ProjektleiterIn: Yudytskiy Petro

Projektnummer: P 25591-N25

III. KURZBERICHT ÜBER DEN PROJEKTFORTSCHRITT
(muss nicht in Englisch sein)

Das Forschungsvorhaben befindet sich im

☑ 1. Jahr
☐ 2. Jahr
☐ 3. Jahr
☐ Jahr

The first main problem of the given project, the so called Kotani-Last problem, was solved completely during this period. The Kotani-Last conjecture for Jacobi matrices states that an ergodic Jacobi matrix cannot have absolutely continuous spectrum unless it is almost periodic. In fact, jointly with A. Volberg, we constructed a theory of non-almost periodic ergodic families of Jacobi matrices with purely absolutely continuous spectrum. This theory deals with Hardy spaces of analytic functions in multi-connected domains. Probably this is the first investigation in which the effect of “blurring” of Hardy spaces in Widom domains was studied and used systematically. We introduced the natural largest and smallest Hardy spaces corresponding to the given character of the fundamental group of the domain. We proved that for almost all characters with respect to the Haar measure these spaces coincide. However, as soon as the Direct Cauchy Theorem (DCT) fails they are different for some characters. In the same time in both cases under certain additional assumption the whole isospectral collection of reflectionless Jacobi matrices can be regarded as an ergodic family with respect to the standard shift and a measure intimately related with the Haar measure on the set of characters. As the result it was shown that in our theory DCT separates two cases: either all reflectionless Jacobi matrices with the given resolvent domain of Widom type and absolutely continuous spectrum are almost periodic, or none of them is. We constructed examples of domains in which all axioms of our theory hold but DCT fails. Thus, we disproved the Kotani-Last conjecture. It was disproven simultaneously in the paper of A. Avila (Fields medalist, 2014) "On the Kotani-Last and Schrödinger conjectures", J. Amer. Math. Soc. (2015). Our result was published in Invent. Mat. (2014). As it was mentioned in the MathSciNet review: “These two articles use very different approaches, and give different but equally fascinating insights on the nature of the absolutely continuous spectrum for Schrödinger-like operators”.

The results were presented at AIMS conference in Madrid and Mini-workshop at Oberwolfach.

Also we organized a mini-workshop KATS-2014 at Linz dedicated to 70th birthday of Prof. Katsnelson (http://www.dynamics-approx.jku.at/kats2014/)

P. Yuditskii visited Prof. V. Totik at Szeged University, Hungary, and professors D. Damanik (Rice University, USA), A. Eremenko (Purdue University, USA) and A. Volberg (Michigan State University, USA) visited Johaness Kepler University of Linz. PhD student B. Eichenger participated in Masterclass of Barry Simon “Spectral Theory of Orthogonal Polynomials” (Aarhus University, Denmark).