Chiral Belle: SuperKEKB e- Polarization Upgrade

Monday Sep 29, 2025, 3:00 PM → 5:15 PM Asia/Tokyo

Meeting room 1st floor (3-go-kan)

Brookhaven National Laboratory

U.S. DEPARTMENT OF ENERGY

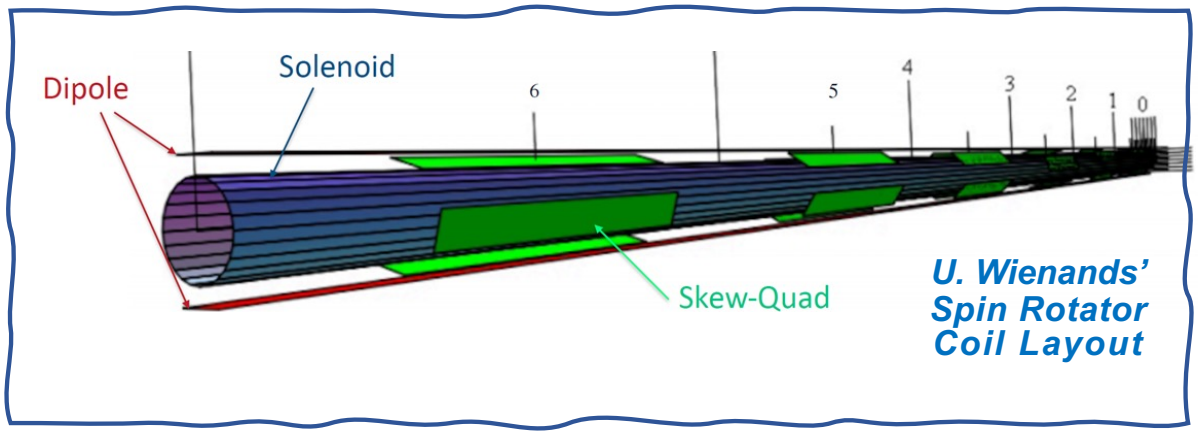
Spin Rotator R&D status: Electromagnetic analysis of HER dipole in OPERA

Vikas Teotia

Superconducting Magnet Division

@BrookhavenLab

The Compact Multifunction Concept for SuperKEKB HER



U. Wienands' Spin Rotator Coil Layout

HER Warm Dipoles in Tunnel at KEK

- Dipole coil matches the HER ring dipole bending,
- Along with solenoid to change the spin direction,
- Skew-quads make optics and coupling corrections.
- **Turning solenoid and skew-quads off restores HER!**

Brett Parker

A novel spin rotator concept for longitudinally polarized beam for Chiral Belle at SuperKEKB

TUB12
Mar 4, 2025, 4:40 PM
30m
304 (EPOCHAL)

Invited Oral Presentation | WG10 : Magnets, IR,... | Magnets, IR, Alignment

Speaker

Brett Parker (Brookhaven National Laboratory)

Each spin rotator module is a drop-in replacement for an existing HER warm dipole that leaves the overall SuperKEKB ring geometry unchanged.*

*Standard solenoid spin rotator solution requires placing them at "magic angles" w.r.t. the IR, causing the ring geometry to change (also needs additional lattice space) and introduces optics changes and coupling that must be carefully (externally!) compensated.

Electromagnetic analysis of HER dipole in OPERA

- For ensuring the dipole field of the proposed spin rotator with the existing HER dipole, Electromagnetic analysis of the existing magnet is being carried out using OPERA.
- Thanks to Mika san for providing Drawings and measured parameters of the HER dipole.
- The magnetic field strength along the beamline at a radius of 50mm was found to have a magnitude of 0.2978 T, reproducing the nominal field value of the original HER dipole magnet, which was measured at 0.2997 T [2]. The difference in the magnetic properties of the yoke material can be one of the source for the difference.
- Further work is under way to understand the longitudinal variation of the magnetic field profile
- This will follow with EM design of the dipole magnet based on BNL's direct wind magnet technology.

Opera EM analysis

Brianna Romasky
Stony Brook University , New York

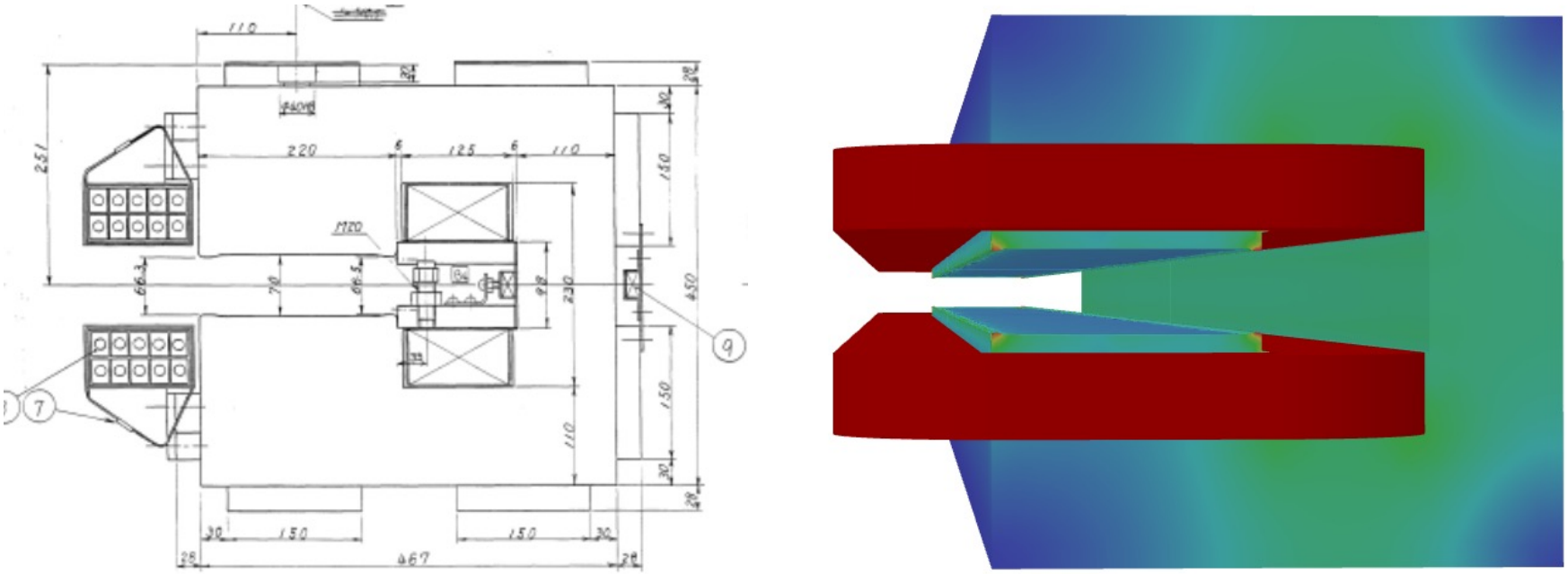


Figure 1. Left: Cross section of the dipole magnet from original CAD diagram, Right: Opera 3D model.

Iron Yoke		Racetrack Coils	
Yoke length	5804 mm	Coil Radius	13.38 mm
Aperture width	220 mm	Coil thickness	65 mm
Aperture height	70 mm	Current density	1.086 A/mm^2

Table 1. Geometry parameters for iron yoke and racetrack coil parameters

Thanks for your kind attention!