Fermilab

TS-SSC 90-072

10/12/90

To: Gale Pewitt

From: Jim Strait

Subject: Modification to 50 mm Dipole Yoke Lamination

In the interests of making the cross sections of the 50 mm dipoles built at BNL and FNAL as much alike as possible, BNL has moved the yoke bus slot and cooling channel holes in their yoke lamination to the same locations as on our lamination. (We moved ours from the original BNL locations to make them clear the end clamp filler pack which supports the skin at the magnet end.) The remaining difference in the magnetic design of the yoke is the position and size of the mid-plane cutout that is used to control the saturation effects on b_2. Ramesh Gupta has re-evaluated the magnetic design and finds that the "BNL" cutout does a better job of controlling b_2 than the one currently in our yoke design. (In principal, the location and size of this feature were optimized by Ramesh for the locations of the bus slot and cooling channels in our yoke design, but clearly there was some communication failure.) I attach copies of e-mail from him to me in which he suggests we change our yoke lamination. Attached also are tables of his calculations for the two cases. The total range of b_2 is reduced from 0.56 to 0.43 units; the changes in the higher multipoles are negligible.

Today Plainfield Tool and Die called John Carson because they had found that no radius was specified for a number of the corners on the yoke lamination drawing. (They are just about to start programming to make the die.) Since Plainfield has not begun to "cut metal" and we have to issue a revision to the drawing, we decided to add the change in mid-plane cutout size and location as well. The revisions have been relayed verbally to Plainfield so no delay in the manufacture of the die will occur. A copy of the unrevised drawing with the changes indicated is attached.

cc: R. Bossert
J. Carson
S. Delchamps
W. Koska
P. Mantsch
M. Wake
R. Gupta
E. Willen
T. Bush
R. Coombes

From: BNLCL6::GUPTA "RAMESH GUPTA, (516)282-4805, BNL, UPTON, NY 11973"
9-OCT-1990 16:48:21.13
To: FNAL::JBS
CC: GUPTA
Subj: 5cm Dipole Cross section

Jim,

In attempt to make the BNL and FNAL cross section as close to each other as possible, a difference in the position and size of the midplane cutout/(SS key) shows up. From the magnetic point of view it is better that Fermilab yoke be modified to have BNL size cutout and location. Is it too late to accommodate that in the FNAL LONG dipole program. May be it is not important?

From: BNLCL6::GUPTA "RAMESH GUPTA, (516)282-4805, BNL, UPTON, NY 11973"
10-OCT-1990 07:42:13.26
To: FNAL::JBS
CC: GUPTA
Subj: RE: 5cm Dipole Cross section

Yes, we are moving the bus slot and bypass hole in the long magnet. It came up at the same time.

You probably have BNL drawings for the location and size of the cutout. In any case the size is 1/2" by 1/2" and the cutout begins at 3.6" from the center (ends at 4.1").

Thanks.

Ramesh

From: BNLCL6::GUPTA "RAMESH GUPTA, (516)282-4805, BNL, UPTON, NY 11973"
10-OCT-1990 09:03:24.99
To: FNAL::JBS
CC: GUPTA
Subj:

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FNAL WITH PRESENT CUTOUT AT MIDPLANE
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POISSON results - DSX201/W6733 FNAL Iron 8/30/90 file=DSX201FNAL83090.LOG;2
Bo(Tesla)
Harmonics bn (Prime Units); T.F.(T/kA)

I(kA)	Bo(T)	TF	b2	b4	b6	b8	b10	b12
0.00000	0.00000	1.04525	-0.181	-0.039	0.000	0.047	0.015	-0.001
2.00000	2.09018	1.04509	-0.175	-0.039	0.001	0.047	0.015	-0.001
3.00000	3.13512	1.04504	-0.180	-0.039	0.001	0.047	0.015	-0.001
4.00000	4.17814	1.04454	-0.178	-0.040	0.001	0.047	0.015	-0.001
4.50000	4.69465	1.04326	-0.192	-0.041	0.001	0.047	0.015	-0.001
4.75000	4.94908	1.04191	-0.178	-0.043	0.001	0.047	0.015	-0.001
5.00000	5.20080	1.04016	-0.129	-0.044	0.001	0.047	0.015	-0.001
5.25000	5.44729	1.03758	-0.005	-0.047	0.000	0.047	0.015	-0.001
5.50000	5.68911	1.03438	0.141	-0.048	0.000	0.048	0.015	-0.001
5.75000	5.92612	1.03063	0.271	-0.049	0.000	0.048	0.015	-0.001
6.00000	6.15791	1.02632	0.349	-0.050	0.000	0.048	0.015	-0.001
6.25000	6.38484	1.02157	0.375	-0.049	0.000	0.048	0.015	-0.001
6.50000	6.60726	1.01650	0.348	-0.049	0.000	0.048	0.015	-0.001
6.75000	6.82506	1.01112	0.266	-0.049	0.000	0.049	0.015	-0.001
7.00000	7.04129	1.00590	0.171	-0.048	0.000	0.049	0.015	-0.001
7.25000	7.25399	1.00055	0.039	-0.047	0.000	0.049	0.015	-0.001

