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Interplay between Superconducting Vortices in the Dynamic Regime and Magnetism in Borocarbides MARCUS WEIGAND, CHRISTIAN BATISTA, LEV BULAEVSKII, SHIZENG LIN, FRANCISCO BACA, LEONARDO CIVALE, Los Alamos National Laboratory, SERGEY BUD'KO, PAUL CANFIELD, Ames Laboratory, BORIS MAIOROV, Los Alamos National Laboratory — In superconductors with coexisting magnetic order an interaction is expected between vortices moving above a certain speed and the intrinsic magnetic moments. It has been predicted that in this dynamic regime vortices emit energy through the radiation of spin waves, thus slowing down and reducing the dissipation associated with their movement.[1] While of potential interest for applications, this effect has not yet been proven experimentally. In order to elucidate the phenomenon, we have carried out electrical transport measurements on $ErNi_2B_2C$ single crystals, covering a broad range of temperatures, applied magnetic fields and field orientations. We observe a distinct change in the shape of current-voltage curves measured above and below the Néel temperature (T_N), which implies that the features seen below T_N are related to the material's antiferromagnetism. We complement these results with measurements of the irreversible magnetization, which also show significant anomalies around T_N. Angular critical current measurements have also been performed to investigate the influence of the material's intrinsic magnetic moments on its current-carrying capabilities.

[1]A. Shekhter, L. N. Bulaevskii, and C. D. Batista, Phys. Rev. Lett. 106, 037001 (2011).

Marcus Weigand
Los Alamos National Laboratory

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