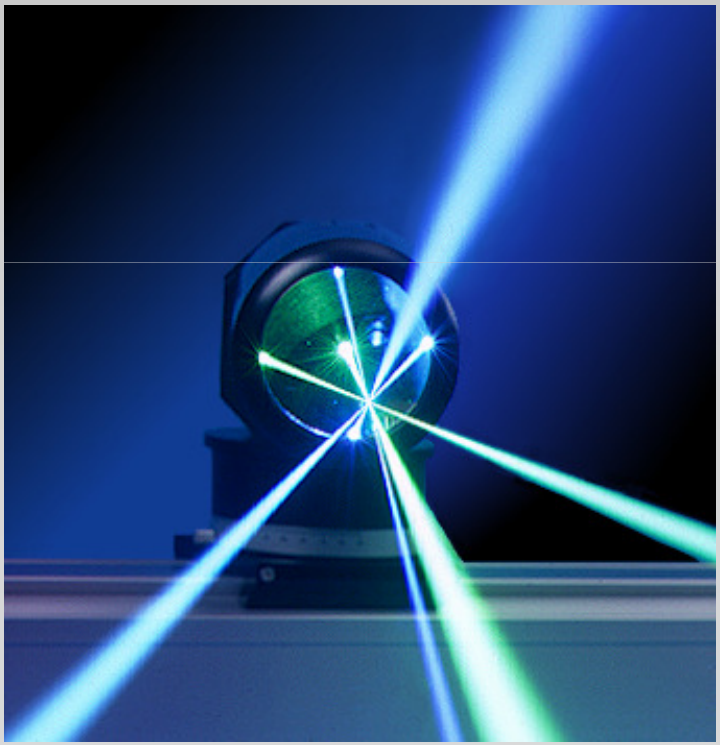
Laser Doppler Anemometry

Introduction to principles and applications



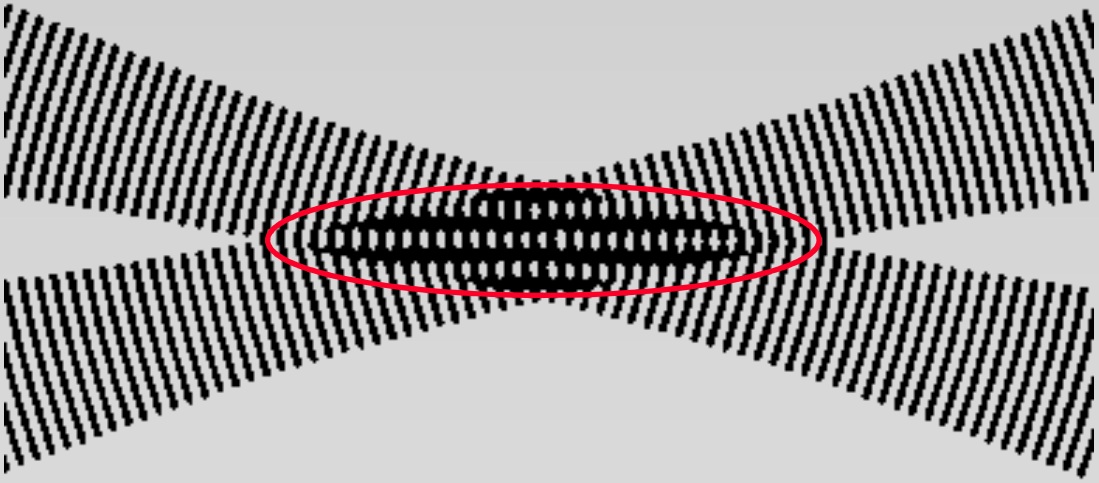
DANTEC
Measurement Technology

Characteristics of LDA

- Velocity measurements in fluid dynamics, e.g. fluid machinery (gas, liquid)
- Up to 3 velocity components
- Non-intrusive measurements (optical technique)
- Absolute measurement technique (no calibration required)
- Very high accuracy
- Very high spatial resolution due to small measurement volume
- Tracer particles, micron o.m. are required (e.g. silicone oil in air, polyamid in water) – velocity of particles

