Astroparticle and High Energy Physics Group - 1999 report

Proposals

- M. G. Catanesi *et al.*, "Proposal to study hadron production for the neutrino factory and for the atmospheric neutrino flux," CERN-SPSC-99-35.
- L. Baudis *et al.* [GENIUS Collaboration], "GENIUS: A supersensitive germanium detector system for rare events," hep-ph/9910205.
- ECFA-DESY Linear Collider Study Supersymmetry Group

Talks at International Congresses, Schools and Workshops:

- Rindberg Euroconference New Trends in Neutrino Physics
  Localidad: Ringberg Castle, Tegernsee, Germany
  Tipo de participación: Conferencia de Apertura
  Autores: J. W. F. Valle.
  Titulo del trabajo: Theory of neutrino properties
  Nombre Publicación: New Trends in Neutrino Physics, ed. Knhiel, Raffelt & Schmitz
- Corfu Summer Institute on Elementary Particle Physics

  Localidad: Corfu, Kerkyra, Greece
  Tipo de participación: Lecciones Invitadas
  Autores: J. W. F. Valle.
  Titulo del trabajo: Neutrino Physics
  Nombre Publicación: JHEP Proceedings, ed. I. Antoniadis, G. Koutsoumbas, N. Tracas & G. Zoupanos
- Festschrift of John Vergados
  Localidad: Ioannina, Greece
  Tipo de participación: Charla Invitada
  Autores: J. W. F. Valle.
  Titulo del trabajo: Neutrino Physics Theory and Experiment
  Nombre Publicación: Springer Tracts in Modern Physics, ed. T. Kosmas, Springer-Verlag, en prensa
- Euroconference: Ve. Colloque Cosmologie
  Localidad: Paris, France
  Tipo de participación: plenary talk
  Autores: J. W. F. Valle.
  Titulo del trabajo: Neutrinos in Astrophysics and Cosmology
  Nombre Publicación: Observatoire Nationale de Paris publication, ed. de Vega & Sanchez

- Nombre del Congreso: V Gleb Wataghin School on High Energy Phenomenology
  Localidad: Campinas, Brazil
  Tipo de participación: Conferencia de Apertura
  Autores: J. W. F. Valle.
  Titulo del trabajo: Neutrino Masses, where do we stand?
  Nombre Publicación: proceedings ed. M. Guzzo et al (1999)

- Nombre del Congreso: 6th International Symposium
  on Particles, Strings and Cosmology
  Localidad: Boston, MA, USA
  Tipo de participación: Invited talk
  Autores: J. W. F. Valle.
  Titulo del trabajo: Supergravity unification with bilinear R parity violation.

- Nombre del Congreso: Non-Accelerator New Physics Workshop - NANP-99
  Localidad: Dubna, Rusia
  Tipo de participación: Conferencia de Apertura
  Autores: J. W. F. Valle.
  Titulo del trabajo: Neutrino Physics at the Turn of the Millenium.
  Nombre Publicación: en prensa Yad. Fys.

- Nombre del Congreso: Neutrino physics and astrophysics
  Localidad: Takayama, Japan
  Tipo de participación: invitada
  Autores: D. Grasso, J. W. F. Valle and H. Nunokawa
  Titulo del trabajo: Pulsar velocities without neutrino mass
  Nombre Publicación: Nucl. Phys. Proc. Suppl. **77** (1999) 440

- "Status of the MSW Solutions to the Solar Neutrino Problem ",
  M.C. Gonzalez-Garcia, C. Pena-Garay, Presented at the Sixth International Workshop on Topics tn Astroparticle and Underground Physics (TAUP99), September 6-10, 1999, College de France, Paris (France).

- "Oscillation Parameters in One Decade from Now",
  M.C. Gonzalez-Garcia, C. Pena-Garay, Presented at ICFA/ECFA Workshop: Neutrino Factories based on Muon Storage Rings, Lyon July 5-9, 1999.

- " Alternative Solutions to the Atmospheric Neutrino Problem ",
  M.C. Gonzalez-Garcia, Presented at Cosenor's Meeting, Oxford, May 8-9.

- "Solutions to the Atmospheric Neutrino Problem",
  M.C. Gonzalez-Garcia, Presented at the 5th International Workshop Valencia 99: Particles in Astrophysics and Cosmology, Valencia May 3-8, 1999.

- “Seasonal Dependence in the Solar Neutrino Flux”,
  P.C. de Holanda, C. Peña Garay, M.C. Gonzalez-Garcia. Presented at the 5th International Workshop Valencia 99: Particles in Astrophysics and Cosmology, Valencia May 3-8, 1999.

