



Pole for Doctoral Studies
Center for Doctoral Studies Sciences and Techniques and Medical Sciences

ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE



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**Will present their research work with the aim of earning a
Doctorate**

Doctoral program: Mathematics, Physics and New Technologies
Discipline: Physics
Specialty: Electronics & Telecommunications

**On 11/07/2026 at 10H00 at the Biology Hall, Faculty of Sciences of
Tetouan, UAE
Under the Theme**

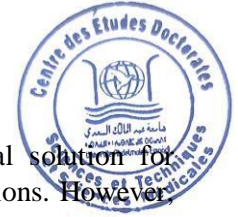
**Design and Optimization of RFID-Tag antennas for Metallic
Object Environments**

Front of the jury composed of :

First Name & Last Name	Establishment	Designation
Pr. BENDAOU Othman	FS of Tetouan, UAE	President
Pr. AZNABET Mariem	FS of Tetouan, UAE	Reviewer
Pr. KANJAA Mohammed	FS of Tetouan, UAE	Reviewer
Pr. OULAD SAID Ahmed	Royal Air Academy, Marrakech, FAR	Reviewer
Pr. AMAR TOUHAMI Naima	FS of Tetouan, UAE	Examiner
Pr. ZUGARI Asmaa	FS of Tetouan, UAE	Examiner
Pr. EL MRABET Otman	FS of Tetouan, UAE	Co-Supervisor
Pr. KHALLADI Mohsine	FS of Tetouan, UAE	Supervisor

Host Research Structure: Intelligent System Design

Abstract



Radio Frequency Identification (RFID) technology has become an essential solution for automatic identification and tracking in industrial, logistics, and supply chain applications. However, the deployment of passive UHF RFID tags on metallic objects remains a major challenge due to the severe degradation of antenna performance caused by metallic surfaces, leading to impedance mismatch, reduced radiation efficiency, and limited reading range. This thesis addresses these challenges through the design and optimization of novel UHF RFID tag antennas specifically intended for metallic environments.

The research begins with a comprehensive investigation of the electromagnetic behavior of conventional RFID tag antennas in the presence of metallic surfaces. Numerical simulations are performed to analyze the mechanisms responsible for impedance detuning, radiation pattern distortion, and efficiency degradation. This study identifies the most influential geometrical and material parameters affecting the performance of RFID tag antennas mounted on metallic objects.

Based on these findings, two compact and low-cost UHF RFID tag antenna configurations are proposed. The first design consists of a capacitively coupled loaded dipole integrated with a metallic patch, providing efficient conjugate impedance matching with the RFID microchip without the need for vias or shorting walls. This simple structure significantly reduces fabrication complexity while maintaining excellent electrical performance. The proposed antenna has been designed, optimized, fabricated, and experimentally characterized. Measurement results demonstrate a reading range of approximately 7 m in free space and up to 10.5 m when mounted directly on a metallic surface, while preserving stable frequency characteristics. These results confirm the suitability of the proposed antenna for reliable RFID operation in both metallic and non-metallic industrial environments.

To further improve compactness, a second antenna configuration is introduced by reducing the size of the radiating metallic patch while maintaining satisfactory impedance matching and radiation characteristics. The proposed miniaturized structure offers a significant size reduction without compromising the overall RFID performance, making it particularly attractive for applications involving space-constrained metallic assets.

The proposed antenna designs provide robust, compact, and cost-effective solutions for passive UHF RFID systems operating in challenging metallic environments, thereby extending the applicability of RFID technology in modern industrial and logistics applications.

Keywords: RFID Technology, tag antenna, Impedance matching, Reading range, Compact antenna, Metallic environments, Antenna miniaturization.