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## Bi-Filar Coil Winding for Fast Quench Protection

*Sunday 10 August 2025 15:00 (3 hours)*

The advancement of high-field magnets utilizing high-temperature superconductors (HTS) brings about complex challenges, especially in quench detection and protection. Traditional methods often fall short due to the inherently slow quench propagation in HTS materials. One promising approach to overcome this involves using a bifilar winding configuration, where two conductors are placed side by side. Under normal operation, they function in series, but during a quench event, they switch to an anti-parallel mode. This shift reduces the differential inductance of the coil to near zero, enabling rapid current oscillations through a capacitor discharge. The resulting high-frequency current flow leads to swift, uniform heating, triggering a full-coil quench within microseconds. Moreover, the strong mutual coupling between the two windings significantly reduces electrical noise in voltage measurements. In this work, we explore the viability of this concept by designing, constructing, and testing a REBCO bifilar racetrack coil in liquid nitrogen. We also present a validated simulation model that closely mirrors the coil's dynamic behavior under these conditions, aligning well with experimental observations.

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No

**Would you like to submit this poster in student poster session on Sunday (August 10th)**

Yes

**Footnotes**

**Funding Agency**

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Yes

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