

Master 2: *International Centre for Fundamental Physics*

INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: ATOS Quantum group & Laboratory Light, nanomaterials & nanotechnologies-L2n UTT/CNRS
CNRS identification code: UTT-L2n CNRS ERL 7004
Internship director's surname: Cyril Allouche (ATOS) & Christophe Couteau (UTT)
e-mail: christophe.couteau@utt.fr Phone number:
Web page: <https://recherche.utt.fr/light-nanomaterials-nanotechnologies-l2n>
Internship location: ATOS, Les Clays Sous Bois and UTT, Troyes

Thesis possibility after internship: YES
Funding: YES If YES, which type of funding: CIFRE

Photonic graph states study using integrated optics

Context

This project is within the context of quantum technologies. This project is a collaboration between the University of Technology of Troyes-UTT and the company ATOS and aims at studying theoretically and experimentally some specific quantum states called graph states that can be produced optically from single photons and/or entangled photons.

Mission

This project has 3 objectives:

- 1) Understand the notion of « graph states » in photonics and how it can be useful within the already existing concepts in quantum technologies
- 2) Elaborate simple models or « toy models » with few qubits in order to test these models experimentally
- 3) Setting-up an optical experiment that will allow the test of these toy models in practice with a quantum optics set-up using few qubits

In this ambitious and novel project, the candidate will have to grasp rather complex theoretical notions and concepts while being able to implement them (or some of them) experimentally.

The project is a collaboration between the company ATOS and its 'quantum' group and with the CNRS laboratory Light, nanomaterials & nanotechnologies-L2n of the University of Technology of Troyes located in Troyes. This project will benefit from the expertise of the 'quantum' group of ATOS and the Nanomat' technological platform of the UTT with a co-supervision from both institutions.

To apply:

<https://jobs.atos.net/job/Les-Clayes-78-Stage-Quantum-Etude-des-amp;graph-states-amp;-photoniques-%C3%A0-l-amp;aide-d-amp;optique-int%C3%A9gr%C3%A9e-HF-Ile/628802001/>

Methods and techniques: Knowledge in numerical simulations are strongly appreciated, knowledge in quantum physics and applied mathematics are also appreciated, experimental quantum optics techniques (non-linear optics, single photon source, entangled photons)

Please, indicate which speciality(ies) seem(s) to be more adapted to the subject:

Condensed Matter Physics: NO Soft Matter and Biological Physics: NO
Quantum Physics: YES Theoretical Physics: A BIT