

Hichem Eleuch

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Research Interests: Quantum Optics, Quantum Information, Quantum Computation, Mathematical Physics, Complex Systems and Applications.

Education

Sept 1995 - June 1998 **PhD** in Quantum Physics. *Kastler Brossel Laboratory**
*Ecole Normale Supérieure (ENS) (Paris Sciences et Lettres University) /
University Pierre and Marie Curie (Sorbonne University) Paris, France*
Title: Theoretical study of quantum fluctuations in emitted light from semiconductor microcavities.

Supervisors: Prof. Elisabeth Giacobino and Prof. Claude Fabre

Sept 1995 Equivalence of DEA (Master Degree) in Quantum Physics
Ecole Normale Supérieure (ENS)

1989 - 1995 **Diploma**, Electric and Information Engineering (equivalent to Master Degree)
Technical University of Munich, Germany
Title of the Diploma Thesis (Diplomarbeit = Master Thesis): Electromagnetically induced transparency due to Laser driven three-level atoms.

Supervisors: Prof. Peter Russer (*Technical University of Munich*)
Prof. Axel Schenzle (*Ludwig Maximilian University and Max Planck Institute for Quantum Optics*)

Additional Qualifications:

June 2004 **Habilitation:** Fluctuations, correlations, and non-linearities in quantum optics and applications

*The Kastler Brossel laboratory is home to three Nobel Prize laureates in Physics, namely: Serge Haroche (2012), Claude Cohen-Tannoudji (1997) and Alfred Kastler (1966). The Nobel Laureate of Physics 2022, Alain Aspect was also working as a Researcher for several years at this Lab.

Professional Experience

- Sep 2020 - Present **Full Professor**, University of Sharjah, Sharjah, UAE
- Jan 2018 - Aug 2020 **Full Professor**, Abu Dhabi University, Abu Dhabi, UAE
- Aug 2017 - Jan 2018 Visiting Full Professor, Abu Dhabi University, Abu Dhabi, UAE
- Jan 2010 - Present **Full Professor**, University of Carthage
- May 2016 - Aug 2017 TEES Research Associate Professor, Institute of Quantum Science and Engineering
Texas A&M University, College Station, Texas, USA
- Oct 2013 - Mar 2016 Visiting Professor, Department of Physics, *McGill University*, Montreal, Canada
- Nov 2014 - Aug 2015 Invited Researcher, Department of Physics, *University of Montreal*, Canada
- Jul 2012 - Jul 2013 Invited Researcher, Research Group of **Prof. Gilles Brassard** (Quantum Inf. Processing),
University of Montreal, Canada
- Jun 2011 - Jun 2012 Guest Scientist, *Max Planck Institute for the Physics of Complex Systems*
Dresden, Germany
- Sep 2008 - Sep 2010 Researcher, Institute for Quantum Studies/Institute of Quantum Science and Engineering,
(Research Group of **Prof. M. O. Scully**, *Texas A&M University*, College Station
Visiting Scientist, *Princeton University*, Princeton, New Jersey, USA
- Jan - Apr 2008 **Fulbright Scholarship**, Institute for Quantum Studies, *Texas A&M University*, College
Station, Texas, Research groups of **Prof. M. O. Scully** and **Prof. M. S. Zubairy**.
- Sep 2004 - Jan 2010 Associate Professor, University of Carthage.
National Institute of Applied Sciences and Technology, Tunis, Tunisia (Institut National des
Sciences appliquées et de Technologie, INSAT)
- Nov 2006 - 2007 **Scientific Consultant** at the **National Center for Nuclear Sciences and Technologies**,
Tunis, Tunisia
(Centre National des Sciences et Technologies Nucléaires CNSTN).
- Jan - Apr 2006 Visiting Scientist, Quantum Optics research group of **Prof. H. Carmichael**, **University
of Auckland**, Auckland, New Zealand
- 2003 - 2006 Associate Researcher, **National Center for Nuclear Sciences and Technologies**
Tunis, Tunisia
- 1999 - 2004 Assistant Professor INSAT, University of Carthage
- 1998 - 1999 Adjunct - Assistant Professor
INSAT, University of Carthage
- 1998 - 2002 Adjunct - Assistant Professor
Ecole Polytechnique (EPT) Tunis, Tunisia
- 2001 - 2003 Adjunct - Assistant Professor
Institute of Higher Studies Tunis, Sousse and Sfax, Tunisia
(L'Institut des Hautes Etudes, IHE)
- 2001 - 2003 Adjunct - Assistant Professor, Faculty of Economic Science and Management Sfax, Tunisia
(Faculté des Sciences Economiques et de Gestion, FSEG)
- 1995 - 1997 Adjunct - Lecturer, University of Cergy-Pontoise, Paris, France

Awards and Honors

2022-	Member of the Governing Council of the Arab Physical Society (ArPS)
2021-	Member of the Mohammed bin Rashid Academy of Scientists, UAE
2019-	Fellow of the African Academy of Sciences
2019-2020	Research Award, Abu Dhabi University, UAE
2018	Research Fellow Award, Abu Dhabi University, UAE
June 2011 - 2012	Guest Scientist, Max Planck Institute for the Physics of Complex Systems, Germany
Jan - Apr 2008	Fulbright Scholarship <i>Council for International Exchange of Scholars and United States Department of State, USA</i>
2006 - 2013	Regular Associate Member, International Center of Theoretical Physics Trieste, Italy
Sep 1995 - Jul 1998	Laureate Fellowship for PhD, <i>Ministry of Research and Higher Education of Tunisia</i>
Sep 1989 - Jun 1995	Laureate Fellowship for engineer studies (+1 year German Language) DAAD (<i>Germany</i>) and <i>Ministry of Research and Higher Education of Tunisia</i>

