Giuseppe Puglisi, PhD
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CONTACT INFORMATION

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RESEARCH INTERESTS

Cosmic Microwave Background
Data-analysis for CMB polarization. Map-making techniques, simulation of systematics , Galactic foreground separation, estimation of cosmological parameters.
Large Scale Structures
Dark Energy equation of state, Neutrino Anomalies
Modelling Galactic and Extragalactic Emission Modelling the polarized emission coming from synchrotron, thermal dust, molecular line processes contaminating the CMB signal at large angular scales. Polarized Radio emission from Active Galactic Nuclei.
Developer of public packages

- Python Inpainter for Cosmological and AStrophysical SOurces (PICASSO)
- Time Ordered Astrophysics Scalable Tools (TOAST and TOAST-Litebird)
- Point Source ForeCast (PS4C)
- COSmic Microwave linear Operator for MAP-making (COSMOMAP)
- Monte-Carlo MOlecular Line Emission 3D (MCMOLE3D)

ACADEMIC APPOINTMENTS

Postdoctoral Fellowship at University of California - Berkeley Berkeley Center for Cosmological Physics BCCP

- Period: January 2020- December 2022
- Referee: Dr. Julian Borrill
- Focus: Data Analysis for future space satellite CMB polarization experiment

RESEARCH EXPERIENCES

Postdoctoral Fellowship
Kavli Institute of Particle Astrophysics and Cosmology (KIPAC) Stanford University

- Period: January 2018- December 2019
- Referee: Prof. Chao-Lin Kuo
- Focus: Systematics simulations for CMB polarization experiment

PhD in Astrophysics
International School for Advanced Studies - SISSA Trieste

- Period:November, 2013 - October, 2017
- Title:*B-mode Polarization Experiments for the Cosmic Microwave Background: Map-making and Foreground Modeling*
- Advisors: Prof. Carlo Baccigalupi (SISSA), Dr. Giulio Fabbian (IAP-Paris)
- Opponents: Prof. Paolo Natoli, Dr. Ingunn Wehus

Master's Degree in High Performance Computing - Research Project
Period: May 2015 - December,16th 2016
Institutions: SISSA, ICTP
Title: *Accelerating CMB Maps production with Deflation Preconditioners*
Advisors: Dr. Luca Heltai, Prof. Carlo Baccigalupi, Dr. Giulio Fabbian (SISSA)

SCHOLARSHIPS AND AWARDS

Dean "Erasmus Traineeship Training PhD Students"
(June 2016-September 2016) AstroParticule et Cosmology (APC), Paris
Research field: Data-analysis for ground based CMB experiments
Focus: Noise estimation and mapmaking for Polarbear experiment
Supervisor: Dr. Radek Stompor

Undergrad scholarship

Period: July 2013-November 2013
Institutions: International School for Advanced Studies (SISSA),Trieste
Research field: Forecast of polarized Galactic emission and parametric component separation for sub-orbital CMB experiments.
Supervisor: Prof. Carlo Baccigalupi

REFEREED JOURNAL PUBLICATIONS

[1] Sugai, H., Ade, P.A.R., Akiba, Y. et al. (2020). *Updated Design of the CMB Polarization Experiment Satellite LiteBIRD* , Journal of Low Temperature Physics, 2001.01724

[2] Matsuda, F. and The POLARBEAR Collarboration, (2019).*The POLARBEAR Fourier transform spectrometer calibrator and spectroscopic characterization of the POLARBEAR instrument* ,
Review of Scientific Instruments 10.1063/1.5095160

[3] The Simons Observatory Collaboration (2019). *The Simons Observatory: science goals and forecasts*, JCAP, 10.1088/1475-7516/2019/02/056

[4] T. Namikawa, Y. Chinone, H. Miyatake, M. Oguri, R. Takahashi, A. Kusaka et al. (2019) .*Evidence for the Cross-correlation between Cosmic Microwave Background Polarization Lensing from Polarbear and Cosmic Shear from Subaru Hyper Suprime-Cam*, JCAP 10.3847/1538-4357/ab3424

[5] The POLARBEAR Collarboration, (2019).*Cross-correlation of CMB Polarization Lensing with High-z Submillimeter Herschel-ATLAS Galaxies*,
ApJ 10.3847/1538-4357/ab4a78

[6] Galluzzi, V. , **Puglisi, G.** , Burkutean S., Liuzzo E., et al. (2019) *ALMA Band 3 polarimetric follow-up of a complete sample of faint PACO sources*. MNRAS,10.1093/mnras/stz1930

[7] Takakura, S., Aguilar, M., Akiba, Y., Arnold, K., Baccigalupi, C., et al., (2018). *Measurements of tropospheric ice clouds with a ground-based CMB polarization experiment*, POLARBEAR. ApJ,10.3847/1538-4357/aaf381

[8] **Puglisi, G.**,Poletti, D., Fabbian, G., Baccigalupi,C., Heltai, L. and Stompor, R., (2018). *Iterative map-making with two-level preconditioning for polarized Cosmic Microwave Background data sets*. Astronomy and Astrophysics, doi:10.1051/0004-6361/201832710

