



Dust Tracking Camera

Technical Excellence (TE) FY24

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1. Introduction

To mitigate dust, you must know where it is. The camera purchased from this funding can:

- Identify and track regolith particles as small as 50 microns
- Measure depth of regolith that has built up on a surface
- Differentiate between regolith and background material/surface (Habitation floor vs human skin cells vs regolith for example).

This technical excellence investment will be useful to multiple projects, departments, and branches

3. Methods

Short Wave Infrared (SWIR) and Mid-Wave Infrared (MWIR) remote sensing relies on the science of spectroscopy.

When many wavelengths of light are shone upon a surface, the wavelengths will reflect with varying intensity depending on the atomic and molecular composition of the material.

This property of light can be used to differentiate materials from a distance.



5. Future Work

Advancements from this funding would be included in the Agency's dust mitigation portfolio. This investment would also advance the TRL of other CIFs/ECIs/TEs and provide technology verification (ICAN-C, R-DUST, Regotricity). ODC/Procurement needed for hardware procurement, lab space reutilization costs and intern for development help.

2. Objectives

- FLIR 8580 InSb (1.5 – 5.0 μm), 1280x1024, f/2.5, 44Hz GigE/60Hz CXP camera and FPO MWIR 50mm Lens and Calibration Package purchase request has been created.
- This camera will be able to identify and track dust particles as small as 50 microns in a live feed video, differentiate between dust and background 98% of the time, and map the depth of regolith on surfaces as deep as 0.5 cm.
- This camera will be available to loan out to other labs and projects on center.

4. Specifications

MWIR Model names	A8580
Detector Type	FLIR Indium antimonide (InSb)
Spectral range	1.5–5.0 μm
Resolution	1280 × 1024
Pixel size	12 μm
Thermal sensitivity/NEDT	≤40 mK (≤30 mK typical)
Well capacity	Gain 0: 3.0 Me-, Gain 1: 11.5 Me-
Operability	≥99.5% (≥99.9% typical)
Sensor cooling	Linear Sterling cooler

General

Operating temperature range	-20°C to 50°C (-4°F to 122°F)
Shock / vibration	40 g, 11 msec ½ sine pulse/4.3 g RMS random vibration, all 3 axes
Power	24 VDC (< 24 W steady state)
Weight w/o lens	2.3 kg (5 lbs)
Size (L × W × H) w/o lens	226 × 102 × 109 mm (8.9 × 4.0 × 4.3 in.)
Mounting	2x ¼" -20 tapped holes, 1x 3/8"-16 tapped hole, 4x 10-24 tapped holes

Optics

Camera f/#	f/2.5
Available lenses	Manual (broadband): 25 mm, 50 mm, 100 mm. Motorized: TBA
Close-up lenses / microscopes	—
Lens interface	FLIR FPO-M (4-tab bayonet, motorized)
Focus	Motorized (compatible w/manual lenses)

Electronics

Readout	Snapshot
Readout modes	Asynchronous integrate while read, Asynchronous integrate then read
Synchronization modes	Sync In, Sync Out
Image time stamp	Yes
Integration time	480 ns to –full frame
Pixel clock	100 MHz
Frame rate (full window)	Programmable; Up to ~45 Hz (GigE), 60 Hz (CXP)
Subwindow mode	Flexible windowing down to 32 × 4 (steps of 32 columns, 4 rows)
Dynamic range	14-bit
On-camera image storage	None
Radiometric data streaming	Gigabit Ethernet (GigE Vision), CoaXPress
Standard video	HD-SDI
Command and control	GenICam (GigE, CXP), RS-232