Publications

- Over 260 publications in peer-reviewed journals (see the list of publications below)
- More than 40 invited talks
- Participated in over 70 international conferences
- 8 US Patents + 3 Patents (Applied to the United States Patent and Trademark Office).
- H-factor: 40 (Web of Science), 43 (Scopus), 46 (Google Scholar).
- Total received funds in the last 10 years: More than 2.5 million AED.
- Among the top 2 % scientists in the field of general physics (Stanford University's List) for both the career-long and single years (2019 & 2020 & 2021) rankings.
<https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw/3>
<https://drive.google.com/file/d/1bUJrvurVVBbxS19eFZRSHFif7tt30-5U/view>
<https://data.mendeley.com/datasets/btchxktzyw/2>
<https://elsevier.digitalcommonsdata.com/datasets/btchxktzyw>

Ten selected publications

1. "Universal quantum computation with symmetric qubit clusters coupled to an environment"
C. Boudreault, H. Eleuch, M. Hilke, and R. Mackenzie
Physical Review A **106**, 062610 (2022).
2. "Hybrid Two-Mode Squeezing of Microwave and Optical Fields Using Optically Pumped Graphene Layers"
M. Qasymeh and H. Eleuch, *Scientific Reports* **10**, 16676 (2020)
3. "Quantum plasmonic control of trions in a picocavity with monolayer WS₂"
Z. He, Z. Han, J. Yuan, A. M. Sinyukov, H. Eleuch, C. Niu, Z. Zhang, J. Lou, J. Hu, D. V. Voronine, and M. O. Scully, *Science Advances* **5**, EAAU8763 (2019)
4. "Quantum Microwave-to-Optical Conversion in electrically driven Multilayer Graphene"
M. Qasymeh and H. Eleuch, *Optics Express* **25**, 5945 (2019)
5. "Probing Anderson localization using the dynamics of a qubit"
H. Eleuch, M. Hilke, and R. MacKenzie, *Phys. Rev. A* **95**, 062114 (2017)
6. "High-efficiency quantum state transfer and quantum memory using a mechanical oscillator"
E. A. Sete and H. Eleuch, *Phys. Rev. A* **91**, 032309 (2015)
7. "Localization and delocalization for strong disorder in one-dimensional continuous potentials"
H. Eleuch and M. Hilke, *New J. Phys.* **17**, 083061 (2015)

8. "Effects of an external environment on a cavity quantum electrodynamics system controlled by bichromatic adiabatic passage", H. Eleuch, S. Guérin, and H. R. Jauslin, *Phys. Rev. A* **85**, 013830 (2012)
9. "Excitation of Atomic Coherence Using Off-Resonant Strong Laser Pulses", Y. Rostovstev, H. Eleuch, A. Svidzinsky, H. Li, V. Sautenkov and M. O. Scully, *Phys. Rev. A* **79**, 063833 (2009)
10. "Optical Bistability in Semiconductor Microcavities" A. Baas, J. Ph. Karr, H. Eleuch and E. Giacobino, *Phys. Rev. A* **69**, 023809 (2004)

Patents

1. Frequency-Tunable Quantum Microwave to Optical Conversion System, M. Qasymeh and H. El Euch. Patent No: US 10,824,048 B2. Date of the Patent Publication: Nov. 3, 2020. (Supported by TAKAMUL for patent filling, Abu Dhabi Department of Economic Development, 50 000 AED).
2. Continuation of the patent 1: Frequency-Tunable Quantum Microwave to Optical Conversion System, M. Qasymeh and H. El Euch. Patent No: US 11,294,259 B2. Date of the Patent Publication: April. 5, 2022.
3. Wideband Graphene-Based Electro-Optic Entangler, M. Qasymeh and H. El Euch Patent No: US 11,048,107 B2. Date of the Patent Publication: June. 29, 2021.
4. Quantum Random Access Memory, H. El Euch, M. Zidan, M. Abdel-Aty, A. H. Abdel-Aty, A. Khalil Patent No: US 11,093,850 B1. Date of Publication: August 17, 2021.
5. Graphene Multi-Layered Structure for ultra-sensitive microphotonic devices with microvolts inputs, M. Qasymeh and H. El Euch, Patent No: US 11,314,144 B2. Date of Publication: April 26, 2022.
6. Optically Activated Graphene-Based Microwave Field Squeezer, M. Qasymeh and H. El Euch Patent No: US 11,320,719 B2. Date of the Patent Publication: May. 3, 2022.
7. Continuation of the patent 3: Wideband Graphene-Based Electro-Optic Entangler, M. Qasymeh and H. El Euch. Patent No: US 11,513,376 B2. Date of the Patent Publication: November 29, 2022.
8. Continuation of the patents 3 and 7: Wideband Graphene-Based Electro-Optic Entangler, M. Qasymeh and H. El Euch, Patent No: US 11,513,377 B2. Date of the Patent Publication: November 29, 2022.
9. Coherent Microwave transmission without refrigeration at room temperature, M. Qasymeh and H. El Euch (Applied Patent to the United States Patent and Trademark Office).
10. Quantum Teleportation Using Microwave Enabled Plasmonic Graphene Waveguide M. Qasymeh, M. Asjad and H. El Euch (Applied Patent to the United States Patent and Trademark Office).
11. Quantum Teleportation Network Using Electronically Enabled Graphene Waveguides M. Qasymeh, M. Asjad and H. El Euch (Applied Patent to the United States Patent and Trademark Office).

