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Overview of Recent Alcator C-Mod Highlights[1] EARL MARMAR, MIT-PSFC, C-MOD TEAM — Analysis and modeling of recent C-Mod experiments has yielded significant results across multiple research topics. I-mode provides routine access to high confinement plasma (H_{98} up to 1.2) in quasi-steady state, without large ELMs; pedestal pressure and impurity transport are regulated by short-wavelength EM waves, and core turbulence is reduced. Multi-channel transport is being investigated in Ohmic and RF-heated plasmas, using advanced diagnostics to validate non-linear gyrokinetic simulations. Results from the new field-aligned ICRF antenna, including significantly reduced high-Z metal impurity contamination, and greatly improved load-tolerance, are being understood through antenna-plasma modeling. Reduced LHCD efficiency at high density correlates with parametric decay and enhanced edge absorption. Strong flow drive and edge turbulence suppression are seen from LHRF, providing new approaches for plasma control. Plasma density profiles directly in front of the LH coupler show non-linear modifications, with important consequences for wave coupling. Disruption-mitigation experiments using massive gas injection at multiple toroidal locations show unexpected results, with potentially significant implications for ITER. First results from a novel accelerator-based PMI diagnostic are presented. What would be the world's first actively-heated high-temperature advanced tungsten divertor is designed and ready for construction. Conceptual designs are being developed for an ultra-advanced divertor facility, Alcator DX, to attack key FNSF and DEMO heat-flux challenges integrated with a high-performance core.

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