

DAVIDE FERMI

Curriculum Vitae et Studiorum

Personal Data

Name and surname: Davide Fermi
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Academic Positions

from 01/01/2021 **Postdoc**, Università degli Studi di Roma “La Sapienza” (Roma, Italy)
Project: “*Metodi matematici in meccanica quantistica*”
(transl. “*Mathematical Methods in Quantum Mechanics*”)
Supervisor: Prof. Alessandro Teta
Expected end date: 31/12/2021 (tempo determinato)

02/03/2020 - present **Postdoc**, Scuola Normale Superiore, Classe di Scienze (Pisa, Italy)
Project: “*Aspetti Matematici della Fisica della Materia Condensata*”
(transl. “*Mathematical Aspects of Condensed Matter Physics*”)
Supervisor: Prof. Michele Correggi

01/12/2016 - 29/02/2020 **Postdoc**, Università degli Studi di Milano, Mathematics Department (Milano, Italy)
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*”)
Supervisors: Prof. Marco M. Peloso and Prof. Livio Pizzocchero

15/04/2016 - 30/11/2016 **Postdoc**, Università degli Studi dell’Insubria, DiSAT (Como, Italy)
Project: “*Problemi matematici nella fisica della materia condensata - FIR 2013*”
(transl. “*Mathematical Problems in Condensed Matter Physics*”)
Supervisors: Dr. Claudio Cacciapuoti and Prof. Andrea Posilicano

Qualifications and Education

2020 **Abilitazione Scientifica Nazionale** for Associate Professor in Mathematical Physics
(Professore di II Fascia, s.c. 01/A4 - Fisica Matematica, valid until 09/11/2029).

2012 - 2016 **Ph.D. degree in Mathematics**, Università degli Studi di Milano, Math. Dep. (Milano, Italy)
(XXVIII cycle, with scholarship)
Thesis: “*A functional analytic framework for local zeta regularization and the scalar Casimir effect*”
defended in Milan, Italy on 22 February 2016
Advisor: Prof. Livio Pizzocchero

2010 - 2012 **Master degree in Physics**, Università degli Studi di Milano, Physics Dep. (Milano, Italy)
Thesis: “*L’Effetto Casimir e la Regolarizzazione Zeta*”
(transl. “*Zeta regularization and the Casimir effect*”)
defended in Milan, Italy on 24 July 2012
Marks: 110/110 *magna cum laude*
Advisor: Prof. Livio Pizzocchero
Co-advisor: Prof. Franco Gallone

2007 - 2010 **Bachelor degree in Physics**, Università degli Studi di Milano, Physics Dep. (Milano, Italy)
Thesis: “*Lo Spaziotempo di Alcubierre*” (transl. “*Alcubierre’s spacetime*”)
defended in Milan, Italy on 21 October 2010
Marks: 110/110 *magna cum laude*
Advisor: Prof. Livio Pizzocchero

2002 - 2007 **Italian High School diploma**, Liceo Scientifico Statale Giordano Bruno, Melzo (Milan, Italy)
(diploma di Maturità Scientifica PNI - Piano Nazionale Informatica)
Marks: 100/100

