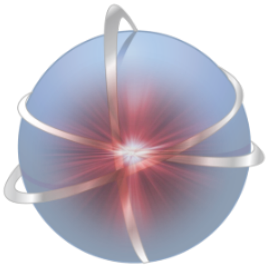
TESNAT 2018

20-22 April 2018 Akdeniz University, Antalya, Turkey

4th International Conference on Theoretical and Experimental Studies in Nuclear Applications and Technology



Abstract Book

Editors
Eyyup TEL, Abdullah AYDIN, İsmail Hakkı SARPÜN

TESNAT 2018

4th International Conference on Theoretical and Experimental Studies in Nuclear Applications and Technology

20-22 April 2018
Akdeniz University
Antalya, Turkey

Abstract Book

Editors

Eyyup TEL
Abdullah AYDIN
İsmail Hakkı SARPÜN

tesnat.org

Dear Colleagues,

Welcome to the 4th International Conference on Theoretical and Experimental Studies in Nuclear Applications and Technology (TESNAT 2018). This conference is the fourth step of the TESNAT Conference series. TESNAT 2015 was held in Osmaniye Korkut Ata University, Osmaniye, TESNAT 2016 was held in Mustafa Kemal University, Hatay and TESNAT 2017 was held in Çukurova University, Adana. The world of nuclear physics is an exciting area in which to work, and we'll continue to meet and bring inspired people together in conference like this, to ensure TESNAT remains at the cutting edge.

We intend in this conference to discuss and compare all applicable methods as are being applied at present in nuclear physics. The problems faced in these fields at present are focused in the development of new methods and in the improving of existing techniques to achieve an understanding of existing experimental data and in predicting with high reliability new properties and processes. We propose this conference as a mean to bring together all these related communities with the goal of creating an enriching dialog across the disciplines. The conference will give an overview on the theoretical and experimental challenges in nuclear physics and applications.

We'd like to thank each of you for attending our conference and bringing your expertise to our gathering. You are truly our greatest asset today and tomorrow, and we could not accomplish what we do without your support and leadership.

TESNAT 2018 Organization Committee

Contents

Committees

Honorary Committee

Prof.Dr. Mustafa ÜNAL	Rector, Akdeniz Uni.
Dr. Zafer DEMİRCAN	Director, TAEK

Organising Committee

Prof.Dr. Eyyup TEL (Chair)	Osmaniye Korkut Ata University, Turkey
Assoc.Prof.Dr. Ismail H. Sarpün (Sci.Sec.)	Akdeniz University, Turkey
Prof. Dr. Arjan KONING	International Atomic Energy Agency (IAEA), Austria
Prof.Dr. Abdullah AYDIN	Kırıkkale University, Turkey
Prof. Dr. Mohamed BELGAID	University of Sciences and Technology Houari Boumediene, Algeria
Prof.Dr. Abdullah KAPLAN	Süleyman Demirel University, Turkey
Prof. Dr. Jameel-Un NABI	GIK, Pakistan
Prof.Dr. Ahmet BOZKURT	Akdeniz University, Turkey
Prof.Dr. Bayram DEMİR	Istanbul University, Turkey
Assoc.Prof.Dr. Muhittin ŞAHAN	Osmaniye Korkut Ata University, Turkey
Assoc.Prof.Dr. Nina TUNCEL	Akdeniz University, Turkey

Local Organizing Committee

Assoc.Prof.Dr. Ahmet BÜLBÜL	Osmaniye Korkut Ata University
Dr. Ercan YILDIZ	Kırıkkale University
Dr. Yusuf KAVUN	Osmaniye Korkut Ata University
Res. Asst. Dr. Hasan ÖZDOĞAN	Akdeniz University
Res. Asst. Nuri YORULMAZ	Harran University
Res. Asst. Mehmet Murat YAŞAR	Harran University
Gözde DEMİRELLİ	Doğa Private Schools
Tuğba ÇEPNİ	İstanbul University

Scientific Committee

Prof. Dr. Yousry ABUSHADY	Alexandria University, Egypt
Prof. Dr. Emel ALĞIN	Eskisehir Osmangazi University, Turkey
Prof. Dr. Hüseyin AYTEKİN	Bulent Ecevit University, Turkey
Dr. Ahmed AZBOUCHE	Nuclear Research Center of Algeria, Algeria
Prof. Dr. Mohamed BELGAID	University of Sciences and Technology Houari Boumediene, Algeria
Assoc.Prof.Dr. Mahmut BÖYÜKATA	Kırıkkale University, Turkey
Dr. Thomas CALLIGARO	Louvre Museum, France
Prof. Dr. Üner ÇOLAK	Istanbul Technical University, Turkey
Prof. Dr. Mitra DJAMAL	ITB, Indonesia
Prof.Dr. Stéphane GORIELY	Université libre de Bruxelles, Belgium
Prof.Dr. Nalan ÖZKAN GÜRAY	Kocaeli University, Turkey
Prof. Dr. Orhan GÜRLER	Uludağ University, Turkey
Dr. Lama HADID-BEURRIER	PSRPM, France
Assoc.Prof.Dr. Erol KAM	Yıldız Technical University, Turkey
Prof. Dr. Salem KESSAL	University of Sciences and Technology Houari Boumediene, Algeria
Dr. Ali İhsan KILIÇ	TRIUMF, Canada
Prof. Dr. Arjan KONING	International Atomic Energy Agency (IAEA), Austria
Prof. Dr. Jameel-Un NABI	GIK, Pakistan
Prof. Dr. Dimitri A. ROCHMAN	Paul Scherrer Institute, Switzerland
Prof. Dr. Mahdi SADEGHI	University of Medical Sciences, Iran
Prof. Dr. Cevad SELAM	Mus Alparslan University, Turkey
Prof. Dr. Saleh SULTANSOY	TOBB University of Economics & Technology, Turkey
Prof. Dr. Güneş TANIR	Gazi University, Turkey
Prof. Dr. Mustafa TOPAKSU	Cukurova University, Turkey
Prof. Dr. Osman YILMAZ	Middle East Technical University (METU), Turkey

Scientific Program

20 April 2018 Friday

09:00	REGISTRATION			
10:30	OPENING CEREMONY			
11:00	Inv. Talk: Prof. Dr. Yousry ABUSHADY Current and future nuclear reactors option in the World			
11:30	Inv. Talk: Prof. Dr. Nazmi Turan OKUMUŞOĞLU Türkiye neden nükleer enerji teknolojisine girmeli?			
	FERMI HALL Chair: Prof.Dr. Saleh SULTANSOY	BECQUEREL HALL Chair: Prof.Dr. İlkay TÜRK ÇAKIR	HESS HALL Chair: Prof.Dr. Hüseyin Ali YALIM	LAWRENCE HALL Chair: Prof.Dr. Mohamed BELGAID
13:00 – 13:15	Aidin GHALEHASADI Spectral statistics of transition probabilities in regular nuclei	Sabin STOICA Double beta decay and its potential to investigate BSM physics	Doğan YAŞAR An assessment of therapy dosimeter calibrations performed in SSDL	Muhammad Syahir SARKAWI Radiation shielding properties of concrete containing ferro-boron and barite-colemanite using Monte Carlo method
13:15 – 13:30	Hasan BİRCAN A new Aziz potential parameter set for nucleon-nucleon interaction: first results		Kürşad Osman AY Nuclear level densities of ^{143,147}Nd isotopes	R. Gökhan TÜRECİ The effect of the linear-quadratic anisotropic scattering and the slab thickness over the albedo problem
13:30 – 13:45	Kaan MANİSA VMC calculations for nuclear matter by using Aziz potential with a new parameter set	Jameel-Un NABI How effective are the pn-QRPA calculation of weak rates of odd-A nuclei in stellar environment	Özlem DAĞLI Comparison of different embolization materials on gamma knife arteriovenous malformation dose distributions	Pınar KAAN The criticality problem with the quadratically anisotropic scattering
13:45 – 14:00	Mehmet Emin KORKMAZ Investigation of fusion-fission target systems with Monte Carlo method by using accelerated deuterons	Ali İhsan KILIÇ Reaction mechanism of ^{8}Li(a,n)^{11}B at low energies	Özlem DAĞLI Material selection for gamma knife phantoms	Mehmet Ertan KÜRKÇÜOĞLU Indoor Radon in Isparta
14:00 – 14:05	Boumediene LASRI Excitation of heliumlike Kr34+(1s2) ions by neutrals at intermediate impact energies: projectile nuclear charge dependence	Ercan YILDIZ Calculations of cross-sections and astrophysical S-factors for the ^{13}C(a,n)^{16}O reaction	Vildan ÖZKAN BİLİCİ Physical properties of TiN reactor structural material	Esra UYAR Determination of the full energy peak efficiency of HPGe detector using Monte Carlo simulation
14:05 – 14:10	Furkan OK Exploring the magicity for the ^{78}Ni nucleus	Merve AYDOĞAN Investigation of the geometric shapes of $^{80-88}$Zr isotopes within the interacting boson model-1	Vildan ÖZKAN BİLİCİ Structural properties of the candidate reactor material VC composites	Fatma YAKUT Use of Boron and Boron compounds as shielding material in reactors
14:10 – 14:15	Rıdvan ÜNAL Radon (Rn-222) activity in some deep well water in Uşak and its surrounding	İsmail Hakkı SARPÜN Light charged particle emission of VC composites	Ceren KARAMAN Investigation of the potential use of 3D graphene networks and composites for high-performance electromagnetic interference shielding	Fatma YAKUT Investigation of the use of Samarium and Gadolinium materials in nuclear technology
14:15	BREAK			
	FERMI HALL Chair: Prof. Dr. Yousry ABUSHADY			
14:30	Inv. Talk: Prof. Dr. Saleh SULTANSOY Green Nuclear Energy: Thorium			
15:00	Inv. Talk: Prof. Dr. İlkay TÜRK ÇAKIR LHC Experiments and Future Circular Collider (FCC) Project			
15:30	BREAK			
	FERMI HALL Chair: Prof.Dr. Jameel-Un NABI	BECQUEREL HALL Chair: Prof.Dr. Abdullah AYDIN	HESS HALL Chair: Prof.Dr. Ahmet BOZKURT	LAWRENCE HALL Chair: Prof.Dr. Rıdvan ÜNAL
15:45 – 16:00	Seyed Khalil MOBAREKH Relation of spectral statisitcs and medical applications	Sefer BALCI Development of an algorithm for the spectrum deconvolution of uranium samples measured by CdZnTe detector	Ahmet BOZKURT Stopping power and range of protons between 10-1000 MeV energies in water using the Monte Carlo technique	Hande KAYACIK X-ray shielding performance of Sodium metasilicate/Barium oxide glassy composites

16:00 – 16:15	Yusuf KAVUN A study of excitation functions calculations for some A<20 target nuclei	Murat DAĞ MDM spectrometer and Oxford detector (MDM-focal plane) at TAMU cyclotron institute	Fatih EKİNCİ Investigation of lateral spread of 80-250 MeV energy protons in water and cortal bone	Yaren ERGİN As a shielding glassy structures against gamma rays: epoxy/PbO and epoxy/BaO composites
16:15 – 16:30	Ghazi ALSBEIH Cytogenetic biodosimetery for the assessment of radiation doses in cases of radiological accidents	Sefer BALCI Implementation of two-window and three-window peak area methods to determine the ^{235}U abundance in Uranium samples measured by a $LaBr_3(Ce)$ scintillation detector	Mohamed BELGAID Excitation functions systematics studies of (n,a) nuclear reactions with neutron energy range from threshold to 20 MeV	Tuğba DEMİRBAY Investigation of gamma-ray shielding parameters of $Na_2Si_3O_7/Bi_2O_3$ glassy composites
16:30 – 16:45	Erdem UZUN One trap one recombination model under the first order kinetic parameters	M. Cüneyt KAHRAMAN Hydrogen recombination in REKO-4 facility and analysis of recombination	Fatih EKİNCİ Effects of Biomaterials on Lateral Spreading Dose in Proton Therapy	İsmail Hakkı KARAHAN Genetic programming modelling of Radon measurements of some touristic places in Hatay, Turkey
16:45 – 16:50	Ayla GÜMÜŞ Comparison of Radon Concentration Results Measured by Two Different Methods in Well Waters	Fatma Aysun UĞUR Use of Boron in reactors as shielding and moderator material	Ceren KARAMAN A novel approach to electromagnetic interference shielding: conductive polymer/graphene nanocomposites	Tuğba ÇEPNİ The radiochemical purity test of ^{99m}Tc-sestamibi
16:60 – 16:55	Mehmet ERDOĞAN Gamma exposure and annual effective dose due to terrestrial radioactivity in Ortaköy granitic zone of Aksaray province (Turkey)	Kemal TAŞDÖVEN Gamma ray strength function calculations in some Osmium isotopes	Mehmet Emin KORKMAZ Evaluation of the perlite as a new radiation shielding material	Tuğba ÇEPNİ Quality control tests of cardiac SPECT camera

21 April 2018 SATURDAY

	FERMI HALL Chair: Prof.Dr. Eyyup TEL	BECQUEREL HALL Chair: Prof.Dr. Muhittin ŞAHAN	HESS HALL Chair: Prof.Dr. Sabin STOICA	LAWRENCE HALL Chair: Assoc.Prof.Dr. Doğan YAŞAR
09:00 – 09.15	Özgür CULFA Measurements of generated proton energy spectra by high power lasers	Abdullah AYDIN Investigation of the effects of the level density models and g-strength function models on the ^{92,94,98,100}Mo(p,g) reaction cross sections	İlker SERT Temporal evolution of lead isotope ratios and metal concentrations in sediments of the North Aegean sea, in Turkish coast	Hatice Kübra BELEN Investigation of the possibility of producing ^{225}Ac radioisotope in a proton cyclotron
09:15 – 09:30	Duygu BOLAT Dosimetric comparison of two different VMAT techniques in lung cancer radiotherapy	Erol KAM Comparison of gamma-ray sources which used to measure of material density especially -metals and alloys via using transmission technique	Kübra BAYRAK Determination of count intensity and elemental weight percentages of sediments in the Altınova shipyard region (Yalova-Izmit gulf) by SEM-EDX	Salih Mustafa KARABIDAK An application of the dead time correction program at gamma-rays detectors
09:30 – 09.45	Ersin ÇİÇEK Design of a 352.21 MHz RF power coupler for the SANAEM RFQ	Erol KAM Outdoor gamma dose in air and investigation cancer risk for Hatay province, Turkey	Mehmet KOŞAL Luminescence dating of Harran ruins bricks	Salih Mustafa KARABIDAK A program for dead time correction at gamma-rays detectors
09:45	BREAK			
	FERMI HALL Chair: Assoc.Prof.Dr. Kaan MANİSA	BECQUEREL HALL Chair: Assoc.Prof.Dr. R. Gökhan TÜRECİ	HESS HALL Chair: Assoc.Prof.Dr. Mahmut BÖYÜKATA	LAWRENCE HALL Chair: Dr. Zafer SAĞEL
10:00 – 10:15	Aslıhan ÇAĞLAR Electromagnetic Simulations for 800 MHz Pillbox Cavity and Power Coupler	Burcu UÇAR Bohr Hamiltonian for $\gamma=30^{\circ}$ with Kratzer potential	Fatma Aysun UĞUR Investigation of the use of Boron and clay materials in radioactive waste storage systems	Elif Ebru ERMİŞ Can FLUKA determine light yields of the scintillators used in medical imaging?
10:15 – 10:30	Nihal BÜYÜKÇİZMECİ On the determination of binding energy of hypernuclei	Tuğba TURAN A Solution of Bohr Hamiltonian for $\gamma=0°$ with Kratzer Potential	Yunus Emre DOĞAN Excitation function of (g,xn) reaction in some lanthanides	Elif Ebru ERMİŞ Investigation of gamma ray percent absorption efficiencies of the crystals used in medical imaging by means of FLUKA Monte Carlo program
10:30 – 10:35	Özgür CULFA Effects of Radiation Pressure Acceleration on Heavy Ion Generation for Ultra Intense Laser Solid Interaction	Yusuf KAVUN Comparison of Radiation Shielding Properties of Fir with other Wooden Materials at 6 MeV X-rays Energy	Rıdvan ÜNAL Preparation of Organic Nano Thin Film Sensor for Harmful Gas Detections	Adem PEHLİVANLI Determination of secondary neutrons produced by 100 MeV energy protons in water

10:35 – 10:40	Volkan SERT Acceleration of Carbon ions by high power lasers	R. Ömer TURHAN Mean free path calculations for some shielding barite concrete elements	Ozan TOKER Prediction of breast cancer pattern using artificial neural network algorithms	Tuğçe GÜLÜMSER Investigation of p, d and α emission spectra for neutron and proton induced reactions on ^{63}Cu
10:40 – 10:45	Hüseyin Ali YALIM Investigation of the Excitation-Autoionization States of Helium	Enis KAPDAN Radiologic risk assessment of outdoor radioactivity in capital city Ankara, Turkey	Ozan TOKER Classification of breast cancer patients' blood samples using machine learning algorithms	Tuğçe GÜLÜMSER A theoretical study on the production cross–section calculations for ^{86}Y medical isotope
10:45	BREAK			
	FERMI HALL Chair: Prof.Dr. Nazmi Turan OKUMUŞOĞLU			
11:00	Inv. Talk: Prof.Dr. Üner ÇOLAK Nuclear Energy: Historical Developments and Future Perspectives			
11:30	Inv. Talk: Dr. Zafer SAĞEL Nuclear Applications in Agriculture			
	FERMI HALL Chair: Prof.Dr. Nihal BÜYÜKÇİZMECİ	BECQUEREL HALL Chair: Assoc.Prof.Dr. M.Hicabi BÖLÜKDEMİR	HESS HALL Chair: Prof. Dr. Abdellatif Elanique	LAWRENCE HALL Chair: Assoc.Prof.Dr. İsmail Hakkı SARPÜN
13:00 – 13:15	Yousry ABUSHADY Reactor design calculations	Burcu UÇAR A solution of Bohr hamiltonian for γ≈30° with Kratzer potential	Erol KAM Outdoor gamma dose rates in air and assessment of cancer risk for Kocaeli province, Turkey	Nina TUNÇEL Medical imaging from analog to digital systems: A review
13:15 – 13:30	Mahmut BÖYÜKATA Study on shape structure of even-even cerium isotopes within the interacting boson model-1 and the cranking Nilsson Strutinsky model	A. Güneş TANIR Application of active-OSL approximation to experimental decay curves from NaCl sample exposed to different doses	İlker SERT Sediment chronology and historical evolution of heavy metal contamination in terms of pollution index in Turkish coast, North Aegean Sea	Önder SÖNMEZ Investigation of level density parameter dependence for some even-odd and odd-even nuclei in fission cross sections induced by neutrons with the incident energy up to 20 MeV
13:30 – 13:45	Abdullah AYDIN The comparison of the effect of the different sets of the deformation parameters on the cross sections calculations of $^{96\text{-}104}$Ru targets	Hüseyin TOKTAMIŞ Investigation of thermoluminescence properties of calcite mineral conducted by bacterial calcium carbonate ($CaCO_3$) precipitation in organic soil	Kübra BAYRAK Study of gross alpha and gross beta activity concentration in sediments in the Büyükçekmece lake basin (İstanbul, Turkey)	Hediye ACUN BUCHT Calculation of the in-air output factors of 6MV photon beam of a medical linear accelerator by means of photon phase spaces attained by the Geant4/GATE Simulation
13:45 – 13:50	Rıdvan ÜNAL The calculation of (n,x) reaction cross sections for ^{209}Bi, ^{232}Th and ^{238}U nuclei between 0 and 30 MeV	Hatice BİLGİN Excitation functions of nuclear reactions induced by alpha particles up to 50 MeV on ^{46}Ti, ^{45}Sc and ^{51}V	Muhittin ŞAHAN Cross-section calculations of Gallium and Arsenic nuclei for (n,2n) and (n,p) Reactions up to 20 MeV	Oğuz AYDIN Dosimetric comparison of three different VMAT techniques in head and neck cancer radiotherapy
13:50 – 13:55	Aysun İNAL The radiation dose measurements on linear accelerator (Linac) unit, produces high energy x-rays	Gözde DEMİRELLİ Theoretically proton emission DDX calculation on Ge isotopes of neutron induced reactions	Mert ŞEKERCİ (n,p) reaction cross–section calculations of fission reactor control rod materials ^{107}Ag, ^{111,112,113}Cd, ^{115}In	Tahir ÇAKIR Calculation of radiological properties of iodine compounds contrast agents (iodixanol, iohexol, iopamidol, iopromide, ioxagalete)
13:55 – 14:00	Hüseyin Ali YALIM Experimental study of double excitation-ionization resonance profiles of helium by electrons	Mehmet BÜYÜKTÜRKMEN Investigation of ^{131}Cs medical radioisotope production by TALYS	Mert ŞEKERCİ (n,2n) reaction cross–section calculations of some Cd isotopes	Asuman KOLBAŞI Node locator: An intraoperative gamma camera
14:00	BREAK			
	FERMI HALL Chair: Prof.Dr. A. Güneş TANIR			
14:15	Inv. Talk: Dr. Thomas CALLIGARO Nuclear Imaging of Paintings			
	FERMI HALL Chair: Asst.Prof.Dr. Tahir ÇAKIR	BECQUEREL HALL Chair: Prof.Dr. Abdullah KAPLAN	HESS HALL Chair: Assoc.Prof.Dr. Erol KAM	LAWRENCE HALL Chair: Assoc.Prof.Dr. Nina TUNÇEL
14:45 – 15:00	Tuğba TURAN Bohr hamiltonian for γ≈0° with Kratzer potential	Mustafa ÖZGÜR The γ-ray strength functions of ^{143,147}Nd isotopes	M. Özgür SEZER ESR investigation of radiation effect on CoQ10 drug	Hülya ÖZDEMİR Recent developments in medical imaging
15:15 – 15:20	Erhan ESER Calculation specific heat capacity of Uranium Nitride nuclear fuel	Ali Nadi KAPLAN Investigation of radiation effects on polymer concretes designed with different aggregates	Sümeyra BALCI YEĞEN Thermoluminescence heating rate behaviour of Zn(BO2)2:0.05Dy3+	Boumediene LASRI Triple differential cross sections for the single ionization of water molecule (H_2O) by electron impact
15:20 – 15:25	Uğur BÜYÜKER A survey distribution of terrestrial radionuclides in surface soil samples in and around Erzin province, Turkey	Ali Nadi KAPLAN Proton and alpha radiation effects on hematite aggregated polymer concretes by using Geant4	Dilek TOKTAMIŞ Variation of the kinetic parameters of traps found in the fluorapatite mineral ($Ca_5F(PO_4)_3$) in tooth enamel under the different annealing temperatures	Mehmet Murat YAŞAR Calculation of mass attenuation coefficients of hormirad and galena materials for radiation shielding by Monte Carlo method

15:25 – 15:30	Uğur BÜYÜKER Measurements of gross alpha and gross beta activities in Erzin Water	Hasan ÖZDOĞAN Comparison of penetrating distance calculations for magnetite and ordinary concrete	Nihal BÜYÜKÇİZMECİ Investigation of the Lambda hypernuclei in nuclear reactions	Asiye GÜROL Theoretical calculation of gamma induced fission cross section on some actinides
15:30 – 15:35	Elif GÖREN Tritium activity levels in drinking water of Adana, Turkey	Hasan ÖZDOĞAN Comparison of stopping power calculations for magnetite and ordinary concrete	Bekir ORUNCAK Excitation Function of (p,xn) reactions for ^{113}Cd Nucleus	Ceren KARAMAN High performance graphene-based photodetectors
15:35 – 15:40	Erdem UZUN Investigation of the glow curves of the Ermenek-Sarıveliler-Başyayla region soil samples	Abdullah KAPLAN Deuteron induced reaction cross–section calculations for ^{107,109}Ag, ^{151,153}Eu and ^{160}Gd isotopes	Aysun İNAL Evaluation of the dosimetric results of 3 mm geometric error in linear accelerator (LINAC) beam data measurements	İsmail Hakkı SARPÜN Photo-neutron cross section calculations of ^{84,86,87,88}Sr
15:40 – 15:45	Ahmet BÜLBÜL Calculation of diffusion length with Anli-Güngör phase function using UN method	Abdullah KAPLAN Neutron production cross–section calculations of ^{111}Cd for (p,xn) reactions	Asiye GÜROL Theoretical calculation of neutron induced fission cross section on some actinides	İsmail Hakkı SARPÜN Proton, deuteron and alpha emission of TiN composites

22 April 2018 SUNDAY

	FERMI HALL Chair: Assoc.Prof.Dr. Ahmet BÜLBÜL	BECQUEREL HALL Chair: Assoc.Prof.Dr. Hüseyin TOKTAMIŞ	HESS HALL Chair: Dr. Ercan YILDIZ	LAWRENCE HALL Chair: Prof.Dr. İbrahim Halil MUTLU
09:00 – 09.15	Mehmet Murat YAŞAR Calculation of linear attenuation coefficient of amethyst material for radiation shielding by Monte Carlo method	Gökmen ŞEKER The effects on radiation damage of some nuclear libraries in a hybrid reactor	Orkhan MUKHTARLI Tritium activity levels in bottled water and mineral water sold in Azerbaijan	İsmail Hakkı KARAHAN Optimization of the electrophoretic deposition parameters for Biocomposite hydroxyapatite /chitosan/ collagen/h-BN
09:15 – 09:30	Sergey KARPENKO Leukemia Incidence in the Russian Cohort of Chernobyl Emergency Workers: Estimates of Radiation Risks in the Follow-up Period 1986–2014	Erol KAM Determination of morphological characteristics and mineralogical structure of the Kulakcayiri sediments by SEM and XRD	Sergey LOVACHEV Estimate of individualized radiation risk coefficients under internal exposure for the cohort of Russian emergency workers	İsmail Hakkı KARAHAN The effect of chitosan concentration on the corrosion characteristics of the biomedical grade $Ti_6A_{l4}V$ implants electrophretically coated with hydroxyapatite/chitosan biocomposites
09:30 – 09.45	Maria CHUSHNYAKOVA Influence of backscattering on fission rate of excited nuclei	Hilal BARDAKÇI Three-dimensional Monte Carlo calculation of the nuclear parameters for some nuclear libraries	Abdellatif ELANIQUE Determination of the dead layer thickness for HPGe detector: measurements vs. Monte Carlo methods	Ali Armağan GÖK A study of mean free path on the radiation shielding properties of normal concrete
09:45	BREAK			
	FERMI HALL Chair: Assoc.Prof.Dr. Mehmet ERDOĞAN	BECQUEREL HALL Chair: Assoc.Prof.Dr. Fatma Aysun UĞUR	HESS HALL Chair: Dr. Yusuf KAVUN	LAWRENCE HALL Chair:Dr. Hasan ÖZDOĞAN
10:00 – 10:15	Aydan ALTIKULAÇ Measurement of natural radioactivity in quartz stone	Gökmen ŞEKER The investigation of convert ^{232}Th(n,γ)^{233}U for some nuclear libraries in a hybrid reactor	Abdellatif ELANIQUE validation of a NaI(Tl) and $LaBr_3$(Ce) detector's models: experiment and Monte Carlo simulations	Yusuf Alper KAPLAN Necessity of nuclear energy in Turkey
10:15 – 10:30	Aydan ALTIKULAÇ Determination of radioactivity levels in feldspar samples in Turkey	Erol KAM Evaluation outdoor gamma dose rates in air and cancer risk determination for Nevsehir, Turkey	Murat DAĞ Determination of direct capture reaction rate for ^{26}Si(p,γ)^{27}P	Yusuf Alper KAPLAN The role of nuclear energy for generating electric in Turkey
10:30 – 10:45	Eyyup TEL Investigation of using neutron generator source in Thorium fuel efficiency at new generation nuclear reactor types	Hilal BARDAKÇI The calculation of neutron flux for some nuclear libraries using Monte Carlo method	Ali Zafer BOZKIR The effect of varying constant source over albedo problem for quadratically anisotropic scattering	Asuman KOLBAŞI A Monte Carlo calculation of the x-ray attenuation of tungsten functional papers (TFP)
10:45	BREAK			
	FERMI HALL Chair: Prof.Dr. Üner ÇOLAK			
11:00	Inv. Talk: Prof.Dr. İbrahim Halil MUTLU How Innovation is Related to STEM Education? Where are we at? What can be Done?			
11:30	Inv. Talk: Prof. Dr. Yousry ABUSHADY 3NS [Nuclear Safety, Nuclear Security and Nuclear Safeguards] and World Nuclear Crises			

Invited Talks

Nuclear energy; Historical developments and future perspectives

ÜNER ÇOLAK Istanbul Technical University

Nuclear energy has been utilized commercially since the late 1950's. Currently, there are 450 reactors worldwide producing 10% of the world's electricity. It is expected to preserve this share for the next 40 years. The development of civilian use of nuclear energy was initiated in the US, The UK, France, Canada, and the Soviet Union. Each country decided to follow a different path to develop different technology. Later on, these technologies converged into only a number of alternatives with water cooled reactors. In addition to these countrıes, Japan, South Korea, and China developed their own reactor designs. Countries like, Czech Republic, Italy, and Spain developed industrial infrastructure to manufacture almost all the heavy equipment in their countries and capacity to export them. Currently, nuclear industry focused on safety improvements and better fuel utilization with improved economy. Meanwhile, major nuclear accidents, Three Mile Island, Chernobyl, and Fukushima, influenced the fate on the nuclear industry. Public perception of nuclear energy was also affected by these accidents. Nuclear is still considered to be an important way of generating electricity without greenhouse gas emission and base load capability. The historical developments in nuclear energy and future perspectives are discussed in this study.

