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## Design and Construction of a Polarized Electron Source for the Chiral Belle Upgrade to the SuperKEKB Collider

Wednesday 11 June 2025 15:30 (15 minutes)

The SuperKEKB collider, operating at the  $\Upsilon(4S)$  resonance energy, delivers  $e^+e^-$  collisions at the world's highest instantaneous luminosity for the Belle II experiment. A proposed long-term Chiral Belle upgrade aims to introduce a polarized electron beam in the High Energy Ring (HER), enabling a new and unique program of precision physics. This upgrade will facilitate precision measurements of electroweak parameters, such as  $\sin^2\theta_W$ , with projected precision matching the LEP/SLC world average but at a center-of-mass energy of 10.58 GeV. The polarization upgrade also enables the world's highest precision measurements of the tau anomalous magnetic moment and the Michel parameters of tau leptonic decays, improving precision by orders of magnitude. These results open new avenues for the discovery of New Physics.

In order to introduce a polarized electron beam in the HER, a low-emittance polarized electron source is required. This source will supply transversely polarized electrons, allowing for separate data sets with opposite polarization states. This talk presents the design, construction, and testing of a GaAs-based polarized electron source for the preliminary phase of the upgrade.

The polarized electron source will be constructed and tested during the spring and summer of 2025. Upon approval, it will be integrated into the SuperKEKB injection room during the 2026 summer shutdown. The source will be used in a dedicated experiment to measure the polarization lifetime of electrons in the HER via Touschek scattering.

### Keyword-1

Belle II

### Keyword-2

SuperKEKB

### Keyword-3

Polarization Upgrade

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