# Curriculum Vitae of Rinaldo Santonico

## Academic Career

1967 "Laurea" in Physics at the University of Rome "La Sapienza" under the guidance of Prof. Marcello Conversi
1968 Fellow and collaborator of the Conversi's research group until 1982
1971 Assistant professor with temporary contracts (after a 15 months interruption for military service)
1975 Assistant professor of Advanced Physics at the University of Rome "La Sapienza" (permanent contract)
1976-1977 CERN paid scientific associate
1982 Transfer, as Associate Professor of General Physics, from the University of Rome to the new University of Rome "Tor Vergata", created in the same year
1990-2013 Full Professor of Experimental Physics at the University of Rome "Tor Vergata" (up to retirement)
2013-2018 Honorary Professor of the Physics Department at the same University

Member of many local and national Committees for the selection of researchers, associate professors and full professors of Italian Universities

## Experiments and Covered Responsibilities

1967-1973 Experiment μ/π Adone at LNF Frascati
- Responsible for the project, construction and test of the e+e- luminometer of the Experiment
- Responsible for the detector construction and data analysis of the two photon channels

1974-1975 Experiment E-247 Fermilab
- Responsible for the construction and test of the muon tracker
- Group coordinator during the data taking at the Fermilab

1976-1979 Experiment WA17 SPS CERN
- Technical Coordinator for the project and the construction of the detector located in front of the Bubble Chamber

1980-1981 Experiment NA19 SPS CERN

1980-81 Invention of Resistive Plate Chamber

1982-1987 Experiment Nadir "Search for n→ñ transitions at the reactor of the laboratory Lena Pavia University"
- Responsible for the project, construction and running of the cosmic ray anticoincidence RPC System

1984-1988 Responsible person for the "Gruppo Collegato INFN" of Roma2, on charge for the creation of the future "Sezione INFN" of Roma Tor Vergata

1988-1993 Experiment Fenice "Measurement of the e+ e- → n ñ cross section at Adone LNF Frascati"

- Responsible for the cosmic ray anticoincidence RPC system

1994-2000 Member of the INFN Scientific Committee I

1990-1995 Experiments WA92
- Responsible for the muon triggering and detection

Experiment R&D 5
- Responsible for the muon triggering and detection

1993- Experiment ATLAS
- Member of the Atlas muon panel
- Proponent of the RPC muon trigger detector in the barrel and Project Leader for the same detector
- Member of the muon management in the Executive Board of the experiment as the responsible person for the RPC trigger chambers
- Member of the muon steering group
- Proponent of the muon trigger extension to the inner barrel region, using RPC trigger chambers as in the middle and outer regions. This Phase 2 upgrade proposal is a completion of the original muon trigger project of Atlas

2000-2016 Experiment ARGO (Cosmic Ray astrophysics with a ground-based detector)
- Responsible for the RPC detector project and construction
- Responsible for the first test in the YBJ-Tibet laboratory
- Responsible for the optimization, monitoring and maintenance of the RPC detector operating for the first time in a hostile environment

2008-1011 Director of the Department of Physics - University of Roma, Tor Vergata

2013-2018 Present activity as honorary professor
- Participation to the Atlas phase 2 upgrade project as responsible person for the RPC gas gaps production and quality control
- Promotion of further RPC applications

**Scientific achievements**

a) Collider Physics

- Participation, under the leadership of Marcello Conversi, to the discovery of the multihadron production in the e+e- interaction (experiment $\mu/\pi$ at Adone)
- First observation of e+e- pairs, muon pairs and hadron production through the two photon channel in e+e- interactions (experiment $\mu/\pi$ at Adone)
- First observation of charmed particles production and decay in nuclear emulsions irradiated with neutrinos (experiments E247 Fermilab and W17 CERN)
- Upper limit to the neutron-antineutron oscillation
- Measurement of the anisotropy in the cosmic muon bundles distribution
- Measurement of the $e^+ e^- \rightarrow n \bar{n}$ cross section
- Study of the p-p interaction at the Large Hadron Collider - CERN Laboratory.
- Discovery of the Higgs Boson in the experiment Atlas

b) Cosmic ray astrophysics

- Introduction and optimization of a new approach to the astrophysics with ground based detectors. This approach, based on the Resistive Plate Chamber, has the advantage to cover a very wide energy interval, ranging from 300 GeV to 5 PeV, and to detect the shower core with an unprecedented detail.
- Detection and study of gamma ray sources with particular emphasis to the variable intensity sources
- Study of the Cosmic Ray anisotropy
- Measurement of the light Cosmic Ray component, energy spectrum

c) Physics of the gaseous ionization detectors

- Invention of the Resistive Plate Chambers (RPC)
  After the invention of the Geiger Muller counters, the RPC is the first and unique gaseous detector working with the uniform electric field generated by a plane capacitor, instead of the 1/r field generated by a positively charged wire. The plane geometry indeed, before the RPCs, was only reserved to pulsed detectors (like the optical spark chambers) that required to be coupled to a trigger detector (usually scintillator).
- Introduction and diffusion of the RPCs in the elementary particle physics, as a detector offering, in addition to the crucial advantage of a nanosecond/sub-nanosecond time resolution, other relevant advantages like robustness, simplicity of construction, substantial insensitivity to the magnetic field, possibility of read out strips tailored at any wonted shape. This work, finalized to the RPC diffusion/promotion, required a very relevant investment of discussion to convince the scientific community, which was extremely sceptical about the fact that a gaseous planar detector could ever work.
- Creation of the international "RPC workshop" which has the purpose to bring together the physicists interested to use and to develop this detector. This workshop occurs every two years and is conceived as an itinerating conference. The site choice at each new edition intends to recognize the contribution of the local group to the development of the RPC detector. The 14$^{th}$ edition of the conference was celebrated this year at Puerto Vallarta (Mexico)
- Stimulation of new ideas inside the RPC community, mainly through the RPC workshop. This produced relevant progresses of the detector, due to the contributions of other groups, independent and sometimes in competition with the original RPC group. As an example:
  - the multigap RPC that achieved time resolutions down to 30 ps and is used in the Alice time of flight
  - the digital and semi-digital RPC hadron calorimetry made with RPCs optimized for this purpose
  - the first study and test of RPCs with semiconductor electrode plates to achieve extremely high rate capabilities
- Industrialization of the RPC production and definition of rigorous construction procedures for the mass production of large systems that would be unfeasible inside research institutions
- Transmission of the know-how, particularly for the industrial production, to other potential or actual production sites: KODEL (Seul, Korea); Max Plank Institute (Munich, Germany)
- Proposals for RPC application to problems of relevant practical importance like the muon scattering tomography and the positron emission tomography

Rome, Jul 18th 2018