10th Conference on Nuclear and Particle Physics

NUPPAC' 17

07-10 October 2017
Hurghada, Egypt

NUPPAC' 17

Conference Scientific Sessions

Saturday, 07 Oct. 2017

16:00 - 16:15	Conference Opening
16:15 - 17:45	Session NA

Sunday, 08 Oct. 2017

9:30 - 11:00	Session ST-1 / Session NS
11:00 - 12:30	Session KN
14:30 - 16:00	Session NRE-1 / Session FCT
16:00 - 17:30	Session RID-1 / Session ST-2

Monday, 09 Oct. 2017

14:30 - 16:30	Session NRE-2 / Session ST-3
16:30 -17 :30	Session PS-1 / Session PS-2

Tuesday, 10 Oct. 2017

9:30 - 11:00	Session RTD
11:30 - 11:45	Conference Closing

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Conference Timetable

Time	Sat., 7 Oct.	Time	Sun., 8 Oct.	Mon., 9 Oct.	Time	Fri., 23
7:00	Gathering AEA Site, Nasr City	8:00-9:00	Breakfast	Breakfast	8:00-9:00	Breakfast
7:30	**Departure Cairo**	9:30-11:00	**ST-1 / NS**	Free	9:30-11:00	**RTD**
9:45-10:15	Mid-way Rest	11:00-12:30	**KN**	Beforenoon	11:30-11:45	**CS**
12:30-13:00	**Arrival Hurghada**			Hurghada	12:00-12:30	Hotel Check- Out
13:00-14:00	Hotel Check-In & Accommodation	13:00-14:00	Lunch	Lunch	13:30-14:00	**Departure Hurghada**
14:00-15:00	Lunch			Rest		
15:00-16:00	Rest	14:30-16:00	**NRE-1 / FCT**	**NRE-2/ ST-3**		
16:00-16:15	**OS**	16:00-17:30	**RID / ST-2**	**PS-1 / PS-2**	16:00-16:30	Mid-way Rest
16:15-17:45	**NA**					
19:00-20:00	Dinner	19:00-20:00	Dinner	Dinner	19:00-19:30	**Arrival Cairo**
21:00-23:00	Free Evening	21:00-23:00	Cult Evening	Cult Evening		

Programme abbreviations

OS	Opening Session	**FCT**	Fuel Cell Technologies
NA	Neutrons & Applications	**RID**	Radiation Interactions & Detectors
KN	Keynote Talks	**PS**	Poster Session
ST	Selected Topics		
NS	Nuclear Safety	**RTD**	Round Table Discussion
NRE	Natural RA & Environment	**CS**	Closing Session

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Conference Abstracts Arranged by Receiving Date

(Numbered according to the list of abstracts on the conference web site)

1-

A SIMULATED STUDY OF FILTERED QUASI MONO-ENERGETIC NEUTRON BEAMS IN KEV ENERGY REGION

Hanan N. Morcos, Kamelia Naguib and Mamdouh Adib

Reactor Physics Department, NRC, EAEA, Cairo, Egypt.

A simulation study for producing neuron filters covering the keV energy region with its optimum configurations are presented. A computer code QMENF-G2 was designed, which can select filter components and amounts to give a required purity and transmitted intensity from a given neutron source spectrum. The result of study gave 18- neutron filters with purity over 95% and suitable transmission coefficient.

Keywords: Neutron filters, Neutron monochromatic beams, Quasi-mono-energetic neutron beams

2-

A NOVEL ALGORITHM FOR ANALYSIS OF ENVIRONMENTAL DATABASE

M. Hefnawi

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Any environmental database system contains one or many environmental measurements such as temperature degree, humidity percentage, CO concentration, NOx concentration, etc. Any environmental measurement is recorded in the environmental database with its date and time. This paper introduces a new algorithm which represents any environmental database in the new form. This new form is storing all measurements values of one type with their number of duplicated and date and time for each reduplicated measurement value. All these measurements values are sorted in ascending order in the new form.

With these properties the user can deal with this new form as dealing with the dictionary. The method for Looking for a ward in the dictionary is the same as the method used for looking for a measurement value in this new form. The output result from this new form is the number of happening of the measurement value and date and time for each happening. This new algorithm is a good tool for building an environmental reference for many sites around the world. This environmental reference can be used in sitting evaluation processes, risk assessment processes, and environmental decision-making processes.

5-

ANALYTICAL STUDY FOR ARCHITECTURAL DESIGN FOR NUCLEAR POWER PLANTS – REVIEW PAPER

Mohamed Abd El-Monem Zaki Farahat

Siting and Environment Department, Egyptian Nuclear and Radiological Regulatory Authority (ENRRA), Nasr City, Cairo, Egypt,

This paper aims to study the architectural design and components of nuclear power plants (NPPs). Its main objective is to set general guidelines for architects who will design these plants. They should be aware of the basics of nuclear facilities designs and components. An onshore nuclear power plant consists of a nuclear reactor, a control building, a turbine building, cooling towers, service buildings (an office building & a medical research center) and a nuclear & radiation waste storage building. The paper is also focusing on the simulation system (simulator) and the site characteristics of onshore nuclear power plants. It aims to study the architectural principles and standards used in designing and planning of onshore nuclear power plants. In drawing up a master plan of an onshore nuclear power plant, the methods used in town planning should be used. These methods are centralized, linear, radial, clustered and grid. This paper aims also to study the special features of the master plan of an onshore nuclear power plant. The buildings in an onshore nuclear power plant should be segregated according to the levels of radioactivity in each one of them. There are cold areas, warm areas and hot areas. It aims also to study the site related factors and design criteria considered in the architectural design of nuclear power plants. An environmental impact assessment (EIA) of nuclear power plants is a process in which environmental factors are integrated into project planning and decision – making. The EIA identifies, predicts, interprets and communicates information, and proposes preventive and mitigative measures, to minimize impacts of a proposed nuclear power plant on the environment. Its purpose is to evaluate the environmental implications (negative or positive) of carrying out a nuclear power plant, before irrevocable decisions are made. Angra nuclear power plant in Brazil, Atucha nuclear power plant in Argentina, Koeberg nuclear power plant in South Africa, and Hinkley Point nuclear power plant in Great Britainhave been chosen as examples. Also, this paper presents design analyses for these nuclear power plants. These analyses include main components, design theory (radial design and linear design) and positive & negative aspects of these designs. Furthermore, this paper aims to study the recent design concepts of offshore (ocean) nuclear power plants to help the engineers from different departments who will design these plants. The development of design concepts of offshore nuclear power plants has continued due to initiatives taking place in France, United States, Russia, and South Korea. Submerged-Type Offshore NPP designed by a research group in France and Gravity Based Structure (GBS)-Type Offshore NPP designed bya research group in South Korea have been studied. In addition, Floating (Spar–Type) Offshore NPP designed by a research group in United Statesof America and Russia's first Floating Offshore NPP (Akademik Lomonosov) utilizing the (PWR) technology have been studied. At the end of this paper, conclusions and recommendations on the architectural aspects of nuclear power plants are revealed. This paper is important as it reveals the need to study nuclear facilities and give recommendations to the architects on how to deal with these vital facilities that have an increasing demand on the international, regional and national levels.

