SOLAR NEUTRINO DETECTOR GT STRENGTH DISTRIBUTIONS VIA (p,n) REACTIONS

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We have continued our study of strength functions associated with likely candidates for new solar neutrino detectors. These (p,n) reaction studies can provide unique information about the neutrino capture rates of these targets. Analysis of our earlier measurements on ^{98}Mo, ^{115}In, ^{71}Ga, and ^{81}Br has indicated that the resolution obtained (approximately 350 keV) was inadequate to separate the GT contributions to low-lying states. Remeasurements of angular distributions on the latter two targets have recently been performed under improved experimental conditions to provide better information concerning the capture strength to individual states. Improved techniques in accelerator mass spectrometry have also renewed interest in ^{205}Tl as a solar neutrino detector. Therefore, ^{205}Tl and an associated calibration target, ^{199}Hg, were included in these recent measurements. In both cases a $J=1^-$ transition is involved. In the ^{199}Hg case, the $1/2^-$ to $1/2^+$ transition has log(ft)=6.5.

These (p,n) reactions were studied at 120 MeV using a neutron flight path of 132 meters. Angular distributions of the differential cross sections over an angular range from 0 to 10 degrees were obtained. Preliminary reduction of these data suggest that such angular information will be very valuable in identifying the J=1 multipole in 0 degree differential cross sections, an important feature considering the uncertainties in extracting reliable GT strengths from lower energy Ga(p,n) reaction studies.[1,2] Our previous Ga target had been made as an alloy with ^{24}Mg, resulting in a large target thickness contribution to the overall energy resolution. These recent measurements were made with a 26 mg/cm^2 target of rolled ^{71}Ga metal, resulting in a target contribution to the neutron energy resolution of only 110 keV. The resulting total energy resolution for the $^{71}Ga(p,n)^{71}Ge$ reaction was on the order of 240 keV FWHM. Analysis of these data is in progress.

1) A.J. Baltz, J. Weneser, B.A. Brown and J. Rapaport, Phys. Rev. Lett. 53, 2078 (1984).

2) H. Orihara et al., Phys. Rev. Lett. 51, 1328 (1983).