



Contribution ID: 256 Contribution code: WED-PO2-718-10

Type: Poster

## Screening current simulation of REBCO pancake coils considering coil deformation

*Wednesday, 17 November 2021 10:30 (20 minutes)*

Several ultra-high magnetic field ( $>20$  T) REBCO magnets are under development for fundamental research or practical applications. A few quench protection techniques, such as a no-insulation winding technique and a temperature rise technique by heaters, were proposed to protect REBCO magnets from thermal runaway and burning-out. Meanwhile, it was reported that REBCO tapes were plastically deformed after ultra-high magnetic field generations. A main research topic on magnet protection have shifted from thermal to mechanical damages. Hahn, et al. pointed out a locally concentrated stress due to screening currents. Last year, it was also reported that the screening current was reduced because of coil deformation. On the development of ultra-high magnetic field REBCO magnets, the importance of screening current and stress simulation increases.

We have developed an electromagnetic and deformation simulation tool; combining an extended partial element equivalent circuit (PEEC) model as a screening current and a finite element method (FEM) as a deformation simulation. Using the developed simulation tool, we will investigate the screening current and stress behaviors of LBC3 magnets, which generated 14.4 T inside an external resistive magnet generating 31.1 T. When considering the coil-deformation effect on the screening current, the screening current distribution differs from that without consideration of coil-deformation effect. We will also try to simulate the MIT 1.3-GHz HTS/LTS magnet. Finally, we will investigate a cause of plastic deformation of REBCO tapes.

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**Session Classification:** WED-PO2-718 Design and Analysis I