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Control of Static and Dynamic Non-axisymmetric Magnetic Fields in HBT-EP J.P. LEVESQUE, P.J. BYRNE, B. DEBONO, B. LI, M.E. MAUEL, D.A. MAURER, G.A. NAVRATIL, N. RATH, D. SHIRAKI, Columbia University — A major research goal of the HBT-EP tokamak is to control multi-mode non-axisymmetric magnetic perturbations. Even small non-axisymmetic equilibrium field errors in tokamaks can have a dramatic impact on plasma performance, and reducing these field errors can improve plasma behavior. We report progress and plans to minimize non-axisymmetric perturbations through (i) precision alignment of the equilibrium coils, conducting wall segments, and 120 control coils, and (ii) active control of the 3D plasma boundary using an upgraded real-time digital control system. Tokamak metrology is accomplished using both a radial measurement arm built on a rotating central axis of HBT-EP and a ROMER coordinate measuring machine provided through collaboration with PPPL. Metrology results are used to account for asymmetries of sensors and control coils during resistive wall mode studies. Dynamic control and analysis of non-symmetric fields excited from both unstable resistive wall modes and from pulsed external perturbations will be accomplished by a high-throughput active control system. Details of the tokamak metrology, analysis of field errors produced by small misalignments of the equilibrium field coils, and plans for active control will be presented. Supported by U.S. DOE Grant DE-FG02-86ER53222.

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