

## **ALLEGATO A**

UNIVERSITÀ DEGLI STUDI DI MILANO

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## **[Nataschia Vignaroli] CURRICULUM VITAE**

### **INFORMAZIONI PERSONALI**

|                        |                         |
|------------------------|-------------------------|
| <b>COGNOME</b>         | <b>VIGNAROLI</b>        |
| <b>NOME</b>            | <b>NATASCIA</b>         |
| <b>DATA DI NASCITA</b> | <b>[ 07, 12, 1984 ]</b> |

**INSERIRE IL PROPRIO CURRICULUM  
(non eccedente le 30 pagine)**

Data

03/09/2020

Luogo

Pisa

# Curriculum Vitae of NATASCIA VIGNAROLI

Department of Physics “E. Fermi”, University of Pisa, Largo Bruno Pontecorvo, 3, 56127  
Pisa, Italy

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WEB PROFILES:

<http://inspirehep.net/author/profile/N.Vignaroli.1> [HEP - Inspire ]

<https://scholar.google.it/citations?user=sZJEz6EAAAAJ&hl=en> [Google Scholar]

DATE and PLACE of BIRTH: 7<sup>th</sup> December 1984, Frascati (RM), Italy

## RESEARCH INTERESTS

My research interests focus on the phenomenology of theories beyond the Standard Model (BSM), with emphasis on the search for new particles at colliders, including future colliders, and on the interpretation and prediction of the results from collider experiments. I find particularly appealing the theories with a BSM strong dynamics responsible for the electroweak symmetry breaking (EWSB) where the Higgs emerges as a composite state. I am also interested in BSM model building, in theories for Dark Matter, in the study of the flavour structure of BSM models and in developing new techniques to extract information on the Higgs sector. My research enjoys close collaboration with experimental teams.

## RESEARCH EXPERIENCE

|                       |  |
|-----------------------|--|
| Sept 2019 – Present   | PostDoc Researcher at University of Pisa, Department of Physics “E. Fermi”, Pisa, Italy  |
| Sept 2017 – Sept 2019 | PostDoc Researcher at “INFN, theory group of Padova”, Padova, Italy  |
| Sept 2015 – Sept 2017 | PostDoc Researcher at “Centre for Cosmology and Particle Physics Phenomenology – CP3-Origins”, University of Southern Denmark, Odense, Denmark |
| Sept 2012 – Aug 2015  | PostDoc Researcher at “Michigan State University, Department of Physics and Astronomy”, East Lansing, MI, USA                                  |
| Oct 2011 – Aug 2012   | PostDoc Researcher at “Iowa State University, Department of Physics and Astronomy”, Ames, IA, USA  |

## PROFESSIONAL ACHIEVEMENTS

28 March 2018 – 28 March 2024

Italian National Scientific Qualification to function as Associate Professor in Theoretical Physics (Abilitazione Scientifica Nazionale per il ruolo di Professore di seconda fascia per il settore concorsuale FIS 02/A2 - Fisica Teorica delle Interazioni Fondamentali)

## EDUCATION

Nov 2008 – Feb 2012

**Ph.D. in Physics** University of Rome “La Sapienza”

*Thesis:* “Phenomenology of heavy fermion and vector resonances in Composite Higgs Models”

*Supervisor:* Roberto Contino

*Examiners:* Giovanni Ridolfi, Antonio D. Polosa, Mauro Dell' Orso

*Defense Date:* February 14<sup>th</sup> 2012

Sept 2006 – Oct 2008

**Master Degree in Theoretical Physics**, University of Rome “La Sapienza”

Summa cum Laude (110/110 e Lode)

*Thesis:* “The Higgs boson in the  $\mu^+\mu^-$  channel at the LHC: expected differences in conformal models with a dilaton-Higgs”

*Advisors:* Barbara Mele, Silvano Petrarca

*Defense date:* October 24<sup>th</sup> 2008

2007 – 2008

**Excellence Program\*** of the Faculty of Mathematical, Physical and Natural Sciences of “La Sapienza” (admitted for academic merit)

*\*The Excellence Program is a supplemental program for deserving students, providing additional courses and activities*

Aug, Sept 2007

**Summer Student Trainee** at the Fermi National Accelerator Laboratory (**Fermilab**), Batavia, IL, USA

Collaboration with the CDF Rome 1 group.

