

Curriculum Vitæ

updated: October 5, 2022

Philipp M. Schicho



1. Personal information

name Dr. Philipp Maximilian Schicho
born in Graz, Austria, 01 October 1991

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2. Current position

09/2022 – 09/2024 Postdoctoral researcher
Institute for Theoretical Physics, Goethe University
Advisors: Laura Sagunski, Jürgen Schaffner-Bielich
Research: Early universe particle cosmology, cold dense QCD, energetic quarks and gluons inside quark-gluon plasma

05/2020 – 08/2022 Postdoctoral researcher
University of Helsinki, Helsinki Institute of Physics
Advisors: Aleksi Vuorinen, Kari Rummukainen
Research: Early universe particle cosmology, cold dense QCD

3. Employment history

02/2017 – 04/2020 Doctor of Philosophy, PhD Physics (magna cum laude), 23/04/2020
AEC, Institute for Theoretical Physics, University of Bern
Major: Thermal field theory and particle cosmology
Advisor: Mikko Laine
Thesis: *Multi-loop investigations of strong interactions at high temperatures*, (cf. research output [4]).

- 10/2016 – 01/2017 Technical student
CERN, Accelerator and Beam Transfer, Beam Transfer Physics
Theoretical optimisation of slow extraction (cf. research output [6]).
Advisors: Matthew A. Fraser, Malika Meddahi
- 06/2015 – 08/2015 Summer student
CERN, ABT, BTP
Thesis: *Optimising simulation times of SPS slow extraction using MAD-X*, (cf. research output [5]).
- 07/2014 – 08/2014 Summer student (GPA 1.0/1.0)
HEPHY, Institute of High Energy Physics, Vienna
Advisor: Robert Schöffbeck
Thesis: *Increasing the sensitivity of a search for supersymmetry in the single lepton channel with the Transverse Mass M_{T2} (CMS)*, (cf. research output [1]).

4. Education

- 07/2017 Ècole de physique des Houches
Effective Field Theory (EFT) in particle physics and cosmology
Introduction to EFT to describe multi-scale quantum systems in a tractable fashion. EFT allows to concisely parametrise possible new physics beyond established models such as the Standard Model of particle physics and cosmology.
- 03/2017 Computer algebra and particle physics (CAPP) school, DESY, Hamburg
Topics at the interface of modern computer algebra and particle physics such as Feynman integrals and multi-loop techniques.
- 09/2014 – 11/2016 Master of Science, MSc Physics (GPA 5.5/6.0), 01/11/2016
ETH Zürich, Switzerland
Major: Theoretical high energy physics, lattice QCD, applied mathematics
Advisor: Philippe de Forcrand
Thesis: *Inhomogeneous condensation in quark-based QCD effective models via wavelet pseudoparticles*, (cf. research output [3]).
- 07/2014 Summer School in Particle and Astroparticle physics
LAPP Annecy-le-Vieux, France
- 09/2011 – 08/2014 Bachelor of Science, BSc Physics (with distinction, GPA 1.1/1.0), 12/08/2014
Graz University of Technology, Austria
Advisors: H. G. Evertz, C. B. Lang
Thesis: *π - and ρ -Meson mass spectroscopy from Lattice QCD*, (cf. research output [2]).

- 08/2013 Summer school, University of Utrecht, Netherlands
Theoretical topics on thermal and statistical physics, quantum mechanics, electrodynamics, condensed matter, high energy physics and quantum gravity.
- 09/2002 – 05/2010 Österreichische Reifeprüfung, Matura (with distinction, GPA 1.0/1.0)
AHS BG/BRG Leibnitz, Austria
Major: Physics and geometry
Advisor: Hermann Scherz
Thesis: *Sonoluminescence – A bubble’s enlightenment*. A theoretical and experimental approach to the effect of Sonoluminescence.

5. Teaching activities

- 03/2022 School tutor, Galileo Galilei Institute for Theoretical Physics
Theoretical Aspects of Astroparticle Physics, Cosmology and Gravitation
Phase transitions in the early universe
- 2021– MSc thesis supervisor, University of Helsinki, Helsinki Institute of Physics
Sami Vihko, 06/2021 – 03/2022, co-supervised with Aleksi Vuorinen
Thesis: *EFT methods and calculational techniques in imaginary time formalism of thermal QCD*.
- 02/2017 – 02/2020 Teaching assistant, AEC, Institute for Theoretical Physics, University of Bern
Lecturing, designing and grading exercises and exams at Bachelor and Master level.
Quantum theory I/II, the Standard Model, statistical mechanics, introduction to BSM physics, theoretical exercises
References: Thomas Becher, Susanne Reffert, Rakhi Mahbubani
- 02/2015 – 05/2016 Teaching assistant, ETH Zürich, D-MATH/D-PHYS
Numerical mathematics I, Numerical methods, Physics I
References: Christoph Schwab, Sandra May, Andreas Vaterlaus
- 2013 – 2014 Teaching assistant, Graz University of Technology, ITP/IEP
Theoretical mechanics, physics laboratory I/II
References: W. v. d. Linden, Enrico Arrigoni

