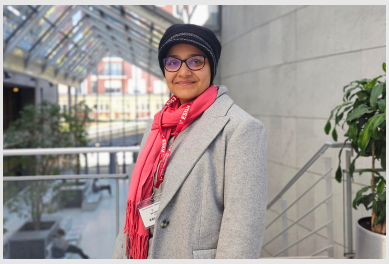

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S. Ayari

English	C1
French	C1
Arabic	Native
spanish	A2

Sabrine Ayari

Work experience

Teacher-Researcher — Since Oct 2024

Ecole superieure d'ingénieurs Léonard-de-Vinci (ES-ILV),De Vinci Higher Education, De Vinci Research Center, Paris, France

Coordinator of HPC and AI Program

Post Doctoral — April 2022 - Sept 2024

Laboratry of physics at École Normale Supérieure, (ENS), CNRS, Paris, France

- Conducting theoretical calculations within the Extreme Optical Nonlinearities in two-dimensional 2D materials .
- Investigate and optimize the electronic and optical properties of 2D transition metal dichalcogenides (TMDs) and Dirac materials (DM).

Temporary lecturer — March 2020 - April 2022

Faculty of Sciences Bizerte, Tunisia

- **The teachings were conducted through :**
- Given courses for bachelor's and master's degree programs: Fluid Mechanics, Electromagnetism, Thermodynamics,Analog Electronics.
- contributed to the writing of two chapters for the Density Functional Theory course within the Master's degree program.
- Co-supervised a Master's student during PFE (Final Year Project).

Education

Phd in Physics of Materials: Structures and Applications — Sep 2017 - Jan 2022

Faculty of science of Bizerte, University of Carthage-Tunisia

Thesis title: *"Contribution to the study of the optical and dynamic properties of excitons in 2D materials: Transition metal dichalcogenides (TMDCs) and CdSe Nanoplatelets."*

Master in Physics of Materials: Structures and Applications — Sep 2014 - Dec 2016

Faculty of science of Bizerte, University of Carthage,Tunisia

Thesis title: *The effect of dielectric screening and disorder potential on the excitonic properties of a monolayer of molybdenum diselenide ($MoSe_2$)*

Bachelor's Degree in Fundamental Physics. — Sep 2012 - June 2014

Faculty of science of Bizerte, University of Carthage-Tunisia

Baccalaureate in Mathematics. — Sep 2010-June 2017

Bach Hamba High School - Bizerte, Tunisia

Awards and honors

Poster Award from the Yambo School of Programming, May 2022
Rome, Italy
School name : Ab initio many-body perturbation theory: from equilibrium to time-resolved spectroscopies and nonlinear optics

Doctorate Degree with Highest Honors Jan 2022
Faculty of science of Bizerte, University of Carthage-Tunisia

Scholarship for a 4-month internship Sept 2020
University of Carthage-Tunisia

Scholarship for a 4-month internship April 2019
University of Carthage

Scholarship for a 3-month internship May 2018
Faculty of science of Bizerte

Master's diploma in Physics with highest honors Dec 2016
Faculty of science of Bizerte, University of Carthage-Tunisia
Major of promotion in Master of Physics

Excellence prize Dec 2016
Faculty of science of Bizerte, University of Carthage-Tunisia

Bachelor's diploma in Physics with honors June 2014
Faculty of science of Bizerte, University of Carthage-Tunisia

Conferences and Seminars

Infrared and Terahertz quantum Workshop ITQW 2023
06-12 June 2023

Erice, Italy

Oral Presentation: *Layer-controlled optical and electronic properties in Multilayer PtSe2*
***Sabrine Ayari**, Minoosh Hammat, Martin Micca, Mehdi Arfaoui, Sihem Jaziri, Francesca Carosella, Sukhy Dhillion, Robson Ferraira .*

Summer School optical systems and quantum Devices for MIR and THZ technologies.
27 June-1 July 2023

Villa Clythia à Fréjus

Oral Presentation: *Layer- controlled nonlinear terahertz valleytronics intwo-dimensional semimetal and semiconductor PtSe2*
***Sabrine Ayari**, Minoosh Hammat, Martin Micca , Mehdi Arfaoui, Sihem Jaziri, Francesca Carosella, Sukhy Dhillion, Robson Ferraira.*

International Conference Meeting on Advanced Materials (IMAM).
06-08 Sep 2021

Hamamat,Tunisia

Oral Presentation: *Phonon assited exciton /trion conversion efficiency in transition metal dichalcogenides.*
***Sabrine Ayari**, Sihem Jaziri, Robson Ferreira, and Gerald Bastard.*

