

Rafał Masełek

Particle Physics Phenomenologist

Laboratory of Subatomic
Physics & Cosmology (LPSC)
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Grenoble, France

Personal

Researcher driven by the curiosity and willingness to discover and deeply understand. In love with science, theoretical and computational physics, modern technology and Machine Learning. Interested mainly in BSM Physics and collider phenomenology, but always willing to learn something new.

 born 1994-03-23 (Polish nationality)
 PhD acquired in 2023
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10.2023-09.2025 **PostDoc, LPSC Grenoble, France**

2-year PostDoc position in Machine Learning applications to modern Particle Physics problems, with emphasis on Collider Physics Phenomenology; supervised by Sabine Kraml.

2019-2023

PhD in Particle Physics Phenomenology, University of Warsaw

Supervised by Kazuki Sakurai; thesis topic "Prospects for detecting long-lived particles at the Large Hadron Collider"; employment in SONATA BIS 7 grant by the Polish National Science Centre.

2017-2019

MSc in Theoretical Physics, University of Warsaw

Supervised by Kazuki Sakurai; graduated with exceptional results — "Summa cum laude".

2018-2019

Erasmus+ exchange student, University of Padova

One semester-long participation in the Erasmus+ exchange programme.

2013-2017

BEng in Computational Physics, Warsaw University of Technology

Supervised by Małgorzata Janik; graduated with exceptional results — "Summa cum laude".

10.2020-04.2024 **Member in GRIEG grant, University of Warsaw, Warsaw**

Project: "*Understanding the Early Universe: interplay of theory and collider experiments*" lead by Stefan Pokorski; involvement in tasks related to reinterpretation of the Monojet searches, and detection of sphalerons and microscopic Black Holes at the HL-LHC using ML.

05.2017-04.2018 **Researcher, National Centre for Nuclear Research, Świerk, Poland**

Involvement in the J-PET medical experiment. Main task: developing Monte Carlo simulations framework. Supervisor: Wojciech Wiślicki.

09.2016

Intern, GSI Helmholtz Centre for Heavy Ion Research, Darmstadt, Germany

Three-week internship connected to the realisation of the BEng thesis and Heavy Ion Physics.

Education

Other experience

07.2016-09.2016 User, CERN, Geneva, Switzerland

Internship in the ALICE experiment connected to realisation of the BEng thesis and Heavy Ion Physics.

1. **MoEDAL Search in the CMS Beam Pipe for Magnetic Monopoles Produced via the Schwinger Effect**
MoEDAL Collaboration; Phys.Rev.Lett. 133 (2024) 7, 071803;
<https://doi.org/10.1103/PhysRevLett.133.071803>
2. **Search for Highly-Ionizing Particles in pp Collisions During LHC Run-2 Using the Full MoEDAL Detector**
MoEDAL Collaboration; e-Print: 2311.06509 [hep-ex]
3. **Machine learning classification of sphalerons and black holes at the LHC**
A. S. Grefsrud, T. Buane, F. Koutoulis, A. Lipniacka, R. Masełek, A. Papaefstathiou, K. Sakurai, T. B. Sjoers, I. Slazyk; Eur.Phys.J.C 84 (2024) 4, 442;
<https://doi.org/10.1140/epjc/s10052-024-12790-x>
4. **Prospects for detecting long-lived particles at the Large Hadron Collider**
Rafał Masełek; PhD thesis; <https://arxiv.org/pdf/2310.13748>
5. **MoEDAL-MAPP, an LHC Dedicated Detector Search Facility**
MoEDAL Collaboration; Contribution to Snowmass 2021; <https://arxiv.org/pdf/2209.03988>
6. **Monojet signatures from gluino and squark decays**
Inaki Lara, Trygve Buane, Rafał Masełek, Mihoko M. Nojiri, Krzysztof Rolbiecki, Kazuki Sakurai; JHEP 10 (2022) 150;
[https://doi.org/10.1007/JHEP10\(2022\)150](https://doi.org/10.1007/JHEP10(2022)150)
7. **Discovery prospects for long-lived multiply charged particles at the LHC**
M. M. Altakach, P. Lamba, R. Masełek, K. Sakurai, V. A. Mitsou; Eur. Phys. J. C 82 (2022) 9, 848;
<https://doi.org/10.1140/epjc/s10052-022-10805-z>
8. **Supersymmetric explanation of the muon $g - 2$ anomaly with and without stable neutralino**
M. Chakraborti, S. Iwamoto, J. S. Kim, R. Masełek, K. Sakurai; JHEP 08 (2022) 124;
[https://doi.org/10.1007/JHEP08\(2022\)124](https://doi.org/10.1007/JHEP08(2022)124)
9. **Search for highly-ionizing particles in pp collisions at the LHC's Run-1 using the prototype MoEDAL detector**
MoEDAL Collaboration; Eur. Phys. J. C 82 (2022) 8, 694;
<https://doi.org/10.1140/epjc/s10052-022-10608-2>
10. **Detecting long-lived multi-charged particles in neutrino mass models with MoEDAL**
M. Hirsch, R. Masełek, K. Sakurai; Eur. Phys. J. C 81 (2021) 8, 697;
<https://doi.org/10.1140/epjc/s10052-021-09507-9>
11. **Prospects of searches for long-lived charged particles with MoEDAL**
B. S. Acharya, A. De Roeck, J. Ellis, D. K. Ghosh, R. Masełek, G. Panizzo, J. L. Pinfold, K. Sakurai, A. Shaa & A. Wall;
Eur. Phys. J. C 80 (2020) 6, 572;
<https://doi.org/10.1140/epjc/s10052-020-8093-5>
12. **Prospects for discovering supersymmetric long-lived particles with MoEDAL**
D. Felea, J. Mamuzic, R. Masełek, N.E. Mavromatos, V. A. Mitsou, J. L. Pinfold, R. Ruiz de Austri, K. Sakurai, A. Santra & O. Vives;
Eur. Phys. J. C 80 (2020) 5, 431;
<https://doi.org/10.1140/epjc/s10052-020-7994-7>

