PICO

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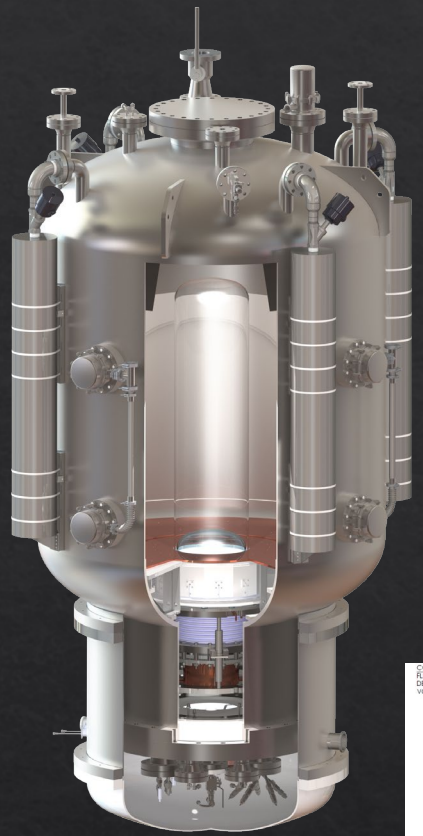
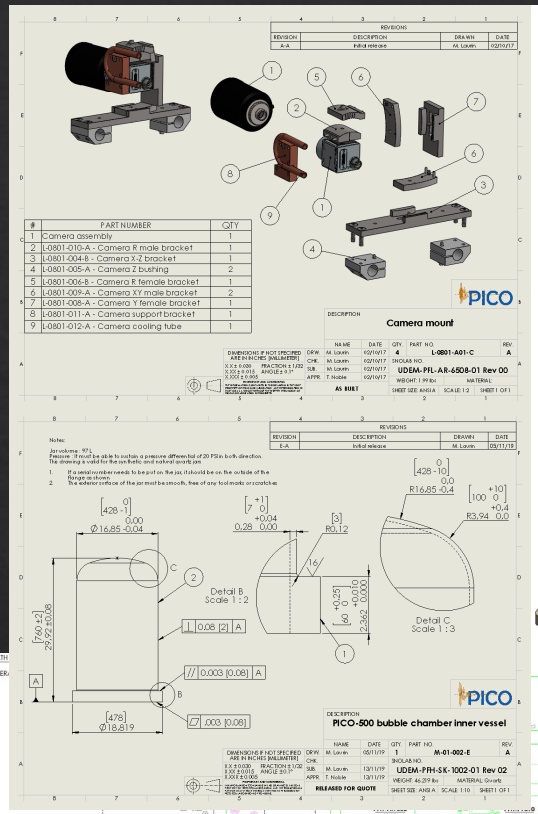
Résumé

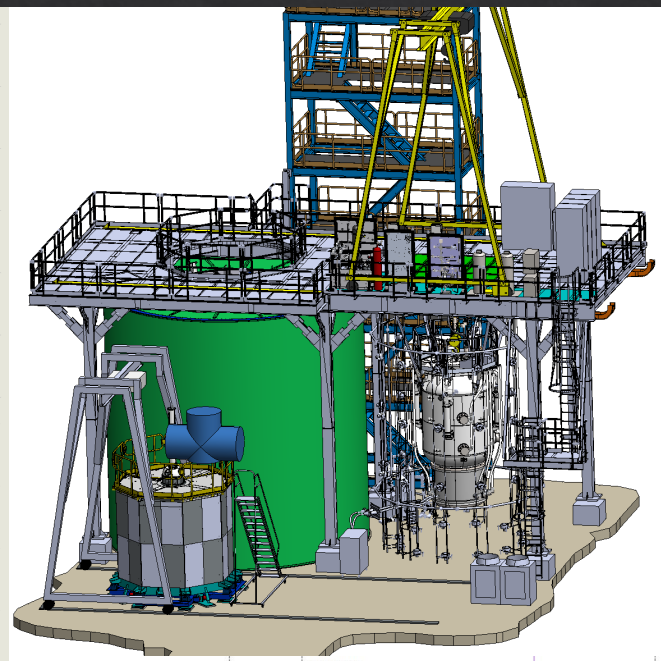
- Ph.D. in Physics, Particle Astrophysics
- Research scientist @ UdeM since 2017
- UdeM LTA manager
- Present/past experiments
  - PICO
    - Systems engineering lead
  - SBC
  - Picasso
- Contributions
  - SuperCDMS
  - UdeM Faculty of Medicine
  - UdeM Astrophysics
- Skills
  - Mechanical/electrical engineering
  - CAD
    - SolidWorks, AutoCAD
  - Coding/computing/networking
    - Labview, C++, Python, Arduino & Co.
  - FEA simulations
    - COMSOL
  - Tandem accelerator operator
  - Vacuum systems
  - 3D printing
  - Manual skills
    - Micro soldering, electrical work, construction, assembly

