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Some Magnetic Properties of LASS with iron wedge

L. Keller and P. Bosted

Abstract

Calculations using MERMAID show the magnetic field distributions of the LASS magnet with a 1.4 m long wedge, for a variety of currents.

1 Bdl versus Current

Fig. 1 shows the integrated vertical component of the magnetic field as a function of current (in kA turns) for the LASS dipole with the E160 iron wedge inserted (140 cm long, flaring from 60 cm wide at the front to 80 cm wide at the back). The curve rises very steeply up to about 50 kA, then more slowly up to 475 kA (the practical maximum available from a single 1.5 mW supply in building 108). This shows that with a slight reduction in resolution for E160 and E161, a large saving in power costs could be obtained.

2 By versus z for different currents

Fig. 2 shows the vertical component on the magnetic field, on the beam axis, as a function of distance from the magnet center. The fringe field drops off more rapidly than the central field. Going from 475 kA to 93 kA, the fringe field drops about a factor of three, while the central field only goes down about 20%. For E160, this means that the front detectors can be placed closer to the mirror plate, allowing better resolution. For E161, it means that the polarized target magnet can be closer to the up-beam mirror plate, which allows for a better solid angle coverage. For example, if the criteria is that the field should be below 5 G, then the magnet can be about 50 cm from the mirror plate at 93 kA, but must be about 100 cm from the mirror plate at 475 kA.

Fig. 3 is the same as Fig. 2, except at $y = 10$ cm. The conclusion is that the fringe field has no appreciable dependence on y, comparing 0 and 10 cm. These data can also be used to calculate the axial force on the E161 polarized target solenoid.

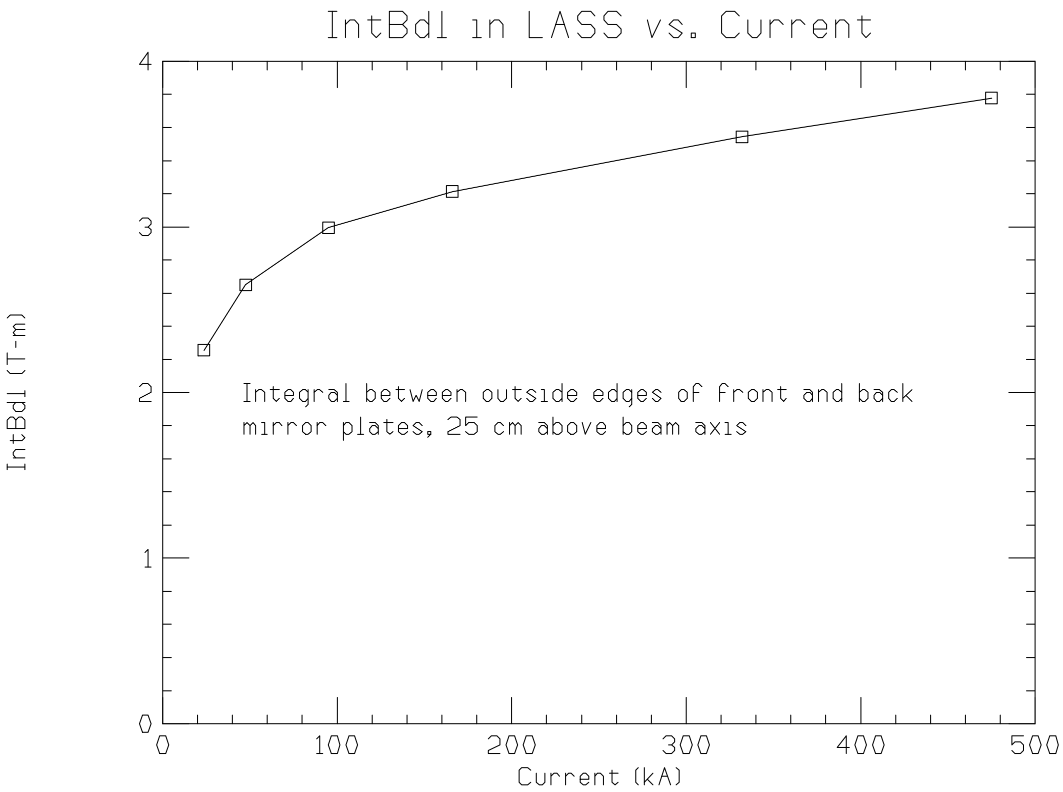

Figure 1: Bdl versus current.

