Science

CMU researchers to benefit from $250 million upgrade to Va. facility

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By Byron Spice, Pittsburgh Post-Gazette

Department of Energy officials yesterday took a first step toward upgrading a 9-year-old electron beam accelerator in Newport News, Va., an action that will have big implications for physicists at Carnegie Mellon University.

The $250 million upgrade would double the energy of the Continuous Electron Beam Accelerator Facility and make possible a new series of experiments exploring the subatomic glue that holds quarks together.

About $40 million of the upgrade costs would pay for GlueX, the experiment that will study that glue -- force-carrying particles known as gluons, said Curtis Meyer, a CMU physics professor and a GlueX leader. Meyer and his students already are building a prototype GlueX detector here.

"We're very excited about this," Meyer said yesterday from the **Jefferson National Accelerator Facility**, where the electron beam accelerator is housed and where Deputy Energy Secretary Kyle McSlarrow announced a "mission need" for the accelerator upgrade.

Determining that a need exists -- "Critical Decision Zero" in DOE parlance -- is only the first of five steps that govern construction of DOE projects. But for Meyer, who has been laying the scientific groundwork for the decision for seven years, "it's a big political milestone."

Completion of the project may not be guaranteed, but it now has become likely, Meyer said. He added that he expects the GlueX experiment to begin gathering data in 2009 or 2010.

The upgrade will double the accelerator's energy to 12 GeV, or 12 billion electron volts, and will ensure that it remains "one of the premier nuclear physics machines in the world," McSlarrow told lab employees.

GlueX, an experiment headed by Alex Dzierba of Indiana University, Bloomington, will address a phenomenon related to quarks, the subatomic particles believed to be the fundamental building blocks of all matter. Quarks bound together by gluons comprise such particles as proton and neutrons, but individual quarks can never be isolated. It's a phenomenon physicists call confinement.

"We don't completely understand why it's doing that," Meyer said. He and his GlueX colleagues propose using the new 12 GeV electron beam to produce a 9 GeV photon beam, which in turn will be used to produce a family of particles known as exotic mesons. Identifying these mesons and their properties may provide some clues about what's going on.

Supercomputer calculations suggest that the gluons binding these quarks are confined in a tube-like structure resembling a string. This "flux tube" may rotate much like a jump rope, Meyer said.

Understanding what's going on won't necessarily translate into new applications or even explain how the universe came into existence, Meyer said. "But it might tell us why the universe is the way it is."

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