NANYANG TECHNOLOGICAL UNIVERSITY

PAP Seminar Announcement

The Photonics Institute

Photorefractive soliton waveguiding

By

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Date: 3 December 2015, Thursday
Time: 2.30pm - 3.30pm
Venue: MAS Executive Classroom 1 (SPMS-MAS-03-06)
Host: Prof N. Zheludev

Abstract

Spatial solitons have attracted large interest in the last decades, especially those induced by photorefractive nonlinearities due to the possibility to be generated at low optical intensities (few-microwatt laser beams). Excitation of nonlinearities requires always stressing the physical system to drive it outside its harmonic response. Photorefractivity moves the stress from the optical to the electric regime, requiring not high luminous fluencies but intense static electric fields overlapped to light. This characteristics has induced the scientific community to investigate them, in order to carry out the whole solitonic physics using ultra-low beams.

Among all photorefractive media, lithium niobate (LiNbO3) is particularly interesting from the technological-applicability point of view mainly for two reasons:

A) It has a very long dielectric relaxation. Consequently, solitonic modifications induced in the host bulk crystal result practically permanent, with a very small degradation over months

B) It is the most used nonlinear medium in photonics: all the integrated devices, (acousto-optic or electro-optic modulators, Q-switches etc) due to its large amount of nonlinear properties .

The permanent characteristics of photorefractive nonlinearity in lithium niobate allows to use the soliton channels like waveguides. Solitonic waveguides are much more interesting than traditional ones because they are 3-dimensional and their refractive profile is self-optimized by light for the confined propagation, resulting in ultra-low propagation losses. We have estimated losses of the order or 0.07-0.04 dB/cm.

The introduction of solitonic waveguides in photonics might be as innovative as the magnetic recording on tapes was for music, with the possibility to record and delete traces whenever needed, using just laser diodes.

Short Biography

Eugenio Fazio is a professor of Optics and Experimental Physics at Sapienza Università di Roma, and since 1992 directs the Ultrafast Photonics Laboratory at the Department of Fundamental and Applied Sciences for Engineering. He is also one of the founders and the technical director of OptSensor s.r.l., a spin-off company of Sapienza Università di Roma.

His research interests are: Nonlinear optics, self confinement, spatial solitons and soliton waveguides in photorefractive media; Linear and nonlinear nano-photonics; Natural photonics: optical biomorphism, analysis of bio-photons emitted by germinating seeds and electromagnetic signalling, interaction of DNA-RNA macro-molecules with photons; Opto-electronic devices for medical investigations, environmental monitoring and industrial process controls. He has published about 150 scientific papers on international journals and several book chapters on linear and nonlinear optics, both integrated in waveguides or in bulk materials. He is topical editor of many scientific journals and acts as referee for the most prestigious physical and optical journals.

He is one of the chairs of Optical MicroSystems, the series of Topical Meetings of the European Optical Society. Within the framework of the UNESCO's International Year of Light, he organized in Roma Fiat-Lux, the first philosophic and scientific conference on the nature, meaning, understanding and use of Light.

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