



Offer #2022-05513

## High performance computing for the study of nanoscale light-matter interactions

**Contract type** : Fixed-term contract

**Renewable contract** : Yes

**Level of qualifications required** : Graduate degree or equivalent

**Fonction** : Temporary scientific engineer

**Level of experience** : Recently graduated

### About the research centre or Inria department

The Inria Sophia Antipolis - Méditerranée center counts 37 research teams and 9 support departments. The center's staff (about 600 people including 400 Inria employees) is composed of scientists of different nationalities (250 foreigners of 50 nationalities), engineers, technicians and administrators. 1/3 of the staff are civil servants, the others are contractual. The majority of the research teams at the center are located in Sophia Antipolis and Nice in the Alpes-Maritimes. Six teams are based in Montpellier and a team is hosted by the computer science department of the University of Bologna in Italy. The Center is a member of the University and Institution Community (ComUE) "Université Côte d'Azur (UCA)".

### Context

Atlantis is a joint project-team between Inria and the Jean-Alexandre Dieudonné Mathematics Laboratory at Université Côte d'Azur. The team gathers applied mathematicians and computational scientists who are collaboratively undertaking research activities aiming at the design, analysis, development and application of innovative numerical methods for systems of partial differential equations (PDEs) modelling nanoscale light-matter interaction problems. In this context, the team is developing the DIOGENeS [<https://diogenes.inria.fr/>] software suite, which implements several Discontinuous Galerkin (DG) type methods tailored to the systems of time- and frequency-domain Maxwell equations possibly coupled to differential equations modeling the behaviour of propagation media at optical frequencies. DIOGENeS is a unique numerical framework leveraging the capabilities of DG techniques for the simulation of multiscale problems relevant to nanophotonics and nanoplasmonics.

### Assignment

The main objective in this assignment is to further enhance the **high performance computing** capabilities of the numerical tools developed in the DIOGENeS software suite.

The recruited engineer will also actively participate in the studies conducted by the Atlantis team members for demonstrating the benefits of these numerical tools through the simulation of realistic and challenging use cases pertaining to various applications of nanoscale light-matter interactions. In particular, the team is now actively collaborating with potential end-users of the DIOGENeS software suite who are raising various modeling issues that need to be addressed prior to simulating such realistic uses cases.

### Main activities

Concretely, this will concern two components of DIOGENeS:

- On one hand, the **DG-type high order finite element solvers** for solving the differential models of nanophotonics. Here, the goal will be to develop GPU and multi-GPU-enabled versions of the compute intensive numerical kernels of these solvers;
- On the other hand, the **inverse design workflows** for mastering and enhancing the properties of nanophotonic structures and devices. Here, the goal will be to develop and implement parallelization strategies for a statistical learning-based global optimization method, which is coupled to the above-mentioned DG-type high order finite element solvers.

### Skills

Candidates will hold a Master degree or a PhD degree in applied mathematics/scientific computing or

computational wave physics or computational photonics.

Required skills:

- Sound knowledge of numerical analysis and development of finite element type methods for computational physics;
- A concrete experience in numerical modeling for computational electromagnetics will be an asset;
- Strong programming skills and exposure to high performance computing models (MPI, OpenMP/OpenACC, CUDA);
- Knowledge and experience of Fortran 95/2000x and Python programming languages;
- Fluent spoken and written English.

## Benefits package

- Subsidised catering service
- Partially-reimbursed public transport
- Social security
- Paid leave
- Flexible working hours
- Sports facilities

## Remuneration

From 2652 euros gross monthly (according to degree and experience)

## General Information

- **Theme/Domain** : Numerical schemes and simulations  
Scientific computing (BAP E)
- **Town/city** : Sophia Antipolis
- **Inria Center** : [Centre Inria d'Université Côte d'Azur](#)
- **Starting date** : 2023-02-01
- **Duration of contract** : 12 months
- **Deadline to apply** : 2024-12-31

## Contacts

- **Inria Team** : [ATLANTIS](#)
- **Recruiter** :  
Lanteri Stéphane / [Stephane.Lanteri@inria.fr](mailto:Stephane.Lanteri@inria.fr)

## About Inria

Inria is the French national research institute dedicated to digital science and technology. It employs 2,600 people. Its 200 agile project teams, generally run jointly with academic partners, include more than 3,500 scientists and engineers working to meet the challenges of digital technology, often at the interface with other disciplines. The Institute also employs numerous talents in over forty different professions. 900 research support staff contribute to the preparation and development of scientific and entrepreneurial projects that have a worldwide impact.

**Warning** : you must enter your e-mail address in order to save your application to Inria. Applications must be submitted online on the Inria website. Processing of applications sent from other channels is not guaranteed.

## Instruction to apply

**Defence Security** :

This position is likely to be situated in a restricted area (ZRR), as defined in Decree No. 2011-1425 relating to the protection of national scientific and technical potential (PPST). Authorisation to enter an area is granted by the director of the unit, following a favourable Ministerial decision, as defined in the decree of 3 July 2012 relating to the PPST. An unfavourable Ministerial decision in respect of a position situated in a ZRR would result in the cancellation of the appointment.

**Recruitment Policy** :

As part of its diversity policy, all Inria positions are accessible to people with disabilities.