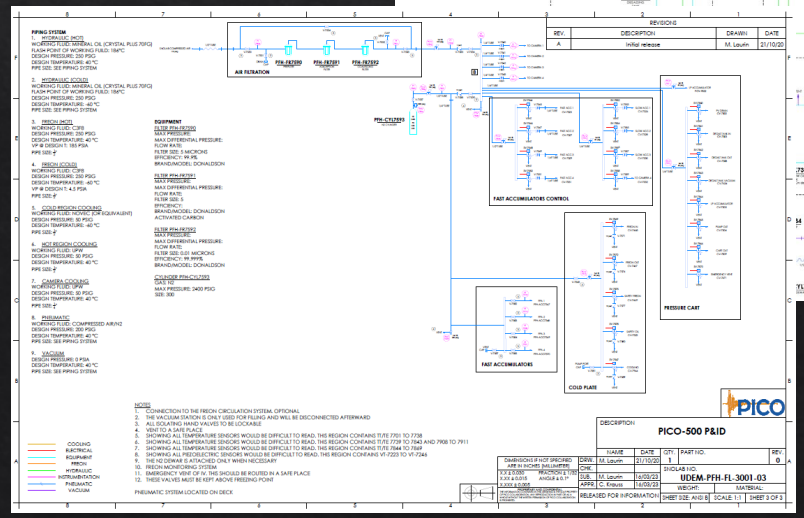
PICO

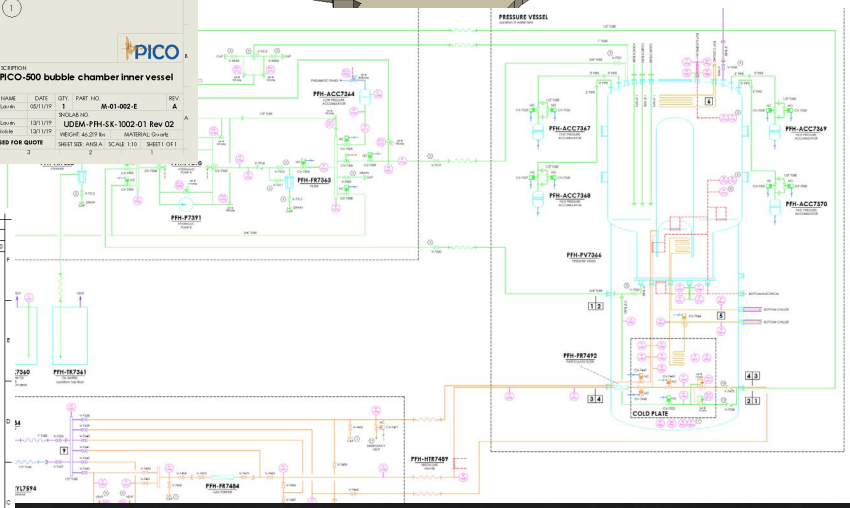
- CAD
  - Worked on almost all systems!
  - 3D, 2D, rendering
- P&ID
  - Full system P&ID





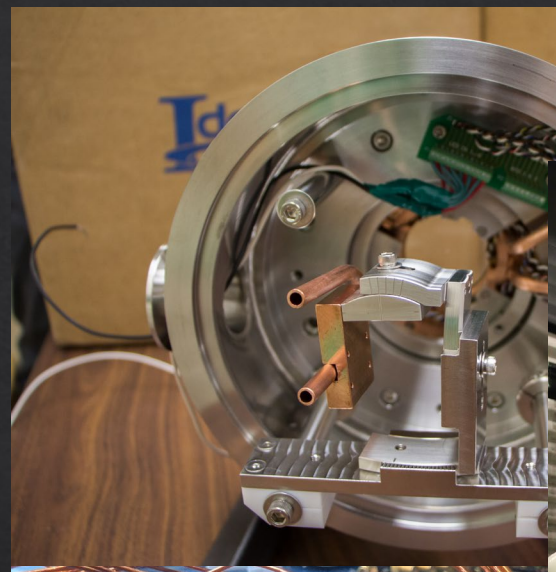


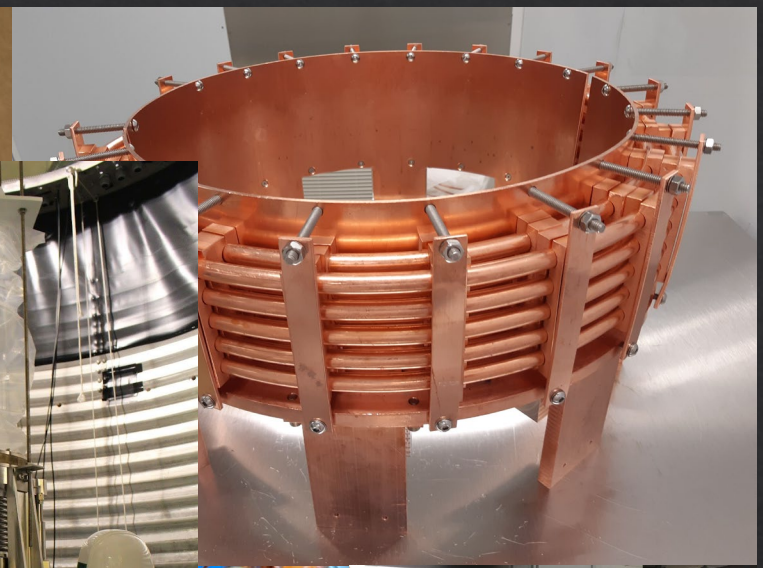


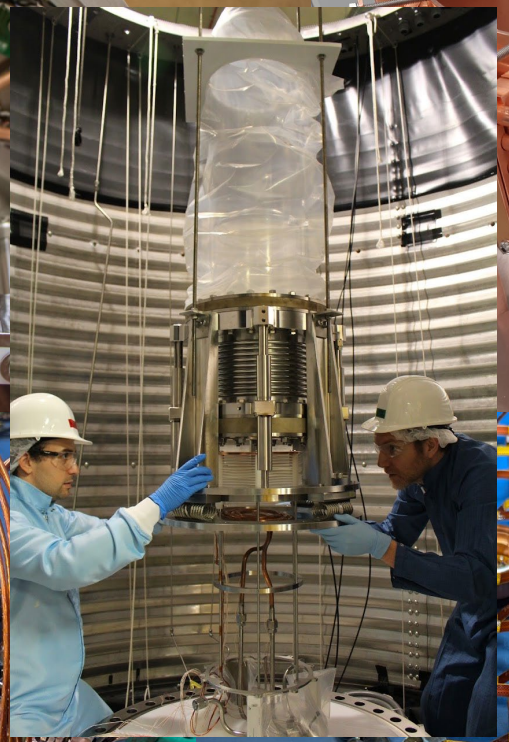


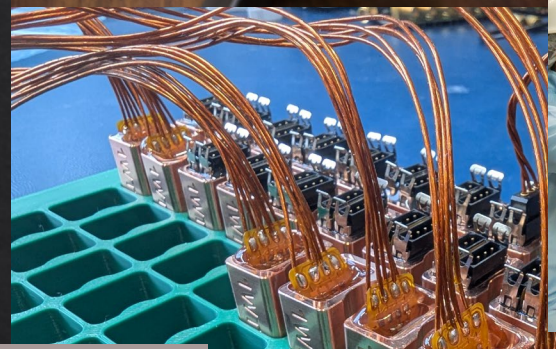
PICO

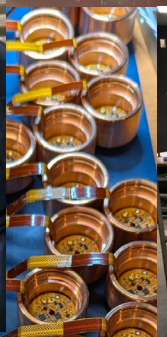
- Several builds
  - Camera mounts and LED rings
  - Temperature sensors
  - Cooling coils
  - Acoustic sensors
  - PICO-40L

