

Monte Carlo Simulations for Shielding Analysis of the TR24 Cyclotron at INRNE-BAS

A Demerdjiev, N Goutev, G Asova, K Shegunov and D Tonev

Institute for Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences, BG-1784, Sofia, Bulgaria

E-mail: angelid@inrne.bas.bg

Abstract. The Institute for Nuclear Research and Nuclear Energy at the Bulgarian Academy of Sciences (INRNE-BAS) is preparing to operate a TR24 cyclotron for production of radioisotopes for nuclear medicine and research in radiochemistry, radiobiology, nuclear physics [1]. This requires preliminary cyclotron shielding analysis. For this purpose numerical simulations based on Monte Carlo techniques are performed by employing the code FLUKA [2, 3], widely used for accelerator shielding analysis. In our models we consider two geometries of the cyclotron bunker - simplified spherical and full-scale bunker. For both geometries, the effects of additional local shielding around the target and changing the material of the bunker walls from standard concrete to low activation one are studied. The obtained results are for neutron and gamma ambient dose equivalent and the generated radioisotopes in the bunker walls.

Acknowledgments

The research has been supported by Bulgarian Science Fund under Contract No. DM18/2, 12.12.2017 and by the National programme "Post-doctoral students and young scientists", funded by the Bulgarian Ministry of Education and Science.

References

- [1] Tonev D, Goutev N, Georgiev L S 2016 *J. Phys. Conf. Proc.* **724** 012049
- [2] Böhlen T T, Cerutti F, Chin M. P W, Fassó A, Ferrari A, Ortega P G, Mairani A, Sala P R, Smirnov G and Vlachoudis A 2014 *Nuclear Data Sheets* **120** 211–214
- [3] Ferrari A, Sala P R, Fassó A, Ranft J 2005, *FLUKA: A multi-particle transport code (program version 2005)*, **CERN-2005-010, INFN-TC-05-11, SLAC-R-773**