

Experimental Physicist (Particle Physics)

Otilia Anamaria Ducu

Spoken languages: Romanian, English, French

Research experience

- Since Sept. 2010 – Second degree scientific researcher (since Sept. 2019)
Department of Elementary Particles Physics (DFPE) at Horia Hulubei National Institute for R&D in Physics and Nuclear Engineering ([IFIN-HH](#)), Bucharest, Romania
- Feb. 2020 – Senior Research Fellow at CERN, [ATLAS](#) experiment
Mar. 2022 – Fellowship Programme: Theoretical & Experimental Physics, [AFC-2019-2/RES](#)
European Organization for Nuclear Research, Geneva, Switzerland
Location: CERN 100%
- Dec. 2015 – Post-doctoral researcher, ATLAS experiment
Nov. 2019 – [Université de Montréal](#), Physics Department, Montreal, Canada
Location: CERN 30%, Montreal 70%
- Sept. 2012 – PhD in Particle Physics awarded jointly by
Oct. 2015 – [Aix-Marseille Université, Marseilles](#), France and [Universitatea Bucuresti](#), Bucharest, Romania
Center for Particle Physics of Marseilles ([CPPM](#), France) and IFIN-HH (Romania)
Supervisors : Pascal Pralavorio (pralavop@cern.ch) and Calin Alexa (calexa@cern.ch)
Qualification : *Très honorable avec félicitations*
Location: CERN 25%, Bucharest 25%, Marseilles 50%
- Sept. 2006 – Bachelor (4 years) and master (2 years) degrees in Physics
June 2012 – Universitatea Bucuresti, Bucharest, Romania

Grants / Awards

- Institut de valorisation des donnees ([IVADO](#)) grant, 185000 \$CAD, *Machine learning for the analysis of the Large Hadron Collider Data at CERN*, co-applicant, Montreal, Canada (Winter 2017 – Winter 2019)
- *ED352 Doctoral school thesis award*, attributed by École Doctorale Physique et Sciences de la Matière, Marseille, France (Apr. 2016)
- PhD grant from the French government for my Romania-France joint PhD, attributed by the French embassy in Bucharest and Institut francais de Roumanie, covering a 12 months stay in France, distributed over three years (Fall 2012 – Fall 2015)
- *2014 Serban Titeica IFIN-HH award* for remarkable scientific contributions of young researchers (Dec. 2014)
- Yearly grants attributed by the University of Bucharest, Romania, for outstanding academic performance (over the period Fall 2006 - Fall 2015)

Leadership roles in ATLAS

Details on these responsibilities in ATLAS are given [here](#)

- **(Ongoing)** Convener of Clustering and Tracking in Dense Environments (CTIDE) subgroup (Oct. 2023 – Sept. 2025), Tracking performance group
- Coordinator of the reprocessing effort in the Data Preparation group (Oct. 2021 – Sept. 2023)
- Convener of SUSY Strong Production subgroup (Apr. 2020 – Sep. 2021), SUSY working group
- Convener of Inclusive Squark/Gluino Production subgroup (Oct. 2019 – Mar. 2020), SUSY working group
- Convener of Isolation and Fake Forum (IFF, Aug. 2017 – Dec. 2019)

- **(Ongoing)** Analysis contact of the Run 2 search for heavy neutral leptons analysis in the EXOTICS group (since Dec. 2023)
- **(Ongoing)** Analysis contact of the Run 2+Run 3 BSM charged Higgs bosons ($H^{\pm\pm}$, H^\pm) analysis in the Higgs and Diboson Searches ATLAS group (since July 2022)
- Analysis contact of the same-sign / three light leptons (SS/3Lep) analysis in the SUSY group (May 2016 – Nov. 2019, Nov. 2020 – Feb. 2024)

- Electron/Photon performance group liaison with the SUSY group (Apr. 2016 – Mar. 2021)
- Coordinator of the review group for methods estimating the fake/non-prompt lepton background in the SUSY group (May 2016 – Apr. 2017)

Other activities in ATLAS

Data analysis:

- **(Ongoing)** Search for low mass right-handed Majorana neutrinos, usually referred to as heavy neutral leptons, HNL, in decays of W bosons (since Summer 2022)
- Member of the team that performed the Run 2 search for BSM charged Higgs bosons ($H^{\pm\pm}$, H^\pm), which are considered to be predicted by a type-II seesaw model (Spring 2020 – Summer 2021).
(Ongoing) Since Summer 2022 I am involved in the Run 3 analysis preparation

- **(Ongoing)** SS/3Lep SUSY analysis, targeting strong and electroweak production of SUSY particles (since Spring 2012)
- Member of the multi b -jets SUSY team (Spring 2016 - Summer 2022)
- Member of the RPV multi-lepton SUSY team (Spring 2020 – Summer 2021)