International conference on Smart Materials and spectroscopy (SMS).
24-27 june 2021

Hamamat,Tunisia

Oral Presentation: *Phonon assited exciton /trion conversion efficiency in transition metal dichalcogenides*
***Sabrine Ayari**, Sihem Jaziri, Robson Ferreira, and Gerald Bastard.*

E3S Symposium, Exciton Engineering in Emerging Semiconductors.
24-27 june 2021

Madrid, Spain

Poster Presentation: *Radiative lifetime of localised excitons in transition metals dichalcogenides*
***Sabrine Ayari**, Adlen. Smiri, Aida. Hichri, Sihem Jaziri, Thierry Amand.*

Young Researchers Day in Physic.
24-27 june 2018

Tunis, Tunisia

Poster Presentation: *Dynamaics of localized exciton in Transition Metals Dichalcogenides*
***Sabrine Ayari**,Sihem Jaziri.*

Internships and Training

Programming School — **May 2022**

Rome, Italy

Ab initio many-body perturbation theory: from equilibrium to time-resolved spectroscopies and nonlinear optics

Training in University Pedagogy — **11-12 Sep 2021**

Spectrum Training Center STC,Tunisia

Traning in the methods and techniques of academic Pedagogy.

Python Programming — **01-04 Sep 2021**

Spectrum Training Center STC,Tunisia

Training in Methodology for Developing a Doctoral Thesis — **11 July 2021**

Spectrum Training Center STC,Tunis

6 month Internship under the supervision of Dr. Alexander W. Achtstein and Prof. Ulrike Wogoon — **Sep 2020- Feb 2021**

Technical University of Berlin, Germany

Topic: 'Exciton-Phonon interaction and carrier mobility in 2D semiconductor systems: The examples of TMDs materials and CdSe nanoplatelets

Winter School on Quantum Computing — **Dec 2019**

Tunisian Physical Society (STP), Faculty of Sciences, Tunis El Manar University, Tunisia

4 months Internship under the supervision of Dr. Alexander W. Achtstein and Prof. Ulrike Wogoon — **April-July 2019**

Technical University of Berlin, Germany

Topic:Optical properties of a laterally finite 2D systems: CdSe Nanoplatelets

3 months Internship under the supervision of Dr. Alexander W. Achtstein and Prof. Ulrike Wogoon — **May-July 2018**

Technical University of Berlin, Germany

Topic:Trions and their recombination dynamics in 2D materials

Publications

Martin Micica, ***Sabrine Ayari*** *et al* . **Determining Bandgaps in the Layered Group-10 2D Transition Metal Dichalcogenide PtSe2** *Advanced Functional Materials,35,2408982 (2025)*

Marin Tharrault, ***Sabrine Ayari****, et al*. **Optical Absorption in Indirect Semiconductor to Semimetal PtSe2 Arises from Direct Transitions** *Phys. Rev. Lett. 134, 066901 (2025)*

Quentin Wach, Sabrine Ayari al. **Field-Dependent THz Transport Nonlinearities in Semiconductor Nano Structures** *Phys. Chem. Chem. Phys.,26, 13995-14005 (2024)*

Minoosh Hemmat, ***Sabrine Ayari****, et al*. **Layer- controlled nonlinear terahertz valleytronics intwo-dimensional semimetal and semiconductor PtSe2** *Info Mat, e12468 (2023)*

Mehdi Arfaoui, Natalia Zawadzka, ***Sabrine Ayari****, et al*. **Optical properties of Orthorhombic germanium sulfide: unveiling the anisotropic nature of Wannier excitons** *Nanoscale, 15, 17014 (2023)*

Michael T. Quick, ***Sabrine Ayari****, et al*. **THz mobility and polarizability: impact of transformation and dephasing on the spectral response of excitons in a 2D semiconductor** *Phys. Chem. Chem. Phys, 25, 3354 (2023)*

Michael T. Quick, ***Sabrine Ayari****, et al*. **Quantum Nature of THz Conductivity: Excitons, Charges, and Trions in 2D Semiconductor Nanoplatelets and Implications for THz Imaging and Solar Hydrogen Generation** *ACS Appl. Nano Mater., 5, 6, 8306–8313 (2022)*

