

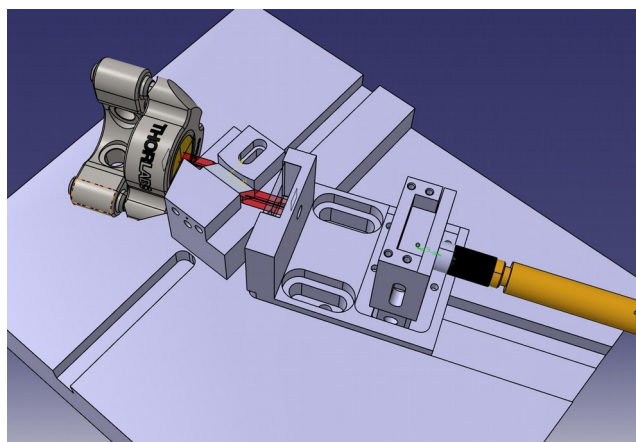
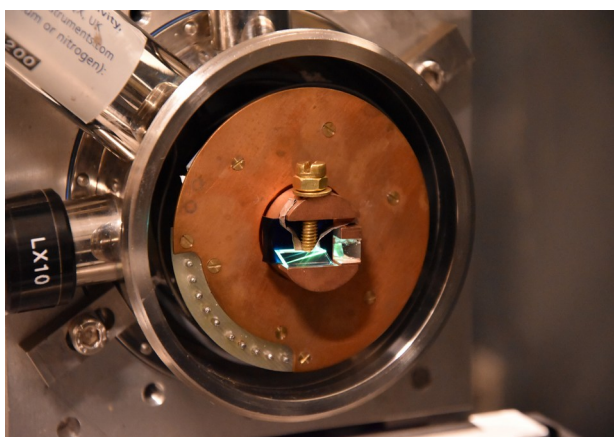
Laser cooling of solids for a new generation of spatial cryocooler

General Scope:

Laser cooling is a full-optical way to extract heat from a solid by pumping optical transitions of rare-earth ions embedded in the crystal matrix. It is seen as a breakthrough technology for a new generation of vibration free cryocoolers in the ~ 100 K temperature range which are required for some low-earth observation satellite missions.

Research topic and facilities available:

Crystals for lasercooling are grown by our colleagues from Pisa University (Italy). They are made of Yttrium Lithium Fluoride (YLF) and are doped by as far as 10 % Yb rare-earth ions. We are now building a experimental setup in order to implement cooling of a crystal in vacuum. The setup will be as compact as possible and fiber coupled to a laser source in order to meet the criteria for spatial integration.



LEFT: A crystal for laser cooling is installed in a cryostat for spectroscopy . The green line in its middle correspond to fluorescence under laser excitation. RIGHT : 3D design of the laser cooling test bench, to be mounted in vacuum. The laser will arrive through the fiber chuck on the right of the image

During its internship the student will have the opportunity to work with the complete setup on the first cooling tests. Numerical simulation by finite-element software will also be undertaken.

Possible collaboration and networking:

Air Liquide Advanced Technologies (Sassenage)
University of Pisa

Possible extension as a PhD: current application for a grant. Budget for extension not secured yet

Required skills: good knowledge of optics, interest for experimental physics

Starting date: any date starting January 2020

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