



Workshop on Stochastic Analysis

IMECC - Unicamp

From August 10th to 13th, 2026



Evelina Shamarova
(UFPB)

Bounded-domain solvability for the planar stationary stochastic Landau-Lifshitz-Gilbert equation

Abstract

We obtain the existence of solutions to the stationary R^3 -valued singular stochastic Landau–Lifshitz–Gilbert equation

$$\alpha u \times (u \times \Delta u) - \beta u \times \Delta u = \gamma u \times W, \quad |u| = 1,$$

on a bounded planar domain, where W is a three-dimensional white noise and $\alpha^2 + \beta^2 = 1$. To handle the problem, we introduce a Hashimoto-type transform which reduces the singular geometric equation to a singular first-order system containing the Cauchy-Riemann operator and ill-defined products of noises. The bounded-domain formulation requires two additional analytic ingredients. The first one is an extension procedure for Hölder functions which preserves the Hölder norm up to a fixed multiplicative constant and allows the fixed point map to be defined through compactly supported extensions. The second one is a definition of the Young product directly on the domain, independent of the chosen extensions when tested against functions supported inside the domain. These ingredients make it possible to carry out the fixed

point argument for the transformed Cauchy-Riemann system. The remaining singular noise term is treated using the regularity computation and cancellation mechanism developed for the Cauchy-Riemann equation with white noise. Finally, the spin field and the associated orthonormal frame are reconstructed from the transformed variables, yielding solutions to the original stationary stochastic Landau-Lifshitz-Gilbert equation for sufficiently small noise intensity. This talk is based on joint work with Zdzisław Brzeźniak and Mikhail Neklyudov.