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LEMBAR ABSTRAK

I Made Ardana, Yohannes Sardjono, *Optimization Of A Neutron Beam Shaping Assembly Design For BNCT And Its Dosimetry Simulation Based on MCNPX.*, Jurnal Teknologi Reaktor Nuklir TRI DASA MEGA, 19 (3), 121.

This article involves two main objectives of BNCT system. The first goal includes optimization of 30 MeV Cyclotron-based Boron Neutron Capture Therapy (BNCT) beam shaping assembly. The second goal is to calculate the neutron flux and dosimetry system of BNCT in the head and neck soft tissue sarcoma. A series of simulations has been carried out using a Monte Carlo N Particle X program to find out the final composition and configuration of a beam shaping assembly design to moderate the fast neutron flux, which is generated from the thick beryllium target. The final configuration of the beam shaping assembly design includes a 39 cm aluminum moderator, 8.2 cm of lithium fluoride as a fast neutron filter and a 0.5 cm boron carbide as a thermal neutron filter. Bismuth, lead fluoride, and lead were chosen as the aperture, reflector, and gamma shielding, respectively. Epithermal neutron fluxes in the suggested design were 2.83 x 10^9 *n/s* cm^{-2}*, while other IAEA parameters for BNCT beam shaping assembly design have been satisfied. In the next step, its dosimetry for head and neck soft tissue sarcoma is simulated by varying the concentration of boron compounds in ORNL neck phantom model to obtain the optimal dosimetry results. MCNPX calculation showed that the optimal depth for thermal neutrons was 4.8 cm in tissue phantom with the maximum dose rate found in the GTV on each boron concentration variation. The irradiation time needed for this therapy were less than an hour for each level of boron concentration.*

Keywords: Optimization, Beam Shaping Assembly, BNCT, Dosimetry, 30 MeV Cyclotron, MCNPX

Iman Kuntoro, Surian Pinem, Tagor Malem Sembiring, *Analysis Of Reactivity Coefficient Change Due To Burn Up In AP1000 Reactor Core Using NODAL3,* Jurnal Teknologi Reaktor Nuklir TRI DASA MEGA, 19 (3), 131.

One of the important things in reactor safety is the value of inherent safety parameter namely reactivity coefficient. These inherent safety parameters are fuel and moderator temperature coefficients of reactivity. The objective of the study is to obtain the change of those reactivity coefficients as a function of fuel burn up during the cycle operation of AP 1000 reactor core. Fuel and moderator temperature coefficients of reactivity and in addition moderator density coefficient of reactivity were calculated using SRAC 2006 and NODAL3 computer codes. Cross section generation of all core material was done by SRAC 2006 Code. The calculation of core reactivity as a function of temperature and burn up were carried out using NODAL3 Code. The results show that all reactivity coefficients of AP 1000 reactor core are always negative during the operation cycles and the values are in a good agreement to the design. It can be concluded that the AP 1000 core has a good inherent safety of its fuel.

Keywords: reactivity coefficient, burn up, AP1000, NODAL3.

Gani Priambodo, Fahrudin Nugroho, Dwi Satya Palupi, Rosilatul Zailani, Yohannes Sardjono**,** *Optimization Of Biological Shield for Boron Neutron Capture Cancer Therapy (BNCT) At Kartini Research Reactor,* Jurnal Teknologi Reaktor Nuklir TRI DASA MEGA, 19 (3), 139.

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A study to optimize a model of neutron radiation shielding for BNCT facility in the irradiation room has been performed. The collimator used in this study is a predesigned collimator from earlier studies. The model includes the selection of the materials and the thickness of materials used for radiation shield. The radiation shield is required to absorb leaking radiation in order to protect workers at the threshold dose of 20 mSv/year. The considered materials were barite concrete, paraffin, stainless steel 304 and lead. The leaking neutron radiation dose rates have been determined using Monte Carlo N Particle Version Extended (MCNPX) with a radiation dose limit rate that is less than 10 µSv/hour. This dose limit is in accordance with BAPETEN regulation related the threshold dose for workers, in which the working duration is 8 hours per day and 5 days per week. It is recommended that the best model for the irradiation room has a dimension 30 cm width, 30 cm length, 30 cm height and a main layer of irradiation room shielding made from the material paraffin which is 68 cm thickness on the left side and bottom of the irradiation room, 70 cm thickness on the right side of the iradiation room, 45 cm thickness on the front of the irradiation room and 67 cm thickness on the top of the irradiation room. The additional layers of 15 cm and 10 cm thickness are used along with paraffin in order to reduce the intensity of primary radiation from piercing the beamport after two primary layers. There is no neutron radiation leakage in this model.

Keywords: Radiation shielding, BNCT, MCNPX, radiation dose rate, piercing beamport.

Susyadi, Hendro Tjahjono, D.T. Sony Tjahyani, *Numerical Study On Condensation In Immersed Containment System Of Advanced SMR During Uncontrolled Depressurization,* Jurnal Teknologi Reaktor Nuklir TRI DASA MEGA, 19 (3), 149

A number of Small Modular Reactor designs have been developed by several countries and mostly each comes with specific innovative improvements. One of them is NuScale reactor which implements a steel, small size immersed-in-pool containment system. This new approach derives new challenges as the control for temperature and pressure inside the containment is conducted without any active system. Passive heat transfer and condensation is important parameter that needs to be investigated for this kind of containment design. Hence, this work examines the condensation, pressure and the effect of pool temperature on the capability of the containment to remove heat and maintain integrity passively. The work is performed using numerical simulation by modeling the reactor into RELAP5 code. The calculation result shows that during depressurization, the maximum pressure limit of 5.5 MPa is not exceeded. Besides, the containment design provides enough capability to transfer heat from the containment to the water pool passively. This work also investigates sensitivity analysis of pool temperature which shows that for the increase of about 17 ºC, the heat removal from the containment to water pool is only slightly affected with value less than 3 percent.

Keywords: Containment, Condensation, RELAP5, NuScale, Depresurization

Suhendra Gunawan Ntoy, Yohannes Sardjono, *Calculation of BNCT Dosimetry for Brain Cancer Based On Kartini Research Reactor Using PHITS Code,* Jurnal Teknologi Reaktor Nuklir TRI DASA MEGA, 19 (3), 159

Cancer is a dangerous disease caused by the growth of a mass of cells that are unnatural and uncontrollable. Glioblastoma, also called as glioblastoma multiforme (GBM), is one of dangerous brain cancer. The dismal prognosis associated with glioblastoma is attributable not only to its aggressive and infiltrative behavior, but also to its location typically deep in the parenchyma of the brain. In resolving this chalenge, the BNCT method can be a solution. This study aims to calculate BNCT dosimetry in different of cancer positions and irradiation geometries using PHITS code. The results show that the deeper the cancers target at brain the slower the total absorbed dose rate of cancer target. It takes a longer treatment time. Based on the treatment time and total absorbed dose rate of cancer target, the TOP irradiation geometry is an appropriate choice in treating the cancer target in this case. To achieve the histopathological cure of GBM at the primary site, the absorbed dose of brain was calculated to be 1.07 Gy and 1.64 Gy for the LLAT and PA irradiation geometry, respectively. While, for cancer position of 3 cm, 5 cm, 7.15 cm, 9 cm, and 11 cm, the absorbed dose of brain is 0.25 Gy, 0.48 Gy, 0.85 Gy, 1.33 Gy, and 2.01 Gy, respectively. In addition to the stochastic effect, it was found also deterministic effects that may be produced such as cataracts.

Keywords: BNCT dosimetry; GBM; brain cancer cases; PHITS; MIRD phantom

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