Electron scattering dynamics studied via bremsstrahlung from a polarized electron beam

Dr. Stanislav Tashenov
Physikalisches Institut Heidelberg

Linear polarization of hard x-rays emitted in the process of the atomic field electron bremsstrahlung has been measured with a polarized electron beam. The correlation between the initial orientation of the electron spin and the angle of photon polarization has been systematically studied by means of Compton and Rayleigh polarimetry techniques applied to a segmented germanium detector. The results are in a good agreement with the fully-relativistic calculations based on Dirac theory. They are also explained classically and in a unique way manifest that due to the spin-orbital interaction the electron scattering trajectory is not confined to a single scattering plane. The developed photon polarimetry technique with a passive scatterer is very efficient and accurate and thus allows for novel applications. Bremsstrahlung polarization correlations lead to a new method of polarimetry of electron beams. Such a method is sensitive to all three components of the electron spin. It can be applied in a broad range of the electron beam energies from 100 keV up 10 MeV. The results of the test measurement at 100 keV will be shown. The optimum scheme for electron polarimetry will be analyzed and the relevant theoretical predictions will be presented.