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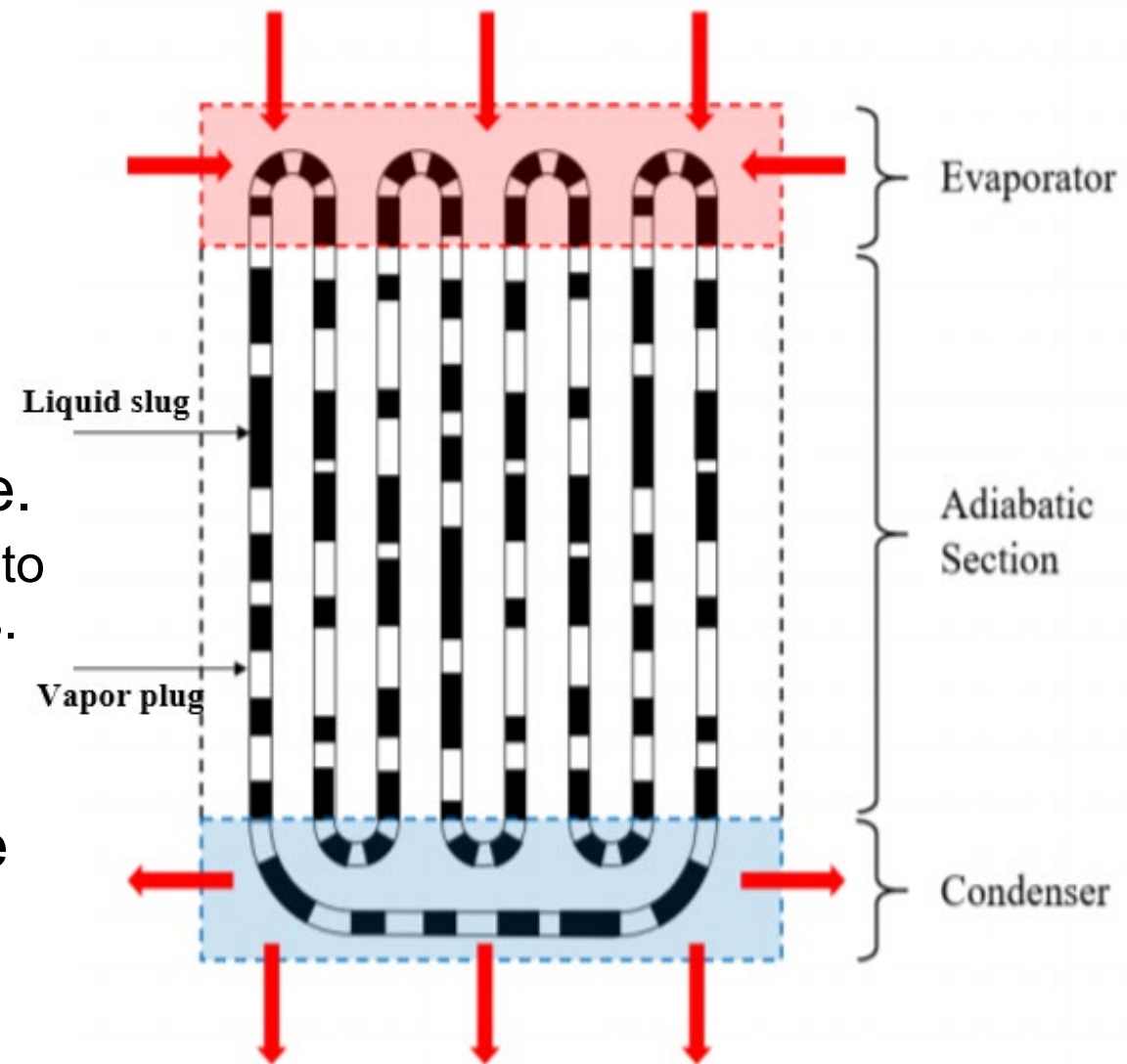
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**Low-mass Long-distance
Effective Heat Transfer via Helium
Pulsating Heat Pipes**

