



MAX/DARKSIDE

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A Depleted Argon TPC for Direct Dark Matter Searches

**R. Alarcon¹, D. Alton², F. Calaprice³, A. Chou⁴, P. Collon⁵,
D. Durben⁶, E. Hungerford⁷, C. Galbiati³, K. Keeter⁶,
J. Martoff⁸, P. Meyers³, J. Monroe⁹, A. Pocar¹⁰, S. Pordes⁵,
A. Sonnenschein⁴, M. Zehfus⁶**

¹Arizona State University

²Augustana College

³Princeton University

⁴Fermi National Accelerator Laboratory

⁵Notre Dame University

⁶Black Hills State University

⁷Houston University

⁸Temple University

⁹Massachusetts Institute of Technology

¹⁰University of Massachusetts at Amherst

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The MAX/DarkSide collaboration is developing the first TPC to be operated with argon from underground sources depleted in the ³⁹Ar radioisotope.

The MAX S4 proposal was approved by the National Science Foundation in the middle of July 2009. MAX stands for "Multi-ton Argon and Xenon" experiment, and is a partnership between the DarkSide (Depleted Argon) and XENON collaborations to pursue joint development of twin Depleted Argon (5 ton active mass) and Xenon (2.5 tons active mass) TPCs, with matching sensitivity of 2×10^{-47} cm² at $M_W=100$ GeV.

As a stepping stone towards the DUSEL Initial Suite of Experiment, the DarkSide collaboration is considering a proposal to NSF and DOE for a 800-kg (500-kg fiducial) Depleted Argon TPC with sensitivity of 2×10^{-46} cm².

This Letter of Intent requests the directorate of Sanford Lab to allocate space in the underground campus at 4850 ft for the DarkSide-500 kg detector. This communication follows and updates the original submission dating April 2, 2008.

Experimental systems, Environmental Needs, Time Table, and Specific Hazards

The detector will consist of a ³⁹Ar-depleted argon target contained in a cryostat, within a neutron and gamma passive shield.

We are open to discuss a variety of possible accommodations for the neutron and gamma passive shield at Sanford Lab.

The ideal and preferred accommodation would use a lead+polyethylene shield. The overall dimensions of the shield would be 4×4×4 m. The limited dimensions of the internal cryostat (1.5 m diameter, 2 m height) should allow the entire cryostat to be assembled in a clean facility at Princeton, at Fermilab, or at the above-ground Sanford Lab campus, thus reducing the need for staging space in the underground cavern, and eliminating the need for an underground clean-room.

The 500-kg detector could possibly be accommodated in a shared mode within the large tank designed for the LUX detector in the Davis cavern. This idea needs to be examined very carefully, to examine possible interferences with the LUX program and with the desired operations and timeline of DarkSide-500.

We foresee construction of the detector in the years 2010 and 2011, with installation starting in 2011, and operations lasting through 2012 and 2013.