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FNAL YOKE WITH BNL CUTOUT AT THE MIDPLANE
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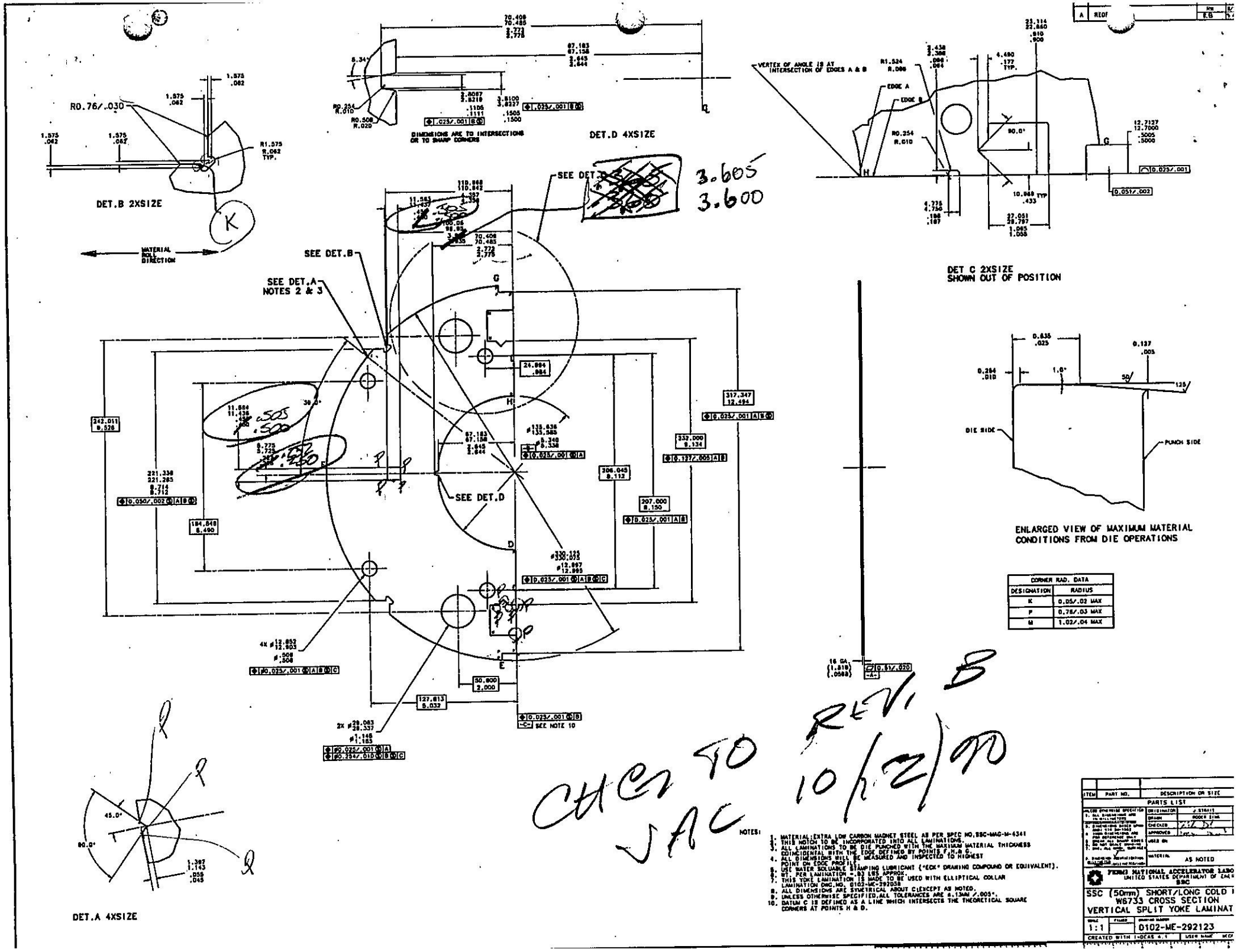
POISSON results - DSX201:VS 1/2"CutAddHole file=DSX201FNAL_HALF_INCH.LIS;2
Bo(Tesla)
Harmonics bn (Prime Units); T.F.(T/kA)

