

## UNIVERSITA' DEGLI STUDI DI MILANO

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**Maria Archidiacono**

## CURRICULUM VITAE

### INFORMAZIONI PERSONALI

COGNOME: Archidiacono

NOME: Maria

DATA DI NASCITA: 07/09/1984

### KEY RESEARCH AREAS

Neutrino physics	Cosmological constraints on the neutrino mass, neutrino physics beyond the Standard Model (e.g., non-standard neutrino interactions, sterile neutrinos)
Cosmology	Cosmic microwave background, structure formation, galaxy clustering, weak lensing
Dark matter	Particle models of dark matter - dark radiation interactions and the impact on small scale structure

### ACADEMIC POSITIONS

Mar 2019 –	Postdoctoral research fellow INFN-Bologna and Department of Physics and Astronomy, University of Bologna, Italy
Oct 2015 – Sep 2018	Postdoctoral research fellow Institute for Theoretical Particle Physics and Cosmology, RWTH Aachen University, Germany
Jul 13, 2018	Habilitation for professorship in Italian universities 02/C1 (Astronomy and Astrophysics) and 02/A2 (Theoretical Physics)
Nov 2014 – Sep 2015	Postdoctoral research fellow Department of Physics and Astronomy, Aarhus University, Denmark
Nov 2012 – Oct 2014	Marie Curie early stage researcher Initial Training Network "Invisibles" Department of Physics and Astronomy, Aarhus University, Denmark

### EDUCATION

Jan 21, 2013	Ph.D. in Astronomy Defending the thesis "Constraints on Neutrino Physics in light of recent Cosmological Data"
Nov 2009 – Oct 2012	Ph.D. student Department of Physics, University of Rome La Sapienza, Italy
Oct 30, 2009	M.Sc. in Astronomy and Astrophysics 110/110 cum Laude, Department of Physics, University of Rome La Sapienza, Italy
Oct 29, 2007	B.Sc. in Physics and Astrophysics 110/110 cum Laude, Department of Physics, University of Rome La Sapienza, Italy

### RESEARCH EXPERIENCE

Jan – Jun 2011	Visiting researcher Department of Physics and Astronomy, Torino, Italy
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Jun – Sep 2010 Visiting researcher  
Department of Physics and Astronomy, University of California Irvine, US

#### INTERNATIONAL COLLABORATIONS

2012 – present Euclid collaboration member  
Theory Science Working Group  
2017 – present Square Kilometre Array collaboration member

#### INVITED CONFERENCE TALKS

Feb 2019 Concordances and challenges in cosmology after Planck, Sexten Center for Astrophysics, Italy  
Feb 2019 Euclid and beyond: the many faces of modern cosmology, Rome, Italy  
Dec 2018 The quest for new physics, IFIC, Valencia, Spain  
Sep 2018 CASTLE – Cosmological and Astrophysical Synergies: Tactics for the Latest Era, Tagliolo Monferrato, Italy  
Sep 2017 DESY Theory Workshop 2016, DESY, Hamburg, Germany  
Sep 2017 International School of Nuclear Physics, Erice, Italy  
Aug 2017 Self-interacting dark matter workshop, Niels Bohr Institute, Copenhagen, Denmark  
Jul 2017 European Physical Society Conference on High Energy Physics, Venice, Italy  
Jan 2017 CrossTalk Workshop: The Fate of Sterile Neutrinos, VUB, Brussel, Belgium  
Dec 2016 NuPhys 2016, London, UK  
Sep 2016 DESY Theory Workshop 2016, DESY, Hamburg, Germany  
Sep 2016 TeV Particle Astrophysics 2016, CERN, Geneva, Switzerland  
Jul 2015 Invisibles workshop 2015, Madrid, Spain  
Jul 2014 Invisibles workshop 2014, Paris, France  
Jun 2014 Astroparticle physics 2014, a joint TeVPA/IDM conference, Amsterdam, Netherlands  
Aug 2013 Nufact 2013, Beijing, China  
Jul 2013 Invisibles 2013 school, Durham, UK  
Jun 2012 “What is  $\nu$ ?” Invisibles 2012 school, Florence, Italy  
Mar 2012 Invisibles ITN premeeting, Madrid, Spain

