



# 5<sup>th</sup> Conference on Elementary Processes in Atomic Systems

*Belgrade, Serbia, June 21 - 25, 2011*



## CEPAS 2011 & CEAMPP 2011

CONTRIBUTED PAPERS  
&  
ABSTRACTS OF INVITED LECTURES

*Editors*

Aleksandar R. Milosavljević

Saša Dujko

Bratislav P. Marinković

**IPB** Institute of Physics  
Belgrade - Serbia

2<sup>nd</sup> National Conference on Electronic,  
Atomic, Molecular and Photonic Physics



**IPB** CEPAS 2011

Abstracts and Contributed Papers

ISBN 978-86-82441-32-8



**5<sup>th</sup> Conference on Elementary Processes  
in Atomic Systems**



**2<sup>nd</sup> National Conference on Electronic,  
Atomic, Molecular and Photonic Physics**

**CEPAS 2011 & CEAMPP 2011**

**CONTRIBUTED PAPERS  
&  
ABSTRACTS OF INVITED LECTURES**

*Editors*

**Aleksandar R. Milosavljević, Saša Dujko and Bratislav P. Marinković**

Institute of Physics  
Belgrade, Serbia

Belgrade, 2011

CONTRIBUTED PAPERS & ABSTRACTS OF INVITED LECTURES  
of the  
5<sup>th</sup> CONFERENCE ON ELEMENTARY PROCESSES IN ATOMIC  
SYSTEMS  
and the satellite meeting  
2<sup>nd</sup> NATIONAL CONFERENCE ON ELECTRONIC, ATOMIC,  
MOLECULAR AND PHOTONIC PHYSICS

21<sup>st</sup> – 25<sup>th</sup> June 2011  
Belgrade, Serbia

*Editors*

**Aleksandar R. Milosavljević, Saša Dujko and Bratislav P. Marinković**

*Publisher*

Institute of Physics  
Pregrevica 118, P. O. Box 68  
11080 Belgrade, Serbia

*Computer processing*

Aleksandar R. Milosavljević, Sanja D. Tošić, Nikola Škoro, Maja Rabasović and Saša Dujko

*Printed by*

*SZR "Kragulj"*

Kneza Višeslava 88, Belgrade

*Number of copies*

150

ISBN

©2011 by the Institute of Physics, Belgrade, Serbia. All rights reserved. No part of this book may be reproduced, stored or transmitted in any manner without the written permission of the Publisher.

## PREFACE

This book contains the Contributed papers and abstracts of the Invited lectures to be presented at the 5<sup>st</sup> Conference on Elementary Processes in Atomic Systems – CEPAS 2011 and 2<sup>nd</sup> National Conference on Electronic, Atomic, Molecular and Photonic Physics – CEAMPP 2011.

The Conference on Elementary Processes in Atomic Systems (CEPAS) is held triennially to promote the growth and exchange of scientific information in the field of photo-processes and laser collisions, electron (positron)/atom collisions, collisions with biomolecules, heavy particles (ion/atom) collisions, interactions with surfaces and processes with nano-sized complex systems. The first conference in the CEPAS series was organized in Uzhorod (Ukraine, 2000), the second one in Gdańsk (Poland, 2002), the third in Miskolc (Hungary, 2005), the fourth in Cluj-Napoha (Romania, 2008) and the present fifth in Belgrade (Serbia, 2011). In all of these places, scientific research has been well established in particular fields that highlight the conference topics but the given opportunity to organize the CEPAS conference leads to further promotion of science and local research groups, thus receiving the full international recognition. The scientific program of the CEPAS 2011 consists of sessions of invited plenary (30 min) and topical (25 min) lectures. Contributed papers are presented as posters in afternoon sessions.

The National Conference on Electronic, Atomic, Molecular and Photonic Physics - CEAMPP is now a traditional national conference covering a wide range of scientific topics in atomic and molecular physics. The CEAMPP aims to bring together and support collaboration between different groups working basically in various fields of atomic and molecular physics, so to induce new ideas and interdisciplinary research. The focus of the CEAMPP is placed upon the young and distinguished researchers, who will be invited to give the most of the lectures at the conference. Still, the CEAMPP aims to preserve a high scientific level with the goal of presenting the frontier results both in Serbia and worldwide.

We are grateful for the support to Ministry of Education and Science of Republic of Serbia, Embassy of France in Belgrade, Embassy of Austria in Belgrade, Framework programme 7 project "Virtual Atomic and Molecular Data Centre" - VAMDC, Springer's journal "European Physical Journal D: Atomic, Molecular, Optical and Plasma Physics". We also acknowledge the support of Serbian Academy of Science and Arts and Institute of Physics, University of Belgrade. Finally, we are also grateful to Astra travel agency for technical organization of the conference.

The Editors would like to thank the members of the International Advisory Board of CEPAS 2011 and Scientific Committee of CEAMPP 2011 for their efforts in proposing the program of the conference, as well as plenary and topical invited lectures. Finally, we acknowledge the support of all members of the Organizing Committee who contributed to the preparing and running of the conference.

The participants have been asked to send their papers in a format already prepared for publication. After peer review of contributions, the basic corrections have

been made to meet general form of the book and to avoid, as much as possible, typing, spelling and grammatical errors. The Editors apologize for all mistakes that emerged from the preparation process and software problems in the process of printing.

Finally we would like to thank all the invited speakers and the participants for taking part in CEPAS 2011 and CEAMPP 2011 and to wish them to have a pleasant stay in Belgrade.

