Effect of a laser pre-pulse on the laser-induced proton generation

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Abstract

Effect of a long laser pre-pulse, or ASE (Amplified Spontaneous Emission) on the generation of the laser-induced proton beam was investigated. The ASE pulse which appears a few nanoseconds prior to a main 30 fs laser pulse is adjusted by varying Pockel cell delay time (Fig. 1). The proton beam, which is generated by irradiating the ultra-intense laser pulse with an intensity of $2x10^{18}$ W/cm^2 on a thin foil target, was measured by a Faraday cup. Experimental results show that as the ASE level decreases, the proton signal increases and such a tendency becomes stronger as the target thickness gets thinner. Characteristics of Faraday cup signals on different targets will be presented.

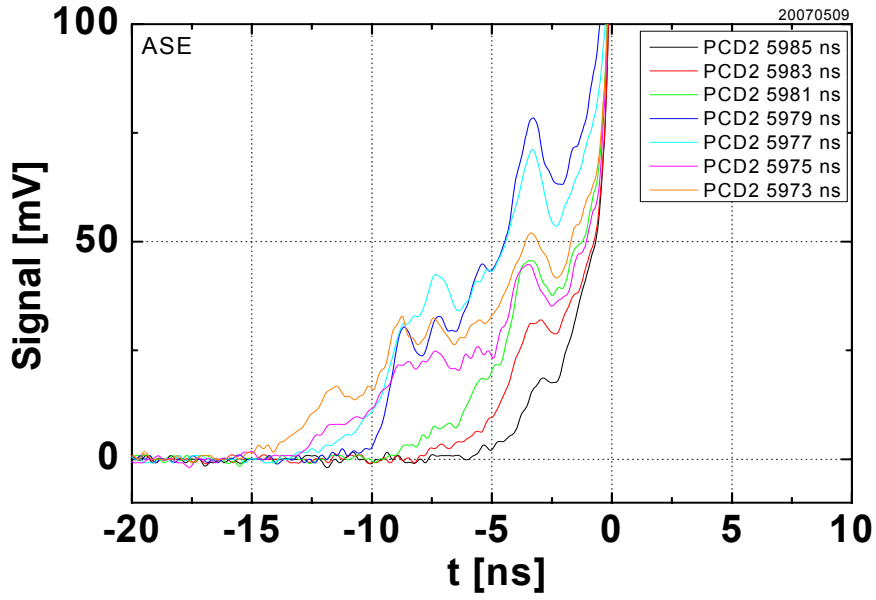

Fig. 1 Fast photodiode signals for different Pockel cell delay time (PCD), which show ASE pre-pulses before main pulse.

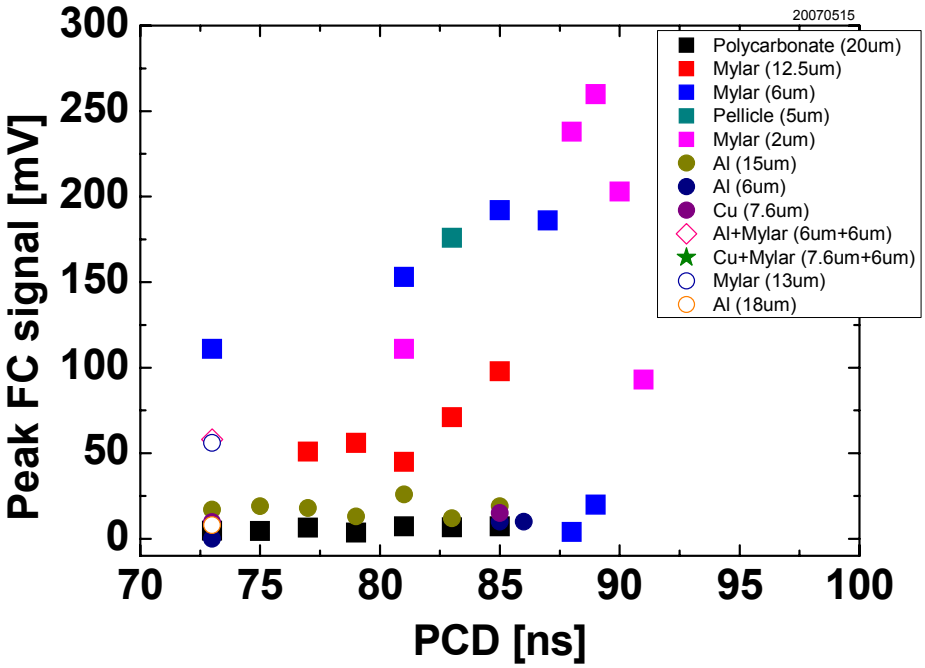

Fig. 2 Variations of peak Faraday Cup signals on Pockel cell delay time for different target materials, which show the proton signal increases as ASE decreases.