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(U*) PICO-500 Overview and Calibration

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PICO-500 is a large scale bubble chamber WIMP dark matter detector in its early stages of construction underground at SNOLAB. The detector will contain ~250 litres of superheated C_3F_8 (freon) contained between two quartz jars. The quartz jars will sit inside a pressure vessel filled with mineral oil that will control the pressure of the active freon volume. The entire detector will be housed inside a tank of ultrapure water. PICO-500's detection method is based on the Seitz model, in which nuclear recoiling of freon from an incoming particle results in localized boiling if the energy deposition, within a critical radius, is in excess of the Seitz threshold energy. The operating Seitz threshold of PICO-500 will be optimized for dark matter sensitivity and gamma and electron insensitivity. Muons will be vetoed using strings of photomultiplier tubes around the edges of the water tank to detect their Cherenkov light. Alphas will be discriminated from dark matter signals by the acoustic parameter (AP), which describes the acoustic power of the bubble formation, and is larger in alpha events than neutron or WIMP events. Calibration of the Seitz threshold will be done by lowering a ⁶⁰Co gamma source into the detector through 3 separate source tubes, 2 of which feed into the water tank, and 1 of which feeds into the pressure vessel. AP calibrations will be done using runs with AmBe and/or ²⁵²Cf neutron sources. This talk will give an overview of PICO-500 and the methods of calibration.

Keyword-1

Dark Matter

Keyword-2

PICO

Keyword-3

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