Belgrade, June, 2011

Editors

## ACKNOWLEDGEMENT

5<sup>th</sup> CONFERENCE ON ELEMENTARY PROCESSES IN  
ATOMIC SYSTEMS  
&  
2<sup>nd</sup> NATIONAL CONFERENCE ON ELECTRONIC, ATOMIC,  
MOLECULAR AND PHOTONIC PHYSICS

*are organized by the*

**Institute of Physics  
Belgrade, Serbia**

*in collaboration with the*

**Serbian Academy of Sciences and Arts**

*and under the auspices and with the support of the*

**Ministry of Education and Science, Republic of Serbia**

*and also sponsored by:*



## **CONFERENCE TOPICS**

### **CEPAS 2011**

1. Photo-processes and laser collisions
2. Electron(positron)/atom collisions
3. Collisions with biomolecules
4. Heavy particles (ion/atom) collisions
5. Interactions with surfaces
6. Processes with nano-sized complex systems

### **CEAMPP 2011**

1. Atomic and Molecular Structure and Properties
2. Collision Processes
3. Photon Interaction with Atoms and Molecules



# CEPAS 2011

## ADVISORY BOARD

**Bratislav P. Marinković,**

Institute of Physics, University of  
Belgrade, Serbia

**Károly Tókési,**

MTA Atomki Debrecen, Hungary

**Zoran Lj. Petrović,**

Institute of Physics, University of  
Belgrade and Serbian Academy of  
Sciences and Arts, Serbia

**Mariusz Zubek,**

Gdańsk University of Technology,  
Poland

**Jiří Horáček,**

Charles University, Prague, Czech  
Republic

**Gustavo Garcia Gomez-Tejedor,**

Instituto de Fisica Fundamental, CSIC  
Madrid, Spain

**Joachim Burgdörfer,**

Vienna University of Technology,  
Austria

**John A. Tanis,**

Western Michigan University, USA

**Friedrich Aumayr,**

Vienna University of Technology,  
Austria

**Robert DuBois,**

Missouri University of Science and  
Technology, Rolla, USA

**Andrey Solov'yov,**

Frankfurt Institute for Advanced  
Studies, Goethe University, Germany

**Ladislau Nagy,**

Facultatea de Fizica, Universitatea  
Babeş-Bolyai, Romania

**Viorica Stancalie,**

National Institute for Laser, Plasma  
and Radiation Physics, Magurele,  
Romania

**Nigel J. Mason,**

OBE, The Open University, United  
Kingdom

**Otto B. Shpenik,**

Institute of Electron Physics, National  
Academy of Sciences, Ukraine

## ORGANIZING COMMITTEE

(Institute of Physics, University of Belgrade, Serbia)

**Bratislav P. Marinković,** Chair

**Aleksandar R. Milosavljević,** Secretary

**Nenad Simonović**

**Saša Dujko**

**Nikola Škoro**

**Sanja Tošić**

**Maja Rabasović**

**Jelena Maljković**

**Dalibor Radosavljević**

**Branko Petruševski**

# CEAMPP 2011

## SCIENTIFIC COMMITTEE

**Bratislav P. Marinković,**

Institute of Physics, University of  
Belgrade, Serbia

**Zoran Lj. Petrović,**

Institute of Physics, University of  
Belgrade and Serbian Academy of  
Sciences and Arts, Serbia

**Jozo J. Jureta,**

Institute of Physics, University of  
Belgrade, Serbia

**Miljenko N. Perić,**

Faculty for Physical Chemistry,  
University of Belgrade, Serbia

**Nenad Simonović,**

Institute of Physics, University of  
Belgrade, Serbia

**Sonja Jovičević,**

Institute of Physics, University of  
Belgrade, Serbia

**Goran Poparić,**

Faculty of Physics, University of  
Belgrade, Serbia

**Aleksandar R. Milosavljević,**

Institute of Physics, University of  
Belgrade, Serbia

## ORGANIZING COMMITTEE

(Institute of Physics, University of Belgrade, Serbia)

**Saša Dujko,** Chair

**Nikola Škoro**

**Sanja Tošić**

## CEAMPP/ CEPAS 2011 PROGRAM

Tuesday 21 <sup>st</sup> June 2011		
2 <sup>nd</sup> National Conference on Electronic, Atomic, Molecular and Photonic Physics - CEAMPP		
(PL – Plenary lecture: 25+5 min; PR – Progress report: 15+5 min)		
08:00-09:15	Registration (CEAMPP)	
09:15-09:30	Opening (CEAMPP), Chair: Saša Dujko	
	<b>Plenary Session</b> , Chair: Aleksandar Milosavljević	
09:30-10:00	<i>Dynamics of dissociative electron attachment to small molecules</i>	<b>Juraj Fedor</b> , University of Fribourg, Switzerland
10:00-10:30	<i>Soft X-ray spectroscopy of molecules and biomolecules</i>	<b>Christoph Nicolas</b> , SOLEIL Synchrotron, Saint-Aubin, France
10:30-11:00	<i>Grazing incidence fast atom diffraction on different materials</i>	<b>Nenad Bundaleski</b> , CEFITEC, Caparica, Portugal
<b>11:00-11:30</b>	<b>Coffee break</b>	
	<b>Session 2</b> , Chair: Saša Dujko	
11:30-11:50	<i>On the propagation of positive streamers in N<sub>2</sub>:O<sub>2</sub> mixtures</i>	<b>Gideon Wormeester</b> , CWI, Amsterdam, The Netherlands
11:50-12:10	<i>Numerical modeling of buffer gas positron traps</i>	<b>Srđan Marjanović</b> , Institute of Physics, Belgrade, Serbia
12:10-12:30	<i>Absolute cross sections for electron scattering from metal vapours</i>	<b>Sanja Tošić</b> , Institute of Physics, Belgrade, Serbia
12:30-12:50	<i>Excitation of molecules by low-energy electrons</i>	<b>Miroslav Ristić</b> , Faculty of Physics, Belgrade, Serbia
<b>13:00-15:00</b>	<b>Lunch break</b>	
	<b>Session 3</b> , Chair: Nenad Simonović	
15:00-15:20	<i>Ab initio calculation of low-lying vibronic levels in the ground X<sup>2</sup>Π<sub>u</sub> electronic state of dicyanoacetylene cation</i>	<b>Radomir Ranković</b> , Faculty of Physical Chemistry, Belgrade, Serbia
15:20-15:40	<i>Theoretical study of the Jahn-Teller effect</i>	<b>Maja Gruden Pavlović</b> , Faculty of Chemistry, Belgrade, Serbia
15:40-16:00	<i>Coherent effects in laser driven rubidium vapor</i>	<b>Milan Radonjić</b> , Institute of Physics, Belgrade, Serbia
16:00-16:20	<i>Monte Carlo modeling of Townsend discharges in hydrogen</i>	<b>Vladimir Stojanović</b> , Institute of Physics, Belgrade, Serbia
<b>16:20-16:40</b>	<b>Coffee break</b>	

