Design and produce machined spectrometer frame STL-045-21 [STL-003-19], Year 1 of 1

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Challenge

- Making a very small, LWIR, high-resolution spectrometer with sufficient throughput for passive gas sensing would open up a variety of mobile applications on platforms such as UAV, handheld, and satellite for a variety of remote applications
- The trade-offs of sensitivity, resolution vs. size, weight, and power are very challenging

Innovation

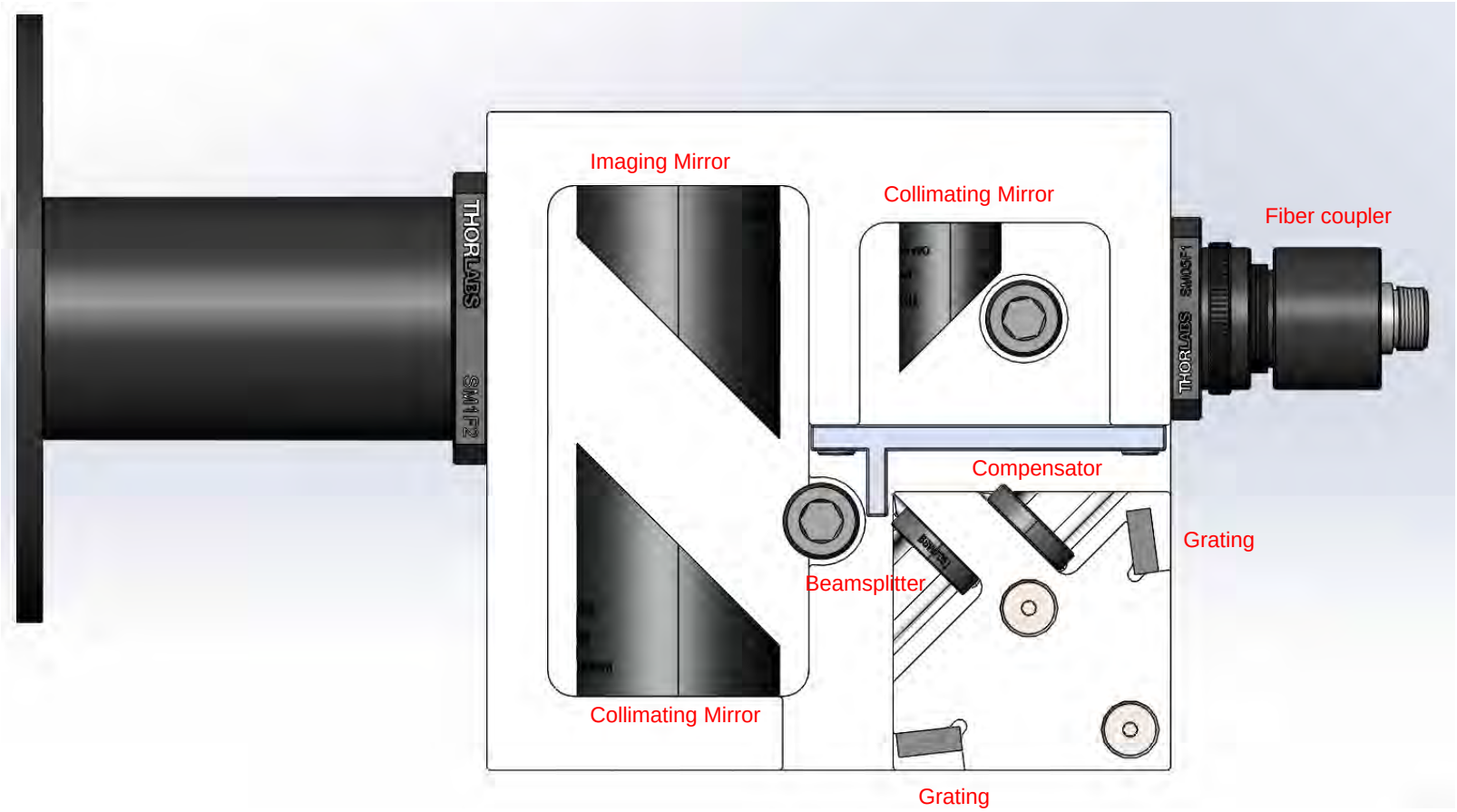
- We have assembled a much smaller system than previous incarnations, using COTS and commercial custom optics
- Our work is pushing the SWaP limits to enable wider application