Honors and awards

- 12/2020 **Winner** of a 1 – year postdoc scholarship (assegno di ricerca), funded by Università degli Studi di Roma “La Sapienza”, Mathematics Dep. (Roma, Italy)
Selection committee: Dott. Domenico Monaco, Prof. Gianluca Panati, Prof. Alessandro Teta
- 12/2020 **Shortlisted** for a tenured researcher position in mathematical physics (Ricercatore a Tempo Determinato di tipo b, s.c. 01/A4, s.s.d. MAT/07), Politecnico di Milano, Dip. di Matematica (Milano, Italy).
Selection committee: Prof. Michele Correggi, Prof. Diego Noja, Prof. Alessandro Giuliani
- 12/2020 **Shortlisted** for a non-tenured researcher position in mathematical physics (Ricercatore a Tempo Determinato di tipo a, s.c. 01/A4, s.s.d. MAT/07), Università degli Studi di Genova, Dip. di Matematica (Genova, Italy).
Selection committee: Prof. Stefano Vignolo, Prof. Cristian Giardinà, Prof. Maria Grazia Naso
- 12/2020 **Shortlisted** for a non-tenured researcher position in mathematical physics (Ricercatore a Tempo Determinato di tipo a, s.c. 01/A4, s.s.d. MAT/07), Università degli Studi di Milano, Dip. di Matematica “Federigo Enriques” (Milano, Italy).
Selection committee: Prof. Giuseppe Gaeta, Prof. Maria Groppi, Prof. Marcello Porta
- 11/2020 **Shortlisted** for a non-tenured researcher position in mathematical physics (Ricercatore a Tempo Determinato di tipo a, s.c. 01/A4, s.s.d. MAT/07), SISSA - Scuola Internazionale Superiore di Studi Avanzati (Trieste, Italy).
Selection committee: Prof. Giada Basile, Prof. Alessandro Giuliani, Prof. Marcello Porta
- 2019/2020 **Shortlisted** (6th place, >20 participants) for a permanent full-time researcher position at INdAM (concorso pubblico per titoli ed esami per l’assunzione con contratto di lavoro a tempo pieno e indeterminato di una unità di personale Profilo Ricercatore, III Livello Professionale presso l’Istituto Nazionale di Alta Matematica “Francesco Severi”),
Selection procedure: 1 preliminary written evaluation, 2 written exams, 1 oral exam
(8 participants selected for final stage).
Selection committee: Prof. Dario Bambusi, Prof. Carla Manni, Prof. Marco Romito
- 01/2020 **Winner** (2 participants) of a 2 – years postdoc scholarship (assegno di ricerca) at SISSA, Trieste, funded by ERC Starting Grant “*MaMBoQ-Macroscopic Behavior of Many-Body Quantum Systems*” (I renounced the assignment in favour of a postdoc scholarship at Scuola Normale Superiore).
Selection committee: Prof. Gianni dal Maso, Prof. Marcello Porta, Prof. Ludwik Dabrowski
- 01/2020 **Winner** (2 participants) of a 1 – year postdoc scholarship (assegno di ricerca), funded by Scuola Normale Superiore (Faculty of Sciences).
Selection committee: Prof. Michele Correggi, Prof. Andrea Malchiodi, Prof. Stefano Marmi
- 07/2019 **Shortlisted** for a non-tenured researcher position in mathematical physics (Ricercatore a Tempo Determinato di tipo a, s.c. 01/A4, s.s.d. MAT/07), Università degli Studi di Roma “La Sapienza”, Mathematics Dep. (Roma, Italy).
Selection committee: Prof. Alessandro Giuliani, Prof. Diego D. Noja, Prof. Alessandro Teta
- 05/2019 **Shortlisted** for a non-tenured researcher position in mathematical physics (Ricercatore a Tempo Determinato di tipo a, s.c. 01/A4, s.s.d. MAT/07), Università degli Studi di Firenze, Dip. di Matematica e Informatica “Ulisse Dini” (Firenze, Italy).
Selection committee: Prof. Luigi Barletti, Prof. Luigi Preziosi, Prof. Fabio Rosso
- 02/2019 **Shortlisted** for a non-tenured researcher position in mathematical physics (Ricercatore a Tempo Determinato di tipo a, s.c. 01/A4, s.s.d. MAT/07), Università degli Studi di Milano Bicocca, Dip. di Matematica e Applicazioni (Milano, Italy).
Selection committee: Prof. Gregorio Falqui, Prof. Annalisa Marzuoli, Prof. Marco Pedroni
- 11/2018 **Shortlisted** for a non-tenured researcher position in mathematical physics (Ricercatore a Tempo Determinato di tipo a, s.c. 01/A4, s.s.d. MAT/07), GSSI - Gran Sasso Science Institute (l’Aquila, Italy).
Selection committee: Prof. Paolo Buttà, Prof. Andrea Sacchetti, Prof. Alessandro Teta
- 08/2016 **Winner** (2nd place, 7 participants) of a 2 – years renewable postdoc scholarship (assegno di ricerca), funded by Università degli Studi di Milano, Mathematics Dep. (Milano, Italy).
Selection committee: Prof. Giovanni Gallavotti, Prof. Valter Moretti, Prof. Marco Rigoli
- 03/2016 **Winner** (3 participants) of a 1 – year postdoc scholarship (assegno di ricerca), funded by FIR project 2014-2017 “*COND-MATH - Condensed Matter in Mathematical Physics*”, Università degli Studi dell’Insubria, DiSAT (Como, Italy).
Selection committee: Prof. Claudio Cacciapuoti, Prof. Andrea Posilicano, Dott.ssa Stefania Ugolini
- 11/2012 **Winner** (1st place, 26 participants) of a 3 – years Ph.D. scholarship funded by MIUR (Italy), Università degli Studi di Milano, Mathematics Dep. (Milano, Italy).
Selection committee: Prof. Livio Pizzocchero, Prof. Paolo Stellari, Prof. Enrico Valdinoci

Preprints

3. M. Correggi, D. Fermi,
Magnetic perturbations of anyonic and Aharonov-Bohm Schrödinger operators,
arXiv:2006.09056 [math-ph] (2020); submitted
2. C. Cacciapuoti, D. Fermi, A. Posilicano,
The semiclassical limit on a star-graph with Kirchhoff conditions,
arXiv:2005.03790 [math-ph] (2020);
to appear in *Analysis and Mathematical Physics*
1. C. Cacciapuoti, D. Fermi, A. Posilicano,
Scattering theory for delta-potentials supported by locally deformed planes;
to appear in A. Michelangeli (Ed.), “Mathematical Challenges of Zero-Range Physics”, Springer (2021)