16:45-18:00	Poster session (CEAMPP)	
18:00-19:00	Registration (CEPAS)	
<b>19:00</b>	<b><i>Welcome party for CEAMPP and CEPAS participants</i></b>	
<b>Wednesday 22<sup>nd</sup> June 2011</b>		
<b>5<sup>th</sup> Conference on Elementary Processes in Atomic Systems - CEPAS</b>		
<i>(PL – Plenary lecture: 30+5 min; TL – Topical lecture: 20+5 min)</i>		
08:00-08:45	Registration (CEPAS)	
08:45-09:00	Opening (CEPAS), Chair: Bratislav P. Marinković	
	<b>Plenary Session</b> , Chair: Zoran Lj. Petrović	
09:00-09:35	<i>Positronium negative ion experiments</i>	<b>Yasuyuki Nagashima</b> , Tokyo University of Science, Japan
09:35-10:10	<i>Imaging electron/ion coincidences for gas phase photoionization studies of chiral systems on the DESIRS beamline at SOLEIL</i>	<b>Laurent Nahon</b> , SOLEIL synchrotron, France
<b>10:10-10:40</b>	<b>Coffee break</b>	
	<b>Session 2</b> , Chair: Nigel Mason	
10:40-11:05	<i>Cross sections for elastic electron scattering from iodine</i>	<b>Michael Brunger</b> , Flinders University, Australia
11:05-11:30	<i>Quantum interferences in atomic ionization by short laser pulses</i>	<b>Diego Arbó</b> , Astronomia y Física del Espacio, Buenos Aires , Argentina
11:30-11:55	<i>Electron driven processes in biomolecules</i>	<b>Janina Kopyra</b> , University of Podlasie, Poland
11:55-12:20	<i>Multi- photon ionization of biomolecular clusters</i>	<b>Sam Eden</b> , The Open University, UK
<b>12:30-15:00</b>	<b>Lunch break</b>	
	<b>Session 3</b> , Chair: Robert DuBois	
15:00-15:25	<i>Coherent wavepacket shaping in high Rydberg states</i>	<b>Shuhei Yoshida</b> , Vienna University of Technology, Austria
15:25-15:50	<i>Positron scattering from krypton</i>	<b>James Sullivan</b> , Australian National University, Australia
15:50-16:15	<i>Absolute differential cross sections for electron scattering from building blocks of biopolymers</i>	<b>Aleksandar Milosavljević</b> , Institute of Physics Belgrade, Serbia
<b>16:15-16:35</b>	<b>Coffee break</b>	

	<b>Session 4, Chair: Viorica Stancalie</b>	
16:35-17:00	<i>Differential cross sections of some noble atoms studied by fast electron impact and inelastic x-ray scattering</i>	<b>Lin-Fan Zhu,</b> Hefei National Laboratory for Physical Sciences at Microscale, China
17:00-17:25	<i>The effect of temperature on guiding of slow highly charged ions through mesoscopic glass capillaries</i>	<b>Réka Bereczky,</b> ATOMKI, Debrecen, Hungary
<b>17:30-19:00</b>	<b>Poster session (1)</b>	
<b>Thursday 23<sup>rd</sup> June 2011</b>		
	<b>Plenary Session, Chair: Bratislav P. Marinković</b>	
09:00-09:35	<i>Effect of projectile coherence on atomic fragmentation processes</i>	<b>Michael Schulz,</b> Missouri University of Science and Technology, USA
09:35-10:10	<i>Collisions with biomolecules: negative ion formation</i>	<b>Paulo Limão-Vieira,</b> Universidade Nova de Lisboa, Portugal
<b>10:10-10:40</b>	<b>Coffee break</b>	
	<b>Session 2, Chair: Paulo Limão-Vieira</b>	
10:40-11:05	<i>Hard X-ray polarimetry in energetic ion-atom collisions</i>	<b>Günter Weber,</b> Helmholtz Institute Jena, Germany
11:05-11:30	<i>Photoionization study of trapped biopolymer ions in the gas phase</i>	<b>Alexandre Giuliani,</b> SOLEIL synchrotron, France
11:30-11:55	<i>Spatially resolved transport properties for electrons in gases: Definition, interpretation, and calculation</i>	<b>Saša Dujko,</b> Institute of Physics Belgrade, Serbia
11:55-12:20	<i>Excitation reactions studied by electron induced fluorescence method</i>	<b>Juraj Országh,</b> Comenius University Bratislava, Slovakia
<b>12:30-15:00</b>	<b>Lunch break</b>	
	<b>Session 3, Chair: Károly Tőkési</b>	
15:00-15:25	<i>On deviations from theory of electron-atom elastic scattering cross sections</i>	<b>Raymond Moreh,</b> Ben-Gurion University of the Negev, Israel
15:25-15:50	<i>Photofragmentation of organic molecules of biological interest</i>	<b>Paola Bolognesi,</b> CNR-IMIP, Italy
15:50-16:15	<i>Electron-impact and thermal fragmentation of the amino acid molecules: mechanisms and structure of the molecules</i>	<b>Alexander Snegursky,</b> Institute of Electron Physics Uzhgorod, Ukraine
16:15-16:40	<i>Nanostructures formed on various surfaces due to the impact of individual slow highly charged ions</i>	<b>Robert Ritter,</b> Vienna University of Technology, Austria
<b>16:40-17:00</b>	<b>Coffee break</b>	

