What does 'almost nothing' weigh? FSU physicist aims to find out

November 8 2005

If subatomic particles had personalities, neutrinos would be the ultimate wallflowers.
One of the most basic particles of matter in the universe, they've been around for 14 billion years and permeate every inch of space, but they're so inconceivably tiny that they've been called "almost nothing" and pass straight through things - for example, the Earth - without a bump.

So it's easy to see why no one thought they existed until the 1930s, and why it wasn't until the 1950s that scientists were finally able to confirm their inconspicuous presence. It's also easy to see why their masses, once believed to be zero, remain so elusive, but could help unlock the universe's mysteries on everything from dark matter to the births of galaxies.

With a Precision Measurement Grant from the National Institute of Standards and Technology that will provide up to $150,000 in funding over three years, Florida State University research physicist Edmund G. Myers and student researchers hope to meet part of that challenge by measuring the precise difference in mass of tritium, a form of hydrogen, and helium-3 atoms. This will help pin down the mass of the electron neutrino.

To make such a measurement, Myers will use the state-of-the-art Penning trap that he brought to FSU from the Massachusetts Institute of Technology in 2003. It's arguably the most precise equipment made for the purpose of determining atomic mass.

"With neutrino mass, the game is to keep lowering the upper limit until you find it," Myers said.

Right now, that ceiling is around 2 electron Volts (eV). Myers' work, combined with results from other experiments, could drop this by a factor of at least 10, to 0.2 eV or even lower. By comparison, an electron, which is probably the lightest commonly known subatomic particle, has a mass of 511,000 eV.

Myers was one of two recipients of this year's Precision Measurement Grants, which the National Institute of Standards and Technology has been awarding since 1970. Among the 34 applications, Myers' research stood out because it so snugly fit the institute's mission to support physics research at the most fundamental level, said Peter Mohr, the institute's grant program manager.

"What he's doing is very precise measurements," Mohr said. "The results are very important."

To learn more about the nuclear and atomic physics research taking place at FSU, please visit the physics department's Web site at www.physics.fsu.edu.

Source: Florida State University (By Christine Suh)

Citation: What does 'almost nothing' weigh? FSU physicist aims to find out (2005, November 8) retrieved 19 April 2024 from https://phys.org/news/2005-11-fsu-physicist-aims.html