

МАТЕМАТИЧКИ ИНСТИТУТ САНУ

КНЕЗА МИХАИЛА 36

11 000 БЕОГРАД

Директору МИ САНУ др Зорану Огњановићу

Председнику Научног већа МИ САНУ академику проф др Драгошу Цетковићу

НАУЧНОМ ВЕЋУ МИ САНУ

СТРУЧНИ ИЗВЕШТАЈ СА ИНТЕРНАЦИОНАЛНЕ НАУЧНЕ КОНФЕРЕНЦИЈЕ *RAD 2018- Sixth international conferences on radiation and application in various fields of research*, 18.06.-22.06.2018. Охрид, Македонија, у организацији RAD асоцијације и Електронског факултета Универзитета у Нишу, Србија

Поштовани,

У периоду од 18.06.-22.06.2018 учествовала сам на интернационалној научној конференцији **RAD 2018. *Sixth international conferences on radiation and application in various fields of research*** која се одржала у Охриду, Македонија, у организацији **RAD асоцијације и Електронског факултета Универзитета у Нишу, Србија**, на којој сам усмено излагала рад под насловом „Kinetic energy of homologous chromosome pairs in biomechanical oscillatory model of mitotic spindle“-**RAD6-25** у оквиру секције из Биомеханике. Излагање на овом научном скупу реализовано је у склопу активности на пројекту ОИ 174001.

После мог саопштења било је питања и дискусије. Проф Евгениј Глебов из лабораторије за фотохемију Водовског института за хемијску кинетику и сагоревање, и академик руске академије наука – огранак у Сибиру био је заинтересован за молекуларне моделе деобног вретена. Моје саопштење је било једно од 6 номинованих за најбоље усмено излагање. <http://rad2018.rad-conference.org/awards.php>

На конференцији су учествовали научници из земаља региона (Србија, Македонија, Црна Гора, Хрватска, Бугарска, Грчка, Турска) као и из Русије, Немачке, Аустрије, Италије, Индије, Ирске, Јапана, Кореје..... На конференцији су биле заступљене следеће области: Radiobiology, Radiochemistry, Radiation Chemistry, Radiation Physics, Radiation in Medicine, Radiation Measurements, Radiation Protection, Radioecology, Radon and Thoron, Radiation Detectors, Radiation Effects, Medical Physics, Radiology, Nuclear Medicine, Radiotherapy, Radiation Oncology, Radiopharmacology, Cancer Research, Environmental Chemistry, Environmental Physics, Neutron and Heavy Ion Radiations, Microwave, Laser, RF and UV radiations, Medical Imaging, Medical Devices, Pharmaceutical Sciences, Biomedicine, Biochemistry, Biophysics, Biomaterials, Biopharmaceuticals, Medical Physics, Biotechnology, Bioengineering, Biomedical Engineering, Biomechanics.

Било је укупно 634 рада (усмена излагања, постер секције и виртуелна секција).

Пленарни предавачи:

Nataša Avramović, Faculty of Medicine, University of Belgrade, Serbia - Structure, function and application of rhamnolipid and exopolysaccharide biosurfactants of *Pseudomonas aeruginosa*

Sergei Baranovski, The Philipps University of Marburg, Germany - Lead oxide photoconductor for applications in direct conversion X-ray

Peter Bossew, German Federal Office for Radiation Protection (BfS), Berlin, Germany - The European atlas of natural radiation

Francesco Cardellini, Italian National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA), Rome, Italy - Experimental activity in the field of radon and thoron measurement in the Italian Metrological institute for Ionizing Radiation

Kiril Krezhov, Bulgarian Academy of Science, Sofia, Bulgaria - Environmental radiation monitoring and radiological assessments of the IRT-Sofia nuclear site

Arkadiusz Mandowski, Jan Długosz University in Częstochowa, Poland - Novel methods and development of radiation induced optically stimulated luminescence (OSL) measurements

Ana Pejovic-Milic, Ryerson University, Toronto, Canada - Use of radiation in non-conventional medical diagnostic procedures.

