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FAKULTÄT FÜR MATHEMATIK  
Dekan Univ.-Prof. Dr. Christian Krattenthaler

Einladung zur öffentlichen Defensio von

**Faulhuber Markus BSc, MSc**

Thema der Dissertation:

**Extremal Bounds of Gaussian Gabor Frames and  
Properties of Jacobi's Theta Functions**

Abstract:

The thesis treats extremal problems in the field of time-frequency analysis which should be addressed to a conjecture by Strohmer and Beaver in 2003 about the optimal condition number for Gaussian Gabor frames. The question is as follows: Given a standard Gaussian window, which lattice of fixed volume minimizes the ratio of the resulting Gabor frame bounds? This ratio is the condition number of the associated frame operator and the conjecture by Strohmer and Beaver is, inspired by sphere packing problems, that the optimal lattice should be a hexagonal lattice. We will see solutions for the class of rectangular lattices, where the optimal solution is the square lattice and we will see a proof that, among all lattices, the hexagonal lattice minimizes the upper frame bound. The proofs require the notion of theta functions and new properties of Jacobi's theta functions are established. We will see empirical evidence that the problem of maximizing the lower frame bound, and hence the condition number of the frame operator, roots deep and that it is linked to an open problem in geometric function theory posed by Landau in 1929, where the solution is also expected to come from a hexagonal lattice as describe by Rademacher in 1943.

Prüfungssenat:

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**Zeit:** Dienstag, 28 Februar 2017, 15:00 Uhr

**Ort:** Fakultät für Mathematik, Seminarraum 14, Oskar-Morgenstern-Platz 1