



Michael Werner

Curriculum Vitae

Academic Education

- 10.2013–10.2016 **Bachelor of Science**, *Leibniz University Hannover*, Germany.
Honours Degree
- 10.2016–10.2019 **Master of Science**, *Leibniz University Hannover*, Germany.
- 10.2019–10.2024 **Graduation**, *Institute for Theoretical Physics, Leibniz University Hannover*, Germany.
- since 10.2024 **PostDoc**, *Institute of Quantum Optics, Leibniz University Hannover*, Germany.

Bachelor Thesis

- Title *Wigner Functions For Arbitrary Operator Tuples*
- Supervisor Prof. Dr. Reinhard F. Werner
- Description This thesis elaborates the idea to construct Wigner functions not just for position and momentum operators, but for every possible n-tuple of hermitian operators using distribution theory.

Master Thesis

- Title *One-Dimensional Field Theories Arising From Continuous Measurement*
- Supervisors Prof. Dr. Reinhard F. Werner & Prof. Dr. Tobias J. Osborne
- Description This thesis uses inductive limit constructions and Stinesprings factorization theorem to build continuous dilation spaces upon quantum channels. One obtains a subtle correspondence to gauge fields and cMPS. Those one-dimensional quantum fields are then analysed to gain as much information about the underlying quantum system as possible.

PhD Thesis

- Title *Gravitational Curvature And Relativistic Effects In Atom Interferometers*
- Supervisor Prof. Dr. Klemens Hammerer

Description This work is a theoretical investigation of atom interferometers in complex gravitational fields. The underlying gravitational models include non-trivial corrections in the gravitational potential within the framework of classical Newtonian mechanics, which go beyond the assumption of an idealised or even completely homogeneous gravitational field. On the other hand, the theory of general relativity is used to enable a post-Newtonian description, particularly in the area of weak gravitational fields.

PostDoc

Group Theory of Quantum Sensing
Group Leader Dr. Naceur Gaaloul

Description Continuation on the description of atom interferometers in complex gravitational fields. Now, also including more sophisticated numerical models and a variety of experimental imperfections such as wavefront aberrations, parasitic ports and noise.

Teaching and Mentoring Experiences

Winter term 16/17 **Tutor**, Lecture: *"Theoretical Physics For Teachers"*.
Summer term 17 **Tutor**, Seminar: *"Advanced Quantum Theory"*.
Winter term 17/18 **Tutor**, Lecture: *"Theoretical Physics For Teachers"*.
Summer term 18 **Tutor**, Lecture: *"Advanced Quantum Theory"*.
Winter term 18/19 **Tutor**, Lecture: *"Theoretical Physics For Teachers"*.
Summer term 19 **Tutor**, Lecture: *"Introduction To Quantum Theory"*.
Summer term 20 **Tutor**, Lecture: *"Advanced Quantum Theory"*.
Summer term 20 **Exercise Leader**, Repetitorium: *"Classical Electrodynamics"*.
Summer term 21 **Tutor**, Lecture: *"Introduction To Quantum Theory"*.
Summer term 22 **Tutor**, Lecture: *"Quantum Physics for Nanotechnology"*.
Summer term 23 **Tutor**, Lecture: *"Quantum Physics for Nanotechnology"*.
Summer term 24 **Tutor**, Lecture: *"Quantum Physics for Nanotechnology"*.

Academic and Professional Activities

March 2016 **DPG Conference**, Technical support, Hannover.
November 2018 **Einstein Inside Exhibition**, Hannover.
Technical support and giving guided tours in general relativity.
August 2025 **3rd TVLBAI Workshop**, Co-Organization, Hannover.

Languages

German Mother tongue
English Fluent
Japanese Basic

Conferences and Talks (Selection)

- 2021 **Experimental Tests and Signatures of Modified and Quantum Gravity**, *Bad Honnef, Germany (Online)*, Poster Contribution.
- 2022 **Frontiers of Matter Wave Optics**, *Trieste, Italy*, Poster Contribution.
- 2023 **TVLBAl 1st Workshop**, *CERN, Switzerland*, Poster Contribution.
- 2023 **Time and Clocks**, *Bad Honnef, Germany*, Poster Contribution.
- 2024 **TVLBAl 2nd Workshop**, *London, UK*, Poster Contribution.
- 2024 **Frontiers of Matter Wave Optics**, *Crete, Greece*, Poster Contribution.
- 2025 **Photonics West**, *San Francisco, USA*, Talk.
- 2025 **Rencontres de Moriond**, *La Thuile, Italy*, Talk.
- 2025 **TVLBAl 3rd Workshop**, *Hannover, Germany*, Co-Organization.
- 2026 **ICAP**, *Wuhan, China*, Poster Contribution.
- 2026 **RQI Gravitational Quantum Physics and Metrology**, *Ljubljana, Slovenia*, Talk.
- 2026 **AICE Workshop**, *CERN, Switzerland*, Talk.

