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Proton Energy Optimization and Spatial Distribution Analysis from a Thickness Study Using Liquid Crystal Targets[1] CHRISTOPHER WILLIS, PATRICK POOLE, DOUGLAS SCHUMACHER, RICHARD FREEMAN, LINN VAN WOERKOM, The Ohio State University — Laser-accelerated ions from thin targets have been widely studied for applications including secondary radiation sources and cancer therapy, with recent studies trending towards thinner targets which can provide improved ion energies and yields. Here we discuss results from an experiment on the Scarlet laser at OSU using variable thickness liquid crystal targets. On this experiment, the spatial and spectral distributions of accelerated ions were measured along target normal and laser axes at varying thicknesses from $150\,nm$ to $2000\,nm$ at a laser intensity of $1 \times 10^{20}\,W/cm^2$. Maximum ion energy was observed for targets in the $600-800\,nm$ thickness range, with proton energies reaching $24\,MeV$. The ions were further characterized using radiochromic film, revealing an unusual spatial distribution on many laser shots. Here, the peak ion yield falls in an annular ring surrounding the target normal, with an increasing divergence angle as a function of ion energy. Details of these spatial and spectral ion distributions will be presented, including spectral deconvolution of the RCF data, revealing additional trends in the accelerated ion distributions.

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