[9] **G. Puglisi**,V. Galluzzi, M. Massardi, F. Perrotta, A. Lapi, L. Danese, C. Baccigalupi, (2018). *Forecasting the Contribution of Polarized Extragalactic Radio Sources in CMB Observations*, doi:10.3847/1538-4357/aab3c7 eprint arXiv:1712.09639

[10] The POLARBEAR Collaboration, (2017). *A Measurement of the Cosmic Microwave Background BB-Mode Polarization Power Spectrum at Sub-Degree Scales from 2 years of POLARBEAR Data*, ApJ , 10.3847/1538-4357/aa8e9f

[11] **Puglisi, G.**, Fabbian, G., Baccigalupi, C., (2017). *A 3D model for carbon monoxide molecular line emission as a potential cosmic microwave background polarization contaminant*, MNRAS, 10.1093/mnras/stx1029

[12] Takakura, S., Aguilar, M., Akiba, Y., Arnold, K., Baccigalupi, C., et al., (2017). *Performance of a continuously rotating half-wave plate on the POLARBEAR telescope*, JCAP ,10.1088/1475-7516/2017/05/008

[13] Poletti, D., Fabbian, G., Jeune, M. Le, Peloton, J., Arnold, K., Baccigalupi, C., et al., (2016). *Making maps of Cosmic Microwave Background polarization for B-mode studies: the POLARBEAR example*. Astronomy and Astrophysics, 10.1051/0004-6361/201629467

[14] Suzuki, A., Ade, P., Akiba, Y., Aleman, C., Arnold, K., Baccigalupi, C., et al., (2016). *The Polarbear-2 and the Simons Array Experiments. Journal of Low Temperature Physics*. 10.1007/s10909-015-1425-4

[15] The POLARBEAR Collaboration (2015). *POLARBEAR constraints on cosmic birefringence and primordial magnetic fields*. Physical Review D, 10.1103/92.123509.

[16] Errard, J. and the Polarbear Collaboration (2015). *Modelling atmospheric emission for CMB ground-based observations*. ApJ, 10.1088/0004-637X/809/1/63

Submitted Publications

[17] **Puglisi, G.** and Bai, X.(2020). *Inpainting Galactic Foreground Intensity and Polarization maps using Convolutional Neural Networks*, submitted to ApJ

[18] The POLARBEAR Collarboration, (2019). *Internal delensing of cosmic microwave background polarization B-modes with the POLARBEAR experiment*, Physics Review Letters 1909.13832v1

[19] S. Hanany, M. Alvarez, E. Artis, P. Ashton, J. Aumont, R. Aurlien, et al. (2019). *PICO: Probe of inflation and cosmic origins*, 1902.10541

[20] The POLARBEAR Collaboration, (2019). *A Measurement of the Degree Scale CMB B-mode Angular Power Spectrum with POLARBEAR*, 1910.02608

Mentoring and Teaching

Summer Project

- Xiran Bai (University of Michigan)
  Period: May -October 2018
  Focus: Deep Learning methodologies for CMB data analysis

Co-advisor of Master Thesis

- Li Yang and Li Siyu (Beijing University), in collaboration with prof. Jun-Qing Xia (Beijing University-IHEP) and prof. Carlo Baccigalupi (SISSA)
  Period: September-October 2015
  Focus: Atmospheric forecasts for the Ali Station (Tibet) proposal to observe CMB polarization B-modes.
- Alberto Annoni (Univ. Milan), in collaboration with prof. Carlo Baccigalupi, Dr. Giulio Fabbian (SISSA), prof. Aniello Mennella and Dr. Nicoletta Krachmalnicoff (Univ. Milan)
  Period: July 2015 - April 2016
  Focus: Cross-Correlation of Thermal Dust and Synchrotron polarization maps.

Professional Activities

- Litebird Instrument Model design Co-Leader, 2019-present
- Litebird Simulation pipeline member , 2019-present
- Member of Foreground and Systematics Litebird Joint Study Groups, 2018-present
- Referee fpr *Monthly Notices of the Royal Astronomical Society*, 2018 -present
- Referee for *Astronomy & Astrophysics* , 2019 - present
- Simons Observatory Galactic Science Foreground and Data -Analysis working groups, 2017-present
- Member of Polarbear and Simons Array Collaboration, 2014-present
- Organizer of KIPAC Postdoc workshops and Astro-ph discussion, 2018-2019
- Organizer, Sissa weekly Cosmology discussion, 2015-2017

Education

Course in Convolutional Neural Networks - Coursera
Certification Date Oct 2018, License 48PYEMPR4XB8

Course in Machine Learning - Stanford University
Certification Date Sept 2018, License P3Q2PH3MYC2U

Master in High Performance Computing SISSA - ICTP
http://www.mhpc.it
Period: September 2014- May 2015
Thesis Defense: December, 16th 2016

MSC in Physics, curriculum of Astrophysics,("Laurea Magistrale") , 110/110
Universitá degli Studi di Milano
Final GPA: **28.85/30** with 2 special mentions
18th October 2010 - 16th April 2013