Keywords: Nuclear technology

Green Nuclear Energy: Thorium

SALEH SULTANSOY, TOBB ETÜ Engineering Faculty
Azerbaycan Elmler Akademiyası Fizika İnstitutu
ATLAS, CLIC and LHeC Collaborations, CERN
European Committee for Future Accelerators

Energy production and consumption are among the most important indicators of the level of development of the countries. In particular, electricity consumption is directly related to the level of prosperity. In this respect, the diversity of energy sources and optimization are very important. Today, the lion's share of energy production is obtained from fossil resources; but the rate of fossil resources must be reduced rapidly in terms of reducing global warming. In terms of meeting the energy supply at the required level, we have two options: renewable energy sources and nuclear energy. Actually, these two sources are not alternatives to each other; they should be considered as complementary.

Electricity generation from renewable sources has two major disadvantages: it is expensive and non-persistent (the problem of continuity can be overcome in the coming years thanks to new energy storage technologies). Even the developed countries are still forced with the cost problem. In fact, renewable energy sources are not as ecological as one might think. For example, space required for 100 GW plants: nuclear – 100 km^2, solar – 50.000 km^2, wind – 60.000 km^2, hydraulic – 240.000 km^2, biomass – 600.000 km^2 (for comparison: Turkey's area is 780.000 km^2). Concerning developing and underdeveloped countries, there is no serious alternative to nuclear energy. We meet here with two major problems: the risk of accidents and nuclear waste. The 3rd and especially the 4th generation technologies solve the reliability problem (Chernobyl and Fukushima were based on 2nd generation technology). Concerning GNP per capita: if > 30.000 $ renewable, if < 10.000 $ nuclear.

Thorium-fueled nuclear systems, especially ADS, which are much safer than uranium-fueled reactors, will also be able to solve the waste problem. While the amount of waste generated in these systems is much lower, they can also be used to burn waste from uranium-fueled reactors, as well as military plutonium.

Forecasts:

- commercialization of thorium-fueled conventional type nuclear reactors within next 5-10 years,
- commercialization of thorium-fueled molten salt reactors within next 10-15 years,
- commercialization of 100% thorium-fueled (real "green" nuclear energy) accelerator driven (ADS) nuclear reactors within next 15-20 years.

Finally, in the 21st century, this scenario is much more realistic than ITER's choice to solve the energy problem of mankind and requires an order less investments.

LHC Experiments and Future Circular Collider (FCC) Project

İLKAY TÜRK ÇAKIR Giresun University

This presentation includes information about the world's largest particle-physics laboratory, European Organization for Nuclear Research (CERN). In addition, the Large Hadron Collider (LHC) and its dedectors called ATLAS, CMS, ALICE and LHCb are introduced. Moreover, current status of Turkey and CERN relationship has been given in this presentation. Furthermore, a nuclear experiment namely the Isotope mass Separator On-Line facility (ISOLDE) is explained. Finally, the next generation collider as Future Circular Collider (FCC) and its options (FCC-hh, FCC-ee, and FCC-he) are mentioned for comparision, which is supported by EuroCirCol project.

How Innovation Is Related to STEM Education? Where are we at? What can be Done?

İBRAHİM HALİL MUTLU Akdeniz University

In this study, we will briefly discuss the applications of physics as a basic science in our daily lives and provide important scientific contributions to physics by the scientists along with the training they received. In addition, the requirements for admission on basic science and engineering programs in developed countries will be presented and compared the current system in Turkey and the relationship between education and development will be addressed. It is important that the STEM education or the basic science education programs should be updated in accordance with the developing techniques and technologies of educational sciences. Taking the best practices in the world as an example, the efforts that can be practiced to correct the situation in our country should be put forward on such platforms where all stakeholders can contribute. The proposal for a solution that will increase the competitiveness of our future generations on the world scale that will also conform to our culture should be urgently addressed and put into practice.

Nuclear imaging of paintings

THOMAS CALLIGARO Centre de Recherche et de Restauration des Musées de France, C2RMF, Palais du Louvre - Porte des Lions, 14 Quai François Mitterrand, 75001 Paris, France

Beams of X-rays ions and neutrons have been successfully applied to record elemental maps of historical paintings. Such probes can notably reveal without contact and in a non-destructive way pigment distribution within entire paintworks through their elemental fingerprints. The comparison of the images recorded using such nuclear techniques with pictures taken with routine imaging techniques (e.g. visible, UV, IR photography and X-ray radiography) provide curators, art historians and restorers information concerning the painter techniques and choices, and can help in the preparation and the monitoring of restorations.
The presentation will focus on three nuclear imaging techniques employed in the study of paintworks. First is the scanning X-ray fluorescence technique that was initially developed at the synchrotron, and then transposed to the laboratory under the name MA-XRF [1]. The second approach is the PIXE scanning using an external microbeam of protons of a few MeV [2]. The last is the Neutron-Activation Auto-Radiography technique (NAAR), which exploits the flux of cold neurons from a nuclear reactor. The merits and limitations of the three approaches will be discussed. For example, excitation with protons confers to PIXE a probing depth that can be adapted with incident ion energy, an improved yield for light elements compared to heavier ones, and an easy beam scanning. On the other hand, the scanning X-ray beam is probing deeper and exhibits unique features such as Compton scattering and is less susceptible to induce modifications in paint materials than ion beams. Finally, the deep penetration of neutrons and gamma-rays permits to image isotopes independently of the paint layer thickness and stratigraphy.
The capabilities and limitations of the nuclear imaging of paintings will be illustrated by the results obtained on Leonardo da Vinci masterpieces from the Louvre museum (MA-XRF), 19th c paintings (scanning-PIXE) and a portrait by Rembrandt (NAAR).

[1] E. Ravaud, L. Pichon, E. Laval, V. Gonzalez, M. Eveno, T. Calligaro, Development of a versatile XRF scanner for the elemental imaging of paintworks, Appl. Phys. A122 (2016) 17
[2] T. Calligaro, V. Gonzalez, L. Pichon, PIXE analysis of historical paintings: Is the gain worth the risk?, Nucl. Instr. And Meth. B363 (2015) 135

Türkiye neden nükleer enerji teknolojisine girmeli?

NAZMİ TURAN OKUMUŞOĞLU Ondokuz Mayıs University

Türkiye'nin enerji durumu ve nükleer enerji teknolojisine girmesi için gerekçeler. Nükleer enerjinin tarihçesi, gelişimi. Dünya'da nükleer enerjinin bugünkü durumu. Türkiey'de nükleer enerji santralleri kurma çalışmaları. Akkuyu nükleer santrali ile ilgili ana başlıklar.

Oral Presentations

Spectral statisitcs of transition probablities in regular nuclei

[1] HADI SABRI University of Tabriz
[2] AIDIN GHALEHASADI University of Tabriz
[3] ASGAR HOSSEINNEZHAD University of Tabriz

In this study, we have analyzed the fluctuation properteis of electromagnetic transition intensities in the regular nuclei. All the available experimental data are used to construct different sequences and consider the effect of mass and deformation on statistical properties. Results show a Poisson-like behavior for quadrupole transitions. Also, we have observed GOE like statitics for the transition probabilities of deformed regular nuclei.

Keywords: transition probablities, Spectral statisitcs, quadrupole t, quadrupole transitions, nuclear deformation

A new Aziz potential parameter set for nucleon-nucleon interaction: First results

[1] HASAN BİRCAN Dumlupınar University
[2] KAAN MANİSA Dumlupınar University
[3] MEHMET ERDOĞAN Selçuk University
[4] AHMET BİÇER Dumlupınar University

Atomic theory based on the shell model has provided remarkable clarification of the complicated details of atomic structure. Therefore, nuclear physicists attempted to use a similar theory to attack the problem of nuclear structure in the hope of similar success in clarifying the properties of nuclei. We keep it in our mind, we have tried to obtain a new parameter set for Aziz potential, which used in atomic interaction for Helium, for nucleon-nucleon interactions.

Keywords: Aziz potential, nucleon-nucleon interaction, nuclear matter

VMC calculations for nuclear matter by using Aziz potential with a new parameter set

[1] HASAN BİRCAN Dumlupınar University
[2] KAAN MANİSA Dumlupınar University
[3] MEHMET ERDOĞAN Selçuk University
[4] AHMET BİÇER Dumlupınar University

We have obtained ground state properties of Symmetric nuclear matter (SNM) by using a Variational Monte Carlo method (VMC) in our previous studies. Accepting these studies as the results of a computer experiment, a new parameter set for Aziz potential is found to consistently reproduce the saturation properties of the nuclear matter obtained VMC calculations. The saturation properties of SNM are calculated by the Aziz potential with the new parameter set.

Keywords: Aziz potential, nuclear matter, Variational Monte Carlo

Investigation of fusion-fission target systems with Monte Carlo method by using accelerated deuterons

[1] MEHMET EMİN KORKMAZ Karamanoğlu Mehmetbey University
[2] ÖZGÜR CULFA Karamanoğlu Mehmetbey University

Fusion-fission reactions can be performed on a fine pitch of micron thickness by using high power lasers. The basic concept of this scenario is based on the density and energy of accelerated particles or ion beams by high intense lasers. In this study, we have used accelerated deuteron energy spectra by high power laser-solid interactions obtained computationally using 2D EPOCH PIC simulations. These accelerated deuterons bombarded the solid Fusion-Fission targets. The Monte Carlo code MCNPX2.7.0 was used for reactions occurring in the fusion-fission target system. As a result; fusion-fission reactions have been achieved with accelerated deuteron by high-intense table-top terawatt laser and the deuterons can reach up to 10 MeV of energy.

Keywords: High intensity lasers, Deuteron, Monte Carlo Method, PIC code, Fusion-Fission

Excitation of heliumlike Kr34+(1s2) ions by neutrals at intermediate impact energies: Projectile nuclear charge dependence

[1] BOUMEDIENE LASRI University tahar Moulay of Saïda, Algeria Theoretical Physics laboratory, University of tlemcen, Algeria
[2] FATIMA BOUASRIA University tahar Moulay of Saïda, Algeria
[3] MOHAMMED SAHLAOUI Theoretical Physics laboratory, University of tlemcen, Algeria
[4] MAMMAR BOUAMOUD Theoretical Physics laboratory, University of tlemcen, Algeria

Schwinger variational approach to the process of direct electronic excitation of atoms by impact of ions at intermediate impact energies was shown to be very successful in predicting the saturation of excitation cross sections when the projectile charge is increased. In this study, our new approach is based on the fractional form of the Schwinger variational principle and applied to study the excitation of Kr34+ (1s2) ions impinging at 34 MeV/u (v=35 a.u) by various atoms of nuclear charges Zp (2<ZT<54) which include neutral gaseous (He, N_2, Ne, Ar, Kr, Xe). Our theoretical calculations of the excitation cross sections stay in good agreement with experimental data of Chabot et al.

Keywords: Schwinger variational principle, excitation cross section, saturation effect.

Exploring the magicity for the ^{78}Ni nucleus

[1] FURKAN OK Yıldız Teknik University Physics Department
[2] HAŞİM ZAHİD GÜVEN Yıldız Teknik University Physics Department
[3] KUTSAL BOZKURT Yıldız Teknik University Physics Department
[4] ESRA YÜKSEL Yıldız Teknik University Physics Department

Exploration of nuclei with extreme number of protons and neutrons has become a very active area of research with the advances in the experimental facilities and theoretical models. In recent years, it has been shown that exotic nuclei display some special properties like weakening or disappearance of some well-known magic numbers (2, 8, 20, 28, 50 and 82), and formation of the new ones [1]. Therefore, exploration of these nuclei is quite important in order to understand the changes in the nucleon-nucleon interaction and shell structure of nuclei through the nuclear drip lines. Presently the Hartree-Fock Bogoliubov (HFB) approach with Skyrme type energy density functionals provide the most complete and reliable results in the calculation of the properties of nuclei over the nuclide chart [2].

In this work, we explore the magic nature of the ^{78}Ni nucleus using the Hartree-Fock-Bogoliubov approach with Skyrme type energy density functionals. The effect of the tensor interaction on the Z=28 and N=50 magic numbers is investigated using SLy5 (without tensor) and SLy5+T, T44 and T66 (with tensor) interactions in Nickel isotopic chain and N=50 isotones, respectively. The single-particle energies and two-nucleon gaps are analyzed and compared with the available experimental data. It is shown that the tensor force strengthens the magicity of the ^{78}Ni nucleus by increasing the single-particle gap of protons and neutrons, which also supports the results of the recent experimental data in Refs. [3,4].

[1] O. Sorlin and M.-G. Porquet, Prog. Part. Nucl. Phys. 61, 602 (2008).
[2] K. Bennaceur and J. Dobaczewski, Comput. Phys. Commun. 168 (2005) 96.
[3] L. Olivier et al., Phys. Rev. Lett. 119 (2017) 192501.
[4] A. Welker et al., Phys. Rev. Lett. 119 (2017) 192502.

This work is supported by the Scientific and Technological Research Council of Turkey (TÜBİTAK) under project number MFAG-114F335.

Keywords: magicity, skyrme, hfb, tensor interaction, nickel

Radon (Rn-222) activity in some deep well water in Uşak and its surrounding

[1] RIDVAN ÜNAL Uşak University Vocational School of Health Services, ,
[2] TUNCAY ERDOĞAN Alpay Günbayram Anadolu Lisesi

Radon gas and other decay products constitute half of natural radiation exposition. One of the main sources of radioactive elements is underground water that includes radioactive elements from ^{238}U and ^{232}Th group because of radioactive materials which it passes through and contacts. Moreover, there are studies trying to predict eartquakes by focusing on the relation between changing radon gas activities and seismic activities. This study aims on determining radon and radium activities contained in deep well water in Uşak and its surroundings. The water samples taken from 10 different wells by weekly periods between August and September are examined in the Nuclear Physics Laboratory of Physics Department at Afyon Kocatepe University. According to analysis, maximum and minimum radon activities are 21.56 Bq/L and 0.05 Bq/L, respectively. Regarding radium activity in the deep well water, its maximum and minimum activities are found as 5.84 Bq/L and 0.02 Bq/L, respectively.

Keywords: Radon, Radium, Earthquake, Activity, Deep Well Water

Double beta decay and its potential to investigate BSM physics

[1] SABIN STOICA International Centre for Advanced Training and Research in Physics (CIFRA), Romania

International Centre for Advanced Training and Research in Physics, Bucharest-Magurele, Romania Double beta decay (DBD) is a rare nuclear process of great interest due to its potential to provide information about physics beyond the Standard Model (BSM). Indeed, the discovery of the so called neutrinoless DBD mode would give answers to fundamental issues about possible violation of the Lorentz and CP symmetries in the weak sector, lepton number conservation, or neutrino properties such as i) are neutrinos Dirac or Majorana particles? ii) what are the neutrino absolute masses; iii) what is the correct hierarchy of the neutrino masses? iv) are there sterile neutrinos? In my talk, I will give a short review on the actual DBD investigations, especially the theoretical ones. I will present the theoretical challenges related to the DBD study, namely the calculation of the nuclear matrix elements, phase space factors, predictions of half-lives and constrains on BSM parameters. Finally, I will present results obtained by our group in the study of this process.

Keywords: nuclear physics, double beta decay, nuclear matrix elements, beyond SM physics

How effective are the PN-QRPA calculation of weak rates of odd-a nuclei in stellar environment

[1] JAMEEL-UN NABI GIK Institute of Engineering Sciences & Technology
[2] MUHAMMAD MAJID GIK Institute of Engineering Sciences & Technology
[3] MUHAMMAD RIAZ GIK Institute of Engineering Sciences & Technology

In a recent study by Cole et al. [Phys. Rev. C 86 (2012) 015809], it was concluded that quasi-particle random phase approximation (QRPA) calculations show larger deviations and overestimate the total experimental Gamow–Teller (GT) strength. It was also concluded that QRPA calculated electron capture rates exhibit larger deviation than those derived from the measured GT strength distributions. The main purpose of this study is to probe the findings of the Cole et al. paper. This study gives useful information on the performance of QRPA-based nuclear models. As per simulation results, the capturing of electrons that occur on medium heavy isotopes have a significant role in decreasing the ratio of electron-to-baryon content of the stellar interior during the late stages of core evolution. We report the calculation of allowed charge-changing transitions strength for odd-A fp-shell nuclei (^{45}Sc and ^{55}Mn) by employing the deformed pn-QRPA approach. The computed GT transition strength is compared with previous theoretical calculations and measured data. For stellar applications, the corresponding electron capture rates are computed and compared with rates using previously calculated and measured GT values. Our finding shows that our calculated results are in decent accordance with measured data. At higher stellar temperature, our calculated electron capture rates are larger than those calculated by independent particle model (IPM) and shell model. It was further concluded that at low temperature and high density regions, the positron emission weak-rates from ^{45}Sc and ^{55}Mn may be neglected in simulation codes.

Keywords: Gamow–Teller transitions; electron capture rates; pn-QRPA theory; stellar evolution; core-collapse

Reaction mechanism of $^{8}Li(a,n)^{11}B$ at low energies

[1] ALİ İHSAN KILIÇ Czech Academy of Science, Czech Rep.
[2] BARRY DAVIDS TRIUMF, Canada
[3] FADİME KILIÇ Gazi University
[4] İSMAİL HAKKI SARPÜN Akdeniz University
[5] ALEX BROWN Michigan State University, USA

The investigation of cross sections for the $^{8}Li(a,n)^{11}B$ reaction has important impact for both primordial nucleosynthesis in the inhomogeneous models as well as constraining the physical conditions characterizing the r-process. However, there are large discrepancies existing between inclusive and exclusive measurements of the $^{8}Li(a,n)^{11}B$ reaction cross section below 3 MeV. In the present work, in order to undertand reaction mechnanism of $^{8}Li(a,n)^{11}B$, we have applied WKB, DWBA and R matrix theory. Spectroscopic factor has been calculated for 12B compound structures. The cross section for the $^{8}Li+^{4}He$ reaction comes from not only direct reaction but also compound nucleus ^{12}B. Inclusive measurements are close to calculated the theoretical calculations which including direct reaction contribution with DWBA below 3 MeV. However, there are dramatic discrepancy between theory and experimental cross section data below the 3 MeV. Furthermore, channel dependence of WKB approximation for penetration factor dependency of cross-section and S-factor calculation have been applied to illustrate the cross section measurements below the Coulomb barrier. The new R-matrix calculations have been carried out to achieve both reaction rates and partial S factor, R-matrix calculation shows that there could be a new resonance structure in the astrophysical site. Moreover, nobody has mentioned up to now that it is important to remark that the tail of sub-threshold resonance effect might be effect of the total cross section below the 0.6 MeV.

Keywords: inhomogeneous models, exclusive measurements, Spectroscopic factor, compound structures

Calculations of cross-sections and astrophysical S-factors for the $^{13}C(a,n)^{16}O$ reaction

ERCAN YILDIZ Kırıkkale University

This study cross sections of the $^{13}C(\alpha,n)^{16}O$ reaction have been calculated at low energy ranges. In these theoretical calculations, the TALYS 1.8 codes were used. Also, the astrophysical S-factors which describe the possibility of reaction in low energies were calculated. Results of our calculations were checked to the experimental data obtained from EXFOR database.

Keywords: cross section s-factor, TALYS

Investigation of the geometric shapes of $^{80-88}$Zr isotopes within the interacting boson model-1

[1] MERVE AYDOĞAN Kırıkkale University
[2] MAHMUT BÖYÜKATA Kırıkkale University

In this recent work, we focus on the prediction of the geometric shapes of the even-even ^{80,82,84,86,88}Zr isotopes. For this purpose, the potential energy surfaces (PES) obtained from the interacting boson model-1 (IBM-1) were plotted as a function of the deformation parameters (β,γ) by using common Hamiltonian parameters of IBM-1. For this process, the energy levels of given nuclei were calculated by fitting the parameters of the constructed IBM-1 Hamiltonian. Later, the B(E2) transition values were calculated to obtain other set of the deformation parameters. We compared all calculated β deformations within the experimental ones.

Keywords: energy levels, B(E2) values, deformation parameters, IBM-1 model

Light charged particle emission of VC composites

[1] İSMAİL HAKKI SARPÜN Akdeniz University
[2] AHMET BOZKURT Akdeniz University
[3] ABDULLAH AYDIN Kırıkkale University
[4] SUAT PAT Eskişehir Osmangazi University
[5] MOHAMED BELGAID USTHB

Composite materials that are made of ceramics are considered to be suitable as structural materials for the first-wall or blanket material in fusion research. Vanadium carbide (VC) composites that are known to be radiation-resistant have been developed to serve as candidate structural materials for future fusion reactors that will operate at extremely high temperatures. In this study, VC composites, which were produced in Eskisehir Osmangazi University by plasma RF sputtering method, have been investigated as a target material using Monte Carlo simulations to obtain light charged particle (proton, deuteron and alpha) emission spectra.

Keywords: MCNP, VC, Composite

An assessment of therapy dosimeter calibrations performed in SSDL

[1] DOĞAN YAŞAR TAEK
[2] ENİS KAPDAN TAEK
[3] MUHARREM KORKMAZ TAEK

Purpose: In this study, it was aimed to evaluate the calibration performance and stabilities of user ionization chambers and the reference standards between 2006 and 2016. Methods: The user dosimeters were calibrated according to the international dose protocols, air kerma, NK and absorbed dose to water, ND, W methods. The extended uncertainties for NK and ND, W calibration coefficients were calculated to be 1.0% and 0.9%, for a coverage factor k=2, with a confidence probability of 95%, respectively. The stability was obtained by repeated calibrations and intercomparison of IAEA/WHO transfer chamber calibrations. Results: Relative response of reference dosimeter was in the range of 0.993-1.005 and 0.999-1.013 for NK and ND, W, respectively. The results are within the acceptable limit (±1.5%) determined by the IAEA. The stability of user ionization chambers is determined by evaluating repeated calibrations and is calculated to be in the range 0.9946±0.0034 to 1.0104±0.0014 for NK and 0.9968±0.0096 to 1.0024±0.0009 for ND, W. Conclusions: User chambers'stability was observed to be within 0.3% limit as recommended by TG-51 addendum. This study confirms the opinion that the calibration of therapy dosimeters does not need to be performed every year, taking into account long-term stability of the chambers and except for breakdown and maintenance.

Keywords: Calibration, SSDL, Standardization, Ionization chambers, Radiotherapy

Nuclear level densities of ^{143,147}Nd isotopes

[1] KÜRŞAD OSMAN AY Eskişehir Osmangazi University
[2] MUSTAFA ÖZGÜR Eskişehir Osmangazi University
[3] MAGNE GUTTORMSEN University of Oslo
[4] EMEL ALĞIN Adana Bilim ve Teknoloji University
[5] FRANK LEONEL BELLO GARROTE University of Oslo
[6] LUCIA CRESPO CAMPO University of Oslo
[7] ANDREAS GORGEN University of Oslo
[8] TRINE WIBORG HAGEN University of Oslo
[9] ANN CECILIE LARSEN University of Oslo
[10] VICTOR MODAMIO University of Oslo
[11] FABIO ZEISER University of Oslo
[12] SUNNIVA SIEM University of Oslo
[13] VETLE WEGNER INGEBERG University of Oslo
[14] SUNNIVA ROSE University of Oslo
[15] EDA ŞAHİN University of Oslo
[16] GRY MERETE TVETEN University of Oslo
[17] JORGEN ERIKSSON MIDTBO University of Oslo
[18] BONGINKOSI VINCENT KHESWA University of Oslo
[19] MALIN KLINTEFJORD University of Oslo
[20] THERESE RENSTROM University of Oslo

Nuclear level densities, which are described as number of accessible quantum levels per unit energy at a certain excitation energy, have been very important quantities since first described by Hans Bethe [1]. They are used in various areas, including neutron-capture cross section calculations in astrophysics, designing and testing nuclear reactors, transmutation of nuclear waste. The Nuclear Physics Group at the University of Oslo has established a method to determine simultaneously the nuclear level densities and γ-ray strength functions from particle-γ coincidences [2,3]. For nearly three decades, the so-called Oslo method has been a robust way to obtain level densities and γ-ray strength functions. ^{142,146}Nd metallic isotopes were bombarded by deuteron beam at the Oslo Cyclotron Laboratory and ^{142}Nd(d,p) and 146Nd(d,p) reactions were studied. The level densities of ^{143,147}Nd isotopes will be presented.

[1] H.A. Bethe, Phys. Rev. 50, 332 (1936) .
[2] A. Schiller et al., Nucl. Instrum. Methods Phys. Res. A 447 (2000).
[3] A.C. Larsen et al., Phys. Rev. C 83, 034315 (2011).

This study is supported by the Scientific and Technological Research Council of Turkey (TUBITAK) under the Project No: 115F196. kursadosmanay@gmail.com

Keywords: Nuclear, level, Density,^{143}Nd,^{147}Nd

Comparison of different embolization materials on gamma knife arteriovenous malformation dose distributions

[1] ÖZLEM DAĞLI Gazi University
[2] ERKAN BOSTANCI Ankara University
[3] HAKAN EMMEZ Gazi University
[4] FATİH EKİNCİ Gazi University

Embolization materials are employed in AVM (Arteriovenous malformation) treatment. Gamma Knife treatment is generally applied in AVM and AVM residue situations. This study analyses the doses accumulated by three different embolization materials, namely: onyx, cyanoacrylate and polyvinyl alcohol (PVA). A collimator helmet size of 8mm was used in a Monte-Carlo simulation implemented in Geant4. Obtained dose accumulations are analysed and results show differences in the dosimetries computed.

Keywords: Embolization, onyx, cyanoacrylate, polyvinyl alcohol, Gamma Knife, Geant4, dosimetry

Material selection for gamma knife phantoms

[1] ÖZLEM DAĞLI Gazi University
[2] ERKAN BOSTANCI Ankara University
[3] GÖKHAN KURT Gazi University
[4] FATİH EKİNCİ Gazi University

This study analyses the dose difference for a variety of phantom materials that can be used for Leksell Gamma Knife. These materials have properties that are very similar to the human tissue not including the skull bone. Geant4 was employed in the analysis for collimator helmet sizes of 4mm and 8mm. The phantom had a radius of 80mm. Water, brain, PMMA (Poly-methyl methacrylate) and polystyrene were used as the material types. Results show different radiation dosimetries depending on the material types.

Keywords: Gamma Knife, Geant4, material types, dosimetry

Physical properties of TiN reactor structural material

[1] VİLDAN ÖZKAN BİLİCİ Afyon Kocatepe University
[2] ZEYNEP ŞİLAN TURHAN IRAK Iğdır University
[3] CEREN KARAMAN Pamukkale University
[4] AHMET BOZKURT Akdeniz University
[5] SUAT PAT Eskişehir Osmangazi University
[6] İSMAİL HAKKI SARPÜN Akdeniz University

The composites were accepted as suitable structural materials for both fission and fusion reactors. The physical properties of nitrites and its coatings are very high temperature stability, excellent corrosion resistance, superior mechanical properties and good thermal conductivity applications. Titanium nitride has found numerous applications due to its excellent corrosion and erosion resistance, excellent adhesion on various steel substrates, high inertness, high melting temperature, high hardness and optimum optical and electronic properties. For this study, TiN composite samples were produced at Eskişehir Osmangazi University to investigate some physical properties.

Structural properties of the candidate reactor material VC composites

[1] VİLDAN ÖZKAN BİLİCİ Afyon Kocatepe University
[2] ZEYNEP ŞİLAN TURHAN IRAK Iğdır University
[3] CEREN KARAMAN Pamukkale University
[4] AHMET BOZKURT Akdeniz University
[5] SUAT PAT Eskişehir Osmangazi University
[6] İSMAİL HAKKI SARPÜN Akdeniz University

In the nuclear energy renaissance, performance-enhanced materials, driven by fission reactor concepts using very high temperatures and fast neutron spectra, play a central role. The development of advanced materials to be used in next-generation reactors is due to the need for extreme environmental resistance due to long-term, high-damage radiation flows, extreme temperatures and high stress conditions combined with well understood and widely used materials. In fusion and fission reactor applications, materials that play an important role have some important characteristics that must be maintained. These include low activation, structural integrity, dimensional stability, thermal conductivity, and thermal odor absorption. In this study, some features of VC composites produced as candidate materials (diameter, refraction index, wsd analysis, electron imaging with GOF and FESEM) were investigated.

Investigation of the potential use of 3D graphene networks and composites for high-performance electromagnetic interference shielding

[1] CEREN KARAMAN Pamukkale University, Department of Chemical Engineering
[2] EDİP BAYRAM Akdeniz University, Department of Chemistry
[3] ONUR KARAMAN Akdeniz University Vocational School of Health Services,
[4] İSMAİL HAKKI SARPÜN Akdeniz University, Department of Physics

Electromagnetic radiation is one of the serious problems that threaten human health, affect the nervous system and endocrine system. Shielding protection is the most effective way of preventing electromagnetic radiation. Hence, development of high-performance electromagnetic interference (EMI) shielding materials has gained importance. Materials which have high electrical conductivity such as metals are the most common EMI shielding materials with high shielding effectiveness (SE). For example, Cu-Ni composite and silver nanowires exhibited a SE of 25.0 dB at a thickness of 15.0 mm, and 35.0 dB at a thickness of 5.0 mm, respectively. However, metals suffer from high cost, poor resistance to corrosion, and high weight. Carbon nanomaterials with a high specific surface area and electrical conductivity can be used as lightweight and high-performance EMI shielding materials. With excellent optical and electrical properties, graphene networks are one of the prominent structures among these carbon materials. Considering the requirement of being lightweight and flexible, assembling two dimensional (2D) graphene sheets into three dimensional (3D) graphene structures (e.g., graphene foams, graphene aerogels or graphene sponge) emerged as an effective approach. In this work, with the light of detailed literature survey, it is concluded that 3D graphene networks have been considered as one of the most promising candidates for providing EMI shielding performance. It is provided that they can be directly used as high-performance EMI shielding films in areas such as flexible electronics, aerospace, packaging, and communication.

