On the Operational Ideal Magnetohydrodynamic β Limit in Sawtoothing Discharges

A.D. Turnbull, L.D. Pearlstein,* R. Bulmer,*
L.L. Lao, and R.J. La Haye

General Atomics, P.O. Box 85608,
San Diego, California 92186-5608 U.S.A.

Abstract

Magnetohydrodynamic (MHD) stability calculations of the $n=1$ kink mode for equilibria with increasing β and values of the axis safety factor $q_0 > 1$ and $q_0 < 1$ show that for $q_0 < 1$ there is a transition in both the unstable mode structure and the growth rate to a more virulent instability at approximately the β limit obtained with $q_0 > 1$. This provides justification for the usual procedure of optimizing β by taking $q_0 > 1$ and applying it to predict the β limit of sawtoothing discharges.

*Lawrence Livermore National Laboratory, P.O. Box 808, Livermore, Caluifornia 94551-9900.