Schedule

Monday, March 8

10:00–11:00 ROMAN SAUER
Survey on L^2-Invariants I

11:45–12:45 WOLFGANG LÜCK
Survey on L^2-Invariants II

15:00–16:00 BACHIR BEKKA
Kazhdan's Property (T)

17:00–18:00 DAMIEN GABORIAU
Survey on Orbit Equivalence

Tuesday, March 9

10:00–11:00 DIMITRI SHLYAKHTENKO
Connections between L^2-Invariants and Free Probability Theory

11:45–12:45 YEHUDA SHALOM
Cohomological Invariants in the Large Scale Geometry of Amenable Groups

15:00–16:00 ANTONY WASSERMANN
Loop groups and Connes-Jones invariants

17:00–18:00 DIMITRI SHLYAKHTENKO
L^2-Betti Numbers of II_1-Factors

Wednesday, March 9

9:15–10:15 ALAIN VALETTE
A-(T)-menable Groups

10:30–11:30 SORIN POPA
tba

12:00-13:00 SORIN POPA
tba

Thursday, March 11

10:00–11:00 ROSTISLAV GRIGORCHUK
A Spectrum related to Fractal Groups as an Invariant Set of Multidimensional Rational Mappings

11:45–12:45 PIERRE PANSU
Quasi-Isometry Invariance of L^2-Betti Numbers

15:00–16:00 NICOLAS MONOD
Measure Equivalence of Groups

17:00–18:00 YANN OLLIVIER
A Panorama of Random Groups

Friday, March 12

9:15–10:15 ANDRZEJ ZUK
Spectra of Automata

10:30–11:30 JOHN LOTT
Noncommutative Geometry of Limit Sets

12:00–13:00 THOMAS SCHICK
Homotopy Equivalence of L^2-eta Invariants

14:30–15:30 PETER LINNELL
L^2-Betti Numbers of One Relator Groups

Abstracts

BACHIR BEKKA

Kazhdan's Property (T)

Property (T), a property of locally compact groups introduced by Kazhdan 1967, is a powerful tool with applications in several areas: geometry, ergodic theory, graph theory, combinatorial group theory, von Neumann algebras... We will review the basic definitions as well as the first consequences. We will present the (classical) application to the construction of expander graphs as well as the recently discovered link to the PRA algorithm. We will mention the cohomological approach to Property (T) and the spectral criterion (Zuk, Garland, Gromov). Finally, we will discuss Property (T) for von Neumann algebras (Connes, Jones).

DAMIEN GABORIAU

Survey on Orbit Equivalence

Orbit equivalence theory studies partitions into orbits resulting from measure class preserving group actions. We shall concentrate on probability measure preserving free actions of countable groups. I will present some invariants of orbit equivalence and examine connections with L^2-invariants and geometric group theory. A particular attention will be paid on L^2-Betti Numbers (invariant under OE) and on Measure Equivalence (= a classification of countable groups, parallel to quasi-isometry, to which OE naturally leads).

ROSTISLAV GRIGORCHUK

A spectrum related to fractal groups as an invariant set of multidimensional rational mappings

We will describe a method which in some cases leads to a computation of spectra of groups generated by finite automata or to a computation of spectra of their Schreier graphs. One important step of this method is the presentation of a spectrum as an invariant set of a rational multidimensional map. This relates the spectral problem to the theory of strange attractors.

PETER LINNELL

L^2-Betti Numbers of One Relator Groups

We shall determine the L^2-Betti numbers for a one-relator group. We shall use the techniques to show, for example, that for a left ordered two-generated group, either the group is free or the first L^2-Betti number is 0.

JOHN LOTT

Noncommutative Geometry of Limit Sets

I'll describe the construction of equivariant K-cycles for the cross-product algebra arising from the action of a discrete group of hyperbolic isometries on its limit set. This extends some results of Connes and Sullivan to arbitrary dimension. I'll also describe how the Patterson-Sullivan measure can be seen as a center-valued KMS state.

WOLFGANG LÜCK

Survey on L^2-invariants II

We continue the survey on L^2-invariants given by Roman Sauer. We focus on the $L2$-torsion which is a kind of secondary L^2-invariant, i.e. it is defined if the L^2-Betti-numbers vanish, and gives more refined information. We present its main properties applications and computations for certain cases. We discuss the conjecture that the vanishing of the L^2-torsion is an invariant of the measure equivalence class of groups G for which there exists a finite model for BG and whose L^2-Betti numbers all vanish.

NICOLAS MONOD

Measure Equivalence of Groups

Whilst geometric group theory has become a very classical topic, its relative, Measure Equivalence, is a recent focus of interest. Geometric group theory proposes to consider abstract groups as geometric objects, and to study algebraic properties from the point of view of large-scale geometry. Measure equivalence, on the other hand, aims at studying abstract groups through ergodic-theoretic techniques. It is therefore unsurprising that L^2 type invariants are important tools for that programme, and that there are connections to questions in von Neumann algebras. We will give an introduction to this programme, and indicate how our joint work with Y. Shalom imports ideas from geometric group theory into measure equivalence by

cohomological means.

YANN OLLIVIER

A Panorama of Random Groups

We will present the philosophy and main results about random groups: critical density and phase transitions phenomenon, algebraic and spectral properties, and construction of groups with prescribed Cayley graphs.

ROMAN SAUER

Survey on L^2-Invariants I

We will give an introduction to L^2-Betti numbers from the point of view of Lück's dimension theory. This algebraic approach makes it possible to use standard tools from homological algebra like spectral sequences for the study of L^2-invariants. Some examples, where this can be successfully applied, will be presented.

THOMAS SCHICK

Homotopy Invariance of L^2-eta Invariants

Using the signature operator of a closed oriented Riemannian manifold M and its lift to the universal covering, one can define the L^2-eta invariant of M. These invariants are defined in terms of a complicated integral using the heat kernel of the operators involved. It turns out that for a torsion free fundamental group which satisfies a certain version of the Baum-Connes conjecture, this invariant does only depend on the homotopy type of M. We present a new proof of this result, which is originally due to Navin Keswani, which we think sheds some new light on this theorem. Finally, we will discuss generalizations and examples.

ALAIN VALETTE

A-(T)-menable Groups

A locally compact group is a-(T)-menable if it admits a proper, affine, isometric action on a Hilbert space. We will give various characterizations of this class of groups. Using proper actions on spaces with (measured) walls, we will provide several examples. We will give the proof of the recent result by Guentner-Higson-Weinberger: if K is a field, every countable subgroup of $GL(2, K)$ is a-(T)-menable.

Finally, we will briefly discuss the analogue of a-(T)-menability for II_1-factors.