Minutes from the LBNF-BARC meeting
June 18, 2020

Present:

1. From BARC: Sanjay Malhotra, Elina Mishra, Kumud Singh, Vikas Teotia, S.Sundar Rajan, Janvin Itteera, U.G.P.S.Sachan, Prashant Karn
2. From FNAL: Kevin Duel, Dave Hixon, Vladimir Kashikhin, Jonathan Lewis, Thomas R Kobilarcik, Philip Schlabach, George Velev, Karl Williams, Miao M Yu

Agenda:

1. Project update
2. Action items update
3. Quadrupole magnets manufacturing design and plan
4. AOB

1. Project update:
   Waiting for PPD to get approved.

2. Action items update:
   1) The tolerances in the integral field strength
   Required from the lattice, George will get the parameter next week.

   2) The difference of the dipole end design between 4-m and 6-m dipole magnets.
   From BARC, The end design of 4m and 6m dipole magnet is different. However, the ratio integral field strength between 4m and 6m dipole will be maintained at 2:3, to satisfy the physics requirements
   David: Entrance angle is different. George, David and Vladimir will discuss and make it clear.

   3) COVID19 Impact

3. Engineering design of Quadrupole magnets for LBNF (3Q120 & 3Q60) by Vikas Teotia
   Question and Discussion:
   1) George: on page of single Quad, where is the asymmetry design?
      Vikas: Height & width offset by 20 mm. (need better illustration)
   2) Vikas: What is the max. cooling water pressure difference that FNAL can handle?
      David: Maybe 4 bars, need clarification.
   3) Sanjay: What is the maximum pressure, < 10 bar? We require the pressures in the inlet and outlet headers.
      No comment in the meeting.
   4) Vikas: do we need to cancel the solenoid component while making inter-coil connections in quadrupole?
      No comment in the meeting.
   5) George How to make the lamination? Will be stamped
      Yes.
   6) George: how to assemble the laminations.

7) Miao: Use only 4 rods as to stack the lamination during assembly. FNAL also use corner and edge to help align.
   Only use rods, with minimum 3 rods per layer (200mm per layer with many laminations)
8) Vladimir: Any Experience of assembly the long coil (Vertical vs. horizontal). Not only need the rods, but also good support fixture, because the rods can bend along the length.
   Vikas: New assembly method proposed by BARC. BARC will prepare detailed assembly drawings.
9) Vladimir: use electrical steel vs. AK steel, concern of anisotropy or non-homogeneous. The silicon or some other content in different direction (along/across the flux line) may affect the BH curve. How the BH curve in the presentation is measured?
   George: ask BARC to send the steel sample to FNAL
   BARC: The B-H curve was measured with DC permeameter. Silicon content in the iron is ~ 1.5 %.
10) Chris: Where is the thermal switch located?
   BARC: Mounted on copper coil/busbar.
   Jonathan: Do FNAL need to provide these thermal switches?
   BARC: It may lead to better compatibility with the instrumentation/controls intelock at FNAL.

Action item:

1) George, David and Vladimir will discuss the end pack requirement and design for 4-m and 6-m dipoles.
2) Christ will comment on where the thermal switches should be mounted, and the requirement.
3) Miao will ask FNAL QC group the size of the electrical steel we need to do the magnetic measurement (B-H curve).
4) Vikas and Sanjay will send the question
   (a). Water pressure of inlet and outlet headers and allowable flow / quad magnet
   (b). Do we need to cancel the solenoid component while making inter-coil connections in quadrupole?
5) Sanjay will upload the presentation to the indico page.
6) George will remove the previous bi-weekly meeting invitation.

4. AOB: Our next meeting will be held on 7/2, 9am/7:30pm, on Engineering design of 4-m long dipole.