Thomas Boulier

PhD in Quantum Physics

Personal details

Address **85 rue du Villiers**, *Neuilly-sur-Seine 92200*.

Date of birth **October the 9th, 1987**, *Algrange, France*.

Education

2008 **Bachelor degree**, *École Normale Supérieure (ENS)*, Paris, France.
Specialization in Fundamental Physics

2011 **Master degree**, *École Normale Supérieure (ENS)*, Paris, France.
Specialization in Quantum Physics

2014 **PhD**, *Laboratoire Kastler Brossel (ENS, Université Pierre et Marie Curie (UPMC), CNRS and Collège de France)*, Paris, France.
Under the supervision of Pr. Alberto Bramati, with the highest honors

Examination Commission: Mauro Antezza, Pavlos Savvidis, Raphaelle Colombelli, Maxime Richard, Valia Voliotis, and Alberto Bramati.

Full Time Research Experience

Jun–Aug 2008 **Undergraduate training at PIIM, Marseille, France**, *"Probe Characteristics of a Hydrogen plasma", directed by Pr. Fabrice Doveil*.

Feb–Aug 2009 **Graduate training at School of Engineering and Applied Science, Harvard, MA, USA**, *"Repulsive Casimir effect between a microsphere and a plane: towards nanoscale quantum levitation", directed by Pr. Federico Capasso*.

Feb–May 2011 **Short graduate training at LPS, Paris-Sud University, Orsay, France**, *"Hubbard model for disordered fermions and bosons mixture", directed by Pr. Pascal Simon*.

Oct 2011 – Nov 2014 **PhD thesis at Laboratoire Kastler Brossel, Paris, France**, *"Controlled vortex lattices and non-classical light with microcavity polaritons", directed by Pr. Alberto Bramati and Pr. Elisabeth Giacobino*.

Feb 2015 – Sep 2018 **Postdoctoral researcher at NIST, Gaithersburg, and UMD, College Park, MD, USA**, *Laser Cooling and Trapping group, Joint Quantum Institute – "Many-body physics in a double-well optical lattice", in the team of Dr. Trey Porto and Pr. William Phillips*.

Apr–Jul 2017 **Short term Postdoctoral researcher at ETHZ, Zurich, Switzerland**, *Quantum Optics group, "Many-body Floquet engineering in a honeycomb optical superlattice", Pr. Tilman Esslinger team*, Part of the Marie Sklodowska-Curie Action (MSCA) Fellowship.

Seb 2018 – now **Postdoctoral researcher at LCF (IOGS), palaiseau, France**, *Quantum Optics group – "Rydberg atom tweezers", Pr. Antoine Browaeys' team*.

Additional Experience

Aug 2015 – Aug 2016 **Supervised the complete move and partial rebuilding of an ultracold atoms experiment**, *(Ultracold Rydbergs on a 3D double-well optical superlattice)*, from NIST to UMD.

Teaching Experience

Assistant at University Pierre et Marie Curie – Paris (192h)

2011–2012 **Undergraduate level**, *Lectures and Experimental Work (64h). Thermodynamics and wave phenomena*.

2012–2013 **Undergraduate level**, *Lectures (64h). Electromagnetic waves*.

Undergraduate level, *Experimental Work (24h). Thermodynamics and wave phenomena*.

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Graduate level, *Experimental Work, (32h). Lasers: principles and applications.*

2013–2014 **Graduate level**, *Experimental Work, (8h). Lasers: principles and applications.*

Students supervision

2011–2014 **4 undergraduate students**, *for duration of 2, 3, 4 and 6 months.*

2015–present **Full time managing a 4 graduate students team and 1 undergrad**, *as lead postdoc.*

Grants and Awards

2016 **Marie Sklodowska-Curie Action (MSCA)**, *Individual Fellowship*, Global (3 years), Grant H2020-MSCA-IF-2015 – 701034 – MADAME.

