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Technique to determine intense electron beam parameters and X-ray spectra from dose-rate measurements at different angles*

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Electrical parameters (current and voltage) of intense electron beams are often difficult to measure directly in pulsed power experiments, and additional information (electron angles of incidence) is required to determine the photon spectra produced. Measured dose-rates in the far field at selected angles can determine the electron-beam current, voltage, and an effective angle of incidence on the converter package, all as functions of time. This information enables calculation of the far-field photon spectrum as a function of time and polar angle. The axisymmetric 2D Monte-Carlo CYLTRAN code calculates photon spectra escaping the converter package for a range of electron energies and angles of incidence. Spectral attenuation by intervening materials and absorption in CaF₂ is calculated using mass attenuation and absorption coefficients. The CYLTRAN results indicate promising angles for dose-rate measurements to optimize the sensitivity to voltage and electron angle. This technique is described for a 2-MV generator, Gamble II, and an 8-MV generator, RITS-6.

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