Reviewer

Physics

- Nature Communications; Scientific Reports
- MITACS (Canadian Funding Agency); Austrian Science Fund (FWF)
- Physical Review Letters; Physical Review A; Physical Review B; Physical Review Applied; Physical Review Research
- Annals of Physics; Nanomaterials; Physics Letters A; Optics Express; Photonics (Topical Advisory Panel Member);
- Proceedings of the Royal Society A; Journal of the Optical Society of America B; Optics Letters
- Laser Physics Letters; Laser Physics; Solid State Communications; Sensors; European Journal of Physics D

- Optics Communications; Journal of Modern Physics; European Physical Journal Plus;
- Fortschritte der Physik - Progress of Physics; Optics & Laser Technology; Physica A; Physica E
- Member of the IAA (International Academy of Astronautics) Program Committee 22nd IAA Humans in Space Symposium
- Molecular Physics; Frontiers of Physics; Canadian Journal of Physics; Few Body Systems
- International Journal of Theoretical Physics; Energies; Chaos, Solitons & Fractals; Energy Reports
- International Journal of Modern Physics B
- Results in Physics; Invited Editor for Frontiers in Physics special issue.
- Entropy; Invited Guest Editor for the Special Issue on "Coherence in Open Quantum Systems", Entropy
- Modern Physics Letters B; Invited editor for Computer Communications special issue;
- International Journal of Quantum Information; Guest editor for Applied Sciences special issue.
- Chinese Physics B; Crystal; Journal of Low Temperature Physics
- Optical Review; Invited Guest Editor for special Issue "Chaos, Disorder and Quantum Entanglement" (Entropy).
- Optik;
- Acta Physica Polonica B; International Journal of Nanoscience; Journal of Communication
- Nuclear Science and Techniques; Neural Computing and Applications
- Open Physics; Asian Journal of Spectroscopy; Information; SETIT-IEEE Conferences

Mathematics

- Mathematical Reviews (American Mathematical Society); Zentral Blatt MATH
- Mathematics; Axioms; Journal of Mathematical Physics
- Applied Mathematics and Computation; Mathematical and Computational Applications
- Numerical Methods for Partial Differential Equations; Fractal and Fractional
- Neuronal Computing and Applications; Applied Mathematics & Information Sciences; Journal of Number Theory

Grants Received in the Last 8 Years

- 2021-2024, Fundamental Research Grant Scheme (FRGS), Ministry of Higher Education, Malaysia, "Theory for Entanglement in a Quad Guided Waves Quantum Coupler with Kerr Nonlinearity.", 120 000 RM (Collaborator).
- 2022-2024, Competitive Research Fund, Sharjah University, "Novel devices based on nonlinear and quantum effects in graphene layers", 42000 AED (PI).
- 2022-2023, University of Sharjah, (Operational Grant) Quantum Information, Quantum Simulation, and Quantum Processing Research Group 100,000 AED (PI).
- 2020-2023, Abu Dhabi Award for Research Excellence 2019, "AARE19-062 Graphene-Based Modulator for Passive Transmission and White Light Communications", 985 000 AED (PI until August 2020 and then became a CO-PI due to my move to the University of Sharjah).
- 2022-2023, Funding from Umm Al-Qura University Saudi Arabia, "Quantum Characteristics of some solid-state systems: New proposal of information and energy storage", 100 000 RS (Consultant).
- 2021-2022, International Partnership Research Grant Program, Funding from Prince Sattam Bin Abdulaziz University Saudi Arabia, "Quantum Information of Some Natural and Artificial Atoms.", 110 000 RS (Consultant).

- 2022 “*Quantum Switches Based on Electrically Activated Graphene Multilayers*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 50 000 AED (Co-Pi).
- 2022 “*Analysis of a multi-level atom by deriving exact solutions for the Bloch Equations: Pulse Shape Investigation*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 50 000 AED (Co-Pi).
- 2021-2022, “*Renewable Energy Transfer and Quantum Correlations in Realistic Quantum Confined Systems*”, funding from King Abdulaziz University, SA; 100 000 RS (Co-Pi).
- 2021 “*Atomic population inversion in a two-level atom for shaped and chirped laser pulses*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 40 000 AED (Co-Pi).
- 2020 “*Quantum sensor: Detecting topological edge states with the dynamics of a qubit*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 50 000 AED (PI).
- 2020 “*Design of Optimal Quantum Circuits*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 50 000 AED (PI).
- 2019 Funding from TAKAMUL for patent filing, Department of Economic Development, Abu Dhabi, 50 000 AED.
- 2020 “*Experimental Realization of Microwave and Photonic Quantum Entanglement*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 50 000 AED (Co-PI).
- 2020 “*Analytic Solutions of Solitary Waves in Three-Level Unbalanced Dense Media*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 20 000 AED (Co-PI).
- 2020 International Partnership Research Grant, Funding from Prince Sattam Bin Abdulaziz University Saudi Arabia; 110 000 RS (Co-PI).
- 2019 “*Quantum correlations and coherence in a driven two-qubit system in non-Markovian environment*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 20 000 AED (PI).
- 2019 “*Exceptional points and non-linearity in open quantum systems*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 20 000 AED (PI).
- 2019 “*Analytical solutions to the Schrödinger equation with a short-range potential and applications to nuclear science*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 25 000 AED (Co-PI).
- 2018 “*Planetary exploration Physical conditions and simulations*” Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 20 000 AED (PI).
- 2018 “*Dynamics in terahertz semiconductor microcavity quantum noise spectra*” . Funding from the Office of Research & Sponsored Programs, Abu Dhabi University, Abu Dhabi, UAE; 20 000 AED (PI).
- 2018 “*Using Quantum Algorithms to Solve Travelling Salesman Problem*” Funding from The Office of Research & Sponsored Programs (Center of Excellence), Abu Dhabi University, Abu Dhabi, UAE; 35 000 AED (Co-PI).
- 2018 “*Q-deformed function, q-calculus, quantum asymmetries and their applications*” Funding from the Office of Research & Sponsored Programs (Faculty Research Incentive Grant), Abu Dhabi University, Abu Dhabi, UAE; 20 000 AED (Co-PI).
- 2018 “*Novel Graphene-Based Information Transmission Systems*” Funding from The Office of Research & Sponsored Programs (Center of Excellence), Abu Dhabi University, Abu Dhabi, UAE; 40 000 AED (Co-PI).
- 2016-2018 Funding from King Fahd University of Petroleum and Minerals, Saudi Arabia; 135 000 Rs (Scientific Consultant).
- 2016 “*New Quantum Correlations and Novel Quantum Models*” Funding from University Prince Sattam Bin Abdulaziz University, Saudi Arabia; 100 000 Rs (Co-PI).
- 2015 Funding from INTRIQ(Institut Transdisciplinaire d’Information Quantique: Transdisciplinary Institute for Quantum Information, Quebec, Canada): 36 000 CA\$ (PI).
- 2014 Funding from Prince Sattam Bin Abdulaziz University Saudi Arabia; 50 000 Rs= 13 333.87 \$ (Co-PI).
- 2014 Funding from INTRIQ (Canada): 9 000 CA\$ (Co-PI).

