

Prof. Nils Ole Tippenhauer

Head, Secure Cyber-Physical Systems Group (SCy-Phy)

CISPA Helmholtz Center for Information Security

Dear Prof. Tippenhauer and the Selection Committee,

I am writing to express my profound interest in the PhD position within the Secure Cyber-Physical Systems Group under your esteemed leadership. As a researcher with a unique interdisciplinary background spanning both physics and cybersecurity, I am excited by the possibility of contributing to your groundbreaking work at the intersection of embedded systems security, anomaly detection, and cyber-physical infrastructure protection.

My academic journey has been defined not by ease but by persistence in the face of significant challenges. When I made the decision to transition from my physics background to specialize in cybersecurity and cryptology, many believed this radical shift would prove insurmountable. Indeed, my initial semester yielded a modest GPA of 1.95, seemingly confirming these doubts. However, what this figure did not reveal was my unwavering determination.

Rather than being discouraged, I embraced this challenge as an opportunity for growth. Through countless late nights, relentless study, and an unyielding commitment to mastering new concepts, I steadily improved my academic performance—rising from 1.95 to 2.43 in my second semester, and now achieving a 3.0 GPA in the most recent term. This progression reflects not just academic improvement but embodies my core philosophy: I may not always be the quickest to grasp new concepts, but I am committed to never abandoning a challenge until I have conquered it.

My doctoral research in physics, focusing on localized waves in inhomogeneous media including Bose-Einstein Condensates, has equipped me with a deep understanding of electromagnetic wave theory, complex mathematical modeling, and analytical problem-solving. I believe this background offers a distinctive lens through which to examine cybersecurity challenges in embedded systems, particularly regarding electromagnetic side-channel vulnerabilities.

My current Master's thesis on "LIGHTWEIGHT POLYNOMIAL MULTIPLICATION FOR POST-QUANTUM CRYPTOGRAPHIC SCHEMES" represents my effort to bridge these disciplines by applying rigorous mathematical principles to practical cybersecurity implementations. This work explores how to optimize critical cryptographic operations for resource-constrained environments, a crucial consideration for the security of cyber-physical systems.

Beyond my academic pursuits, I am deeply committed to fostering cybersecurity awareness and expertise in my community. Recently, I had the honor of serving on the leadership team for the first-ever SpringHack event at our Center for Cybersecurity, where I helped design and implement various laboratory challenges for the competition. This experience allowed me to translate complex security concepts into practical learning experiences for participants.

I regularly mentor undergraduate students who face difficulties in their cybersecurity studies, organizing informal study groups to address challenging concepts. These activities reflect my belief

that knowledge gains value when shared and that developing cybersecurity talent is critical for addressing the mounting challenges faced by countries like Cameroon.

As a Student Ambassador for the American Physical Society and previous winner of the "Prize Francesco Iorio" for applying high-level physics to real-life problems in developing countries, I have consistently sought opportunities to bridge theoretical knowledge with practical applications that serve community needs.

Your group's focus on anomaly detection, security analysis, and protection of cyber-physical systems resonates deeply with my research interests. I am particularly drawn to your work on:

1. **Detection of anomalies and intrusions using process data, traffic, and hardware features:** My background in stochastic analysis and wave behavior in complex media provides a unique foundation for developing novel detection approaches that combine both mathematical models and AI-based solutions.
2. **Security analysis of proprietary protocols, firmware, and applications:** My experience with both electromagnetic theory and cryptographic implementations positions me to examine security from multiple layers—from the physical to the algorithmic.
3. **Attacks and countermeasures for real-world cyber-physical systems:** As embedded systems increasingly control critical infrastructure, I am motivated to contribute to protecting these systems, particularly in developing regions where security expertise may be limited.

My ultimate aspiration extends beyond personal academic achievement. I aim to become a leader and influencer in cybersecurity within Cameroon, helping to develop the necessary expertise and infrastructure to protect our increasingly connected society. The skills and knowledge I would gain through this PhD opportunity would be instrumental in achieving this goal, as I could return to Cameroon equipped not just with technical expertise but with international research experience and connections.

The PhD position with the Secure Cyber-Physical Systems Group represents an ideal opportunity to combine my interdisciplinary background, commitment to academic excellence, and passion for community impact. While I acknowledge that I may not have the most perfect academic record, I offer something perhaps more valuable: the proven ability to overcome challenges through persistence, a unique interdisciplinary perspective, and an unwavering commitment to using knowledge for positive societal impact.

I am ready to bring my full dedication and unique perspective to your team, and I would be honored to discuss how my background and aspirations align with your research group's vision.

Thank you for considering my application. I look forward to the possibility of contributing to your pioneering work in securing cyber-physical systems.

Sincerely,

PILAH MBIESSET Marius Blaise