

**CHRISTMAS TREE MEETING GDR GNC 2017  
ABSTRACTS**

PLENARY LECTURES

**Yves Benoist** (CNRS & Université Paris-Sud)

**Title: Tempered homogeneous spaces**

**Abstract:** Let  $G$  be a semisimple real Lie group,  $H$  a closed connected subgroup, and  $V$  the Hilbert space of square integrable functions on the homogeneous space  $G/H$ . I will tell when the unitary representation of  $G$  in  $V$  is tempered. Joint work with T. Kobayashi.

**Stefaan Vaes** (KU Leuven)

**Title: Classification of free Araki-Woods factors**

**Abstract:** Free Araki-Woods factors are a free probability analog of the type III hyperfinite factors. They were introduced by Shlyakhtenko in 1996, who completely classified the free Araki-Woods factors associated with almost periodic orthogonal representations of the real numbers. I present a joint work with Houdayer and Shlyakhtenko in which we completely classify a large class of non almost periodic free Araki-Woods factors. The key technical result is a deformation/rigidity criterion for the unitary conjugacy of two faithful normal states on a von Neumann algebra. As an application, I also present non-classifiability results for free Araki-Woods factors.

INVITED TALKS

**Adrien Boyer** (Université Paris Diderot)

**Title: Harish-Chandra's Schwartz algebras associated with discrete groups of semisimple Lie groups**

**Abstract:** I will discuss a convolution operator associated with Harish-Chandra's Schwartz space of discrete groups of any semisimple Lie groups. I will show that the latter space carries a natural structure of convolution algebra. Besides, a control of the  $L^2$ -convolutor norm by the norm of this space holds. I will explain how this inequality is related to property RD and I will make a connection with the Baum-Connes conjecture.

**Léonard Cadilhac** (Université de Caen)

**Title: Weak boundedness of Calderon-Zygmund operator in noncommutative analysis**

**Abstract:** We will present a simplified proof of a result first shown by J. Parcet in 2008 which extends the weak  $(1, 1)$  boundedness of Calderon-Zygmund operators, a well-known result in harmonic analysis, to the noncommutative setting. To this effect, we will explain how ideas from noncommutative integration and martingale theory can be used to adapt the classical proof. Nevertheless, this is not enough and we will introduce the second main ingredient, a pseudo-localisation

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lemma of purely commutative nature, which captures the behaviour of singular integrals “far from the diagonal”.

**Tobe Deprez** (KU Leuven)

**Title: Rigidity for von Neumann algebras given by locally compact groups**

**Abstract:** In recent years, Popa’s deformation/rigidity theory has lead to a wealth of classification and rigidity results for von Neumann algebras given by countable groups and their actions on measure spaces. In this talk, I will present the first rigidity and classification results for von Neumann algebras given by locally compact groups and their actions. I establish that the crossed product von Neumann algebra  $L^\infty(X, \mu) \rtimes G$  has a unique Cartan subalgebra, when  $G \curvearrowright (X, \mu)$  is free and probability measure preserving and  $G$  is a connected simple Lie group of real rank one, or a group acting properly on a tree. From this, I deduce a  $W^*$ -strong rigidity result for irreducible actions of products of such groups. I will also show that the group von Neumann algebra of such groups are strongly solid. More generally, our results hold for locally compact groups that are non-amenable, weakly amenable and belong to Ozawa’s class  $\mathcal{S}$ . This is joint work with Arnaud Brothier and Stefaan Vaes.

**Tomás Ibarlucía** (Université Paris Diderot)

**Title: Coalescence of strongly ergodic distal systems**

**Abstract:** I will discuss a strengthening of a recent rigidity result of Ioana and Tucker-Drob, from which we deduce that strongly ergodic systems with generalized discrete spectrum are coalescent: every self-factor is an isomorphism. This is based on a model-theoretic understanding of this rigidity phenomenon. Joint work with Todor Tsankov.

**Lison Jacoboni** (Université Paris-Sud)

**Title: Propriétés métriques et probabilistes des groupes métabéliens de type fini**

PhD defense (in French).

**Amine Marrakchi** (Université Paris-Sud)

**Title: Stable equivalence relations**

**Abstract:** An ergodic probability measure preserving equivalence relation  $\mathcal{R}$  is called stable if it is isomorphic to the direct product  $\mathcal{R} \times \mathcal{R}_0$  where  $\mathcal{R}_0$  is the unique hyperfinite equivalence relation. In this talk, we will present a new local characterization of stable equivalence relations. As an application, we obtain the following rigidity result: a product equivalence relation  $\mathcal{R} \times \mathcal{S}$  is stable if and only if one of the equivalence relations  $\mathcal{R}$  or  $\mathcal{S}$  is stable.

**Ignacio Vergara** (ENS de Lyon)

**Title: Radial Schur multipliers**

**Abstract:** Given a nonempty set  $X$ , we say that a function  $\phi : X \times X \rightarrow \mathbb{C}$  is a Schur multiplier if it associates, to each bounded operator  $T \in \mathbf{B}(\ell_2(X))$ , a new operator  $M_\phi T$  defined by multiplication of the matrix coefficients:  $(M_\phi T)_{x,y} = \phi(x,y)T_{x,y}$ . In this talk, I will focus on the particular case

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when the set  $X$  is an infinite graph and the function  $\phi$  is radial. This means that there exists another function  $\dot{\phi} : \mathbb{N} \rightarrow \mathbb{C}$  such that  $\phi(x, y) = \dot{\phi}(d(x, y))$ , where  $d$  is the combinatorial distance on the graph.

Haagerup, Steenstrup and Szwarc proved that, for homogeneous trees, a radial function is a Schur multiplier if and only if a certain Hankel matrix is of trace class. I will discuss some extensions of this result to products of trees, products of hyperbolic graphs and CAT(0) cube complexes.

**Jonas Wahl** (KU Leuven)

**Title: Bernoulli actions of type III and  $L^2$ -cohomology**

**Abstract:** While the study of measure preserving Bernoulli actions of discrete groups has yielded many stunning results during recent years, not so much is known as soon as one steps away from the measure preserving case. In fact, until recently, the only discrete group known to admit a Bernoulli action without invariant measure was the group of integers. In this talk, I aim to demonstrate that the question whether or not a given group admits a Bernoulli action without invariant measure, depends strongly on its first  $L^2$ -cohomology. In particular, I will show how to construct such actions for a large class of discrete groups and give some applications. This is joint work with Stefaan Vaes.

**Simeng Wang** (Saarland University)

**Title: Noncommutative individual ergodic theorems for groups with polynomial growth**

**Abstract:** In this talk I will present some recent progress on noncommutative individual ergodic theorems for group actions on von Neumann algebras. The main result is a noncommutative extension of the individual ergodic theorems by Calderon, Breuillard and Tessera. We establish a noncommutative Calderon transference principle for actions by amenable groups. On the other hand, applying the Gaussian estimates in random walk theory, we show that the ergodic averages for word metrics with polynomial growth can be dominated by the classical ergodic averages. Also we obtain the Hardy-Littlewood maximal inequality on general doubling metric spaces for the operator-valued setting. Based on these results, we may prove several maximal and individual ergodic theorems for some group actions on von Neumann algebras. This is joint work with Guixiang Hong and Benben Liao.