

Abstract Submitted
for the DPP19 Meeting of
The American Physical Society

Radiative cooling effect on the stability of magnetic islands

THOMAS GRISMAYER, KEVIN SCHOEFFLER, GoLP/Instituto de Plasmas e Fusao Nuclear, Universidade de Lisboa, DMITRI UZDENSKY, University of Colorado - Boulder, RICARDO FONSECA, DCTI/ISCTE Instituto Universitario de Lisboa, LUIS SILVA, GoLP/Instituto de Plasmas e Fusao Nuclear, Universidade de Lisboa — A magnetic island is a well-known concept of plasma physics composed of a magnetic flux tube bounded by a separatrix (in 2D). Magnetic reconnection is a typical plasma phenomenon where magnetic islands emerge either separated by X points or Y points. One of the simplest ways to model the equilibrium of a cylindrical flux tube (the magnetic island being the cross-section) is given by the Bennett equilibrium where total plasma pressure and the magnetic pressure balances out the magnetic tension. We study analytically the stability of a slowly time-evolving Bennett equilibrium under the influence of radiative cooling that could occur due to synchrotron emission. If the temperature of the plasma is not sustained because of radiation losses, the equilibrium pinch is broken due to a lower pressure which eventually leads to the collapse of the island [1]. The analytical model, confirmed by particle-in-cell simulations, suggests that the collapse can only occur for a special hierarchy of the characteristic times of the system. These results have profound implications for magnetic reconnection in ultra-intense fields.[1] Kevin Schoeffler, Thomas Grismayer, Dmitri Uzdensky, Ricardo Fonseca, Lus Silva, ApJ 870 (2019).

Thomas Grismayer
GoLP/Instituto de Plasmas e Fusao Nuclear, Universidade de Lisboa

Date submitted: 03 Jul 2019

Electronic form version 1.4