

CubeSat Infrared Atmospheric Sounder (CIRAS)

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Objective

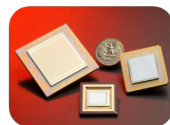
In-space validation of key technologies enabling high fidelity measurements of hyperspectral infrared radiances:

- Develop CIRAS as a 6U CubeSat atmospheric IR (4.08 – 5.13 microns) sounder to measure temperature and water vapor profiles with accuracy comparable to legacy IR sounders, e.g., AIRS on AQUA and CrIS on JPSS, but only in the lower troposphere (< 300 mb)
- Demonstrate key technologies for high accuracy infrared imaging and sounding including:
 - Hot-Bird Infrared Detector Materials
 - Lockheed Martin Micro Pulse Tube Cryocooler
 - MWIR Grating Spectrometer
- Perform retrievals of temperature and water vapor profiles in lower troposphere in MWIR to validate technology

Approach

- Develop CIRAS to test technologies for IR imaging and sounding in a CubeSat configuration
- Build and hybridize HOT-BIRD detectors to commercial ROIC, camera electronics and Dewar from IR Cameras
- Build new spectrometer based on proven grating spectrometer designs built at JPL and Ball Aerospace
- Develop immersed grating, black silicon slit and blackbody at JPL's MicroDevices Lab
- Integrate payload into Blue Canyon Technologies (BCT) 6U CubeSat
- Launch, acquire data, retrieve temperature and water vapor profiles covering at least 100 hours

Co-Is/Partners: UMBC, STC, BATC, IR Cameras, BCT



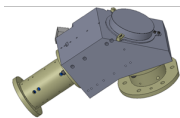
Detectors and FPA
HOTBIRD
(JPL)

| | |
|-----------|------------|
| Size | 6U Cubesat |
| Mass | 14 kg |
| Power | 37.5W |
| Data Rate | 0.3 Mbps |

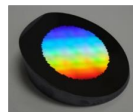
7 Major Subsystems

Blue Canyon Technologies
Spacecraft

Optics Assembly
Telescope/MGS
(Ball)



Immersion Grating



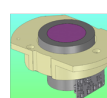
Blackbody Assembly
Black Silicon



Scan Mirror Assy
Commercial Stepper
Motor + Electronics



Dewar (IDCA)
(IR Cameras)



Payload Electronics
(JPL) +
Camera Electronics
(IR Cameras)



Key Milestones

- | | |
|---|-------|
| • Preliminary System Requirements Review (SRR) | 06/16 |
| • Complete spacecraft conceptual design | 02/17 |
| • System Requirements Review (SRR) | 05/17 |
| • Complete payload subsystems and PDR/CDR | 12/17 |
| • Deliver payload to spacecraft bus integrator [Task Cancelled] | N/A |
| • Spacecraft delivery and Mission Readiness Review (MRR) | N/A |
| • Target Launch Date (NASA CSLI) | N/A |
| • Validate technologies for measurement of hyperspectral infrared radiances on 6U CubeSat | N/A |

TRL_{in} = 5

TRL_{current} = 5