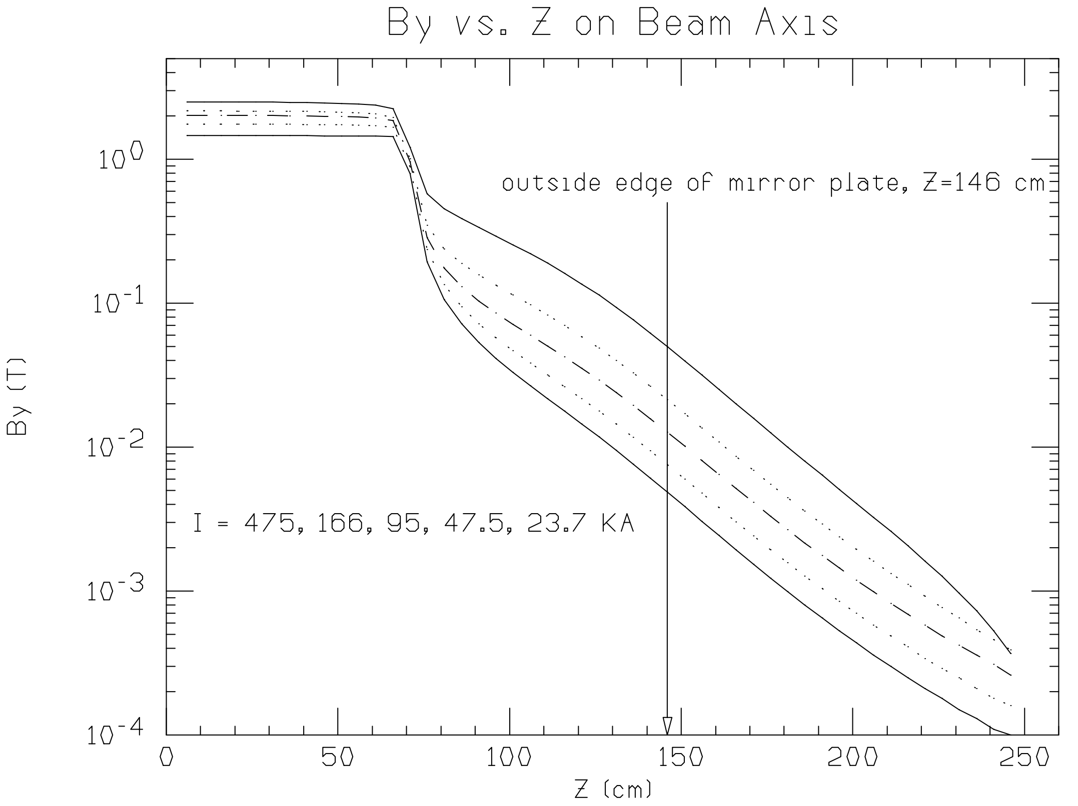

Figure 2: By versus z for $y = 0$ and selected currents.

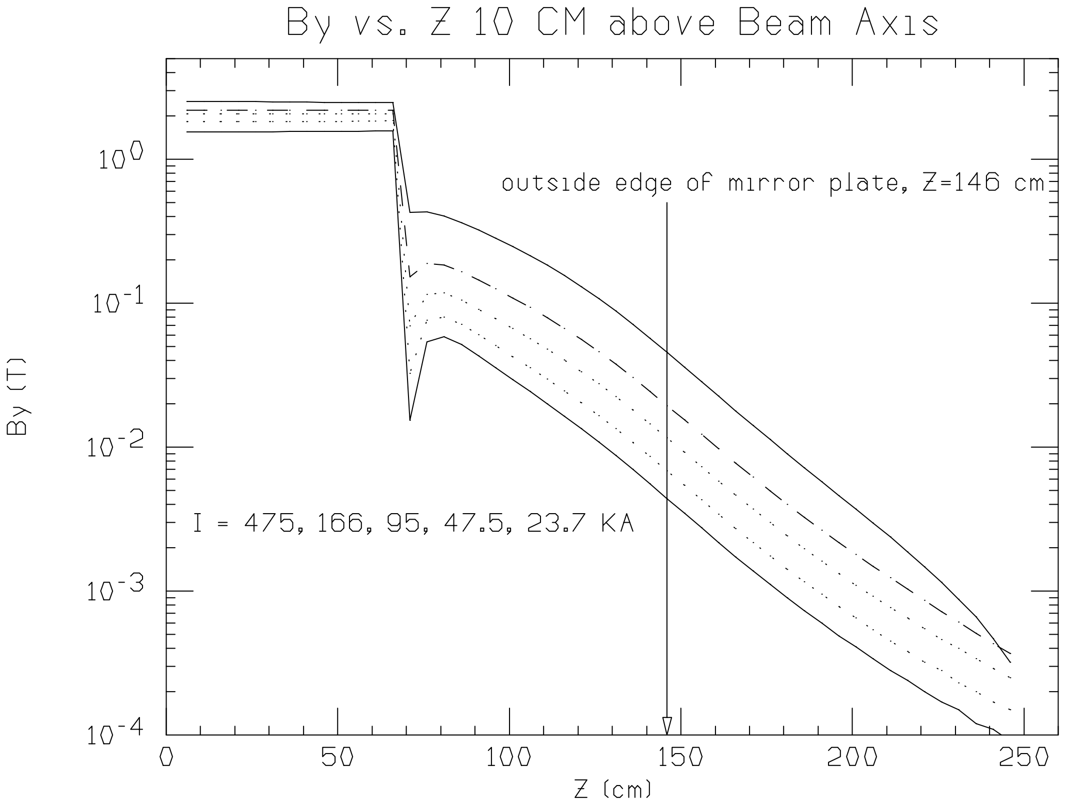

Figure 3: By versus z for $y = 10$ cm and selected currents.