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Proceedings

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ELECTRON CAPTURE PROCESS IN THE DENSE SEMICLASSICAL HYDROGEN PLASMA

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In this work the collisions of the electron with hydrogen atom and proton were investigated on the basis of the effective interaction potentials taking into account screening and diffraction effects. The capture radii were determined. The time of the capture was determined as the time when electron moves within capture radius. The cross sections of the electron capture were estimated.

One of the elementary processes in the plasmas is the electron capture process, at the electron collisions with atoms or ions. Collision processes determine almost all properties of the plasma: its composition, thermodynamics, transport properties, electromagnetic properties, etc. Therefore correct and reliable research in this field at the level of the elementary processes is particularly important.

In this work the processes of electron capture by the atom or proton were investigated. Interaction between impacting electron and proton was considered on the basis of the effective interaction potential, which was presented in work [1]. Effective potential, which discribes the interaction of the electron with atom, was proposed in work [2]. These effective potentials take into account quantum-meechanical effects of diffraction at short distance and screening effects at large distance, also have finite values at the distances close to zero.

In this work results of calculation of the electron capture radius and interaction time of the electron with hydrogen atom and proton were presented. To determine the radius, time and probability of the electron capture Bohr-Lindhard method was applied. Using the electron capture probability, capture cross sections were calculated by the formula [3]:

$$\sigma_{cap} = 2\pi \int dbbP_{cap}(b), \qquad (2)$$

here $P_{cap}(b)$ is the electron capture probability. Also capture cross sections were investigated for different values of coupling and dense parameters. The capture cross sections of interaction of the electron with hydrogen atom and proton were compared.

References

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[3] D.-H. Ki, Y.-D. Jung, Formation of negative hydrogen ion: Polarization electron capture and nonthermal shielding, *Jour.Chem.Phys.***137** (2012) 094310