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## 24kA DC Energy Extraction Switch for LARP Magnet Testing at BNL

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Abstract: The high luminosity upgrade of the Large Hadron Collider (LHC) at CERN will consist of Nb<sub>3</sub>Sn based superconducting magnets operating at about 22kA DC. When these magnets quench, the power source has to be disconnected and stored energy should be discharged into a dump resistor very quickly. For this purpose, a 24kA DC current interruption switch based on Insulated Gate Bipolar Transistors (IGBT) has been developed. As opposed to Thyristor or mechanical switches which take milliseconds to interrupt the current, an IGBT based switch interrupts the current in microseconds. The switch is realized by paralleling twelve 3600A IGBTs. Paralleling of high current IGBTs made from different batches of silicon and of different voltage ratings is a challenging task. This paper discuss techniques developed to synchronize the turn off of twelve 3600A IGBTs made by Infineon Inc. Techniques developed pertain to gate charge control, snubber design, steady state and transient current sharing, stray inductance and thermal management.

Index Terms- LARP, LHC, IGBT, Quench

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