

COLD-WARM MAGNETIC FIELD MEASUREMENT COMPARISONS

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In connection with SSC-N-516, SSC-N-529, SSC-N-543 and SSC-N-578, all dealing with the above mentioned subject, it was of interest to determine the correlation between cold and warm field multipole data of some superconducting magnets (in historical order:TEVATRON, CBA AND DSS). The values for the normal geometric sextupoles, their standard deviations as well as correlation coefficients and standard errors of the estimates *) are reproduced in the table below (all data,except no. of magnets, are in "units").

	TEVATRON	CBA	DSS
No. of magnets	65	11	6
\bar{b}_{2w}	+2.33	-25.81	-1.58
\bar{b}_{2c}	+1.71	-26.96	-2.17
\bar{b}_{2diff}	-0.63	- 1.15	-0.59
σ_{2w}	2.57	3.99	5.18
σ_{2w}/\sqrt{n}	0.32	1.20	2.11
σ_{2c}	2.60	4.65	5.11
σ_{2c}/\sqrt{n}	0.32	1.40	2.09
σ_{2diff}	1.33	0.95	0.21
r	0.85	0.9876	0.9998
σ_{2chw}	1.34	0.77	0.21

For DDS and CBA magnets the results show an excellent correlation between the cold and warm measurements, whilst the correlation for TEVATRON magnets is not quite as strong.

*) See reverse page for definitions.

DEFINITIONS

CORRELATION	Relationship between two or more variables.
CORRELATION COEFFICIENT	Measure of the degree of association between the variables (in our case: 2).
REGRESSION	Statistical term for average relationship (introduced in 1880's by Sir Francis Galton).
REGRESSION LINE	Linear least square fit of the data, whose degree of correlation (see correlation coefficient) one wants to determine.
STANDARD ERROR OF ESTIMATE	The square root of the variance due to the scatter in Y (ordinate), of the observed points about the regression line. Also defined as the standard error of estimate for regression of Y on X (in our case: bivariate regression).

REFERENCES

Duncan, A.J. :	Quality Control and Industrial Statistics, 5th ed., R.D. Irwin Inc., Homewood, IL (1986)
Crow, E.L.. et al. :	Statistics Manual, Dover Publications Inc., New York (1960)

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