Keywords: Analytical Study, Architectural Design, Nuclear Power Plants, Environmental Impact.

6-

ATTENUATION OF GAMMA RAYS EMITTED FROM CONTAMINATED INDIVIDUAL USING HOMOGENEOUS AND HETEROGENEOUS SHIELDS

M. A. M. Gomaa

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Following latest ICRP recommendations Individuals working in various disciplines usually work in planning exposure situations. In several cases individual exposure may be classified as emergency exposure situation or existing exposure situations. Contamination with long lived isotopes may lead to existing exposure situations. In emergency or existing exposure situations individuals may be contaminated externally or internally. Working around Contaminated individual as in research laboratory or nursing patient; for radiation protection purposes shielding is proposed as optimization for protection tools.

Attenuation of gamma rays using several shields are examined not only as homogeneous shield but also as heterogeneous shield

7-

SOL-GEL AUTO-COMBUSTION SYNTHESIS OF Sm DOPED Ni-FERRITE AND ITS CHARACTERIZATION

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Polycrystalline ferrites $NiFe_2O_4$ and $NiFe_{2-x}Sm_xO_4$ (x= 0.0, 0.01, 0.025, 0.5, 0.075, 0.1) samples were prepared by auto combustion method. The structural and the magnetic properties of the samples were characterized by X-ray powder diffraction (XRD), Mössbauer Effect (ME) spectroscopy and vibrating sample magnetometer (VSM). Indexed XRD patterns confirm the formation of pure cubic spinel phase. The lattice parameters (a) of the rare earth (R) doped samples were smaller than that of the pure Ni-ferrite. Mössbauer effect spectroscopy was used to study the distribution of cations in tetrahedral (A) and octahedral [B] sites of the spinel. The hysteresis loops indicated that the saturation magnetization and coercivity increased with R-substitution and appeared to be greatly affected by the nature of R ions. The obtained results are interpreted based on the rearrangement of cations between the A-site and B-site.

8-

RISK ASSESSMENT OF MEDITERRANEAN SEA WATERS ON COOLING SYSTEM OF NUCLEAR POWER PLANT

F. S. Tawfik

Egyptian Nuclear and Radiological Regulatory Authority, Cairo, Egypt

(Abstract not available)

9-

NEW TRENDS IN THE INTERNAL DESIGN FOR RADIATION PROTECTION IN RADIOLOGICAL MEDICAL FACILITIES

Nadia Mahmoud Sirag

Nuclear and Radiological Regulatory Authority, Egypt

(Abstract not available)

10-

REVIEW OF GEOPHYSICAL METHODS FOR SITE CHARACTERIZATION OF NUCLEAR WASTE DISPOSAL SITES

S.T. El-hemimy etal,

Nuclear and Radiological Regulatory Authority, Egypt

(Abstract not available)

12-

THORIUM AS PROMISING SOURCE FOR NUCLEAR ENERGY

M.N.H. Comsan

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Nuclear energy (NE) contributes sizeably to the world electricity production (~ 12% in 2017). Due to its economic and environmental advantages, NE will continue to be an essential part of the low-carbon electricity generation in the world for decades to come. One of the major obstacles hindering NE potential leap is the problem of accumulated nuclear spent fuel waste and aging of the current fleet of nuclear power plants (NPP). It is believed that thorium will pave the way as an alternative fuel for the coming generation of NPPs due to its vast advantages over uranium, and this will be the key economic driver of the 21st century, and likely beyond.

14.

SIMULATION OF GERMANIUM BASED GAMMA SPECTROMETERS USING MONTE CARLO TECHNIQUE

A. H. M. Solieman

Experimental Nuclear Physics department (Cyclotron Project), Nuclear Research Centre, Atomic Energy Authority, Cairo 13759, Egypt

Monte Carlo technique was employed to simulate the high-purity germanium (HPGe) detector equipped gamma spectrometer. The geometry of the detector had initially been taken from the supplier specifications, and was later fine-tuned to match computed and experimental efficiency transfer factors. Detector model fine tuning is a mandatory simulation step to account for the detector aging process. The spectrometer absolute efficiency of full-energy peak was calculated and compared to experimental data taken at different measurement geometries. The spectrometer energy response, with regard to the absolute efficiency, was studied considering the sample dimensions, composition and density.

Keywords: High-purity germanium (HPGe) detector, efficiency Monte Carlo Simulation, Efftran Code.

