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Professor Len Keeler receives \$130,000 National Science Foundation grant

Summary: The physics professor is developing a new way to measure and to interpret the behavior of highly excited atoms.

(October 28, 2009)-The National Science Foundation (NSF) has awarded Matthew “Len” Keeler, associate professor of physics at the University of Minnesota, Morris, a research grant of \$130,000, with funding from the American Recovery and Reinvestment Act. Keeler is developing a new way to measure and to interpret the behavior of highly excited atoms. The grant will be used to conduct an experimental investigation of the influence of background gas collisions on the classical orbits of Rydberg electrons. His emerging theory melds the classic “solar-system” atom model and quantum mechanics.

Providing background, Keeler remarks that a recent introduction of new technology in home entertainment opened a new door for his work. While lasers, developed in the 1960s, make his area of atomic research possible, Blu-Ray lasers used in optical disc technologies such as DVDs make his particular research relatively affordable. Keeler designed and constructed his research apparatus based on this new technology. It is located in his third-floor lab in the Science and Mathematics building.

Keeler’s research equipment is comprised of blue and infrared laser diodes, a pure-vacuum experimental chamber fitted with two copper plates, pumps to infuse argon gas, and computerized monitoring components. With careful control over electrical current, temperature, and a specific color of light from the lasers, Keeler “excites” an atom of potassium that launches an electron into a large trajectory or orbit around the atom’s nucleus. Then, he pumps argon into the chamber, steeping the excited atom in the gas.

While others have conducted similar studies, Keeler is approaching his investigation from a fresh perspective and testing different ways of interpreting spectra of highly excited atoms.

“The gas is the new thing,” explains Keeler. “I measure how often we find the electron in one trajectory path versus another. I hope to convince people that we can measure external influence on electrons in the Rydberg [highly excited] state with this sensitive tool.”

A professor at Morris since 2003, Keeler earned a doctorate in atomic physics in 1998 at Wesleyan University in Middletown, Connecticut. At Morris, he teaches Biological and Medical Physics, Optics, Circuits and Electronic Devices, Quantum Mechanics, Experimental Physics, and General Physics. Students will be able to collaborate with Keeler on his research through Morris Academic Partners and the Undergraduate Research Opportunities Program.

Photo: Keeler explains his research apparatus in his lab

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