Thermal Performance Testing of Two Thales 9310 Pulse-tube Cryocoolers for PHyTIR

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- PHyTIR is a lab demonstrator for HyspIRI technology in thermal infra-red
  - critical technologies and techniques
- One cryocooler for 60 K focal plane
- One cryocooler to simulate passive cryoradiator
• Selected Thales 9310 mid-size pulse tube cooler
  – Using Thales CDE7232 drive electronics with active vibration cancellation capability
• Cooling via recirculated fluid, temperature-controlled chiller
test conditions

- Entire TMU in vacuum:
  - varied heat rejection temperature and orientation
  - relative heat rejection at motor and at cold head
- Only cold finger in vacuum:
  - varied cold finger orientation and drive power
• heat lift as function of
  – heat rejection temperature
  – orientation
  – drive power
• relative amount of heat rejected at motor and at cold head
• individual temperature probes in cooling flow

\[ F_{motor} = \frac{DT(\text{motor})}{DT(\text{motor} + \text{cold head})} \]

\[ = \frac{P(\text{compressor})}{P(\text{compressor maximum})} \]

• \( \sim 50\% \) of heat is rejected at motor

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**performance results**
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- effect of cold finger orientation and drive power
in conclusion

• Two Thales 9310 cryocooler have been characterized for use in a laboratory-based technology-development instrument