Measurement of the $^3\text{He}(\alpha, \gamma)^7\text{Be}$ gamma-ray angular distribution

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The $^3\text{He}(\alpha, \gamma)^7\text{Be}$ reaction affects the nucleosynthesis of $^7\text{Li}$ as well as the predicted solar $^7\text{Be}$ and $^8\text{B}$ neutrino fluxes. It is being studied over a wide energy range at the Rossendorf 3 MV Tandetron accelerator, with a focus on the measurement of the $\gamma$-ray angular distribution at $E \approx 1$ MeV.

There are multiple and overlapping precise experimental data sets at $E = 0.7 - 1.3$ MeV. Any extrapolation of this precise data down to a unique data set from an experiment of the LUNA collaboration at $E = 0.09$ MeV - 0.13 MeV has to deal with the fact that at $E = 1$ MeV, the capture is possible both from s-wave incident particles and from d-wave incident particles, whereas at 0.1 MeV and lower the d-wave component plays no role due to the angular momentum barrier. A measurement of the angular distribution of the emitted $\gamma$-rays at $E = 1$ MeV may constrain the relative contributions of s-wave and d-wave components at high energies and thus enable a better comparison between the high-energy and the low-energy data points.

Data from a first run for the angular distribution of the emitted prompt $\gamma$-rays in the $^3\text{He}(\alpha, \gamma)^7\text{Be}$ reaction was done using a setup of four HPGe detectors at various angles and shall be presented here.