Texas Tech Physics

Bucy Distinguished Lecture

Amazing Accelerators: Petavolt Collider and Gigawatt Fission Power

Professor Peter McIntyre
Mitchell-Heep Chair in Experimental Physics
Texas A&M University

Two new technologies are making possible a next generation of particle accelerators for high energy physics and for nuclear power. First, Nb_3Sn superconductor has been tamed into practical use to make possible high-field dipoles (16 T) and solenoids (25 T). A ring of Nb_3Sn dipoles and quadrupoles could be installed in the SSC tunnel in Waxahatchie to make a hadron collider with 100 TeV collision energy - 7 times higher than the design energy of CERN's LHC. The Petavac would access new physics through boson fusion, making it possible to observe signals from supersymmetry and superstrings up to ~10 TeV mass scales.

Second, a flux-coupled stack of superconducting isochronous cyclotrons could be used to drive thorium-cycle fission power. The 800 MeV proton beams produce fast neutrons through spallation, then the fast neutrons transmute the thorium into uranium and drive fission. The thorium reactor would provide GW electric power, eat its own long-lived waste, run for 7 years between core accesses, operate below criticality, and be stable against melt-down. Reserves of thorium are sufficient to provide the world's energy needs for a thousand years.

Thursday, November 12, 2009 3:30 PM
Science Building Room 234
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