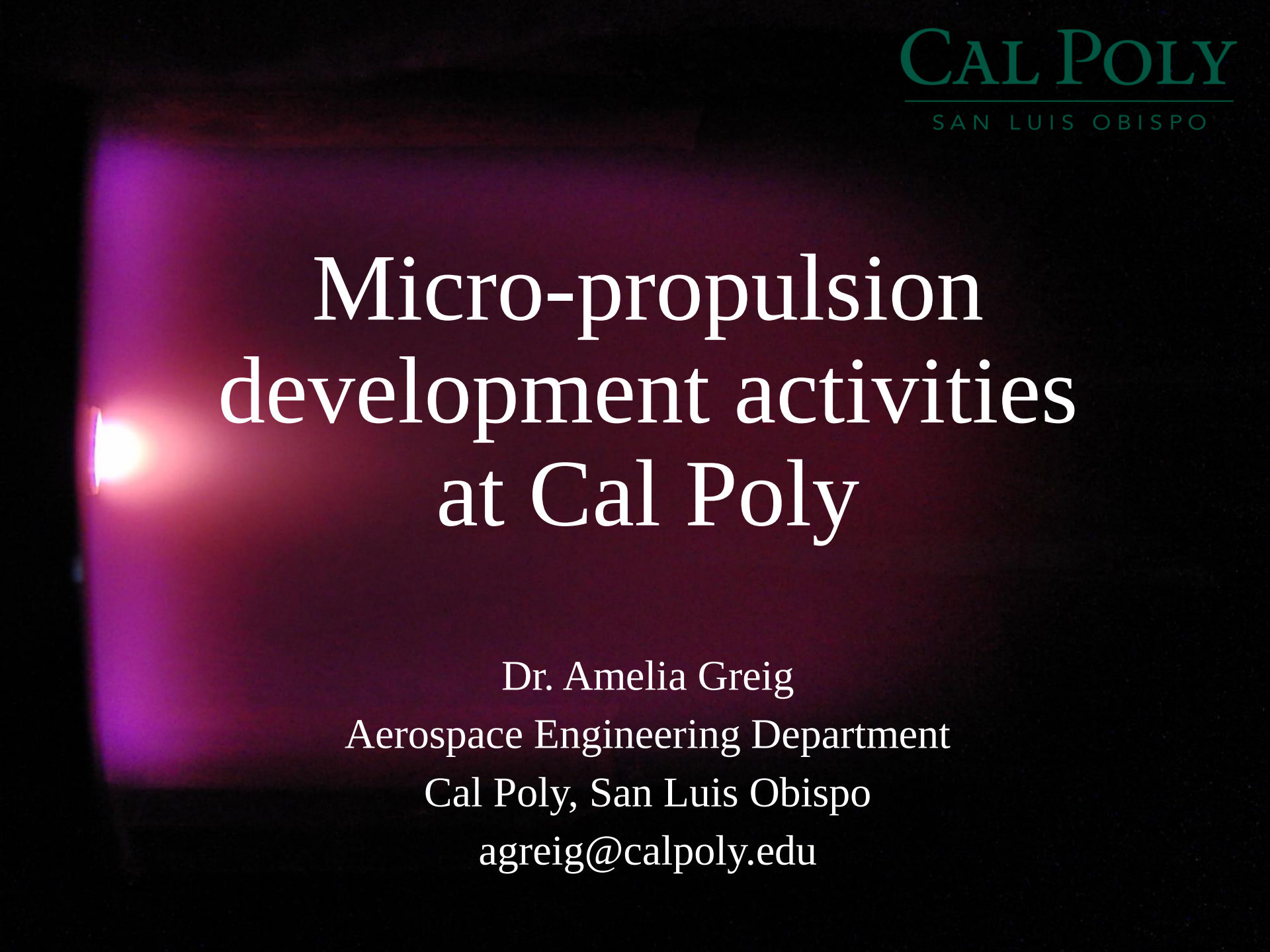
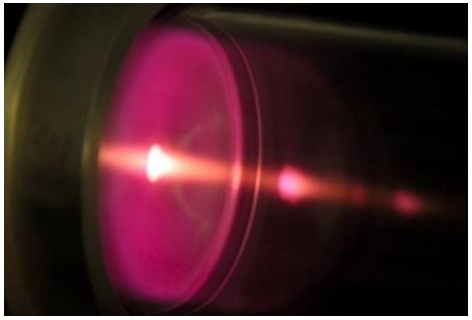


