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Italian citizenship

Emanuele Angelo Bagnaschi

Current position

10/2018 - present **Postdoctoral researcher**, PSI, Villigen, Switzerland.
Member of the LTP theory group under the supervision of Dr. Michael Spira.

Education

10/2011–09/2014 **Ph.D. in Particle Physics**, Université Paris Diderot, Paris, *Mention très honorable avec les félicitations du jury.*
10/2009–10/2011 **Laurea Magistrale (M. S.) in Physics**, Università degli studi di Milano, Milano, *110/110 cum laude.*
10/2004–10/2009 **Laurea Triennale (B. S.) in Physics**, Università degli studi di Milano, Milano, *110/110 cum laude.*

Doctoral thesis

Title *Precision phenomenology at the LHC and characterization of theoretical uncertainties*
Supervisor Prof. Matteo Cacciari (Université Paris Diderot-Paris 7)

Master thesis

Title *Implementation of the gluon fusion process in the POWHEG framework in the SM and in the MSSM*
Supervisors Prof. Alessandro Vicini (University of Milano) and Prof. Giuseppe Degrandi (University of Rome 3)

Bachelor thesis

Title *Extension of harmonic polylogarithms to the complex plane*
Supervisor Prof. Alessandro Vicini (University of Milano)

Experience

10/2014–09/2018 **Postdoctoral researcher**, DESY, Hamburg, Germany.
Member of the DESY theory group under the supervision of Dr. Georg Weiglein.
09/2012–12/2012 **Internship**, Wolfram Research Inc., Champaign, IL, USA.
Top-level implementation in Mathematica of Mathieu functions. This internship was organized in the framework of the LHCPhenonet Initial Training Network.

2008–2010 **System administrator for the LCM laboratory**, *Department of Physics of the University of Milan*, Milan, Italy.

The Laboratorio Calcolo e Multimedia (LCM) cluster has more than four hundred active users and it is composed of about forty nodes, three servers (for various tasks - NFS server, web server and log server), four firewall/gateway systems and a dedicated batch farm for computing intensive application that I personally built with the collaboration of another staff member and that I maintained alone personally for more than a year. The computing farm, used by members of the Theoretical Physics group, consists of several clients connected in a double gigabit-ethernet/Infiniband network and managed by TORQUE/MAUI. All systems run Debian Linux.

This work was funded by a joint private-public partnership of the Department of Physics and Messagenet (<http://www.messagenet.it/>).

07/2010-08/2010 **Summer student**, *CERN*, Geneva, Switzerland.

Automation of CERN accounting data collection for the World Large Computing Grid (WLCG). The task was solved by writing a Python program that interfaced to several database and monitoring systems to collect the data. The latter were in turn presented to the user through a Django-based web interface.

Fellowships

2014-2018 **DESY**, Hamburg, Germany.

Fellowship of the SFB676 collaborative research center.

2011-2014 **Marie Curie Early Stage Researcher (ESR) doctoral fellowship**.

From the LHCPHENONET European initial training network (<http://www.lhcphenonet.eu/>).

Habilitations

- ASN2019 – habilitation to the role of associate professor in Italy (“Professore universitario di seconda fascia”).

Research areas

- Collider physics.
- Monte Carlo event generators.
- Precision physics of the Higgs and electroweak sectors.
- BSM physics at collider.
- Global likelihood studies of BSM models.
- Interplay between collider and non-collider experiments in the quest for dark matter.
- Computational physics, with a specific interest in high-performance software and technologies for scientific computing.

Student supervisions

2015 **Julia Gehrlein**, **summer student**, *DESY*, Hamburg, Germany.

Revisiting Higgs production at LEP. Co-supervision with Dr. Georg Weiglein.

2017 **Margarita Gavrilova**, **summer student**, *DESY*, Hamburg, Germany.

A re-appraisal of Higgs production in vector boson associated production in the 2HDM. Co-supervision with Dr. Georg Weiglein and Dr. Stefan Liebler.

2017 **Roberto Corral Lopez**, **summer student**, *DESY*, Hamburg, Germany.

MSSM Higgs scenarios in light of the current LHC constraints. Co-supervision with Dr. Georg Weiglein and Dr. Stefan Liebler.

2018 **Sebastian Trifa**, **MSci project student**, *U. Bristol*, Bristol, United Kingdom.

Global study of DMSM with a vector mediator. Co-supervision with Dr. Henning Flächer.

2018 **Thea Engler**, **summer student**, *DESY*, Hamburg, Germany.

MSSM Higgs scenarios with Heavy Higgs decay to electroweakinos. Co-supervision with Dr. Georg Weiglein and Dr. Tim Stefaniak.