#### INVITED DEPARTMENTAL SEMINARS AND COLLOQUIA

Apr 2019 Particle and Astroparticle Theory Seminar, MPIK, Heidelberg, Germany  
Jan 2019 CERN Theory Colloquium, Geneva, Switzerland  
Jan 2019 PRISMA seminar, Johannes Gutenberg University, Mainz, Germany  
Jul 2018 TU Dortmund seminar, Recent Topics of Particle Theory, Germany  
May 2018 SISSA Astroparticle seminar, Trieste, Italy  
Apr 2016 Cosmology seminar, Helsinki University, Finland  
Nov 2015 HEP Theory seminar, Bielefeld University, Germany  
Jun 2015 HEP Theory seminar, RWTH Aachen, Germany  
Apr 2014 SISSA Astroparticle seminar, Trieste, Italy  
May 2013 Cosmology seminar, Institute for Theoretical Physics, Heidelberg, Germany  
Apr 2013 Theory seminar, DESY, Hamburg, Germany  
Apr 2013 Web-seminar, Invisibles Journal Club

#### CONTRIBUTED CONFERENCE TALKS

Apr 2016 “Cosmology after Planck: what is next?”, Les Houches, France

- Dec 2015 Texas symposium on relativistic astrophysics, Geneva, Switzerland
- Sep 2015 TAUP 2015, Topics in Astroparticle and Underground Physics, Torino, Italy
- Jul 2013 Invisible 2013 workshop, Durham, UK (Poster presentation)
- Jul 2013 "New Horizons for Modern Cosmology" school, Varenna, Italy
- Jan 2012 "Essential Cosmology for the Next Generation", Cancun, Mexico (Poster presentation)
- Dec 2010 Conference on elementary particles, astrophysics, and cosmology, Miami, USA  
Awarded with the Scientific Workplace and MuPAD as the best graduate student's talk

#### ATTENDED SCHOOLS AND MEETINGS

- May 2017 Euclid Theory Working Group meeting, Heidelberg, Germany
- Jul 2014 Invisibles school, Gif-Sur-Yvette, France
- Mar 2013 Euclid meeting (Theory Working Group and Cosmological Simulations Working Group), Oxford, UK
- Sep 2011 Azores School on Observational Cosmology, Angra do Heroismo, Portugal
- May 2011 "Neutrinos in Cosmology", Padova, Italy

#### TEACHING

- Apr 2015 – Sep 2018 Teaching assistant  
"Advanced Cosmology: The Perturbed Universe" (M.Sc. in Physics), Department of Physics, RWTH Aachen University  
SS (Summer Semester) 2016, SS 2017, SS 2018
- Oct 2015 – Mar 2017 Teaching assistant  
"Introduction to Theoretical Physics" (B.Sc. in Physics), Department of Physics, RWTH Aachen University  
WS (Winter Semester) 2015/2016, WS 2016/2017
- Dec 2014 Guest lecturer  
Lectures on Dark Energy, "Observational Cosmology" (M.Sc. in Physics), Department of Physics and Astronomy, Aarhus University

#### STUDENT ADVISING

- Oct 2017 – Sep 2018 Samuel Brieden  
Master thesis, (co-mentored with Julien Lesgourgues), Department of Physics, RWTH Aachen University  
Now a PhD student at ICC University of Barcelona
- Oct 2016 – Sep 2017 Sebastian Bohr  
Master thesis, (co-mentored with Julien Lesgourgues), Department of Physics, RWTH Aachen University  
Now a PhD student at University of Iceland
- Oct 2016 – Sep 2017 Tim Sprenger  
Master thesis, (co-mentored with Julien Lesgourgues and Sebastien Clesse), Department of Physics, RWTH Aachen University
- Apr – Sep 2016 Daniel Mann  
Bachelor thesis, (co-mentored with Julien Lesgourgues), Department of Physics, RWTH Aachen University

#### COMPUTER SKILLS

Extensive knowledge of Boltzmann codes CLASS (contributor) and CAMB  
Extensive knowledge of Monte Carlo samplers Monte Python (contributor) and CosmoMC

Programming Languages: Fortran, Matlab, C, Python

## PROFESSIONAL SERVICE

- Journal referee** Reviewer for Astronomy and Astrophysics, Journal of Cosmology and Astroparticle Physics, New Astronomy and European Physical Journal C
- Conference Organisation** Organiser of the session “Small-scale structure beyond SIDM” of the Self-interacting dark matter workshop, Niels Bohr Institute, Copenhagen, August 2017
- Outreach**
- Collaboration with the JCAP editorial office as part of the EU ITN Invisibles secondment at SISSA MediaLab, Trieste, Italy, April 2014
  - Participation in the outreach activities of the EU ITN Invisibles, including two reviews of the “Paper of the month” for the Invisibles website
  - Talk on Neutrinos for the science channel of periscope tv

