



Erik Piatti

Corso Duca degli Abruzzi 24 • Torino, Italy • 10129

CELL +39(329) 538-8547 • E-MAIL erik.piatti@polito.it

ORCID 0000-0001-8733-5230

RESEARCH GATE https://www.researchgate.net/profile/Erik_Piatti

LINKEDIN www.linkedin.com/in/erik-piatti

PROFILE

I am currently Postdoctoral Research Associate in the group of prof. Renato S. Gonnelli at the Department of Applied Science and Technology of Politecnico di Torino. My research work is grounded in condensed matter physics, studying the electronic properties of advanced materials at low temperatures under the application of extremely high electric fields. My current focus is the control of exotic quantum phases – such as superconductivity and charge-density waves – by means of electrostatic and electrochemical charge doping.

EDUCATION

Doctor of Philosophy in Physics

Politecnico di Torino, corso Duca degli Abruzzi 24, 10129 Torino, Italy
Ph.D. program completed on 31/12/2016, graduated *cum laude* 21/4/2017

Master of Science in Nanotechnologies for ICTs

Politecnico di Torino, corso Duca degli Abruzzi 24, 10129 Torino, Italy
Graduated *cum laude* 17/10/2013

Bachelor of Science in Physical Engineering

Politecnico di Torino, corso Duca degli Abruzzi 24, 10129 Torino, Italy
Graduated *cum laude* 29/7/2011

SKILLS

English EFSET 79 Proficient (CEFR C2) PET with merit Research
Solid state physics Material science Quantum mechanics 2D materials
Graphene Superconductivity Thin films and nanotechnology
Ionic liquids Material characterization Cryogenic measurements
Microfabrication Electron Beam Lithography Reactive Ion Etching
Cleanroom technology Vacuum technology Chemical Vapor Deposition
Raman and IR spectroscopy Scanning Tunnelling Microscopy Atomic
Force Microscopy Point-contact spectroscopy Density Functional Theory
MATLAB OriginLab LaTeX Quantum ESPRESSO

EXPERIENCE

Politecnico di Torino, Italy

February 2021 – Ongoing

Postdoctoral research associate in prof. Renato Gonnelli's group at DISAT, studying the physical properties of advanced materials when subjected to electric-field-driven intercalation of hydrogen ions via the electrochemical method. The research project is titled "Hydrogen Intercalation by Electrochemical Gating in Layered Physical Systems" (HYEROGlyph).

Politecnico di Torino, Italy

February 2018 – January 2021

Postdoctoral research associate in prof. Renato Gonnelli's group at DISAT, studying the physical properties of advanced materials at low temperatures and under the application of ultrahigh electric fields. The research project was titled "Cryogenic-Temperature Electrical Characterization of Two-Dimensional Electronic Systems" (CRYOTECH2D).

University of Cambridge, Cambridge Graphene Centre, United Kingdom

June 2016 – July 2016; May 2017 – June 2017

Academic visitor in prof. Andrea Ferrari's group at the Cambridge Graphene Centre (CGC). The project deals with the study and control of the properties of superconducting EDL-FET devices based on transition metal chalcogenides.

Politecnico di Torino, Italy

February 2017 – January 2018

Research associate in prof. Renato Gonnelli's group at DISAT, studying the physical properties of advanced materials at low temperatures and under the application of ultrahigh electric fields. The research project was titled "Electrical and thermal characterization of 2-dimensional electronic systems" (ELTECH2D).

RUG, Zernike Institute for Advanced Materials, The Netherlands

September 2015 – December 2015

Visiting researcher in prof. Jianting Ye's group of Device Physics of Complex Materials. The project deals with gate-controlled alkali ion intercalation and induced superconductivity in molybdenum disulfide EDL-FET devices.

Politecnico di Torino, Italy

January 2014 – December 2016

PhD fellowship in Physics in prof. Renato Gonnelli's group at the Department of Applied Science and Technology. The research program focused on inducing and controlling the superconducting state in ultrathin films and 2-dimensional materials via the ionic gating technique, and resulted in the doctoral dissertation titled "Electrochemical gating for superconductivity engineering in materials towards the 2D limit".

University of California at Berkeley, USA

February 2013 – September 2013

Research internship in prof. Michael F. Crommie's group for my Master's thesis on "Graphene-on-boron nitride heterostructure fabrication for STM analysis".

I.N.R.I.M. Istituto Nazionale di Ricerca Metrologica, Torino, Italy

March 2011 – July 2011

Research internship in dr. Stefano Borini's group for my Bachelors' thesis on "Graphene deposition and characterization techniques for field-effect devices manufacturing".

