

# Joachim Pomper

BSc

Am Brühlwald 2a  
8075 Hart bei Graz  
Austria

+43 664 73320390

✉ joachim.pomper@edu.uni-graz.at

📄 joachim-pomper.github.io/homepage/

🐦 JoachimPomper

🌐 Joachim-Pomper

## Personal information

Date of birth 22.04.1997

Nationality Austria

## Education

2020-now **Master studies in theoretical and computational physics**, University of Technology Graz (TUG) and University of Graz (KFU).

2016-2020 **Bachelor studies in technical physics**, University of Technology Graz (TUG) and University of Graz (KFU).  
Graduated with distinction (grade 1.0).

2007-2015 **School of general education**, BRG Petersgasse Graz.

2003 -2007 **Elementary school**, Sacré Coeur Graz.

### Summer school programs

14.03.2022 - **Theoretical Aspects of Astroparticle Physics, Cosmology and Gravitation**,  
25.03.2022 Galileo Galilei Institute.

## Teaching

01.10.2022- **Teaching assistant for advanced Quantum Mechanics**, *Institute of Theoretical*  
31.01.2023 *Physics of KFU-Graz*, Physics master course.  
Correcting homework and tutoring students in the subject of quantum mechanics.

01.10.2021- **Teaching assistant for statistical physics**, *Institute of Theoretical Physics of*  
31.01.2022 *KFU-Graz*, Physics master course.  
Tutoring and grading of first semester master students in statistical physics.

01.10.2021- **Teaching assistant for linear algebra**, *Institute of Applied Mathematics of TU-*  
31.01.2022 *Graz*, Physics Bachelor course.  
Tutoring and grading of first semester bachelor students in linear algebra.

01.3.2021- **Teaching assistant for differential forms in the context of electromagnetism**,  
30.06.2021 *Institute of Applied Mathematics of TU-Graz*, Mathematics master course.  
Researching, writing and preparing lecture notes for a mathematics master's program special topic lecture on differential forms in the context of electromagnetism.

- 01.3.2021- **Teaching assistant for vector-calculus**, *Institute of Applied Mathematics of TU-Graz*, Physics bachelor course.  
Tutoring and grading of second semester bachelor students in vector-calculus.
- 01.10.2020- **Teaching assistant for calculus**, *Institute of Applied Mathematics of TU-Graz*, Physics Bachelor course.  
Tutoring and grading of first semester bachelor students in basic calculus.
- 01.3.2019- **Teaching assistant for programming in physics**, *Institute of Computational Physics of TU-Graz*, Physics bachelor course.  
Tutoring students in basic Matlab programming.
- 01.10.2018- **Teaching assistant for linear algebra**, *Institute of Applied Mathematics of TU-Graz*, Physics bachelor course.  
Tutoring and grading of first semester bachelor students in linear algebra.
- 01.10.2017- **Teaching assistant for linear algebra**, *Institute of Applied Mathematics of TU-Graz*, Physics bachelor course.  
Tutoring and grading of first semester bachelor students in linear algebra.

## Work

### Part-time jobs

- 01.10.2019- **Student trainee**, *BEST - Bioenergy and Sustainable Technologies, Area for automation and control*, <https://best-research.eu>.  
30.09.2020  
Primarily focused on testing and developing software for hydraulic and thermal simulation of buildings and district heating grids

### Internships

- 05.08.2018 - **Internship**, *BEST - Bioenergy and Sustainable Technologies, Subarea 4.2*.  
30.09.2018  
Primarily focused on quality analysis of prediction models for a model predictive controller.

## Languages

German Mother tongue  
English fluent

## Computer knowledge

### Programming languages

Matlab	Advanced knowledge	<i>work experience</i>
Python	Basic knowledge	<i>university course</i>
Julia	Advanced knowledge	<i>work experience</i>
C++	Basic knowledge	<i>university course</i>
Mathematica	Basic knowledge	<i>self-taught</i>

### Organization

Microsoft Office  
Basic knowledge

Latex  
Advanced knowledge, used for articles and presentations

Zotero For structured literature management  
Git For software version control

## Conference talks

I have had the pleasure to give a talk in the parallel sessions of two conference, one at international level, which took place in Sydney in Australia.

