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Stroboscopic interferometric full-field imaging of laser-induced surface acoustic waves

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Surface acoustic waves (SAW) have the interesting property that they specifically interact with surface and sub-surface regions, rendering them suitable for non-contact investigation of sub-surface properties and heterogeneities. Transmission, reflection and diffraction effects of SAW propagation are analysed in order to reveal information on the region over which they propagate. Laser excitation allows to efficiently excite SAW with short wavelengths, enhancing both the lateral and the depth resolution. Typically information on the waves is collected by scanning a part of the surface of interest with a fast laser probe, using the surface displacement or slope as a real time witness of the wave field. Here we present results obtained by a full field imaging technique [1], in which the sample is repetitively excited by a pulsed pump laser, and the wave displacement field is stroboscopically gathered by illuminating the sample surface with an electronically delayed pulsed probe laser, whose displacement induced optical path variations are visualized by interferometrically analyzing it. In this work, the technique is applied on different samples, varying the geometry of the pump laser beam pattern, the interferometric configuration, and the heterogeneities of the sample.

[1] "Phase mask-based interferometer: operation principle, performance, and application to thermo-elastic phenomena", C.Glorieux, J.D.Beers, E.H.Bentefour, K.Van de Rostyne and K.A.Nelson, Rev.Scient.Instr.75(9), 2906-2920(2004)