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Cryo-free multisection superconducting magnetic system with MgB2 coil

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Comprehensive studies of the transport and the magnetic properties of MgB2 wires were carried out at temperatures 4.2-20 K and magnetic field up to 8 T. Cryomagnetic system with MgB2 coil was designed and constructed based on the received data. Cryomagnetic system is designed to create a permanent magnetic field of up to 5 T in the warm bore of 40 mm in diameter. The operating current of the system is 100 A. The magnetic field is created by a system of three concentric solenoids. The inner coil is composed of a 10 double pancakes wound with the 2nd generation HTS tape produced by SuperOx. Middle coil is made of multifilament MgB2 wire with a diameter of 1 mm produced by Columbus Superconductors. Middle coil has height of 120 mm, an inner diameter of 80 mm and an outer diameter of 88 mm. The inner and middle coils are connected in series, what allows both sections to operate at temperature range from 4.2 K to 20 K. The external coil of background field is wound of NbTi. It is powered by a separate pair of current leads. The solenoids are cooled by cryocooler though copper bar. The present report describes the design, the manufacture and the test results of the cryomagnetic system.

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