Philipp Gadow

Curriculum Vitae

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Employment and education

2020+ **Postdoctoral Research Fellow**, *Deutsches Elektronensynchrotron DESY*, Hamburg, Germany

2016–2020 **PhD Physics**, *Max-Planck-Institut für Physik*, Munich, Germany
Advisor: PD Dr. Oliver Kortner
Thesis: Search for Dark Matter Produced in Association with Hadronically Decaying Bosons at $\sqrt{s} = 13\,\text{TeV}$ with the ATLAS Detector at the LHC

2013–2016 **M.Sc. Particle Physics**, *Technical University of Munich*, Munich, Germany
Thesis: Development of a Concept for the Muon Trigger of the ATLAS Detector at the HL-LHC

Winter 2013 **Erasmus SMS**, *University of Edinburgh*, Edinburgh, United Kingdom

2010–2013 **B.Sc. Physics**, *Technical University of Munich*, Munich, Germany
Thesis: dE/dx studies with pion and electron tracks of the ALICE GEM IROC prototype

Leadership

2021+ **Flavour tagging algorithms sub-group convener**, *ATLAS experiment*
Co-coordination (2 conveners) of a group consisting of 40 physicists working on machine learning algorithms for the identification of heavy-flavour jets at the ATLAS experiment

2021+ **Analysis contact**, *ATLAS experiment*
Co-coordination (2 contacts) of the heavy resonances search in four-top-quark final states

Research experience

Searches for heavy particles

2020+ **Search for heavy resonances in four-top-quark final states**
Explicit resonance search in challenging four-top-quark final state.
I co-lead the analysis team,maintained the analysis software and produced the inputs for the statistical analysis. Further, I contributed to fitting studies and simulated the signal process.

Searches for dark matter

2018–2021 **Dark matter search with dark Higgs bosons decaying to vector boson pairs**
First exploration of signature with missing transverse momentum and resonantly produced vector boson pair, using novel track-assisted-reclustering jet algorithm.
I was central analyser, responsible for all essential parts of this new analysis, involving signal process simulation, analysis strategy design, analysis software, distributed computing, and statistical analysis.

2017–2021 **Dark matter searches with Higgs bosons decaying to b-quarks**

Unprecedented sensitivity to Higgs bosons with large recoil by using jets built from inner detector tracks with variable radius, results provide strongest constraints on models with extended Higgs sector.

I was a central analyser in the search using the partial Run-2 data collected during 2015–2017 and contributed to the full Run-2 search. In the former, I was responsible for the analysis software, producing the fit inputs, statistical analysis, commissioning of a new object-based missing transverse momentum significance, and multijet background estimate. In the latter, I contributed to maintaining the derivation datasets, and the optimisation of the object-based missing transverse momentum significance requirements.

2016–2018 **Dark matter search with hadronically decaying vector bosons**

Reconstruction of hadronic vector boson decays using jet substructure and jet flavour tagging information. Relevant signature for simplified dark matter models, models with extended Higgs sector and searches for invisible Higgs boson decays.

I was a central analyser (of 2), responsible for analysis software maintenance, distributed computing, and statistical analysis. I developed and evaluated a method for estimating the multijet background. Further, I was the liaison for incorporating the results to a broader summary publication, reinterpreted them in terms of a model with extended Higgs sector and contributed to their use in a combination of Higgs(invisible) searches.

ATLAS combined performance

2021+ **Flavour tagging algorithms**

Jet flavour tagging underpins a large part of the ATLAS physics programme. Machine learning techniques are used in inferring the jets' flavour.

I contribute to the development of the next generation of recommended flavour tagging algorithms for Run-3 ATLAS physics analysis. I further contribute to the Umami framework which used in the training and evaluation of neural-network-based algorithms.

Reinterpretation and reproducible research

2019+ **ATLAS RECAST reinterpretation framework**

Preservation and automated reinterpretation of searches drastically increases their relevance to a broader class of theoretical models. All recently published ATLAS searches are required to provide a RECAST reinterpretation framework implementation.

