# ABSTRAK

Sinar-X merupakan salah satu radiasi pengion. Pemanfaatan sinar-X dapat menimbulkan efek negatif bagi pekerja radiasi. Ruang pesawat sinar-X perlu didesain sebagai proteksi radiasi bagi pekerja. Penelitian ini bertujuan untuk menentukan spektrum energi radiasi sinar-X industri dengan tegangan 250 kV dan arus 5 mA serta menentukan tebal timbal pada dinding ruangan sehingga mampu memproteksi radiasi sinar-X menggunakan simulasi PHITS. Penelitian dilakukan melalui tiga tahap yaitu tahap I memodelkan sumber sinar-X dan desain ruangan pesawat sinar-X, tahap II menentukan spektrum sinar-X yang dihasilkan dan nilai fluks energi di luar dinding ruangan pesawat sinar-X, serta tahap III melakukan analisis dimana nilai fluks energi di luar dinding ruang pesawat sinar-X mencapai nilai 0 $1/cm^2$/Source. Berdasarkan hasil penelitian, spektrum sinar-X yang dihasilkan memiliki rentang energi 8,5 keV sampai 250 keV. Spektrum sinar-X terdiri dari sinar-X karakteristik dan sinar-X *bremsstrahlung*. Ketebalan dinding 5 mm mampu memproteksi dinding pada sisi depan, belakang, dan kanan tetapi belum mampu memproteksi dinding kiri.

**Kata kunci** : spektrum, sinar-X karakteristik, sinar-X *bremsstrahlung*, perisai radiasi, timbal

# *ABSTRACT*

*X-rays are one of the ionizing radiations. The use of X-rays can harm radiation workers. The X-ray room needs to be designed as radiation protection for workers. This study aims to determine the energy spectrum of industrial X-ray radiation with a voltage of 250 kV and a current of 5 mA and to determine the thickness of lead on the walls of the room to be able to protect X-ray radiation using PHITS simulation. The research was carried out in three stages, namely the first stage of modeling the X-ray source and the design of the X-ray plane room, stage II determining the resulting X-ray spectrum and the value of the energy flux outside the walls of the X-ray plane, and stage III analyzing where the value the energy flux outside the walls of the X-ray plane reaches a value of 0 1/cm$^2$/Source. Based on the research results, the resulting X-ray spectrum has an energy range of 8.5 keV to 250 keV. The X-ray spectrum consists of characteristic X-rays and bremsstrahlung X-rays. The wall thickness of 5 mm can protect the walls on the front, back, and right sides but has not been able to protect the left wall.*

*Keywords : spectrum, characteristic X-ray, bremsstrahlung X-ray, shielding, lead*