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Simplified modeling of pulsed corona for dielectric design of high-voltage devices SERGEY PANCHESHNYI, THOMAS SCHEFER, ABB Corporate Research, Switzerland — Physics-based modeling of discharges in insulating gases (air, SF6, CO2, etc.) is required for quantitative prediction of withstand voltages of high-voltage devices. Breakdown of not very long gaps at elevated pressures occurs typically by streamer (or spark) mechanism. Glow or streamer corona can delay the inception of breakdown streamers. This is often attributed to the so-called corona stabilization effect that is lowering of electric field close to the stressed electrodes due to corona space charge. However, compared to corona-less streamer breakdown of short gaps at elevated pressures, breakdown voltages are typically lower if corona starts. Direct simulation of discharges are often computationally costly, especially for 3D cases, and simplified engineering approaches are developing. Such models are then used for prediction of the "worst-case scenario", which might lead to breakdown of gaseous insulation in real design. The engineering models used for simulation of corona inception and development for different voltage shapes (DC, AC, pulsed) will be discussed for several geometries, including rod-plane case and electrode-less inception near a dielectric surface.

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