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CU physicist to use stimulus funds to study electron beams

By Joseph Mansky


Bazarov

Determining the brightness limits of electron beams in X-ray synchrotron radiation facilities will be the focus of a five-year research project by assistant professor of physics Ivan Bazarov.

The U.S. Department of Energy (DOE) has announced that it is awarding him $750,000 under the American Recovery and Reinvestment Act (ARRA) as part of DOE's new Early Career Research Program.

The new program is designed "to bolster the nation's scientific workforce by providing support to exceptional researchers during the crucial early career years, when many scientists do their most formative work."

In linear accelerators (linacs), a laser is shined on a material called a photocathode, which causes it to eject free electrons. These electron beams are shot at nearly the speed of light with a property called emittance, which is "the size of the beam times its divergence or angle," according to Bazarov.

His research involves investigating the photocathodes and generating a bright beam with low emittance, so that the electron beams are as compact and bright or as intense as possible.

Many researchers in high-energy accelerator physics are trying to build brighter, more focused electron beams, Bazarov noted.

"The more intense we make the beams, the more enabling the technology becomes," he said.

If Bazarov can successfully and significantly brighten the beams, Cornell's development of a particle accelerator known as the Energy Recovery Linac (ERL) will benefit tremendously.

"There's a whole facility that will depend on this bright beam," he said.

The possible benefits of his research, however, go beyond Cornell. A brighter, more intense source of electrons could make all linear accelerators more efficient, Bazarov said.

"If your source is brighter to begin with, you could build a smaller accelerator that would deliver similar quality of the beam," he said, because the particles' energy would not have to be as high as in a longer accelerator with a less intense beam. This would help reduce costs while still allowing the same type of synchrotron radiation research to take place, he added.

The ARRA grant will provide half of the funding for two graduate students and one postdoctoral researcher. The money will also help retain engineering staff and technicians currently working on the project.

Joseph Mansky '12 is a writer intern for the Cornell Chronicle.

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ARRA - Recovery Act