Dose Rate Calculations and Van-de-Graaff Irradiations for Testing Radiation Stability of Materials and Equipment

V. Makarashvili, S. Chemerisov, P. Tkac, G. F. Vandegrift, S. Zaijing, K. J. Quigley
Chemical Sciences and Engineering division
Argonne National Laboratory, 9700 S. Cass. Ave. Argonne IL 60439 - USA

ABSTRACT

Dose rates and integrated total doses to various parts and components (cameras, bottles, syringe and valve controllers, etc.) of the Mo-99 production experimental and commercial systems have been calculated in order to assess the radiation stability and reliability of those systems. The calculations have been performed using Monte Carlo particle transport code – MCNPX. The modeling results have been used as a guidance to set up experiments at the Van-de-Graaff accelerator facility at Argonne to deliver desired doses (or dose rates) suggested by the calculations for a given source of Mo99/Tc99m. The low energy (3 MeV) Van-de-Graaff accelerator provides the capability of delivering high levels of electron/photon dose rates to critical components without presenting activation and handling hazard of the irradiated targets. The functionality of the irradiated critical components is monitored during and after the irradiations. Modeling and experimental results of our work are presented in this paper.