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DEAP-3600 Acrylic Vessel Construction and Light Guide Bonding

DEAP-3600, comprised of a 1 ton fiducial mass of ultra-pure liquid argon, is designed to achieve world-leading sensitivity for spin-independent dark matter (interactions). In addition to rejection of backgrounds through event-wise pulse shape discrimination, the detector must be constructed with materials that have low natural U and Th concentrations to realize the three years of background-free operation design goal. Acrylic represents an ideal material for fabricating the crucial dark matter detector vessels given its ability to be produced with very low levels of U and Th, its excellent optical properties for transmission of the argon generated scintillation light, and the effective shielding it provides for externally produced neutrons that could mimic the dark matter signal. Discussed here is an overview of creating the full-scale DEAP-3600 cryogenic acrylic vessel. Included in the discussion is primary the bonding process developed to attach optically perfect light guides for the project's photodetectors.

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