6. Outreach

- 09/2017 Public research display, University of Bern
Nacht der Forschung (NdF)

7. Research visits

- 06/2022 SUBATECH, Nantes; Jacopo Ghiglieri
10/2021 University of Basel; Stefan Antusch
10/2021 University of Bern, AEC, Institute for Theoretical Physics; Mikko Laine
08/2019 University of Helsinki, Helsinki Institute of Physics; Aleksi Vuorinen, Kari Rummukainen
08/2018 Universidad del Bío-Bío, Grupo de Cosmología y Partículas Elementales; York Schröder

8. Professional services

- 03/2022– Referee
American Physical Society’s journals: Phys. Rev. **D**, Phys. Rev. **L**
Springer’s journals: Eur. Phys. J. **C**

9. Scientific research skills

- Theoretical* (Dimensionally reduced) effective field theories, thermal field theory, quantum field theory, Lattice QCD, simulations in physics, computer algebra techniques, general relativity, cosmology, string theory, conformal field theory, group theory
Computational C/C++, Python, Matlab, FORM, ROOT, FORTRAN 77, Unix, Linux, Mathematica, LaTeX, computer hardware, HTML, Office, CAD-Software

10. Prizes, awards, fellowships

- 2011 – 2014 Scholarship of excellence Graz University of Technology
(EUR 800 scholarship p.a.)

11. Languages

- German* Mother-tongue
English Proficient C2, TOEFL 106/120 (2014), Cambridge ESOL B2 First FCE (2010)
Spanish Intermediate B1
Danish Elementary A2
French Beginner A1
Latin Very good (literal translation)

Research output list

Journal articles

- [19] S. Biondini, **P. Schicho**, and T. V. I. Tenkanen, *Strong electroweak phase transition in t -channel simplified dark matter models*, (2022), [2207.12207].
- [18] J. Hirvonen, J. Löfgren, M. J. Ramsey-Musolf, **P. Schicho**, and T. V. I. Tenkanen, *Computing the gauge-invariant bubble nucleation rate in finite temperature effective field theory*, JHEP **07**, 135 (2022), [2112.08912].
- [17] A. Ekstedt, **P. Schicho**, and T. V. I. Tenkanen, *DRalgo: a package for effective field theory approach for thermal phase transitions*, (2022), [2205.08815].
- [16] T. Gorda, A. Kurkela, J. Österman, R. Paatelainen, S. Säppi, **P. Schicho**, K. Seppänen, and A. Vuorinen, *Degenerate fermionic matter at N^3LO : Quantum Electrodynamics*, (2022), [2204.11893].
- [15] T. Gorda, A. Kurkela, J. Österman, R. Paatelainen, S. Säppi, **P. Schicho**, K. Seppänen, and A. Vuorinen, *Soft photon propagation in a hot and dense medium to next-to-leading order*, (2022), [2204.11279].
- [14] **P. Schicho**, T. V. I. Tenkanen, and G. White, *Combining thermal resummation and gauge invariance for electroweak phase transition*, (2022), [2203.04284].
- [13] J. Ghiglieri, G. D. Moore, **P. Schicho**, and N. Schlusser, *The force-force-correlator in hot QCD perturbatively and from the lattice*, JHEP **02**, 58 (2022), [2112.01407].
- [12] J. Löfgren, M. J. Ramsey-Musolf, **P. Schicho**, and T. V. I. Tenkanen, *Nucleation at finite temperature: a gauge-invariant, perturbative framework*, (2021), [2112.05472].
- [11] L. Niemi, **P. Schicho**, and T. V. I. Tenkanen, *Singlet-assisted electroweak phase transition at two loops*, Phys. Rev. D **103**, 115035 (2021), [2103.07467].
- [10] D. Croon, O. Gould, **P. Schicho**, T. V. I. Tenkanen, and G. White, *Theoretical uncertainties for cosmological first-order phase transitions*, JHEP **04**, 055 (2021), [2009.10080].
- [9] **P. M. Schicho**, T. V. I. Tenkanen, and J. Österman, *Robust approach to thermal resummation: Standard Model meets a singlet*, JHEP **06**, 130 (2021), [2102.11145].
- [8] M. Laine, **P. Schicho**, and Y. Schröder, *A QCD Debye mass in a broad temperature range*, Phys. Rev. D **101**, 023532 (2020), [1911.09123].
- [7] M. Laine, **P. Schicho**, and Y. Schröder, *Soft thermal contributions to 3-loop gauge coupling*, JHEP **2018**, 37 (2018), [1803.08689].

