HERON: A Solar Neutrino Detector Using Superfluid Helium

Dr. Weijun Yao

The Heron project is an effort to develop a real time detector for low-energy solar neutrinos by observing their elastic scattering from electrons using superfluid helium as the target material. In the proposed detector, having a fiducial volume of 55 m^3, 20 events per day are to be expected from p-p and ^{7}Be neutrinos.

A recoil electron propagates in the superfluid helium and deposits its energy by ionization of helium atoms and by generation of elementary excitations, phonons and rotons. The helium ions and electrons recombine and immediately form helium dimers in excited states, which radioactively dissociate emitting16 eV photons. The scintillation and the roton signals can be used to reconstruct the location of the scattered electron and thus separate a neutrino event from the dominant multiple Compton scatters which constitute the principle background. In the talk, some experimental details on the observation of energetic electrons in superfluid helium at temperatures around 50 mK will be discussed.