Curriculum Vitae of Marialuisa FRAU

Academic Titles and Positions

- 14.11.1985:
  Laurea in Physics at the University of Torino (110/110 magna cum laude)
- Nov. 1985 – April 1986:
  High school teacher of Mathematics and Physics
- May 1987 – July 1988:
  INFN fellowship at Niels Bohr Institute (Copenhagen, DK) and INFN, Sez. di Torino
- Aug.1988 - July 1990:
  INFN fellowship at INFN, Sez. di Torino
- Sept.1990 - Aug. 1991:
  Advanced NATO-CNR fellowship at the Department of Physics, Brandeis University, Waltham, MASS (USA)
- Oct. 1991 – Sept. 1992:
  Research Associate at the Laboratoire de Physique Theorique, Ecole Normale Superieure de Lyon (France)
- Sept. 1992 – March 1994:
  High school teacher of Physics
- April 1994 – October 2006:
  Researcher at the Department of Theoretical Physics of the University of Torino
- November 2006 - today:
  Associate Professor at the Department of Physics of the University of Torino

Academic Services

- Advisor of several undergraduate and graduate students (L. Giacone and P.V. Larocca)
- Member of many final examination committees for Ph.D.
- Member of many selection committees for post-doc and permanent positions (recently K.U. Leuven, Niels Bohr Institute Copenhagen, Chalmers University Goteborg)
- Referee for the Levi-Montalcini and FIRB projects and for VQR

- From 2006 to 2010 member of the "Commissione didattica paritetica" of the Faculty of Natural Science of Torino University
- From 2008 to 2014 Coordinator of the Theoretical Curriculum of the Master Degree in Physics
- Since 2011 member of the "Giunta di Dipartimento" of the Physics Department of Torino University
- Since 2013 member of the "Collegio di Disciplina" of Torino University

Teaching Activity

- 2001-2008:
  "Mathematical Methods for Physics –Introduction" for the first level degree (Laurea Triennale) in Physics
- 2006-2012:
  "Introduction to String Theory" for the Master Degree (Laurea magistrale) in Physics
- 2009-2018:
  "Quantum Mechanics" for the first level degree (Laurea Triennale) in Material Science

- 2013-2018:
  "Analytical Mechanics and Special Relativity" for the first level degree (Laurea Triennale) in Physics
- 2017-2018:
  "Mathematical Methods for Physics II" for the first level degree (Laurea Triennale) in Physics

- 2001-2011:
  "Anomalies and Non-perturbative aspects of gauge theories" for the first year graduate course of the Torino Ph.D. School

- Member of the e-learning project of the University of Torino as author of the on-line course "Mathematical Methods for Physics –Introduction"
- Member of several committees of the "Consiglio di Corso di Studi" in Physics of Torino University (for example, admission committees to the master degrees, commissione didattica, commissione semestri)

- Speaker at several outreach initiatives for high school students

Organizational Activity

- Member of the organizing committee of the "RTN Winter School on Strings, Supergravity and Gauge Theories" (Torino, January 7-11, 2003)
- Member of the "TMR Winter School on Quantum aspects of gauge theories, supersymmetry and quantum gravity", (Torino, January 26 – February 2, 2000)
- Member of the organizing committee of the workshop "From dual models to strings and branes",Torino, October 28-29, 2011
- Chair of the organizing committee of the workshop "New Frontiers in Theoretical Physics, Cortona 2018", Cortona, May 23-26, 2018

Grants

- Principal Investigator of the research project MAST "Modern Applications of String Theory", project of "Excellent Science" of Torino University funded by Compagnia di San Paolo.
- Primary coordinator of the FP7-PEOPLE-2009-IEF project n. 253534 CMADS "Condensed Matter Applications of the AdS/CFT correspondence" (Marie Curie fellowship of Dr. A. Cotrone)