2018 **Alexander Spies**, **summer student**, *DESY*, Hamburg, Germany.

MSSM Higgs scenarios with Heavy Higgs decay to staus. Co-supervision with Dr. Georg Weiglein and Dr. Tim Stefaniak.

2019 **Gabriele Vergani**, **bachelor student**, *U. Milano*, Milano, Italy.

Boosted top quark tagging with neural networks. Co-supervision with Prof. Alessandro Vicini.

- 2019 **Ian Yi En Pang, bachelor student, NTU Singapore/CERN.**
Global likelihood study of the CMSSM in light of the latest experimental constraints. Co-supervision with Prof. John Ellis.
- 2019 **Edwin Goh Duo Yao, bachelor student, NTU Singapore/CERN.**
Global likelihood study of a leptophilic vector dark matter simplified model. Co-supervision with Prof. John Ellis.

Scientific responsibilities

- Co-organizer of the *LHCPhenonet workshop on particle physics*, Paris, France, 4-6 June 2014.
- Organizer of the *12th KUTS workshop*, PSI, Switzerland, 25-26 June 2020 (moved to 2021 due to the coronavirus pandemic).
- Co-convenor of the electroweak session of the 2020 International Workshop on the High Energy Circular Electron Positron Collider, Shanghai, China, 26-28 October 2020.
- Co-organizer of the LTP Thursday colloquia at PSI (2018 - present).
- Organizer of the LTP Theory seminars at PSI (2019 - present).

Working groups and forums

- Participation and contributions to the Higgs Cross Section Working Group (HXSWG).
- Theory convener of the MSSM subgroup of the HXSWG (2020 - present).
- Participation and contributions to the Electroweak Working Group (EWWG).
- Participation to the Forum on the Interpretation of the LHC Results for BSM studies.
- Participation and contributions to KUTS working group on the Higgs mass prediction in SUSY models.

Association and society memberships

- Marie Curie Alumni Association.
- Deutsche Physikalische Gesellschaft e.V..

Other academic activities

- I presented my scientific activity at 9 seminars in research institutes.
- Reviewer for the European Physical Journal C (EPJC).
- Reviewer for the Journal of High Energy Physics (JHEP).
- Visiting researcher at the U. Bristol (2017 - present).
- Visiting scientist (VISC) at CERN (2019 - present).

Interaction with the private sector

- Through U. Bristol, collaboration with Oracle to understand the feasibility of using their bare-metal cloud services for particle physics research (2017-2018).

Referees

Alphabetical order

1. **J. Ellis** , (*King's College, CERN*).
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Department of Physics
King's College London
Strand, London, WC2R 2LS, United Kingdom
2. **S. Heinemeyer** , (*Instituto de Física Teórica UAM-CSIC*).
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3. **M. Spira** , (PSI Villigen).
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4. **A. Vicini** , (U. Milano and INFN Milano).
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5. **G. Weiglein** , (DESY Hamburg).
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Publications

