

CURRICULUM VITAE

Vlad Popa (VP)

Permanent address:

Institute for Space Sciences,
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ROMANIA

1 Personal data

- Family name: Popa
- First name: Vlad
- Nationality and citizenship: Romanian
- Home address: Cal. Vacaresti 242, sc B ap. 22, 40061 Bucharest Romania
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- E-mail: vpopa@venus.nipne.ro
- Place and date of birth: Timișoara, Romania, October 29, 1956
- Marital status: married (Lucia Aurelia Popa), one child (Mihail Popa)

2 Academic degrees

- 1976 - 1980, University of Bucharest, Romania - undergraduate student.
1980, Diplomat Physicist, University of Bucharest, Romania. Diploma Thesis on an original model for hadron-nucleus interactions at intermediate and high energies.
- 1980 - 1981, University of Bucharest, Romania - graduate student;
1981, MSc in Nuclear Physics, University of Bucharest, Romania. Specialization Thesis on the derivation of the geometric characteristics of hadronic distribution inside nuclei from hadron-nucleus cross section data.
- 1989 - 1993, University of Bucharest, Romania - PhD Stage.
Adviser: Prof. Călin Beșliu, Subject: The production of exotic multi-quark states in relativistic nuclear reactions.

1993, PhD in Physics, High Energy and Nuclear Physics Dept.,
University of Bucharest, Romania.

3 Professional background

1. 1981 - 1983: physics teacher, Industrial High School No. 1, Mangalia, Romania
2. 1983 - 1986: research assistant, Institute for Space Sciences Bucharest, Romania (I.S.S.)
3. 1986 - 1995: researcher, Institute for Space Sciences, Bucharest, Romania
4. 1995 - 1999: 3rd senior researcher, Institute for Space Sciences, Bucharest, Romania
5. 1999 - May 2001: 2nd senior researcher, Institute for Space Sciences, Bucharest, Romania
6. From May 2001: 1st senior researcher¹, Institute for Space Sciences, Bucharest, Romania.
7. From January 2002: Scientific secretary of I.S.S.
8. December 2002 - December 2004 researcher at INFN - Bologna (art. 23 - temporary assignment).
9. February 2005 - February 2006: *Primo ricercatore* at INFN - Bologna (art. 23 - temporary assignment).
10. April 2006 - May 2006: Invited professor at the *Facoltà di Scienze Matematiche, Fisiche e Naturali, Università degli Studi di Bologna*.
11. From June 2006: Scientific secretary, Institute for Space Sciences, Bucharest, Romania

4 Research activities

Early research activities of Vlad Popa (V.P.) consisted in the search for non-strange and strange dibaryonic resonances in neutron - proton interactions at few GeV/c and nucleus - nucleus interactions at few GeV/nucleon, at the JINR Dubna synchrotron.

The study of the neutron - proton interaction (in the 1m bubble chamber at JINR) led to the observation of anomalies in the NN , $NN\pi$ and $NN\pi\pi$ invariant mass spectra. They were interpreted in a modified quark bag model, assuming a diquark - four quark cluster structure of

¹the highest research degree in Romania, equivalent to Professor

the dibaryonic states. The same model was shown to describe well also the data on the observed $S=-1$ dibaryonic candidates by other experiments at JINR.

The nucleus - nucleus interactions were studied using the SKM200 2m streamer chamber at JINR. The main result concerned the "cumulative" production of pions. Assuming that dibaryonic states should also be present inside the compressed nuclear matter and considering the mass-shift effect for such states as predicted by the diquark - for quark cluster model, this observation could be explained in terms of pion (and kaon) production through intra-dibaryonic de-excitations.

V.P. also contributed to the analysis of track-etch detectors exposed to primary cosmic rays on-board some recoverable Russian satellites of the COSMOS type. These experiments were meant to measure the radiation dose absorbed by astronauts during orbit missions.

V.P. participated to many phases and studies of the **MACRO** experiment at Gran Sasso. He has taken regular data taking shifts at Gran Sasso and developed computer programs for simulation, analyses, and evaluation of the G.U.T. super-massive monopoles global flux limits. The final flux limit is about $\Phi < 1.5 \times 10^{-16} \text{ cm}^{-2} \text{ s}^{-1} \text{ sr}^{-1}$ for $0.0005 < \beta < 1$, which is the best existing limit and covers a very large range of velocities.

