Contribution ID: **846** Type: **Poster Presentation**

C3Po1G-05 [41]: Design and Fabrication of the Mu2e Cryogenic Distribution System

Wednesday, July 24, 2019 9:00 AM (2 hours)

The muon-to-electron conversion (Mu2e) experiment at Fermilab will be used to search for the charged lepton flavor-violating conversion of muons to electrons in the field of an atomic nucleus. The Mu2e experiment is currently in the design and construction stage and is expected to begin operations in 2022. The Mu2e experiment uses 4 large superconducting solenoid magnets including a Production Solenoid (PS), an Upstream and Downstream Transport Solenoid (TSu and TSd) and a Detector Solenoid (DS).
This paper will focus on the cryogenic distribution system for these 4 solenoid magnets. Liquid helium will be supplied from two re-purposed Tevatron satellite refrigerators. A large cryogenic distribution box will be located in the Mu2e building to distribute the required cryogens to each of the four solenoid magnets. Each solenoid magnet will have a dedicated transfer line and cryogenic feedbox. The solenoid magnets each require two liquid helium circuits and two liquid nitrogen circuits.

The most unique feature about this cryogenic system is that the assemblies for the start of the superconducting portion of the power leads are mounted in feedboxes that are in the range of 23 m to 31 m away from the solenoid magnets. The cryogenic feedboxes are located remotely to provide protection from radiation damage and high magnetic fields. The power leads are NbTi superconducting cable stabilized with high conductivity aluminum. The 6061-T6 aluminum grade was selected for the transfer line piping so that the piping would thermally contract at the same rate as the power lead. A major concern for this transfer line is that a small helium leak could create an electric discharge arc due to the Paschen effect. This paper includes a description of the design features and testing done to ensure that the power leads are protected from the Paschen effect while still being adequately cooled to liquid helium temperatures.

Primary authors: WHITE, Michael (Fermilab); LAMM, Michael (Fermi National Accelerator Laboratory (FNAL)); HOCKER, Andy; Mr ARNOLD, Donald (Fermi National Accelerator Lab); TATKOWSKI, Grzegorz (Fermi National Accelerator Laboratory); Mr KILMER, James (Fermilab); POLOUBOTKO, Valeri (Unknown); TOPE, Terry (Fermilab); HUANG, Yuenian (Fermilab); ELEMENTI, Luciano (Fermilab); BADGLEY, Karie (Fermilab); VOIRIN, Erik (Fermi National Accelerator Lab. (Fermilab)); Mr YOUNG, Ian (Fermilab); DHANARAJ, Nandhini (Fermi National Accelerator Laboratory); Mr BRANDT, Jeff (Fermilab); FEHER, Sandor (Fermi National Accelerator Lab. (US)); Mr HESS, Charles (Fermilab)

Presenter: WHITE, Michael (Fermilab)

Session Classification: C3Po1G - Cryogenic Distribution Systems