

Preparations for Insertion of “Long-Bo” in the Liquid Argon Purity Demonstrator  
Matthew R. Hall (State University of New York at Geneseo, Geneseo, NY 14454), Stephen H. Pordes (Fermi National Accelerator Laboratory, Batavia, IL 60510).

### **ABSTRACT**

When cosmic ray muons pass through liquid argon, they leave behind a trail of ionized electrons. These electrons can be then recorded by a time projection chamber to display the path of the particle through the liquid argon. Highly electronegative molecules present in the argon, such as oxygen and water, will attract the electrons and ruin the data. The purpose of the liquid argon purity demonstrator at Fermilab is to discover a new way to achieve a high level of liquid argon purity without complete evacuation of the vessel. It has been shown that the required purity can be reached in an empty vessel using a gaseous argon purge prior to filling the tank with liquid argon. The purpose of the liquid argon purity demonstrator now is to test whether this same level of purity can be reached with a time projection chamber in the volume. Resistance temperature detectors placed at various locations in the volume will also provide an understanding about the temperature gradients present in the tank, as well as information about convection currents. The resistances of three resistance temperature detectors were recorded at varying temperatures (-196 °C to 70 °C) and found that the temperature and resistance are linearly correlated. The temperature of the resistance temperature detectors is also expected to gradually rise due to the current passing through them, and we found that this expected rise in temperature should be 0.001273 °C/s. Scintillation counters hung from ladders mounted every 60° around the tank will act as the trigger to tell the time projection chamber to begin recording data, and were the other focus of the research performed. Using a coincidence module and a visual scaler, coincidences between two, three, and four scintillators were tested. We found that coincidence rates between two counters were much higher than coincidence rates between three or four counters, and attributed this discrepancy to vertical cosmic ray showers. Scintillation counters were also tested for efficiency, and it was found that four of the counters had a low efficiency and thus will not be used in the setup. The setup of the liquid argon purity demonstrator is ongoing and data is expected to be recorded in the coming months.