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Model Study of Breakdown in Long Tubes W.J.M. BROK, J.J.A.M. VAN DER MULLEN, G.M.W. KROESEN, Eindhoven University of Technology, EPG TEAM — The mechanisms responsible for the propagation of ionization waves that occur in a straight discharge tube during breakdown are studied by means of a fluid model. The discharge tube contains a gas mixture of argon at 3.0 Torr and saturated mercury vapour. The electrodes are heated to thermal emission temperatures. These conditions are similar to those found in fluorescent lamps. Firstly, operation at a dc applied voltage is investigated numerically and compared to experimental observations. Secondly, breakdown at a high frequency (tens of kHz) applied voltage is considered. It will be shown that during dc operation, the anode directed ionization wave charges the wall of the lamp and thereby shields it from outside influences on the electric field. When this wave reaches the anode, a conducting path is established between the electrodes. The subsequent cathode directed ionization wave increases the plasma density and redistributes the axial electric field towards the situation found in stationary operating discharges. During ac operation, depending on the frequency, these two processes alternate as the ionisation wave cannot cross the entire tube in a half-cycle of the applied voltage.

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