I worked on “SM predictions for  $Z(b)\text{jet}$  processes at NLO using MCFM”

Courses taken: C++ programming; Data-analysis with ROOT

Sept 2003 – Oct 2006

**Bachelor Degree in Physics**, University of Rome “La Sapienza”

Summa cum Laude (110/110 e Lode)

*Thesis:* “Exit times in stochastic processes”

*Advisors:* Angelo Vulpiani, Massimo Falcioni

*Defense date:* October 2<sup>nd</sup> 2006

Sept 1998 - Jul 2003

**High School Diploma on Scientific Studies**, Science High School “Gregorio da Catino”

100/100 with honors

## **SCHOOLS ATTENDED**

2015 Odense Winter School on Theoretical Physics, University of Southern Denmark

2013 Prospects In Theoretical Physics, “LHC Physics”, Institute for Advanced Studies (IAS),  
Princeton, NJ, USA

2009 Hadron Collider Physics Summer School, CERN, Geneva, Swiss

2008 Frascati Spring School "Bruno Touschek" in Nuclear, Subnuclear and Astroparticle Physics,  
Frascati (Rome), Italy

## **AWARDS and FELLOWSHIPS**

2019 winner of the selection for a Post-Doctoral position at the University of Pisa for working in  
the project ERC NEO-NAT of Prof. A. Strumia

2017 INFN post-doctoral fellowship for research activity in Theoretical Physics at Padua  
(I won one of the 15 INFN fellowships of the 2017 INFN fellowship program for activity in  
theoretical Physics)

2008-2011 Ph.D. Scholarship, University of Rome “La Sapienza” (obtained as a winner of the  
public competitive examination)

ADISU (Agency for the Right to University Studies) Fellowship for academic merit  
for the academic years 2004/05, 2005/06, 2006/07, 2007/08

2008 ADISU award for the M.Sc

2007 Joint DoE (US Department of Energy)/INFN Fellowship for summer training at Fermilab  
(obtained after a merit-based selection)

2006 ADISU award for the B.Sc

## TEACHING EXPERIENCE

2009-2010

**Teaching assistant** for the course of Physics, degree in Biology, of the University of Rome “La Sapienza” (contract obtained after a merit-based selection)

2018

**“Discussion leader”** (upon CERN invitation) for the CERN-JINR school of High Energy Physics, ESHEP 2018, 20 June-3 July, Maratea, Italy

## PROFESSIONAL ACTIVITY

**Referee** for the Journals:

Physics Letters B, Physical Review D, Annals of Physics, Physical Review Letters

2016 **Organizer of Seminars** at CP3-Origins

2012-2015 **Organizer** of HEP and Journal Club **Seminars** at Michigan State University

2015 **chair** for the BSM I session at the Phenomenology 2015 Symposium (PHENO), Pittsburgh, PA, USA

2014 **chair** for the BSM Higgs II session at PHENO 2014, Pittsburgh

## OUTREACH

Contribution to the outreach program “Quantum Rascals” from CP3-Origins, University of Southern Denmark (<http://www.kvantebanditter.dk/en/about>)

## COLLABORATION IN INTERNATIONAL PROJECTS

Member of the collaboration: **Future Circular Collider (FCC)**.

CERN-ACC-2018-0056 (Vol. 1 Physics opportunities), CERN-ACC- 2018-0057 (Vol. 2 The Lepton Collider), CERN-ACC-2018-0058 (Vol. 3 The Hadron Collider), CERN-ACC-2018-0059 (Vol. 4 The High- Energy LHC)

**Physics at a 100 TeV pp collider: beyond the Standard Model phenomena.**

Physics opportunities in the search and study of physics beyond the Standard Model at a 100 TeV pp collider.

