

# Federico Bianchini

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<https://fbianchini.github.io/>

## RESEARCH INTERESTS

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Cosmology: phenomenology and data analysis; Cosmic microwave background; Large-scale structure; Gravitational Lensing; Sunyaev-Zel'dovich effect; Cross-correlations and connections with astrophysics; Cosmological test of fundamental physics; Statistical and computational methods for cosmology

## CURRENT POSITION

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2016-present      **Postdoctoral Fellow**      Advisor: Christian L. Reichardt  
School of Physics, University of Melbourne, Australia

## EDUCATION

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2016    **Ph.D. in Astrophysics**      Supervisor: Carlo Baccigalupi  
Astrophysics Sector, SISSA/ISAS International School for Advanced Studies, Italy  
2012    **Master Degree in Astrophysics**      Supervisor: Alessandro Melchiorri  
Department of Physics, University of Rome "La Sapienza", Italy  
2010    **Bachelor Degree in Physics & Astrophysics**      Supervisor: Alessandro Melchiorri  
Department of Physics, University of Rome "La Sapienza", Italy

## FELLOWSHIPS AND AWARDS

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2018    **Betty Laby ECR Travel Bursary**  
2015    **Erasmus Job Placement Fellowship**  
2014    **International Astronomical Union Symposium 306 Travel Grant**  
2012    **PhD Scholarship in Astrophysics curriculum, SISSA**

## MENTORED STUDENTS

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**The University of Melbourne** (co-supervised with Dr Christian Reichardt)

|                |   |
|----------------|---|
| 2018 – present | Mitchell Dylan De Zylva (MSc candidate) |
| 2018 – 2018    | Bryce Murphy (MSc candidate)            |

2016 – present

Anh Pham Thi Phuong (PhD candidate)

## INSTITUTIONAL RESPONSIBILITIES

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2019 – present      Organizer of the Astrophysics seminar, University of Melbourne, School of Physics, Australia

## PROFESSIONAL ACTIVITIES

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- Member of the **SPT** collaboration 2016 – present
- Member of the **POLARBEAR** collaboration 2016 – present
- Member of the **Simons Observatory** collaboration 2016 – present
- Member of the **EUCLID** collaboration 2015 – present
- Member of the Astronomical Society of Australia (ASA) 2016 – present
- Member of the Italian National Institute for Nuclear Physics (INFN) 2012 – 2016
- Member of the Italian National Institute for Astrophysics (INAF) 2012 – 2016
- Referee for Nature Astronomy (2018 - present), Monthly Notices of Royal Astronomical Society (2015 - present)

## TECHNICAL SKILLS

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- Computer languages: Python, C, Fortran (basics), IDL, scripting languages
- Scientific software: HEALPix, CAMB, CosmoMC, CLASS, emcee, PolSpice, scikit-learn, pandas
- Supercomputing: MPI, OpenMP; clusters used: NERSC (USA), Midway (USA), Spartan (Australia)

## OUTREACH AND SERVICE

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- Talks for year 10 students @ University of Melbourne 2018 - present
- Pint of Science @ Melbourne 2018 - present

## REFERENCES

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- Prof. Carlo Baccigalupi, SISSA/ISAS, email: [bacci@sissa.it](mailto:bacci@sissa.it)
- Dr. Christian Reichardt, University of Melbourne, email: [christian.reichardt@unimelb.edu.au](mailto:christian.reichardt@unimelb.edu.au)
- Prof. John Carlstrom, University of Chicago, email: [jc@astro.uchicago.edu](mailto:jc@astro.uchicago.edu)
- Prof. Alessandra Silvestri, Leiden University, email: [silvestri@lorentz.leidenuniv.nl](mailto:silvestri@lorentz.leidenuniv.nl)

## PRESENTATIONS AT SCIENTIFIC CONFERENCES

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Inv. = invited talk; \* = Talk; Pos = Poster; Sem = seminar

