Abstract Submitted
for the APR10 Meeting of
The American Physical Society

ShellFit: Reconstruction in the MiniCLEAN Detector[1] STANLEY SEIBERT, Los Alamos National Laboratory, DEAP/CLEAN COLLABORATION — The MiniCLEAN dark matter experiment is an ultra-low background liquid cryogen detector with a fiducial volume of approximately 150 kg. Dark matter candidate events produce ultraviolet scintillation light in argon at 128 nm and in neon at 80 nm. In order to detect this scintillation light, the target volume is enclosed by acrylic plates forming a spherical shell upon which an organic fluor, tetraphenyl butadiene (TPB), has been applied. TPB absorbs UV light and reemits visible light isotropically which can be detected by photomultiplier tubes. Two significant sources of background events in MiniCLEAN are decays of radon daughters embedded in the acrylic surface and external sources of neutrons, such as the photomultiplier tubes themselves. Both of these backgrounds can be mitigated by reconstructing the origin of the scintillation light and cutting events beyond a particular radius. The scrambling of photon trajectories at the TPB surface makes this task very challenging. The "ShellFit" algorithm for reconstructing event position and energy in a detector with a spherical wavelength-shifting shell will be described. The performance of ShellFit will be demonstrated using Monte Carlo simulation of several event types in the MiniCLEAN detector.

[1]This work is supported by the LANL LDRD program.

Stanley Seibert
Los Alamos National Laboratory

Date submitted: 23 Oct 2009 Electronic form version 1.4