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P1.2021 X-ray absorption in plasma by one-photon stimulated bremsstrahlung with the exact consideration of Coulomb potential

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With the appearance of recent X-ray free electron lasers (FEL) [1], the stimulated bremsstrahlung (SB) process of electrons on plasma ions' scattering centres may provide a sufficient energy for plasma heating at the absorption even one-two photons [2], which makes the SB as one of the effective mechanisms for laser heating of a plasma with X-ray FELs.
In the present work the absorption process of X-ray quanta with energies above 5-10 keV (~Å wavelengths) in high temperature plasma with the high nuclear charge is investigated beyond the Born approximation. The coherent electromagnetic radiation field is considered by the perturbation theory. The quantum dynamics of X-ray absorption process at the electron-ion SB in maxwellian plasma is studied by the fourth-order adaptive Runge-Kutta method for absorption coefficient via inverse-bremsstrahlung mechanism with the exact consideration of the Coulomb field. The temperature dependence of the absorption coefficient is investigated numerically.
The present work extends the known analytical results of the paper [3] with the help of numerical simulations and evaluation of the bulk formulas containing, in particular, complex special (hypergeometric) functions. The obtained results can have practical significance for plasma heating, taking into account that XUV/X-ray laser beams of necessary frequencies at present are available at the Stanford and DESY Accelerator Centres.

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