<b>17:00-18:30</b>	<b>CEPAS Advisory Board meeting</b>	
<b>19:30</b>	<i>Concert</i>	
<b>Friday 24<sup>th</sup> June 2011</b>		
	<b>Plenary Session, Chair: Friedrich Aumayr</b>	
09:00-09:35	<i>Inelastic transitions of atoms (and molecules) induced by van der Waals interaction with a surface</i>	<b>Jacques Baudon,</b> University Paris 13, France
09:35-10:10	<i>Ions Colliding with Cold Polycyclic Aromatic Hydrocarbon Clusters</i>	<b>Patrick Rousseau,</b> CIMAP Caen, France
<b>10:10-10:40</b>	<b>Coffee break</b>	
	<b>Session 2, Chair: Jiří Horáček</b>	
10:40-11:05	<i>Laser Raman scattering from biomolecules in nanoparticles-embedded tissue</i>	<b>Simona Cintă Pinzaru,</b> Babes-Bolyai University, Romania
11:05-11:30	<i>Scattering from biomolecules in helium droplets</i>	<b>Stefan Denifl,</b> University of Innsbruck, Austria
11:30-11:55	<i>Channeling of charged particles through carbon nanotubes</i>	<b>Duško Borka,</b> Vinča Institute of Nuclear Sciences, Serbia
11:55-12:20	<i>Resonant inelastic collisions of electrons with diatomic molecules</i>	<b>Karel Houfek,</b> Institute for Theoretical Physics Prague, Czech Republic
<b>12:30-15:00</b>	<b>Lunch break</b>	
	<b>Closing session, Chair: Andrey Solov'yov</b>	
15:00-15:35	<i>Classical theory of atomic collisions – the first hundred years</i>	<b>Petar Grujić,</b> Institute of Physics Belgrade, Serbia
15:35-16:00	<i>Thermo-mechanical impact on biomolecules induced by heavy ions</i>	<b>Alexander V. Yakubovich,</b> Frankfurt Institute for Adv. Studies, Germany
16:00-16:25	<i>Ion Interactions with Graphene</i>	<b>Zoran Mišković,</b> University of Waterloo, Canada
<b>16:30-16:50</b>	<b>Coffee break</b>	
<b>16:50-18:20</b>	<b>Poster session (2)</b>	
<b>20:00</b>	<i>Conference dinner</i>	
<b>Saturday 25<sup>th</sup> June 2011</b>		
<b>10:00</b>	<b>Excursion</b>	

# CONTENTS

## CEPAS 2011

### Abstracts of Invited Plenary Lectures

- L. Nahon*  
Imaging electron/ion coincidences for gas phase photoionization studies of chiral systems on the DESIRS beamline at SOLEIL .....5
- Y. Nagashima*  
Positronium negative ion experiments .....6
- P. Limão-Vieira*  
Collisions with biomolecules: negative ion formation .....7
- M. Schulz, K. Egodapitiya, S. Sharma, A.C. Laforge, R. Moshhammer, A. Hasan, D.H. Madison*  
Effect of projectile coherence on atomic fragmentation processes .....8
- J. Baudon, M. Hamamda, M. Boustimi, V. Bocvarski, T. Taillandier-Loize, G. Dutier, F. Perales and M. Ducloy*  
Inelastic transitions of atoms (and molecules) induced by van der Waals interaction with a surface .....10
- P. Rousseau, A. I. S. Holm, A. Ławicki, H. Zettergren, M. Capron, H. A. B. Johansson, E. Lattouf, S. Maclot, R. Maisonny, F. Seitz, A. Domaracka, A. Méry, J.-C. Poully, J. Rangama, S. Rosén, H. T. Schmidt, L. Adoui, B. Manil, H. Cederquist, B. A. Huber*  
Ions colliding with cold polycyclic aromatic hydrocarbon clusters .....11
- P. Grujić*  
Classical theory of atomic collisions – the first hundred years .....12

### Abstracts of Invited Topical Lectures

- S. Yoshida, C. O. Reinhold, J. Burgdorfer, B. Wyker, S. Ye, F. B. Dunning*  
Probing the coherent evolution of wavepackets in high Rydberg states .....15
- D. G. Arbó*  
Quantum interferences in atomic ionization by short laser pulses.....16
- P. Bolognesi, P. O’Keeffe, L. Avaldi*  
Photofragmentation of organic molecules of biological interest .....17
- J. Országh, M. Danko, A. Ribar, Š. Matejčík*  
Excitation reactions studied by electron induced fluorescence method .....18  
Lin-Fan Zhu and Ya-Wei Liu
- Lin-Fan Zhu and Ya-Wei Liu*  
Differential cross sections of some noble atoms studied by fast electron impact and inelastic x-ray scattering .....19

