

Abstract Submitted
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Design Fundamentals for Cost-Optimized Neutron Detectors Based on an Array of Helium-3 Tubes¹ RANDY SPAULDING, CHRIS MORRIS, STEVE GREENE, MARK MAKELA, Los Alamos National Laboratory, TONY FOREST, Idaho State University — Increasing competition over the world's finite helium-3 reserves has recently created an urgent need to utilize our existing supplies of the gas in the most efficient manner possible. A new design for helium-3-based neutron detectors has been developed at Los Alamos National Laboratory which maximizes utilization of helium-3 on the basis of cost efficiency. This design employs atmospheric-pressure tubes that contain less than one bar partial pressure of helium-3 nestled inside a lattice of thin HDPE sheets. This results in a net gain of 200-300% in efficiency per gram helium-3 compared to traditional high-pressure tubes. The cost efficiency is independent of surface area, making the design concept appropriate for a wide range of applications involving detector surface areas from <100 cm² to >100 m². A prototype detector with surface area 1.01 m² was built at LANL and the results of benchmarking experiments are presented.

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Randy Spaulding
Los Alamos National Laboratory

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