

# Job Title: Internal Research Fellow (PostDoc) in Adaptive Optics with Laser Guide Stars

Req ID 7621 - Posted 08/08/2018



## EUROPEAN SPACE AGENCY

Research Fellowship Opportunity in the Directorate of Telecommunications and Integrated Applications.

ESA is an equal opportunity employer, committed to achieving diversity within the workforce and creating an inclusive working environment. Applications from women are encouraged.

### Post

#### Internal Research Fellow (PostDoc) in Adaptive Optics with Laser Guide Stars

This post is classified F2.

### Location

ESTEC, Noordwijk, The Netherlands

### Our team and mission

The research position will be in the GovSatCom and Secure Communications Section of the Institutional and European Programme Office, Telecommunication Technologies, Products and Systems Department, which is part of the Directorate of Telecommunications and Integrated Applications.

The proposed field of research is of relevance for future space/ground optical communications, which is one of the main topics of the ScyLight Programme.

The work to be performed will be supervised by the Opto-Electronics Section of the Mechatronics and Optics, Division, which is part of the Directorate of Technology, Engineering and Quality.

Among other areas of expertise, the Optoelectronics Section deals with/supports the development of optical communication systems (e.g. EDRS, Optel-mu, Second Generation GNSS, optical ground station operations) and it is also in charge of ESA's Optical Ground Station.

Interested candidates are encouraged to visit the ESA website related to the Division's activities

### Field(s) of activities/research

The field of research will be in the area of adaptive optics with laser guider stars, with the final application of laser communications through the atmosphere.

Laser beam characteristics degrade due to detrimental effects such as scintillation, beam spreading, beam wandering, angle of arrival fluctuations and wavefront distortion, caused by the propagation through a turbulent medium like the atmosphere. In practical terms, the laser beam is distorted such that the detection and recovery of the communications signal modulating the optical carrier is severely affected in terms of quality of service (bit error probability and availability).

Countermeasures need to be implemented in order to correct/minimize atmospheric turbulence effects. In most cases, (part of) the received signal is used as a reference to evaluate the disturbance and to determine the amount of correction needed to apply to the incoming optical signal, and also to the outgoing optical signal (so called pre-compensation or pre-distortion). However, in some cases the distortion of the received signal cannot be used to pre-distort the outgoing signal because the angular separation between the incoming and the outgoing optical signals is so large that the turbulence effects in both directions are uncorrelated (i.e., the point ahead angle can be larger than the isoplanatic angle in some scenarios). In this case, one could envisage placing a laser guide star in the direction of the outgoing laser beam and using the distortion sensed by the received light from the laser guide star to pre-distort the wavefront of the outgoing laser beam.

In this context, the Research Fellow will participate in measurement campaigns and will analyze the resulting data of an

experiment assessing the feasibility of using a laser guide star for laser communications through the atmosphere. The Research Fellow will investigate how to extract the wavefront distortion information of the laser guide star in a way that this information can be used to correct/pre-distort the wavefront of the outgoing laser beam, such that the reception at the counterpart location is optimized.

The research will be carried out in close co-operation with other investigators from ESO (European Southern Observatory) and DLR (German Aerospace Centre).

### **Technical competencies**

Ability to conduct research autonomously  
Breadth of exposure coming from past and/or current research/activities  
Research/publication record  
Knowledge relevant to the field of research  
Interest in space and space research  
Ability to gather and share relevant information

### **Behavioural competencies**

Innovation & Creativity  
Continuous Learning  
Relationship Management  
Self Motivation  
Communication  
Problem Solving  
Cross-Cultural Sensitivity

### **Education**

Applicants should have recently completed, or be close to completion of a PhD in a related technical or scientific discipline, preferably in physics or mathematics or engineering. Preference will be given to applications submitted by candidates within five years of receiving their PhD.

### **Additional requirements**

The Research Fellow must have demonstrated excellent programming skills using Matlab (or Python or C) in order to be able to evaluate the results of the measurement test campaigns. Knowledge of laser communications and atmospheric turbulence would be an asset. A background in statistics and random processes, and in imaging processing, is required.

The Research Fellow must be able to work in a team with other international investigators in a spirit of positive co-operation and, at the same time, be capable of working autonomously in his/her area of research. At the end of the fellowship, the Research Fellow will be required to summarize the work completed so that it can be included in papers to be submitted to specialised conferences/journals in the field of laser communications for space (e.g., SPIE, ICSO, ICSOS, IEEE).

The working languages of the Agency are English and French. A good knowledge of one of these is required. Knowledge of another Member State language would be an asset

### **Other information**

For behavioural competencies expected from ESA staff in general, please refer to the [ESA Competency Framework](#).

The Agency may require applicants to undergo selection tests.

**The closing date for applications is 05 September 2018.**

In addition to your CV and your motivation letter, please add your proposal of no more than 5 pages outlining your proposed research in the "additional documents" field of the "application information" section. Candidates are asked to arrange for 3 reference letters, to be sent by the referees themselves, before the closing date to [temp.htr@esa.int](mailto:temp.htr@esa.int). Please ensure your name is mentioned in the subject of the e-mail.

If you require support with your application due to a disability, please email [contact.human.resources@esa.int](mailto:contact.human.resources@esa.int).

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Please note that applications are only considered from nationals of one of the following States: Austria, Belgium, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, Romania, Spain, Sweden, Switzerland, the United Kingdom and Canada and Slovenia as well as Bulgaria, Cyprus, Latvia, Lithuania, Slovakia as European Cooperating States (ECS). Priority will first be given to candidates from under-represented Member States.

In accordance with the European Space Agency's security procedures and as part of the selection process, successful candidates will be required to undergo basic screening before appointment