Dominik Lentrodt

PhD Student

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Educational history

2017– **PhD Student**, *Max-Planck-Institut für Kernphysik*, Heidelberg, Germany.
Supervisor: apl. Prof. Dr. Jörg Evers
Expected date of thesis: April 2021

2016–2017 **4+4 Program of the Heidelberg Graduate School for Fundamental Physics**, *Max-Planck-Institut für Kernphysik and University of Heidelberg*, Heidelberg, Germany.

2012–2016 **MSc & BA Hons Physics**, *Gonville and Caius College, University of Cambridge*, Cambridge, UK.

2009–2012 **German Abitur**, *Maria-Theresia Gymnasium*, Munich, Germany.

2010–2011 **Frühstudium Informatik**, *Technical University of Munich*, Munich, Germany.

Relevant awards and funding

2018 **XXV International Summer School Nicolás Cabrera scholarship**, *Instituto Nicolás Cabrera at the Universidad Autónoma de Madrid*.
Value approx. 400€.

2018 **RACIRI Summer School scholarship**, *Röntgen-Angström-Cluster (RAC), Ioffe-Röntgen-Institute (IRI) & German electron synchrotron (DESY)*.
Value approx. 1500€.

2016 **Summer research project**, *University of Cambridge*, Cambridge, UK.

2013–2016 **Gonville and Caius College Scholar**, *University of Cambridge*, Cambridge, UK.
Yearly prize for continued academic excellence.

2015 **Gonville and Caius College Bell-Wade Bursary**, *University of Cambridge*, Cambridge, UK.
Financial support for students succesfully performing in academia and sports.

2011 **"Projekt Unitag für hochbegabte und besonders leistungsfähige Gymnasiastinnen und Gymnasiasten"**, *Ludwig-Maximilians-University Munich*, Munich, Germany.
"University project day for highly able students".

Leadership roles and outreach

2018– **Student Representative of the International Max-Planck Research School for Quantum Dynamics in Physics, Chemistry and Biology (IMPRS-QD)**.

2018–2019 **Organising Committee of the 12th HGSFP Winterschool**.
A committee of five students elected to organise the yearly winterschool funded by the Heidelberg Graduate School of Fundemental Physics (HGSFP). Financial volume of ∼27000€.

2017–2019 **Outreach at the Max Planck Institute for Nuclear Physics**.
Jointly organised the "Girls day" and two other outreach projects at the Max Planck Institute for Nuclear Physics, which involved teaching students and children about the physics of light in interactive experiments.

2014–2015 **Cambridge University Kickboxing Society Committee: Treasurer**.
Responsible for a financial volume of ∼1000 GBP.

Teaching experience

2017 **Theoretical quantum optics, Head tutor and tutor to class of 8**, *University of Heidelberg*.
Theoretical quantum optics including advanced topics
∼12 hours of lessons + preparation, exercise correction and co-conducting oral examinations.

2017 **Experimental physics I (PEPI), Tutor to class of 22**, *University of Heidelberg*.
Mechanics and Thermodynamics
∼12 hours of lessons + preparation, exercise correction and grading exams.

2017-2019 **Various replacement teaching**, *University of Heidelberg*.
Replacement lectures and tutorials for apl. Prof. Dr. Jörg Evers. ∼4 hours of lecturing on Theoretical Quantum Optics. ∼6 hours of tutoring experimental and theoretical physics courses.

Languages

German Mother tongue

English Fluent; lived in England for 4 years

Programming

Python, MATLAB, C++, Java

Scientific proposals and large-scale facility experiments

2019– **Co-proposer of Proposal No. 2664 submitted to the European XFEL (Hamburg)**.
Proposal submitted Dec 2019.

2019– **Co-proposer of Proposal No. 2628 submitted to the European XFEL (Hamburg)**.
Proposal submitted Dec 2019.

2018–2019 **Co-proposer and Co-investigator of Proposal I-20180786 at PETRA III (Hamburg)**, *Proposal title: "Optimizing resonant photon flux enhancement with yoctosecond phase stability in mechanically controlled nuclear resonance scattering".*.
Experiment conducted May 2019, resulting in publication s1 (submitted).

2017–2018 **Co-investigator of five experiments at PETRA III (Hamburg) and ESRF (Grenoble)**.
Resulting in one refereed publication (publication 1) and four articles in preparation.

Publications

Published in refereed journals

1. K. P. Heeg, A. Kaldun, C. Strohm, P. Reiser, C. Ott, R. Subramanian, D. Lentrodt, J. Haber, H.-C. Wille, S. Goerttler, R. Rüffer, C. H. Keitel, R. Röhlsberger, T. Pfeifer and J. Evers, "Spectral narrowing of x-ray pulses for precision spectroscopy with nuclear resonances", *Science* **357**, 375-378 (2017).
2. D. Lentrodt and J. Evers, "*Ab Initio* Few-Mode Theory for Quantum Potential Scattering Problems", *Phys. Rev. X* **10**, 011008 (2020).
3. D. Lentrodt, K. P. Heeg, C. H. Keitel and J. Evers, "Ab initio quantum models for thin-film X-ray cavity QED with Mössbauer nuclei", *Phys. Rev. Research* **2**, 023396 (2020).

Submitted

s1 K. P. Heeg, A. Kaldun, C. Strohm, P. Reiser, C. Ott, R. Subramanian, D. Lentrodt, J. Haber, H.-C. Wille, S. Goerttler, R. Rüffer, C. H. Keitel, R. Röhlsberger, T. Pfeifer and J. Evers, "Coherent x-ray-optical control of nuclear excitons with zeptosecond phase-stability", *arXiv:2003.03755 [quant-ph]*.