Collaborators, Last 10 Years (Selected list)

- M. O. Scully, Texas A&M University and Princeton University
- I. Rotter, Max Planck Institute for the Physics of Complex Systems
- M. Hilke, McGill University
- V. Hussein, University of Montreal
- R. Mackenzie, University of Montreal
- Y. V. Rostovtsev, North Texas University
- S. Suckewer, Princeton University
- P. K. Jha, University of Berkely
- C .H. R. Ooi, University of Malaya, Kuala Lumpur
- S. Das, Niels Bohr Institute
- H. R. Jauslin, S. Guerin, University of Bourgogne
- A. Prasad, University of Delhi
- H. Bahlouli, King Fahd University of Petroleum and Minerals

MS and PhD Dissertations Supervised and Post-docs Monitored

Post-docs

- Muzzamal Iqbal Shaukat (July 2020-August 2022)
- Mohammed Zidan (June 2020-Present)
- Ali Homid (September-December 2020)
- Muhammed Asjad (January 2021-February 2022)
- Jitendra Verma (January-March 2022)
- Amjad Sohail Shah (March 2023-Present)

PhD Thesis

- Muhammad Hunza Awan (Comsats University Islamabad, starting date of the thesis: January 2022)

Institute of Quantum Science and Engineering (Texas A&M University)

(Monitored) May 2016 - Aug 2017

- Tuguldur Begzjav (PhD student at Texas A&M University, College Station, Texas)
- Han Cai (PhD student at Texas A&M University, College Station, Texas)
- Sheng-Wen Li (Post-doc researcher at Texas A&M University, College Station, Texas)
- Reed Nessler (Post-doc researcher at Texas A&M University, College Station, Texas)

Department of Mathematics (University of Montreal)

Sep 2012 - Jun 2013

Masters Thesis Monitored

- Anaëlle Hertz (Currently a PhD student at Centre for Quantum Information and Communication, École Polytechnique, Université Libre de Bruxelles, Bruxelles, Belgium)

PhD Theses Monitored

- Pankaj Jha (Currently a Postdoc at University of California, Berkeley)
- Eyob Sete (Currently a Senior Research Scientist Rigetti Quantum Computing, Berkeley, California)
- Dong Sun (Currently a Research Fellow at Nanyang Technological University, Singapore)
- Luqi Yuan (Currently a Postdoc at Stanford University, California)

Postdoc Monitored

Jan - Aug 2010

- Sumanta Das (Currently an Assistant Professor at Niels Bohr Institute, Copenhagen University)

Faculty of Sciences Tunis (FST)

Masters Theses Supervised and Co-Supervised

- Ghassen Dridi, 2007 (Postdoc at Ecole Polytechnique, Paris)
- Imen Hassini, 2007 (Teacher at Secondary School Beja, Tunisia)
- Riadh Rebhi, 2004 (Research Fellow at Center for Quantum Technologies, National University of Singapore)
- Nidhal Fraj, 2004
- Jamel Jouini, 2003
- Houchem Jabri, 2002 (Assistant Professor at University of Carthage, Tunisia)
- Nader Rachid, 2001 (Assistant Professor at University of Carthage, Tunisia)
- Belhassen Chamkhi Attaya, 2000 (Training Manager at Nokia Siemens Networks, Tunisia)
- Samia Hadded, 1999 (Assistant Professor at University of Carthage, Tunisia)

INSAT (National Institute of Applied Science and Technology)

Masters Theses Supervised

- Khalil Ben Fredj, 2008 (Medical Physicist at Hospital Ennasr, Tunis)
- Arbi Mejri, 2007 (Radiation Security Engineer at National Center for Nuclear Sciences and Technologies, Tunisia)
- Slim Ben Othman, 2004 (Assistant at University El Manar, Tunisia)

University of Stuttgart (Germany)

Masters Thesis Supervised

2004

- Dominique Elser (Researcher at Max Planck Institute for the Science of Light, University of Erlangen-Nuremberg, Germany)

Faculty of Economic Sciences and Management, Sfax, Tunisia

Co-Supervised Masters Theses (Finance)

2002

- Souha Boutouria
- Nadia Ben Hamida
- Jihéne Rebai

PhD Theses Supervised

- Housseem Jabri, 2008 (Assistant Professor at University of Carthage)
- Arbi Mejri, 2014 (Researcher at National Center for Nuclear Sciences and Technologies, Tunisia)
- M. Ali Amdouni, 2016 (Lecturer at Preparatory Engineering Institute, Bizerte, Tunisia)

Membership in Scientific Committees

2022-	Member of the Governing Council of the Arab Physical Society (ArPS)
2021-	Member of the Mohammed bin Rashid Academy of Scientists, UAE
2021 -	Member of Sigma Xi, The Scientific Research Honor Society, USA.
2019-	Fellow of the African Academy of Sciences
	Member of the American Physical Society (APS)
2019 - 2020	Member in National Committee for EmSAT Physics, Ministry of Education, UAE
2016 - 2017	Member in Program Committee for Quantum Africa 4
2006 - 2013	Regular Associate Member, Abdus Salem International Centre of Theoretical Physics Trieste, Italy
Nov 2006 - 2007	Scientific Consultant , National Center for Nuclear Sciences and Technologies, (Tunis, Tunisia) (Centre National des Sciences et Technologies Nucléaires (CNSTN))
Jan 2003 - Nov 2006	Associate Researcher to the National Center for Nuclear Sciences and Technologies (Tunis, Tunisia)
May 2005 - Sep 2008	University board member representative of Associate and Full Professors Member of internal committee for educational new reform for Bachelor-Master-PhD studies Member of internal committee for research University of Carthage, Tunisia

