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Project: Extended Length Helium Pulsating Heat Pipes Advisors: John Pfotenhauer and Franklin Miller Sponsor: NASA





- Pulsating Heat Pipes (PHPs) are a unique heat pipe variant that provide several improvements over the current state of the art.
- Small ID tubing in a serpentine shape filled with saturated helium.
 - Surface tension > gravity → saturated phases separate and are suspended in the tubes.
- Conductance is not a strong function of length due to low viscosity of liquid helium (5x less than air).
- Chaotic fluid behavior due to boiling/condensation and complex dynamics of multiple plugs/slugs in series.







Objectives

- Characterize the thermal performance of helium pulsating heat pipes as a function of their adiabatic length, applied heat load, fill ratio, and orientation.
- 2) Determine the limits of length independence for the conductance of helium pulsating heat pipes.
- 3) Infer PHP phase and flow behavior and correlate with performance and failure points.

Cooling large space telescopes

Helium PHPs could be used to help remotely cool astrophysics detectors and mirror arrays.

- Reduced complexity/cost/mass compared to Aluminum straps or JT loops.
- Self-redundant due to switching ability.