PUBLICATIONS Journal Articles

P. Jagdale, J. R. Nair, A. Khan, M. Armandi, G. Meligrana, F. Robles Hernandez, I. Rusakova, E. Piatti, M. Rovere, A. Tagliaferro, M. Winter, and C. Gerbaldi. Waste to life: Low-cost, self-standing, 2D carbon fiber green Li-ion battery anode made from end-of-life cotton textile. *Electrochimica Acta* **368**, 137644 (2021).

D. Romanin, G. A. Ummarino, and E. Piatti. Migdal-Eliashberg theory of multi-band high-temperature superconductivity in field-effect-doped hydrogenated (111) diamond. *Applied Surface Science* **536**, 147723 (2021).

D. Daghero, E. Piatti, N. D. Zhigadlo, G. A. Ummarino, N. Barbero, and T. Shiroka. Superconductivity of underdoped PrFeAs(O,F) investigated via point-contact spectroscopy and nuclear magnetic resonance. *Physical Review B* **102**, 104513 (2020).

D. Romanin, T. Brumme, D. Daghero, R. S. Gonnelli, and E. Piatti. Strong band-filling-dependence of the scattering lifetime in gated MoS₂ nanolayers induced by the opening of intervalley scattering channels. *Journal of Applied Physics* **128**, 063907 (2020).

E. Piatti, A. Pasquarelli, and R. S. Gonnelli. Orientation-dependent electric transport and band filling in hole co-doped epitaxial diamond films. *Applied Surface Science* **528**, 146795 (2020).

A. Noori, M. Bartoli, A. Frache, E. Piatti, M. Giorcelli, and A. Tagliaferro. Development of Pressure-Responsive PolyPropylene and Biochar-Based Materials. *Micromachines* **11**, 339 (2020).

E. Piatti, D. Romanin, D. Daghero, and R. S. Gonnelli. Two-dimensional hole transport in ion-gated diamond surfaces: A brief review. *Low Temperature Physics* **45**, 1143-1155 (2019).

E. Piatti, F. Galanti, G. Pippione, A. Pasquarelli, and R. S. Gonnelli. Towards the insulator-to-metal transition at the surface of ion-gated nanocrystalline diamond films. *The European Physical Journal: Special Topics* **228**, 689-696 (2019).

J. Lu, H.-Z. Tsai, A. N. Tatan, S. Wickenburg, A. A. Omrani, D. Wong, A. Riss, E. Piatti, K. Watanabe, T. Taniguchi, A. Zettl, V. M. Pereira, and M. F. Crommie. Frustrated supercritical collapse in tunable charge arrays on graphene. *Nature Communications* **10**, 477 (2019).

E. Piatti, D. Romanin, and R. S. Gonnelli. Mapping multi-valley Lifshitz transitions induced by field-effect doping in strained MoS₂ nanolayers. *Journal of Physics: Condensed Matter* **31**, 114002 (2019).

M. Parmeggiani, A. Verna, A. Ballesio, M. Cocuzza, E. Piatti, V. Fra, C. F. Pirri, and S. L. Marasso. P3HT Processing Study for In-Liquid EGO-FET Biosensors: Effects of the Solvent and the Surface. *Sensors* **19**, 4497 (2019).

E. Piatti, T. Hatano, D. Daghero, F. Galanti, C. Gerbaldi, C. Portesi, I. Nakamura, R. Fujimoto, K. Iida, H. Ikuta, and R. S. Gonnelli. Ambipolar suppression of superconductivity by ionic gating in optimally-doped BaFe₂(As,P)₂ ultrathin films. *Physical Review Materials* **3**, 044801 (2019).

E. Piatti, D. De Fazio, D. Daghero, S. R. Tamalampudi, D. Yoon, A. C. Ferrari, and R. S. Gonnelli. Multi-Valley superconductivity in Ion-Gated MoS₂ Layers. *Nano Letters* **18**, 4821-4830 (2018).

E. Piatti, Q. Chen, M. Tortello, J. T. Ye, and R. S. Gonnelli. Possible charge-density-wave signatures in the anomalous resistivity of Li-intercalated multilayer MoS₂. *Applied Surface Science* **461**, 269-275 (2018).

E. Piatti, D. Romanin, R. S. Gonnelli, and D. Daghero. Anomalous screening of an electrostatic field at the surface of niobium nitride. *Applied Surface Science* **461**, 17-22 (2018).

D. Daghero, M. Tortello, G. A. Ummarino, E. Piatti, G. Ghigo, T. Hatano, T. Kawaguchi, H. Ikuta and R. S. Gonnelli. Decoupling of critical temperature and superconducting gaps in irradiated films of a Fe-based superconductor. *Superconductor Science and Technology* **31**, 034005 (2018).

G. A. Ummarino, E. Piatti, D. Daghero, R. S. Gonnelli, Irina Yu. Sklyadneva, E. V. Chulkov, and R. Heid. Proximity Eliashberg theory of electrostatic field-effect-doping in superconducting films. *Physical Review B* **96**, 064509 (2017).

