



Contribution ID: 1180

Type: Regular 15 minutes Oral Presentation

## Quench detection via Rayleigh backscattering interrogated optical fibers

Tuesday, 29 August 2017 11:00 (15 minutes)

The application of high temperature superconductors for the generation of high magnetic field is still limited by technical issues like quench detection. A novel quench detection technique is developed using Rayleigh backscattering interrogated optical fibers (RIOF). In particular, the technique is based on the comparison of Rayleigh backscattering signals of a reference and perturbed state. A spectral shift quantifies the mismatch between the two conditions, which depends on temperature and strain changes between the two compared states. Several HTS coils have been fabricated, instrumented and tested. Results show that RIOF is a viable choice for quench detection. In addition to demonstrating that the system works as a detector of normal zones, strain, the experiments also show the different advantages of the fiber optic system over a conventional voltage based one. In particular, optical fibers are co-wound with HTS wire using different integration schemes. Experiments at temperatures as low as 4.2 K have been performed and show that RIOF is operable at 4.2 K with no fundamental differences relative to higher temperature operation. The combination of high spatial resolution and high speed allows for rapid detection and localization of hotspots. Additionally, RIOF allows for a fine calculation of the instantaneous normal zone propagation velocity as a function of time, along with the normal zone size as a function of time. These capabilities, along with a deeper understanding of the minimum propagating zone (MPZ), enable the use of a criterion based on the MPZ to identify unstable (propagating) normal zones, instead of the conventional threshold voltage.

### Submitters Country

United States

**Primary author:** SCURTI, Federico (NCSU)

**Co-authors:** Dr STRAKA, Weston (NC State University); SCHWARTZ, Justin (NC State University)

**Presenter:** SCURTI, Federico (NCSU)

**Session Classification:** Tue-Mo-Or15

**Track Classification:** G1 - Quench Detection and Protection Systems