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Davide Fermi

Curriculum Vitae et Studiorum

Address: Department of Mathematics
Università degli Studi di Milano
Via Cesare Saldini, 50
I-20133 Milano, Italy

Phone: +39-0250316148

Email: davide.fermi@unimi.it,
fermidavide@gmail.com

Webpage: <http://users.mat.unimi.it/users/fermi/>



Personal Data

Name and surname: Davide Fermi
Place and date of birth: Milan (Italy), on 1 August 1988
Nationality: Italian
Status: married with Erika Ghidini since 25 July 2015,
father of one child born on 7 October 2018

Spoken Languages

Italian: first language
English: fluent

Present Position

Post-doctoral fellow: Dipartimento di Matematica, Università degli Studi di Milano
Supervisor: Prof. Marco M. Peloso
Tutor: Prof. Livio Pizzocchero
Project: “*Metodi Analitici e Geometrici per le Equazioni Differenziali e la Teoria Quantistica dei Campi*” (transl. “*Analytical and Geometrical Methods for Differential Equations and Quantum Field Theory*”)
Milano (Italy), from 01 December 2016

Working Experiences and Fellowships

2016 *Post-doctoral fellow:* Dipartimento di Scienza e Alta Tecnologia (DiSAT), Università degli Studi dell’Insubria
Supervisor: Prof. Claudio Cacciapuoti
Project: FIR 2013 project “*Problemi matematici nella fisica della materia condensata*” (transl. “*Condensed Matter in Mathematical Physics*”)
Como (Italy), 15 April 2016 - 30 November 2016

Education

2016 *Ph.D. in Mathematics* at Università degli Studi di Milano on 22 February 2016, with a written thesis in mathematical physics presenting a rigorous functional analytic setting for the implementation of local zeta regularization in the Wightman approach to field quantization in the scalar case, especially in connection with the renormalization of vacuum expectation values.
Title of the thesis: “*A functional analytic framework for local zeta regularization and the scalar Casimir effect*”
Advisor: Prof. Livio Pizzocchero

2012 *Master's Degree in Physics* at Università degli Studi di Milano on 24 July 2012 (marks 110/110 *magna cum laude*), with a written thesis in theoretical physics on the renormalization of the vacuum expectation value of the stress-energy tensor for a scalar field theory interacting with classical background potentials and with classical boundaries.

Title of the thesis: “*L’Effetto Casimir e la Regolarizzazione Zeta*” (transl. “*Zeta regularization and the Casimir effect*”)

Advisor: Prof. Livio Pizzocchero

Co-advisor: Prof. Franco Gallone

2010 *Bachelor's Degree in Physics* at Università degli Studi di Milano on 21 October 2010 (marks 110/110 *magna cum laude*), with a written thesis in theoretical physics on the analysis of stress-energy tensors violating the energy conditions and their relation to superluminal motion in general relativity.

Title of the thesis: “*Lo Spaziotempo di Alcubierre*” (transl. “*Alcubierre’s spacetime*”)

Advisor: Prof. Livio Pizzocchero

Further Education

2007 Liceo Scientifico Statale Giordano Bruno, Melzo (Italy) (2002–2007),
diploma di Maturità Scientifica PNI (Piano Nazionale Informatica), marks 100/100.

Scientific Works

Books

1. D. Fermi, L. Pizzocchero,
Local zeta regularization and the scalar Casimir effect. A general approach based on integral kernels,
World Scientific Publishing (2017)
ISBN: 978-981-3224-99-5 (hardcover), ISBN: 978-981-3225-01-5 (ebook)

Preprints

10. D. Fermi,
Some remarks on a new exotic spacetime for time travel by free fall,
arXiv:1812.09021 (2018)

Published papers

9. D. Fermi, M. Gengo, L. Pizzocchero,
On the necessity of phantom fields for solving the horizon problem in scalar cosmologies,
Universe **2019**, 5(3) (2018), 76 [20 pages] (invited feature article)
DOI:10.3390/universe5030076; arXiv:1901.11511
8. C. Cacciapuoti, D. Fermi, A. Posilicano,
Scattering from local deformations of a semitransparent plane,
J. Math. Anal. Appl. **473**(1) (2019), 215–257 [43 pages]
DOI:10.1016/j.jmaa.2018.12.045; arXiv:1807.07916
7. C. Cacciapuoti, D. Fermi, A. Posilicano,
On inverses of Krein’s Q-functions,
Rend. Mat. Appl. (7) **39**(2) (2018), 229–240 [12 pages]
Editor’s page; arXiv:1809.05150
6. D. Fermi, L. Pizzocchero,
A time machine for free fall into the past,
Class. Quant. Grav. **35**(16) (2018), 165003 [42 pages]
DOI:10.1088/1361-6382/aace6e; arXiv:1803.08214

