

Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Effect of Experimental Parameters and Image Noise on the Error Levels in Molecular Tagging Velocimetry/Thermometry (MTV/T)
JIANGHUA KE, Clarkson University, DOUGLAS BOHL, Clarkson University — In this work the effect of experimental parameters on the error levels associated with simultaneous measurement of velocity and temperature using Molecular Tagging Velocimetry/Thermometry (MTV/T) are quantified via simulated images. Images were simulated using Gaussian profile laser lines. Noise was added to the images using a uniform random distribution and a Gaussian random distribution to simulate electronic noise and shot noise respectively. The results showed that the error levels in the velocity and temperature measurements were inversely related for most experimental parameters including the laser line thickness, fluid temperature and image delay times. It is concluded that the dynamic range of the technique depends on the flow speeds and temperatures and must be determined for each experiment individually. Error levels, for 95% confidence, were found to be better than 0.3°C for temperature and 0.2 pixels for velocity given typical experimental parameters.

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Date submitted: 29 Jul 2009

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