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Divertor Optimization via Control at DIII-D,* E. Kolemen, *PPPL*; S.L. Allen, M.A. Makowski, V.A. Soukhanovskii, *LLNL*; B.D. Bray, D.A. Humphreys, R. Johnson, A.W. Leonard, C. Liu, B.G. Penaflor, T.W. Petrie, *GA*; D. Eldon, *UCSD*; A.G. McLean, E.A. Unterberg, *ORNL* – DIII-D divertor performance and heat-handling capabilities are optimized using advanced control techniques. The world's first real-time snowflake divertor detection and control system was implemented on DIII-D in order to stabilize and optimize this configuration. A new control system was implemented to regulate and study detachment and radiation, since future fusion reactors will require detached or partially detached plasmas to achieve acceptable divertor target heat fluxes. The algorithm regulates the D_2 and impurity gas injection level by using the divertor temperature measurements from real-time Thomson diagnostics to compute the detachment level, and the real-time bolometer diagnostics to determine core and divertor radiation. This control allows the optimization of the detachment and radiation from the core and the divertor to achieve high core performance compatible with reduced heat-flux to the divertor.

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