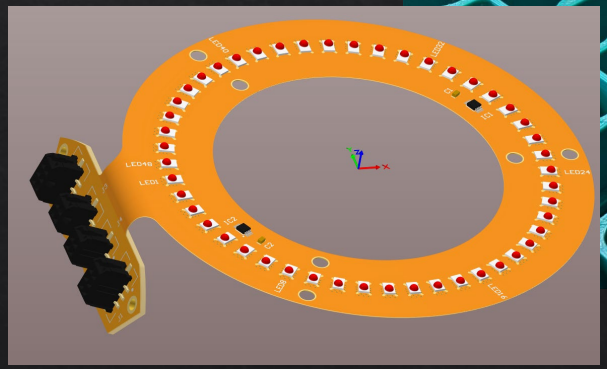






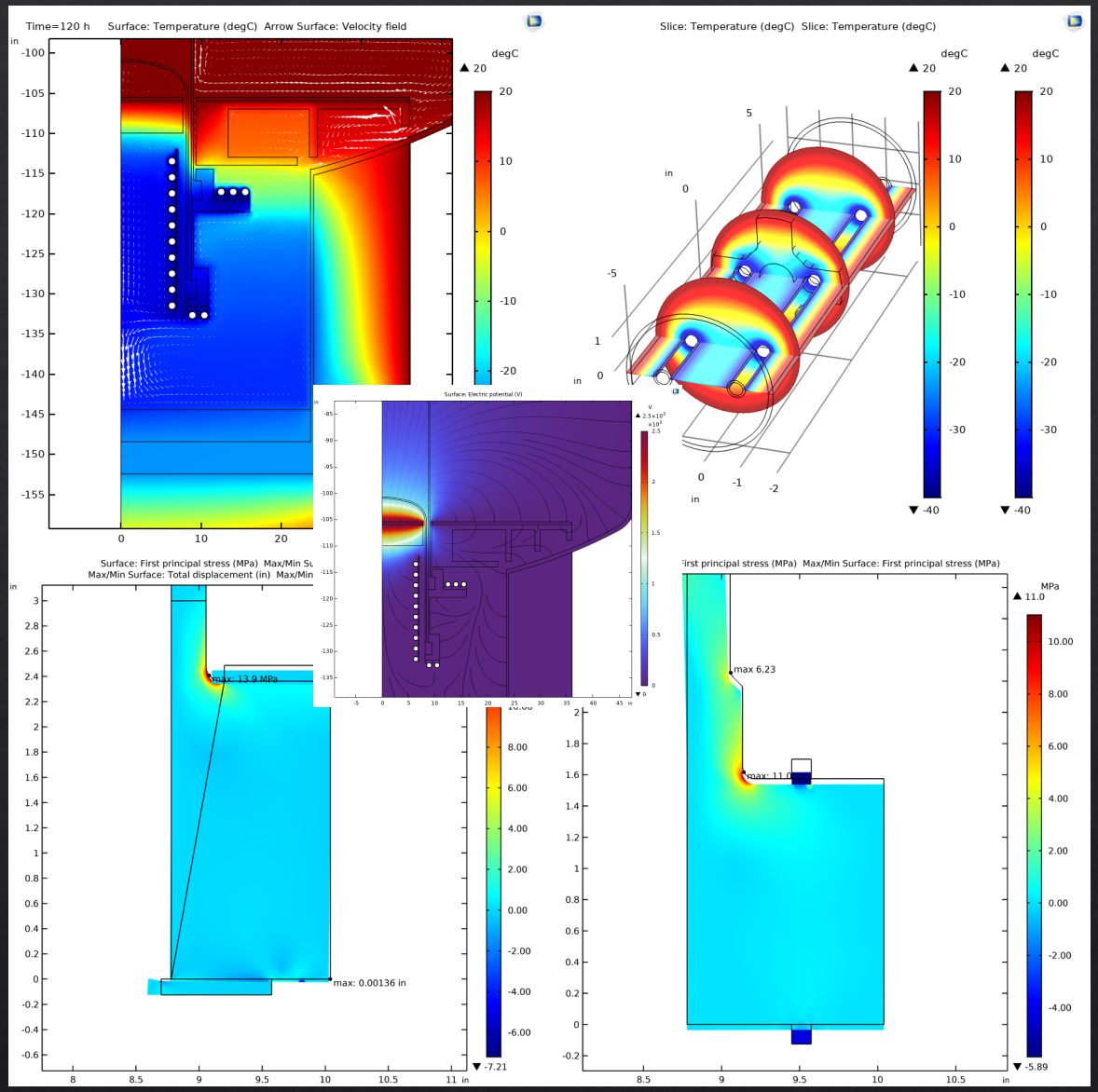






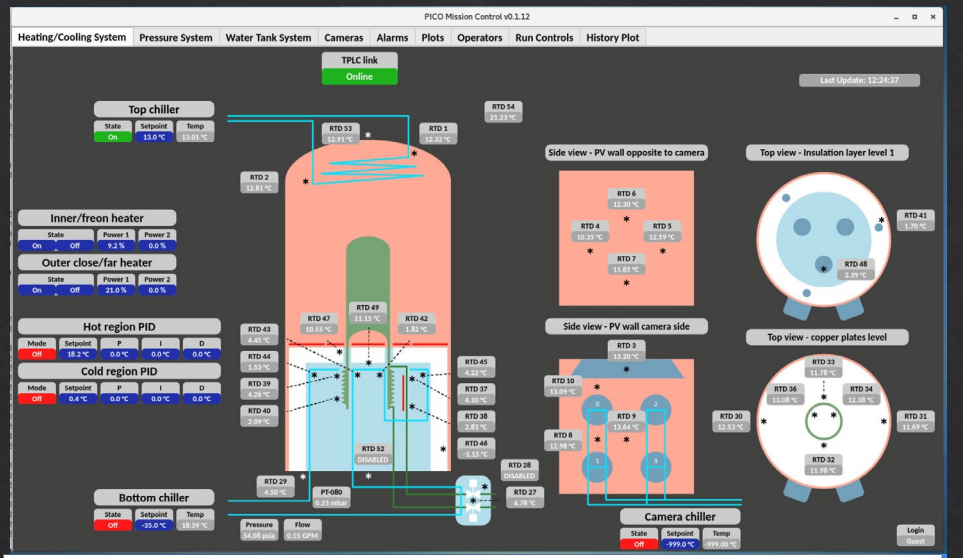
PICO

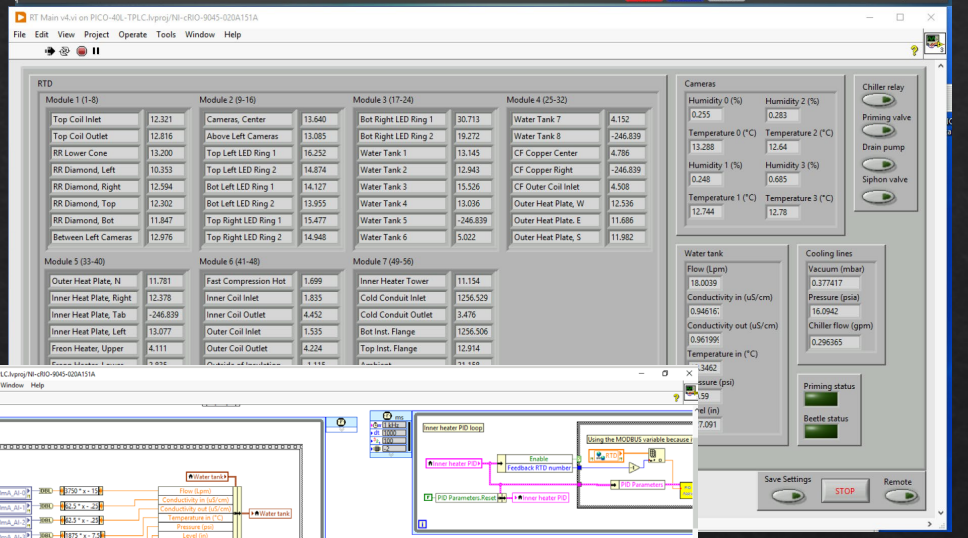
- FEA
  - Jar seal stresses
  - Detector cooling convection
  - Cooling conduit thermal losses
  - HV electrode field

