



Fermilab

TS-SSC 90-080

11/6/90

To: John Carson
From: Jim Strait
Subject: DC0304 Collaring Shims

The Kapton collaring shims for DC0304 should be 17 mils in the inner coil and 10 mils in the outer coil. These thicknesses include the adhesive and represent the thickness that would be measured with a flat anvil micrometer. The thickness, with and without adhesive, of each of the layers used to make the shim packages should be measured and recorded in the traveller.

The inner and outer coils in DC0304 are, on the average, 0.5 mils and 1.2 mils larger than those in DC0303. The average prestress in DC0303[1] is 8.6 kpsi in the inner coil and 8.5 kpsi in the outer coil. The shims specified above will make the sum of the inner coil plus shim be 0.5 mils larger and the sum of the outer coil plus shims 1.6 mils smaller than in DC0303[2]. The expected prestress in DC0304 should be a bit larger in the inner and smaller in the outer than in DC0303.

Reference

- [1] J. Strait, Keying of DC0303: Strain Gage Data, TS-SSC 90-079, 10/5/90.
- [2] J. Strait, DC0303 Collaring Shims, TS-SSC 90-074, 10/16/90.

cc: Rodger Bossert
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----- Magnet Number DC0303 -----

Collar Parameters:

Undefl. Cavity Oversize (nom.) = 2.00 mils
 d(cavity_in)/d(stress_in) = 0.28 mils/kpsi
 d(cavity_in)/d(stress_out) = 0.28 mils/kpsi
 d(cavity_out)/d(stress_in) = 0.28 mils/kpsi
 d(cavity_out)/d(stress_out) = 0.28 mils/kpsi
 Ground wrap thickness (inner) = 20.00 mils
 Ground wrap thickness (outer) = 35.00 mils
 Compressive modulus of Kapton = 99999.00 kpsi
 Compressive modulus of shims = 99999.00 kpsi
 Collar cavity "error" (inner) = 10.50 mils
 Collar cavity "error" (outer) = 8.40 mils
 Friction fudge factor (inner) = 1.00
 Friction fudge factor (outer) = 1.00

Average Coil Parameters:

Undefl. Inner Coil Oversize = 8.91 mils
 Undefl. Outer Coil Oversize = 8.23 mils
 d(coil_in)/d(stress_in) = -0.51 mils/kpsi
 d(coil_out)/d(stress_out) = -0.63 mils/kpsi

shim (mils)		prestress (kpsi)	
inner	outer	inner	outer
13.0	12.0	9.1	8.0
14.0	12.0	10.5	7.6
15.0	12.0	12.0	7.1
14.0	11.0	11.0	6.3
14.0	13.0	10.1	8.8
11.0	11.0	6.7	7.7
15.0	13.0	11.5	8.4

	DC0303	DC0304	$((304) - (303))/2$
10 kpsi Σ_{inner}	7.5	8.4	+ 0.5
Σ_{outer}	3.7	6.1	+ 1.2

$\Rightarrow$ DC0304 shims

same inner
- 2 mils outer

----- Magnet Number DC0303 -----

Data file: ts_ssc_prj\$root:[ts_ssc_prj.data.coil_size]ssc_inner_17m1010.dat

Coil # 17M-1010 Coil type: INNER Coil location: Lower Inner
COIL # 17M-1010 COIL TYPE: INNER DATE:

MEAS. BY:

coil stress (kpsi)	6.0	8.0	10.0	12.0
average size (mils)	0.0054	0.0048	0.0035	0.0025
sigma	0.0014	0.0008	0.0008	0.0011
minimum	0.0005	0.0029	0.0020	-0.0005
maximum	0.0074	0.0082	0.0051	0.0124
range	0.0069	0.0033	0.0031	0.0129
#points	20	20	20	441