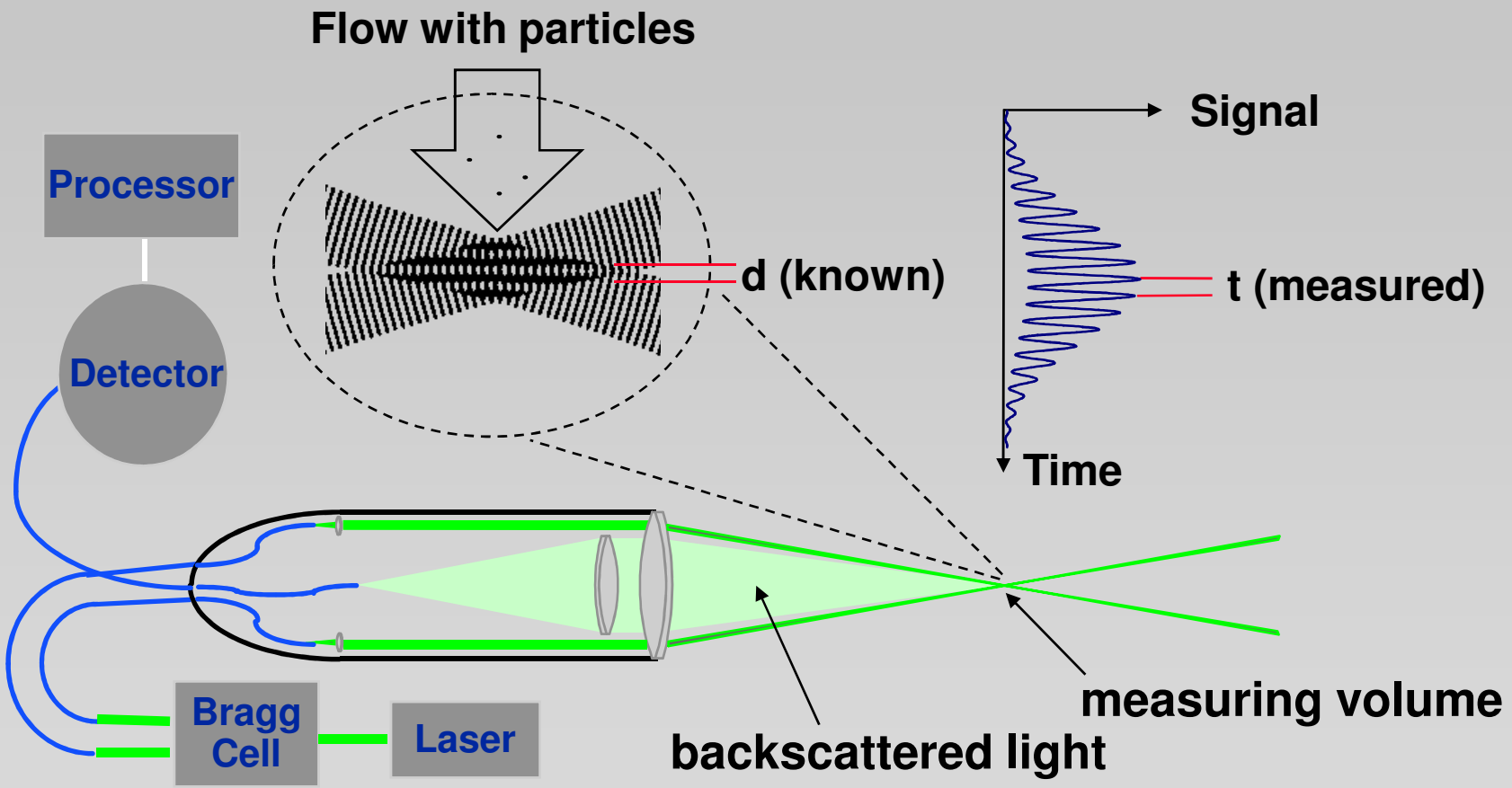
LDA - Fringe Model

- Focused Laser beams intersect and form the measurement volume
- Interference in the plane of intersection
- Pattern of bright and dark stripes/planes