Једна од новина на конференцији јесте могућност публиковања радова у целини са DOI бројем у оквиру RAD Proceedings-а као и могућност учествовања у оквиру виртуалне секције: учесници који нису били у могућности да присуствују конференцији могли су да пошаљу презентацију која је потом била доступна на сајту конференције за остале учеснике; као могућност постављања профила учесника конференције –кратако представљање учесника са фотографијом. На конференцији сам искористила прилику за успостављање контаката са колегама из Италије, Аустрије, Црне Горе, Хрватске и Русије. Социјални програм обухватао је коктеле, свечану вечеру и излет бродом до св. Наума као и обилазак града.

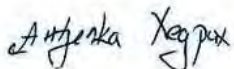
Програм као и списак радова се може видети на следећим линковима:

<http://rad2018.rad-conference.org/news.php>

http://rad2018.rad-conference.org/title_list.php

У прилогу вам шаљем извод из програма и пар фотографија.

С Поштовањем,



др Анђелка Хедрих, научни сарадник
истраживач на пројекту ОИ 174001

МИ САНУ

Кнеза Михаила 36

11 000 Београд

Србија

У Београду 05.07.2018.



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RAD 2018 SIXTH INTERNATIONAL CONFERENCE
ON RADIATION AND APPLICATIONS IN VARIOUS FIELDS OF RESEARCH
18. 06. - 22. 06. 2018 | Metropol Lake Resort | Ohrid | Macedonia (FYROM)

AWARDS

Nominations for the best contributions at RAD 2018 Conference

NB: Please note that contributions in all categories are arranged by the surname of the presenting author.

I - Best oral contribution nominations:

- ♣ Krystle Bartholomew for:
K. Bartholomew, C. Landstetter, V. Damberger, B. Hiegesberger, M. Korner, Assessment of radionuclide ratios in soil samples
- ♣ Andjelka Hedrih for:
A. Hedrih, K. (Stevanovic) Hedrih, Kinetic energy of homologue chromosome pairs in biomechanical oscillatory model of mitotic spindle
- ♣ Mateusz Bilski for:
M. Bilski et al., Abscopal effect of radiotherapy - The pursuit of the unknown
- ♣ Maria Cristina Montesi for:
M. C. Montesi et al., The FOOT experiment: Fragmentation measurements in particle therapy

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ca dr Francesco Cardellini-jem



Sunday, June 17

10:00-20:00 Registration

Monday, June 18

08:00-09:00 Registration

09:30-19:30 Registration

Plenary Session Biljana Hall

09:00 Official Opening

09:30 Invited Lectures

Francesco Cardellini, Experimental activity in the field of radon and thoron measurement at Italian Metrological Institute for measurement of ionizing radiation

Nataša Avramović, Structure, function and application of rhamnolipid and exopolysaccharide biosurfactants of *Pseudomonas aeruginosa*

10:30 Refreshments

11:00 Poster Sessions Samoil Hall

Radiation Measurements

M. Troshina, V. Potetnya, E. Koryakina, R. Baykuzina, S. Koryakin, S. Ulyanenko, Dosimetry of proton scanning beam with FBX dosimetric system

A. Stepanov et al., Using of the remote methods for radiation survey during reactor MR dismantling

A. Jevremović et al., Determination of coincidence summing correction factors for ^{22}Na point source

I. Stonecka, Z. Baranowska, K. Łukasik, K. Fornalski, Bayesian statistics as a modern tool in retrospective dosimetry of mixed ionizing radiation

P. Ochoa Parra, F. Cristancho, E. Fajardo, W. Rodriguez, F. Bautista, Extended source efficiency correction and optimization of the sample position to measure the concentrations of NORM using a HPGe detector

Friday, June 22

09:00-15:00 Registration

I. Yarmoshenko, G. Malinovsky, A. Vasilyev, Experimental system for measurement of radon-activated advection from the soil

I. Čeliković, G. Pantelić, M. Živanović, I. Vukanac, P. Ujić, B. Lončar, Radon in soil gas in the vicinity of Niška Banja, a high radon area

A. S. Silva, M. de Lurdes Dinis, Measurements of radon concentration in natural mineral water

W. Hofmann, R. Winkler-Heil, H. Lettner, A. Hubmer, Simulation of the radon transfer from thermal water through the skin in radon therapy

14:00 Oral Session: **Medical Devices** **Kaneo Hall**

Biomedical Engineering

Biomechanics

Biophysics

Yu. Kovalenko, S. Miroshnichenko, A. Nevgasymyy, Increase of diagnostic roentgenology efficiency by adding dynamic digital receivers to the operated conventional x-ray equipment

