Curriculum Vitae

Surname: HADDAD
First name: Sonia
Date and place of birth: 11 January 1971 (Dumont, France)
Nationality: original nationality: Algerian, present nationality: Tunisian
Permanent Institute: Laboratoire de Physique de la Matière Condensée, Faculté des Sciences de Tunis, Université Tunis El Manar
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ORCID: 0000-0002-4057-1110

Education:

Habilitation (accreditation to supervise research in Physics):
Area: Condensed Matter
Name of institute: Faculty of Sciences de Tunis
Date of achievement: 22 May 2008
Qualification obtained: first class Honors with the examining board's utmost praise

Doctorate:
Area: Condensed Matter Physics
Name of institute: Faculty of Sciences of Tunis, Tunisia
Date of achievement: April 2000
Qualification obtained: first class Honors with the examining board's utmost praise

Post-graduate diploma:
Area: Quantum physics
Name of Institute: Faculty of Sciences de Tunis
Date of achievement: December 1996
Qualification obtained: first class Honors with the examining board's utmost praise

Under-graduate diploma (Maîtrise en Physique):
Area: fundamental physics
Name of institute: Faculty of Sciences de Tunis
Date of achievement: June 1994
Qualification obtained: upper second-class Honors

Research work:

I am interested in**:**

- Dirac electrons systems and topological materials, twistronics in 2D heterostructures
- Inhomogenous superconductivity in low dimensional organic conductors and high temperature superconductors (role of disorder and interactions)

I use analytical and numerical approaches.

Awards and Fellowships:

- Visiting professor for the period of December 2021 to August 2022, at the Institute of Solid State Physics (ISSP), University of Tokyo in the group of Prof. Toshihito Osada (depending on pandemic situation).
- Simons-ICTP associateship for the period of 2014-2019, (ICTP, Trieste, Italy)
- Tow month visiting fellowship to Max Planck Institute of Complex systems in Dresden (Germany).
- Qualification for an Assistant professor position in France: I have been qualified to participate to the selection of Assistant professors in France. This qualification is valuable for four years starting from 2001.
- Postdoc position in International Center for Theoretical Physics (ICTP), Trieste (Italy): I have been selected for a one-year postdoc in ICTP in the group of condensed matter starting from March 2001. Unfortunately, I was unable to join the post for personal reasons.
- Researcher-Lecturer position (ATER) in University of Paris XI, Orsay (France) for the academic year 2001-2002. I did not join this position due to administrative reasons related to the request of visa to France which took me too much time.
- Tunisian Presidential prize for Bachelor in Physics, 1994.

Scientific and administrative responsibilities:

- Co-conveners of the Condensed Matter and Materials Physics group for the African Strategy of Fundamental and Applied Physics (https://africanphysicsstrategy.org/).
- Head of the Condensed Matter Physics Laboratory at the Faculty of Sciences of Tunis, since March 2018.
- Coordinator of the Master of Condensed Matter Physics, since September 2017.

H-index

google scholar
h-index: 7
i10-indix: 6

Languages:

Mother tongue: Arabic
Foreign languages:
1/ French: fluent
2/ English: good
3/ Italian: average

Publications and communications:

Papers:

Twistronics versus straintronics in twisted bilayers of graphene and transition metal dichalcogenides
M Mannaï, S Haddad, Physical Review B 103 (20), L201112 (2021)

Strain tuned topology in the Haldane and the modified Haldane models
Marwa Mannaï, Sonia Haddad, *J. Phys.: Condens. Matter* **32** 225501 (2020)

Kohn anomaly of optical zone boundary phonons in uniaxial strained graphene: role of the electronic band structure
Sonia Haddad, Lassaad Mandhour, Phys. Rev. B 98, 115420 (2018)

Electric field-induced valley degeneracy lifting in uniaxial strained graphene:
Evidence from magnetophonon resonance, Mohamed Assili, Sonia Haddad, and Woun Kang Phys. Rev. B 91, 115422 (2015)

