

# DEAP-3600 Hardware Upgrades & Liquid Level Estimation Using PMT Rates

*Tuesday, August 20, 2024 9:45 AM (10 minutes)*

DEAP-3600 is a single-phase direct detection dark matter experiment using a 3600kg liquid Argon (LAr) target to search for Weakly Interacting Massive Particles (WIMPs)—a proposed dark matter candidate. The detector has 255 photomultiplier tubes (PMTs) that can detect photons created by events on the outside of the spherical volume of the detector.

6800ft underground, work is being conducted at SNOLAB to upgrade the detector before the third fill. Recently, new flow guides were installed into the neck of the detector to help tag alpha events that happen in the neck and leach into the main detector volume.

Once the detector is being filled, knowing the liquid level in the detector is crucial. The initial methods used to determine the liquid level had too large a margin of error, so other tactics have to be employed. One approach is using the data from the PMT rates to model the liquid level. This is because the photon detection rate differs above, at, and below the liquid level. This is due to effects like total internal reflection, light yield, and scintillation rates. This data can allow us to know how much liquid is in our detector, which is completely closed off from the world around it.

Both the hardware work on DEAP-3600 and the analysis and modelling work are crucial for the upcoming third fill.

## What area of study best describes your talk?

Physics

## If you answered 'Other', please provide the study area.

**Primary author:** MACDONALD, Rory (Queen's University)

**Presenter:** MACDONALD, Rory (Queen's University)

**Session Classification:** Presentations