16-

THE ROLE OF ENVIRONMENTAL ISOTOPES IN HYDROLOGICAL STUDIES

Sawsan Abd El Samie

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Use of natural isotopes in hydrological studies is now a recognized scientific discipline often involved as an integral part of the investigations related to water resources assessment, development and management. Temporal and spatial variations induced by various natural processes in the isotopic content of natural water bodies, provide a label for waters of different sources so that water movement in hydrological systems can be traced. Natural stable and radioactive isotopes in water resources can solve several problems related to source and transport dynamics in the hydrological cycles, age dating, as well in contamination processes. Also, the isotopic evolution during different salinization processes is well understood by isotopes, which enabling differentiation between various processes and mechanism that could be responsible for ground water salinization.

17-

IMPROVEMENT OF LR-115 (NTDS) REGISTRATION RESPONSE OF CHARGED PARTICLE SPECTROSCOPY AND ENERGY IDENTIFICATION APPLICATIONS

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In this work, track etching and spectrometric properties of LR-115 track detectors were investigated. An etchant solution of 2.5N NaOH at varying depth of removal layer and different etching temperature were applied. After etching process, to detect a higher energy of alpha tracks (5.48 MeV), the plastic foils were pre-sparked using a home-made sparker at applied voltage of about 900 v to clear the diameter of the alpha-particle track of dark openings as well as to improve the registration response of LR-115 foils. Then, effective track core size for the use nuclear track plastics were evaluated under optical microscope. Track-etch rate, VT and detector registration response, V, were determined. The response of LR-115 etched track detector to alpha particle energy registration and spectroscopic measurements were also studied. LR-115 detectors showed a Bragg-peak around 2.5 MeV using 2.5N NaOH solutions at the applied conditions. The use of the studied detector as an alpha spectrometer was carried out at energies of range of 1.0 5.0 MeV.

Track etch-rate (VT) as well as registration response V; etch-rate ratio (V=VT/VB); measurements were carried out at different alpha energies. VT was obtained from the radius (r) measurements of the induced tracks produced in plastic detectors. Different factors affecting the response function of LR-115 type II nuclear track detectors were discussed. Also, the excess etch rate ratio as a function of both restricted energy loss (REL) and residual range (R) was described through an empirical formula. Results of this study are discussed within the frame work of nuclear track formation mechanisms and etching theories in nuclear track plastic detectors.

18-

IN-PHANTOM NEUTRON TRANSPORT MONITORING USING NEUTRON ACTIVATION ANALYSIS

M. Fayz-Hassan, Gehan Y. Mohamed, Elsayed K. Elmaghraby, M. A. Ali

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An experimental 3-dimensional investigation of the transport and thermalization of neutrons from AmBe source in a head of Alderson Radiation Therapy phantom was reported. Thermal neutron fluence from three arrangements, longitudinal, lateral, and vertical directions, in the phantom was estimated using activation technique of metallic indium. These monitors were placed both in-phantom and outside the exposed material. Results showed that thermal neutrons are focused in the sense of increasing the thermal neutron component on expense of fast neutron component within circumscribed region. Outer shape of the phantom was found to slightly manifest itself in the neutron fluence distribution as a result of neutron back scattering.

19-

DETERMINATION OF CONCENTRATIONS OF Fe, Mg AND Zn IN SOME FERRITE SAMPLES USING NEUTRON ACTIVATION ANALYSIS AND X-RAY FLUORESCENCE TECHNIQUES

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Mg–Zn ferrite is considered as one of the important material, which has a potential use in many applications. In this work, samples of ferrite Mg(1-x) ZnxFe2O4 (where x=0.0, 0.2, 0.4, 0.6, 0.8 and 1) were synthesized by sol-gel method to be use in some hyperthermia applications. The composition and the purity of the prepared samples affect hardly their properties. Therefore, the elemental concentration of these samples was measured by the x-ray fluorescence (XRF) technique as well as thermal neutron activation analysis (NAA), in order to check the quality of the prepared samples. The results of both methods were compared with each other and with the molecular ratios of the as prepared samples. Also, no existing elemental impurity, with considerable concentration, was measured.

Keywords: Ferrite; Neutron Activation Analysis; X-Ray Fluorescence.

22-

DESIGN SIMULATION OF A 30 Curi AmBe IRRADIATION FACILITY

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[2] Experimental Nuclear Physics Department, Nuclear Research centre, Atomic Energy Authority, Egypt

[3] Physics Department, Faculty of Science, Al-Azhar University, Girls Branch Cairo, Egypt.

Monte Carlo (MCNP5) was used to simulate an irradiation facility consists of six 241Am-Be isotopic neutron sources with total activity of 30 Ci and total neutron yield in the range of 6.6×107 n/s. Our design criteria was to maximize the thermal neutron flux over the sample irradiation volume, minimize the fast-to-thermal ratio and maintain a maximum homogeneity of neutron flux-distribution over the irradiation volume. The suggested design employed paraffin wax as a moderator and reflector. A maximum thermal neutron flux φ_{th} = 4.858× 104 n/s/cm^2 was obtained at the irradiation volume based on optimization procedure. The obtained thermal-to -fast and thermal-to-epithermal ratios were found to be 2.13 and 4.8 at the center of irradiation facility, considering a 5cm diameter volume sample. A special attention was given to the 3D geometrical symmetry of the sources relative to irradiation position yielding a high degree of homogeneity of neutron flux distribution throughout the irradiation volume.

23-

IDENTIFICATION OF ^{235}U SHORT-LIVED FISSION PRODUCTS BY DELAYED GAMMA-RAY EMISSION USING 241Am-Be NEUTRON SOURCE

M. Tohamy[1], S. Abd El-Ghany[2], S. M. El-Minyawi[2], M. Fayez-Hassan[1], Elham H. El-hakim[3], Sayed A. El-Mongy[4] and M. N. H. Comsan[1]

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A compact a spherical irradiator based on 5 Ci Am-Be source was used to identify short-lived fission products interrogated by thermal neutron flux. The products were identified based on delayed gamma-rays measured using high-efficiency (70%) HPGe detector. The obtained spectra were analyzed and the peaks were assigned to the appropriate fission products. 44 gamma-lines covering the energy range 250-2392 keV and corresponding to 20 short-lived isotopes were observed. Among these, 14 isotopes were identified by measuring and evaluating their half-lives in the range from 15.0 min and 1.37 day. Our study goal was to observe and identify gamma-ray lines emitted from short-lived fission products of ^{235}U using isotopic neutron source of relatively low neutron flux that can be used in a mobile system.

