Deliverable Report

Deliverable No: D5.3

Deliverable Title: Leaflets on project goals

Grant Agreement number: 255914

Project acronym: PHORBITECH

Project title: A Toolbox for Photon Orbital Angular Momentum Technology

Project website address: www.phorbitech.eu

Name, title and organisation of the scientific representative of deliverable's lead beneficiary (task leader):

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Naples, Italy

Deliverable table

Deliverable no.	D5.3
Deliverable name	Leaflet on project goals
WP no.	5
Lead beneficiary no.	1 (UNAP)
Nature	O
Dissemination level	PU
Delivery date from Annex I	Month 12
Actual delivery date	30 September 2011

D5.3) Leaflets on project goals: Leaflets and/or brochures on the project targets and first results, for distribution at events. Posting on project website. *[Excerpt from GA-Annex I DoW]*

A leaflet describing PHORBITECH's main concepts has been developed. It was designed to be graphically appealing and includes brief information about the project (name, funding scheme and list of participating institutions) and aims. To ensure effective dissemination to experts and non-experts, a few basic concepts have been included explained in an easy-to-understand, attractive fashion, and illustrated with images related to the results obtained within the project by consortium partners. The leaflet is targeted to a technical and non-technical audience and is intended for distribution at medium/large scientific events and/or public-at-large events.

The leaflet was circulated among all partners for suggestions, and discussed during the First Annual PHORBITECH meeting held in Castelldefels in September 2011. The suggestions of all partners have been incorporated in the leaflet together with new figures and photos.

A copy of the leaflet has been posted on the PHORBITECH website in the "Dissemination to the General Public" webpage.

Leaflet enclosed.

Project full title: "A Toolbox for Photon Orbital Angular Momentum Technology"
Grant agreement no: 255914
Funding scheme: THEME [ICT-2007.8.0] - [FET Open]
Duration: 1st October 2010/30 September 2013
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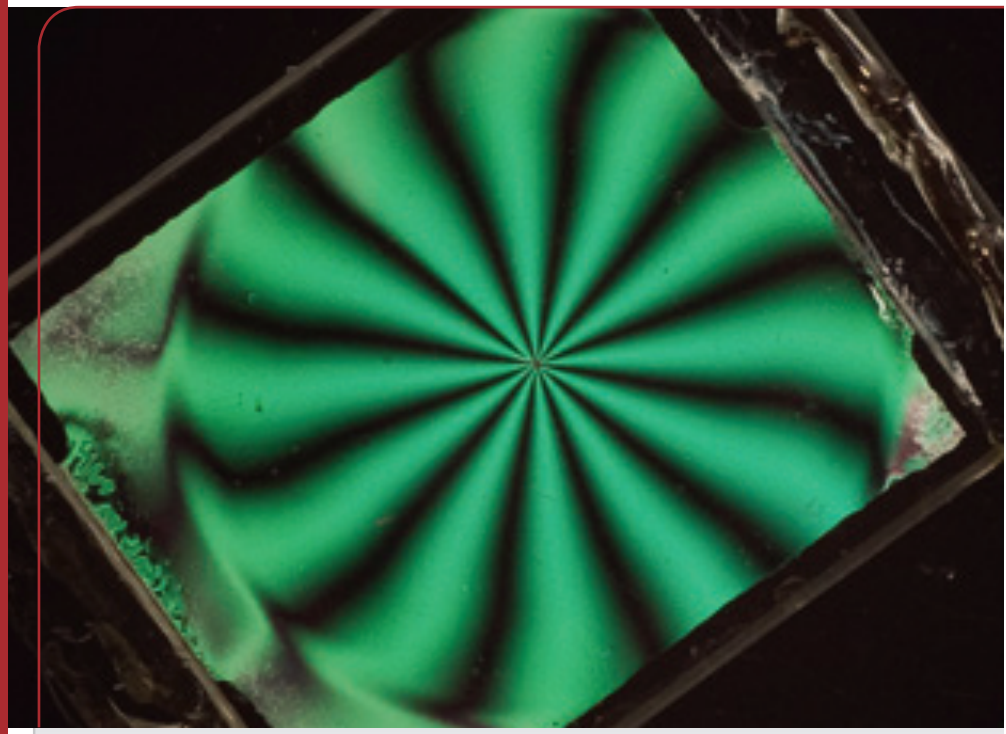
On the cover:
Prototype of electrically tunable q-plate, with topological charge $q = 3$, as seen between crossed polarizers. This device can be used for generating light beams carrying an Orbital Angular Momentum of $\pm 6\hbar$.

The project PHORBITECH acknowledges the financial support of the Future and Emerging Technologies (FET) programme within the Seventh Framework Programme for Research of the European Commission, under FET-Open grant number: 255914.

