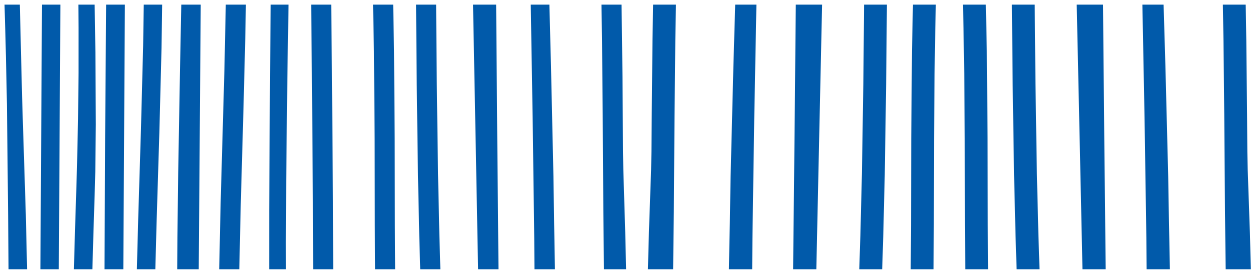
RAP 2023

INTERNATIONAL CONFERENCE ON RADIATION APPLICATIONS

In Physics, Chemistry, Biology, Medical Sciences, Engineering and Environmental Sciences

BOOK OF ABSTRACTS



May 29 - June 2, 2023 | Hellenic Centre of Marine Research | Anavyssos | Attica | Greece | **www.rap-conference.org**

BOOK OF ABSTRACTS

INTERNATIONAL CONFERENCE ON RADIATION APPLICATIONS (RAP 2023)
May 29–June 2, 2023 | Hellenic Centre for Marine Research (HCMR) |
Anavyssos, Attica, Greece | www.rap-conference.org

TABLE OF CONTENTS

Click on the title of the abstract to access it

INVITED TALKS

Advanced semiconductor microdosimetry for particle therapy and space
A.B. Rosenfeld, L.T. Tran, S. Guatelli, D. Bolst, S. Peracchi, B. James, V. Pan, J. Vohradsky, M. Petasecca, M. Lerch, M. Povoli, A. Kok, T. Inaniwa 1

New insights from climate change studies using temporal trends of marine environment indicators
Jasmina Obhodas, Andrija Vinković, Umberta Tinivella, Michela Giustiniani, Vanessa Cardin, Manuel Bensi, Danijela Joksimović, Christos Tsabaris, Branimir Radun, Tarzan Legović 2

Novel isotope labeling approaches to determine organic matter transformations in the environment
Travis B. Meador, Stanislav Jabinski, Matthias Pilecky, Martin Kainz, Leonard I. Wassenaar 3

Developing radiopharmaceuticals for health
Giancarlo Pascali 4

CONFERENCE ABSTRACTS

CALIBRA: A national research infrastructure for accelerator-based research and interdisciplinary applications
Sotirios Harissopulos, Anastasios Lagoyannis, Mihail Axiotis, Andreas Germanos Karydas, Angelos Laoutaris, Ion Stamatelatos 5

A contribution to the current debate on the rationale of the Linear-No Threshold Hypothesis (LNT)
Peter Bossew 6

Heavily-doped lead tungstate scintillators for fast detectors of ionizing radiation
Gintautas Tamulaitis, Saulius Nargelas, Yauheni Talochka 7

Novel diamond detector development for harsh neutron flux environments
Kalliopi Kaperoni, Maria Diakaki, Michael Kokkoris, Christina Weiss, Michael Bacak, Erich Griesmayer 8

Development of a silicon carbide radiation detection system and experimentation of the system performance
Jinlin Song, Xiaobin Tang, Pin Gong, Zhimeng Hu, Dajian Liang, Zeyu Wang, Peng Wang, Hong Ying, Haining Shi, Ao Liu, Zhifei Zhao, Song Bai 9

Effect of the activator material in Gd_2O_2S phosphor based EPID systems: A theoretical study
Marios Tzomakas, Vasiliki Peppa, Antigoni Alexiou, Georgios Karakatsanis, Anastasios Episkopakis, Christos Michail, Ioannis Valais, George Fountos, Ioannis S. Kandarakis, Nektarios Kalyvas 10

Pulsed infrared stimulated luminescence of Ce^{3+} doped YAG crystals as a dosimetric tool
Dorota Kuźnik, Anna Mrozik, Paweł Bilski, Yuriy Zorenko 11

Determination of thermal neutron dosimetry using nuclear track detectors
Emad Ghanim, Sara Othman, Abdel Azeem Hussein, Hussein El-Samman, Ahmed El-Sersy 12

Spectral matching factor calculations between $(Gd,Y)_3(Al,Ga)_5O_{12}$ fluorescent screens of various activators and photodetectors
Nikolaos Potiriadis, David Stratos, Marios Stogiannos, Panagiotis Liaparinos, Aikaterini Skouroliakou, Ilia Kmendo, Georgy A. Dosovitskiy 13

LGAD sensors for application in proton CT
Gregor Kramberger 14

Efficiency transfer factors calculation for gamma-ray detectors using multipurpose Monte Carlo codes
Ioana Lalau, Aurelian Luca, Claudia Olaru, Mastaneh Zadehrafi, Mihail-Razvan Ioan, Andrei Antohe 15

ANET-2D Multichannel Compact Neutron Collimators for high intensity pulsed and continuous beams
Marco Costa, Oriol Sans Planell, Francesco Grazzi, Francesco Cantini, Valeria Monti 16

Radionuclides transfer from soil-to-tea leaves and concomitant impact assessment
Mayeen Khandaker, Nur Fadhilah Binti Mokhrizal, David Bradley, Hamid Osman 17

