PARTICLE IMAGE VELOCIMETRY (PIV) MEASUREMENTS IN S2MA

PIV objectives at transonic speed

The PIV technique enables the measurement of a 2- or 3-components averaged flow velocity distribution in a plane around a model.

PIV application

S2MA is equipped with a stereo PIV system based on off-the-shelf PIV cameras and laser, and using in-house FOLKI-SPIV image processing and data reduction software. Up to 5 generators (Laskin nozzle type) are used to seed the flow at the settling chamber with micron-sized droplets of DEHS.

The PIV system was extensively tested in 2008, and validated by comparison with different reference flowfields.

Wake survey (observation plan orthogonal to the flow) or configurations with laser plan scanning the flowfield around the wing have been investigated and validated.

Preparation

set up of optical arrangement (light sheet and cameras), reduced light scattering in the test section (painting of the model and/or wall with rhodamin or black paint is often necessary), calibration of the whole system.

Camera and laser installation are performed in parallel with other preparation tasks. Most of the PIV system optic components are remotely controlled. Laser and camera adjustment and calibration require 2 working days inside S2MA.

Testing

PIV measurements are performed at fixed flow conditions. The number of images required to assess the averaged velocity field depends on the flow conditions: typically a minimum of 200 images is acquired.

Re-positioning of the light sheet plus calibration requires about 3 hours of S2MA occupancy.

Results

The PIV system has its own independent data acquisition system.

PIV measurements are validated at the end of each run and available immediately.

Accuracy

This is strongly dependent on the configuration.

For a typical wake traversing plane, an accuracy of about 1 % can be expected.

Limitations

Due to limited optical access, implementation of laser and cameras has to be investigated carefully prior to the test.

DEHS use is not compatible with PSP and MDM measurements. Attribution of slots for PIV measurements is submitted to wind tunnel management agreement.