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Quenching HTS Pancake Coils using Frequency Loss Induced Quench Protection System.

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We have been developing the Frequency Loss Induced Quench (FLIQ) protection system for high-temperature superconducting magnets. We have studied the sensitivities of the various FLIQ system parameters to understand the design of an effective quench protection system. FLIQ drives AC current in the magnet coil and generates AC losses. The heating associated with the losses quenches the HTS magnet safely. This distributed heating of the magnet will cause the field energy to dissipate over the entire volume of the magnet to minimize peak hot spot temperatures and compensate for the thermal margin caused by the normalized region.

Due to the uncertainty and complexity of AC Loss calculations during the quenching process at high frequencies, we conducted a series of tests of the FLIQ system on 2G HTS pancake coils in liquid nitrogen to study the dynamics of quench and the energies involved in the quenching process. Liquid nitrogen boil-off measurements were used to measure the heat energy deposited. The paper will present the experimental results and an analysis of the results concerning the FLIQ design parameters.

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