

Existence and confinement of periodic magnetic orbits at low energy

Valerio Assenza

February 19, 2025

Abstract

Magnetic systems form a standard class of classical Hamiltonian systems that describe the motion of a charged particle moving on a Riemannian manifold under the influence of a magnetic force. At energy levels above the Mañé critical value, the dynamics closely resemble that of geodesic flow and have been extensively investigated. Despite several remarkable results obtained in recent decades, the magnetic dynamics at low energy levels remain incompletely understood. For instance, the existence of a periodic orbit with energy below the Mañé critical value is still unknown. Using recent techniques developed in magnetic geometry, we prove the existence of contractible closed orbits at every energy level close to zero, confined to regions with high magnetic intensity. This work is a collaboration with Gabriele Benedetti and Leonardo Macarini.