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The control and measurement of helicity correlated beam asymmetries for parity-violation experiments
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The availability of high current, high polarization electron beams from laser-driven GaAs photocathodes has enabled a broad program studying parity violation in electron scattering. Measurements of the parity-violating beam-helicity asymmetry are used to study the structure of nuclei or to test the Standard Model of electroweak interactions. With experiments requiring a precision around 1 part-per-billion, asymmetric beam properties between the two beam helicity states threaten to become a leading source of experimental uncertainty. Changes in various beam properties must be considered, including intensity, energy, trajectory, shape, and halo. The measurement and control of helicity-correlated changes in these properties will be discussed from the perspective of the electron-scattering experimentalist.