ACOUSTICS2008/1973
Coherant acoustic excitation of nanostructures probed with asynchronous optical sampling

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We report the high-sensitivity detection of coherent acoustic excitation in semiconductor heterostructures and metallic nanostructures by using high-speed asynchronous optical sampling. Asynchronous optical sampling is based on two tunable femtosecond Ti:sapphire lasers with slightly different repetition rates close to 1 GHz. This new technique provides the performance of an all-optical oscilloscope for coherent excitations in a pump-probe set-up without any mechanically moving part. A time delay of 1 ns is scanned with a frequency of 10 kHz and a time resolution of 100 fs. Investigations on coherent zone-folded phonons in semiconductor superlattices and nanoscale metallic structures are discussed. For the latter the influence of the substrate on the damping of acoustic excitations is investigated in detail.