

STATUS REPORT ON DIPOLE MAGNETS FOR TRANSFER LINE-2 FOR CTF3

22 Jan 2008

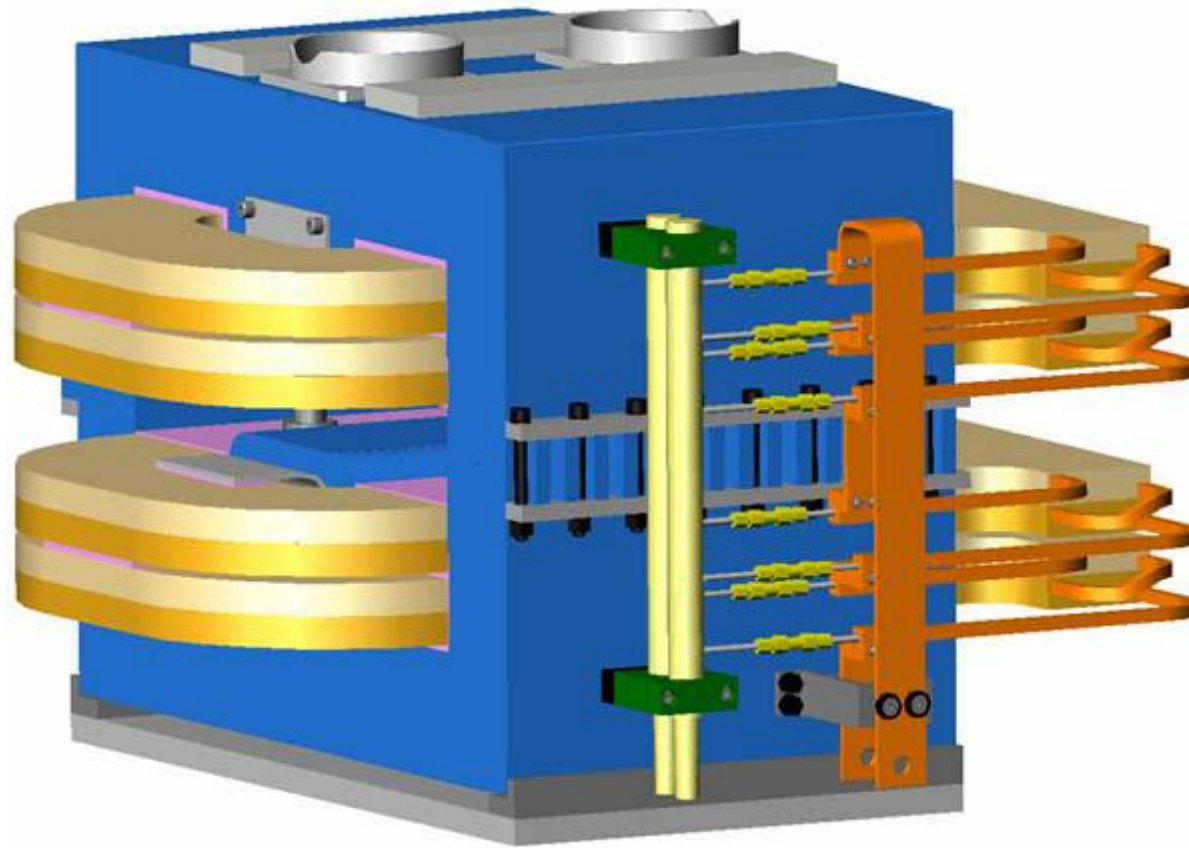
**S.S. PRABHU, A. K. JAIN & V. C. SAHNI
RRCAT, INDORE (INDIA)**

DIPOLE MAGNET

Specifications

Sr. No.	Parameters	Values (Type-1) 35°	Values (Type-2) 17.5°
1	Nominal Field	1.3 Tesla	1.3 Tesla
2	Nominal current	340 A	340 A
3	Pole Gap	45 mm ± 50 micron	45 mm ± 50 micron
4	Pole width	240 mm	240 mm
5	Coil Pocket size	176 mm (width) X 157.5 mm (height)	176 mm (width) X 157.5 mm (height)
6	Yoke Length	0.465 m	(0.235 m)
7	Magnetic Length	0.518 m	0.268 m
8	Bending Angle	35°	17.5°
9	Construction Length	0.92 m	0.69 m
10	Core weight	1273 kg	640 Kg
11	Coil weight	860 Kg.	445 Kg
12	No of Pan Cakes	4	4
13	No of turns	48/pancake	48/pancake
14	Total no of turns	192	192
15	Resistance	60 milli-Ohm	32.5 milli-ohm
16	Voltage	20.4 Volts	11.3 volts
17	Power dissipated	6.8 Kilo-watt	(3.8 KW)
18	Cooling water flow	9.5 LPM	9.5 LPM
19	Pressure drop	2.4 ata	1.24 ata
20	No of cooling circuits	4	4
21	Water temperature rise	11° C	5.8° C
22	Quantity Required	2 Nos.	3 Nos.