DSU2022 **Composite dark matter from non-abelian gauge theories with real representations.**

Presentation of results of my master's thesis

ÖPG2022 **Low energy effective description of dark  $Sp(4)$  theory with matter in non fundamental representation.**

Presentation of preliminary results of my master's thesis

## Project selection from my time as a student

Bachelor thesis **Analytische Berechnung der spontanen Magnetisierung von isotropen homogenen Ising Ferromagneten unter der Verwendung von Graßmann Zahlen.**

Supervisor: Univ.-Prof. Dipl.-Phys. Dr.rer.nat. Wolfgang von der Linden

Master thesis (WIP) **Dark matter from an  $Sp(4)$  gauge theory with fermions in the antisymmetric tensor representation.**

Supervisor: PD. Dr. Suchita Kulkarni

Uni course project **A simple way to explain phenomena at the horizon of a static black hole.**

Supervisor: Univ.-Prof. Dr.rer.nat. Reinhard Alkofer

Uni course project **Particle creation in an expanding universe.**

Supervisor: Univ.-Prof. Dr.rer.nat. Reinhard Alkofer

Uni course project **Functional renormalization group approach for interacting Dirac fermions.**

Supervisor: Univ.-Prof. Dr.rer.nat. Reinhard Alkofer

For more information look at my personal website.

## Further presentations during my time as a student

Besides the presentations above, I also gave a talk in the institutes master seminar.

Master seminar **Introduction to dark matter phenomenology.**

General introduction to the topic of dark matter

Furthermore, I have gathered experience in reading, communicating and discussing research by presenting papers in my research groups journal club. Seven of the papers I presented are stated in terms of their arXiv numbers below.

[arXiv:hep-ph/2205.08088], [arXiv:gr-qc/1111.4824], [arXiv:gr-qc/0507028], [arXiv:hep-ph/2112.03755], [arXiv:astro-ph/1706.07433], [arXiv:hep-ph/1402.5143], [arXiv:hep-ph/1312.3325], [arXiv:hep-th/1803.07585], [arXiv:hep-th/9602093]

## Transcript of records

My transcripts of records are listed on the pages below.

Mr

Joachim Pomper

Date of Birth: 22.04.1997

Citizenship: Austria

Code for study programme: UF 033 678

Registration number: 01530093

**Vizerektor für Lehre**

Studiendekan Physik  
Univ.-Prof. Dr.rer.nat.  
Wolfgang von der Linden

Petersgasse 16, A-8010 Graz  
Tel.: +43(0)316 873-8112  
Fax: +43(0)316 873-8113

SB: Martina Pichler  
physik.mpug@tugraz.at

## NOTIFICATION

You have duly completed the inter-university

### **Bachelor programme Physics**

[joint study programme with the University of Graz in the framework of NAWI Graz]

according to the Universities Act 2002, BGBl. I No. 120/2002 at Graz University of Technology.

According to § 87 (1) Universities Act 2002 I herewith confer upon you the academic degree, to be used after your name, of

### **Bachelor of Science (BSc)**

Information on legal remedy:

This notification becomes legally valid on the date given below. Further information on legal remedy is waived.

