

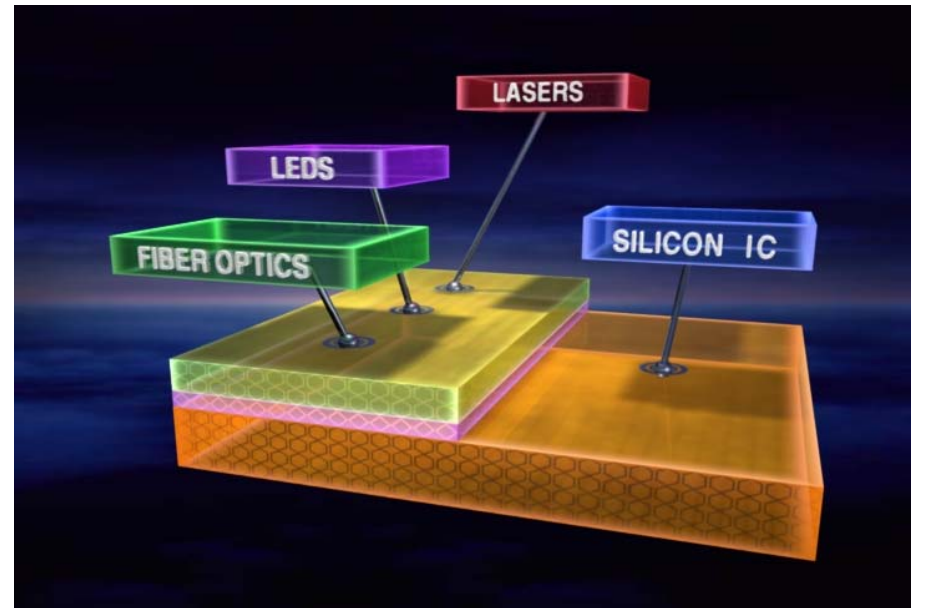
Vertical-Cavity Surface-Emitting Lasers (VCSELs) on Si

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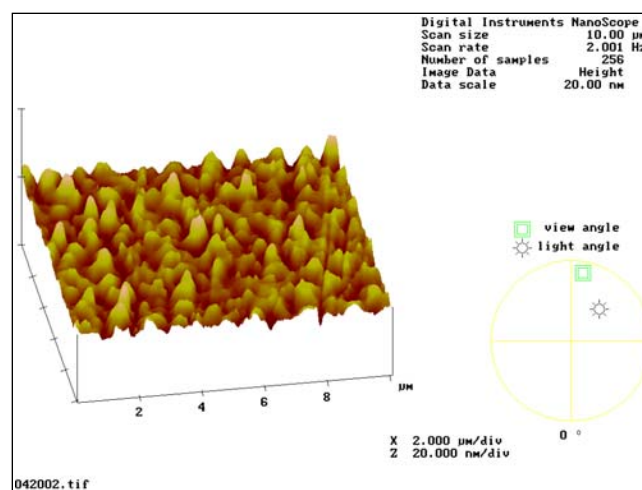
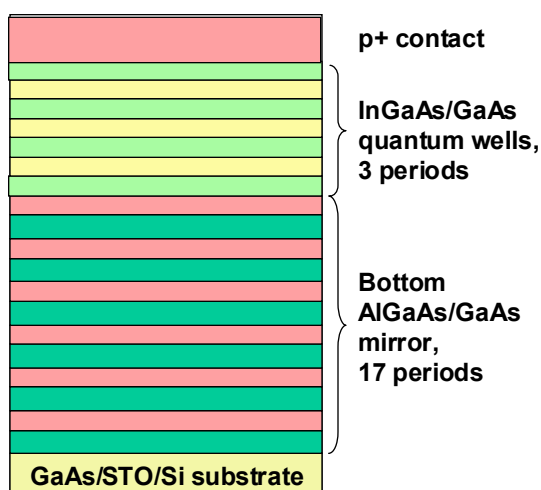
Objective: Monolithic integration of GaAs-based light emitters and detectors on Si through a process compatible with the fabrication of Si integrated circuits.

Challenge: 4% lattice mismatch between GaAs and Si.

Approach: Motorola has demonstrated high-frequency GaAs transistors on Si through a nm-thin SrTiO₃ buffer. Similar approach is used for GaAs VCSELs on Si for the first time.



