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Advanced Divertor Developments at DIII-D,* E. Kolemen, *PPPL*; S.L. Allen, M.A. Makowski, V.A. Soukhanovskii, *LLNL*; B.D. Bray, D. Eldon, D.A. Humphreys, R. Johnson, A.W. Leonard, C. Liu, B.G. Penaflor, T.W. Petrie, *GA*; A.G. McLean, E.A. Unterberg, *ORNL* – Novel divertor configurations and control schemes have been implemented at DIII-D to test and optimize heat and particle handling capabilities for advanced tokamaks. The snowflake configuration is stabilized by first calculating the position of the two null-points using real-time equilibrium reconstruction and then regulating the shaping coil currents. Experiments in which the snowflake divertor is stabilized for many confinement times show that it is compatible with high-performance operation and results in greatly reduced divertor heat flux. An advanced divertor control system regulates the gas injection to achieve partial or full detachment by using the divertor temperature measurements from real-time Thomson diagnostics and a line ratio measurement, and adjusts the core and divertor radiation via measurement of the real-time bolometer diagnostics. Prospects of achieving acceptable divertor target heat fluxes for future fusion reactors are analyzed and challenges are presented.

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