**MINUTES –ACCEPTANCE MEETING FOR LHC MAGNETS BUILT AT BNL**
Magnet: D1L103
Date of meeting: 23 September 2002
Date of these minutes: 5 November 2002
Present: Anerella, Escallier, Hocker, Jain, Muratore, Plate, Porretto, Schmalzle, Wanderer, Willen

[Information added after the acceptance meeting is in square brackets or has been added as footnotes.]

**Summary:** The acceptance of D1L103 was completed at the meeting of September 23 except for review of the survey data and acceptance of the deviation waiver for the pipe positions at the ends of the magnet by the US LHC PMO. These two tasks were completed later, as documented in the footnotes. This magnet has been accepted by the BNL LHC Acceptance Committee.

**Quench Data:** Muratore showed the quench data and wrote the following summary: D1 magnets have, by design, a more restricted space between the magnet cold bore tube and the ID of the magnet coils than the RHIC arc dipoles. This will reduce the flow of the helium to cool the conductor, especially after a quench or the introduction of heat leaks from the outside such as that from the warm bore tube (WBT). In previous D1 magnets, the initial quench performance of the magnet was lowered from what was expected, and various measures to reduce the heat leaks were performed until proper quench performance was achieved. Insulation was added to end can; copper braid attached from warm bore tube to helium line as heat sink. This did little to improve quench performance, and the 7000A level was reached only after thermal cycle and complete removal of the WBT.

For D1L103, the WBT was further improved to reduce the heat leak into the magnet. The WBT was fitted with periodic spacers to hold it off from any contact with the magnet cold bore, and the space between the two bore tubes was filled with superinsulation. Since this magnet was chosen to be the only one of the D1 magnets to have cold magnetic field measurements, all quenches were done with the WBT installed.

Quenches 1-4: WBT installed, sealed, and under vacuum.

Quench 5: WBT installed, open to room temperature.

As can be seen from the accompanying quench plot and summary, the magnet quickly trained to almost 7000A, but then quenched lower. All four quenches went above the higher 7.56TeV operating level of 6290A. Clearly the heat leak was still affecting quench performance but at a much reduced level. During field measurements, with the WBT now open, the magnet was operated repeatedly at 6500A with no instabilities. After field measurements were finished, a quench test was performed and a quench current of 6844A was reached. This gives an 8.8% margin with an open WBT. Since there was no time to

schedule a thermal cycle and remove the WBT, this was considered an acceptable performance even though the 7000A level was not actually demonstrated.

**Field Quality:** Jain showed warm data from all five magnets. (D1L102 measurements were made on the cold mass.) The data shown today are the same data shown as the D1L105 acceptance meeting plus some added warm measurements. The AP group reviewed and approved the D1L103 field quality when it considered the D1L105 data. (The relevant email from Pilat is attached to the end of the D1L105 minutes.)

**Engineering, QA:**
Escallier reported that the magnet has passed all electrical tests.
Plate reported that the magnet was ok except that some pipes were out of position so that preparations for shipping were not finished. A final survey will have to be done after the pipe positions are corrected. [Following discussions among BNL staff, Pfund and Peterson at Fermilab, and Rasson at LBL, the DW for the out of tolerance pipe positions was accepted, via email from Pfund, note [1].]
Hocker agreed with the summary as of September 23. [On November 5, he stated that all the documentation needed to certify that the magnet was suitable for use in the LHC was in order.]

**Survey:** No information was available. [Subsequently, the survey data were reviewed by Plate, note [2], and sent to CERN, notes [3], [4] and [5].]

## FOOTNOTES

### [1] Excerpt from email from Pfund to Wanderer, 5 November 2002

The pipe position deviations reported in DWR No. M0286, 28 October 2002 for magnet D1L103 are acceptable. This is based on my analysis of the reported deviations and discussed with Tom Peterson, Joseph Rasson, Jon Zbasnik and Daryl Oshatz. To accommodate the reported conditions we modified the clearances in the DFBX pipe support plate and the installed lengths of the DFBX pipes.

### [2] Email from Plate to Wanderer, November 1, 2002

I have looked at Frank Karl's survey data for magnet D1L103, and compared it to the data for D1L105, the latter magnet having been accepted. I see nothing in the data that leads to me to believe any values are in error. Therefore, I give engineering approval that the data for 103 be accepted, with one exception. The "a" and "c" coordinate values for the beam screen at the lead end (PBS11) should be ignored because that pipe was relocated to bring it within tolerance after the survey data was taken. The new coordinates, as measured by the technicians, are:
a=168.419
c=-197.425

**[3] Email from Plate to Quesnel, 30 October 2002**

Jean-Pierre,
Attached is a courtesy copy of the survey data from the D1 magnet that will be shipped from BNL first, magnet D1L103. This data is in the same format as the data sent for magnet 105, so I have opted to send you the Excel spreadsheet and coordinate system definition alone (the drawing would look identical).

Please indicate by return email that you have received this file in readable form. Your response will indicate to us an acceptable transmission of the data to CERN. Thank you.

**[4] Email from Quesnel to Plate, 30 October 2002**

Steve,

I forward your mail to Dominique Missiaen who will visit you next week at Fermilab.
Regards,

Jean-Pierre

**[5] Email from Plate to Missiaen, 1 November 2002**

Dominique,
Jean-Pierre Quesnel forwarded to you the survey data for BNL magnet D1L103 that I previously sent to him. I neglected to include in that data the re-measured "a" and "c" coordinates for the beam screen pipe at the lead end (PBS11). The new values are a result of bringing that pipe position within tolerance subsequent to the survey being done. I ask that you discard the first set of data that was provided earlier this week and use the attached data in its place. Sorry for any confusion this might have caused.