

Stefano Maria Mari

Curriculum Vitae

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Education

Ph.D., *Physics Department*, University of Perugia

Master in Physics, *Physics Department*, University of Rome "La Sapienza"

Fellowship, *DESY labs*, Hamburg

Degree in Physics, *Physics Department*, University of Rome "La Sapienza"

Academic Appointments

- Present Full Professor, *University of Roma Tre*, Rome
Department of Mathematics and Physics; (GSD 02/PHYS-01; SSD PHYS-01/A — Experimental Physics of Fundamental Interactions and Applications).
- 2010 Associate Professor, *University of Roma Tre*, Rome
Faculty of Science, Experimental Physics.
- 2000 Researcher, *University of Roma Tre*, Rome
Permanent researcher position.
- 1994 Assistant Researcher, *Bonn University / DESY Laboratory*, Hamburg
Post-Doctoral position at Roma Tre University.

Memberships and Professional Roles

- Present Chair, Physics Department Division, Department of Mathematics and Physics, University of Roma Tre. Chair, M.Sc. Track "Data Analytics — Fundamentals", University of Roma Tre. Chair, M.Sc. Track "Data Analytics — Artificial Intelligence and Social Data", University of Roma Tre. Coordinator, Minor in "Data Science", University of Roma Tre.
- DARKSIDE International Research Collaboration: Member, Institutional Board. Co-National Coordinator for Computing and Data Management. Local Coordinator.
- JUNO International Research Collaboration: Member, Executive Board and Computing CSG Board. Member, Institutional Board. National Coordinator for Computing and Data Management. Responsible for the L2 layer of the trigger system. Chair, Data Acquisition Review Committee and Computing Review Committee. Responsible for the TAO detector.
- Past Chair, IT Division, Department of Mathematics and Physics, University of Roma Tre. Head of Computing and Data Management, JUNO International Collaboration. Head of Computing and Data Management, DARKSIDE International Collaboration. Head of the Computing Service, ARGO International Collaboration. Head of the Computing Center, Department of Mathematics and Physics, University of Roma Tre. Member, National Scientific Committee II, Istituto Nazionale di Fisica Nucleare. Member, Executive Board and Technical Board, ARGO International Research Collaboration. Head of IT Services, Department of Mathematics and Physics, University of Roma Tre. Head of Web and Social Media Services, Department of Mathematics and Physics, University of Roma Tre.

Summary of Research Interests

My research focuses on experimental particle and astroparticle physics, encompassing neutrino oscillations, dark matter detection, and measurements of cosmic rays and gamma rays. I have extensive experience in the design and optimization of particle detectors (LAR TPCs, RPCs, scintillators, and muon systems), advanced trigger and data acquisition systems, and large-scale scientific computing. I have coordinated and contributed to major international collaborations, including JUNO, DARKSIDE, ARGO, ZEUS, HESS, and LHCb. My expertise spans detector R&D, data analysis, and project leadership within international physics collaborations. I am also deeply involved in scientific computing, with a focus on simulation frameworks, large-scale data processing, and computing infrastructures supporting experimental physics.

Research Activities

The JUNO International Experiment

Since the end of 2015 I have been involved in neutrino physics and established the JUNO group at the University of Roma Tre with colleagues interested in measuring the neutrino mass hierarchy using a large-mass detector located at a medium distance from high-power reactors. JUNO is an international experiment whose main goal is to study the neutrino mass hierarchy and to precisely measure several parameters of the mixing matrix. In addition, it aims to measure the spectra of geo-neutrinos and atmospheric neutrinos, as well as those produced by supernova explosions. JUNO is carried out by an international collaboration of researchers from more than 70 countries, formed in 2015, and includes research groups from several Italian universities. The Roma Tre group is among the founding members.

I coordinated the activity of the local group until 2022 and have been responsible for the computing services for the Italian section of the collaboration. I am a member of the *Computing Board* and the *Technical Board* of the experiment. I am responsible of the second trigger layer (L2) of the experiment.