Micro-propulsion development activities at Cal Poly

Dr. Amelia Greig
Aerospace Engineering Department
Cal Poly, San Luis Obispo
agreig@calpoly.edu

Cal Poly Micro-Propulsion



Current Major Project: ‘Pocket Rocket’
- Optimize design
- Integration into a 1U CubeSat
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- Micro-Newton Thrust Balance
  - Four-arm pendulum
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  - Upgrade/Expand for Propulsion

Future Projects

- Electrospray/Colloid
  - Design, development and testing
  - Starting Summer 2017
- Electric Propulsion Simulations
  - Hybrid regime (high and low pressure)
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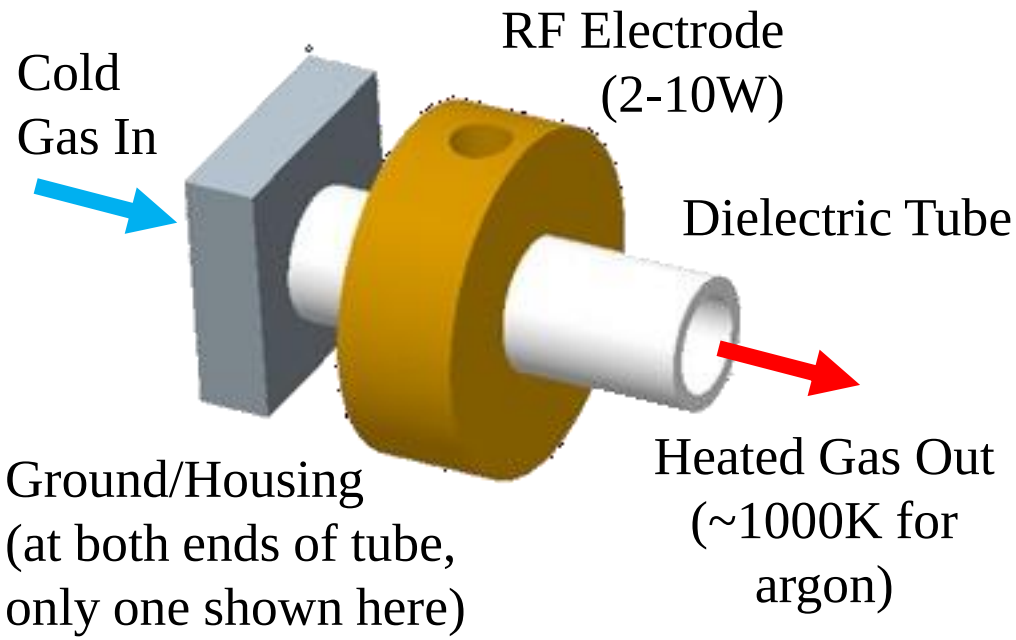
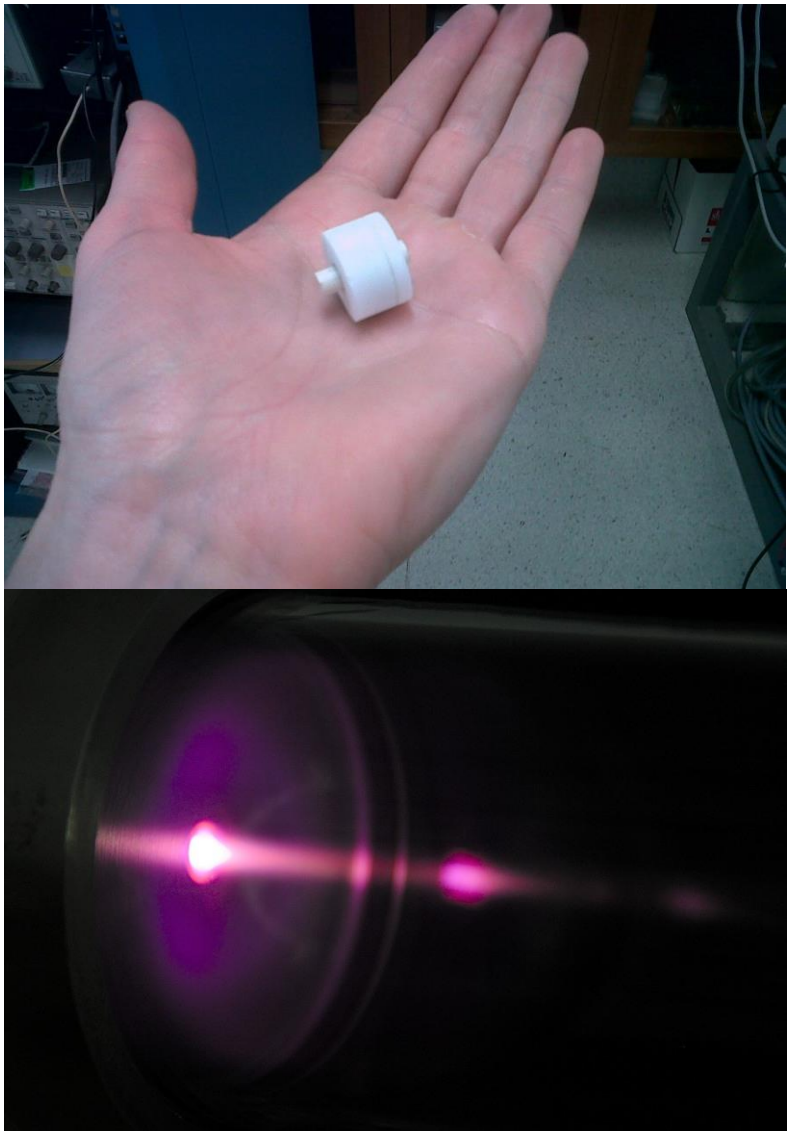
Pocket Rocket