Graz, 22.09.2020

For the: Vizerektor für Lehre



Univ.-Prof. Dipl.-Phys. Dr.rer.nat. Wolfgang von der Linden, Studiendekan

**TECHNISCHE UNIVERSITÄT GRAZ**  
**GRAZ UNIVERSITY OF TECHNOLOGY - AUSTRIA**

Rechbauerstraße 12  
8010 Graz  
Österreich

**TRANSCRIPT OF RECORDS**

<b>NAME OF STUDENT:</b> Pomper			<b>First name:</b> Joachim		
<b>Date of birth:</b> 22 April 1997			<b>Academic degree:</b> BSc		
<b>Date of admission:</b>			19 August 2016	<b>Matriculation number:</b> 01530093	
<b>Study:</b>			Bachelor programme; Physics;[joint study programme with the University of Graz in the framework of NAWI Graz] (as a degree student)		
Number / Academic Year		Title of the course / type / semester hour	Duration of the course / examination / recognition date	Local grade	ECTS Credits
(1)		(2)	(3)	(4)	(5)
PHYA10	16/17	Introducton to Bachelor Study of Physics; SE; 0,50	1S / 05.10.2016*	successfully completed	0.50
PHYA30	16/17	Introduction to Mathematical Methods; SE; 1,00	1S / 04.11.2016	1	1.00
PHYA20	16/17	Concepts and Applications of Modern Physics; L; 1,50	1S / 31.01.2017	1	1.50
PHYB10	16/17	Experimental Physics I (Mechanics, Thermodynamics); L; 4,00	1S / 06.02.2017*	1	6.00
PHYC30	16/17	Differential- and Integral Calculations; L; 4,00	1S / 07.02.2017*	2	6.00
PHYC20_1	16/17	Linear Algebra; PE; 2,00	1S / 27.02.2017	1	3.00
PHYC40_1	16/17	Calculus; PE; 2,00	1S / 27.02.2017	1	3.00
PHYA40	16/17	Introduction to Basic Chemistry; L; 2,00	1S / 01.03.2017	1	3.00
PHYC10	16/17	Elementary Mathematical Methods: Linear Algebra; L; 2,00	1S / 01.03.2017	1	3.00
PHYB20_1	16/17	Experimental Physics I (Mechanics, Thermodynamics); PE; 2,00	1S / 08.03.2017	1	3.00
PHYC50	16/17	Ordinary Differential Equations; SE; 2,00	1S / 22.06.2017	1	3.00
PHYD10_1	16/17	Introduction in measuring techniques; SE; 2,00	1S / 26.06.2017	1	2.50
PHYE20_1	16/17	Vector Analysis; PE; 2,00	1S / 28.06.2017	1	3.00
PHYE10	16/17	Vector Analysis; L; 3,00	1S / 03.07.2017*	1	4.50
PHYA50	16/17	Programming in Physics: Matlab; L; 2,00	1S / 04.07.2017	1	2.00
PHYA60	16/17	Programming in Physics: Matlab; PE; 2,00	1S / 04.07.2017	1	3.00
PHYD20_1	16/17	Laboratory Course 1 (Mechanics and Thermodynamics); PE; 3,00	1S / 06.07.2017	1	3.00
PHYB40_1	16/17	Experimental Physics II (Electricity, Magnetism, Optics); PE; 2,00	1S / 19.07.2017	1	3.00
PHYB30	16/17	Experimental Physics II (Electricity, Magnetism, Optics); L; 4,00	1S / 02.10.2017*	1	6.00
PHYD30UF	17/18	Laboratory Course 2 (Electricity Magnetism and Optics); PE; 5,00	1S / 02.02.2018	1	6.00
PHYG20_2UB	17/18	Practical Exercises in Theoretical Mechanics; PE; 2,00	1S / 05.02.2018*	1	3.00
PHYG10UF	17/18	Theoretical Mechanics; L; 4,00	1S / 06.02.2018	1	6.00
PHYE30UB	17/18	Functional analysis and partial differential equations; L; 4,00	1S / 08.02.2018*	1	6.00
PHYE40_1UF	17/18	Functional Analysis and Partial Differential Equations; PE; 2,00	1S / 19.02.2018	1	3.00
PHYF10UB	17/18	Atomic, nuclear and particle physics; L; 4,00	1S / 12.03.2018*	1	6.00
PHYL10UF	17/18	Crvo Technology, Vacuum Technology, and Analysis	1S / 18.06.2018	1	4.50

