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Turbulent transport regimes and the SOL heat flux width[1] J.R. MYRA, D.A. D'IPPOLITO, D.A. RUSSELL, Lodestar Research Corp. — Understanding the responsible mechanisms and resulting scaling of the scrape-off layer (SOL) heat flux width is important for predicting viable operating regimes in future tokamaks, and for seeking possible mitigation schemes. Simulation and theory results using reduced edge/SOL turbulence models have produced SOL widths and scalings in reasonable accord with experiments in many cases. In this work, we attempt to qualitatively and conceptually understand various regimes of edge/SOL turbulence and the role of turbulent transport in establishing the SOL heat flux width. Relevant considerations include the type and spectral characteristics of underlying instabilities, the location of the gradient drive relative to the SOL, the nonlinear saturation mechanism, and the parallel heat transport regime. Recent SOLT turbulence code results are employed to understand the roles of these considerations and to develop analytical scalings. We find a heat flux width scaling with major radius R that is generally positive, consistent with older results reviewed in J. W. Connor et al., Nucl. Fusion 39, 169 (1999). The possible relationship of turbulence mechanisms to the heuristic drift mechanism is considered, together with implications for future experiments.

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