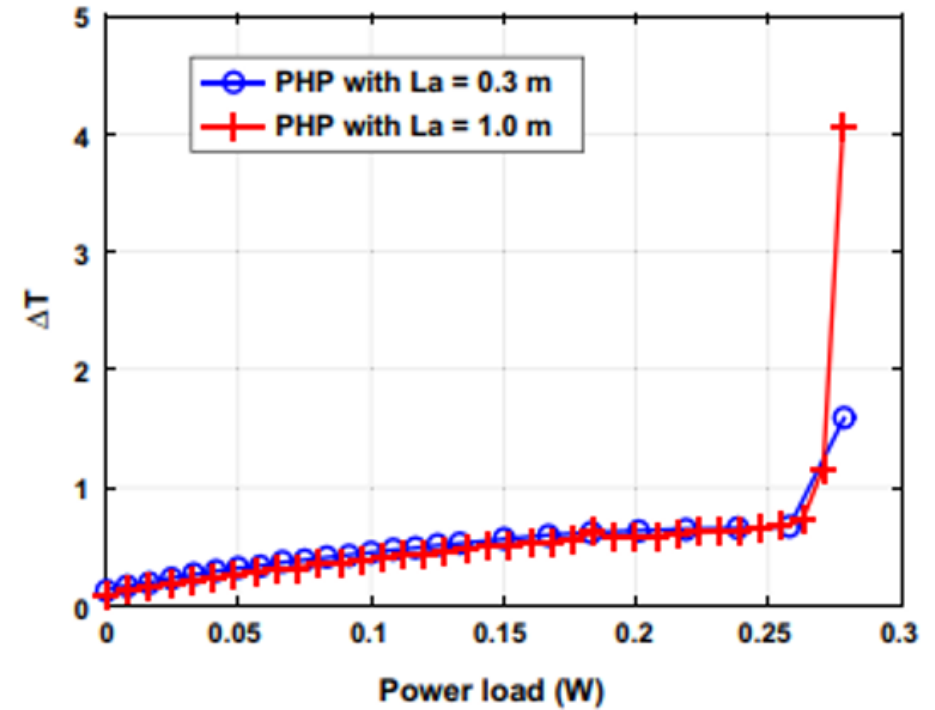
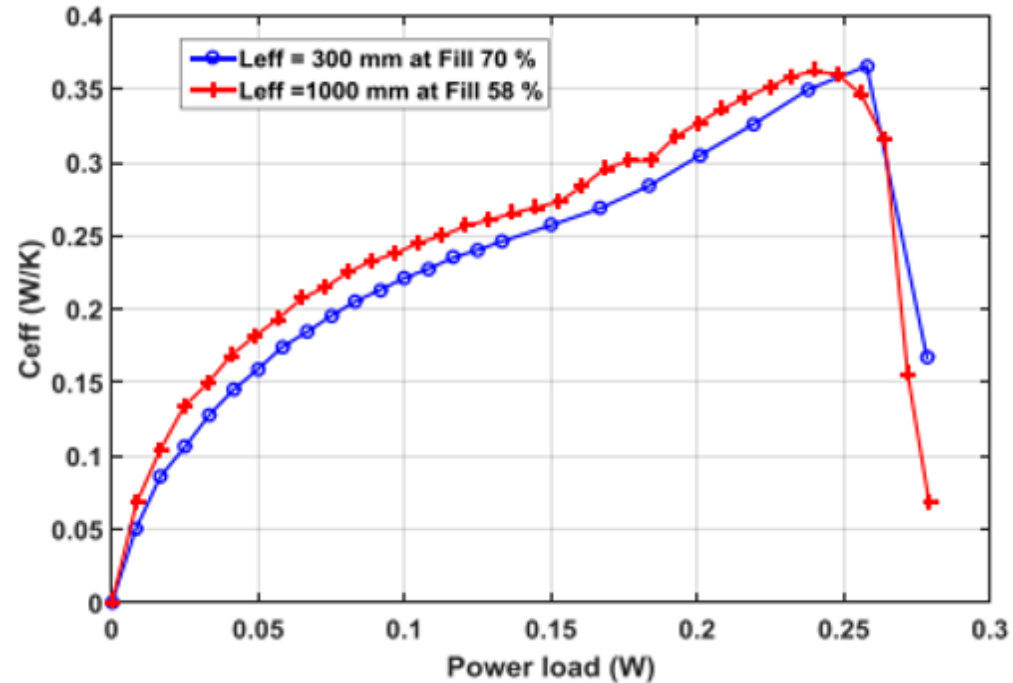


Background

- Pulsating Heat Pipes (PHPs) are passive, two-phase heat transfer devices that are able to spread heat very efficiently.
- Comprised of small inner-diameter channels connected in a serpentine shape.
 - The small diameter forces the two-phase fluid to separate into distinct liquid and vapor sections.
- Heat is transferred by latent heat from the phase change, and sensible heat from the movement of liquid slugs.