- “Solutions to the Atmospheric Neutrino Problem”
  M.C. Gonzalez-Garcia, Lectures at the 10th International Baksan School “Particles and Cosmology”, Baksan Valley (Russia) on April 19-25, 1999.

- ”Electroweak Baryogenesis and Supersymmetry”,
  Rius,N. presented at the III International Workshop on “Particle Physics and the Early Universe”, Trieste, Italy. September 27 - October 2, 1999.

- “Electroweak Baryogenesis in the MSSM”,
  Rius,N. presented at the Summer Institute on “Massive Neutrinos in Physics and Cosmology”, Gran Sasso, Italy. September 13-17, 1999.

- “Supersymmetric Electroweak Baryogenesis”,
  Rius,N. presented at the International Workshop *Particles in Astrophysics and Cosmology: From Theory to Observation*, Valencia, Spain. May 3-8, 1999.

- Porod, W. “Testing supersymmetry breaking at high energy scales using precision measurments at Linear Colliders ”,
  Presented at the ECFA DESY, Linear Collider Workshop, Obernai meeting, France, Sept. 16–19, 1999.

- “Production and Decays of Stops, Sbottoms, and Staus”
  H. Eberl, S. Kraml, W. Majerotto, A. Bartl, W. Porod To be published in the proceedings of 4th International Workshop on Linear Colliders (LCWS 99), Sitges, Barcelona, Spain, 28 Apr - 5 May 1999. e-Print Archive: hep-ph/9909378

- Hirsch,M. ”Neutrinoless double beta decay in bilinear R-parity breaking SUSY”,
  Presented at Trieste Meeting of the TMR Network on Physics beyond the Standard Model, Trieste, Italy, 24.-27. Feb., 1999, JHEP Proceedings (http://jhep.sissa.it/), eds I. Antoniadis, A. Masiero and S. Pastor, PRHEP-trieste99/004.

- Hirsch,M. ”Solar and atmospheric neutrinos in bilinear R-parity broken SUSY”,
  Presented at DESY Theory Workshop: νews from the universe, 29.9.-1.10.1999, Hamburg, Germany

- Hirsch,M. ”Bilinear R-parity breaking and solar and atmospheric neutrino problems”,
  Presented at Triangle Meeting, 26.-27.11.1999, Vienna, Austria

- Hirsch,M. ”Neutrinoless double beta decay, neutrino mass and bilinear R-parity breaking supersymmetry”,
  Presented at Valencia 1999, Particles in Astrophysics and Cosmology: From theory to

observation, Valencia, Spain, May 3-8, 1999, Nucl. Phys. B, Proc. Suppl. in press and hep-ph/9909443.

- A. Bottino and N. Fornengo, Dark matter and its particle candidates.
Lectures given at the Fifth School on Non–Accelerator Particle Astrophysics (Abdus Salam International Centre for Theoretical Physics, Trieste, June–July 1998), to appear in the School Proceedings (Eds. R.A. Carrigan, Jr., G. Giacomelli and N. Paver) preprint DFTT 20/99, FTUV/99-24, IFIC/99-26, March 1999 and *hep-ph/9904469*.

- N. Fornengo, Neutrino signals from WIMP annihilation
Proceedings of the International Workshop "Weak Interactions and Neutrinos (WIN99)", Cape Town, South Africa, January 1999 (ed. Dominguez, Viollier), preprint FTUV/99-26, IFIC/99-29, April 1999

- N. Fornengo, Neutrino oscillation effect on the indirect signal of neutralino dark matter from the earth core.
Proceedings of the European Network "Physics Beyond The Standard Model", SISSA, Trieste, Italy, February 1999, preprint FTUV/99-27, IFIC/99-30, April 1999 and *hep-ph/9904351*

- N. Fornengo, Supersymmetric dark matter - direct searches
Proceedings of the International Workshop on "Particles in Astrophysics and Cosmology: From Theory to Observation (Valencia99)", Valencia, May 1999, Nuclear Physics B (Proc. Suppl.), to appear (ed. J.W.F. Valle)

- N. Fornengo, Relic Neutralinos- update on neutralino–nucleon scalar cross–section.
Proceedings of the Sixth International Workshop on "Topics in Astroparticle and Underground Physics (TAUP99)", Collège de France, Paris, September 1999, Elsevier, to appear (ed. M. Froissart, J. Dumarchez, D. Vignaud)

- N. Fornengo, Standard and exotic interpretations of the atmospheric neutrino data.
Proceedings of the Sixth International Workshop on "Topics in Astroparticle and Underground Physics (TAUP99)", Collège de France, Paris, September 1999, Elsevier, to appear (ed. M. Froissart, J. Dumarchez, D. Vignaud)

- Miranda,O. "Testing new physisc with future low energy neutrino experiments."
Presented at the Trieste meeting of the TMR network on physics beyond the SM. February 1999, ICTP Trieste (Italy)

- Miranda,O. "Searching for new physics with future low energy neutrino experiments"
Presented at the Valencia 99: Particles in Astrophysics and Cosmology, May 3-8 1999, Valencia (Spain).

