Status of Kink Stability Calculations

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NCSX Project Meeting, Sept. 23, 1998

(1) Code Development

(2) Stability Results

(3) Key Issues

(1) Code Development:

TERPSICHORE code

(a) benchmark with PEST;

For a Aries equilibrium, the calculated critical beta of n=1 external kink agrees with that of PEST code.

(b) Solved the vacuum grid problem;

(c) solved the numerical mode problem;

(d) The code has been re-written extensively such that the individual contributions can now be evaluated:

$\delta W =$ field line bending term + current-driven term + pressure-driven term + vacuum term

(2). Stability Results

(a) current:
strongly destabilizing. As current increases, the shear decreases and i(a) increases.

(b) beta:
stabilizing. Effects of beta increase the shear and decrease ι(a).

(c) iota profile:
shear is stabilizing,
ι(a) is destabilizing.
empirical formula for critical shear.

(d) current and pressure profile:
broad current profile is stabilizing;
broad pressure profile is destabilizing.

(e) n=0 boundary shape:
elongation can be destabilizing;
triangularity is stabilizing.

(f) n=0 boundary shape:
helical corrugation of QA shape is significantly stabilizing.

(3) Key Issues

(1) physics mechanism of kink mode and its control;

(2) needs a systematic way of optimization to reduce degree of freedom in boundary shape.

(3) integration of kink stability consideration with those of ballooning mode, quasi-symmetry, and coils.