PERSONAL DETAILS

Family name, First name: **Masi, Silvia**

ORCID: 0000-0001-5105-1439

Date of birth:

Nationality: Italian

URL for web site: https://orcid.org/0000-0001-5105-1439

- **Education and key qualifications**

1984-11-02 to 1987-11-27: Ph.D. in Physics

Measurements of CMB anisotropy from Antarctica;
Balloon-borne Measurements of Cosmic Microwave Background Anisotropy;
Bolometric Detectors

1978-10-10 to 1982-12-12: Laurea (Master) degree in Physics

Balloon-borne Measurements of Cosmic Microwave Background anisotropy;
Cryogenics;
Low noise electronics;
Bolometric detectors

- **Current position**

2024-current: Full professor, Physics Department, University of Rome La Sapienza, Italy (since 2024).

Chair of Electromagnetism Laboratory.

- **Previous positions**

2012-2024 Associate Professor

Sciences/Physics, University of Rome La Sapienza/ Italy

1991-2012 Researcher

Sciences/Physics, University of Rome La Sapienza/ Italy

1989 to 1991 Graduated Technical Officier

Sciences/Physics, University of Rome La Sapienza/ Italy

RESEARCH ACHIEVEMENTS AND PEER RECOGNITION

Research achievements

Author or co-author of 694 papers (390 refereed). >71400 citations. H index 111 (ADS, sept. 2025).

Selected papers:

1. Masi, S., et al., *Foregrounds Removal and CMB Fluctuations in a Multiband Anisotropy Experiment: ARGO 1993*, ApJL, 463, L47, (1996)
2. Masi, S., et al., *ARGO 1993 Observations of Interstellar Dust Emission*, ApJ, 452, 253, (1995)
3. Masi, S., et al., *A self-contained 3He refrigerator suitable for long duration balloon experiments*, Cryogenics, 38, 319 (1998)
4. Masi, S., et al., *A long duration cryostat suitable for balloon borne photometry*, Cryogenics, 39, 217 (1999)
5. de Bernardis, P., ... Masi, S.,... et al., *A flat universe from high-resolution maps of the cosmic microwave background radiation*, Nature, 404, 955 (2000)

6. Masi, S., et al., *High-Latitude Galactic Dust Emission in the BOOMERANG Maps*, ApJL, 553, L93, (2001)
7. Masi, S., et al., *Instrument, method, brightness, and polarization maps from the 2003 flight of BOOMERanG*, A&A, 458, 687, (2006)
8. Masi, S. et al., *On the effect of cosmic rays in bolometric cosmic microwave background measurements from the stratosphere*, Astronomy and Astrophysics, 519, A24, (2010)
9. Mangilli, A., ... Masi, S., .. et al., *The geometry of the magnetic field in the central molecular zone measured by PILOT*, A&A, 630, A74 (2019)
10. Masi, S., et al., *Kinetic Inductance Detectors for the OLIMPO experiment: in-flight operation and performance*, JCAP, 2019(7):003 (2019)
11. Coppolecchia, A., .. Masi, S., ... et al., *The long duration cryogenic system of the OLIMPO balloon-borne experiment: Design and in-flight performance*, Cryogenics, 110, 103129 (2020)
12. The LSPE collaboration, ... Masi, S., ... et al., *The large scale polarization explorer (LSPE) for CMB measurements: performance forecast*, JCAP, 2021(8):008 (2021)
13. Masi, S. et al., *The Crab Nebula as a Calibrator for Wide-beam Cosmic Microwave Background Polarization Surveys*, Ap.J., 921, 34 (2021)
14. Masi, S. et al., *QUBIC V: Cryogenic system design and performance*, JCAP, 2022(4):038 (2022)
15. LiteBIRD collaboration, ... Masi, S. ... et al., *Probing Cosmic Inflation with the LiteBIRD Cosmic Microwave Background Polarization Survey*, *Progress of Theoretical and Experimental Physics*, Volume 2023, Issue 4, 042F01, (2023).
16. S. Masi, et al., *The COSmic Monopole Observer (COSMO)*, The Sixteenth Marcel Grossmann Meeting, pp. 1654-1671 (2023) https://doi.org/10.1142/9789811269776_0131

In general:

I have 40 years of experience developing innovative experimental methodologies and building balloon-borne and ground-based instruments for comprehensive studies of the Cosmic Microwave Background (CMB). My work covers anisotropy, polarization, and isotropic and anisotropic spectral distortions, and I have consistently designed and executed original measurements.

