BROOKHAVEN NATIONAL LABORATORY

LHC PROJECT
MEMORANDUM

Date: 19 May 2000
To: Erich Willen
From: Steve Plate
Subj: Pressure Test Rating of BNL-Built LHC Cold Masses

The Functional Engineering Specification "Superconducting Beam Separation Dipoles" for the BNL magnets has one comment from Rob VanWeelderen that BNL must resolve having to do with the operating and test pressures at which these magnets should be rated. Rob stated that all "magnet cold mass design and test pressures must be identical to the pressure specifications of item L of LHC-Q-ES-0001 rev. 1.0, Table 4, page 15". In accordance with this document all LHC magnets are designed for an operating pressure of 2.0 MPa (20 bar or 290 psia) with a 125% test pressure requirement. In contrast to this, all RHIC cold masses were rated for a nominal operating pressure of 275 psia and the same 125% test requirement. Since D1 is essentially a RHIC dipole, what was in question was the adequacy of the existing design in meeting this requirement, as well as BNL's intention of making D2, D3, and D4 comply.

I have reviewed the RHIC Dipole Safety Analysis documentation, reviewing the calculations and assumptions made regarding the design stresses and allowable stress intensities at the nominal 275 psia operating pressure and the higher pressure required in the referenced CERN specification. The most severe stresses occur in the weld joining the end volume sleeve to the end volume plate. However, comparing the stress intensities obtained at the operating pressure of 2.0 Mpa with the allowable stresses still gives a design that is in compliance with the ASME Code, Section VIII, Div 2, as was used for the original design analysis. Therefore we will be able to comply with the CERN requirement, and our Functional Specification should be clear for incorporation on that account.

All MAPs and Travelers that are written at BNL for the production of LHC cold masses that reference either design or test pressures must therefore use the CERN-specified values of 2.0 Mpa (290 psia) and 2.5 Mpa (363 psia) respectively.

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