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3D Equilibrium Reconstruction with Islands[1] M. CIANCIOSA, S.P. HIRSHMAN, S.K. SEAL, M.W. SHAFER, Oak Ridge National Laboratory — Up until now, equilibrium reconstruction for studying 3D effects in fusion plasmas, has been limited to plasmas with nested magnetic topologies. To reconstruct plasmas with more general topologies, such as the island diverter of W7-X, it is necessary to use an equilibrium solver allowing for non-nested or stochastic magnetic fields. The SIESTA code tears the nested magnetic surfaces by applying resonant magnetic perturbations. These perturbations control the size of islands in the equilibrium solution and add another unknown parameter (the perturbation strength) to the equilibrium solution. Experiments show that measured temperature and density profiles flatten inside magnetic islands. Using this signal information, the size of the SIESTA island perturbation can be reconstructed by matching temperature and density profiles to flattened regions in experimental measurements. Recent work has coupled SIESTA into the V3FIT 3D equilibrium reconstruction code. From the SIESTA solution, V3FIT computes synthetic signals in the presence of magnetic islands. The unknown parameters of the model are then adjusted to minimize the mismatch between the observed and synthetic signal. Using this capability, initial results of reconstructed islands in a tokamak equilibrium will be presented.

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