Weak stability for the 2D plasma-vacuum interface problem

Davide Catania*[1,2]

[1]eCampus University – Italy
[2]DICATAM, Mathematical Division [Brescia University] – Via Valotti 9 - 25133 Brescia Tel. 030/3715.775-776 - Fax 030/3715745, Italy

Abstract

We consider the free boundary problem for the plasma-vacuum interface in 2D ideal compressible magnetohydrodynamics (MHD). In the plasma region, the flow is governed by the usual compressible MHD equations, while in the vacuum region we consider the Maxwell system for the electric and the magnetic fields, in order to investigate the linear stability of the problem, in particular in relation with the electric field in vacuum. At the free interface, driven by the plasma velocity, the total pressure is continuous and the magnetic field on both sides is tangent to the boundary.

Under suitable conditions satisfied at each point of the plasma-vacuum interface, we prove an energy estimate for the linearized boundary value problem with a loss of derivatives, due to the failure of the uniform Kreiss–Lopatinskii condition. The proof follows by an analysis of the Lopatinskii determinant and the construction of a suitable symmetrizer.

These results have been obtained in a joint work with Marcello d'Abbicco and Paolo Secchi.

*Speaker