Photonics Technology Laboratory (PTLab)
Centre for Research in Photonics at the University of Ottawa, School of Information Technology and Engineering
University of Ottawa, 800 King Edward Avenue, Ottawa ON K1N 6N5, Canada
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III-V Semiconductor Photonic Device Integration on Group-IV Substrates
• Can we GaAs on Ge solar cells as a micro-mote's renewable energy source?
• A micro-mote is a chip of ~1 mm² that incorporates
  • autonomous sensing
  • computing systems
  • communication systems
• Micro-motes ("smart dust") are used in wireless sensor networks
• The designed solar cells are fabricated at the Canadian Photonics fabrication Facility and characterized and tested at the University of Ottawa

Enabling device technologies
• Quantum dot semiconductors
• Quantum well semiconductor lasers
• All optical logic, fibre ring lasers
• Integrated power splitter and optical switch
• Polarisation insensitive wavelength converter
• Nonlinear optics in crystals

Monolithically Integrated InGaAsP/InP 1x2 SOA Optical Switch
• Design of a practical 1x2 monolithically integrated SOA-based switching element
  • Objective: use it in larger switching fabrics such as ROADM modules
  • Implemented using single-mode vertical integration (SMV)
  • Fabricated at the Centre for Emerging Device Technology at MacMaster University

Our laboratory
Established by Professor Trevor J. Hall in August 2002.

Vision
• To contribute new networking, switching and device concepts that improve the service to end-users by
  • the migration of photonics from the core to the edges of the network and
  • the penetration of photonics into the nodes themselves.
• To realise 3D integrated active photonics with the intelligence required for communications and computing applications.

Support
We are supported by governmental and industrial organizations such as NSERC, CMC, PRO, CRC, CPEC, Nortel Networks, JDS Uniphase, Agilent, Altera, Cyturn Technologies, and others.

Opto-electronic packet switches
• Building demonstrators with electronics implemented with FPGA technology
• Different optical technologies used
• Study of various control mechanisms
  • Flexible Bandwidth Provision in a Packet Switch with an Optical Core (FBP)
  • Load Balancing in a Packet Switch with Layered Cross-Point Queues (LCPQ)

Optical interconnects
• Fourier lens design for free-space interconnects
• POGED: A fast alternative to computer generated holograms design by simulated annealing
  • Gratings fabricated at the Institute for Microstructural Sciences (NRC)

Reconfigurable optical networks
• Recirculating loop testbed
  • To evaluate network scenarios, control strategies and device technologies
  • Multiple concatenated ROADMs through multiple passes on the loop through a single device
    • Provides a cost-effective manner of investigation
  • To devise creative solutions to engineering challenges like:
    • synchronisation
    • optical amplifier transients
    • dynamic OSNR optimization

Emerging Device Technology
Fabricated at the Centre for vertical integration (SMVI)
Implemented using single-mode element integrated SOA-based switching
Design of a practical 1x2 monolithically integrated SOA Optical Switch

Optical in interconnects

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