1. **Long-lived highly charged particles at Run 3 and High Luminosity LHC**; R. Masełek, M. M. Altakach, P. Lamba, K. Sakurai, V. A. Mitsou; PoS DISCRETE2020-2021 (405), 081, (2022); <https://doi.org/10.22323/1.405.0081>
2. **Muon g-2 in SUSY scenarios with and without stable neutralinos**; R. Masełek; Contribution to Moriond 2022 EW, (2022); <https://doi.org/10.48550/arXiv.2205.04378>
3. **Towards 2+1 photon tomography: Energy-based selection of two 511 keV photons and a prompt photon with the J-PET scanner**; J-PET Collaboration; Contribution to Młodzi Naukowcy w Polsce - Badania i Rozwój 2017; arXiv:1803.00996 [physics.med-ph]

1. **Principal Investigator, PRELUDIUM 20, Polish National Science Center**; "Developing a new direction for collider BSM searches with Machine Learning"; 2+1 years; total budget: 76 610 PLN (~17 924 EUR)
2. **Principal Investigator, BEKKER 2022, Polish National Agency for Academic Exchange**; "Developing anomaly detector algorithm to search for New Physics", grant to establish collaboration with the KEK institute in Japan and for a 3-month visit, total budget: 39 000 PLN (~9 121 EUR)

1. **Machine Learning in Particle Theory - MITP Summer School 2023**; Oppenheim, Germany; 3-21 Jul. 2023
2. **3rd Terascale of Machine Learning (Part 2: advanced topics)**; DESY, Germany; 10-12 Oct. 2022
3. **Joint ICTP-SAIFR/MITP Summer School on Particle Physics beyond the Standard Model**; Sao Paolo, Brazil, 12-23 Sep. 2022
4. **pre-SUSY 2022 Summer School**; University of Ioannina; Ioannina, Greece; 22-25 Jun. 2022
5. **Seventh Machine Learning in High Energy Physics Summer School 2021**; HSE University; online; 15-30 Jul. 2021
6. **International Summer School on Deep Learning 2021**; University of Gdańsk; online; 5-10 Jul. 2021
7. **Quantum Computing and Programming workshop**; Quantum AI Foundation; online; 21-29 Nov. 2020

- ♦ **2021/2022** Programming (Python) (tutorial 30 h)
- ♦ **2021/2022** Machine Learning (tutorial 30 h)
- ♦ **2020/2021** Programming (C++) and numerical methods (tutorial 45 h)
- ♦ **2020/2021** Statistics for naturalists (tutorial 30 h)
- ♦ **2019/2020** Programming (C++) and numerical methods (tutorial 45 h)

- ♦ **2024** Co-organiser of "ML coffee" club at the LPSC
- ♦ **2021** Active member of a committee selecting new PhD candidates