Investigation on Pixel-to-Pixel isolation by Trench and p-stop technologies under high charge density injection: Case study of segmented LGAD
Gordana Lastovicka-Medin, Mateusz Rebarz, Gregor Kramberger 18

Angular correlation of gamma-gamma coincidence measurements for neutron activation analysis
Sheldon Landsberger, Kevin Smith, Brandon De Luna, Stefano Marin 19

Characterization of the neutron flux through the RMC SLOWPOKE-2 pool via neutron activation analysis and MCNP modelling
Daniel Huston, Pavel Samuleev, Fiona Kelly, Emily Corcoran 20

Measurements of Th/U ratio using different techniques: A comparative study
Wafaa Arafa, Hala Bakeer, Eman Yousf, Ashry Ashry, Ahmed Abdelgawad, Ahmed El Sersy, Ibrahim El Aassy, Hussein El Samman 21

Comparing dosimetric and spectroscopic capabilities of handheld Na(Tl)I γ-spectrometers
Konstantinos Kamoutsis, Eleftheria Ioannidou, Ioannis Kaissas, Alexandra Ioannidou, Stylianos Xanthos 22

Evaluation of proficiency test results of gamma ray spectrometry in determination of anthropogenic and natural radionuclides
Manjola Shyti, Erjon Spahiu 23

Evaluation of the primary quality control parameters on diagnostic radiographic equipment in governmental and private healthcare institutions in Albania
Luljeta Disha, Manjola Shyti 24

Non-destructive determination of ^{90}Sr, ^{241}Am and ^{137}Cs activity in Chernobyl fuel particles using gamma-beta-spectroscopy coupled with autoradiography method
Valentyn Protsak, Gennady Laptev, Kyrylo Korychenskyi 25

Assessment of radiation exposure in area of holiday cottages in Šumadija region, Serbia
Mirjana Cujic, Ljiljana Jankovic Mandic, Danijela Maksin, Antonije Onjia 26

Activity determination of a ^{137}Cs radioactive source used in oil-welling company in Albania
Dritan Prifti, Kozeta Tushe 27

Chemical decontamination technique used to minimize the radioactive waste from IFIN-HH
Daniela Gurau, Ioan Iorga, Laura Zicman 28

Traceability of solid state detectors used for Half Value Layer measurements in diagnostic radiology
Milos Zivanovic, Ivana Komatina, Nikola Krzanovic 29

Solid state detector energy response in W/Al mammography radiation quality series
Andrea Kojic, Nikola Krzanovic, Milos Zivanovic, Predrag Bozovic, Jelena Stankovic Petrovic, Ivana Komatina, Jelena Vlahovic 30

A Time Series Forest Method for automatic classification of anomalous glow curves of LiF:Mg,Ti based thermoluminescent dosemeters
Dusan Topalovic, Marko Krajinovic, Jelena Vlahovic, Nikola Krzanovic, Predrag Bozovic, Jelena Stankovic Petrovic 31

Quality control of NaI scintillation detector for gamma spectrometric determination of radon concentration
Ivana Vukanac, Milica Rajacic, Jelena Krneta Nikolic, Marija Jankovic, Natasa Sarap, Jelena Stankovic Petrovic, Andrea Kojic 32

Impact of high gamma doses on structure, optical behavior and track parameters of polymeric NTD for γ-dosimetry
Sara Othman, Emad Ghanim, Asmaa El-Badawy, Intesar El-Mesady 33

Measurement of radiation exposure dose using emergency detectors and OSL Helios reader
Renata Majgier, Katarzyna Szufa 34

Progress in high resolution gamma-ray spectrometry of environmental samples at the Marine Environmental Radioactivity Laboratory, HCMR
Georgios Eleftheriou, Effrossyni G. Androulakaki, Christos Tsabaris, Filothei K. Pappa, Dionisis L. Patiris, Constantinos A. Kalfas 35

Investigation of several new ionic liquids' behavior during ^{210}Pb/^{210}Bi Cherenkov counting in waters
Ivana Stojković, Nataša Todorović, Jovana Nikolov, Teona Teodora Borović, Milan Vraneš, Slobodan Gadžurić 36

On site calibration of Ionization Chamber for ^{166}Ho at Gemelli Hospital in Rome by using portable ENEA TDCR detector
Maria Vaccaro, Amedeo Capotosti, Marco Capogni, Aldo Fazio, Teresa Scotognella, Luca Indovina 37

Development of a method for characterization and segregation of metallic waste after decommissioning
Dimitrios Mavrikis, Angelos Markopoulos, Alexandra Ioannidou, Anastasia Savidou 38

Radiological characterization of metallic waste on decommissioning by comparing real and simulated spectrum
Angelos Markopoulos, Dimitrios Mavrikis, Alexandra Ioannidou, Anastasia Savidou 39

Analysis of DPRK's trade and prohibited items of UN sanction transactions
Hansol Ko, Chansuh Lee 40

Role of the International Nuclear Security Educational Network (INSEN) in strengthening Nuclear Security Globally
Alexandra Ioannidou 41

Experimental evaluation of different wireless sensor modules under Gamma radiation
Jin Jiang 42

Monitoring of ^{210}Po and uranium in vegetables and fruits for Kuwaiti adults
Aishah Alboloushi, Omar Alboloushi 43

Present problems of radiation protection quantities: Too many inconsistent quantities
Jozef Sabol 44

Conceptual shielding design of sandwich walls for a particle therapy centre using Monte-Carlo simulations with FLUKA
Redona Izairi Bexheti, Mimoza Ristova 45

