Abstract Submitted
for the DPP14 Meeting of
The American Physical Society

Chaotic coordinates for the Large Helical Device STUART HUDSON, Princeton Plasma Physics Laboratory, YASUHIRO SUZUKI, National Institute for Fusion Science — The study of dynamical systems is facilitated by a coordinate framework with coordinate surfaces that coincide with invariant structures of the dynamical flow. For axisymmetric systems, a continuous family of invariant surfaces is guaranteed and straight-fieldline coordinates may be constructed. For non-integrable systems, e.g. stellarators, perturbed tokamaks, this continuous family is broken. Nevertheless, coordinates can still be constructed that simplify the description of the dynamics. The Poincare-Birkhoff theorem, the Aubry-Mather theorem, and the KAM theorem show that there are important structures that are invariant under the perturbed dynamics; namely the periodic orbits, the cantori, and the irrational flux surfaces. Coordinates adapted to these invariant sets, which we call chaotic coordinates, provide substantial advantages. The regular motion becomes straight, and the irregular motion is bounded by, and dissected by, coordinate surfaces that coincide with surfaces of locally-minimal magnetic-fieldline flux. The chaotic edge of the magnetic field, as calculated by HINT2 code, in the Large Helical Device (LHD) is examined, and a coordinate system is constructed so that the flux surfaces are "straight" and the islands become "square."

Stuart Hudson
Princeton Plasma Physics Laboratory

Date submitted: 10 Jul 2014 Electronic form version 1.4