

The injection channel of the muEDM experiment

martedì 16 maggio 2023 16:55 (15 minuti)

At the Paul Scherrer Institute (PSI), we are setting up an experiment to search for the electric dipole moment of the muon (muEDM) using the frozen-spin technique. The discovery of a muEDM would indicate violation of charge conjugation parity symmetry and lepton flavor universality, beyond the Standard Model. The experiment aims to achieve a sensitivity of $\sigma(d_\mu) \leq 6 \times 10^{-23} e \cdot cm$.

The focus of this study is the off-axis injection of muons into a $3T$ storage solenoid. Muons need to be transported from the exit of the beamline, low-field region, into the strong magnetic field of the solenoid. For this purpose, a magnetically shielded channel is constructed. In the direct vicinity of the injection helix inside the solenoid bore, we will use superconducting (SC) shield to avoid any hysteresis effect, while farther away in the fringe field we will use an iron tube. We will produce two prototypes of SC injection tubes: the first will use a commercial high temperature SC tape wrapped around a $15mm$ inner diameter copper tube, while the second will utilize several Nb-Ti/Nb/Cu sheets obtained from CERN, wrapped and mechanically clamped around another $15mm$ inner diameter copper tube. To evaluate the effectiveness of the SC shields, we will measure their shielding factors and calculate the muon injection efficiency from the beamline into the solenoid.

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