24-

INVESTIGATION OF THE GAMMA-RAYS ATTENUATION COEFFICIENTS BY EXPERIMENTAL AND MCNP SIMULATION FOR POLYAMIDE 6/ ACRYLONITRILE-BUTADIENE-STYRENE BLENDS

A.Y. Abdel-Haseib
Egyptian Nuclear and Radiological Regulatory Authority (ENRRA), Nasr City, Cairo, Egypt
(Abstract not available)

26-

REACTION AND TOTAL CROSS SECTION OF K+ MESON FROM 40Ca NUCLEUS AT SOME INTERMEDIATE ENERGIES Alaa El-Sh. M. E. Sewailem

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Reaction and total cross sections are calculated in the framework of a relativistic optical potential and an impulse approximation method. The treatment of mesonnucleus scattering have used Klein-Gordon equation for spin zero projectiles or Schrodinger equation. The scattering of Kaon-meson from the nucleus at incident several kaon momenta in the range 488-800MeV/c, has been studied in the present work, and comparison with experiments results were made. Our potential constructed on the One-Meson -Exchange (OME) form, and the isospin of the Kaon was extracted. The associated generalized Yukawa (GY) meson exchange function used in the calculations.

Keywords: Kaon-Nucleon Scattering, Kaon-Nucleus Scattering, One-Boson-Exchange-Potential (OBE).

27-

DESIGN OF PORTABLE SHIELD FOR NEUTRON SOURCES USING MCNP COMPUTER CODE

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(Abstract not available)

28-

MULTI-SOURCE IRRADIATION FACILITY WITH IMPROVED SPACE CONFIGURATION FOR NEUTRON ACTIVATION ANALYSIS: DESIGN OPTIMIZATION

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Neutron irradiation facility consisting of six 241Am-Be neutron sources, with 30 Ci total activity and 6.6×107 n/s total neutron yield, has been designed. The sources are embedded in a cubic paraffin wax that plays a double role as moderator and reflector. The sample passage and irradiation channel is represented by a cylindrical path of 5 cm diameter

passing through the facility core. The proposed design yields a high degree of space symmetry and thermal neutron homogeneity within 98.2% of flux distribution throughout the irradiated spherical sample of 5 cm diameter. The obtained thermal neutron flux is 4.86×104 n/cm2.s over the sample volume, with thermal-to-fast and thermal-to-epithermal ratios of 2.13 and 4.81, respectively. The design was optimized and characterized using MCNP-5 code. The irradiation facility is supposed to be employed principally for neutron activation analysis.

29-

IMPLEMENTATIONS OF ATMOSPHERIC DISPERSION MODELS BY MATLAB

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Atmospheric dispersion modeling refers to the mathematical description of contaminant transport in the atmosphere. The term dispersion used to describe the combination of diffusion (due to turbulent eddy motion) and advection (due to the wind) that occurs within the air near the Earth's surface. The concentration of a contaminant released into the air described by the advection-diffusion equation, which is a second-order partial differential equation. The software package MATLAB for the numerical simulations is used. Our results is illustrated with an application to the study of zinc emissions from a large smelting operation, revealing that the model can be applicable to any other released of pollutants whichever is chemical or radioactive respectively.

30-

BEHAVIOR OF ELECTRON BEAM DYNAMICS IN AXIAL VIRTUAL CATHODE OSCILLATOR

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The electron beam dynamics in axial Virtual cathode oscillators (vircator) was studied to improve the efficiency of microwave generation. The vircator is simple in construction and operation. In all types of high power microwave generation sources, the kinetic energy of the electron beam is transformed into microwave energy. This study is carried out by DC discharge in axial vircator through nitrogen gas and fixed anode cathode gap distance of 4 mm. We study the axial distribution of MW frequency, current density, electric current and thermal velocity of the electron beam. The MW frequency essentially depended on electron density, where the virtual cathode position depends on the gas pressure, which plays an important role on both the mean free path of electrons collision and in the ionization potential.

Keywords: DC discharge, Vircator, Virtual cathode, Microwave, Electron dynamic

33-

A NON-PRECIOUS FUEL CELL CATALYST USING A METAL OXIDE NANOPARTICLE

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The design of electrodes for polymer electrolyte membrane fuel cells is a delicate balancing of transport media. Zinc oxide nanoparticles were synthesized via sol-gel method using zinc acetate and citric acid in basic media with different calcination temperatures. It was found that the particles size ranges between 7 and 19 nm as the treatment temperature increases from 420 to 620 oC. Poly vinyl alcohol (PVA) was prepared by a casting method at 60 ^{o}C left for 24h under steering until having a viscous solution. The solution was mixed with Zinc oxide nanoparticles at room temperature under stirring for 24 hours and finally carbonation at 750 ^{o}C, as a result of a new non-precious catalyst. The samples were characterized by x-ray diffraction (XRD), energy energy-dispersive X-ray spectroscopy

(EDAX), transmission electron microscope (TEM), and cyclic voltammetry (CV). The results will be discussed and shown.

34-

PREPARATION AND EVALUATION OF NAFION HP JP MEMBRANE AS AN ENERGY MATERIAL.

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Nafion® is being widely used as proton exchange membrane in polymer electrolyte membrane (PEM) and direct methanol fuel cell (DMFC), under moderate operating conditions of temperature and relative humidity. The new Nafion HP JP membrane was characterized by different techniques to investigate its validity to be used as a PEM for fuel cell application. Transport properties including proton conductivity and methanol crossover were studied under different operating conditions similar to the cell conditions. The value of methanol permeability of the new membrane under study was found to be $5.6x10^{-7}$ cm^2/s at 2 M methanol concentration (*i.e.*~ 79% decrease from Nafion NRE212). Nafion HP JP membrane exhibited higher relative crystallinity (47.3%) than that of Nafion NRE212 (27.3%). In addition, the Nafion HP JP membrane has a Young's modulus value of $23.4x10^6$ Pa and a tensile strength value (16.43 MPa) while Nafion NRE212 has lower values (3.28 & 11.07 MPa, respectively). For both membranes, the proton conductivity results indicate a considerable dependence on the relative humidity. The obtained results show that Nafion HP JP is a good membrane for DMFCs application.