5. D. Fermi, L. Pizzocchero,
Local Casimir Effect for a Scalar Field in Presence of a Point Impurity,
invited contribution in “Casimir Physics and Applications” Special Issue of Symmetry, guest
editors I. H. Brevik and K. A. Milton,
Symmetry **2018**, **10**(2) (2018), 38 [20 pages]
DOI:10.3390/sym10020038; arXiv:1712.10039
4. C. Cacciapuoti, D. Fermi, A. Posilicano,
Relative-Zeta and Casimir energy for a semitransparent hyperplane selecting transverse modes,
pp. 71–97 in “Advances in Quantum Mechanics: contemporary trends and open problems”,
edited by G.F. DellAntonio and A. Michelangeli, Springer (2017) [26 pages]
DOI:10.1007/978-3-319-58904-6_5; arXiv:1702.05296
3. D. Fermi, L. Pizzocchero,
Local zeta regularization and the scalar Casimir effect IV. The case of a rectangular box,
Int. J. Mod. Phys. A **31**(04&05) (2016), 1650003 [56 pages]
DOI:10.1142/S0217751X16500032; arXiv:1505.03276
2. D. Fermi, L. Pizzocchero,
*Local zeta regularization and the scalar Casimir effect III. The case with a background har-
monic potential*,
Int. J. Mod. Phys. A **30**(35) (2015), 1550213 [42 pages]
DOI:10.1142/S0217751X15502139; arXiv:1505.01651
1. D. Fermi, L. Pizzocchero,
Local Zeta Regularization and the Casimir Effect,
Prog. Theor. Phys. **126**(3) (2011), 419 [15 pages]
DOI:10.1143/PTP.126.419; arXiv:1104.4330

Invited Talks

- 2018 “Free fall into the past. A time-orientable spacetime model with closed timelike curves and no curvature singularity”,
Dipartimento di Matematica, Università degli Studi di Milano, 18 January 2018.
- 2017 “Local Casimir effect and ζ -regularization: scalar field in a rectangular box”, invited talk at
QFT Day in Milan: mathematical aspects of renormalization,
Dipartimento di Matematica, Università degli Studi di Milano, 13 April 2017.
- 2017 “Zeta regularization and Casimir effect for a scalar field with singular background potentials”,
invited talk at Microlocal analysis: a tool to explore the quantum world,
Dipartimento di Matematica, Università degli Studi di Genova, 12–13 January 2017.
- 2016 “Zeta-function regularization in Wightman scalar field theory and applications to the Casimir effect”, invited talk at Workshop in Mathematical Physics,
ETH Zürich 28–30 November 2016.
- 2016 “Casimir energy for singular potentials concentrated on a plane”, invited talk at Mathematical Challenges of Zero-Range Physics: rigorous results and open problems,
SISSA Trieste 7–10 November 2016.
- 2015 “A functional analytic framework for local zeta regularization and the scalar Casimir effect”,
Dipartimento di Matematica, Università degli Studi di Trento, 5 October 2015.
- 2011 “La regolarizzazione zeta locale e l’effetto Casimir” (transl. “Local zeta regularization and the Casimir effect”),
Dipartimento di Matematica, Università degli Studi di Milano, 28 June 2011.

Contributed Talks

- 2018 “*Free fall into the past*”, contribution at *DOMOSCHOOL - International Alpine School of Mathematics and Physics. Einstein’s Equations: Physical and Mathematical Aspects of General Relativity*, Domodossola, 16–20 July 2018.
- 2018 “*Some results on scattering theory for delta interactions concentrated on deformed planes*”, contribution at *Mathematical Challenges in Quantum Mechanics 2018*, “Sapienza” Università di Roma, 19–24 February 2018.
- 2016 “*Zeta regularization and the Casimir effect: a functional analytic framework*”, contribution at *Mathematical Challenges in Quantum Mechanics 2016*, Bressanone, 8–13 February 2016.
- 2015 “*Local zeta regularization and the scalar Casimir effect*”, contribution at *Assemblea Scientifica GNFM*, Montecatini, 22–24 October 2015.

Invited visiting

- 2016 Invited visiting scientist at SISSA (International School for Advanced Studies, Trieste), 26–29 September 2016.

Refereeing activity

- *European Journal of Physics* (by IOP Science)
- *International Journal of Geometric Methods in Modern Physics* (by World Scientific)
- *Journal of Physics G: Nuclear and Particle Physics* (by IOP Science)
- *Physica Scripta* (by IOP Science)

Research Projects

- MIUR-PRIN 2010-2011: “*Teorie geometriche e analitiche dei sistemi Hamiltoniani in dimensioni finite e infinite*” (transl. “*Geometric and analytic theories of Hamiltonian systems in finite and infinite dimensions*”)
National coordinator : Prof. Boris Anatolevitch Dubrovin
Local coordinator: Prof. Dario Paolo Bambusi
Role: participant
- Progetto Giovani GNFM 2017: “*Dinamica quasi classica per il modello di polarone*” (transl. “*Quasi-classical dynamics for the polaron model*”)
Principal investigator: Dott. Raffaele Carlone
Role: participant
- INFN Project 2017-2019: “*BELL - Fundamental Problems in Quantum Physics*”
National coordinator: Prof. Pierantonio Zanghì
Local coordinator: Prof. Bassano Vacchini
Role: participant

Affiliations

- Member of the “*Gruppo Nazionale per la Fisica Matematica*” (INdAM-GNFM, Italian National Group for Mathematical Physics), Section *Relatività e Teoria dei Campi* since 2015.
- Member of the “*International Association of Mathematical Physics*” (IAMP) since 2017.
- Member of the “*Istituto Nazionale di Fisica Nucleare*” (INFN, Italian National Institute for Nuclear Physics) since 2017.
- Member of the “*Unione Matematica Italiana*” (UMI) since 2019.

