

POWERSIGHT SOLID STATE LASER-BASED LDV SYSTEM

LDV DATA TAKEN ON A ROTATING DISK

APPLICATION NOTE POWERSIGHT-001

Data was taken using the PowerSight Solid State Laser-Based LDV/PDPA System from TSI Incorporated on a rotating disk. A schematic of the rotating disk configuration can be seen in Fig. 1. The wheel is used as an absolute calibration device because the motor is a constant 12.5 rps (revolutions per second) (750 rpm) at 50 Hz and 15 rps (900 rpm) at 60 Hz. It is an AC synchronous motor which is tied to line frequency. Typical line frequency varies by only $<\pm 0.02\%$ in the United States.

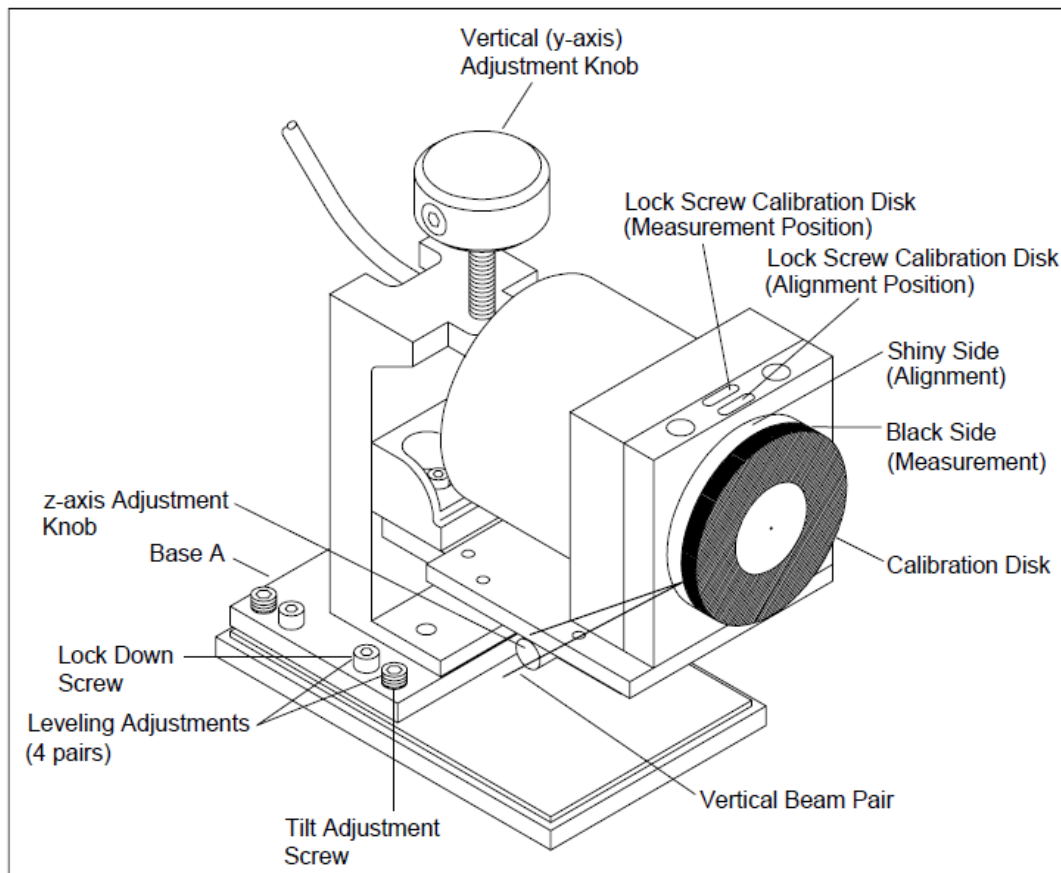


Fig. 1. Schematic showing the components of the rotating calibration disk.



The 1-component PowerSight system was aligned on the wheel and data was taken. The correct velocity of the wheel at 60 Hz line voltage is:

$$\begin{aligned} \text{Wheel Tip Velocity} &= 15 \text{ rps} \times \pi \times .0800 \text{ M (diameter of wheel)} \\ &= 3.77 \text{ m/s.} \end{aligned}$$

The value measured by the PowerSight system was 3.7643 m/s (with RMS velocity of 0.0338 m/s). This translates to an uncertainty of 0.15%. A screenshot of the dataset can be seen in Fig. 2.

