PHOTONICA2015

V International School and Conference on Photonics
& COST actions: MP1204 and BM1205
& the Second international workshop "Control of light and matter waves propagation and localization in photonic lattices“
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Book of Abstracts

Editors
Suzana Petrović, Goran Gligorić and Milutin Stepić

Belgrade, 2015.

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24 August – 28 August 2015

Belgrade, Serbia

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Vinča Institute of Nuclear Sciences, Belgrade, Serbia

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ABSTRACTS OF TUTORIAL, KEYNOTE AND INVITED LECTURES AND CONTRIBUTED PAPERS

of

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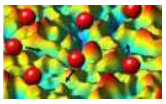
Conference Topics

1. Quantum optics
2. Nonlinear optics
3. Ultrafast phenomena
4. Laser spectroscopy
5. Devices and components
6. Biophotonics
7. Optical communications
8. Sensing: plasmonics, fiber optics and interferometers
9. Holography and adaptive optics
10. Optical materials

BMBS COST Action BM1205
European Network for Skin Cancer Detection using Laser Imaging
(24-28 August)

MPNS COST Action MP1204
TERA-MIR Radiation: Materials, Generation, Detection and Applications
(24-28 August)



WORKSHOP
Control of light and matter waves propagation and localization in photonic lattices
(28-29 August)

The **International School and Conference on Photonics- PHOTONICA**, is a biennial event held in Belgrade since 2007. The first meeting in the series was called ISCOM (International School and Conference on Optics and Optical Materials), but it was later renamed to Photonica to reflect more clearly the aims of the event as a forum for education of young scientists, exchanging new knowledge and ideas, and fostering collaboration between scientists working within emerging areas of photonic science and technology.

A particular educational feature of the program is to enable students and young researchers to benefit from the event, by providing introductory lectures preceding most recent results in many topics covered by the regular talks. In other words, apart from the regular lectures, the plenary speakers will also give tutorial lectures specifically designed for students and scientists starting in this field.

The Conference consists of oral presentations and vibrant poster sessions. The wish of the organizers is to provide a platform for discussing new developments and concepts within various disciplines of photonics, by bringing together researchers from academia, government and industrial laboratories for scientific interaction, the showcasing of new results in the relevant fields and debate on future trends. This year our conference will contribute celebration of the International Year of Light as a global initiative which will highlight to the citizens of the world the importance of light and optical technologies. This PHOTONICA 2015 will include two COST Action meetings and one workshop with the main objective to promote knowledge in various disciplines of photonics. In additional to the lectures and seminars, a Round Table "Scientific publishing: Editors et altera" will be organized where the editors will present editorial and publishing policies of their journals and share their experiences. Following the official program, the participants will also have plenty of opportunity to mix and network outside of the lecture theatre with planned free time and social events.

This book contains 219 abstracts of all presentations at the **5th International School and Conference on Photonics, PHOTONICA2015**. Authors from 50 countries from all continents will present their work at the conference. There will be six tutorial and seven keynote lectures to the benefits of students and young researches. Twenty four invited lectures, five progress reports of young Serbian researchers and thirty one contributed talks will present most recent results in their research fields. Within the two poster sessions, students and young researches will present 146 poster presentations on their new results in a cozy atmosphere of the Serbian academy of science and arts.

Belgrade, July 2015
Editors

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Light propagation through the composite linear photonic lattice containing two nonlinear defects

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Photonic lattices represent suitable systems for investigation of wave propagation in periodic structures [1]. However, different unavoidable defects may arise either during their process of fabrication or as result of misusage, accidental damage, etc. Although undesirable in the first place, these imperfections enable the existence of different types of stable, localized defect modes [2].

In this paper, we investigate light propagation through composite photonic lattice composed of two identical linear and lossless lattices. The interface between them represents a geometric defect, while each lattice contains a single nonlinear defect that is placed symmetrically with respect to the interface. Depending on the input light beam parameters (its position, width and transverse tilt), the width of geometric defect, strength and position of the nonlinear defects, different dynamical regimes have been identified. These dynamical regimes are caused by the balance of photonic lattice potentials' contributions originating from the presence of the geometric and two nonlinear defects.

We have found numerically conditions under which dynamically stable bounded modes can exist in the area between nonlinear defects or between a nonlinear and a geometric defect. Various types of localized modes such as: two-hump, multi-hump, one- and multi-component moving breathers localized at a certain area among defects have been observed. The parameters can be adjusted to capture light and to prevent light launched inside the area among defects to leave it, i.e. this corresponds to the appearance of the modes trapped inside this area. Since the configuration of the lattice prevents transmission of the light through the area confined by defects, these modes can formally be related to Fano resonances and Fano- blockade [3, 4]. When light is launched outside

the area among defects, different dynamical regimes have been distinguished: total reflection, single and double partial reflection and full transmission through the area among defects.

These numerical findings may lead to interesting applications such as blocking, filtering and transporting light beams through the optical medium. Photonic devices based on resonant tunneling such as waveguides interacting through the area between defects, may be applied as add-drop filters.

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On high power dynamically stable vortices in multicore optical fibers

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Vortex structures are widespread in nature (tornadoes, the Great Red Spot of Jupiter, and microscopic objects in quantum physics) [1]. Optical vortices are characterized by a wave field with zero intensity, undefined phase in the vortex center, a screw dislocation of the wave front and conservation of the topological charge. The vortex property most significant for applications, such as in optical traps, information transmission, multiplexing in communications and amplification of power in multi-core-fiber (MCF) based lasers, is their ability to carry orbital angular momentum and energy [2].

The mathematical model of the circularly coupled MCF without and with the central core is based on the general complex difference-differential Ginzburg-Landau equation. Here we considered its linear variant with identical small number of periphery cores including loss and gain, as well as, the nonlinear one without the loss-gain mechanisms [2,3].

The most significant finding is the stable propagation of high power vortices in the MCFs. They appeared as eigenvalue solutions of linear MCFs in both the configuration without and with central core [3]. In certain circumstances propagation of 'frozen' vortex