## PERSONAL SKILLS

**Mother tongue** Italian

**Other languages**

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C2	C1	C2	C2

Levels: A1 and A2: Basic user – B1 and B2: Independent user – C1 and C2: Proficient user  
[Common European Framework of Reference for Languages](#)

## REFERENCES

- Prof. Julien Lesgourgues** Institute for Theoretical Particle Physics and Cosmology, RWTH Aachen University  
 Otto-Blumenthal-Str, 52074 Aachen, Germany  
 Phone number: +49 241 80 25724  
 Email: lesgourg@physik.rwth-aachen.de
- Prof. Steen Hannestad** Department of Physics and Astronomy, Aarhus University  
 Ny Munkegade 120, DK-8000 Aarhus C, Denmark  
 Phone number: +45 87155601  
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- Prof. Olga Mena Requejo** Instituto de Física Corpuscular, Universidad de Valencia, Spain  
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- Prof. Matteo Viel** SISSA  
 via Bonomea 265, Trieste, Italy  
 Phone number: +39 040 3787517  
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- Dr. Carlo Giunti** Department of Theoretical Physics, University of Torino and INFN - Torino  
 via P. Giuria 1, 10125 Torino, Italy  
 Phone number: +39 011 670 7242  
 Email: giunti@to.infn.it
- Prof. Nicolao Fornengo** Department of Theoretical Physics, University of Torino and INFN - Torino  
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 Phone number: +39 011 670 7225  
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## TRACK RECORD

My lines of research focus on the interface between cosmology and particle physics. Since the beginning of my academic career, I have worked on constraining neutrino physics with cosmological data, and on comparing the stringent, but model dependent, cosmological bounds with the results of ground-based experiments. Over the past few years, I have expanded my expertise investigating cosmological scenarios related to particle physics beyond the Standard Model: e.g., non-standard neutrino interactions, axions and particle models of dark matter - dark radiation interactions. I have contributed to the development of the Boltzmann code CLASS, implementing the aforementioned particle models, which represent physically motivated extensions of the standard cosmological model.

As a member of the Euclid collaboration, I am involved in the Theory Science Working Group. Currently, I am working on the implementation in `Monte Python` of mock likelihoods that will contribute to the pipeline for the analysis of future galaxy clustering and cosmic shear data. In the near future, I will have the opportunity to exploit the great accuracy of the Euclid measurements in order to achieve the first detection of a non-zero neutrino mass from cosmology.

I have authored 41 papers (23 first-author). I have presented my research at international conferences (19 invited talks and 7 contributed talks) and at departmental seminars (12 seminars, including the CERN Theory Colloquium on January 23, 2019).

Besides my work as a researcher, I have served as a teaching assistant and guest lecturer for introductory bachelor classes (Introduction to Theoretical Physics) and for advanced master courses (Advanced Cosmology: The Perturbed Universe), receiving very positive feedback from the students. I also had the opportunity to supervise students during their bachelor and master theses.

## PUBLICATIONS

(41 totals, 23 first-author)

## Recent Preprints

A. Spurio Mancini, F. Köhlinger, B. Joachimi, V. Pettorino, B. M. Schäfer, R. Reischke, S. Brieden, **M. Archidiacono**, and J. Lesgourgues. KiDS+GAMA: Constraints on Horndeski gravity from combined large-scale structure probes. 2019

Christian Fidler, Nils Sujata, and **Maria Archidiacono**. Relativistic bias in neutrino cosmologies. 2018

H. Hildebrandt, ... , **M. Archidiacono**, et al. KiDS+VIKING-450: Cosmic shear tomography with optical+infrared data. 2018

## Peer-reviewed published articles

Tim Sprenger, **Maria Archidiacono**, Thejs Brinckmann, Sébastien Clesse, and Julien Lesgourgues. Cosmology in the era of Euclid and the Square Kilometre Array. *JCAP*, 1902:047, 2019

Thejs Brinckmann, Deanna C. Hooper, **Maria Archidiacono**, Julien Lesgourgues, and Tim Sprenger. The promising future of a robust cosmological neutrino mass measurement. *JCAP*, 1901:059, 2019