Keywords: 3D graphene, Electromagnetic interference shielding, Electrical conductivity

Radiation shielding properties of concrete containing ferro-boron and barite-colemanite using Monte Carlo method

[1] MUHAMMAD SYAHIR SARKAWI Universiti Teknologi Malaysia
[2] MUHAMMAD RAWI MOHAMED ZAIN Malaysian Nuclear Agency
[3] JASMAN ZAINAL Universiti Teknologi Malaysia
[4] FARIDAH MOHAMAD IDRIS Malaysian Nuclear Agency
[5] MOHAMAD HAIRIE RABIR Malaysian Nuclear Agency

Radiation shielding is very important component in nuclear facility since unwanted radiation can cause contamination and health problems. The problem of shielding against neutron and gamma radiation have always captivate by the important of this issue. Normally, the best known materials for shielding both neutron and gamma radiation are concrete. Concrete is made up form three basic components which are water, aggregate (rock, sand, gravel) and porland cement. However, normal concrete has low neutron absorption cross section. Hence, additional compound is needed to increase the neutron absorption cross section of the concrete. In this work, ferro-boron and barite-colemanite compound is used to enhance the radiation shielding properties of the concrete. Ferro-boron is an alloy, which is formed by combining iron with boron compound content between 10% to 17%. In this paper, Monte Carlo simulation code of MCNPX is used to simulate the radiation shielding properties of ferro-boron and barite-colemanite concrete. There are limited studies related to these concrete. According to the simulation results, it is clearly shows that adding ferro-boron compound into concrete mixture can significantly enhance the radiation shielding properties of the concrete.

Keywords: Radiation shielding, Ferro-Boron, Monte Carlo simulation code, Concrete mixture

The effect of the linear-quadratic anisotropic scattering and the slab thickness over the albedo problem

R. GÖKHAN TÜRECİ Kırıkkale University

Case's eigenfunctions and the orthogonality properties between these eigenfunctions is expanded to both linearly and quadratically anisotropic scattering for one-speed neutron transport theory. The slab albedo problem is investigated with the proper boundary conditions and with the suggested neutron fluxes over the surfaces by using Modified FN method. The calculated numerical results are tabulated according to the varying slab thicknesses and with varying scattering coefficients.

Keywords: Linear-Quadratic anisotropy, slab albeo, Modified FN method, Case's eigenfunctions

The criticality problem with the quadratically anisotropic scattering

[1] PINAR KAAN Kırıkkale University
[2] R. GÖKHAN TÜRECİ Kırıkkale University

One speed, time independent neutron transport equation is solved for a slab reactor. The general solution is written according to the quadratically anisotropic scattering. The criticality equation, which defines a relation between the secondary neutron number and the thickness of slab, is written with proper boundary conditions. The thickness of slab is calculated for varying secondary neutron numbers and varying scattering coefficients. The tabulated values represent the calculated critical thickness.

Keywords: Neutron transport theory, General solution of transport equation, Quadratically Anisotropic scattering, Criticality equation, Modified FN method

Indoor radon in Isparta

MEHMET ERTAN KÜRKÇÜOĞLU Süleyman Demirel University

Radon, a naturally occurring noble gas, is the most significant contributor to the natural indoor radioactivity. At the end of its half-life (3.82 days), radon-222 emits an α-particle (5.48 MeV) and then, decays into the first short-lived radon product (radioactive polonium-218). ^{222}Rn is much heavier than air therefore it can accumulate in enclosed spaces by time. When this is the case for dwellings or work places, radon may become a serious health concern for the habitants. Since radon is a class-A carcinogen and inhalation of radon and radon products is related to aetiology of lung cancer, it is quite important to determine the indoor radon levels from the point view of public health. In worldwide, up to 15% of the lung cancer cases are connected to radon (world's indoor radon average is 39 $Bq/^{m3}$). The average value for atmospheric radon concentration of the dwellings in Turkey is ~83 $Bq/^{m3}$. In addition, our previous surveys performed for Isparta city centre showed that, all of the atmospheric indoor radon concentration averages are higher than the national level (up to by a factor of 4). In the present study, the results of the atmospheric radon level measurements, which were performed for different dwellings and work places in the city centre by using passive measurement techniques (by using either long-term CR-39 nuclear etched track detectors, or long-term E-PERM electret ion chambers) at different time periods during the last ten years, have been summarized. Then, the annual effective doses taken by people in the city centre have been estimated. Within the limitations of this study it is revealed that, although all the averages obtained for both dwellings and work places are lower than the national limits, local people can receive annual doses close to 10 mSv due to radon inhalation.

Keywords: Isparta, indoor radon, annual effective dose equivalent

Determination of the full energy peak efficiency of HPGe detector using Monte Carlo simulation

[1] ESRA UYAR Gazi University
[2] MUSTAFA HİCABİ BÖLÜKDEMİR Gazi University
[3] ERHAN ESER Gazi University

High purity germanium (HPGe) detectors are widely used in γ-ray spectrometry to identify radionuclides and to determine their activity. To determine the activity, one of the most important characteristics of an HPGe detector is its full energy peak (photopeak) efficiency. In this study, the Monte Carlo method was used in calculating full energy peak efficiency for the HPGe detector within the 46.5-1836 keV energy range. The detector considered for the Monte Carlo simulation was a coaxial HPGe detector with an active volume of ~207 cm^3. Monte Carlo simulations were performed using the PHITS (Particle and Heavy Ion Transport code System) software, version 2.88. At least three separate simulations were done, with 108 particles for each energy and in modeling the pulse height mode detector, T-Deposit tally was chosen. Energy bin width in the tally was set low to 0.2 keV. As a result, the coaxial HPGe detector was modeled with PHITS software and it has been that the efficiency results obtained are in good agreement with the literature.

Keywords: PHITS, HPGe detector, efficiency, Monte Carlo simulations

Use of boron and boron compounds as shielding material in reactors

[1] FATMA AYSUN UĞUR Osmaniye Korkut Ata University
[2] FATMA YAKUT Osmaniye Korkut Ata University

Boron and boron compounds can be used as a moderator material around the control rods in reactors. The data obtained from the Xcom photon cross section data program have been observed to be a good material when fast neutrons are slowed down to the level of thermal neutrons. From the results obtained, the neutron flux cross sections are graphically investigated for neutron energies ranging from 0.001 MeV to 10000 MeV.

Investigation of the use of samarium and gadolinium materials in nuclear technology

[1] FATMA AYSUN UĞUR Osmani ye Korkut Ata University
[2] FATMA YAKUT Osmaniye Korkut Ata University

In this study, the applications of samarium and gadolinium materials in nuclear technology were investigated. Using the Xcom data program, the linear absorption coefficients of the samarium and the gadolinium are obtained at the energy range of 0.001 MeV and 100 GeV, and the graphs are discussed.

Relation of spectral statisitcs and medical applications

[1] HADI SABRI University of Tabriz
[2] SEYED KHALIL MOUSAVI MOBARAKEH University of Tabriz

In this paper, the spectral statistic of radionuclides which are used in therapeutic and imaging applications have been investigated by Random Matrix Theory. The Maximum Likelihood Estimation technique is used for estimating the chaotic parameter of each category. The results suggest that radionuclides which are being used for treatment and therapeutic are more regular in comparison with nuclei that are used for imaging. These results can be considered in choosing the appropriate radionuclides for different critical organs an application.

Keywords: spectral statisitcs, Random Matrix Theory, therapy, imaging

A study of excitation functions calculations for some A<20 target nuclei

[1] YUSUF KAVUN Kahramanmaraş Sütçü İmam University Sağlık Hizmetleri Meslek Yüksek Okulu
[2] EYYUP TEL Osmaniye Korkut Ata University

Many research activities to produce new energy sources are available due to the ever-increasing energy consumption on the world. One of the clean reliable and abundant energy sources on the nature is fusion energy. It may be used as a continuously alternative energy source for humankind when compared to other sources. Many researches have therefore done for designing and development of fusion reactor technology. In this study, the excitation functions for some reactions have been calculated by using PCROSS nuclear reaction calculation code. Charged particles induced nuclear reactions of some target nuclei (A<20) have been investigated in the incident proton and alpha at energy range from threshold to 50 MeV. Also, the semi-empirical calculations for (p,a) reactions have been done by developed new coefficient cross section formula that is in the literature. The results were compared with the experimental data for different energy levels that is taken from the EXFOR.

Keywords: Cross-section, Excitation function, PCROSS, EXFOR

Cytogenetic biodosimetery for the assessment of radiation doses in cases of radiological accidents

GHAZI ALSBEIH King Faisal Specialist Hospital and Research Centre Biomedical Physics Dept.

The continuous expansions in the applications of nuclear technologies in various aspects of life increase the probability of overexposure due to involuntary or premeditated nuclear accidents. National radiation-protection preparedness response plan requires adequate estimate of dose received for efficient medical assistance of victims. Cytogenetic biodosimetry is a proven, ISO/IAEA standardized biotechnology technique for calculating medically relevant radiation doses. In addition to diagnosis of overexposure, it provides triage capability for rapid stratification of patients who need more specialized medical care. It can also detect false positives and false negatives exposure particularly in cases of legal allegations. This study aimed to build biological dosimetry capabilities in and construct the dose-response calibration curve for dicentric chromosomes pre-required to estimate doses received. These were accomplished and a fully-fledged biodosimetry laboratory was established, a standard dose-response calibration curve was determined. Networking was established with international biodosimetry network in cooperation with IAEA/WHO. Being the first in the region, the formation of this laboratory in biodosimetry may have an impact on the ability to respond to nuclear events. It enhances the nation's casualty management capabilities by providing a platform for diagnostic technique for triage and medical management purposes as part of a national emergency response plan. The various activities of this reference biodosimetry laboratory can also provide officials with tools to distinguish affected from the worried individuals, and alleviate public concerns about the health effects of possible radiological exposures. It also adds depth to information for decision-makers and public health officials who assess the magnitude of public, medical, occupational and accidental radiation exposures in addition to providing a platform for advanced education, research and development.

Supported by Operational Transformation Initiatives #31, titled “Integrated Biomedical Physics Center: Delivery of Precision Radiation Medicine” (RAC# 2170 005).

Keywords: biodosimetry, radiation accident

One trap one recombination model under the first order kinetic parameters

ERDEM UZUN Karamanoğlu Mehmetbey University

Lots of models were proposed to explain complex emission mechanisms of the thermoluminescence event and one of the models is one trap one recombination center model. According to the model, one trap and one recombination centers are available for electrons and holes, respectively. Charge carrier transitions and thermoluminescence emissions are determined by a simple set of differential equations but the equations are not linear and analytical solutions are not possible. In this work, the model was applied to a first ordered glow curve. Firstly, numerical solutions of the model were performed for different initial irradiation conditions and different heating rates. Numerical solutions were performed iteratively by using ninth order Explicit Runge–Kutta method for Fehlberg coefficients. Results were compared thermoluminescence glow curve of the Seydişehir alumina.

Keywords: otor model, numerical solutions, Runge–Kutta method, Fehlberg coefficients, Şeydişehir alumina

Comparison of radon concentration results measured by two different methods in well waters

[1] AYLA GÜMÜŞ Afyon Kocatepe University
[2] HÜSEYİN ALİ YALIM Afyon Kocatepe University

Radon occurs as a result of radioactive decay of natural uranium in rock, soil, and water. The radon with atomic number 86 is the only radioactive gas in nature, with no reaction and a half-life of 3.82 days. Since radon is a colorless, tasteless, odorless radioactive gas, it cannot be detected and recognized by the human senses. Today, many radon measurement techniques have been developed to measure radon and decay products and they can be categorized into two groups; namely active and passive. Instant radon measurements are made by the active radon measurement technique. In the passive measurement technique, long-term radon measurements are made using nuclear trace detectors. In this study, radon concentrations in water were actively measured by using two different model devices. One of the devices is the WG-1001 Gas Separation Unit and AB-5R detector manufactured by Pylon Electronics; the other is the AlphaGUARD PQ2000 PRO Radon Imaging System. Measurements were made at 15 different deep-water sources determined in and around Afyonkarahisar's Sultandağı and Çay districts. The measurements in water samples were fortnightly repeated for 54 weeks using the two devices separately and the obtained results were compared.

Keywords: radon in well water, Afyonkarahisar

Gamma exposure and annual effective dose due to terrestrial and cosmic radiation in Ortaköy granitic zone of Aksaray province (Turkey)

[1] MEHMET ERDOĞAN Selçuk University Science Faculty, Physics Department
[2] KAAN MANİSA Dumlupınar University Art and Science Faculty, Physics Department
[3] HASAN BİRCAN Dumlupınar University Art and Science Faculty, Physics Department
[4] EMRE VATAN Selçuk University Science Faculty, Physics Department
[5] NESLİ BİNGÖLDAĞ TAEK, Çekmece Nuclear Research and Training Center,
[6] RECEP BIYIK TAEK Çekmece Nuclear Research and Training Center

The radiation exposure for people and all living things is inevitable. The 80 % of these exposures is natural, while the 20 % is artificial. The terrestrial and cosmic radiation sources are the most important contribution to these exposures which originated from the fractionation of U-238, Th-232, gamma radiation of K-40 and high-energy cosmic particles incident on the earth's atmosphere. These radionuclides are found various concentrations in the crust of earth depending on geological conditions of the region. This study assesses environmental outdoor gamma dose rates (terrestrial and cosmic radiation) from the naturally occurring radionuclides and cosmic ray particles in Ortaköy Granitic Zone of Aksaray province of Turkey since this area has plenty of acidic magmatic, granitic, intrusive rocks. The measurements were performed on surface soil using NaI(Tl) scintillation type gamma-ray detector. The average external annual effective doses are also calculated from such terrestrial and cosmic gamma radiation dose rates for each individual.

Keywords: Natural Radiation, Terrestrial and Cosmic Radiation, Annual Effective Dose, Ortaköy Granitic Zone, Aksaray Province

Development of an algorithm for the spectrum deconvolution of uranium samples measured by CdZnTe detector

[1] HALUK YÜCEL Ankara University Institute of Nuclear Science
[2] SEFER BALCI Ankara University Institute of Nuclear Science
[3] RECEP BORA NARTTÜRK Ankara University Institute of Nuclear Science
[4] EMİN YELTEPE Ankara University Institute of Nuclear Science

The determination of ^{235}U enrichment value in uranium samples has great importance in nuclear technology. Especially, there is a need to determine the abundances of uranium isotopes for obtaining basic sample information to compare with facility records, and for reporting or comparison purposes for data validation and evaluation in safeguards and illicit trafficiking activities. On the other hand, gamma-ray spectrometry is used to identify special nuclear materials such as enriched uranium or plutonium. The current semiconductor detector technology such as CdZnTe presents new opportunities to measure uranium samples in room temperature and/or onsite conditions. This type of detector has better resolution than the scintillation detectors such as NaI:Tl and all plastic scintillators. However, the problem is that the measured gamma-ray spectra of uranium between 80-130 keV is quite complex and it requires a careful de-convolution process to obtain accurate peak information to estimate ^{235}U enrichment value. In this study, an algorithm was developed to determine the net peak areas of analytical peaks in the spectra of low enriched uranium taken by a 1000 mm^3 coplanar grid CdZnTe detector. The algorithm is implemented in MATLAB software to get automatic results. In this deconvolution algorithm, the Gaussian function is applied to 92.4 keV double peak and the pseudo Voight functions to 94.6keV and 98.4 keV UKX-rays (Yücel, 2009). The developed algorithm was applied to de-convolute the gamma-ray spectra of certified reference uranium standards having 0.31%,0.71%,1.94%, 2.95% and 4.46% ^{235}U enrichment values in U_3O_8 powder. The developed methodology and the results obtained from the study will presented in detail.

This work was supported by IAEA coordinated research project(CRP), J02012 coded and titled "Advancing Radiation Detection Equipment for Detecting Nuclear and Other Radioactive out of Material Out of Regulatory Control"

Keywords: CdZnTe, de-convolution, Gamma ray spectrum, ^{235}U enrichment

MDM spectrometer and Oxford detector (mdm-focal plane) at tamu cyclotron institute

MURAT DAĞ Ahi Evran University

One of spectrometers hosted at The Texas A&M University Cyclotron Institute is MDM (Multipole-Dipole-Multipole) spectrometer primarily used to conduct experiments involving proton and neutron transfer reactions along with Oxford detector. MDM spectrometer was designed based on a single dipole magnet to achieve large dispersion, low magnification and a high-energy product. One of the focal plane detection systems coupled with the MDM spectrometer is the Oxford detector sitting at the back of the spectrometer, which is used to identify particles, measure their energy and trajectory. This gridded ionization chamber is made of stainless steel, with entrance and exit windows covered by Aramica foil. The inside of the chamber is filled with isobutane gas. In order to minimize any further impurities of the gas during the experiment, this gas is continuously refreshed at a constant rate by a low flow regulation system. The inside structure of the detector consisted of a cathode plate, three anode plates to measure particle energy loss in isobutane gas, four resistive avalanche counters to determine the position of the particles in the focal plane as well as their deviation angles, a thick scintillator (type BC-400) placed behind the exit window where the particles stop, and two photomultiplier tubes positioned at each end to determine their residual energy.The Oxford detector had been used with this setup to study scattering and transfer reactions involving beams up to Ne. However, we encountered significant difficulties such as the energy resolutions obtained from the anode plates and the scintillator for the particle identification (PID), especially at larger scattering angles where cross sections of interest drop. Hence, in order to improve the particle identification resolution for the heavier particles, and increase the detection of both of these signals, the Oxford detector was upgraded by replacing the aluminum anode plate with a Micromegas array.

Keywords: MDM spectrometer, Oxford Detector

Implementation of two-window and three-window peak area methods to determine the ^{235}U abundance in uranium samples measured by a $LaBr_3(Ce)$ scintillation detector

[1] HALUK YÜCEL Ankara University
[2] RECEP BORA NARTTÜRK Ankara University Institute of Nuclear Science
[3] EMİN YELTEPE Ankara University Institute of Nuclear Science
[4] SEFER BALCI Ankara University Institute of Nuclear Science
[5] AYŞEN BARUT Ankara University Institute of Nuclear Science
[6] NESLİHAN CEREN KAPLAN Ankara University Institute of Nuclear Science
[7] SELİN SAATCI Ankara University Institute of Nuclear Science

In recent years, new types of scintillation detectors such as Lanthanum Bromide $LaBr_3(Ce)$ and Lanthanum Chloride $LaCl_3(Ce)$ are commercially available for the measurement of ^{235}U abundance in uranium samples. Historically, NaI(Tl) detectors are commonly used to determine ^{235}U abundance from 185.7 keV peak using enrichment meter principle if the sample thickness and the detector are met the required conditions. However, the measurement accuracy is generally affected the used detector resolution. Depending on its crystal size, NaI(Tl) detectors have relatively worse resolution (7-11% at 662keV) than those of especially new technology LaBr detectors, and thus they cannot separate the185.7 keV analytical peak from the close peaks in the measured spectrum. This might lead to erroneous results for ^{235}U isotopic abundance. In this study, a relatively high resolution (2.7% at 662 keV) LaBr(Ce) (its crystal size: 38mmx38mm, BrilLanCe 380 purchased from Saint Gobain Inc.) detector was used to obtain more accurate results for ^{235}U isotopic abundance in certified uranium samples (NRM 171-031,071, 195, 295 and 446). In this work, two-window peak area and three-window peak area calculation methods were employed in the enrichment meter principle to estimate the 185.7 keV peak counts. To do this, the first region-of-interest(ROI1) for 185.7 keV peak, the second window (ROI2) and third window for linear background continuum at right side is chosen to be about 10 keV. For the measured uranium samples, the results obtained from both two-window and three window peak area methods are compared, the results will be presented in detail.

This work was supported by the IAEA coordinated research project(CRP), coded J02012 and titled “Advancing Radiation Detection Equipment for Detecting Nuclear and Other Radioactive out of Material Out of Regulatory Control”.

Keywords: ^{235}U, uranium, LanthanBromide detector, Enrichment meter principle, Two-window, Three window, Peak area calculation, Gamma-ray spectroscopy

Use of boron in reactors as shielding and moderator material

[1] FATMA AYSUN UĞUR Osmaniye Korkut Ata University
[2] ELİF GÖREN Çukurova University

In this study, the use of boron and boron compounds as a moderator and shielding material in reactor control rods has been investigated. The data was taken from the Xcom photon cross section program. At different energies, the attenuation coefficient for the gamma and the mean free path were calculated while the reaction cross sections were calculated for the neutrons. It has been observed that boron and boron compounds are good shielding and moderator materials in the reactors.

Keywords: Boron, Shielding, Gamma, Neutron

Effects of gamma ray strenght function on reaction cross section calculations in some osmium isotopes

[1] KEMAL TAŞDÖVEN Afyon Kocatepe University
[2] İSMAİL HAKKI SARPÜN Akdeniz University
[3] HÜSEYİN ALİ YALIM Afyon Kocatepe University

Gamma-ray strength functions are important for description of the gamma emission channel in nuclear reactions. This is an almost universal reaction channel since gamma rays, in general, may accompany emission of any other emitted particle. In this study, theoretical evaluation of gamma ray strength function for some Osmium isotopes (Os-186, Os-188, Os-189, Os-190, Os-192) have been investigated in the different incident photon energy range. TALYS 1.8 was used to show the effects of gamma ray strength function models to cross-section calculations. The present results were compared with the experimental values in EXFOR Library.

Keywords: Talys 1.8, EXFOR, Gamma-ray, radiative function

Stopping power and range of protons between 10-1000 MeV energies in water using the Monte Carlo technique

[1] AHMET BOZKURT Akdeniz University Faculty of Engineering
[2] İSMAİL HAKKI SARPÜN Akdeniz University Faculty of Science

Monte Carlo simulations were carried out to obtain stopping power and range of protons in the energy range 10-1000 MeV in water medium. A point source emitting mono-energetic pencil beam of protons was employed. A water cylinder placed in vacuum represented the phantom, a cylinder of 30 cm radius and 100 cm height. Thin disk-shaped detectors (r=2 cm) were created in this phantom to compute average values of absorbed dose and flux. The position and thickness of each detector cell varied from simulation to simulation depending on the energy of the primary protons. The Monte Carlo simulations provided average flux and absorbed dose from proton interactions computed in each detector cell to later evaluate, for water, the value of the stopping power and the range of protons at that specific energy. In addition, the simulations yielded the location of the Bragg peak for the proton energies investigated in this study. The simulation results were later compared with the data available in the NIST compilation.

Keywords: Stopping Power, Range, Protons, Monte Carlo Technique

Investigation of lateral spread of 80-250 MeV energy protons in water and cortal bone

[1] FATİH EKİNCİ Gazi University Türkiye
[2] MUSTAFA HİCABİ BÖLÜKDEMİR Gazi University Türkiye

The most important advantage of interacting protons with the target is maximum energy transfer at a certain depth. In other words, the maximum energy is stored at Bragg Peak point. But Coulomb collisions of protons are caused by numerous small angular deviations. These deviations also cause multiple scattering and lateral expansion in the dose profile, so the range of the proton beam is not a straight line. Lateral deviations are important in determining the closeness of irradiation to critical tissues, particularly in the treatment of tumors closed to critical tissues. In this study, Bragg peak and lateral scattering of the 80-250 MeV proton beam were calculated and evaluated by Monte Carlo simulation using the TRIM code in the case in water and 1 cm thick cortical bone.

Keywords: Lateral spreading, Bragg peak, Proton therapy, Monte Carlo

Excitation functions systematics studies of (n,a) nuclear reactions with neutron energy range from threshold to 20 MeV

MOHAMED BELGAID USTHB, Physics Faculty, Algeria

As not charged particle, the neutron is projectile who interacts only with atomic nucleus and consequently it can be the most penetrating projectile in the matter. The fast neutrons brings more understanding about the nuclear interaction and it can be used in inspections of transported goods as neutron interrogation system. To describe neutron-nucleus interaction, a several models have been developed, and used to quantify the neutron interaction by means of the nuclear cross sections determination. In the incident energy range from threshold to 30 MeV, the statistical equilibrium and pre-equilibrium models are the most models used to carried out several codes (TALYS, EMPIRE, GNASH, STAPRE-H etc..) and several systematics studies for nuclear reaction cross sections calculations. In this study, the formalism of these models is developed in order to obtain excitation functions formulae of (n, charged particles) reactions in the incident energy range from threshold to 20 MeV. The new formulae derived from the evaporation model and the pre-equilibrium exciton model contains an adjustable free parameter. The Droplet model of Myers and Swiatecki was used to express the reaction energy Q and the Dostrovsky model was introduced to formulate the expression of the inverse cross section channel. The systematics behavior of the different terms of the Droplet model involved in the reaction energy Q was verified individually before choosing the relevant terms and setting up the formulae. By fitting these formulae to the existing cross-section data, the adjustable parameters have been determined and the systematics of the (n,α) reaction have been studied. New semi-empirical formula for the predictions excitation functions has been obtained for the first time and it was compared with the experimental data and EMPIRE code calculations. A good agreement between excitation functions systematics and EXFOR data was observed for great number of (n, α) reactions.

Keywords: Fast Neutrons, systematics cross sections, pre-equilibrium exciton model, statistical evaporation model, neutrons interrogation

Effects of biomaterials on lateral spreading dose in proton therapy

[1] FATİH EKİNCİ Gazi University Türkiye
[2] MUSTAFA HİCABİ BÖLÜKDEMİR Gazi University Türkiye

Hard tissues in human body are generally damaged due to aging, accidents, birth defects, genetic defects and cancer. The displacement of hard tissue damaged with biomaterials by surgery is a widely practiced method in practice. In proton therapy, the thickness, density and electronic properties of the biomaterial used affect the range of the protons, the Bragg peak point and lateral spreading. As the protons interact with the biomaterials, a second peak near or below the Bragg peak occurs. In this study, Bragg peak and lateral spreading were calculated and evaluated for five different (1.2, 1, 0.8, 0.6 and 0.4 cm) thicknesses of seven different biomaterials (Nital (TiNi), Ti_6Al_4V, Co-Ni-Cr-Mo, Vitallium, Al_2O_3, Teflon and Stainless Steel) at the 100, 120, 140, 160 and 200 MeV energetic proton beams using TRIM Monte Carlo code.

Keywords: Lateral spreading, Biomaterial, Proton therapy, Monte Carlo

A novel approach to electromagnetic interference shielding: Conductive polymer/graphene nanocomposites

[1] CEREN KARAMAN Pamukkale University, Chemical Engineering Department
[2] EDİP BAYRAM Akdeniz University, Department of Chemistry
[3] İSMAİL HAKKI SARPÜN Akdeniz University, Department of Physics
[4] ONUR KARAMAN Akdeniz University Vocational School of Health Services

Nowadays, in information and signal processing, and telecommunication technologies, electronic devices are widely used. Electromagnetic (EM) pollution not also increases the degradation of the electronic devices performance but also threats the human health. Therefore, it is important to develop advanced electromagnetic interference (EMI) shielding materials for the prevention of damages caused by unwanted interference. Traditionally, thin sheets or sheathing forms of metals are used as EMI shielding materials. However, generally, metals are heavy, prone to corrosion, expensive and difficult to process. Hence, it need to develop alternative materials which are light, cheap and resistant to corrosion. In the last four decades, owing to their physicochemical properties, carbon materials and conductive polymers have gained prominence as EMI shielding materials. The EMI shielding and microwave absorption properties of these materials can be explained in terms of electrical conductivity and presence of polarons/bipolarons. The properties of these materials can be tunned by controlling of production conditions and precursors. However, in some cases, it may require using a high concentration of conductive polymers in the matrix to obtain acceptable electrical properties which often affect adversely the mechanical properties of resultant composites. This problem can be solved by combining the good properties of carbon materials and conductive polymers. Graphene is one of the promising carbon materials due to its multi-faceted superiority in electrical and thermal conductivity, flame retardancy, mechanical stability, and biocompatibility. In this study, a survey of the literature on the potential use of conductive polymers and graphene to improve EMI shielding efficiency is presented. The structure-performance of different nanocomposites are reviewed in detail. As a result, it is suggested that conductive polymer/graphene nanocomposites (such as PEDOT/graphene or PPy/graphene) can be a promising EMI shielding materials thanks to combining their superior features.

Keywords: Conductive polymers, Nanocomposites, Graphene, EMI shielding

Evaluation of the perlite as a new radiation shielding material

[1] OSMAN AĞAR Karamanoğlu Mehmetbey University
[2] GENCEBAY KARAKAYA Karamanoğlu Mehmetbey University
[3] CAN ERTUGAY Akdeniz University
[4] HÜSEYİN OZAN TEKİN Üsküdar University
[5] MEHMET EMİN KORKMAZ Karamanoğlu Mehmetbey University
[6] ÖZGÜR CULFA Karamanoğlu Mehmetbey University

In this study, the photon interaction parameters of concretes containing the natural perlite mineral and boron carbide (B_4C) in different ratios have been investigated experimentally by using ^{133}Ba (81, 276, 303, 356 and 384 keV), ^{137}Cs (662 keV), ^{60}Co (1173 and 1333 keV) and ^{22}Na (1275 keV) radioactive point sources. The experimental results of the mass attenuation coefficient, the mean free path (MFP), the half (HVL) and tenth value layers (TVL) will be presented and also compared to the other materials such as lead, granite and concrete.