D. Yurkov et al., Novel generators for nuclear medicine: technical and antitumor characteristics

R. Pop-Iliev, W. Yi Pao, P. Karimipour-Fard, G. Rizvi, Visualization and morphological characterization of integral skin cellular polymeric composites using X-ray microtomography

M. Radu, M. Bacalum, M. Straticiuc, R. Vasilache, M. Temelie, D. Savu, Radiobiological effects of laser driven ion beams - Preparation for ELI-NP perspective

A. Hedrih, K. (Stevanovic) Hedrih, Kinetic energy of homologue chromosome pairs in biomechanical oscillatory model of mitotic spindle

T. Stankovski, Coupling functions: Universal insights into dynamical interactions

I. Shpachenko, N. Brandt, A. Chikishev, Raman spectroscopy in the study of enzyme kinetics

Yu. P. Chukova, Radiation hormesis in the light of laws of quantum thermodynamics

Virtual Session

Radiobiology

N. Metlyaeva, A. Bushmanov, V. Krasnuk, O. Shcherbatykh, Ly. Yunanov, Assessment of the adaptation of patients with ARS, the victims of ChNPP and different radiation accidents, past psychophysiological examination

E. Beketov, E. Isaeva, N. Nasedkina, E. Malakhov, O. Golovanova, S. Ulyanenko, Relative biological effectiveness of "Prometheus" scanning proton beam on B-16 cells in vitro

J. Pajić, D. Jovičić, A. P. S. Milovanović, Inter-individual variability in biological response to ionizing radiation measured by dicentric and micronuclei

J. Pajić, D. Jovičić, A. P. S. Milovanović, Micronuclei frequency in peripheral blood lymphocytes of the serbian adult population: database for dose assessment by biodosimetry tools

Kinetic energy of homologue chromosomes pairs in biomechanical oscillatory model of mitotic spindle

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The ways chromosomes move within the cell during cell division process is called functional genomic architecture. Weise et al (2016) postulate that functional genomic architecture is not only present in interphase but also in metaphase stage of cell division cycle.

The aim of this work was to study how different oscillatory behavior of centrosomes as well as chromosomes' mass arrangement affects kinetic energy of pairs of homologue chromosomes in the system of mitotic spindle during metaphase. The analyses were done through biomechanical oscillatory model of mitotic spindle. In biomechanical oscillatory model of mitotic spindle mitotic spindle is presented as a system of coupled oscillators where coupling is made over two rheonomic centers -centrosomes. One oscillatory pair consists of a centrosome, a microtubule and a related chromosome and these are interconnected with their homologous pair. Each element in the model has its mechanical counterpart.

Analytical expressions for kinetic energy of oscillating pair of homologues chromosomes are given for the case that biomechanical system of mitotic spindle is conservative, linear and oscillate under external single frequency oscillation. Numerical analyses with some approximation for mouse chromosomes were done.

Our numerical experiment reveals that kinetic energy of oscillating pair of homologue chromosomes has oscillatory character and is affected by chromosomes' mass arrangement and frequency of centrosome excitation. If centrosomes oscillate with different frequencies, energy of pairs of homologue chromosomes has non-linear oscillatory character. Maximum value of amplitudes of kinetic energy of pair of same homologue chromosomes are equal in the case of equal frequency of forced centrosome excitation but differ over time in a case of different frequency of forced centrosome excitation.

Regardless the distribution of chromosome masses (central or peripheral position of chromosomes with heavier masses) kinetic energy for each particular pair of homologue chromosomes are lower in the central zone of mitotic spindle, but amplitudes of kinetic energy for each pair of homologue chromosomes subsystems are lower when chromosomes with heavier masses are positioned in central zone of mitotic spindle compare to the case when they have peripheral positions in mitotic spindle.

This difference in energy distribution regarding different centrosome oscillatory frequency in the same cell and mass chromosomes arrangement may carry additional epigenetic information and could be important for process of cell differentiation.

Key words: kinetic energy, chromosomes, centrosome, mitotic spindle, oscillations, biomechanical model

Acknowledgement: This work was supported by Ministry of Education, Sciences and Technology Development of Republic of Serbia through Mathematical Institute SASA, Belgrade Grant ON174001 "Dynamics of hybrid systems with complex structures, Mechanics of materials".