Library for RF Interactions in Orbit Following Codes

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A new code-library has been developed to handle quasi-linear wave particle interactions in orbit following Monte Carlo codes – RFOF (RF interactions in Orbit Following codes). This library will enable a large number of orbit following codes to model fast ion acceleration during ICRF and Lower Hybrid heating. The RFOF consists of two main modules: one evaluates the resonance condition, the other the resulting RF acceleration. The resonance condition is tested at each step along the orbit and predicts the location of the next upcoming resonance. When a particle reaches the resonance, a quasi-linear acceleration is calculated with a novel Monte Carlo technique that avoids the time-consuming evaluation of phase-space derivatives of the interaction strength. In RFOF the wave-particles interactions are assumed to be localized to a single point on the orbit. This is often valid for the ion cyclotron and lower hybrid frequency ranges, but prevents the treatment of bounce and precessional resonances. The RFOF has been developed within the European Task Force for Integrated Tokamak Modelling, enabling interaction between experts in different fields. As a result the code is designed with a simple and generic interface, with a minimum of assumptions on e.g. the geometry. Successful integration with the two orbit following codes, ASCOT and SPOT, has already been demonstrated.