

Mathematical Physics

Optimal \mathfrak{L}^β -Control for the Global Cauchy Problem of the Relativistic Vlasov-Poisson System

Brent Young

(Submitted on 10 Nov 2010)

Recently, M.K.-H. Kiessling and A.S. Tahvildar-Zadeh proved that a unique global classical solution to the relativistic Vlasov-Poisson system exists whenever the positive, integrable initial datum is spherically symmetric, compactly supported in momentum space, vanishes on characteristics with vanishing angular momentum, and for $\beta \geq 3/2$ has \mathfrak{L}^β -norm strictly below a positive, critical value \mathcal{C}_β . Everything else being equal, data leading to finite time blow-up can be found with \mathfrak{L}^β -norm surpassing \mathcal{C}_β for any $\beta > 1$, with $\mathcal{C}_\beta > 0$ if and only if $\beta \geq 3/2$. In their paper, the critical value for $\beta = 3/2$ is calculated explicitly while the value for all other β is merely characterized as the infimum of a functional over an appropriate function space. In this work, the existence of minimizers is established, and the exact expression of \mathcal{C}_β is calculated in terms of the famous Lane-Emden functions. Numerical computations of the \mathcal{C}_β are presented along with some elementary asymptotics near the critical exponent $3/2$.

Comments: 24 pages, 2 figures Refereed and accepted for publication in Transport Theory and Statistical Physics

Subjects: **Mathematical Physics (math-ph)**; Analysis of PDEs (math.AP)

Cite as: [arXiv:1011.2265v1](https://arxiv.org/abs/1011.2265v1) [math-ph]

Submission history

From: Brent Young [[view email](#)]

[v1] Wed, 10 Nov 2010 03:06:18 GMT (122kb)

Which authors of this paper are endorsers?

Download:

- [PDF](#)
- [PostScript](#)
- [Other formats](#)

Current browse context:

math-ph

[< prev](#) | [next >](#)

[new](#) | [recent](#) | [1011](#)

Change to browse by:

[math](#)

[math.AP](#)

References & Citations

- [NASA ADS](#)

Bookmark (what is this?)