<http://inspirehep.net/record/1467223>

CERN Yellow Report (2017) no.3, 441-634

### **Top Quark Working Group Collaboration.**

Work of the Energy Frontier Top Quark working group of the 2013 Community Summer Study (Snowmass).

<http://inspirehep.net/record/1263763>

SLAC-econf-C130729.2, FERMILAB-CONF-13-648, SLAC-PUB-15960, arXiv:1311.2028

### **LHC Reinterpretation Forum Collaboration**

aimed at improving the reinterpretation of searches and measurements at the LHC in terms of models for new physics

<https://inspirehep.net/record/1785921>

arXiv:2003.07868, SciPost Physics, Vol. 9, issue 2

## **PARTECIPATION IN GRANTS / PROJECTS**

2019 - Participation in the activity of the Pisa theory group (ERC grant NEO-NAT) and INFN Pisa theory group

2017- 2019 Participation in the activity of the INFN Padua theory group

2017- 2019 Participation in the network “elusives: neutrinos, dark matter and dark energy physics”, European ITN project (H2020-MSCA-ITN-2015//674896-ELUSIVES)

2015-2017 Danish National Research Foundation, project DNRF-90, CP3-Origins, University of Southern Denmark

2012-2015 “QCD, Electroweak Symmetry Breaking, and Physics Beyond the Standard Model”, NSF grant PHY-0854889, Michigan State University

2012-2015 “Global QCD Analysis and Electroweak Symmetry Breaking in High Energy Collider Phenomenology”, NSF grant PHY-0855561, Michigan State University

2011-2012 “Investigations in Experimental and Theoretical High Energy Physics”, DOE grant DE-FG02-01ER41155, Iowa State University

2009-2012 association to the INFN Rome 1 group

## **PARTECIPATION IN WORKSHOPS**

2019 Jun “Physics at TeV Colliders”, Les Houches Workshop Series, Les Houces, France

2018 Sept-Oct “Beyond Standard Model: Where do we go from here?”, Galileo Galilei Institute, Firenze, Italy

2018 Jun “The Future of BSM Physics, theoretical MITP program”, Anacapri, Italy

2017 Dec “6th Rome Joint Workshop: Weird Theoretical Ideas”, Frascati National Laboratory, Frascati (RM), Italy

2017 Jan “1st FCC Physics Workshop”, CERN, Geneva, Swiss

2016 Sept “9th International Workshop on Top Quark Physics TOP 2016”, Olomouc, Czech Republic

2016 Apr “Composite Dynamics: from Lattice to the LHC Run II”, Mainz Institute for Theoretical Physics (MITP), Mainz, Germany

2015 Nov “CoDyCE 5, Composite Dynamics and Dark Matter”, Institut de Physique Nucléaire de Lyon (IPNL), Lyon, France

2015 May “Vector-Like Quark (VLQ) Workshop”, Argonne National Laboratory, USA

2009 Oct “Searching for New Physics at the LHC”, Galileo Galilei Institute (GGI), Florence, Italy

2008 Feb “Workshop on Monte Carlo, Physics and Simulations at LHC”, Frascati National Laboratory (LNF), Frascati, Italy

### **Contribution to**

LHCSki 2016 - A First Discussion of 13 TeV Results, Obergurgl, Austria

2015 Mar “Sakata Memorial KMI Workshop on Origin of Mass and Strong Coupling Gauge Theories”, Nagoya, Japan

2013 Community Summer Study: “Snowmass on the Mississippi”, Minneapolis, MN, USA  
on the future program of particle physics in the U.S  
(I was part of the Top Working Group Collaboration )

2012 Dec “KMI-GCOE Workshop on Strong Coupling Gauge Theories in the LHC Perspective”, Nagoya, Japan

2012 Nov “Understanding the TeV Scale Through LHC Data, Dark Matter, and Other Experiments”, GGI, Florence, Italy

### **SELECTED PLENARY INVITED TALKS**

20 May 2019 “[Discovery Prospects of Leptoquarks at the High luminosity LHC](#)”, Origin of Mass 2019 Conference, CP3-Origins SDU, Odense, Denmark

