

## ALLEGATO B

### UNIVERSITÀ DEGLI STUDI DI MILANO

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## Ugo Marzolino CURRICULUM VITAE

### INFORMAZIONI PERSONALI (NON INSERIRE INDIRIZZO PRIVATO E TELEFONO FISSO O CELLULARE)

COGNOME	MARZOLINO
NOME	UGO
DATA DI NASCITA	03/12/1983

### Education, training, and funded projects

<b>Since 2017, March 14<sup>th</sup></b>	Post-doctoral research fellowship, at the Ruder Boskovic Institute, Division of Theoretical Physics, in Zagreb, in the group of Dr. Fabio Franchini, funded by H2020 CSA Twinning project No. 692194, "RBI-T-WINNING".
<b>2013, October 1<sup>st</sup> - 2017 March 10<sup>th</sup></b>	Post-doctoral research fellowship, at the University of Ljubljana, Faculty of Mathematics and Physics, in the group of Prof. Tomaž Prosen, supported by the grants J1-5439 and N1-0025 of Slovenian Research Agency.
<b>2012, October 1<sup>st</sup> - December 31<sup>st</sup></b>	Visiting position as invited researcher at the University Paul Sabatier of Toulouse, Laboratoire de Physique Théorique, in the group of Prof. Daniel Braun, funded by Centre National de la Recherche Scientifique (CNRS).
<b>2012, January 16<sup>th</sup> - 2013 July 31<sup>st</sup></b>	Post-doctoral research fellowship, at the Albert-Ludwigs University of Freiburg, Institute of Physics, in the group of Prof. Andreas Buchleitner, supported by Deutsche Forschungsgemeinschaft and by Evaluierter Fonds der Albert Ludwigs-Universität Freiburg.
<b>2011, November 2<sup>nd</sup> - December 31<sup>st</sup></b>	Visiting position at the University of Trieste, Department of Physics, in the group of Prof. Fabio Benatti.
<b>2011, May 2<sup>nd</sup> - November 1<sup>st</sup></b>	Post-doctoral research fellowship, at the University of Salerno, Department of Physics, in the group of Prof. Fabrizio Illuminati, supported by FP7-ICT Project "Hybrid information processing" (HIP), project ID 221889.
<b>2008, April 14<sup>th</sup> - May 14<sup>th</sup></b>	Fellowship upon invitation at University of Napoli "Federico II", Department of Physics, in the group of Prof. Giuseppe Marmo.

**2008, January 1<sup>st</sup> -  
2011, March 23<sup>rd</sup>**

Ph.D. in physics with scholarship at the University of Trieste, Department of Theoretical Physics (merged into the Department of Physics since 2009), supervised by Prof. Fabio Benatti and Dr. Roberto Floreanini. Thesis defended on March 23<sup>th</sup>, 2011, final mark excellent. Thesis: "Entanglement and decoherence in many-body physics".

**2005, October 1<sup>st</sup> -  
2007, July 19<sup>th</sup>**

Laurea specialistica (equivalent to Master of Science) in physics, University of Roma "La Sapienza" (theoretical curriculum). Thesis defended on July 19<sup>th</sup>, 2007, final mark 110/110 cum laude. Graduation thesis: "Entanglement multipartito e sistemi disordinati" (Multipartite entanglement and disordered systems), supervised by Prof. Giorgio Parisi, Prof. Saverio Pascazio, and Prof. Paolo Facchi.

**2002, October 1<sup>st</sup> -  
2005, October 5<sup>th</sup>**

Laurea triennale (equivalent to Bachelor of Science) in physics, University of L'Aquila. Thesis defended on October 5<sup>th</sup>, 2005, final mark 110/110 cum laude. Graduation thesis: "Un modello di decoerenza in meccanica quantistica" (A model of decoherence in quantum mechanics), supervised by Prof. Alessandro Teta.

### **Habilitations and awards**

**2017, April 24<sup>th</sup>**

*Seal of Excellence* Certificate delivered by the European Commission, as the institution managing Horizon 2020, the EU Framework Programme for Research and Innovation 2014-2020.

