Accelerator Department
BROOKHAVEN NATIONAL LABORATORY
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ISABELLE PROJECT

INTERSECTING STORAGE ACCELERATOR NOTES

SOME SIX BLOCK COIL CONFIGURATIONS FOR A COSINE BENDING MAGNET

G. Parzen and K. Jellett

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When the cosine winding in a bending magnet is arranged in six blocks in a Beth configuration, one finds difference in the percent good field aperture obtained depending on the ribbon distribution used. This note presents results for three different ribbon distributions which give percent good field apertures that vary from 62% to 71%.

The fields are corrected in the manner suggested by G. Morgan by moving each of the six blocks azimuthally a small amount, denoted by $\Delta\theta_n$, which $\Delta\theta_n$ are chosen to eliminate the lowest six undesired multipoles, $b_2, b_4, b_6, b_8, b_{12}$. The percent good field one obtains appears to be determined by what happens to b_{14} when the blocks are displaced by $\Delta\theta_n$ to eliminate b_2 to b_{12} .

The results are shown in Table I. The amount of b_{14} generated by $\Delta\theta_n$ is related to how large the multipoles are which have to be eliminated by the $\Delta\theta_n$. Coil A was proposed by G. Morgan. Coil C, which requires the least correction, generates the least amount of b_{14} and has the largest good aperture of 71%.

In this study, the ribbons in each block were placed in the center of each block with no separators between them.

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M. Goldhaber, L.J. Haworth, G.H. Vineyaru

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TABLE I

	Coil A		Coil B		Coil C	
	Uncorrected	Corrected	Uncorrected	Corrected	Uncorrected	Corrected
b_2	-1.438	0.025	-0.216	0.009	0.458	0.018
b_4	0.348	-0.006	-0.089	-0.003	0.233	0.001
b_6	0.066	0.004	0.055	0.006	-0.073	0.000
b_8	-0.067	-0.002	0.089	-0.005	-0.021	0.000
b_{10}	0.058	0.001	-0.043	0.002	0.012	0.000
b_{12}	-0.008	-0.000	0.000	-0.001	0.000	0.000
b_{14}	-0.005	-0.018	0.005	0.012	-0.001	-0.003
b_{16}	0.002	0.007	-0.001	-0.003	0.000	0.001
b_{18}	-0.000	-0.004	0.000	0.000	0.000	0.004
b_{20}	-0.001	0.002	-0.000	0.000	-0.001	-0.001
Ribbon Distribution	14,13,12,9,7,3		16,15,13,11,7,4		17,16,14,11,8,4	
$\Delta\theta_1$		0.777		-0.644		0.408
$\Delta\theta_2$		-3.118		0.030		0.719
$\Delta\theta_3$		1.274		-4.247		1.900
$\Delta\theta_4$		2.132		-0.865		-0.329
$\Delta\theta_5$		7.980		-2.019		-2.036
$\Delta\theta_6$		32.415		-15.552		1.813
Percent Good Aperture	62		64		71	
W	0.0258		0.0255		0.0213	
Total Ribbons/ Quadrant	58		66		70	

Results for three six block configurations having 58, 66, and 70 ribbon turns per quadrant. The b_m are the multipoles in in^{-m} . The $\Delta\theta_n$ are the block displacements in milliradians, required to eliminate the lowest six undesired multipoles. W is the thickness of the ribbon in inches. The ribbon is assumed to be 5/8 in. wide, the inner radius of the coil is 1.5 in. and the coil is 1/8 in. from the iron shield.