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ACCELERATOR DEPARTMENT
Informal Report

SMALLER QUADRUPOLES FOR ISABELLE

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ABSTRACT

Smaller quadrupoles are studied for use in the experimental insertions of ISABELLE. The reduction in size is obtained by reducing the maximum field gradient. A 40 kG/cm quadrupole will allow the distance between the two beams to go down to 22.8 cm.

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MASTER

According to M. Month, the beam separation at the quadrupoles in the experimental insertions will be about 22.8 cm. This will require quadrupoles which are no more than 22.8 cm in their outer diameter. The quadrupoles in the normal cell will be about 30.4 cm in outer diameter. One way to reduce the size of the quadrupoles is to reduce the maximum field gradient, and to compensate for this by increasing their length. The primary reduction in size comes from the reduction in the thickness of the iron shield.

Computer studies show that the required iron shield thickness as a function of the maximum field gradient is given by the following table:

Maximum Gradient (kG)/cm	6.67	4	3
Iron Shield Thickness (cm)	7.	3.8	2.8
Outer Diameter of iron (cm)	30.4	22.8	20.4

The criterion used in choosing the thickness of the iron shield was to require the field in the iron, at the outer edge, to be no more than about 20 KG so that the leakage field is no more than about 400 G.

Figure 1 shows the 4 kG/cm quadrupole which has an outer diameter of 22.8 cm. The coil thickness has been reduced from the 0.67 in. of the normal cell quadrupoles to 0.4 in. According to W. Sampson, the coil thickness may be reduced even further, and scaled more like the square of the field rather than linearly. Another possible reduction in space is the space between the vacuum tank and the coils which has been held constant here at 2 cm.

Fig. 1. 4 kG/cm Quadrupole