

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.

Book of abstracts



PHOTONICA2015

the Fifth international school and conference on
photonics

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24 August – 28 August 2015

Belgrade, Serbia

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Suzana Petrović, Goran Gligorić and Milutin Stepić

Vinča Institute of Nuclear Sciences, Belgrade, Serbia

Belgrade, 2015

ABSTRACTS OF TUTORIAL, KEYNOTE AND INVITED
LECTURES AND CONTRIBUTED PAPERS

of

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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



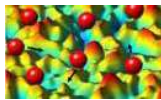
BMBS COST Action BM1205

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 addition 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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Estimation of the Sensitivity of a Multi-Parameter Fiber Grating Sensor

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In this paper, we use a powerful mathematical concept based on Fisher information (FI) to estimate the cross-sensitivity of multi-parameter sensors. FI has been used in various branches of natural and social sciences [1], in both classical and quantum systems [2]. Lately, it has been used for estimation of interferometer sensitivity in quantum optics [3], as well as in classical optical interferometers [4]. Here, we expand its application to fibre grating sensors that are sensitive to several environmental (temperature, humidity) and mechanical (strain, pressure, curvature) parameters simultaneously [5].

FI is a local probability measure of obtaining an unknown parameter θ from the data measured at the sensor output, X . In the theory of measurement, FI directly enters the relation which determines the lower bound of the measurement uncertainty known as Cramer-Rao bound ($CRB = 1/\sqrt{FI(\theta)}$). The sensor sensitivity is optimized by maximization of the corresponding FI. In the case of a multi-parameter sensor, FI assumes a matrix form defined via the probability distribution function $f(X|\theta)$ of the measured variable X conditioned by θ , where both X and θ are vector quantities.

$$FI(\theta)_{i,j} = -E \left[\frac{\partial^2 \ln f(X|\theta)}{\partial \theta_i \partial \theta_j} \right]; i = 1, 2, \dots, n; j = 1, 2, \dots, n.$$

Here, we develop a comprehensive model of the spectral response of fibre gratings to changes in multiple parameters and apply Fisher's formalism to optimize their sensitivity in the realistic parameter space. We start from a 1-parameter model of a long-period grating sensor of curvature and corroborate our approach by comparison with the conventional sensitivity models and the experimental data. We then expand the model to describe a 2-parameter long-period grating sensor of curvature and temperature. Based on this analysis, we recommend the multi-parameter interrogation scheme (estimator) and optimize grating parameters to render the highest sensitivity.

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