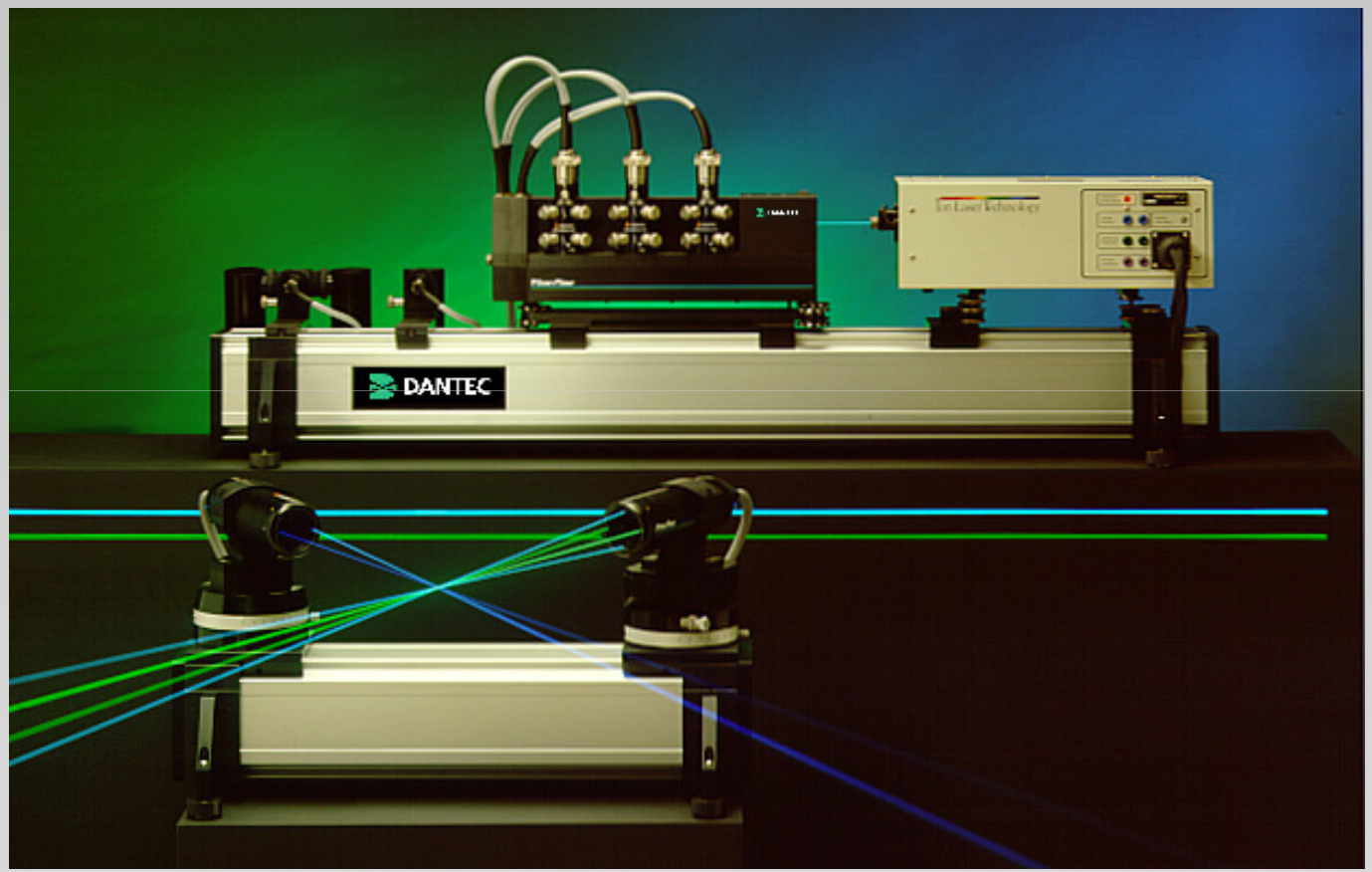


Velocity = distance/time

$$d = \frac{\lambda}{2\sin(\alpha/2)}$$

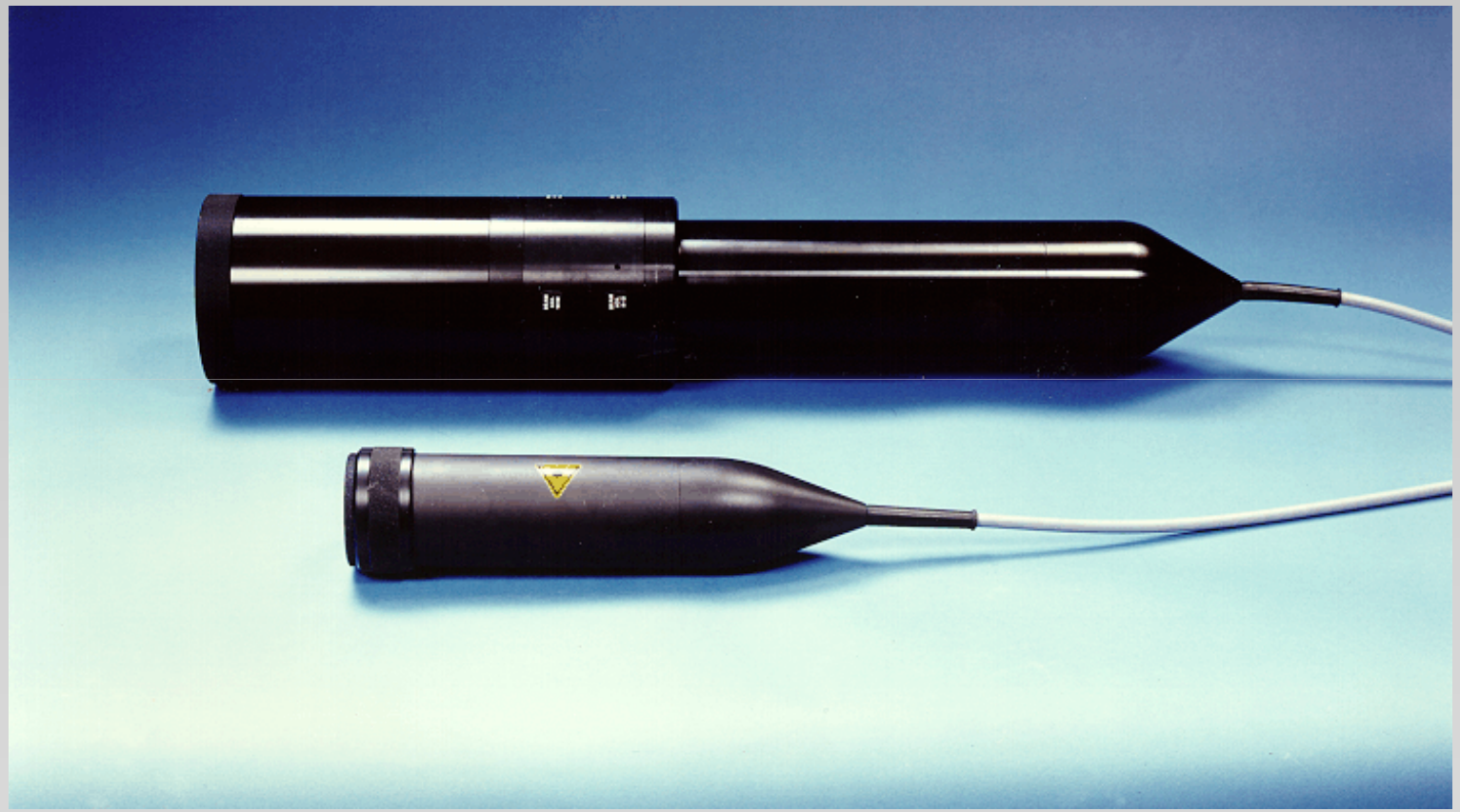


LDA Fibre Optical System



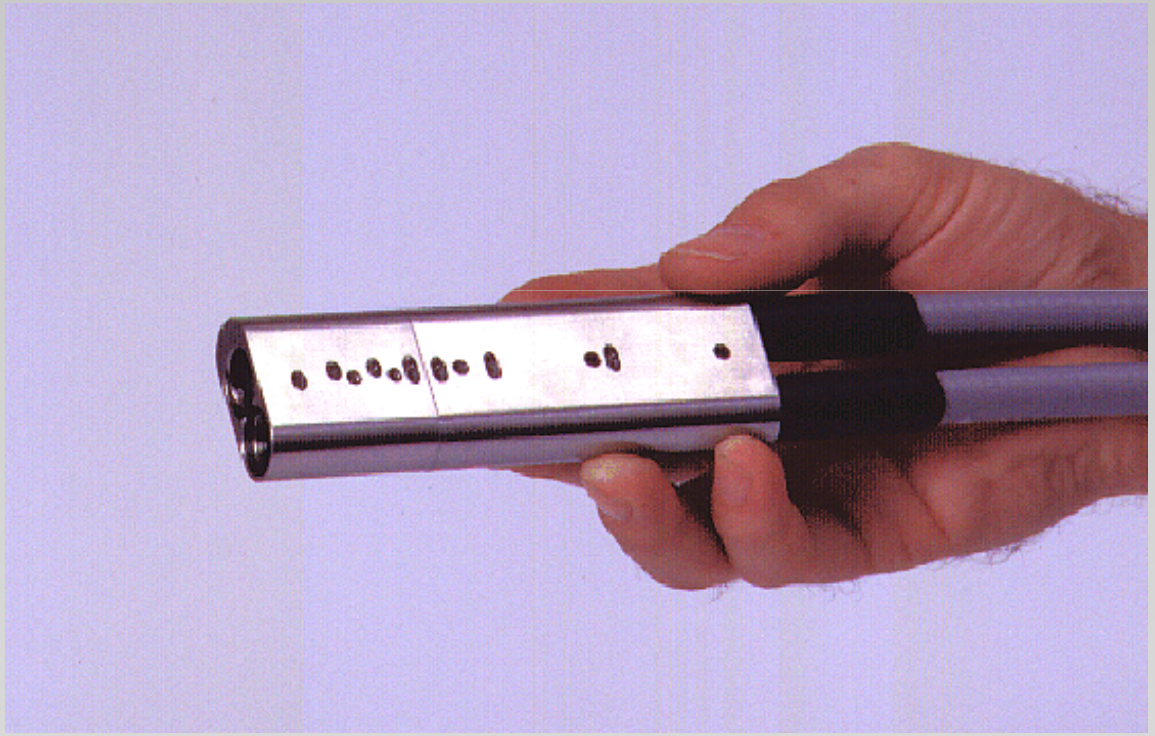
DANTEC