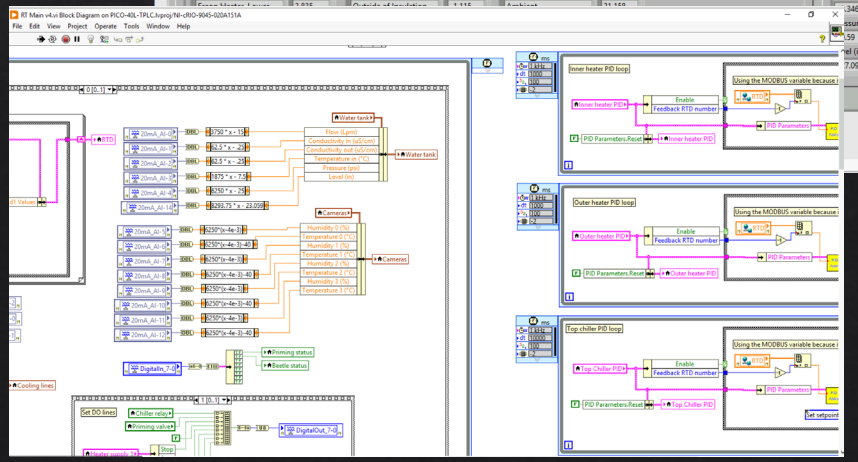


PICO

- Software
  - PICO mission control
    - Python/QT GUI
    - Detector monitoring and control
    - Alarm management
    - History plots
  - Temperature and pressure PLCs
    - Labview cRIO
    - Instrumentation drivers
    - State machines