9 Apr 2019 “[Leptoquarks in B-meson anomalies: simplified models and HL-LHC reach](#)”, Incontri

di Fisica delle Alte Energie, Napoli, Italy

6 Mar 2018 “[tt/tb Resonances](#)”, invited theory speaker at “ATLAS Heavy Quark and Top Workshop”, CERN, Geneva, Swiss

19 Jan 2017 “[Composite Resonances](#)”, “1st FCC Physics Workshop”, CERN, Geneva, Swiss

20 Sept 2016 “[Top Signatures From Composite Higgs Theories](#)”, plenary talk at the Young Scientist Forum in the 9th International Workshop on Top Quark Physics TOP 2016, Olomouc, Czech Republic

1 Jun 2016 “[Diphoton Excess From Minimal Composite Dynamics](#)”, “Origin of Mass 2016” Conference, Odense, Denmark

13 Apr 2016 “[Exotics combinations](#)”, invited theoretical speaker at “ATLAS Beyond the Standard Model Higgs and Exotics Joint Workshop”, Laboratoire de physique subatomique et de cosmologie de Grenoble (LPSC), Grenoble, France

8 Apr 2016 “[Topological Terms in Composite Models and their Phenomenology](#)”, Composite Dynamics: from Lattice to the LHC Run II workshop, MITP, Mainz, Germany

27 May 2015 “[Vector-Like Quark Phenomenology Overview](#)”, “VLQ Workshop”, Argonne National Laboratory, USA

26 Jan 2015 “[New strategies for W-prime searches at the LHC](#)”, ATLAS meeting of the Exotics group, CERN

29 Apr 2013 “[Top-partners in Single-EW Production](#)”, ATLAS meeting: 4th generation and top group, CERN

## INVITED SEMINARS

15 July 2020 “[a<sub>τ</sub> in heavy ion collisions at the LHC: modelling and theoretical aspects](#)”, (online) talk at ATLAS meeting for g-2 tau analyses

12 May 2020 “[Constraints on a<sub>τ</sub> from UPC at the LHC](#)”, (online) talk at ATLAS meeting, University of Pisa, Italy

19 Sept 2019 “[Investigating and Revealing New Physics Beyond the SM](#)”, University of Liverpool, Liverpool, Great Britain

14 Sept 2018 “[Searching for Leptoquarks at the High-Luminosity LHC](#)”, Frascati National Laboratories, Frascati, Italy

21 Dec 2017 “[Unveiling BSM strong dynamics at future colliders](#)”, Joint Rome Seminar,



University of Rome “La Sapienza”, Rome, Italy

16 Feb 2017 “[Collider Phenomenology of Composite Higgs Models](#)”, Theory seminar, Laboratoire de physique subatomique et de cosmologie de Grenoble (LPSC), Grenoble, France

23 Apr 2016 “[Collider Phenomenology of Higgs Compositeness](#)”, Theory seminar, Frascati National Laboratory, Frascati (RM), Italy

23 Apr 2015 “[Distinguishing dijet resonances at the LHC](#)”, Theory Seminar, Fermilab, USA

2014 “[BSM strong dynamics at the LHC](#)” HEP Seminar, Michigan State University, East Lansing, USA

2014 “[W-prime search at the LHC](#)”, HEP Seminar, Michigan State University, East Lansing, USA

2013 “[Discriminating Higgs production mechanisms using jet energy profiles](#)”, HEP Seminar, Michigan State University, East Lansing, USA

2012 “[Top Partners at the LHC](#)”, HEP Seminar, Michigan State University, East Lansing, USA

2011 “[Phenomenology of heavy fermion and vector resonances in Composite Higgs Models](#)”, HEP Seminar, Iowa State University, Ames, USA

## OTHER TALKS

2017 “[Revealing BSM Composite Dynamics Through Topological Interactions at Future Colliders](#)”, parallel talk at the “European Physical Society Conference on High Energy Physics (EPS-HEP)”, Venice, Italy

2015 “[Distinguishing dijet resonances at the LHC using jet energy profile](#)”, parallel talk at PHENO 2015, Pittsburgh, USA