Measurement Technology

60 mm and 85 mm *FiberFlow* probes



DANTEC
Measurement Technology

The small integrated 3D *FiberFlow* probe



DANTEC
Measurement Technology

Measurement of air flow around a helicopter rotor model in a wind tunnel

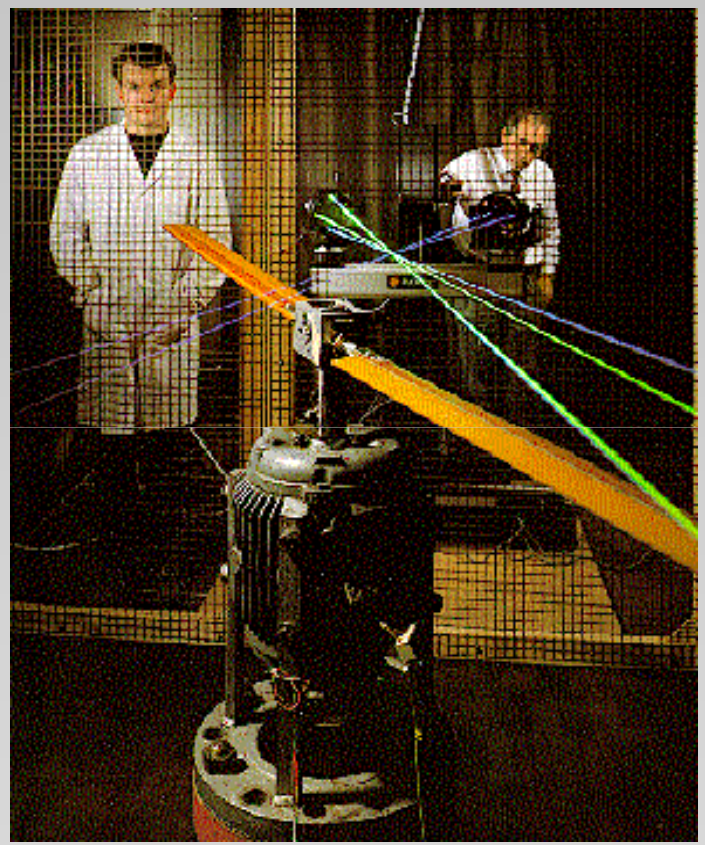


Photo courtesy of University of Bristol, UK

DANTEC
Measurement Technology

Measurement of water flow inside a pump model

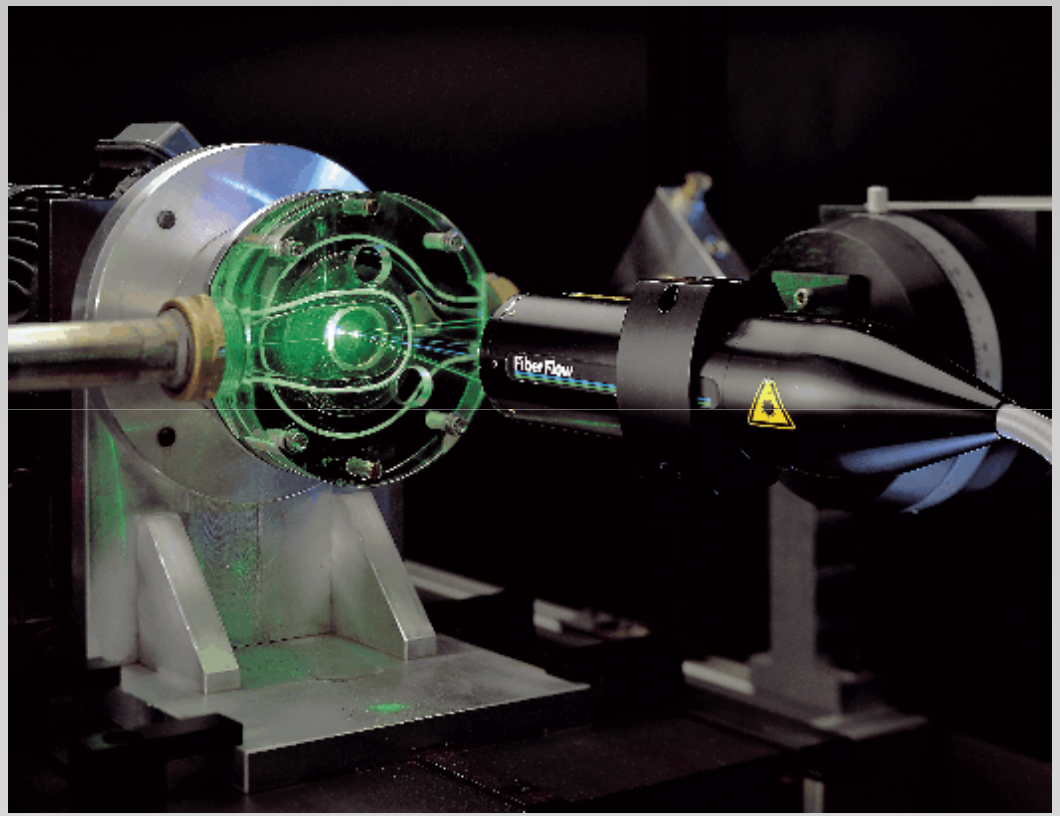
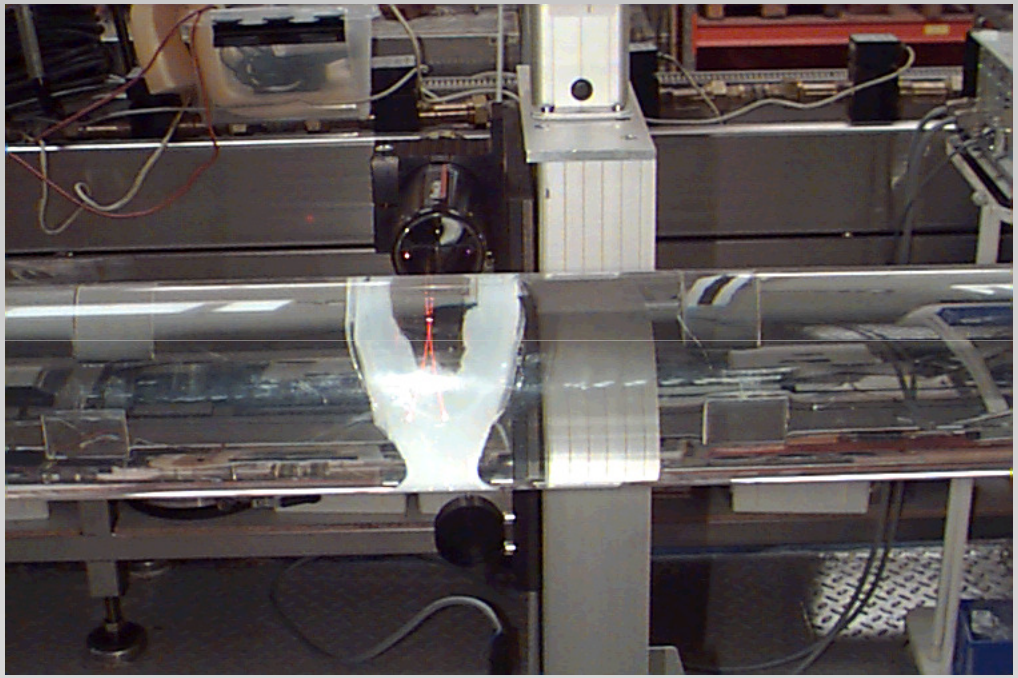