He participated in the search for magnetic monopoles with the track-etch sub-detector of MACRO, contributing to its calibration, installation and exploitation, developing computer programs for the calculation of the flux limits obtained from the CR39 analysis, for magnetic monopoles of different magnetic charges and for dyons. It was also shown that the response of the CR39 detector depends only on the restricted energy loss (REL) of the traversing ions. From the calibration of the MACRO CR39 with relativistic lead ions at the CERN SPS (experiment **EMU18**), total and partial charge - changing lead fragmentation cross sections on different targets were obtained.

V.P. contributed to the extension of the MACRO magnetic monopole analysis to the search for other possible super-massive components of the penetrating cosmic radiation: nuclearites and Q-balls.

He followed the calculations of the energy losses of magnetic monopoles, nuclearites and Q-balls in the Earth as well as in the different subdetectors of MACRO.

He also studied atmospheric neutrino oscillations, a field where MACRO obtained important results; and also evaluated the MACRO sensitivity for "exotic" oscillation mechanisms (violation of the Lorentz invariance or of the equivalence principle). Taking advantage of the muon energy reconstruction based on multiple Coulomb scattering, V.P. studied the possible effect of a mixing between the mass-induced and "exotic" neutrino oscillations.

SLIM: Search for "light" magnetic monopoles and nuclearites in the cosmic radiation. V.P. participated in writing the proposal (hep-ex 0003028), estimated the detection conditions for monopoles and nuclearites at the SLIM altitude (Chacaltaya, Bolivia). He participated in the analysis of the nuclear track detectors exposed at Chacaltaya, developing the algorithms used in the computation of monopole and nuclearite upper flux limits. V.P. analyzed the propagation of low-mass and intermediate-mass nuclearites in the atmosphere and their expected signatures in SLIM.

NOTTE: V.P. is one of the ideators of the NOTTE experiment, looking for the possible radiative decay of solar neutrinos, during total solar eclipses. He made Monte Carlo simulations of the radiative decay of solar neutrinos, prepared the experimental set-ups and participated to the observations (Romania – 1999, Zambia – 2001 and Lybia - 2006) and conducted the data analyses. The main result from the 1999 observations is the observation of an excess of luminosity in the center of the dark disk of the Moon, during total solar eclipses, that could originate from a diffraction phenomenon (similar to the Poisson spot) and that may be superimposed to the decay signal. The analysis of the 2001 yielded stringent lower limits for neutrino life times were published. V.P. was involved in the preparation and the realization of an improved experiment, performed during the total solar eclipse in 2006. The collected data are under analysis.

ANTARES: V.P. contributed to the simulations concerning the possible signals produced by light and relativistic magnetic monopoles in the ANTARES detector. He also studied the light yield of slow intermediate mass nuclearites in water, aiming to simulate the signal characteristic for such particles in ANTARES and to design an off-line "trigger" for an experimental search. V.P. developed of a complete Monte Carlo simulation of nuclearite detection in ANTARES and in the inclusion in the "event filter" of a procedure intended to identify possible candidates. V.P. made preliminary estimations on the sensitivity of ANTARES to possible violation of the Lorentz invariance

effects to be searched using the atmospheric neutrino data. Since September 2006, V.P. is a member of the ANTARES Institution Board (as a representative of I.S.S. Bucharest).

OPERA: V.P. co-proposed a search for new nuclear radioactivities (muonic and pionic), as a by-product of the OPERA experiment. A small pilot experiment, meant primarily to the study of the background sources, is in preparation at LNGS.

V.P. also analyzed the implications of a possible superposition of different muon neutrino oscillation mechanisms (as suggested by the on-going analysis on a MACRO data subset) would have for the ANTARES and OPERA experiments.

V.P. was co-director of NATO Linkage Grants CRG. LG. 972840 and PST. CLG. 977691 (both in connection with the NOTTE experiments) and of the Joint Research Project “Experimental and phenomenological contributions to astroparticle physics”, included in the Scientific and Technological Cooperation Agreement between Italy and Romania (position 17). The Italian co-director of all these projects was Prof. Giorgio Giacomelli, from the Bologna University, Italy.

