



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
Steve Delchamps
Wayne Koska
Gale Pewitt
Ried Rihel
Dan Smith
Masayohsi Wake

Collar Parameters:

Undef . Cavity oversize (nom.)	=	2.00 mils
d(cavity_in)/d(stress_in)	=	0.28 mils/kpsi
d(cavity_out)/d(stress_out)	=	0.28 mils/kpsi
d(cavity_in)/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:

shim (mils)	prestress (kpsi)	inner	outer
inner	inner	9.1	8.0
13.0	outer	12.0	10.5
14.0	inner	12.0	10.5
15.0	outer	12.0	12.0
14.0	inner	11.0	11.0
14.0	outer	13.0	10.1
11.0	inner	11.0	6.7
15.0	outer	13.0	11.5

10 Kpsi	Σ_{inner}	Σ_{outer}	D_{C0303}	D_{C0304}	$((304) - (303)) / 2$
	7.5	8.4	6.1	6.0	+ 0.5

$\Rightarrow D_{C0304}$ shows
same inner
- 2 mils outer

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----- 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)  0.00054  0.00046  0.00035  0.00025
sigma                0.0014   0.0008   0.0008   0.0011
minimum              0.0005   0.0029   0.0020   -0.0005
maximum              0.0074   0.0062   0.0051   0.0124
range                0.0069   0.0033   0.0031   0.0129
#points              29      20      20      441

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Fit avg = avg_θ + (dI/dsig) * stress
 $\text{avg}_\theta = 8.4 \frac{dI}{dsig} = -0.48$

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----- 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)  0.00052  0.00048  0.00040  0.00032
sigma                0.0010   0.0009   0.0009   0.0010
minimum              0.00047  0.00036  0.00028  0.0001
maximum              0.00084  0.00071  0.00061  0.0124
range                0.00037  0.00035  0.00033  0.0123
#points              29      20      20      444

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Fit avg = avg_θ + (dI/dsig) * stress
 $\text{avg}_\theta = 9.4 \frac{dI}{dsig} = -0.53$

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----- 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 -.0002 -.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_θ + (dI/dsig) * stress
avg_θ = 7.9          dI/dsig = -0.64

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----- 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 -.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_θ + (dI/dsig) * stress
avg_θ = 8.5          dI/dsig = -0.61

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Collar Parameters:

Undefl. Cavity oversize (nom.)	=	2.00 mils
$d(\text{cavity_in})/d(\text{stress_in})$	=	0.28 mils/kpsi
$d(\text{cavity_in})/d(\text{stress_out})$	=	0.28 mils/kpsi
$d(\text{cavity_out})/d(\text{stress_in})$	=	0.28 mils/kpsi
$d(\text{cavity_out})/d(\text{stress_out})$	=	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:

Undefl. Inner Coil oversize	=	8.87 mils
Undefl. Outer Coil oversize	=	7.54 mils
$d(\text{coil_in})/(d\text{stress_in})$	=	-0.48 mils/kpsi
$d(\text{coil_out})/(d\text{stress_out})$	=	-0.44 mils/kpsi

shim (mils)		prestress (kpsi)	
inner	outer	inner	outer
13.0	12.0	7.1	6.6
14.0	12.0	8.0	5.8
15.0	12.0	8.9	5.6
14.0	11.0	8.2	5.6
14.0	13.0	7.8	6.7
11.0	11.0	5.4	5.6
15.0	13.0	8.7	6.4

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----- 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               0.0016  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_θ + (dθ/dsig) * stress
avg_θ = 9.0   dθ/dsig = -0.46

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----- 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  0.0026  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_θ + (dθ/dsig) * stress
avg_θ = 8.8   dθ/dsig = -0.55

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----- 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 0.0046 0.0036 0.0029
sigma 0.0008 0.0007 0.0008 0.0008
minimum 0.0047 0.0036 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

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Fit avg = avg_θ + (dI/dsig) * stress
 $\text{avg}_\theta = 8.7 \frac{dI}{dsig} = -0.50$

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----- 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 0.0026 0.0015 0.0008 -0.0023
maximum 0.0056 0.0045 0.0039 0.0046
range 0.0030 0.0030 0.0031 0.0069
#points 20 20 20 108

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Fit avg = avg_θ + (dI/dsig) * stress
 $\text{avg}_\theta = 6.3 \frac{dI}{dsig} = -0.38$