Current Drive Scaling of Local Helicity Injection in
the Pegasus Toroidal Experiment\textsuperscript{1} G.M. BODNER, M.W. BONGARD, R.J. FONCK, J.A. REUSCH, N.J. RICHNER, University of
Wisconsin-Madison — Local Helicity Injection (LHI) is a non-solenoidal
startup technique that utilizes electron current injectors at the plasma
edge to initiate a tokamak-like discharge. In order to determine the scal-
ability of LHI to MA-class facilities, it is necessary to identify the key
parameters that dictate LHI performance. Injection on the high-field-
side (HFS) allows for the creation of discharges driven purely by helicity
injection. Ohmic and stochastic confinement scalings predict a favor-
able non-linear relationship between $I_p$ and drive voltage $V_{LHI}$. Recent
experiments have indicated a linear current drive scaling suggesting a
constant impedance. This scaling has been observed over different levels
of $B_T$ and MHD activity. Thomson measurements at low $B_T$ indicate
hollow $T_e$ profiles that increase in $\langle T_e \rangle$ and decrease in $\langle \eta \rangle$ as the input
power is increased. Despite this decrease in $\langle \eta \rangle$, the current drive scaling
remains linear. At higher levels of $B_T$, peaked $T_e$ profiles ($T_{e,0} \sim 100$
eV) and higher $I_p$ are observed for the same amount of $V_{LHI}$. These
results have been compared to the first Thomson documentation of Ohmic
discharges in PEGASUS which feature $T_e \leq 250$ eV. Calculation of neo-
classical resistivity and plasma impedance from equilibrium reconstruc-
tions and Thomson data suggest this scaling result may be attributed
to an increase in $Z_{e,eff}$.

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