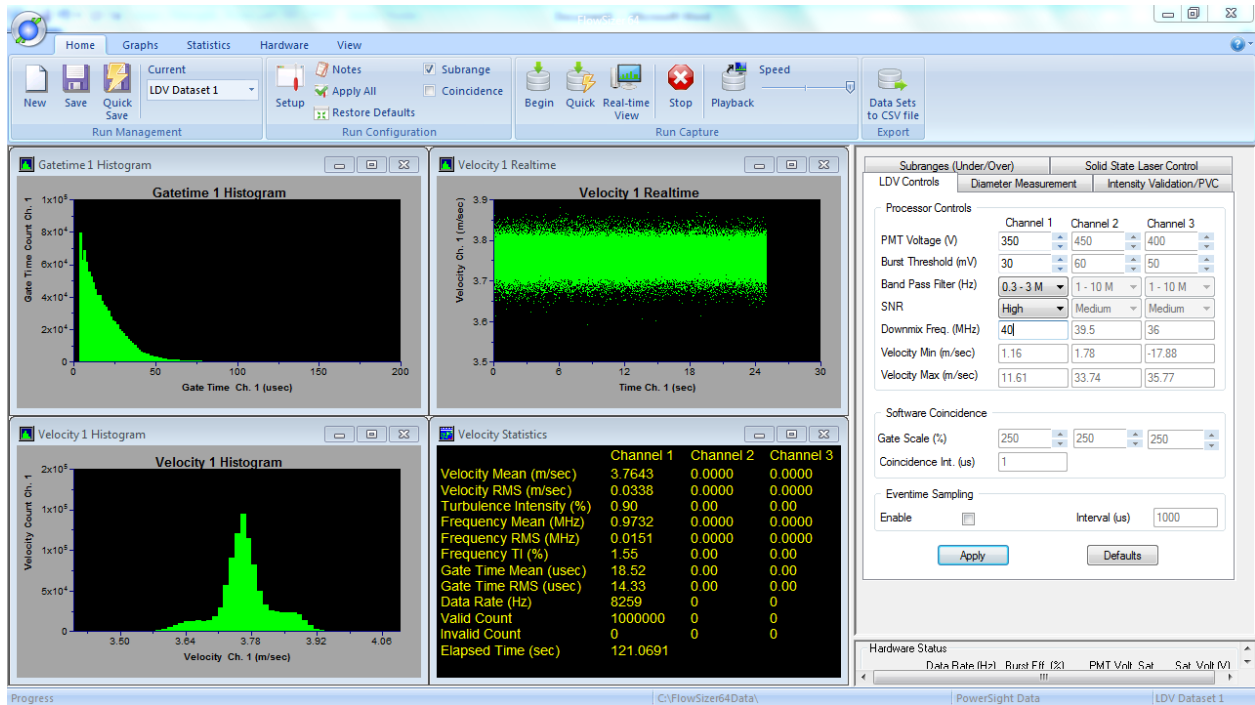


Fig. 2. A screenshot from the dataset taken of the rotating calibration wheel.

A table showing the relevant optical parameters for the experiment can be seen in Table 1.

Table 1. Relevant optical parameters from the experiment.

Parameter	Channel 1
Wavelength (nm)	532
Focal Length (mm)	363.00
Beam Separation (mm)	50.00
Laser Beam Diam (mm)	2.10
Beam Expander (ratio)	1.00
Expanded Beam Sep. (mm)	50
Expanded Beam Dia. (mm)	2.1
Fringe Spacing (um)	3.8715
Beam Waist (um)	117.09
Bragg Cell Freq. (MHz)	40
Velocity Limit Min (m/sec)	1.16
Velocity Limit Max (m/sec)	11.61



UNDERSTANDING, ACCELERATED

TSI Incorporated – Visit our website www.tsi.com for more information.

USA Tel: +1 800 874 2811
 UK Tel: +44 149 4 459200
 France Tel: +33 4 91 11 87 64
 Germany Tel: +49 241 523030

India Tel: +91 80 67877200
 China Tel: +86 10 8251 6588
 Singapore Tel: +65 6595 6388