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Test Results of Alternative Magnet Technologies for HTS Magnet Quench Detection and Protection

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The main challenges to implementing HTS in ultra-high field are management of stress and quench, due to intrinsic strain limits and lower normal zone propagation velocities than LTS magnets. While Bi-2212 magnets can be considered comparatively easier to protect than ReBCO coils due to Bi-2212's more moderate margin and high silver stabilizer fraction, quench management is critical when moving towards larger volume magnets with higher stored energies. While evaluating the mechanical and quench limits of several Bi-2212 test solenoids including one wound from Rutherford cable, we implemented alternative quench management methods. Among these were the installation of capacitance sensor arrays for rapid heat/quench detection, implementing varistor energy extraction to validate predicted improvements to quench protection, as well as demonstrating the benefits of Rutherford cable solenoids for rapid detection and protection (lower inductance and voltage tap section length). An analysis of the quench data from these test coils will be presented.

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