I(kA)	Bo(T)	TF	b2	b4	b6	b8	b10	b12
0.00000	0.00000	1.04525	-0.185	-0.040	0.000	0.047	0.015	-0.001
3.00000	3.13510	1.04503	-0.185	-0.040	0.001	0.047	0.015	-0.001
4.00000	4.17782	1.04446	-0.199	-0.040	0.001	0.047	0.015	-0.001
4.50000	4.69359	1.04302	-0.235	-0.042	0.001	0.047	0.015	-0.001
4.75000	4.94804	1.04169	-0.256	-0.044	0.001	0.047	0.015	-0.001
5.00000	5.19848	1.03970	-0.222	-0.047	0.001	0.047	0.015	-0.001
5.25000	5.44433	1.03702	-0.120	-0.050	0.001	0.048	0.015	-0.001
5.50000	5.68546	1.03372	0.006	-0.052	0.000	0.048	0.015	-0.001
5.75000	5.92157	1.02984	0.110	-0.053	0.000	0.048	0.015	-0.001
6.00000	6.15246	1.02541	0.161	-0.054	0.000	0.048	0.015	-0.001
6.25000	6.37889	1.02062	0.175	-0.055	0.000	0.048	0.015	-0.001
6.50000	6.60099	1.01554	0.145	-0.054	0.000	0.049	0.015	-0.001
7.00000	7.03470	1.00496	-0.025	-0.054	0.000	0.049	0.015	-0.001


DET.B 2XSIZE
DET.D 4XSIZE
DIMENSIONS ARE TO INTERSECTIONS OR TO SHARP CORNERS
VERTEX OF ANGLE IS AT INTERSECTION OF EDGES A & B
DET C 2XSIZE SHOWN OUT OF POSITION
SEE DET.B
SEE DET.A NOTES 2 & 3
SEE DET.D
SEE NOTE 10
DET.A 4XSIZE
ENLARGED VIEW OF MAXIMUM MATERIAL CONDITIONS FROM DIE OPERATIONS
DIE SIDE
PUNCH SIDE
CORNER RAD. DATA
DESIGNATION | RADIUS
K | 0.05/.02 MAX
P | 0.76/.03 MAX
M | 1.02/.04 MAX
NOTES:
1. MATERIAL:EXTRA LOW CARBON MAGNET STEEL AS PER SPEC NO.SSC-MAG-M-4341
2. THIS NOTCH TO BE INCORPORATED INTO ALL LAMINATIONS.
3. ALL LAMINATIONS TO BE DIE PUNCHED WITH THE MAXIMUM MATERIAL THICKNESS COINCIDENTAL WITH THE EDGE DEFINED BY POINTS F,H,& G.
4. ALL DIMENSIONS WILL BE MEASURED AND INSPECTED TO HIGHEST POINT ON EDGE PROFILE.
5. USE WATER SOLUABLE STAMPING LUBRICANT ("ECK" DRAWING COMPOUND OR EQUIVALENT).
6. WT. PER LAMINATION ~.83 LBS APPROX.
7. THIS YOKE LAMINATION IS MADE TO BE USED WITH ELLIPTICAL COLLAR LAMINATION DWG.NO. 0102-ME-292058
8. ALL DIMENSIONS ARE SYMETRICAL ABOUT C;EXCEPT AS NOTED.
9. UNLESS OTHERWISE SPECIFIED,ALL TOLERANCES ARE ±.13MM /.005".
10. DATUM C IS DEFINED AS A LINE WHICH INTERSECTS THE THEORETICAL SQUARE CORNERS AT POINTS H & D.
PARTS LIST
AS NOTED
FERMI NATIONAL ACCELERATOR LABO
UNITED STATES DEPARTMENT OF ENE
SSC
SSC (50mm) SHORT/LONG COLD
W6733 CROSS SECTION
VERTICAL SPLIT YOKE LAMINAT
1:1
0102-ME-292123
CREATED WITH I-DEAS 4.1
CHG TO REV. B
JAC 10/2/90