On the Schrödinger equation with nonlinear point interactions in $d = 2$

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Abstract

We present some recent results on the twodimensional nonlinear Schrödinger equation with concentrated nonlinearity. We start by discussing local well-posedness of the associated Cauchy problem, as well as mass and energy conservation along the flow ([2, 3]). Then, we show that in the repulsive case solutions are global-in-time ([2]), whereas in the attractive case one can exhibit a class of initial data that gives rise to blow-up phenomena ([1]). Finally, we present the family of the standing waves of the problem ([1]), and discuss their stability properties. These are joint works with R. Adami, R. Carlone, M. Correggi and A. Fiorenza.

References

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[2] R. Carlone, M. Correggi, L. Tentarelli, Well-posedness of the two-dimensional nonlinear Schrödinger equation with concentrated nonlinearity, accepted *Ann. Inst. H. Poincaré Anal. Non Linéaire*, arXiv:1702.03651 [math-ph] (2017).

[3] R. Carlone, A. Fiorenza, L. Tentarelli, The action of Volterra integral operators with highly singular kernels on Hölder continuous, Lebesgue and Sobolev functions, *J. Funct. Anal.* **273** (2017), no. 3, 1258–1294.