Bachelor in Physics, curriculum of General Physics, 110/110 cum laude
Universitá degli studi di Catania
Final GPA: **28.8/30** with 4 special mentions
10th October 2007 - 18th November 2010

Musical Studies Degree for Clarinet, Final Score: 8/10
2003 - 2010 Istituto Musicale "V. Bellini" di Catania

Conference and Invited Talks

- Poster, Making maps with Deflation preconditioner, CMB-Stage 4 meeting, March 2019, Fermilab Chicago
- Poster, Mitigating Gain Systematics, Litebird Collaboration Meeting, January 2019, ASI Rome
- Talk, B-mode forecasts from extra-galactic point sources, In: *CMB foreground B-mode studies* , October 2018, Tenerife
- Invited Talk, Building 3D Galactic models, In: *ASI Cosmos- Conference* , April 18, 2018, SISSA Trieste
- Talk, B-mode forecasts from extra-galactic radio sources, , *ASI Cosmos- Conference* , April 2018, SISSA Trieste
- Talk, Challenges in CMB B-mode data analysis: what's next?, ,March 2018, KIPAC Stanford
- Talk, A 3D model for CO molecular line emission, *AstroTS Conference*, September 2017, SISSA Trieste
- Talk, Assessing Point Source emission in Polarbear 2nd season maps, Simons Array meeting, June 2017, Berkeley
- Talk, Modeling CO line emission, Simons Observatory meeting , October 2016, Princeton
- Invited Talk, CMB B-mode Polarization Experiments and Galactic Foreground Modelling, *University of Bologna , Astrophysics Dept., Istituto di Fisica Cosmica (IASF) and Istituto di Radio Astronomia (IRA)*, October 2017

Conferences and Schools

- *New challenges in Cosmic Microwave Background studies*
  30 March 2016, Italian CMB-day workshop, Italian Space Agency (ASI) Rome
- *Workshop on High Performance Computing*,
  24-26 February 2016, SISSA - Trieste
- *First ICTP Advanced School on Cosmology*,
  18-29 May 2015, ICTP - Trieste
- *PhD School of Astrophysics Francesco Lucchin*,
  15-20 September 2013, Gaeta - Italy

- *New Light in Cosmology from the CMB* School & Workshop
  22th July - 2nd August 2013, ICTP - Trieste

LANGUAGES

Italian **Native**
English **Fluent**
French **Good**
Spanish **Good**

COMPUTER SKILLS AND COMPETENCES

- **Programming Languages**: C, C++, Fortran, Python, parallel computing (`OpenMP`, `OpenMPI`, etc...), Mathematica, IDL, Bash scripting
- **Operating systems**: LINUX, Macintosh, Windows
- **Productivity applications**: Installation of Scientific libraries, TEX, Gnuplot, GIT

EDUCATIONAL OUTREACH

- Talk at KIPAC Open house, May, 5 2018, "The echo of Big Bang"
- 2013-2016 I have actively participated in a plethora of outreach activities organized in SISSA: **SISSA for Schools** (monthly meetings with students in primary schools), **SISSA High-School** Open-Days, **Trieste-Next**, **Science Picnic** (organized by ICTP and SISSA), **SISSA in Festa** (outreach event open to all the people in Trieste)
- December, 16th 2015: I participated at a Radio transmission at RadioCapodistria (Koper, Slovenia): *"The echo of Big Bang"*
- November,9th-13th 2015: JCOM Masterclasses training course, "Communicating your own research to many audiences".
- April, 19th 2015, "Quando la passione per la verita' conta piu della competizione" Chairman of a public meeting with prof. Carlo Baccigalupi, Dr. Giulio Fabbian (SISSA) and prof. Giovanni Comelli (Univ. of Trieste) organized by the *TriesteIncontra* association.
- 2011-2012: Introductory Astronomy lectures to high school classes *Liceo Scientifico Galileo Galilei* and *Istituto Sant'Orsola* Catania
- 2010-now: Member of the *Euresis Association* for the promotion of scientific endeavour. I contributed to the preparation of scientific outreach exhibition (*" Is the atom really invisible? Questions and certainties in science"*) presented at the Rimini Meeting 2011, a one-week cultural event visited by more 800.000 people every year.
- 2010-2013: Tutoring session for undergraduate students (Mathematics and Physics) in Camplus Residences

COMMUNITY SERVICES AND VOLUNTEER JOBS

- 2014-2016: Student representative of the SISSA phD courses in the council for Research Fundings of Friuli-Venezia-Giulia region
- 2014-2016: Elected member of the SISSA student council as representative of the Astrophysics Sector
- Since 2004 Volunteer at *Colletta Alimentare* an yearly appointment organized by the Banco Alimentare Foundation which provide to redistribute food to needy families in Italy
- 2008-2010: Elected member, as student representative in the Physics Coordination Committee of the University of Catania ("Consiglio di Coordinamento Didattico")

- 2007-2012: Volunteer at the centers for disabled support *ODA (Catania)* and *Inst. Sacra Famiglia Cesano Boscone (Milan)*.