

# Curriculum Vitæ

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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:  *$\pi$ - and  $\rho$ -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

## 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

- [18] A. Ekstedt, **P. Schicho**, and T. V. I. Tenkanen, *DRalgo: a package for effective field theory approach for thermal phase transitions*, (2022), [2205.08815].
- [17] 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].
- [16] 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].
- [15] **P. Schicho**, T. V. I. Tenkanen, and G. White, *Combining thermal resummation and gauge invariance for electroweak phase transition*, (2022), [2203.04284].
- [14] 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].
- [13] 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*, (2021), [2112.08912].
- [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**,  *$\pi$ - and  $\rho$ -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 Transverse Mass*, Project thesis (HEPHY Vienna, 2014).

## Seminar and contributed talks

- 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