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TH/P6-04: Alpha Particle Redistribution in Sawteeth

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The dynamics of alpha particles will be extremely important in ITER and future fusion reactors. Sawteeth can redistribute the alpha particles, thus modifying the power deposition profile and increasing alpha particle losses and wall loading. It is also hoped that they will help removing the helium ash. We study the effect of sawteeth on alpha particle confinement by following the trajectories of a large number of particles. The total electric and magnetic fields, sum of the equilibrium plus perturbation, are used to calculate the trajectories. Two approaches are being employed to calculate these fields. The first one uses a simple analytical equilibrium with ITER like parameters and q_{axis} less than 1 and the experimental information regarding the space and time dependence of the displacement eigenfunction to calculate the total fields. Using ideal MHD, the perturbed magnetic field is calculated as the curl of the cross product of the displacement with the equilibrium field and the perturbed electric field is obtained from Ohm's law. The second method uses a more realistic equilibrium, solution of a nonlinear Grad-Shafranov equation, and 3D resistive MHD simulations to calculate the total fields. A "diffusion coefficient" is introduced to quantify the displacement of the particles from their initial flux surface and different particle energies and mode frequency and amplitude are employed.

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