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Poster

RADIATIVE TRANSFER RECONSIDERED AS A QUANTUM KINETIC THEORY PROBLEM

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We revisit the radiative transfer theory from a first principles approach, inspired from the Bogoliubov-Born-Green-Kirkwood-Yvon (BBGKY) hierarchy of equations. The radiation field is described within the second quantization formalism. The density operator of the total (radiation-matter) system is expanded in a series involving correlations of successive orders between atoms. We focus on the lowest order in correlations and examine the role of coherence on the formation of spectral lines in optically thick media. As an illustration, we perform calculations of absorption lines in stellar atmosphere conditions. Emission lines in laboratory discharges (magnetic fusion) are also examined in a plasma diagnostic context. A link to partial frequency redistribution modeling is established.