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Mon-Mo-Or3-03: Use of Silicon Carbide Varistors For Quench Protection of Superconducting Magnets in Cryogenic Environments

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The use of silicon carbide varistors for quench protection of superconducting magnets has previously been reported [1], where the varistor unit is external to the magnet in a room temperature environment. Here it has been demonstrated that, in comparison to similar linear resistors, the varistor has beneficial effects in both limiting the magnitude of clamping voltages as well as limiting the temperature of hotspots in superconducting elements, through an accelerated discharge time.

This piece of work now considers how silicon carbide varistors may be applied to superconducting magnets, whereby the dump resistor is located inside the cryogenic system. Typical electrical characteristics of the varistors at room and cryogenic conditions are presented and the benefits of using silicon carbide varistors as a replacement to traditional metallic resistors, commonly used in these applications, is then discussed. These benefits include a device with a higher failure energy (for a comparable footprint size) as well as having a preferred short circuit failure mode.

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