About ColOpt

ColOpt is a novel research and training network for young scientists in the fields of cold atoms, quantum physics, optical technologies and complexity science.

The research training provided will comprise a broad portfolio of technical and transferable skills training on local and network level.

Major secondments to partners, in particular inter-sectorial placements, are an intrinsic part of the network experience.

Each of the fifteen individual projects will be part of a vibrant and stimulating international and inter-sectorial collaboration.

Our graduates will be excellently prepared for a broad range of academic and industrial careers and be at the forefront to drive the emerging quantum technologies.

Project Contact

Coordinator: Prof Thorsten Ackemann
Email: colopt@phys.strath.ac.uk
Website: http://colopt.phys.strath.ac.uk

Collective effects and Optomechanics in Ultra-cold Matter

ColOpt

European Training Network

Funded by the Marie Skłodowska-Curie Action
January 2017 – December 2020
ColOpt Research

ColOpt’s research programme focuses on collective interactions of structured light with laser-cooled cold and quantum-degenerate matter.

Collective, nonlinear dynamics and spontaneous self-organization are abundant in nature, sciences and technology and of central importance.

Building on this interdisciplinary relevance, a particular novelty of ColOpt is the integration of classical and quantum self-organization. We will explore innovative control of matter through opto-mechanical effects, identify novel quantum phases, enhance knowledge of long-range coupled systems and advance the associated trapping, laser and optical technologies, thus establishing new concepts in quantum information and simulation.

Four scientific work packages will explore:

1. **Spatial self-organization**
   This WP studies the spontaneous emergence of regular spatial order from optomechanical nonlinearities in cold atomic ensembles as well as quantum degenerate gases.

2. **Novel trapping schemes and complex light fields**
   This WP advances light trapping tools for application in quantum information technology realizing complex, unconventional and disordered potentials and to store information in quantum coherences.

3. **Collective scattering and coupled dipoles**
   This WP addresses phenomena of collective scattering and interaction of dipoles emerging at high optical density due to the interaction of many atomic dipoles.

4. **Laser technology**
   Two leading European laser manufacturers will advance the performance of Ti:Sapphire and semiconductor laser systems.

The ColOpt network brings together fifteen world leading research organisations and industry in the fields of cold atoms, quantum physics, optical technologies and complexity science:

- University of Strathclyde, Department of Physics
- University of Glasgow, School of Physics and Astronomy
- Universita degli Studi di Milano, Dipartimento di Fisica
- Westfälische Wilhelms-Universität Münster, Institut für Angewandte Physik
- Eberhard Karls Universität Tübingen, Physikalisches Institut
- Universität des Saarlandes, Theoretical Physics
- ETH Zürich, Institute for Quantum Optics
- Universität Innsbruck, Institute for Theoretical Physics
- CNRS, Institut de Physique de Nice
- TOPTICA Photonics AG
- Holoeye Photonics AG
- M Squared Laser Ltd
- Third country partners:
  - University of São Paulo, Instituto de Física
  - University of Wisconsin, Department of Physics

This project receives funding from the European Union’s Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 721465.