Electrothermal Plasma Thruster
Designed for CubeSats





Heating occurs in bulk propellant
Continuous or pulsed operation
Can also operate as a cold gas thruster

Pocket Rocket - Performance

Estimated Pocket Rocket performance and comparisons

Thruster	Specific Impulse	Power	Thrust	Propellant Flow Rate
Cold Gas Thruster[1]	40s	NA	1mN	1mg/s
Pocket Rocket[2]	80s	10 W	2.6mN	1mg/s
Argon Resistojet[3]	85s	50 W	100mN	100mg/s

1) Calculated using Pocket Rocket dimensions
2) Estimated from experimental temperature measurements
3) Sitael XR-Resistojet Range (http://www.sitael.com/wp-content/uploads/2015/10/XR-family.pdf)

The ‘Pocket Rocket’ Collective

Pocket Rocket - Integration

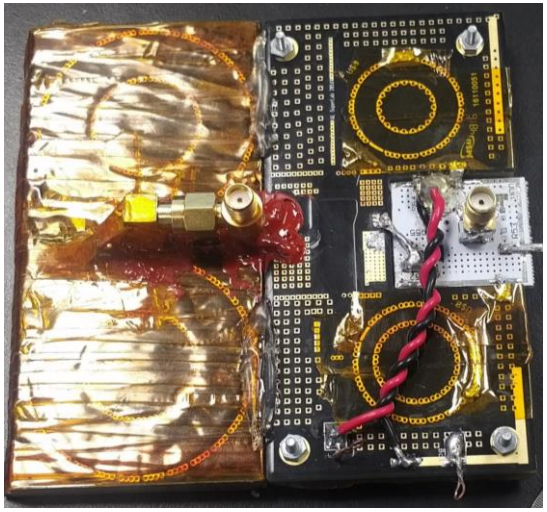
Currently being fully integrated into a 1U CubeSat by Cal Poly students

