THREE-DIMENSIONAL ACOUSTO-OPTIC DEFLECTOR-LENS (3D AODL)

Tech ID: 33938 / UC Case 2025-093-0

PATENT STATUS

Patent Pending

BRIEF DESCRIPTION

Optical tweezers generated with light modulation devices have great importance for highly precise laser imaging and addressing systems e.g. excitation and readout of single atoms, imaging of interactions between molecules, or highly precise spatial trapping and movement of particles. To generate dynamic optical tweezers adjustable at the microsecond scale, acousto-optic deflectors (AOD) are commonly used to modulate the spatial profile of laser light. Dynamic optical tweezers are increasingly relevant for emerging technologies such as neutral atom quantum computers, and tightly focused laser spot arrays may enable advanced imaging and/or semiconductor processing applications. However, dynamic optical tweezer systems capable of rapid, aberration-free movement of one or multiple atoms in independent, arbitrary three-dimensional trajectories with minimal aberration have not yet been realized.

UC Berkeley researchers have developed a dynamic optical tweezer system that overcomes significant defects such as limited 2D motion and optical aberration present in existing art. Carefully designed waveform modulation of one or more acousto-optic deflector lenses (AODLs) enables atomic addressing and rapid tweezer motions while minimizing significant optical aberrations present in prior methods. The invention is capable of microsecond scale single or multi tweezer motion in arbitrary three-dimensional trajectories without the use of translation stages. The invention can flexibly address one atom, multiple atoms, or the entire array.

SUGGESTED USES

- Neutral atom quantum computing
- Multi-focal-spot laser imaging and/or semiconductor processing

ADVANTAGES

- Smooth, rapid/microsecond motion in X, Y, and Z without mechanical components
- Tightly focused laser spots remain free from optical aberration
- Addresses one or multiple atoms simultaneously

RELATED MATERIALS

ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

- Improved Optical Atomic Clock In The Telecom Wavelength Range

CONTACT

Sabrina N. David
sabrina.david@berkeley.edu
tel: .

INVENTORS

- Stamper-Kurn, Dan M.

OTHER INFORMATION

CATEGORIZED AS

- **Optics and Photonics**
  - All Optics and Photonics
- **Computer**
  - Hardware
  - Other
- **Engineering**
  - Engineering
  - Other
- **Imaging**
  - 3D/Immersive
  - Medical
  - Other
- **Research Tools**
  - Other

RELATED CASES

2025-093-0

University of California, Berkeley Office of Technology Licensing
2150 Shattuck Avenue, Suite 510, Berkeley,CA 94704
Tel: 510.643.7201 | Fax: 510.642.4566
https://ipira.berkeley.edu/ | otl-feedback@lists.berkeley.edu