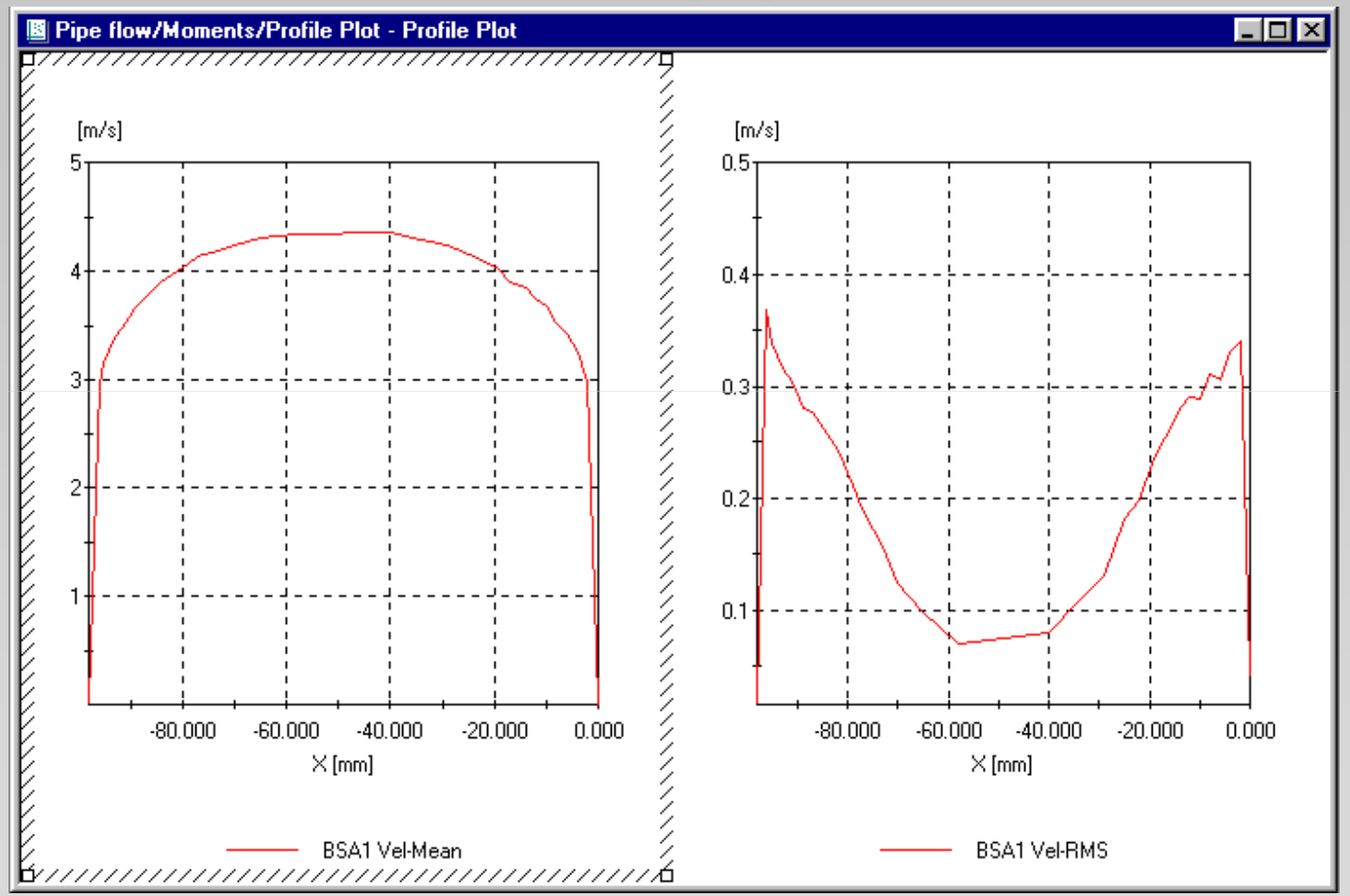
Photo courtesy of Grundfos A/S, DK

DANTEC
Measurement Technology

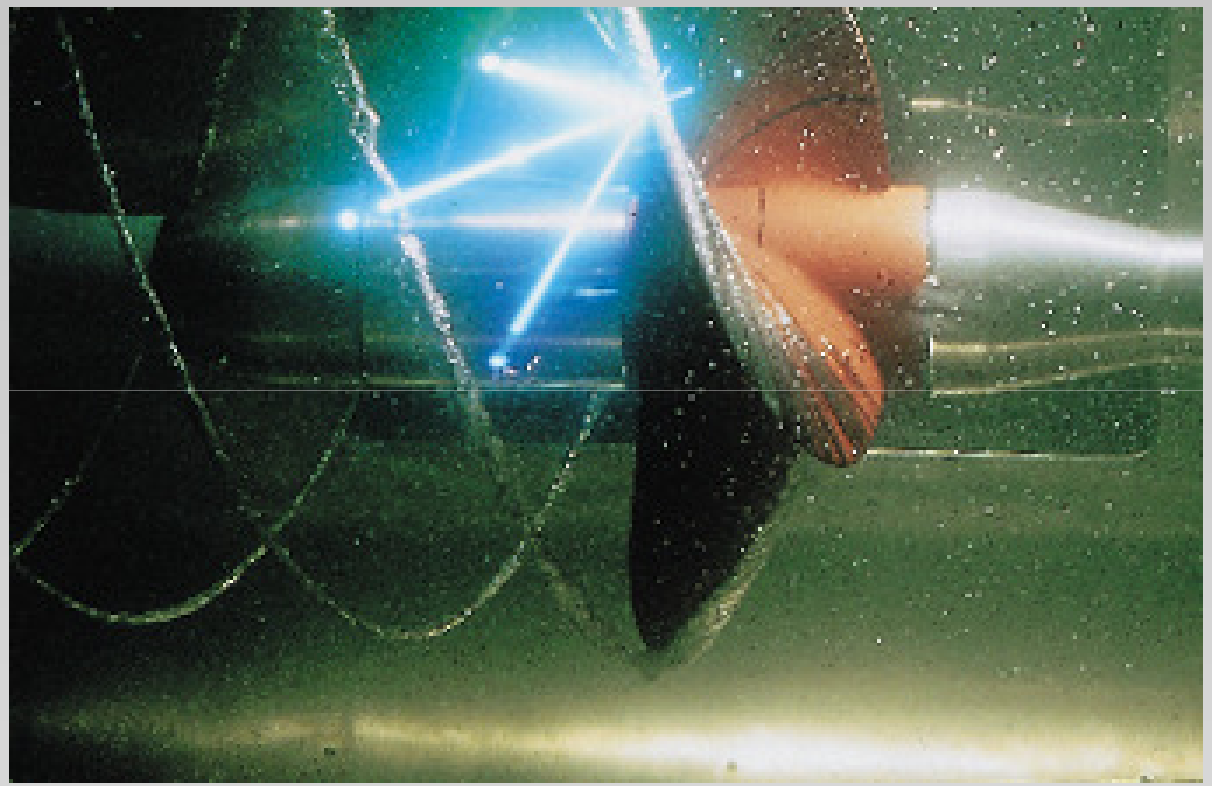
Measurement of velocity profiles in a water pipe