Presentations

Invited Conference Talks

Jan. 2020 **41st Extreme Atomic Systems (EAS) conference**, Rietzlern, Kleinwalsertal, Austria,
Ab initio few-mode theory
Invited by: Prof. Dr. Thomas Pfeifer

Sep. 2019 **QSEC 2019**, Heidelberg, Germany,
Ab initio few-mode theory for quantum potential scattering problems
Invited by: Conference committee

July 2019 **LPHYS'19 - 28th annual International Laser Physics Workshop**, Gyeongju, South Korea
Coherent X-Ray-Optical Control of Nuclear Dynamics with Zeptosecond Phase-Stability
Invited by: Prof. Dr. Olga Kocharovskaya

Feb. 2019 **40th Extreme Atomic Systems (EAS) conference**, Rietzlern, Kleinwalsertal, Austria,
X-ray Quantum Optics with Mössbauer Nuclei
Invited by: Prof. Dr. A. Buchleitner, Prof. Dr. T. Pfeifer, Prof. Dr. J. M. Rost

Invited Seminar Talks/Colloquia

Okt. 2019 **Seminarium Fizyki Materii Skondensowanej**, University of Warsaw, Warsaw, Poland
Ab initio few-mode theories for quantum potential scattering problems
Hosts: Dr. habil. Magdalena Stobińska, Dr. Thomas Sturges

May 2019 **MPSD Theory Seminar**, Max-Planck-Institut für Struktur und Dynamik der Materie, Center for Free-Electron Laser Science, Hamburg, Germany
Ab initio few-mode theories for quantum potential scattering problems
Hosts: Prof. Dr. Angel Rubio, Dr. Michael Ruggenthaler

Feb. 2019 **Quantum Optics and Statistics Colloquium**, Albert-Ludwigs-Universität Freiburg, Freiburg, Germany,
Ab initio few-mode theories for quantum potential scattering problems
Hosts: Prof. Dr. Andreas Buchleitner, Dr. Stefan Buhmann

Nov. 2018 **ITP Seminar**, Institute for Theoretical Physics, Vienna University of Technology, Vienna, Austria
Effective few-mode theories for ab initio cavity QED
Hosts: Prof. Dr. Stefan Rotter, Dr. Himadri Shekhar Dhar

Contributed Talks/Other Talks

July 2019 **LPHYS'19 - 28th annual International Laser Physics Workshop**, Gyeongju, South Korea
Ab Initio Few-Mode Theories for Quantum Potential Scattering Problems
Invited by: Prof. Dr. Olga Kocharovskaya

Mar. 2019 **DPG Spring Meeting for Atomic, Molecular, Quantum Optical and Plasma Physics**, Rostock, Germany
Ab initio few-mode Hamiltonians for cavity QED

Nov. 2018 **CQD Colloquium - IMPRS-QD Pretalk**, Center for Quantum Dynamics, Heidelberg University, Heidelberg, Germany
Effective few-mode theories for resonant quantum scattering problems

May 2018 **Evaluation of the International Max Planck Research School for Quantum Dynamics in Physics, Chemistry and Biology - Student Talk**, MPI für Kernphysik, Heidelberg, Germany
X-ray quantum optics with Mössbauer nuclei

Mar. 2018 **DPG Spring Meeting for Atomic, Molecular, Quantum Optical and Plasma Physics**, Erlangen, Germany
Linking ab initio theory and phenomenological models in cavity QED

Jan. 2018 **Seminar Theoretical Quantum Dynamics**, MPI für Kernphysik, Heidelberg, Germany
Effective few-mode theories for quantum scattering problems in X-ray cavity QED

Posters

Sep. 2019 **QSEC 2019**, Heidelberg, Germany
Ab initio few-mode theory for quantum potential scattering problems

Mar. 2019 **DPG Spring Meeting for Atomic, Molecular, Quantum Optical and Plasma Physics**, Rostock, Germany
Beyond input-output models in X-ray cavity QED with overlapping modes

Sep. 2018 **XXV International Summer School Nicolás Cabrera**, Miraflores de la Sierra, Madrid, Spain
X-ray cavity QED in the overlapping modes regime

Aug. 2018 **RACIRI Summer School**, Sellin, Rügen, Germany
X-ray cavity QED with Mössbauer nuclei in the overlapping modes regime

May 2018 **SFB 1225 ISOQUANT Workshop**, Heidelberg, Germany
Effective few-mode theories for quantum potential scattering in X-ray cavity QED

Mar. 2018 **DPG Spring Meeting for Atomic, Molecular, Quantum Optical and Plasma Physics**, Erlangen, Germany
X-ray cavity QED beyond the input-output formalism

Jan. 2018 **11th Winterschool of the Heidelberg Graduate School of Fundamental Physics**, Obergurgl, Austria
Effective few-mode theories for quantum scattering problems in X-ray cavity QED

Dez. 2017 **Center for Quantum Dynamics Colloquium**, Ruprecht-Karls University, Heidelberg, Germany
Cavity QED beyond the input-output formalism

Mar. 2017 **DPG Spring Meeting for Atomic, Molecular, Quantum Optical and Plasma Physics**, Mainz, Germany
Collective sensing at x-ray energies

Feb. 2017 **SFB 1225 ISOQUANT Kick-Off Workshop**, Obergurgl, Austria
Many-body dynamics of large ensembles of nuclei