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Fri-Af-Po.11-07: Development of Paschen-tight Insulation Repair for Complex Geometries for the ITER CS Modules

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General Atomics (GA) is fabricating seven ITER Central Solenoid Modules (CSM) for the ITER Organization (IO). As part of the fabrication process, all CSMs undergo factory acceptance testing (FAT) prior to shipment to the IO. The FAT includes Paschen testing the CSMs up to 15kV between 1e-3 and 100 mbar. During post-cooldown Paschen testing of CSM6, there was a fault on one of the terminal breakout locations which would require a repair. This location of the fault consisted of complex geometry that required development of advanced insulation repair methods to return the module to Paschen-tight condition.

Successful insulation repairs require sufficient compression to achieve a Paschen-tight seal of the applied insulation to the underlying surfaces. Typically for circumferential shapes, compression is achieved utilizing shrink tape or silicone tape wrapped around the perimeter. The complex geometry of CSM6 required research into other compression methods including vacuum bagging, expanding foam, and externally pressurized bladders of complex shapes. Multiple test articles were created to replicate the shape of the fault area and repair methods were developed and Paschen tested to 30kV from 1e-3 to 100 mbar.

This paper will discuss the development of the qualified repair process for the complex fault location of CSM6, and present to the magnet community the lessons learned from that development.

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