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Plasma Physics CC-6

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H.OD Physics

[#] Townsend's theory of collision ionization.

Based on the theory of collision of electrons with atoms, Townsend advanced the theory of collision by ionization which ultimately leads to the breakdown of the gas. Say two parallel plates, separated by a distance d one of which is the cathode is emitting electrons. Let n electrons crossing one square centimeter of a plane distant x from the cathode as the electrons are moving under the action of the applied electric field. In traversing an elementary volume of cross-section unity and thickness dx the number of ions produced by n electrons in the volume will be proportional to ndx and if dn is the number of ions produced

$$dn = \alpha n dx$$

if we neglect diffusion and recombination.