BROOKHAVEN NATIONAL LABORATORY
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Upton, New York

ACCELERATOR DEPARTMENT
Informal Report

COMPUTED AND EXPERIMENTAL RESULTS FOR THE 14-IN. MODEL

G. Parzen

February 10, 1972

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INTERSECTING STORAGE ACCELERATOR NOTES

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There is at present a disagreement between the computed results using the GRACY program and the measured results for the 14-in. model bending magnet. The calculations have been repeated by G. H. Morgan using the LINDA program. Although LINDA has some trouble in computing the absolute values of the multi-poles, b_n , it appears able to compute the change in b_n , Δb_n , due to iron saturation as the field goes from 0 to 40 kG.

The results of GRACY, LINDA, and experiment are compared in Table I. The good agreement between LINDA and GRACY would seem to rule out the possibility of errors in the computer programs. LINDA and GRACY are very different programs, and it is unlikely they would give essentially the same answer unless the results found are the correct solution of Maxwell's equations.

One is left with the possibilities that there is an error in the input to the programs, such as the B- μ table, or there is something physically going on which is not understood.

An apparently promising possible explanation is an error in the B- μ table in the vicinity of B = 21 kG. All three discrepancies between computed and measured results, the change in b_2 and b_4 at 40 kG, the leakage field at 40 kG, and the B vs NI result at 40 kG may all indicate that the actual value of μ near B = 21 kG is considerably more than was measured by McInturff and Claus.

More detailed experimental measurements on the 14-in. model seem very desirable.

Distr.: HE S&P at Physics
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TABLE I. Δb_n is the change in the multipole coefficients as the field goes from 0 to 40 kG. B_{leak} is the leakage field at the outer iron shield surface on the median plane. I/I_∞ is the fraction more current required to obtain 40 kG, due to saturation of the iron.

	GRACY	LINDA	Experiment
$\Delta b_2/10^{-3}$ (in. $^{-1}$)	-4.15	-4.94	Small
$\Delta b_4/10^{-3}$ (in. $^{-4}$)	-2.9	-2.60	~ 0.55
B_{leak} (G)	1350	1350	400
I/I_∞	1.07	1.07	1.03
$\Delta b_6/10^{-3}$ (in. $^{-6}$)	-0.32	-0.3	-
$\Delta b_8/10^{-3}$ (in. $^{-8}$)	0.056	0.05	-