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Control Grid Testing For Optimized Lifetime In MHVDC Breaker[1] DARRYL MICHAEL, DAVID SMITH, JASON TROTTER, GE Global Research — In a related paper in this conference, work is reported describing the interruption phase of a Medium High Voltage (MHV) DC Breaker driven by a thermionic hollow cathode. When a fault in the DC grid is detected, circuit interruption occurs by driving the third electrode (Control Grid) of the plasma switch rapidly (less than 1μs) to a negative potential. The rapidly formed Child-Langmuir sheath near the grid surface and in the apertures repels the energetic electrons and absorbs the ions. The incident ions, which have the same potential energy as the negative bias, could cause damage to the grid by sputtering. In prior work, we achieved maximum interruption current density of 5 A/cm2 but through use of thermionic cathode and control grid design we expect to achieve significantly higher current densities. We describe the design and operation of a test apparatus that facilitates the use of specially fabricated demountable grids with varying geometries (grid thickness, aperture diameter and separation) that will be exposed to interruption current densities as high as 10A/cm2 for 30,000 cycles. The grids are analyzed for sputtering loses. The data is used to design the optimum grid geometry that meets the program lifetime goal for breaker operation of 30 years.

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