The project proposal 749102, QE-TherMa "Quantum equilibrium thermal machines" submitted under the Horizon 2020's Marie Skłodowska-Curie actions call H2020-MSCA-IF-2016 of 14 September 2016 by Ugo Marzolino and the University of Trieste following evaluation by an international panel of independent experts was scored as a high-quality project proposal in a highly competitive evaluation process.

This proposal was recommended for funding by other sources since Horizon 2020 resources available for this specific Call were already allocated following a competitive ranking.

**2017, March 12<sup>th</sup>**

Sêr Cymru II / Marie-Skłodowska-Curie COFUND Fellowship funded partly by European Union and partly by the Aberystwyth University.

**2016**

Recognition of my PhD by the Croatian Ministry.

**2013**

Habilitation for teaching in Slovenian universities.

**2012**

Accepted in the liste de qualification (qualification list) for maître de conférences (equivalent to assistant professor) in French universities for Section 28 – Milieux denses et matériaux (Dense media and materials) and for Section 30 – Milieux dilués et optique (Diluted media and optics).

### **Other habilitations under evaluation**

**2017, December 5<sup>th</sup>**

I applied for the Italian habilitation for associate professor within the academic recruitment field 01/A4 – mathematical physics. According to Web of Science I have the required bibliometric indices. I also have the

other required titles to get the habilitation.

**2017, December 5<sup>th</sup>**

I applied for the Italian habilitation for associate professor within the academic recruitment field 02/A2 – theoretical physics of fundamental interactions. According to Web of Science I have the required bibliometric indices. I also have the other required titles to get the habilitation.

**2017, December 5<sup>th</sup>**

I applied for the Italian habilitation for associate professor within the academic recruitment field 02/B2 – theoretical physics of condensed matter. According to Web of Science I have the required bibliometric indices. I also have the other required titles to get the habilitation.

### **Teaching and tutoring**

**2015, October  
2016, July**

- Co-supervisor of the Master student Marko Ljubotina, in the group of Prof. Tomaž Prosen, at the University of Ljubljana, Faculty of Mathematics and Physics, on non-equilibrium steady states of quantum spin chains.

**Academic Year  
2014-2015, 1<sup>st</sup>  
semester**

Lectures on generalised Bose-Einstein condensation and condensation in low dimensions within the course of Advanced Quantum Mechanics held by Prof. Tomaž Prosen for the Master in Physics (4<sup>th</sup> year) at the University of Ljubljana.

**Academic Year  
2012-2013, 2<sup>nd</sup>  
semester**

Tutor of the course Experimentalphysik II (Electromagnetism), held by Prof. Oliver Waldmann, for the Bachelor in Physics and for the Bachelor in Microsystem Engineering (1<sup>st</sup> year) at the Albert-Ludwigs University of Freiburg.

**2012, September -  
2013, July**

Co-supervisor of the Ph.D. student Dominik Hörndlein, in the group of Prof. Andreas Buchleitner, at the Albert-Ludwigs University of Freiburg, Institute of Physics, on entanglement and transport in solid state systems.

**2012, May - 2013,  
February**

Co-supervisor of the Ph.D. student Hong-Bin Chen, visitor student in the group of Prof. Andreas Buchleitner, at the Albert-Ludwigs University of Freiburg, Institute of Physics, on quantum models for photosynthetic complexes.

**2012, April - 2013,  
July**

Co-supervisor of the Ph.D. student Manuel Gessner, in the group of Prof. Andreas Buchleitner, at the Albert-Ludwigs University of Freiburg, Institute of Physics, on quantum correlations in noisy dynamics.

**Academic Year  
2011-2012, 2<sup>nd</sup>  
semester**

Tutor of the course of Computational Complexity, held by Prof. David Gross, for the Master in Physics (4<sup>th</sup> year) at the Albert-Ludwigs University of Freiburg. I also gave a lecture on simulated annealing within the course.

