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A complete magnetic design for the DUNE ND-GAr solenoid magnet

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The Deep Underground Neutrino Experiment (DUNE) at Fermilab is one of the most challenging next-generation experiments in the field of neutrino physics. It will feature two detectors for a detailed study of neutrino oscillations using an unprecedentedly intense neutrino beam. The two detectors are a Near Detector located on the Fermilab site, 574 m away from the neutrino generation, and a Far Detector in South Dakota, 1300 km away. Among the three elements of the Near Detector, designed for the best understanding of the neutrino beam and neutrino interactions on argon, ND-GAr is a High-Pressure gaseous Argon TPC surrounded by a calorimeter, in a 0.5 T magnetic field. The needed magnetic field is transverse to the neutrino beam direction and the solenoid will have a 7 m diameter, 8 m long warm bore. To minimise the material budget along the particle path a thin superconducting solenoid with a partial yoke has been designed. The design of this magnet is tightly bonded with the mechanics of the detector, resulting in an unprecedented design. In this paper we present the up-to-date magnetic design and a detailed study for the mechanical integration for this magnet.

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