E. Piatti, Q. Chen, and J. T. Ye. Strong dopant dependence of electric transport in ion-gated MoS₂. *Applied Physics Letters* **111**, 013106 (2017).

R. S. Gonnelli, E. Piatti, A. Sola, M. Tortello, F. Dolcini, S. Galasso, J. R. Nair, C. Gerbaldi, E. Cappelluti, M. Bruna, and A. C. Ferrari. Weak Localization in Electric-Double-Layer Gated Few-layer Graphene. *2D Materials* **4**, 035006 (2017).

E. Piatti, D. Daghero, G. A. Ummarino, F. Laviano, J. R. Nair, R. Cristiano, A. Casaburi, C. Portesi, A. Sola, and R. S. Gonnelli. Control of bulk superconductivity in a BCS superconductor by surface charge doping via electrochemical gating. *Physical Review B* **95**, 140501(R) (2017).

E. Piatti, S. Galasso, M. Tortello, J. R. Nair, C. Gerbaldi, M. Bruna, S. Borini, D. Daghero, and R. S. Gonnelli. Carrier mobility and scattering lifetime in electric-double-layer gated few-layer graphene. *Applied Surface Science* **395**, 37 (2017).

E. Piatti, A. Sola, D. Daghero, G. A. Ummarino, F. Laviano, J. R. Nair, C. Gerbaldi, R. Cristiano, A. Casaburi, and R. S. Gonnelli. Superconducting Transition Temperature Modulation in NbN via EDL Gating. *Journal of Superconductivity and Novel Magnetism* **29**, 587 (2016).

R. S. Gonnelli, F. Paolucci, E. Piatti, K. Sharda, A. Sola, M. Tortello, J. R. Nair, C. Gerbaldi, M. Bruna, and S. Borini. Temperature Dependence of Electric Transport in Few-layer Graphene under Large Charge Doping Induced by Electrochemical Gating. *Scientific Reports* **5**, 9554 (2015).

Proceedings

E. Piatti, D. Daghero, G. A. Ummarino, M. Colangelo, D. Romanin, O. Medeiros, F. Galanti, F. Laviano, J. R. Nair, A. Sola, C. Portesi, R. Cristiano, A. Casaburi, I. Yu. Sklyadneva, E. V. Chulkov, R. Heid, K. K. Berggren, and R. S. Gonnelli. Control of bulk superconductivity via surface-bound electric fields in ion-gated niobium nitride thin films. In *Proceedings of the 11th Conference "Solid State Surfaces and Interfaces"*, pp. 67-69 (2020).

M. Parmeggiani, A. Verna, A. Ballesio, M. Cocuzza, E. Piatti, V. Fra, C. F. Pirri, and S. L. Marasso. P3HT Processing Study for In-Liquid EGOFET Biosensors: Effects of the Solvent and the Surface. In *Proceedings* **15**, 39 (2019).

E. Piatti, D. Romanin, F. Galanti, G. Pippione, A. Pasquarelli, D. Daghero, and R. S. Gonnelli. Towards electric-field-induced superconductivity in ion-gated diamond surfaces. In *SURFINT-SREN VI - Extended Abstract Book*, pp. 128-131 (2019).

D. Daghero, E. Piatti, G. A. Ummarino, F. Laviano, J. R. Nair, R. Cristiano, A. Casaburi, C. Portesi, A. Sola, and R. S. Gonnelli. Control of bulk superconductivity by surface charge doping in a BCS superconductor. In *SURFINT-SREN V - Extended Abstract Book*, pp. 26-29 (2017).

E. Piatti, D. De Fazio, D. Daghero, S. R. Tamalampudi, D. Yoon, Q. H. Chen, J. T. Ye, A. C. Ferrari and R. S. Gonnelli. Electronic phases in ion-gated MoS₂ ultrathin layers: Multi-valley superconductivity and possible charge-density wave. In *SURFINT-SREN V - Extended Abstract Book*, pp. 106-109 (2017).

R. S. Gonnelli, A. Sola, E. Piatti, D. Daghero, M. Tortello, K. Sharda, J. R. Nair, C. Gerbaldi, S. Galasso, F. Dolcini, E. Cappelluti, M. Bruna, S. Borini, and A. C. Ferrari. The physics of few-layer graphene under strong surface doping via electrochemical gating. In *SURFINT-SREN IV - Extended Abstracts Book* (2015).

D. Daghero, A. Sola, E. Piatti, M. Tortello, C. Gerbaldi, R. Cristiano, A. Casaburi, K. Iida, H. Ikuta, and R. S. Gonnelli. Electrochemical charge doping in conventional and unconventional superconductors: the cases of NbN and Ba-122. In *Superstripes 2015*, pp. 89-90 (2015).

