An Approach for Correcting the Velocity Bias Error in One-Component Molecular Tagging Velocimetry: Experimental Demonstration[1] PATRICK HAMMER, SHAHRAM POUYA, AHMED NAGUIB, MANOOCHEHR KOOCHESFAHANI, Michigan State University — Measurements and simulated experiments have been performed to demonstrate the validity of a method to correct for the velocity bias error associated with single-component Molecular Tagging Velocimetry due to the presence of a velocity component along the line of tagged molecules. The method, the theoretical basis for which is presented in a preceding talk, utilizes two MTV images obtained using two different time delays relative to the un-delayed image to correct for the bias error. An experiment based on fully developed flow in a rectangular channel is used to validate the correction approach. In the experiment, a velocity component along the "tag line" is deliberately imposed by tagging molecules along a line that is inclined to the flow direction in the channel. The error produced by interrogation normal to the line is corrected using the new approach, and the result is compared against bias-error-free measurements based on interrogation of the line in the flow direction. The results show that the new approach successfully corrects for the bias error. The sensitivity of the correction to parameters such as measurement noise, time-delay pairs, and flow angle, is assessed using simulated experiments.

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Date submitted: 09 Aug 2012　　　　　　　　　　Electronic form version 1.4