ABSTRAK

Pesawat Radioterapi Cobalt-60 (Co-60) merupakan salah satu alat yang digunakan untuk pengobatan kanker dengan menggunakan sumber radiasi Co-60. Co-60 adalah atom yang memancarkan radiasi elektromagnetik sinar gamma. Namun radiasi gamma memiliki dampak negatif apabila mengenai jaringan normal tubuh manusia dan dapat memicu tumbuhnya sel kanker. Penentuan ketebalan *shielding* yang efektif diperlukan sebagai tindakan pengendalian terhadap radiasi bagi petugas radiasi, pasien, serta masyarakat umum. Penelitian ini bertujuan untuk memodelkan ruangan radioterapi Co-60 dan menentukan ketebalan minimum *shielding* beton dan Pb yang efektif untuk memproteksi radiasi gamma menggunakan program PHITS. Penelitian dilakukan melalui 2 (dua) tahap, tahap pertama yaitu tahap pemodelan ruang radioterapi Co-60 dan penentuan spektrum sumber radiasi Co-60. Tahap kedua yaitu simulasi dengan variasi tebal *shielding* yang mampu memproteksi radiasi. Hasil penelitian menunjukkan bahwa ruang radioterapi Co-60 dengan ukuran ruang tindakan 6,5 × 6 × 3 m dan ruang jalan masuk 6,5 × 2,5 × 3 m dapat divisualisasikan dalam bentuk dua dan tiga dimensi serta sumber radiasi gamma yang memancarkan radiasi dengan spektrum energi utamanya 1,17 MeV dan 1,33 MeV. Hasil variasi ketebalan shielding beton dengan sudut penyinaran 0º dan 90º diperoleh ketebalan minimum yang efektif untuk memproteksi radiasi primer adalah 150 cm dan radiasi sekunder 100 cm, sedangkan untuk shielding Pb diperoleh ketebalan minimum efektif untuk memproteksi radiasi primer sebesar 24 cm dan radiasi sekunder 16 cm.

Kata kunci : *Shielding*, Pb, beton, PHITS.

ABSTRACT

The Cobalt-60 (Co-60) radiotherapy aircraft is a tool used to treat cancer using a Co-60 radiation source. Co-60 is an atom that emits gamma ray electromagnetic radiation. However, gamma radiation has a negative impact when it hits normal human body tissue and can trigger the growth of cancer cells. Determining effective shielding thickness is needed as a radiation control measure for radiation officers, patients and the general public. This research aims to model a Co-60 radiotherapy room and determine the minimum thickness of concrete and Pb shielding that is effective for protecting gamma radiation using the PHITS program. The research was carried out in 2 (two) stages, the first stage was the modeling stage of the Co-60 radiotherapy room and determining the spectrum of the Co-60 radiation source. The second stage is a simulation with variations in shielding thickness that can protect radiation. The research results show that the Co-60 radiotherapy room with a treatment room size of 6.5 × 6 × 3 m and an entrance room of 6.5 × 2.5 × 3 m can be visualized in two and three dimensions as well as a gamma radiation source that emits radiation. with its main energy spectrum of 1.17 MeV and 1.33 MeV. The results of varying the thickness of concrete shielding with radiation angles of 0º and 90º showed that the minimum effective thickness for protecting primary radiation was 150 cm and secondary radiation 100 cm, while for Pb shielding the minimum effective thickness for protecting primary radiation was 24 cm and secondary radiation 16 cm.

***Keywords**: Shielding, Pb, concrete, PHITS.*