AWARDS

1st prize in the Best Young Researcher Contribution Contest - SSSI 2020

Issued by the Scientific committee of the SSSI 2020 conference

First prize in the "best work competition for young scientists under 35 years old" organized by the scientific committee of the 11th edition of the "International conference Solid State Surfaces and Interfaces (SSSI 2020)". The prize was awarded after the invited talk "Control of bulk superconductivity via surface-bound electric fields in ion-gated niobium nitride thin films".

1st prize in the Best Young Researcher Contribution Contest - SurfInt-SREN VI

Issued by the Scientific committee of the SURFINT-SREN VI conference

First prize in the "best work competition for young scientists under 35 years old" organized by the scientific committee of the 2019 edition of the conference "Progress in Applied Surface, Interface and Thin Film Science - Solar Renewable Energy News (SURFINT-SREN VI)". The prize was awarded after the invited talk "Towards electric-field-induced superconductivity in ion-gated diamond surfaces".

Outstanding Referee

Issued by *Communications Physics* / Springer Nature (2019)

This commendation is awarded by the Editors of *Communications Physics* to "highlight the exceptional contribution of some of the outstanding referees that have reviewed for *Communications Physics*".

DISSEMINATION Invited talks

9th International Conference "Science and Engineering of Novel Superconductors" (CIMTEC 2021)

Montecatini Terme, Italy, 21-30 June 2021

"Ion-gated molybdenum disulphide: a new platform for tunable multi-band superconductivity"

11th International Conference on Solid State Surfaces and Interfaces (SSSI 2020)

Smolenice Castle, Smolenice, Slovakia, 23-25 November 2020

"Control of bulk superconductivity via surface-bound electric fields in ion-gated niobium nitride thin films"

Progress in Applied Surface, Interface and Thin Film Science – Solar Energy News 2019 (SurfInt-SREN VI)

Auditorium al Duomo, Florence, Italy, 18-21 November 2019

"Towards electric field-induced superconductivity in ion-gated diamond surfaces"

Contributed talks

Conference on Superconductivity and Functional Oxides 2020 (SuperFOx 2020)

Hotel Regina Elena, Santa Margherita Ligure, Italy, 10-12 February 2020

"Ultrathin molybdenum disulphide as a gate-tunable multi-valley superconductor"

Italian National Conference on the Physics of Matter (FisMat 2019)

Università di Catania, Catania, Italy, 30 September-04 October 2019

"Ultrathin molybdenum disulphide as a gate-tunable multi-valley superconductor"

International Conference on Multi-Condensate Superconductivity and Superfluidity in Solids and Ultra-cold Gases (MultiSuper 2018)

ICPT-SISSA, Trieste, Italy, 14-18 May 2018

"Evidence for Multi-valley Superconductivity and Possible Charge Density Waves in Ion-gated Few-layer MoS₂"

Italian National Conference on the Physics of Matter (FisMat 2017)

ICPT-SISSA, Trieste, Italy, 01-05 October 2017

“Ionic gating in superconducting thin films: control of bulk superconductivity via surface-bound electric fields”

Workshop on Localisation in Quantum Systems (WoLQS)

King’s College London, London, United Kingdom, 01-02 June 2017

“Localization and scattering in ion-gated few-layer graphene: the competing roles of gate-induced disorder and ultra-high carrier density”

7th Young Researcher Meeting (7th YRM)

Istituto Nazionale di Ricerca Metrologica, Torino, Italy, 24-26 October 2016

“Electrochemical gating in thin film superconductors: control of bulk superconductivity via surface-bound electric fields”

Conference on Superconductivity and Functional Oxides 2016 (SuperFOx 2016)

Politecnico di Torino, Torino, Italy, 19-21 September 2016

“Electrochemical gating in thin films of conventional and unconventional superconductors: NbN and P-doped BaFe₂As₂”

Conference on Superconductivity and Functional Oxides 2014 (SuperFOx 2014)

La Sapienza Università di Roma, Roma, Italy, 24-26 September 2014

“Temperature dependence of electric transport in few-layer graphene under strong electrochemical gating: scattering and weak localization”

TEACHING

Physics II: Electromagnetism

2nd year course in the Bachelor's Degree in Engineering and Management

Academic years: 2018/2019, 2019/2020, 2020/2021

Technologies for Nanoscience

3rd year course in the Bachelor's Degree in Physical Engineering

Academic years: 2018/2019, 2019/2020, 2020/2021

Advanced Experimental Physics

1st year course in the Master's Degree in Physics of Complex Systems

Academic years: 2018/2019, 2019/2020, 2020/2021

Scanning Probe Microscopy

Graduate course for PhD students

Academic years: 2018/2019, 2019/2020, 2020/2021