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# Fri-Af-Po.01-06: A Quench Detection Method for HTS Magnets Based on Fiber Optic Michelson Interfering Principle

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High temperature superconducting (HTS) magnet is only option for applications of high magnetic field above 20 T due to high upper critical magnetic field at low temperature. However, the quench detection is challenge for HTS magnet since its low quench propagation velocity coming from low thermal conductivity and wide operation range of temperature. In this paper, we propose a novel quench detection method based on Michelson interfering principle. There are two arm, one arm optical fiber was co-wound with HTS tapes and the other path, so called reference arm, has same length with co-wound optical fiber and locates outside of HTS magnet in bath cooling with constant temperature environment. The laser emits light which is transmitted through a fiber splitter to two arms, that is, the measuring fiber arm and the reference fiber arm. The two beams of light interfere and form interfering intensity which is detected by potoelectric conversion device. The interfering effect associates closely with optical path difference coming from two arms since the refractive index of optical fiber depends on temperature. Since the reference arm locates in constant temperature environment, the measuring arm has same temperature with HTS magnet. While the temperature in HTS magnet rises, although the refractive index of optical fiber in reference arm keeps constant since it in constant temperature so that its optical path also keeps constant, the refractive index of co-wound optical fiber changes so that the optical path difference between two arms creates and the intensity of interfering occurs. Then, the magnets temperature rise is reflected by the phase difference change of the interference light from two arms. The experiment is performed in liquid nitrogen temperature. The results show that the proposed method has the significant advantages of fast response, high accuracy and immunity from electromagnetic interference compared to conventional techniques, which is potential for bottleneck of quench detection for HTS magnet.

**Authors:** HAO, Mengyuan (State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University); WANG, Yinshun (State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University)

**Co-authors:** PI, Wei (State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University); ZHU, Lingfeng (School of Mechanical Engineering, University of Houston)

**Presenters:** PI, Wei (State Key Laboratory of Alternate Electrical Power System with Renewable Energy Sources, North China Electric Power University); ZHU, Lingfeng (School of Mechanical Engineering, University of Houston)

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