

Generic regularity of the two-component Novikov equation

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This talk concerns the Cauchy problem for the following two-component Novikov system:

It is well-known that this system admits the wave-breaking phenomena: the slope of solution corresponding to the smooth initial data can blow-up in finite time.

The goal is to establish the generic regularity for the two-component Novikov system. More in detail, we show that there exists an open dense subset of initial data, such that the corresponding global weak solutions (which exist beyond blow-up) retain certain regularity properties in the t, x plane. Applying the Bressan and Chen’s approach [1], originally developed for the nonlinear variational wave equation, we prove the following result [2].

Theorem. Consider the regular initial data (u_0, v_0) in the metric space $\Upsilon^k \subset (C^k)^2 \cap (H^1)^2$, $k \geq 5$, see [2] for details. Then for any $T > 0$ there exists an open in Υ^k and dense in $\Upsilon^{k-1} \cap C_{\text{loc}}^k$ subset $\mathcal{M}_T \subset \Upsilon^k$, such that for any initial data $(u_0, v_0) \in \mathcal{M}_T$ the corresponding global weak solution $(u, v)(t)$ satisfies the following regularity properties. There exist two sets of piecewise C^{k-1} curves, say $\{\mathbf{C}_i^W\}_{i=1}^{N_1}, \{\mathbf{C}_j^Z\}_{j=1}^{N_2} \subset [-T, T] \times \mathbb{R}$, such that

- both components u and v are C^k regular away from the characteristic sets $\mathbf{C}_i^W$ and $\mathbf{C}_j^Z$
- u is of class C^1 along each $\mathbf{C}_j^Z$ and v is of class C^1 along each $\mathbf{C}_i^W$.

[1] A. Bressan, G. Chen. Generic regularity of conservative solutions to a nonlinear wave equation. Ann. I. H. Poincaré 34 (2017) 335–354.

[2] K.H. Karlsen, Ya. Rybalko. Generic regularity and Lipschitz metric for a two-component Novikov system. arXiv :2512.13305v2 (2026).

Primary author: RYBALKO, Yan (B.Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine)

Presenter: RYBALKO, Yan (B.Verkin Institute for Low Temperature Physics and Engineering of the National Academy of Sciences of Ukraine)

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