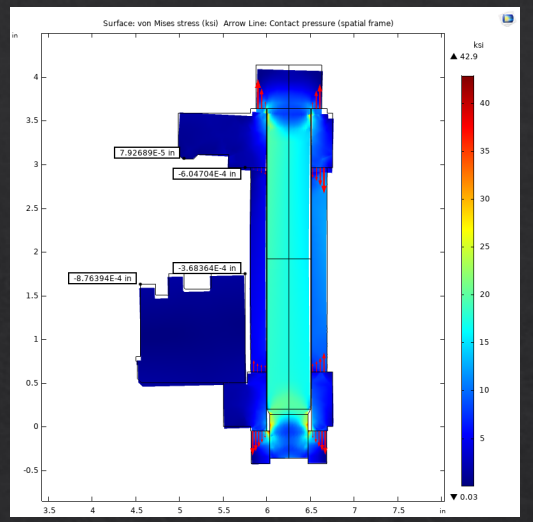


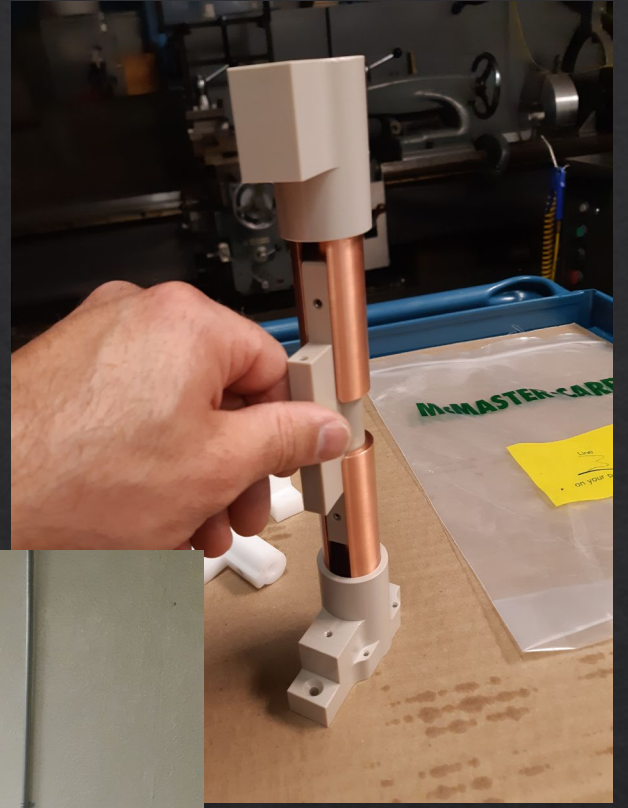


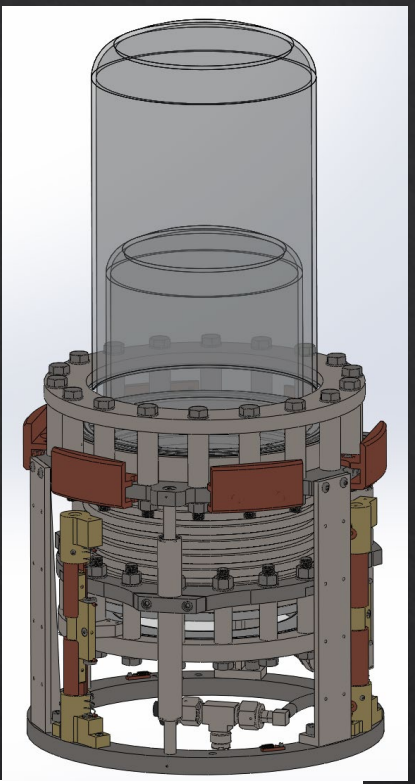


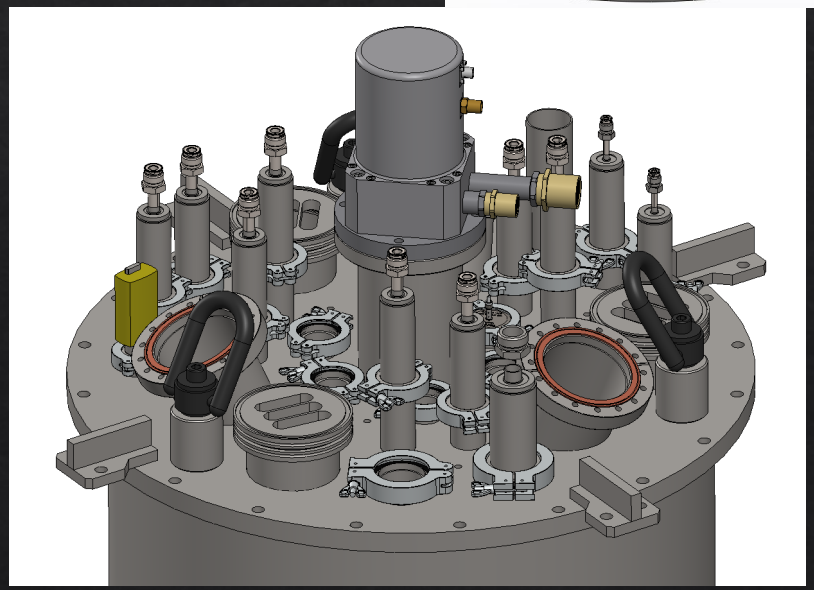
SBC

- Inner vessel design
  - Jar and bellows system
  - Jar seal
  - Capacitive position sensor
  - Heating and insulation
  - HV electrode
- Vacuum jacket lid design
- FEA simulation
  - Mechanical stresses
  - Seals
  - Thermal
  - HV electrode field



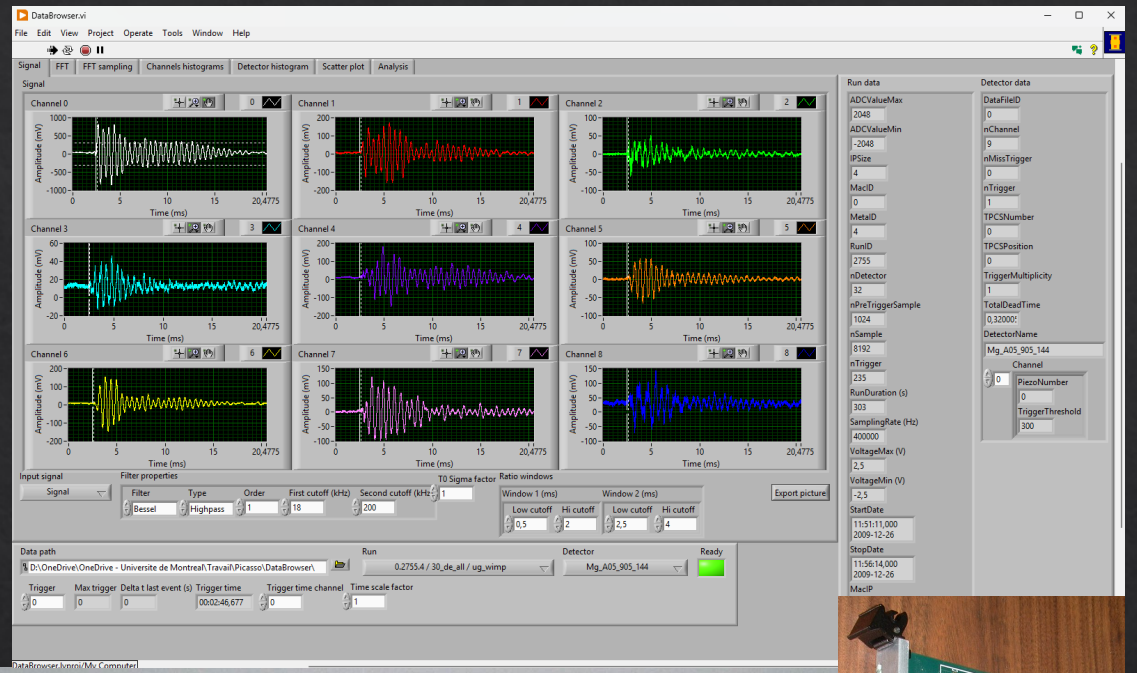


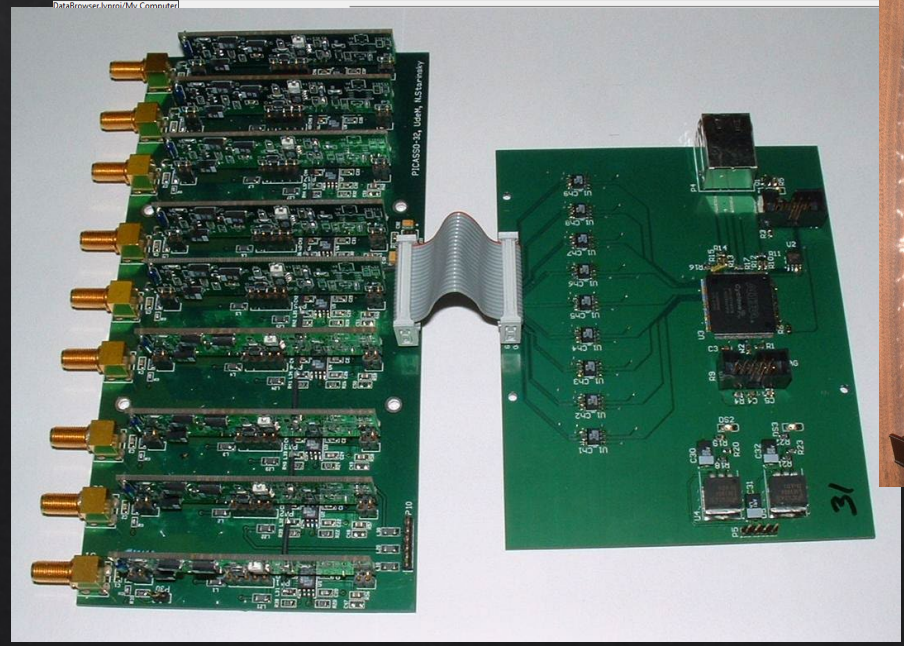


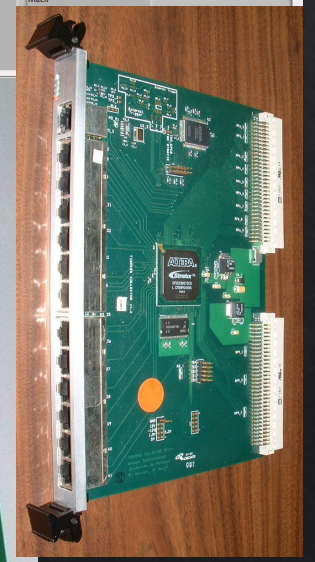


Picasso

- Data browser
  - Labview event display
  - Basic live analysis
- Electronic upgrade
  - Acoustic pre-amp modifications
    - Gain, filtering, offset
  - FPGA code modifications
    - New test modes
    - Sampling frequency doubling