Ridha .Eddhib, ***Sabrine Ayari****, et al*. **Manipulating single photon emitter radiative lifetime in transition-metal dichalcogenides through Forster resonance energy transfer to graphene** *Phys.Rev .B 104,115426 (2021)*

Alexander W. Achtstein, ***Sabrine Ayari****, et al*. **Tuning exciton diffusion, mobility and emission line width in CdSe nanoplatelets via lateral size.** *Nanoscale, 12, 23521 (2020)*

Sabrine Ayari *et al*. **Phonon-assisted exciton/trion conversion efficiency in transition metal dichalcogenides** *Phys. Rev. B 102, 125410 (2020)*

Sabrine Ayari *et al*. **Tuning trion binding energy and oscillator strength in a laterally finite 2D system: CdSe nanoplatelets as a model system for trion properties** *Nanoscale, 12, 14448-14458 (2020)*

Haitham Zahra, ***Sabrine Ayari*** *et al*. **Scaling of the free and the relaxed exciton in perovskites** $(RNH_3)_2(CH_3NH_3)_{p1}Pb_pI_{3p+1}$ **large sized monolayers** *Journal of Applied Physics 126, 085502 (2019)*

Sabrine Ayari*, et al* . **Dynamics of Free and Localized Excitons Two Dimensional Transition Metal Dichalcogenides** *PSS(b),256, 1800682 (2019)*

Sabrine Ayari *et al* . **Radiative lifetime of localized excitons in transition metal dichalcogenides** *Phys. Rev. B, 98, 4205430 (2018).*

*Aida Hichri, Imen . Ben Amara,****Sabrine Ayari*** *et al* . **Exciton center-of-mass localization and dielectric environment effect in monolayer WS2** *Journal of Applied Physics 121, 235702 (2017).*

Aida Hichri, Imen.Ben Amara, ***Sabrine Ayari*** *et al* . **Dielectric environment and/or random disorder effects on free, charged and localized excitonic states in monolayer WS2** *Condens. Matter 29, 435305 (2017).*

Skills

Computer skills

Cluster Slarm

DFT:Quantum Espresso

DFT : WIEN2k

DFT:EPW Phonon

DFT:Wannier90

MBPT:Yambo

Programming languages

Fortran

Python

mathlab

Mathematica

Contact

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Professeur au Laboratoire de Physique de l'École normale Supérieure, 24 rue Lhomond 75231 Paris Cedex 05, France
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Prof. Robson Ferreira
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e-mail: robson.ferreira@ens.fr

Prof Sihem Jaziri Professeur au Laboratoire de physique des materiaux, Faculté de science de Bizerte
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Professeur assistant à l'École Normale Supérieure 24 rue Lhomond, 75231 Paris Cedex 05, France
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Professeur assistant à l'Université Paris Cité, Coordinateur du Master 1 en Physique Fondamentale et Applications
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Pioneering Terahertz Technology with 2D Materials: Extreme Optical Nonlinearities for Far-Infrared Photonics

Sabrine Ayari (1,2), Mehdi Arfaoui (2,3,) Minoosh Hemmat (2), Martin Micica (2), Marin Tharault (2), Francesca Carosella (2), Sihem Jaziri (3), Robson Ferreira (2), Emmanuel Baudin (2) and Sukhdeep Dhillon (2)

(1) De Vinci Higher Education, Research Center, 92 916 Paris La Défense, France.

(2) Laboratoire de Physique de l'Ecole normale supérieure, ENS, Université PSL, CNRS, Sorbonne Université, Université de Paris-Cité, Paris, France

(3) Laboratoire de Physique de la Matière Condensée, Faculté des Sciences de Tunis, Université Tunis El Manar, Tunis, Tunisia.

2D materials are promising for terahertz (THz) photonics, offering tunable bandgap properties from semiconductor to semimetal with layer thickness. These materials, with their exceptional electronic, optical, and mechanical properties, have revolutionized fields such as optoelectronics, quantum computing, and next-generation photonic devices. Their atomic-scale thickness and high surface-to-volume ratio make them ideal for integrating into compact, efficient systems, addressing the growing demand for miniaturization in technology. We demonstrate extreme optical nonlinearities in TMD (transition metal dichalcogenides), where ultrafast photocurrents and THz emissions are engineered through layer-dependent valley manipulation. The material exhibits strong circular dichroism in the semimetal phase, enabling precise control of THz pulse phase and valleytronics. This work highlights TMD for applications in THz spintronics, harmonic generation, and THz valleytronics for advanced photonic systems and next-gen communication technologies.