<i>M. J. Brunger, L. R. Hargreaves, D. B. Jones, R. Murrie, J. R. Brunton, O. Zatsarinny, K. Bartschat, G. García, F. Blanco, M. Hoshino, S. J. Buckman</i>	
Cross sections for elastic electron scattering from iodine .....	21
<i>R. Moreh, D. Nemirovsky</i>	
On deviations from theory of electron-atom elastic scattering cross sections .....	22
<i>S. Dujko, R. D. White, Z. M. Raspopović, Z. Lj. Petrović</i>	
Spatially resolved transport properties for electrons in gases: definition, interpretation, and calculation .....	23
<i>J. P. Sullivan</i>	
Positron scattering from krypton .....	24
<i>K. Houfek, M. Čížek, J. Horáček</i>	
Resonant inelastic collisions of electrons with diatomic molecules .....	25
<i>J. Kopyra, H. Abdoul-Carime, E. Illenberger</i>	
Electron driven processes in biomolecules .....	26
<i>A. Giuliani, A. R. Milosavljević, C. Nicolas, M. Réfrégiers, L. Nahon</i>	
Photoionization and photodetachment study of trapped biopolymer ions in the gas phase .....	27
<i>A. R. Milosavljević, F. Blanco, J. B. Maljković, G. García, B. P. Marinković</i>	
Absolute differential cross sections for electron scattering from building blocks of biopolymers .....	28
<i>A. V. Yakubovich, E. Surdutovich, A.V. Solov'yov</i>	
Thermo-mechanical impact on biomolecules induced by ion beams propagating in biological medium as seen from molecular dynamics simulations .....	29
<i>J. Tamuliene, L.G. Romanova, V.S. Vukstich, A.V. Snegursky</i>	
Electron-impact and thermal fragmentation of the amino acid molecules: mechanisms and structure of the molecules .....	30
<i>G. Weber, H. Bräuning, S. Fritzsche, S. Hess, R. Martin, R. Reuschl, U. Spillmann, A. Surzhykov, D. F. A. Winters, Th. Stöhlker</i>	
Title of the hard X-ray polarimetry in energetic ion-atom collision .....	31
<i>I. Radović, V. Borka Jovanović, D. Borka, Z. L. Mišković</i>	
Wake effect in the polarization of graphene by slowly moving charges .....	32
<i>D. Borka</i>	
Channeling of charged particles through carbon nanotubes .....	33
<i>R. J. Bereczky, G. Kowarik, F. Ladinig, K. Tőkés, F. Aumayr</i>	
The effect of temperature on guiding of slow highly charged ions through mesoscopic glass capillaries .....	34
<i>S. Cintă Pinzaru, A. Falamas, C. Dehelean</i>	
Laser Raman scattering from biomolecules in nanoparticles-embedded tissue .....	35
<i>S. Denifl, F. Ferreira da Silva, P. Bartl, A. M. Ellis, T. D. Märk, P. Scheier</i>	
Scattering from biomolecules in helium droplets .....	36



<i>S. Eden, B. Barc, P. Cahillane, N. J. Mason</i> Nanosecond-timescale UV multi-photon ionization of DNA base monomers and hydrated clusters .....	37
<i>R. Ritter, G. Kowarik, R. A. Wilhelm, R. Heller, R. Ginzl, L. Maunoury, M. Toulemonde, C. Dufour, H. Lebius, R. M. Papaléo, W. Rupp, Q. Shen, C. Teichert, S. Facsko, J. R. Crespo López-Urrutia, J. Ullrich, F. Aumayr</i> Nanostructures formed on various surfaces due to the impact of individual slow highly charged ions .....	38

### Abstracts of Poster Contributions

<i>D. G. Arbó, K.L. Ishikawa, E. Persson and J. Burgdörfer</i> Intracycle interferences traces in 2D-momentum distribution of atomic photoionization.....	41
<i>M. Boca, V. Dinu, V. Florescu</i> Spin effects in nonlinear Compton scattering in a plane-wave laser pulse .....	42
<i>D. B. Popović, I. P. Mendaš</i> Multiphoton excitation in a $\Gamma$ -type three-level system with generally nondegenerate excited states .....	43
<i>G. Buica</i> Propagation of a laser pulse train under electromagnetically induced transparency conditions .....	44
<i>M. Vatasescu</i> Preparing isolated vibrational wave packets by light-induced molecular potentials with chirped laser pulses .....	45
<i>J. Dimitrijević, D. Arsenović and B. M. Jelenković</i> Perturbative solution for analysis of processes in a double- $\Lambda$ atomic scheme ....	46
<i>S. Vučić</i> Electronic densities associated with atomic resonances in laser fields .....	47
<i>I. L. Glukhov</i> Blackbody radiation induced excitation and decay of Rydberg states in potassium .....	48
<i>M. Klenivskiy, V. Kelman, Yu. Zhmenyak, Yu. Shpenik</i> Luminescence of exciplex XeCl*- and XeBr*- molecules excited by an electric discharge in the Xe/CsCl/CsBr gas-vapor mixture .....	49
<i>M. S. Rabasović, D. Šević, M. Terzić, B. P. Marinković</i> Time resolved laser induced fluorescence measurements: considerations when using Nd:YAG based system .....	50
<i>M. S. Rabasović, D. Šević, V. Pejčev, B. P. Marinković</i> Detecting indium spectral lines using electron spectroscopy and laser induced breakdown spectroscopy .....	51
<i>J. Országh, M. Danko, M. Lacko, Š. Matejčík</i> Nitrogen first negative system studied by electron induced fluorescence .....	52