DIPOLE MAGNET ASSEMBLY



Overall Size of Assembled Dipole Magnet (35° bending angle)

Magnet height – 640 mm

Magnet Width – 1000 mm (812 + 30 + 158)

Magnet Length – 910 mm

Magnet total weight - 2200 kg

Fabrication Stages :

Laser Cutting of Stampings.

Stacking of stampings & pressing to form a block.

Welding of stampings to get block.

Machining of pole surface & other reference surfaces.

Assembly of two blocks along with water cooled coil pancakes.

Stacking Fixture





Stacking Fixture with laminations



First short magnet core assembly at RRCAT



Coil winding



Coil potting



Finished coil
and magnet assembly

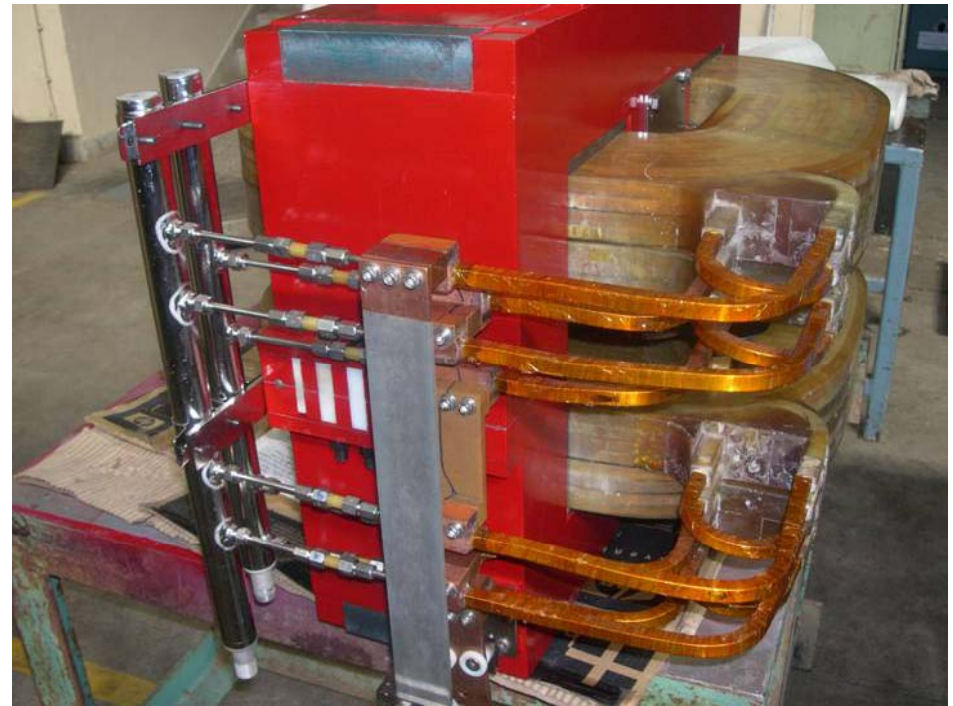


Magnet measurement of first dipole magnet at RRCAT



Details of coil
interconnections

Assembled short magnet



Packing of short magnet



Arrangement for safe transportation





Final packing ready for shipment

Painting of remaining cores



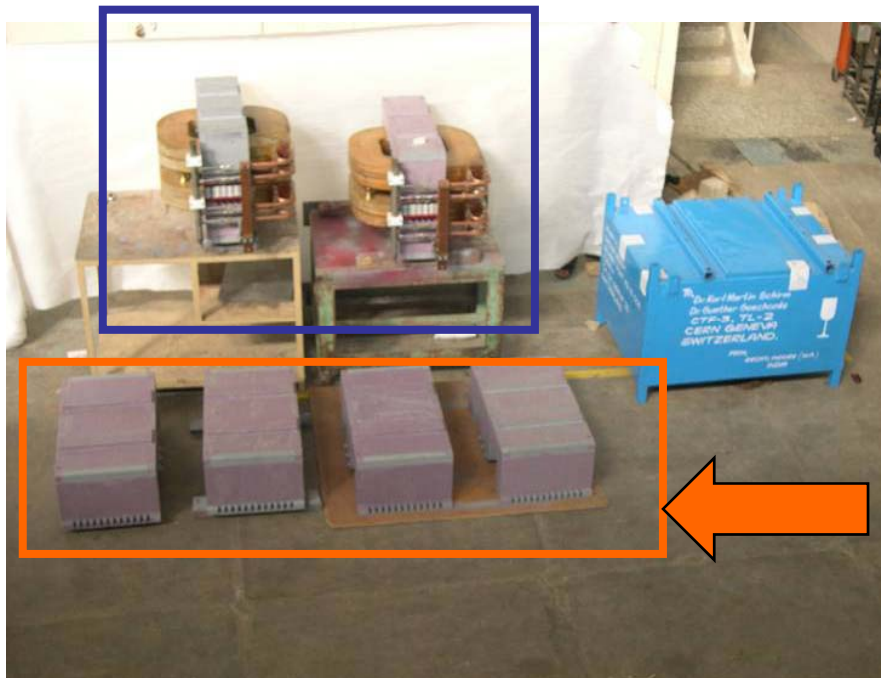
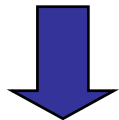
Magnet Core Fabrication Inspection Details – Before welding