- Sem. Aug 2019, UC Los Angeles, USA – ‘*Distortions in the Cosmic Microwave Background*’
- Sem. Aug 2019, CCA, Flatiron Institute, USA – ‘*Distortions in the Cosmic Microwave Background*’
- \* July 2019, ASA2019, Brisbane, Australia – ‘*A new CMB lensing measurement from 500 square degrees of SPTpol data*’
- Sem. April 2019, University of Sussex, UK – ‘*Distortions in the Cosmic Microwave Background*’
- Sem. April 2019, SISSA/ISAS, Italy – ‘*Distortions in the Cosmic Microwave Background*’
- Sem. April 2019, Padua Observatory, Italy – ‘*Distortions in the Cosmic Microwave Background*’
- Inv. July 2018, LSS2LSS, Paris Orsay, France – ‘*Measuring peculiar velocities (and more) with the Cosmic Microwave Background*’
- \* July 2017, ASA2017, Canberra, Australia – ‘*A new CMB lensing measurement from 500 square degrees of SPTpol data*’
- Sem. Apr 2017, University of Melbourne, Melbourne, Australia – ‘*Cross-correlations in the high-redshift sky: the Planck and Herschel case*’
- Sem. Nov 2016, Swinburne University of Technology, Melbourne, Australia – ‘*Cross-correlations in the high-redshift sky: the Planck and Herschel case*’
- Sem. Jan 2016, UC Irvine, US, - ‘*Investigating the Universe with Cosmic Microwave Background-Large Scale structure interactions*’
- \* Jan 2016, Statistical sampling and non-sampling methods in cosmology, Berkeley, US – ‘*Towards a tomographic analysis of Planck CMB lensing-Herschel cross-correlation*’
- \* Dec 2015, CMBXC Meeting Italia, Bologna, Italy – ‘*Methods and algorithms for CMB-LSS cross-correlations*’
- \* Sep 2015, Science with LSS and CMB cross-correlations, Merate, Italy – ‘*Towards a tomographic analysis of Planck CMB lensing-Herschel cross-correlation*’
- \* Jul 2015, 14<sup>th</sup> Marcel Grossmann Meeting, Rome, Italy – ‘*Cross-correlations in the high-redshift sky: the Planck and Herschel case*’
- Sem. Imperial Centre for Inference and Cosmology, Imperial College London, UK – ‘*Cross-correlations in the high-redshift sky: the Planck and Herschel case*’
- \* Euclid Consortium Meeting 2015, EPFL, Lausanne, Switzerland – ‘*Cross-correlations in the high-redshift sky: the Planck and Herschel case*’

- Inv. Jun 2015, ASTRO@TS 2015, Trieste, Italy - – ‘*Cross-correlations in the high-redshift sky: the Planck and Herschel case*’
- Sem. Instituut-Lorentz for theoretical physics, Leiden, Netherlands – ‘*Cross-correlations in the high-redshift sky: the Planck and Herschel case*’
- Pos. Dec 2014, PLANCK2014, Ferrara, Italy – ‘*Cross-correlating Planck CMB Lensing with high- $z$  sub-mm H-ATLAS galaxies*’
- \* Jun 2014, Cross-correlation in the high-redshift sky, London, UK - ‘*Cross-correlations in the high-redshift sky: the Planck and Herschel case*’
- \* May 2014, Statistical Challenges in 21<sup>st</sup> century cosmology, Lisbon, Portugal – ‘*Cross-correlations between cosmological and astrophysical data sets*’

## LIST OF PUBLICATIONS

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32 papers, 23 published, 9 submitted, 5 white papers/conference proceedings, 380+ citations of published papers, according to [Inspire](#)

### i) Publications as Lead Author or with Substantial Contribution

11. “*Constraints on Cosmological Parameters from the 500 deg<sup>2</sup> SPTpol Lensing Power Spectrum*”  
**F. Bianchini**, W.L.K. Wu, ... et al. [71 authors]  
Submitted to The Astrophysical Journal, Astro-ph:1910.07157 (2019)
10. “*Cross-correlation of POLARBEAR CMB Polarization Lensing with High- $z$  Sub-mm Herschel-ATLAS galaxies*”  
M. Aguilar Faúndez, ..., **F. Bianchini**, ... et al. [48 authors – I am the corresponding author]  
The Astrophysical Journal 886 (2019) 1
9. “*Broadband spectral energy distributions of SDSS-selected quasars and of their host galaxies: intense activity at the onset of AGN feedback*”  
**F. Bianchini**, G. Fabbian, A.Lapi, J. Gonzalez-Nuevo, R. Gilli, C. Baccigalupi  
The Astrophysical Journal 871 (2019) 136
8. “*Pancakes and fingers in the sky*”  
**F. Bianchini**  
Nature Astronomy 2 (2018) 942-943
7. “*Imprints of gravitational lensing in the Planck cosmic microwave background data at the location of WISE $\times$ SCOS galaxies*”  
S. Raghunathan, **F. Bianchini**, C. L. Reichardt  
Physical Review D 98 (2018) 4, 043506

6. “*Constraining gravity at large scales with the 2MASS Photometric Redshift catalogue and Planck lensing*”  
**F. Bianchini** & C. L. Reichardt  
 The Astrophysical Journal 862 (2018) 81
  
