Proton beam steering from ultra-thin foils irradiated by intense laser pulses

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Laser interaction with thin solid foils at the intensities currently available (> 10^{20} W/cm2) has opened up several novel and exciting avenues of research, including the development of compact ion accelerators with potential, high impact applications in medicine, science and industry. We have reported on observations of proton beam steering from the target normal direction using high contrast laser pulses from the VULCAN PW laser. With 100nm Cu targets beam deviations from target normal of up to 30º were observed (fig), which showed a correlation with the laser incidence angle. The steering effect was not observed without PM, and became progressively weaker for thicker targets. The phenomenology of the results does not fit easily with explanations provided for previous, similar observations [1-2], based on shock perturbation of the target rear surface. It appears likely that the results are related to non-ideal PM operation due to a strongly uneven near field profile.

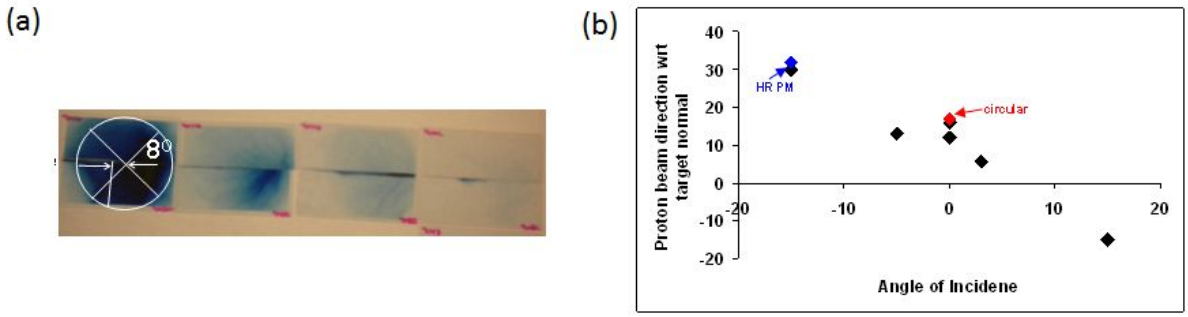

Figure: (a) The beam imprints on RCF for 200 nm Cu target. (b) The proton beam deviation with respect to TN is plotted as a function of laser incidence angle.

1. F. Lindau et. al., Phys. Rev. Lett. **95**, 175002 (2005)
2. K Zeil et. al., New Journal Phys. **12**, 045015 (2010)