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Halo and Runaway Currents in ITER[1] ALLEN BOOZER, Columbia University — In ITER, halo currents can unacceptably increase maintenance requirements, and a strong current of runaway electrons cannot be allowed to occur. Halo-current mitigation may unacceptably exacerbate the problem of runaways. A strong halo current flows along magnetic field lines that intercept the walls just outside the main plasma body when the plasma becomes too kink unstable for the chamber walls to slow the growth rate. Basic physics constrains and simplifies the calculation of the effects of halo currents. The plasma current in ITER is naturally converted into a current of runaway electrons with a typical energy of about 10MeV by an exponential avalanche mechanism when the temperature drops much below 1keV for any reason. Pitch-angle scattering on high-Z impurities may be important but has not been adequately studied. Scattering may explain anomalies in runaway production seen in experiments. Scattering also affects the anisotropy of runaways, $\epsilon_a \equiv j_r/en_rc$. The parallel current and number density of runaways are j_r and n_r. The power that runaway electrons loose by drag on background electrons is en_rE_c. Runaway electron production is not energetically possible unless the parallel electric field satisfies $E_{||} \geq E_c/\epsilon_a$.

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