

## A.1 Scientific highlights

1. C. Skau (Trondheim) and coworkers have proved that all free and minimal  $\mathbf{Z}^2$ -actions (as homeomorphisms on the Cantor set) is topologically orbit equivalent to  $\mathbf{Z}$ -actions (cf. Connes, Feldman, Weiss in the ergodic measure-theoretic setting). (Team 5; B7)

Reference: T.Giordano, H. Matui, I. Putnam, C. Skau, *The orbit structure of Cantor minimal  $\mathbf{Z}^2$ -systems*, preprint (2006).

[Substitute this for what appears in your preliminary FINAL REPORT, keeping reference [112], but supplanting reference [113] with the above.]

2. Nadia Larsen (Oslo) and Iain Raeburn give a new proof of a theorem of Mallat concerning existence of wavelets by using a construction of a direct limit of Hilbert spaces (Team 5; B7)

Reference: N. Larsen, I. Raeburn, *From filters to wavelets via direct limits*, arXiv: math. FA/ 0602450

3. E. Bedos (Oslo) and R. Conti studied convergence and summation processes of Fourier series in reduced twisted  $C^*$ -algebras of discrete groups (Team 5; B7)

Reference: E.Bedos, R. Conti, *On twisted Fourier analysis and convergence of Fourier series on discrete groups*, arXiv: math. OA/ 0605145

4. **T. M. CARLSEN** (Trondheim) and S. Silvestrov associate a  $C^*$ -algebra to every shift space and show that it can be viewed as a generalization of the universal Cuntz–Krieger algebra. They provide conditions for it to be nuclear, satisfying UCT, being simple, being purely infinite, respectively. (Team 5; B1)

Reference: T.M. Carlsen, S. Silvestrov,  *$C^*$ -crossed products and shift spaces*, arXiv: math. OA/ 0512488

5. **T. M. CARLSEN** (Trondheim) constructed a universal  $C^*$ -algebra generated by partial isometries for each (partial) dynamical system. The class of  $C^*$ -algebras thus obtained is in a natural way a generalization of the Cuntz–Krieger algebras (both finite and infinite matrices), crossed products of two-sided shift spaces, and of  $C^*$ -algebras associated to one-sided shift spaces, respectively. (Team 5; B1)

Reference: T. M. Carlsen, *Symbolic-dynamics, partial dynamical systems, Boolean algebras and  $C^*$ -algebras generated by partial isometries*, arXiv: math. OA/ 060416

6. S. Neshveyev (Oslo) and coworkers completely determine the ratio set of the orbit equivalence relation on the boundary of a non-amenable hyperbolic group, considered with the harmonic measure defined by a non-degenerate finite range random walk on the group (Team 5; B7)

Reference: M. Izumi, S. Neshveyev, R. Okayasu, *The ratio set of the harmonic measure of a random walk on a hyperbolic group*, arXiv: math. DS/ 0602409

7. S. Neshveyev (Oslo), L. Tuset (Oslo) and M. Izumi prove that for any non-trivial product type action of  $SU_q(n)$  ( $0 < q < 1$ ) on an ITPFI factor  $N$ , the relative commutant of the fixed point algebra in  $N$  is isomorphic to the algebra of bounded measurable functions on the quantum flag manifold. This is equivalent to the computation of the Poisson boundary of the dual discrete quantum group. (Team 5; B7)

Reference: M. Izumi, S. Neshveyev, L. Tuset, *Poisson boundary of the dual of  $SU_q(n)$* , Comm. Math. Phys. 262(2006), 505-531

8. L. Tuset (Oslo) and M. Mueger prove that an absorbing monoid is an abstract tensor category is naturally associated to a discrete quantum group. Conversely, one can associate an absorbing monoid to such a quantum group. (Team 5; D3)

Reference: M. Mueger, L. Tuset, *Monoids, embeddings functors and quantum groups*, preprint (2006)

9. **M. Molberg** (Trondheim) established that an AF-equivalence relation can be characterized as the inductive limit of an ascending sequence of finite etale equivalence relations. This gives rise to a new definition of AF-equivalence relations that is more in line with the definition of hyperfinite equivalence relations in the measure-theoretic setting. (Team 5; B1)

Reference: M. Molberg, *AF-equivalence relations*, to appear in Math. Scand.

10. M. Landstad (Trondheim) and coworkers study the Hecke algebra of a Hecke pair  $(G, H)$  by using the Schlichting completion  $(G', H')$ . The representation theory and  $C^*$ -completions can then be addressed in terms of a single projection in  $C^*(R')$ . (Team 5; B2)

Reference: S. Kaliszewski, M. Landstad, J. Quigg, *Hecke  $C^*$ -algebras, Schlichting completions and Morita equivalence*, arXiv: math. OA/ 0311222

## B.4.2 Major network meetings, network workshops

1.  *$C^*$ -algebras, Oberwolfach, Germany, August 28–September 3, 2005*

Participants:

Ola Bratteli  
Erling Størmer  
Sergey Neshveyev  
Nadia Larsen  
**TOKE M. CARLSEN**

2. *Operator algebras and Applications*, University of Southern Denmark, Odense, April 19–23, 2006.

