Advanced Micro Sun Sensor

Problem Statement

- Sun sensors are widely used in spacecraft attitude determination subsystems. NASA Mars rovers use much larger, less accurate sun cameras to determine the heading and point high gain antenna toward earth. Current digital sun sensors are too big and consume a lot of power
- AMSS is an integrated highly accurate, small, low mass (reduces mass by an order of magnitude), and low power digital sun sensor
- NASA and industry requiring small, highly accurate sun sensors for sub-orbital, orbital, and lander (rover) missions.

Technology Development Team

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Proposed Flight Experiment

Experiment Readiness:

- Two AMSS units have been built using MEMS and Active Pixel Sensor (APS) processes. The units are being calibrated. The support equipment (Single Board Computer) is being ruggedized for sRLV.

Test Vehicles:

- sRLV is needed for for performance validation and space qualification of AMSS.

Test Environment:

- Micro-gravity is not required for the test.

Test Apparatus Description:

- The AMSS is a miniaturized pinhole camera. The focal plane is an APS camera on a chip and the optics is a small piece of Silicon wafer. The electrical interface to the AMSS is though a single nanonics connector made by Tyco.
- Two AMSS will be delivered. The units will need to be mounted close to the access panel window.
- The units will be turned on prior to sRLV launch. The SBC will continuously issue commands and collect sun vector data during the flight.

Technology Maturation

- This highly integrated micro sun sensor represents a paradigm shift, because of its one order of magnitude lower mass and power compared to commercially available products.
- Using MEMS and APS processes would have a big impact on the cost of multiple sensors since MEMS and APS technologies allow the production of more than 50 masks and detectors simultaneously.
- The flight is the last missing part to qualify the JPL developed AMSS for sounding rockets.

Objective of Proposed Experiment

- Pre-Launch
  - Turn the units on and collect sun vector data and determine LV attitude
- During the flight
  - Successfully acquire sun during flight
  - Collect & store the data
- Post Landing
  - Retrieve the payload
  - Retrieve stored data from payload
  - Perform a 2-Axis attitude construction of the launch vehicle

Applicable Technology Areas: Technology Area 05 Technical Challenge 1.4.4

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