



WALID EN-NAGHMA

Doctor of Electrical Engineering

Development of Innovative Antennas and RF-to-DC Circuits for Wireless Communications and RF Energy Harvesting

DOCTORAL PROJECT

The research focuses on the design, optimization, fabrication, and experimental characterization of high-performance rectennas dedicated to ambient electromagnetic energy harvesting. It is based on the development of advanced antenna geometry modification techniques and the design of high-efficiency RF-to-DC conversion circuits to maximize radio-frequency energy capture and its efficient conversion into usable direct-current electrical power. The performance of the developed systems is experimentally validated using a vector network analyzer (VNA) and measurements conducted in an anechoic chamber. This research contributes to the development of high-performance, sustainable, and self-powered energy solutions for low-power electronic devices, thereby reducing their dependence on conventional batteries.

ACADEMIC TRAINING

- Doctorate in Electrical Engineering - Very Honorable
Faculty of Sciences Dhar El Mahraz, Fes, Morocco – 2021-2026
- Specialized Master's degree in Microelectronics, Signals and Systems
Faculty of Sciences Dhar El Mahraz, Fes, Morocco – 2019-2021
- Bachelor's degree in Physical Sciences, specializing in Electronics
Faculty of Sciences Dhar El Mahraz, Fes, Morocco – 2018-2019
- Diploma of General University Studies in Physical Sciences
Faculty of Sciences Dhar El Mahraz, Fes, Morocco – 2017-2018

RESEARCH PROJECTS

- Modeling, Simulation, and Optimization of a Rectenna System - Master's Dissertation in 2021
 - Modeling and simulation of a rectenna system for electromagnetic energy harvesting.
 - Electromagnetic simulation using CST Microwave Studio, HFSS, and ADS.
 - Expertise in CST Microwave Studio, ADS, and HFSS.
- Hysteresis Comparator Design Using Cadence – Mini Project (2021)
 - Physical layout design of a hysteresis comparator, design rule checking (DRC), Cadence-based simulations, and validation of functional and electrical performance.
- Synchronous and Asynchronous Machine Modeling – Mini Project (2020)
 - Theoretical and comparative analysis of synchronous and asynchronous machines, followed by the evaluation of their electromechanical performance and the preparation of a comprehensive technical report.
- Design and Development of a Smart Parking Prototype – Final-Year Project (2019)
 - Development of an automatic parking space detection system.
 - Integration of sensors for real-time parking occupancy monitoring.

INTERNSHIP

- International Mobility Internship - ESEO, Angers, France (2024)
 - Design and fabrication of antenna and RF circuit prototypes using the LPKF ProtoLaser S4.
 - Training in free-space and anechoic chamber measurement techniques.
 - Experimental characterization of fabricated prototypes.
 - Presentation of my research findings.
 - Preparation and submission of two scientific journal articles and two international conference papers.

EDUCATIONAL ACTIVITIES

- Laboratory Teaching Assistant
 - Delivered laboratory practical sessions for undergraduate students, explaining theoretical concepts and providing guidance during experimental activities.
- Supervised and mentored undergraduate, Master's, and doctoral students in their academic and research activities
 - Supported students in managing academic and research projects through project planning, methodological guidance, scientific writing support, resource identification, regular progress assessment, and academic coaching.
- Academic tutoring of undergraduate students
 - Provided academic tutoring to undergraduate students, helping them improve their understanding of course content and prepare effectively for examinations.

PERSONAL INFORMATION

- **Walid EN-NAGHMA**
- **January 25, 1993, in Taounate**
- **Moroccan**
- **Narjiss B, Fès - Maroc**
- **Category B Driving Licence**

CONTACT

- **+212642132976**
- **walid.ennaghma@usmba.ac.ma**
- **https://www.researchgate.net/profile/Walid-En-Naghma?ev=hdr_xprf**
- **<https://orcid.org/0009-0008-0253-3739>**
- **<https://scholar.google.com/citations?user=RMkypOEAAA&hl=fr&oi=ao>**

TRAINING CERTIFICATES

- Certificate of Examination Proctoring
- Certificate of Laboratory Teaching
- Certificate of Academic Tutoring
- Certificate of Academic Supervision

CERTIFICATS

- Certificate of Article Acceptance
- Certificate of Peer Review
- Certificate of Organizing Committee Membership
- Certificate of Oral Presentation
- Certificates of Training Participation

LANGUAGES

- Arabic: Native
- French: Proficient
- English: Intermediate

PERSONAL SKILLS

- Adaptability and flexibility
- Autonomy and teamwork
- Strong learning ability, analytical thinking, and creativity
- Intellectual curiosity and continuous learning mindset
- Critical thinking
- Motivation and enthusiasm
- Perseverance, rigor, and attention to detail

SOFTWARE AND COMPUTING SKILLS

- Programming Languages: C++, MATLAB/Simulink, Python
- Office Applications: Microsoft Office (Word, Excel, PowerPoint).
- Electronic Design Automation: ADS, Cadence.
- Scientific Writing: LaTeX.
- Simulation Software: Simulink.
- Circuit Simulation Tools: LTspice, Multisim.
- Electromagnetic Simulation Software: CST MWS, HFSS, ADS.