<i>M. Popović, G. Poparić</i>	
Optimizing the parameters for maximal ion extraction efficiency in time-of-flight mass spectroscopy .....	53
<i>V. I. Kelemen, E. Yu. Remeta</i>	
Spin exchange asymmetry in the elastic electron scattering by Eu atom .....	54
<i>B. Paripás, B. Palásthy, M. Žitnik</i>	
Experimental (e,2e) study of resonant Auger states of Ar .....	55
<i>T. Mukoyama, Y. Nagashima, K. Tőkési</i>	
K-shell ionization of Cu by positron impact .....	56
<i>K. Tőkési</i>	
Site selective electron capture in low energy positron and argon collisions .....	57
<i>N. V. Delić, J. P. Šetrajčić, S. Armačević, I. J. Šetrajčić</i>	
Possible structure of electron and positron .....	58
<i>N. Simonović</i>	
The collinear versus 3D adiabatic model for helium atom in hyperspherical coordinates .....	59
<i>A. Nina, V. Čadež, D. Šulić, V. Srećković</i>	
Altitude distribution of electron concentration in the ionospheric D-region in presence of time-varying solar radiation flux .....	60
<i>A. Nina, V. Čadež, D. Šulić, V. Srećković, V. Žigman</i>	
Effective electron recombination coefficient in the ionospheric D-region during the relaxation regime following a solar flare on February 18, 2011 .....	61
<i>V. Stojanović, Ž. Nikitović, Z. Lj. Petrović</i>	
Title of the Monte Carlo modeling of electrons and heavy particles in pure H <sub>2</sub> discharge .....	62
<i>S. Marjanović, M. Šuvakov, J. J. Engbrecht, Z. Lj. Petrović</i>	
Numerical modeling of positronium thermalization .....	63
<i>M. Radmilović-Radjenović, B. Radjenović, M. Savić</i>	
Modelling of microhollow cathode discharges in argon at atmospheric pressures .....	64
<i>M. Klas, Š. Matejčik, B. Radjenović, M. Radmilović-Radjenović</i>	
The secondary emission coefficient for air .....	65
<i>A. Banković, S. Dujko, R. D. White, S. J. Buckman, Z. Lj. Petrović</i>	
Monte Carlo simulation and Boltzmann equation analysis of non-conservative positron transport in H <sub>2</sub> .....	66
<i>V. Stojanović, Z. Raspopović, J. Jovanović, S. Radovanov, Ž. Nikitović, Z. Lj. Petrović</i>	
Transport properties of positive ions in BF <sub>3</sub> plasmas .....	67
<i>V. Stancalie</i>	
Contribution of near threshold states to dielectronic recombination in Li-like Al and C ions .....	68
<i>J. B. Maljković, F. Blanco, G. García, B. P. Marinković, A. R. Milosavljević</i>	
Elastic electron scattering from formamide molecule .....	69

<i>M. Stano, P. Papp, K. Pisklová, Š. Matejíček, J. Urban</i> Electron impact ionization and electron attachment to Gly-Gly in a gas phase ...	70
<i>P. Papp, M. Stano, S. Engmann, P. Mach, O. Ingolfsson, Š. Matejíček</i> Combined experimental and theoretical study of electron impact ionization of Co(CO) <sub>3</sub> NO molecule .....	71
<i>I. V. Chernyshova, J. E. Kontros, P. P. Markus, O. B. Shpenik</i> Near-threshold electron-impact ionization of thymine .....	72
<i>I. V. Chernyshova, J. E. Kontros, P. P. Markus, O. B. Shpenik</i> Positive and negative electron-impact ionization of the cytosine molecule .....	73
<i>M. M. Erdevdy, O. B. Shpenik, V. V. Zvenihorodsky</i> Electron impact excitation of the gas-phase thymine molecule .....	74
<i>O. B. Shpenik, M. M. Erdevdy, V. V. Zvenihorodsky</i> Electron impact excitation of the gas-phase uracil molecule .....	75
<i>M. C. Castrovillia, P. Bolognesia, P. O'Keeffe, A. Casavolaa, D. Catonec, S. Turchinic, L. Avaldia</i> Site-selective fragmentation studies of halogenated pyrimidines in the valence and inner shell region .....	76
<i>A. V. Verkhovtsev, R. G. Polozkov, V. K. Ivanov, A. V. Korol, A. V. Solov'yov</i> Calculations of the structure and photoionization processes of pristine and endofullerenes .....	77
<i>I. Benkő, I. Rajta, A. Csik, J. Tóth, K. Géresi, É. Ungvári, B. Szabó, G. Sarkadi, K. Tőkési</i> Major and trace elements in mouse bone measured by surface and bulk sensitive methods .....	78
<i>S. Maclot, M. Capron, R. Maisonny, E. Lattouf, A. Ławicki, S. Bari, A. Méry, J. Rangama, J.-Y. Chesnel, A. Domaracka, J.-C. Pouilly, R. Hoekstra, T. Schlathölter, B. Manil, L. Adoui, P. Rousseau, B. A. Huber</i> Influence of the environment on the fragmentation of amino acids provoked by low-energy ions .....	79
<i>S. Kovács, P. Herczku, Z. Juhász, L. L. Horváth, F. Gáll, B. Sulik</i> A specific beamline at a 5 MV electrostatic accelerator for studying ion- biomolecule collisions in the energy region of the Bragg peak .....	80
<i>B. S. Frankland, R. O. Barrachina, J.-Y. Chesnel, F. Frémont</i> Oscillations in the Auger energy distribution following atoms colliding with molecules .....	81
<i>S. Das, A. Källberg, J. Harasimowicz</i> Spatial resolution test of a beam profile monitoring system with a proton beam of energy 0.5, 1, 10, and 40 keV .....	82
<i>A. C. Scafes, C. Ciortea, D. E. Dumitriu, A. Enulescu, D. Fluerasu, M. M. Gugiu, D. M. Pena, I. Piticu</i> Radiative electron capture and K-shell vacancy production in <sup>32</sup> S, <sup>35</sup> Cl + Cu collisions at 0.5 ÷ 2.5 MeV/u energies .....	83