Sr no	Magnet no	Magnet type	Block no	Packing factor	Block dimensions before welding					Date of completion
					Left top	Left bottom	Rt top	Rt bottom	centre	
1	CLIC-TL2-DP-S-01	First Short	first	0.9892402	234.8	234.3	234.8	234.3	235	3/8/2007
			second	0.9901424	235	234.5	235.1	234.34	235	6/8/2007
2	CLIC-TL2-DP-S-02	Second Short	first	0.9891454	235.2	234.4	235.38	234.4	235	1/10/2007
			second	0.9871354	235.3	234.55	235.5	234.3	235	5/10/2007
3	CLIC-TL2-DP-S-03	3rd Short	first	0.9870542	235.6	234.5	235.4	234.2	235	9/10/2007
			second	0.98627	235.5	234.44	235.64	234.4	235	23-10-07
1	CLIC-TL2-DP-L-01	First Long	first	0.9889475	465.7	465	465.7	464.9	465	19/9/2007
			second	0.9888276	465.7	465.1	465.7	465.15	465	21/9/2007
1	CLIC-TL2-DP-L-02	Second Long	first	0.9855214	465	463.7	464.9	463.7	464	27-09-07
			second	0.9875455	466.1	465	466.4	465	464	3/10/2007

Magnet Core Fabrication Inspection Details – After welding

Sr no	Magnet no	Magnet type	Block no	Block dimensions after welding					Total weight	Date of completion
				Left top	Left bottom	Rt top	Rt bottom	centre		
1	CLIC-TL2-DP-S-01	First Short	first	233.4	233.42	234.1	234.1	234.9	316.1821	3/8/2007
			second	234.2	233.78	234.24	233.82	235	316.1969	6/8/2007
2	CLIC-TL2-DP-S-02	Second Short	first	234	233.42	234.32	233.36	235.1	316.3741	1/10/2007
			second	234.6	233.78	234.54	232.7		316.4713	5/10/2007
3	CLIC-TL2-DP-S-03	3rd Short	first	234.8	233.6	234.7	233.6	235.5	316.9228	9/10/2007
			second	235	233.5	234.56	233.86	235.2	316.5056	23-10-07
1	CLIC-TL2-DP-L-01	First Long	first	465.3	464.6	465	464.3	466.2	631.8839	19/9/2007
			second	464.8	465.1	464.5	464.8	466.8	632.2639	21/9/2007
2	CLIC-TL2-DP-L-02	Second Long	first	464	462.6	463.74	463	464.72	629.9204	27-09-07
			second	465.2	464.1	465.1	463.7	464.7	629.5204	3/10/2007

Short dipole magnets



Long dipole magnets

Dipole Magnet Fabrication Status as on 15th Jan 2008

Stages of Fabrication	S-1	S-2	S-3	L-1	L-2
Machining work 2 blocks	Complete	Completed	Complete	Complete	Complete
Assembly of Core	Complete	Completed	Complete	Complete	Complete
Coil winding 8 pan cakes	Complete	Complete	Complete	Complete	Winding Started
Coil Potting 4 double pan cakes	Complete	Complete	Complete	Complete	
Magnet Assembly work	Completed dt 29-11-07	Completed on 4 th Jan 2008	Completed on 11 th Jan 2008		
Magnet Magnetic Testing work	Complete				
Painting work	Complete	Complete except finish coat	Complete except finish coat	Complete except finish coat	Complete except finish coat
Packing in Box	Complete 18 th Dec 07				

S-1 - Short Dipole Magnet Magnetic Field Measurement Results

Current Amp	B_0 in Tesla	dB/ B_0 for 120 mm radial dist	B_0L in Tesla-mm	dBL/ B_0L for 120 mm radial dist
166 A	0.85966	0.00055	270.492	0.011416
290 A	1.2213	0.00056	380.662	0.011
320 A	1.28153	0.00057	398.7756	0.01212
340 A	1.31881	0.0006	409.9414	0.0123

Further Work

- Optimization of first short dipole magnet entry-exit taper angle at CERN.
- Providing same taper on entry-exit block of all balance 4 dipole magnets at RRCAT, India
- Magnetic measurement of remaining 4 dipole magnets at RRCAT, India

THANK YOU FOR YOUR ATTENTION