Mirror Test Structure Grown on GaAs/SrTiO₃/Si Substrate:



Atomic force microscopy showing roughness of 1.4 nm

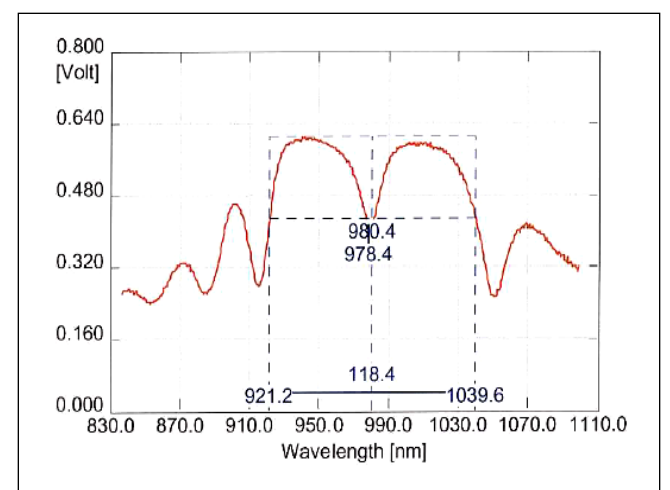
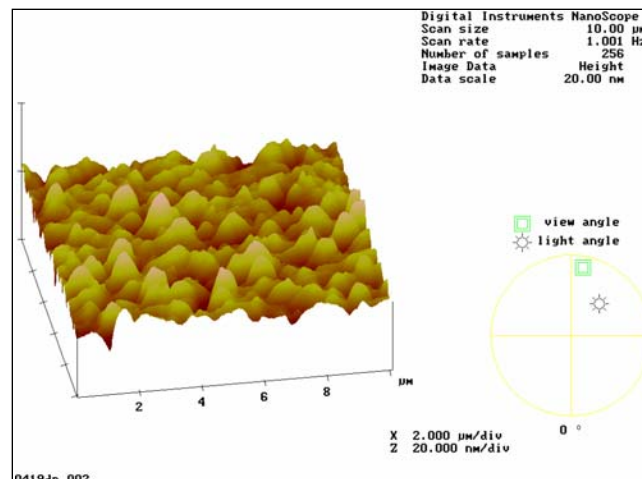
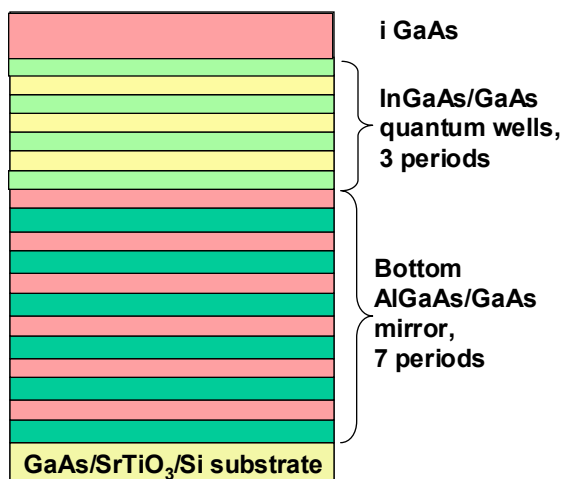
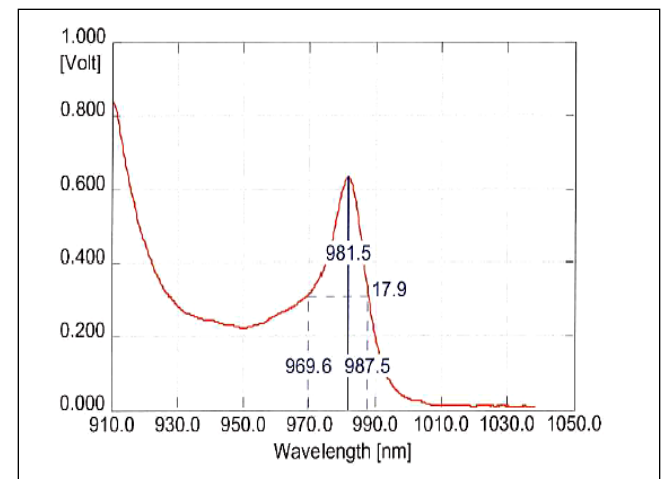


Photo-reflectance from bottom mirror peaks at 979 nm

Quantum-Well Test Structure Grown on GaAs/SrTiO₃/Si Substrate:



Atomic force microscopy showing roughness of 2.1 nm



Photoluminescence peaks at 981.5 nm with 7% intensity of that grown on GaAs

VCSEL Structure Grown on GaAs/SrTiO₃/Si Substrate:

Structure grown. VCSELs to be fabricated at Army Research Lab.