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Investigation of the γ-ray angular distribution of the 3He(α,γ)7Be reaction at the Felsenkeller shallow-underground laboratory

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The 3He(α,γ)7Be reaction plays a role in two distinct astrophysical scenarios, solar fusion as well as Big Bang nucleosynthesis. The nuclear reaction cross section (expressed as astrophysical S-factor) of this reaction has been studied several times for energies E > 0.3MeV and once for energies between 0.1MeV and 0.2MeV, but never directly for energies below 0.1MeV. The energies below the measured range are relevant for solar fusion, but rely on extrapolation of the existing data. A recent theory work by Zhang et al. suggests a connection between the angular distribution of the emitted γ-rays from the 3He(α,γ)7Be reaction at E = 1 MeV and the value of S(0), the extrapolated S-factor at E=0.
At the 5 MV Felsenkeller underground accelerator, implanted 3He targets and a setup of 21 HPGe detectors are being used to study the angular distribution of this reaction at six different energies between $E_{\mathrm{cm}} = 450$ keV and $E_{\mathrm{cm}} = 1220$ keV. This will aid the extrapolation to lower energies and improve the precision of solar 7Be and 8B neutrino fluxes calculated in solar models, to be compared with the recent BOREXINO data on these fluxes. The contribution will report on the preliminary analysis of the angular distribution measurement.

Submitted on behalf of a Collaboration?

No

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