Publications in international refereed journals

- **T. Boulier**, J Maslek, M Bukov, C Bracamontes, E Magnan, S Lellouch, E Demler, N Goldman, JV Porto, Parametric instabilities in a 2D periodically-driven bosonic system: Beyond the weakly-interacting regime. arXiv: 1808.07637
- E. Magnan, J. Malsek, A. Ristelli, C. Bracamontes, **T. Boulier** and J. V. Porto, "A low-steering piezo-driven mirror." Rev. of Sci. Instr. **89.7** 073110 (2018)
- **T. Boulier**, S. Pigeon, E. Cancellieri, P. Robin, E. Giacobino and A. Bramati, "Coherent merging of counterpropagating exciton-polariton superfluids. *Phys. Rev. B 98* 024503 (2018)
- J. Young, **T. Boulier**, E. Magnan, E. A. Goldschmidt, R. M. Wilson, S. L. Rolston, J. V. Porto and A. V. Gorshkov, Dissipation-induced dipole blockade and antiblockade in driven Rydberg systems. *Phys. Rev. A 97.2* 023424 (2018).
- **T. Boulier**, E. Magnan, C. Bracamontes, J. Malsek, J. Young, E. A. Goldschmidt, A. V. Gorshkov, S. L. Rolston and J. V. Porto, Spontaneous avalanche dephasing in Rydberg ensembles. *Phys. Rev. A 96.5,* 053409 (2017).
- **T. Boulier**, E. Cancellieri, N. D. Sangouard, R. Hivet, Q. Glorieux, E. Giacobino and A. Bramati, Lattices of quantized vortices in polariton superfluids. *Comptes Rendus de l'Académie des Sciences - Series IV - Physics-Astrophysics* **17,** 805-956 (2016)
- E. A. Goldschmidt, **T. Boulier**, R. C. Brown, S. B. Koller, J. Young, A. V. Gorshkov, S. L. Rolston and J. V. Porto, Anomalous broadening in driven dissipative Rydberg systems. *Phys. Rev. Lett.* **116,** 113001 (2016).
- **T. Boulier**, E. Cancellieri, N. D. Sangouard, Q. Glorieux, A. V. Kavokin, D. M. Whittaker, E. Giacobino and A. Bramati, Injection of Orbital Angular Momentum and Storage of Quantized Vortices in Polariton Superfluids. *Phys. Rev. Lett.* **116,** 116402 (2016).
- **T. Boulier**, H. Terças, D. D. Solnyshkov, Q. Glorieux, E. Giacobino, G. Malpuech and A. Bramati, Annular Vortex Chain in a Resonantly Pumped Polariton Superfluid. *Sci. Rep.* **5,** 9230 (2015).
- E. Cancellieri, **T. Boulier**, R. Hivet, D. Ballarini, D. Sanvitto, M. H. Szymanska, C. Ciuti, E. Giacobino and A. Bramati, Merging of vortices and antivortices in polariton superfluids. *Phys. Rev. B* **90,** 214518 (2014).
- R. Hivet, E. Cancellieri, **T. Boulier**, D. Ballarini, D. Sanvitto, F. M. Marchetti, M. H. Szymanska, C. Ciuti, E. Giacobino and A. Bramati, Interaction-shaped vortex-antivortex lattices in polariton fluids. *Phys. Rev. B* **89,** 134501 (2014).
- **T. Boulier**, M. Bamba, A. Amo, C.Adrados, A. Lemaitre, E. Galopin, I. Sagnes, J.Bloch, C. Ciuti, E. Giacobino and A. Bramati, Polariton-Generated Intensity Squeezing in Semiconductor Micropillars. *Nature Communications* **5,** 3260, (2014).
- R. Hivet, H. Flayac, D. D. Solnyshkov, D. Tanese, **T. Boulier**, D. Andreoli, E. Giacobino, J. Bloch and A. Bramati, G. Malpuech and A. Amo, Half-solitons in a polariton quantum fluid behave like magnetic monopoles. *Nature Physics* **8,** 724–728, (2012).

Publications in international refereed conference proceedings

- **T. Boulier**, R. Hivet, E. Cancellieri, Q. Glorieux, A. Bramati, and E. Giacobino, Microcavity polaritons: from quantum optics to quantum fluids. *European Quantum Electronics Conference* (p. EC_3_1). Optical Society of America (2015).

