

Curriculum vitae

PERSONAL INFORMATION



Marco Billò

📍 Via Madama Cristina 37, 10125, Torino

📞 +39 339 6644489 📠 +39 011 7940123 📠 +39 011 6707213

✉ billo@to.infn.it

Gender Male | Date of birth August, 2nd, 1966 | Nationality Italian

CAREER

November 2010 - Today

Associate Professor

Department of Physics, Università degli Studi di Torino

December 1998 - October 2010

Researcher

Department of Physics, Università degli Studi di Torino

December 1998 - June 1999

Visiting Professor

K.U. Luven, Belgium

November 1997 - December 1998

Junior Fellow

K.U. Luven, Belgium

November 1995 - November 1997

Postdoctoral Fellow

NORDITA, Copenhagen, Denmark, with a fellowship from INFN

QUALIFICATIONS

Abilitazione Scientifica Nazionale (National Scientific Qualification)

ASN 2012 I got the National Scientific Qualification to function as full professor in Italian Universities, valid from 2012 to 2020.

EDUCATION

31/10/1995

Ph. D. in Elementary Particle Physics

SISSA, Trieste. Supervisor: Pietro Frè. Thesis: *Gravitational Instantons and $N = 2$ dualities.*

July 1990

Laurea (Master degree) in Fisica.

Università degli Studi di Torino. Grade: 110/110 cum laude. Supervisor: Pietro Frè.

June 1985

Diploma di Maturità Classica (high school diploma)

Liceo Classico G. B. Beccaria, Mondovì. Grade: 60/60.

RESEARCH ACTIVITY

Bibliometrics

Data taken on 22/03/2018 from the HEP-Spires database, which is the most reliable database for the theoretical High Energy Physics community.

Publications 83 papers, of which 63 published on refereed journals.

Citations 2139, of which 2090 for the published papers. Average number of citations per paper: 25.8, and 33.2 for the published ones.

Indicators *h*-index 28.

Research topics

I work in High Energy Theoretical Physics, especially in Quantum Field Theory and in String Theory. A list of subjects on which I have given some contributions is listed here in (approximate) inverse chronological order.

| | |
|--------------------------------------|---|
| Supersymmetric QFT | $\mathcal{N} = 2$ super Yang-Mills theories, mostly in $d = 4$: defects (Wilson loops [1], surface defects), non perturbative aspects (instantons, dualities, modular anomaly, non-perturbative gauge/gravity correspondence), perturbative aspects (relation of correlators to matrix models from localization). Relation to stringy constructions (Dbrane systems). |
| CFT in $d > 2$ | Defect Conformal Field Theory: general aspects [2], examples in $\mathcal{N} = 2$ SYM theories, checks using Lattice Field Theory [3]. |
| D-brane physics | Exotic instantons. RR backgrounds and instanton calculus [4]. Background fluxes in brane-world scenarios. Branes at angles or magnetized [5]. Open strings in non-trivial backgrounds and deformed gauge theories. Open strings and instantons [7]. D-branes on pp-waves [8]. D-branes on orbifolds [9]. D-branes in type 0 theories and non-BPS D-branes. Interactions among D-branes [10,11]. |
| Effective String Theory | Expectation values of Polyakov loop correlators [7], interfaces and Wilson loops from string techniques and comparison to Lattice Field Theory results. |
| Yang-Mills theories in $d = 2$ | YM2 and the theory of coverings. YM2 and matrix strings. |
| Gauge theories at finite temperature | Analytical aspects of the confinement-deconfinement transitions. |
| Supergravity and Strings | AdS/CFT. String Dualities. Strings and Gravitational Instantons [12]. |

