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Wave generation in a rare gas low-voltage beam discharge. RUSTEM MATVEEV, VLADIMIR SUKHOMLINOV, Saint-Petersburg State University, ALEXANDER MUSTAFAEV[1], National Mineral-Resource University, NIKOLAY TIMOFEEV, Saint-Petersburg State University — The work is devoted to the theoretical study of the instability of a low-voltage beam discharge (LVBD) in rare gases for the Knudsen numbers of the order of 1, when it is necessary to use the kinetic approach to describe the processes occurring in the LVBD. The discharge in He is used as an example. Based on the solution to the system of kinetic equations for the distribution functions of the beam and plasma electrons and the Poisson equation, the instability of the LVBD is studied analytically and numerically taking into account the attenuation of the electron beam due to electron - atom collisions when the electron mean free path is of the order of the inter-electrode distance. It was found that at the loss of stability in the conditions in question the amplification of several waves with different growth rates is possible, and the waves propagate at different speeds. With a linear decrease in the beam intensity, two waves are generated; named “n” and “p”. The wave “p” having a smaller gain increment propagates at a higher speed. The indicated phenomenon is characteristic not only for the LVBD in rare gases, but for any system of a “cold” high-energy electron beam - plasma under conditions when it is necessary to take into account collisions between beam electrons and atoms.

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