Study of shielding properties of zinc borate doped polypropylene matrix
Songül Akbulut Özen, Ömer Yunus Gümüş, Toygar Çardak, Ahmet Çelik, Ali Gürol, Recep İlhan 46

Prospective prussian blue - cellulose hybrid materials for the environmental and human protection from exposure to radioactive fallouts
Ingars Reinholds, Kristine Saleniece, Ugis Eismonts, Maris Bertins, Andris Actins, Liga Avotina, Olga Mutere, Arturs Viksna, Gunta Kizane, Andrejs Grinbergs 47

Identification of biomarkers for acute radiation syndrome using various omic platforms and nonhuman primate model
Vijay Singh 48

Indication of the magnetic fields influence by bioluminescent analysis
Olena Gromozova, Victor Martyniuk, Ihor Hretskyi, Oleksandr Artemenko, Victoriia Kobernyk, Olexander Kisten 49

Improved measurement of potassium levels in rats using a *in vivo* neutron activation analysis system
Sana Tabbassum, Pinjing Cheng, Frank Yanko, Rekha Balachandran, Michael Aschner, Aaron B. Bowman, Linda H. Nie 50

Application of the combined method of radiation sterilization for the effective processing and preservation of bone material of ancient animals
Nadezhda Nikolaeva, Vladimir Rozanov, Igor Matveychuk, Aleksandr Chernyaev, Saiyyna Nikitina, Dmitry Yurov, Milena Makarova ___ 51

The measurement of the dielectric parameters of blood erythrocytes in cancer patients
Liliya Batyuk, Nataliya Kizilova _____ 52

Effects of ionizing radiation on the concentration of volatile organic compounds in beef, turkey and salmon
Ulyana Bliznyuk, Polina Borshchegovskay, Timofey Bolotnik, Victoria Ipatova, Igor Rodin, Oleg Khmelevskiy, Alexander Chernyaev, Dmitriy Yurov _____ 53

Improvement of hydrogen fuel cells seen by positron annihilation spectroscopy
Mircea Lechintan, Mihai Straticiuc, Florin Constantin _____ 54

Algorithm for calculation of depth dose distributions in materials when processing objects with electron beam
Sergey Zolotov, Ulyana Bliznyuk, Felix Studenikin, Alexander Nikitchenko, Polina Borshchegovskaya, Alexander Chernyaev, Natalya Antipina, Anna Nikolaeva _____ 55

Boron content determination in ore samples using Geant4-simulated PGNAA and MCLLS algorithm
Onur Erbay, İskender Atilla Reyhancan _____ 56

Research activities at the Police Academy in Prague aimed at the detection and elimination of the CBRN threat
Jozef Sabol _____ 57

Challenges in the use of handheld radiation detection equipment and radioisotopes identification from front line officers (FLOs)
Kozeta Tushe, Dritan Prifti, Charles Massey, Issariya Chairam _____ 58

Radiological risk assessment of food crops grown in Rustenburg, South Africa
Peter Oluwadamilare Olagbaju, Bola Olarenwaju Wojuola _____ 59

LiF:Mg,Ti TLD angular dependence evaluation at low energy incident radiation
Nikola Krzanovic, Jelena Stankovic Petrovic, Milos Zivanovic, Marko Krajinovic, Dusan Topalovic, Andrea Kojic, Predrag Bozovic _____ 60

Status of radiation safety management for workers in KOMAC
Yeeun Lee, Yisub Min _____ 61

Space radiation quality factor for Galactic Cosmic Rays and typical space mission scenarios using a microdosimetric approach
Alexis Papadopoulos, Ioanna Kyriakou, Sébastien Incerti, Giovanni Santin, Petteri Nieminen, Ioannis Daglis, Weibo Li, Dimitris Emfietzoglou 62

Doses in contrast-enhanced mammography dual-energy digital mammography versus doses in full-field digital detector mammography
Ewa Fabiszewska, Katarzyna Pasicz, Witold Skrzyński 63

Comparison of gamma and X radiation attenuation characteristics for ordinary concrete, concrete with barite and concrete with limonite and steel
Ksenija Jankovic, Srboljub Stankovic, Anja Terzic, Marko Stojanovic, Dragan Bojovic 64

Development of the safety indicator for Korea Multi-purpose Accelerator Complex
Yi-Sub Min, Jung-Min Park 65

Applications of radioactive ^{197}Hg as a highly specific tracer for atmospheric mercury sampling and calibration studies
Igor Zivkovic, Jan Gacnik, Joze Kotnik, Sreekanth Vijayakumaran Nair, Radojko Jacimovic, Sergio Ribeiro Guevara, Andrea Jurov, Uros Cvelbar, Milena Horvat 66

Nuclear and related analytical techniques used to study atmospheric deposition of trace elements and radionuclides in Europe, Asia and the Pacific Region based on moss analysis
Marina Frontasyeva 67

Radiocarbon dating of planktonic foraminifera in sediment cores from the NE Mediterranean Sea: paleoceanographic and paleoclimatic reconstructions during the last 20 kyrs
Maria Triantaphyllou, Gregory Rousakis, Margarita Dimiza, Constantine Parinos, Elisavet Skampa, Dimitrios Velaoras, Alexandra Gogou 68

Bioaccumulation of trace elements in keystone bivalve and fish species in the Bulgarian Black Sea ecosystem
Melania Istrati, Madlena Andreeva, Hristiyana Kanzova, Nesho Chipev, Albena Alexandrova, Vlad Vasilca, Tatiana Tozar, Mihai Straticiuc 69

Heavy metal pollution history in marine sediments from Bosphorus and İstanbul's Black Sea coastal area by ^{210}Pb and ^{137}Cs chronology
Günseli Yaprak, İlker Sert, Jasmina Obhodas, Gennady Laptyev, Şule Aytaş, Ahmet Sinan Demirel, Doğan Yaşar, Hakan Savaş Sazak, Serkan Gürleyen, Haluk Yücel, Buket Canbaz Öztürk 70