Pedagogical Materials

I published three manuals (internal publications) for the 1st year students at INSAT:

- Course of Electricity for 1st year in Chemistry and Biology
- Course of Mechanics for 1st year in Chemistry and Biology
- Course of Optics for 1st year in Mathematics-physics

Teaching Experience

Graduate Level Courses:

Sept 2022-	Methods of Mathematical Physics University of Sharjah
Sept - Dec 2012	Fundamental concepts of photonics (For Graduates and Undergraduates) Ecole Polytechnique, Montreal
March 2012	Stochastic Differential Equations and Integral Equations Master of Finance, IHEC, Sfax/Tunisia
2004 - 2008	Quantum Mechanics, Master of Measurement and Instrumentation INSAT, University of Carthage, Tunisia
2001 - 2003	Variation Calculus (Modeling and Optimization), Master of Operational Research FSEG, Tunisia
2000 - 2001	Laser Physics and Applications, DEA (=Master) Measurement and Instrumentation INSAT, University of Carthage Quantum Mechanics, DEA (=Master) Measurement and Instrumentation INSAT, University of Carthage
2001 - 2004	Quantum Mechanics, Master of Measurement and Instrumentation, INSAT, University of Carthage

- 2001 - 2002 Invited Course Seminar: Differential Equations and Stochastic Differential Equations for
Researchers in the field of Finance
FSEG, Tunisia
- 2002 - 2003 Differential Equations and Stochastic Differential Equations
Master of Finance
IHE, Tunisia
- 2000 - 2008 Laser and Optronics
5th year Measurement and Instrumentation engineering
INSAT, University of Carthage

Undergraduate Level Courses:

- Feb - Apr 2006 Basic Concepts in Physics
(12 Lectures) University of Auckland, New Zealand
- Jan 2022- Physics 1
University of Sharjah
- Sept 2021 - Quantum Mechanics 1
University of Sharjah
- Jan 2021- Quantum Mechanics 2
University of Sharjah
- 2020 -2022 Remedial Physics
University of Sharjah
- 2017 - 2020 Physics 102 (Mechanics)
1st year engineering, Abu Dhabi University, UAE
Physics 201 (Electricity and Magnetism)
1st year engineering, Abu Dhabi University, UAE
- 1998 - 2008 Physics I (Electricity)
1st year Chemistry and Biology (CBA), INSAT, University of Carthage
- 1998 - 2008 Physics II (Mechanics)
CBA, INSAT, University of Carthage
- 1998 - 2001 Optics
1st year Mathematics-Physics (MPI), INSAT, University of Carthage
- 1999 - 2008 Laboratory course in Physics I
CBA, INSAT, University of Carthage
- 1998 - 2002 TD (=Recitation/Tutorial) Waves and Fields
3rd year Engineering Ecole Polytechnique (EPT) Tunis, Tunisia
- 1998 - 2001 TD Quantum Mechanics and Statistical Physics
3rd year Engineering Ecole Polytechnique (EPT) Tunis, Tunisia
- 1999 - 2000 TD Semiconductors
3rd year Engineering Ecole Polytechnique (EPT) Tunis, Tunisia
- 1999 - 2004 Laboratory course in Physics II
CBA, INSAT, University of Carthage
- 1995 - 1997 Laboratory courses in Mechanics and Electricity
1st Year DEUG, University of Cergy,Pontoise, France

