Capabilities of Fully Parallelized MHD Stability Code MARS[1]

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— Results of full parallelization of the plasma stability code MARS will be reported. MARS calculates eigenmodes in 2D axisymmetric toroidal equilibria in MHD-kinetic plasma models. Parallel version of MARS, named PMARS, has been recently developed at FAR-TECH. Parallelized MARS is an efficient tool for simulation of MHD instabilities with low, intermediate and high toroidal mode numbers within both fluid and kinetic plasma models, implemented in MARS. Parallelization of the code included parallelization of the construction of the matrix for the eigenvalue problem and parallelization of the inverse vector iterations algorithm, implemented in MARS for the solution of the formulated eigenvalue problem. Construction of the matrix is parallelized by distributing the load among processors assigned to different magnetic surfaces. Parallelization of the solution of the eigenvalue problem is made by repeating steps of the MARS algorithm using parallel libraries and procedures. Parallelized MARS is capable of calculating eigenmodes with significantly increased spatial resolution: up to 5,000 adapted radial grid points with up to 500 poloidal harmonics. Such resolution is sufficient for simulation of kink, tearing and peeling-ballooning instabilities with physically relevant parameters.

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