- Thruster
- Electronics
- Propellant storage and feed
- Control system

Argon Gas Canister

Integrated 1U system will be ground tested

- Remote Vacuum Operation
- Thermal Vacuum
- Thrust Measurements
- Vibration Test



DC-RF Driver

Expected completion – March 2018

Pocket Rocket – DC-RF Driver

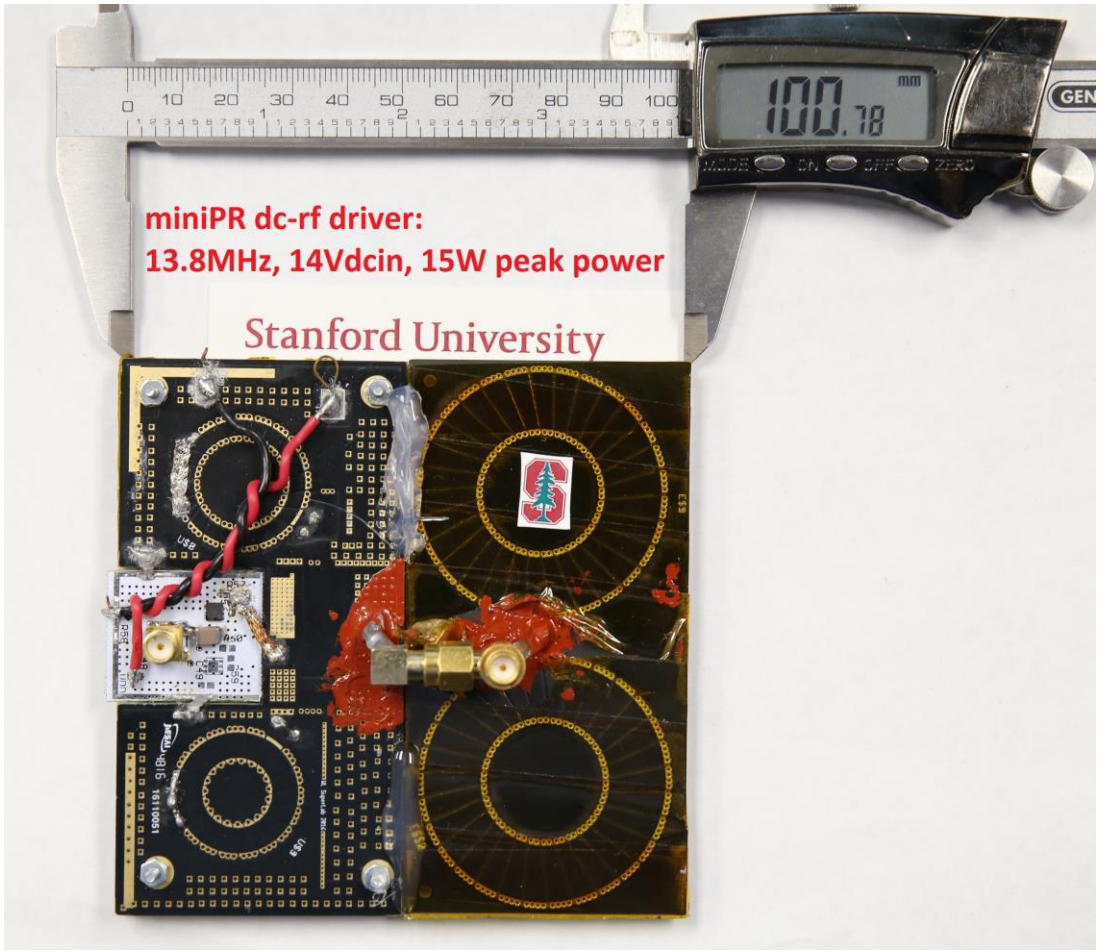


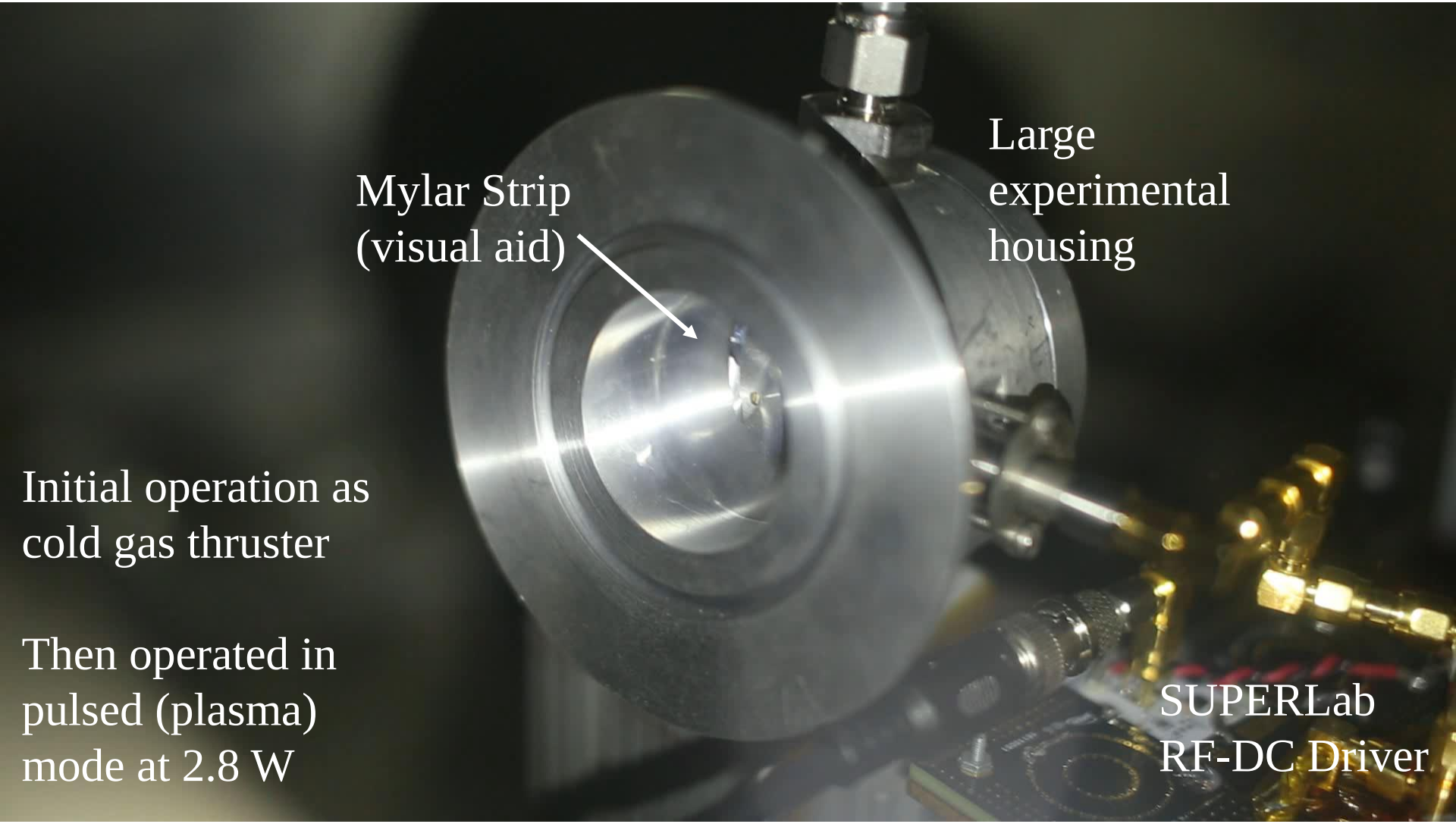
Photo credit: SUPERLab@Stanford

Working CubeSat sized DC-RF generator developed by Prof. Juan Rivas-Davila and Wei Liang at Stanford University Power Electronics Research Lab (SUPERLab)
superlab.stanford.edu