A Toolbox for Photon Orbital Angular Momentum Technology

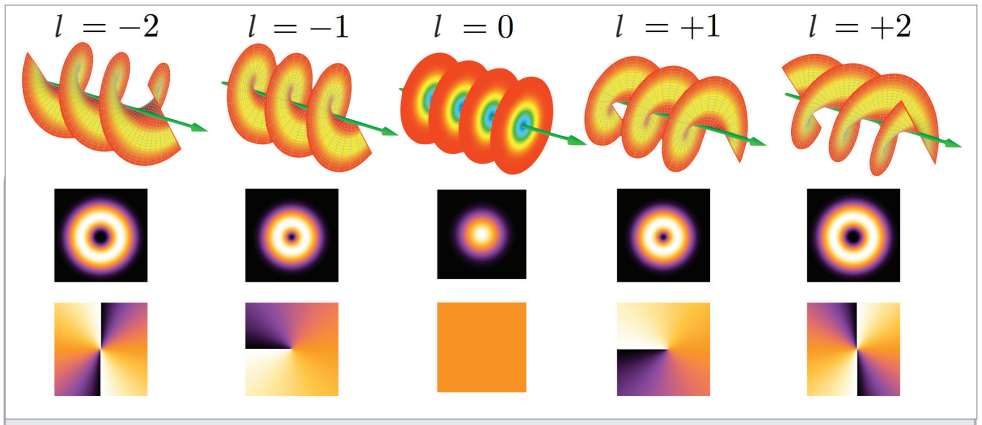
2010-2013



www.phorbitech.eu

What is the Orbital Angular Momentum (OAM) of Light?

Orbital angular momentum (OAM) is a physical property of light beams independent of wavelength and polarisation. A beam of light, while travelling approximately in a straight line, can be also rotating (or "twisting") around its own axis. This rotation, though not visible to the naked eye, can be revealed by the interaction of the light beam with matter and is associated with the transport of a conserved physical quantity: angular momentum. OAM, in particular, is a specific form of angular momentum that arises when the beam wavefront is structured in a helical shape (see figure), and the beam also carries an "optical vortex" at its core. OAM can be exploited for many applications, including encoding information, creating separate channels of communication within the same beam (multiplexing), detecting or sensing properties of illuminated materials, manipulating small particles, etc. Even single photons, the fundamental particles of light, can carry a well defined OAM. This could be exploited in the future in the emerging field of quantum information technology. This allows to extend quantum information techniques to high dimensional or hyperentangled systems.

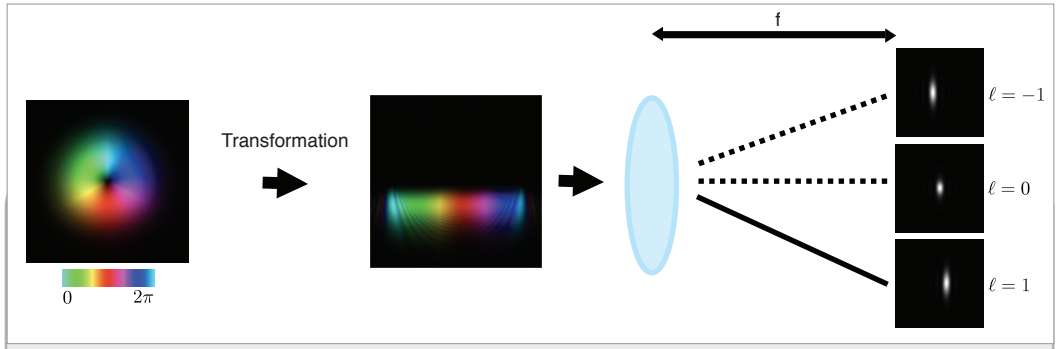


Schematic picture showing the helical wavefront structure (first row), intensity cross-section (second row), and phase cross-section (third row, in false colors) of light beams carrying nonzero OAM (as specified by the integer l in units of $\hbar$).

PHORBITECH Vision and Aims

PHORBITECH long-term vision is to make the OAM generation, manipulation, transmission and detection as easy and commonplace as currently is the management of other degrees of freedom, such as the polarization, both in the classical regime and in the quantum regime.
More specific aims are:

1) To develop a "toolbox" of highly innovative optical components and devices for the full and convenient control of OAM, including its generation, manipulation, transmission and detection.
2) To advance scientific knowledge by performing fundamental investigation of the concepts associated with these new optical devices.

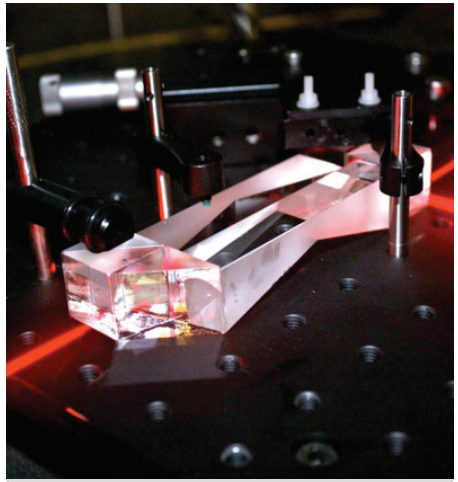


Demonstrated OAM sorting via phase unfolding

Possible applications of the orbital angular momentum of light

As an additional degree of freedom of light beams, OAM can be exploited in the photonic technology for a variety of purposes. Many applications of OAM have been already demonstrated in research laboratories at the proof-of-principle level.
The main application areas that can be currently envisioned for OAM are the following:

i) High-bandwidth information encoding
ii) Higher-dimensional quantum information encoding, for possible future quantum cryptography, quantum computation applications and fundamental tests of quantum mechanics.
iii) Orientational manipulation of particles or particle aggregates in optical tweezers
iv) Sensing and material analysis



Compact mode sorter based on an interferometer incorporating two Dove prisms. Martin P J Lavery et al 2011 New J. Phys. 13 093014

PHORBITECH group during the First Annual Meeting
ICFO, Castelldefels (Barcelona)
16-17 September 2011