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Long-path breakdown in micro-discharges NIKOLA ŠKORO, DRAGANA MARIĆ, GORDANA MALOVIĆ, ZORAN LJ. PETROVIĆ, Institute of Physics, Belgrade, Serbia — We report results of our studies of the influence of long-path breakdown to the shape of Paschen curves in micro-discharges. It has often been postulated that any departure from the rapidly rising left hand side of the Paschen curve is an indication of field emission effects with little attention being paid to a possibility of the long path breakdown. For that purpose, we designed complex electrodes that facilitate the long-path breakdown in the left branch of the Paschen curve. Along with the measurements of the breakdown voltages, we recorded emission profiles with ICCD camera, in order to follow the exact path of the discharge. Diameter of the electrodes in our experiment was 2 mm, while the electrode gap was between 500 microns and 1 millimetre. Our results show that the long-path breakdown leads to the shape of the left branch of the Paschen curve, which is either flat or broadened to the lower pd-s. Quite often, this shape has been incorrectly attributed to the breakdown of the Paschen law even in standard dimension discharges. We have confirmed that when long path breakdown is possible the left hand side remains more or less constant as long as the effective d is not the minimal gap and has enough room to increase. Simulations indicate that when field emission is important the voltage continues to drop rapidly towards smaller pd.

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