Keywords: Shielding, Attenuation coefficients, Radiation, Perlite

X-ray shielding performance of sodium metasilicate/barium oxide glassy composites

[1] HANDE KAYACIK Yildiz Technical University
[2] YAŞAR KARABUL Yıldız Teknik University
[3] MEHMET KILIÇ Yıldız Teknik University
[4] ZEYNEP GÜVEN ÖZDEMİR Yıldız Teknik University
[5] ORHAN İÇELLİ Yıldız Teknik University

Radiation shielding panels, which are used in hospitals and nuclear plants, are usually made of lead and concrete. In recent years, as an alternative to lead and concrete, the search for non-toxic, low cost and light-weight materials with high radiation shielding ability has gained momentum. In the search of new radiation shielding materials, glassy structures are at the forefront due to their remarkable properties such as high light transmittance, easy preparation and low cost. In this work, Sodium silicate/Barium oxide ($Na_2Si_3O_7$/BaO) glassy composites were prepared with different concentrations of BaO (10%, 20% and 40%). During the preparation process of the composites, $Na_2Si_3O_7$ and BaO were mixed in appropriate ratios and each mixtures was allowed to dry at room temperature for 96 hours to ensure hardening. Finally, the mixtures were grinded to obtain a homogenous dispersion and the mixtures were brought into a tablet form by applying a pressure of five tons. The related glassy samples were irradiated by Ba-133 gamma-ray source for the photon energies of 81 and 356 keV. The mass attenuation coefficients (μ/ρ) of the samples were measured at 81 and 356 keV energies by using NaI(Tl) scintillation detector. The effective atomic number (Z_{eff}), half value layer (HVL), tenth-value layer (TVL) and mean free path (λ) were calculated. The experimental values of gamma-ray shielding parameters were also determined by WinXCom. A good agreement was achieved between the experimental and simulation results of the radiation shielding parameters. The details of the results will be presented in the conference.

Keywords: Glassy structure, Radiation Shielding, Monte Carlo Simulation, Gamma spectroscopy

As a shielding glassy structures against gamma rays: epoxy/PbO and epoxy/BaO composites

[1] YAREN ERGİN Yildiz technical university
[2] YAŞAR KARABUL Yıldız Teknik University
[3] MEHMET KILIÇ Yıldız Teknik University
[4] ZEYNEP GÜVEN ÖZDEMİR Yıldız Teknik University
[5] ORHAN İÇELLİ Yıldız Teknik University

With the increasing usage of nuclear radiation sources in medicine, nuclear plants and mobile devices, scientists have focused on producing new polymer based radiation shielding glassy structures. In recent years, the radiation shielding ability of filler-reinforced polymer composites have been extensively investigated due to their light weights and high workability properties. In this study, the low cost commercial epoxy polymers were reinforced by lead oxide and barium oxide with different weight percentages (10%, 20% and 40%) to enhance the gamma ray shielding property of the epoxy resins. The ratio of the resin to the hardener (isophorone diamine) was 65/25 in the epoxy polymer. All samples including pure epoxy were irradiated by gamma ray point source of Ba-133 at the 81 keV and 356 keV energies. The mass attenuation coefficients (μ/ρ) of the samples were measured for the related photon energies by using NaI(Tl) scintillation detector. The experimental half value layer (HVL), tenth-value layer (TVL) and mean free path were calculated to determine the radiation shielding performance of the samples. In the context of gamma ray shielding parameters, the influence of adding PbO and BaO to the epoxy polymer was discussed. The details of the results will be presented in the conference.

Keywords: Glassy structure, Radiation shielding, Gamma spectroscopy, Epoxy resin

Investigation of gamma-ray shielding parameters of $Na_2Si_3O_7/Bi_2O_3$ glassy composites

[1] TUĞBA DEMİRBAY Yıldız Teknik University
[2] YAŞAR KARABUL Yıldız Teknik University
[3] MEHMET KILIÇ Yıldız Teknik University
[4] ZEYNEP GÜVEN ÖZDEMİR Yıldız Teknik University
[5] ORHAN İÇELLİ Yıldız Teknik University

Due to increasing gamma ray sources in nuclear medicine and various industrial applications, the production of new lead free gamma ray shielding materials has become inevitable. Among various gamma ray shielding materials, glassy composites have promising properties such as having high transparency to visible light, 100% recyclability, low cost and considerable easy preparation methods. In the present study, Sodium silicate/Bismuth (III) oxide glassy composite structures have been produced with different Bi_2O_3 wt. concentrations which is varying from 10 wt.% to 35wt. %. The samples were irradiated by Ba-133 gamma ray point source with the photon energies of 81 and 356 keV. The mass attenuation coefficients (μ/ρ) of the samples were measured 81 and 356 keV energies by using NaI(Tl) scintillation detector. The experimental half value layer (HVL), tenth-value layer (TVL) and mean free path were calculated. The experimental values of gamma ray shielding parameters such as μ/ρ, HVL, TVL and mean free path were also determined by WINXCOM software. A good agreement was achieved between the experimental and theoretical results of the radiation shielding parameters. The details of the results will be presented in the conference.

Keywords: Glassy structure, Radiation shielding, WINXCOM, Gamma spectroscopy

Genetic programming modelling of radon measurements of some touristic places in Hatay, Turkey

[1] İSMAİL HAKKI KARAHAN Mustafa Kemal University
[2] ALİ TOZAR Mustafa Kemal University

^{222}Radon is a colorless, odorless, tasteless, radioactive gas that occurs naturally in soil, rocks, underground water, and air. It is produced by the natural breakdown of ^{226}Radium in soil and rocks. In outdoor air, radon is usually presents at such low levels that there is very little risk. However, when radon enters a building, it and its decay products can accumulate to high concentrations. Radon, itself, naturally breaks down and forms radioactive decay products. As one breathes, the radon decay products can become trapped in lungs. As these decay products break down further, they release small bursts of energy which can damage lung tissue and lead to lung cancer. This paper proposes a Genetic Programming approach to learn how to effect trace numbers, density of traces and number of measurement to radon measurement of touristic places in Hatay. Input parameters were selected as trace numbers, density of traces and number of measurement. Radon values (Bq/m^3) values was the output parameter. Training and testing sets in total of 45 samples were selected. The comparative results prove the superior performance for predicting Radon values of the touristic places. The produced model proposed close relationship for all the input parameters with the Radon values of the outdoor touristic places.

Keywords: Radon measuruments; Genetic Programming; Touristic places

The radiochemical purity test of ^{99m}Tc-sestamibi

[1] TUĞBA ÇEPNİ İstanbul University Science Faculty
[2] HATİCE KOVAN Okmeydani Training and Research Hospital
[3] BURCU DİRLİK SEVİM İstanbul University Cardiology Institute
[4] BAYRAM DEMİR İstanbul University Science Faculty
[5] VEDAT SANSOY İstanbul University Cardiology Institute
[6] ZERRİN YİĞİT İstanbul University Cardiology Institute

A radiopharmaceutial consists of two components. The first component is an isotope emitting gamma rays and the second component is a type of drug which is engaged to the organ chosen to be screening. In cardiac scanning, ^{99m}Tc-sestamibi radiopharmaceutical is used. The quality of scanning will be negatively affected if the patient has free ^{99m}Tc during the scanning. For this reason, the radiochemical purity of ^{99m}Tc-sestamibi should be higher than %90. In this research, our objective has been to determine the radiochemical purity rate of ^{99m}Tc-sestamibi right after the process and after 7 hours from process. In the tests results, we found out the radiochemical purity rate to be 95% right after the process. We also found out the radiochemical purity rate to be 52% after 7 hours. In order for the quality of imaging to be higher, it is determined that two ^{99m}Tc-sestamibi procedures in the morning and afternoon are found out better.

Quality control tests of cardiac spect camera

[1] TUĞBA ÇEPNİ İstanbul University Science Faculty
[2] BURCU DİRLİK SEVİM İstanbul University Cardiology Institute
[3] BİLAL KOVAN İstanbul University Istanbul Medicine Faculty, Department of Nuclear Medicine
[4] BAYRAM DEMİR İstanbul University Science Faculty
[5] VEDAT SANSOY İstanbul University Cardiology Institute
[6] ZERRİN YİĞİT İstanbul University Cardiology Institute

Nuclear medicine is a medical field specialized in imaging various diseases with the help of radio-isotopes giving out gamma rays. There are cameras designed specifically for imaging functions of the heart. This camera system is a SPECT system consisting of two gamma cameras stabilized to each other in a 90^{o} angle. In this research, the quality control tests of cardiac SPECT camera has been evaluated. In COR (Center of Rotation) tests, the value of Mean X – error is found to be as -0.86 (with a maximum error rate of 4.6 mm), the value of maximum X-Error is found to be as 0.24 (maximum 0±2 mm), the value of maximum X-Error -1.4 (maximum 0±2 mm) and Range X-Error 1.63 (maximum 0±2 mm). Furthermore, maximum Y-error value is found to be as 0.51 (maximum 0±2 mm), maximum Y-error is -0.59 (maximum 0±2 mm) and Range Y-error is 1.10 (maximum 0±2 mm). As a result of quality control test, the Cardiac SPECT camera test values have been determined within the acceptable limits.

Measurements of generated proton energy spectra by high power lasers

ÖZGÜR CULFA Karamanoglu Mehmetbey University

In this research, the energy spectra of protons generated by ultra-intense (10^{20} W cm^{-2}) laser with a preformed plasma of scale length are presented. The effects of the preformed plasma with a controlled pre-pulse and the varied target thickness on the proton beam temperature, the number of protons and maximum energy of protons are evaluated. Simulations and experimental parameters show that preformed plasma scale length and target thickness have a significant importance on proton acceleration by high power lasers. Two-dimensional EPOCH particle-in-cell code simulations of the proton spectra are in a good agreement with measurements over a range of experimental parameters.

Keywords: High Power Lasers, Laser-Plasma Interactions, Proton Acceleration

Dosimetric comparison of two different VMAT techniques in lung cancer radiotherapy

[1] DUYGU BOLAT Uludağ University
[2] OĞUZ AYDIN Uludağ University
[3] SEMA GÖZCÜ TUNÇ Uludağ University
[4] ZENCİYE KIRAY Uludağ University
[5] SÜREYYA SARIHAN Uludağ University

Volumetric modulated arc therapy (VMAT) was introduced as a new treatment modality for lung tumors. In this study we aimed to compare angled table non-coplanar VMAT(n-VMAT) and coplanar VMAT (c-VMAT) techniques dosimetrically in lung cancer radiotherapy. For this study: A patient with NSCLC (non-small cell lung cancer) treated with 50 curative radiotherapy was randomly selected. For each patient, two VMAT plans were generated to meet the same objectives with 60 Gy covering 95% of the PTV. Dynamic arcs were used in each VMAT plan. The couch was set at ± 15° to the 0° straight position for the two non-coplanar arcs. Monaco treatment planning system with VMAT was used. We analyzed the conformity index (CI), the homogeneity index (HI); as well as the V5, V10, V20 and mean lung dose (Dmean). Paired non-parametric analysis of variance tests with post-tests were performed to examine the statistical significance of the differences of the dosimetric indices. There was no significant difference in the D2% ($p = 0.692$), D95% ($p = 0.989$) and Dmean ($p = 0.504$) in the two treatment techniques could be given the desired dose PTV. And no difference between the two techniques in terms of HI .CI and MU were found to be statistically better then the c-VMAT technique. c-VMAT was lower than the MU value of the n-VMAT. Dmean lung ($p = 0.191$) were no differences between the two techniques is examined. However, the n-VMAT technique is statistically better in patients with V5% ($p = 0.001$) and V10% ($p = 0.001$) in the whole lung. V20 was also lower in n-VMAT plans than c-VMAT. The results show that the n-VMAT is superior to the c-VMAT in terms of protection of critical organ doses. n-VMAT is preferable because of was superior in dosimetric outcomes for treating locally-advanced NSCLC compared to c-VMAT.

Keywords: Lung cancer, Volumetric Modulated Arc Therapy, Lung R, Lung Radiotherapy

Design of a 352.21 MHz RF power coupler for the Sanaem RFQ

[1] ERSİN ÇİÇEK Gazi University, Department of Physics
[2] YEŞİM OLGAÇ TAEK, Saraykoy Nuclear Research and Training Center
[3] ARİFE SEDA BÖLÜKDEMİR TAEK, Saraykoy Nuclear Research and Training Center
[4] BETÜL YASATEKİN TAEK, Saraykoy Nuclear Research and Training Center
[5] MUSTAFA HİCABİ BÖLÜKDEMİR Gazi University, Department of Physics
[6] İHSAN KILIÇ TAEK, Saraykoy Nuclear Research and Training Center
[7] ALİ ALAÇAKIR TAEK, Saraykoy Nuclear Research and Training Center

In all accelerator systems in which Radio Frequency (RF) Electromagnetic (EM) waves are used, one of the most critical component designed to feed RF power to a particle accelerating cavity is the power coupler. The Radio Frequency Quadrupole (RFQ) accelerators, designed for a given natural oscillation frequency, performing complicated tasks such as bunching, accelerating and focusing are the most popular method to accelerate the low energy beams. The RF power must be transferred to the cavity under the right conditions to provide the power needed for operation. In this study, we will discuss the EM design of the new coupler structures with grooved plexiglass vacuum windows for the RFQ with 352.21 MHz frequency, developed under a project at the Turkish Atomic Energy Authority (TAEK), Sarayköy Nuclear Research and Training Center (SANAEM). The coupler is required to operate in the pulsed mode with up to 120 kW of the forward power. Its important parameters such as scattering parameters, quality factor and resonant frequency, the determination of RF window, the power feeding scheme are optimized with the CST Microwave Studio.

Keywords: Power Coupler, Radio Frequency, Accelerator, Radio Frequency Quadrupole, Turkish Atomic Energy Authority, Computer Simulation Technology

Electromagnetic simulations for 800 MHz pillbox cavity and power coupler

[1] ASLIHAN ÇAĞLAR İzmir Yüksek Teknoloji Enstitüsü
[2] HAKAN ÇETİNKAYA Boğaziçi University
[3] CİHAN ÇİÇEK Boğaziçi University
[4] AYDIN ÖZBEY İstanbul University
[5] EZGİ SUNAR Boğaziçi University
[6] GÖRKEM TÜREMEN Ankara University
[7] HÜSEYİN YILDIZ İstanbul University
[8] ALPEREN YÜNCÜ Boğaziçi University
[9] VEYSİ ERKCAN ÖZCAN Boğaziçi University
[10] GÖKHAN ÜNEL University of California
[11] FATİH YAMAN İzmir Yüksek Teknoloji Enstitüsü

RF800 project aims to build a high power radio frequency transmission line operating at 800 MHz. The RF source is a Valvo YK 1198 klystron generating 60 kW continuous power; and the goal is to channel this power into an accelerator cavity. The transmission line consists of coaxial to waveguide converter, rectangular waveguides, E and H bends, 3-port waveguide circulator, waveguide to coaxial converter and an RF cavity with input power coupler. As a part educational project, all components are to be designed and produced locally. In the first phase of the project, a simple pillbox cavity is selected due to its convenient design and manufacture. In order to obtain high power transmission from RF power generator to cavity efficiently, power coupler with a loop antenna is designed to achieve critical coupling condition. The electromagnetic wave reflections due to possible impedance mismatch between the cavity and the coupler are minimized for 800 MHz. Effective coupling is observed in the S11 vs. frequency variation of the coupler-cavity structure. Design and error studies for both the cavity and the coupler, completed using CST-MWS, along with the current status of the RF transmission line will be presented.

On the determination of binding energy of hypernuclei

[1] NİHAL BÜYÜKÇİZMECİ Selçuk University
[2] RIZA OĞUL Selçuk University

In nuclear reactions of high energy one can simultaneously produce a lot of hypernuclei after the capture of hyperons by nuclear residues. We consider statistical disintegration of such hypernuclear systems and the connection of fragment production with the binding energies of hyperons. It is demonstrated that the hyperon binding energies can be effectively evaluated from the yields of different isotopes of hypernuclei. The double ratio method is suggested for this purpose. The advantage of this procedure is its universality and the possibility to involve many different isotopes. This method can also be applied for multi-strange nuclei, which binding energies were very difficult to measure in previous hypernuclear experiments. We believe that our calculations would be the pioneering for the extraction and analysis of future hyperon experiments such as GSI/FAIR or other similar facilities.

*The work has been performed in the framework of TUBITAK 114F328 and COST Action THOR-CA15213.

Keywords: nuclear reactions, hypernuclei, evaporation

Effects of radiation pressure acceleration on heavy ion generation for ultra intense laser solid interaction

[1] ÖZGÜR CULFA Karamanoglu Mehmetbey University
[2] MEHMET EMİN KORKMAZ Karamanoglu Mehmetbey University
[3] OSMAN AĞAR Karamanoglu Mehmetbey University
[4] VOLKAN SERT Karamanoglu Mehmetbey University

Particle acceleration with high power lasers has been studied for last two decades. It is well known that laser acceleration mechanisms have a dependence on target thicknesses. Radiation pressure acceleration (RPA) is on the process for such thin targets (nm levels). High power laser solid target interactions for the irradiances of up to the ~10^{20} W/cm^2 have been studied experimentally and theoretically for such thin targets. ELI-NP project gives an opportunity to us to study laser solid interactions with the irradiances of up to the ~ 10^{23} W/cm^2 with fs level short pulse durations experimentally. In this research, we investigated the laser solid interactions theoretically with such high power lasers (irradiances of 5x10^{22} W/cm^2) with such thin targets (few nanometers). We used 2D EPOCH PIC code simulations to investigate heavy ion acceleration in ultra thin targets and studied effects of the target thicknesses on heavy ion angular and energy distributions.

Keywords: Particle Acceleration, Laser-Plasma Interactions, High Power Lasers

Acceleration of carbon ions by high power lasers

[1] VOLKAN SERT Karamanoglu Mehmetbey University
[2] ÖZGÜR CULFA Karamanoglu Mehmetbey University
[3] MEHMET EMİN KORKMAZ Karamanoglu Mehmetbey University

Nowadays, with the rapidly advancing technology lasers can reach up to 10PW. With the right focusing, the intensity of the lasers at this level can easily go up to $>10^{22}$W/cm^2. Extremely high intense lasers have an important role especially in particle accelerator technology. In this study, we have investigated the effects of the future laser technology on particle acceleration. With this aim, we have investigated the maximum energy and heat exchange between fully ionized C^{+6} ions and electrons, and preformed plasma produced before the main laser interaction by using 10PW lasers with the irradiances of $5x10^{22}$W/cm^2. In this study, we have employed two-dimensional EPOCH PIC (particle in cell) simulation codes.

Keywords: High Power Lasers, Carbon Ions

Investigation of the excitation-autoionization states of helium

[1] ZEHRA NUR ÖZER Afyon Kocatepe University
[2] NURÇİN KARADENİZ Afyon Kocatepe University
[3] HÜSEYİN ALİ YALIM Afyon Kocatepe University

The physical and practical significance of the autoionization phenomenon has been attracted the attention of many researchers for many years. Autoionization and resonance profiles, electron interactions and the differences in the energy and angle dependent cross sections are important in atomic collision studies. In this study, the autoionization energy levels of helium were experimentally investigated by measuring the intermediate angular distributions of ejected electrons using the experimental setup in the Electron Collision Laboratory at Afyon Kocatepe University. The main purpose of these type of studies is to examine the structure of atomic systems, to see how the electron correlations occur in such processes, to produce experimental data for solving the multi-particle problem and to test the correctness of theoretical models. Further studies on Helium autoionization states in combination with theoretical calculations is needed to interpret the correlation dynamics.

Keywords: Electron spectrometry, Autoionization, Angular spectrum, Resonance levels, Helium atom

Investigation of the effects of the level density models and g-strength function models on the ^{92,94,98,100}Mo(p,g) reaction cross sections

[1] ABDULLAH AYDIN Kırıkkale University
[2] HANDE BOYDAŞ Kırıkkale University

The nuclear reaction studies and the cross section calculations related the astrophysical processes are very important to the nucleosynthesis. We have studied the cross sections of (p,g) reactions for ^{92,94,98,100}Mo isotopes in the energy range of the Gamow window. The cross sections have been calculated by using TALYS 1.8 code. In the calculations, different level density models and g-strength function models have been used and the effects of these models have been investigated on the cross sections. The calculated cross sections have been compared with the experimental data from EXFOR database. Results obtained in the present work show that the cross section calculations have a strong dependence on the level density models and g-strength function models, which used as an input for TALYS 1.8 code.

Keywords: level density model, g-strength function, cross section, astrophysical processes

Comparison of gamma-ray sources which used to measure of material density especially -metals and alloys via using transmission technique

[1] M. ERGÜN TURGAY Yalova University
[2] EROL KAM Yıldız Teknik University

One of solutions for density measurement is to use the gamma-ray transmission technique. Its outstanding specification is to applicable without any connection to material. Herewith we studied this technique by two gamma-ray sources as Co-60 and Cs-137. At first, each source, without materials in the geometry, was counted and noted intensities as (I_0) Then, all materials were counted and noted intensities as (I). By using these initial radiation intensity (I_0) and radiation intensity (I); [I/I_0] rates were calculated and then density of materials could be determined by using Beer-Lambert Equation. Experimental application was performed on widespread industrial metals or metal alloys e.g. lead, copper and steel, brass. Minimum difference was obtained as 0.26% and 1.11% up for steel and copper, near by 5.07% and 5.73% down for brass and lead (source: Co-60). Minimum difference was obtained as 0.22% down for copper, near by 1.07%, 2.34% and 3.08% up for lead, brass and steel respectively (source: Cs-137). Another point, these difference ratios would be references for next studies about another material density measurement, too. Besides, it will be also useful to select the gamma ray source for future different studies. With this study, it is shown that gamma transmission technique, can be used for density measurements. There were acceptable differences obtained between the measured densities and given densities of them.

Keywords: Co-60, Cs-137, Density Measurement, Gamma-Transmission Technique

Outdoor gamma dose in air and investigation cancer risk for Hatay province, Turkey

[1] M. ERGÜN TURGAY Yalova University
[2] EROL KAM Yıldız Teknik University

The radioactivity analysis was performed for air measurements around Hatay province which is in the Southeast region of Turkey. By measuring of the outdoor gamma dose rates on 215 different stations, it was calculated to annual dose in air. On the other hand, cancer risk was evaluated for Hatay. These values were compared with the World's references (UNSCEAR) and assumed. It was measured the average dose rate as 52.13 $nGyhr^{-1}$ and annual dose was calculated to 63.93 μSv. This dose is required to excess lifetime cancer risk as $2.24x10^{-4}$. These values could be compared with the similar studies which existed around the world. Finally, the average annual effective dose equivalent and excess lifetime cancer risk for Hatay, are less than the world average. This study would be also reference for future researches, besides it will be useful to compare with different studies for Hatay which, will be evaluated in the future, for example after a nuclear pollution, such as based on a reactor leakage, nuclear attacks, etc., too.

Keywords: Radioactivity, ADRA, AEDE, Air, Outdoor Gamma, Cancer Risk, RESA, Hatay

Bohr hamiltonian for γ=30◦ with Kratzer potential

[1] İBRAHİM YİĞİTOĞLU Gaziosmanpaşa University Physics Department
[2] BURCU UÇAR Gaziosmanpaşa University Physics Department

A γ-rigid solution of the Bohr Hamiltonian is derived for $\gamma=30^{\circ}$ using the Kratzer potential in the β variable. The model is conventionally called Z(4)-Kratzer. The energy eigenvalues and wave functions are obtained by using an analytic method developed by Nikiforov and Uvarov. The obtained energy spectra and the calculated B(E2) transition rates are presented and compared with existing experimental data.

Keywords: Critical Point Symmetries, Kratzer potential, Nikiforov-Uvarov Method, Bohr Hamiltonian

A solution of bohr hamiltonian for γ=0° with Kratzer potential

[1] İBRAHİM YİĞİTOĞLU Gaziosmanpaşa University Physics Department
[2] TUĞBA TURAN Gaziosmanpaşa University Physics Department

A γ-rigid solution of Bohr Hamiltonian for γ=0° is derived with Kratzer Potential. This solution will be called X(3)-Kratzer. The energy eigenvalues and wave functions are obtained by using an analytic method which has been developed by Nikiforov and Uvarov. The B (E2) transition rates are also calculated. The obtained results are compared to the previous studies. The agreement with the experiment is achieved.

Keywords: Bohr Hamiltonian, Critical Point Symmetries, Kratzer Potential, X(3) Model

Comparison of radiation shielding properties of fir with other wooden materials at 6 MeV x-rays energy

[1] YUSUF KAVUN Kahramanmaraş Sütçü İmam University
[2] MUHİTTİN ŞAHAN Osmaniye Korkut Ata University
[3] MAHMUT ÖZGEN Osmaniye Korkut Ata University
[4] EYYUP TEL Osmaniye Korkut Ata University

With the development of technology, radiation shielding is essential for the protection of human and environment. Various materials can affect the amount of radiation transmitted from the source to the receptor when placed between a source and a receptor. In this study, to reveal efficiency of wooden materials, we aim to compare usability of fir wooden material with other woodens as a shielding material in the radiation treatment centers that in use Medical Linac. We analysed dose-thickness relations of fir and some of other wooden materials at 6 MeV X-rays energy for different surface areas and thicknesses and these results compared with literature.

Keywords: fir, x-ray, dose measurement, radiation shielding, wooden material

Mean free path calculations for some shielding barite concrete elements

[1] EYYUP TEL Osmaniye Korkut Ata University, Department of Physics
[2] AHMET BÜLBÜL Osmaniye Korkut Ata University Osmaniye Vocational High Scholl
[3] R.ÖMER TURHAN Osmaniye Korkut Ata University, Department of Physics
[4] MUHİTTİN ŞAHAN Osmaniye Korkut Ata University Department of Physics

Calculations of macroscopic cross sections and mean free path have a great importance on shielding of the nuclear reactors. Unlike normal concrete, barite concrete is mostly used for shielding to reduce the negative effects of nuclear reactor to the environment. In this study, the macroscopic cross section and mean free path values obtained for (n,p) reactions with Al, Fe, Ba, Si elements at the 14-15 MeV energy using Levkovski (1974) and Tel et al. (2003) formula. The obtained results are then compared with each other.

Keywords: barite concrete, Tel formula, mean free path

Radiologic risk assessment of outdoor radioactivity in capital city Ankara, Turkey

[1] ENİS KAPDAN TAEK
[2] NESRİN ALTINSOY İTÜ

The aim of this study is to determine the outdoor radioactivity level and relevant health risks for Ankara, the capital city of Turkey. For this purpose, Absorbed Gamma Dose rate readings were taken at 379 stations around the province. The mean, minimum and maximum outdoor absorbed gamma dose rates were determined as 67.7, 14.3, 234.1 $nGyh^{-1}$ respectively for the region. The district of Etimesgut has minimum mean outdoor absorbed gamma dose rate with 42.8 $nGyh^{-1}$ and Evren district has maximum with 121.9 $nGyh^{-1}$. The annual effective cumulative dose equivalent was determined as 73μSv/y due to outdoor gamma exposure to the inhabitants. The mean estimated cancer risk value depending on irradiations was found to be $2.74x10^{-04}$ for the region using the risk factors of ICRP 103. Furthermore, maps for the demonstration of relative distribution of outdoor gamma dose rate and the relevant annual effective dose equivalent were plotted. Finally, it was found that the average outdoor gamma dose rate for Ankara were compatible to the most of the Turkish cities investigated depending radiological underground structure of the province.

Keywords: outdoor radioactivity; cancer risk; effective dose; drinking water; Ankara

Investigation of the use of boron and clay materials in radioactive waste storage systems

FATMA AYSUN UĞUR Osmaniye Korkut Ata University

In this study, the availability of boron and clay derived materials in radioactive waste storage systems has been investigated. Boron radiation is a slowing material while clay is a material that adsorbs radioactive materials. The new material obtained by mixing these two materials at different ratios has been evaluated and interpreted graphically by using the calculations in the systems formed for the storage of radioactive wastes.

Keywords: Boron, clay, adsorption, radioactive waste

Excitation function of (g,xn) reaction in some lanthanides

[1] YUNUS EMRE DOĞAN İstanbul University
[2] BAYRAM DEMİR İstanbul University
[3] İSMAİL HAKKI SARPÜN Akdeniz University

Several elements of the lanthanides are important in areas of nuclear medicine, radiation therapy, imaging and industrial applications as metals or compounds. Excitation function of (g,xn) reactions in some lanthanides elements have theoretically calculated using TALYS 1.8 nuclear reaction code different energy range. Theoretical calculations have compared with the available experimental data obtained from EXFOR Nuclear Data library.

Preparation of organic nano thin film sensor for harmful gas detections

[1] YASER AÇIKBAŞ Usak University Department of Materials Science and Nanotechnology Engineering
[2] SELAHATTİN BOZKURT Uşak University Vocational School of Health Services
[3] ERKAN HALAY Uşak University Scientific Analysis Technological Application and Research Center
[4] RIFAT ÇAPAN Balıkesir University Department of Physics,
[5] MATEM ERDOĞAN Balıkesir University Department of Physics
[6] ABDÜLKADİR SIRIT Necmettin Erbakan University Department of Chemistry,
[7] RIDVAN ÜNAL Uşak University Vocational School of Health Services

The harmful gas detection is a serious task due to their natural or nuclear toxicity with very serious irreversible effects for the environment and human beings. This study investigates the calix[4]arene(organic materials) nano thin film sensor element exposed to harmful vapors (dichloromethane, chloroform and toluene vapors). All measurements were carried out at room temperature. The gas kinetic measurement results show that, the photodetector response change, ΔIrf for saturated dichloromethane vapor is much larger than the other vapors with the ΔIrf value of 48 au and the diffusion coefficient value of 5.1 $x10^{-16}$ cm^2s^{-1}. Swelling process was analyzed by Fick's Equations. The diffusion coefficients for swelling were correlated with the volatile organic compounds. The present study indicated that calix[4]arene thin film is highly selective with a large response to dichloromethane. One may conclude that the calix[4]arene nanosensor has potential applications in the development of room temperature organic gas sensing devices.

