



CASCADE 2027 NON-CONFIDENTIAL SUMMARY »

Acousto-Optic Beam Steering

Overview

Beam steering technologies are required for any laser-based system that provides imaging and detection capabilities, including LiDAR, bio-imaging, quantum computing, and optical communication. Conventional methods of beam steering use a mechanically rotating mirror (or mirrors) on a gimbal to deflect laser light in different directions. This type of system is power-intensive and bulky, limiting its usefulness for applications requiring high precision and compact form factors. The current technology combines a piezoelectric planar photonics device with electromechanically excited gigahertz (~11 GHz) acoustic Lamb waves. Acousto-optic beam steering (AOBS) uses the phase grating generated by sound waves to scatter the light from the chip into the free-space. Simply changing the acoustic frequency steers the light beam in different directions in a single integrated chip.

Description

AOBS combines integrated acoustic wave transducers, optical waveguides, and lenses, all fabricated on a thin film lithium niobate (TFLN) substrate and capable of steering a conventional fiber-coupled or on-chip laser. The AOBS devices are very compact, with a footprint of only 0.2 mm square, yet covering a field-of-view of 18° with diffraction-limited resolution. The research team has further included frequency-angular resolution capable of capturing coherent, 3D images of objects as far as 100 meters away.

Technology Readiness Level (TRL)

TRL 5 — System or subsystem components tested in a relevant environment that models real-world conditions.

Value Proposition

- Completely integrated optical beam-steering technology eliminates bulky and costly mechanical componentry with a broad field of view.
- Applications in precise beam-steering include LiDAR, free-space optical communication, biomedical and brain imaging.
- Compatible with a broad range of laser wavelengths from visible to infrared.
- Recently working on integrating lasers on the same chip platform.

COMOTION REFERENCE »

BDP 8032

INNOVATION MANAGER »

Forest Bohrer

SECTOR »

Hardware

LEAD INVESTIGATOR »

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Intellectual Property Position

- [US11940712B2](#) – Patent issued/granted March 26, 2024.
- [US20250020806A1](#) - Patent application pending.

Market Opportunity

- Market opportunities include LiDAR applications, with solid state LiDAR systems poised to take a sizeable share of the ~\$1B automotive LiDAR market.
- Data center optical communications form a sizeable portion (\$2.5B) of the massive and expanding data center construction market.
- Biomedical and brain imaging as part of the broader biophotonics market, which was valued at \$62.6B US in 2024, Medical diagnostics are expected to be approximately 70% of that total.

References

1. Li, B; Lin, Q.; Li, M. "Frequency-angular resolving LiDAR using chip-scale acousto-optic beam steering." Nature, 2023, 620, 316-322. URL: <https://www.nature.com/articles/s41586-023-06201-6>
2. Qixuan Lin, Shucheng Fang, Yue Yu, Zichen Xi, Linbo Shao, Bingzhao Li, Mo Li, "Optical multi-beam steering and communication using integrated acousto-optics arrays," Nature Communications, 16, 4501 (2025) URL: <https://doi.org/10.1038/s41467-025-59831-x>
3. Yue Yu, Qixuan Lin, Shucheng Fang, Joseph G. Thomas, Yibing Zhou, Zichen Xi, Jun Ji, Yizheng Zhu, Linbo Shao, Bingzhao Li, and Mo Li, "Resonance-enhanced integrated acousto-optic beam steering," Nature Communications (2026) URL: <https://doi.org/10.1038/s41467-026-77864-8>