In 2018, the need arose to develop an independent detector (TAO), a reference detector located a few tens of meters from one of the reactors. TAO is essential to control and reduce systematic effects through high-precision measurement of the energy spectrum of the antineutrinos emitted by the nuclear reactors, which are then detected by the JUNO apparatus. I am the *co-spokesperson* of the TAO project, which it is now in the commissioning stage .

Alongside the detector-related activities (JUNO, TAO), I formed a small group dedicated to the preparation of data analysis, focusing particularly on the study of atmospheric neutrinos and those generated by supernova explosions. I am currently coordinating the data analysis work of TAO.

The DARKSIDE International Experiment

The DarkSide group at the University of Roma Tre, under my leadership, works for the DarkSide-20k, the next generation experiment, based on DARKSIDE-50 experience, with an unprecedented sensitivity to WIMP dark-matter particles detection. I share responsibility for the Computing activities.

In 2012 I established the DarkSide group at the University of Roma Tre. The group has been participating in the international DARKSIDE project dedicated to dark matter searches, by means of a Liquid Argon (LAr) Time Projection Chamber (TPC) at the Gran Sasso INFN Laboratory since the foundation.. I'm coordinating the group.

The Roma Tre DarkSide group collaborated in the construction of the test apparatus (DARKSIDE-50) at the Gran Sasso National Laboratories, dedicated to validating the experimental approach.

The future evolution (DS-20k) involves the group in the R&D project focused on studying directionality in WIMP–LAr nucleus collisions.

The Double Beta Decay Studies

In 2016, I participated in a project studying a large-mass 0ν DBD (neutrinoless double beta decay) experiment based on Xe^{136} dissolved in a liquid scintillator.

The ARGO International Experiment

Since the beginning of 2001, I have been the coordinator of the scientific activities of the ARGO group at the University of Roma Tre. The ARGO experiment, carried out at the International Laboratory for Cosmic Rays in Tibet at an altitude of 4,300 meters above sea level, is devoted to search for gamma-ray sources in the energy range of approximately 300 GeV to 10 TeV, and the measurement of primary cosmic rays in the $1\text{--}10^4$ TeV range. The design and construction were completed under my direct responsibility.

Subsequently, I coordinated the upgrade activity of the experiment's data acquisition system to extend its sensitivity toward lower energies (<1 TeV). During these years, I was involved in data analysis leading to the first measurement using air-shower arrays of the cosmic-ray energy spectrum in the 1–200 TeV region. The ARGO experiment concluded in December 2014.

The ARGO-Test Project

In the 2000s, I contributed to the *ARGO-Test* project, a demonstrator experiment developed to assess detector technologies for high-altitude observations of cosmic rays and gamma rays.

The HESS and LHCb Experiments

In 1990s end, as a Researcher at the University of Basilicata, I worked with the HESS International Collaboration, to realize a TeV gamma-ray astronomy Cherenkov telescope array in Namibia.

During the same period, I collaborated with the LHCb experiment, installed at the LHC (Large Hadron Collider) at CERN in Geneva, devoted to CP study in the b-meson sector. My work was focused on the design and construction of prototypes of TGC (Thin Gap Chamber) muon chambers.

The ZEUS Experiment

I joined the ZEUS group of the INFN “Roma1” Division during my undergraduate studies, contributing to the investigation of proton structure at the HERA electron–proton collider at DESY in Hamburg. My early work focused on developing and testing prototypes of Limited Streamer Tubes (LST) to optimize their design for the experiment. I received a fellowship from the F.A.R. Foundation as graduated student and moved to DESY in 1990 as the Rome group's representative, where I supervised the installation of the muon chamber system in the ZEUS detector. During my Ph.D. period, I returned to DESY to analyze data in the “Hard Photoproduction” group, studying high-energy photon–proton interactions involving jets. My doctoral research focused on measuring the J/ψ meson production cross-section through its semileptonic decay into muons.

After my Ph.D., in 1994 I joined the University of Bonn as an Assistant Researcher, where I developed software for online data decoding and event reconstruction. Later, as an Assistant Researcher at DESY, I contributed to low-x physics studies.