Overview of MAST results

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Since its first physics campaign, the principal parameters on MAST have been brought up towards their design values. Considerable advances have been made in a range of physics areas of direct relevance to ITER (e.g. H-mode access, confinement scaling, neo-classical tearing modes, halo currents, divertor power loading) and in addressing key issues for operations in next-step STs (start-up, sustainment and exhaust issues). Data from MAST are significantly extending the International Confinement Database (ICD) in plasma aspect ratio, which allows differentiation between various forms of the H-mode threshold scaling. ELMy sawtoothing regimes with HH98(y,2) ~ 1 can be produced for several confinement times τ_E, which satisfy the ICD criteria. Plasmas with $\beta_N = 3.4$ and $H_{H98(y,2)} = 1.2$ have been produced for a duration of $5\times\tau_E$. Experiments on plasma formation, current ramp and sustainment without use of the central solenoid flux have been performed and demonstrate the efficient use of poloidal flux from the external coils in STs. Operation at high elongation (up to 2.5) combined with efficient NB heating has produced plasmas with significant bootstrap current fraction. Co- and counter-injection experiments have provided the first tests of NB current drive in STs. Extensive studies of the power handling have demonstrated that most of the power is deposited on the large outboard divertor targets, especially during ELMs (which appear to be largely convective and hence more tolerable in MAST). Progress in diagnostics and plans for a modified divertor with greater power handling capability and for extending the discharge and heating duration up to 5 s will be overviewed.

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