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A Scintillation Detector as a First Main Detector for PERC

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The instrument PERC at the FRM II will soon be ready for commissioning. Like its predecessors PERKEO II and PERKEO III, it will measure the beta spectrum of neutron decay and determine several of its correlation coefficients. It aims to improve the precision by up to one order of magnitude over current best values. This enables testing the Standard Model and search for new physics via effective couplings.

PERC will observe neutron decay in an 8 m long neutron guide and a high magnetic field will guide the charged decay products to the main detector, positioned downstream of the experiment. To detect and correct for backscattering events, another detector system will be installed upstream of the decay volume. The PERC spectrometer is designed such that one can install different types of detectors as a main detector, for example a scintillation detector, a silicon detector or a magnetic spectrometer, all of which offer unique advantages. Building on the knowledge and expertise from using scintillation detectors in the PERKEO experiments, the first detector to be installed is a scintillation detector with a PMT photon readout on the backside.

We present Geant4 simulations on a possible design for this scintillation detector and the resulting light yield and uniformity.

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