

Abstract Submitted
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Evanescent wave based near-wall thermometry utilizing Brownian motion¹ KANJIRAKAT ANOOP, RANA KHADER, REZA SADR, Texas A&M at Qatar — Near wall velocity and temperature measurement is instrumental in research associated with convection heat transfer. Nano Particle Image Velocimetry (nPIV) technique is known to be an effective tool for near-wall velocity measurements. nPIV uses evanescent wave generated by total internal reflection of light to illuminate particles within few hundred nanometers of the wall. Furthermore, temperature measurement at micro scale using Brownian motion characteristics of sub-micron tracer particles used in Micro PIV is well established. This temperature measurement technique is based on the fact that a change in temperature affects Brownian motion that consequently affects the PIV cross-correlation characteristics. In this study the possibility of utilizing this effect for near-wall thermometry is investigated using synthetic nPIV images of 100nm diameter particles. In addition to Hindered Brownian motion, the numerical method includes other near wall forces on the particles such as shear induced lift, buoyancy, electrostatic repulsion, and van der Waals attraction. Simple experiments are carried out using stationary liquids at different temperatures to verify the obtained results.

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