Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

Overview of Alcator C-Mod Research[1] ANNE WHITE, MIT — Research on C-Mod supports next-step-devices: RF heating, current and flow drive, divertor/PMI physics, non-ELMing regimes with enhanced confinement, and disruption mitigation/runaway dynamics. Disruption mitigation experiments in MHD-unstable plasmas show MGI works equally well with and without locked modes. The L-I-mode threshold is found to be independent of magnetic field, opening an expanded operating range at high field. The toroidal and radial structure of power deposition of RF waves into the edge plasma has been systematically quantified, through the use of a unique set of fast time resolution edge diagnostics. Progress in understanding multi-channel core transport has been significant. Full-physics, ITG/TEM/ETG gyrokinetic simulations show that nonlinear cross-scale coupling enhances both ion and electron heat flux to match experiments, explaining the origin of electron heat flux and stiffness. Dynamic, passive measurements of the core rotation velocity profiles with X-ray imaging crystal spectroscopy show the direction of intrinsic rotation reversals depends on central safety factor, not on the magnetic shear. Design studies for ADX and SPARC are establishing the engineering, economics and physics for a fusion energy development path leveraging new superconducting magnet technologies.

[1]This work is supported by the US DOE under DE- FC02-99ER54512-CMOD

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Date submitted: 24 Jul 2015 Electronic form version 1.4