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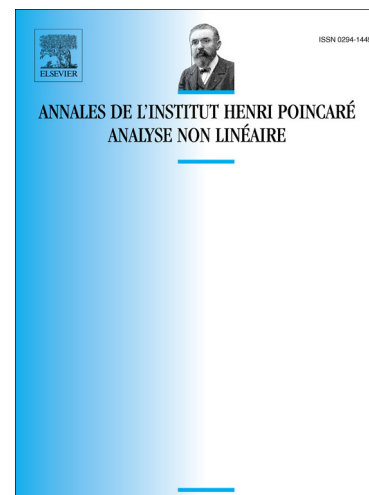
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# log-log blow up solutions blow up at exactly m points

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## Abstract

We study the focusing mass-critical nonlinear Schrödinger equation, and construct certain solutions which blow up at exactly  $m$  points according to the log-log law.

## Résumé

Nous étudions l'équation de Schrödinger non linéaire focalisante de masse critique, et construisons certaines solutions avec exactement  $m$  points d'explosion d'après la loi de log-log.

*Keywords:* NLS, log-log blow up,  $m$  points blow up, bootstrap, propagation of regularity, topological argument.

*2010 MSC:* 35Q55, 35B44.

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## 1. Introduction

We consider the Cauchy Problem for the mass-critical focusing nonlinear Schrödinger equation (NLS) on  $\mathbb{R}^d$  for  $d = 1, 2$ :

$$(NLS) \begin{cases} iu_t = -\Delta u - |u|^{\frac{4}{d}}u, \\ u(0) = u_0 \in H^1(\mathbb{R}^d). \end{cases} \quad (1.1)$$

Problem (1.1) has three conservation laws :

— Mass :

$$M(u(t, x)) := \int |u(t, x)|^2 dx = M(u_0), \quad (1.2)$$

— Energy :

$$E(u(t, x)) := \frac{1}{2} \int |\nabla u(t, x)|^2 dx - \frac{1}{2 + \frac{4}{d}} \int |u(t, x)|^{2 + \frac{4}{d}} dx = E(u_0), \quad (1.3)$$

— Momentum :

$$P(u(t, x)) := \Im \left( \int \nabla u(t, x) \overline{u(t, x)} dx \right) = P(u_0), \quad (1.4)$$

and the following symmetry :

1. Space-time translation : If  $u(t, x)$  solves (1.1), then  $\forall t_0 \in \mathbb{R}, x_0 \in \mathbb{R}^d$ , we have  $u(t - t_0, x - x_0)$  solves (1.1).

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