# Gross-Pitaevskii at low regularity

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## Abstract

In this joint work with X. Liao, we address uniform bounds for solutions to the Gross-Pitaevskii at all nonnegative regularity levels. This is based on a study of the nonlinear phase space

$$X^s = \{u \in H^s_{loc} : u_x, |u|^2 - 1 \in X^{s-1}\}/\mathbb{S}^1,$$

where we consider functions modulo the multiplication by a complex number of modulus 1. We equipp this space with a metric and an analytic structure. We construct conserved Hamiltonians for all $s \geq 0$. Going below $s = \frac{1}{2}$ relies on a study of the nontrivial topology of the metric space $X^s$.

## References

[1] H. Koch, X. Liao, Conserved energies for the one dimensional Gross-Pitaevskii equation. *Adv. Math.* **377** (2021)

[2] –, Conserved energies for the one dimensional Gross-Pitaevskii equation: low regularity case,

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