

Fermilab

TS-SSC 91-126
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To: Brian Smith

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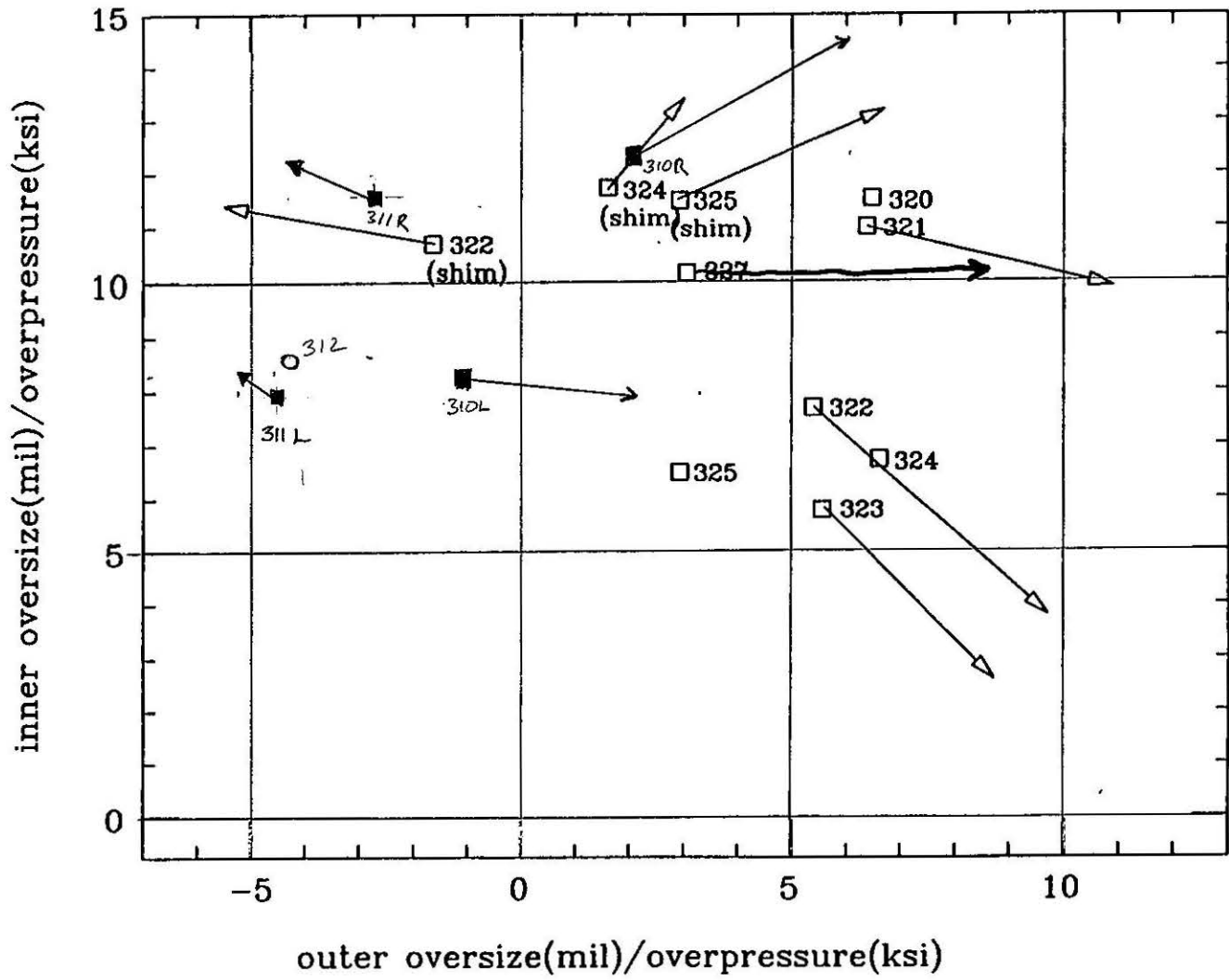
Subj: Pole shims for DCA312

No pole shims should be applied to the inner or the outer coils of DCA312. The inner coils for DCA312 (15M-50-1005 and -1006) have average sizes of +8.5 and +8.2 mils at 12 kpsi respectively. These are within what is currently believed to be the acceptable size range and therefore no shimming is required. The outer coils (15M-50-2006 and -2007) have average sizes of -3.2 and -5.0 mils at 12 kpsi. Their average, -4.1 mils, is 1.1 mils smaller than the average of the DCA311 outer coils. This is at the bottom of the range of what is currently believed to be the acceptable range of outer coil sizes and the small point, typically about 2.5 mils smaller than the average, will be below the acceptable range. However, the lower bound on coil size, corresponding to a lower bound on prestress of 6 kpsi, is relatively conservative (see below). Given the difficulty of installing a pole shim in the outer coils with their molded-in end keys and the effect of pole shims on the field harmonics, I believe that we need not and should not install them.

Based on the DCA310 and DCA311 post keying prestresses, the expected outer coil prestress in DCA312 if the outer coils are not shimmed is about 5-7 kpsi. Based on the tests of 3 short model magnets, the outer stress at 6.6 kA is 3.5-4.0 kpsi lower than the post-keying prestress. Thus the outer coil of DCA312, unshimmed, may have only 1-2 kpsi of preload at 6.6 kA. This is judged to be acceptable.

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Long Coil Average Size Summary

Inner	Inner	Outer	Outer
1	0.0105 (with 5 mil shim)	1	0.0025 DCA310
1	0.0055 DCA310	2	-0.0004
2	0.0107	3	-0.0018
3	0.0104 DCA311	4	-0.0023 DCA311
4	0.0094	5	-0.0037
5	0.0085 DCA312	6	-0.0032 DCA312
6	0.0082	7	-0.0050