CHAPTER 5 CONCLUSION

5.1 Conclusion

Based on the simulation results, all research objectives were successfully achieved in optimizing the neutron irradiation direction for esophageal cancer therapy using BNCT. The shortest irradiation time was obtained at the 90° right lateral direction, with a total duration of 32 minutes and 36 seconds, for a tumor located in the middle thoracic region of the esophagus. In this direction, both the equivalent dose and effective dose received by the target volume and surrounding OARs remained within safe limits, with all OARs receiving doses below the maximum allowable thresholds. Therefore, the 90° right lateral direction is considered the most optimal irradiation angle, as it delivers the highest thermal neutron flux to the tumor area, resulting in shorter therapy time and effective therapy without endangering surrounding healthy tissue.

In general, these results emphasize that the location and orientation of the tumor relative to the direction of the neutron beam significantly influence the effectiveness of the therapy. Tumors positioned closer to the BSA receive higher thermal neutron flux, allowing for shorter and more efficient irradiation. This principle can be broadly applied in BNCT planning for various types of cancer, not limited to esophageal cancer alone.

5.2 Suggestion

Future research is recommended to use phantom models adjusted to the body size and shape (anthropometry) of the Indonesian population to improve the accuracy and relevance of dose simulations. In addition, utilizing high-performance computers is advised when running PHITS with a large number of particles to minimize statistical errors, speed up processing, and enhance simulation accuracy.