Sunny Vagnozzi, Thejs Brinckmann, **Maria Archidiacono**, Katherine Freese, Martina Gerbino, Julien Lesgourgues, and Tim Sprenger. Bias due to neutrinos must not uncorrect'd go. *JCAP*, 1809(09):001, 2018

S. Gariazzo, **M. Archidiacono**, P. F. de Salas, O. Mena, C. A. Ternes, and M. Tórtola. Neutrino masses and their ordering: Global Data, Priors and Models. *JCAP*, 1803(03):011, 2018

**Maria Archidiacono**, Sebastian Bohr, Steen Hannestad, Jonas Helboe Jørgensen, and Julien Lesgourgues. Linear scale bounds on dark matter–dark radiation interactions and connection with the small scale crisis of cold dark matter. *JCAP*, 1711(11):010, 2017

**Maria Archidiacono**, Thejs Brinckmann, Julien Lesgourgues, and Vivian Poulin. Physical effects involved in the measurements of neutrino masses with future cosmological data. *JCAP*, 1702(02):052, 2017

**Maria Archidiacono**, Stefano Gariazzo, Carlo Giunti, Steen Hannestad, Rasmus Hansen, Marco Laveder, and Thomas Tram. Pseudoscalar-sterile neutrino interactions: reconciling the cosmos with neutrino oscillations. *JCAP*, 1608(08):067, 2016

- Maria Archidiacono** and Steen Hannestad. Efficient calculation of cosmological neutrino clustering in the non-linear regime. *JCAP*, 1606(06):018, 2016
- Maria Archidiacono**, Steen Hannestad, Rasmus Sloth Hansen, and Thomas Tram. Sterile neutrinos with pseudoscalar self-interactions and cosmology. *Phys. Rev.*, D93(4):045004, 2016
- Maria Archidiacono**, Tobias Basse, Jan Hamann, Steen Hannestad, Georg Raffelt, and Yvonne Y. Y. Wong. Future cosmological sensitivity for hot dark matter axions. *JCAP*, 1505(05):050, 2015
- Maria Archidiacono**, Laura Lopez-Honorez, and Olga Mena. Current constraints on early and stressed dark energy models and future 21 cm perspectives. *Phys. Rev.*, D90(12):123016, 2014
- Maria Archidiacono**, Steen Hannestad, Rasmus Sloth Hansen, and Thomas Tram. Cosmology with self-interacting sterile neutrinos and dark matter - A pseudoscalar model. *Phys. Rev.*, D91(6):065021, 2015
- Maria Archidiacono**, Nicolao Fornengo, Stefano Gariazzo, Carlo Giunti, Steen Hannestad, and Marco Laveder. Light sterile neutrinos after BICEP-2. *JCAP*, 1406:031, 2014
- Maria Archidiacono** and Steen Hannestad. Updated constraints on non-standard neutrino interactions from Planck. *JCAP*, 1407:046, 2014
- Maria Archidiacono**, Steen Hannestad, Alessandro Mirizzi, Georg Raffelt, and Yvonne Y. Y. Wong. Axion hot dark matter bounds after Planck. *JCAP*, 1310:020, 2013
- Maria Archidiacono**, Nicolao Fornengo, Carlo Giunti, Steen Hannestad, and Alessandro Melchiorri. Sterile neutrinos: Cosmology versus short-baseline experiments. *Phys. Rev.*, D87(12):125034, 2013
- Maria Archidiacono**, Elena Giusarma, Alessandro Melchiorri, and Olga Mena. Neutrino and dark radiation properties in light of recent CMB observations. *Phys. Rev.*, D87(10):103519, 2013
- Roberta Diamanti, Elena Giusarma, Olga Mena, **Maria Archidiacono**, and Alessandro Melchiorri. Dark Radiation and interacting scenarios. *Phys. Rev.*, D87(6):063509, 2013
- Maria Archidiacono**, Nicolao Fornengo, Carlo Giunti, and Alessandro Melchiorri. Testing 3+1 and 3+2 neutrino mass models with cosmology and short baseline experiments. *Phys. Rev.*, D86:065028, 2012
- Maria Archidiacono**, Elena Giusarma, Alessandro Melchiorri, and Olga Mena. Dark Radiation in extended cosmological scenarios. *Phys. Rev.*, D86:043509, 2012
- Erminia Calabrese, **Maria Archidiacono**, Alessandro Melchiorri, and Bharat Ratra. The impact of a new median statistics  $H_0$  prior on the evidence for dark radiation. *Phys. Rev.*, D86:043520, 2012
- Eloisa Menegoni, **Maria Archidiacono**, Erminia Calabrese, Silvia Galli, C. J. A. P. Martins, and Alessandro Melchiorri. The Fine Structure Constant and the CMB Damping Scale. *Phys. Rev.*, D85:107301, 2012
- Elena Giusarma, **Maria Archidiacono**, Roland de Putter, Alessandro Melchiorri, and Olga Mena. Sterile neutrino models and nonminimal cosmologies. *Phys. Rev.*, D85:083522, 2012
- Aaron Smith, **Maria Archidiacono**, Asantha Cooray, Francesco De Bernardis, Alessandro Melchiorri, and Joseph Smidt. The Impact of Assuming Flatness in the Determination of Neutrino Properties from Cosmological Data. *Phys. Rev.*, D85:123521, 2012
- Maria Archidiacono**, Erminia Calabrese, and Alessandro Melchiorri. The Case for Dark Radiation. *Phys. Rev.*, D84:123008, 2011
- Maria Archidiacono**, Francesco De Bernardis, Asantha Cooray, Alessandro Melchiorri, Alexandre Amblard, Luca Pagano, and Paolo Serra. Amplitudes of thermal and kinetic Sunyaev-Zel'dovich signals from small-scale CMB anisotropies. *Phys. Rev.*, D85:043015, 2012
- Elena Giusarma, Martina Corsi, **Maria Archidiacono**, Roland de Putter, Alessandro Melchiorri, Olga Mena, and Stefania Pandolfi. Constraints on massive sterile neutrino species from current and future cosmological data. *Phys. Rev.*, D83:115023, 2011
- Maria Archidiacono**, Asantha Cooray, Alessandro Melchiorri, and Stefania Pandolfi. CMB Neutrino Mass Bounds and Reionization. *Phys. Rev.*, D82:087302, 2010

