Electron Scattering Properties in Dense Quantum Plasma of Neon

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Precise electron–atom scattering data are critically important for various applications, ranging from astrophysical plasma modeling to the development of plasma-based light sources and thermonuclear fusion technologies. Particular attention is given to electron collisions with neon atoms, which play a key role in gas-discharge lighting, diagnostic systems, and laboratory studies of plasma kinetics. Achieving a comprehensive theoretical description remains a challenging problem due to the combined influence of many-body quantum effects, exchange interactions, and long-range polarization forces. These factors highlight the continuing importance of accurate and universal approaches to studying electron–atom collisions, particularly in noble-gas plasmas, over a wide range of energies and physical conditions. In the present work, a convenient approach is applied to describe electron scattering by atoms through the construction of an optical potential in dense plasma, taking into account quantum nonlocality, electronic correlation effects, and screening phenomena. This potential simultaneously incorporates short- and long-range interactions, providing an accurate description of phase shifts and scattering cross sections across a broad energy range. Using this potential, phase shifts and scattering cross sections were calculated and analyzed, offering a comprehensive description of the scattering process under quantum plasma conditions. This research was funded by the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan (Grant No. AP19676689).