



2018 数学物理专题研讨会

报告人:

陈小俊, 四川大学

陈酌, 清华大学

郭铤, Rutgers University

姜恺, 北京大学

李慧, 苏州大学

李忠华, 同济大学

刘张炬, 北京大学

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喻厚义, 西南大学

张涛, 河南师范大学

左达峰, 中国科学技术大学



参会人员

姓名	单位
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陈靖越	清华大学
陈小俊	四川大学
陈友明	重庆理工大学
陈酌	清华大学
杜承勇	四川师范大学
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曾杰恒	四川大学
张涛	河南师范大学
张天杰	宁夏大学
赵明镜	北京信息工程大学
郑泉	四川大学
左达峰	中国科学技术大学



日程

2018/08/02	报到
2018/08/03	
9:00-9:50: 郭锂	Algebraic Birkhoff factorization, locality principle and group actions in renormalization
9:50-10:20: 照相, 茶歇	
10:20-11:10: 徐晓濛	Stokes phenomenon, quantum groups and Gromov-Witten theory
11:30-2:30: 午休	
2:30-3:20: 刘张炬	The Atiyah class for generalized holomorphic vector bundles
3:30-4:20: 生云鹤	CLWX 2-algebroids and the first Pontryagin class of quadratic Lie algebroids
4:20-4:50: 茶歇	
4:50-5:40: 李忠华	Sum of interpolated multiple q -zeta values
2018/08/04	



9:00-9:50: Sylvie Paycha	An algebraic locality principle to renormalise higher zeta functions
10:00-10:50: 许明	Closed geodesics on Finsler spheres of constant flag curvature
10:50-11:10: 茶歇	
11:10-12:10: 向茂松	Cohomologies from Leibniz algebras
12:20-2:30: 午休	
2:30-3:20: 陈小俊	Deformation quantization of unimodular Poisson algebras and Koszul duality
3:30-4:20: 唐鑫星	Singularity Torsion and Anomaly Formula
4:20-4:50: 茶歇	
4:50-5:40: 喻厚义	Rota-Baxter Algebras and Quasi-Symmetric Functions
2017/08/05	
9:00-9:50: 左达峰	Extended affine Weyl groups of BCD-type: their Frobenius manifolds and Landau-Ginzburg superpotentials
9:50-10:20: 茶歇	
10:20-11:10: 李慧	Hamiltonian circle actions with isolated fixed points



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11:30-2:30: 午休	
2:30-3:20: 张涛	Higher omni-Lie algebroids
3:30-4:20: 姜恺	A basic introduction to CR structure
4:20-4:50: 茶歇	
4:50-5:40: 陈酌	Atiyah classes and homotopy Leibniz algebras
2017/08/06	返程



报告摘要

陈小俊:

Deformation quantization of unimodular Poisson algebras and Koszul duality

In this talk we study the noncommutative Poincaré duality between the Poisson homology and cohomology of unimodular Poisson algebras, and show that Kontsevich's deformation quantization as well as Koszul duality preserve the corresponding Poincaré duality. As a corollary, the Batalin-Vilkovisky algebra structures that naturally arise in these cases are all isomorphic. The talk is based on the joint work with Y. Chen, F. Eshmatov and S. Yang.

陈酌:

Atiyah classes and homotopy Leibniz algebras



We give an review of Atiyah classes and introduce the algebraic approach to such classes and their natural byproducts - homotopy Leibniz algebras.

This is a joint work by Chen, Liu and Xiang.

郭铨

Algebraic Birkhoff factorization, locality principle and group actions in renormalization

The Algebraic Birkhoff Factorization (ABF) of Connes and Kreimer gives an algebraic formulation of the renormalization process in quantum field theory. Their ABF is an factorization of an algebra homomorphism from a Hopf algebra to a Rota-Baxter algebra. This algebraic formulation facilitates the mathematical study in renormalization and allows the renormalization method to be applied to problems in mathematics.

In this talk we first give an introduction to ABF with a baby model for renormalization of Riemann integrals. We then give generalize ABF to locality Hopf algebras. This is an interpretation of the locality principle in renormalization, stating that a locality property is preserved in the



process of renormalization. More precisely we show that if a regularization map is a locality map, then so is the corresponding renormalization map from the algebraic Birkhoff factorization. Group actions on ABF are also considered. As an application, we again consider the baby model. This is a joint work with P. Clavier, S. Paycha and B. Zhang.

姜恺

A basic introduction to CR structure

In this talk, I will give a brief introduction to the CR structure, including historical background, basic definitions and some examples. Then I will introduce the normal forms of certain CR hypersurfaces. The talk is mostly based on the first several chapters of the book *An introduction to CR structures* by Howard JACOBOWITZ.

李慧

Hamiltonian circle actions with isolated fixed points.



We consider a symplectic manifold which admits a Hamiltonian circle action with isolated fixed points. The geometry and topology of the manifold and the circle action put constraints on each other. We discuss how the integral cohomology and total Chern class of the manifold and the circle representations at the fixed points determine each other.

李忠华

Sum of interpolated multiple q -zeta values

Abstract: Interpolated multiple q -zeta values are deformation of multiple q -zeta values with one parameter t , and restore classical multiple zeta values as $t=0$ and $q \rightarrow 1$. In this talk, we will discuss generating functions for sum of interpolated multiple q -zeta values with fixed weight, depth and i -height. The functions are systematically expressed in terms of the basic hypergeometric functions. This is my joint work with Noriko Wakabayashi.