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(1)		(2)	(3)	(4)	(5)
		Methods; L; 3,00			
PHYG40_2UB	17/18	Exercises on Quantum Mechanics; PE; 2,00	1S / 26.06.2018*	1	4.00
PHYE60UF	17/18	Probability Theory, Statistics and Data Analysis; PE; 1,00	1S / 27.06.2018	1	2.00
PHYM30UF	17/18	Introduction to mechanical applications; PE; 1,00	1S / 28.06.2018	1	1.00
PHYG30UB	17/18	Quantum Mechanics; L; 4,00	1S / 05.07.2018*	2	6.50
PHYE50UF	17/18	Mathematical Methods: Statistical Methods; L; 2,00	1S / 06.07.2018	1	3.00
PHYM20UF	17/18	Electronics and Computer Supported Measurement Technique; PE; 2,00	1S / 12.07.2018	1	2.50
MAB01012UB	17/18	Analysis 1; L; 5,00	1S / 18.10.2018	2	7.50
PHYM10UF	17/18	Electronics and Computer Supported Measurement Technique; L; 3,00	1S / 13.12.2018	1	4.50
PHYH40UB	18/19	Practical Exercises in Thermodynamics; PE; 1,00	1S / 31.01.2019*	1	2.00
PHYI10UB	18/19	Academic Writing and Presentation Techniques; SE; 2,00	1S / 31.01.2019*	1	2.00
PHYH20UF	18/19	Theoretical Electrodynamics; PE; 2,00	1S / 01.02.2019	1	4.00
PHYH10UF	18/19	Theoretical Electrodynamics; L; 4,00	1S / 07.02.2019	1	6.50
PHYH30UB	18/19	Thermodynamics; L; 2,00	1S / 12.02.2019*	1	3.00
PHYL30UF	18/19	Computational Methods in Technical Physics; PE; 2,00	1S / 05.03.2019	1	3.00
PHYL20UF	18/19	Computational Methods in Technical Physics; L; 2,00	1S / 12.03.2019	1	3.00
PHYF30UF	18/19	Molecule and Solid State Physics Exercises; PE; 1,00	1S / 25.06.2019	1	2.00
MAT152UF	18/19	Analysis 2; PE; 2,00	1S / 27.06.2019	1	3.00
PHYL50UF	18/19	Continuum and Fluid Mechanics; SE; 1,50	1S / 04.07.2019	1	3.00
PHYA70UB	18/19	Programming in Physics: C++ and Mathematica; L; 2,00	1S / 09.07.2019*	1	2.00
PHYA80UB	18/19	Exercises to Programming in Physics: C++ and Mathematica; PE; 2,00	1S / 09.07.2019*	1	3.00
PHYM40UF	18/19	Advanced Laboratory Technical Physics 1; PE; 2,50	1S / 01.08.2019	1	4.00
PHYM50UF	18/19	Advanced Laboratory Technical Physics 2; PE; 2,50	1S / 01.08.2019	1	4.00
MAT151UF	18/19	Analysis 2; L; 5,00	1S / 28.10.2019	1	7.50
MAT211UB	19/20	Measure and Integration Theory; PE; 0,50	1S / 31.01.2020*	1	1.00
MAT202UF	19/20	Analysis 3; PE; 2,00	1S / 05.02.2020	1	3.00
MAT210UB	19/20	Measure and Integration Theory; L; 2,50	1S / 25.02.2020*	1	3.50
MAT156UB	19/20	Programming in C++; SE; 4,00	1S / 24.06.2020	1	6.00
PHYF20UF	19/20	Molecule and solid state-physics; L; 3,00	1S / 25.06.2020	1	5.00
PHYL40UF	19/20	Physical Principles of Materials Science; L; 3,00	1S / 14.07.2020	1	4.50
MAT258UF	19/20	Introduction to Functional Analysis; PE; 1,00	1S / 28.08.2020	1	1.50
PHYI20_5UF	19/20	Bachelorarbeit; PE; 1,00	1S / 22.09.2020	1	6.00

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<b>Number / Academic Year</b>	<b>Title of the course / type / semester hour</b>	<b>Duration of the course / examination / recognition date</b>	<b>Local grade</b>	<b>ECTS Credits</b>
(1)	(2)	(3)	(4)	(5)
				<b>208.00</b>
(1) (2) (3) (4) (5) See explanations on next page				
Certificate (678) 22 September 2020				
Date		For the Rectorate:		
19 January 2023		The Vice Rector for Academic Affairs: Univ.-Prof. Dipl.-Ing. Dr.techn. Stefan Vorbach		

## ECTS - EUROPEAN CREDIT TRANSFER SYSTEM

Information available on the Europe server: [http://ec.europa.eu/education/lifelong-learning-policy/doc48\\_en.htm](http://ec.europa.eu/education/lifelong-learning-policy/doc48_en.htm)

(1) **Number / Academic Year**

Information available on INTERNET: <https://online.tugraz.at>

(2) **Type of course**

SE = Seminar

PE = Practical

L = Lecture

Semester hour: unit of academic credit: 45 minutes a week for one semester

(3) **Duration of course unit:**

Y = 1 full academic year

1S = 1 semester

(4) **Description of the institutional grading system:**

Austrian Grading Scale

Definition

1 EXCELLENT: outstanding performance

2 GOOD: above the average standard but with some errors

3 SATISFACTORY: generally sound work with a number of notable errors

4 SUFFICIENT: performance meets the minimum criteria

5 UNSATISFACTORY: Substantial improvement necessary; requirement of further work

successfully completed Positive performance, where a strict differentiation is not adequate

not completed Negative performance, where a strict differentiation is not adequate

**Overall classification of the qualification:**

"mit Auszeichnung bestanden"

Pass with Distinction (in case of excellent performance)

"bestanden"

Pass (in case of positive assessment)

"nicht bestanden"

Fail (in case of negative assessment)