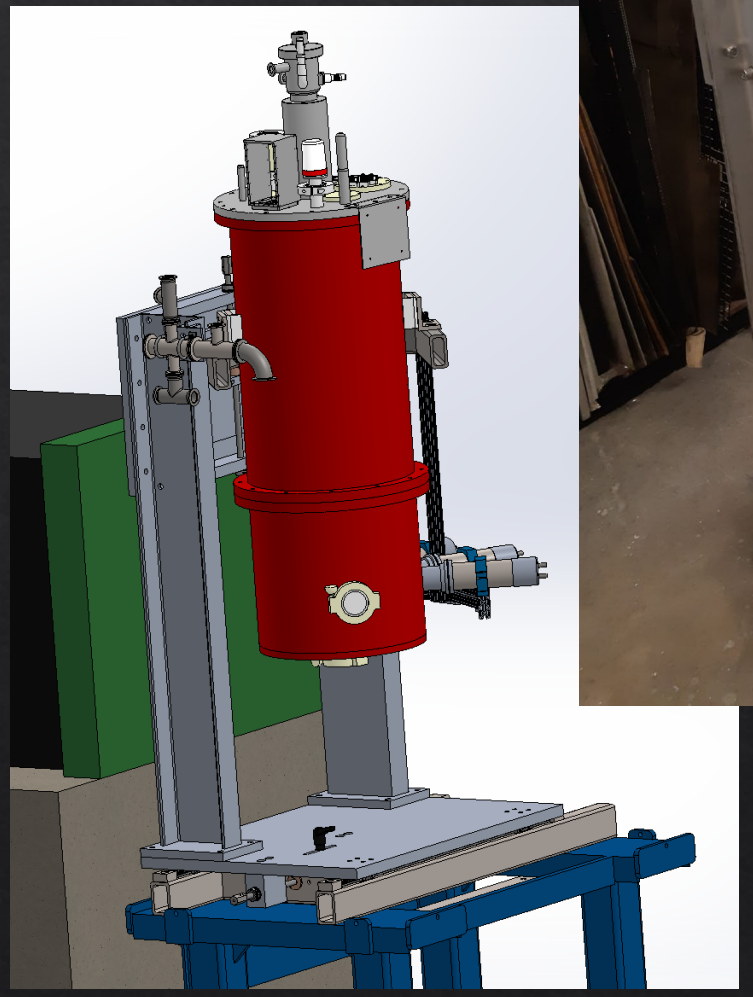






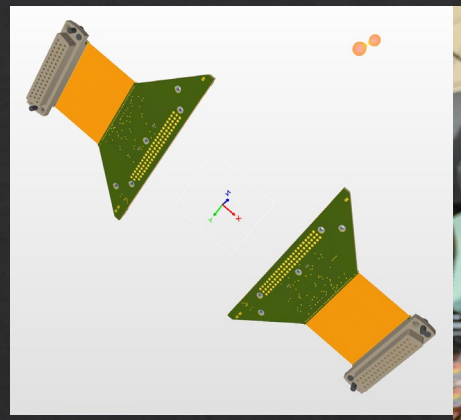
SuperCDMS

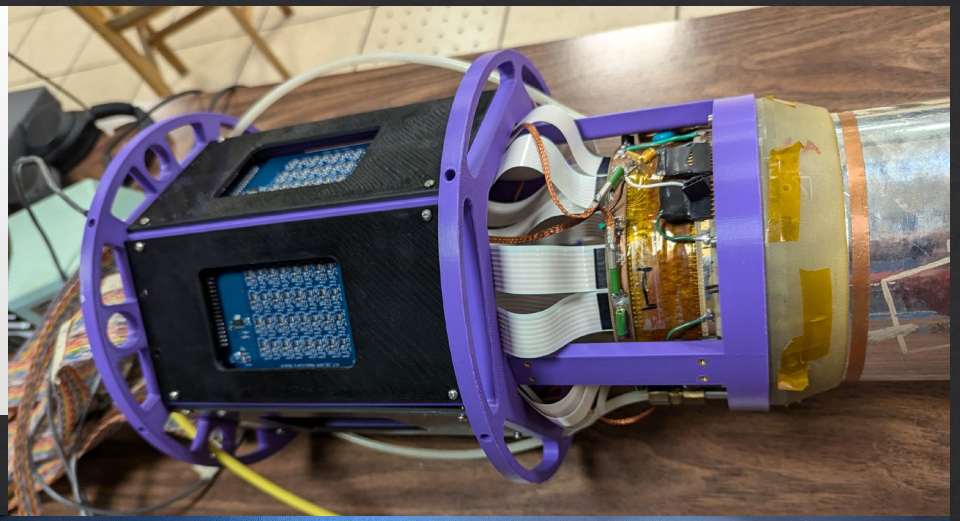
- Desing of a new cryostat stand

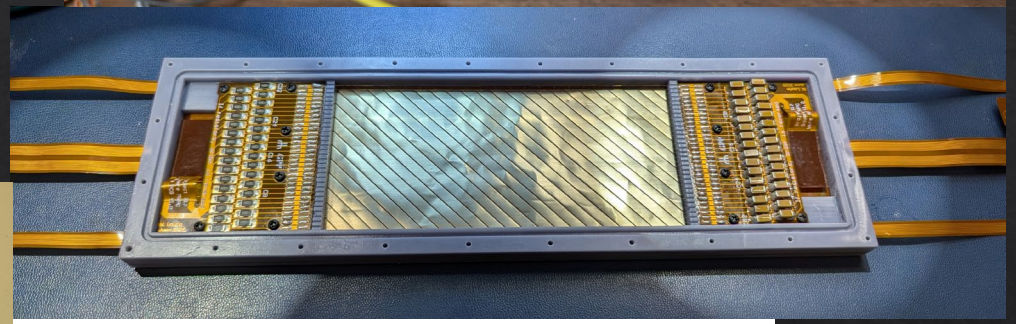


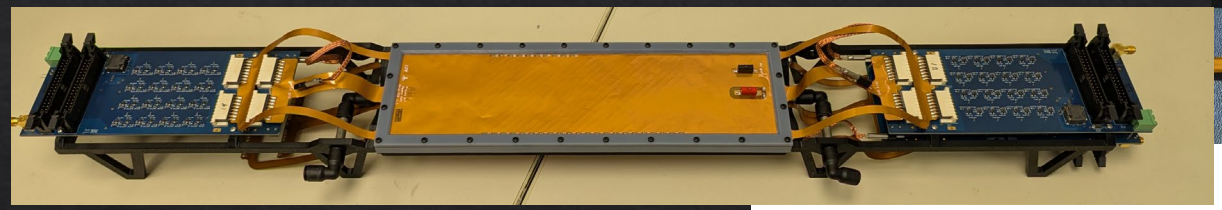
Other projects

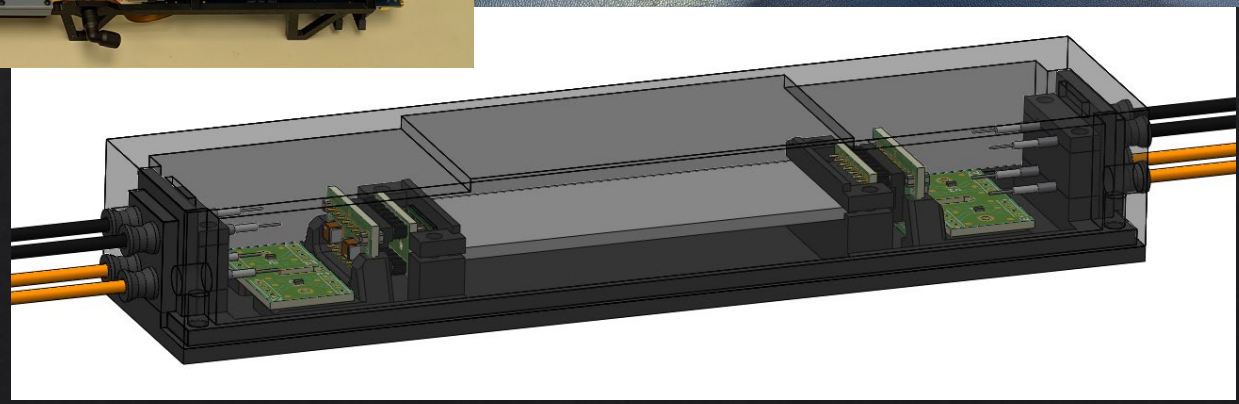
- EMCCD PCB modifications
- MWPC pre-amps support structure
- Small MWPC prototype
- dE scintillator detector with SiPM





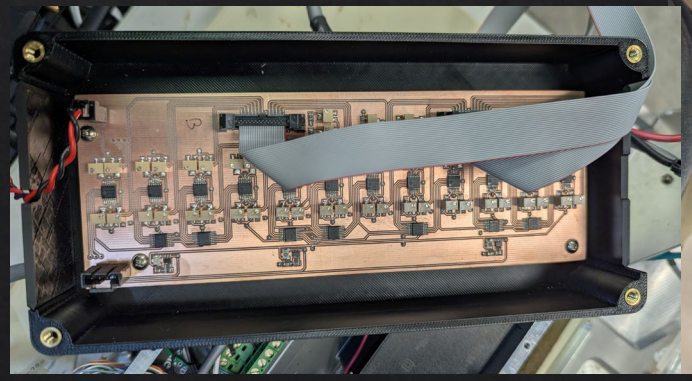