Conference proceedings

- [6] M. Fraser, D. Björkman, K. Cornelis, B. Goddard, V. Kain, **P. Schicho**, C. Theis, and H. Vincke. *Modelling the Radioactivity Induced by Slow-Extraction Losses in the CERN SPS*. In *Proc. of International Particle Accelerator Conference (IPAC'17)* (May 2017), 1897–1900.
- [5] M. A. Fraser, R. G. Alia, B. Balhan, H. Bartosik, C. Bertone, D. Björkman, J. Borburgh, N. Conan, K. Cornelis, L. Gatignon, B. Goddard, Y. Kadi, V. Kain, A. Mereghetti, F. Roncarolo, **P. M. Schicho**, J. Spanggaard, O. Stein, L. Stoel, F. M. Velotti, and H. Vincke. *SPS Slow Extraction Losses and Activation: Challenges and Possibilities for Improvement*. In *Proc. of International Particle Accelerator Conference (IPAC'17)* (Copenhagen. 2017), 611–614.

Theses

- [4] **P. M. Schicho**, *Multi-loop investigations of strong interactions at high temperatures*, PhD thesis (U. Bern, 2020).
- [3] **P. M. Schicho**, *Inhomogeneous condensation in quark-based QCD effective models via wavelet pseudoparticles*, MA thesis (ETH Zürich, 2016).
- [2] **P. Schicho**, *π - and ρ -Meson mass spectroscopy from Lattice QCD*, BA thesis (TU Graz, 2014).
- [1] **P. Schicho**, *Increasing the sensitivity of a search for supersymmetry in the single lepton channel with the Stransverse Mass*, Project thesis (HEPHY Vienna, 2014).

Seminar and contributed talks

- 15/09/2022 *(Gauge independent) Bubble nucleation rate at finite temperature*, invited seminar talk at Jožef Stefan Institute, Ljubljana, Slovenia
- 24/08/2022 *Can EFT tell us if there was an electroweak phase transition?*, invited seminar talk at University of Graz, Graz, Austria
- 11/07/2022 *Soft light-cone observables from electrostatic QCD*, invited seminar talk (online) at the QCD theory seminar
- 07/07/2022 *Degenerate fermionic matter at N^3LO* , invited seminar talk at the Nuclear Physics Colloquium, Goethe University, Frankfurt, Germany
- 20/06/2022 *Jet dispersion in hot QCD from the lattice*, contributed talk at SEWM 2022, Paris, France
- 16/06/2022 *Can EFT tell us if there was an electroweak phase transition?*, invited seminar talk at SUBATECH, Nantes, France

- 31/05/2022 *Electroweak phase transition: Combining thermal resummation and gauge invariance*, invited seminar talk at NICPB, Tallinn University, Estonia
- 24/05/2022 *Combining thermal resummation and gauge invariance for electroweak phase transition*, invited seminar talk (online) at School of Physics and Astronomy, Monash University, Australia
- 06/04/2022 *(Non-)perturbative jet dispersion hot QCD*, contributed talk at Quark Matter 2022, Kraków, Poland
- 30/03/2022 *(Non-)perturbative jet dispersion hot QCD*, contributed talk at Mini workshop: Phase transitions in particle physics, Galileo Galilei Institute, Firenze, Italy
- 03/03/2022 *Effective theory approach to cosmological phase transitions*, invited seminar talk at Instituto de Astrofísica de Canarias, La Laguna, Spain
- 28/10/2021 *Gauge independent bubble nucleation rate at finite temperature*, invited seminar talk at University of Basel, Basel, Switzerland
- 19/10/2021 *Cosmological phase transition: Robust thermal resummation*, invited seminar talk at University of Bern, Bern, Switzerland
- 13/05/2021 *Cosmological phase transition: Robust thermal resummation*, invited seminar talk (online) at KIAS, Seoul, South Korea
- 29/03/2021 *Soft thermal contributions to 3-loop gauge coupling*, contributed parallel talk at FunQCD (online), Barcelona, Spain
- 25/11/2020 *How to be precise at the electroweak scale at finite-temperature*, invited seminar talk (online) at Kavli IPMU, Tokyo, Japan
- 13/08/2019 *3-Loop Gauge Coupling in Hot Yang-Mills*, invited seminar talk at Helsinki Institute of Physics, Helsinki, Finland
- 28/08/2018 *Fun with thermal dimension-six operators*, invited seminar talk at Universidad del Bío-Bío, Chillán, Chile
- 28/06/2018 *Fun with thermal dimension-six operators*, contributed parallel talk at SEWM 2018, Barcelona, Spain