

The Search for Axions

Prof. Pierre Sikivie

Department of Physics, University of Florida

The axion was proposed, approximately 35 years ago, to explain why the strong interactions are P and CP invariant. Additional motivation for the existence of axions is due to their status as a cold dark matter candidate. I'll briefly review the limits on the axion from particle physics, stellar evolution and cosmology. The various constraints suggest that the axion mass is in the micro-eV to milli-eV range. In this range, their interactions are extremely weak. Nonetheless a number of methods have been proposed to search for such so-called "invisible" axions. Dark matter axions can be searched for on Earth by stimulating their conversion to microwave photons in an electromagnetic cavity permeated by a strong magnetic field. Solar axions can be searched for by converting them to x-rays in a laboratory magnetic field. Yet other methods have been proposed. I'll describe these techniques, various experiments (such as ADMX and CAST) that have implemented them, and the results that have been obtained so far.