- Prospects for the constraints on the top Yukawa coupling in the second stage of LHC exploitation (Run 2) using signal regions targeting $t\bar{t}H$ processes and two same-charge light leptons final states (2014)

Performance studies:

- **(Ongoing)** Performance studies for tracks in the core of the jets (Spring 2016 – Summer 2019, Spring 2022, and again since Spring 2023)
- In-situ calibration of the presampler energy scale using muons from W or Z bosons decays recorded in LHC low-pileup Run 2 data (Winter 2020 – Summer 2021)
- Calibration of photon isolation efficiency (Spring 2018 – Autumn 2019)

- Electron reconstruction and identification (Fall 2012, for one year) and isolation (Spring 2018, for half a year) efficiency measurements with the ATLAS data, using $Z \rightarrow e^+e^-$ events

More activities:

- **(Ongoing)** Member of Distributed Analysis Support Team (DAST, since Spring 2017)
- Co-developer and maintainer of the [IFFTruthClassifier](#) tool (Summer 2018 - Summer 2022), hosted in the ATLAS Isolation and Fake Forum group
- Part of the team performing the quality control of the Micromegas readout boards (Summer 2020). The work was carried out in the context of the New Small Wheel Phase-1 Upgrade, to replace the so-called “Small Wheels” of the ATLAS muon spectrometer
- Qualification task in the ATLAS collaboration (Spring – Summer 2012): maintenance and improvement of the software employed by the ATLAS Supersymmetry group to produce analysable data and simulation samples under formats easily usable by the group members (the so-called SUSY D3PDs)

Editorial work

Details on these responsibilities in ATLAS are given [here](#)

- Contact editor of the *Search for RPV SUSY in a final state containing leptons and many jets* paper (Eur.Phys.J. C [81 \(2021\) 1023](#))
- Contact editor of the *Search for charged Higgs scalar bosons* paper (J.High Energy Phys. [06 \(2021\) 146](#))
- Contact editor of the following SS/3Lep SUSY papers: J.High Energy Phys. [1406 \(2014\) 035](#), J. High Energy Phys. [1709 \(2017\) 084](#)
- Contact editor of the *Electron and photon efficiencies in LHC Run 2 with the ATLAS experiment*, submitted to JHEP (JHEP_287P_0823)
- Editor of the *Combined electron/photon performance* paper (JINST [14 \(2019\) 12, P12006](#))
- Contact editor of *Modelling of Track Reconstruction Inside Jets with the ATLAS $\sqrt{s} = 13$ TeV pp dataset* PUB note ([ATL-PHYS-PUB-2017-016](#))
- Contact editor of many ATLAS internal notes which document in detail the work performed by me, or by the team I was/am working with. These documents are used by the e.g Supersymmetry group to review and further approve an analysis, toward its publication
- Member of the review team for several SUSY analyses toward their approval by the ATLAS Supersymmetry group
- Member of the review team for one BSM Higgs analysis toward its approval by the ATLAS Higgs and Diboson Searches group
- Member of the editorial board for four ATLAS publications. The chair of the editorial board for one ongoing ATLAS publication.

Student supervision

- As subgroup convener or analysis contact I had to guide and help students from various international teams
- Supervisor of several students at IFIN-HH, of several under-grad students at the University of Montreal during the post-doctoral fellowship, and of one student at CPPM during my last year of PhD
- Supervisor of one CERN summer student working on the *Presampler energy scale calibration* using electrons from W or Z bosons decays recorded in Run 2 data. The job details are [here](#) (Summer 2021)

PhD thesis

- [1] *Search for new physics in events with same-sign leptons and missing energy with ATLAS at LHC*, CERN-THESIS-2015-163, CPPM-T-2015-06, <https://cds.cern.ch/record/2060995>

Main journal publications

Author of > 900 publications in journals indexed by Web of Science; Hirsch index, $h > 90$

Below are only the publications where I made direct and significant contributions

My inspire record is [here](#) (ID 1121917)

