



## JOB OFFER

**Who ?** Engineer or Physicist in time & frequency, opto-electronics, laser physics or telecommunication

**Goal:** development of time and frequency dissemination through the Belgium optical fiber networks.

**Duration:** three-year position

The Royal Observatory of Belgium (ROB) maintains a time and frequency laboratory with atomic clocks that contribute to the international reference UTC (Coordinated Universal Time). They furthermore generate a precise realisation of UTC, namely UTC(ORB), available for Belgian users. The scientific team also carries out cutting edge researches in remote atomic clock comparisons, ionosphere/plasmasphere physics, electromagnetic signal perturbations and fundamental physics, using Global Navigation Satellites Systems (GNSS, like the US GPS or the European Galileo).

GNSS time and frequency transfer is the most used technique for obtaining an accurate T&F synchronisation, with an uncertainty  $10^{-16}$  in relative frequency with a one-day averaging, and is available in any location at a reasonable cost. However, the GNSS T&F transfer is vulnerable to disturbances (interferences, spoofing, jamming...) and is inadequate for applications demanding higher precision and security. The most promising alternative is the T&F transfer through optical fibers, which can overcome the GNSS T&F transfer performances by several orders of magnitude. Several European time laboratories are already interconnected, and the dissemination of their realization of UTC to scientific institutes and to the industry through optical fibers has furthermore already started.

The ROB was recently awarded for funding to develop a network of T&F transfer through optical fibers in Belgium and to connect it to the European metrological network via the French network. The project is named BOOSTED, for Belgium Optical network for Optical frequency Standards and Time Dissemination. The proposed approach considers that the signal will propagate in parallel to data traffic over the active telecom network connecting Belgian research institutions, managed by Belnet. This Belgian network will be furthermore connected to the French network REFIMEVE where an ultra-stable reference frequency is already distributed. The work will therefore be carried out in close collaboration with the Observatoire de Paris (OP) and Laboratoire de Physique des Lasers (Paris). In Belgium, a connection will be designed between the ROB and Belgian universities, where ultra-stable reference frequency will be used for high resolution laser spectroscopy (e.g. IMCN institute of UCLouvain), for photonic research (ULB, or UGent) etc... Finally, this project paves the way for a precise dissemination of the Belgian legal time to private companies dealing with the T&F metrology, e.g. telecommunications or electricity distribution. It will be also an open door to connect the future Belgian network to the already existing European infrastructure. The French network is already in operation with 30 laboratories and research centers linked to the OP ultra-stable signal and connections with the UK, Germany and Italy.



During the contract period, the selected candidate will be the reference person in the development and implementation of the initial phase of the Belgian BOOSTED network, with a strong interaction with Research Centers in Belgium but also in Europe. Her/his tasks will include:

- 1) The technical roadmap of the BOOSTED network. This includes:
  - State-of-the-art, conformity and compliance of the telecom network configuration,
  - Simulations in parallel with tests in real conditions,
  - Determination of the optimal design.
- 2) The knowledge transfer from REFIMEVE partners (OP, LPL, RENETER, Industrial partners...) to the BOOSTED network (ROB, BELNET...), including Belgian Research Centers. In collaboration with Belnet, the selected candidate will provide a scientific expertise to all potential users and stakeholders for receiving the ultra-stable signal in their institutions.
- 3) The implementation of the initial BOOSTED network with subsequent tests of resilience and vulnerability to validate the initial phase.
- 4) The sustainability of the new Research Infrastructure (RI), including economical, technical, and maintenance aspects. This will also imply the definition and the application of the Data Management Plan.

This position offers a contract of determined duration (salary level SW11) funded by INFRA-FED, a Belgian Federal State impulse action to fostering the development of emerging RI within federal research institutions. The allocated budget covers 3,3 years of salary from September 2023 to December 2026. According to his/her availability, the selected candidate has the possibility to postpone the start of the contract up to January 2024 (maximum) to have a 3 years position.

The candidate must have a Master in physics or in engineering. Applications that include one or more of the following characteristics/qualities will be ranked as a priority:

- Background in laser physics, laser interferometry, T&F, telecommunication or optical fibers.
- Technical skills in opto-electronics.
- A good knowledge of time and frequency metrology is an asset.
- Proficiency in written and spoken English. Knowledge of French, Dutch or German is an added value.
- A PhD in the aforementioned fields is an asset.

The candidate is expected to be part of the Time & Ionosphere team of the ROB, to be able to work autonomously and to lead research projects. Strong communication skills and an open-minded personality are also expected.

#### **How to apply:**

- The candidate needs to send a cv and a motivation letter to [pascale.defraigne@oma.be](mailto:pascale.defraigne@oma.be) with a copy to [bruno.bertrand@oma.be](mailto:bruno.bertrand@oma.be) at the latest on May 31, 2023.
- The candidate needs to demonstrate past activity in the desired fields.
- The candidate must provide contact names for recommendations.

If his/her master was awarded outside of Belgium, the Netherlands and the Grand-Duchy of Luxembourg, the selected candidate will need a certificate to demonstrate the degree equivalence before we can offer a contract.