1. **CPTGA Journée de Physique Théorique**; Grenoble, France; 15 Oct. 2024, **invited** oral presentation
2. **AISSAI workshop on "Heterogeneous Data and Large Representation Models in Science"**; Toulouse, France; 30 Sept. - 3 Oct. 2024; poster + short oral presentation
3. **Dark Side of the Universe**; Corfu, Greece; 8-14 Sept. 2024; oral presentation
4. **BOOST 2024**; Genova, Italy; 29 Jul. - 2 Aug. 2024; oral presentation
5. **Reinterpretation & OpenMAPP mini-workshop**; Grenoble, France; 17-20 Jun. 2024; oral presentation
6. **New Physics Directions in the LHC era and beyond**; Heidelberg, Germany; 22-26 Apr. 2024; oral presentation
7. **AISSAI Anomaly Detection Workshop**; Clermont-Ferrand, France; 4-7 Mar. 2024; poster
8. **LPSC PostDoc seminar**; Grenoble, France; 23 Jan. 2024; oral presentation
9. **IRN Terascale Meeting**; Marseille, France; 25-27 Oct. 2023; oral presentation
10. **23rd Hellenic School and Workshops on Elementary Particle Physics and Gravity, Workshop on the Standard Model and Beyond**; Corfu, Greece; 27 Aug. - 7 Sep. 2023; oral presentation
11. **Rencontres du Vietnam**; Quy Nhon, Vietnam; 6-12 Aug. 2023; oral presentation
12. **KEK Theory Centre seminar**; Tsukuba, Japan; 29 May 2023; oral presentation
13. **KEK Theory Centre seminar**; Tsukuba, Japan; 28 Mar. 2023; oral presentation
14. **28th MoEDAL Collaboration Meeting**; Geneva, Switzerland; 5-7 Dec. 2022; oral presentation
15. **Konferencja Interdyscyplinarna Szkół Doktorskiej Nauk Ścisłych i Przyrodniczych UW**; Chęciny, Poland; 22 Nov. 2022; oral presentation
16. **22nd Hellenic School and Workshops on Elementary Particle Physics and Gravity, Workshop on the Standard Model and Beyond**; Corfu, Greece; 29 Aug. - 8 Sep. 2022; oral presentation
17. **The XXIX International Conference on Supersymmetry and Unification of Fundamental Interactions (SUSY 2022)**; Ioannina, Greece; 27 Jun. - 2 Jul. 2022; oral presentation
18. **Searching for long-lived particles at the LHC and beyond: Eleventh workshop of the LLP Community**; online; 30 May - 3 Jun. 2022; **invited** oral presentation
19. **56th Rencontres de Moriond (EW)**; La Thuile, Italy; 12-19 Mar. 2022; oral presentation
20. **16th MoEDAL Collaboration Meeting**; online; 15-17 Dec. 2021; oral presentation
21. **Planck 2022**; Paris, France; 30 May - 3 Jun. 2022; oral presentation
22. **DISCRETE 2020-2021**; Bergen, Norway; 29 Nov. - 3 Dec. 2021; oral presentation
23. **BOOST 2021: 13th International Workshop on Boosted Object Phenomenology, Reconstruction and Searches in HEP**; online; 2-5 Aug. 2021; passive participation
24. **15th MoEDAL Collaboration Meeting**; online; 1-4 Jun. 2021; oral presentation
25. **(g-2) Days 2021**; online; 30 May - 4 Jun. 2021; passive participation
26. **17th MoEDAL Collaboration Meeting**; online; 13-20 Jun. 2022; oral presentation
27. **Searching for long-lived particles at the LHC and beyond: Ninth workshop of the LLP Community**; online; 25-28 May 2021; **invited** oral presentation
28. **14th MoEDAL Collaboration Meeting**; online; 15-17 Dec. 2020; oral presentation
29. **13th MoEDAL Collaboration Meeting**; online; 1-3 Jul. 2020; oral presentation
30. **Pierwsza Wirtualna Konferencja Naukowa Kampusu Ochota**; online; 30 Jun. - 01 Jul. 2020; poster
31. **12th MoEDAL Collaboration Meeting**; Geneva, Switzerland; 5-7 Dec. 2019; oral presentation
32. **Badania i Rozwój Młodych Naukowców w Polsce**; Warsaw, Poland; 17 Nov. 2017
33. **28th CBM Collaboration Meeting 2016, PWG Correlations and Fluctuations**; Tübingen, Germany; 26-30 Sept. 2016; joint oral presentation