TOBI HAAS

Senior postdoc in Theoretical Physics

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PERSONAL INFO

Born 16/02/95

Nationality german

Gender male (he/him/his)

Family married since '20

INTERESTS

Information | Fields | Gravity | Quantum optics | Ultracold quantum gases | Entanglement | Quantum field simulation | Uncertainty | Thermalization | Quanta in curved spacetime

SERVICE

Teaching 1 master lecture, 9 bachelor tutorials & 1 master seminar

Co-mentored PhD's Rudi Pietsch, Yixuan Wang, Maciej Jarema, Mauro D'Achille, Benoît Dubus, Moritz Reh Serge Deside & Célia Griffet

Co-supervised master's Jan Bulling, Benoît Dubus, Kobe Vergaerde, Mireia Tolosa-Simeón, Álvaro Parra-López & Neil Dowling

Co-supervised bachelor's Johannes Noll, Johannes Schmidt, Salome Schwark, Sara Ditsch, Henrik Müller-Groeling & Ben Höber

Refereeing Nature, Nat. Commun., Quantum, PRX Quantum, Phys. Rev. Lett., Phys. Rev. Res. & Phys. Rev. A

Memberships Deutsche Physikalische Gesellschaft (DPG), International Society for Relativistic Quantum Information (ISRQI), CA23115 RQI & CA23130 BridgeQG

ACADEMIC RECORD

Senior postdoc

05/25 - now | Ulm University | Martin B. Plenio

Junior postdoc

05/22 - now | Université libre de Bruxelles | Nicolas J. Cerf, Ognyan Oreshkov

Dr. rer. nat. Physics | magna cum lauda (very good)

03/19 – 04/22 | Heidelberg University | Stefan Flörchinger

Thesis: An Entropic Perspective on Equilibrium, Uncertainty and Entanglement

M. Sc. Physics | GPA: 1.0 (very good)

10/16 – 10/18 | Heidelberg University | Jan Pawlowski

Thesis: Higher derivative quantum gravity in different approximations

B. Sc. Physics | GPA: 1.5 (very good)

10/13 – 09/16 | TU Darmstadt | Barbara Drossel

Thesis: Top-down causation in the quantum mechanical measurement process

PUBLICATIONS

Preprints

24. E. Callus, M. Gärttner, T. Haas, **Revealing entanglement through local features of phase-space distributions**, arXiv:2602.21688 '26

23. M. T. Jarema, M. Tajik, J. Schmiedmayer, S. Weinfurtner, T. Haas, **Observation of area laws in an interacting quantum field simulator**, arXiv:2510.13783 '25

22. B. Dubus, T. Haas, N. J. Cerf, **From bosons and fermions to spins: A multi-mode extension of the Jordan-Schwinger map**, arXiv:2411.04918 '24

21. T. Haas, **Area laws from classical entropies**, arXiv:2404.12320 '24

Peer-reviewed

20. S. Deside, T. Haas, N. J. Cerf, **Detecting strongly non-Gaussian entanglement**, PRR 8, 033064 '26

19. M. D'Achille, M. Gärttner, T. Haas, **Configurable photonic simulator for quantum field dynamics**, PRX Quantum 7, 020370 '26

18. N. J. Cerf, T. Haas, **Information and majorization theory for fermionic phase-space distributions**, PRL 135, 110201 '25

17. E. Callus, M. Gärttner, T. Haas, **Interferometric detection of continuous-variable entanglement using two states**, PRA 112, 033704 '25

16. Yannick Deller *et al.*, **Area laws and thermalization from classical entropies in a Bose-Einstein condensate**, PRAL 112, L011303 '25

15. Yannick Deller *et al.*, **Area laws for classical entropies in a spin-1 Bose-Einstein condensate**, NJP 27, 043004 '25

14. J. B. Achour *et al.*, **Quantum Gravity, Hydrodynamics and Emergent Cosmology: A Collection of Perspectives**, Gen. Relativ. Grav. 57, 2 '24

