

## Challenges and Opportunities for Superconductors in High Magnetic Fields

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**Abstract** — High field studies are essential to understand high temperature superconductors. Because of their immense characteristic fields (>100 T) that cannot be reached using conventional DC magnets, measurements in pulsed fields are essential. The advent of hydrogen- and nickel-based superconductors heightens the already present need created by Cu- and Fe-based superconductors. Depending on the superconductor properties (electronic mass anisotropy,  $T_c$ , etc.) and the type and density of material disorder, the vortex solid phase changes drastically from crystalline to diverse glass phases or even to emergent novel phases. I will show how we solve the technical and fundamental challenges imposed by the millisecond time regime for pulsed-field measurements to obtain AC and DC transport measurements.

In this talk, I will present results on the upper critical field on different superconductors and critical current measurements on coated conductors. The analysis of the  $H_{c2}$  as a function of temperature and angle shows the importance of spin pair-breaking mechanisms. The critical currents measurement allows us to study the changes in pinning regimes at low-T/high-H as well as to determine the limits for high field superconducting magnets.

**Keywords (Index Terms)** — Critical currents, pulsed fields, coated conductor, upper critical field.

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