Mini Workshop

KATS 2014

Komplexe Analysis und/et Théorie Spectrale

May 12 – 13, 2014

JKU Linz, Austria

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		Uni-Center Raum D
Monday	09.30 – 10.00	Opening
	10.00 – 10.50	A. Kheifets
	11.00 – 11.50	Yu. Belov
	12.00 – 14.00	Lunch
	14.00 – 14.50	D. Damaniak
	15.00 – 15.50	R. Romanov
	16.00 – 16.50	V. Mityushev
	19.00	Dinner
Tuesday	10.00 – 10.50	V. Katsnelson
	11.00 – 11.50	Yu. Neretin
	12.00 – 14.00	Lunch
	14.00 – 14.50	M. Sodin
	15.00 – 15.50	G. Teschl
	16.00 – 16.50	H. Woracek

- Victor Katsnelson (Weizmann Institute)
- Anton Baranov (St. Petersburg University)
- Yuriy Belov (St. Petersburg University)
- David Damanik (Rice University)
- Alex Eremenko (Purdue University)
- Michael Kaltenbäck (Vienna University of Technology)
- Alexander Kheifets (University of Massachusetts Lowell)
- Vladimir Mityushev (Pedagogical University of Cracow)
- Paul F.X. Mueller (Johannes Kepler Universität Linz)
- Yury Neretin (Moscow State University and University of Vienna)
- Roman Romanov (St. Petersburg University)
- Raphael Pruckner (Vienna University of Technology)
- Mikhail Sodin (Tel Aviv University)
- Gerald Teschl (University of Vienna)
- Alexander Volberg (Michigan State University)
- Harald Woracek (Vienna University of Technology)
- Peter Yuditskii (Johannes Kepler Universität Linz)

Localization of zeros for de Branges spaces and applications to canonical systems

Yuriy Belov

St. Pertersburg, Russia

We study localization of zeros of functions from de Branges spaces. This question is motivated by the theory of canonical systems of differential equations. In particular, we prove that de Branges spaces with the localization property are in one-to-one correspondence with the canonical systems of special type, namely, those whose Hamiltonians consist only of indivisible intervals accumulating on the left.

Uniform Hyperbolicity for Szego Cocycles and Applications to Random CMV Matrices and the Ising Model

David Damaniak

Rice University, USA

We consider products of the matrices associated with the Szegő recursion from the theory of orthogonal polynomials on the unit circle and show that under suitable assumptions, their norms grow exponentially in the number of factors. In the language of dynamical systems, this result expresses a uniform hyperbolicity statement. We present two applications of this result. On the one hand, we identify explicitly the almost sure spectrum of extended CMV matrices with non-negative random Verblunsky coefficients. On the other hand, we show that no Ising model in one dimension exhibits a phase transition. Also, in the case of dynamically generated interaction couplings, we describe a gap labeling theorem for the Lee-Yang zeros in the thermodynamic limit.

This is joint work with Jake Fillman, Milivoje Lukic, and William Yessen.

Stieltjes Functions and Hurwitz Stable Entire Functions

Victor Katsnelson

Weizmann Institute, Israel

The concept of stability, originally introduced for polynomials, is extended to apply to the class of entire functions. This generalization is called Hurwitz stablility. The first theorem shows how, given a Stieltjes class function and the exponential function, one can produce a Hurwitz stable function. The second theorem shows how, given a Stieltjes class function and a Laguerre–Polya class function, one can produce a Hurwitz stable function.

Potapov Matrix Inequality, Abstract Interpolation Problem and Generalized Resolvents.

Alexander Kheifets

University of Massachusetts Lowell, USA

In 60s V. P. Potapov suggested his approach to a class of interpolation problems. The approach is based on the Schwarz Lemma and its generalizations. V. E. Katsnelson significantly development the method. Later on an equivalence was established between Potapovs approach and Adamjan-Arov-Krein approach. Their approach was also developed in 60's and is based on extensions of operators and generalized resolvents.

Riemann-Hilbert problem for multiply connected domains

Vladimir Mityushev

Krakow, Poland

The Riemann-Hilbert problem Re [a(t) f(t)] = g(t), on L, and the R-linear problem for circular multiply connected domains on the complex plane are reduced to functional equations which are solved in terms of the Poincaré series. Applications of these boundary value problems to various physical phenomena in composites and porous media are discussed.

Multivariate characteristic functions for families of operators.

Yury Neretin

Moskow State University, Russia and University of Vienna, Austria

We consider a collection of infinite unitary matrices defined up to a common conjugation by a unitary matrices fixing first k basis vectors. We show that for such collections there exists analog of product of operator colligations. We also defined a characteristic function for such collections; they are inner matrix-valued functions ofmatrix arguments. Characteristic functions are not sufficient for separation of conjugacy classes. We improve them and get sufficient date.

The order problem for canonical systems

Roman Romanov

St. Pertersburg, Russia

The order problem for canonical systems is studied. We derive an estimate of the order in terms of the Hamiltonian which is precise and gives the actual order in all known examples.

Zeroes of random and pseudo-random Taylor series.

Mikhail Sodin

Tel Aviv, Israel

We will discuss how the phases of Taylor coefficients influence the distribution of zeroes of the series. We will consider phase sequences of number-theoretic nature as well as random stationary sequences. Our results significantly extend the results of Littlewood and his students and collaborators as well as a more recent result of Eremenko and Ostrovskii.

This is a joint work with Alexander Borichev (Marseille) and Alon Nishry (Princeton).

A coupling problem for entire functions and its application to the long-time asymptotics of integrable wave equations

Gerald Teschl

Vienna, Austria

We propose a novel technique for analyzing the long-time asymptotics of integrable wave equations in the case where the underlying isospectral problem has purely discrete spectrum. To this end we introduce a natural coupling problem for entire functions which serves as a replacement for the usual Riemann-Hilbert approach, which does not work for these kind of problems. As a prototypical example we investigate the long-time asymptotics of the dispersionless Camassa-Holm equation improving the currently known results.

Spectral theory of a class of canonical systems with two singular endpoints

Harald Woracek

Vienna, Austria