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One-particle spectral function of Jellium from Path-integral Monte Carlo simulations

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Path-integral Monte Carlo (PIMC) simulations are a powerful tool for investigating the properties of dense plasmas in equilibrium, capable of providing exact solutions to the quantum many-body problem. However, being formulated in the imaginary-time domain, these methods only give direct access to imaginary-time correlation functions from which spectral information may be inferred. Carrying out this additional step for the density-density correlation function has e.g. led to the first ab-initio characterization of the dynamic structure factor for the warm dense uniform electron gas [1].

PIMC simulations involving open trajectories as realized by the worm algorithm [2] additionally permit the computation of the one-particle Green's function, the most fundamental object of many-body perturbation theory. Here we present our first results for the one-particle spectral function $A(k, \omega)$.

[1] Dornheim et al., Phys. Rev. Lett. 121, 255001 (2018)
[2] Boninsegni et al., Phys. Rev. E 74, 036701 (2006)

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