Fit avg = avg_0 + (dl/dsig) * stress
avg_0 = 8.4 dl/dsig = -0.48

----- Magnet Number DC0303 -----

Data file: ts_ssc_prj\$root:[ts_ssc_prj.data.coil_size]ssc_inner_17m1012.dat

Coil # 17M-1012 Coil type: INNER Coil location: Upper Inner
COIL # 17M-1012 COIL TYPE: INNER DATE:

8/7/90 MEAS. BY: SANDERS

coil stress (kpsi)	6.0	8.0	10.0	12.0
average size (mils)	0.0063	0.0052	0.0040	0.0032
sigma	0.0010	0.0009	0.0009	0.0010
minimum	0.0047	0.0036	0.0028	0.0001
maximum	0.0084	0.0071	0.0061	0.0124
range	0.0037	0.0035	0.0033	0.0123
#points	20	20	20	444

Fit avg = avg_0 + (dl/dsig) * stress
avg_0 = 9.4 dl/dsig = -0.53

----- Magnet Number DC0303 -----

Data file: ts_ssc_prj\$root:[ts_ssc_prj.data.coil_size]ssc_outer_17m2012.dat

Coil # 17M-2012 Coil type: OUTER Coil location: Lower Outer

COIL # 17M-2012 COIL TYPE: OUTER DATE: 8/30/90 MEAS. BY: PHILLIPS

coil stress (kpsi)	6.0	8.0	10.0	12.0
average size (mils)	0.0042	0.0027	0.0014	0.0004
sigma	0.0009	0.0010	0.0010	0.0009
minimum	0.0025	0.0008	-0.0002	-0.0047
maximum	0.0059	0.0044	0.0032	0.0034
range	0.0034	0.0036	0.0034	0.0081
#points	20	20	20	444

Fit $avg = avg_0 + (dl/dsig) * stress$

$avg_0 = 7.9$ $dl/dsig = -0.64$

----- Magnet Number DC0303 -----

Data file: ts_ssc_prj\$root:[ts_ssc_prj.data.coil_size]ssc_outer_17m2011.dat

Coil # 17M-2011 Coil type: OUTER Coil location: Upper Outer

COIL # 17M-2011 COIL TYPE: OUTER DATE: 8/17/90 MEAS. BY: SANDERS

coil stress (kpsi)	6.0	8.0	10.0	12.0
average size (mils)	0.0048	0.0037	0.0023	0.0012
sigma	0.0009	0.0012	0.0008	0.0008
minimum	0.0035	0.0021	0.0009	-0.0017
maximum	0.0064	0.0075	0.0038	0.0030
range	0.0029	0.0054	0.0029	0.0047
#points	20	20	20	443

Fit $avg = avg_0 + (dl/dsig) * stress$

$avg_0 = 8.5$ $dl/dsig = -0.61$

----- Magnet Number DC0304 -----

Collar Parameters:

Uninfl. Cavity Oversize (nom.) = 2.00 mils
d(cavity_in)/d(stress_in) = 0.28 mils/kpsi
d(cavity_in)/d(stress_out) = 0.28 mils/kpsi
d(cavity_out)/d(stress_in) = 0.28 mils/kpsi
d(cavity_out)/d(stress_out) = 0.28 mils/kpsi
Ground wrap thickness (inner) = 20.00 mils
Ground wrap thickness (outer) = 35.00 mils
Compressive modulus of Kapton = 100.00 kpsi
Compressive modulus of shims = 100.00 kpsi
Collar cavity "error" (inner) = 10.50 mils
Collar cavity "error" (outer) = 8.40 mils
Friction fudge factor (inner) = 1.00
Friction fudge factor (outer) = 1.00

Average Coil Parameters:

