

THE SECONDARY EMISSION MONITOR AS A LINEAR ACCELERATOR ELECTRON BEAM DOSE MONITOR

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The secondary electron emission monitor (SEM) is useful for monitoring electron or bremsstrahlung beams at high dose rates since it is a vacuum device and free of the ion recombination problem encountered with ionization chambers.¹ A description will be given of an

SEM unit which exhibits a desirable voltage saturation characteristic and good linearity with beam current. The SEM is basically a current monitor. However, for a scattered electron beam of constant incident energy, a unique relationship exists between SEM current and dose rate at a specified point in the radiation field. However, if the energy varies by only a few per cent, the relationship of SEM current to absorbed dose rate at the point is greatly altered. This is primarily due to a variation in scattered electron intensity stemming from the energy-dependent nature of the scattering process but also to the dependence of secondary electron yield on beam energy. Over a beam energy range of about 1 to 600 MeV the variation of yield with beam energy is similar to that for electron stopping power. By improving the energy stability of a particular linac the variation in this factor was confined to a few per cent, an improvement by a factor of about 10. The effects of voltage changes, beam loading, and temperature will be discussed.

1 C.J. Karzmark, "Secondary Emission Monitor as a Linear Accelerator Electron Beam Dose Monitor", vol. 35, pp 1646-1652; Dec., 1964

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This investigation was supported in part by Public Health Service Fellowship CSP-15,904 and Research Grant C-5838, National Cancer Institute, U.S. Public Health Service.

This paper not available at time of publication.