

In-Vacuum Heat Switch

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LIGO Voyager is a design concept for a cryogenic interferometric detector that aims to reduce the thermal noise in the mirrors by switching to crystalline silicon substrates and operating at 123K. A clamping mechanism is being designed that can attach to the mirrors to provide fast and efficient cooling, and then be released during operation to prevent coupling seismic noise to the system. Studying the rate of heat transfer across the interface between polished silicon and the contacting surface of a potential heat switch mechanism is important research for this project. By creating a temperature gradient inside a cryostat with a known amount of injected heat and measuring the temperatures on both sides of the interface, it is possible to determine the heat flow. This method was used to investigate how the thermal heat transfer of the interface changes depending on contact pressure and surface quality. The set up was also used to investigate the heat flow across optically bonded silicon pieces to evaluate the effectiveness of different curing strategies post-initial contact.