

## Abstract

Scattering experiments with polarized targets and beams are necessary to check the present models and to achieve a better knowledge of the nucleon structure. The development of the frozen spin target technique has opened the possibility to use a polarized target with high density of polarized nucleons in combination with a particle detector with nearly  $4\pi$  solid angle. Thus, high luminosity experiments, even with low intensity beams, can be performed. The frozen spin target at MAMI uses a thin, superconducting holding coil inside the refrigerator to keep the polarization with a relaxation time in the order of 1000 hours. After a measurement period of approximately one week the detector or the target has to be changed and the target material has to be re-polarized in a strong superconducting magnet. This leads to a loss in beamtime and overall efficiency. To allow a continuous operation of the target, the theory and design of a 10 layer notched internal superconducting solenoid of length 13.6 cm and radius 2.4 cm is described. Calculations of the magnetic field inside the solenoid are summarized. The simulated results show that it is possible to attain a magnetic field of 2.5 T with homogeneity of  $10^{-4}$  at the target region.