Keywords: Nanosensors, calix[4]arene; gas detection.

Prediction of breast cancer pattern using artificial neural network algorithms.

[1] OZAN TOKER Yıldız Teknik University
[2] SELÇUK ALP Yıldız Teknik University
[3] ÖMER TOPDAĞI Atatürk University
[4] ÖNDER EYECİOĞLU Nişantaşı University
[5] MURAT BEKEN Nişantaşı University Statistics
[6] ERSOY ÖZ Yıldız Teknik University
[7] ORHAN İÇELLİ Yıldız Teknik University

Breast cancer is one of the most common types of cancer. In this type of cancer, effective and rapid diagnostic methods have great importance in increasing patients' quality of life. There are many studies in the literature about rapid and effective diagnostic methods. Some of these methods are prediction methods based on node biopsies or markers. Artificial neural network algorithms (ANN) are one of these prediction methods. In this study, we used Artificial Neural Network (ANN) prediction model as an effective and rapid model for breast cancer diagnosis. Firstly, Al, Cr, Fe, Cu, Zn, Se, Na, K, Ca and Mg element concentrations were determined in all blood samples. Determination of element concentrations were carried out with ICP-MS and ICP-OES systems. Same patients' CA 15.3 (biomarker) values were used as the "TARGET" data set. Blood samples from 40 breast cancer and 40 healthy individuals from living in Turkey were collected (Total 80 data sets). 60 randomly selected data sets were used for training and 20 randomly selected data sets were used for the testing. After that, pattern recognition with ANN model was applied. At this stage of the study, the "confusion matrix" of the samples was created. In this model, the predictive performance ratio was 96.4% in the training phase and 91.7% in the test phase.

This research is supported financially by TUBITAK (2210C) and Yildiz Technical University BAP (2015-01-01-YL04, 832)
Ethical Approval: Atatürk University Medical Faculty ethics committee; 10.24.2016, sesion 6, number: 22

Keywords: Artificial Neural Network Algoritm, Breast Cancer,

Classification of breast cancer patients' blood samples using machine learning algorithms

[1] OZAN TOKER Yıldız Teknik University
[2] SELÇUK ALP Yıldız Teknik University
[3] ÖMER TOPDAĞI Atatürk University
[4] ÖNDER EYECİOĞLU Nişantaşı University
[5] MURAT BEKEN Nişantaşı University
[6] ERSOY ÖZ Yıldız Teknik University
[7] ORHAN İÇELLİ Yıldız Teknik University

In this study, blood samples from 40 breast cancer and 40 healthy individuals from living in Turkey were collected. Firstly, Al, Cr, Fe, Cu, Zn, Se, Na, K, Ca and Mg element concentrations were determined in all blood samples. Determinations of element concentrations were carried out with ICP-MS and ICP-OES. In addition to this data, an outcome variable was defined which takes the value of 1 for cancer patients and 0 for healthy individuals. Since the classification using all the elements is time-consuming and performance-degrading, the ones that were effective among these data were identified. In order to identify the effective elements, Information Gain Ranking Filter, CFS Subset Evaluator, Correlation Ranking Filter, Gain Ratio feature evaluator, ReliefF Ranking Filter, OneR feature evaluator, Symmetrical Uncertainty Ranking Filter methods were used. So that Se, Cu, Cr, Al, Mg and Na elements were identified as the most effective elements. 80 samples were divided into 2 groups of 60 and 20 samples. The system was trained using data from 60 randomly selected samples (30 cancerous and 30 healthy) for Se, Cu, Cr, Al, Mg and Na elements. After, in order to test the validity of the generated models, 20 samples (other group) were accepted as test data. The trained system was tested with these 20 samples. As classification algorithms, logistic regression, decision tree, support vector machines and k-nearest neighbors methods were used. Classification successes of models obtained with data of 30 healthy 30 cancer patients were named with "Training". Also, models were tested with 20 samples (10 healthy, 10 Cancerous) and classification successes of models were given as "Testing". When the test phase is considered, Medium Gaussian SVM and Weighted KNN are the the most efficient algorithms with 90% correct classification rate.

Keywords: Breast Cancer, Classification, Blood Samples

Investigation of the possibility of producing ^{225}Ac radioisotope in a proton cyclotron

[1] HATİCE KÜBRA BELEN Kirikkale University, Physics Department
[2] ABDULLAH AYDIN Kirikkale UniveRSİTY, Physics Department

Today in nuclear medicine, diagnostic and therapeutic radioisotopes are used in numerous and will continue to be used. Radioisotopes are produced in cyclotron, reactor, neutron generator and linear accelerators. In recent years there has been a rapid increase in the use of therapeutic radioisotopes. Especially, Targeted Alpha Therapy (TAT) is an important cancer treatment. In this method, selected cancer cells are destroyed by alpha particle radiation. In this study, the potential of producing ^{225}Ac by proton irradiation of ^{226}Ra in a cyclotron through the reaction ^{226}Ra (p,2n) ^{225}Ac has been investigated. For this, the cross section of ^{226}Ra (p,2n) ^{225}Ac reaction have been calculated by using TALYS code and optimum proton energy range, maximum product activity and product yield have been determined. As a results it has been shown that 225Ac could be produce in a 30 MeV proton cyclotron.

Keywords: Medical radioisotope, radioisotope production, targeted alpha therapy, 225Ac

An application of the dead time correction program at gamma-rays detectors

[1] SALİH MUSTAFA KARABIDAK Gümüşhane University Physics Engineering
[2] ALİ KAYA Gümüşhane University Engineering Physics

For the dead time correction at gamma-rays detectors, a computer program was developed. This program has been applied to gamma ray measurements taken for the purpose of determining the radioactivity of the Bahçecik village network water and Bahçecik village highland water district of Gümüşhane province. According to the results obtained from gamma analysis without dead time correction from 10.8 ± 1.02 mBq/L to 13.7 ± 1.24 mBq/L for ^{226}Ra, from 2.1 ± 0.23 mBq/L to 3.6 ± 0.36 mBq/L for ^{232}Th, and from 91.3 ± 4.05 mBq/L to 118.0 ± 5.09 mBq/L for ^{40}K were determined to be in range. After correcting the dead time, these results ranged from 12.6 ± 1.07 mBq/L to 16.0 ± 1.31 mBq/L for ^{226}Ra, from 2.5 ± 0.24 mBq/L to 4.2 ± 0.38 mBq/L for ^{232}Th, and from 106.8 ± 4.56 mBq/L to 136.9 ± 5.34 mBq/L for ^{40}K. The average of these changes is around 17%. For this reason, the dead time correction must be performed in activity measurements and dose calculations.

Keywords: Gamma Rays, Dead Time Correcting, Activity Measurements, Dose Calculations

A program for dead time correction at gamma-rays detectors

[1] SALİH MUSTAFA KARABIDAK Gümüşhane University Physics Engineering
[2] ÖZKAN BİNGÖL Gümüşhane University Department of Software Engineering
[3] SELİM KAYA Gümüşhane University Physics Engineering

Determination of compensating for count losses for the correctness of analyses in spectrometric analysis of qualitative and quantitative use of x-gamma ray detectors are of importance. These counting losses in spectrometry are due to paralyzable and non-paralyzable system dead time. In this work, a new method is suggested for compensate for counting losses resulting from this factors. For this purpose, a computer program was developed. Experimental studies were performed to test of this program. As a result, it was seen to provide an effective correction. it is coded a computer program including original dead time correction, peak search, graphics module, program interface, a report module with the Delphi program compiler.

Keywords: Gamma Rays, Gamma Rays Detectors, Counting Loss, Dead Time, Computer Programs

Can Fluka determine light yields of the scintillators used in medical imaging?

[1] ELİF EBRU ERMİŞ Ege University, Physics Department
[2] CÜNEYT ÇELİKTAŞ Ege University, Physics Department

BaF_2, BGO, GSO, LYSO, LSO, NaI(Tl), $CdWO_4$, CsI(Tl) and LFS scintillators that are often used in medical imaging systems were examined. Since the light yield value of a scintillation crystal is one of the most important parameter for these type systems, the above scintillators were handled from this point of view. These crystals were first formed, then their light yield values were determined using FLUKA Monte Carlo (MC) program in the present work. Comparisons between the calculated and the literature values were made in the final section of the study. Highly compatible results were found. Thus, we concluded that FLUKA MC program can be used to determine light yield values of different types of scintillators used in medical imaging.

Keywords: Light yield, scintillation crystals, FLUKA

Investigation of gamma ray percent absorption efficiencies of the crystals used in medical imaging by means of Fluka Monte Carlo program

[1] ELİF EBRU ERMİŞ Ege University
[2] CÜNEYT ÇELİKTAŞ Ege University

This work has been focused on the calculating gamma ray percent absorption efficiency values of various scintillation crystals. BaF_2, BGO ($Bi_4Ge_3O_{12}$), CaF_2, CsI, $CdWO_4$, LYSO and polyvinyltoluene (PVT) scintillation crystals were chosen because they are often used in medical imaging systems. They were formed in various dimensions through Monte Carlo (MC) method. FLUKA MC program which is one of the MC method was used. It was evaluated how gamma rays in different numbers and energies affect these efficiency values using FLUKA MC program in the presented work. Extensive comparisons between calculated and literature values were also performed. Obtained results indicated that FLUKA MC program would be able to use as an alternative way to determine the gamma ray percent absorption efficiency of any scintillation crystal, which it is one of the important parameter of the sensitivity of medical imaging systems, believing this paper will be helpful in determining the most appropriate crystal type for an aimed application.

Keywords: Gamma ray percent absorption efficiency, scintillation crystals, FLUKA.

Determination of secondary neutrons produced by 100 MeV energy protons in water

[1] ADEM PEHLİVANLI Gazi University
[2] MUSTAFA HİCABİ BÖLÜKDEMİR Gazi University

70-230 MeV energy protons are used to treat cancerous tumors in proton therapy and to protect healthy surrounding tissues as much as possible. Secondary neutrons can be produced by interaction with accelerator components or directly with the patient's body of protons. This leads to an undesirable dose contribution, which can be important for long-term health of cancer patients and healthy tissues outside the target volume concerned. Due to the high biological activity of secondary neutrons in terms of cancer induction, small neutron doses can be important. Published comparisons of neutron dose measurements and the corresponding estimates of cancer risk between different treatment modalities differ over orders of magnitude. The purpose of this study is to calculate neutrons produced in the water by the Monte Carlo simulation performed with the PHITS code. The calculations were performed for protons with 100 MeV energy. As a result, the distribution of neutron and other radiation doses was obtained at some depths in water.

Keywords: Proton therapy, Secondary neutrons, Monte Carlo, PHITS

Investigation of p, d and α emission spectra for neutron and proton induced reactions on ^{63}Cu

[1] TUĞÇE GÜLÜMSER Süleyman Demirel University
[2] MERT ŞEKERCİ Süleyman Demirel University
[3] ABDULLAH KAPLAN Süleyman Demirel University

Many studies in nuclear field require both theoretical and experimental data which could be helpful for the estimations before planning any particular study. One of the most important theoretical data is the cross–section value of a certain reaction in where it also indicates that particular reactions occurrence probability. The importance of this data results the generation of many ways to obtain it in theoretical ways. The most improved theoretical calculation methods require advanced operations for calculations while developed computer codes give the opportunity for obtaining this data with less effort and more accuracy. Even there exists many computer codes developed for similar calculations, in this study one of the most well-known and used, TALYS 1.8 has been employed for calculations. The advantage of TALYS is the ability to select the desired method for calculations in where Two Component Exciton Model and Hauser-Feshbach Model have been selected for this study as pre-equilibrium and equilibrium reaction mechanism calculations, respectively. The p, d and α emission spectra calculations have been done for ^{63}Cu(n,xp), ^{63}Cu (n,xd), ^{63}Cu (p,xp) and ^{63}Cu (p,xα) reactions and the obtained results have been compared with the experimental data taken from the EXFOR database.

Keywords: emission spectra, copper, TALYS

A theoretical study on the production cross–section calculations for ^{86}Y medical isotope

[1] TUĞÇE GÜLÜMSER Süleyman Demirel University
[2] MERT ŞEKERCİ Süleyman Demirel University
[3] ABDULLAH KAPLAN Süleyman Demirel University

With the growth of technological and industrial developments, human beings' daily life become more effected from their outcomes which may increase the carcinogenic effects. As a result, the importance of the cancer diagnostic becomes more crucial and the studies in this field have gain attention. Among the exist diagnostic methods for different cancer types, Positron Emission Tomography (PET) scanning is almost the most useful one in where different medical isotopes have been using for its operation. In this study, ^{86}Y which is one of these isotopes, have been studied in the manner of its production routes. In accordance with the aims of the study, ^{85}Rb(α,3n)^{86}Y, ^{88}Sr(p,3n)^{86}Y, ^{90}Zr(α,3n+p+α)^{86}Y and ^{86}Sr(p,n)^{86}Y reactions have been selected and production cross–section values of ^{86}Y from these reactions have been calculated by using TALYS 1.8 computer code. The Two Component Exciton for pre-equilibrium and Hauser-Feshbach for equilibrium models have been used for calculations. The results obtained from calculations have been compared with the experimental data from the literature.

Keywords: Yttrium, production cross-section, TALYS

Temporal evolution of lead isotope ratios and metal concentrations in sediments of the North Aegean Sea, in Turkish coast

İLKER SERT Ege University

In present research, fifteen surficial and two profile sediment samples were studied in terms of sediment chronology and pollution degree on the ground of pollution indexes (EF, CF, PLI) and lead isotope ratios ($^{206}Pb/^{207}Pb$, $^{208}Pb/^{206}Pb$). Lead-210 (Polonium-210) activity concentrations were measured by utilizing alpha spectrometry. Sediment chronology was determined via Modified CRS mathematical model. Average mass accumulation rates are 0.301 and 0.227 $gcm^{-2}y^{-1}$ in Bakırçay River mouth and Ayvalık offshore stations respectively. Mass accumulation rates do not display the systematic increases along the cores from bottom layers to top layers. In Bakırçay River mouth station ^{210}Pb flux is higher than the range of global atmospheric ^{210}Pb flux value. Due to the high CF and EF values of Sr both of stations have hydrothermal features. Ayvalık offshore station has displayed Na, Cd pollution since 1945, but Na, Cd, As, Mo, Ag pollutions have existed in Bakırçay River mouth station since 1983 in terms of CF and EF values. According to PLI index, Bakırçay River mouth station has "starting level pollution" degree and it displayed an "acute corruption" in 1981. $^{206}Pb/^{207}Pb$ ratios range from 1.17 to 1.25, $^{208}Pb/^{206}Pb$ ratios range from 1.99 to 2.16 in study area. When $^{206}Pb/^{207}Pb$ and $^{208}Pb/^{206}Pb$ ratios are evaluated with together, it is seen that both of the stations have had the natural (geologic) sediments since 2011.

Keywords: Mass accumulation rates, EF, CF, PLI, Lead-isotope ratios ($^{206}Pb/^{207}Pb$, $^{208}Pb/^{206}Pb$).

Determination of count intensity and elemental weight percentages of sediments in the Altinova shipyard region (Yalova-İzmit gulf) by SEM-EDX

[1] KÜBRA BAYRAK Yıldız Teknik University
[2] EROL KAM Yıldız Teknik University
[3] ZEKİ ÜNAL YÜMÜN Namık Kemal University

In this study, the count intensity and elemental weight percentages of sediment samples taken from Altınova region was evaluated using scanning electron microscopy (SEM) and energy dispersive X-ray (EDX). Within the scope of the study, six sea sediment samples were obtained from different depths along the shoreline of the Altinova shipyard area. The samples were subjected to a series of classical laboratory procedures to make the samples suitable for analysis. Then, SEM images of sediment samples were taken with JEOL JSM-6390, which has high resolution power. At the same time, from the EDX analysis, count intensity and elemental weight percentages are calculated by EDX spectra. According to the count intensity of ALT-2 are calculated as N-33.46 c/s, O-30.35 c/s, Na-1.66 c/s, Mg-0.03 c/s, Al-3.31 c/s, Si-11.09 c/s, Ca-2.71 c/s and Fe-1.61 c/s. Besides, elemental weight percentages of ALT-2 are calculated as N-34.269%, O-58.138%, Na-1.108%, Mg-0.013%, Al-1.180%, Si-3.388%, Ca-0.874% and Fe-1.029%. The count intensity and elemental weight percentages of six sediment samples were calculated and evaluated, respectively. The results were similar because all the samples were taken from the same region. In conclusion, this study provides preliminary information about the elemental composition of the sedimentology of the region. For being one of the few studies in the study area, it will be the source for future work.

Keywords: Count Intensity, Elemental Weight Percentages, SEM, EDX, Altınova, Yalova, Izmit Gulf

Luminescence dating of Harran ruins bricks

MEHMET KOŞAL Harran University

Luminescence dating of different brick samples taken from archaeological excavations in a tumulus at Harran Ruins was done. At the end of the scraping and crushing process (<20 mm), the polymineral samples were prepared using HCl (10%) and H_2O_2 acids. Luminescence counts were performed with a Lexsyg OSL reader. The equivalent doses were determined from the infrared-stimulated optical luminescence (IRSL) counts according to a single aliquot (SAR) protocol. The annual dose values were calculated by counting of K-40, uranium and thorium activities in the samples in a NaI scintillation detector. It was finally determined that the bricks were produced in the 12th century, dividing the equivalent doses by the annual doses.

Keywords: Luminescence Dating, annual dose, Harran, archaeology

Study on shape structure of even-even cerium isotopes within the interacting boson model-1 and the Cranking Nilsson Strutinsky model

[1] MAHMUT BÖYÜKATA Kırıkkale University
[2] SAMRA KAİM Université des Frères Mentouri Constantine1

In this study, the Interacting Boson Model-1 (IBM-1) and the Cranking Nilsson Strutinsky (CNS) model were applied to investigate the geometric shape of even-even $^{122-138}$Ce isotopes. For the process of IBM-1 calculations, the parametrizations of the constructed Hamiltonian were firstly performed to calculate the energy levels of the given isotopes. Then same set of parameters were used to plot the energy surface as a function of deformation parameters. The β parameters were obtained by minimizing the potential energy surface. According to the patential energy surfaces of IBM-1 calculations, $^{122-132}$Ce isotopes have prolate shape and $^{134-138}$Ce isotopes show spherical behavior when moving to the shell. Later the potential energy surfaces of these isotopes obtained by the CNS code were presented to compare with the energy surfaces of IBM-1 to see differences of shape changing along to isotopic chain of Cerium isotopes.

Keywords: Cerium, Interacting Boson Model-1, Cranked Nilsson Strutinsky, deformation, energy surface.

The comparison of the effect of the different sets of the deformation parameters on the cross sections calculations of $^{96-104}$Ru targets

[1] MAHMUT BÖYÜKATA Kırıkkale University
[2] HANDE BOYDAŞ Kırıkkale University
[3] ABDULLAH AYDIN Kırıkkale University

The quadrupole collectivities of even-even $^{96-104}$Ru isotopes were studied on in the framework of interacting boson model-1 (IBM-1) in this work. Their energy levels and B(E2) values were calculated within the established IBM-1 Hamiltonian. The Hamiltonian parameters were fitting from the experimental data obtained from the National Nuclear Data Center (NNDC). The potential energy surfaces (PES) of the given isotopes were plotted as a function of deformation parameters to predict their shapes and to get β deformation parameters of target nuclei. Also same deformation parameters were calculated from the experimental B(E2)↑ values and the theoretical ones of IBM-1. By this way, three sets of deformation parameters were used as input in the TALYS 1.8 code to calculate the cross sections of the stable $^{96-104}$Ru target nuclei for photo-nuclear reactions to compare the effect of each deformation sets on the cross sections.

Keywords: deformation parameter, cross section

The calculation of (n,x) reaction cross sections for ^{209}Bi, ^{232}Th and ^{238}U nuclei between 0 and 30 MeV

[1] RIDVAN ÜNAL Uşak University
[2] GÜLNUR ERASLAN İskenderun Doğru Cevap Okulları

In this study, (n,2n) and (n,3n) total reaction cross sections were calculated between 0 and 30 MeV neutron incident energy on ^{209}Bi, ^{232}Th and ^{238}U nucleiby using pre-equilibrium models. The model calculations were performed by using TALYS 1.2 and ALICE-ASH nuclear reaction computer codes. The results are compared with experimental results available in literature and found to be in good agreement.

Keywords: Direct Reactions, Reaction Cross Sections, TALYS 1.2, ALICE-ASH

Investigation of level density parameter dependence for some even-odd and odd-even nuclei in fission cross sections induced by neutrons with the incident energy up to 20 MeV

[1] ÖNDER SÖNMEZ Gazi University
[2] AYNUR ÖZCAN Gazi University

This study aims to show the dependence on of the level density parameters regarding the cases of even-odd odd-even neutron, proton numbers of four selected subactinite targets. These cases are analyzed for the neutron induced fission cross sections of ^{227}Ac, ^{251}Cf, ^{231}Pa, ^{235}Pu subactinide targets. The method was implemented using different level density parameters for each fission cross-section calculation in TALYS computer code. The TALYS code calculations were compared with the available experimental data. It is found that the fission cross sections are highly dependent on level density parameters in the neutron fission channels for these four subactinide nuclei. Besides, the even-odd odd-even number of neutron proton cases are investigated and it is found that the fission cross sections are also dependant to these even-odd odd-even cases.

Keywords: Fission cross-section, Level density parameter, Even-Odd Odd-Even neutron proton numbers, TALYS 1.8

Experimental study of double excitation-ionization resonance profiles of helium by electrons

[1] ZEHRA NUR ÖZER Afyon Kocatepe University
[2] NURÇİN KARADENİZ KAYAR Afyon Kocatepe University
[3] HÜSEYİN ALİ YALIM Afyon Kocatepe University

Excitation to any energy level in the atom can be examined by looking at the energy loss spectra of the emitted electrons. For excitation to the resonance levels, incoming electrons lose as much energy as excitation energy and the remaining energy is shared between the scattered and the ejected electrons. Resonance levels can be examined by detecting either scattered or ejected electron from a collision event. From the resonance energy levels, the ionization event and the direct ionization event overlap in the energy spectrum. This changes the symmetry of the resonance profiles. Resonance profiles are formed in an asymmetric structure above the direct ionization cross sections around the resonance levels. In this study, cross sections were measured at certain angles, i.e. one at low and one at high angle to see the resonance levels well. Since the resolution of the system is independent of the electron gun, only the energy resolution of the analyzer is determined. Thus, levels close to each other can be distinguished. Measurements taken at low and high angles will be evaluated in terms of resonance profiles during the conference.

Keywords: Electron spectrometry, Autoionization, Angular spectrum of resonance levels, Helium atom

A solution of Bohr hamiltonian for γ≈30° with Kratzer potential

[1] İBRAHİM YİĞİTOĞLU Gaziosmanpaşa University Physics Departmen
[2] BURCU UÇAR Gaziosmanpaşa University Physics Department

A critical point symmetry for the prolate to oblate shape phase transition is introduced starting from the Bohr Hamiltonian and approximately separating variables for γ≈30°. The β part of Bohr Hamiltonian for γ≈30° is solved with Kratzer potential using the Nikiforov-Uvarov method. This solution is going to be called Z(5)-K. The calculated intraband and interband BE(2) transitions rates are also calculated and compared with existing experimental data.

Keywords: Bohr Hamiltonian, Kratzer potential, Critical Point Symmetries, Z(5) Model

Bohr hamiltonian for γ≈0° with Kratzer potential

[1] İBRAHİM YİĞİTOĞLU Gaziosmanpaşa University Physics Department
[2] TUĞBA TURAN Gaziosmanpaşa University Physics Department

An analytical solution of Bohr Hamiltonian for γ≈0° is developed by Nikiforov Uvarov Method using Kratzer potential. This solution will be called X(5)-Kratzer. The energy eigenvalues and wave function are obtained. B (E2) transition rates were calculated. The agreement with experimment is investigated.

Keywords: Bohr Hamiltonian,Critical Point Symmetries,X(5) Model,Kratzer Potential

Investigation of thermoluminescence properties of calcite mineral conducted by bacterial calcium carbonate ($CaCo_3$) precipitation in organic soil

[1] HÜSEYİN TOKTAMIŞ Gaziantep University
[2] MOHAMMAD KHATEEB Gaziantep University

In the past few years, the use of bacterial calcium carbonate ($CaCO_3$) precipitation (BCCP) has become popular. BCCP has been applied in a variety of civil and geotechnical engineering applications. In this study, the thermoluminescence properties of samples conducted by bacterial calcium carbonate ($CaCO_3$) precipitation (BCCP) in organic soil were investigated. As a result of this work, the calcite mineral conducted by bacterial calcium carbonate ($CaCO_3$) shows Thermoluminescence behaviour and a wide linear dose response region between 150Gy and 2.3kGy is observed. In addition, a good reproducibility is seen in the high temperature peaks. The peak temperatures of TL glow curve peaks are not affected by the cycle of experiment.

Keywords: thermoluminescence, dosimeter, bacterial calcium carbonate

Excitation functions of nuclear reactions induced by alpha particles up to 50 MeV on ^{46}Ti, ^{45}Sc and ^{51}V

[1] HATİCE BİLGİN Afyon Kocatepe University
[2] İSMAİL HAKKI SARPÜN Afyon Kocatepe University .
[3] ABDULLAH AYDIN Kırıkkale University .

Nuclear fuel cycle and particle accelerator facilities require neutron production data of alpha particle induced reactions especially in design and operation steps. Light nuclei have large cross section for (α,n) reactions and therefore have influence on safety design and operation of these facilities. In this study, total cross sections of (α,n) reactions were theoretically calculated on ^{46}Ti, ^{45}Sc, ^{51}V target elements with the TALYS 1.8 nuclear reaction code and compared with available experimental values in the EXFOR Nuclear Data Library.

Keywords: Nuclear physic, Talys 1.8

Theoretically proton emission DDX calculation on Ge isotopes of neutron induced reactions

[1] GÖZDE DEMİRELLİ Doğa Private Schools Physics
[2] BEKİR ORUNCAK Akdeniz University
[3] ABDULLAH AYDIN Kırklareli University

In this study, proton emission DDX, necessary in determination of heating and damages in structural fusion material research, of ^{70}Ge and ^{72}Ge target nuclei were theoretically calculated by the TALYS 1.8 code at 200 MeV neutron incident energy and also compared with available experimental data in EXFOR Nuclear Data Library. Furthermore, in theoretical calculations direct, compound and pre-equilibrium reaction contribution have been investigated.

Keywords: DDX, Germanium, TALYS

Investigation of 131-Cs medical radioisotope production by TALYS

[1] MEHMET BÜYÜKTÜRKMEN Afyon Kocatepe University
[2] BEKİR ORUNCAK Afyon Kocatepe University
[3] BAYRAM DEMİR İstanbul University

Radioisotope production is an expensive and time consuming process. Influence of the cross section of the production path help. The production of radioisotopes is usually based on nuclear reactions. Reaction cross-sectional data are important in understanding nuclear reaction models and in improving the use of radioisotopes produced by these reactions. Since nuclear reactions are not known in more detail as energy dependence, the cross-sections of the effects must be examined for many energies. In this study various manufacturing nuclear reaction cross sections of many unused radioisotopes ^{131}Cs in Turkey calculated with TALYS 1.8 simulation program. The theoretical cross section of each reaction was compared with the experimental cross sections present in the EXFOR library of the International Atomic Energy Agency and the results were discussed.

Keywords: Radioisotope production, Nuclear reaction, Cross Section, TALYS 1.8

Outdoor gamma dose rates in air and assessment of cancer risk for Kocaeli province, Turkey

[1] EROL KAM Yıldız Teknik University
[2] ZEYNEP KARAALİOĞLU Yıldız Teknik University
[3] AREV ARTUN Yıldız Teknik University
[4] M. ERGÜN TURGAY Yalova University

Our study was focused to assessment of inhalation quality for Kocaeli province. In this case, radioactivity analysis in air was realized via air dose rate measurements around this region which is so closed neighbor to big city Istanbul. By measuring of the outdoor gamma dose rates on 35 stations, it was possible to get the average dose rate. Then it was calculated to annual dose in air. Besides, cancer risk was determined for Kocaeli. All these values were compared with the World's references (UNSCEAR) and assumed, finally. It was measured the average dose rate as 19.85 $nGyhr^{-1}$ and annual dose was calculated to 24.34 μSv. This dose is required to excess lifetime cancer risk as $0.7x10^{-4}$. These values could be compared to the similar studies which existed around the world. Finally, the average annual effective dose equivalent and excess lifetime cancer risk for Kocaeli, are less than the world average. This study would be used to a reference for further investigations, besides it will be usefull to compare with different studies for Kocaeli which, will be evaluated in the future, for example after a nuclear pollution, such as based on a reactor leakage, nuclear attacks, etc., too.

