ABSTRAK

Telah dilakukan perancangan *Beam Shapping Assembly* (BSA) di *beam port* tembus Reaktor Kartini untuk *boron neutron capture therapy* (BNCT). Tujuan penelitian adalah memperoleh desain kolimator pada *beam port* tembus Reaktor Kartini guna menghasilkan fluks neutron sesuai standar IAEA dan mengetahui karakteristik berkas neutron yang dihasilkan desain BSA di *beam port* tembus untuk keperluan BNCT. Model BSA didesain menggunakan program PHITS. BSA yang terdiri dari moderator, reflektor, kolimator dan filter. Desain 1 menggunakan Al sebagai moderator, (2) Pb sebagai reflektor, (3) Fe sebagai filter neutron cepat, dan (4) Gd sebagai filter neutron termal, serta Bi sebagai *shielding* gamma. Sedangkan desain 2 menggunakan AlF_3 sebagai moderator, (2) Ni sebagai reflektor, (3) FeC sebagai filter neutron cepat, dan (4) Cd sebagai filter neutron termal, serta Bi sebagai *shielding* gamma. Hasil penelitian menunujukan program PHITS dapat digunakan untuk perancangan BSA pada *beam port* tembus Reaktor Kartini. Karakteristik berkas neutron yang dihasilkan desain kolimator di *beam port* tembus menghasilkan neutron epitermal yang dominan pada komponen moderator dan menyebar mulai komponen moderator sampai filter dan aperture pada kedua desain. Hasil analisis juga ditemukan distribusi kontaminan berupa neutron cepat, termal dan gamma yang masih timbul menyertai neutron epitermal di dalam BSA tersebut. Hasil simulasi pada desain 1 diperoleh fluks neutron epitermal $1{,}91\times10^{8}$ n/cm^2.s dan desain 2 sebesar $1{,}1\times10^{8}$ n/cm^2.s Karakteristik berkas neutron yang dihasilkan masih dibawah persyaratan IAEA dan masih banyak mengandung kontaminan.

Kata Kunci:, Desain BSA, PHITS, neutron epitermal, BNCT.

ABSTRACT

A Beam Shaping Assembly (BSA) design has been carried out in the Kartini reactor translucent beam port for boron neutron capture therapy (BNCT). The research aimed to obtain a collimator design for a KartiniRreactor translucent beam port to produce a neutron flux according to IAEA standards and to determine the characteristics of the neutron beam produced by the BSA design for a translucent beam port for BNCT purposes. The BSA model was designed using the PHITS program. BSA which consists of a moderator, reflector, collimator, and filter. Design 1 uses Al as a moderator, (2) Pb as a reflector, (3) Fe as a fast neutron filter, (4) Gd as a thermal neutron filter, and Bi as a gamma shielding. Whereas design 2 uses AlF_3 as a moderator, (2) Ni as a reflector, (3) FeC as a fast neutron filter, and (4) Cd as a thermal neutron filter, and Bi as a gamma shielding. The results of the research show that the PHITS program can be used to design a BSA at the Kartini reactor translucent beam port. The characteristics of the neutron beam generated by the collimator design in the translucent beam port produce epithermal neutrons that are dominant in the moderator component and spread from the moderator component to the filter and aperture in both designs. The results of the analysis also found the distribution of contaminants in the form of fast, thermal and gamma neutrons that still arise accompanying the epithermal neutrons in the BSA. The simulation results in design 1 obtained an epithermal neutron flux of 1.91×10^8 $n/cm^2.s$ and design 2 of 1.1×10^8 $n/cm^2.s$ The characteristics of neutron the resulting beam were still below IAEA requirements and still contained a lot of contaminants.

Keywords: BSA design, PHITS, epithermal neutrons, BNCT