1. E. Bagnaschi, G. Degrandi, P. Slavich, and A. Vicini. *Higgs production via gluon fusion in the POWHEG approach in the SM and in the MSSM*. JHEP, 1202:088, 2012
2. E. Bagnaschi, R. Harlander, S. Liebler, H. Mantler, P. Slavich, et al. *Towards precise predictions for Higgs-boson production in the MSSM*. JHEP, 1406:167, 2014
3. E. Bagnaschi, G. F. Giudice, P. Slavich, and A. Strumia. *Higgs Mass and Unnatural Supersymmetry*. JHEP, 1409:092, 2014
4. E. Bagnaschi, M. Cacciari, A. Guffanti, and L. Jenniches. *An extensive survey of the estimation of uncertainties from missing higher orders in perturbative calculations*. JHEP, 02:133, 2015
5. K. J. de Vries et al. *The pMSSM10 after LHC Run 1*. Eur. Phys. J., C75(9):422, 2015
6. E. Bagnaschi and A. Vicini. *The Higgs transverse momentum distribution in gluon fusion as a multiscale problem*. JHEP, 01:056, 2016
7. E. A. Bagnaschi et al. *Supersymmetric Dark Matter after LHC Run 1*. Eur. Phys. J., C75:500, 2015
8. E. Bagnaschi, R. V. Harlander, H. Mantler, A. Vicini, and M. Wiesemann. *Resummation ambiguities in the Higgs transverse-momentum spectrum in the Standard Model and beyond*. JHEP, 01:090, 2016
9. E. Bagnaschi, F. Brümmer, W. Buchmüller, A. Voigt, and G. Weiglein. *Vacuum stability and supersymmetry at high scales with two Higgs doublets*. JHEP, 03:158, 2016
10. E. Bagnaschi, J. Costa, K. Sakurai, et al. *Likelihood Analysis of Supersymmetric SU(5) GUTs*. Eur. Phys. J., C77(2):104, 2017
11. E. Bagnaschi, M. Borsato, K. Sakurai, et al. *Likelihood Analysis of the Minimal AMSB Model*. Eur. Phys. J., C77(4):268, 2017
12. E. Bagnaschi, J. Pardo Vega, and P. Slavich. *Improved determination of the Higgs mass in the MSSM with heavy superpartners*. Eur. Phys. J., C77(5):334, 2017
13. E. Bagnaschi, K. Sakurai, et al. *Likelihood Analysis of the pMSSM11 in Light of LHC 13-TeV Data*. Eur. Phys. J., C78(3):256, 2018
14. J. C. Costa, E. Bagnaschi, K. Sakurai, et al. *Likelihood Analysis of the Sub-GUT MSSM in Light of LHC 13-TeV Data*. Eur. Phys. J., C78(2):158, 2018
15. J. Gomes, E. Bagnaschi, I. Campos, M. David, L. Alves, J. Martins, J. Pina, A. López-García, and P. Orviz. *Enabling rootless Linux Containers in multi-user environments: the udocker tool*. Comput. Phys. Commun., 232:84–97, 2018
16. E. Bagnaschi, F. Maltoni, A. Vicini, and M. Zaro. *Lepton-pair production in association with a $b\bar{b}$ pair and the determination of the W boson mass*. JHEP, 07:101, 2018
17. E. Bagnaschi et al. *Supersymmetric Models in Light of Improved Higgs Mass Calculations*. Eur. Phys. J., C79(2):149, 2019

18. E. Bagnaschi, J. Costa, K. Sakurai, et al. *Global Analysis of Dark Matter Simplified Models with Leptophobic Spin-One Mediators using MasterCode*. Eur. Phys. J., C79(11):895, 2019
19. E. Bagnaschi et al. *MSSM Higgs Boson Searches at the LHC: Benchmark Scenarios for Run 2 and Beyond*. Eur. Phys. J., C79(7):617, 2019
20. E. Bagnaschi, G. Degrandi, S. Paßehr, and P. Slavich. *Full two-loop QCD corrections to the Higgs mass in the MSSM with heavy superpartners*. Eur. Phys. J., C79(11):910, 2019
21. E. Bagnaschi and A. Vicini. *A new look at the estimation of the PDF uncertainties in the determination of electroweak parameters at hadron colliders*. Submitted to PRL, 2019

Reports and notes

1. S. Dittmaier, S. Dittmaier, C. Mariotti, G. Passarino, R. Tanaka, et al. “*Handbook of LHC Higgs Cross Sections: 2. Differential Distributions*”. arXiv, 1201.3084, 2012
2. S. Heinemeyer et al. “*Handbook of LHC Higgs Cross Sections: 3. Higgs Properties*”. arXiv, 1307.1347, 2013
3. E. Bagnaschi et al. *Benchmark scenarios for low $\tan\beta$ in the MSSM*. LHCHXSWG-2015-002, 2015
4. D. de Florian et al. *Handbook of LHC Higgs Cross Sections: 4. Deciphering the Nature of the Higgs Sector*. arXiv, 1610.07922, 2016
5. E. Bagnaschi, P. Bechtle, J. Haller, R. Kogler, T. Peiffer, T. Stefaniak, and G. Weiglein. *Global SM and BSM Fits using Results from LHC and other Experiments*. In J. Haller and M. Grefe, editors, *Particles, Strings and the Early Universe: The Structure of Matter and Space-Time*, pages 203–230. 2018
6. J. Alison et al. *Higgs boson pair production at colliders: status and perspectives*. In B. Di Micco, M. Gouzevitch, J. Mazzitelli, and C. Vernieri, editors, *Double Higgs Production at Colliders Batavia, IL, USA, September 4, 2018-9, 2019*, 2019
7. W. Abdallah et al. *Reinterpretation of LHC Results for New Physics: Status and Recommendations after Run 2*. 3 2020