Velocity profile, fully developed turbulent pipe flow



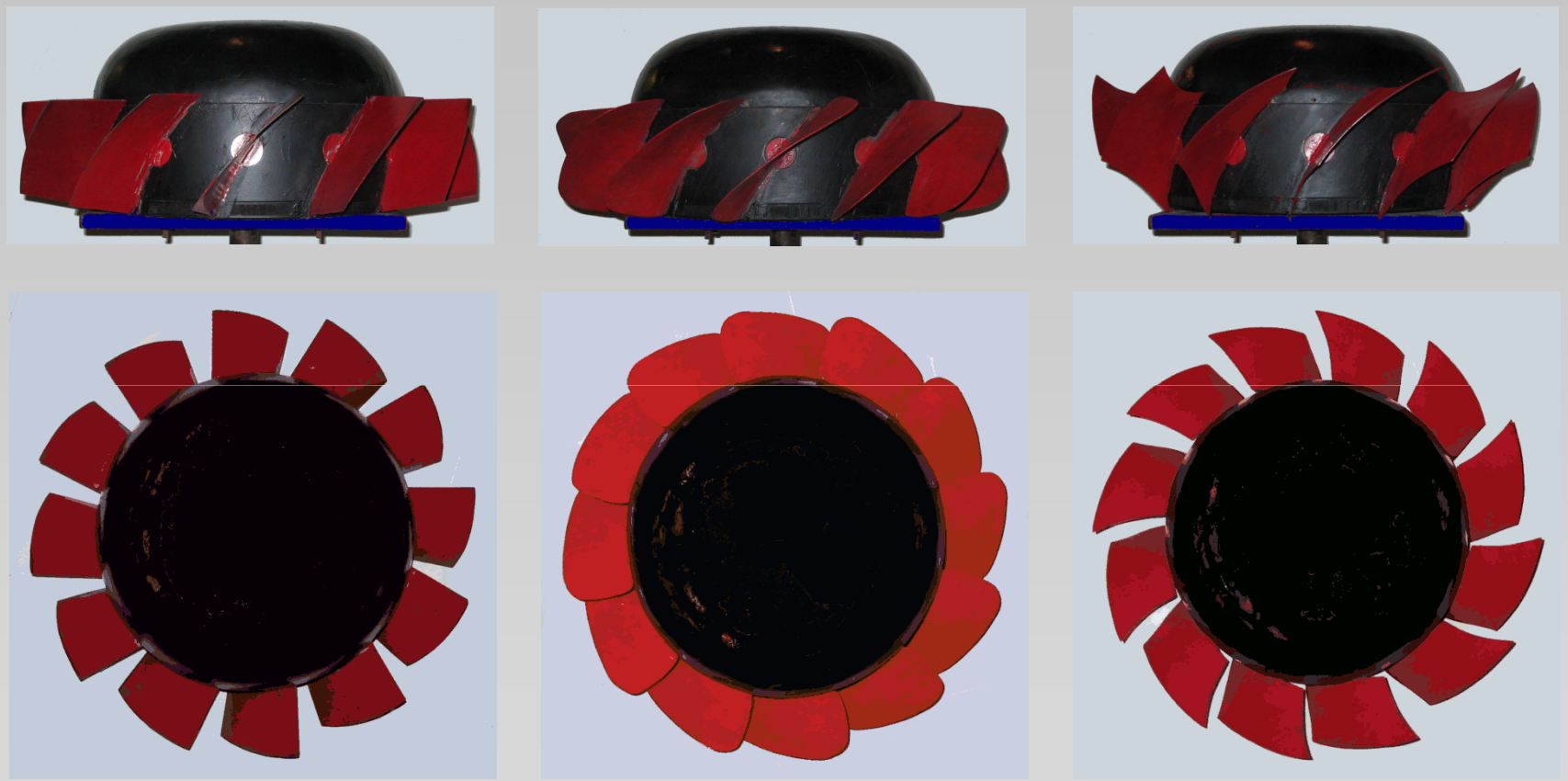
Measurement of flow around a ship propeller in a cavitation tank



