Abstract Submitted
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Tokamak Halo Currents[1] ALLEN BOOZER, Columbia University — A halo current flows for part of its path through the plasma edge and for part through the chamber walls and can be tenths of the plasma current. The primary interest in halo currents is the large force that they can exert on machine components. Two discordant constraints are central to the theory: (1) Halo currents must produce the magnetic field distribution required to maintain plasma force balance—a distribution that depends on the two angular coordinates of a torus. (2) Halo currents must flow along the magnetic field lines in the plasma, which implies a dependence on a linear combination of the two angular coordinates—only one angular coordinate is free. The physics basis of these two constraints is explained as is their application to the calculation of the properties of halo currents, such as their broad toroidal spectrum. Existing codes could be used to (1) provide detailed comparisons with experiments to validate that the critical elements of physics are adequately included, (2) allow more complete predictions for future machines such as ITER, and (3) design shunts and resistive elements to ensure halo currents follow paths that are the least damaging to the machine.

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