- Local coordinator of the MIUR-PRIN contract 2015MP2CX4 "Non-perturbative Aspects Of Gauge Theories And String"
- Member of the MIUR-PRIN contract 2001-1025492 "Field Theories, Superstrings and Supergravity"
- Member of the MIUR-PRIN contract 2003023852 "Physics of fundamental interactions: gauge theories, gravity and strings"
- Member of the MIUR-PRIN contract 2005023102, "Strings, D-branes and Gauge Theories"
- Member of the MIUR-PRIN contract 2009KHZKRX-007 "Symmetries of the Universe and of the Fundamental Interactions"

- Member of the SCI*-CT92-0789 European Research Program "Gauge Theories, Applied Supersymmetry and Quantum Gravity"
- Member of the European TMR network project ERBFMRX-CT96-0045 "Quantum Aspects of Gauge Theories, Supersymmetry and Unification"

- Member of the European RTN network HPRN-CT-2000-00131 "The quantum structure of spacetime and the geometric nature of fundamental interactions"
- Member of the COST EU project MP 1210 "The String Theory Universe" (workgroups "Gauge/Gravity Duality, String Phenomenology, Gender and Outreach)

- Coordinator of the Torino University research project "Perturbative and non perturbative aspects of StringTheory" 2001 - 2008
- Coordinator of the Torino University research project "String Theory and Applications" 2012-2018

- **Publications**

- Author of more than 60 papers

- The citations record on Inspire is (as of July 2018):
  Tot citations 2473 (2437 published only), h=30

  Among the publications there are 6 "very well-known papers" with more than 100 citations and 10 "well-known papers" with more than 50 citations.

  10 representative publications are:
  1) M. Billò , M. Frau, L. Gallot, A. Lerda and I. Pesando,
     Deformed N=2 theories, generalized recursion relations and S-duality
     JHEP 1304 (2013) 051 (43 citations)
  2) M. Billò, P. Di Vecchia, M. Frau, A. Lerda, I. Pesando, R. Marotta,
     Instanton effects in N=1 brane models in the Kahler metric of twisted
     JHEP 0712 (2007) 051 (55 citations)
  3) M. Billò, M. Frau, F. Fucito and A. Lerda,
     Instanton calculus and RR background and the topological strings
     JHEP 0611(2006)012 (97 citations)
  4) M. Billò, M. Frau, I. Pesando, F. Fucito, A. Lerda and A. Liccardo,
     Classical gauge instantons from open strings
     JHEP 0302(2003)045 (151 citations)
  5) M. Bertolini, P. Di Vecchia, M. Frau, A. Lerda and R. Marotta,
     N=2 gauge theories on systems of fractional D3/D7 branes
     Nucl.Phys. B621(2002)157 (163 citations)
  6) M. Bertolini, P. Di Vecchia, M. Frau, A. Lerda, R. Marotta and I. Pesando,
     Fractional D-branes and their gauge duals
     JHEP 0102(2001)014 (135 citations)
This paper has been selected as one of the 5 most significant joint pubblications of the European Collaboration RTN HPRN-CT-2000-00131.
  7) M. Frau, L. Gallot, A. Lerda and P. Strigazzi
     Stable non BPS D-branes in type I string theory
     Nucl. Phys. B564 (2000) 60-85 (96 citations)
  8) M. Billò, P. Di Vecchia, M. Frau, A. Lerda, I. Pesando, R. Russo and S. Sciuto,
     Microscopic string analysis of the D0 - D8-brane system and dual R - R states
     Nucl.Phys. B526(1998)199 (127 citations)
  9) P. Di Vecchia, M. Frau, I. Pesando, S. Sciuto, A. Lerda and R. Russo,
     Classical p-branes from boundary state
     Nucl.Phys. B507(1997)259 (207 citations)
  10) P. Di Vecchia, F. Pezzella, M. Frau, K. Hornfeck, A. Lerda and A. Sciuto,
     N-Point g-Loop Vertex for a Free Bosonic Theory with Vacuum Charge Q
     Nucl.Phys. B322(1989)317 (108 citations)

