**Reconstruction method of laser-driven ion-beam trace probe diagnosing the poloidal magnetic field in spherical tokamak**

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The poloidal magnetic field ( is a critical factor for plasma equilibrium and stability, and multiple diagnostics are in need for a more accurate profile of . The laser-driven ion-beam trace probe (LITP) has been proposed recently to diagnose the poloidal magnetic field () and radial electric field () in tokamak.[1-3] It measures the displacements of laser-driven ion beams which directly depend on electromagnetic field along the beam traces, and tomography methods are employed for the reconstruction. Based on the three properties of laser-driven ion beam: large energy spread, short pulse lengths, and multiple charge states, the two-dimensional profile of both and can be diagnosed by LITP.

Spherical tokamak (ST) is a promising compact device with high plasma beta and increased vertical stability. When applying LITP to diagnose in ST, the larger comparable to the toroidal magnetic field, turns the reconstruction problem into solving the nonlinear equations. In this presentation, an iterative reconstruction method is proposed to solve the nonlinear equations and a model to reconstruct profile in ST is built. The schemes of ion traces are designed for EXL-50 (a middle-sized ST in Langfang) and simulated reconstruction has been conducted. The relative errors of reconstructed are mostly under 10%. The effects of measurement error and system error have been evaluated, suggesting LITP can reconstruct in ST for practical purposes.

**References**

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