GLOBAL WELL-POSEDNESS OF COMPLEX GINZBURG-LANDAU EQUATION WITH A SPACE-TIME WHITE NOISE

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We discuss the global-in-time well-posedness of the stochastic complex cubic Ginzburg-Landau equation:

$$\partial_t u = (i+\mu)\Delta u - \nu|u|^2 u + \lambda u + \xi, \quad t > 0,\ x \in \mathbb{T}^3,$$

where $\mu > 0$, $\nu, \lambda \in \mathbb{C}$, and ξ is a complex space-time white noise. By using the theory of regularity structures by Hairer or the paracontrolled calculus by Gubinelli, Imkeller and Perkowski, it is easy to see that the renormalization of the form

$$\partial_t u = (i+\mu)\Delta u - \nu(|u|^2 - \infty)u + \lambda u + \xi$$

works well.

In general, we get only the local well-posedness of the renormalized equation. However, if the parameters satisfy

$$\mu > \frac{1}{2\sqrt{2}}, \quad \Re\nu > 0,$$

we also get the global well-posedness.