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Schwerpunkt Stochastik

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## Rhein-Main-Kolloquium Stochastik

TU Darmstadt, Goethe-Universität Frankfurt und Gutenberg-Universität Mainz

Friday, 13 February 2026

3:15 pm: [Quirin Vogel \(Universität Klagenfurt\)](#)

### “Loop Representations for the Bose Gas”

The Bose gas is a fundamental model in quantum statistical mechanics. It admits a representation in terms of interacting Brownian bridges. We review this connection and discuss the connection between condensation and the appearance of long loops/random interlacements. We also review some progress made recently for the interacting Bose gas concerning Gibbs measures and large deviations.

4:15 pm: Coffee break

4:45 pm: [Maximilian Fels \(Universität zu Köln\)](#)

### “Gaussian Free Field Subject to a Hard Wall”

The Discrete Gaussian Free Field (DGFF) serves as a canonical model for random interfaces in statistical mechanics. When conditioned to stay non-negative on a domain—an event known as the “hard wall” constraint—the field undergoes entropic repulsion, lifting away from the wall to accommodate its fluctuations.

The study of this phenomenon in two dimensions was pioneered by Bolthausen, Deuschel, and Giacomin (2001), who established the leading-order asymptotics for the probability of the hard wall event. In this talk, I will present two major recent advancements that significantly refine our understanding of this problem:

The Binary Tree (Fels, Hartung, Loidor 2024): We first discuss the case of the DGFF on the binary tree, where the hierarchical structure permits a complete derivation of the conditioned field’s behavior. We will show that the hard wall constraint leads to a repulsion profile that makes the conditioned law asymptotically mutually singular with respect to the unconditioned law.

The 2D Plane (Fels, Loidor, Wu 2026): Turning to the Euclidean lattice  $\mathbb{Z}^2$ , I will present very recent work that improves upon the classical BDG result by capturing the subleading order of the probability asymptotics. The analysis relies on a novel orthogonal decomposition of the field into a “constant” component and a conditioned remainder, handled via multi-scale analysis and double-exponential tail bounds.

<https://www.stochastik.mathematik.uni-mainz.de/rhein-main-kolloquium-stochastik/>

Venue:

**TU Darmstadt**  
**S2|15 Mathematikgebäude**  
**Room 244**  
**Schlossgartenstraße 7**  
**64289 Darmstadt**

Any interested parties are welcome.

Yours, Frank Aurzada and Volker Betz