Keywords: Dose rate, Air, AEDE, Outdoor Gamma, Cancer Risk, Kocaeli

Sediment chronology and historical evolution of heavy metal contamination in terms of pollution index in Turkish coast, North Aegean Sea

[1] İLKER SERT Ege University

In present study, two cores and fifteen surficial sediment samples were investigated in terms of chronology and pollution levels. Lead-210 (Polonium-210) activity concentrations were measured via alpha spectrometry. Sediment dating was realized by utilizing Lead-210 (CRS, CIC) mathematical models. Residence time of the ^{210}Pb was calculated to improve the precision of the dating in North Aegean Sea. Average residence time of the ^{210}Pb is 2.4 years and average sedimentation rate is 0.237 ± 0.011 cm y-1 in the sea. Sedimentation rates along the cores display irregular increases and decreases in Ayvalik Offshore and Bakircay River Mouth stations. Metal concentrations were evaluated by using pollution indexes (EF, CF, PLI, Igeo) and Lead-isotope ratios (^{206}Pb/^{207}Pb). According the Pollution Load Index, both Ayvalik offshore and Bakircay River Mouth have shown a starting level pollution from past to nowadays but Ayvalik Offshore displayed an acute corruption in 2004. In terms of Geo-accumulation Index, both stations have Ca and Hg pollutions and both stations have had the “unpolluted to moderately polluted” pollution degree since 1995.

Keywords: Sedimentation rate, Residence time of the ^{210}Pb, PLI, Igeo, Lead-isotopes.

Study of gross alpha and gross beta activity concentration in sediments in the Büyükçekmece lake basin (Istanbul, Turkey)

[1] ZEKİ ÜNAL YÜMÜN Namık Kemal University
[2] KÜBRA BAYRAK Yıldız Teknik University
[3] DİLEK KURT Yıldız Teknik University
[4] MÜGE ŞENGÜL Yıldız Teknik University

Environmental pollution, including naturally occurring radiation is one of the most crucial issues of this century. Natural radioactivity depends directly on the regional geology, weather conditions and physic-chemical variability of the water. Industrial processes and other anthropogenic factors may also change the water's nature and raise its activity. The study of gross alpha and gross beta activity concentration in sediment cores was investigated in the Büyükçekmece Lake. The drilling sediment specimens were collected from the Büyükçekmece Lake, where is a brackish lagoon attached to the Marmara Sea, and situated at the western of the Bosphorus. The lake is adversely affected by the increase of settlements, the concentration of industrial activities in the region, the degradation of the streams flowing to it, and the cutting of the sea relation. In this study, a low-background counter (Berthold, LB 770 10 channel α−β low-level counter) counting system was used. The gross alpha activities were higher than the gross beta activities in all locations. The mean gross alpha and beta activity concentrations were 89.2± 24.87 and 431.32± 34.3 Bg kg^{-1}, respectively. The results show the sediment specimens from the Büyükçekmece Lake do not pose a significant radiological risk to the ambient area.

Keywords: Gross alpha, Gross beta, Büyükçekmece Lake, pollution, sediment

Cross-section calculations of gallium and arsenic nuclei for (n,2n) and (n,p) reactions up to 20 MeV

[1] HALİDE ŞAHAN Osmaniye Korkut Ata University
[2] MUHİTTİN ŞAHAN Osmaniye Korkut Ata University
[3] EYYUP TEL Osmaniye Korkut Ata University

In this study, neutron cross sections calculations for ^{69,71}Ga(n,2n), ^{69,7}1Ga(n,p), ^{75}As(n,2n) and ^{75}As(n,p) reactions have been calculated at the neutron energies up to 20 MeV. ALICE/ASH (GDH), TALYS 1.6, and EMPIRE codes have been used for model calculations based on the Weisskopf-Ewing and Hauser-Feshbach theories. Results from three models have been compared with in the JENDL-4.0, TENDL, JEFF-3.3, and ENDF/B-VIII.0 evaluated nuclear data libraries. The (n,2n) and (n,p) reaction cross section calculations for each nuclei have been also estimated at 14.5 MeV using semi empirical formulae developed by Lu and Fink (1971), Konno et al. (1993), Kasugai et al. (1996), Broeders et al. (2006), and Tel et al. (2003, 2008). All results of theoretical calculations were also compared with the experimental data obtained from EXFOR.

Keywords: Nuclear Reactions, cross section, ALICE, TALYS, EMPIRE, EXFOR library

(n,p) reaction cross–section calculations of fission reactor control rod materials ^{107}Ag, ^{111,112,113}Cd, ^{115}In

[1] MERT ŞEKERCİ Süleyman Demirel University
[2] HASAN ÖZDOĞAN Akdeniz University
[3] ABDULLAH KAPLAN Süleyman Demirel University

Since from the industrial revolution, one of the most important and required need has always been energy. There may exists many ways to resolve day by day increasing energy demand but one of the most efficient and sustainable among them is the usage of nuclear energy. Nuclear reactors, which designed to produce energy, works with the chain fission reaction mechanism where a great amount of energy released compared to the same amount of other fuels usage. The chain fission mechanism must be controlled to keep the reactor in a steady and safe situation and this is achieved by using control rods. In this study, (n,p) reaction cross–section calculations have been done for ^{107}Ag, ^{111,112,113}Cd, ^{115}In control rod materials. The definition of the nuclear reaction cross–section could be done as the probability of a reactions occurrence and the existence of this data provides many benefits to the researchers like avoiding from unexpected results of a reaction or arranging the amount of sample/product of the reaction. There exists developed theoretical models for nuclear reaction mechanisms and computer codes to handle the calculation with speed and validity. Among many of those codes, in this study, TALYS 1.8 and EMPIRE 3.2 have been employed where both provide wide options as the reaction mechanisms to use. Calculations have been performed with two component exciton and Hauser-Feshbach models from TALYS 1.8 and PCROSS exciton and Hauser-Feshbach models from EMPIRE 3.2. To comment about the calculation results, obtained data have been compared with the exist literature data taken from EXFOR and TENDL-2015.

Keywords: cross–section, fission reactor materials, reaction models, EXFOR

(n,2n) reaction cross–section calculations of some Cd isotopes

[1] MERT ŞEKERCİ Süleyman Demirel University
[2] HASAN ÖZDOĞAN Akdeniz University
[3] ABDULLAH KAPLAN Süleyman Demirel University

Theoretical calculation results obtained via verified models and by the usage of computer based computation tools have many advantages in the manner of time, cost efficiency, accuracy and also they provide a foresight to the scientists. In the terms of a nuclear reaction, one of the most important concept is the reaction cross–section, which also could be calculated by employing computer based codes. This concept provides many advantages to the researchers since it also means the possibility of a reactions taking place. In this study; theoretical reaction cross–section calculations have been completed for (n,2n) reactions on some isotopes of cadmium in which the material has a great number of known and investigating usage probability in scientific and industrial areas. Calculations performed with the TALYS 1.8 code by using with two component exciton and Hauser-Feshbach models and EMPIRE 3.2 code by using PCROSS exciton and Hauser-Feshbach models. To search for the accuracy of the calculations and comment about the results, obtained values have been compared with the experimental data taken from EXFOR library.

Keywords: cross–section, cadmium, TALYS,EMPIRE,EXFOR

Calculation of the in-air output factors of 6mv photon beam of a medical linear accelerator by means of photon phase spaces attained by the GEANT4/GATE simulation

[1] HEDİYE ACUN BUCHT Harran University, Faculty of Medicine, Department of Biophysics Medical Radiation Physics
[2] DAVID BOERSMA Uppsala University, Medical Radiation Sciences, Institute for Immunology, Genetics and Pathology Medical Radiation Physics
[3] ANDERS AHNESJÖ Uppsala University, Medical Radiation Sciences, Institute for Immunology, Genetics and Pathology Medical Radiation Physics

In-air output factor (S_c), also known as collimator or head scatter factor, is an important quantity in radiotherapy as it indicates the variation of the photon beam fluence relative to the collimator settings. This parameter is measured with ion chambers or diodes with build-up cap in the air at SAD distance. It is challenging to measure S_c for the small field sizes due to the lack of electronic equilibrium and volume averaging effect of the detectors. AAPM TG-74 report formalizes S_c as a ratio of collision water kerma in free-space per MU for a field size of interest to that for reference field. In this study we aim to calculate S_c factors of a 6 MV photon beam for different collimator settings based on the collision kerma formalism, as described in TG-74, using photon phase spaces generated with Geant4/GATE simulations. 6 MV photon beam of Elekta Synergy linac was simulated with Geant4/GATE. Photon phase spaces at SAD distance were generated for four different collimator settings. Collision kerma was calculated by integrating the photon energy fluence with its mass energy absorption coefficient over the phase space. S_c values of the field sizes in question were calculated from the ratios of the collision kerma values and compared with those measured with RK-chamber. S_c values of 5x5, 15x15, 20x20 and 40x40 cm^2 fields were calculated as 0.975, 1.012, 1.016 and 1.020 respectively. Difference between the measured and calculated Sc quantities was found to be less than 1% for all involved fields. There is good consistency between the calculated and measured in-air output factors. The collision kerma formalism based calculation method of S_c can be used for the derivation of the S_c values for small photon beams as a further step of this study.

Keywords: In-air output factor,collision kerma,Monte Carlo, AAPM TG-74

The radiation dose measurements on linear accelarator (linac) unit, produces high energy x-rays

[1] AYSUN İNAL Antalya Eğitim ve Araştırma Hastanesi
[2] İSKENDER AKKURT Süleyman Demirel University

Linear accelerator is one of the most effective device to be used in radiotherapy. In linac, high energy X-rays (photon) is produced by impinging electrons into high-Z materials. Photon radiotherapy is a treatment method where X-rays produced to destroy cancerous cells by ion creation feature in tissue. Unfortunatelly, none of the tumors are alone, there is certainly a vital organ nearby. While giving the maximum dose to the tumor, it is very important to minimize the dose around the health tissues. For this purpose, the most important development technique in radiatiotherapy is the intensity modulated radiation theraphy (IMRT). This technique requires a special quality control procedure due to the its complexity and challenges. Material and Methods: In this study, the required dose measurement parameters were obtained for 6 and 18 MV photon beam of energy which were used by photon radiotherapy. Various geometric and dosimetric analysis of the device were done using different ion chambers, 2D measurement system(Matrixx) and the X-Omat V films. The measured results were compared with the calculated results by Treatment Planning System (TPS). Gamma evaluation index was used while comparing results. Discussion and Conclusion: The results show the correct quality control tests and limits which should be performed at the starting of IMRT. Radiotherapy clinics should establish quality control procedures in accordance with international protocols, before and during the ongoing IMRT implementation. In the quality control, the appropriate dosimetric measurement method should be determined for each test.

Keywords: IMRT, Quality Control, radiotherapy

Medical imaging from analog to digital systems: A review

[1] NİNA TUNÇEL Akdeniz University Medical Physics

Along last century, the medical image acquisition highly changes from analog (X-ray screen film) to digital systems (CR, DR and DDR) regarding to growing of digital technology. In the early years the screen-film systems involved manual developing processor and then it changes with automated film processor. Both of them require long working time and special room (dark room). The invention and continuously improving of computed tomography (CT) scanner firstly lead the medical imaging to digital processor in 1970. In 1990, the invention of magnetic resonance imaging (MRI) was established and the requirements of digital processors in the medical imaging strongly arise. Generally, the imaging in diagnostic radiology is rooted in three solutions of diagnostic data acquisition. There are sequentially approaches. The first is analogue systems. The second is computed radiography. The later is direct digital systems (DR) and indirect digital systems (DDR). These detector systems offer excellent image quality and realistic options for dose reduction based on their high dose efficiency. Important tools to describe the physical performance of a detector system that ultimately determines image quality are dynamic range, spatial resolution and dose efficiency. There are many software products that use similar algorithms such as edge enhancement, noise reduction, and contrast enhancement to alter the appearance of the image. It is used to improve image quality by reducing noise, removing technical artefacts, and optimizing contrast for viewing. Spatial resolution is not improved by the processing software because it is dependent on the technical properties of the detector (eg, pixel size). Second revolution in digital imaging has been accompanied by the adoption of picture archiving and communication systems (PACS), which provide electronic storage, retrieval, distribution, and presentation of images from the radiology department.

Keywords: Medical imaging, Analog and digital systems

Recent developments in medical imaging

[1] HÜLYA ÖZDEMİR Akdeniz University
[2] NİNA TUNÇEL Akdeniz University

Recent Developments in Medical Imaging The main aim of this study is to present the most important recent developments in medical imaging. Technological inventions and developments have created new possibilities in medical diagnostics. Diagnostic imaging is an invaluable tool for medical science today. While medical imaging has been advancing by introduction of new imaging modalities and methodologies as cone-beam/multi-slice scanner, positron-emission tomography, magnetic resonance imaging with diffusion-weighted, current modulation tomography and diffuse optical tomography. So, the new machine-learning algorithms/applications are demanded in the medical imaging field. Algorithms for finding outlines of anatomical structures and other areas of interest are called image segmentation or image segmentation algorithms. Partitioning methods vary depending on a particular application, imaging method, and other factors. Such as, the division of brain and liver tissues needs different methods. In addition, the motion also creates serious effect on the performance of partitioning algorithms. Till now, there are many different partitioning algorithms created for partition medical images to give reasonable results. Some of them are thresholding approaches, region growing approaches, classifiers, and clustering algorithms. The partitioning algorithms restrictedly used in ultrasound imaging. With a development of new imaging based on physiologic function, the requirements for image processing and analysis of acquire images of physiologic function rather than of anatomy is increasing. The recent advances in medical imaging lead to high accuracy in images for better diagnosis of patient. The steady progress on development in multi-modal imaging, dynamic imaging, and diagnostic imaging have been increased not only with ionizing radiation but also with non-ionizing radiation.

Keywords: imaging, medical imaging

Calculation of radiological properties of iodine compounds contrast agents (iodixanol, iohexol, iopamidol, iopromide, ioxagalete)

[1] TAHİR ÇAKIR Yüzüncü Yıl University
[2] BERNA OTO Yüzüncü Yıl University

Ussually contrast agents are used in computed tomography (CT) for tissue imaging in clinical applications. X-ray attenuating contrast media containing atoms of high atomic number are used in clinical applications to obtain images of soft tissues. To generate images with the highest contrast to the surrounding tissue, the energy of the X-ray source can be adjusted to closely match the absorption edge value (k) of the relevant imaging-agent atoms. In this study, the possibility of photon interactions with 5 diffrent iodines (compounds) have been calculated in the wide energy range of 1keV–100GeV using WinXCOM computer program. The variations of mass attenuation coefficient (μ_ρ), effective atomic number (Z_{eff}) and electron density (N_{el}) with photon energy were plotted for total photon interactions. It has been observed that although all compounds have the same type of elements, the variation of the atom numbers in the compound changes the values of μ_ρ, Z_{eff} and N_{el}. The variation of theoretical μ_ρ, Z_{eff} and N_{el} values with energy can be explained by the predominance of different interaction mechanism of photons with compounds. In 0.01MeV-0.1MeV energy range, photoelectric absorption effect, whose cross section depends on Z_{4-5} is dominant process and μ_ρ, Z_{eff} and N_{el} values of the samples are the highest. In this energy range, a few jumps in the calculated values have been observed due to the presence of K, L and M absorption edges of the I element (33.16, 5.18, 4.85, 4.55 and 1.07 keV). In 0.1-3MeV energy range, Compton scattering becomes more dominant. Compton scattering cross section varies with Z and μ_ρ, Z_{eff} and N_{el} values decrease gradually and become the lowest. In 10MeV < E, the pair production becomes dominant. Finally, the values of μ_ρ, Z_{eff} and N_{el} increase and become constant at around 100MeV energy. The μ_ρ, Z_{eff}, N_{el} values of compounds were given comparatively with each other for medical imaging applications.

Keywords: Effective atomic number,mass attenuation coefficient,iodine contrast agent

Node locator: An intraoperative gamma camera

[1] ASUMAN KOLBAŞI Göztepe Training and Research Hospital
[2] ONUR KARAMAN Akdeniz University

The definition of a sentinel lymph node (SLN) is the first lymph node to which cancer cells are most likely to spread from a primary tumour. In some cases, there can be more than one sentinel lymph node. Before the biopsy or surgical removal practices, to know if there is one (or more) sentinel lymph node and the location is important. For this reason, patients are guided to the Nuclear Medicine for preoperative lymphoscintigraphy via peritumoral intradermal injection of Tc-99m radio-pharmaceuticals. In surgery, a mobile gamma probe is used to find the location of SNL and after surgery residual tissue controls also. In this study, a mobile intraoperative gamma ray detector has been designed to define the SNL and the exact location of it in the tissue. Three photomultiplier arrays covering three sides of a cube shaped scintillation material will be used for detection. The XY coordinates of the SNL will given by the array at the bottom of scintillator and the arrays located on sides, will give the Z coordinate (depth). Since the penetration in a material is proportional to the energy of gamma rays, the depth of the source in tissue can be found with this method. The radiation matter interaction calculations is carried out with using Monte Carlo method. A GEANT4 based framework GAMOS is used for the first trials of the simulations to evaluate the mechanism in theoretical aspect.

Keywords: Medical Physics, Radiation Detetor, Gamma Camera, Scintillator, Sentinel Lymph Node, Intraoperative, Monte Carlo, GEANT4, GAMOS, Gamma ray

Application of active-OSL approximation to experimental decay curves from nacl sample exposed to different doses

[1] A. GÜNEŞ TANIR Gazi University
[2] MUSTAFA HİCABİ BÖLÜKDEMİR Gazi University

Active-OSL Approximation (AOSLA) that suggested by Tanır and Bölükdemir was applied to experimental optical stimulated luminescence decay from NaCl sample. The explanation of the AOSLA was based on the radioactive decay law of successive disintegration. It allows obtaining the peak forms of luminescence mechanism. This work shows that detrapping constants that have great importance in dating and dosimeters studies can be rapidly and clearly found using the AOSLA. Also, it can be concluded that the OSL is a process similar to the radioactive decay law of successive disintegration.

Keywords: OSL, radiation, nuclear successive decay

Calculation specific heat capacity of uranium nitride nuclear fuel

[1] ERHAN ESER Gazi University
[2] BURAK DUYURAN Gazi University
[3] HÜSEYİN KOÇ Muş Alparslan University
[4] MUSTAFA HİCABİ BÖLÜKDEMİR Gazi University

Determining thermophysical properties of nuclear fuels is one of the most challenging problems in nuclear physics and material sciences. The safer nuclear fuels to prevent tragic accidents is very important in the design of nuclear reactors. In this context, the Uranium Nitride (UN) fuels have been used as safer fuels in nuclear reactors based on its high uranium density, thermal conductivity and low fission-gas release. For this purpose, we have evaluated the heat capacity, which is one of the most exciting thermal properties of fuels, of UN fuel by the use of Einstein-Debye approach. The obtained results show that our method gives reliable computational efficiency.

Keywords: Uranium Nitride, Specific Heat Capacity, Einstein-Debye Model

A survey distribution of terrestrial radionuclides in surface soil samples in and around Erzin province, Turkey.

[1] FATMA AYSUN UĞUR Osmaniye Korkut Ata University
[2] UĞUR BÜYÜKER Osmaniye Korkut Ata University
[3] MEHMET EMİN KORKMAZ Osmaniye Korkut Ata University

The purpose of this survey is to determine the distribution of terrestrial radionuclides U-238, Th-232, K-40 in surface soil samples collected from different locations in and around Erzin and assess the radiological implication caused from external exposure in out door. Measurements shall be made by gamma spectrometry method. As a result, the results marked on the map will be compared with results obtained in other parts of the turkey.

Keywords: Terrestrial Radionuclides,gamma ray spectrometry,soil

Measurements of gross alpha and gross beta activities in Erzin water

[1] UĞUR BÜYÜKER Osmaniye Korkut Ata University
[2] FATMA AYSUN UĞUR Osmaniye Korkut Ata University
[3] MEHMET EMİN KORKMAZ Karamanoğlu Mehmetbey University

Gross alpha and gross beta activities were determined for seventeen water samples collected from different locations in Erzin city. The instrumentations used to count the gross alpha and gross beta activities were gas proportional counter. Concentrations ranging from 0.083 ± 0.016 Bq/L to 0.886 ± 0.089 Bq/L with average 0.541 ± 0.066 Bq/L and from 0.014 ± 0.004 Bq/L to 0.911 ± 0.044 Bq/l with an average 0.2318 ± 0.023 Bq/L were observed for the gross alpha and gross beta activities, respectively. The results show that the natural activities of alpha and beta emitting radionuclides in water samples did not exceed WHO recommended levels and were conparable with data available in other parts of the world. It suggests that the radioactivity in water for the people residing in Erzin city is not yet a problem. To ensure the safe level of radioactivity in drinking water, however, periodic monitoring of water quality for compliance is necessary.

Keywords: Gross alpha,gross beta,gas proportional counter

Tritium activity levels in drinking water of Adana, Turkey

[1] FATMA AYSUN UĞUR Osmaniye Korkut Ata University
[2] ELİF GÖREN Osmaniye Korkut Ata University

Tritium activity in potable drinking water samples from Adana city were measured using liquid scintillation counting after distillation procedure. The results exposed that the activity concentrations of the tritium measured in one-third of these samples were lower than minimum detectable activity which has a value of 2 Bq/L for counting time of 1,500 min. However, the maximum and mean value of the tritium activity was found to be 9.1 Bq/L (77.3 TU) and 7.0 Bq/l (59.4 TU), respectively. These values were substantially below the 100 Bq/L which is normative limit in Turkey for waters intended for human consumption. The highest values of annual effective dose received by infants, children and adults due to measured tritium activity were estimated as 0.041, 0.057 and 0.120 μSv/y, respectively.

Keywords: Tritium, water, liquid scintilation counter

Investigation of the glow curves of the Ermenek-Sariveliler-Başyayla region soil samples

[1] ERDEM UZUN Karamanoğlu Mehmetbey University

Within this paper, thermoluminescence glow curves of the Ermenek-Sarıveliler-Başyayla region soil samples were investigated. For this purpose, the soil samples were taken from randomly selected 28 points in Karaman province under certain conditions. Samples were dried, sieved and stones in crystal form were separated by using light microscope. Then, they were crushed in a mortar, sieved and treated with 30% HCl to remove calcium carbonate. Treat with 30% H_2O_2 processing to remove organic materials and, washed and dried. Then samples were irradiated with beta radiation for 300s and thermoluminescence glow curve were recorded. Glow curves were also analyzed by using computerized glow curve deconvolution method.

Keywords: otor model, numerical solutions, Runge–Kutta method, Fehlberg coefficients, Şeydişehir alumina

Calculation of diffusion length with Anli-Güngör phase function using un method

[1] AHMET BÜLBÜL Osmaniye Korkut Ata University Osmaniye Vocational High Scholl, Department of Electricity and Energy,
[2] FİKRET ANLI Kahramanmaraş Sütçü İmam University Faculty of Arts and Sciences, Department of Physics

The second kind of Chebyshev polynomial approximation (UN approximation) is applied to neutron transport equation in slab geometry and then diffusion lengths are calculated for positive values of scattering parameters (t) using Anli-Güngör phase function. Numerical results obtained from U1 and P1 approximations are compared with each other for different collision parameters and t parameters.

Keywords: Diffusion length, Anli-Güngör Phase, UN method

The γ-ray strength functions of ^{143,147}Nd isotopes

[1] MUSTAFA ÖZGÜR Eskişehir Osmangazi University
[2] KÜRŞAD OSMAN AY Eskişehir Osmangazi University
[3] MAGNE GUTTORMSEN Oslo University
[4] EMEL ALĞIN Adana Bilim ve Teknoloji University
[5] FRANK LEONEL BELLO GARROTE Oslo University
[6] LUCIA CRESPO CAMPO Oslo University
[7] ANDREAS GORGEN Oslo University
[8] TRINE WIBORG HAGEN Oslo University
[9] ANN CECILIE LARSEN Oslo University
[10] VICTOR MODAMIO Oslo University
[11] FABIO ZEISER Oslo University
[12] SUNNIVA SIEM Oslo University
[13] VETLE WEGNER INGEBERG Oslo University
[14] SUNNIVA ROSE Oslo University
[15] EDA ŞAHİN Oslo University
[16] GRY MERETE TVETEN Oslo University
[17] JORGEN ERIKSSON MIDTBO Oslo University
[18] BONGINKOSI VINCENT KHESWA Oslo University
[19] MALIN KLINTEFJORD Oslo University
[20] THERESE RENSTROM Oslo University

The γ-ray strength function (γ_{SF}) is a measure of the average electromagnetic properties of excited nuclei and was first introduced by Blatt and Weisskopf [1]. The γ_{SF} is one important quantity for calculating neutron-induced reaction cross sections in stellar nucleosynthesis and also in nuclear power reactors. The γ_{SF} has been studied extensively by (γ,γ') and (e,e') reactions and theoretical models [2]. Here, γ-ray strength functions of ^{143,147}Nd in the quasi-continuum have been studied via (d,p) reactions performed on ^{142,146}Nd isotopes at the Oslo Cyclotron Laboratory. The results will be compared with the photo-neutron cross sections of Nd data [3,4] from the neutron separation region up to the 14-MeV energy as well.

[1] J.M. Blatt and V.F. Weisskopf, Theoretical Nuclear Physics, Wiley, New York, 1952.
[2] K. Heyde et al., Rev. Mod. Phys. 82, 2365 (2010).
[3] H.T. Nyhus et al., Phys. Rev. C 91, 015808 (2015).
[4] P. Carlos et al., Nucl. Phys. A 172, 437 (1971).

This study is supported by the Scientific and Technological Research Council of Turkey (TUBITAK) under the Project No: 115F196. mustafaozgr@gmail.com

Keywords: gamma ray strength functions, oslo method,gsf

Investigation of radiation effects on polymer concretes designed with different aggregates

[1] CENGİZ ÖZEL Süleyman Demirel University
[2] ALİ NADİ KAPLAN Süleyman Demirel University

The polymers are widely used for clothing, equipment or construction materials due to its preferable regarding physical, chemical and mechanic properties such as low permeability, ease of synthesizing and light weight etc. Toxic or heavy metals (metallic materials) or concretes (mixtures containing heavy aggregates and cement) are commonly used as radiation shielding materials. A polymer concrete, which is a composite material that results from polymerization of a monomer/aggregate mixture, is produced by using the polymer as the binder in concrete. In this study, the effects of different aggregate variations in polymer concrete on stopping power and the penetrating distance of proton and alpha radiations have been investigated. The calculations have been done by using GEANT4 simulation program in the energy range from 1 MeV to 250 MeV with an increase rate of 50 MeV incoming particle energies. The investigated samples are generated by using vinylester resin as the binder in polymer concrete where the concrete samples have been generated as 0% aggregate, 50% standard CEN sand aggregate and 50% hematite aggregate of total volume, respectively. According to the results of the analysis, the minimum penetration distance is determined in the hematite aggregated sample whereas the maximum penetration distance is found in the non-containing aggregate sample (0% aggregate) for proton and alpha particles. Similarly, the maximum stopping power is found in the sample containing hematite aggregates while the minimum value is determined in the non-containing aggregate sample for proton and alpha induced particles. Obtained stopping power and penetrating distance results for the samples have been compared with each other for the possibility of using the polymer concrete as the shielding material. Also, numerical results have been given for all investigated samples.

Keywords: polymer,aggregates,shielding,concrete

Proton and alpha radiation effects on hematite aggregated polymer concretes by using GEANT4

[1] ALİ NADİ KAPLAN Süleyman Demirel University
[2] CENGİZ ÖZEL Süleyman Demirel University
[3] MERT ŞEKERCİ Süleyman Demirel University
[4] HASAN ÖZDOĞAN Akdeniz University

Nuclear reactors are one of the pieces of scientific advancement and have many usage areas to serve in many purposes. The most known reason of the nuclear reactor's usage is to produce electricity energy to be used in our daily life. The unexpectedly occurred high energetic particles from the reactions take place in the process of electricity generation may cause various problems. Radiation shielding has vital to protect against unexpected damage of those particles. One way to avoid from these problems is to use various materials as radiation shielding. Heavyweight concrete is one of the most widely used materials for radiation shielding. As alternative to conventional construction materials, the polymer concrete has been developed by combining the different type of aggregates and the polymers as binders instead of cement and water. Hematite aggregates contain about 88% of Fe_2O_3 and are called heavy aggregates because of their high density. In this study, the effects of different hematite aggregate volume rate in polymer concrete samples have been investigated on the stopping power of alpha and proton radiations. Also, those particles penetration distance calculations have been generated. Samples with different rates of hematite for polymer concrete have been investigated by using GEANT4 simulation program in the energy range from 1 MeV to 250 MeV incoming particle energies. Four different types of polymer concrete samples have been used for the calculations. The samples are prepared in different concentrations of hematite aggregate (0%, 33%, 50% and 66% as volume ratios) in the polymer concrete. Vinylester resin is used as the binder material in all polymer concrete. The results of the analysis illustrate that while the aggregate ratio in the polymer concrete increases, the usability as shielding also increases. The numerical results for stopping power and penetrating distance values have been compared for each sample.

Keywords: shielding, concrete, GEANT4, hematite

Comparison of penetrating distance calculations for magnetite and ordinary concrete

[1] HASAN ÖZDOĞAN Akdeniz University
[2] ABDULLAH KAPLAN Süleyman Demirel University
[3] MERT ŞEKERCİ Süleyman Demirel University
[4] ALİ NADİ KAPLAN Süleyman Demirel University

The interactions of the charged particles with matter are unique and determine their penetrability through matter and, consequently, the type and amount of shielding needed for radiation protection. To avoid from harmful effects of radiation, different shielding materials can be used. Concrete is one of the most popular and relatively cheap material used for radiation shielding. In this study, we aim to investigate the penetrating distance of charged particles within ordinary and magnetite concrete. Calculations have been performed by using GEANT4 and MCNP codes for the incident proton, deuteron, triton, hellion and alpha particles up to 100 MeV energy by taking into consideration of all possible reactions. For MCNP calculations geometry design have been done by using Nucwiz code. The obtained calculation results have been compared with the each other.

