

Simone MURRO

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SCIENTIFIC INTERESTS

PHYSICS Classical and Quantum Field Theory on Curved Spacetimes, General Relativity
MATH Differential Geometry, Microlocal Analysis, Mathematical Physics, Operator Algebras

ACADEMIC POSITIONS

<i>Current</i> FEBRUARY 2022	Assistant Professor (RTD-A) , University of Genoa
<i>January 2022</i> OCTOBER 2020	Research fellowship , University of Paris-Saclay Funded by the DFG project MU 4559/1-1 " <i>Hadamard States in Linearized Quantum Gravity</i> "
SEPTEMBER 2020 OCTOBER 2019	Postdoc position , University of Trento Supported by a INFN-TIPFA project " <i>Bell</i> "
SEPTEMBER 2019 AUGUST 2017	Postdoc position , University of Freiburg Funded by the project " <i>Boundary value problem for the Dirac operator</i> " Supported by a DFG Graduiertenkolleg GRK 1821 " <i>Cohomological Methods in Geometry</i> "
JULY 2017 APRIL 2017	Postdoc position , University of Regensburg Funded by a DFG Graduiertenkolleg GRK 1692 " <i>Curvature, Cycles, and Cohomology</i> "

EDUCATION

APRIL 2017 APRIL 2014	University of Regensburg , Germany, Magna cum laude <i>Ph.D. Degree in MATHEMATICS</i> Thesis: " <i>Quantum states on the algebras of Dirac fields: A functional analytic approach</i> " Advisor: Prof. Dr. Felix FINSTER Coadvisor: Prof. Dr. Claudio DAPPIAGGI
OCTOBER 2013 OCTOBER 2011	University of Pavia , Italy 110/110 <i>Master Degree in THEORETICAL AND MATHEMATICAL PHYSICS</i> Thesis: " <i>Hadamard states for linearized gravity on asymptotically flat spacetimes</i> " Advisor: Prof. Dr. Claudio DAPPIAGGI
APRIL 2011 OCTOBER 2007	University of Pavia , Italy 92/110 <i>Bachelor Degree in PHYSICS</i> Thesis: " <i>Produzione dei bosoni vettori W e Z negli esperimenti di LHC</i> " Advisor: Prof. Dr. Claudio CONTA

AWARDS, GRANTS AND FELLOWSHIP

MAY 2030 JUNE 2021	Abilitazione scientifica nazionale Seconda Fascia, Settore concorsuale 01/A4
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MARCH 2022	P.I. grant DFG MU 4559/1-1 “Hadamard states in Linearized Quantum Gravity”
OCTOBER 2020	DFG Research Fellowship MU 4559/1-1 “Hadamard states in Linearized Quantum Gravity”
SEPTEMBER 2020	Fellowship INFN-TIFPA project “Bell”
OCTOBER 2019	funded by National Institute of Nuclear Physics
SEPTEMBER 2019	Fellowship DFG GRK 1821 “Cohomological Methods in Geometry”
AUGUST 2017	funded by of the German National Academic Foundation
MARCH 2019	Research in Pairs with Nicolás Drago
18-29	Oberwolfach
JULY 2018	Fellowship CRM Applied Mathematics Laboratory
18-30	funded by Centre de recherches mathématiques de l’Université de Montréal
NOVEMBER 2015	P.I. short-visit grant COST Action MP 1405
11-25	<i>funded by European Cooperation in Science and Technology</i>
JULY 2017	Fellowship DFG GRK 1692 “Curvature, Cycles, and Cohomology”
APRIL 2014	funded by German National Academic Foundation

PUBLICATIONS

Peer-review articles

12. **“Injective tensor products in strict deformation quantization”**
Mathematical Physics, Analysis and Geometry (2022) vol 25: 2
(with C.J.F. van de Ven)
11. **“Intertwining operators for symmetric hyperbolic systems on globally hyperbolic manifolds”**
Annals of Global Analysis and Geometry (2021) vol 59: 1-25
(with D. Volpe)
10. **“On the uniqueness of invariant states”**
Advances in Mathematics vol 376: 107445 (2021)
(with F. Bambozzi)
9. **“The well-posedness of the Cauchy problem for the Dirac operator on globally hyperbolic manifolds with timelike boundary”**
Documenta Mathematica (2020) vol 25: 737-765
(with N. Große)
8. **“The Fermionic Signature Operator in De Sitter Spacetime”**
Journal of Mathematical Analysis and Applications (2020) vol 485: 123808
(with C. Dappiaggi, F. Finster and E. Radici)
7. **“Invariant states on noncommutative tori”**
International Mathematics Research Notices (2019) vol 2021: 3299-3313
(with F. Bambozzi and N. Pinamonti)
6. **“A new class of Fermionic Projectors: Møller operators and mass oscillation properties”**
Letters in Mathematical Physics (2017) vol 117: 2433-2451
(with N. Drago)
5. **“The Fermionic Signature Operator and Quantum States in Rindler Space-time”**
Journal of Mathematical Analysis and Applications (2017) vol 454: 385-411
(with F. Finster and C. Röken)
4. **“Non-existence of natural states for Abelian Chern-Simons theory”**
Journal of Geometry and Physics (2017) vol 116: 119-123
(with C. Dappiaggi and A. Schenkel)

