Questions: 3D Fields and the Pedestal

Allen Boozer
March 4, 2011

1. Which is the primary determinant of the density profile, the particle flux Γ or the heat flux q?

The density and temperature gradients depend on both fluxes. But if $T\Gamma/q \ll 1$, both gradients are essentially determined by the heat flux.

Density gradient is then small when the diffusive transport process is similar for particles of all energies

Density gradient is then large and in the same direction as the temperature gradient when higher energy—but near thermal--particles diffuse more rapidly.

What information is available on magnitude of $T\Gamma/q$?

2. How large must drive for islands be to obtain stochasiticity?

If the IPEC drive for islands would give islands of width δ_d, then the opening of islands is slow (Rutherford like) and relatively easily shielded by rotation unless the actual island width $\delta_I<k\delta_d^2/4$, where $k\sim m/a$.

The Cherikov overlap criterion for stochastic magnetic fields is $S_I=2ks_q\delta_I>1$, where $s_q=dln(q)/dln(r)$.

The condition for rapid (difficult to shield) island opening all the way to stochasticity using the driven island width, δ_d, is then $S_d=2ks_q\delta_d>2s_q^{1/2}$, and not $S_d>1$.

Does the change in the effective shear dependence of the Cherikov criterion modify any interpretations?

3. Do the electric potentials that give EXB transport rotate with the diamagnetic speed?

Diamagnetic rotation is expected for potentials produced by microturbulence but not for potentials produced by externally imposed 3D magnetic fields.

Can one determine if there is a static electric potential variation?