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DEAP-3600 Hardware Upgrades

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DEAP-3600 is a single-phase liquid argon (LAr) direct dark matter search experiment. DEAP uses a LAr target to search for weakly interacting massive particles (WIMPs), a prime candidate for dark matter. The LAr is contained within an acrylic vessel surrounded by 255 photomultiplier tubes in order to detect scintillation light.

Background characterization for events that might mimic a WIMP interaction has been carried out with DEAP-3600 data. While these backgrounds are already very low, there are two sources of alpha backgrounds that can be improved: in the neck of the detector and from the particulates suspended in the bulk LAr. Upgrades to the detector will significantly reduce both of these sources. A new set of LAr flow guides coated in pyrene, a fluorescent material, will be installed in the neck of the detector to increase our rejection of these neck alphas. In order to reduce the backgrounds due to suspended particulates, two new methods of argon filtration will be used both to reduce the amount of dust entering the detector and also to allow for analysis of any dust extracted from the detector. These hardware upgrades are currently underway on DEAP-3600.

These upgrades will both improve DEAP-3600 results and inform on construction of future dark matter experiments.

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