

Pieter Naaijkens

CURRICULUM VITAE¹

PERSONAL INFORMATION

Contact details:

Institut für Quanteninformatik
RWTH Aachen University
Otto-Blumenthal-Str. 20
52074 Aachen, Germany

E: pieter.naijkens AT physik.rwth-aachen.de
T: +49 (0)241 8028775
W: <https://pieter.naijkens.nl/>
 <https://orcid.org/0000-0001-5670-243X>
 <https://goo.gl/VJ5cF1>

ACADEMIC EMPLOYMENT

- | | |
|------------------|---|
| 9/2015 – 8/2018 | <i>Marie Skłodowska-Curie Individual Fellow (Global Fellowship)</i>
UC Davis (supervisor Prof. Bruno Nachtergaele), 2015–2017
RWTH Aachen University (supervisor Prof. Barbara Terhal), 2017–2018 |
| 4/2012 – 8/2015 | <i>Scientific assistant</i> (two years as Rubicon fellow)
Leibniz University Hannover
Supervisors: Prof. Tobias Osborne and Prof. Reinhard Werner |
| 10/2007 – 1/2012 | <i>PhD Candidate</i>
Radboud University Nijmegen
Supervisors: Prof. Klaas Landsman and Dr. Michael Müger |

EDUCATION

- | | |
|------------------|--|
| 10/2007 – 1/2012 | <i>PhD</i> , Radboud University Nijmegen
Thesis: <i>Anyons in infinite quantum systems: QFT in $d=2+1$ and the Toric Code</i>
Supervisors: Prof. Klaas Landsman and Dr. Michael Müger
Defended on May 15, 2012 |
| 9/2001 – 8/2012 | <i>MSc Mathematics</i> and <i>MSc Theoretical Physics</i> , Utrecht University
MSc Thesis: <i>Four-point functions of $N = 4$ SYM₄ in the AdS/CFT correspondence</i>
Supervisor: Dr. Gleb Arutyunov. Grade 8.5/10
Kleine scriptie (~ BSc thesis): <i>Cartesisch gesloten deelcategorieën van Top</i>
[Cartesian closed subcategories of Top]
Supervisor: Dr. Jaap van Oosten. Grade 9.5/10 |

GRANTS AND AWARDS

- EU Marie Skłodowska-Curie Actions-Individual Fellowship, € 258k, 2015–2018. Project: *Operator Algebraic Approach to Topological Phases*
- Netherlands Organisation for Scientific Research (NWO) Rubicon, € 118k, 2012–2014. Project: *Mathematical structure of anyons in planar quantum spin systems*
- Humboldt Research Fellowship for Postdoctoral Researchers, € 73k, 2012. (Declined in favour of Rubicon).

¹Last updated: September 6, 2017

Refereed journals

1. M. Cha, P. Naaijken, B. Nachtergaele: The complete set of infinite volume ground states for Kitaev's abelian quantum double models, *Commun. Math. Phys.* (to appear) (2017) [arXiv:1608.04449](#)
2. L. Fiedler, P. Naaijken, T.J. Osborne: Jones index, secret sharing and total quantum dimension, *New J. Phys.* **19**:023039 (2017) [arXiv:1608.02618](#)
3. S. Bachmann, W. Dybalski, P. Naaijken: Lieb-Robinson bounds, Arveson spectrum and Haag-Ruelle scattering theory for gapped quantum spin systems, *Ann. Henri Poincaré* **17**:1737–1791 (2016) [arXiv:1412.2970](#)
4. L. Chang, M. Cheng, S.X. Cui, Y. Hu, W. Jin, R. Movassagh, P. Naaijken, Z. Wang, A. Young: On Enriching the Levin-Wen model with Symmetry, *J. Phys. A: Math. Theor.* **48**:12FT01 (2015) [arXiv:1412.6589](#)
5. L. Fiedler, P. Naaijken: Haag duality for Kitaev's quantum double model for abelian groups, *Rev. Math. Phys.* **27**:1550021:1–43 (2015) [arXiv:1406.1084](#)
6. P. Naaijken: Kosaki-Longo index and classification of charges in 2D quantum spin models, *J. Math. Phys.* **54**:081901-1–17 (2013). **Note:** selected as “editor's pick”. [arXiv:1303.4420](#)
7. P. Naaijken: Haag duality and the distal split property for cones in the toric code, *Lett. Math. Phys.* **101**:341–354 (2012) [arXiv:1106.4171](#)
8. P. Naaijken: Localized endomorphisms in Kitaev's toric code on the plane, *Rev. Math. Phys.* **23**:347–373 (2011) [arXiv:1012.3857](#)
9. P. Naaijken: On the extension of stringlike localised sectors in 2+1 dimensions, *Commun. Math. Phys.* **303**:385–420 (2011) [arXiv:1004.4775](#)
10. P. Naaijken: Topologische kwantumcomputers: rekenen met vlechten, *Nieuw Arch. Wiskd.* **11**:187–193 (sept. 2010)
11. L. Berdichevsky, P. Naaijken: Four-point functions of different-weight operators in the AdS/CFT correspondence, *JHEP* **0801**:071 (2008) [arXiv:0709.1365](#)

