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MHD stability constraints on divertor heat flux width in DIII-D[1]

A.W. LEONARD, GA, A.E. JAERVINEN, A.G. MCLEAN, LLNL — The spatial width of heat flux flowing into the divertor is examined in DIII-D in the context of MHD stability limits. At low power the SOL width remains consistent with the ITPA scaling, dependent only on the midplane poloidal field. The midplane separatrix pressure gradient remains below the MHD ballooning stability limit even for very high density with divertor detachment. At high power with increasing density the midplane pressure gradient approaches the MHD stability limit at a midplane density near half of the Greenwald density limit. Further increases in density result in a broadening of the SOL and divertor temperature and density profiles to keep the pressure gradient below the MHD limit. However, the increased turbulence and transport required to maintain midplane separatrix MHD stability does not degrade the edge pedestal pressure and overall performance. The implications of these effects for divertor heat flux and its control in future reactor scale tokamaks will be explored.

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