Conference proceedings

1. E. Bagnaschi and L. Jenniches. *Missing higher-order theoretical uncertainties in a Bayesian statistics*. Proceedings, 49th Rencontres de Moriond on QCD and High Energy Interactions, pages 301–308, 2014
2. E. Bagnaschi. *Estimation of uncertainties from missing higher orders in perturbative calculations*. Proceedings, 50th Rencontres de Moriond, QCD and high energy interactions, pages 131–134, 2015
3. E. A. Bagnaschi. *Prospects for SUSY discovery after the LHC Run 1*. PoS, EPS-HEP2015:183, 2015
4. E. A. Bagnaschi. *Prospects for SUSY dark matter after the LHC Run 1*. PoS, EPS-HEP2015:411, 2015
5. E. Bagnaschi. *Matching uncertainties in the prediction of the Higgs boson transverse momentum in the SM and beyond*. PoS, LHCP2016:077, 2016
6. E. Bagnaschi. *Low-energy SUSY facing LHC constraints*. Nuovo Cim., C40(5):190, 2018

Schools, workshops and conferences

- I have attended 3 schools, 35 workshops, 17 conferences and 20 meetings.
- I have presented my scientific activity in 39 talks of which 9 were invited ones.
- I have designed one poster.
- List of events where I have presented my work
 - *LHCPhenonet Winter School 2012*, Ascona, Switzerland, 22-29 January 2012.
Contributed talk (student session), “Higgs boson production in the POWHEG approach in the SM and in the MSSM”.

- *LHCPhenonet Annual Meeting 2012*, Durham, United Kingdom, 19-22 March 2012. **Contributed talk**, “Higgs boson production in the POWHEG approach in the SM and in the MSSM”.
- *Higgs Hunting 2012*, Orsay, France 18-20 July 2012. **Contributed talk (student session)**, “Developments in Higgs production through gluon fusion in the SM and in MSSM in the POWHEG framework”.
- *GDR Terascale@Annecy*, Annecy, France, 28-30 October 2013. **Contributed talk**, “Effect of quark masses in gluon fusion processes: a theoretical review”.
- *Rencontres de Moriond: QCD and High Energy interactions*, La Thuile, Italy, 22-29 March 2014. **Contributed talk**, “Missing higher order theoretical uncertainties in the Cacciari-Houdeau framework: extension to hadronic observables”.
- *LHCPhenonet workshop on particle physics*, Paris, France, 4-6 June 2014. **Contributed talk**, “QCD theoretical uncertainties in a Bayesian framework”.
- *BSM Parameter Fitting Workshop*, DESY, Hamburg, 29-30 September 2014. **Contributed talk**, “Characterization of Theoretical Uncertainties in Higgs Phenomenology”.
- *Heraeus Seminar: Physics Landscape after the Higgs discovery at the LHC*, Bad Honnef, Germany, 4-7 November 2014. **Contributed poster**, “Towards precise predictions for Higgs boson production in the MSSM”
- *Higgs (N)NLO MC and Tools Workshop for LHC RUN-2*, CERN, Switzerland, 17-19 December 2014. **Contributed talk**, “Higgs p_T in gluon fusion beyond the Standard Model”.
- *Rencontres de Moriond: QCD and High Energy interactions*, La Thuile, Italy, 21-28 March 2015. **Contributed talk**, “Estimation of uncertainties from missing higher orders in perturbative calculations”.
- *The 10th Workshop of the LHC Higgs Cross Section Working Group*, CERN, Switzerland, 15-17 July 2015. **Contributed talk**, “Towards precise predictions for p_T Higgs distributions in BSM physics”.
- *European Physical Society (EPS) conference on High Energy Physics 2015*, Vienna, Austria, 22-29 July 2015. **Contributed two talks**, “Prospects for SUSY dark matter after the LHC Run 1” and “Prospects for SUSY discovery after the LHC Run 1”.
- *2nd Workshop REF 2015 (Resummation, Evolution, Factorization)*, DESY, Hamburg, Germany, 02-03 November 2015. **Invited talk**, “The Higgs transverse momentum in gluon fusion as a multiscale problem: ambiguities and predictions in different p_T -resummation frameworks”.
- *XI ATLAS Italia workshop on Run 2*, Cosenza, Italy, 04-06 November 2015. **Invited talk**, “Prospects for BSM Higgs boson phenomenology at Run 2”.
- *Milano Christmas meeting 2015*, Milano, Italy, 21-23 December 2015. **Contributed talk**, “Higgs mass and unnatural Supersymmetry”.
- *4th KUTS workshop*, Heidelberg, Germany, 20-22 January 2016. **Contributed talk**, “Heavy SUSY with a light THDM”.
- *Fourth Annual Large Hadron Collider Physics Conference (LHCP2016)*, Lund, Sweden, 13-18 June 2016. **Invited talk**: “Resummation ambiguities in the Higgs transverse-momentum spectrum in the Standard Model and beyond”.
- *Matter and the universe meeting*, Mainz, Germany 12 December 2016. **Contributed talk**: “Higgs mass computation in BSM”.
- *Milano Christmas workshop 2016*, Milano, Italy, 22 December 2016. **Contributed talk**: “Perspective for Supersymmetry after current LHC runs”.