Gamma spectrometric measurement of radioactivity in soils profile samples of the Hadžići area, B&H
Mirza Nuhanović, Narcisa Smječanin, Nedim Mujić, Nedžad Gradaščević ___ 71

Assessment of trace metals contamination of port sediments on the Montenegrin Coast
Danijela Joksimović, Ana Perošević-Bajčeta, Rajko Martinović, Vladimir Živković, Danijela Šuković ___ 72

***Conchix* (shell organic matrix) – an innovative medium for the assessment of trace metals in marine environment**
Rajko Martinović, Danijela Joksimović, Ana Perošević-Bajčeta, Ivana Čabarkapa, Hermann Ehrlich ___ 73

Distribution of heavy metals in bottom sediment samples at the Azerbaijan sector of the Caspian Sea
Famil Humbatov ___ 74

Assessment of the vertical distribution of natural and anthropogenic radionuclides in sediments of the Aral Sea
Almira Aidarkhanova, Natalya Larionova, Zhanna Tleukanova, Ainur Mamyrbayeva, Assiya Mulikova ___ 75

The research of the radionuclide contamination distribution in various types of water bodies at the Semipalatinsk test site territory
Almira Aidarkhanova, Natalya Larionova, Zhanna Tleukanova, Ainur Mamyrbayeva, Rinata Yermakova ___ 76

The ^{129}I AMS measurements for determining the nuclear pollution of the environment
Alexandru Razvan Petre, Mihaela Enachescu, Paul Emil Mereuta, Daniela Pascal, Decebal Alexandru Iancu ___ 77

^{238,239,240}Pu in the Antarctic ecosystems
Katarzyna Maria Szufa, Jerzy Wojciech Mietelski, Dariusz Sala, Maria Agata Olech ___ 78

Soil activity levels assessment for VVR-S nuclear Research Reactor Decommissioning area
Carmen A. Tuca, Laurentiu Done ___ 79

Can we see differences between the ^{14}C activities of urban (Zagreb) and rural (Cvetković) sites (central Croatia)?
Ines Krajcar Bronić, Damir Borković, Tjaša Kanduč, Andreja Sironić, Jadranka Barešić ___ 80

Levels of natural and artificial radioactivity in infant powdered milk consumed in Albania and estimation of the annual effective dose
Erjon Spahiu, Manjola Shyti 81

Impact of rapid warming on the mobile forms of uranium and thorium in soils – a model experiment
Petya Kovacheva, Kristiana Atanasova, Miryana Varbeva 82

A study of the mobility of uranium and thorium in soils after freezing
Petya Kovacheva, Kamelia Bineva, Miryana Varbeva 83

Study of the effect of Sr-90 on plant variability
Elena Syssoyeva, Elena Polivkina, Alyona Yankauskas 84

Radiation dose rate and morphological changes in leaves of *Betula Pendula* Roth. and *Phragmites australis* (Cav.) Trin. ex Steud in some water ecosystems of the Chernobyl Exclusion Zone
Dmytro Ganzha, Dmytro Ganzha, Dmitry Gudkov, Alexandr Nazarov 85

Relationship between Safecast ambient dose rate and indoor radon data
Peter Bossew, Giorgia Cinelli, Eric Petermann, Petr Kuca, Jan Helebrant 86

Anomalous radon emission as pre-signal of moderate to strong earthquakes in Vrancea geotectonic active region in Romania
Dan Savastru, Maria Zoran, Roxana Savastru, Marina Tautan 87

Soil gas radon measurement in urban area: A case study of Yerevan, Armenia
Nona Movsisyan, Spartak Hovhannisyan, Konstantin Pyuskyulyan, Gayane Melkonyan, Olga Belyaeva 88

Citizen Science in radiation protection: A necessary approach to radon action plans
Danila Carrijo da Silva Dias, Wanilson Luiz Silva, Nivaldo Carlos da Silva, Paloma França Machado 89

Climate effects of aerosols and ^{222}Rn on COVID-19 pandemic in Bucharest metropolitan area
Maria Zoran, Roxana Savastru, Dan Savastru, Marina Tautan 90

Introducing a regional database of radioactivity in the air – GRAMON
Jelena Ajtić, Darko Sarvan, Milica Rajačić, Jelena Krneta Nikolić, Ivana Vukanac, Zorana Ilić, Alfred Vidic, Irma Didović, Jovan Janušeski, Jordanka Anusheva, Snezana Dimovska, Dejan Danilovski, Tomislav Anđelić, Ranko Zekić, Nikola Svrkota, Slavko Radonjić, Branko Vodenik, Benjamin Zorko 91

Revealing relationships between meteorological elements and airborne radioactive particles in ambient air of Kuwait
Anfal Ismaeel, Abdulaziz Aba, Abdullah Al-Dabbous, Mariam Malak, Aishah Al-Boloushi, Hanadi Al-Shammari, Omar Al-Boloushi 92

Concentration levels of gross αlpha and βeta and annual effective dose in drinking waters of Albania
Florinda Cfarku, Irma Bërdufi, Manjola Shyti 93

Assessment of lignite-fired power plants impact on radon activity concentrations
Gazmend Nafezi 94

^{210}Pb and trace elements concentrations in Helsinki urban air, Finland
Eleftheria Ioannidou, Stefanos Papagiannis, Manos Manousakas, Chrysoula Betsou, Konstantinos Eleftheriadis, Jussi Paatero, Lambrini Papadopoulou, Alexandra Ioannidou 95

