

Micro PIV System

For robust microflow measurements

Microvec Micro PIV Systems are easy to integrate and to operate, designed for research and university customers. They work in small fields of view ($100\mu\text{m}$ to 10mm) with micron scale spatial resolution and limited flow speed (up to 10m/s). They can also be used to acquire images with the high speed of over thousands frames per second. It works with a microscopic lens or integrated with an epi-fluorescent microscope.

System overview

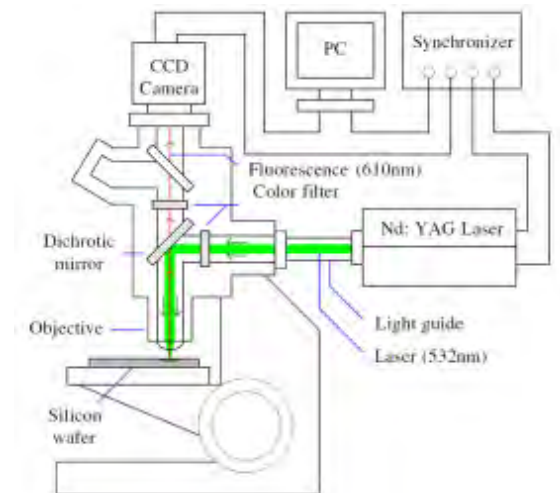
Microvec Micro-PIV System measures velocity fields of flows with microscopic resolutions using PIV and PLIF techniques. The light source is usually a double pulsed PIV laser that is focused by microscopic lens or microscope on a microfluidic device. For PIV the flow is seeded with fluorescent tracer particles. A camera is installed on the microscope to acquire image pairs with particles excited to a higher wavelength than the illuminating light passing through the high-pass filter. These image pairs are then analysed with standard PIV algorithms.

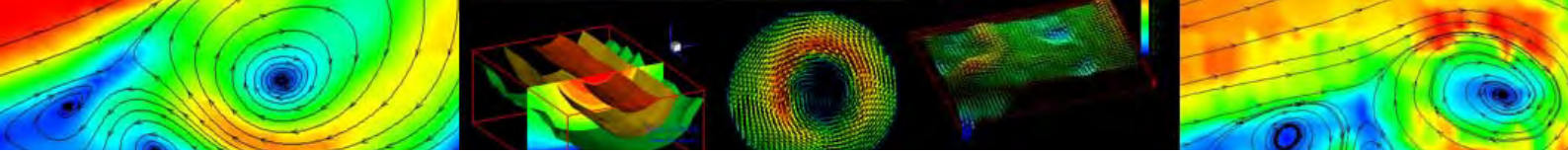
A classic example on the next page shows PIV and LIF results of a study on flow characteristics in $200\mu\text{m}$ wide microchannel model. The results shown here correspond to two phase flow characteristics of oil-water mixed measurement. Laser used for the experiment was double pulse 532nm Nd:YAG solid-state pulsed laser, $350\text{mJ} \times 2$; 15Hz with pulse width of $6\text{-}8\text{ns}$. 5 megapixel camera with the maximum sampling rate of 15Hz using double exposure mode with Epix EB1 frame grabber and MicroPulse725 synchronizer. Maximum speed of the plane was 1m/s and the spatial resolution was $0.475\mu\text{m}/\text{pixel}$. Latest MicroVec software was used for the calculations.



Standard Components

- PIV lasers: $2 \times 70\text{mJ}/15\text{Hz}$, $2 \times 135\text{mJ}/15\text{Hz}$, $2 \times 200\text{mJ}/15\text{Hz}$
- DPSS lasers: 1W, 2W, 3W, 5W, 8W, 10W
- CCD cameras: including all interface cables and camera frame grabber: VGA/260fps, 1 MP/148fps, 2 MP/30fps, 4MP/41s, 5MP/16fps, 8MP/21fps, 11MP/6fps, 16MP/4fps or 29MP/4fps
- Synchronizer: 7, 8 or 15 channel TTL control, 0.25ns jitter, USB controlled





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- MicroCap PIV Image Capture Module & MicroVec 2D high precision PIV software package (Windows 32-bit & 64-bit)

