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Charge transfer in positronium-proton collisions: Comparison of classical and quantum-mechanical theories[1] HARINDRANATH AMBALAMPITIYA, University of Nebraska-Lincoln, DMITRY FURSA, ALISHER KADYROV, IGOR BRAY, Curtin University, ILYA FABRIKANT, University of Nebraska-Lincoln — Charge transfer in collisions of excited positronium with protons is calculated using the quantum-mechanical convergent close-coupling method and classical trajectory Monte-Carlo method. Both calculations produce the same dependence of the cross section on the center-of-mass collision energy and the principal quantum number in the initial state which is justified by analysis of classical and quantum scattering in a dipolar potential. However, the quantum cross section is systematically lower than classical one in absolute magnitude. To investigate the origin of this quantum suppression effect, we compare the charge transfer probabilities as functions of the impact parameter. We show that the quantum suppression in the cross section is mainly due to the low-impact parameter behavior of the probabilities governed by the quantum uncertainty principle.

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