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Comparison of Flux-Surface Aligned Curvilinear Coordinate Systems and Neoclassical Magnetic Field Predictions[1] T.G COLLART, W.M. STACEY, GA Tech — Several methods are presented for extending the traditional analytic "circular" representation of flux-surface aligned curvilinear coordinate systems to more accurately describe equilibrium plasma geometry and magnetic fields in DIII-D. The formalism originally presented by Miller is extended to include different poloidal variations in the upper and lower hemispheres. A coordinate system based on separate Fourier expansions of major radius and vertical position greatly improves accuracy in edge plasma structure representation. Scale factors and basis vectors for a system formed by expanding the circular model minor radius can be represented using linear combinations of Fourier basis functions. A general method for coordinate system orthogonalization is presented and applied to all curvilinear models. A formalism for the magnetic field structure in these curvilinear models is presented, and the resulting magnetic field predictions are compared against calculations performed in a Cartesian system using an experimentally based EFIT prediction for the Grad-Shafranov equilibrium.

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