Selected publications

1. M. Billò, F. Galvagno, P. Gregori and A. Lerda, *Correlators between Wilson loop and chiral operators in $\mathcal{N} = 2$ conformal gauge theories*, arXiv:1802.09813 [hep-th], to appear on JHEP.
2. M. Billò, V. Gonçalves, E. Lauria and M. Meineri, *Defects in conformal field theory*, JHEP **1604** (2016) 091.
3. M. Billò, M. Caselle, D. Gaiotto, F. Gliozzi, M. Meineri and R. Pellegrini, *Line defects in the 3d Ising model*, JHEP **1307** (2013) 055.
4. M. Billò, M. Frau, F. Fucito and A. Lerda, *Instanton calculus in R-R background and the topological string*, JHEP **0611** (2006) 012.
5. M. Bertolini, M. Billò, A. Lerda, J. F. Morales and R. Russo, *Brane world effective actions for D-branes with fluxes*, Nucl. Phys. B **743** (2006) 1.
6. M. Billò and M. Caselle, *Polyakov loop correlators from D0-brane interactions in bosonic string theory*, JHEP **0507** (2005) 038.
7. M. Billò, M. Frau, I. Pesando, F. Fucito, A. Lerda and A. Liccardo, *Classical gauge instantons from open strings*, JHEP **0302** (2003) 045.
8. M. Billò and I. Pesando, *Boundary states for GS superstrings in an Hpp wave background*, Phys. Lett. B **536** (2002) 121.
9. M. Billò, B. Craps and F. Roose, *Orbifold boundary states from Cardy's condition*, JHEP **0101** (2001) 038.
10. 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. B **526** (1998) 199.
11. M. Billò, P. Di Vecchia and D. Cangemi, *Boundary states for moving D-branes*, Phys. Lett. B **400** (1997) 63.
12. D. Anselmi, M. Billò, P. Fre, L. Girardello and A. Zaffaroni, *ALE manifolds and conformal field theories*, Int. J. Mod. Phys. A **9** (1994) 3007.

Presentations, talks

I have given invited talks at many institutions, including for instance CERN, the Institut Henri Poincaré in Paris, L.M.U. Muenich, Utrecht U., and many presentations at conferences and workshops, including for instance the *Strings at the LHC and in the Early Universe* workshop at K.I.T.P., Santa Barbara, April 2010 and the *Geometry of Strings and Fields* workshop at the G.G.I. Institute, Florence, September 2013.

Participation to research projects

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|----------|---|
| European | MPNS COST Action MP1210 <i>The String Theory Universe</i> . EC Human Potential Programme MRTN-CT-2004-005104 <i>Constituents, Fundamental Forces and Symmetries of the Universe</i> . RTN network project HPRN-CT-2000-00131 <i>The quantum structure of spacetime and the geometric nature of fundamental interactions</i> . TMR programme ERBFMRX-CT96-0045. |
| National | MIUR-PRIN Contract 2015MP2CX4 <i>Non-perturbative Aspects Of Gauge Theories And Strings</i> . MIUR-PRIN contract 2009KHZKRX-007 <i>Symmetries of the Universe and of the Fundamental Interactions</i> . MIUR-PRIN-2005023102 contract <i>Strings, D-branes and Gauge Theories</i> . MIUR-PRIN-2003023852 contract <i>Physics of fundamental interactions: gauge theories, gravity and strings</i> . |
| Local | Compagnia di San Paolo contract <i>Modern Application of String Theory</i> (MAST) TO-Call3-2012-0088 |

TEACHING EXPERIENCE

Master and bachelor level

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|-------------------------|--|
| Since a.y. 2017/18 | <i>Complementi di Meccanica Quantistica</i> (Relativistic Quantum Mechanics, basics of Quantum Field Theory), 48 hours. |
| Since 2013/14 | <i>Introduzione alla Teoria dei Gruppi</i> (Group Theory). I teach the part on discrete groups and on representation theory, 24 hours. |
| Since 2012/13 | <i>Introduzione alla Meccanica Statistica</i> (basic Statistical Mechanics), 24 hours. |
| Since 2011/12 | <i>Fisica</i> (General Physics for students of the degree in Mathematics and Finance). 72 hours, reduced to 24 starting from a.y. 2017/18. |
| 2010/11 | <i>Tecniche Informatiche per la Fisica</i> (Informatics for Physics - focused on the <i>Mathematica</i> software), 24 hours. |
| From 2006/07 to 2011/12 | <i>Meccanica Quantistica</i> (Quantum Mechanics for students in Mathematics), 56 hours. |
| From 2001/02 to 2005/06 | <i>Introduzione alla Teoria dei Gruppi</i> (Group Theory), 48 hours. |
| 2000/01 and 2001/02 | <i>Meccanica (esercitazioni)</i> (teaching assistance, Classical Mechanics). 70 hours the first year, 35 the second. |

