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EDITORIAL

Dear readers,

We are delighted to present the second issue of Atom Indonesia, Volume 51 No. 3 (2025), featuring ten articles that highlight the advancements and applications of nuclear science and technology. These contributions come from a diverse group of authors representing both national and international institutions, emphasizing the global importance and collaborative nature of nuclear research.

We begin with the first article, **"Optimizing Quality Assurance in Breast IMRT Treatment Plans: A Comparative Study of Point Dose and 2D Dose Verification".** The research aimed to evaluate point dose and 2D dose verification techniques in detecting dose discrepancies in post-mastectomy breast cancer IMRT treatment plans. The findings suggest that while point dose verification provides reliable absolute dose measurements, it lacks spatial resolution, whereas 2D verification captures dose variations more effectively. The study emphasized the importance of precise patient positioning, as shifts beyond ±5 mm resulted in clinically significant deviations.

The next article, **"Strategic Intelligence Analysis in The Integration of National Defense Components to Counter the Threat of Nuclear Terrorism in Indonesia"**. This study investigates and enhances Indonesia's defense system against nuclear terrorism by examining the integration and coordination mechanisms of its defense components. The findings revealed that while each component plays a crucial role in intelligence functions such as investigation, security, and information gathering, seamless integration and coordination are essential for maximizing strategic analysis efforts. The study proposes actionable recommendations to improve Indonesia's defense posture against nuclear terrorism.

In "**Verification of Breast Cancer Treatment Planning with Various Radiation Techniques using Monte Carlo Simulations and Linac Log Files"**, the research aimed to evaluate the performance of the Treatment Planning System (TPS) by comparing its dose distributions with those from the PRIMO Monte Carlo simulation. The findings showed that 3D-CRT plans had smaller deviations in Homogeneity Index (HI) and Conformity Index (CI) compared to IMRT and VMAT plans. Furthermore, improvements in HI and CI values were noted in both IMRT and VMAT simulations, highlighting enhanced plan quality, with the 3D-CRT technique being the safest for PSQA procedures.

The article "**PHITS-Based Simulation of Dose Distributions and Secondary Particle Fluence from Light and Heavy Ions at Therapeutic Energies in a Water Phantom"** evaluates the dose distributions and secondary particle fluence for different ion types using PHITS simulations. Results showed that lighter ions like helium and heavier ions like carbon and oxygen exhibited favorable treatment characteristics, such as lower entrance doses and minimal scattering. The study underlines the potential benefits of these ions for enhancing treatment precision, with PHITS simulations closely matching experimental data.

"Comparison of Lung Cancer Lesion Detection Capability on Standard Dose and Low Dose Computed Tomography Capabilities: An In-House Phantom Study" investigates the effectiveness of Low-Dose Computed Tomography (LDCT) protocols for detecting cancerous lesions in high-risk populations. The study found that the low-dose protocol, despite higher image noise, was effective in detecting small lesions with good contrast and an optimal Signal Difference to Noise Ratio (SDNR). The approach is both time-efficient and cost-effective, making it suitable for widespread use.

In "**Analysis of Alpha and Lithium-7 Particle Energy Deposition in BNCT using Geant4 Simulation"**, the research uses high-fidelity Monte Carlo simulations to examine the energy deposition of alpha and lithium-7 particles in Boron Neutron Capture Therapy (BNCT). The findings contribute to the understanding of BNCT's effects at the cellular level, crucial for optimizing treatment planning and minimizing side effects in patients.

"Measurement of Percentage Depth Dose using Fabricated Water Phantom Tank for 6 MV Photon Beam" focuses on the development and testing of a locally fabricated water phantom for radiation dose calibration in therapy. The study found that the locally designed water phantom provided dose measurements consistent with commercially available phantoms, demonstrating its potential as a cost-effective tool for radiation dosimetry.

Next contribution article, **"Characterization and Sorption Study of Cesium-137 by Bentonite from Santrijaya, Indonesia as an Engineering Barrier Material for Radioactive Waste Disposal Facilities"**, the study evaluates the suitability of Santrijaya bentonite for use as an engineered barrier material for radioactive waste disposal. The results showed high sorption efficiency for Cesium-137, highlighting the material's potential for improving the safety of radioactive waste containment systems.

"The Effect of Loop Inclination on Natural Circulation Mass Flow Rate and Heat Removal Inside Rectangular Passive Cooling Loop" investigates the impact of loop inclination angles on natural circulation mass flow rates and heat removal efficiency. The findings indicated that the highest flow rate and heat removal efficiency were observed at a 90° inclination angle and a set water temperature of 90°C, suggesting that these conditions optimize natural circulation for cooling systems in reactors.

Closing this edition, the tenth article, **"Evaluation of Neutron Flux in Boron Neutron Capture Therapy for a 10-Year-Old Child with Head and Neck Rhabdomyosarcoma Using Monte Carlo Simulation"** aims to evaluate the neutron beam quality of a BNCT collimator in a pediatric simulation model. The results demonstrated effective tumor targeting with a high epithermal neutron flux, though further optimization of the filter components was recommended to reduce unwanted thermal flux and enhance therapeutic efficacy.

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