- [2] ATLAS Collaboration, *Search for pair production of higgsinos in events with two Higgs bosons and missing transverse momentum in $\sqrt{s} = 13$ TeV pp collisions at the ATLAS experiment*, submitted to Phys. Rev. D (DN13548), [[hep-ex:2401.14922](#)]
- [3] ATLAS Collaboration, *Measurement of the Higgs boson mass with $H \rightarrow \gamma\gamma$ decays in 140 fb^{-1} of $\sqrt{s} = 13$ TeV pp collisions with the ATLAS detector*, Phys. Lett. B **847** (2023) 138315, [[hep-ex:2308.07216](#)]
- [4] ATLAS Collaboration, *Electron and photon energy calibration with the ATLAS detector using LHC Run 2 data*, JINST **19** (2024) 02, P02009, [[hep-ex:2309.05471](#)]
- [5] ATLAS Collaboration, *Electron and photon efficiencies in LHC Run 2 with the ATLAS experiment*, submitted to JHEP (JHEP_287P_0823), [[hep-ex:2308.13362](#)]
- [6] ATLAS Collaboration, *Search for pair production of squarks or gluinos decaying via sleptons or weak bosons in final states with two same-sign or three leptons with the ATLAS detector*, J.High Energy Phys. **02** (2024) 107, [[hep-ex:2307.01094](#)]
- [7] ATLAS Collaboration, *Search for direct production of winos and higgsinos in events with two same-charge leptons or three leptons in pp collision data at $\sqrt{s} = 13$ TeV with the ATLAS detector*, J.High Energy Phys. **11** (2023) 150, [[hep-ex:2305.09322](#)]
- [8] ATLAS Collaboration, *Tools for estimating fake/non-prompt lepton backgrounds with the ATLAS detector at the LHC*, JINST **18** (2023) 11, T11004, [[hep-ex:arXiv:2211.16178](#)]
- [9] ATLAS Collaboration, *Search for supersymmetry in final states with missing transverse momentum and three or more b-jets in 139 fb^{-1} of proton–proton collisions at $\sqrt{s} = 13$ TeV with the ATLAS detector*, Eur. Phys. J. C **83** (2023) 561, [[hep-ex:2211.08028](#)]
- [10] ATLAS Collaboration, *Search for R-parity-violating supersymmetry in a final state containing leptons and many jets with the ATLAS experiment using $\sqrt{s}=13$ TeV proton–proton collision data*, Eur.Phys.J. C **81** (2021) 1023, [[hep-ex:2106.09609](#)]
- [11] ATLAS Collaboration, *Search for doubly and singly charged Higgs bosons decaying into vector bosons in multi-lepton final states with the ATLAS detector using proton-proton collisions at $\sqrt{s} = 13$ TeV*, J.High Energy Phys. **06** (2021) 146, [[hep-ex:2101.11961](#)]
- [12] ATLAS Collaboration, *Search for squarks and gluinos in final states with same-sign leptons and jets using 139 fb^{-1} of $\sqrt{s} = 13$ TeV pp collision data collected with the ATLAS detector*, J.High Energy Phys. **06** (2020) 046, [[hep-ex:1909.08457](#)]

- [13] ATLAS Collaboration, *Electron and photon performance measurements with the ATLAS detector using the 2015-2017 LHC proton-proton collision data*, JINST **14** (2019) 12, P12006, [[hep-ex:1908.00005](#)]
- [14] ATLAS Collaboration, *Search for supersymmetry in final states with two same-sign or three leptons and jets using 36 fb^{-1} of $\sqrt{s} = 13 \text{ TeV}$ pp collision data with the ATLAS detector*, J.High Energy Phys. **1709** (2017) 084, [[hep-ex:1706.03731](#)]
- [15] ATLAS Collaboration, *Search for Supersymmetry in final states with missing transverse momentum and multiple b-jets in proton-proton collisions at $\sqrt{s} = 13 \text{ TeV}$ with the ATLAS detector*, J.High Energy Phys. **06** (2017) 107, [[hep-ex:1711.01901](#)]
- [16] ATLAS Collaboration, *Electron efficiency measurements with the ATLAS detector using 2012 LHC proton-proton collision data*, Eur.Phys.J. C **77** (2017) 195 [[hep-ex:1612.01456](#)]
- [17] ATLAS Collaboration, *Search for supersymmetry at $\sqrt{s}=13 \text{ TeV}$ in final states with jets and two same-sign leptons or three leptons with the ATLAS detector*, Eur.Phys.J. C **76** (2016) 259, [[hep-ex:1602.09058](#)]
- [18] O. Ducu, L. Heurtier and J. Maurer, *LHC signatures of a Z' mediator between dark matter and the $SU(3)$ sector*, J.High Energy Phys. **03** (2016) 006, [[hep-ex:1509.05615](#)]
- [19] ATLAS Collaboration, *ATLAS Run 1 searches for direct pair production of third-generation squarks at the Large Hadron Collider*, Eur.Phys.J. C **75** (2015) 510 [[hep-ex:1506.08616](#)]
- [20] ATLAS Collaboration, *Summary of the searches for squarks and gluinos using $\sqrt{s} = 8 \text{ TeV}$ pp collisions with the ATLAS experiment at the LHC*, J.High Energy Phys. **1510** (2015) 054, [[hep-ex:1507.05525](#)]
- [21] ATLAS Collaboration, *Search for supersymmetry at $\sqrt{s}=8 \text{ TeV}$ in final states with jets and two same-sign leptons or three leptons with the ATLAS detector*, J.High Energy Phys. **06** (2014) 035, [[hep-ex:1404.2500](#)]

ATLAS conference notes

- Author of more than 10 ATLAS conference notes where I made direct and significant contributions

ATLAS internal documentation

- Author of 34 internal notes documenting the studies I have done in the various ATLAS Physics Analysis and Combined Performance subgroups