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Development of a Split Bitter-type Magnet System for Dusty Plasma Experiments EVAN BATES, CARLOS A. ROMERO-TALAMAS, WILLIAM J. BIRMINGHAM, WILLIAM F. RIVERA, UMBC — A 10 Tesla Bitter-type magnetic system is under development at the Dusty Plasma Laboratory of the University of Maryland, Baltimore County (UMBC). We present here an optimization technique that uses differential evolution to minimize the ohmic heating produced by the coils, while constraining the magnetic field in the experimental volume. The code gives us the optimal dimensions for the coil system including: coil length, turn thickness, disks radii, resistance, and total current required for a constant magnetic field. Finite element parametric optimization is then used to establish the optimal design for water cooling holes. Placement of the cooling holes will also take into consideration the magnetic forces acting on the copper alloy disks to ensure the material strength is not compromised during operation. The proposed power and cooling water delivery subsystems for the coils are also presented. Upon completion and testing of the magnet system, planned experiments include the propagation of magnetized waves in dusty plasma crystals under various boundary conditions, and viscosity in rotational shear flow, among others.

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