### **Invitations at congresses**

**2014, September  
15<sup>th</sup>-19<sup>th</sup>**

School “Advances in Quantum Information: Theory and Applications” held at the Mohammed V-Agdal University in Rabat, Morocco. Invited lecturer, lectures on “Introduction to classical and

- 2014, September 22<sup>th</sup>-26<sup>th</sup>** quantum information".  
Conference "Quantum Africa Conference 3: Advances in Quantum Sciences" held at the Mohammed-V Agdal University in Rabat, Morocco. Invited talk "Teleportation with identical particles".
- 2007, December 3<sup>rd</sup>-6<sup>th</sup>** Workshop "Open Problems in Quantum Mechanics" in Bertinoro (FC), Italy. Invited talk "Phase transitions of bipartite entanglement".

### Schools

- 2017, August 21<sup>th</sup>-26<sup>th</sup>** "AAAS-TWAS Science Diplomacy Course", held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste, Italy.
- 2017, July 31<sup>th</sup>-August 4<sup>th</sup>** School on "Fundamentals on Quantum Transport", held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste, Italy.
- 2017, June 26<sup>th</sup>-July 7<sup>th</sup>** First Zagreb School on Theoretical Physics, held at the Division of Theoretical Physics, Ruđer Bošković Institute in Zagreb, Croatia.
- 2014, September 15<sup>th</sup>-19<sup>th</sup>** School "Advances in Quantum Information: Theory and Applications" held at the Mohammed V-Agdal University in Rabat, Morocco. Invited lecturer, lectures on "Introduction to classical and quantum information".
- 2011, February 14<sup>th</sup>-18<sup>th</sup>** School "New Trends in Quantum Dynamics and Quantum Entanglement" held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste, Italy.
- 2009, June 22<sup>th</sup>-July 3<sup>rd</sup>** Summer School "Trends and Developments in Linear Algebra" held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste, Italy.
- 2009, May 3<sup>rd</sup>-17<sup>th</sup>** QUROPE09 International school "Quantum Information and Many-Body Systems" in Cortona (AR), Italy. Poster contribution "Off-resonant entanglement generation beyond weak coupling".
- 2008, July 1<sup>st</sup>-11<sup>th</sup>** International school of physics "Enrico Fermi" course CLXXI "Quantum Coherence in Solid State Systems" in Varenna (LC), Italy.

### Workshops

- 2017, December 11<sup>th</sup>-12<sup>th</sup>** Discussion meeting "Foundations of quantum mechanics and their impact on contemporary society", held at the Royal Society in London. Poster contributions "Entanglement and (in)distinguishability" and "Quantum physics and contemporary philosophy".
- 2017, August 7<sup>th</sup>-11<sup>th</sup>** Workshop on "Fundamentals on Quantum Transport", held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste, Italy.
- 2016, November 11<sup>th</sup>** ICTP - Ljubljana condensed matter theory meeting, held at the University of Ljubljana.
- 2016, June 16<sup>th</sup>-19<sup>th</sup>** CEQIP2016 "13<sup>th</sup> Central European Quantum Information Processing

- Workshop" held in Valtice, Czech Republic. Poster contribution "Entanglement and teleportation with identical particles".
- 2015, October 10<sup>th</sup>-11<sup>th</sup>** "Convention Scuola 2015 - Incontrare ed educare l'umano - Il lavoro dell'insegnante" (Congress School 2015 - Meeting and educating the human - The work of teaching) in Bologna. Parallel workshops/teamworks on innovative teaching of different fields in schools. I participated in the teamwork on physics "Attrezzi e materiali per la progettazione di percorsi sulla fisica quantistica" (Tools and material to plan educational path of quantum physics).
- 2012, May 18<sup>th</sup>** "Andrejewski-Day - The mathematics of quantum transport" held at the Institute of Physics, Albert-Ludwigs University of Freiburg. Poster contribution "Entanglement of identical particles: mathematical structures and applications".
- 2011, February 21<sup>th</sup>-25<sup>th</sup>** Workshop "New Trends in Quantum Dynamics and Quantum Entanglement" held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste, Italy.
- 2010, June 14<sup>th</sup>-18<sup>th</sup>** Workshop "Quantum Statistical Mechanics, Computational and Information" held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste, Italy.
- 2009, July 6<sup>th</sup>-10<sup>th</sup>** Advanced Workshop "Trends and Developments in Linear Algebra" held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste, Italy.
- 2008, June 19<sup>th</sup>-20<sup>th</sup>** Workshop "physics@UniTS - La Ricerca in Fisica nell'Università degli Studi di Trieste" (The Physics Research at the University of Trieste), Department of Physics, Department of Theoretical Physics and Department of Astronomy at the University of Trieste (TS), Italy.
- 2007, December 3<sup>rd</sup>-6<sup>th</sup>** Workshop "Open Problems in Quantum Mechanics" in Bertinoro (FC), Italy. Invited talk "Phase transitions of bipartite entanglement".