Vertical distribution of radionuclides in a marine sediment core from the deep basin Northern of Skyros Isl., Aegean Sea
Spyridoula-Konstantina Roumelioti, Dionisis Patiris, Christos Tsabaris, Stylianos Alexakis 96

Towards the implementation of a phantom for the low contrast evaluation of Electronic Portal Imaging Detectors (EPID): A theoretical study
Nektarios Kalyvas, Marios Tzomakas, Vasiliki Peppa, Antigoni Alexiou, Georgios Karakatsanis, Anastasios Episkopakis, Christos Michail, Ioannis Valais, George Fountos, Ioannis Kandarakis 97

Radiobiologic evaluation of anatomical changes during weight loss in head and neck cancer
Islam Sagov, Ol'ga Stakhova, Evgeniia Sukhikh 98

The implementation of a 3D verification system to analyze the effect of limiting the dynamic parameters of a multileaf collimator on the dose distribution
Andrey Vertinskiy, Evgenia Sukhikh, Leonid Sukhikh 99

Comparison of various types of ionization chambers in terms of calibration coefficients
Iwona Grabska, Paweł Kukołowicz 100

The effect of body mass index on patient radiation dose during lumbar discectomy and fusion utilising VirtualDose-IR software
Vasileios Metaxas, Fotios Efthymiou, Christos Dimitroukas, Harry Delis, George Gatzounis, Petros Zampakis, Fotios Tzortzidis, Dimitrios Papadakos, Constantine Constantoyannis, George Panayiotakis 101

Relationship between patient radiation dose and procedural factors in anterior cervical discectomy and fusion utilising VirtualDose-IR software
Vasileios Metaxas, Christos Dimitroukas, Fotios Efthymiou, Harry Delis, George Gatzounis, Fotios Tzortzidis, Petros Zampakis, Andreas Theofanopoulos, Constantine Constantoyannis, George Panayiotakis 102

Local diagnostic reference level for computed tomography of chest and abdomen in two Saudi cities
Amna Mohammed Ahmed, Hamid Osman, Alamin Musa, Afaf Mohamed Ahmed Medani, Mustafa Mahmoud, Magbool Alelyani, Mayeen Uddin Khandaker 103

Evaluation of the effectiveness of Monte Carlo simulations to describe the excitation features of a Macro-XRF imaging spectrometer
Effrossyni Androulakaki, Kalliopi Tsampa, Andreas G. Karydas 104

3 MV Tandetron beamline upgrade for ultra-high dose rate irradiation
Mihai Straticiuc, Andrei-Theodor Hotnog, Mina Raileanu, Mihaela Bacalum, Melania-Beatrice Istrati, Decebal Iancu, Mircea Lechintan, Mihai Radu 105

Comparative analysis of medical exposure to ionizing radiation – the 2021 National Report and the 2020/2021 UNSCEAR Report
Olga Gîrjoabă, Diana Mocăniță, Vasilica Ion 106

Characteristics of the inexpensive 2D plastic scintillator detectors for radiotherapy departments
Beata Kozłowska, Grzegorz Wozniak 107

Applications of 2D plastic scintillator detectors in radiotherapy departments
Grzegorz Woźniak, Beata Kozłowska 108

Processing heterogeneity problem in the case of two-dimensional radiotherapy
Mostafa Y. A. Mostafa, Saleh A. Mohamed, Mahmoud S. M. Ali, Nada M. A. Abas, Mariam N. M. Kamel, Abdelrhman A. Ahmed, Amer Mohamed 109

Development of a dynamic liver phantom for radiotherapy applications
Serdar Sahin, S. Kutay Ozen, Ferihan Ertan, Eren Sahiner 110

Evaluating VMAT delivery accuracy using end-to-end test for different types of VMAT plans
Angela Dameska, Milena Teodosevska-Dilindarski, Dushko Lukarski 111

Evaluation of dosimetric plan quality for glioblastoma treated with 3D conformal radiotherapy
Irena Muçollari, Aurora Cangu, Anastela Mano, Gramoz Braçe, Artur Xhumari, Jetmira Kerxhaliu, Blerina Myzeqari 112

Outcome prediction in radiotherapy
Olga Stakhova, Islam Sagov, Evgenia Sukhikh 113

$LaCl_3$:Ce crystalline scintillator thickness optimization for low radiographic X-ray tube voltages: A theoretical study
Stavros Tseremoglou, Dionysios Linardatos, Christos MIchail, Ioannis Valais, Athanasios Bakas, Konstantinos Ninos, Ioannis Kandarakis, George Fountos, Nektarios Kalyvas 114

Mapping the melanin concentration distribution in common nevus using hyperspectral imaging as prognostic diagnosis
Dragos Manea, Mihaela Antonina Calin, Florin Stanescu, Viorel Parasca Sorin 115

Spectral characterization and detection of skin tumors based on hyperspectral imaging
Mihaela Antonina Calin, Dragos Manea, Andrei Dumitrescu, Viorel Parasca Sorin 116

E-ROD – A new metric to evaluate the relative detectability of two digital mammography systems
Anna Wysocka-Rabin, Magdalena Dobrzynska, Katarzyna Pasicz, Witold Skrzynski, Ewa Fabiszewska 117

Dental X-ray imaging: The construction of a novel teeth phantom
M. Kalakos, A. Fountou, G. Fasoulas, G. Fountos, N. Kalyvas, P. Liaparinos 118

Infrared thermographic imaging of the human lower limb
Agathi Kaloudi, David Stratos, Nektarios Kalyvas, Ioannis Kalatzis, Aikaterini Skouroliakou 119

Evaluation of a new procedure for stability checks of well-type brachytherapy chambers
Ivana Komatina, Milos Zivanovic, Nikola Krzanovic, Milos Djaletic, Srboljub Stankovic 120

