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Derivation of Expression for Canonical Density Profiles and Comparison with DIII-D Measurements¹

D.R. BAKER, General Atomics, M.N. ROSENBLUTH, ITER Joint Central Team, San Diego — It has been recently proposed that, for highly turbulent discharges, there exists a consistent density profile for the electrons in a high aspect ratio circular cross-section tokamak which has a radial dependence on $q(r)$,² where q is the usual safety factor. Here we extend this result to include non-circular cross section tokamaks of arbitrary cross section. The predicted shape of the profile is independent of the spatial dependence of the transport coefficients, but depends on the relative transport of trapped versus passing particles. If both trapped and passing particles transport the same, then the density profile varies approximately as $1/q$. If the passing particles transport slower than the trapped particles then the density is flatter than $1/q$. Agreement between theory and experiment is obtained for Ohmic, L-mode and some ELMing H-modes plasmas. Plasmas with internal transport barriers or time varying density are not described by this theory.

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²M.B. Isichenko, A.V. Gruzinov, and P.H. Diamond, Phys. Rev. Lett. **74**, 4436 (1995).

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