Long-wavelength optical phonon behavior in uniaxial strained graphene:
Role of electron-phonon interaction, M. Assili and S. Haddad , Phys. Rev. B 90, 125401 (2014)

Interlayer magnetoresistance in multilayer Dirac electron systems: motion and merging of Dirac cones, M Assili and S Haddad, J. Phys.: Condens. Matter **25** 365503 (2013)

Inhomogeneous superconductivity in organic conductors: role of disorder, S. Haddad, S. Charfi-Kaddour and J.-P. Pouget, Journal of Physics: Condensed Matter, **23**, 464205 (2011)

Disorder-induced superconductivity in ropes of carbon nanotubes, B. Bellafi, S. Haddad, and S. Charfi-Kaddour Phys. Rev.B 80, 075401 (2009).

Field induced confinement in quasi-one dimensional organic conductors, S. Haddad, N. Belmechri, S. Charfi-Kaddour and M. Héritier, Phys. Rev. B 78, 075104 (2008)

Role of the cooling rate in the stability of the superconducting phase of $(TMTSF)_2ClO_4$, S. Haddad, I. Sfar, S. Charfi-Kaddour and R. Bennaceur Eurhys. Lett. 80, 17001 (2007)

Field induced confinement in $(TMTSF)_2ClO_4$ under accurately aligned magnetic field
N. Joo, P. Auban-Senzier, C. Pasquier, S. Yonezawa, R. Higashinaka, Y.Maeno, S. Haddad, S. Charfi-Kaddour, M. Héritier, K. Bechgaard and D. Jérome, Eur. Phys. J. B 52, 337 (2006)

Field-induced-spin-density wave phases in (TMTSF)2ClO4 at high magnetic
field: effect of anion ordering,S. Haddad, S. Charfi-Kaddour, M. Héritier and R. Bennaceur, Phys. Rev. B 72, 085104 (2005)

Renormalization of the hopping parameters in quasi-one-dimensional conductors in the presence of a magnetic field, S. Haddad, S. Charfi-Kaddour, C. Nickel, M. Héritier and R. Bennaceur, Eur. Phys. J. B 34, 33 (2003)

Competing phases in the high field phase diagram of $(TMTSF)_2ClO_4$: S. Haddad, S. Charfi-Kaddour, C. Nickel, M. Héritier and R. Bennaceur, Phys. Rev. Lett. 89, 087001 (2002).

Orbital effect of a magnetic field on tow-leg Hubbard ladder, S. Haddad, M. Héritier and R. Bennaceur, Eur. Phys. J. B, 11, 429 (1999)

Invited papers
Unconventional electronic states in $(TMTSF)_2X$: the case of $(TMTSF)_2ClO_4$,
S. Haddad, M. Héritier and S. Charfi-Kaddour, in *The Physics of Organic Superconductors and Conductors* edited by A. G. Lebed (Springer Eds.) (2008).

Guest Editor : *J. Phys.: Condens. Matter* **23**, Special section on superconducting materials

Talks:

Strain tuned topology in the Haldane and the modified Haldane models
Workshop on Emergent Materials, 3-7 December 2019 (Agya event) at University of Mohamed V, Rabat (Morocco).

Strain tuned topology in the Haldane and the modified Haldane models
Workshop "Electronic Transport and dynamics in graphene and 2D materials" - June 27-28, 2019 at Cergy-Pontoise (France).

Kohn anomaly in strained graphene; role of the tilt of Dirac cone, NANOSMAT- Mediterrane 2019, Rabat, Morocco (2-5 May 2019).

Kohn anomaly in strained graphene; role of the tilt of Dirac cone, JMC 2018, Grenoble, France (27-31 august 2018).

