**Current and Future plans for the PICO
Presented by A. Sonnenschein for the PICO Collaboration**

The PICO collaboration has 62 members from 17 universities and laboratories in the US, Canada, India, Mexico, the Czech Republic and Spain. We are pursuing a program of WIMP searches with bubble chambers at SNOLAB. These detectors can be made very large, have extremely low backgrounds, and work with diverse target nuclei. Our most important recent scientific impacts have come from C3F8 targets, where the 19F nucleus gives unique sensitivity to spin-dependent WIMP couplings to the proton. Our current and projected future sensitivity for C3F8 chambers is shown in Figure 1. We note that xenon-target experiments are sensitive to spin-dependent couplings to the neutron, while fluorine experiments are sensitive to proton couplings. Due to coherent enhancement of the background neutrino rate, the ultimate background from atmospheric and solar neutrinos is expected to be two orders of magnitude lower for C3F8 than for xenon, when cast in terms of spin-dependent sensitivity.

PICO showed recent results from the PICO-60 detector at the Cosmic Visions conference (dark blue line in Figure 1). Within the next year, we expect to begin operation of the PICO-40L detector, which will be capable of improving sensitivity by up to an order of magnitude beyond PICO-60, due to lower neutron backgrounds. On the 1-3 year time scale we plan to build PICO-500, a ton-scale experiment that has been proposed in Canada to the Canada Foundation for Innovation (CFI). The total project cost of this experiment is $4M CAD ($3M USD), of which CFI is asked to contribute 40%, with an additional 40% match assumed from Canadian provinces and a 20% contribution assumed from private industry and international partners, including India, the Czech Republic and the US. We expect a funding decision from CFI in June 2017.

In addition to the C3F8 program, the PICO Collaboration is investigating alternative targets for future searches in PICO-40L, PICO-500, or an array of PICO-500 detectors. These include hydrocarbons for low-mass WIMP searches, CF3I to search for coupling to proton orbital angular momentum in iodine or as follow-up to a spin-independent signal in xenon, and superheated nobles (argon, xenon) to take advantage of the extra discrimination and event-by-event energy information provided by the scintillation signal.



Figure 1. Spin-dependent nucleon coupling sensitivity of PICO [1] and other recent experiments. Dashed lines show limits from indirect and collider WIMP searches, as well as projections for LZ and PICO-500. The expected background from atmospheric, supernova and solar neutrinos in both xenon and C3F8 is shown by the shaded regions, taken from [2].

**References:**

[1] C. Amole *et al*. “Dark Matter Search Results from the PICO-60 C3F8 Bubble Chamber.” arXiv:1702:07666

[2] F. Ruppin, J. Billard, and E. Figueroa-Feliciano. “Complementarity of dark matter detectors in light of the neutrino background.” Phys. Rev. D **90**, 083510 (2014).