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# MODELING OF COLLISIONAL REDISTRIBUTION OF LINE RADIATION BY COMPUTER SIMULATIONS

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In plasma physics, the process of radiation scattering is described by a redistribution function $R(\omega, \vec{n}, \omega', \vec{n}')$: this quantity is the joint probability density for an atom absorbing a photon with frequency $\omega'$ and direction $\vec{n}'$ and reemitting it with frequency $\omega$ and direction $\vec{n}$. Redistribution function models are widely used in astrophysics for the description of spectral line formation from stellar atmospheres out of local thermodynamic equilibrium, e.g. Mihalas (1978). In regimes where collisions between the radiator and the plasma particles are frequent, the reemitted photon loses memory of the state of the incoming photon and the corresponding emission line shape function is identical to the absorption line shape function; this situation is referred to as complete redistribution. In a more general case, the reemitted radiation spectrum presents a more elaborated structure, which is closely related to the shape of the redistribution function $R(\omega, \vec{n}, \omega', \vec{n}')$. In this work, we reconsider the modeling of collisional redistribution through a recently developed computer simulation method (Rosato in press). The power spectrum is written in terms of the dipole operator expressed in the Heisenberg picture. The latter is described as a linear response to the electric field related to the incoming photon, and collisions with neighboring particles are accounted for through an additive perturbation term in the Hamiltonian. We examine the redistribution of hydrogen line radiation in a selection of cases from astrophysics and laboratory plasma research. Calculations are performed and comparisons to already available models are done.

## References

Mihalas, D.: 1978, Stellar Atmospheres (W. H. Freeman, San Francisco).

Rosato, J. Collisional redistribution of hydrogen line radiation in low- and moderate-density magnetized plasmas, *Phys. Rev. E*, in press.