Discussion

The upper limit of the neutrino capture rate per Cl^{37} atom is a factor of two lower than expected from current solar model calculations. The calculations of Dr. Bahcall and his co-workers in Table I, that give a total neutrino capture rate of 6.2×10^{-36} sec^{-1}, were made using the accepted values of the various parameters introduced in the model. One can adopt the view, as Dr. Bahcall has done, that errors in the parameters are sufficiently large to accommodate the present result. To resolve this question would require an increase in the sensitivity of the experiment. For example, if the sensitivity of the experiment were increased by a factor of five, the combined low energy neutrino fluxes from Be^{7} and the $H(He,\nu)D$ reaction should be observed. Perhaps an improvement in sensitivity by a factor of five is possible. The experimental approaches toward reaching this goal will be discussed later. Bahcall, Bahcall, and Shaviv[4] have shown that the flux of more energetic neutrinos (1.44 MeV) from the $H(He,\nu)D$ reaction does not depend upon the parameters used in the calculation. Hence, if the sun is composed mainly of hydrogen, and is producing energy by thermal fission, a flux of 1.44 MeV neutrinos equal to 1.7×10^{8} cm^{-2} sec^{-1} should be observable at the earth. This flux would give a capture rate of 0.3×10^{-36} sec^{-1} per Cl^{37} atom. To observe these neutrinos alone would require an increase in sensitivity of more than a factor of ten over that achieved in the experiments reported here. It appears from our knowledge of background effects, that it is unlikely that the sensitivity of the present experiment will be increased enough to measure the neutrinos from the $H(He,\nu)D$ reaction if this is the only source of solar neutrinos.

Since the cross section for the $Cl^{37}(\nu,e^{-})Ar^{37}$ reaction is well known,[5,9,10,11] the experimental limit on the capture rate can be used to calculate an upper limit on the flux of neutrinos from various specific