



**Offre n°2025-08785**

## **PhD Position F/M PhD - Symmetry-driven computational framework for metamaterial design**

*Le descriptif de l'offre ci-dessous est en Anglais*

**Type de contrat :** CDD

**Niveau de diplôme exigé :** Bac + 5 ou équivalent

**Fonction :** Doctorant

### **A propos du centre ou de la direction fonctionnelle**

The Inria Rennes - Bretagne Atlantique Centre is one of Inria's eight centres and has more than thirty research teams. The Inria Center is a major and recognized player in the field of digital sciences. It is at the heart of a rich R&D and innovation ecosystem: highly innovative PMEs, large industrial groups, competitiveness clusters, research and higher education players, laboratories of excellence, technological research institute, etc.

### **Contexte et atouts du poste**

The recruited researcher will join a multi-disciplinary team involving established, **full-time research scientists** of all ages, MSc, PhD and postdocs (~30 ppl). The training programme intends to prepare candidates for scientific positions, either in academia or industry, by working in a research-intensive environment which fosters both scientific excellence (world-class researchers and over 65 prestigious ERC grants) and entrepreneurship (over 200 startups launched and a dedicated Inria Startup Studio). You will also have access to an extensive portfolio of training courses on digital science and technology, scientific programming or Artificial Intelligence. You will be recruited by Inria in the Beaulieu Scientific Campus of University of Rennes, Bretagne (France), a medium town (~220.000 inhabitants)

close from Paris and from the sea, with an intense student life (25% of the population). Rennes was ranked 1<sup>st</sup> city in France for quality of life and 8th most attractive city in Europe.

## Mission confiée

This PhD project aims for an advance in the simulation and design of metamaterials - engineered structures with unique physical properties surpassing natural materials. It aims to develop automated finite element methods to enhance numerical modeling, focusing on precision and efficiency in simulations while enabling predictive design of adaptive systems. The research targets critical defense technologies, including stealth, cloaking, and wave manipulation, with applications spanning multispectral furtivity, dynamic resilience, and active wave modulation, relevant to both defense and civilian contexts.

Metamaterials leverage microstructural periodicity to control electromagnetic, acoustic, or mechanical waves, offering strategic capabilities like broadband signature reduction or shock absorption. Symmetry is central to this work and a key property of periodic structures that governs wave behavior. By exploiting symmetries, the project seeks to optimize computational performance and deepen insights into metamaterial functionality.

The supervising team is pioneering wave propagation methods for periodic structures and associated computational challenges, providing top-tier expertise. Integrating mathematics, computer science, finite element techniques, computer graphics and mechanics, the research addresses complex simulation demands. Potential impacts include stealth coatings for aircrafts, adaptive armors, predictive monitoring techniques, and wave-modulating systems for stealth.

Hosted in a leading research environment, this PhD offers a chance to drive metamaterial innovation with broad implications, collaborating with experts in wave-based computational methods.

## Principales activités

This PhD, focused on advancing metamaterial simulation through symmetry analysis, seeks motivated MSc (or soon-to-be) graduates with the following qualifications:

- **Graduation Topics:** Ideal candidates have backgrounds in computational mechanics, applied mathematics, and/or advanced scientific computing. Relevant MSc-level curricula include computational mechanics or physics, computer science, or finite element methods. Experience implementing numerical methods in high-level programming languages (e.g., Matlab, Python, Julia) is essential.
- **Academic Excellence:** A very good curriculum with top-class grades.

- **Computer Literacy:** Proficiency – and interest – in navigating advanced algorithms and theoretical concepts, with outstanding problem-solving capabilities.
- **Citizenship:** Candidates must have an EU citizenship, due to the defense-related scope of the project.
- Enthusiasm for computational modeling, metamaterials, symmetry-driven computational challenges in metamaterial design and innovative defense technologies.

## Avantages

- Subsidized meals
- Partial reimbursement of public transport costs
- Leave: 7 weeks of annual leave + 10 extra days off due to RTT (statutory reduction in working hours) + possibility of exceptional leave (sick children, moving home, etc.)
- Possibility of teleworking (after 6 months of employment) and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

## Rémunération

2 200 per month

## Informations générales

- **Thème/Domaine :** Optimisation et contrôle de systèmes dynamiques  
Calcul Scientifique (BAP E)
- **Ville :** Rennes
- **Centre Inria :** [Centre Inria de l'Université de Rennes](#)
- **Date de prise de fonction souhaitée :** 2025-10-01
- **Durée de contrat :** 3 ans
- **Date limite pour postuler :** 2025-06-01

## Contacts

- **Équipe Inria :** [I4S](#)
- **Directeur de thèse :**  
Droz Christophe / [christophe.droz@inria.fr](mailto:christophe.droz@inria.fr)

## A propos d'Inria

Inria est l'institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 215 équipes-projets agiles, en général communes avec des partenaires académiques, impliquent plus de 3900 scientifiques pour relever les défis du numérique, souvent à l'interface d'autres disciplines. L'institut fait appel à de nombreux talents dans plus d'une quarantaine de métiers différents. 900 personnels d'appui à la recherche et à l'innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde. Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 200 start-up. L'institut s'efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l'économie.

## L'essentiel pour réussir

### Application & selection procedure:

- Submit your **initial application documents on this platform (see guidelines below)**.
- Applications will be screened on a rolling basis. Please submit your application as soon as possible: shortlisted candidates will be invited to an online interview.
- As soon as the best candidate has been identified, the offer will be removed from the application platform. The selected candidate will then be expected to provide some additional transcripts, diploma and references.
- The complete application documents will then be evaluated by the Defense Selection Committee. Final results will be communicated by **15/06/2025** and the PhD will begin in Oct. 2025.

### Initial application documents:

- Field '**CV**': A detailed curriculum vitae (indicating your nationality and current country of residence).
- Field '**Motivation**': In one page or less, please outline your interest in this position and tell us about your most significant achievement.
- Field '**Recommendation**': A recent/MSc 2 academic transcript.
- Field '**Other documents**': Any additional document to support your application.

**Attention:** Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.

## Consignes pour postuler

Please submit your CV, cover letter, and any recommandations online

### **Sécurité défense :**

Ce poste est susceptible d'être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L'autorisation d'accès à une zone est délivrée par le chef d'établissement, après avis ministériel favorable, tel que défini dans l'arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel défavorable pour un poste affecté dans une ZRR aurait pour conséquence l'annulation du recrutement.

### **Politique de recrutement :**

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.