

4CF13-2013-000035

Abstract for an Invited Paper
for the 4CF13 Meeting of
the American Physical Society

Directional dark matter detection and the DRIFT experiment

JOHN HARTON, Colorado State University

Evidence for a form of matter unlike normal atoms and molecules has become very compelling in the decades since the early 1930's when it was discovered that the gravitational mass in a cluster of galaxies far exceeded the mass of the visible matter in that cluster and that the orbital velocity of stars in the Milky Way could not be accounted for by the visible matter alone. The search for the nature of this "dark matter" is one of the most compelling mysteries in science today with experiments worldwide. A leading candidate for the dark matter is the WIMP or Weakly Interacting Massive Particle, which is posited to have a mass in the GeV/c^2 range and to interact with normal matter with a cross section on the weak scale. Experimental evidence points to galaxies being surrounded by a halo of dark matter, and that halo may be a cloud of WIMPs. In the overall standard model of WIMP dark matter the halo does not rotate with the stars in a galaxy, and collisions of WIMPs with normal matter would result in recoil nuclei with energies of a few keV to perhaps few hundred keV. This talk will focus on the subset of experiments called directional dark matter detectors; these experiments aim to exploit a daily modulation in the dark matter signal by measuring the direction of travel of the recoiling nucleus. The DRIFT dark matter collaboration is one such directional experiment, and the group is running a detector called DRIFT-IIId in the Boulby mine in the UK.