### Conferences

- 2017, October 23<sup>th</sup>-27<sup>th</sup>** Conference on Weyl Fermions in Material, held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste, Italy. Poster contribution "Entanglement and (in)distinguishability".
- 2017, October 3<sup>rd</sup>-6<sup>th</sup>** "3rd International Conference for Young Quantum Information Scientists (YQIS)", held at the Max Planck Institute for the science of light and at Friedrich-Alexander-Universität Erlangen-Nürnberg in Erlangen, Germany. Poster contribution "Entanglement and (in)distinguishability".
- 2017, September 12<sup>th</sup>-15<sup>th</sup>** "Italian Quantum Information Science Conference IQIS 2017" held at Firenze, Italy. Talk contribution "Fisher information approach to non-equilibrium phase transitions in quantum XXZ spin chain with bound noise".
- 2017, July 10<sup>th</sup>-14<sup>th</sup>** "Many-Body Localization: Advances in the Theory and Experimental

	Progress" held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste.
<b>2015, September 10<sup>th</sup>-12<sup>th</sup></b>	"Italian Quantum Information Science Conference IQIS 2015" held at Monopoli (BA), Italy. Talk contribution "Sensitivity and complexity of non-equilibrium steady states of quantum spin chains".
<b>2015, June 29<sup>th</sup>-July 1<sup>st</sup></b>	"XX convegno nazionale di fisica statistica e dei sistemi complessi" (XX national conference of statistical physics and complex systems), held at the University of Parma, Italy. Talk contribution "Computational complexity of non-equilibrium steady state of quantum spin chains".
<b>2014, October 9<sup>th</sup>-11<sup>th</sup></b>	"Quantum and classical chaos: What comes next?" Symposium in honour of Prof. Marko Robnik on the occasion of his 60 <sup>th</sup> birthday, held in Ljubljana.
<b>2014, September 22<sup>th</sup>-26<sup>th</sup></b>	"Quantum Africa Conference 3: Advances in Quantum Sciences" held at the Mohammed-V Agdal University in Rabat, Morocco. Invited talk "Teleportation with identical particles".
<b>2010, September 11<sup>th</sup>-14<sup>th</sup></b>	"International Iran Conference on Quantum Information 2010" held in Kish Island, Iran. Talk contribution "Sub-shot-noise quantum metrology with entangled identical particles".
<b>2009, November 5<sup>th</sup>-8<sup>th</sup></b>	"Italian Quantum Information Science Conference 2009" held at Scuola Normale Superiore (SNS), Pisa, Italy. Poster contribution "Entanglement and Fisher information: identical particles vs. distinguishable qubits".
<b>2008, October 24<sup>th</sup>-29<sup>th</sup></b>	"Italian Quantum Information Science Conference, IQIS 2008" held at the University of Camerino (MC), Italy. Poster contribution "Beyond ergodic averaged weak coupling in open quantum systems".