Keywords: penetrating distance, concrete, MCNP, GEANT4

Comparison of stopping power calculations for magnetite and ordinary concrete

[1] HASAN ÖZDOĞAN Akdeniz University
[2] ALİ NADİ KAPLAN Süleyman Demirel University
[3] MERT ŞEKERCİ Süleyman Demirel University
[4] ABDULLAH KAPLAN Süleyman Demirel University

Concrete is one of the most popular and relatively cheap material used for radiation shielding in facilities that contain radioactive sources and radiation generating equipment. A concrete that contains only magnetite ore, cement, and water is found to have appreciably better shielding properties rather than ordinary concrete, and to possess good strength and ease of handling. In this study, stopping power calculations of ordinary and magnetite concrete have been performed for the incident proton, deuteron, triton, hellion and alpha particles up to 100 MeV energy by taking into consideration of all possible reactions such as ionization, scattering, absorption, transmission and charge transfer. In calculations the MCNP and GEANT4 codes, which adopt the Bethe-Bloch approach for charged particle-material interactions, have been employed. To understand the differences of the materials, a graphical comparison has been performed for every particle.

Keywords: Stopping Power, Concrete, MCNP, GEANT4

Deuteron induced reaction cross–section calculations for ^{107,109}Ag, ^{151,153}Eu and ^{160}Gd isotopes

[1] ABDULLAH KAPLAN Süleyman Demirel University
[2] HASAN ÖZDOĞAN Akdeniz University
[3] MERT ŞEKERCİ Süleyman Demirel University

Due to the complexity of the nuclear reaction mechanisms nature, making researches on this topic has always been on the high orders of the researches. The developed models for the nuclear reaction mechanisms make the scientists to understand the processes in a more detailed way and help to resolve nuclear reactions steps. However, the hard and complex mathematical operations which also changes from model to model and reaction type, requires a fast and stabilized way to study on these topics. To overcome this situation, many computer-based codes have been developed by the researches. In this study, two of the most known and used codes among all the exists codes, which are TALYS 1.8 and EMPIRE 3.2, have been selected to calculate the nuclear reaction cross–sections of ^{107,109}Ag, ^{151,153}Eu and ^{160}Gd for deuteron induced reactions. The concept of the nuclear reaction cross–section is also explained in the meaning of a reactions probability to take place. Since the information of a reactions occurrence has many beneficial information about the reaction itself, the data of cross–section has an exclusive importance for the studies. The cross–section calculations have been completed by using two reaction mechanism models within each code which are two component exciton and Hauser-Feshbach models from TALYS 1.8 and PCROSS exciton and Hauser-Feshbach models from EMPIRE 3.2. Obtained results have been compared with the experimental data taken from EXFOR and theoretical computation data library TENDL 2015.

Keywords: cross–section, deuteron induced reactions, TALYS, EMPIRE

Neutron production cross–section calculations of ^{111}Cd for (p,xn) reactions

[1] ABDULLAH KAPLAN Süleyman Demirel University
[2] MERT ŞEKERCİ Süleyman Demirel University
[3] HASAN ÖZDOĞAN Akdeniz University

There exists many parameters used in the investigations of nuclear reactions. Some of these parameters could only be observed with the experiments while some of them could also be calculated by using validated models. One of these parameters is the reaction cross–section value which indicates the probability of a reactions formation. The importance of the cross–section data may vital for many cases since this knowledge helps researchers to understand the outcomes of the reaction and also help to be prevented from not desired outcomes. For this reason, there exists many tools for reaction cross–section calculations by using the theoretical models. The main idea of using computer based tools instead of self-calculations is due to the great time and effort gain especially because of the complex and upper level mathematical processes that the models contains. In this study, TALYS 1.8 and EMPIRE 3.2 computer codes have been used among all exists computer based calculation programs to complete the neutron production cross–section calculations for ^{111}Cd(p,n), ^{111}Cd(p,2n), ^{111}Cd(p,3n) and ^{111}Cd(p,4n) reactions. While both codes provide many theoretical models for calculations, two component exciton and Hauser-Feshbach models from TALYS 1.8 and PCROSS exciton and Hauser-Feshbach models from EMPIRE 3.2 have been selected. Experimental data for the investigated reactions have been taken from EXFOR library and used for comparisons of the obtained calculation results. Also, theoretical calculation results from TENDL 2015 library have been included to these comparisons.

Keywords: cross–section, cadmium, TALYS, EMPIRE

ESR investigation of radiation effect on CoQ10 drug

[1] M. ÖZGÜR SEZER Selçuk University
[2] EMEL ECE Karamanoğlu Mehmetbey University
[3] AYHAN ÖZMEN Selçuk University
[4] RECEP BIYIK Türkiye Atom Enerjisi Kurumu
[5] ÜLKÜ SAYIN Selçuk University

Electron Spin Resonance (ESR) is a special technique that allows direct radical determination of paramagnetic centers containing unpaired electrons and allows repeated measurements without damaging the examined sample. Radiation is nowadays, widely used for the treatment of certain diseases, sterilization of medicinal products as well as medicines. Due to the irradiation process, radiation-induced radicals can form in the structure of drugs. Since medicines have an important role in our life, it is very important to identify these radiation-induced radicals and determine their sensitivity to radiation, their stability, their behavior in different physical conditions, and even their usefulness as an accident dosimeter. CoQ10 is an enzyme found naturally in the human body and responsible for the conversion of food into energy. There are many studies about the usage of this enzyme, which is very popular recently, in the treatment of diabetes, cholesterol, Parkinson's disease and migraine. It is claimed that antioxidants and anti-aging properties are also present. It may be added in the content of some vitamins and food supplements, and even can be used as a CoQ10 tablet alone. In this study, the effects of radiation on the CoQ10 enzyme were investigated through ESR technique, taking into account its important role in terms of health. For this purpose, the spectra of natural and irradiated samples were recorded under different spectrometer conditions. The behavior of the radiation-induced radicals in terms of absorbed dose, microwave power and different temperature conditions was investigated. Using the obtained data, the characteristic features of the radical are revealed.

Keywords: Electron Spin Resonance (ESR), radiation, CoQ10, radical

Thermoluminescence heating rate behaviour of $Zn(BO_2)2:0.05Dy3+$

[1] SÜMEYRA BALCI-YEĞEN Çukurova University, Department of Physics, Adana, Turkey
[2] MEHMET YÜKSEL Çukurova University, Department of Physics, Adana, Turkey
[3] NİL KÜÇÜK Uludağ University, Department of Physics, Bursa, Turkey
[4] YÜKSEL KARABULUT Manisa Celal Bayar University, Department of Physics, Muradiye, Manisa, Turkey
[5] MEHMET AYVACIKLI Manisa Celal Bayar University, Department of Physics, Muradiye, Manisa, Turkey
[6] NURDOĞAN CAN Jazan University, Saudi Arabia
[7] MUSTAFA TOPAKSU Çukurova University, Department of Physics, Adana, Turkey

$Zn(BO_2)_2:0.05Dy3+$ phosphor prepared by using the nitric acid method was examined via thermoluminescence (TL) technic. The TL glow curves of the sample exposed to beta ray in the dose range of 1-80 Gy show a TL maximum at c.a. 180°C (preheated at 140°C and measured at a constant heating rate (HR) value: 2°C s^{-1}, by using Lexsyg Smart TL reader). The linearity was noted and TL signal saturation has not been observed up to 80 Gy. Furthermore TL glow curves of $Zn(BO_2)_2:0.05Dy3+$ phosphor exposed to 20 Gy beta dose were studied using different HRs in the range of 0.5–10°C s^{-1}. While HR value increases: (i) the temperature value at maximum TL intensity (Tm) shifts to higher temperature values, (ii) maximum TL intensity value of the glow peak decreases, (iii) the integrated peak area of the glow curve decreases, and (iv) full width at half maximum (FWHM) increases, as presence evidences of temperature lag effect and thermal quenching phenomenon.

Keywords: Thermoluminescence, Zinc borate, dosimetry, heating rate

Variation of the kinetic parameters of traps found in the fluorapatite mineral ($Ca_5F(PO_4)_3$) in tooth enamel under the different annealing temperatures

[1] DİLEK TOKTAMIŞ Gaziantep University
[2] HÜSEYİN TOKTAMIŞ Gaziantep University
[3] A. NECMEDDİN YAZICI Gaziantep University

Fluorapatite, $Ca_5F(PO_4)_3$, is a kind of important thermoluminescence dosimeter (TLD) material, because the effective atomic number of fluorapatite is close to that of human bones and teeth. In this study, the kinetic parameters of the traps found in the fluorapatite mineral ($Ca_5F(PO_4)_3$) in tooth enamel were obtained at different annealing temperatures (from 500^{o}C to 1100^{o}C) by using a computer glow curve deconvulation program and analysed how the kinetic parameters vary at different annealing temperatures. All samples were irradiated about 35 Gy by the beta source and read out by the TLD reader at 1^{o}C/s after each annealing process.

Keywords: Thermoluminescence, kinetic parameters, fluorapatite, annealing

Investigation of the lambda hypernuclei in nuclear reactions

[1] NİHAL BÜYÜKÇİZMECİ Selçuk University
[2] RIZA OĞUL Selçuk University

Recently, hypernuclei coming from fragmentation and multifragmentation of spectator residues obtained in relativistic heavy ion collisions were investigated in Ref. [1]. We have compared two different mass formula [1-4] for the production of hypernuclei and their properties. The effect of addition of a single Lambda in a non-strange normal nucleus is investigated through the one-neutron and one-proton separation energies. In this way, one can distinguish between different mass formulae of hypernuclei. These kind of investigations give us the opportunity to understand the properties of exotic hypernuclei in the future.

[1] Buyukcizmeci N., Botvina A.S., Pochodzalla, J., Bleicher, M., Phys. Rev. C 88, 014611 (2013).
[2] Botvina A.S and Pochodzalla, J., Phys. Rev. C 76, 024909 (2007).
[3] Samanta C, Roy Chowdhury P and Basu D N., J. Phys. G: Nucl. Part. Phys. 32 363(2006).
[4] Samanta, C., Roy Chowdhury, P., BasuD.N., J. Phys. G: Nucl. Part. Phys. 35 065101(2008).

the work has been performed in the framework of COST 114F328 project and COST Action THOR-CA15213

Keywords: Lambda hyperon, hypernuclei, nuclear reactions

Excitation function of (p,xn) reactions for ^{113}Cd nucleous

[1] BEKİR ORUNCAK Afyon Kocatepe University

The excitation function of (p,n), (p,2n) and (p,3n) reactions for ^{113}Cd target nucleus has been measured up to 400 MeV excitation energy. Reaction cross sections were calculated using Talys 1.8 Nuclear reaction code and compared with the experimental data available in EXFOR nuclear data library. Experimental and calculated cross sections are in good agreement.

Keywords: Nuclear reaction, Talys, Excitation function

Evaluation of the dosimetric results of 3 mm geometric error in linear accelerator (linac) beam data measurements

[1] AYSUN İNAL Antalya Eğitim ve Araştırma Hastanesi Radyasyon Onkolojisi Bölümü

Introduction: It is aimed to find the dosimetric results of 3mm geometric error which can be made in beam data(BD) measurements taken for Treatment Planning System(TPS) modeling. Material and Methods: BD measurements were obtained for 6MV photon energy by the LINAC. Measurements were made for two different sets. At first, the ionisation chambers were positioned at the central axis (T6MVX) and the other was positioned with a 3mm error (F6MVX). The data was loaded into the TPS for modeling. Absorbed doses(AD) corresponding to 100 monitor unit were calculated at points created in the TPS. The dose calculations were made different field sizes. The total dose of cancer patient's Intensity Modulated Radiation Therapy (IMRT) plan was calculated. Also, dose maps were obtained for the same fields and the IMRT plan on a 2-D ion chamber array (I'mRTMatrixx). Measurements were taken on the Linac under the same conditions for all sets. Differences between the calculated-measured values were assessed by performing an AD and gamma evaluation (GE). The differences between the two sets were compared in terms of critical organ (OAR) doses of the IMRT plan. Results: The largest difference between calculated-measured of AD was 0.7%. The percentage difference between the calculated-measured AD, T6MVX and F6MVX was 0.6% and 2.7%, respectively for IMRT. As a result of I'mRTMatriXX, the greatest difference for calculated-measured GE was found 0.5%. When OAR's was compared between T6MVX-F6MVX plans for IMRT, the maximum difference was for the spinal cord (3.1%). Discussion and Conclusion: At TPS quality control, both point-dose and 2-D dose maps (2DDM) should be used in symmetric and AF. Also, central axis, off-axis absorbed dose and 2DDM should be checked. It was observed that the 3 mm geometric error was not recognized in GE for 2 mm, 2% criteria. However, an error was noticed when evaluated for the criterion of 1mm,1%.

Keywords: Beam data, absorbed dose, dose map

Calculation of mass attenuation coefficients of hormirad and galena materials for radiation shielding by Monte Carlo method

[1] NURİ YORULMAZ Harran University Physics Department
[2] MEHMET MURAT YAŞAR Harran University Health Services Vocational School
[3] AHMET BOZKURT Akdeniz University Department of Biomedical Engineering

When utilizing the benefits of radiation in different applications such as health and energy production, it is necessary to minimize the possible hazards on public, workers and the environment. Therefore, shielding plays an important role among the radiation protection measures, especially for external radiation sources. The composition and thickness of a material to be chosen for a specific shielding design can be determined either through laboratory measurements or computer simulations. The aim of this study is to obtain mass attenuation coefficients of hormirad and galena, a shielding material using the Monte Carlo technique. The simulation results produced with MCNP5 were compared with those from XCOM database and literature data based on GEANT4 simulations and good agreement was observed.

Keywords: Hormirad, Galena, Mass Attenuation Coefficient, Monte Carlo, MCNP5

Dosimetric comparison of three different VMAT techniques in head and neck cancer radiotherapy

[1] OĞUZ AYDIN Uludağ University
[2] DUYGU BOLAT Uludağ University
[3] SEMA GÖZCÜ TUNÇ Uludağ University
[4] CANDAN DEMİRÖZ ABAKAY Uludağ University
[5] SİBEL KAHRAMAN ÇETİNTAŞ Uludağ University
[6] MERAL KURT Uludağ University
[7] ALİ ALTAY Uludağ University

In head and neck cancer radiotherapy, at three different radiotherapy plans prepared by Volumetric Modulated Arc Therapy (VMAT) technique, target volume, dose and critical organ doses were examined. In this study, 8 head and neck cancer cases were evaluated. In radiotherapy plans; (sVMAT) as a one bean-double arc and two beam as double rotation (dVMAT)and double arc as 150-3450 collimator angular (cVMAT) plans were prepared. For each patient, three VMAT plans were generated to meet the same objectives of the PTV.And the results were compared dosimetrically. PTV doses, Homogeneity index (HI), Conformity index (CI) and monitor unit (MU) were compared and analyzed with the IBM SPSS Statistics 20 program. The target volume doses, HI, CI and MU was examined and there was no statistically significant difference between methods. The sVMAT technique gave a lower dose value when there was no significant difference in right parotid D_{mean} ($p = 0.412$) and V30% ($p = 0.412$). In the left parotid D_{mean} ($p = 0.939$) and V30% ($p = 0.714$), three techniques gave similar results. There was no significant difference in oral cavity D_{mean} ($p = 0.616$), but lower dose values were observed in the sVMAT technique The statistical result of the mandibular data was found to be $p = 0.957$ for the D_{max} value and no significant difference was observed between the methods; but maximum dose was little bit higher in plans using collimator angles. Result of this study, we are considering that the three techniques are suitable for use in patient treatment because they provide the desired tumor dose and critical organ doses in limitations, but also, we believe that in sVMAT technique can minimize side effects that may occur at patients, because of providing lower dose to the critical organs.

Keywords: Colimator Angle, Head and Neck Cancer, Monaco, VMAT

Triple differential cross sections for the single ionization of water molecule (H_2O) by electron impact

[1] BOUMEDIENE LASRI University Tahar Mouly of Saïda, Algeria.
[2] MOHAMED SAHLAOUI Science and Technology Preparatory School, Tlemcen, Algeria
[3] FATIMA BOUASRIA University Tahar Moulay of Saïda, Algeria
[4] MAMMAR BOUAMOUD University Center of Naama, Algeria
[5] MEVLÜT DOĞAN Turkey

The single ionization of atomic and molecular targets by electron impact called (e,2e) is one of the complex and fundamental processes in collision theory. An accurate description of this reaction is very important for several fields, such as plasma physics, astrophysics, laser physics, and radiobiology as the macroscopic effects of radiations on biological tissues. However, dealing with the ionization of a molecular target is a challenge. So, several approximations are necessary to construct an accurate formalism. In this work, we present our analytical formalism developed to calculate triple differential cross section (TDCS) for the ionization by electron impact of simple molecules with the chemical form XHn. This formalism is used in this case to predict the triple differential cross sections for the single ionization of a water molecule by electron impact. Our theoretical calculations (First Born, second Born and Schwinger approximations) stay in good agreement with experimental data.

Keywords: TDCS, Born Approximation, cross section, ionization process

Theoretical calculation of neutron induced fission cross section on some actinides

[1] ASİYE GÜROL Afyon Kocatepe University
[2] İSMAİL HAKKI SARPÜN Akdeniz University
[3] AHMET BOZKURT Akdeniz University

Actinide element, any of a series of 15 consecutive chemical elements in the periodic table from actinium to lawrencium (atomic numbers 89–103). As a group, they are significant largely because of their radioactivity. Although several members of the group, including uranium (the most familiar), occur naturally, most are man-made. Both uranium and plutonium have been used in atomic weapons for their explosive power and currently are being employed in nuclear plants for the production of electrical power. These elements are also called the actinide elements. In this study, fission cross section (n,f) of neutron induced reaction were theoretically calculated by Talys 1.8 nuclear reaction code and compared with experimental data in the EXFOR Nuclear Data Library.

Keywords: Fisssion, Actinides, TALYS

Theoretical calculation of gamma induced fission cross section on some actinides

[1] ASİYE GÜROL Afyon Kocatepe University
[2] İSMAİL HAKKI SARPÜN Akdeniz University
[3] RIDVAN ÜNAL Uşak University

The Actinide series contains elements with atomic numbers 89 to 103 and is the third group in the periodic table. These elements all have a high diversity in oxidation numbers and all are radioactive. The most common and known element is Uranium, which is used as nuclear fuel when its converted into plutonium, through a nuclear reaction. In this study, fission cross sections of some actinides were calculated by Talys 1.8 nuclear reaction code for gamma induced reactions. Theoretical calculated results were compared with experimental data available in the EXFOR Nuclear Data Library.

Keywords: Fission, Actinide, Talys

High performance graphene-based photodetectors

[1] CEREN KARAMAN Pamukkale University Faculty of Engineering,Department of Chemical Engineering
[2] A. GÜNEŞ TANIR Gazi University
[3] İSMAİL HAKKI SARPÜN Akdeniz University
[4] ONUR KARAMAN Akdeniz University
[5] EDİP BAYRAM Akdeniz University Department of Chemistry
[6] ASUMAN KOLBAŞI Göztepe Training and Research Hospital

Graphene promise many outstanding physicochemical properties such as high carrier mobility, good light transmittance within wide wavelength range, great mechanical strength and flexibility, excellent electrical and thermal conductivity which indicate several potentials in electronics and optoelectronic device applications. The versatility of graphene enables its application in several areas such as ultrafast and ultrasensitive detection of light in the ultraviolet, visible, infrared and terahertz frequency ranges. These detectors can be integrated with other photonic components based on the same material, as well as with silicon photonic and electronic technologies. A variety of graphene-based optoelectronic devices including transparent electrodes in displays and photovoltaic modules, optical modulators, plasmonic devices and ultrafast lasers have already been investigated. Among these, developing photodetectors, based on a graphene and related materials, have gained importance. Distinct characteristics and unique properties of graphene based photodetection systems have been studied over the past few years. Here, it is provided an overview of state-of-the-art photodetectors based on graphene, and hybrid systems based on the combination of different crystals and other nanomaterials. It is concluded that photodetectors based on graphene are being developed, with great promise for a wide variety of application fields. It can be said that in order to enhance the graphene-based detector performance, it is need to produce large-scale, high quality graphene at low cost, and to establish large-scale integration with existing photonic and electronic platforms.

Keywords: Graphene, physicochemical properties, photodetectors

Photo-neutron cross section calculations of ^{84,86,87,88}Sr

[1] İSMAİL HAKKI SARPÜN Akdeniz University
[2] HASAN ÖZDOĞAN Akdeniz University
[3] MERT ŞEKERCİ Süleyman Demirel University
[4] ABDULLAH KAPLAN Süleyman Demirel University

Understanding of the structure and dynamics of the atomic nucleus, photonuclear reaction data are very essential. The investigation of photon induced reactions are crucial for a variety of current and emerging fields, such as radiation shielding and transport, design of fusion-fission reactors. The two most important inputs in the computation of cross section of photonuclear reactions are; level density and gamma strength function. In this study, the purpose is to investigate gamma strength function effect on photo-neutron cross sections using TALYS 1.8 code through the five gamma strength function models. The reaction cross sections of ^{84,86,87,88}Sr(γ,n) have been calculated using Kopecky-Uhl generalized Lorentzian Model, Brink-Axel Lorentzian Model, Hartree-Fock BCS tables, Hartree-Fock-Bogolyubov tables and Goriely's Hybrid Model. To appoint the best gamma strength function model, the relative variance and mean weighted deviation are used. Experimental data for the investigated reactions have been taken from EXFOR library and used for comparisons of the obtained calculation results.

Keywords: Photoneutron, Talys, Gama-Strength function

Proton, deuteron and alpha emission of TiN composites

[1] İSMAİL HAKKI SARPÜN Akdeniz University
[2] AHMET BOZKURT Akdeniz University
[3] ABDULLAH AYDIN Kırıkkale University
[4] SUAT PAT Eskişehir Osmangazi University
[5] MOHAMED BELGAID USTHB

Titanium nitride composites (TiN) are industrially available materials that are considered to be promising for applications in nuclear technology, especially, as fusion reactor structural material. They are known to be particularly resistant to very high neutron irradiation environments due to low activation characteristics. In this study, TiN composites, which were produced in Eskisehir Osmangazi University by plasma RF sputtering method, have been investigated as a target material using Monte Carlo simulations to obtain proton, deuteron and alpha emission spectra under neutron irradiation.

Keywords: MCNP, Composite, TiN

Calculation of linear attenuation coefficient of amethyst material for radiation shielding by Monte Carlo method

[1] MEHMET MURAT YAŞAR Harran University Health Services Vocational School
[2] NURİ YORULMAZ Harran University Physics
[3] AHMET BOZKURT Akdeniz University Department of Biomedical Engineering

When utilizing the benefits of radiation in different applications such as health and energy production, it is necessary to minimize the possible hazards on public, workers and the environment. Therefore, shielding plays an important role among the radiation protection measures, especially for external radiation sources. The composition and thickness of a material to be chosen for a specific shielding design can be determined either through laboratory measurements or computer simulations. The aim of this study is to obtain linear attenuation coefficients of amethyst, a natural shielding material using the Monte Carlo technique. The simulation results produced with MCNP5 were compared with those from XCOM database and literature data based on FLUKA simulations and good agreement was observed.

Keywords: Amethyst, Linear Attenuation Coefficient, Monte Carlo, MCNP5

Leukemia incidence in the Russian cohort of Chernobyl emergency workers: estimates of radiation risks in the follow-up period 1986–2014

[1] SERGEY KARPENKO A. Tsyb Medical Radiological Research Center – branch of the National Medical Research Radiological Center of the Ministry of Health of the Russian Federation (A. Tsyb MRRC)

Leukemia incidence was studied in the Russian cohort of male emergency workers of 78,110 persons over the follow-up period 1986–2014. The mean age of emergency workers at the time of entry to the Chernobyl zone was 34 years. Radiation risk of leukemia (chronic lymphocytic leukemia excluded) was analyzed for emergency workers having official data about individual external whole-body gamma radiation dose accrued over the recovery works period. A total of 157 cases of leukemia were detected (excluding chronic lymphocytic leukemia). The mean dose for emergency workers was 108 mGy. For the period 1986–1997, a linear dose response of leukemia is found to be statistically significant ($p<0.05$), with the excess relative risk per Gy (ERR Gy^{-1}) = 4.17 [90% confidence internal (CI): 0.18; 13.24]. From 1998 to the end of the follow-up period, as well as for the whole follow-up period (from 1986 to 2014), no statistically significant excess relative risks were found. A statistically significant excess incidence of leukemia that may be due to external gamma radiation exposure for the Russian cohort of emergency workers is seen in the period 0-11 years after exposure, based on our estimates.

Keywords: Radiation risk, Leukemia incidence, Excess relative risk, Relative risk, Chernobyl accident, Liquidators

Influence of backscattering on fission rate of excited nuclei

[1] MARIA CHUSHNYAKOVA Akdeniz University, Antalya, Turkey
[2] IGOR GONTCHAR Omsk State Transport University, Omsk, Russia

The nuclear fission of excited nuclei is an example of the thermal decay of a metastable state [1-3]. We model this process numerically using the Langevin equations [2,4]. Within such modeling, this process is described as a Brownian particle motion which is affected by conservative, dissipative, and fluctuating forces. When this particle overcomes fission barrier, it still has a chance to be scattered back to the potential well due to fluctuations [4,5]. We study the effect of this backscattering for the wide range of the friction coefficient. Usually, to model numerically thermal decay of a metastable state one uses different approaches for different ranges of friction [1,2,6]. We perform numerical modeling of this process within the framework of the very same approach for all values of friction coefficient. First, we compare two approximate analytical Kramers rates with the numerical quasistationary fission rates: one of the analytical formulas is for the case of middle and large friction (spatial diffusion regime) [1] and the other is for the case of relatively small friction (energy diffusion regime) [1,7]. Second, we analyze the influence of descent of the Brownian particle from the barrier on the quasistationary fission rate: as the friction coefficient decreases, this influence gradually disappears. It is found, in the energy diffusion regime, backscattering absents and therefore the descent stage does not influence the fission rate. As the value of friction increases, the descent stage alters the rate by more than 50%.

[1] Kramers// Physica 7 (1940) 284-304
[2] Fröbrich, Gontchar// Phys. Rep. 292 (1998) 131-237
[3] Gontchar, Chushnyakova// Pramana J. Phys. 88 (2017) 90
[4] Chushnyakova, Gontchar// PRE 97 (2018) 032107
[5] Boilley, Marchix, Jurado, Schmidt// EP JA 33 (2007) 47-52
[6] Gontchar, Chushnyakova, Aktaev, Litnevsky, Pavlova// PRC 82 (2010) 064606
[7] Buttiker, Harris, Landauer// PRB 28 (1983) 1268

Keywords: Fission rate, Langevin dynamics

Measurement of natural radioactivity in quartz stone

[1] AYDAN ALTIKULAÇ Muğla Sıtkı Koçman University, Ula Ali Koçman MYO

Granite is a natural stone in the structure of quartz and alkali feldspar. These are 35% Quartz, 45% Potassium feldspar and mica (biotite) minerals in the structure. Some granites are known to contain radioactivity due to radionuclides present in their mineralogica compositions. Quartz is a crystal group mineral that is very common in nature. In this study, natural radioactivity analysis was performed from quartz stones. The mean radioactivity values of ^{226}Ra, ^{232}Th and ^{40}K were found to be 9.1, 22.5 and 615.8 Bq/kg respectively.

Keywords: Natural radioactivity, granite, quatrz

Determination of radioactivity levels in feldspar samples in Turkey

[1] AYDAN ALTIKULAÇ Muğla Sıtkı Koçman University, Ula Ali Koçman MYO

Feldspar is one of the most important mineral group that the make up rocks on earth and make up 60% of the earth's crust and is the most commonly found mineral group on earth. It is also used as raw material in the glass and ceramics industry. In this study, natural radioactivity measurements were made in different feldspar samples (K-Feldspar, Na Feldspar) from the southern Aegean region in Turkey. The mean radioactivity concentrations of ^{226}Ra, ^{232}Th and ^{40}K in K-Feldspar samples determined to be 60.65, 62.3 and 1821.85 Bq/kg, respectively. The measurements result of Na-Feldspar samples were 57.9, 70.63 and 785.80 Bq/kg, respectively.

Keywords: Gamma spectrometry, radioactivity, feldspar

The effects on radiation damage of some nuclear libraries in a hybrid reactor

[1] MEHTAP DÜZ İnönü University
[2] GÖKMEN ŞEKER İnönü University

In this study, salt-heavy metal mixture consisting of 79.9% $Li_{17}Pb_{83}$ + 20% ThF_4 + 0.1% AmO_2 was used as fluid. The fluid was used in the liquid first-wall, blanket and shield zones of the designed hybrid reactor system. A beryllium (Be) zone with a width of 3 cm was used for neutron multiplicity between the liquid first wall and the blanket. V_4Cr_4Ti ferritic steel with the width of 4 cm was used as the structural material. Proton, deuterium, tritium, He-3 and He-4 gas production rates are the parameters of radiation damage. In this study, the effect on the radiation damage of the selected fluid and libraries were investigated for 30 full power years (FPYs) in the structural material. Three-dimensional analyses were performed using the most recent MCNPX-2.7.0 Monte Carlo radiation transport code and some nuclear data libraries.

