Design of the Thomson Scattering Diagnostic on the Pegasus Toroidal Experiment

D.J. SCHLOSSBERG, R.J. FONCK, B.A. KUJAK-FORD, B.T. LEWICKI, J.I. MORITZ, University of Wisconsin-Madison — A critical question concerning use of point-source helicity injection for non-inductive startup is whether, as \( I_p \) increases, energy confinement is dominated by cross-field transport or by parallel losses due to field line stochasticity. Furthermore, resistively-driven helicity dissipation during plasma formation must be characterized. Both of these topics are important for predictive scaling to larger tokamaks. In addition, \( T_e \) and \( n_e \) profiles are needed for accurate magnetic equilibrium reconstructions at high \( \beta_T \) and \( I_N \). To resolve these issues, a Thomson scattering diagnostic is being developed for the PEGASUS Toroidal experiment. The design is guided by systems on MST\(^2\) and HSX.\(^3\) Scattered light from an incident Nd-YAG laser (\( \lambda = 1064 \) nm) will be detected by a polychromator system. Implementation on Pegasus will measure \( n_e \) and \( T_e \) at \( \geq 10 \) radial locations for plasmas with \( n_e \geq 10^{19} \text{ m}^{-3} \) and \( T_e \sim 10 \text{ eV} - 1 \text{ keV} \), with radial resolutions of \( \sim 1.75 \text{ cm} \) and \( 5 \text{ cm} \) for fine and coarse configurations, respectively.

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\(^3\)K. Zhai, et al. RSI 75, 10 (2004)