Master 2: ***International Centre for Fundamental Physics***

INTERNSHIP PROPOSAL

(One page maximum)

Laboratory name: Laboratoire Traitement et Communication de l'Information
CNRS identification code: ex UMR 5141
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Internship location: 23 avenue d'Italie, Paris 75013

Thesis possibility after internship: YES
Funding: not yet obtained
If YES, which type of funding: H2020, Digicosme, DGA

Title Bridging the gap between quantum and classical communication technologies

Summary
The envisaged work intends to tackle "frontier research" intersecting with optical communications, quantum communication and cryptography, in order to bridge the gap between widely deployed photonics technology and quantum communications. We will take continuous-variable quantum key distribution (CV-QKD) as the reference platform. The hardware similarities of CV-QKD systems with "classical" coherent systems is a driving technical motivation, as well as he demonstrated noise tolerance of CV-QKD [1]. Moreover, our team at Telecom ParisTech has a thorough experimental and theoretical expertise in CV-QKD.
In this internship we plan to investigate one (or both) of the following challenges, that can open towards several options PhD research, depending on the profile and the interests of the candidate:

a) Co-design of classical and quantum communication systems. We have recently proposed [2] a new system design allowing to operate CV-QKD with (mostly) standard photonics hardware. It opens an avenue for co-design of quantum and classical communications: digital signal processing techniques (DSP), inherited from classical coherent communications can be used in order to reduce the noise on quantum communications and hence increase performance and in particular distance.

b) Convergence. The objective will be to use shared hardware to jointly perform classical and quantum communications [3]. We aim to study and demonstrate original optical architectures in which quantum security could be offered as a additional service, at very low marginal cost, in addition to classical communications.

[1] R. Kumar, H. Qin, R. Alléaume, New Journal of Physics, 17(4), 043027, (2015).

[2] A. Marie, R. Alléaume, Phys. Rev. A 95, 012316, (2017).

[3] B. Qi, Phys. Rev. A, 94(4), 042340, (2016).

Quantum Physics: YES