Simulation and characterization methods of proton beams for ultra-high dose rate irradiation
Andrei-Theodor Hotnog, Mircea Lechinţan, Melania-Beatrice Istrati, Decebal Iancu, Radu-Florin Andrei, Robert Sîrbu, Mihai Straticiuc 121

Experience of the calibration and testing laboratory in establishing and maintaining a management system in accordance with the ISO/IEC 17025 standard
Iwona Grabska, Wioletta Ślusarczyk-Kacprzyk, Marcin Szymański, Paweł Kukołowicz 122

The number of radiation beams audited during TLD postal dose audit performed by the Secondary Standards Dosimetry Laboratory in Poland in the context of the COVID-19 pandemic
Iwona Grabska, Wioletta Ślusarczyk-Kacprzyk, Marcin Szymański 123

Secondary Standards Dosimetry Laboratory (SSDL) at the Maria Sklodowska-Curie National Research Institute of Oncology – results of the 2018-2022 activity
Wioletta Ślusarczyk-Kacprzyk, Iwona Grabska, Marcin Szymański 124

Results of the intermediate checks on the working standards used for routine calibrations of ionizing radiation dosimeters in a ^{60}Co gamma ray beam – experience from over a year of calibration laboratory activity
Iwona Grabska, Wioletta Ślusarczyk-Kacprzyk, Marcin Szymański 125

The number of calibrations of electrometers with different types of ionization chambers performed by the calibration laboratory in Poland in the context of the COVID-19 pandemic
Iwona Grabska, Wioletta Ślusarczyk-Kacprzyk, Marcin Szymański 126

Short wavelength UV in combination with cold storage can minimize postharvest gray mold losses in strawberry
Aruppillai Suthaparan 127

Investigation of the OAM EM wave interaction with tissue at microwave and millimeter wave frequencies
Jelena Trajković, Slobodan Savić, Milan Ilić, Andjelija Ilić 128

Examining the function of NK cells towards various target tumor cells
Vladimir Jurisic 129

Evaluation of radiology devices quality compared to COCIR standards and the problems observed during the facing of the Covid 19 pandemic
Niko Hyka, Dafina Xhako, Partizan Malkaj 130

Evaluation of planter fascia among patients with painful heel in Sudan: Sonographic findings
Amna Mohamed Ahmed, Nurein Mohamed A. Salam, Elamin Asma Ibrahim, Abukuna Mohamed Nur, Muna M.A. Abushanab, Babiker Awadelseed, Saida Abdelkreem, Hamid Osman, Waleed Alshehrani, Maueen Uddin Khandaker 131

Comparison of different immunological techniques for the detection of anti-cytomegalovirus IgM antibodies in pregnant women
Blerta Laze 132

Changes in various amino acid concentrations in the small intestine and pathogenesis of an intestinal injury caused by carbon-ion irradiation
Saori Nakamura, Nobuhiko Takai, Yoshino Katsuki, Akiko Uzawa, Ryoichi Hirayama, Yoshihito Ohba 133

Investigation of proton irradiation induced effects in chondrosarcoma and bystander normal chondrocytes and endothelial cells
Mihaela Tudor, Mihaela Temelie, Antoine Gilbert, Anca Dinischiotu, François Chevalier, Diana Iulia Savu 134

Radiosensitizing effect of ATM and ATR kinase inhibitors on glioblastoma
Ana-Maria-Adriana Șerban, Mihaela Temelie, Gro Elise Rødland, Antoine Gilbert, François Chevalier, Randi Syljuåsen, Diana-Iulia Savu 135

The appearance of prion-like proteins in descendants of soybean planted under radionuclide contamination in Chornobyl aliened zone for several generations
Namik Rashydov, Djamal Rakhmetov 136

Pilot lung cancer screening program in Serbia after 2-year results and challenges
Dragan Dragišić, Gordana Vujasinović, Jelena Đekić Malbaša, Ilija Andrijević, Dijana Bjelajac, Jelena Djokic, Sanja Vunjak 137

The importance of immunization as a preventive measure in the fight against tuberculosis
Violeta Ilić Todorović, Jasmina Jovanović Mirković, Christos Alexopoulos, Bojana Miljković, Dragana Đorđević Šopalović, Zorica Kaluđerović 138

The role of the pharmacist in the implementation of self-medication
Violeta Ilić Todorović, Jasmina Jovanović Mirković, Christos Alexopoulos, Momčilo Todorović, Nemanja Nenezić, Zorica Kaluđerović 139

Health education of the population about the prevention possibilities of HPV infection
Milica Stanojević, Jasmina Jovanović Mirković, Christos Alexopoulos, Violeta Ilić Todorović, Svetlana Čapaković 140

Vaccine prophylaxis as the key to success against polio
Milica Stanojević, Jasmina Jovanović Mirković, Christos Alexopoulos, Bojana Miljković, Marko Jovanović, Dragana Đorđević Šopalović 141

Investigation of the effect of surface roughness on the structural features of dental implants
Neşe Benay Seken, Nilgün Baydoğan 142

Evaluating changes in retinal nerve fiber layer and photopic negative response for patients under glaucoma treatment
Marsida Bekollari, Maria Dettoraki, Valentina Stavrou, Aikaterini Skouroliakou, Panagiotis Liaparinos 143

Effects of seeds irradiation with a microwave on the properties of wheat
Hyam Khalaf, Mostafa Y. A. Mostafa, Mona Moustafa, Manar A. N. Mohamed, Alaa A. M. Kamel, Marwa A. S. Abd Algawad, Karim M. A. Mohamed, Rasha Kamal Helmey 144

