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Progress in 3D self-consistent full wave-PIC modelling of space resolved ECR plasma properties

Tuesday, September 17, 2024 11:00 AM (30 minutes)

We present updates of a simulation suite to model in-plasma ion-electron dynamics, including self-consistent electromagnetic (EM) wave propagation and ion population kinetics to study atomic processes in ECR plasmas. The EM absorption is modelled by a heuristic collisional term in the cold dielectric tensor. However, we are stepping beyond the cold approximation, modelling the hot tensor with non-collisional RF wave damping. The tool calculates steady-state particle distributions via a full wave-PIC code and solves for collisional-radiative process giving atomic population and charge state distribution. The scheme is general and applicable to many physics'cases of interest for the ECRIS community, including the build-up of the charge-state-distribution and the plasma emitted X-ray and optical radiation. We present its last updates and future perspectives, using as a case-study the PANDORA scenario. We report about studying in-plasma dynamics of injected metallic species and radioisotopes ionisation efficiency for different injection conditions and plasma parameters. The code is capable of reconstructing space-resolved plasma emissivity, to be directly compared to plasma emission measurements, and modelling plasma-induced modification of radioactivity.

Footnotes

Funding Agency

I have read and accept the Privacy Policy Statement

Yes

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