References

Prof. Dr. Klemens Hammerer

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Publications

- [Abdalla et al., 2024] Abdalla, A., Abe, M., Abend, S., Abidi, M., Aidelsburger, M., Alibabaei, A., Allard, B., Antoniadis, J., Arduini, G., Augst, N., et al. (2024). Terrestrial very-long-baseline atom interferometry: Summary of the second workshop. *arXiv preprint arXiv:2412.14960*.
- [Abend et al., 2024] Abend, S., Allard, B., Alonso, I., Antoniadis, J., Araújo, H., Arduini, G., Arnold, A. S., Asano, T., Augst, N., Badurina, L., et al. (2024). Terrestrial very-long-

baseline atom interferometry: Workshop summary. *AVS quantum science*, 6(2).

- [Alibabaei et al., 2026] Alibabaei, A., Mönkeberg, P., Fitzek, F., Werner, M., Gauguier, A., Allard, B., Hammerer, K., and Gaaloul, N. (2026). Fundamental limits of large momentum transfer in optical lattices.
- [Arduini et al., 2026] Arduini, G., Augst, N., Bason, M. G., Baynham, C., Bertoldi, A., Bertone, G., Blas, D., Bortoletto, D., Bose, S., Ales Bozzi, R., Buchmueller, O., Bud, T. A., Burrage, C., Calatroni, S., Carlton, J., Charmandaris, V., Chiofalo, M. L., Cladé, P., Coleman, J., Corsanigo, F., De Roeck, A., Devienne, A., Di Pumpo, F., Ellis, J., Fayet, P., Foot, C., Fuchs, E., Gaaloul, N., Gardner, S., Giese, E., Granados, E., Guellati-Khelifa, S., Guinchard, M., Hakulinen, T., Harte, T., Hobson, R., Holynski, M., Infantino, A., Kehagias, A., Kilian-Rademacher, E., Korsch, W., Lafarge, D., Lellouch, S., Lombriser, L., Lopez Asamar, E., Lopez-Gonzalez, J. L., Maggiore, M., Marcel, C., Marchant, A., McCabe, C., Mileti, G., Millington, P., Mitchell, J., Mouelle, N., Navascues Cornago, A., Pillon, F., Poggiani, R., Rafelski, J., Rasel, E. M., Reckermann, M., Roura, A., Samois, R., Sanchez Nieto, F., Sander, J., Scarfia, C., Schelfhout, J., Schleich, W., Schlippert, D., Schneider, U., Schramm, S., Schreck, F., Sergijenko, O., Soares-Santos, M., Tino, G. M., Tinsley, J. N., Valenzuela, T., Valuch, D., van der Grinten, M., van Druten, K., Vaskonen, V., von Klitzing, W., and Werner, M. (2026). Technical Proposal for the Atom Interferometer CERN Experiment (AICE) Facility. *arXiv e-prints*, page arXiv:2608.18743.
- [Werner, 2025] Werner, M. (2025). Gravitational curvature and relativistic effects in atom interferometers.
- [Werner, 2026] Werner, M. (2026). Dataset: Terrestrial gravitational wave detection with atom interferometers.
- [Werner et al., 2026] Werner, M., Alibabaei, A., and Gaaloul, N. (2026). Terrestrial gravitational wave detection with atom interferometers.
- [Werner and Hammerer, 2023] Werner, M. and Hammerer, K. (2023). Atom interferometers in weakly curved spacetimes using bragg diffraction and bloch oscillations.
- [Werner and Hammerer, 2024] Werner, M. and Hammerer, K. (2024). Local Measurement Scheme of Gravitational Curvature using Atom Interferometers [Data set].
- [Werner et al., 2024a] Werner, M., Lezeik, A., Schlippert, D., Rasel, E., Gaaloul, N., and Hammerer, K. (2024a). Local Measurement Scheme of Gravitational Curvature using Atom Interferometers.
- [Werner et al., 2024b] Werner, M., Schwartz, P. K., Kirsten-Siemß, J.-N., Gaaloul, N., Giulini, D., and Hammerer, K. (2024b). Atom interferometers in weakly curved spacetimes using Bragg diffraction and Bloch oscillations. *Physical Review D*, 109(2):022008.

Other

Since 2022 **Co-CEO of 'MW Gesellschaft für Solar & Science mbH'**, *Private company dedicated to push renewable energies in Germany*, www.mw-solar-science.com.