

Physics Seminar

Michigan Technological University

Friday, September 22, 2006, 1:00 to 2:00 pm
Room 101, Fisher Hall

Investigations of Antimatter-Matter Interactions using Annihilation Spectroscopy

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Abstract

The annihilation of antimatter with matter has been found to occur naturally in solar flares, in the direction towards the center of our Milky Way Galaxy, and in other exotic astronomical sources. Antimatter-matter annihilation has an important application in medicine with positron emission tomography (PET). Starting from first principles, I will discuss the basics of annihilation and how our research group has developed a new method of annihilation spectroscopy PsARS (positronium annihilation ratio spectroscopy) for investigations of the formation and destruction of positronium (Ps), where Ps is a short-lived atom composed of a positron and an electron. We find Ps is formed in significant amounts during collisions of low energy positrons with atoms and molecules.

Biography



Prof. Kauppila received his B. S. in 1964 from Michigan Technological University and Ph. D. in 1969 from University of Pittsburg in Atomic Physics. His research interests are in the area of experimental atomic physics where he investigates the scattering of low energy positrons (and electrons) by atoms and molecules.

Investigations of positron interactions with atoms and molecules provide information about the interaction of antimatter with regular matter that is potentially useful in a variety of applications in science and technology.

For example, information from such studies is helping astrophysicists to interpret what is happening in solar flares and the direction towards the center of our Milky Way Galaxy (where a supermassive black hole most likely exists), from which characteristic positron annihilation gamma rays have been observed. In addition, comparisons between positron and electron scattering by atoms and molecules help to provide a better understanding of fundamental scattering processes in atomic physics.