- *6th KUTS workshop*, Aachen, Germany, 23-25 January 2017. **Contributed talk**: “Improved estimation of the EFT uncertainty in the determination of the Higgs mass with heavy superpartners”.
- *Les Rencontres de Physique de la Vallée d’Aoste (La Thuile 2017)*, La Thuile, Italy, 05-11 March 2017. **Invited talk**: “Low-energy SUSY facing LHC constraints”.
- *29th Rencontres de Blois*, Blois, France, 28 May/2 June 2017. **Invited talk**: “Perspectives on the Higgs p_T as a probe of BSM physics”.
- *QCD@LHC 2017*, Debrecen, Hungary, 28 August/01 September 2017. **Invited talk**: “Status of QCD corrections for BSM Higgs physics”; **Contributed talk**: “ $l\bar{l} b\bar{b}$ associated production and its impact on the W mass measurement”.
- *11th Annual meeting of the Helmholtz Alliance “Physics at the Terascale”*, Hamburg, Germany, 27-29 November 2017. **Contributed two talks**: “Perspectives on the pMSSM11 in light of current LHC results”; “Container technology for phenomenology tools: the udocker middleware suite”.
- *(Re)interpreting the results of new physics searches at the LHC*, CERN, Switzerland, 14-16 May 2018. **Invited talk**: “Perspectives on the pMSSM11 in light of current LHC results”.
- *9th KUTS workshop*, Würzburg University, Würzburg, Germany, 16-18 July 2018. **Contributed talk**: “Update on the EFT Higgs mass computation in FlexibleSUSY”
- *SUSY2018*, Barcelona, Spain, 23-27 July 2018. **Contributed four talks**: “Towards high-precision for high-scale SUSY: status and perspectives on the EFT Higgs-mass computation in FlexibleSUSY”; “Global perspectives on dark matter simplified models”; “Prospects for SUSY discovery in light of LHC Run 2 results”; “Prospects for SUSY dark matter in light of LHC Run 2 results”.
- *10th KUTS workshop*, Dresden, Germany, 8-10 April 2019. **Contributed talk**: “A preliminary study of effects and approximations in the SM matching at 2-loops”.
- *KIT-NEP ’19*, Karlsruhe, Germany, 7-9 October 2019. **Invited talk**: “Vacuum stability and supersymmetry at high scales with two Higgs doublets”.
- *LHC EW precision sub-group workshop*, CERN, Switzerland, 14-18 October 2019. **Contributed talk**: “A new look at the estimation of the PDF uncertainties in the determination of electroweak parameters at hadron colliders”.
- *Ultimate precision at hadron colliders workshop*, Institut Pascal, Paris-Saclay, France, 25-29 November 2019. **Contributed talk**: “Revisiting the role of bin-bin correlations in PDF uncertainties for the M_W measurement”.
- *Kick-off meeting “Precision Electroweak Physics at the CERN Large Hadron Collider”*, PRIN 2017F28R78, Scuola Normale Superiore, Pisa, Italy, 7th February 2020. **Contributed talk**: “Impact of the PDFs on the determination of M_W ”.
- *LHC-EW WG: Jets and EW bosons meeting*, online, 16 March 2020. **Invited talk**: “Matching uncertainties and choices of the PS scales in Z+bb”.
- *LHC Higgs group general meeting*, online, 9-11 November 2020. **Contribution with a talk**: “MSSM subgroup status report”.

Languages

Italian	Native speaker.
English	Advanced knowledge, both written and spoken.
French	Advanced knowledge, both written and spoken.
German	Intermediate knowledge, both written and spoken.

Computer skills

Operating systems	Linux (Gentoo, Debian, Fedora, Arch), FreeBSD, Windows.
Programming languages	C, C++, Fortran77/90, Python, Perl (basic knowledge), Common Lisp (basic knowledge), Haskell (basic knowledge), Julia (basic knowledge).
Scripting languages	sh, bash, awk, sed.
Databases	SQLite.
Scientific tools	Mathematica, GiNaC, ROOT.
Text authoring	L ^A T _E X, MS Office, Open Office.
Version control	cvs, svn, git.

Voluntary experience

Gentoo Linux	Several contributions to the Gentoo project in form ebuilds and eclasses. This experience enriched my knowledge of shell scripting, sed, awk and of the inner working of the Linux toolchain.
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