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The aSPECT experiment – Investigation of systematic uncertainties by Monte Carlo simulations

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The aSPECT retardation spectrometer measures the beta–neutrino angular correlation coefficient a in free neutron beta-decay. This measurement can be used to determine the ratio g_A/g_V of the weak coupling constants, as well as to search for physics beyond the Standard Model.

In 2013 aSPECT had a successful beam time at the Institut Laue-Langevin. The goal of this beam time is to improve the current uncertainty of a from $\Delta a/a \approx 5\%$ to about $\sim 1\%$. The data analysis is in its final stage and nearly finished. In order to achieve an uncertainty of 1%, the systematics of aSPECT have to be understood accordingly. This is achieved by systematic tests and measurements of a with different parameter settings for the spectrometer during the beam time. Additionally, offline measurements have been performed to determine the effect on the systematics, e.g. the detector's edge effect, electrodes' work function fluctuations and the magnetic field ratio. These measurements are used as input for on-going simulations of the spectrometer to understand and reduce the systematic uncertainties further.

In this poster the current status of the electromagnetic field and particle tracking simulations is presented. This includes an overview of the simulation tools and the methods to investigate systematics, e.g. the detectors' edge effect and the effect of the measured electrodes' work function fluctuations, and their influence on a .

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