

Training Opportunity for Belgian National Trainees

Reference	Title	Duty Station
BE-2023-TEC-MME	Opto-Electronics Engineering	ESTEC, Noordwijk

Overview of the mission:

The Optoelectronics Section provides functional support to ESA projects and carries out technology research (R&D) in optoelectronic device technologies and applications. In particular, the Section deals with the specification, development and characterisation of photonic components, subsystems and active optical instruments, such as detectors and lasers operating in the UV to FIR wavelength ranges, fibre-optic sensors, lidars, optical communication systems and quantum technologies.

You are encouraged to visit the ESA website: <http://www.esa.int>

Overview of the field of activity proposed:

Quantum communication uses quantum properties, typically those of photons, to perform communication protocols of various types. The most prominent example is quantum key distribution (QKD), whereby a secret key can be exchanged between two parties. Apart from QKD, quantum properties of light can also be used to support data communication, time and frequency transfer, long baseline interferometry or future connections of quantum computers using laser links. Satellite-based quantum communication is used, in particular, due to the limitations of ground-based fibres for transmitting photons over long distances.

The growing use of classical optical communication in space has established a mature technology and supply chain for space and ground terminals. These technologies, therefore, offer a very high-TRL (technology readiness level) starting point with a view to their being used, with some modifications, for quantum communication links.

As a Belgian National Trainee, you will be responsible for leading research activities that are expected to advance the understanding of the applicability of quantum communication systems to space applications.

Your activities will aim to increase the performance and TRL for optical communication systems, and more specifically quantum communication-related hardware such as photon sources, detectors and terminal designs. You will have the opportunity to investigate ways to enhance the performance, the TRL and the commercial viability of quantum space-to-space or space-ground communication links for QKD or other applications, taking account of considerations for high-performance detectors, adaptive optics, security engineering,

standardised interfaces, protocols and deployment in urban environments and benefitting from parallel developments in classical optical communication.

Required education and skills:

- You should have just completed, or be in the final year of your Master's degree in a technical or scientific discipline, with a preference for physics, optoelectronic engineering or optical communications.
- Good interpersonal and communication skills
- Ability to work in a multi-cultural environment, both independently and as part of a team
- Fluency in English and/or French, the working languages of the Agency