35-

FREE VOLUME AND TRANSPORT PROPERTIES FOR NAFION HP JP

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Proton exchange membrane fuel cell (PEMFC)is one of the promising alternative energy sources due to its direct energy conversion, being clean energy source with high efficiency and power density. One of the most important requirements for an efficient PEMFC is the improvement of a polymer electrolyte membrane (PEM) with high proton conductivity, low fuel cross-over and low cost. During fuel cell operation, the operation condition of the membrane environment varies because the cell temperature increases due to exothermic reactions. Temperature variation also affects relative humidity of the cell environment. These changes in operating conditions of the cell have strong effects on the membrane performance. Positron annihilation lifetime spectroscopy (PALS) is one of the most sensitive techniques as it can probe the structure of the material in sub-nanometer scale. In PEM, free volume size and concentration strongly affects transport properties; proton conductivity and methanol permeability. In this work, the variation of the free volume size and content of Nafion HP JP membrane was investigated over a wide range of temperature and relative humidity. A correlation between proton conductivity and free volume size was established. The crystal structure and thermal stability was investigated for the as-received membrane and after heating-cooling process. All the previous measurements were carried out for the standard Nafion NRE212 membrane for comparison. The obtained results showed that Nafion HP JP has a smaller free volume size, with stronger dependence, than that of Nafion NRE212 over the entire temperature range studied. Nafion HP JP showed a stronger dependence on relative humidity than Nafion NRE212 due to its higher water uptake.

36-

PROTON DYNAMICS IN ETHYLENE (CHLOROTRIFLUOROETHYLENE) AS A PROTON EXCHANGE MEMBRANE

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Polymer electrolyte membrane fuel cells (PEMFCs) are one of the attractive energy conversion systems. Poly (ethylene chlorotrifluoroethylene) (ECTFE) is acopolymer of ethylene and chlorotrifluoroethylene with good chemical, thermal and mechanical properties. Styrene was grafted onto Ethylene (chlorotrifluoroethylene) (ECTFE), by chemical grafting method. The grafted films were sulfonated for use as proton exchange membranes (PEM)s. The effects of solvent, monomer concentration, and concentration of chlorosulfonic acid on the properties of the membrane were investigated. The charge carrier dynamics was also studied. The mobility of the charge carriers calculated from proton conductivity data has strong dependence on the degree of grafting and temperature. The mechanical properties of the grafted PTFE were tested. The tensile strength and elongation at break ratio decreases with the increase in DG. The grafted membranes showed higher proton conductivity to Nafion-212 membrane. Moreover, the activation energy of the sulfonated membranes was obtained ranging from (8-10 KJ/mol). Therefore, the conduction mechanism in these membranes is a collective of tow mechanisms (hopping and Vehicle). Finally, the ECTFE membranes, owing to its fluorine free nature, have lower cost and higher conductivity they could be better used instead of Nafion in direct methanol fuel cells.

37-

RELIABILITY ANALYSIS OF THE REACTOR PROTECTION SYSTEM USING RELIABILITY BLOCK DIAGRAM

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The reliability of reactor protection system (RPS) is directly related to the safety of NPPs. RPS is mainly used to protect the safety of the nuclear reactor, which can ensure reactor trip system to generate reliable and timely protection action in an accident situation, and bring the NPP into a controlled state.

The analysis provides an appropriate model to represent the system that will facilitate the applications of reliability engineering techniques during the design, production, and operation stages of a plant's life.

In this paper, the reliability quantitative analysis method based on Reliability block diagram is proposed for the RPS. The reliability of the RPS for PWR is modeled and analyzed by the proposed method as an example. The results show that the proposed method is capable to estimate the RPS reliability effectively and provide support to maintenance and troubleshooting of digital RPS system.

38-

ENERGY RESPONSE FUNCTION OF LABR3:CE DETECTOR USING MONTE CARLO SIMULATION, GEANT4, AND FEASIBILITY OF UTILIZING IT IN NUCLEAR APPLICATION

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To study a possibility of a LaBr3:Ce detector for measuring Nuclear Resonance Fluorescence (NRF), the Energy Response Function (ERF) has been performed using a Monte Carlo (MC) simulation toolkit GEANT4 taking into account the internal radioactivity sources. The measurement spectra were used for calibration of the simulation up to 2.8 MeV. The quenching ration of the α-particles was deduced and showed a 2nd polynomial response to their emission energies. The ERF reproduced from MC code shows reasonable agreement in the energy range of interested. The internal radiation activities (count rate per cm3) of the LaBr3:Ce crystal used here have been deduced to be 1.420.12 (1.3710-23.210-4 Bq/cc). The ERF code was applied to calculate the background spectrum of NRF of 238U measured in HIGS facility. The integrated NRF cross-sections of 238U levels around 2.5 MeV measured by LaBr3:Ce showed good agreement with corresponding one measured with HPGe detector.

