NASA SBIR/STTR Technologies

S4.01-9812 - MARVY: Mars Velocity Sensor

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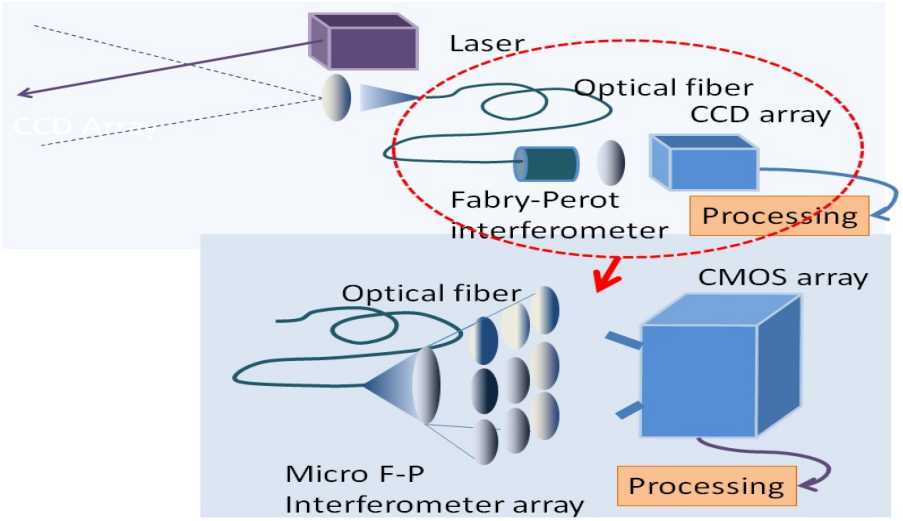
Identification and Significance of Innovation

The successful landing of the large Mars rover Curiosity on August 5, 2012 outlined the increasing complexity of safely landing large rovers on the planet. A precise knowledge of the spacecraft speed is required in order to initiate the landing sequence near 900 mph.

The proposed MArs VelocitY sensor, MARVY:
* MARVY is a short range air data sensor based on direct, or incoherent, detection of backscattered light.
* MARVY operates in the absence of aerosols, thus enabling operation in completely clear atmosphere,
* The design is based on micro-fabricated optical components to provide an instrument that affords all requirements for planetary exploration.

This Phase I will entail modeling and design of the instrument. Critical components will be tested in Phase II.

Estimated TRL at beginning and end of contract: (Begin: 3 End: 4)



Technical Objectives and Work Plan

Objective 1: Determine the operational envelope for MARVY and the resulting requirements.
Objective 2: Perform trade studies and photon budgets using models to determine the design parameters of the instrument.
Objective 3: Design of the micro Fabry-Perot interferometer.
Objective 3: Design the full instrument for prototype fabrication and testing in Phase II.

Work plan:
Task 1: Requirement definition (Define all instrument requirements and flow down; 1 month)
Task 2: Trade studies (Model the instrument for transmitter and receiver, determine photon budget and SNR based on the requirements; 2 months)
Task 3: Fabry-Perot interferometer design (Reflectivity of the individual interferometers, tuning range, finesse; 2.5 months)
Task 4: Instrument design (Design of MARVY including size, weight, and power requirements; 2.5 months)
Task 5: Management (throughout program, including risk matrix and mitigation plan, 6 months)

NASA Applications

NASA's interest in this instrument will not only be for the target use of airspeed measurement during Mars and other planetary atmospheric entry, but also for Earth sample-return capsules and other re-entry vehicles. NASA research involving UAVs and hypersonic vehicles would also benefit from this compact air data sensor.

Non-NASA Applications

The commercial impact of a micro-fabricated air data sensor receiver is substantial. The proposed research and development opens the path to extremely compact optical air data systems (OADS) for UAVs, cruise missiles and other ordnance with significant flight time, and re-entry and hypersonic platforms.

Firm Contacts

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