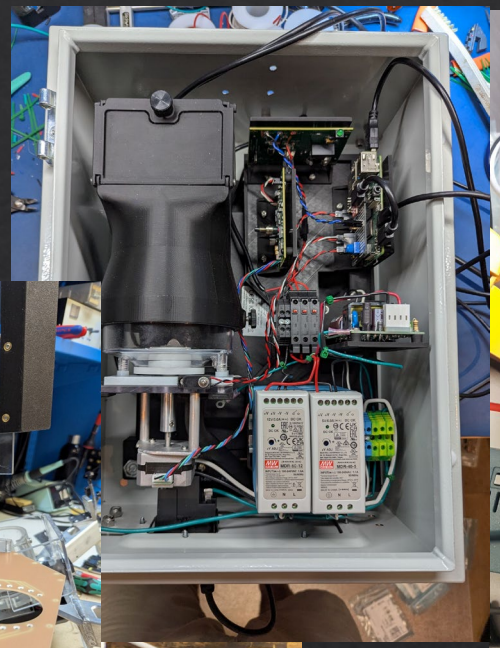


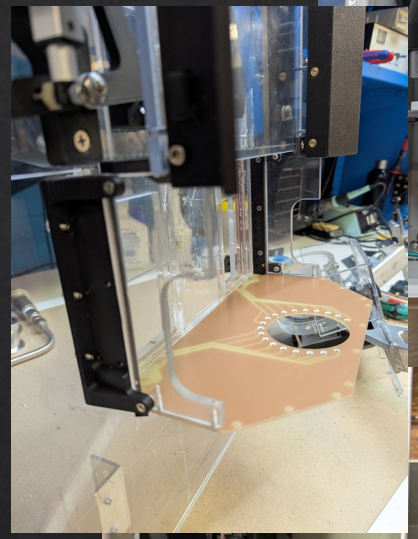


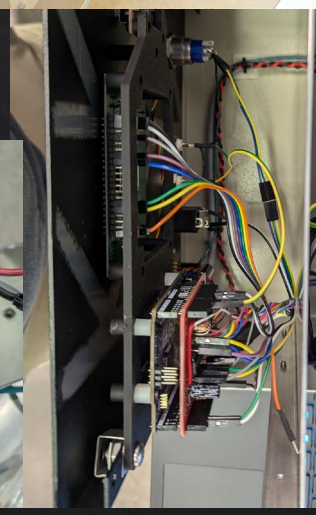
Faculty of Medicine

- Integrated systems
  - Treadmill motor controller
  - Monkey training touchscreen with reward dispenser
  - Loadcell readout and PSU
  - IR beam detector
  - Various smaller devices



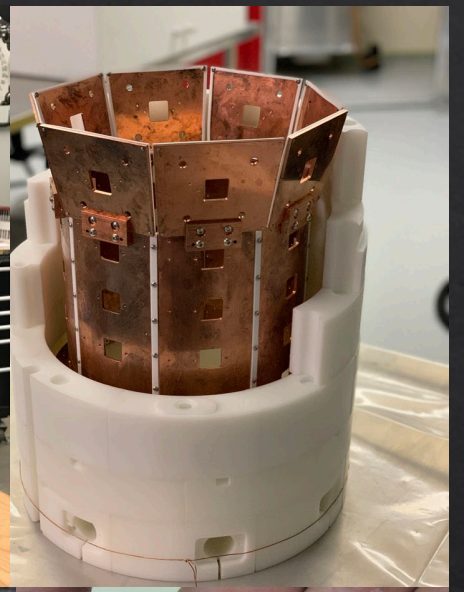


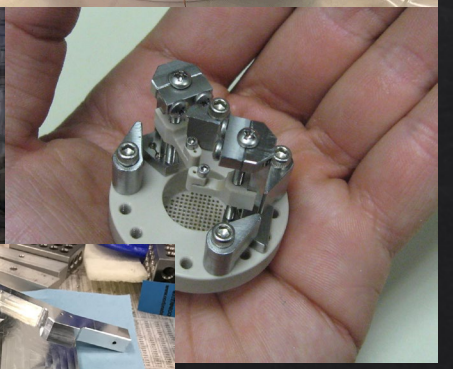




LTA (Laboratoire Technologique Avancé)

