List of abstracts

1) **Florent Baudier:** Nonlinear embeddings: a quantitative tale

Abstract: We will present and discuss a selection of nonlinear embedding results, and their connections to noncommutative geometry. The various embeddings are mainly from a metric space into a Banach space. They describe in some sense, either the large scale structure or the small scale structure, or both, of the spaces involved. We will not only be interested in the existence of such embeddings but how can we describe and quantify the quality of the embeddings. For instance we can quantify how close to bi-Lipschitz an embedding can be by using metric invariants such as compression exponents or more generally deformation gaps.

2) **Martijn Caspers :** The Haagerup property for arbitrary von Neumann algebras

Abstract: We introduce a natural generalization of the Haagerup property of a finite von Neumann algebra to an arbitrary von Neumann algebra equipped with a normal, semi-finite, faithful weight and prove that this property does not depend on the choice of the weight. In particular this defines the Haagerup property as an intrinsic invariant of the von Neumann algebra. We shall discuss stability properties of the Haagerup property regarding crossed products and free products. We also show how to define a noncommutative counterpart of the group-Haagerup property in terms of the existence of a proper, continuous, conditionally negative de?nite function. This is joint work with Adam Skalski.

3) **Kuokfai Chao:** On the reduced C*-algebras of p-adic groups

Abstract: In this talk, we will talk about the Aubert-Baum-Plymen-Solleveld conjecture and explain how to use it to compute the reduced C*-algebras of p-adic groups.

4) **Xiaoman Chen:** TBA

Abstract: TBA

5) **Chunlan Jiang:** Curvature, second fundamental form and similarity classification of quasi-homogeneous bundls

Abstract: In this talk, we give the complete similarity invarints of a classes of complex bundls by using the curvature and second fuundamental form.

6) **Tim de Laat:** Noncommutative-L^p-rigidity and nonembeddability of expanders

Abstract: For $1 < p < \infty$, a countable discrete group Γ is said to be noncommutative-L^p-rigid if the noncommutative L^p-space $L^p(L(\Gamma))$ does not have the completely bounded approximation property. In the last years, several examples of noncommutative-L^p-rigid groups have been provided for different values of p. After an overview of these results, I will explain a recent joint work with Mikael de la Salle, in which we proved that for every $p \neq 2$, the group $\mathrm{SL}(n, \mathbb{Z})$ is noncommutative-L^p-rigid for n sufficiently large. The proof of this result gives rise to an essentially different rigidity result on the non-coarse-embeddability of families of expanders constructed from $\mathrm{SL}(n, \mathbb{Z})$. Both results can be generalized to lattices in Lie groups of high real rank.

7) **Hanfeng Li:** Ergodicity of principal algebraic actions

Abstract: For a countable group G and an element f of the integral group ring ZG of G, one may consider the natural action of G on the Pontryagin dual of ZG/ZGf. I will discuss when such an action is ergodic. This is joint work with Jesse Peterson and Klaus Schmidt.

8) **Benben Liao:** About the difficulty to prove Baum Connes conjecture for a non-cocompact lattice in Sp_4 over a local field of positive characteristic

Abstract: We prove a variant of strong property (T) for the non-cocompact lattice $\Gamma = Sp_4(\mathbb{F}_q[\pi^{-1}])$ in $Sp_4(\mathbb{F}_q((\pi)))$ over the field of Laurent series $\mathbb{F}_q((\pi))$ of a finite field $\mathbb{F}_q$. This property is an obstruction of known methods for proving Baum Connes conjecture for Γ, in particular, it implies that Γ does not have property (RD). We prove our result by constructing two families of functions on the unipotent subgroups of Γ, which have C_r^* norms with exponential decay.

