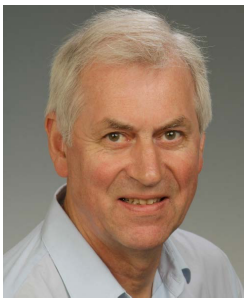
Multiparticle Dynamics Group

Current MDG members (2024)

Julian Rössler
Has started a MSc thesis about *Elastic versus inelastic gluon scattering in the NBDE approach.* Previously derived exact analytical solutions of the NBDE are compared with numerical solutions for energy-dependent drift and diffusion coefficients that are needed to account for the fast thermalization of gluons in relativistic heavy-ion collisions.



Georg Wolschin

is a professor at the University of Heidelberg (UHD) since 2012. He did his PhD work at the Lawrence Berkeley National Laboratory, completing it at Darmstadt University in 1976, followed by a habilitation at UHD in 1982. He has been editor of Spektrum d. Wissenschaft until 1989, subsequently worked in Science publishing (Springer Nature, etc.), and freelance. He returned to UHD in 2006 to coordinate the transregional collaborative research center TR33 “The dark universe” (with Bonn University, LMU Munich, MPIA, MPI-Ext. Res., ESO), until 2018. He is currently (2023) doing theoretical research, teaching, and leading the MD-group.

Former MDG members

Alessandro Rizzi
has completed a MSc thesis about *Algebraic solution methods of Fokker-Planck equations for relativistic heavy-ion collisions* end of 2023. He now (2024) works as a PhD student in theoretical biophysics at the École Polytechnique Fédérale de

Lausanne. We have extended results for charged-hadron production in Pb-Pb at LHC energies, submitted to Eur. Phys. J. A (2024).

Maurice Larsson
has completed a MSc thesis *Time-dependent Bose-Einstein condensation of bosonic and fermionic atoms* end of 2023. The work is based on a previously derived nonlinear boson diffusion equation (NBDE) that is exactly solvable in the limit of constant transport coefficients, and is solved here numerically for energy-dependent drift and diffusion coefficients. The thesis results have been compared to the exact solution and to Cambridge data for BEC formation in K-39. An updated and extended version has been published in Phys. Rev. A (2024).

Louis Möhringer
has completed a BSc thesis about *Exact analytical solutions of the nonlinear boson diffusion equation (NBDE) in gluon-gluon scattering* end of 2023. He is now a MSc student at Heidelberg University. We have published results of his thesis in J. Stat. Mech. (2024).

Philipp Schulz
BSc and MSc (2017) in physics at the Institute for Theoretical Physics (ITP) in Heidelberg. His MSc thesis concerns *Charged-Hadron production in asymmetric collisions at LHC energies*. Results have partly been published in EPJA (2015) and included in a MPLA paper (2018) about sources of charged-hadron production in p-Pb and Pb-Pb collisions at LHC energies. In his PhD work, Philipp combines a microscopic foundation of the fragmentation sources and the gluon-gluon source for produced charged hadrons with a diffusion model for the time-evolution of the sources in asymmetric systems. In parallel he has been working at the software company SAP, where he is employed permanently since Nov 2021 - topics include machine learning and distributed algorithms. The PhD was completed Nov. 2023. We have extended results for centrality-dependend charged-hadron production in p-Pb at LHC energies, submitted to Phys. Rev. C in 2024.

Johannes Hölck
MSc thesis at Heidelberg University (2017) on *Electromagnetic field effects on the suppression of Υ-mesons in the quark-gluon plasma*. Results have been published in the European Physical Journal A (2017), previous results – with strong interaction only – in the Physical Review C (2017). Johannes finished his PhD thesis in November 2022 about *Dynamical and nonequilibrium statistical processes in relativistic heavy-ion physics*. Extended results on stopping in Au-Au and Pb-Pb collisions at SPS, RHIC and LHC energies have appeared in Phys. Rev. Res. (2020) and PLB (2023). Results on charged-hadron production in Pb-Pb at LHC energies have been published in an invited article for Annalen der Physik (2024). Since March 2023, Johannes is on an unlimited contract at Landesbank, Stuttgart, investigating financial risks with nonequilibrium-statistical methods.

Anton Kabelac
has completed his BSc thesis on *Formation times of Bose-Einstein condensates* in 2021 based on analytical solutions of a nonlinear boson diffusion equation (NBDE). It became part of a Eur. Phys. J. D (2022) publication about the time-dependence of BEC formation in ultracold K-39 atoms, where we compare with recent Cambridge data.

Benjamin Kellers
has completed a MSc degree in Business & Law at UAS Aschaffenburg, and a MSc in physics at Heidelberg University. His BSc thesis *Limiting fragmentation in relativistic heavy-ion collisions at LHC energies* (2018) has been extended and has appeared in Prog. Theor. Exp. Phys. (Kyoto-Oxford, 2019), followed by a MSc thesis on *Centrality dependence of limiting fragmentation,* and a related paper that is published open-access in Eur. Phys. J. A (2021). Benjamin is now (2024) a PhD student at Ulm University and works on numerical simulations of fluid flow.

