

Fully Digitally Controlled Laser Pulse Time Delay for Ultrasound Detection

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Abstract

Ultrasound is a form of sound wave that can propagate in different modes throughout the medium by elastic deformation. Ultrasound has been used in wide range of applications such as biomedical imaging research and chemical analysis [1,2]. In this work, we have demonstrated a digital time delay technique to precisely control laser pulse with the ultrasonic shock wave to monitor the diffraction pattern. Experimentally, the ultrasound signal is generated from a pulser-receiver (PR5073 Olympus) which is triggered by an external function generator at 10 KHz. Additionally, a gain switched semiconductor pulsed diode laser (LDH-705, PicoQuant) with a wavelength 705 nm is synchronized by a digital delay box (DG645, Stanford Research Systems). The laser spot is focused inside the cuvette which is filled with water. The transducer is dipped into water sample and fix above the laser focal area. In this way, diffraction pattern can be monitored by a CMOS camera (ASI294MC Pro, ZWO) when both ultrasound and laser pulse are temporally overlapped.

References

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