Books and book chapters

12. Quantum Spin Systems on Infinite Lattices: A Concise Introduction, *Lecture Notes in Physics* **933**, Springer International Publishing (2017) [arXiv:1311.2717](#)
13. Kitaev's quantum double model from a local quantum physics point of view. In: R. Brunetti C. Dappiaggi, K. Fredenhagen, J. Yngvason (eds), *Advances in Algebraic Quantum Field Theory*, pp. 365–395, Springer (2015) [arXiv:1508.07170](#)

Submitted

14. P. Naaijken: Subfactors and quantum information theory, submitted, [arXiv:1704.05562](#)

INVITED TALKS

- Quantum Algebra and Topology Seminar, UC Santa Barbara, 3 May 2017
- Subfactor seminar, Vanderbilt, Nashville TN, 14 April 2017
- QMath13 (New topics session), Atlanta, GA, 9 October 2016
- Entanglement in Quantum Spin Systems, Simons Center, Stony Brook NY, 3 October 2016
- 34th Western States Meeting, Caltech, 16 February 2016
- Mathematical Physics and Probability seminar, UC Davis, October 21, 2015
- Quantum Spin Systems workshop, Cergy-Pontoise, France, June 24, 2015
- Born-Hilbert seminar, Göttingen, Germany, January 26, 2015

- Mathematical Physics and Probability seminar, UC Davis, January 14, 2015
- AMS Joint Mathematics Meeting, MRC session, San Antonio, TX, January 11, 2015
- Group seminar RWTH Aachen, Germany, September 4, 2014
- NSF/CBMS Conference on Quantum Spin Systems, Birmingham, AL, June 19, 2014
- Bonn-Köln-Algebra Seminar, Cologne, Germany, October 29, 2013
- Group Seminar Free University Berlin, Germany, August 27, 2013
- NTH Colloquium, Braunschweig, Germany, May 24, 2012
- Ph.D. Colloquium, Utrecht University, The Netherlands, June 23, 2010
- Oberseminar C^* -Algebren, Münster, Germany, February 2, 2010
- EIDMA Seminar, Eindhoven, The Netherlands, May 20, 2009

CONTRIBUTED TALKS

- QMAP Seminar, UC Davis, January 27, 2017
- DPG Frühjahrstagung, Berlin, Germany, March 18, 2015
- DPG Frühjahrstagung, Berlin, Germany, March 20, 2014
- Poster. QIP 2014, Barcelona, Spain, February 3, 2014
- DPG Frühjahrstagung, Jena, Germany, February 28, 2013
- Poster. Benasque symposium on topological quantum information, Spain, February 14, 2013
- Young Researcher Symposium, International Congress on Mathematical Physics, Aalborg, Denmark, August 4, 2012
- 28th workshop on foundations and constructive aspects of QFT, Göttingen, Germany, July 2, 2011
- 27th workshop on foundations and constructive aspects of QFT, Leipzig, Germany, November 20, 2010
- 25th workshop on foundations and constructive aspects of QFT, Göttingen, Germany, January 15, 2010
- Mathematics staff colloquium, Nijmegen, May 27, 2009
- Philips mathematics award session, Dutch Mathematical Congress, Groningen, The Netherlands, April 15, 2009
- Seminar on quantization, non-commutative geometry and symmetry, Nijmegen, The Netherlands, February 2, 2008
- Seminar on quantization, non-commutative geometry and symmetry, Nijmegen, The Netherlands, January 22, 2008

