

ACOUSTICS2008/2056 LED-based Stroboscopic Schlieren System

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A stroboscopic Schlieren system is proposed to characterize acoustic fields in transparent media. Schlieren imaging has been used to visualize beam profiles of ultrasonic transducers mostly in liquids. The method is sensitive to gradients in refractive index, and can thus be used with solids and fluids. A stroboscopic illumination synchronized with the ultrasonic vibration (controllable phase delay between the illumination and the ultrasonic drive signal), allows obtaining an image of a propagating tone burst. An LED source provides relatively fast response time for high measurement bandwidth. Incoherent light doesn't suffer from unwanted interference, as with laser sources. Our setup employs two 90° off-axis parabolic mirrors. Non-reflected light is blocked with spatial filtering which is achieved with a knife-edge, placed at the focal point of the focusing mirror. We first present a time-averaged Schlieren image of the acoustic field of a 7.5 MHz focusing transducer, as a proof-of-principle result. Then a custom-built LED-based stroboscopic illumination system is used to visualize wave propagation in water emitted by a high power 20 kHz transducer. Schlieren imaging is useful in applications, where non-contact characterization of acoustic fields is necessary.