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Thu-Mo-Or17-04: Development of High Field Superconducting Magnets with Increasing Persistence and EXperimental Access

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Following the development of wide bore superconducting magnets using low temperature superconductors (LTS) for integrating ultra-high field high temperature superconductor (HTS) inserts, new applications for this LTS 'outsert'technology require higher temporal and mechanical stability. The development of an 18 Tesla, 150mm bore magnet system designed for scanning tunneling microscopy (STM) experiments is one such application. The design and performance of this magnet system is described. A second application for compact, large bore, high field magnets is the study of dark matter. The design of a 12 Tesla, 320mm bore LTS magnet with an adjacent region low in B field is described. This system currently being developed requires a significant extension to existing 'outsert'technology utilizing large, reverse wound shield coils above the main solenoids.

In addition, the technical advances required for the development of solenoid 'outsert' magnets are now extending the design envelope for magnets with split access for beamline applications. Such systems are designed to run with sets of coils either side of the beam in symmetric and asymmetric modes. The increasing trend for such systems requiring active shielding to reduce B field external to the cryostat leads to new design challenges. Managing quench events with increased current densities at high magnetic field in all modes of operation is essential. The current state of the art and also the potential for further development of these wide bore superconducting systems is described.

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