List of Publications

Papers in Physics and Mathematics

- System of six-level atom interacting with a quantized field in the existence of time-varying coupling**
M. Algarni, K. Berrada, S. Abdel-Khalek, and *H. Eleuch*
Results in Physics 45, 106233 (2023).
- Entanglement and coherence in a system of two atoms in the presence of Kerr medium and field dissipation**
K. Berrada, S. Abdel-Khalek, A. Alkaoud, and *H. Eleuch*
Results in Physics 44, 106172 (2023).
- Analytical solutions for a new form of the generalized q -deformed Sinh-Gordon equation: $\frac{\partial^2 u}{\partial z \partial \zeta} = e^{\alpha u} [\sinh_q(u^\gamma)]^p - \delta$.**
K. K. Ali, H. I. Alrebdy, N. A. Alsaif, A-H Abdel-Aty,, and *H. Eleuch*
Symmetry 15, 470 (2023).
- Entanglement and coherence in a system of two atoms in the presence of Kerr medium and field dissipation**
K. Berrada, S. Abdel-Khalek, A. Alkaoud, and *H. Eleuch*
Results in Physics 44, 106172 (2023).
- Dynamics of two-qubit quantum nonlocality in a Heisenberg chain model with the intrinsic decoherence**
A.-B. A. Mohamed, F. M. Aldosari, and *H. Eleuch*
Optical and Quantum Electronics 55, 284(2023).
- Scanning qubit probe of edge states in a topological insulator**
N. Delnoura, A. Bissonneteb, *H. Eleuch*, R. MacKenzie, and M. Hilkea
Physics Letters A 466, 128716 (2023).
- Squeezed vacuum interaction with an optomechanical cavity containing a quantum well**
H. Jabri, and *H. Eleuch*
Scientific Reports 12, 3658 (2022).
- Non-local Correlation Dynamics in Two-Dimensional Graphene**
A. B. A. Mohamed,A-H Abdel-Aty, M. Qasymeh, and *H. Eleuch*
Scientific Reports 12, 3581 (2022).
- Analysis of a Q-Deformed Hyperbolic Short Laser Pulse in a Multi-Level Atomic System**
N. Boutabba, S. Grira and *H. Eleuch*
Scientific Reports 12, 9308 (2022).
- Spatial Solitons in an Electrically Driven Graphene Multilayer Medium**
M. I. Shaukat, M. Qasymeh, and *H. Eleuch*
Scientific Reports 12, 10931 (2022).
- High-Fidelity Quantum Information Transmission Using a Room-Temperature Nonrefrigerated Lossy Microwave Waveguide**
M. Qasymeh, and *H. Eleuch*
Scientific Reports 12, 16352 (2022).
- Optical Tomography Dynamics Induced by Qubit-Resonator Interaction Under Intrinsic Decoherence**
A.-B. A. Mohamed, and *H. Eleuch*
Scientific Reports 12, 17162 (2022).
- A Local Area Quantum Teleportation Network Based on an Array of Electrically Activated Graphene Waveguides**
M. Asjad, M. Qasymeh, and *H. Eleuch*
Optics Express 30, 21016 (2022).
- Generation And Robustness of Quantum Memory Assisted Entropic Uncertainty And Uncertainty Induced Non- Locality Of Two Nitrogen-Vacancy Centers Coupled By Open Two Nanocavities**
A-H Abdel-Aty, A. B. A. Mohamed, A . Ur Rahman and *H. Eleuch*
Fractals 30, 2240185 (2022).
- Quantum Coherence and Total Phase in Semiconductor Microcavities for Multi-Photon Excitation**
A. S. Altowyan, K. Berrada, S. Abdel-Khalek, and *H. Eleuch*
Nanomaterials 12, 2671 (2022).
- Entanglement and Fisher information for a two-atom system interacting with deformed fields in correlated two-mode states**
K. Berrada, S. Abdel-Khalek, E. M. Khalil, and *H. Eleuch*
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274. **Long Run Performance Following Seasoned Equity Offering on Tunisian Stock Market: Cumulative Prospect Preference Approach.**
Dorsaf BEN AISSIA, Slaheddine HALLARA and *Hichem ELEUCH*
[International Research Journal of Finance and Economics](#) Issue 34, 83 (2009).
275. **Reasoning by Analogy Using Coulomb's law (RAUCL) Model in Multi-Criteria Negotiation**
Chokri El Aoun, *Hichem Eleuch*, Hella Ben Ayed, Esma Aïmeur, and Farouk Kamoun
[Chaos and Complexity Letters, Vol 4](#), Iss 1, 3 (2009).
276. **New Approach of Case-Based Reasoning**
Chokri El Aoun, *Hichem Eleuch*, Hella Ben Ayed, and Esma Aïmeur
[Chaos and Complexity Letters, Vol 4](#), Iss 1, 35 (2009).
277. **Options Assessments and Risk Management in Presence of the imperfections**
Saleh Ben Hamed and *Hichem Eleuch*
[JIFE](#) 2, 77 (2008).
278. **Options Pricing in Presence of Dynamical Imperfections**
Saleh Ben Hamed and *Hichem Eleuch*
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279. **The ICT's Acceptance: Analytical Framework and Empirical Example**
Jamel Choukir, Mouna Baccour Hentati, Bilel Bellaj and *Hichem Eleuch*
[Internet Journal](#) 2, 1 (2008).
280. **Analogy in Making Predictions**
Chokri El Aoun, *Hichem Eleuch*, Esma Aïmeur, Hella Ben Ayed, and Farouk Kamoun
[Journal of Decision Systems](#) 16/3, 393 (2007).

Conference Papers

281. **Optical Teleportation Using Electro-Optic Plasmonic Graphene Waveguide**
M. Qasmehy, M. Asjad, H. Eleuch
Proceedings CLEO: Laser Science to Photonics Applications, JTU3A.14 (2022).
May 2022, San Jose, California, USA.
282. **The analysis of the atomic population inversion under a few cycle strong shaped laser with a double exponential wave form**
N. Boutabba, S. Grira, and H. Eleuch
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283. **Qubits, decoherence and edge state detection: illustration using the SSH model**
M. Zaimi, C. Boudreault, N. Baspin, H. Eleuch, R. MacKenzie, M. Hilke
Bulgarian Journal of Physics 48, 174 (2021).
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284. **Electro-Optic Two-Mode Squeezing using Graphene Periodic Layers**
M. Qasmehy, H. Eleuch
Proceedings CLEO: Conference on Lasers and Electro-Optics, paper JTU3A.99 (2021).
May 2022, San Jose, California, USA.
285. **Graphene-Based Electro-Optic Entangler**
M. Qasmehy, H. Eleuch
Proceedings CLEO: Laser Science to Photonics Applications, FF1D.6 (2020).
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286. **Quantum States in Nonlinear Coupler with Frequency Mismatch**
M. Zahirzai, R. Julius, A.-B.M.A. Ibrahim, *H. Eleuch*, and P.K. Choudhury ,
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287. **Solitary waves propagation in Three-Level Atomic Media**
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H. Acka, J. Benbourenane, *H. Eleuch*,
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289. **Robust squeezing by dipolaritons in double quantum wells microcavity**
H. Eleuch, H. Jabri
Conference paper in
VII International Conference “Frontiers of Nonlinear Physics”,
June-July 2019, Nizhny Novgorod, Russia
290. **Graphene Multilayers for Quantum Microwave Signal Up-Conversion to the Optical Domain**
Montasir Qasymeh, Hichem Eleuch
Conference paper IEEE, NUSOD 2019, 157-158. Connecting Theory and Application of Optoelectronic Devices (NUSOD), 19th
International conference,
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291. **Probing Anderson Localization Using the Dynamics of a Qubit**
Hichem Eleuch, Michael Hilke and Richard MacKenzie
Springer Proceedings in Mathematics and Statistics
263: Quantum Theory and Symmetries with Lie Theory and Its Applications in Physics, Volume 1, p321-329 (2018)
QTS-X/LT-XII, Varna, Bulgaria, June 2017
292. **Experimental demonstration of Rabi Oscillations produced by adiabatic pulse due to initial atomic coherence**
Z. Yi, X. Zhao, Z. Wang, T. Peng, A. A. Svidzinsky, H. Eleuch, and M. O. Scully
Conference on Lasers and Electro-Optics, (Optical Society of America, 2018), paper FM4H.4.
293. **Statistical Properties of a Raman Three-level Atom Interacting with a Cavity Field**
AHM Ahmed, LY Cheong, N. Zakaria, N. Metwally and *H. Eleuch*.
INTERNATIONAL CONFERENCE ON FUNDAMENTAL AND APPLIED SCIENCES 2012 (ICFAS2012)
Book Series: AIP Conference Proceedings, Volume: 1482 Pages: 373-375 (2012).
294. **Transient lasing without inversion in He-like Boron**
E. A. Sete, A. A. Svidzinsky, Y. V. Rostovtsev, *H. Eleuch*, P. K. Jha, S. Suckewer, and M. O. Scully
American Physical Society, Joint Fall 2011 Meeting of the Texas Sections of the APS
295. **Le Raisonnement à Base de Cas Appliqué à la Négociation Electronique**
Chokri El Aoun, Hella Ben Ayed, *Hichem Eleuch*, Esma Aïmeur and Farouk Kamoun
5th International Conference for Sciences of Electronics, Technology of Information and Telecommunications (SETIT-IEEE) Hammamet, Tunisia, March 22-26, 2009.
296. **Generation of Maximal Coherence in a Two-Level System via Breaking Adiabaticity**
Yuri Rostovstev, *Hichem Eleuch*, Anatoly Svidinsky and Marlan O; Scully.
Frontiers in Optics, Rochester, October 2008.
297. **The Reasoning by Analogy in Negotiation**
Chokri El Aoun, *Hichem Eleuch*, Hella Ben Ayed, Esma Aïmeur and Farouk Kamoun
(SETIT-IEEE) Hammamet, Tunisia, March 25-29, 2007.
298. **An Electric Physics-Based Strategy For Multicriterion Negotiation**
Chokri El Aoun, Hella Ben Ayed, *Hichem Eleuch*, Esma Aïmeur and Farouk Kamoun
Seventh International on Electronic Commerce Research, Dallas - USA, June10-13, 2004.
299. **Modèle Electrique Non Linéaire Des Cellules Solaires**
M.Abdelkarim, *Hichem Eleuch* et M.Fathallah
(SETIT-IEEE) Sousse, Tunisia, March 15-20, 2004.
300. **An Electric Physics-Based Approach for Stock Exchange Prediction**
Chokri El Aoun, Hella Ben Ayed, Esma Aïmeur, Farouk Kamoun and *Hichem Eleuch*
Sixth International on Electronic Commerce Research, Dallas, USA,. October 23 - 26, 2003.
301. **Zero inflation and interest credit and opportunity (Zico) with stochastic returns and continuous time modelling**
Fathi Abid and *Hichem Eleuch*
Global Business & Economics Review - Anthology 2002, 371 (2002)

