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## Study: Electromagnetic Constant a Bit Smaller Than Thought

Thursday, August 17, 2006  
By Sara Goudarzi



The fundamental force that keeps electrons inside atoms and governs how charged particles and light interact is a little weaker than previously thought, scientists reported today.

The strength of the **electromagnetic force**, one of the four fundamental forces of nature, is specified through a value known as the **fine structure constant**, commonly referred to by physicists as **alpha**, or  $\alpha$ .

Through studying an individual electron in isolation, scientists have been able to recalculate a new value for the constant, one that is six times more precise than previous estimates.

"Little did we know that the binding energies of all the atoms in the universe were smaller by a millionth of a percent — a lot of energy, given the huge number of atoms in the universe," said Gerald Gabrielse, a researcher at **Harvard University**.

Gabrielse and his colleagues isolated a single electron in a bottle devoid of almost all other particles, and chilled it to temperatures colder than the surface of Pluto.

To replicate the conditions in an atom, they kept the lone electron in circular motion by using electric and magnetic forces.

*(Story continues below)*

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The electron also wobbled up and down in the direction of the magnetic field, a setup similar to a merry-go-round, with an electromagnetic trap as the carousel and the electron as the lone horse.

The setup was sensitive enough to sense when the electron was moving upwards and when its motion was restricted, allowing the electron's energy to be precisely measured. This helped refine measurements of the fine structure constant.

The recalculated value could help improve the design of electric devices and aid scientists in the details of the workings of the universe, the researchers say.

The study was reported in two articles in the July 21 issue of **Physical Review Letters**.

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