I coordinated the reinterpretation of a dark matter search with Higgs bosons decaying to b-quarks in terms of a dark Higgs model with the RECAST framework and co-edited the first dedicated public note on RECAST together with Lukas Heinrich. I am interested in improving the limit setting in searches exploiting active learning algorithms based on RECAST.

Upgrade studies

2015–2017 **First-level muon trigger for HL-LHC**

Highly selective first-level muon triggers are essential for the ATLAS experiment at the High-Luminosity LHC. Including the precision monitored-drift-tube information substantially increases the trigger selectivity.

I studied a concept for a HL-LHC muon trigger, which is included in the Technical Design Report for the Phase-II Upgrade of the ATLAS Muon Spectrometer. Further, I studied fast track reconstruction algorithms which can be applied at trigger-level.

Talks and posters

Invited talks

Feb 2020 **Dark matter searches with the ATLAS detector at the LHC**, *Cavendish Laboratory HEP Seminar*, Cambridge, United Kingdom, seminar talk

International conferences

Jul 2019 **ATLAS Highlights on Dark Matter Searches in Exotic Models**, *XIII International Workshop on Interconnections between Particle Physics and Cosmology*, Cartagena, Columbia, conference talk

Oct 2018 **Search for dark matter produced in association with a Higgs boson decaying to bb**, *Puzzle of Dark Matter Workshop*, DESY Hamburg, Germany, Young Scientist Forum talk

Jun 2018 **Search for Dark Matter in association with a hadronically decaying Z' vector boson with the ATLAS detector in pp collisions at 13 TeV**, *Sixth Annual Conference on Large Hadron Collider Physics*, Bologna, Italien, poster

Awards

2010-2016 **Full scholarship**
Studienstiftung des deutschen Volkes (German Academic Scholarship Foundation)
The German Academic Scholarship Foundation is Germany's largest and most prestigious scholarship foundation. Scholarships are awarded to fewer than 0.5% of German students.

2014 **Teaching award**
Goldene Kreide der Physikfachschaft
The "Goldene Kreide" is awarded annually by the student council of the physics department to distinguish outstanding student tutors.

Schools

Jul 2019 **Fifth Machine Learning in High Energy Physics Summer School 2019** , *DESY*, Hamburg, Germany, 10 days

Sep 2017 **49. Herbstschule für Hochenergiephysik 2019**, *University of Siegen*, Maria Laach, Germany, 10 days

Mentoring

Graduate Students

2021+ **Elisaveta Sitnikova**, DESY / University of Hamburg (Physics)
Search for heavy resonances in four-top-quark final states

2020–2022 **Alicia Wongel**, DESY / University of Hamburg (Physics)
Search for heavy resonances in four-top-quark final states

Undergraduate Students

2021 **John Lawless**, DESY Summer Student
Machine learning techniques for top quark reconstruction in four-top-quark final states

Teaching

2021 **SUSY+HDBS+Exotics RECAST Tutorial**, *HEP Software Foundation*, mentor

2020 **Docker training**, *HEP Software Foundation*, mentor

2020 **CI/CD pipelines training**, *HEP Software Foundation*, mentor

2016/17 **Mechanics**, *TU Munich*, tutor

2016/17 **Mechanics**, *TU Munich*, tutor

2012, 2014, 2017 **Electromagnetism and Special Relativity**, *TU Munich*, tutor

2012/13, 2015/16 **Optics**, *TU Munich*, tutor

2011/12, 2012/13 **Linear Algebra**, *TU Munich*, tutor

2011/12, 2012/13 **Maths introductory course for freshman students**, *TU Munich*, tutor

Outreach

ATLAS Masterclass

High school students learn about fundamentals of particle physics in lectures and engange in hands-on data analysis. I participated in ATLAS masterclasses by preparing and giving lectures and instructing the students in the hands-on session.

Science Slams

Science slams are competetive events in which scientists present their research in a given time frame to a diverse audience in an entertaining way. I participated in over 30 such events with a talk about dark matter searches at the Large Hadron Collider, including the Southern German championship.