Doctoral level

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| Since 2014 | <i>Introduction to bosonic String Theory</i> , intensive course for the Joint European Doctoral school on String Theory (Amsterdam/Bruxelles/Geneva/Paris). I teach the part on string amplitudes, 12 hours. |
| 2015 | <i>Introduction to Instantons in QM and QFT and to Seiberg-Witten Theory</i> , at the School on Instantons in Supersymmetric Field Theories/String Theory and Applications, IPM, Tehran Feb 2-8, 2015. 9 hours. |
| 2011 | <i>D-branes: perturbative and non-perturbative applications to SUSY gauge theories (part II)</i> , at the LACES Doctoral School, GGI institute, Florence, Nov. 28 - Dec 16, 2011. 6 hours. |
| 2001 | Course on <i>Non-perturbative field configurations</i> for the Ph. D programme in Physics, Torino. repeated several times since in different years. 10 hours. |
| 2001 | Course on <i>2-d Gauge theories as String theories</i> , Phd. D programme in Physics, University of Parma. 6 hours. |

Supervising

- Ph. D students I have been the supervisor of the following Ph. D. students: Fabio Lonegro, Livia Ferro, Roberto Pellegrini, Davide Vadicchino and Alessandro Nada (co-supervised with M. Caselle), Daniele Ruggeri (co-supervised with M. Trigiante), Paolo Gregori (co-supervised with F. Ferrari). I am currently supervising Francesco Galvagno.
- I have supervised many bachelor (Laurea triennale) and master (Laurea magistrale) students.

ORGANIZATIONAL EXPERIENCE

Conferences, schools

I have been in the organizing committee of the following international conferences, workshops and schools

- 2018 *50 years of the Veneziano model: from dual models to strings, M-theory and beyond*, GGI institute, Florence, May 11-15, 2018
- 2018 *Supersymmetric Quantum Field Theories in the Non-perturbative Regime*, GGI institute, Florence, April 02 - May 11, 2018
- 2003 *RTN Winter School on Strings, Supergravity and Gauge Theories*, Torino, January 7-11 2003. Editor of the proceedings, in *Fortschritte der Physik*, Vol 52, no 2-3 (February-March 2004).
- 2002 Workshop of the European RTN network *The quantum structure of spacetime and the geometric nature of fundamental interactions*, Leuven, September 13-19, 2002. Editor of the proceedings, in *Class. Quantum Grav.* 20 (2003) 321-579.
- 2000 School on *Quantum aspects of gauge theories, supersymmetry and quantum gravity*, Turin, January 26 - February 2, 2000. Editor of the proceedings, in *Class. Quant. Grav.* 17 (2000) 3377-3597.

Committees

- Since 2002 Since 2002 I am a member of the Outreach committee of the Laurea in Fisica of the University of Turin. In these years I have thus organized, and sometimes invented, many types of activities aimed at illustrating our courses to high school students: visits to the institute and to its labs, conferences and seminars at the institute and in high schools, and so on.

OUTREACH

Aimed at high school students

- Relativity I have taught already 7 times an intensive introductory course to Special and General Relativity, of 10-12 hours, during residential weekend activities for high school students, going under the name of *Campus di Matematica Fisica Sport*, see <http://www.campusmfs.it/>. The attendance has always been of 50 or more, so this activity has been followed by now by a quite large number of students. I have also given shorter conferences on the same subject in specific High Schools or during activities dedicated to high school students, such as the *Scuola di Fisica 2016* organized by the University of Torino.

Aimed at a general public

- Conferences I have given several talks aimed at the dissemination of Physics. For instance, in April 2017 I gave a conference on Supergravity entitled *Sviluppi della Relatività Einsteiniana: la Supergravità*, within a cycle of conferences entitled *Seralmente*, in Grugliasco, that had a remarkably large audience of around 350 people.