

4D LABS

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INSTITUTION

**Simon Fraser University
Burnaby, B.C.**

WHAT IT DOES

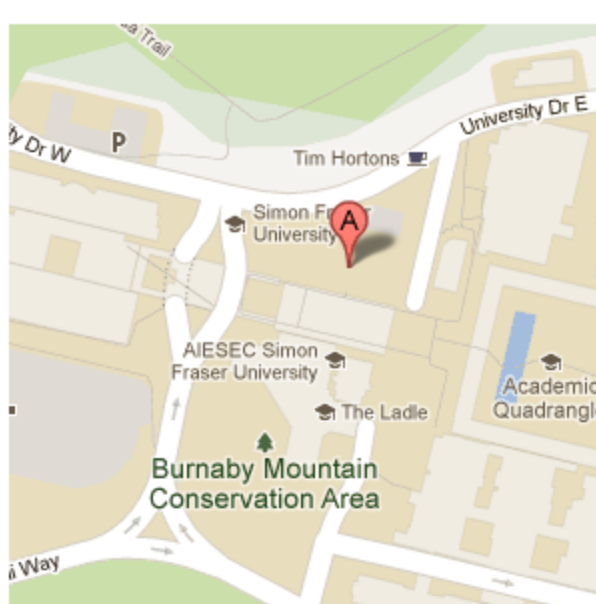
materials science and engineering

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Area(s) of expertise

4D LABS works with academic and industrial researchers to move new technologies from the benchtop to the marketplace in a range of fields, including clean energy, information technology, health and medicine and telecommunications. Aside from a range of materials-specific academic laboratories, 4D LABS also hosts three user facilities that are accessible to all researchers in academia, industry and government. These three user facilities include a cleanroom for micro- and nano-fabrication, an electron microscopy centre and an advanced laser laboratory. Together, the user facilities are a means to design, build, and fully characterize new materials and devices all under one roof. There are a variety of ways to work with 4D LABS. Researchers may elect to be fully trained and perform all aspects of their device design, build and test themselves, or they may contract 4D LABS to do some or all of the work for them, or they may decide that a collaboration with a 4D LABS faculty member is the best option. To date, 4D LABS has worked across the full range of industrial sectors in a variety of ways. 4D LABS has partnered to develop high-efficiency solar cells, leading edge lighting, nanomaterials for security features, biofluidic, and a myriad of other devices.

Area(s) of application

engineering

Research services

additive technologies
proof of concept/proof of commercial concept
product enhancement/transformational technologies
modelling, simulation, prototyping
manufacturing design and development
analytics
photonics
information and telecommunication technologies
industrial instrumentation
alpha and beta testing



Specialized labs and equipment

The **Nanofabrication** facility specializes in micro and nanofabrication and has 4,700 square feet of Class 100 Clean Room space with Class 1 mini-environments for processing and materials characterization. Equipment includes:

- Low pressure and atmospheric furnaces, PECVD, PVD, ALD, and electroplating
- Thin Film Deposition Equipment
- Lithography, including an electron beam writer, laser writer, mask-making laser writer,
- contact/proximity aligners, spinners and develop stations for resists, SU-8, PDMS
- Full range of wet etch and cleaning chemistries for metal, oxide, nitride, and silicon films
- Both fluorine (for dielectric films) and chlorine (for metals) dry etch (reactive ion etchers) capability. Standard plasma strip and descum systems in addition to a XeF2 for MEMS silicon release
- Advanced Spectrometry, including X-ray photoelectron spectroscopy, X-ray diffractometry, auger spectroscopy and secondary ion mass spectroscopy
- Thin Film Measurement, including ellipsometry, reflectometry profilometry, and stress measurement
- Rapid thermal processing, critical point dryer, probe station, wirebonder, 4-point probe, contact angle goniometer, microscopes

The **Nanoimaging facility** contains the following tools for high-resolution nanoscopic characterization of materials:

- Scanning electron microscopes (SEM) and FIB, including FEI Strata Dualbeam SEM/FIB and Baush & Lomb SEM (W), to display surface features less than five nanometres in size; the microscopes use an electron beam to scan samples and determine elemental composition through X-ray spectroscopy
- Scanning transmission electron microscopes (STEM), including Tecnai F20 (200 keV FEG) and Hitachi 8000 (200 keV LaB), to investigate internal structure, including crystallinity and defects with compositional analysis
- Scanning probe microscopes (SPM), including Atomic Force Microscope (AFM) or Scanning Tunneling Microscope (STM), and Near-Field Scanning Optical Microscope (NSOM); these microscopes create atomic-resolution topographic maps of material surfaces that may include electronic properties and can be used to manipulate atoms or molecules and create image resolution to the atomic level
- Focused Ion Beam for fabricating small devices

The **Laboratory for Advanced Spectroscopy and Imaging Research (LASIR)** facility contains the following tools for exploring photonics and laser-matter interaction:

- pulsed laser systems, spanning X-ray to infrared wavelengths, from nanosecond to femtosecond pulse durations
- time-resolved X-ray spectroscopy
- terahertz spectroscopy
- two-photon laser scanning confocal microscope for advanced imaging
- transient absorption spectroscopy
- fluorescence lifetime measurement systems, capable of probing timescales from millisecond to Femtosecond

Private and public sector research partners

4D LABS has worked with more than 30 companies, including:

- Cooledge Lighting Inc.
- Photon Control Inc.
- Automotive Fuel Cell Cooperative
- Nanotech Security Corp.

Additional information

CFI Features

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