HVDC Insulator Charging in SF6 Insulated Systems — Ueli Straumann\textsuperscript{1}, Uwe Riechert\textsuperscript{1}, Robin Gremaud\textsuperscript{2}, Michael Schüller\textsuperscript{3}, and Christian M. Franck\textsuperscript{3} — \textsuperscript{1}High Voltage Products, ABB Switzerland Ltd. — \textsuperscript{2}Corporate Research, ABB Switzerland Ltd. — \textsuperscript{3}Power Systems and High Voltage Laboratories, ETH Zurich, Switzerland

To decarbonize our societies, electricity production from renewable sources is rising across Europe. It is widely expected that the integration of these renewables will be accompanied with a large increase of HVDC installations. For the latter, the utilization of gas insulated (GI) systems is becoming attractive, particularly as they require less space than air insulated systems, similar to the situation of gas insulated switchgear (GIS) in the case of AC.

When adapting AC GIS for DC application, one of the main challenges might be the insulators, which, under DC voltage, are charged, potentially leading to dielectric stresses differing considerably from those under AC. The temperature dependent electric conductivity of the solid insulation as well as ions from the gas deposited on the insulators surface determine the electric field under DC conditions.

To be able to assess the role of the ion-currents charging the insulator surface, the ion production rate and their drift in the electric field have to be determined. These ions are generated by natural radiation and, in the case of excessive field strengths, by collision and field emission. Measurements show that such insulator charging may be simulated fairly well by means of the discontinuous Galerkin Method.

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