Permissible three dimensional areas of motion surround planar equilibrium points in the four dipole problem

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Abstract

We have extended Stormer's problem considering four magnetic dipoles in motion. In this environment, because of the enormous three dimensional instability, the permissible areas of motion of a charged particle moving under the influence of the electromagnetic field of the system, consist layers of small thickness similar to natural phenomena we observe in the rings of Saturn. We give the planar equilibrium points for two sets of values of the magnetic moments and for every one of the no collinear equilibrium points, we present the corresponding surfaces, which determine the three dimensional area which surrounds it, within the motion is permitted. We also give the height of the lowest and highest points of the corresponding trapping space regions according to the third dimension; it is clear that these points are zero velocity curves with zero arc length.

Keyword: Magnetic dipoles, Equilibrium points, Saturn.