#### Review Articles

**Maria Archidiacono**, Elena Giusarma, Steen Hannestad, and Olga Mena. Cosmic dark radiation and neutrinos. *Adv. High Energy Phys.*, 2013:191047, 2013

#### White Papers

M. Drewes, .. ., **M. Archidiacono**, et al. A White Paper on keV Sterile Neutrino Dark Matter. *JCAP*, 1701(01):025, 2017

#### Conference proceedings

**Maria Archidiacono**, Thejs Brinckmann, Julien Lesgourgues, and Vivian Poulin. Neutrino properties from cosmology. In *Proceedings, Prospects in Neutrino Physics (NuPhys2016): London, UK, December 12-14, 2016*, 2017

Rasmus S. L. Lundkvist, **Maria Archidiacono**, Steen Hannestad, and Thomas Tram. How to make the short baseline sterile neutrino compatible with cosmology. *PoS, ICHEP2016:478*, 2016

**Maria Archidiacono**, Steen Hannestad, Rasmus Sloth Hansen, and Thomas Tram. Secret neutrino interactions: a pseudoscalar model. *J. Phys. Conf. Ser.*, 718(3):032002, 2016

Alessandro Melchiorri, **Maria Archidiacono**, Erminia Calabrese, and Eloisa Menegoni. Constraints on neutrino physics from cosmology. *J. Phys. Conf. Ser.*, 485:012014, 2014

**M. Archidiacono**. Constraints on sterile neutrinos from the latest cosmological data. *Proc. Int. Sch. Phys. Fermi*, 186:237–242, 2014

E. Menegoni, S. Galli, **M. Archidiacono**, E. Calabrese, and A. Melchiorri. Cosmological constraints on variations of the fine structure constant at the epoch of recombination. *J. Phys. Conf. Ser.*, 470:012007, 2013

A. Melchiorri, **M. Archidiacono**, and E. Calabrese. New Constraints on Neutrino Physics from Cosmology. *Nucl. Phys. Proc. Suppl.*, 237-238:13–18, 2013

**M. Archidiacono**, A. Melchiorri, and S. Pandolfi. The impact of reionization modelling on CMB neutrino mass bounds. *Nucl. Phys. Proc. Suppl.*, 217:65–67, 2011

Luogo e Data  
Bologna April 28, 2019