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EDITORIAL

Dear readers,

We are pleased to announce that the number of articles in Volume 52, Number 2 (August 2026) has been increased to twelve. We proudly present the second issue of Atom Indonesia, Volume 52 (2) in (2026), featuring twelve articles that highlight advancements and applications in nuclear science and technology. These articles represent contributions from a diverse range of authors across national and international institutions, underscoring the global significance and collaborative nature of nuclear research.

We begin with the first article **“Comparison of Electron Density and Absorption Dose Values of Artificial Boluses as Tissue Substitutes”**, which evaluates the electron density values obtained from CT imaging and the absorbed dose characteristics of artificial boluses developed from resin Lycal 1079, silicone rubber, and plasticine as potential tissue-equivalent materials for radiotherapy applications. All three materials were found to increase absorbed dose compared with the absence of a bolus, with the resin bolus showed the most favorable characteristics. Its electron density closely matches breast and skin tissue, indicating its potential as an effective and economical tissue-equivalent material for clinical radiotherapy.

In similar theme of radiation applications, the second article entitled **“Effect of MoO₃ on the Radiation Shielding Properties of Bismuth Boro-Tellurite Glass (B₂O₃-TeO₂-Bi₂O₃-Li₂O): Theoretical and Simulation Studies”**, aims to investigate the influence of molybdenum oxide addition on the gamma-ray shielding performance of bismuth boro-tellurite glass compositions. The study evaluates different glass formulations using theoretical calculations and simulation tools. The results reveal that increasing MoO₃ concentration enhances shielding capability by increasing density, improving attenuation parameters, and reducing transmission factors. The findings highlight the potential of MoO₃-modified bismuth boro-tellurite glass as an advanced radiation shielding material.

From materials science, the discussion moves to nuclear structure physics in **“Internal Conversion and Internal Pair Production, Need for New Measurements”**, which focuses on reviewing Internal Conversion and Internal Pair Production processes and comparing theoretical predictions with experimental measurements for several nuclear isotopes. The results reveal considerable differences between theoretical and experimental coefficients for several isotopes, including 101Ru, 152Gd, 58Co, and 125Te. These findings indicate the importance of obtaining more accurate experimental data and developing improved theoretical models for nuclear transition studies.

The article **“Developing a Novel Method for Photon Skyshine Dose Estimation in Radiation Therapy Facilities Compared to the NCRP151 Approach”**, presents a modified formulation for photon skyshine dose estimation based on Monte Carlo simulation validation. The study compares the proposed approach with the NCRP 151 analytical method for different photon beam energies. The results show that the modified method provides improved agreement with Monte Carlo calculations compared with the conventional NCRP 151 approach, supporting its potential application in radiation protection assessments for radiotherapy facilities.

Another contribution, **“Monte Carlo Evaluation of the Impact of Flattening Filter Removal and Collimator on the Energy Properties of a 6 MV Photon Beam Using GATE”**, examines how removing the flattening filter and altering the secondary collimator affect the energy characteristics of a photon beam. The results demonstrate strong agreement between simulation and validation data. The removal of the flattening filter significantly increases energy fluence at the phantom surface, while the secondary collimator plays an important role in generating secondary particles that influence beam properties and dose distribution.

The sixth contribution, **“Analysis of Boron Neutron Capture Therapy Dose Rate for Head and Neck Rhabdomyosarcoma Cancer in a 10-Year-Old Child Phantom”**, evaluates BNCT dose distribution in a pediatric phantom representing head and neck rhabdomyosarcoma treatment. Using MCNP 6.2 simulation, the study calculates absorbed doses in several critical organs. The results show that absorbed doses in the skin and thyroid remain below deterministic effect threshold limits, indicating minimal risk to these organs under the investigated conditions.

A related study **“Proton and Helium-4 Ion Beams for Hadron Therapy: Depth, Lateral, and Secondary Particle Dose Calculations”**, compares proton and helium-4 ion beams for hadron therapy applications through Monte Carlo-based dose calculations. The results indicate that helium-4 ions produce sharper Bragg peaks, lower lateral scattering, and fewer long-range secondary particles compared with proton beams. These characteristics suggest that helium-4 ion therapy may provide improved dose conformity and reduced radiation exposure to surrounding healthy tissues.

The following article **“Core and/or No-Core Shell Model Calculations of the Nuclear Structure for the ${}^6\text{Li}$, ${}^{32}\text{S}$, ${}^{92}\text{Mo}$, and ${}^{90}\text{Zr}$ Nuclei”**, calculates nuclear energy levels and electron scattering form factors using core-shell and no-core shell model approaches. The results show that calculated energy levels for several nuclei demonstrate reasonable agreement with experimental observations. The electron scattering form factors obtained from theoretical calculations also show good agreement with experimental data, supporting the capability of shell model approaches in describing nuclear structures.

A further contribution **“Application of Radiolabeled Technique in Indonesia: A Receptor Binding Assay (RBA) Approach for Analysing Paralytic Shellfish Poisoning (PSP) Toxins in Green Mussels from Lampung Bay”**, applies a radiolabeled receptor binding assay for detecting PSP toxins in green mussels collected from Lampung Bay during harmful algal bloom events. The results demonstrate that RBA provides a lower detection limit compared with the conventional Mouse Bio-Assay method while offering improved sensitivity, specificity, and faster analysis. The study highlights the effectiveness of RBA as a monitoring approach for PSP toxin contamination and marine ecosystem risk assessment.

An **“A Fault Tree Analysis and Importance Indexes Approach for Maintenance Optimization of the Chemical Volume Control System in Pressurized Water Reactors,”** develops a maintenance optimization framework for nuclear power plant systems by integrating Fault Tree Analysis and importance indexes. The results identify critical components affecting system reliability and demonstrate that maintenance priorities depend strongly on mission time and failure probability assumptions. The proposed approach provides a systematic basis for improving maintenance decision-making in Pressurized Water Reactor systems.

The eleventh contribution, **“Dose Distribution Prediction by Machine Learning (Random Forest): Impact of Data Specificity in Cervical Cancer IMRT,”** explores the application of Random Forest (RF) to predict dose distributions in cervical cancer Intensity Modulated Radiotherapy (IMRT). Using retrospective clinical data and specific inclusion criteria, the study demonstrates that data specificity improves prediction performance, particularly in reducing dose prediction errors for organs at risk. The findings highlight the potential of machine learning to support radiotherapy planning standardization, reduce clinical workload, and improve treatment efficiency while maintaining the role of expert judgment.

Closing this edition, the twelfth article, **“Calibration Model Development and Performance Evaluation of Portable Multichannel Analyzer for In-Situ Nuclear Forensics,”** evaluates a Portable Multichannel Analyzer (PMCA) equipped with a NaI(Tl) detector as a rapid-response instrument for nuclear forensic applications. Calibration models using natural and depleted uranium standards were developed and assessed through precision, uncertainty, and accuracy evaluations. The results demonstrate that polynomial calibration provides high accuracy and reliable measurements, confirming the potential of PMCA as a portable solution for rapid in-situ nuclear material analysis.

Each article reflects significant contributions to nuclear science applications, including reactor safety, radiation protection, and environmental monitoring. On behalf of Atom Indonesia, I would like to thank you all for your contributions and endless support that have enabled Atom Indonesia to achieve an outstanding performance over all the years. This outstanding performance could not have been achieved without the great efforts and cooperation of the editors, reviewers, management personnel, authors, and readers. Enjoy reading.

Editor in Chief