UPC 004

DIPOLE ACCEPTANCE CRITERIA

Revised UPC 4

February, 1979

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Part I	Magnetic	Mag #	<160	≥160
1)	Quench Current QI	>4300A @≥100 a/s		>4350 @≥200 a/s
2)	AC Loss	<1000 J/cyc @ 4000A and 200 a/s		<500 J/cyc @ 4000A and 300 a/s

3a) ∫Bdl absolute measurement 2000A

Absolute accuract ¼ x 10^{-3} tolerable acceptance about mean ± 10^{-3}.

b) Relative $\int Bdl/I \Big/ \int Bdl/I|_{2000A}$

At 4300A relative accuracy ¼ x 10^{-3} tolerable acceptance about mean ± ½ x 10^{-3}.

At injection (~600A) relative accuracy ½ x 10^{-3} tolerable acceptance about mean ± 1.5 x 10^{-3}.

Excitation curve of relative ∫Bdl needed also.

Presently

Good ∫Bdl measurements do not exist; NMR data with no end measurements are used. The criteria for the transfer function is:

	<#160	≥#160
TF = 9.985 @ 2000A ±	.01	±.01

Differential T.F. is probably inaccurate especially at low excitation. Reproducibility has not been checked.

4) The Vertical Axis measured and marked using standard supports

@ 2000A absolute accuracy ½ x 10^{-3} rad (if possible)

@ higher excitation to 4300A relative to 2000A value ± ½ x 10^{-3} rad.

@ injection (~600A) relative to 2000A value ± 1.5 x 10^{-3} rad.

The vertical axis should be within ≤ 3 mrad of the external surfaces of the laminations.

Presently we do not know accuracy of any of measurements or whether the method of support and alignment is similar enough to that used in tunnel.

5) Mechanical flatness, twist, and curvature of iron

a) Curvature ± 15 mils from nominal measured 7 points.

b) Flatness and twist within a 30 mil envelope when supported in standard way, measured at 14 points. Relative twist should be less than 2 mr over the 7 longitudinal positions.

c) Multiple Data at 2000A and above; DC integral data

units/inches^{-n}	<160	≥160	
quad	$\pm 3.8 \times 10^{-4}$	$\pm 2.5 \times 10^{-4}$	(was)
s-quad	±3.8	±2.5	
sextupole	-16 to 0	±6	6.4
s-sextupole	±1.3	±1.0	.64
oct	±2.5	±1.5	1.6
s-oct	±2.5	±1.5	1.6
10 pole	--	3 ± 1.5	
s-10 pole	--	±1.0	

Presently skew quad and normal sextupole are most out of tolerance. AC data or ramping effects must still be evaluated.

Part II Electrical (measurements to be made after magnetic measurements and repeated if necessary within 2 weeks of shipment.)

		#160	≥160
1) Hi pot.	Coil to bus bus and coil to ground heater to ground	< 5μA @ 3KV	@ 5KV
	heater to coil	< 5μA @ 1KV	1KV

2) Coil - (coil & return bus jumpered together)

a) Resistance measured to accuracy of ±.3% (R≈ 4.8 ohms) and temperature recorded to 1°K.

b) Capacitance of coil and bus to ground accuracy of ≈ 10% ($C \approx 60\mu F$).

c) Inductance and Q (series equiv circuit) at 1 KHz ± .5%.

Inductance L ≈ 23 MH accuracy ± ½ Mh tolerance ± 1 mh

Q ≈ 1.7 accuracy ± .1 tolerance ± .2

Complete specifications and procedure given by R. Shafer UPC (85).

3) Heater continuity (connector installed according to specification)

(Burndy connector) H-V 16 ± 1 ohm

e-L 16 ± 1 ohm

E to downstream Coil lead 0.8 ± 0.5 ohms

Better connector should be found for future magnet production. (Need more space between pins to prevent arcing.)

Part III Vacuum

Test procedure for measurement of magnet vacuum leaks while the magnet is on the magnetic measurements stand is to be set up by C. Owen, F. Cole and D. Gross. Such measurements while the magnet is cold should be more sensitive than room temperature measurements taken afterward. In the meantime, room temperature measurements are to be made after magnetic measurements as follows:

1) Magnet is to be purged at least three times with nitrogen and all vacuum readings taken at opposite end of magnet from where pump is located.

2) Beam pipe vacuum $\leq 10^{-5}$ torr

Insulating vac ≤ 200μ

3) Leak detector sensitivity - minimum detectable leak of 50×10^{-10} atm cc/sec or better. If external pup other than leak detector is used calibrated leak must be placed before any branch point in the pump leak detector system.

(Pup at one end of magnet - leak detector at other end is not permitted.)

4) Leak check N_2, 1ϕ, 2ϕ lines by pressurizing them one at a time. Look at both insulating and bore tube vac (for 1ϕ) with detector at each end of magnet. No detectable leak should be observed. Outside end boxes and bellows should be checked by bagging ends and spraying inside bags.

Bore tube vacuum should be checked separately for leaks to insulating vacuum by leak hunting end bellows and connections.

Part IV Mechanical Specifications

1) Type 5 collars.

2) Flapper and relief modifications of 1ϕ and large 3" D relief port on insulating vacuum.

3) Sufficient lead length (US & DS) to make proper connections between magnets.

4) Mounting plates (MB-106987) and tie rod lugs (MA107214) welded to magnet (Drawing No. 1620-MD-106502, Rev. B.)

5) Use templates to check locations of beam tube, 1ϕ, 2ϕ N_2 flanges relative to laminations.

6) Miscellaneous

a) All sealing surfaces are free of scratches.

b) All bellows are free of dents and scratches.

c) All wrench flats clear of weld bead.

Part V Heat leak measurement on individual magnets should be developed if possible.