<i>A. A Mihajlov, V. A. Srećković, Lj. M. Ignjatović</i> Chemi-ionization processes in slow Neon Rydberg atom collisions with ground state parent atoms .....	84
<i>M. Popović, M. Novaković, N. Bibić</i> Effects of 200 keV argon ions irradiation on microstructural properties of titanium nitride films .....	85
<i>O. B. Shpenik, T. Yu. Popika, R. O. Ortikova, V. M. Feyerb, Yu. V. Popikc</i> Elementary processes of interaction of slow electrons with metal surfaces .....	86
<i>I. Rajta, R. J. Berezky, K. Vad, K. Tőkési</i> Investigation of MeV proton microbeam transmission between two flat plates – the cases of homogeneous metallic and insulator plates .....	87
<i>Z. Juhász, P. Herczku, S. Kovács, R. Rácz, S. Biri, I. Rajta, G. Gáll, S. Szilasi, B. Sulik</i> Ion-guiding and blocking of ion transmission in dense polycarbonate nanocapillary arrays at 3 keVAr <sup>7+</sup> impact .....	88
<i>A. R. Milosavljević, K. Schiessl, C. Lemell, M. Mátéfi-Tempfli, S. Mátéfi-Tempfli, B. P. Marinković, J. Burgdörfer</i> Establishing a dynamical equilibrium in electron transmission through insulating microcapillaries .....	89
<i>R. D. DuBois, K. Tőkési</i> Can positrons be guided by insulating capillaries .....	90
<i>D. Borka, V. Lukic, J. Timko, V. Borka Jovanović</i> Identification of the types of carbon nanotubes using donut effects .....	91
<i>R. Brzozowski, M. E. Moneta</i> Correlation between thermal induced structural and magnetic transformations in Si-rich Fe <sub>73</sub> Cu <sub>1</sub> Si <sub>16</sub> B <sub>7</sub> Nb <sub>3</sub> metal alloy .....	92
<i>A. Puszkarz, M. E. Moneta</i> Role of Ta replacing Nb in finemet alloy .....	93
<i>B. Pawłowski, M. E. Moneta</i> Depth selective PIXE for surface analysis with low energy heavy ions .....	94
<i>T. M. Gwizdała, M. E. Moneta</i> Mössbauer distribution fitting by using global optimization approach .....	95
<i>M. M. Milić, N. Dj. Lazarov, D. A. Cucić</i> Study on the photo-induced oxygen reordering in YBa <sub>2</sub> Cu <sub>3</sub> O <sub>6+x</sub> .....	96
<i>N. Dj. Lazarov, M. M. Milić, V. M. Matić, D.A. Cucić</i> Effect of illumination on the superconducting transition temperature $T_c$ in YBa <sub>2</sub> Cu <sub>3</sub> O <sub>6+x</sub> .....	97

## **CEAMPP 2011**

### **Abstracts of Invited Plenary Lectures**

- J. Fedor, O. May, D. Kubala, M. Allan*  
Dynamics of dissociative electron attachment to small molecules .....103
- C. Nicolas*  
Soft X-ray spectroscopy of molecules and biomolecules .....104
- N. Bundaleski*  
Grazing incidence fast atom diffraction on different materials .....105

### **Abstracts of Invited Progress Reports**

- M. Gruden Pavlović*  
Theoretical study of the Jahn-Teller effect .....109
- R. Ranković*  
Ab initio calculation of low-lying vibronic levels in the ground X<sup>2</sup>Π<sub>u</sub> electronic state of dicyanoacetylene cation .....110
- M. Ristić*  
Excitation of molecules by low-energy electrons .....111
- S. Tošić*  
Absolute cross sections for electron scattering from metal vapours .....112
- M. Radonjić*  
Coherent effects in laser driven rubidium vapor .....113
- S. Marjanović*  
Numerical modeling of buffer gas positron traps .....114
- V. Stojanović*  
Monte Carlo modeling of Townsend discharges in hydrogen .....115
- G. Wormeester*  
On the propagation of positive streamers in N<sub>2</sub>:O<sub>2</sub> mixtures .....116

### **Abstracts of Poster Contributions**

- M. Milovanović and S. Jerosimić*  
An ab initio calculation of the vibronic energy levels in the X<sup>2</sup>Π electronic state of C<sub>2</sub>Sb .....119
- Lj. Stojanović*  
Ab initio study of the non-adiabatic coupling between X<sup>1</sup>A' and 2<sup>1</sup>A' states of D<sub>3</sub><sup>+</sup> ion .....120
- N. V. Delić, B. Markoski, J. P. Šetrajčić, S. Armačević and I. J. Šetrajčić*  
Photon structure .....121
- Lj. Stevanović and V. Pavlović*  
Confined hydrogen atom in the stationary electric field .....122