Talks

Invited speakers to several national and international conferences and workshops, recently at
- Sigrav 2016 – Cefalù, Italy, 12-18 September 2016
- Women at the Intersection of Mathematics and High Energy Physics, Mainz Institute for Theoretical Physics, 6-10 March 2017
- Pollica Summer Workshp on Dualities in Superconfomal Field Theories, Mathematical Institute of Oxford University, Pollica (SA), 12-23 June 2017
- TFI 2017: Theories of the Fundamental Interactions, INFN Parma, 11-13 September 2017

Scientific Activity

The main Research Subjects are:

- String perturbation theory and multi-loop calculations in the BRST invariant operator formalism

   The main results are the construction of the the N-point and g-loop vertex $V_{N,g}$, which is the generator of the N-particle g-loops amplitudes, and the computation of the explicit expression of the integration measure on the moduli space of an arbitrary Riemann surface [10]

- Conformal field theory on Riemann surfaces

   The main result is the computation of the conformal blocks of the minimal models of the Virasoro algebra on higher genus Riemann surfaces.

- W-gravity

- Anyons and quantum groups

- Effective Theories for system of strongly correlated particles

- Study of D-branes with the boundary state formalism

   The main results are the construction of the BRST invariant boundary states describing BPS D-branes and the proof that the D-brane classical solutions are generated by the boundary state [8-9].

- Non BPS D-brane

   The main result are the construction of the boundary state describing non BPS stable D-branes in Type I and the computation of the classical solution corresponding to non BPS stable configurations in Type II string models [7].

- Fractional D-branes and gauge/gravity correspondence for non maximally supersymmetric gauge theories

   The main results are the computation of classical solutions for systems of fractional D- branes in type II theories that are dual to N=2 Super Yang-Mills theories in four dimensions, and the proof that these classical solutions encode the complete perturbative quantum information about the dual gauge theories, such as the running of the coupling constant and the chiral anomaly [5-6].

- Non-perturbative aspects of gauge theories and instanton corrections from string theory.

  The main achievment is the description of 4-dimensional instantons of gauge theories in terms of D(-1) brane systems with the proof that the classical profile of the super-instanton and the ADHM measure on moduli space are reconstructed from the correlation functions on disks with mixed boundary conditions [4].

- Deformed gauge theories

  It has been shown that the deformation of N=1 SYM theory corresponding to its formulation on non-anticommutative superspace (N=1/2 theory) and its non perturbative corrections can be obtained as the effective theory of open strings ending on D3-branes in presence of a costant closed string background of Ramond-Ramond type [3].

- Brane-world models of magnetized D-branes with generalized fluxes

  The main achievement is the analysis of many non perturbative properties of magnetized branes models, such as for instance the holomorphic properties of the non-perturbative contributions to the effective actions, and of their dependence on non-trivial supergravity backgrounds [2].

- Exotic instantons

  The main results are the extension of the world-sheet tecniques used to describe ordinary istantons to these stringy configurations and the proof that the exotic instantons corrections to the couplings of the field theory associated to D-branes of Type I or Type II theories match exactly the ones computed in the dual heterotic models, giving a precise test of the duality.

- Non-perturbative gauge/gravity correspondence

  The main result is the computation of the exact profile (i.e. including non perturbative contributions) of scalar supergravity fields emitted by D-brane systems supporting N=2 SYM theories and the discussion of their relation with the exact effective gauge couplings.

- Exact results in N=2 Super Yang-Mills theories

  The most recent research activity concerns the study of the perturbative and non perturbative properties N=2 Super Yang-Mills theories. It has been investigated the possibility of computing exact results for the physical observables, thanks to the combined use of the S-duality property of the theory and explicit instanton calculus a la Nekrasov, even in presence of extended defects. In particular, it has been possible to compute the exact expressions for the coefficients of the mass expansion of the prepotential of various superconformal N=2 theories and the expression of the chiral superpotential induced by the presence of surface operators [1]