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Onsager-Machlup under Renormalization

Stochastic quantization is a procedure for constructing measures, typically on spaces of distributions, with a given "probability density function" as the invariant measure of a stochastic PDE. These "densities" typically involve nonlinearities of distributions which necessitates renormalization. The renormalization, and the lack of a Lebesgue measure on infinite dimensional spaces leads to the question of in what sense these rigorously constructed measures have the given "density". The Onsager-Machlup function is one rigorous notion of probability density function on infinite dimensional spaces.

We are interested in the Φ_d^4, and related, measures in dimensions $d \leq 3$ arising from EQFT. In dimension 1, no renormalization is required. In dimension 2, Wick renormalization is sufficient and in dimension 3, the theory of regularity structures or paracontrolled calculus can be used to renormalize.

In an ongoing joint work with Ioannis Gasteratos (TU Berlin) we analyze the Onsager-Machlup function of the Φ^4 and related measures.