Abstract Submitted
for the DPP16 Meeting of
The American Physical Society

BETA (Bitter Electromagnet Testing Apparatus) Design and Testing EVAN BATES, WILLIAM BIRMINGHAM, WILLIAM RIVERA, CARLOS ROMERO-TALAMAS, University of Maryland Baltimore County — BETA is a 1T water cooled Bitter-type magnetic system that has been designed and constructed at the Dusty Plasma Laboratory of the University of Maryland, Baltimore County to serve as a prototype of a scaled 10T version. Currently the system is undergoing magnetic, thermal and mechanical testing to ensure safe operating conditions and to prove analytical design optimizations. These magnets will function as experimental tools for future dusty plasma based and collaborative experiments. An overview of design methods used for building a custom made Bitter magnet with user defined experimental constraints is reviewed. The three main design methods consist of minimizing the following: ohmic power, peak conductor temperatures, and stresses induced by Lorentz forces. We will also discuss the design of BETA which includes: the magnet core, pressure vessel, cooling system, power storage bank, high powered switching system, diagnostics with safety cutoff feedback, and data acquisition (DAQ)/magnet control *Matlab* code. Furthermore, we present experimental data from diagnostics for validation of our analytical preliminary design methodologies and finite element analysis calculations. BETA will contribute to the knowledge necessary to finalize the 10 T magnet design.

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Date submitted: 05 Aug 2016 Electronic form version 1.4