Electron-phonon interaction in strained graphene, 13 novembre 2015, Laboratoire des Champs magnétiques intenses, Grenoble, France (invited seminar)

Magnetophonon resonance in strained graphene : valley degeneracy lifting
25 February 2015, Nano-tn international conference, Hammamet, Tunisia (invited)

Inhomogeneous supercnductivity in low dimensional organic superconductors and ropes of carbon nanotubes.
19 June 2012 à Sungkyunkwan University ,Seoul (South Korea) (invited seminar)

Magnetoresistance in multilayered graphene : effect of Dirac cone motion
à Ewha Womans University, Seoul (South Korea), 14 June 2012 (invited seminar)

Upper critical fields and Nernst effect in inhomogeneous superconductors
Superstripes 2011, 10-16 July 2011, Rome (Italy), (Invited talk)

Upper critical fields and Nernst effect in inhomogeneous superconductivitors,
ECRYS2011, 15-25 August 2011, Cargèse (France).

Inhomogeneous superconductivity in organic conductors: role of disorderand magnetic field,
Superstripes2010, 19-25 July 2010, Erice (Italy).

Disorder induced superconductivity in ropes of carbon nanotubes
SCMC2009, 17-19 September 2009, Narita (Japan).

Field induced confinement in low dimensional organic conductors
The International Conference on Electronic Crystals ECRYS-2008 25-30 August 2008, Cargèse, France.

Field induced confinement in low dimensional organic conductors
The International Conference on Science and Technology of Synthetic Metals, ICSM2008 6-11 July 2008, Porto de Galinhas, Brazil.

Interplay between Superconductivity and Spin Density wave in (TMTSF)2ClO4.
The International Conference on Science and Technology of Synthetic Metals, ICSM 2006 July 2-7, 2006, Dublin, Ireland.

Participation to recent international events:

Three lectures on Introduction to Solid State Physics in the African School of Physics, 19-27 July 2021

Workshop on Emergent Materials, 3-7 December 2019 (Agya event) at University of Mohamed V, Rabat (Morocco).

Workshop "Electronic Transport and dynamics in graphene and 2D materials" - June 27-28, 2019 at Cergy-Pontoise (France).

Signatures of Topology in condensed matter, 21-25 October 2019 at ICTP, Trieste, Italy.

Conference on Modern Concepts and new Material for Thermoelectricity,11-15 March 2019 at ICTP, Trieste, Italy.

School on Electron-phonon interaction from first principles, 19-23 March 2018, ICTP, Trieste, Italy

Conference on Weyl Fermions in Materials 23-27/10/2017, ICTP, Trieste, Italy

Conference on Interactions and Topology in Dirac Systems, 3-9 August 2016, ICTP, Trieste, Italy

School and Workshop on Strongly Correlated Electronic Systems, Novel Materials and Novel Theories, 10-21 August 2015, ICTP, Trieste, Italy

Conference on Frontiers of Nanoscience 24 August to 1 September 2015, ICTP, Trieste, Italy

5th Workshop on Entrepreneurship for Physicists and Engineers from Developing Countries
I could attend the workshop from 31 March to 3 April 2014

International Conference on Field Theory Methods in Low-Dimensional Strongly Correlated Quantum
Systems, 25/08/2014 - 29/08/2014, Trieste, Italy

International Conference on Recent Progress in Graphene Research 2013, September 9-13 2013, Tokyo (Japan)

8th international Symposium on Crystalline Organic Metals, Superconductors and Ferromagnets (ISCOM 2009), 12-17 September 2009, Niseko, Hokkaido (Japan).

The International Conference on Electronic Crystals ECRYS-2008 25-30 August 2008, Cargèse, France.

The International symposium on conducting molecular systems ISCOM-2007, 23-29 September Peniscula, (Spain).

ISCOM-2005, 11-16 September 2005, Key-West, Florida (USA)

Collaborations:

Theory:

Prof. Gilles Montambaux, Prof. Jean-Noël Fuchs, Dr. Frédéric Piéchon and Prof. Mark Goerbig, Laboratoire de Physique des Solides, université Paris-Saclay Orsay, France

Young-Woo Son, KIAS (Korean Institute for advanced Study), Seoul, South Korea

Denis Basko, University Joseph Fourier, Grenoble, France

Lalla Btissam Drissi, University of Mohamed V, Rabat (Morocco)

Edurado Castro, University of Porto, Portugal.

