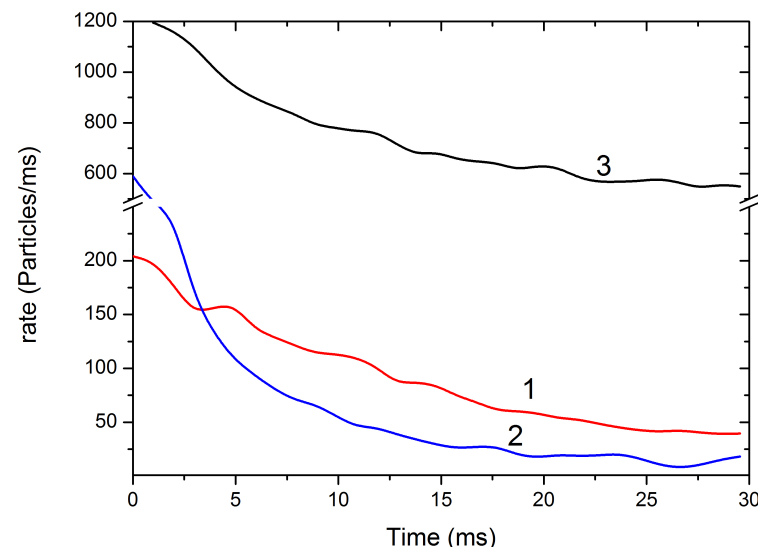


Diffusion of energetic particles due to charge changes and neoclassical tearing modes

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- Charge changes produced by atomic processes (i. e. charge exchange) can result in a significant alpha particle flux.
- This mechanism will be important in the edge-SOL region, where the neutral density becomes larger.
- A numerical code that calculates the exact alpha particle trajectories and introduces the probability of charge changing events via a Monte Carlo type method was employed. Classic Coulomb collisions were also included [C. F. Clauser and R. Farengo, *Phys. Plasmas* **22**, 122502 (2015)].
- A realistic, ITER-like, 2D equilibrium was employed
- The gradient in the neutral density, that increases with radius, produces an inward flux of alpha particles that reduces losses below the classical values. When a uniform neutral density profile is used, losses result much larger than with classic collisions alone.
- The electric field produced by the rotation of the mode can significantly increase the redistribution of energetic particles produced by (2,1) NTMs.



Loss rate as a function of time. 1- Classical collisions. 2- Classical plus inelastic collision with neutral density gradient. 3- Same as 2-, but with a uniform neutral density.