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Tue-Af-Po2.23-01 [88]: Recent State of The Art Magnets for Beamline Applications

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High-field split solenoids requirements for beamline applications have become increasingly demanding and an area of significant development in magnet engineering. A number of new magnet designs have been developed utilizing the high current density achievable in modern Nb3Sn superconductors. The magnets described are custom designed for individual experimental applications and have unique design features in order to maximize both the central field and beam access. These high field compact magnets provide significant engineering challenges due to high coil forces and current densities required for each new geometry. These include a 12T/11T actively shielded symmetric and asymmetric operation with a 35 mm split and ±4° to a 20 mm high x 20 mm diameter sample volume The development of a higher field 14T/12T symmetric and asymmetric operation with a parallel split of 40 mm and with ±10° angular access to a sample volume of 20 mm diameter x 20 mm height is detailed. The development steps leading to the use of Nb3Sn to achieve a lower field 7T actively shielded magnet with ±10⊠ to an extended 40 mm high x 20 mm diameter sample volume are also described.

Modelling of the high stresses on both the coils and the magnet formers holding the coils are described as well as the quench management approach required to manage the stored energy. Other recent advances in active shielding of the beamline magnets to restrict stray field effects in both symmetric and non-symmetric modes of operation are also described

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