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Solar Neutrinos*

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INTRODUCTION

The prospect of studying the solar energy generation process directly by observing the solar neutrino radiation has been discussed for many years. The main difficulty with this approach is that the sun emits predominantly low energy neutrinos, and detectors for observing low fluxes of low energy neutrinos have not been developed. However, experimental techniques have been developed for observing neutrinos, and one can foresee that in the near future these techniques will be improved sufficiently in sensitivity to observe solar neutrinos. At present several experiments are being designed and hopefully will be operating in the next year or so. We will discuss an experiment based upon the neutrino capture reaction

$$\nu + Cl^{37} \longrightarrow Ar^{37} + e^{-} . \qquad (1)$$

This reaction is the inverse of the electron-capture radioactive decay of argon-37. The method depends upon exposing a large volume of a chlorine compound, removing the radioactive argon-37 and observing the characteristic decay in a small low-level counter. A high sensitivity for neutrino detection is achieved by using a large mass of chlorine and performing the counting measurements in a counter with a very low background. An experiment will be described that has been performed with 1000 gallons (6.1 tons) of perchloroethylene (C_2Cl_4) that served as a pilot experiment to test the method. A

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