Books

1. D. Fermi, L. Pizzocchero,
Local zeta regularization and the scalar Casimir effect. A general approach based on integral kernels,
World Scientific Publishing, Singapore (2017) [276 pages]
ISBN: 978-981-3224-99-5 (hardcover), ISBN: 978-981-3225-01-5 (ebook); arXiv:1505.00711, arXiv:1505.01044.

Published papers

13. D. Fermi, M. Gengo, L. Pizzocchero,
Integrable scalar cosmologies with matter and curvature,
Nucl. Phys. B **957** (2020), 115095 [102 pages].
DOI:10.1016/j.nuclphysb.2020.115095; arXiv:2001.03228 [gr-qc]
12. C. Cacciapuoti, D. Fermi, A. Posilicano,
The semi-classical limit with a delta potential,
Annali di Matematica Pura ed Applicata (2020), *online first* [37 pages].
DOI:10.1007/s10231-020-01002-4; arXiv:1907.05801 [math-ph]
11. D. Fermi,
The Casimir energy anomaly for a point interaction,
Mod. Phys. Lett. A **35**(03) (2020), 2040008 [5 pages]
DOI:10.1142/S0217732320400088; arXiv:1909.00604 [math-ph]
10. D. Fermi,
Some remarks on a new exotic spacetime for time travel by free fall,
pp. 243–265 in S. Cacciatori, B. Güneysu, S. Pigola (Eds.), “Einstein Equations: Physical and Mathematical Aspects of General Relativity. DOMOSCHOOL 2018”, Birkhäuser, Cham, Springer Nature Switzerland AG (2019) [23 pages].
DOI:10.1007/978-3-030-18061-4_8; arXiv:1812.09021 [gr-qc]
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) (2019), 76 [20 pages]
(invited feature article).
DOI:10.3390/universe5030076; arXiv:1901.11511 [gr-qc]
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 [math-ph]
Corrigendum,
J. Math. Anal. Appl. **482**(1) (2020), 123554 [2 pages]
DOI:10.1016/j.jmaa.2019.123554
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 [math.SP]
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 [gr-qc]
5. D. Fermi, L. Pizzocchero,
Local Casimir Effect for a Scalar Field in Presence of a Point Impurity,
Symmetry **2018**, **10**(2) (2018), 38 [20 pages]
(invited contribution in I. H. Brevik, K. A. Milton (guest Eds.), Special Issue of Symmetry “Casimir Physics and Applications”).
DOI:10.3390/sym10020038; arXiv:1712.10039 [math-ph]

4. C. Cacciapuoti, D. Fermi, A. Posilicano,
Relative-Zeta and Casimir energy for a semitransparent hyperplane selecting transverse modes,
pp. 71–97 in G.F. Dell’Antonio and A. Michelangeli (Eds.), “Advances in Quantum Mechanics: contemporary trends and open problems”, Springer (2017) [26 pages].
DOI:10.1007/978-3-319-58904-6_5; arXiv:1702.05296 [math-ph]
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 [math-ph]
2. D. Fermi, L. Pizzocchero,
Local zeta regularization and the scalar Casimir effect III. The case with a background harmonic potential,
Int. J. Mod. Phys. A **30**(35) (2015), 1550213 [42 pages].
DOI:10.1142/S0217751X15502139; arXiv:1505.01651 [math-ph]
1. D. Fermi, L. Pizzocchero,
Local Zeta Regularization and the Casimir Effect,
Prog. Theor. Phys. **126**(3) (2011), 419–434 [15 pages].
DOI:10.1143/PTP.126.419; arXiv:1104.4330 [math-ph]

Invited Talks

- 2019 “*Casimir energy and relative zeta function for a semitransparent plane*”,
Dipartimento di Matematica, Università degli Studi di Genova, 21 May 2019.
- 2019 “*Zeta regularization in the scalar Casimir effect*”,
invited talk at *1st Vacuum Fluctuations at Nanoscale and Gravitation conference: theory and experiments*,
Orosei, 28 April – 3 May 2019.
- 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

- 2019 “*Scattering from local deformations of a semitransparent plane*”,
contribution at *XXI Congresso dell’Unione Matematica Italiana*,
Università degli Studi di Pavia, 2–7 September 2019.
- 2019 “*Scalar Casimir effect for delta-type potentials*”,
contribution at *10th Alexander Friedmann International Seminar on Gravitation and Cosmology, and 4th Symposium on the Casimir Effect*,
Saint Petersburg Polytechnic University, 23–29 June 2019.
- 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 degli Studi 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

- 2020 Visiting professor at Scuola Normale Superiore di Pisa, Pisa, 12–14 February 2020.
- 2016 Visiting scientist at SISSA (International School for Advanced Studies, Trieste), Trieste, 26–29 September 2016.