Invited Talks for Conferences, Workshops, and Seminars

- ERS method and Applications
December 2021, Khalifa University, UAE
- Applications of ERS and Supersymmetry for Generating Analytical Solutions of the Schrödinger equations
December 2020, New York University at Abu Dhabi, UAE
- Analytical solutions of the Schrödinger equation
November 2020, Sharjah University, Department of Applied Physics and Astronomy, UAE
- Exact spectra of harmonic like potentials
January 2020, IQSE, Texas A&M University, College Station, Tx, USA
- Harmonic-like Potentials: New classes of potentials with exact eigenenergies and eigenfunctions.
The Winter Colloquium on the physics of Quantum Electronics 2020.
January 2020, Snow Bird, Utah, USA
- ERS-method, analytical solutions for the Schrödinger equation and applications in random media.
December 2019, American University of Sharjah, Sharjah, UAE.
- Robust squeezing by dipolaritons in double quantum wells microcavity
VII International Conference “Frontiers of Nonlinear Physics”,
June-July 2019, Nizhny Novgorod, Russia
- Black Holes : The Fascinating Journey from Predicting them to Seeing them.
April 2019, Abu Dhabi University, Abu Dhabi, UAE.
- ERS Method, Analytical Solutions of the Schrödinger Equation and Application for the Wave Propagation in Random Media
February 2019, Department of Physics, University of North Texas, Denton, Texas, USA.
- Non-Hermitian Formalism, width bifurcation and dynamical phase transition in open quantum systems
The Winter Colloquium on the physics of Quantum Electronics 2019.
January 2019, Snow Bird, Utah, USA
- Non-Hermitian Formalism in open quantum systems
TAMU-PQE Follow-on Workshop on Black Hole, Nonequilibrium Physics and Quantum Computing.
January 2019, College Station, Texas
- Quantum Computing Technologies for the Future Mars Missions
One-Day MiniSymposium on Mars
November 2017, United Arab Emirates University, Al Ain, UAE.
- Analytical solutions from two-level system to Anderson localization
TAMU-Princeton-Baylor Summer Symposium on Quantum Science and Engineering
Casper, Wyoming, July 2017.
- Analytical Methods for Schrödinger Equation and Application to Random Media
Princeton-TAMU Symposium on Quantum Physics and Engineering, Princeton University,
Princeton, New Jersey, June 2017.
- Analytical Methods for studying the dynamics of the two-level system
Quantum Africa 4, Tunis, Tunisia, May 2017.
- The ERS Method and its applications: From for Schrödinger Equations to Anderson Localization.
Faculty of Mathematical, Physical and Natural Sciences of Tunis
Tunisia, May 2017.
- Physical Models and applications in Finance.
Colloque International Financement Et Gestion Des Risques Des Projets
Innovants et Clusters Industriels, Hammet, Tunisia, May 2017.
- Analytical Methods for Schrödinger Equation:
From Two-Level System to Anderson Localization.
AMO-CM Seminar.
College Station, Texas, February 2017.
- Hamiltonian for Raman Scattering via Canonical X-Form
Mini Seminar on Raman Scattering: Fundamental and Applications
Baylor University, Waco, Texas, February 2017.
- Magnus expansion method for a two-level system interacting with a few-cycle TAMU-PQE Follow-on Workshop
College Station, Texas, January 2017.
- Population transfer and pulse propagation in atomic media (Plenary speaker)
The Third International Conference on Research to Applications & Markets, Nanosciences session
Hammet, Tunisia, September 2016

