WORKSHOP ON QUANTUM GROUPS AND PHYSICS
Caen 2010, Sept. 6th-10th

PROGRAMME

Monday 6th	Tuesday 7th	Wednesday 8th	Thursday 9th	Friday 10th
	09:00 Lecture by J. Barrett	09:00 Lecture by J. Barrett	09:00 Lecture by J. Barrett	09:00 Lecture by J. Barrett
10:00 welcome	*10:15 coffee break*	*10:15 coffee break*	*10:15 coffee break*	*10:15 coffee break*
10:30 Lecture by J. Barrett	10:45 Talk by S. Majid	10:45 Talk by J. Lukierski	10:45 Talk by P. Kasprzak	10:45 Talk by P. Martinetti
11:45 lunch break	*11:45 lunch break*	*11:45 lunch break*	*11:45 lunch break*	*11:45 lunch*
13:30 Talk by P. Fima 14:30 Talk by C. Meusburger	13:30 Talk by J. Kowalski 14:30 Talk by M. Arzano	13:30 Talk by D. Nikshych 14:30 Talk by F. Girelli	13:30 Talk by L. Vainerman 14:30 Talk by F. D'Andrea	
15:30 coffee break	*15:30 coffee break*	*15:30 coffee break*	*15:30 coffee break*	
16:00 Talk by K. Noui	16:00 Talk by V. Tolstoy	16:00 Talk by D. Pranzetti 16:30 Talk by M. Dupuis	16:00 Talk by A. Borowiec	

M. Arzano (Utrecht)
Anatomy of a deformed symmetry
Relativistic particles with momentum space described by a group manifold provide a very interesting link between (quantum) gravity, quantum group symmetries and non-commutative field theories. I will discuss the construction of a one-particle Hilbert space from the classical k-deformed phase space (a well studied model of relativistic kinematics with curved momentum space) and show how curvature in momentum space leads to an ambiguity in the quantization procedure reminiscent of the ambiguities one finds when quantizing fields in curved space-times. Moving to the multiparticle sector I will discuss how the quantum group symmetry of the Hilbert space induces additional structure which reflects in a non-trivial, momentum-dependent statistics. The richer structure of the deformed Fock space allows for the possibility of entanglement between the field modes and "planckian" degrees of freedom.

A. Borowiec (Wrocław)
kappa-Minkowski spacetime, deformed phase space and DSR algebra
Some class of Deformed Special Relativity (DSR) theories are reconsidered within Hopf algebraic formulation. For this purpose we shall explore a minimal framework of deformed Weyl-Heisenberg algebras provided by a smash product construction of DSR algebra. It is proved that this DSR algebra, which uniquely unifies kappa-Minkowski spacetime coordinates with Poincare generators, can be obtained by nonlinear change of generators from undeformed one. Its various realizations in terms of the standard (undeformed) Weyl-Heisenberg algebra opens the way for quantum mechanical interpretation of DSR theories in terms of relativistic (Stuckelberg version) Quantum Mechanics. On this basis we review some recent results concerning twist realization of kappa-Minkowski spacetime

described as a quantum covariant algebra determining deformation quantization of the corresponding linear Poisson structure. Formal and conceptual issues concerning quantum kappa-Poincare and kappa-Minkowski algebras as well as DSR theories are discussed. Particularly, the so-called "q-analog" version of DSR algebra is introduced. Is deformed special relativity quantization of doubly special relativity remains an open question. Finally, possible physical applications of DSR algebra to description of some aspects of Planck scale physics are shortly recalled.

F. D'Andrea (Trieste)
Deformations of Kahlerian Lie groups
I will discuss formal and non-formal deformations of Lie groups with an invariant Kahler structure. Decomposing these into a sequence of split extensions of split solvable Ricci type symmetric spaces (plus possibly an Abelian factor) it is possible to iterate a previous construction by P. Bieliavsky and obtain a cocycle quantization of any such a group and explicitly compute the corresponding Drinfeld twist. Non-formal quantizations are obtained through the construction of multiplicative unitaries. This is a joint work with P. Bieliavsky et al.

M. Dupuis (Lyon)
U(N) framework and simplicity constraints for spin foam models

P. Fima (Paris)
Twisting of locally compact quantum groups

F. Girelli (Sidney)
Quantum group symmetries in Snyder space-time
I will discuss the quantum group symmetries associated to Snyder's non-commutative space-time. The construction relies on the notion of K-loop or Bruck loop, a type of quasi-group which is a non-associative generalization of the notion of abelian group.