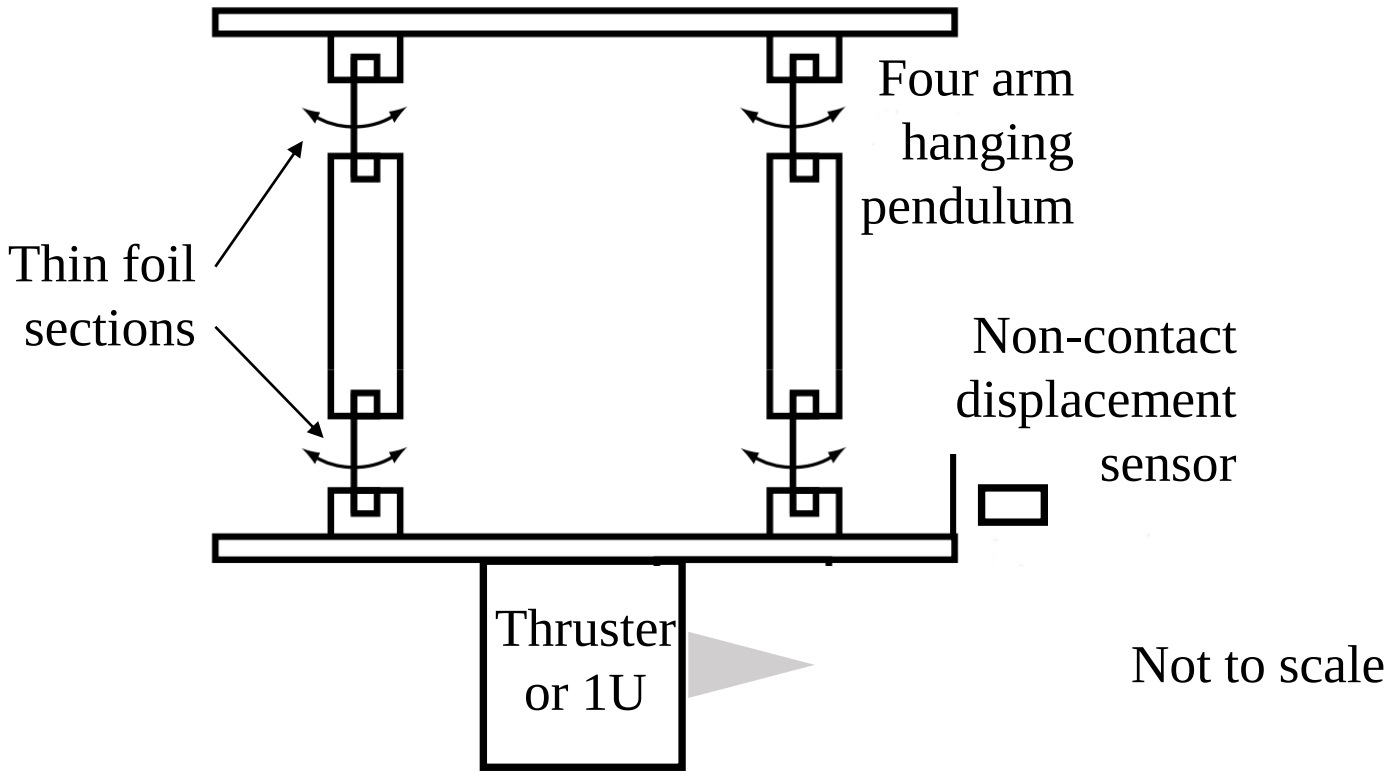
Current Aims:

- Reduce board size to <9.5cm
- Reduce VDC input

Pocket Rocket – Test Video

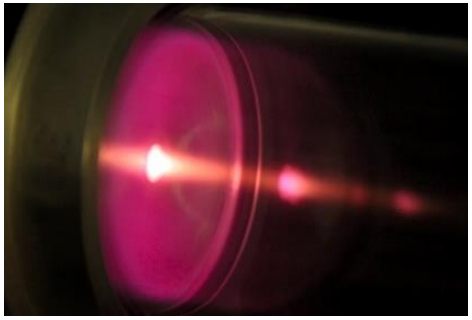


Micro-Newton Thrust Balance



Current resolution estimate: 20μN
Desired resolution: 2μN

Cal Poly Micro-Propulsion – Recap



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Open to suggestions/collaborations