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Optimizing current density measurements for intense low beta electron beams

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The cathode test stand at LANL is utilized to test velvet emitters over pulse durations of up to 2.5 μ s. Diode voltages range from 120 kV to 275 kV and extracted currents exceed 25 A and depend on cathode size and pulse duration. Current density measurements taken with scintillators or Cherenkov emitters produce inconsistent patterns that disagree with the anticipated beam profile. Several factors contribute to the measured beam distribution, such as electron scatter, X-ray scatter, and Snell's law. Here, we present a range of experiments designed to evaluate both electron scatter and Cherenkov emission limits in efforts to optimize current density measurements. For electron ranging studies, metal foils of different densities and thicknesses are coupled with a scintillator, which is then imaged with an ICCD. Similarly, Cherenkov emission and Snell's law are investigated through imaging materials with differing indices of refraction over a range of beam energies. MCNP6[®] modeling is utilized to further guide and evaluate these experimental measurements.

Footnotes

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