Publications

- J. W. F. Valle, “Neutrino physics at the turn of the millenium,” hep-ph/9911224.
- “Four-Neutrino Oscillation Solutions of the Solar Neutrino Problem”, C. Giunti , M.C. Gonzalez-Garcia, C. Pena-Garay, hep-ph/000110. To appear in Phys. Rev. D.
- “Probing Intermediate Mass Higgs Interactions at the CERN Large Hadron Collider”, O.J.P. Eboli, M.C. Gonzalez-Garcia, S.M . Lietti, S.F. Novaes, hep-ph/0001030. To appear in Phys. Lett. B.
- “Anomalous Couplings of the Third Generation in Rare B Decays”, Gustavo Burdman, M.C. Gonzalez-Garcia, S.F. Novaes, hep-ph/9906329. To appear in Phys. Rev. D.
- “Indirect Constraints on the Triple Gauge Boson Couplings from $Z \to b\bar{b}$ Partial Width: an Update”, O.J.P. Eboli, M.C. Gonzalez-Garcia, S.F. Novaes, hep-ph/9811388. To appear in Mod. Phys. Lett. A.
- **(*)** “Status of the MSW Solutions of the Solar Neutrino Problem”, M.C. Gonzalez-Garcia, P.C. de Holanda, C. Pena-Garay, J.W.F. Valle, Nucl. Phys. **B572** (2000).
- “Seasonal Dependence in the Solar Neutrino Flux, ” P.C. de Holanda, C. Pena-Garay, M.C. Gonzalez-Garcia, J.W.F. Valle, Phys. Rev. **D60** (1999), 093010 .
- “Anomalous Higgs Couplings”, M.C. Gonzalez-Garcia, Articulo Invitado en Int. J. Mod. Phys. **A14** (1999) 3121.
- “New Higgs Couplings at $e^+ e^-$ and Hadronic Colliders”, M.C. Gonzalez-Garcia, S.M. Lietti, S.F. Novaes, Phys. Rev. **D59** (1999) 075008.
- ***** “Atmospheric Neutrino Observations and Flavor Changing Interactions” M. C. Gonzalez-Garcia, M. M. Guzzo, P. I. Krastev, H. Nunokawa, O. L. G. Peres, V. Pleitez, J. W. F. Valle y R. Zukanovich Funchal, Phys. Rev. Lett. **82** (1999) 3202.
- **(*)** “ Active-Active and Active-Sterile Neutrino Oscillation Solutions to the Atmospheric Neutrino Anomaly”, M.C. Gonzalez-Garcia, H. Nunokawa, O.L.G. Peres, J.W.F.Valle, Nucl. Phys. **B543** (1999) 3.
- “Strongly Interacting Vector Bosons at the LHC: Quartic Anomalous Couplings”, A.S. Belyaev, O.J.P. Eboli, M.C. Gonzalez-Garcia, J.K. Mizukoshi, S.F. Novaes, I. Zacharov, Phys. Rev. **D59** (1999) 015022.
- N. Rius and V. Sanz, “Supersymmetric electroweak baryogenesis,” Nucl. Phys. **B570**, 155 (2000) [hep-ph/9907460].
- “Neutralino propierties in the light of a further indication of an annual modulation effect in WIMP direct search”, A. Bottino, F. Donato, N. Fornengo and S. Scopel Phys. Rev. **D59** (1999) 095003.

