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SEXTUPOLE COMPARISON OF BENDING-MAGNET STEELS

E. Malamud and C. Schmidt

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Measurement of the sextupole field for the various steels considered for use in the main-ring magnets has been obtained.

The measurements were done with the aid of the magnetic-field measuring system. Two coils separated by 3/8 inch and connected to buck each other provided a voltage output from an integrator proportional to the field gradient. A second coil fixed in the magnet provided the B_o value. As the magnet was pulsed, values of B_o and dB/dX were obtained for a number of values of B_o at several points on the median plane. The sextupole field

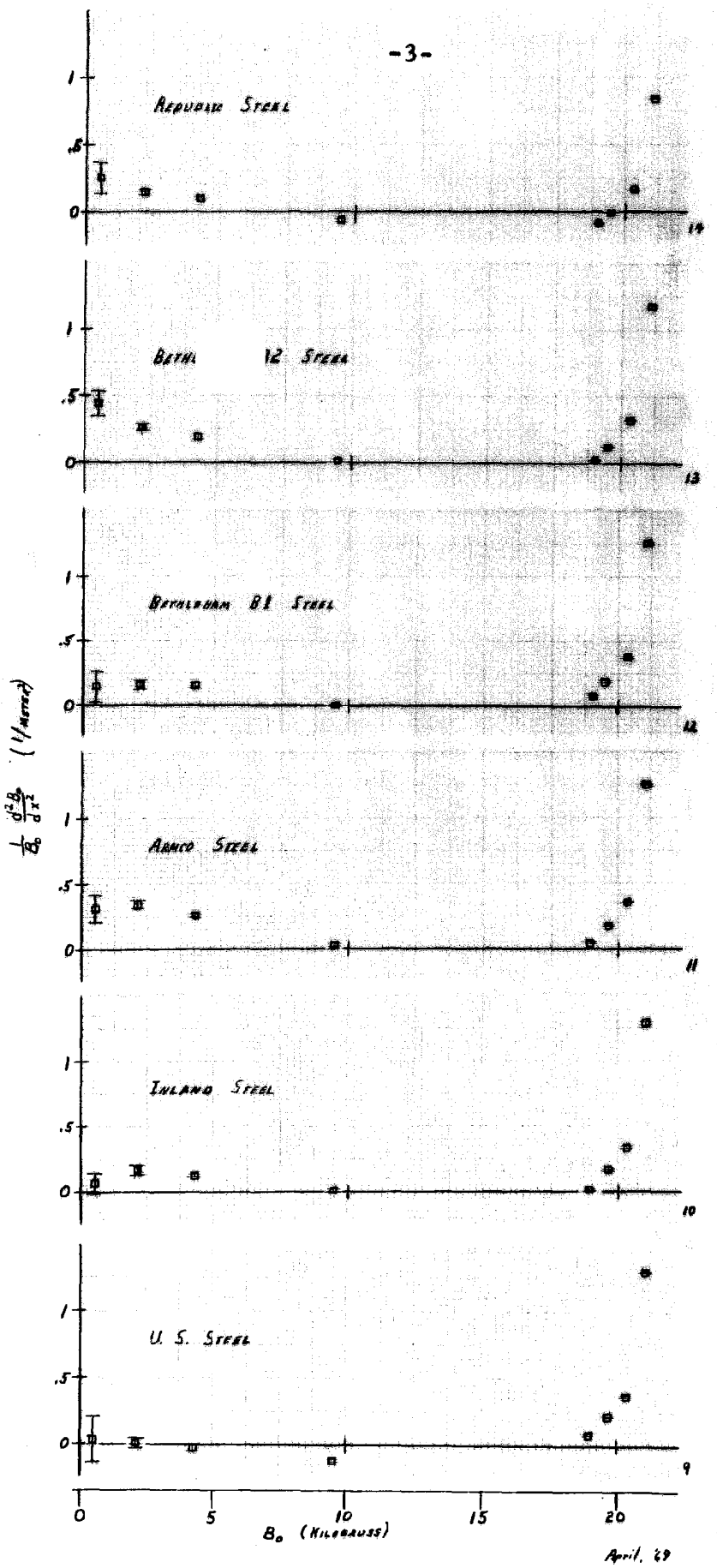
$$\frac{1}{B_o} \frac{d^2 B}{dX^2}$$

was then obtained by applying a least-squares fit to the data over the central inch (±1/2 inch from center) of the magnet.

The errors are primarily statistical resulting from integrator noise and drift so that only the low-field points are seriously effected. Systematic error due to search coil position is small. The coils are positioned on the median plane to within ±0.01 inch. A more serious

error could be obtained by the magnet coil variations since the upper and lower coils differ. Work is underway to construct more accurate coils to reduce any possible effect of this type.

The accompanying plots show the sextupole component up to 21 kilogauss for the different steels. Since the measurements are done with the integrator reset to zero between magnet pulses, the remenant field is not observed. However, eddy-current effects are present and their differences at low field are due to coil variations.


Republic Steel
Bethl V2 Steel
Bethlehem B1 Steel
Armco Steel
Inland Steel
U. S. Steel
14
13
12
11
10
9
1
.5
0
$\frac{1}{B_0}\frac{d^2B_0}{dx^2}$ (1/Mesh²)
0
5
10
15
20
B_0 (Kilogauss)

April, '69