

ESF Exploratory Workshop on **Polaritonics: From Basic Research to Device Applications**

Rome (Italy), 20-23 March 2012

**Convened by:
Alexey Kavokin ^①**

^① Physics and Astronomy School, University of Southampton, United Kingdom

Co-sponsored by





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Main Objectives of the Workshop:

Intensive studies of the strong – light matter coupling in semiconductor quantum microcavities have allowed to observe many fascinating fundamental effects (polariton lasing, polariton bistability and multistability, polariton superfluidity). Fundamental knowledge obtained has allowed to formulate new concept of polariton based coherent light sources, all-optical information processing systems, and THz sources and detectors. The idea of the workshop is to bring together researchers working in the area of polaritonics and neighbouring areas in order to discuss recent progress and construct a roadmap for the development of new concepts of polaritonic devices and its commercialisation.

PRELIMINARY PROGRAMME

The format of the workshop will be one of short presentations by designated speakers with most of the time spent in informal discussion and round-table discussions. There will be no pre-circulated papers.

Tuesday 20 March 2012

Afternoon *Arrival*

19.00 *Get-together - Buffet welcoming reception, Grand Hotel Helio Cabala*

Wednesday 21 March 2012

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| 09.00-09.20 | Welcome by Convenor
Alexey Kavokin (University of Southampton, UK) |
| 09.20-09.40 | Presentation of the European Science Foundation (ESF)
Ana Helman (ESF Standing Committee for Physical and Engineering Sciences - PESC) |
| 09.40-12.40 | Morning Session |
| 09.40-10.10 | "Polariton condensates in optical traps"
Alberto Amo (LPN-CNRS, Marcoussis, France) |
| 10.10-10.40 | "Present status of polaritonic nonlinearities in planar III-nitride microcavities"
Rafael Butte (EPFL, Lausanne, Switzerland) |
| 10.40-11.00 | <i>Coffee Break</i> |
| 11.00-11.30 | "Polaritonic crystals: from optical response to Casimir effect"
Laura Piloizzi (CNR, Italy, Rome) |
| 11.30-12.00 | "Spatial correlation functions and topological defects in polariton condensates."
Marzena Szymanska (University of Warwick, Coventry, United Kingdom) |
| 12.00-12.40 | Discussion. |
| 12.40-14.00 | <i>Lunch</i> |
| 14.00-18.00 | Afternoon Session |
| 14.00-14.30 | "Polariton-electron mixtures"
Ivan Shelykh (Nanyang Technological University, Singapore; University of Iceland, Reykjavik, Iceland) |
| 14.30-15.00 | "Manipulating polariton condensates on a chip"
Pavlos Savvidis (University of Crete, Heraklion, Greece) |
| 15.00-15.30 | "Toward InGaN/GaN quantum well based polariton laser diodes: experimental and theoretical status"
Marlene Glauser (EPFL, Lausanne, Switzerland) |
| 15.30-16.00 | <i>Coffee / tea break</i> |

- 16.00-16.30 **"Universality class of polariton condensates"**
Natalia Berloff (University of Cambridge, United Kingdom)
- 16.30-18.00 **Discussion Workshop**
- 19.30 *Dinner*

Thursday 22 March 2012

- 09.00-12.40 Morning Session**
- 09.00-09.30 **"Universal infrared absorbance in graphene, silicene and germanene"**
Olivia Pulci (University of Rome Tor Vergata, Rome, Italy)
- 09.30-10.00 **"Model of the time-resolved polarised photoluminescence from resonantly excited p-doped InAs/GaAs quantum dots: Towards realistic modelling of a dot-cavity system"**
Gabriela Slavcheva (Imperial College London, United Kingdom)
- 10.00-10.30 **"Microcavity polaritons: quantum fluid phenomena and optoelectronic applications"**
Alberto Bramati (UPMC, Paris, France)
- 10.30-11.00 *Coffee / Tea Break*
- 11.00-11.30 **"Vortices and solitons formation in polariton Bose condensate"**
Nina Voronova (National Research Nuclear University MEPhI, Moscow, Russia)
- 11.30-12.00 **"Spin noise in quantum microcavities"**
Mikhail Glazov (Ioffe Institute, Saint-Petersburg, Russia)
- 12.00-12.40 **Discussion**
- 12.40-14.00 *Lunch*
- 14.00-18.30 Afternoon Session:**
- 14.00-14.30 **"Entanglement with Quantum Boxes"**
Tim Liew (EPFL, Lausanne, Switzerland)
- 4.30-15.00 **"Spontaneous harmonic oscillations and vortex lattices in polariton condensates"**
Guilherme Tosi (University of Cambridge, United Kingdom; University of Madrid, Spain)
- 15.00-15.30 **"Electronic and optical properties of graphene- and graphane-like SiC layers"**
Paola Gori (CNR, Italy, Rome)
- 15.30-16.00 *Coffee / tea break*
- 16.00-16.30 **"The thermodynamic model of the macroscopically ordered exciton state"**
Sergey Andreev (CNRS, University of Montpellier, France)
- 16.30-18.30 **discussion on follow-up activities. setting the main goals of the polaritonic devices implementation**
- 19.30 *Social dinner, Dancing hall*

Friday 23 March 2012

09.00-12.40	Morning Session
09.00-09.30	"Simulation of electrically driven polariton lasers" Aldo Di Carlo (University of Rome Tor Vergata, Rome, Italy)
09.30-10.00	"Electron Spin and Exciton Emission Polarization in Heterovalent Coupled Quantum Wells III-V/II-(Mn)-VI Structures" Fabio Liaci (Ioffe Institute, Saint-Petersburg, Russia)
10.00-10.30	"Polariton transistor: towards all-optical logics" Daniele Sanvitto (CNR, Lecce, Italy)
10.30-11.00	<i>Coffee / Tea Break</i>
11.00-11.30	"Vertical Cavity Surface Emitting Terahertz Lasers" Alexey Kavokin (University of Southampton, United Kingdom)
11.30-13.00	Collaborative work, development of new concepts of polaritonic devices
13.00-14.00	<i>Lunch</i>
14.30	<i>End of Workshop and departure</i>

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Objectives of the ESF Standing Committee for Physical and Engineering Sciences (PESC)

The **ESF Standing Committee for Physical and Engineering Sciences (PESC)** covers a broad number of fields from physics, chemistry, mathematics, informatics and computer sciences, to engineering, material and technical sciences. PESC has the following responsibilities and tasks:

- to develop scientific initiatives within the ESF operational framework;
- to make proposals for 'a la carte' scientific initiatives;
- to undertake studies on large research facilities and assist in the evaluations and assessments and other special reviews requested by Member Organisations;
- to provide specialist advice and input on a wide range of ESF actions and contribute to the development of the ESF science policy agenda and take a strategic view of the scientific area for which it has responsibility; and
- where appropriate, to work with other Committees and groups in promoting multidisciplinary and interdisciplinary activities.

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