Free boundary problems: Liouville equation and Bose-Einstein condensates

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The first result claims the existence of solutions with infinite mass for the Liouville equation with Dirichlet boundary conditions in a two dimensional doubly connected domain. The key ingredient in the construction is the solution of a suitable free boundary problem. The method of the proof inspired the second result which states the existence of a solution of a two component system of coupled non linear Schrödinger equations modeling the phase separation in the binary mixture of Bose–Einstein condensates. The results have been obtained in collaboration with Michał Kowalczyk and Giusi Vaira in [1, 2]

References

[1] Kowalczyk, Michał; Pistoia, Angela; Vaira, Giusi *Maximal solution of the Liouville equation in doubly connected domains.* J. Funct. Anal. 277 (2019), no. 9, 2997–3050.

[2] Kowalczyk, Michał; Pistoia, Angela; Vaira, Giusi *Phase separating solutions for two component systems in general planar domains.* Calc. Var. Partial Differential Equations 62 (2023), no. 5, Paper No. 142, 46 pp.