As Co-Investigator (Co-I) or Co-Principal Investigator (Co-PI), I have contributed to instruments such as ULISSE, ARGO, BOOMERanG B98 and B03, Archeops, PILOT, and Planck-HFI. I am currently Co-I and instrument scientist for LSPE-SWIPE, and I am part of LiteBIRD, both focused on measuring CMB polarization on large angular scales. I also served as PI of the OLIMPO mission, which achieved a successful technical flight in 2018, and I am leading the COSMO experiment, designed to measure CMB monopole spectral distortions from Dome-C in Antarctica.

I participated in multiple Antarctic campaigns (1998–2007) with BOOMERanG and BRAIN, and Arctic campaigns in Svalbard (2005–2018) with PEGASO, DUSTER, SORA, and OLIMPO.

Specific research interests:

Anisotropy of the CMB

From the pioneering balloon flights of the 1980s, I developed expertise in measuring CMB anisotropy with bolometers at stratospheric altitudes. I was a main developer of BOOMERanG B98, which provided the first CMB anisotropy maps where causal horizons have been resolved, and marked the beginning of precision cosmology. I was in charge of the cryogenic systems [3,4], and my role included cryogenic operations during the Antarctic campaign, and, later, the analysis of the effect of interstellar dust in the measured maps [5,6]. I later contributed to the Planck High-Frequency Instrument, designing cryogenic amplifiers that enabled extremely stable measurements throughout the mission.

Polarization of the CMB

My interest in polarization began with my Laurea thesis. With BOOMERanG B03, I contributed to one of the first detections of E-mode polarization [7], and I later played a role in Planck's polarization results. Recognizing the importance of polarization modulators, I have since developed such cryogenic devices for PILOT [9], LSPE-SWIPE, and LiteBIRD experiments. I also coordinated the Italian participation in QUBIC [14], an innovative polarizing Fizeau interferometer for the CMB, installed in the Argentinian Andes since 2022.

Interstellar Dust Emission

My work on interstellar dust began with early estimates of its infrared emission fluctuations, before IRAS data, and continued with pioneering efforts [1] in dust foreground removal from CMB experiments (ARGO, BOOMERanG, Archeops, Planck-HFI). I also contributed to balloon-borne measurements [2] and Herschel surveys of the Galactic plane. This research has established polarized dust emission as the key foreground for

future CMB polarization missions, and my expertise is very useful for calibrating wide-beam polarimeters like LSPE-SWIPE and LiteBIRD [13].

Sunyaev–Zeldovich Effect and Spectral Distortions

For over a decade, I developed the OLIMPO balloon-borne telescope, introducing innovations such as a differential Fourier Transform Spectrometer and Kinetic Inductance Detectors (KIDs), validated in near space in 2018 [10]. I also promoted the application of KIDs to the W-band MISTRAL receiver at the Sardinia Radio Telescope. With COSMO [16], I am advancing methods to measure CMB monopole spectral distortions using fast, sky and spectral modulation in association with KID detectors.

Cryogenics and Detectors

I have designed custom cryogenic systems for many experiments, pioneering the use of pulse tube coolers in Antarctica and long-duration refrigerators for stratospheric balloons as BOOMERanG. I also developed cryogenic mechanisms for polarimeters, calibrators, and amplifiers. Since the late 1980s, I have developed advanced detector technologies, from bolometers to large arrays of KIDs, now implemented in OLIMPO [11], MISTRAL, and COSMO [16].

Stratospheric Ballooning and Space Applications

I pioneered balloon launches from Svalbard, opening new opportunities for Arctic missions. I also conducted early studies on the impact of cosmic rays on bolometers [8], leading to new detector designs resistant to space radiation [10].

