

Abstract Submitted  
for the DFD15 Meeting of  
The American Physical Society

**PIV as a temperature measurement tool** GHANEM F. OWEIS, Department of Mechanical Engineering, American University of Beirut, PO Box 11-0236, Beirut, Lebanon — In particle image velocimetry (PIV), a camera records time-lapse snapshot images of the positions of particles embedded in a fluid, which faithfully trace the flow path. Cross correlating sequential particle image pairs results in 2D maps of the particle displacement and velocity fields. Here, the same PIV method is extended to temperature measurements in viscoelastic material. The motivation originates in a need for tissue temperature measurements in hyperthermia therapies such as laser ablation eye surgery and high intensity focused ultrasound (HIFU) tumor ablation. Micron sized particles are embedded in an optically clear tissue mimicking phantom, illuminated with a laser sheet, and imaged with a CCD camera. When the phantom is subjected to heating from a focused ultrasound beam, the particles remain stationary, but not their spatial distribution in the recorded images. The images manifest particle displacements commensurate with alterations in the temperature distribution from heating. The underlying principle behind the thermometric capability of PIV is discussed. Temperature changes can be detected with high sensitivity, and the method works best with spatially localized temperature distributions.

Ghanem F. Oweis  
Dept of Mechanical Engineering, American University of Beirut,  
PO Box 11-0236, Beirut, Lebanon

Date submitted: 01 Aug 2015

Electronic form version 1.4