MT25 Conference 2017 - Timetable, Abstracts, Orals and Posters



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Indirectly cooled superconducting power supply for the CMD-3 thin solenoid

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A thin superconducting solenoid is used to provide magnetic field in the CMD-3 particle detector. For power supply of the solenoid a superconducting fullwave AC/DC rectifier is designed. The rectifier is a current stepup superconducting transformer with two thermally controlled superconducting switches connected to its secondary windings. The CMD-3 solenoid is indirectly cooled, so the indirect cooling method is used for the rectifier. The transformer and switches are mounted on the outer surface of the stainless cylindrical vessel. They face the protection vacuum of the CMD-3 cryogenic system. The vessel is filled with liquid helium, so the rectifier is cooled via thermal conductivity of the vessel's wall. Placing the rectifier outside of the liquid helium bath allows avoiding the use of vacuum tight high current connectors for current leads from the rectifier to the solenoid. The rectifier is designed to provide charging the solenoid, long-term magnetic field stabilization and discharging the solenoid. At the bench tests with dummy coil the rectifier output current up to 1600 A had been achieved. The solenoid operational magnetic field is 1.3 T with 860 A current. The rectifier charges the solenoid to this field within 7 hours. Achieved long-term stability of the field is $2 \times 10-5$ T. The rectifier has been demonstrating good reliability since 2010, when the magnet system of the CMD-3 had been commissioned. Design, test results and performance of the rectifier are reported here.

Submitters Country

Russia

Author: KARPOV, Sergey (Budker Institute of Nuclear Physics)

Co-authors: Dr BRAGIN, Alexey (Budker Institute of Nuclear Physics); Mr RUBAN, Alexander (Budker Institute of Nuclear Physics); Mr POPOV, Yuri (Budker Institute of Nuclear Physics)

Presenter: KARPOV, Sergey (Budker Institute of Nuclear Physics)

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