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## Thermal analysis of the cold mass of the 2 T solenoid for the PANDA detector at FAIR

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The superconducting solenoid of the PANDA experiment at the Facility for Antiproton and Ion Research (FAIR) in Darmstadt, Germany, is designed to provide a magnetic field of 2 T over a length of about 4 m in a bore of 1.9 m. To allow a warm target feed pipe oriented transversely to the solenoid axis and penetrating through the cryostat and solenoid, the magnet is split into 3 inter-connected coils fitted in a common support cylinder. During normal operation, cooling of the cold mass to the working temperature of 4.5 K will be achieved through the circulation by natural convection of two-phase helium in cooling pipes attached to the Al-alloy support cylinder. Pure aluminum strips glued to the inner surface of the three coils and thermally bonded to the cooling pipes allow minimizing the temperature gradient across the 6-layers coils.

The thermal design of the cold mass during normal operation and current ramps up and down is validated using analytical approximations and numerical simulation.

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