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- **T. Boulier**, Q. Glorieux, E. Cancellieri, E. Giacobino, and A. Bramati, Orbital angular momentum injection in a polariton superfluid. *Proc. SPIE* **9370,** Quantum Sensing and Nanophotonic Devices XII, 93702R (2015).
- A. Amo, **T. Boulier**, E. Cancellieri, R. Hivet, D. Sanvitto, C. Ciuti, I. Carusotto, R. Houdre, A. Bramati, and E. Giacobino, Quantum Coherence in Polariton Fluids. *The Rochester Conferences on Coherence and Quantum Optics and the Quantum Information and Measurement meeting*, OSA Technical Digest (online) (Optical Society of America, 2013), paper T4A.1.
- R. Hivet, H. Flayac, D. Tanese, **T. Boulier**, D. Andreoli, J. Bloch, D. D. Solnyshkov, G. Malpuech, A. Amo, E. Giacobino and A. Bramati, Observation of Oblique Half-Solitons in polariton Superfluids. *Conference on Lasers and Electro-Optics 2012*, OSA Technical Digest (Optical Society of America, 2012), paper QM2C.3.
- A. Amo, M. Abbarchi, R. Hivet, H. Flayac, D. D. Solnyshkov, D. Tanese, **T. Boulier**, D. Andreoli, E. Giacobino, J. Bloch, A. Bramati and G. Malpuech, Macroscopic Self-trapping and Non-linear Oscillations in Coupled Polariton Condensates. *Frontiers in Optics 2012/Laser Science XXVIII*, OSA Technical Digest (online) (Optical Society of America, 2012), paper LM3J.3.

Communications at international conferences

- Spontaneous avalanche dephasing in Rydberg ensembles, Talk – International Conference on Quantum Simulation (ICQSIM), 2017, Paris, France.
- Spontaneous avalanche dephasing in Rydberg ensembles, Poster – BEC conference, 2017, San Felíu de Guixols, Spain.
- Spontaneous avalanche dephasing in Rydberg ensembles, Poster – International Conference On Laser Spectroscopy (ICOLS), 2017, Arcachon, France.
- Properties of spontaneous avalanche dephasing in large Rydberg ensembles, Poster – 7th colloquium of the CNRS research network "Quantum Engineering, from Fundamental Aspects to Applications" (IQFA), 2016, Paris, France.
- Anomalous broadening in driven dissipative Rydberg systems, Talk – 47th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics (DAMOP), 2016, Providence, MD, USA.
- Anomalous broadening in driven dissipative Rydberg systems, Talk – Coherent Control of Complex Quantum Systems (C3QS), 2016, Okinawa, Japan.
- Quantization of angular momentum in an interacting 2D quantum fluid of exciton-polariton, Talk – Workshop on Coherent Phenomena in Disordered Optical Systems, 2014, Trieste, Italy.
- Exploiting exciton nonlinearities to engineer squeezed light, Poster – 13th International Conference on Optics of Excitons in Confined Systems, 2013, Rome, Italy.
- Generation of squeezed states of light with exciton-polariton interactions, Talk – 14th Conference on Physics of Light-Matter Coupling in Nanostructures, 2013, Hersonissos, Greece.
- Nonlinear optics with exciton-polaritons, Poster, 2012, School of Physics: International School of Nanophotonics and Photovoltaics, Phuket, Thailand.

Local Communications

- Speaker at JQI/UMD Seminar, College park, USA, Oct 2017.
- Speaker at ETHZ Seminar Series, Zurich, Switzerland, May 2017.
- Speaker at NIST seminar, Maryland, USA, September 2014.
- Speaker at EPFL seminar, Lausanne, Switzerland, July 2014.
- Speaker at LKB Quantum Optics group seminar, Paris, France, January 2014.
- Speaker at Quandid ANR meeting, Marcoussis, France, September 2013.
- Poster presentation at LKB internal seminar, La Rochelle, France, June 2013.

Scientific mediation, public outreach

2015–now **Referee for Physical Review Letters**.

2013–2014 **Presentation of the Physics department**, *Pierre et Marie Curie University, for the yearly Student Fair.*

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