DANTEC
Measurement Technology

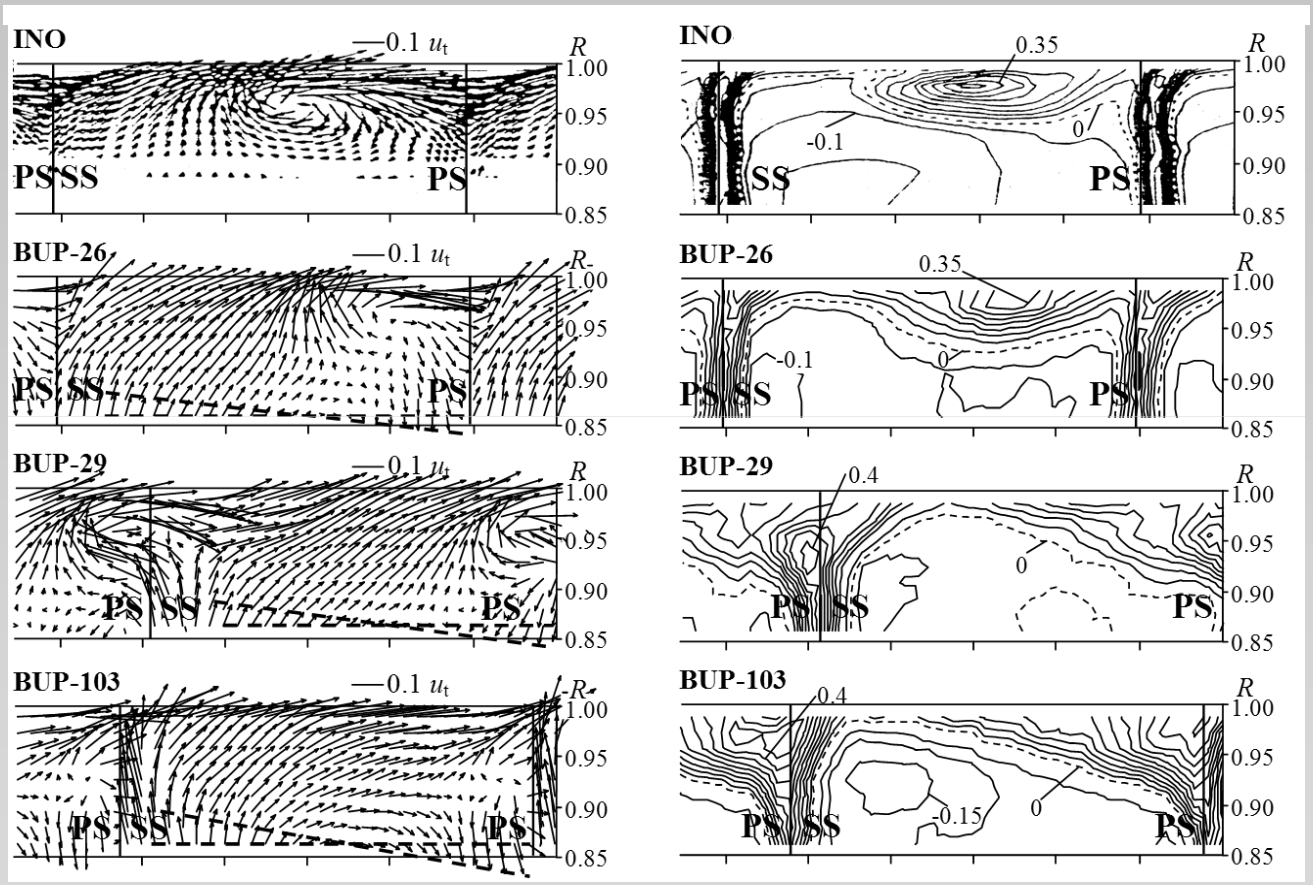
High-pressure axial fans

- Customized design, redesign, for industry



Laser Doppler Anemometry (LDA)

Measurements on near-tip phenomena in various rotors



Secondary flow map ***Kinetic energy defect***