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Electron beam scattering in Rubidium vapour at AWAKE

Sunday 1 June 2025 14:00 (2 hours)

The Advanced Wakefield Experiment (AWAKE) at CERN uses bunches from the CERN SPS to develop proton-driven plasma wakefield acceleration. AWAKE Run 2c (starting in 2029) plans for external on-axis injection of a 150 MeV electron witness bunch. The goal is to demonstrate emittance control of multi-GeV accelerated electron beams. Prior to injection, the electron witness bunch may have to traverse rubidium vapour. Since the beam must have the correct beam size and emittance at injection, it is important to quantify the effect of scattering. For this, first-principle estimates and the results from Geant4 simulations are compared with measurements of a ˜20 MeV electron beam scattering in 5.5 m of rubidium vapour, showing good agreement. Building on this agreement, Geant4 simulations using the estimated AWAKE Run 2c parameters are performed. These predict that scattering will not increase the electron beam size or emittance

Footnotes

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