刘张炬

The Atiyah class for generalized holomorphic vector bundles



The original Atiyah class is an obstruction of the existence of holomorphic connections on a holomorphic vector bundle. In this talk, we will introduce the Atiyah class for the generalized complex geometry. This is joint work with X. Jia and H.L. Lang

Sylvie Paycha

An algebraic locality principle to renormalise higher zeta functions

According to the principle of locality in physics, events taking place at different locations should behave independently of each other, a feature expected to be reflected in the measurements. We propose an algebraic locality framework to keep track of the independence, where sets are equipped with a binary symmetric relation we call a locality relation on the set, this giving rise to a locality set category. In this algebraic locality setup, we implement a multivariate regularisation, which gives rise to multivariate meromorphic functions. In this case, independence of events is reflected in the fact that the multivariate meromorphic functions involve independent sets of variables. A minimal subtraction scheme defined in terms of a projection map onto the holomorphic part then



yields renormalised values. This multivariate approach can be implemented to renormalise at poles, various higher multizeta functions such as conical zeta functions (discrete sums on convex cones) and branched zeta functions (discrete sums associated with rooted trees). This renormalisation scheme strongly relies on the fact that the maps we are renormalising can be viewed as locality algebra morphisms. This talk is based on joint work with Pierre Clavier, Li Guo and Bin Zhang.

生云鹤

Title: CLWX 2-algebroids and the first Pontryagin class of quadratic Lie algebroids.

Abstract: We introduce the notion of a CLWX 2-algebroid (named after Courant-Liu-Weinstein-Xu) and study its properties. We give a detailed study on the structure of a transitive Lie 2-algebroid and describe a transitive Lie 2-algebroid using a morphism from the tangent Lie algebroid TM to a strict Lie 3-algebroid constructed from derivations. Then we introduce the notion of a quadratic Lie 2-algebroid and define its first Pontryagin class, which is a cohomology class in $H^5(M)$. Associated to a CLWX 2-algebroid, there is a quadratic Lie 2-algebroid



naturally. Conversely, we show that the first Pontryagin class of a quadratic Lie 2-algebroid is the obstruction class of the existence of a CLWX-extension.

唐鑫星

Singularity Torsion and Anomaly Formula

BCOV find that the genus 1 partition function of CY 3-fold is related to the Ray-Singer torsion via the holomorphic anomaly equation. Inspired by the LG/CY correspondence, in the LG B-model, we develop the heat kernel theory associated to the deformation f of a quasi-homogeneous polynomial f_0 . We define the corresponding singularity torsion associated to Δ_f and prove that the $2d_n$ torsion gives us the genus 1 information of LG B-model.

向茂松

Title: Cohomologies from Leibniz algebras

Abstract: Given a left Leibniz algebra \mathfrak{g} with left center



$Z(\mathfrak{g})$, we prove that the Chevalley-Eilenberg cohomology of the Lie algebra $\mathfrak{g}/Z(\mathfrak{g})$ is isomorphic to the cohomology of the Lie-2-algebra $Z(\mathfrak{g}) [1] \oplus \mathfrak{g}$ constructed by Z.Liu and Y.Sheng. This is part of joint work with X.Cai and Z.Liu.

许明

Closed geodesics on Finsler spheres of constant flag curvature

Recently, R. Bryant and his co-authors used Lie method to provide a classification of 2-dimensional Finsler spheres with constant flag curvature $K=1$ according to the behavior of geodesics. Their work inspired me to use similar techniques to study the closed geodesics on high dimensional Finsler spheres with $K=1$, and get an estimate on the number of geometrically distinct orbits of prime closed geodesics with respect to the action of the connected isometry group.

As a by-product, we see that for a Finsler sphere with $K=1$ and only finite orbits of prime closed geodesics, there are orbits of its connected isometry group, which are Riemannian or Randers, totally geodesics



subspheres.

徐晓濛

Stokes phenomenon, quantum groups and Gromov-Witten theory

This talk will give an introduction to a linear differential system with singularities, and then explore its relation with Poisson geometry, Yang-Baxter equations and topological field theories.

喻厚义

Rota-Baxter Algebras and Quasi-Symmetric Functions

In the 1960s, Rota applied his first construction of free Rota-Baxter algebra and his algebraic formulation of Spitzer's identity to obtain the well-known Warning formula which relates elementary symmetric functions to power symmetric functions. He later suggested that there should be a close connection between Rota-Baxter algebras and generalizations of symmetric functions. We present some results that verify Rota's suggestion by introducing the Hopf algebra of quasi-



symmetric functions with semigroup exponents generalizing the Hopf algebra of quasi-symmetric functions. We show that a free commutative Rota-Baxter algebra can be interpreted as generalized quasi-symmetric functions. This equips the free commutative Rota-Baxter algebra with a natural Hopf algebra structure.

This is a joint work with Li Guo, Jean-Yves Thibon and Jianqiang Zhao.

张涛

Higher omni-Lie algebroids

Abstract: We introduce the notion of higher omni-Lie algebroids defined on the direct sum bundle of the gauge Lie algebroid and the cochain complex with respect to jet bundle. Dirac structures of higher omni-Lie algebroids are investigated.

左达峰:

Extended affine Weyl groups of BCD-type: their Frobenius manifolds and Landau-Ginzburg superpotentials



For the root systems of type B_l , C_l and D_l , we generalize the result of \cite{DZ1998} by showing the existence of Frobenius manifold structures on the orbit spaces of the extended affine Weyl groups that correspond to any vertex of the Dynkin diagram instead of a particular choice made in \cite{DZ1998}. It also depends on certain additional data. We also construct Landau-Ginzburg superpotentials for these Frobenius manifold structures. This is a joint work with B.Dubrovin, Ian. Strachan and Youjin Zhang.