Peer recognition

1995: Visiting Researcher (5 months) Caltech (USA)

1999: Antarctic Service Medal of the National Science Foundation (USA)

1999: MURST-PNRA medal for Italian Antarctic Expedition 1998-99 (Italy)

2001: MURST-PNRA medal for Italian Antarctic Expedition 2000-2001 (Italy)

2003: MURST-PNRA medal for Italian Antarctic Expedition 2002-2003 (Italy)

2004: MURST-PNRA medal for Italian Antarctic Expedition 2003-2004 (Italy)

2006: Antarctic Service Medal of the National Science Foundation (USA)

2009: Award “Sapienza Ricerca” for excellence in research (Sapienza, Italy)

2009: Appreciation certificate of the Italian Space Agency for the contribution to the Planck Satellite

2010: Grand Prix Special French Astronautical Association AAAF as member of the Planck Core Team

2015: American Institute of Aeronautics and Astronautics Space Systems Award To the Herschel and Planck project teams)

2018: Royal Astronomical Society Group Achievement Award 'A' To the Planck Team (UK)

2018: Gruber Cosmology Prize to the Planck Team (USA)

2019: European Physical Society (High energy and Particle division) Giuseppe and Vanna Cocconi Prize to the WMAP and Planck teams (EU)

2011-current: Women in Aerospace (WIA), member

Since 1984: 56 invited talks in important academic institutions

Main Grants (as Principal Investigator)

- OLIMPO (ASI contracts 2001, 2002, 2004, 2005, 2007, 2009,2013, 2016) € 2,352,964
- BRAIN/QUBIC (PNRA contracts 2003, 2006, 2010, 2015, 2019) € 413,000
- QUBIC (INFN contracts 2017..2025) € 925,500
- ASI contract 2017 Kinetic Inductance Detectors for Space € 677,490
- Precision Mechanical Prototyping (Sapienza infrastructures 2015) € 250,000
- ASI contract 2012 LSPE (as Instrument scientist, share of € 388,741)

ADDITIONAL INFORMATION

SERVICE TO NATIONAL AND INTERNATIONAL COMMUNITY

- Since 2005 Ph.D. in Astronomy, Astrophysics and Space Science, Member of the Board
- 2006-2007 Elected member of the National Macroarea 5 Committee - National Institute for Astrophysics (INAF)
- 2007-2008 Member of the Science and technology Council of the Italian Space Agency
- Since 2008 Centro Ricerca Aerospaziale Sapienza, member of the board (consiglio direttivo)
- Since 2008 Scientific coordinator of the physics department machine shop
- 2011-2015 Member of the Scientific Council of the National Institute for Astrophysics (INAF)
- 2012-2015 Member of the Excellence Path Committee of the physics department
- Since 2015 In charge of the Education Career (Percorsi Formativi) for the Bachelor Course in Physics
- Since 2017 Member of the CGAQ (Committee for teaching quality assurance)
- Since 2020 Editor of the international Journal "*Experimental Astronomy*" (Springer)
- Since 2022 Member of the Placement Committee
- Since 2023 Member of the National Committee for Antarctic Research of the Ministry of University and Research (Commissione Scientifica Nazionale per l'Antartide).

TEACHING EXPERIENCE

- 1992-2000 "Laboratorio di Fisica I" and "Laboratorio di Fisica II" (lab. assistance)

- 2005 - current “Laboratorio di Elettromagnetismo e Circuiti” – Physics (6 CFU) average 100 students/year - for the Bachelor degree in Physics (L30)
- 2004 - current “Methods of Space Astrophysics” (6 CFU) average 20 students/year - for the Master degree in Astronomy and Astrophyics (LM58)
- 2004 - 2008 short class “Precision Cosmology” for the Ph.D. in Astronomy (10 hours)
- 2000- current laboratory supervision of a group of 3-4 students for a specific research experiment - class “Astrophysics Laboratory” of the Master degree in Astronomy and Astrophsyics (LM58)
- Supervision of 30 master students for the master thesis in Astronomy and Astrophysics
- Supervision of 7 PhD students for the Astronomy Astrophysics and Space Science PhD
- Supervision of 13 post-docs for the Observational Cosmology Laboratory (G31)

Career breaks, unconventional career paths and major life events

- 5 months long maternity leave of absence in 1993 (mandatory, paid).