3. **“Wavefront sets and polarizations on supermanifolds”**
Journal of Mathematical Physics (2017) vol 58: 023504
 (with C. Dappiaggi, H. Gimperlein and A. Schenkel)
2. **“The fermionic projector in a time-dependent external potential: mass oscillation property and Hadamard states”**
Journal of Mathematical Physics (2016) vol 57: 072303
 (with F. Finster and C. Röken)
1. **“Radiative observables for linearized gravity on asymptotically flat spacetimes and their boundary induced states”**
Journal of Mathematical Physics (2014) vol 55: 082301
 (with M. Benini and C. Dappiaggi)

Pre-print

5. **“Global and microlocal aspects of Dirac operators: propagators and Hadamard states”**
 arXiv:2201.12104 [math.AP] (2022) (with M. Capoferri)
4. **“Paracausal deformations of Lorentzian metrics and Møller isomorphisms in algebraic quantum field theory”**
 arXiv:2109.06685 [math-ph] (2021) (with V. Moretti and D. Volpe)
3. **“Møller operators and Hadamard states for Dirac fields with MIT boundary conditions”**
 arXiv:2109.01375 [math-ph] (2021). (with N. Drago and N. Ginoux)
2. **“The Cauchy problem of the Lorentzian Dirac operator with APS boundary conditions”**
 arXiv:2104.00585 [math.AP] (2021). (with N. Drago and N. Große)
1. **“On the Cauchy problem for Friedrichs systems on globally hyperbolic manifolds with timelike boundary”**
 arXiv:2007.02544 [math.AP] (2020). (with N. Ginoux)

INVITED TALKS

Conferences and Workshops

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| 2019 | Symmetric systems on manifolds
CONFERENCE: <i>Cross-diffusion systems, gradient flows, and their perturbations</i>
L'Aquila, Italy |
| 2018 | On the Cauchy problem for the Dirac operator on Lorentzian spin manifolds
CONFERENCE: <i>Journées nancéiennes de géométrie</i>
Nancy, France |
| 2017 | A taste of microlocal analysis on supermanifolds
WORKSHOP: <i>Microlocal analysis: a tool to explore a quantum world</i>
Genoa, Italy |

Seminars

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| 2021 | Paracausal deformations of Lorentzian metrics and their consequences in quantum field theory
Séminaire de Geometrie differentielle”
Institut Elie Cartan de Lorraine |
| | On the Cauchy problem for Friedrichs systems on Lorentzian manifolds
Séminaire “Quantum fields interacting with geometry”
Institut Henri Poincaré |

- 2020 | **On the Cauchy problem for symmetric hyperbolic systems on Lorentzian manifolds**
 Forschungsseminar Differentialgeometrie
 University of Potsdam
- On the Cauchy problem for symmetric hyperbolic systems**
 Seminar über Mathematische Physik
 University of Regensburg
- 2018 | **On the Cauchy problem for the Dirac operator**
 Seminario di Fisica Matematica
 University of Genova
- 2017 | **On the initial-boundary value problem for symmetric positive systems**
 Seminar über Mathematische Physik
 University of Regensburg
- Linearized gravity and Hadamard states**
 Séminaires Math-Physique
 University of Bourgogne
- Looking at the quantum states with the eyes of algebraic quantum field theory**
 Seminario di Fisica Matematica
 University of Roma 3
- 2016 | **Is there a natural state for Abelian Chern-Simons theory?**
 Seminario di Fisica Matematica
 University of Genova
- On the algebraic approach to quantum Dirac fields**
 Coloquio de Matemática UC
 Pontificia Universidad Católica de Chile
- A novel way of constructing Hadamard states in absence of symmetry**
 Seminiario de Teoria Espectral
 Pontificia Universidad Católica de Chile
- On quasi-free states on CAR algebras and the Fermionic Signature Operator**
 Münchner Mathematische
 LMU München
- 2015 | **Introduction to Microlocal Analysis**
 Seminars of Analysis and Nonlinear Partial Differential Equations
 Friedrich-Alexander-Universität Erlangen-Nürnberg
- A new construction of algebraic states for CAR algebras**
 Seminars of Mathematical Physics
 Heriot-Watt University
- Hadamard states in a time-dependent external potential**
 Seminario di Fisica Matematica
 University of Genova
- 2014 | **The fermionic projector on globally hyperbolic spacetimes**
 Seminario di Fisica Matematica
 University of Pavia

