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Design and first tests of the MANGO scattering setup for characterization of liquid scintillators

Detectors for low-energy particles (MeV) are often calibrated using gamma rays to induce electron-like signals. Yet the energies of standard calibration sources are often not sufficient. For instance, the JUNO reactor neutrino experiment requires excellent understanding of the energy response to energies of 8 MeV and higher. The MANGO experiment will use 9 MeV gamma rays from neutron capture on nickel to characterize scintillator samples. Neutrons are produced by a DD108 fusion generator, which creates mono-energetic neutrons of 2.45 MeV that can also be directly used for neutron irradiation of the detector. Using a secondary detector array of neutron and gamma detectors, the energy and momentum direction of the scattered particles can be determined. This additional information can help to relate the visible scintillation signal to the deposited energy and thus to investigate non-linearity or quenching of the scintillator response. This contribution presents the setup as well as first tests of the experimental components. Once MANGO is fully constructed and understood, it will be used for the characterization of the liquid scintillator of the JUNO neutrino detector.

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