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Optimization design and development of septum magnet

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As one of the key components of synchrotron injection and extraction system, the septum magnet not only needs to produce a strong magnetic field to deflect the injection/ extraction beam, but also cannot affect the circulating beam passing by it. Otherwise, the disturbance of the leakage magnetic field to the circulating beam will affect the beam loss. Based on the theory of electromagnetic field, the magnetic field design and leakage field analysis of septum magnet are carried out by using the electromagnetic field analysis software-Opera. On this basis, different shielding measures are proposed to reduce the loss caused by leakage magnetic field. Based on the factor analysis method, the models of different shielding modes are simulated, and the variation of leakage magnetic field in the circulating beam pipe area with different shielding structures and parameters is analyzed. According to the analysis results of the influencing factors, the septum magnet is optimized design and manufactured. Through the test of the magnetic field, the experimental results and the numerical simulation results are compared to verify the correctness of the numerical simulation and the rationality of the shielding structure.

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