Conceptual Study for Accelerator Driven Neutron Multiplication

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Abstract

A nuclear reactor, as a major neutron source, has been contributed to the study of both fundamental and applied sciences. The neutron flux from a nuclear reactor has been continuously improved; however, scientists (e.g., in the fields of structural biology and materials science) require more intense and flexible neutron sources. In this study, a conceptual neutron multiplicator driven by an accelerator is proposed; both the intensity and economy for the neutron flux are emphasized. In order to determine the accelerator type, we used the photon neutron yield data of Fig. 1; we consider a 50-MeV electron accelerator as a photo-fission source since the photon neutron yield changes gently after the electron energy of 50-MeV in the figure. Now, a preliminary study is under progress by using a 10-MeV electron accelerator as a substitute for the 50-MeV; radiation safety from unfamiliar neutrons is one of the major concerns.

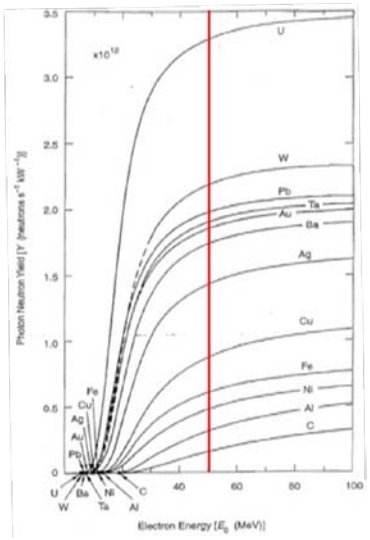

Figure 1. Calculated neutron yields for various targets and electron energies below 100-MeV

References

[1] H.H. Barschall et al. Neutron Sources for basic physics and applications, Pergamon Press 1983 ISBN 0-08-029351-4