2014 “[New W-prime signals at the LHC](#)” parallel talk at PHENO 2014, Pittsburgh, USA

2012 “[Discovering the composite Higgs through the decay of a heavy fermion](#)”, parallel talk at PHENO 2012, Pittsburgh, USA

2011 “[Discovering Heavy Colored Vectors at the LHC](#)”, plenary talk at IFAE 2011, Incontri di Fisica delle Alte Energie, Perugia, Italy

2010 “ [\$b \rightarrow s\gamma\$  in Composite Higgs Models](#)”, parallel talk at Cortona Theoretical Physics Conference, Cortona (AR), Italy

## PUBLICATIONS

23 papers published in international peer-reviewed journals, of which 7 as single author  
10 papers published in conference proceedings  
1 book from the Ph.D. Thesis  
4 reports (including a CERN Yellow Report) of international collaborations

(From database: Inspire-HEP)

Total number of citable papers: **35** (Published only: **22**)

Total number of citations: **1628** (Published only: **1288**)

H-index: **17** (Published only: **16**)

## EXPERIMENTAL SEARCHES PARTLY BASED ON STUDIES OF MINE

*i.e. which have used as a benchmark a model and/or a search strategy suggested in a work of mine*

ATLAS Collaboration, “Search for single production of vector-like quarks decaying into  $Wb$  in  $pp$  collisions at  $\sqrt{s} = 8$  TeV with the ATLAS detector,” arXiv:1602.05606

*and*

ATLAS Collaboration, “Search for pair and single production of new heavy quarks that decay to a  $Z$  boson and a third-generation quark in  $pp$  collisions at  $\sqrt{s}=8$  TeV with the ATLAS detector,” JHEP **1411**, 104 (2014), arXiv:1409.5500 [hep-ex]

*for which I also provided my Monte Carlo implementation of the theoretical model in NV, PRD **86** (2012) 075017 for signal simulations*

CMS Collaboration, “Search for a  $W'$  boson decaying to a vector-like quark and a top or bottom quark in the all-jets final state,”  
CMS-PAS-B2G-18-001, arXiv:1811.07010

*Considered the search channel suggested in NV, Phys. Rev. D**89** (2014) no.9, 095027 and adopted the theoretical description of that study*

ATLAS Collaboration, “Search for the production of single vector-like and excited quarks in the  $Wt$  final state in  $pp$  collisions at  $\sqrt{s} = 8$  TeV with the ATLAS detector,”  
JHEP **1602** (2016) 110, arXiv:1510.02664 [hep-ex]

*for which I also provided my Monte Carlo implementation of the theoretical model in NV, JHEP **1207** (2012) 158*

CMS Collaboration, “Search for heavy resonances decaying to top and vector-like quarks in the all-hadronic channel at  $\sqrt{s}=13$  TeV”, CMS-PAS-B2G-16-013, arXiv:1703.06352

*for which I calculated values of signal cross sections and I provided my Monte Carlo implementation of the theoretical model in Bini, Contino, NV, JHEP 1201 (2012) 157*

CMS Collaboration, “Search for the production of an excited bottom quark decaying to  $tW$  in proton-proton collisions at  $\sqrt{s}=8$  TeV,” JHEP **1601** (2016) 166, arXiv:1509.08141 [hep-ex]

ATLAS Collaboration, “Search for single  $b^*$ -quark production with the ATLAS detector at  $\sqrt{s}=7$  TeV,” Phys. Lett. B **721** (2013) 171-189, arXiv:1301.1583 [hep-ex]

ATLAS Collaboration, “Search for single production of a vector-like quark via a heavy gluon in the  $4b$  final state with the ATLAS detector in pp collisions at  $\sqrt{s}=8$  TeV,” Phys. Lett. B **758**, 249 (2016), arXiv:1602.06034

CMS Collaboration, “Search for single production of vector-like quarks decaying to a  $Z$  boson and a top or a bottom quark in proton-proton collisions at 13 TeV ”  
CMS-PAS-B2G-17-007

*Considered the search channels suggested in Bini, Contino, NV, JHEP 1201 (2012) 157*