

REPORT ON THE DISCUSSIONS OF THE FNAL MAGNET ACCEPTANCE COMMITTEE W/RESPECT TO LQXB06

The Fermilab magnet acceptance committee has reviewed the magnet assembly LQXB06 with respect to the acceptance criteria. A summary of the comparison between the results and the criteria are presented in the summary table.

The magnet acceptance committee concludes the magnet is ready to ship.

LQXB06 (MQXB07, MQXB09) ACCEPTANCE CRITERIA SUMMARY

Criteria	Description	Status	Resp. Party	Reported by
2.1.1	MQXB MECHANICAL TWIST AND STRAIGHTNESS	OK*	rb	rb
2.1.2	MQXB COIL RINGING		sf	sf
2.1.3	THERMOMETER AND WARM UP HEATER INSTALLATION	OK*	rb	rb
2.1.4	BUS WORK CHECKOUT	OK	rb	rb
2.1.5	ROOM TEMPERATURE HIPOT	OK	ml/ah	ah
2.1.6	ROOM TEMPERATURE ELECTRICAL CHECKOUT	OK	ml/ah	ah
2.1.7	PRESSURE TEST DOCUMENTATION	done	tn/tp	tp
2.1.8	LEAK CHECK DOCUMENTATION	done	tn/tp	tp
2.1.9	CRYOSTAT SAFETY DOCUMENTATION	done	tn/tp	tp
2.1.10	PIPE ASSEMBLY DOCUMENTATION	done	tn/tp	
2.1.11	WARM CRYOSTAT TO MAGNETIC AXIS REFERENCE	done	ps	ps
2.2.1	COLD INSTRUMENTATION CHECK OUT	OK	ml/ah	ah
2.2.2	COLD HEATER CHECKOUT	Q2 section of Q2a heater strip "A" bypassed	ml/ah	ah
2.2.3	COLD ELECTRICAL HIPOT	OK	ml/ah	ah
2.2.4	NO QUENCHING UP TO AND INCLUDING OPERATING GRADIENT (AFTER TRAINING)	pass	ps	ps
2.2.5	NO TRAINING DEGRADATION AFTER FULL ENERGY DEPOSITION TRIP (SEE ABOVE)	dropped from test plan	ps	ps
2.2.6	TRANSFER FUNCTION	pass	ps	ps
2.2.7	INTEGRATED COLD HARMONICS	pass	ps	ps
2.2.8	COLD ALIGNMENT	accept*	ps	ps

* see comments below

LQXB06 includes:

- Quadrupole MQXB07 (Q2a)
- Quadrupole MQXB09 (Q2b)
- Corrector HCMCBX_001-SI000013

The ID card for LQXB06 has been completed and is being transmitted separately.

COMMENTS:

2.1.1 Twist within spec on both cold masses. Straightness within spec on MQXB07. Straightness on MQXB09 measured up to 575um in vertical direction and 750um in horizontal direction.

2.1.3 All thermometer and warm-up (cryogenic) heater installation was OK. Thermometers (RTD's) removed and replaced on both cold masses when magnet was disassembled for strip heater repair.

2.2.7 Harmonics between the 2 and 3 sigma acceptance bands at collision: none; greater than 3 sigma: none.

2.2.8

as measured

relative x, y average offset (-1.3, 0.53 mm > 0.5); pitch, yaw (-0.16, -0.35 mrad > 0.1)

REFERENCED CRITERIA:

2.1.1 MQXB MECHANICAL TWIST AND STRAIGHTNESS

Requirement: Less than 1 mR/5 m twist, 100 μ m/5 m straightness
(Cold mass traveler)

2.1.2 MQXB COIL RINGING

Requirement: No evidence of coil to coil breakdown
(Cold mass traveler)

2.1.3 THERMOMETER AND WARM UP HEATER INSTALLATION

Requirement: Thermometers and heaters installed properly
(Module assembly traveler)

2.1.4 BUS WORK CHECKOUT

Requirements: Bus work properly insulated, strain relieved
(Module assembly traveler)

2.1.5 ROOM TEMPERATURE HIPOT

Requirement: In air or bagged in dry N₂, Quadrant to quadrant (prior to quadrant busing), 3 kV.

For completed LQXB 1) with coil shorted to ground, hipot heater to ground 5kV, 2) with heater shorted to ground, hipot heater to ground 5 kV. Leakage current less than 5mA and no breakover.

(Cold mass traveler/module assembly traveler)

2.1.6 ROOM TEMPERATURE ELECTRICAL CHECKOUT

Requirements: Instrumentation wires are properly labelled, correct wire gauge, correctly wired to instrumentation connector, proper continuity
(Module assembly traveler)

2.1.7 PRESSURE TEST DOCUMENTATION

Requirement: Test pressure of 1.25 times the design pressure. The design pressure is 20 bar so the test pressure is 25 bar or approximately (2.5 Mpa).

2.1.8 LEAK CHECK DOCUMENTATION

Requirement: Follow requirements in Fermilab Specification ES-107240 [2]
(Cryostat assembly traveler)

2.1.9 CRYOSTAT SAFETY DOCUMENTATION

Requirement: Design according to ASME BPV Section VIII, Division I and must meet all applicable Fermilab safety codes.

2.1.10 PIPE ASSEMBLY DOCUMENTATION

Requirement: See LHC-LQX-ES-0007 [6] and reference drawings
(Cryostat assembly traveler)

2.1.11 WARM CRYOSTAT TO MAGNETIC AXIS REFERENCE

Requirements: See LHC-LQX-ES-0007

2.2.1 COLD INSTRUMENTATION CHECK OUT

Requirement: Instrumentation wires have proper continuity, no shorts to ground

2.2.2 COLD HEATER CHECKOUT

Requirements: Heater circuits have proper resistance, quenches all quadrants

2.2.3 COLD ELECTRICAL HIPOT

Requirement: On test stand, in liquid helium, coil to ground/heater can withstand 1.2 kV voltage difference with leakage current less than 5mA, heater to ground/coil can withstand 1.4 kV voltage difference with leakage current less than 5mA

2.2.4 NO QUENCHING UP TO AND INCLUDING OPERATING GRADIENT (AFTER TRAINING)

Requirement: Magnet reaches 230T/m during first 1.9 K thermal cycle, ~~reaches 220T/m on 2nd and successive thermal cycles without quenching~~
(dropped from the test plan)

2.2.5 NO TRAINING DEGRADATION AFTER FULL ENERGY DEPOSITION TRIP (SEE ABOVE)

Requirement: ~~Magnet reaches 220 T/m after full energy deposition quench~~
(dropped from the test plan)

2.2.6 TRANSFER FUNCTION

Requirement: Gradient /excitation current correlation

2.2.7 INTEGRATED COLD HARMONICS

Requirements: Harmonics fall within acceptance table limits.

2.2.8 COLD ALIGNMENT

Requirements: See LHC-LQX-ES-0007

REPORTERS:

Initials	Name
ps	Phil Schlabach
rb	Rodger Bossert
ml	Mike Lamm
ah	Andy Hocker
tn	Tom Nicol
tp	Tom Page
sf	Sandor Feher