39-

MEASUREMENTS OF NATURAL RADIOACTIVITY AND ASSOCIATED RADIOLOGICAL HAZARDS IN SAND AND GRAVEL QUARRIES IN ASSIUT, EGYPT

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This study contains 70 samples and covered a total of 36 different sand and gravel quarries in Assiut, Egypt. Activity concentration of ^{226}Ra, ^{232}Th and ^{40}K were measured using gamma-ray spectrometry (NaI (Tl) 3 x 3). The average values of specific activity for ^{226}Ra, ^{232}Th and ^{40}K in sand samples are 4.74, 4.10 and 109.82 Bq Kg-1, respectively, and in gravel samples these values are 6.01, 1.82 and 31.6 Bq Kg-1, respectively. These values are smaller than the world average values that reported by the UNSCEAR 2000, which are 35, 30 and 400 Bq kg-1 for ^{226}Ra, 232Th and 40K, respectively. Some radiological indices such as Radium equivalent activity (Raeq), Absorbed dose rate (D), External and Internal hazard indices (Hex and Hin), Gamma index (Iγ), Annual Effective Dose Equivalent (AEDE), Excess Lifetime Cancer Risk (ELCR) and the Annual Gonadal Dose Equivalent (AGDE), were calculated, to estimate the radiological hazards arising from using these row building materials in Assiut governorate, and, found that all the investigated quarries are safe from radiological view for use in building construction.

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A PORTABLE LOW-COST, GAMMA-RAY DETECTOR BASED ON THE USE OFTHE MULTI-PIXEL APDs

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The development of high performance hand-held computing devices, such as smart phones, has enabled a new generation of instruments that can be used outside the traditional laboratory environment. In this sense our project looks at a portable detection equipment to enable quickly detection of radioactivity with the help of low-cost, portable tools. Avalanche photodiodes (APDs) have proven to be useful as light detectors for high energy physics experiments. Their compactness makes these devices excellent candidates for replacing bulky photomultiplier tubes (PMTs) in different detection systems where space limitations are an issue. Silicon photomultipliers (SiPMs) are arrays of parallel interconnected avalanche photodiodes (APDs) in Geiger mode offer high dynamic range and linearity

by using a structure of multiple microcells with a common anode, allowing multiple photons to be detected within the same timeframe.

In this work we presents a simple yet compact Gamma-ray detector prototype based on the use of SiPMs in combination with a small LYSO crystal (Cerium□doped Lutetium Yttrium Orth silicate) of 4 mm thickness and 22 mm length. On both sides, LYSO crystal was optically coupled to 3×3 mm2 MPPCs series (S10931-100P) from Hamamatsu, Japan. For the signal read out, MPPCs are attached to a new custom developed printed circuit board(PCB). The PCB-board had been designed to include step-up bias voltage and two differential preamplifiers. In the lab our detector prototype has been exposed to gamma radiation using different radioactive sources with different activities (Ba-133, Co-60, and Cs-137). In response to the penetrating radiation, output pulses were digitized and processed for pulse counting using a digital technique allowing the module to be easily connected to any personal hand-held computing devices. Results revealed that our detection system has succeeded to monitor gamma radiations with very good efficiency. It is compact, robust and very easy to operate and provides quick and reliable measurement results which could be presented clearly on a large graphical display. Due to the relevant advantages the new detector is ideally suited for radioactivity measurements in several fields of radiation protection, such as Healthcare, Homeland Security. In this review, basic principles of the detector prototype, operation as well as laboratory test measurements and results are briefly discussed.

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INVESTIGATION OF DELTAI = 1 LEVEL STAGGERING IN DOUBLY ODD TANTALUM NUCLEI A.M. Khalaf[1,*], M.M. Khalifa[1], A. M. Khalaf, M. Kotb and Asmaa Abdelsalam

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The anomalous energy staggering present in odd-odd normal by deformed 168-174Ta nuclei are investigated and parameterized by proposing two staggering functions S(I) and e(I) depending on the dipole transitions and quadrupole transition linking the levels. These staggering functions differing from the conventional staggering function depending on the concept of gamma transition energy over spin. The signature has been found laying lower than that the and an anomalous odd-even signature splitting of the bands is happened

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NATURAL RADIONUCLIDES (^{226}Ra, ^{232}Th, and ^{40}K) AND RADON-222 AND ANNUAL EFFECTIVE DOSE RATE LEVELS IN TAP WATER SAMPLES FROM LUXOR, EGYPT.

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To measure the concentrations of natural radionuclides (Rn-222, Ra-226, Th-232and K-40) in 40 tap water samples from the different water stations in Luxor company of water and waste water (Luxor Governorate) by using radon detector RAD7 and NaI(TI) Scintillation Counter, the result showed that the concentration of radionuclides ranged from 4.510.75, 0.1150.0049, 0.02130.0012, 3.710.32 in raw tap water to 1.150.45, 0.0810.0034, 0.0120.0006, 2.950.253 Bq/l in purified water for Rn-222, Ra-226, Th-232 and K-40 respectively. The annual effective dose for human exposure to radon in raw tap water and purified water ranges from 0.0502 mSv/y to 0.0258 mSv/y for adult, from 0.0726 mSv/y to 0.0374 mSv/y for children and from 0.0679 mSv/y to 0.0268 mSv/y for infants which are lower than the permissible limit 0.26, 0.2 and 0.1 mSv/y for Adult, Children and Infants respectively published by IAEA (IAEA 2002).

Keyword: Raw water, Treatments, Radionuclides, RAD7, NaI(TI), Annual effective dose, Luxor.

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ELEMENTAL AND RADIOLOGICAL INVESTIGATION OF ROCK SAMPLES FROM GEDDAMI MOUNTAIN, EASTERN DESERT, EGYPT

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In the present study, the elemental analysis of the samples was performed using X-ray Fluorescence and remarkable concentrations of Si, K, Al, Fe, Ca, Ti, Rb and Zr have been observed. Further, the concentrations of ^{226}Ra, ^{232}Th and ^{40}K in rock samples from Geddami Mountain, Eastern Desert, Egypt were determined using gamma ray spectrometry in order to assess the associated radiation hazard impacts. The mean activity concentrations of ^{226}Ra, ^{232}Th and ^{40}K were found to be 100.851.81, 59.941.12 and 1067.938.07 Bq kg-1 respectively. These values exceed the maximum international limits. Radium equivalent (Ra_{eq}), the external hazard index (Hex), the internal hazard index (H_{in}), the representative level index (Iγ), dose rate (D), annual effective dose equivalent (AEDE), annual gonadal dose equivalent (AGDE) and excess lifetime cancer risk (ELCR) were estimated and discussed.

