

# Analysis of multipole components in the electromagnets of next-generation storage rings and beam dynamics in storage rings

*Thursday, November 14, 2024 1:00 PM (1h 30m)*

The recently introduced 4th-generation storage ring (4GSR) requires not only a higher magnetic field gradient compared to the sextupole and octupole magnets used in existing 3rd-generation synchrotron accelerators, but also utilizes magnets with complex magnetic field distributions, such as Longitudinal Gradient Bending magnets, which significantly differ from hard-edge models. These complex magnetic field variations typically generate unwanted multipole components. In storage rings, even small multipole components can have a significant impact on the beam due to the continuous motion of the electron beam. Therefore, it is essential to calculate the multipoles from the three-dimensional magnetic field distribution of the designed magnets and apply this analysis to beam physics research to precisely evaluate the effects on the beam. In this study, we analyze the multipole components based on the three-dimensional magnetic fields calculated using the OPERA3D code and investigate methods to track the beam.

## Paper submission Plan

Yes

## Best Presentation

Yes

## Contribution track

ICABU WG2. Beam Physics, Diagnostics & Novel Techniques

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**Session Classification:** ICABU Poster Session

**Track Classification:** ICABU: ICABU WG2. Beam Physics, Diagnostics & Novel Techniques