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Study of energetic particle interaction with MHD using the M3D-C1 code[1] CHANG LIU, STEPHEN JARDIN, Princeton Plasma Physics Laboratory — Studying nonlinear interactions between MHD activities and energetic particles using first-principle simulation is an important and challenging task. Recently, a new kinetic module of M3D-C1 code has been developed to address this issue. The module utilizes GPU to accelerate particles pushing, which can reach up to 16 times speedup compared to CPU code. Both drift-kinetic and gyro-kinetic schemes for delta-f calculations and both pressure coupling and current coupling schemes for MHD-kinetic interaction have both been implemented. Several linear and nonlinear benchmarks have been conducted, and good agreements with other codes have been obtained. In nonlinear runs, the energy conservation of the MHD-kinetic coupling system has been tested. In addition, it is found that this module, with slight modification, can also be used to improve the runaway electron calculation used in M3D-C1, which can save computation time and provide better numerical stability.

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