### Seminars

<b>2017, January 9<sup>th</sup></b>	Seminar "Quantum Fisher information of thermal states and non-equilibrium steady states: quantum metrology and phase transitions" at the Department of Physics, University of L'Aquila.
<b>2016, September 7<sup>th</sup></b>	Seminar "Quantum information in many-body physics" at the Max-Planck Institute of Quantum Optics in Garching, München, Germany.
<b>2016, April 13<sup>th</sup></b>	Seminar "Quantum enhanced measurements with thermal states and nonequilibrium steady states" at the Department of Physics, University of Parma.
<b>2014, October 22<sup>th</sup></b>	Seminar "Statistical mechanics of entanglement" at the Universidad Autonoma de Barcelona.
<b>2014, March 18<sup>th</sup></b>	Seminar "Precision measurements of temperature and chemical potential of quantum gases" at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste.
<b>2013, November</b>	Seminar "Entanglement benchmarked transport in fermion

<b>26<sup>th</sup></b>	systems" at the Laboratoire Traitement et Communication de l'information, CNRS – Télécom ParisTech in Paris.
<b>2013, June 18<sup>th</sup></b>	Seminar "Quantum information with identical particles" at the Department of Physics, University of Ljubljana.
<b>2013, May 29<sup>th</sup></b>	Seminar "Quantum information with identical particles" at the Institute of Atomic and Subatomic Physics, University of Technology in Vienna.
<b>2013, April 23<sup>th</sup></b>	Seminar "Quantum metrology with identical particles" at the Department of Physics, University of Basel.
<b>2013, February 14<sup>th</sup></b>	Seminar "Entanglement of identical particles and its applications" at the Department of Physics of the Université Henri Poincaré Nancy I, Nancy.
<b>2012, December 5<sup>th</sup></b>	Journal Club "Entanglement of identical particles and its applications" at the LPT (Laboratoire de Physique Théorique) of the Université Paul Sabatier Toulouse III, Toulouse.
<b>2012, July 11<sup>th</sup></b>	Seminar "Entanglement of identical particles: theory and possible applications" at the Institute of Theoretical Physics, University of Heidelberg.
<b>2012, February 27<sup>th</sup></b>	Seminar "Entanglement of identical particles: theory and applications" at the Institute of Physics, Albert-Ludwigs University of Freiburg.
<b>2011, December 16<sup>th</sup></b>	Journal Club "Entanglement of identical particles: theory and applications" at SISSA (Scuola Internazionale di Studi Superiori Avanzati), Trieste.
<b>2011, December 13<sup>th</sup></b>	Seminar "Entanglement of identical particles: mathematical characterizations and practical applications" at the Université Paul Sabatier Toulouse III, Toulouse.
<b>2010, December 7<sup>th</sup></b>	Seminar "Sub-shot-noise quantum metrology with entangled identical particles" at SISSA (Scuola Internazionale di Studi Superiori Avanzati), Trieste.
<b>2010, November 15<sup>th</sup></b>	Seminar "Sub-shot-noise quantum metrology with entangled identical particles", at the Department of Theoretical Physics I, Universidad Complutense de Madrid.
<b>2010, October 7<sup>th</sup></b>	Seminar "Sub-shot-noise quantum metrology with entangled identical particles", at the Institute of Physics, Albert-Ludwigs University of Freiburg.
<b>2010, March 25<sup>th</sup></b>	Seminar "Reconstruction of Master Equations Parameters through symplectic tomographic", at the Department of Physics, University of Trieste.
<b>2010, February 12<sup>th</sup></b>	Seminar "Sub-shot-noise quantum metrology with entangled identical particles", at the Department of Physics, University of Basel.
<b>2009, March 11<sup>th</sup></b>	Seminar "Beyond ergodic averaged weak coupling in open quantum systems", at the Department of Theoretical Physics, University of

Trieste.