9) **Tao Mei:** Riesz transforms on group von Neumann algebras

Abstract: This talk is on joint work with M. Junge and J. Parcet. Let $\mathcal{S}$ be the class of Schwarz functions on $\mathbb{R}$ and $\Delta = \partial^2$ the Laplace operator on $\mathcal{S}$. The classical Reisz transform inequality says that the L^p norms of ∂f and $\Delta^{\frac{1}{2}} f$ are equivalent for any $f \in \mathcal{S}, 1 < p < \infty$. Given a discrete group G, let $|g|$ be the word length of g for a fixed generating set. Denote by λ the left regular representation of G and $\lambda(\mathbb{C}[G])$ the set of linear combinations of $\lambda_g, g \in G$. Let us consider the linear map $L : \lambda_g \mapsto |g|\lambda_g$ on $\lambda(\mathbb{C}[G])$ and the bilinear map Γ from $\lambda(\mathbb{C}[G]) \times \lambda(\mathbb{C}[G])$ to $\lambda(\mathbb{C}[G])$ associated with the Gromov product,

$$\Gamma(\lambda_g, \lambda_h) = \frac{|g| + |h| - |g^{-1}h|}{2} \lambda_{g^{-1}h}.$$

$\Gamma(\cdot,\cdot)$ and L are analogues of the classical differential operators $|\partial(\cdot)|^2$ and Δ following P. A. Meyer and D. Bakry's work. What is the relation between Γ and L? It is easy to see that, for any $f \in \lambda(\mathbb{C}[G])$,

$$\tau\Gamma(f, f) = \tau|L^{\frac{1}{2}} f|^2$$

with τ the usual trace on the group von Neumann algebra. The mystery is the relation between $\tau\Gamma^p(f, f)$ and $\tau|L^{\frac{1}{2}} f|^{2p}$.

10) **Masato Mimura:** Group approximation in Cayley topology and coarse geometry, part II: fibered coarse embeddings

Abstract: Chen–Wang–Yu define the notion of **fibered coarse embeddings** (hereafter we write as "FCE") into a metric space, that is weaker than that of the coarse embeddings. For a proper metric space X with bounded geometry, the maximal coarse Baum–Connes conjecture for X holds ture if X admits an FCE into a Hilbert space; and the coarse Novikov conjecture for X holds ture if X admits an FCE into an Hadamard manifold.

This talk is part II of a project in progress with Hiroki Sako (Tokai University), and deals with FCE's of coarse disjoint unions of finite marked groups. We prove a generalization of results of Chen–Wang–Wang for box spaces, and provide the first (and explicit) example of expander families with the following two properties: 1) it does not admit FCE's into any "non-singular" CAT(0) spaces (such as Hilbert spaces, Hadamard manifolds, and Euclidean buildings associated to linear algebraic groups); 2) but it *does* admit a *bi-Lipschitz* embedding into some "singular" CAT(0) space.

11) **Bogdan Nica:** K-homological finiteness for hyperbolic groups

Abstract: I will discuss a result saying that reduced C*-algebras of (certain classes of) hyperbolic groups enjoy a strong finiteness property in K-homology. This is joint work with Heath Emerson.

12) **Baptiste Olivier:** Variants of the Haagerup property relative to non-commutative L_p-spaces

Abstract: For a non-commutative L_p-space $L_p(\mathcal{M})$, we define a variant of the Haagerup property (H), property $(H_{L_p(\mathcal{M})})$, in terms of orthogonal representations on $L_p(\mathcal{M})$ which have

vanishing coefficients. We will study the relationships between property (H) and property $(H_{L_p(\mathcal{M})})$ for various von Neumann algebras $\mathcal{M}$. We will also discuss the existence of proper actions by affine isometries on $L_p(\mathcal{M})$ for groups with property (H) and some von Neumann algebras $\mathcal{M}$.

13) **Hervé Oyono-Oyono:** Persistent approximation property, controlled K-theory and large scale geometry

Abstract: The study of elliptic differential operators from the point of view of index theory and its generalizations to higher order indices gives rise to C*-algebras where propagation makes sense and encodes the underlying large scale geometry. Prominent examples for such C*-algebras are Roe algebras, group C*-algebras and crossed product C*-algebras. Unfortunately, K-theory for operator algebras does not keep track of these propagation properties. Together with G. Yu, we have developed a quantitative version of K-theory that takes into account propagation phenomena. In this lecture we explain that in many cases, these quantitative K-theory groups approximate in a particular relevant way the K-theory. We also discuss connection with the Baum-Connes and the Novikov conjecture.

