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Thu-Mo-Po.03-05: Tilted Solenoids Magnet Using Superconducting Stacked Tapes

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As a recently developed type of dipole field magnets, the tilted solenoids technology has great potential in various fields such as proton therapy, particle accelerators, and high-field applications. High-temperature superconducting materials can further enhance the magnetic field strength, reduce the bending radius, and lower the device cost. This research is based on differential geometry theory and proposes design methodology along with optimization principle for tilted solenoids magnet utilizing stacked high-temperature superconducting tapes. The engineering implementation strategies for tilted solenoid technology employing superconducting tapes are explored. Both single-turn and multi-turn coils are designed and fabricated respectively, and the critical currents are tested. Additionally, a double-layer tilted solenoids magnet was modeled; magnetic field simulation as well as higher-order analyses were conducted to validate the effectiveness of this methodology.

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