13. S. Ditsch, T. Haas, **Entropic distinguishability of quantum fields**, Quantum 8, 1414 '24

12. C. Griffet, T. Haas, N. J. Cerf, **Accessing continuous-variable entanglement witnesses with multimode spin observables**, PRA 108, 022421 '23

Organization Teaching for Physicists at Ulm University '26, Heidelberg's Schöntal workshop '20 & chaired 6 conference sessions

Social commitment Founder of qmeets (online talks on breakthroughs in quantum physics) & Dedda (student group helping with mental problems), Co-organized „Escape the lab" for the Girls' Day 2021 at Heidelberg University

AWARDS

Top 10 Breakthroughs of the Year 2023 (Physics World) for Nature study

Outstanding teaching award in Heidelberg '20

Outstanding teaching award in Darmstadt '16

Grading awards for physics and maths by DPG and DMV, respectively, for A-level exam performance '13

Academic studies in physics and mathematics during high school in Darmstadt '12

Skipped 7th grade '07

REFEREES

Martin B. Plenio

ITP Ulm

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Nicolas J. Cerf

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Martin Gärttner

qiqs-jena.de

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Markus K. Oberthaler

synqs.de

markus.oberthaler@kip.uni-heidelberg.de

11. M. Gärttner, T. Haas, J. Noll, **General class of continuous variable entanglement criteria**, PRL 131, 150201 '23

10. M. Gärttner, T. Haas, J. Noll, **Detecting continuous variable entanglement in phase space with the Q-distribution**, PRA 108, 042410 '23

9. C. Viermann *et al.*, **Quantum field simulator for dynamics in curved spacetime**, Nature 611, 260–264 '22

8. M. Tolosa-Simeón *et al.*, **Curved and expanding spacetime geometries in Bose-Einstein condensates**, PRA 106, 033313 '22

7. N. Sánchez-Kuntz *et al.*, **Scalar quantum fields in cosmologies with 2+1 spacetime dimensions**, PRD 105, 105020 '22

6. S. Floerchinger, T. Haas, Markus Schröfl, **Relative entropic uncertainty relation for scalar quantum fields**, SciPost Phys. 12, 089 '22

5. S. Floerchinger, M. Gärttner, T. Haas, O. Stockdale, **Entropic entanglement criteria in phase space**, PRA 105, 012409 '22

4. S. Floerchinger, T. Haas, H. Müller-Groeling, **Wehrl entropy, entropic uncertainty relations, and entanglement**, PRA 103, 062222 '21

3. S. Floerchinger, T. Haas, B. Hoeber, **Relative entropic uncertainty relation**, PRA 103, 062209 '21

2. S. Floerchinger, T. Haas, **Second law of thermodynamics for relativistic fluids formulated with relative entropy**, PRD 102, 105002 '20

1. S. Floerchinger, T. Haas, **Thermodynamics from relative entropy**, PRE 102, 052117 '20

CONFERENCES, SEMINARS & VISITS

43. DPG Conference *SAMOP*: **Quantum field simulation on bosonic platforms** (invited talk), Mainz 03/26

42. Conference *IQST Day 2026*: **Configurable photonic simulator for quantum field dynamics** (contributed poster), Karlsruhe 02/26

41. Seminar *Renema group*: **Enabling light-based quantum devices** (invited talk), Online 01/26

40. Workshop *Quasi-probability distributions*: **Information for negative probabilities & entropic uncertainty in phase space** (invited talk), Paris 11/25

39. Retreat *ISOQUANT YRC*: **(Quantum) information theory and Entanglement (with connections to QFT and many-body physics)** (invited 3-day lecture), Schwarzwald 09/25

