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Edge Radial Electric Field and Ion Orbit Loss in DIII-D,*
J.S. deGrassie, R.J. Groebner, General Atomics; J.A. Boedo, UCSD;
B.A. Grierson, PPPL – The edge radial electric field, $E_r$, may be
largely determined by the value necessary to supply the neoclassical
return current to balance the loss current due to ion orbit loss. This is
the indication from a phenomenological model, motivated by recent
Mach Probe measurements of the edge co-$L_p$ flow layer in DIII-D
[1,2], based on a simple empty loss cone orbit loss model [3,4].
Probe and charge exchange recombination measurements also show
a relatively large positive edge $E_r$ just inside the LCFS in Ohmic
conditions, $\sim 10$ kV/m, which is explained in this model by the
propensity of the flow layer to drive return current. The $E_r$ level is
also dependent on $Z_{\text{eff}}$ in the edge - lower $Z_{\text{eff}}$ promotes greater
negative $E_r$ for current balance. The model will be compared with
measurements in Ohmic, L- and H-mode conditions.


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