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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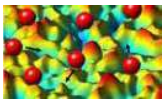
Conference Topics

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

Table of Contents

Nonlinear optics

Devices and components

Optical communication

studies are conducted by analyzing each block of the device, starting with the control loop of the DFB laser at 1560 nm.

In the optical part of the DFB laser stabilization loop, we demonstrate the existence of two etalon-like cavities. The associated optical interferences lead to frequency instabilities, of the DFB laser frequency, in the order of $2\text{-}6\cdot10^{-11}$ for averaging times between 5 and 60 seconds. We will also report on our spectroscopic studies to evaluate the accuracy and systematic frequency shifts due to, for instance, the Doppler-broadened component of the signal. Depending on the selected sub-Doppler transition, these shifts may be at the 10^{-9} level or higher and must therefore be well characterized in order to guarantee the overall system level specifications.

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Surface enhanced Raman spectroscopy of thiacyanine dye J-aggregates on single silver nanoaggregates

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Dye-coated colloidal metal nanoparticles (NPs) exhibit interesting optical properties originating from the interaction between metal core and dye shell. Depending on the interaction mechanism between the two, optical properties of dyes or NPs can be changed separately or jointly within the dye-NP assembly [1]. Many of the recent studies are focused on dyes which are able to self-assemble in highly oriented structures called J-aggregates on the surface of metallic NPs [2,3]. Owing to the variety of mechanisms by which dyes and their J-aggregates can interact with metallic NPs, dye-NP assemblies can lead to applications ranging from nanoscale sensing [4] to advanced composite materials for novel active and nonlinear optical devices [5].

Here we study the influence of TC concentration on its J-aggregation on the surface of AgNPs assemblies using Raman mapping and atomic force microscopy (AFM). Aqueous solutions (colloids) of citrate stabilized AgNPs with an average diameter of ~10 nm are mixed with TC dye solution and then deposited onto freshly cleaved highly oriented pyrolytic graphite and mica surfaces. The spectral signature of citrate ions is identified by (i) the O-H band around 220 cm^{-1}, (ii) the C-H band around 2950 cm^{-1} and (iii)

pronounced blinking in the 1000-1800 cm^{-1} range. In contrast, dye molecules adsorbed on nanoparticles are recognized by several stable Raman bands between 200 and 1600 cm^{-1}. In situ AFM measurements show that SERS 'hot spots' are formed either on large single nanoparticles (diameter > 100 nm) or within assemblies of small nanoparticles (with diameters in the 10 - 50 nm range). However, only the latter are found to yield a citrate or TC dye SERS signal. We find that the TC dye adsorbed on the surface of AgNP nanoassemblies always forms J-aggregates when the dye concentration in the TC-AgNP solution is varied between 0.5μM and 17μM. Even though, a clear SERS spectra of dye J-aggregates can be acquired for high dye concentration (17μM) the citrate ions always exist on the AgNP surface and so does their SERS signature in form of O-H (220 cm-1) and C-H (2960 cm-1) bands. Assemblies with low TC concentration (0.5μM) do not have a clear dye SERS spectra, but rather spectra similar to the one of citrate ions meaning that either not all AgNPs are dye coated, or rather that the amount of TC molecules adsorbed on the surface of the nanoparticle is small and hence not detectable.

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Measurements of Rb hyperfine splitting with a femtosecond optical frequency comb

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The femtosecond laser frequency comb spectrum is composed of many thousands equidistantly spaced modes [1]. One could simply imagine it as a ruler consisting of narrow modes at known optical frequencies. It has provided us with optical clocks which use optical frequency standards and a clock operating at a higher frequency is more precise.

The advent of precision femtosecond optical combs brings a new set of tools for precision atomic and molecular spectroscopy. For example, it can be used for precision spectroscopy of electronic transitions [2]. The absolute frequency can be determined by