- "Compatibility of the new DAMA/NAI data of an annual modulation effect in WIMP direct search with a relic neutralino in supergravity schemes", A. Bottino, F. Donato, N. Fornengo and S. Scopel Phys. Rev. **D59** (1999) 095004.
- A. Ioannisian and J. W. F. Valle, "Brane-inspired four-neutrino models," hep-ph/9911349.
- S. Davidson, M. Losada and N. Rius, "Neutral Higgs sector of the MSSM without R(p)," hep-ph/9911317.
- D. Grasso, J. W. F. Valle and H. Nunokawa, "Pulsar velocities without neutrino mass," Nucl. Phys. Proc. Suppl. **77**, 440 (1999).
- M. A. Diaz, J. Ferrandis and J. W. F. Valle, "Supersymmetry unification predictions for m(top), V(cb) and tan(beta)," hep-ph/9909212.
- I. Barabanov *et al.*, "Testing for new physics with low-energy antineutrino sources: LAMA as a case study," Nucl. Phys. **B546**, 19 (1999).
- M. A. Diaz, D. A. Restrepo and J. W. F. Valle, "Two-body decays of the lightest stop in supergravity with and without R-parity," hep-ph/9908286.
- J. C. Romao, M. A. Diaz, M. Hirsch, W. Porod and J. W. F. Valle, "A supersymmetric solution to the solar and atmospheric neutrino problems," Phys. Rev. **D61**, 071703 (2000) [hep-ph/9907499].
- V. B. Semikoz, A. A. Bykov, V. Y. Popov, A. I. Rez and D. D. Sokoloff, "Neutrino spin-flavor conversions and anti-nu/e emission from the Sun with random magnetic field," hep-ph/9907253.
- M. A. Diaz, J. Ferrandis, J. C. Romao and J. W. F. Valle, "Unification of gauge couplings and the tau neutrino mass in supergravity without R-parity," hep-ph/9906343.
- O. G. Miranda, J. Segura, V. B. Semikoz and J. W. F. Valle, "Probing neutrino magnetic moments at underground detectors with artificial neutrino sources," hep-ph/9906328.
- B. Allanach *et al.*, "Searching for R-parity violation at Run-II of the Tevatron," hep-ph/9906224.
- S. Pastor, J. Segura, V. B. Semikoz and J. W. F. Valle, "A potential test of the CP properties and Majorana nature of neutrinos," Nucl. Phys. **B566**, 92 (2000) [hep-ph/9905405].
- L. Navarro, W. Porod and J. W. F. Valle, "Top-quark phenomenology in models with bilinearly and spontaneously broken R-parity," Phys. Lett. **B459**, 615 (1999) [hep-ph/9903474].

- A. Bartl, W. Majerotto and W. Porod, "Large Higgs boson exchange contribution in three-body neutralino decays," Phys. Lett. **B465**, 187 (1999) [hep-ph/9907377].

- A. Bartl, H. Eberl, K. Hidaka, S. Kraml, W. Majerotto, W. Porod and Y. Yamada, "SUSY - QCD corrections to top and bottom squark decays into Higgs bosons," Phys. Rev. **D59**, 115007 (1999).

- A. Bartl *et al.*, "Impact of bosonic decays on the search for tau(tilde)(2) and nu(tilde)/tau," Phys. Lett. **B460**, 157 (1999) [hep-ph/9904417].

- A. Bartl, T. Gajdosik, W. Porod, P. Stockinger and H. Stremnitzer, "Electron and neutron electric dipole moments in the constrained MSSM," Phys. Rev. **D60**, 073003 (1999) [hep-ph/9903402].

- S. Kolb, M. Hirsch, H. V. Klapdor-Kleingrothaus and O. Panella, "Collider signatures of sneutrino cold dark matter," hep-ph/9910542.

- M. Hirsch, "Neutrinoless double beta decay, neutrino mass and bilinear R-parity breaking supersymmetry," hep-ph/9909443.

- H. Pas, M. Hirsch, H. V. Klapdor-Kleingrothaus and S. G. Kovalenko, "Towards a superformula for neutrinoless double beta decay," Phys. Lett. **B453**, 194 (1999).

- M. Maltoni, V. A. Novikov, L. B. Okun, A. N. Rozanov and M. I. Vysotsky, "Extra quark-lepton generations and precision measurements," Phys. Lett. **B476**, 107 (2000) [hep-ph/9911535].

- M. Maltoni and M. I. Vysotsky, "Diminishing 'charginos nearly degenerate with the lightest neutralino' slit using precision data," Phys. Lett. **B463**, 230 (1999) [hep-ph/9907219].

- K. Dimopoulos and A. Davis, "Cosmological consequences of superconducting string networks," Phys. Lett. **B446**, 238 (1999) [hep-ph/9901250].

- A. Ioannisian and A. Pilaftsis, "Cumulative non-decoupling effects of Kaluza-Klein neutrinos in electroweak processes," hep-ph/9907522.

- V. Berezinsky and M. Kachelriess, "New particles as ultrahigh energy primaries," Nucl. Phys. Proc. Suppl. **75A**, 377 (1999).

