Sub-micron accuracy target alignment

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The drive to ever higher intensities with higher repetition rates and the move to shorter focal length reflective optics for focussing in solid target interactions are increasingly important for studies into high intensity secondary source generation, QED and high field studies. To ensure reproducible optimum interaction conditions, presents a significant problem for accurate target positioning. Commercial optical systems exist to aid the imaging and positioning of targets. However, these are often expensive and difficult to situate within the limited space available inside the interaction chamber.

At the Central Laser Facility, the push for ultra high intensities above $I = 10^{21}$ Wcm^{-2} requires positioning targets within the focussing optic Rayleigh range. We will present details of two systems to be implemented on the Astra-Gemini system to cheaply and accurately position targets with ≈ micron accuracy. These involve; (a) a multi-wavelength interferometer to enable sub-micron accuracy and (b) a small, low cost near field/far field microscope with illumination at 800nm for imaging the rear of the target and the focal plane with high resolution. The combination of these two systems significantly improves our accuracy in target positioning and also results in a decrease in the time required to align targets between shots.

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