Technical Approach

- We have assembled a two-arm Michelson-type SHS
- The use of commercial ZnSe beamsplitter plate required the incorporation of a phase compensating plate
- This year we took away the complication of aligning such a small spectrometer system with invisible wavelengths by:
  - Modelling and ray tracing
  - Creating fixed position monolithic mounting with careful machine tolerances

Technical Approach

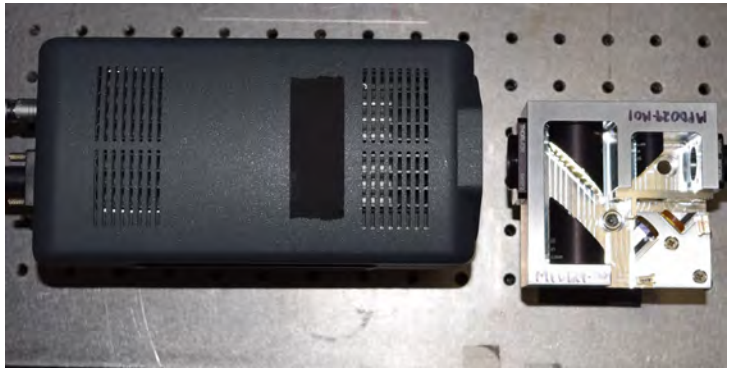
Technical Approach

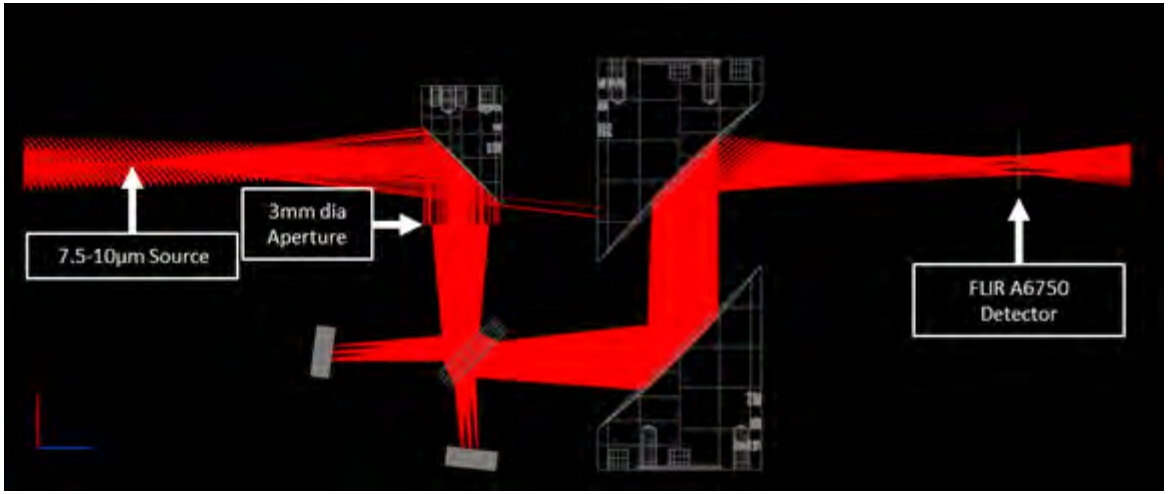


Results

- We have assembled everything except the mount to the FLIR LWIR camera
- We lacked published detail on the exact location of the detector plane
- With that info in hand, we are making a flange for final assembly of the device
- Through the course of the project, we have learned that current uncooled microbolometer detectors are insufficient for SHS devices in this wavelength region

Results





Results

- Reserve space for an image and/or spectrum from the assembled device if it is successful before presentation

Summary of Results, Path Forward

- We need to make a flange, glue in optics (currently just clamped), and turn it on
- Determine sensitivity for approaching future applications

Impact

- If successful in the final experiment, we will write follow-on proposals for SIPP sponsors for a VERY compact SWIR full spectrum device and will submit a note on the design to Rev. Sci. Instrum.