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Development of Experimental Plan to Test Pedestal Physics Processes*

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A major goal of pedestal research is the development of a validated predictive model for the H-mode pedestal height. Current theoretical and modeling research in pedestal physics indicates that a successful model for pedestal height will be composed of several physics processes. The current state of this research has been reviewed and used to identify several theoretical physics processes that could be important for pedestal structure and for which sufficient theoretical knowledge exists that experimental tests can be devised. An experimental plan is being developed to test these processes as part of the FY11 experimental campaign in DIII-D. These processes include: kinetic ballooning modes (KBM), which are predicted to drive the pedestal pressure gradient; paleoclassical transport, which is predicted to control the pedestal electron temperature and density profiles; and electron temperature gradient modes (ETG), which are proposed to limit the pedestal electron thermal transport. For each of these processes, there are strong predictions about quantitative features of pedestal profiles. Thus, the first level of experimental tests is to obtain high quality profiles of pedestal temperature and density and to compare the observed profiles or gradients with the theoretical predictions. In addition, critical parameters in the theories will be used to devise experimental scans that can be used to provide appropriate tests of the theories over a wide parameter range. A second level of tests for the KBM and ETG processes, which are both critical gradient gyrokinetic processes, is to look for evidence of fluctuations with expected characteristics when the critical gradients are experimentally approached.

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