May 1, 1996 EXPECTED_D10.TABLE4_F

Table 4(f)

Expected values of body harmonics in 100 mm Insertion Arc dipoles D0 at 5000 A :

[<bn> = mean, d(bn) = uncertainty in mean, sig(bn) = sigma for bn]

n	<bn>	d(bn)	sig(bn)	<an>	d(an)	sig(an)
1	0.	0.4	0.8	-2.5	1.	1.3
2	0	2	2.3	0.	0.4	.5
3	0.	0.2	.3	0	.3	1.0
4	0	.5	.6	0	.06	.2
5	0	.03	.1	0	0.1	.26
6	0.0	.1	.1	0	.03	.1
7	0	.03	.1	0	.03	.1
8	0.0	.1	.1	0	.03	.1
9	0.0	.03	.1	0	.03	.1
10	0.0	.1	.1	0	.03	.1

Expected values of body harmonics at 660 Amp
(same as above for all harmonics except)

1				0	1	1.3
2	-4.0	2.	2.3			
4	-0.24	.5	0.6			
6	-0.28	.1	0.2			

Expected values of body harmonics at 1450 Amp
(same as above for all harmonics except)

1				0	1	1.3
2	-1.2	2.	2.3			
4	-0.1	.5	0.6			
6	-0.1	.1	0.2			

Expected values of harmonics in LEAD END at ALL current (Unit-m)

n	<Bn>	d(Bn)	sig(Bn)	<An>	d(An)	sig(An)
1	-1	1	1	1	2	1.
2	11	2	2	-10.	2	1
3	0.3	.2	.2	0	1	1.

4	0	.5	.2	2	.5	.3
5	0	.2	.2	0	1	.2
6	1	.2	.1	-0.9	.2	.2
7	0	.1	.1	0	.1	.1
8	-.2	.1	.1	0.2	.1	.1
9	0	.1	.2	0	.1	.1
10	0	.1	.1	-0.1	.1	.1

Expected values of harmonics in RETURN END at ALL current (Unit-m)

n	<Bn>	d(Bn)	sig(Bn)	<An>	d(An)	sig(An)
1	0	1	1.	0.	.5	1.
2	3.	1	1.	.0	.5	1.
3	0.	.2	.1	.0	.3	.5
4	0.	.5	.2	.0	.1	.1
5	0.	.1	.1	.0	.1	.2
6	-0.1	.1	.1	.0	.05	.1
7	0.	.1	.1	0	.05	.1
8	0.	.1	.1	0.	.05	.1
9	0.	.1	.1	0	.05	.1
10	-.2	.1	.1	0	.05	.1

Notes:

1. This table is basically derived from the table on the 80 mm aperture arc dipoles.

2. The differences are on (a) saturation induced harmonics which are practically zero at 5000 A in D0 dipole (Note that the the current dependence in field harmonics show the maximum b2= +2.7 unit at 4.5 kA, b4 =-0.5 at 4 kA and b6 = 0.5 at 4 kA) and
(b) the harmonics may be lower in the lead end - if some thing is done to reduce the contribution due to lead, etc.

***3. The harmonics are optimized at the maximum design current. At 660 and 1450 Amp, the estimated contributions are from the persistent currents. These are scaled from the measurements in 80 mm dipoles in the ratio of the amount of superconductor present. This is a first order estimate which may not be completely correct.

4. As compared to the 8 cm dipoles, we have assigned a lower value for d(b2) and d(b4) because we are taking credit for the planned use of the pole and midplane coil shims.

5. a1 saturation is the computed value in 8 cm dipole. This would be different in this magnet. However, since no computation is done we have used the 8 cm dipole value as the first guess. Note that the a1 saturation can be reduced by adding some extra iron in the lower half of the magnet. This is very practical in these magnets as they are being built in house and only a fewer number of them are needed.

6. The harmonics in the ends are copied from the table arrived for the 8 cm aperture arc dipoles.

7. Please see notes for table 3(b), file EXPECTED_D8.TABLE3_C, for general comments in the case 8 cm dipole which are also valid here.

Oct 18, 1993

8. The end harmonics in D0 dipoles are changed in the spirit of changing them in the 8 cm arc dipole. Please see file EXPECTED_D8.TABLE3_D for general comments.

9. The uncertainty in body <a1> is made 1, same as in the 8 cm arc dipoles.

Nov 21, 1994

10. The end harmonics in lead end for B2 and A2 are reduced by a factor of two and d(Bn) increased by a factor of two to allow a credit for the improved scheme for designing ends.

May 1, 1996

11. Revised estimate based on warm measurements in D0. Expected ends harmonics are revised.