### Publications

1. Fabio Benatti, Roberto Floreanini, Fabio Franchini, Ugo Marzolino: *Remarks on entanglement and identical particles*, Open. Sys. Inf. Dyn. **24**, 1740004 (2017), arXiv:1709.05520.
2. Ugo Marzolino, Tomaž Prosen: *Fisher information approach to non-equilibrium phase transitions in quantum XXZ spin chain with boundary noise*, Phys. Rev. B **96**, 104402 (2017), arXiv:1708.07121.
3. Ugo Marzolino, Tomaž Prosen: *Erratum: Quantum metrology with non-equilibrium steady states of quantum spin chains [Phys. Rev. A 90, 062130 (2014)]*, Phys. Rev. A **94**, 039903 (2016).
4. Ugo Marzolino, Tomaž Prosen: *Computational complexity of non-equilibrium steady states of quantum spin chains*, Phys. Rev. A **93**, 032306 (2016), arXiv:1601.08066.
5. Ugo Marzolino, Andreas Buchleitner: *Performances and robustness of quantum teleportation with identical particles*, Proc. R. Soc. A. **472**, 2015.0621 (2016), arXiv:1512.02692.
6. Ugo Marzolino, Daniel Braun: *Erratum: Precision measurements of the temperature and the chemical potential of quantum gases [Phys. Rev. A 88, 063609 (2013)]*, Phys. Rev. A **91**, 039902 (2015).
7. Ugo Marzolino, Andreas Buchleitner: *Quantum teleportation with identical particles*, Phys. Rev. A **91**, 032316 (2015), arXiv:1502.05814.
8. Ugo Marzolino, Tomaž Prosen: *Quantum metrology with non-equilibrium steady states of quantum spin chains*, Phys. Rev. A **90**, 062130 (2014), arXiv:1412.1977.
9. Fabio Benatti, Roberto Floreanini, Ugo Marzolino: *Entanglement in fermion systems and quantum metrology*, Phys. Rev. A **89**, 032326 (2014), arXiv:1403.1144.
10. Ugo Marzolino: *Entanglement in dissipative dynamics of identical particles*, Europhys. Lett. **104**, 40004 (2013), arXiv:1311.7592.
11. Ugo Marzolino, Daniel Braun: *Precision measurements of the temperature and the chemical potential of quantum gases*, Phys. Rev. A **88**, 063609 (2013), arXiv:1308.2735.
12. Ugo Marzolino, Salvatore Marco Giampaolo, Fabrizio Illuminati: *Frustration, entanglement, and correlations in quantum many body systems*, Phys. Rev. A **88**, 020301 (2013) Rapid Communication, arXiv:1302.6251.
13. Fabio Benatti, Roberto Floreanini, Ugo Marzolino: *Entanglement robustness and geometry in systems of identical particles*, Phys. Rev. A **85**, 042329 (2012), arXiv:1204.3746.
14. Fabio Benatti, Roberto Floreanini, Ugo Marzolino: *Bipartite entanglement in systems of identical particles: the partial transposition criterion*, Ann. Phys. **327**, 1304 (2012), arXiv:1202.2993.
15. Giuseppe Argentieri, Fabio Benatti, Roberto Floreanini, Ugo Marzolino: *Entangled identical particles and noise*, Int. J. Quantum Inf. **9**, 1745 (2011), Special Issue on Quantum Correlations: Entanglement and beyond, arXiv:1107.5071.