Research Projects and Funding

- INFN Project 2017-2019: “*BELL - Fundamental Problems in Quantum Physics*”
National coordinator: Prof. Pierantonio Zanghì
Local coordinator: Prof. Bassano Vacchini
Role: participant
- Progetto Giovani GNFM 2017: “*Dinamica quasi classica per il modello di polarone*”
(transl. “*Quasi-classical dynamics for the polaron model*”)
Principal investigator: Dr. Raffaele Carlone
Role: participant
- FIR project 2014-2017: “*COND-MATH - Condensed Matter in Mathematical Physics*”
Principal investigator: Prof. Michele Correggi
Role: participant (University of Insubria Unit, from 2016)
- 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 A. Dubrovin
Local coordinator: Prof. Dario P. Bambusi
Role: participant

Referee’s activity

- *Communications in Mathematical Physics* (by Springer)
- *Classical and Quantum Gravity* (by IOP Science)
- *Journal of Statistical Physics* (by Springer)
- *International Journal of Geometric Methods in Modern Physics* (by World Scientific)
- *Journal of Physics A: Mathematical and Theoretical* (by IOP Science)
- *Journal of Physics G: Nuclear and Particle Physics* (by IOP Science)
- *European Journal of Physics* (by IOP Science)
- *European Physical Journal C* (by Springer)
- *Physica Scripta* (by IOP Science)
- *Universe* (by MDPI)

Supervised Students

- Guglielmo Moroni, M.Sc. in Theoretical Physics, Università degli Studi di Milano, Physics Department
Thesis: “*Scalar Casimir effect on a line in presence of delta-interaction*”
Dissertation date: 2 April 2020
Co-supervised with Prof. Livio Pizzocchero

Teaching activity

Total hours of teaching activity: 240

Total hours of support for exams: 60

- Teaching assistant for “Fisica Matematica” (Mathematical Physics) for the B.Sc. degree in Mathematics, Università degli Studi dell’Insubria, academic year 2020/2021 (12 hours of online teaching activity).
- Teaching assistant for “Meccanica Analitica” (Analytical Mechanics) for the B.Sc. degree in Physics, Università degli Studi di Milano, academic years 2017/2018, 2018/2019, 2019/2020 (20 hours of teaching activity per year).
- Teaching assistant for “Matematica del continuo”, mathematics course for the B.Sc. degree in Computer Science, Università degli Studi di Milano, academic years 2014/2015, 2015/2016 (48 hours of teaching activity, 20 hours of support for exams per year).

- Teaching assistant for “Istituzioni di matematica”, mathematics course for the B.Sc. degree in Computer Science, Università degli Studi di Milano, academic year 2013/2014 (48 hours of teaching activity, 20 hours of support for exams).
- Freshmen tutor for “Corsi di azzeramento”, mathematics pre-introductory course for the B.Sc. degree in Biological Sciences, Università degli Studi di Milano, September 2014 (24 hours of teaching activity).

Administration Posts

- Representative of postdoc researchers at the Department Council (“Consiglio di Dipartimento”) of the Department of Mathematics, Università degli Studi di Milano, academic years 2017/2018, 2018/2019, 2019/2020.
- Member of the Didactic Board (“Collegio Didattico”) of the Department of Physics, Università degli Studi di Milano, academic years 2017/2018, 2018/2019, 2019/2020.

Affiliations

- Member of the “*Unione Matematica Italiana*” (UMI) since 2019.
- 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) from March 2017 to March 2020.
- 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.

Research Interests

- Schrödinger operators with Aharonov-Bohm potentials; anyonic systems and fractional statistics.
- Schrödinger operators with singular potentials; perturbations of self-adjoint operators and self-adjoint extensions of symmetric operators; scattering theory for non-relativistic quantum particles; semi-classical limit; quantum graphs.
- Mathematical aspects of relativistic quantum field theories (axiomatic QFT); zeta-regularization and its applications to the renormalization of vacuum expectation values; Casimir effect for a scalar field in presence of external potentials or classical boundaries.
- Exotic solutions of Einstein’s field equations; violations of the classical positive energy conditions; non-standard causal structures with closed timelike curves; scalar field models for early-stage inflation in cosmology.

Citation Metrics

	Scopus	Web of Science	Google Scholar
Number of citations	48	36	78
H-index	5	4	7

Last update: December 17, 2020

Ai fini della pubblicazione.