Participants.

Ola Bratteli  
Erling Størmer  
Erik Alfsen  
Nadia Larsen  
Sergey Neshveyev  
Christian Skau  
**Adam Sierakowski**  
**Troels Jensen**

3. *Operator algebras and Applications*, National Univ. of Ireland, Cork, June 1–4, 2005.

Participants:

Nadia Larsen  
Magnus Landstad  
**TOKE M. CARLSEN**

## B.4.3 Networking

Nadia Larsen (Oslo) visited Ryszard Nest (Copenhagen) December 7–10, 2005

Sergey Nesveyev (Oslo) visited Ryszard Nest (Copenhagen) May 10–12, 2006.

### List of individual members of the Oslo node (and Trondheim subnode)

(The postdocs and predocs supported by the EU-grant are marked with \*, and their stay had terminated by May 1, 2006. Young researchers are in boldface.)

- Erik Alfsen, `alfsen@math.uio.no`. Geometry of state spaces of operator algebras.
- Erik Bedos, `bedos@math.uio.no`. Discrete magnetic Laplacians, amenability aspects for quantum groups, projective unitary representations and twisted Fourier analysis of discrete groups.
- Ola Bratteli, `bratteli@math.uio.no`. Wavelets and operator theory, noncommutative dynamical systems.
- **Toke Meier Carlsen\***, `tokem@math.uio.no`.  $C^*$ -algebras associated to shift spaces (QSNG - postdoc in Trondheim 01.07.2004–30.09.2005. Postdoc in Oslo 01.10–31.12.2006)
- **Heidi Dahl**, `heidi.dahl@math.ntnu.no`. Doctoral student in Trondheim.
- Trond Digernes, `Trond.Digernes@math.ntnu.no`.  $p$ -adic quantum systems.
- **Sindre Duedahl**, `sindred@math.uio.no`. SUP doctoral student in Oslo.
- **Olav Gravir Imenes**, `olavgim@math.uio.no`. Doctoral student in Oslo.
- **Troels Jensen\***, `troelssj@imada.sdu.dk`. (QSNG predoc in Trondheim 11.3–24.4,2006).
- Magnus Landstad, `magnusla@math.ntnu.no`. Hecke algebra and groupoid actions on  $C^*$ -algebras.
- Nadia S. Larsen, `nadiasl@math.uio.no`. Hecke algebras and  $C^*$ -completions, crossed products of  $C^*$ -algebras by semigroups of endomorphisms.
- **Mats Molberg**, `matism@math.ntnu.no`. Doctoral student in Trondheim.
- Sergey Neshveyev, `sergeyn@math.uio.no`. Noncommutative ergodic theory, boundary theory of quantum discrete groups, noncommutative differential calculus, rigidity properties of group actions.
- Kamran Reihani, `kamranr@math.uio.no`. Connections between  $C^*$ -algebras and dynamical systems (SUP - postdoc in Oslo 01.01.2005–31.12.2006)
- **Kjetil Røysland**, `roysland@math.uio.no`. Doctoral student in Oslo.
- **Adam Sierakowski\***, `adam@imada.sdu.dk`. (QSNG predoc in Trondheim 11.3–24.4,2006).
- Christian Skau, `csk@math.ntnu.no`. Induced equivalence relations of discrete group actions on Cantor sets,  $K$ -theoretic data defined by dynamics.
- Erling Størmer, `erlings@math.uio.no`. Contractions on von Neumann algebras, noncommutative information theory and entropy.

- **Anne Louise Svendsen\***, `svendsen@math.ku.dk`. Entropy of endomorphisms arising from subfactors (QSNQ - postdoc in Oslo 01.09.2002–30.11.2003)
- Lars Tuset, `Lars.Tuset@iu.hio.no`. Cyclic cohomology for Hopf algebras, tensor categories, Martin boundary for compact quantum groups.

## Postdocs and predocs supported under the grant

(who do not feature in the Midterm review report).

Full name: **Adam Sierakowski**

Category of researcher: pre-doc

Age of time of appointment and date of birth: 25 years, March 30, 1980.

Sex: Male

Nationality: Danish

Eligibility criterion used to fund this particular person (e.g Danish citizenships): Danish citizenship

Dates of appointment and total number of person-months: March 11-April 24, 2006 (1, 5 person-months)

Scientific speciality: purely infinite  $C^*$ -algebras

Place of work: NTNU, Trondheim, Norway

Email address of young researcher: `adam@imada.sdu.dk`

Full name: **Troels Jensen**

Category of researcher: pre-doc

Age of time of appointment and date of birth: 25 years, february 22, 1981.

Sex: Male

Nationality: Danish

Eligibility criterion used to fund this particular person (e.g Danish citizenships): Danish citizenship

Dates of appointment and total number of person-months: March 11-April 24, 2006 (1, 5 person-months)

Scientific speciality:  $C^*$ -algebras, non-commutative probability

Place of work: NTNU, Trondheim, Norway

Email address of young researcher: `troelssj@imada.sdu.dk`