HOBBIES AND INTERESTS

- Physical Activities: Running, Football, Swimming.
- Culture: Reading, Scientific Research.
- Intellectual Activities and Creativity: Chess, Programming.
- Travel.
- Video Games.

SCIENTIFIC BOOK CHAPTERS

- **En-Naghma, W.**, Halaq. H., and El Ougli, A. (31 August 2024) “Design, and optimization using genetic algorithms of a dual-band microstrip antenna based on defective ground structure for wireless power transmission applications”, *Digital Technologies and Applications, International Conference on Digital Technologies and Applications (ICDTA)*, Benguerir, Morocco, pp. 96-106.

CONFERENCE PUBLICATIONS

- **En-Naghma, W.**, et al., New circularly polarized microstrip patch antenna array design for energy harvesting applications, E3S Web of Conferences (2023)
- **En-Naghma, W.**, et al., An improvement performance of a novel triple-band microstrip antenna design based on a hexagonal patch and truncation in the ground for RF energy harvesting systems, ICCSC (2024)
- **En-Naghma, W.**, et al., Design of a High-Efficiency Circularly Polarized Antenna Array for Microwave Power Transmission Applications, IRASET (2025)
- **En-Naghma, W.**, et al., A Dual-Band Modified Monopole Antenna operating for ISM Band Applications, IEEE AP-S/URSI (2025)
- **En-Naghma, W.**, et al., A High-Efficiency Circularly Polarized Antenna Array Structure for Energy Harvesting Applications: Experimental validation, ICCSC (2025)
- **En-Naghma, W.**, et al., A Dual-Band Monopole Antenna Tailored for 2.45/5.8 GHz in ISM Band Applications, ICCSC (2025)
- M. Jabbar, **En-Naghma, W.**, et al., Efficient Design of Rectifier Circuit for Low Power Applications at 2.45 GHz, IRASET (2025)]
- M. Jabbar, **En-Naghma, W.**, et al., Enhanced Design and Performance of a 1×2 Circularly Polarized Antenna Array for ISM Band Applications at 5.8 GHz, ICCSC (2025)
- M. El-Kahiri, **En-Naghma, W.**, et al., Improved Performance of 1×2 Circular Polarized Antenna Array Design for ISM Band Applications, IRASET (2025)
- O. SALAH, **En-Naghma, W.**, et al., High-Performance of a Microstrip Patch Antenna for 38 GHz Band Applications, ICCSC (2025)
- H. El kari, **En-Naghma, W.**, et al., Enhanced Microstrip Antenna with Four Modified Circular Elements for High-Gain Operation at 5.8 GHz, ICCSC (2026)
- H. El kari, **En-Naghma, W.**, et al., High-Gain Compact Crescent-Shaped Antenna for 5.8 GHz Wireless Power Transmission, IRASET (2026)

SCIENTIFIC PUBLICATIONS

- **En-Naghma, W.**, et al., New conception of 3×4 circularly polarized antenna patch network for radio frequency energy harvesting at 2.45 GHz, IJECS 31 (2023)
- **En-Naghma, W.**, et al., Novel broadband circularly polarized pentagonal printed antenna design for wireless power transmission applications, IJECS 32 (2023)
- **En-Naghma, W.**, et al., Improved design and performance of the global rectenna system for wireless power transmission applications around 2.45 GHz, IJECE 14 (2024)
- **En-Naghma, W.**, et al., Analysis, Design, and Optimization based on Genetic Algorithms of a Highly Efficient Dual-Band Rectenna System for Radiofrequency Energy-Harvesting Applications, Results in Engineering 23 (2024)
- **En-Naghma, W.**, et al., Analysis, An experimental study of a high-gain, wideband circularly polarized printed antenna array at 2.45 GHz in the ISM band for wireless power transmission applications, Scientific African 27 (2025)
- **En-Naghma, W.**, et al., Experimental Validation of a Dual-Band Printed Antenna Array Operating at 2.45/5.8 GHz with a High Efficiency for Wireless Power Transmission Applications, IJECE
- H. El kari, **En-Naghma, W.**, A High-Isolation MIMO Antenna Design for Future 5G mm-Wave Applications at 28 and 38 GHz, Engineering Research Express
- **En-Naghma, W.**, et al., Design of a Circularly Polarized Microstrip Rectenna for Low-Power Ambient RF Energy Harvesting at 2.45 GHz, Computers and Electrical Engineering [Accepted]
- **En-Naghma, W.**, et al., A Novel Hybrid-Decoupled Compact MIMO Antenna with Low Mutual Coupling for 28/38 GHz 5G Millimeter-Wave Applications, Journal of Infrared, Millimeter, and Terahertz Waves [Submitted]
- **En-Naghma, W.**, et al., Design, Parametric Optimization, Fabrication, and Experimental Validation of a Compact Wideband Interdigital Bandpass Filter for RF Front-End Applications, Engineering Research Express [Submitted]
- **En-Naghma, W.**, et al., Design and Development of a Compact 5.8 GHz Elliptical Microstrip Patch Antenna with Machine Learning-Based Prediction of the Reflection Coefficient, Computers and Electrical Engineering [Submitted]