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Detection of elastic and optical contrasts in tissue mimicking phantoms based on the interaction of coherent laser light and transient displacements caused by the acoustic radiation force

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We recently demonstrated experimentally the possibility to optically detect transient perturbations generated by the acoustic radiation force, applied several centimetres deep in a tissue-mimicking phantom [Bossy *et al.*, APL **90**(17), 2007]. We proposed a detection scheme based on the transient decorrelation (millisecond time scale) of optical speckle patterns formed by coherent laser light that propagates through the phantom during the application of the radiation force. We demonstrated that this approach allows to detect optical contrasts embedded several centimetres deep in the phantom, based on the time-evolution of the correlation coefficient during the transient motion of the medium. In the present work, we demonstrate that this approach also allows the detection of shear mechanical contrast. Moreover, the shape of the observed decorrelation curve provides a way to discriminate between an optical contrast and a shear mechanical contrast. We are now currently investigating the feasibility of detecting with spatial resolution the propagation of a shear wave, based on its effect on localized acousto-optic interaction.