WEPO1A7-04

Progress of the Insert Coil Design for the US-NHMFL 100T Class Nondestructive Short Pulse Magnet System

C. Swenson(1), A. Gaverlin(1), V. Topoloski(1), B. Lesch(1), J. Schillig(2), and J. R. Sims, Jr.(3)
(1)National High Magnetic Field Laboratory, 1800 E Paul Dirac Dr., Tallahassee, FL 32310, USA, (2)Los Alamos National Laboratory and National High Magnetic Field Laboratory, PO BOX 1663, LOS ALAMOS, NM 87544, USA, (3)Los Alamos National Laboratory and National High Magnetic Field Laboratory, PO BOX 1663, LOS ALAMOS, NM 87544, USA

This paper updates progress on the design of the insert coil for the 100T class nondestructive short pulse magnet system, consisting of a long pulse outsert coil, powered by a generator / converter set, and a short pulse insert coil, powered by a capacitor bank. The magnet system, funded by DOE and NSF and designed by NHMFL, has entered the construction phase and will be installed at the NHMFL Los Alamos site. The electro-mechanical aspects of insert coil designs are reviewed in the context of the mechanical properties of newly developed and available materials. The specific materials discussed are a high strength CuNb composite conductor, as well as high modulus PBO-zylon fiber, and MP35N (a multiphase cobalt super-alloy) based reinforcements. We discuss various winding, reinforcement and lead designs for the insert coil, as well as planned testing to verify the performance of these designs prior to operation inside the outsert coil set. The paper also outlines the assembly process together with a discussion of tolerances and their impact on performance.

WEPO1A7-05

Pulse Magnet Development for B > 80 T

C. Swenson(1), Y. Eyssa(1), S. Askenazy(2) and H. Schneider-Muntau(1)
(1)National High Magnetic Field Laboratory, 1800 E Paul Dirac Dr., Tallahassee, FL, 32310, USA, (2)Service National Des Champs Magnétiques Pulsés, INSA Complexe Scientifique De Rangueil, 3 Allée Roland Carros, Cedex 4, F-31077 Toulouse, France

This paper reviews issues in the design and construction of monolithic pulse magnet coils with internal reinforcement for fields >80 T. The objective of this work is to improve peak field performance, and to advance reliability of monolithic pulse magnets even further. We attempt to bridge the gap between 90 T and 100 T paper designs and the present performance limit of ~80 T. Candidate conductor materials are CuNb and CuSS, and high modulus PBO-zylon together with MP35N is used as reinforcement. We present the results of our optimization calculations, and practical design issues such as insulation selection for high voltage, conductor manufacturing, winding methodology, end mechanics, and thermal contraction properties to achieve a predictable reinforcement configuration at 77 K.

WEPO1A9-01

Design of High Temperature Superconducting Magnet

Y. Jo(1), Y. Kwon (1), K. Ryu (1), J. Hong (2)
(1)Korea Electrotechnology Research Institute, Changwon, 641-120, Korea, (2)Dept. of Electrical Engineering, Changwon National University, Changwon, 641-773, Korea

It is well known that Ic (critical current) in High Temperature Superconducting (HTS) materials is more sensitive to magnetic fields perpendicular to the wide face of the HTS tape (B^) than to fields parallel to that (B//). Thus, in shape design of the HTS magnet, a method to reduce the value of B^ should be considered. This work presents racetrack HTS magnet with iron plates to achieve the maximum current-carrying capacity and the simple shape that can easily be wound and jointed. The shape, position and kinds of iron plates are chosen by using 3 Dimensional Finite Element Analysis (3D FEA) considering magnetic saturation of iron plates. The racetrack HTS magnet with iron plates, magnet having optimized current distribution and initial magnet are compared with each other through 3D FEA, manufacturing and testing these magnets. The measured performance of the magnet with iron plates improved by 50% on the basis of initial magnet.

WEPO1A9-02

Cryocooler-Cooled Bi-2212/Ag HTS Solenoid Magnet System

H. Morita(1), K. Itoh(3), H. Kitaguchi(3), H. Kumakura(3), M. Okada(1), J. Sato(2), K. Tanaka(1), K. Togano(3), H. Wada(3)
(1)Hitachi Research Lab., Hitachi, Ltd., 7-1-1, Omika-cho, Hitachi 319-1292, Japan, (2)Hitachi Cable, Ltd., 3550, Kidamari-cho, Tsuchiura 300-0026, Japan, (3)National Institute for Materials Science, 1-2-1, Sengen, Tsukuba 305-0047, Japan

Cryocooler-cooled HTS magnet systems are considered to be the most promising systems for superconducting magnets for the next generation. These systems give us a lot of benefits; high field, high thermal stability, low operation cost and so on. In order to demonstrate feasibility, we have been developing a cryocooler-cooled HTS solenoid magnet system that is fabricated with Bi-2212/Ag ROSATwire (ROtation-Symmetric Arranged Tape-in-tube wire). ROSATwire shows less field anisotropy of the transport current property than tape conductors; therefore ROSATwire is ideal for solenoid magnets that generate high and uniform magnetic field. So far, we succeeded in the fabrication of 3.5km ROSATwire in length without breaking, and critical current was achieved up to 500A at 4.2K, 10T. Plural solenoid magnets have been fabricated with ROSATwire and tested. On a high sweep rate operation test, a magnet cooled with a cryocooler succeeded in being stably charged up to 200A (1.66T) at 50A/s (0.415T/s). Some high sweep rate operation test results and thermal properties of the magnet will be discussed.