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Master in Photonics – “PHOTONICS BCN” Master ERASMUS+ “EuroPhotonics”

MASTER THESIS PROPOSAL

Dates: April 2020 - September 2021

Laboratory: Quantum Information Theory Group

Institution: ICFO

City, Country: Castelldefels, Barcelona

Title of the master thesis: Thermodynamic length for non-equilibrium steady states

Name of the master thesis supervisor and co-supervisor: Matteo Scandi, Antonio Acín
(for external proposals a co-supervisor from the program is needed)

Email address: scandimatteo@gmail.com, antonio.acin@icfo.eu

Phone number:

Mail address:

Keywords:

Thermodynamics, Geometry, Optimization

Summary of the subject (maximum 1 page):

The use of differential geometry has been fundamental in the development of many areas of physics. The aim of this thesis is to show that this is true also when treating thermodynamic states out of equilibrium. The work will build up on results regarding the space of Gibbs states: in this context, the expansion of the dissipation rate around the quasi-static limit imposes a natural metric structure on the space of parameters. The geodesics in this space give the minimally dissipating curves for slowly driven systems. The aim of this project is to reproduce the results connected with this construction for non-equilibrium steady states (e.g., generalised Gibbs states, states containing currents, etc.). This project will give the opportunity to the student to have a first-hand experience with state-of-the-art research, which falls in a very active area of investigation.

Bibliography:

Measuring thermodynamic length, Phys. Rev. Lett. 99 100602 (2007),
arXiv:0706.0559

Thermodynamic length in open quantum systems, Quantum 3, 197 (2019),
arXiv:1810.05583



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Erasmus+

Geometric optimisation of quantum thermodynamic processes, Entropy 22(10), 1076 (2020), arXiv:2008.13593

Quantum work statistics close to equilibrium, Phys. Rev. Research 2, 023377 (2020), arXiv:1911.04306

Additional information (if needed):

* Required skills :

* Miscellaneous :