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NATURAL RADIOACTIVITY AND ASSOCIATED DOSE RATES OF SOIL SAMPLES IN DIFFERENT LIBYAN REGIONS

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The activity concentrations of ^{238}U, ^{235}U, ^{226}Ra, ^{232}Th and ^{40}K were measured using HPGe detector for soil samples collected from western and mid Libyan regions. The average activity concentration of ^{226}Ra, ^{232}Th and ^{40}K for twenty samples were found to be 53.35±4.38, 75.37±7.36 and 50.82±17.59 Bq/kg respectively. ^{235}U was detected for six samples with average activity 183.27±25.97Bq/kg. The results obtained for the corresponding nuclides ^{226}Ra and^{232}Th are above worldwide average values (35 and 30 Bq/kg) while ^{40}K was smaller than worldwide average (400 Bq/kg). The average outdoor absorbed dose and the annual effective dose rates due to ^{226}Ra, ^{232}Th and ^{40}K were observed to be 66.50±6.2 nGy/h, 81.55±7.6μSv/y respectively, which are slightly above the world average (60n Gy/h and 80 μSv/y). The radium equivalent activity and external hazard indices are less than the world wide average values.

Keywords: Activity concentration, Absorbed Dose, Effective Dose, world average Activity values, soil samples, gamma spectroscopy, Western and Mid Libya.

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DEVELOPMENT OF SELENIUM COMPOUNDS AS TARGETS FOR 76,77Br PRODUCTION USING PROTONS OF ENERGIES UP TO 34 MeV

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Selenium compounds of Zn, Sn and Cu were prepared using conventional sintering method and tested under variable irradiation and separation conditions for ^{76,77}Br radioisotopes production. The phase composition of the prepared compounds was investigated using X-ray diffraction. The activity of ^{77}Br was measured as a function of protons beam current within the range 2-15μA and the thermal stability of the irradiated compounds was investigated. The results showed that ZnSe and Cu_2Se compounds were thermally stable in comparison to the SnSe. The effect of several factors such as temperature, gas flow rate, separation time were studied to obtain maximum separation yield of radiobromine by the dry distillation method. The data showed that the Cu_2Se was the most suitable target for proton irradiation and production of ^{76,77}Br radiobromine. A simplified method was used to prepare CuSe compound, which was tested to resist the beam currents up to 10 μA and the time of irradiation up to 170 min. The data of typical production run using the Cu_2Se target were analyzed.

Keywords: ^{76,77}Br radioisotopes / Distillation method / Selenium compounds / Isotope production / Nuclear reactions

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PURIFICATION AND BIOLOGICAL EVALUATION OF RADIOIODINATED OF 5-AMINOISOQUINOLINE: A NOVEL POLY (ADP-RIBOSE) POLYMERASE-1 INHIBITOR

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The isoquinoline derivative, 5-AIQ, is already a potent inhibitor of PARP-1 activity in the carcinoma cells. The developing effective and highly specific radioiodinated PARP-1 binding tracer, [^{125}I]5-AIQ, was studied. The radiolabelling reaction conditions were optimized. The main aspect of the production of [^{125}I]5-AIQ is its purification, which was practically achieved on the base of host–guest inclusion complex of 5-AIQ with β-cyclodextrin (β-CD) (1:1 stoichiometry). In the meantime, the inclusion complex of [^{125}I]5-AIQ with β-CD was not found. The labeled compound was subsequently purified by HPLC from free radioiodide. The maximum radiochemical yield was found to be 78% at a radiochemical purity of 98%. It was investigated on different carcinoma cell lines. The log P value for [^{125}I]5-AIQ was measured as an important parameter and found to be 3.96 ± 0.5.

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BEST LOCATIONS FOR GROUNDWATER MONITORING WELLS INSIDE HIGH RISK FACILITIES

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High risk facilities like oil refinery plant represent a source of hazard on the surrounding environment due to its production from gaseous pollutants that emit to air or liquid pollutants that release to surface and groundwater. All local legislations and environmental management systems recommend the surrounding environment of such facilities should cover with a network of monitoring systems among them a system for monitoring groundwater to determine the compliance of the facility with legal requirements. In this work, six vertical electrical soundings were used to

define the hydro geological units occupied the subsurface in the area. And hence, six well selected locations have been proposed for installing six monitoring wells inside the fence of the oil refinery plant. Best locations for groundwater monitoring wells inside high risk facilities.

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CHARACTERIZATION OF PHOTO-NEUTRONS PRODUCED BY 150 MeV AND 1 GeV ELECTRONS IMPINGING ON HIGH Z METALLIC TARGETS FOR NEUTRON RESONANCE SPECTROSCOPY

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Monte Carlo calculations have been performed using MCNP code to study the generation, angular distribution and energy spectrum of photo-neutrons for 1 GeV and 150 MeV electron beam energies impinging on different thickness of Tungsten, Tantalum and Lead targets. It is noticed that the photo-neutron yield increases as the target thickness increases then saturates beyond an optimized thickness of the target. Moreover, the photo-neutron yield shows significant increase as the electron energy increases. At the optimized thickness, the angular distribution of photo-neutrons is found almost isotropic for 150 MeV electrons and anisotropic for 1 GeV electrons. Further, by increasing the electron energy and/or the target thickness the angular distribution is found to be forward peaked. The energy spectrum of photo-neutrons can be well described by a Maxwellian distribution for both electron energies. Such calculations can help in developing a photo-neutron source based time of flight facility (TOF) for elemental and isotopic identification via neutron resonance spectroscopy. Photo-neutron yields, angular distribution, mean energy, energy spectrum and nuclear temperature for 1 GeV and 150 MeV electron energies and different target materials are presented.

