Velocity measurement of laser-induced shock using a spectral domain interferometer and a chirped pulse laser

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In the fast ignition scheme inertial fusion, shock waves driven by ultra-intense lasers are one of candidates for the core heating. To measure the velocity and pressure of shock wave, we have developed a spectral domain interferometer using a part of the chirped pulse amplified (CPA) laser of 800 nm wavelength, which we call the probe beam [1]. The laser pulse with the pulse width of 110 fs and the peak intensity of 1.73×10^{17} W/cm^2 irradiates 150 μm-thickness solid Zirconia plate, which is coated with 20 nm-thick vanadium on the surface, The probe beam is illuminated from the backside of the plate. Figure 1 shows a measured interference fringe at the moment of the laser irradiation. From the fringe analysis, the velocity of shock wave is estimated to be 4×10^5 cm/s. In the presentation, we compare the velocity of shock wave with the numerical result obtained from the two-dimensional radiation hydrodynamic code (STAR2D) and discuss the pressure of the shock wave.

References

[1] K. Ishii et al., Proc SPIE, 10089, 1008916 (2017).

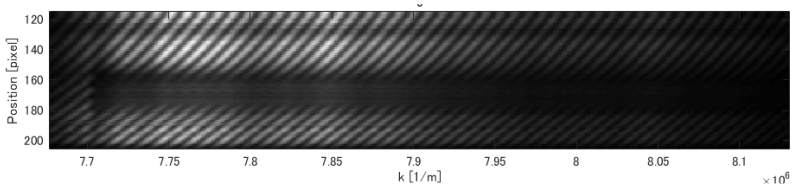

Fig. 1 Interference fringe at the moment of the laser irradiation to a solid Zirconia plate. It is measured using a spectral domain interferometer and a chirped pulse laser.