Determination of the original dose of irradiated fruits by EPR spectroscopy
Katerina Aleksieva, Yordanka Karakirova 145

Evaluation of gamma irradiation effects on antioxidant capacity of propolis
Ralitsa Mladenova, Nikolay Solakov, Kamelia Loginovska 146

Detection of chemical changes in X-rayed potato tubers using fingerprinting technique
Yana Zubritskaya, Ulyana Bliznyuk, Polina Borshchegovskaya, Anna Malyuga, Valentina Avdyukhina, Natalya Chulikova, Sergei Zolotov, Mikhail Beklemishev, Alexander Nikitchenko, Alexander Chernyaev, Victoria Ipatova 147

Development of a method to identify and quantify the content of the active form of protein molecules after exposure to radiation using enzymatic hydrolysis by trypsin
Oleg Khmelevsky, Ulyana Bliznyuk, Polina Borshchegovskaya, Irina Ananyeva, Alexander Chernyaev, Arkady Braun, Igor Rodin, Dmitry Yurov, Victoria Ipatova 148

Valence distribution of As-76 atoms in arsenic thiocompounds irradiated with neutrons
Juan F. Facetti Masulli, Hector Colmán 149

Radiation-induced catalysis in the presence of metal oxide nanoparticles produced by pulsed electron beam evaporation
Andrey Gerasimov, Mikhail Balezin, Vladislav Ilves, Sergey Sokovnin 150

^{236}U and its determination with accelerator mass spectrometry
Tomáš Prášek, Mojmír Němec 151

Radioisotopic ratios in marine research – a multi-case study
Petros Leivadaros, Jan John, Mojmír Němec, Nikolaos Kallithrakas-Kontos 152

Isotopic signature and mixing between groundwater, surface water and precipitation in the Zagreb aquifer area
Zoran Kovač, Jadranka Barešić, Nataša Todorović, Jelena Parlov, Andrea Sironić, Jovana Nikolov 153

Concentration of selected radionuclides in high dust deposition areas: Consideration of depleted uranium
Abdulaziz Aba, Omar Alboloushi, Anfal Ismaeel 154

Sorption of Europium and Cobalt using thermally modified winery waste
Eleftheria Kapasii, Fotini Noli, Panayiotis Tsamos 155

Production yield analysis of ^{97,95}Ru radionuclides from Li-induced reactions
Ankur Singh, Moumita Maiti 156

Visualizing industrial processes with gamma process tomography: A non-invasive approach
Daniela Gurau 157

Assessment of Ho(III), Er(III) and Gd(III) uptake by cyanobacteria *Arthrospira platensis* using neutron activation analysis and their effects on biomass biochemical composition
Inga Zinicovscaia, Liliana Cepoi, Ludmila Rudi, Tatiana Chiriac, Dmitrii Grozdov 158

Previous impoundment studies on Itaipu Dam: submerged biomass effect in water quality
Juan F. Facetti Masulli, Cesar Taboada 159

Effect of mycelium-based biosorbent modifications on efficiency of strontium removal from aqueous solutions
Małgorzata Jakubiak, Natalia Perzyna, Miriam Wierska, Romuald Stęborowski, Monika Asztemborska 160

Natural and artificial radionuclides in wood biomass used for heating – comparison of North-East Italy and imported wood pellets
Chiara Cantaluppi, Beatrice Morelli, Raffaele Cavalli, Nicolò Pradel, Rosa Greco 161

Athermal healing of preexisting defect in crystalline silicon under local electronic excitation processes
Gihan Velişa, Eva Zarkadoula, Yang Tong, William J. Weber 162

Structural characteristics of some bifunctional catalysts for rechargeable zinc-air batteries
Tanya Malakova, Kiril Krezhov, Gergana Raikova, Elena Mihaylova-Dimitrova, Peter Tzvetkov, Tatyana Koutzarova 163

Biocompatible collagen-based hydrogels with a hybrid structure developed by e-beam irradiation technology
Maria Demeter, Andreea Mariana Negrescu, Anisoara Cimpean, Ion Calina, Anca Scărișoreanu, Mădălina Albu Kaya, Marin Micutz, Bogdana Mitu, Veronica Satulu, Marius Dumitru-Grivei 164

Speciation of fission products in the grey phases of spent nuclear fuel: A study of novel complex sodium, barium, and strontium molybdates
Andres Lara-Contreras, Mohammad Affan, Jennifer Scott, Emily Catherine Corcoran 165

Effects of preparation route on magnetic ordering near room temperature in Al-substituted Ba-Sr Y-type hexaferrites
Tatyana Koutzarova, Kiril Krezhov, Borislava Georgieva, Anatoliy Senyshyn 166

Radiation-induced modification effects in covalent-network glass formers: phenomenological description within unified configuration-enthalpy diagram
Oleh Shpotyuk, Mykola Vakiv, Andriy Andriy, Roman Golovchak, Valentina Balitska, Mykhaylo Shpotyuk 167

On the numerical criterion of radiation-modification efficiency in chalcogenide glasses
Oleh Shpotyuk, Andriy Kovalskiy, Jacek Filipecki, Roman Golovchak, Yaroslav Shpotyuk, Mykhaylo Shpotyuk, Vitaliy Boyko, Valentina Balitska 168

Sequential dual ion beam irradiation effects on $KTaO_3$
Decebal Iancu, Maria Diana Mihai, Eva Zarkadoula, Yanwen Zhang, William John Weber, Gihan Velisa 169

X-ray induced structural changes in germanium sulfide glasses
Roman Holovchak, Andriy Kovalskiy, Yaroslav Shpotyuk, Oleh Shpotyuk 170

Radiation synthesis of microemulsion-based hydrogels loaded with lavender oil
Anca Scărișoreanu, Maria Demeter, Ion Călina, Marius Dumitru-Grivei, Marin Micutz 171

