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MonteCarlo Simulations with GEANT4 for the XENON100 Detector

Thursday, 15 October 2009 17:00 (25 minutes)

The XENON100 detector is a dual phase (liquid-gas) xenon time-projection chamber for direct dark matter detection. The total amount of liquid xenon is 165 kg, of which 65 kg are in the active target enclosed in a teflon/copper structure, the rest being in the surrounding active veto volume.

UV light signals are produced by particle interactions and detected by 242 PMTs (178 in the target and 64 in the veto).

In this talk, the importance of MonteCarlo simulations for the complete understanding of the detector performance and the expected sensitivity of the experiment will be discussed. We will report simulation results and comparison with the experimental data, including light simulation and background predictions.

Are you a Member of the Geant4 Collaboration (yes/no)

no

Keywords

Dark Matter, Background Radiation, Scintillation Light, MonteCarlo, Xenon

Summary

A high precision model of the XENON100 detector has been created within the GEANT4 toolkit. GEANT4 has been used to simulate the transport of the optical photons produced in the detector medium by particle interactions. This is done in order to estimate light collection efficiency in the different detector regions, to model its response, and to develop an algorithm for the 3 dimensional event vertex reconstruction. In addition, electron and nuclear recoil backgrounds from various sources are predicted, based on the results of the MonteCarlo simulations with the GEANT4, SOURCES, and MUSUN toolkits.

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