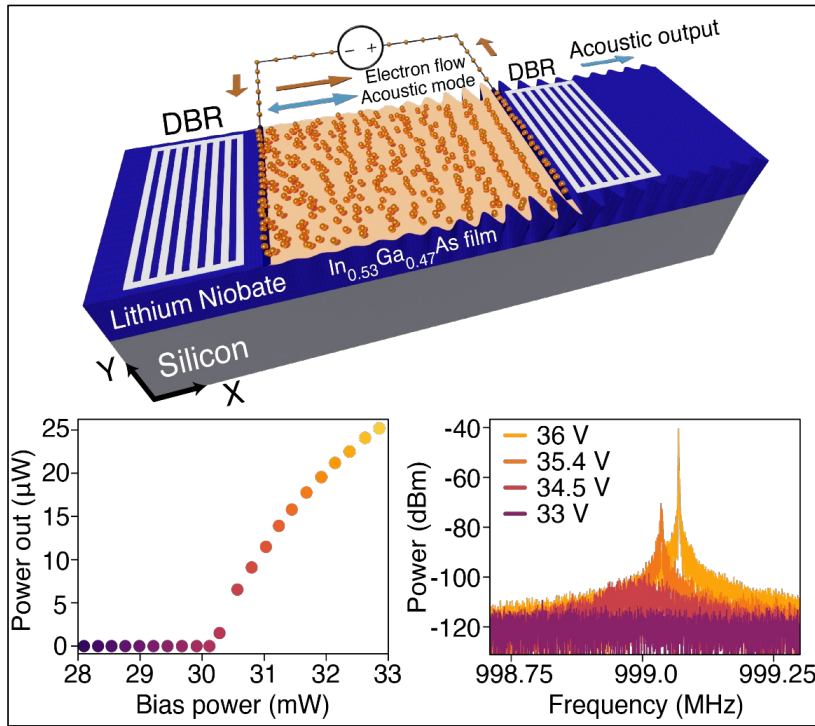


An Electrically Injected, Solid-State, Surface Acoustic Wave Phonon Laser



Scientific Achievement

A CINT User Team electrically injected, fully solid-state surface acoustic wave phonon laser, enabling on-chip generation of coherent GHz surface acoustic waves with narrow linewidth and no external RF source.

Significance and Impact

This work provides a compact, low-power source of coherent surface acoustic waves, enabling scalable RF, sensing, and quantum technologies without bulky external electronics.

Research Details

- Demonstrated self-oscillation using hybrid semiconductor-piezoelectric heterostructure.
- Achieved -6.1 dBm acoustic output power at ~ 1 GHz with < 77 Hz linewidth.
- Measured low phase noise and electrical frequency tuning.

Wendt, A.; Storey, M. J.; Miller, M.; Anderson, D.; Chatterjee, E.; Horrocks, W.; Smith, B.; Wong, P.-S.; Arterburn, S.; Friedmann, T. A.; Hackett, L.; Eichenfield, M. An Electrically Injected Solid-State Surface Acoustic Wave Phonon Laser. *Nature*. 2026.

Figure: a) An acoustoelectric amplifier is embedded in a surface acoustic wave resonator, formed by two mirrors (DBRs). b) A clear threshold is demonstrated. c) Oscillation linewidth narrows to < 100 Hz as bias is swept through threshold

Work was performed, in part, at the Center for Integrated Nanotechnologies.



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