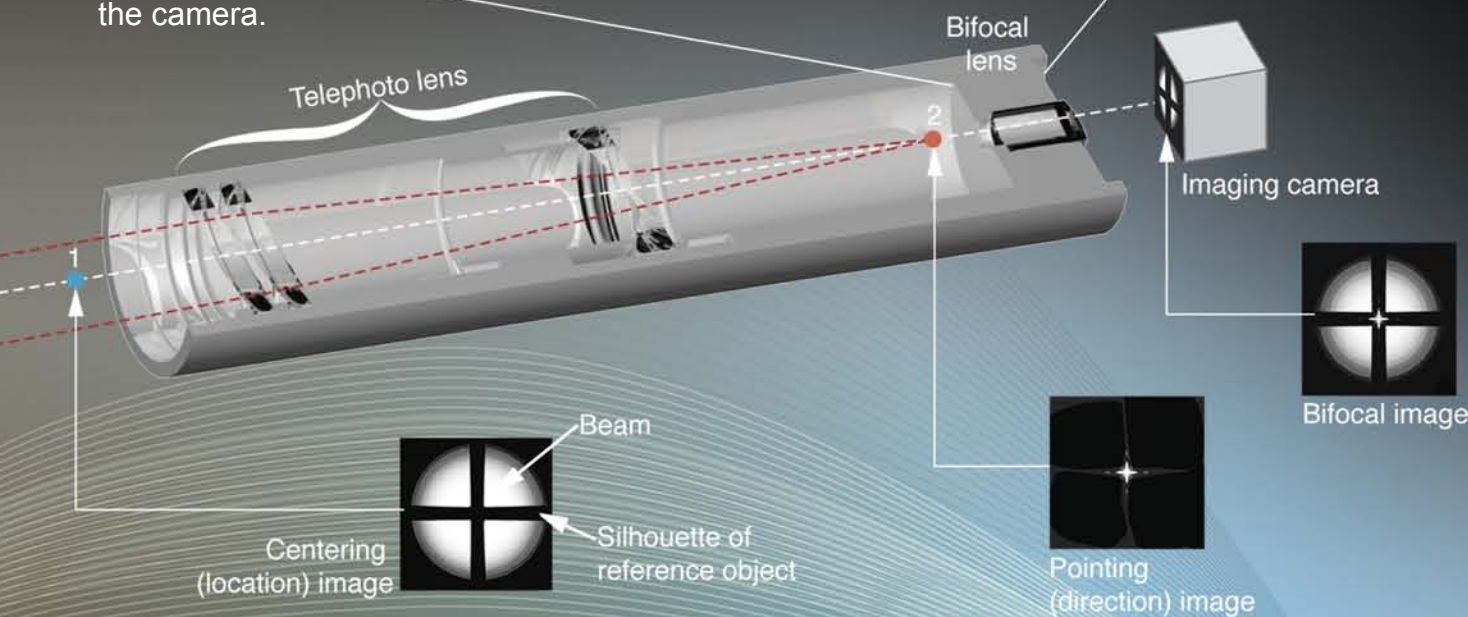
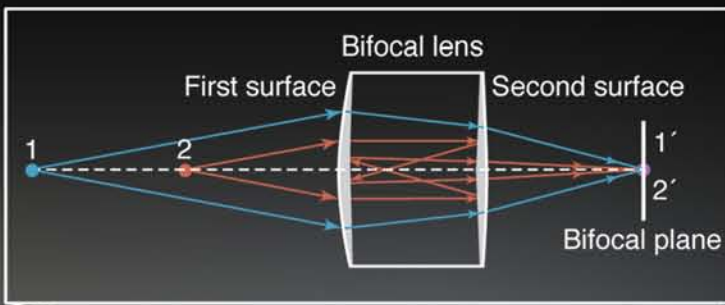
### How It Works

The rigidly mounted LBCAPS tube contains a three-element telephoto lens and a two-surface bifocal lens, whose two focal lengths allow it to produce images of both near and distant objects. Setting the focal lengths and positions of the telephoto lens and adjusting the curvatures and thickness of the bifocal lens allows for optimal magnifications of both the centering and pointing images for a particular application. Because beam centering and pointing can be monitored relative to the backlit fixed-reference object, LBCAPS is self-referencing and does not depend on the location of the camera for beam alignment.

### Future Applications

LBCAPS is being tested for the Laboratory's Mercury laser project and the Livermore-developed extreme x-ray system used in nuclear materials detection. In addition, incorporating a stable local reference for both centering and pointing could be beneficial in many industrial high-power laser applications, such as laser welding and cutting, and in scientific experiments to explore the nature of atoms and molecules.

The laser beam centering and pointing system combines two laser beam alignment sensors—centering and pointing—into one. The dual-imaging bifocal lens images both the “centering” and “pointing” data onto the camera.



Physicist and optical engineer Mike Rushford developed the laser beam centering and pointing system.