Experiments:

Claude Pasquier, Laboratoire de Physique des Solides, Orsay, France (low dimensional organic conductors)

John Singleton, National High Magnetic Field Laboratory, LANL, Los Alamos, USA

Keizo Murata, Osaka University, Japan

Martin Dressel, University of Stuttgart (Germny)

Won Kang, Ewha Womans University Seoul, (Seoul, South Korea)

Laura Greene, University of Illinois at Urbana-Champaign

Marek Potemski (Laboratoire des semi-conducteurs et nanophysique, CNRS, Grenoble, France)

Nedjma Bendiab, University of Grenoble Alpes, Institut Néel, Grenoble, France

Cooperation projects:

I mounted with African groups the **Extended African Network for Advanced two dimensional materials** which is funded basically by the ICTP (International Center of Theoretical Physics), Trieste, Italy.
The network includes members from Tunisia, Algeria, Cameroon, Congo-Brazzaville, Sudan, Morocco, Rwanda and South-Africa. It also has European consultants from France, Italy, Sweden and UK.
The projects lasted for two years 2018-2019.

I prepared, with colleagues from Morocco, South Africa, Kenya, Rwanda, and Ghana a proposal intitled *Advanced Materials for Africa Development and Sustainability* within the Intra-Africa Academic Mobility Scheme of the European EACEA programme.

The objective of the programme is to establish an outstanding postgraduate education (Master and Doctorate degrees) in accordance with the international standards.

I also the Tunisian coordinator of a bilateral project between Tunisia and Morocco which was accepted in March 2020 (26 projects accepted of 174 submitted). The project deals with applications of 2D advanced materials in biology and energy.

I have contributed to establish the following cooperation projects:

1/ Tunisian-French cooperation project CMCU 01F/1303 (2001-2003)
2/ Tunisian-French cooperation project CMCU 04G/1307 (2004-2006)
3/ Tunisian-French cooperation project CMCU 10 G1306 (2010-2013)
4/ Tunisian-French cooperation project CMCU 10 G1503 (2015-2018)
5/ Tunisian-Greek cooperation project 28/TG/05 (2005-2006)
6/ Tunisian-South Korea cooperation project (2012) with Prof. W. Kang (Ewha Womans University)

Scientific Employment and Academic Responsibilities:

Duties: Full Professor (tenure)
Name of Institute: Faculté des Sciences de Tunis (Tunisia)
Period of service: since 2015

Duties: Associate professor (tenure)
Name of Institute: Faculté des Sciences de Tunis (Tunisia)
Period of service: since 2008

Duties: Assistant professor (tenure)
Name of Institute: Faculté des Sciences de Tunis (Tunisia)
Period of service: 2003-2008

Research supervision:

Master students:

Miss Sameh Manaï
Subject: Inhomogeneous superconductivity in layered organic conductors: effect of cooling rate. Defended on: 17 July 2008.

Mr Mohamed Assili
Subject: Magnetoresistance in multilayred grapheme: effect of merging Dirac points, defended on 28 September 2012

Miss Raja Amri
Subject: Optical conductivity in twisted graphene
Defended on: 22 October 2013.

Miss Asma Saïdia
Subject: Superconductivity in graphene: BCS approach
Defended on: 22 October 2013.

Mr Mohmaed Assali
Subject: Electron-phonon interaction in strained graphene: role of temperature

Defended on: 22 November 2017

Miss Marwa Mannai
Introduction to topological band structure: Haldane model in strained graphene.
Defended on: 12 November 2029

Ph.D Students:

Mr Mohamed Assili
Title: Elecron-phonon intrecation in strained graphene: role of electronic structure
Date: defended on 15 April 2016

Miss Marwa Mannai
Contribution to the study of the electronic properties of topological materials: role of strain, disorder and interactions.
Since January 2019.
In progress

Teaching responsibilities

Levels: undergraduate (Bachelor) and graduate (Master).
Locations: Faculty of Sciences of Tunis and Ecole Polytechnique de Tunis, Tunisia

Participation to Teaching Physics events:

In order to improve my teaching methods I have attended Active Learning events:
1/ Active Learning in Optics and Photonics, ALOP II, 24-25 November 2006, Bizerte (Tunisia)
2/ Active Learning in Mechanics, October 2005, Faculty of Sciences of Tunis (Tunisia) under the supervision of two leading professors from USA and Philippines.
3/ French-Tunisian School on teaching Physics, IPEST (Tunis) 2-6 July, 2007.

