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Plasma Mirror Reflectivity Measurements on Gemini in a Staged Laser Plasma Wakefield Acceleration Set-Up

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The acceleration of electrons with ultra-short, high-intensity laser pulses has a successful method. Although, the maximum accelerated electron energy is limited mostly due to de-phasing of the electrons with the driving laser pulse and the depletion of the laser pulse. Staging two laser wakefield accelerators with two laser beams can overcome these limitations. Using the first plasma cell for electron-trapping and acceleration and a secondary plasma cell for further acceleration. The space-constraints and the high intensity of the laser pulse does not allow conventional reflective optics. One way to solve this issue are plasma mirrors. In this case composed of ultra-thin foil, it can inject the second laser pulse into the second gas cell, minimally disturbing an electron beam as it passes through. The reflectivity and subsequent focus spot in such a compact two stage set-up has been measured and is presented as well as its guiding characteristic in a 18 mm plasma cell.

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