Uninfl. Inner Coil Oversize = 8.87 mils
Uninfl. Outer Coil Oversize = 7.54 mils
d(coil_in)/(dstress_in) = -0.48 mils/kpsi
d(coil_out)/(dstress_out) = -0.44 mils/kpsi

shim (mils)		prestress (kpsi)	
inner	outer	inner	outer
13.0	12.0	7.1	6.0
14.0	12.0	8.0	5.8
15.0	12.0	8.9	5.6
14.0	11.0	8.2	5.0
14.0	13.0	7.8	6.7
11.0	11.0	5.4	5.6
15.0	13.0	8.7	6.4

----- Magnet Number DC0304 -----

Data file: ts_ssc_prj\$root:[ts_ssc_prj.data.coil_size]ssc_inner_17m1008.dat

Coil # 17M-1008 Coil type: INNER Coil location: Lower Inner
COIL # 17M-1008 COIL TYPE: INNER DATE:

MEAS. BY:

coil stress (kpsi)	6.0	8.0	10.0	12.0
average size (mils)	0.0065	0.0058	0.0047	0.0042
sigma	0.0018	0.0007	0.0007	0.0010
minimum	0.0004	0.0048	0.0035	-0.0019
maximum	0.0085	0.0075	0.0065	0.0089
range	0.0081	0.0027	0.0030	0.0108
#points	20	20	20	443

Fit avg = avg_0 + (dl/dsig) * stress
avg_0 = 9.0 dl/dsig = -0.40

----- Magnet Number DC0304 -----

Data file: ts_ssc_prj\$root:[ts_ssc_prj.data.coil_size]ssc_inner_17m1011R.dat

Coil # 17M-1011R Coil type: INNER Coil location: Upper Inner
COIL # 17M-1011R COIL TYPE: INNER DATE:

10/27/90

MEAS. BY: SANDERS

coil stress (kpsi)	6.0	8.0	10.0	12.0
average size (mils)	0.0052	0.0046	0.0037	0.0019
sigma	0.0010	0.0011	0.0023	0.0011
minimum	0.0029	0.0028	0.0012	-0.0015
maximum	0.0072	0.0074	0.0128	0.0114
range	0.0043	0.0048	0.0116	0.0129
#points	20	20	20	446

Fit avg = avg_0 + (dl/dsig) * stress
avg_0 = 8.8 dl/dsig = -0.55

----- Magnet Number DC0304 -----

Data file: ts_ssc_prj\$root:[ts_ssc_prj.data.coil_size]ssc_outer_17m2007.dat

Coil # 17M2007 Coil type: OUTER Coil location: Lower Outer

COIL # 17M2007 COIL TYPE: OUTER DATE:

MEAS. BY:

coil stress (kpsi)	6.0	8.0	10.0	12.0
average size (mils)	0.0059	0.0048	0.0038	0.0029
sigma	0.0008	0.0007	0.0008	0.0008
minimum	0.0047	0.0038	0.0025	0.0012
maximum	0.0074	0.0060	0.0051	0.0049
range	0.0027	0.0024	0.0026	0.0037
#points	20	20	20	108

Fit $avg = avg_0 + (dl/dsig) * stress$

$avg_0 = 8.7$ $dl/dsig = -0.50$

----- Magnet Number DC0304 -----

Data file: ts_ssc_prj\$root:[ts_ssc_prj.data.coil_size]ssc_outer_17m2005.dat

Coil # 17M2005 Coil type: OUTER Coil location: Upper Outer

COIL # 17M2005 COIL TYPE: OUTER DATE: 3/30/90

MEAS. BY:

SANDERS

coil stress (kpsi)	6.0	8.0	10.0	12.0
average size (mils)	0.0042	0.0033	0.0025	0.0019
sigma	0.0009	0.0009	0.0009	0.0010
minimum	0.0028	0.0015	0.0008	-0.0023
maximum	0.0058	0.0045	0.0039	0.0046
range	0.0030	0.0030	0.0031	0.0069
#points	20	20	20	108

Fit $avg = avg_0 + (dl/dsig) * stress$

$avg_0 = 6.3$ $dl/dsig = -0.38$