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Optimization of the Pedestal for High Fusion Performance and Low Recirculating Power[1] P.B. SNYDER, M. KNOLKER, O. MENEGHINI, T. OSBORNE, S. SAARELMA, W. SOLOMON, General Atomics, J.W. HUGHES, T. WILKS, MIT, L. FRASSINETTI, EURATOM-VR, H.R. WILSON, U. of York
— The pressure and temperature at the top of the pedestal play a key role in fusion performance of tokamaks. We employ an updated version of the EPED model to predict the pedestal structure, and derive a set of metrics to evaluate pedestal contributions to performance. We review comparisons of EPED predictions to observations on several tokamaks, focusing on high pedestal regimes such as Super H Mode, which has been explored in experiments on C-Mod and DIII-D [1-3]. EPED predictions, and DIII-D experiments in JET-similar shapes, suggest the possibility of Super H access on JET if sufficiently high triangularity shapes can be developed. The role of both plasma shaping and aspect ratio is studied in detail. Optimization of the pedestal presents opportunities to enable not only high fusion power density but also very high bootstrap current fraction, enabling compact devices with low recirculating power and continuous operation. A regime is identified with intermediate R/a=2.3-2.7, and strong shaping, which holds promise for next-generation fusion devices. [1] Hughes, J.W.., Nucl. Fus. 58 112003 (2018). [2] Snyder, P.B., Nucl. Fus. 59 086017 (2019). [3] Knolker, M., APS/DPP invited talk (2019), submitted to Phys. Plasmas.

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