# NASA SBIR/STTR Technologies

## S1.01-7997 - Agile Etalon Filter for Differential Absorption LIDAR

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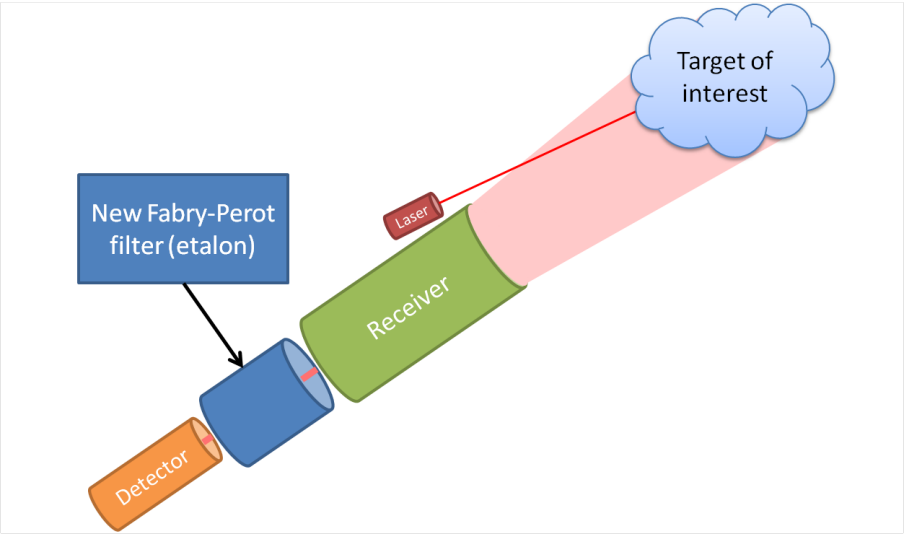
## Identification and Significance of Innovation

Modern sensing systems often are required to pick out a very specific wavelength in a sea of other light (such as in daylight), making precise optical filtering a vital part of many sensing systems. Michigan Aerospace Corporation (MAC) plans to design, build and test an agile, frequency-tunable Fabry-Perot interferometer (etalon) for use as an optical filter of background light as part of a Differential Absorption LIDAR (DIAL) system. MAC's extensive history with designing and building rugged etalons for NASA and other customers will be key to this effort. Phase I will involve the design of this specific etalon and the testing of a faster actuation method for precisely tuning it. Phase II will then involve the construction and test of the etalon.




Estimated TRL at beginning and end of contract: ( Begin: 2 End: 3 )

## Technical Objectives and Work Plan

***Technical Objectives:***

- **Objective 1:** Determine the requirements and operational constraints for a tunable Fabry–Perot etalon in a DIAL application.
- **Objective 2:** Perform trades studies to determine the operating specifications a DIAL Fabry-Perot etalon, including the piezo etalon motors and capacitive feedback requirements.
- **Objective 3:** Perform a lab demonstration of the piezo force motor to validate the feasibility of a rapid agile tunable Fabry-Perot etalon.
- **Objective 4:** Create a conceptual design for the agile tuned Fabry-Perot with a Pound-Drever-Hall (PDH) optical port that is suitable for fabrication in Phase II.

***Work Plan:***

- **Task 1:** Requirements Analysis
- **Task 2:** Design Analysis and Trade Studies
- **Task 3:** Force Motor Test Design
- **Task 4:** Force Motor Testing
- **Task 5:** Conceptual Design for the agile Fabry-Perot Tunable Etalon
- **Task 6:** Program Management *(throughout project)*

## NASA Applications

This new, faster-tuning etalon technology will be approriate not only for NASA DIAL/IPDA-type LIDAR systems, but also for other NASA remote-sensing tasks requiring rapidly-tunable wavelength discrimination. The ruggedness of the design will ensure the ability to use such etalons in airborne and space applications, as well as with ground systems.

## Non-NASA Applications

Non-NASA applications will be similar to NASA applications for precise, rapidly-tunable optical filters for sensing systems of all kinds, including those in rugged environments (airborne, shipborne, etc).

## Firm Contacts

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