



# Fumio Koyama Lab

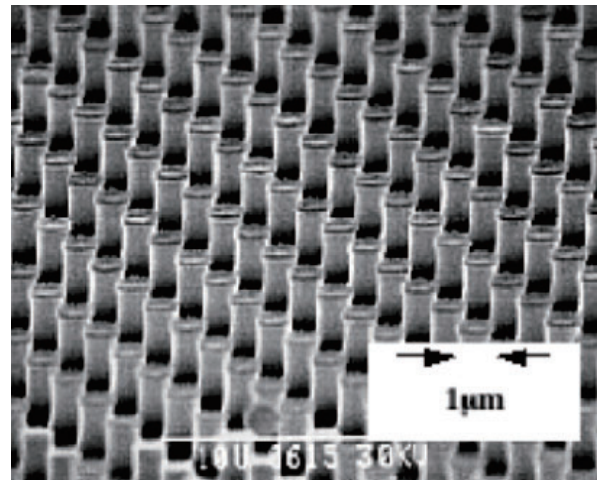
## VCSEL Photonics and Integration

FIRST, Photonics Integration System Research Center

<http://vcsel-www.pi.titech.ac.jp/index-e.html>

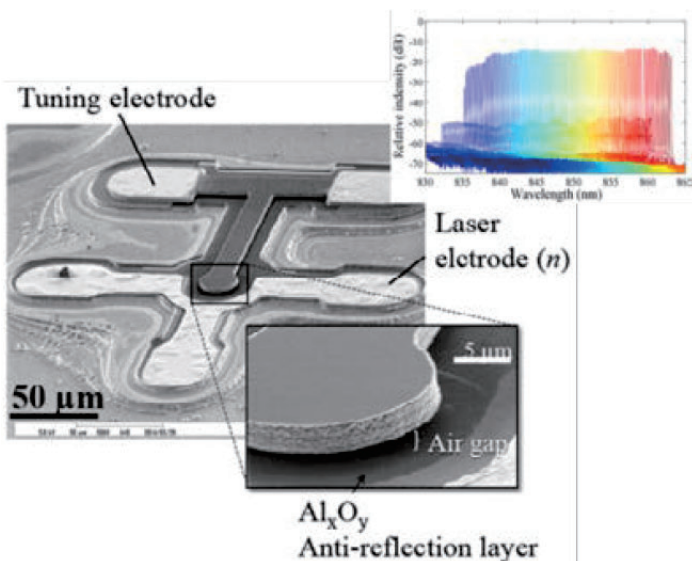
- VCSEL Photonics Integration
- High-resolution Beam Scanner and LiDAR
- Tunable VCSELs and 3D Imaging
- High-speed VCSELs for Data Center Networks

The 40 years' research of VCSELs (Vertical Cavity Surface Emitting Lasers) opened up a new world of VCSEL photonics, including, sensors, optical interconnects, laser printers, LiDAR and high power sources. We are working on new functions and integration of VCSEL photonics, including high speed coupled cavity VCSELs with low power consumption, high power VCSEL amplifiers, high-resolution beam scanners for 3D sensing and their integrations.



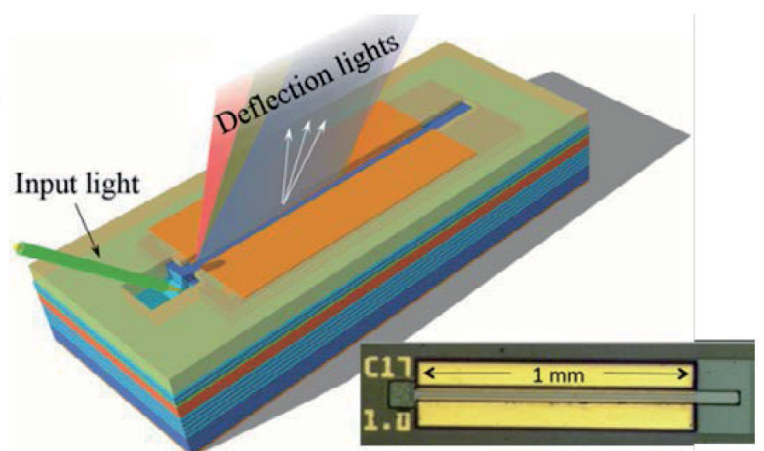
### VCSEL Photonics and Integration

- New function and large-scale 2D integration
- Ultrahigh speed coupled cavity VCSELs



### Widely tunable MEMS VCSELs

- MEMS Integration platform
- High speed wavelength tuning for 3D imaging
- Athermal and tunable lasers



### High-resolution beam scanner for 3D imaging

- Giant angular dispersion based on slowing light
- High power operation based on VCSEL amplifier
- Lateral integration of VCSEL and beam scanner
- Solid state LiDAR and structured light sensing