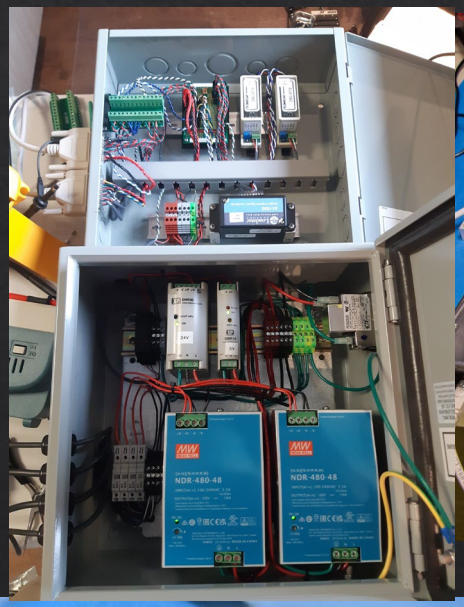
- https://wiki.umontreal.ca/spaces/LTA/overview
- Machine shop
  - CNC/conventional machining
  - Welding/brazing
  - Laser cut/waterjet
  - 3D print (FFF, SLA)

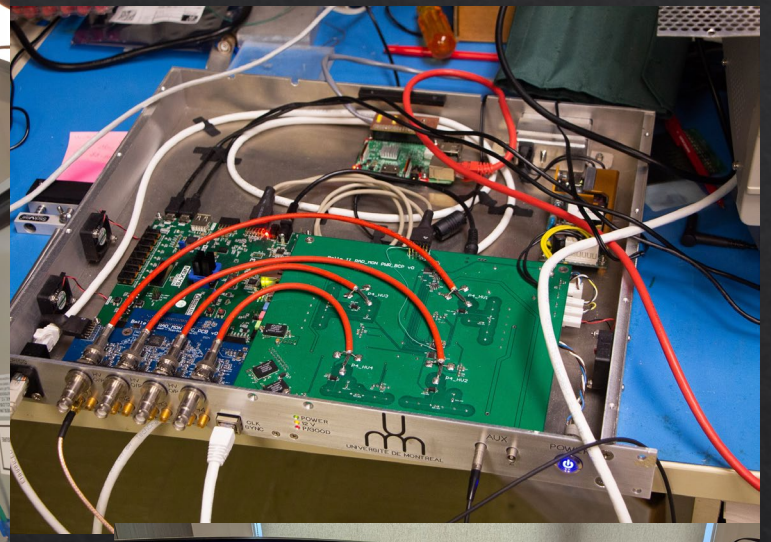


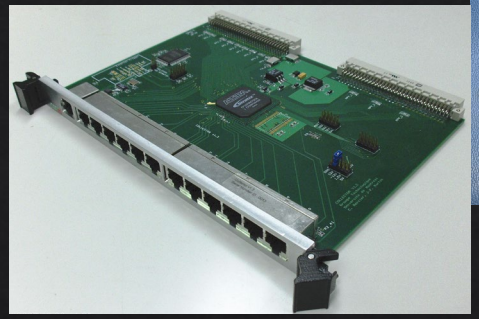


LTA (Laboratoire Technologique Avancé)

- Electronics workshop
  - High-speed/low noise analog electronics
  - FPGA/firmware design
  - Embedded trigger/DAQ systems
  - Microcontroller systems
  - HV systems
  - Prototyping

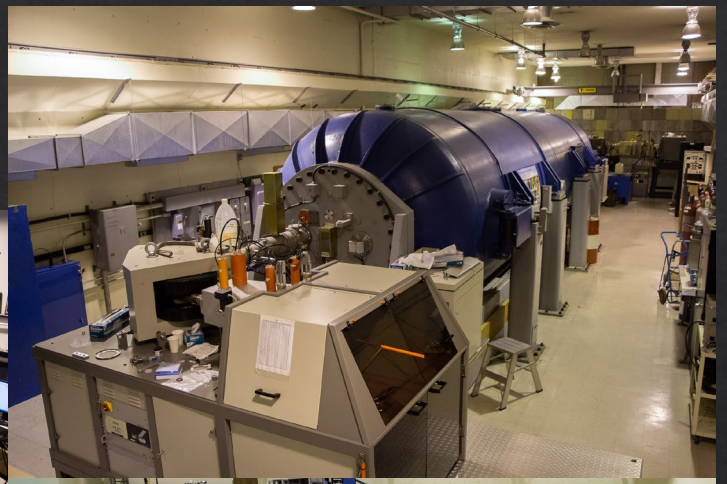


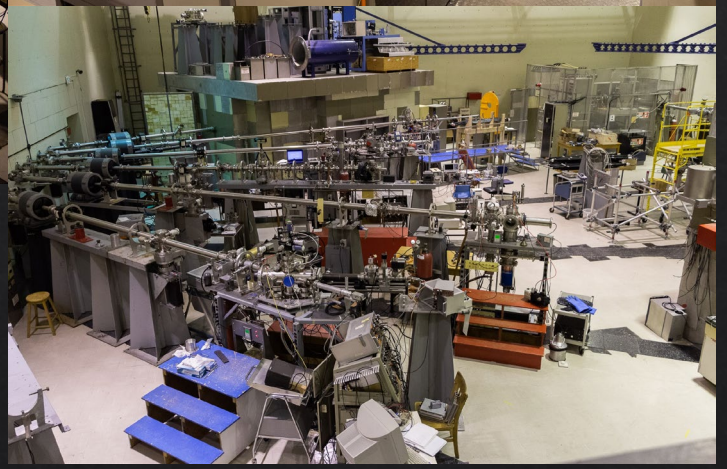




LTA (Laboratoire Technologique Avancé)

- 6 MV Pelletron Tandem accelerator
  - 11 MeV proton energy
  - 15 uA current
  - ~ 0.1 keV resolution
- 1.7 MV Tendetron accelerator
- Material analysis
  - c-RBS
  - ERD-TOF
  - μ-PIXE
- Monoenergetic neutron (4.8 to 118 keV)
- 10 000 class cleanroom with UPW





Thank you!