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Thin luminous tracks during a nanosecond discharge in a nonuniform electric field

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The glow of a nanosecond diffuse discharge between two tips has been studied with a high spatial resolution. At atmospheric air pressure, as well as at pressures of 300, 100 and 30 Torr, a large number of thin luminous tracks were found, starting from the region of bright spots on the electrodes. It is shown that the shape of the tracks changes from straight lines to winding ones, and the direction of their movement in some cases changes to the opposite. It has been established that under the conditions of the formation of thin luminous tracks, the bands of the second positive nitrogen system dominate in the emission spectrum of a diffuse plasma with a sharply inhomogeneous electric field and a nanosecond duration of the voltage pulse. Using an ICCD camera, it was shown that the emission of tracks in the first tens of nanoseconds against the background of wide streamers and a diffuse discharge is not recorded. A hypothesis has been put forward to explain the appearance of numerous tracks during the breakdown of air in a nonuniform electric field.

Keywords: luminous tracks, nanosecond discharge, air, inhomogeneous electric field.

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