Fermilab

TS-SSC 91-026
2/5/91

To: R. Bossert, J. Carson, S. Delchamps, S. Gourlay, W. Koska, M. Lamm, M. Wake

From: Jim Strait

Subject: DSA321 Collaring and Yoking: Strain Gauge Data

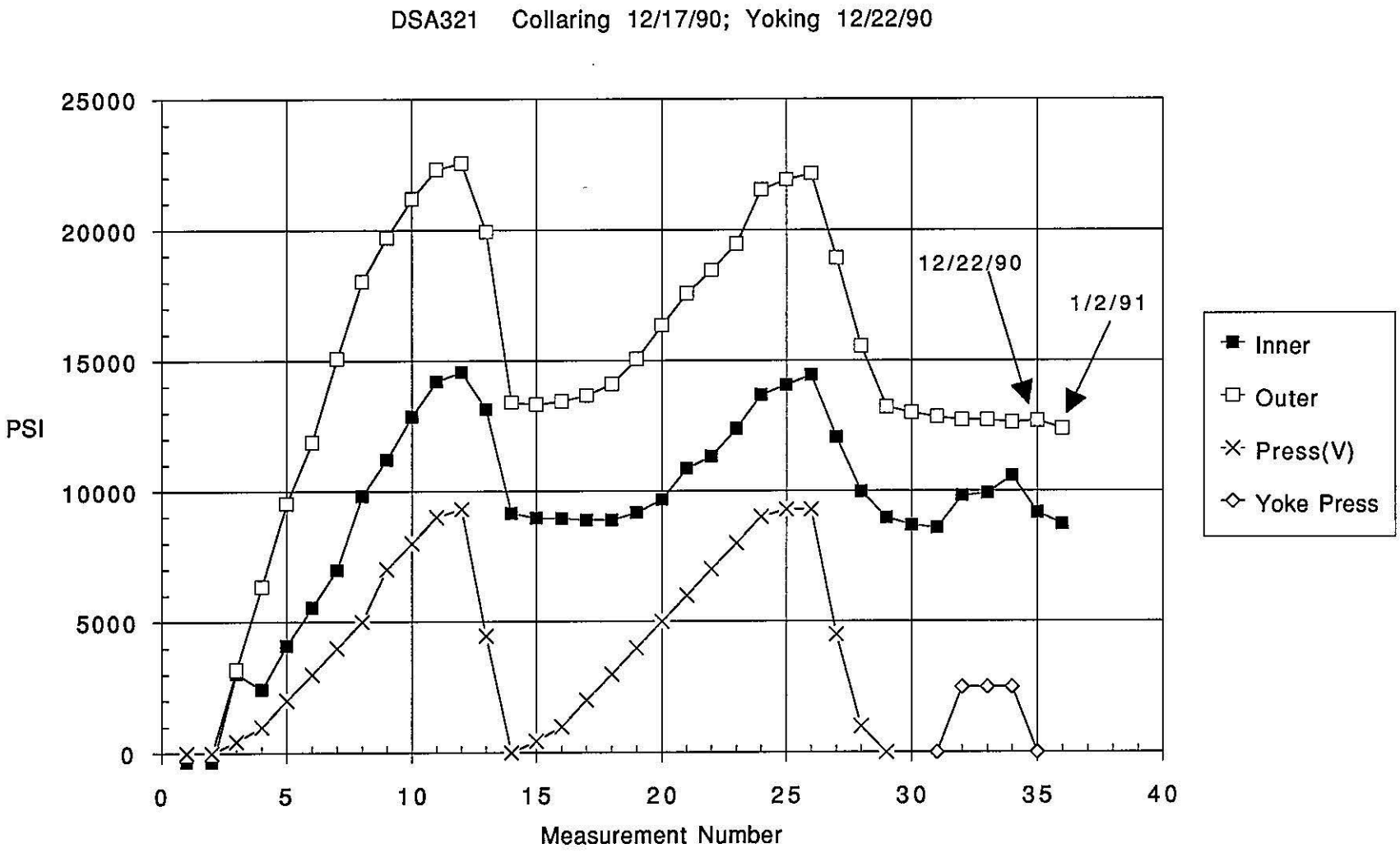
At the time DSA321 was collared (on 12/18/90) the new 84 inch press was not complete. It was collared in the Tevatron collaring press which has insufficient capacity to collar the entire magnet at once. Upper collaring tooling was used both as upper and as lower tooling. To concentrate the press load the tooling covered only somewhat more than half the coil at a time the the coil was keyed in two operations. The keys were inserted by finger and hammer. (For a further discussion, see Reference 1.) The shell was welded on 12/22/90 in the (just commissioned) 84 inch press.

Strain gauge data were recorded during both compressions for collar keying and during the yoking operation. The data are summarized in the attached table and figure which display averages over the four inner and four outer coil gauges. The strain gauge pack, located at the center of the magnet, was compressed on both pressings because the collaring tooling covered somewhat more than half the coil. The final stresses after keying were 9 and 13 kpsi in the inner and outer coils respectively. In the four days between yoking and keying the stresses decreased by a few hundred psi. The welding of the shell around the yoke resulted in a net increase of the inner stress of 0.6 kpsi and an apparent decrease of the outer stress by 0.1 kpsi. This is a smaller change than typically occurs in magnets with horizontally split yokes because the collars are compressed horizontally and are free to expand vertically. The last strain gauge measurement in Table I was taken eleven days after yoking. During this time there was a stress loss of 0.4 kpsi in the inner coil and 0.3 kpsi in the outer coil.