Motivation



Fonseca 2016: Helium PHPs of lengths 0.3m and 1m displayed the same effective conductance for a given heat load (at each PHPs optimal fill ratio).

- For a given heat load, the end-to-end temperature difference remained constant, despite a significant change in length

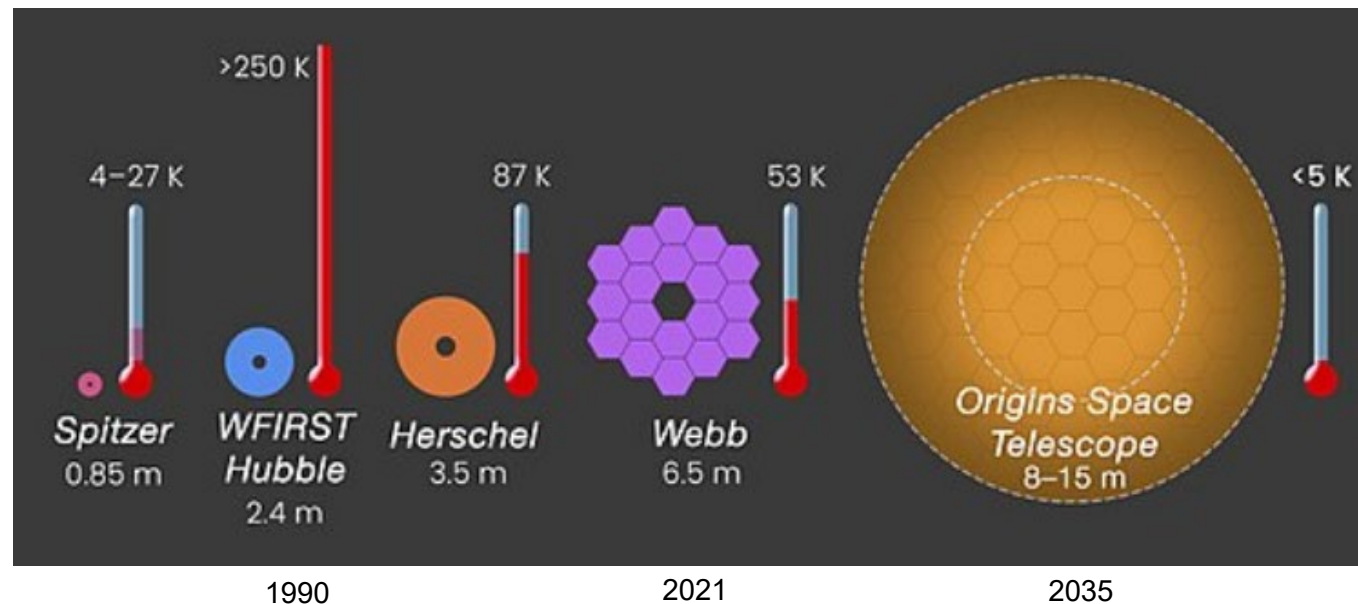
Potential Applications

Zero boil-off liquid fuel storage

- Liquid Fuel: hydrogen and oxygen
- Hard to keep large fuel storage containers at a constant temperature
- Larger containers = longer missions

Cooling large space telescopes

- Origins Space Telescope (OST) for the Far-IR surveyor mission (2035)
- Larger than previous orbital telescopes
- Needs to be near liquid helium temperatures to operate



Objectives

- 1) Characterize the thermal performance of helium pulsating heat pipes as a function of their adiabatic length.
- 2) Determine the limits of length independence for the conductance of helium pulsating heat pipes