38. DPG Conference *Quantum2025*: **From bosons and fermions to spins** (contributed talk), Göttingen 09/25

37. Visit *Silberhorn group*: **Quantum field simulation** (invited talk), Paderborn 08/25

36. Conference *RQI North*: **Quantum features from classical entropies** (contributed talk), Napoli 06/25

35. Workshop QSimFP: **Information measures for quantum simulators** (invited talk), Nottingham 03/25

34. DPG Conference *SAMOP*: **Quantum features from classical entropies** (contributed talk), Bonn 03/25

33. Workshop *EOS*: **Information and majorization theory for fermions** (contributed talk), Gent 02/25

32. Visit *Plenio group*: **The bit, the many, and the heavy** (invited talk), Ulm 01/25

31. Visit *Altand group*: **Classical entropies & entanglement witnessing** (invited talk), Köln 12/24

30. Visit *Bruß group*: **General class of continuous variable entanglement criteria** (invited talk), Düsseldorf 12/24

29. Seminar *QSimFP*: **Quantum features from classical entropies** (invited talk), Online 11/24

28. Conference *Young Quantum Information Scientists*: **Quantum features from classical entropies** (contributed talk), Paris 11/24

27. Conference *Young Quantum Information Scientists*: **Information and majorization theory in fermionic phase space** (contributed poster), Paris 11/24

26. Visit *Roscilde group*: **Quantum features from classical entropies** (invited talk), Lyon 10/24

25. Visit *Weinfurtner group*: **Quantum features from classical entropies** (invited talk), Nottingham 10/24

24. Workshop *Geometry of Quantum Dynamics*: **Quantum features from classical entropies** (contributed talk), Siegen 08/24

23. Many-body theory seminar *Cirac group*: **Quantum features from classical entropies** (invited talk), Munich 08/24

22. Seminar *Goldman group*: **Area laws from classical entropies** (invited talk), Brussels 06/24

21. Seminar *ISOQUANT YRC*: **Area laws from classical entropies** (invited talk), Heidelberg 06/24

20. DPG Conference *SMuK*: **General class of continuous variable entanglement criteria** (contributed talk), Berlin 03/24

19. DPG Conference *SMuK*: **Area laws and thermalization from classical entropies** (contributed talk), Berlin 03/24

18. DPG Conference *SMuK*: **Information and majorization theory in fermionic phase space** (contributed talk), Berlin 03/24

17. Colloquium *BQPi*: **General class of continuous variable entanglement criteria** (invited talk), Brussels 12/23

16. Workshop *Quasi-probability distributions*: **General class of continuous variable entanglement criteria** (contributed flash talk), Lille 11/23

15. Workshop *Quantum gravity, hydrodynamics and emergent phenomena*: **A Universe in Heidelberg** (invited talk), Munich 12/22

14. Colloquium *BQPi*: **A Universe in Heidelberg** (invited talk), Brussels 10/22

13. Seminar *Quantum group Gent*: **A Universe in Heidelberg** (invited talk), Gent 09/22

12. Colloquium *STRUCTURES Jour Fixe*: **A Universe in Heidelberg** (invited talk), Online 07/22

11. Seminar *Kraus group*: **Entropic entanglement criteria in phase space** (invited talk), Online 11/21

10. Seminar *Quantum group Gent*: **Relative entropic uncertainty relation for scalar quantum fields** (invited talk), Gent 10/21

9. Seminar *QuIC*: **Entropic entanglement criteria in phase space** (invited talk), Brussels 10/21

8. Seminar *QuIC*: **Relative entropic uncertainty relation for scalar quantum fields**(invited talk), Brussels 10/21

7. DPG Conference *SMuK*: **Relative entropic uncertainty relation for scalar quantum fields** (contributed talk), Online 09/21

6. Visit *Gühne group*: **Relative entropic uncertainty relation for scalar quantum fields** (invited talk), Siegen 08/21

5. Many-body theory seminar *Cirac group*: **Relative entropic uncertainty relation for scalar quantum fields** (invited talk), Online 07/21

4. Seminar *Berges group*: **Relative entropic uncertainty relation for scalar quantum fields** (invited talk), Online 07/21

3. Workshop *Entanglement in quantum fields*: **Entropic entanglement criteria in phase space** (invited talk), Heidelberg 06/21

2. Student workshop *Entanglement*: **Entanglement and general relativity: black hole information paradox** (contributed talk and co-organizer), Schöntal 09/20

1. Student workshop *Entropy*: **The role of entropy in statistical physics** (contributed talk), Schöntal 09/19