14) **Narutaka Ozawa :** Noncommutative real algebraic geometry of Kazhdan's property (T)

Abstract: I will start with a gentle introduction to the emerging (?) subject of "noncommutative real algebraic geometry," a subject which deals with equations and inequalities in noncommutative algebra over the reals, with the help of analytic tools such as representation theory and operator algebras. I will then present a surprisingly simple proof that a group G has Kazhdan's property (T) if and only if a certain inequality in the group algebra $\mathbf{R}[G]$ is satisfied. Very recently, Netzer and Thom used a computer to verify this inequality for $\mathrm{SL}(3,\mathbf{Z})$, thus giving a new proof of property (T) for $\mathrm{SL}(3,\mathbf{Z})$ with a much better estimate of the Kazhdan constant than the previously known.

15) **Walther Paravicini:** Bivariant K-theories

Abstract: I'll try to provide an overview of several types of bivariant K-theories in the Banach algebraic framework, including Lafforgue's KK^{ban} and suitable versions of Cuntz's kk-theory. This talk is also meant to be an invitation to think about several interesting open problems.

16) **Michael Puschnigg:** The Chern-Connes character is not rationally injective

Abstract: The ChernConnes character is the unique non-trivial multiplicative transformation from Kasparov's bivariant K-theory of C*-algebras to bivariant local cyclic cohomology. It is rationally injective on the bootstrap class of C*-algebras KK-equivalent to commutative ones, but not in general. We outline the construction of the counterexample and explain two different proofs of the result.

17) **Yanqi Qiu:** Spectral measure of infinite random matrices with Hua-Pickrell laws

Abstract: In this talk, I will introduce the spectral measure of unitarily invariant measures on the space of infinite Hermitian matrices. In particular, by answering affirmatively a question of Borodin-Olshanski, we are now able to discribe completely the ergodic decomposition of the so-called Hua-Pickrell measures. The connection with spherical representations of infinite dimensional Cartan motion groups will be mentioned. This is a joint work with Alexander Bufetov.

18) **Qinggang Ren:** Nagata property and asymptotic cone

Abstract: Nagata dimension and Nagata property are defined to study the topological dimension of metrizable spaces. we use modified Nagata property to show that every asymptotic cone of a

metric space X has c-Nagata property if and only if X has asymptotic $(c+\epsilon)$-Nagata property. As an application, every asymptotic cone of a metric space X is an ultrametric space if and only if X has asymptotic $(1+\epsilon)$-Nagata property.

19) **Mikael de la Salle :** Towards Banach space strong property (T) for higher rank Lie groups

Abstract: Banach space strong property (T) for a group G was introduced by Vincent Lafforgue as a rigidity property for the linear representations π of G on Banach spaces with type > 1 with moderated growth of the norm $\|\pi(g)\|$. Consequences of this property include non-embeddability of expanders in spaces with type > 1, and fixed point properties for affine actions on such Banach spaces. Lafforgue proved that $\mathrm{SL}(3, F)$ has this property for a non-archimedean local field F (eg the field of p-adic numbers $\mathbb{Q}_p$). I will explain a partial result for $\mathrm{SL}(3, R)$ in which the Banach spaces allowed are interpolation spaces between an arbitrary Banach space and a space with sufficiently good type and cotype. In a joint work with Tim de Laat we prove the same result for all connected simple Lie groups of real rank ≥ 2.

20) **Xiang Tang:** A Toeplitz index theorem on varieties with isolated singularities

Abstract: In this talk, we will introduce an extension of the Boutet de Monvel Toeplitz index theorem to complex manifold with isolated singularities following the relative K-homology theory of Baum, Douglas, and Taylor for manifold with boundary. As an application, we will use this index theorem to study the Arveson-Douglas conjecture. This is joint work with R. Douglas and G. Yu.

21) **Hang Wang:** On an L^2-Lefschetz fixed point formula

Abstract: We formulate an L^2-Lefschetz fixed point formula for geometric actions of some groups on complete Riemannian manifolds. The cohomological formulas give rise to topological invariants for compact orbifolds with quotient singularities and some application in representation theory. This talk is related to my joint work with Bai-Ling Wang.

