

SUPPORTING INFORMATION

Line Fluence: The standard unit to quantify the number of ions used for irradiation is the areal fluence, ψ_a , defined as the number of ions incident upon a given surface area, ions/cm². However, for irradiating narrow regions where the surface line width is smaller than the size of ion lateral straggling effect at the end-of-range, a more useful parameter is the line fluence, ψ_l , given by the number of ions used for irradiating a line of zero width per centimeter of line length. We use the unit of line fluence for irradiations less than 3 μm in width for irradiation with 1 MeV protons where the full-width-at-half-maximum (FWHM) of the lateral scattering at the end-of-range is $\sim 2 \mu\text{m}$, and for all results using 100 keV protons where only narrow line irradiations are presented.