

MEETING REPORT

Subject:

Structural safety requirements for the Fermilab and KEK quadrupoles for the LHC.

Participants:

Fermilab: J. Kerby
US-LHC Project: P. Pfund
KEK: A. Yamamoto
CERN: M. Bona, A. Desirelli, T. Taylor.

Place and date:

CERN, 19 April 2000.

This report documents the main points of the discussion held at CERN concerning the safety structural requirements for the Fermilab and KEK quadrupoles for the LHC machine.

In a meeting prior to this one, held at Fermilab on 17 March 2000, the Fermilab responsible engineers presented to TIS their proposal for the qualification of the welds and the production checks. On the same occasion a number of technical documents were given to TIS for assessment.

In the March meeting at Fermilab it was agreed with A. Yamamoto, the KEK responsible person, that the requirements for KEK will be in line with those established for Fermilab.

The main points discussed and agreed upon are reported below.

FERMILAB quadrupoles.

Based on the assessment made in collaboration with the metallurgy department of the EST Division, TIS agrees with the documents received at Fermilab in March 2000.

Based on these documents, on the chosen materials and welding technique, as well as on the agreed list of checks and controls to be carried out during the prototype and series production phases, TIS will drop its request for a 100% X-ray check of the longitudinal weld seams.

The agreed checks and controls are those listed in the Fermilab proposal (technical note by J. Kerby and D. Chichili) provided to TIS in March, with the addition of impact testing at 4.2 K.

Fermilab will place strain gauges on one of the two prototypes before welding in order to verify the level of stress obtained after welding. Due to the kinematics of the cross-section, no monitoring of the stress evolution is required during cool-down.

The prototypes will be used to complete the welding qualification, which will consist of elements drawn from the requirements of ASME Section VIII, Division 1 and ASME Section IX, and further checks agreed upon between TIS and Fermilab. A draft table of these checks was presented at the meeting and forms the basis for the detailed list under development as mentioned below.

Once the weld qualification is completed, no further checks will be made on the series production magnets, as is also the case for the RHIC-based BNL magnets for the LHC. However, weld coupons will be produced for each series magnet.

Although not a formal requirement, TIS suggested that the weld coupons of from first series magnet be x-rayed to verify that the quality of the weld has not diminished from that demonstrated during qualification.

Re-qualification of the welding procedure and welding operators will satisfy the requirements of ASME Section IX. Such a need for re-qualification is typically due to a period of inactivity resulting from an interruption of production.

TIS, Fermilab and US-LHC Project representatives will construct a detailed list of the checks and controls agreed upon for qualification and series production. Once this list is finalized, TIS will prepare an official communication, as prescribed by the MoU between CERN and the US-LHC Project, documenting the final safety structural requirements.

KEK quadrupoles.

A. Yamamoto explained the status of the KEK models. He said that two models (#4 and #5) are being developed in parallel by KEK and by the

manufacturer. These two models are supposed to be finished soon and will serve for the full qualification of the welding procedure.

KEK will soon provide TIS with some technical documents concerning the KEK design and the technical specification, which were due in the past months.

KEK has decided to use the same materials and welding procedure as Fermilab. Therefore the TIS acceptance of the Fermilab technical documents is extended to the KEK magnets.

The final list of checks and controls established for Fermilab will be used also for the KEK magnets.

KEK has already planned to monitor the stress distribution induced by the weld operation by means of strain gauges.

As soon as possible TIS will issue an official Safety Study Report which, according to the agreement established between CERN and KEK, will define the official structural safety requirements. It is expected that, apart few possible specific points, these requirements will be those defined for the Fermilab magnets.

It was planned to have a meeting between A. Yamamoto, M. Bona and T. Taylor in Japan before the end of the year, to assess the evolution of the work.

M. Bona

Distribution:

- Participants
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- CERN: A. Faugier, H. Schönbacher., S. Sgobba, R. Vuillermet, W. Weingarten.