16. Fabio Benatti, Roberto Floreanini, Ugo Marzolino: *Entanglement and squeezing with identical particles: ultracold atom quantum metrology*, J. Phys. B **44**, 091001 (2011), arXiv:1009.0995.
17. Bruno Bellomo, Antonella De Pasquale, Giulia Gualdi, Ugo Marzolino: *Reconstruction of time-dependent coefficients: a check of approximation schemes for non-Markovian convolutionless dissipative generators*, Phys. Rev. A **82**, 062104 (2010), arXiv:1007.4537.
18. Bruno Bellomo, Antonella De Pasquale, Giulia Gualdi, Ugo Marzolino: *A tomographic approach to non-Markovian master equation*, J. Phys. A **43**, 395303 (2010), arXiv:1005.4572.
19. Paolo Facchi, Giuseppe Florio, Ugo Marzolino, Giorgio Parisi, Saverio Pascazio: *Classical statistical mechanics approach to multipartite entanglement*, J. Phys. A **43**, 225303 (2010) arXiv:1002.2592.
20. Fabio Benatti, Roberto Floreanini, Ugo Marzolino: *Sub-shot-noise quantum metrology with entangled identical particles*, Ann. Phys. **325**, 924 (2010), arXiv:1001.3313.
21. Paolo Facchi, Giuseppe Florio, Ugo Marzolino, Giorgio Parisi, Saverio Pascazio: *Multipartite entanglement and frustration*, New J. Phys. **12**, 025015 (2010), arXiv:0910.3134.
22. Fabio Benatti, Roberto Floreanini, Ugo Marzolino: *Entangling two unequal atoms through a common bath*, Phys. Rev. A **81**, 012105 (2010), arXiv:0912.0354.
23. Bruno Bellomo, Antonella De Pasquale, Giulia Gualdi, Ugo Marzolino: *Reconstruction of Markovian Master Equation parameters through a tomographic approach*, Phys. Rev. A **80**, 052108 (2009), arXiv:0909.2250.
24. Fabio Benatti, Roberto Floreanini, Ugo Marzolino: *Environment induced entanglement in a refined weak-coupling limit*, Europhys. Lett. **88**, 20011 (2009), arXiv:0910.4021.
25. Paolo Facchi, Giuseppe Florio, Ugo Marzolino, Giorgio Parisi, Saverio Pascazio: *Statistical mechanics of multipartite entanglement*, J. Phys. A **42**, 055304 (2009), arXiv:0803.4498.
26. Paolo Facchi, Ugo Marzolino, Giorgio Parisi, Saverio Pascazio, Antonello Scardicchio: *Phase transitions of bipartite entanglement*, Phys. Rev. Lett. **101**, 050502 (2008), arXiv:0712.0015.

### Preprints

- ✓ Ugo Marzolino:  *$\mu$ PT statistical ensemble: systems which exchange energy, particles, and volume*, submitted to Phys. Rev. Lett.
- ✓ Daniel Braun, Gerardo Adesso, Fabio Benatti, Roberto Floreanini, Ugo Marzolino, Morgan Mitchell, Stefano Pirandola: *Quantum enhanced measurements without entanglement*, submitted to Rev. Mod. Phys. upon invitation, arXiv:1701.05152.

### Work in progress

- ✓ Domink Hörndlein, Ugo Marzolino, Vivan V. Franca, Andreas Buchleitner: *Entanglement benchmarked transport*.
- ✓ Ugo Marzolino: *Pedagogical note on Bose-Einstein condensation in effectively low dimensions*.

- ✓ Ugo Marzolino, Ezio Sciarra, Valerio Taraschi: *Contemporary philosophy of quantum physics*.
- ✓ Fabio Benatti, Roberto Floreanini, Fabio Franchini, Ugo Marzolino: *Entanglement and (in)distinguishability*, to be submitted to Phys. Rev. X.

### **Ideas for future and long-term research**

#### Quantum non-equilibrium critical phenomena

This is a natural continuation of my work at the University of Ljubljana, requiring both analytical and numerical expertise. It deals with the quantum information characterization of non-equilibrium quantum phase transitions, i.e. sudden changes of the non-equilibrium steady states of quantum master equations or after a quench.

- ✓ Characterization of quantum non-equilibrium phase transitions and related critical phases with the quantum Fisher information (which is proportional to the Bures metric also known as fidelity susceptibility) approach and applications to quantum metrology. I will investigate models more complicated than those that I have already studied and other paradigm of non-equilibrium physics, like time-evolution after a quench.
- ✓ Study of non-equilibrium phase transitions in the presence of disorder through the Fisher information approach and comparison with disordered phase transitions (Griffith phases) at equilibrium.
- ✓ Emergence of non-equilibrium phase transition from the finite time dynamics of the Fisher information.

#### Quantum thermodynamics and applications

This is a collection of ideas accumulated during my post-doc experience, that can be all together structured in a coherent long-term project, requiring either analytical or numerical expertise, or can lead and inspire short projects available for theses.

- ✓ Quantum thermodynamics and thermal machines with quantum gases at equilibrium: the role of quantum degeneracy, e.g. BEC and generalised “low-dimensional” BEC, finite size scaling, and interactions.
- ✓ Study of the transition between standard BEC and generalised BEC (where the BEC is an effectively low dimensional gas) using the Fisher information: understanding whether it is a phase transition or a crossover.
- ✓ Applications of precise chemical potential estimation in quantum gases in the presence of Bose-Einstein condensation: precision gravimetry, and precision magnetometry using magnon Bose-Einstein condensates.
- ✓ Study of BEC transitions in the isothermal-isobaric ensemble and its generalisation with fluctuating particle number.

