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Design and calculation of the 4Pi-Continuous-Mode-Target current leads

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The new concept of the "4π-Continuous-Mode-Target" will allow for the first time the simultaneous usage of a large angular acceptance detector with a continuously polarised target. For polarising a target the process of Dynamic Nuclear Polarisation (DNP) is used which requires low temperatures and a high homogeneous magnetic field within the target volume. A thin, superconducting magnet as a part of the new horizontal cryostat creates a longitudinal magnetic field of \SI{2.5}{\tesla} with a field homogeneity of 10^{-4}. Since the internal superconducting magnet is operated with a high direct current there has to be two current leads for connecting the magnet terminals found in the low temperature region to the power supply located at room temperature. Due to \emph{Fourier's Law} and joule heating a current lead can be a large heat load on the magnet and the cryostat. As the magnet is operated near its critical parameters, it is important to reduce the heat flux to the superconducting wire to an absolute minimum. The geometry of the normal conducting part of these current leads has been adapted to the cryostat requirements and has been optimised to minimise the heat load. A FEM calculation has been additonally used to check the fulfillment of the requirements.

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