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Runaway electrons and mitigation studies in MST tokamak plasmas J.A. GOETZ, B.E. CHAPMAN, A.F. ALMAGRI, B.S. CORNILLE, A. DUBOIS, K.J. MCCOLLAM, S. MUNARETTO, C.R. SOVINEC, University of Wisconsin - Madison — Studies of runaway electrons generated in low-density MST tokamak plasmas are being undertaken. The plasmas have $B_t \leq 0.14$ T, $I_p \leq 50$ kA, $q(a) = 2.2$, and an electron density and temperature of about $5x10^{17} m^{-3}$ and 150 eV. Runaway electrons are detected via x-ray bremsstrahlung emission. The density and electric field thresholds for production and suppression have been previously explored with variations in gas puffing for density control. Runaway electrons are now being probed with resonant magnetic perturbations (RMP's). An $m = 3$ RMP strongly suppresses the runaway electrons and initial NIMROD modeling shows that this may be due to degradation of flux surfaces. The RMP is produced by a poloidal array of 32 saddle coils at the narrow vertical insulated cut in MST's thick conducting shell, with each RMP having a single m but a broad n spectrum. While a sufficiently strong $m = 3$ RMP suppresses the runaway electrons, an RMP with $m = 1$ and comparable amplitude has little effect. The impact of the RMP's on the magnetic topology of these plasmas is being studied with the nonlinear MHD code NIMROD. With an $m = 3$ RMP, stochasticity is introduced in the outer third of the plasma but no such flux surface degradation is observed with an $m = 1$ RMP. NIMROD also predicts regularly occurring MHD activity similar to that observed in the experiment. These studies have also been done in $q(a) = 2.7$ plasmas and analysis and modeling is ongoing. This work supported by USDoE.

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