Organization of Physics events:

Organization on several seminars and courses:

I have invited several outstanding researchers to give seminars, conferences and courses.
I have recently organized, in collaboration with the *ICTP Physics without Frontiers programme*, a course on particle physics given remotely during one month in 2016 by Prof. Mario Campanelli from UCL, UK, for master and PhD students at the Faculty of Sciences of Tunis. This course was very helpful for students undertaking research activities in high energy physics and a master student managed to be selected, after this course, in a PhD programme in particle physics in Belgium and CERN.
I then organized, in October 2019, crash courses on Solid state Physics with the ICTP Physics without Frontiers programme given by Prof. Sandro Scandolo (ICTP). More than forty Master and Ph.D students attended the courses and about thirty took the final exam. These courses will be helpful for students willing to apply for the ICTP postgraduate diploma.
I also invited Jean-Noël Fuchs from Sorbone University to give a 12 hours course for master and Ph.D student on topological quantum mechanics and topological superconductors. The courses were very helpful for students interested in topological materials.

Organization of outreach conferences for pupils and students in collaboration with Cité des Sciences of Tunis

Organization of laboratories visits for Master students in different research centers in Tunis.

Organization of workshops and conferences

I have participated to the organization of several events in Tunisia and Morocco, in particular

Co-organization of the International Conference NANOSMAT- Mediterrane 2019, Rabat, Morocco (2-5 May 2019).

Organization of the Second Meeting of the Network members of Extended African Network for Advanced 2D Materials, 18-25 December 2019 in Tunis, including courses, seminars, visits for laboratories. Participants were from Tunisia, Algeria, South Africa and Morocco.

Organization of the first Meeting of the Network members of Extended African Network for Advanced 2D Materials, 9-12 July 2018, in Tunis including courses, seminars, visits for laboratories. Participants were from Tunisia, Algeria and Morocco.

Organization of the Junior research days in Physics, Faculty of Sciences of Tunis on 2012, 2014, 2016 and 2018.

Co-organization of the International Conference on Conducting Materials (ICoCoM2010), 2-7 November 2010, Sousse (Tunisia) http://www.stp.org.tn/ICOCOM2010/OrganizingCommittee.html.

Workshop on "Publishing in peer-reviewd journals" 4 May 2013. The organization of this workshop was proposed by G. Richmond (President of COACh for women in science) and N. Berah.

Membership: member of
The Tunisian Physical Society
The European Physical Society
COACh for women in science (http://coach.uoregon.edu/coach/)
OSIRIS organization for sustainable energy

References:

Prof. Jean-Noël Fuchs
LPTMC, Sorbonne Université, Tour 12-13/13-23, Boîte 121, 4, Place Jussieu,75252 Paris Cedex 05, France
Phone : +33 (0)6 75 04 99 14
Email: fuchs@lptmc.jussieu.fr

Prof. Mark Oliver Goerbig
Laboratoire de Physique des Solides (groupe théorique/Theory Group) CNRS UMR 8502
Université Paris-Saclay, Bât. 510, Bureau : 162
F-91405 Orsay cedexTel: ++33 (0)1 69 15 76 65
E-mail: goerbig@lps.u-psud.fr

Dr. Eduardo Vieira de Castro,
Centro de Fisica do Porto, Departamento de Fisica da FCUP, Rua do Campo Alegre, 687
P-4169-007 Porto, Portugal
Email: evcastro@fc.up.pt

Prof. Sandro Scandolo
ICTP - Strada Costiera, 11
I - 34151 Trieste Italy
Email: scandolo@ictp.it

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J1K-2R1
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Telecopy : 819-821-8046
e-mail: Claude.Bourbonnais@USherbrooke.ca