22) **Qin Wang:** Fibred coarse embedding into Hilbert space and its applications

Abstract: We introduce a concept of fibred coarse embedding into Hilbert space for metric spaces, which is a generalization of Gromov's notion of coarse embedding into Hilbert space and has applications in higher index problems. This is based on joint work with Xiaoman Chen and Guoliang Yu.

23) **Zhizhang Xie:** Banach algebras and higher rho invariants twisted by non-unitary representations

Abstract: Higher rho invariants were first introduced by Higson and Roe in their study of mapping surgery exact sequence in topology to analysis. For a closed spin manifold M equipped with a positive scalar curvature metric g, the Dirac operator D together with the metric g naturally produce a higher rho invariant $\rho(D, g)$ in an analytic structure group, which is the K-theory group of a certain C^*-algebra. Higson and Roe showed that the higher rho invariant $\rho(D, g)$ recovers the classical rho invariant of Atiyah, Patodi and Singer for unitary finite dimensional representations of the fundamental group Γ of M. In this talk, I will talk about how to extend the define of higher rho invariants to allow non-unitary finite dimensional representations of Γ. This is inspired by the works of Lafforgue and Gomez-Aparicio. In particular, we introduce a Banach analogue of the C^*-algebraic analytic structure group, which is the receptacle of our Banach analogue of the higher rho invariant of Higson and Roe. This talk is based on joint work with Guoliang Yu.

24) **Xiao Xiong:** Sobolev and Besov spaces on quantum tori

Abstract: On a quantum tori $\mathbb{T}^d_\theta$, consider a series of unbounded operators defined by:

$$\delta_j(U_j) = 2\pi i U_j, \;\; \delta_k(U_j) = 0, k \neq j.$$

These operators δ_j commute with the adjoint operation $*$, and play the roles of the partial derivatives $\frac{\partial}{\partial x_j}$ in classical analysis on the d-torus. With this differential structure, we can define the Sobolev spaces as well. We prove the Sobolev embedding theorem on quantum tori. Assume that $s - d/p = s_1 - d/p_1$, then we have:

$$W^s_p(\mathbb{T}^d_\theta) \subset W^{s_1}_{p_1}(\mathbb{T}^d_\theta), \quad 1 \leq p \leq p_1 < \infty, s, s_1 \in \mathbb{N}.$$

We divide the proof of embedding theorem into two part : we use interpolation method to prove the case $1 < p \leq p_1 < \infty$, via a corresponding embedding theorem of Besov spaces; for the case $p = 1$, as the interpolation method fails, we should take some other special path. This talk is based on joint work with Zhi Yin and Quanhua Xu.

25) **Guoliang Yu:** The Novikov conjecture and geometry of Banach spaces

Abstract: I will explain what is the Novikov conjecture, why it is interesting, and how it is related to geometry of Banach spaces. This is joint work with Gennadi Kasparov.

26) **Weiping Zhang:** On the transverse Euler class of a foliation

Abstract: we extend the Bott vanishing theorem of foliations to include the Euler class, by making use of the Connes fibration over a foliation. This is a joint work with Huitao Feng.

27) **Bentuo Zheng:** Game theory and unconditional bases

Abstract: In this talk, I am going to start with the famous Hereditarily Indecomposable (H.I) space of Gowers and Maurey and a recent striking result of Argyros and Haydon (solution of the scalar plus compact problem). By introducing the weak star unconditional tree property and playing certain asymptotic games, I will give a characterization of Banach spaces which embed into a superspace with an unconditional basis and separable dual. To be more precise, we will show that a separable Banach space with the weak star unconditional tree property is isomorphic to a subspace as well as a quotient of a Banach space with a shrinking unconditional basis. This solves a problem dating back to the 1970s.

28) **Ping Zhong:** Subordination functions and infinitely divisible distributions relative to free convolutions

Abstract: The free additive convolution and the free multiplicative convolution are defined to describe the distributions of the addition and the product of free random variables, in Voiculescu's sense, respectively. The subordination technique is important in the proofs of regularities of measures obtained by free convolutions. We give a survey of some recent results on the spectral distributions of free Brownian motion and partially defined semigroups relative to free convolutions. In these cases, subordination functions are closely related with freely infinitely divisible distributions.