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GREENHOUSE CONTROLLED STUDY OF THE UPTAKE OF ^{226}Ra BY LEAFY VEGETABLES

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Greenhouse experiments were carried out to investigate the ^{226}Ra uptake by two types of leafy vegetables (cabbage and lettuce) that are widely consumed in Saudi Arabia and represent a considerable pathway for radium intake by the Saudi population. The presence of intense irrigation in some areas where the groundwaters have relatively high radium content has initiated the need to carry out this study. The tests were performed on non-contaminated soil (control) and the typical soil contaminated with the same irrigation water spiked with ^{226}Ra in plastic pots. A high purity germanium detector of 70% relative efficiency has been exploited in the gamma measurements. The ^{226}Ra transfer factors to cabbage and lettuce were 0.13 and 0.33 respectively. The ^{226}Ra transfer factor to cabbage and lettuce showed similar values for both the control and contaminated samples. A correlation was found between the ^{226}Ra content in irrigation water and its content in lettuce leaves. The limited number of samples and the lack of different radium activities didn't allow reaching definitive facts regarding the transfer of ^{226}Ra to leafy vegetables, taking into consideration that there may be a difference in the field conditions. It may be noted that irrigation water takes a considerable part in controlling the Ra transfer to leafy vegetables, since the soil components factor was kept constant in these tests.

Keywords: radium, cabbage, lettuce, transfer factor, greenhouse, Saudi Arabia.

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TRANSFER FACTOR OF NATURAL RADIONUCLIDES FROM SOIL TO PLANT IN UPPER EGYPT

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Soil pollution in agricultural lands poses a serious threat to food safety, and suggests the need for consolidated methods providing advisory indications for soil management and crop production. In this work, Transfer Factors were estimated for Ra-226, Th-232 and K-40 by HPGe detector setup in two agriculture sites in Upper Egypt, namely El-Sebaiya in Aswan and El-Marashda in Qena. Substantial differences were observed in the soil-plant transfer factor (TF) among these radionuclides and plants. The transfer factor values are ranged from 0.03 to 0.87, from 0.02 to 0.58 and from 0.44 to 14.78 for Ra-226, Th-232 and K-40, respectively. The results are discussed and compered with others experimental values

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SPACE- TIME FRACTIONAL KDV EQUATION FOR PLASMA OF WARM IONS AND ISOTHERMAL ELECTRONS

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The evolution Kortweg de-Vries (KdV) equation derived using the reductive
perturbation method for a system of un-magnetized collision-less plasma containing warm ions and electrons obeying the Boltzmann distribution. The Agrawal technique used to convert the regular KdV equation to the space- time fractional KdV equation. The different effects of the space and time fractional parameter on the ion acoustic wave propagation for the system under consideration studied. The application of our model might be particularly interesting in some plasma environments, such as the ionosphere plasma.

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THE EFFECT OF SUPERTHERMAL DISTRIBUTED ELECTRONS AND IONS ON THE DYNAMICS OF SOLITARY AND SHOCK WAVES INTERACTION

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The characteristics of head-on collision of two propagating dust acoustic (DA) solitary and shock waves in a strongly coupled dusty plasma with superthermal electron and ion distributions are investigated. The dusty plasma system is analyzed nonlinearly via the extended Poincar-Lighthill-Kuo perturbation technique to derive a coupled set of Korteweg-de Vries-Burgers (KdV-Burgers) equations. Some interesting physical solutions such as solitary waves, shock waves and combination between solitary and shock waves solutions are obtained to describe the collision process between such type of nonlinear waves. As a result, phase shifts due to the collision are produced and the effect of the superthermal parameter on the phase shifts is studied as well. It is found that the superthermal parameter plays a significant role on the properties of the nonlinear waves since the associated phase shifts are found to be increased with increasing the superthermal parameter. Our results may help to understand the characteristics of solitary and shock waves interaction that occur in plasma physics and ocean waves as well.

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SPACE-TIME FRACTIONAL KdV EQUATION FOR DUSTY PLASMA IN TWO TEMPERATURES CHARGED DUSTY GRAINS

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The reductive perturbation method has been used to derive the Kortewege-de Vries (KdV) equation for dust acoustic waves in a homogeneous unmagnetized plasma having electrons, singly charged ions, hot and cold dust species with Boltzmann distributions for electrons and ions in the presence of the cold (hot) dust. The Agrawal technique used to adapt the regular KdV equation to the space- time fractional KdV equation. The different effects of the space and time fractional parameter on dust acoustic wave propagation for the system under consideration studied. The present investigation can help us to identify the origin of charge separation as well as dust setting in plasma containing cold and hot dust. For example, the results presented may be applicable to dusty plasma existing in Saturn F-ring's region.

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SOLUTIONS OF VARIABLE COEFFICIENTS CKP EQUATION FOR DUSTY PLASMA SYSTEM WITH G'/G-EXPANSION METHOD

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By using the reductive perturbation method (RPM), the nonlinear Cylindrical Kadomtsev-Petviashvili (CKP) equation with variable coefficients, for a system of plasma composed of positive and negative dust grains in addition to Maxwellian distributed ions and elections, is derived. With the aid of MATHEMATICA, the G'/G-expansion method is used to analytically solve this CKP equation. New classes of hyperbolic solutions, geometrical solutions, and rational solutions are obtained. The behavior of some of these solutions is graphically presented. At certain conditions, one of the hyperbolic type solutions degenerates into solitary wave solution and the effects of physical parameters on this solitary wave solution are examined. The present study could be helpful to understand the excitation of nonlinear dust-acoustic waves in astrophysical objects such as Saturn rings.

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ALBEDO PROBLEM FOR PURE-TRIPLET SCATTERING IN A FINITE MEDIUM WITH OPTICALLY SMOOTH AND ROUGH SURFACES

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An exact integral formulation of radiative transfer equation in a medium with optically smooth and rough surfaces, absorbing and puretriplet scattering is developed. The resulting integral equations are solved using Galerkin approximation. The effect of scattering coefficients, optical thickness and the roughness of the boundary on the reflection coefficients are investigated. Numerical results are calculated and compared with the available experimental and theoretical data for both smooth and rough boundaries.

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