**Recommended ECTS grades:**

Grade at TU Graz

ECTS grade

1

A

2

B

3

C

4

D/E

5

F

**ECTS-Credits**

1 Academic Year = 60

1 Semester = 30



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8010 Graz  
Österreich

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<b>Date of admission:</b>			29 September 2020	<b>Matriculation number:</b> 01530093		
<b>Study:</b>			Master's programme; Physics (as a degree student)			
<b>Number / Academic Year</b>			<b>Title of the course / type / semester hour</b>	<b>Duration of the course / examination / recognition date</b>	<b>Local grade</b>	<b>ECTS Credits</b>
(1)			(2)	(3)	(4)	(5)
PHU001UB	20/21	Statistical Physics; L; 2,00		1S / 24.11.2020	1	4.00
PHU002UF	20/21	Statistical Physics; PE; 1,00		1S / 22.01.2021	1	2.00
PHU004UF	20/21	Advanced Quantum Mechanics; PE; 1,00		1S / 27.01.2021	1	2.00
PHU003UF	20/21	Advanced Quantum Mechanics; L; 2,00		1S / 01.02.2021	1	4.00
PHM509UB	20/21	Computational Methods in Solid State Physics; SE; 2,00		1S / 11.02.2021	1	3.00
PHU012UB	20/21	Advanced Statistical Physics; L; 2,00		1S / 12.02.2021	1	3.00
PHM508UB	20/21	Monte-Carlo Methods; SE; 2,00		1S / 26.02.2021	1	3.00
PHM500UB	20/21	Advanced Mathematical Methods; L; 3,00		1S / 04.06.2021	1	4.50
PHM501UB	20/21	Advanced Mathematical Methods; PE; 1,00		1S / 04.06.2021	1	1.50
PHM504UB	20/21	Advanced Quantum Mechanics II; L; 2,00		1S / 24.06.2021	1	3.00
PHM503UB	20/21	Quantum Field Theory; PE; 1,00		1S / 05.07.2021	1	1.50
PHT508UF	20/21	Green´s Functions in Many-Particle Physics; SE; 2,00		1S / 05.07.2021	1	3.00
PHM502UB	20/21	Quantum Field Theory; L; 3,00		1S / 16.07.2021	1	4.50
PHM525UB	20/21	Hadron Physics; L; 2,00		1S / 29.07.2021	1	3.00
PHM524UB	20/21	Project in: "Foundations of Particle Physics"; PE; 2,00		1S / 30.07.2021	1	3.00
MAT656UF	20/21	Elective Subject Mathematics (Electromagnetism and Differential Forms); L; 2,00		1S / 03.09.2021	1	3.00
PHM001UB	21/22	Introduction to General Relativity and Cosmology; L; 2,00		1S / 14.10.2021	1	3.00
PHM507UB	21/22	Numerical Methods in Linear Algebra; SE; 2,00		1S / 15.11.2021*	1	3.00
A00036996	21/22	M0.3 Master's Seminar in the Area of the Master's Thesis, SE; L; 2,00		1S / 08.02.2022	1	2.00
PHM520UB	21/22	Quantum Field Theory 2: Gauge Theories; SE; 4,00		1S / 12.02.2022	1	6.00
PHM528UB	21/22	Project in: "Phenomenology of Particle Physics"; PE; 2,00		1S / 23.02.2022	1	3.00
PHM802UB	20/21	Astroparticle Physics; L; 2,00		1S / 25.02.2022	1	3.00
PHM506UB	21/22	Basic Concepts in Solid-state Theory; L; 2,00		1S / 28.02.2022	1	3.00
PHM523UB	21/22	Advanced Mathematical Methods 2; L; 2,00		1S / 28.03.2022	1	3.00
PHM012_2UB	21/22	Master's Seminar in the Area of the Master's Thesis (Strong Interaction in QFT); SE; 2,00		1S / 28.06.2022	1	2.00

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(1)	(2)	(3)	(4)	(5)
				<b>76.00</b>
(1) (2) (3) (4) (5) See explanations on next page				
<b>Date</b>		<b>For the Rectorate:</b>		
19 January 2023		The Vice Rector for Academic Affairs: Univ.-Prof. Dipl.-Ing. Dr.techn. Stefan Vorbach		

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**Overall classification of the qualification:**

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**Recommended ECTS grades:**

Grade at TU Graz	ECTS grade
1	A
2	B
3	C
4	D/E
5	F

**ECTS-Credits**

1 Academic Year = 60

1 Semester = 30