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An Optimal Magnetic Coordinate system for High-Beta ST configurations[1] JANARDHAN MANICKAM, Princeton Plasma Physics Laboratory — In the study of magnetohydrodynamics of magnetically confined systems, it is well known that both analysis and computation are facilitated by an appropriate coordinate system. Specifically, a magnetic coordinate system,(Ψ, θ, ζ),where Ψ is a flux label, θ a poloidal angle and ζ a generalized toroidal angle, such that magnetic field lines are straight in (θ, ζ) space. The generalized toroidal angle, ζ, can be related to the Cartesian angle ϕ, by introducing a periodic function $\delta(\Psi, \theta)$. This function depends on the choice of Jacobian, and is identically zero when the Jacobian is proportional to x^2. This coordinate is commonly referred to as PEST coordinates. A more general approach to straight field line coordinates is obtained when the Jacobian is defined as $J = X^i/\alpha(\Psi)|\nabla\dot{\Psi}|^j$. Commonly used coordinate systems are: PEST, with i=2 , j=0; Equal Arcs, with i=j=1; and Hamada with i=j=0. Each of these coordinates has its own merits, but for high beta spherical tori, we identify a new coordinate system, i=0, j=1, which is optimal to this regime. We present results comparing the different coordinate systems in different parameter regimes.

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Janardhan Manickam
Princeton Plasma Physics Laboratory

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