Alessandro Simon
BSc thesis (2017) on numerical solutions of a Fokker-Planck equation with a nonlinear diffusion term. The work has been extended in 2018 and has appeared in Phys. Rev. C as *Examining nonextensive statistics in relativistic heavy-ion collisions*. It falsifies published claims that *nonextensive statistics* provides a basis to reproduce broad rapidity distributions found in stopping and particle production.
He continued his MSc studies at Sophia University, Tokyo, October 2018-July 2019, with a fellowship of Heidelberg University, and in 2020 with a MSc thesis on *Thermalization and entropy production in Bose systems*. We extended the results and published them in 2021 as *Time-dependent condensate fraction in an analytical model* in Physica A. Alessandro is now (2024) a PhD student at Tübingen University and works on machine learning.

Sven Fritsch
has completed a BSc thesis about particle-production anisotropies in relativistic heavy-ion collisions at LHC energies. The emphasis is on the theoretical investigation of elliptic azimuthal asymmetries of Υ-meson momentum distributions – which are found to be absent in recent LHC data.

Niklas Rasch
has completed a BSc thesis about thermalization in ultracold atoms. Starting from a nonlinear bosonic diffusion equation (NBDE) that was published earlier, exact analytical solutions are derived for various initial and boundary conditions, and their relevance for time-dependent thermalization and condensate formation processes is discussed. We have extended and published these results in Physics Open (2020). Niklas is now (2024) a PhD student at Heidelberg University in Prof. Thomas Gasenzer's group.

Viet Hung Dinh
MSc thesis (2019) in Heidelberg about *Cold nuclear matter effects on Υ-meson suppression in p+Pb collisions at LHC energies*. We have combined the CNM results with our model for hot-matter effects in the Quark-gluon plasma (QGP), and published the results in Phys. Rev. C (2019). Hung is now (2024) doing PhD work at Orsay, with a fellowship from the PHENIICS doctoral school, Université Paris-Sud.

Thomas Bartsch
BSc thesis (2018) about *Equilibration in fermionic systems*. We have subsequently extended the results, and published the work (2019) in Annals of Physics. Thomas has meanwhile completed his studies for a MSc in mathematics at St. John's College of Cambridge University, as a fellow of the Studienstiftung. He has also performed MSc work at the École normale supérieure, Paris, and continued with a PhD in the UK or US.

Freerik Forndran
BSc thesis (2017) on Numerical solutions of a transport equation with nonlinear drift. Extended results published in EPJA (2017). Freerik worked on an IAESTE-internship in Brasil in 2018, and then switched to experimental physics. He is now (2023) a PhD student at TU Chemnitz.

Elif Yildirim
BSc thesis (2017) on *Particle production in relativistic collisions*.

Madhukar Mishra
guest scientist (2016). Participated in the group's project on Υ *suppression in relativistic heavy-ion collisions* at RHIC and LHC energies. Madhukar works as a theorist, and assistant professor in India on a permanent position.

Frederike Vogel
BSc thesis (2016) on relativistic heavy-ion collisions.

Felix Nendzig
PhD thesis (2014) embedded in the group's project on Υ *suppression in relativistic heavy-ion collisions*. Common publications in Phys. Lett. B, Phys. Rev. C, Journal of Physics G, Europhys. Lett.
Felix works as a software specialist at Accso-Accelerated Solutions GmbH, Darmstadt/Munich on an unlimited contract.

Francesco Vaccaro
BSc student (2013). Results concerning the Υ *meson decay cascade* have been extended and published in Europhys. Lett. (2013).

Thilo Kind
BSc thesis (2013) on *The transverse expansion of the quark-gluon plasma in PbPb collisions at LHC energies*. Thilo has studied economics in parallel with physics. He meanwhile holds an MRes in Finance from London Business School, a MPhil in Finance from the University of Cambridge, and a PhD from the London Business School. He is now (2024) Senior Quantitative Investment Researcher at Othoz GmbH.

David Röhrscheid
MSc thesis (2012) on *Pseudorapidity distributions of produced charged hadrons at LHC energies*. Extended results published in Phys. Rev. C (2013). Subsequently, David started working as senior analyst, and became vice president at Deloitte Tohmatsu in Tokyo, Japan, and later Director, Strategy & Innovation at Yuzu Kyodai. He is now (2024) back at Deloitte Tohmatsu in Tokyo and lives in Yokohama with his family.

Johannes Wahner
BSc thesis (2012) about *Damping widths of* Υ *mesons in the quark-gluon medium at LHC energies*. MSc at the School of Governance, Berlin, later Auswärtiges Amt, then consultant. Now (>2019) Attaché at Federal Foreign Office, Berlin.

Fabian Frahsa
Diploma student (2012). Fabian did a PhD in physics at Konstanz University and now works as teamleader at ARRK Engineering, Munich.

Yacine Mehtar-Tani
Postdoc (2008/09). Work on *Baryon stopping as a new probe of geometric scaling*, and related topics about stopping and fragmentation sources in relativistic heavy-ion collisions at SPS, RHIC and LHC energies in a QCD-based approach.
Common publications in Phys. Rev. Lett., Phys. Rev. C, Phys. Lett. B, Europhys. Lett. Yacine now (2024) works as a tenured theorist at Brookhaven National Laboratory.

Rolf Kuiper
Diploma thesis (2006). Explores the relativistic diffusion model and its applications in heavy-ion collisions at RHIC energies. Published in Europhys. Lett. and Ann. Physik (2007). Following his PhD at the Max Planck Institute for Astronomy, Rolf became an Emmy Noether Research Group Leader at the Institute of Astronomy and Astrophysics, Tübingen University, and returned later to Heidelberg University. Since 2022, he is Professor of Theoretical Physics at Duisburg University.