Keywords: Hybrid Reactor, Monte Carlo, MCNPX, liquid first-wall

The calculation of neutron flux for some nuclear libraries using Monte Carlo method

[1] MEHTAP DÜZ İnönü University, Science and Art Faculty, Physics Dept
[2] HİLAL BARDAKÇI İnönü University, Science and Art Faculty, Physics Dept

In this study, a hybrid reactor system was designed by using 79.9% $Li_{17}Pb_{83}$ + 20% ThF_4 + 0.1% AmO_2 fluid, some evaluated nuclear data libraries and V_4Cr_4Ti ferritic steel structural material. The fluid was used in the liquid first wall, liquid second wall (blanket) and shield zones of a fusion–fission hybrid reactor system. The neutron flux was calculated according to radial and energy spectrum in the designed hybrid reactor system for the selected fluid, some nuclear libraries and structural material. Three-dimensional nucleonic calculations were performed using the most recent version MCNPX-2.7.0 Monte Carlo code.

Keywords: MCNPX-2.7.0, Nuclear Libraries, Thorium, Hybrid Reactor

Three-dimensional Monte Carlo calculation of the nuclear parameters for some nuclear libraries

[1] MEHTAP DÜZ İnönü University, Science and Art Faculty, Physics Dept
[2] HİLAL BARDAKÇI İnönü University, Science and Art Faculty, Physics Dept

In this study, a fusion–fission hybrid reactor system was designed by using V_4Cr_4Ti Ferritic steel structural material and the molten salt-heavy metal mixture 79.9% $Li_{17}Pb_{83}$ + 20% ThF_4 + 0.1% AmO_2, as fluid. The fluid was used in the liquid first wall, blanket and shield zones of a fusion–fission hybrid reactor system. Beryllium (Be) zone with the width of 3 cm was used for the neutron multiplication between the liquid first wall and blanket. In this study was investigated the nuclear parameters such as tritium breeding ratio (TBR), energy multiplication factor (M), heat deposition rate, fission reaction rate in liquid first wall, blanket and shield zones. Three-dimensional analyses were performed by using the Monte Carlo code MCNPX-2.7.0 and some nuclear data libraries.

Keywords: fusion-fission hybrid reactor system, Three-Dimensional Monte Carlo Calculation, Nuclear Libraries

The investigation of convert $^{232}Th(n,\gamma)^{233}U$ for some nuclear libraries in a hybrid reactor

[1] MEHTAP DÜZ İnönü University
[2] GÖKMEN ŞEKER İnönü University

In this study, the fluid was composed mixture the molten salt-the heavy metals 79.9% $Li_{17}Pb_{83}$ + 20% ThF_4 + 0.1% AmO_2. In study, the effect of some nuclear libraries on convert to $^{232}Th(n,\gamma)^{233}U$ was investigated in designed the hybrid reactor system. Beryllium (Be) is neutron multiplicity by (n,2n) reactions. Thence, Be zone in thick 3 cm was used in order to contribute on ^{233}U between liquid first wall and blanket. V_4Cr_4Ti ferritic steel is used as a structural material. The convert to $^{232}Th(n,\gamma)^{233}U$ was calculated in liquid first wall, blanket and shield zones, which thorium content. Three-dimensional nucleonic calculations were performed by using the most recent version MCNPX-2.7.0 Monte Carlo code and some nuclear data libraries.

Keywords: Hybrid Reactor, Monte Carlo, MCNPX, liquid first wall

The effect of varying constant source over albedo problem for quadratically anisotropic scattering

[1] ALİ ZAFER BOZKIR Kırıkkale University
[2] R. GÖKHAN TÜRECİ Kırıkkale University

One speed, time independent neutron transport equation with quadratically anisotropic scattering is solved with a constant neutron source. The general solution is written and half-space albedo problem is thought for proper boundary conditions. The tabulated values are calculated for the varying scattering coefficients, secondary neutron numbers and varying source terms.

Keywords: Neutron transport theory, Quadratically anisotropic scattering, Constant source, Albedo, Modified FN method

Tritium activity levels in bottled water and mineral water sold in Azerbaijan

[1] ORKHAN MUKHTARLI Recep Tayyip Erdoğan University
[2] SERDAR DİZMAN Recep Tayyip Erdoğan University
[3] RECEP KESER Recep Tayyip Erdoğan University
[4] FİLİZ KORKMAZ GÖRÜR Abant İzzet Baysal University

Water constitutes about three quarters of our planet and human body. Considering the daily consumption level of drinking water, the purity and cleanliness of the consumed water is very important. The cleanliness of the water also depends on the tolerable levels of radionuclide materials in water. One of the radionuclides in water is tritium. Tritium is a radioactive isotope of hydrogen that emits low-energy beta particles, with a maximum energy of 18.6 keV, and with a half live of 12.3 years. In present study, tritium activity concentrations in 8 different bottled mineral water and 7 different bottled water brands sold in Azerbaijan were measured by liquid scintillation counter (LSC). Liquid scintillation counting is the most commonly used technique for determining tritium in low-level environmental samples. The MDA for this method was 1.69 Bq/L. The tritium concentrations of 1 bottled water samples (14.3 %) and 4 bottled mineral water samples (50 %) were below of the MDA. The average tritium activity levels of collected water samples are found as 2.69±0.91 Bq/L for bottled water samples and 2.43±0.89 Bq/L for bottled mineral water samples, respectively. These results are much lower than the upper levels determined by WHO, USEPA, TSI and MOH. Also, the annual effective doses for studied water samples were evaluated and compared with the limit values determined by international organizations.

Keywords: Tritium, Water, Mineral Water, Azerbaijan

Investigation of using neutron generator source in thorium fuel efficiency at new generation nuclear reactor types

[1] EYYUP TEL Osmaniye Korkut Ata University
[2] YUSUF KAVUN Kahramanmaraş Sütçü İmam University
[3] SULTAN KILIÇ Osmaniye Korkut Ata University
[4] AFİFE BÖLÜKBAŞI Osmaniye Korkut Ata University

Today, electricity can be generated from conventional fission reactors and the next-generation reactors based on accelerators continue to be investigated in many developed countries, especially in China, Canada and the USA. But it is not yet commercialized due to economic problems. In this study, thorium-fueled reactor types using neutron generators, a new type of nuclear reactor planned to be used in energy generation of the future, were investigated. In addition, the cross sections of reactions occurring through neutron generators were calculated using newly developed formulas.

Keywords: neutron generator, nuclear reactors, cross-section

Determination of the dead layer thickness for hpge detector: Measurements vs Monte Carlo methods

[1] ABDELLATİF ELANIQUE University Ibn Zohr, Morocco

The activity concentration of radionuclides in the environment is routinely measured using high-purity germanium (HPGe) detectors. A very important characteristic of a gamma-ray detector is its intrinsic efficiency which is usually measured by calibration sources or calculated by Monte Carlo simulations. The intrinsic efficiency depends on many factors among which are the detector to sample geometry, photon transmission of the entrance window of the cryostat and the crystal dead layer (DL). The in vivo laboratory (IVM) at Karlsruhe Institute of Technology (KIT), Germany, is running HPGe detectors having very thin DL< 0.5 µm. An initial HPGe detector model was recently developed using scanning measurements with collimated radiation sources. However, no information about DL thickness, which is essential at low photon energy range, was derived. In the work reported here we developed a method to determine DL thickness using one of the HPGe detectors. Its intrinsic efficiency curve was measured using an Americium-241 radioactive source in 10-60 keV energy range. A comparison between experimental efficiency and Monte Carlo results (MCNPX) showed that the DL value of 0.4 µm, initially quoted by the manufacturer, has to be changed to 7.5 µm to reproduce measurements. The validated detector model will permit an accurate Monte Carlo calibration of the in vivo counting system.

Keywords: Dead layer, HPGe detector, Monte Carlo, MCNP, Radioactive source.

Validation of a NaI(Tl) and $LaBr_3$(Ce) detector's models: Experiment and Monte Carlo simulations

[1] MOHAMED YOUSSEF MESSOUS National Center for Energy, Sciences and Nuclear Techniques CNESTEN, Rabat, Morocco
[2] ISSAM MOUHTI Laboratory of Condensed Matter and Nanomaterials for Renewable Energy, Faculty of Sciences, University Ibn Zohr Agadir, Morocco
[3] ABDELLATİF ELANIQUE Laboratory of Condensed Matter and Nanomaterials for Renewable Energy, Faculty of Sciences, University Ibn Zohr Agadir, Morocco

Lanthanum Bromide $LaBr_3$(Ce) inorganic scintillator is a new type of nuclear detector used in gamma spectrometric systems. It is becoming an attractive alternative to the conventional NaI(Tl) detector because of its promising intrinsic performances: Compared to NaI(Tl) detector, the $LaBr_3$(Ce) scintillator has many useful characteristics: improved energy resolution (3% at 662 keV), fast time response (decay constant of circa 26 ns) enabling high count rate applications, high gamma detection efficiency, operation at room temperature and promising technology for manufacturing crystal at larger sizes. This work relates to the study and characterization of the response function of two cylindrical scintillation detectors with similar size: 2"x2" NaI(Tl) and 2"x2" $LaBr_3$(Ce). The photon detection efficiency and energy resolution curve were measured for the NaI(Tl) detector in the gamma energy range from 60 keV to 1408 keV. A precise mathematical model of the two scintillators was developed using the Monte Carlo simulation code MCNP. Comparison of the efficiency data with MCNP simulations showed good agreement enabling the validation of the computational models for both NaI(Tl) and $LaBr_3$(Ce) detectors. The energy resolution function was determined experimentally and used to improve the simulated spectra.

Keywords: Monte Carlo, scintillation detector, NaI, $LaBr_3$

Determination of direct capture reaction rate for $^{26}Si(p,\gamma)^{27}P$

[1] MURAT DAĞ Ahi Evran University

^{26}Al is a radioisotope produced in a variety of stellar sites such as novae, supernovae, Wolf Rayet (WR) stars, and Asymptotic Giant Branch (AGB) stars. The possible reaction sequence for production of ^{26}Al is $^{24}Mg(p,\gamma)^{25}Al(\beta+,\nu)$ $^{25}Mg(p,\gamma)^{26}Al$, and its ground state β+ decays to the first excited state of ^{26}Mg which then deexcites to its ground state, emitting a characteristic γ-ray line at $E\gamma = 1.809$ MeV. This γ-ray emission at 1.809 MeV were first observed by HEAO3 satellite, and later measured by the COMPTEL telescope installed on the CGRO (Compton Gamma Ray Observatory) satellite and INTEGRAL. Since the half-life ($T_{1/2} = 7.2x10^5$ yrs) of the radioisotope ^{26}Al is very short compared to the time scale of galactic chemical evolutions out in an all-sky distribution of 1.809MeV γ-rays over the galaxy, which provided a confirmation that ongoing nucleosynthetic processes are active. However, due to the proton capture on ^{25}Al being faster than its β-decay in the sites which have high stellar density and temperature, the possible dominant chain of the production of ^{26}Al can be by-passed through $Si(p,\gamma)^{27}P$ reaction is therefore of interest in connection with its role in the destruction of the important astrophysical observable ^{26}Al, and determination of reaction rate for the radioactive proton capture $^{26}Si(p,\gamma)^{27}P$ at stellar energies is of great importance for determining the quantity of the ground state of ^{26}Al produced through thermal equilibrium.

This work was supported by Ahi Evran University Scientific Research Projects Coordinations Unit. Project Number: FEF.A4.18.005

Keywords: Reaction Rate, thermal equilibrium, proton capture reaction

Optimization of the electrophoretic deposition parameters (hydroxyapatite concentration, collagen concentration, and deposition temperature speed) for biocomposite hydroxyapatite/chitosan/collagen/h-BN coatings via response surface methodology

[1] İSMAİL HAKKI KARAHAN Mustafa Kemal University
[2] ALİ TOZAR Mustafa Kemal University
[3] YASİN YÜCEL Mustafa Kemal University

Titanium and its alloys are very good alternatives for orthopedic operations and commonly utilized as bone substitute materials due to their excellent mechanical and corrosion properties and their decent biocompatibility. Due to its excellent bone bonding properties, HA becomes widely used metal coatings in biomedical applications. HA coatings constitute an osteoconductive surface for new bone growth. Thereby stabilizing the metal implant and transferring the load to the skeleton, HA coatings help to deal with bone atrophy problem. Electrophoretic deposition draws interest due to its low cost, ease of use, room temperature application, controllable parameters and various alternatives for both precursors (dissolved salts, suspensions, sols) and substrates. Nevertheless, electrophoretically deposited pure HA coatings need further high-temperature sintering causing decomposition of HA to tricalcium phosphate. To overcome this issue and further enhancement of biocompatibility moreover functionalize HA, composite coatings of HA with organic and/or inorganic materials has become a hot research topic. Response Surface Methodology (RSM) which is a technique for modeling and analyzing the relationship between independent variables. This technique is a beneficial chemometric practice for determining the mutual effects of empirical parameters and moreover for optimizing primary parameters with the fewest count of experiments. In this study, Ti_6Al_4V alloy biomedical implant materials have been coated with a biocomposite hydroxyapatite/chitosan/collagen/h-BN layer using electrophoretic deposition method at room temperature. RSM and Central Composite Design (CCD) have been employed for modeling and optimizing the electrophoretic deposition parameters of HA concentration, collagen concentration, and deposition temperature.

Keywords: optimization, response surface methodology, electrophoretic deposition, corrosion, biomedical, h-BN

The effect of chitosan concentration on the corrosion characteristics of the biomedical grade Ti_6Al_4V implants electrophretically coated with hydroxyapatite/chitosan biocomposites

[1] İSMAİL HAKKI KARAHAN Mustafa Kemal University
[2] ALİ TOZAR Mustafa Kemal University

Using Ti_6Al_4V alloy as implant material draws much interest because of its great corrosion resistance and appropriate mechanical strength. However, the biocompatibilities of these type of biomaterials are the major concern for the biomedical field researchers. In order to improve the biocompatibility, the coating of the implant surface with hydroxyapatite (HA) has been greatly studied and is still being studied due to the mineral component of bone is composed of HA. Various methods are being used for HA coating on metallic implant surfaces such as pulsed laser deposition, micro-arc oxidation, plasma spraying, RF magnetron sputtering, ion beam assisted deposition, and electrophoretic deposition (EPD). Unfortunately, these techniques require during and post-production high temperatures procedures that cause decomposition of HA into far less biocompatible tricalcium phosphate (TCP) form. In order to avoid the during and post-production high-temperature procedures, EPD of HA/chitosan (HA/CTS) composite coatings on Ti_6Al_4V implants is becoming a very encouraging technique due to its versatility, low-cost and not requiring of high-temperature procedures. In this study, HA/CTS biocomposite coatings have been produced on biomedical grade Ti_6Al_4V implants by EPD. The effect of concentration of chitosan in the EPD suspension on the corrosion protection performance of the coatings has been investigated. Our results showed that the corrosion protection performance of the HA/CTS coating increases with the increase of chitosan concentration up to 2.5 g/L and than slightly decreases.

Keywords: biomedical, hydroxyapatite, chitosan, electrophoretic deposition, corrosion

A study of mean free path on the radiation shielding properties of normal concrete

[1] EYYUP TEL Osmaniye Korkut Ata University
[2] YUSUF KAVUN Kahramanmaraş Sütçü İmam University
[3] ALİ ARMAĞAN GÖK Osmaniye Korkut Ata University
[4] MESUT DEPEDELEN Osmaniye Korkut Ata University

Today along with developing technology and rapid population growth, energy needs have been increasing in the worldwide. In order to supply rising energy demands, the countries have been tending to nuclear power plants which have high productivity. In nuclear power plants established by using high technology, required precautions are adopted by assessing all negative effects that can harm environmental health. For this reason, it is important to investigate the radiation shielding and efficiency of traditional concretes. In this study, it was studied efficiency of shielding at different energies and also calculated macroscopic cross-sections and mean free path of normal concrete material. So, the consequences of using normal concrete material in nuclear power plants have been investigated.

Keywords: nuclear energy, normal concrete material, macroscopic cross-section, mean free path

Necessity of nuclear energy in Turkey

[1] EYYUP TEL Osmaniye Korkut Ata University
[2] YUSUF ALPER KAPLAN Osmaniye Korkut Ata University
[3] MERVE KARAGÖZ Osmaniye Korkut Ata University

Concerning the basic needs of the world we live in 21st century (AC), energy has a huge priority. For energy wise, any country wishes to progress or develop requires itself to find different solutions for generating that energy, which will help them to be self dependent. For this occasion, Turkey must have interest in nuclear energy along with renewable energy. Nuclear power plants, which are built to generate nuclear energy, are known to have negative sides such as high building costs and raditation risks, but apart from that it also takes attention for supplying non-stop(uninterrupted) energy resource especially for industrial complexes. In this study, the subjects concerning the ways for Turkey to have less external dependence along with the ways to reduce the energy deficiency in the country has been examined.

Keywords: Energy, Nuclear energy, Energy policy

The role of nuclear energy for generating electric in Turkey

[1] MERVE KARAGÖZ Osmaniye Korkut Ata University
[2] YUSUF ALPER KAPLAN Osmaniye Korkut Ata University

As being continuosly developing country, Turkey's necessity for energy resources increases as a result of having constant economic growth that happens every year. Having limited domestic production which fairly does not cover for meeting the ever growing energy demand, substantial amount of energy is met by importation. Having high rate imports have negative effects for Turkey in areas such financial stability, sustainable growth, energy demand safety. Looking at recent developments, the state primarily put nuclear energy option in the effect as an alternative to solve this problem. In this study, we examined the differences or alteration on electric production subject as Turkey leans to nuclear energy. Akkuyu power plant project, having 1200MW each, consist of 4 units. Sinop power plant project consist of 4 units and has a established power of 4480MW.

Keywords: Energy, Nuclear Energy, Energy generating

Hydrogen recombination in REKO-4 facility and analysis of recombination

[1] MAHMUT CÜNEYT KAHRAMAN Yalova University Energy Systems Engineering

Previous accidents happened in LWR have proved that safety device installation to the reactors is necessary to remove the hydrogen gases inside the vessel in case of an accident. The aim of the study was to investigate a PAR with catalyst sheets as a safety device to calculate the hydrogen consumption, determine the temperature distribution and inlet velocity in the test facility, REKO-4, Jülich Forschungszentrum (Research Center) Germany.Test series were carried out under atmospheric pressure and natural flow conditions. For the test purposes, hydrogen between 2.0 and 6.0 vol. % was injected to the vessel with volumetric flow, 1.9 m^3/h. The first rise in the temperature of the PAR inlet was found after 100 seconds of first hydrogen injection, this result demonstrated that reaction started and hydrogen was consumed. Additionally, in order to investigate the buoyancy-driven flows, particles velocity was measured by PIV and particles motion was examined. The experiment results show that the PAR is an ideal device for removing of hydrogen from vessel and creating the buoyancy-driven flow, it conforms the purpose of installing PAR to the system.

Keywords: Hydrogen, REKO-4, Recombination, Reactor, Safety

Determination of morphological characteristics and mineralogical structure of the Kulakcayiri sediments by SEM and XRD

[1] GÜLDEREN AÇIKGÖZ Yıldız Teknik University
[2] ZEKİ ÜNAL YÜMÜN Namik Kemal University
[3] EROL KAM Yıldız Teknik University
[4] KÜBRA BAYRAK Yıldız Teknik University

The Kulakcayiri Lake is located in the town of Arnavutkoy in the province of Istanbul. It is a shallow lake formed on the ore deposits which have been closed in the past. This study was carried out to investigate the morphological and mineralogical attributes of the sediments of Kulakcayiri Lake. For this purpose, 3 core sediments were extracted from the depths of 5, 10 and 15 meters of the lake. First, SEM (Scanning Electron Microscopy) images were taken by JEOL JSM-6390LV and then mineralogy of sediment samples was determined by XRD. SEM analysis is an imaging technique in which the topographic and morphological properties of materials can be examined. During SEM analysis, the accelerating voltage for each sample was set to 20 kV. The SEM images of the samples were examined in µm dimension (up to X3500 magnification). The complex structure of SEM images is noteworthy because the sediments are composed of various organic and inorganic compounds. XRD is an analytical technique based on the fact that X-rays form different diffraction profiles due to the unique atomic structure and arrangement of crystals. As a result of XRD analysis, a large number of peaks were obtained and various minerals were detected from the obtained peaks. Crystal structure of the minerals such as Hematite (Fe_2O_3), Quartz (SiO_2), Calcite ($CaCO_3$) and Corundum (Al_2O_3) were investigated and evaluated. In conclusion, the physical and chemical properties of the sediments of Kulakcayiri Lake are reflected by this study. The mineralogical structure of the different depths of the lake was evaluated and compared with each other.

Keywords: Kulakcayiri Lake, sediment, SEM, XRD

Evaluation outdoor gamma dose rates in air and cancer risk determination for nevsehir, turkey

[1] MERVE YAPRAK Yildiz Technical University
[2] M. ERGÜN TURGAY Yalova University
[3] EROL KAM Yildiz Technical University

Assessment of inhalation quality for Nevşehir which well-known touristic destination, is important for local population nearby also for visitors. In this case, spread map was prepared in order to take a lot of output around this province as well distinguished cities as Kapadokya, Avanos, Göreme, Ihlara and Ürgüp especially. Radioactivity analysis in air was realized by using air dose rate measurements around the province. Via counting of 46 stations, it was possible to get the average dose rate. Then it was calculated to annual dose in air. Besides, cancer risk was determined for Nevşehir. All these values were compared with the World's references (UNSCEAR) and assumed, finally. It was measured the average dose rate as 87.39 $nGyhr^{-1}$ and annual dose was calculated to 107.18 μSv. This dose is required to excess lifetime cancer risk as $3.75x10^{-4}$. These values could be compared to the similar studies which existed around the world. Finally, the average annual effective dose equivalent and excess lifetime cancer risk for Nevşehir, are more than the world average but less than Artvin and Çanakkale. This study would be used to a reference for further investigations, besides it will be useful to compare with different studies which, will be evaluated in the future, for example after a nuclear pollution, or to compare the seasonal results, or such as based on a reactor leakage, nuclear attacks, etc., too.

Keywords: Nevsehir, ADRA, AEDE, Radioactivitiy, Cancer Risk

Estimate of individualized radiation risk coefficients under internal exposure for the cohort of Russian emergency workers

[1] SERGEY LOVACHEV A. Tsyb Medical Radiological Research Center – branch of the National Medical Research Radiological Center of the Ministry of Health of the Russian Federation (A. Tsyb MRRC)

International basic radiation safety standards 2011 of the International International Atomic Energy Agency require to inform the exposed persons about possible effects of radiation on their health. This information applies to all types of exposure situations (planned, emergency and existing). In accordance with the Recommendations of the ICRP in 2007 (Publication 103), the nominal risk coefficients and the effective doses can not be used for assessment of the individual radiological exposure consequences and harm to health. This is relevant for the radiation risk estimation of internal exposure, when the exposure of different organs and tissues is uneven. The purpose of the study is to determine the dependence of lifetime radiation risk (LAR) on sex and age at exposure (inhalation intake for internal exposure) for Russian exposed cohorts. The ICRP radiation risk models (Publication 103), Russian age-sex cancer incidence and mortality rates and death rates from all causes were used for risk calculations. The LAR calculation for a single inhalation intake can be generalized to the case of repeated or prolonged exposure, provided that the excess absolute risk (EAR) are additive. We used the standard conditions the aerosol U234 intermediate type of solubility (P) with AMAD=1μm. The dynamics of equivalent doses in tissues and organs can be found in the ICRP database. The value of LAR/Sv for lungs may be approximated by a polynomial of the fifth degree. The risk coefficient for Russian exposed cohorts exceeds the nominal risk coefficient from Radiation Safety Standards 99/2009 for adults (0.041/Sv) in next cases: -internal exposure: men younger than 54, women younger than 69.

Keywords: ICRP radiation risk models, internal exposure, radionuclides, ICRP dose coefficients

A Monte Carlo calculation of the x-ray attenuation of tungsten functional papers (TFP)

[1] ASUMAN KOLBAŞI Göztepe Training and Research Hospital

In radiology units of Hospitals, the Lead aprons are widely used for protection from the radiation which produced in imaging devices using the ionizing X- and gamma rays. However, the regular usage of these aprons may cause back pain and disk diseases. Other disadvantages of the lead aprons are inflexibility and toxicity. Because of the negative health effects of Lead, a strong demand for lead-free product development in health-care and industrial applications. There are several studies of alternative x-ray protection materials. Usage of Tungsten Functional Papers (TFP) is one of the alternative materials. Since they are lead-free, easy to cut and fold; the TFPs are less harmful to the body.
In this study, GEANT4 based GAMOS framework is used to calculate the shielding effect of TFP sheets with different thicknesses and the results are compared with the Lead as reference.

Participant list

1. ABDELLATIF ELANIQUE
2. ABDULLAH AYDIN
3. ABDULLAH KAPLAN
4. ADEM PEHLİVANLI
5. AFİFE BÖLÜKBAŞI
6. AHMET BİÇER
7. AHMET BOZKURT
8. AHMET BÜLBÜL
9. ALİ ARMAĞAN GÖK
10. ALİ İHSAN KILIÇ
11. ALİ NADİ KAPLAN
12. ALİ ZAFER BOZKIR
13. ASGAR HOSSEINNEZHAD
14. ASİYE GÜROL
15. ASLIHAN ÇAĞLAR
16. ASUMAN KOLBAŞI
17. AYDAN ALTIKULAÇ
18. AIDIN GHALEHASADI
19. AYLA GÜMÜŞ
20. AYSUN İNAL
21. BEKİR ORUNCAK
22. BOUMEDINE LASRI
23. BURCU UÇAR
24. CEREN KAHRAMAN
25. DİLEK TOKTAMIŞ
26. DOĞAN YAŞAR
27. DUYGU BOLAT
28. ELİF EBRU ERMİŞ
29. ELİF GÖREN
30. ENİS KAPDAN
31. ERCAN YILDIZ
32. ERDEM UZUN
33. ERHAN ESER
34. EROL KAM
35. ERSİN ÇİÇEK
36. ESRA UYAR
37. EYYUP TEL
38. F. AYSUN UĞUR
39. FATİH EKİNCİ
40. FATMA YAKUT
41. FURKAN OK
42. GHAZI ALSBEIH
43. GÖKMEN ŞEKER
44. GÖZDE DEMİRELLİ
45. GÜLPER AKSOY
46. A. GÜNEŞ TANIR
47. HANDE KAYACIK
48. HANDE ÜNAL
49. HASAN BİRCAN
50. HASAN ÖZDOĞAN
51. HATİCE BİLGİN
52. HATİCE KÜBRA BELEN
53. HEDİYE ACUN BUCHT
54. HİLAL BARDAKÇI
55. HÜLYA ÖZDEMİR
56. HÜSEYİN ALİ YALIM
57. HÜSEYİN TOKTAMIŞ
58. İBRAHİM HALİL MUTLU
59. İLKAY TÜRK ÇAKIR
60. İLKER SERT
61. İSMAİL HAKKI KARAHAN
62. İSMAİL HAKKI SARPÜN
63. JAMEEL-UN NABI
64. KAAN MANİSA

65. KEMAL TAŞDÖVEN
66. KENAN ÖZKAYA
67. KÜRŞAD OSMAN AY
68. KÜBRA BAYRAK
69. M. ERTAN KÜRKÇÜOĞLU
70. M. MURAT YAŞAR
71. M. ÖZGÜR SEZER
72. MAHMUT BÖYÜKATA
73. M. CÜNEYT KAHRAMAN
74. MARİA CHUSHNYAKOVA
75. MEHMET BÜYÜKTÜRKMEN
76. MEHMET EMİN KORKMAZ
77. MEHMET ERDOĞAN
78. MEHMET KOŞAL
79. MERT ŞEKERCİ
80. MERVE AYDOĞAN
81. MERVE KARAGÖZ
82. MOHAMED BELGAID
83. MUHAMMED SYAHIR SARKAWI
84. MUHİTTİN ŞAHAN
85. MURAT DAĞ
86. MUSTAFA HİCABİ BÖLÜKDEMİR
87. MUSTAFA ÖZGÜR
88. NAZMİ T. OKUMUŞOĞLU
89. NİHAL BÜYÜKÇİZMECİ
90. NİNA TUNÇEL
91. NURİ YORULMAZ
92. OĞUZ AYDIN
93. ONUR KARAMAN
94. ORKHAN MUKHTARLI
95. OZAN TOKER
96. ÖNDER SÖNMEZ
97. ÖZGÜR CULFA
98. ÖZLEM DAĞLI
99. ÖZLEM TOYKAN
100. PINAR KAAN
101. PINAR KARACAN
102. R. GÖKHAN TÜRECİ
103. R. ÖMER TURHAN
104. RIDVAN ÜNAL
105. SABIN STOICA
106. SALEH SULTANSOY
107. SALİH MUSTAFA KARABIDAK
108. SEFER BALCI
109. SERGEY KARPENKO
110. SERGEY LOVACHEV
111. SEYED KHALIL MOBAREKH
112. SULTAN KILIÇ
113. SÜMEYRA BALCI-YEĞEN
114. TAHİR ÇAKIR
115. TARIK SAĞEL
116. THOMAS CALLIGARO
117. TOLGA AYDIN
118. TUĞBA ÇEPNİ
119. TUĞBA DEMİRBAY
120. TUĞBA TURAN
121. TUĞÇE GÜLÜMSER
122. UĞUR BÜYÜKER
123. ÜNER ÇOLAK
124. VİLDAN ÖZKAN BİLİCİ
125. VOLKAN SERT
126. YAREN ERGİN
127. YOUSRY ABUSHADY
128. YUNUS EMRE DOĞAN
129. YUSUF KAVUN
130. YUSUF ALPER KAPLAN

Index