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RxB drift momentum spectrometer

We propose a new type of momentum spectrometer, which uses the RxB drift effect to disperse the charged particles in a uniformly curved magnetic field, and measures the particles with large phase space acceptance and high resolution. This kind of RxB spectrometer is designed for the momentum analyses of the decay electrons and protons in the PERC (Proton and Electron Radiation Channel) beam station, which provides a strong magnetic field to guide the charged particles in the instrument. Instead of eliminating the guiding field, the RxB spectrometer evolves the field gradually to the analysing field, and the charged particles can be adiabatically transported during the dispersion and detection. The drifts of the particles have similar properties as their dispersion in the normal magnetic spectrometer. Besides, the RxB spectrometer is especially ideal for the measurements of particles with low momenta and large incident angles. We present a design of the RxB spectrometer, which can be used in PERC. For the particles with solid angle smaller than 88 msr, the maximum aberration is below $1E-4$. The resolution of the momentum spectra can reach 14.4 keV/c, if the particle position measurements have a resolution of 1 mm.

quote your primary experiment

PERC

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