Project Goals

Build and commission a hybrid mass spectrometry/optical spectroscopy instrument for chemical analysis. This is to be housed in the Chemistry and Biology Instrument Center and managed by a staff member (Dr. Fabian Menges) for general use by the chemical and biological sciences at Yale. The instrument uses class IV lasers and can therefore not be operated as a walk-up instrument (safety concerns and experience needed).

The instrument and the control software need to be designed so that a minimum amount of operator time is needed, otherwise it won’t be used!

Resources Needed

Machine Shop & Student Machine Shop
ITS software library (licenses for e.g. Autodesk Inventor)
Facilities
Budget tracking
Programming Classes
Electronics Shop and Engineers
Mechanical Engineers for optimization of design


PI/Group

Mark Johnson
Current use of Cores, needed personal development (amplified by training resources) and potential advances through an ‘Advanced Instrumentation Development Center’

**Mechanical Parts:**
- Autodesk Inventor student license through ITS software library - software training
- Revision of design by engineer
- Student workshop for basic metal manufacturing techniques
- Machine shop for manufacturing of parts
- Vacuum grade welding in the machine shop
- Integrated workflow from CAD design to CNC machine manufacturing

**Control Electronics:**
- Electronics specialists in the fields of:
  - Microcontrollers
  - Instrument communication & interface design
  - Circuit design for DC power supplies, remote control of these and TTL triggering
  - Radio Frequency applications
- Cryo engineer for optimization of the existing design with respect to heat transfer, would also be great for having a look at the CBIC Helium recovery system, cryo EM facilities, our lab and likely for several others
- Engineer in material flow simulation who could help optimize He buffer gas cooling, optimizing vacuum envelopes with respect to leak rates, pumping efficiency etc.

**Control Software:**
- ITS software library - software training classes
- Software engineer to discuss the scope of the project and guidance on program design - programming as part of the instrument development
- Outsourcing of tasks that are too complex for a beginner/intermediate in programming