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Prototype of 10 Tesla Water Cooled Bitter-type Magnet System
E.M. BATES, W.J. BIRMINGHAM, W.F. RIVERVA, C.A. ROMERO-TALAMAS, University of Maryland Baltimore County — A 1 Tesla water cooled Bitter-type magnetic system has been designed and is under construction at the Dusty Plasma Laboratory of the University of Maryland, Baltimore County (UMBC). It is a scaled version of a 10 T Bitter-type magnet that will be used in dusty plasma experiments where dust larger than 500 nm diameter will be strongly magnetized. We present here the design methods used for both magnets, and discuss the design parameters that drive the magnet cooling and power storage bank subsystems. The pressure vessel and plasma vacuum chamber subsystems are then built with the aforementioned subsystems as constraints. To validate our design, magnetic field and temperature measurements within the prototype magnet are compared to finite element analysis (FEA) and analytical methods used for preliminary designing. This knowledge will be used to finalize the 10 T magnet design. Once operational, the 10 T magnet will be programmable to be on for at least ten seconds to several minutes, with up to 20 plasma events planned per day.

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