

Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

BETA (Bitter Electromagnet Testing Apparatus) EVAN M. BATES, WILLIAM J. BIRMINGHAM, WILLIAM F. RIVERA, CARLOS A. ROMERO-TALAMAS, University of Maryland, Baltimore County — The Bitter Electromagnet Testing Apparatus (BETA) is a 1-Tesla (T) prototype of the 10-T Adjustable Long Pulse High-Field Apparatus (ALPHA). These water-cooled resistive magnets use high DC currents to produce strong uniform magnetic fields. Presented here is the successful completion of the BETA project and experimental results validating analytical magnet designing methods developed at the Dusty Plasma Laboratory (DPL). BETA's final design specifications will be highlighted which include electromagnetic, thermal and stress analyses. The magnet core design will be explained which include: Bitter Arcs, helix starters, and clamping annuli. The final version of the magnet's vessel and cooling system are also presented, as well as the electrical system of BETA, which is composed of a unique solid-state breaker circuit. Experimental results presented will show the operation of BETA at 1 T. The results are compared to both analytical design methods and finite element analysis calculations. We also explore the steady state maximums and theoretical limits of BETA's design. The completion of BETA validates the design and manufacturing techniques that will be used in the succeeding magnet, ALPHA.

Evan M. Bates
University of Maryland, Baltimore County

Date submitted: 16 Jul 2017

Electronic form version 1.4