- V. Berezinsky, M. Kachelriess and A. Vilenkin, "Ultra-high energy cosmic rays from decaying relic particles," Nucl. Phys. Proc. Suppl. **70**, 500 (1999).

- J. M. Mira, E. Nardi and D. A. Restrepo, "A SU(3)C x SU(2)L x U(1)Y x U(1)H gauge model of flavor," hep-ph/9911212.

- H. Baer, M. A. Diaz, J. Ferrandis and X. Tata, "Sparticle mass spectra from SO(10) grand unified models with Yukawa coupling unification," hep-ph/9907211.

Seminars at other Institutions:

- Max-Planck Institute fur Physik, Munich, October 1998; Titulo: "Status of Neutrino Physics. (colloquium)"
  J. W. F. Valle
- Centre de Physique des Particules de Marseille, Marseille, Mon. Jan 25, 1999; Titulo: "Implications of R- parity Breaking"
  J. W. F. Valle
- Institute for Nuclear Theory, University of Washington, July 28, 1999, Titulo: *Status of Neutrino Physics*,
  J. W. F. Valle
- DESY, Hamburgo, September 29, 1999, Titulo: *Making Sense of Present Neutrino Data*
  J. W. F. Valle
- University of Vienna, November 26, 1999, Titulo: *Status of Neutrino Physics*
  J. W. F. Valle
- Inst. Fsica Terica, Univ. Estadual de Sao Paulo, Brasil, march 15, 2000, special colloquium, Title: *Neutrinos: where we are and where we go?*
  J. W. F. Valle

Organization of Congresses

As part of the bi-annual **Series on the Frontiers in Particle Astroparticle Physics and Cosmology** we have organanized the fifth such meeting, which was also part of the activities related to the 500 anniversaty of the Universitat de València, from May 3-8, 1999. Proceedings will be published by Elsevier.

In recognition to the group's contribution to the organization of high-level scientific conferences **it has been awarded by the European Science Foundation** and also by the **European Commission**, a grant to support a new **Euresco-EuroConference series on the Frontiers in Astrophysics and Cosmology**, with the first two meetings scheduled for the Fall of 2000 (San Feliu de Guixols, Spain) and Fall 2001 (Lenggries, Germany) in collaboration with the Georg Raffelt from the Max-Planck-Institut fr Physik.

Long-Term Postdocs at the Group

- **Dr. O. Miranda (Mexico)** (now at CINVESTAV)
- **Dr. Michael Kachelriess (U. Bochum)** (now at CERN)
- **Dr. A. Akeroyd (Durham)** (now at KEK)
- **Dr. M. A. Diaz (Chile/UK)** (now at Chile's Catholic Univ.)
- **Dr. D. Grasso (Rome)** (now at Padova)

- **Dr. W. Porod (Vienna)**, DGICYT fellow
- **Dr. Martin Hirsch (Max-Planck Inst. Heidelberg)** *Marie Curie* fellow
- **Dr. K. Dimopoulos (Tessaloniki/Cambridge),** European U. fellow
- **Dr. M. Maltoni (Ferrara),** European U. fellow

In recognition to the group's contribution in the training of young post-doctoral scientists within the past IV Framework programme **the European Commission reiterated our status with another financed Training Network** within their most recent V Framework programme, covering the period from Fall 2000-Fall 2004.

In recognition to the group's contribution in the training of young pre-doctoral scientists **the European Commission awarded us the status of an officially recognized and financed Training Site** within their recent V Framework programme, covering the period from Fall 2000-Fall 2004.

Long-Term Sabbatical Visitors at the Group:

- **Dr. V. Semikoz** (Izmiran, Troitsk, Moscow)
- **Dr. A. Ioannissian** (Munich/Yerphi)
- **Prof. O. Eboli** (S. Paulo, Brasil)
- **Prof. A. Yu. Smirnov** (Trieste/ICTP)

In recognition to our tradition in hosting distinguished scientists the group was awarded the **1999-Iberdrola Grant** *Profesores Visitantes Iberdrola de Ciencia y Tecnologa* in the area of theoretical physics, covering the period from 2000-2003.

Committees

Apart from permanent engagements in long-term Committees and Evaluating Boards, in this period we have served on the following :

- **International Advisory Committee del Non-Accelerator New Physics Workshop - NANP-99**, Dubna, Rusia, June 28 - July 3, 1999
  J. W. F. Valle
- **International Advisory Committee for the International Workshop on Theoretical and Phenomenological aspects of Underground Physics**
  J. W. F. Valle