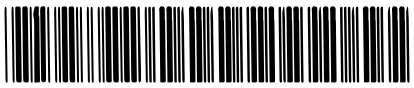


ISR-BOM/SP/ml

1.10.1982

ISR PERFORMANCE REPORT

Compensation of the magnetic fringe field

During the MP 1290 on 7.9.1982, the efficiency of the fringe field compensation by backleg windings was measured as well as the fringe field of magnet unit F662 and its increase due to the fringe field from ring 1.

1. Compensation of the fringe field by backleg windings

The magnet units of ring 2: F662, D658, D654 and F650 were equipped with backleg windings with the following number of turns (based on the measurement of the field change due to fringe field from ring 1 performed on 24.5.1982):

F662	14	turns
D658	6	"
D654	3	"
F650	3	"

These windings were connected in series and connected to a d.c. power supply of 55 A, 100 V. A probe (Teslameter) was placed into the gap of each unit to measure the magnetic field.

The current in R2 was set to 76.5% which corresponds to 26.588 GeV and the current in R1 was increased from 0 to 100%. Then the current in R2 was increased to 100% i.e. 31.41 GeV/c and the field in R1 was again increased from 76.5% to 100%.

When increasing the current in R1 the field errors in the magnets of R2, created by the fringe field from R1 were compensated by adjusting the current in the backleg windings. Table 1 summarises the currents needed in relation to the current in the R1 magnets. In addition, by cycling the backleg windings between 0 and 20 A, it was verified that there was no hysteresis efect. The compensation coefficient is 23.8 AT Gauss^{-1} at 26.588 GeV/c and 30.8 AT Gauss^{-1} at 31.41 GeV/c. Compared to the correction windings the backleg windings are not as efficient.

Table 1

	R1 at I =						R2 at
	75.5 26.588	78.4 27.0	81.1 27.8	87.1 29.0	91.95 30.0	100 % 31.41 GeV/c	
I comp	-	2.04	2.9	5.1	7.0	10.2	26.588 GeV/c
(A)	-	2.3	3.8	8.9	13.0	20.0	31.41 GeV/c

With the results of these measurements, estimates concerning cost and installation were made, which will not be reported, but in order to give some indication a few considerations are given.

The maximum current should not be more that 10 A, and for reasons of simplicity the cross-section of the winding should not be bigger than 6 mm^2. With these limits, the number of turns per intersection and ring would be 55 for both the F-blocks and the D-blocks. This gives a total conductor length of about 612 m per intersection or 4900 m for one ring, not including the 2300 m long interconnecting cable. The cross-section of the interconnecting cable and the conductor for the backleg windings would have to be chosen to stay within practical limits for the power supply.

2. Magnetic shielding

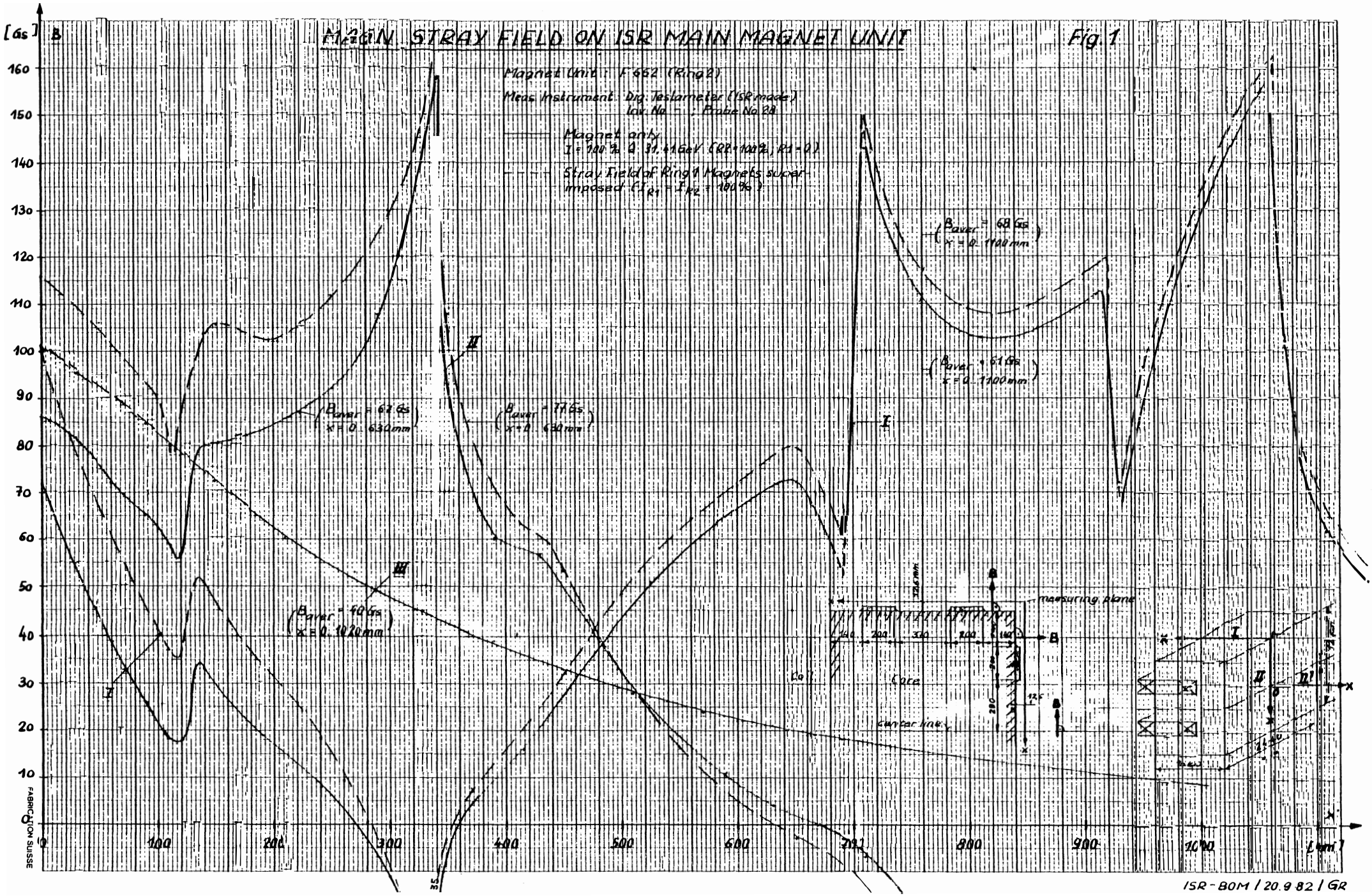
In order to make estimates about the shielding requirements the fringe field was measured on unit F662. The relevant results are given in Fig. 1. One can see that the fringe field from the other is ring is maximum 25 % to 30 % of the fringe field from the magnet unit proper.

Based on these measurements, the amount of shielding needed was estimated. Assuming one would shield 5 blocks per intersection and ring, 37 tons of 1.5 mm thick iron sheets would be needed.

The shielding would decouple the two rings but would change the field of the shielded units. This error would have to be corrected by the correction windings. The size of the correction can only be determined by another set of measurements on a shielded unit. However, one can already see that the correction would have to be about three times bigger than that needed to correct the fringe field from the other ring.

Considering the amount of iron sheets needed, the work involved, and the need for additional correction, this solution does not seem very practical.

H. Grabner and S. Pichler



ISR-BOM / 20.9.82 / GR