3:30 pm • Friday April 26, 2013 • 2241 Chamberlin Hall • Coffee at 4:30 pm

Glennys Farrar

New York University

Physics and Astrophysics from Ultrahigh Energy Cosmic Ray Observations

Department of Physics Colloquium

WISCONSIN

Predictions for UHECR air showers using hadronic event generators tuned with LHC and lower energy accelerator data, are in serious tension with Pierre Auger Observatory measurements, for any assumed primary composition. It appears very difficult to get agreement with observations, without invoking new physics above LHC energies. Some options for types of new physics which can explain the data (and others which cannot) will be discussed. Fortunately, as will be shown, there is intrinsically enough information in hybrid events—those observed with both air fluorescence and ground detectors—to constrain the new physics and composition simultaneously. With improvements in separating the electromagnetic and muonic components of the ground signal, it should be possible to obatin remarkably detailed diagnostics about what is wrong in present hadronic event generators, and estimate composition on an event-to-event basis. Some new astrophysics results pertaining to UHECR sources and deflections in the Galactic magnetic field will be presented as well.

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