Superconducting Magnet System for the COMET experiment

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The COMET experiment (J-PARC E21) [1] aims at searching for coherent neutrino-less conversion of a muon to an electron. Facility construction has begun at J-PARC. A pulsed negative-charged muon beam with the high intensity of 10^{11} μ^-/sec is mandatory to achieve sensitivity in branching ratio at a level of 10^{-16}. The unprecedented intense muon beam can be realized by using high intensity proton beam at J-PARC and newly-developed superconducting magnet system.

The experiment requires large superconducting solenoid system that consists of pion capture solenoid and curved solenoid for pion decay / muon transport. The capture solenoid encloses a target to maximize acceptance to trap pions emitted in the strong magnetic field of 5 T. The neutron irradiation generated by the target causes various influences to the capture solenoid magnet. One of the major issues is degradation of thermal conductance causing the degradation of cooling of the coil. The analyses and the design that accommodate the irradiation were performed. The concept of the superconducting magnet system with radiation tolerance in the COMET experiment and also the design of the solenoid system including the analyses associated with the neutron irradiation will be presented.

References

[1] The COMET Collaboration, "Conceptual Design Report for Experimental Search for Lepton Flavor Violating $\mu^-N \rightarrow e^-N$ Conversion at Sensitivity of 10^{-16} with a Slow-Extracted Bunched Proton Beam (COMET)," KEK Report 2009-10 (2009).