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Features of ion acceleration from ultra-thin foils in the radiation-pressure regime[1] NICHOLAS DOVER, Department of Physics, Imperial College London — The acceleration of protons and ions from the interaction of the VULCAN Petawatt laser pulse, at the Rutherford Appleton Laboratory, with ultra-thin, nanometre scale diamond-like-carbon foils has been investigated experimentally. A number of different ion features are observed with different spatial structure and energy spectra, including 1) low energy ring structures, due to channel formation as the target becomes underdense; 2) filamentation for 5 and 10 nm targets due to the Rayleigh-Taylor instability; 3) central non-thermal peaked proton beams due to self cleaning of the lower charge density proton species; 4) a smooth off-axis proton beam going to higher energies with a characteristic low flux, possibly related to post-acceleration in the relativistic transparency regime. The experimental work is supported by 2D numerical PIC simulations, which further elucidate the underlying acceleration mechanisms. These experiments help to improve our understanding of ion acceleration in the radiation pressure dominated regime, and will thus guide future experiments aiming to reach higher proton and carbon energies with high efficiency.

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