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Quench protection of a large aperture 15 T Cable Test Facility Nb₃Sn Magnet

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In the framework of a joint collaboration funded by US Department of Energy (DOE), a large bore “Cable Test Facility Magnet” is under development. This is a joint effort between the Office of High Energy Physics (HEP) and the Office of Fusion Energy Sciences (FES). A 15 T Nb₃Sn dipole magnet is being developed at Lawrence Berkley National Laboratory (LBNL). The magnet will produce the background field needed test advanced superconducting cables and inserts in large field. The test facility will be located at Fermi National Accelerator Laboratory, that is also developing the cryostat.

Due to the large field and stored energy (> 12 MJ), the quench protection is one of the challenges of the magnet design. In this paper we present how an active protection system based on dump resistor can keep the magnet hot spot temperature within Nb₃Sn limits, and peak voltages within insulation sustain level, and how a CLIQ unit can be used in order to make the system more robust, efficient and redundant. We show also how the magnet interact with inserts during a quench.

Primary authors: MARINOZZI, Vittorio (FNAL); KOSHELEV, Sergey (Fermi National Accelerator Laboratory); VELEV, Gueorgui (FNAL); ARBELAEZ, Diego; KASHIKHIN, VLADIMIR (Fermilab); Mr NIKOLIC, Vladica (Fermi National Accelerator Laboratory); ORRIS, Darryl (Fermi National Accelerator Laboratory); PRESTEMON, Soren; SABBÌ, GianLuca (LBNL); GALT, Artur (Fermi National Accelerator Laboratory (FNAL))

Presenter: MARINOZZI, Vittorio (FNAL)

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