

## Stability of Second Generation HTS Pancake Coils at 4.2K for High Heat Flux Applications

C. L. H. Thieme, K.J. Gagnon, J.Y. Coulter,  
H. Song, and J. Schwartz, Fellow, IEEE

**Abstract**—We explored high magnetic field superconducting properties and stability at 4.2 K of Second-Generation High Temperature Superconductors using both short conductors and small pancake coils. A 50 m length of wire was carefully characterized for performance along the length in self-field at 77 K and in 10 m lengths at 75 K and a 0.52 T field oriented parallel and perpendicular to the face of the conductor. Short lengths of conductor were tested at 4.2 K and 0-25 T in parallel and perpendicular fields, demonstrating an overall critical current of 420 A/mm<sup>2</sup> in a parallel field of 25 T. These characterized lengths were made into small pancake coils which were equipped with a central heater, voltage taps and taps for thermocouples. We report on the stability testing at 4.2 K of one of these coils.

**Index Terms** — High-temperature superconductors, high magnetic fields, stability, superconducting coils.

Manuscript received 19 August 2008.

This work was supported in part by the U.S. Department of Energy,

C. L. H. Thieme is with American Superconductor, Devens, MA 01434, USA. Phone: 978-842-3355; fax: 978-842-3024; e-mail: [cthieme@amsc.com](mailto:cthieme@amsc.com)).

K.J. Gagnon was with American Superconductor. He is now at the Chemistry Department, Texas A&M University, College Station, Texas 77843 (e-mail: [kgagnon@mail.chem.tamu.edu](mailto:kgagnon@mail.chem.tamu.edu)).

J.Y. Coulter is with the Superconductivity Technology Center, Los Alamos National Laboratory, Los Alamos, NM 87545 (e-mail: [jycoulter@lanl.gov](mailto:jycoulter@lanl.gov)).

H. Song is with the National High Magnetic Field Laboratory, Florida State University, Tallahassee FL 32310 (e-mail: [hsong@magnet.fsu.edu](mailto:hsong@magnet.fsu.edu))

J. Schwartz is a Jack E. Crow Professor of Engineering at the Department of Mechanical Engineering & National High Magnetic Field Laboratory Florida State University, Tallahassee FL 32310 (e-mail: [hsong@magnet.fsu.edu](mailto:hsong@magnet.fsu.edu) and [schwartz@magnet.fsu.edu](mailto:schwartz@magnet.fsu.edu)).