5 Teaching at university level

- 1984 - 1990: teaching assistant (supplementary assignment), Department of Nuclear and High Energy Physics, Faculty of Physics, University of Bucharest, Romania
- 1990 - 1993: assistant professor, Faculty of Applied Informatics, The Informatized Academy of Technical Sciences, Economy and Administration Law, Bucharest, Romania
- Since 1996: “Correlatore” for 4 “Tesi di Laurea” at the Departments of Physics and of Astronomy, Bologna University
- 2006: V.P. delivered a module of lessons on Astroparticle Physics, included in the *corso di specializzazione*, at the Department of Physics of the Bologna University.

6 Stages of research abroad

- From 1983 till 1991: Several research stages (short and medium term) at the Laboratory of Automation Techniques and at the Laboratory of High Energy Physics, Joint Institute for Nuclear Research, Dubna, Russia.
Member of the “np” and “SKM-200” Collaborations.

- From 1993 till December 2003: Several research stages (short and medium term) at the Department of Physics of the University and I.N.F.N. Bologna, Torino, and I.N.F.N. National Laboratories of Gran Sasso, Italy.

Member of the MACRO, EMU18, SLIM, NOTTE, NOTTE-2 and ANTARES Collaborations.

Co-director of the NATO Collaborative Linkage Grant PST.CLG.977691, together with Prof. G. Giacomelli, University of Bologna.

Co-spokesman (together with Prof. G. Giacomelli, University of Bologna) of the Project "Experimental and Phenomenological Contributions to the Astroparticle Physics", included (in September 2000) in the Intergovernmental Agreement on the Scientific and Technological Co-operation between Italy and Romania.

7 Invited papers presented by V.P. at international and national (Italian) meetings:

1. X^{th} International Seminar on High Energy Physics Problems, Dubna, Russia, 1990
2. 18^{th} International Conference on Nuclear Tracks in Solids, Cairo, Egypt, 1996
3. LXXXII Congresso Nazionale della SIF, Verona, 1996
4. 8^{th} UN/ESA Workshop on Basic Space Sciences, Mafrag, Jordan, 1999
5. 9^{th} UN/ESA Workshop on Basic Space Sciences, Toulouse, France, 2000
6. NATO A.R.W. Cosmic Radiations from Astronomy to Particle Physics, Oujda, Morocco, 2001
7. South-Eastern European Astronomy Association Workshop, Solar Searches in the South-Eastern European Countries: Present and Perspectives, Bucharest, Romania, 2001
8. 10^{th} UN/ESA Workshop on Basic Space Sciences, Reduit, Mauritius, 2001

V.P. attended also the following meetings where he presented communications or posters:

1. International School of Nuclear Physics, Erice, Italy 1987
2. International School on the Structure of Hadrons and Hadronic

- Matter, Dronen, The Netherlands, 1990
3. International School of Non-Accelerator Particle Astrophysics, Trieste, Italy 1991, 1993, 1995 and 2001 (co-organizer of the poster session in 1995 and 2001)
 4. Conference on Recent Developments in High Energy Physics Phenomenology, Trieste, 1991 and 1992
 5. I.C.R.C: Roma 1995 and Durban (South Africa) 1997
 6. Int. Symp. on Large-Scale Collective Motion of Atomic Nuclei, Brolo (Messina) 1996
 7. AHEP-2003 Workshop, Valencia, Spain 2003.
 8. Congresso Nazionale della S.I.F., Como 1997, Milano 2001, Parma 2003 and Brescia 2004.
 9. Neutrino 2004 Conference, Paris, France 2004.
 10. C2CR Conference, Prague, Czech Republic, 2005
 11. VLVvT Workshop, Catania, Italy, 2005
 12. SPSE2006 Symposium, Waw an Namos, Libya, March 2006

8 Affiliation to professional associations

- The Romanian Physical Society, 1990
- The Association of the Users of the Accelerators and Experimental Facilities of the Laboratory of High Energy Physics at JINR Dubna - Russia, 1990
- The European Physical Society, 1993 (Ordinary member 937851)
- Società Italiana di Fisica, 1996 (6914)
- International Society for Nuclear Tracks in Solids, 1996

9 Awards

- Certificate and Medal for Excellence in Scientific Research of the Romanian Government, 2000

10 Specialization

- main field: Astroparticle Physics
- other fields: High Energy Physics, Relativistic Nuclear Physics
- current research interests: cosmic rays, super-massive relics, neutrino astrophysics

11 Publications

- Number of papers in refereed journals: 99
- Invited papers given in international meetings: 9
- Number of communication to scientific meetings (including papers presented by other colleagues): about 200