Evaluation of biopolymers modified by ionizing radiation and cold plasma processing based on a multivariate statistical approach
Mirela Brașoveanu, Maria Demeter, Dorina Ticoș, Monica R. Nemțanu 172

Gold nanoparticle-composite hydrogel synthesized by e-beam irradiation
Anca Scărișoreanu, Maria Demeter, Ion Călina, Mihaela Bojan 173

Investigation and characterization of 2D materials and vdW heterostructures by application of Raman spectroscopy
Victoria Vartic, Grigory Arzumanyan, Kahramon Mamatkulov, Anna Geronina 174

Photo-induced neutrophil extracellular traps: The role of cytochromes
Kahramon Mamatkulov, Darya Zakrytnaya, Yersultan Arynbek, Nina Vorobyeva, Grigory Arzumanyan, Anka Jevremović 175

Application of electron beam radiation for the development of conductive thermoplastic elastomers with improved mechanical and physicochemical properties
Gunta Kizane, Maris Bertins, Remo Merijs-Meri, Janis Zicans, Ingars Reinholds, Liga Avotina, Arturs Viksna 176

Effect of surfactants on the luminescence of ZnO nano particles
Ioana Perhaita, Laura Elena Muresan, Lucian Barbu-Tudoran, Adriana Popa, Gheorghe Borodi 177

Heavy metals effect on optical properties of zinc oxidic compounds
Laura Elena Muresan, Ioana Perhaita, Lucian Barbu-Tudoran, Gheorghe Borodi 178

Proton irradiation effects on optical properties of undoped $Gd_3Al_xGa_{5-x}O_{12}$ single crystals
Dmitry Spassky, Andrey Spassky, Victor Lebedev, Fedor Fedyunin, Nina Kozlova, Evgeniia Zabelina, Valentina Kasimova, Oleg Buzanov 179

Luminescence of undoped and RE doped $Na_3Sc_2(PO_4)_3$ under high energy irradiation
Nataliya Krutyak, Dmitry Spassky, Ekaterina Shabalina, Dina Deyneko, Irina Kudryavtseva, Vitali Nagirnyi 180

Analytical investigations concerning copies after Roman Imperial Denarius – case study
Daniela Cristea-Stan, Lucian Munteanu 181

Alloy composition studies on some silver coins from the Hellenistic period. Case study: posthumous Macedonian silver coins and imitations of Histrian coins - Apollo type
Daniela Cristea-Stan, Gabriel Mircea Talmatchi 182

Solid state detector energy response in W/Al mammography radiation quality series

Andrea Kojic[1,2], Nikola Krzanovic[1], Milos Zivanovic[1], Predrag Bozovic[1], Jelena Stankovic Petrovic[1], Ivana Komatina[1,3], Jelena Vlahovic[1,4]

1 Vinca Institute of Nuclear Sciences, National Institute of the Republic of Serbia, University of Belgrade, Belgrade, Serbia
2 Faculty of Physics, University of Belgrade, Belgrade, Serbia
3 Faculty of Physical Chemistry, University of Belgrade, Belgrade, Serbia
4 Faculty of Sciences, University of Novi Sad, Novi Sad, Serbia

Ionization chambers and solid state detectors incorporated into multimeters are often used for quality control in different modalities of medical imaging and diagnostic radiology. The equipment to be used in the routine QC procedures needs to be calibrated under well-known radiation conditions (known as radiation qualities) defined by the international standards. International standards IEC 61267:2005 [IEC 62167, IEC 2005] and IAEA TRS 457:2007 [IAEA TRS 457, IAEA 2007] cover general radiography and fluoroscopy radiation qualities (abbreviated as RQR and RQA series, in the voltage range from 40 kV to 150 kV), and computerized tomography radiation qualities (abbreviated as RQT series, in the voltage range from 100 kV to 150 kV), among other. In the field of mammography reference radiation fields are defined for molybdenum anode/filtration combination (Mo/Mo, abbreviated as RQR-M series, in the voltage range from 25 kV to 35 kV). Since Mo/Mo mammography units are widespread and available at hospitals they have been included in the standard [IEC 62167, IEC 2005]. Even so, Secondary Standard Dosimetry Laboratories (SSDLs) that are performing calibrations of QC dosimeters for end-users, rarely have availability of such anode/filtration combination under reference laboratory conditions. SSDLs most often employ X-ray generators with W/Al combinations. Additionally, nowadays many different combinations of anode/filtration are present in mammography units of different manufacturers that are commonly used in the hospitals. Multimeters are often sensitive to spectral changes caused by different anode/filter combination, so it is doubtful that the traceability established for one anode/filter combination can be used to measure doses for another combination. Measurements with different solid state detectors were performed under laboratory conditions with W/Al radiation qualities established in the SSDL. In the future, research will be expanded to clinical conditions in radiation fields produced by mammography units which employ Mo/Mo, Mo/Rh, Rh/Rh, W/Rh and W/Ag. Dosimeter response will be evaluated based on the dependency of 1st HVL which is correlated to radiation output of the X-ray generator (the incident photon spectra).

Keywords: diagnostic radiology, mammography, solid-state detector, energy response, anode/filtration combination

Acknowledgments: This work was funded by The Ministry of Science, Technological Development and Innovation of the Republic of Serbia under contract 451-03-47/2023-01/ 200017, and International Atomic Energy Agency (IAEA) under the research contract No: 24688, which is part of the IAEA Coordinated Research Project E24024, entitled 'Evaluation of the Dosimetry Needs and Practices for the Update of the Code of Practice for Dosimetry in Diagnostic Radiology (TRS-457)'.