Teaching activity

- Teaching assistant for “Meccanica Analitica” (Analytical Mechanics) for the degree in “Physics”, Università degli Studi di Milano, academic year 2018/2019 (20 hours of teaching activity).
- Teaching assistant for “Meccanica Analitica” (Analytical Mechanics) for the degree in “Physics”, Università degli Studi di Milano, academic year 2017/2018 (20 hours of teaching activity).
- Teaching assistant for “Matematica del continuo”, mathematics course for the degree in “Computer science”, Università degli Studi di Milano, academic year 2015/2016 (48 hours of teaching activity, 20 hours of support for exams).
- Teaching assistant for “Matematica del continuo”, mathematics course for the degree in “Computer science”, Università degli Studi di Milano, academic year 2014/2015 (48 hours of teaching activity, 20 hours of support for exams).
- Teaching assistant for “Istituzioni di matematica”, mathematics course for the degree in “Computer science”, Università degli Studi di Milano, academic year 2013/2014 (48 hours of teaching activity, 20 hours of support for exams).

Attended Schools and Meetings

- 2019 “*Foundations and Constructive Aspects of QFT*”, 43rd workshop of the LQP series at Galileo Galilei Institute, Firenze, 20–22 February 2019.
- 2018 “*Mathematical Challenges of Zero Range Physics: rigorous results and open problems*”, INdAM workshop at “Sapienza” Università di Roma, 9–13 July 2018.
- 2018 “*Trails in Quantum Mechanics and Surroundings*”, workshop at SISSA Trieste, 29–30 January 2018.
- 2017 “*Spectral and scattering theory: from selfadjoint operators to boundary value problems - Insubria Summer School in Mathematical Physics*”, workshop at Department of Science, Università degli Studi dell’Insubria (Como), 18–22 September 2017.
- 2017 “*Fundamental problems of quantum physics*”, workshop INFN BELL 2017 at Dipartimento di Fisica, Università degli Studi di Milano, 16 June 2017.
- 2017 “*Linear and Nonlinear Dirac Equation: advances and open problems*”, workshop at Dipartimento di Scienza e Alta Tecnologia, Università degli Studi dell’Insubria (Como), 08–10 February 2017.
- 2016 “*EMS – IAMP Summer School in Mathematical Physics. Universality, Scaling Limits and Effective Theories*”, “Sapienza” Università di Roma, 11–15 July 2016.
- 2016 “*Contemporary Trends in the Mathematics of Quantum Mechanics*”, INdAM workshop at “Sapienza” Università di Roma, 04–08 July 2016.
- 2016 “*Operator Algebras and Quantum Field Theory*”, workshop at Frascati INFN-LNF, 27–29 June 2016.
- 2016 “*Mathematical Challenges in Quantum Mechanics*”, workshop at Bressanone, 8–13 February 2016.
- 2016 “*Geometric and Analytic Theory of Hamiltonian Systems in Finite and Infinite Dimensions*”, workshop at SISSA (Trieste), 18–21 January 2016.
- 2015 “*Assemblea Scientifica GNFM*”, workshop at Montecatini, 22–24 October 2015.
- 2015 “*New Trends in Algebraic Quantum Field Theory (AQFT2015)*”, workshop at Frascati INFN-LNF, 11–13 February 2015.

- 2014 “*Operator and Geometric Analysis on Quantum Theory*”, workshop at Levico Terme (Trento), 15–19 September 2014.
- 2014 “*Algebraic Quantum Field Theory: its status and its future*”, workshop at ESI Wien, 19–23 May 2014.
- 2013 “*Finite and Infinite Dimensional Hamiltonian Systems*”, workshop at Dipartimento di Matematica, Università di Roma Tre, 24–25 October 2013.
- 2013 “*Recent Advances in Partial Differential Equations and Applications*”, International School at Dipartimento di Matematica, Università degli studi di Milano, 17–21 June 2013.
- 2013 “*Analytical Aspects of Mathematical Physics*”, workshop at ETH Zürich, 27–31 May 2013.
- 2012 “*La geometria degli atomi e delle molecole. La Meccanica negli studi di Carlo Cercignani*”, workshop at Istituto Lombardo , Accademia di Scienze e Lettere, 22 November 2012.