#### Quantum information and computation

This is another collection of ideas accumulated during my post-doc experience, that can be all together structured in a coherent long-term project, requiring either analytical or numerical expertise, or can lead and inspire short projects available for theses.

- ✓ Information-theoretic applications of entanglement of identical particles: efficient quantum cryptology such as distributed blind quantum computation, computation

models and information processing with limited and currently achievable resources (e.g. teleportation using only atomic coherent states), errors in quantum computation and information processing induced by the identity of employed particles, distillation protocols of entanglement, universal computation and semantics with identical particles.

- ✓ Multipartite entanglement of identical particles: definition, characterization and quantification of particle-entanglement and mode-entanglement by means of exact algebraic structures and statistical tools; connection of multipartite entanglement properties with quantum information protocols.
- ✓ Extending the study of entanglement of identical particles to Majorana fermions, anyons, and parastatistics.

### Quantum mechanics

These are general interests that I would like to investigate once I reach a permanent academic position and scientific and research maturity.

- ✓ Investigation of time operator in quantum mechanics, especially using the proper time approach to relativistic quantum mechanics first developed by Feynman, and relativistic wave equations: understanding the physical meaning of the no-interaction theorem, and the phenomenology of the time operator.
- ✓ Study of the wave function of photons and its compatibility with the fundamental interaction of QED; generalisation to other gauge particles.

### **Referee activity for the following journals**

<b>Since 2013, January</b>	Journal of Physics B: Atomic, Molecular and Optical Physics Open Systems & Information Dynamics
<b>Since 2013, March</b>	Physical Review A Nature Communications
<b>Since 2013, April</b>	New Journal of Physics Physical Review Letters
<b>Since 2013, May</b>	Journal of Physics A: Mathematical and Theoretical
<b>Since 2013, November</b>	Zeitschrift für Naturforschung A
<b>Since 2014, December</b>	Physical Review E
<b>Since 2015, March</b>	Annalen der Physik
<b>Since 2016, January</b>	Scientific Reports
<b>Since 2016, February</b>	Physical Review B
<b>Since 2017, January</b>	Journal of Physics: Condensed Matter
<b>Since 2017, June</b>	Laser Physics Letters

### **Seminar organiser**

- 2010, February 25<sup>th</sup> - June 17<sup>th</sup>** Organizer of the series of weekly seminars of the Theoretical Physics sector of the Department of Physics of the University of Trieste.
- 2012, February - July** Organizer of the series of weekly quantum information meetings in the group of Prof. Andreas Buchleitner, at the Institute of Physics of the Albert-Ludwigs University of Freiburg.

### Outreach

- ✓ **2017, August 21<sup>th</sup>-26<sup>th</sup>** - Attendance at “AAAS-TWAS Science Diplomacy Course”, held at the Abdus Salam International Center of Theoretical Physics (ICTP) in Trieste, Italy.
- ✓ **2017, December 22<sup>th</sup>** - I was interviewed for the article “Viele Holzwege führen nach Rom” (“Many wood paths lead to Rome”) written by the journalist Mahya Karbalaii for Frankfurter Allgemeine Zeitung (FAZ): <http://blogs.faz.net/blogseminar/viele-holzwege-fuehren-nach-rom/>.
- ✓ I'm interested and active in discussing basic aspects of quantum mechanics in high schools.

### Technical background

#### Computer Skills:

- OS: Linux, Unix, Mac, Windows.
- Programming languages: C, Fortran, Pascal.
- Applications: office applications (Microsoft and open-source) and Latex, Mathematica, Root, Paw, Gnuplot, graphic applications (GIMP, Inkscape, Photoshop, Illustrator).

Languages: Italian (native), English (excellent).

Data	22/12/2017	Luogo	Trieste
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