Simulation study of ballooning modes in LHD

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The MHD Infrastructural code for Plasma Simulation, MIPS, has been composed for the purpose of promotion of collaborative simulation research of fusion plasmas. The MIPS code can be used for MHD simulation of toroidal plasmas and can be employed as a basis of extended-MHD simulations. The MIPS code was benchmarked on the ballooning modes in LHD. The results of the MIPS code were compared with those of the MHD linear analysis code CAS3D. The equilibrium analyzed was constructed with the HINT code in the rotating helical coordinates. The equilibrium data computed with the HINT code was transformed onto the cylindrical grid points of the MIPS code. The numbers of the grid points are (128, 640, 128) for (R, φ, z). The linear growth rates of the ballooning modes are compared between MIPS and CAS3D. Good agreement was found for low toroidal mode numbers n≤7, while the MIPS simulation gives lower growth rates for n≥8 than the CAS3D analysis. The spatial profiles of the ballooning mode with n=-3 are compared in Fig. 1. Good agreement between the MIPS simulation and the CAS3D analysis is seen in Fig. 1. The MIPS code is a useful tool for simulation study of MHD instabilities in LHD. The nonlinear evolution of the ballooning modes was investigated with the MIPS code. The results will be also presented.

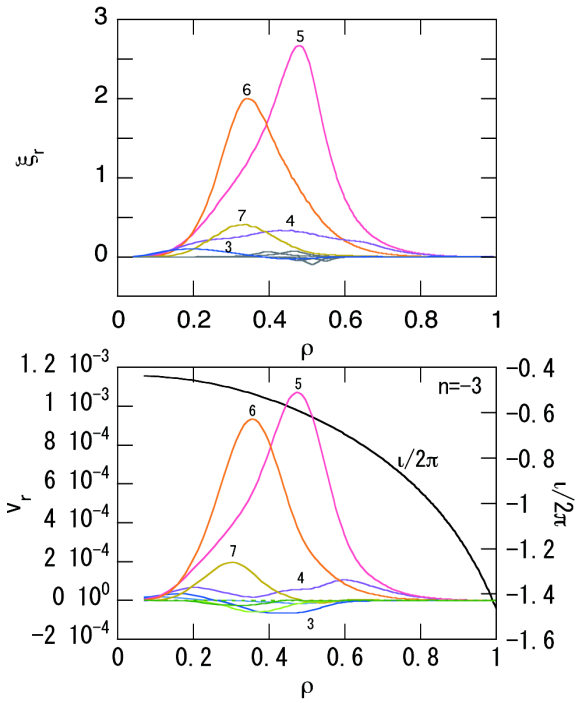

Fig. 1. Comparison of spatial profiles between the CAS3D analysis (top) and the MIPS simulation (bottom) for the ballooning mode with toroidal mode number n=-3.