

APPENDIX II

Plastic Strain Ratio r

IDDRG Cooperative Program - Two Factor Nested Experiment (unbalanced)
Longitudinal Tests by up to 7 Laboratories of 22 Materials

M - Materials

L - Laboratories within materials

R - Residual - Within laboratory and within coil variation

The Analysis of Variance is approximate only and assumes Random Model II

ANOVA

Code	Source of Variation	Degrees of Freedom	Sum of Squares	Mean Squares	Expected Mean Squares
M	Between materials	21	30.4753	1.4512	$\sigma^2 + 2.23 \sigma_L^2 + 13.87 \sigma_M^2$
L	Between labs within materials	100	0.5106	0.0051	$\sigma^2 + 1.07 \sigma_L^2$
R	Residual	185	0.3845	0.0021	σ^2
	Total	306	31.3704		

F test $F_L = 2.46 > F(100, 185, 0.0005) = 1.74$ \therefore Significant difference between labs at 99.95% confidence level.

$F_M = 284.2 > F(21, 100, 0.005) = 2.75$ \therefore Significant difference between materials at 99.95% confidence level.

Conclusions:

97.1% of the observed total variation in r is explained by differences between materials at the 99.95% confidence level.

1.6% by differences between laboratories at the 99.95% confidence level.

1.3% by test error and variation within coils.

TABLE OF AVERAGES

Supplier	Material					
	1a	1b	1c	2	3	4
A	1.70			1.70	0.93	0.94
B	1.80			1.72	1.23	1.24
C	1.65	1.68	1.63	1.64	1.53	1.20
D _y	1.63			1.64	0.92	0.92
D _z	1.65			1.62	0.93	0.91