

LARP Magnet Tests at Fermilab

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Why at Fermilab?

- Fermilab carried out:

1. HGQ program => VMTF
2. LQXB (long magnets) => HMTF4

FOR LHC IR Quads

At VMTF 9 HGQ cold mass and more than 20 HFM objects

At HMTF4 ~ 20 cold masses

For LARP IR Quads there is no need for a new cryostat and Test Stand

- State of the art cryogenic and DAQ system (excellent electronics and cryogenics group) – great infrastructure.
- Full service test facility; whole range of tests; continuous operation – Tevatron operation support until 2008.
- Efficient and relatively low cost.
- Independent Test Department with magnet scientist included (M. J. Lamm, J. C. Tompkins, S. Feher, G. Velev, J. DiMarco, P. Schlabach) but partner with magnet designers
- Continuous upgrade of the Test Facility => Top of the line
- Demonstrated that interfacing magnets from different labs (LBNL) is possible even without any planning at the design and fabrication phase.

Cost of a test

Test Plan Overview:

1. Quench training (0-30kA)
2. Ramp rate studies
3. Magnetic Measurements
4. Temperature Dependence Studies (1.75K – 4.65K)
5. AC loss measurements
6. Spot and Strip Heater studies
7. RRR measurement
8. Temperature and Strain Gauge Measurements continuously

Cost: 5 days of cold testing/test cycle (average values for 7-8 tests)

LHe \$4500, LN2 \$200,

Cryo-Mechanical tech labor (mounting, running, dismounting) 72 man hours

Electrical tech labor (electrical check, wiring etc) 15 man hours

Engineers 8 man hours, Software support 4 man hours

Physicists 65 man hour

Total: \$ 26k (G&A included)

Upgrade under progress

- Main goal to have a top facility for HFM R&D.

TEST ⇔ EXPERIMENT

Our group is not a “support” group, it provides full analysis as well. On the other hand we work closely with magnet designers.

- Plans:
 1. DAQ upgrade:
 - Fast readout system (100kHz) with 32 VTap channels
 - Fast Strain gauge (8 gauges) & Temperature sensor (4 sensors) readout system (few kHz)
 - Fast Quench Antenna readout system (100kHz) 12 channels. Triggering capability.
 2. PS voltage noise reduction (it was optimized for current ripple => accelerator quality system) so we can deal with the “spike trend” more efficiently.

Upgrade under progress cont's

3. Data Storage & Analysis

New approach to use MathLab readable database and MathLab program to do the analysis.

Advantages:

- Easy data transfer.
- Stand alone executable – no licensing issues so it can be distributed easily among the Labs.

Disadvantages:

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