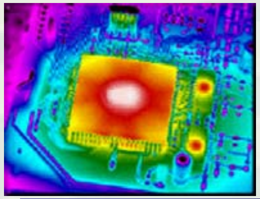


Micro-scale Temperature measurement

Faculty: S. T. Wereley and S. V. Garimella   Student: P. Chamarthy

Objective

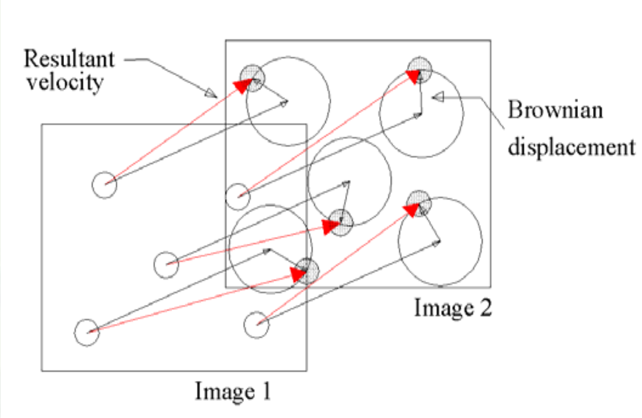
Novel non-intrusive temperature measurement technique to be applied in microchannels

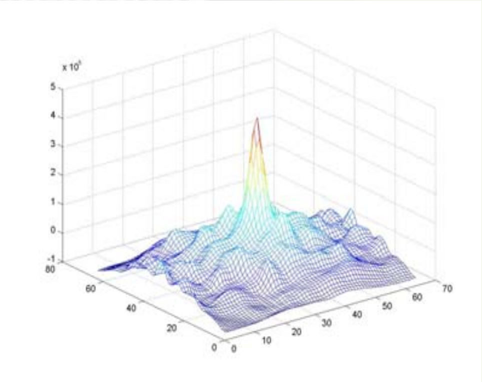
Impact

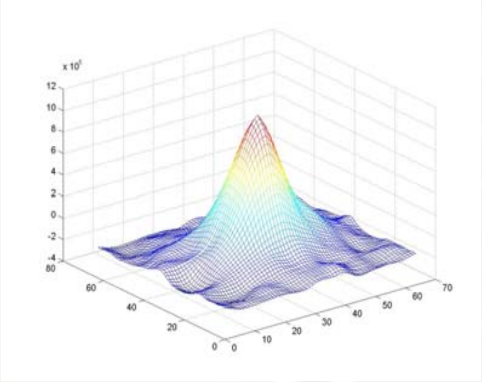
Microchannel heat sinks, lab on a chip, …

Approach

Measurement of Brownian motion of suspended particles is used to extract temperature information from low-speed, steady flows. A novel technique is being developed to measure temperature at higher velocities.



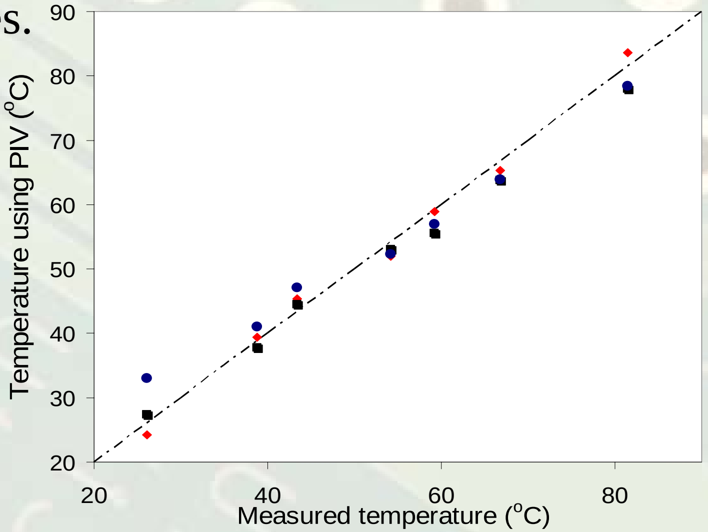




$$\Delta s_{o,c} = \sqrt{2d_e^2 / \beta^2}$$

$$\Delta s_{o,c} = \sqrt{2(d_e^2 + 8M^2 \beta^2 D\Delta t) / \beta^2}$$

Shows the effect of Brownian motion in PIV analysis and the equation that relates it to temperature.



Plots shows the measured temperature vs the actual temperature. Uncertainty involved in the method is ±1 K.

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