SELECTED CONFERENCES, WORKSHOPS AND SUMMER SCHOOLS ATTENDED

- Workshop “Entanglement in Quantum Spin Systems”, Simons Center, Stony Brook, NY, October 3–7, 2016
- Workshop “Quantum spins”, Cergy-Pontoise, France, June 22–24, 2015
- AMS Joint Mathematics Meetings, San Antonio, TX, January 10–13, 2015
- AMS Mathematical Research Communities “Mathematics of Quantum Phases of Matter and Quantum Information”, Snowbird, UT, June 23–30, 2014
- NSF/CBMS conference on Quantum Spin Systems, Birmingham, AL, June 16–20, 2014
- Quantum Information Processing 2014, Barcelona, Spain, February 3–7, 2014
- QMath 12, Berlin, Germany, September 10–13, 2013
- Benasque symposium on topological quantum information, Benasque, Spain, February 12–16, 2013
- International Congress on Mathematical Physics, Aalborg, Denmark, August 3–11, 2012
- Mathematical Aspects of QFT and Quantum Statistical Mechanics, Hamburg, Germany, July 30–August 1, 2012
- Workshop “Topological Quantum Computing”, Simons Center, Stony Brook, NY, September 12–16, 2011
- Conference on Quantum Groups, Clermont-Ferrand, France, August 30–September 3, 2010

- International Congress on Mathematical Physics, Prague, Czech Republic, August 3–8, 2009
- AQFT: The first 50 years, Göttingen, Germany, July 29–31, 2009
- Summer school “Operator algebras and their applications”, Lisbon, Portugal, June 15–19, 2009
- DIAMANT meets GQT workshop, Leiden, The Netherlands, October 27–31, 2008
- Workshop ESI programme on “Operator algebras and conformal field theory”, Vienna, Austria, September 8–19, 2008
- 5th European Congress of Mathematics, Amsterdam, The Netherlands, July 14–19, 2008
- Stieltjes educational week on non-commutative integration, Leiden, The Netherlands, June 9–13, 2008

TEACHING

As instructor:

- *MAT-22A (Introduction to Linear Algebra)*, Spring quarter 2016.
- *Quantum spin systems on infinite lattices*, Summer semester 2013.
- *Zomercursus wiskunde*. Crash course for prospective students not meeting admission requirements for mathematics and physics. I could recommend students for admission after successful completion of the course. Summer 2008.
- Various lectures (including preparing materials) for high school students aged 12–18 in the *Sprint-Up* programme. Topics included for example fractals and infinity, 2008–2010.

As teaching assistant:

- *Lie-Algebren und ihre Darstellungen in der Physik* [Lie Algebras and their representations in physics], Summer semester 2014
- *Ergänzungen zur klassischen Physik* [Advanced classical physics], Fall semester 2012
- *Symmetry Breaking*, Spring 2011
- *Introduction to Fourier analysis* [Introduction to Fourier analysis], Spring 2010
- *Topologie* [Topology], Fall 2009
- *Introduction to partial differential equations*, Spring 2009
- *Analysis I*, Spring 2008

Student supervision:

- Leander Fiedler (PhD). Co-supervision with Prof. Reinhard Werner, referee for thesis. *Haag duality and Jones-Kosaki-Longo index in Kitaev’s quantum double models for finite abelian groups*. Defended January 18, 2017
- Deniz Stiegemann (MSc). Co-supervision with Prof. Tobias Osborne. *Many-Body Localization and Spectral Theory*, October 2015
- Bachelor students:
 - Deniz Stiegemann (co-supervision with Prof. Tobias Osborne), *Lieb-Robinson bounds and coarse geometry*, December 2013
 - Lars Dammeier (co-supervision with Prof. Reinhard Werner), *Fehlertoleranzen von Basisprotokollen in der Quanteninformationsverarbeitung* [Fault tolerance of basic protocols in quantum information], December 2012

SERVICE TO THE COMMUNITY

- Organised and co-organised the following seminar series:

- *Mathematical Physics and Probability seminar*, Winter 2017, UC Davis
 - *Anyons!* research group seminar, Spring 2016, and with Bruno Nachtergaele for Fall 2016, Winter 2017 and Spring 2017, UC Davis
 - *Mathematics Ph.D. Colloquium*, September 2008–May 2011, Radboud University Nijmegen
 - Ph.D. seminars on operator algebras and harmonic analysis (as co-organiser), 2009–2010, Radboud University Nijmegen
- Outreach activities:
 - supervised group of three highschool students in *Siemens Competition in Science & Technology* (2016)
 - taught to high school students in Radboud University’s *Sprint-Up* programme (2007–2010)
 - active on *Academia StackExchange* (since 2012)
 - Referee for *Communications in Mathematical Physics*, *Journal of Mathematical Physics*, *Reviews in Mathematical Physics*, *International Journal on Quantum Information*, and *QIP 2014*
 - Reviewer for *AMS Mathematical Reviews*

MISCELLANEOUS

- Member of *International Association of Mathematical Physics*, *American Mathematical Society*, *Koninklijk Wiskundig Genootschap* (Dutch Royal Mathematical Society), and *Deutsche Physikalische Gesellschaft* (German Physics Society).
- Languages: Dutch (native), English (full proficiency), German (upper intermediate), French (elementary)