CONFERENCE AND WORKSHOP ORGANIZATION

16-18 April 2019 | **Algebraic and Geometric Aspects in Quantum Field Theory**
University of Freiburg

24-26 Sept. 2018 | **Analysis of Differential Operators on Manifolds**
University of Freiburg

TEACHING EXPERIENCES

University of Trento

2019-2020 | **“Mathematical Aspects of Quantum and Classical Physical Theories”**
Organizer of the seminar

University of Freiburg

Wi.SE. 2018/19 | **Operator Algebras and Quantum Field Theory**
Seminars (2h per week)

SU.SE. 2018 | **Operator Algebras and Quantum Mechanics**
Seminars (2h per week)

Wi.SE. 2017/16 | **Mikrolocale Analysis**
Master class in Mathematics (2h per week)

University of Regensburg

SU.SE. 2017 | **Analysis II für Physiker**
Assistant (2h. per week)

University of Pavia

SU.SE. 2013 | **Fisica per Biologi**
Tutoring (2h. per week)

MENTORING

CURRENT
OCTOBER 2019 | **Daniele Volpe**
project: Deformation arguments in hyperbolic PDEs and AQFT
Ph.D. candidate at the University of Trento
co-supervised with Prof. Valter Moretti

RESEARCH VISITS

11-13 OCTOBER 2021	NICOLAS GINOX, Institut Élie Cartan de Lorraine
26-30 OCTOBER 2020	CHRISTIAN BÄR AND PENELOPE GEHRING, University of Potsdam
1-5 JUNE 2020	INSTITUT MITTAG-LEFFLER, <i>scattering, microlocal analysis and renormalisation</i>
22 SEPT. - 5 OCT. 2019	KOBI KREMNITZER AND FEDERICO BAMBOZZI, University of Oxford
8-12 APRIL 2019	EMANUELA RADICI, University of L'Aquila
17-20 DECEMBER 2018	NICOLA PINAMONTI, University of Genova
28 MAY -1 JUNE 2018	FEDERICO BAMBOZZI, University of Regensburg
12-16 FEBRUARY 2018	FEDERICO BAMBOZZI, University of Regensburg
12-14 JULY 2017	NICOLA PINAMONTI, University of Genova
8-11 MAY 2017	GIUSEPPE DITO AND JOSE-LUIS JARAMILLO, University of Bourgogne
24 OCT - 8 NOV 2016	GIUSEPPE DE NITTIS, Pontificia Universidad Católica de Chile
10-25 OCTOBER 2015	ALEXANDER SCHENKEL, Heriot-Watt University
1-12 SEPTEMBER 2015	ERWIN SCHRÖDINGER INSTITUTE, <i>Modern theory of wave equations</i>
12-15 JUANARY 2015	CLAUDIO DAPPIAGGI, University of Pavia
21-25 JUANARY 2014	CLAUDIO DAPPIAGGI, University of Pavia

REFEREE AND REVIEWER – PEER REVIEWED JOURNAL

ADVANCES IN MATHEMATICAL PHYSICS
JOURNAL OF LONDON MATHEMATICAL SOCIETY
JOURNAL OF GEOMETRY AND PHYSICS
INTERNATIONAL JOURNAL OF GEOMETRIC METHODS IN MODERN PHYSICS
MATHEMATICAL METHODS IN THE APPLIED SCIENCES

REFERENCES

Prof. Dr. C. Dappiaggi	<i>Dipartimento di Fisica, Università di Pavia</i> Via Bassi 6, 27100 Pavia, Italy claudio.dappiaggi@unipv.it
Prof. Dr. F. Finster	<i>Fakultät für Mathematik, Universität Regensburg</i> Universitätsstraße 31, 93053 Regensburg, Germany finster@ur.de
Prof. Dr. C. Gérard	<i>Département de Mathématiques, Université Paris-Sud</i> Bât. 425, F-91405 Orsay Cedex, France christian.gerard@math.u-psud.fr
Prof. Dr. V. Moretti	<i>Dipartimento di Matematica, Università di Trento</i> Via Sommarive 14, 38123 Povo, Italy valter.moretti@unitn.it
Prof. Dr. N. Pinamonti	<i>Dipartimento di Matematica, Università di Genova</i> Via Dodecaneso 35, 16146 Genova, Italy pinamont@dima.unige.it

Genova
January 31, 2022