5. “*Where is Population II?*”  
 J. Mould, **F. Bianchini**, D. Forbes, C. L. Reichardt  
 Publications of the Astronomical Society of Australia 35 (2018) e016
  
4. “*Needlet estimation of cross-correlation between CMB lensing maps and LSS experiments*”  
**F. Bianchini**, A. Renzi, D. Marinucci  
 Journal of Cosmology and Astroparticle Physics 1611 (2016) 11, 050
  
3. “*Toward a tomographic analysis of the cross-correlation between Planck CMB lensing and H-ATLAS galaxies*”  
**F. Bianchini**, A. Lapi, M. Calabrese, P. Bielewicz, J. Gonzalez-Nuevo, C. Baccigalupi, L. Danese, G. de Zotti, N. Bourne, A. Cooray, L. Dunne, S. Eales, E. Valiante  
 The Astrophysical Journal 825 (2016) 1, 24
  
2. “*The kinetic Sunyaev-Zel’dovich effect in modified gravity*”  
**F. Bianchini** & A. Silvestri  
 Physical Review D 93 (2016) 06, 064026
  
1. “*Cross-correlation between the CMB lensing potential measured by Planck and high- $z$  sub-mm galaxies detected by the Herschel-ATLAS survey*”  
**F. Bianchini**, P. Bielewicz, A. Lapi, J. Gonzalez-Nuevo, C. Baccigalupi, G. de Zotti, L. Danese, N. Bourne, A. Cooray, L. Dunne, R. Ivison, S. Maddox, M. Negrello, E. Valiante, M.W.L. Smith, D. Scott, S. Eales, S. Dye  
 The Astrophysical Journal 802 (2015) 1, 64

## ii) Collaborative papers with some contribution

21. “*Measurement of the Cosmic Microwave Background Polarization Lensing Power Spectrum from Two Years of POLARBEAR Data*”  
 M. Aguilar Faúndez, ..., **F. Bianchini**, ... et al. [51 authors]  
 Submitted to The Astrophysical Journal, Astro-ph:1911.10980 (2019)
  
20. “*Measurements of B-mode Polarization of the Cosmic Microwave Background from 500 Square Degrees of SPTpol Data*”  
 J.T. Sayre, ..., **F. Bianchini**, ... et al. [65 authors]  
 Submitted to The Astrophysical Journal, Astro-ph:1910.05748 (2019)
  
19. “*The SPTpol Extended Cluster Survey*”  
 L.E. Bleem, ..., **F. Bianchini**, ... et al. [138 authors]  
 Submitted to The Astrophysical Journal, Astro-ph:1910.04121 (2019)

18. “A Measurement of the Degree Scale CMB B-mode Angular Power Spectrum with POLARBEAR”  
S. Adachi, ..., **F. Bianchini**, ... et al. [72 authors]  
Submitted to The Astrophysical Journal, Astro-ph:1910.02608 (2019)
17. “Internal delensing of cosmic microwave background polarization B-modes with the POLARBEAR experiment”  
S. Adachi, ..., **F. Bianchini**, ... et al. [53 authors]  
Submitted to Physical Review Letter, Astro-ph:1909.13832 (2019)
16. “Galaxy Clusters Selected via the Sunyaev-Zel'dovich Effect in the SPTpol 100-Square-Degree Survey”  
N. Huang, ..., **F. Bianchini**, ... et al. [76 authors]  
Submitted to The Astrophysical Journal, Astro-ph:1907.09621 (2019)
15. “Fractional Polarisation of Extragalactic Sources in the 500-square-degree SPTpol Survey”  
N. Gupta, ..., **F. Bianchini**, ... et al. [80 authors]  
Accepted by the Monthly Notices of Royal Astronomical Society, Astro-ph:1907.02156 (2019)
14. “A Detection of CMB-Cluster Lensing using Polarization Data from SPTpol”  
S. Raghunathan, ..., **F. Bianchini**, ... et al. [129 authors]  
Physical Review Letter 123 (2019) 18, 181301
13. “A Measurement of the Cosmic Microwave Background Lensing Potential and Power Spectrum from 500 deg<sup>2</sup> of SPTpol Temperature and Polarization Data”  
W.L.K. Wu, ..., **F. Bianchini**, ... et al. [71 authors]  
The Astrophysical Journal 884 (2019) 1, 70
12. “Constraining Radio Mode Feedback in Galaxy Clusters with the Cluster Radio AGN Properties to  $z \sim 1$ ”  
N. Gupta, ..., **F. Bianchini**, ... et al. [62 authors]  
Submitted to Monthly Notices of Royal Astronomical Society, Astro-ph: 1906.11388 (2019)
11. “The POLARBEAR Fourier Transform Spectrometer Calibrator and Spectroscopic Characterization of the POLARBEAR Instrument”  
F. Matsuda, ..., **F. Bianchini**, ... et al. [28 authors]  
Astro-ph:1904.02901 (2019)
10. “Evidence for the Cross-correlation between Cosmic Microwave Background Polarization Lensing from POLARBEAR and Cosmic Shear from Subaru Hyper Suprime-Cam”  
T. Namikawa, ..., **F. Bianchini**, ... et al. [73 authors]  
The Astrophysical Journal 882 (2019) 1, 62