P. Kasprzak (Copenhagen)
Quantum Homogeneous Spaces
The aim of this talk is to present and analyze a new definition of a quantum homogeneous space of a locally compact quantum group G. It will be shown to be an appropriate quantum counterpart of the classical notion of homogeneity, providing an operator algebraic characterization of the transitive group actions. Furthermore our framework covers different classes of examples such as the quotient of a locally compact quantum group by its closed quantum subgroup due to S. Vaes and (generically non-quotient) quantum homogeneous spaces of a compact quantum group studied by P. Podles as well as the Rieffel deformation of G-homogeneous spaces. On the other hand, the paradoxical examples of non-compact quantum homogeneous spaces of a compact quantum group due to S.L. Woronowicz are ruled out. We also prove that the homogeneity of a quantum G-space implies its G-simplicity.

J. Kowalski-Glikman (Wrocław)
An apology for DSR
In my talk I would like to describe the present status of Doubly Special Relativity. DSR is an extension of Special Relativity aimed at describing kinematics of particles and fields in the regime where (quantum) gravity effects might become relevant. I will discuss an interplay between DSR physics and mathematics of Hopf algebras.

J. Lukierski (Wrocław)
From kappa-deformed oscillators to kappa-deformed quantum field theory
We stress that free quantum fields are deformed due to the appearance of noncommutative space-time coordinates and the deformation of momentum-dependent field oscillators algebra. Firstly we discuss the alternatives in simpler case of canonical space-time deformations (commutator of noncommutative coordinates is a constant c-number tensor). Further we consider the case of kappa-deformed oscillators and describe corresponding kappa-Fock space. In order to define products of kappa-deformed free fields we introduce nontrivial braid factor between the noncommutative plane wave exponentials and kappa-deformed oscillators. In such a way we arrive at the star-commutator of kappa-deformed free quantum fields which is a c-number. We shall point out that because such a kappa-deformation can be obtained by nonstandard twist factor depending on dilatation operator, it provides only an approximation to the right solution of the problem of kappa-deformation of quantum free fields. In the course of the talk I shall comment on the relation between the kappa-deformed Poincare-Hopf algebra approach and the DSR framework.

S. Majid (London)
Almost commutative Riemannian geometry

P. Martinetti (Rome)
Noether analysis on noncommutative spacetime

C. Meusburger (Hamburg)
Quantum group symmetries and the quantum torus universe
We quantise the Euclidean torus universe with a combinatorial quantisation formalism based on the representation theory of the Drinfel'd double DSU(2). We explicitly construct the algebra of gauge invariant quantum observables and its irreducible Hilbert space representations. We discuss the role of quantum group symmetries in the implementation of the constraints and the action of the modular group in the quantum theory. The talk is based on joint work with Karim Noui.

D. Nikshych (New Hampshire)
The Witt group of non-degenerate braided fusion categories
This is a report on my joint work with A. Davydov, M. Müger, and V. Ostrik. The classical Witt group is the quotient of the monoid of quadratic forms on finite Abelian groups by hyperbolic quadratic forms. Its categorical generalization is the quotient of the monoid of braided fusion categories by the relation saying that the class of any Drinfeld center is zero. I will explain basic results about this group and discuss open questions.

K. Noui (Tours)
Quantum groups and quantum gravity

D. Pranzetti (Luminy)
Quantum groups and black hole entropy in loop quantum gravity
I will show how quantum groups play a central role describing the basic degrees of freedom leading o black hole entropy in loop quantum gravity.

V.N. Tolstoy (Moskow)
Quantum Deformations of Relativistic Symmetries and Supersymmetries
The Lorentz, Poincaré and super-Poincaré Lie algebras play a fundamental role in the relativistic physics - they are algebras of relativistic symmetries and supersymmetries. Therefore it is very interesting to consider quantum deformations of the algebras. These quantum deformations are classified by classical r-matrices. There are two types of the classical r-matrices: standard and non-standard. The first type r-matrices satisfy the homogeneous classical Yang-Baxter equation (CYBE) and the second ones are solutions of the inhomogeneous (CYBE). In the case of the Lorentz algebra a complete list of the classical r-matrices involves the four independent formulas and the corresponding quantum deformations are presented in explicit form. In the case of Poincaré algebra the total list of the non-standard classical r-matrices consists of 21 cases. These r-matrices have various numbers of free parameters and almost all of them can be presented as a sum of subordinated r-matrices of Abelian and Jordanian types. Almost all r-matrices of the list for the Poincaré algebra can be extend to the Poincaré superalgebra. Corresponding twists describing quantum deformations are given in explicit form.

L. Vainerman (Caen)
Subfactors and quantum groupoids related to Tambara-Yamagami categories