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The Search for Dark Matter with Liquid Argon: DEAP-3600, DarkSide-20k, and ARGO

The Global Argon Dark Matter Collaboration is carrying out a phased program of direct search for dark matter using liquid argon. First, we will briefly summarize the results from DarkSide-50 and DEAP-3600 followed by an overview of the DEAP-3600 hardware upgrades, goals and run plan for the third fill. Second, we will discuss the work for DarkSide-20k, currently under construction at LNGS. Finally, we turn to ARGO, a multi-hundred tonne detector proposed for deployment with SNOLAB as the preferred site. We will present the long-term science scope and detector design. To test and select the optimal detector technology, we plan to build a pair of one-tonne scale R&D test detectors –one dual phase and one single phase –proposed for deployment once DEAP-3600 is decommissioned. The R&D program required for ARGO includes the development of SiPM-based Photon to Digital Converters, design of an AI-based real-time data acquisition system to handle the large data rates, development of advanced coatings to suppress backgrounds, and in-depth study of the background budget.

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