Reference

[1] R. Bossert, DSA321 Construction Review, TS-SSC 90-007, 1/17/91.

	A	B	C	D	E	F	G	H	I	J	K	L	M
1				CORRECTED AVERAGING FORMULAS 11-20-90									
2					DSA321								
3											BNL C3	BNL C2	BNL C1
4				GAGE NO.	TYPE	COIL	Quadrant	Gage Fact	R0 (Ohms)	FNAL A0	FNAL A1	FNAL A2	FNAL A3
5				A006	Active	Inner	1	2.03	350.236	-7.1	4.7E+00	6.31E-03	0.00000
6				A005	Active	Inner	2	2.03	349.996	-50.9	5.4E+00	4.57E-03	0.00000
7				C005	Comp.	Inner	1&2	2.03	349.906				
8				A008	Active	Inner	3	2.03	350.078	14.6	5.3E+00	5.27E-03	0.00000
9				A007	Active	Inner	4	2.03	350.218	-1.3E+02	3.25E+00	0.00590	0.00000
10				C007	Comp.	Inner	3&4	2.03	349.914				
11				A001	Active	Outer	1	2.03	350.151	-76.1	3.4E+00	6.43E-03	0.00000
12				A002	Active	Outer	2	2.03	350.115	41.3	4.7E+00	6.41E-03	0.00000
13				C001	Comp.	Outer	1	2.03	349.612				
14				C002	Comp.	Outer	2	2.03	350.112				
15				A004	Active	Outer	3	2.03	350.631	-80.8	4.2E+00	5.82E-03	0.00000
16				A003	Active	Outer	4	2.03	349.922	-15.0	4.1E+00	7.60E-03	0.00000
17				C006	Comp.	Outer	3	2.03	349.825				
18				C003	Comp.	Outer	4	2.03	349.924				
19													
20													
21						Hydraulic Pressure		Average Coil Stress			d(Stress)/dPv		
22			Seq #	Date	Press	Press(V)	Horizontal	Inner	Outer	All	Inner	Outer	All
23			1	12/17/90	0	0	0	-509	-74	-291			
24			2	12/18/90	0	0	0	-552	-64	-308			
25			3	12/18/90	0	443	0	3031	3175	3103	8.09	7.31	7.70
26			4	12/18/90	0	1000	0	2427	6332	4380	-1.08	5.67	2.29
27			5	12/18/90	0	2000	0	4105	9544	6824	1.68	3.21	2.44
28			6	12/18/90	0	3000	0	5555	11890	8723	1.45	2.35	1.90
29			7	12/18/90	0	4000	0	6977	15075	11026	1.42	3.18	2.30
30			8	12/18/90	0	5000	0	9828	18045	13936	2.85	2.97	2.91
31			9	12/18/90	0	7000	0	11204	19703	15453	0.69	0.83	0.76
32			10	12/18/90	0	8000	0	12846	21184	17015	1.64	1.48	1.56
33			11	12/18/90	0	9000	0	14218	22316	18267	1.37	1.13	1.25
34			12	12/18/90	0	9317	0	14579	22566	18573	1.14	0.79	0.97
35			13	12/18/90	0	4458	0	13133	19930	16531			
36			14	12/18/90	0	0	0	9162	13398	11280			
37			15	12/18/90	0	449	0	8965	13314	11140			
38			16	12/18/90	0	1000	0	8947	13448	11197			
39			17	12/18/90	0	2000	0	8878	13664	11271			
40			18	12/18/90	0	3000	0	8892	14110	11501			
41			19	12/18/90	0	4000	0	9164	15054	12109			
42			20	12/18/90	0	5000	0	9683	16358	13021			
43			21	12/18/90	0	6000	0	10878	17566	14222			
44			22	12/18/90	0	7000	0	11345	18469	14907			
45			23	12/18/90	0	8000	0	12400	19467	15933			
46			24	12/18/90	0	9000	0	13681	21529	17605			
47			25	12/18/90	0	9300	0	14062	21917	17989			
48			26	12/18/90	0	9300	0	14442	22165	18303			
49			27	12/18/90	0	4500	0	12061	18920	15490			
50			28	12/18/90	0	1000	0	9979	15542	12760			
51			29	12/18/90	0	0	0	8975	13217	11096			
52			30	12/21/90		0	0	8678	13007	10842	oke Press		
53			31	12/22/90	Yoking	0	0	8574	12826	10700			
54			32	12/22/90	Yoking	2500	0	9821	12718	11269			
55			33	12/22/90	Yoking	2500	0	9915	12721	11318			
56			34	12/22/90	Yoking	2500	0	10588	12640	11614			
57			35	12/22/90	Yoking	0	0	9173	12699	10936			
58			36	1/2/91	0	0	0	8727	12388	10558			
59													
60													


DSA321 Collaring 12/17/90; Yoking 12/22/90
25000
20000
15000
10000
5000
0
PSI
0
5
10
15
20
25
30
35
40
Measurement Number
12/22/90
1/2/91
Inner
Outer
Press(V)
Yoke Press