<i>Lj. Stevanović, V. Pavlović and M. Rančić</i>	
Properties of the F center based on the model of confined atomic system .....	123
<i>C. Köhn and U. Ebert</i>	
Differential cross sections for Bremsstrahlung and pair production and for predicting Terrestrial Gamma – ray flashes .....	124
<i>B. P. Marinković, V. Pejčev, B. Predojević and D. Šević</i>	
Elastic electron scattering by bismuth .....	125
<i>J. J. Jureta, A. R. Milosavljević and B. P. Marinković</i>	
High resolution electron spectrometer OHRHA .....	126
<i>A. R. Milosavljević, C. Nicolas, J.-F. Gil, F. Canon, M. Réfrégiers, L. Nahon and A.     Giuliani</i>	
Fast in-vacuo photon shutter for synchrotron radiation quadrupole ion trap tandem mass spectrometry.....	127
<i>M. Terzić, M. S. Rabasović, D. Šević, A. Delneri, M. Franko and B. P. Marinković</i>	
Analysis of cyanobacterial Cr-Phycocyanin by laser based techniques .....	128
<i>S. N. Nikolić, M. Radonjić, S. M. Ćuk, Z. D. Grujić, A. J. Kmrpot, B. M. Jelenković</i>	
The influence of radial laser beam profile on handle dark state evolution .....	129
<i>P. Kolarž and B. Miljković</i>	
Air-ion counter and mobility spectrometer .....	130
<i>N. Škoro, D. Marić, G. Malović and Z. Lj. Petrović</i>	
Effective ionization coefficients in water vapour.....	131
<i>D. Maletić, S. Lazović, N. Puač, G. Malović and Z. Lj. Petrović</i>	
Detection of atomic species in micro atmospheric pressure discharge by using mass spectrometry .....	132
<i>A. Banković, S. Dujko, R. D. White, S.J. Buckman and Z. Lj. Petrović</i>	
Transport properties of positron swarm in molecular nitrogen under the influence of electric and magnetic field .....	133
<i>M. Savić, M. Radmilović-Radjenović, M. Šuvakov and Z. Lj. Petrović</i>	
Monte Carlo simulation of RF discharges .....	134

**5<sup>th</sup> Conference on Elementary Processes in  
Atomic Systems**

# **TOPICAL LECTURES**



## Absolute differential cross sections for electron scattering from building blocks of biopolymers

A. R. Milosavljević<sup>a</sup>, F. Blanco<sup>b</sup>, J. B. Maljković<sup>a</sup>, G. García<sup>c</sup> and B. P. Marinković<sup>a</sup>

<sup>a</sup>Laboratory for Atomic Collision Processes, Institute of Physics, University of Belgrade, Pregrevica 118, 11080 Belgrade, Serbia

<sup>b</sup>Departamento de Física Atómica Molecular y Nuclear, Facultad de Ciencias Físicas, Universidad Complutense, Avda. Complutense s/n, E-28040 Madrid, Spain

<sup>c</sup>Instituto de Matemáticas y Física Fundamental, Consejo Superior de Investigaciones Científicas, Serrano 121, 28006 Madrid, Spain

Beside a fundamental interest to investigate processes of electron interaction with different molecular systems and test corresponding available theoretical models, the investigation of electron interaction with the molecules representing building blocks of large biopolymers (DNA, RNA, proteins) has been dominantly motivated in recent years by the research on radiation damage in biomolecular systems. The primary high-energy ionizing particles produces on its track a large number of secondary low-energy electrons, which carry most of the energy deposited in the tissue and may play an important role in the final radiation damage [1].

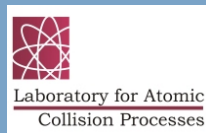
In recent years, we have reported both experimental and theoretical absolute differential cross sections (DCSs) for electron interaction with several different molecules representing building blocks of DNA [2-5]. The present experimental procedure includes three independent measurements, namely: 1) relative DCSs measured at a fixed incident electron energy as a function of scattering angle, 2) relative DCSs measured at a fixed scattering angle as a function of the incident electron energy and 3) absolute DCSs obtained at specific scattering angle and incident energy by applying relative flow technique, with Ar or Kr as reference gases. All these independent measurements make up a consistent set of absolute DCSs for a specific target, which is finally compared to the theoretical results. The calculations of molecular cross sections are based on a corrected form of the independent-atom method, known as the SCAR (Screen Corrected Additivity Rule) procedure and using an improved quasifree absorption model. For all treated molecular targets, a very good agreement between the experimental and theoretical results has been obtained.

The present contribution discusses previously obtained results, comparison between the experiment and the theory, as well as different target molecules. The difficulties and drawbacks of the experimental procedure are particularly elaborated. Additionally, some preliminary results for molecules representing the smallest systems containing the peptide bond, which links amino acids in protein chains, will be reported, as well.

**Acknowledgments:** The work was supported by the Ministry of Education and Science of Republic of Serbia (Project No. 171020) and Spanish Ministerio de Ciencia e Innovación Project FIS2009-10245, and motivated by COST projects ECCL and Nano-IBCT.

### REFERENCES

- [1] B. Boudaiffa, P. Cloutier, D. Hunting, M. A. Huels, and L. Sanche, *Science* 287 (2000) 1658.
- [2] J. B. Maljković, A. R. Milosavljević, F. Blanco, D. Šević, G. García and B. P. Marinković, *Phys. Rev. A* 79 (2009) 052706.
- [3] A. R. Milosavljević, F. Blanco, J. B. Maljkovic, D. Šević, G. García and B. P. Marinkovic, *New Journal of Physics* 10 (2008) 103005.
- [4] A. R. Milosavljević, F. Blanco, D. Ševic, G. Garcia and B.P. Marinković, *Eur. Phys. J. D* 40 (2006) 107.
- [5] A. R. Milosavljević, A. Giuliani, D. Ševic, M. J. Hubin-Franskin and B.P. Marinković, *Eur. Phys. J. D* 35 (2005) 411.



ISBN 978-86-82441-32-8



9 788682 441328