- Research at the Institute of Quantum Science and Engineering
Faculty of Mathematical, Physical and Natural Sciences of Tunis
Tunisia, September 2016
- Canonical Transformation of Raman Transitions
TAMU-Princeton-Baylor Summer Symposium, Quantum Biophotonics,
Casper, Wyoming, July 2016.
- Anderson Localization for strong disorder: Analytical results
Institute for quantum Science and Engineering, Physics department, Texas A&M University
March 2016
- Entanglement, quantum state transfer and quantum memory in nanoresonators
The 5th International Conference on Mathematics and Information Sciences, Zewail City of Science and Technology, Egypt, February
2016.
- Entanglement, nonlinearity and quantum state transfer in nanoresonators
Department of Physics
Concordia University, March 2015.
- Analytical solution to the Schrödinger equation and the ERS method
Montreal Joint High Energy Physics Seminars
Université de Montréal, May 2013.
- Analytical solution to the Schrödinger equation and the ERS (Eleuch-Rostovtsev-Scully) method
Department of Physics
McGill University, November 2012.
- ERS-method and analytical solutions for Schrödinger and Dirac equations.
Department of Mathematics and Statistics.
Concordia University, June 2012.
- Alpha-Model and predictions.
Max Planck Institute for the Physics of Complex Systems, Dresden.
February 2012
- Strong fields and photon statistics
Technical University of Dresden, November 2011.
- Analytical Solution to Position Dependent Mass for 3D-Schrödinger Equation
The 2nd International Conference Mathematics & Information science
Sohag, Egypt, September 2011.
- Geometric Phase in Semiconductor Microcavities
The 2nd International Conference Mathematics & Information science
Sohag, Egypt, September 2011.
- Analytical Solution to the 3+1 Dirac Equation
The 2nd International Conference Mathematics & Information science
Sohag, Egypt, September 2011.
- Analytical solution to the Schrödinger equation.
Max Planck Institute for the Physics of Complex Systems, Dresden.
August 2011.
- Alpha-model for prevision
July 2012, Max Planck Institute for the Physics of Complex Systems, Dresden.
- Attosecond Physics: An atom interacting with ultra-short pulse
King Fahd University of Petroleum & Minerals
February 2011.
- Some analytical solutions to fundamental equations in physics
in King Abdulaziz City for Science and Technology.
Riyadh, January 2011.
- Analytical Solution for 3D Stationary Schrödinger Equation: Implementation of Huygens's Principle for Matter Waves.
Summer School on Quantum Science and Engineering
Casper, Wyoming, July 2010.
- Analytical Solutions of the Schrödinger Equation
TAMU Physics of Quantum Electronics Workshop
College Station, Texas, January 2010.
- Analytical Solutions to the Schrödinger Equation in Time and Space
Physics of Quantum Electronics Workshop (40), Snowbird
Snowbird, January 2010.

- Excitation of atomic coherence using off-resonant laser pulses
TAMU/Princeton Workshop on Quantum Science and Engineering
Jackson Hole, WY, August 2009.
- Analytic Solution to the Schrödinger's Equation
TAMU Physics of Quantum electronics Workshop, Texas
Texas, January 2009.
- The Photon sheds light on quantum: The Lamb Shift in single Photon Dicke Super-radiance
SPIE conference San Jose, California [On behalf of Prof. M. O. Scully
January 2009.
- XUV coherent Super-radiance (Atto-second Nonlinear optics)
SPIE conference San Jose, California [On behalf of Prof. M. O. Scully
January 2009.
- Excitation of atomic coherence using off-resonant laser physics
Physics of Quantum electronics Workshop, Snowbird
January 2009.

Patents

- 1. Frequency-Tunable Quantum Microwave to Optical Conversion System**
M. Qasymeh and *H. El Euch*
Patent No: US 10,824,048 B2. Date of Patent: Nov. 3, 2020. (Supported by TAKAMUL for patent filing, Abu Dhabi Department of Economic Development, 50 000 AED).
- 2. Continuation of the patent 1: Frequency-Tunable Quantum Microwave to Optical Conversion System**
M. Qasymeh and *H. El Euch*
Patent No: US 11,294,259 B2. Date of the Patent Publication: April. 5, 2022.
- 3. Wideband Graphene-Based Electro-Optic Entangler**
M. Qasymeh and *H. El Euch*
Patent No: US 11,048,107 B2. Date of Patent: June. 29, 2021.
- 4. Quantum Random Access Memory**
H. Eleuch, M. Zidan, M. Abdel-Aty, and A. H. Abdel-Aty, A. Khalil
Patent No: US 11,093,850 B1. Date of Publication: August 17, 2021.
- 5. Graphene Multi-Layered Structure for ultra-sensitive microphotonic devices with microvolts inputs**
M. Qasymeh and *H. El Euch*
Patent No: US 11,314,144 B2. Date of Publication: April 26, 2022.
- 6. Optically Activated Graphene-Based Microwave Field Squeezer**
M. Qasymeh and *H. El Euch*
Patent No: US 11,320,719 B2. Date of the Patent Publication: May. 3, 2022.
- 7. Continuation of the patent 3: Wideband Graphene-Based Electro-Optic Entangler**
M. Qasymeh and *H. El Euch*
Patent No: US 11,513,376 B2. Date of the Patent Publication: November 29, 2022.
- 8. Continuation of the patents 3 and 7: Wideband Graphene-Based Electro-Optic Entangler**
M. Qasymeh and *H. El Euch*,
Patent No: US 11,513,377 B2. Date of the Patent Publication: November 29, 2022.
- 9. Coherent Microwave transmission without refrigeration at room temperature**
M. Qasymeh and *H. El Euch*
Applied to US Patent Office.
- 10. Quantum Teleportation Using Microwave Enabled Plasmonic Graphene Waveguide**
M. Qasymeh, M. Asjad and *H. El Euch*
Applied to US Patent Office.
- 11. Quantum Teleportation Network Using Electronically Enabled Graphene Waveguides**
M. Qasymeh, M. Asjad and *H. El Euch*
Applied to US Patent Office.