9. “*QSOs acting as gravitational lenses: halo mass and projected mass density profile at  $z \sim 0.7$* ”  
L. Bonavera, J. González-Nuevo, S. L. Suárez Gómez, A. Lapi, **F. Bianchini**, M. Negrello,  
E. Díez Alonso, J. D. Santos, F. J. de Cos Juez  
Journal of Cosmology and Astroparticle Physics 1708 (2017) 9, 21
8. “*The Simons Observatory: Science goals and forecasts*”  
J. Aguirre, ..., **F. Bianchini**, ... et al. [249 authors]  
Journal of Cosmology and Astroparticle Physics 1902 (2019) 056
7. “*Mass Calibration of Optically Selected DES clusters using a Measurement of CMB-Cluster Lensing with SPTpol Data*”  
S. Raghunathan, ..., **F. Bianchini**, ... et al. [131 authors]  
The Astrophysical Journal 872 (2019) 2, 170
6. “*Dark Energy Survey Year 1 Results: tomographic cross-correlations between DES galaxies and CMB lensing from SPT+Planck*”  
Y. Omori, ..., **F. Bianchini**, ... et al. [137 authors]  
Physical Review D 100 (2019) 4, 043501
5. “*Dark Energy Survey Year 1 Results: Joint Analysis of Galaxy Clustering, Galaxy Lensing, and CMB Lensing Two-point Functions*”  
T. Abbott, ..., **F. Bianchini**, ... et al. [164 authors]  
Physical Review D 100 (2019) 2, 023541
4. “*Measurements of tropospheric ice clouds with a ground-based CMB polarization experiment, POLARBEAR*”  
S. Takakura, ..., **F. Bianchini**, ... et al. [48 authors]  
The Astrophysical Journal 870 (2019) 102
3. “*The POLARBEAR-2 and Simons Array Focal Plane Fabrication Status*”  
B. Westbrook, ..., **F. Bianchini**, ... et al. [93 authors]  
Journal of Low Temperature Physics, 193 (2018) 5-6, 758-770
2. “*Measuring galaxy cluster masses with CMB lensing using a Maximum Likelihood estimator: Statistical and systematic error budgets for future experiments*”  
S. Raghunathan, S. Patil, E. J. Baxter, **F. Bianchini**, L. E. Bleem, T. M. Crawford, G. P. Holder, A. Manzotti, C. L. Reichardt  
Journal of Cosmology and Astroparticle Physics 1708 (2017) 08, 30
1. “*A Measurement of the Cosmic Microwave Background BB-Mode Polarization Power Spectrum at Sub-Degree Scales from 2 years of POLARBEAR Data*”  
P.A.R. Ade, M. Aguilar, Y. Akiba, ..., **F. Bianchini**, ... et al. [81 authors]  
The Astrophysical Journal 842 (2017) 2, 121

### iii) Conference proceedings / White papers

5. *“The Simons Observatory: Astro2020 Decadal Project Whitepaper”*  
M.H. Abitbol, ..., **F. Bianchini**, ... et al. [281 authors]  
Bull. Am. Astron. Soc. 51 (2019) 147, Astro-ph:1907.08284
4. *“Dark Energy and Modified Gravity”*  
A. Slošar, ..., **F. Bianchini**, ... et al. [203 authors]  
Astro-ph:1903.12016 (2019)
3. *“Electrical characterization and tuning of the integrated POLARBEAR-2a focal plane and readout”*  
C. Barron, ..., **F. Bianchini**, ... et al. [103 authors]  
Proc.SPIE Int.Soc.Opt.Eng. 10708 (2018) 1070808
2. *“Cross-correlation between cosmological and astrophysical datasets: the Planck and Herschel case”*  
**F. Bianchini**, A. Lapi  
SCCC21/IAU306 (2014)
1. *“H-ATLAS High- $z$  Sources: An Optimal Sample for Cross-Correlation Analysis”*  
J. Gonzalez-Nuevo, A. Lapi, **F. Bianchini**,  
49th Rencontres de Moriond: Cosmology, La Thuile, Italy, 22 - 29 Mar 2014, pp.121-126,  
(2014)