Features

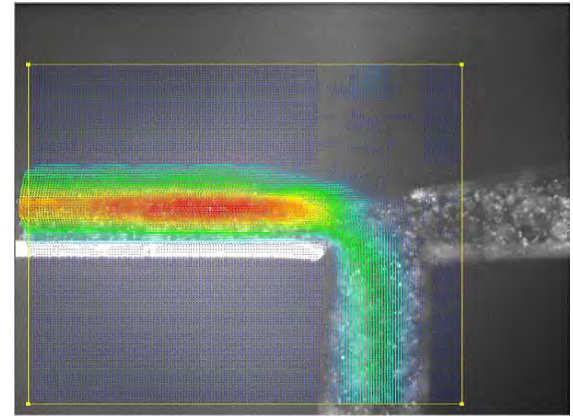
- MicroCap software for image capture and MicroVec software for image-processing and analysis
- Integrated and easy control of all hardware components: CCD, laser, synchronizer, external trigger
- Support multiple image files: TIFF, BMP, JPG and AVI
- Online particle image-acquisition and velocity-analyses function
- High resolution 2D PIV with adaptive multi-pass, multi-grid window deformation algorithm
- Support Mask function and multi-average function (particle image and vector result average function)
- Batch processing: single directory or multi-directory auto process
- Support high density PTV function and particle size analysis
- Advanced vector filter and multi zoom combination function
- Scalar field measurements
- Momentum (MV) measurements
- Includes GPU parallel processing support improving computing acceleration by factor 10

Applications

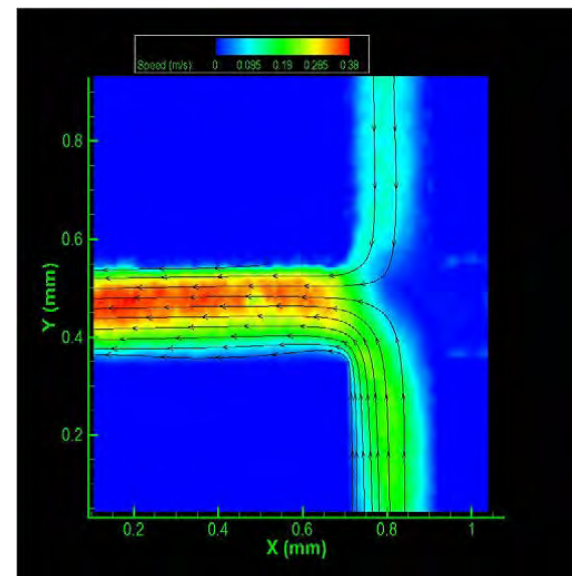
- Microfluidic Devices
- Liquid Jets/Nozzles
- Microscale Deformations and Strains
- Particle Analysis
- Micro Channels
- MEMS applications

Options

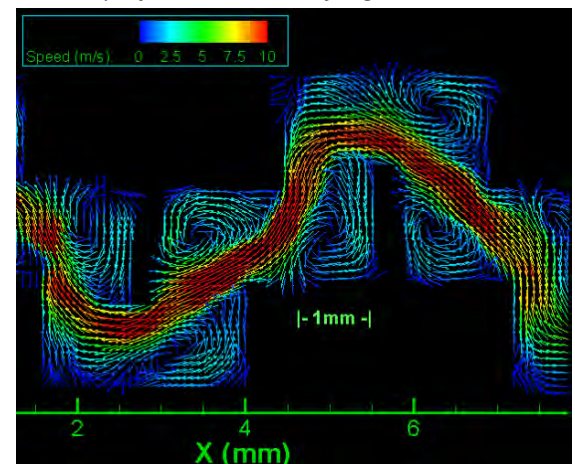
- Proper Orthogonal Decomposition (POD) module
- Dynamic Mode Decomposition (DMD) module
- Pressure measurement with PIV module
- Single Pixel PIV



Application: Two phase flow characteristics of oil-water



Application: Two phase flow characteristics of oil-water (Pictures courtesy of Dr. Wang Xi, Institute of Process Engineering, Chinese Academy of Sciences, Beijing, China)



Application: Flow characteristics in a labyrinth flow path of a drip irrigation emitter